

C2PC FCC / ISED RF Test Report

Report No.: FCC_IC_RF_SL21020901-SLX-160A1_BLE_Rev_2.0

FCC ID: U4G-RHINO

IC ID: 3862E-RHINO

Test Model: QCNFA324

Received Date: 01/04/2021

Test Date: 06/02/2021 - 01/12/2022

Issued Date: 01/14/2022

Applicant: Datalogic S.r.l.

Address: Via san Vitalino 13, 40012 Lippo di Calderara di Reno (BO), Italy

Issued By: Bureau Veritas Consumer Products Services, Inc.

Lab Address: 775 Montague Expressway, Milpitas, CA 95035

**FCC Registration /
Designation Number:** 540430

ISED# / CAB identifier: 4842D



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Release Control Record

Issue No.	Description	Date Issued
FCC_IC_RF_SL21020901-SLX-160A1_BT	Original Report	06/09/2021
FCC_IC_RF_SL21020901-SLX-160A1_BT_Rev_1.0	Updated Title page, Section 2 - Summary of Test Results, Section 3 - General Information, Section 4 - Test Types and Results	01/03/2022
FCC_IC_RF_SL21020901-SLX-160A1_BT_Rev_2.0	Updated Antenna type, calibration list, and 18-25 GHz test results	01/14/2022

1 Certificate of Conformity

Product: PCIe 2x2 AC Wireless Module

Brand: Datalogic S.r.l

Test Model: QCNFA324

Sample Status: Engineering sample

Applicant: Datalogic S.r.l

Test Date: 06/02/2021 - 01/12/2022

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)

RSS-247 Issue 2, February 2017

ANSI C63.10: 2013

RSS Gen Issue5, March 2019

The above equipment has been tested by **Bureau Veritas Consumer Products Services, Inc., Milpitas Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Gary Chou
Prepared by : _____ **Date:** _____
Gary Chou / Compliance Engineer 06/09/2021

Deon
Approved by : _____ **Date:** _____
Deon Dai / Engineer Reviewer 06/09/2021

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (SECTION 15.247) / ISED RSS-247				
RSS-247 Issue2, RSS Gen Issue5				
FCC Clause	RSS Section(s)	Test Item	Result	Remarks
15.205 & 15.209 & 15.247(d)	RSS-247 [7.3]	Radiated Emissions & Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing QP margin.
15.203	RSS-Gen [6.8]	Antenna Requirement	PASS	PCB antenna with IPEX connector

Note:

1. Refer the test report. FCC ID: PPD-QCNFA324, Report Number: RF140808E04B-2 for all other tests.
2. If The Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.
3. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Conducted Emissions at mains ports	150kHz ~ 30MHz	3.856 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.638 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	4.64dB
	6GHz ~ 18GHz	4.82dB
	18GHz ~ 40GHz	4.91dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	PCIe 2x2 AC Wireless Module
Brand	Datalogic S.r.l
Test Model	QCNFA324
Status of EUT	Engineering Sample
Power Supply Rating	3.3Vdc from the host equipment
Modulation Type	GFSK, $\pi/4$ -DQPSK, 8DPSK
Modulation Technology	FHSS
Transfer Rate	BDR/EDR: up to 3MB/s
Operating Frequency	2402~2480MHz
Number of Channel	79
Output Power	14.488mW
Antenna Brand	Huber+Suhner
Antenna Type	Dual band WiFi embedded patch antenna pair
Antenna Model	1399.99.0151
Antenna Gain	1 dBi
Antenna Connector	I-PEX MHF-4

Note:

1. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
2. Output power was verified and transmitting at full max output power. Measurements were taken prior to starting RSE testing.
3. The purpose of this report is to address the C2PC changes due to the addition of the dual patch antenna.

3.2 Description of Test Modes

79 channels are provided for BT-BDR/EDR mode:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE \geq 1G	RE<1G	PLC	APCM	
-	√	√	-	-	-

Where **RE \geq 1G**: Radiated Emission above 1GHz **RE<1G**: Radiated Emission below 1GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

NOTE:

1. The EUT had been pre-tested on the positions of each 3 axis. The worst case was found when positioned on **X-plane**.
2. "-" means no effect.

Radiated Emission Test (Above 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	0, 39, 78	FHSS	GFSK	DH5
-	0 to 78	0, 39, 78	FHSS	8DPSK	3DH5

Radiated Emission Test (Below 1GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT CONFIGURE MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	PACKET TYPE
-	0 to 78	39	FHSS	GFSK	DH5
-	0 to 78	39	FHSS	8DPSK	3DH5

3.3 Description of Support Units

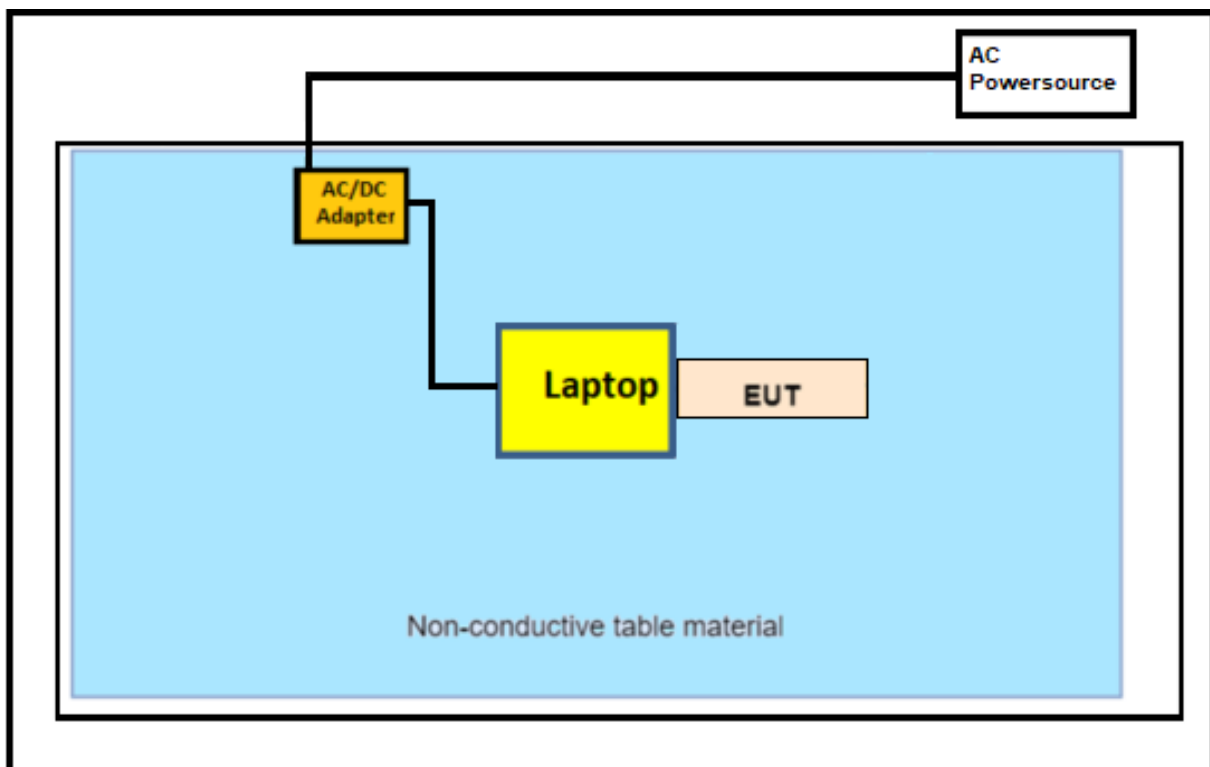
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	Dell	Latitude E6420	56CK3R1	N/A	N/A
B.	Power Supply (Laptop)	Dell	DA130PEI-00	JU012	N/A	N/A

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. EUT is connected via an express card adapter.

3.3.1 Configuration of System under Test



3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)
KDB 558074 D01 15.247 Meas Guidance v05r02
RSS-247, Issue 2, February 2017
RSS Gen Issue5, March 2019
ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

The peak field strength of emissions from 18-40GHz did not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation. Therefore, only 1-18 GHz has been included in the report

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
PXA Signal Analyzer KEYSIGHT	N9030B	MY57140374	07/07/2020	07/07/2021
Horn Antenna ETS-Lindgren	3117	218554	07/24/2020	07/24/2021
Biconilog Antenna Sunol	JB6	A111717	03/04/2021	03/04/2022
Pre-Amplifier RF-Lambda	RAMP00M50G A	18040300055	10/1/2020	10/1/2021

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
EMI Receiver Rohde and Schwarz	ESW44	1328.4100K- 101662-MH	09/22/2021	09/22/2022
Biconilog Antenna Sunol	JB1	A111717	09/04/2020	9/4/2022
Horn Antenna ETS-Lindgren	3117	218553	02/20/2020	2/20/2022
DRG Horn Antenna	SAS-117	579	08/05/2020	08/05/2022
Pre-Amplifier RF-Lambda	RAMP00M50GA	18040300055	08/05/2020	08/05/2022
Microwavetown (0.80 m)	FSB360PK-KMKM	201906110002	12/09/2021	12/09/2022
Microwavetown (6.0 m)	FSB360PK-KMKM	202103270001	12/09/2021	12/09/2022

NOTE:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna and HP preamplifier (model: 3117) are used only for the measurement of emission frequency above 1GHz if tested.

TEST PROCEDURES

For Radiated emission below 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Both Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

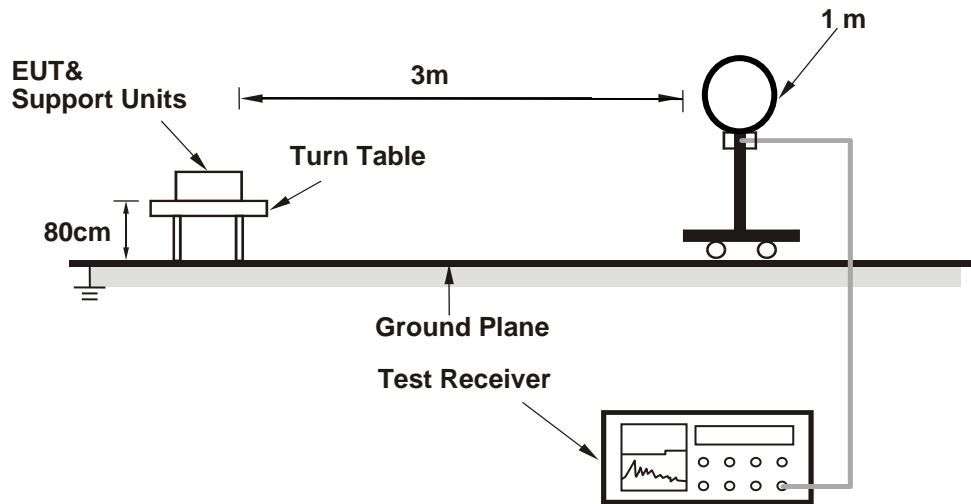
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is $\geq 1/T$ (Duty cycle $< 98\%$) or 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

4.1.3 Deviation from Test Standard

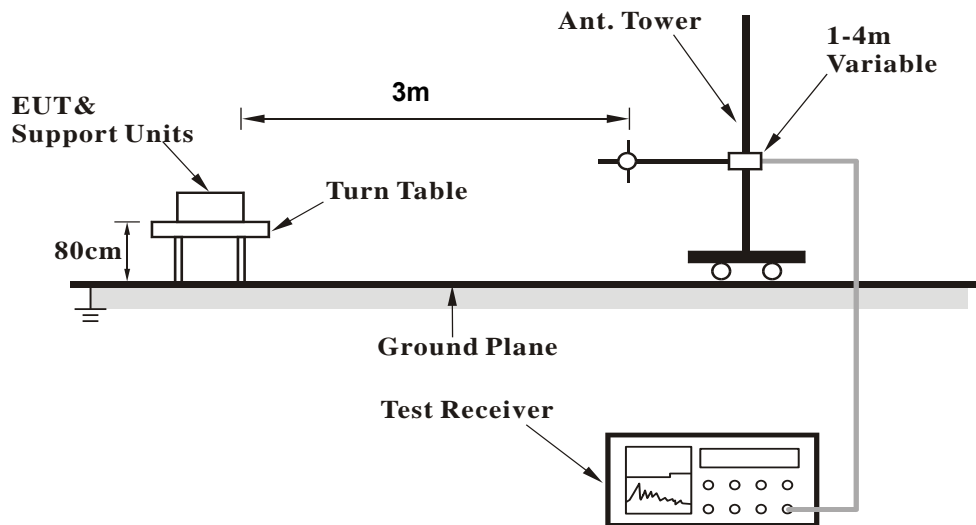
No deviation.

