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Assessment of IMT Base Station (BS) emissions in relation to Block Edge Masks (BEM)

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Contents

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Foreword

This Technical Report (TR) has been produced by ETSI Technical Committee Mobile Standards Group (MSG).

1 Scope

The present document describes measurement procedures and considerations in order to evaluate the alignment of IMT Base Station (BS) emission performance with Block Edge Mask technical license conditions.

2 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 version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

NOTE: While any hyperlinks included in this clause were valid at the time of publication ETSI cannot guarantee their long term validity.

2.1 Normative references

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

Not applicable.

2.2 Informative 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] ETSI TR 102 748: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Impact of the trend towards flexibility in spectrum usage on the principles for drafting Harmonized Standards and the ETSI work programme for Harmonized Standards".

[i.2] ECC Recommendation (11)06: "Block Edge Mask Compliance Measurements for Base Stations" (October 2011).

[i.3] ETSI EN 301 908-3: "IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 3: CDMA Direct Spread (UTRA FDD) Base Stations (BS)".

[i.4] ETSI TS 125 141: "Universal Mobile Telecommunications System (UMTS); Base Station (BS) conformance testing (FDD) (3GPP TS 25.141)".

[i.5] ETSI EN 301 908-14: "IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 14: Evolved Universal Terrestrial Radio Access (E-UTRA) Base Stations (BS)".

[i.6] ETSI TS 136 141: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing (3GPP TS 36.141)".

[i.7] ETSI EN 301 908-18: "IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 18: E-UTRA, UTRA and GSM/EDGE Multi-Standard Radio (MSR) Base Station (BS)".

[i.8] ETSI TS 137 141: "Digital cellular telecommunications system (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing (3GPP TS 37.141)".

[i.9] ETSI EN 301 908-5: "IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 5: CDMA Multi-Carrier (cdma2000) Base Stations (BS)".

[i.10] TIA-97-H: "Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Base Stations" (3GPP2 C.S0010-D V1.0).

[i.11] TIA-864-D: "Recommended Minimum Performance Standards for cdma2000 High Rate Packet Data Access Network" (3GPP2 C.S0032-C V1.0).

[i.12] ETSI EN 301 908-20: "IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 20: OFDMA TDD WMAN (Mobile WiMAX) TDD Base Stations (BS)".

[i.13] Recommendation ITU-R SM.329-12 (09/2012): "Unwanted emissions in the spurious domain".

3 Definitions and abbreviations

3.1 Definitions

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

in-block emissions: unwanted emissions in the frequency range within an operator's assigned frequency block

out-of-band domain: frequency range, immediately outside the necessary bandwidth but excluding the spurious domain, in which out-of-band emissions generally predominate

NOTE: Out-of-band emissions, defined based on their source, occur in the out-of-band domain and, to a lesser extent, in the spurious domain. Spurious emissions likewise may occur in the out-of-band domain as well as in the spurious domain.

out-of-band emissions: emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions

out-of-block emissions: unwanted emissions in the frequency range outside an operator's assigned frequency block

spurious domain: frequency range beyond the out-of-band domain in which spurious emissions generally predominate

unwanted emissions: consist of spurious emissions and out-of-band emissions

3.2 Abbreviations

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

BEM	Block Edge Mask
BS	Base Station
BW	Bandwidth
e.i.r.p.	equivalent isotropically radiated power
MIMO	Multiple Input Multiple Output
MSR	Multi-Standard Radio
RAT	Radio Access Technology
RBW	Resolution BandWidth
RET	Remote Electrical Tilting
RF	Radio Frequency
UMTS	Universal Mobile Telecommunications System
UTRA	Universal Terrestrial Radio Access
WAPECS	Wireless Access Policy for Electronic Communication Services
WIMAX	Worldwide Interoperability for Microwave Access

4 Block Edge Masks

For several EC and ECC harmonized frequency band decisions, parameters in terms of Block Edge Masks (BEM) have been part of the technical conditions in the decisions and will thus form part of license conditions when mobile systems are deployed. The BEM approach has been an essential part of the so called WAPECS approach for flexibility of spectrum usage. The trend towards flexibility and its impact on ETSI harmonized standards was studied by ETSI ERM in the *ERM Flex* activity, as reported in [i.1].

