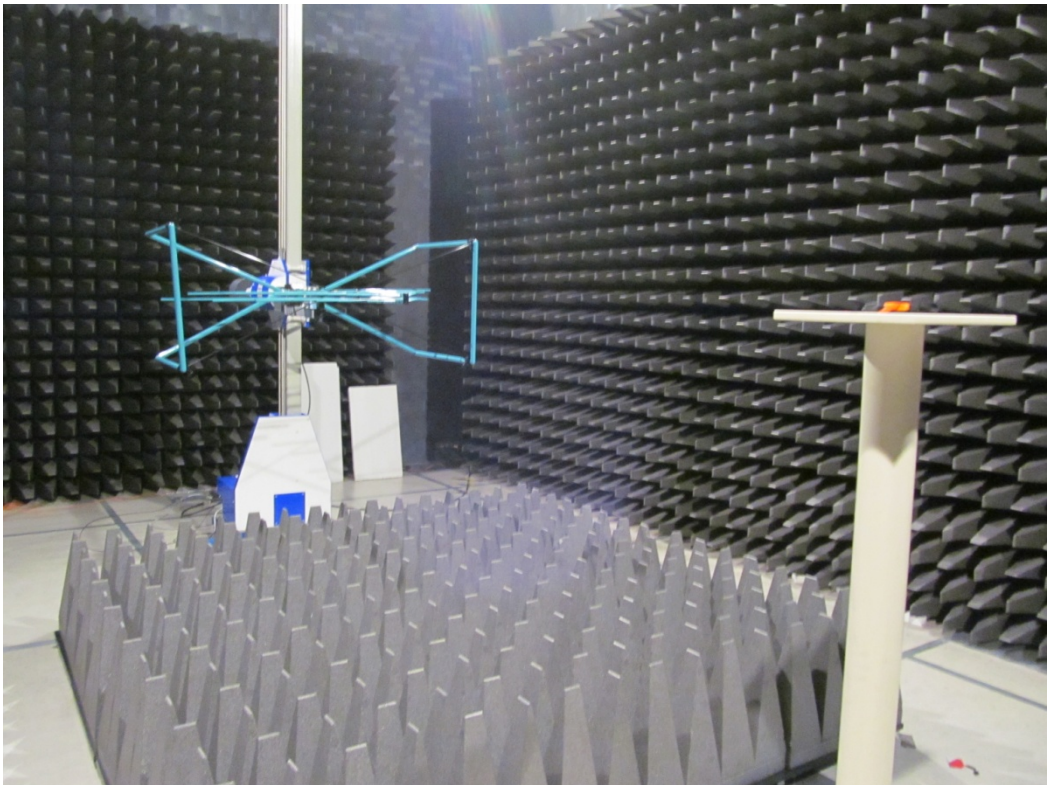
