EMI – TEST REPORT

- FCC Part 15.249, RSS210 -

Type / Model Name	:	Power Check II Magazine
Product Description	:	2.4 GHz Module
Applicant	:	OTT-JAKOB Spanntechnik GmbH
Address	:	Industriestrasse 3-7
		87663 LENGENWANG, GERMANY
Manufacturer	:	OTT-JAKOB Spanntechnik GmbH
Address	:	Industriestrasse 3-7
		87663 LENGENWANG, GERMANY

Test Result according to the standards listed in clause 1 test standards:	**POSITIVE**

Test Report No. : T45791-02-00HS	17. November 2020 Date of issue

Deutsche Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

FCC ID: 2AXLG-OJ2500

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FCC ID: 2AXLG-OJ2500

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September 2020)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (September 2020)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.249	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ETSI TR 100 028 V1.3.1: 2001-03	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); Uncertainties in the Measurement of Mobile Radio Equipment Characteristics—Part 1 and Part 2

FCC ID: 2AXLG-OJ2500

2 EQUIPMENT UNDER TEST

2.1 Information provided by the Client

Please note, we do not take any responsibility for information provided by the client or his representative which may have an influence on the validity of the test results.

2.2 Sampling

The customer is responsible for the choice of sample. Sample configuration, start-up and operation is carried out by the customer or according his/her instructions.

2.3 Photo documentation of the EUT – Detailed photos see attachment A

2.4 Equipment category

EUT is a short-range device.

2.5 Short description of the equipment under test (EUT)

The EUT is a 2.4 GHz transceiver and supports 256 channels. It is used for managing machine tools magazine.

Number of tested samples:	3 radiated samples
Serial number:	1040330, 1040331, 1040340
Firmware version mobile panel:	V10_TX

EUT configuration:
(The CDF filled by the applicant can be viewed at the test laboratory.)

2.6 Variants of the EUT

There are no variants.

2.7 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

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FCC ID: 2AXLG-OJ2500

Channel plan:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2407.0	43	2415.6	86	2424.2	129	2432.8	172	2441.4	215	2450.0
1	2407.2	44	2415.8	87	2424.4	130	2433.0	173	2441.6	216	2450.2
2	2407.4	45	2416.0	88	2424.6	131	2433.2	174	2441.8	217	2450.4
3	2407.6	46	2416.2	89	2424.8	132	2433.4	175	2442.0	218	2450.6
4	2407.8	47	2416.4	90	2425.0	133	2433.6	176	2442.2	219	2450.8
5	2408.0	48	2416.6	91	2425.2	134	2433.8	177	2442.4	220	2451.0
6	2408.2	49	2416.8	92	2425.4	135	2434.0	178	2442.6	221	2451.2
7	2408.4	50	2417.0	93	2425.6	136	2434.2	179	2442.8	222	2451.4
8	2408.6	51	2417.2	94	2425.8	137	2434.4	180	2443.0	223	2451.6
9	2408.8	52	2417.4	95	2426.0	138	2434.6	181	2443.2	224	2451.8
10	2409.0	53	2417.6	96	2426.2	139	2434.8	182	2443.4	225	2452.0
11	2409.2	54	2417.8	97	2426.4	140	2435.0	183	2443.6	226	2452.2
12	2409.4	55	2418.0	98	2426.6	141	2435.2	184	2443.8	227	2452.4
13	2409.6	56	2418.2	99	2426.8	142	2435.4	185	2444.0	228	2452.6
14	2409.8	57	2418.4	100	2427.0	143	2435.6	186	2444.2	229	2452.8
15	2410.0	58	2418.6	101	2427.2	144	2435.8	187	2444.4	230	2453.0
16	2410.2	59	2418.8	102	2427.4	145	2436.0	188	2444.6	231	2453.2
17	2410.4	60	2419.0	103	2427.6	146	2436.2	189	2444.8	232	2453.4
18	2410.6	61	2419.2	104	2427.8	147	2436.4	190	2445.0	233	2453.6
19	2410.8	62	2419.4	105	2428.0	148	2436.6	191	2445.2	234	2453.8
20	2411.0	63	2419.6	106	2428.2	149	2436.8	192	2445.4	235	2454.0
21	2411.2	64	2419.8	107	2428.4	150	2437.0	193	2445.6	236	2454.2
22	2411.4	65	2420.0	108	2428.6	151	2437.2	194	2445.8	237	2454.4
23	2411.6	66	2420.2	109	2428.8	152	2437.4	195	2446.0	238	2454.6
24	2411.8	67	2420.4	110	2429.0	153	2437.6	196	2446.2	239	2454.8
25	2412.0	68	2420.6	111	2429.2	154	2437.8	197	2446.4	240	2455.0
26	2412.2	69	2420.8	112	2429.4	155	2438.0	198	2446.6	241	2455.2
27	2412.4	70	2421.0	113	2429.6	156	2438.2	199	2446.8	242	2455.4
28	2412.6	71	2421.2	114	2429.8	157	2438.4	200	2447.0	243	2455.6
29	2412.8	72	2421.4	115	2430.0	158	2438.6	201	2447.2	244	2455.8
30	2413.0	73	2421.6	116	2430.2	159	2438.8	202	2447.4	245	2456.0
31	2413.2	74	2421.8	117	2430.4	160	2439.0	203	2447.6	246	2456.2
32	2413.4	75	2422.0	118	2430.6	161	2439.2	204	2447.8	247	2456.4
33	2413.6	76	2422.2	119	2430.8	162	2439.4	205	2448.0	248	2456.6
34	2413.8	77	2422.4	120	2431.0	163	2439.6	206	2448.2	249	2456.8
35	2414.0	78	2422.6	121	2431.2	164	2439.8	207	2448.4	250	2457.0
36	2414.2	79	2422.8	122	2431.4	165	2440.0	208	2448.6	251	2457.2
37	2414.4	80	2423.0	123	2431.6	166	2440.2	209	2448.8	252	2457.4
38	2414.6	81	2423.2	124	2431.8	167	2440.4	210	2449.0	253	2457.6
39	2414.8	82	2423.4	125	2432.0	168	2440.6	211	2449.2	254	2457.8
40	2415.0	83	2423.6	126	2432.2	169	2440.8	212	2449.4	255	2458.0
41	2415.2	84	2423.8	127	2432.4	170	2441.0	213	2449.6		
42	2415.4	85	2424.0	128	2432.6	171	2441.2	214	2449.8		

Note: the marked frequencies are determined for final testing.

2.8 Transmit operating modes

The EUT provide following data rate: 500 kbps (kbps = *kilobits per second)*

2.9 Antenna

The following antennas shall be used with the EUT:

Number	Characteristic	Model number	Plug	Frequency range (GHz)	Gain (dBi)	Cable loss (dB)	Effective gain (dBi)
1	Omni	Antennova A5839	-	2.4 – 2.4835	2.1	0	2.1

2.10 Power supply system utilised

Power supply voltage, V_{nom} : 3.6 VDC, lithium battery

2.11 Peripheral devices and interface cables

The following peripheral devices and interface cables are connected during the measurements:

- Model : -

2.12 Determination of worst-case conditions for final measurement

Measurements have been made in all three orthogonal axes and the settings of the EUT were changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the further measurement the EUT is set in Y position with the maximum output power.

2.12.1 Test jig

No test jig is used.

