FCC PART 15C

TEST REPORT

No. I14Z45989-SRD02

for

Sony Mobile Communications Inc.

Bluetooth Headset

FCC ID: PY7-RD0170

with

Hardware Version: AP2.0

Software Version: AP2.0B

Issued Date: 2014-08-20

DAkkS Deutsche Akkreditierungsstelle D-PL-12123-01-01

DAR accreditation (DIN EN ISO/IEC 17025): No. D-PL-12123-01-01
FCC 2.948 Listed: No.733176
IC O.A.T.S listed: No.6629A-1

Test Laboratory:
TMC Beijing, Telecommunication Metrology Center of Ministry of Industry and Information Technology
No. 52 Hua Yuanbei Road, Haidian District, Beijing, P.R.China 100191
Tel:+86(0)10-62304633-2054, Fax:+86(0)10-62304633-2504 Email:welcome@emcite.com. www.emcite.com

CONTENTS

1. Test Laboratory

1.1. Testing Location

Company Name:	TMC Beijing, Telecommunication Metrology Center of MIIT
Address:	No. 52, Huayuan Bei Road, Haidian District, Beijing, P. R. China
Postal Code:	100191
Telephone:	+86-10-62304633-2054
Fax:	+86-10-62304633-2504

1.2. Testing Environment

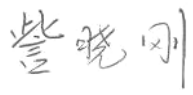
Normal Temperature:	15-35 ℃
Extreme Temperature:	-20/+55 ℃
Relative Humidity:	30-60%
Air Pressure	990hPa-1040hPa

Note: The climatic requirements above are general exclude the special requirements for dedicated test environments listed in section 5 and some specific test cases in other parts of this report.

1.3. Project data

Project Leader:	Zi Xiaogang
Testing Start Date:	2014-07-24
Testing End Date:	2014-08-06

1.4. Signature

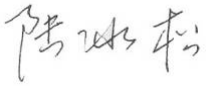


Zi Xiaogang

(Prepared this test report)

Sun Xiangqian

(Reviewed this test report)



Lu Bingsong

Deputy Director of the laboratory

(Approved this test report)

2. Client Information

2.1. Applicant Information

Company Name:	Sony Mobile Communications (China) Co. Ltd
Address /Post:	Sony Mobile R&D Center, No. 16, Guangshun South Street, Chaoyang District
City:	Beijing
Postal Code:	100102
Country:	China
Contact Person:	Ma, Gang
Telephone:	+86-10-58656312
Fax:	+86-10-58659049

2.2. Manufacturer Information

Company Name:	Sony Mobile Communications Inc.
Address /Post:	1-8-15 Konan, Minato-ku, Tokyo, 108-0075, Japan
City:	Tokyo
Postal Code:	108-0075
Country:	Japan

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	Bluetooth headset
FCC ID	PY7-RD0170
Frequency Range	ISM 2400MHz~2483.5MHz
Type of Modulation	GFSK/π/4 DQPSK
Number of Channels	79
Antenna	Integrated Antenna
Power Supply	Battery (charged by travel adapter)

3.2. Internal Identification of EUT used during the test

EUT ID*	HW Version	SW Version
EUT1	AP2.0	AP2.0B
EUT2	AP2.0	AP2.0B

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	SN	Revision
#23083	Travel Charger	8512W321020003EM0600	1
#24287	USB Cable EC300	13230D76039863A	1

#23083

Commercial name	EP880
Type	AC-0400EU
Manufacturer	SALCOMP
Length of cable	100 cm (length of USB cable)

#24287

Type	AI-1000
Manufacturer	Sony Mobile
Length of cable	16 cm

*AE ID: is used to identify the test sample in the lab internally.

3.4. General Description

Fully charged battery was used during the test

3.5. General Description

The Equipment Under Test (EUT) is a model of Bluetooth Headset with integrated antenna and inbuilt battery.

It has Bluetooth (EDR) and NFC function.

It consists of normal options: travel charger and USB Cable EC300

Manual and specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

It consists of normal options: travel charger, USB cable and Phone.

Manual and specifications of the EUT were provided to fulfil the test.

4. Reference Documents

4.1. Documents supplied by applicant

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

FCC Part15	FCC CFR 47, Part 15, Subpart C: 15.205 Restricted bands of operation; 15.209 Radiated emission limits, general requirements; 15.247 Operation within the bands 902–928MHz, 2400–2483.5 MHz, and 5725–5850 MHz.	10–1–13 Edition
FCC Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations	10–1–13 Edition
ANSI C63.10	American National Standard for Testing Unlicensed Wireless Devices	2009

5. LABORATORY ENVIRONMENT

Semi-anechoic chamber (23 meters×17meters×10meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 30 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω
Normalised site attenuation (NSA)	< ±3.2 dB, 10 m distance, from 30 to 1000 MHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 2000 MHz

Control room/ conducted chamber did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 35 ℃
Relative humidity	Min. =20 %, Max. = 80 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω

Fully-anechoic chamber1 (6.8 meters×3.08 meters×3.53 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

Fully-anechoic chamber2 (8.6 meters×6.1 meters×3.85 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 110 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 1 Ω
Uniformity of field strength	Between 0 and 6 dB, from 80 to 4000 MHz

Fully-anechoic chamber3 (10 meters×6.7 meters×6.15 meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 ℃, Max. = 30 ℃
Relative humidity	Min. = 35 %, Max. = 60 %
Shielding effectiveness	> 100 dB
Electrical insulation	> 2 MΩ
Ground system resistance	< 0.5 Ω
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz

Additional Humidity Requirements for Electrostatic Discharge Test: Min. = 30%, Max. = 60%.

6. SUMMARY OF TEST RESULTS

6.1. Summary of Test Results

SUMMARY OF MEASUREMENT RESULTS	Modulation	Sub-clause of Part15C	Verdict
Peak Output Power (Conducted)	GFSK/	15.247 (b)(1)	P
	π/4DQPSK		P
Peak Output Power(Radiated)	GFSK	15.247 (b)(1)	P
Antenna Gain	GFSK/	None	P
Frequency Band Edges	GFSK	15.247 (d)	P
	π/4DQPSK		P
Conducted Emission	GFSK	15.247 (d)	P
	π/4DQPSK		P
Radiated Emission	GFSK	15.247(d),15.205,15.209,15.109	P
	π/4DQPSK		P
Time of Occupancy (Dwell Time)	GFSK	15.247 (a) (1)(iii)	P
	π/4DQPSK		P
20dB Bandwidth	GFSK	15.247 (a)(1)	P
	π/4DQPSK		P
Carrier Frequency Separation	GFSK	15.247 (a)(1)	P
	π/4DQPSK		P
Number of hopping channels	GFSK	15.247 (a)(1)(iii)	P
	π/4DQPSK		P
AC Powerline Conducted Emission	GFSK	15.107, 15.207	P

Please refer to **ANNEX A** for detail.

The measurement is made according to ANSI C63.10.

Terms used in Verdict column

P	Pass, The EUT complies with the essential requirements in the standard.
NP	Not Perform, The test was not performed by TMC
NA	Not Applicable, The test was not applicable
F	Fail, The EUT does not comply with the essential requirements in the standard

6.2. Statements

The test cases as listed in section 6.1 of this report for the EUT specified in section 3 was performed by TMC and according to the standards or reference documents listed in section 4.2 The EUT met all requirements of the standards or reference documents.

This report only deals with the Bluetooth including EDR functions among the features described in section 3.

6.3. Test Conditions

T nom	Normal Temperature
T min	Low Temperature
T max	High Temperature
V nom	Normal Voltage
V min	Low Voltage
V max	High Voltage
H nom	Norm Humidity
A nom	Norm Air Pressure

For this report, all the test case listed above are tested under Normal Temperature and Normal Voltage, and also under norm humidity, the specific conditions as following:

Temperature	T nom	25℃
Voltage	V nom	3.7V
Humidity	H nom	38%
Air Pressure	A nom	1010hPa

7. Test Equipments Utilized

Conducted test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Calibration Due date
1	Vector Signal Analyzer	FSQ26	200136	Rohde & Schwarz	2014-01-07	2015-01-06
2	Bluetooth Tester	CBT32	100649	Rohde & Schwarz	2014-02-10	2015-02-09

Radiated emission test system

No.	Equipment	Model	Serial Number	Manufacturer	Calibration date	Calibration Due date
1	Test Receiver	ESCI 7	100948	Rohde & Schwarz	2014-07-19	2015-07-18
2	EMI Antenna	VULB 9163	9163 175	Schwarzbeck	2012-07-14	2015-07-13
3	EMI Antenna	3117	00119021	ETS-Lindgren	2014-04-20	2017-04-19
4	Dual-Ridge Waveguide Horn Antenna	3116	2663	ETS-Lindgren	2011-07-01	2017-06-30
5	Dual-Ridge Waveguide Horn Antenna	3116	2661	ETS-Lindgren	2011-07-01	2017-06-30
6	Bluetooth Tester	CBT	100153	Rohde & Schwarz	2013-09-16	2014-09-15
7	LISN	ESH2-Z5	829991/012	Rohde & Schwarz	2014-04-15	2017-04-14
8	Loop Antenna	HFH2-Z2	829324/007	Rohde & Schwarz	2011-12-13	2014-12-12
9	Pre-amplifier(18GHz)	SCU18	1005277	Rohde & Schwarz	/	/
10	Pre-amplifier(26.5GHz)	SCU26	1006788	Rohde & Schwarz	/	/

Anechoic chamber

Fully anechoic chamber by Frankonia German.

Note : The pre amplifiers is calibrated with routes calibration every time before test, therefore no need for the calibration date.

ANNEX A: MEASUREMENT RESULTS

A.1. Measurement Method

A.1.1. Conducted Measurements

The measurement is made according to ANSI C63.10.

1). Connect the EUT to the test system correctly.

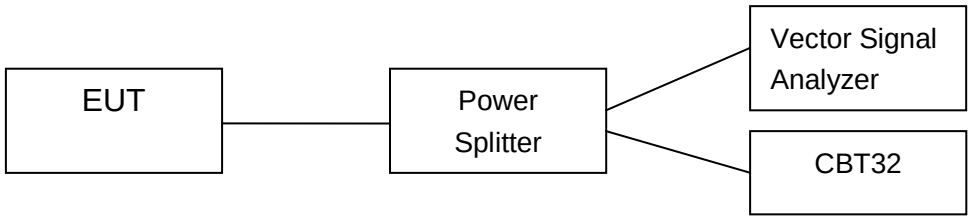
2). Set the EUT to the required work mode (Transmitter, receiver or transmitter & receiver).

3). Set the EUT to the required channel.

4). Set the EUT hopping mode (hopping or hopping off).

5). Set the spectrum analyzer to start measurement.

6). Record the values. Vector Signal Analyzer



A.1.2. Radiated Emission Measurements

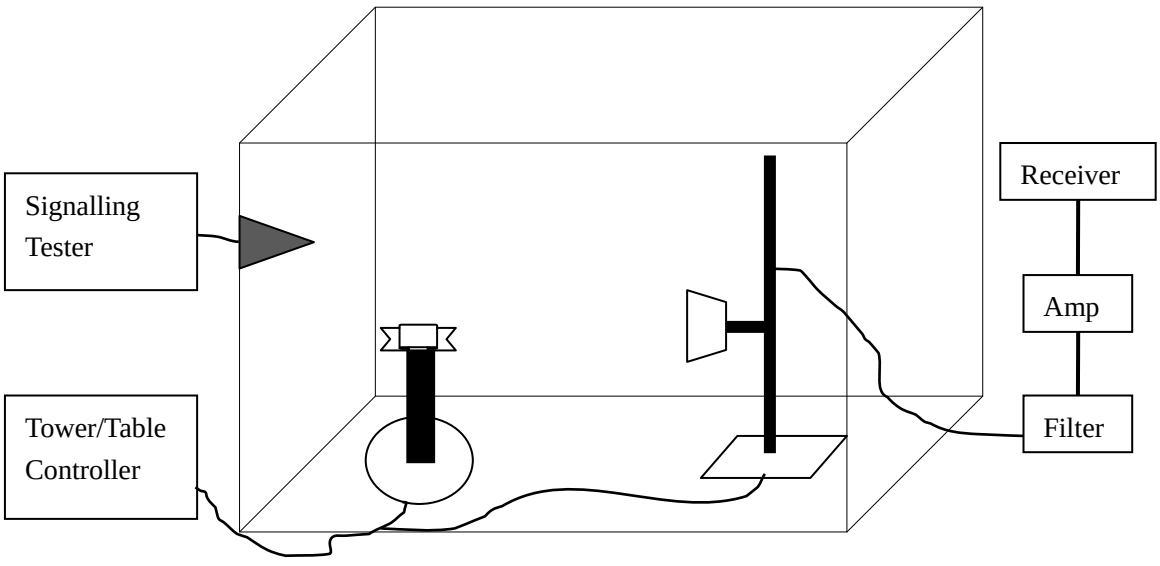
The measurement is made according to ANSI C63.10

The radiated emission test is performed in semi-anechoic chamber. The distance from the EUT to the reference point of measurement antenna is 3m. The test is carried out on both vertical and horizontal polarization and only maximization result of both polarizations is kept. During the test, the turntable is rotated 360° and the measurement antenna is moved from 1m to 4m to get the maximization result.

In the case of radiated emission, the used settings are as follows,

Sweep frequency from 30 MHz to 1GHz, RBW = 100 kHz, VBW = 300 kHz;

Sweep frequency from 1 GHz to 26GHz, RBW = 1MHz, VBW = 1MHz;



A.2. Peak Output Power

Measurement Limit:

Standard	Limit (dBm)
FCC Part 15.247(b)(1)	< 30

The measurement is made according to ANSI C63.10.

Measurement Results:

A.2.1 Antenna gain

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the EUT.

Antenna gain = GFSK (Radiated) - GFSK (Conducted)

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz
GFSK (Conducted)	5.46	7.54	8.32
GFSK (Radiated)	8.06	7.91	5.25
Gain(dBi)	2.60	0.37	-3.07

Conclusion: PASS

A.2.2 Conducted Output Power

Peak(RBW=VBW=2MHz; SPAN=5MHz; Detector: Peak)

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
GFSK (dBm)	5.46	7.54	8.32	P
π/4 DQPSK (dBm)	3.37	6.58	7.50	P
8DPSK (dBm)	/	/	/	/

Measurement Uncertainty: ±1.17dB

Conclusion: PASS

A.2.3 Radiated Output Power

Peak(RBW=VBW=8MHz; SPAN=8MHz; Detector: Peak)

Channel	Ch 0 2402 MHz	Ch 39 2441 MHz	Ch 78 2480 MHz	Conclusion
GFSK (dBm)	8.06	7.91	5.25	P
π/4 DQPSK * (dBm)	5.97	6.95	4.43	P
8DPSK * (dBm)	/	/	/	/

Note:* These values are calculated with the antenna gain

Measurement Uncertainty: ±1.98dB

Conclusion: PASS

A.3. Frequency Band Edges - Conducted

Measurement Limit:

Standard	Limit (dBc)
FCC 47 CFR Part 15.247 (d)	<-20 Note：The measurement results are calculated as power measured in any 100KHz bandwidth outside the frequency band in dBm minus power measured in the 100 kHz bandwidth within the band that contains the highest level of the desired power

The measurement is made according to ANSI C63.10.