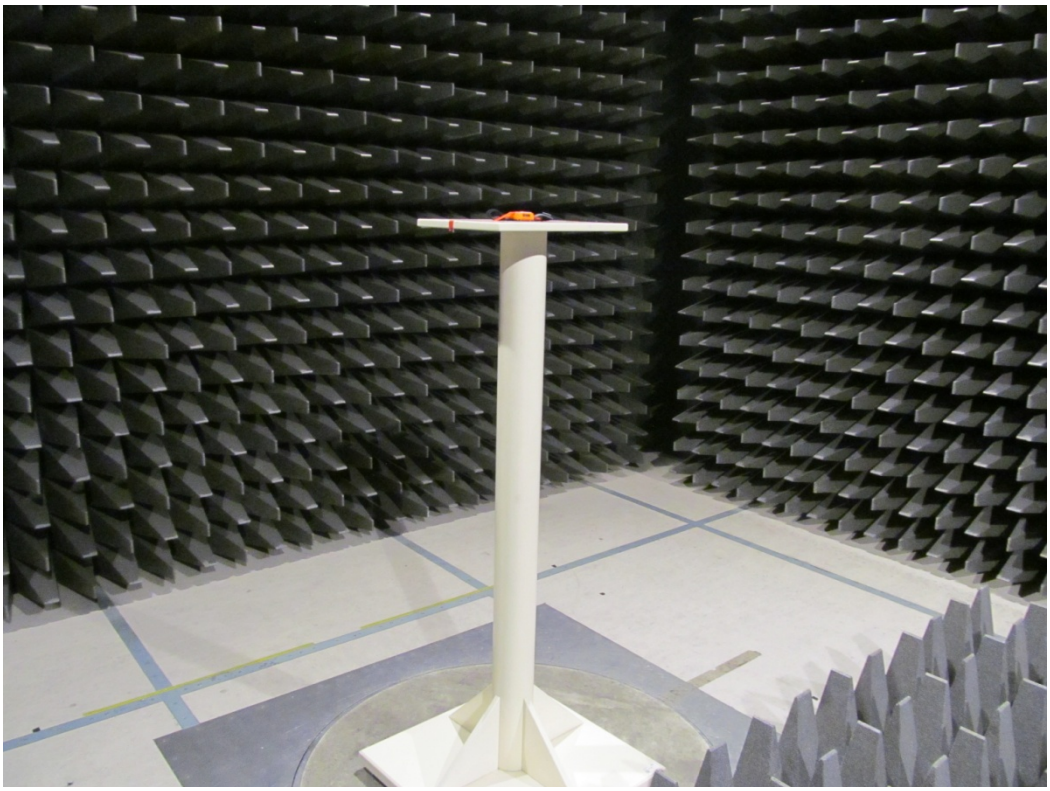
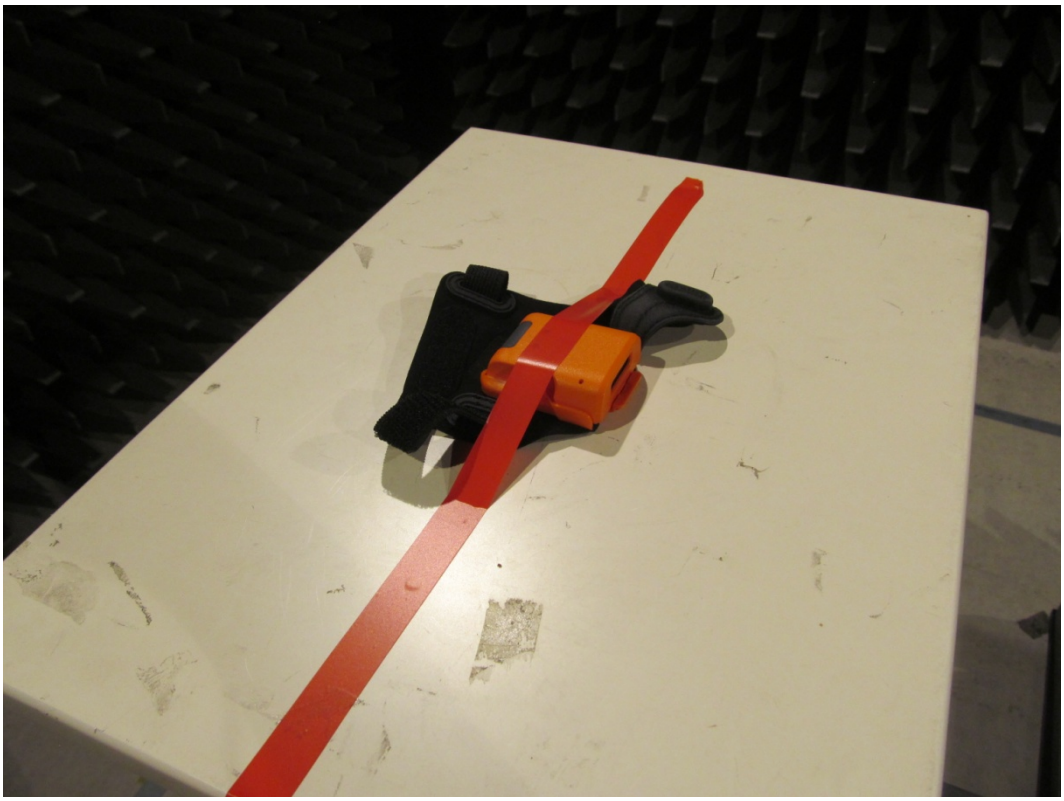
