



EMI – TEST REPORT

- FCC Part 15.247, RSS-247 -

Type / Model Name : BMW FBD5

Product Description : UWB+BLE CAN gateway for comfort access function in vehicles

Applicant : Continental Automotive GmbH

Address : Siemensstraße 12

93055 REGENSBURG, GERMANY

Manufacturer : Continental Automotive GmbH

Address : Siemensstraße 12

93055 REGENSBURG, GERMANY

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

POSITIVE

Test Report No. : **T46614-00-05FX**

10. December 2020

Date of issue



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

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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 General remarks

None.

2.4 Photo documentation of the EUT – Detailed photos see ATTACHMENT A1 and A2

2.5 Equipment type

BLE device

2.6 Short description of the equipment under test (EUT)

The FBD5 is a wireless UWB and BLE transceiver with CAN gateway for comfort access function in vehicles. 2 FBD5 anchors are mounted under the headliner of a vehicle. UWB is used for ranging, BLE for data transfer and security features. 4 further anchors (FBD5s) are mounted at the outer body of a vehicle and provide UWB functionality for ranging purposes. The anchors are connected to a central control unit and paired with a smartphone or wearable ID tag. The FBD5 can also communicate among each other for an initialization procedure. After initialization and training procedure the distance between FBD5 and smartphone or ID tag is measured and the position in relation to the vehicle is determined. The vehicle is unlocked, locked or started in case the smartphone or ID tag is in a permitted area around or inside the vehicle.

Number of tested samples: 2
Serial number: DUT BLE_1 (radiated sample), DUT BLE_5 (conducted sample)
Firmware version: A3C04887505

EUT configuration:

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

2.7 Variants of the EUT

There are no variants

FCC ID: KR5FBD5 IC: 7812D-FBD5

2.8 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan BT-Standard 802.15.1:

Channel	Frequency	Channel	Frequency
37	2402	18	2442
0	2404	19	2444
1	2406	20	2446
2	2408	21	2448
3	2410	22	2450
4	2412	23	2452
5	2414	24	2454
6	2416	25	2456
7	2418	26	2458
8	2420	27	2460
9	2422	28	2462
10	2424	29	2464
38	2426	30	2466
11	2428	31	2468
12	2430	32	2470
13	2432	33	2472
14	2434	34	2474
15	2436	35	2476
16	2438	36	2478
17	2440	39	2480

Note: the marked frequencies are determined for final testing.

2.9 Transmit operating modes

The EUT uses GFSK modulation and may provide following data rates:

- 500 kbps
- 1000 kbps

(kbps = kilobits per second)

2.10 Antennas

The following antennas shall be used with the EUT:

The EUT has only an integrated PCB antenna, no temporary connector and no external antenna to be connected.

Number	Characteristic	Type	Plug	f-range (GHz)	Max. Gain (dBi)
1	Omni	PCB antenna	none	2.4 - 2.4835	+ 3.3

2.11 Power supply system utilised

Power supply voltage, V_{nom} : 12 VDC

FCC ID: KR5FBD5 IC: 7812D-FBD5

2.12 Peripheral devices and interface cables

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

- CAN/LIN interface Model: Vector VN1630A
- Flat flexible cables with SUB-D9 plug Model: Customer specific
- Dual Output DC Power Supply Model: Agilent E3647A
- USB/GPIB Interface Model: NI GPIB-USB-HS
- Laptop with software Model: HP EliteBook

2.13 Determination of worst case conditions for final measurement

Measurements are made in all three orthogonal axes and the settings of the EUT are 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 X position.

The tests are carried out in the following frequency band:

2400 MHz – 2483.5 MHz

Preliminary tests are performed to find the worst case mode from all possible combinations between available modulations and data rates. The maximum output power depends on used data rate.

For the final test the following channels and test modes are selected:

Wireless system	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
BLE 5.0	0 – 39	37, 17, 39	Max.	DSSS	GFSK	0.5 Mbps
BLE 5.0	0 – 39	37, 17, 39	Max.	DSSS	GFSK	1 Mbps

- TX continuous mode, 802.15.1

2.13.1 Test jig

No test jig is used. The conducted measurements are performed under the support of an antenna connector. Radiated measurements are performed under real conditions using the original antenna.

2.13.2 Test software

The test software for the EUT provides free power setting, the special test mode RX and the TX continuous mode, modulated. The EUT was set with test modulation to transmit data during the tests with a maximum duty cycle (x) from an internal packet generator.

3 TEST RESULT SUMMARY

BLE device using digital modulation:

Operating in the 2400 MHz – 2483.5 MHz:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS-Gen, 8.8	AC power line conducted emissions	passed
15.247(a)(2)	RSS-247, 6.2.4(1)	-6 dB EBW	passed
15.247(b)(3)	RSS-247, 6.2.4(1)	Maximum peak conducted output power	passed
15.247(b)(4)	-	Defacto limit	passed
15.247(d)	RSS-247, 6.2.4(2)	Out-of-band emission, radiated	passed
15.247(d)	RSS-Gen, 8.9	Emissions in restricted bands	passed
15.247(e)	RSS-247, 6.2.4(1)	PSD	passed
15.35(c)	RSS-Gen, 6.10	Pulsed operation	not applicable
15.203	RSS-Gen, 6.6	Antenna requirement	passed
-	RSS-Gen, 6.11	Transmitter frequency stability	passed
-	RSS-Gen, 6.6	99 % Bandwidth	passed

The mentioned new RSS Rule Parts in the above table are related to:
 RSS-Gen, Issue 5, March 2019
 RSS-247, Issue 2, February 2017

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 : 24 September 2020

Testing concluded on : 07 October 2020

Checked by:

Tested by:

 Klaus Gegenfurtner
 Teamleader Radio

 Franz-Xaver Schrettenbrunner
 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

4.3 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 Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	± 3.29 dB
20 dB Bandwidth	Center frequency of EUT	95%	$\pm 2.5 \times 10^{-7}$
99% Occupied Bandwidth	Center frequency of EUT	95%	$\pm 2.5 \times 10^{-7}$
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	± 3.53 dB
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	± 3.71 dB
Radiated Spurious Emissions	1000 MHz to 10000 MHz	95%	± 2.34 dB
Peak conducted output power	902 MHz to 928 MHz	95%	± 0.35 dB
Conducted Spurious Emissions	9 kHz to 10000 MHz	95%	± 2.15 dB

4.1 Conformity Decision Rule

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

FCC ID: KR5FBD5 IC: 7812D-FBD5

4.2 Measurement protocol for FCC and ISED

4.2.1 General information

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

**FCC: DE 0011
ISED: DE0009**

4.2.2 General Standard information

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

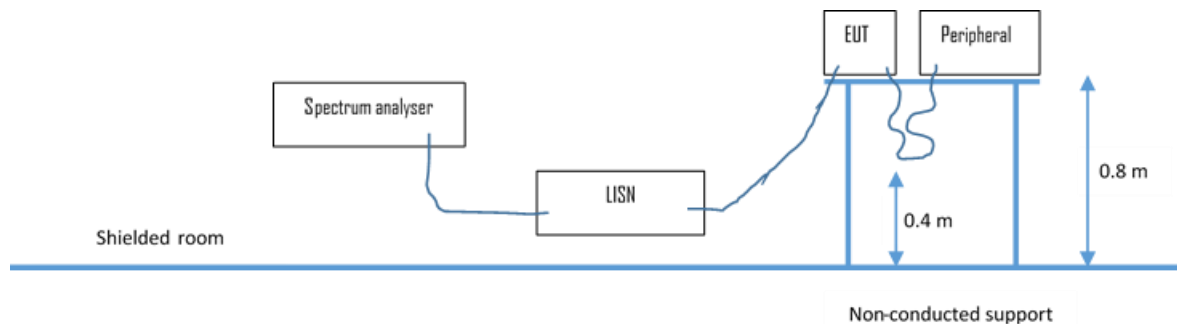
4.2.2.1 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions.

4.2.3 Details of test procedures

4.2.3.1 Conducted emission

Test setup according ANSI C63.10



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

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20(\log \mu\text{V})$$

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

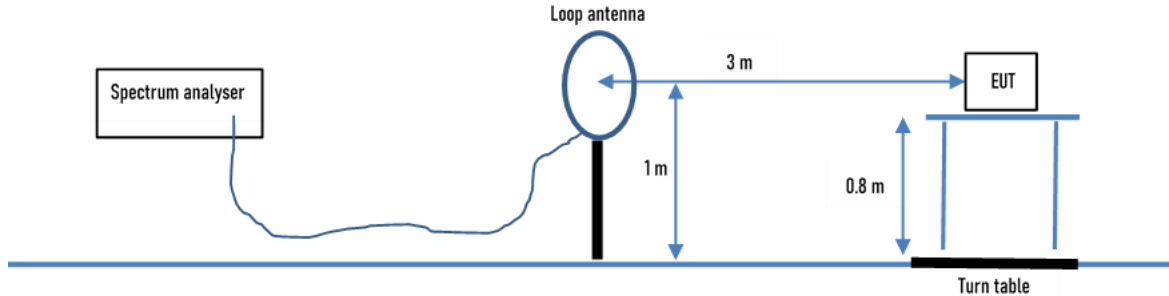
Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω / 50 μ H (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.

FCC ID: KR5FBD5 IC: 7812D-FBD5

4.2.3.2 Radiated emission

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

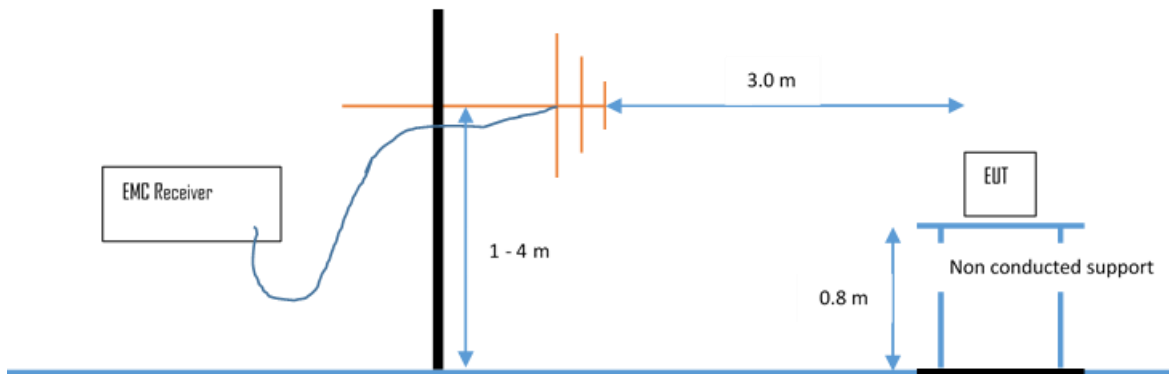
Test setup according ANSI C63.10



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 X 1.5 m non-conducting table 80 centimetres 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.

4.2.3.2.2 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 in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

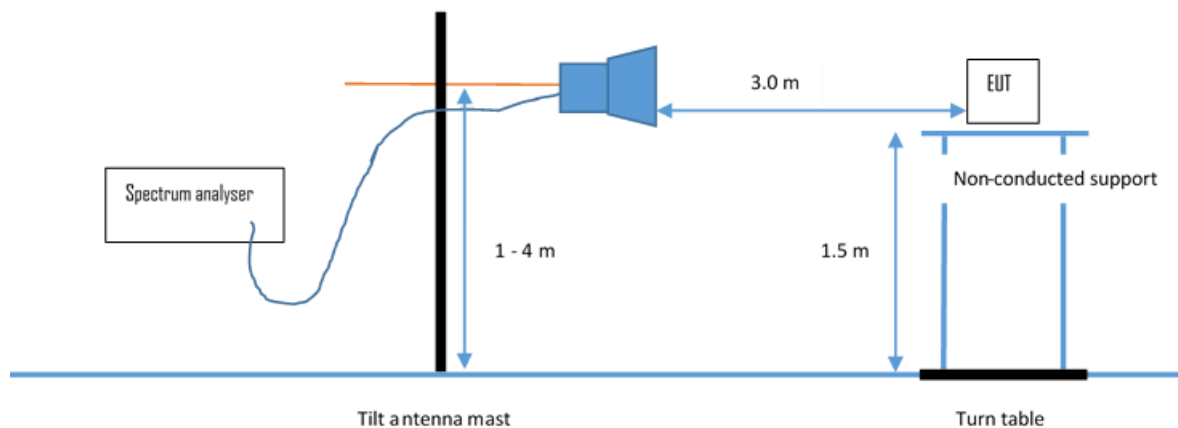
Example:

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

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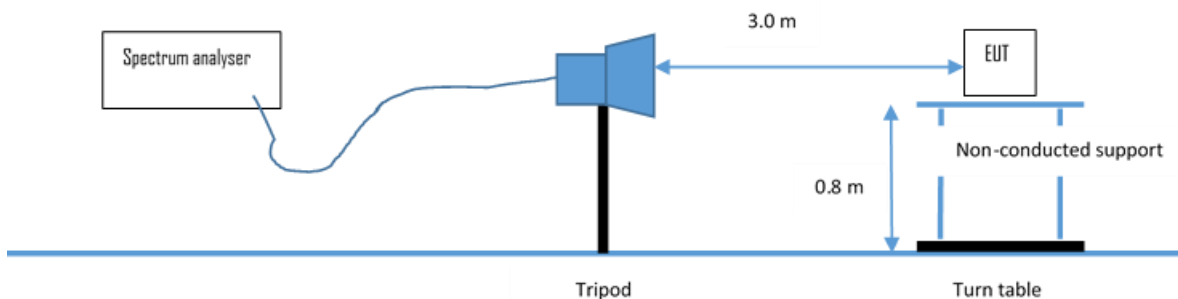
4.2.3.2.3 Anechoic chamber 1 (1000 MHz – 18000 MHz)

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 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.

4.2.3.2.4 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 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 are adopted.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

5 TEST CONDITIONS AND RESULTS

5.1 AC power line conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.10 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

FCC ID: KR5FBD5 IC: 7812D-FBD5

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz
 Min. limit margin -27.4 dB at 25.293 MHz

Limit according to FCC Part 15, Section 15.207(a):

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

The requirements are **FULFILLED**.

Remarks: For detailed test result please see the following test protocols

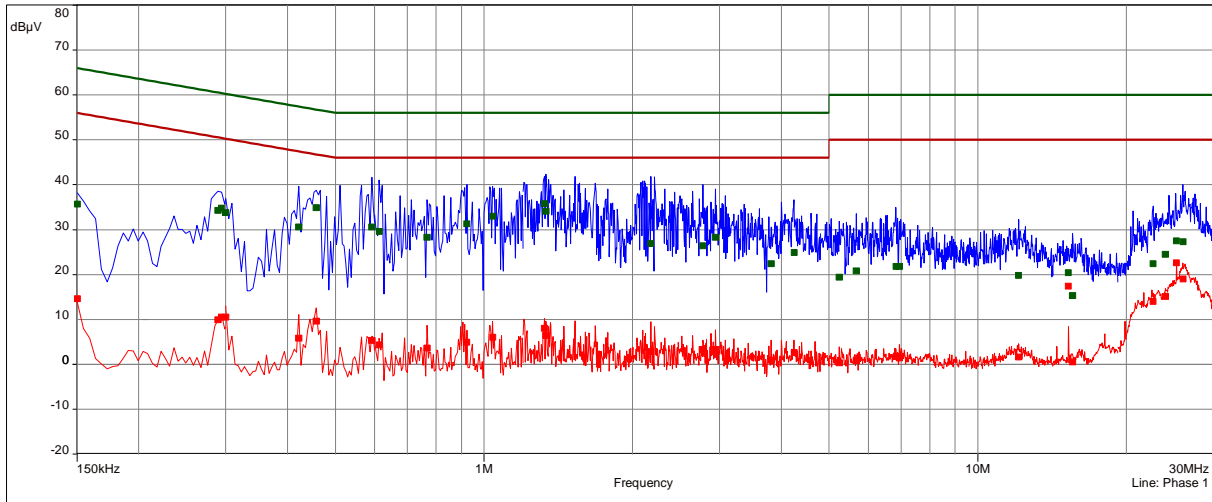
FCC ID: KR5FBD5 IC: 7812D-FBD5

5.1.6 Test protocol

Test point: L1
 Operation mode: Transmission at 2.4 GHz
 Remarks: None

Result: passed

- FCC/FCC Part 15C (15.207) B - Average/
- FCC/FCC Part 15C (15.207) B - QPeak/
- Meas.Peak (Phase 1)
- Mes. CISPR AVG (Phase 1)
- QuasiPeak (Finals) (Phase 1)
- CISPR AV (Finals) (Phase 1)



FCC/FCC Part 15C (15.207)B

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FCC ID: KR5FBD5 IC: 7812D-FBD5

freq	QP	margin	limit	AV	margin	limit	corr
MHz	dB(μV)	dB	dB	dB(μV)	dB	dB	dB
0.150	35.8	-30.2	66.0	14.6	-41.4	56.0	10.1
0.290	34.4	-26.2	60.5	10.0	-40.6	50.5	10.1
0.294	34.8	-25.6	60.4	10.6	-39.8	50.4	10.1
0.300	33.8	-26.4	60.2	10.5	-39.7	50.2	10.1
0.422	30.6	-26.8	57.4	5.9	-41.6	47.4	10.2
0.458	34.9	-21.8	56.7	9.7	-37.1	46.7	10.2
0.593	30.6	-25.4	56.0	5.4	-40.6	46.0	10.2
0.614	29.6	-26.4	56.0	4.4	-41.6	46.0	10.2
0.767	28.4	-27.6	56.0	3.7	-42.3	46.0	10.2
0.924	31.4	-24.6	56.0	4.9	-41.1	46.0	10.2
1.041	33.0	-23.0	56.0	6.1	-40.0	46.0	10.2
1.326	35.8	-20.2	56.0	8.1	-37.9	46.0	10.3
1.335	34.2	-21.8	56.0	6.5	-39.5	46.0	10.3
2.177	27.0	-29.0	56.0	2.9	-43.1	46.0	10.3
2.774	26.4	-29.6	56.0	3.4	-42.6	46.0	10.3
2.940	28.3	-27.7	56.0	3.4	-42.6	46.0	10.4
3.813	22.4	-33.6	56.0	1.0	-45.0	46.0	10.4
4.245	25.0	-31.0	56.0	2.7	-43.3	46.0	10.4
5.246	19.5	-40.5	60.0	0.4	-49.6	50.0	10.5
5.678	20.9	-39.1	60.0	0.9	-49.1	50.0	10.5
6.821	21.9	-38.1	60.0	1.8	-48.3	50.0	10.6
6.942	21.8	-38.2	60.0	1.5	-48.5	50.0	10.6
12.107	19.9	-40.1	60.0	1.7	-48.3	50.0	10.9
15.261	20.5	-39.5	60.0	17.5	-32.5	50.0	11.2
15.558	15.3	-44.7	60.0	0.6	-49.4	50.0	11.2
22.688	22.5	-37.5	60.0	14.1	-35.9	50.0	11.6
23.988	24.6	-35.4	60.0	15.2	-34.8	50.0	11.6
25.293	27.6	-32.4	60.0	22.6	-27.4	50.0	11.7
26.036	27.4	-32.6	60.0	19.1	-30.9	50.0	11.7

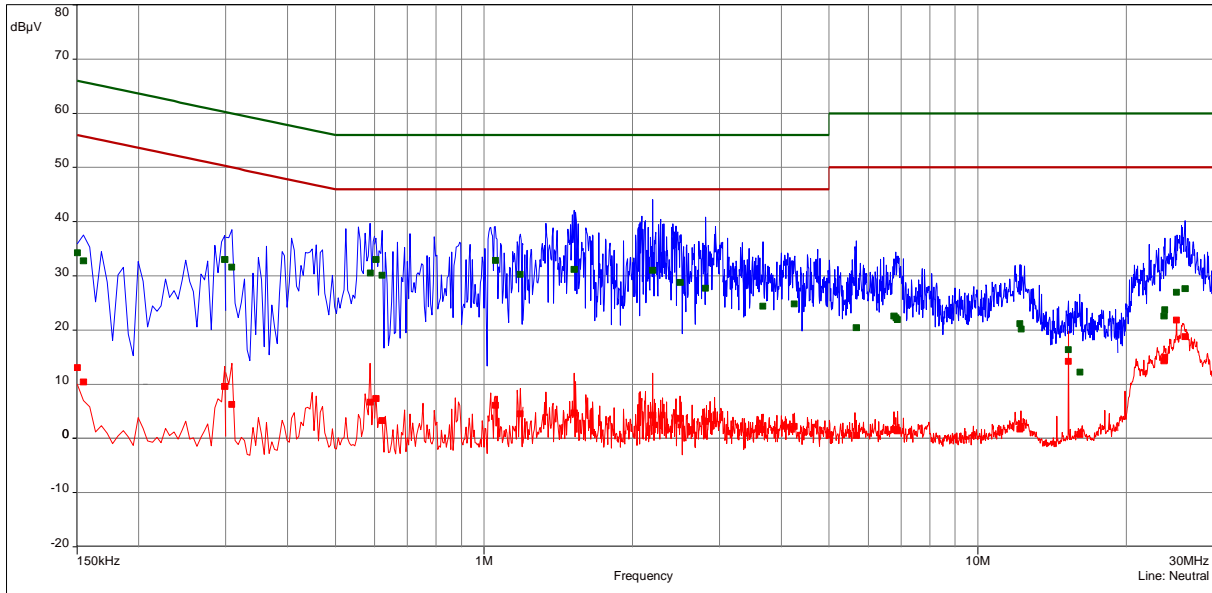
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FCC ID: KR5FBD5 IC: 7812D-FBD5

Test point: N
 Operation mode: Transmission at 2.4 GHz
 Remarks: None

Result: passed

- FCC/FCC Part 15C (15.207) B - Average/
- FCC/FCC Part 15C (15.207) B - QPeak/
- Meas.Peak (Neutral)
- Mes. CISPR AVG (Neutral)
- QuasiPeak (Finals) (Neutral)
- CISPR AV (Finals) (Neutral)



FCC/FCC Part 15C (15.207)B

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: KR5FBD5 IC: 7812D-FBD5

freq	QP	margin	limit	AV	margin	limit	corr
MHz	dB(μV)	dB	dB	dB(μV)	dB	dB	dB
0.150	34.3	-31.7	66.0	13.1	-42.9	56.0	10.1
0.155	32.9	-32.9	65.8	10.5	-45.3	55.8	10.1
0.299	33.1	-27.2	60.3	9.6	-40.7	50.3	10.1
0.309	31.7	-28.3	60.0	6.3	-43.7	50.0	10.1
0.588	30.6	-25.4	56.0	6.8	-39.2	46.0	10.2
0.605	33.0	-23.0	56.0	7.4	-38.6	46.0	10.2
0.623	30.2	-25.9	56.0	3.4	-42.6	46.0	10.2
1.055	32.9	-23.1	56.0	6.2	-39.8	46.0	10.2
1.185	30.4	-25.6	56.0	4.6	-41.4	46.0	10.2
1.524	31.3	-24.8	56.0	4.8	-41.3	46.0	10.3
2.195	31.1	-25.0	56.0	4.3	-41.7	46.0	10.3
2.495	28.9	-27.2	56.0	3.7	-42.3	46.0	10.3
2.810	27.8	-28.2	56.0	3.2	-42.8	46.0	10.3
3.674	24.5	-31.6	56.0	1.7	-44.3	46.0	10.4
4.250	24.9	-31.2	56.0	2.3	-43.7	46.0	10.4
5.673	20.5	-39.5	60.0	0.7	-49.4	50.0	10.5
6.767	22.7	-37.3	60.0	1.7	-48.3	50.0	10.6
6.830	22.3	-37.7	60.0	1.6	-48.4	50.0	10.6
6.875	21.9	-38.1	60.0	1.4	-48.6	50.0	10.6
12.188	21.2	-38.8	60.0	1.8	-48.2	50.0	10.8
12.219	20.3	-39.7	60.0	2.1	-47.9	50.0	10.8
15.261	16.4	-43.6	60.0	14.3	-35.7	50.0	11.0
16.103	12.3	-47.7	60.0	0.8	-49.3	50.0	11.1
23.817	22.7	-37.3	60.0	14.4	-35.6	50.0	11.3
23.916	23.8	-36.2	60.0	15.0	-35.0	50.0	11.3
25.293	27.0	-33.0	60.0	21.9	-28.1	50.0	11.2
26.319	27.7	-32.4	60.0	18.8	-31.2	50.0	11.2

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: KR5FBD5 IC: 7812D-FBD5

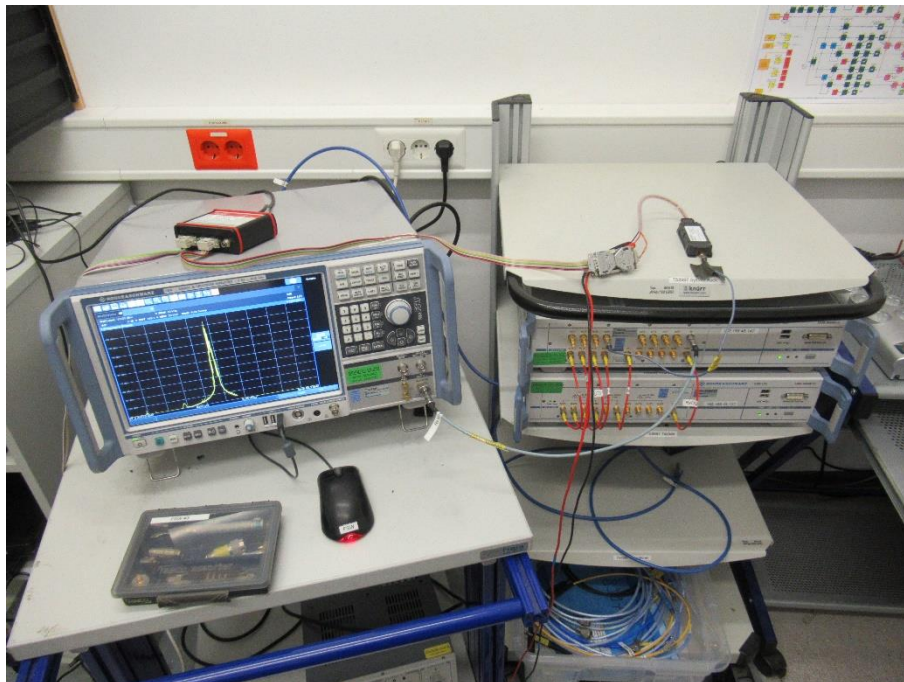
5.2 EBW, OBW and frequency stability

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

5.2.1 Description of the test location

Test location: Shielded Room S6

5.2.2 Photo documentation of the test set-up



5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(2):
Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -6 dB. The reference level is the level of the highest signal amplitude observed at the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. An alternative is to use the bandwidth measurement of the analyser.

