NATIONAL PHYSICAL LABORATORY
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Certificate of Calibration

UKAS CALIBRATION 0478

SLEEVED DIPOLE ANTENNA

FOR: Cambridge Consultants
Science Park
Milton Road
Cambridge
CB4 0DW

DESCRIPTION: Sleeved dipole set consisting of 7 sleeved dipole antennas.

IDENTIFICATION:
SD 900 serial number E2374
SD 1800 serial number E2375
SD 1900 serial number E2376
SD 2050 serial number E2377
SD 2450 serial number E2378
SD 5150 serial number E2372
SD 5650 serial number E2373

MEASUREMENTS COMPLETED ON: 17 December 2021

The reported uncertainty is based on a coverage factor k=2, providing a level of confidence of approximately 95%

Reference : 2021100393-2 **Page 1 of 10**

Date of Issue : 17 December 2021 **Signed :** D.Knight **(Authorised Signatory)**

Checked by : D.Knight **Name : D A Knight** **on behalf of NPLML**

MEASUREMENT PROCEDURE

Radiation pattern

The patterns were measured in an anechoic chamber with the antenna mounted on a low reflectivity mast. The E-plane radiation patterns of the antenna are presented in Figures 1 to 7.

The E-plane radiation pattern for the antenna was measured along a single cut, in a plane parallel to the antenna balun. The antenna was positioned with the axis of the antenna horizontal relative to the azimuth positioner in the anechoic chamber, and rotated around the axis orthogonal to the antenna balun. In each figure, the 180 degree position corresponds to the position of the input connector. A 90 degree adaptor was used so the coaxial cable dropped vertically to the ground.

Each antenna had a physical reference groove which was placed directly above the centre of rotation. For example, the SD5650's reference mark was 14 mm from the tip of the antenna.

Summary of applicable parameters in Figures 1 to 7

Measured frequencies	SD 900 – 900 MHz SD 1800 – 1800 MHz SD 1900 – 1900 MHz SD 2050 – 2050 MHz SD 2450 – 2450 MHz SD 5150 – 5150 MHz SD 5650 – 5650 MHz
Measurement parameter	E-plane radiation pattern
Measurement uncertainty *	Frequency < 2000 MHz ±0.46 dB for values greater than –6.0 dB ±1.0 dB within the range –6.0 dB to –15 dB Frequency > 2000 MHz ±0.6 dB for values greater than –6.0 dB ±1.12 dB within the range –6.0 dB to –15 dB (For all patterns 0 dB reference is defined as the maximum level)

* The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a coverage probability of approximately 95 %. The uncertainty evaluation has been carried out in accordance with UKAS requirements. The uncertainty applies only to the measured values and gives no indication of the long term stability of the antenna.

ELECTRONIC CERTIFICATE

This certificate is designed to be viewed electronically. Printed copies of the document are permitted providing they are made in full and without modification. The electronic version of the certificate should be considered the master copy.

ENVIRONMENT

The measuring equipment was in a temperature controlled room at 23°C ± 2°C. In our experience there is no significant variation in the performance of passive antennas in the temperature range –5°C to +35°C.

ANNEX TO NPL CERTIFICATE

The radiation pattern uncertainty and any additional measurement uncertainty can be combined by following the guidance given by UKAS[1].

[1] The expression of uncertainty in EMC testing, LAB 34, UKAS, August 2002.