Measurement Result:

For GFSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.1	-45.62	P
	Hopping ON	Fig.2	-47.15	P
78	Hopping OFF	Fig.3	-54.45	P
	Hopping ON	Fig.4	-54.63	P

Forπ/4 DQPSK

Channel	Hopping	Band Edge Power (dBc)		Conclusion
0	Hopping OFF	Fig.5	-45.42	P
	Hopping ON	Fig.6	-44.86	P
78	Hopping OFF	Fig.7	-58.66	P
	Hopping ON	Fig.8	-57.31	P

Conclusion: PASS

Test graphs as below

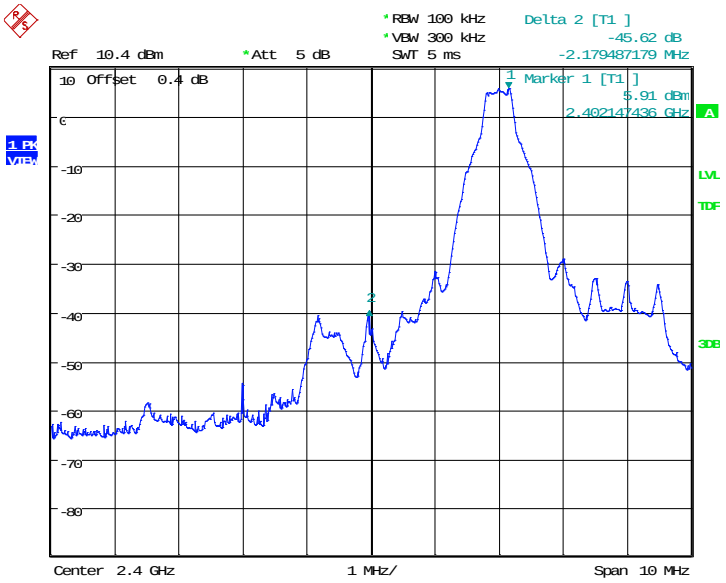


Fig.1. Frequency Band Edges: GFSK, Channel 0, Hopping Off

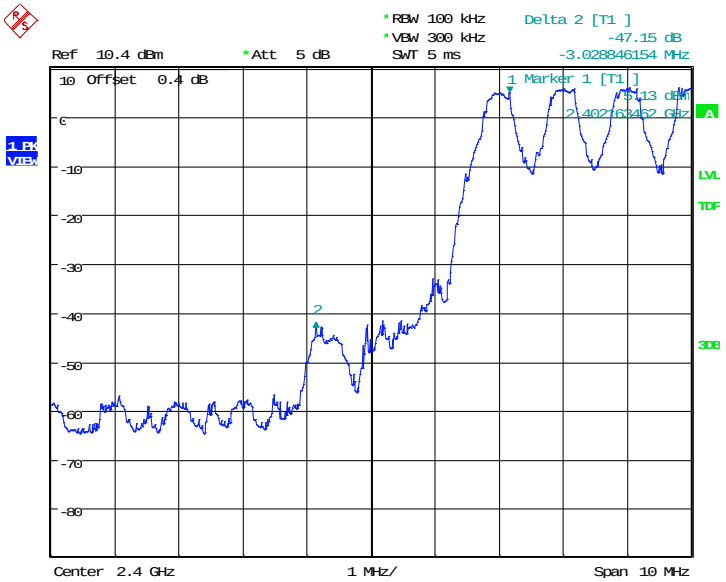


Fig.2. Frequency Band Edges: GFSK, Channel 0, Hopping On

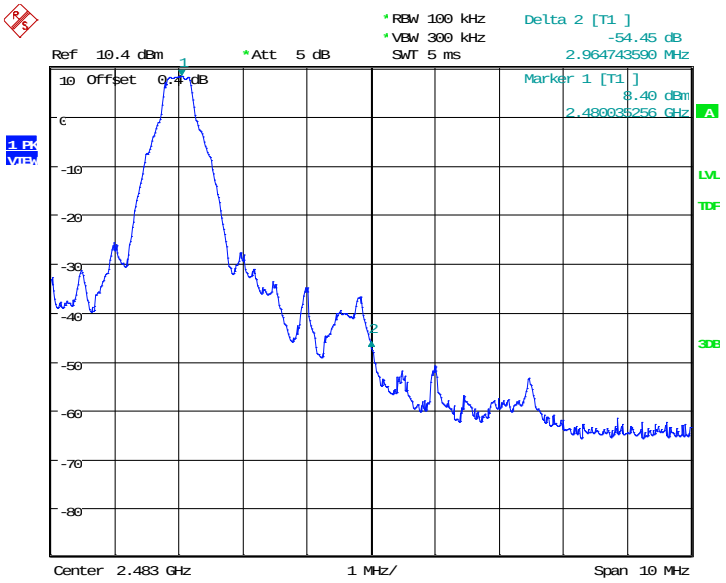


Fig.3. Frequency Band Edges: GFSK, Channel 78, Hopping Off

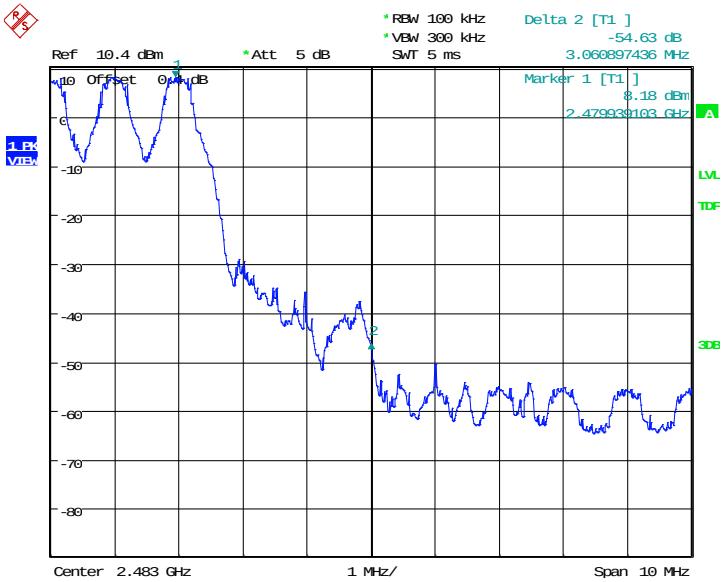


Fig.4. Frequency Band Edges: GFSK, Channel 78, Hopping On

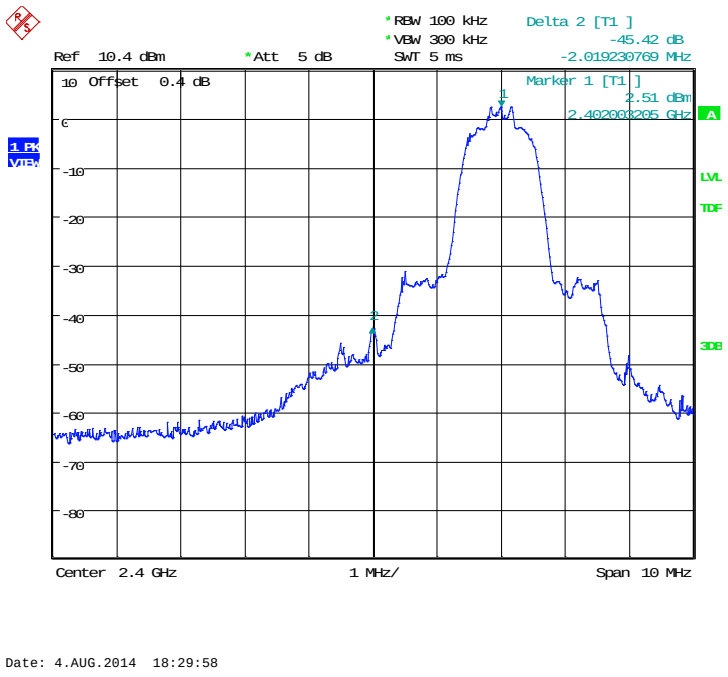


Fig.5. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping Off

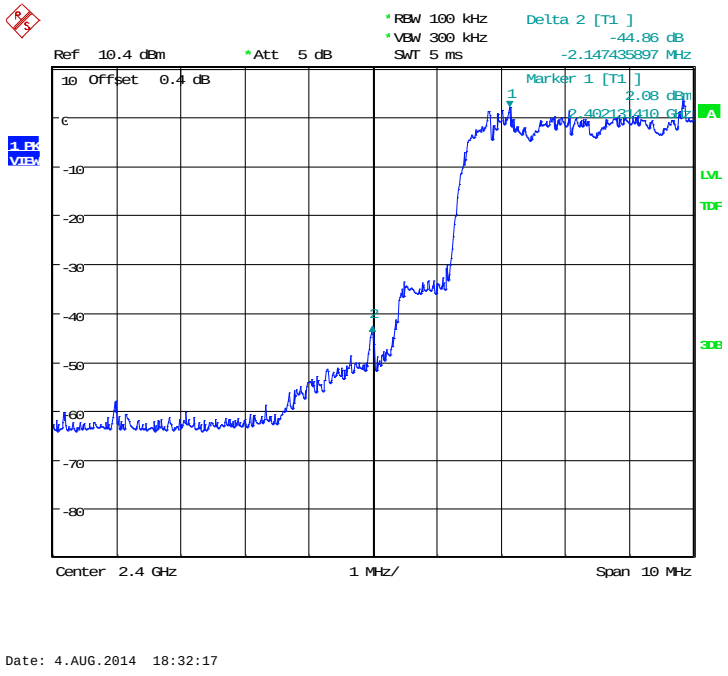


Fig.6. Frequency Band Edges: π/4 DQPSK, Channel 0, Hopping On

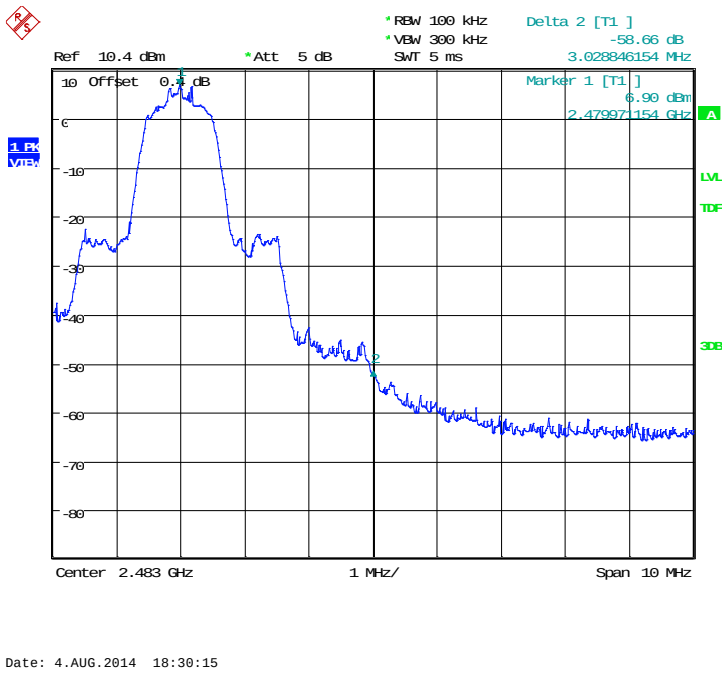


Fig.7. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping Off

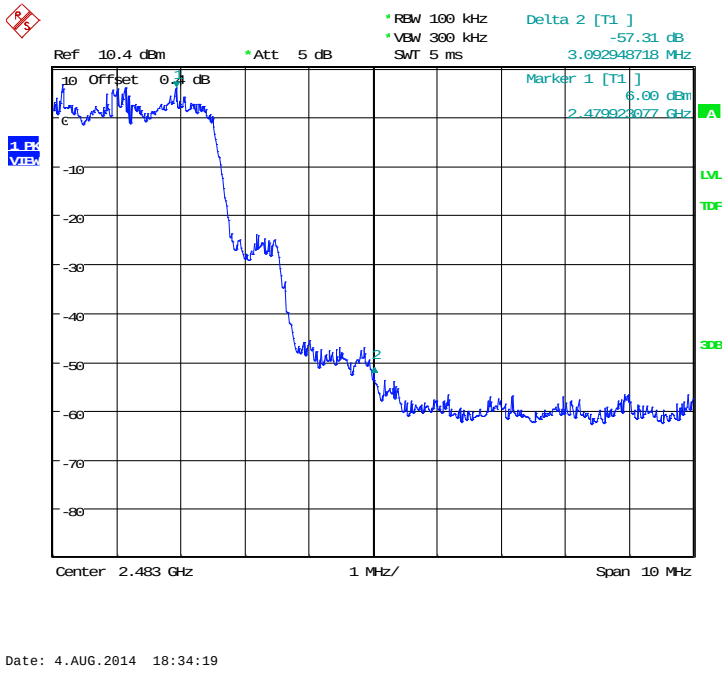


Fig.8. Frequency Band Edges: π/4 DQPSK, Channel 78, Hopping On

A.4. Conducted Emission

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247 (d)	20dB below peak output power in 100 kHz bandwidth

The measurement is made according to ANSI C63.10

Measurement Results:

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	Center Frequency	Fig.9	P
	30 MHz ~ 1 GHz	Fig.10	P
	1 GHz ~ 3 GHz	Fig.11	P
	3 GHz ~ 10 GHz	Fig.12	P
	10 GHz ~ 26 GHz	Fig.13	P
Ch 39 2441 MHz	Center Frequency	Fig.14	P
	30 MHz ~ 1 GHz	Fig.15	P
	1 GHz ~ 3 GHz	Fig.16	P
	3 GHz ~ 10 GHz	Fig.17	P
	10 GHz ~ 26 GHz	Fig.18	P
Ch 78 2480 MHz	Center Frequency	Fig.19	P
	30 MHz ~ 1 GHz	Fig.20	P
	1 GHz ~ 3 GHz	Fig.21	P
	3 GHz ~ 10 GHz	Fig.22	P
	10 GHz ~ 26 GHz	Fig.23	P

For π/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	Center Frequency	Fig.24	P
	30 MHz ~ 1 GHz	Fig.25	P
	1 GHz ~ 3 GHz	Fig.26	P
	3 GHz ~ 10 GHz	Fig.27	P
	10 GHz ~ 26 GHz	Fig.28	P
Ch 39 2441 MHz	Center Frequency	Fig.29	P
	30 MHz ~ 1 GHz	Fig.30	P
	1 GHz ~ 3 GHz	Fig.31	P
	3 GHz ~ 10 GHz	Fig.32	P
	10 GHz ~ 26 GHz	Fig.33	P
Ch 78 2480 MHz	Center Frequency	Fig.34	P
	30 MHz ~ 1 GHz	Fig.35	P

