

Prüfbericht-Nr.: Test report no.:	CN238IT4 001	Auftrags-Nr.: Order no.:	244490783	Seite 1 von 38 Page 1 of 38
Kunden-Referenz-Nr.: Client reference no.:	1288983	Auftragsdatum: Order date:	2023-01-18	
Auftraggeber: Client:	IKEA of Sweden AB Box 702, SE-343 81, Älmhult, Sweden			
Prüfgegenstand: Test item:	PARASOLL Open/Close Sensor			
Bezeichnung / Typ-Nr.: Identification / Type no.:	E2013 FCC ID: FHO-E2013			
Auftrags-Inhalt: Order content:	TÜV Rheinland EMC service			
Prüfgrundlage: Test specification:	FCC 47 CFR Part 15, Subpart B:2021 Class B ICES-003:2020			
Wareneingangsdatum: Date of sample receipt:	2023-02-02	Please refer to Photo Document		
Prüfmuster-Nr.: Test sample no.:	A003408704-001/-002			
Prüfzeitraum: Testing period:	Refer to test report			
Ort der Prüfung: Place of testing:	Refer to clause 1.1			
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shanghai) Co., Ltd.			
Prüfergebnis*: Test result*:	Pass			
geprüft von: tested by:	genehmigt von: authorized by:			
Datum: Date: 2023-04-06	Ausstellungsdatum: Issue date: 2023-04-06			
Stellung / Position: Sachverständige(r)/Expert	Stellung / Position: Sachverständige(r)/Expert			
Sonstiges / Refer to clause 2.2 for more information. Other:				
Zustand des Prüfgegenstandes bei Anlieferung: Condition of the test item at delivery:		Prüfmuster vollständig und unbeschädigt Test item complete and undamaged		
* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet * Legend: P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
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Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. <i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i>
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. <i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i>
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. <i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.</i>

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TEST SUMMARY

5.1.1 RADIATED EMISSION (30 MHz - 1 GHz)

Result:

Passed

5.1.2 RADIATED EMISSION (ABOVE 1 GHz)

Result:

Passed

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1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Shanghai) Co., Ltd.

Address: No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

Refer to Clause 6 for test and measurement instruments.

2 General Product Information

2.1 Product Function and Intended Use

The EUTs (equipment under test) are PARASOLL Open/Close Sensors. For the further information, refer to the user's manual.

2.2 Ratings and System Details

Rated input : 1xAAA
Protection class : III

There are two Boosts MAX17224 and OC6811 for the model E2013. Therefore, all the EMC tests were performed on the model E2013 with Boosts MAX17224 and OC6811 respectively.

2.3 Independent Operation Modess

The basic operation modes are the below,

1. On by zigbee
2. Off by zigbee
3. Standby by zigbee

2.4 Description of interconnecting cables

None.

2.5 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

2.6 Highest frequency generated or used in the device or on which the device operates or tunes

The highest frequency used in the EUT is 2.4 GHz.

2.7 Submitted Documents

Circuit diagram, PCB layout and rating label.

3 Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

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

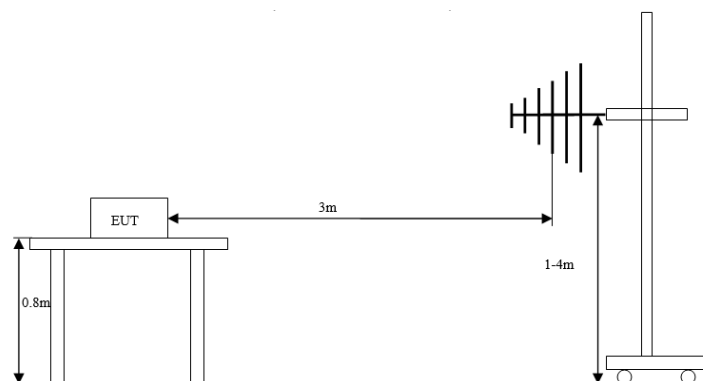
Refer to the related paragraph of this report.

The sequence of testing:

1. Radiated emission tests were performed on 2023-03-07.

3.2 Equipment and cable arrangement

Block diagram for radiated emission tests is as follows:



Also refer to photographs on attachment 1 for test setups for radiated emission test.

3.3 Test Software

No special test software was used during the tests.

3.4 Special Accessories and Auxiliary Equipment

During the tests, the below equipment were used.

No.	Equipment	Model	Manufacturer
1	Laptop	T450	lenovo
2	D-Dongle-Zigbee-5169-U2.1	JX-01 E248715	-

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3.5 Countermeasures to achieve EMC Compliance

No other special measure is employed to achieve the requirement.

4 Conformity Decision Rule

For all EMI tests included in this report, as measurement uncertainties are less than the values U_{CISPR} given in CISPR 16-4-2, compliance with the limits is determined by comparing measurement results directly with corresponding limits without taking into consideration of measurement uncertainties.

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5 Test Results EMISSION

5.1 Emission in the Frequency Range above 30 MHz

5.1.1 Radiated emission (30 MHz - 1 GHz)

Result:		Passed
Date of testing	: 2023-03-07	
Test procedure	: FCC 47 CFR Part 15, Subpart B:2021, ICES-003:2020, ANSI C63.4-2014 and CISPR 16-2-3	
Frequency range	: 30 – 1000 MHz	
Limits	: Quasi-peak limits (3 m distance): 30 – 88 MHz, 40 dB μ V/m; 88 – 216 MHz, 43.5 dB μ V/m; 216 – 1000 MHz, 46 dB μ V/m (see Note 1)	
Bandwidth of EMI receiver for final measurement	: 120 kHz	
Measurement time for final measurement	: 1 s	
Kind of test site	: Semi-anechoic chamber	
Operational mode	: Modes 1, 2, 3 as defined in clause 2.3	
Input voltage	: 1xAAA battery	
Ambient condition	: Temperature: 22.3 °C; Relative humidity: 46.8 %	
Expanded measurement uncertainty ($k=2$)	: 5.49 dB	

The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a 0.8 m high wooden table above the reference ground plane. The wooden table was rotated 360° around and the height of the antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. A preview test was firstly performed with peak detector. The final test was performed with quasi-peak at those critical frequencies during the preview test. In the following spectral diagram, “×” means quasi-peak test results.

Notes on following tables of radiated emission results and conversions:

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QuasiPeak (dB μ V/m): final measurement results by using quasi-peak detector

Corr. (dB): correction factor including: antenna factor, cable loss, and gain of pre-amplifier (if used)

Margin: Limit (dB μ V/m) - QuasiPeak (dB μ V/m)

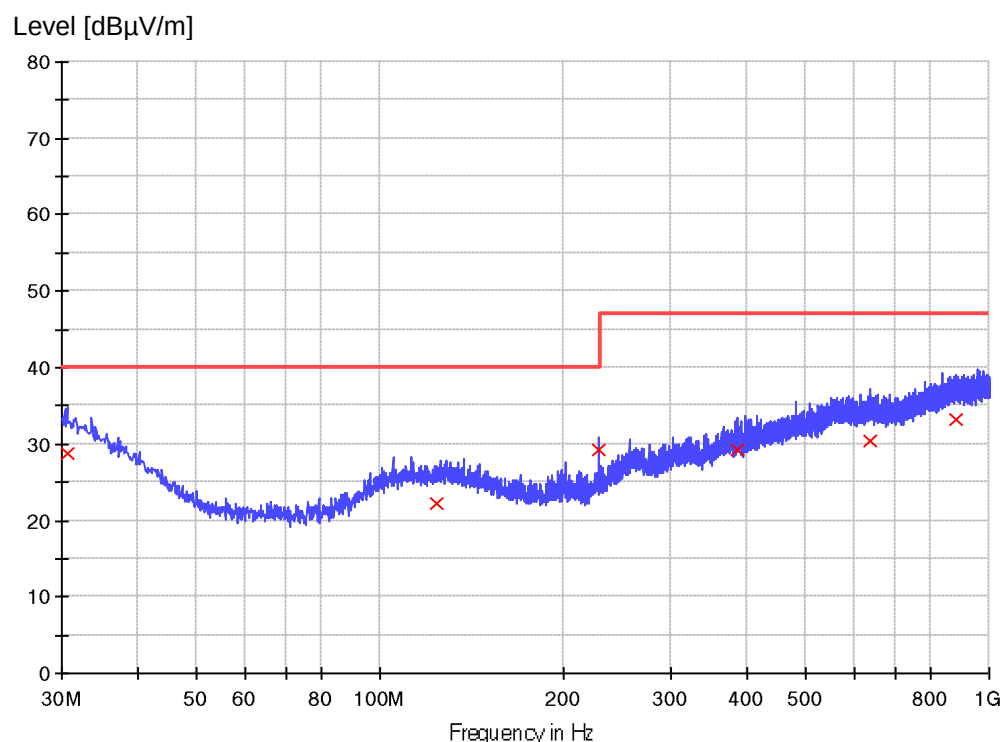
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Figure 1: Spectral Diagrams and measurement results, horizontal polarization (30 MHz to 1 GHz), OC6811, mode 1



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
30.606250	28.9	120.000	100.0	H	-24.0	25.1	11.1	40.0
123.362500	22.1	120.000	130.0	H	180.0	18.7	17.9	40.0
228.850000	29.1	120.000	110.0	H	-85.0	16.8	10.9	40.0
385.626250	29.4	120.000	160.0	H	-180.0	22.0	17.7	47.0
638.917500	30.5	120.000	120.0	H	172.0	26.4	16.5	47.0
885.176250	33.2	120.000	150.0	H	-180.0	28.0	13.8	47.0

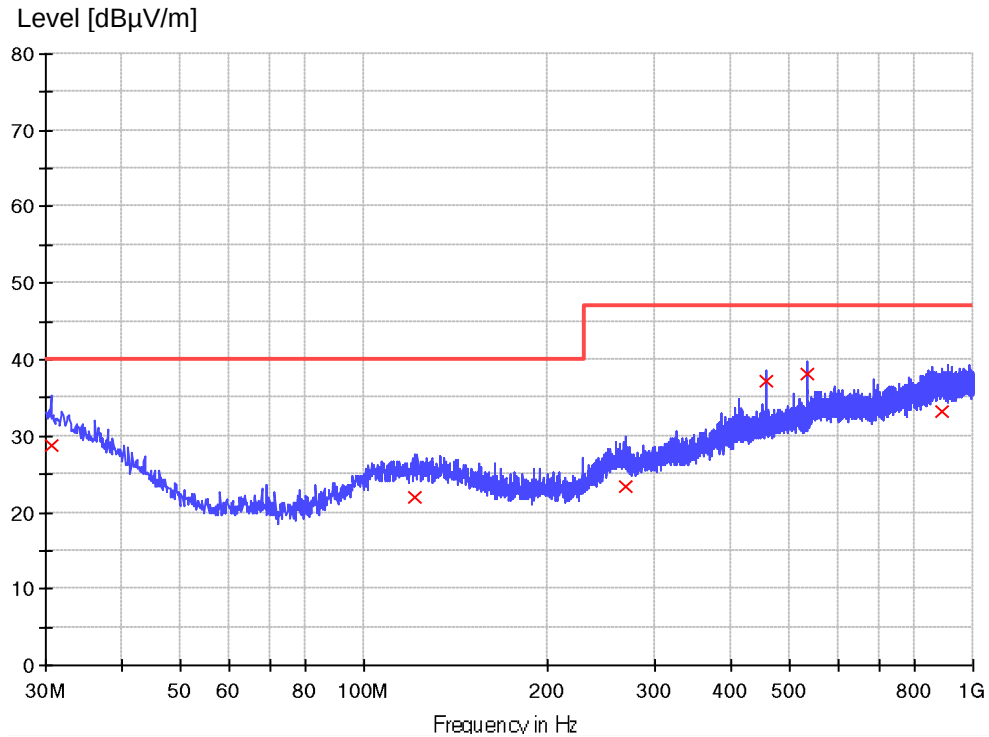
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Figure 2: Spectral Diagrams and measurement results, vertical polarization (30 MHz to 1 GHz), OC6811, mode 1