Spectrum analyser settings for EBW:
RBW: 100 kHz, VBW: 300 kHz, Detector: Max peak, Sweep time: 5 s, Span: 2 EBW;
Spectrum analyser settings for OBW:
RBW: 1-5% OBW, VBW: 3 RBW, Detector: Max peak, Sweep time: 5 s, Span: 2 OBW;

FCC ID: KR5FBD5 IC: 7812D-FBD5

5.2.5 Test result

Standard 802.15.1

DUT Frequency (MHz)	Data rate (Mbps)	Bandwidth (MHz)	Limit Min (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)	Max Level (dBm)	Result
2402	0.5	0.712872	0.500000	2401.574257	2402.287129	0.8	PASS
2440	0.5	0.712872	0.500000	2439.574257	2440.287129	1.2	PASS
2480	0.5	0.722773	0.500000	2479.564356	2480.287129	1.5	PASS
2402	1	0.673268	0.500000	2401.623762	2402.297030	1.9	PASS
2440	1	0.693070	0.500000	2439.623762	2440.316832	2.3	PASS
2480	1	0.673268	0.500000	2479.623762	2480.297030	2.5	PASS

The requirements are **FULFILLED**.

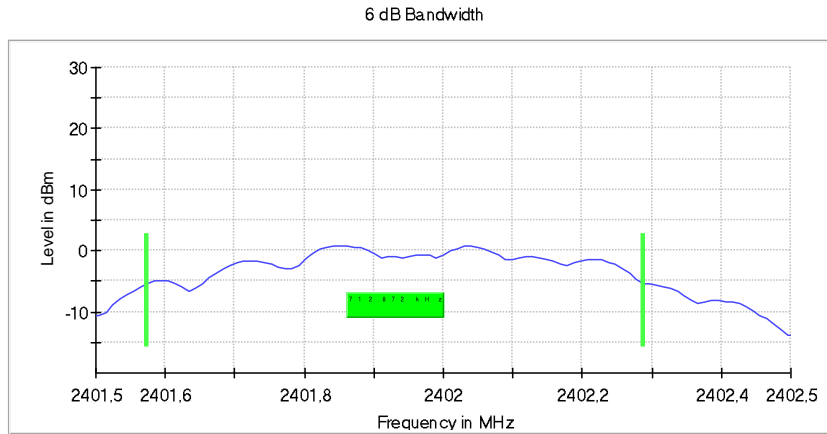
Remarks: For detailed test result please see the following test protocols.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

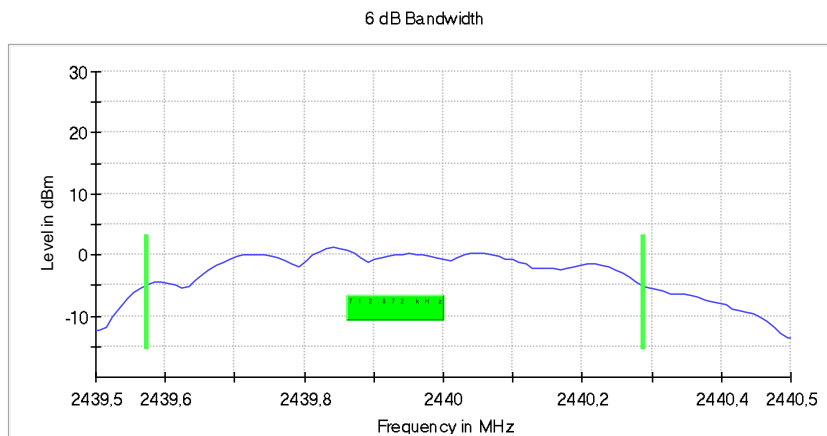
FCC ID: KR5FBD5 IC: 7812D-FBD5

5.2.6 Test protocols EBW

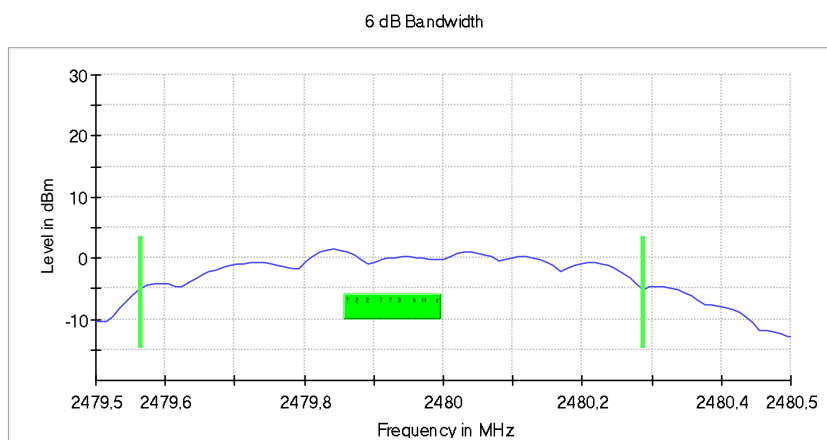
802.15.1, Channel 37 (2402 MHz), 500kbps



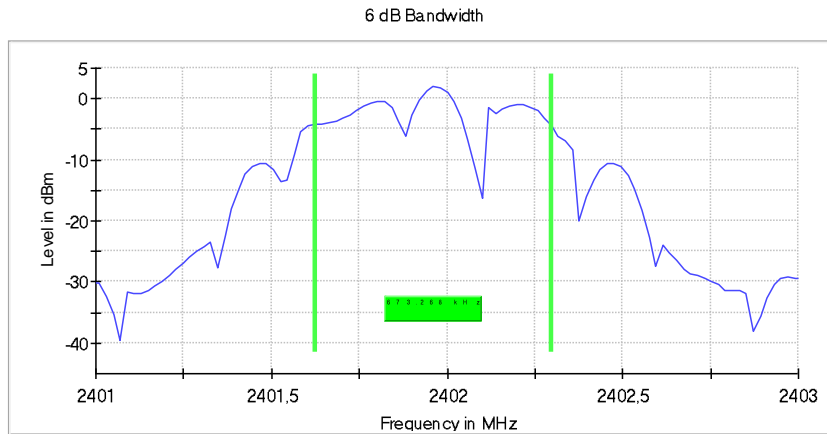
802.15.1, Channel 17 (2440 MHz), 500kbps



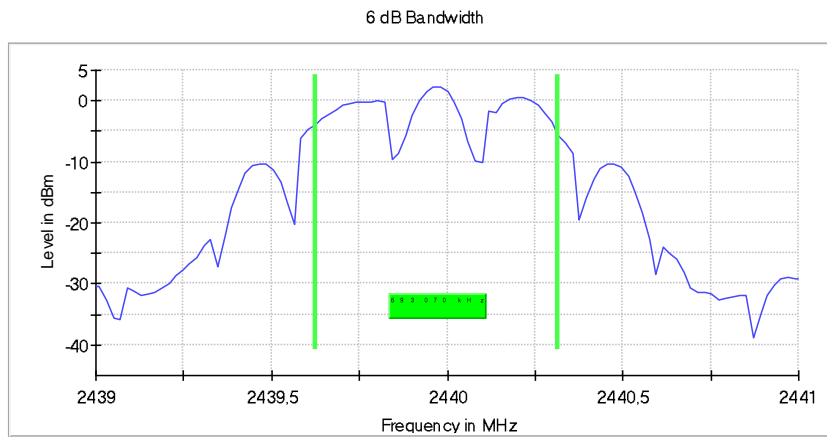
802.15.1, Channel 39 (2480 MHz), 500kbps



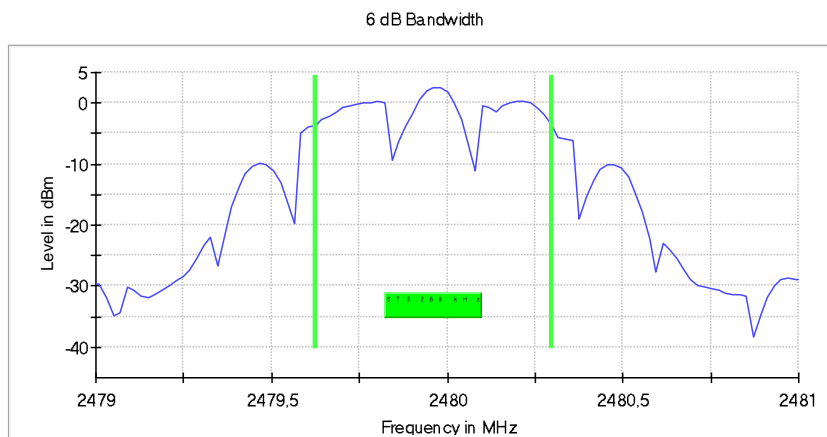
FCC ID: KR5FBD5 IC: 7812D-FBD5
 802.15.1, Channel 37 (2402 MHz), 1 Mbps



802.15.1, Channel 17 (2440 MHz), 1 Mbps



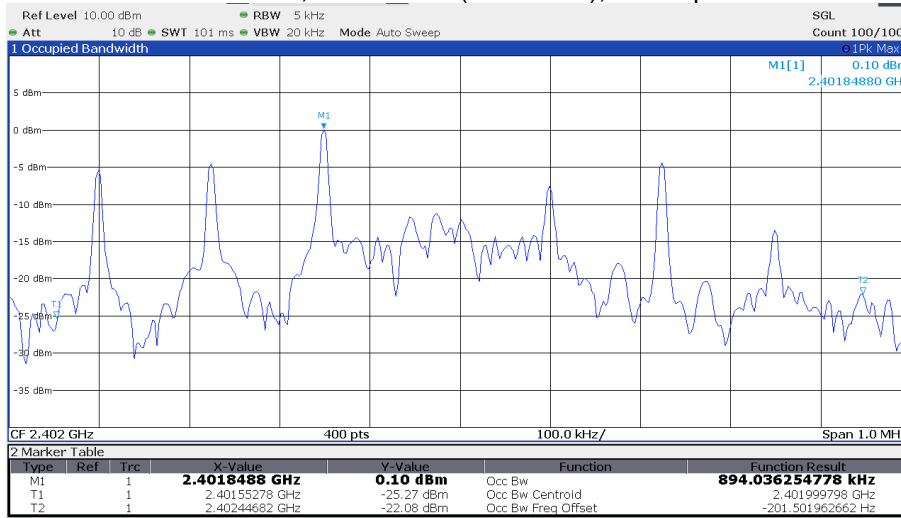
802.15.1, Channel 39 (2480 MHz), 1 Mbps



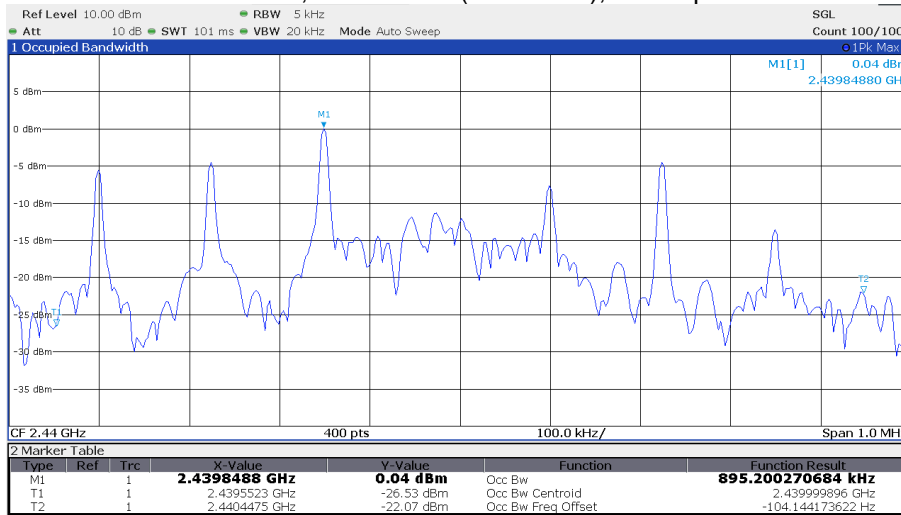
5.2.7 Test protocols OBW

T = 20°C, V = 12 V

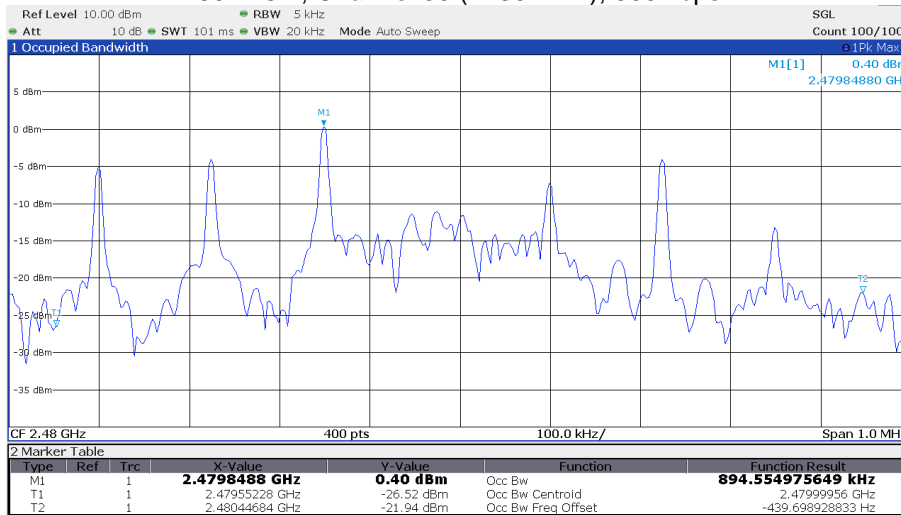
802.15.1, Channel 37 (2402 MHz), 500 kbps



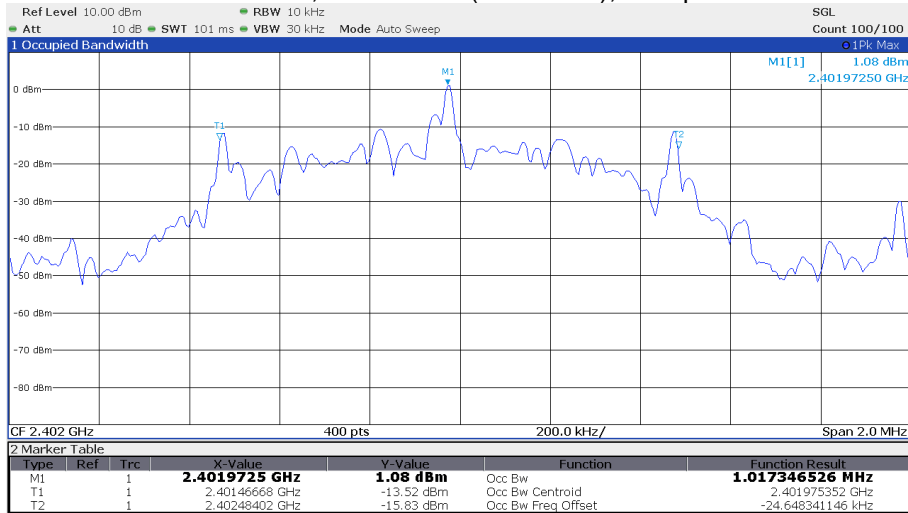
802.15.1, Channel 17 (2440 MHz), 500 kbps



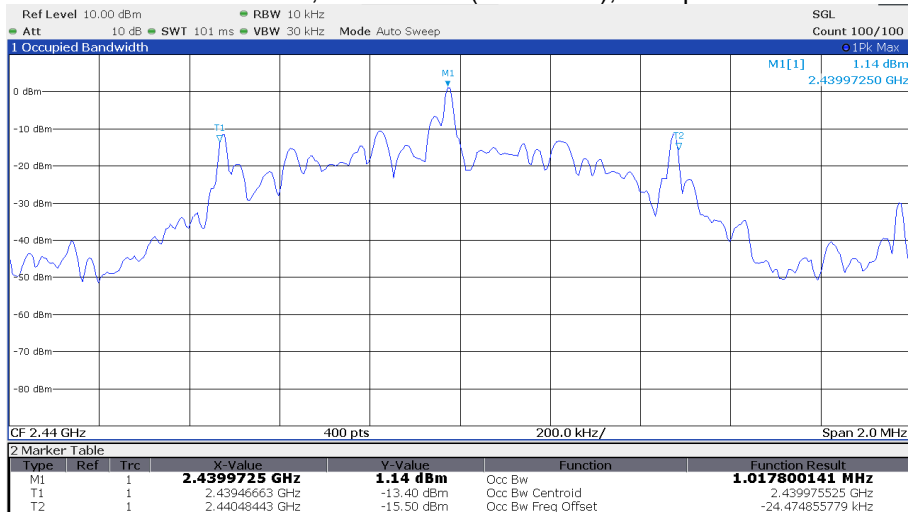
802.15.1, Channel 39 (2480 MHz), 500 kbps



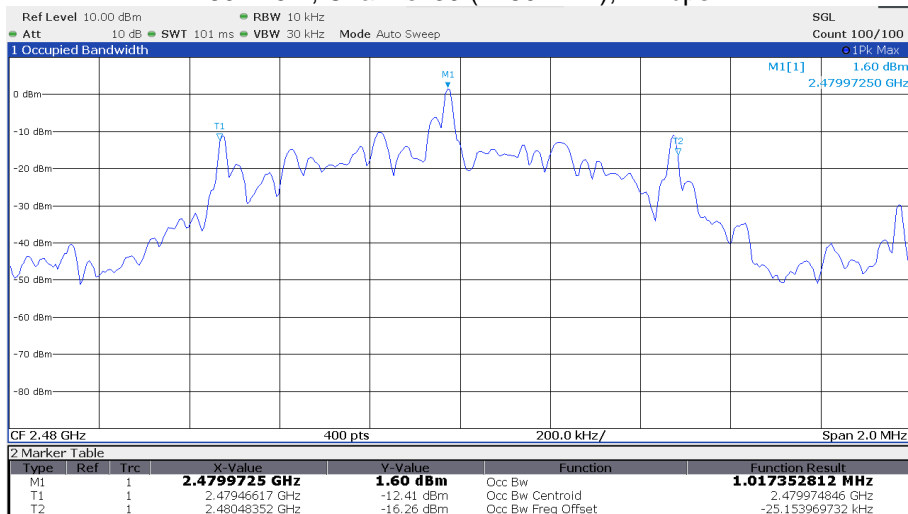
FCC ID: KR5FBD5 IC: 7812D-FBD5 802.15.1, Channel 37 (2402 MHz), 1 Mbps



802.15.1, Channel 17 (2440 MHz), 1 Mbps



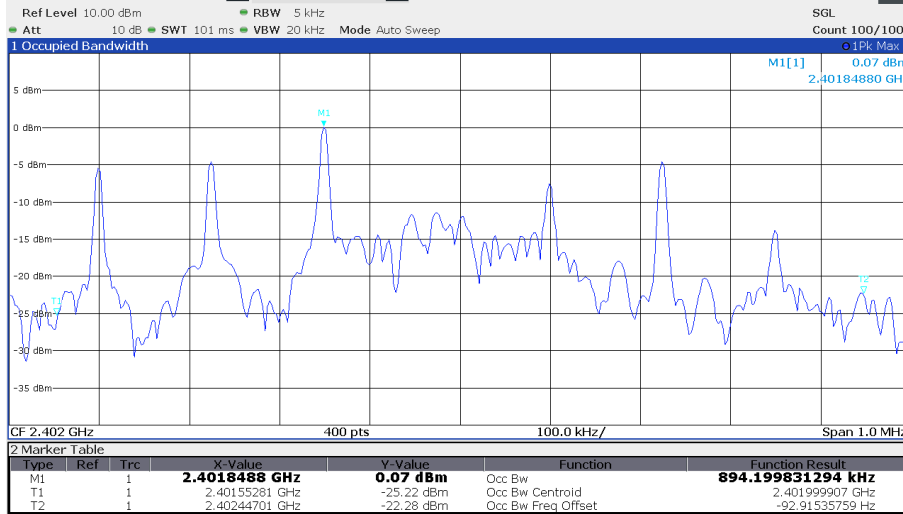
802.15.1, Channel 39 (2480 MHz), 1 Mbps



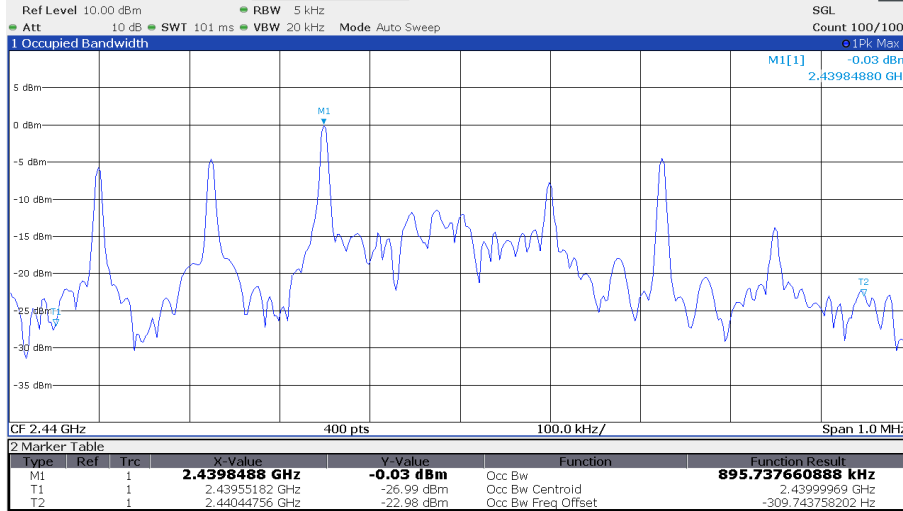
FCC ID: KR5FBD5 IC: 7812D-FBD5

T = 20°C, V = 10.2 V

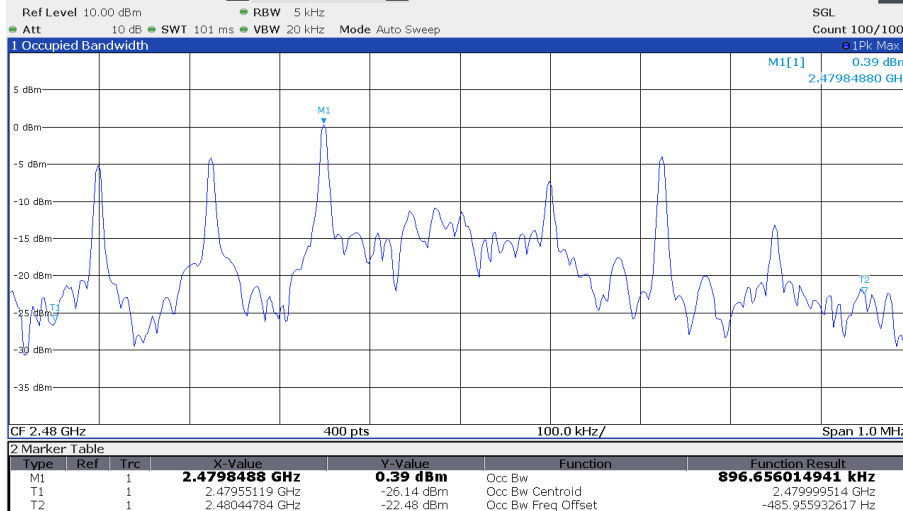
802.15.1, Channel 37 (2402 MHz), 500 kbps