2.12.2 Test software

A special test software is used for setting TX continuous. The EUT's are set with another channel. After connection to power supply the EUT is transmitting in continuous mode.

3 TEST RESULT SUMMARY

Operating in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.35(c)	RSS-Gen, 8.2	Pulsed operation	not applicable
15.203	RSS-Gen, 6.8	Antenna requirement	passed
15.204	RSS-Gen, 8.3	External radio frequency power amplifiers	passed
15.205(a)	RSS-Gen, 8.10	Emissions in restricted bands	passed
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	not applicable
15.215(c)	-	EBW	passed
-	RSS-Gen, 6.6	OBW	passed
15.249(a)	RSS-210, B10(a)	Field strength of fundamental	passed
15.249(d)	RSS-210, B10(b)	Out-of-band emission, radiated	passed
-	RSS-Gen, 8.11	Transmitter frequency stability	not applicable

The mentioned RSS Rule Parts in the above table are related to:
RSS-Gen, Issue 5, Amendment 1, March 2019
RSS-210, Issue 10, December 2019

3.1 Final assessment

The equipment under test fulfills the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 01 September 2020

Testing concluded on : 01 September 2020

Checked by:

Klaus Gegenfurtner 2020.11.18 11:33:39 +01'00'

Klaus Gegenfurtner
Teamleader Radio

Tested by:

Lukas Scheuermann 2020.11.17 14:46:21 +01'00'

Lukas Scheuermann
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	86-106 kPa

4.1 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor k = 2. The true value is located in the corresponding interval with a probability of 95 % The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 2011 + A1 / 2014 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern GmbH, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Measurement Type	Range	Confidence Level	Calculated Uncertainty
AC power line conducted emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
EBW and OBW	2400 MHz to 30000 MHz	95%	± 2.5 x 10^{-7}
Output power ERP, radiated	1000 MHz to 7000 MHz	95%	± 2.71 dB
Field strength of the fundamental	1000 MHz to 7000 MHz	95%	± 2.71 dB
Power spectral density	2400 MHz to 3000 MHz	95%	± 0.62 dB
Spurious Emissions, conducted	9 kHz to 10000 MHz	95%	± 2.15 dB
Spurious Emissions, conducted	10000 MHz to 40000 MHz	95%	± 3.47 dB
Spurious Emissions, radiated	9 kHz to 30 MHz	95%	± 3.53 dB
Spurious Emissions, radiated	30 MHz to 1000 MHz	95%	± 4.44 dB
Spurious Emissions, radiated	1000 MHz to 30000 MHz	95%	± 2.34 dB
Spurious Emissions, radiated	30000 MHz to 40000 MHz	95%	± 5.13 dB

4.2 Conformity Decision Rule

The conformity decision rule is based on the ILAC G8 published at the time of reporting.

4.3 Measurement protocol for FCC and ISED

4.3.1 General information

CSA Group Bayern GmbH is recognized as wireless testing laboratory under the CAB identifier:

FCC: DE 0011
ISED: DE0009

4.3.2 General Standard information

The test methods used comply with ANSI C63.10 - "Testing Unlicensed Wireless Devices".

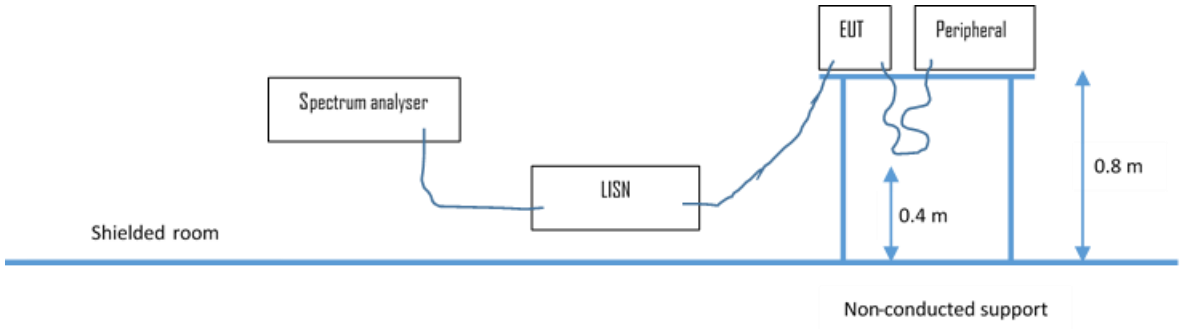
4.3.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.3.3 Details of test procedures

4.3.3.1 Conducted emission

Test setup according ANSI C63.10



The final level, expressed in dBµV, is arrived at by taking the reading directly from the Spectrum analyser. This level is compared to the limit.

To convert between dBµV and µV, the following conversions apply:

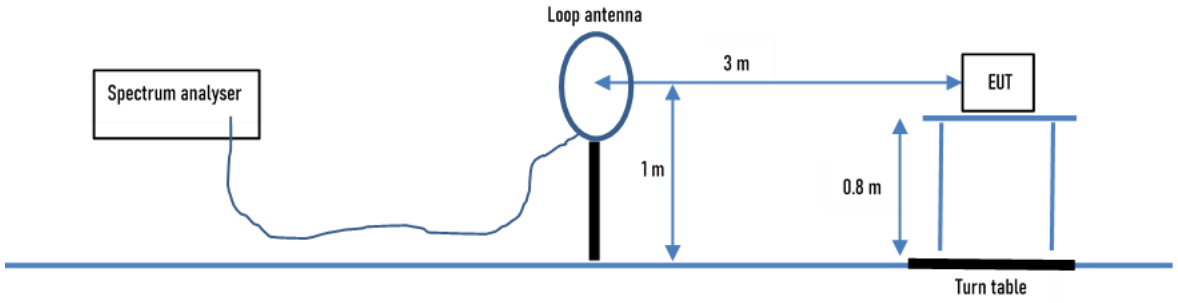
dBµV = 20(log µV)
µV = Inverse log(dBµV/20)

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 µH (CISPR 16) characteristics. The receiver is protected by means of an impedance matched pulse limiter connected directly to the RF input. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emission is re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.3.3.2 Radiated emission

4.3.3.2.1 OATS1 test site (9 kHz - 30 MHz):

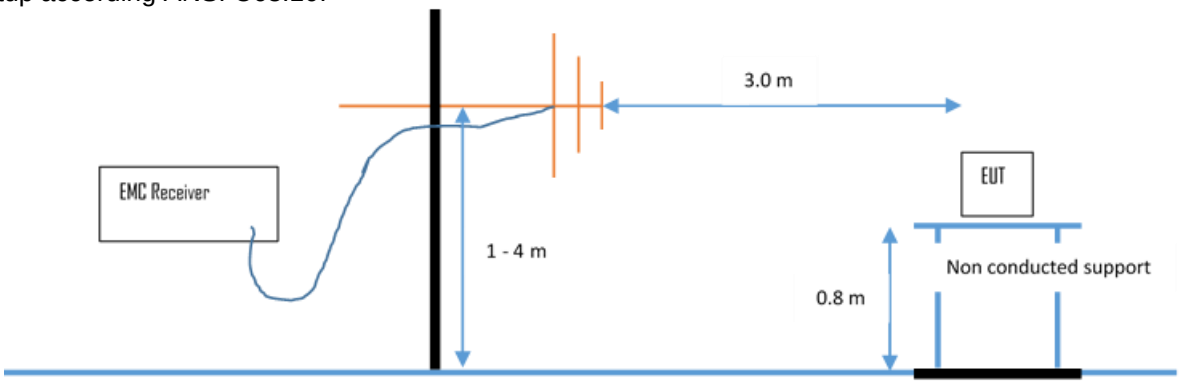
Test setup according ANSI C63.10



Emissions from the EUT are measured in the frequency range of 9 MHz to 30 MHz using a tuned receiver and a calibrated loop antenna. Table top equipment is placed on a 1.0 m × 1.5 m non-conducting table 80 cm above the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 metres horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied along the site axis and the EUT is rotated 360 degrees.

