


|   |                 |   |   |
|---|-----------------|---|---|
|  | <b>Activity</b> | Frequency planning of additional DTTB sites   |   |
|   | <b>Date</b>     | 2 February 2015   |   |
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|   | <b>Title</b>    | Summary of the main features of DTTB Plan 3.2   |   |
| <b>NBTC-ITU project</b>   | <b>Status</b>   | For information   |   |
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|   |                 | As agreed   | X |
|   |                 | This report has been prepared in cooperation with<br>Mr. Supatrasit Suansook of the Office of the NBTC. |   |

# Summary of the main features of DTTB Plan 3.2

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## 1. Introduction

This report summarises the main features of DTTB Plan 3.2 in the situation after analogue TV switch-off.

DTTB Plan 3.2 consists of:

- 39 DTTB main sites as presented in the report “Detailed planning of the 39 DTTB main sites”, dated 24 February 2014” (DTTB Plan 3.0);
- 132 additional DTTB sites needed to reach the required target of 95.0% household coverage.

An overview of the planning principles is shown in Annex 1.

In the following sections a brief description is given of the station characteristics and the achieved coverage.

## 2. Station characteristics

A summary of the characteristics of the sites in Plan 3.2 is shown in Annex 2. The applied antennas are described in Annex 3.

The following types of sites were defined:

| #  | Type of sites                             | Status  |
|----|---|---|
| M  | Main sites                                | Approved in DTTB Plan 3.0                       |
| A1 | Additional existing sites, most ATV sites | Site location agreed by the network operators   |
| A2 | Additional existing sites                 | Site location proposed by the network operators |
| A3 | Additional non-existing sites             | Site location proposed by the ITU team          |

Table 1: Categories of sites

In summary DTTB Plan 3.2 contains 132 additional sites:

- 45 A1 sites of which;
  - 44 sites stem from the list of 45 sites provided by NBTC on 18 June 2014;
  - 1 site was added by NBTC on 23 January 2015 (Dan Chang 2);
- 38 A2 sites of which;
  - 31 sites were selected from the list of 84 sites provided on 18 June 2014;
  - 7 sites were selected from the list of CAT and TOT sites provided on 28 August 2014;
- 49 A3 sites.

Six additional sites and one main site are in MFN mode. Plan 3.2 contains 48 SFNs involving:

- 126 additional sites, of which 34 additional sites are in a SFN without a main site;
- Sixteen sites (fourteen additional sites and two main sites) with an artificial delay ranging from 3 to 177  $\mu$ s.

### 3. Coverage with fixed reception

The coverage achieved by Plan 3.2 is presented as percentage of the total number of households and as the aggregated coverage areas of the SFNs and sites in MFN mode.

#### 3.1 Household coverage

The household coverage per multiplex is shown in Table 2.

| Multiplex | Operator     | Household coverage |
|-----------|--------------|--------------------|
| 1         | NBT          | 95.0%              |
| 2         | Army TV-1    | 95.0%              |
| 3         | MCOT         | 95.0%              |
| 4         | TPBS         | 95.0%              |
| 5         | Army TV-2    | 95.1%              |
| 6         | Community TV | 95.4%              |

Table 2: Fixed household coverage per multiplex

The household coverage ranges from 95.0% to 95.4%. Consequently the coverage target of 95.0% of the households has been met with each of the multiplexes.

The household coverage resulting from the different types of sites is shown in Table 3.

| Type of sites | Number of sites | Household coverage | Difference per type of site |
|---------------|-----------------|--------------------|-----------------------------|
| M             | 39              | 84.2%              | 84.2%                       |
| M+A1          | 84              | 90.4%              | 6.2%                        |
| M+A1+A2       | 122             | 92.8%              | 2.4%                        |
| M+A1+A2+A3    | 171             | 95.0%              | 2.2%                        |

Table 3: Relative contribution to household coverage per type of site (Mux 1)

The 39 main sites cover more than 80% of the households. The 45 A1 sites increase the household coverage to about 90%. To reach 95.0% of the households 87 additional sites (38 A2 sites and 49 A3 sites) are needed.

#### 3.2 Area coverage

Figure 1 shows the coverage area of one of the multiplexes (Mux 1) and the location of the sites.

