Practical Principle and Technical Standards for DAB+ National and Local Planning

Deliverable No. 3

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Notice

This document is provided in good faith and is based on the Consultants' understanding of the NBTC's Radio Frequency Plan Project requirements. We would be pleased to discuss the contents of this document with you, particularly if NBTC's requirements have in any way changed.

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1. Executive Summary

The Office of the National Broadcast and Telecommunications Commission, herein in this report referred to as "NBTC", has the mandate to implement and promote the Thai Government's policy objectives for the broadcast and telecommunications sector in Thailand, and to establish and monitor the regulatory framework for the guidance of the telecommunications and broadcasting industries.

In the execution of its mandate to regulate the broadcasting sector in Thailand in line with the duties and responsibilities laid down in the Telecom Act BE2555 sections 27(1) and (5), the NBTC has embarked on a Radio Frequency Plan Project, hereinafter referred to as "RFPP", with the main objective to develop a forward-looking radio frequency plan. This plan includes all related policies and implementation strategies for the introduction and management of digital radio services in Thailand based on, among others, international best practises established through a comparative assessment and benchmark study on Thailand and the benchmark countries subject to this study.

The technical terms and conditions for the use of radio frequency services to be developed within the scope of this project shall give consideration to public, local, and commercial services (including local, regional, and national levels). In addition technical standards for the sound broadcasting services shall be defined. The radio frequency plan and related technical standards shall be developed in compliance with the Act on Organization to Assign Radio Frequency and to Regulate the Broadcasting and Telecommunications Services B.E 2553 (2010): article 27 (1) (5) and (10).

The main focus of the Consultancy is intended to be laid on

- the maximisation of the overall public benefit from use of the spectrum allocated for digital radio services;
- transparent and effective process for the introduction and management of digital radio services;
- assessment, evaluation and recommendations to optimise the FM radio services;
- assessment of the current AM radio services; and
- benchmarking of the different proposals with international country's standards.

The NBTC has entrusted LS telcom Limited, hereinafter referred to as the "Consultant", with the task to conduct this Radio Frequency Plan Project.

1.1 Scope of Practical Principle and Technical Standards for the DAB+ National and Local Planning

The scope of this document is to present the proposed DAB National and Local Coverage plans ("Scenario 3"). Scenario 3 is defined as follows:

Provide a National DAB+ SFN coverage for 4 multiplexes considering a full analogue television (ATV) switch-off situation, including an additional 4 multiplexes for the 39 local areas as defined by the ITU[1] *and accepted by NBTC.*

[1] ITU, "Local and regional areas for digital radio", 25 April 2014.

1.2 CONTEXT OF WORK ASSIGNMENT: NATIONAL DAB+ SFN COVERAGE

In 2013, the NBTC issued the "Term of Reference Consultancy Service for Radio Frequency Plan and Technical Standards of Sound Broadcasting Service'' in the context of Thailand's plans and strategy to migrate to digital broadcast technology for radio and TV broadcast services. The Consultant responded to the NBTC and after a successful negotiation period has been attributed the mandate to complete the AM, FM and digital radio plans for Thailand.

The NBTC selected a staged approach for the introduction of DAB+ in Thailand and 3 project evolvement stages – an introductory stage, a transitional stage and a final stage.

In response to NBTC's requirements under this mandate, the Consultant originally planned to provide three (3) digital radio plan scenarios, as follows:

- DAB+ Plan for 11 cities specified by the NBTC (Scenario 1);
- Transitional DAB+ Plan on a national level (Scenario 2); and
- Final National DAB+ Plan after analogue TV switch-off on a local, regional and national level according to the ITU report presented to NBTC (Scenario 3).

After further discussion with the NBTC during the week of July 14th, 2014, it was concluded that it would be more efficient to eliminate the Transitional DAB+ plan (Scenario 2) and jump directly from the 11 cities plan (Scenario 1 – Trail DAB+ Plan) to the final National DAB+ Plan (Scenario 3). During these meetings in July 2014, the NBTC also indicated that other Consultants are presently in the process of evaluating the value of the spectrum that will be required for the DAB+ usage, thus the National DAB+ SFN plan had to be given priority.

1.3 PRELIMINARY KEY FINDINGS

In the course of this work assignment the following preliminary key findings were made by the Consultant when establishing the Draft National DAB+ SFN Plan:

- Desired number of multiplex (4) could be realized for the National SFN Plan.
- To ensure continuity with Scenario 1, the Draft National DAB+ SFN Plan has been based on ATV channel 8 (4 full multiplexes) for all regions with the exception of the 4 local areas located within or close to the coordination zone with Malaysia.
- For the areas of Satun, Trang, Songkhla and Yala channel 7 has been selected. This is compatible with the Scenario 1 plan as per NBTC's requirement since Songkhla was using channel 7. This ensures coordination compatibility with Malaysia. The local multiplexes in this area use ATV channel numbers 6 and 9, with the exception of Trang that will be using channel 5 (Trang is located 75 km from the Malaysian border). These ATV channels are pre-coordinated with Malaysia.
- All multiplexes (A, B, C and D) in the 2 selected channels provide equivalent coverage. For this reason the Consultant has decided that due to the affinity of the coverage area only one multiplex has been represented on the coverage maps.
- Since the multiplexes will be co-located, no adjacent interference will occur within each block.
- Potential interferences between adjacent blocks Xd and (X+1)a (for example 5d and 6a) have been evaluated for critical cases and were found to be less than 1%, which is within the margin of error of the simulation model and has consequently not been further evaluated for each instance where this situation was present.
- The multiplexes' Effective Radiated Power (ERP) has been selected from the following specific values: 50 kW; 25 kW; 10 kW; 5 kW; 1 kW.
- The proposed antenna height for the DAB+ system has been set as the antenna height of the tower provided in the database minus 15m for broadcasting towers (FM and ATV).
- The proposed antenna height for the DAB+ system has been set as the antenna height of the tower provided in the database minus 10m for telecom towers (TOT/CAT). For the telecom towers, the DAB+ system ERP has been set at 5 kW.
- This report demonstrates that by only using the existing tower infrastructures as provided by the NBTC, the population coverage objectives as defined in the ITU Roadmap Report could not be met. For this reason the Consultant added allotment parameters to the plan that will allow for the addition of new greenfield towers to achieve the 95% population coverage objectives.
- At the request of NBTC, for business case sensitivity analysis purposes, the Consultant has also provided an intermediate value coverage scenario with the objective of providing DAB+ service coverage for about 70% of the Thai population.

2. Network Design and Presentation Format

In the following section the Consultant describes the simulation software, input parameters and methodology applied in determining the National DAB+ SFN Plan.

Based on NBTC inputs with respect to the actual usage of the analogue television (ATV) channels and FM channels databases in Thailand, the Consultant has identified and computed the required sites in order to provide the National DAB+ SFN Plan. The National Plan has been split into the following two different zones:

- Malaysian border area, where channel 7 has been used for the national SFN service and where channel 6, channel 9 and channel 12 have been used for the local services. The SFN coverage included the following provinces: Narathiwat, Pattani, Phatthalung, Satun, Trang, Songkhla and Yala.
- For the rest of Thailand channel 8 has been used for the national SFN service.

Moreover, all other TV channels (channels 5 to 11) have been used for the local SFN services. Since it was not necessary, and following the NBTC guidance, channel 12 has not been considered in this plan.

It should be noted that a limited zone of interference may occur at the edges of the coverage areas of channel 7 and channel 8 (see Section 3.2). Multiplex blocks 7D and 8A may therefore be minimally affected through this potential minimal interference.

The simulation parameters for the DAB+ system used in this study are based on transmission Mode I, considering a 3A channel protection mode, as thoroughly defined in the section 5 of the Inception Report.

2.1 Planning Tool and Digital Terrain Data

For conducting the technical coverage analysis for the National SFN Plan on the DAB+ standard, the Consultant used its own and market leading broadcast network planning solution ***CHIRplus_BC***, which is also in operation at the NBTC. ***CHIRplus_BC***, developed by the Consultant, is currently used by more than 50 clients (regulators and operators) worldwide, including ACMA, Ofcom, Industry Canada and MCMC.

The CHIRplus_BC software solution respective licenses used in this project are and will remain the property of the LS telcom unless otherwise described. The user rights will not be transferred within the course of this project.

The analysis has been based on the DTM (200 m resolution) and population layers provided by the NBTC.

Please note that the quality and the resolution of the digital terrain database as well as the quality of the other required input parameters have a significant impact on the quality of the analysis results.

In addition to the digital mapping data, NBTC made the following information available to the Consultant:

- Site information for main FM and Television transmitters including information such as, but not limited to:
    - Coordinates, elevation height of site, elevation height of the transmitting antenna for some of the sites, EIRP (W) for some of the sites, channel information, name of the site.
- Population/demographic data.

Please note for sites for which the Consultant had not received all of the required information, the Consultant made assumptions and applied default values as described in this report.

2.2 SET UP OF PLANNING/SIMULATION ENVIRONMENT

The Consultant did carry out the following basic preparation and tool configuration work to conduct and deliver this coverage study:

- Setup planning tool CHIRplus_BC
  - Import digital terrain data provide by the NBTC
  - Import population data provided by the NBTC
- Import main analogue TV and FM transmitter stations currently deployed and in operation in Thailand as provided by the NBTC.
  - Name
  - Coordinates
  - Frequency
  - Antenna pattern (for the purpose of this study, all antenna patterns are considered to be non-directional)
  - EIRP (for analogue TV sites, many EIRP values were not available and a value of 50 dBW was considered as a default value)
  - Antenna elevation height above sea level
  - Terrain elevation height above sea level (this value was derived using the NBTC 200m resolution database)

The coverage analysis calculations for analogue television services are based on the applicable ITU recommendations (ITU-R BS.412-9 for FM station coordination, ITU-R 1546 for the DAB+ coordination simulations and ITU-R SM.851-1 for ATV station coordination).

The coverage analysis for the analogue transmitter stations are based on the transmitter data provided by the NBTC. Please note, the quality of the calculation results depends on the accuracy of the provided data and information.

The purpose of this study is to establish the National DAB+ SFN service coverage for portable indoor and mobile reception based on a SFN configuration in Thailand.

2.3 PLANNING METHODOLOGY

In order to derive the Scenario 3 Plan, the Consultant has developed the following methodology:

- Use channel 8 for all of Thailand with the exception of channel 7 in vicinity of the Malaysian border.
- Analyze the best transmission sites, as provided by NBTC analogue television and FM database in order to provide coverage to all regions.
- Make sure that all regions currently covered by broadcast services (FM or TV) will have DAB+ service coverage.
- Determine the resulting DAB+ service coverage.
- Evaluate the feasibility of the population coverage objective of 95% of the total population of Thailand as defined in the document from the ITU – "Roadmap Report for the transition from analogue to digital broadcasting[2] services based on the DAB+ standard".

2.3.1 Tower Selection Concept

The Consultant has created the Scenario 3 Plan by expanding the resulting coverage from the 5 primary sites defined in Scenario 1. The selection of towers was based on the following criteria:

- Proximity to urban region: a tower located near an urban center was given priority over a tower located outside urban regions, in order to ensure maximum power density in the cities.
- Tower height: when multiple suitable tower candidates located within close proximity were identified, the highest tower was generally selected.
- DAB+ antenna positioning: since only limited information regarding the tower spacing availability was provided to the Consultant, it was assumed that the DAB+ antenna radiation centers will be located 15m lower than the reported tower height.
- Additional telecom towers were considered in the areas where no broadcasting towers were available. The information was taken from the *CAT_Tower_Database ENG v4.xlsx* and from the *TOT Addition_Site 050857 V.4.xlsx*. Both files were received on September 9th, 2014. The Consultant made the following assumptions:
    - Vertical Tower spacing for the installation of a DAB+ antenna is available at a radiation center 10m below the reported height of the tower in the TOT/CAT databases.
    - Towers can sustain the architectural weight and wind load of the DAB+ VHF antenna system.
- Towers were not subject to non-ionising radiation constraints. The Consultant did not consider the non-ioninsing radiation (NIR) compatibility when selecting the positioning of the towers. Therefore, some tower positions may not be compatible with the possible increase in NIR levels.

[2] Consideration of available DAB+ capacity in Thailand, final rev 1, 22 November, 2013; DAB+ service & planning requirements, version 2.3, 21 February 2014

2.3.2 Specific Effective Radiated Power (ERP) selection

The following criteria were considered when selecting the ERP for each site:

- The ERP values considered were chosen, depending on the individual situation from among the following ERP values: 1 kW, 5 kW, 10 kW, 25 kW and 50 kW.
- When a site was first identified, an ERP value of 25 kW was initially selected.
- For sites near the Thai borders, lower ERP values were considered (1 kW to 10 kW).
- When, after simulations, the 25 kW ERP coverage was "filling the gaps" between multiple transmitters, it was then considered as the final ERP.
- All telecom tower sites were fixed at 5 kW ERP. Higher ERP values would generally require a bigger and longer antenna, which would be difficult to fit on most of the existing towers that were made available to the Consultant.
- When a site was an isolated site, it was sometimes decided to increase the power to 50 kW (for major markets) to better meet coverage objectives.
- When the site was located at a high elevation, the Consultant analysed how to best synchronize the signal transmitted from this site with other signals, coming from transmitters located afar. If this transmitter was creating intra-SFN interference to distanced transmitters, its ERP was lowered to 10 kW or 5 kW in order to minimize the interference.

2.3.3 Site Synchronisation

The site synchronization has been selected in order to minimize the out-of-guard interval interference to the surrounding sites. Basically, the Consultant started with the analysis in Bangkok where a 500 µs delay was attributed and started with the frequency planning from this site. The synchronization was adjusted by increments of 25 µs in order to minimize the intra-SFN interference.

Additionaly, the Consultant has analysed the resulting coverage of the SFN networks for both the National and Local plans, and has adjusted the synchronisation, in conjunction of the transmitter ERP, in order to minimise the intra-SFN interference and, consequently, maximise the coverage. This process involved trial and error and many possibilities can lead to good coverage results. Another optimisation could have been done by modifying the antenna patterns and down tilt, which were not considered for this study.

The complete list of all towers used in this study, including their parameters and SFN synchronisation settings for the National SFN Plan is provided in Appendix B and for the Local SFN Plan in Appendix E.

2.4 PLANNING TOOL SETTINGS FOR DAB+ COVERAGE SIMULATIONS

The Consultant defined the following data, parameters set and analysis models to run the DAB+ service coverage simulation:

- ***CHIRplusBC Version 5.8.0 r1***
- Wave propagation model: ITU-1546 Terrain Mode Model
    - Statistics: 50% time, 50% location
- Receiving antenna height for fixed reception: 1.5 m
- Usage of DTM-data (digital terrain model) – resolution 200m
- Usage of Clutter-data (land use data) – resolution 200m
- Wanted summation procedure: DAB+ Power Sum
- Interfering summation procedure: DAB+ Power Sum (No interference simulations between DAB+ services have been undertaken at this stage)

The following CHIRplus_BC screen shots demonstrate the parameter setup for DAB+ coverage simulations:

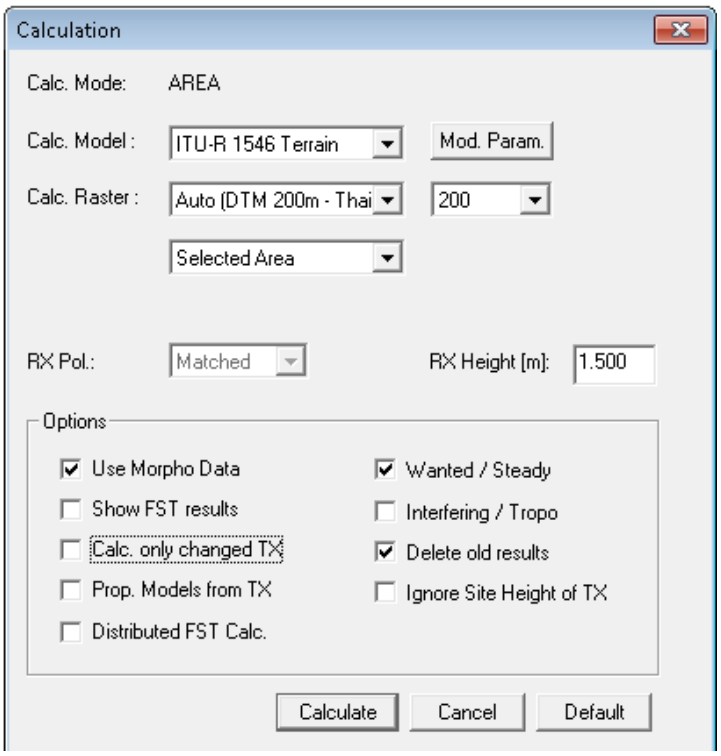


Figure 1: Screen shot CHIRplus_BC - Planning Parameters DAB+ Coverage

In addition the following configuration of the CHIRplus_BC network simulator was used for the DAB+ service coverage simulations:

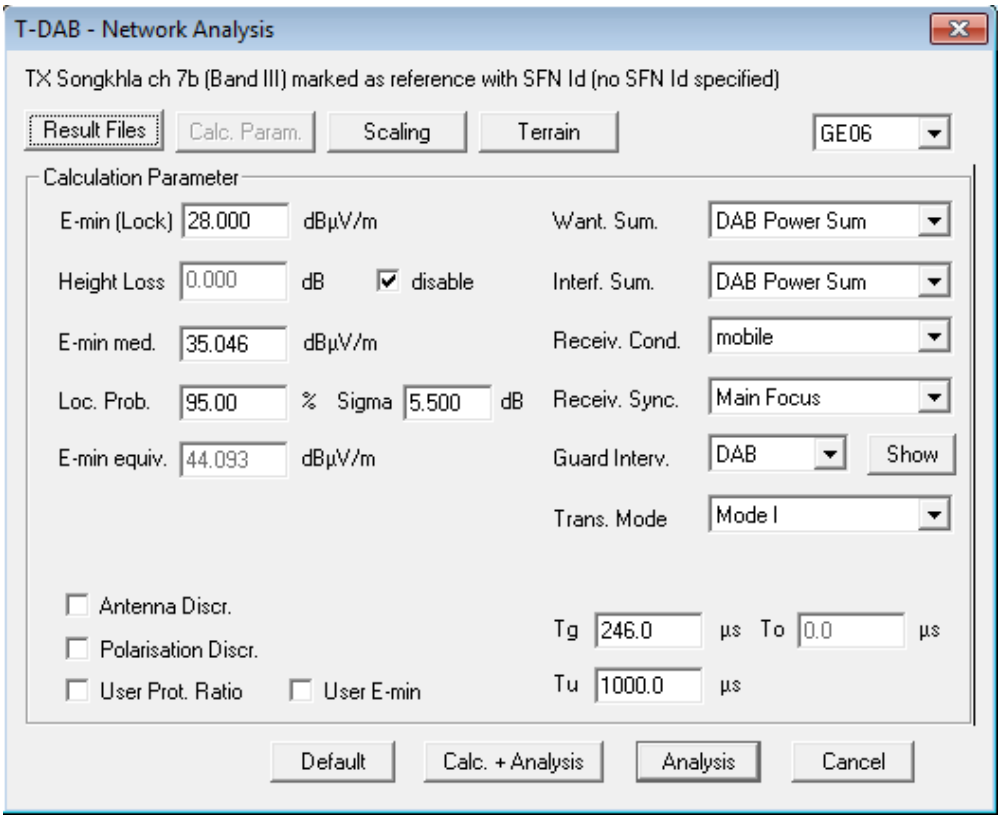


Figure 2: Screen shot CHIRplus_BC – Configuration Network Simulator

The parameters used for the simulations are those accepted in the ITU GE06 Agreement for Digital Broadcasting. The selected values correspond to the following DAB+ planning parameters:

Parameter	Value
Planning Tool	LS telcom CHIRplus_BC
Propagation model	ITU 1546 Terrain
Terrain and clutter Database	NBTC Thailand Database 200m
Population Database	Provided by NBTC
Equivalent Median Reception Level	44.093 dBµV/m
DAB+ Transmission Mode	Mode I, EEP 3A
Receiving Antenna height above ground level	1.5 m
Coverage Area Simulation Size	200 X 200
Coverage Area Target Service Availability	95%; Sigma: 5.5 dB

Table 1: DAB+ Planning Parameters

Additional information on the transmission mode used or other relevant DAB+ information is available in the section 5 of the Inception Report.

The Equivalent Median Reception Level from Table 1 was calculated and is presented in the following table:

Minimum median equivalent field strength for planning Mobile and portable outdoor reception	Unit	Value
Frequency (Band III)	F [MHz]	200
Minimum receiver signal power (for a Gaussian Channel at EEP level 3A)	Ps min [dBW]	-128.1
C/N correction for mobile reception condition	[dB]	5.6
Minimum receiver signal input power with C/N correction	Ps min corr [dBW]	-122.5
Antenna gain relative to half wave dipole	Gd [dB]	-2.2
Effective antenna aperture	Aa [dBm²]	-7.5
Minimum power flux density at receiving place	ϕmin [dBW/m²]	-112.8
Allowance for man made noise	Pmmm [dB]	2
Minimum equivalent field strength at receiving place	Emin [dBµV/m]	35.0
Height loss (not considered since the simulations were undertaken at 1.5m at the model level)	Lh [dB]	0
Location correction for 95% location probability (Table 4.1 of TR21)	Cl [dB]	9.0
Minimum median equivalent field strength required at 1.5m AGL for 50% of the time and 50% of locations to achieve coverage at 95% of location at 1.5m AGL.	Emed [dBµV/m]	44.0

Table 2: Minimum median equivalent field strength for Mobile (95%)

All simulations presented in this study show a service coverage for 95% of location probability, displaying the additional service margin in dB (coverage reserve) as per the following table:

Coverage Reserve	Service Quality
0.1-3 dB	Marginal Operation
3-10 dB	Outside Aerial Operation
10-20 dB	Good Mobile Operation / Basic Indoor Operation
20 dB+	Good Indoor Operation

Table 3: Coverage Reserve

The coverage reserve value proposed in Table 3 above are based on Mobile Receiver condition (95% of location) and represents the additional signal level in dB present at a given location in order to provide a demodulated signal at 10^{-4} BER (Bit Error Rate). The ranges have been selected to compensate for the additional local losses when considering different receiver environment (outdoor to portable indoor).

The simulator therefore considers a more stringent C/N criteria for mobile reception than for fixed reception. It should be noted that the TR025 document from the EBU[3] has specified the C/N for DAB+ fixed reception with 5.7 dB while 11.8 dB is required for mobile reception. The Consultant based the simulations on a DAB+ demodulation factor of 15 dB of C/N. By applying this approach the Consultant was able to gain an 'additional coverage reserve' of 9.3 dB relative to fixed DAB+ reception. This is how the resulting Emed of 44 dBµV/m is obtained.

The main reasons for selecting the *Mobile Receiver Condition* instead of the *Indoor Receiver Condition* have been the following:

- After network implementation, it is much easier to compare the measured performance of the network using a mobile receiving device on a vehicle's rooftop, than measuring multiple indoor sites. Therefore the measurements can be directly and quickly compared with the proposed coverage in this report.
- Indoor receiver usage is highly variable. Receivers located near a window facing a transmitter installed on a 4-storey building in comparison with receivers in a concrete basement will experience a large signal variability, even if they are located only 100m apart. Also, indoor receivers can generally be optimised (moving the receiving antenna), so the received signal can easily fluctuate by more than 10 dB, thus yielding to the coverage reserve range of 10 to 20 dB.
- The house structure types in Thailand vary significantly depening on their geo-location - urban, sub-urban, sub-rural to rural. House structure types range from densely concrete constructions to open wooden constructions. This creates a strong variability (10-20 dB) in the experienced indoor reception levels. Here again, the Mobile Outdoor operation simulations offer a much more reliable benchmarking value. Considering the house structure types, sub-rural and rural areas could be adequately serviced using the 3-10 dB simulation criteria.
- Listeners using an outdoor antenna, located on a rooftop (5 m to 10 m above the rooftop) with a positive gain, could be served in areas lower than the 0-3 dB criteria, and are therefore not considered in this study.

Although the Consultant understands that the coverage objective in downtown Bangkok area requires a strong signal density, it is the Consultant's opinion that the 10 dB+ range should provide adequate representation of the coverage objective for all fixed indoor situations where a window is accessible in the room the receiver is located in. For basements and central building rooms, even the 20 dB+ range might not be sufficient to cover these areas and only an SFN approach might produce sufficient power density to allow for the adequate reception of the signal.

[3] European Broadcasting Union, *Report on Frequency and Network Planning Parameters Related to DAB+ TR 025*, Geneva, October 2013. Table 3.

2.5 ANTENNA PATTERNS

Unless otherwise specified in the report, all DAB+ allotments use non-directional (omni) antennas as decided by the NBTC.

3. DAB+ Allocations Discussions

The following sections discuss the findings and recommendations regarding the National SFN Coverage Plan and the Local SFN Coverage Plan.

3.1 Scenario 3 Population Coverage Objectives

The population coverage objective as defined by the ITU for Scenario 3 was to provide 95% population DAB+ service coverage in Thailand.

For executing the population coverage analysis the 2012 population census database as provided by NBTC to the Consultant on May 26, 2014 was used.

In order to evaluate whether the proposed population coverage target can be met, the general objective of the plan, the population in the 10-20 dB and 20 dB+ DAB+ signal coverage range areas was considered (see also the discussion in section 2.6), with the exception of Bangkok where only the population in the 20 dB+ signal coverage area was considered. The methodology to calculate the total coverage objective is explained in details in the Trial DAB+ Plan Report, section 3.1.1. The complete result breakdown per province is provided in Appendix C.

The following table highlights the population covered under the National SFN DAB+ Plan (considering potential interference) in Scenario 3:

Coverage Reserver	Population Covered	% of Thai Population (cumulative)
0-3 dB	4 061 179	77.47 %
3-10 dB	11 068 214	71.17 %
10-20 dB	**14 854 811**	**54.00 %**
20 dB+	19 952 499	30.95 %
Total Objective Achievement	**33 421 865**	**51.85 %**
Total Thailand Pop	64 456 693	

Table 4: Scenario 3 Population Coverage

Definition of the table elements:

- **Population Covered:** number of people covered for a specific layer of coverage.
- **% of Thai Population (cumulative):** total number of people, expressed in percentage, that are covered in the cumulative layer. As an example for the layer 3-10 dB, the total number of people is established as follows: 3-10 dB + 10-20 dB + 20 dB+ = 45,875,524 / 64,456,693 = 71.17%.
- **Total Objective Achievement:** total number of people in the range 10-20 dB+ plus 20 dB+ signal coverage area with the exception of the Bangkok province, where only the population in the 20 dB+ signal coverage area is considered (see Appendix C for details).

3.2 NATIONAL NETWORK INTERFERENCE EVALUATION

The Consultant has calculated the interference for the national network evaluation between channels 8A and 7D in the southern part of Thailand. The calculation methodology is defined in the ITU GE06 document, as implemented in the CHIRplus_BC software. All transmitters on the boundary zone between the National SFN channel 7 and National SFN channel 8 are considered using the critical emission mask (unless specified otherwise, all transmitters in this study are considered using the critical emission mask).

The Consultant has selected the above mentioned boundary zone in the area where the signals from the SFN8A network can reach over the southern provinces and vice versa for SFN7D.

When considering the interference that channel 7 will receive in the southern part of Thailand, the Consultant has simulated the cases where a) channel 8 was present (Figure 4) and b) channel 8 was absent (Figure 3), as per the following figures:

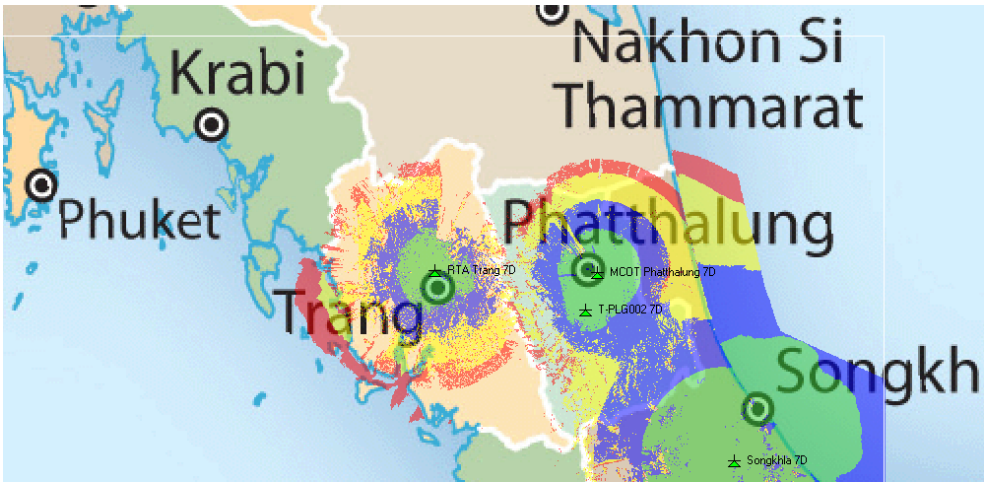


Figure 3: National Channel 7 - No Interference

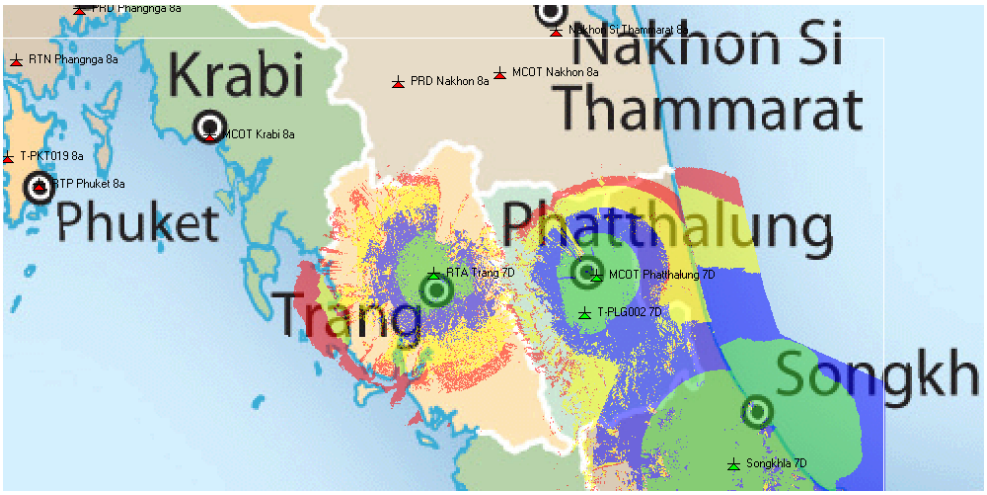


Figure 4: National Channel 7 - Considering Interference from CH 8

The reverse situation was also evaluated, i.e. interference on channel 8 when channel 7 is present (Figure 6) or absent (Figure 5).

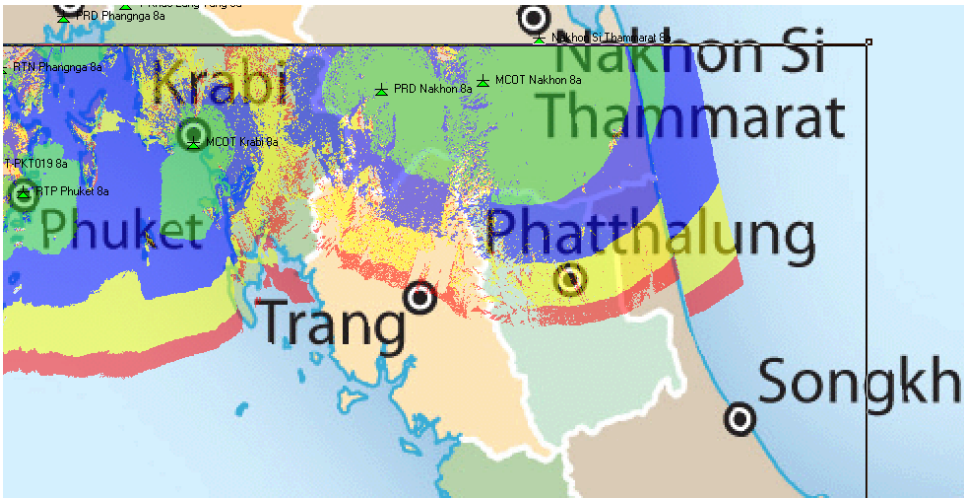


Figure 5: National Channel 8 - No Interference

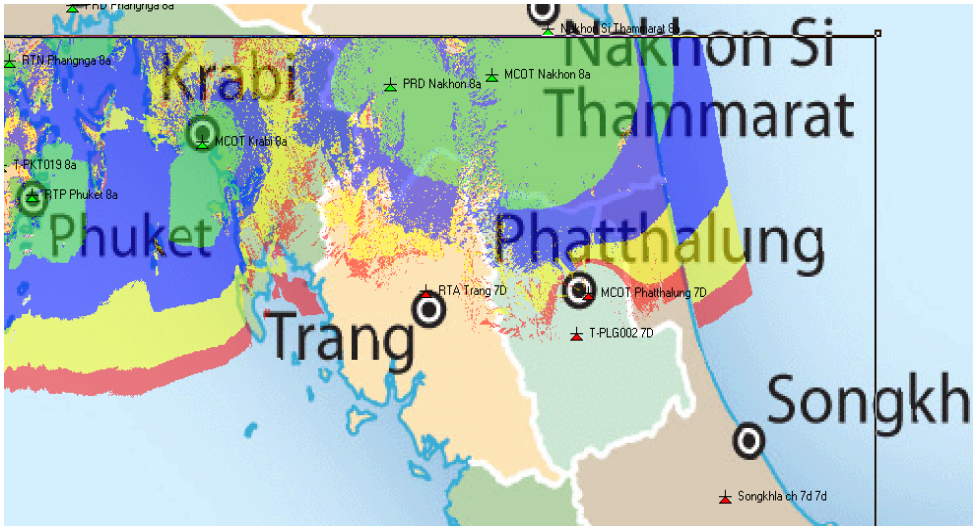


Figure 6: National Channel 8 - Considering Interference from CH 7

The visual inspection of the previous figures shows that the interference on channel 7 will be minimal, while the interference on channel 8 will only occur around the channel 7 transmitters in the Trang and Phatthalung provinces, where the National Service will already be available from these sites.

When analysing the population that may experience some interference (using the population losses in the 10 dB+ criteria of reception), the following results were found:

Affected Province	Population in study (no interference)	Population in study (with interference)	Population Interfered	Total Population in Study	% interfered
Interference Analysis Between 8A (Desired) and 7D (Undesired)					
KRABI	241 528	241 528	0	438 151	0.00%
NAKHON SI THAMMARAT	1 220 501	1 220 501	0	1 264 677	0.00%
Interference Analysis Between 7D (Desired) and 8A (Undesired)					
PHATTHALUNG	356 418	351 524	4 894	514 492	0.95%
SONGKHLA	908 241	907 977	264	1 031 973	0.03%
TRANG	300 573	300 191	382	631 920	0.06%

Table 5: Population within 7D/8A interference zones

Column definition:

- **Affected Province:** Name of the province considered in the interference study.
- **Population in study (no interference):** This population number does not represent the total population in the province, but only the population located within the simulation study window. This population figure represents the number of people that can receive a signal (with 10 dB and more of coverage reserve) when no interference is present.
- **Population in study (with interference):** This population number does not represent the total population in the province, but only the population located within the simulation study window. This population figure represents the number of people that can receive a signal (with 10 dB and more of coverage reserve) considering the interference coming from the adjacent station.
- **Population Interfered:** This value represents the difference between the population with no interference and the population with interference.
- **Total Population in the study:** This value represents the total number of people that were counted within the simulation window for each province (irrespective of any coverage level).
- **% Interfered:** This value represents the ratio of **Population Interfered / Total Population** in the study.

As the results in Table 5 show, no interference will be received on channel 8A in the provinces covered by channel 8A. Interference to channel 8A in the southern province where channel 7A is available is not considered (because an alternate receiving channel is available for listeners). The interference on channel 7D will be minimal (less than 1% in the worst case). Consequently, channel 7D should be treated equally with the other channel blocks 7A, 7B and 7C.

Nevertheless, for the National Population count in Section 3.1, the Consultant has analysed the population covered by channel block 7D and block 8A considering interference from each side in order to present a worst case scenario.

3.3 LOCAL NETWORKS FREQUENCY PLANNING

The following map (Figure 7) shows which proposed channels (each channel representing 4 blocks) can be used to create the DAB+ Local SFN Plan in Thailand. This figure has been extracted from the ITU document entitled: “Local and regional areas for Digital Radio, 25 April 2014”.

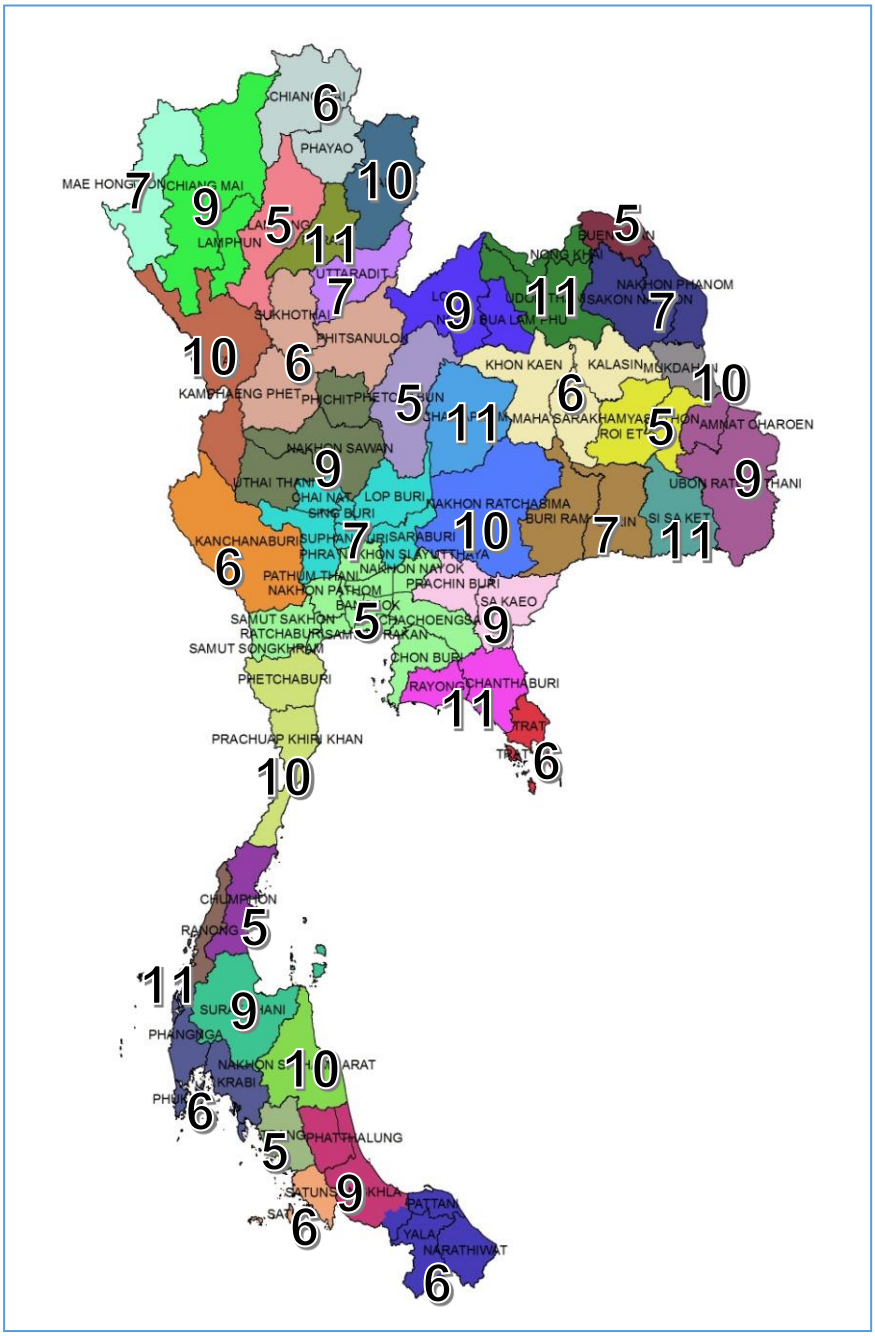


Figure 7: Local Area and Channels for DAB+

LOCAL AREA	Channel	LOCAL AREA	Channel	LOCAL AREA	Channel
RANONG	11	PHETCHABUN	5	CHIANGMAI	9
TRAT	6	SAKAEO	9	UDONTHANI	11
MAE HONG SON	7	SURAT THANI	9	SUKHOTHAI	6
SATUN	6	PHUKET	6	UBONRATCHATHANI	9
MUKDAHAN	10	CHAIYAPHUM	11	NAKHONRATCHASIMA	10
BUENGKAN	5	LOEI	9	SURIN	7
PHRAE	11	RAYONG	11	SINGBURI	7
UTTARADIT	7	SISAKET	11	KHONKAEN	6
NAN	10	NAKHON SI THAMMARAT	9	BANGKOK	5
CHUMPHON	5	CHIANGRAI	6		
TAK	10	SAKONNAKHON	7		
TRANG	5	ROI ET	5		
LAMPANG	5	SONGKHLA	9		
KANCHANABURI	6	YALA	6		
PRACHUAP KHIRI KHAN	10	NAKHONSAWAN	9		

Table 6: Local Area and Channels for DAB+

3.3.1 Local DAB+ Planning Principles

To define the best channels that could be used for Local DAB+ transmitters, the Consultant has considered the following criteria:

- For the areas located near the Malaysian border, only channels 6, 7, 9 and 12 have been considered.
- To minimise the interference, the Consultant assumed that all transmitters were co-located with the National SFN transmitters.
- Protection of co-channel coverages.
- All simulations for stations located within 100km of the edge of the coverage consider the co-channel and first adjacent channel interference as per the GE06 criteria, as defined in the CHIRplus_BC software suite;
- As previously analyzed, the interference experienced across the 4 proposed blocks (A, B, C and D) of a given channel will be minimal (less than 1% in the worst case scenario), therefore only the coverage for block A for each given channel has been provided, since the coverage of the other blocks will be similar.
- All SFN synchronisations have been revised and therefore can be different from the National SFN DAB+ Plan, to ensure optimum reception of the local DAB+ signal.
- Channel 12 has not been used in this planning exercise, as requested by NBTC.

3.3.2 Analysis of Local DAB+ Multiplexes

The Consultant has analysed the potential interference with the local multiplexes. This interference can be caused by different sources:

- Interference from the National SFN Channel 8, or 7 in the south: Since all transmitters will be co-located with the National Network, the risk of this type interference will be minimal.
- Interference from local co-channels: The frequency plan presented in Figure 7 shows that no two co-channels will be located within 100 to 150 km of each other. Consequently, interference from this type will be also minimal.
- Interference at Malaysian border: According to NBTC's agreement with the Malaysian government, only the channels 6, 7 and 9 can be used for the multiplexes located within an area of 100 km from the Malaysian border. This has been respected by the Consultant in all cases. But, it should be noted that the Trang local multiplex is currently on channel 5. The transmitter in Trang is located farther than 100 km from the Malaysian border, but Trang's closest point to the border is about 75 km away. It is recommended that, during coordination meeting with Malaysia, an agreement is achieved in order to define the maximum parameters that could be used for channel 5 in the Trang province in order to mitigate potential interference with Malaysian services.
- Interference from local adjacent channels: Although the Consultant tried as much as possible to avoid adjacent channel situations, they do occur in some cases. To evaluate the impact, the Consultant has performed a detailed analysis of the situation in Nakhon Si Thammarat and Surat Thani and came to the conclusion that the interference will be minimal (see section 3.3.3 for details). Consequently, unless the adjacent channel situation resulted in one transmitter being located within 20 km, for this specific analysis, of the edge of the coverage coming from another local adjacent channel, no further investigation has been undertaken as it was deemed to be unnecessary.

In view of the above, the Consultant has simulated the coverage of the local channels for block A only (unless otherwise specified). The resulting coverage map for each local SFN service is provided in Appendix D. The population covered in each local SFN service area is provided in Appendix E.

3.3.3 Co-channel Interference Potential

The Consultant has evaluated the potential of co-channel interference between 2 local multiplexes.

For this analysis, the Consultant has considered the following regions (that were the 2 instances of the closest distance for the reuse of the same channel):

- Narathiwat and Satun (channel 6)
- Chayaphum and Udon Thani (channel 11)

The following table demonstrates the population coverage analysis considering interference:

Region	Population 10db+ no interference	Population 10db+ with interference	% of population loss
Satun	157 278	156 845	0.27%
Narathiwat	1 417 472	1 417 378	0.0066%
Chayaphum	404 122	399 839	1.05%
Udon Thani	954 497	951 649	0.29%

Table 7: Co-channel Interference Study

From the previous table it can be derived that the co-channel interference will be around 1% in the worst case. It should be noted that the coverage in Chayaphum was already limited (35.91% of population for the 10 dB+ coverage reserve range). If the population would have been closer to the overall objectives of 95%, the interference would have been, most likely, around 3 times smaller (and even more due to the proximity and density of the signal).

Therefore, it can be concluded that the Consultant's recommended plan offers an adequate protection in terms of co-channel interference. Section 4 in this document (allotment definition) specifies the protection ratios to co-channels

3.3.4 First adjacent interference potential for local multiplexes

The Consultant has analysed the potential interference between the local Surat Thani 9d and Nakhon Si Thammarat 10a multiplexes. For this study, the Concultant has used all relevant broadcasting and telecom towers (similar as for the National and Local SFNs). The following highlights the potential impact between the 2 channels.

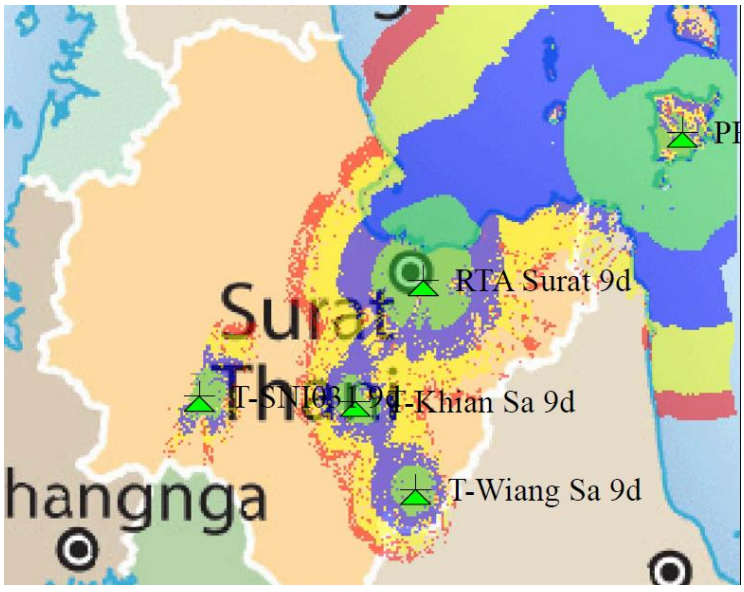


Figure 8: Surat Thani 9c

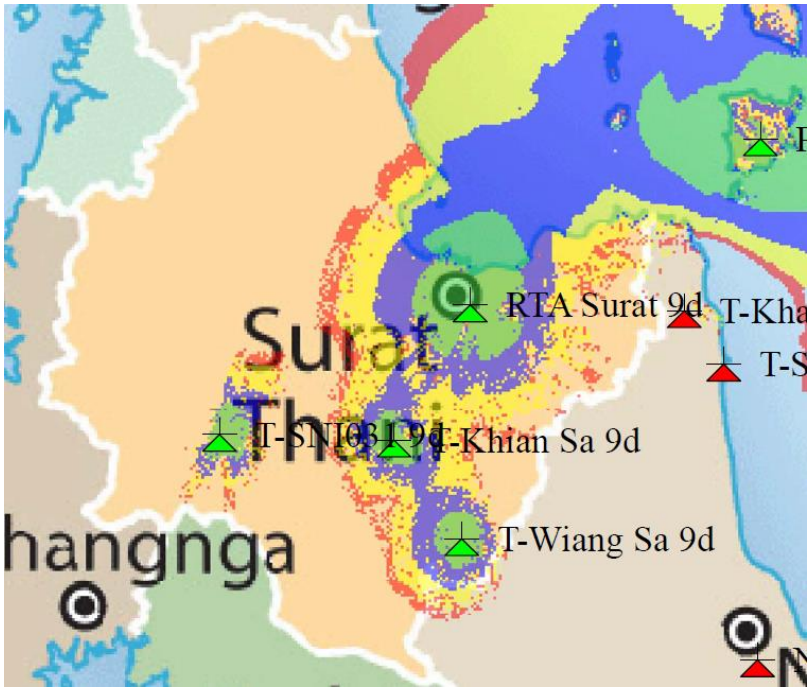


Figure 9: Surat Thani 10d

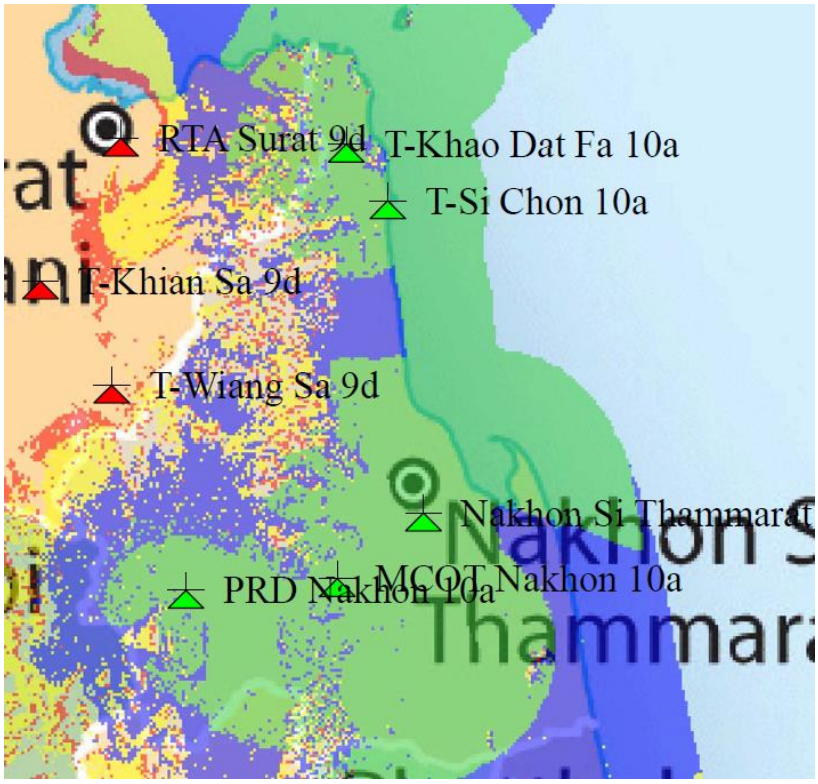


Figure 10: Nakhon Si Thammarat 10a

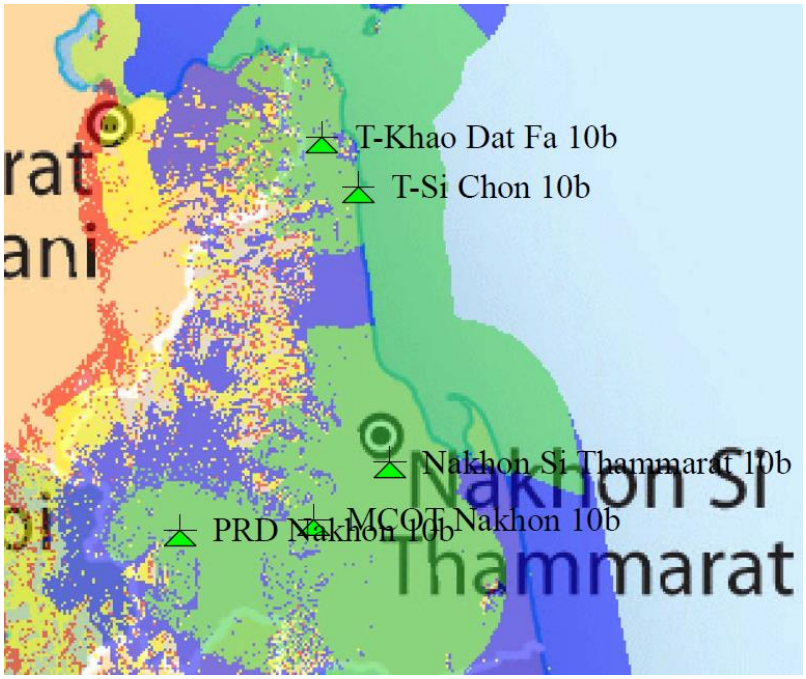


Figure 11: Nakhon Si Thammarat 10b

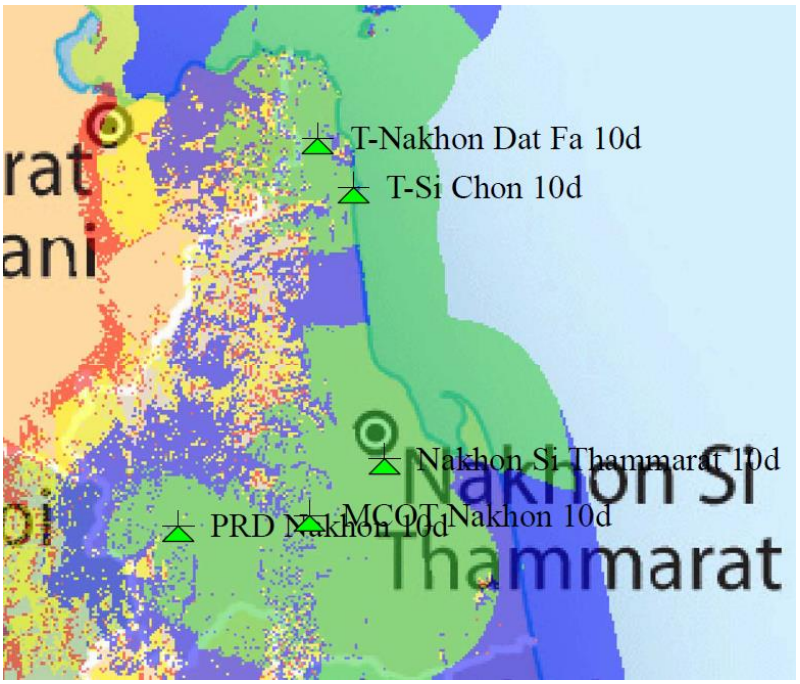


Figure 12: Nakhon Si Thammarat 10d

The only interference situation that the Consultant was able to identify from the results showed in Figure 8 to 12 occurs in the area surrounding the RTA Surat 9d transmitter as shown in Figure 10. This interference is entirely located in the Surat Tani province, so no actual interference on the local channel 10a in Nakhon Si Thammarat will be recorded.

Considering the Surat Thani site, the T-Kao Dat Fa 10a site is one of the worst case situations where the transmitter is located near the border of 2 provinces. Nevertheless, the interference is minimal.

The following table highlights the population that could potentially be affected by this situation.

Province	Channel	Population in province	Population covered (10 dB+)	Population interfered	% Losses	% of Population
Surat Thani	9c	1 021 152	473 455	0	0.000%	0.000%
Surat Thani	9d	1 021 152	468 444	5 011	1.058%	0.491%
Nakhon Si Thammarat	10a	1 534 887	1 481 628	26	0.002%	0.002%
Nakhon Si Thammarat	10b & C	1 534 887	1 481 602	0	0.000%	0.000%
Nakhon Si Thammarat	10d	1 534 887	1 481 579	23	0.002%	0.001%

Table 8: Population within Surat Thani/Nakhom Si Thammarat interference zone

Column definition:

- **Province:** Name of the province considered in the interference study.
- **Channel:** Channel number under investigation.
- **Population in province:** This number represents the total population of the province.
- **Population covered (10 dB+):** This population figure represents the number of people that can receive a signal (with 10 dB and more of coverage reserve) considering potential interference from the adjacent channel.
- **Population Interfered:** This value represents the difference between the population with no interference (channel 9c for Surat Thani and 10b & c for Nakhon Si Thammarat) and the population with interference.
- **% Losses:** This value presents the ratio of the **Population Interfered / Population** covered.
- **% of Population:** This value presents the ratio of the **Population Interfered / Population** in province.