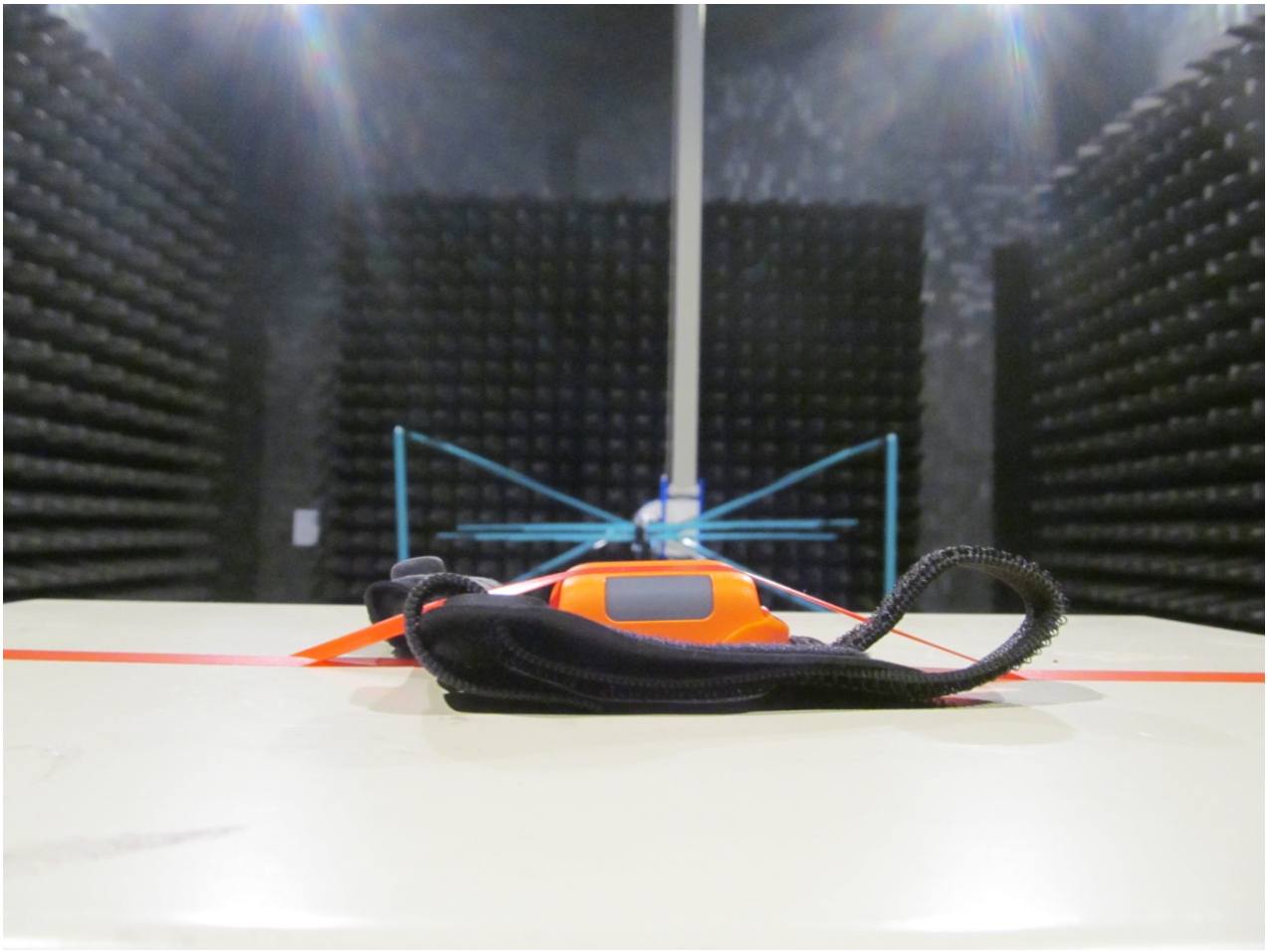






