EBU **TECHNICAL**

Issues related to other services in the UHF Band

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Issues related to other services in the UHF Band

- Situation in the UHF band
- Technical conditions for Mobile in the sub-band 790-862 MHz in Europe
- Developments in ITU on cross border issues
- Developments in Europe on White Space Devices

Situation in the UHF band

- RRC06 : GE06 Agreement in June 2006: 470-862 MHz planned for DVB-T
- Decision of WRC07 in November 2007: Mobile service primary in 790-862 MHz
- Technical conditions for Mobile and Fixed communications in this sub-band defined by ECC decision on 30 October 09
- Decisions taken or under consideration in European countries to release this sub-band from Broadcasting
- Ongoing ITU/JTG5/6 activities towards WRC12
- Ongoing SE43 activities on White Space Devices

Technical conditions for Mobile in Europe

- Channelling arrangements

790-791	791-796	796-801	801-806	806-811	811-816	816-821	821 – 832	832-837	837-842	842-847	847-852	852-857	857-862
Guard band	Downlink						Duplex gap	Uplink					
1MHz	30 MHz (6 blocks of 5 MHz)						11 MHz	30 MHz (6 blocks of 5 MHz)					

Preferred harmonised channelling arrangement for the band 790-862 MHz

790-797	797-802	802-807	807-812	812-817	817-822	822-827	827-832	832 – 837	837 – 842	842 – 847	847-852	852-857	857-862
Guard band	Unpaired												
7 MHz	65 MHz (13 blocks of 5 MHz)												

TDD channelling arrangement for the band 790-862 MHz

The block-edge mask (BEM) approach

- The block-edge mask (BEM) approach consists of in-block and out-of-block limits depending on frequency offset
- It should be understood that block edge masks do not always provide the required level of protection of victim services and
- In order to resolve the remaining cases of interference additional mitigation techniques would need to be applied.

