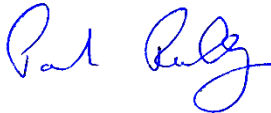


Project Num	24E11226-3
Quotation	Q24-2409-1
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Tested By	Joy Dalayap
Test Report By	Michael Kirby
Issue Date	1st Oct 2024
FCC Test Firm Designation	IE0002
ISED Cab Identifier	IE0001
EUT Description	Tracker Device
EUT Model	Skoll
Authorised by	Paul Reilly
Authorised Signature :	

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15. The test results presented in this report relate only to the object tested.

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1. Equipment Under Test (EUT)

1.1 Identification of EUT

Manufacturer:	Alps Electric Ireland Ltd
Model Name or Number:	Skoll
FCCID:	2AT4VSKOLL

1.2 Description of E.U.T.

The product was a battery powered asset tracker which contained a custom BLE Radio. This report covers the BLE antenna radiation pattern and gain test.

1.1. Modifications

There were no modifications on the EUT

1.2. Date of Test

The tests were carried out on the 26th Sept 2024.

1.3. Environmental Conditions

	Temperature	Relative Humidity
Test	°C	%
Radiated Emissions <1GHz	22	53

2. Operation of E.U.T. During Testing

2.1. Operating Environment

The EUT was powered from its internal battery. A new battery was used for the test.

2.2. Operating Mode:

The EUT was operated at 1Mbps in PRBS modulated mode for radiation pattern testing. The EUT operated on frequency 2402 MHz, 2440 MHz and 2480MHz.



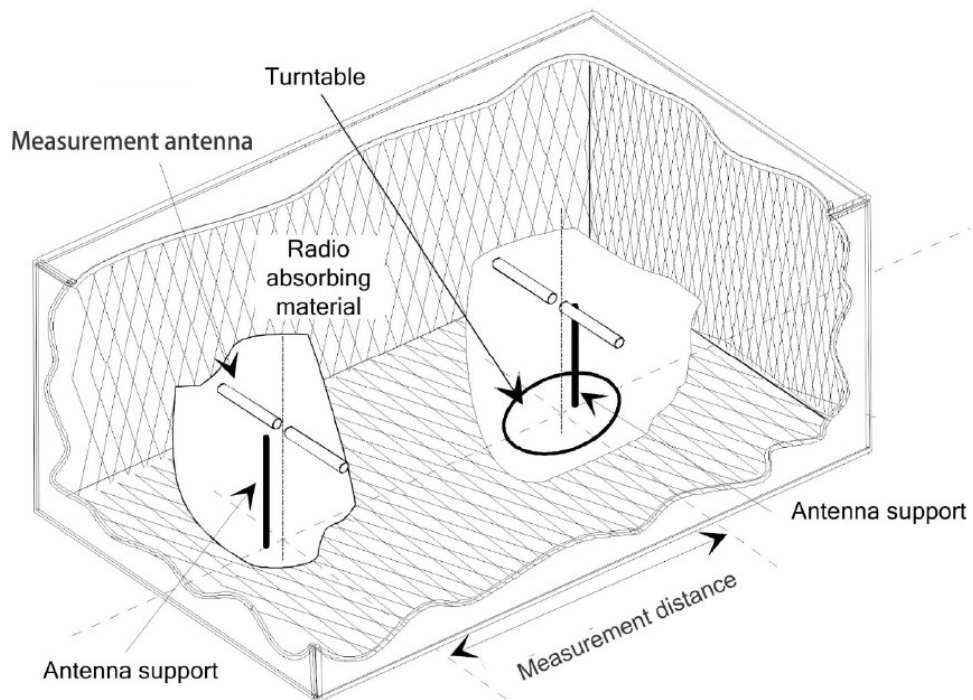
Tests were performed with an RBW of 1MHz on the analyser. Note the test was not performed at 2Mbps data rate as the antenna gain will not change.