4.3.3.2.2 OATS1 test site (30 MHz - 1 GHz):

Test setup according ANSI C63.10.



Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres and the EUT is rotated 360 degrees. The final level in dBµV/m is calculated by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (dB). The FCC limit is subtracted from this result to provide the limit margin listed in the measurement protocol.

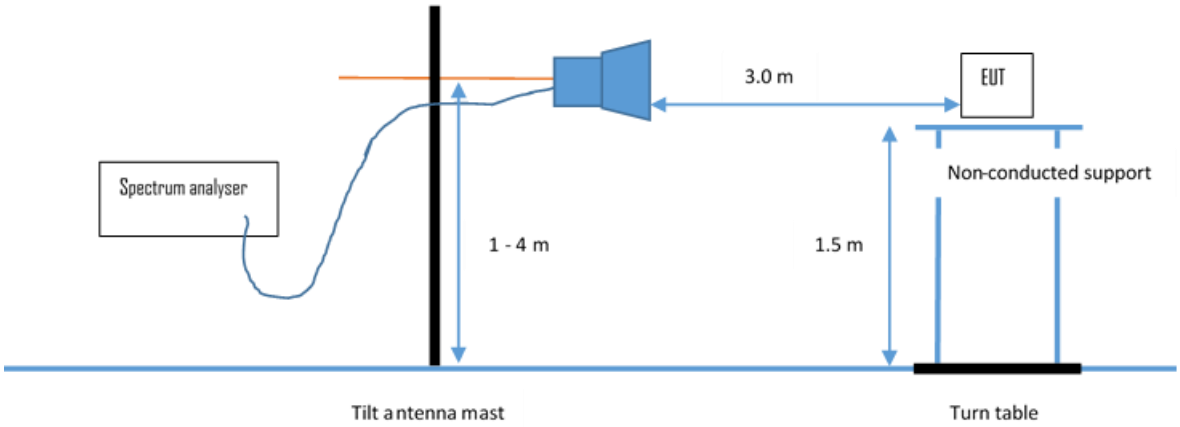
The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Level (dBµV)	+	Factor (dB)	=	Level (dBµV/m)	-	Limit (dBµV/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

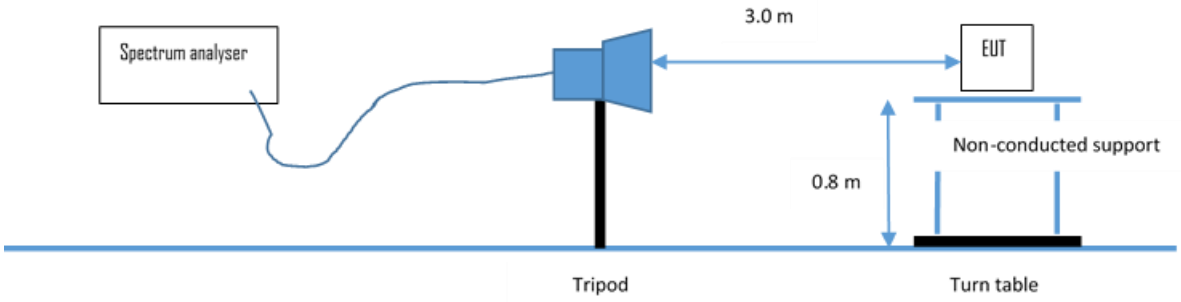
4.3.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

Test setup according ANSI C63.10.



Radiated emissions from the EUT are measured in the frequency range 1 GHz up to 18 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 1.5 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements.

4.3.3.2.4 Anechoic chamber 1 (18 GHz – 40 GHz)



Emissions from the EUT are measured in the frequency range 18 GHz up to 40 GHz as specified in 47 CFR Part 15, Subpart A, Section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a non-conducting table, 0.8 metre above the ground plane. The turntable is fully covered with the appropriate absorber (Type VHP-12). Any controlling device is positioned such that it does not significantly influence the measurement results. Interconnecting cables that hang closer than 40 cm to the ground plane are folded back and forth in the center, forming a bundle 30 cm to 40 cm long. Measurements are made in in three orientations of the EUT and the horizontal and vertical polarization planes of measurement antenna in a fully anechoic room. The measurement antenna is adjusted and the EUT orientated to permit the measurement of the maximum emission from the EUT. The conditions determined as worst-case will then be used for the final measurements. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty. The limit is adopted.

5 TEST CONDITIONS AND RESULTS

5.1 Field strength of fundamental

For test instruments and accessories used see section 6 Part **CPR 3**.

5.1.1 Description of the test location

Test location: Anechoic chamber 1
Test distance: 3 m

5.1.2 Photo documentation of the test set-up see Attachment B

5.1.1 Applicable standard

According to FCC Part 15C, Section 15.249(a):
The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the effective limits.

5.1.2 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 6.5. The EUT is measured in TX continuous mode unmodulated under normal conditions.

Analyser settings:
RMS measurement: RBW: 1 MHz VBW: 3 MHz Detector: RMS

5.1.3 Test result

500 kbps, TX		Test results radiated			
		Fieldstrength E (dBµV/m)	EIRP (dBm)	Fieldstrength E Limit (dBµV/m)	Margin (dB)
Lowest frequency: 2407.0 MHz					
T_{nom}	V_{nom}	91.3	-4.0	94.0	-2.7
Middle frequency: 2413.4 MHz					
T_{nom}	V_{nom}	84.6	-10.7	94.0	-9.4
Highest frequency: 2458.0 MHz					
T_{nom}	V_{nom}	85.2	-10.1	94.0	-8.8

according to FCC Part 15C, Section 15.249(a):

Frequency	Field strength of fundamental	
(MHz)	(mV/m)	dB(µV/m)
902 - 928	50	94
2400 - 2483.5	**50**	**94**
5725-5875	50	94
24000 - 24250	250	108

Peak-Limit according to FCC Part 15C, Section 15.249(e):
However, the peak fieldstrength shall not exceed the maximum permitted average limit by more than 20 dB.

The requirements are **FULFILLED.**

Remarks: -

5.2 Out-of-band emission, radiated

For test instruments and accessories used see section 6 Part **SER 2, SER 3**.

5.2.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2

Test distance: 3 m

5.2.2 Photo documentation of the test set-up see Attatchment B

5.2.3 Applicable standard

According to FCC Part 15C, Section 15.249 (d):
Emission radiated outside of the specified frequency bands, except harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limit in FCC Part 15C, Section 15.209, whichever is the lesser attenuation.

5.2.4 Description of Measurement

The radiated emissions from the EUT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 6.3. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. If the emission level in peak mode complies with the average limit testing is stopped and peak values will be reported, otherwise, the emission is measured in average mode again and reported. The EUT is measured in TX continuous mode unmodulated under normal conditions.