	1 GHz ~ 3 GHz	Fig.36	P
	3 GHz ~ 10 GHz	Fig.37	P
	10 GHz ~ 26 GHz	Fig.38	P

Conclusion: PASS

Test graphs as below

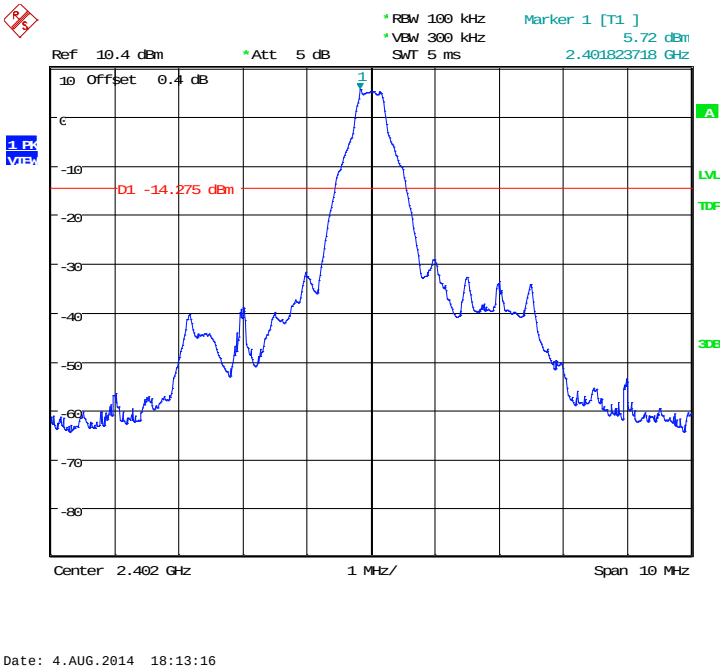


Fig.9. Conducted spurious emission: GFSK, Channel 0,2402MHz

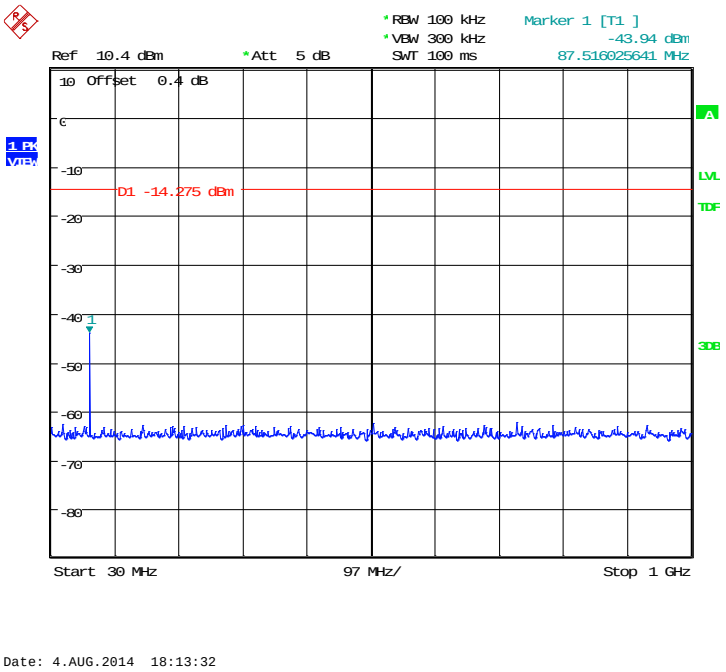


Fig.10. Conducted spurious emission: GFSK, Channel 0, 30MHz - 1GHz

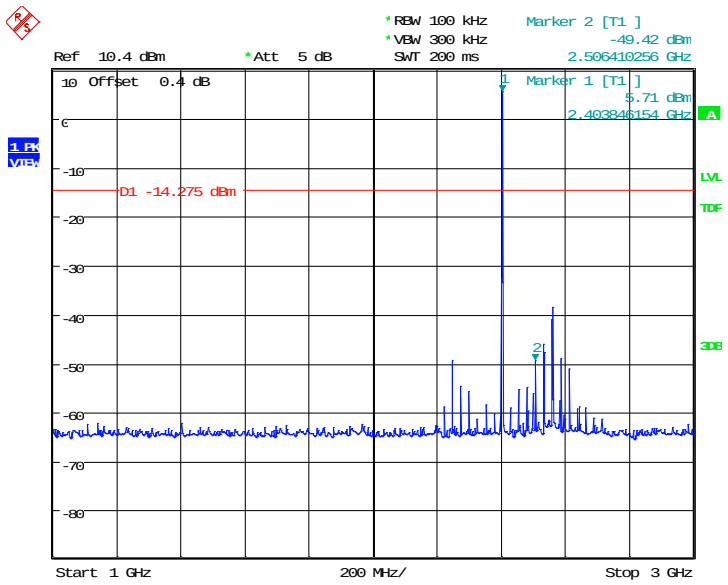


Fig.11. Conducted spurious emission: GFSK, Channel 0, 1GHz - 3GHz

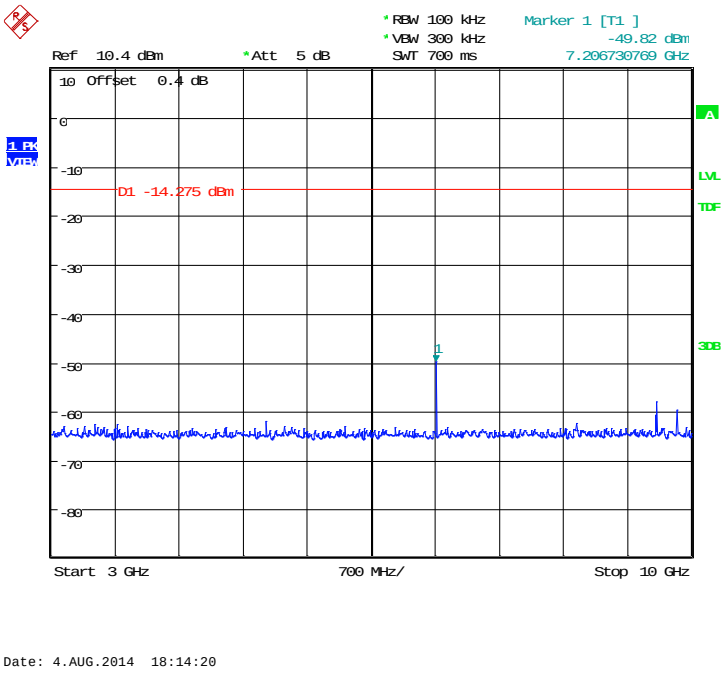


Fig.12. Conducted spurious emission: GFSK, Channel 0, 3GHz - 10GHz

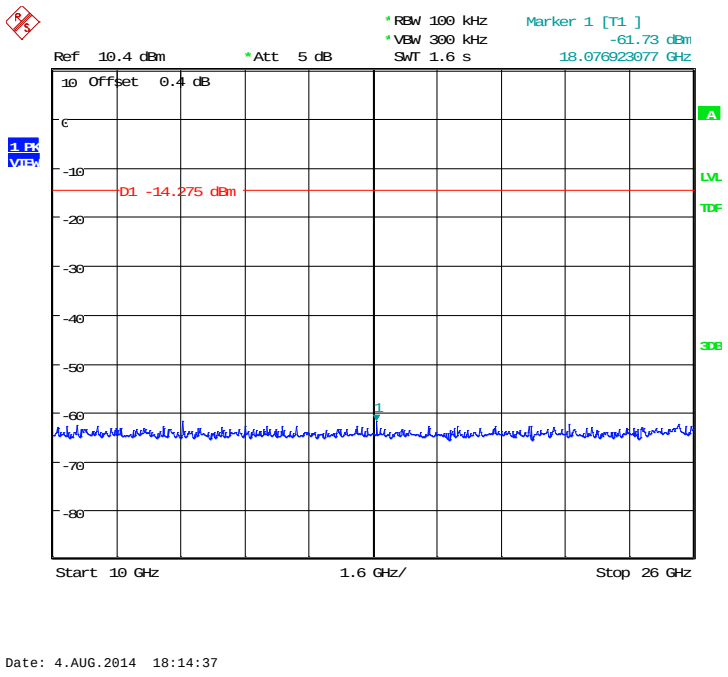


Fig.13. Conducted spurious emission: GFSK, Channel 0,10GHz - 26GHz

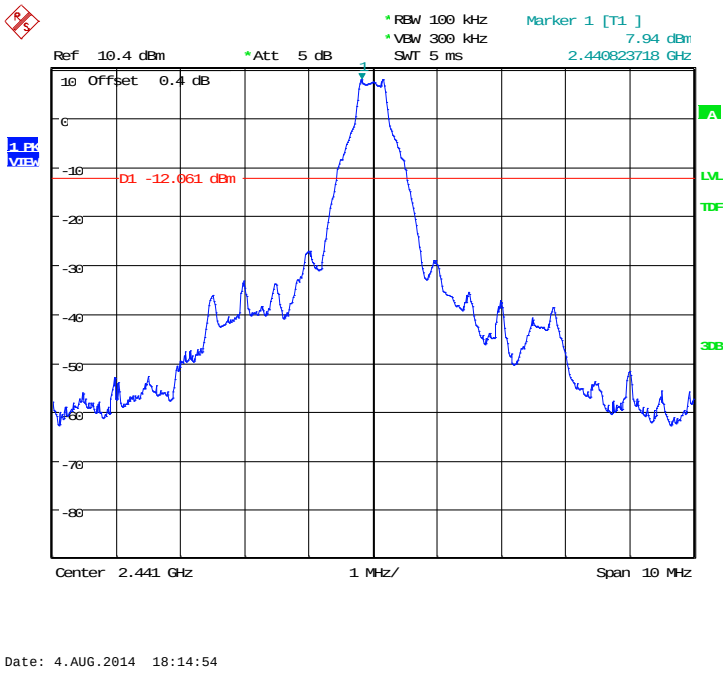


Fig.14. Conducted spurious emission: GFSK, Channel 39, 2441MHz

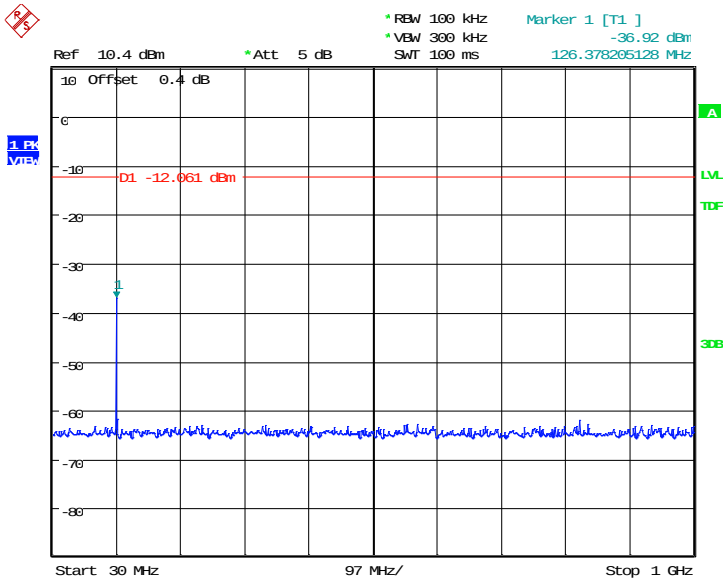


Fig.15. Conducted spurious emission: GFSK, Channel 39, 30MHz - 1GHz

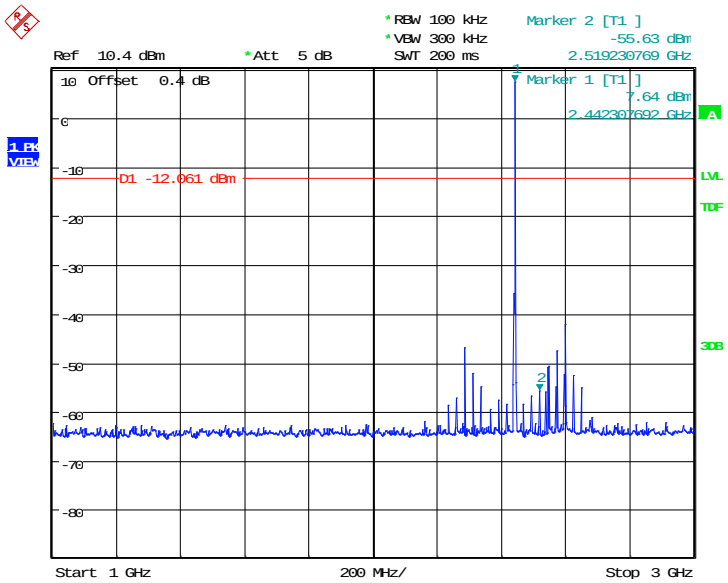


Fig.16. Conducted spurious emission: GFSK, Channel 39, 1GHz – 3GHz

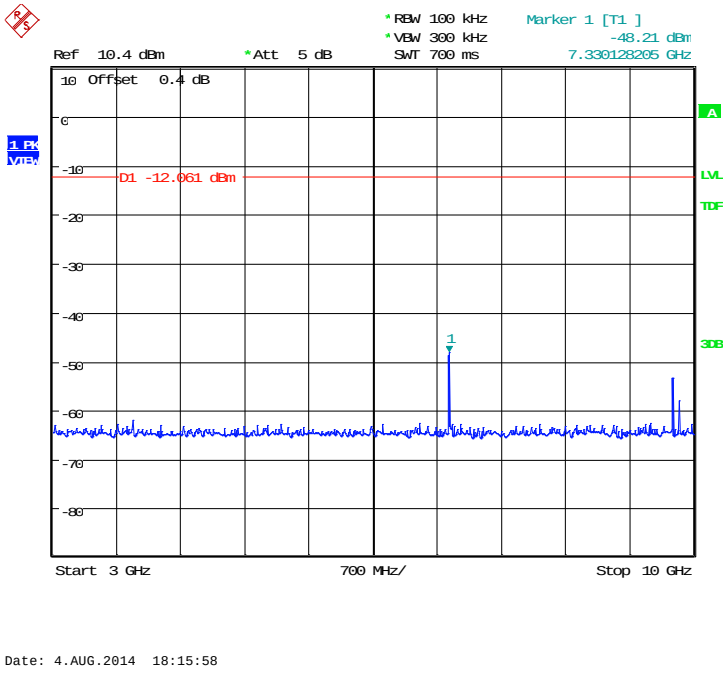


Fig.17. Conducted spurious emission: GFSK, Channel 39, 3GHz – 10GHz

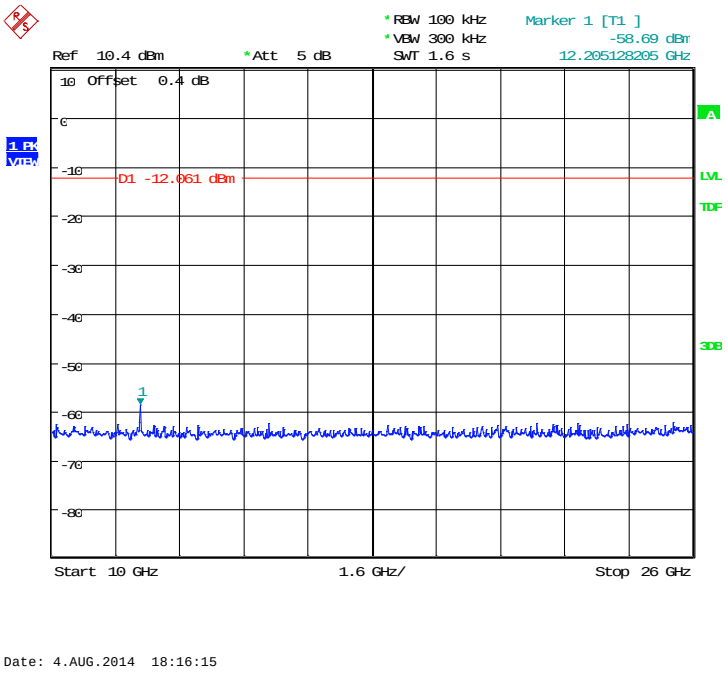


Fig.18. Conducted spurious emission: GFSK, Channel 39, 10GHz – 26GHz

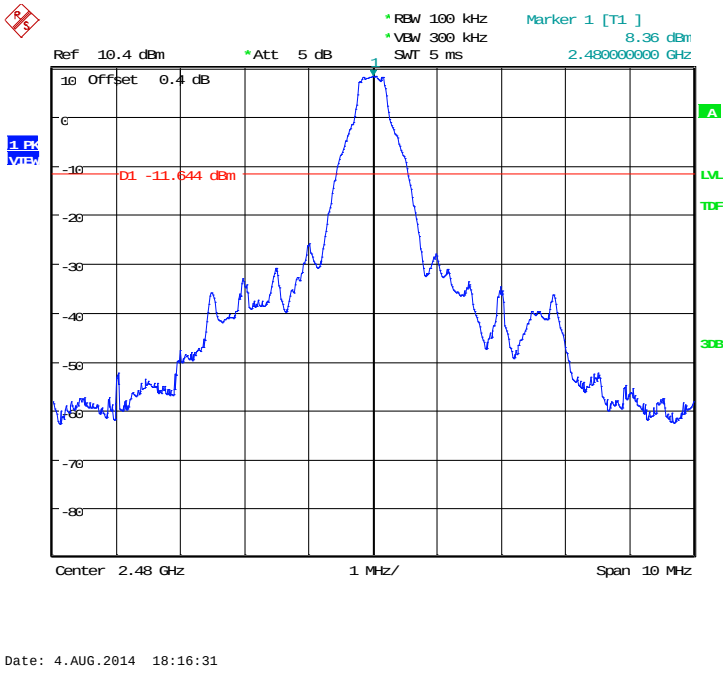


Fig.19. Conducted spurious emission: GFSK, Channel 78, 2480MHz

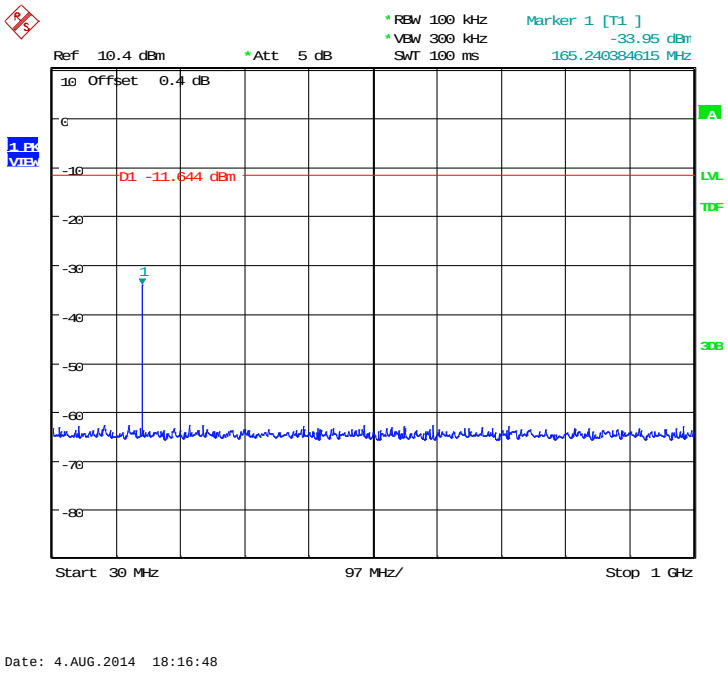


Fig.20. Conducted spurious emission: GFSK, Channel 78, 30MHz - 1GHz

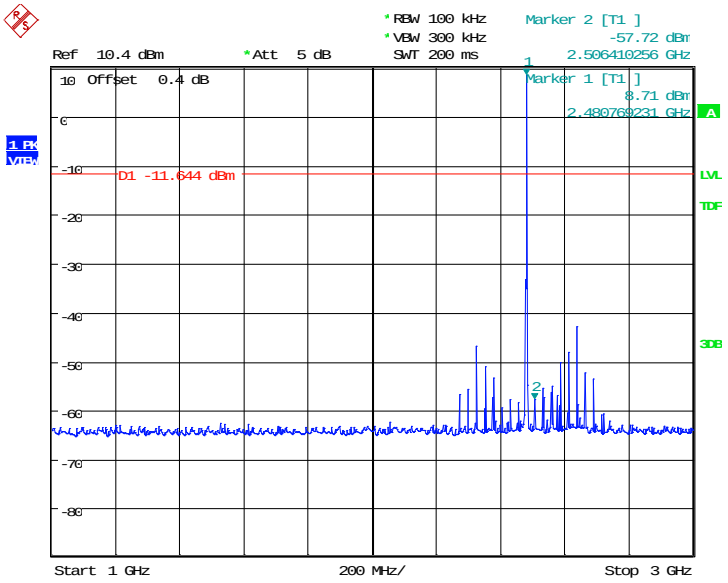


Fig.21. Conducted spurious emission: GFSK, Channel 78, 1GHz - 3GHz

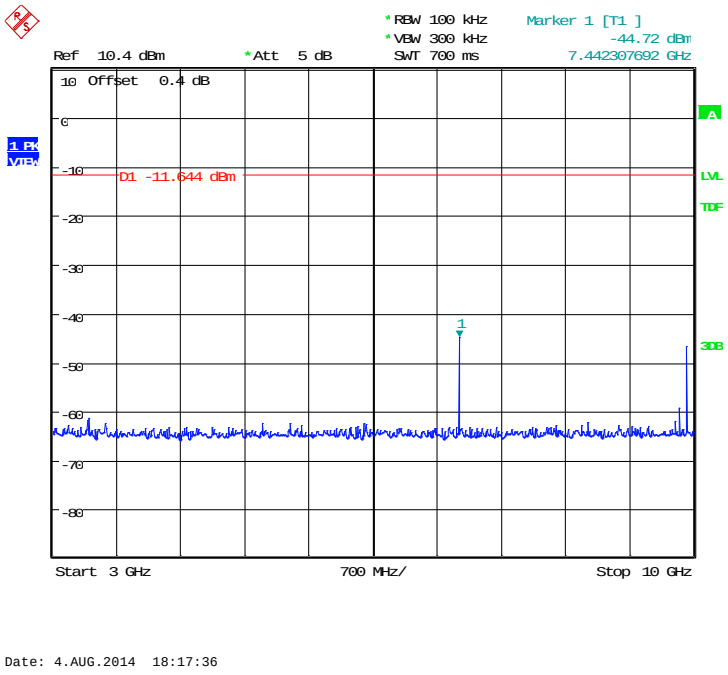


Fig.22. Conducted spurious emission: GFSK, Channel 78, 3GHz - 10GHz

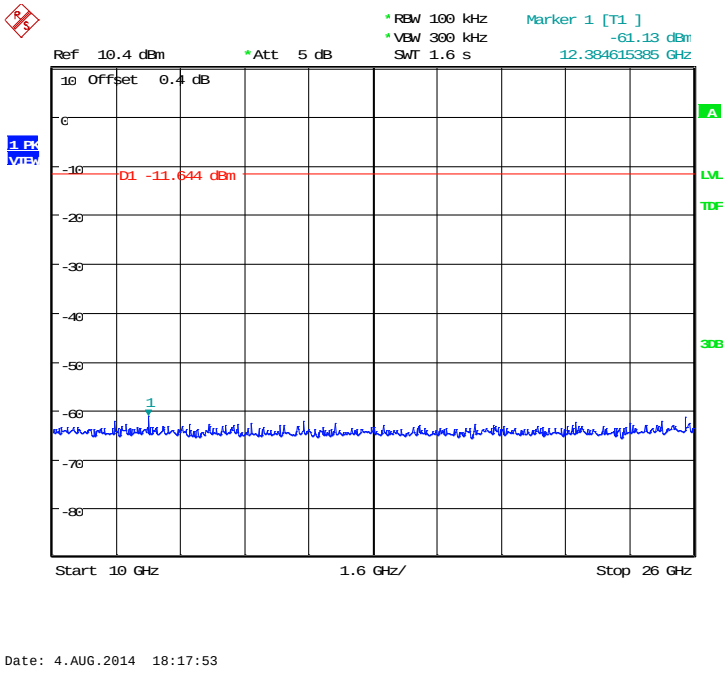


Fig.23. Conducted spurious emission: GFSK, Channel 78, 10GHz - 26GHz