2.3. Measurement Uncertainties

Measurement	Uncertainty
Radio Frequency	+/- 5×10^{-7}
Radiated Emissions by Substitution Test	± 2.25 dB
Maximum Frequency Deviation	+/- 1.7 %
Occupied Bandwidth	$\pm 5\%$
Conducted RF power	± 1.23 dB
Conducted Spurious Emission of transmitter	± 2.14 dB
Conducted Emissions of Receivers	± 2.14 dB
RF level of uncertainty for a given BER	± 1.23 dB
Temperature	$\pm 0.8^{\circ}\text{C}$
Humidity	$\pm 4\%$ RH

The measurement uncertainties stated were calculated with a k=2 for a confidence level of 95.45%.

3. Test Setup



Measurements were performed in a fully anechoic chamber with the measuring antenna at 3 metres distant from the EUT which was positioned at a height of 1.5metres.

4 Results

4.1 Effective Isotropic Radiated Power Max

4.1.1 Radiated measurements

Frequency	Reading Peak	EUT Orientation	Antenna Polarity	Antenna Factor	Preamp Gain	Cable loss	Final Field Strength Peak	Transmitted Power	Limit	Margin	Result
GHz	dBuV/m		V/H	dB	dB	dB	dBuV/m	dBm	dBm	dB	P/F
2.402	64.8	O2	Vertical	28.6	0	4.8	98.21	2.98	36.0	33.02	Pass
2.402	64.9	O3	Horizontal	28.6	0	4.8	98.31	3.08	36.0	32.92	Pass
2.440	61.4	O2	Vertical	28.6	0	4.8	94.77	-0.46	36.0	36.46	Pass
2.440	62.5	O3	Horizontal	28.6	0	4.8	95.93	0.70	36.0	35.3	Pass
2.480	58.8	O2	Vertical	28.6	0	4.9	92.29	-2.94	36.0	38.94	Pass
2.480	58.9	O3	Horizontal	28.6	0	4.9	92.37	-2.86	36.0	38.86	Pass

Final Field Strength Peak (dBuV/m) = Reading Peak (dBuV/m) + Antenna Factor (dB) - Pre-amp Gain (dB) + Cable Loss (dB)
Calculation Example $92.37 = 58.9 + 28.6 - 0 + 4.9$

Transmitted power (dBm) = Final Field Strength Peak (dBuV/m) - 95.23 dB
Calculation Example $2.98 = 98.21 - 95.23$

4.1.2 Antenna Gain calculations

Conducted Peak Power readings supplied from the manufacturer for a data rate of 1MBps.

Freq	Conducted power peak	Max Radiated power EIRP	Antenna Gain
GHz	dBm	dBm	dBi
2.402	5.43	3.08	-2.35
2.440	5.27	0.7	-4.57
2.480	4.95	-2.86	-7.81

Antenna gain (dBi) = Max Radiated power EIRP (dBm) - Conducted Power (dBm)
Calculation Example $-2.35 = 3.08 - 5.43$

