

Test report

Number T251-0740/22

Project file: C20221441

Date: 2022-10-03

Pages: 17

Product: Avalanche Transciever

Type reference: **Black Diamond: Guide BT, Recon X**
PIEPS: Powder BT, PRO BT

Ratings: 3x Alkaline batteries (AAA) LR03 1,5 V or
3x Lithium batteies(AAA) FR03 1,5 V
Protection class: III

Trademark:  or  **Black Diamond™**

Applicant: **Black Diamond Equipment Ltd.**
2084 East 3900 South Salt Lake City, Utah 84124, USA

Manufacturer: Pieps GmbH
Parkring 4, 8403 Lebring, Austria

Place of manufacture: Anton Paar ShapeTec BA d.o.o.
Gornja Močila bb, 74450 Brod, Bosnia and Herzegovina

Summary of testing

Testing method: Antenna pattern measurements

Testing location: SIQ Ljubljana
Mašera-Spasičeva ulica 10, SI-1000 Ljubljana, Slovenia

Remarks: Date of receipt of test items: 2022-05-25
Number of items tested: 1
Date of performance of tests: 2022-09-30
The test results presented in this report relate only to the items tested.
The product complies with the requirements of the testing methods.

Tested by: Luka Cvajnar

Approved by: Marjan Mak

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1 GENERAL

History sheet			
Date	Report No.	Change	Revision
2022-10-03	T251-0740/22	Initial Test Report issued.	--

Environmental conditions:

Ambient temperature: 15 °C to 35 °C

Relative humidity: 30 % to 60 %

Atmospheric pressure: 860 mbar to 1060 mbar

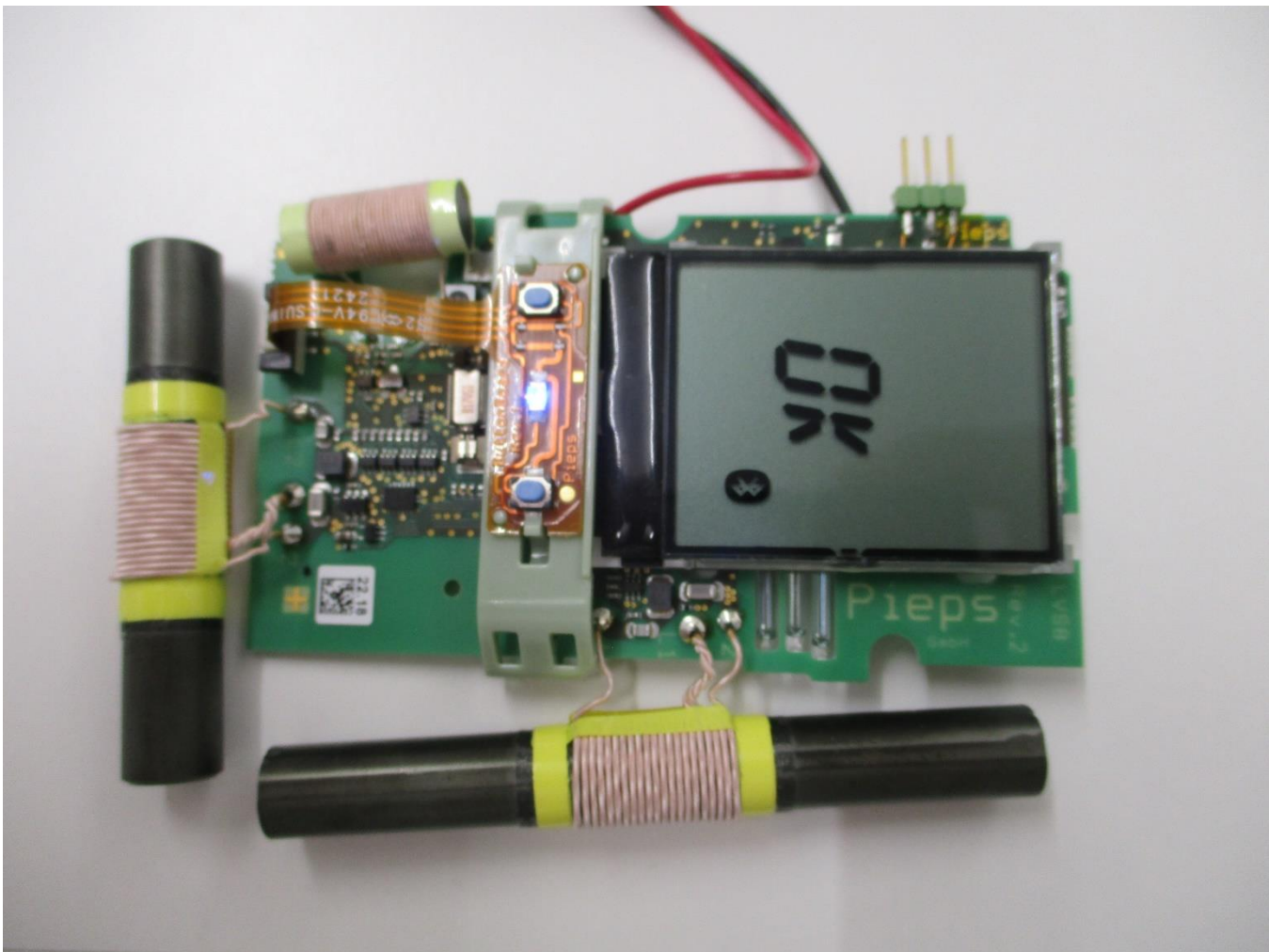
1.1 Equipment under test

Avalanche Transciever

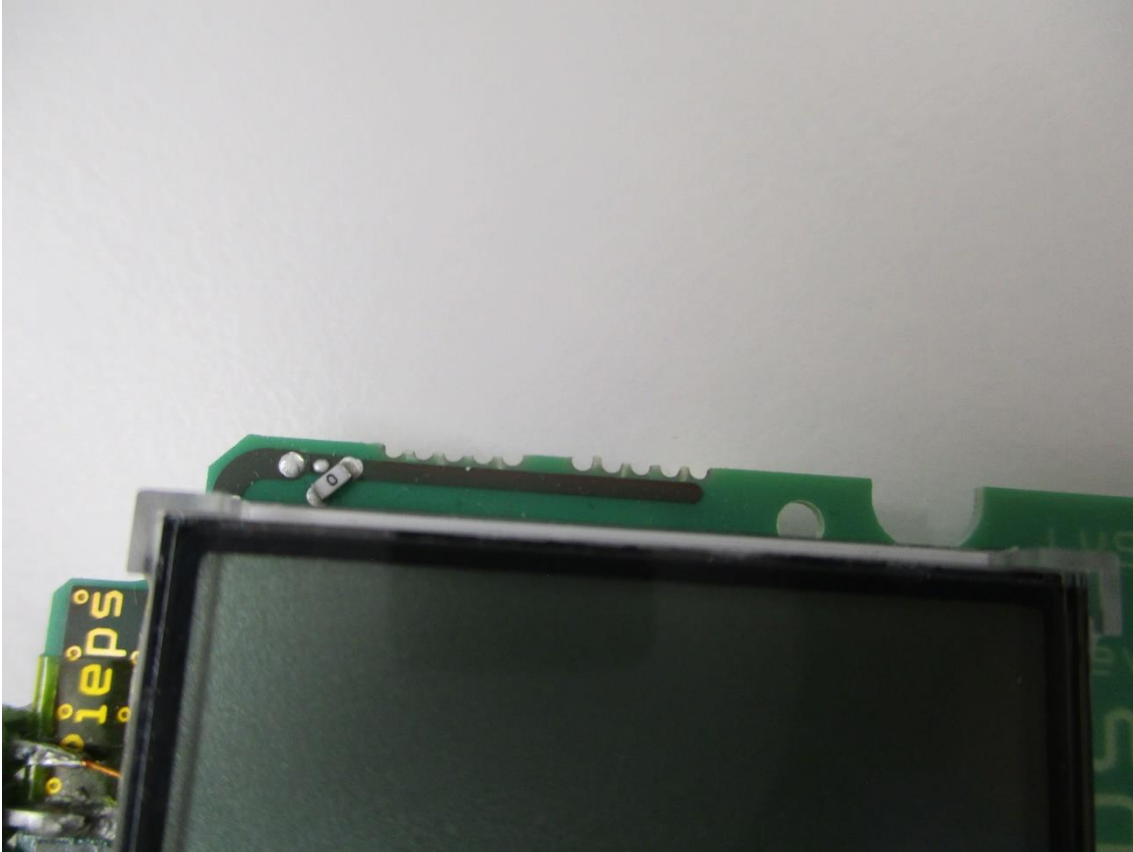
Type: **Black Diamond: Guide BT, Recon X**

PIEPS: Powder BT, PRO BT

Tested was antenna pattern of the sample below.



Picture of test sample – 457 kHz Antennas



Picture of test sample – BLE Antenna

1.2 Antenna pattern measurement

1.2.1 Test procedure

The radiation pattern for BLE antenna implemented to PCB reference design has been measured in an anechoic chamber with 3 meters test distance. Test results show radiation patterns for two planes, measured with vertical and horizontal polarization of measuring antenna. The sample was measured in vertical and horizontal position. All measurements were performed at 2402, 2440 and 2480 MHz frequency.

The radiation pattern for 457 kHz antennas has been measured in an anechoic chamber with 3 meters test distance. Test results show radiation patterns for two planes. The sample was measured in vertical and horizontal position.