Recently CEPT/ECC WG FM22 produced ECC Rec (11)06 [i.2] describing measurement methods that would enable CEPT administrations to verify BEM compliance in the field. The recommendation provides descriptions of both radiated (e.i.r.p.) measurements and assessment of BEM through conducted measurements. ECC Rec (11)06 [i.2] recommends that assessment of block edge masks with absolute power limits should be done using a conducted measurement directly at the transmitter output. While the methods described in ECC Rec (11)06 [i.2] provide one way for administrations to conduct monitoring of already deployed systems, it is not a feasible general approach for assessing BEM condition alignment by other relevant parties such as the license holder (operator) or the Base Station vendor.

4.1 Relation between BEM and unwanted emission limits

The report from the *ERM Flex* activity [i.1] makes a thorough analysis of how technical conditions in the form of Block Edge Masks relate to technical requirements such as unwanted emission limits that are set out in harmonized standards and technical specifications. The BEM covers part of the requirements to prevent harmful interference and is defined together with assumptions on the deployment scenario. This is depicted in figure 4.1-1, which illustrates that BEM conditions relate both to technical requirements on equipment such as a Base Station, and to the licensing conditions on the operator.

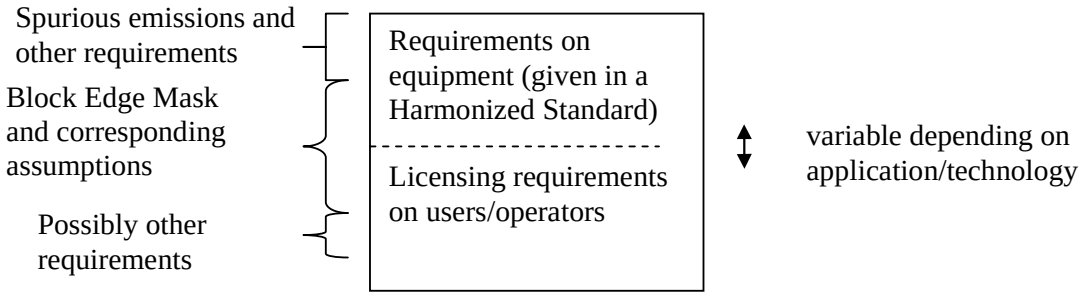

Figure 4.1-1: Division of requirements to avoid harmful interference and facilitate efficient use of spectrum (adapted from [i.1])

The harmonized standards and technical specifications for Base Stations define unwanted emission limits, usually in the form of a spectrum emissions mask that covers frequencies in the *out-of-band domain* adjacent to the transmitted carriers. For some types of BS, the mask is called an *Operating band unwanted emissions* mask and may then cover frequencies in both the *out-of-band* and *spurious domains*. The emission masks are expressed in terms of conducted power at the antenna connector(s) of the BS equipment and do therefore not explicitly account for antennas or any other site equipment that may be attached to the BS. These emission masks are related to the specific transmitter characteristics and channel arrangement of the Radio Access Technology (RAT) concerned, so different RATs may have different equipment emission masks. The emission mask limits are set as absolute power or relative to the transmitted carrier power.

Block Edge Masks, on the other hand, apply to the entire block of spectrum that is assigned to an operator, irrespective of the number of channels occupied by the chosen technology that any operator may deploy in their allocated block. A BEM can be specified in terms of absolute radiated power (e.i.r.p.) or transmitted power. The mask covers frequency ranges outside the assigned frequency block (out-of-block emissions), but in some cases also emissions inside the assigned frequency block (in-block emissions).