Max antenna gain is -2.35 dBi

Test Result Pass

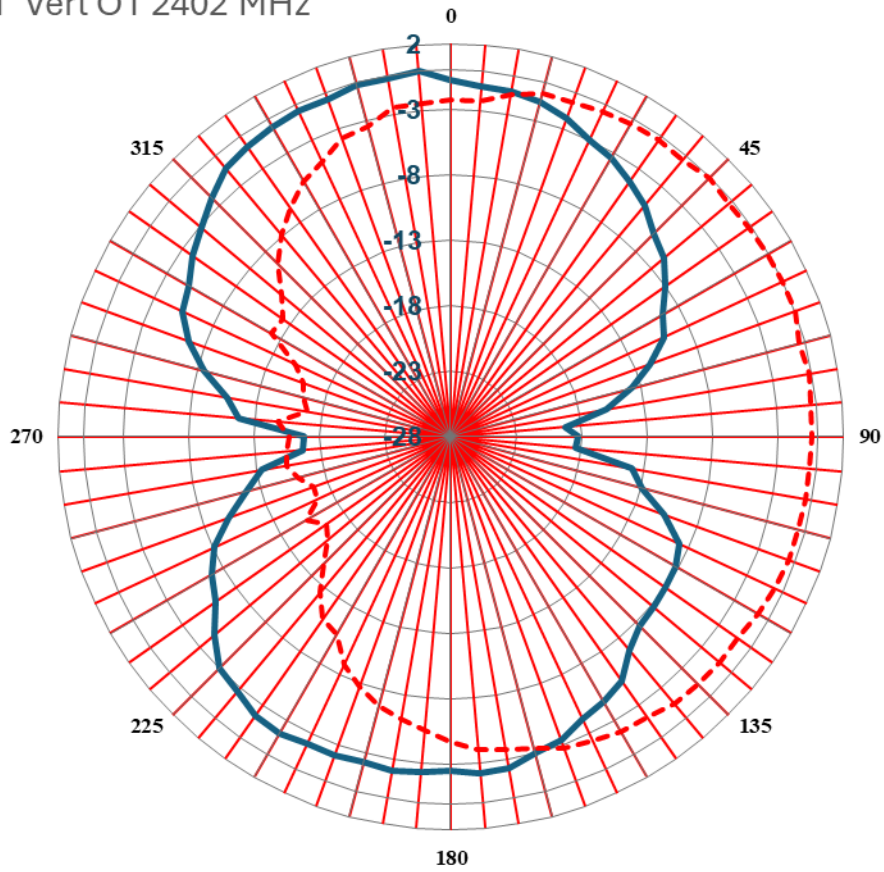
4.1.3 Summary of Max EIRP for each orientation and polarisation

2402 MHz	2440 MHz	2480 MHz	Polarisation	Orientation
Max EIRP dBm	Max EIRP dBm	Max EIRP dBm	V/H	O1/O2/O3
0.96	-2.51	-6.41	V	O1
2.98	-0.46	-2.94	V	O2
-13.26	-13.52	-14.19	V	O3
0.71	-2.34	-5.12	H	O1
2.64	-0.73	-4.59	H	O2
3.08	0.7	-2.86	H	O3

Note the normalised scans on the following pages use the max EIRP as the 0 dB reference.

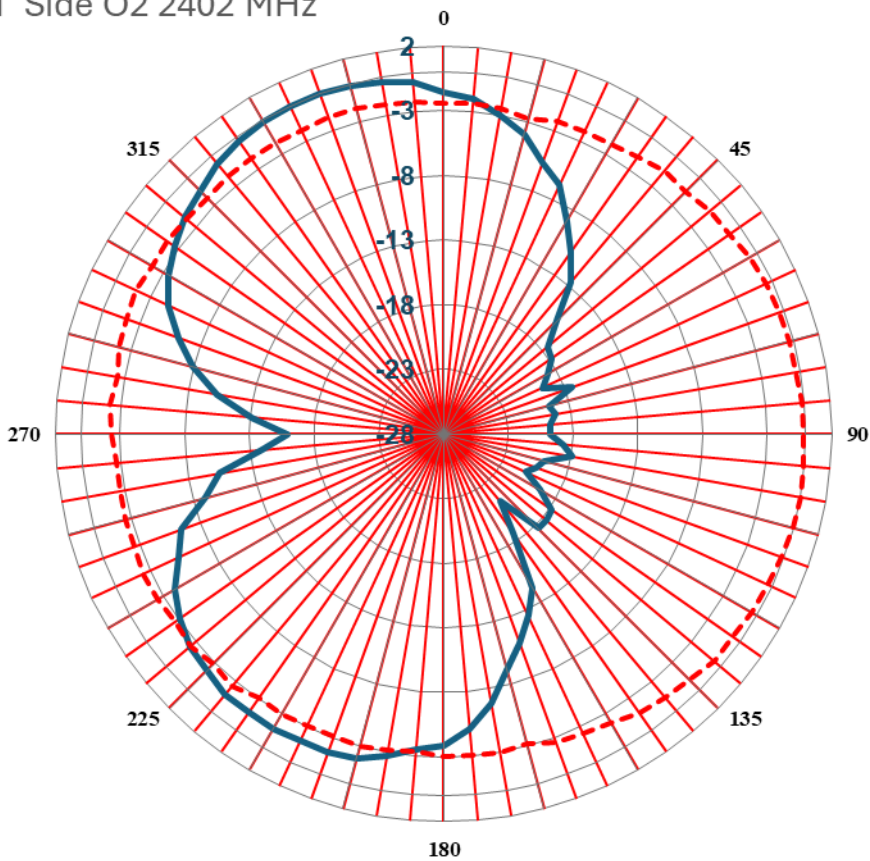
4.2 Normalised Scans for Radiation Test Patterns Frequency 2402 MHz

