

**Practical Principle and
Technical Standards
Addendum 2 to DAB+ Plan
(DAB+ Transmitter Technical
Specifications)**

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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. Summary

The Office of the National Broadcast and Telecommunications Commission, hereinafter 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 frameworks and to provide guidance for the telecommunications and broadcast industry.

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

This Addendum 2 to the Practical Principle and Technical Standards for DAB+ National and Local Planning report includes the Consultant’s recommendation in respect to a technical standard for digital sound broadcasting transmitters for the implementation of the DAB+ system in Thailand.

2. Scope of the Document

NBTC has requested the Consultant to provide a recommendation for a DAB+ radio transmitter technical specification for the introduction of the DAB+ services in Thailand. Understanding the strong integration of the international economy regarding consumer electronics and relating market mechanisms from a manufacturer's perspective, it is recommended that the Thailand DAB+ transmitter technical specifications should align with an international or, at least, an ASEAN regional standard.

In addition to the United Kingdom and Australia a very few other countries in the world have officially launch a commercial operation of a DAB+ system. Therefore, to maximise receiver compatibility, portability between countries and economy of scale for manufacturers, all of which will result in lower equipment prices, the Consultant recommends that Thailand adopts an existing standard for the benefit of the consumers in Thailand rather than creating its own standard.

The Consultant's recommendation, which is based on an existing standard, represents the minimum transmitter specification that should form part of the technical DAB+ spectrum management framework.

3. Minimum Technical Specifications for DAB+ Transmitters

In the following the Consultant lists the recommended minimum technical specifications for DAB+ transmitters.

3.1 EMC Specifications

DAB+ transmitters should be compliant with the ElectroMagnetic Compatibility (EMC) standard for radio equipment and services EN 301 489-11.

3.2 Health and Safety Specifications

DAB+ transmitters should be compliant with the IEC 215 standard on Safety requirements for radio transmitting equipment.

Additionally, the DAB+ transmitter and its installation shall be compatible with the International Commission on non-ionizing radiation protection's "Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz), including the information provided in the ICNIRP "Statement on the "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)" and the high frequency review of 2009.

3.3 Transmission Standards

DAB+ transmitters should be compliant with the following transmissions standards:

- EN 300 401: Digital Audio Broadcasting (DAB to mobile, portable and fixed receivers
- EN 302 077-1: Transmitting equipment for the Terrestrial – Digital Audio Broadcasting (T-DAB) service; Part 1: Technical characteristics and test methods
- EN 302 077-2: Transmitting equipment for the Terrestrial – Digital Audio Broadcasting (T-DAB) service; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive
- TS 102 563: Transport of Advanced Audio Coding (AAC) audio
- TS 101 756: Registered Tables
- TS 102 427: Data Broadcasting – MPEG-2 TS streaming

3.4 Frequency Range

Transmitters should be capable of broadcasting DAB+ signals in the frequency range of 174 MHz to 240 MHz. The centre frequencies of the transmitted signal should comply with the preferred Band III frequencies specified in ETSI TR 101 496.

The recommended frequency allocation is presented in the following table:

Block	Centre Frequency
5A	174.928 MHz
5B	176.640 MHz
5C	178.352 MHz
5D	180.064 MHz
6A	181.936 MHz
6B	183.648 MHz
6C	185.360 MHz
6D	187.072 MHz
7A	188.928 MHz
7B	190.640 MHz
7C	192.352 MHz
7D	194.064 MHz
8A	195.936 MHz
8B	197.648 MHz
8C	199.360 MHz
8D	201.072 MHz
9A	202.928 MHz
9B	204.640 MHz
9C	206.352 MHz
9D	208.064 MHz
10A	209.936 MHz
10B	211.648 MHz
10C	213.360 MHz
10D	215.072 MHz
11A	216.928 MHz
11B	218.640 MHz
11C	220.352 MHz

Block	Centre Frequency
11D	222.064 MHz
12A	223.936 MHz
12B	225.648 MHz
12C	227.360 MHz
12D	229.072 MHz

Table 1: Frequency Allocation Table

3.5 Emission Mask

All regular power transmitters (with a resulting ERP above 100 Watts) should be compliant with the “Critical Mask” as defined in section 4.6 of the ETSI document ‘TR 021 – Technical Bases for T-DAB Services Network Planning and Compatibility with Existing Broadcasting Services’. Transmitters, operating as repeater or under a resulting ERP of 100 W should comply with the Case 2 emission mask. The Masks have been reproduced below:

Power level measured in a 4 kHz bandwidth where 0 dB corresponds to the total output power