4.1.4 Test Setup

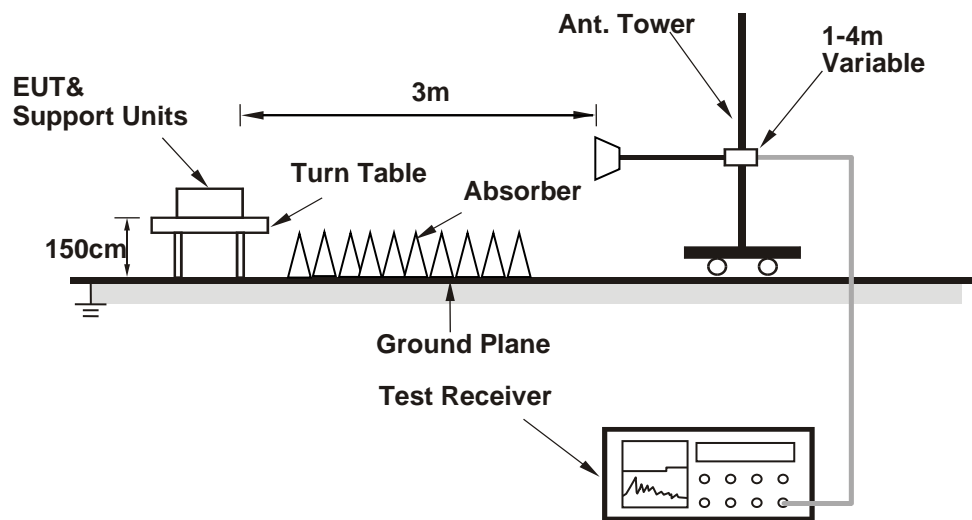
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.5 EUT Operating Conditions

- a. Connected the EUT with the Notebook Computer which is placed on the table with the EUT.
- b. Controlling software has been activated to set the EUT on specific status.

4.1.6 Test Results

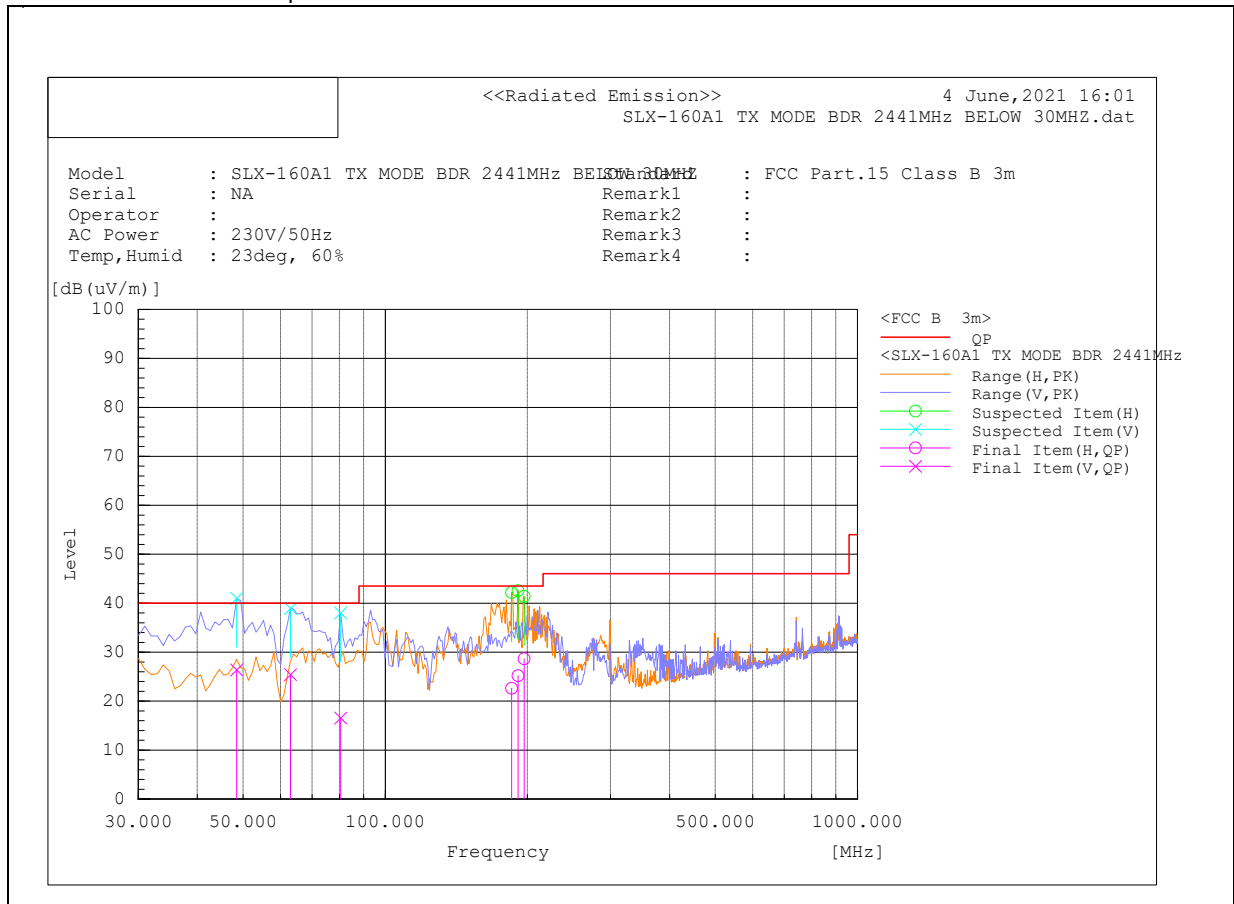
Below 1GHz Data:
BT_GFSK

CHANNEL	TX MODE 2441 MHz	DETECTOR FUNCTION	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m										
No.	Frequency (MHz)	Polarization (H/V)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP dB(uV/m)	Margin QP [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	48.43*	V	12.8	13.6	26.4	40	-13.6	130.4	166.8	Pass
2	62.98*	V	12.4	13	25.4	40	-14.6	101.4	4.4	Pass
3	80.44*	V	3.5	13.1	16.6	40	-23.4	132.8	303.4	Pass
4	185.2*	H	5	17.6	22.6	43.5	-20.9	340.3	282	Pass
5	191.02*	H	7.4	17.8	25.2	43.5	-18.3	110.7	213.1	Pass
6	196.84*	H	9.9	18.7	28.6	43.5	-14.9	100	246.3	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. * Worst case points outside of the restricted band were measured.



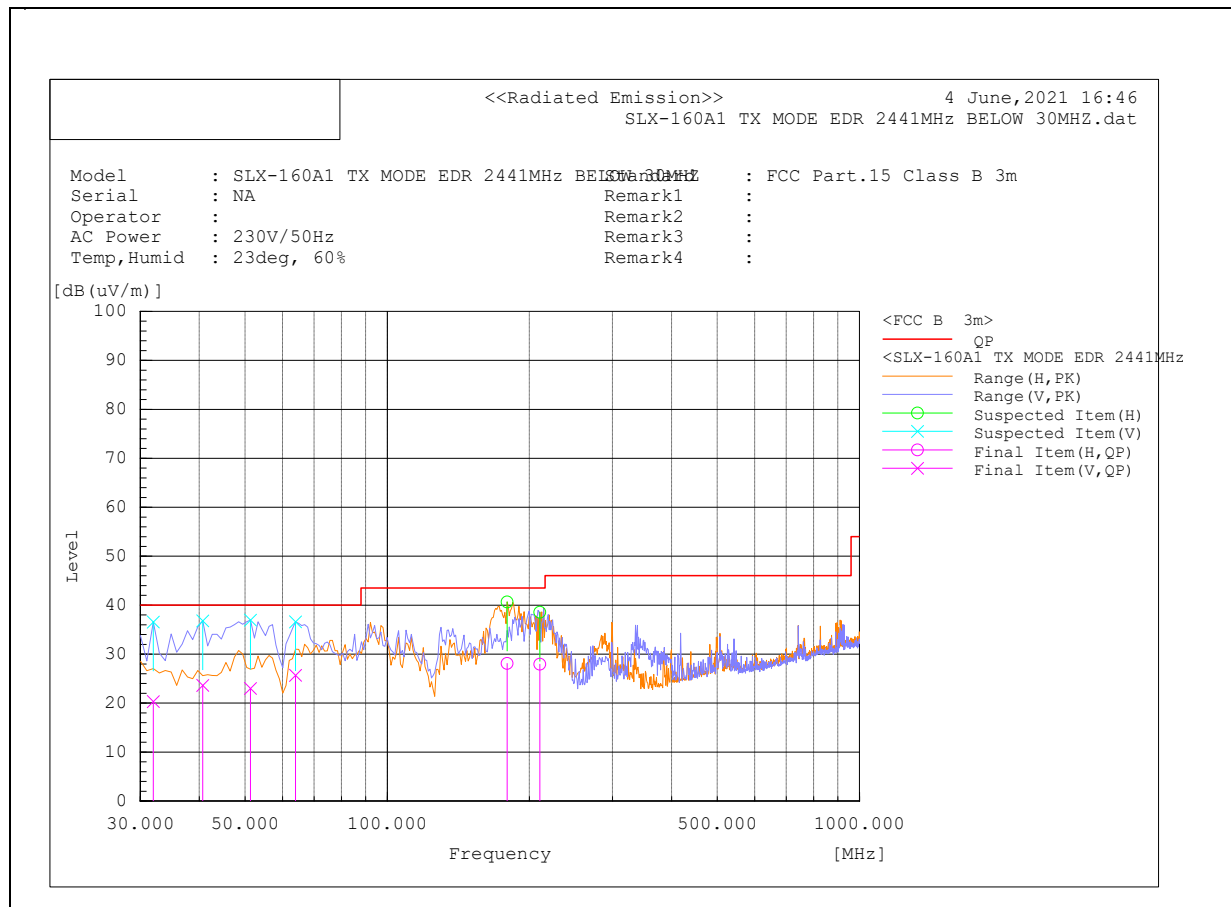
BT_8DPSK

CHANNEL	TX MODE 2441 MHz	DETECTOR FUNCTION	Quasi Peak
FREQUENCY RANGE	30MHz – 1GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m										
No.	Frequency (MHz)	Polarization (H/V)	Reading QP [dB(uV)]	Factor [dB(1/m)]	Level QP [dB(uV/m)]	Limit\QP dB(uV/m)	Margin QP [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	31.94*	V	-3.9	24.2	20.3	40	-19.7	105.4	183	Pass
2	40.67*	V	5.5	18.1	23.6	40	-16.4	107.4	291.7	Pass
3	51.34*	V	10.2	12.8	23	40	-17	174.4	221	Pass
4	63.95*	V	12.6	13.1	25.7	40	-14.3	139	0	Pass
5	179.38*	H	10.4	17.7	28.1	43.5	-15.4	199.5	258.8	Pass
6	210.42	H	10.5	17.4	27.9	43.5	-15.6	145.6	330.9	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. * Worst case points outside of the restricted band were measured.