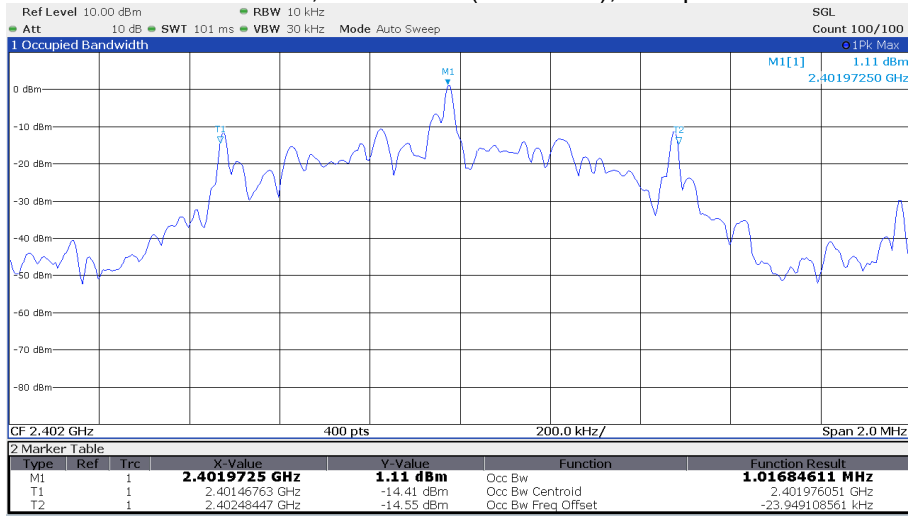
802.15.1, Channel 17 (2440 MHz), 500 kbps



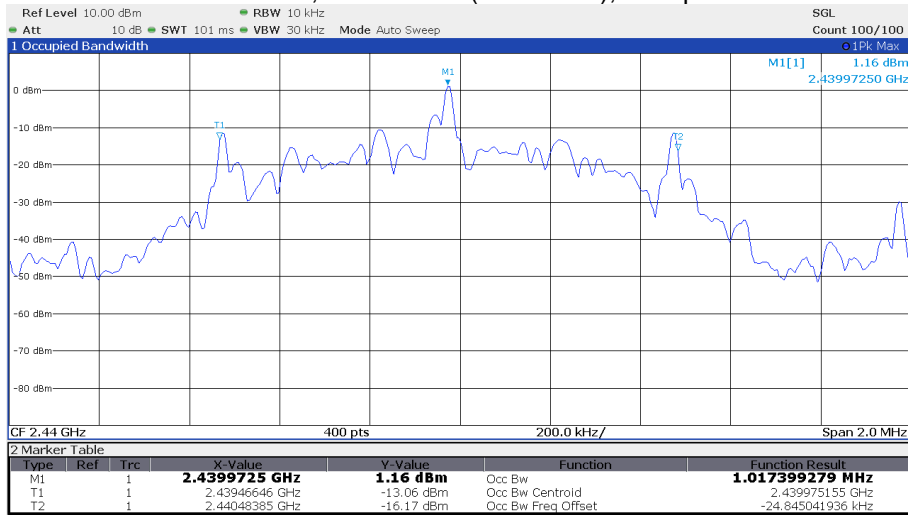
802.15.1, Channel 39 (2480 MHz), 500 kbps



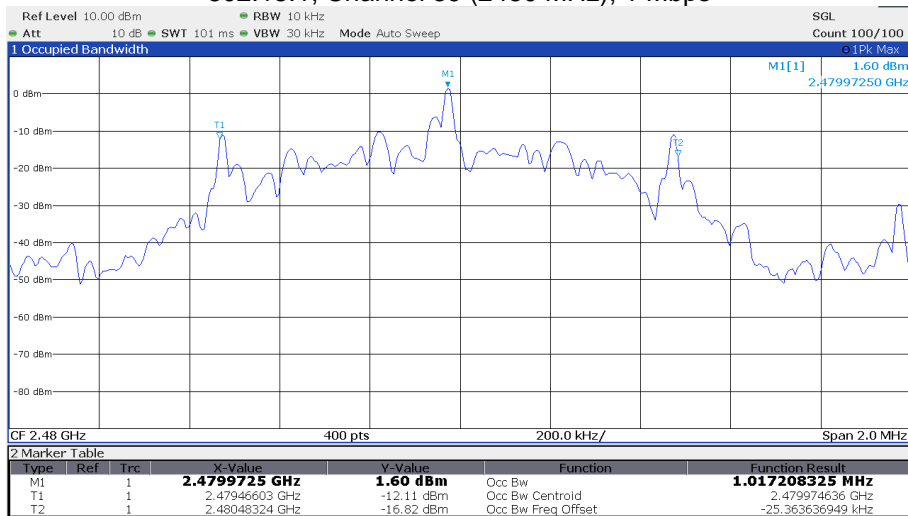
FCC ID: KR5FBD5 IC: 7812D-FBD5 802.15.1, Channel 37 (2402 MHz), 1 Mbps



802.15.1, Channel 17 (2440 MHz), 1 Mbps



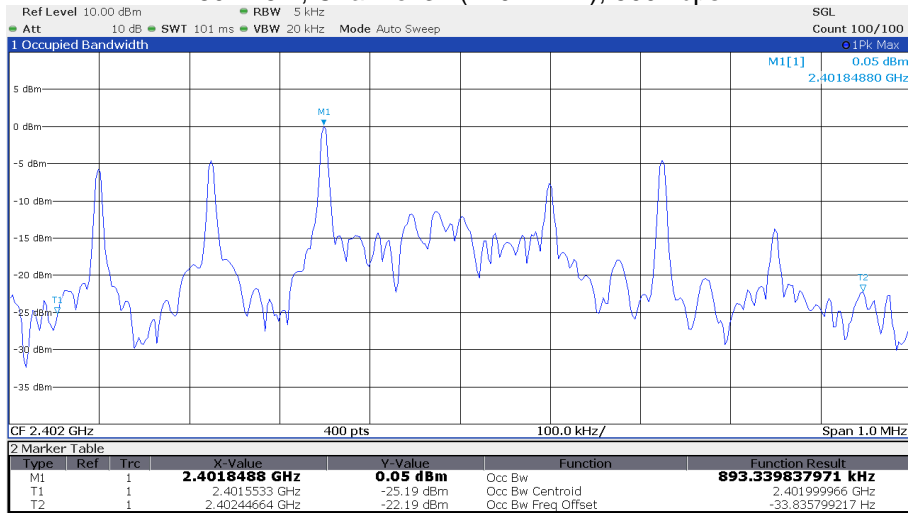
802.15.1, Channel 39 (2480 MHz), 1 Mbps



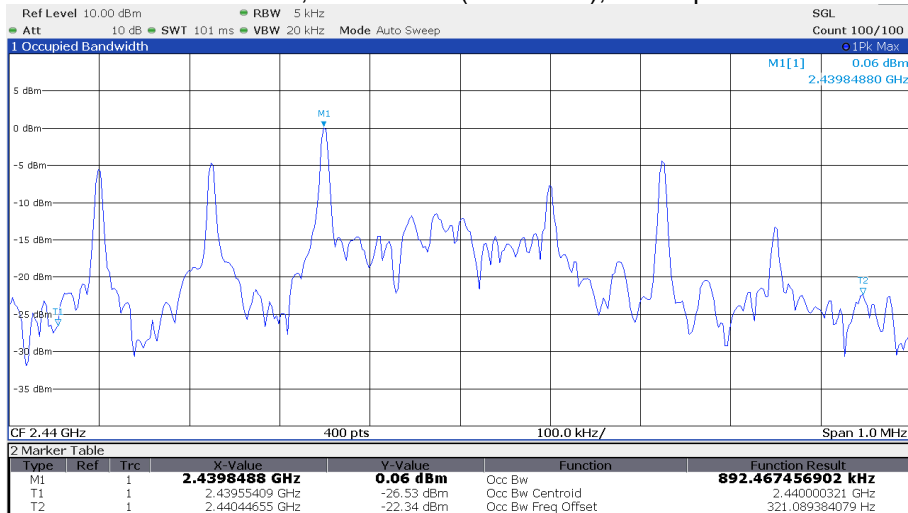
FCC ID: KR5FBD5 IC: 7812D-FBD5

T = 20°C, V = 13.8 V

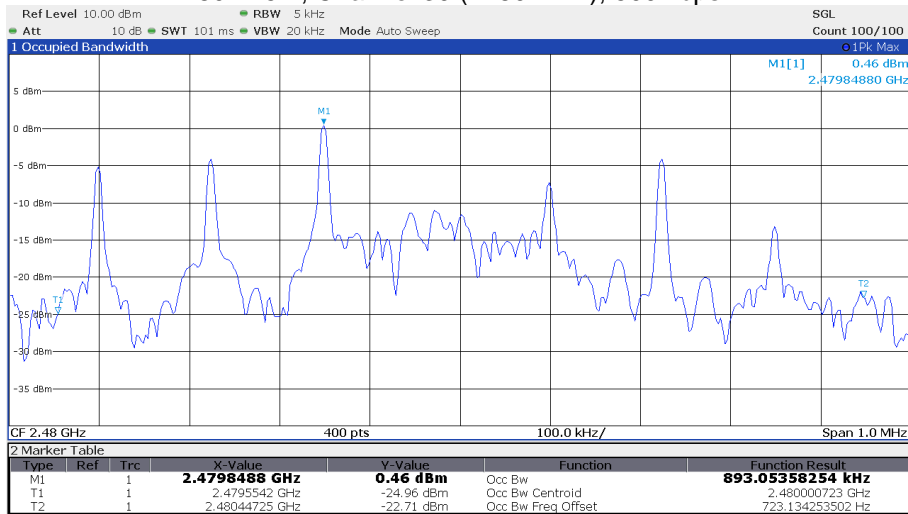
802.15.1, Channel 37 (2402 MHz), 500 kbps



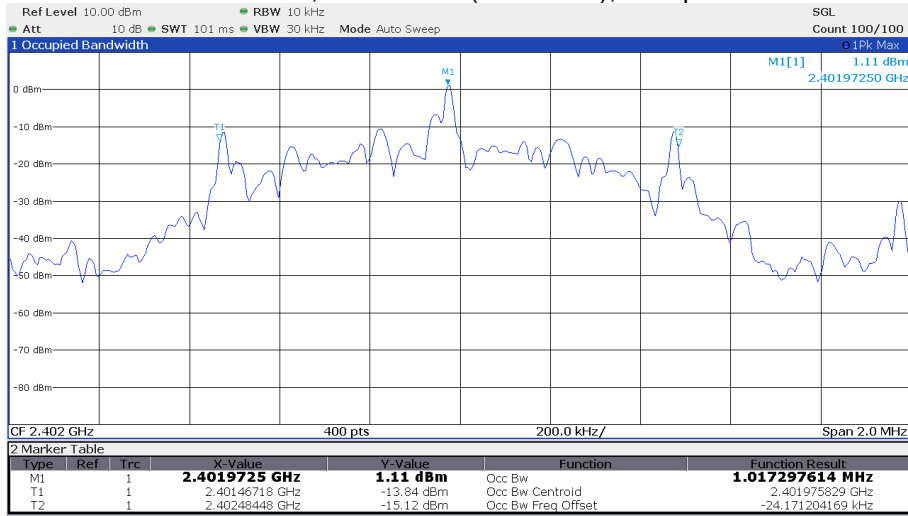
802.15.1, Channel 17 (2440 MHz), 500 kbps



802.15.1, Channel 39 (2480 MHz), 500 kbps



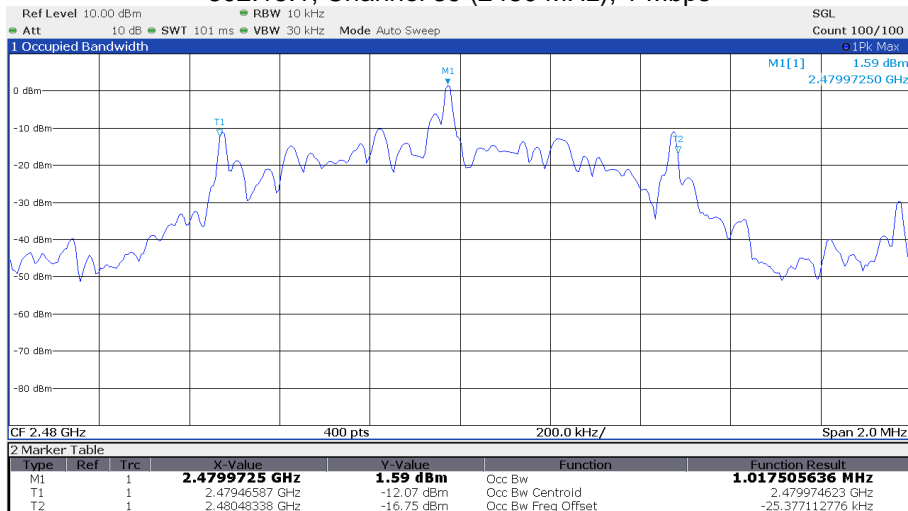
FCC ID: KR5FBD5 IC: 7812D-FBD5 802.15.1, Channel 37 (2402 MHz), 1 Mbps



802.15.1, Channel 17 (2440 MHz), 1 Mbps



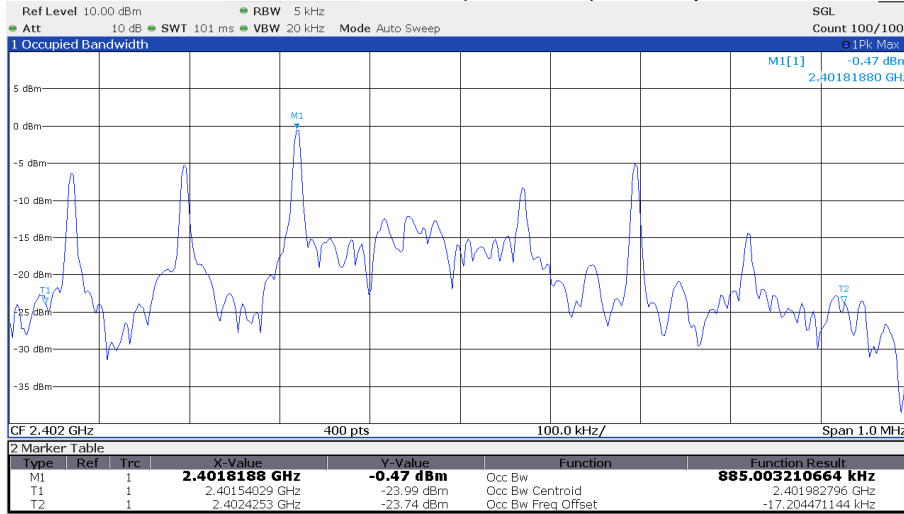
802.15.1, Channel 39 (2480 MHz), 1 Mbps



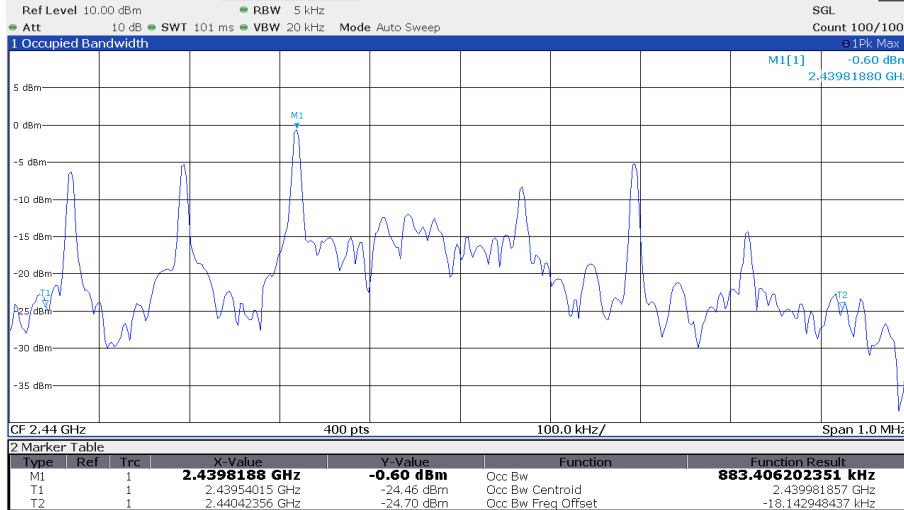
FCC ID: KR5FBD5 IC: 7812D-FBD5

T = 50°C, V = 12 V

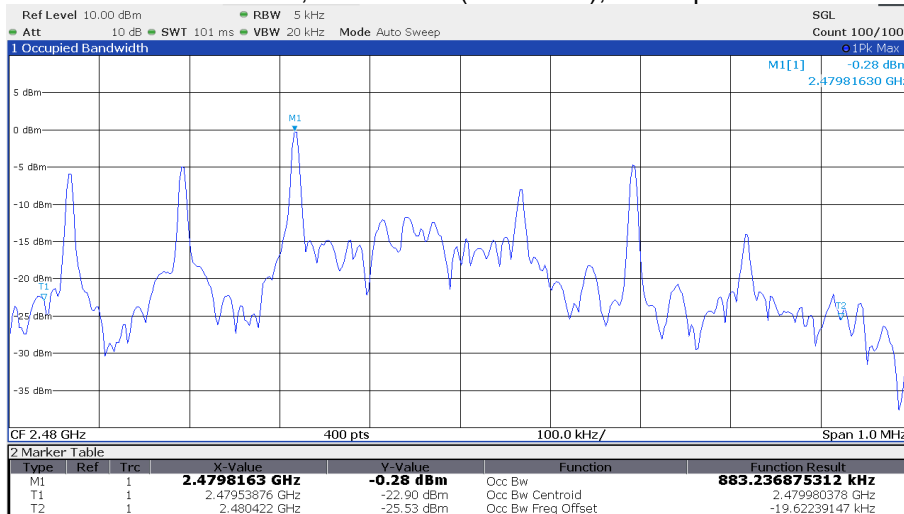
802.15.1, Channel 37 (2402 MHz), 500 kbps



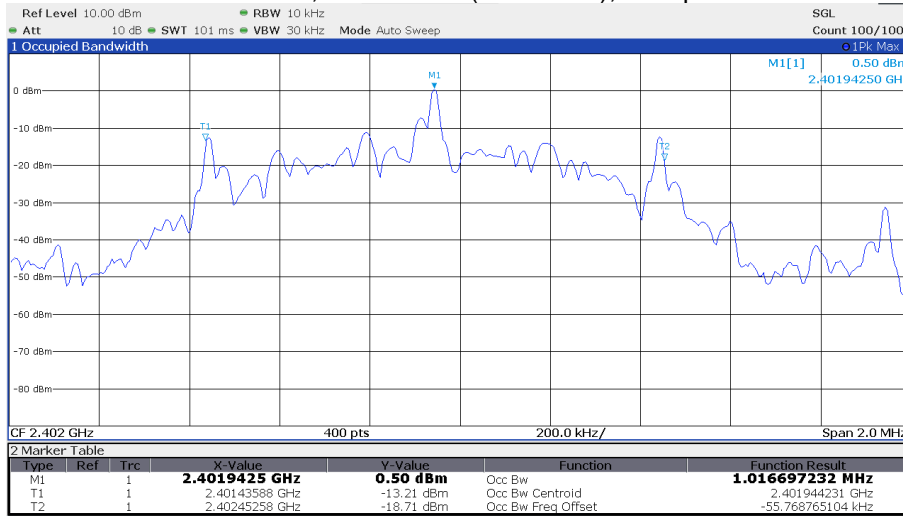
802.15.1, Channel 17 (2440 MHz), 500 kbps



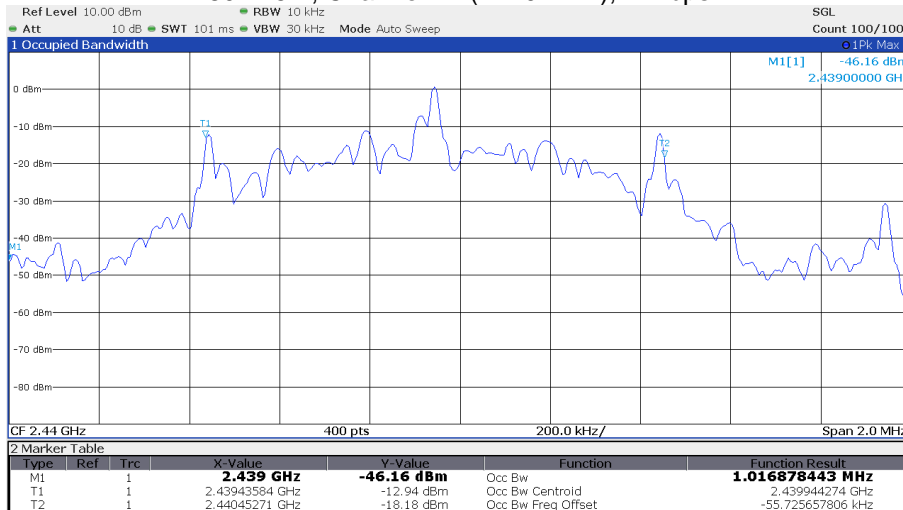
802.15.1, Channel 39 (2480 MHz), 500 kbps



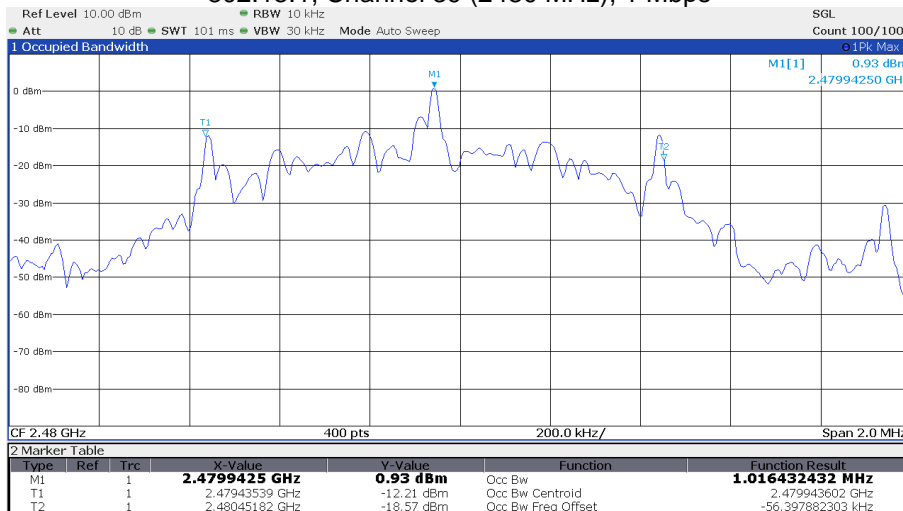
FCC ID: KR5FBD5 IC: 7812D-FBD5 802.15.1, Channel 37 (2402 MHz), 1 Mbps



