

Prüfbericht-Nr.: <i>Test report no.:</i>	60420089 001	Auftrags-Nr.: <i>Order no.:</i>	168272923	Seite 1 von 21 Page 1 of 21	
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2020-07-09		
Auftraggeber: <i>Client:</i>	LinHai Zhongtian Electronic Appliance Co., Ltd No.168, Yangqin River Road, Linhai, Zhejiang, China				
Prüfgegenstand: <i>Test item:</i>	Colorful Bluetooth Central Light				
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	ZT-X-B1				
Auftrags-Inhalt: <i>Order content:</i>	FCC & IC approval				
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.247 CFR47 FCC Part 15: Subpart C Section 15.209				
Wareneingangsdatum: <i>Date of sample receipt:</i>	2020-07-10	Please refer to Photo Document			
Prüfmuster-Nr.: <i>Test sample no:</i>	A002864356-001				
Prüfzeitraum: <i>Testing period:</i>	2020-07-10 – 2020-07-20				
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von: <i>tested by:</i>			genehmigt von: <i>authorized by:</i>		
Datum: <i>Date:</i> 2020-12-28	Signed by: Jackson Yang		Ausstellungsdatum: <i>Issue date:</i> 2020-12-28	Signed by: Winnie Hou	
Stellung / Position:	Project Engineer		Stellung / Position:	Technical Certifier	
Sonstiges / Other:	FCC ID: 2AN8X-ZT-X-B1 Note: The Radiated Spurious Emission above 18GHz and Radiated band edge of Bluetooth Low Energy function are evaluated in this report. All other tests refer to test report 50262798 001.				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>				
* Legende:	1 = sehr gut P(ass) = entspricht o.g. Prüfgrundlage(n)	2 = gut F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	3 = befriedigend F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	4 = ausreichend N/A = nicht anwendbar	5 = mangelhaft N/T = nicht getestet
* Legend:	1 = very good P(ass) = passed a.m. test specification(s)	2 = good F(ail) = failed a.m. test specification(s)	3 = satisfactory F(ail) = failed a.m. test specification(s)	4 = sufficient N/A = not applicable	5 = poor N/T = not tested
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

Prüfbericht - Nr.: 60420089 001
Test Report No.

Seite 2 von 21
Page 2 of 21

Test Summary

5.1.1 RADIATED SPURIOUS EMISSION
RESULT: Pass

Contents

1	GENERAL REMARKS	4
1.1	COMPLEMENTARY MATERIALS	4
2	TEST SITES	5
2.1	TEST FACILITIES	5
2.2	LIST OF TEST AND MEASUREMENT INSTRUMENTS.....	5
2.3	TRACEABILITY	6
2.4	CALIBRATION	6
2.5	MEASUREMENT UNCERTAINTY.....	6
2.6	LOCATION OF ORIGINAL DATA.....	6
2.7	STATUS OF FACILITY USED FOR TESTING.....	6
3	GENERAL PRODUCT INFORMATION	7
3.1	PRODUCT FUNCTION AND INTENDED USE.....	7
3.2	RATINGS AND SYSTEM DETAILS	7
3.3	INDEPENDENT OPERATION MODES	8
3.4	NOISE GENERATING AND NOISE SUPPRESSING PARTS.....	8
3.5	SUBMITTED DOCUMENTS.....	8
4	TEST SET-UP AND OPERATION MODES	9
4.1	PRINCIPLE OF CONFIGURATION SELECTION	9
4.2	TEST OPERATION AND TEST SOFTWARE	9
4.3	SPECIAL ACCESSORIES AND AUXILIARY EQUIPMENT	9
4.4	COUNTERMEASURES TO ACHIEVE EMC COMPLIANCE	9
4.5	TEST SETUP DIAGRAM	10
5	TEST RESULTS	11
5.1	TRANSMITTER REQUIREMENT & TEST SUITES	11
5.1.1	<i>Radiated Spurious Emission</i>	<i>11</i>
6	PHOTOGRAPHS OF THE TEST SET-UP	20
7	LIST OF TABLES.....	21
8	LIST OF PHOTOGRAPHS	21

Prüfbericht - Nr.: 60420089 001
Test Report No.

Seite 4 von 21
Page 4 of 21

1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

N/A

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China

FCC Registration No.: 694916

ISED wireless device testing laboratory: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

TÜV Rheinland (Shenzhen) Co., Ltd.

Unwanted Emission Testing (TS9975)				
Equipment	Manufacturer	Model	Serial No.	Cal. until
EMI Test Receiver	R&S	ESR 7	102021	2020-08-19
Signal Analyzer	R&S	FSV 40	101439	2020-08-21
System Controller Interface	R&S	SCI-100	S10010038	N/A
Filterbank	R&S	Wlan	100759	2020-08-21
OSP	R&S	OSP 120	102040	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2020-08-20
Amplifier	R&S	SCU-18F	180070	2020-08-20
Amplifier	R&S	SCU40A	100475	2020-08-20
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2020-09-02
Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2020-09-02
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	2020-09-02
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2020-09-01
Wideband Ridged Horn Antenna (12-18 GHz)	Steatite	QMS-00208	18313	2020-09-02
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	2021-07-06

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Parameter	Uncertainty
Radiated Spurious Emissions (up to 1GHz)	± 4.84 dB
Radiated Spurious Emissions (1GHz to 26.5GHz)	± 4.76 dB

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached in this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at 362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT is a Colorful Bluetooth Central Light, which supports Bluetooth function operated at 2400-2483.5MHz.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	Colorful Bluetooth Central Light
Type Designation	ZT-X-B1
FCC ID	2AN8X-ZT-X-B1
Operating Voltage	DC 3.7V via internal battery
Testing Voltage	Fully charged battery

Technical Specification of BLE

Technical Specification	BLE
Operating Frequency band	2402 – 2480 MHz
Bluetooth Core Version	Bluetooth Low Energy 4.2
Channel separation	2MHz
Extreme Temperature Range	-20°C ~ 60°C
Modulation	GFSK
Data Rate	1Mbps
Antenna Type	PIFA Antenna
Antenna Gain(dBi)	3.3
Channel	0~39

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, Bluetooth Low Energy transmitting mode
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- B. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

N/A

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013.