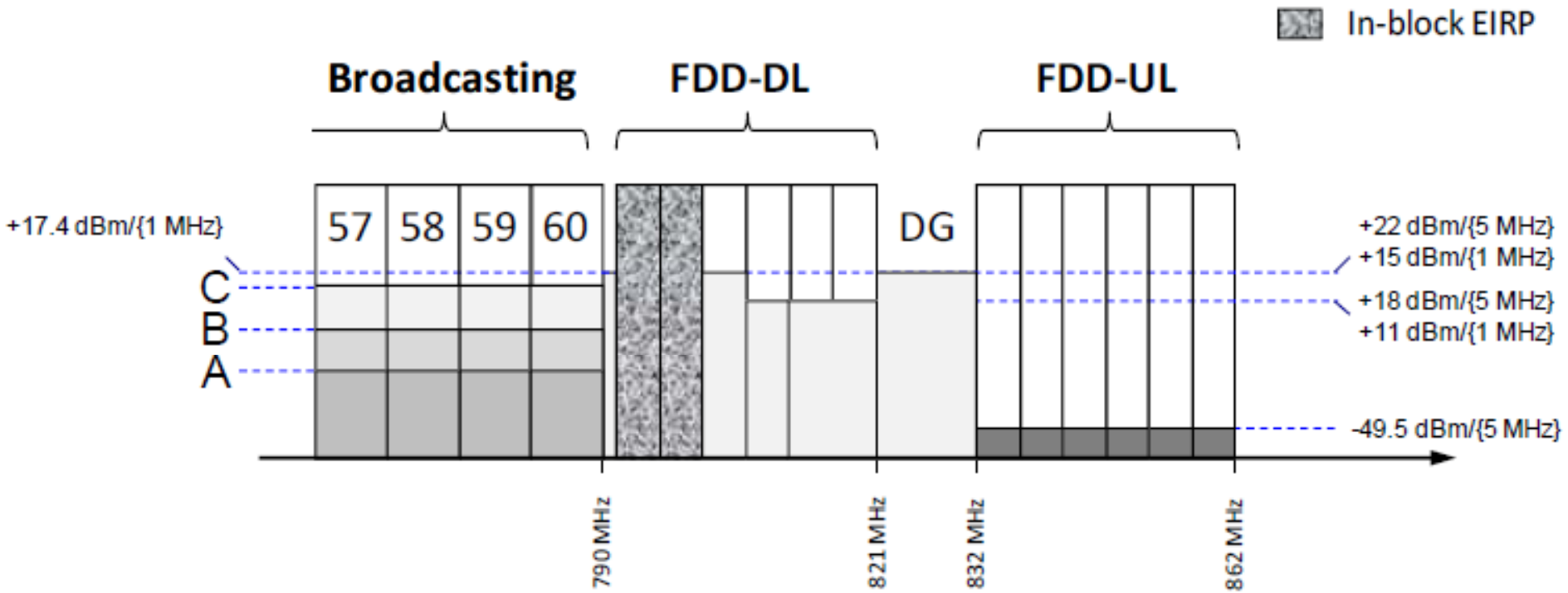
Main conditions for Base stations

- No mandatory limit for In-Band emission of Base stations
  - suggested maximum EIRP limits range from 56 dBm/(5 MHz) to 64 dBm/(5 MHz)
- Out of Band emission limits for Base stations

Case	Frequency range of out-of-block emissions	Condition on base station in-block E.I.R.P., P (dBm/10MHz)	Maximum mean out-of-block EIRP	Measurement bandwidth
A	For DTT frequencies where broadcasting is protected	$P \geq 59$	0 dBm	8 MHz
		$36 \leq P < 59$	(P-59) dBm	8 MHz
		$P < 36$	- 23 dBm	8 MHz
B	For DTT frequencies where broadcasting is subject to an intermediate level of protec-tion	$P \geq 59$	10 dBm	8 MHz
		$36 \leq P < 59$	(P-49) dBm	8 MHz
		$P < 36$	-13 dBm	8 MHz
C	For DTT frequencies where broadcasting is not protected	No condition	22 dBm	8 MHz

For explanation of cases A, B and C, refer to CEPT report 30

Out of Band emission limits for Base stations



BS BEM for a FDD operator in the lowest two 5 MHz blocks in the preferred harmonized frequency arrangement. Note that only baseline limit "A" applies over broadcasting channels that are in use