Above 1GHz Data:

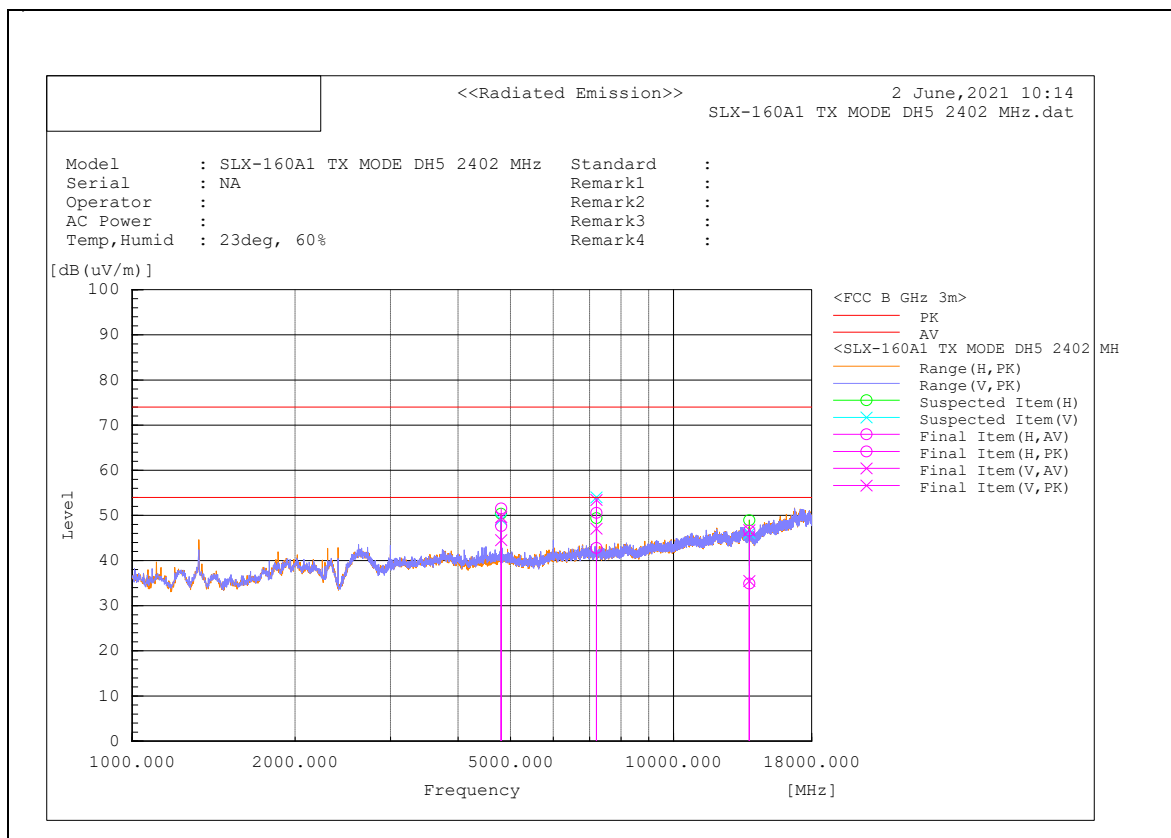
BT_GFSK

CHANNEL	TX MODE 2402 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	1GHz ~ 18GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	LimitAV dB(uV/m)	LimitPK dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	4803.816	H	53.7	57.5	-6	47.7	51.5	54	74	-6.3	-22.5	104.3	72.6	Pass
2	4803.807	V	50.5	55.6	-6	44.5	49.6	54	74	-9.5	-24.4	107.5	70.4	Pass
3	7205.738	V	47.8	54.2	-0.8	47	53.4	54	74	-7	-20.6	111.8	87.6	Pass
4	7205.84	H	43.6	51.4	-0.8	42.8	50.6	54	74	-11.2	-23.4	116.3	140.3	Pass
5	13808.808*	H	26.9	38.6	8	34.9	46.6	54	74	-19.1	-27.4	292.6	0	Pass
6	13811.087*	V	27.5	38.8	8	35.5	46.8	54	74	-18.5	-27.2	398.2	1.8	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. * Worst case points outside of the restricted band were measured.

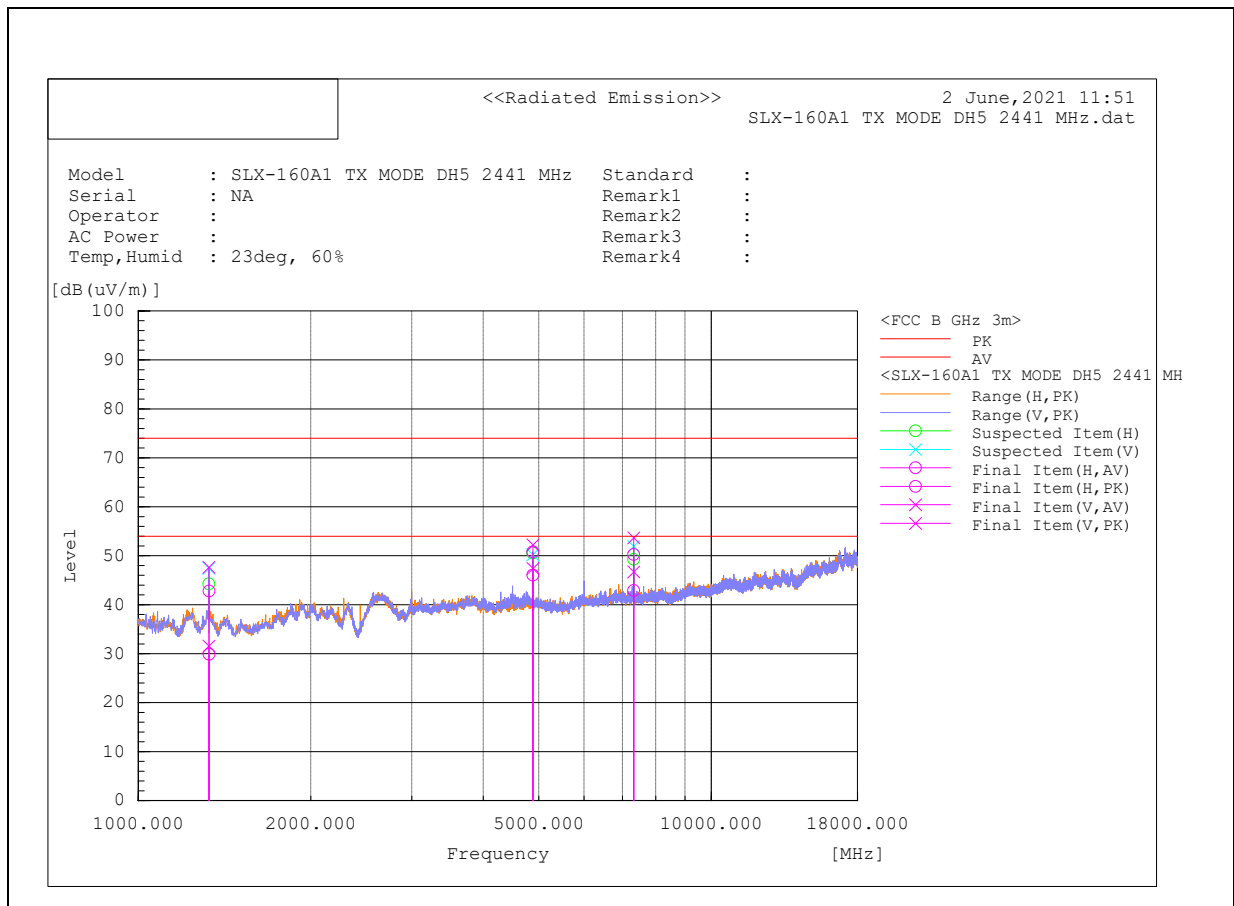


CHANNEL	TX MODE 2441 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	1GHz ~ 18GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	1327.725	V	47.8	64	-16.3	31.5	47.7	54	74	-22.5	-26.3	195.3	280.1	Pass
2	1328.36	H	46.2	59.1	-16.3	29.9	42.8	54	74	-24.1	-31.2	304.4	214.8	Pass
3	4882.085	H	52.1	56.8	-6	46.1	50.8	54	74	-7.9	-23.2	129	73.8	Pass
4	4882.109	V	53.4	58.2	-6	47.4	52.2	54	74	-6.6	-21.8	104.1	94.3	Pass
5	7322.575	H	43.4	50.8	-0.5	42.9	50.3	54	74	-11.1	-23.7	185.2	87.3	Pass
6	7323.221	V	47.2	54.2	-0.5	46.7	53.7	54	74	-7.3	-20.3	107.4	96.7	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. * Worst case points outside of the restricted band were measured.