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
30.600000	28.9	120.000	100.0	V	57.0	25.1	11.1	40.0
120.937500	22.0	120.000	160.0	V	180.0	18.5	18.0	40.0
268.741250	23.3	120.000	110.0	V	113.0	19.9	23.7	47.0
457.891250	37.2	120.000	130.0	V	-180.0	24.3	9.8	47.0
534.157500	38.1	120.000	150.0	V	180.0	25.1	8.9	47.0
890.632500	33.2	120.000	120.0	V	-142.0	28.1	13.8	47.0

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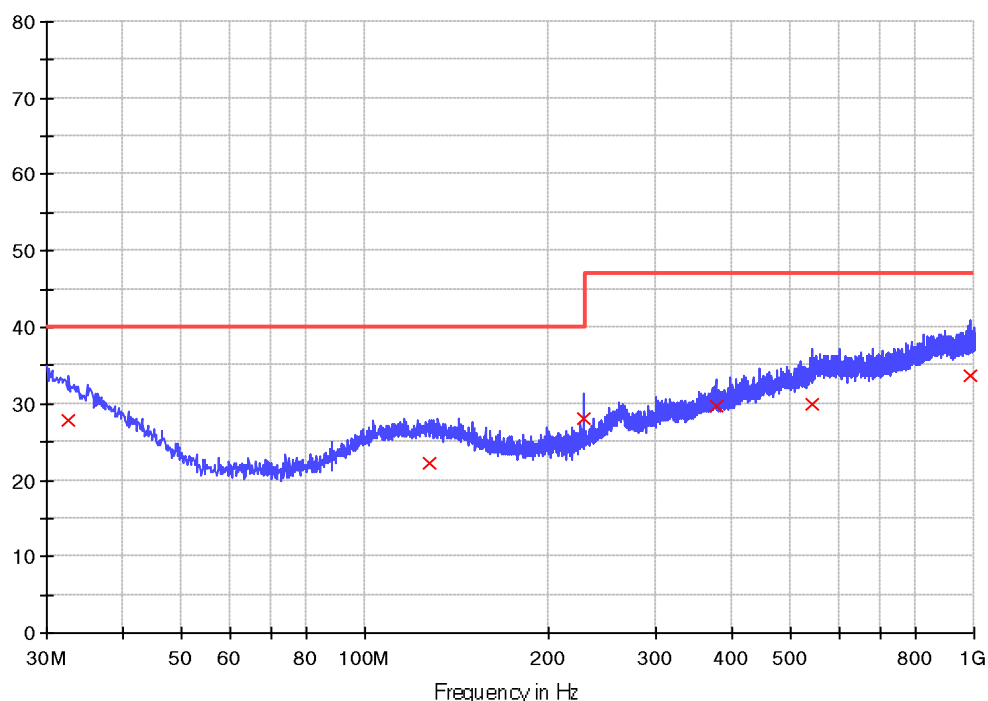
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Figure 3: Spectral Diagrams and measurement results, horizontal polarization (30 MHz to 1 GHz), OC6811, mode 2

Level [dBμV/m]



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
32.546250	27.9	120.000	120.0	H	29.0	24.1	12.1	40.0
127.485000	22.3	120.000	150.0	H	-50.0	18.7	17.7	40.0
228.971250	28.1	120.000	110.0	H	180.0	16.8	11.9	40.0
376.047500	29.6	120.000	160.0	H	-180.0	22.0	17.4	47.0
543.736250	29.9	120.000	100.0	H	-114.0	25.8	17.2	47.0
983.510000	33.6	120.000	135.0	H	167.0	28.8	13.4	47.0

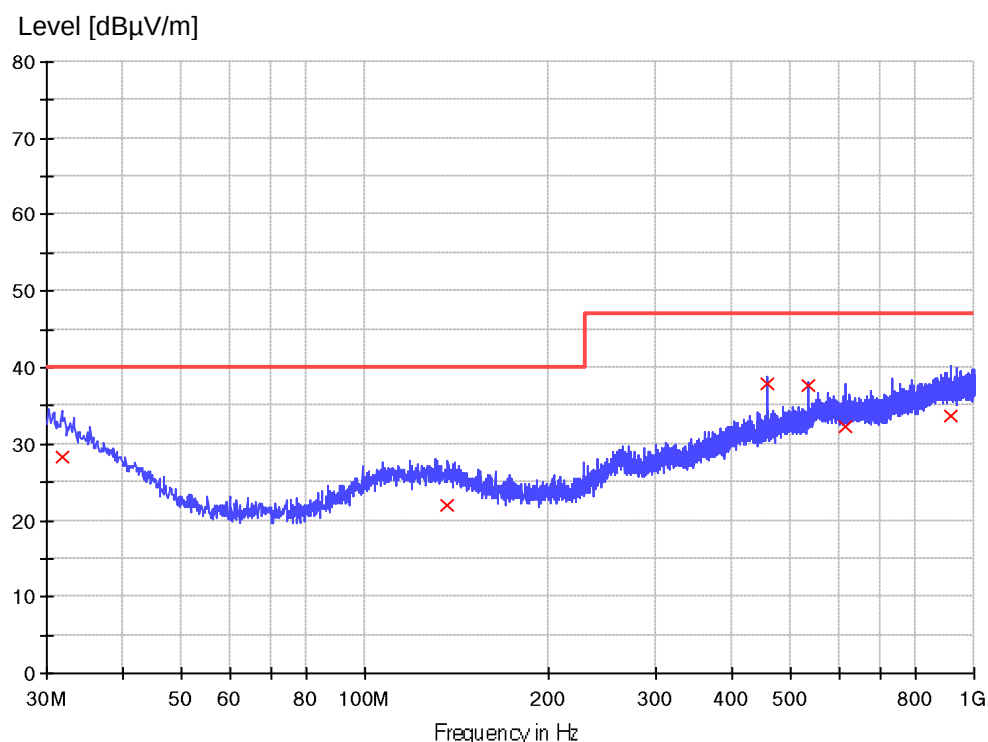
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Figure 4: Spectral Diagrams and measurement results, vertical polarization (30 MHz to 1 GHz), OC6811, mode 2



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
31.818750	28.4	120.000	100.0	V	168.0	24.6	11.6	40.0
136.700000	22.0	120.000	130.0	V	-180.0	18.3	18.0	40.0
457.770000	37.9	120.000	165.0	V	26.0	24.3	9.1	47.0
534.157500	37.7	120.000	110.0	V	-115.0	25.1	9.3	47.0
612.485000	32.4	120.000	150.0	V	-180.0	26.2	14.6	47.0
915.367500	33.6	120.000	110.0	V	94.0	28.1	13.4	47.0

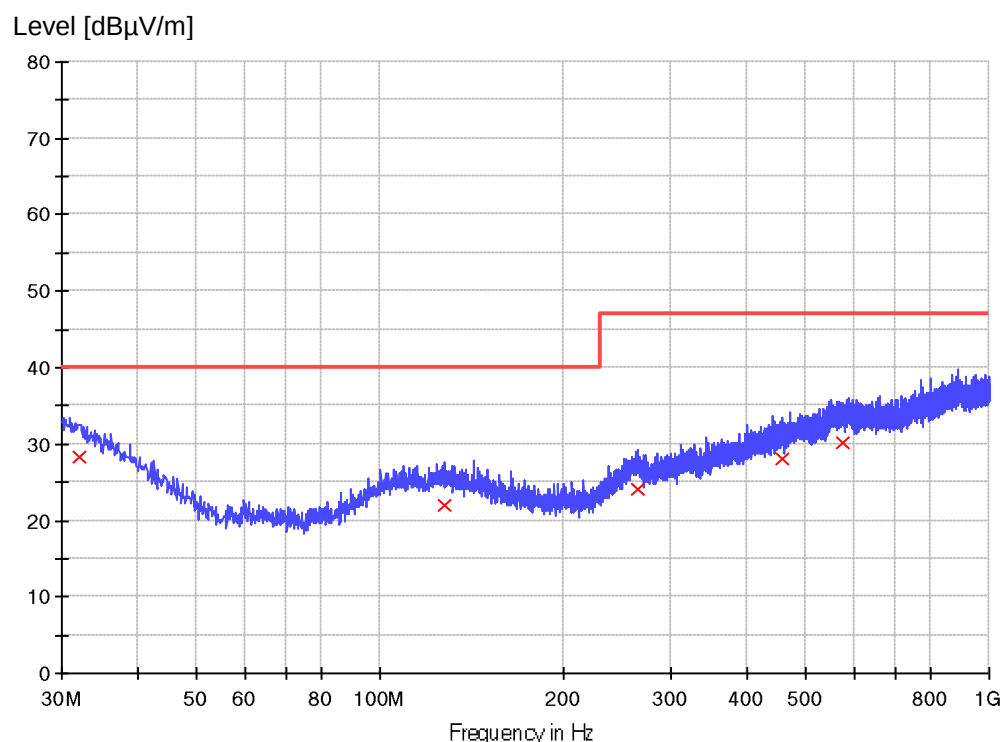
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Figure 5: Spectral Diagrams and measurement results, horizontal polarization (30 MHz to 1 GHz), OC6811, mode 3



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
32.061250	28.2	120.000	110.0	H	-28.0	24.5	11.8	40.0
127.242500	22.1	120.000	160.0	H	147.0	18.7	17.9	40.0
265.225000	24.0	120.000	180.0	H	110.0	20.7	23.0	47.0
455.708750	28.0	120.000	130.0	H	180.0	24.3	19.0	47.0
575.503750	30.3	120.000	100.0	H	-71.0	26.1	16.7	47.0