NOTE: In some regulatory documents, out-of-block emissions in relation to Block Edge Masks are incorrectly called "out-of-band emissions". The term *out-of-band emissions* is defined in the Radio Regulations as "Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions" [i.13] and it is a term that is not related to an operator's assigned frequency block or to an operating band available for mobile services.

The BEM limits set in several harmonized spectrum decisions are intended to form part of national authorization regimes for spectrum usage and are set relative to the license block of an operator. It is identified in the ETSI study in [i.1] that emissions limited by an e.i.r.p. BEM may be controlled through several parameters. These are:

1) Transmit power level.

2) Antenna gain.

3) Minimum frequency separation from the block edge of outermost channels.

4) Transmit spectrum mask attenuation enhancements (additional filters, BS only).

Of these four parameters, only one (additional filters) can be provided by the manufacturer, while the other three are under the control of the operator (as allowed for by the equipment) and can thus potentially be adjusted to meet the BEM limits when deploying the equipment.

4.2 Conclusion for BEM conditions expressed as e.i.r.p.

It is concluded in the ERM Flex study [i.1] that it would not be possible to directly demonstrate conformance with an e.i.r.p. Block Edge Mask in a lab environment, since the BEM puts a limit on the radiated emissions from the antenna of the deployed Base Station relative to an operator license block, and not on the emissions relative to the transmitted signal at the antenna connector. The e.i.r.p. emissions of the deployed system will obviously depend on the conducted spectrum emissions of the transmitter, but they will in addition depend on transmitter power dynamics and frequency settings, chosen antenna gain, site configuration and additional attenuation enhancements provided by the manufacturer (e.g. additional BS filter) that may be implemented with the BS equipment or at the site.

It is however possible to make an assessment of unwanted emissions from a BS in relation to BEM technical conditions that are expressed as e.i.r.p. This is done by *indirect* reference to the BEM limits, relating them to the unwanted emissions as measured at the antenna connector. Together with an assessment or a declaration of deployment parameters such as antenna gain and feeder losses, conformance to the unwanted emission limits can be related to meeting the BEM limits.

It will in the end be under the discretion of the license holder (operator) to set the deployment parameters in such a way that the BEM limits are met or to sign specific coordination agreements (if permitted within the licensing provision) with neighboring operators. The BEM assessment described in the present document will however assist both the operator and the BS vendor in that process.

Clause 5 of the present document describes the measurement procedures needed to assess the conducted unwanted emissions from different types of Base Stations. Clause 6 demonstrates how the assessment or declaration of the unwanted emission characteristics can be applied in a BEM evaluation.

5 BEM Assessment

The BEMs applicable for the frequency bands relevant for IMT BS have absolute limits and it is therefore recommended to use conducted measurements, see also [i.2]. Conducted measurements are essential for evaluating the BS emission characteristics against a BEM, since they are performed on individual equipment in the lab, before Base Stations are deployed in the field.

Base station emission characteristics to be used for evaluation against BEM requirements are derived from conducted measurements. Procedures for measuring Base Station conducted emissions are described in detail in the base station part of harmonized standard for the BS type, in many cases with support in terms of test models and other detailed conditions from the respective product standard. A BEM sets *out-of-block limits*, which are normally defined as e.i.r.p. These are related to the unwanted emissions from the BS. Some BEM provisions may in addition be set as *in-block limits*, which are defined as e.i.r.p. for frequencies inside the operator's license block. In-block emissions are intended emissions from the BS and are related to the BS output power.

5.1 UTRA BS Measurement procedure

5.1.1 Measurement procedure

For UMTS (UTRA) Base Stations, the harmonized standard reference for measurement procedures is EN 301 908-3 [i.3] and the product standard reference for test models and other detailed conditions is TS 125 141 [i.4].