EUT Vert O1 2402 MHz



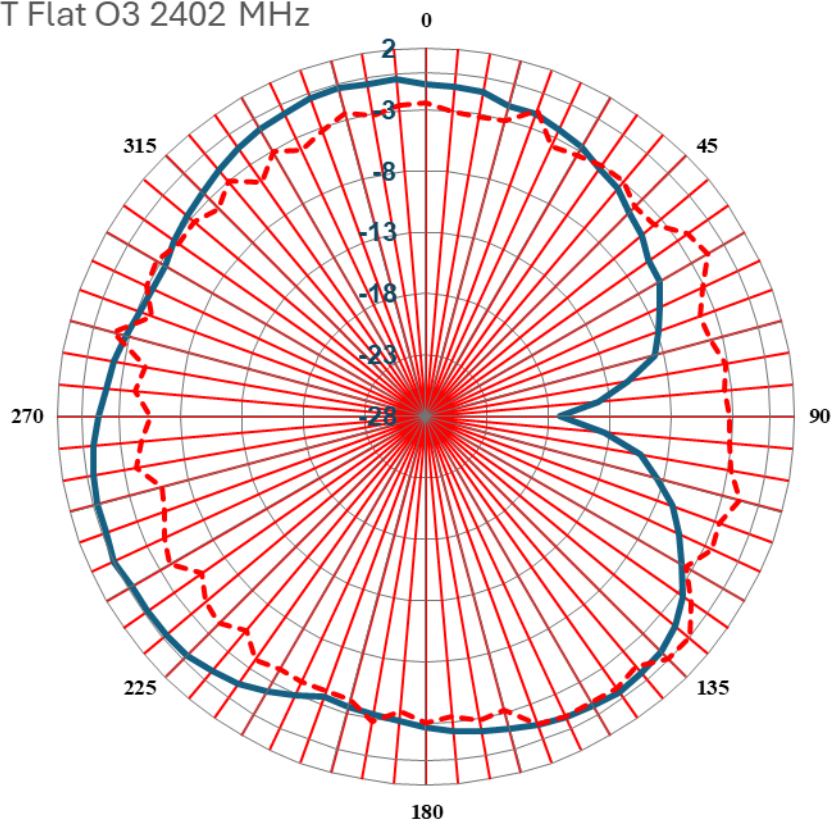
Radiation pattern Vertical Polarisation dashed line ; Horizontal Polarisation solid line

EUT Side O2 2402 MHz



Radiation pattern Vertical Polarisation dashed line ; Horizontal Polarisation solid line