Since the worst case situation produces an estimated interference level of about 1% (a value that is within the statistical error margin of the simulation), the local SFN study did not include an analysis of the detailed interference situation for each channel. It should be noted, for the purpose of the implementation stage, that channel blocks B and C will be interference-free and therefore their implementation should be given priority.

4. Channel Allotment Plan

The previous results (see section 3.1), have demonstrated that the maximum population coverage hat can be reached, for the defined objectives, is 51.85% when considering an allocation plan using existing infrastructure in Thailand. Therefore, the Consultant is proposing the use of additional "greenfield" towers that will increase the coverage up to the total population coverage objective of 95%.

Since the location of the proposed greenfield towers cannot be verified during the course of this study, the Consultant is proposing to use a set of parameters that will define the future allotment usage so that new potential sites can be added at a later stage of the migration project. These parameters will be tested in 4 regions in order to demonstrate the required tower density that will be needed to achieve the 95% service coverage. The 4 regions (based on the local region definition of section 3.3) are:

- Bangkok
- Chiang Mai
- Khon Kaen
- Songkhla

The proposed allotment plan is a forward looking concept and considers the possibility of adding new greenfield towers with the following characteristics for an increased population coverage:

- Typical height: 120 m (could be adjusted when located on top of mountains)
- Typical power: 5 kW (could be from 1 kW to 10 kW, depending on other factors: terrain, synchronisation, close proximity to 1st adjacent, etc.).

The following sections will describe the rules proposed by the Consultant for the deployment of DAB+ new greenfield towers.

4.1 Channel Allotment Coordination

As demonstrated in section 3.3.3 and section 3.3.4 in this study, co-channel and 1st adjacent channel interference can occur. This interference can be calculated using advanced simulation tools such as CHIRplus_BC, which integrate the international coordination rules as specified in the GE06[4] standards.

Additionally, the EBU TR21 document specifies in its section 5.4.8 "Protection ratios for T-DAB interfered with T-DAB" protection ratios of (for a minimum C/N of 15 dB):

- Co-block interference: 12 dB
- Adjacent block interference: -30 dB

[4] « Final Acts of the Regional Radiocommunications Conference for planning of the digital terrestrial broadcasting service in parts of Regions 1 and 3, in the frequency bands 174-230 MHZ and 470-862 MHz (RRC-06) », Geneva, June 2006

The following maximum interfering contours can be derived (see also EBU TR21 Sections 5.6, 5.7 and 4.2.2.4):

	Mobile and portable (95%)	Mobile and portable (99%)	Indoor reception (95%)
Minimum median equivalent field strength at 10 m	57 dBµV/m	58 dBµV/m	63 dBµV/m
Location correction margin (see 4.2.2.4 and 4.4 of TR021)	12.8 dB	18.2 dB	14.5 dB
Co-block protection ratio	12 dB	12 dB	12 dB
Maximum permissible interfering equivalent field strength at 10 m for Co-block	32.2 dBµV/m	27.8 dBµV/m	36.7 dBµV/m
Adjacent protection ratio	-30 dB	-30 dB	-30 dB
Maximum permissible interfering equivalent field strength at 10m for adjacent block	74.2 dBµV/m	69.8 dBµV/m	78.5 dBµV/m

Table 9: Minimum DAB+ Allotment Separation

In the EBU TR21 document, sections 5.6, 5.7 and 4.2.2.4, the following values are defined:

- **Minimum Median Equivalent Field Strength at 10 m:** This value is calculated in the EBU TR21 document in Table 5.2 (mobile 99%) and Table 5.3 (indoor). Values from Mobile and portable (95%) are derived from Table 2 of this report with an additional 13 dB to compensate for height loss (as per TR21).
- **Location correction margin (see 4.2.2.4):** This value has been calculated for Mobile (95%) but has been extracted from Table 5.4 of EBU TR21 for Mobile (99%) and Table 5.5 of EBU TR21 for Indoor (95%). The value for Mobile (95%) is different from the value used from the Table 2 of our report (9 dB) since the Table 2 value was extracted from Table 4.1 of EBU TR21 which is the value used for the calculation of the E_{med}. The new value (12.8) adds the system protection ratios (see TR21).
- **Co-block protection ratio:** 12 dB, as defined in TR21
- **Maximum permissible interfering equivalent field strength at 10m for Co-block:** Calculated by taking the Minimum Median FS and subtracting the Location Correction Margin and then subtracting the co-block protection: 58 – 18.2- 12 = 27.8 dBµV/m. For indoor: 63 - 10.3 - 12 = 40.7 dBµV/m.
- **Adjacent protection ratio:** -30 dB, as defined in TR21.
- **Maximum permissible interfering equivalent field strength at 10m for adjacent block:** Please see above for the definition.
    - Calculated for mobile reception: 58 - 12.8 - (-30) = 75.2 dBµV/m.
    - For indoor reception: 63 - 10.3 - (-30) = 82.7 dBµV/m.

The minimum distances that can be coordinated between 2 towers have been calculated using the propagation model ITU-1546 Database (1%,50%) for the interfering signals and ITU-1546 Database (50%,50%) for the protected signal. All simulations have been done for channel 8D.

The results are displayed in the following table below, representing the maximum distance when no terrain database is considered:

Tower Height	60 m			90 m			120 m		
	Protected	Interfering Co-channel	Interfering 1st adjacent	Protected	Interfering Co-channel	Interfering 1st adjacent	Protected	Interfering Co-Channel	Interfering 1st adjacent
Mobile and Portable (95%): Protected: 57 dBµV/m; Co-Channel: 32.2 dBµV/m; 1st adj: 74.2 dBµV/m									
1 kW	16.3 km	79.7 km	6.2 km	19.4 km	89.8 km	7.7 km	22.8 km	97.1 km	8.9 km
5 kW	22.7 km	127.0 km	9.9 km	27.1 km	137.5 km	12.2 km	31.3 km	146.2 km	13.7 km
10 kW	25.8 km	151.0 km	11.7 km	31.4 km	162.1 km	14.8 km	35.6 km	170.1 km	17.0 km
Mobile and Portable (99%): Protected: 58 dBµV/m; Co-Channel: 27.8 dBµV/m; 1st adj: 69.8 dBµV/m									
1 kW	15.6 km	107.1 km	8.2 km	18.8 km	117.9 km	9.8 km	21.7 km	125.5 km	12.1 km
5 kW	21.7 km	164.3 km	12.8 km	26.1 km	174.1 km	15.8 km	30.7 km	181.4 km	18.1 km
10 kW	24.9 km	190.5 km	15.4 km	29.8 km	201.4 km	18.9 km	34.1 km	207.9 km	22.0 km
Indoor Portable (95%): Protected: 63 dBµV/m; Co-Channel: 36.7 dBµV/m; 1st adj: 78.5 dBµV/m									
1 kW	11.6 km	59.5 km	4.6 km	14.2 km	68.5 km	5.4 km	16.6 km	75.0 km	6.4 km
5 kW	16.7 km	94.1 km	7.6 km	20.6 km	105.0 km	9.3 km	23.4 km	113.0 km	10.4 km
10 kW	19.5 km	115.1 km	9.0 km	23.8 km	126.2 km	11.2 km	26.7 km	133.8 km	12.7 km

Table 10: Separation Distances for DAB+ Coordination

The previous table can be interpreted as in the following example (for Mobile and Portable at 99%):

- If an operator wants to install a new 90m tower operating at 5 kW, the minimum following criteria have to be met:
    - Co-channel interfering contour: 174.1 km
    - 1st adjacent interfering contour: 15.8 km
- Consequently, the minimum separation to existing towers will be:
    - Co-channel 1 kW at 60m height: 15.6 km (protected) + 174.1 km = 189.7 km minimum separation
    - 1st adjacent 10 kW at 120 m height: 34.1 km (protected) + 15.8 km = 49.9 km minimum separation

For the introduction of DAB+ in Thailand, the Consultant recommends to use the values for Mobile and Portable at 95%. These values offer a good compromise between the more stringent Mobile and Portable at 99% and Indoor Portable at 95%. Also, the coverage planning parameters used by Consultant throughout this study are based on those parameters.

In conclusion, when considering the planning of additional greenfield towers, network operators can consider that towers that meet the minimum separation distance from Table 10 for co-channel or adjacent channel should generally meet the protection criteria to other existing infrastructure. Nevertheless, a detailed network analysis must be undertaken to ensure that existing infrastructure will not be affected. If the minimum separation distance is not met, or if the tower characteristics are exceeding those defined in Table 10, a detailed analysis must be undertaken in all cases in order to demonstrate that the overall interference created by the addition of the new tower will not create a loss of population coverage of more than 1%.

4.2 EXAMPLE OF REFERENCE SFN NETWORKS

In order to evaluate the required tower density to provide service coverage to 95% of the population in a given region for Local and National multiplexes, the Consultant has provided 4 reference SFN networks based on the following assumptions:

- Using the existing towers as per Section 3 in this study for the basic network.
- Adding additional towers based on the following criteria:
    - Typical height: 120 m (could be adjusted when located on top of mountains)
    - Typical power: 5 kW (could be from 1 kW to 10 kW, depending on other factors: terrain, synchronisation, close proximity to 1st adjacent, etc.).
    - Overlay the population database and add towers in the highest or widest population density area first.
- Calculate the resulting coverage and population coverage.
- Making sure that the synchronisation of all towers was sufficient.
- If the population coverage objective of 95% was not met, then repeat the addition of new towers.

Once the evaluation was completed, the Consultant proceeded with a reverse study, by removing towers from the less populated areas, by visually inspecting the population database layer, until a population of around 70% (+/- 5%) for the total region was met, as requested by NBTC.

4.2.1 Reference SFN Network in Bangkok Local Multiplex

The following coverage results map represents the SFN reference network that has been calculated for the Bangkok area in order to meet the population objective of 95%:

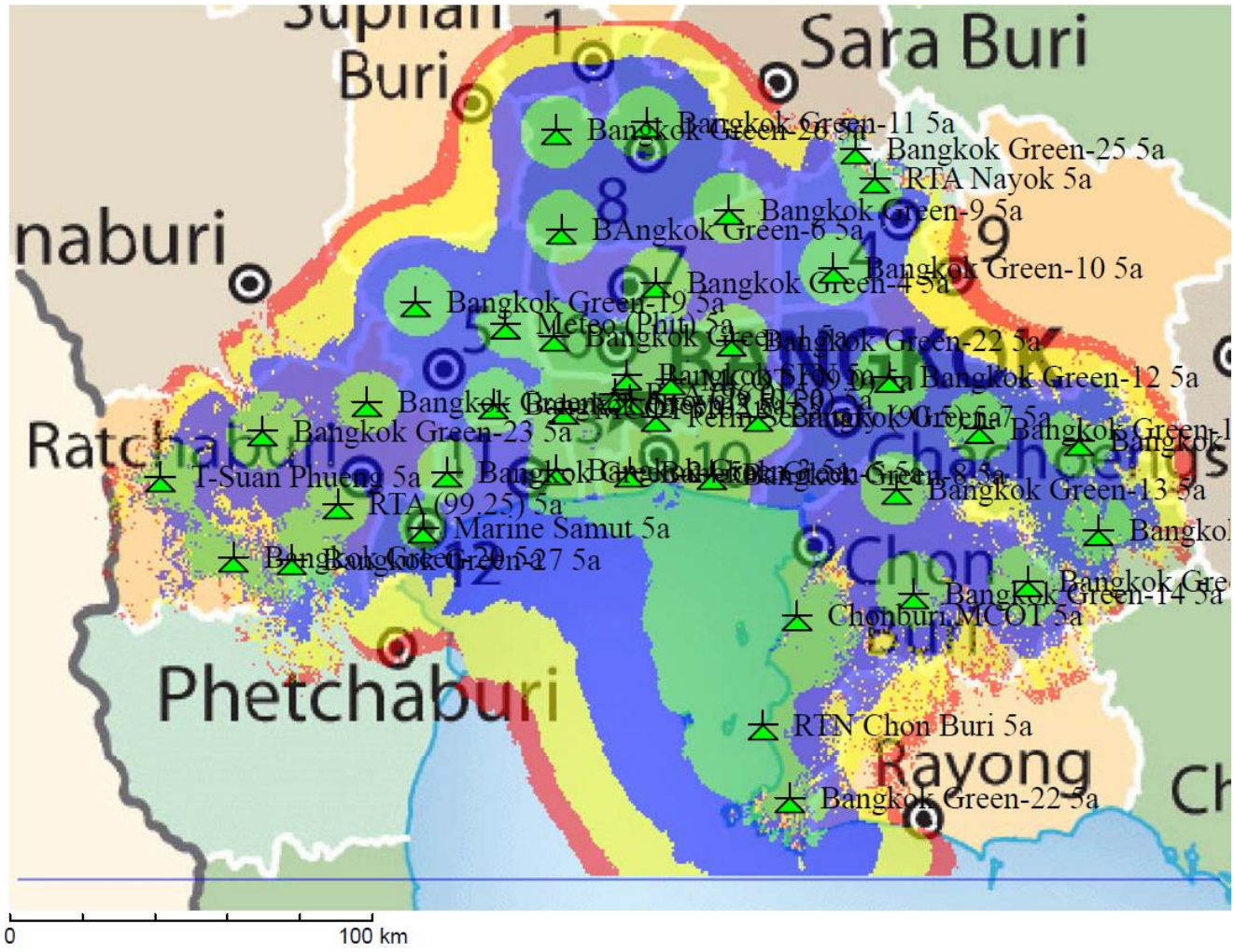


Figure 13: Bangkok Regional Coverage 95%

The following table lists the number of transmitters that were required in order to create this network (for 95% of population coverage):

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	Ant.H. (m)	SFN Id	Time Del. (µs)
T-Suan Phueng	5a	36.9897	099E20 09.810	13N32 39.310	102	BANG5a	625
RTA (99.25)	5a	36.9897	099E47 16.184	13N28 23.268	100	BANG5a	500
Marine Samut	5a	36.9897	100E00 04.835	13N24 50.897	80	BANG5a	500
Meteo (Phit)	5a	36.9897	100E13 00.620	13N55 21.516	85	BANG5a	500
Bangkok SFN	5a	40.0000	100E31 31.240	13N47 25.960	185	BANG5a	500
Perm Secratary (90.5)	5a	40.0000	100E36 03.715	13N41 21.599	109	BANG5a	500
RTA Nayok	5a	36.9897	101E09 49.165	14N16 44.803	85	BANG5a	500
Chonburi MCOT	5a	40.0000	100E57 02.030	13N11 23.359	43	BANG5a	500
RTN Chon Buri	5a	36.9897	100E51 58.752	12N55 17.364	25	BANG5a	500

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	Ant.H. (m)	SFN Id	Time Del. (µs)
Bangkok Green-1	5a	36.9897	100E20 32.594	13N53 29.570	120	BANG5a	500
Bangkok Green-2	5a	36.9897	100E11 00.424	13N43 32.877	120	BANG5a	500
Bangkok Green-3	5a	36.9897	100E20 48.128	13N33 41.144	120	BANG5a	500
Bangkok Green-4	5a	36.9897	100E36 13.236	14N01 23.536	120	BANG5a	500
Bangkok Green-5	5a	36.9897	100E31 56.582	13N33 15.488	120	BANG5a	500
Bangkok Green-6	5a	36.9897	100E21 45.276	14N09 39.435	120	BANG5a	500
Bangkok Green-7	5a	36.9897	100E51 41.417	13N41 17.932	120	BANG5a	500
Bangkok Green-8	5a	36.9897	100E44 34.070	13N32 48.721	120	BANG5a	500
Bangkok Green-28	5a	36.9897	100E47 41.426	13N52 46.409	120	BANG5a	500
MCOT (105.5)	5a	36.9897	100E21 37.508	13N42 42.840	95	BANG5a	500
RTA (96.0)	5a	36.9897	100E29 41.579	13N44 44.869	90	BANG5a	500
Royal (104.0)	5a	36.9897	100E32 00.132	13N44 01.320	60	BANG5a	500
MCOT (99.0)	5a	36.9897	100E38 08.401	13N46 50.923	111	BANG5a	500
Bangkok Green-9	5a	36.9897	100E47 17.084	14N12 23.776	120	BANG5a	500
Bangkok Green-10	5a	36.9897	101E03 24.187	14N03 21.988	120	BANG5a	500
Bangkok Green-11	5a	36.9897	100E34 42.735	14N25 23.034	120	BANG5a	500
Bangkok Green-12	5a	36.9897	101E11 48.497	13N47 07.662	120	BANG5a	500
Bangkok Green-13	5a	36.9897	101E12 46.040	13N30 24.559	120	BANG5a	500
Bangkok Green-14	5a	36.9897	101E15 02.098	13N14 46.151	120	BANG5a	500
Bangkok Green-15	5a	36.9897	101E25 28.758	13N39 22.315	120	BANG5a	500
Bangkok Green-16	5a	36.9897	101E32 28.625	13N16 14.384	120	BANG5a	500
Bangkok Green-17	5a	36.9897	101E40 40.891	13N37 13.094	120	BANG5a	500
Bangkok Green-18	5a	36.9897	101E43 30.045	13N23 55.992	120	BANG5a	500
Bangkok Green-20	5a	36.9897	099E31 10.615	13N20 36.226	120	BANG5a	500
Bangkok Green-21	5a	36.9897	099E51 40.577	13N43 48.583	120	BANG5a	500
Bangkok Green-19	5a	36.9897	099E59 21.689	13N58 51.831	120	BANG5a	500
Bangkok Green-22	5a	36.9897	100E56 00.874	12N44 18.090	120	BANG5a	500
Bangkok Green-23	5a	36.9897	099E35 40.690	13N39 29.707	120	BANG5a	500
Bangkok Green-24	5a	36.9897	100E03 53.895	13N33 24.235	120	BANG5a	500
Bangkok Green-25	5a	36.9897	101E06 43.958	14N21 19.156	40	BANG5a	500
Bangkok Green-26	5a	36.9897	100E20 54.670	14N24 22.760	120	BANG5a	500
Bangkok Green-27	5a	36.9897	099E40 05.088	13N20 13.165	120	BANG5a	500

Table 11: Bangkok Regional SFN Towers for 95% Coverage

The following table demonstrates the population and coverage areas that will result from the SFN network based on the towers listed in Table 11:

Province Name	Tot-Popul.	Cov. Pop. 10 dB+	%	Tot-Area	Cov. Area	%
BANGKOK*	5 673 559	5 566 418	98.11	1 570.90	1 487.65	94.7
CHACHOENGSAO	685 721	650 204	94.82	5 170.15	4 223.91	81.7
CHON BURI	1 364 001	1 297 331	95.11	4 504.89	3 783.95	84
NAKHON NAYOK	255 174	217 021	85.05	2 138.11	1 334.83	62.43
NAKHON PATHOM	874 616	862 716	98.64	2 138.28	2 073.79	96.98
NONTHABURI	1 141 673	1 141 673	100	636.49	636.49	100
PATHUM THANI	1 033 837	1 033 837	100	1 517.83	1 517.75	99.99
PHRA NAKHON SI AYUTTHAYA	793 509	743 384	93.68	2 552.85	2 398.11	93.94
RATCHABURI	846 631	825 791	97.54	5 198.49	3 685.77	70.9
SAMUT PRAKAN	1 223 302	1 223 302	100	948.81	948.81	100
SAMUT SAKHON	508 812	508 812	100	856.64	856.64	100
SAMUT SONGKHRAM	194 042	193 592	99.77	414.06	399.61	96.51
Total	14 594 877	14 264 081	97.73%	27 647.49	23 347.30	84.45%

Table 12: Bangkok Regional SFN Population Covered for 95%

*Note: The population coverage in central Bangkok has been calculated for a 20 dB+ of coverage reserve. For all other provinces a 10 dB+ coverage reserve has been considered.

When analysing the previous information it can be noted that an additional 28 greenfield towers will be required in order to meet the coverage requirements for the Bangkok regional SFN.

For the 70% regional population coverage objective the Consultant has, upon completion of the previous study, deleted greenfield towers, starting from the edges going towards the center, until the total regional population coverage was around 70%. The rational for deleting the greenfield towers starting at the edges is to preserve the coverage density in the metropolitan Bangkok area. Other approaches can lead to different results of tower positioning.

The resulting coverage for a population coverage of around 70% is displayed in the following figure:

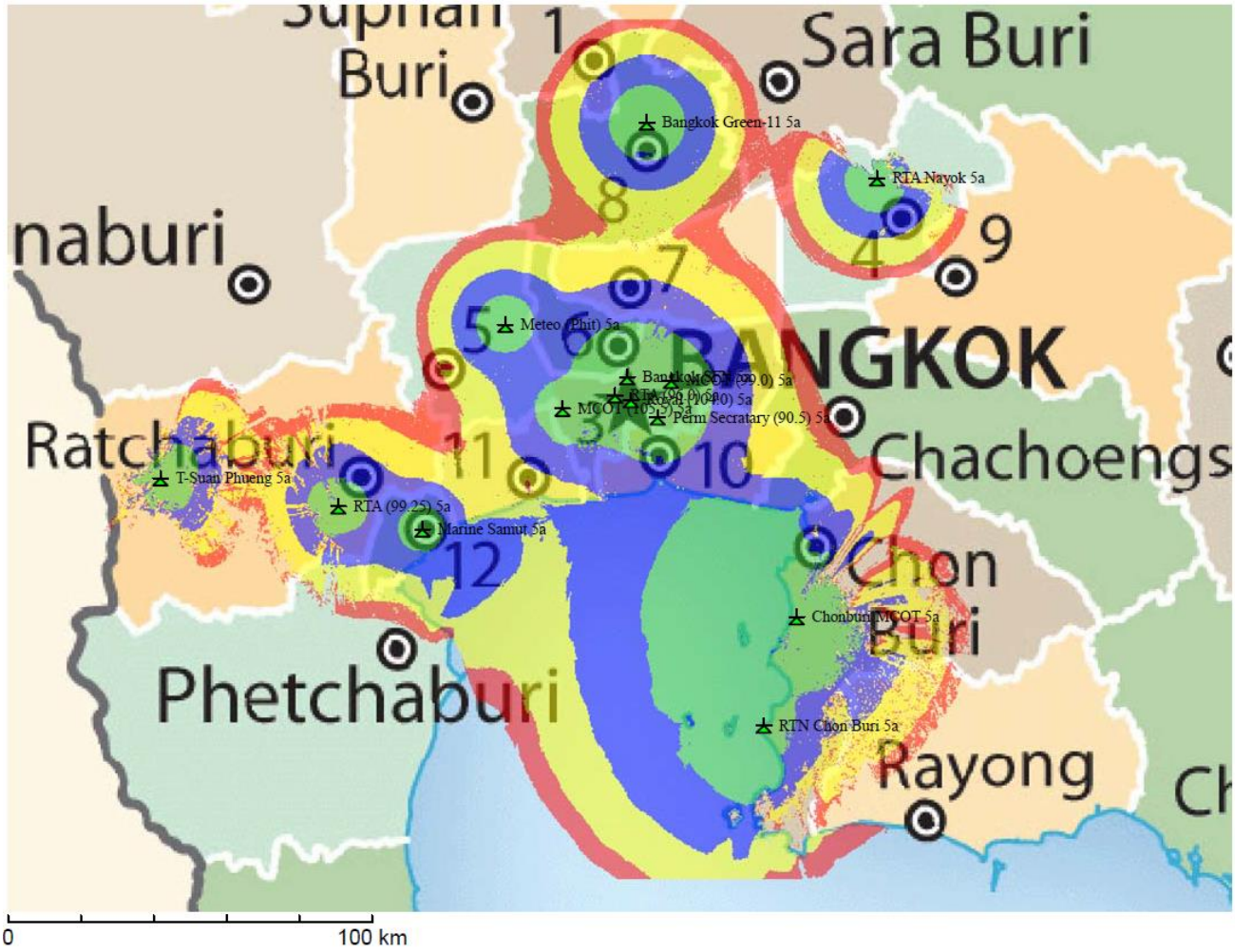


Figure 14: Bangkok Regional Coverage 70%

The following table lists the number of transmitters that were required in order to create this network (for 70% of population coverage):

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	Ant.H. (m)	SFN Id	Time Del. (µs)
T-Suan Phueng	5a	36.9897	099E20 09.810	13N32 39.310	102	BANG5a	625
RTA (99.25)	5a	36.9897	099E47 16.184	13N28 23.268	100	BANG5a	500
Marine Samut	5a	36.9897	100E00 04.835	13N24 50.897	80	BANG5a	500
Meteo (Phit)	5a	36.9897	100E13 00.620	13N55 21.516	85	BANG5a	500
Bangkok SFN	5a	40.0000	100E31 31.240	13N47 25.960	185	BANG5a	500
Perm Secratary (90.5)	5a	40.0000	100E36 03.715	13N41 21.599	109	BANG5a	500
RTA Nayok	5a	36.9897	101E09 49.165	14N16 44.803	85	BANG5a	500
Chonburi MCOT	5a	40.0000	100E57 02.030	13N11 23.359	43	BANG5a	500
RTN Chon Buri	5a	36.9897	100E51 58.752	12N55 17.364	25	BANG5a	500

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	Ant.H. (m)	SFN Id	Time Del. (µs)
MCOT (105.5)	5a	36.9897	100E21 37.508	13N42 42.840	95	BANG5a	500
RTA (96.0)	5a	36.9897	100E29 41.579	13N44 44.869	90	BANG5a	500
Royal (104.0)	5a	36.9897	100E32 00.132	13N44 01.320	60	BANG5a	500
MCOT (99.0)	5a	36.9897	100E38 08.401	13N46 50.923	111	BANG5a	500
Bangkok Green-11	5a	36.9897	100E34 42.735	14N25 23.034	120	BANG5a	500

Table 13: Bangkok Regional SFN Towers for 70% Coverage

The following table shows the population and coverage area that will result from the SFN network based on the towers listed in Table 13:

Province Name	Tot-Popul.	Cov. Pop. 10 dB+	%	Tot-Area	Cov. Area	%
BANGKOK*	5 673 559	4 952 605	87.29	1 570.90	930.86	59.26
CHACHOENGSAO	685 721	35 496	5.18	5 170.15	112.63	2.18
CHON BURI	1 364 001	859 203	62.99	4 504.89	1 372.78	30.47
NAKHON NAYOK	255 174	120 216	47.11	2 138.11	496.56	23.22
NAKHON PATHOM	874 616	352 386	40.29	2 138.28	732.54	34.26
NONTHABURI	1 141 673	1 128 436	98.84	636.49	566.93	89.07
PATHUM THANI	1 033 837	483 157	46.73	1 517.83	304.72	20.08
PHRA NAKHON SI AYUTTHAYA	793 509	394 455	49.71	2 552.85	999.50	39.15
RATCHABURI	846 631	332 707	39.30	5 198.49	1 142.29	21.97
SAMUT PRAKAN	1 223 302	1 151 864	94.16	948.81	774.23	81.60
SAMUT SAKHON	508 812	241 043	47.37	856.64	278.88	32.55
SAMUT SONGKHRAM	194 042	192 606	99.26	414.06	352.04	85.02
	14 594 877	10 244 174	70.19%	27647	8064	29.17%

Table 14: Bangkok Regional SFN Population Coverage for 70%

*Note: The population in central Bangkok has been calculated based on a 20 dB+ coverage reserve. All other provinces are evaluated at a 10 dB+ coverage reserve.

A quick analysis of the 95% coverage target and the 70% coverage target demonstrates that the objective of 70% population coverage can be achieved by using the existing towers and by adding only one (1) new greenfield tower. This coverage objective is easier to deploy as a first target for the introduction of DAB+ services in Thailand.

It is important to mention that when 95% population coverage is reached, the coverage area also corresponds to 84.45% of the total area of the combined provinces. In order to reach 70% of the population in the Bangkok area, only 29.17% of the total area needs to be reached. This is due to the high density of the population surrounding Bangkok.

Finally, the overall number of transmitters required for a 70% population coverage drops from 41 to 14 transmitter stations, which represents a significant change in the required deployment investment (CAPEX).

4.2.2 Reference SFN Network in Khon Kaen Local Multiplex

The following result coverage map represents the SFN reference network that has been calculated for the Khon Kaen area in order to meet the population objective of 95%:

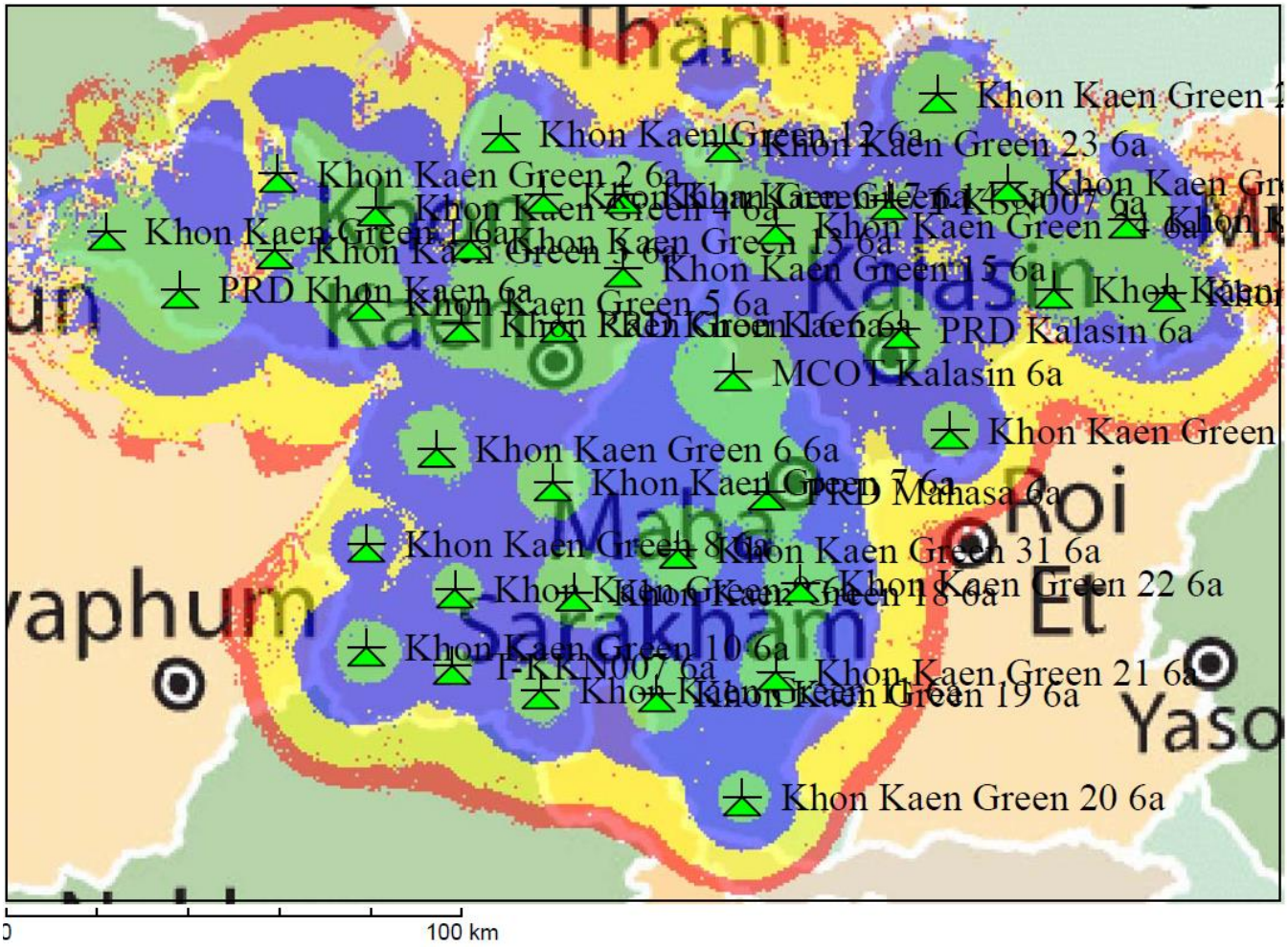


Figure 15: Khon Kaen Regional Coverage 95%

The following table lists the number of transmitters that were required to create this network (for 95% of population coverage):

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	SFN Id	Time Del. (µs)
MCOT Kalasin	6a	43.9794	103E11 05.982	16N22 32.059	KHON6a	850
PRD Khon Kaen	6a	43.9794	102E50 01.100	16N28 31.501	KHON6a	850
PRD Khon Kaen	6a	43.9794	102E03 20.099	16N33 21.199	KHON6a	900
PRD Kalasin	6a	40.0000	103E32 05.492	16N27 12.445	KHON6a	875
PRD Mahasa	6a	40.0000	103E15 11.560	16N08 20.677	KHON6a	850
T-KKN007	6a	36.9897	102E36 11.970	15N48 17.860	KHON6a	750
T-KSN007	6a	36.9897	103E30 42.150	16N42 14.190	KHON6a	875
Khon Kaen Green 1	6a	30.0000	101E54 29.634	16N40 34.945	KHON6a	900
Khon Kaen Green 2	6a	30.0000	102E15 52.911	16N47 09.519	KHON6a	900
Khon Kaen Green 3	6a	36.9897	102E15 21.073	16N38 05.663	KHON6a	900
Khon Kaen Green 4	6a	36.9897	102E27 51.615	16N42 58.290	KHON6a	900
Khon Kaen Green 5	6a	36.9897	102E26 20.338	16N31 34.025	KHON6a	875
Khon Kaen Green 6	6a	36.9897	102E34 51.612	16N14 11.409	KHON6a	800
Khon Kaen Green 7	6a	36.9897	102E48 51.410	16N09 46.464	KHON6a	800
Khon Kaen Green 8	6a	36.9897	102E25 50.369	16N02 54.551	KHON6a	800
Khon Kaen Green 9	6a	36.9897	102E36 48.428	15N57 17.197	KHON6a	750
Khon Kaen Green 10	6a	36.9897	102E25 49.205	15N50 45.201	KHON6a	750
Khon Kaen Green 11	6a	36.9897	102E46 53.743	15N45 19.429	KHON6a	750
Khon Kaen Green 12	6a	36.9897	102E43 16.332	16N51 24.565	KHON6a	850
Khon Kaen Green 13	6a	36.9897	102E39 15.815	16N38 47.059	KHON6a	800
Khon Kaen Green 14	6a	36.9897	102E58 10.925	16N43 52.577	KHON6a	850
Khon Kaen Green 15	6a	36.9897	102E58 00.155	16N35 10.539	KHON6a	850
Khon Kaen Green 16	6a	36.9897	102E37 57.068	16N29 00.725	KHON6a	850
Kkon Khan Green 17	6a	36.9897	102E48 23.955	16N44 03.644	KHON6a	850
Khon Kaen Green 18	6a	36.9897	102E51 13.892	15N56 40.416	KHON6a	800
Khon Kaen Green 19	6a	36.9897	103E01 17.960	15N44 31.291	KHON6a	800
Khon Kaen Green 20	6a	30.0000	103E11 31.667	15N32 00.009	KHON6a	800
Khon Kaen Green 21	6a	36.9897	103E15 57.145	15N46 57.712	KHON6a	800
Khon Kaen Green 22	6a	36.9897	103E18 58.773	15N57 14.077	KHON6a	800
Khon Kaen Green 23	6a	36.9897	103E10 43.834	16N49 47.540	KHON6a	850
Khon Kaen Green 24	6a	36.9897	103E17 05.536	16N39 41.463	KHON6a	850

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	SFN Id	Time Del. (µs)
Khon Kaen Green 25	6a	36.9897	103E37 23.362	16N54 50.257	KHON6a	850
Khon Kaen Green 26	6a	36.9897	103E45 35.481	16N44 08.465	KHON6a	850
Khon Kaen Green 27	6a	36.9897	104E00 19.507	16N39 37.570	KHON6a	850
Khon Kaen Green 28	6a	36.9897	103E50 54.822	16N31 31.039	KHON6a	850
Khon Kaen Green 29	6a	30.0000	103E37 56.496	16N15 08.509	KHON6a	850
Khon Kaen Green 30	6a	36.9897	104E04 58.400	16N30 38.332	KHON6a	850
Khon Kaen Green 31	6a	36.9897	103E04 15.732	16N01 30.642	KHON6a	850

Table 15: Khon Kaen Regional SFN Towers for 95% Coverage

The following table shows the population and coverage areas that will result from the SFN network based on the towers listed in Table 15.

Name	Tot-Popul.	Cov. Pop. 10 dB+	%	Tot-Area	Cov. Area	%
KALASIN	985 084	944 833	95.91	6 925.17	6 150.35	88.81
KHON KAEN	1 774 816	1 748 334	98.51	10 642.55	9 896.95	92.99
MAHA SARAKHAM	945 149	914 579	96.77	5 631.58	5 386.27	95.64
	3 705 049	3 607 746	97.37%	23 199.30	21 433.57	92.39%

Table 16: Khon Kaen Regional SFN Population Coverage for 95%

Analysing the previous results for this objective, an additional 31 greenfield towers will be required in order to meet the coverage requirements for the Khon Kaen regional SFN.

For the 70% regional population coverage objective the Consultant has, upon completion of the previous study, deleted greenfield towers, analysing the main population centers and removed towers covering a lower population density, until the total regional population was around 70%.

The resulting coverage for a population coverage of around 70% is displayed in the following figure:

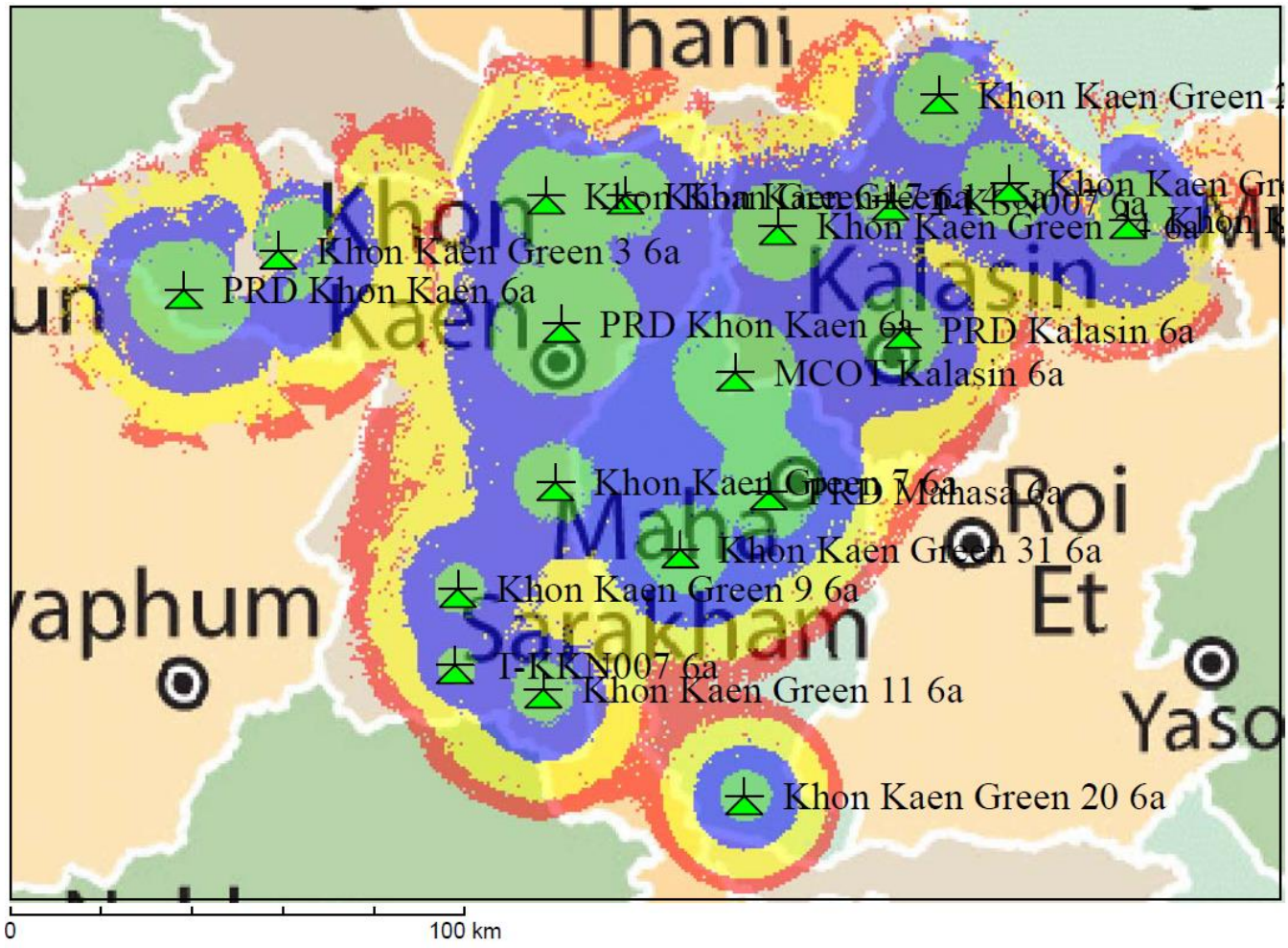


Figure 16: Khon Kaen Regional Coverage 70%

The following table lists the number of transmitters that were required in order to create this network (for 70% of population coverage):

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	Ant.H.	SFN Id	Time Del. (µs)
MCOT Kalasin	6a	43.9794	103E11 05.982	16N22 32.059	93	KHON6a	850
PRD Khon Kaen	6a	43.9794	102E50 01.100	16N28 31.501	98	KHON6a	850
PRD Khon Kaen	6a	43.9794	102E03 20.099	16N33 21.199	75	KHON6a	900
PRD Kalasin	6a	40.0000	103E32 05.492	16N27 12.445	75	KHON6a	875
PRD Mahasa	6a	40.0000	103E15 11.560	16N08 20.677	93	KHON6a	850
T-KKN007	6a	36.9897	102E36 11.970	15N48 17.860	50	KHON6a	750
T-KSN007	6a	36.9897	103E30 42.150	16N42 14.190	35	KHON6a	875
Khon Kaen Green 3	6a	36.9897	102E15 21.073	16N38 05.663	120	KHON6a	900
Khon Kaen Green 7	6a	36.9897	102E48 51.410	16N09 46.464	120	KHON6a	800

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	Ant.H.	SFN Id	Time Del. (µs)
Khon Kaen Green 9	6a	36.9897	102E36 48.428	15N57 17.197	120	KHON6a	750
Khon Kaen Green 11	6a	36.9897	102E46 53.743	15N45 19.429	120	KHON6a	750
Khon Kaen Green 14	6a	36.9897	102E58 10.925	16N43 52.577	120	KHON6a	850
Kkon Khan Green 17	6a	36.9897	102E48 23.955	16N44 03.644	120	KHON6a	850
Khon Kaen Green 20	6a	30.0000	103E11 31.667	15N32 00.009	120	KHON6a	800
Khon Kaen Green 24	6a	36.9897	103E17 05.536	16N39 41.463	120	KHON6a	850
Khon Kaen Green 25	6a	36.9897	103E37 23.362	16N54 50.257	120	KHON6a	850
Khon Kaen Green 26	6a	36.9897	103E45 35.481	16N44 08.465	120	KHON6a	850
Khon Kaen Green 27	6a	36.9897	104E00 19.507	16N39 37.570	120	KHON6a	850
Khon Kaen Green 31	6a	36.9897	103E04 15.732	16N01 30.642	120	KHON6a	850

Table 17: Khon Kaen Regional SFN Towers for 70% Coverage

The following table demonstrates the population and coverage areas that will result from the SFN network based on the towers listed in Table 17.

Name	Tot-Popul.	Cov. Pop. 10 dB+	%	Tot-Area	Cov. Area	%
KALASIN	985 084	787 596	79.95	6 925.17	4 883.98	70.53
KHON KAEN	1 774 816	1 315 858	74.14	10 642.55	6 233.15	58.57
MAHA SARAKHAM	945 149	631 526	66.82	5 631.58	3 590.62	63.76
	3 705 049	2 734 980	73.82%	23 199.30	14 707.75	63.40%

Table 18: Khon Kaen Regional SFN Population Coverage for 70%

A quick analysis of the 95% coverage target and the 70% coverage target demonstrates that to achieve the 70% population coverage objective only 19 towers instead of 38 towers would be required with the corresponding impact on the required deployment investment (CAPEX).

Another important point is that when 95% population coverage is reached, the coverage area also corresponds to 92.39% of the total area of the combined provinces. In order to reach 70% of the population, only 63.40% of the total area needs to be reached. Since the population in those provinces is more spread out than in the Bangkok area, a larger sized area is required in order to meet the coverage objectives.

4.2.3 Reference SFN Network in Chiang Mai Local Multiplex

As calculated and shown in Appendix F, the covered population in the Chiang Mai region (including Lamphun province), considering existing telecom and broadcasting towers, is 76.32%. Therefore, the Consultant has not evaluated the study for a population coverage target of around 70%.

It should be noted that after 90% of the population was reached, it was very difficult to meet the additional 5% population coverage due to the fact that the small villages are isolated between mountain chains. The following result coverage map represents the SFN reference network that has been calculated for the Chiang Mai area to meet around 90% of population coverage:

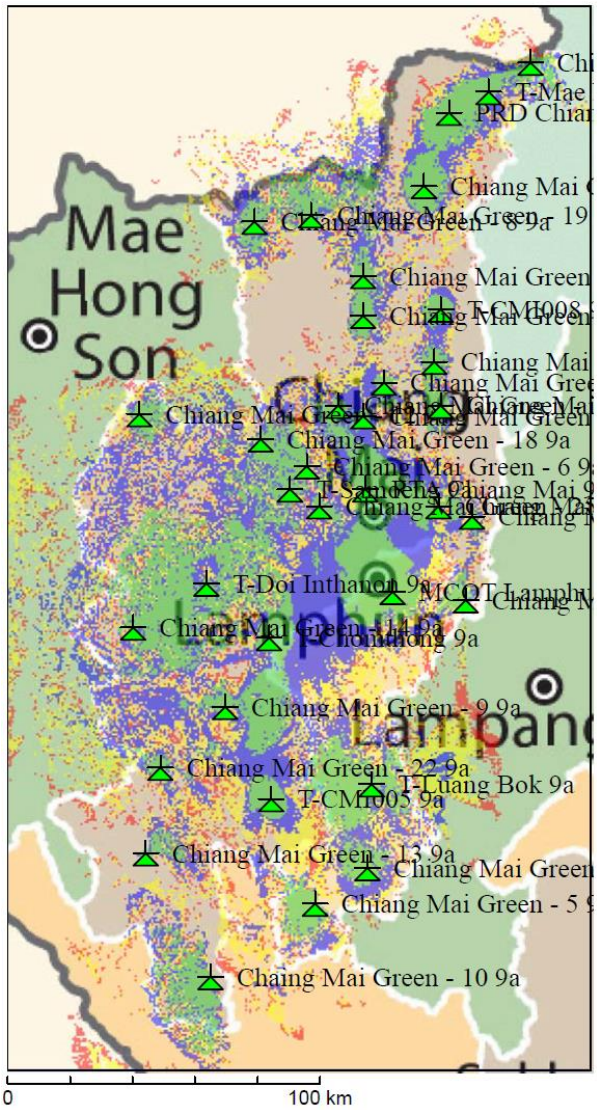


Figure 17: Chiang Mai Regional Coverage 90%

The following table lists the number of transmitters that were required in order to create this network (for 90% of population coverage):

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	SFN Id	Time Del. (µs)
MCOT Lamphump	9a	43.9794	099E02 54.931	18N33 16.250	CHIM9a	850
RTA Chiang Mai	9a	43.9794	098E58 13.710	18N50 50.165	CHIM9a	800
PRD Chiang Mai	9a	43.9794	099E13 18.678	19N56 26.563	CHIM9a	750
T-CMI005	9a	36.9897	098E40 54.260	17N57 10.940	CHIM9a	850
T-CMI008	9a	36.9897	099E11 49.700	19N22 11.640	CHIM9a	800
Chiang Mai Green - 9	9a	36.9897	098E32 32.034	18N13 18.956	CHIM9a	850
T-Chomthong	9a	36.9897	098E40 31.880	18N25 05.590	CHIM9a	825
T-Samoeng	9a	36.9897	098E44 11.930	18N51 00.290	CHIM9a	800
T-Doi Inthanon	9a	30.0000	098E28 56.850	18N34 26.280	CHIM9a	800
T-Luang Bok	9a	36.9897	098E59 07.020	17N59 49.910	CHIM9a	850
T-Mae Na Wang	9a	36.9897	099E20 34.350	19N59 58.750	CHIM9a	750
Chiang Mai Green - 1	9a	36.9897	099E08 42.224	19N43 47.673	CHIM9a	750
Chiang Mai Green - 2	9a	36.9897	098E57 49.656	19N27 57.892	CHIM9a	750
Chiang Mai Green - 3	9a	36.9897	098E57 36.038	19N21 01.451	CHIM9a	750
Chiang Mai Green - 4	9a	36.9897	099E10 43.885	19N13 06.146	CHIM9a	750
Chiang Mai Green - 5	9a	36.9897	098E48 54.773	17N39 04.127	CHIM9a	850
Chiang Mai Green - 6	9a	36.9897	098E47 27.889	18N54 52.847	CHIM9a	750
Chiang Mai Green - 7	9a	36.9897	098E53 02.478	19N05 30.838	CHIM9a	750
Chiang Mai Green - 8	9a	36.9897	098E37 34.081	19N37 35.608	CHIM9a	750
Chaing Mai Green - 10	9a	36.9897	098E29 59.914	17N26 10.967	CHIM9a	800
Chiang Mai Green - 11	9a	36.9897	098E58 18.120	17N45 21.896	CHIM9a	800
Chiang Mai Green - 12	9a	36.9897	098E16 39.484	19N04 01.285	CHIM9a	800
Chiang Mai Green - 13	9a	36.9897	098E18 20.062	17N47 40.643	CHIM9a	800
Chiang Mai Green - 14	9a	30.0000	098E15 49.964	18N26 55.088	CHIM9a	800
Chiang Mai Green - 15	9a	30.0000	099E17 32.399	18N46 14.796	CHIM9a	750
Chiang Mai Green - 16	9a	36.9897	099E01 42.712	19N09 38.229	CHIM9a	750
Chiang Mai Green - 18	9a	36.9897	098E39 08.187	18N59 31.902	CHIM9a	750
Chiang Mai Green - 19	9a	36.9897	098E48 06.451	19N38 34.196	CHIM9a	750
Chiang Mai Green - 20	9a	36.9897	099E28 38.420	20N05 14.333	CHIM9a	750
Chiang Mai Green - 17	9a	36.9897	099E11 36.949	18N48 09.460	CHIM9a	800

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	SFN Id	Time Del. (µs)
Chiang Mai Green - 21	9a	36.9897	099E16 22.365	18N31 53.821	CHIM9a	800
Chiang Mai Green - 22	9a	36.9897	098E20 46.216	18N02 39.186	CHIM9a	750
Chiang Mai Green - 23	9a	36.9897	098E57 43.134	19N03 33.827	CHIM9a	750
Chiang Mai Green - 24	9a	36.9897	099E11 44.988	19N05 24.087	CHIM9a	750
Chiang Mai Green - 25	9a	36.9897	098E49 38.218	18N48 03.027	CHIM9a	800

Table 19: Chiang Mai Regional SFN Towers for 90% Coverage

The following table demonstrates the population and coverage areas that will result from the SFN network based on the towers listed in Table 19.

Name	Tot-Popul.	Cov. Pop. For 10 dB+	%	Tot-Area	Cov. Area	%
CHIANG MAI	1 655 642	1 487 555	89.85	22159.8925	10805.7275	48.76
LAMPHUN	404 673	373 972	92.41	4478.765	2633.66	58.80
	2 060 315	1 861 527	90.35%	26 638.66	13 439.39	50.45%

Table 20: Chiang Mai Regional SFN Population Coverage for 90%

Analysing the previous results for this objective, an additional 25 greenfield towers will be required, but 2 existing telecom towers located in poor positions have been removed, in order to meet the coverage requirements for the Chiang Mai regional SFN.

For this region, the percentage of the covered area is only 50.45% of the total area in order to meet the 90.35% of population. This reflects the fact that some villages are isolated between the mountains and the population is concentrated in valleys.

4.2.4 Reference SFN Network in Songkhla Local Multiplex

As calculated and shown in Appendix F, the covered population in Songkhla region (including Phatthalung province), considering existing telecom and broadcasting towers, is 72.97%. Therefore, the Consultant has not executed a study for a population coverage target of around 70%.

The following result coverage map represents the SFN reference network that has been calculated for the Songkhla regional area in order to meet the population objective of 95%:

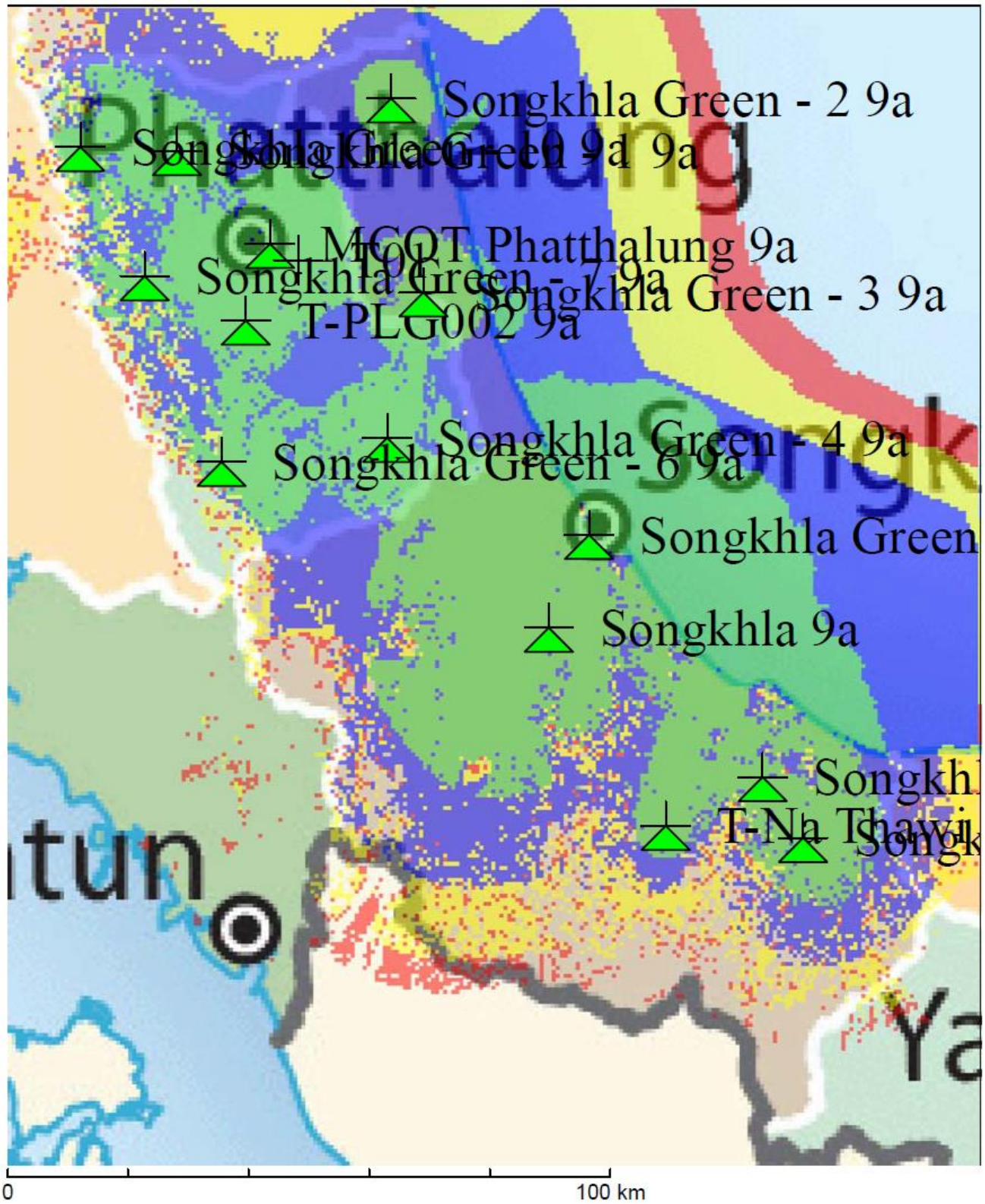


Figure 18: Songkhla Regional Coverage 95%

The following table lists the number of transmitters that were required in order to create this network (for 95% of population coverage):

TX-Name	Ch.	ERP (dBW)	Longitude	Latitude	Ant.H.	SFN Id	Time Del. (µs)
MCOT Phatthalung	9a	43.9794	100E06 02.059	07N36 58.763	95	SONG9a	525
T-PLG002	9a	36.9897	100E03 47.380	07N29 58.780	50	SONG9a	500
Songkhla	9a	46.9897	100E31 07.104	07N02 15.706	40	SONG9a	500
T-Na Thawi	9a	36.9897	100E41 30.650	06N44 28.600	37	SONG9a	525
Songkhla Green – 1	9a	36.9897	099E57 43.912	07N45 26.690	120	SONG9a	500
Songkhla Green – 2	9a	36.9897	100E17 03.593	07N50 06.870	120	SONG9a	500
Songkhla Green – 3	9a	36.9897	100E19 56.622	07N32 41.287	120	SONG9a	500
Songkhla Green – 4	9a	36.9897	100E16 19.005	07N19 24.288	120	SONG9a	500
Songkhla Green – 5	9a	36.9897	100E53 59.463	06N43 18.394	120	SONG9a	500
Songkhla Green – 6	9a	36.9897	100E01 31.708	07N17 13.056	120	SONG9a	500
Songkhla Green – 7	9a	36.9897	099E54 29.846	07N33 56.833	80	SONG9a	500
Songkhla Green – 8	9a	30.0000	100E34 39.298	07N10 43.211	120	SONG9a	500
Songkhla Green – 9	9a	36.9897	100E50 06.329	06N48 57.798	120	SONG9a	500
Songkhla Green - 10	9a	36.9897	099E48 45.317	07N45 53.862	120	SONG9a	500

Table 21: Songkhla Regional SFN Towers for 95% Coverage

The following table shows the population and coverage areas that will result from the SFN network based on the towers listed in Table 21.

