# Introduction

This report provides technical studies on the adjacent-band co-existence between 5G MFCN network operating below 3800 MHz and WBB LMP local area network above 3800 MHz considering unsynchronised operation.

Parameters used for the studies are listed in section 2 taken from agreed list of parameters. Scenarios covered are urban/sub-urban outdoor deployment. Indoor and rural area scenarios are not covered in this Report.

# Parameters

## Deployment Parameters

Table 1: WBB LMP and MFCN Deployment Parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | WBB LMP BS | 5G MFCN | Note |
| Centre frequency (MHz) | 3850, 3910 | 3750 |  |
| Channel bandwidth (MHz) | 100  (98.280 MHz Nrb=273 Rb=12\*30kHz) | |  |
| SCS (kHz) | 30 | |  |
| Maximum BS Tx Power (EIRP) | 51 dBm/100 MHz (MP)  31 dBm/100 MHz (LP) | N/A | 5G MFCN uplink is simulated |
| Non-AAS antenna gain (dBi) | 13 dBi for MR non-AAS BS  6 dBi for Local Area (LA) BS  0 dBi (omni) for indoor BS | 18 dBi |  |
| Non-AAS antenna pattern | ITU-R F.1336 | ITU-R F.1336 |  |
| AAS antenna configuration | 4x4x3 | 4x8x3 | For MR BS (Gain = 23.2 dBi)  Macro BS gain = 24.8 dBi |
| Element gain (dBi) | 6.4 | 5 |  |
| H\_Spacing  V\_Spacing | 0.5 for H  0.7 for V | |  |
| BS antenna height (m) | 25 and 10 | 25 |  |
| BS antenna downtilt(°) | -6° | |  |
| Noise figure (dB) | 10 for MR BS  13 for LA BS | 5 |  |
| UE Noise figure (dB) | 9 | |  |
| UE Tx Power (dBm) | 24 | | UE power control is used |
| Indoor/Outdoor UE height (m) | 1.5 above ground | |  |
| Mobile/Nomadic UE antenna gain (dBi) | -4 | |  |
| UE Tx mask | ACLR=30 dB | | 3GPP TS.38.101 |
| UE Rx mask | ACS=30 dB | | 3GPP TS.38.101 |
| Network loading (%) | 100% for single BS case  50% for network case | | The simulation is done on single BS with 100% load |
| Indoor/outdoor UE percentage | 70% / 30% in urban/suburban | |  |
| Cell Range (m) | 400 m | |  |
| Propagation model | Recommendation ITU-R P.452 | |  |

## WBB LMP Tx Mask

### WBB LMP non-AAS

Table 2: Out-of-block emission limits of the WBB LMP non-AAS providing local area network connectivity in 3.8-4.2 GHz from UK approach, derived from ECC Decision (11)06

|  |  |
| --- | --- |
| Frequency offset | Maximum mean EIRP density |
| -5 to 0 MHz offset from lower channel edge  0 to 5 MHz offset from upper channel edge | (Pmax – 40) dBm / 5 MHz EIRP per antenna |
| -10 to -5 MHz offset from lower channel edge  5 to 10 MHz offset from upper channel edge | (Pmax – 43) dBm / 5 MHz EIRP per antenna |
| Out of block baseline power limit (BS)  < -10 MHz offset from lower channel edge  > 10 MHz offset from upper channel edge | (Pmax – 43) dBm / 5 MHz EIRP per antenna |

Table 3: Out-of-band emission limits of the WBB LMP non-AAS providing local area network connectivity in 3.8-4.2 GHz from UK approach, derived from ECC Decision (11)06

|  |  |
| --- | --- |
| Frequency offset | Maximum mean EIRP density |
| 3795 MHz-3800 MHz, 4200 MHz-4205 MHz | (Pmax – 40) dBm / 5 MHz EIRP per antenna |
| 3790 MHz-3795 MHz 4205 MHz-4210 MHz | (Pmax – 43) dBm / 5 MHz EIRP per antenna |
| 3760 MHz-3790 MHz, 4210 MHz-4240 MHz | (Pmax – 43) dBm / 5 MHz EIRP per antenna |
| Below 3760 MHz Above 4240 MHz | -2 dBm / 5 MHz EIRP per antenna |
| Note: Pmax is the maximum mean carrier power in dBm for the base station measured as e.i.r.p. per carrier, interpreted as per antenna  Note: The spurious emission domain for the base station in these frequency bands start 40 MHz from the band edge and the corresponding limits are defined in current ERC Recommendation 74-01 which is used Below 3760 MHz Above 4240 MHz. | |

### WBB LMP AAS

The EIRP based emission mask in section 2.2.1 above is taken from UK regulations which is not suitable for medium power AAS BS. BEM for AAS BS in all the legacy regulations is defined in TRP. Therefore, following BEM in table 4 for MR WBB BS is used in the studies as per 3GPP Medium Range (MR) BS operating band unwanted emission limits for Prated,c,TRP  40 dBm as starting point.