The relevant test suites that can be found in EN 301 908-3 [i.3] for the frequency ranges covered by BEMs are spectrum emissions mask and spurious emissions for out-of-block limits, and Base Station maximum output power for in-block limits:

- The test suite for the *spectrum emissions mask* in clause 5.3.1 of EN 301 908-3 [i.3] covers conducted measurements of out-of-block emissions up to 12.5 MHz from the carrier frequency, and for the full frequency range of the supported operating band.
- The test suite for *spurious emissions* in clause 5.3.3 of EN 301 908-3 [i.3] covers conducted measurements of emissions in the spurious domain (frequencies more than 12.5 MHz from the carrier frequency).
- The test suite for *Base Station maximum output power* in clause 5.3.4 of EN 301 908-3 [i.3] covers conducted measurements of the transmitted power of an in-block UMTS carrier.

The resolution bandwidth (RBW) of the conducted measurement may be smaller than the reference BW for the BEM, in order to improve measurement accuracy, sensitivity, efficiency or to avoid carrier leakage. The measurements then need to be normalized to the reference BW using the principles described in [i.2].

The test suites in EN 301 908-3 [i.3] define the test environment, describe how to set up the initial conditions for the test and provide a step-wise test procedure. A fundamental part of the test procedure is to set up a pre-defined set of channels for the BS transmitted signal, in order to provide a consistent and realistic test condition. The pre-defined set of channels is called a *Test Model*. The test models to use in the measurements are identified as part of the initial conditions for each test suite in EN 301 908-3 [i.3]. The detailed parameters for the test models are in clause 6.1.1 of TS 125 141 [i.4].

For evaluating the alignment of the measurement results against the BEM requirements, the results should be compared with the BEM limit as described in clause 5.1.3, with interpretation of measurement results as described in clause 5.1.4.

5.1.2 Environmental conditions

The BS manufacturer declares an environmental profile, which defines the intended use of the BS. The profile is used for conformance testing according to clause 5.1 of EN 301 908-3 [i.3], but also defines the conditions within which the BEM provisions are met. Further details of the specific environmental conditions are given in clause 4.4 of TS 125 141 [i.4]. Guidance for defining an environmental profile is given in annex C of EN 301 908-3 [i.3].

5.1.3 Measurement of different Base Station configurations

The measurement procedures apply for a number of different Base Station configurations. annex B of EN 301 908-3 [i.3] describes how to apply the test suites for a BS with duplexer, different power supply options, ancillary amplifiers, antenna arrays, transmit diversity, MIMO operation and integrated modem for Remote Electrical Tilting of antennas (RET).

5.1.4 Interpretation of measurement results

Guidance for interpretation of measurement results is given in clause 5.2 of EN 301 908-3 [i.3], where also the maximum measurement uncertainty of the test system is defined. In order to ensure BEM alignment, the evaluation against the BEM requirements from the conducted measurements is made directly, without any modification related to test tolerances.

5.2 E-UTRA BS Measurement procedure

5.2.1 Measurement procedure

For LTE (E-UTRA) Base Stations, the harmonized standard reference for measurement procedures is EN 301 908-14 [i.5] and the product standard reference for test models and other detailed conditions is TS 136 141 [i.6].

The relevant test suites that can be found in EN 301 908-14 [i.5] for the frequency ranges covered by BEMs are operating band unwanted emissions and spurious emissions for out-of-block limits, and Base Station maximum output power for in-block limits:

- The test suite for *operating band unwanted emissions* in clause 5.3.1 of EN 301 908-14 [i.5] covers conducted measurements of out-of-block emissions within the supported operating band, and for the 10 MHz immediately above and the 10 MHz immediately below the operating band.
- The test suite for *spurious emissions* in clause 5.3.3 of EN 301 908-14 [i.5] covers conducted measurements of emissions for the remaining frequencies in the spurious domain.
- The test suite for *Base Station maximum output power* in clause 5.3.4 of EN 301 908-14 [i.5] covers conducted measurements of the transmitted power of an in-block LTE carrier.