1.3 Test results BLE Antenna

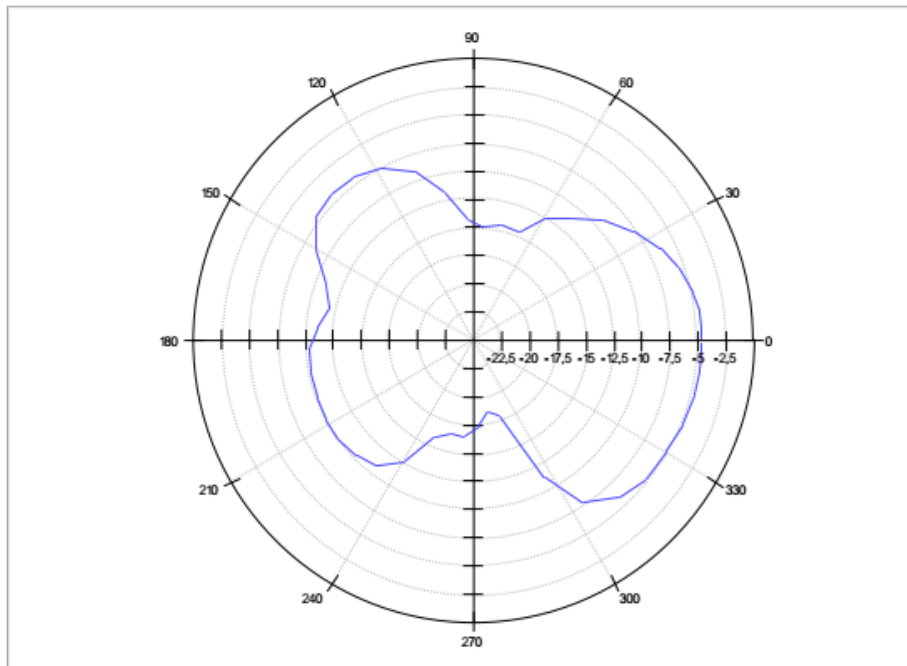
EUT Information

EUT: LVS8
 Operating mode: TX 2402 MHz
 Sample position: Vertical

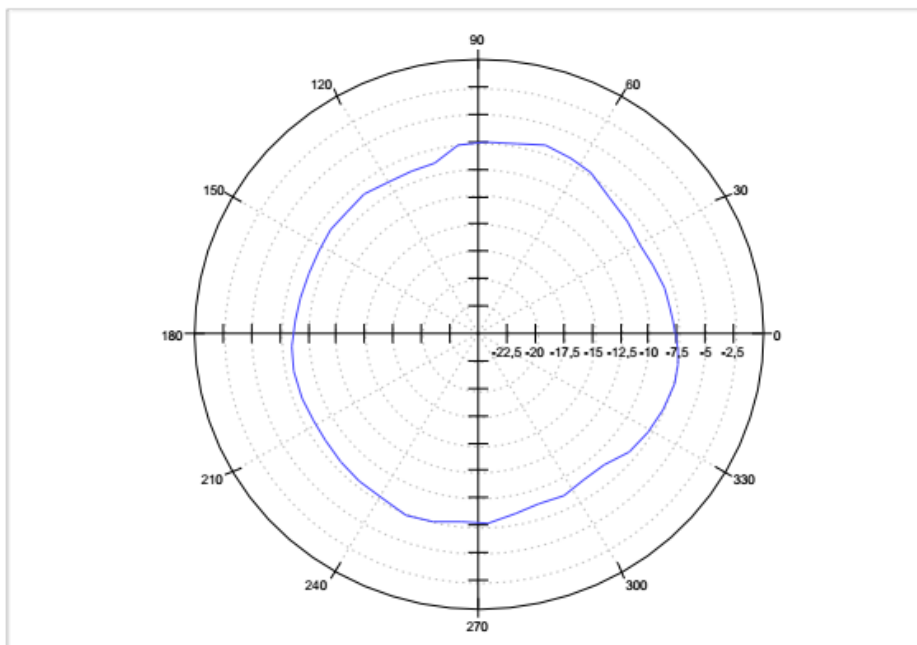
AziChart MinMax Eval

Frequency (MHz)	Max. Value (dBi)	Azimuth max. (deg)	Pol max.	Min. Value (dBi)	Azimuth min. (deg)	Pol min.
2402.000000	-4.65	356	H	-18.45	281	H