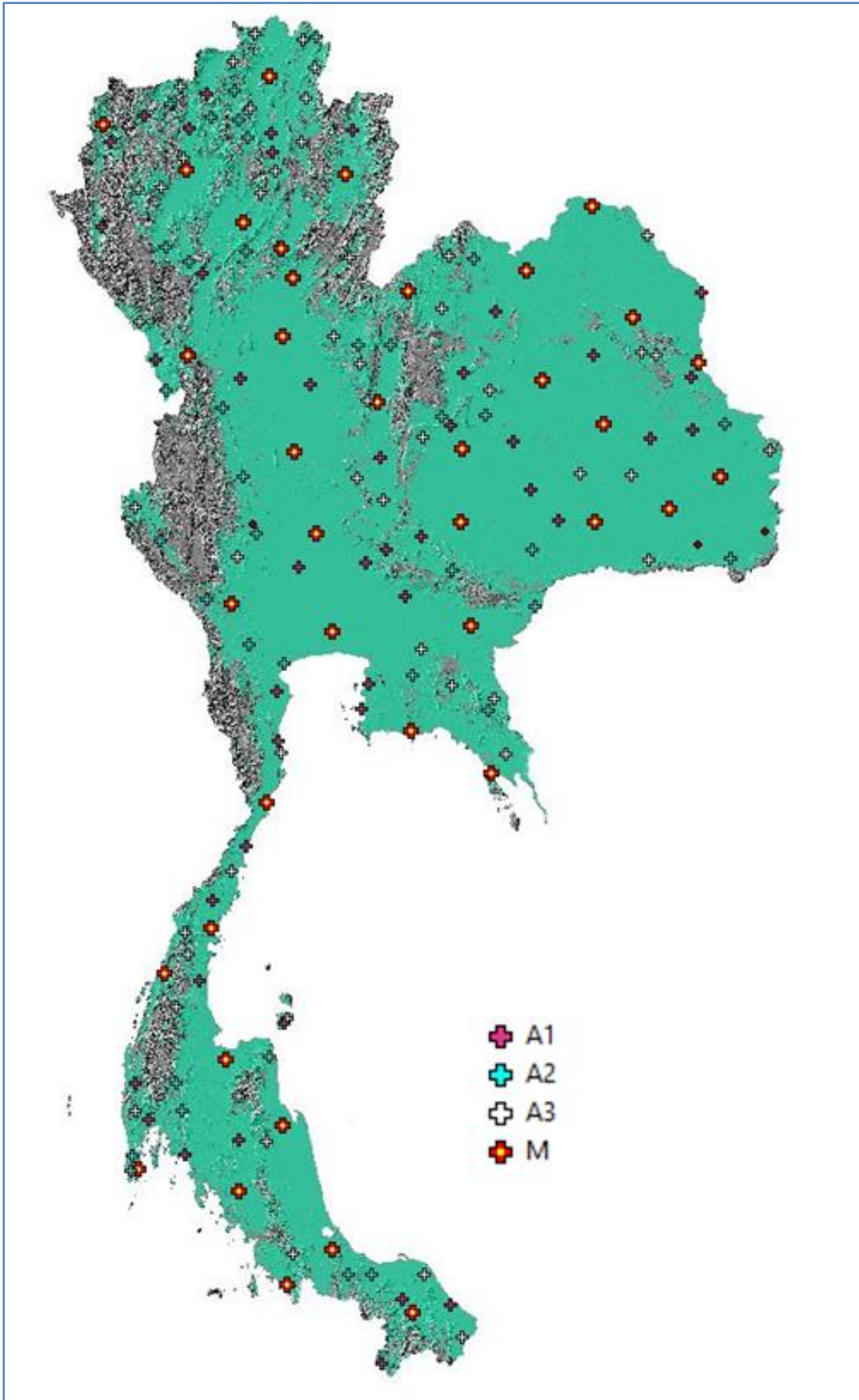


Figure 1: Fixed area coverage

## Annex 1 Planning principles

| #          | DTTB planning criteria                                     | Specification  |       |  |    |    |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
|------------|--|--|-------|--|----|----|--|--|--|-----------|----|----|----|----|----|----|-----------|----|----|----|----|----|----|-----------|----|----|----|----|----|----|-----------|----|----|----|----|----|----|-----------|----|----|----|----|----|----|-----------|----|----|----|----|----|--|------------|----|----|----|----|----|----|------------|----|----|----|----|----|----|
| 1          | <b>Frequency band for DTTB planning</b>                    | a. Channels 26-60<br>b. In border area with Malaysia: <ul style="list-style-type: none"> <li>– Even numbered channels in accordance with coordination agreement and preferably channels below 49 at request of NBTC;</li> <li>– Channels 50 and 52 where needed for planning reasons.</li> </ul> c. In border area with Laos: <ul style="list-style-type: none"> <li>– Avoid use of channel 37 at main site Ubon Ratchathani</li> </ul>  |       |  |    |    |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| 2          | <b>Channel distribution</b>                                | a. Five channel groups, Da to De, containing six unique channels, for sites situated more than 100 km from the Malaysian border;<br>b. Two channel groups, TDa and TDb, containing six even numbered channels for sites within 100 km from the Malaysian border;<br>c. One channel group, Df, containing five unique channels, for resolving incompatibilities with analogue TV and for future requirements. <table border="1" data-bbox="497 792 1385 1160"> <thead> <tr> <th>Group</th> <th colspan="6">Channel numbers in numerical sequence per channel group *)</th> </tr> </thead> <tbody> <tr> <td><b>Da</b></td> <td>28</td> <td>31</td> <td>35</td> <td>39</td> <td>47</td> <td>51</td> </tr> <tr> <td><b>Db</b></td> <td>26</td> <td>29</td> <td>32</td> <td>36</td> <td>40</td> <td>44</td> </tr> <tr> <td><b>Dc</b></td> <td>27</td> <td>30</td> <td>33</td> <td>37</td> <td>41</td> <td>49</td> </tr> <tr> <td><b>Dd</b></td> <td>34</td> <td>38</td> <td>46</td> <td>50</td> <td>54</td> <td>57</td> </tr> <tr> <td><b>De</b></td> <td>43</td> <td>45</td> <td>48</td> <td>53</td> <td>56</td> <td>59</td> </tr> <tr> <td><b>Df</b></td> <td>42</td> <td>52</td> <td>55</td> <td>58</td> <td>60</td> <td></td> </tr> <tr> <td><b>TDa</b></td> <td>26</td> <td>50</td> <td>34</td> <td>38</td> <td>42</td> <td>46</td> </tr> <tr> <td><b>TDb</b></td> <td>28</td> <td>32</td> <td>36</td> <td>40</td> <td>44</td> <td>48</td> </tr> </tbody> </table> <p>*) The channel assignment per multiplex within a channel group differs per site.</p> | Group | Channel numbers in numerical sequence per channel group *) |    |    |  |  |  | <b>Da</b> | 28 | 31 | 35 | 39 | 47 | 51 | <b>Db</b> | 26 | 29 | 32 | 36 | 40 | 44 | <b>Dc</b> | 27 | 30 | 33 | 37 | 41 | 49 | <b>Dd</b> | 34 | 38 | 46 | 50 | 54 | 57 | <b>De</b> | 43 | 45 | 48 | 53 | 56 | 59 | <b>Df</b> | 42 | 52 | 55 | 58 | 60 |  | <b>TDa</b> | 26 | 50 | 34 | 38 | 42 | 46 | <b>TDb</b> | 28 | 32 | 36 | 40 | 44 | 48 |
| Group      | Channel numbers in numerical sequence per channel group *) |  |       |  |    |    |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| <b>Da</b>  | 28   | 31   | 35    | 39   | 47 | 51 |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| <b>Db</b>  | 26   | 29   | 32    | 36   | 40 | 44 |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| <b>Dc</b>  | 27   | 30   | 33    | 37   | 41 | 49 |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| <b>Dd</b>  | 34   | 38   | 46    | 50   | 54 | 57 |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| <b>De</b>  | 43   | 45   | 48    | 53   | 56 | 59 |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| <b>Df</b>  | 42   | 52   | 55    | 58   | 60 |    |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| <b>TDa</b> | 26   | 50   | 34    | 38   | 42 | 46 |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| <b>TDb</b> | 28   | 32   | 36    | 40   | 44 | 48 |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| 3          | <b>DVB-T2 system variant</b>                               | 16k, extended bandwidth, 64QAM, code rate 3/5, PP2, guard interval 266 $\mu$ s.  |       |  |    |    |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| 4          | <b>Planning parameters</b>                                 | a. Protection ratios and minimum field strength: Rec. ITU-R. BT.2033 (including adjacent channel protection ratios);<br>b. FX receiving antenna characteristics: Rec. ITU-R BT.419-3;<br>c. Outdoor reception standard deviation: 5.5 dB;<br>d. Indoor reception: building penetration loss 11 dB and standard deviation of 6 dB (according to Rec. ITU-R P.1812);<br>e. Interfering signal calculated for 1% of time;<br>f. Wanted signal calculated for 50% of time;<br>g. Signal summation: Log normal method.  |       |  |    |    |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| 5          | <b>Reception mode</b>                                      | a. FX reception for planning and coverage presentations;<br>b. PI reception for coverage presentations.  |       |  |    |    |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |
| 6          | <b>Compatibility criteria</b>                              | Protection of main sites: <ol style="list-style-type: none"> <li>a. Combined interference at a pixel in main site coverage is acceptable if:               <ul style="list-style-type: none"> <li>– Pixel is covered by other main site or A1 site, or;</li> <li>– Location probability <math>\geq</math> 90%, or;</li> <li>– Considered acceptable after judging the HH gained by the additional sites to be planed and loss by the already licenced main site;</li> </ul> </li> <li>b. Protection of additional sites:               <ul style="list-style-type: none"> <li>– Combined interference in coverage of additional sites is acceptable if it considered “not critical”.</li> </ul> </li> </ol>  |       |  |    |    |  |  |  |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |    |           |    |    |    |    |    |  |            |    |    |    |    |    |    |            |    |    |    |    |    |    |

|          |                             |  |
|----------|-----------------------------|--|
| <b>7</b> | <b>DTTB coverage target</b> | <p>a. Overall 95% of households with FX reception and in fringe areas receiving installation of good quality:</p> <ul style="list-style-type: none"> <li>– Emin reduced by 5 dB because of antenna amplifier;</li> <li>– At least 90% location probability because of well selected receiving antenna location, or good quality directional antenna</li> </ul> <p>b. Similar coverage of all multiplexes per site.</p> |
|----------|-----------------------------|--|

Table 4: DTTB planning principles

| #        | Planning software        | Specification  |
|----------|--------------------------|--|
| <b>1</b> | <b>Progira plan</b>      | One license for planning expert during the duration of the project.  |
| <b>2</b> | <b>Propagation model</b> | CRC predict  |
| <b>3</b> | <b>Data bases</b>        | <p>a. Terrain and clutter data as provided by NBTC for the DTTB Plan analysis:</p> <ul style="list-style-type: none"> <li>– Terrain data base 100 by 100 m;</li> <li>– Clutter (morpho) 100 by 100 m; in addition 20 by 20 m for Bangkok (see also the <b>Note 1</b>);</li> </ul> <p>b. Population database per sub-district as provided by NBTC with a total population of 64,505,166 people and 22,865,383 households;</p> <ul style="list-style-type: none"> <li>– Corrected for double counts in sub-districts with non-contiguous areas.</li> </ul> |

Table 5: Planning software

#### Note 1

The heights specified in the clutter codes of the 20 by 20 m clutter data (see Table 5) have been modified to reflect the specific situation in Bangkok as shown in the table below. The 20 by 20m clutter data are also available for Chang Mai. However, the amended heights are not appropriate for the situation in Chang Mai. Therefore the 20 by 20m clutter codes are not applied in Chiang Mai.

| Modified clutter codes         | Original height (m) | Changed to (m) |
|--------------------------------|---------------------|----------------|
| <b>10. Suburban</b>            | 6                   | 10             |
| <b>11. Industrial</b>          | 10                  | No change      |
| <b>13. Urban</b>               | 10                  | 20             |
| <b>14. Dense urban</b>         | 12                  | 60             |
| <b>15. Dense urban high</b>    | 30                  | 100            |
| <b>16. Blocks of buildings</b> | 12                  | No change      |

Table 6: Clutter height

## Annex 2 Summary of DTTB Plan 3.2

DTTB Plan 3.2 is summarised in Table 7.

| Site nr | Type | Network ID    | Art. delay (µs) | Site name          | Longitude  | Latitude  | Rec. mode | Ant. height (m) | Max ERP (kW) | HRP (degrees) | Antenna type | Ch gr | Ch Mux 1 | Ch Mux 2 | Ch Mux 3 | Ch Mux 4 | Ch Mux 5 | Ch Mux 6 |
|---------|------|---------------|-----------------|--------------------|------------|-----------|-----------|-----------------|--------------|---------------|--------------|-------|----------|----------|----------|----------|----------|----------|
| 1.00    | M    | SFN(1-6) 1-Db | 0               | Bangkok_DTT        | 100.540270 | 13.754300 | FX        | 328             | 100.0        | ND            |              | Db    | 26       | 36       | 40       | 44       | 32       | 29       |
| 1.01    | A1   | SFN(1-6) 4-De | 0               | Khao Chalak        | 100.949558 | 13.190653 | FX        | 40              | 1.0          | 170           | Type 3a      | De    | 45       | 59       | 53       | 56       | 43       | 48       |
| 1.02    | A1   | SFN(1-6) 4-De | 0               | Pattaya            | 100.866450 | 12.921333 | FX        | 60              | 1.0          | 120           | Type 2       | De    | 45       | 59       | 53       | 56       | 43       | 48       |
| 1.03    | A2   | SFN(1-6) 2-Dc | 0               | CHOM BUENG         | 99.613515  | 13.627185 | FX        | 112             | 5.0          | 250           | Type 2       | Dc    | 49       | 37       | 41       | 30       | 27       | 33       |
| 1.04    | A2   | SFN(1-6) 4-De | 0               | BO THONG           | 101.439334 | 13.278336 | FX        | 72              | 5.0          | 155;345       | Type 5a      | De    | 45       | 59       | 53       | 56       | 43       | 48       |
| 1.05    | A2   | SFN(1-6) 1-Db | 0               | SAMUT SONGKHRAM    | 100.003068 | 13.409810 | FX        | 73              | 0.5          | 270           | Type 4       | Db    | 26       | 36       | 40       | 44       | 32       | 29       |
| 1.06    | A3   | SFN(1-6) 5-Dd | 0               | _AddSite_100       | 101.532330 | 13.560010 | FX        | 70              | 1.0          | 140;320       | Type 5       | Dd    | 54       | 50       | 46       | 38       | 57       | 34       |
| 2.00    | M    | SFN(1-6) 2-Dc | 0               | Kanchana Buri_DTT  | 99.420556  | 14.074444 | FX        | 124             | 25.0         | 60            | Type 4       | Dc    | 49       | 37       | 41       | 30       | 27       | 33       |
| 2.01    | A2   | SFN(1-6) 2-Dc | 0               | TOT_Sai Yok        | 99.144000  | 14.118230 | FX        | 70              | 0.5          | 130;310       | Type 5       | Dc    | 49       | 37       | 41       | 30       | 27       | 33       |
| 2.02    | A2   | SFN(1-6) 2-Dd | 0               | TOT_Thong Pha Phum | 98.623956  | 14.752401 | FX        | 70              | 0.5          | 150;330       | Type 5       | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 2.03    | A3   | SFN(1-6) 2-Dd | 0               | _AddSite_101       | 98.344410  | 15.115130 | FX        | 70              | 1.0          | ND            | Type 1       | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 2.04    | A3   | SFN(1-6) 2-De | 0               | _AddSite_064       | 99.482219  | 14.583099 | FX        | 70              | 10.0         | 270           | Type 2       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 3.00    | M    | SFN(1-6) 3-Da | 0               | Singburi_DTT       | 100.377004 | 14.836115 | FX        | 126             | 15.0         | ND            |              | Da    | 35       | 51       | 47       | 39       | 31       | 28       |
| 3.01    | A1   | SFN(1-6) 3-Da | 0               | Suphan Buri        | 100.180238 | 14.463391 | FX        | 100             | 1.0          | 260           | Type 4       | Da    | 35       | 51       | 47       | 39       | 31       | 28       |
| 3.02    | A1   | SFN(1-6) 2-De | 0               | Dan Chang 2        | 99.66790   | 14.93061  | FX        | 60              | 0.3          | 255           | Type 3a      | Da    | 35       | 51       | 47       | 39       | 31       | 28       |
| 3.03    | A1   | SFN(1-6) 8-Dc | 56              | Muak Lek           | 101.153715 | 14.652015 | FX        | 20              | 0.5          | 90            | Type 2       | Dc    | 41       | 49       | 30       | 33       | 37       | 27       |
| 3.04    | A1   | SFN(1-6) 3-Da | 3               | Saraburi           | 100.926111 | 14.508056 | FX        | 80              | 0.5          | 45            | Type 3a      | Da    | 35       | 51       | 47       | 39       | 31       | 28       |
| 3.05    | A2   | SFN(1-6) 2-De | 0               | DAN CHANG          | 99.695923  | 14.842848 | FX        | 107             | 2.0          | 260           | Type 2       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 3.06    | A3   | SFN(1-6) 3-De | 0               | _AddSite_102       | 101.138520 | 15.191100 | FX        | 70              | 1.0          | ND            | Type 1       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 3.07    | A3   | SFN(1-6) 3-De | 0               | _AddSite_031       | 100.833144 | 15.437557 | FX        | 70              | 1.0          | ND            | Type 1       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 4.00    | M    | SFN(1-6) 4-De | 0               | Rayong_DTT         | 101.412925 | 12.675987 | FX        | 52              | 50.0         | 0             |              | De    | 45       | 59       | 53       | 56       | 43       | 48       |
| 4.01    | A2   | SFN(1-6) 4-Da | 0               | PONG NAM RON       | 102.274523 | 12.889700 | FX        | 92              | 10.0         | ND            | Type 1       | Da    | 47       | 31       | 35       | 28       | 39       | 51       |
| 4.02    | A3   | SFN(1-6) 4-Da | 0               | _AddSite_025       | 102.354020 | 13.008778 | FX        | 70              | 10.0         | 250           | Type 2       | Da    | 47       | 31       | 35       | 28       | 39       | 51       |
| 4.03    | A3   | SFN(1-6) 4-Da | 0               | _AddSite_069       | 101.883540 | 13.165515 | FX        | 70              | 2.0          | ND            | Type 1       | Da    | 47       | 31       | 35       | 28       | 39       | 51       |
| 5.00    | M    | SFN(1-6) 5-Dd | 0               | Sakaeo_DTT         | 102.104231 | 13.804003 | FX        | 156             | 50.0         | 190           |              | Dd    | 54       | 50       | 46       | 38       | 57       | 34       |

