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Transport, Energy and Communications DETEC
Federal Office of Communications OFCOM

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Technical Standard

concerning

DAB / DAB + In-House low power Repeaters

Titre and French: **Norme technique** concernandant les **réémetteurs DAB band III de faible great destinations for** future exploitation of the interior.

Title on German: **Technical standard** concerning the **Band III DAB Umsetzer von lesser Performance** which is incorporated into buildings.

Titolo in italiano: **Norma tecnica** relative a **ripetitori DAB band III bass potenza** destinati ad essere esercitati nelle case.

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OFCOM
 Rue de l'Avenir 44
 Case postale
 CH-2501 Biel-Bienne
 www.ofcom.admin.ch

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1 General

1.1 Foreword / introduction / introduction / introductions

This technical standard specifies, for Band III DAB / DAB + In-House low power Repeaters, the essential requirement of effective use of the spectrum in accordance with Article 7 paragraph 2 TIO (Ordinance on Telecommunications Installations [I.2]). Products manufactured in compliance with the requirements of this technical standard benefit from a presumption of conformity with the corresponding essential requirements. This standard is published in the Official Federal Gazette as designated technical standard in accordance with Article 31 paragraph 2 letter a TCA (Telecommunications Act of 30 April 1997 [I.1]) and Article 4 paragraph 2 TIO [I.2].

Note for placing on the market outside Switzerland: This standard is not harmonized standard according to the European RED Directive, it does not provide presumption of conformity with the essential requirement of effective use of radio spectrum outside Switzerland.

Some standard technique concrete for the repairs of the fables DAB / DAB + band III destined for more exploitation in the interior of the furnishings, the essential essential utilization efficiently spectra selon l'art. 7 al. 2 de l'OIT (Ordinance for installation of telecommunications [I.2]).

Son respect permits the presumption that exigence is essential to remit. Elle est public

dance to the federal federal standards for the design of art. 31, al. 2, easy. a, LTC (Loi sur les télécommunications du 30 avril 1997 [1.1]) an art. 4, al. 2, OIT ([1.2]).

Note the concern of the march to the exterior of the Suisse: This is a norm but not fit a standard harmonic in the sense of the European directive RED, or no pose before presumption the conformity to the essence of the utilization of efficient spectra and dehors de la Suisse.

The suite of documents is editable and langue anglaise.

This technical standard provides for band III DAB turnover of lower performance, which Buildings are built, the basic requirements can be used efficiently of the spectrum in agreement with Art. 7 Abs. 2 FAV (Regulation on remote control systems) [1.2]) fixed. Words contained in this technical standard include requirements, so it is suspected that this basic requirement is fulfilled. This norm is in the official magazine as designated standard in agreement with Art. 31 Abs. 2 Bst. and FMG (Federal Law of 30) April 1997 [1.1]) and Art. 4 Abs. 2 FAV [1.2] published.

Note on commissioning outside Switzerland in terms of the European RED-Guideline: Since this standard is not a harmonized norm within the RED guideline, it mediates Outside Switzerland there is no compliance requirement for the basic requirement efficient spectrum utilization.

The further content of these documents is in English language.

Questa norma tecnica concretizza, per i ripetitori DAB band III a bassa potenza destinati ad this is an esceritati nelle case, l'esigenza foundation per l'uso efficient dello spettro ai sensi dell'art. 7 cpv. 2, OIT (Ordinanza sugli impianti di telecomunicazione [1.2]). Il rispetto di questa norma tecnica presume che questa esigenza fondamentale sia adempiuta. Questa norma è pubblicata nel Foglio federal come norme designata ai sensi dell'art. 31, cpv. 2, easy. a, LTC (Adding April 30, 1997 should telecomunicazioni [1.1]) e dell'art. 4, cpv. 2, OIT (Ordinanza sugli impianti di telecomunicazione [1.2]).

Services related to the emission in commercial al di fuori dalla Svizzera. Poiché la questa norma non è una norma armonizzata ai sensi della direttiva europea RED, non presuppone la conformità al requisito fundamental concern to the utilizzo effective del spettro al di fuori dalla Swizzle.

The rest of the document is written in lingua lingua.