802.15.1, Channel 17 (2440 MHz), 1 Mbps



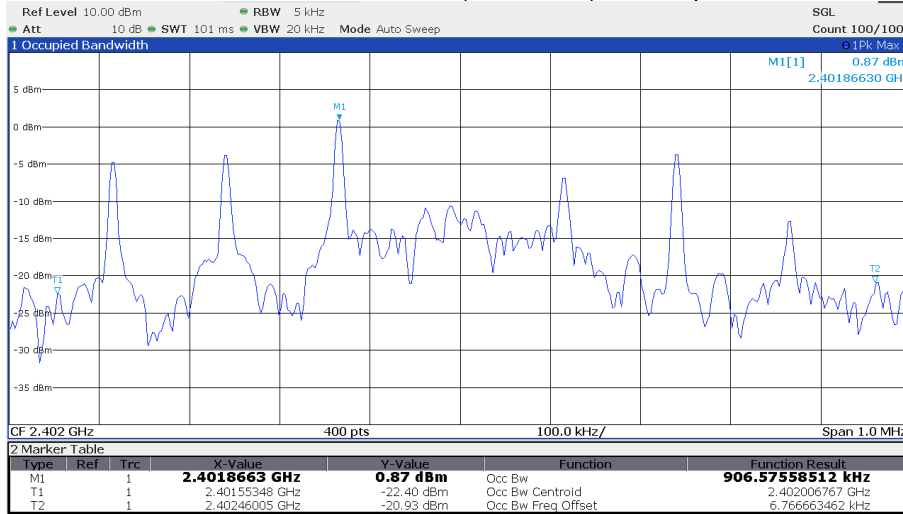
802.15.1, Channel 39 (2480 MHz), 1 Mbps



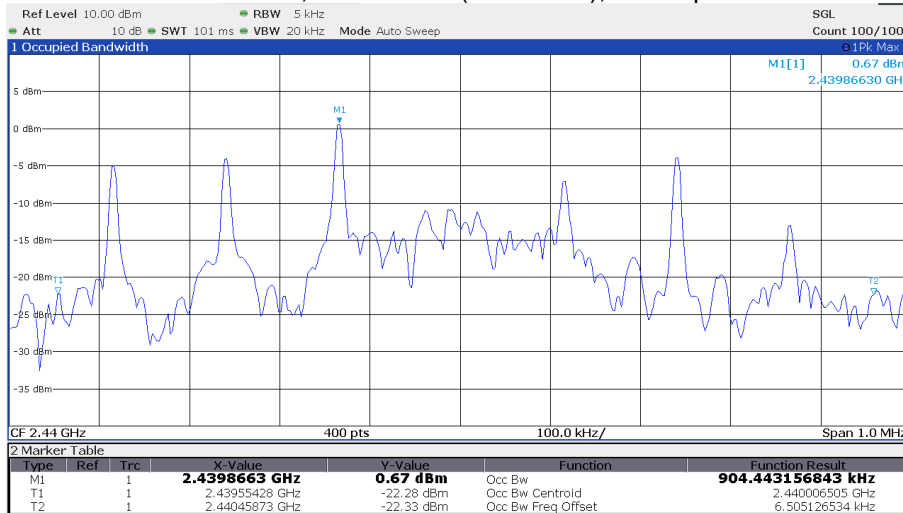
FCC ID: KR5FBD5 IC: 7812D-FBD5

T = -30°C, V = 12 V

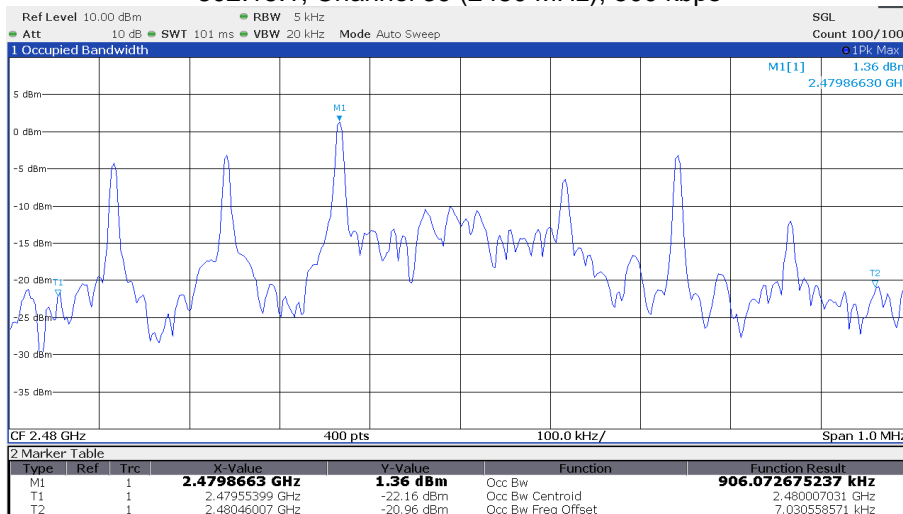
802.15.1, Channel 37 (2402 MHz), 500 kbps



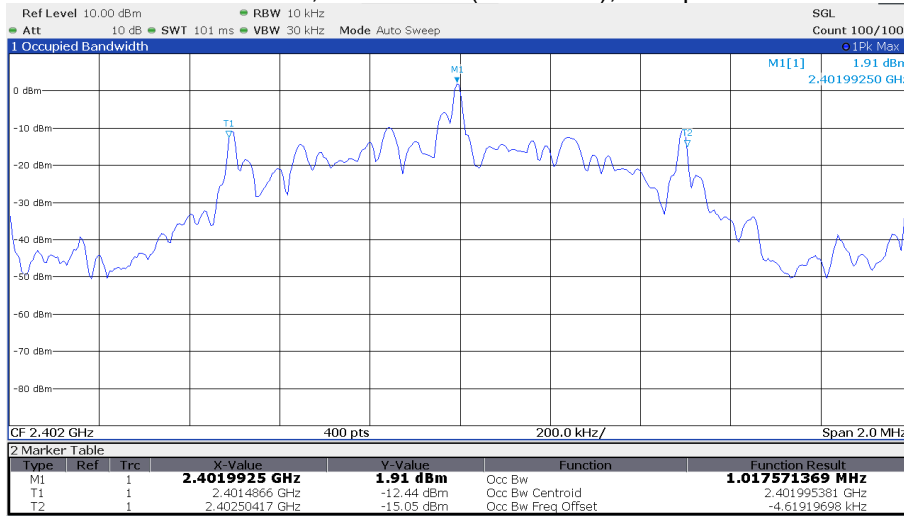
802.15.1, Channel 17 (2440 MHz), 500 kbps



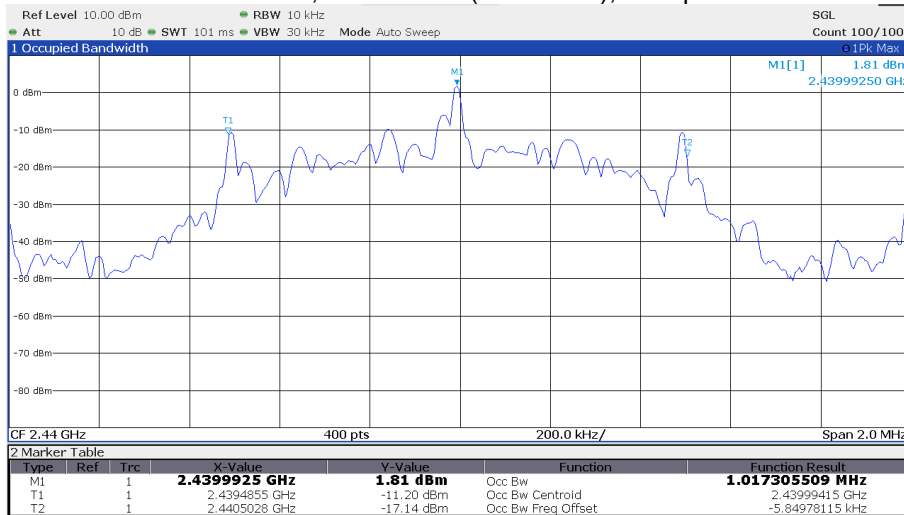
802.15.1, Channel 39 (2480 MHz), 500 kbps



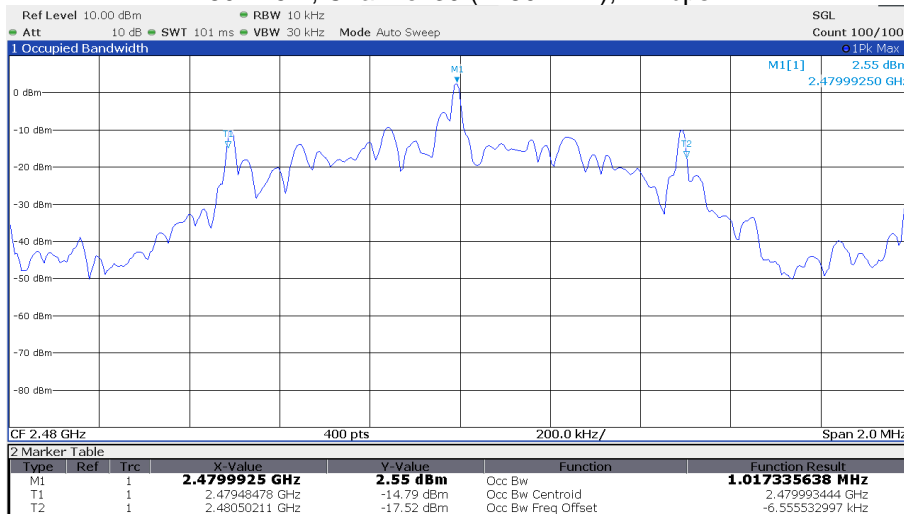
FCC ID: KR5FBD5 IC: 7812D-FBD5 802.15.1, Channel 37 (2402 MHz), 1 Mbps



802.15.1, Channel 17 (2440 MHz), 1 Mbps



802.15.1, Channel 39 (2480 MHz), 1 Mbps



FCC ID: KR5FBD5 IC: 7812D-FBD5

5.3.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):

For systems using digital modulation in the 2400-2483.5 MHz and 5725 – 5850 MHz bands, the maximum peak output power of the transmitter shall not exceed 1 Watt. The limit is based on transmitting antennas of directional gain that do not exceed 6 dBi.

5.3.4 Description of Measurement

The maximum peak radiated output power is measured using a spectrum analyser following the procedure set out in KDB 558074, item 9.1.1. The EUT is set in TX continuous advertising mode while measuring. The radiated measurement was performed in a fieldstrength measurement. Therefore the formula set out in ANSI C63.10, item 12.2.2 e) is changed into the following term:

$$E = \text{EIRP} - (20 \cdot \log_{10} 3) + 104.8$$

5.3.5 Test result

BLE continuous Tx		Test results radiated			
		FS (dBµV/m)	P [EIRP] (dBm)	Limit (dBm)	Margin (dB)
CH37 500 kBps					
T_{nom}	V_{nom}	100.7	5.5	36.0	-30.5
CH17 500 kBps					
T_{nom}	V_{nom}	99.9	4.7	36.0	-31.3
CH39 500 kBps					
T_{nom}	V_{nom}	102.8	7.6	36.0	-28.4
CH37 1 Mbps					
T_{nom}	V_{nom}	102.9	7.7	36.0	-28.3
CH17 1 Mbps					
T_{nom}	V_{nom}	101.3	6.1	36.0	-29.9
CH39 1 Mbps					
T_{nom}	V_{nom}	102.9	7.7	36.0	-28.3

Peak Power Limit according to FCC Part 15, Section 15.247(b)(3):

Frequency (MHz)	Peak Power Limit	
	(dBm)	(W)
902-928	36	4.0
2400-2483.5	36	4.0
5725-5850	36	4.0

The requirements are **FULFILLED**.

Remarks: None.

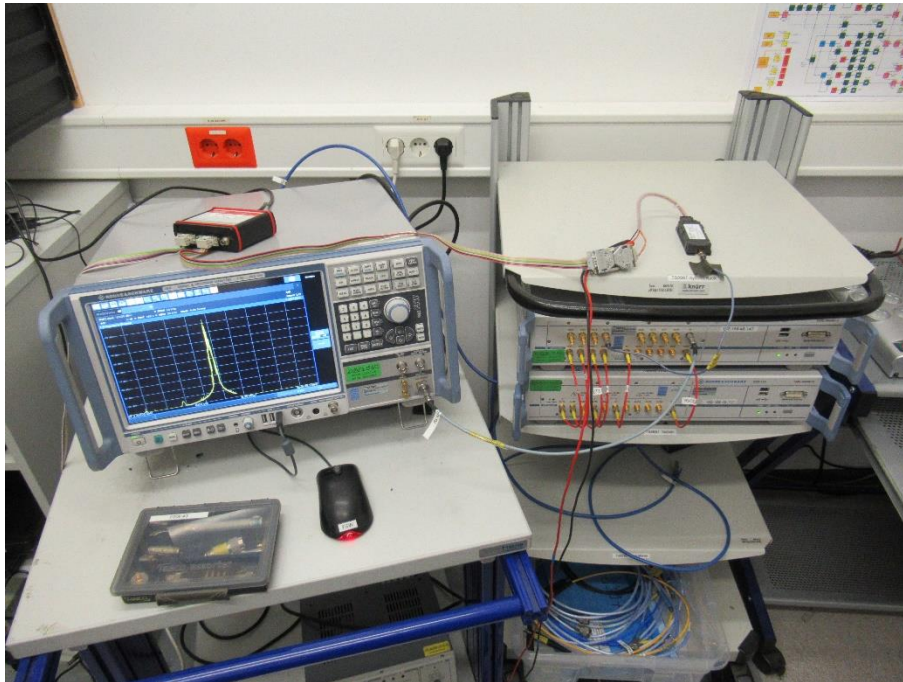
5.4 Power spectral density

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

5.4.1 Description of the test location

Test location: NONE

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15, Section 15.247(e):

For digitally modulated systems, the power spectral density radiated from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the radiated output power shall be used to determine the power spectral density.

5.4.4 Description of Measurement

The measurement is performed using the procedure 10.2 set out in KDB-558074. Therefore the PKPSD is measured conducted. The max peak was located and measured with the spectrum analyser and the marker set to peak. An offset of 10.5 dB was set to compensate the matching and cable attenuation. The maximum antenna gain being computed in paragraph 5.9 of this test report is used to calculate the maximum peak power spectral density.

Spectrum analyser settings:

RBW: 3 kHz, VBW: 10 kHz, Detector: Peak, Sweep time: Auto

FCC ID: KR5FBD5 IC: 7812D-FBD5

5.4.5 Test result

Standard 802.15.1

DUT Frequency (MHz)	Data rate (Mbps)	Frequency (MHz)	PSD (dBm)	Limit Max (dBm)	Result
2402	0.5	2401.842500	0.753	8.0	PASS
2440	0.5	2439.842500	1.070	8.0	PASS
2480	0.5	2479.842500	1.456	8.0	PASS
2402	1	2401.967500	1.918	8.0	PASS
2440	1	2439.967500	2.264	8.0	PASS
2480	1	2479.967500	2.595	8.0	PASS

Power spectral density limit according to FCC Part 15, Section 15.247(e):

Frequency (MHz)	Power spectral density limit (EIRP)
	(dBm/3 kHz)
2400 - 2483.5	8

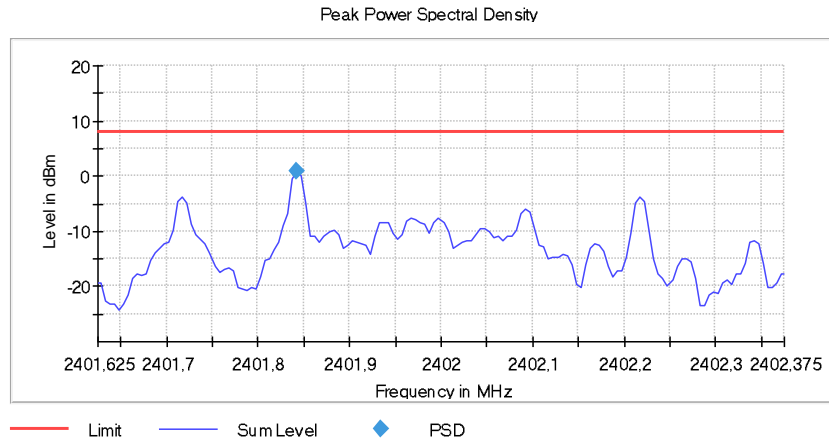
The requirements are **FULFILLED**.

Remarks: For detailed test result please see the following test protocols

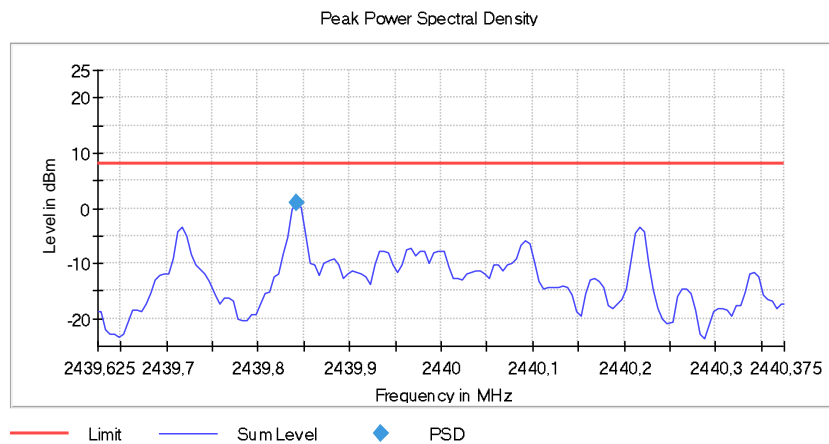
FCC ID: KR5FBD5 IC: 7812D-FBD5

5.4.6 Test protocols

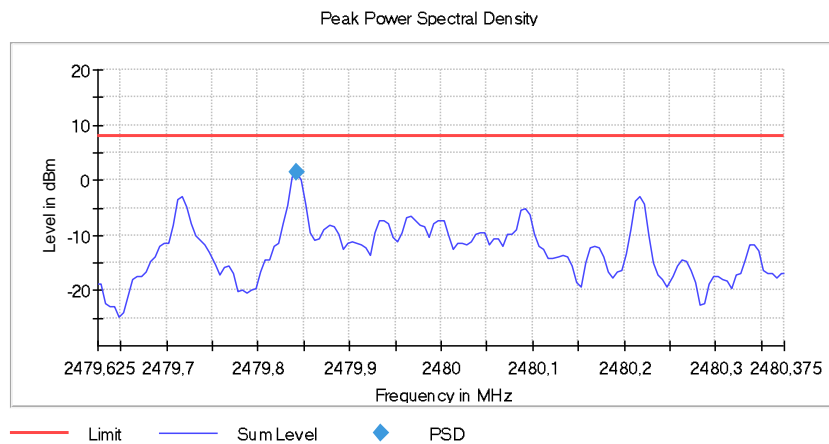
802.15.1, Channel 37 (2402 MHz), 500 kbps



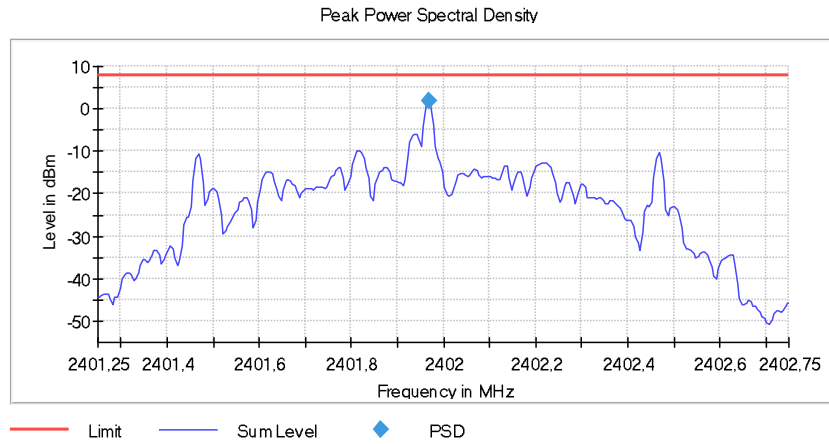
802.15.1, Channel 17 (2440 MHz), 500 kbps



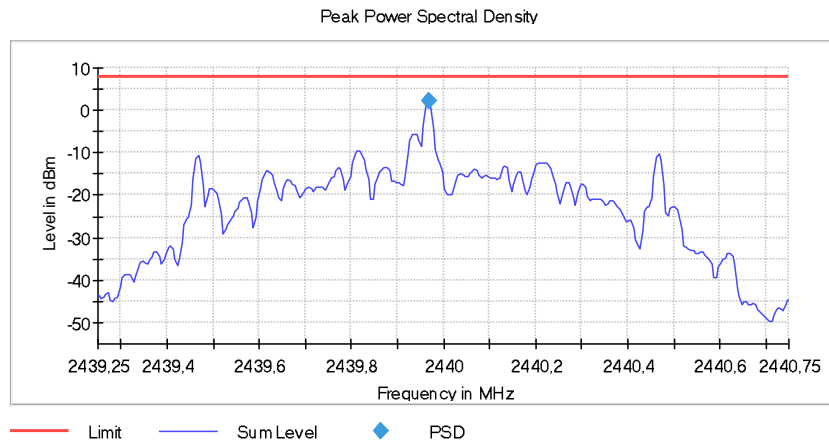
802.15.1, Channel 39 (2480 MHz), 500 kbps



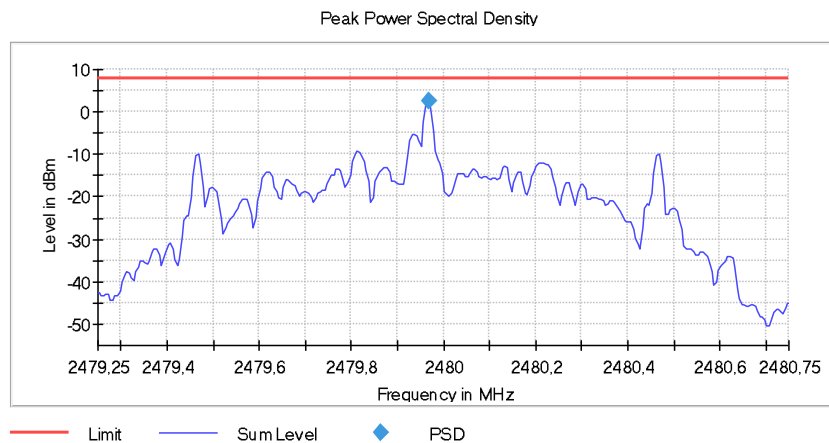
FCC ID: KR5FBD5 IC: 7812D-FBD5
 802.15.1, Channel 37 (2402 MHz), 1Mbps



802.15.1, Channel 17 (2440 MHz), 1Mbps



802.15.1, Channel 39 (2480 MHz), 1Mbps



The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: KR5FBD5 IC: 7812D-FBD5

5.5 Radiated emissions in restricted bands

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

5.5.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1
Test distance: 3 m

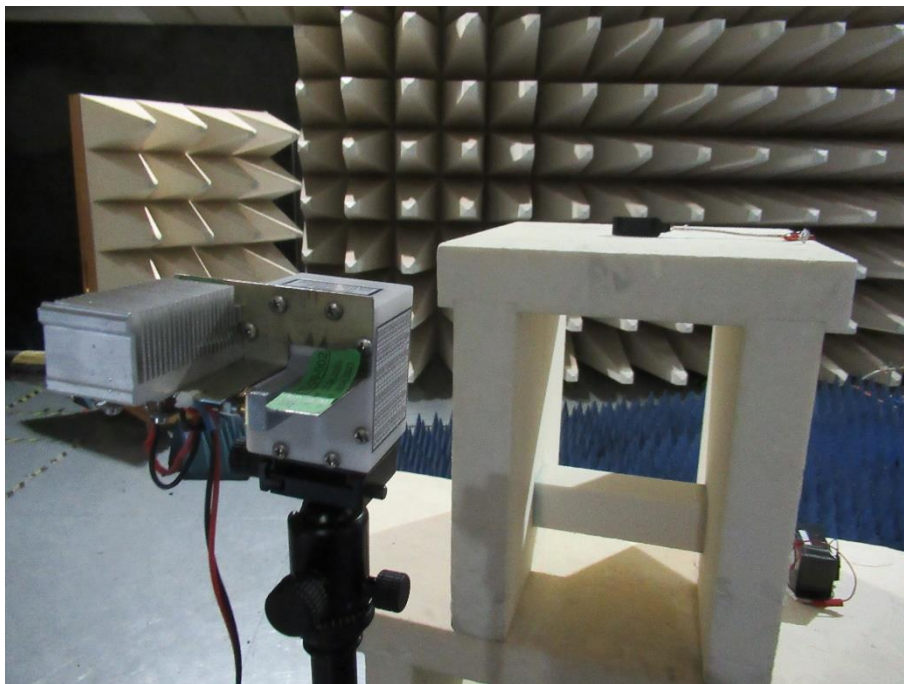
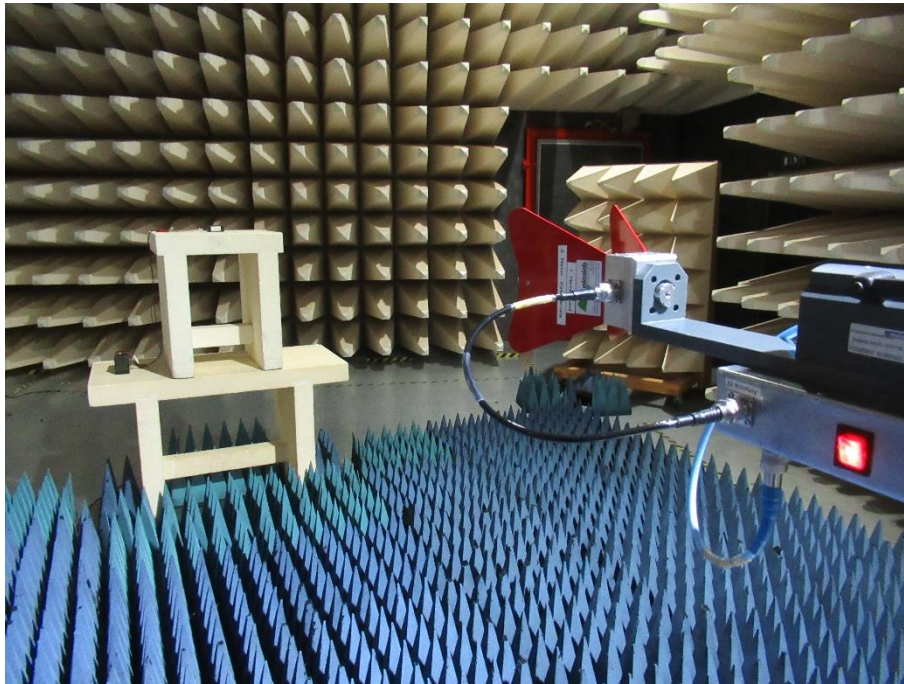
5.5.2 Photo documentation of the test set-up

Open area test site



FCC ID: KR5FBD5 IC: 7812D-FBD5

Anechoic chamber



According to FCC Part 15, Section 15.205(a):

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

FCC ID: KR5FBD5 IC: 7812D-FBD5

5.5.3 Description of Measurement

The restricted bands are measured radiated. The span of the spectrum analyser is set wide enough to capture the restricted band and measure the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The restricted bands are measured falling emissions into it and the nearest restricted band are checked for emissions also the restricted band for the harmonics of the carrier.