Instrument settings:

30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 25 GHz	RBW:	1 MHz

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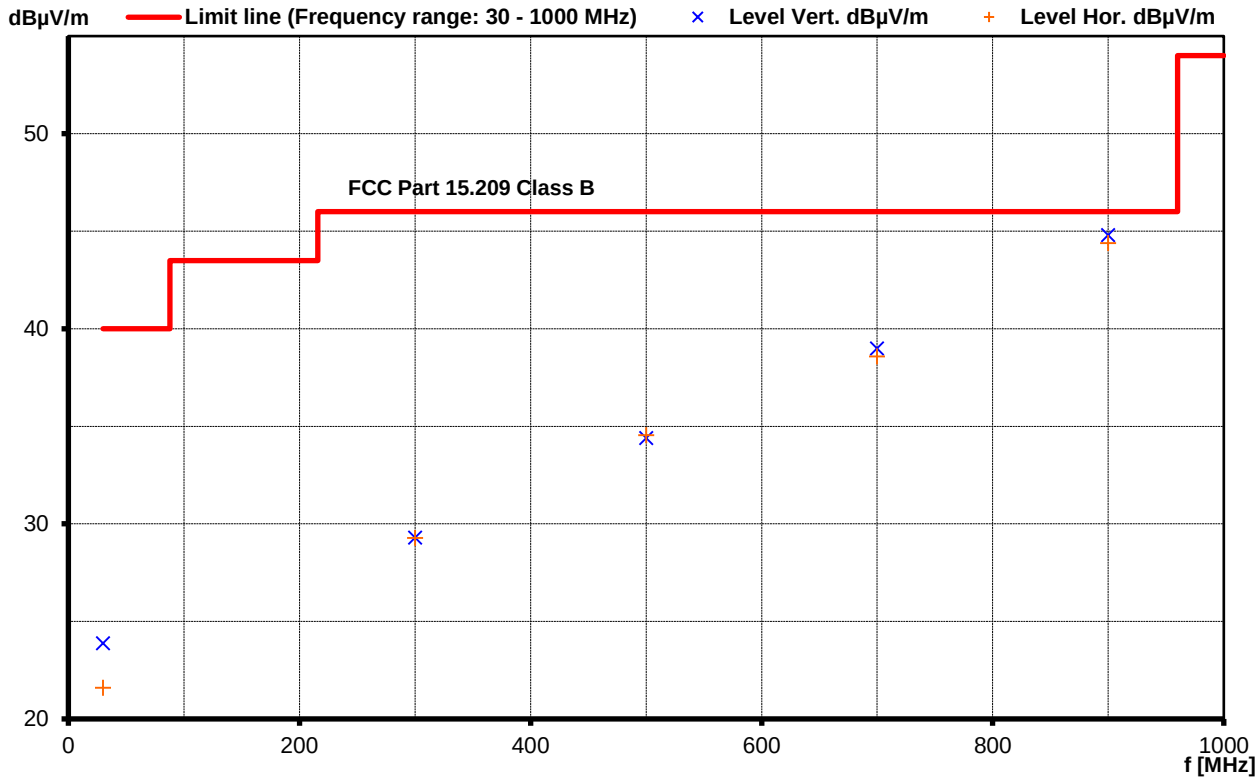
5.2.5 Test result f < 1 GHz

Frequency (MHz)	Reading Vert. (dBµV)	Reading Hor. (dBµV)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dBµV/m)	Level Hor. (dBµV/m)	Limit (dBµV/m)	Dlimit (dB)
30.00	9.8	9.1	14.1	12.5	23.9	21.6	40.0	-16.1
300.00	12.4	12.8	16.9	16.5	29.3	29.3	46.0	-16.7
500.00	11.9	12.3	22.5	22.3	34.4	34.6	46.0	-11.4
700.00	12.0	12.1	27.0	26.5	39.0	38.6	46.0	-7.0
900.00	13.7	13.7	31.1	30.7	44.8	44.4	46.0	-1.2

Note: Below 1 GHz no Emission was detected.
Recorded values correspond to noise values.
The correction factor includes cable loss and antenna factor.



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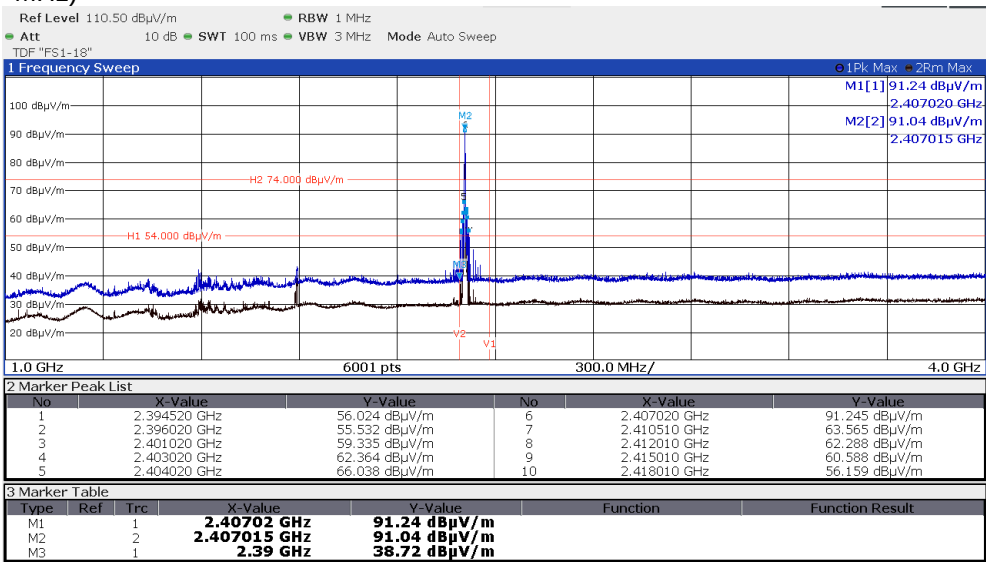
5.2.6 Test result f > 1 GHz

Channel 0 (2407 MHz)