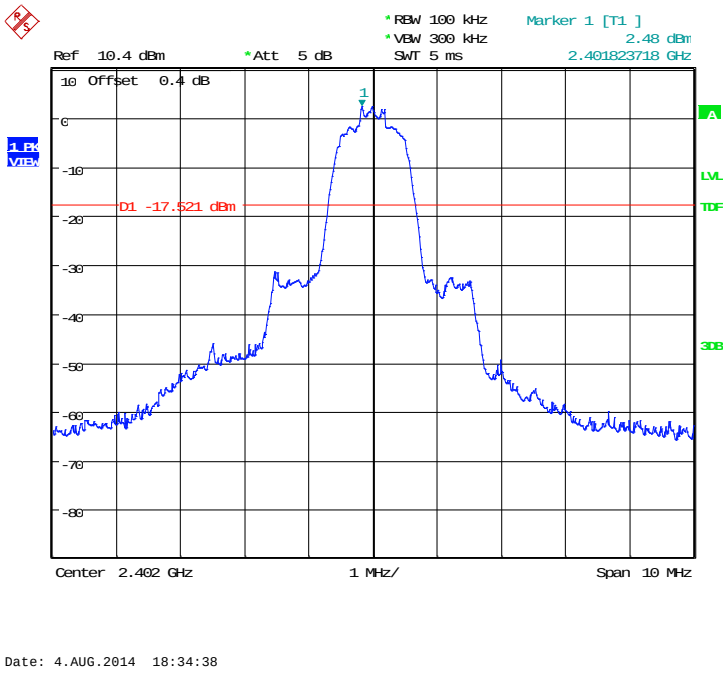


Fig.24. Conducted spurious emission: π/4 DQPSK, Channel 0,2402MHz

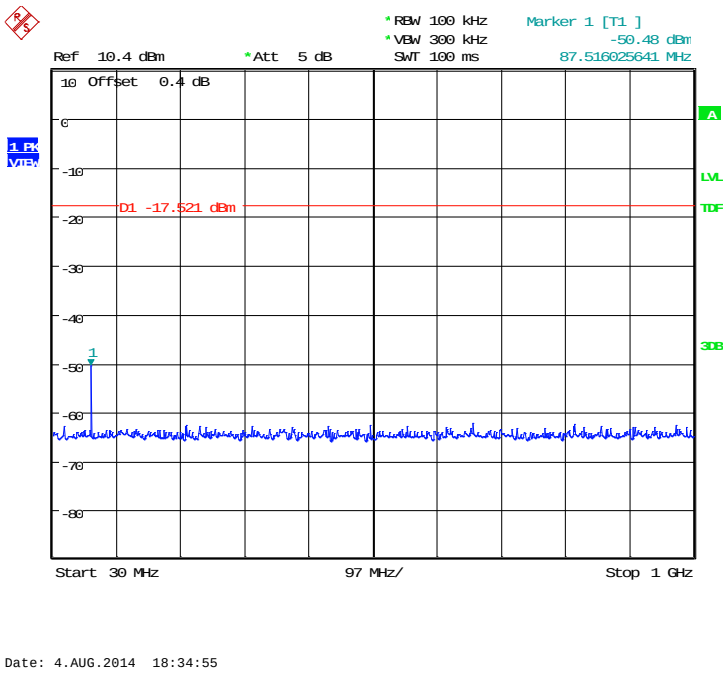


Fig.25. Conducted spurious emission: π/4 DQPSK, Channel 0, 30MHz - 1GHz

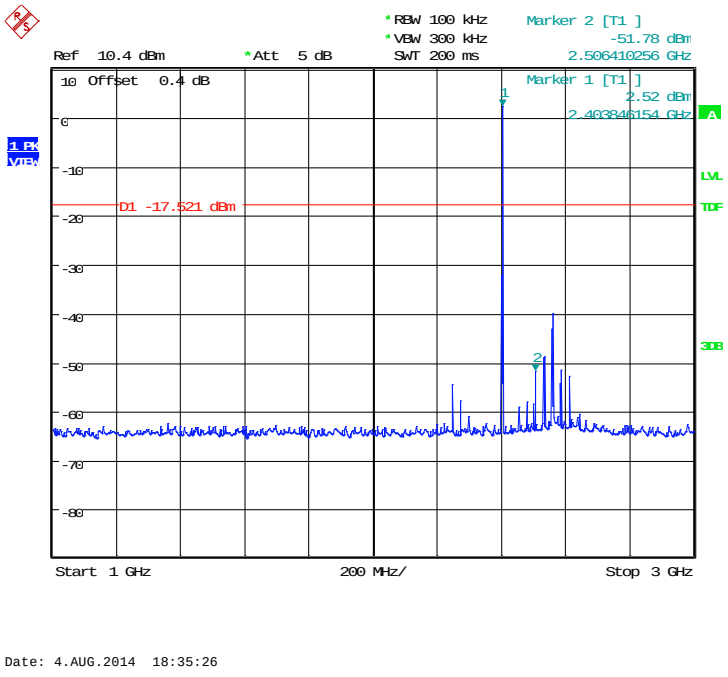


Fig.26. Conducted spurious emission: π/4 DQPSK, Channel 0, 1GHz - 3GHz

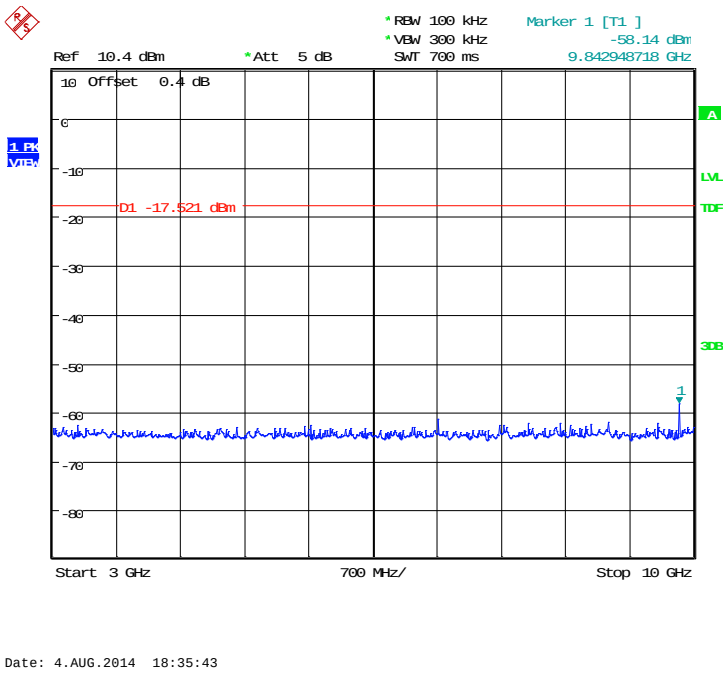


Fig.27. Conducted spurious emission: π/4 DQPSK, Channel 0, 3GHz - 10GHz

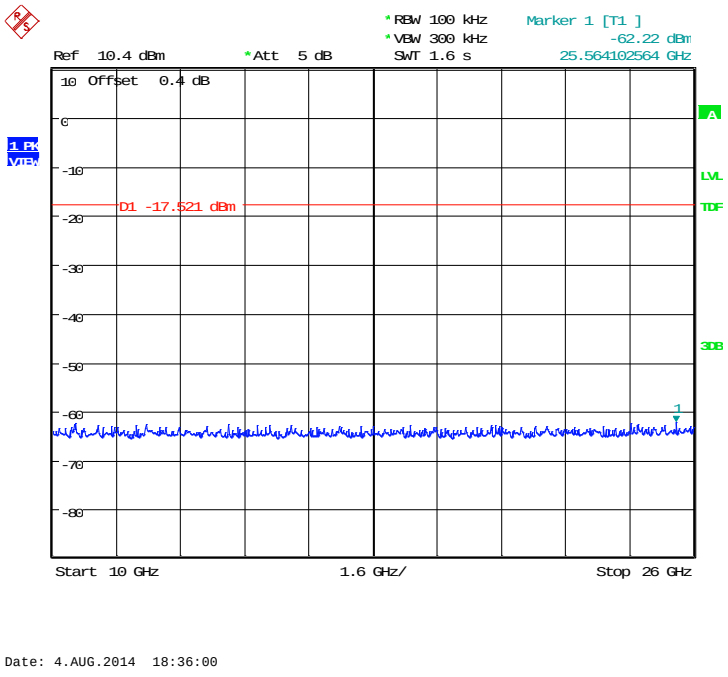


Fig.28. Conducted spurious emission: π/4 DQPSK, Channel 0,10GHz - 26GHz

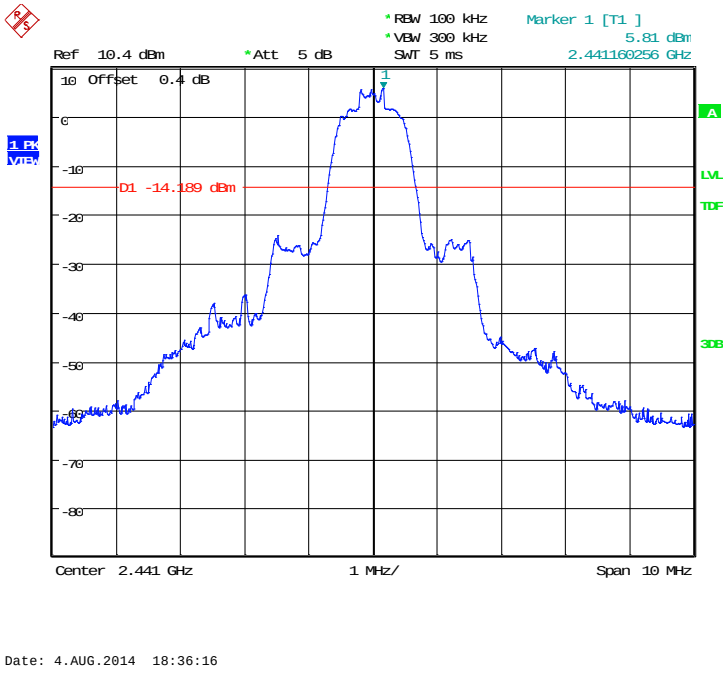


Fig.29. Conducted spurious emission: π/4 DQPSK, Channel 39, 2441MHz

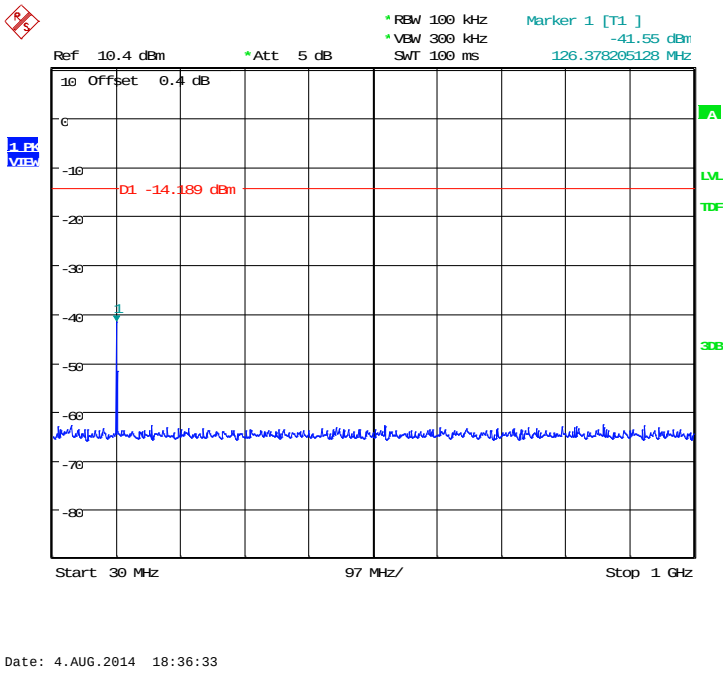


Fig.30. Conducted spurious emission: π/4 DQPSK, Channel 39, 30MHz - 1GHz

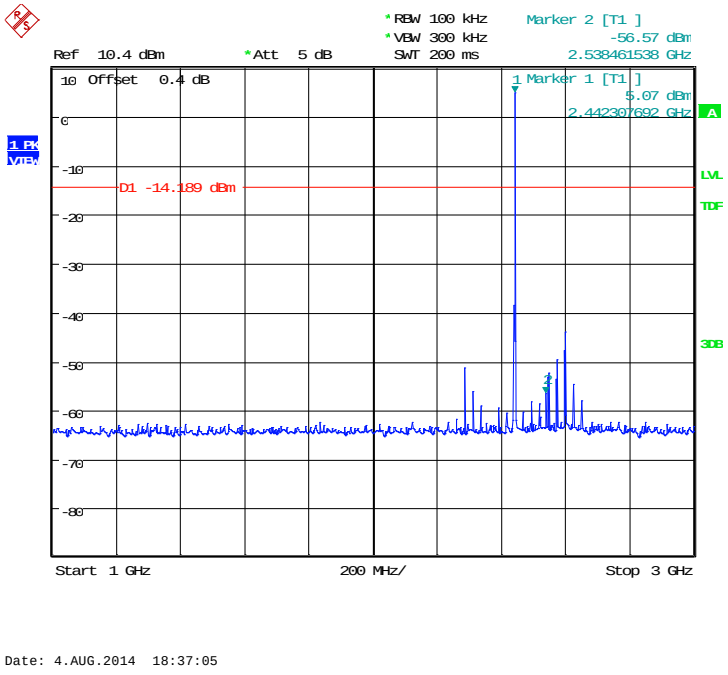


Fig.31. Conducted spurious emission: π/4 DQPSK, Channel 39, 1GHz - 3GHz

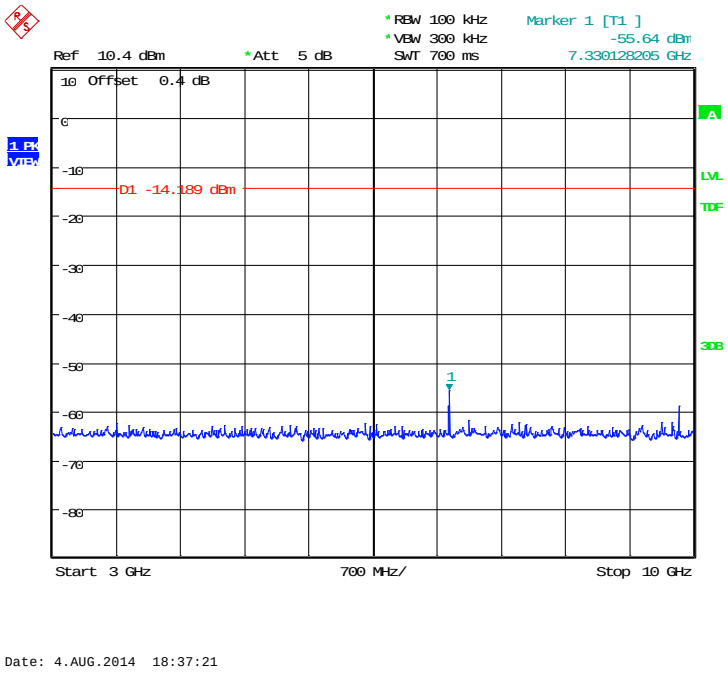


Fig.32. Conducted spurious emission: π/4 DQPSK, Channel 39, 3GHz - 10GHz

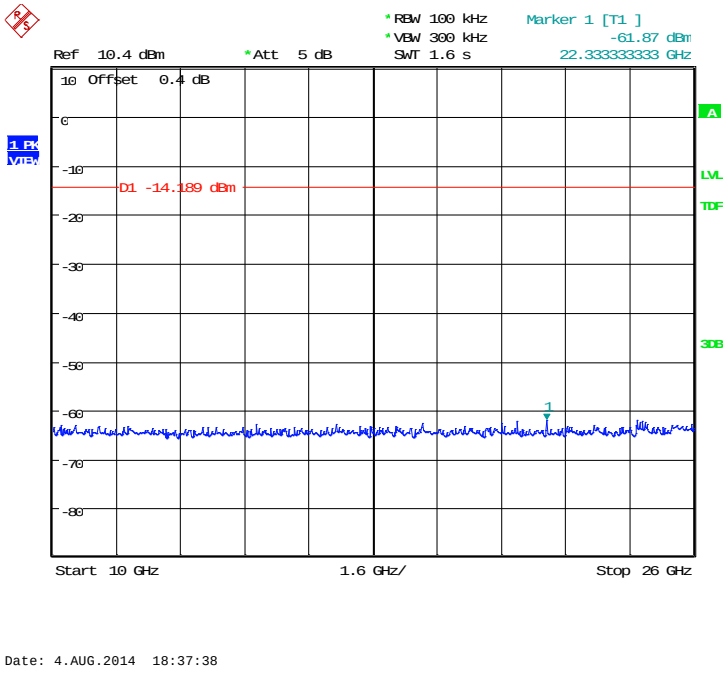


Fig.33. Conducted spurious emission: π/4 DQPSK, Channel 39, 10GHz – 26GHz

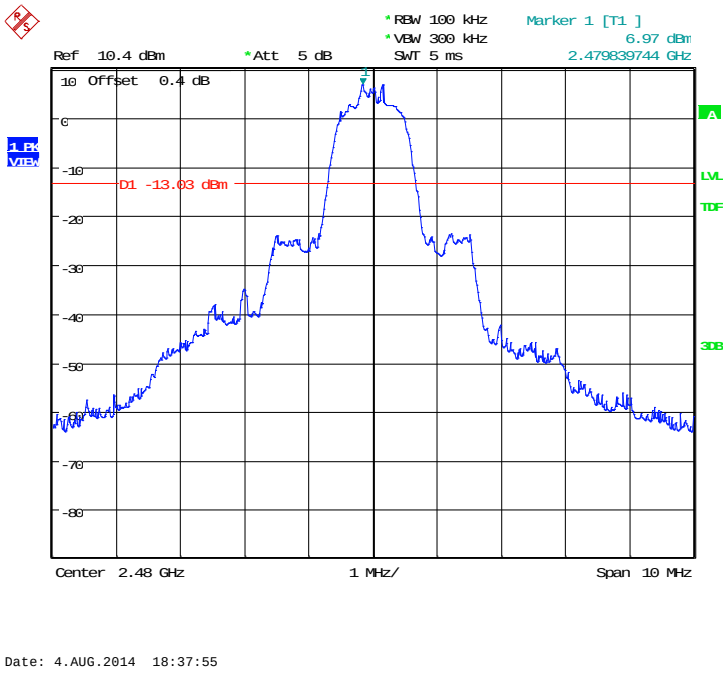


Fig.34. Conducted spurious emission: π/4 DQPSK, Channel 78, 2480MHz

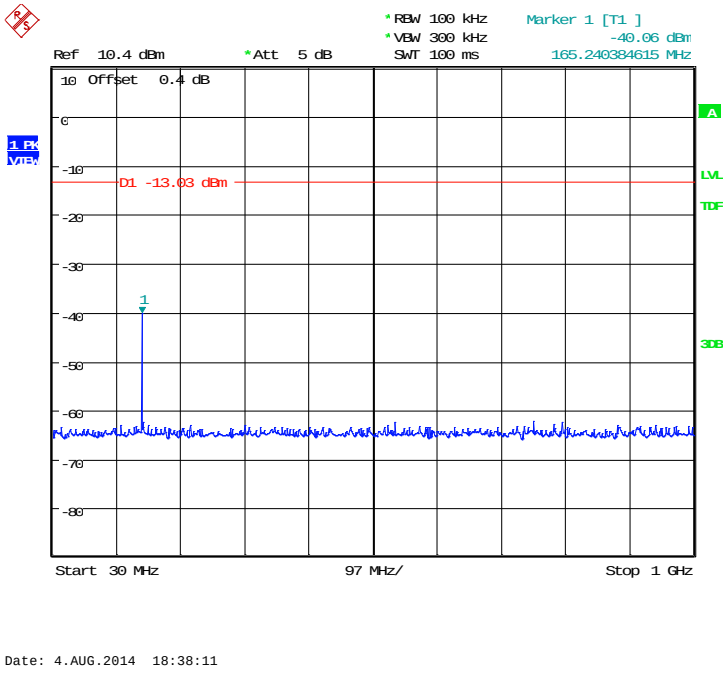


Fig.35. Conducted spurious emission: π/4 DQPSK, Channel 78, 30MHz - 1GHz

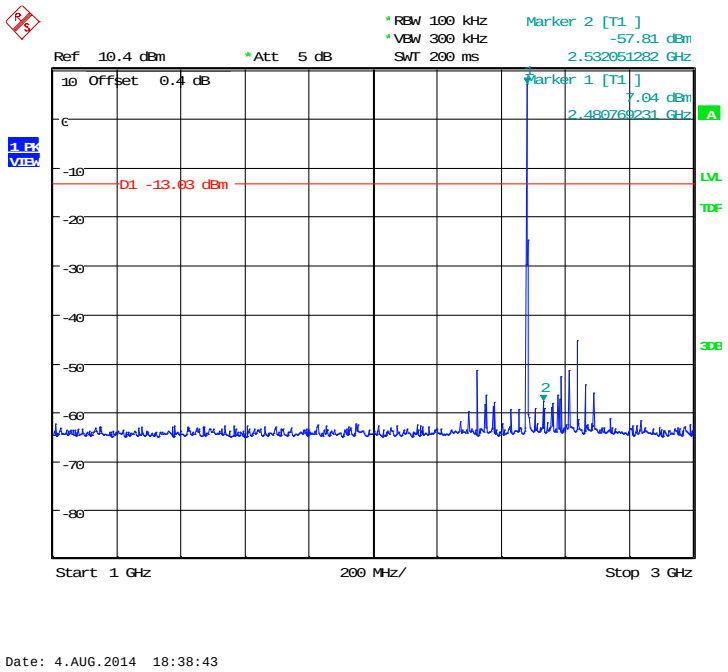


Fig.36. Conducted spurious emission: π/4 DQPSK, Channel 78, 1GHz - 3GHz

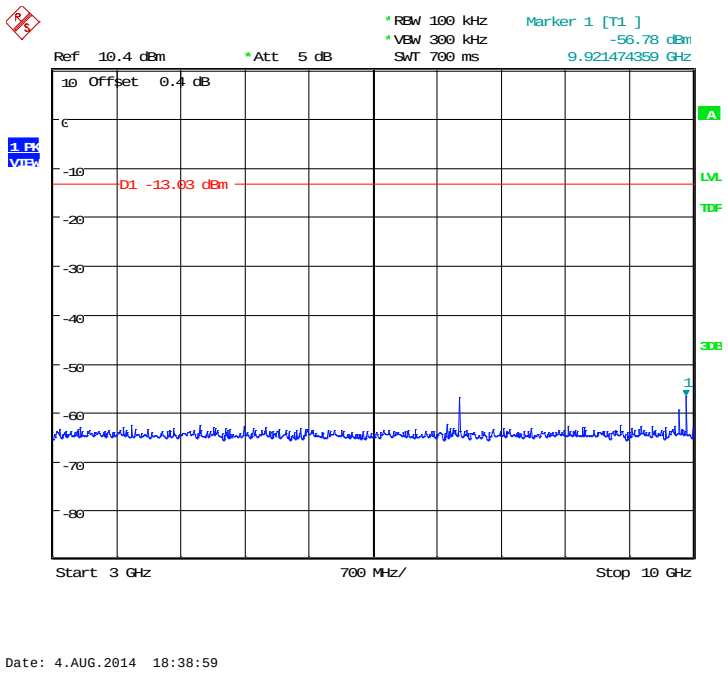


Fig.37. Conducted spurious emission: π/4 DQPSK, Channel 78, 3GHz - 10GHz

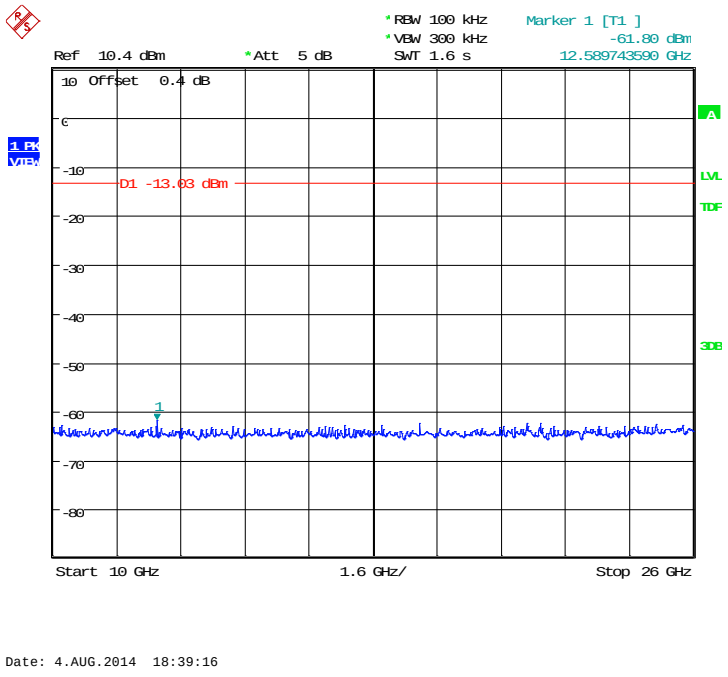


Fig.38. Fig.30 Conducted spurious emission: π/4 DQPSK, Channel 78, 10GHz - 26GHz

A.5. Radiated Emission

