studies between DECT NR+ and adjacent MFCN below 3.8 GHz

# Coexsitence study between dect nr+ in the 3.8 to 4.2 ghz band and mfcn below 3.8 ghz

## introduction

The DECT Forum commissioned Transfinite Systems Ltd (Transfinite) to carry out a set of in-band and adjacent band compatibility analyses for DECT NR+ operating in the 3.8 to 4.2 GHz band.

This document provides a summary of the adjacent band studies between DECT NR+ operating in 3.8 to 4.2 GHz and MFCN below 3.8 GHz. The analysis focuses on the MFCN base station as the victim and assesses adjacent channel compatibility via calculated Net Filter Discrimination values given in Table 1. The NFD assumes a 100 MHz MFCN carrier with a centre frequency of 3.75 GHz. Transmitter mask on DECT channel BW, receiver mask on 100 MHz MFCN channel.[[1]](#footnote-2).

Table 1: Calculated NFD for MFCN and DECT NR+

|  |  |
| --- | --- |
| DECT NR+ Channel Centre Frequency (GHz) | NFD dB (MFCN as victim) |
| 3.805 | -21.0574 |
| 3.815 | -22.8877 |
| 3.825 | -24.2855 |
| 3.835 | -25.8083 |
| 3.845 | -28.1724 |
| 3.855 | -28.9566 |
| 3.865 | -29.1181 |
| 3.875 | -29.1189 |
| 3.885 | -29.1191 |
| 3.895 | -29.1192 |
| 3.905 | -29.1194 |
| 3.915 | -29.1195 |

Other NFD values are at greater frequency separations levels off at -29.1195 dB. This levelling-off is an artifact of NFD calculations when extended spectrum masks are defined (i.e. masks that extend beyond the first adjacent channel or the out-of-band domain).

All technical details of DECT NR+ and MFCN and modelling assumptions are included in the draft ECC Report and are not repeated here for the sake of brevity.

## The simulation approach

For adjacent band scenarios involving MFCN, Monte Carlo simulations were developed in Visualyse Professional. The analysis considered two alternative approaches: the first based on the calculation of I/N at the MFCN base station receiver, in accordance with the agreed parameters, and the second based on a C/I analysis at the receiver as a sensitivity analysis to illustrate the effect when considering the wanted MFCN signal within the analysis.

The basis of both the I/N and the C/I approach is the independent random variation in the location of the DECT NR+ and MFCN UE devices within the service area of the base station. These simulations have been run for the urban macro case only.

Table 2: Deployment and Monte-Carlo Parameters

|  |  |  |
| --- | --- | --- |
| Parameter | Urban Macro | Unit/description |
| Sector shape | hexagonal |  |
| Sector azimuth range | +/- 60 | degrees |
| Sector Radius | 600 | metres |

Transmit Power Control was included for DECT NR+ in the simulations. Transmit Power Control is an important feature of DECT NR+ with [1] and [2] indicating a transmit power control range of between -40 dBm and +23 dBm.

## I/N analysis over the service area

To statistically characterise the risk of interference the percentage of locations that are potentially impacted was assessed over 1 million samples.

To account for those cases when the UE and DECT NR+ radios are not co-located, the location of the DECT NR+ radio was also independently randomised within the MFCN cell.

Using the Urban Macro scenario as an example, an NFD (Net Filter Discrimination) range calculated with values between -21.0574 to -29.1195 dB is used. The percentage of instances where the I/N is more than −6 dB over 1 million samples is calculated. The results are provided in Table 3.

Table 3: Percentage of Locations with I/N above -6 dB, Urban Macro case under assumptions of minimum and maximum NFD and with power control on the DECT NR+ TX link

|  |  |  |
| --- | --- | --- |
| MFCN Scenario | NFD assumed | % locations with excess I/N |
| Urban Macro | -21.0574 dB | 4.27% |
| Urban Macro | -29.1195 dB | 2.01 % |

## References

1. <https://devzone.nordicsemi.com/nordic/nordic-blog/b/blog/posts/dect-nr-a-technical-dive-into-non-cellular-5g>
2. ECC Report 352, Harmonised conditions and spectrum bands for the operation of governmental Unmanned Aircraft System (UAS)

1. The NFD between MFCN and DECT NR+ is calculated using the method given in ETSI TR 101 854, and a bandwidth correction is applied if the interfering transmitter’s bandwidth is greater than that of the victim receiver. The NFD is specified in the model as a loss on the radio interference path. [↑](#footnote-ref-2)