4.3 Special Accessories and Auxiliary Equipment

Table 3: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N	Rating
Laptop	Lenovo	T480	PF-16A6N8	N/A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

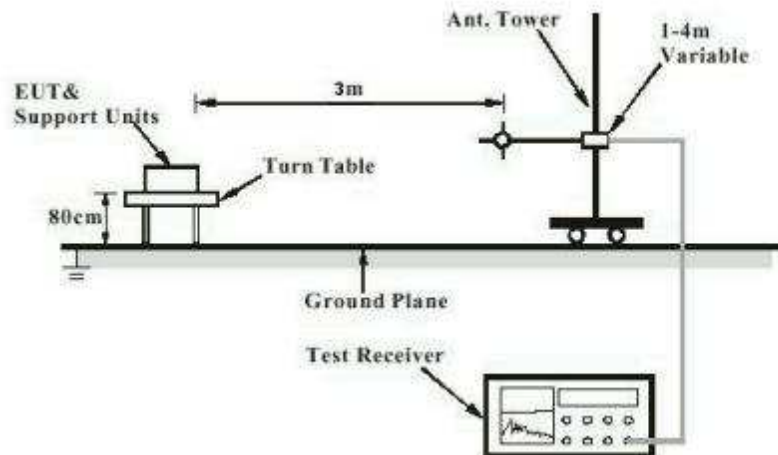
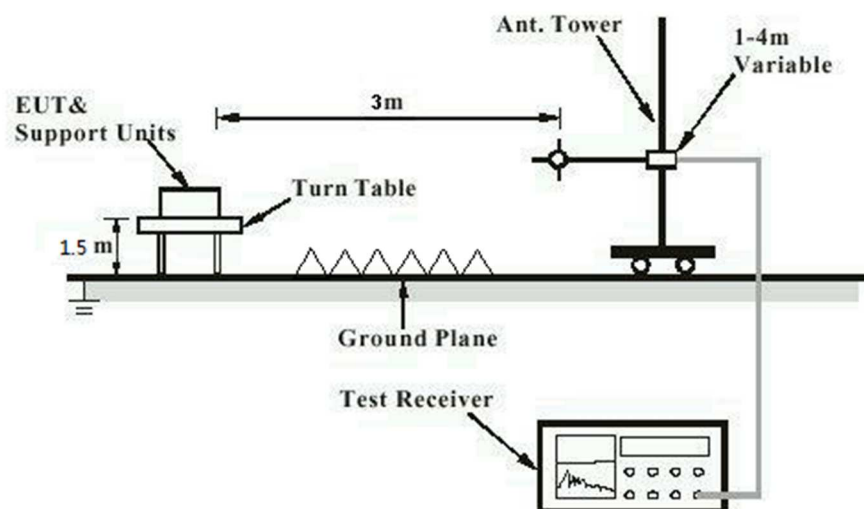


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Radiated Spurious Emission

RESULT:

Pass

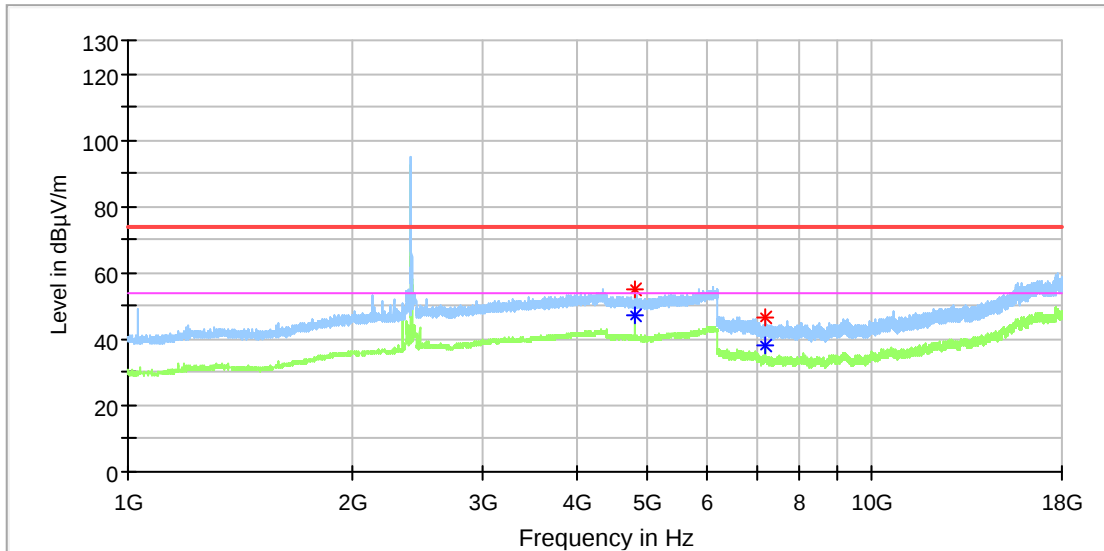
Test Specification

Test standard	: FCC Part 15.247(d) & FCC Part 15.205
Basic standard	: ANSI C63.10: 2013
Limits	: FCC Part 15.209(a)
Kind of test site	: 3m Semi-anechoic Chamber