Table 4: Proposed baseline and transitional power limits for synchronised WBB (medium Power) AAS BS as per 3GPP

| **BEM element** | **Frequency range** | **AAS TRP limit per cell** |
| --- | --- | --- |
| Transitional region | -5 to 0 MHz offset from lower block edge  0 to 5 MHz offset from upper block edge | +0.94 dBm / 5 MHz |
| Transitional region | -10 to -5 MHz offset from lower block edge 5 to 10 MHz offset from upper block edge | -3 dBm / 5 MHz |
| Baseline | Below -10 MHz offset from lower block edge. Above 10 MHz offset from upper block edge. Within 3400-3800 MHz. | -3 dBm / 5 MHz |
| The BS transitional region BEM elements are based on the assumption that the emissions come from a Micro BS. In a multi-sector base station, the radiated power limit applies to each one of the individual sectors.  Note: The spurious emission domain for the base station in these frequency bands start 40 MHz from the band edge and the corresponding limits are defined in current ERC Recommendation 74-01 | | |

### Restricted Mask

To improve the coexistence between MFCN and WBB LMP following strict BEM from ECC Decision 11(06) is also used in the studies.

Table 5: Restricted baseline power limits for unsynchronised and semi­synchronised MFCN networks, for non-AAS and AAS base stations ECC Decision (11)06

| **BEM element** | **Frequency range** | **Non-AAS e.i.r.p. limit** **dBm/(5 MHz) per cell (2)** | **AAS TRP limit dBm/(5 MHz) per cell (1)** |
| --- | --- | --- | --- |
| Restricted baseline | Unsynchronised and semi-synchronised blocks.  Below the lower block edge. Above the upper block edge.  Within 3400-3800 MHz | -34 | -43 |
| (1) In a multi-sector base station, the radiated power limit applies to each one of the individual sectors  (2) It is assumed that note (1) also applies in this case. | | | |

## WBB LMP BS Rx mask

Not used in the study as WBB LMP is the aggressor with downlink only.

Table 6: Adjacent band receiver characteristics for WBS LMP base station (3GPP 38.104)

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Low Power BS**  (Interfering signal mean power (dBm) 6 dB desensitization) | **Medium Power BS**  (Interfering signal mean power (dBm) 6 dB desensitization) |
| ACS | -47 dBm for LP BS | -44 dBm for MR BS |
| In-band blocking | -38 dBm | -35 dBm |
| Out-of-band blocking (3GPP 1-H) | -15 dBm | -15 dBm |

Relative ACS and in-band blocking attenuation to be derived with the associated bandwidth (100 MHz) and NF (ITU-R Report M.2039).

The above ACS, In-band and out of band blocking level are defined for a 6 dB desensitization in 3GPP. However, in co-existence studies, 1 dB desensitization is considered for the protection of MFCN bands from harmful interference. Hence, the above values of ACS/In-band and out of band blocking were recalculated assuming 1 dB desensitization as the highest (ECC Reports 165, 252 & 325).

A 1 dB noise rise is equivalent to I/N = -6 dB. For 6 dB desensitization, the maximum interference experienced by the receiver is Noise\_floor + 4.74 dB. Similarly, for a 1 dB desensitization, the maximum interference experienced by the receiver is Noise\_floor-5.87 dB. Therefore, the values in Table 6 can be adjusted by 10.5 dB for 1 dB desensitization. And for positive attenuation values shown in table 7 below, the blocking response for SEAMCAT can be calculated by using following equation (ECC Report 326):

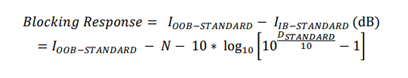


Table 7: WBB LMP Receiver Mask in SEAMCAT

|  |  |  |
| --- | --- | --- |
| Frequency offset | Medium Power – 1 dB Desensitization (Attenuation) | Low Power – 1 dB Desensitization (Attenuation) |
| 3800 MHz - 3780 MHz | 35.5 dB | 29.5 dB |
| 3780 MHz - 3740 MHz | 44.5 dB | 38.5 dB |
| Below 3740 MHz | 64.5 dB | 61.5 dB |

## 5G MFCN BS Tx Mask

Not required as in the study only 5G MFCN uplink is simulated. UE Tx mask from Table 1 is used.