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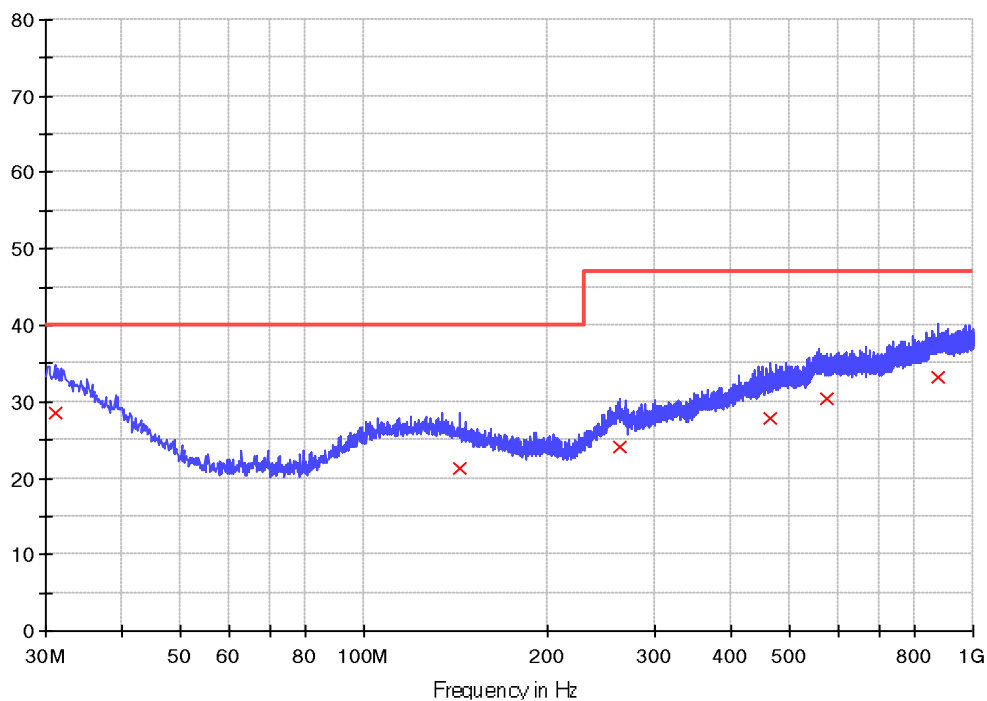
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Figure 6: Spectral Diagrams and measurement results, vertical polarization (30 MHz to 1 GHz), OC6811, mode 3

Level [dB μ V/m]



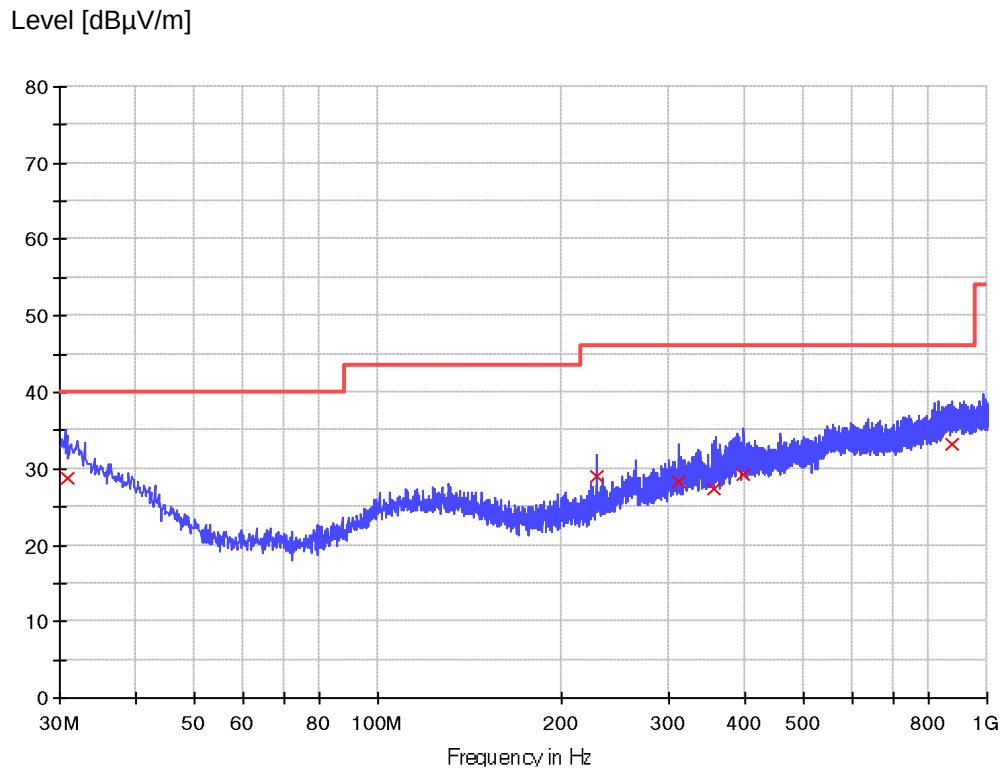
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
31.091250	28.7	120.000	130.0	V	-180.0	24.9	11.4	40.0
143.853750	21.4	120.000	160.0	V	180.0	17.8	18.6	40.0
263.527500	24.2	120.000	180.0	V	103.0	20.7	22.8	47.0
463.711250	27.9	120.000	110.0	V	-93.0	24.2	19.1	47.0
573.442500	30.3	120.000	150.0	V	-180.0	26.1	16.7	47.0
873.293750	33.3	120.000	100.0	V	166.0	28.0	13.7	47.0

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Figure 7: Spectral Diagrams and measurement results, horizontal polarization (30 MHz to 1 GHz), MAX17224, mode 1



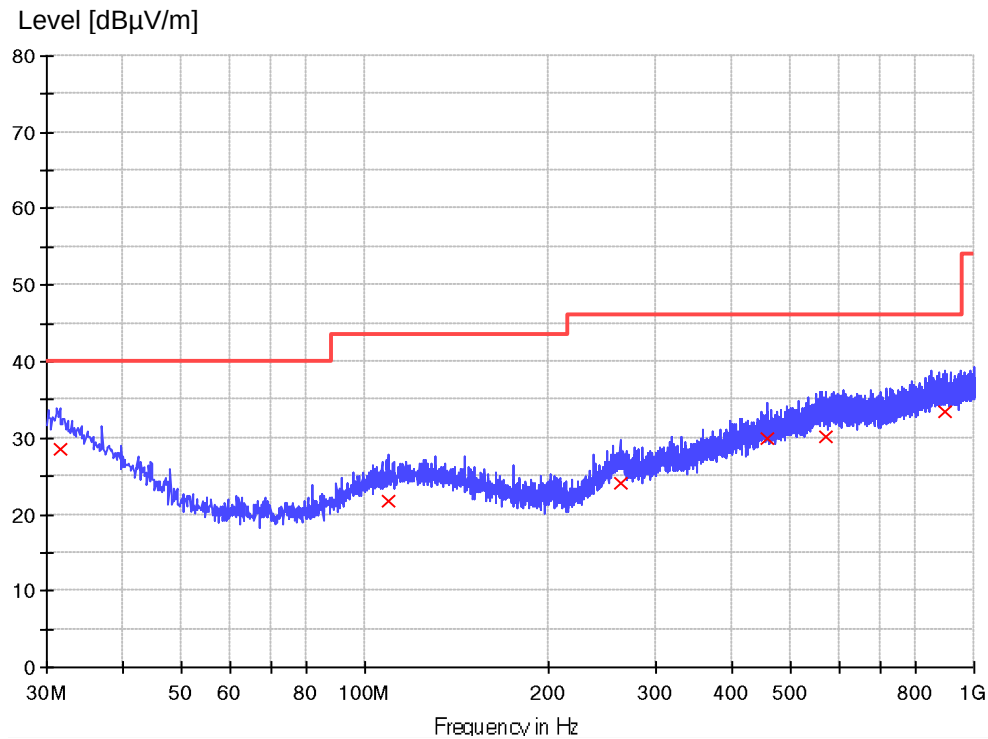
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
30.848750	28.8	120.000	100.0	H	-139.0	25.0	11.3	40.0
228.971250	29.1	120.000	180.0	H	94.0	16.8	17.0	46.0
310.693750	28.3	120.000	150.0	H	-180.0	20.3	17.7	46.0
356.768750	27.3	120.000	110.0	H	-83.0	21.6	18.7	46.0
398.842500	29.2	120.000	160.0	H	180.0	22.5	16.8	46.0
873.293750	33.3	120.000	140.0	H	-46.0	28.0	12.7	46.0

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Figure 8: Spectral Diagrams and measurement results, vertical polarization (30 MHz to 1 GHz), MAX17224, mode 1



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
31.576250	28.4	120.000	100.0	V	-149.0	24.7	11.6	40.0
109.418750	21.8	120.000	160.0	V	-180.0	18.5	21.7	43.5
262.557500	24.1	120.000	110.0	V	-117.0	20.7	21.9	46.0
457.770000	29.9	120.000	130.0	V	-97.0	24.3	16.1	46.0
571.502500	30.3	120.000	150.0	V	180.0	26.1	15.7	46.0
893.421250	33.5	120.000	110.0	V	-58.0	28.3	12.5	46.0

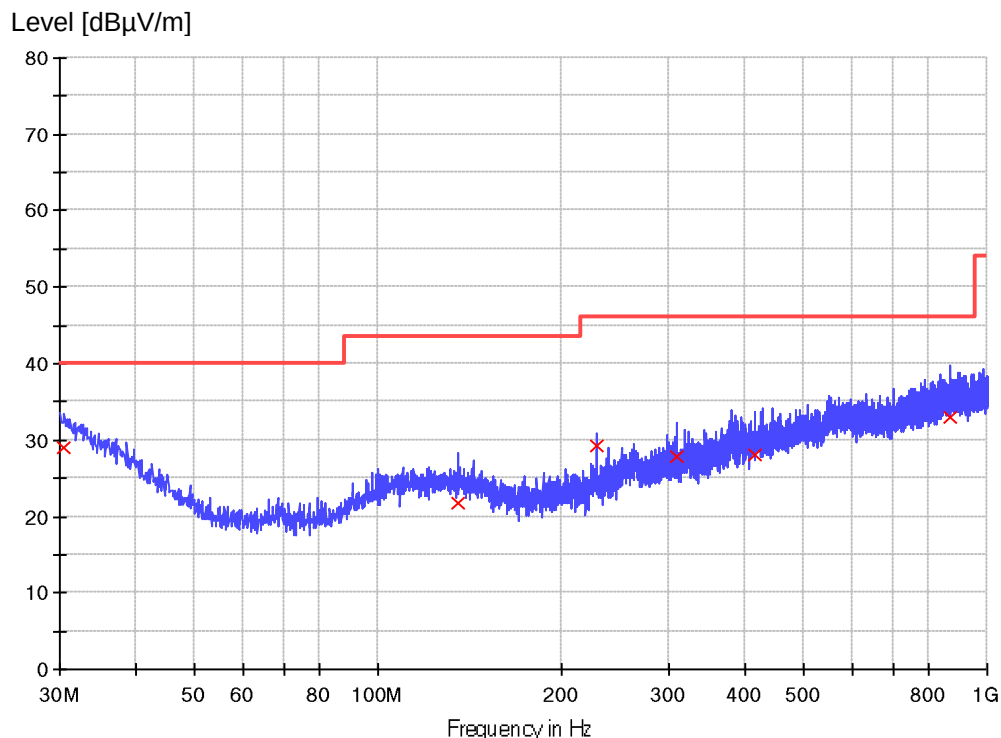
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Figure 9: Spectral Diagrams and measurement results, horizontal polarization (30 MHz to 1 GHz), MAX17224, mode 2



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
30.485000	28.9	120.000	100.0	H	33.0	25.2	11.1	40.0
135.002500	21.8	120.000	160.0	H	180.0	18.4	21.7	43.5
228.850000	29.4	120.000	135.0	H	70.0	16.8	16.7	46.0
308.268750	27.9	120.000	100.0	H	-180.0	20.2	18.1	46.0
416.423750	28.1	120.000	110.0	H	104.0	23.3	17.9	46.0
867.352500	33.1	120.000	140.0	H	127.0	27.9	13.0	46.0