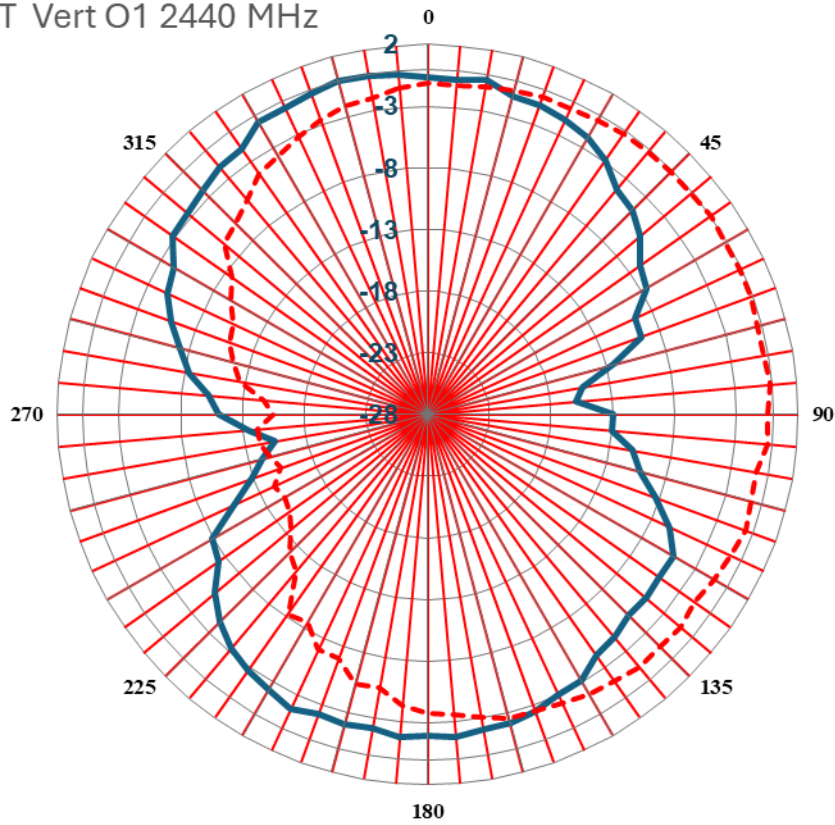
EUT Flat O3 2402 MHz



Radiation pattern Vertical Polarisation dashed line ; Horizontal Polarisation solid line

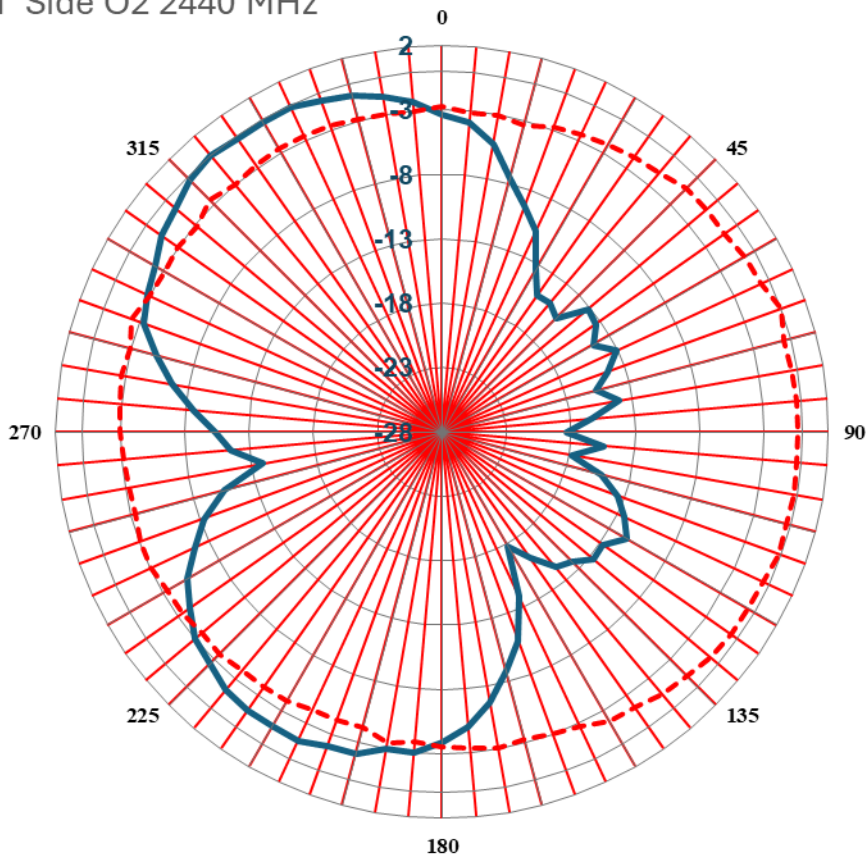
4.3 Normalised Scans for Radiation Test Patterns Frequency 2440 MHz