Test receiver settings for SER2:

RBW: 120 MHz, Detector: Quasi peak, Mes. Time: 1 s,

Spectrum analyser settings for SER3:

RBW: 1 MHz, VBW: 3 MHz, Detector: Max. peak, Trace: Max. hold, Sweep: Auto

5.5.4 Test result

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	($\mu\text{V}/\text{m}$)	$\text{dB}(\mu\text{V}/\text{m})$	
0.009-0.490	2400/F (kHz)		300
0.490-1.705	24000/F (kHz)		30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

FCC ID: KR5FBD5 IC: 7812D-FBD5

RSS-Gen, Table 6 – Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	12.57675 - 12.57725	399.9 - 410	7.250 - 7.750
0.495 - 0.505	13.36 - 13.41	608 - 614	8.025 – 8.500
2.1735 - 2.1905	16.42 - 16.423	960 - 1427	9.0 - 9.2
3.020 - 3.026	16.69475 - 16.69525	1435 - 1626.5	9.3 - 9.5
4.125 - 4.128	16.80425 - 16.80475	1645.5 - 1646.5	10.6 - 12.7
4.17725 - 4.17775	25.5 - 25.67	1660 - 1710	13.25 - 13.4
4.20725 - 4.20775	37.5 - 38.25	1718.8 - 1722.2	14.47 - 14.5
5.677 - 5.683	73 - 74.6	2200 - 2300	15.35 - 16.2
6.215 - 6.218	74.8 - 75.2	2310 - 2390	17.7 - 21.4
6.26775 - 6.26825	108 – 138	2483.5 - 2500	22.01 - 23.12
6.31175 - 6.31225	149.9 - 150.05	2655 - 2900	23.6 - 24.0
8.291 - 8.294	156.52475 - 156.52525	3260 – 3267	31.2 - 31.8
8.362 - 8.366	156.7 - 156.9	3332 - 3339	36.43 - 36.5
8.37625 - 8.38675	162.0125 - 167.17	3345.8 - 3358	Above 38.6
8.41425 - 8.41475	167.72 - 173.2	3500 - 4400	
12.29 - 12.293	240 – 285	4500 - 5150	
12.51975 - 12.52025	322 - 335.4	5350 - 5460	

The requirements are **FULFILLED**.

Remarks: The measurement was performed up to the 10th harmonic. For detailed test results please see the following test protocols.

5.5.5 Test protocols

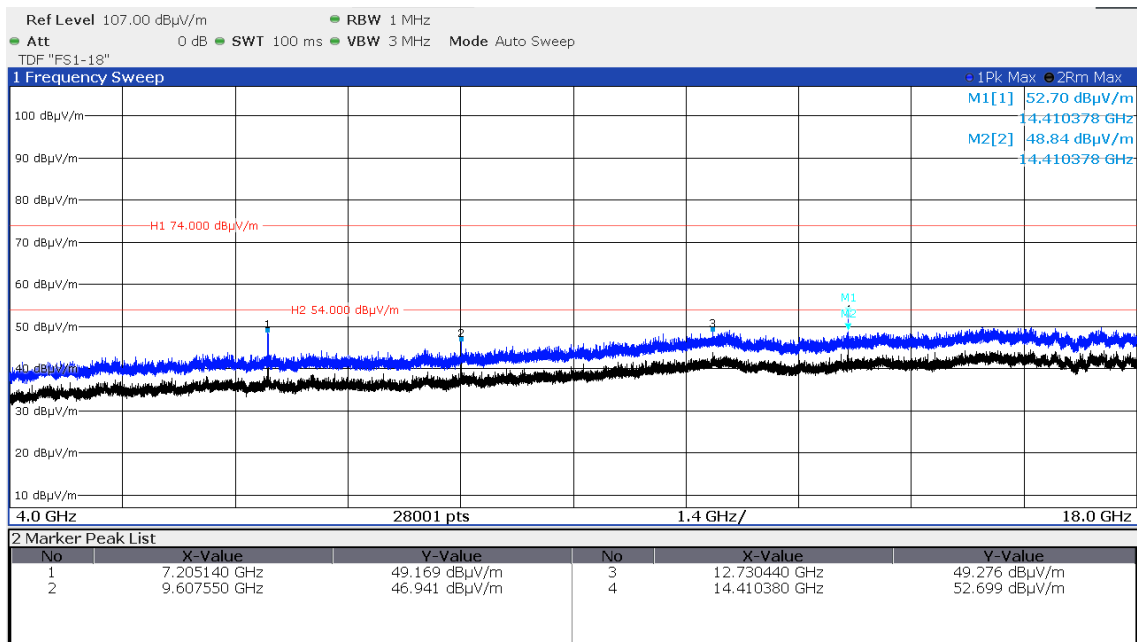
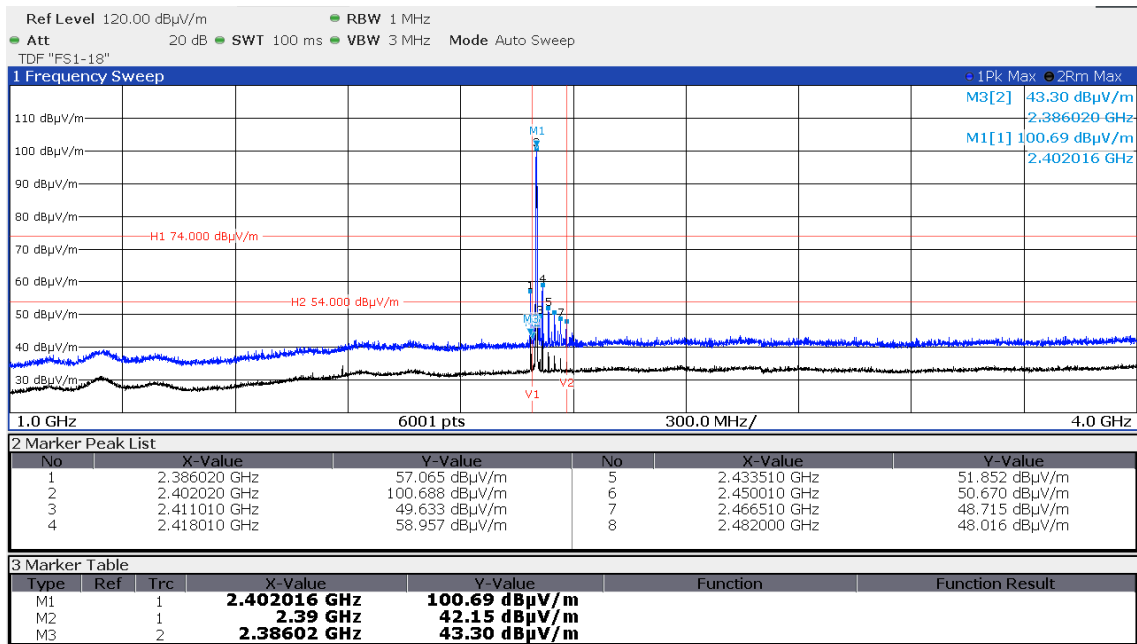
f < 1GHz

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)
77.10	0.6	3.8	11.9	11.5	12.5	15.3	40.0	-24.7
200.00	7.1	7.2	11.3	12.0	18.4	19.2	43.5	-24.3
400.00	-2.5	-2.6	19.8	19.6	17.3	17.0	46.0	-28.7
600.00	-2.1	-1.0	25.5	25.3	23.4	24.3	46.0	-21.7
825.00	-1.7	-1.8	29.9	29.4	28.2	27.6	46.0	-17.8

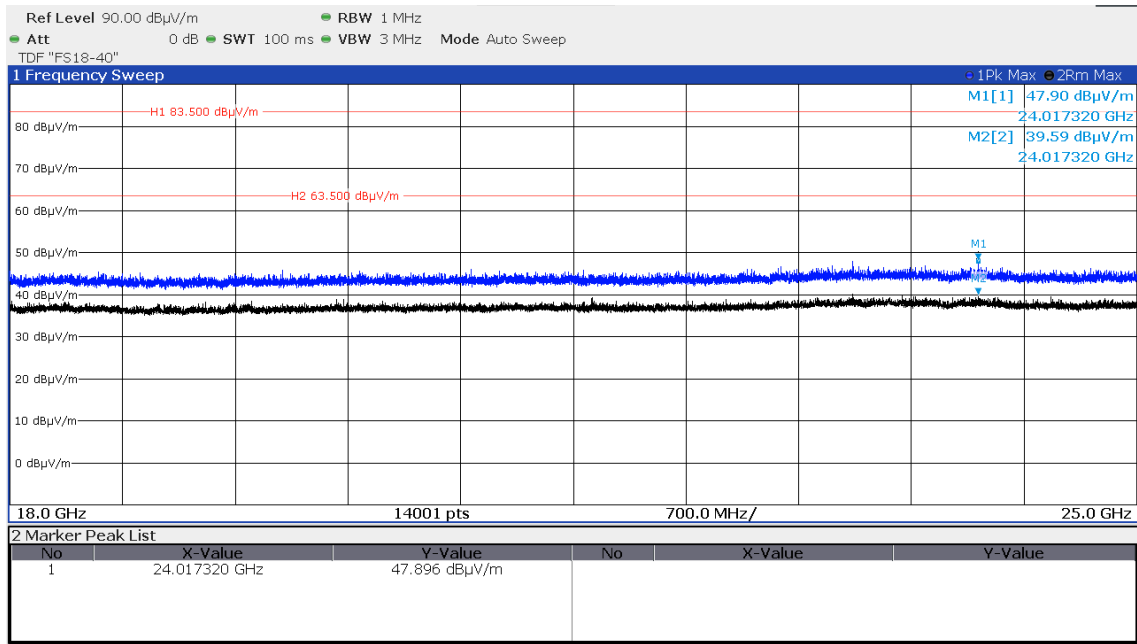
Note: No emissions above the noise level are detected. The measurement is independent of channel and data transmission rate.

f > 1GHz

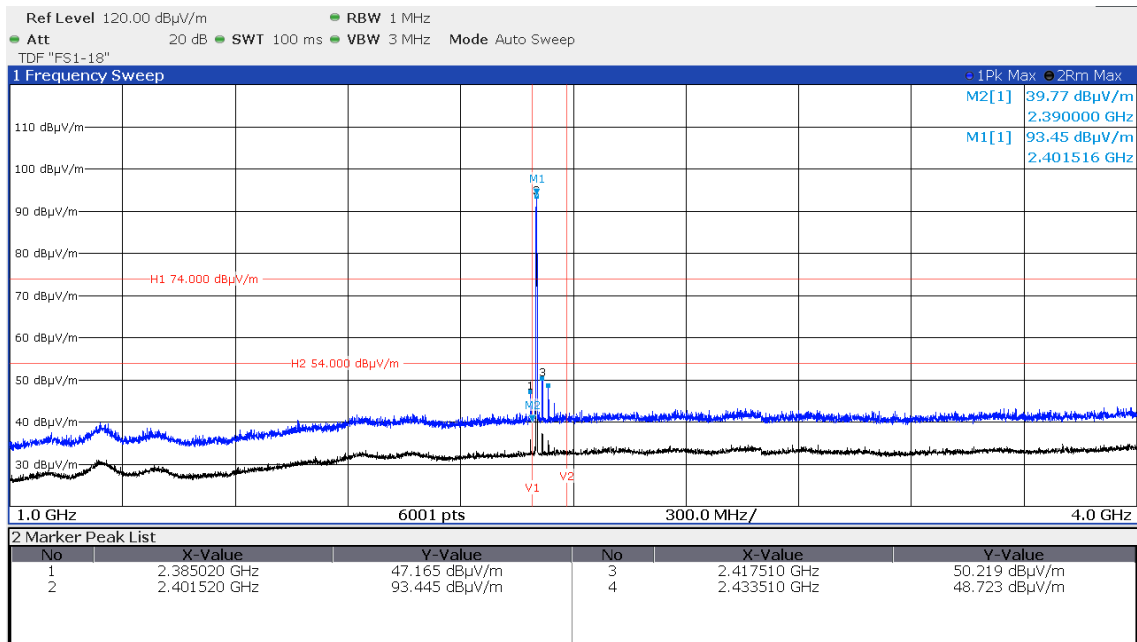
CH37 500kbps horizontal



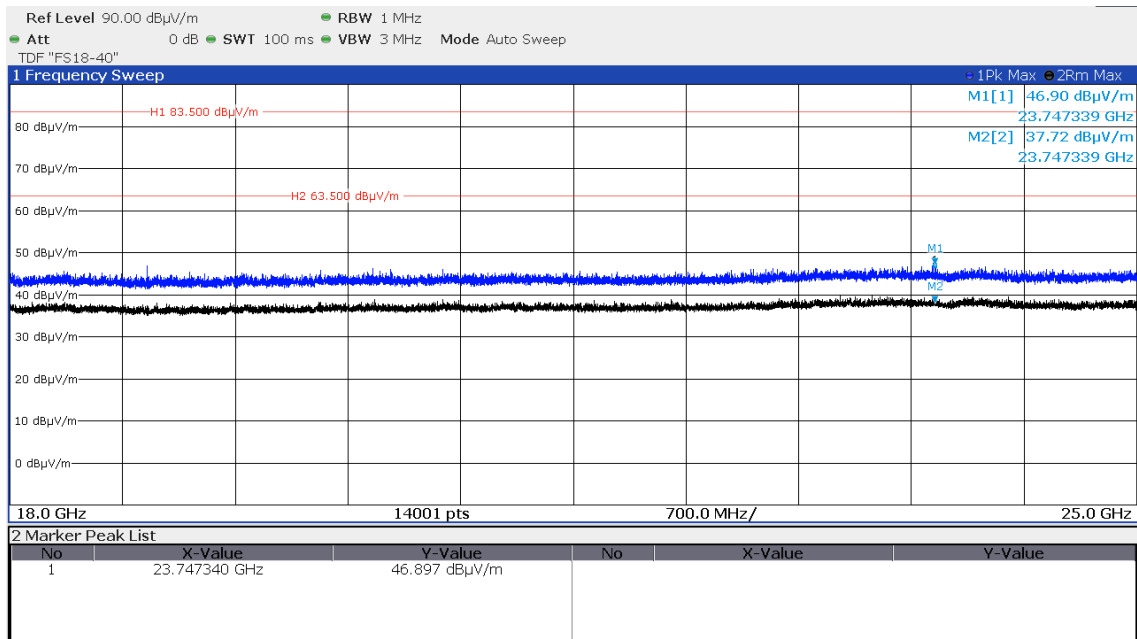
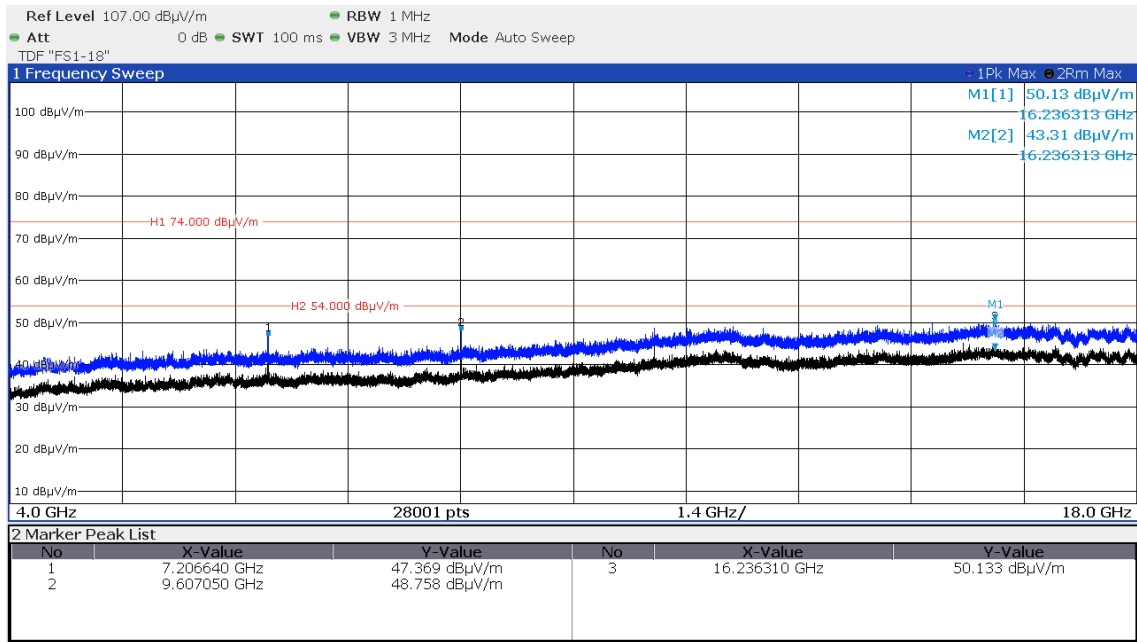
FCC ID: KR5FBD5 IC: 7812D-FBD5



CH37 500kpbs vertical

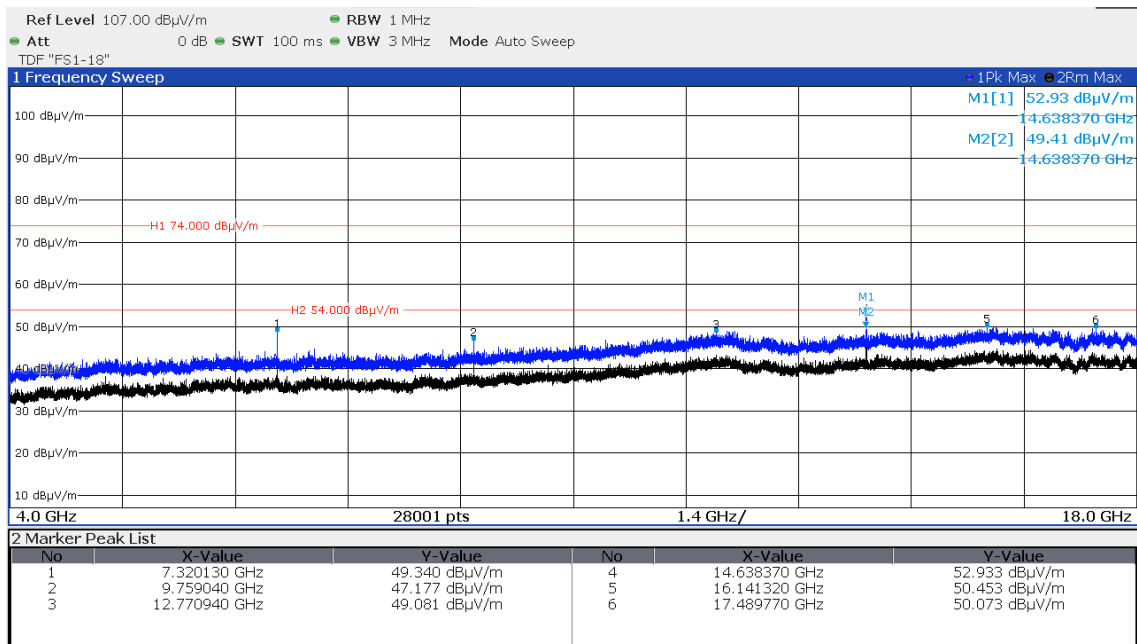
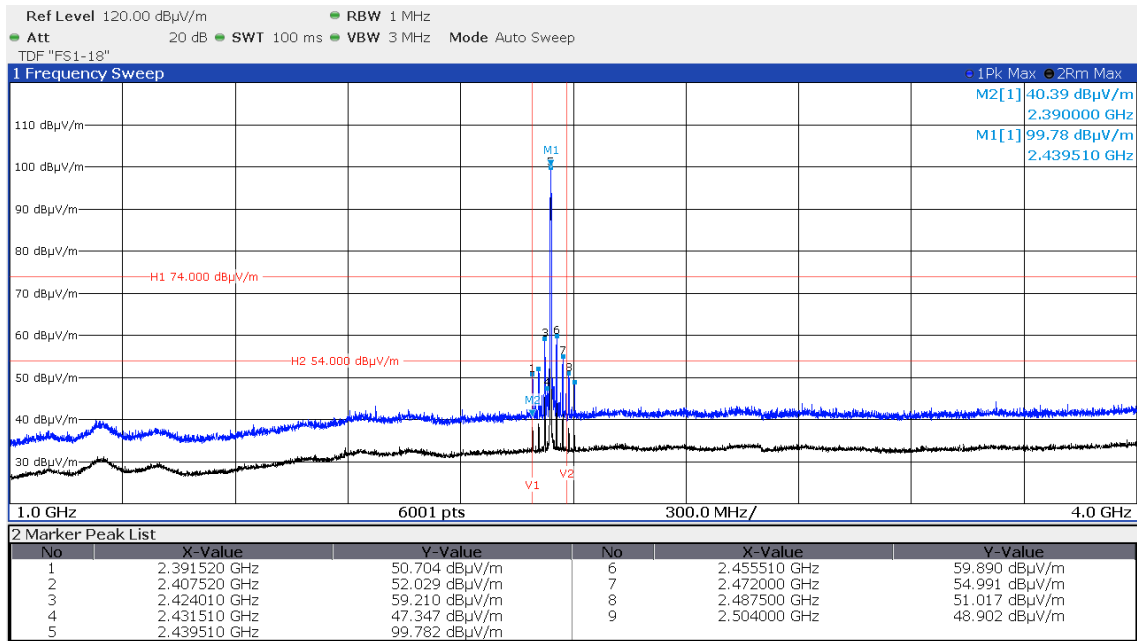