The resolution bandwidth (RBW) of the conducted measurement may be smaller than the reference BW for the BEM, in order to improve measurement accuracy, sensitivity, efficiency or to avoid carrier leakage. The measurements then need to be normalized to the reference BW using the principles described in [i.2].

The test suites in EN 301 908-14 [i.5] define the test environment, describe how to set up the initial conditions for the test and provide a step-wise test procedure. A fundamental part of the test procedure is to set up a pre-defined set of channels for the BS transmitted signal, in order to provide a consistent and realistic test condition. The pre-defined set of channels is called a *Test Model*. The test models to use in the measurements are identified as part of the initial conditions for each test suite in EN 301 908-14 [i.5]. The detailed parameters for the test models are in clause 6.1.1 of TS 136 141 [i.6].

For evaluating the alignment of the measurement results against the BEM requirements, the results should be compared with the BEM limit as described in clause 5.2.3, with interpretation of measurement results as described in clause 5.2.2.4.

5.2.2 Environmental conditions

The BS manufacturer declares an environmental profile, which defines the intended use of the BS. The profile is used for conformance testing according to clause 5.1 of EN 301 908-14 [i.5], but also defines the conditions within which the BEM provisions are met. Further details of the specific environmental conditions are given in annex D of TS 136 141 [i.6]. Guidance for defining an environmental profile is given in annex C of EN 301 908-14 [i.5].

5.2.3 Measurement of different Base Station configurations

The measurement procedures apply for a number of different Base Station configurations. Annex B of EN 301 908-14 [i.5] describes how to apply the test suites for a BS with duplexer, different power supply options, ancillary amplifiers, antenna arrays, transmit diversity, MIMO operation and integrated modem for Remote Electrical Tilting of antennas (RET).

5.2.4 Interpretation of measurement results

Guidance for interpretation of measurement results is given in clause 5.2 of EN 301 908-14 [i.5], where also the maximum measurement uncertainty of the test system is defined. In order to ensure BEM alignment, the evaluation against the BEM requirements from the conducted measurements is made directly, without any modification related to test tolerances.

5.3 MSR BS Measurement procedure

5.3.1 Measurement procedure

For MSR Base Stations, the harmonized standard reference for measurement procedures is EN 301 908-18 [i.7] and the product standard reference for test configurations, test models and other detailed conditions is TS 137 141 [i.8]. The MSR harmonized standard and product specification are applicable to multi-RAT capable BS for E-UTRA, UTRA and GSM/EDGE), and single-RAT capable E-UTRA and UTRA BS.

The relevant test suites that can be found in EN 301 908-18 [i.7] for the frequency ranges covered by BEMs are operating band unwanted emissions and spurious emissions for out-of-block limits, and Base Station maximum output power for in-block limits:

- The test suite for *operating band unwanted emissions* in clause 5.3.1 of EN 301 908-18 [i.7] covers conducted measurements of out-of-block emissions within the supported operating band, and for the 10 MHz immediately above and the 10 MHz immediately below the operating band.
- The test suite for *spurious emissions* in clause 5.3.3 of EN 301 908-18 [i.7] covers conducted measurements of emissions for the remaining frequencies in the spurious domain.
- The test suite for *Base Station maximum output power* in clause 5.3.4 of EN 301 908-18 [i.7] covers conducted measurements of the transmitted power of an in-block transmission.

The resolution bandwidth (RBW) of the conducted measurement may be smaller than the reference BW for the BEM, in order to improve measurement accuracy, sensitivity, efficiency or to avoid carrier leakage. The measurements then need to be normalized to the reference BW using the principles described in [i.2].

The test suites in EN 301 908-18 [i.7] define the test environment, describe how to set up the initial conditions for the test and provide a step-wise test procedure. A fundamental part of the test procedure is to set up a pre-defined set of channels for the BS transmitted signal, in order to provide a consistent and realistic test condition. The pre-defined set of channels is called a Test Configuration, where the channels may be defined by a *Test Models* for each RAT. The test configurations and test models to use in the measurements are identified as part of the initial conditions for each test suite in EN 301 908-18 [i.7]. The detailed parameters for the test configurations and test models are in clauses 5 and 4.9.2 respectively of TS 137 141 [i.8].