Name	Tot-Popul.	Cov. Pop. For 10 dB+	%	Tot-Area	Cov. Area	%
PHATTHALUNG	514 492	509 244	98.98	3860.2125	3390.145	87.82
SONGKHLA	1378574	1248060	90.53	7740.7875	5423.935	70.07
	1 893 066	1 757 304	92.83%	11 601.00	8 814.08	75.98%

Table 22: Songkhla Regional SFN Population Coverage for 95%

Analysing the previous results for this objective, an additional 10 greenfield towers will be required, but 1 existing telecom tower located in a poor position has been removed, in order to meet the coverage requirements for the Songkhla regional SFN. For this region, the percentage of the covered area is 75.98 % in order to meet the 92.83% of population.

4.2.5 Conclusion for Reference SFN Local Network Studies

The 4 reference SFN network studies documented in the previous sections provide a good indication of the required tower density for the different regions of Thailand. The calculation of the tower density is shown in the following table:

Local Area	Population Covered	% Population Covered	Area covered (sq.km)	# TX	Transmitter density (population)	Transmitter density (total area)
Bangkok*	9 250 396	63.38%	9230.498	9	1 027 821.78	1 025.61
Bangkok*	10 244 174	70.19%	8064	14	731 726.71	576.00
Bangkok*	14 264 081	97.73%	23347.3	41	347 904.41	569.45
Khon Kaen	1 528 756	41.26%	5299.2	7	218 393.71	757.03
Khon Kaen	2 734 980	73.82%	14707.75	19	143 946.32	774.09
Khon Kaen	3 607 746	92.39%	21433.57	38	94 940.68	564.04
Chiang Mai	1 572 525	76.32%	7613.55	12	131 043.75	634.46
Chiang Mai	1 861 527	90.35%	13493.39	35	53 186.49	385.53
Songkhla	1 374 675	72.62%	8653.28	5	274 935.00	1 730.66
Songkhla	1 757 304	92.83%	8814.08	14	125 521.71	629.58

Table 23: Reference Studies Summary

*Note: The population in central Bangkok has been calculated for a 20 dB+ coverage reserve. For all other provinces a 10 dB+ coverage reserve has been considered.

The table columns represent:

- **Local Area:** Name of the local area under study.
- **Population Covered:** Amount of population covered in this study. This represents the population in the 10 dB+ coverage reserve and above layer, with the exception of central Bangkok region which represents the 20 dB+ coverage reserve and above layer.
- **% Population Covered:** Represents the Population Covered divided by the total population in the local area.
- **Area covered (sq.km):** Represents the area covered for a 10 dB+ coverage reserve and above coverage objective, expressed in square km.
- **# TX:** Number of transmitters required in this study.
- **Transmitter density (population):** Represents the number of population covered on average by one transmitter in that local area (Population Covered / # TX).
- **Transmitter density (total area):** Represents the average area covered by one transmitter for this study (Area covered / # TX).

As it can be noted, it is difficult to identify a trend in this table. Nevertheless, the Consultant has found one interesting fact. It was the result obtained by the analysis of the percentage of the population covered vs the number of transmitters, represented by the following figure:

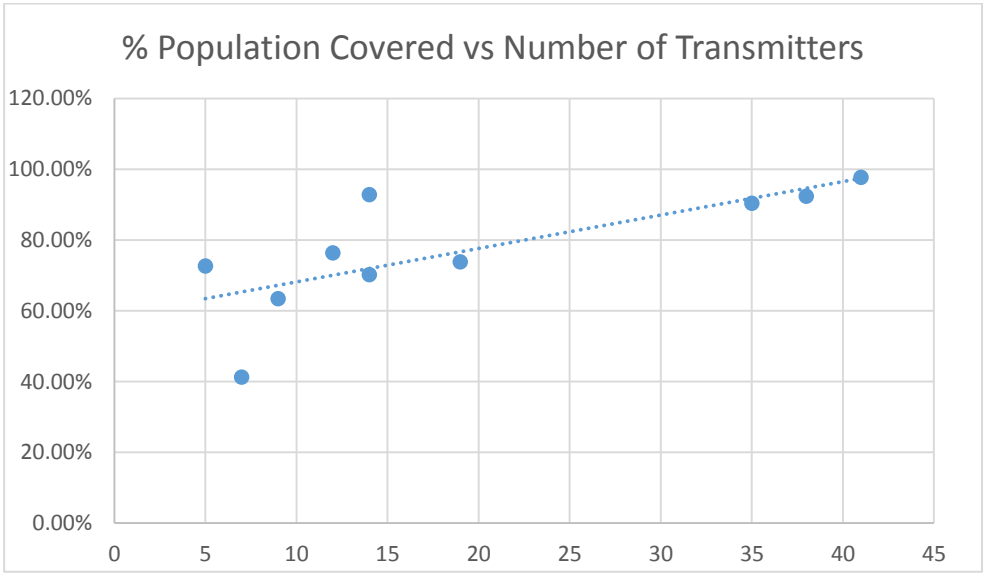


Figure 19: % Population Covered vs # TX

When analysing Figure 19, it can be noted that the gain in percentage of population vs the number of required transmitter is almost linear. This might be due to the fact that the simulation follows an upper asymptot behaviour of a logarithm curve where the first transmitters provide a rapid gain in terms of population coverage and where more than 5 transmitters in a given local region are located in the "upper elbow" of the curve.

This means that most population gains will generally be provided by the first 5 transmitters and any transmitter added after that will just slightly contribute to the total population coverage.

5. Conclusion

In conclusion, the objective of this study was to deliver the elements as defined in the Scope of Work as defined in the **TOR-radio v10 27-08-55_Eng_edit.doc** document that were related to the potential introduction of DAB+ services in Thailand. In response to the terms of reference document and exsutuon this study the following scope items were covered by the Consultant:

- Section 3.2: Study and analyze the international rules, regulations, and recommendations including international guidelines associated with the development of frequency plan for sound broadcasting service: here Digital Radios.
    - All relevant rules and recommendations haven provided in the submitted reports. Official references that have been cited by the Consultant are referenced at the bottom of the page in which the citation has been made.
- Section 3.3: Study and analyze the international rules, regulations, and recommendations including international guidelines associated with the development of technical standard for sound broadcasting service: here Digital Radios.
    - All relevant rules and recommendations haven provided in the submitted reports. Official references that have been cited by the Consultant are referenced at the bottom of the page in which the citation has been made.
- Section 3.4: Study and analyze the sound broadcasting technology for Digital Radios to provide a recommendation for selecting appropriate technology for each frequency band.
    - As agreed with NBTC, the digital sound broadcasting technology considered by the NBTC for the potential introduction of digistal radio services in Thailand and studied in this report is the DAB+ system.
- Section 3.5: Calculate the signal coverage using simulation tools along with the development of the radio frequency plans for digital radio broadcasting services.
    - All proposed signal coverage has been calculated and documented throughout the entire study.
- Section 3.8: Develop a radio frequency plan for digital radio to be used for public, local, and commercial services (local, regional, and national levels) including conditions for use of radio frequency. The radio frequency plan has to cover the following topics (at least):
    - 3.8.1 Plan the radio frequency channels
        - The frequency plans for the National SFN and Local SFN have been provided in this document. The NBTC decided to drop the regional (transitional) frequency plan. Conditions to use and deploy the transmitters are provided in section 4.1 of this report.
    - 3.8.2 Determine the radio frequency channels for each service area in the specified portion for public, community, and commercial services (local, regional, and national levels) aiming for efficiency and least impact to the existing licenses.
        - Since the proposed plans consider a Television Analogue Switch-off scenario, the existing services will be fully protected. The plan also provides adequate protection (less than 1% of maximum interference) between the future DAB+ services. The scenarios include all required multiplexes (4 national and 4 local multiplexes) to provide capacity for the public, community and commercial services, as requested by the NBTC.

- 3.8.3 Determine relevant technical parameters.
  - All relevant parameters have been presented and documented in this study.
- 3.8.4 Conditions for use of radio frequency, including conditions for use of radio frequency along border areas.
  - All conditions have been presented and documented and only the coordinated channels have been used in border areas (with Malaysia, no coordination information with other borders).

- Section 3.9 Develop a frequency tuning plan and/or a plan to adjust the radio frequency channel in case of changing the channel spacing or changing the radio frequency channel different from existing plan.
  - The frequency tuning plan for DAB+ was provided in the Inception Report provided by the Consultant as one of the project's deliverables. This presented plan is compatible with international standards.
- Section 3.11 Develop the technical standard for sound broadcasting service (transmitter or transmission technology, and receiver) in digital radio system. The technical standard for transmitter and receiver has to cover the following topics (at least):
  - 3.11.1 Technical standard for digital sound broadcasting transmission
    - The technical standards for the DAB+ system used or refered to in this document are:
      - ETSI EN 300 401 – Original DAB+ Specifications
      - ETSI TS 102 562 – DAB+ enhancement specifications
  - 3.11.2 Technical standard for receiver in digital sound broadcasting system
    - The technical standard for DAB+ receiver is provided as an addendum to this document.

The Consultant considers that all of the above items have been delivered and acceped by the NBTC.

Appendix A – Coverage Maps National SFN Service

The following maps demonstrate the achievable DAB+ coverage when all relevant broadcasting and telecom tower facilities are used.

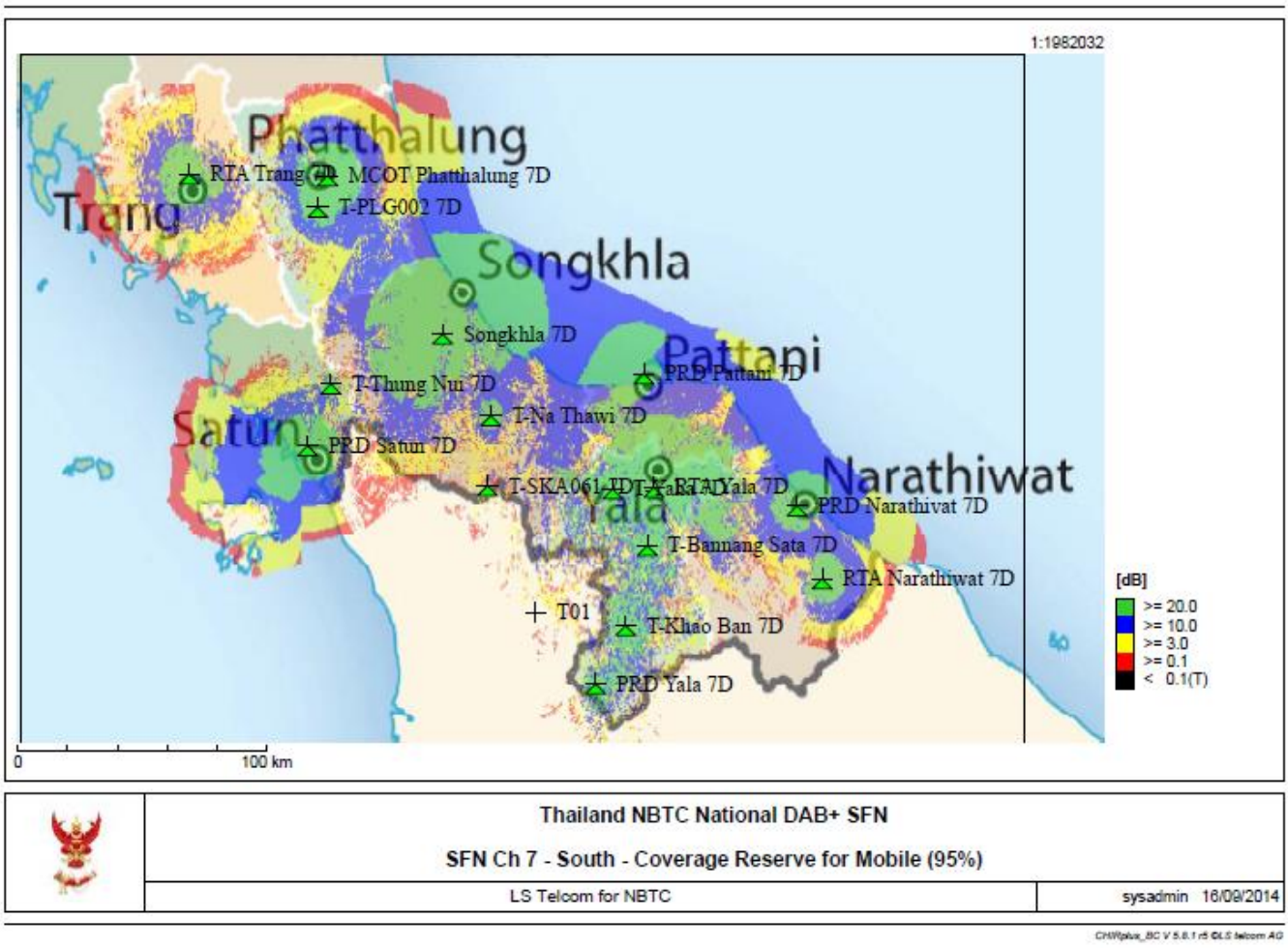


Figure 20: National SFN Ch 7 – South

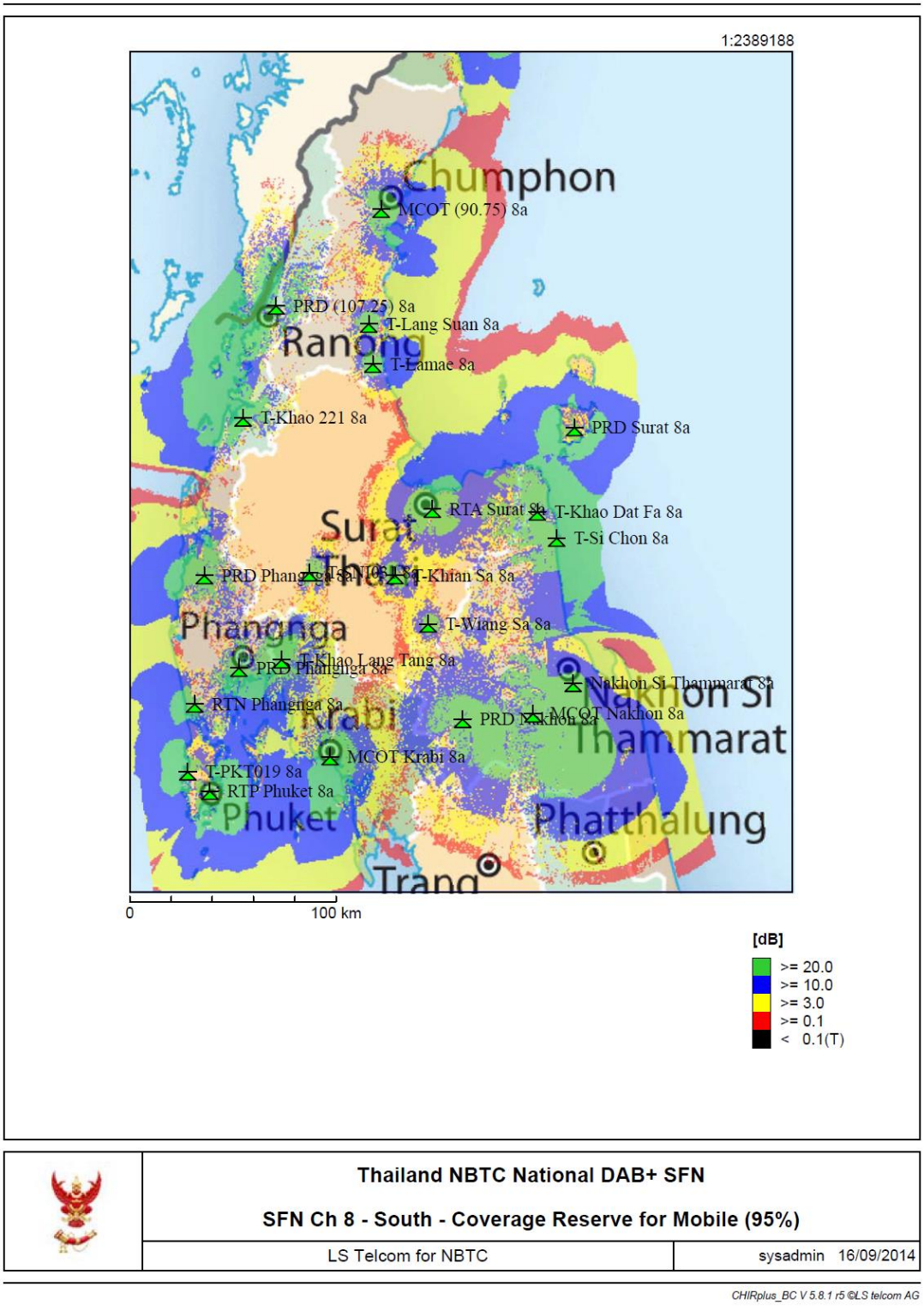


Figure 21: National SFN Ch8 South

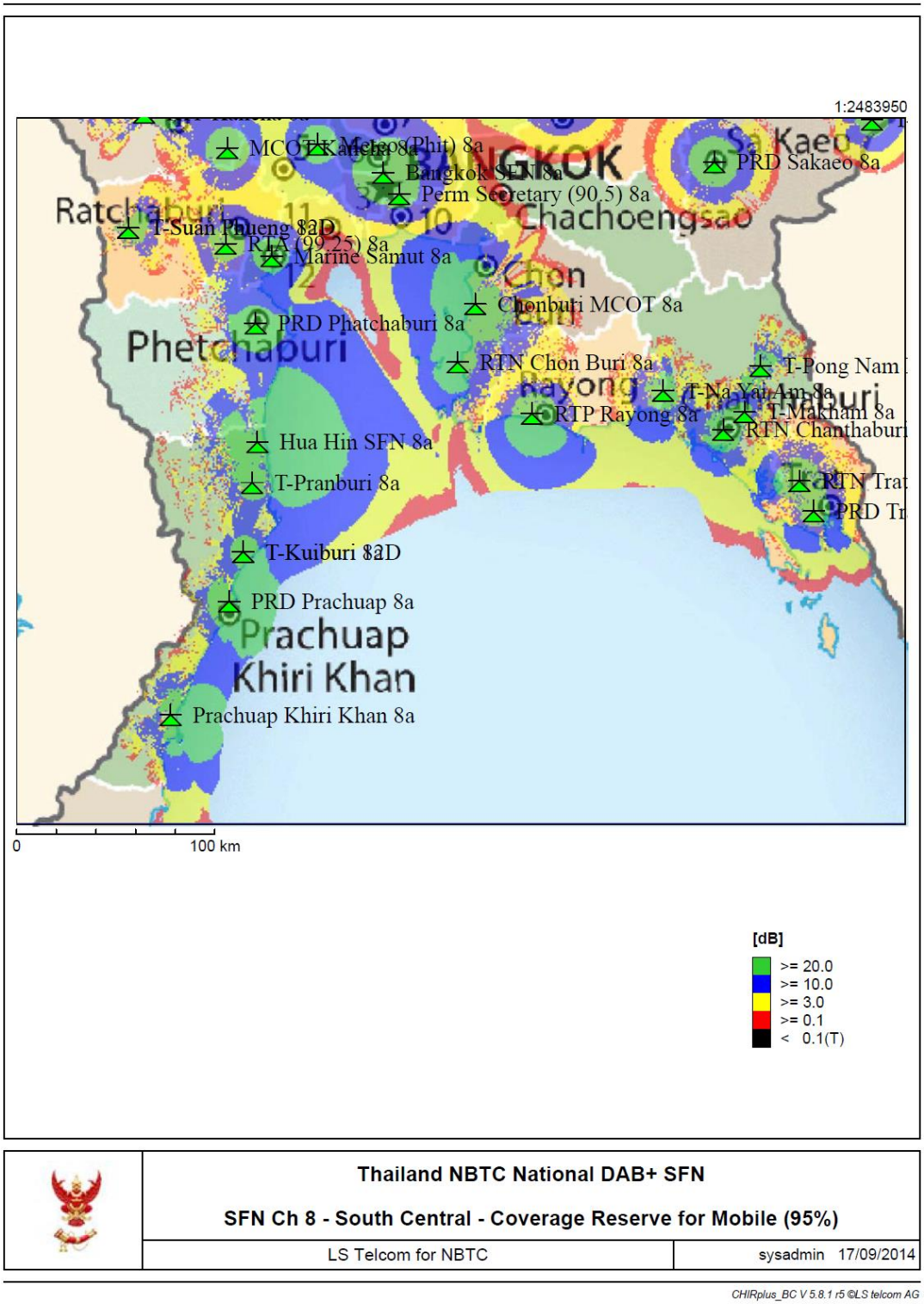


Figure 22: National SFN Ch8 South Central

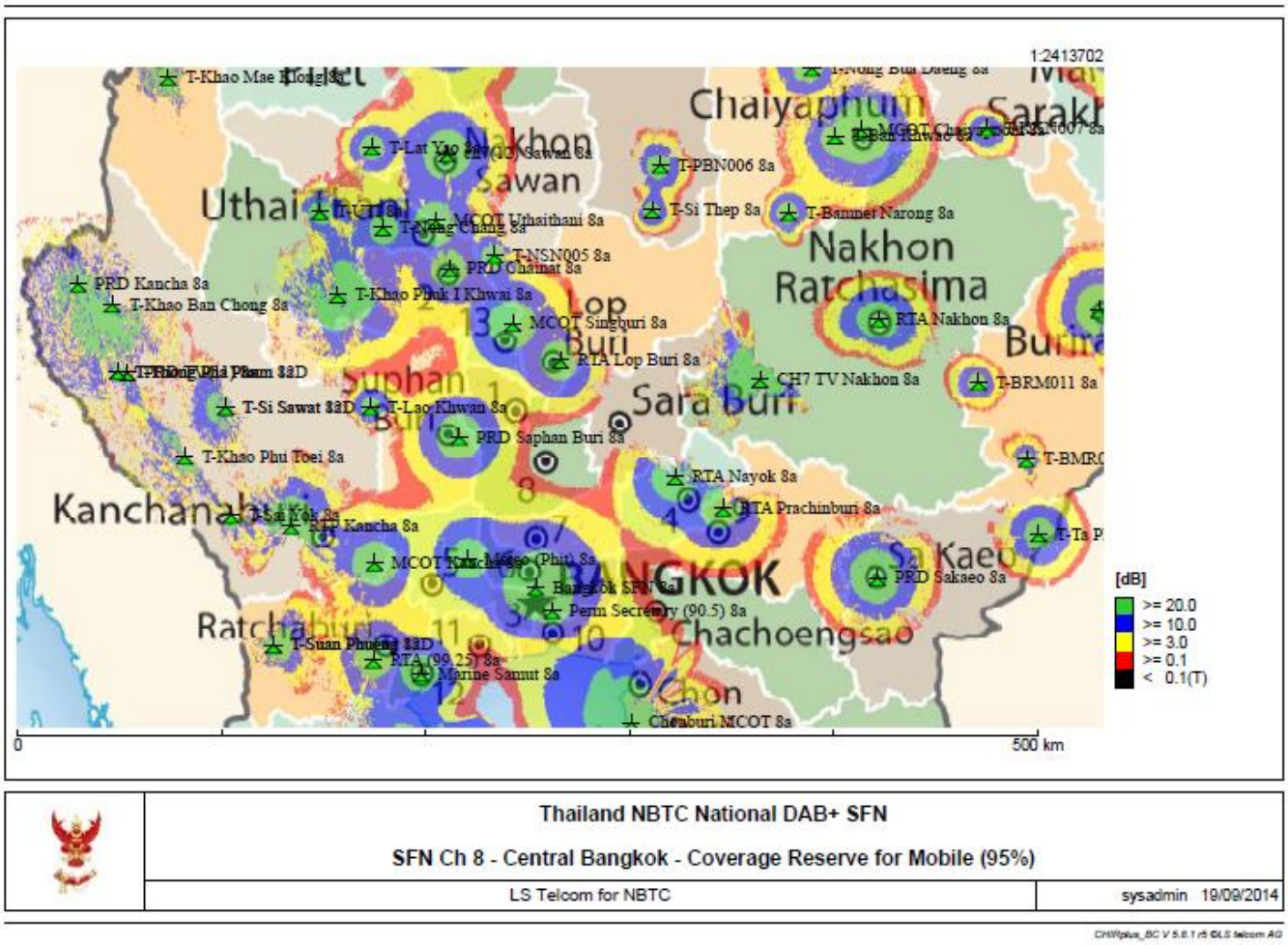


Figure 23: National SFN Ch8 - Central Bangkok

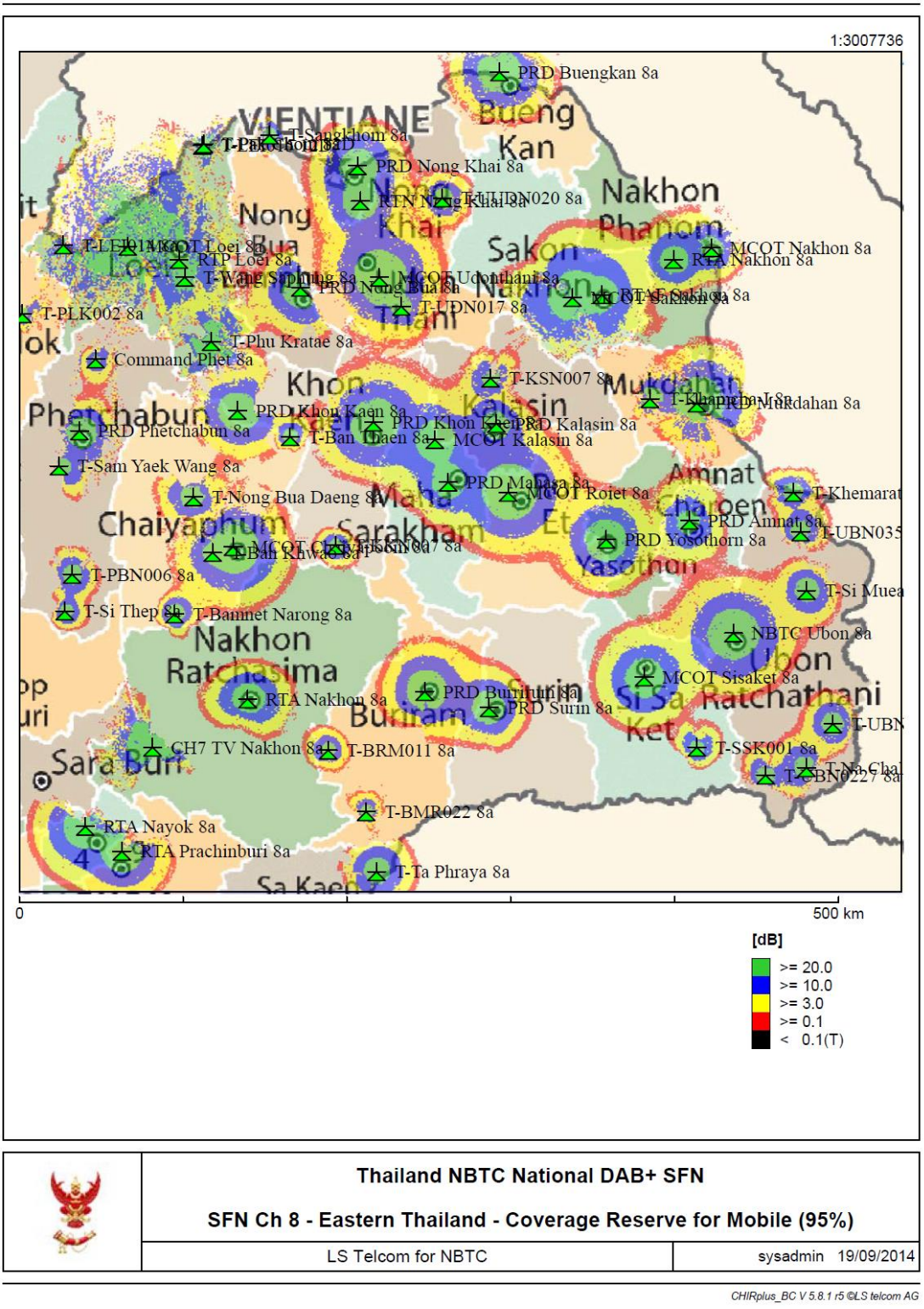
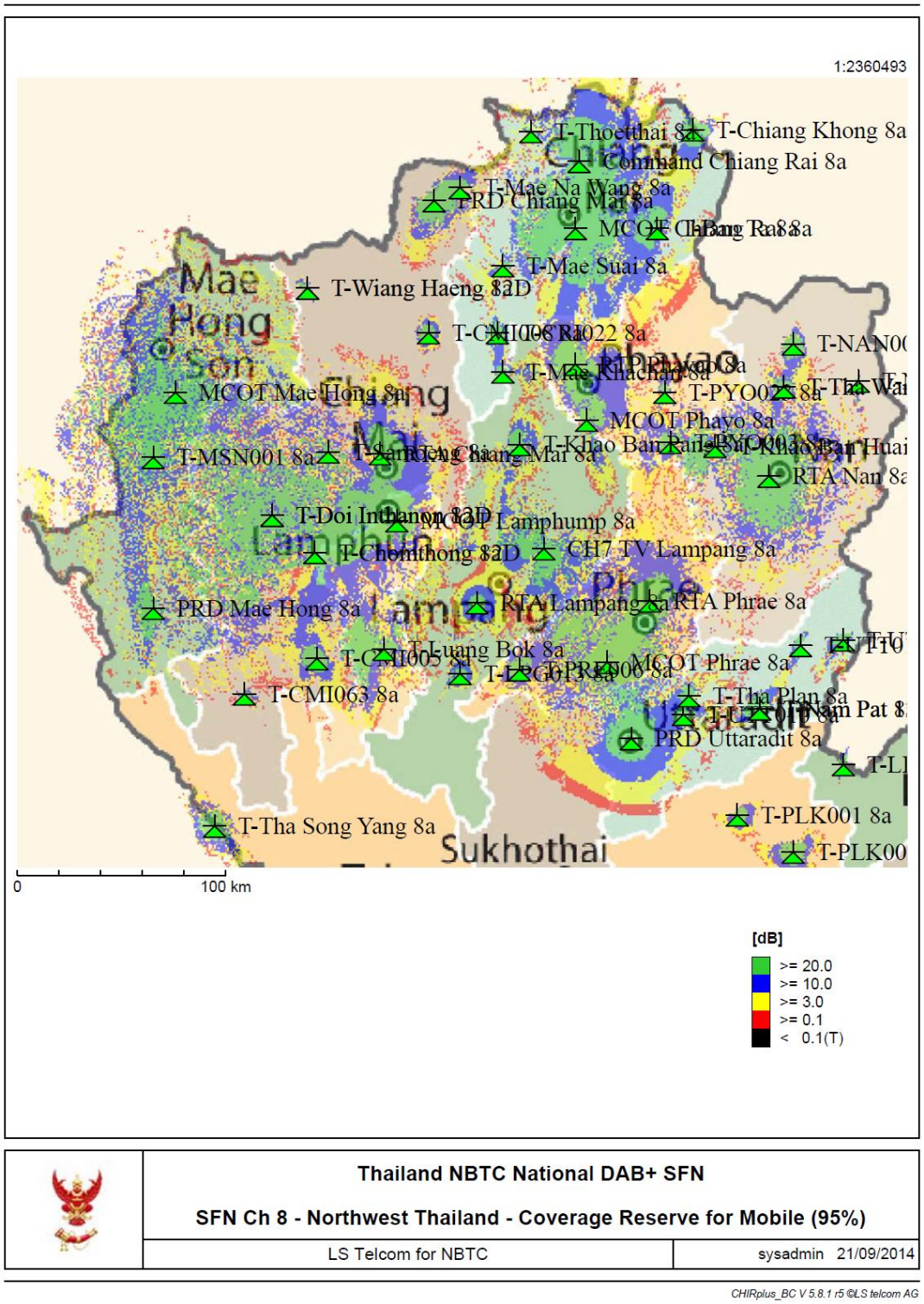


Figure 24: National SFN Ch8 - Eastern Thailand



Thailand NBTC National DAB+ SFN

SFN Ch 8 - Northwest Thailand - Coverage Reserve for Mobile (95%)

LS Telcom for NBTC	sysadmin 21/09/2014

CHIRplus_BC V 5.8.1 r5 ©LS telcom AG

Figure 25: National SFN Ch8 - Northwest Thailand

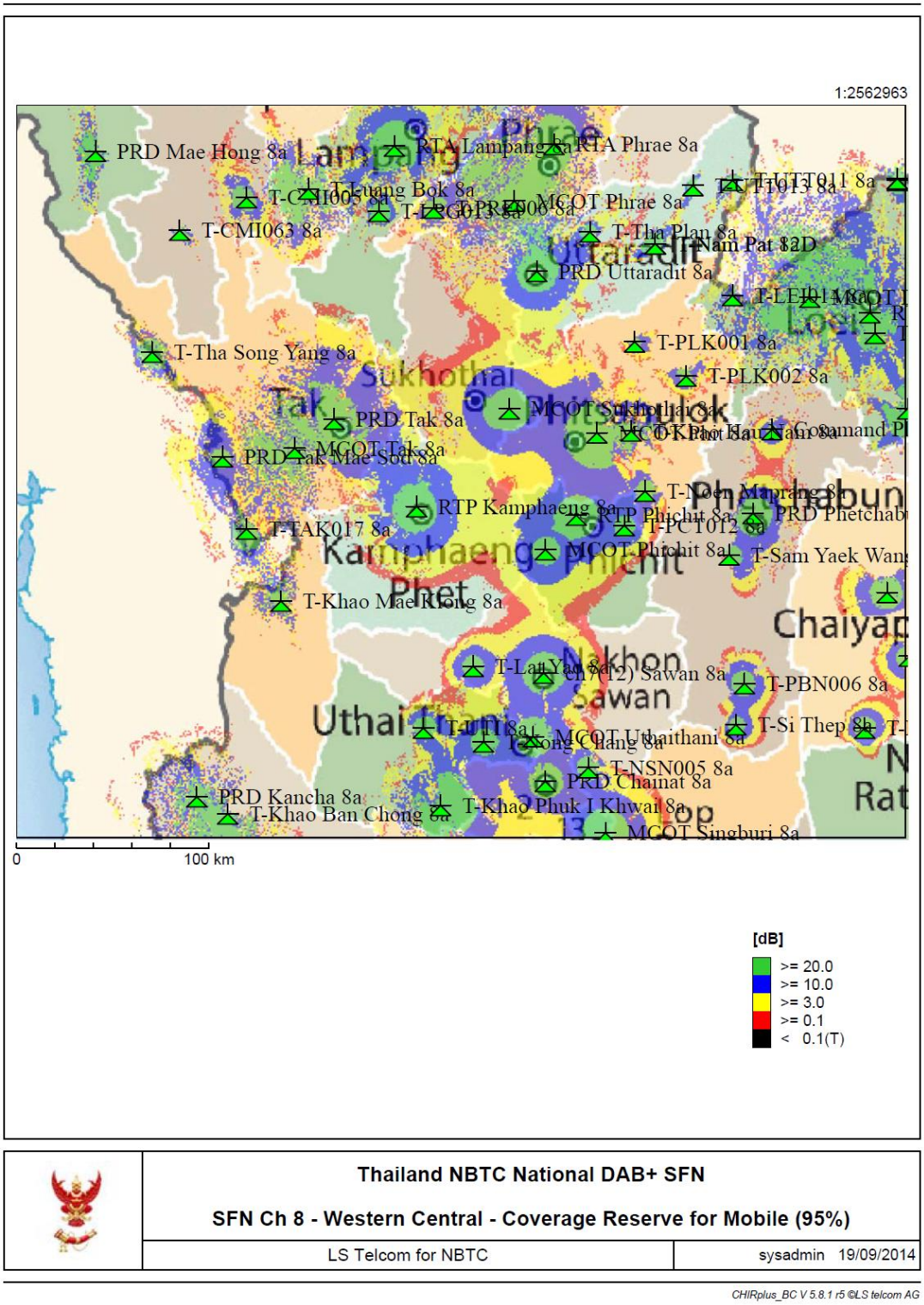


Figure 26: National SFN Ch8 - Western Central

Appendix B – List of Transmitter Parameters for the National SFN Service

The following table lists the broadcasting and telecom tower facilities used to create the National SFN coverage.

Column description		
Column 1	#	Row number
Column 2	Id	Transmitter Id from CHIRPplus_BC DAB database
Column 3	TX-Name	Transmitter name used for simulations. "T-" prefix refers to a CAT/TOT transmitters while other name refers to a broadcast transmit tower.
Column 4	Freq.	Center Frequency of DAB+ channel block
Column 5	Ch.	DAB+ Channel block number
Column 6	ERP	Effective Radiated Power in dBW
Column 7	Longit.	Longitude of the transmitter location
Column 8	Latit.	Latitude of the transmitter location
Column 9	Patt	Antenna pattern where ND represents "Non-directional". Please note that all antenna patterns used in this report are non-directional
Column 10	Ant.H.	Antenna Height in the tower (center of radiation above ground level)
Column 11	SFN Id	Single Frequency Network Id used in CHIRplus_BC for the network simulation
Column 12	Time Del.	Time Delay value for the optimal SFN synchronisation in order to minimise the intra-SFN interference

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
1	25	RTA Trang	194.0640	7D	43.9794	099E35 52.397	07N37 20.366	ND	100	SFN7	450
2	26	MCOT Phatthalung	194.0640	7D	43.9794	100E06 02.059	07N36 58.763	ND	95	SFN7	525
3	27	PRD Satun	194.0640	7D	40.0000	100E01 30.900	06N38 07.102	ND	49	SFN7	550
4	28	PRD Pattani	194.0640	7D	40.0000	101E15 00.356	06N53 31.837	ND	75	SFN7	500
5	29	RTA Yala	194.0640	7D	46.9897	101E16 58.501	06N28 39.000	ND	65	SFN7	400
6	30	PRD Narathivat	194.0640	7D	40.0000	101E48 09.500	06N24 37.800	ND	80	SFN7	500
7	31	Songkhla	194.0640	7D	46.9897	100E31 07.104	07N02 15.706	ND	40	SFN7	500
8	32	RTA Narathiwat	194.0640	7D	40.0000	101E53 32.748	06N08 35.930	ND	80	SFN7	600
9	33	PRD Yala	194.0640	7D	40.0000	101E04 04.000	05N45 44.000	ND	80	SFN7	600

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
10	131	T-SKA061	194.0640	7D	36.9897	100E40 42.200	06N29 23.960	ND	30	SFN7	550
11	168	T-PLG002	194.0640	7D	36.9897	100E03 47.380	07N29 58.780	ND	50	SFN7	525
12	254	T-Na Thawi	194.0640	7D	36.9897	100E41 30.650	06N44 28.600	ND	37	SFN7	525
13	255	T-Thung Nui	194.0640	7D	36.9897	100E06 44.580	06N51 24.300	ND	22	SFN7	525
14	258	T-Bannang Sata	194.0640	7D	36.9897	101E15 35.130	06N16 02.560	ND	112	SFN7	550
15	259	T-Yaha	194.0640	7D	36.9897	101E07 46.600	06N28 34.770	ND	47	SFN7	500
16	260	T-Khao Ban	194.0640	7D	36.9897	101E10 52.730	05N58 41.100	ND	62	SFN7	500
17	34	Bangkok SFN	195.9360	8a	46.9897	100E31 31.240	13N47 25.960	ND	185	SFN8	500
18	35	Chonburi MCOT	195.9360	8a	43.9794	100E57 02.030	13N11 23.359	ND	43	SFN8	500
19	36	Hua Hin SFN	195.9360	8a	43.9794	099E56 07.000	12N33 55.000	ND	55	SFN8	700
20	37	Meteo (Phit)	195.9360	8a	43.9794	100E13 00.620	13N55 21.516	ND	85	SFN8	550
21	38	Perm Secretary (90.5)	195.9360	8a	40.0000	100E36 03.715	13N41 21.599	ND	109	SFN8	500
22	39	Marine Samut	195.9360	8a	43.9794	100E00 04.835	13N24 50.897	ND	80	SFN8	600
23	40	PRD Phatchaburi	195.9360	8a	43.9794	099E55 44.458	13N06 15.800	ND	75	SFN8	625
24	41	RTP Kancha	195.9360	8a	43.9794	099E24 45.742	14N04 05.531	ND	105	SFN8	700
25	42	MCOT Kancha	195.9360	8a	40.0000	099E47 39.746	13N54 18.144	ND	105	SFN8	625
26	43	RTA (99.25)	195.9360	8a	40.0000	099E47 16.184	13N28 23.268	ND	100	SFN8	625
27	44	PRD Prachuap	195.9360	8a	43.9794	099E48 02.999	11N50 07.199	ND	105	SFN8	700
28	45	Prachuap Khiri Khan	195.9360	8a	43.9794	099E31 33.181	11N19 25.759	ND	85	SFN8	750
29	46	MCOT (90.75)	195.9360	8a	43.9794	099E08 02.915	10N26 45.521	ND	105	SFN8	750
30	47	PRD (107.25)	195.9360	8a	43.9794	098E40 07.230	10N01 29.076	ND	97	SFN8	825

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
31	48	Nakhon Si Thammarat	195.9360	8a	43.9794	099E58 38.480	08N21 59.880	ND	108	SFN8	575
32	49	RTP Phuket	195.9360	8a	43.9794	098E22 58.645	07N53 40.513	ND	85	SFN8	625
33	50	PRD Phangnga	195.9360	8a	40.0000	098E21 05.238	08N50 22.247	ND	15	SFN8	700
34	51	PRD Phangnga	195.9360	8a	43.9794	098E30 24.408	08N26 02.735	ND	85	SFN8	625
35	52	MCOT Krabi	195.9360	8a	43.9794	098E54 31.338	08N02 56.886	ND	105	SFN8	650
36	53	PRD Nakhon	195.9360	8a	40.0000	099E29 23.813	08N12 36.767	ND	32	SFN8	625
37	54	RTA Surat	195.9360	8a	46.9897	099E21 42.080	09N07 47.748	ND	71	SFN8	700
38	55	RTN Phangnga	195.9360	8a	40.0000	098E18 39.726	08N16 36.070	ND	85	SFN8	575
39	56	MCOT Nakhon	195.9360	8a	43.9794	099E48 14.152	08N14 12.077	ND	36	SFN8	600
40	57	PRD Surat	195.9360	8a	30.0000	099E59 18.676	09N29 23.676	ND	39	SFN8	600
41	58	RTN Chon Buri	195.9360	8a	43.9794	100E51 58.752	12N55 17.364	ND	25	SFN8	600
42	59	RTP Rayong	195.9360	8a	43.9794	101E12 43.340	12N41 22.420	ND	75	SFN8	600
43	60	RTN Chanthaburi	195.9360	8a	43.9794	102E05 50.482	12N36 27.612	ND	75	SFN8	500
44	61	RTN Trat	195.9360	8a	43.9794	102E26 38.015	12N21 50.778	ND	85	SFN8	500
45	62	PRD Trat	195.9360	8a	36.9897	102E30 40.608	12N13 45.588	ND	70	SFN8	525
46	63	PRD Sakaeo	195.9360	8a	43.9794	102E04 17.458	13N49 27.455	ND	80	SFN8	600
47	64	RTA Nayok	195.9360	8a	43.9794	101E09 49.165	14N16 44.803	ND	85	SFN8	500
48	65	PRD Saphan Buri	195.9360	8a	43.9794	100E10 48.857	14N27 48.208	ND	85	SFN8	550
49	66	RTA Prachinburi	195.9360	8a	43.9794	101E22 26.378	14N08 05.813	ND	66	SFN8	500
50	67	RTA Lop Buri	195.9360	8a	40.0000	100E38 33.634	14N48 02.149	ND	85	SFN8	550
51	68	MCOT Singburi	195.9360	8a	40.0000	100E25 40.778	14N57 45.710	ND	125	SFN8	575

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
52	69	PRD Chainat	195.9360	8a	40.0000	100E08 25.562	15N12 24.473	ND	65	SFN8	575
53	70	MCOT Uthaithani	195.9360	8a	40.0000	100E04 45.232	15N25 03.691	ND	97	SFN8	575
54	71	PRD TV(11)	195.9360	8a	36.9897	098E40 14.440	14N45 04.120	ND	65	SFN8	575
55	72	PRD Kancha	195.9360	8a	40.0000	098E26 41.752	15N08 23.471	ND	85	SFN8	600
56	73	RTA Nakhon	195.9360	8a	43.9794	102E05 44.610	14N57 54.090	ND	95	SFN8	550
57	74	CH7 TV Nakhon	195.9360	8a	46.9897	101E33 04.590	14N42 25.109	ND	70	SFN8	525
58	75	ch7(12) Sawan	195.9360	8a	40.0000	100E07 59.106	15N42 53.244	ND	33	SFN8	600
59	76	PRD Burrirum	195.9360	8a	43.9794	103E05 46.104	14N59 30.192	ND	97	SFN8	750
60	77	PRD Phetchabun	195.9360	8a	43.9794	101E09 15.329	16N27 26.125	ND	73	SFN8	600
61	78	RTP Phichit	195.9360	8a	43.9794	100E17 51.140	16N27 14.220	ND	75	SFN8	650
62	79	RTP Kamphaeng	195.9360	8a	46.9897	099E31 11.379	16N29 59.749	ND	105	SFN8	600
63	80	PRD Tak	195.9360	8a	43.9794	099E06 58.367	16N54 54.234	ND	65	SFN8	650
64	81	PRD Tak Mae Sod	195.9360	8a	30.0000	098E33 58.712	16N43 56.845	ND	75	SFN8	600
65	82	MCOT Sukhothai	195.9360	8a	43.9794	099E58 01.801	16N57 47.902	ND	105	SFN8	700
66	83	MCOT Tak	195.9360	8a	43.9794	098E55 30.983	16N46 44.882	ND	75	SFN8	650
67	84	MCOT Phit	195.9360	8a	43.9794	100E24 07.528	16N50 29.141	ND	75	SFN8	700
68	85	Command Phet	195.9360	8a	36.9897	101E15 10.994	16N51 02.797	ND	93	SFN8	600
69	86	MCOT Phichit	195.9360	8a	43.9794	100E08 47.490	16N17 51.140	ND	97	SFN8	600
70	87	PRD Uttaradit	195.9360	8a	43.9794	100E06 32.926	17N36 30.838	ND	85	SFN8	700
71	88	MCOT Phrae	195.9360	8a	43.9794	100E00 03.139	17N55 58.894	ND	45	SFN8	675
72	89	RTA Phrae	195.9360	8a	43.9794	100E11 52.494	18N12 17.968	ND	105	SFN8	700

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
73	90	RTA Lampang	195.9360	8a	43.9794	099E24 29.808	18N11 50.035	ND	105	SFN8	750
74	91	CH7 TV Lampang	195.9360	8a	43.9794	099E42 48.850	18N25 55.210	ND	85	SFN8	750
75	92	MCOT Lamphump	195.9360	8a	43.9794	099E02 54.931	18N33 16.250	ND	105	SFN8	850
76	93	RTA Chiang Mai	195.9360	8a	46.9897	098E58 13.710	18N50 50.165	ND	75	SFN8	800
77	94	MCOT Mae Hong	195.9360	8a	43.9794	098E02 08.581	19N06 21.625	ND	40	SFN8	775
78	95	PRD Mae Hong	195.9360	8a	36.9897	097E56 40.380	18N10 06.834	ND	25	SFN8	1000
79	96	RTA Nan	195.9360	8a	46.9897	100E44 32.852	18N44 33.522	ND	105	SFN8	750
80	97	RTP Phayao	195.9360	8a	46.9897	099E51 41.684	19N13 55.974	ND	93	SFN8	750
81	98	MCOT Chiang Rai	195.9360	8a	43.9794	099E52 03.061	19N48 55.598	ND	45	SFN8	750
82	99	Command Chiang Rai	195.9360	8a	43.9794	099E53 12.574	20N06 33.271	ND	105	SFN8	800
83	100	PRD Chiang Mai	195.9360	8a	43.9794	099E13 18.678	19N56 26.563	ND	75	SFN8	750
84	101	MCOT Phayo	195.9360	8a	40.0000	099E54 41.177	18N59 18.092	ND	30	SFN8	750
85	102	RTP Loei	195.9360	8a	43.9794	101E44 17.498	17N23 32.798	ND	95	SFN8	750
86	103	MCOT Loei	195.9360	8a	40.0000	101E26 40.402	17N28 11.302	ND	146	SFN8	750
87	104	PRD Nong Bua	195.9360	8a	43.9794	102E25 46.499	17N13 41.401	ND	74	SFN8	850
88	105	PRD Nong Khai	195.9360	8a	40.0000	102E46 26.022	17N53 14.687	ND	97	SFN8	900
89	106	RTN Nong Khai	195.9360	8a	40.0000	102E46 56.010	17N41 54.388	ND	95	SFN8	900
90	107	MCOT Udonthani	195.9360	8a	46.9897	102E53 04.596	17N16 41.628	ND	89	SFN8	875
91	108	RTA Nakhon	195.9360	8a	40.0000	104E34 25.802	17N19 47.755	ND	95	SFN8	750
92	109	MCOT Nakhon	195.9360	8a	40.0000	104E47 16.699	17N23 16.825	ND	94	SFN8	700
93	110	RTAF Sakhon	195.9360	8a	43.9794	104E09 14.339	17N09 01.634	ND	65	SFN8	800

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
94	111	PRD Buengkan	195.9360	8a	43.9794	103E35 54.118	18N23 14.557	ND	93	SFN8	700
95	112	MCOT Sakhon	195.9360	8a	36.9897	103E59 20.749	17N08 15.598	ND	32	SFN8	750
96	113	PRD Mukdahan	195.9360	8a	46.9897	104E40 50.362	16N32 40.679	ND	80	SFN8	925
97	114	MCOT Kalasin	195.9360	8a	43.9794	103E11 05.982	16N22 32.059	ND	93	SFN8	850
98	115	PRD Khon Kaen	195.9360	8a	43.9794	102E50 01.100	16N28 31.501	ND	98	SFN8	850
99	116	PRD Khon Kaen	195.9360	8a	43.9794	102E03 20.099	16N33 21.199	ND	75	SFN8	900
100	117	PRD Kalasin	195.9360	8a	40.0000	103E32 05.492	16N27 12.445	ND	75	SFN8	875
101	118	MCOT Chaiyapoom	195.9360	8a	46.9897	102E01 35.616	15N48 16.200	ND	105	SFN8	750
102	119	MCOT Roiet	195.9360	8a	43.9794	103E35 47.116	16N04 31.199	ND	135	SFN8	900
103	120	PRD Mahasa	195.9360	8a	40.0000	103E15 11.560	16N08 20.677	ND	93	SFN8	850
104	121	PRD Surin	195.9360	8a	43.9794	103E27 25.200	14N53 39.012	ND	55	SFN8	850
105	122	MCOT Sisaket	195.9360	8a	43.9794	104E20 41.568	15N02 33.000	ND	95	SFN8	750
106	123	NBTC Ubon	195.9360	8a	43.9794	104E50 59.154	15N16 20.204	ND	135	SFN8	750
107	124	PRD Amnat	195.9360	8a	40.0000	104E37 07.918	15N53 55.331	ND	75	SFN8	800
108	125	PRD Yosothorn	195.9360	8a	43.9794	104E08 34.336	15N48 12.852	ND	85	SFN8	900
109	126	T-CMI005	195.9360	8a	36.9897	098E40 54.260	17N57 10.940	ND	50	SFN8	800
110	127	T-CMI008	195.9360	8a	36.9897	099E11 49.700	19N22 11.640	ND	50	SFN8	800
111	128	T-CMI063	195.9360	8a	36.9897	098E21 29.520	17N47 49.310	ND	50	SFN8	800
112	129	T-KKN007	195.9360	8a	36.9897	102E36 11.970	15N48 17.860	ND	50	SFN8	750
113	132	T-CRI022	195.9360	8a	36.9897	099E30 21.960	19N21 52.420	ND	50	SFN8	750
114	135	T-LPG013	195.9360	8a	36.9897	099E20 10.770	17N53 25.490	ND	50	SFN8	750

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
115	136	T-MSN001	195.9360	8a	36.9897	097E56 10.080	18N49 42.420	ND	50	SFN8	825
116	137	T-NAN007	195.9360	8a	36.9897	100E51 36.370	19N18 36.930	ND	50	SFN8	750
117	138	T-NAN011	195.9360	8a	36.9897	101E09 15.080	19N08 37.100	ND	50	SFN8	750
118	140	T-NSN005	195.9360	8a	36.9897	100E20 55.180	15N16 07.180	ND	50	SFN8	575
119	141	T-PBN006	195.9360	8a	36.9897	101E06 17.800	15N39 43.850	ND	50	SFN8	650
120	142	T-PCT012	195.9360	8a	36.9897	100E31 48.700	16N24 18.980	ND	50	SFN8	625
121	143	T-PLK001	195.9360	8a	30.0000	100E35 17.810	17N16 24.280	ND	50	SFN8	700
122	144	T-PLK002	195.9360	8a	36.9897	100E50 16.100	17N06 14.470	ND	50	SFN8	700
123	145	T-PRE006	195.9360	8a	36.9897	099E36 06.120	17N54 32.940	ND	50	SFN8	700
124	146	T-PYO003	195.9360	8a	36.9897	100E17 49.530	18N53 10.540	ND	50	SFN8	750
125	147	T-PYO023	195.9360	8a	36.9897	100E16 21.860	19N06 15.980	ND	35	SFN8	750
126	148	T-TAK017	195.9360	8a	36.9897	098E41 30.950	16N23 34.510	ND	35	SFN8	600
127	150	T-UTI	195.9360	8a	36.9897	099E32 59.060	15N27 39.350	ND	50	SFN8	600
128	151	T-UTT010	195.9360	8a	36.9897	100E20 52.400	17N42 21.600	ND	25	SFN8	700
129	152	T-UTT011	195.9360	8a	36.9897	101E04 25.860	18N01 40.370	ND	35	SFN8	850
130	153	T-UTT013	195.9360	8a	36.9897	100E52 56.060	18N00 14.620	ND	35	SFN8	850
131	154	T-BRM011	195.9360	8a	36.9897	102E32 46.050	14N40 48.890	ND	50	SFN8	550
132	155	T-BMR022	195.9360	8a	36.9897	102E45 23.940	14N20 06.790	ND	35	SFN8	500
133	156	T-KSN007	195.9360	8a	36.9897	103E30 42.150	16N42 14.190	ND	35	SFN8	875
134	157	T-LEI014	195.9360	8a	36.9897	101E04 13.620	17N28 53.040	ND	35	SFN8	750
135	160	T-SSK001	195.9360	8a	36.9897	104E37 52.550	14N39 01.900	ND	35	SFN8	700