| Site nr | Type | Network ID     | Art. delay (μs) | Site name               | Longitude  | Latitude  | Rec. mode | Ant. height (m) | Max ERP (kW) | HRP (degrees) | Antenna type | Ch gr | Ch Mux 1 | Ch Mux 2 | Ch Mux 3 | Ch Mux 4 | Ch Mux 5 | Ch Mux 6 |
|---------|------|----------------|-----------------|-------------------------|------------|-----------|-----------|-----------------|--------------|---------------|--------------|-------|----------|----------|----------|----------|----------|----------|
| 5.01    | A1   | SFN(1-6) 8-Dc  | 108             | Prachin Buri            | 101.373976 | 14.134715 | FX        | 80              | 1.0          | 160           | Type 4       | Dc    | 41       | 49       | 30       | 33       | 37       | 27       |
| 5.02    | A2   | MFN(1-6) 5-De  | 0               | TA PHRAYA               | 102.804796 | 14.002854 | FX        | 97              | 0.5          | 310           | Type 2       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 6.00    | M    | SFN(1-6) 6-Dc  | 0               | Trat_DTT                | 102.298440 | 12.195510 | FX        | 64              | 50.0         | 90            |              | Dc    | 33       | 37       | 41       | 49       | 30       | 27       |
| 6.01    | A3   | SFN(1-6) 6-Dc  | 0               | _AddSite_103            | 102.469067 | 12.408588 | FX        | 70              | 1.0          | ND            | Type 1       | Dc    | 33       | 37       | 41       | 49       | 30       | 27       |
| 7.00    | M    | SFN(1-6) 7-Dd  | 0               | Prachaub Khiri Khun_DTT | 99.801300  | 11.905940 | FX        | 60              | 20.0         | ND            |              | Dd    | 46       | 50       | 54       | 57       | 38       | 34       |
| 7.01    | A1   | SFN(1-6) 7-Dd  | 0               | Hua Hin                 | 99.935176  | 12.565142 | FX        | 75              | 1.0          | 270           | Type 7       | Dd    | 46       | 50       | 54       | 57       | 38       | 34       |
| 7.02    | A1   | MFN(1-6) 7-Da  | 0               | Phetchaburi             | 99.929012  | 13.104522 | FX        | 80              | 0.5          | 70            | Type 2       | Da    | 47       | 31       | 35       | 28       | 39       | 51       |
| 7.03    | A1   | SFN(1-6) 7-De  | 0               | Thap Sakae              | 99.588250  | 11.418960 | FX        | 84              | 5.0          | 25;195        | Type 5a      | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 7.04    | A3   | SFN(1-6) 7-Dd  | 0               | _AddSite_019            | 99.978240  | 12.447620 | FX        | 70              | 0.5          | 270           | Type 3       | Dd    | 46       | 50       | 54       | 57       | 38       | 34       |
| 7.05    | A3   | SFN(1-6) 7-De  | 0               | _AddSite_104            | 99.415020  | 11.154510 | FX        | 70              | 2.0          | 10;190        | Type 5       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 8.00    | M    | SFN(1-6) 8-Dc  | 0               | Nakhon Ratchasima_DTT   | 101.995052 | 14.947688 | FX        | 156             | 50.0         | ND            |              | Dc    | 41       | 49       | 30       | 33       | 37       | 27       |
| 8.01    | A1   | SFN(1-6) 10-Db | 22              | Chum Phuang             | 102.794060 | 15.273160 | FX        | 120             | 5.0          | 295           | Type 2       | Db    | 26       | 32       | 40       | 36       | 44       | 29       |
| 8.02    | A1   | SFN(1-6) 8-Dc  | 0               | Khao Yai Thiang         | 101.546679 | 14.786090 | FX        | 80              | 5.0          | 225           | Type 3a      | Dc    | 41       | 49       | 30       | 33       | 37       | 27       |
| 8.03    | A2   | SFN(1-6) 8-Dc  | 0               | WANG NAM KHIAO          | 101.900449 | 14.415619 | FX        | 40              | 0.5          | 185           | Type 2       | Dc    | 41       | 49       | 30       | 33       | 37       | 27       |
| 9.00    | M    | SFN(1-6) 9-Da  | 0               | Chaiyaphum_DTT          | 102.026740 | 15.729570 | FX        | 120             | 15.0         | 0             |              | Da    | 31       | 47       | 39       | 35       | 51       | 28       |
| 9.01    | A1   | SFN(1-6) 9-Da  | 0               | Nong Bua Daeng          | 101.895300 | 15.999858 | FX        | 120             | 0.5          | 345           | Type 4       | Da    | 31       | 47       | 39       | 35       | 51       | 28       |
| 9.02    | A2   | SFN(1-6) 9-Da  | 0               | TOT_Nong Bua Daeng      | 101.804348 | 16.082553 | FX        | 70              | 0.5          | 270           | Type 2       | Da    | 31       | 47       | 39       | 35       | 51       | 28       |
| 9.03    | A3   | SFN(1-6) 9-Da  | 0               | _AddSite_055            | 101.586120 | 15.871080 | FX        | 70              | 0.5          | 30;210        | Type 5       | Da    | 31       | 47       | 39       | 35       | 51       | 28       |
| 9.04    | A3   | SFN(1-6) 15-De | 0               | _AddSite_046            | 102.352360 | 16.366759 | FX        | 70              | 10.0         | ND            | Type 1       | De    | 59       | 45       | 53       | 56       | 48       | 43       |
| 10.00   | M    | SFN(1-6) 10-Db | 0               | Surin_DTT               | 103.507680 | 14.919520 | FX        | 126             | 50.0         | ND            |              | Db    | 26       | 32       | 40       | 36       | 44       | 29       |
| 10.01   | A1   | SFN(1-6) 10-Db | 0               | Buriram                 | 103.098123 | 14.934247 | FX        | 80              | 2.0          | 255           | Type 3a      | Db    | 26       | 32       | 40       | 36       | 44       | 29       |
| 10.02   | A2   | SFN(1-6) 10-Db | 11              | NANG RONG               | 102.794802 | 14.630352 | FX        | 72              | 20.0         | 240           | Type 2       | Db    | 26       | 32       | 40       | 36       | 44       | 29       |
| 10.03   | A3   | SFN(1-6) 14-Dd | 0               | _AddSite_105            | 103.922471 | 15.411229 | FX        | 70              | 0.5          | ND            | Type 1       | Dd    | 57       | 50       | 46       | 54       | 34       | 38       |
| 11.00   | M    | SFN(1-6) 11-Dc | 0               | Sisaket_DTT             | 104.345228 | 15.042331 | FX        | 120             | 20.0         | ND            |              | Dc    | 41       | 30       | 33       | 27       | 49       | 37       |
| 11.01   | A2   | SFN(1-6) 12-Da | 0               | KANTHARALAK             | 104.651717 | 14.641479 | FX        | 72              | 2.0          | 160           | Type 2       | Da    | 47       | 31       | 35       | 28       | 39       | 51       |
| 11.02   | A3   | SFN(1-6) 11-Dc | 177             | _AddSite_106            | 104.104981 | 14.489833 | FX        | 70              | 0.5          | 260;80        | Type 5       | Dc    | 41       | 30       | 33       | 27       | 49       | 37       |
| 12.00   | M    | SFN(1-5) 11-Dc | 0               | Ubon Ratchathani_DTT    | 104.923611 | 15.381667 | FX        | 156             | 50.0         | ND            |              | Dc    | 41       | 30       | 33       | 27       | 49       | 52       |
| 12.01   | A1   | SFN(1-6) 11-Dc | 67              | Amnat Charoen           | 104.618922 | 15.898967 | FX        | 100             | 0.5          | 350           | Type 2       | Dc    | 41       | 30       | 33       | 27       | 49       | 37       |