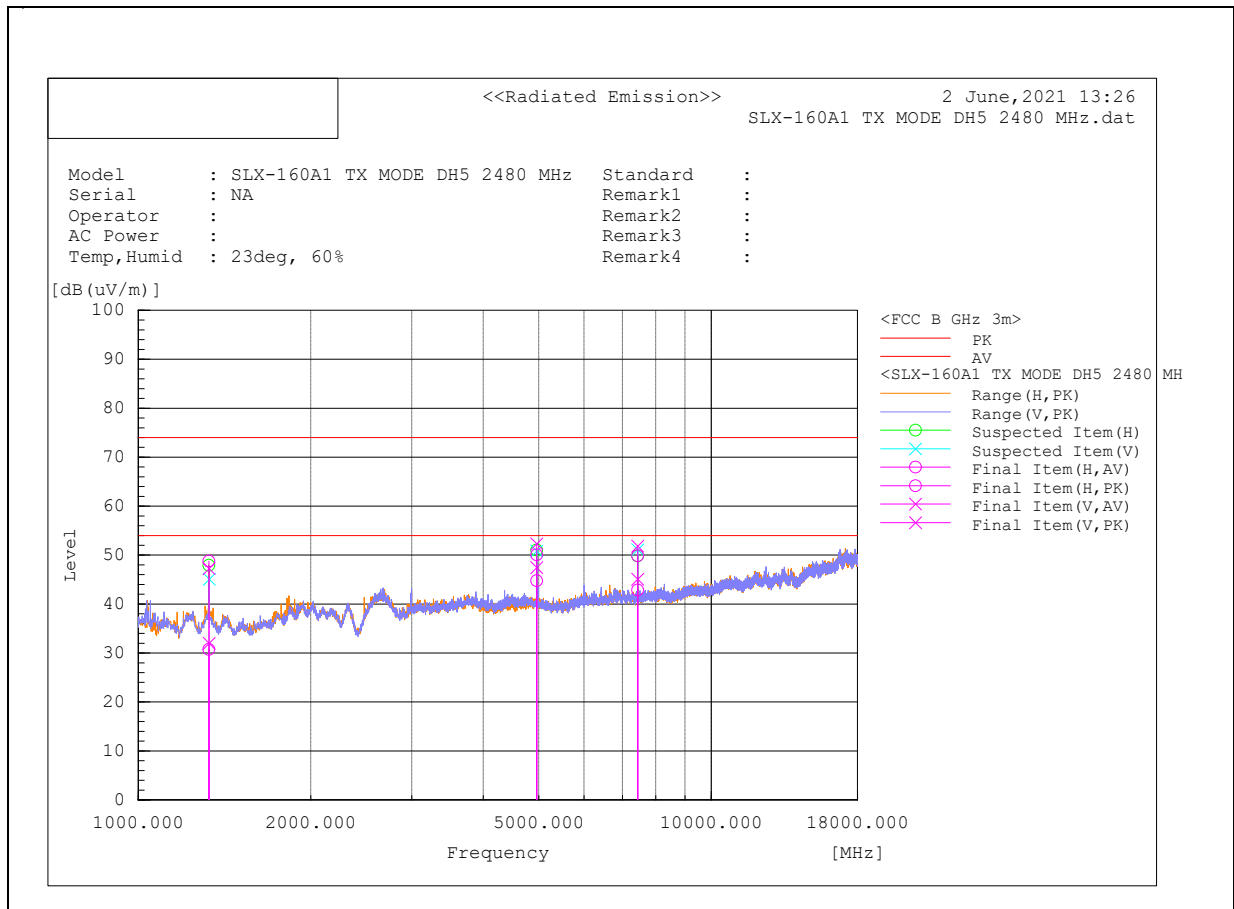


CHANNEL	TX MODE 2480 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	1GHz ~ 18GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	1327.897	H	47.1	65.1	-16.3	30.8	48.8	54	74	-23.2	-25.2	116.4	144.8	Pass
2	1328.708	V	48.3	63.5	-16.3	32	47.2	54	74	-22	-26.8	134.9	131.9	Pass
3	4960.186	H	50.7	56	-5.9	44.8	50.1	54	74	-9.2	-23.9	129.1	80.2	Pass
4	4960.014	V	53.4	58.2	-5.9	47.5	52.3	54	74	-6.5	-21.7	104.4	189.6	Pass
5	7439.845	H	43	50	-0.1	42.9	49.9	54	74	-11.1	-24.1	163.2	123.1	Pass
6	7439.727	V	45.2	51.9	-0.1	45.1	51.8	54	74	-8.9	-22.2	107.2	331.4	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. * Worst case points outside of the restricted band were measured.



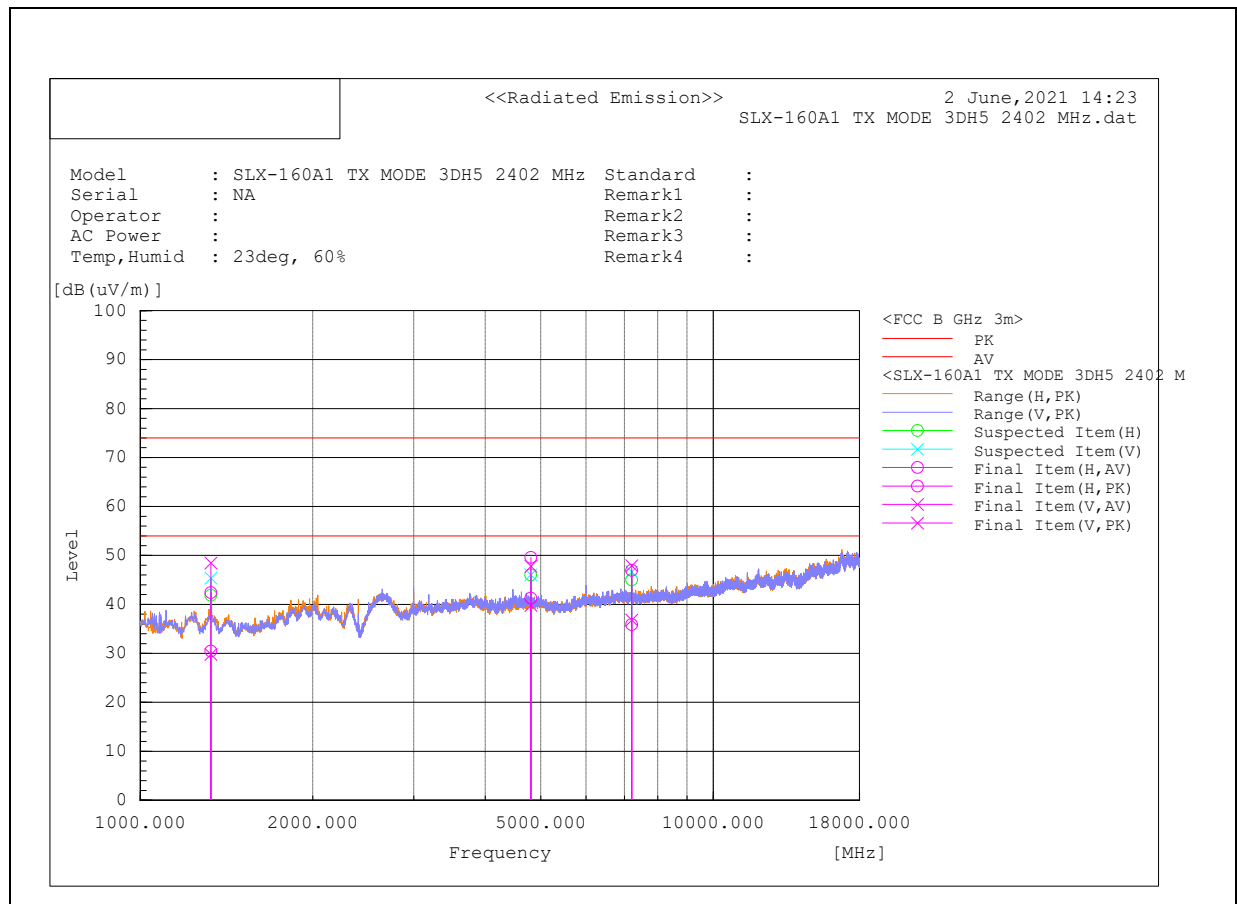
BT_8DPSK

CHANNEL	TX MODE 2402 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	1GHz ~ 18GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	1327.998	V	46.1	64.8	-16.3	29.8	48.5	54	74	-24.2	-25.5	128.3	264.5	Pass
2	1327.758	H	46.8	58.7	-16.3	30.5	42.4	54	74	-23.5	-31.6	305.2	213.2	Pass
3	4803.821	H	47.3	55.6	-6	41.3	49.6	54	74	-12.7	-24.4	111.5	175.1	Pass
4	4803.772	V	45.8	53.8	-6	39.8	47.8	54	74	-14.2	-26.2	153	189	Pass
5	7206.029	V	37.6	48.7	-0.8	36.8	47.9	54	74	-17.2	-26.1	128.6	79.5	Pass
6	7206.344	H	36.7	47.7	-0.8	35.9	46.9	54	74	-18.1	-27.1	162.8	37.9	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. * Worst case points outside of the restricted band were measured.

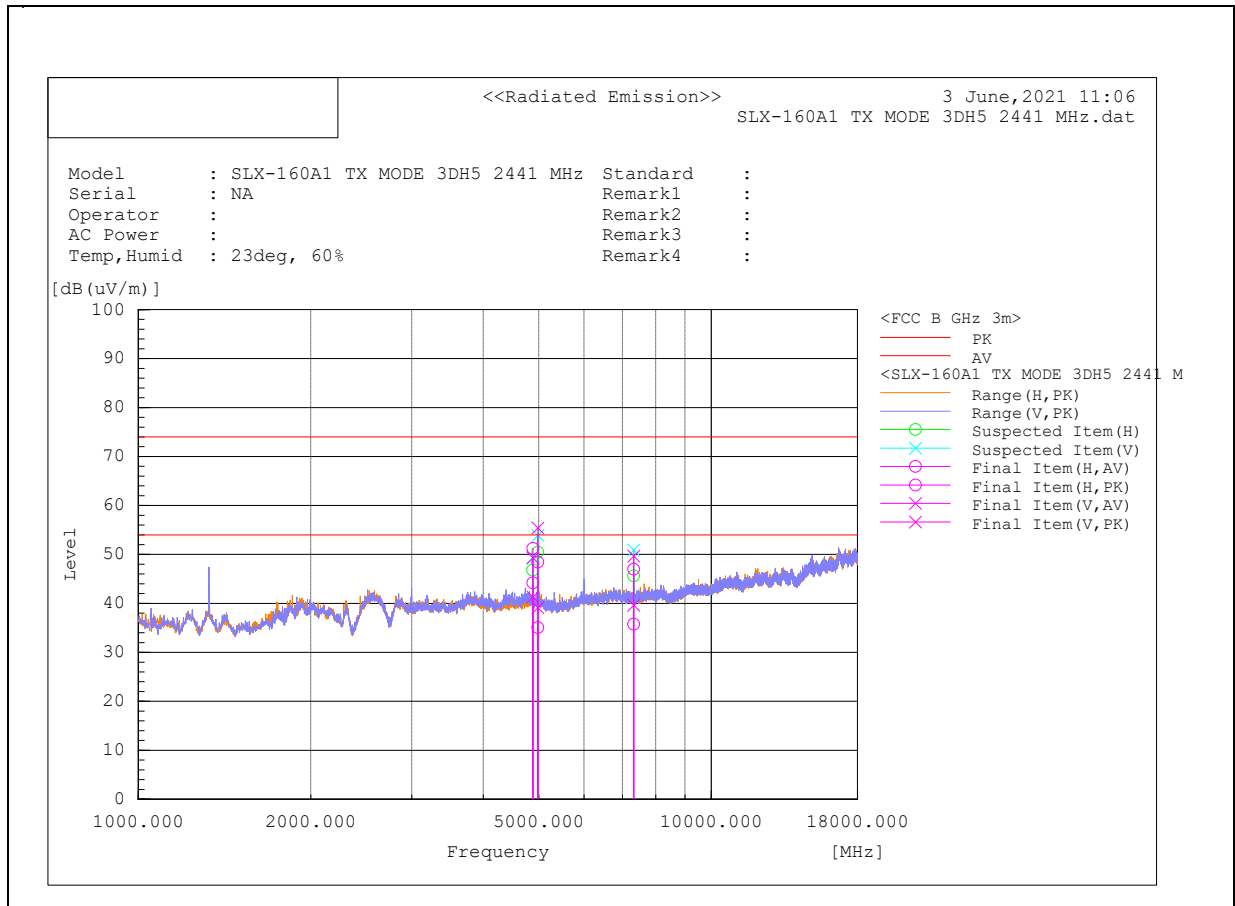


CHANNEL	TX MODE 2441 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	1GHz ~ 18GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	LimitAV dB(uV/m)	Limit(PK [dB(uV/m)	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	4881.911	V	47.3	55.3	-6	41.3	49.3	54	74	-12.7	-24.7	216.9	111.6	Pass
2	4882.075	H	50.2	57.2	-6	44.2	51.2	54	74	-9.8	-22.8	217.5	96.5	Pass
3	4982.345	V	44.9	61.2	-5.8	39.1	55.4	54	74	-14.9	-18.6	107.5	102.7	Pass
4	4982.067	H	40.9	54.2	-5.8	35.1	48.4	54	74	-18.9	-25.6	239	24.7	Pass
5	7323.136	V	40.1	50.2	-0.5	39.6	49.7	54	74	-14.4	-24.3	196.1	141.7	Pass
6	7322.812	H	36.3	47.5	-0.5	35.8	47	54	74	-18.2	-27	107.6	167.2	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. * Worst case points outside of the restricted band were measured.