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1.2 Scope

The present document specifies the technical characteristics, test methods, limits and the requirements for low power In-door DAB / DAB + Repeaters. The present document is applicable to **full-band** , **multi-block** and **single-block** DAB / DAB + repeater systems operating on radio frequencies in the Band III (174-230 MHz).

1.3 References

References are either specific (identified by date of publication and / or edition number or version) number) or non-specific. For specific references, only the cited version applies. For non-specific

references, the latest published version of the reference document (including any amendments) applies.

1.4 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 302 077-1 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the Terrestrial - Digital Audio Broadcasting (T-DAB) service; Part 1: Technical characteristics and test methods "
- [2] ETSI EN 300 401 "Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers ”
- [3] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics ”.
- [4] ETSI EG 200 053 "Electromagnetic compatibility and Radio spectrum Matters (ERM); Radio site engineering for radio equipment and systems ".

1.5 Legal references

The following referenced documents are legal documents.

- [1.1] SR 784.10; Telecommunications Act of April 30, 1997 (TCA).
- [1.2] SR 784.101.2; Ordinance of November 25, 2015 on Telecommunications Installations (FAV).
- [1.3] SR 784.101.21 / RIR0201-35; Technical interfaces regulations In-door low power DAB / DAB + Repeater Band III. The technical interface regulations are published in Appendix 2 of the Decree of OFCOM on telecommunication equipment EVER; SR 784.101.21.

1.6 Informational references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Directive 2014/53 / EU of the European Parliament and of the Council of 16 April 2014 related to the making available on the market of radio equipment (RED).

2 Definitions and abbreviations

2.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

antenna port: port of an apparatus which is designed, in normal operation, to be connected to an antenna using coaxial cable

block: a DAB block is a frequency channel 1.536 MHz wide.

broadcasting service: radiocommunication service in which the transmissions are intended direct reception by the general public

cabinet radiation: radiation from an enclosure containing, equipment, excluding radiation from connected antennas or cables

class of emission: set of characteristics of an emission, designated by standard symbols, eg type of modulation of the main carrier, modulating signal, type of information to be transmitted, and also, if appropriate, any additional signal characteristics

DAB / DAB + repeater: directional Radio Frequency (RF) amplifier, which is used to amplify and transmit a received DAB / DAB + signal in the DAB frequency band (eg signal from a DAB + base station).

dBc: decibels relative to the unmodulated carrier power of the emission

NOTE: In the cases, which do not have a carrier, for example in some digital modulation schemes where the carrier is not accessible for measurement, the reference level is equivalent to dBc decibels relative to the mean power P.

dBi: decibels relative to the hypothetical isotropic antenna, which uniformly distributes energy all directions

enclosure port: physical boundary of the apparatus through which electromagnetic fields may radiate or impinge

NOTE: In the case of integral antenna equipment, this port is inseparable from the antenna port.

full-band repeater: repeater, which is designed to retransmit the entire Band III Frequency (174 - 230 MHz; block 5A to block 12D). Repeater, which is designed for operation on a subset or Band III, is not considered a full-band repeater; it is a multi-block repeater or a single-block repeater.

harmonic: component of order greater than 1 of the Fourier series of a periodic quantity

intermodulation products: unwanted frequencies resulting from intermodulation between carriers or harmonics of emission, or between any oscillations generated to produce the carrier

mean power: average power supplied to the antenna port by a transmitter during an interval of time sufficiently long compared to the lowest frequency encountered in the modulation envelope tasks under normal operating conditions

multi-block repeater: repeater which is designed for operation on more than one DAB / DAB + frequency block.

necessary bandwidth: for a given class of emission, the width of the frequency band which is sufficient to ensure the transmission of information at the rate and with the quality required below specified conditions

rated output power: power that the transmitter or repeater will deliver at its output under specified conditions of operation

maximum total radiated power: maximum power that the repeater together with the transmit assembly antenna shall radiate under specified conditions of operation

reference bandwidth: bandwidth in which the emission level is specified

RMS power: the apparent power of an AC power calculated by multiplying root-mean-square (rms) current at the root mean square voltage

single-block repeater: repeater which is designed for operation on a single DAB / DAB + frequency block.

spurious emissions: emissions on a frequency or frequencies that are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions and intermodulation products.