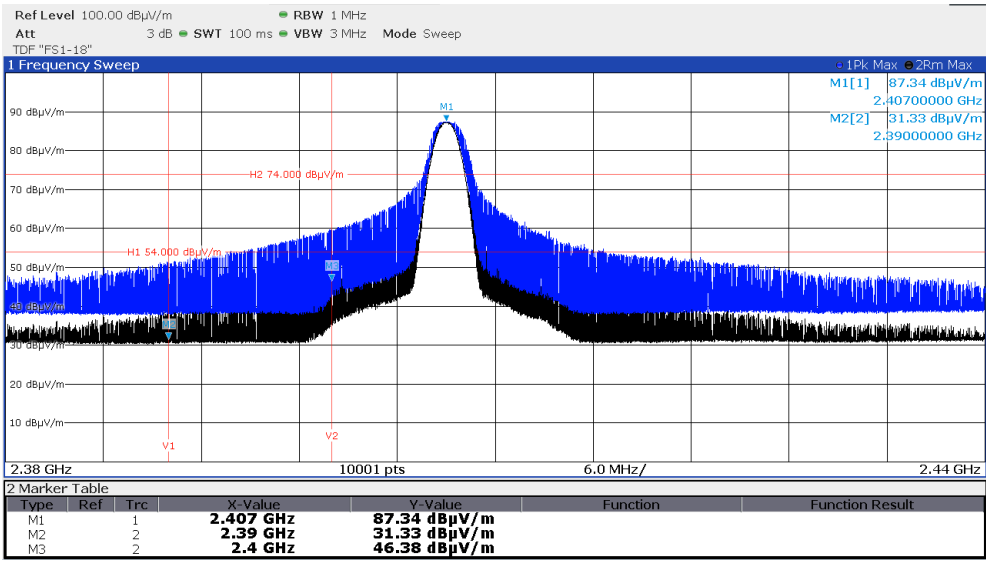


2 Marker Peak List

No	X-Value	Y-Value	No	X-Value	Y-Value
1	2.394520 GHz	56.024 dBµV/m	6	2.407020 GHz	91.245 dBµV/m
2	2.396020 GHz	55.532 dBµV/m	7	2.410510 GHz	63.565 dBµV/m
3	2.401020 GHz	59.335 dBµV/m	8	2.412010 GHz	62.288 dBµV/m
4	2.403020 GHz	62.364 dBµV/m	9	2.415010 GHz	60.588 dBµV/m
5	2.404020 GHz	66.038 dBµV/m	10	2.418010 GHz	56.159 dBµV/m

3 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.40702 GHz**	**91.24 dBµV/m**		
M2		2	**2.407015 GHz**	**91.04 dBµV/m**		
M3		1	**2.39 GHz**	**38.72 dBµV/m**		



2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.407 GHz**	**87.34 dBµV/m**		
M2		2	**2.39 GHz**	**31.33 dBµV/m**		
M3		2	**2.4 GHz**	**46.38 dBµV/m**		

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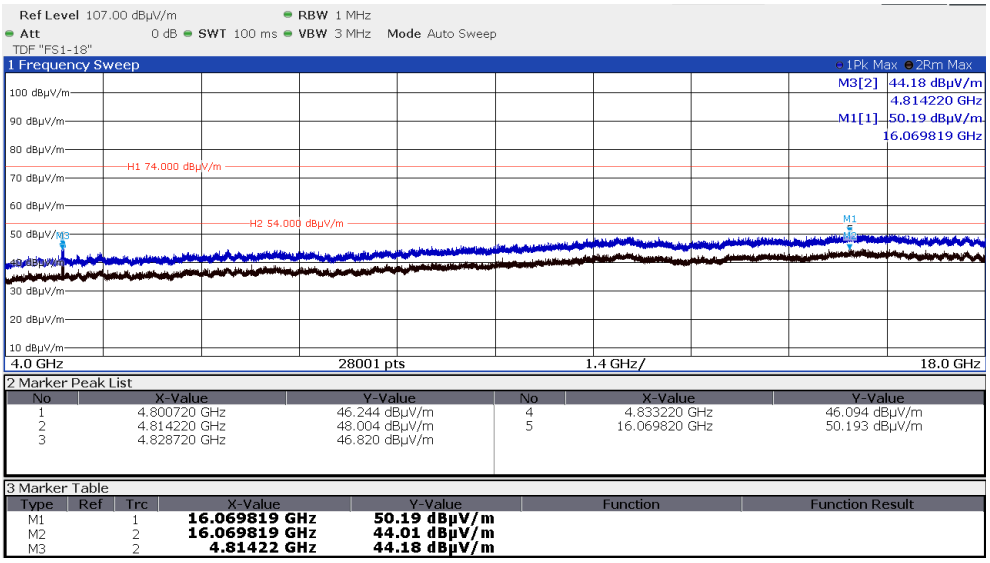

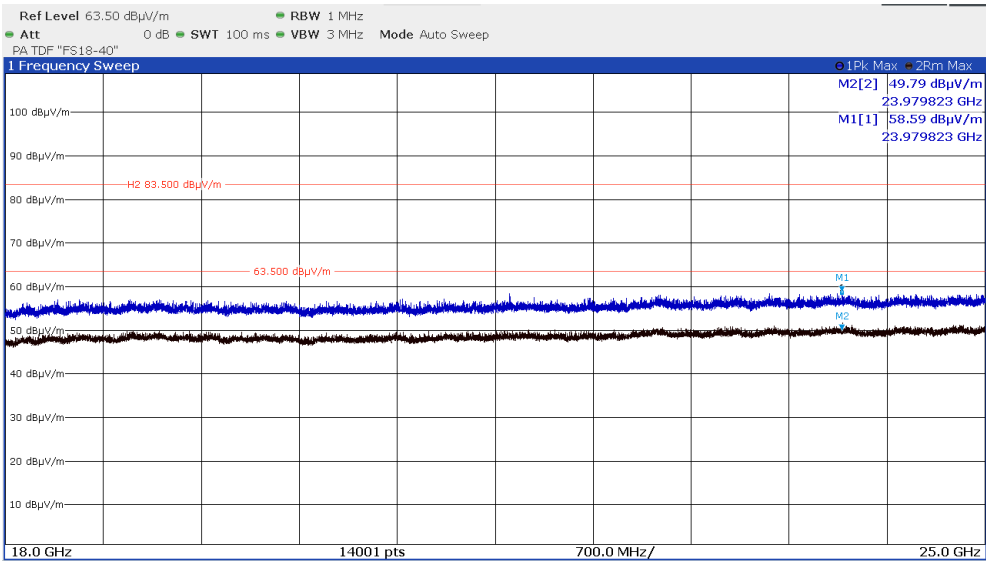

Note: 18-25 GHz was measured at 1 m distance, therefore the limits are 9.5 dB higher.

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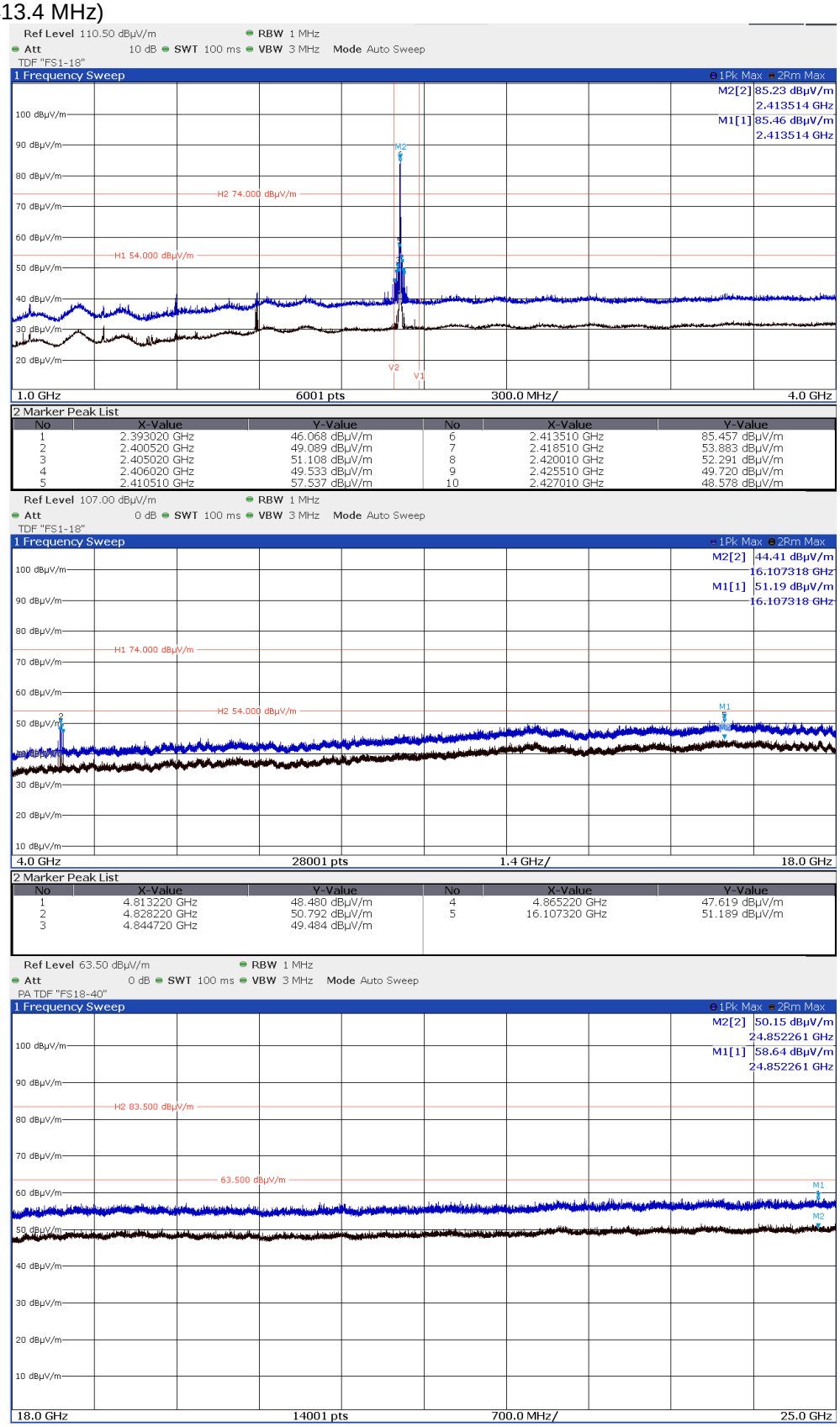
Channel 32 (2413.4 MHz)