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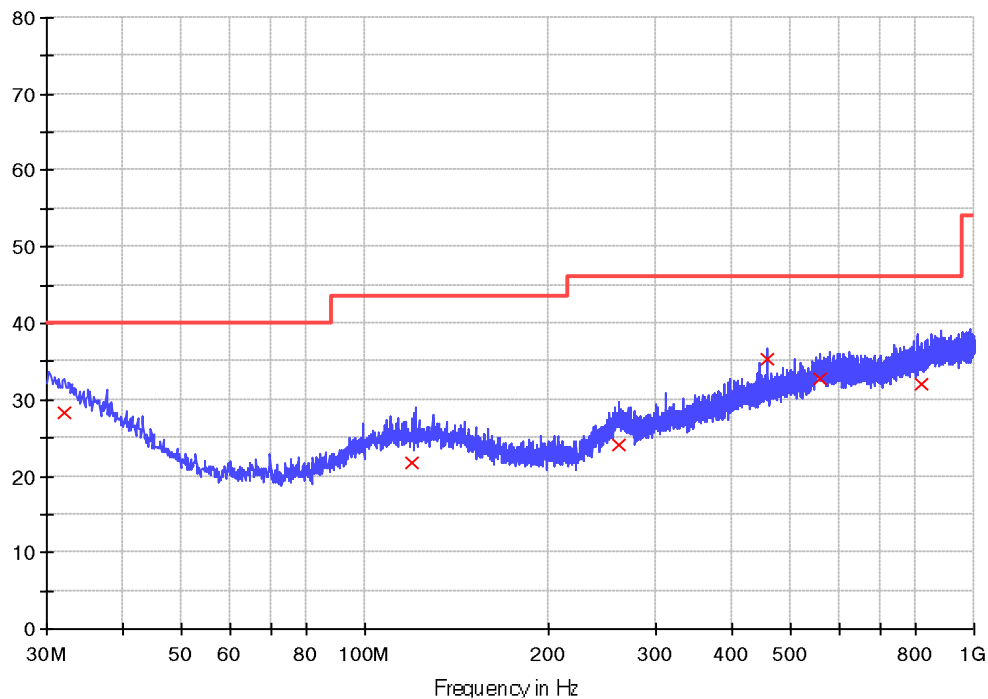
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Figure 10: Spectral Diagrams and measurement results, vertical polarization (30 MHz to 1 GHz), MAX17224, mode 2

Level [dB μ V/m]



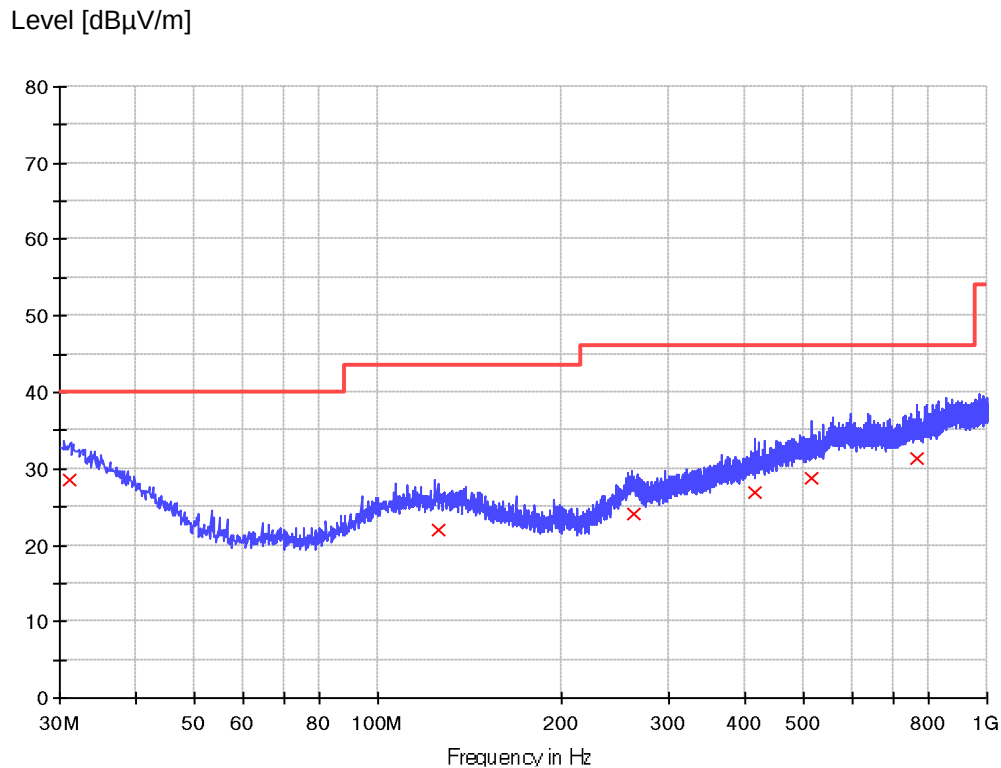
Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dB μ V/m)
32.061250	28.2	120.000	100.0	V	180.0	24.5	11.8	40.0
119.118750	21.8	120.000	160.0	V	66.0	18.4	21.7	43.5
260.617500	24.1	120.000	180.0	V	-180.0	20.7	21.9	46.0
457.770000	35.4	120.000	130.0	V	123.0	24.3	10.7	46.0
558.286250	32.7	120.000	100.0	V	-117.0	26.4	13.3	46.0
820.065000	32.1	120.000	150.0	V	89.0	27.5	14.0	46.0

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Figure 11: Spectral Diagrams and measurement results, horizontal polarization (30 MHz to 1 GHz), MAX17224, mode 3



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
31.091250	28.6	120.000	100.0	H	180.0	24.9	11.4	40.0
125.181250	22.1	120.000	160.0	H	-180.0	18.8	21.4	43.5
263.770000	24.2	120.000	110.0	H	65.0	20.7	21.9	46.0
416.666250	26.8	120.000	180.0	H	-124.0	23.3	19.2	46.0
514.272500	28.7	120.000	150.0	H	115.0	25.0	17.3	46.0
765.138750	31.4	120.000	120.0	H	96.0	27.3	14.7	46.0

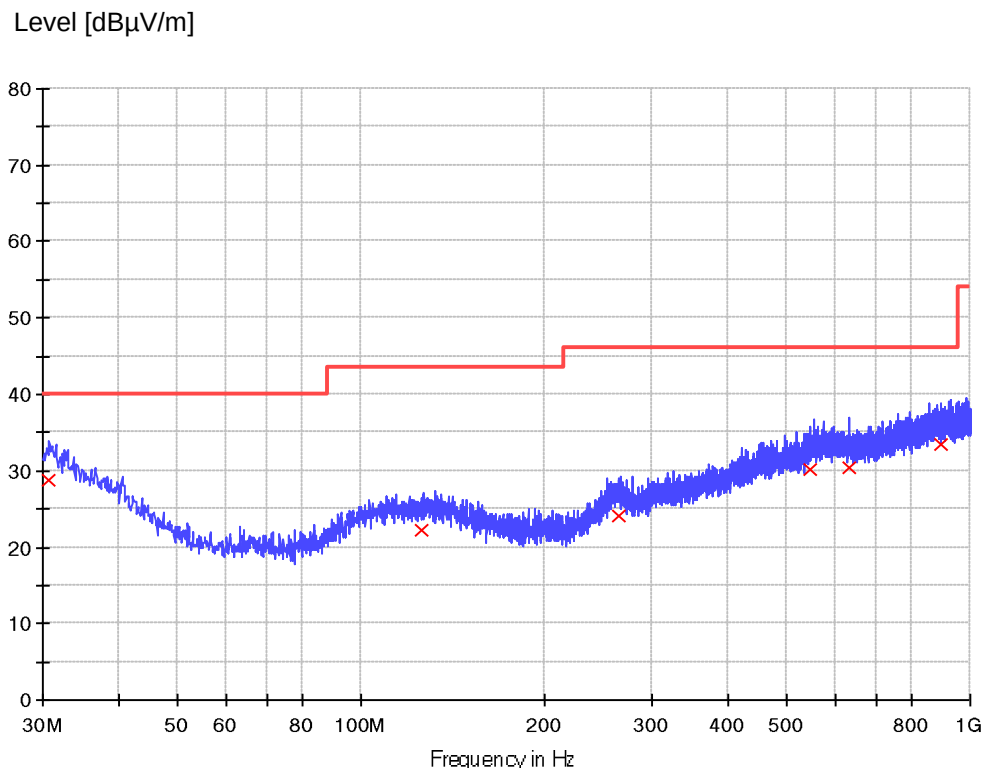
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Figure 12: Spectral Diagrams and measurement results, vertical polarization (30 MHz to 1 GHz), MAX17224, mode 3



Final Quasi-peak measurement result:

Frequency (MHz)	QuasiPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBμV/m)
30.727500	28.8	120.000	100.0	V	-17.0	25.0	11.2	40.0
125.908750	22.1	120.000	150.0	V	180.0	18.8	21.4	43.5
264.740000	24.1	120.000	100.0	V	24.0	20.7	21.9	46.0
547.131250	30.1	120.000	110.0	V	-180.0	26.1	15.9	46.0
631.157500	30.4	120.000	130.0	V	-155.0	26.4	15.6	46.0
896.331250	33.5	120.000	165.0	V	102.0	28.4	12.5	46.0

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5.1.2 Radiated emission (Above 1 GHz)

Result:	Passed
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Date of testing	: 2023-03-07
Port	: Enclosure
Test procedure	: FCC 47 CFR Part 15, Subpart B:2021, ANSI C63.4-2014 and CISPR 16-2-3 ICES-003:2020
Limit	: Above 1 GHz, Peak limit: 74 dB μ V/m; Average limit: 54 dB μ V/m
Frequency range	: 1-18 GHz Note: The highest frequency in the EUT is 2.4 GHz. According to FCC Part 15 subpart B §15.33 (b) (1), the upper frequency for radiated emission measurement is 12 GHz. The actual test frequency is up to 18 GHz.
Bandwidth of EMI receiver for final measurement	: 1000 kHz
Measurement time for final measurement	: 1 s
Test distance	: 3 m
Kind of test site	: Semi-anechoic chamber
Operational mode	: Mode 1 as defined in clause 2.3
Input voltage	: 1xAAA battery
Earthing	: No earthing
Ambient condition	: Temperature: 22.3 °C; Relative humidity: 46.8 %

The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a poly table, which is 0.8 m high. The wooden table was rotated 360° around and the antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures and tables were those measured by an automatic measurement system. The final test was performed with peak detector and average detector at those critical frequencies during the preview test. In the following figure, “x(red)” means measurement results with peak detector and “+ (blue)” means measurement results with average detector.