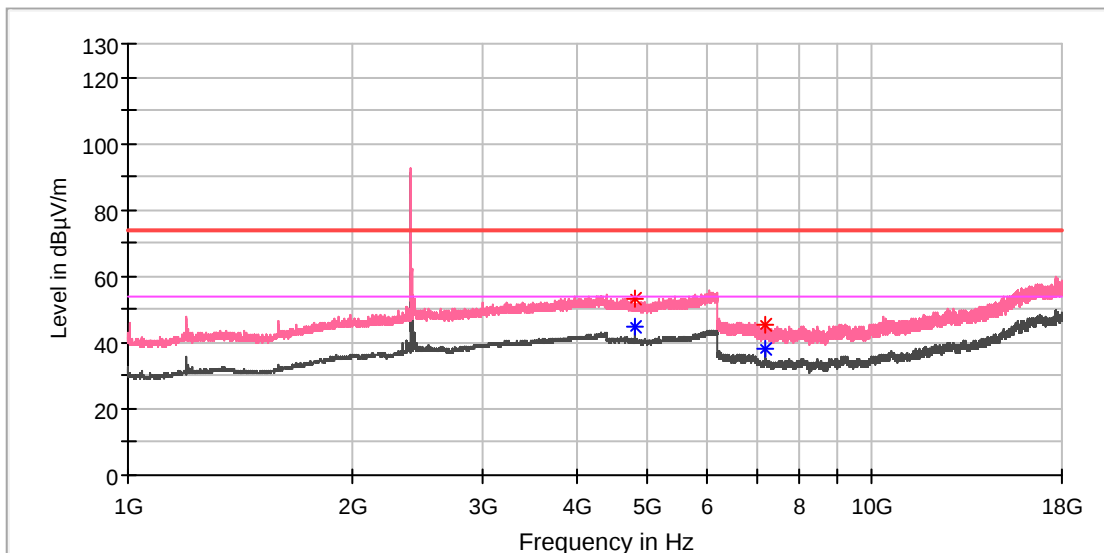
Test Setup

Date of testing	: 2020-07-16 ~ 2020-07-17
Input voltage	: Fully charged battery
Operation mode	: A.1, A.2, A.3
Ambient temperature	: 22 °C
Relative humidity	: 50 %
Atmospheric pressure	: 101 kPa

For details refer to following test result, only the worst case was shown.

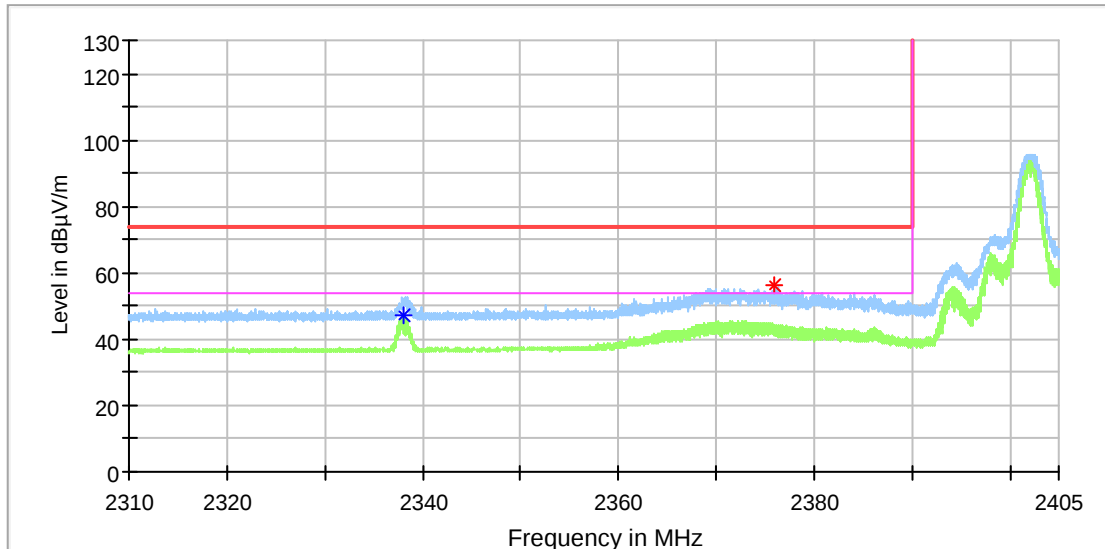
Mode A.1
Horizontal


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4803.500000	---	47.04	54.00	6.96	100.0	H	339.0	13.6
4804.000000	54.86	---	74.00	19.14	100.0	H	356.0	13.6
7206.441667	46.35	---	74.00	27.65	100.0	H	296.0	8.8
7206.933333	---	38.36	54.00	15.64	100.0	H	296.0	8.8

Vertical


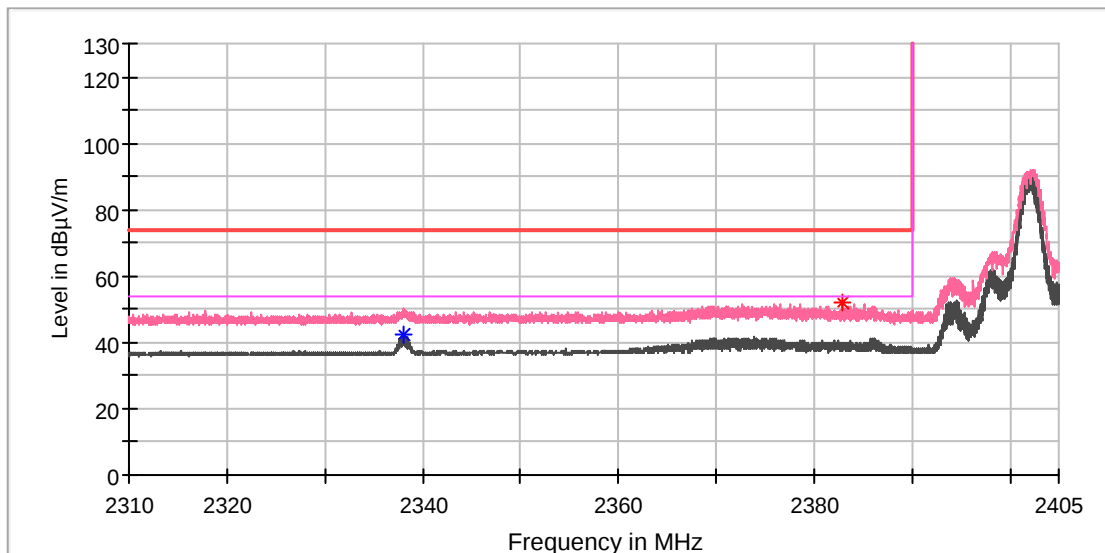
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4804.000000	---	44.93	54.00	9.07	100.0	V	158.0	13.6
4806.000000	53.42	---	74.00	20.58	100.0	V	180.0	13.6
7205.458333	45.29	---	74.00	28.71	100.0	V	106.0	8.8
7205.458333	---	38.25	54.00	15.75	100.0	V	106.0	8.8