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
136	161	T-UBN007	195.9360	8a	36.9897	105E24 07.240	14N45 27.360	ND	50	SFN8	800
137	162	T-UBN0227	195.9360	8a	36.9897	105E00 41.830	14N29 29.580	ND	50	SFN8	800
138	163	T-UBN035	195.9360	8a	36.9897	105E14 50.960	15N49 07.280	ND	50	SFN8	850
139	164	T-UDN017	195.9360	8a	36.9897	103E00 37.060	17N06 46.630	ND	35	SFN8	875
140	165	T-UUDN020	195.9360	8a	36.9897	103E15 21.600	17N42 12.280	ND	50	SFN8	900
141	167	T-PKT019	195.9360	8a	36.9897	098E17 04.200	07N58 44.720	ND	50	SFN8	600
142	169	T-SNI031	195.9360	8a	36.9897	098E49 01.060	08N51 20.580	ND	50	SFN8	750
143	173	T-Si Sawat	195.9360	8a	36.9897	099E06 56.020	14N35 48.890	ND	102	SFN8	600
144	174	T-Lao Khwan	195.9360	8a	36.9897	099E46 28.140	14N35 49.510	ND	52	SFN8	550
145	175	T-Khao Phu Toei	195.9360	8a	36.9897	098E55 56.410	14N22 50.100	ND	32	SFN8	600
146	177	T-Sai Yok	195.9360	8a	36.9897	099E08 38.400	14N07 05.630	ND	62	SFN8	625
147	178	T-Suan Phueng	195.9360	8a	36.9897	099E20 09.810	13N32 39.310	ND	102	SFN8	625
148	179	T-Khao Ban Chong	195.9360	8a	36.9897	098E35 57.660	15N03 07.740	ND	22	SFN8	600
149	180	T-Thong Pha Phum	195.9360	8a	36.9897	098E37 26.240	14N45 08.640	ND	62	SFN8	575
150	181	T-Na Yai Am	195.9360	8a	36.9897	101E49 19.200	12N47 15.720	ND	117	SFN8	550
151	182	T-Ta Phraya	195.9360	8a	36.9897	102E48 17.270	14N00 10.270	ND	87	SFN8	500
152	184	T-Pong Nam Ron	195.9360	8a	36.9897	102E16 28.280	12N53 22.920	ND	82	SFN8	575
153	185	T-Makham	195.9360	8a	36.9897	102E11 42.190	12N40 53.410	ND	22	SFN8	500
154	187	T-Pranburi	195.9360	8a	36.9897	099E54 24.170	12N22 33.140	ND	67	SFN8	700
155	190	T-Kuiburi	195.9360	8a	36.9897	099E51 55.360	12N04 03.500	ND	67	SFN8	700
156	191	T-Ban Khwao	195.9360	8a	36.9897	101E54 23.280	15N46 43.830	ND	42	SFN8	750

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
157	192	T-Bamnet Narong	195.9360	8a	36.9897	101E41 16.810	15N26 35.840	ND	32	SFN8	700
158	193	T-Na Chaluai	195.9360	8a	36.9897	105E14 42.830	14N31 24.700	ND	38	SFN8	800
159	194	T-Khemarat	195.9360	8a	36.9897	105E12 53.860	16N02 19.680	ND	42	SFN8	850
160	195	T-Si Mueang Mai	195.9360	8a	36.9897	105E16 37.250	15N29 53.110	ND	62	SFN8	800
161	196	T-Khamcha-I	195.9360	8a	36.9897	104E25 01.600	16N34 32.030	ND	52	SFN8	900
162	197	T-Ban Thaen	195.9360	8a	36.9897	102E21 15.170	16N24 34.430	ND	22	SFN8	875
163	198	T-Wang Saphung	195.9360	8a	36.9897	101E45 54.110	17N17 50.770	ND	112	SFN8	750
164	203	T-Phu Kratae	195.9360	8a	36.9897	101E55 03.130	16N56 28.380	ND	27	SFN8	875
165	204	T-Pak Chom	195.9360	8a	36.9897	101E53 08.900	18N01 23.740	ND	92	SFN8	900
166	205	T-Sangkhom	195.9360	8a	36.9897	102E15 58.090	18N04 18.650	ND	22	SFN8	900
167	208	T-Chomthong	195.9360	8a	36.9897	098E40 31.880	18N25 05.590	ND	30	SFN8	825
168	210	T-Mae Khachan	195.9360	8a	36.9897	099E31 58.570	19N11 39.720	ND	22	SFN8	750
169	212	T-Samoeng	195.9360	8a	36.9897	098E44 11.930	18N51 00.290	ND	72	SFN8	800
170	214	T-Wiang Haeng	195.9360	8a	36.9897	098E38 19.080	19N33 44.520	ND	22	SFN8	800
171	215	T-Khao Ban Pang	195.9360	8a	36.9897	099E36 21.370	18N53 11.850	ND	52	SFN8	750
172	216	T-Doi Inthanon	195.9360	8a	36.9897	098E28 56.850	18N34 26.280	ND	102	SFN8	800
173	219	T-Luang Bok	195.9360	8a	36.9897	098E59 07.020	17N59 49.910	ND	62	SFN8	800
174	220	T-Chiang Khong	195.9360	8a	36.9897	100E24 39.780	20N14 46.380	ND	72	SFN8	750
175	221	T-Ban Ta	195.9360	8a	36.9897	100E14 30.600	19N48 55.790	ND	107	SFN8	725
176	222	T-Mae Suai	195.9360	8a	36.9897	099E32 16.380	19N39 31.910	ND	22	SFN8	750
177	223	T-Mae Na Wang	195.9360	8a	36.9897	099E20 34.350	19N59 58.750	ND	15	SFN8	750

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
178	224	T-Thoetthai	195.9360	8a	36.9897	099E40 02.130	20N14 19.700	ND	22	SFN8	800
179	226	T-Tha Wang Pha	195.9360	8a	36.9897	100E48 50.400	19N07 27.430	ND	47	SFN8	750
180	227	T-Khao Ban Huai	195.9360	8a	36.9897	100E29 52.570	18N52 20.650	ND	77	SFN8	750
181	229	T-Tha Plan	195.9360	8a	36.9897	100E22 23.200	17N47 21.120	ND	37	SFN8	700
182	230	T-Nam Pat	195.9360	8a	36.9897	100E41 14.830	17N43 41.510	ND	82	SFN8	700
183	231	T-Khao Hau Nam	195.9360	8a	36.9897	100E34 11.270	16N50 53.970	ND	52	SFN8	700
184	233	T-Tha Song Yang	195.9360	8a	36.9897	098E13 30.760	17N13 38.680	ND	122	SFN8	700
185	234	T-Khao Mae Klong	195.9360	8a	36.9897	098E51 11.200	16N03 38.510	ND	102	SFN8	600
186	237	T-Khao Phuk I Khwai	195.9360	8a	36.9897	099E37 55.100	15N05 35.150	ND	17	SFN8	575
187	238	T-Nong Chang	195.9360	8a	36.9897	099E50 22.520	15N23 30.200	ND	62	SFN8	600
188	239	T-Lat Yao	195.9360	8a	36.9897	099E47 12.920	15N44 55.100	ND	47	SFN8	600
189	240	T-Noen Maprang	195.9360	8a	36.9897	100E38 03.690	16N34 12.860	ND	52	SFN8	625
190	241	T-Si Thep	195.9360	8a	36.9897	101E03 51.510	15N27 46.560	ND	22	SFN8	650
191	242	T-Nong Bua Daeng	195.9360	8a	36.9897	101E48 15.650	16N04 57.190	ND	82	SFN8	750
192	243	T-Sam Yaek Wang	195.9360	8a	36.9897	101E02 21.770	16N15 46.300	ND	38	SFN8	600
193	245	T-Lang Suan	195.9360	8a	36.9897	099E04 36.120	09N56 49.180	ND	62	SFN8	750
194	246	T-Khao 221	195.9360	8a	36.9897	098E31 24.530	09N31 59.450	ND	87	SFN8	875
195	247	T-Khian Sa	195.9360	8a	36.9897	099E11 46.610	08N50 27.460	ND	42	SFN8	700
196	248	T-Lamae	195.9360	8a	36.9897	099E05 42.520	09N46 15.430	ND	67	SFN8	750
197	249	T-Si Chon	195.9360	8a	36.9897	099E54 20.990	09N00 25.020	ND	87	SFN8	700
198	250	T-Khao Dat Fa	195.9360	8a	36.9897	099E49 31.670	09N07 06.310	ND	27	SFN8	700

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
199	251	T-Khao Lang Tang	195.9360	8a	36.9897	098E41 49.710	08N28 27.690	ND	55	SFN8	600
200	252	T-Wiang Sa	195.9360	8a	36.9897	099E20 33.650	08N37 42.720	ND	47	SFN8	650

Appendix C – Population Detailed Estimation of the National SFN Service

The following table calculates the achievable DAB+ National coverage when all relevant broadcasting and telecom tower facilities are used.

Province Name	District	Total Population	0dB - 3 dB	3 dB - 10 dB	10 dB - 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
SFN7 - Southern Provinces										
NARATHIWAT	96	757 397	34 942	159 859	289 332	192 560	**676 693**	**89.34%**	**481 892**	**63.62%**
PATTANI	94	671 615	6 574	33 222	303 707	323 885	**667 388**	**99.37%**	**627 592**	**93.45%**
PHATTHALUNG	93	514 492	28 356	88 983	201 527	149 799	**468 665**	**91.09%**	**351 326**	**68.29%**
SATUN	91	305 879	30 236	37 479	53 646	103 156	**224 517**	**73.40%**	**156 802**	**51.26%**
SONGKHLA	90	1 378 574	29 300	178 837	331 568	815 039	**1 354 744**	**98.27%**	**1 146 607**	**83.17%**
TRANG	92	631 920	40 223	144 112	130 896	169 085	**484 316**	**76.64%**	**299 981**	**47.47%**
YALA	95	500 814	5 739	19 897	36 126	434 038	**495 800**	**99.00%**	**470 164**	**93.88%**
Sub Total SFN7 - Southern Provinces		**4 760 691**	**175 370**	**662 389**	**1 346 802**	**2 187 562**	**4 372 123**	**91.84%**	**3 534 364**	**74.24%**
SFN8 - South Thailand										
CHUMPHON	86	495 310	25 228	83 215	119 113	138 128	**365 684**	**73.83%**	**257 241**	**51.94%**
KRABI	81	444 967	38 930	109 460	118 433	113 593	**380 416**	**85.49%**	**232 026**	**52.14%**
NAKHON SI THAMMARAT	80	1 534 887	11 726	153 687	642 442	722 907	**1 530 762**	**99.73%**	**1 365 349**	**88.95%**

Province Name	District	Total Population	0dB - 3 dB	3 dB - 10 dB	10 dB - 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
PHANGNGA	82	257 493	13 086	23 895	54 368	122 545	**213 894**	**83.07%**	**176 913**	**68.71%**
PHUKET	83	360 905	8 234	26 348	54 769	259 676	**349 027**	**96.71%**	**314 445**	**87.13%**
RANONG	85	182 648	2 296	11 339	27 229	100 051	**140 915**	**77.15%**	**127 280**	**69.69%**
SURAT THANI	84	1 023 288	96 708	184 810	199 815	324 595	**805 928**	**78.76%**	**524 410**	**51.25%**
Sub Total SFN8 - South Thailand		**4 299 498**	**196 208**	**592 754**	**1 216 169**	**1 781 495**	**3 786 626**	**88.07%**	**2 997 664**	**69.72%**
SFN8 - South Central										
CHACHOENGSAO	24	685 721	154 182	122 087	56 432	0	**332 701**	**48.52%**	**56 432**	**8.23%**
CHANTHABURI	22	521 812	20 786	74 714	111 079	174 556	**381 135**	**73.04%**	**285 635**	**54.74%**
CHON BURI	20	1 364 001	100 227	211 991	297 531	610 197	**1 219 946**	**89.44%**	**907 728**	**66.55%**
PHETCHABURI	76	468 874	7 033	35 258	181 219	224 900	**448 410**	**95.64%**	**406 119**	**86.62%**
PRACHUAP KHIRI KHAN	77	517 050	6 422	56 249	121 986	280 820	**465 477**	**90.03%**	**402 806**	**77.90%**
RATCHABURI	70	846 631	26 270	252 625	355 483	186 563	**820 941**	**96.97%**	**542 046**	**64.02%**
RAYONG	21	649 275	24 456	164 036	187 628	191 740	**567 860**	**87.46%**	**379 368**	**58.43%**
SAMUT SONGKHRAM	75	194 042	0	0	38 412	155 630	**194 042**	**100.00%**	**194 042**	**100.00%**
TRAT	23	222 855	10 168	47 562	29 995	85 348	**173 073**	**77.66%**	**115 343**	**51.76%**
Sub Total SFN8 - South Central		**5 470 261**	**349 544**	**964 522**	**1 379 765**	**1 909 754**	**4 603 585**	**84.16%**	**3 289 519**	**60.13%**
SFN8 - Central Bangkok										
ANG THONG	15	283 882	18 913	217 309	38 688	8 205	**283 115**	**99.73%**	**46 893**	**16.52%**

Province Name	District	Total Population	0dB - 3 dB	3 dB - 10 dB	10 dB - 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
BANGKOK	10	5 673 559	74	151 882	1 385 445	4 136 158	5 673 559	100.00%	4 136 158	72.90%
CHAI NAT	18	333 172	2 892	98 667	150 801	78 908	331 268	99.43%	229 709	68.95%
KANCHANABURI	71	838 269	69 539	120 174	192 058	258 006	639 777	76.32%	450 064	53.69%
LOP BURI	16	758 059	32 904	47 806	123 756	210 015	414 481	54.68%	333 771	44.03%
NAKHON NAYOK	26	255 174	18 343	55 006	79 502	89 040	241 891	94.79%	168 542	66.05%
NAKHON PATHOM	73	874 616	684	466 573	345 133	62 226	874 616	100.00%	407 359	46.58%
NAKHON RATCHASIMA	30	2 601 167	121 947	202 402	221 631	425 279	971 259	37.34%	646 910	24.87%
NONTHABURI	12	1 141 673	0	3 815	339 269	798 589	1 141 673	100.00%	1 137 858	99.67%
PATHUM THANI	13	1 033 837	35 859	292 356	694 841	9 968	1 033 024	99.92%	704 809	68.17%
PHRA NAKHON SI AYUTTHAYA	14	793 509	153 796	240 447	28 552	3 289	426 084	53.70%	31 841	4.01%
PRACHIN BURI	25	473 770	66 957	114 741	68 485	80 054	330 237	69.70%	148 539	31.35%
SA KAEO	27	548 342	42 058	63 500	83 030	90 056	278 644	50.82%	173 086	31.57%
SAMUT PRAKAN	11	1 223 302	9	302 478	660 534	260 281	1 223 302	100.00%	920 815	75.27%
SAMUT SAKHON	74	508 812	63 739	345 701	97 207	681	507 328	99.71%	97 888	19.24%
SARABURI	19	625 689	59 864	115 082	41 627	2 673	219 246	35.04%	44 300	7.08%
SING BURI	17	213 216	125	32 718	96 943	83 430	213 216	100.00%	180 373	84.60%
SUPHAN BURI	72	847 308	236 691	282 284	129 002	124 110	772 087	91.12%	253 112	29.87%
UTHAI THANI	61	328 950	10 770	60 823	113 821	120 567	305 981	93.02%	234 388	71.25%
Sub Total SFN8 - Central Bangkok		19 356 306	935 164	3 213 764	4 890 325	6 841 535	15 880 788	82.04%	10 346 415	53.45%

Province Name	District	Total Population	0dB - 3 dB	3 dB - 10 dB	10 dB - 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
SFN8 - Eastern Thailand										
AMNAT CHAROEN	37	373 494	47 167	118 375	59 560	41 325	**266 427**	**71.33%**	**100 885**	**27.01%**
BUENG KAN	38	412 613	32 366	53 518	33 459	43 676	**163 019**	**39.51%**	**77 135**	**18.69%**
BURI RAM	31	1 566 740	106 219	206 938	218 987	204 887	**737 031**	**47.04%**	**423 874**	**27.05%**
CHAIYAPHUM	36	1 133 034	104 481	256 146	222 178	248 479	**831 284**	**73.37%**	**470 657**	**41.54%**
KALASIN	46	985 084	76 935	124 307	275 073	126 989	**603 304**	**61.24%**	**402 062**	**40.81%**
KHON KAEN	40	1 774 816	163 987	324 536	282 329	439 189	**1 210 041**	**68.18%**	**721 518**	**40.65%**
LOEI	42	629 787	24 188	131 356	177 011	225 023	**557 578**	**88.53%**	**402 034**	**63.84%**
MAHA SARAKHAM	44	945 149	45 917	141 291	274 350	199 837	**661 395**	**69.98%**	**474 187**	**50.17%**
MUKDAHAN	49	342 868	23 915	46 545	80 231	108 604	**259 295**	**75.63%**	**188 835**	**55.08%**
NAKHON PHANOM	48	708 350	79 495	147 414	77 396	64 591	**368 896**	**52.08%**	**141 987**	**20.04%**
NONG BUA LAM PHU	39	505 071	85 161	122 060	51 208	51 996	**310 425**	**61.46%**	**103 204**	**20.43%**
NONG KHAI	43	512 439	28 457	79 355	73 174	143 627	**324 613**	**63.35%**	**216 801**	**42.31%**
ROI ET	45	1 308 570	122 049	312 422	204 210	280 510	**919 191**	**70.24%**	**484 720**	**37.04%**
SAKON NAKHON	47	1 129 174	70 857	142 510	209 607	167 088	**590 062**	**52.26%**	**376 695**	**33.36%**
SI SA KET	33	1 458 370	202 790	352 178	205 516	162 114	**922 598**	**63.26%**	**367 630**	**25.21%**
SURIN	32	1 386 277	73 357	99 893	69 072	125 984	**368 306**	**26.57%**	**195 056**	**14.07%**
UBON RATCHATHANI	34	1 826 920	199 600	400 283	298 386	438 939	**1 337 208**	**73.19%**	**737 325**	**40.36%**
UDON THANI	41	1 557 298	129 035	347 614	461 811	288 328	**1 226 788**	**78.78%**	**750 139**	**48.17%**
YASOTHON	35	540 267	85 950	128 497	74 627	94 037	**383 111**	**70.91%**	**168 664**	**31.22%**

Province Name	District	Total Population	0dB - 3 dB	3 dB - 10 dB	10 dB - 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
Sub Total SFN8 - Eastern Thailand		**19 096 321**	**1 701 926**	**3 535 238**	**3 348 185**	**3 455 223**	**12 040 572**	**63.05%**	**6 803 408**	**35.63%**
SFN8 - Western Central										
KAMPHAENG PHET	62	727 555	77 003	228 978	140 913	110 127	**557 021**	**76.56%**	**251 040**	**34.50%**
NAKHON SAWAN	60	1 073 347	75 877	157 800	218 715	284 503	**736 895**	**68.65%**	**503 218**	**46.88%**
PHETCHABUN	67	993 702	75 482	151 941	162 142	165 518	**555 083**	**55.86%**	**327 660**	**32.97%**
PHICHIT	66	549 395	50 326	112 745	178 044	116 354	**457 469**	**83.27%**	**294 398**	**53.59%**
PHITSANULOK	65	854 372	24 347	156 064	336 155	258 663	**775 229**	**90.74%**	**594 818**	**69.62%**
SUKHOTHAI	64	602 601	91 670	201 244	139 645	57 489	**490 048**	**81.32%**	**197 134**	**32.71%**
TAK	63	526 045	13 312	80 757	154 428	187 818	**436 315**	**82.94%**	**342 246**	**65.06%**
UTTARADIT	53	461 294	26 567	100 595	110 916	179 531	**417 609**	**90.53%**	**290 447**	**62.96%**
Sub Total SFN8 - Western Central Thailand		**5 788 311**	**434 584**	**1 190 124**	**1 440 958**	**1 360 003**	**4 425 669**	**76.46%**	**2 800 961**	**48.39%**
SFN8 - Northwest Thailand										
CHIANG MAI	50	1 655 642	37 869	166 721	373 954	845 457	**1 424 001**	**86.01%**	**1 219 411**	**73.65%**
CHIANG RAI	57	1 200 423	38 486	190 236	294 697	533 263	**1 056 682**	**88.03%**	**827 960**	**68.97%**
LAMPANG	52	756 811	62 935	286 098	142 506	67 976	**559 515**	**73.93%**	**210 482**	**27.81%**
LAMPHUN	51	404 673	7 094	30 554	93 914	246 779	**378 341**	**93.49%**	**340 693**	**84.19%**
MAE HONG SON	58	244 356	28 597	44 427	45 153	69 570	**187 747**	**76.83%**	**114 723**	**46.95%**
NAN	55	477 673	22 106	75 373	62 953	212 153	**372 585**	**78.00%**	**275 106**	**57.59%**

Province Name	District	Total Population	0dB - 3 dB	3 dB - 10 dB	10 dB - 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
PHAYAO	56	488 120	63 431	82 797	124 890	140 781	**411 899**	**84.38%**	**265 671**	**54.43%**
PHRAE	54	457 607	7 865	33 217	94 540	300 948	**436 570**	**95.40%**	**395 488**	**86.43%**
Sub Total SFN8 - Northwest Thailand		**5 685 305**	**268 383**	**909 423**	**1 232 607**	**2 416 927**	**4 827 340**	**84.91%**	**3 649 534**	**64.19%**
Total National SFN Thailand		**64 456 693**	**4 061 179**	**11 068 214**	**14 854 811**	**19 952 499**	**49 936 703**	**77.47%**	**33 421 865**	**51.85%**

Appendix D – Coverage Maps of Local SFN Services

The following maps demonstrate the achievable DAB+ local coverage when all relevant broadcasting and telecom tower facilities are used.

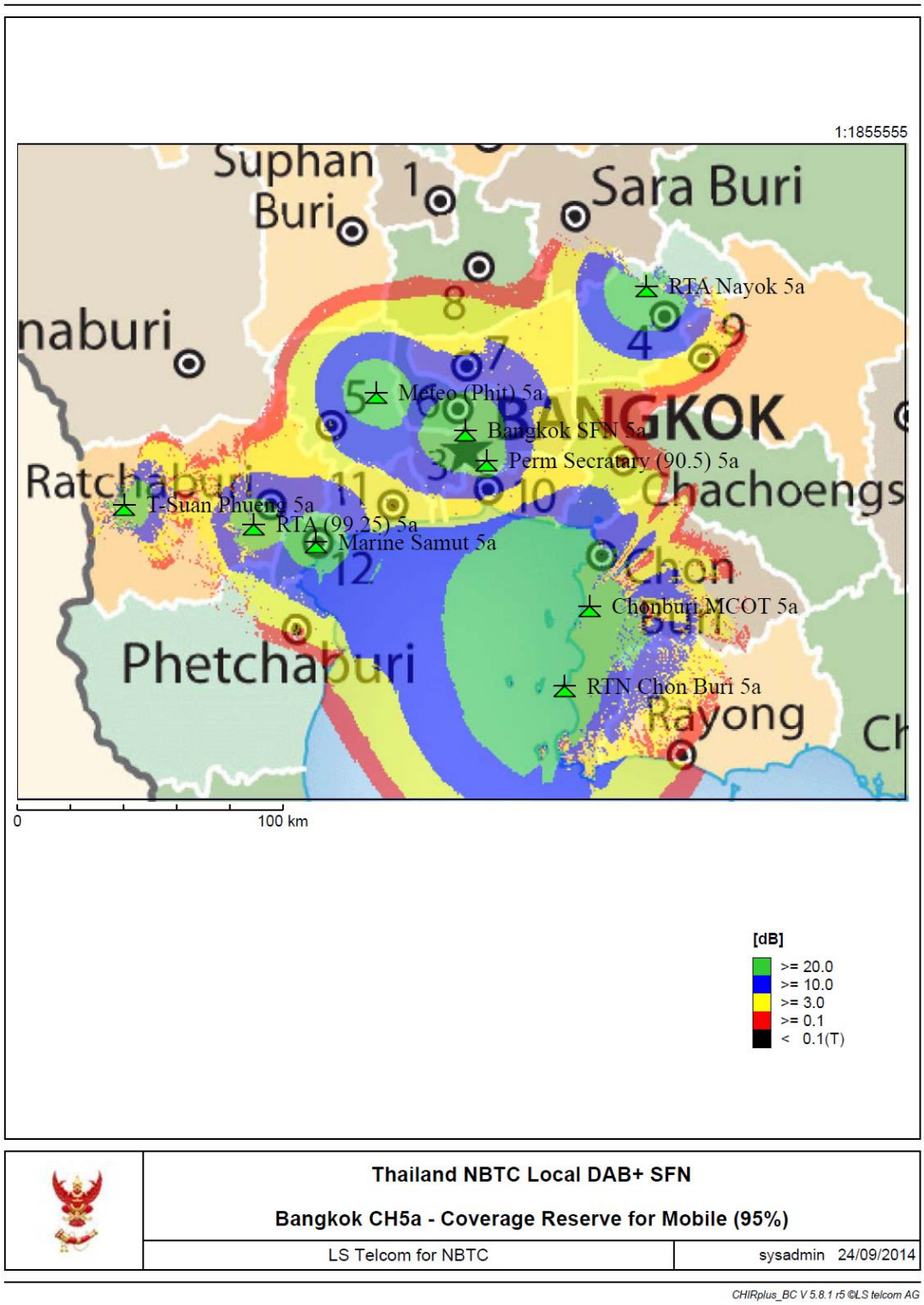


Figure 27: Local Bangkok CH5a

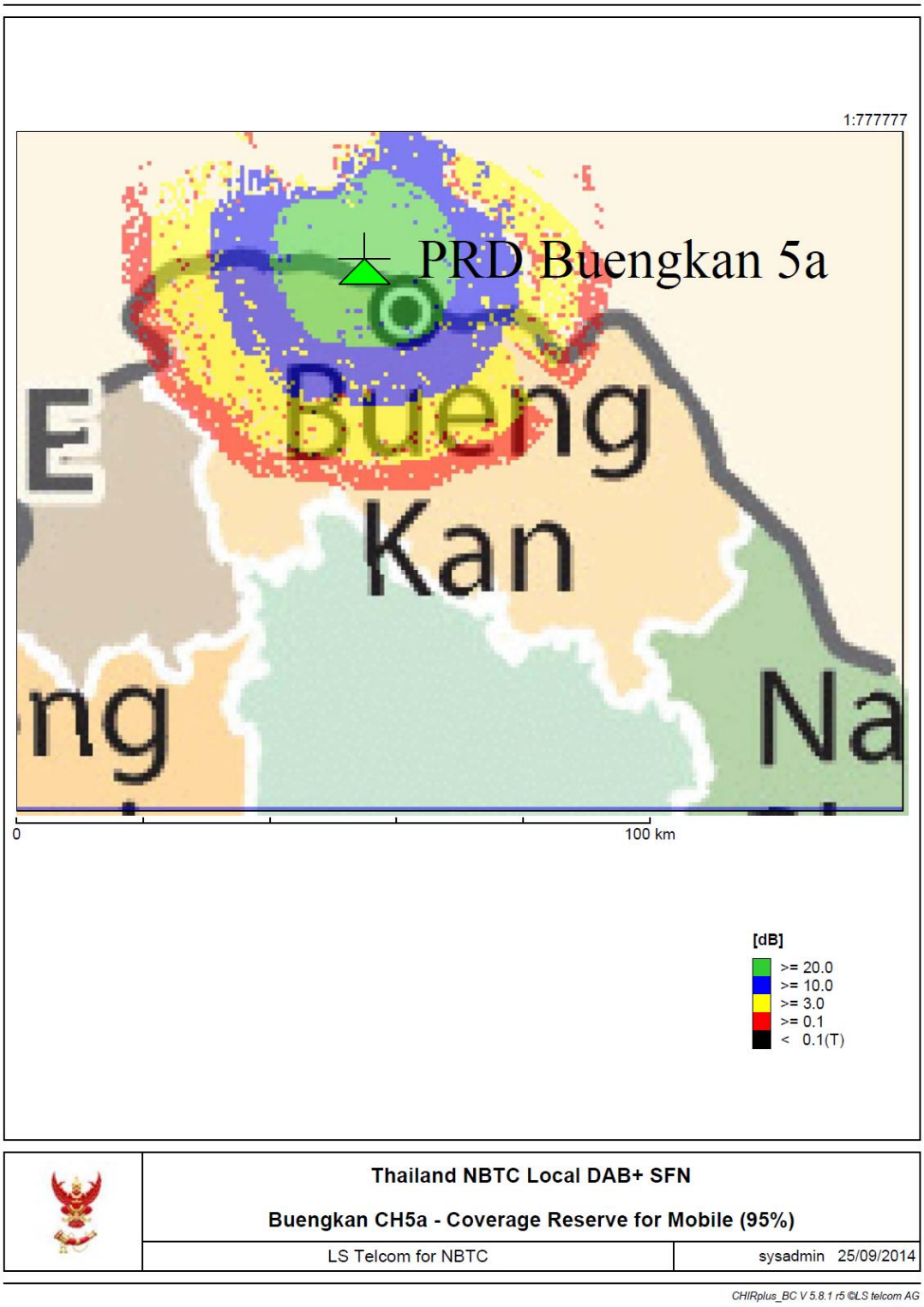


Figure 28: Local Buengkan Ch5a

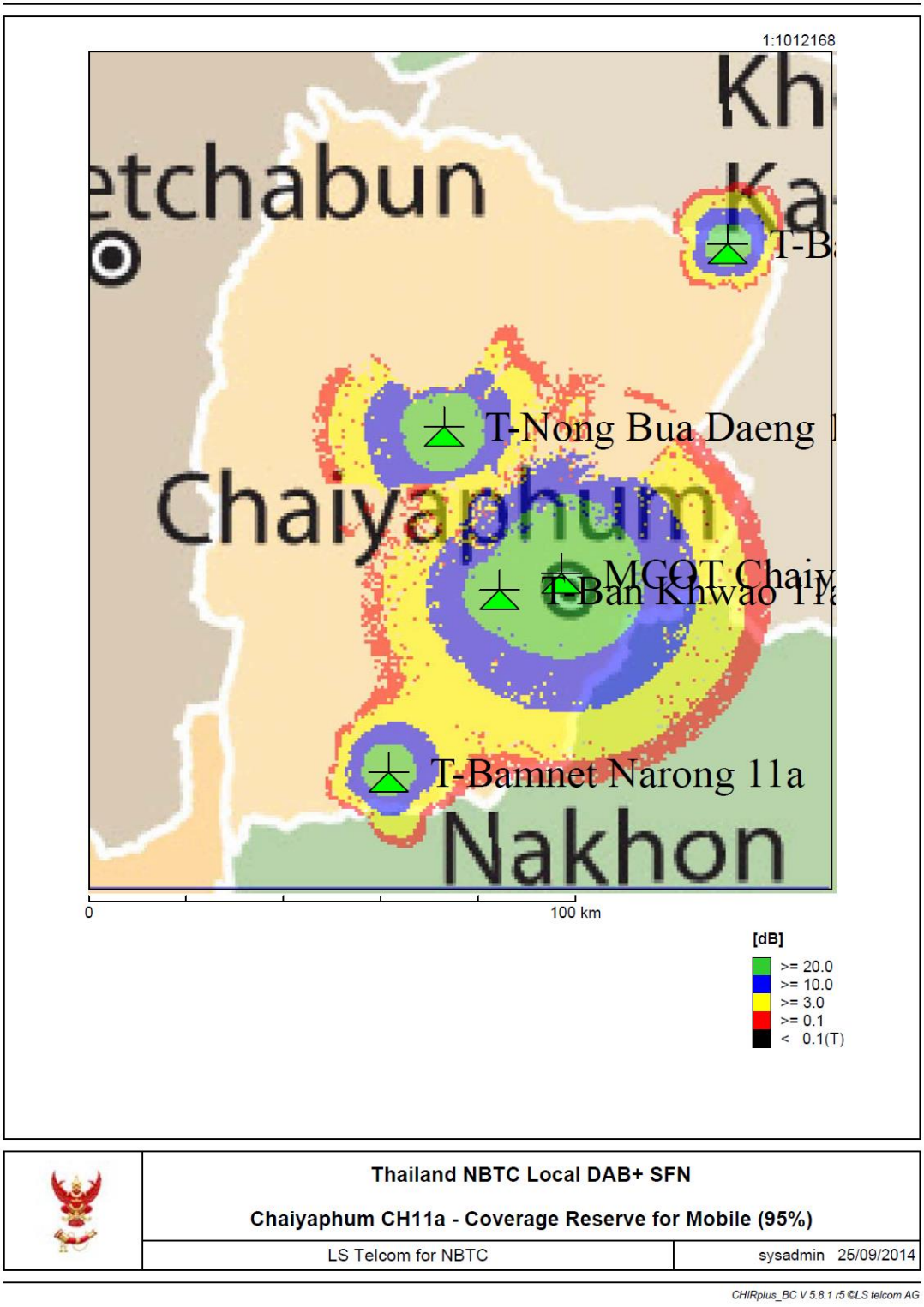


Figure 29: Local Chaiyaphum Ch11a

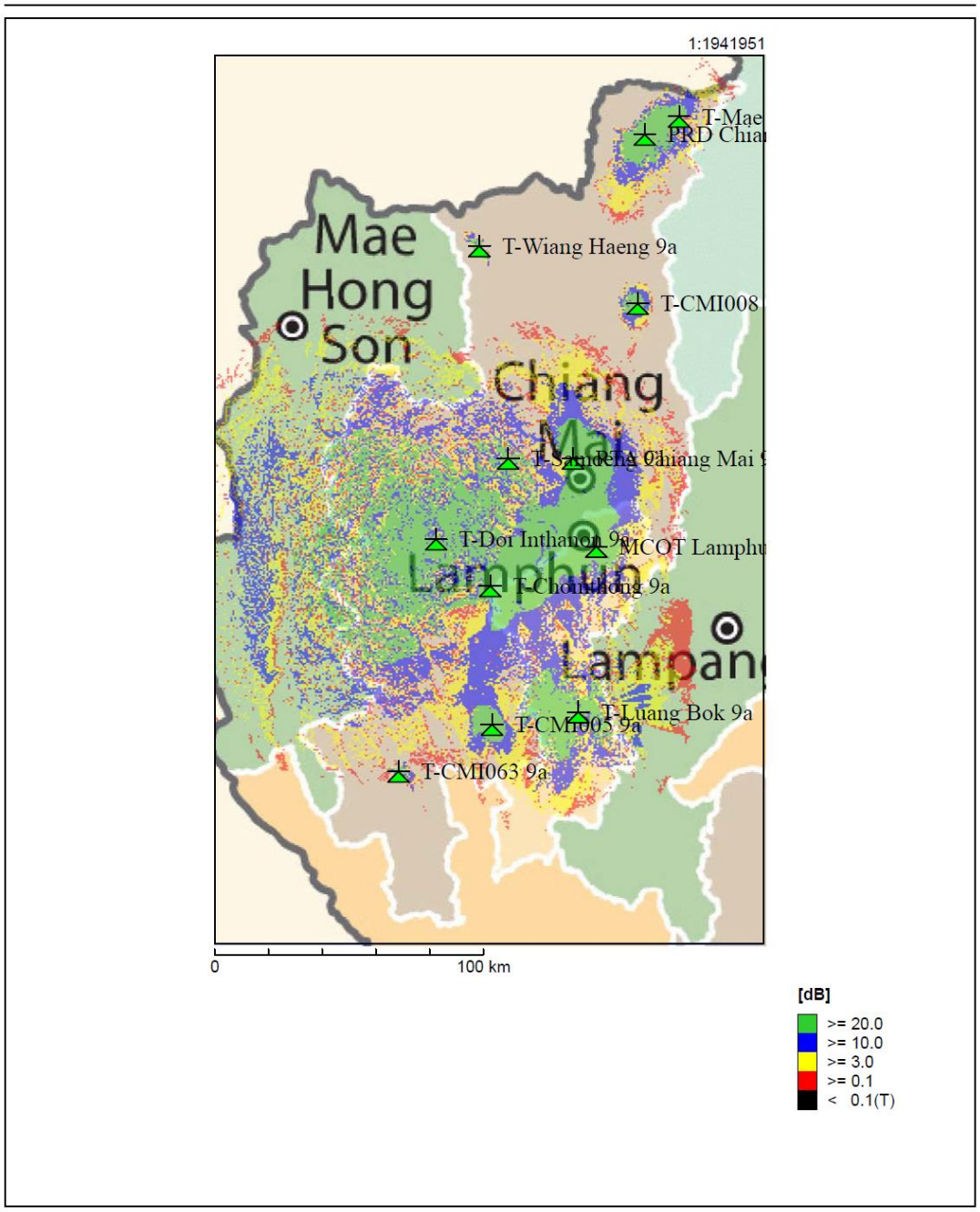
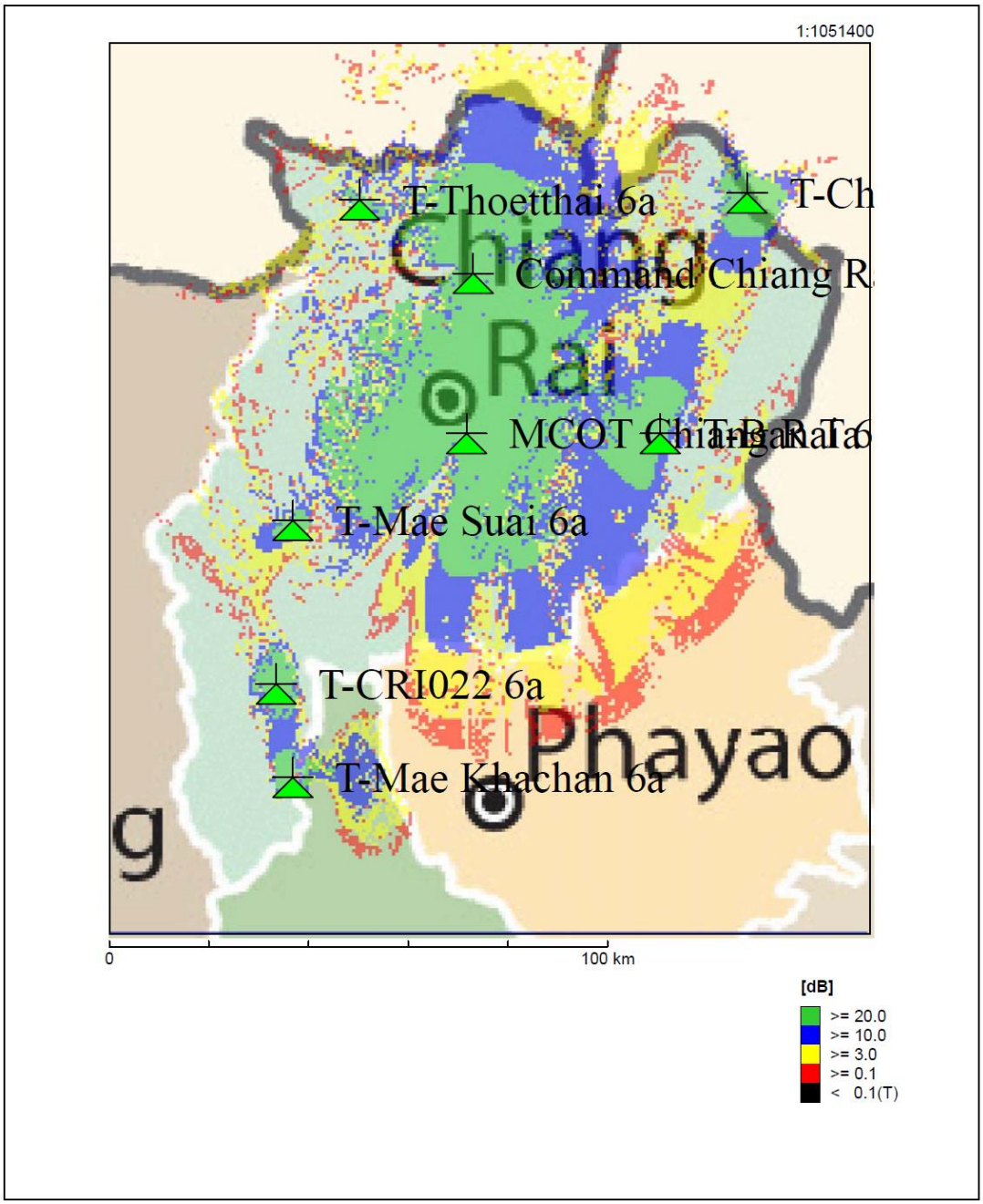


Figure 30: Local Chiang Mai Ch9a



	Thailand NBTC Local DAB+ SFN **Chiangrai CH6a - Coverage Reserve for Mobile (95%)**	
	LS Telcom for NBTC	sysadmin 25/09/2014