FCC ID: KR5FBD5 IC: 7812D-FBD5

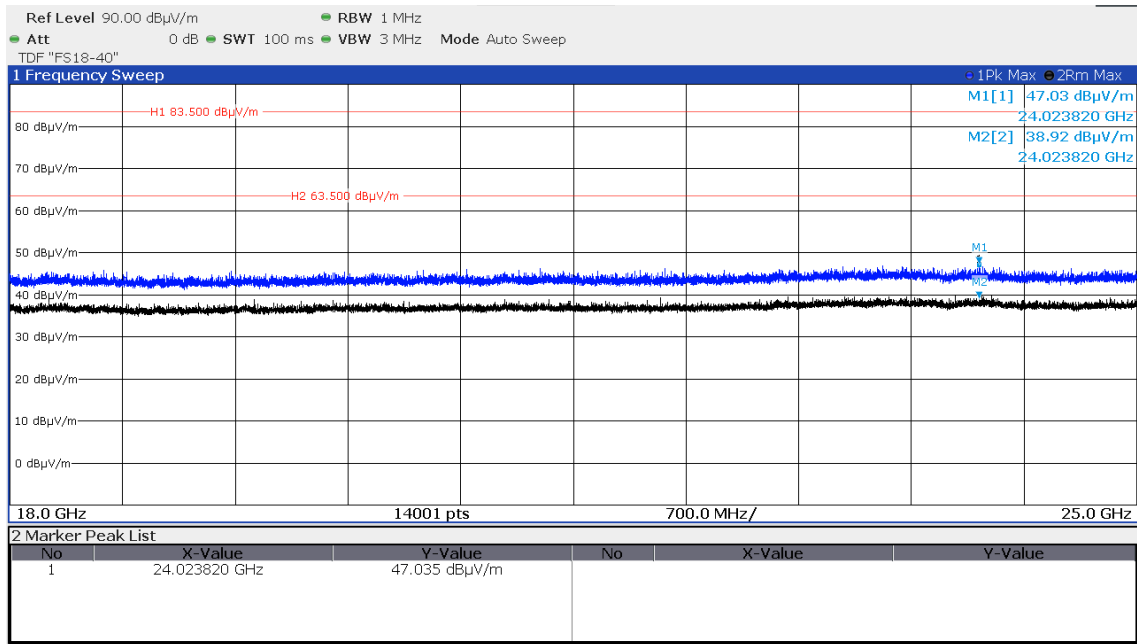


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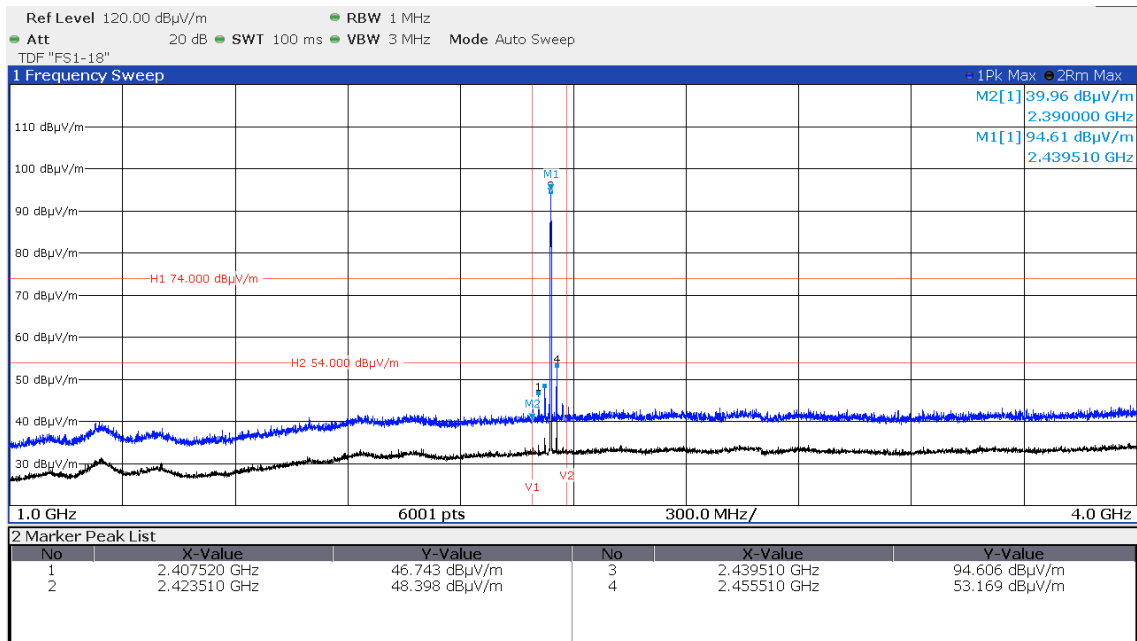
CH17 500kpbs horizontal



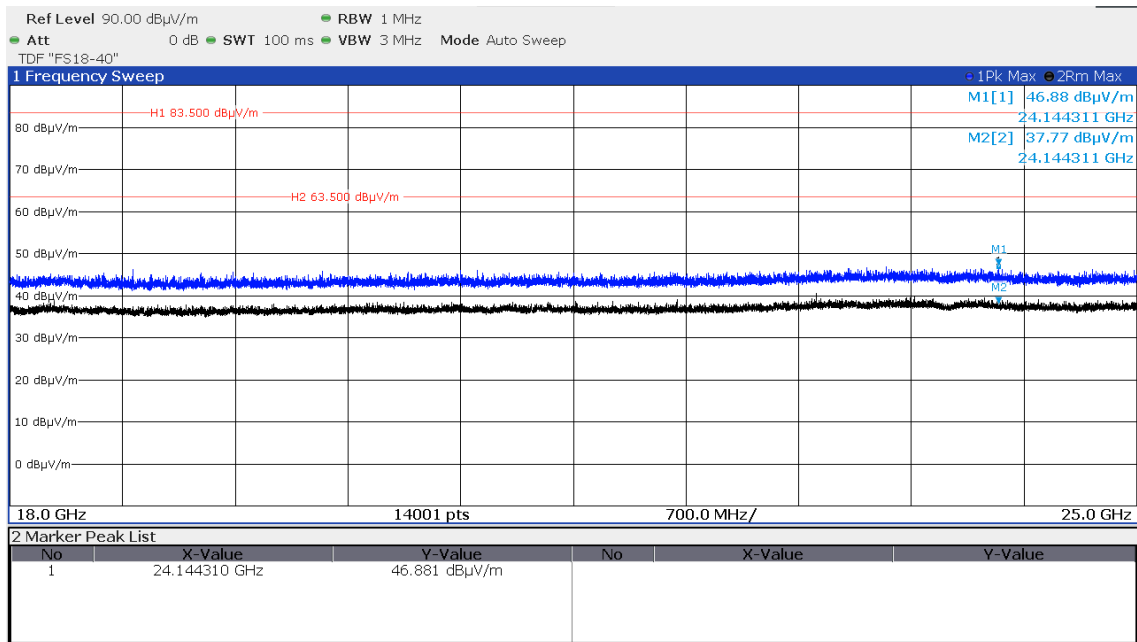
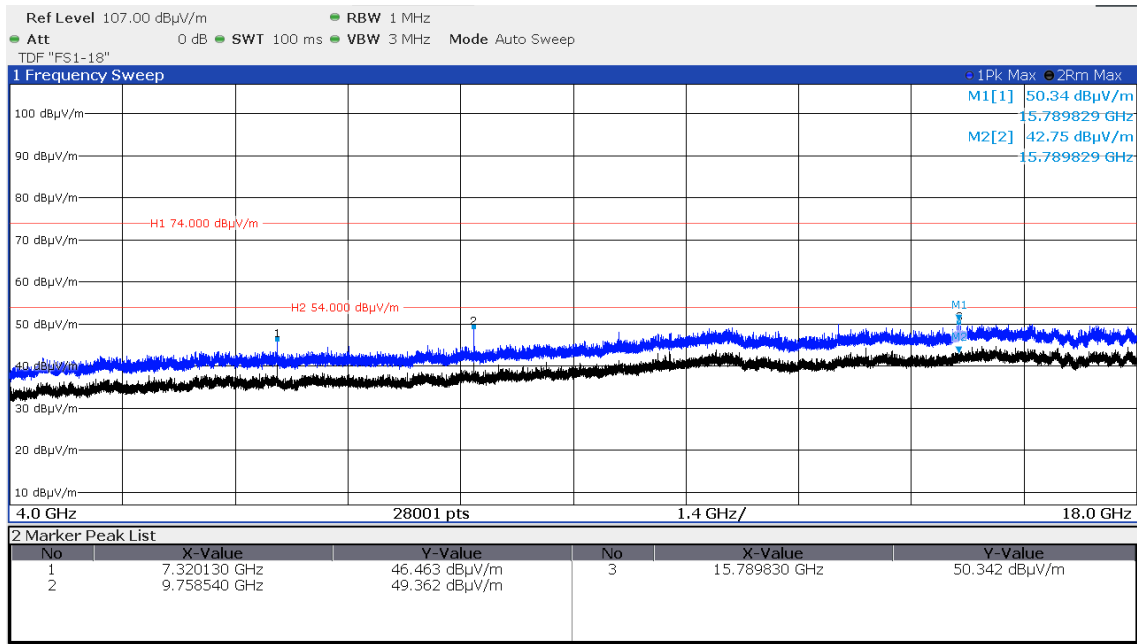
FCC ID: KR5FBD5 IC: 7812D-FBD5



CH17 500kpbs vertical

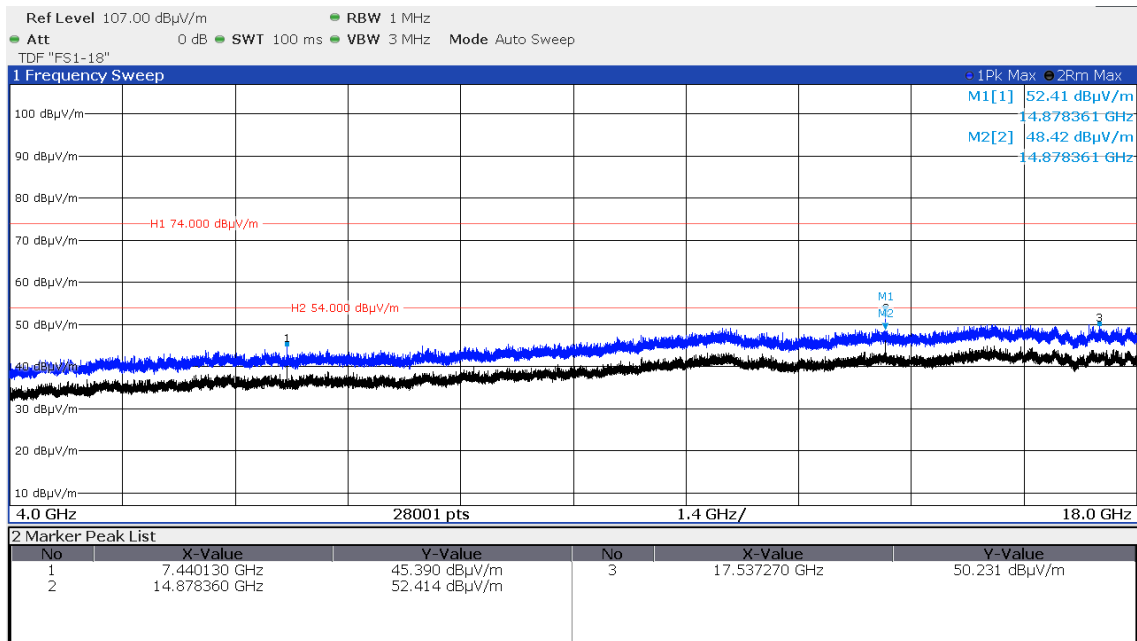
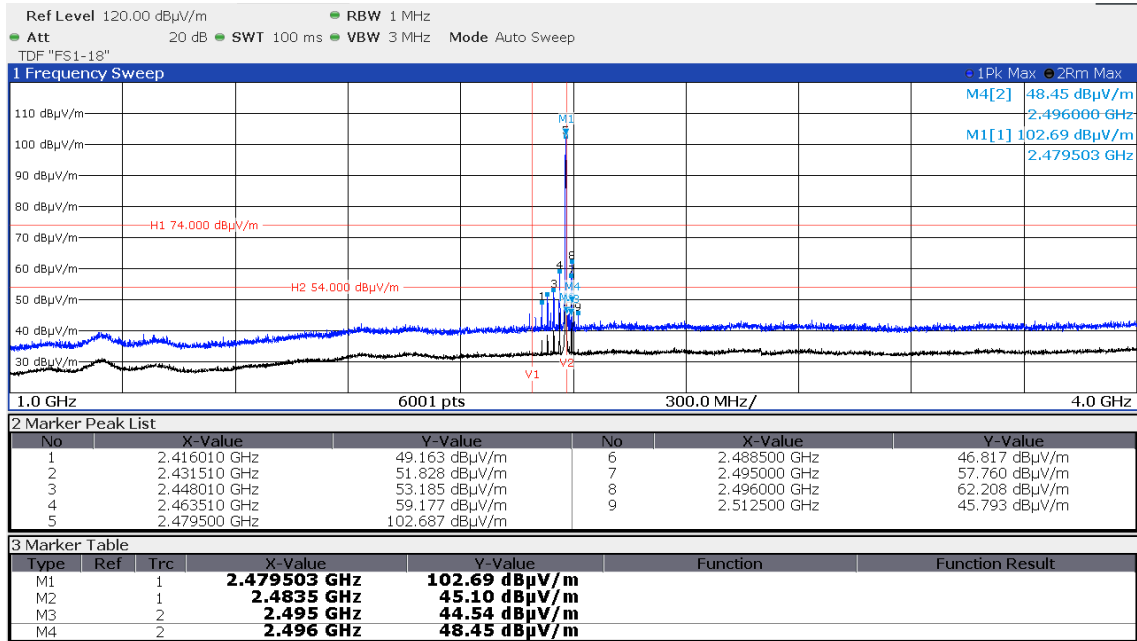


FCC ID: KR5FBD5 IC: 7812D-FBD5

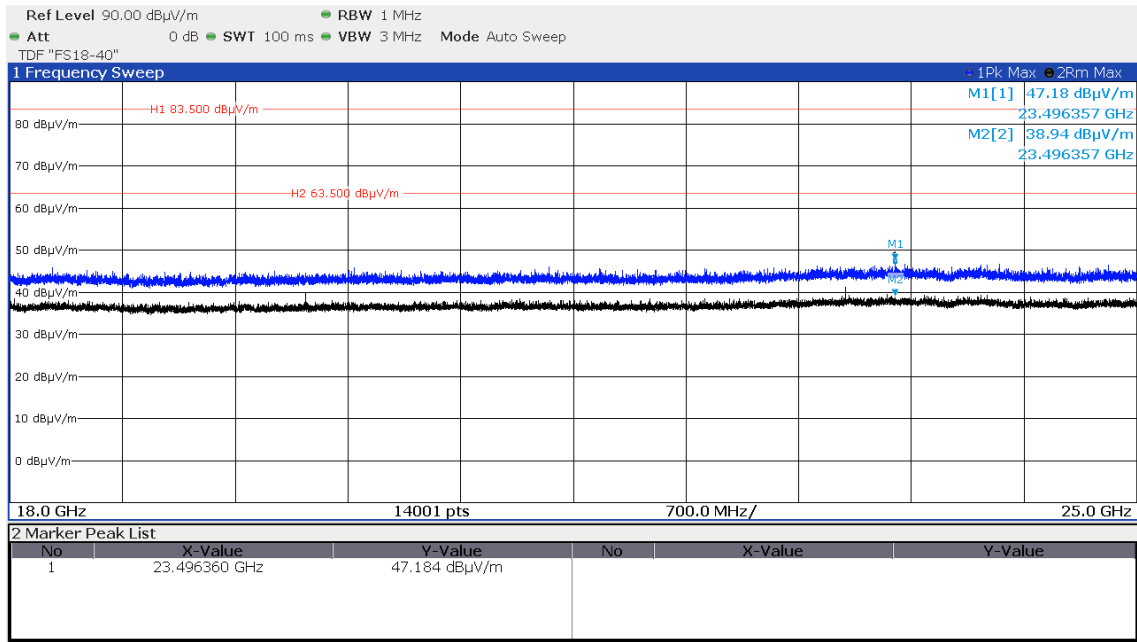


FCC ID: KR5FBD5 IC: 7812D-FBD5

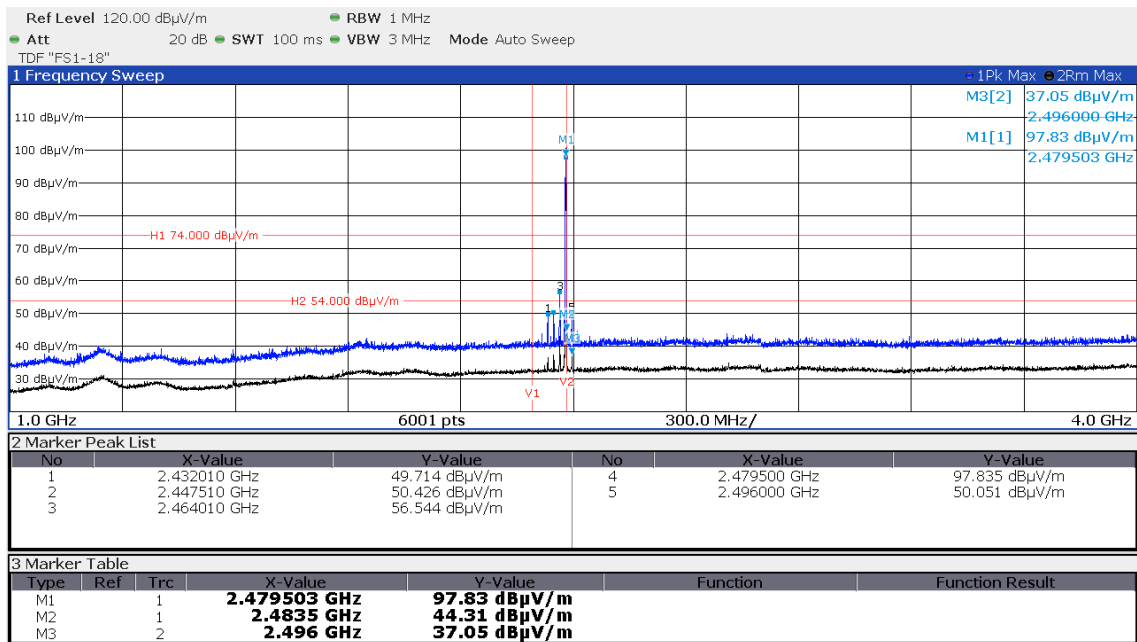
CH39 500kpbs horizontal



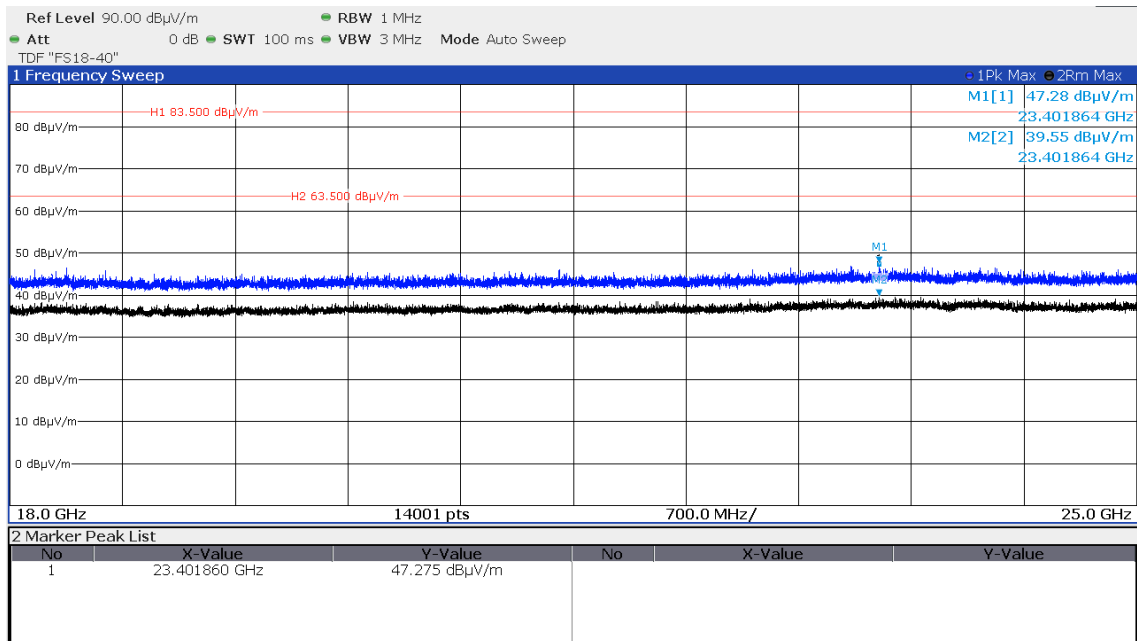
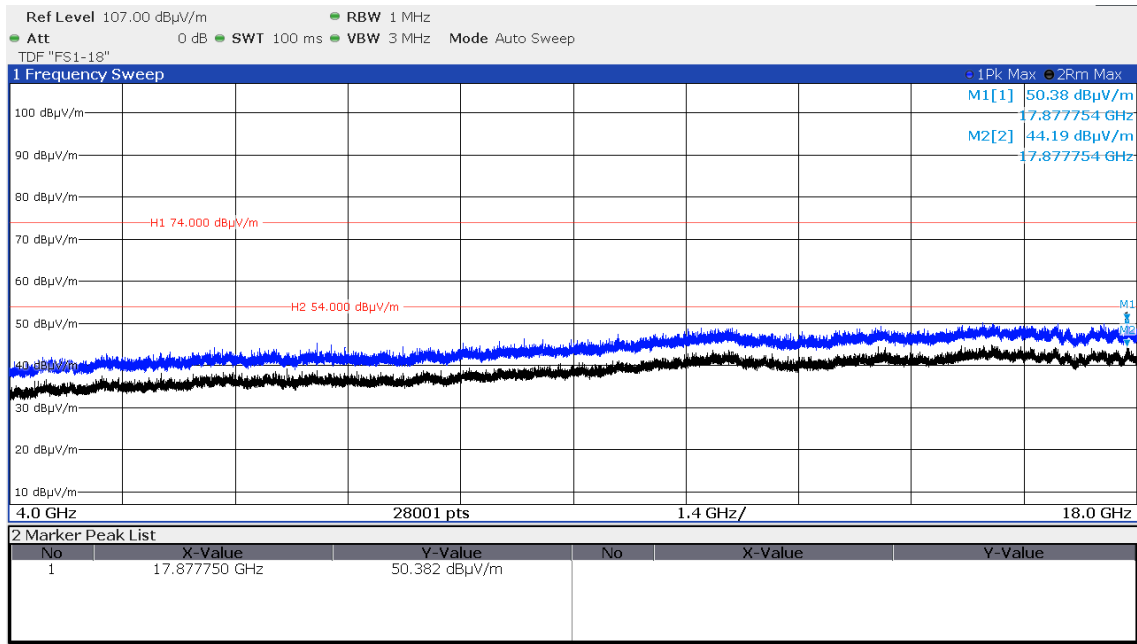
FCC ID: KR5FBD5 IC: 7812D-FBD5



CH39 500kpbs vertical

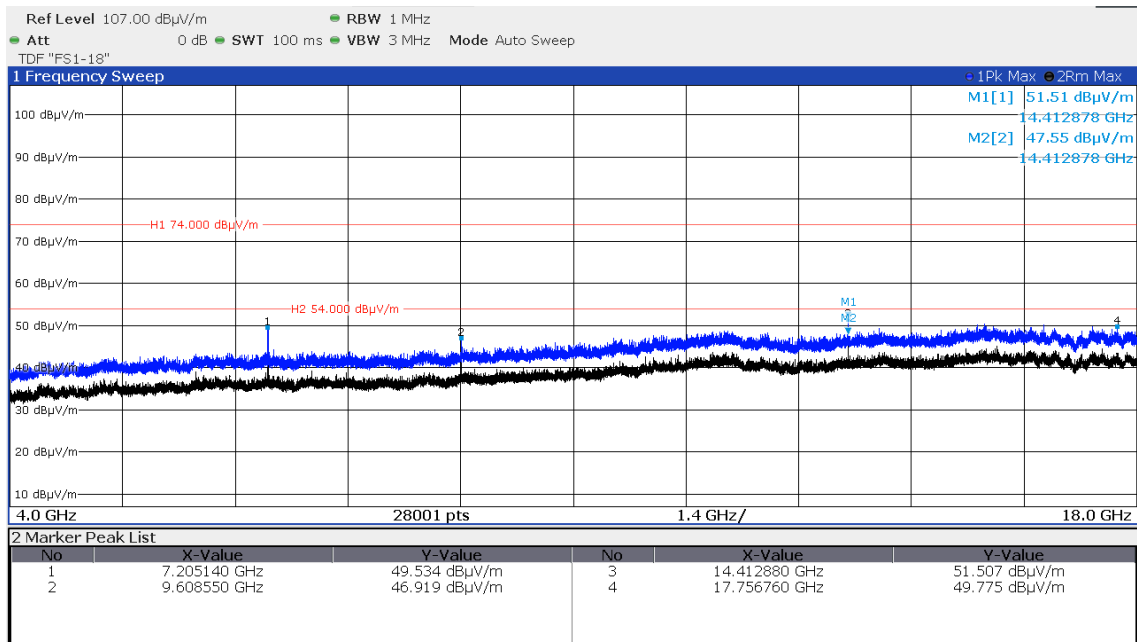
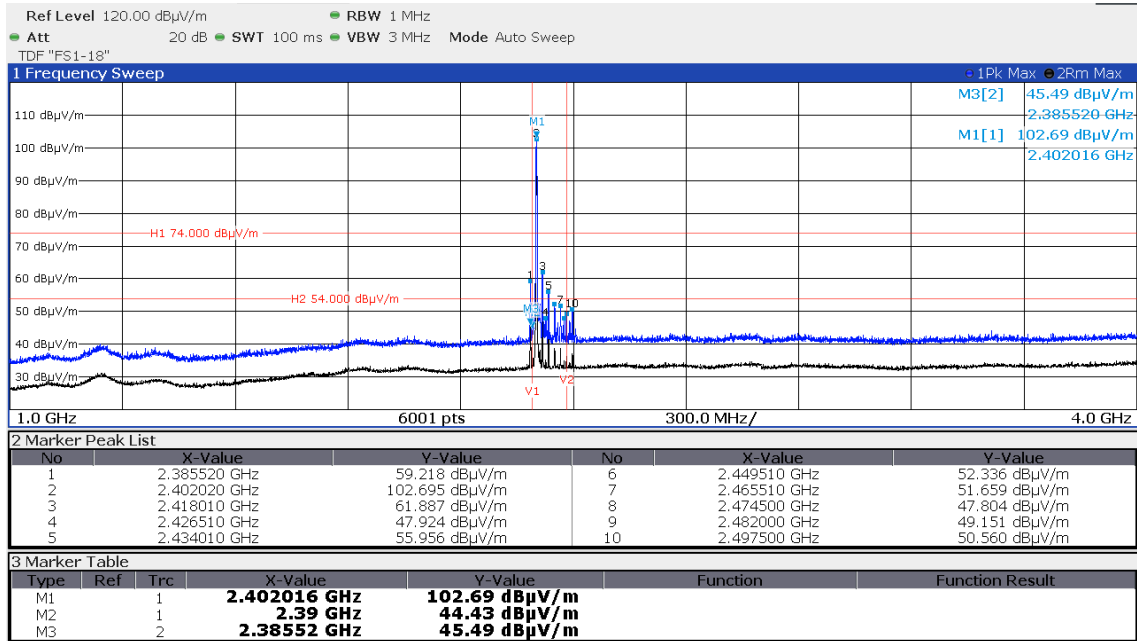