Azimuth Chart: Horizontal



Azimuth Chart: Vertical



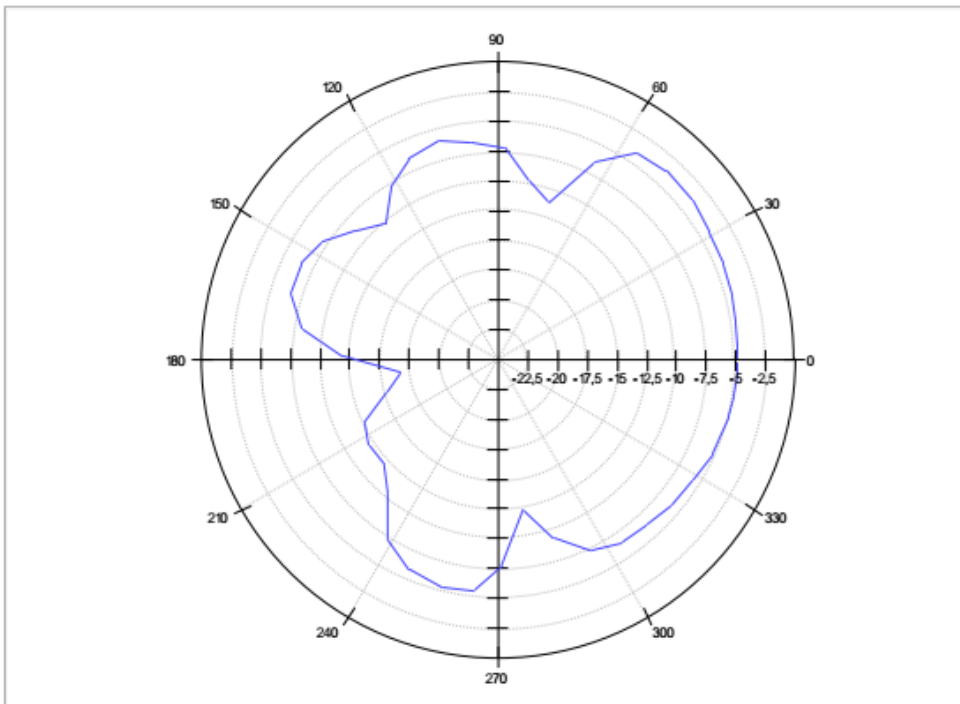
EUT Information

EUT: LVS8
 Operating mode: TX 2402 MHz
 Sample position: Horizontal

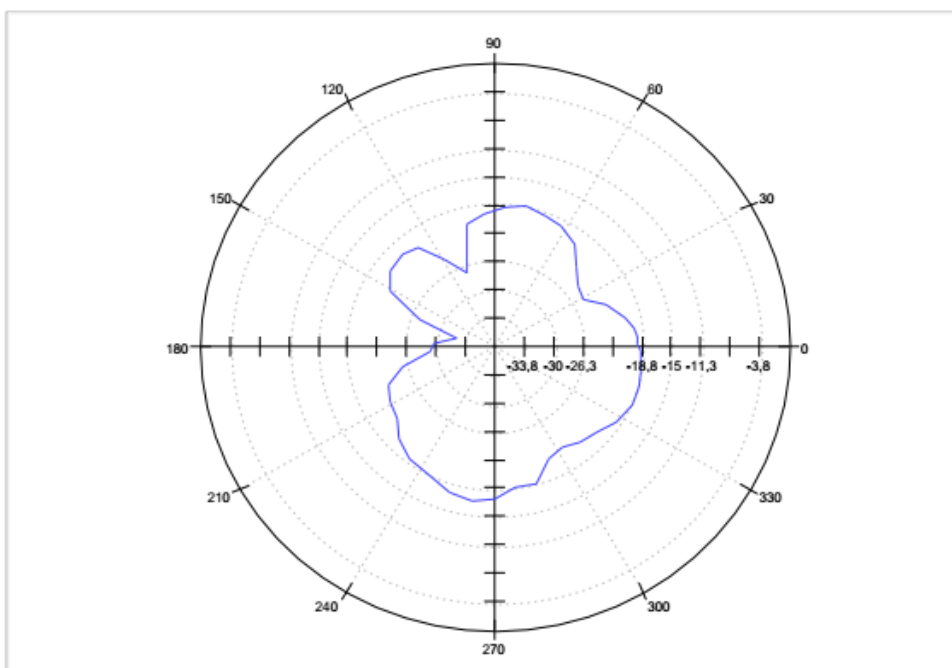
AziChart MinMax Eval

Frequency (MHz)	Max. Value (dBi)	Azimuth max. (deg)	Pol max.	Min. Value (dBi)	Azimuth min. (deg)	Pol min.
2402.000000	-3.67	48	H	-32.51	168	V

Azimuth Chart: Horizontal



Azimuth Chart: Vertical





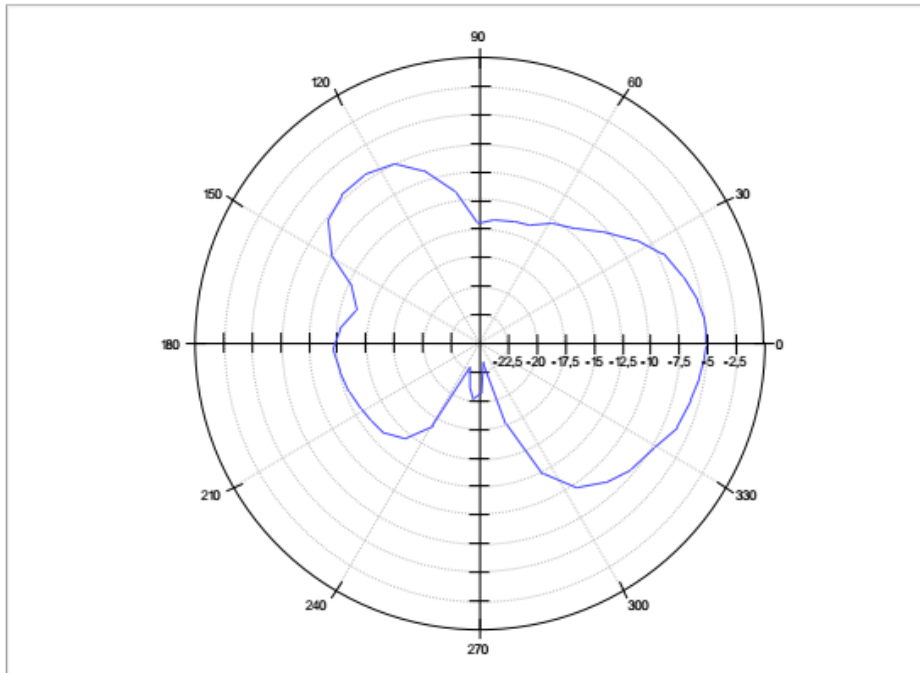
EUT Information

EUT: LVS8
 Operating mode: TX 2440 MHz
 Sample position: Vertical

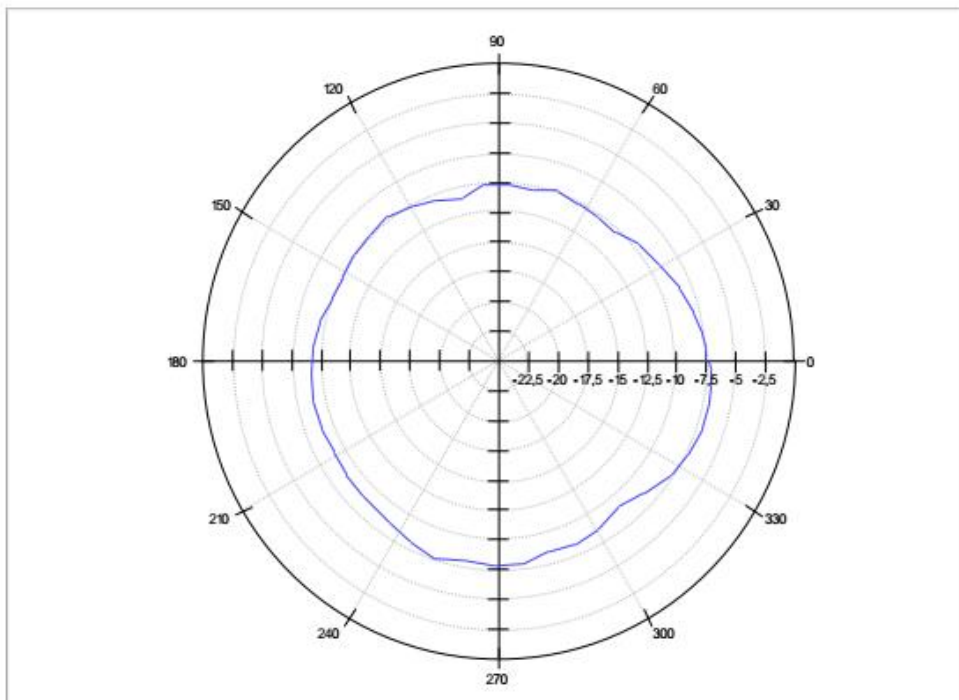
AziChart MinMax Eval

Frequency (MHz)	Max. Value (dBi)	Azimuth max. (deg)	Pol max.	Min. Value (dBi)	Azimuth min. (deg)	Pol min.
2440.000000	-5.14	1	H	-23.34	280	H