Figure 1
E-plane radiation pattern at 900 MHz.
Antenna: SD 900, s/n E2374

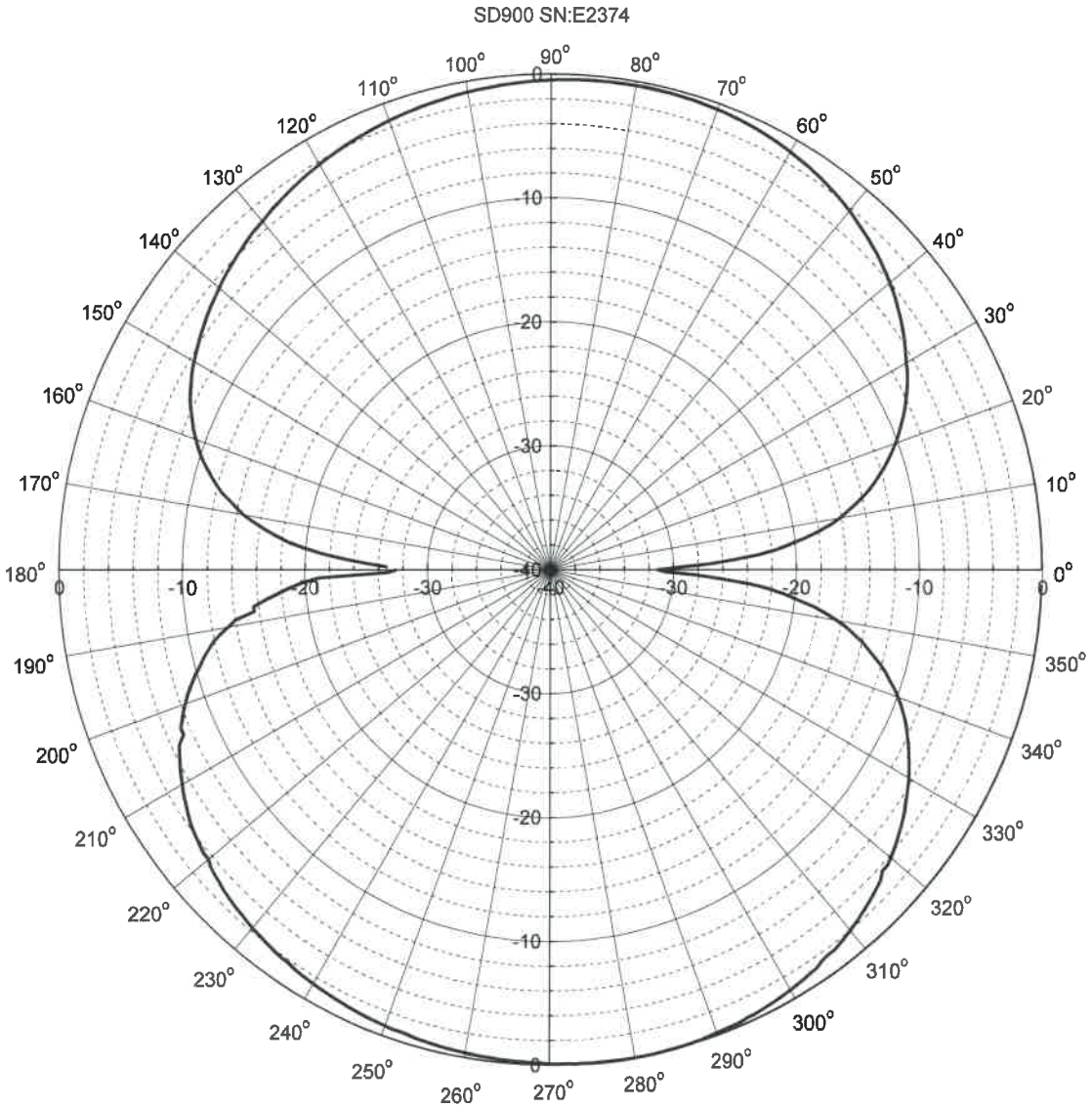

Figure 2