Note: 18-25 GHz was measured at 1 m distance, therefore the limits are 9.5 dB higher.

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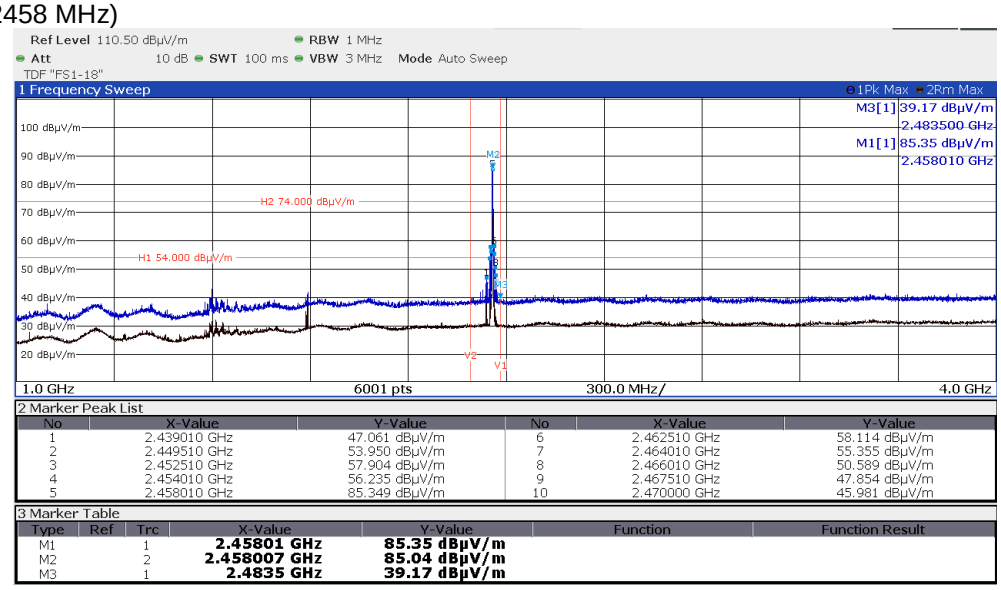
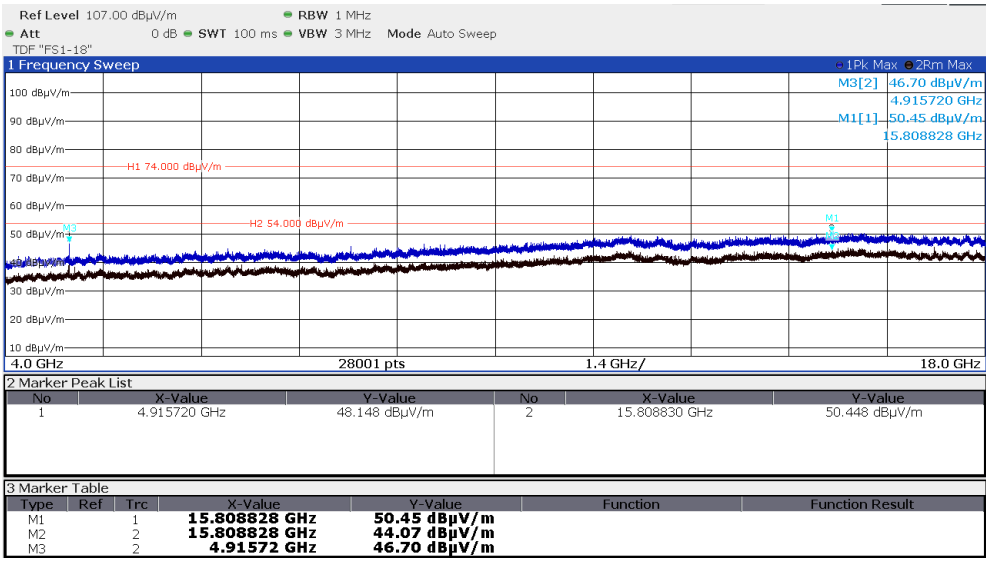
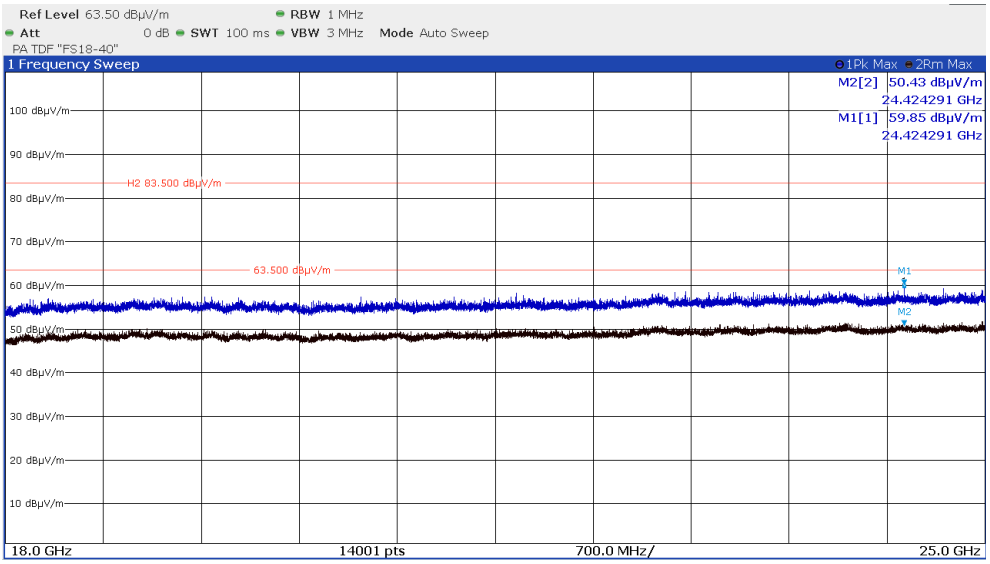
Channel 255 (2458 MHz)





FCC ID: 2AXLG-OJ2500



Note: 18-25 GHz was measured at 1 m distance, therefore the Limits are 9.5 dB higher.