## 5G MFCN BS Rx Mask

Table 8: 5G Macro BS Receiver mask (3GPP 38.104)

|  |  |  |  |
| --- | --- | --- | --- |
| AAS/ non-AAS | ACS  3800-3820 MHz (Interfering signal mean power (dBm) | In-band blocking  3820-3860 MHz (Interfering signal mean power (dBm) | Out-of-blocking  >3860 MHz (Interfering signal mean power (dBm) |
| Interferer signal level  6 dB desensitization | -52 dBm  (Table 7.4.1.2-1) | -43 dBm  (Table 7.4.2.2-1) | -15 dBm  (Table 7.5.2-1)  (3GPP 1-H) |

As explained in section 2.3 above, the above values of ACS/In-band and out of band blocking were recalculated assuming 1 dB desensitization and corresponding positive attenuation values are shown in Table 9 below.

Table 9: 5G Macro BS Receiver mask SEAMCAT

|  |  |  |  |
| --- | --- | --- | --- |
| AAS/ non-AAS | ACS  3800-3820 MHz | In-band blocking  3820-3860 MHz | Out-of-blocking  >3860 MHz |
| Attenuation (considering 1 dB desensitization) | 34.3 dB | 43.3 dB | 71.3 dB |

# Methodology and deployment scenario

In this report a monte-Carlo analysis is performed using SEAMCAT to analyse coexistence conditions between WBB LMP and MFCN below 3800 MHz. The simulation scenario is shown in Figure 1 where a single LAN BS (non-AAS / AAS) in LOS of a 5G MFCN BS (AAS / non-AAS). Appropriate antenna pattern and downtilt considered as mentioned in parameters table above. One million iterations are run for each case and UEs are randomly generated within the coverage area of the base station for each iteration.

Minimum separation distance of 100 m between the WBB LMP BS and the 5G MFCN BS is assumed considering the dense urban/ sub-urban environment. The distance between the BS is incrementally increased until uplink throughput loss at 5G MFCN BS is less than 5%. Furthermore, effect of strict block edge mask (BEM), guard band and in-block power reduction are also analysed for better and realistic coexistence.

In the study 5G MFCN uplink throughput loss is simulated. The study analyses the impact of separation distance, frequency separation, in-block power and restricted BEM on coexistence between WBB LMP BS and 5G MFCN BS. The target 5G MFCN BS uplink throughput loss is < 5%.

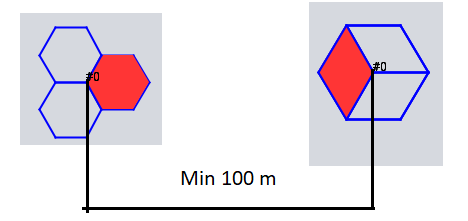


Figure 1: Minimum separation distance of 100 m between the WBB LMP BS and the 5G MFCN BS

Four scenarios are considered in this report:

1. Unsynchronised 5G non-AAS BS vs WBB non-AAS.
2. Unsynchronised 5G AAS BS vs WBB non-AAS.
3. Unsynchronised 5G non-AAS BS vs WBB AAS
4. Unsynchronised 5G AAS BS vs WBB AAS