E-plane radiation pattern at 1800 MHz.
Antenna: SD 1800, s/n E2375

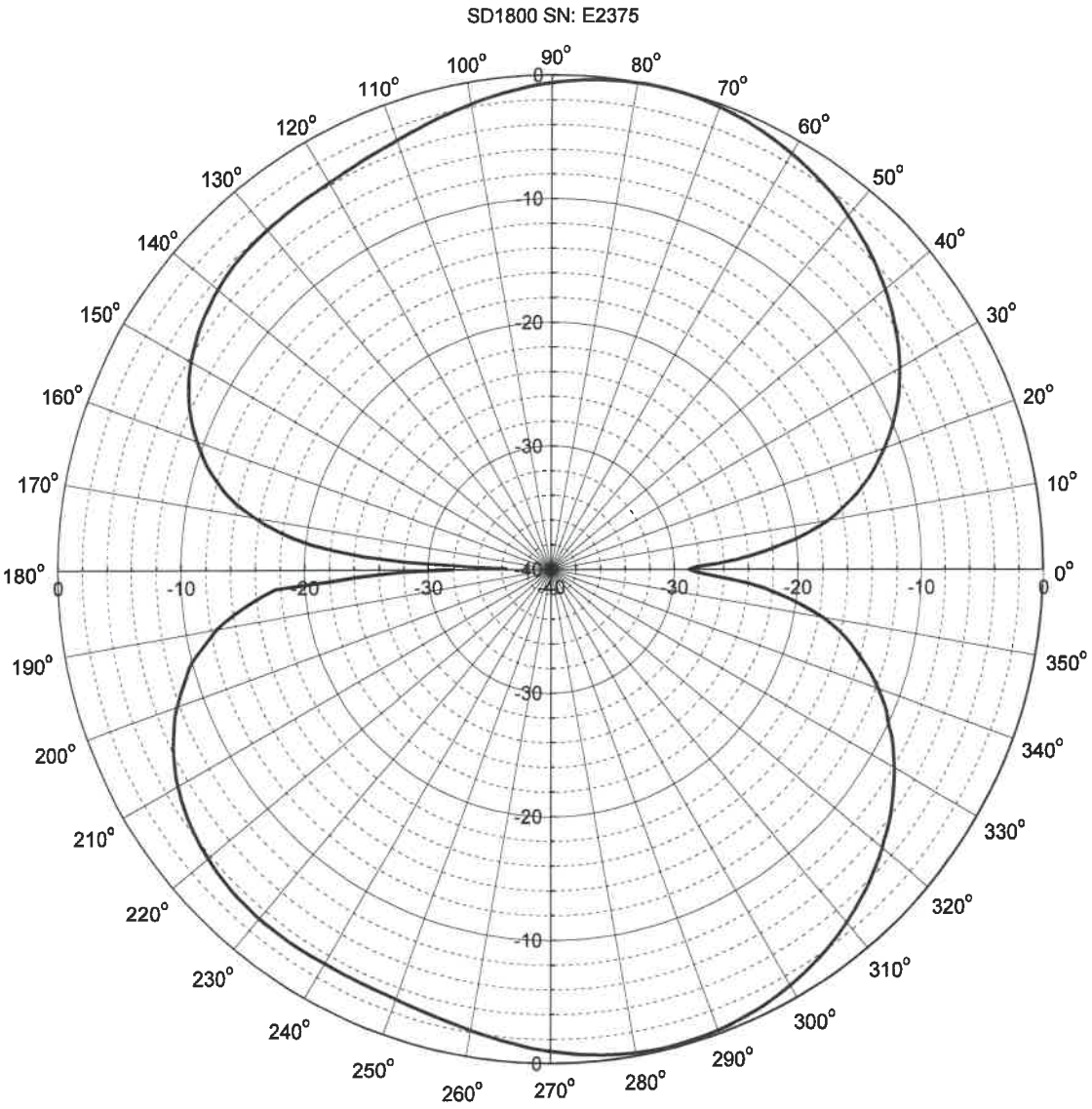

Figure 3