Horizontal

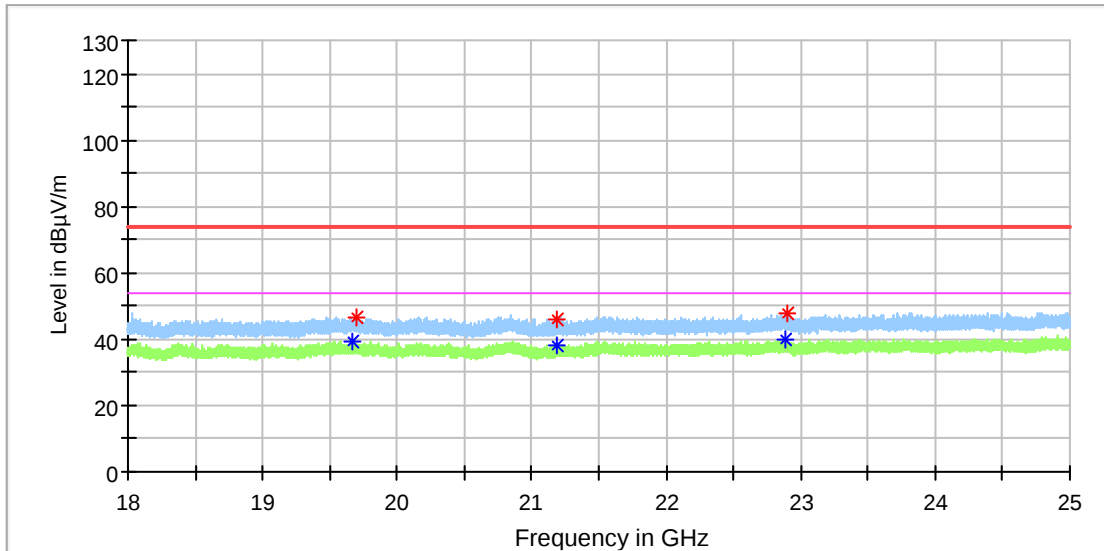


Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2337.983088	56.13	47.05	54.00	6.95	100.0	H	168.0	6.8
2375.997059	56.13	---	74.00	17.87	100.0	H	181.0	6.9

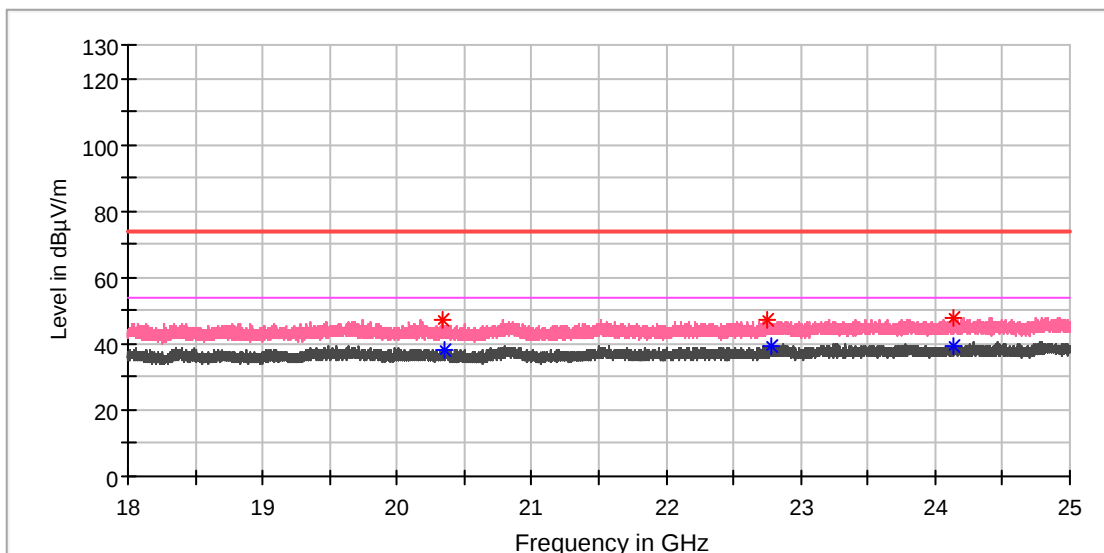
Vertical



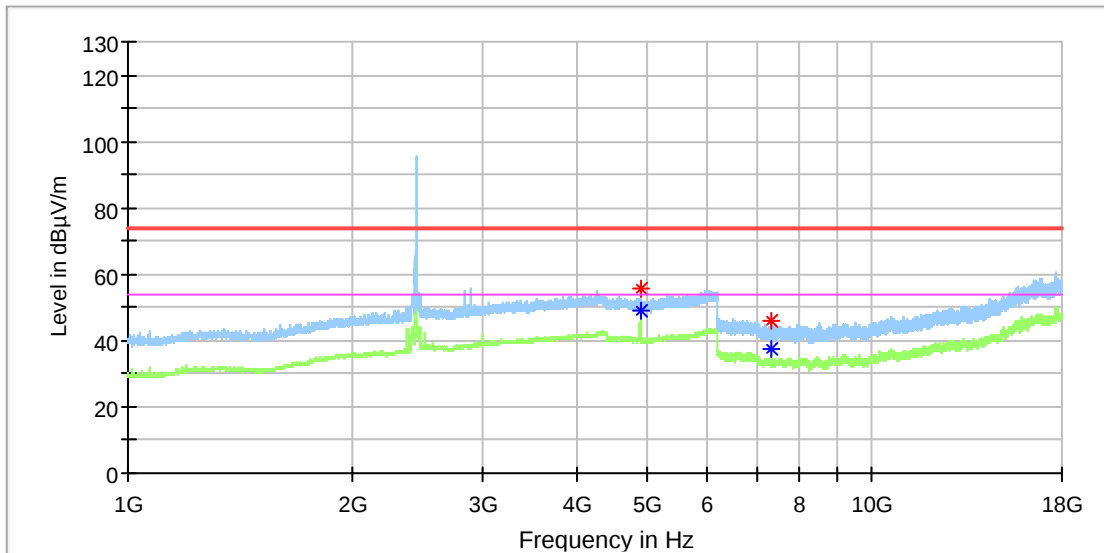
Frequency (MHz)	MaxPeak (dBμV/m)	Average (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2338.025000	51.90	42.26	54.00	11.74	100.0	V	187.0	6.8
2382.814706	51.90	---	74.00	22.10	100.0	V	214.0	7.0