# Study results (WBB medium power vs mfcn)

## Unsynchronised 5G non-AAS BS vs WBB non-AAS

Table 10: 5G MFCN non-AAS vs WBB LMP non-AAS unsynchronised

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| BS Tx EIRP (dBm/100 MHz) | LMP BS OOBE EIRP  Below 3800 MHz | WBB LMP CF MHz | Mean iRSS\_unwanted (dBm) | Mean iRSS\_blocking (dBm) | Distance between BS (km) | Average 5G MFCN UL TP Loss (%) |
| 51 | Table 3\* | 3850 | -56.96 | -63.82 | 0.1 | 100 |
| 51 | -76.97 | -83.82 | 1 | 76.781 |
| 51 | -83 | -89.95 | 2 | 48.242 |
| 51 | -90.98 | -97.84 | 5 | 15.239 |
| **51** | **-97.04** | **-103.9** | **10** | **4.686** |
| 51 | -40 dBm/MHz | -94.5 | -63.82 | 0.1 | 100 |
| **16** | **-45 dBm/MHz** | **-99.5** | **-98.82** | **0.1** | **4.492** |
| 51 | -40 dBm/MHz | 3910 | -94.64 | -94.86 | 0.1 | 11.547 |
| 31 | -40 dBm/MHz | -94.64 | -114.86 | 0.1 | 6.529 |
| **45** | **-45 dBm/MHz** | **-99.64** | **-100.86** | **0.1** | **3.801** |
| \*Spurious value in dBc adjusted in SEAMCAT according to in block power to maintain spurious level of -30dBm/MHz. | | | | | | |

## Unsynchronised 5G AAS BS vs WBB non-AAS

Table 11: 5G MFCN AAS vs WBB LMP non-AAS unsynchronised

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| BS Tx EIRP (dBm/100 MHz) | LMP BS OOBE EIRP  Below 3800 MHz | WBB LMP CF MHz | Mean iRSS\_unwanted (dBm) | Mean iRSS\_blocking (dBm) | Distance between BS (km) | 5G MFCN UL TP Loss (%) |
| 51 | Table 3\* | 3850 | -67.81 | -66.02 | 0.1 | 93.907 |
| 51 | -87.82 | -86.03 | 1 | 30.247 |
| 51 | -93.83 | -92.06, | 2 | 14.557 |
| 51 | -97.36 | -95.59 | 3 | 9.123 |
| **51** | **-100.91** | **-99.12** | **4.5** | **5.161** |
| 51 | -40 dBm/MHz | -105.33 | -66.02 | 0.1 | 88.278 |
| 28 | **-40 dBm/MHz** | **-105.35** | **-89.02** | **0.1** | **4.097** |
| 51 | **-40 dBm/MHz** | **3910** | **-105.46** | **-97.07** | **0.1** | **1.876** |
| \*Spurious value in dBc adjusted in SEAMCAT according to in block power to maintain spurious level of -30 dBm/MHz. | | | | | | |

## Unsynchronized 5G non-AAS BS vs WBB AAS

Table 12: 5G MFCN non-AAS vs WBB LMP AAS unsynchronised

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| BS Tx EIRP (dBm/100 MHz) | LMP BS OOBE TRP  Below 3800 MHz | WBB LMP CF | Mean iRSS\_unwanted (dBm) | Mean iRSS\_blocking (dBm) | Distance between BS (km) | 5G MFCN UL TP Loss (%) |
| 51 | Table 4\* | 3850 | -57.4 | -82.03 | 0.1 | 100 |
| 51 | **3850** | **-94.36** | **-118.99** | **7** | **4.146** |
| 21.8 | -43 dBm/ 5 MHz | **3850** | **-95.5** | **-111.22** | **0.1** | **3.772** |
| 51 | -43 dBm/ 5 MHz | 3850 | -94.1 | -82.01 | 0.1 | 47.517 |
| 51 | -43 dBm/ 5 MHz | **3910** | **-94.24** | **-113.06** | **0.1** | **4.519** |
| \*Spurious value in dBc adjusted in SEAMCAT according to in block power to maintain spurious level of -30 dBm/MHz. | | | | | | |

## Unsynchronised 5G AAS BS vs WBB AAS

The study is conducted in SEAMCAT by placing two BS f2f. SEAMCAT has two types of cell layout one hexagonal (3GPP) and one diamond (3GPP2). Different cell layouts does not matter in case of non-AAS deployment as antenna pattern is fixed. However, for AAS as the beams are directed towards a UE and same antenna pattern is used to calculate interference towards the victim system, so different cell layouts can result in different iRSS unwanted strength. The difference is explained in ANNEX 1 with steps taken to cater this difference.

Note: In all above scenarios hexagonal (3GPP) cell layout is used for AAS BS.