2.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

BER	Bit Error Ratio
COFDM	Coded Orthogonal Frequency Division Multiplex
CW	Continuous Wave
EMC	ElectroMagnetic Compatibility
OJ	Equipment Under Test
Hz	Hertz (cycles per second)
IEC	International Electrotechnical Commission
IF	Intermediate Frequency
ITU	International Telecommunications Union
PRBS	Pseudo Random Binary Sequence
R & TTE	Radio and Telecommunications Terminal Equipment
RF	Radio Frequency
rms	root mean square
SFN	Single Frequency Network
T-DAB	Terrestrial - Digital Audio Broadcast
Tx	Transmitter
VHF	Very High Frequency
W	Watt

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3 Technical requirements specifications and limits

3.1 Introduction

Any low power DAB / DAB + repeater should amplify one or more DAB RF frequency blocks, the transmit frequency shall be the same as receive frequency.

The apparatus shall **include filters** to obtain the necessary protection against the users of adjacent frequency bands and ensure that the spurious emissions and intermodulation products of the low power DAB / DAB + repeater remain within the limits. The repeater shall operate within the frequency bands defined in the Technical Interfaces Regulations for In-door Low power DAB / DAB + Repeaters Band III; RIR0201-35 [1.3].

Receive antenna (located generally outside the building) and transmit antenna (located inside the building) **gain and directivity** shall be specified by the manufacturer of the low power DAB / DAB + repeater.

The gain characteristics of this antennal should be:

- receive antenna gain equal or higher than +7 dBi.
- transmit antenna gain should not exceed + 6 dBi.

The repeater may have a **gain regulation** to enable the correct gain adjustment according to the received signal strength, the cable attenuation, and the antenna coupling factor (indoor antenna - outdoor antenna). This may be a manual and / or an automatic adjustment mechanism.

The coaxial cable used between receive antenna (outside the building) and the other parts of the repeater should have good shielding effectiveness to avoid any feedback loop (TX to RX via the coaxial cable). The **shielding effectiveness** of this coaxial cable should be better than 50 dB within the operating range of the repeater.

3.2 Basic rules, EC 200 053

The basic rules described in the ETSI guide "Radio site engineering for radio equipment and mobile service systems, EG 200 053 "[4] apply to equipment that falls within the scope of this document. The rules stated in clause 5.5 "Repeaters", where installation recommendations (clause 5.5.4) listed are particularly noteworthy. For example, these rules are applicable:

- antenna coupling,

- maximum gain (which will depend on the antenna coupling loss or isolation),
- necessary isolation between several systems,
- the use of filters to obtain the necessary protection against co-located radiocommunication equipment,
- etc.

Annexe H, "Equipment used to avoid radio frequency problems", will provide useful information on the connection between several radiocommunication equipment.

Annexe N, "Radiocommunication in confined spaces", applies particularly to equipment intended to be operated in tunnels and confined spaces.

The design principle, the installation rules, the specification calculation described in the EG 200 053 are to be considered and taken into account.

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3.3 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the manufacturer of the equipment. The equipment must comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

3.4 Nominal DAB RF Test Signal

A nominal DAB RF test signal according to EN 300 401 [2] clause 15.3 for transmission mode I and fulfilling the critical mask defined in EN 300 401 [2] clause 15.4 shall be applied to the RX antenna port, the level of this signal should be set to produce the nominal TX output power (according to manufacturer's declaration).

The frequency of this RF test signal should be adjusted according to the description of each test procedure below.

3.5 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value compared to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;

For the test methods, according to the present document, the measurement uncertainty figures

shall be calculated in accordance with TR 100 028 [3] and shall correspond to an expansion factor (coverage factor) $k = 1.96$ or $k = 2$ (which provide 95% confidence levels, respectively) 95.45% in the case where the distributions characterize the actual measurement uncertainties are normal (Gaussian)).

The particular expansion factor used for the evaluation of the measurement uncertainty shall be stated in the report.