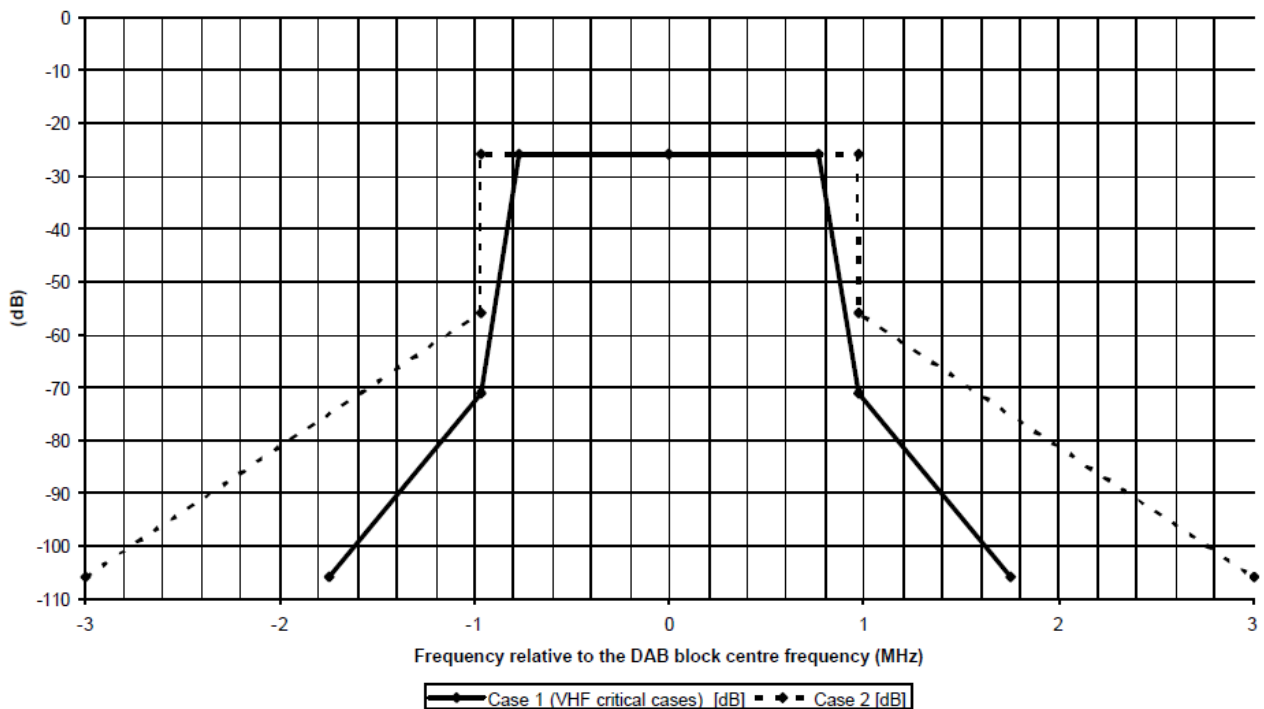


Figure 1: DAB Emission Masks

3.6 Frequency Accuracy

The center carrier deviation should not be more than 1 kHz of the assigned frequency.

3.7 Audio Encoding

Audio encoding should conform to the MPEG-4 High Efficiency Advanced Audio Coding v2 (HE AAC v2) Layer 2 profile as described in the documents ISO/IEC 14496-3 (Audio MPEG4 AAC Standard) and ETSI TS 102 563.

4. Conclusions and Recommendations

For the reasons outlined above it is highly recommended by the Consultant that the NBTC should adopt as much as possible an existing international standard or regional standard and avoid developing an own Thai specific standard. When adopting an existing standard, Thailand and the NBTC respectively will, apart from the benefits mentioned above, also benefit automatically from any improvement in the respective international or regional standard.

Additionally, in order to be compatible with the common practices used in United Kingdom and Australia, the Consultant recommends:

- The NBTC should provide a transmitter certification based on the proof that the transmission mask, as described in section 3.5, is met by the operator;
- The operators are responsible to decide which characteristics of the standards shall be implemented.

5. References

The Consultant derived the presented recommendation on the following sources and documents that describe and define international specifications that are considered as the fundamental basis of the DAB and DAB+ technology:

- ETSI EN 300 401 Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to Mobile, Portable and Fixed receivers.
- ETSI TS 101 756 Digital Audio Broadcasting (DAB); Registered Tables.
- ETSI TS 102 563 Digital Audio Broadcasting (DAB); Transport of Advanced Audio Coding (AAC) audio.
- ETSI TR 101 496 Digital Audio Broadcasting (DAB); Guidelines and rules form implementation and operation; (Parts 1 and 2).
- ETSI 300 384 Radio broadcasting systems; Very High Frequency (VHF), frequency modulated, sound broadcasting transmitters
- BS EN 62104:2007 Characteristics of DAB Receivers
- ETSI TS 103 176 Digital Audio Broadcasting (DAB); Rules of implementation; Service information features

ETSI standards are available and can be retrieved free of charge from the ETSI's website www.etsi.org.