CHIRplus_BC V 5.8.1 r5 ©LS telcom AG

Figure 31: Local Chiangrai Ch6a

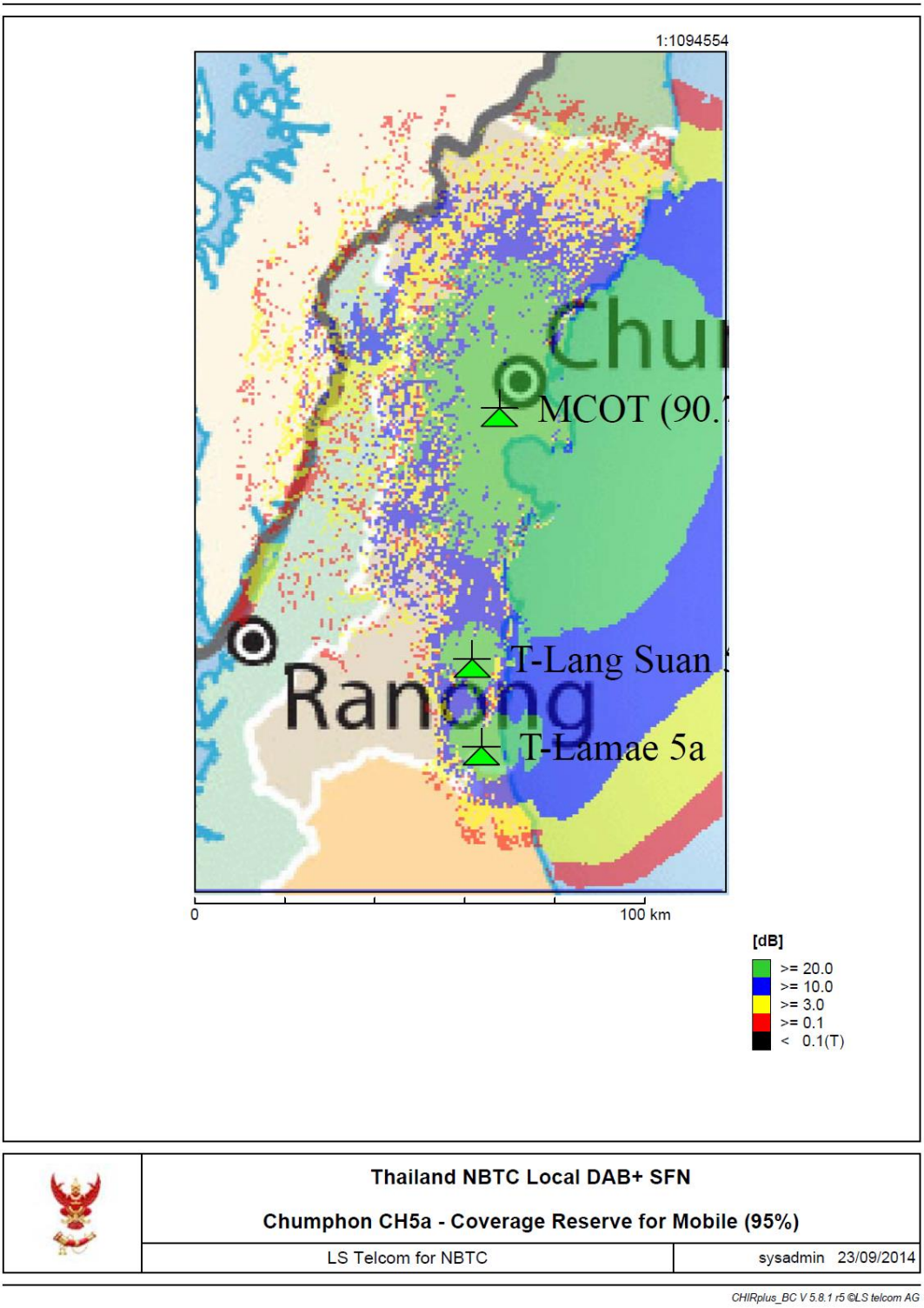


Figure 32: Local Chumphon Ch5a

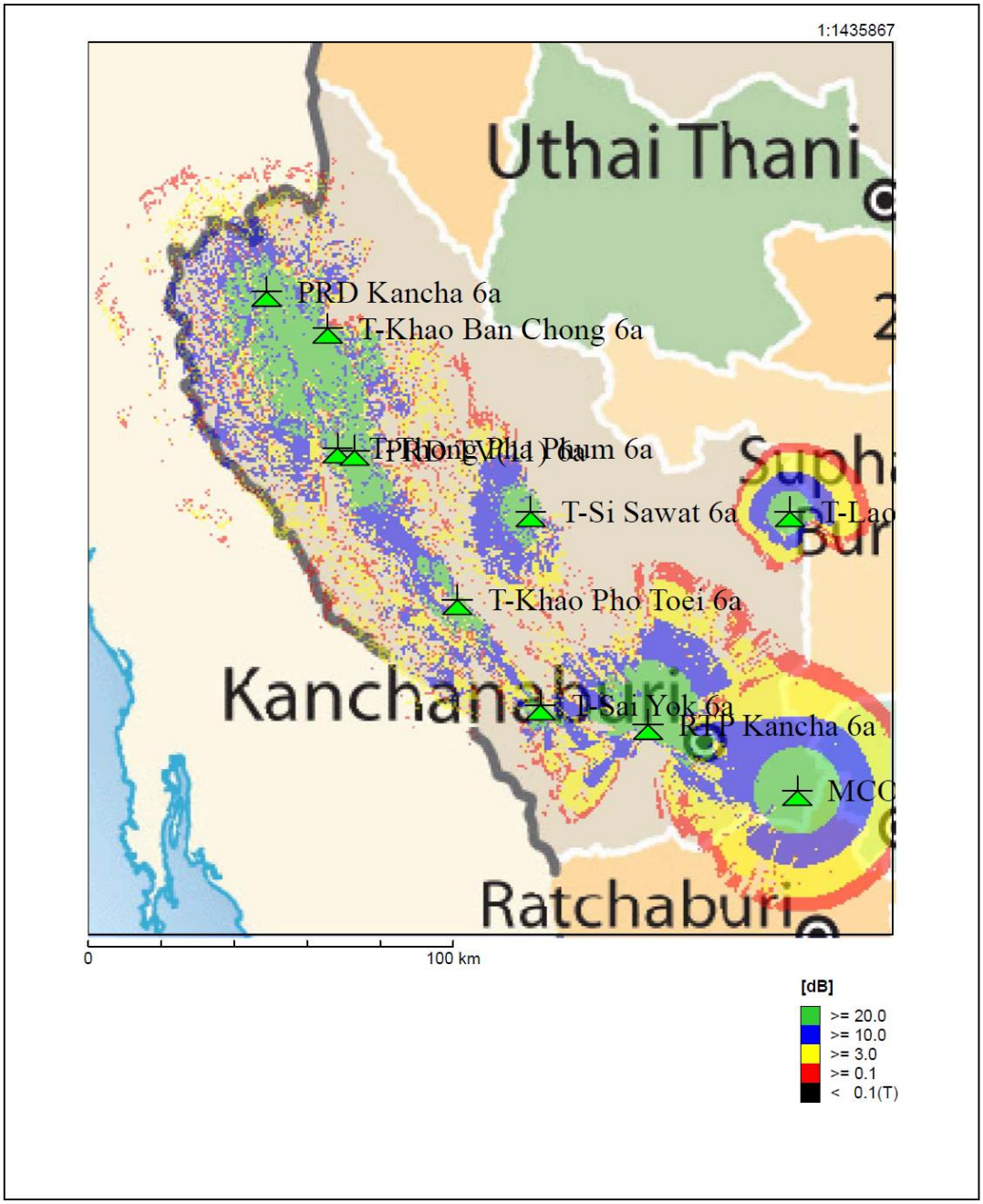


Figure 33: Local Kanchanaburi Ch6a

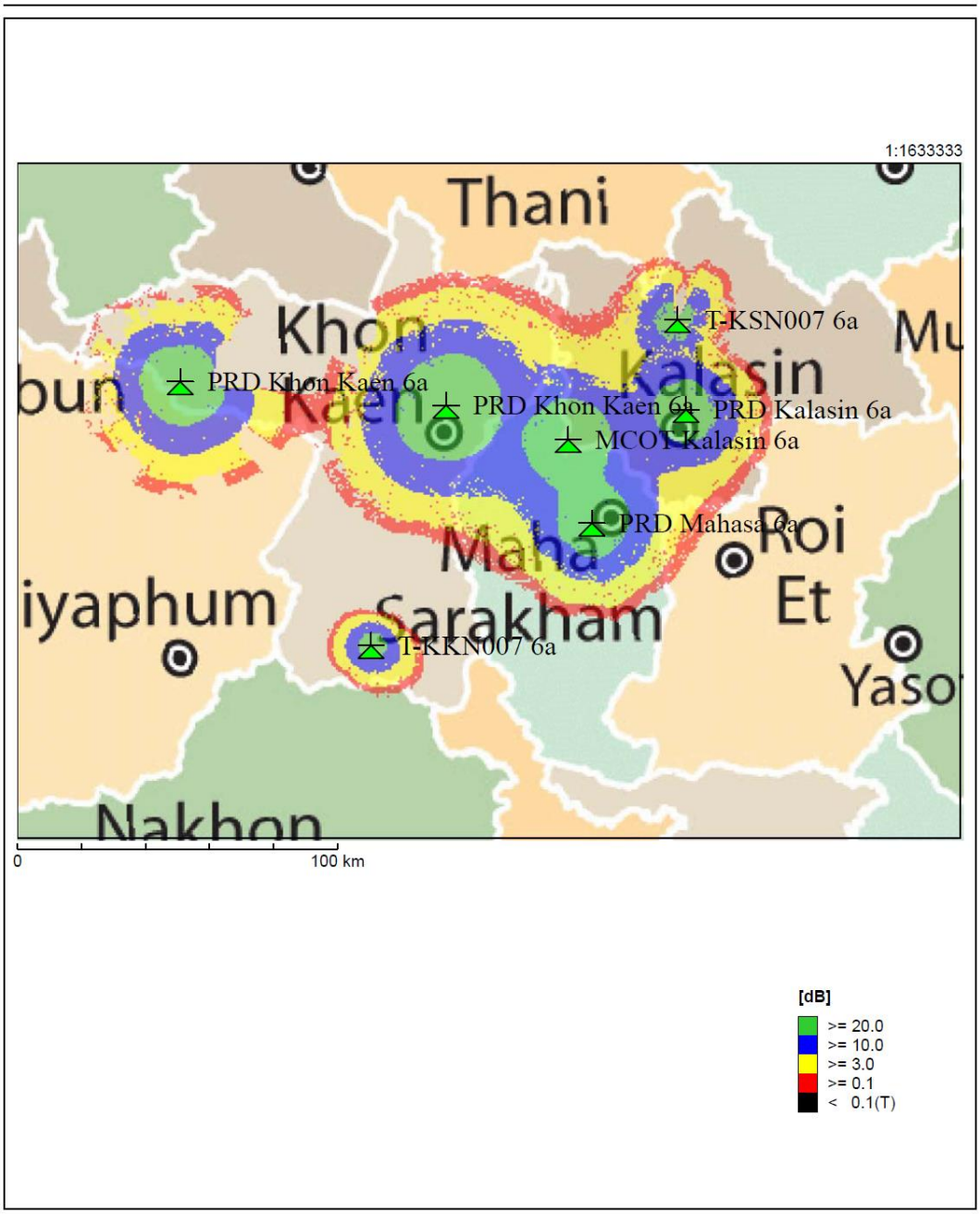


Figure 34: Local Khon Kaen Ch6a

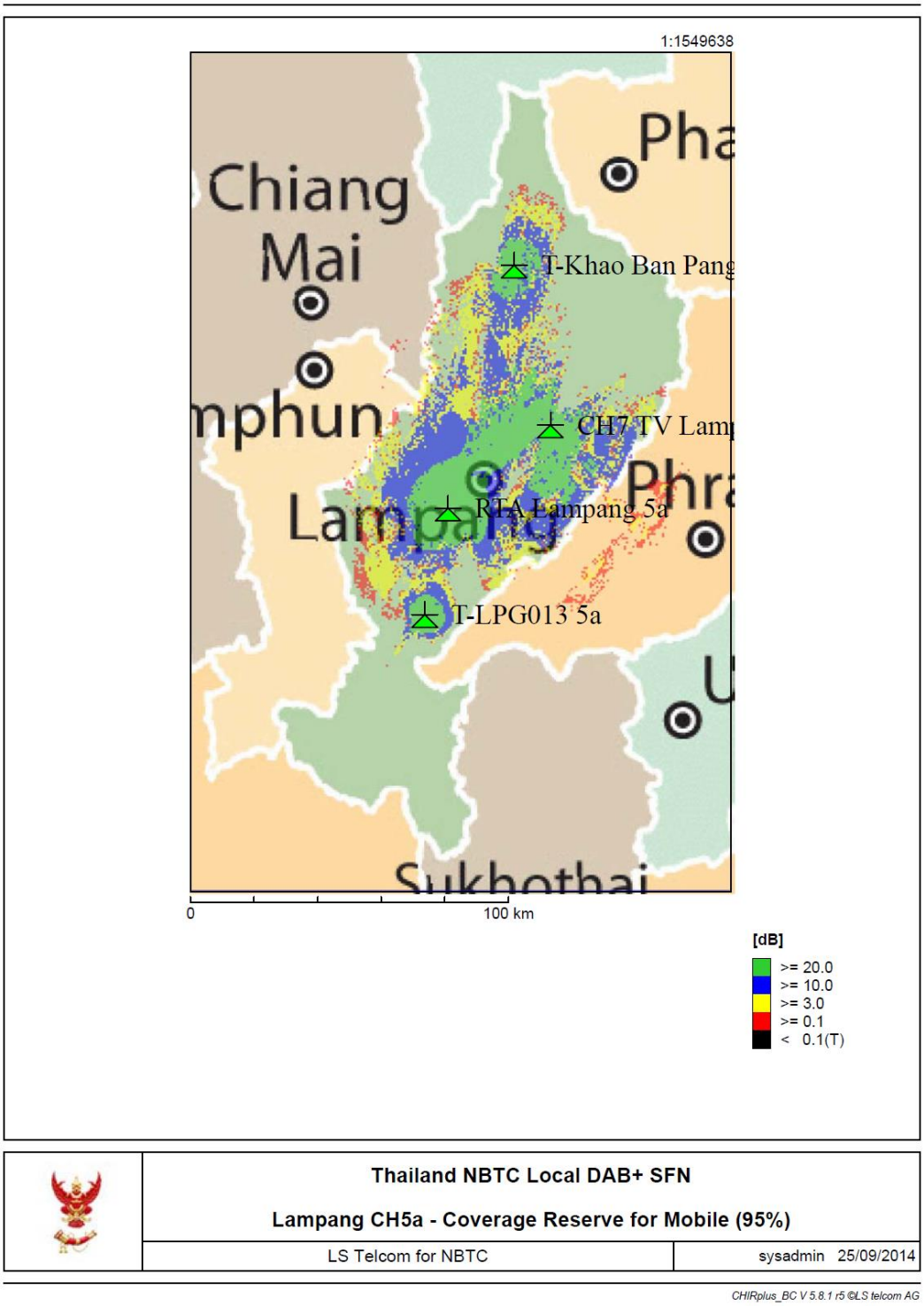


Figure 35: Local Lampang Ch5a

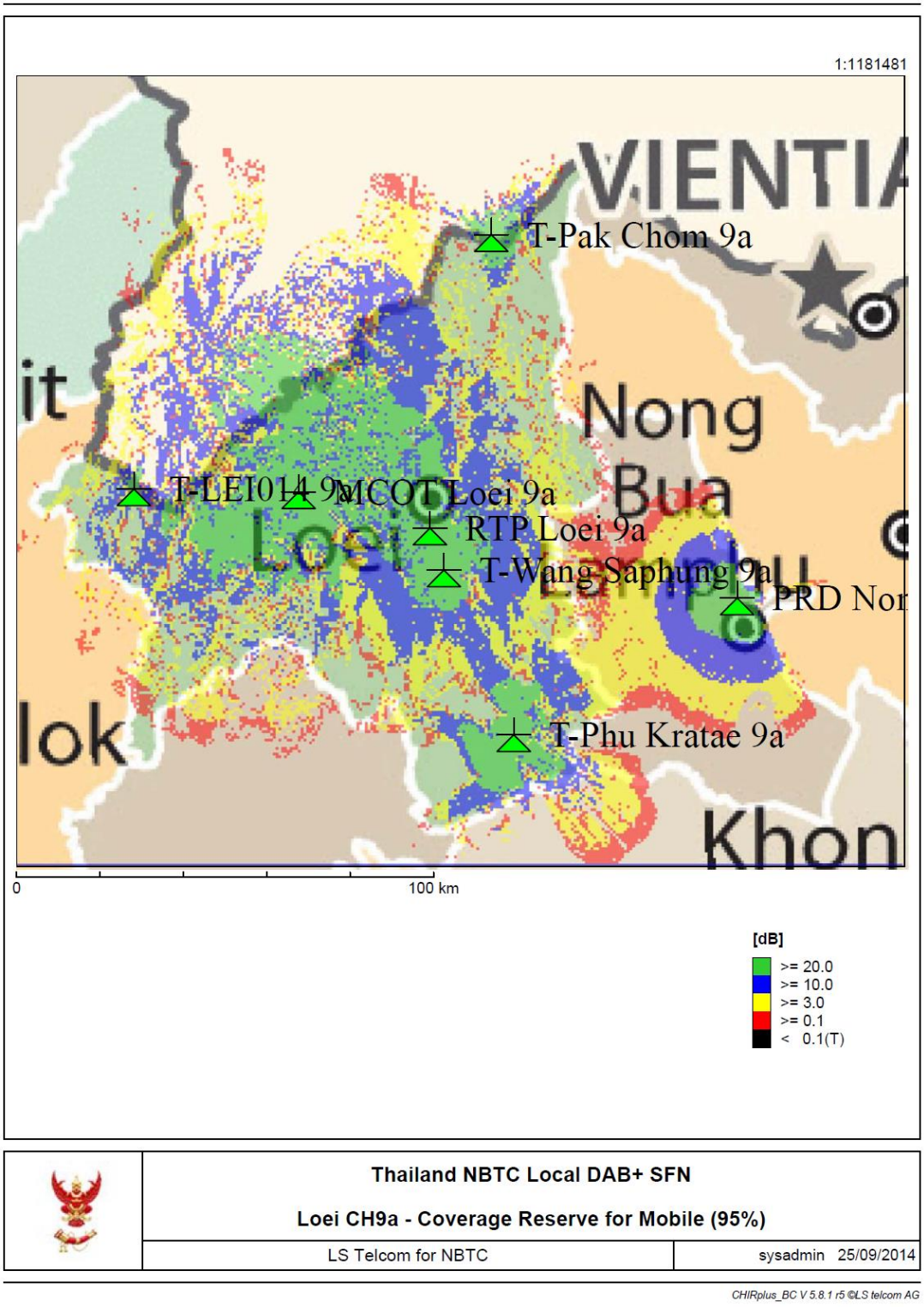


Figure 36: Local Loei Ch9a

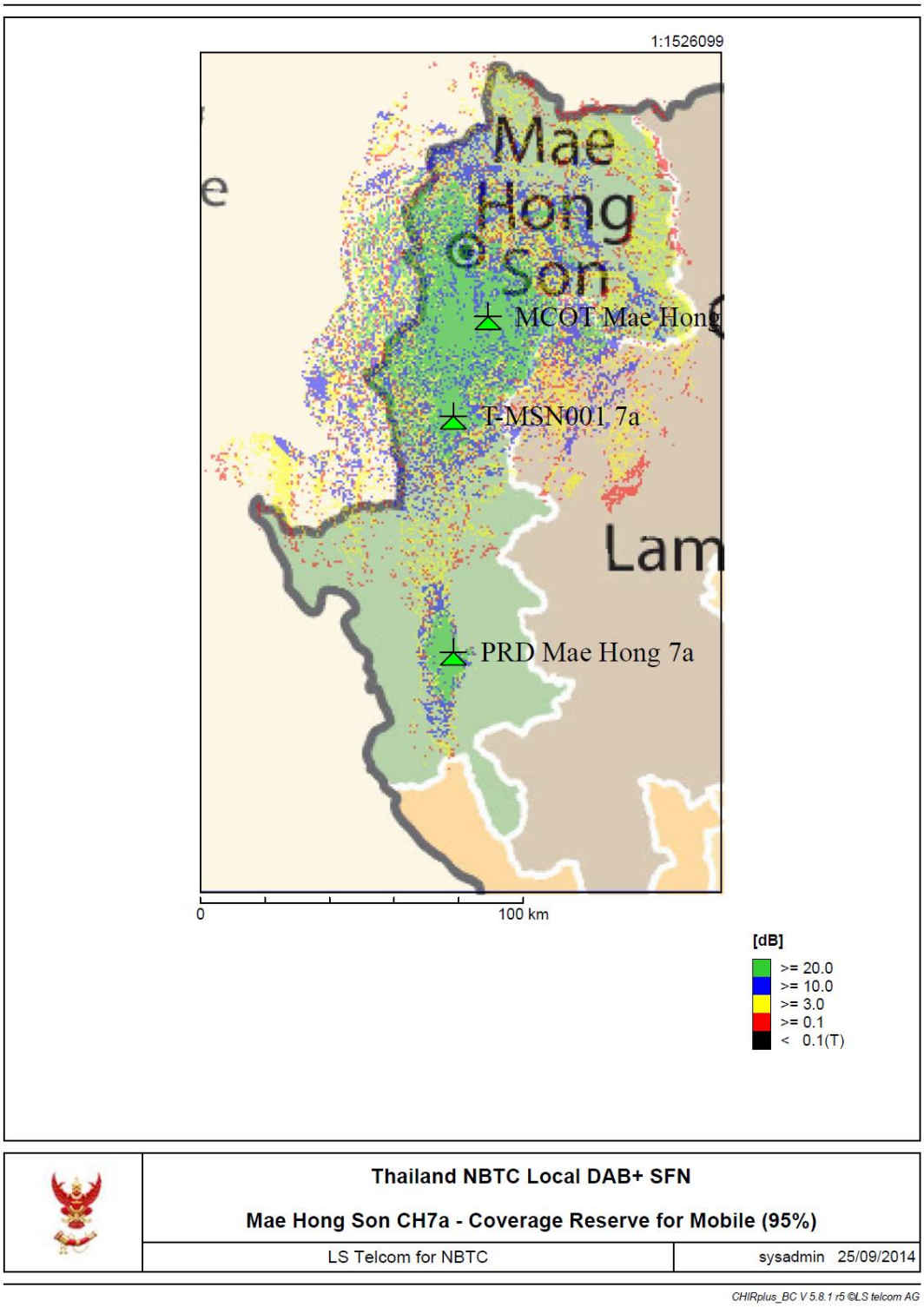


Figure 37: Local Mae Hong Son Ch7a

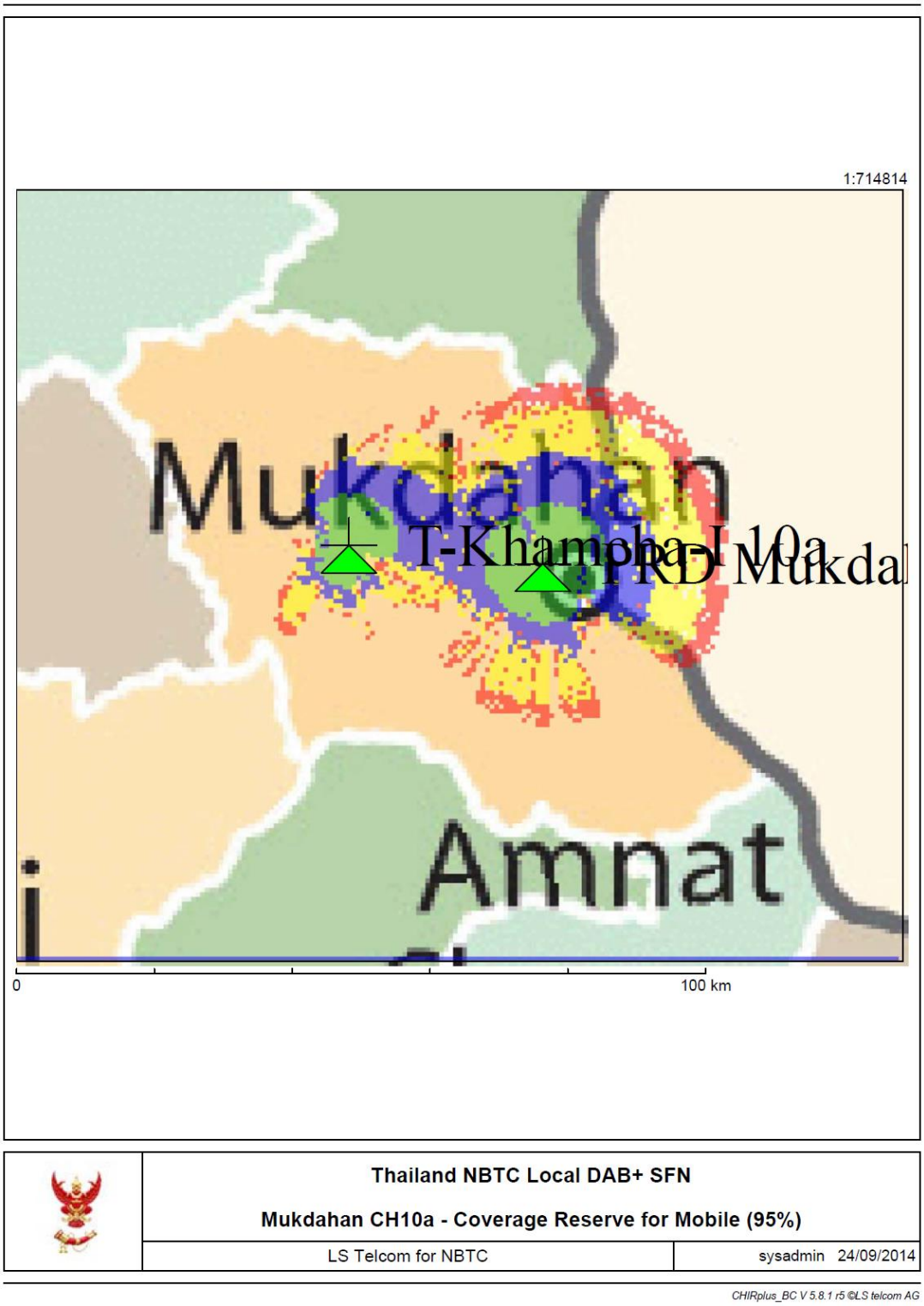


Figure 38: Local Mukdahan Ch10a

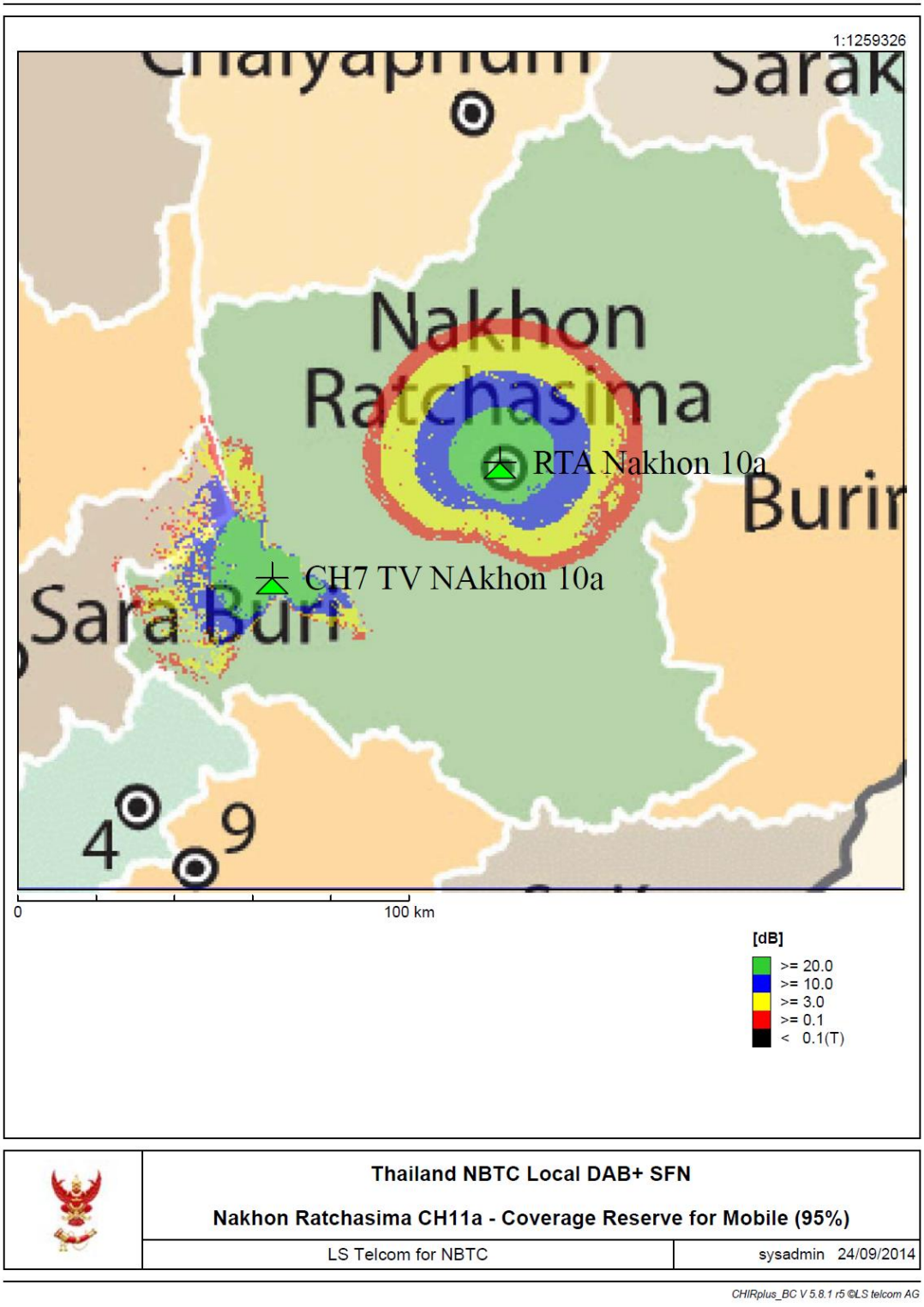


Figure 39: Local Nakhon Ratchasima Ch11a

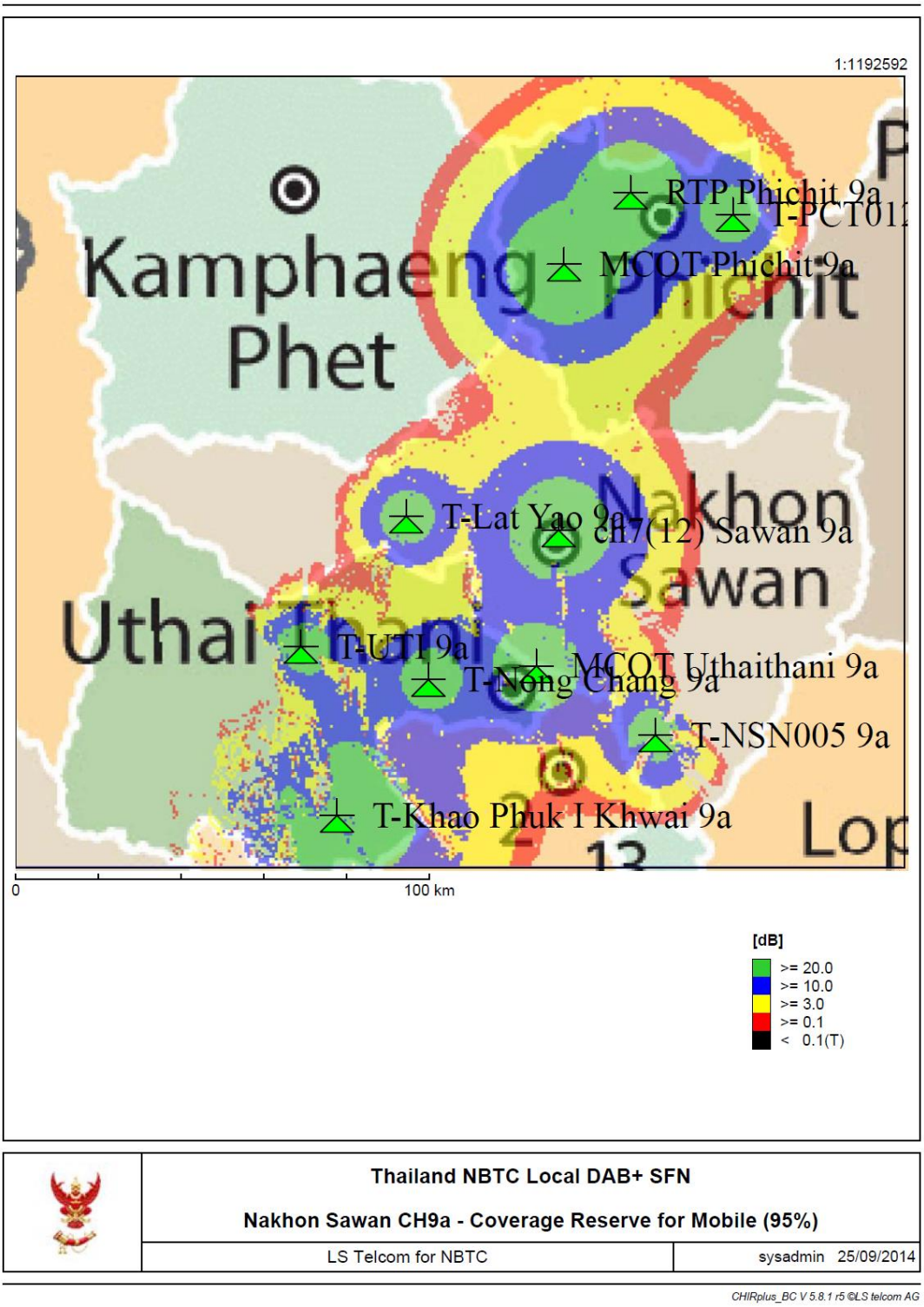


Figure 40: Local Nakhon Sawan Ch9a

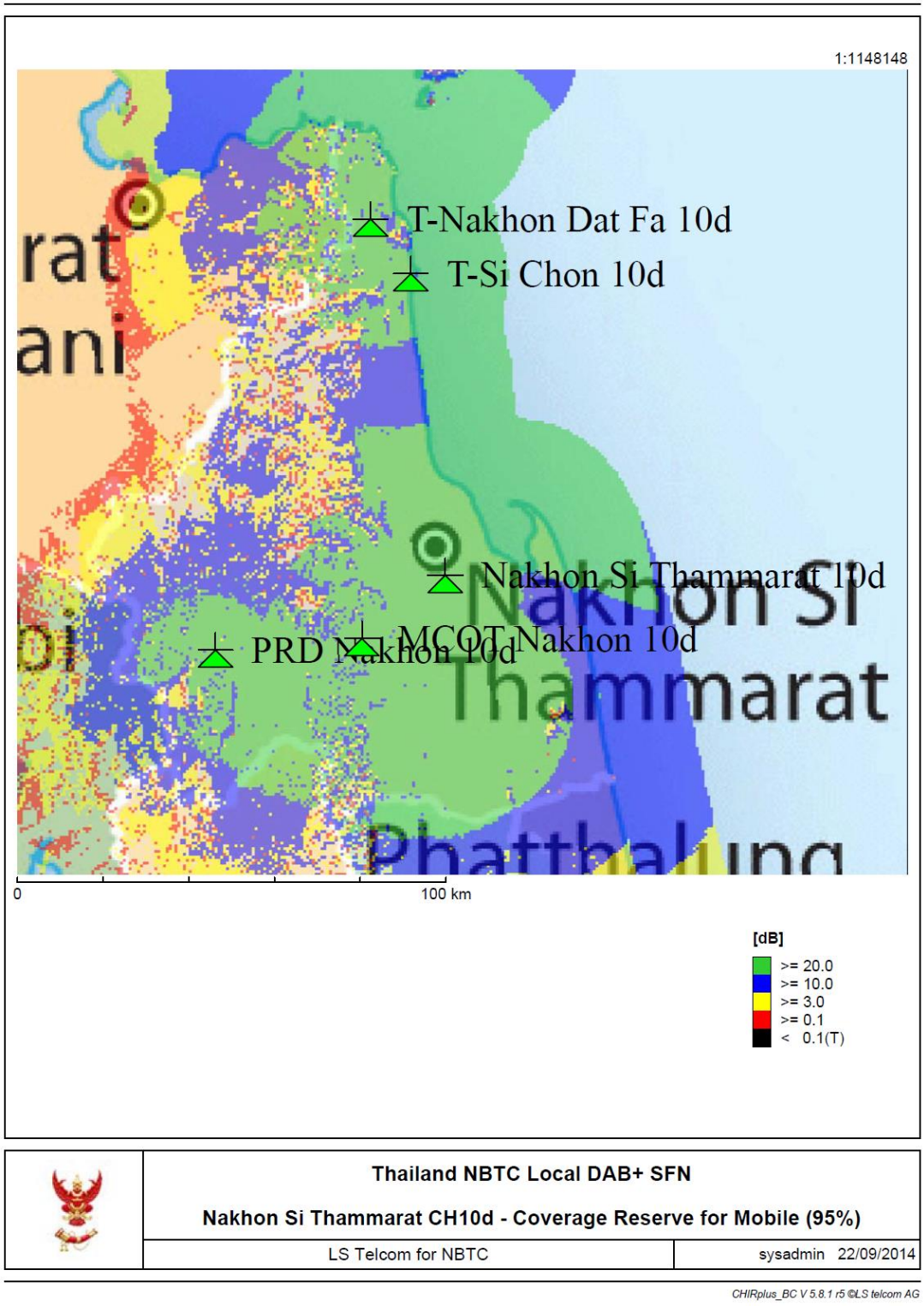


Figure 41: Local Nakhon Si Thammarat Ch10d

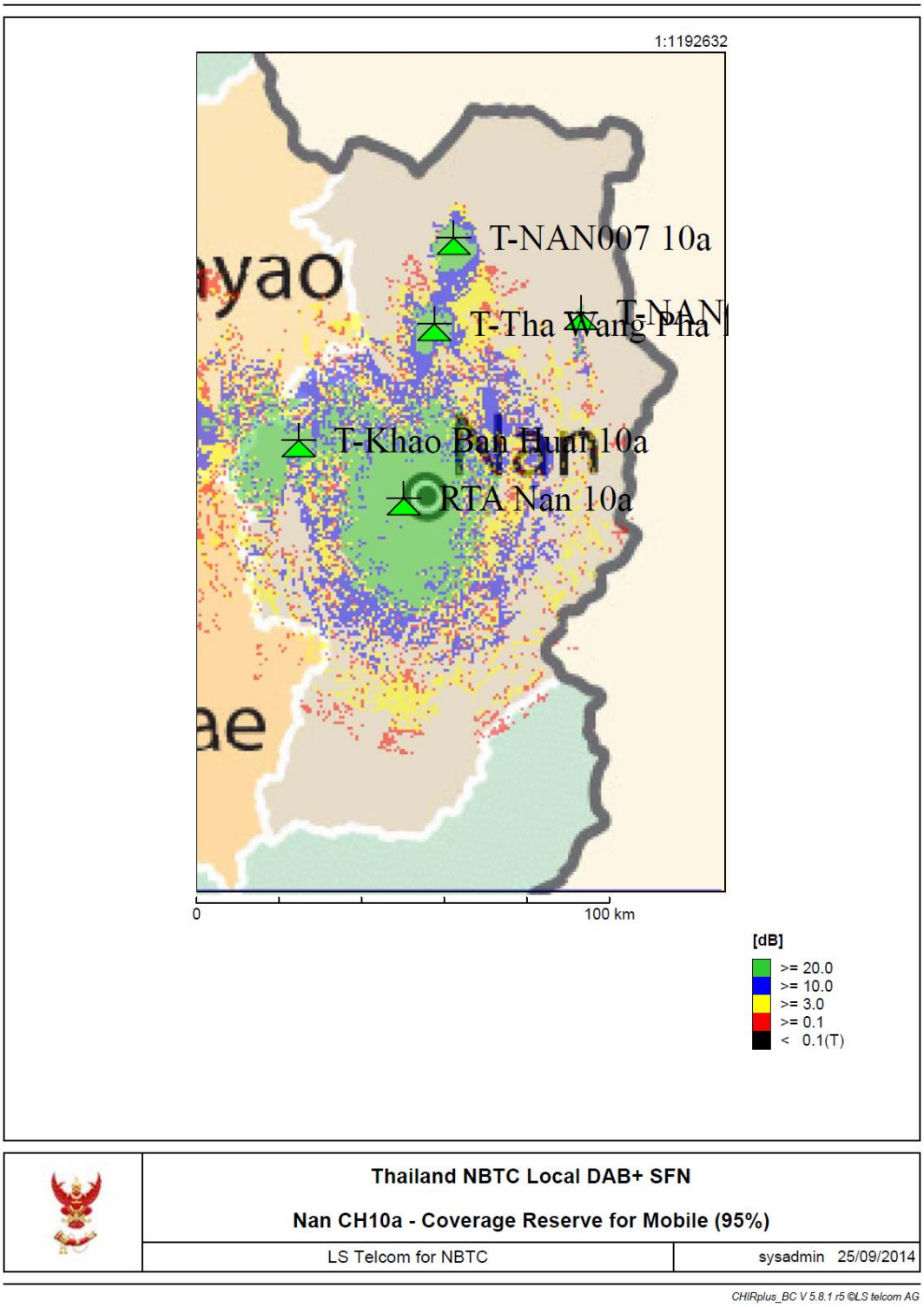


Figure 42: Local Nan Ch10a

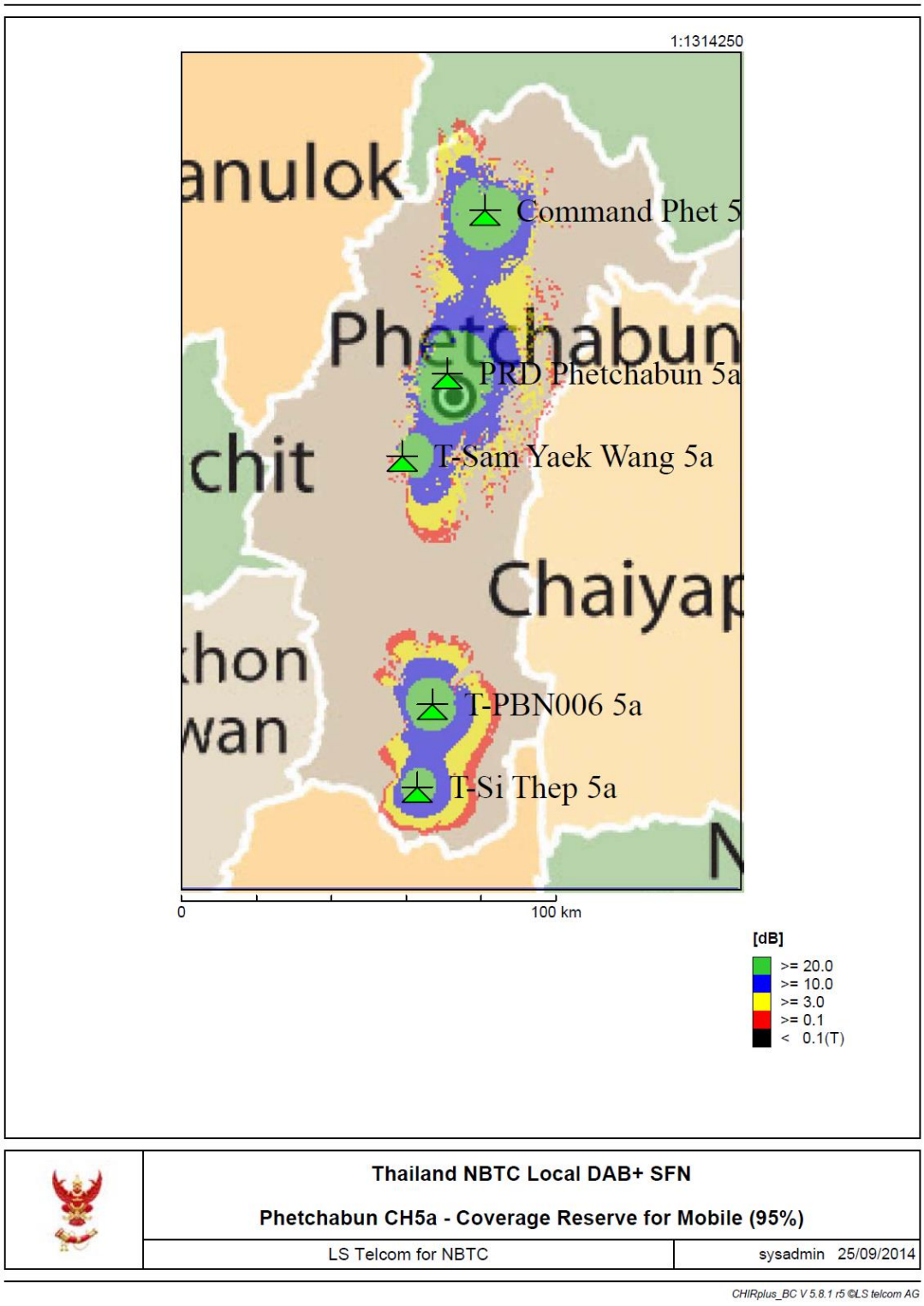


Figure 43: Local Phetchabun Ch5a

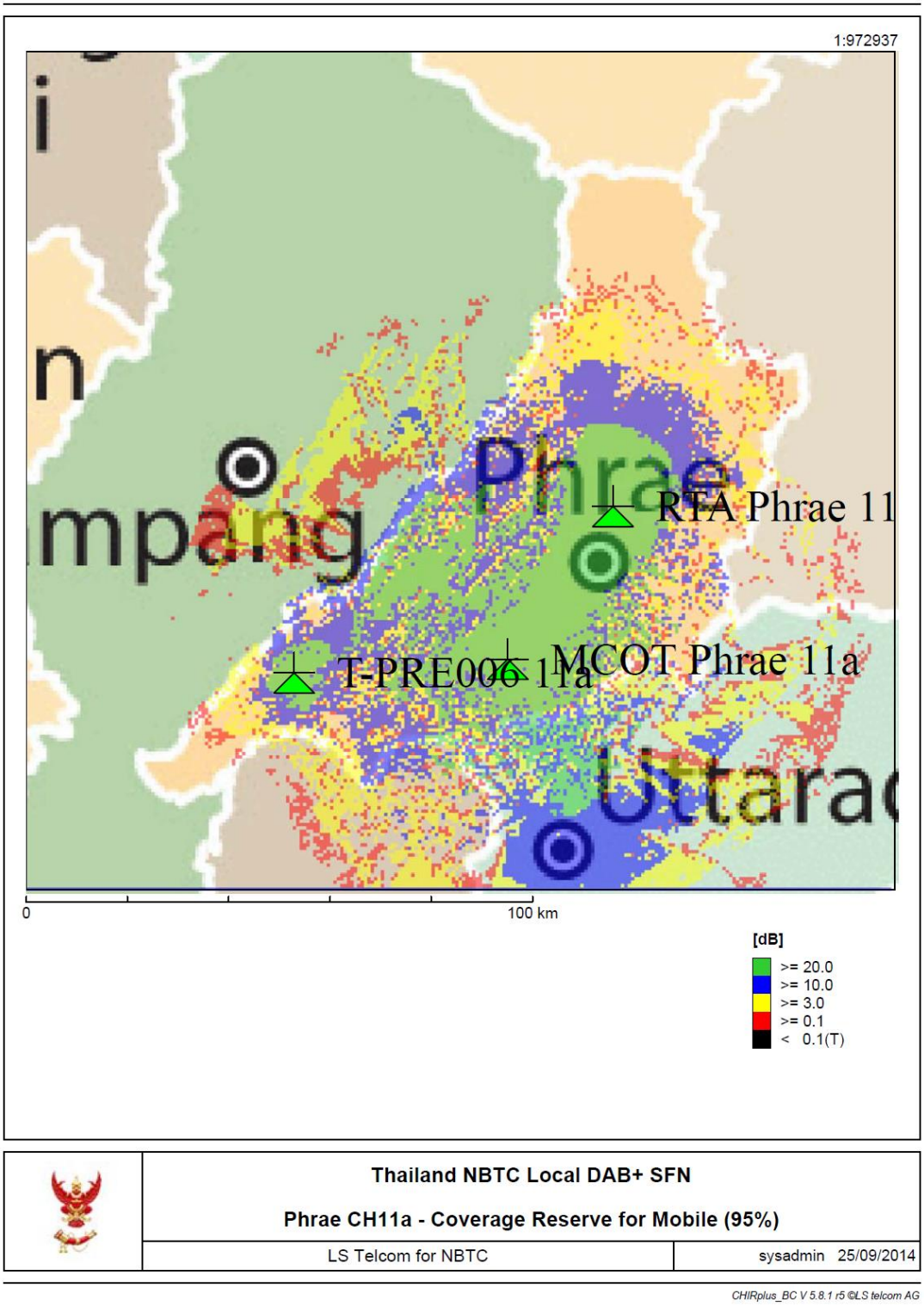


Figure 44: Local Phrae Ch11a

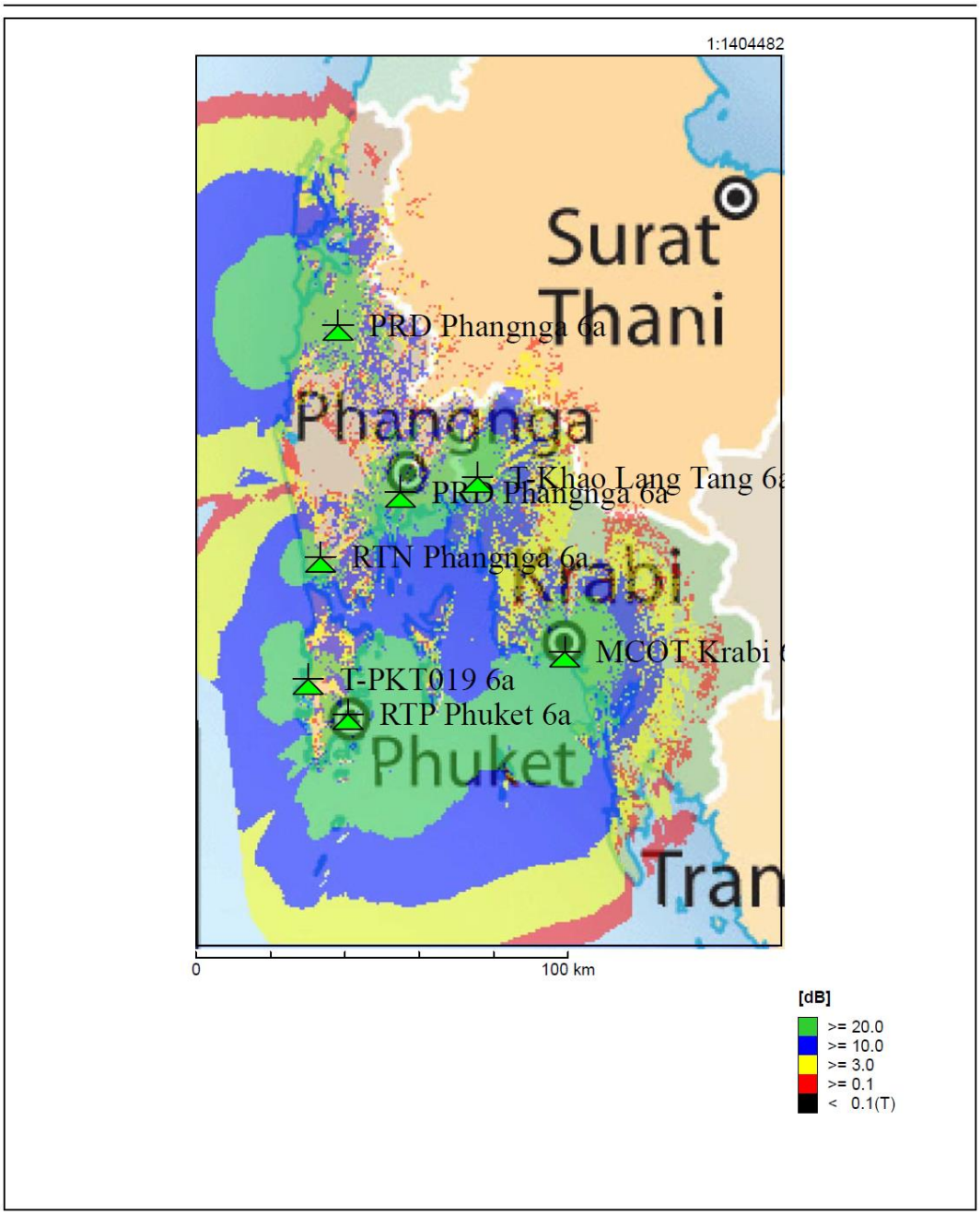
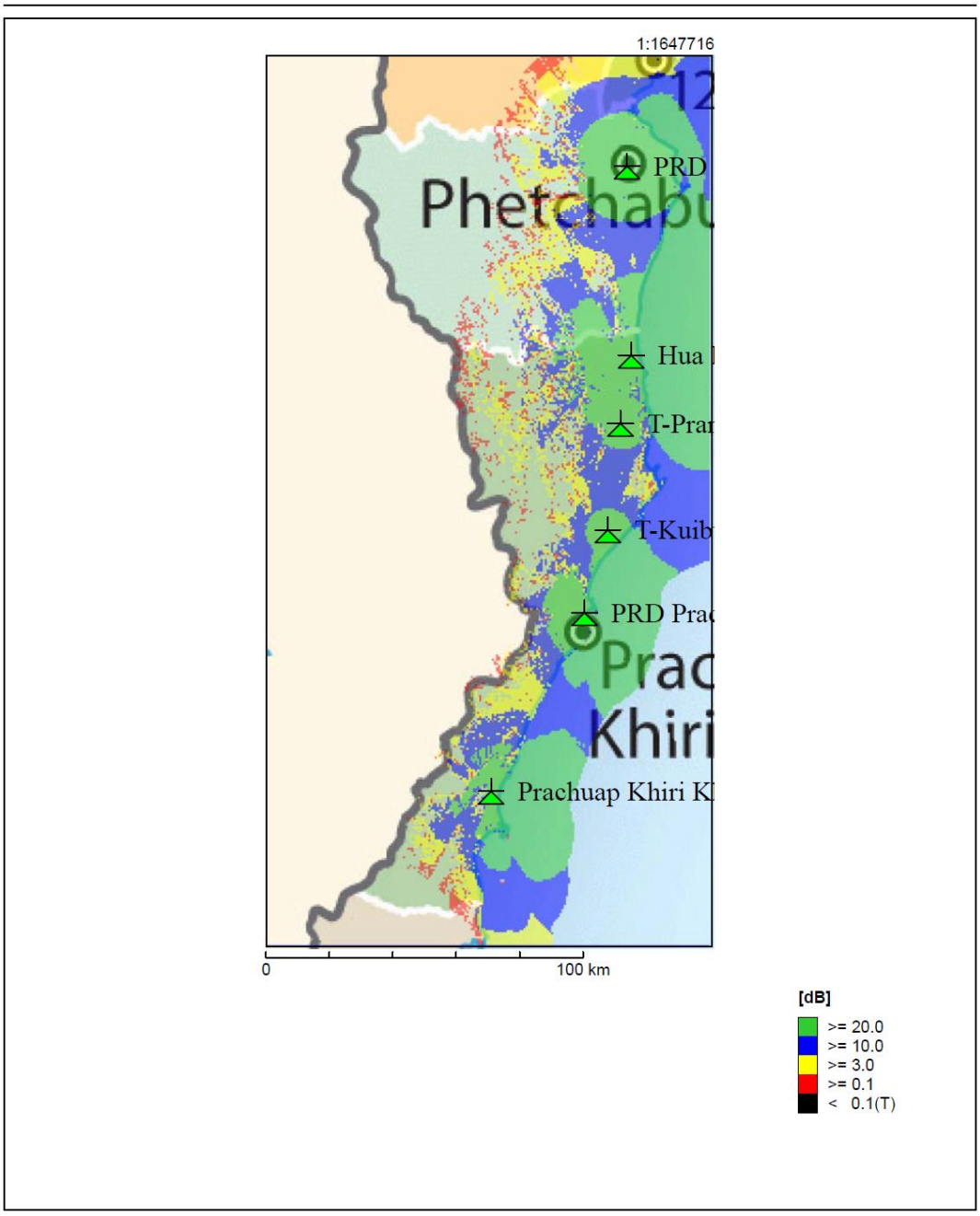


Figure 45: Local Phuket Ch6a



	Thailand NBTC Local DAB+ SFN **Prachuap Khiri Khan CH10a - Coverage Reserve for Mobile (95%)**
LS Telcom for NBTC	sysadmin 23/09/2014