3.6 Requirements, limits and test procedure

3.6.1 Maximum radiated total power

3.6.1.1 Definition

The total power of the signal from a T-DAB repeater is defined as the long-term average of the time-varying short-term signal power.

For full-band repeaters, the total power of the signal from a T-DAB Band III repeater is the radiated power resulting in the simultaneous application of several signals to the RX port of this repeater.

For multi-block or single-block repeaters, the total power of the signal of a T-DAB Band III repeater is the radiated power resulting in the application of a single signal to the RX port of this repeater.

For devices with a permanent 50 Ω or 75 Ω TX antenna connector, the maximum declared TX antenna gain “G” in dB has to be taken into account to determine the maximum radiated total power “P” in dBm as follows.

$$P = A + G$$

According to “A” is the maximum output power in dBm that the repeater delivers at its TX antenna port.

For devices without a permanent 50 Ω or 75 Ω port, the effective radiated power should be measured.

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3.6.1.2 Limit

3.6.1.2.1 Limit applicable to full-band repeater

The maximum radiated total power should not exceed -5.15 dBm (305 μ W) erp

3.6.1.2.2 Limit applicable to all repeaters except full-band repeaters

The maximum radiated total power should not exceed -12.15 dBm (61 μ W) erp.

3.6.1.3 Conformance

3.6.1.3.1 Full-band repeater

The repeater should be set to maximum gain. Five nominal DAB RF test signals according to clause [3.4](#) of this document shall be applied simultaneously via a coupling device to the RX antenna port, the level of this signal should be increased by 10 dB. The frequency of the 5 DAB RF test signal should be:

1st test signal: $F_c = 174,928$ MHz (Block 5A)

2nd test signal: $F_c = 188,928$ MHz (Block 7A)

3rd test signal: $F_c = 202,928$ MHz (Block 9A)

4th test signal: $F_c = 216,928$ MHz (Block 11A)

5th test signal: $F_c = 229.072$ MHz (Block 12D)

Alternatively, five RF CW signals may be applied. The level of these RF CW signals should be adjusted 10 dB higher than the one producing the nominal TX output power, the frequency being the same as described above for the DAB RF test signals.

For the maximum output power measurements, a thermal power meter should be used.

For devices having a permanent antenna connector, the maximum output power is measured at the TX antenna port of the repeater.

The maximum radiated power shall be tested under the following operating conditions:

- nominal supply voltage

The results obtained shall be compared with the limits in clause [3.6.1.2.1](#) in order to prove compliance with the requirement.

3.6.1.3.2 all repeaters except full-band repeaters

The repeater should be set to maximum gain. A nominal DAB RF test signal according to clause [3.4](#) of this document should be applied to the RX antenna port, the level of this signal should be increased by 10 dB.

The frequency of this RF test signal should correspond to the center frequency of the single block repeater. For multi-block repeaters, tests should be performed on the nominal frequency of the lowest frequency DAB block within the declared repeater frequency band; and repeated on the nominal frequency of the highest frequency DAB block within the declared repeater frequency band.

Alternatively, an RF CW signal may be applied. The level of this RF CW signal must be adjusted 10 dB higher than the one producing the nominal TX output power, the frequency being the same as described above for the DAB RF test signal.

For the maximum output power measurements a thermal power meter must be used.

For devices having a permanent antenna connector, the maximum output power is measured at the TX antenna port of the repeater.

The maximum radiated power shall be tested under the following operating conditions:

- nominal supply voltage

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The results obtained shall be compared with the limits in clause [3.6.1.2.2](#) in order to prove compliance with the requirement.

3.6.2 Intermodulation products

3.6.2.1 Definition

This test should be used to verify that the level of intermodulation products generated in non-linear elements of the repeater, in the presence of several RF input signals, do not exceed the specified limits.

For the purposes of the present document, intermodulation products are emissions at frequencies within the repeater's operating band.

For devices with a permanent 50 Ω or 75 Ω TX antenna connector, the maximum declared TX antenna gain "G" in dBi has to be taken into account to determine the maximum radiated power of the intermodulation products "P_{Radiated of product #n}" as follows.

$$P_{\text{Radiated from product \#n}} = A_{\text{Conducted from product \#n}} + G$$

According to the maximum output power "A_{Conducted of product #n}" in dBm is the power of an intermodulation product that the repeater delivers at its TX antenna port.