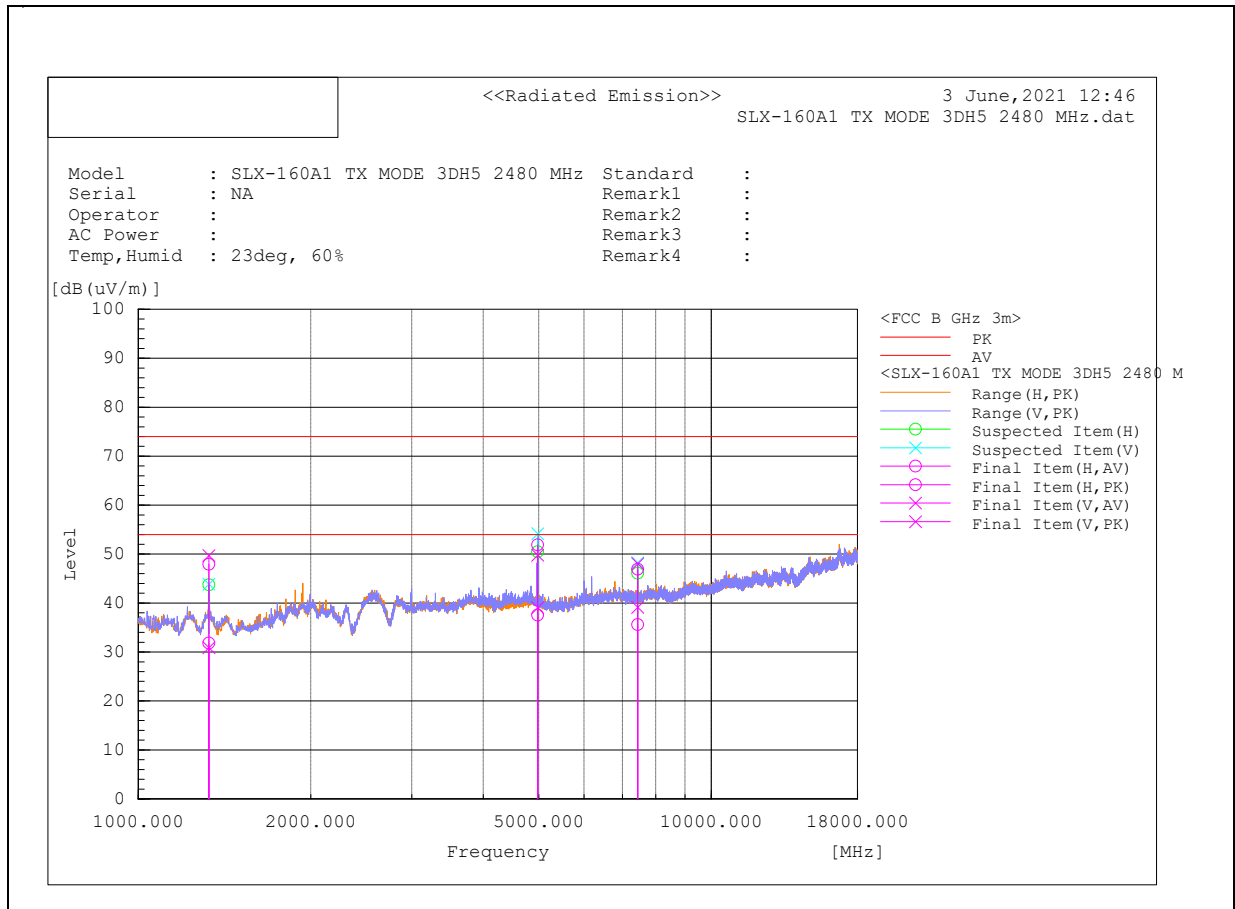


CHANNEL	TX MODE 2480 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	1GHz ~ 18GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	1327.906	V	47.2	66	-16.3	30.9	49.7	54	74	-23.1	-24.3	216.2	89.1	Pass
2	1327.593	H	48.1	64.2	-16.3	31.8	47.9	54	74	-22.2	-26.1	128.5	98.9	Pass
3	4978.835	V	45	55.7	-5.9	39.1	49.8	54	74	-14.9	-24.2	115.4	65.2	Pass
4	4978.907	H	43.5	57.8	-5.9	37.6	51.9	54	74	-16.4	-22.1	100	224.7	Pass
5	7439.783	V	39.2	48.1	-0.1	39.1	48	54	74	-14.9	-26	135.8	112.4	Pass
6	7439.646	H	35.7	47	-0.1	35.6	46.9	54	74	-18.4	-27.1	195.3	50.5	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)
4. * Worst case points outside of the restricted band were measured.



Above 18 GHz Data:

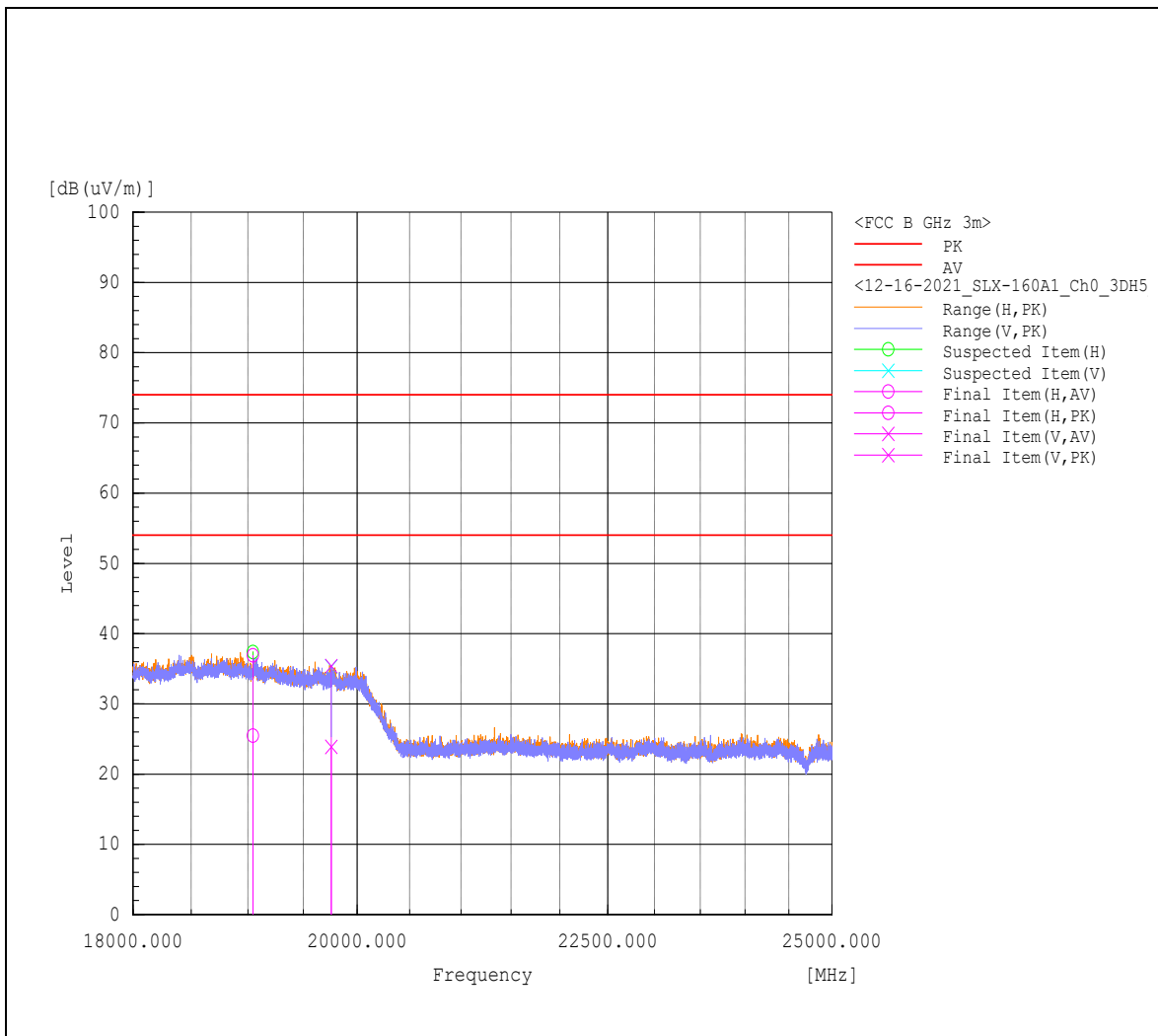
BT_GFSK

CHANNEL	TX MODE 2402 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	18GHz ~ 25GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK dB(uV/m)	LimitAV dB(uV/m)	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	19044.27	H	21.6	33	3.9	25.5	36.9	54	74	28.5	37.1	103	50.5	Pass
2	19757.88	V	20.5	32	3.4	23.9	35.4	54	74	30.1	38.6	99	0	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

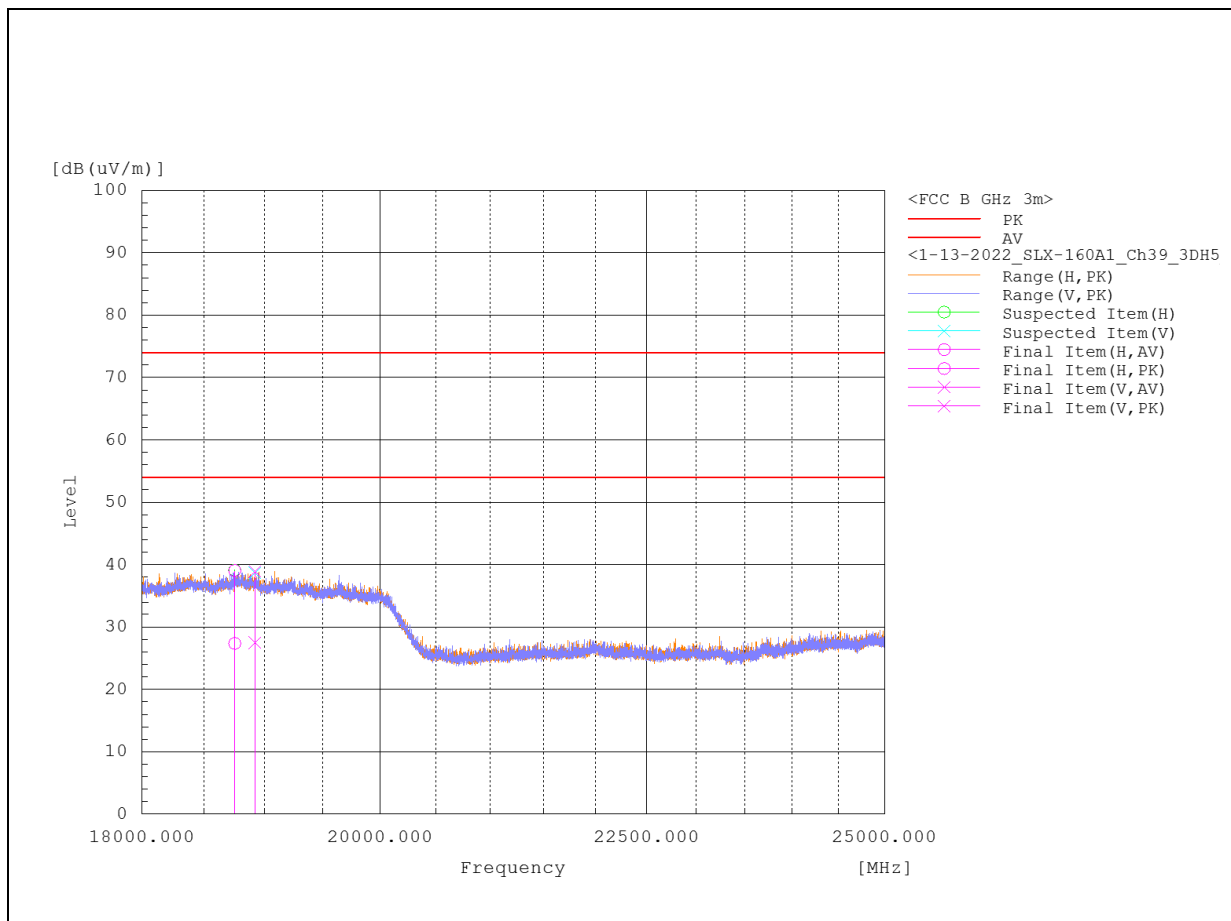


CHANNEL	TX MODE 2441 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	18GHz ~ 25GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	18753.508	H	22.9	34.5	4.5	27.4	39	54	74	26.6	35	352	230.1	Pass
2	18921.45	V	23.4	34.7	4.1	27.5	38.8	54	74	26.5	35.2	132	154.9	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