CHIRplus_BC V 5.8.1 r5 ©LS telcom AG

Figure 46: Local Prachuap Khiri Khan Ch10a

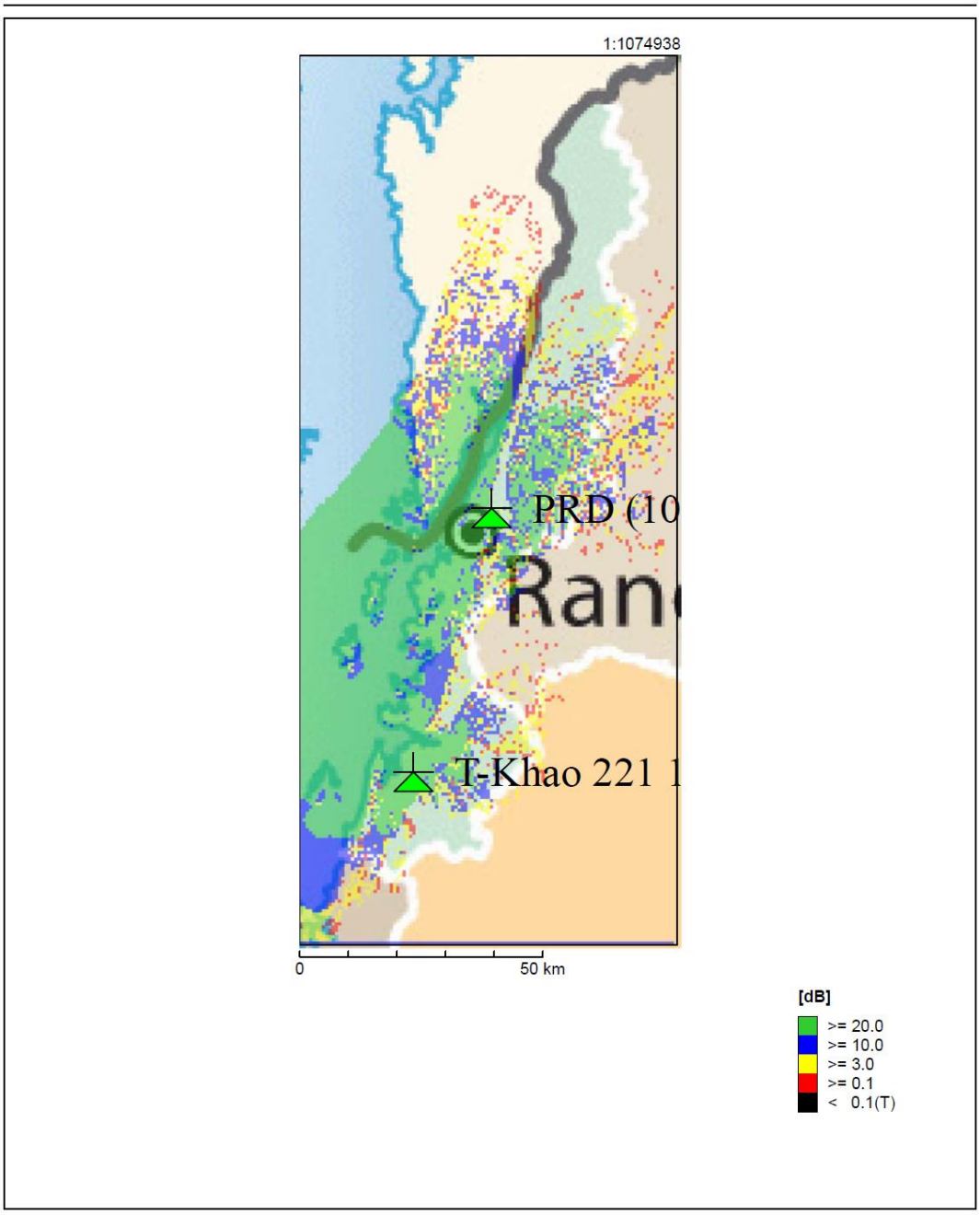


Figure 47: Local Ranong Ch11a

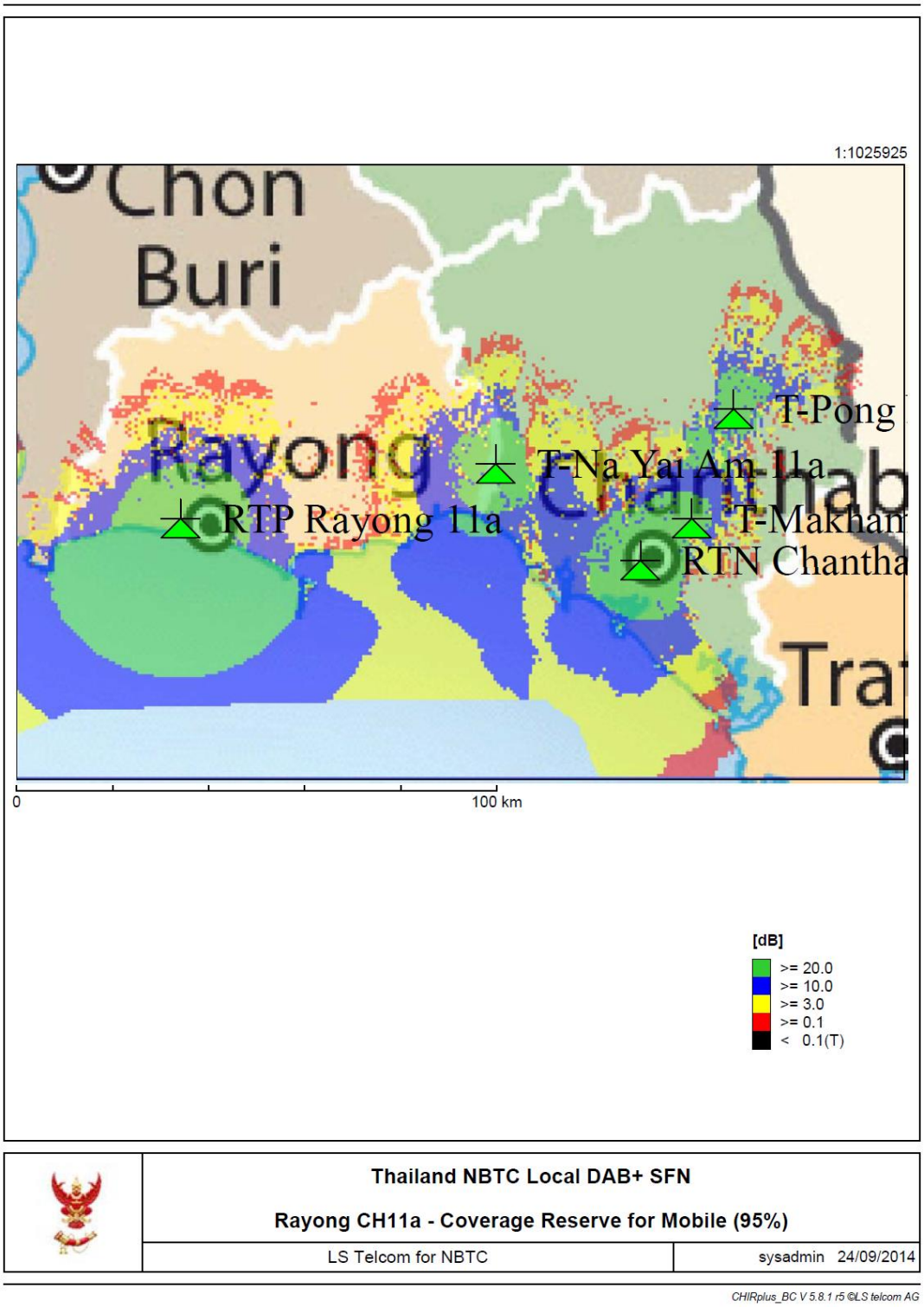


Figure 48: Local Rayong Ch11a

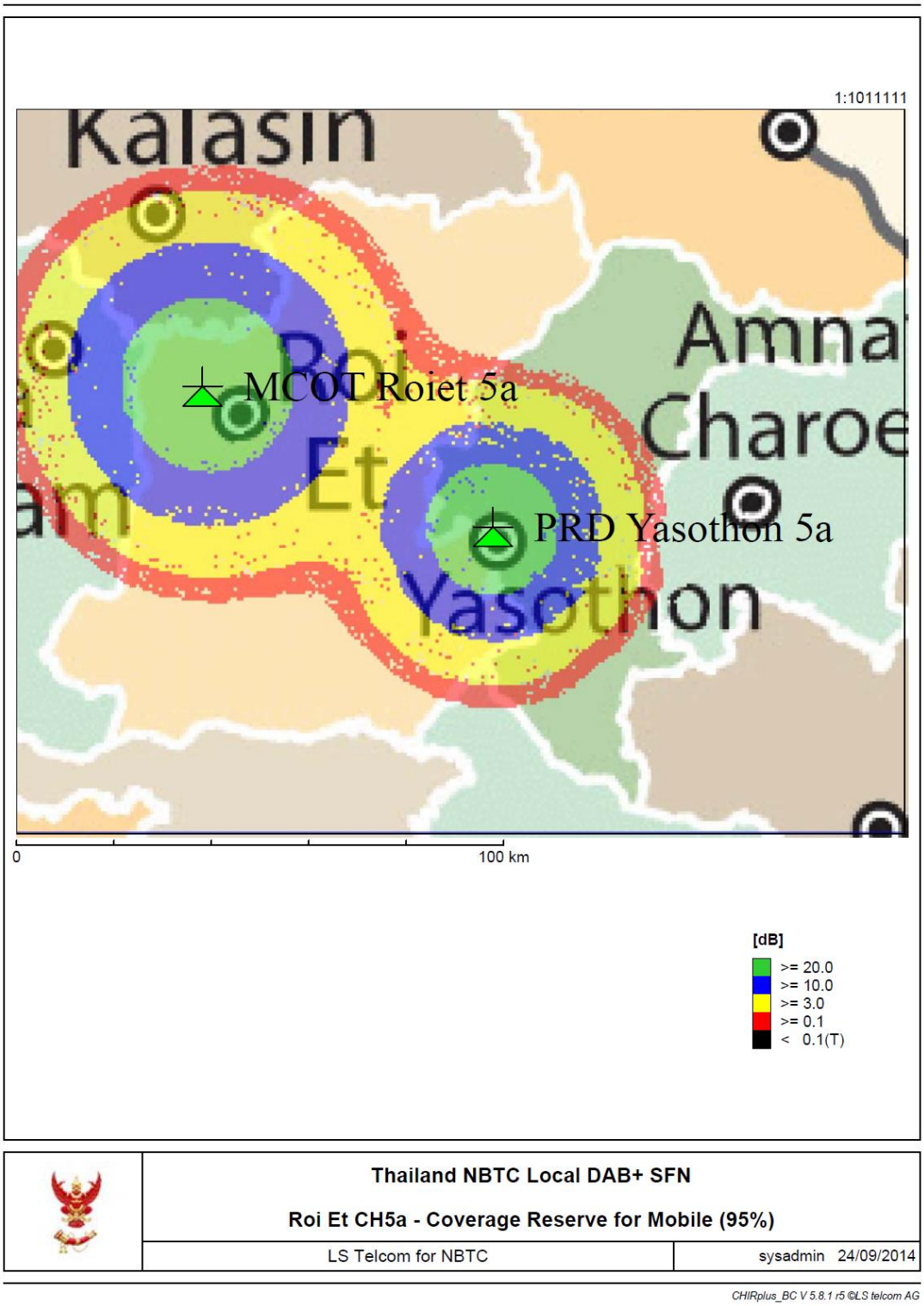


Figure 49: Local Roi Et Ch5a

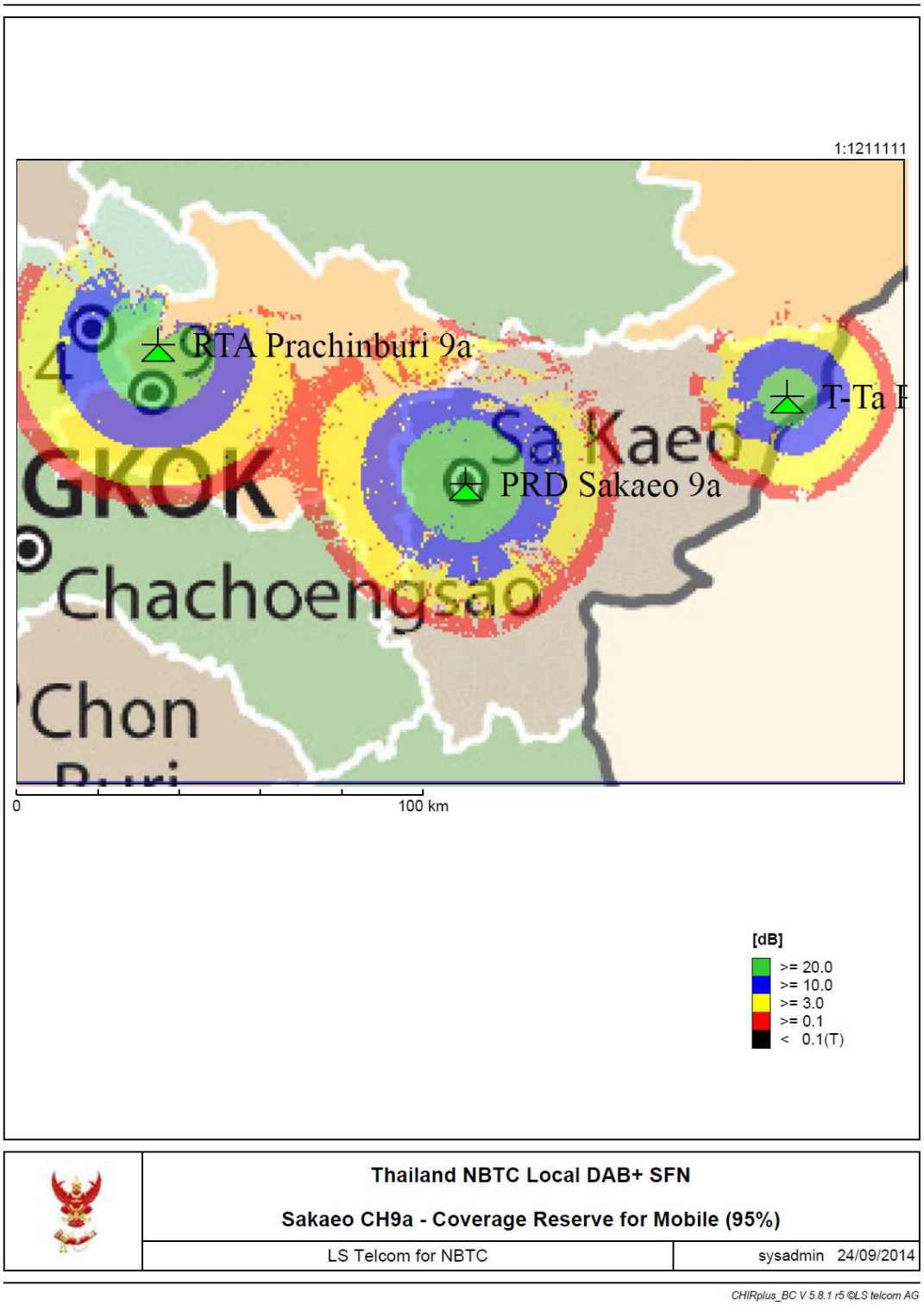


Figure 50: Local Sakaeo Ch9a

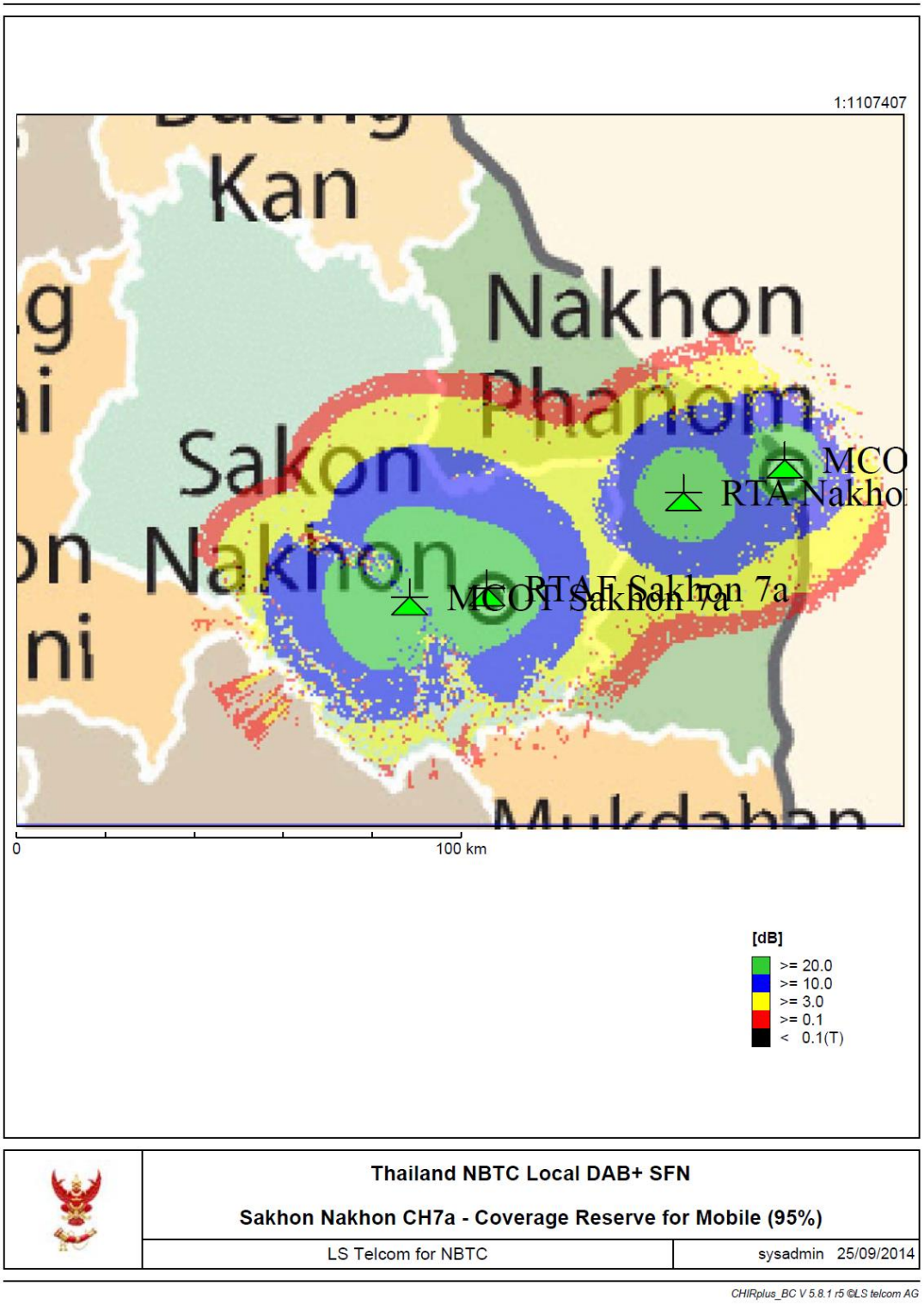


Figure 51: Local Sakhon Nakhon Ch7a

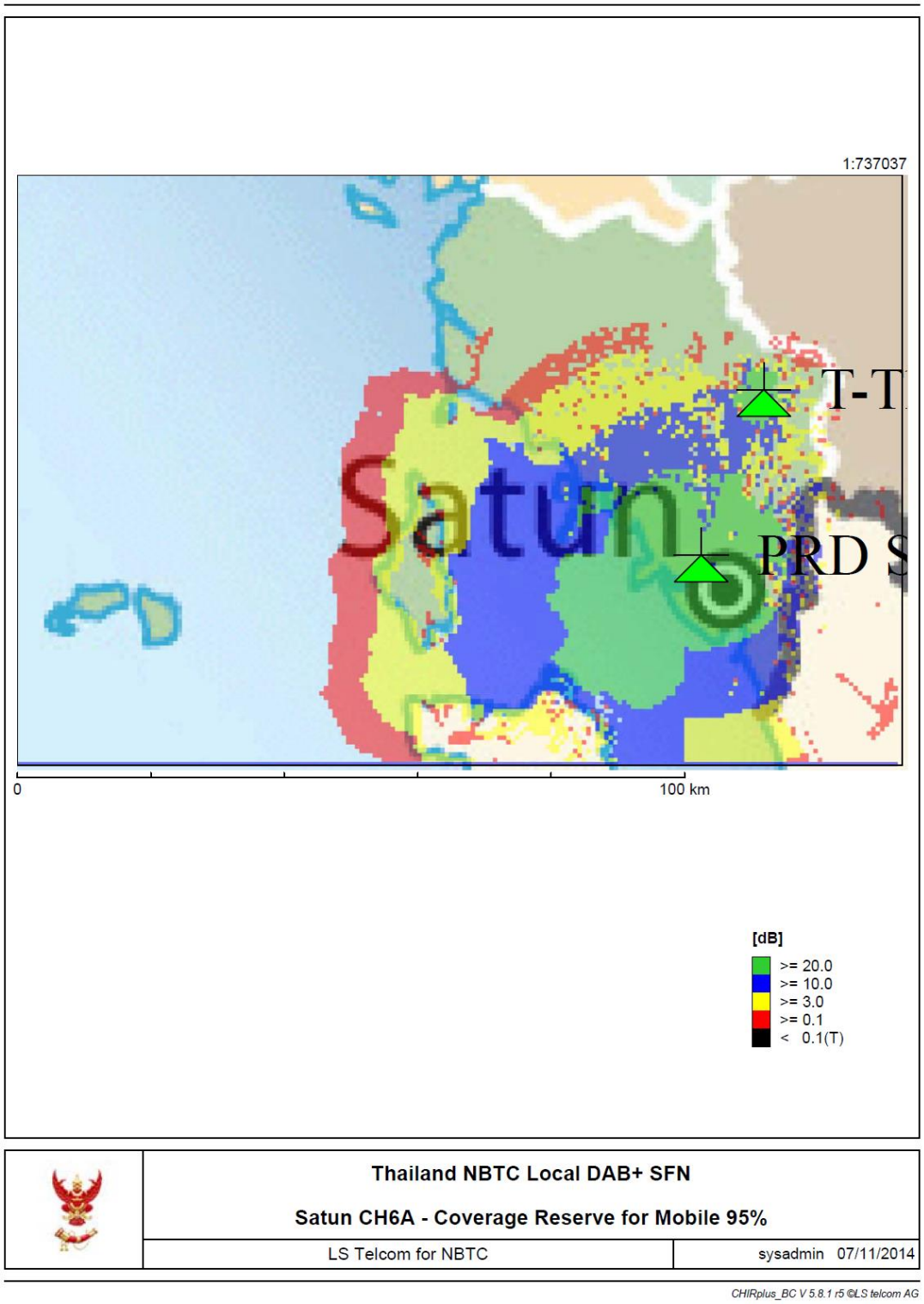


Figure 52: Local Satun Ch6a

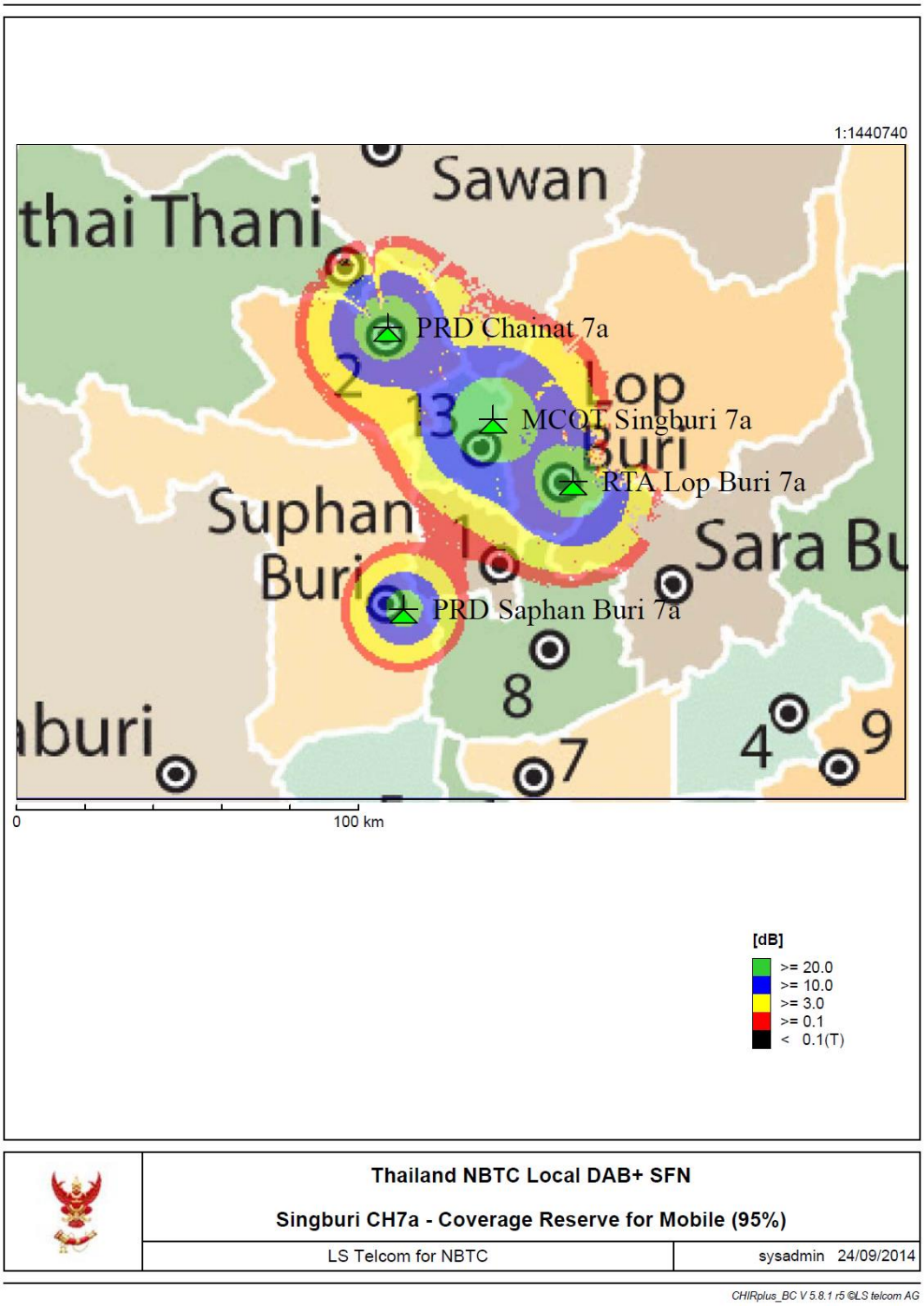


Figure 53: Local Singburi Ch7a

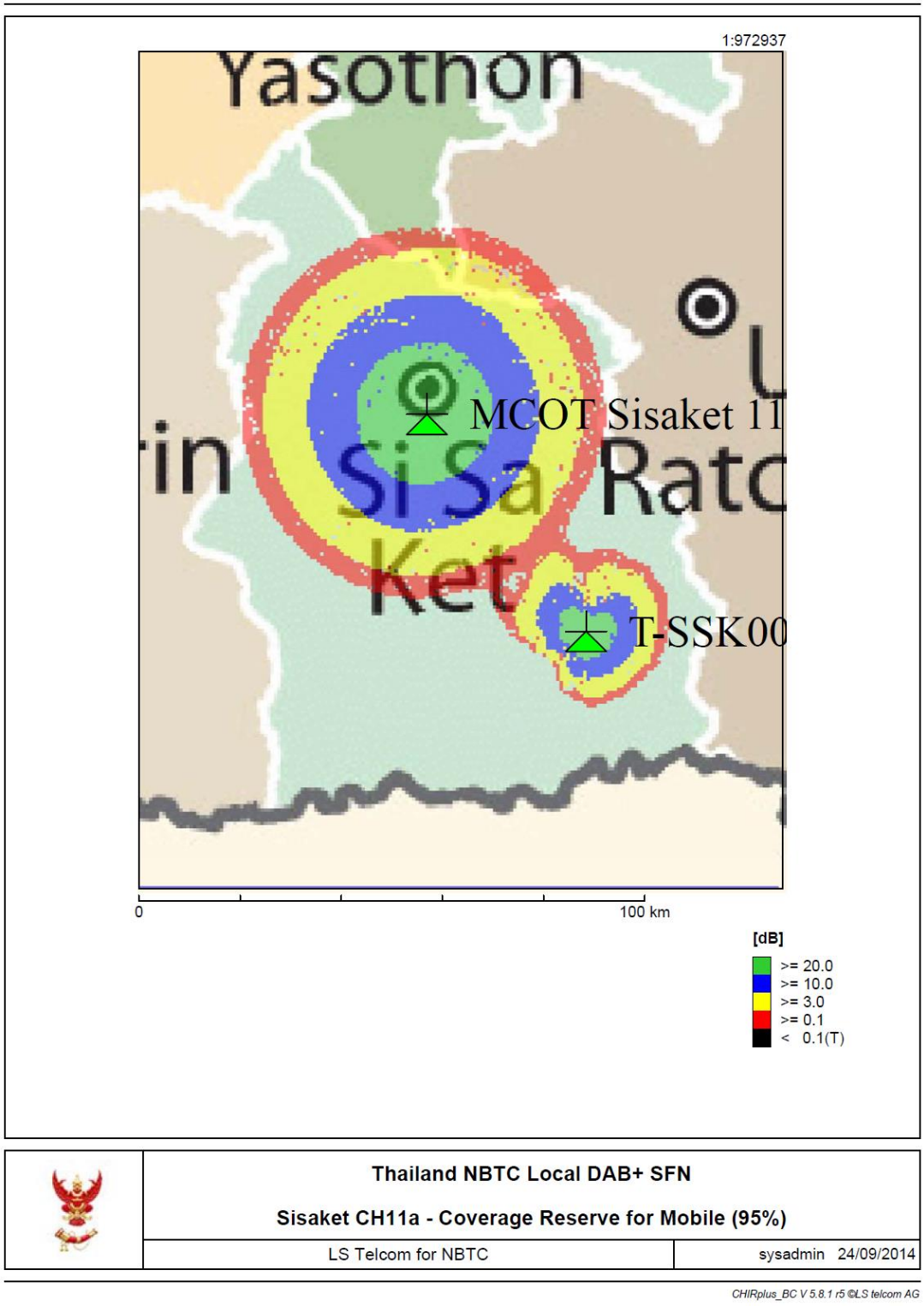


Figure 54: Local Sisaket Ch11a

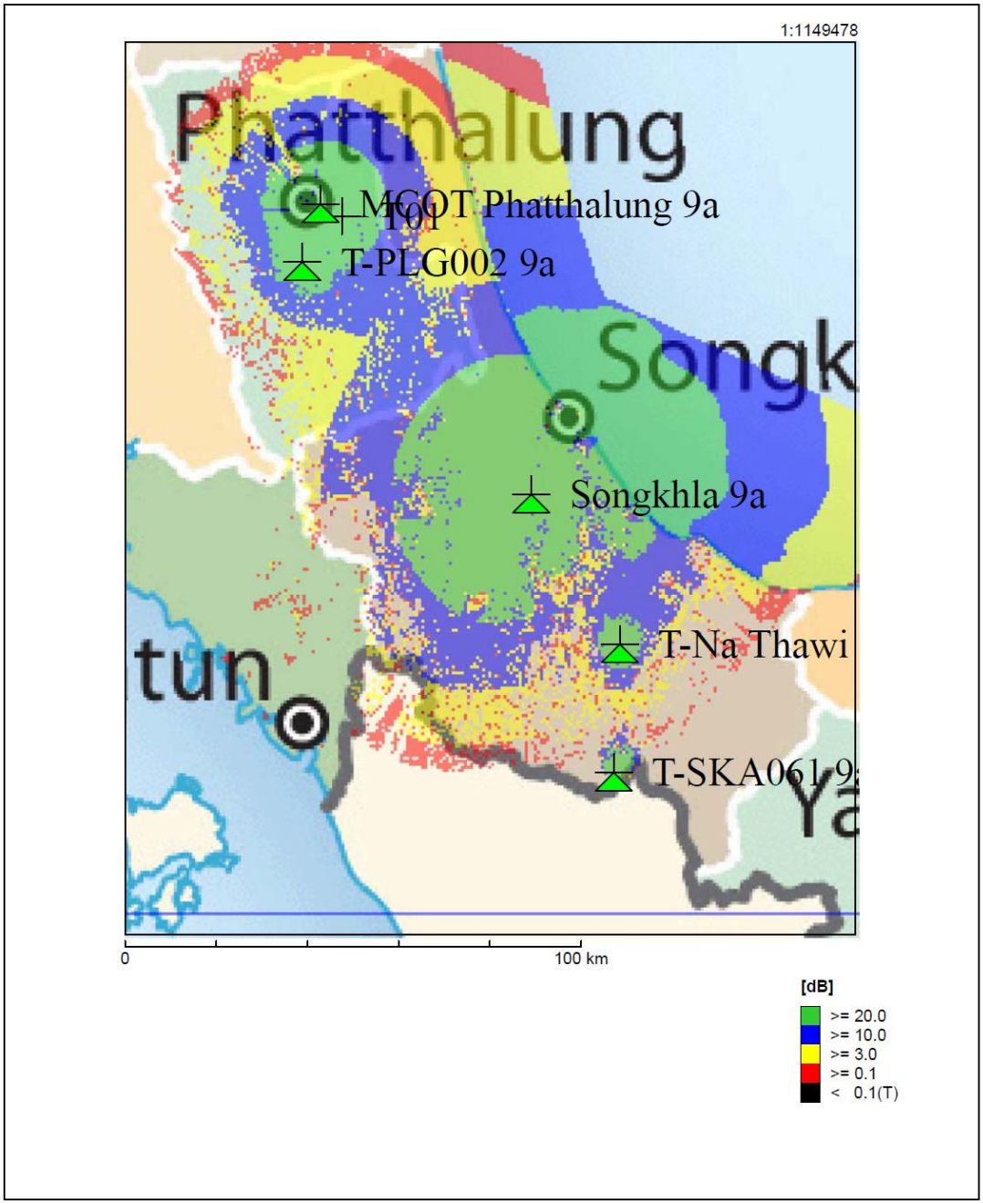


Figure 55: Local Songkhla Ch9a

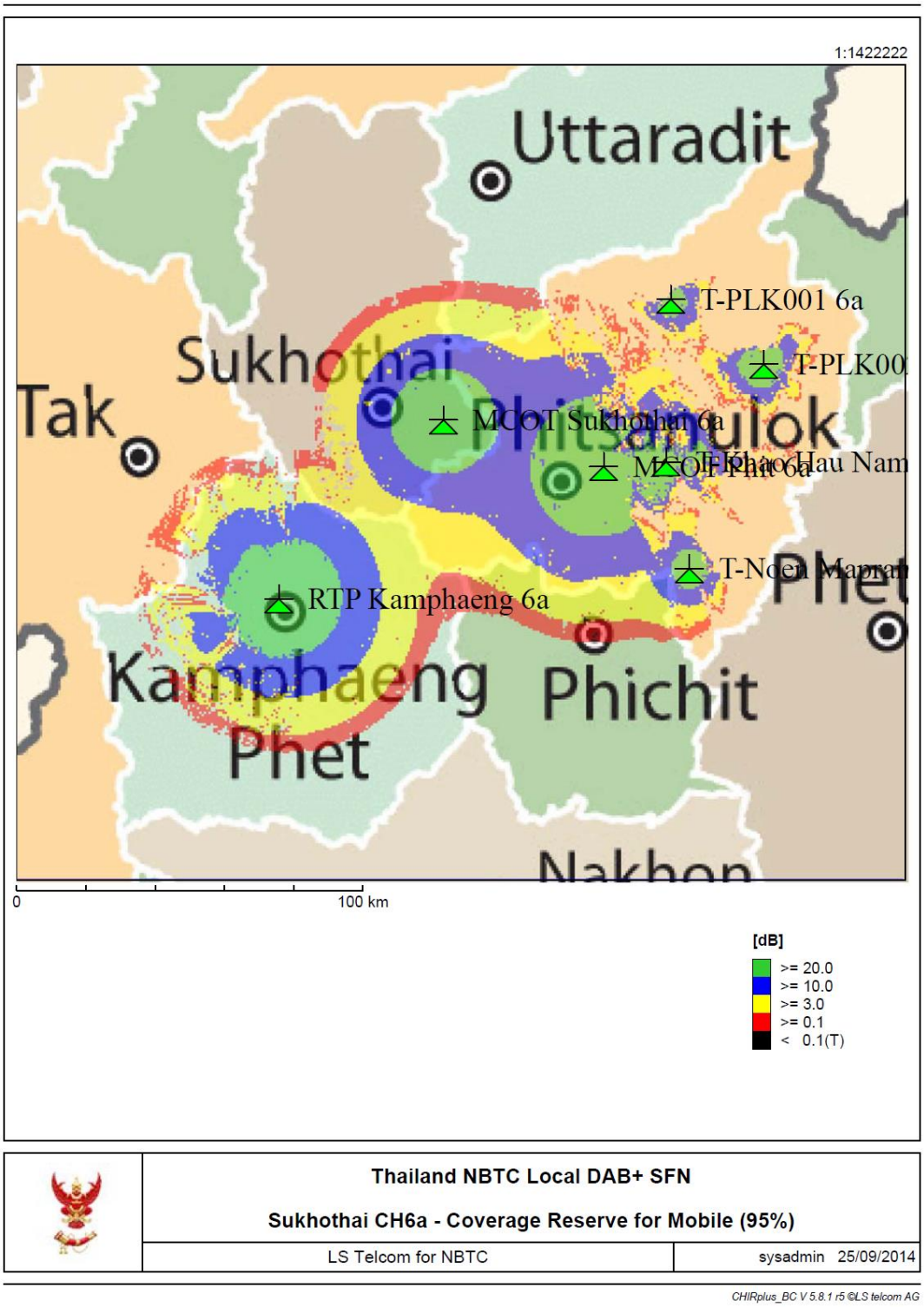


Figure 56: Local Sukhothai Ch6a

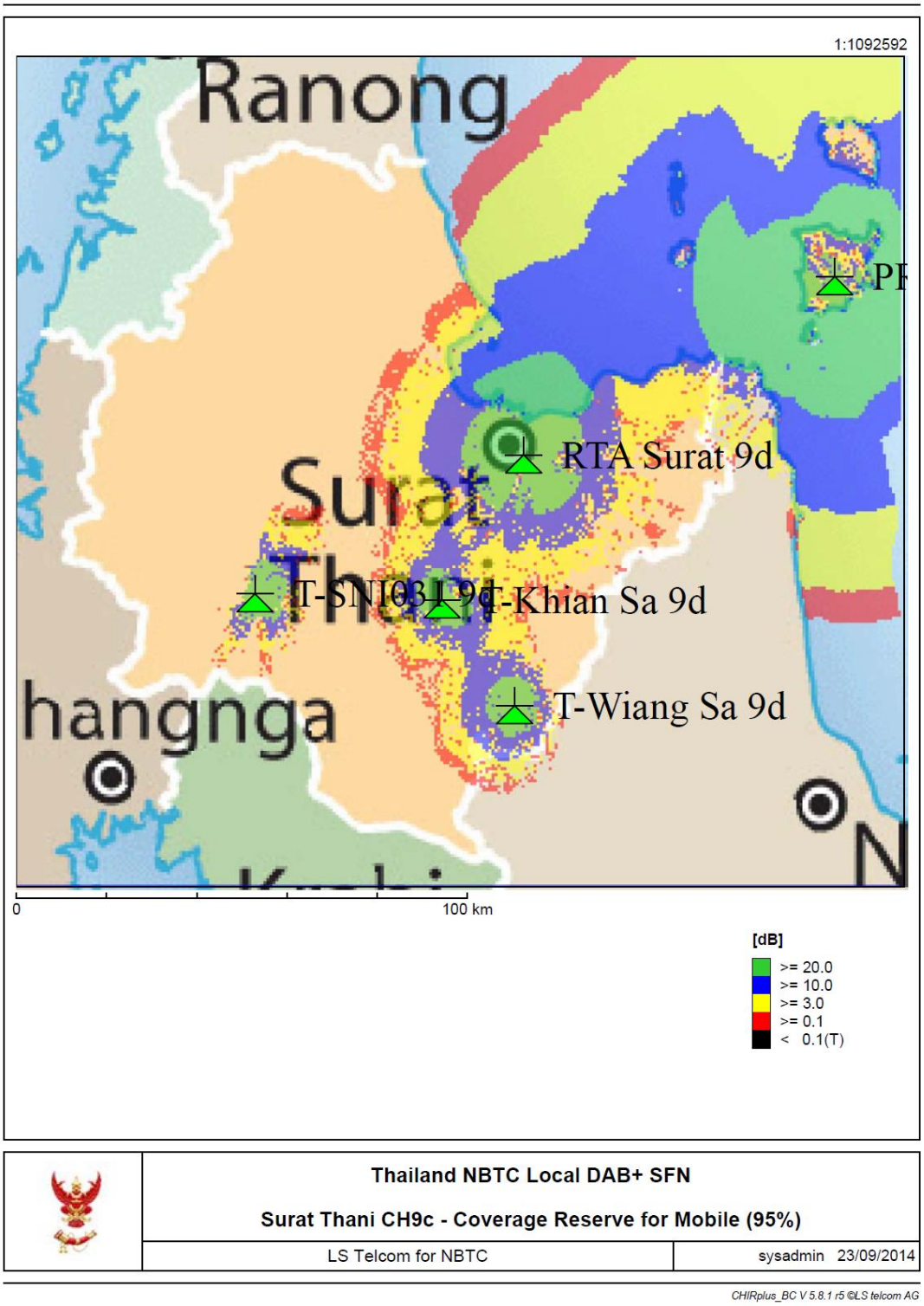


Figure 57: Local Surat Thani Ch9c

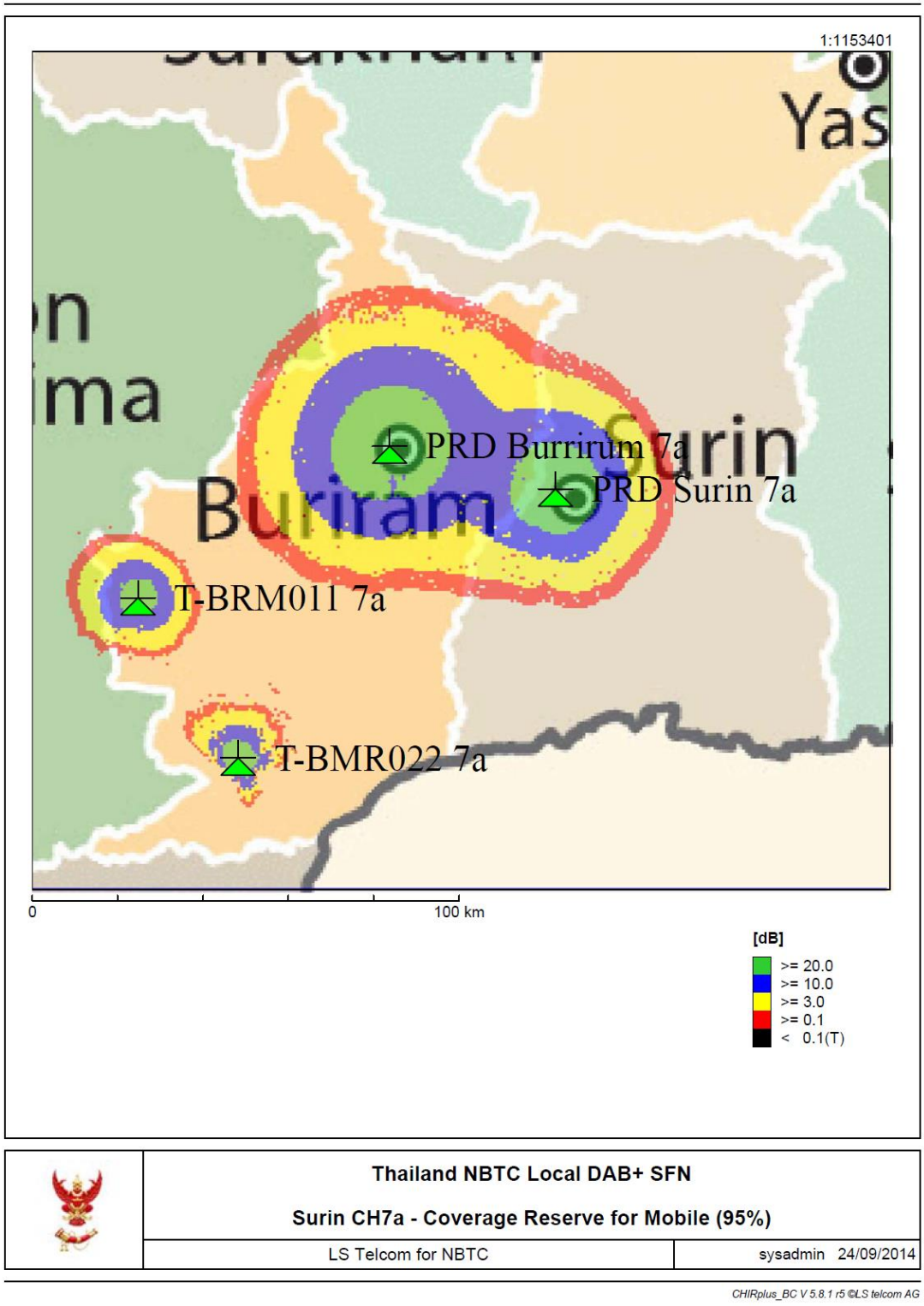


Figure 58: Local Surin Ch7a

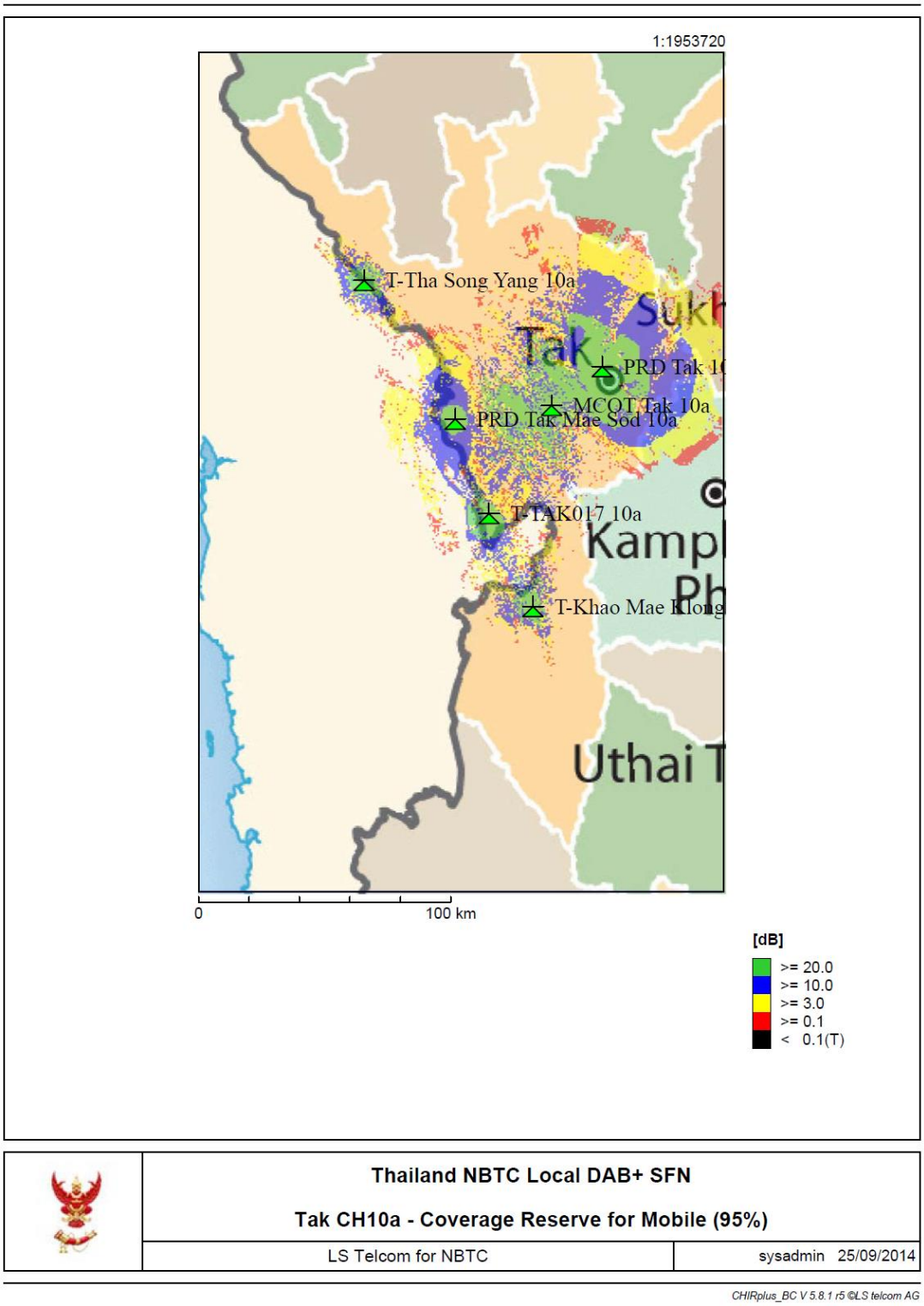


Figure 59: Local Tak Ch10a

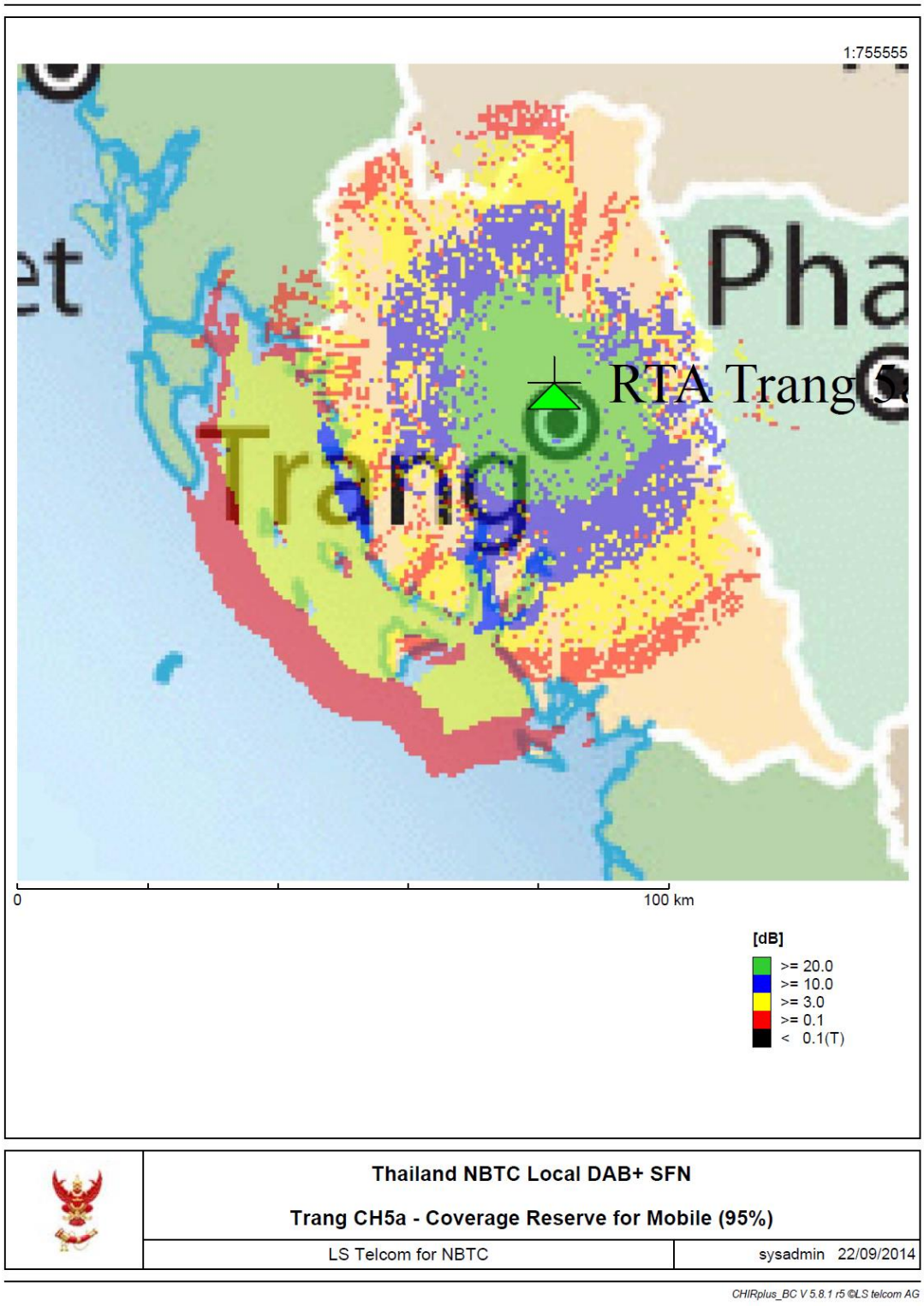


Figure 60: Local Trang Ch5a

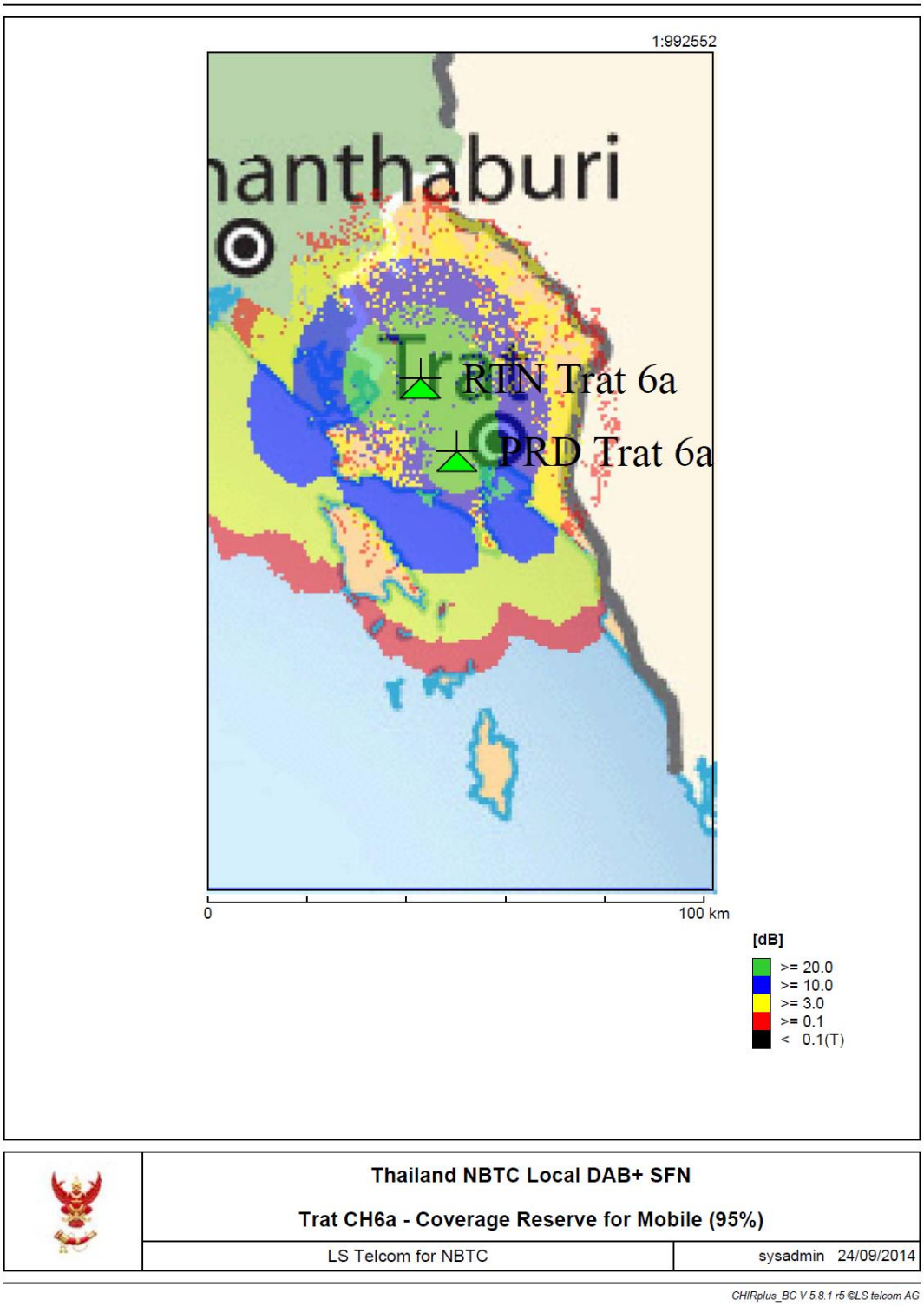


Figure 61: Local Trat Ch6a

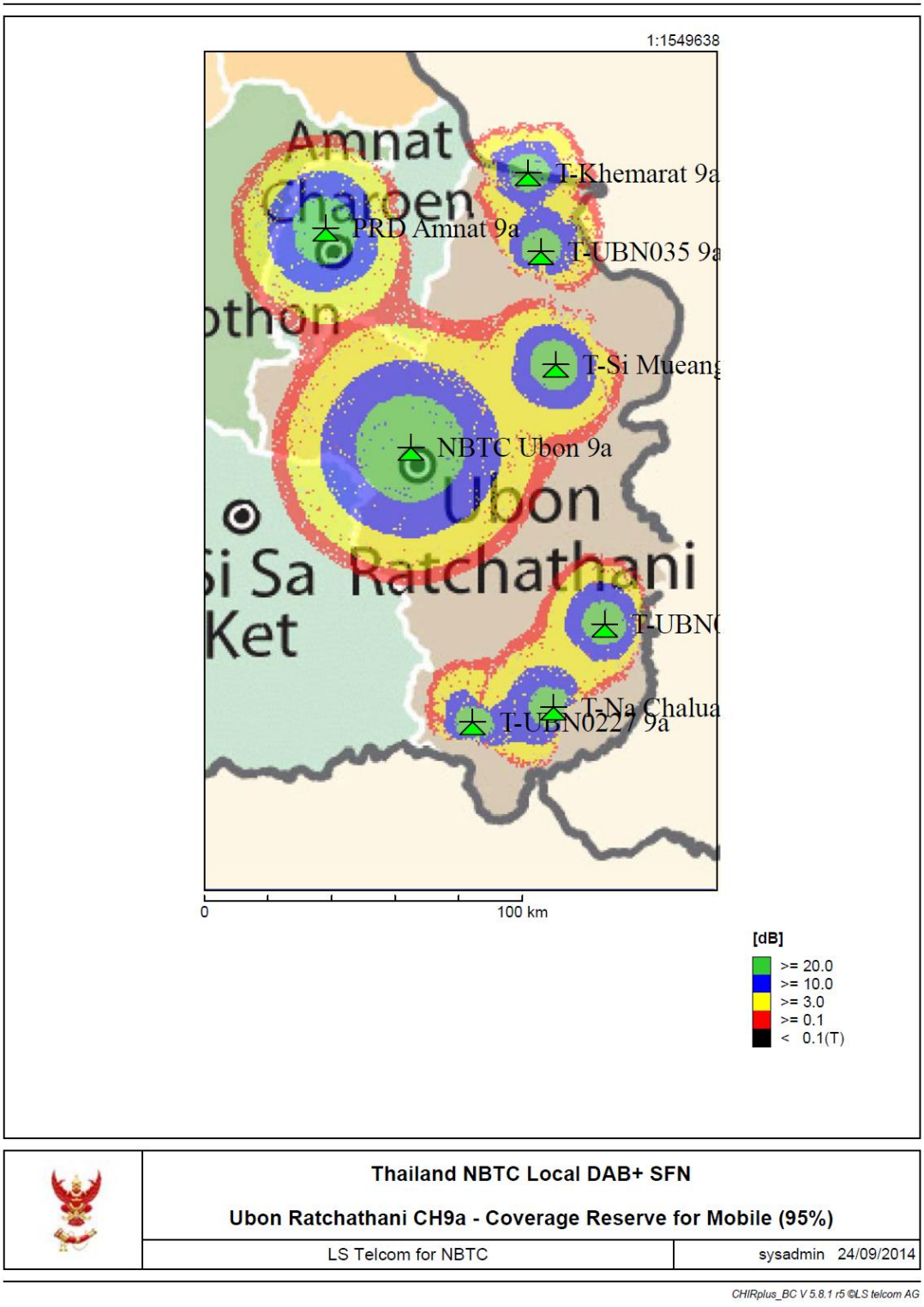


Figure 62: Local Ubon Ratchathani Ch9a

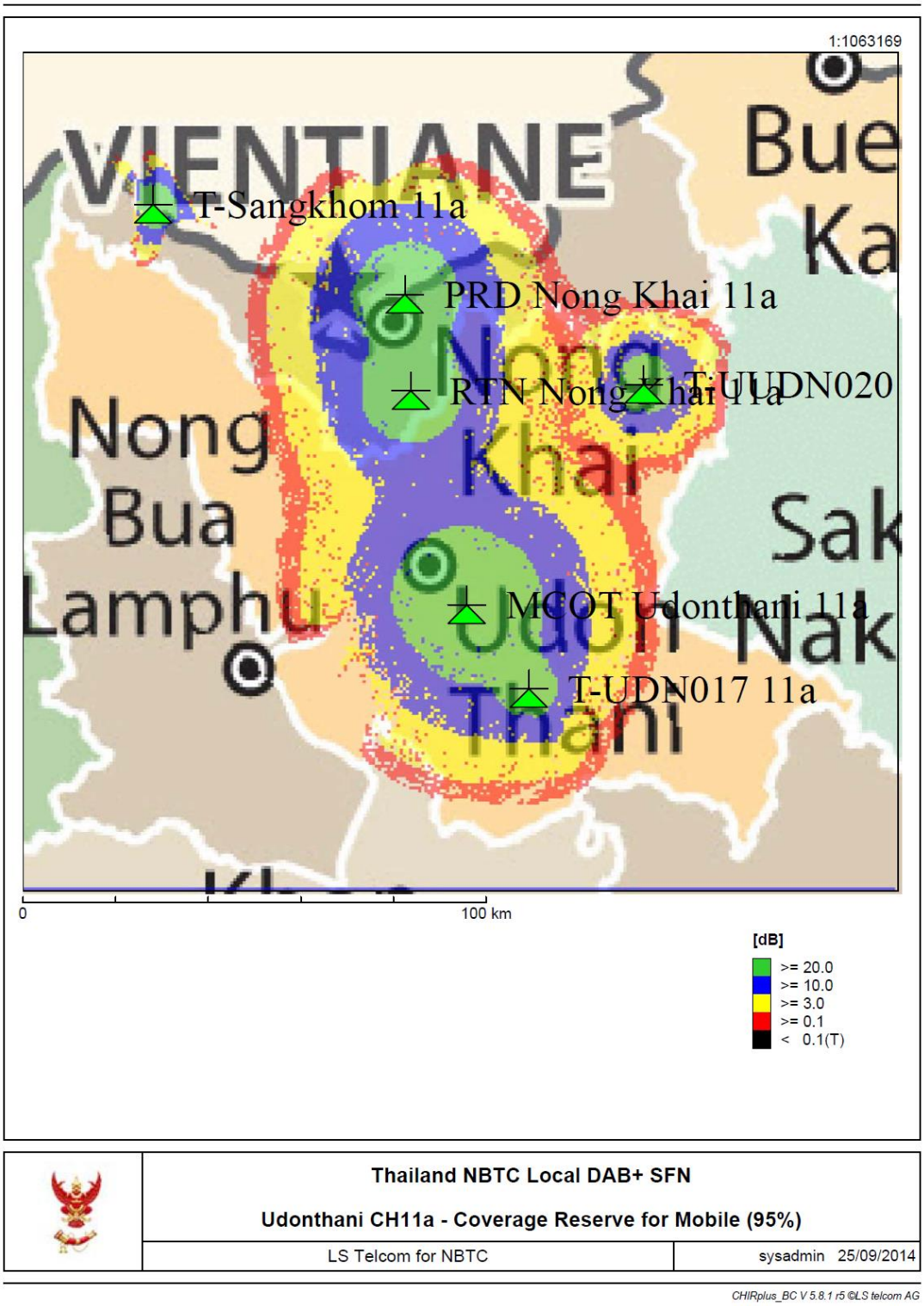


Figure 63: Local Udonthani Ch11a

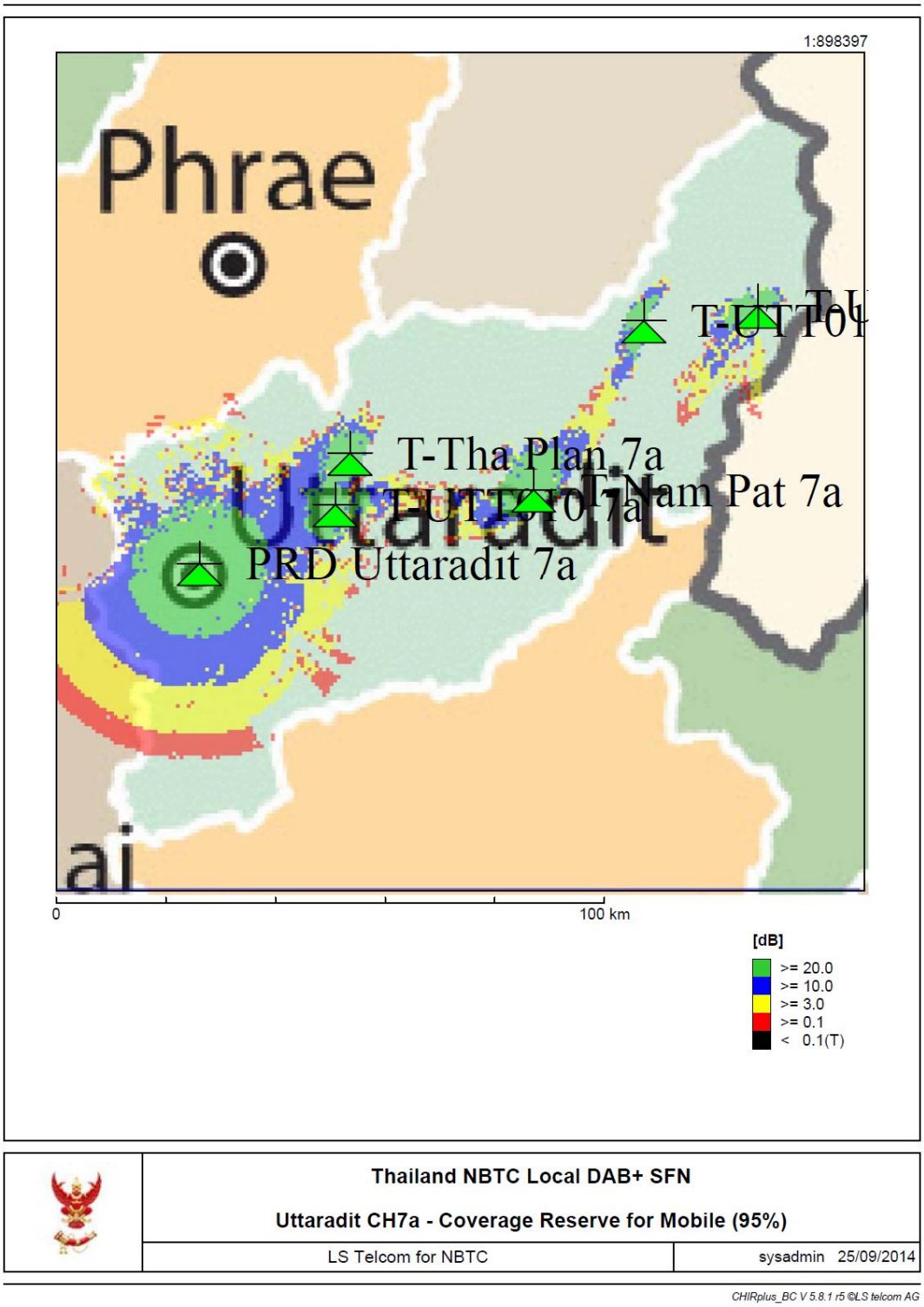


Figure 64: Local Uttaradit Ch7a

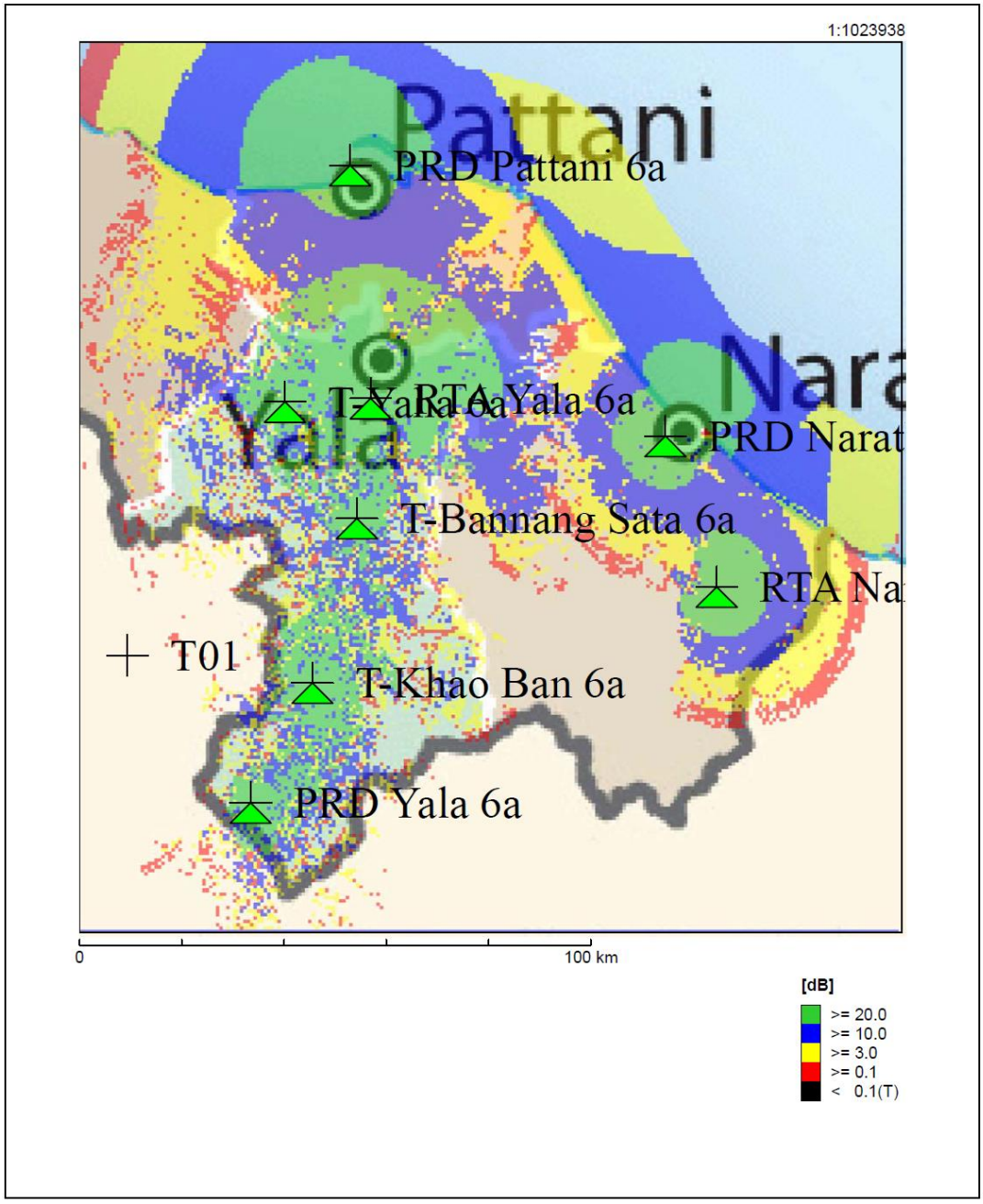


Figure 65: Local Yala Ch6a

Appendix E – List of Transmitter Parameters for the Local SFN Services

The following table lists the broadcasting and telecom tower facilities used to create the Local SFN coverage.