EUT Vert O1 2440 MHz



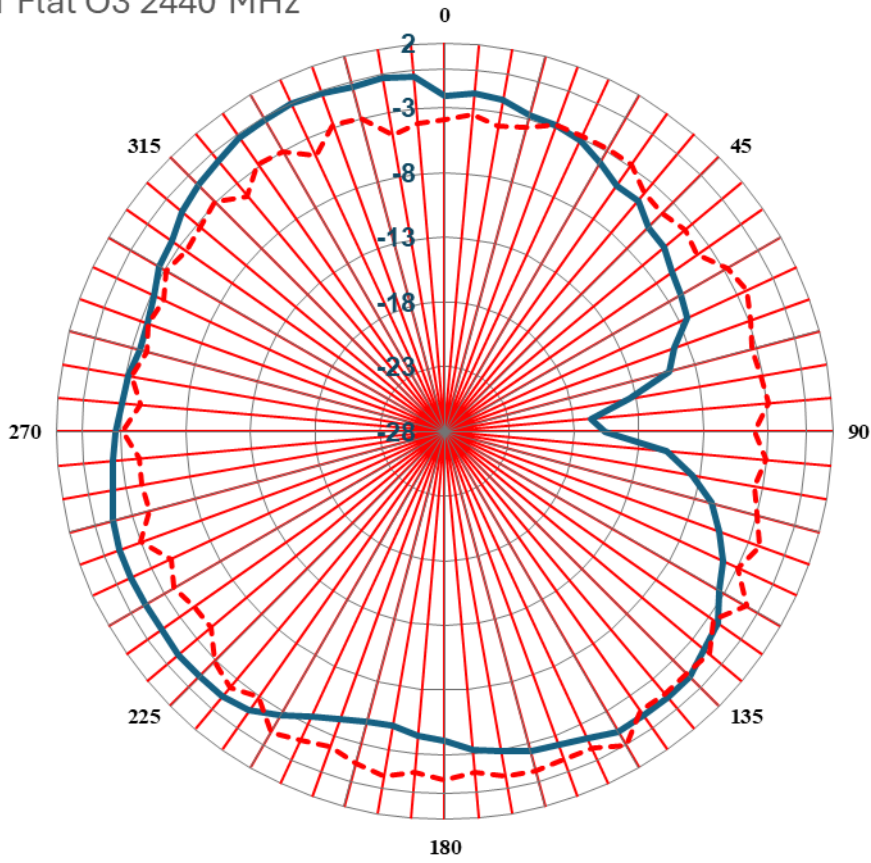
Radiation pattern Vertical Polarisation dashed line ; Horizontal Polarisation solid line

EUT Side O2 2440 MHz



Radiation pattern Vertical Polarisation dashed line ; Horizontal Polarisation solid line