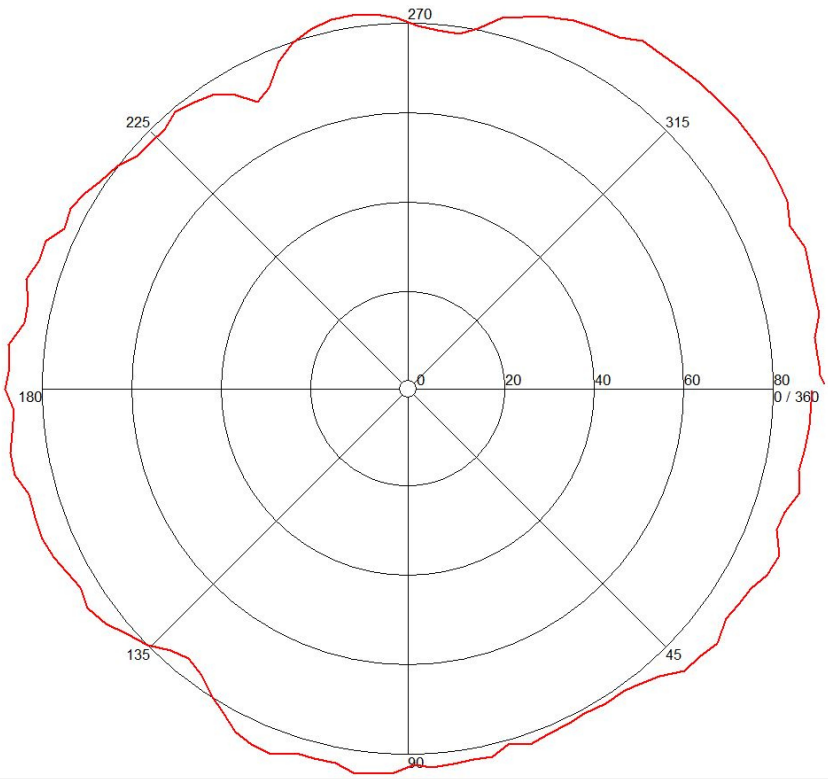
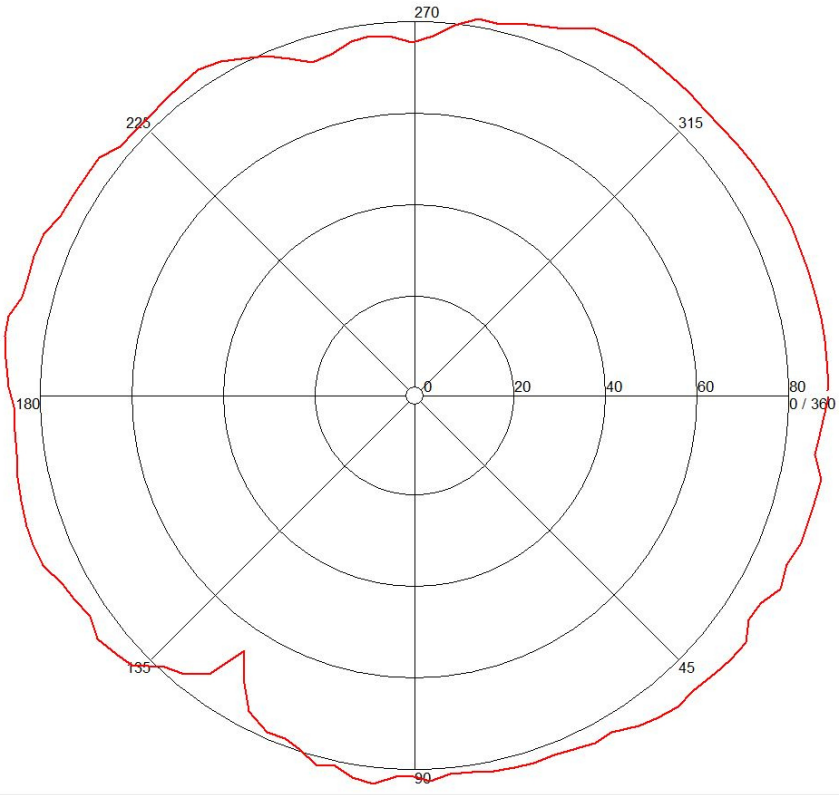