Simulation principles

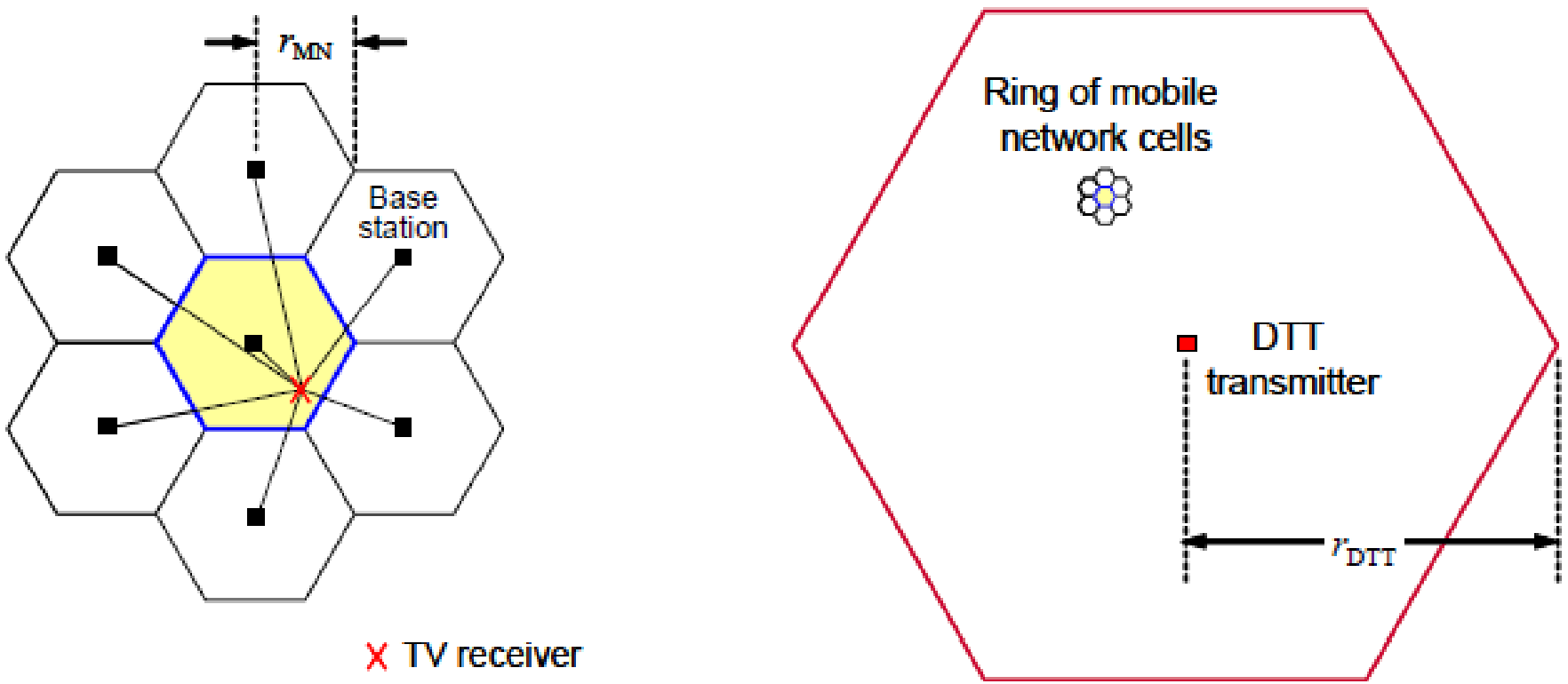
