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1 Introduction

In this document we show results from measurements of the antenna-to-antenna isolation between different types of base station antenna configurations. The measurements are conducted on antennas for the GSM1800 band. However, since this band is relatively close to the IMT-2000 band it is reasonable to assume similar results for antennas to be used in this band.

In this report we present measurement results from antennas with both vertical and slanted dual polarisation, and different horizontal beamwidths. The different antennas are shown in Table 1. The isolation is measured with the antennas positioned for some different configurations.

	Antenna	Horizontal beamwidth	Gain	Polarisation	Frequency band
Vert. Pol	A	65º	18 dBi	Vertically linear	1710 – 1880 MHz
	B	90º	16 dBi	Vertically linear	1710 – 1880 MHz
	C	90º	17.5 dBi	Vertically linear	1710 – 1880 MHz
Dual. Pol	D	90º	16 dBi	+/- 45º dual pol.	1710 – 1880 MHz

Table 1: The antennas and their main characteristics.

2 Measurement set-up

Two reference antennas of the same kind were mounted next to each other in order to measure the isolation between them. The measurements were conducted using a HP8753/D network analyser. To evaluate different antenna configurations (i.e. different sectorisation as well as post- and wall-mounted antennas) measurements were made for antenna inclination angles of 90°, 120° and 180°, as well as, for horizontal and vertical separation. (The five configurations are shown schematically in Figure 1 and photographs are shown in Appendix I).

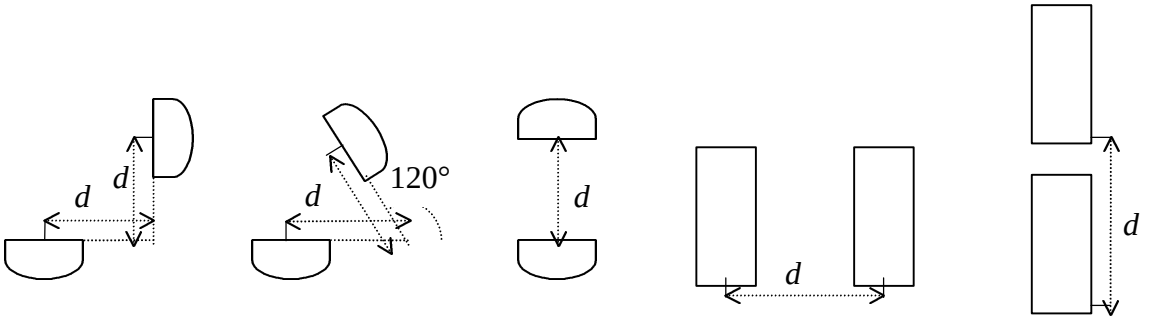


Fig. 1: The different configurations used during the measurements. *d* denotes the displacement.

For the three first mountings (configurations I-III, see Figure 1) the antennas were mounted on 50mm aluminium posts in an anechoic chamber. For configurations II and III the measurements were also conducted for the antennas mounted on the same post, denoted “same” in the Figures below. For the measurements of antenna-to-antenna isolation as a function of vertical and horizontal displacement, the antennas were placed on the ground outdoors, in order to simulate a wall mounting.

3 Results for the vertically polarised antennas

The minimum isolation in the GSM-1800 band as measured from one antenna to the other and for the various configurations is shown in Figures 2-6. Note, that in all figures: squares, triangles and stars denote reference antennas A, B and C (given in Table 1).

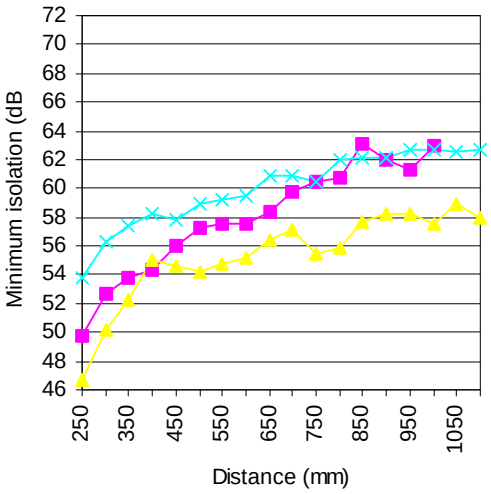


Fig. 2: Results from measurements of the isolation between vertically polarised antennas (A-C) mounted in configuration I (90° inclination).

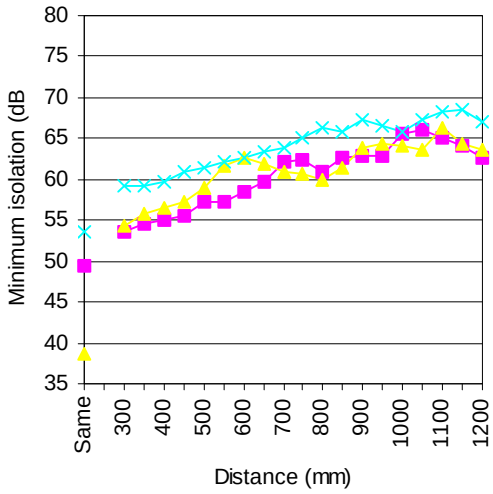


Fig. 3: Results from measurements of the isolation between vertically polarised antennas (A-C) mounted in configuration II (120° inclination).