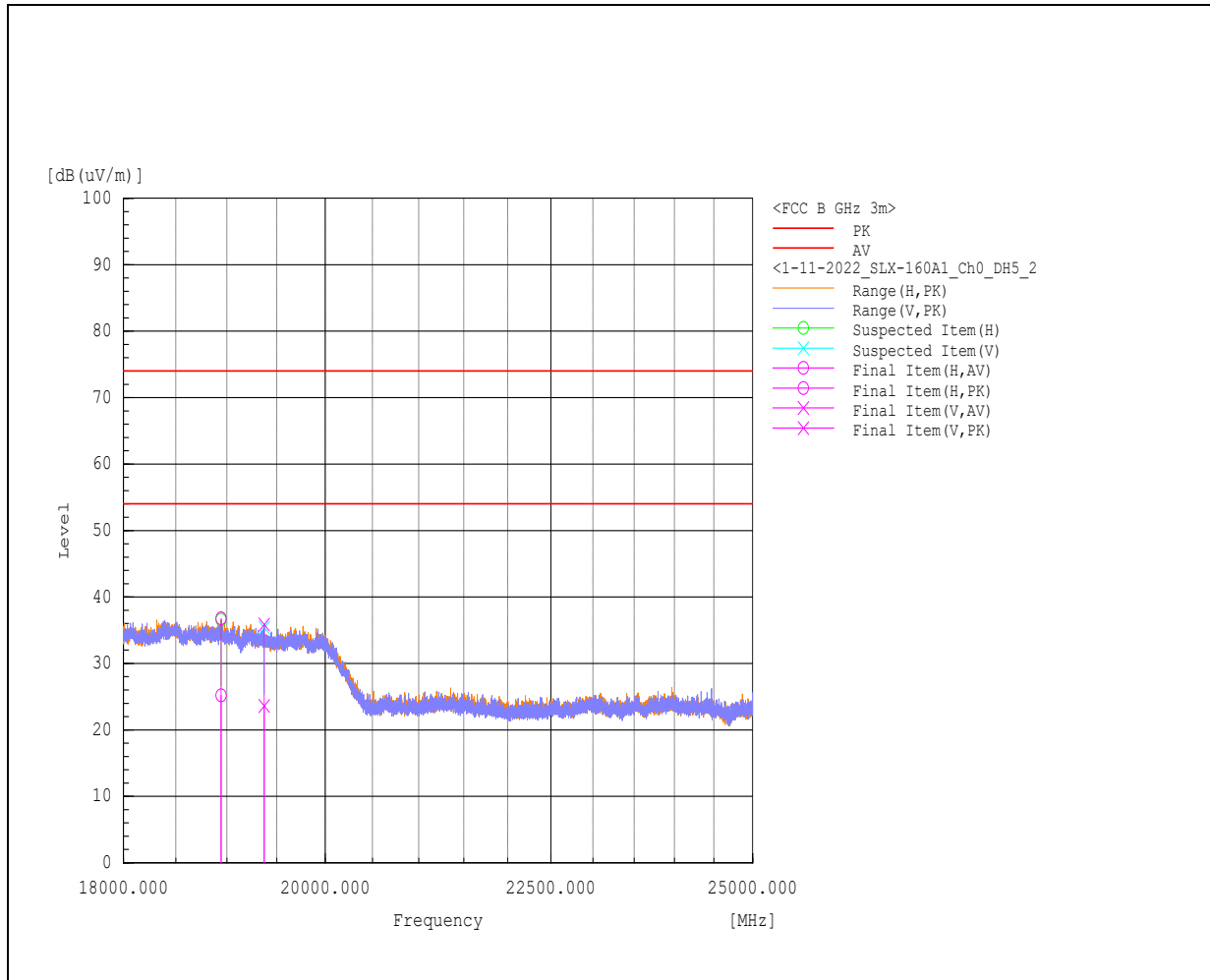


CHANNEL	TX MODE 2480 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	18GHz ~ 25GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	18508.644	H	21	32.3	4.8	25.8	37.1	54	74	28.2	36.9	322	278.6	Pass
2	18756.336	V	20.9	32.1	4.5	25.4	36.6	54	74	28.6	37.4	140	43.8	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)



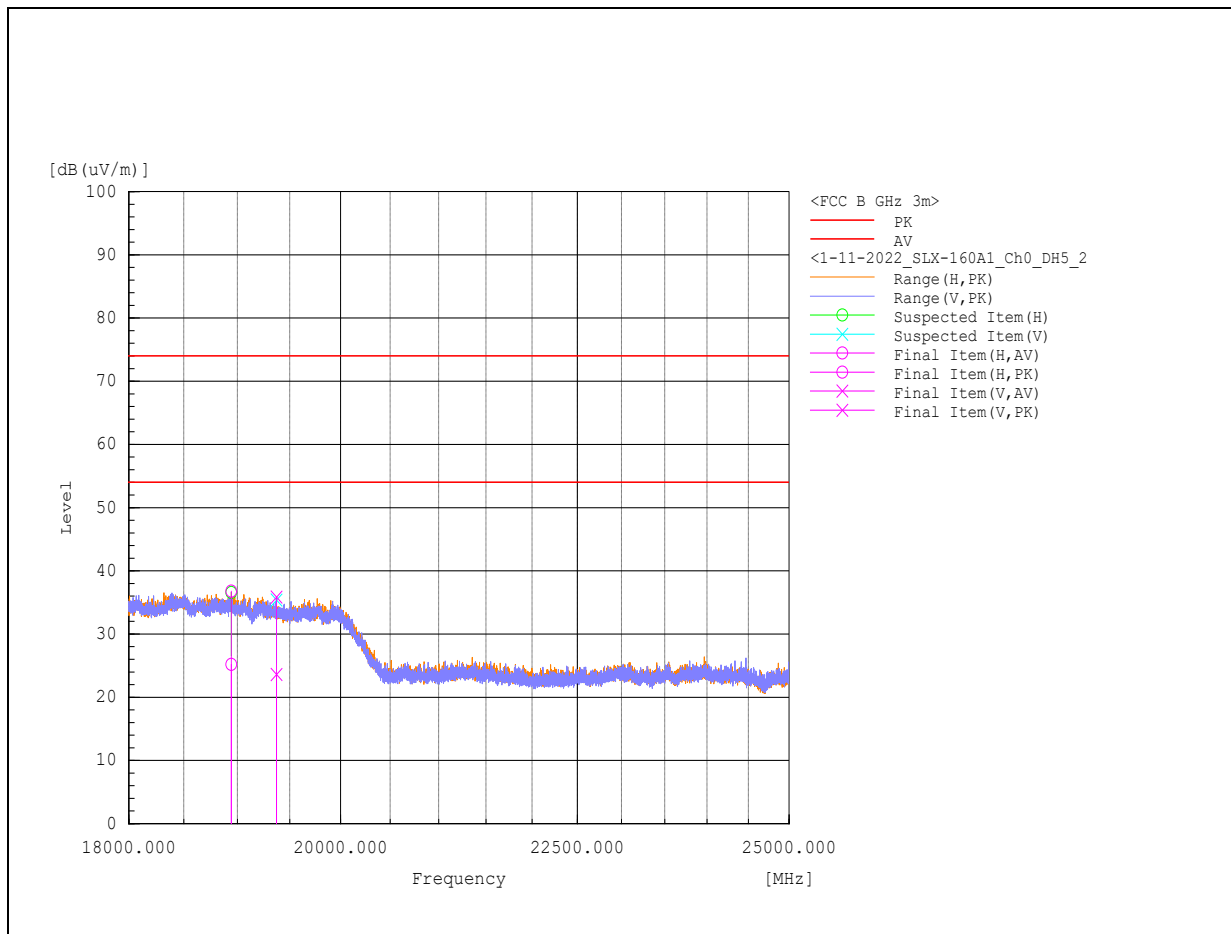
BT_8DPSK

CHANNEL	TX MODE 2402 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	18GHz ~ 25GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	18941.608	H	21	32.6	4.2	25.2	36.8	54	74	28.8	37.2	298	183.1	Pass
2	19372.27	V	20.1	32.4	3.5	23.6	35.9	54	74	30.4	38.1	396	197.3	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

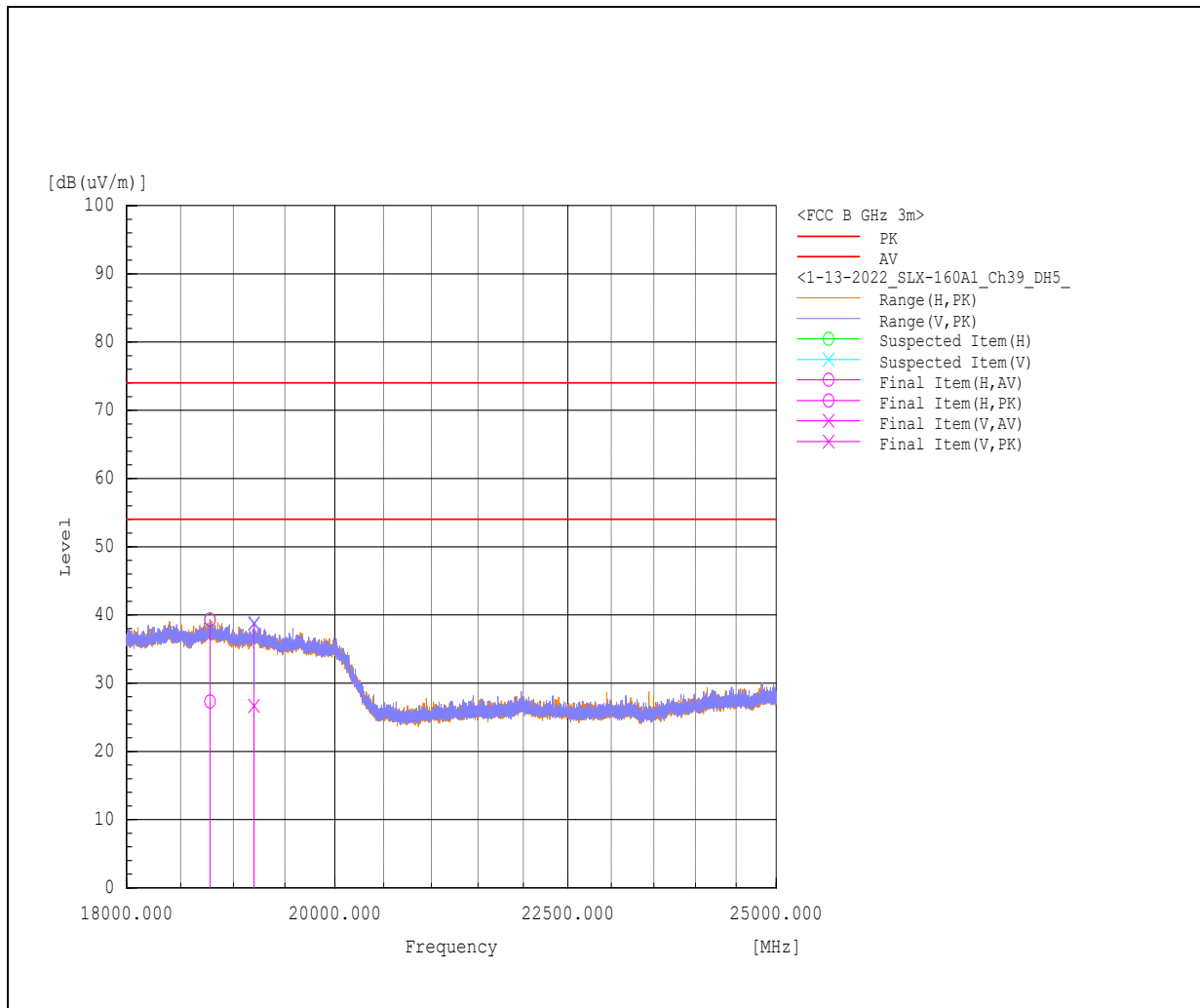


CHANNEL	TX MODE 2441 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	18GHz ~ 25GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	18776.404	H	23	35	4.3	27.3	39.3	54	74	26.7	34.7	170	18.7	Pass
2	19198.532	V	23	35	3.7	26.7	38.7	54	74	27.3	35.3	132	42.5	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)