Notes on following tables of radiated emission results and conversions:

Peak (dB μ V/m): final measurement results by using peak detector

Average (dB μ V/m): final measurement results by using average detector

Corr. (dB): correction factor including: antenna factor, cable loss, and gain of pre-amplifier (if used)

Margin: Limit PK (dB μ V/m) - Peak (dB μ V/m)

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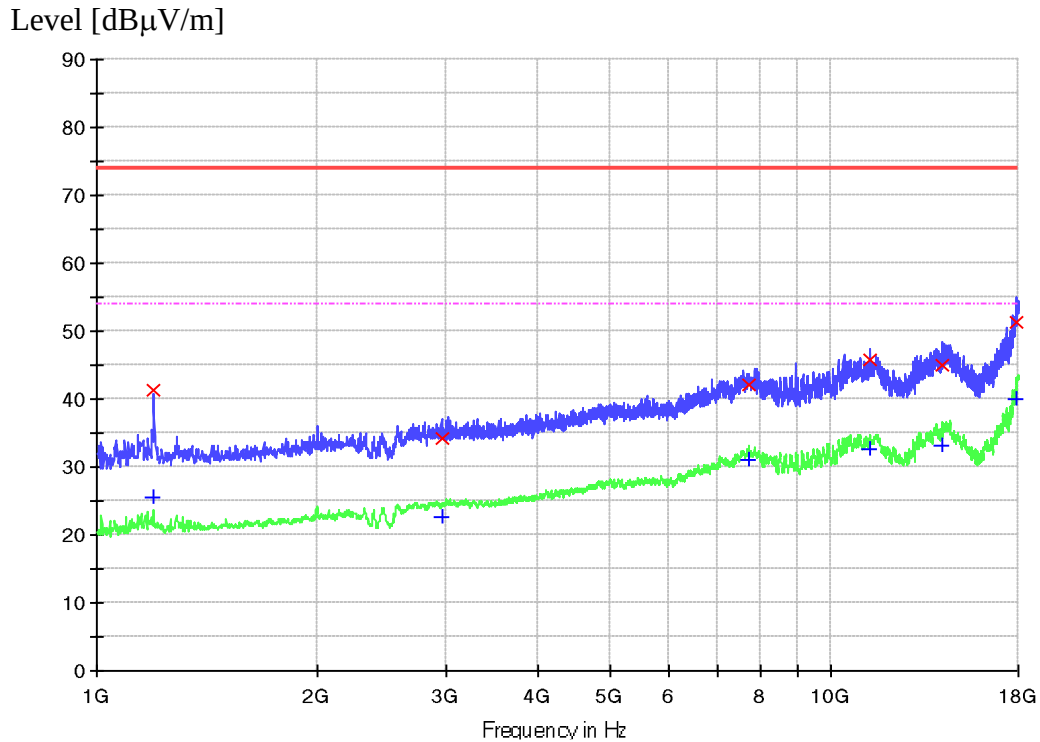
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Limit CAV (dB μ V/m) – Average (dB μ V/m)

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Figure 13: Spectral Diagrams and measurement results, 1-18 GHz, horizontal polarization, OC6811, mode 1



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBμV/m)
1195.500000	41.4	1000.000	155.0	H	-71.0	-20.6	32.6	74.0
2948.625000	34.1	1000.000	165.0	H	180.0	-14.7	39.9	74.0
7725.625000	42.0	1000.000	140.0	H	91.0	-5.3	32.0	74.0
11306.250000	45.7	1000.000	120.0	H	-116.0	-0.9	28.3	74.0
14198.375000	45.0	1000.000	155.0	H	180.0	2.0	29.0	74.0
17942.625000	51.4	1000.000	135.0	H	-180.0	11.6	22.6	74.0

Final Average measurement results:

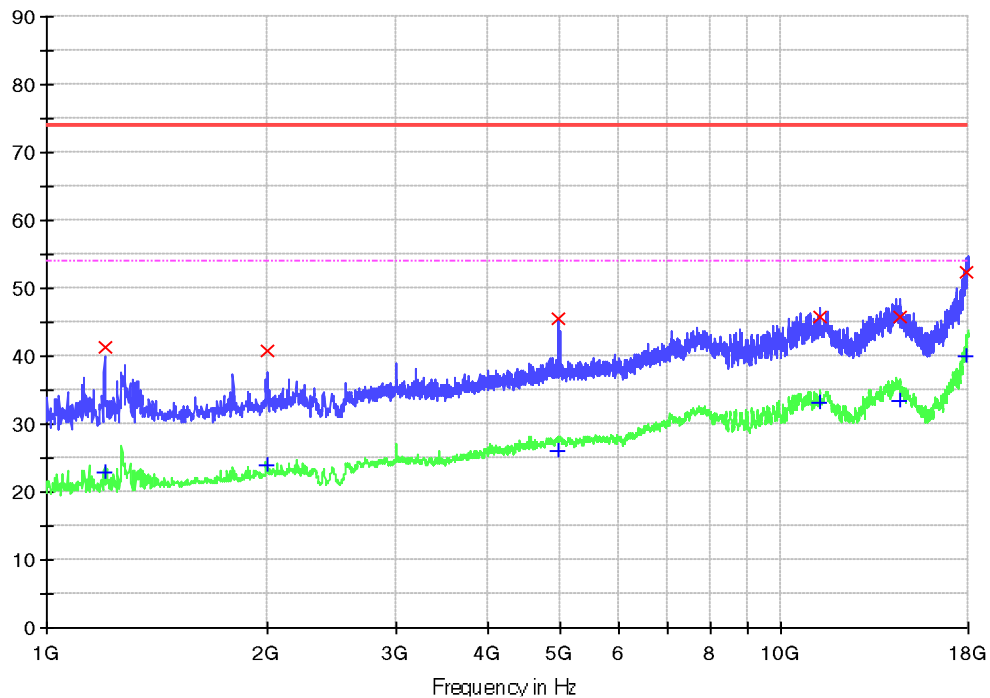
Frequency (MHz)	Average (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
1195.500000	25.4	1000.000	155.0	H	-71.0	-20.6	28.6	54.0
2948.625000	22.7	1000.000	165.0	H	180.0	-14.7	31.3	54.0
7725.625000	31.0	1000.000	140.0	H	91.0	-5.3	23.0	54.0
11306.250000	32.6	1000.000	120.0	H	-116.0	-0.9	21.4	54.0
14198.375000	33.1	1000.000	155.0	H	180.0	2.0	20.9	54.0
17942.625000	39.9	1000.000	135.0	H	-180.0	11.6	14.1	54.0

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Figure 14: Spectral Diagrams and measurement results, 1-18 GHz, vertical polarization, OC6811, mode 1

Level [dB μ V/m]



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dB μ V/m)
1199.750000	41.4	1000.000	130.0	V	180.0	-20.6	32.6	74.0
1994.500000	40.8	1000.000	150.0	V	-180.0	-17.5	33.2	74.0
4982.250000	45.6	1000.000	130.0	V	-28.0	-10.4	28.4	74.0
11297.750000	45.9	1000.000	165.0	V	164.0	-0.9	28.1	74.0
14491.625000	45.8	1000.000	135.0	V	-114.0	2.5	28.2	74.0
17891.625000	52.4	1000.000	160.0	V	180.0	10.6	21.6	74.0

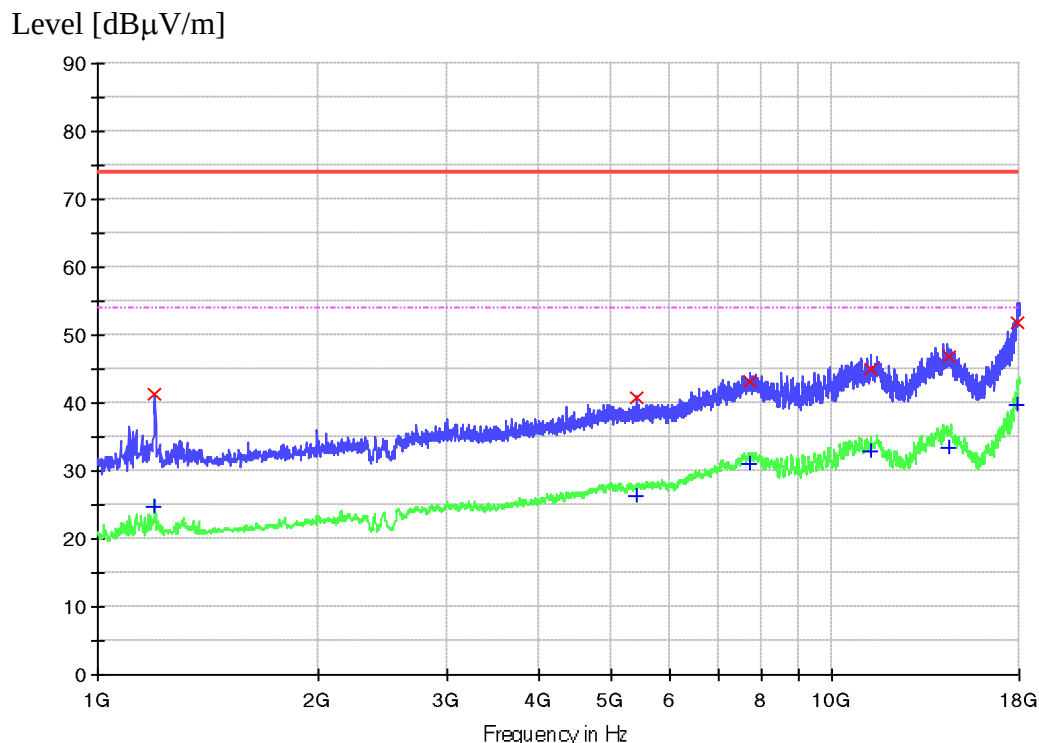
Final Average measurement results:

Frequency (MHz)	Average (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
1199.750000	22.9	1000.000	130.0	V	180.0	-20.6	31.1	54.0
1994.500000	23.9	1000.000	150.0	V	-180.0	-17.5	30.1	54.0
4982.250000	26.2	1000.000	130.0	V	-28.0	-10.4	27.8	54.0
11297.750000	33.3	1000.000	165.0	V	164.0	-0.9	20.7	54.0
14491.625000	33.5	1000.000	135.0	V	-114.0	2.5	20.5	54.0
17891.625000	40.0	1000.000	160.0	V	180.0	10.6	14.0	54.0

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Figure 15: Spectral Diagrams and measurement results, 1-18 GHz, horizontal polarization, OC6811, mode 2



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBμV/m)
1197.625000	41.4	1000.000	160.0	H	180.0	-20.6	32.6	74.0
5417.875000	40.7	1000.000	150.0	H	128.0	-9.8	33.3	74.0
7746.875000	43.2	1000.000	130.0	H	-121.0	-5.4	30.8	74.0
11306.250000	44.9	1000.000	150.0	H	-180.0	-0.9	29.1	74.0
14481.000000	46.9	1000.000	165.0	H	80.0	2.6	27.2	74.0
17908.625000	51.7	1000.000	110.0	H	142.0	10.9	22.3	74.0

Final Average measurement results:

Frequency (MHz)	Average (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
1197.625000	24.7	1000.000	160.0	H	180.0	-20.6	29.3	54.0
5417.875000	26.2	1000.000	150.0	H	128.0	-9.8	27.8	54.0
7746.875000	31.0	1000.000	130.0	H	-121.0	-5.4	23.0	54.0
11306.250000	32.9	1000.000	150.0	H	-180.0	-0.9	21.1	54.0
14481.000000	33.3	1000.000	165.0	H	80.0	2.6	20.7	54.0
17908.625000	39.6	1000.000	110.0	H	142.0	10.9	14.4	54.0