Azimuth Chart: Horizontal



Azimuth Chart: Vertical



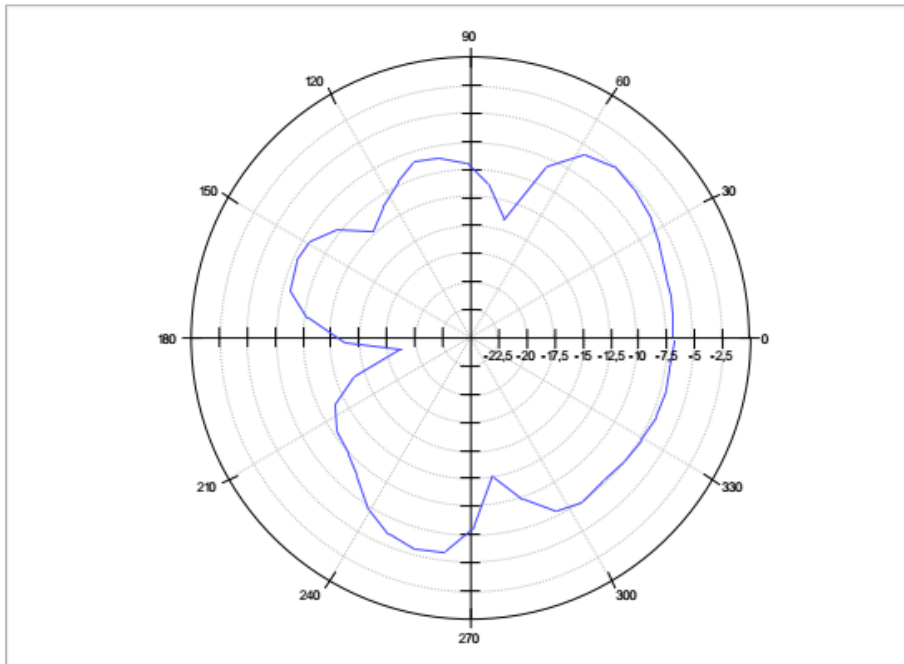
EUT Information

EUT: LVS8
 Operating mode: TX 2440 MHz
 Sample position: Horizontal

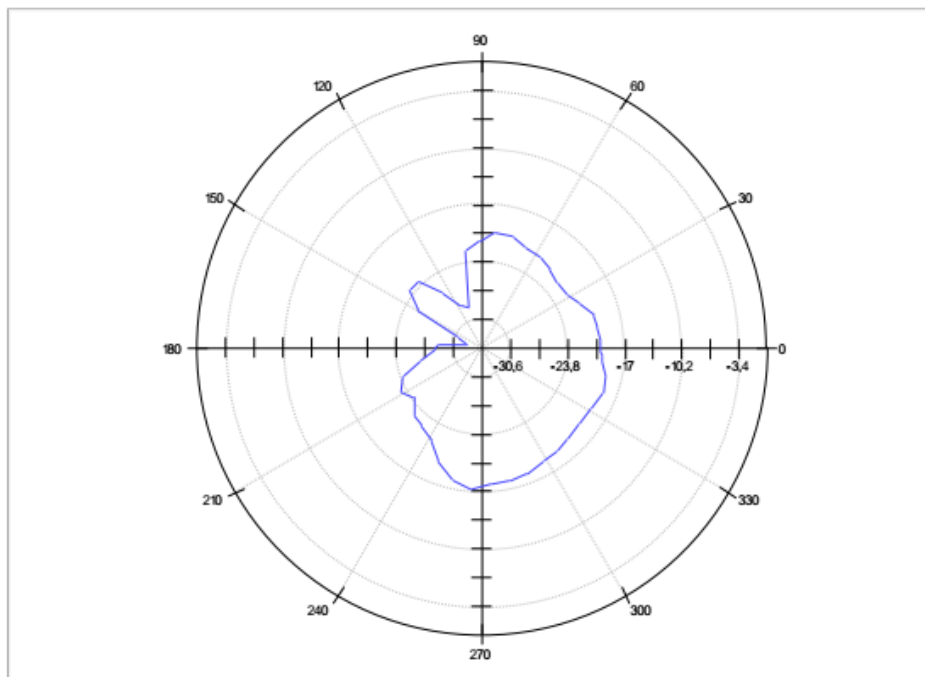
AziChart MinMax Eval

Frequency (MHz)	Max. Value (dBi)	Azimuth max. (deg)	Pol max.	Min. Value (dBi)	Azimuth min. (deg)	Pol min.
2440.000000	-5.09	50	H	-32.03	166	V