Table 13: 5G MFCN AAS vs WBB LMP AAS unsynchronised

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| BS Tx EIRP (dBm/100 MHz) | LMP BS OOBE TRP  Below 3800 MHz | WBB LMP CF | Mean iRSS\_unwanted (dBm) | Mean iRSS\_blocking (dBm) | Distance between BS (km) | 5G MFCN UL TP Loss (%) |
| 51 | Table 4\* | 3850 | -69.77 | -84.21 | 0.1 | 81.319 |
| 51 | 3850 | -106.07 | -120.56 | 6.5 | 4.531 |
| 51 | -43 dBm/ 5 MHz | 3850 | -106.48 | -84.25 | 0.1 | 42.502 |
| 23.2 | -43 dBm/ 5 MHz | 3850 | -106.48 | -112.05 | 0.1 | 4.48 |
| 51 | Table 4\* | 3910 | -86.628 | -115.28 | 0.1 | 32.264 |
| 51 | -43 dBm/ 5 MHz | 3910 | -106.61 | -115.29 | 0.1 | 3.978 |
| \*Spurious value in dBc adjusted in SEAMCAT according to in block power to maintain spurious level of -30dBm/MHz. | | | | | | |

# Study results (WBB low power vs mfcn)

## Unsynchronised 5G AAS BS vs WBB non-AAS

Table 14: 5G MFCN AAS vs WBB LMP non-AAS unsynchronised

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| BS Tx EIRP (dBm/100 MHz) | LMP BS OOBE EIRP  Below 3800 MHz | WBB LMP CF MHz | Mean iRSS\_unwanted (dBm) | Mean iRSS\_blocking (dBm) | Distance between BS (km) | 5G MFCN UL TP Loss (%) |
| 31 | Table 3\* | 3850 | -85.58 | -85.3 | 0.1 | 36.296 |
| 31 | -91.62 | -91.32 | 0.2 | 18.55 |
| 31 | -99.59 | -99.28, | 0.5 | 6.49 |
| 31 | -102.52 | -102.2 | 0.7 | 3.687 |
| 31 | -40 dBm/MHz | -104.59 | -85.3 | 0.1 | 12.29 |
| 26 | -40 dBm/MHz | -104.61 | -90.3 | 0.1 | 3.66 |
| 31 | Table 3\* | 3910 | -88.76 | -116.34 | 0.1 | 22.119 |
| 31 | -40 dBm/MHz | -104.72 | -116.34 | 0.1 | 2.04 |
| \*Spurious value in dBc adjusted in SEAMCAT according to in block power to maintain spurious level of -30dBm/MHz. | | | | | | |

# Conclusion

The study results shows that adjacent channel unsynchronised coexistence between outdoor MFCN below 3800 MHz and WBB LMP above 3800 MHz is quite challenging as technical conditions will be too restrictive.

The study also shows that defining only a strict BEM will not solve the problem, blocking impact from WBB LMP systems also needs to be considered for which guard band of at least 60 MHz is needed between the two networks.

## WBB medium power

In-block power restriction of as low as 16 dBm/100 MHz EIRP for non-AAS WBB LMP BS with restrictive block edge mask (BEM) of -45 dBm/ MHz EIRP will be needed. And for AAS, power restriction of 21.8 dBm/100 MHz EIRP with restricted emissions of -43 dBm/ 5MHz TRP below 3800 MHz is required to sufficiently protect 5G MFCN network below 3800 MHz.

Measures like separation distance at least 10 km or frequency separation of at least 60 MHz with restrictive BEM significantly improve the coexistence in case of unsynchronised operation. However, in real world large separation distance of at least 10 km with MFCN network might not be possible so alternatively 60 MHz GB with restrictive BEM seems more appropriate.

## WBB low power

Coexistence conditions are better compared to medium power scenario. However, separation distance of at least 700 m is needed to protect MFCN below 3800 MHz which could be challenging in dense urban/ sub-urban scenario as generally MFCN cell sizes are smaller than 700 m in dense urban/ sub-urban locations. Guard band of at least 60 MHz (to reduce the impact of blocking) with restrictive BEM significantly improves the coexistence.

Furthermore, study also shows the coexistence conditions improve significantly in case of AAS deployments.

The impact of MFCN macro BS interference towards unsynchronized WBB LMP BS is not analysed in this Report. However, considering the high power of macro BS the separation distance could be considerably large to achieve the desirable quality of service of a WBB LMP network depending upon the use case.

Results of the study are summarised in the table below.