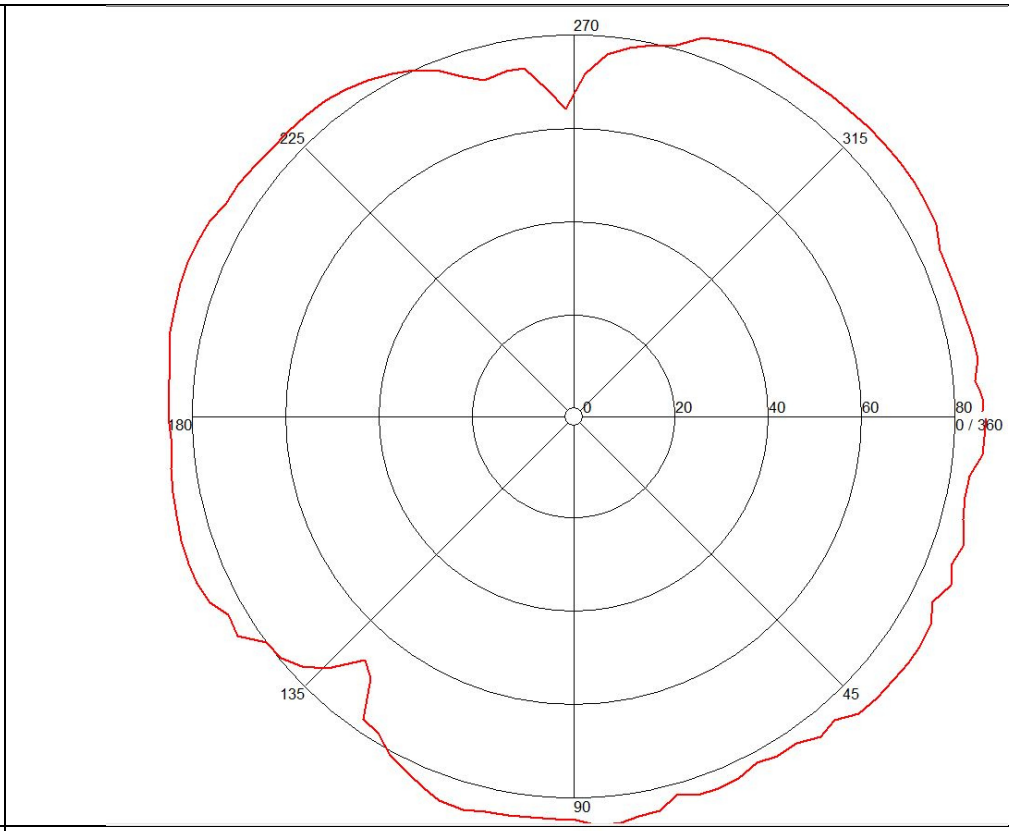
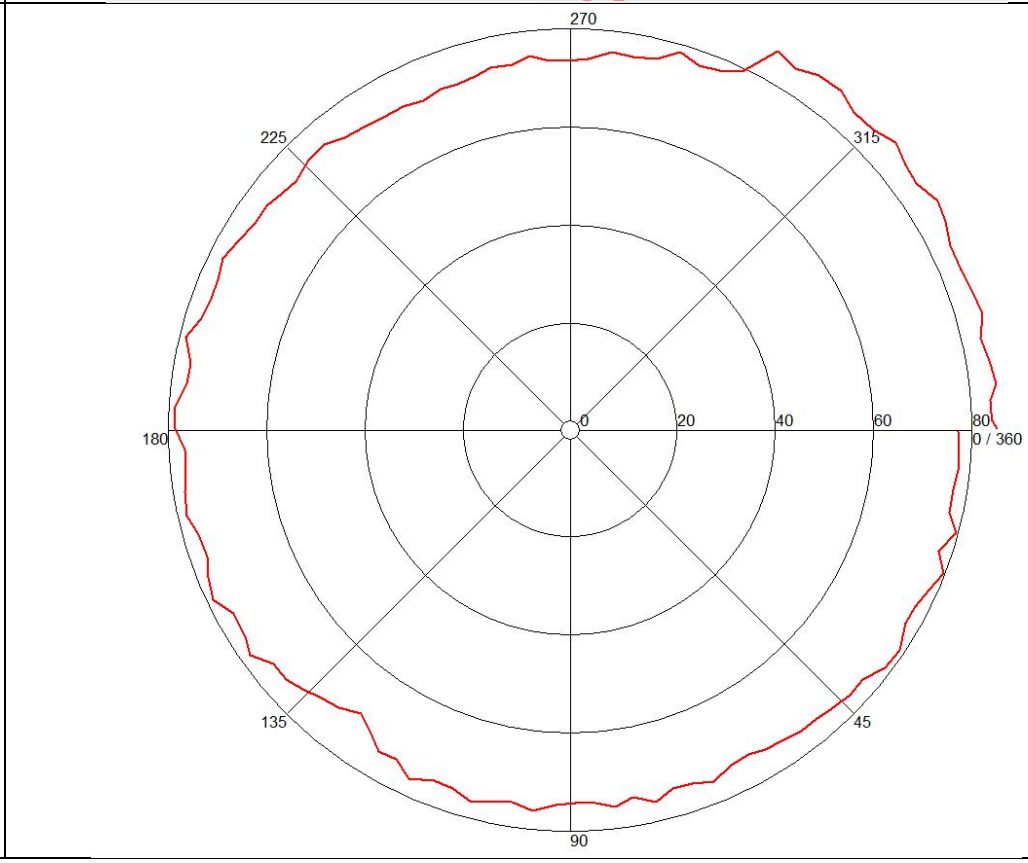
Test location:	semi-anechoic chamber
EUT to receiving antenna distance:	3 m
EUT height:	1.5 m
Azimuth during pre-scan:	0° (photos)
Azimuth during radiation pattern measurement:	0 – 360° with 5° step
Elevation angle:	0° (photo) – EUT is set in typical position for use, according to the manufacturer
Receiving antenna polarization during pre-scan:	VER and HOR (HOR is determined as the worst case for the measurements)
Mode of operation:	Normal modulation (continuous transmission)