Azimuth Chart: Horizontal



Azimuth Chart: Vertical





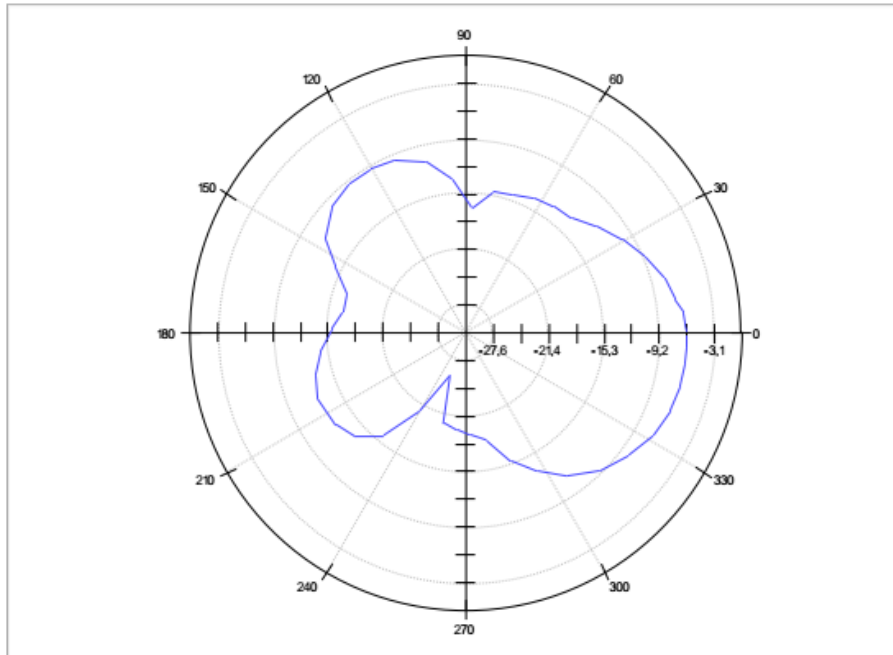
EUT Information

EUT: LVS8
 Operating mode: TX 2480 MHz
 Sample position: Vertical

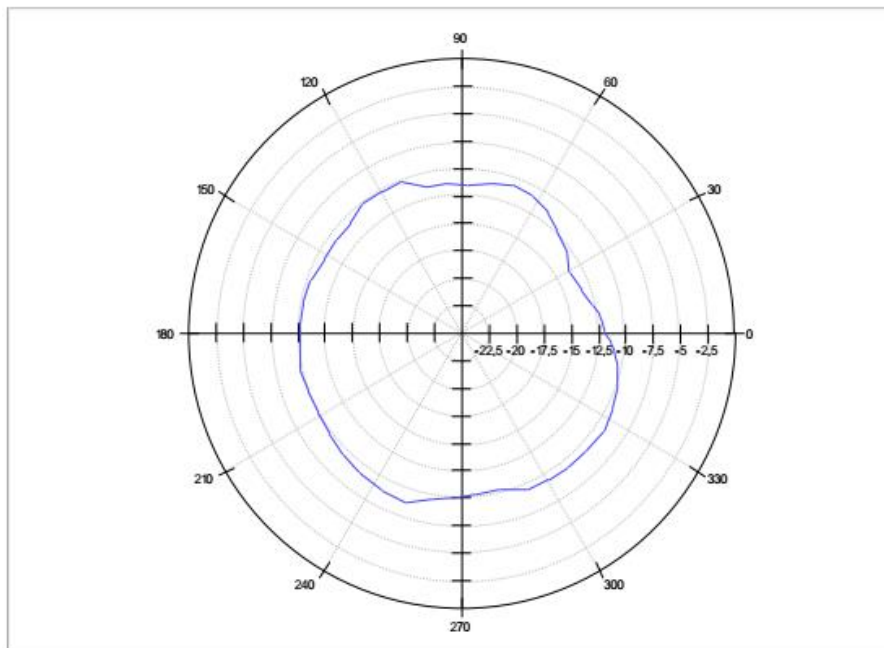
AziChart MinMax Eval

Frequency (MHz)	Max. Value (dBi)	Azimuth max. (deg)	Pol max.	Min. Value (dBi)	Azimuth min. (deg)	Pol min.
2480.000000	-6.02	352	H	-25.63	248	H