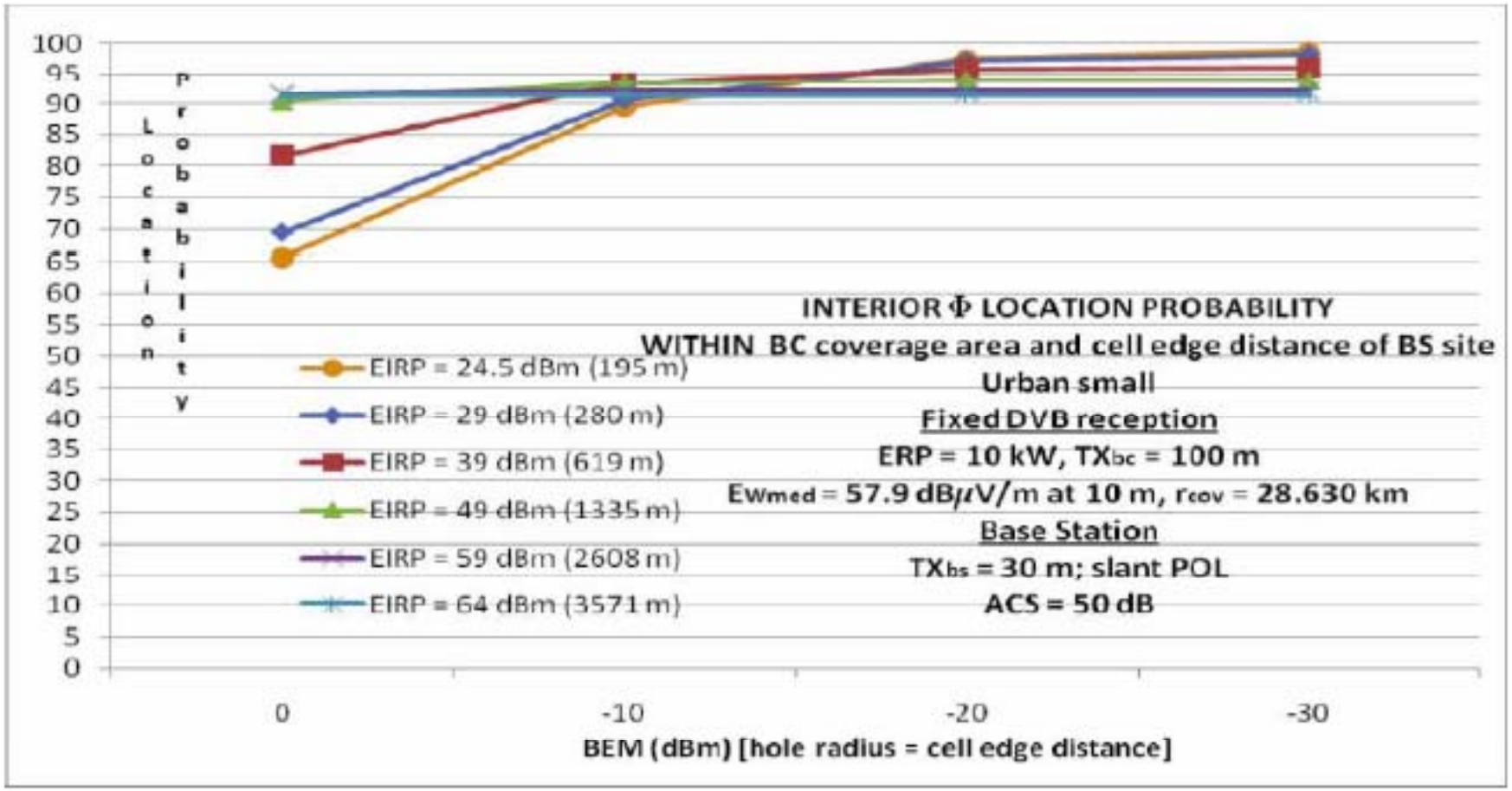