Limit according to FCC Part 15C, Section 15.209:

Frequency (MHz)	15.209 Limits (µV/m)	Measurement distance (m)
0.009 - -0.49	2400/f(kHz)	300
0.49 – 1.705	24000/f(kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

Average limit according to FCC Part 15C, Section 15.249(a):

Fundamental frequency	Field strength of harmonics	
(MHz)	(µV/m)	dB(µV/m)
2400 - 2483.5	500	54

The requirements are **FULFILLED.**

Remarks: The measurement was performed up to 25000 MHz to cover the 10th harmonic (24580 MHz).

5.3 EBW and OBW

For test instruments and accessories used see section 6 Part **MB**.

5.3.1 Description of the test location

Test location: Anechoic chamber 1

5.3.2 Photo documentation of the test set-up see Attachment B

5.3.3 Applicable standard

According to FCC Part 15, Section 15.215(c):
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in Section 15.217 through Section 15.257, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band designated in the rule section under which the equipment is operated.

5.3.4 Description of Measurement

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio of -20 dB (99%). The x-dB-down (OBW) function of the analyser is used. The measurement is performed with normal modulation in TX continuous mode.

Spectrum analyser settings:
RBW: 5 kHz, VBW: 20 kHz, Span: 1 MHz, Trace mode: max. hold, Detector: RMS;

5.3.5 Test result

Operating frequency band (MHz)	Central 80 % of band (MHz)	20 dB Bandwidth (MHz)
$f_{low} \geq 2400.0$	$f_{low} \geq 2408.3$	$f_{low} = 2406.9$
$f_{high} \leq 2483.5$	$f_{high} \leq 2475.2$	$f_{high} = 2458.3$

Limit according to FCC Part 15C, Section 15.215(c):
If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within the central 80 % of the permitted band in order to minimize the possibility of out-of-band operation.
Due to the channelizing of the operating band into 256 channels with channel bandwidth of 200 kHz from 2407 MHz to 2458 MHz the limit central 80 % of the permitted band cannot be applied.

The requirements are **FULFILLED.**

Remarks: For detailed test result please refer to following test protocols.

The OBW99 is measured for RSS only.

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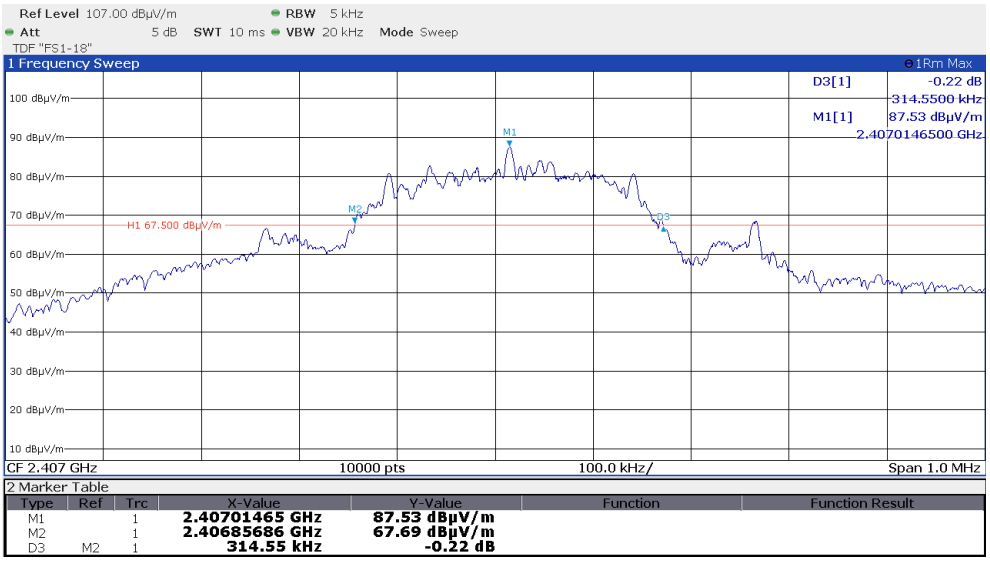
5.3.6 Test protocols

20 dB bandwidth

CH0



CH32

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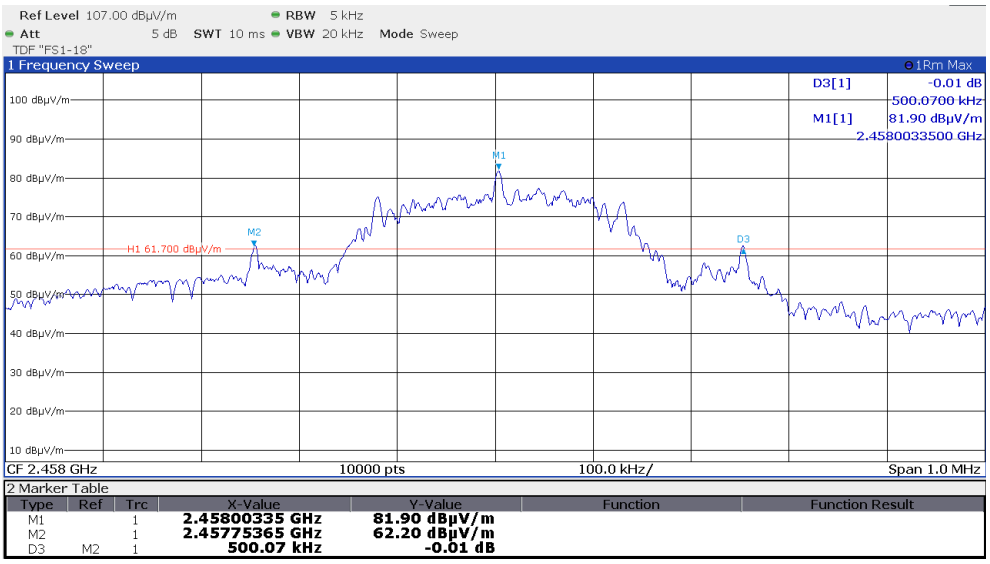
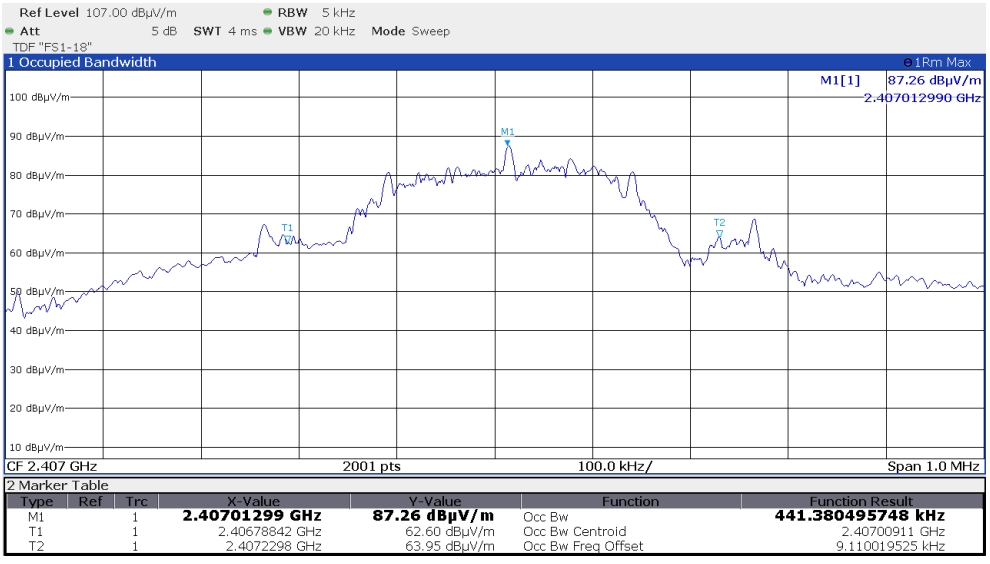
CH255