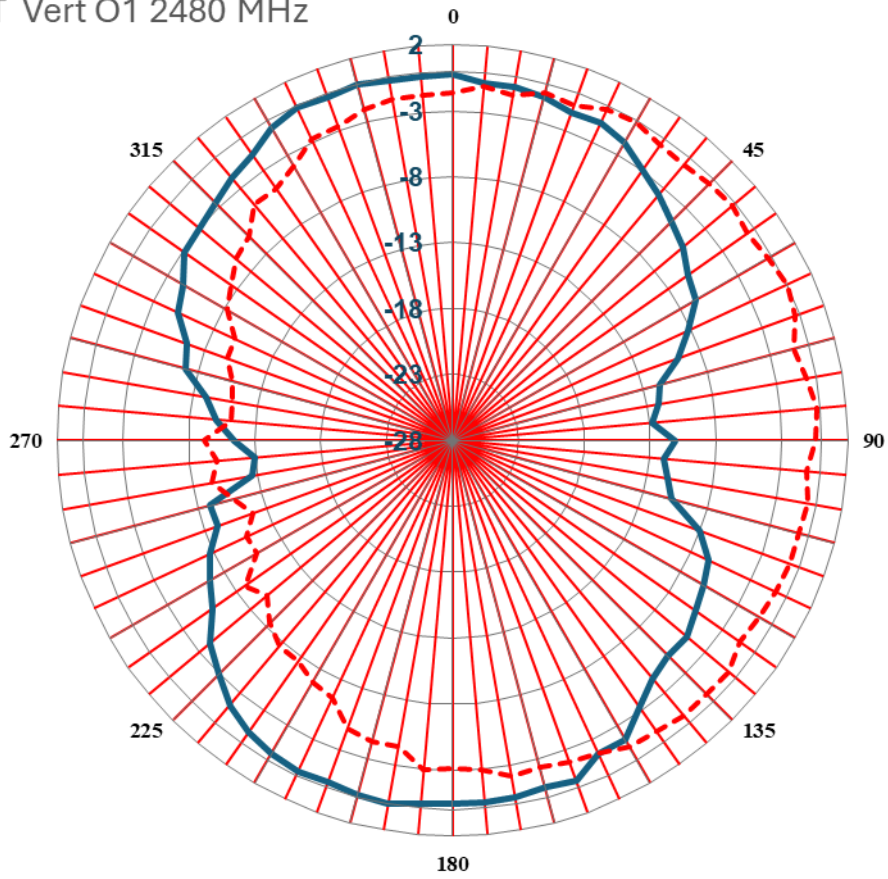
EUT Flat O3 2440 MHz



Radiation pattern Vertical Polarisation dashed line ; Horizontal Polarisation solid line

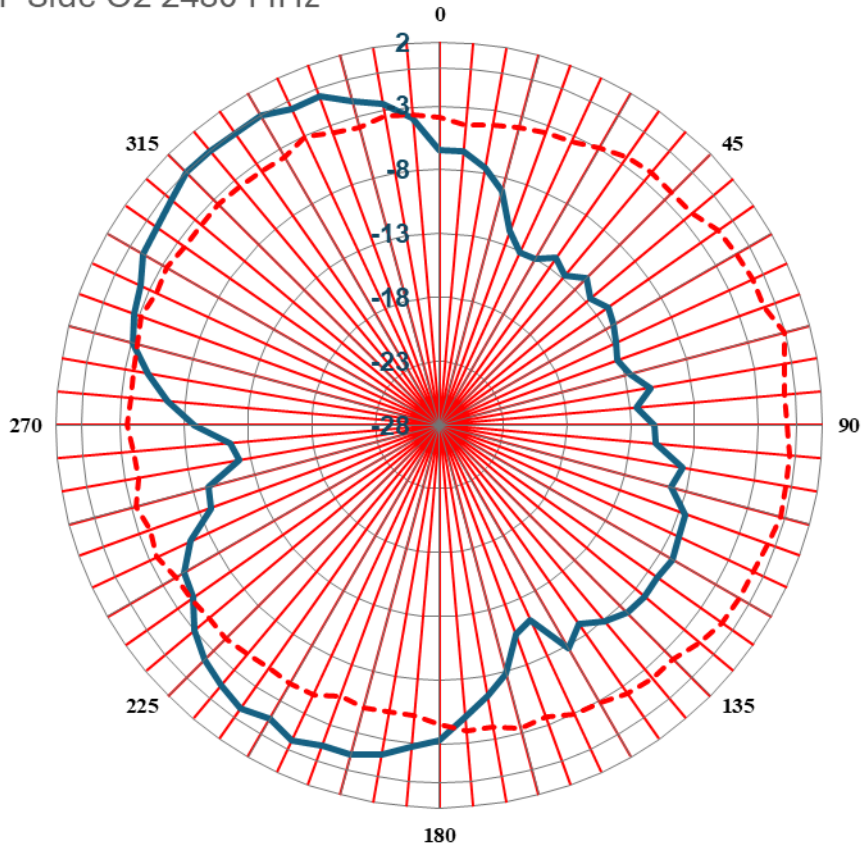
4.4 Normalised Scans for Radiation Test Patterns Frequency 2480 MHz