Horizontal


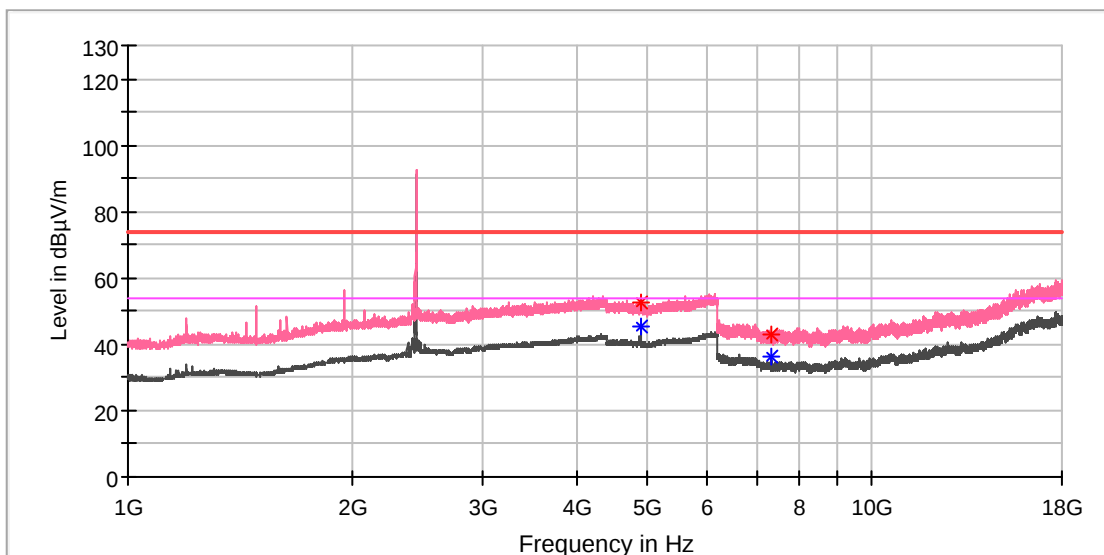
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19675.406250	---	39.49	54.00	14.51	100.0	H	35.0	-13.1
19693.562500	46.65	---	74.00	27.35	100.0	H	118.0	-13.1
21191.562500	46.15	---	74.00	27.85	100.0	H	237.0	-12.0
21193.312500	---	38.33	54.00	15.67	100.0	H	118.0	-12.0
22879.000000	---	39.77	54.00	14.23	100.0	H	317.0	-10.9
22898.031250	47.74	---	74.00	26.26	100.0	H	23.0	-10.9

Vertical


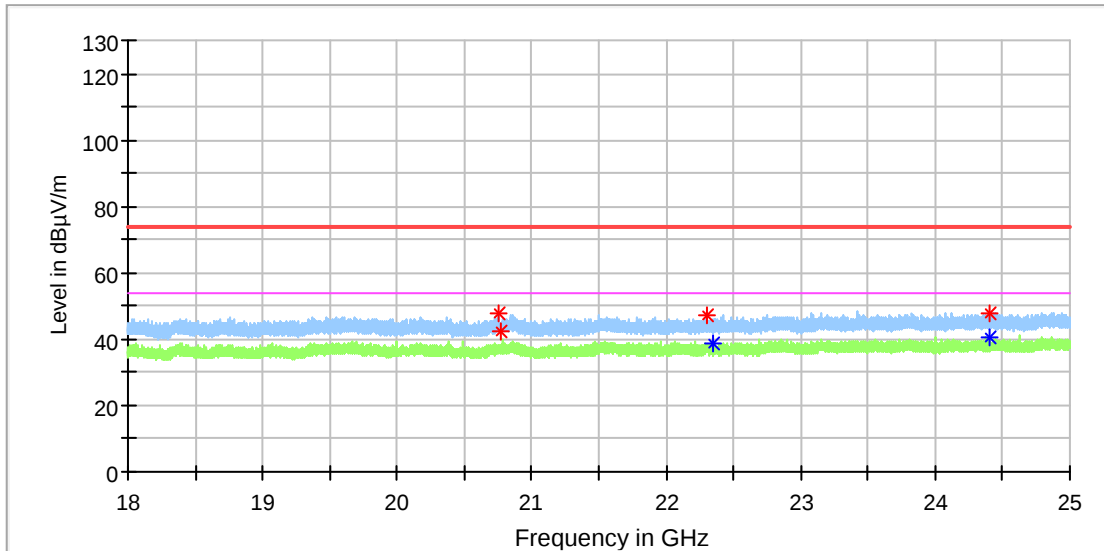
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20331.000000	47.20	---	74.00	26.80	100.0	V	288.0	-12.7
20354.625000	---	38.35	54.00	15.65	100.0	V	276.0	-12.7
22757.156250	47.44	---	74.00	26.56	100.0	V	300.0	-10.9
22777.062500	---	39.12	54.00	14.88	100.0	V	0.0	-10.9
24140.093750	47.59	---	74.00	26.41	100.0	V	81.0	-10.1
24141.187500	---	39.50	54.00	14.50	100.0	V	241.0	-10.1