For evaluating the alignment of the measurement results against the BEM requirements, the results should be compared with the BEM limit as described in clause 5.3.3, with interpretation of measurement results as described in clause 5.3.4.

5.3.2 Environmental conditions

The BS manufacturer declares an environmental profile, which defines the intended use of the BS. The profile is used for conformance testing according to clause 5.1 of EN 301 908-18 [i.7], but also defines the conditions within which the BEM provisions are met. Further details of the specific environmental conditions are given in annex B of TS 137 141 [i.8]. Guidance for defining an environmental profile is given in annex C of EN 301 908-18 [i.7].

5.3.3 Measurement of different Base Station configurations

The measurement procedures apply for a number of different Base Station configurations. Annex B of EN 301 908-18 [i.7] describes how to apply the test suites for a BS with duplexer, different power supply options, ancillary amplifiers, antenna arrays, transmit diversity, MIMO operation and integrated modem for Remote Electrical Tilting of antennas (RET).

5.3.4 Interpretation of measurement results

Guidance for interpretation of measurement results is given in clause 5.2 of EN 301 908-18 [i.7], where also the maximum measurement uncertainty of the test system is defined. In order to ensure BEM alignment, the evaluation against the BEM requirements from the conducted measurements is made directly, without any modification related to test tolerances.

5.4 Cdma2000 Measurement procedure

5.4.1 Measurement procedure

For cdma2000 Base Stations, the harmonized standard reference for measurement procedures is EN 301 908-5 [i.9] and the product standard reference for test models and other detailed conditions are TIA-97-H [i.10] and TIA-864-D [i.11].

The relevant test suites that can be found in EN 301 908-5 [i.9] for the frequency ranges covered by BEMs are transmitter spurious emissions test and maximum output power test:

- The test suite for *transmitter spurious emissions* in clause 5.3.1 of EN 301 908-5 [i.9] covers conducted measurements of emissions in the spurious domain (frequencies more than 885 KHz from the carrier frequency).
- The test suite for *Base Station maximum output power* in clause 5.3.2 of EN 301 908-5 [i.9] covers conducted measurements of the transmitted power of an in-block cdma2000 carrier.

The resolution bandwidth (RBW) of the conducted measurement may be smaller than the reference BW for the BEM, in order to improve measurement accuracy, sensitivity, efficiency or to avoid carrier leakage. The measurements then need to be normalized to the reference BW using the principles described in [i.2].

The test suites in EN 301 908-5 [i.9] define the test environment, describe how to set up the initial conditions for the test and provide a step-wise test procedure. A fundamental part of the test procedure is to set up a pre-defined set of channels for the BS transmitted signal, in order to provide a consistent and realistic test condition. The pre-defined set of channels is called a *Test Model*. The test models to use in the measurements are identified as part of the initial conditions for each test suite in EN 301 908-5 [i.9]. The detailed parameters for the test models are in clause 6.5.2 of TIA-97-H [i.10] and clause 8.4.3 of TIA-864-D [i.11].

For evaluating the alignment of the measurement results against the BEM requirements, the results should be compared with the BEM limit as described in clause 5.4.3, with interpretation of measurement results as described in clause 5.4.4.

5.4.2 Environmental conditions

The BS manufacturer declares an environmental profile, which defines the intended use of the BS. The profile is used for conformance testing according to clause 4.1 of EN 301 908-5 [i.9], but also defines the conditions within which the BEM provisions are met. Further details of the specific environmental conditions are given in clause 6.2 of TIA-97-H [i.9] and clause 6.2 of TIA-864-D [i.11]. Guidance for defining an environmental profile is given in annex C of
EN 301 908-5 [i.9].