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247, 15.205, 15.209	Listed as follows

Frequency (MHz) Field strength	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

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

The measurement is made according to ANSI C63.10

Limit in restricted band:

Frequency of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Test Condition

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

Frequency of emission (MHz)	RBW/VBW	Sweep Time(s)
0.009-30	100KHz/300KHz	5
30-1000	100KHz/300KHz	5
1000-4000	1MHz/1MHz	15
4000-18000	1MHz/1MHz	40
18000-26500	1MHz/1MHz	20

Measurement Results:

A "reference path loss" is established and the A_{Rpl} is the attenuation of “reference path loss”, and

including the gain of receive antenna, the gain of the preamplifier, the cable los.
The measurement results are obtained as described below:

Result=P_{Mea}+A_{Rpl}

For GFSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	1 GHz ~ 3 GHz	Fig.39	P
	3 GHz ~ 18 GHz	Fig.40	P
Ch 39 2441 MHz	9kHz ~ 30 MHz	Fig.41	P
	30 MHz ~ 1 GHz	Fig.42	P
	1 GHz ~ 3 GHz	Fig.43	P
	3 GHz ~ 18 GHz	Fig.44	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	Fig.45	P
	3 GHz ~ 18 GHz	Fig.46	P
Power	2.38GHz~2.4GHz---L	Fig.47	P
Power	2.45GHz~2.5GHz---H	Fig.48	P
For all channels	18 GHz ~ 26 GHz	Fig.49	P

Forπ/4 DQPSK

Channel	Frequency Range	Test Results	Conclusion
Ch 0 2402 MHz	1 GHz ~ 3 GHz	Fig.50	P
	3 GHz ~ 18 GHz	Fig.51	P
Ch 39 2441 MHz	30 MHz ~ 1 GHz	Fig.52	P
	1 GHz ~ 3 GHz	Fig.53	P
	3 GHz ~ 18 GHz	Fig.54	P
Ch 78 2480 MHz	1 GHz ~ 3 GHz	Fig.55	P
	3 GHz ~ 18 GHz	Fig.56	P
Power	2.38GHz~2.4GHz---L	Fig.57	P
Power	2.45GHz~2.5GHz---H	Fig.58	P
For all channels	18 GHz ~ 26 GHz	Fig.59	P

Note: Only worst case result is given.