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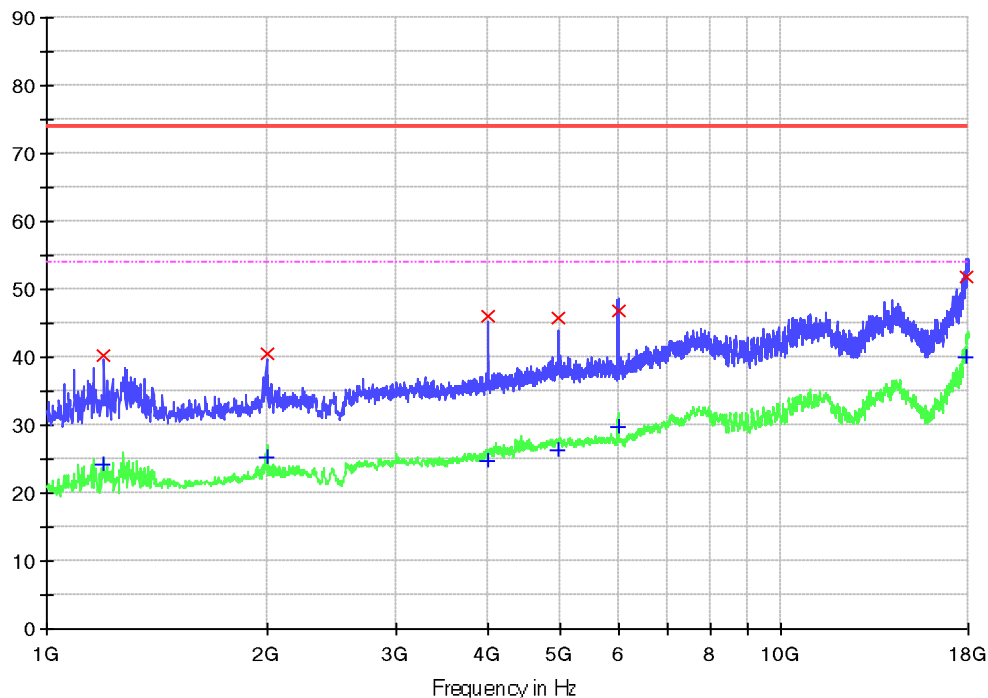
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Figure 16: Spectral Diagrams and measurement results, 1-18 GHz, vertical polarization, OC6811, mode 2

Level [dB μ V/m]



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dB μ V/m)
1197.625000	40.3	1000.000	150.0	V	-91.0	-20.6	33.7	74.0
1992.375000	40.5	1000.000	165.0	V	70.0	-17.5	33.5	74.0
3987.750000	46.2	1000.000	135.0	V	180.0	-12.9	27.9	74.0
4978.000000	45.9	1000.000	120.0	V	-180.0	-10.4	28.1	74.0
5998.000000	46.9	1000.000	160.0	V	-134.0	-10.4	27.1	74.0
17893.750000	51.8	1000.000	130.0	V	35.0	10.7	22.2	74.0

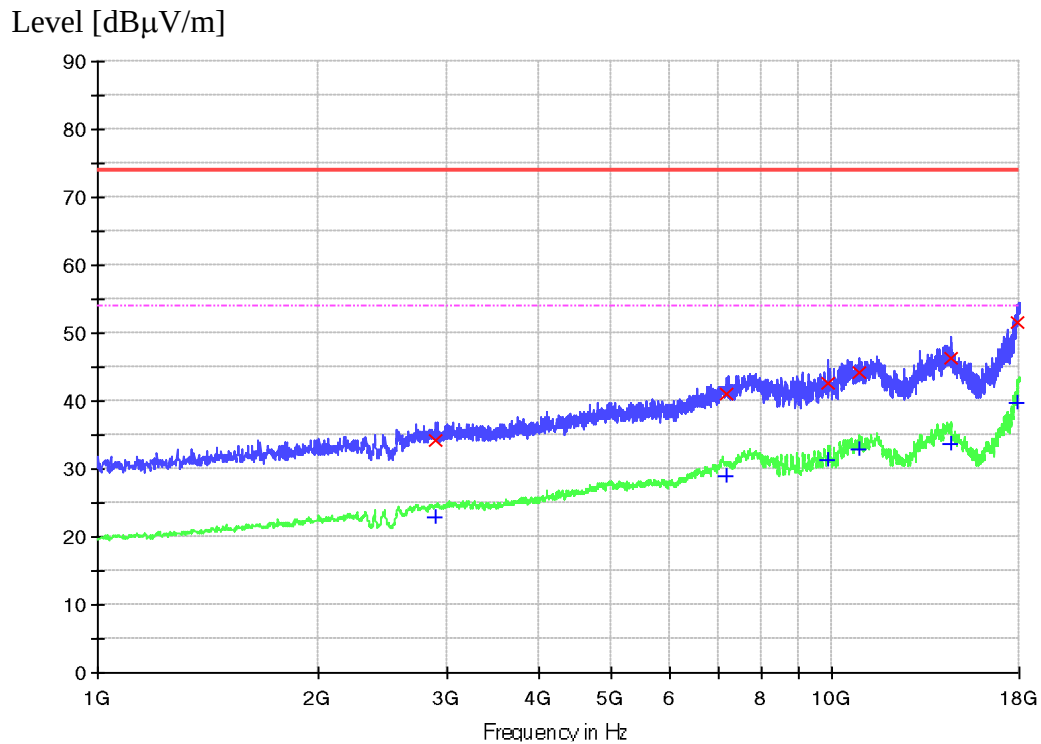
Final Average measurement results:

Frequency (MHz)	Average (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
1197.625000	24.1	1000.000	150.0	V	-91.0	-20.6	29.9	54.0
1992.375000	25.3	1000.000	165.0	V	70.0	-17.5	28.7	54.0
3987.750000	24.8	1000.000	135.0	V	180.0	-12.9	29.2	54.0
4978.000000	26.4	1000.000	120.0	V	-180.0	-10.4	27.6	54.0
5998.000000	29.8	1000.000	160.0	V	-134.0	-10.4	24.2	54.0
17893.750000	39.9	1000.000	130.0	V	35.0	10.7	14.1	54.0

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Figure 17: Spectral Diagrams and measurement results, 1-18 GHz, horizontal polarization, OC6811, mode 3



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBμV/m)
2887.000000	34.2	1000.000	135.0	H	-180.0	-14.9	39.8	74.0
7198.625000	41.2	1000.000	150.0	H	92.0	-6.5	32.8	74.0
9901.625000	42.6	1000.000	165.0	H	180.0	-3.2	31.4	74.0
10923.750000	44.3	1000.000	150.0	H	161.0	-0.9	29.7	74.0
14502.250000	46.4	1000.000	120.0	H	-124.0	2.5	27.6	74.0
17883.125000	51.7	1000.000	155.0	H	-180.0	10.5	22.3	74.0

Final Average measurement results:

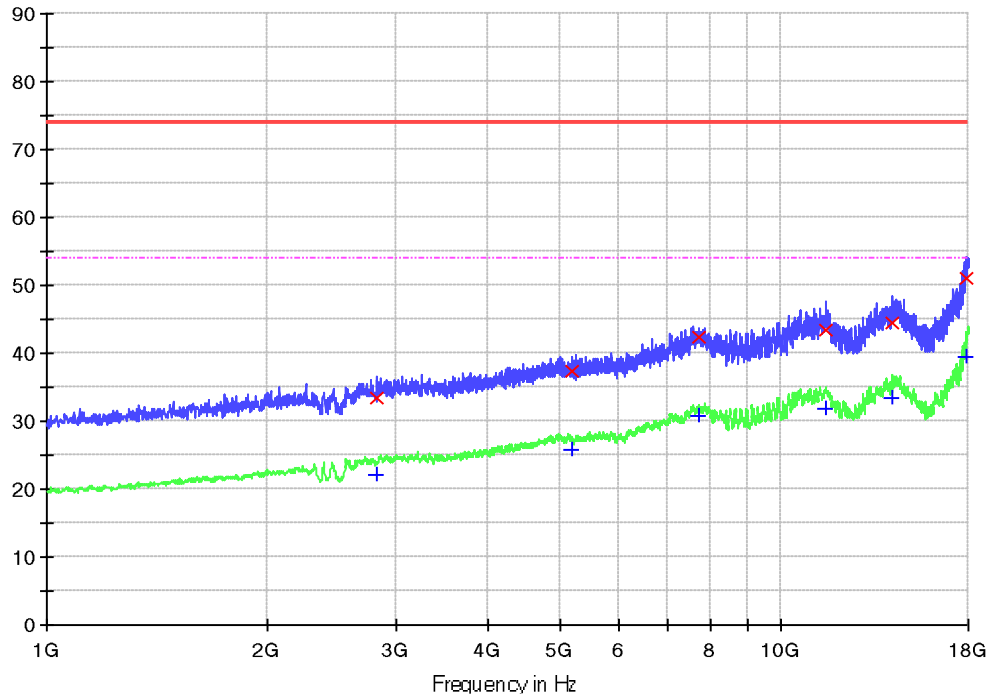
Frequency (MHz)	Average (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
2887.000000	22.9	1000.000	135.0	H	-180.0	-14.9	31.2	54.0
7198.625000	29.0	1000.000	150.0	H	92.0	-6.5	25.0	54.0
9901.625000	31.3	1000.000	165.0	H	180.0	-3.2	22.7	54.0
10923.750000	32.8	1000.000	150.0	H	161.0	-0.9	21.2	54.0
14502.250000	33.7	1000.000	120.0	H	-124.0	2.5	20.3	54.0
17883.125000	39.7	1000.000	155.0	H	-180.0	10.5	14.3	54.0

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Figure 18: Spectral Diagrams and measurement results, 1-18 GHz, vertical polarization, OC6811, mode 3

Level [dB μ V/m]



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dB μ V/m)
2808.375000	33.5	1000.000	150.0	V	0.0	-15.1	40.5	74.0
5203.250000	37.3	1000.000	150.0	V	0.0	-10.2	36.7	74.0
7717.125000	42.4	1000.000	150.0	V	0.0	-5.3	31.6	74.0
11537.875000	43.3	1000.000	150.0	V	0.0	-0.6	30.7	74.0
14192.000000	44.4	1000.000	150.0	V	0.0	2.0	29.6	74.0
17874.625000	51.2	1000.000	150.0	V	0.0	10.3	22.8	74.0

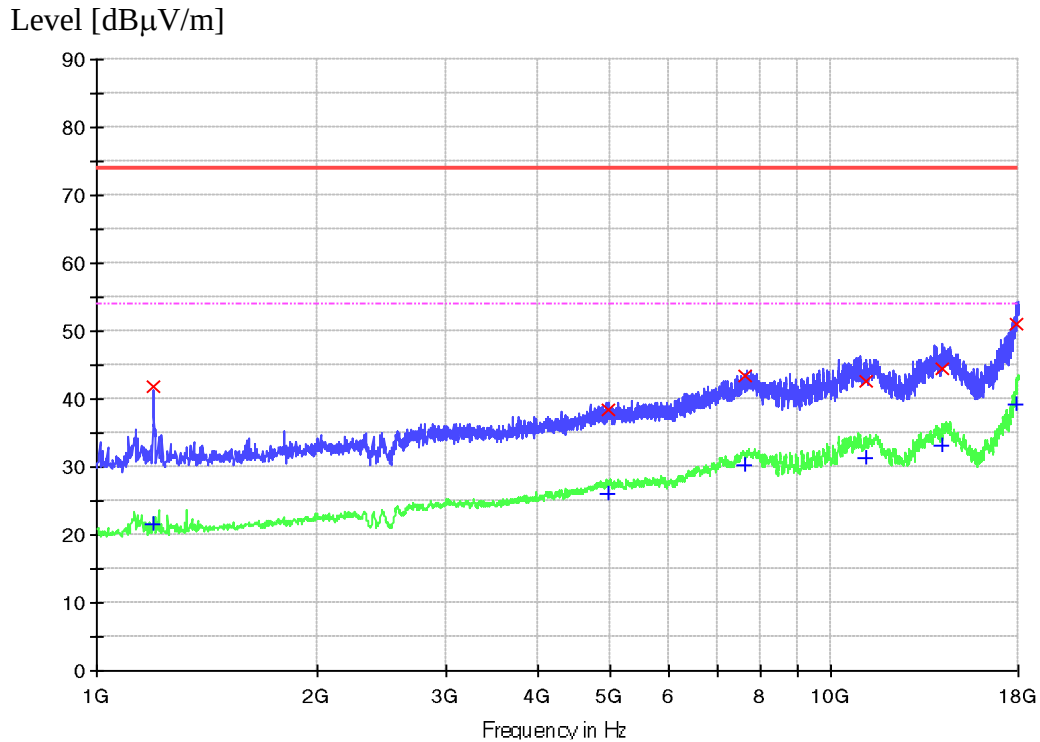
Final Average measurement results:

Frequency (MHz)	Average (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
2808.375000	22.1	1000.000	150.0	V	0.0	-15.1	51.9	74.0
5203.250000	25.7	1000.000	150.0	V	0.0	-10.2	48.3	74.0
7717.125000	30.8	1000.000	150.0	V	0.0	-5.3	43.2	74.0
11537.875000	31.8	1000.000	150.0	V	0.0	-0.6	42.2	74.0
14192.000000	33.4	1000.000	150.0	V	0.0	2.0	40.6	74.0
17874.625000	39.6	1000.000	150.0	V	0.0	10.3	34.5	74.0

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Figure 19: Spectral Diagrams and measurement results, 1-18 GHz, horizontal polarization, MAX17224, mode 1



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBμV/m)
1195.500000	41.9	1000.000	155.0	H	-116.0	-20.6	32.1	74.0
4980.125000	38.4	1000.000	130.0	H	-32.0	-10.4	35.6	74.0
7619.375000	43.3	1000.000	160.0	H	180.0	-5.6	30.7	74.0
11140.500000	42.7	1000.000	120.0	H	-114.0	-1.3	31.3	74.0
14200.500000	44.6	1000.000	135.0	H	95.0	2.1	29.4	74.0
17870.375000	51.2	1000.000	150.0	H	180.0	10.2	22.9	74.0

Final Average measurement results:

Frequency (MHz)	Average (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
1195.500000	21.5	1000.000	155.0	H	-116.0	-20.6	32.5	54.0
4980.125000	26.0	1000.000	130.0	H	-32.0	-10.4	28.0	54.0
7619.375000	30.4	1000.000	160.0	H	180.0	-5.6	23.7	54.0
11140.500000	31.4	1000.000	120.0	H	-114.0	-1.3	22.6	54.0
14200.500000	33.2	1000.000	135.0	H	95.0	2.1	20.8	54.0
17870.375000	39.3	1000.000	150.0	H	180.0	10.2	14.7	54.0

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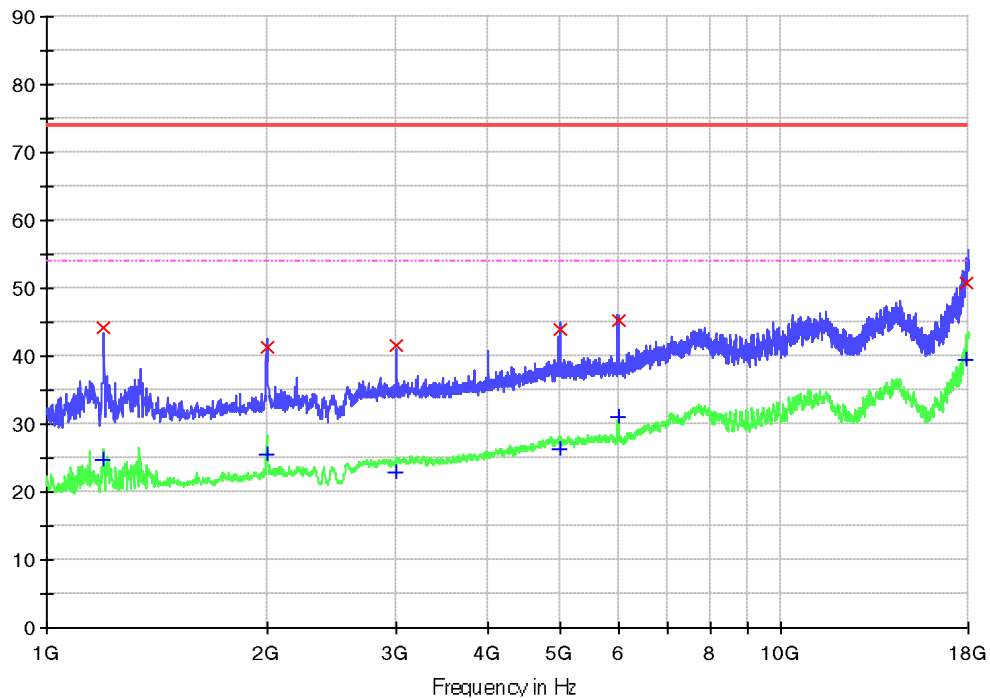
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Figure 20: Spectral Diagrams and measurement results, 1-18 GHz, vertical polarization, MAX17224, mode 1

Level [dB μ V/m]



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dB μ V/m)
1195.500000	44.1	1000.000	155.0	V	134.0	-20.6	29.9	74.0
1992.375000	41.3	1000.000	120.0	V	-180.0	-17.5	32.7	74.0
2989.000000	41.7	1000.000	165.0	V	116.0	-14.6	32.3	74.0
4995.000000	43.9	1000.000	155.0	V	180.0	-10.4	30.1	74.0
5998.000000	45.1	1000.000	160.0	V	34.0	-10.4	28.9	74.0
17900.125000	50.9	1000.000	135.0	V	-137.0	10.8	23.1	74.0

Final Average measurement results:

Frequency (MHz)	Average (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
1195.500000	24.7	1000.000	155.0	V	134.0	-20.6	29.3	54.0
1992.375000	25.5	1000.000	120.0	V	-180.0	-17.5	28.5	54.0
2989.000000	22.9	1000.000	165.0	V	116.0	-14.6	31.1	54.0
4995.000000	26.3	1000.000	155.0	V	180.0	-10.4	27.7	54.0
5998.000000	31.0	1000.000	160.0	V	34.0	-10.4	23.0	54.0
17900.125000	39.5	1000.000	135.0	V	-137.0	10.8	14.5	54.0

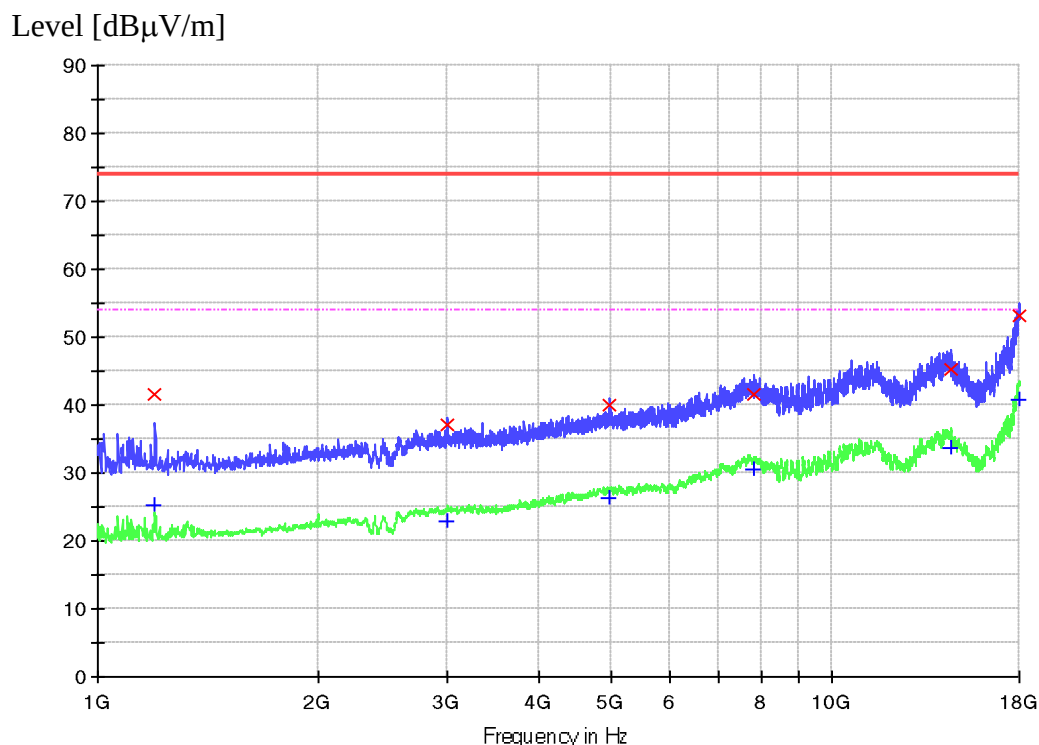
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Figure 21: Spectral Diagrams and measurement results, 1-18 GHz, horizontal polarization, MAX17224, mode 2



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBμV/m)
1195.500000	41.5	1000.000	135.0	H	113.0	-20.6	32.5	74.0
2993.250000	37.1	1000.000	155.0	H	180.0	-14.6	36.9	74.0
4988.625000	40.0	1000.000	160.0	H	-116.0	-10.4	34.1	74.0
7848.875000	41.6	1000.000	155.0	H	-180.0	-5.3	32.4	74.0
14500.125000	45.3	1000.000	140.0	H	143.0	2.5	28.7	74.0
17978.750000	53.1	1000.000	165.0	H	95.0	12.3	20.9	74.0

Final Average measurement results:

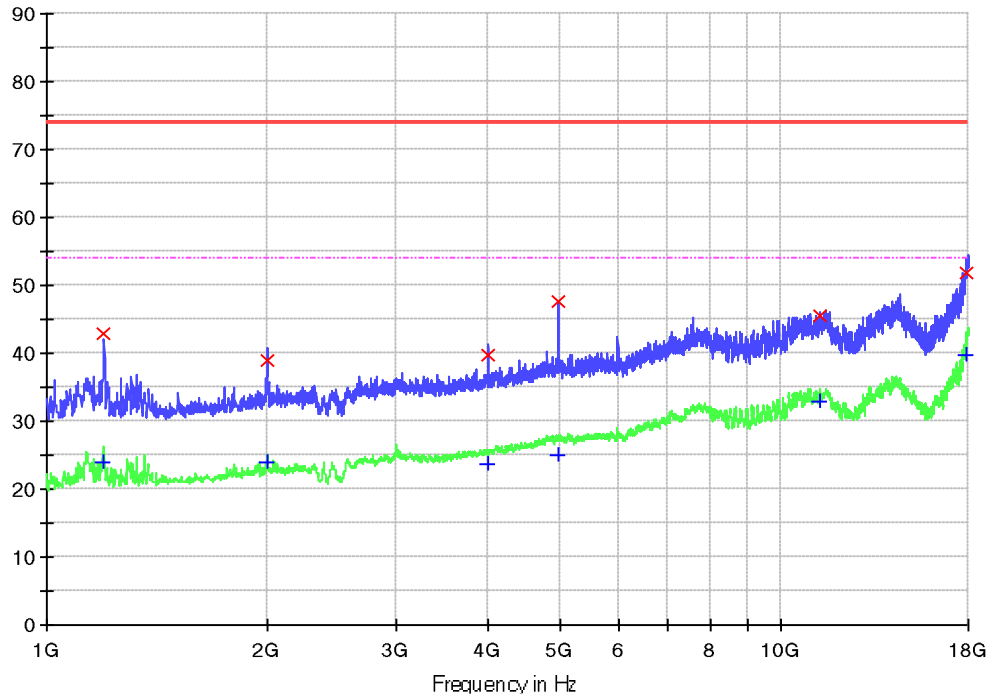
Frequency (MHz)	Average (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
1195.500000	25.2	1000.000	135.0	H	113.0	-20.6	28.8	54.0
2993.250000	22.9	1000.000	155.0	H	180.0	-14.6	31.1	54.0
4988.625000	26.2	1000.000	160.0	H	-116.0	-10.4	27.8	54.0
7848.875000	30.4	1000.000	155.0	H	-180.0	-5.3	23.6	54.0
14500.125000	33.6	1000.000	140.0	H	143.0	2.5	20.4	54.0
17978.750000	40.7	1000.000	165.0	H	95.0	12.3	13.3	54.0