EUT Vert O1 2480 MHz



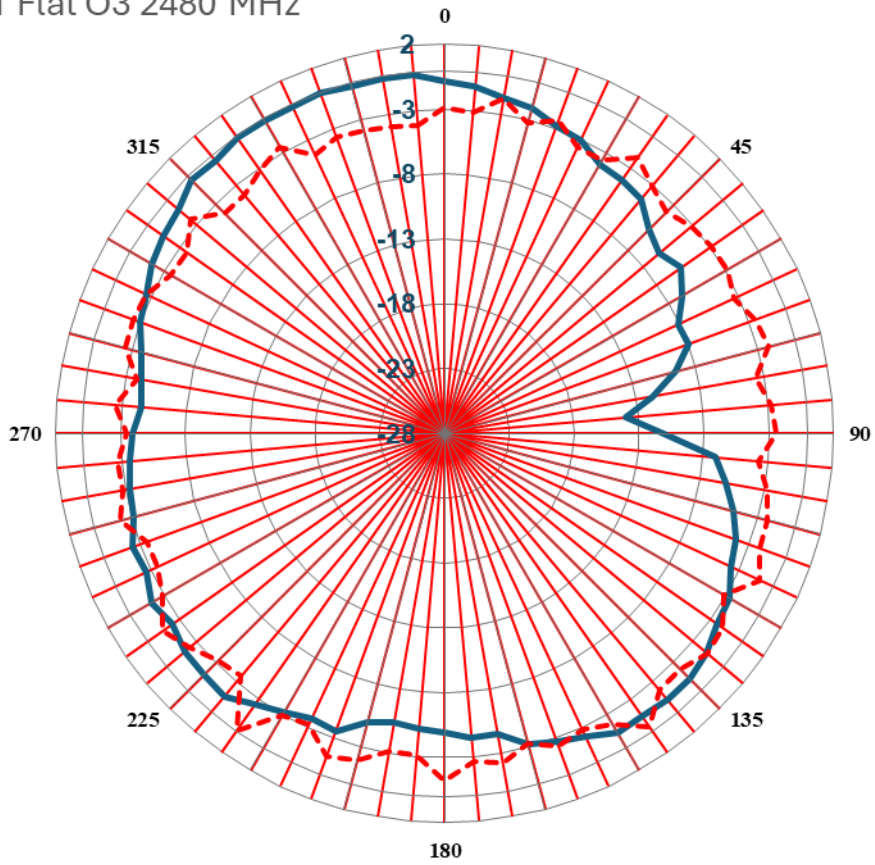
Radiation pattern Vertical Polarisation dashed line ; Horizontal Polarisation solid line

EUT Side O2 2480 MHz



Radiation pattern Vertical Polarisation dashed line ; Horizontal Polarisation solid line

EUT Flat O3 2480 MHz



Radiation pattern Vertical Polarisation dashed line; Horizontal Polarisation solid line

Appendix A Test Equipment Used:

Instrument	Manufacturer	Model	Serial Num	CEI Ref	Cal Date	Cal Interval Months
Test Receiver 3.6GHz	Rohde & Schwarz	ESR	1316.3003k03-101625-s	869	23-May-23	36
Antenna Horn	EMCO	3115	9905-5809	655	21-Jan-22	36
Fully Anechoic Chamber	CEI	FAR 3M	906	906	11-May-23	36
Cable Ntype 10m				914	02-Aug-24	12
Cable SMA	0			853	02-Aug-24	12

End of Report