Test graphs as below:

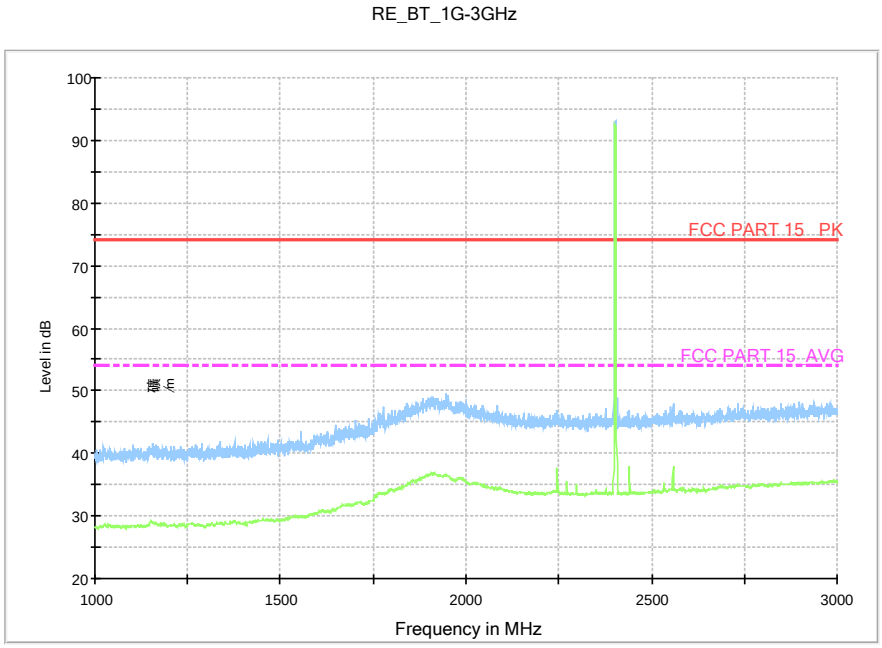


Fig.39. Radiated emission: GFSK, Channel 0, 1 GHz - 3 GHz

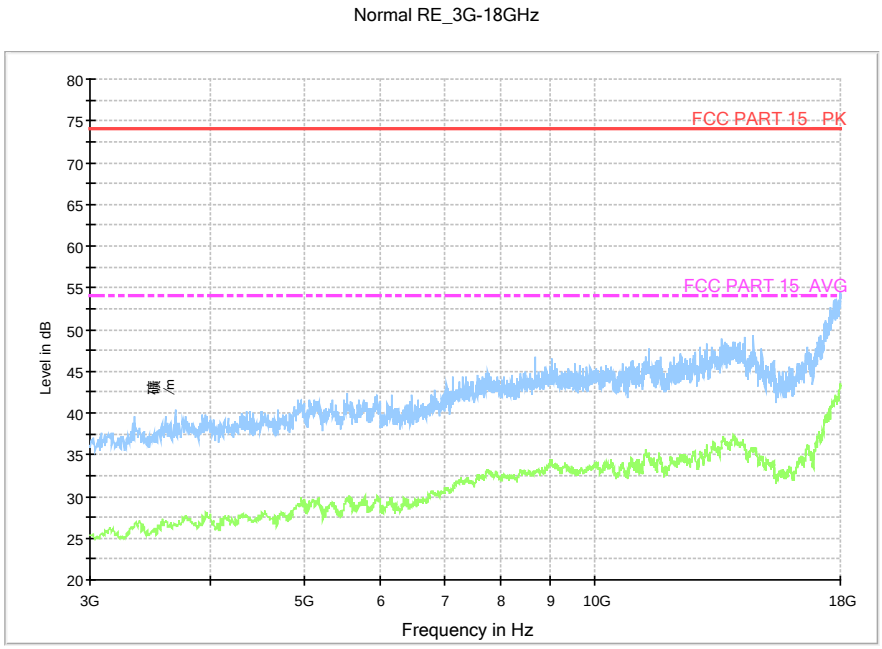


Fig.40. Radiated emission: GFSK, Channel 0, 3 GHz - 18 GHz

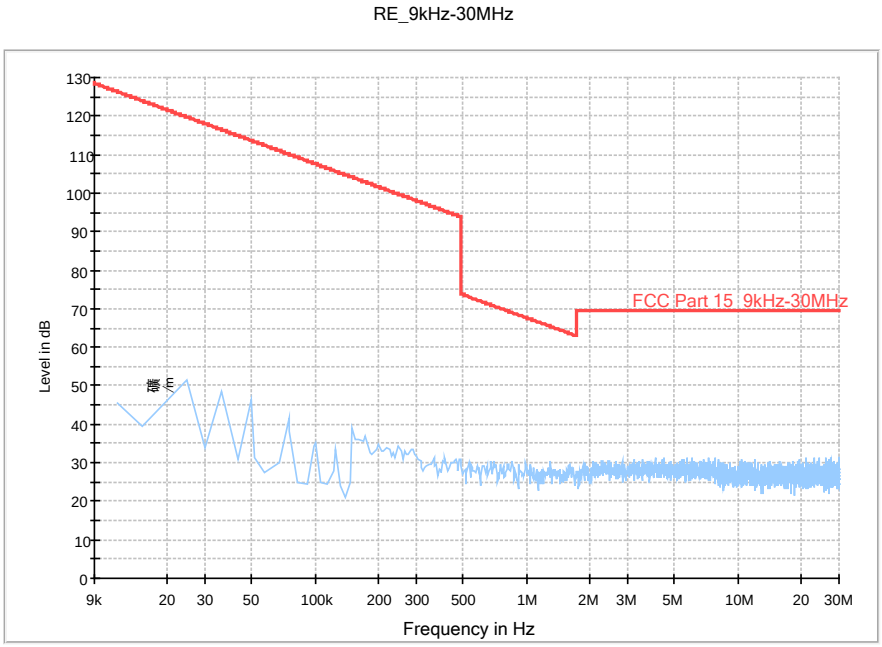


Fig.41. Radiated emission: GFSK, Channel 39, 9 kHz - 30 MHz

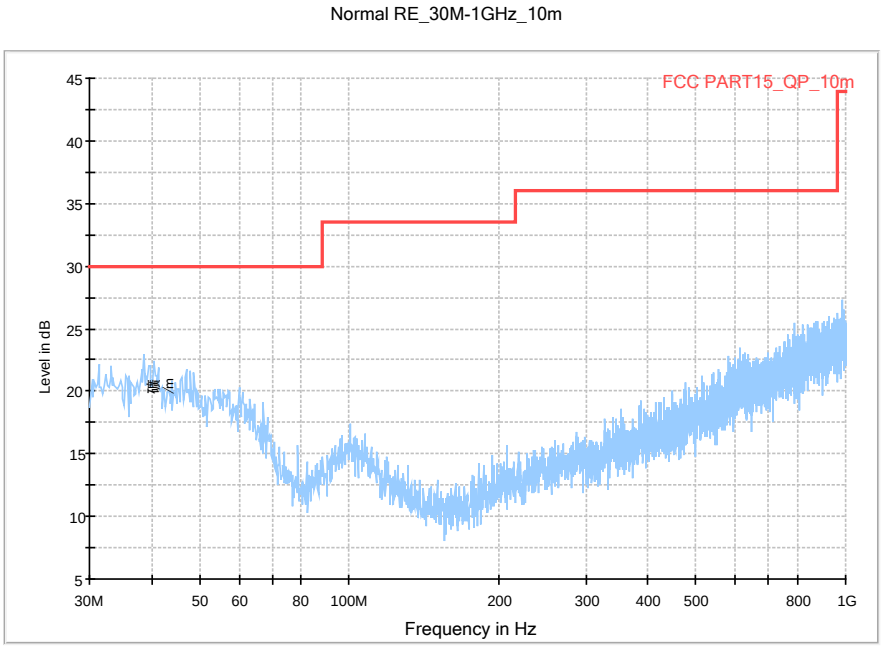


Fig.42. Radiated emission: GFSK, Channel 39, 30 MHz - 1 GHz

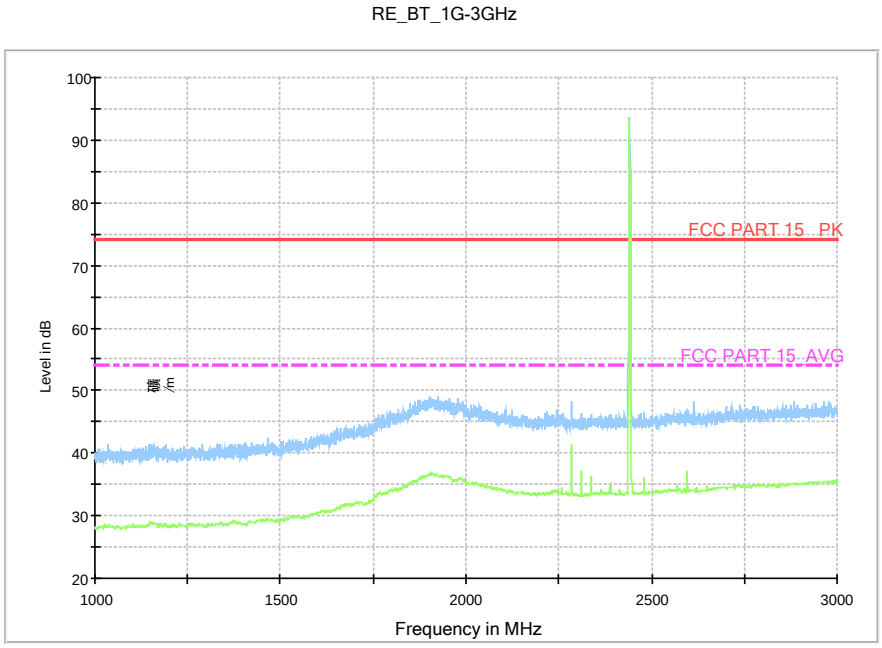


Fig.43. Radiated emission: GFSK, Channel 39, 1 GHz - 3 GHz

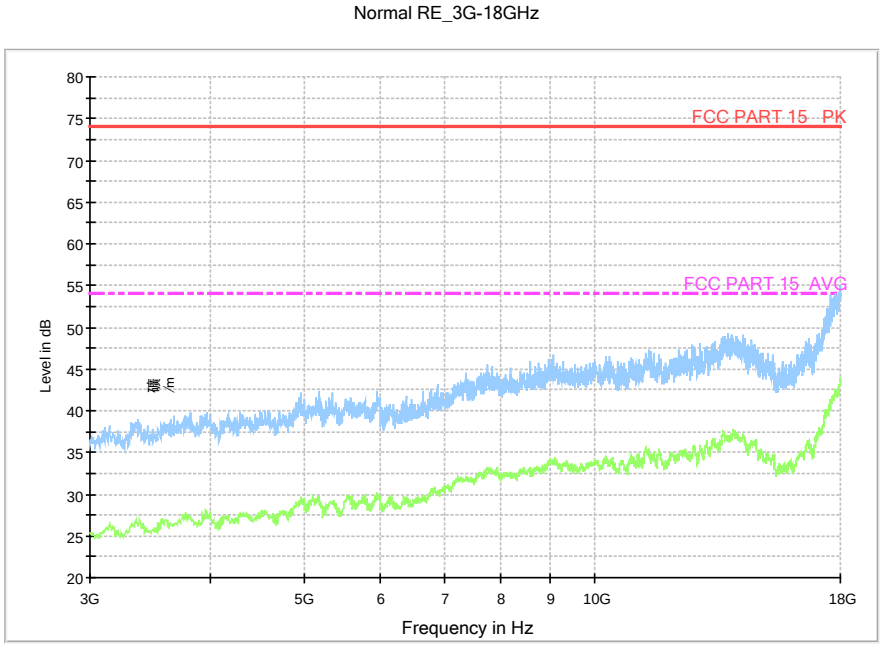


Fig.44. Radiated emission: GFSK, Channel 39, 3 GHz - 18 GHz

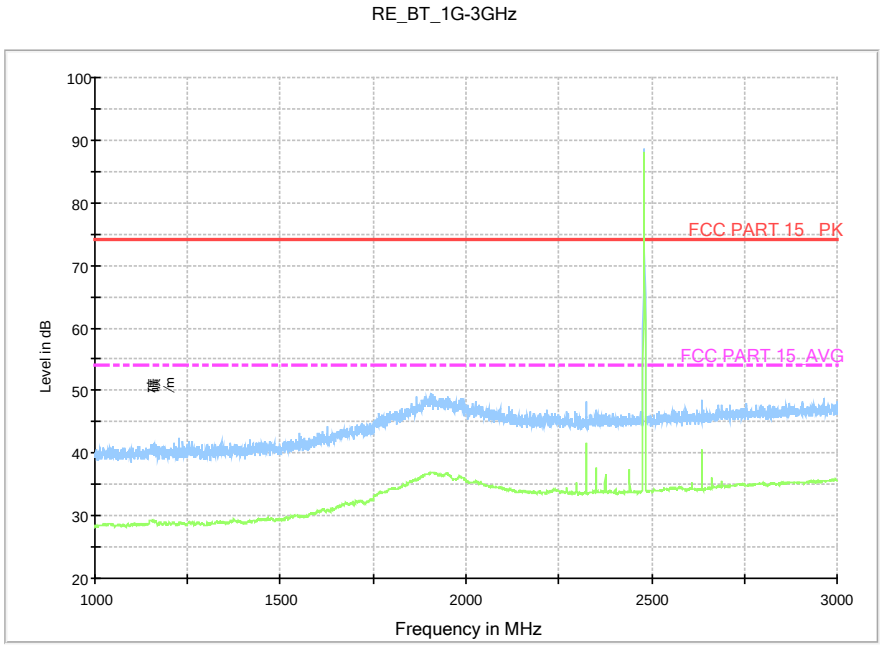


Fig.45. Radiated emission: GFSK, Channel 78, 1 GHz - 3 GHz

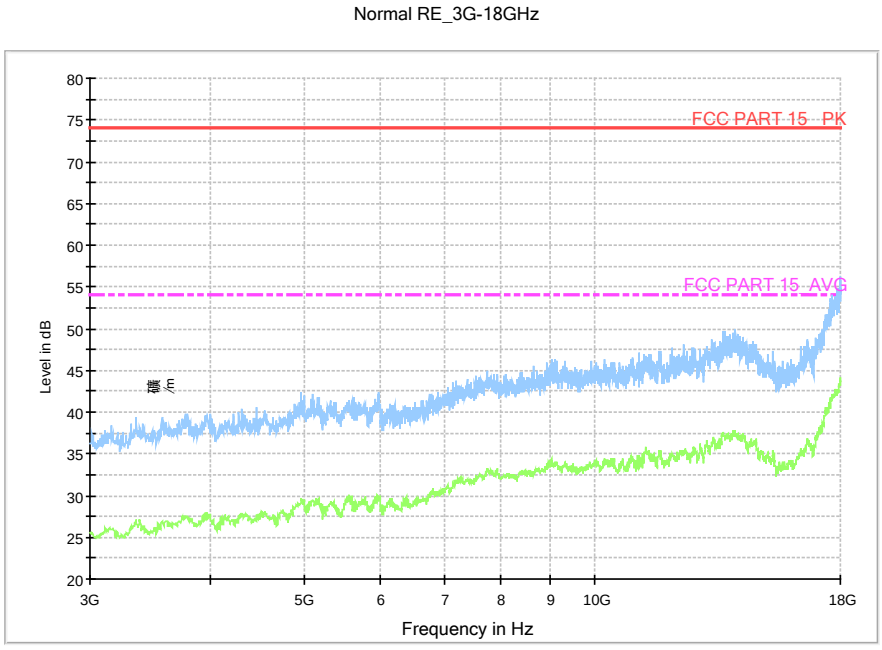


Fig.46. Radiated emission: GFSK, Channel 78, 3 GHz - 18 GHz

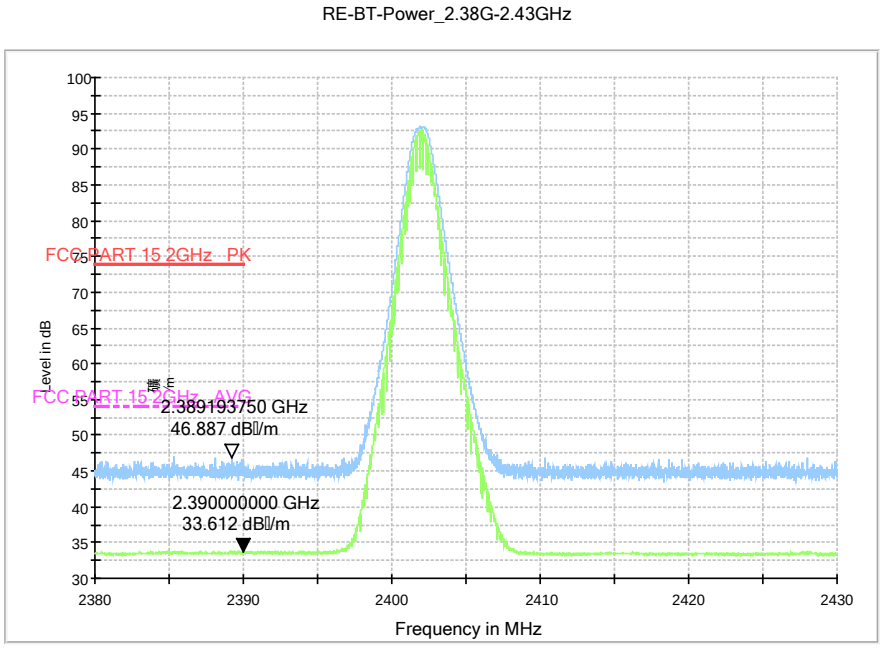


Fig.47. Radiated emission (Power): GFSK, low channel

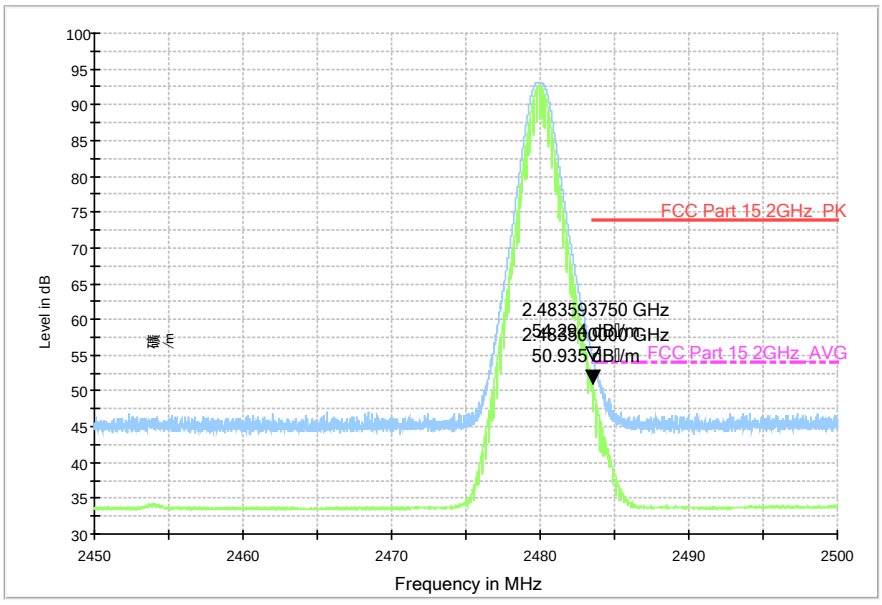


Fig.48. Radiated emission (Power) GFSK, high channel

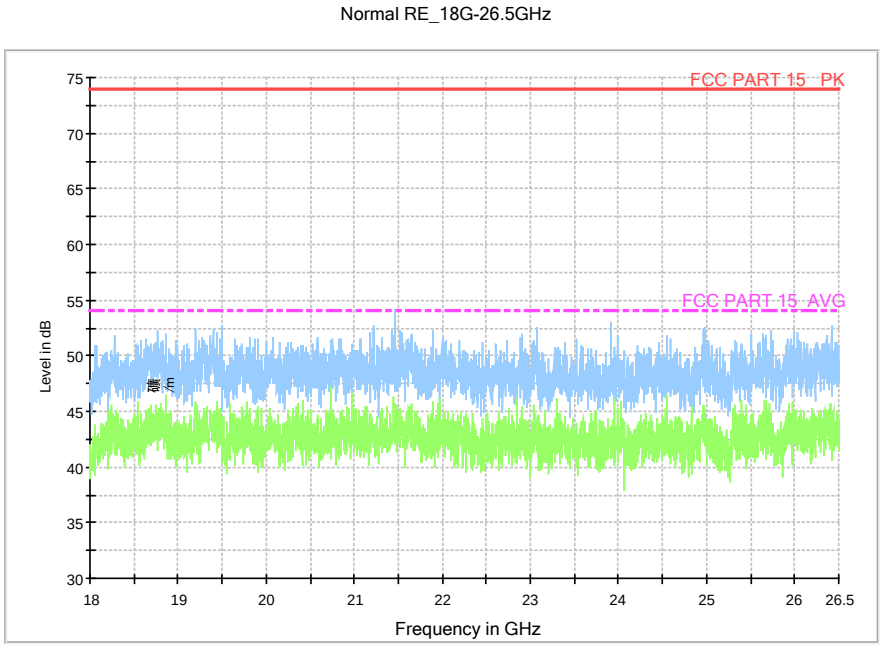