E-plane radiation pattern at 1900 MHz.
Antenna: SD 1900, s/n E2376

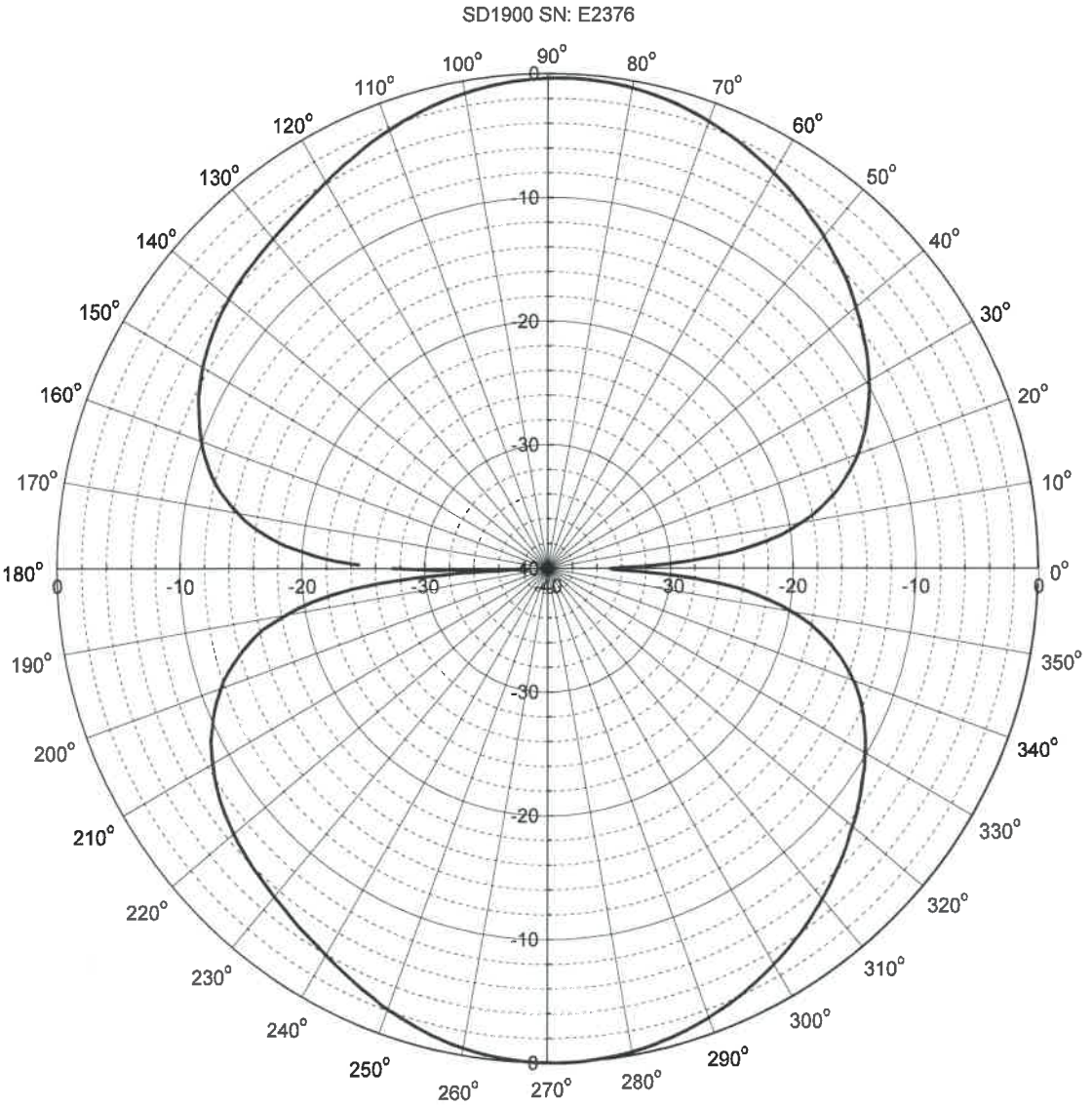

Figure 4
E-plane radiation pattern at 2050 MHz.