Mode A.2
Horizontal


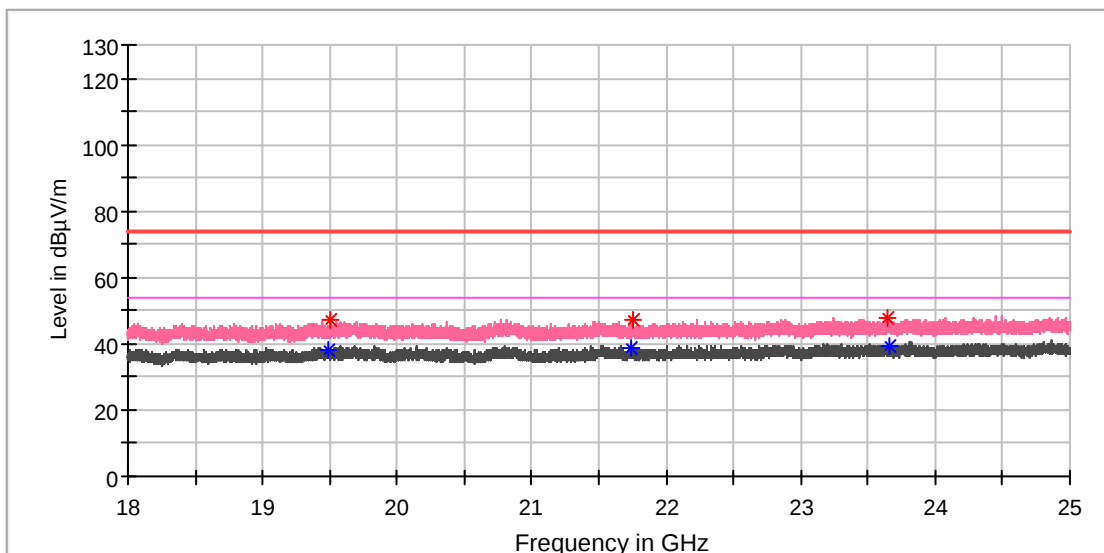
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4879.500000	---	48.91	54.00	5.09	100.0	H	40.0	13.4
4881.000000	55.39	---	74.00	18.61	100.0	H	159.0	13.4
7320.016667	45.70	---	74.00	28.30	100.0	H	45.0	8.2
7320.016667	---	37.74	54.00	16.26	100.0	H	45.0	8.2

Vertical


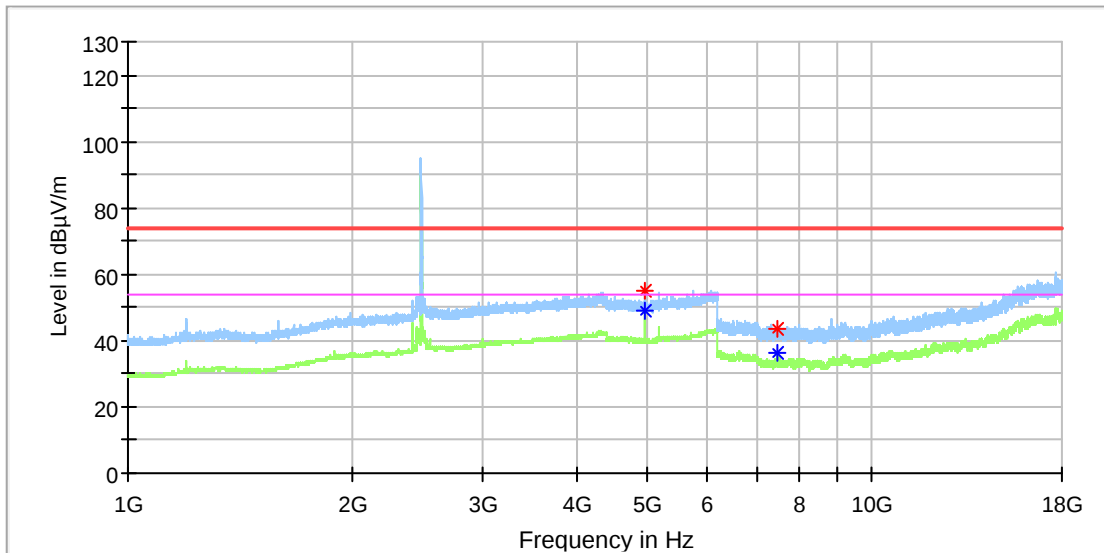
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4879.000000	52.50	---	74.00	21.50	100.0	V	342.0	13.4
4880.000000	---	45.19	54.00	8.81	100.0	V	84.0	13.4
7320.508333	---	36.09	54.00	17.91	100.0	V	222.0	8.2
7321.000000	43.07	---	74.00	30.93	100.0	V	222.0	8.2

Horizontal


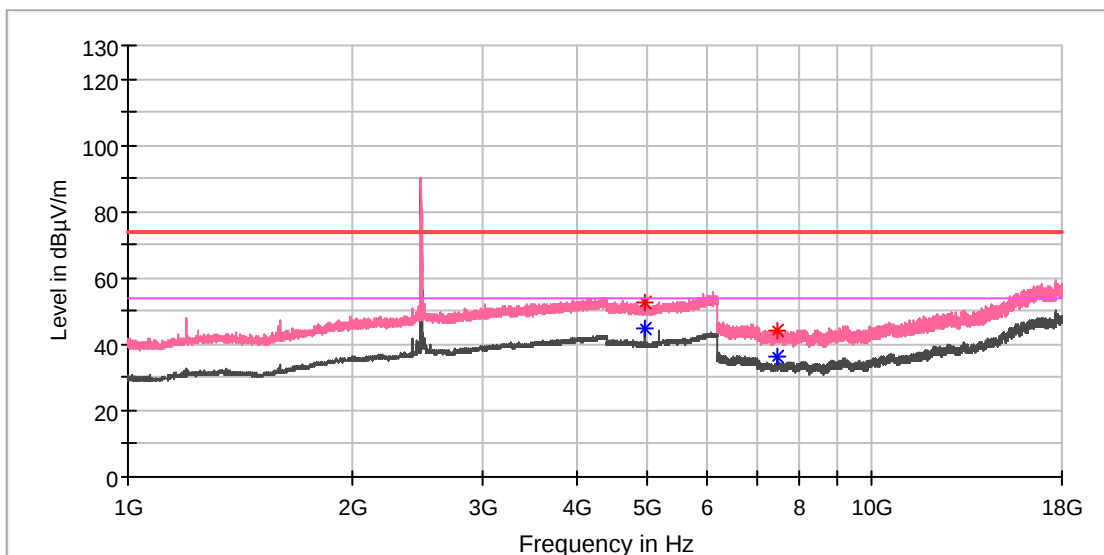
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20759.312500	48.04	---	74.00	25.96	100.0	H	4.0	-12.4
20771.125000	42.30	---	74.00	31.70	100.0	H	231.0	-12.4
22309.593750	47.18	---	74.00	26.82	100.0	H	100.0	-11.2
22353.125000	---	38.97	54.00	15.03	100.0	H	112.0	-11.2
24407.406250	48.01	---	74.00	25.99	100.0	H	0.0	-10.1
24408.937500	---	40.52	54.00	13.48	100.0	H	60.0	-10.1