| Site nr | Type | Network ID     | Art. delay (µs) | Site name                            | Longitude   | Latitude   | Rec. mode | Ant. height (m) | Max ERP (kW) | HRP (degrees) | Antenna type | Ch gr | Ch Mux 1 | Ch Mux 2 | Ch Mux 3 | Ch Mux 4 | Ch Mux 5 | Ch Mux 6 |
|---------|------|----------------|-----------------|--------------------------------------|-------------|------------|-----------|-----------------|--------------|---------------|--------------|-------|----------|----------|----------|----------|----------|----------|
| 12.02   | A2   | MFN(1-6) 12-Db | 0               | BUNTHARIK                            | 105.413027  | 14.756517  | FX        | 102             | 2.0          | 300           | Type 2       | Db    | 32       | 29       | 36       | 26       | 40       | 44       |
| 12.03   | A2   | SFN(1-6) 12-Da | 0               | NAM YUEN                             | 105.002684  | 14.490170  | FX        | 107             | 5.0          | 350           | Type 2       | Da    | 47       | 31       | 35       | 28       | 39       | 51       |
| 12.04   | A2   | SFN(1-6) 12-De | 0               | HUAI HIN KHROK (PATHUM RATCHAWONGSA) | 104.985411  | 15.942518  | FX        | 100             | 5.0          | 35            | Type 3a      | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 12.05   | A3   | SFN(1-6) 12-De | 0               | _AddSite_075                         | 105.487970  | 15.643609  | FX        | 70              | 10.0         | 240           | Type 2       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 13.00   | M    | SFN(1-6) 13-Da | 0               | Mukdahan_DTT                         | 104.718181  | 16.613679  | FX        | 124             | 20.0         | 240           |              | Da    | 47       | 39       | 35       | 28       | 51       | 31       |
| 13.01   | A1   | SFN(1-6) 13-Da | 0               | Phu Hin Khan (Mukdahan)              | 104.629602  | 16.468387  | FX        | 80              | 2.0          | 190           | Type 4       | Da    | 47       | 39       | 35       | 28       | 51       | 31       |
| 13.02   | A3   | SFN(1-6) 13-Da | 0               | _AddSite_070                         | 104.238151  | 16.706297  | FX        | 70              | 10.0         | ND            | Type 1       | Da    | 47       | 39       | 35       | 28       | 51       | 31       |
| 14.00   | M    | SFN(1-6) 14-Dd | 0               | Roi ET_DTT                           | 103.624210  | 15.978350  | FX        | 126             | 50.0         | ND            |              | Dd    | 57       | 50       | 46       | 54       | 34       | 38       |
| 14.01   | A1   | SFN(1-6) 14-Dd | 0               | Yasothon                             | 104.142504  | 15.803563  | FX        | 100             | 1.0          | 145           | Type 3a      | Dd    | 57       | 50       | 46       | 54       | 34       | 38       |
| 15.00   | M    | SFN(1-6) 15-De | 0               | Khon Kaen_DTT                        | 102.946222  | 16.463686  | FX        | 156             | 50.0         | ND            |              | De    | 59       | 45       | 53       | 56       | 48       | 43       |
| 15.01   | A1   | SFN(1-6) 15-De | 52              | Chum Phae                            | 102.061324  | 16.562602  | FX        | 124             | 2.0          | ND            | Type 1       | De    | 59       | 45       | 53       | 56       | 48       | 43       |
| 15.02   | A1   | SFN(1-6) 15-De | 40              | Phu Sing. Kalasin                    | 103.518611  | 16.722778  | FX        | 112             | 1.0          | 70            | Type 3       | De    | 59       | 45       | 53       | 56       | 48       | 43       |
| 15.03   | A1   | SFN(1-6) 15-De | 125             | Phon                                 | 102.600232  | 15.809009  | FX        | 60              | 0.5          | 175           | Type 3a      | De    | 59       | 45       | 53       | 56       | 48       | 43       |
| 15.04   | A2   | SFN(1-6) 15-De | 3               | KAENG KHRO (PHU PHA DAENG)           | 102.295658  | 16.098189  | FX        | 25              | 0.5          | 130           | Type 4       | De    | 59       | 45       | 53       | 56       | 48       | 43       |
| 15.05   | A3   | SFN(1-6) 14-Dd | 0               | _AddSite_107                         | 103.35015   | 15.43819   | FX        | 70              | 10.0         | 250           | Type 3       | Dd    | 57       | 50       | 46       | 54       | 34       | 38       |
| 15.06   | A3   | SFN(1-6) 13-Da | 0               | _AddSite_108                         | 104.0663822 | 16.7516608 | FX        | 70              | 0.5          | 140;320       | Type 5       | Da    | 47       | 39       | 35       | 28       | 51       | 31       |
| 16.00   | M    | SFN(1-6) 16-Dd | 0               | Loie_DTT                             | 101.444519  | 17.470655  | FX        | 35              | 20.0         | 130           |              | Dd    | 46       | 50       | 57       | 54       | 38       | 34       |
| 16.01   | A1   | SFN(1-6) 17-Da | 0               | Nong Bua Lam Phu                     | 102.429346  | 17.228005  | FX        | 100             | 0.2          | 235           | Type 3a      | Da    | 47       | 35       | 31       | 39       | 51       | 28       |
| 16.02   | A3   | SFN(1-6) 16-Dd | 0               | _AddSite_002                         | 101.816650  | 17.262750  | FX        | 70              | 2.0          | 230           | Type 2       | Dd    | 46       | 50       | 57       | 54       | 38       | 34       |
| 16.03   | A3   | SFN(1-6) 17-Da | 54              | _AddSite_067                         | 101.909770  | 17.836250  | FX        | 70              | 2.0          | 20;200        | Type 5       | Da    | 47       | 35       | 31       | 39       | 51       | 28       |
| 17.00   | M    | SFN(1-6) 17-Da | 0               | Udonthani_DTT                        | 102.794088  | 17.664041  | FX        | 156             | 50.0         | ND            |              | Da    | 47       | 35       | 31       | 39       | 51       | 28       |
| 17.01   | A2   | SFN(1-6) 17-Da | 0               | NAM SOM (UDON THANI)                 | 102.189221  | 17.79859   | FX        | 70              | 1.0          | 15            | Type 4       | Da    | 47       | 35       | 31       | 39       | 51       | 28       |
| 18.00   | M    | SFN(1-6) 18-Db | 0               | Buengkan_DTT                         | 103.553190  | 18.354690  | FX        | 100             | 10.0         | 180           |              | Db    | 44       | 32       | 36       | 40       | 26       | 29       |
| 19.00   | M    | SFN(1-6) 19-Dc | 0               | Sakhon Nakhon_DTT                    | 103.987520  | 17.138050  | FX        | 109             | 50.0         | 340           |              | Dc    | 30       | 49       | 41       | 33       | 37       | 27       |
| 19.01   | A1   | SFN(1-6) 19-Dc | 26              | Nakhon Phanom                        | 104.770131  | 17.374367  | FX        | 120             | 0.5          | 90            | Type 3       | Dc    | 30       | 49       | 41       | 33       | 37       | 27       |
| 19.02   | A3   | SFN(1-6) 18-Db | 0               | _AddSite_110                         | 104.167004  | 18.017511  | FX        | 70              | 0.1          | 270           | Type 3       | Db    | 44       | 32       | 36       | 40       | 26       | 29       |
| 20.00   | M    | SFN(1-6) 20-Dd | 0               | Chiang Mai_DTT                       | 98.915020   | 18.808140  | FX        | 78              | 50.0         | 40;180        |              | Dd    | 46       | 50       | 54       | 57       | 38       | 34       |
| 20.01   | A1   | SFN(1-6) 20-Db | 0               | Chai Prakan                          | 99.144830   | 19.628480  | FX        | 19              | 2.0          | 20            | Type 4       | Db    | 32       | 29       | 36       | 26       | 40       | 44       |