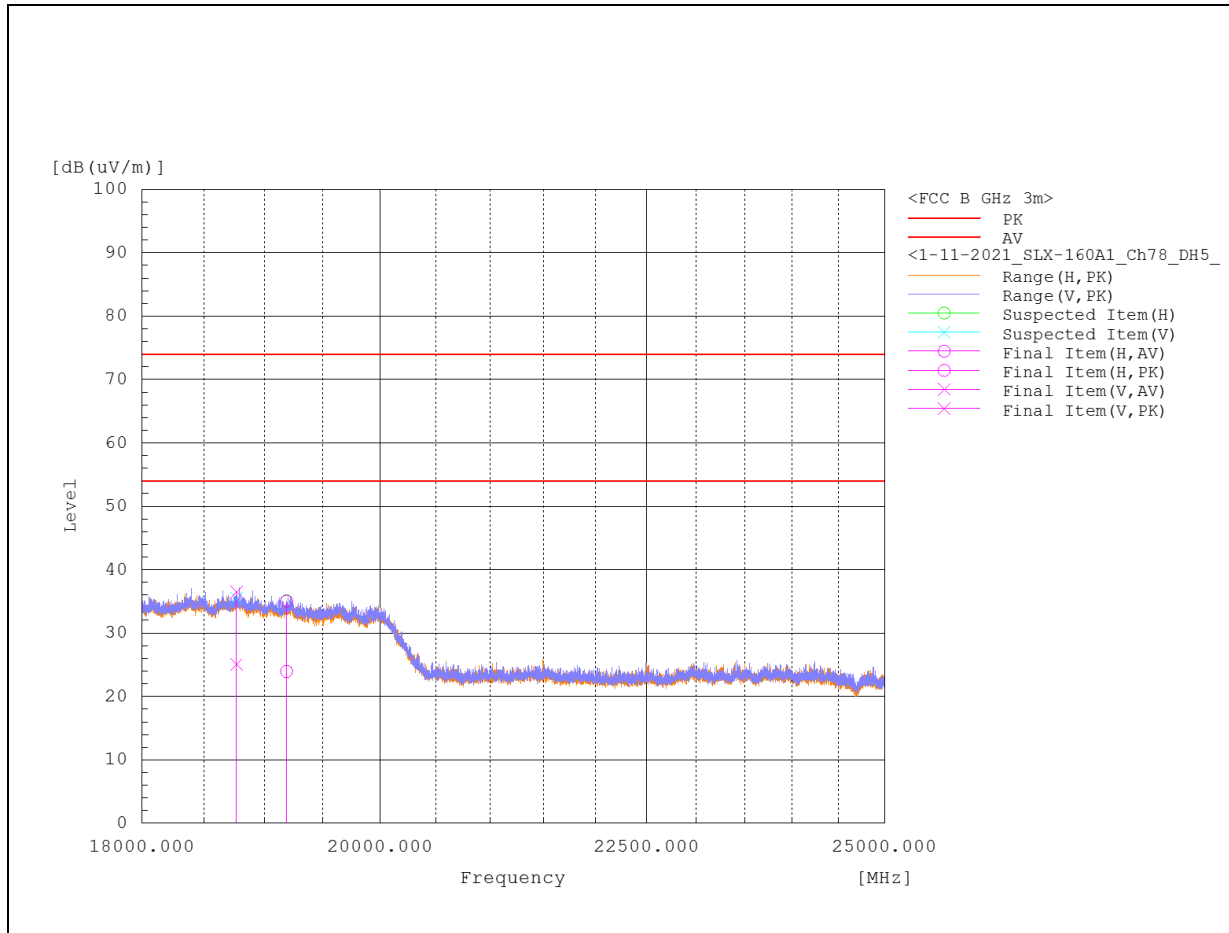


CHANNEL	TX MODE 2480 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	18GHz ~ 25GHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	18766.776	V	20.7	32.1	4.4	25.1	36.5	54	74	28.9	37.5	400	0.5	Pass
2	19188.592	H	20	31.2	3.9	23.9	35	54	74	30.1	39	103	350.7	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)



RESTRICTED BAND

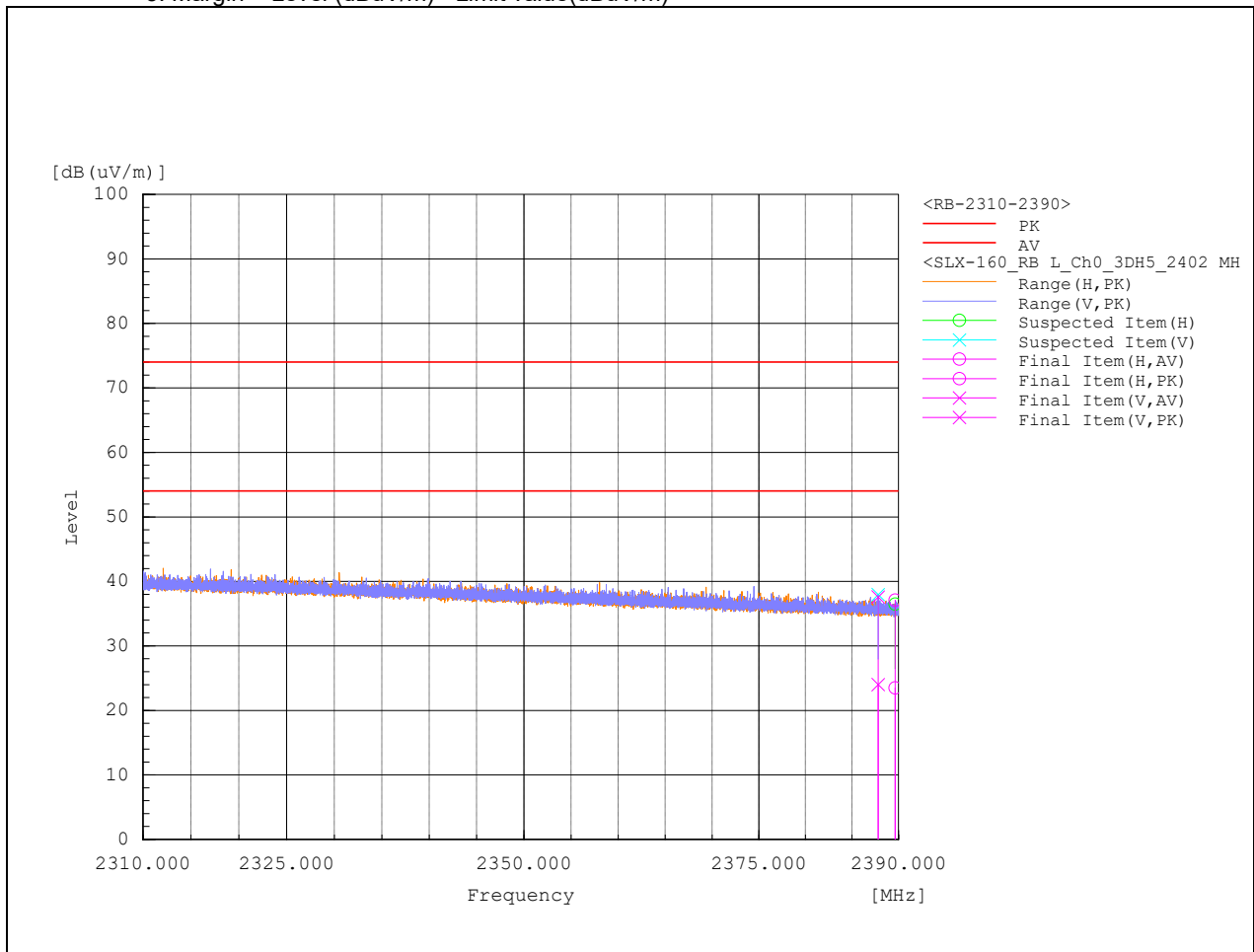
BT_GFSK

CHANNEL	TX MODE 2402 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	2310MHz-2390MHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	2387.816	V	35.7	49.3	-11.7	24	37.6	54	74	30	36.4	115	326.1	Pass
2	2389.624	H	35.2	48.8	-11.7	23.5	37.1	54	74	30.5	36.9	247	0	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)



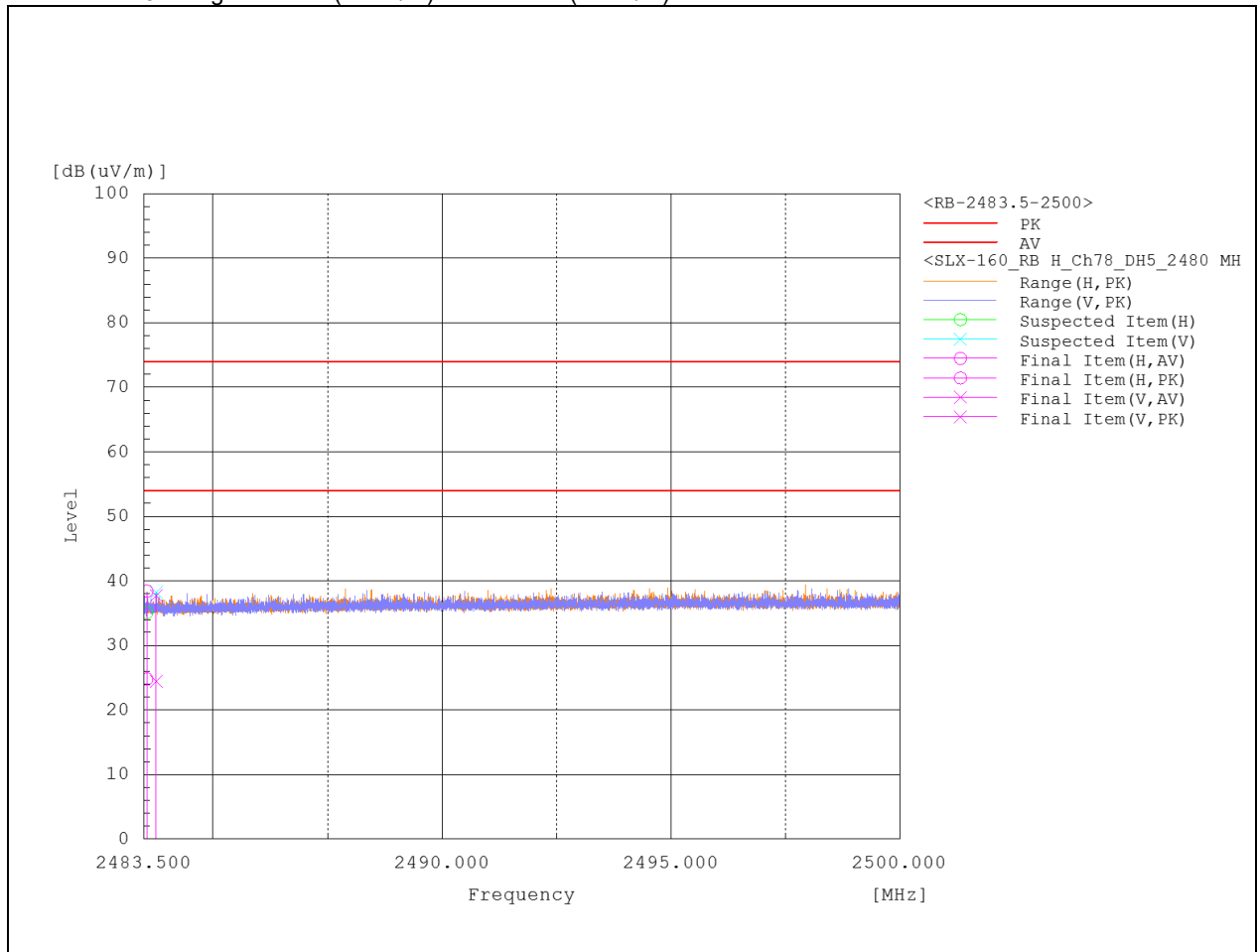
RESTRICTED BAND

CHANNEL	TX MODE 2480 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	2483.5MHz-2500MHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	2483.563	H	36	49.6	-11.2	24.8	38.4	54	74	29.2	35.6	181	184.8	Pass
2	2483.766	V	35.6	49	-11.2	24.4	37.8	54	74	29.6	36.2	228	29.8	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)