Figure A1.12: Geometry used for the interference assessment

Location probabilities & effect of the base station EIRP



Location probability within the distance to the cell edge of the BS transmitter which is situated randomly within the BC coverage edge - function of BEM, using EIRP as a parameter

Need for mitigation techniques

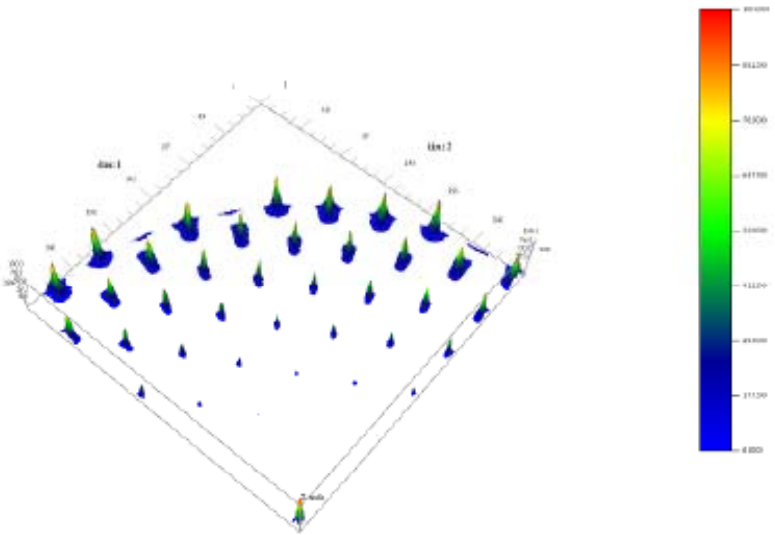
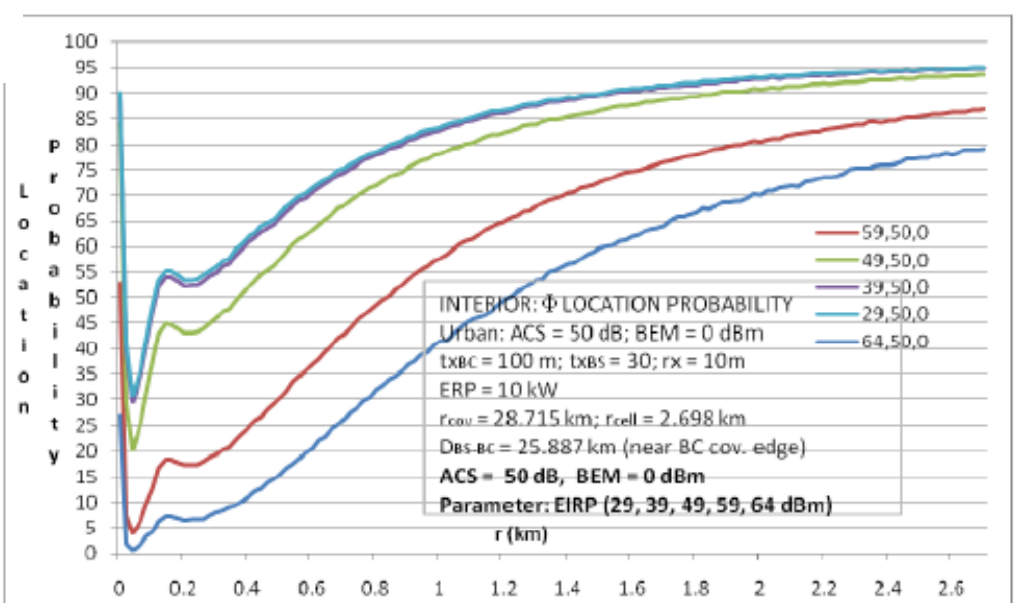