| Site nr | Type | Network ID     | Art. delay (μs) | Site name                    | Longitude  | Latitude   | Rec. mode | Ant. height (m) | Max ERP (kW) | HRP (degrees) | Antenna type | Ch gr | Ch Mux 1 | Ch Mux 2 | Ch Mux 3 | Ch Mux 4 | Ch Mux 5 | Ch Mux 6 |
|---------|------|----------------|-----------------|------------------------------|------------|------------|-----------|-----------------|--------------|---------------|--------------|-------|----------|----------|----------|----------|----------|----------|
| 20.02   | A1   | SFN(1-6) 20-Dd | 0               | Chiang Dao                   | 98.951143  | 19.250543  | FX        | 32              | 0.5          | 0;180         | Type 5       | Dd    | 46       | 50       | 54       | 57       | 38       | 34       |
| 20.03   | A2   | SFN(1-6) 20-Db | 0               | PHRAO                        | 99.197111  | 19.369972  | FX        | 30              | 2.0          | ND            | Type 1       | Db    | 32       | 29       | 36       | 26       | 40       | 44       |
| 20.04   | A2   | SFN(1-6) 22-Db | 3               | LI                           | 98.947841  | 17.801315  | FX        | 85              | 2.0          | 155;345       | Type 5       | Db    | 26       | 44       | 32       | 36       | 40       | 29       |
| 20.05   | A2   | MFN(1-6) 20-De | 0               | DOI TAO                      | 98.681750  | 17.953028  | FX        | 58              | 10.0         | ND            | Type 1       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 20.06   | A2   | SFN(1-6) 20-Db | 0               | WIANG HAENG                  | 98.725861  | 19.521639  | FX        | 30              | 10.0         | ND            | Type 1       | Db    | 32       | 29       | 36       | 26       | 40       | 44       |
| 20.07   | A3   | SFN(1-6) 20-Dd | 0               | _AddSite_007                 | 98.364610  | 18.596330  | FX        | 70              | 0.5          | 0;180         | Type 5       | Dd    | 46       | 50       | 54       | 57       | 38       | 34       |
| 20.08   | A3   | SFN(1-6) 20-Dd | 0               | _AddSite_111                 | 98.878759  | 18.934455  | FX        | 70              | 2.0          | 20            | Type 4       | Dd    | 46       | 50       | 54       | 57       | 38       | 34       |
| 20.09   | A3   | SFN(1-6) 20-Dd | 0               | _AddSite_086                 | 98.637408  | 18.613626  | FX        | 70              | 10.0         | ND            | Type 1       | Dd    | 46       | 50       | 54       | 57       | 38       | 34       |
| 20.10   | A3   | SFN(1-6) 20-Db | 0               | _AddSite_058                 | 98.849604  | 19.715375  | FX        | 70              | 0.1          | ND            | Type 1       | Db    | 32       | 29       | 36       | 26       | 40       | 44       |
| 20.11   | A3   | SFN(1-6) 23-Da | 0               | _AddSite_057                 | 99.452483  | 19.981013  | FX        | 70              | 1.0          | 170           | Type 2       | Da    | 47       | 31       | 35       | 28       | 39       | 51       |
| 21.00   | M    | SFN(1-6) 21-Dc | 0               | Mae Hong Son Doi kong mu_DTT | 97.957950  | 19.297550  | FX        | 64              | 1.0          | ND            |              | Dc    | 37       | 41       | 49       | 30       | 33       | 27       |
| 21.01   | A1   | SFN(1-6) 21-Dc | 0               | Mae Hong Son (Huai Nang Pu)  | 98.034777  | 19.106500  | FX        | 50              | 1.0          | 90            | Type 3       | Dc    | 37       | 41       | 49       | 30       | 33       | 27       |
| 21.02   | A1   | MFN(1-6) 21-Da | 0               | Mae Sareang                  | 97.944614  | 18.169806  | FX        | 82              | 1.0          | 10;170        | Type 5a      | Da    | 47       | 31       | 35       | 28       | 39       | 51       |
| 21.03   | A1   | SFN(1-6) 21-Dc | 0               | Pai                          | 98.421248  | 19.385555  | FX        | 100             | 0.5          | 165;335       | Type 5a      | Dc    | 37       | 41       | 49       | 30       | 33       | 27       |
| 22.00   | M    | SFN(1-6) 22-Db | 0               | Lampang_DTT                  | 99.560597  | 18.234928  | FX        | 80              | 50.0         | 220           |              | Db    | 26       | 44       | 32       | 36       | 40       | 29       |
| 22.01   | A1   | SFN(1-6) 22-Db | 0               | Thoen                        | 99.104840  | 17.664020  | FX        | 80              | 5.0          | 135           | Type 3a      | Db    | 26       | 44       | 32       | 36       | 40       | 29       |
| 22.02   | A2   | SFN(1-6) 23-Dc | 0               | WANG NU EA                   | 99.619450  | 19.144704  | FX        | 75              | 2.0          | ND            | Type 1       | Dc    | 49       | 30       | 33       | 37       | 41       | 27       |
| 22.03   | A3   | SFN(1-6) 25-De | 0               | _AddSite_112                 | 99.768928  | 18.543496  | FX        | 70              | 10.0         | ND            | Type 5       | De    | 45       | 48       | 59       | 56       | 43       | 53       |
| 22.04   | A3   | SFN(1-6) 22-Db | 0               | _AddSite_113                 | 99.9276872 | 18.788188  | FX        | 70              | 0.5          | 150;330       | Type 5       | Db    | 26       | 44       | 32       | 36       | 40       | 29       |
| 23.00   | M    | SFN(1-6) 23-Dc | 0               | Chiang Rai_DTT               | 99.867041  | 19.813755  | FX        | 70              | 50.0         | 90            |              | Dc    | 49       | 30       | 33       | 37       | 41       | 27       |
| 23.01   | A1   | SFN(1-6) 23-Dc | 0               | Phayao (Mueang)              | 99.880542  | 19.194063  | FX        | 100             | 0.5          | 60            | Type 2       | Dc    | 49       | 30       | 33       | 37       | 41       | 27       |
| 23.02   | A1   | SFN(1-6) 24-Da | 0               | Phayao (Ban Rai Na Diew)     | 99.911417  | 18.988389  | FX        | 120             | 0.5          | 0;180         | Type 5       | Da    | 28       | 31       | 35       | 39       | 51       | 47       |
| 23.03   | A2   | SFN(1-6) 23-Dd | 0               | CHIANG KHONG                 | 100.411051 | 20.246216  | FX        | 80              | 10.0         | 240           | Type 2       | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 23.04   | A2   | SFN(1-6) 23-Dc | 0               | WIANG PA PAO                 | 99.508308  | 19.344348  | FX        | 95              | 10.0         | 175;345       | Type 5       | Dc    | 49       | 30       | 33       | 37       | 41       | 27       |
| 23.05   | A2   | SFN(1-6) 23-Dc | 0               | MAE SUAI (DOI MON PA KOI)    | 99.466883  | 19.663794  | FX        | 97              | 1.0          | ND            | Type 1       | Dc    | 49       | 30       | 33       | 37       | 41       | 27       |
| 23.06   | A3   | SFN(1-6) 23-Da | 0               | _AddSite_059                 | 99.709690  | 20.288217  | FX        | 70              | 1.0          | 160           | Type 2       | Da    | 47       | 31       | 35       | 28       | 39       | 51       |
| 23.07   | A3   | SFN(1-6) 23-Dc | 0               | _AddSite_115                 | 99.6512700 | 19.4641781 | FX        | 70              | 0.5          | 10; 190       | Type 5       | Dc    | 49       | 30       | 33       | 37       | 41       | 27       |
| 23.08   | A3   | SFN(1-6) 23-Dd | 0               | _AddSite_009                 | 100.402130 | 19.907417  | FX        | 70              | 2.0          | 30;210        | Type 5       | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |

| Site nr | Type | Network ID     | Art. delay (μs) | Site name                        | Longitude  | Latitude  | Rec. mode | Ant. height (m) | Max ERP (kW) | HRP (degrees) | Antenna type | Ch gr | Ch Mux 1 | Ch Mux 2 | Ch Mux 3 | Ch Mux 4 | Ch Mux 5 | Ch Mux 6 |
|---------|------|----------------|-----------------|----------------------------------|------------|-----------|-----------|-----------------|--------------|---------------|--------------|-------|----------|----------|----------|----------|----------|----------|
| 23.09   | A3   | SFN(1-6) 23-Dd | 0               | _AddSite_008                     | 100.265720 | 20.217040 | FX        | 70              | 1.0          | 0;180         | Type 5       | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 23.10   | A3   | SFN(1-6) 23-Dd | 0               | _AddSite_114                     | 100.292240 | 19.582662 | FX        | 70              | 0.5          | 40            | Type 4       | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 23.11   | A3   | SFN(1-6) 24-Da | 0               | _AddSite_004                     | 100.238690 | 19.100680 | FX        | 70              | 0.5          | 10;190        | Type 5       | Da    | 28       | 31       | 35       | 39       | 51       | 47       |
| 24.00   | M    | SFN(1-6) 24-Da | 40              | Nan_DTT                          | 100.741150 | 18.742640 | FX        | 70              | 50.0         | 10;190        |              | Da    | 28       | 31       | 35       | 39       | 51       | 47       |
| 24.01   | A1   | SFN(1-6) 24-Da | 0               | Chiang Klang (Doi Hin Kaew)      | 100.822040 | 19.219755 | FX        | 22              | 1.0          | 90            | Type 3       | Da    | 28       | 31       | 35       | 39       | 51       | 47       |
| 25.00   | M    | SFN(1-6) 25-De | 0               | Phrae_DTT                        | 100.001030 | 17.932690 | FX        | 64              | 30.0         | 110;190       |              | De    | 45       | 48       | 59       | 56       | 43       | 53       |
| 25.01   | A2   | SFN(1-6) 25-De | 0               | WANG CHIN                        | 99.601694  | 17.909139 | FX        | 58              | 0.5          | 55; 235       | Type 5a      | De    | 45       | 48       | 59       | 56       | 43       | 53       |
| 26.00   | M    | SFN(1-5) 27-Dc | 20              | Utaradit_DTT                     | 100.125433 | 17.619686 | FX        | 120             | 2.0          | 180           |              | Dc    | 41       | 30       | 33       | 37       | 49       | 52       |
| 26.01   | A3   | SFN(1-6) 25-De | 0               | _AddSite_003                     | 100.777810 | 17.844210 | FX        | 70              | 0.5          | 30;210        | Type 5       | De    | 45       | 48       | 59       | 56       | 43       | 53       |
| 27.00   | M    | SFN(1-6) 27-Dc | 0               | Sukhothai_DTT                    | 100.010563 | 16.984763 | FX        | 156             | 50.0         | ND            |              | Dc    | 41       | 30       | 33       | 37       | 49       | 27       |
| 27.01   | A1   | SFN(1-6) 27-De | 0               | Kamphaeng Phet                   | 99.524040  | 16.517987 | FX        | 120             | 1.0          | ND            | Type 1       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 27.02   | A2   | SFN(1-6) 27-De | 0               | KHLONG LAN                       | 99.319228  | 16.204277 | FX        | 90              | 10.0         | 85            | Type 2       | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 27.03   | A2   | SFN(1-6) 30-Db | 0               | NAKHON THAI (KHAO HUAI HIN LAD ) | 100.856456 | 16.873538 | FX        | 72              | 10.0         | ND            | Type 1       | Db    | 40       | 44       | 29       | 32       | 36       | 26       |
| 27.04   | A3   | SFN(1-6) 27-Dc | 0               | _AddSite_001                     | 100.585538 | 16.984139 | FX        | 70              | 10.0         | ND            | Type 1       | Dc    | 41       | 30       | 33       | 37       | 49       | 27       |
| 28.00   | M    | SFN(1-6) 28-Da | 0               | Tak_DTT                          | 98.927687  | 16.778691 | FX        | 80              | 50.0         | 350           |              | Da    | 31       | 35       | 39       | 51       | 47       | 28       |
| 28.01   | A1   | SFN(1-6) 28-Da | 0               | Mae Sot                          | 98.566522  | 16.732602 | FX        | 100             | 5.0          | 260           | Type 2       | Da    | 31       | 35       | 39       | 51       | 47       | 28       |
| 28.02   | A2   | SFN(1-6) 28-Da | 0               | CAT_Phop Phra                    | 98.691930  | 16.392920 | FX        | 70              | 0.5          | 70            | Type 2       | Da    | 31       | 35       | 39       | 51       | 47       | 28       |
| 28.03   | A3   | MFN(1-6) 28-Db | 0               | _AddSite_042                     | 98.391390  | 17.139700 | FX        | 70              | 0.5          | 130;310       | Type 5       | Db    | 32       | 29       | 36       | 26       | 40       | 44       |
| 29.00   | M    | SFN(1-6) 29-Dd | 0               | Nakhon Sawan_DTT                 | 100.133580 | 15.716170 | FX        | 86              | 50.0         | ND            |              | Dd    | 57       | 46       | 50       | 54       | 38       | 34       |
| 29.01   | A1   | SFN(1-6) 27-Dc | 0               | Pichit                           | 100.320572 | 16.448243 | FX        | 33              | 2.0          | 160           | Type 2       | Dc    | 41       | 30       | 33       | 37       | 49       | 27       |
| 29.02   | A2   | SFN(1-6) 29-Dd | 0               | CAT_Lan Sak                      | 99.549740  | 15.460930 | FX        | 70              | 10.0         | 70            | Type 2       | Dd    | 57       | 46       | 50       | 54       | 38       | 34       |
| 30.00   | M    | SFN(1-6) 30-Db | 0               | Phetchaboon_DTT                  | 101.071373 | 16.251014 | FX        | 154             | 10.0         | 10;190        |              | Db    | 40       | 44       | 29       | 32       | 36       | 26       |
| 30.01   | A1   | SFN(1-6) 3-De  | 0               | Wichian Buri                     | 101.103522 | 15.656473 | FX        | 80              | 5.0          | 185;355       | Type 5a      | De    | 53       | 43       | 45       | 48       | 56       | 59       |
| 30.02   | A2   | SFN(1-6) 16-Dd | 0               | TOT_Lom Kao                      | 101.232273 | 16.884594 | FX        | 70              | 0.5          | 10;190        | Type 5       | Dd    | 46       | 50       | 57       | 54       | 38       | 34       |
| 30.03   | A3   | SFN(1-6) 30-Db | 0               | _AddSite_018                     | 100.885630 | 16.668883 | FX        | 70              | 20.0         | 160;340       | Type 5       | Db    | 40       | 44       | 29       | 32       | 36       | 26       |
| 30.04   | A3   | SFN(1-6) 30-Db | 0               | _AddSite_094                     | 100.962687 | 16.270036 | FX        | 70              | 0.5          | 230           | Type 2       | Db    | 40       | 44       | 29       | 32       | 36       | 26       |
| 31.00   | M    | SFN(1-6) 31-Da | 0               | Chumphon_DTT                     | 99.191480  | 10.530810 | FX        | 154             | 50.0         | 40;190        |              | Da    | 51       | 47       | 31       | 35       | 39       | 28       |
| 31.01   | A1   | SFN(1-6) 31-Da | 0               | Lang Suan                        | 99.064853  | 9.959558  | FX        | 120             | 2.0          | 185;355       | Type 5a      | Da    | 51       | 47       | 31       | 35       | 39       | 28       |

| Site nr | Type | Network ID      | Art. delay (μs) | Site name               | Longitude  | Latitude   | Rec. mode | Ant. height (m) | Max ERP (kW) | HRP (degrees) | Antenna type | Ch gr | Ch Mux 1 | Ch Mux 2 | Ch Mux 3 | Ch Mux 4 | Ch Mux 5 | Ch Mux 6 |
|---------|------|-----------------|-----------------|-------------------------|------------|------------|-----------|-----------------|--------------|---------------|--------------|-------|----------|----------|----------|----------|----------|----------|
| 31.02   | A1   | SFN(1-6) 31-Da  | 62              | Tha Sae                 | 99.215555  | 10.835377  | FX        | 32              | 0.5          | 20            | Type 2       | Da    | 51       | 47       | 31       | 35       | 39       | 28       |
| 31.03   | A3   | SFN(1-6) 31-Da  | 0               | _AddSite_116            | 98.9321533 | 10.2387322 | FX        | 70              | 0.5          | 20;200        | Type 5       | Da    | 51       | 47       | 31       | 35       | 39       | 28       |
| 32.00   | M    | SFN(1-6) 32-Dc  | 0               | Ranong_DTT              | 98.669486  | 10.028664  | FX        | 123             | 15.0         | 20;200        |              | Dc    | 49       | 30       | 37       | 41       | 33       | 27       |
| 32.01   | A3   | SFN(1-6) 31-Da  | 0               | _AddSite_041            | 98.894538  | 10.482280  | FX        | 70              | 10.0         | 20;200        | Type 6       | Da    | 51       | 47       | 31       | 35       | 39       | 28       |
| 33.00   | M    | SFN(1-6) 33-Db  | 0               | Surat Thani_DTT         | 99.348530  | 9.092330   | FX        | 84              | 50.0         | 270           |              | Db    | 26       | 36       | 40       | 44       | 32       | 29       |
| 33.01   | A1   | SFN(1-6) 33-Dd  | 0               | Ko Samui                | 99.988110  | 9.490660   | FX        | 60              | 0.5          | 5;195         | Type 5a      | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 33.02   | A2   | SFN(1-6) 34-Dd  | 0               | PHANOM (SURAT THANI)    | 98.800205  | 8.835879   | FX        | 45              | 10.0         | ND            | Type 1       | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 33.03   | A3   | SFN(1-6) 32-Dc  | 0               | _AddSite_036            | 98.809130  | 9.665117   | FX        | 70              | 0.5          | 10;190        | Type 5       | Dc    | 49       | 30       | 37       | 41       | 33       | 27       |
| 33.04   | A3   | SFN(1-6) 33-Db  | 0               | _AddSite_095            | 99.489974  | 8.695960   | FX        | 70              | 10.0         | 200           | Type 4       | Db    | 26       | 36       | 40       | 44       | 32       | 29       |
| 33.05   | A3   | SFN(1-6) 33-Dd  | 0               | _AddSite_117            | 100.026494 | 9.532565   | FX        | 70              | 0.1          | 50            | Type 4       | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 34.00   | M    | SFN(1-6) 34-Da  | 0               | Phuket_DTT              | 98.395300  | 7.898710   | FX        | 64              | 25.0         | 50            |              | Da    | 35       | 39       | 51       | 47       | 31       | 28       |
| 34.01   | A1   | SFN(1-6) 34-Dd  | 0               | Takua Pa                | 98.350806  | 8.839694   | FX        | 60              | 2.0          | 185;355       | Type 5a      | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 34.02   | A1   | SFN(1-6) 34-Da  | 0               | Krabi                   | 98.906656  | 8.063000   | FX        | 100             | 5.0          | ND            | Type 1       | Da    | 35       | 39       | 51       | 47       | 31       | 28       |
| 34.03   | A1   | SFN(1-6) 34-Da  | 0               | Phang-nga               | 98.506540  | 8.434645   | FX        | 100             | 2.0          | ND            | Type 1       | Da    | 35       | 39       | 51       | 47       | 31       | 28       |
| 34.04   | A2   | SFN(1-6) 34-Da  | 0               | PA TONG                 | 98.316287  | 7.880979   | FX        | 35              | 0.5          | 310           | Type 4       | Da    | 35       | 39       | 51       | 47       | 31       | 28       |
| 34.05   | A2   | SFN(1-6) 34-Da  | 0               | THALANG                 | 98.329306  | 8.033861   | FX        | 35              | 2.0          | ND            | Type 1       | Da    | 35       | 39       | 51       | 47       | 31       | 28       |
| 34.06   | A2   | SFN(1-6) 34-Dd  | 0               | PLAI PHRAYA             | 98.863561  | 8.529853   | FX        | 87              | 10.0         | ND            | Type 1       | Dd    | 38       | 50       | 46       | 34       | 54       | 57       |
| 34.07   | A3   | SFN(1-6) 34-Da  | 0               | _AddSite_092            | 98.363047  | 8.532641   | FX        | 70              | 2.0          | ND            | Type 1       | Da    | 35       | 39       | 51       | 47       | 31       | 28       |
| 35.00   | M    | SFN(1-6) 35-Dc  | 0               | Nakhon Sri Thumarat_DTT | 99.977210  | 8.366790   | FX        | 124             | 30.0         | 140;320       |              | Dc    | 30       | 33       | 37       | 41       | 49       | 27       |
| 35.01   | A1   | SFN(1-6) 35-Dc  | 0               | Thung Song              | 99.489998  | 8.210180   | FX        | 63              | 10.0         | 270           | Type 7a      | Dc    | 30       | 33       | 37       | 41       | 49       | 27       |
| 35.02   | A2   | SFN(1-6) 33-Db  | 0               | TOT_Khao Dat Fa         | 99.825820  | 9.118560   | FX        | 70              | 0.5          | 350           | Type 2       | Db    | 26       | 36       | 40       | 44       | 32       | 29       |
| 35.03   | A3   | SFN(1-6) 35-Dc  | 0               | _AddSite_118            | 99.801770  | 8.199539   | FX        | 70              | 10.0         | 195           | Type 4       | Dc    | 30       | 33       | 37       | 41       | 49       | 27       |
| 36.00   | M    | MFN(1-6) 36-De  | 0               | Trang_DTT               | 99.486511  | 7.656956   | FX        | 126             | 40.0         | 260           |              | De    | 43       | 59       | 48       | 53       | 56       | 45       |
| 37.00   | M    | SFN(1-6) 37-TDa | 0               | Song Khla_DTT           | 100.519690 | 7.015170   | FX        | 66              | 50.0         | 230           |              | TDa   | 50       | 42       | 46       | 38       | 26       | 34       |
| 37.01   | A2   | SFN(1-6) 39-TDb | 0               | THEPHA                  | 100.938000 | 6.739820   | FX        | 50              | 10.0         | ND            | Type 1       | TDb   | 32       | 48       | 36       | 44       | 28       | 40       |
| 37.02   | A2   | SFN(1-6) 37-TDa | 0               | NA THAWI                | 100.691846 | 6.741278   | FX        | 47              | 10.0         | ND            | Type 1       | TDa   | 50       | 42       | 46       | 38       | 26       | 34       |
| 38.00   | M    | SFN(1-5) 37-TDa | 0               | Satun_DTT               | 100.025600 | 6.635370   | FX        | 64              | 30.0         | 270           |              | TDa   | 50       | 42       | 46       | 38       | 26       | 52       |
| 38.01   | A3   | SFN(1-6) 37-TDa | 0               | _AddSite_074            | 100.077530 | 6.973240   | FX        | 70              | 10.0         | 230           | Type 2       | TDa   | 50       | 42       | 46       | 38       | 26       | 34       |