FCC ID: KR5FBD5 IC: 7812D-FBD5

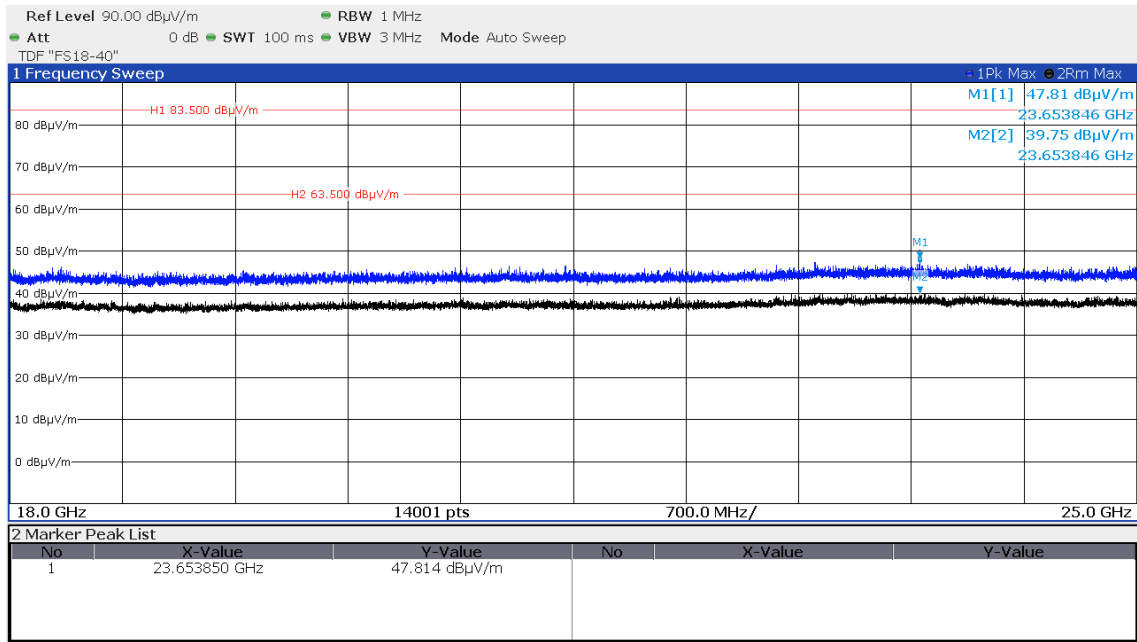


FCC ID: KR5FBD5 IC: 7812D-FBD5

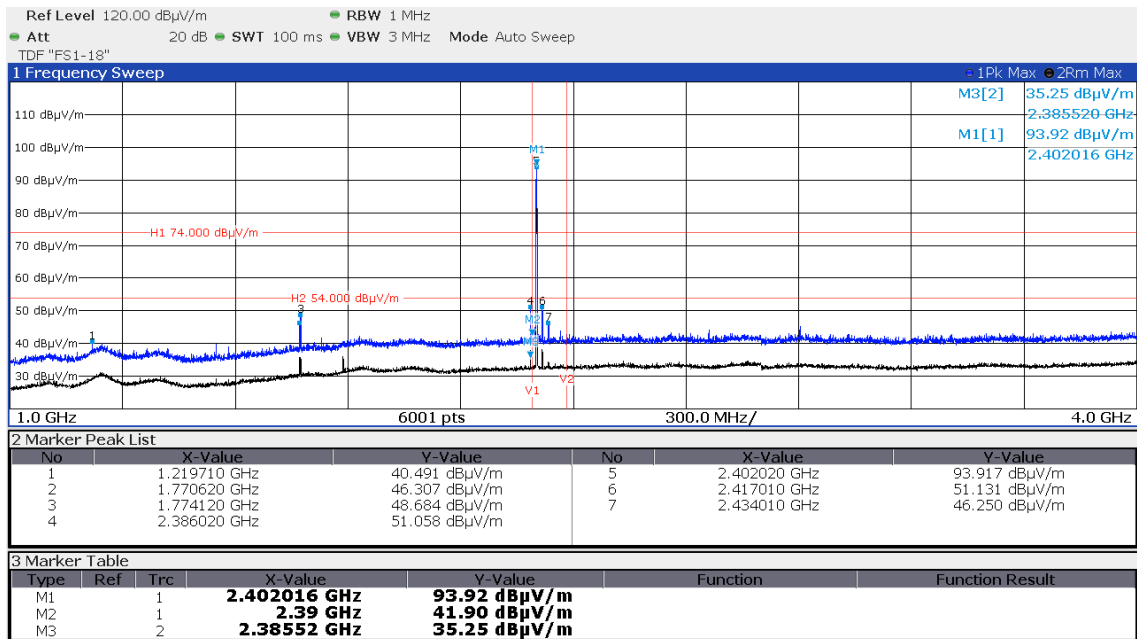
CH37 1Mbps horizontal



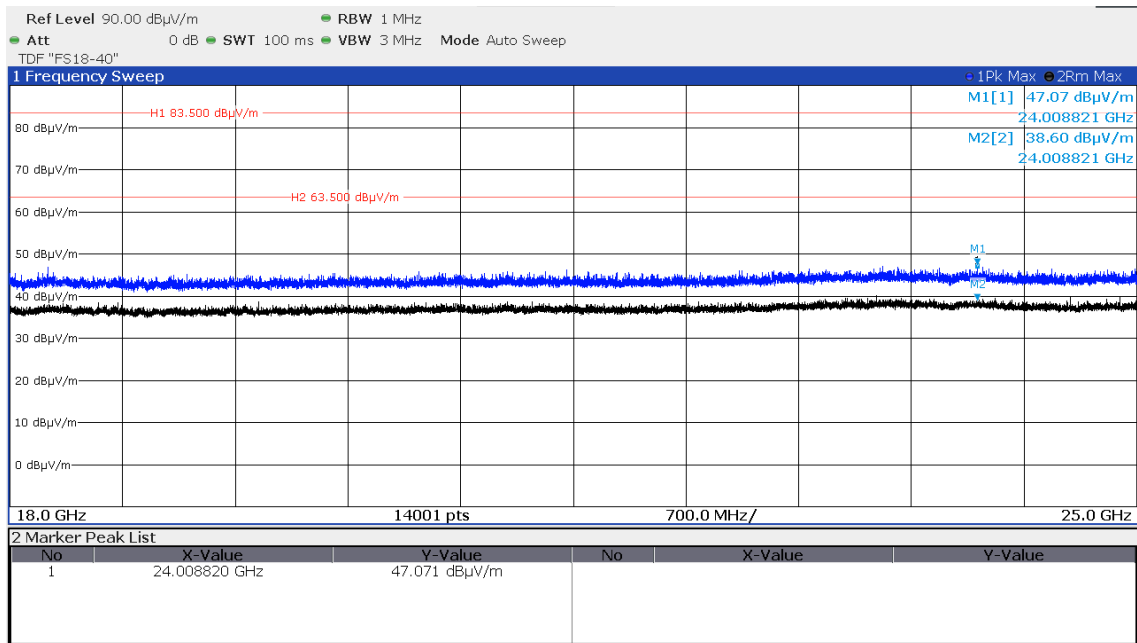
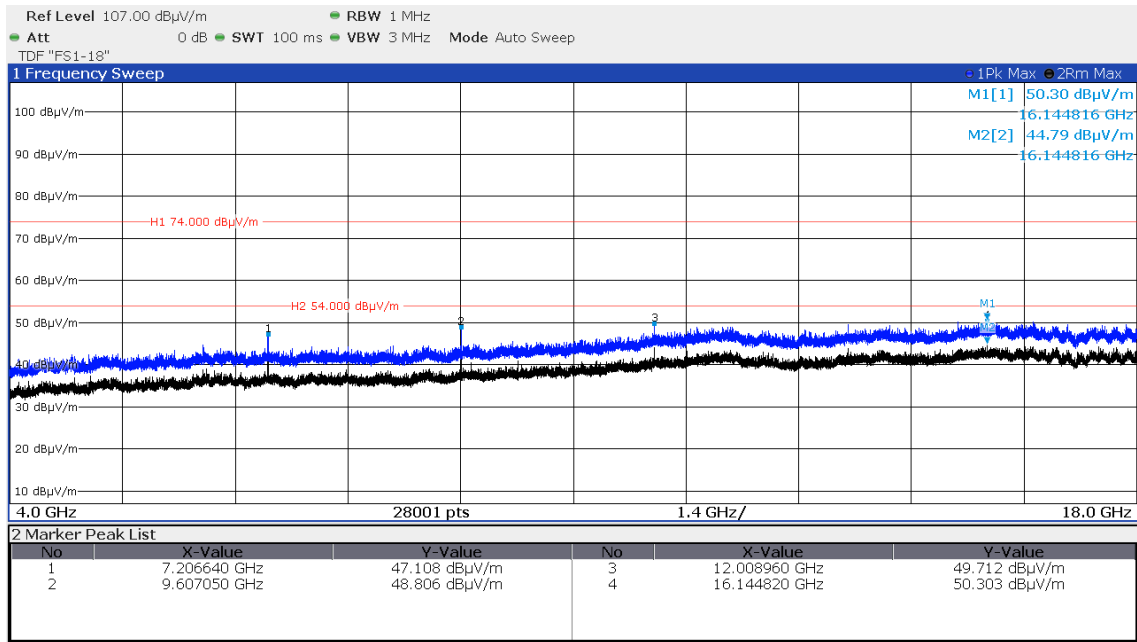
FCC ID: KR5FBD5 IC: 7812D-FBD5



CH37 1Mbps vertical

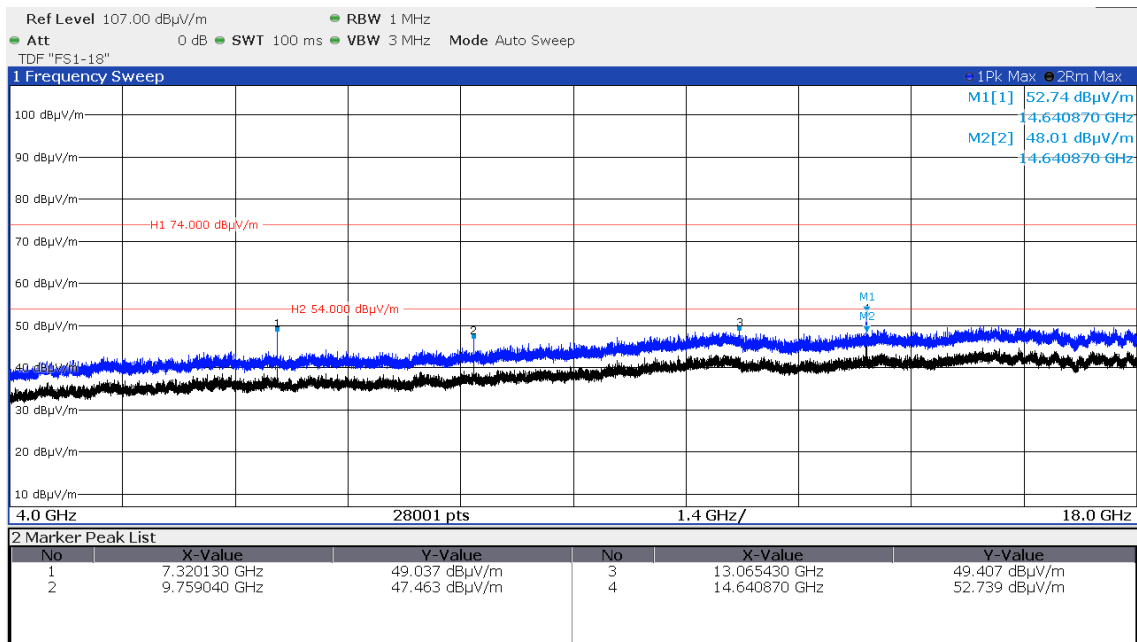
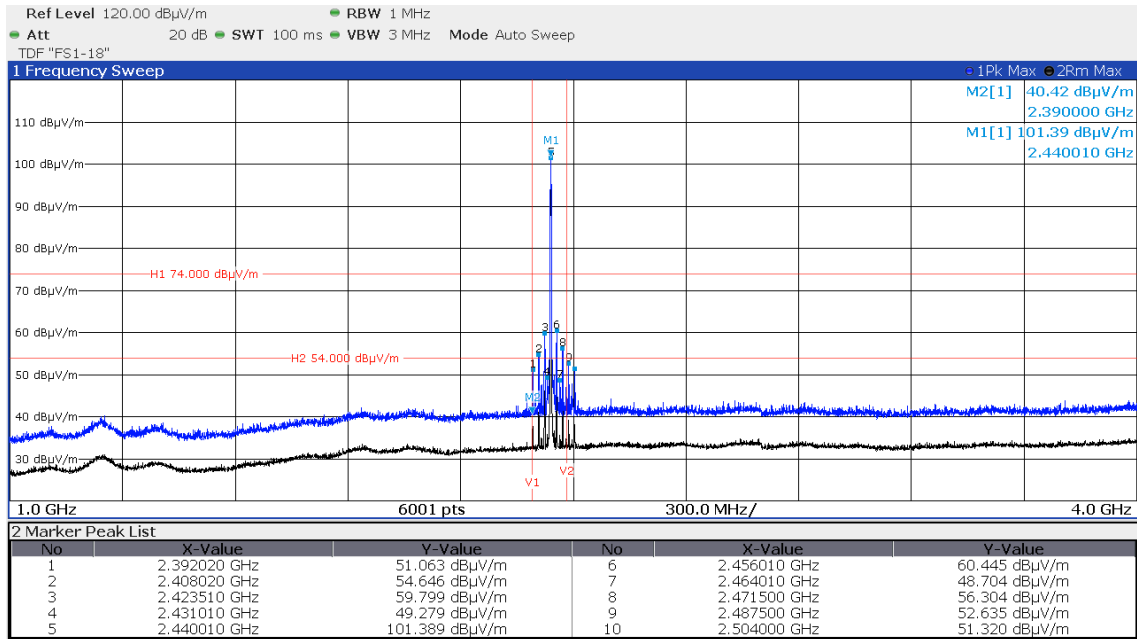


FCC ID: KR5FBD5 IC: 7812D-FBD5

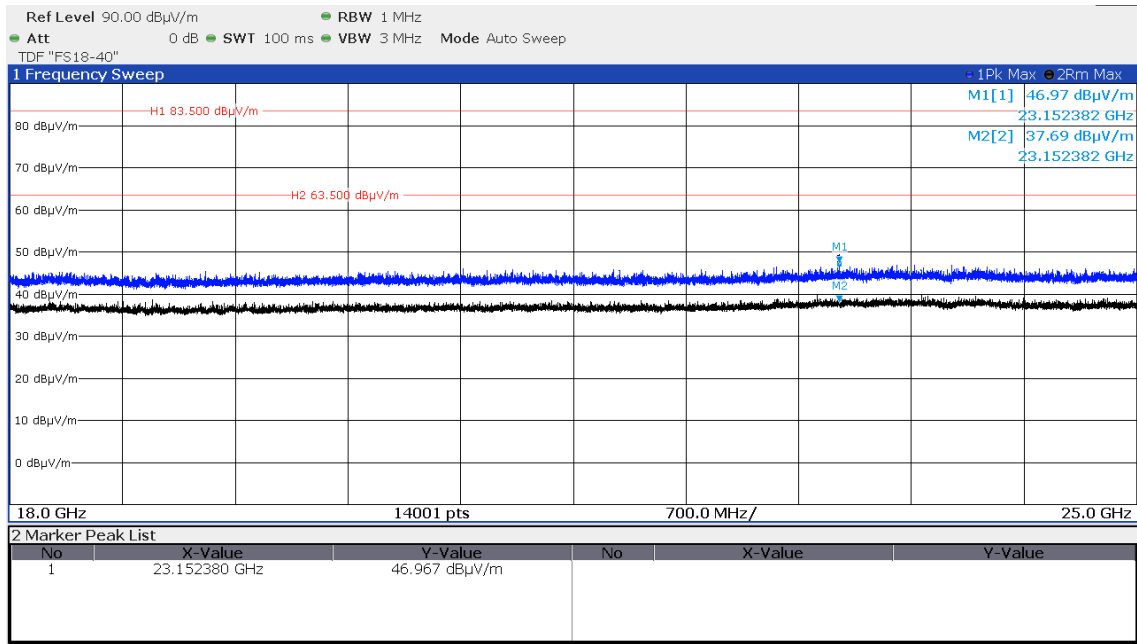


FCC ID: KR5FBD5 IC: 7812D-FBD5

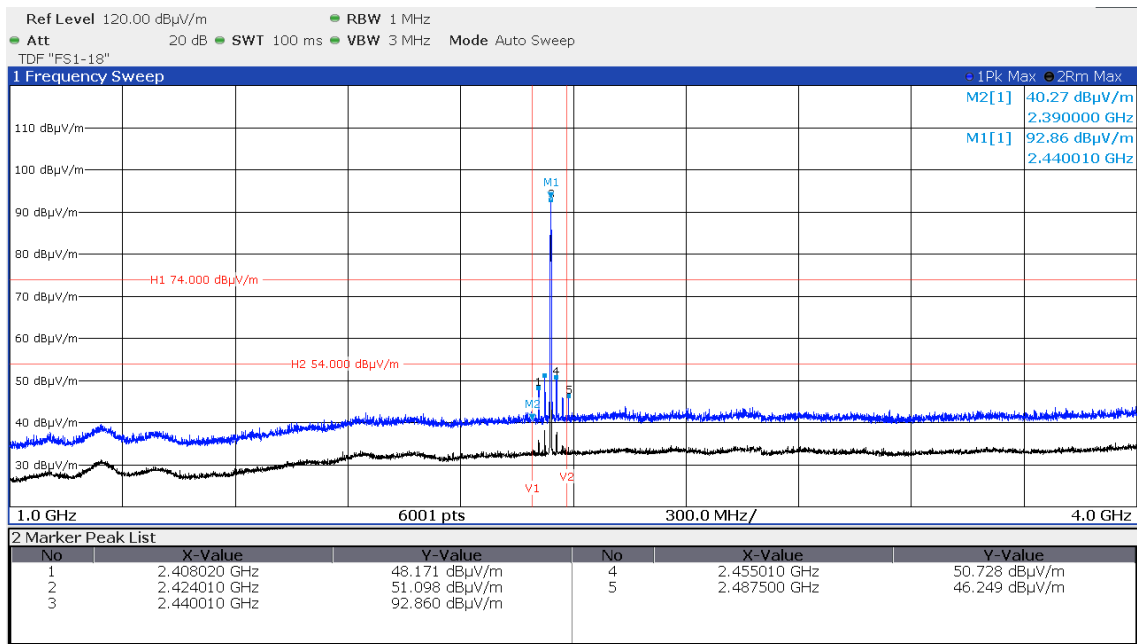
CH17 1Mbps horizontal



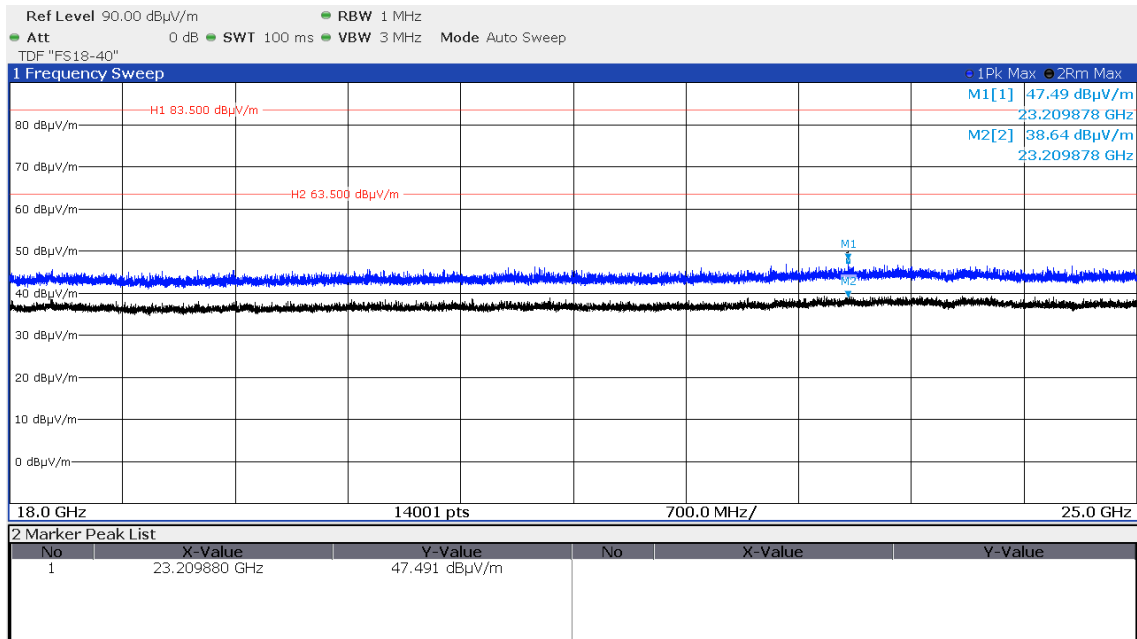
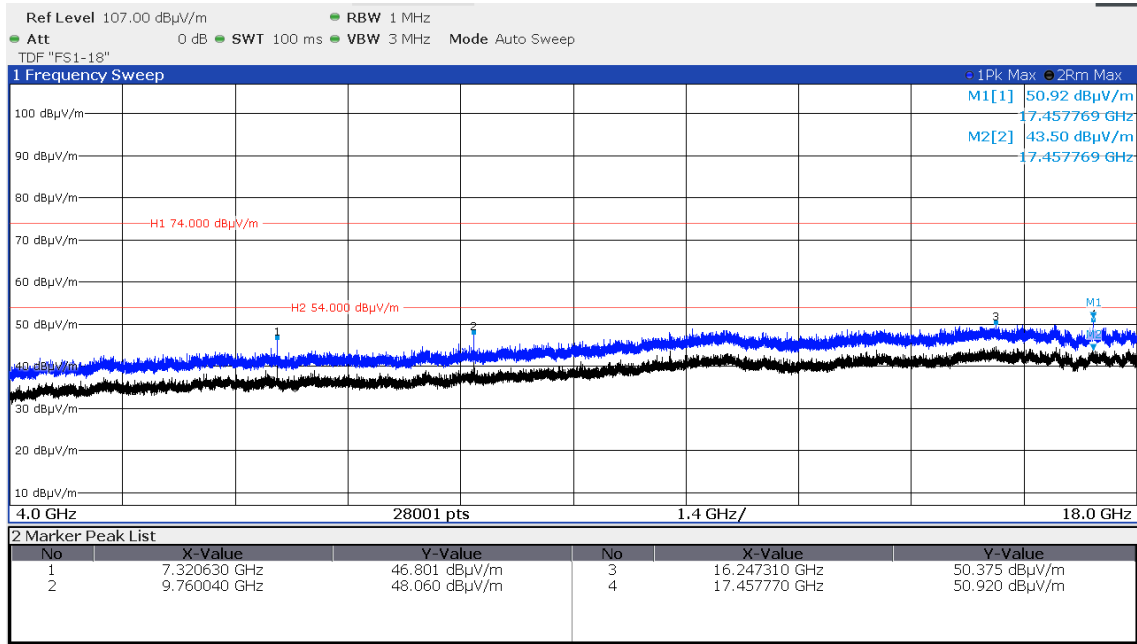
FCC ID: KR5FBD5 IC: 7812D-FBD5