Antenna: SD 2050, s/n E2377

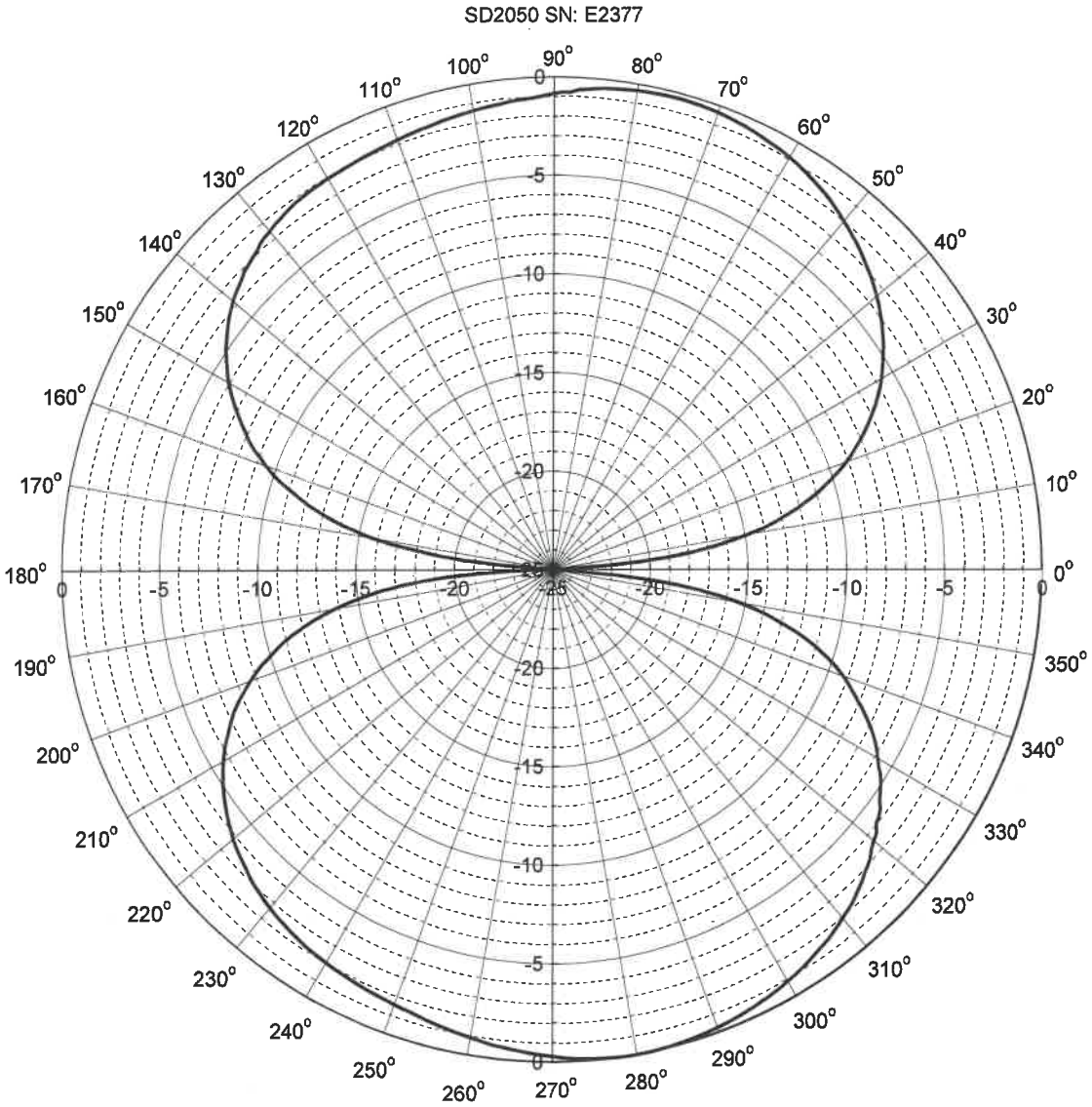

Figure 5
E-plane radiation pattern at 2450 MHz.