Fig.49. Radiated emission: GFSK, 18 GHz - 26 GHz

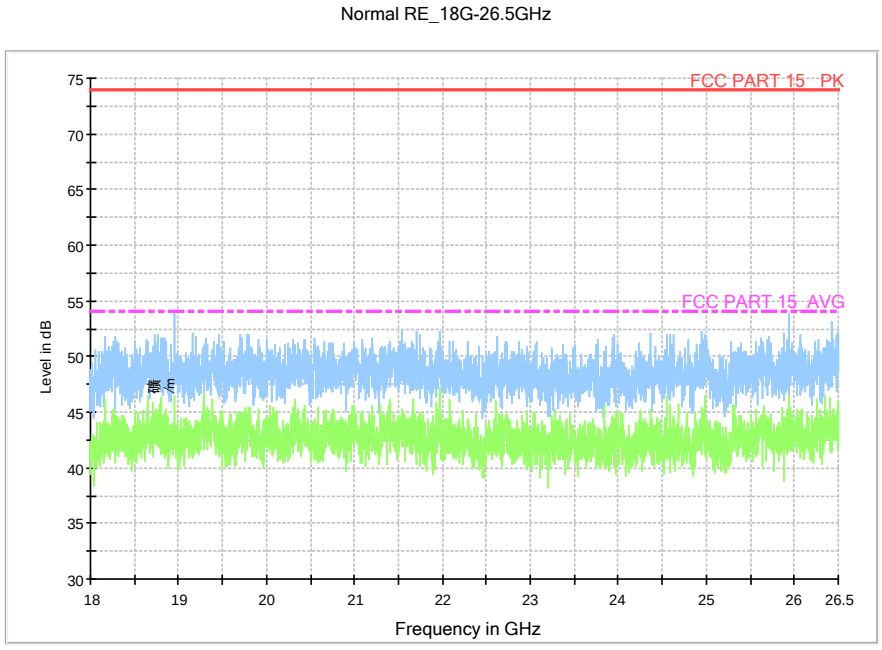


Fig.50. Radiated emission: π/4 DQPSK, Channel 0, 1 GHz - 3 GHz

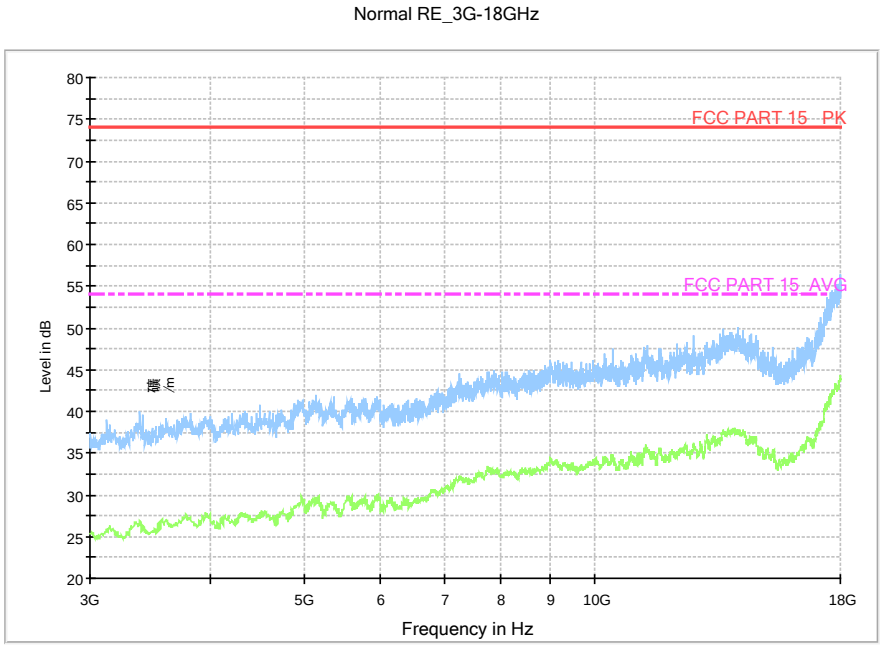


Fig.51. Radiated emission: π/4 DQPSK, Channel 0, 3 GHz - 18 GHz

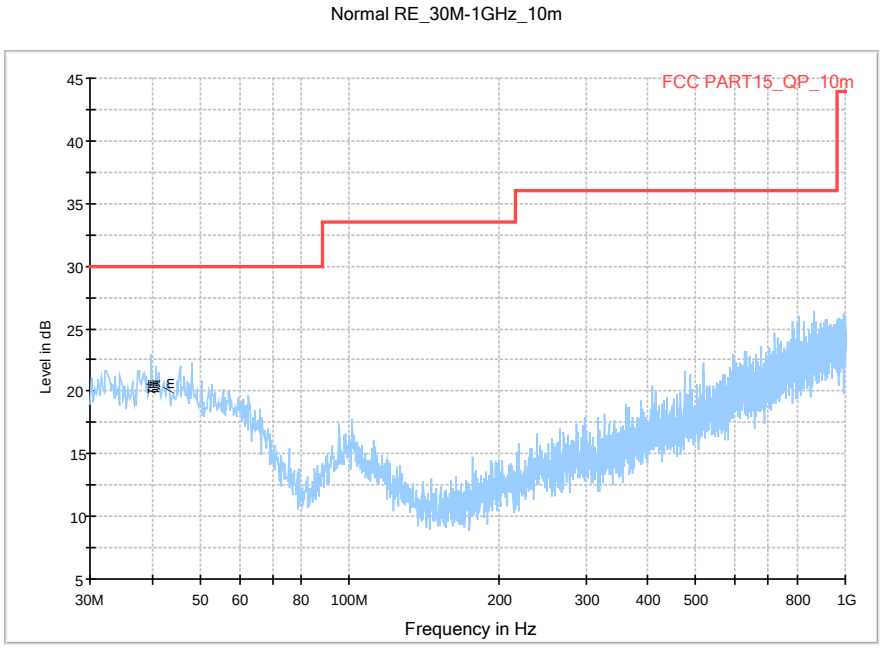


Fig.52. Radiated emission: π/4 DQPSK, Channel 39, 30 MHz - 1 GHz

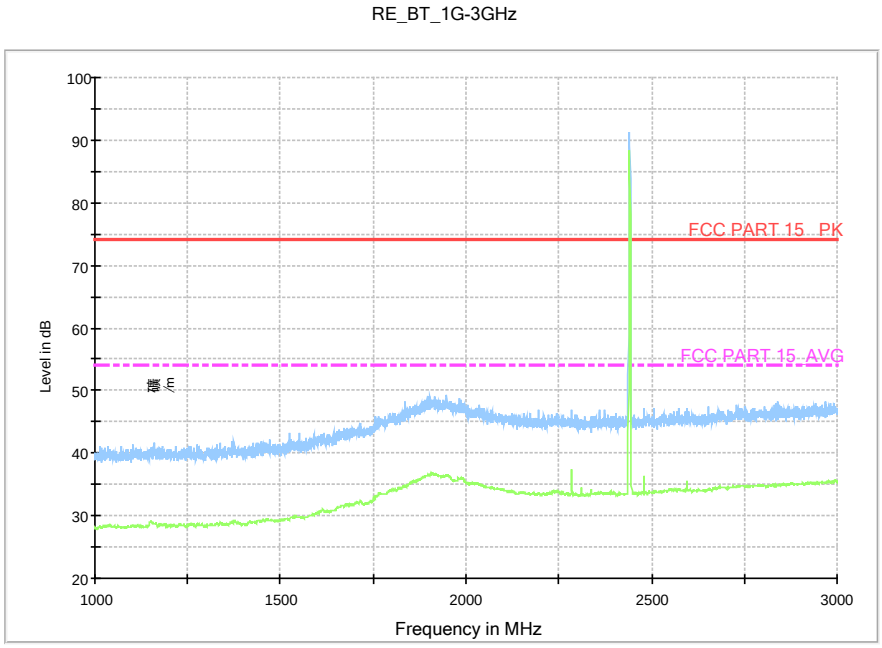


Fig.53. Radiated emission: π/4 DQPSK, Channel 39, 1 GHz - 3 GHz

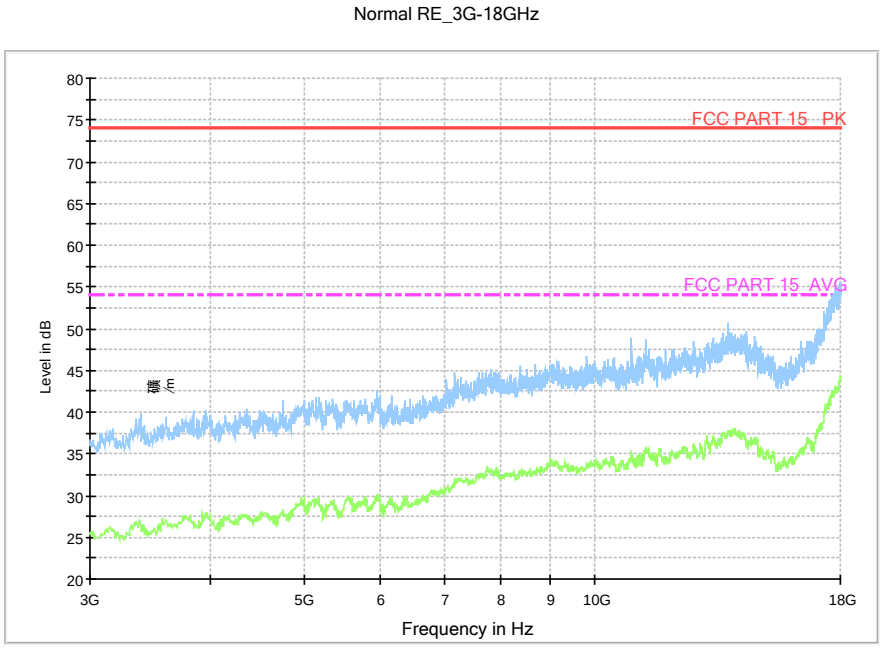


Fig.54. Radiated emission: π/4 DQPSK, Channel 39, 3 GHz - 18 GHz

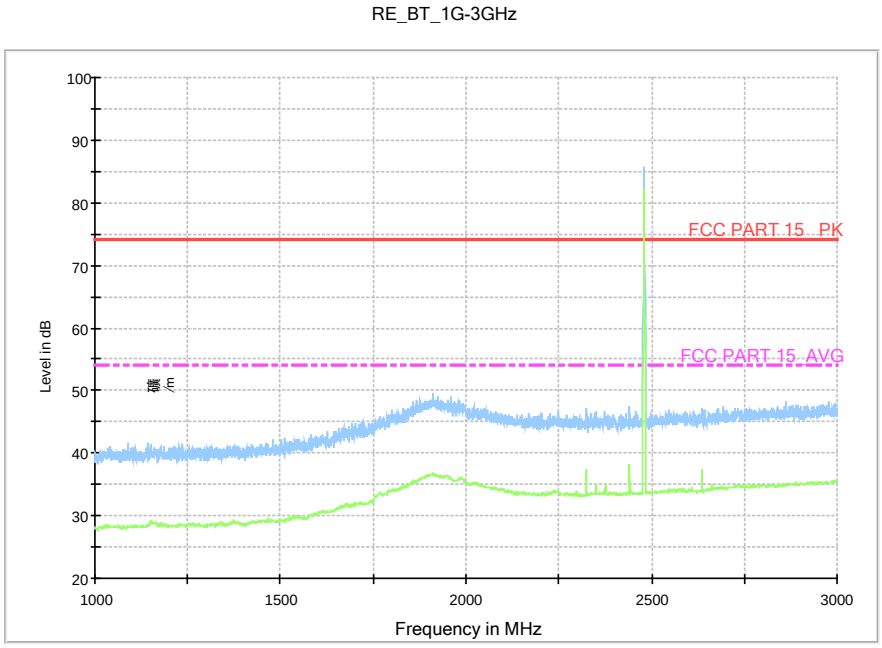


Fig.55. Radiated emission: π/4 DQPSK, Channel 78, 1 GHz - 3 GHz

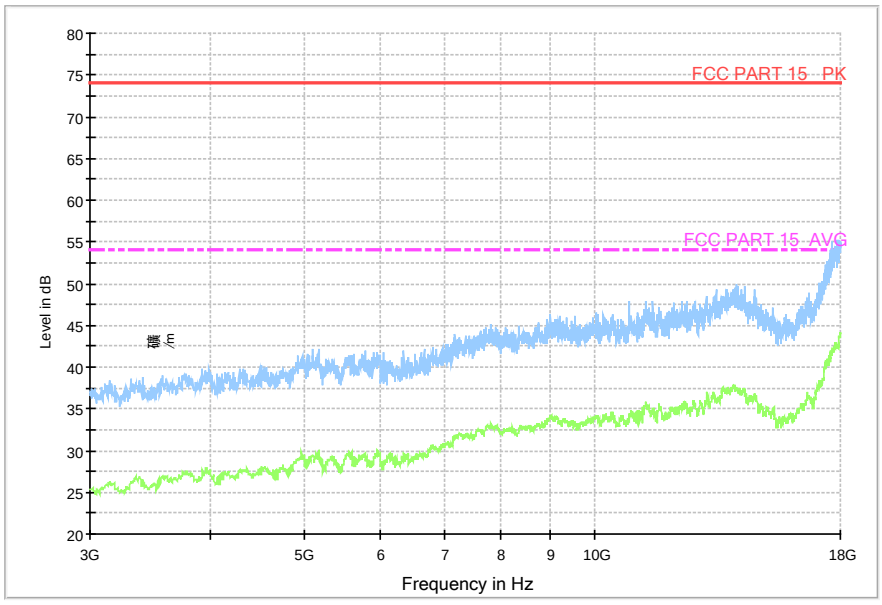


Fig.56. Radiated emission: π/4 DQPSK, Channel 78, 3 GHz - 18 GHz

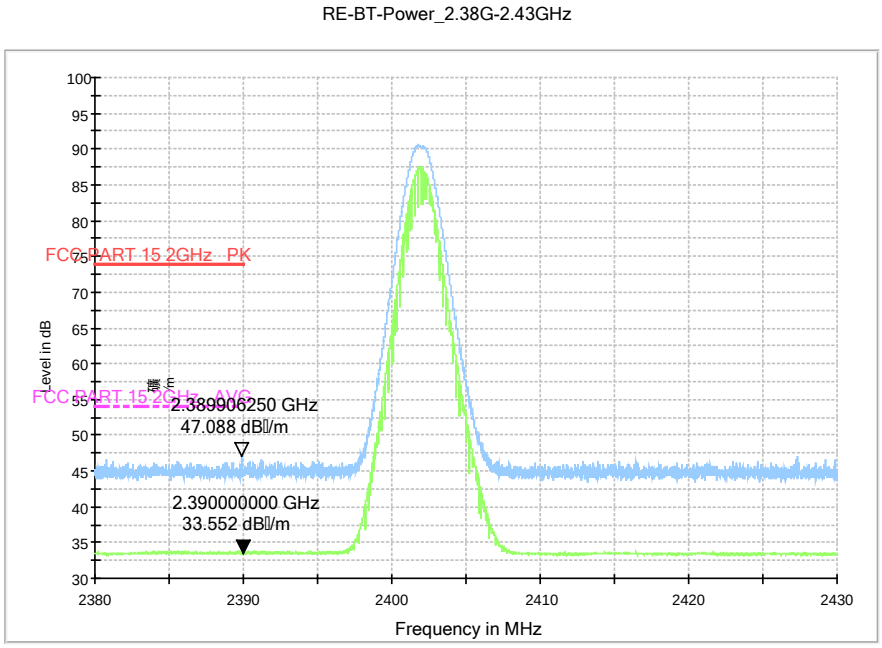


Fig.57. Radiated emission (Power): π/4 DQPSK, low channel

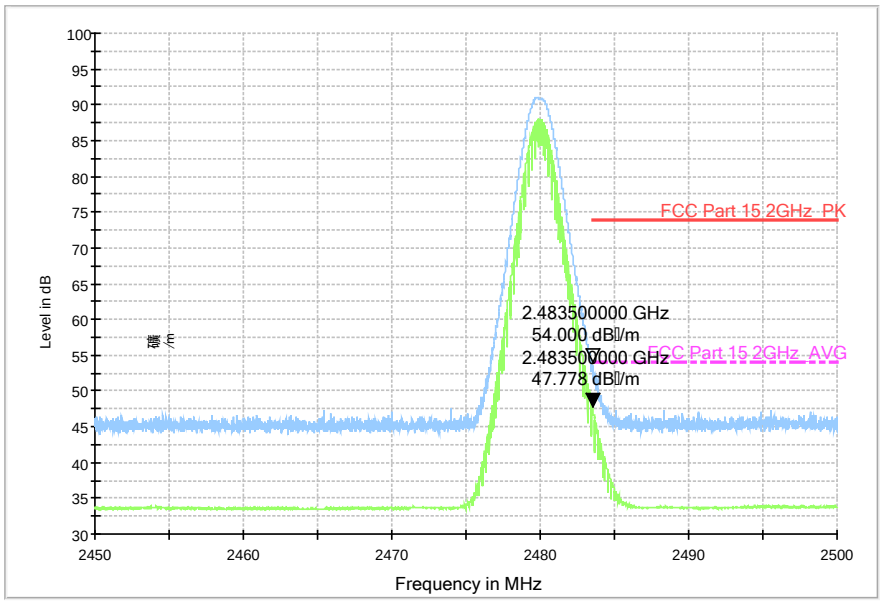


Fig.58. Radiated emission (Power): π/4 DQPSK, high channel

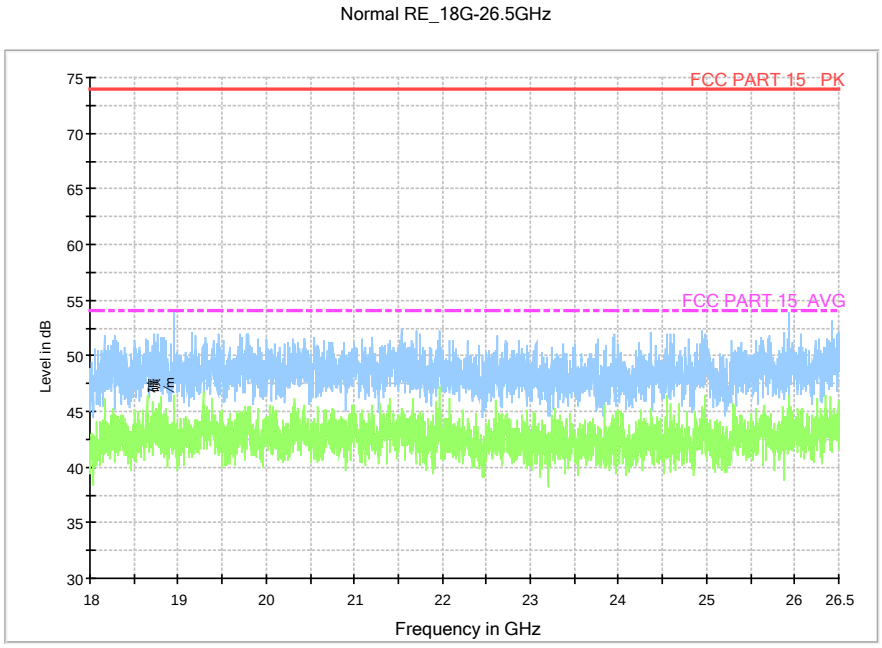


Fig.59. Radiated emission: π/4 DQPSK, 18 GHz - 26 GHz