Table 15: Summary of results (5G Uplink throughput loss < 5 %) WBB Medium Power

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Scenario | Min separation distance (km) | Guard band (GB) | WBB LMP OOBE Below 3800 MHz | Max in-block power (dBm/100 MHz) | 5G MFCN UL TP Loss (%) |
| **WBB non-AAS vs MFCN non-AAS** | 10 | Nil | Table 3 (UK model) EIRP | 51 | 4.686 |
| 0.1 | Nil | -45 dBm/ MHz | 16 | 4.492 |
| 0.1 | 60 MHz | -45 dBm/ MHz | 45 | 3.801 |
| **WBB non-AAS vs MFCN AAS** | 4.5 | Nil | Table 3 (UK model) EIRP | 51 | 5.161 |
| 0.1 | Nil | -40 dBm/ MHz | 28 | 4.097 |
| 0.1 | 60 MHz | -40 dBm/ MHz | 51 | 1.876 |
| **WBB AAS vs MFCN non-AAS** | 7 | Nil | Table 4 (3GPP) TRP | 51 | 4.146 |
| 0.1 | Nil | -43 dBm/ 5 MHz | 21.8 | 3.772 |
| 0.1 | 60 MHz | -43 dBm/ 5 MHz | 51 | 4.519 |
| **WBB AAS vs MFCN AAS** | 6.5 | Nil | Table 4 (3GPP) TRP | 51 | 4.531 |
| 0.1 | Nil | -43 dBm/ 5 MHz | 23.2 | 4.48 |
| 0.1 | 60 MHz | -43 dBm/ 5 MHz | 51 | 3.978 |

Table 16: Summary of results (5G Uplink throughput loss < 5 %) WBB Low Power

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Scenario | Min separation distance (km) | Guard band (GB) | WBB LMP OOBE Below 3800 MHz | Max in-block power (dBm/100 MHz) | 5G MFCN UL TP Loss (%) |
| WBB non-AAS vs MFCN AAS | 0.7 | Nil | Table 3 (UK model) EIRP | 31 | 3.687 |
| 0.1 | Nil | -40 dBm/ MHz EIRP | 26 | 3.66 |
| 0.1 | 60 MHz | -40 dBm/ MHz EIRP | 31 | 2.04 |

1. Approximation use for scenario 4 (Section 4.4, Medium power)

The study is conducted in SEAMCAT by placing two BS f2f. SEAMCAT has two types of cell layout one hexagonal (3GPP) and one diamond (3GPP2).

A screen shot of a graph

Description automatically generated

Figure 2: Hexagonal (3GPP) type cell layout

A screen shot of a graph

Description automatically generated

Figure 3: Diamond (3GPP2) type cell layout

In 3GPP and 3GPP2 cell layout are of different shape as can be seen in picture above and SEAMCAT lacks the feature to select one cell layout and place the two BS f2f. Therefore, two different layouts are chosen to simulate this scenario.

The cell layout does not matter in case of non-AAS deployment as antenna pattern is fixed but for AAS as the beam follows the UE so closer to the UE the beam will be more tilted downwards and gain towards ILT will be less.

Beamforming antenna directs beam towards UE and use same pattern for calculation of interference in direction of ILT. SEAMCAT system uniformly distribute terminals in the given shape so in case of 3GPP2 and 3GPP cell layout gain of AAS antenna in the direction of ILT is different. When user terminal is at “large” angle downwards or closer to the BS then VLR antenna gain in ILT direction would be smaller compared to user terminal as at “small” angle or further away from the BS. So, because of different shape of cells angular spread of beam directions are different.

It can be seen in the figures below for same configuration of WBB LMP non-AAS BS, when VLR (i.e. MFCN AAS BS) uses 3GPP hexagonal cell layout the iRSS unwanted is almost 10 dB higher (Figure 3) -105.98 dBm, compared to when VLR uses 3GPP2 diamond cell layout (Figure 2) -115.21 dBm.

This is so because in case of 3GPP the direction of VLR beam is closer to direction of ILT which means VLR gain is bigger. To cater for this difference when both systems are using AAS antenna the cell size of the system using 3GPP2 diamond cell layout was doubled (Figure 4), i.e. 800 m, to increase the beam spread and iRSS unwanted to be close to what is expected with hexagonal layout 3GPP i.e. -107.46 dBm.

A screen shot of a computer

Description automatically generated

Figure 4: 3GPP2 diamond cell layout with doubled cell size

Table 17: Difference in iRSS unwanted

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Mean iRSS unwanted | Note |
| Figure 2 | MFCN 3GPP2 (Diamond shape layout) | -115.21 dBm | Difference in iRSS unwanted in Figure 3 and Figure 4 is approx 1.4 dB |
| Figure 3 | MFCN 3GPP (Hexagonal layout) | -105.98 dBm |
| Figure 4 | MFCN 3GPP2 (Diamond shape layout) 2 x cell size | -107.46 dBm |