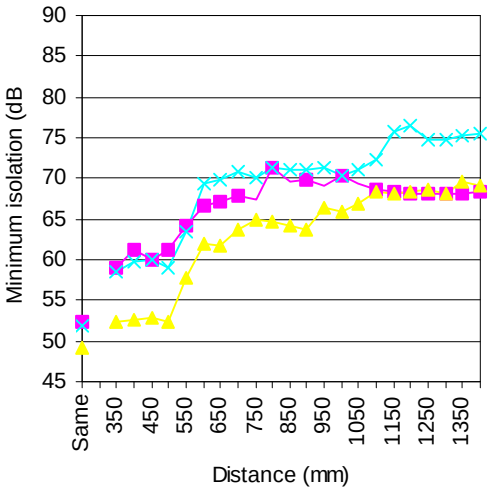


Fig. 4: Results from measurements of the isolation between vertically polarised antennas (A-C) mounted in configuration III (180° inclination).

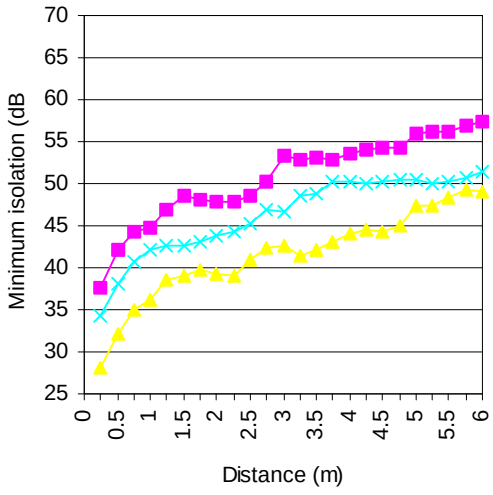


Fig. 5: Results from measurements of the isolation between vertically polarised antennas (A-C) mounted in configuration IV (Horizontal separation).

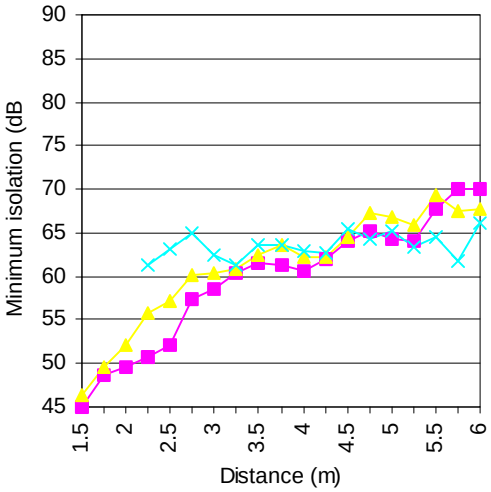


Fig. 6: Results from measurements of the isolation between vertically polarised antennas (A-C) mounted in configuration V (Vertical separation).

4 Results for the dual polarised antenna

The minimum isolation between two dual polarised antennas (D) as measured in the GSM-1800 band for the different configurations are shown on the Figures 7-11. The co-polar isolation is the isolation when the two antennas have the same polarisation, and cross-polar isolation is when the two dual polarised antennas have different polarisation (c.f. Appendix I). Note that, for all figures: squares and triangles denote the co-polar and cross-polar measurements.

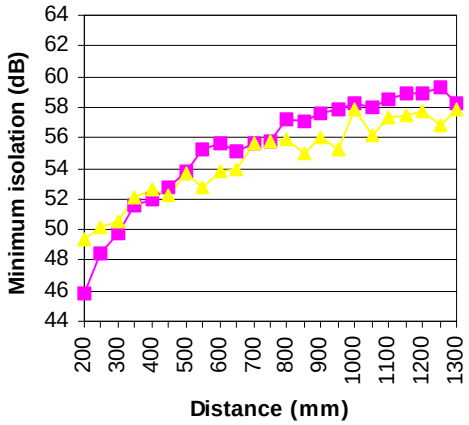


Fig. 7: Results from measurements of the isolation between dual polarised antennas (D) mounted in configuration I (90° inclination).

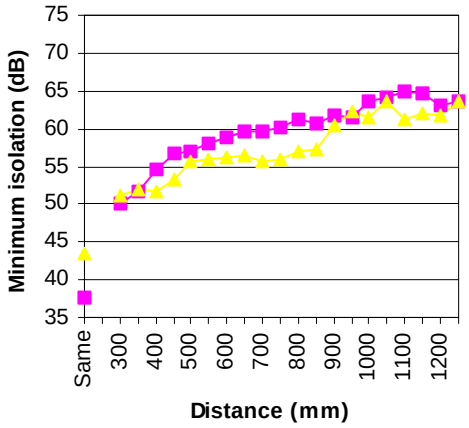


Fig. 8: Results from measurements of the isolation between dual polarised antennas (D) mounted in configuration II (120° inclination).