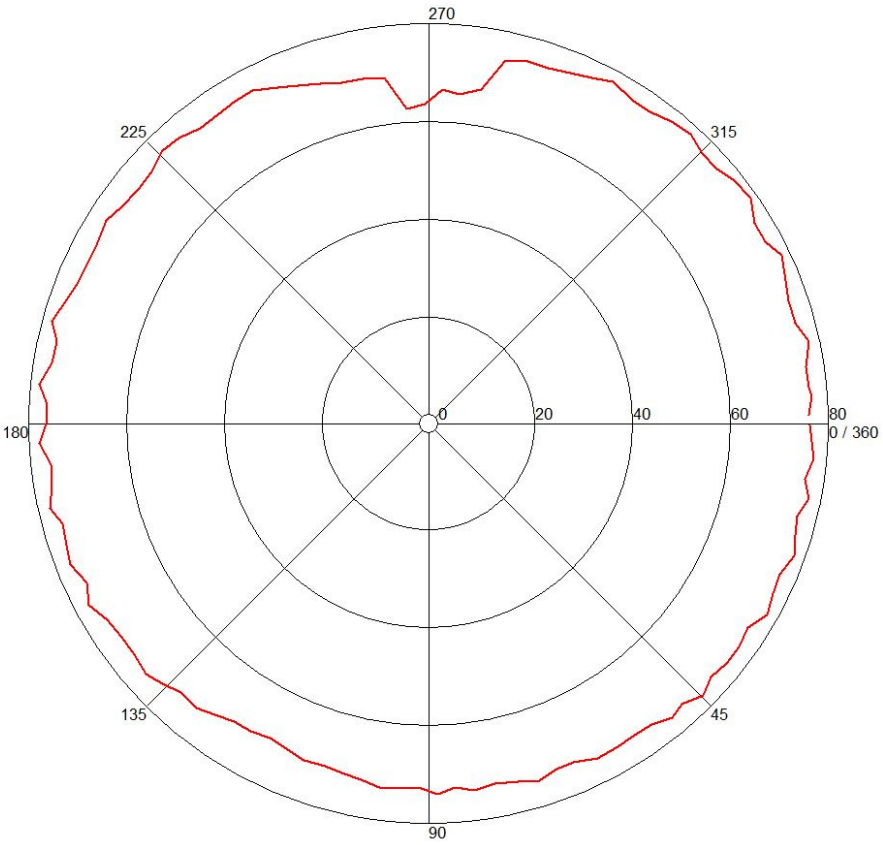
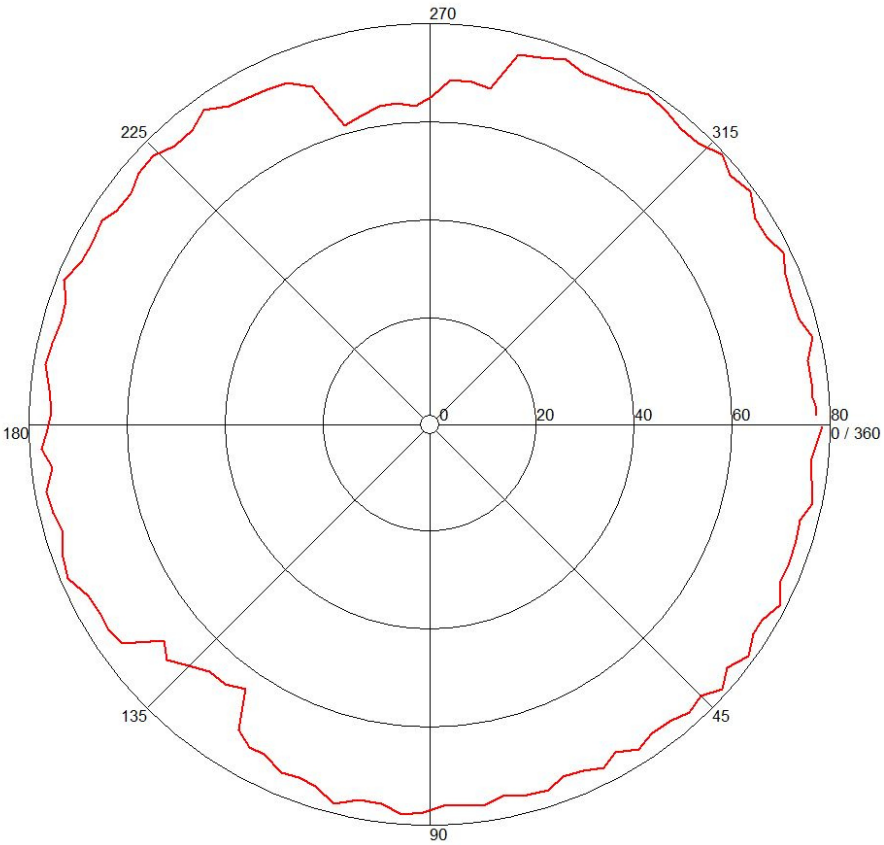
See clause 5.1.4 for the measurement details.