Column description		
Column 1	#	Row number
Column 2	Id	Transmitter Id from CHIRPplus_BC DAB database
Column 3	TX-Name	Transmitter name used for simulations. "T-" prefix refers to a CAT/TOT transmitters while other name refers to a broadcast transmit tower.
Column 4	Freq.	Center Frequency of DAB+ channel block
Column 5	Ch.	DAB+ Channel block number
Column 6	ERP	Effective Radiated Power in dBW
Column 7	Longit.	Longitude of the transmitter location
Column 8	Latit.	Latitude of the transmitter location
Column 9	Patt	Antenna pattern where ND represents "Non-directional". Please note that all antenna patterns used in this report are non-directional
Column 10	Ant.H.	Antenna Height in the tower (center of radiation above ground level)
Column 11	SFN Id	Single Frequency Network Id used in CHIRplus_BC for the network simulation
Column 12	Time Del.	Time Delay value for the optimal SFN synchronisation in order to minimise the intra-SFN interference

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
1	315	T-Suan Phueng	174.9280	5a	36.9897	099E20 09.810	13N32 39.310	ND	102	BANG5a	625
2	316	RTA (99.25)	174.9280	5a	36.9897	099E47 16.184	13N28 23.268	ND	100	BANG5a	500
3	317	Marine Samut	174.9280	5a	36.9897	100E00 04.835	13N24 50.897	ND	80	BANG5a	500
4	318	Meteo (Phit)	174.9280	5a	36.9897	100E13 00.620	13N55 21.516	ND	85	BANG5a	500
5	319	Bangkok SFN	174.9280	5a	40.0000	100E31 31.240	13N47 25.960	ND	185	BANG5a	500
6	320	Perm Secratary (90.5)	174.9280	5a	40.0000	100E36 03.715	13N41 21.599	ND	109	BANG5a	500

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
7	321	RTA Nayok	174.9280	5a	36.9897	101E09 49.165	14N16 44.803	ND	85	BANG5a	500
8	322	Chonburi MCOT	174.9280	5a	40.0000	100E57 02.030	13N11 23.359	ND	43	BANG5a	500
9	323	RTN Chon Buri	174.9280	5a	36.9897	100E51 58.752	12N55 17.364	ND	25	BANG5a	500
10	478	MCOT (105.5)	174.9280	5a	36.9897	100E21 37.508	13N42 42.840	ND	95	BANG5a	500
11	479	RTA (96.0)	174.9280	5a	36.9897	100E29 41.579	13N44 44.869	ND	90	BANG5a	500
12	480	Royal (104.0)	174.9280	5a	36.9897	100E32 00.132	13N44 01.320	ND	60	BANG5a	500
13	481	MCOT (99.0)	174.9280	5a	36.9897	100E38 08.401	13N46 50.923	ND	111	BANG5a	500
14	379	PRD Buengkan	174.9280	5a	43.9794	103E35 54.118	18N23 14.557	ND	93	BUEN5a	700
15	386	MCOT Chaiyapoom	216.9280	11a	46.9897	102E01 35.616	15N48 16.200	ND	105	CHAI11a	750
16	387	T-Ban Khwao	216.9280	11a	36.9897	101E54 23.280	15N46 43.830	ND	42	CHAI11a	750
17	388	T-Bamnet Narong	216.9280	11a	36.9897	101E41 16.810	15N26 35.840	ND	32	CHAI11a	700
18	389	T-Ban Thaen	216.9280	11a	36.9897	102E21 15.170	16N24 34.430	ND	22	CHAI11a	875
19	390	T-Nong Bua Daeng	216.9280	11a	36.9897	101E48 15.650	16N04 57.190	ND	82	CHAI11a	700
20	459	MCOT Chiang Rai	181.9360	6a	43.9794	099E52 03.061	19N48 55.598	ND	45	CHIG6a	750
21	460	Command Chiang Rai	181.9360	6a	43.9794	099E53 12.574	20N06 33.271	ND	105	CHIG6a	800
22	461	T-CRI022	181.9360	6a	36.9897	099E30 21.960	19N21 52.420	ND	50	CHIG6a	850
23	462	T-Mae Khachan	181.9360	6a	36.9897	099E31 58.570	19N11 39.720	ND	22	CHIG6a	850
24	463	T-Chiang Khong	181.9360	6a	36.9897	100E24 39.780	20N14 46.380	ND	72	CHIG6a	750
25	464	T-Ban Ta	181.9360	6a	36.9897	100E14 30.600	19N48 55.790	ND	107	CHIG6a	800
26	465	T-Mae Suai	181.9360	6a	36.9897	099E32 16.380	19N39 31.910	ND	22	CHIG6a	800

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
27	466	T-Thoetthai	181.9360	6a	36.9897	099E40 02.130	20N14 19.700	ND	22	CHIG6a	800
28	444	MCOT Lamphump	202.9280	9a	43.9794	099E02 54.931	18N33 16.250	ND	105	CHIM9a	850
29	445	RTA Chiang Mai	202.9280	9a	43.9794	098E58 13.710	18N50 50.165	ND	75	CHIM9a	800
30	446	PRD Chiang Mai	202.9280	9a	43.9794	099E13 18.678	19N56 26.563	ND	75	CHIM9a	750
31	447	T-CMI005	202.9280	9a	36.9897	098E40 54.260	17N57 10.940	ND	50	CHIM9a	850
32	448	T-CMI008	202.9280	9a	36.9897	099E11 49.700	19N22 11.640	ND	50	CHIM9a	800
33	449	Chiang Mai Green - 9	202.9280	9a	36.9897	098E32 32.034	18N13 18.956	ND	60	CHIM9a	850
34	450	T-Chomthong	202.9280	9a	36.9897	098E40 31.880	18N25 05.590	ND	30	CHIM9a	825
35	451	T-Samoeng	202.9280	9a	36.9897	098E44 11.930	18N51 00.290	ND	72	CHIM9a	800
36	452	T-Wiang Haeng	202.9280	9a	36.9897	098E38 19.080	19N33 44.520	ND	22	CHIM9a	800
37	453	T-Doi Inthanon	202.9280	9a	30.0000	098E28 56.850	18N34 26.280	ND	102	CHIM9a	800
38	454	T-Luang Bok	202.9280	9a	36.9897	098E59 07.020	17N59 49.910	ND	62	CHIM9a	850
39	455	T-Mae Na Wang	202.9280	9a	36.9897	099E20 34.350	19N59 58.750	ND	15	CHIM9a	750
40	306	MCOT (90.75)	174.9280	5a	46.9897	099E08 02.915	10N26 45.521	ND	105	CHUM5a	700
41	307	T-Lang Suan	174.9280	5a	36.9897	099E04 36.120	09N56 49.180	ND	62	CHUM5a	750
42	308	T-Lamae	174.9280	5a	36.9897	099E05 42.520	09N46 15.430	ND	67	CHUM5a	750
43	324	PRD Kancha	181.9360	6a	40.0000	098E26 41.752	15N08 23.471	ND	85	KANC6a	600
44	325	T-Khao Ban Chong	181.9360	6a	36.9897	098E35 57.660	15N03 07.740	ND	22	KANC6a	600
45	326	T-Thong Pha Phum	181.9360	6a	36.9897	098E37 26.240	14N45 08.640	ND	62	KANC6a	575
46	327	PRD TV(11)	181.9360	6a	36.9897	098E40 14.440	14N45 04.120	ND	65	KANC6a	575

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
47	328	T-Si Sawat	181.9360	6a	36.9897	099E06 56.020	14N35 48.890	ND	102	KANC6a	600
48	329	T-Khao Pho Toei	181.9360	6a	36.9897	098E55 56.410	14N22 50.100	ND	32	KANC6a	600
49	330	T-Sai Yok	181.9360	6a	36.9897	099E08 38.400	14N07 05.630	ND	62	KANC6a	625
50	331	RTP Kancha	181.9360	6a	46.9897	099E24 45.742	14N04 05.531	ND	105	KANC6a	700
51	332	MCOT Kancha	181.9360	6a	40.0000	099E47 39.746	13N54 18.144	ND	105	KANC6a	625
52	333	T-Lao Khwan	181.9360	6a	36.9897	099E46 28.140	14N35 49.510	ND	52	KANC6a	650
53	368	MCOT Kalasin	181.9360	6a	43.9794	103E11 05.982	16N22 32.059	ND	93	KHON6a	850
54	369	PRD Khon Kaen	181.9360	6a	43.9794	102E50 01.100	16N28 31.501	ND	98	KHON6a	850
55	370	PRD Khon Kaen	181.9360	6a	43.9794	102E03 20.099	16N33 21.199	ND	75	KHON6a	900
56	371	PRD Kalasin	181.9360	6a	40.0000	103E32 05.492	16N27 12.445	ND	75	KHON6a	875
57	372	PRD Mahasa	181.9360	6a	40.0000	103E15 11.560	16N08 20.677	ND	93	KHON6a	850
58	373	T-KKN007	181.9360	6a	36.9897	102E36 11.970	15N48 17.860	ND	50	KHON6a	750
59	374	T-KSN007	181.9360	6a	36.9897	103E30 42.150	16N42 14.190	ND	35	KHON6a	875
60	440	RTA Lampang	174.9280	5a	43.9794	099E24 29.808	18N11 50.035	ND	105	LAMP5a	750
61	441	CH7 TV Lampang	174.9280	5a	43.9794	099E42 48.850	18N25 55.210	ND	85	LAMP5a	750
62	442	T-LPG013	174.9280	5a	36.9897	099E20 10.770	17N53 25.490	ND	50	LAMP5a	850
63	443	T-Khao Ban Pang	174.9280	5a	36.9897	099E36 21.370	18N53 11.850	ND	52	LAMP5a	750
64	406	RTP Loei	202.9280	9a	43.9794	101E44 17.498	17N23 32.798	ND	95	LOEI9a	750
65	407	MCOT Loei	202.9280	9a	40.0000	101E26 40.402	17N28 11.302	ND	146	LOEI9a	750
66	408	PRD Nong Bua	202.9280	9a	43.9794	102E25 46.499	17N13 41.401	ND	74	LOEI9a	800

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
67	409	T-LEI014	202.9280	9a	36.9897	101E04 13.620	17N28 53.040	ND	35	LOEI9a	750
68	410	T-Wang Saphung	202.9280	9a	36.9897	101E45 54.110	17N17 50.770	ND	112	LOEI9a	750
69	411	T-Phu Kratae	202.9280	9a	36.9897	101E55 03.130	16N56 28.380	ND	27	LOEI9a	875
70	412	T-Pak Chom	202.9280	9a	36.9897	101E53 08.900	18N01 23.740	ND	92	LOEI9a	900
71	456	MCOT Mae Hong	188.9280	7a	43.9794	098E02 08.581	19N06 21.625	ND	40	MAEH7a	775
72	457	PRD Mae Hong	188.9280	7a	36.9897	097E56 40.380	18N10 06.834	ND	25	MAEH7a	1000
73	458	T-MSN001	188.9280	7a	36.9897	097E56 10.080	18N49 42.420	ND	50	MAEH7a	825
74	364	T-Khamcha-I	209.9360	10a	36.9897	104E25 01.600	16N34 32.030	ND	52	MUKD10a	900
75	365	PRD Mukdahan	209.9360	10a	36.9897	104E40 50.362	16N32 40.679	ND	80	MUKD10a	925
76	277	T-Khao Dat Fa	209.9360	10a	36.9897	099E49 31.670	09N07 06.310	ND	27	NAKH10a	700
77	278	T-Si Chon	209.9360	10a	36.9897	099E54 20.990	09N00 25.020	ND	87	NAKH10a	700
78	279	Nakhon Si Thammarat	209.9360	10a	46.9897	099E58 38.480	08N21 59.880	ND	108	NAKH10a	675
79	280	MCOT Nakhon	209.9360	10a	46.9897	099E48 14.152	08N14 12.077	ND	36	NAKH10a	600
80	281	PRD Nakhon	209.9360	10a	40.0000	099E29 23.813	08N12 36.767	ND	32	NAKH10a	625
81	348	RTA Nakhon	209.9360	10a	43.9794	102E05 44.610	14N57 54.090	ND	95	NAKH10a	550
82	349	CH7 TV NAkhon	209.9360	10a	46.9897	101E33 04.590	14N42 25.109	ND	70	NAKH10a	550
83	285	T-Khao Dat Fa	211.6480	10b	36.9897	099E49 31.670	09N07 06.310	ND	27	NAKH10b	700
84	286	T-Si Chon	211.6480	10b	36.9897	099E54 20.990	09N00 25.020	ND	87	NAKH10b	700
85	287	Nakhon Si Thammarat	211.6480	10b	46.9897	099E58 38.480	08N21 59.880	ND	108	NAKH10b	675
86	288	MCOT Nakhon	211.6480	10b	46.9897	099E48 14.152	08N14 12.077	ND	36	NAKH10b	600

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
87	289	PRD Nakhon	211.6480	10b	40.0000	099E29 23.813	08N12 36.767	ND	32	NAKH10b	625
88	290	T-Nakhon Dat Fa	215.0720	10d	36.9897	099E49 31.670	09N07 06.310	ND	27	NAKH10d	700
89	291	T-Si Chon	215.0720	10d	36.9897	099E54 20.990	09N00 25.020	ND	27	NAKH10d	700
90	292	Nakhon Si Thammarat	215.0720	10d	46.9897	099E58 38.480	08N21 59.880	ND	108	NAKH10d	675
91	293	PRD Nakhon	215.0720	10d	40.0000	099E29 23.813	08N12 36.767	ND	32	NAKH10d	625
92	294	MCOT Nakhon	215.0720	10d	46.9897	099E48 14.152	08N14 12.077	ND	36	NAKH10d	600
93	435	RTA Nan	209.9360	10a	46.9897	100E44 32.852	18N44 33.522	ND	105	Nan10a	800
94	436	T-NAN007	209.9360	10a	36.9897	100E51 36.370	19N18 36.930	ND	50	Nan10a	750
95	437	T-NAN011	209.9360	10a	36.9897	101E09 15.080	19N08 37.100	ND	50	Nan10a	750
96	438	T-Tha Wang Pha	209.9360	10a	36.9897	100E48 50.400	19N07 27.430	ND	47	Nan10a	750
97	439	T-Khao Ban Huai	209.9360	10a	36.9897	100E29 52.570	18N52 20.650	ND	77	Nan10a	750
98	396	MCOT Uthaithani	202.9280	9a	40.0000	100E04 45.232	15N25 03.691	ND	97	NASA9a	575
99	397	ch7(12) Sawan	202.9280	9a	40.0000	100E07 59.106	15N42 53.244	ND	33	NASA9a	600
100	398	RTP Phichit	202.9280	9a	43.9794	100E17 51.140	16N27 14.220	ND	75	NASA9a	650
101	399	MCOT Phichit	202.9280	9a	43.9794	100E08 47.490	16N17 51.140	ND	97	NASA9a	600
102	400	T-NSN005	202.9280	9a	36.9897	100E20 55.180	15N16 07.180	ND	50	NASA9a	575
103	401	T-PCT012	202.9280	9a	36.9897	100E31 48.700	16N24 18.980	ND	50	NASA9a	625
104	402	T-UTI	202.9280	9a	36.9897	099E32 59.060	15N27 39.350	ND	50	NASA9a	600
105	403	T-Khao Phuk I Khwai	202.9280	9a	36.9897	099E37 55.100	15N05 35.150	ND	17	NASA9a	575
106	404	T-Nong Chang	202.9280	9a	36.9897	099E50 22.520	15N23 30.200	ND	62	NASA9a	600

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
107	405	T-Lat Yao	202.9280	9a	36.9897	099E47 12.920	15N44 55.100	ND	47	NASA9a	600
108	391	PRD Phetchabun	174.9280	5a	43.9794	101E09 15.329	16N27 26.125	ND	73	PHET5a	600
109	392	Command Phet	174.9280	5a	36.9897	101E15 10.994	16N51 02.797	ND	93	PHET5a	550
110	393	T-PBN006	174.9280	5a	36.9897	101E06 17.800	15N39 43.850	ND	50	PHET5a	650
111	394	T-Si Thep	174.9280	5a	36.9897	101E03 51.510	15N27 46.560	ND	22	PHET5a	650
112	395	T-Sam Yaek Wang	174.9280	5a	36.9897	101E02 21.770	16N15 46.300	ND	38	PHET5a	600
113	432	MCOT Phrae	216.9280	11a	43.9794	100E00 03.139	17N55 58.894	ND	45	PHRA11a	675
114	433	RTA Phrae	216.9280	11a	43.9794	100E11 52.494	18N12 17.968	ND	105	PHRA11a	700
115	434	T-PRE006	216.9280	11a	36.9897	099E36 06.120	17N54 32.940	ND	50	PHRA11a	700
116	297	RTP Phuket	181.9360	6a	46.9897	098E22 58.645	07N53 40.513	ND	85	PHUK6a	625
117	298	RTN Phangnga	181.9360	6a	40.0000	098E18 39.726	08N16 36.070	ND	85	PHUK6a	575
118	299	PRD Phangnga	181.9360	6a	40.0000	098E21 05.238	08N50 22.247	ND	15	PHUK6a	750
119	300	PRD Phangnga	181.9360	6a	46.9897	098E30 24.408	08N26 02.735	ND	85	PHUK6a	625
120	301	T-PKT019	181.9360	6a	36.9897	098E17 04.200	07N58 44.720	ND	50	PHUK6a	600
121	302	T-Khao Lang Tang	181.9360	6a	36.9897	098E41 49.710	08N28 27.690	ND	55	PHUK6a	600
122	303	MCOT Krabi	181.9360	6a	46.9897	098E54 31.338	08N02 56.886	ND	105	PHUK6a	650
123	309	PRD Phatchaburi	209.9360	10a	46.9897	099E55 44.458	13N06 15.800	ND	75	PRAC10a	725
124	310	Hua Hin	209.9360	10a	46.9897	099E56 07.000	12N33 55.000	ND	55	PRAC10a	700
125	311	T-Pranburi	209.9360	10a	36.9897	099E54 24.170	12N22 33.140	ND	67	PRAC10a	700
126	312	T-Kuiburi	209.9360	10a	36.9897	099E51 55.360	12N04 03.500	ND	67	PRAC10a	700

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
127	313	PRD Prachuap	209.9360	10a	46.9897	099E48 02.999	11N50 07.199	ND	105	PRAC10a	700
128	314	Prachuap Khiri Khan	209.9360	10a	46.9897	099E31 33.181	11N19 25.759	ND	85	PRAC10a	725
129	304	PRD (107.25)	216.9280	11a	46.9897	098E40 07.230	10N01 29.076	ND	97	RANO11a	825
130	305	T-Khao 221	216.9280	11a	36.9897	098E31 24.530	09N31 59.450	ND	87	RANO11a	875
131	341	RTP Rayong	216.9280	11a	46.9897	101E12 43.340	12N41 22.420	ND	75	RAYO11a	600
132	342	T-Na Yai Am	216.9280	11a	36.9897	101E49 19.200	12N47 15.720	ND	117	RAYO11a	550
133	343	T-Pong Nam Ron	216.9280	11a	36.9897	102E16 28.280	12N53 22.920	ND	82	RAYO11a	575
134	344	T-Makham	216.9280	11a	36.9897	102E11 42.190	12N40 53.410	ND	22	RAYO11a	500
135	345	RTN Chanthaburi	216.9280	11a	46.9897	102E05 50.482	12N36 27.612	ND	75	RAYO11a	500
136	366	MCOT Roiet	174.9280	5a	43.9794	103E35 47.116	16N04 31.199	ND	135	ROIE5a	900
137	367	PRD Yasothon	174.9280	5a	43.9794	104E08 34.336	15N48 12.852	ND	85	ROIE5a	900
138	338	RTA Prachinburi	202.9280	9a	46.9897	101E22 26.378	14N08 05.813	ND	66	SAKA9a	575
139	339	PRD Sakaeo	202.9280	9a	46.9897	102E04 17.458	13N49 27.455	ND	80	SAKA9a	600
140	340	T-Ta Phraya	202.9280	9a	36.9897	102E48 17.270	14N00 10.270	ND	87	SAKA9a	500
141	375	RTA Nakhon	188.9280	7a	40.0000	104E34 25.802	17N19 47.755	ND	95	SAKO7a	750
142	376	MCOT Nakhon	188.9280	7a	40.0000	104E47 16.699	17N23 16.825	ND	94	SAKO7a	700
143	377	RTAF Sakhon	188.9280	7a	43.9794	104E09 14.339	17N09 01.634	ND	65	SAKO7a	800
144	378	MCOT Sakhon	188.9280	7a	36.9897	103E59 20.749	17N08 15.598	ND	32	SAKO7a	750
145	274	T-Thunk Nui	181.9360	6a	36.9897	100E06 44.580	06N51 24.300	ND	22	SATU6a	525
146	275	PRD Satun	181.9360	6a	40.0000	100E01 30.900	06N38 07.102	ND	49	SATU6a	550

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
147	334	PRD Chainat	188.9280	7a	40.0000	100E08 25.562	15N12 24.473	ND	65	SING7a	575
148	335	MCOT Singburi	188.9280	7a	40.0000	100E25 40.778	14N57 45.710	ND	125	SING7a	575
149	336	RTA Lop Buri	188.9280	7a	40.0000	100E38 33.634	14N48 02.149	ND	85	SING7a	550
150	337	PRD Saphan Buri	188.9280	7a	30.0000	100E10 48.857	14N27 48.208	ND	85	SING7a	550
151	354	MCOT Sisaket	216.9280	11a	43.9794	104E20 41.568	15N02 33.000	ND	95	SISA11a	700
152	355	T-SSK001	216.9280	11a	36.9897	104E37 52.550	14N39 01.900	ND	35	SISA11a	700
153	269	MCOT Phatthalung	202.9280	9a	43.9794	100E06 02.059	07N36 58.763	ND	95	SONG9a	525
154	270	T-PLG002	202.9280	9a	36.9897	100E03 47.380	07N29 58.780	ND	50	SONG9a	500
155	271	Songkhla	202.9280	9a	46.9897	100E31 07.104	07N02 15.706	ND	40	SONG9a	500
156	272	T-Na Thawi	202.9280	9a	36.9897	100E41 30.650	06N44 28.600	ND	37	SONG9a	525
157	273	T-SKA061	202.9280	9a	36.9897	100E40 42.200	06N29 23.960	ND	30	SONG9a	650
158	565	Songkhla Green - 1	202.9280	9a	36.9897	099E57 43.912	07N45 26.690	ND	120	SONG9a	500
159	566	Songkhla Green - 2	202.9280	9a	36.9897	100E17 03.593	07N50 06.870	ND	120	SONG9a	500
160	567	Songkhla Green - 3	202.9280	9a	36.9897	100E19 56.622	07N32 41.287	ND	120	SONG9a	500
161	568	Songkhla Green - 4	202.9280	9a	36.9897	100E16 19.005	07N19 24.288	ND	120	SONG9a	500
162	569	Songkhla Green - 5	202.9280	9a	36.9897	100E53 59.463	06N43 18.394	ND	120	SONG9a	500
163	570	Songkhla Green - 6	202.9280	9a	36.9897	100E01 31.708	07N17 13.056	ND	120	SONG9a	500
164	571	Songkhla Green - 7	202.9280	9a	36.9897	099E54 29.846	07N33 56.833	ND	80	SONG9a	500
165	572	Songkhla Green - 8	202.9280	9a	30.0000	100E34 39.298	07N10 43.211	ND	120	SONG9a	500
166	573	Songkhla Green - 9	202.9280	9a	36.9897	100E50 06.329	06N48 57.798	ND	120	SONG9a	500

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
167	574	Songkhla Green - 10	202.9280	9a	36.9897	099E48 45.317	07N45 53.862	ND	120	SONG9a	500
168	419	RTP Kamphaeng	181.9360	6a	46.9897	099E31 11.379	16N29 59.749	ND	105	SUKH6a	700
169	420	MCOT Sukhothai	181.9360	6a	43.9794	099E58 01.801	16N57 47.902	ND	105	SUKH6a	700
170	421	MCOT Phit	181.9360	6a	43.9794	100E24 07.528	16N50 29.141	ND	75	SUKH6a	700
171	422	T-PLK001	181.9360	6a	30.0000	100E35 17.810	17N16 24.280	ND	50	SUKH6a	700
172	423	T-PLK002	181.9360	6a	36.9897	100E50 16.100	17N06 14.470	ND	50	SUKH6a	700
173	424	T-Khao Hau Nam	181.9360	6a	36.9897	100E34 11.270	16N50 53.970	ND	52	SUKH6a	700
174	425	T-Noen Maprang	181.9360	6a	36.9897	100E38 03.690	16N34 12.860	ND	52	SUKH6a	625
175	282	RTA Surat	208.0640	9d	46.9897	099E21 42.080	09N07 47.748	ND	71	SURA9d	700
176	283	T-Khian Sa	208.0640	9d	36.9897	099E11 46.610	08N50 27.460	ND	42	SURA9d	700
177	284	T-Wiang Sa	208.0640	9d	36.9897	099E20 33.650	08N37 42.720	ND	47	SURA9d	650
178	295	T-SNI031	208.0640	9d	36.9897	098E49 01.060	08N51 20.580	ND	50	SURA9d	750
179	296	PRD Surat	208.0640	9d	30.0000	099E59 18.676	09N29 23.676	ND	39	SURA9d	600
180	350	PRD Burrirum	188.9280	7a	43.9794	103E05 46.104	14N59 30.192	ND	97	SURI7a	750
181	351	PRD Surin	188.9280	7a	43.9794	103E27 25.200	14N53 39.012	ND	55	SURI7a	650
182	352	T-BRM011	188.9280	7a	36.9897	102E32 46.050	14N40 48.890	ND	50	SURI7a	550
183	353	T-BMR022	188.9280	7a	36.9897	102E45 23.940	14N20 06.790	ND	35	SURI7a	500
184	413	PRD Tak	209.9360	10a	43.9794	099E06 58.367	16N54 54.234	ND	65	TAK10a	650
185	414	PRD Tak Mae Sod	209.9360	10a	30.0000	098E33 58.712	16N43 56.845	ND	75	TAK10a	600
186	415	MCOT Tak	209.9360	10a	43.9794	098E55 30.983	16N46 44.882	ND	75	TAK10a	650

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
187	416	T-TAK017	209.9360	10a	36.9897	098E41 30.950	16N23 34.510	ND	35	TAK10a	600
188	417	T-Tha Song Yang	209.9360	10a	36.9897	098E13 30.760	17N13 38.680	ND	122	TAK10a	600
189	418	T-Khao Mae Klong	209.9360	10a	36.9897	098E51 11.200	16N03 38.510	ND	102	TAK10a	600
190	276	RTA Trang	174.9280	5a	46.9897	099E35 52.397	07N37 20.366	ND	100	TRAN5a	500
191	346	RTN Trat	181.9360	6a	46.9897	102E26 38.015	12N21 50.778	ND	85	TRAT6a	500
192	347	PRD Trat	181.9360	6a	36.9897	102E30 40.608	12N13 45.588	ND	70	TRAT6a	525
193	356	PRD Amnat	202.9280	9a	40.0000	104E37 07.918	15N53 55.331	ND	75	UBON9a	800
194	357	T-Khemarat	202.9280	9a	36.9897	105E12 53.860	16N02 19.680	ND	42	UBON9a	850
195	358	T-UBN035	202.9280	9a	36.9897	105E14 50.960	15N49 07.280	ND	50	UBON9a	850
196	359	T-Si Mueang Mai	202.9280	9a	36.9897	105E16 37.250	15N29 53.110	ND	62	UBON9a	800
197	360	NBTC Ubon	202.9280	9a	43.9794	104E50 59.154	15N16 20.204	ND	135	UBON9a	750
198	361	T-UBN007	202.9280	9a	36.9897	105E24 07.240	14N45 27.360	ND	50	UBON9a	800
199	362	T-UBN0227	202.9280	9a	36.9897	105E00 41.830	14N29 29.580	ND	50	UBON9a	800
200	363	T-Na Chaluai	202.9280	9a	36.9897	105E14 42.830	14N31 24.700	ND	38	UBON9a	800
201	380	PRD Nong Khai	216.9280	11a	40.0000	102E46 26.022	17N53 14.687	ND	97	UDON11a	900
202	381	RTN Nong Khai	216.9280	11a	40.0000	102E46 56.010	17N41 54.388	ND	95	UDON11a	900
203	382	MCOT Udonthani	216.9280	11a	46.9897	102E53 04.596	17N16 41.628	ND	89	UDON11a	875
204	383	T-UDN017	216.9280	11a	36.9897	103E00 37.060	17N06 46.630	ND	35	UDON11a	875
205	384	T-UUDN020	216.9280	11a	36.9897	103E15 21.600	17N42 12.280	ND	50	UDON11a	900
206	385	T-Sangkhom	216.9280	11a	36.9897	102E15 58.090	18N04 18.650	ND	22	UDON11a	900

#	Id	TX-Name	Freq. (MHz)	Ch.	ERP (dBW)	Longit.	Latit.	Patt	Ant.H. (m)	SFN Id	Time Del. (µs)
207	426	PRD Uttaradit	188.9280	7a	43.9794	100E06 32.926	17N36 30.838	ND	85	UTTA7a	700
208	427	T-UTT010	188.9280	7a	36.9897	100E20 52.400	17N42 21.600	ND	25	UTTA7a	700
209	428	T-UTT011	188.9280	7a	36.9897	101E04 25.860	18N01 40.370	ND	35	UTTA7a	850
210	429	T-UTT013	188.9280	7a	36.9897	100E52 56.060	18N00 14.620	ND	35	UTTA7a	850
211	430	T-Tha Plan	188.9280	7a	36.9897	100E22 23.200	17N47 21.120	ND	37	UTTA7a	700
212	431	T-Nam Pat	188.9280	7a	36.9897	100E41 14.830	17N43 41.510	ND	82	UTTA7a	700
213	261	PRD Pattani	181.9360	6a	40.0000	101E15 00.356	06N53 31.837	ND	75	YALA6a	550
214	262	T-Yaha	181.9360	6a	36.9897	101E07 46.000	06N28 34.770	ND	47	YALA6a	500
215	263	RTA Yala	181.9360	6a	36.9897	101E16 58.501	06N28 39.000	ND	65	YALA6a	550
216	264	T-Bannang Sata	181.9360	6a	36.9897	101E15 35.130	06N16 02.560	ND	112	YALA6a	550
217	265	T-Khao Ban	181.9360	6a	36.9897	101E10 52.730	05N58 41.100	ND	62	YALA6a	500
218	266	PRD Yala	181.9360	6a	40.0000	101E04 04.000	05N45 44.000	ND	80	YALA6a	600
219	267	PRD Narathivat	181.9360	6a	40.0000	101E48 09.500	06N24 37.800	ND	80	YALA6a	600
220	268	RTA Narathiwat	181.9360	6a	40.0000	101E53 32.748	06N08 35.930	ND	80	YALA6a	650

Appendix F – Population Detailed Estimation of the Local SFN Services

The following table calculates the achievable DAB+ Local coverage when all relevant broadcasting and telecom tower facilities are used.

Note: The blue shaded cells for Bangkok represent a calculation of the population in the 20 dB range only.

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
BANGKOK			**5a**								
BANGKOK	10	5 673 559		300	257 308	1 616 194	3 799 757	5 673 559	100.00%	3 799 757	66.97%
CHACHOENGSAO	24	685 721		115 000	221 698	84 618	44	421 360	61.45%	84 662	12.35%
CHON BURI	20	1 364 001		83 683	237 422	209 352	764 305	1 294 762	94.92%	973 657	71.38%
NAKHON NAYOK	26	255 174		2 170	46 328	70 127	121 648	240 273	94.16%	191 775	75.15%
NAKHON PATHOM	73	874 616		20 746	217 668	507 725	121 818	867 957	99.24%	629 543	71.98%
NONTHABURI	12	1 141 673		0	1 423	405 126	735 124	1 141 673	100.00%	1 140 250	99.88%
PATHUM THANI	13	1 033 837		2 977	309 948	720 056	228	1 033 209	99.94%	720 284	69.67%
PHRA NAKHON SI AYUTTHAYA	14	793 509		127 543	158 049	4	0	285 596	35.99%	4	0.00%
RATCHABURI	70	846 631		113 414	274 134	237 467	174 990	800 005	94.49%	412 457	48.72%
SAMUT PRAKAN	11	1 223 302		28	347 102	659 111	217 061	1 223 302	100.00%	876 172	71.62%

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
SAMUT SAKHON	74	508 812		1 626	279 393	223 730	4 063	508 812	100.00%	227 793	44.77%
SAMUT SONGKHRAM	75	194 042		0	0	16 417	177 625	194 042	100.00%	194 042	100.00%
TOTAL BANGKOK		**14 594 877**		**467 487**	**2 350 473**	**4 749 927**	**6 116 663**	**13 684 550**	**93.76%**	**9 250 396**	**63.38%**
BUENGKAN	**38**	**412613**	**5a**	**46385**	**65070**	**44984**	**47151**	**203 590**	**49.34%**	**92 135**	**22.33%**
CHAIYAPHUM	**36**	**1133034**	**11a**	**67949**	**151492**	**159991**	**246902**	**626 334**	**55.28%**	**406 893**	**35.91%**
CHIANG MAI			**9a**								
CHIANG MAI	50	1655642		37631	162226	305060	915051	1 419 968	85.77%	1 220 111	73.69%
LAMPHUN	51	404673		8733	24504	87172	265242	385 651	95.30%	352 414	87.09%
Total CHIANG MAI		**2 060 315**		**46 364**	**186 730**	**392 232**	**1 180 293**	**1 805 619**	**87.64%**	**1 572 525**	**76.32%**
CHIANG RAI	**57**	**1200423**	**6a**	**40125**	**160852**	**295963**	**556760**	**1 053 700**	**87.78%**	**852 723**	**71.04%**
CHUMPHON	**86**	**495310**	**5a**	**11365**	**53834**	**99535**	**283671**	**448 405**	**90.53%**	**383 206**	**77.37%**
KANCHANABURI	**71**	**838269**	**6a**	**62255**	**123883**	**198095**	**293119**	**677 352**	**80.80%**	**491 214**	**58.60%**

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
KHON KAEN			**6a**								
KALASIN	46	985084		72396	161790	198710	150019	582 915	59.17%	348 729	35.40%
KHON KAEN	40	1774816		158853	267770	254772	484249	1 165 644	65.68%	739 021	41.64%
MAHA SARAKHAM	44	945149		48748	124155	214375	226631	613 909	64.95%	441 006	46.66%
TOTAL KHON KAEN		**3 705 049**		**279 997**	**553 715**	**667 857**	**860 899**	**2 362 468**	**63.76%**	**1 528 756**	**41.26%**
LAMPANG	**52**	**756811**	**5a**	**14293**	**80544**	**156066**	**322011**	**572 914**	**75.70%**	**478 077**	**63.17%**
LOEI			**9a**								
LOEI	42	629787		22262	102454	194214	239398	558 328	88.65%	433 612	68.85%
NONG BUA LAM PHU	39	505071		66996	140454	51632	51704	310 786	61.53%	103 336	20.46%
TOTAL LOEI		**1 134 858**		**89 258**	**242 908**	**245 846**	**291 102**	**869 114**	**76.58%**	**536 948**	**47.31%**
MAE HONG SON	**58**	**244356**	**7a**	**14935**	**19615**	**29341**	**69512**	**133 403**	**54.59%**	**98 853**	**40.45%**
MUKDAHAN	**49**	**342868**	**10a**	**19875**	**40162**	**52398**	**86003**	**198 438**	**57.88%**	**138 401**	**40.37%**

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
NAKHON RATCHASIMA	**30**	**2601167**	**10a**	**141319**	**190133**	**205128**	**493651**	**1 030 231**	**39.61%**	**698 779**	**26.86%**
NAKHON SAWAN			**9a**								
NAKHON SAWAN	60	1073347		60015	159403	209972	302474	731 864	68.19%	512 446	47.74%
PHICHIT	66	549395		40895	103967	146415	181649	472 926	86.08%	328 064	59.71%
UTHAI THANI	61	327395		9144	57710	116542	121311	304 707	93.07%	237 853	72.65%
TOTAL NAKHON SAWAN		**1 950 137**		**110 054**	**321 080**	**472 929**	**605 434**	**1 509 497**	**77.40%**	**1 078 363**	**55.30%**
NAKHON SI THAMMARAT	**80**	**1534887**	**10b**	**2541**	**45745**	**373368**	**1108234**	**1 529 888**	**99.67%**	**1 481 602**	**96.53%**
NAN	**55**	**477673**	**10a**	**15750**	**78737**	**63061**	**211249**	**368 797**	**77.21%**	**274 310**	**57.43%**
PHETCHABUN	**67**	**993702**	**5a**	**30927**	**78258**	**191311**	**288855**	**589 351**	**59.31%**	**480 166**	**48.32%**
PHRAE	**54**	**457607**	**11a**	**6930**	**26978**	**76757**	**322605**	**433 270**	**94.68%**	**399 362**	**87.27%**
PHUKET			**6a**								

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
KRABI	81	444967		35391	92488	93311	125726	346 916	77.96%	219 037	49.23%
PHANGNGA	82	257261		12877	28324	52312	128264	221 777	86.21%	180 576	70.19%
PHUKET	83	360905		7643	20660	43655	281549	353 507	97.95%	325 204	90.11%
TOTAL PHUKET		**1 063 133**		**55 911**	**141 472**	**189 278**	**535 539**	**922 200**	**86.74%**	**724 817**	**68.18%**
PRACHUAP KHIRI KHAN			**10a**								
PHETCHABURI	76	468874		3700	20950	103162	322644	450 456	96.07%	425 806	90.81%
PRACHUAP KHIRI KHAN	77	517050		11273	42477	111282	308216	473 248	91.53%	419 498	81.13%
TOTAL PRACHUAP KHIRI KHAN		**985 924**		**14 973**	**63 427**	**214 444**	**630 860**	**923 704**	**93.69%**	**845 304**	**85.74%**
RANONG	**85**	**182648**	**11a**	**1922**	**10974**	**24494**	**104186**	**141 576**	**77.51%**	**128 680**	**70.45%**
RAYONG			**11a**								
CHANTHABURI	22	521812		17066	40917	102213	185761	345 957	66.30%	287 974	55.19%
RAYONG	21	649275		32296	97100	159650	230740	519 786	80.06%	390 390	60.13%
TOTAL RAYONG		**1 171 087**		**49 362**	**138 017**	**261 863**	**416 501**	**865 743**	**73.93%**	**678 364**	**57.93%**

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
ROI ET			**5a**								
ROI ET	45	1308570		122498	295189	216521	293626	927 834	70.90%	510 147	38.99%
YASOTHON	35	540267		52123	99288	78529	99093	329 033	60.90%	177 622	32.88%
TOTAL ROI ET		**1 848 837**		**174 621**	**394 477**	**295 050**	**392 719**	**1 256 867**	**67.98%**	**687 769**	**37.20%**
SA KAEO			**9a**								
PRACHIN BURI	25	473770		85135	131686	100551	106314	423 686	89.43%	206 865	43.66%
SA KAEO	27	548342		59904	79747	85790	104727	330 168	60.21%	190 517	34.74%
TOTAL SA KAEO		**1 022 112**		**145 039**	**211 433**	**186 341**	**211 041**	**753 854**	**73.75%**	**397 382**	**38.88%**
SAKON NAKHON			**7a**								
NAKHON PHANOM	48	708350		91875	169160	100605	87550	449 190	63.41%	188 155	26.56%
SAKON NAKHON	47	1129174		64848	117533	194067	231557	608 005	53.85%	425 624	37.69%
TOTAL SAKON NAKHON		**1 837 524**		**156 723**	**286 693**	**294 672**	**319 107**	**1 057 195**	**57.53%**	**613 779**	**33.40%**
SATUN	**91**	**305879**	**6a**	**22813**	**36148**	**53054**	**103087**	**215 102**	**70.32%**	**156 141**	**51.05%**

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
SINGBURI			**7a**								
ANG THONG	15	283882		115773	96458	7658	0	219 889	77.46%	7 658	2.70%
CHAI NAT	18	333172		18841	72844	116220	64391	272 296	81.73%	180 611	54.21%
PHRA NAKHON SI AYUTTHAYA	14	793509		46602	30258	8629	0	85 489	10.77%	8 629	1.09%
SARABURI	19	625689		15912	78556	28142	5125	127 735	20.42%	33 267	5.32%
SING BURI	17	213216		147	25068	98922	89079	213 216	100.00%	188 001	88.17%
SUPHAN BURI	72	847308		53345	70583	94669	17222	235 819	27.83%	111 891	13.21%
TOTAL SINGBURI		**3 096 776**		**250 620**	**373 767**	**354 240**	**175 817**	**1 154 444**	**37.28%**	**530 057**	**17.12%**
SI SA KET	**33**	**1458370**	**11a**	**187969**	**310372**	**220716**	**198771**	**917 828**	**62.94%**	**419 487**	**28.76%**
SONGKHLA			**9a**								
PHATTHALUNG	93	514492		27300	96254	199614	147437	470 605	91.47%	347 051	67.46%
SONGKHLA	90	1378574		32824	168231	236922	797328	1 235 305	89.61%	1 034 250	75.02%
TOTAL SONGKHLA		**1 893 066**		**60 124**	**264 485**	**436 536**	**944 765**	**1 705 910**	**90.11%**	**1 381 301**	**72.97%**

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
SUKHOTHAI			**6a**								
KAMPHAENG PHET	62	727555		75022	146890	156027	140252	518 191	71.22%	296 279	40.72%
PHITSANULOK	65	854372		17093	115778	283040	359519	775 430	90.76%	642 559	75.21%
SUKHOTHAI	64	602601		29869	96171	111740	94425	332 205	55.13%	206 165	34.21%
TOTAL SUKHOTHAI		**2 184 528**		**121 984**	**358 839**	**550 807**	**594 196**	**1 625 826**	**74.42%**	**1 145 003**	**52.41%**
SURAT THANI	**84**	**1021152**	**9c**	**52789**	**189723**	**157127**	**316328**	**715 967**	**70.11%**	**473 455**	**46.36%**
SURIN			**7a**								
BURI RAM	31	1566740		134314	256584	243842	236930	871 670	55.64%	480 772	30.69%
SURIN	32	1386277		78175	114702	72416	129875	395 168	28.51%	202 291	14.59%
TOTAL SURIN		**2 953 017**		**212 489**	**371 286**	**316 258**	**366 805**	**1 266 838**	**42.90%**	**683 063**	**23.13%**
TAK	**63**	**526045**	**10a**	**15351**	**77098**	**144972**	**197449**	**434 870**	**82.67%**	**342 421**	**65.09%**
TRANG	**92**	**631920**	**5a**	**41817**	**103118**	**161222**	**225756**	**531 913**	**84.17%**	**386 978**	**61.24%**
TRAT	**23**	**222855**	**6a**	**16678**	**39053**	**40613**	**91968**	**188 312**	**84.50%**	**132 581**	**59.49%**

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
UBON RATCHATHANI			**9a**								
AMNAT CHAROEN	37	373494		46351	96198	81565	61925	286 039	76.58%	143 490	38.42%
UBON RATCHATHANI	34	1826920		183603	388486	309670	463434	1 345 193	73.63%	773 104	42.32%
TOTAL UBON RATCHATHANI		**2 200 414**		**229 954**	**484 684**	**391 235**	**525 359**	**1 631 232**	**74.13%**	**916 594**	**41.66%**
UDON THANI			**11a**								
NONG KHAI	43	512439		26705	84611	65431	143874	320 621	62.57%	209 305	40.84%
UDON THANI	41	1557298		123761	335715	453878	296776	1 210 130	77.71%	750 654	48.20%
TOTAL UBON RATCHATHANI		**2 069 737**		**150 466**	**420 326**	**519 309**	**440 650**	**1 530 751**	**73.96%**	**959 959**	**46.38%**
UTTARADIT	**53**	**461294**	**7a**	**24470**	**45699**	**91136**	**202736**	**364 041**	**78.92%**	**293 872**	**63.71%**
YALA			**6a**								
NARATHIWAT	96	757397		37443	181088	294697	137730	650 958	85.95%	432 427	57.09%
PATTANI	94	671615		13153	95552	306451	237375	652 531	97.16%	543 826	80.97%
YALA	95	500814		10010	23606	60945	392390	486 951	97.23%	453 335	90.52%

Province Name	Dist	Total Population	CH	0dB - 3 dB	3 dB - 10 dB	10 dB – 20 dB	20 dB +	Total Pop Covered (0 dB+)	% of Total Pop	Total Coverage Objectives (10 dB+)	% of Total Pop for Coverage Objectives
TOTAL YALA		1 929 826		60 606	300 246	662 093	767 495	1 790 440	92.78%	1 429 588	74.08%

Appendix G – Thailand VHF Analogue Television Database as provided by NBTC

No	English Name	*Antenna Site Name (Thai)	Lat	Long	*Assign Frequency (MHz)	Service	*Horizontal e.r.p (dBW)	*Antenna AGL (m)	ERP (kW)	**TV_plan_BE 2539.pdf
1	Bangkok TV5	กรุงเทพมหานคร ททบ.5	13.790514	100.525346	177.5	Analog TV (VHF)	no information	215	400.00	1.00
2	Bangkok Ch7	กรุงเทพมหานคร ททบ.7	13.790541	100.525346	191.5	Analog TV (VHF)	55.76	215	376.70	
3	Bangkok MCOT (Baiyok)	กรุงเทพมหานคร อสมท. (ไบหยก)	13.75416667	100.5403611	205.5	Analog TV (VHF)	no information	324	400.00	1.00
4	Bangkok MCOT (Nong Kha9em)	กรุงเทพมหานคร อสมท. (หนองแขม)	13.711689	100.3604	205.5	Analog TV (VHF)	no information	244	400.00	1.00
5	Bangkok PRD	กรุงเทพมหานคร กปส.	13.75416667	100.5403611	219.5	Analog TV (VHF)	48.96	324	78.70	
6	Bangkok PRD (Phetburi Rd.)	กรุงเทพมหานคร กปส. (ถนนเพชรบุรีตัดใหม่)	13.74953	100.571897	219.5	Analog TV (VHF)	no information	180	468.00	1.00
7	Kanchana Buri PRD	กาญจนบุรี กปส. เขาเสาหงษ์(ทศท)	14.75114444	98.6706778	219.5	Analog TV (VHF)	no information	80	0.50	3.10
8	Kanchana Buri PRD	กาญจนบุรี กปส. (สังขละบุรี)	15.13965833	98.4452222	226.5	Analog TV (VHF)	no information	100	0.20	3.30
9	Surin MCOT3	สุรินทร์ อสมท.3	14.807352	103.459560	191.5	Analog TV (VHF)	51.72	100	148.59	
10	Surin MCOT9	สุรินทร์ อสมท.9	14.807352	103.459560	205.5	Analog TV (VHF)	no information	100	100.00	11.00
11	Surin PRD	สุรินทร์ กปส.	14.894170	103.457000	219.5	Analog TV (VHF)	no information	100	100.00	11.00

No	English Name	*Antenna Site Name (Thai)	Lat	Long	*Assign Frequency (MHz)	Service	*Horizontal e.r.p (dBW)	*Antenna AGL (m)	ERP (kW)	**TV_plan_BE 2539.pdf
12	Ubon Ratchathani MCOT3	อุบลราชธานี อสมท.3	15.305669	104.893792	184.5	Analog TV (VHF)	52.88	120	194.09	
13	Ubon Ratchathani MCOT9	อุบลราชธานี อสมท.9	15.305669	104.893792	198.5	Analog TV (VHF)	no information	100	100.00	12.00
14	Ubon Ratchathani TV5	อุบลราชธานี ททบ.5	15.339109	104.909545	212.5	Analog TV (VHF)	no information	110	100.00	12.00
15	Ubon Ratchathani Ch7	อุบลราชธานี ททบ.7สี	15.339109	104.909545	226.5	Analog TV (VHF)	52.7	120	186.21	
16	Mukdahan MCOT9	มุกดาหาร อสมท.9	16.468177	104.629577	198.5	Analog TV (VHF)	no information	100	6.00	13.00
17	Mukdahan Ch5	มุกดาหาร ททบ.5	16.543764	104.684082	212.5	Analog TV (VHF)	no information	90	6.00	13.00
18	Nan Ch5	น่าน ททบ.5	18.73739444	100.7396083	177.5	Analog TV (VHF)	no information	95	100.00	24.00
19	Nan MCOT3	น่าน อสมท.3	18.74342222	100.7416944	191.5	Analog TV (VHF)	no information	60	100.00	24.00
20	Nan MCOT9	น่าน อสมท.9	18.74342222	100.7416944	205.5	Analog TV (VHF)	no information	60	100.00	24.00
21	Nan PRD	น่าน กปส.	18.74261944	100.7411722	219.5	Analog TV (VHF)	no information	60	100.00	24.00
22	Phrae MCOT3	แพร่ อสมท.3	17.93311667	100.0008139	184.5	Analog TV (VHF)	46.87	60	48.64	
23	Phrae PRD	แพร่ กปส.	17.93265278	100.0010306	198.5	Analog TV (VHF)	no information	60	20.00	25.00
24	Phrae MCOT9	แพร่ อสมท.9	17.93311667	100.0008139	212.5	Analog TV (VHF)	no information	60	20.00	25.00
25	Lampang MCOT3	ลำปาง อสมท.3	18.23498056	99.56059444	184.5	Analog TV (VHF)	51.3	70	134.90	
26	Lampang PRD	ลำปาง กปส.	18.24316667	99.56283889	198.5	Analog TV (VHF)	no information	100	100.00	21.00
27	Lampang MCOT9	ลำปาง อสมท.9	18.23498056	99.56059444	212.5	Analog TV (VHF)	no information	70	100.00	21.00

No	English Name	*Antenna Site Name (Thai)	Lat	Long	*Assign Frequency (MHz)	Service	*Horizontal e.r.p (dBW)	*Antenna AGL (m)	ERP (kW)	**TV_plan_BE 2539.pdf
28	Lampang Ch7	ลำปาง ททบ.7 สี	18.43200278	99.71356944	226.5	Analog TV (VHF)	51.7	100	147.91	
29	Chiang Rai Ch7	เชียงราย ททบ.7 สี	20.10519167	99.88648056	184.5	Analog TV (VHF)	52.9	100	194.98	
30	Chiang Rai MCOT3	เชียงราย อสมท.3	19.81567222	99.86772778	198.5	Analog TV (VHF)	51.1	92	128.82	
31	Chiang Rai PRD	เชียงราย กปส	19.81358333	99.86701389	212.5	Analog TV (VHF)	no information	60	100.00	22.00
32	Chiang Rai Ch5	เชียงราย ททบ.5	20.10508056	99.88707778	226.5	Analog TV (VHF)	no information	90	100.00	22.00
33	Song Khla Ch7	สงขลา ททบ.7สี	7.040002	100.519011	184.5	Analog TV (VHF)	53.9	88	245.47	
34	Song Khla Ch 5	สงขลา ททบ. 5	7.037696	100.51864	198.5	Analog TV (VHF)	no information	100	100.00	38.00
35	Song Khla PRD	สงขลา กปส.	7.015807	100.520298	212.5	Analog TV (VHF)	no information	55	100.00	38.00
36	Trang MCOT3	ตรัง อสมท.3	7.66488	99.585039	184.5	Analog TV (VHF)	44.01	49	25.18	
37	Trang Ch5	ตรัง ททบ.5	7.644978	99.579416	198.5	Analog TV (VHF)	no information	93	100.00	37.00
38	Trang MCOT9	ตรัง อสมท.9	7.66448	99.585039	212.5	Analog TV (VHF)	no information	87	100.00	37.00
39	Trang กปส	ตรัง กปส	7.663519	99.583935	226.5	Analog TV (VHF)	no information	98	100.00	37.00
40	Satun Ch5	สตูล ททบ.5	6.6526	100.087123	191.5	Analog TV (VHF)	no information	60	1.00	39.00
41	Satun MCOT9	สตูล อสมท.9	6.635305556	100.02525	205.5	Analog TV (VHF)	no information	94	20.00	39.00
42	Yala MCOT9	ยะลา อสมท.9	6.336511	101.387812	177.5	Analog TV (VHF)	no information	55	100.00	40.00
43	Yala Ch7	ยะลา ททบ.7 สี	6.339167	101.389361	191.5	Analog TV (VHF)	52.1	90	162.18	

No	English Name	*Antenna Site Name (Thai)	Lat	Long	*Assign Frequency (MHz)	Service	*Horizontal e.r.p (dBW)	*Antenna AGL (m)	ERP (kW)	**TV_plan_BE 2539.pdf
44	Yala MCOT3	ยะลา อสมท.3	6.336511	101.387812	205.5	Analog TV (VHF)	51.7	55	147.91	
45	Yala PRD	ยะลา กปส.	6.335666	101.387833	219.5	Analog TV (VHF)	no information	45	100.00	40.00
46	Rayong MCOT3	ระยอง อสมท.3	12.673701	101.412145	184.5	Analog TV (VHF)	51.39	96	137.72	
47	Rayong Ch7	ระยอง ททบ.7	12.651441	101.417753	198.5	Analog TV (VHF)	53.9	80	245.47	
48	Rayong MCOT9	ระยอง อสมท.9	12.673701	101.412145	212.5	Analog TV (VHF)	no information	96	100.00	5.00
49	Rayong PRD	ระยอง กปส	12.676003	101.412956	226.5	Analog TV (VHF)	no information	55	100.00	5.00
50	Sakaeo MCOT3	สระแก้ว อสมท.3	13.853385	102.032662	184.5	Analog TV (VHF)	51.39	130	137.72	
51	Sakaeo Ch5	สระแก้ว ททบ.5	13.800443	102.124948	198.5	Analog TV (VHF)	no information	90	100.00	6.00
52	Sakaeo MCOT9	สระแก้ว อสมท.9	13.853385	102.032662	212.5	Analog TV (VHF)	no information	130	100.00	6.00
53	Sakaeo PRD	สระแก้ว กปส.	13.786796	102.089988	226.5	Analog TV (VHF)	no information	90	100.00	6.00
54	Trat Ch 7	ตราด ททบ. 7สี	12.196005	102.298914	177.5	Analog TV (VHF)	55	85	316.23	
55	Trat MCOT3	ตราด อสมท.3	12.37058	102.445574	191.5	Analog TV (VHF)	53.55	90	226.46	
56	Trat MCOT9	ตราด อสมท.9	12.37058	102.445574	205.5	Analog TV (VHF)	no information	90	100.00	7.00
57	Trat PRD	ตราด กปส.	12.19547	102.29834	219.5	Analog TV (VHF)	no information	55	100.00	7.00
58	Loie MCOT9 (Phu Pha sat)	เลย อสมท.9 (ภูผาสาด)	17.469806	101.444556	184.5	Analog TV (VHF)	no information	40	50.00	16.00
59	Loie Ch7 (Phu Pha sat)	เลย ททบ.7 สี (ภูผาสาด)	17.281028	101.522722	198.5	Analog TV (VHF)	53.9	98	245.47	