Antenna: SD 2450, s/n E2378

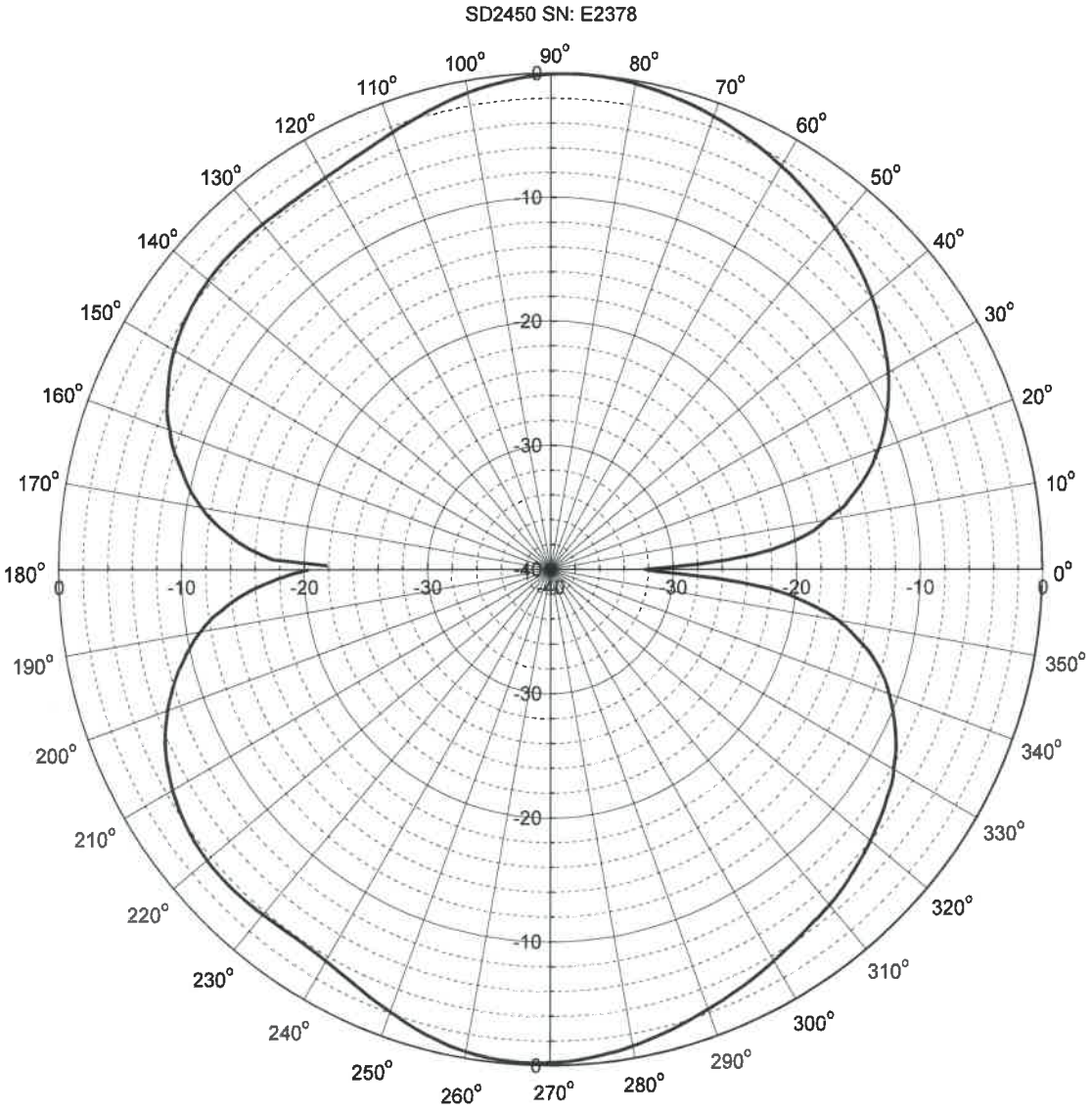

Figure 6
E-plane radiation pattern at 5150 MHz.
Antenna: SD 5150, s/n E2372