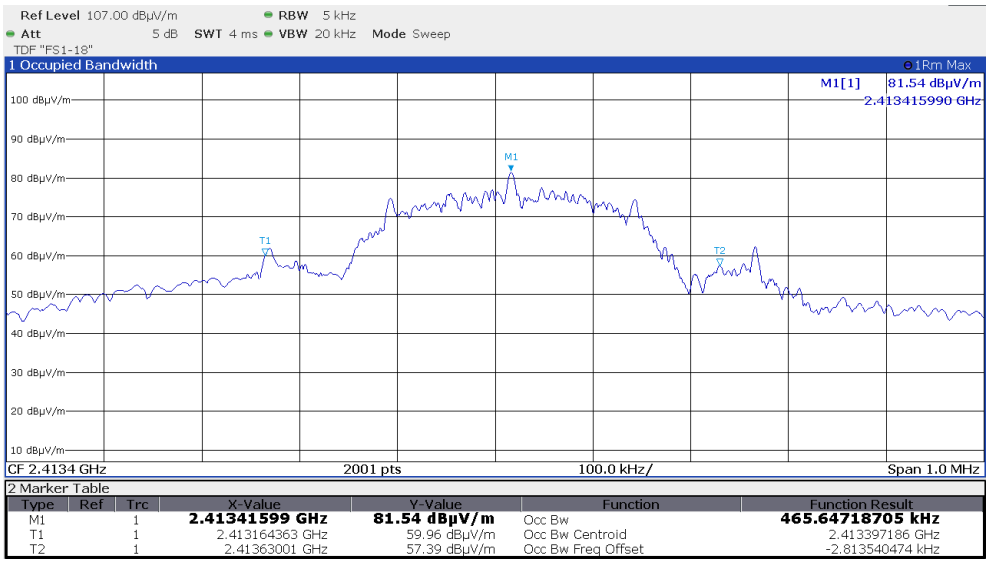
OBW 99%

CH0



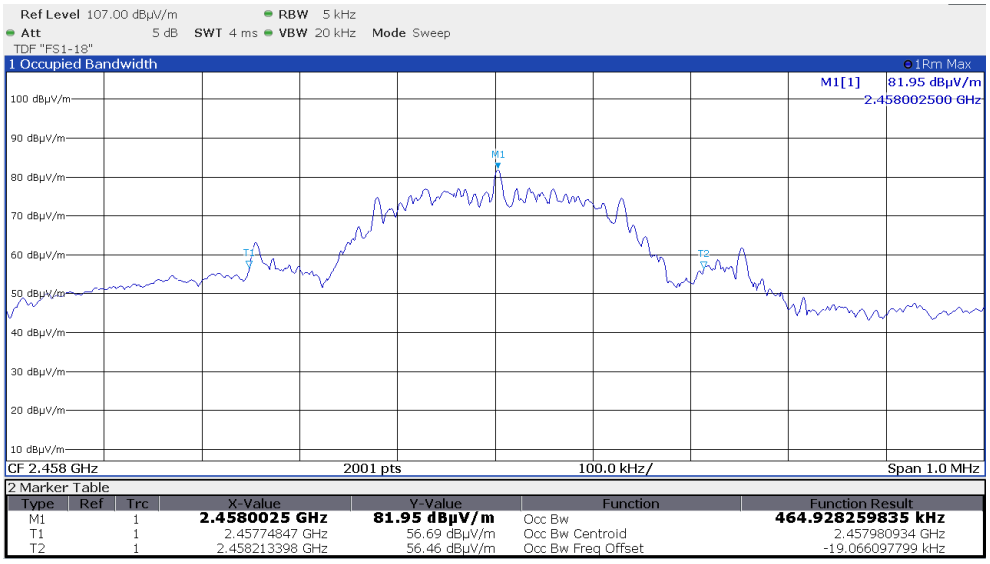
FCC ID: 2AXLG-OJ2500

CH32



Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.41341599 GHz**	**81.54 dBµV/m**	Occ Bw	**465.64718705 kHz**
T1		1	2.413164363 GHz	59.96 dBµV/m	Occ Bw Centroid	2.413397186 GHz
T2		1	2.41363001 GHz	57.39 dBµV/m	Occ Bw Freq Offset	-2.813540474 kHz

CH255



Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	**2.4580025 GHz**	**81.95 dBµV/m**	Occ Bw	**464.928259835 kHz**
T1		1	2.45774847 GHz	56.69 dBµV/m	Occ Bw Centroid	2.457980934 GHz
T2		1	2.458213398 GHz	56.46 dBµV/m	Occ Bw Freq Offset	-19.066097799 kHz

5.4 Antenna application

5.4.1 Applicable standard

According to FCC Part 15C, Section 15.203(a):
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section.

5.4.2 Result

The EUT use an integrated PCB antenna. No other antenna than that furnished by the responsible party or external power amplifier can be applied by a customer.

The antenna of the EUT meets the requirement of FCC Part 15C, Section 15.203 and 15.204.

The requirements are **FULFILLED.**

Remarks: _____

_____

FCC ID: 2AXLG-OJ2500

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 3	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	18/06/2021	18/06/2020		
	18N-20	02-02/50-17-003				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	BAT-EMC 3.19.1.24	02-02/68-13-001				
MB	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	18/06/2021	18/06/2020		
	18N-20	02-02/50-17-003				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	BAT-EMC 3.19.1.24	02-02/68-13-001				
SER 2	ESVS 30	02-02/03-05-006	15/07/2021	15/07/2020		
	VULB 9168	02-02/24-05-005	19/09/2020	19/07/2019		
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
	KK-SD_7/8-2X21N-33,0M	02-02/50-15-028				
SER 3	LNA-40-18004000-33-5P	02-02/17-20-002				
	BBHA 9170	02-02/24-05-013	19/05/2023	19/05/2020	14/01/2021	14/01/2020
	WHK 3.0/18G-10EF	02-02/50-05-180				
	KMS102-1 m	02-02/50-11-014				
	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	AMF-6D-01002000-22-10P	02-02/17-15-004				
	3117	02-02/24-05-009	18/06/2021	18/06/2020		
	18N-20	02-02/50-17-003				
	BAM 4.5-P	02-02/50-17-024				
	NCD	02-02/50-17-025				
	KK-SF106-2X11N-6,5M	02-02/50-18-016				
	BAT-EMC 3.19.1.24	02-02/68-13-001				