Figure A1.24 Birdseye view of coverage holes due to ECN base station network

Birdseye view of coverage holes due to ECN base station network



Local Location probability for different EIRP values (29, 39, 49, 59, 64 dBm), 0 dBm BEM base line level. Edge of BC coverage

Effect of the mitigation techniques

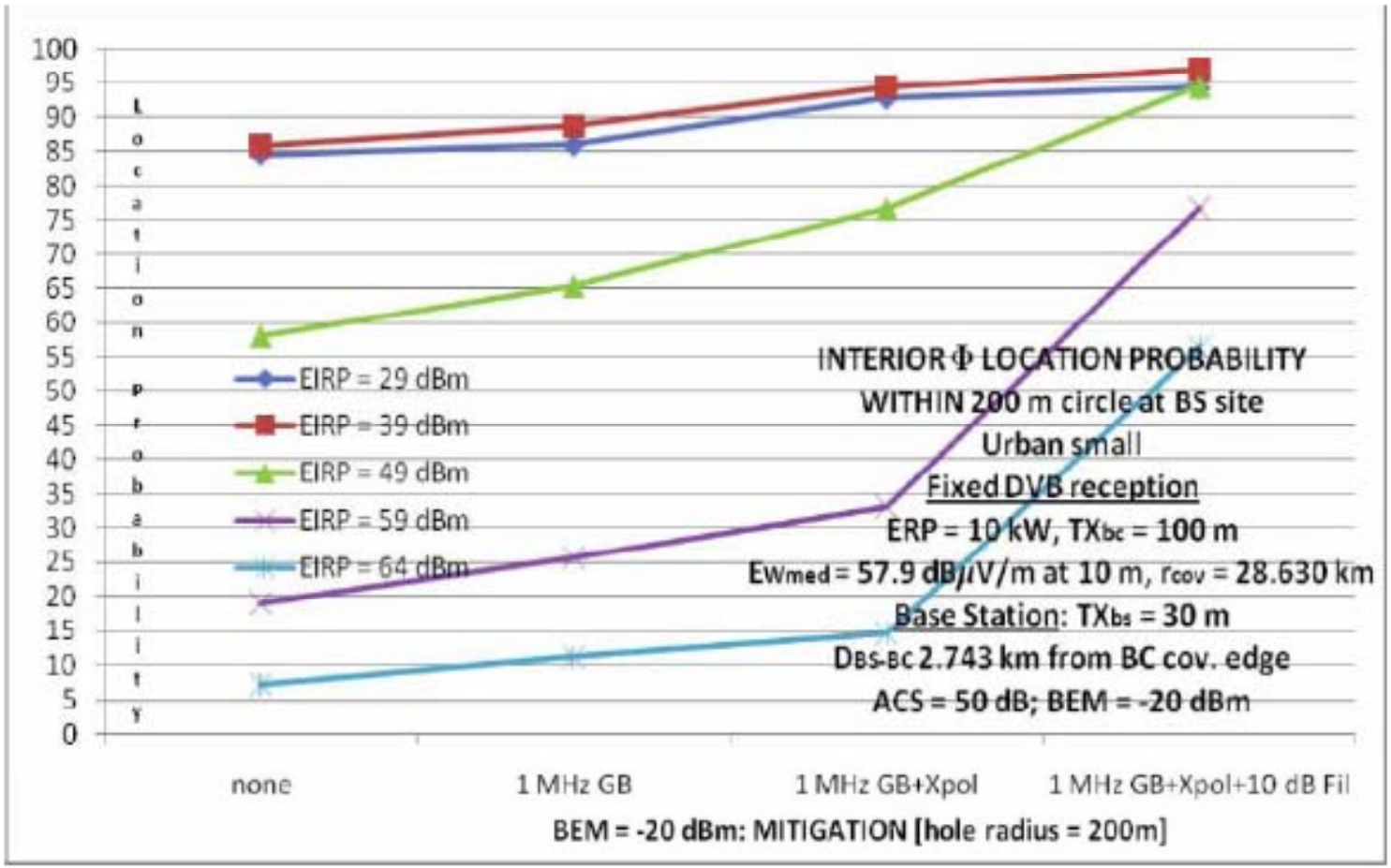


Figure A1.31. Effect of mitigation techniques on location probability for DVB reception within 200 m of the BS transmitter, located near the BC coverage edge and sing EIRP as a parameter (39, 49, 59 and 64 dBm)

Indication of additional protection measures

- In the “considerings” of the ECC decision:

  m) that the protection of broadcasting may require adoption of additional measures at the national level to mitigate the possible remaining interference cases

- In the “Articles” of Draft Commission decision:

  (2) Member States shall ensure that systems referred to in paragraph 1 give appropriate protection to systems in adjacent bands.

Conclusions for Base stations

- The Out-of-band limitations specified are
  - the « best that could be achieved » with the agreed approach
  - not sufficient alone
- Mitigation techniques are required, in particular for the case of high power power base stations located at the edge of a broadcasting coverage area using channel 60
- Possible obligations related to the application of mitigation techniques and responsibility for their cost are matters left to the individual Administrations
- Individual Administrations can decide to relax the limitations if they do not to want protect broadcasting below 790 MHz.