No	English Name	*Antenna Site Name (Thai)	Lat	Long	*Assign Frequency (MHz)	Service	*Horizontal e.r.p (dBW)	*Antenna AGL (m)	ERP (kW)	**TV_plan_BE 2539.pdf
60	Loie PRD (Phu Pha sat)	เลย กปส. (ภูผาสาด)	17.470667	101.444528	212.5	Analog TV (VHF)	no information	50	50.00	16.00
61	Loie MCOT3 (Phu Pha sat)	เลย อสมท.3 (ภูผาสาด)	17.469806	101.444556	226.5	Analog TV (VHF)	46.45	40	44.16	
62	Khon Kaen Ch7	ขอนแก่น ททบ.7 สี	16.836750	102.913778	177.5	Analog TV (VHF)	52.3	90	169.82	
63	Khon Kaen MCOT3	ขอนแก่น อสมท.3	16.453378	102.950160	191.5	Analog TV (VHF)	52.88	136	194.09	
64	Khon Kaen MCOT9	ขอนแก่น อสมท.9	16.453378	102.950160	205.5	Analog TV (VHF)	no information	136	100.00	15.00
65	Khon Kaen Ch5	ขอนแก่น ททบ.5	16.836639	102.912500	219.5	Analog TV (VHF)	no information	90	100.00	15.00
66	Nong Bua Lamphu MCOT3	หนองบัวลำภู อสมท.3	17.230389	102.483556	226.5	Analog TV (VHF)	51.1	74	128.82	
67	Nakhon Ratchasima PRD	นครราชสีมา กปส.	14.78958333	101.5523611	184.5	Analog TV (VHF)	no information	73	100.00	9.00
68	Nakhon Ratchasima Ch5	นครราชสีมา ททบ.5	14.78613889	101.5470278	198.5	Analog TV (VHF)	no information	90	100.00	9.00
69	Nakhon Ratchasima MCOT9	นครราชสีมา อสมท.9	14.78958333	101.5523611	212.5	Analog TV (VHF)	no information	73	100.00	9.00
70	Nakhon Ratchasima Ch7	นครราชสีมา ททบ.7 สี	14.790308	101.551275	226.5	Analog TV (VHF)	52.9	85	194.98	
71	Burirum Ch5	บุรีรัมย์ ททบ.5	14.93436111	103.0982222	177.5	Analog TV (VHF)	no information	86	100.00	11.00
72	Sakhon Nakhon Ch5	สกลนคร ททบ.5	17.142387	103.985908	177.5	Analog TV (VHF)	no information	90	100.00	18.00
73	Sakhon Nakhon MCOT3	สกลนคร อสมท.3	17.137666	103.989097	191.5	Analog TV (VHF)	53.4	67	218.78	
74	Sakhon Nakhon MCOT9	สกลนคร อสมท.9	17.137666	103.989097	205.5	Analog TV (VHF)	no information	67	100.00	18.00
75	Sakhon Nakhon Ch7	สกลนคร ททบ.7สี	17.137956	103.987725	219.5	Analog TV (VHF)	52.85	82	192.75	

No	English Name	*Antenna Site Name (Thai)	Lat	Long	*Assign Frequency (MHz)	Service	*Horizontal e.r.p (dBW)	*Antenna AGL (m)	ERP (kW)	**TV_plan_BE 2539.pdf
76	Udonthani PRD	อุดรธานี กปส.	17.653836	102.790077	212.5	Analog TV (VHF)	no information	83	100.00	17.00
77	Nong Khai Ch5	หนองคาย ททบ.5	17.908634	102.792635	184.5	Analog TV (VHF)	no information	100	100.00	17.00
78	Mae Hong Son MCOT3	แม่ฮ่องสอน อสมท.3	19.106032	98.035706	184.5	Analog TV (VHF)	41.61	45	14.49	
79	Mae Hong Son Ch7	แม่ฮ่องสอน ททบ.7 สี	19.298041	97.958001	198.5	Analog TV (VHF)	40.44	36	11.07	
80	Mae Hong Son MCOT9	แม่ฮ่องสอน อสมท.9	19.106032	98.035706	212.5	Analog TV (VHF)	no information	45	100.00	20.00
81	Mae Hong Son PRD	แม่ฮ่องสอน กปส.	19.106345	98.034847	226.5	Analog TV (VHF)	no information	50	100.00	20.00
82	Mae Hong Son Ch7 (Doi Chang)	แม่ฮ่องสอน ททบ.7 สี (ดอยช้าง)	18.169813	97.945361	198.5	Analog TV (VHF)	34.34	45	2.72	
83	Mae Hong Son Ch7 (Pai)	แม่ฮ่องสอน ททบ.7 สี (ปาย)	19.38833333	98.42102778	198.5	Analog TV (VHF)	37.24	37	5.30	
84	Chiang Mai Ch5	เชียงใหม่ ททบ.5	18.85397222	98.95952778	177.5	Analog TV (VHF)	no information	110	100.00	19.00
85	Chiang Mai Ch7	เชียงใหม่ ททบ.7 สี	18.79788889	98.94266667	191.5	Analog TV (VHF)	54.7	100	295.12	
86	Chiang Mai MCOT9	เชียงใหม่ อสมท.9	18.80905556	98.91247222	205.5	Analog TV (VHF)	no information	60	100.00	19.00
87	Chiang Mai PRD	เชียงใหม่ กปส	18.80797222	98.91541667	219.5	Analog TV (VHF)	no information	70	100.00	19.00
88	Mae Hong Son (Mae Sariang) MCOT9	แม่ฮ่องสอนน (แม่สะเรียง) อสมท.9	18.169743	97.945381	212.5	Analog TV (VHF)	no information	76	0.50	20.10
89	Mae Hong Son (Mae Sariang) PRD	แม่ฮ่องสอนน (แม่สะเรียง) กปส.	18.16858333	97.94452778	226.5	Analog TV (VHF)	no information	40	0.50	20.10
90	Sukhothai Ch7	สุโขทัย ททบ.7 สี	16.78022222	99.70780556	177.5	Analog TV (VHF)	53	106	199.53	
91	Phitsanulok PRD	พิษณุโลก กปส.	16.839777	100.403105	191.5	Analog TV (VHF)	no information	114	100.00	26.00

No	English Name	*Antenna Site Name (Thai)	Lat	Long	*Assign Frequency (MHz)	Service	*Horizontal e.r.p (dBW)	*Antenna AGL (m)	ERP (kW)	**TV_plan_BE 2539.pdf
92	Sukhothai MCOT9	สุโขทัย อสมท.9	16.963368	99.967094	205.5	Analog TV (VHF)	no information	140	100.00	26.00
93	Phitsanulok Ch5	พิษณุโลก ททบ.5	16.8415	100.402	219.5	Analog TV (VHF)	no information	112	100.00	26.00
94	Tak MCOT3	ตาก อสมท.3	16.78022222	98.92622222	184.5	Analog TV (VHF)	48.01	87	63.24	
95	Tak PRD	ตาก กปส.	16.77883333	98.92766667	198.5	Analog TV (VHF)	no information	95	50.00	26.40
96	Tak MCOT9	ตาก อสมท.9	16.78022222	98.92622222	212.5	Analog TV (VHF)	no information	87	50.00	26.40
97	Tak Ch7	ตาก ททบ.7 สี	16.77922222	98.92697222	226.5	Analog TV (VHF)	51	94	125.89	
98	Nakhon Sawan MCOT3	นครสวรรค์ อสมท.3	15.715916	100.133575	184.5	Analog TV (VHF)	52.6	70	181.97	
99	Nakhon Sawan Ch5	นครสวรรค์ ททบ.5	15.714719	100.13228	198.5	Analog TV (VHF)	no information	73	100.00	28.00
100	Nakhon Sawan PRD	นครสวรรค์ กปส.	15.71597222	100.1335278	212.5	Analog TV (VHF)	no information	95	100.00	28.00
101	Nakhon Sawan Ch7	นครสวรรค์ ททบ.7 สี	15.71479	100.133085	226.5	Analog TV (VHF)	no information	58	100.00	28.00
102	Phetchabun MCOT9	เพชรบูรณ์ อสมท.9	16.253299	101.134471	177.5	Analog TV (VHF)	no information	90	50.00	29.00
103	Phetchabun PRD	เพชรบูรณ์ กปส.	16.42681	101.153704	191.5	Analog TV (VHF)	no information	114	50.00	29.00
104	Phetchabun MCOT3	เพชรบูรณ์ อสมท.3	16.25330556	101.1344722	219.5	Analog TV (VHF)	47.61	90	57.68	
105	Phang Nga MCOT3	พังงา อสมท.3	8.839513	98.351455	184.5	Analog TV (VHF)	40.74	55	11.86	
106	Phang Nga MCOT9	พังงา อสมท.9	8.839513	98.351455	212.5	Analog TV (VHF)	no information	55	6.67	33.00
107	Phang Nga PRD	พังงา กปส.	8.839513	98.351455	226.5	Analog TV (VHF)	no information	55	10.00	33.00

No	English Name	*Antenna Site Name (Thai)	Lat	Long	*Assign Frequency (MHz)	Service	*Horizontal e.r.p (dBW)	*Antenna AGL (m)	ERP (kW)	**TV_plan_BE 2539.pdf
108	Phuket PRD	ภูเก็ต กปส.	7.898699	98.395233	177.5	Analog TV (VHF)	no information	55	100.00	34.00
109	Phuket Ch7	ภูเก็ต ททบ.7 สี	7.897646	98.395203	191.5	Analog TV (VHF)	54.2	80	263.03	
110	Phuket MCOT9	ภูเก็ต อสมท.9	7.898639	98.39563	205.5	Analog TV (VHF)	no information	75	100.00	34.00
111	Phuket MCOT3	ภูเก็ต อสมท.3	7.898639	98.39563	219.5	Analog TV (VHF)	53.85	75	242.66	
112	Surat Thani MCOT3	สุราษฎร์ธานี อสมท.3	9.092881	99.348907	184.5	Analog TV (VHF)	51.7	73	147.91	
113	Surat Thani Ch7	สุราษฎร์ธานี ททบ.7 สี	9.095638889	99.34990556	198.5	Analog TV (VHF)	52.1	82	162.18	
114	Surat Thani MCOT9	สุราษฎร์ธานี อสมท.9	9.092881	99.348907	212.5	Analog TV (VHF)	no information	73	100.00	32.00
115	Surat Thani PRD	สุราษฎร์ธานี กปส.	9.092255556	99.34856389	226.5	Analog TV (VHF)	no information	74	100.00	32.00
116	Nakhon Sri Thamarat PRD	นครศรีธรรมราช กปส	8.366633333	99.97735556	177.5	Analog TV (VHF)	no information	113	100.00	36.00
117	Nakhon Sri Thamarat Ch7	นครศรีธรรมราช ททบ.7 สี	8.238216667	99.80552778	191.5	Analog TV (VHF)	53	50	199.53	
118	Nakhon Sri Thamarat MCOT9	นครศรีธรรมราช อสมท.9	8.236697222	99.80393333	205.5	Analog TV (VHF)	no information	54	100.00	36.00
119	Nakhon Sri Thamarat MCOT3	นครศรีธรรมราช อสมท.3	8.236697222	99.80393333	219.5	Analog TV (VHF)	no information	54	100.00	36.00
120	Ranong PRD	ระนอง กปส.	10.02391	98.668675	177.5	Analog TV (VHF)	no information	126	20.00	31.00
121	Ranong Ch7	ระนอง ททบ.7 สี	10.033316	98.671602	191.5	Analog TV (VHF)	42.11	62	16.26	
122	Ranong MCOT9	ระนอง อสมท.9	10.031944	98.671167	205.5	Analog TV (VHF)	no information	63	20.00	31.00
123	Ranong MCOT3	ระนอง อสมท.3	10.031944	98.671167	219.5	Analog TV (VHF)	40.27	51	10.64	

No	English Name	*Antenna Site Name (Thai)	Lat	Long	*Assign Frequency (MHz)	Service	*Horizontal e.r.p (dBW)	*Antenna AGL (m)	ERP (kW)	**TV_plan_BE 2539.pdf
124	Prachuap Khiri Khan MCOT3	ประจวบคีรีขันธ์ อสมท.3	11.905942	99.801317	184.5	Analog TV (VHF)	52.29	60	169.43	
125	Prachuap Khiri Khan Ch7	ประจวบคีรีขันธ์ ททบ.7 สี	11.4185	99.588398	198.5	Analog TV (VHF)	55.13	100	325.84	
126	Prachuap Khiri Khan MCOT9	ประจวบคีรีขันธ์ อสมท.9	11.905942	99.801317	212.5	Analog TV (VHF)	no information	60	100.00	8.00
127	Prachuap Khiri Khan PRD	ประจวบคีรีขันธ์ กปส.	11 50 7.20	99 48 03	226.5	Analog TV (VHF)	no information	150	100.00	8.00
128	Chumphon PRD	ชุมพร กปส.	10.525866	99.192413	177.5	Analog TV (VHF)	no information	110	100.00	30.00
129	Chumphon Ch5	ชุมพร ททบ.5	10.445803	99.134538	191.5	Analog TV (VHF)	no information	90	100.00	30.00
130	Chumphon MCOT9	ชุมพร อสมท.9	10.44615	99.134647	205.5	Analog TV (VHF)	no information	140	100.00	30.00
131	Chumphon MCOT3	ชุมพร อสมท.3	10.445978	99.134143	219.5	Analog TV (VHF)	no information	140	100.00	30.00

Appendix H – Thailand FM Radio Transmitters Database as provided by NBTC

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
1	PRD	Phetchaburi	95.75 MHz.	13.104389	99.929016	75
2	Royal Thai Army	Bangkok	100.00 MHz.	13.790185	100.526688	120
3	MCOT	Bangkok	100.50 MHz.	13.780812	100.635667	126
4	Supreme Command Headquater	Bangkok	101.00 MHz.	13.774232	100.551305	40
5	Ministry of University Affairs	Bangkok	101.50 MHz.	13.74205	100.526446	150
6	Royal Thai Army	Bangkok	102.00 MHz.	13.79568	100.516579	100
7	Royal Thai Air Force	Bangkok	102.50 MHz.	13.753113	100.546757	90
8	Royal Thai Army	Bangkok	103.00 MHz.	13.790185	100.526688	120
9	Royal Thai Army	Bangkok	103.50 MHz.	13.788452	100.562361	120
10	Royal Thai Army	Bangkok	104.50 MHz.	13.798151	100.521837	100
11	PRD	Bangkok	105.00 MHz.	13.781956	100.560232	150
12	MCOT	Bangkok	105.50 MHz.	13.7119	100.360419	110
13	Royal Thai Navy	Bangkok	106.00 MHz.	13.747051	100.48047	110
14	NBTC	Bangkok	106.50 MHz.	13.783604	100.55139	110
15	MCOT	Bangkok	107.00 MHz.	13.780769	100.635611	110

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
16	Parliament	Bangkok	87.50 MHz.	13.782814	100.539402	110
17	PRD	Bangkok	88.00 MHz.	13.781956	100.560232	150
18	Royal Thai Navy	Bangkok	88.50 MHz.	13.747051	100.48047	110
19	Royal Thai Army	Bangkok	89.00 MHz.	13.790226	100.526633	120
20	Ministry of Education	Bangkok	89.50 MHz.	13.756971	100.564735	120
21	Royal Thai Army	Bangkok	90.00 MHz.	13.768141	100.508707	120
22	Office of the Permanent Secretary of Defence	Bangkok	90.50 MHz.	13.689333	100.601032	124
23	Royal Thai Police	Bangkok	91.00 MHz.	13.838171	100.57243	50
24	Royal Thai Army	Bangkok	91.50 MHz.	13.790226	100.526633	120
25	Ministry of Education	Bangkok	92.00 MHz.	13.758782	100.531103	120
26	PRD	Bangkok	92.50 MHz.	13.781956	100.560232	150
27	Royal Thai Navy	Bangkok	93.00 MHz.	13.747051	100.48047	110
28	PRD	Bangkok	93.50 MHz.	13.781956	100.560232	150
29	Royal Thai Army	Bangkok	94.00 MHz.	13.78839	100.562376	125
30	Royal Thai Army	Bangkok	94.50 MHz.	13.790102	100.526595	120
31	MCOT	Bangkok	95.00 MHz.	13.780812	100.635667	126
32	PRD	Bangkok	95.50 MHz.	13.781956	100.560232	150

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
33	Royal Thai Army	Bangkok	96.00 MHz.	13.745797	100.494883	105
34	MCOT	Bangkok	96.50 MHz.	13.780812	100.635667	126
35	PRD	Bangkok	97.00 MHz.	13.781956	100.560232	150
36	MCOT	Bangkok	97.50 MHz.	13.780812	100.635667	126
37	Bureau of the Royal Household	Bangkok	104.00 MHz.	13.7337	100.53337	75
38	Royal Thai Army	Bangkok	98.00 MHz.	13.768353	100.508923	120
39	NBTC	Bangkok	98.50 MHz.	13.783604	100.55139	110
40	MCOT	Bangkok	99.00 MHz.	13.780812	100.635667	126
41	Supreme Command Headquater	Bangkok	99.50 MHz.	13.768144	100.508721	120
42	Parliament	Kanchana Buri	106.25 MHz.	14.063353	99.486922	100
43	MCOT	Kanchana Buri	107.25 MHz.	13.90504	99.794374	120
44	Royal Thai Army	Kanchana Buri	92.75 MHz.	14.043193	99.585165	120
45	PRD	Kanchana Buri	94.25 MHz.	15.139853	98.444931	100
46	Royal Thai Police	Kanchana Buri	97.75 MHz.	14.068203	99.412706	120
47	PRD	Chainat	91.75 MHz.	15.206798	100.140434	80
48	Parliament	Chainat	96.25 MHz.	15.206798	100.140434	80
49	Royal Thai Army	Nakhon Nayok	89.75 MHz.	14.279112	101.163657	116

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
50	Royal Thai Army	Prachinburi	88.25 MHz.	14.134948	101.373994	81
51	Royal Thai Army	Ratchaburi	99.25 MHz.	13.47313	99.787829	115
52	Royal Thai Army	Lop buri	98.75 MHz.	14.800597	100.642676	100
53	Marine Department	Samut Songkhram	107.50 MHz.	13.414138	100.001343	95
54	MCOT	Singburi	105.25 MHz.	14.9626972	100.427994	140
55	PRD	Suphan buri	102.25 MHz.	14.463391	100.180238	100
56	Parliament	Ubon Ratchathani	87.50 MHz.	15.322825	104.729041	120
57	Royal Thai Army	Ubon Ratchathani	95.75 MHz.	15.19364	104.879866	120
58	PRD	Ubon Ratchathani	98.50 MHz.	15.323914	104.729107	120
59	Royal Thai Police	Ubon Ratchathani	99.50 MHz.	15.303215	104.764194	120
60	NBTC	Ubon Ratchathani	102.00 MHz	15.272279	104.849765	150
61	Royal Thai Navy	Ubon Ratchathani	104.00 MHz.	15.306501	104.895914	100
62	Royal Thai Air Force	Ubon Ratchathani	105.25 MHz.	15.326003	104.829486	102
63	MCOT	Ubon Ratchathani	107.00 MHz.	15.305711	104.893749	120
64	Royal Thai Army	Surin	90.25 MHz.	14.867990	103.482110	110
65	PRD	Surin	93.50 MHz.	14.894170	103.457000	50
66	PRD	Surin	97.50 MHz.	14.894170	103.457000	70

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
67	MCOT	Surin	99.75 MHz.	14.954360	103.524690	110
68	Royal Thai Air Force	Surin	107.50 MHz.	14.824930	103.476060	105
69	PRD	Yasothorn	90.00 MHz.	15.803570	104.142871	100
70	MCOT	Yasothorn	95.25 MHz.	15.787200	104.251650	120
71	Royal Thai Army	Yasothorn	100.00 MHz.	15.902200	104.065922	120
72	Royal Thai Police	Yasothorn	105.00 MHz.	15.789323	104.276987	120
73	PRD	Roiet	94.00 MHz.	16.046851	103.650061	100
74	Royal Thai Army	Roiet	95.50 MHz.	16.1124	103.488001	120
75	Royal Thai Police	Roiet	98.75 MHz.	16.00496	103.591777	100
76	MCOT	Roiet	101.00 MHz.	16.075333	103.596421	150
77	Department of Fisheries	Roiet	101.60 MHz.	16.046911	103.720111	100
78	MCOT	Sisaket	95.00 MHz.	15.042500	104.344880	110
79	PRD	Sisaket	100.25 MHz.	15.097700	104.337790	80
80	PRD	Mukdahan	99.25 MHz.	16.544633	104.680656	95
81	PRD	Amnat Charoen	103.25 MHz.	15.898703	104.618866	90
82	Royal Thai Army	Chiang Rai	90.75 MHz.	19.914581	99.824295	48
83	Royal Thai Police	Chiang Rai	92.75 MHz.	19.758519	99.734508	60

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
84	Royal Thai Air Force	Chiang Rai	94.25 MHz.	19.817915	99.867876	60
85	PRD	Chiang Rai	95.75 MHz.	19.813575	99.867005	60
86	Supreme Command Headquater	Chiang Rai	100.25 MHz.	20.109242	99.886826	120
87	MCOT	Chiang Rai	101.25 MHz.	19.815444	99.867517	60
88	Department of Fisheries	Chiang Rai	103.00 MHz.	19.851151	99.940605	60
89	PRD	Phrae	91.00 MHz.	17.933026	100.000872	60
90	MCOT	Phrae	93.00 MHz.	17.933026	100.000872	60
91	Royal Thai Army	Phrae	103.50 MHz.	18.204991	100.197915	120
92	Royal Thai Police	Phrae	106.00 MHz.	17.980793	100.092439	100
93	MCOT	Nan	92.00 MHz.	18.743405	100.741691	60
94	PRD	Nan	94.75 MHz.	18.742616	100.741169	60
95	Royal Thai Air Force	Nan	96.00 MHz.	18.737383	100.739605	60
96	Royal Thai Army	Nan	99.50 MHz.	18.742645	100.742459	120
97	PRD	Phayao	95.25 MHz.	19.202348	99.877027	100
98	MCOT	Phayao	97.25 MHz.	18.988359	99.911438	45
99	Royal Thai Police	Phayao	106.25 MHz.	19.232215	99.861579	108
100	Royal Thai Army	Phayao	107.25 MHz.	19.097353	99.908084	95

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
101	NBTC	Lampang	90.00 MHz			
102	Royal Thai Police	Lampang	91.50 MHz.	18.313172	99.399741	100
103	PRD	Lampang	97.00 MHz.	18.243161	99.562836	100
104	MCOT	Lampang	99.00 MHz.	18.234972	99.560593	70
105	Royal Thai Army	Lampang	101.75 MHz.	18.197232	99.40828	120
106	Royal Thai Police	Uttaradit	90.50 MHz.	17.596417	100.032361	120
107	PRD	Uttaradit	96.75 MHz.	17.608566	100.109146	100
108	Royal Thai Army	Uttaradit	97.50 MHz.	17.666412	100.143756	108
109	MCOT	Uttaradit	98.50 MHz.	17.619802	100.125426	120
110	Prince of Songkla University	Song Khla	88.00 MHz.	7.015183	100.519715	10
111	PRD	Song Khla	89.50 MHz.	7.01542	100.519857	20
112	PRD	Song Khla	90.50 MHz.	7.01542	100.519857	20
113	Royal Thai Navy	Song Khla	94.50 MHz.	7.038711	100.518933	35
114	MCOT	Song Khla	96.50 MHz.	7.008494	100.517902	50
115	PRD	Song Khla	102.25 MHz.	7.01542	100.519857	30
116	Parliament	Song Khla	103.25 MHz.	7.01542	100.519857	20
117	Royal Thai Police	Song Khla	104.00 MHz.	6.9653869	100.4779675	80

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
118	Royal Thai Air Force	Song Khla	107.00 MHz.	7.016155	100.520306	20
119	Royal Thai Army	Song Khla	107.75 MHz.	7.038733	100.518953	25
120	PRD	Trang	91.25 MHz.	7.560501	99.587596	86
121	Royal Thai Army	Trang	103.00 MHz.	7.622324	99.597888	95
122	MCOT	Trang	106.25 MHz.	7.555568	99.561966	115
123	Royal Thai Police	Trang	106.75 MHz.	7.558365	99.610745	89
124	Royal Thai Police	Naratiwat	88.25 MHz.	6.420684	101.817971	80
125	Royal Thai Army	Naratiwat	92.50 MHz.	6.143314	101.89243	95
126	Royal Thai Navy	Naratiwat	94.75 MHz.	6.432523	101.798939	115
127	MCOT	Naratiwat	96.00 MHz.	6.4105	101.802639	70
128	PRD	Naratiwat	98.25 MHz.	6.4105	101.802639	95
129	Supreme Command Headquater	Naratiwat	99.25 MHz.	6.423278	101.81375	23
130	PRD	Naratiwat	106.50 MHz.	6.027271	101.961415	95
131	Royal Thai Army	Phatthalung	89.25 MHz.	7.594472	99.959889	92
132	Royal Thai Police	Phatthalung	90.75 MHz.	7.626704	100.154553	110
133	MCOT	Phatthalung	95.75 MHz.	7.616323	100.100572	110
134	PRD	Phatthalung	98.00 MHz.	7.584861	99.976444	90

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
135	Parliament	Yala	89.00 MHz.	6.337917	101.386944	50
136	PRD	Yala	92.00 MHz.	6.337917	101.386944	40
137	PRD	Yala	93.00 MHz.	5.762222	101.067778	95
138	PRD	Yala	94.25 MHz.	6.337775	101.389721	40
139	PRD	Yala	95.00 MHz.	6.337778	101.389722	40
140	Royal Thai Army	Yala	100.00 MHz.	6.4775	101.282917	80
141	MCOT	Yala	102.50 MHz.	6.336807	101.38686	45
142	Royal Thai Police	Satun	91.75 MHz.	6.7905	99.969389	94
143	MCOT	Satun	93.25 MHz.	6.635306	100.02525	70
144	PRD	Satun	95.50 MHz.	6.635306	100.02525	64
145	PRD	Satun	99.50 MHz.	6.635306	100.02525	64
146	MCOT	Pattani	91.00 MHz.	6.889572	101.254429	100
147	Royal Thai Army	Pattani	93.50 MHz.	6.579943	101.302043	100
148	PRD	Pattani	101.00 MHz.	6.892177	101.250099	90
149	Prince of Songkla University	Pattani	107.25 MHz.	6.877412	101.236888	100
150	Royal Thai Navy	Chanthaburi	88.75 MHz.	12.60767	102.097356	90
151	PRD	Chanthaburi	90.25 MHz.	12.608329	102.102438	55

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
152	Royal Thai Air Force	Chanthaburi	93.25 MHz.	12.59196	102.09047	62
153	MCOT	Chanthaburi	95.25 MHz.	12.6589	102.09083	60
154	Royal Thai Army	Chon buri	98.25 MHz.	13.39375	100.995777	55
155	PRD	Chon buri	99.75 MHz.	13.189833	100.950555	50
156	Royal Thai Navy	Chon buri	104.75 MHz.	12.92149	100.86632	40
157	MCOT	Chon buri	107.75 MHz.	13.190732	100.94958	45
158	PRD	Trat	92.75 MHz.	12.22933	102.51128	85
159	Royal Thai Navy	Trat	93.75 MHz.	12.364105	102.443893	100
160	MCOT	Trat	107.25 MHz.	12.37055	102.44592	85
161	Parliament	Rayong	87.75 MHz.	12.67653	101.41274	55
162	PRD	Rayong	91.75 MHz.	12.67653	101.41274	55
163	MCOT	Rayong	96.75 MHz.	12.67428	101.41189	96
164	Department of Fisheries	Rayong	100.75 MHz.	12.60697	101.4213	43
165	Royal Thai Police	Rayong	102.75 MHz.	12.689561	101.212039	90
166	Thai Meteorological Department	Rayong	105.25 MHz.	12.63357	101.340508	90
167	PRD	Sakaeo	103.25 MHz.	13.824293	102.071516	95
168	Royal Thai Army	Khon Kaen	88.25 MHz.	16.460889	102.846611	109

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
169	MCOT	Khon Kaen	90.75 MHz.	16.453439	102.950175	105
170	PRD	Khon Kaen	93.25 MHz.	16.556722	102.055583	90
171	PRD	Khon Kaen	98.50 MHz.	16.475194	102.833639	88
172	PRD	Khon Kaen	99.50 MHz.	16.475194	102.833639	113
173	Ministry of University Affairs	Khon Kaen	103.00 MHz	16.475417	102.819278	109
174	Royal Thai Police	Khon Kaen	104.50 MHz.	16.41925	102.821583	92
175	Royal Thai Air Force	Khon Kaen	107.75 MHz.	16.4615	102.785139	47
176	Royal Thai Army	Loei	90.00 MHz.	17.598592	101.717789	110
177	Royal Thai Police	Loei	92.50 MHz.	17.392444	101.738194	110
178	PRD	Loei	95.25 MHz.	17.470667	101.444528	32
179	MCOT	Loei	100.00 MHz.	17.469806	101.444556	161
180	MCOT	Kalasin	92.00 MHz.	16.375572	103.184995	108
181	PRD	Kalasin	93.00 MHz.	16.453457	103.534859	90
182	Royal Thai Air Force	Mahasarakham	98.00 MHz.	16.158519	103.303836	80
183	MCOT	Mahasarakham	100.50 MHz.	16.184344	103.30374	70
184	Mahasarakham University	Mahasarakham	102.25 MHz.	16.242843	103.248856	95
185	Royal Thai Army	Mahasarakham	105.50 MHz.	16.197935	103.259134	100

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
186	PRD	Mahasarakham	106.50 MHz.	16.139077	103.253211	108
187	PRD	Nong Bua Lamphu	97.25 MHz.	17.228167	102.429583	89
188	Parliament	Nakhon Ratchasima	87.50 MHz.	14.93725	101.997	110
189	Royal Thai Police	Nakhon Ratchasima	89.25 MHz.	14.951201	102.135389	110
190	Royal Thai Air Force	Nakhon Ratchasima	90.50 MHz.	14.98175	102.07564	100
191	Thai Meteorological Department	Nakhon Ratchasima	94.25 MHz.	14.969908	102.082306	110
192	MCOT	Nakhon Ratchasima	95.75 MHz.	15.0662	102.202567	105
193	PRD	Nakhon Ratchasima	105.25 MHz.	14.93725	101.997	110
194	PRD	Nakhon Ratchasima	106.25 MHz.	14.93725	101.997	110
195	Royal Thai Army	Nakhon Ratchasima	107.25 MHz.	14.965025	102.095725	110
196	Royal Thai Police	Chaiyapoom	88.75 MHz.	15.82883	102.08659	100
197	PRD	Chaiyapoom	92.75 MHz.	15.81175	102.02136	92
198	MCOT	Chaiyapoom	102.00 MHz.	15.8045	102.02656	120
199	MCOT	Burirum	92.00 MHz.	14.97487	103.160918	94
200	Royal Thai Air Force	Burirum	98.25 MHz.	14.984067	103.132355	88
201	Royal Thai Army	Burirum	100.75 MHz.	14.926082	103.082997	113
202	PRD	Burirum	101.75 MHz.	14.99172	103.09614	112

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
203	Parliament	Udonthani	87.50 MHz.	17.293820	102.862000	94.5
204	MCOT	Udonthani	91.50 MHz.	17.278230	102.884610	104
205	PRD	Udonthani	93.75 MHz.	17.293820	102.862000	91.5
206	NBTC	Udonthani	99.00 MHz	17.430540	102.823550	85
207	Royal Thai Police	Udonthani	100.25 MHz.	17.374660	102.840210	95
208	Royal Thai Air Force	Udonthani	104.00 MHz.	17.389270	102.804410	90
209	Royal Thai Police	Udonthani	105.75 MHz.	17.448240	102.787460	85
210	PRD	Nakhon Phanom	90.25 MHz.	17.383392	104.756095	93
211	MCOT	Nakhon Phanom	93.50 MHz.	17.388007	104.787972	109
212	Royal Thai Navy	Nakhon Phanom	97.50 MHz.	17.425628	104.767272	89
213	Royal Thai Army	Nakhon Phanom	98.75 MHz.	17.329932	104.573834	110
214	Parliament	Sakhon Nakhon	87.75 MHz.	17.138073	103.988777	70
215	PRD	Sakhon Nakhon	91.25 MHz.	17.138073	103.988777	70
216	Supreme Command Headquater	Sakhon Nakhon	94.75 MHz.	17.203620	104.100996	110
217	Royal Thai Air Force	Sakhon Nakhon	96.75 MHz.	17.150454	104.153983	80
218	Royal Thai Police	Sakhon Nakhon	101.75 MHz.	17.178682	104.080528	115
219	MCOT	Sakhon Nakhon	107.00 MHz.	17.137666	103.989097	47

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
220	PRD	Nong Khai	90.50 MHz.	17.887413	102.773895	112
221	Royal Thai Navy	Nong Khai	95.75 MHz.	17.698441	102.782225	110
222	MCOT	Nong Khai	102.50 MHz.	17.748859	102.777881	108
223	PRD	Buengkan	104.25 MHz	18.387377	103.598366	108
224	Royal Thai Navy	Chiang Mai	88.00 MHz.	18.856806	99.013251	95
225	PRD	Chiang Mai	89.25 MHz.	19.940712	99.221855	90
226	PRD	Chiang Mai	93.25 MHz.	18.807993	98.91534	70
227	PRD	Chiang Mai	98.00 MHz.	18.807993	98.91534	70
228	Chiang Mai University	Chiang Mai	100.00 MHz.	18.802842	98.947002	75
229	MCOT	Chiang Mai	100.75 MHz.	18.80917	98.912612	60
230	Royal Thai Army	Chiang Mai	101.50 MHz.	18.847268	98.970475	90
231	Royal Thai Air Force	Chiang Mai	102.50 MHz.	18.771364	98.970299	40
232	Royal Thai Police	Chiang Mai	105.75 MHz.	18.841923	99.0139	75
233	Parliament	Chiang Mai	106.75 MHz.	18.807984	98.915343	75
234	PRD	Mae Hong Son	90.50 MHz.	18.168565	97.94455	40
235	MCOT	Mae Hong Son	99.50 MHz.	19.106007	98.035717	55
236	PRD	Mae Hong Son	102.00 MHz.	19.292893	97.957134	36

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
237	PRD	Mae Hong Son	104.00 MHz.	19.106524	98.034692	50
238	PRD	Lamphum	95.00 MHz.	18.568357	99.041317	100
239	MCOT	Lamphum	96.50 MHz.	18.554514	99.048592	110
240	Royal Thai Police	Lamphum	105.00 MHz.	18.554514	99.048592	110
241	Royal Thai Army	Lamphum	107.50 MHz.	18.624667	99.04463	100
242	Parliament	Phitsanulok	92.25 MHz.	16.839777	100.403105	95
243	PRD	Phitsanulok	94.25 MHz.	16.832343	100.217682	110
244	Royal Thai Air Force	Phitsanulok	95.75 MHz.	16.8135	100.273194	50
245	Thai Meteorological Department	Phitsanulok	104.25 MHz.	16.775284	100.216839	100
246	MCOT	Phitsanulok	106.25 MHz.	16.841428	100.402091	90
247	Naresuan University	Phitsanulok	107.25 MHz.	16.750692	100.191206	100
248	PRD	Sukhothai	93.75 MHz.	16.996661	99.792919	108
249	MCOT	Sukhothai	99.25 MHz.	16.963306	99.967167	120
250	Royal Thai Army	Sukhothai	102.25 MHz.	16.962035	100.097458	110
251	Royal Thai Police	Phichit	88.25 MHz.	16.45395	100.297539	90
252	MCOT	Phichit	107.75 MHz.	100.297539	100.146525	111
253	Supreme Command Headquater	Phetchabun	99.00 MHz.	16.850777	101.253054	108

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
254	PRD	Phetchabun	102.75 MHz.	16.457257	101.154258	88
255	Royal Thai Police	Phetchabun	104.75 MHz.	16.698778	101.170661	102
256	PRD	Nakhon Sawan	93.25 MHz.	15.715925	100.133588	100
257	Royal Thai Air Force	Nakhon Sawan	95.25 MHz.	15.25714	100.309935	30
258	Royal Thai Army	Nakhon Sawan	98.25 MHz.	15.67267	100.120774	70
259	Royal Thai Police	Nakhon Sawan	105.75 MHz.	15.704872	100.111489	70
260	Supreme Command Headquater	Uthaithani	88.75 MHz.	15.406755	100.018188	90
261	MCOT	Uthaithani	101.75 MHz.	15.417692	100.079231	111
262	Royal Thai Police	Tak	94.75 MHz.	16.929695	99.117676	112
263	MCOT	Tak	97.25 MHz.	16.779134	98.925273	90
264	PRD	Tak	102.00 MHz.	16.915065	99.116213	80
265	PRD	Tak (Mae sod)	103.75 MHz.	16.732457	98.566309	90
266	Royal Thai Police	Kamphaeng Phet	90.75 MHz.	16.4999303	99.5198274	120
267	MCOT	Kamphaeng Phet	92.75 MHz.	16.51798	99.524044	104
268	PRD	Kamphaeng Phet	97.75 MHz.	16.508284	99.499182	86
269	Royal Thai Army	Kamphaeng Phet	105.00 MHz.	16.469436	99.508453	90
270	Royal Thai Navy	Phuket	88.00 MHz.	7.899357	98.395875	30

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
271	NBTC	Phuket	89.00 MHz.	7.89532	98.378443	100
272	PRD	Phuket	90.50 MHz.	7.898699	98.395233	35
273	Royal Thai Police	Phuket	95.00 MHz.	7.894587	98.382957	100
274	PRD	Phuket	96.75 MHz.	7.898699	98.395233	25
275	Parliament	Phuket	99.25 MHz.	7.898678	98.395432	40
276	MCOT	Phuket	101.50 MHz.	7.898639	98.39563	60
277	Royal Thai Army	Phuket	102.25 MHz.	7.89482	98.378883	100
278	Thai Meteorological Department	Phuket	107.25 MHz.	7.898939	98.39576	25
279	PRD	Phangnga	90.25 MHz.	8.839513	98.351455	25
280	MCOT	Phangnga	91.75 MHz.	8.434619	98.506458	100
281	Royal Thai Navy	Phangnga	97.75 MHz.	8.276686	98.311035	100
282	PRD	Phangnga	100.00 MHz.	8.434093	98.50678	100
283	Royal Thai Police	Phangnga	106.50 MHz.	8.515123	98.638857	120
284	PRD	Krabi	98.50 MHz.	8.063	98.906656	100
285	MCOT	Krabi	105.00 MHz.	8.049135	98.908705	120
286	Royal Thai Police	Nakhon Sri Thamarat	91.50 MHz.	8.445315	99.991515	87
287	Royal Thai Police	Nakhon Sri Thamarat	92.50 MHz.	8.4454598	99.9915878	102

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
288	PRD	Nakhon Sri Thamarat	93.50 MHz.	8.366628	99.977352	88
289	PRD	Nakhon Sri Thamarat	97.00 MHz.	8.210213	99.489948	48
290	MCOT	Nakhon Sri Thamarat	104.50 MHz.	8.236688	99.803931	51
291	Parliament	Surat Thani	87.50 MHz.	9.092257	99.348565	59
292	PRD	Surat Thani	89.75 MHz.	9.092257	99.348565	45
293	Royal Thai Army	Surat Thani	92.25 MHz.	9.12993	99.361689	86
294	PRD	Surat Thani	95.50 MHz.	9.092257	99.348565	46
295	PRD	Surat Thani	96.75 MHz.	9.48991	99.988521	54
296	Royal Thai Air Force	Surat Thani	98.25 MHz.	9.09188	99.348594	55
297	Royal Thai Police	Surat Thani	99.00 MHz.	9.14725	99.38459	86
298	MCOT	Surat Thani	102.00 MHz.	9.092618	99.348976	55
299	MCOT	Ranong	100.50 MHz.	10.028333	98.670192	51
300	PRD	Ranong	105.75 MHz.	10.02391	98.668675	34
301	PRD	Ranong	107.25 MHz.	10.02391	98.668675	112
302	MCOT	Chumphon	90.75 MHz.	10.445978	99.134143	120
303	Thai Meteorological Department	Chumphon	94.25 MHz.	10.500963	99.193138	90
304	PRD	Chumphon	100.00 MHz.	10.534969	99.194887	60

No.	English Name	Province	*Assign Frequency (MHz)	New Latitude Verify In Google Earth after measured by Monitoring Center	New Longtitude Verify In Google Earth after measured by Monitoring Center	*Antenna Height above Ground Level (m)*** Measured By NBTC Monitoring Center
305	Royal Thai Police	Chumphon	104.25 MHz.	10.5332083	99.1196529	110
306	MCOT	Chumphon	104.75 MHz.	10.445765	99.134547	80
307	Royal Thai Army	Chumphon	107.50 MHz.	10.509606	99.101484	120
308	Parliament	Prachuap Khiri Khan	89.25 MHz.	11.83509	99.800775	120
309	Royal Thai Air Force	Prachuap Khiri Khan	91.25 MHz.	12.564714	99.946117	21
310	Royal Thai Army	Prachuap Khiri Khan	96.25 MHz.	12.407978	99.922949	120
311	PRD	Prachuap Khiri Khan	98.75 MHz.	12.564482	99.935652	60
312	Royal Thai Police	Prachuap Khiri Khan	100.25 MHz.	12.564482	99.935652	60
313	PRD	Prachuap Khiri Khan	102.25 MHz.	11.835333	99.800833	120
314	MCOT	Prachuap Khiri Khan	106.75 MHz.	11.908539	99.796559	100

Appendix I – Thailand TOT/CAT Databases as provided by NBTC

CAT Tower Database ENG v4.xlsx

No	Station Name	Address	Province	Type of Tower	Location		Tower Information	
					LAT	LONG	Height above ground level (m)	Available space for additional transmitter and equipment (m^2)
1	CMI005	Doi Tao	Chiang Mai	Self Support	17.953040	98.681740	60	1.3*1.5
2	CMI008	Phrao	Chiang Mai	Self Support	19.369900	99.197140	60	1.5*1.5
3	CMI063	Om Koi	Chiang Mai	Self Support	17.797030	98.358200	60	1.5*1.5
4	KKN007	Phon	Khon Kaen	Self Support	15.804961	102.603324	60	1.5*1.5
5	SKA010	Na Thawi	Song Khla	GUY Wire	6.734920	100.696600	60	1.5*1.5
6	SKA061	Prakop	Song Khla	GUY Wire	6.489990	100.678390	60	1.5*1.5
7	CRI022	Wiang Pa Pao	Chiang Rai	Self Support	19.364560	99.506100	60	1.3*1.5
8	CRI047	Ban Mae Rai/Chiang Khong	Chiang Rai	Self Support	20.202990	100.403590	45	1.5*1.5
9	LPG012	Wang Nuea	Lampang	Self Support	19.143700	99.612950	60	1.3*1.5
10	LPG013	Sop Prap	Lampang	Self Support	17.890415	99.336326	60	1.3*1.5
11	MSN001	Khun Yuam	Mae Hong Son	Self Support	18.828449	97.936133	60	1.3*1.5
12	NAN007	Chiang Klang	Nan	GUY Wire	19.310257	100.860104	60	1.5*1.5
13	NAN011	Bo Kluea	Nan	Self Support	19.143640	101.154190	60	1.3*1.5
14	NAN012	Ban Luang	Nan	GUY Wire	18.849140	100.441110	60	1.5*1.5
15	NSN005	Takhli	Nakhon Sawan	Self Support	15.268660	100.348660	60	1.3*1.5

No	Station Name	Address	Province	Type of Tower	Location		Tower Information	
					LAT	LONG	Height above ground level (m)	Available space for additional transmitter and equipment (m^2)
16	PBN006	Wichian Buri	Phetchabun	Self Support	15.662181	101.104944	60	1.3*1.5
17	PCT012	Wang Sai Phun	Phichit	Self Support	16.405272	100.530195	60	1.3*1.5
18	PLK001	Chat Trakan	Phitsanulok	GUY Wire	17.273410	100.588280	60	1.5*1.5
19	PLK002	Nakhon Thai	Phitsanulok	Self Support	17.104019	100.837806	60	1.3*1.5
20	PRE006	Wang Chin	Phrae	Self Support	17.909150	99.601700	60	1.3*1.5
21	PYO003	Chiang Muan	Phayao	Self Support	18.886261	100.297091	60	1.3*1.5
22	PYO023	Ban Duea/Pong	Phayao	Self Support	19.104440	100.272740	45	1.5*1.5
23	TAK017	Phop Phra	Tak	Self Support	16.392920	98.691930	45	1.5*1.5
24	TAK023	Rim Moei/Mae Sot	Tak	Self Support	16.703188	98.518119	45	1.5*1.5
25	UTI	Lan Sak	Uthai Thani	GUY Wire	15.460930	99.549740	60	1.5*1.5
26	UTT010	Ruam Chit/Tha Pla	Uttaradit	Self Support	17.706000	100.347890	45	1.5*1.5
27	UTT011	Ban Khok	Uttaradit	Self Support	18.027880	101.073850	45	1.5*1.5
28	UTT013	Fak Tha	Uttaradit	Self Support	18.004060	100.882240	45	1.5*1.5
29	BRM011	Nong Ki	Buri Rum	Self Support	14.680246	102.546124	60	1.5*1.5
30	BRM022	Non Din Daeng	Buri Rum	Self Support	14.335220	102.756650	45	1.5*1.5
31	KSN007	Sahatsakhan	Kalasin	Self Support	16.703941	103.511709	45	1.5*1.5
32	LEI014	Na Haeo	Loei	Self Support	17.481400	101.070450	45	1.5*1.5
33	LEI015	Pak Chom	Loei	Self Support	18.014860	101.883030	45	1.5*1.5
34	LEI022	Pha Nok Khao/Phu	Loei	Self Support	16.872520	101.856580	45	1.5*1.5

No	Station Name	Address	Province	Type of Tower	Location		Tower Information	
					LAT	LONG	Height above ground level (m)	Available space for additional transmitter and equipment (m^2)
		Kradueng						
35	SSK001	Kantharalak	Si Sa Ket	Self Support	14.650528	104.631264	45	1.5*1.5
36	UBN007	Buntharik	Ubon Ratchathani	GUY Wire	14.757600	105.402010	60	1.5*1.5
37	UBN0227	Nam Yuen	Ubon Ratchathani	GUY Wire	14.491550	105.011620	60	1.5*1.5
38	UBN035	Pho Sai	Ubon Ratchathani	Self Support	15.818690	105.247490	60	1.5*1.5
39	UDN017	Kumphawapi	Udon Thani	Self Support	17.112120	103.010294	45	1.5*1.5
40	UUDN020	Ban Dung	Udon Thani	GUY Wire	17.703410	103.256000	60	1.5*1.5
41	PKT009	Pa Tong	Phuket	Rooftop Guy Wired	7.884920	98.295690	28	1.5*1.5
42	PKT019	Ban Bang Thao	Phuket	Self Support	7.979090	98.284500	60	1.5*1.5
43	PLG002	Na Not/Phatthalung	Phatthalung	Self Support	7.499660	100.063160	60	1.5*1.5
44	SNI031	Phanom	Surat Thani	Self Support	8.855717	98.816961	60	1.5*1.5

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No.	Station Name	Address	Province	Type of Tower	Location		Tower Information
					LAT	LONG	Height above ground level (m)
2.1	_AddSite_010	Si Sawat	Kanchana Buri		14.596915	99.115562	112
2.2	_AddSite_027	Thong Pha Phum	Kanchana Buri		14.752401	98.623956	72
2.3	_AddSite_039	Sangkhla Buri	Kanchana Buri		15.156378	98.449350	32
2.4	_AddSite_049	Si Sawat	Kanchana Buri		14.596915	99.115562	112
2.5	_AddSite_064	Lao Khwan	Kanchana Buri		14.597086	99.774482	62
2.6	_AddSite_065	Khao Phu Toei	Kanchana Buri		14.380583	98.932335	42
2.7	_AddSite_066	Suan Phueng	Ratchaburi		99.336059	13.544252	112
2.8	_AddSite_076	Sai Yok	Kanchana Buri		14.118230	99.144000	72
2.9	_AddSite_077	Suan Phueng	Ratchaburi		99.336059	13.544252	112
2.1	_AddSite_084	Khao Ban Chong Hua	Kanchana Buri		15.052149	98.59935	32
2.11	_AddSite_093	Thong Pha Phum	Kanchana Buri		14.752401	98.623956	72
4.1	_AddSite_069	Na Yai Am	Chanthaburi		12.787699	101.822000	127
5.2	_AddSite_015	Ta Phraya	Sa Kaeo		14.002854	102.804796	97
5.3	_AddSite_040	Sa Kaeo	Sa Kaeo		13.817627	102.070753	92
6.1	_AddSite_025	Pong Nam Ron	Chanthaburi		12.889700	102.274523	92
6.2	_AddSite_068	Makham	Chanthaburi		12.681504	102.195052	32

No.	Station Name	Address	Province	Type of Tower	Location		Tower Information
					LAT	LONG	Height above ground level (m)
7.5	_AddSite_016	Ban Lat	Phetchaburi		13.050897	99.915569	32
7.6	_AddSite_019	Pranburi	Prachuap Khiri Khan		12.375873	99.906715	77
7.7	_AddSite_043	Kuiburi	Prachuap Khiri Khan		12.067639	99.865377	77
7.8	_AddSite_080	Huahin	Prachuap Khiri Khan		12.566682	99.938558	82
7.9	_AddSite_081	Kuiburi	Prachuap Khiri Khan		12.067639	99.865377	77
9.2	_AddSite_054	Ban Khwao	Chaiyaphum		15.778842	101.906495	52
9.3	_AddSite_055	Bamnet Narong	Chaiyaphum		15.443290	101.688002	42
12.2	_AddSite_051	Na Chaluai	Ubon Ratchathani		14.523529	105.245231	48
12.3	_AddSite_052	Khemarat	Ubon Ratchathani		16.038799	105.214962	52
12.4	_AddSite_075	Si Mueang Mai	Ubon Ratchathani		15.498087	105.277015	72
13.2	_AddSite_070	Khamcha-I	Mukdahan		16.575565	104.417112	62
15.3	_AddSite_046	Ban Thaen	Chaiyaphum		16.409565	102.354214	32
16.1	_AddSite_002	Wang Saphung	Loei		17.297436	101.765030	122
16.2	_AddSite_003	Nam Pat	Uttaradit		17.728198	100.687452	92
16.3	_AddSite_014	Nam Pat	Uttaradit		17.728198	100.687452	92
16.4	_AddSite_023	Lom Kao	Phetchabun		16.884594	101.232273	32
16.5	_AddSite_030	Pak Chom	Loei		18.023262	101.885806	102
16.6	_AddSite_035	Phu Kratae	Loei		16.941218	101.917537	37
16.7	_AddSite_067	Pak Chom	Loei		18.023262	101.885806	102

No.	Station Name	Address	Province	Type of Tower	Location		Tower Information
					LAT	LONG	Height above ground level (m)
17.1	_AddSite_063	Sangkhom	Nong Khai		18.071847	102.266136	32
20.2	_AddSite_007	Chomthong	Chiang Mai		18.418220	98.675521	40
20.3	_AddSite_012	Doi Inthanon	Chiang Mai		18.573967	98.482457	112
20.4	_AddSite_013	Chomthong	Chiang Mai		18.418220	98.675521	40
20.5	_AddSite_017	Wiang Haeng	Chiang Mai		19.562368	98.638633	32
20.6	_AddSite_024	Mae Khachan	Chiang Rai		19.194368	99.532936	32
20.7	_AddSite_028	Chonthong	Chiang Mai		18.418220	98.675521	40
20.8	_AddSite_038	Samoeng	Chiang Mai		18.850080	98.736647	82
20.9	_AddSite_045	Doi Inthanon	Chiang Mai		18.573967	98.482457	112
20.1	_AddSite_058	Wiang Haeng	Chiang Mai		19.562368	98.638633	32
20.11	_AddSite_085	Khao Ban Pang Muang	Lampang		18.886625	99.605937	62
20.12	_AddSite_086	Doi Inthanon	Chiang Mai		18.573967	98.482457	112
21.3	_AddSite_020	Mae Sariang	Mae Hong Son (Doi Kong Mu)		18.169865	97.945120	15,17
21.4	_AddSite_029	Mae Sariang	Mae Hong Son (Doi Kong Mu)		18.169865	97.945120	15,17
21.5	_AddSite_032	Mae Sariang	Mae Hong Son (Doi Kong Mu)		18.169865	97.945120	15,17
22.2	_AddSite_061	Luang Bok	Lamphun		17.997198	98.985282	72
23.1	_AddSite_008	Chiang Khong	Chiang Rai		20.246216	100.411051	82
23.2	_AddSite_009	Ban Ta	Chiang Rai		19.815498	100.241833	117
23.4	_AddSite_048	Mae Suai	Chiang Rai		19.658865	99.537882	32

No.	Station Name	Address	Province	Type of Tower	Location		Tower Information
					LAT	LONG	Height above ground level (m)
23.5	_AddSite_057	Mae Na Wang	Chiang Mai		19.999652	99.342874	25
23.6	_AddSite_059	Thoetthai	Chiang Rai		20.238805	99.667258	32
24.2	_AddSite_004	Tha Wang Pha	Nan		19.124285	100.814000	57
24.3	_AddSite_005	Tha Wang Pha	Nan		19.124285	100.814000	57
24.4	_AddSite_006	Khao Ban Huai Tuem	Nan		18.872402	100.497935	87
25.1	_AddSite_047	Wang Chin	Phrae		17.895482	99.600262	25
25.2	_AddSite_060	Tha Pla	Uttaradit		17.789200	100.373111	47
26.1	_AddSite_056	Nam Pat	Uttaradit		17.728198	100.687452	92
27.2	_AddSite_001	Khao Hau Nam Krai	Phitsanulok		16.848326	100.569797	62
28.1	_AddSite_034	Phopphra	Tak		16.386193	98.689102	112
28.2	_AddSite_042	Tha Song Yang	Tak		17.227412	98.225211	132
28.3	_AddSite_062	Tha Song Yang	Tak		17.227412	98.225211	132
28.4	_AddSite_083	Tha Song Yang	Tak		17.227412	98.225211	132
28.5	_AddSite_088	Khao Mae Klong Kao	Tak		16.060697	98.853111	112
28.6	_AddSite_089	Tak	Tak		16.881923	99.125192	55
28.7	_AddSite_090	Phopphra	Tak		16.386193	98.689102	112
29.1	_AddSite_011	Khao Phuk I Khwai	Uthai Thani		15.093096	99.631971	27
29.2	_AddSite_021	Nong Chang	Uthai Thani		15.391721	99.839590	72
29.3	_AddSite_044	Nong Chang	Uthai Thani		15.391721	99.839590	72

No.	Station Name	Address	Province	Type of Tower	Location		Tower Information
					LAT	LONG	Height above ground level (m)
29.4	_AddSite_087	Lat Yao	Nakhon Nayok		15.748638	99.786922	57
30.1	_AddSite_018	Noen Maprang	Phitsanulok		16.570239	100.634358	62
30.2	_AddSite_031	Si Thep	Phetchabun		15.462933	101.064308	32
30.3	_AddSite_053	Nong Bua Daeng	Chaiyaphum		16.082553	101.804348	92
30.4	_AddSite_094	Sam Yaek Wang Chomphu	Phetchabun		16.262862	101.039380	48
31.1	_AddSite_041	Thung Kha	Chumphon		10.386583	99.130728	35
32.1	_AddSite_022	Lang Suan	Chumphon		9.946995	99.076700	72
32.2	_AddSite_091	Khao 221	Rayong		9.533181	98.523481	87
33.2	_AddSite_033	Khian Sa	Surat Thani		8.840962	99.196281	52
33.3	_AddSite_036	Lamae	Chumphon		9.770953	99.095145	77
33.4	_AddSite_071	Si Chon	Nakhon Si Thammarat		9.006950	99.905830	97
33.5	_AddSite_072	Khao Dat Fa	Nakhon Si Thammarat		9.118419	99.825463	37
33.6	_AddSite_082	Khao Lang Tang	Krabi		8.474357	98.697143	65
33.7	_AddSite_095	Wiang Sa	Surat Thani		8.628532	99.342681	57
34.6	_AddSite_092	Phangnga	Phangnga		8.463652	98.532520	15
37.1	_AddSite_026	Na Thawi	Song Khla		6.741278	100.691846	47
38.1	_AddSite_074	Thung Nui	Satun		6.856751	100.112383	32
39.4	_AddSite_037	Yaha	Yala		6.476325	101.129610	57
39.5	_AddSite_050	Yala_R	Yala		6.477294	101.283174	57

No.	Station Name	Address	Province	Type of Tower	Location		Tower Information
					LAT	LONG	Height above ground level (m)
39.6	_AddSite_073	Bannang Sata	Yala		6.267378	101.259758	122
39.7	_AddSite_078	Yaha	Yala		6.476325	101.129610	57
39.8	_AddSite_079	Khao Ban Kilometer 38	Yala		5.978083	101.181314	72