5.4.3 Measurement of different Base Station configurations

The measurement procedures apply for a number of different Base Station configurations. Annex B of EN 301 908-5 [i.9] describes how to apply the test suites for a BS with receiver diversity, duplexer, different power supply options, ancillary amplifiers, and antenna arrays.

5.4.4 Interpretation of measurement results

Guidance for interpretation of measurement results is given in clause 5.2 of EN 301 908-5 [i.9], where also the maximum measurement uncertainty of the test system is defined. In order to ensure BEM alignment, the evaluation against the BEM requirements from the conducted measurements is made directly, without any modification related to test tolerances.

5.5 Mobile WIMAX Measurement procedure

5.5.1 Measurement procedure

For Mobile WiMAX Base Stations, the harmonized standard reference for measurement procedures is EN 301 908-20 [i.12].

The relevant test suites that can be found in EN 301 908-20 [i.12] for the frequency ranges covered by BEMs are operating band unwanted emissions and spurious emissions for out-of-block limits, and Base Station maximum output power for in-block limits:

- The test suite for *unwanted emissions* in clause 5.4.1 of EN 301 908-20 [i.12] covers conducted measurements of unwanted emissions for frequency offsets up to ±250 % of the system channel spacing immediately above or below the operating system channel.
- The test suite for *spurious emissions* in clause 5.4.3 of EN 301 908-20 [i.12] covers conducted measurements of emissions for the remaining frequencies in the spurious domain.
- The test suite for *Base Station maximum output power* in clause 5.4.4 of EN 301 908-20 [i.12] covers conducted measurements of the transmitted power of an in-block Mobile WiMAX carrier.

The resolution bandwidth (RBW) of the conducted measurement may be smaller than the reference BW for the BEM, in order to improve measurement accuracy, sensitivity, efficiency or to avoid carrier leakage. The measurements then need to be normalized to the reference BW using the principles described in [i.2].

The test suites in EN 301 908-20 [i.12] define the test environment, describe how to set up the initial conditions for the test and provide a step-wise test procedure. A fundamental part of the test procedure is to set up a pre-defined set of operating conditions for the BS transmitted signal, in order to provide a consistent and realistic test condition. The pre-defined set of conditions for use in the measurements are identified as part of the initial conditions for each test suite in EN 301 908-20 [i.12].

For evaluating the alignment of the measurement results against the BEM requirements, the results should be compared with the BEM limit as described in clause 5.2.3, with interpretation of measurement results as described in clause 5.2.2.4.

5.5.2 Environmental conditions

The BS manufacturer declares an environmental profile, which defines the intended use of the BS. The profile is used for conformance testing according to clause 5.1 of EN 301 908-20 [i.12], but also defines the conditions within which the BEM provisions are met. Guidance for defining an environmental profile is given in annex B of EN 301 908-20 [i.12].

5.5.3 Measurement of different Base Station configurations

The measurement procedures include elements to cover multiple antenna systems.

5.5.4 Interpretation of measurement results

Guidance for interpretation of measurement results is given in clause 5.3 of EN 301 908-20 [i.12], where also the maximum measurement uncertainty of the test system is defined. In order to ensure BEM alignment, the evaluation against the BEM requirements from the conducted measurements is made directly, without any modification related to test tolerances.

6 BEM Evaluation

The procedure and related conditions for measuring conducted emissions from an IMT BS in the frequency range relevant for a BEM were described in the previous clause. In order to correctly evaluate alignment with the provisions of the BEM, additional conditions and parameters for the actual deployment of the IMT BS, as well as installation parameters outside the BS have to be accounted for.

Evaluating alignment with the provisions of a BEM according to the present clause can be done before as well as after a BS is deployed at a BS site. In both cases, measurements of conducted emissions can be used. Assessments done before and after deploying a BS are equivalent, since they are both based on conducted measurements. Before deployment, an IMT BS vendor can provide information about the external conditions for which the BS equipment will comply with the provisions of a BEM. Similarly, an IMT network operator may want to ensure that BS equipment together with other site equipment and deployment conditions will meet the BEM provisions, either through measurements or by using information provided by the equipment vendors.