Main conditions for Terminal stations

- Maximum mean in-block power: 23 dBm
- subject to a tolerance of up to +2 dB

- Maximum mean out-of-band power below 790 MHz: -65 dBm/8 MHz

Separation distance and out-of-block emission level

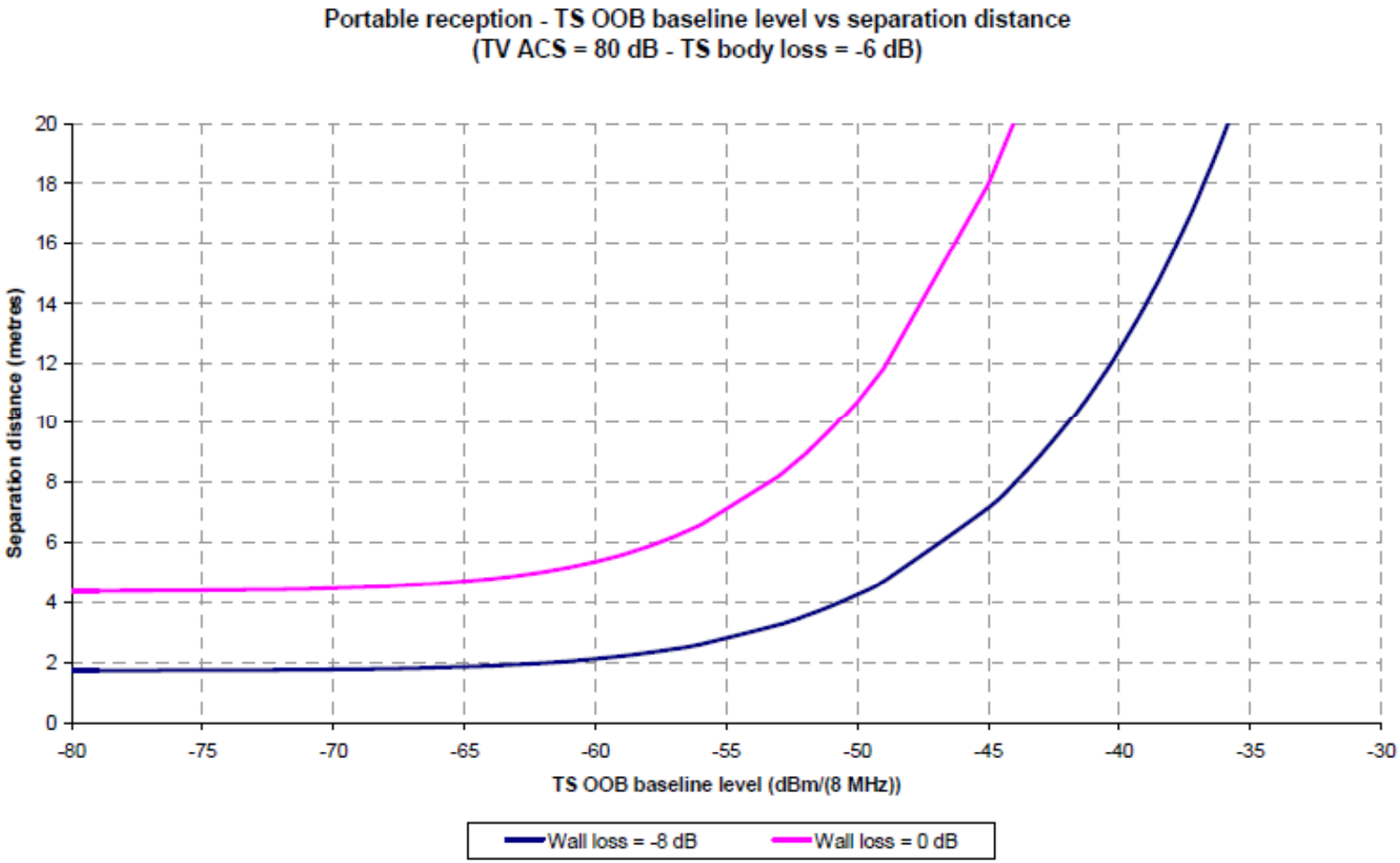


Figure A3.16: Relationship between separation distance and out-of-block baseline

Guard band considerations

- From CEPT report 30:
  - For the protection of fixed-rooftop DTT reception a guard band of 7 MHz would require additional filtering at the DTT receiver, while a guard band of 12 MHz or greater would require no additional filtering at the DTT receiver.
  - For the protection of portable-indoor DTT reception a guard band of greater than 7 MHz would be required. Appropriate guard bands might be 37 MHz without additional filtering at the DTT receiver and 17 MHz with additional filtering at the DTT receiver.”

Conclusions for Terminal stations

- In-band and out-of-band limitations specified are the « best that could be achieved » with the agreed approach for the studies
- The specified FDD channeling raster provides a guard band (42 MHz) favorable for the protection of broadcasting from terminal stations
- In case of interference cases, the only solution is to add a filter at the input of the DVB-T receiver
- TDD channelling raster (with 7 MHz guard band) DOES NOT provide sufficient guard band for the protection of portable indoor reception, even with additional filtering.

Links to the relevant documents

- CEPT report 30: http://www.erodocdb.dk/Docs/doc98/official/pdf/CEPTREP030.PDF
- ECC decision: http://www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC0903.PDF
- Other relevant documents (available on www.ero.dk) :

  CEPT report 31: Frequency (channelling) arrangements for the 790-862 MHz band

  CEPT report 32: Continuation of PMSE operating in the UHF, including the assessment of the advantage of an EU approach