5.1.2. Results

Graphical representation of the measurement results:

Frequency [MHz] / Data rate	Antenna radiation pattern, horizontal polarization
2402 / 1 Mbps	
2440 / 1 Mbps	

2480 / 1 Mbps	
2402 / 2 Mbps	

2440 / 2 Mbps	
2480 / 2 Mbps	

Maximum peak gain found:

Frequency [MHz] / Data rate	P_R [dBm](1)	CL [dB](2)	AF [dB/m](3)	r[m](4)	Correction factor [dB](5)	P_T [dBm](6)	Azimuth [°]	Elevation angle [°]	G_T [dBi](7)
2402 / 1 Mbps	-50.03	3.01	31.25	3	11.77	0.15	327	0	-4.15
2440 / 1 Mbps	-53.03	3.03	31.53	3	11.77	0.15	194	0	-6.85
2480 / 1 Mbps	-55.74	3.06	31.96	3	11.77	0.15	205	0	-9.10
2402 / 2 Mbps	-49.55	2.99	31.25	3	11.77	0.15	322	0	**-3.70**
2440 / 2 Mbps	-51.71	3.03	31.53	3	11.77	0.15	329	0	-5.54
2480 / 2 Mbps	-52.96	3.06	31.96	3	11.77	0.15	321	0	-6.32

(2) RF power measured on the receiver, without corrections
(3) Cable losses
(4) Receiving antenna factor
(5) EUT to antenna distance
(6) See 5.1.4.
(7) Obtained values with the information that the maximum conducted RF output power is 0.15 dBm, according to the test report No. UL-RPT-RP-14317245-216-FCC issued on July 12, 2022 from UL INTERNATIONAL GERMANY GMBH.
(8) $G_{T\,[dBi]} = P_{R\,[dBm]} + 11.77 + AF_{[dB(m^{-1})]} - P_{T[dBm]}$

Maximum peak antenna gain is < 0 dBi (-3.70 dBi).

5.1.3. Deviations

None.