Azimuth Chart: Horizontal



Azimuth Chart: Vertical



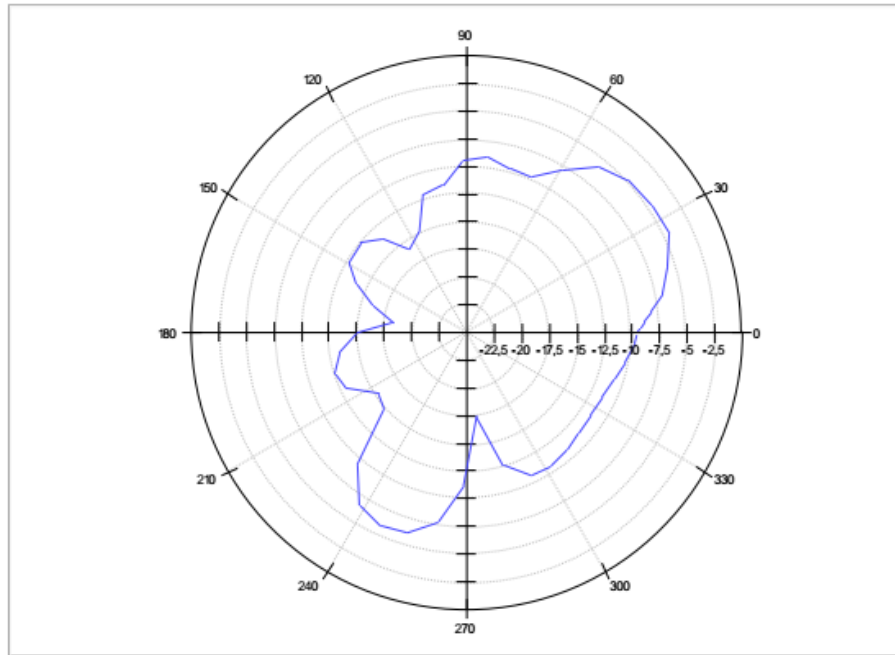
EUT Information

EUT: LVS8
 Operating mode: TX 2480 MHz
 Sample position: Horizontal

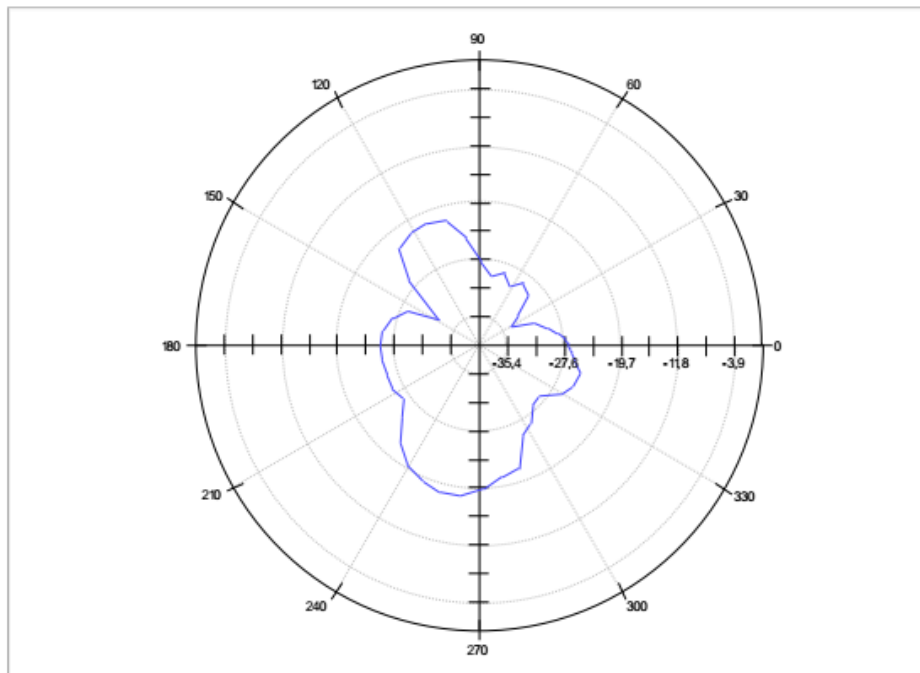
AziChart MinMax Eval

Frequency (MHz)	Max. Value (dBi)	Azimuth max. (deg)	Pol max.	Min. Value (dBi)	Azimuth min. (deg)	Pol min.
2480.000000	-4.59	34	H	-34.37	30	V

Azimuth Chart: Horizontal



Azimuth Chart: Vertical



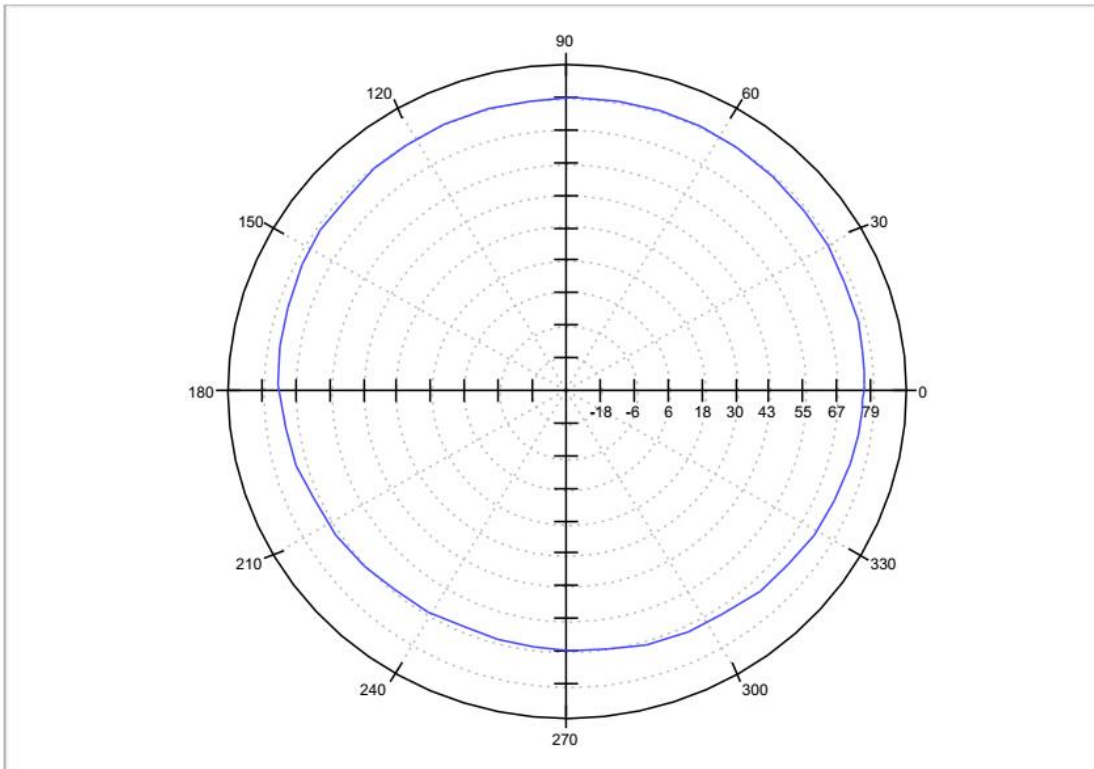


1.4 Test results 457 kHz antennas

EUT Information

EUT: LVS8
 Operating mode: Send mode
 Sample position: Vertical

Azimuth Chart: Horizontal



AziChart hor f1

Azimuth (deg)	Frequency 0.457 MHz (dBµV/m)
0.0	76.70
1.0	76.69
4.0	76.82
8.0	76.95
14.0	77.40
22.0	77.66
30.0	77.94
38.0	78.39
47.0	78.58
56.0	78.81
64.0	78.89
72.0	78.90
80.0	78.85
89.0	78.79
97.0	78.52
105.0	78.33
114.0	78.11
122.0	77.53
130.0	77.16
138.0	76.36