Contributions and studies made by the EBU

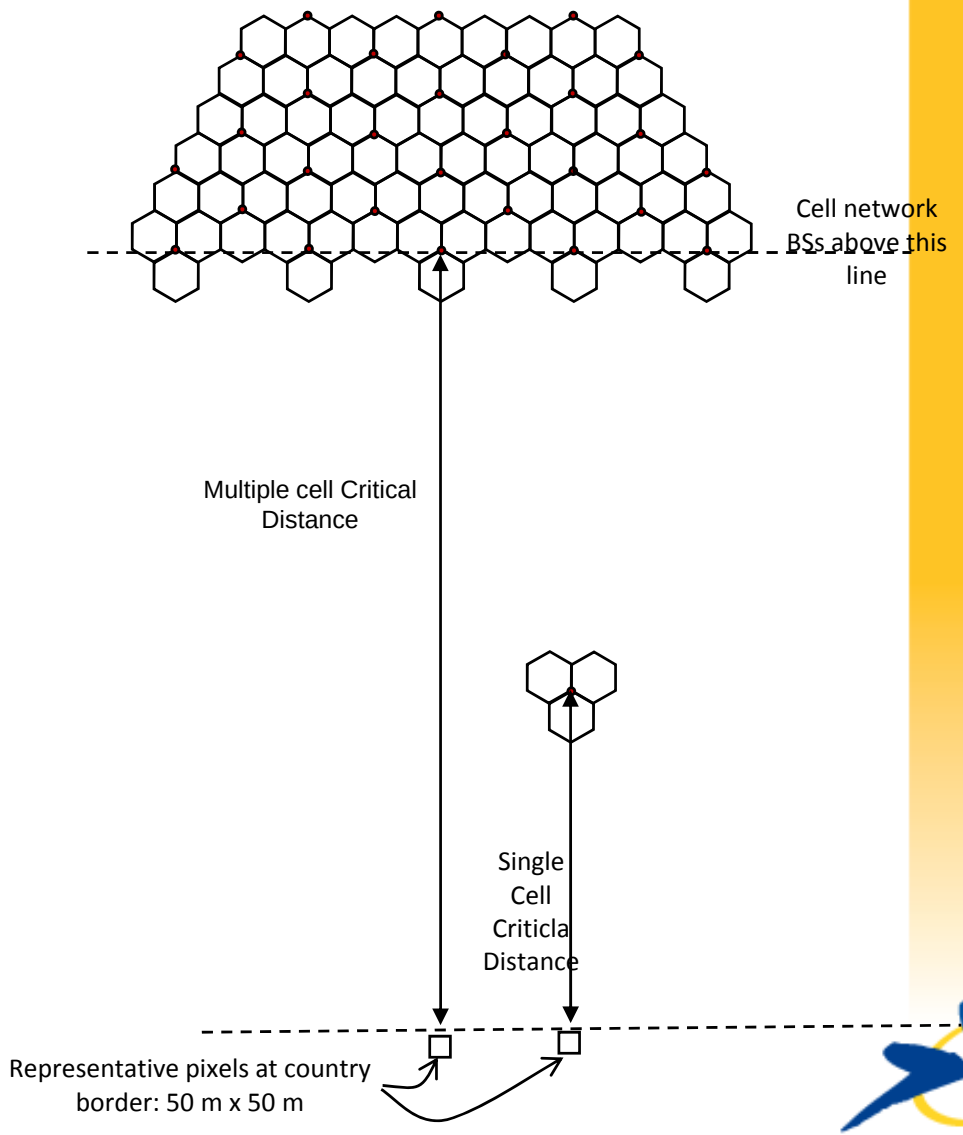
- 58 technical contributions submitted to ECC/TG4, ECC/SE42, CPG/PTD and ITU/JTG5-6 since January 2007 with significant impact on the outputs
- Early tests and demonstrations of the interference of Mobile terminal on portable indoor reception (Video « where has my picture gone » November 2007)
- Field tests made jointly with FreeTV Australia on a real UMTS 800 MHz network in August 2008. Report and videos submitted to ITU/JTG5-6 and ECC/TG4
- Participation in 25 meetings: 15 meetings of ECC/TG4, 6 meetings of ECC/SE42 and 4 meetings of ITU/JTG5-6

ftp://sydney:video@ftp.ebu.ch http://www.ebu.ch/en/technical/where_has_my_picture_gone.php

Full list of EBU contributions available for EBU members on the Wiki area of EBU Technical

Activities in ITU/JTG5-6 (24 November 09)

- WRC12 Agenda Item 1.17
- Issue of multiple interference from Mobile base stations in cross border situation raised by the EBU
- More than 20 dB increase of interference could occur
- Proposal to include more stations of the Mobile service in the coordination by reducing the coordination triggering level of the GE06 Agreement



Activities on White Space Devices in Europe

- CEPT Report 24 issued in July 2008
- ECC/SE43 group tasked in May 2009 to “ ... define technical and operational requirements for the operation of cognitive radio systems in the white spaces of the UHF broadcasting band (470-790 MHz) ...” . To be finalised in May 2010.
- Active participation from EBU Technical and some EBU members

For more details and explanations

Webinar on these issues is scheduled on 8 December 09 at 14:00

http://tech.ebu.ch/events/webinar_digitaldividend

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Thank you

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