| Site nr | Type | Network ID      | Art. delay (μs) | Site name    | Longitude  | Latitude | Rec. mode | Ant. height (m) | Max ERP (kW) | HRP (degrees) | Antenna type | Ch gr | Ch Mux 1 | Ch Mux 2 | Ch Mux 3 | Ch Mux 4 | Ch Mux 5 | Ch Mux 6 |
|---------|------|-----------------|-----------------|--------------|------------|----------|-----------|-----------------|--------------|---------------|--------------|-------|----------|----------|----------|----------|----------|----------|
| 39.00   | M    | SFN(1-6) 39-TDb | 0               | Yala_DTT     | 101.387220 | 6.336110 | FX        | 84              | 30.0         | 120           |              | TDb   | 32       | 48       | 36       | 44       | 28       | 40       |
| 39.01   | A1   | SFN(1-6) 39-TDb | 0               | Betong       | 101.051735 | 5.771216 | FX        | 100             | 1.0          | ND            | Type 1       | TDb   | 32       | 48       | 36       | 44       | 28       | 40       |
| 39.02   | A1   | SFN(1-6) 39-TDb | 0               | Su-ngai Padi | 101.283149 | 6.477219 | FX        | 80              | 2.0          | 90            | Type 3       | TDb   | 32       | 48       | 36       | 44       | 28       | 40       |
| 39.03   | A1   | SFN(1-6) 39-TDb | 0               | Narathiwat   | 101.801944 | 6.411111 | FX        | 100             | 2.0          | 210           | Type 3       | TDb   | 32       | 48       | 36       | 44       | 28       | 40       |
| 39.04   | A3   | SFN(1-6) 39-TDb | 32              | _AddSite_119 | 101.924532 | 6.055026 | FX        | 70              | 1.0          | 30;210        | Type 5       | TDb   | 32       | 48       | 36       | 44       | 28       | 40       |
| 39.05   | A3   | SFN(1-6) 39-TDb | 0               | _AddSite_120 | 101.511731 | 6.748860 | FX        | 70              | 5.0          | 10;190        | Type 5       | TDb   | 32       | 48       | 36       | 44       | 28       | 40       |

Table 7: Summary of DTTB Plan 3.2

## Annex 3 Transmitting antenna diagrams

In June 2014 the network operators agreed on 45 A1 sites, mainly existing TV sites, to be used for planning of additional DTTB sites. In addition a number of telecom sites were indicated which could be used for planning of additional DTTB sites (A2 sites). The location and antenna height of the A1 and A2 sites and the antenna patterns of the A1 sites were provided by NBTC.

All A1 sites were taken into account in the planning process with the antenna characteristics provided. In a few cases the antenna diagram or the orientation was changed in order to obtain better coverage or to avoid interference (either self-interference in a SFN or interference from sites outside the SFN). At A2 and A3 sites, initially an antenna was selected from six standardized antenna patterns (Antenna types 1, 2, 3, 4, 5 and 6 of Table 8).

On 9 September 2014, after having consulted the Network operators, NBTC provided new antenna patterns and orientations for all A1 sites and A2 sites. At that stage the detailed MFN/SFN planning was almost finalised. After consultation with the ITU-team, NBTC indicated that the newly provided antenna patterns should be applied at three A1 sites because at these sites the existing antennas will be used. Furthermore the newly provided antennas should be considered carefully at eleven A1 sites.

This annex gives an overview of the types of antennas applied at additional sites in Plan 3.2.

### 1. Applied antennas

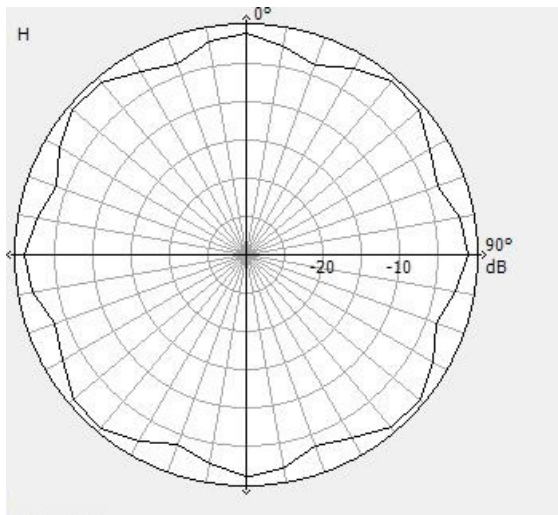
The antennas applied at the additional sites in DTTB Plan 3.2 are summarised in Table 8 and Figure 2.

| #  | Type            | Description                                    | Source   |
|----|-----------------|--|--|
| 1  | ND              | Non-directional                                | “Omni” from sites in list of 45 sites, e.g. at Khao Phu-liab |
| 2  | Directional     | Wide beam                                      | “Directional” in list of 45 sites, e.g. at Khao Chalak       |
| 3  | Directional     | Wide beam and null in one direction            | “H pattern” in list of 45 sites, e.g. at Phu Sing, Kalasin   |
| 3a | Directional     | Wide beam and null in one direction “Dir-2-90” | Provided at 9 September 2014, e.g. at Khao Chalak            |
| 4  | Directional     | Narrow beam                                    | Panel, e.g. gap filler BKA0152                               |
| 5  | Two directional | Two main directions                            | Pattern of main site Petchaboon                              |
| 5a | Two directional | Two main directions “Ellipse H”                | Provided at 9 September 2014 e.g. at Bo Thong                |
| 6  | Two directional | Two main directions and null in one direction  | Pattern of main site Phrea                                   |
| 7  | Directional     | Wide ellipse                                   | Pattern of Hua Hin   |
| 7a | Directional     | Wide ellipse                                   | Pattern of Thung Song  |

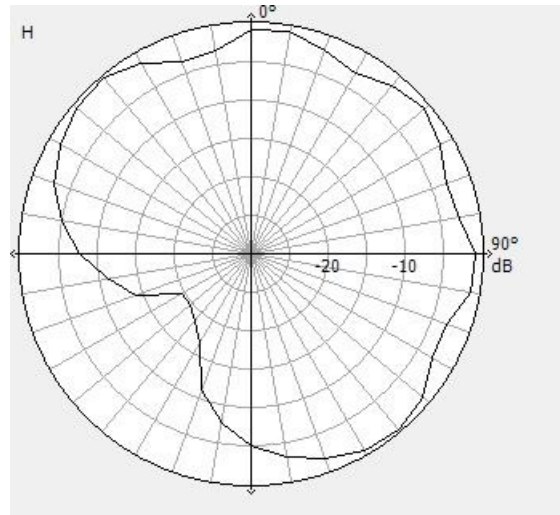
Table 8: Standardised antenna patterns

The antenna types 1, 2, 3, 4, 5 and 6 were either provided in June 2014 by NBTC for A1 sites with a specified orientation, or were selected in the planning process for a site depending on the coverage and interference situation.

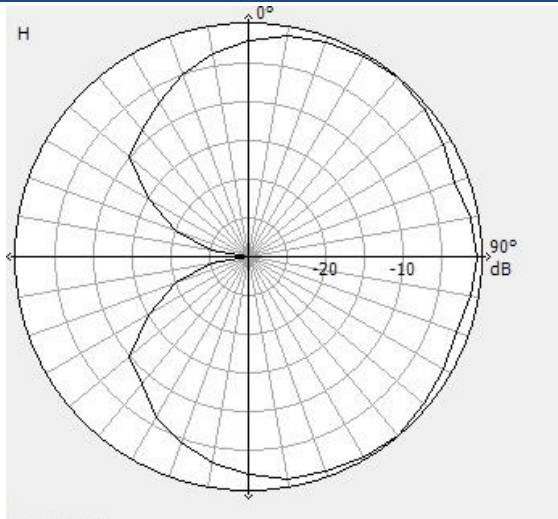
The antenna types 1, 2, 3a, 4, 5a, 7 and 7a with a specified orientation were provided on 9 September for A1 and A2 sites.