Vertical


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19489.906250	---	38.18	54.00	15.82	100.0	V	107.0	-13.1
19498.218750	46.88	---	74.00	27.12	100.0	V	292.0	-13.1
21734.937500	---	38.47	54.00	15.53	100.0	V	351.0	-11.5
21752.875000	47.36	---	74.00	26.64	100.0	V	244.0	-11.5
23648.562500	47.64	---	74.00	26.36	100.0	V	84.0	-10.3
23657.750000	---	39.28	54.00	14.72	100.0	V	351.0	-10.3

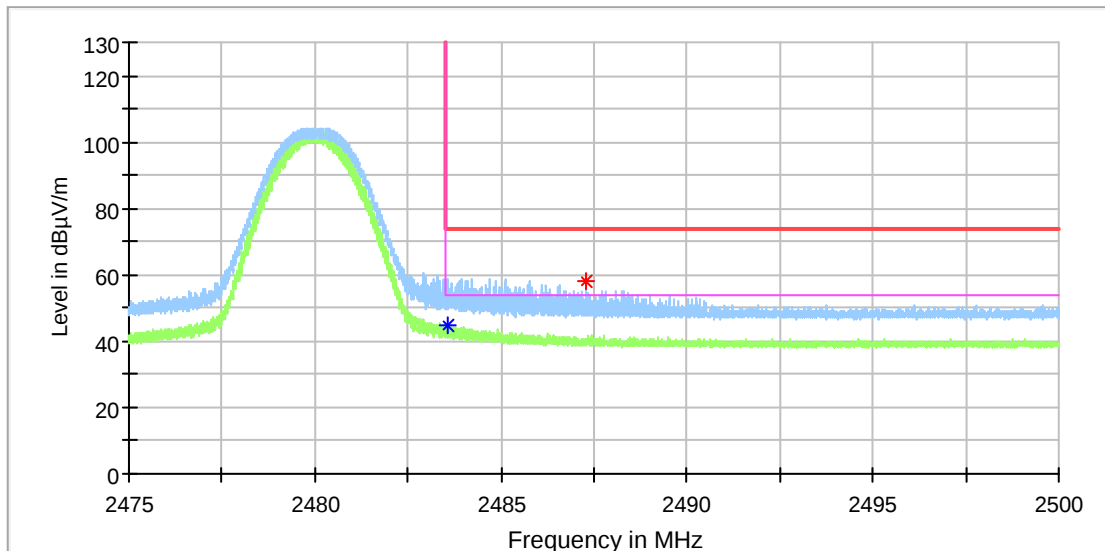
Mode A.3
Horizontal


Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4960.500000	54.75	---	74.00	19.25	100.0	H	347.0	13.2
4960.500000	---	48.70	54.00	5.30	100.0	H	347.0	13.2
7439.491667	43.36	---	74.00	30.64	100.0	H	121.0	8.4
7440.475000	---	36.02	54.00	17.98	100.0	H	121.0	8.4

Vertical


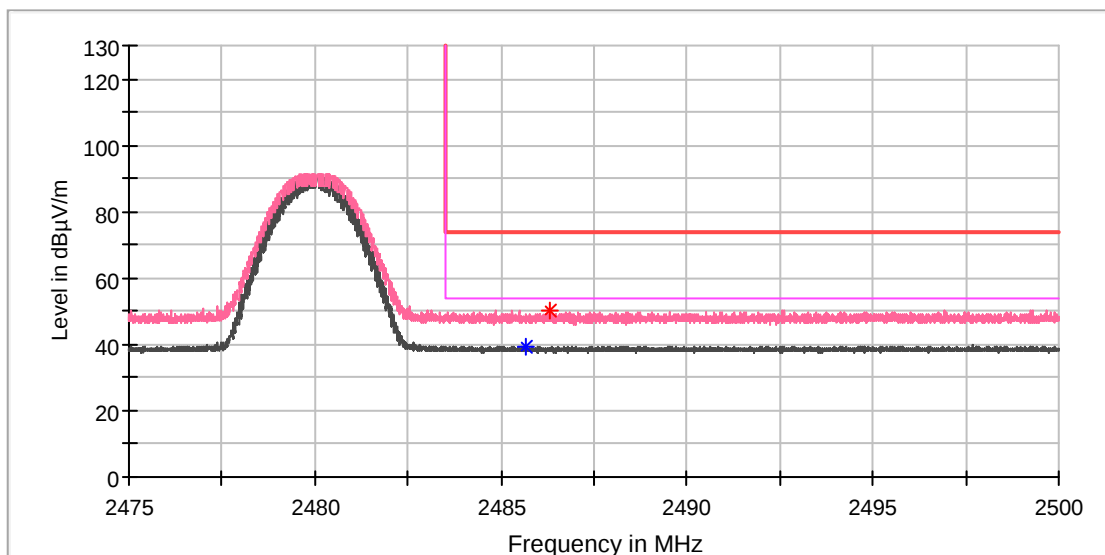
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
4960.000000	---	44.97	54.00	9.03	100.0	V	157.0	13.2
4960.500000	52.85	---	74.00	21.15	100.0	V	191.0	13.2
7439.491667	---	36.06	54.00	17.94	100.0	V	0.0	8.4
7443.425000	43.99	---	74.00	30.01	100.0	V	120.0	8.5