When giving such BEM information, the BS vendor states for which conditions that the BEM is met. As pointed out in [i.2], the knowledge of certain additional parameters is necessary and is related to the particular site and deployment, such as feeder loss and antenna gain.

In a typical deployment example as shown in figure 6-1, a Base Station is connected to an antenna with a certain antenna gain G_{Ant} by means of a feeder, where the total feeder losses are L_{Feeder} including cable and connector losses. The emissions in the BEM frequency ranges are measured as conducted emissions at the BS antenna connector according to clause 5.2.2 as $P_{\text{Conducted}}$. The corresponding radiated emissions for evaluation against the BEM requirements, expressed as P_{EIRP} are:

$$P_{\text{EIRP}} = P_{\text{Conducted}} + G_{\text{Ant}} - L_{\text{Feeder}}$$

Note that in case the conducted measurements are performed using a resolution bandwidth smaller than the reference bandwidth of the BEM, the measured values need to be normalized as described in [i.2].

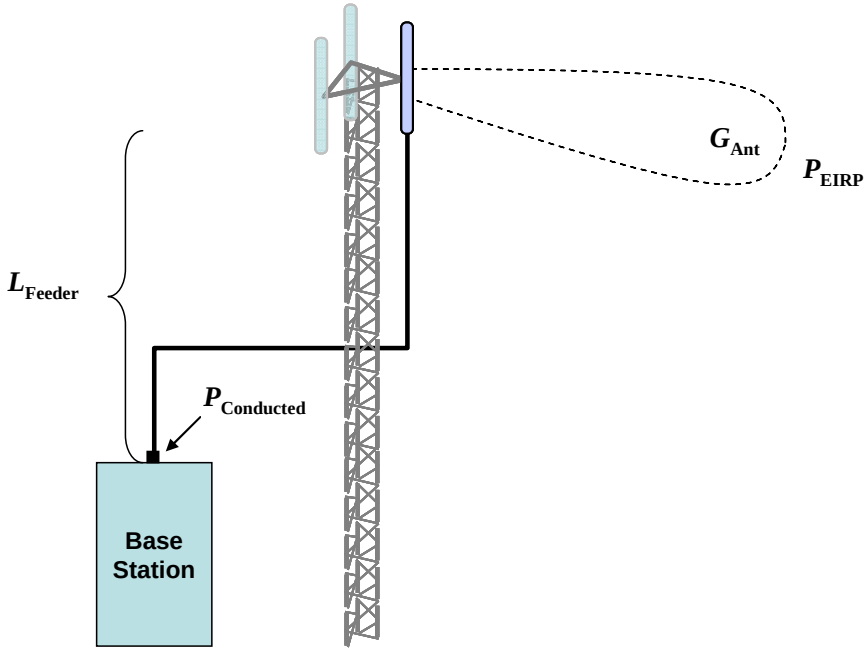

Figure 6-1: Base Station deployment example

For a BS stated to meet the provisions of a BEM, the conditions under which the provisions are met should be given. Examples of parameters as shown in the example above are antenna gain and feeder losses. Other important parameters that may be part of the information given are maximum output power settings, frequency range of operation, RF channel bandwidths for the transmitted carriers and RF carrier positions in relation to the block edges. Such conditions are also important for a network operator deploying a system with IMT base stations.

Annex A: Bibliography

Commission Decision 2010/267/EU of 6 May 2010 on harmonised technical conditions of use in the 790-862 MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union.

Commission Decision 2008/477/EC of 13 June 2008 on the harmonisation of the 2 500-2 690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.

Commission Decision 2008/411/EC of 21 May 2008 on the harmonisation of the 3 400-3 800 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.

History

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