CH17 1Mbps vertical

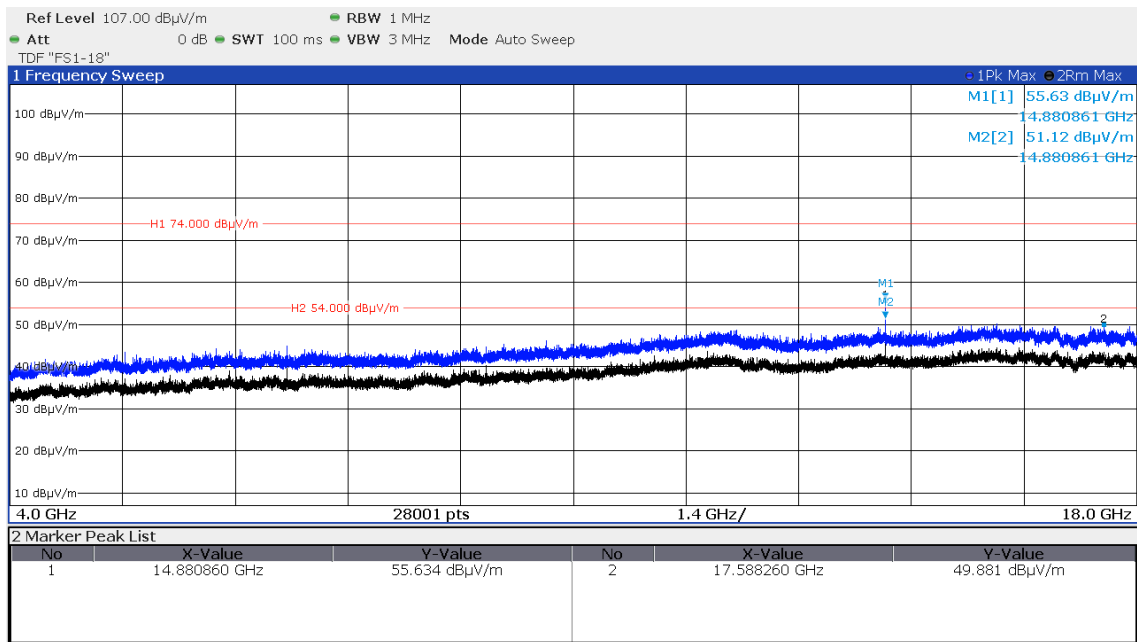
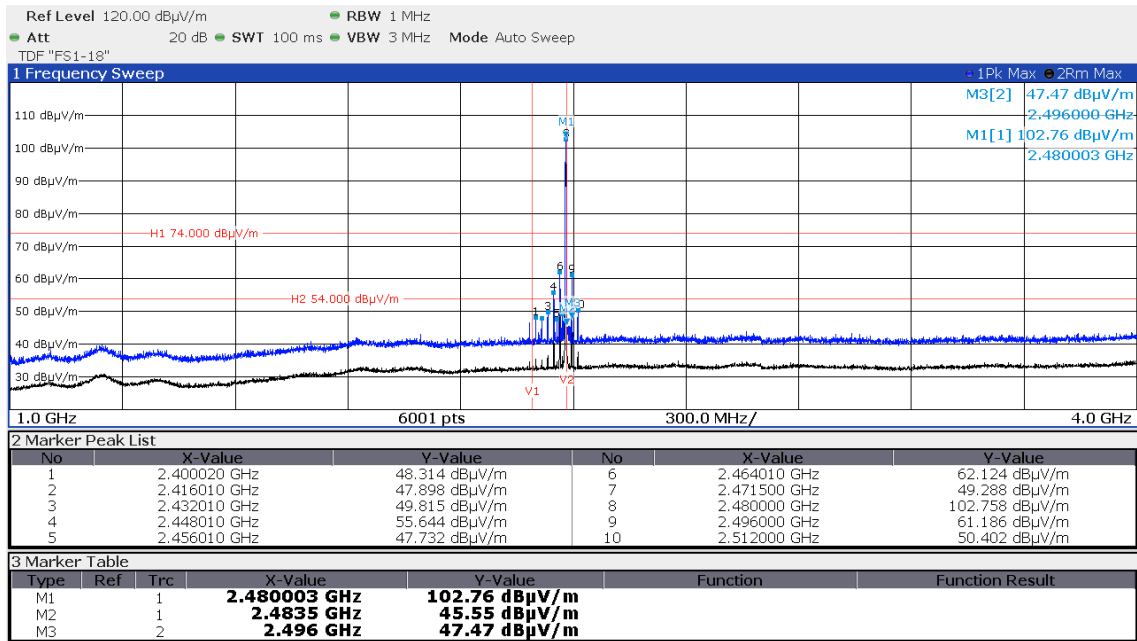


FCC ID: KR5FBD5 IC: 7812D-FBD5

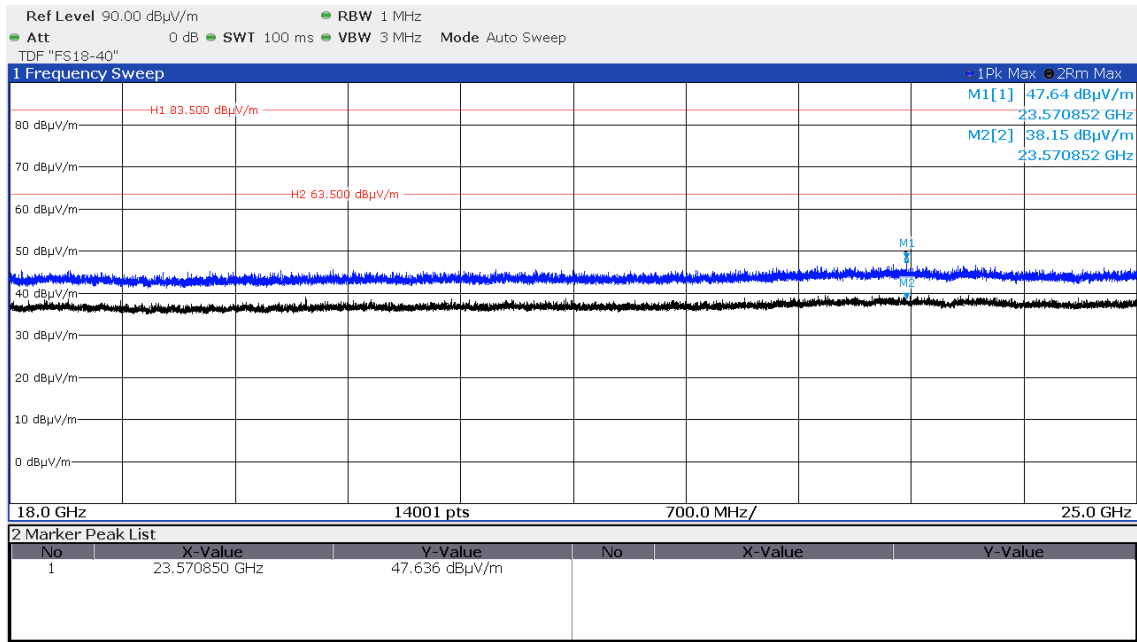


FCC ID: KR5FBD5 IC: 7812D-FBD5

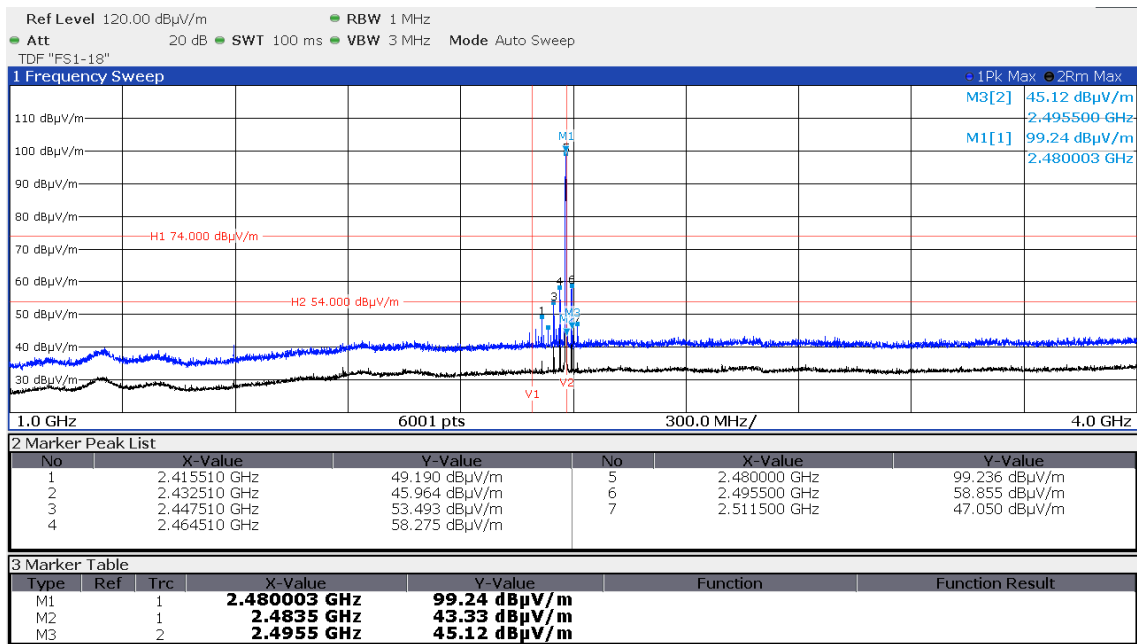
CH39 1Mbps horizontal



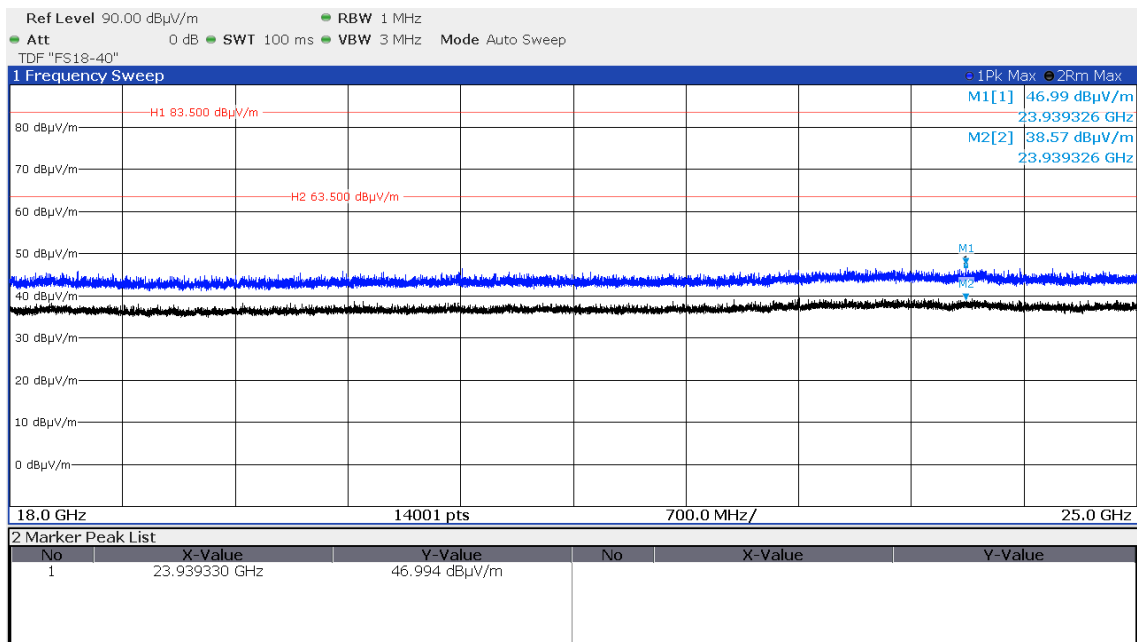
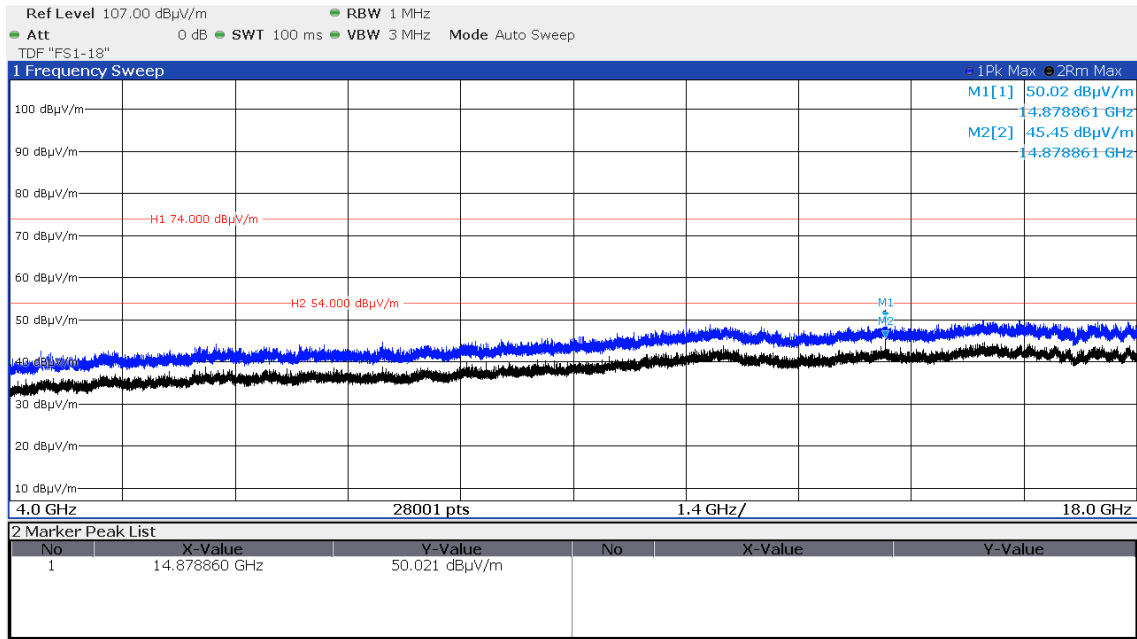
FCC ID: KR5FBD5 IC: 7812D-FBD5



CH39 1Mbps vertical



FCC ID: KR5FBD5 IC: 7812D-FBD5



FCC ID: KR5FBD5 IC: 7812D-FBD5

5.6 Spurious emissions – lower band edge compliance

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

5.6.1 Description of the test location

Test location: Shielded Room S6
 Test distance: -

5.6.2 Applicable standard

According to FCC Part 15, Section 15.247(d):
 In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.50 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.6.3 Description of Measurement

The conducted power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.10. If the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.

5.6.4 Test result

Note:

Measurements were performed in the frequency range from 1 GHz up to 25 GHz with the analyser settings for restricted band measurements to show compliance for emissions falling into restricted bands, else the band edge compliance is fulfilled. In the frequency ranges from 9 kHz up to 30 MHz and from 18 GHz up to 25 GHz no emission can be detected.

According to FCC Part 15, Section 15.205(a):

In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

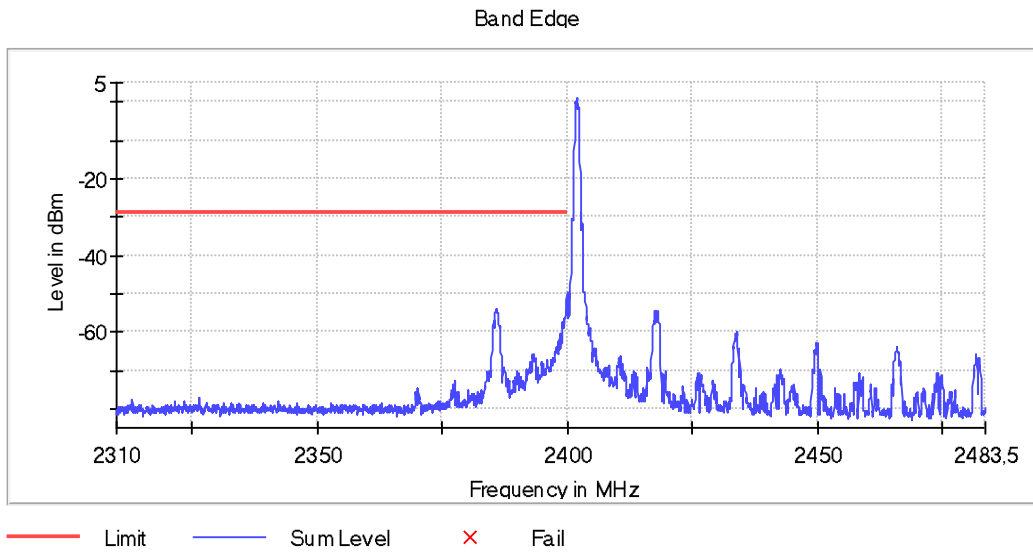
Frequency (MHz)	Spurious emission limit
Below 1000	20 dB below the highest level of the desired power
Above 1000	20 dB below the highest level of the desired power

The requirements are **FULFILLED**.

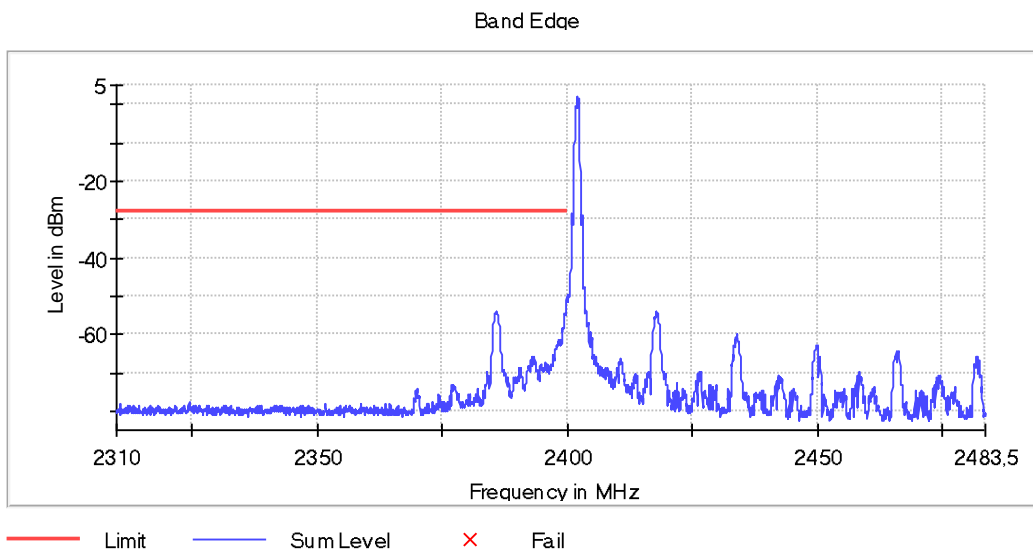
Remarks: Only the band-edge compliance graphs for CH 37 are shown in the test protocols.

5.6.5 Test protocols

CH 37, 500 kbps



CH 37, 1 Mbps



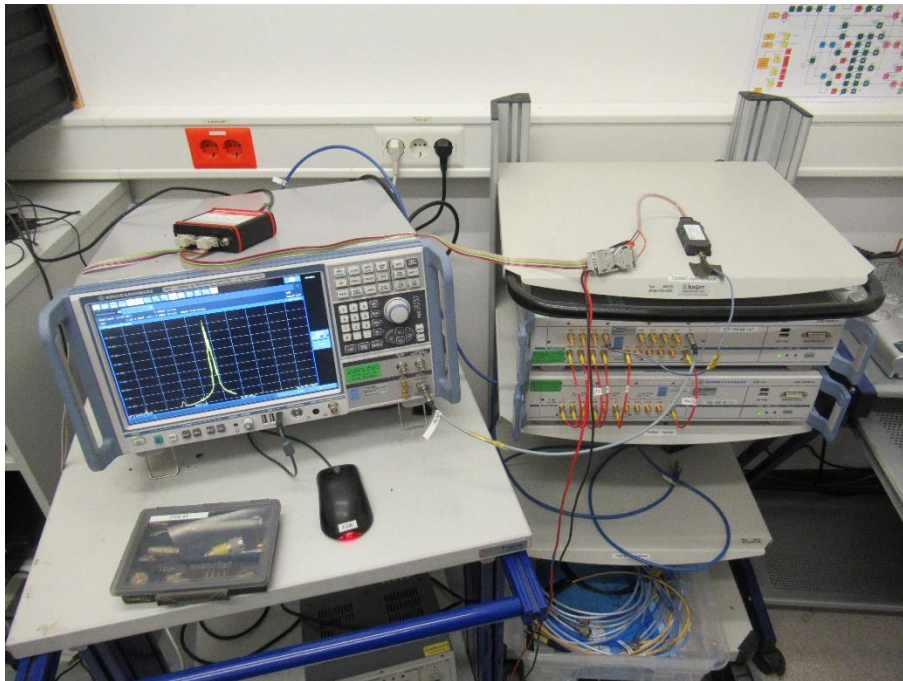
5.7 Antenna application

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

5.7.1 Description of the test location

Test location: Shielded room S6

5.7.2 Photo documentation of the test set-up



5.7.3 Applicable standard

According to FCC Part 15C, Section 15.203:

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. The manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has an integrated antenna. No other antenna can be used with the device. Additional to that a conducted output power measurement was performed. According to the following formula the maximum gain of the antenna was calculated.

$$\text{EIRP} = P + G$$

Where:

EIRP = Equivalent isotropic radiated power

P = Conducted output power

G = Gain of the antenna

FCC ID: KR5FBD5 IC: 7812D-FBD5

Result:

Channel	Data rate (Mbps)	P conducted (dBm)	Max. antenna gain (dBi)	EIRP (dBm)
37	0.5	2.6	3.3	5.9
17	0.5	2.8	3.3	6.1
39	0.5	3.1	3.3	6.4
37	1	2.4	3.3	5.7
17	1	2.6	3.3	5.9
39	1	3.0	3.3	6.3

The supplied antenna meets the requirements of part 15.203 and 15.204.

5.7.4 Antenna requirements

According to FCC Part 15C, Section 15.247(b)(4):

The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The output power has not to be reduced.

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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.
A 4	BAT-EMC 3.19.1.24	01-02/68-13-001				
	ESCI	02-02/03-15-001	24/06/2021	24/06/2020		
	ESH 2 - Z 5	02-02/20-05-004	31/10/2021	31/10/2019	04/11/2020	04/05/2020
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155	13/11/2022	13/11/2019	12/11/2020	12/05/2020
CPR 3	BAT-EMC 3.19.1.24	01-02/68-13-001				
	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	AFS4-00100600-13-10P-4	02-02/17-13-001	02/04/2021	02/04/2020		
	311702-02/24-05-009	18/06/2021	18/06/2020			
	SF104/11SMA/11N/1500MM	02-02/50-13-013				
	SF104/11SMA/11N/2000MM	02-02/50-15-001				
MB	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	OSP-B157W8 with OSP120	02-02/30-13-002	14/08/2021	14/08/2020		
	OSP-B157WX with OSP120	02-02/30-18-007	06/08/2021	06/08/2020		
	Sucoflex N-1000-SMA	02-02/50-05-072				
	KMS116-GL140SE-KMS116-	02-02/50-16-010				
	2.4/5.2/5.8GHz Antenna + S	02-02/50-17-027				
	Semflex K-400-K	02-02/50-19-013				
SMB-K27 PULSETRAIN	02-02/68-19-001					
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	FSW43	02-02/11-15-001	02/04/2021	02/04/2020		
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	LNA-40-18004000-33-5P	02-02/17-20-002				
	3117	02-02/24-05-009	18/06/2021	18/06/2020		
	BBHA 9170	02-02/24-05-013	19/05/2023	19/05/2020	14/01/2021	14/01/2020
	Sucoflex N-2000-SMA	02-02/50-05-075				
WHK 3.0/18G-10EF	02-02/50-05-180					