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Figure 22: Spectral Diagrams and measurement results, 1-18 GHz, vertical polarization, MAX17224, mode 2

Level [dB μ V/m]



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dB μ V/m)
1195.500000	43.0	1000.000	155.0	V	-180.0	-20.6	31.0	74.0
1996.625000	39.1	1000.000	165.0	V	-77.0	-17.5	34.9	74.0
3985.625000	39.7	1000.000	130.0	V	180.0	-12.9	34.3	74.0
4986.500000	47.5	1000.000	155.0	V	-79.0	-10.4	26.5	74.0
11302.000000	45.5	1000.000	120.0	V	-116.0	-0.9	28.6	74.0
17885.250000	51.7	1000.000	155.0	V	124.0	10.5	22.3	74.0

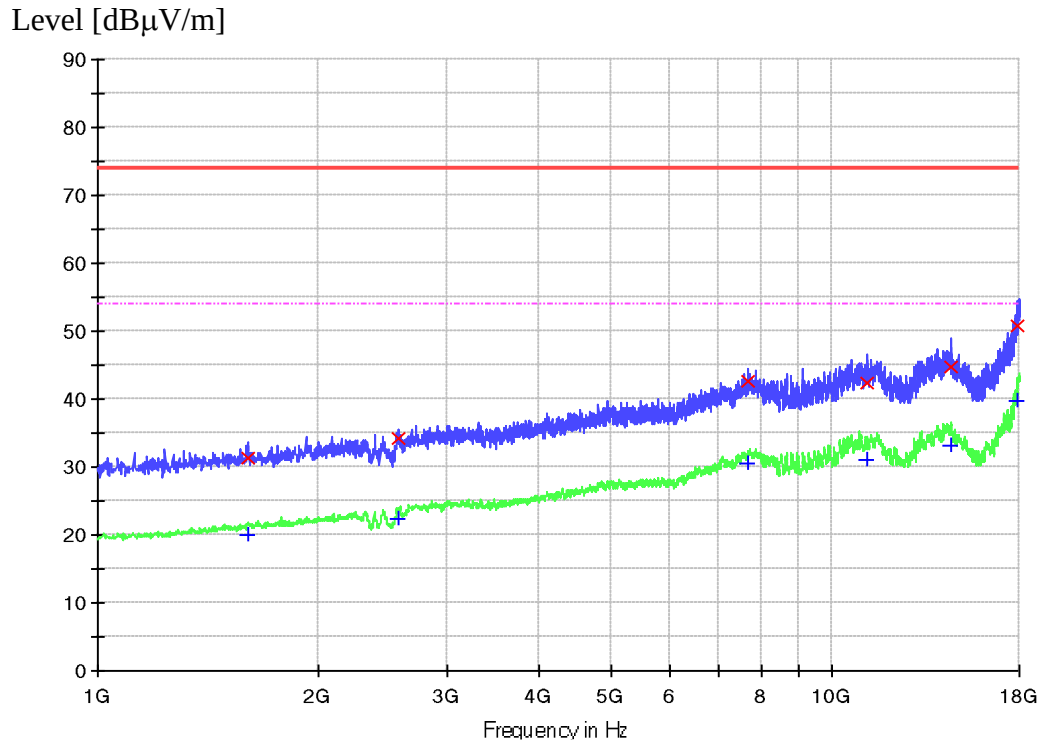
Final Average measurement results:

Frequency (MHz)	Average (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
1195.500000	23.9	1000.000	155.0	V	-180.0	-20.6	30.1	54.0
1996.625000	23.9	1000.000	165.0	V	-77.0	-17.5	30.1	54.0
3985.625000	23.7	1000.000	130.0	V	180.0	-12.9	30.3	54.0
4986.500000	25.1	1000.000	155.0	V	-79.0	-10.4	28.9	54.0
11302.000000	33.0	1000.000	120.0	V	-116.0	-0.9	21.0	54.0
17885.250000	39.8	1000.000	155.0	V	124.0	10.5	14.2	54.0

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Figure 23: Spectral Diagrams and measurement results, 1-18 GHz, horizontal polarization, MAX17224, mode 3



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dBμV/m)
1599.250000	31.4	1000.000	155.0	H	38.0	-18.8	42.6	74.0
2564.000000	34.2	1000.000	120.0	H	-180.0	-15.7	39.8	74.0
7685.250000	42.5	1000.000	135.0	H	180.0	-5.4	31.5	74.0
11142.625000	42.4	1000.000	155.0	H	154.0	-1.3	31.7	74.0
14485.250000	44.8	1000.000	165.0	H	-116.0	2.5	29.2	74.0
17889.500000	50.8	1000.000	130.0	H	92.0	10.6	23.2	74.0

Final Average measurement results:

Frequency (MHz)	Average (dBμV/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dBμV/m)
1599.250000	20.0	1000.000	155.0	H	38.0	-18.8	34.0	54.0
2564.000000	22.5	1000.000	120.0	H	-180.0	-15.7	31.5	54.0
7685.250000	30.6	1000.000	135.0	H	180.0	-5.4	23.5	54.0
11142.625000	31.2	1000.000	155.0	H	154.0	-1.3	22.8	54.0
14485.250000	33.2	1000.000	165.0	H	-116.0	2.5	20.8	54.0
17889.500000	39.8	1000.000	130.0	H	92.0	10.6	14.2	54.0

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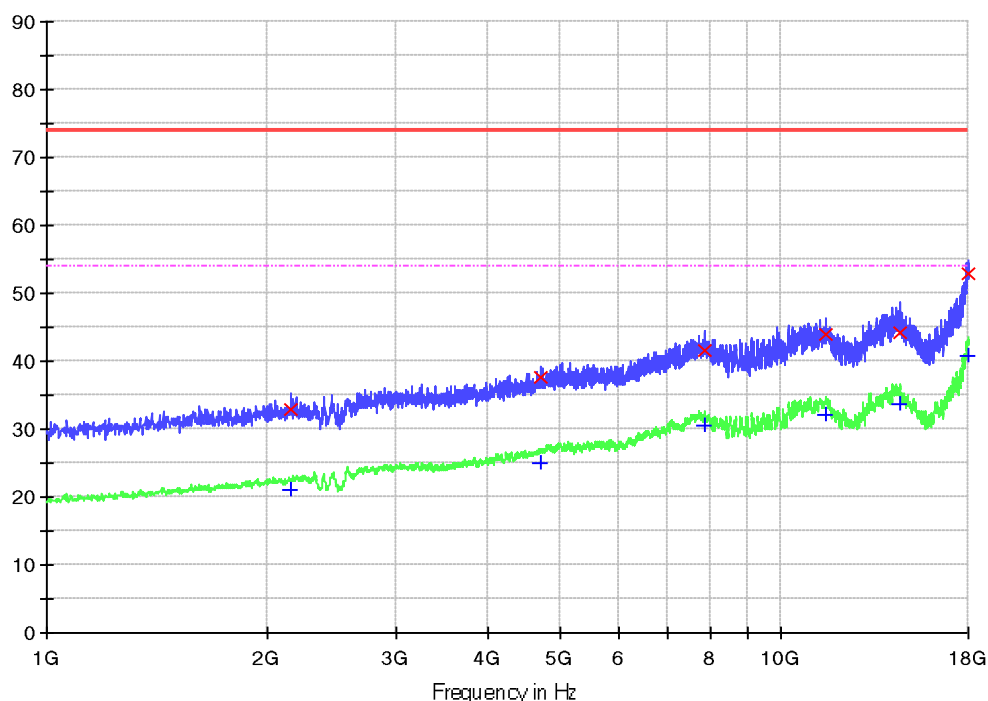
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Figure 24: Spectral Diagrams and measurement results, 1-18 GHz, vertical polarization, MAX17224, mode 3

Level [dB μ V/m]



Final Peak measurement results:

Frequency (MHz)	MaxPeak (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - PK+ (dB)	Limit - PK+ (dB μ V/m)
2153.875000	33.0	1000.000	155.0	V	-63.0	-17.1	41.0	74.0
4712.375000	37.7	1000.000	110.0	V	180.0	-10.8	36.3	74.0
7857.375000	41.6	1000.000	165.0	V	92.0	-5.3	32.4	74.0
11480.500000	43.8	1000.000	130.0	V	-180.0	-0.6	30.2	74.0
14498.000000	44.3	1000.000	120.0	V	-114.0	2.5	29.8	74.0
17974.500000	52.8	1000.000	150.0	V	171.0	12.3	21.2	74.0

Final Average measurement results:

Frequency (MHz)	Average (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
2153.875000	21.1	1000.000	155.0	V	-63.0	-17.1	32.9	54.0
4712.375000	25.1	1000.000	110.0	V	180.0	-10.8	28.9	54.0
7857.375000	30.5	1000.000	165.0	V	92.0	-5.3	23.5	54.0
11480.500000	32.2	1000.000	130.0	V	-180.0	-0.6	21.8	54.0
14498.000000	33.6	1000.000	120.0	V	-114.0	2.5	20.4	54.0
17974.500000	40.7	1000.000	150.0	V	171.0	12.3	13.3	54.0

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6 List of Test and Measurement Instruments

Equip.	Description	Model	Manufacturer	Last Date DD.MM.YYYY	Due Date DD.MM.YYYY
G1811378	3m modified semi-anechoic chamber	SAC3	Frankonia	10.06.2021	10.06.2024
G1811391	EMI test receiver	ESCI	Rohde&Schwarz	29.09.2022	29.09.2023
G1811425	Bilog antenna	CBL 6112D	Teseq	10.03.2020	10.03.2023
G1811417	Log periodic antenna	HL050	Rohde&Schwarz	10.03.2020	10.03.2023
G1822702	Spectrum analyser	FSV40	Rohde&Schwarz	04.11.2021	04.11.2023
G1825371	Preamplifier	EMC051845SE	Taiwan EMCI	14.05.2021	14.05.2023
G1811416	Fully anechoic chamber	FAC3plus	Frankonia	25.07.2019	25.07.2024
G1824845	EMC measurement software	EMC32 (Ver 10.20.01)	Rohde&Schwarz	NA*	NA*

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End of test report