3.6.2.2 Limit

The radiated power of any detected intermodulation product should not exceed -54 dBm erp.

3.6.2.3 Conformance

The measurements should be performed on the TX antenna port of the repeater. For devices without a permanent 50 Ω or 75 Ω port, the effective radiated power of the intermodulation products shall be measured.

The repeater should be set to maximum gain.

The measurement should be performed with an RMS detector and a bandwidth of 100 kHz.

3.6.2.4 Step 1, A band stimulus signals

Two continuous sinusoidal RF signals should be fed to the input antenna port of the repeater using a combining device.

The frequencies of both RF signals should be within the repeater's operating band. The spacing between both RF signals should be lower than a DAB block (eg 400 kHz). The input signals and resulting third order product shall be within the declared operational frequency band of the repeater.

The level of both RF input signals should be increased simultaneously, until the maximum rated output power, as declared by the manufacturer, is reached.

The level of the intermodulation products should be measured by means of a selective measurement device (eg spectrum analyzer) presenting to the repeater a load with an matched impedance of either 50 Ω or 75 Ω .

The test should be repeated with both RF input signals increased by 10 dB each.

NOTE: In this case, the automatic gain (level) control may reduce the gain to a value less than maximum gain in order to keep the maximum rated output power per channel, as declared by the manufacturer.

The results obtained shall be compared with the limits in clause [3.6.2.2](#) in order to prove compliance with the requirement

3.6.2.5 Step 2, Out of band stimulus signals

Two continuous sinusoidal RF signals should be fed to the input antenna port of the repeater using a combining device.

The frequencies of both RF signals should be outside the repeater's operating band. The first signal has to be adjusted to 169,500 MHz, the second one being adjusted to $(2 \times 169,500 \text{ MHz}) - F_c$; F_c is the center frequency of the lowest DAB block contained in the defined repeater band. The resulting third order product shall be within the declared operational frequency band of the repeater.

The level of both RF input signals should be set to -20 dBm.

The level of the intermodulation products should be measured by means of a selective measurement device (eg spectrum analyzer) presenting to the repeater a load with an matched impedance of either 50 Ω or 75 Ω .

The results obtained shall be compared with the limits in clause [3.6.2.2](#) in order to prove compliance with the requirement.

3.6.3 Spurious emissions

3.6.3.1 Definition

This test should be used to verify that the level of spurious emissions (measured at TX antenna) port as well as cabinet radiation) in the presence of RF input signal does not exceed the specified limits.

For devices with a permanent 50 Ω or 75 Ω TX the maximum declared TX antenna gain “G” in dBi has to be taken into account to determine the maximum radiated power of the spurious emissions “ $P_{\text{Radiated spurious emission \#n}}$ ” as follows.

$$P_{\text{Radiated spurious emission \#n}} = A_{\text{Conducted spurious emission \#n}} + G$$

According to:

$A_{\text{Conducted spurious emission \#n}}$ is the maximum output power in dBm of a spurious emission that the repeater delivers at its TX antenna port.

3.6.3.2 Limit

Effective radiated power of spurious emissions and cabinet radiation in the frequency range 30 MHz to 1 GHz (radiated) and 9 kHz to 1 GHz (conducted) shall not exceed -68 dBm erp.

This limit applies to frequencies outside the range $f_c \pm 3 \text{ MHz}$, where f_c is the center frequency of the RF test signal or RF CW signal used, irrespective of the number of carriers employed.

3.6.3.3 Conformance

Conducted spurious emission should be tested between 9 kHz and 1 GHz, and radiated spurious emission must be tested between 30 MHz and 1 GHz.

The repeater should be set to maximum gain. A nominal DAB RF test signal according to clause [3.4](#) of this document should be applied to the RX antenna port.

The frequency of this RF test signal should correspond to:

- Single-block repeater: the nominal frequency of the repeater under test or

- Multi-block repeater: tests should be performed on the nominal frequency of the lowest frequency DAB block within the declared repeater frequency band; and repeated on the nominal frequency of the highest frequency DAB block within the declared repeater frequency band.