Horizontal



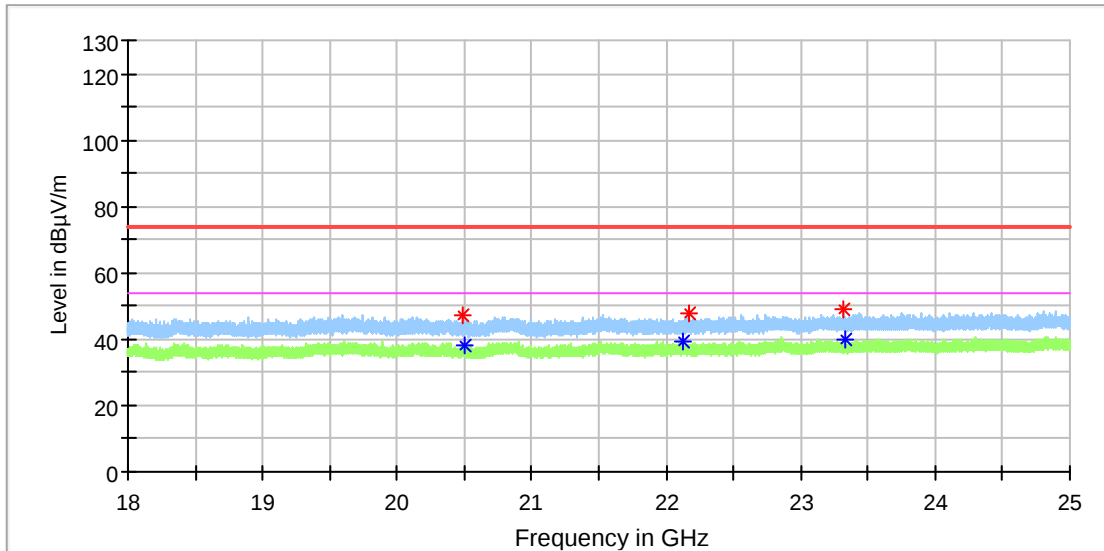
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2483.540441	---	44.80	54.00	9.20	100.0	H	181.0	7.4
2487.275735	57.82	---	74.00	16.18	100.0	H	234.0	7.4

Vertical



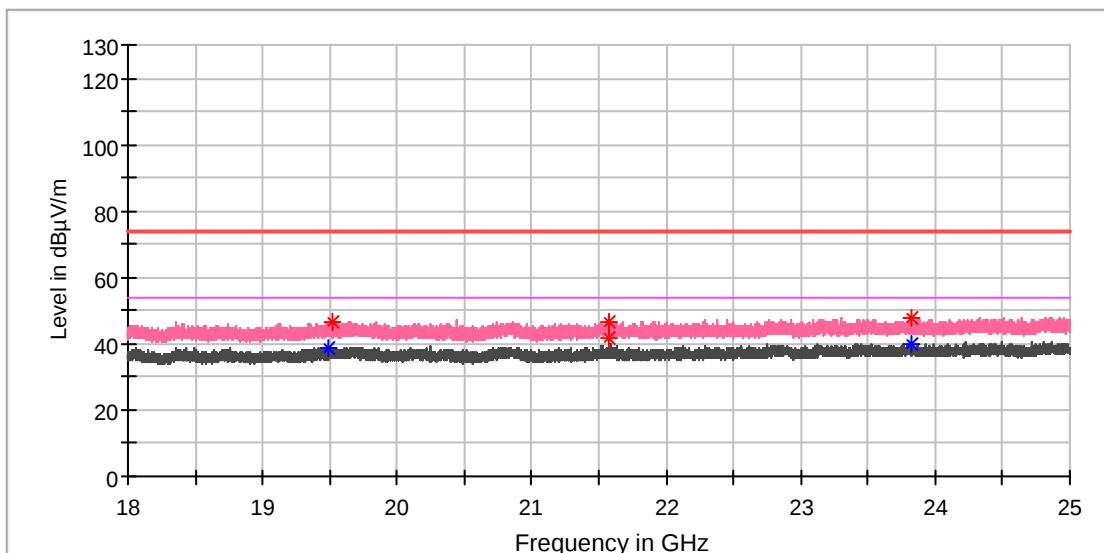
Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2485.647059	---	39.52	54.00	14.48	100.0	V	0.0	7.4
2486.327206	50.20	---	74.00	23.80	100.0	V	93.0	7.4

Horizontal



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
20488.937500	47.24	---	74.00	26.76	100.0	H	231.0	-12.7
20504.906250	---	38.32	54.00	15.68	100.0	H	3.0	-12.6
22119.718750	---	39.11	54.00	14.89	100.0	H	142.0	-11.3
22166.968750	47.84	---	74.00	26.16	100.0	H	35.0	-11.3
23311.031250	48.77	---	74.00	25.23	100.0	H	317.0	-10.4
23328.531250	---	40.01	54.00	13.99	100.0	H	58.0	-10.4

Vertical



Frequency (MHz)	MaxPeak (dBµV/m)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
19484.875000	---	38.53	54.00	15.47	100.0	V	43.0	-13.1
19522.062500	46.78	---	74.00	27.22	100.0	V	297.0	-13.1
21578.531250	41.89	---	74.00	32.11	100.0	V	178.0	-11.7
21579.406250	46.41	---	74.00	27.59	100.0	V	189.0	-11.7
23818.750000	---	40.13	54.00	13.87	100.0	V	142.0	-10.0
23818.750000	47.97	---	74.00	26.03	100.0	V	142.0	-10.0