Azimuth (deg)	Frequency 0.457 MHz (dB μ V/m)
146.0	75.88
154.0	75.37
163.0	74.21
171.0	73.54
179.0	72.88
188.0	71.41
196.0	70.60
204.0	68.98
213.0	68.20
222.0	67.42
230.0	66.13
239.0	65.68
247.0	65.22
255.0	65.26
263.0	65.79
271.0	66.34
279.0	67.01
287.0	68.52
296.0	69.33
304.0	70.13
313.0	71.67
321.0	72.38
329.0	73.74
337.0	74.38
345.0	74.97
351.0	75.83
356.0	76.14
358.0	76.36
360.0	76.60



EUT Information

EUT:

Operating mode:

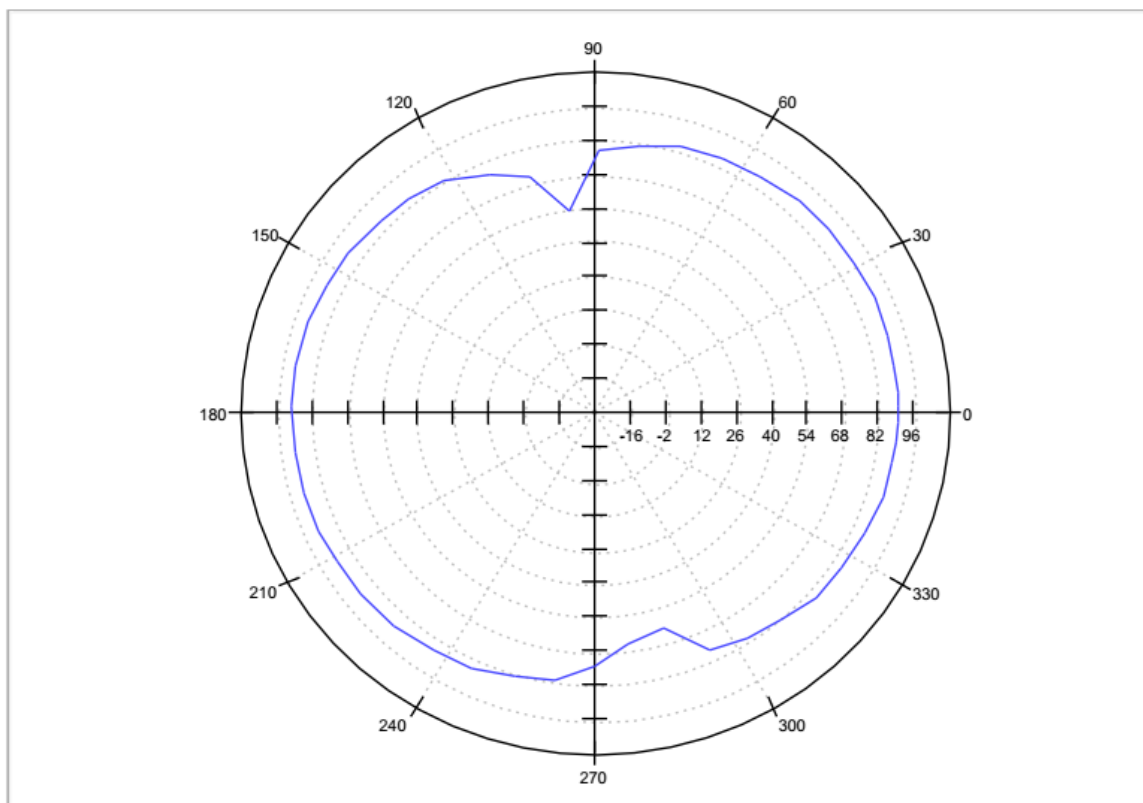
Sample position:

LVS8

Send mode

Horizontal

Azimuth Chart: Horizontal



AziChart hor f1

Azimuth (deg)	Frequency 0.457 MHz (dBμV/m)
0.0	90.28
1.0	90.26
4.0	90.28
9.0	90.33
15.0	90.34
23.0	90.26
31.0	89.77
39.0	89.35
47.0	88.81
56.0	87.23
64.0	86.19
73.0	84.76
81.0	80.74
89.0	77.48
97.0	53.60
105.0	70.51
113.0	76.60
122.0	82.49
130.0	84.26
137.0	85.63



Azimuth (deg)	Frequency 0.457 MHz (dB μ V/m)
146.0	87.63
154.0	88.33
162.0	89.30
171.0	89.64
179.0	89.91
188.0	90.04
196.0	90.01
204.0	89.86
211.0	89.33
219.0	88.87
228.0	88.34
237.0	86.86
245.0	85.87
254.0	83.13
262.0	81.17
270.0	74.53
278.0	66.49
287.0	62.54
295.0	77.84
303.0	80.78
311.0	82.88
319.0	85.86
327.0	86.97
335.0	87.85
343.0	89.12
350.0	89.53
354.0	89.99
358.0	90.14
360.0	90.21



1.5 Maximum BLE antenna gain

DUT Frequency (MHz)	Maximum antenna gain (dBi)
2402.000000	-3.67
2440.000000	-5.09
2480.000000	-4.59

2 USED TEST EQUIPMENT

1.2 Antenna pattern measurement

Manufacturer	Model No.	Used	Calibrated	Calibrated until
Comtest engineering, SAC2 (together with controlling equipment)	SAC 3m	X	2022-04-14	2025-04-14
Maturo, Turn table (2 m diameter)	TT 2.0 SI	X	/	/
Maturo, Bore-sight antenna mast	BAM-4.0-P	X	/	/
Maturo, positioning equipment	NCD	X	/	/
Rohde & Schwarz, RFI receiver	ESU 26	X	2022-01-04	2023-07-04
R&S, Ultra Broadband Antenna	HL562E		2020-09-30	2023-09-30
R&S, Horn Antenna	HF907	X	2020-08-21	2023-08-21