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- Full-band repeater: tests should be performed on the five frequencies listed below [3.6.1.3.1](#).

Alternatively, an RF CW signal may be applied. The level of this RF CW signal should be adjusted to produce the nominal TX output power.

The measurement should be performed with an RMS detector and a bandwidth of 100 kHz.

The results obtained shall be compared with the limits in clause [3.6.3.2](#) in order to prove compliance with the requirement

3.6.4 Repeater in-band gain

3.6.4.1 Definition

This requirement covers the net gain of the repeater within the declared transmit frequency band.

The gain of the repeater is defined as the total gain of the equipment, including receiving and transmitting antennas, filters, cables and amplifiers.

The maximum in-band gain has been set to a value that limits the risk of self oscillation due to feedback loop over the air between the transmitting and receiving antenna.

For equipments without embedded RX and TX antennas, the maximum in-band gain is “G_{Maximum}” in dB shall be calculated as follows:

$$G_{\text{Maximum}} = G_{\text{Conducted measurement}} + G_{\text{TX}} + G_{\text{RX}}$$

According to:

$G_{\text{Conducted measurement}}$ is the maximum gain measured according to clause [3.6.4.3](#)

G_{TX} is the maximum declared TX antenna gain

G_{RX} is the maximum declared RX antenna gain

3.6.4.2 Limits

The in-band gain of the repeater equipment should not exceed 44 dB.

3.6.4.3 Conformance

For equipment that includes filters, cables or similar relevant components these components shall be included in the measurement path.

For equipments without embedded RX and TX antennas the measurement shall be performed

without antennas.

- 1) The repeater should be set to maximum gain.
- 2) A continuous sinusoidal RF signal should be fed into the RX antenna input port of the repeater.
- 3) The frequency should be:
 - single-block repeater: the center frequency of the single-block repeater or
 - multi-block repeater: the center frequency of the lowest DAB block within the declared repeater frequency band and repeated at the center frequency of the highest DAB block within the declared repeater frequency band of the multi-block repeater or
 - full-band repeater: the center frequency of the lowest DAB block (174,928 MHz) and repeated at the center frequency of Band III (202 MHz) and at the center frequency of the highest DAB block (229.072 MHz) for full-band repeater.

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- 4) The power level of the RF input signal applied should be at least 5 dB below the nominal power level, which would produce, when applied within the pass band, maximum rated output power, as declared by the manufacturer. This is to ensure that the equipment is operating in the linear output range.
- 3) The average output power in each case shall be measured and the net gain shall be measured recorded.

The results obtained shall be compared with the limits in clause [3.6.4.2](#) in order to prove compliance.

3.6.5 Repeater out of band gain

3.6.5.1 Definition

This requirement covers the net gain of the repeater outside the declared transmit frequency band.

The gain of the repeater is defined as the total gain of the equipment, including receiving and transmitting antennas, filters, cables and amplifiers.

The out of band gain of DAB repeater has been set to prevent other applications from being disturbed at DAB repeaters. Neighbor applications like Paging base stations, PMR, or others should not produce or suffer from any unnecessary disturbance due to the proximity of a DAB repeater.

For equipments without embedded RX and TX antennas, the maximum in-band gain is “G_{Maximum}” in dB shall be calculated as follows:

$$G_{\text{Maximum}} = G_{\text{Conducted measurement}} + G_{\text{TX}} + G_{\text{RX}}$$

According to:

G_{Conducted measurement} is the maximum gain measured according to clause [3.6.4.3](#)

G_{TX} is the maximum declared TX antenna gain

G_{RX}

is the maximum declared RX antenna gain

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3.6.5.2 Limits

The out of band gain of the repeater equipment shall not exceed the limits shown in Table 1 and table 2.