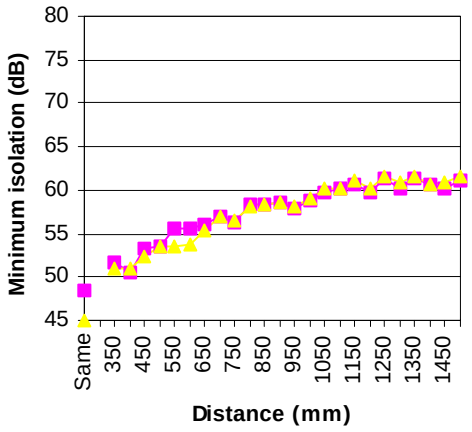


Fig. 9: Results from measurements of the isolation between dual polarised antennas (D) mounted in configuration III (180° inclination).

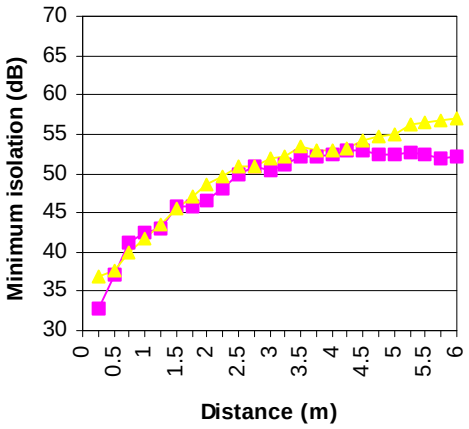


Fig. 10: Results from measurements of the isolation between dual polarised antennas (D) mounted in configuration IV (Horizontal separation).

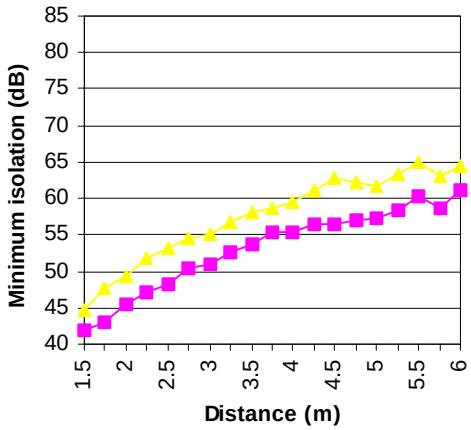


Fig. 11: Results from measurements of the isolation between dual polarised antennas (D) mounted in configuration V (Vertical separation).

5 Discussions and Conclusions

The measured results indicate that the horizontal displacement (c.f. figures 5 and 10) represents a "worst case scenario". For this case the lowest measured isolation is only ~27 dB (Figure 5, antenna B) when the two antennas are put next to each other. However, a displacement of 1m results in a lowest measured isolation of ~35 dB. As Figure 10 indicates, the isolation in the configuration with horizontal displacement (IV) can be improved by using different polarisation on the two antennas.

For the cases simulating different sectorisations using the same post (i.e. configurations I-III) the lowest measured isolation is ~38dB. However, when the antennas were mounted on different poles the isolation increased up to ~46dB. It can be noted that mounting antennas on the same post may result in poor isolation, even though no general conclusions of this fact can be drawn from the results presented here.

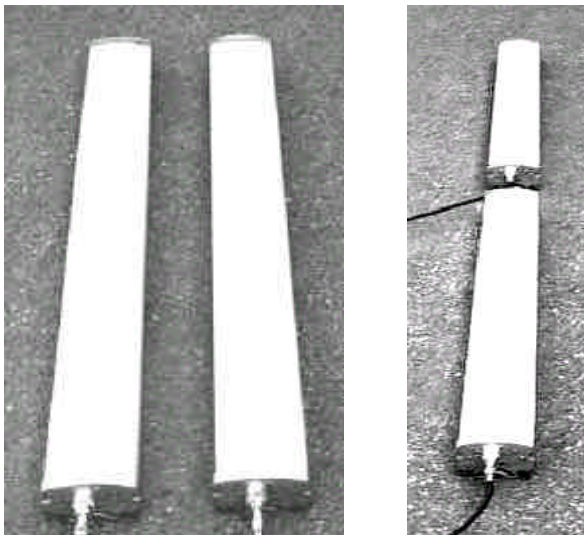
To conclude, we see large variations in the measured isolation, depending on the antenna configuration. However, isolation values of 50 dB are reached with reasonably short displacements (~1m) for all measured configurations except the horizontal.

6 Appendix

This appendix shows photographs taken of the different antenna configurations used in the measurements. Please note that the photographs are taken outside, but the measurements were performed indoors in an anechoic chamber.

a ***b*** ***c*** ***d*** ***e***

Fig 12: *a*: Configuration I (different posts, 90° inclination).
***b*: Configuration II (same post, 120° inclination).**
***c*: Configuration II (different posts, 120° inclination).**
***d*: Configuration III (same post, 180° inclination).**
***e*: Configuration III (different posts, 180° inclination).**



a ***b***

Fig 13: *a*: Configuration IV (horizontal separation).
_b_: Configuration V (vertical separation).

a ***b***

Fig 14: *a*: Co-polar measurements.
_b_: Cross-polar measurements.