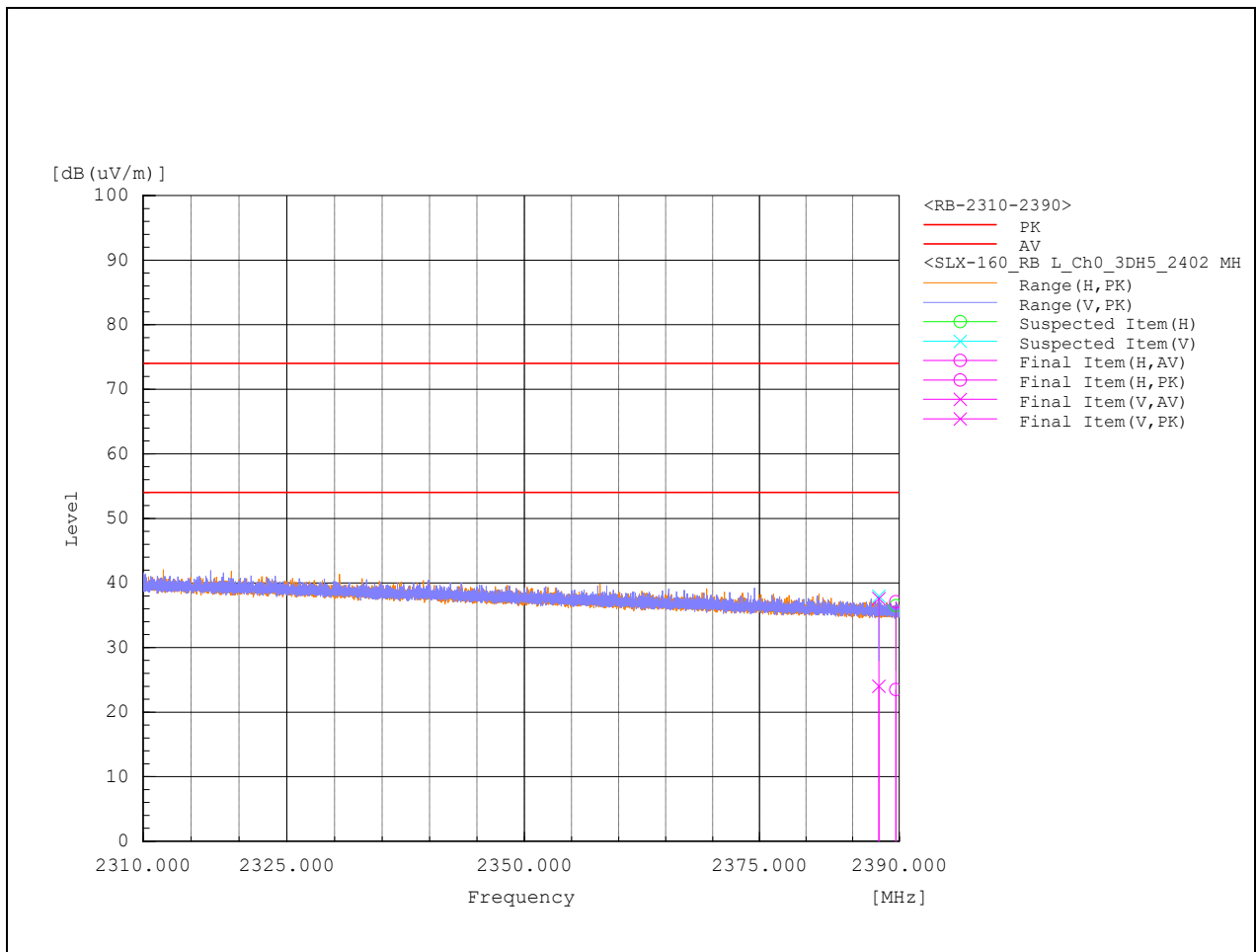
BT_8DPSK

CHANNEL	TX MODE 2402 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	2310MHz-2390MHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	2387.816	V	35.7	49.3	-11.7	24	37.6	54	74	30	36.4	115	326.1	Pass
2	2389.624	H	35.2	48.8	-11.7	23.5	37.1	54	74	30.5	36.9	247	0	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)



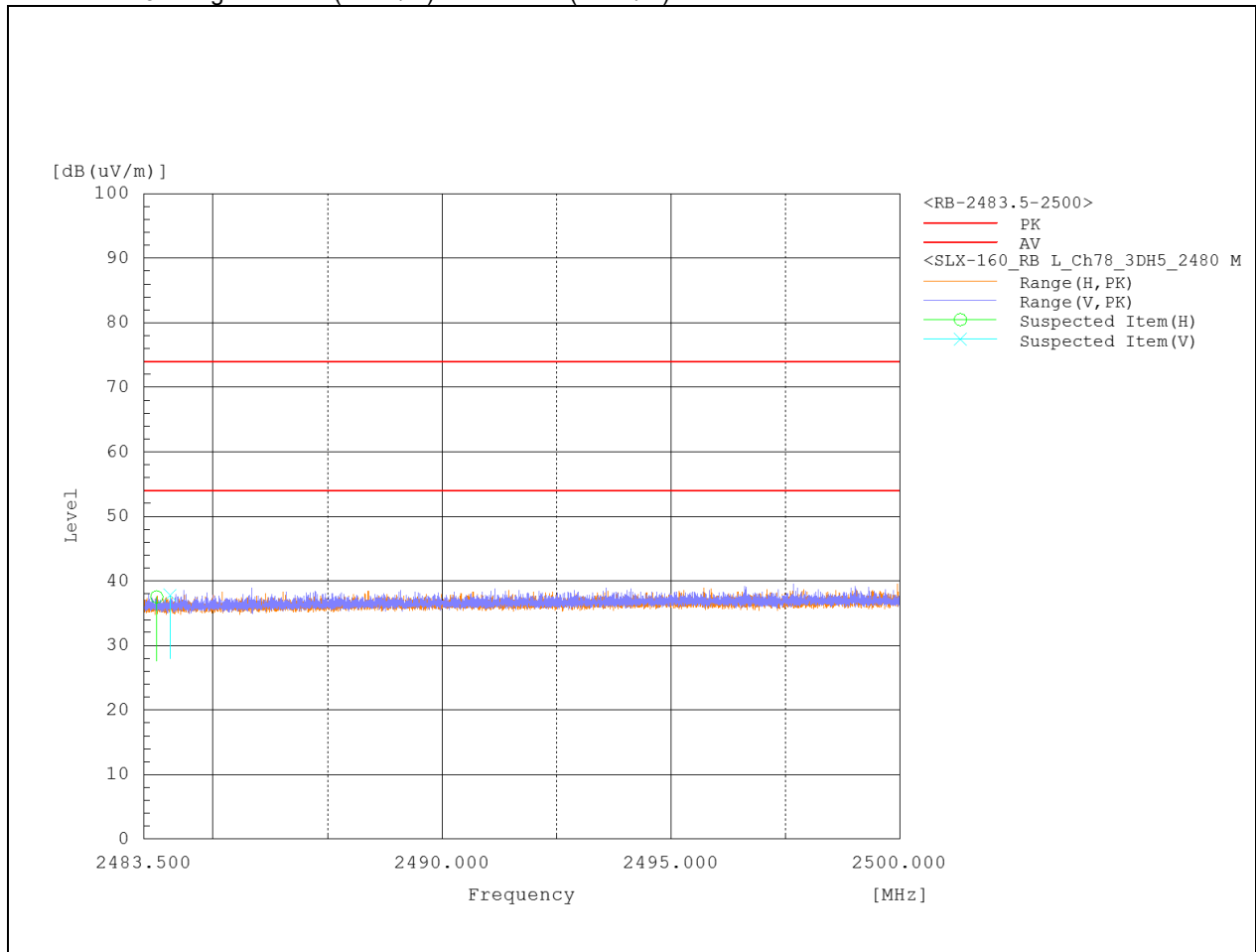
RESTRICTED BAND

CHANNEL	TX MODE 2480 MHz	DETECTOR FUNCTION	Peak Average
FREQUENCY RANGE	2483.5MHz-2500MHz		

Antenna Polarity & Test Distance: Vertical and Horizontal at 3m														
No.	Frequency (MHz)	Polarization (H/V)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	Factor [dB(1/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	LimitAV [dB(uV/m)]	LimitPK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height (cm)	Angle (Deg)	Pass/Fail
1	2483.772	H	36.2	50	-11.2	25	38.8	54	74	29	35.2	106	332.4	Pass
2	2484.071	V	35.7	49.5	-11.2	24.5	38.3	54	74	29.5	35.7	171	214	Pass

REMARKS:

1. Level (dBuV) = Reading (dBuV) + Factor (dB(1/m)).
2. Factor (dB(1/m)) = Antenna Factor(AF) (dB(1/m)) + Cable Loss (dB) –Preamplifier Gain (dB)
3. Margin = Level (dBuV/m) - Limit value(dBuV/m)



5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

Appendix – Information on the Testing Laboratories

Bureau Veritas is a global leader in testing, inspection and certification (TIC) services. We help businesses improve safety, sustainability and productivity; and our clients include the majority of leading brands in retail, manufacturing and other industries. With a presence in every major country around the world, our quality assurance and compliance solutions are vital in helping our customers enhance product quality and concept-to-consumer journeys. We also assist with increasing speed to market, profitability and brand equity throughout the supply chain. Bureau Veritas is a leading wireless/IoT testing, inspection, audit and certification provider, with a global network of test laboratories to support the IoT industry in areas of connectivity, security, interoperability as well as quality, health & safety, and environmental/chemical requirements.

If you have any comments, please feel free to contact us at the following:

Milpitas EMC/RF/Safety/Telecom Lab

775 Montague Expressway, Milpitas, CA 95035

Tel: +1 408 526 1188

Sunnyvale OTA/Bluetooth Lab

1293 Anvilwood Avenue, Sunnyvale, CA 94089

Tel: +1 669 600 5293

Littleton EMC/RF/Safety/Environmental Lab

1 Distribution Center Cir #1, Littleton, MA 01460

Tel: +1 978 486 8880

Irvine OTA/PTCRB/Bluetooth/V2X Lab

15 Musick, Irvine, CA 92618

Tel: +1 949 716 6512

Email: sales.eaw@us.bureauveritas.com

Web Site: www.cpsusa-bureauveritas.com

The address and road map of all our labs can be found in our web site also.

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