Table 1: Frequency dependent gain limits

Frequency	Maximum Gain
$<F_L - 8 \text{ MHz}$	0 dB
$F_L - 8 \text{ MHz to } F_L - 2 \text{ MHz}$	10 dB
$F_L - 2 \text{ MHz to } F_L$	the in-band gain limit applies
$F_H \text{ to } F_H + 2 \text{ MHz}$	the in-band gain limit applies
$F_H + 2 \text{ MHz to } F_H + 8 \text{ MHz}$	10 dB
$> F_H + 8 \text{ MHz}$	0 dB

where F_L and F_H are:

- single-block repeater: F_L = the lower frequency of the repeater DAB block and F_H = the upper frequency of the repeater DAB block;
- multi-block repeater: F_L = the lower frequency of the lowest DAB block contained the defined repeater band and F_H = the upper frequency of the highest DAB block contained in the defined repeater band.
- full-band repeater: F_L = 174,160 MHz and F_H = 229,840 MHz

Table 2: Fixed frequency limits

Frequency	Maximum Gain
242,500 MHz to 243,500 MHz	0 dB

3.6.5.3 Conformance

For equipment that includes filters, cables or similar relevant components these components shall be included in the measurement path.

For equipments without embedded RX and TX antennas the measurement shall be performed without antennas.

- 1) The repeater should be set to maximum gain.
- 2) A continuous sinusoidal RF signal should be fed successively into the RX antenna input. According to the frequency offsets Y shown below from the edges of the relevant transmit frequency band F_L and F_H defined in table 1 in clause 9 of the present document shall be used.

The frequency offsets Y must have the following values:

- 2 MHz;
- 8 MHz;
- 16 MHz;
- 32 MHz

The power level of the RF input signal applied should be at least 5 dB below the nominal power level which would produce, when applied at the center frequency ($\frac{1}{2} (F_L + F_H)$), the maximum rated output power as declared by the manufacturer. This is to ensure that the equipment is operating in the linear output range.

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- 3) The test should be repeated at
 - 242,500 MHz;
 - 243,000 MHz and
 - 243,500 MHz
 with the power level of the RF input signal as defined in point 2) above.
- 4) The average output power in each case shall be measured and the net gain shall be measured

recorded.

The results obtained shall be compared with the limits in clause [3.6.5.2](#) in order to prove compliance.

4 Repealed documents

NT-3003 V1.0.0

NT-3003 V1.1.0

Biel / Bienne, xx.xx.2020

Federal Office of Communications

Philipp Metzger
Director

Annex A (normative): Requirements and conformance test specifications table

The Requirements and Conformance Test specifications Table in Table A.1 serves a number of purposes, as follows:

- it provides a statement of all the essential requirements in words and by cross reference to (a) specific clause (s) in the present document or to (a) specific clause (s) (a) specific referenced document (s);
- it qualifies every requirement to be either:
 - Unconditional: meaning that the requirement applies in all circumstances; or
 - Conditional: meaning that the requirement is dependent on the manufacturer having chosen to support optional functionality defined within the schedule;
- in the case of conditional requirements, it associates the requirement with the particular optional service or functionality;

Table A.1: Requirements and conformance Test specifications Table

The following requirements and test specifications are relevant to the presumption of conformity under the article 7 paragraph 2 TIO (Ordinance on Telecommunications Installations [1.2])

Requirement No	Description	Reference: Clause No	Requirement Conditionality		Test Specification Reference: Clause No
			U / C	Condition	
1	Maximum radiated total power	3.6.1	U		3.6.1.3
2	Intermodulation products	3.6.2	U		3.6.2.3
3	Spurious emissions 3.6.3		U		3.6.3.3
4	Repeater in-band gain		U		3.6.4.3
5	Repeater out of band gain	3.6.5	U		3.6.5.3

Key to columns:

Requirement:

No A unique identifier for one row of the table that may be used to identify a requirement or its test specification.

Description A textual reference to the requirement.

Clause Number Identification of clause (s) defining the requirement in the present document unless another document is explicitly referenced.

Requirement Conditionality:

U / C Indicates whether the requirement is *unconditionally* applicable (U) or is *conditional* upon the manufacturers claimed functionality of the equipment

(C).

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Condition Explains the conditions when the requirement may or may not be applicable for a technical requirement which is classified "conditional".

Test Specification:

Clause Number Identification of clause (s) defining the test specification in the present document unless another document is explicitly referenced. Where no test is specified (that is, where the previous field is "X") this field remains blank.

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