5.1.4. Comments

The test is performed with an unmodified sample, by radiated method. The test is performed in semi-anechoic chamber with absorbers on the floor. RF power ($P_{R\,[dBm]}$) was measured in the maximum radiation direction, with peak detector, at 3 m distance from EUT. The maximum peak gain was calculated using Friis transmission equation:

$$P_{R\,[dBm]} = P_{T[dBm]} + G_{T_{[dBi]}} + G_{R_{[dBi]}} + 20log_{10}\left(\frac{\lambda}{4\pi r}\right) \quad (1)$$

Antenna gain from antenna factor:

$$AF = \frac{9.73}{\lambda\sqrt{G}} \quad (2)$$

$$20log_{10}(AF) = 20log_{10}(9.73) - 20log_{10}(\lambda) - 10log_{10}(G) \quad (3)$$

$$AF_{[dB(m^{-1})]} = 19.76 - 20log_{10}(\lambda) - G[dBi] \quad (4)$$

$$\lambda = \frac{c}{f} = \frac{3*10^8}{f} = \frac{3*10^2}{f\,[MHz]} \quad (5)$$

$$20log_{10}(\lambda) = 20log_{10}\left(\frac{c}{f}\right) = 20log_{10}\left(\frac{3*10^2}{f\,[MHz]}\right) = 20log_{10}(300) - 20log_{10}f_{[MHz]} = 49.54 - 20log_{10}f_{[MHz]} \quad (6)$$

$$AF_{[dB(m^{-1})]} = 19.76 - (49.54 - 20log_{10}f_{[MHz]}) - G[dBi] \quad (7)$$

$$G_{R[dBi]} = 20log_{10}f_{[MHz]} - 29.78 - AF_{[dB(m^{-1})]} \quad (8)$$

Combining equations (1) and (8):

$$P_{R\,[dBm]} = P_{T[dBm]} + G_{T_{[dBi]}} + 20log_{10}f_{[MHz]} - 29.78 - AF_{[dB(m^{-1})]} + 20log_{10}\left(\frac{\lambda}{4\pi r}\right) \quad (9)$$

$$P_{R\,[dBm]} = P_{T[dBm]} + G_{T_{[dBi]}} + 20log_{10}f_{[MHz]} - 29.78 - AF_{[dB(m^{-1})]} + 20log_{10}(\lambda) - 20log_{10}(4\pi r) \quad (10)$$

$$P_{R\,[dBm]} = P_{T[dBm]} + G_{T_{[dBi]}} + 20log_{10}f_{[MHz]} - 29.78 - AF_{[dB(m^{-1})]} + 49.54 - 20log_{10}f_{[MHz]} - 31.53 \quad (11)$$

$$P_{R\,[dBm]} = P_{T[dBm]} + G_{T_{[dBi]}} - 11.77 - AF_{[dB(m^{-1})]} \quad (12)$$

$$P_{T[dBm]} + G_{T_{[dBi]}} = P_{R\,[dBm]} + 11.77 + AF_{[dB(m^{-1})]} \quad (13)$$

(for matched antenna)

Where:

P_T is the power fed into the transmitting (EUT's) antenna input terminals
G_T – gain of transmitting antenna
G_R – gain of receiving antenna
r – distance from EUT to receiving antenna,
λ – wavelength
AF – receiving antenna factor.

Cable losses are also taken into account in the final calculation.

6. MEASUREMENT EQUIPMENT

The following equipment is used for tests:

Type	Manufacturer	Model	Ser. No.	Last cal. date	Cal. Interval (months)	IN number
Antenna	Teseq	CBL6144	35349	02.11.2022.	36	0115
EMI receiver	Schaffner	SMR4503	81	20.10.2021.	20	0138
Software	Teseq	Compliance 5 E/I v5.26.4	517-2881623-74 and 517-2846725-70	N/A		0125
Semi anechoic chamber	Comtest	3m	/	21.01.2022.	36	0305
Antenna mast	Maturo	CAM-4.0	/	N/A		306
Controller	Maturo	MSU	/	N/A		307
FU absorbers + ferrite tiles	Comtest	DMAS HT45 + CAF-6	/	N/A		0308 + 309

N/A - Calibration not applicable
Calibration interval is calculated/defined by using ILAC-G24:2007 methods of control chart and in-use time.

7. MEASUREMENT UNCERTAINTY

Expanded uncertainty of measurement, expressed as the standard uncertainty of measurement multiplied by the coverage factor k = 2, which for normal distribution corresponds to a coverage probability of approximately 95 %.

For test 5.1: 4.62 dB

8. GENERAL REMARKS

Date format is dd.mm.yyyy.
Decimal mark is indicated by dot (.).

9. APPENDIXES

None.

END OF THE REPORT