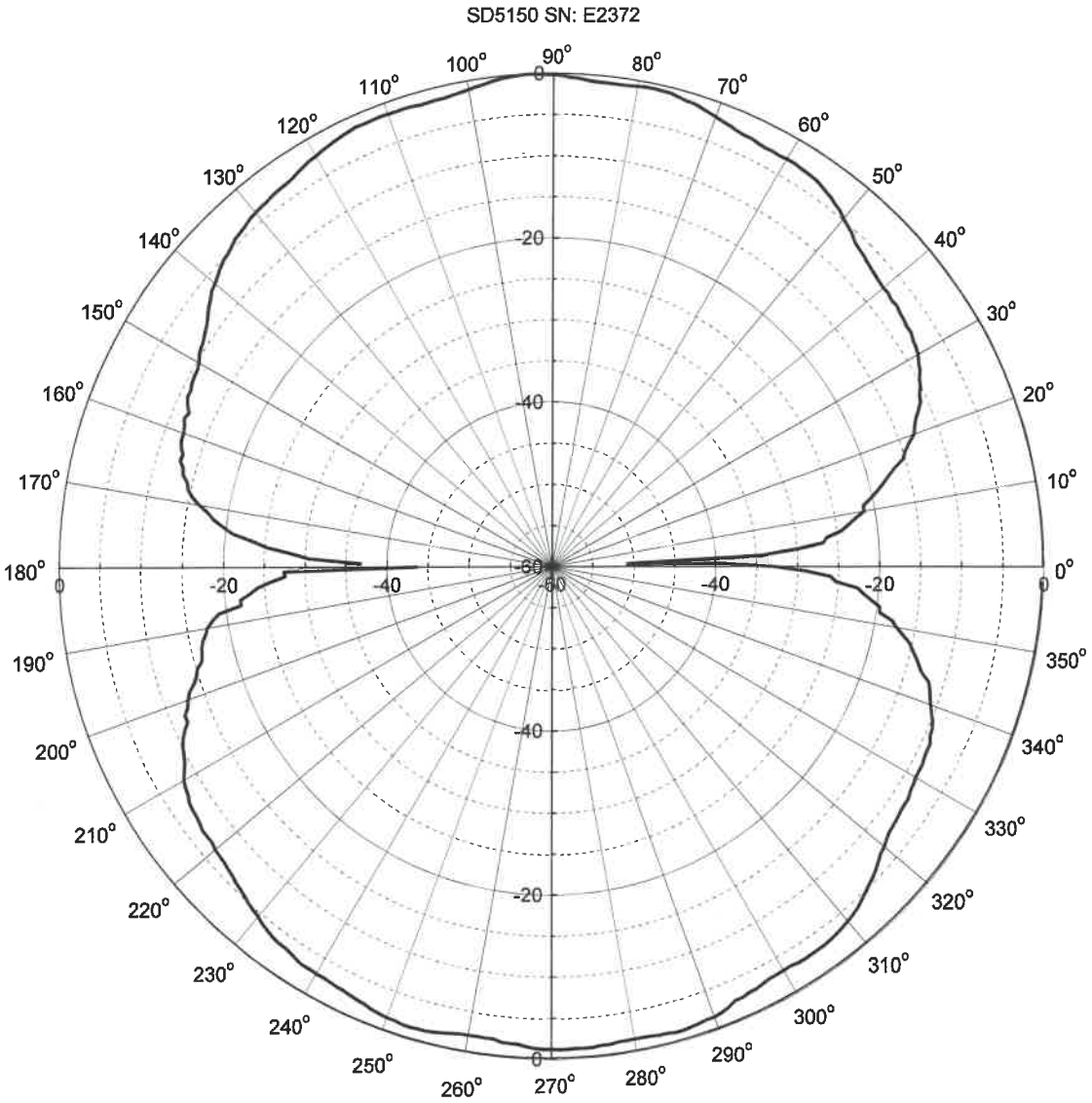

Figure 7
E-plane radiation pattern at 5650 MHz.
Antenna: SD 5650, s/n E2373