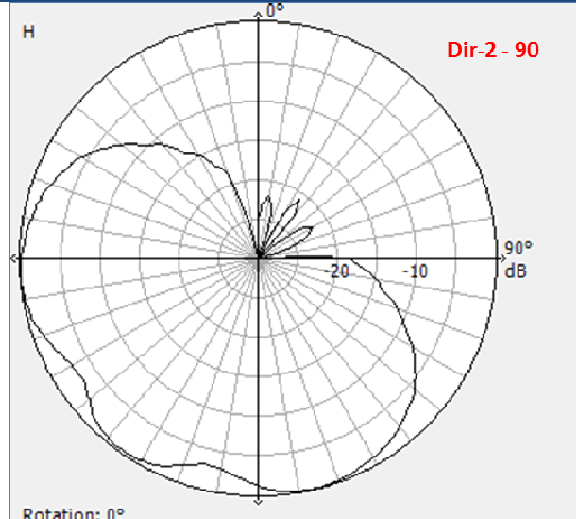
Type 1, non-directional



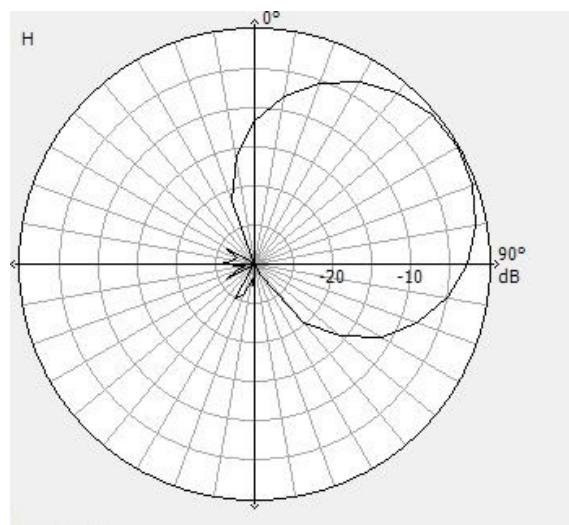
Type 2, wide beam



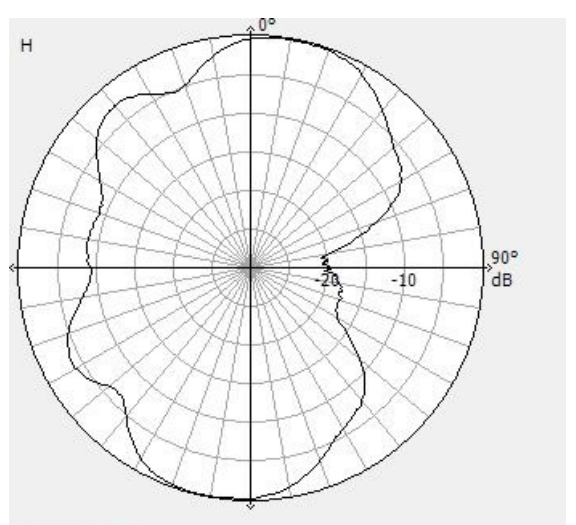
Type 3, wide beam and null in one direction



Type 3a, Wide beam and null in one direction



Type 4, Narrow beam



Type 6, Two main directions and null in one direction



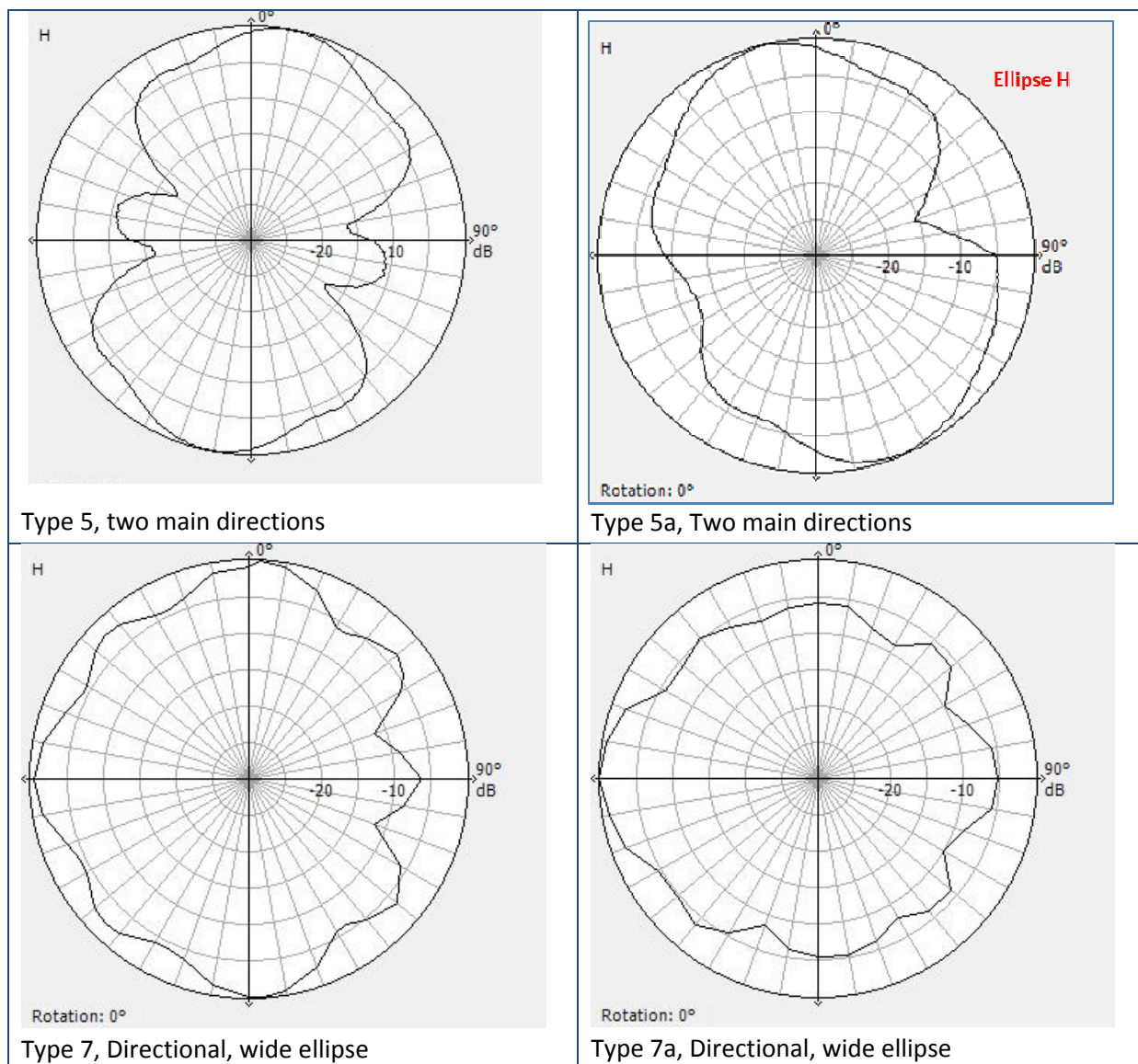


Figure 2: Antenna patterns of additional sites in Plan 3.2

## 2. Antennas provided at 9 September 2014

NBTC requested to apply the antennas provided at 9 September at three A1 sites, because at these sites the existing antennas will be used. Furthermore NBTC requested to consider carefully the antennas at eleven A1 sites. These sites<sup>1</sup> are summarized in Table 9 .

| Request                                | Site number  |
|--|--|
| 1. Antennas that should be applied     | 7.01, 7.03, 35.01  |
| 2. Antennas to be considered carefully | 8.01, 8.02, 10.01, 15.01, 23.01, 3.03, 3.04, 5.01, 7.02, 22.01 |

Table 9: Application of antenna patterns requested on 9 September 2014

<sup>1</sup> One of the eleven sites, “Khao Phu-liab,” was deleted in the course of the planning process. For that reason ten sites are indicated in item 2 of Table 9.



The ITU-team compared the compatibility and coverage of the sites with the antennas provided on 9 September 2014 with the planning results at that stage. At the moment the following antennas were applied:

- a) Antennas provided on 18 June at A1 sites 7.01, 35.01,10.01, 15.01, 23.01, 3.03, 3.04, 5.01, 7.02 and 22.01;
- b) Antenna patterns applied during the planning process to resolve incompatibilities or to provide better coverage at A1 sites 7.03, 8.01 and 8.02.

With regard to the antennas to be considered carefully, the new antenna with the given orientation was applied if:

- a) Compatibility was acceptable according to the procedures described in the planning method;
- b) Coverage was not significantly reduced.

The results of the investigations are summarised in Table 10. The antennas at sites that should be applied are shaded light blue; coverage comparison at these antennas was not made.

| Site nr | Request            | Compatibility comparison | Coverage comparison | HRP main directions (degrees) | Applied antenna                  |
|---------|--------------------|--------------------------|---------------------|-------------------------------|----------------------------------|
| 3.03    | Consider carefully | More interference        | Minus 16 k HH       | 90                            | Type 2                           |
| 3.04    | Consider carefully | Ok                       | Plus 1k HH          | 45                            | Type 3a, as requested at 9 Sept. |
| 5.01    | Consider carefully | Ok                       | Minus 4k HH         | 160                           | Type 4, as requested at 9 Sept.  |
| 7.01    | Should be applied  | Ok                       | -                   | 270                           | Type 7, as requested at 9 Sept.  |
| 7.03    | Should be applied  | Ok                       | -                   | 25;195                        | Type 5a, as requested at 9 Sept. |
| 7.02    | Consider carefully | Ok                       | No difference       | 70                            | Type 2, as requested at 9 Sept.  |
| 8.01    | Consider carefully | More interference        | Minus 32k HH        | 295                           | Type 2                           |
| 8.02    | Consider carefully | Ok                       | Plus 13k HH         | 225                           | Type 3a, as requested at 9 Sept. |
| 10.01   | Consider carefully | Ok                       | Plus 53k HH         | 255                           | Type 3a, as requested at 9 Sept. |
| 15.01   | Consider carefully | Ok                       | No change           | ND                            | Type 1, as requested at 9 Sept.  |
| 22.01   | Consider carefully | Ok                       | Minus 2k HH         | 135                           | Type 3a, as requested at 9 Sept. |
| 23.01   | Consider carefully | Ok                       | Minus 2k HH         | 60                            | Type 2, as requested at 9 Sept.  |
| 35.01   | Should be applied  | Ok                       | -                   | 270                           | Type 7a, as requested at 9 Sept. |

Table 10: Summary of the conclusions on the requested antennas at 13 A1 sites

At fifteen of the remaining A1 sites and at six A2 sites one of the antenna patterns requested at 9 September was selected because of better coverage while the compatibility was not reduced. At the other A1, A2 and A3 sites antenna pattern 1, 2, 3, 4, 5 or 6 were applied.

In Annex 2 the selected antenna type and orientation of each of the additional sites is indicated.