A.6. Time of Occupancy (Dwell Time)

Measurement Limit:

Standard	Limit (ms)
FCC 47 CFR Part 15.247(a) (1)(iii)	< 400

The measurement is made according to ANSI C63.10

Measurement Result:

For GFSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.60	117.15	P
		Fig.61		
	DH3	Fig.62	187.76	P
		Fig.63		
	DH5	Fig.64	199.23	P
		Fig.65		

For π/4 DQPSK

Channel	Packet	Dwell Time (ms)		Conclusion
39	DH1	Fig.66	118.39	P
		Fig.67		
	DH3	Fig.68	159.26	P
		Fig.69		
	DH5	Fig.70	185.24	P
		Fig.71		

Conclusion: PASS

Test graphs as below:

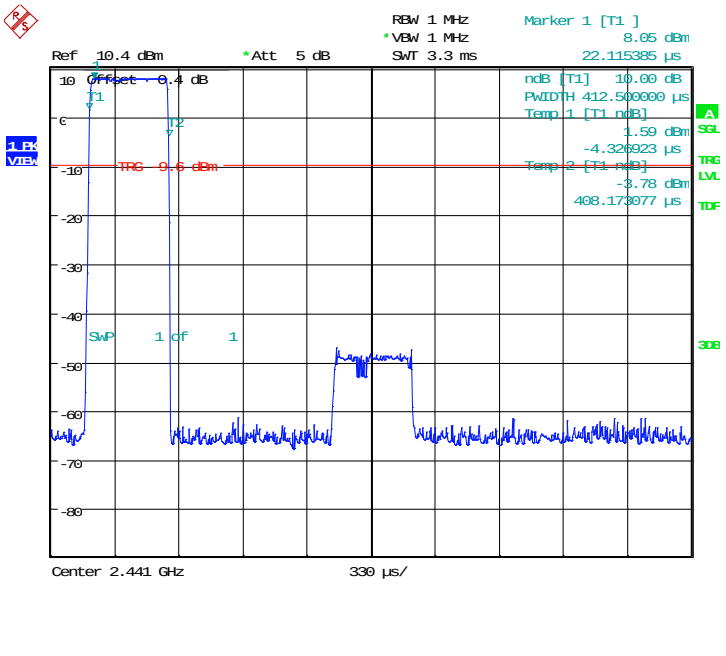


Fig.60. Time of occupancy (Dwell Time): Channel 39, GFSK-DH1

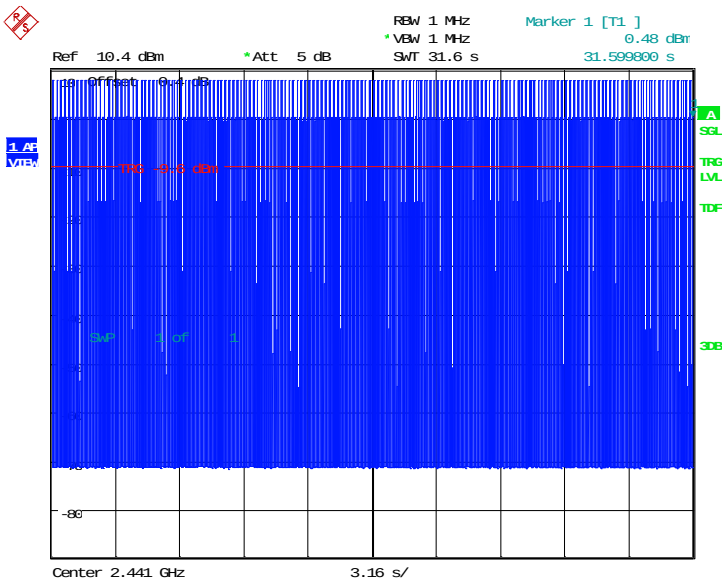


Fig.61. Number of Transmissions Measurement: Channel 39, GFSK-DH1

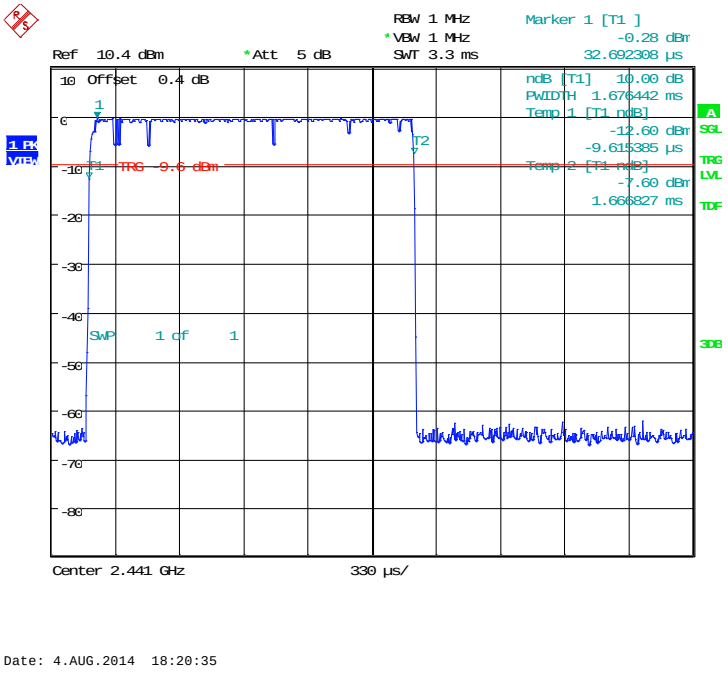


Fig.62. Time of occupancy (Dwell Time): Channel 39, GFSK-DH3

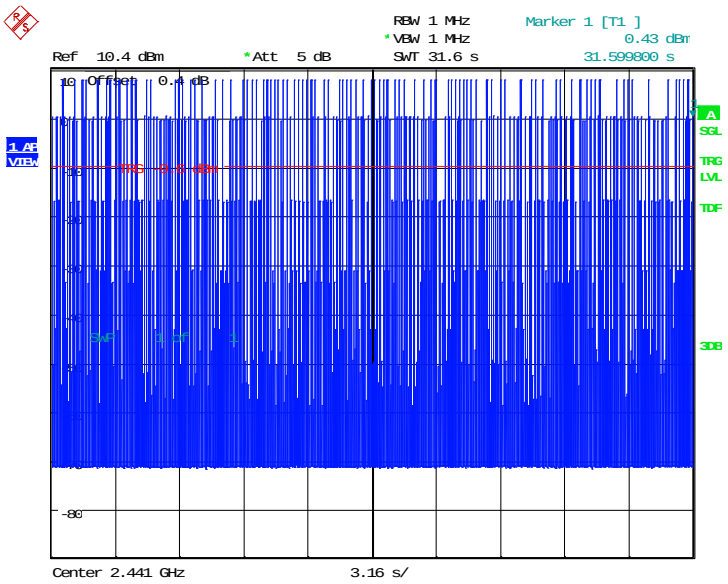


Fig.63. Number of Transmissions Measurement: Channel 39, GFSK-DH3

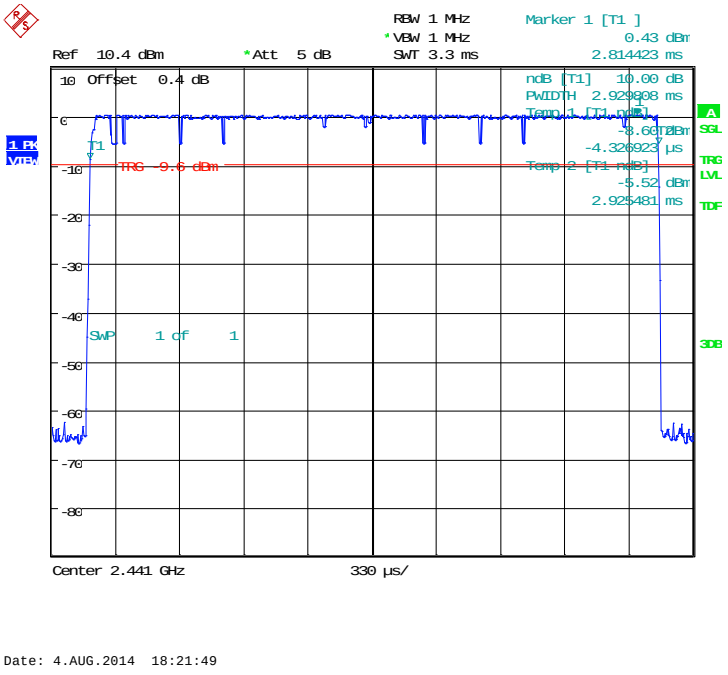


Fig.64. Time of occupancy (Dwell Time): Channel 39, GFSK-DH5

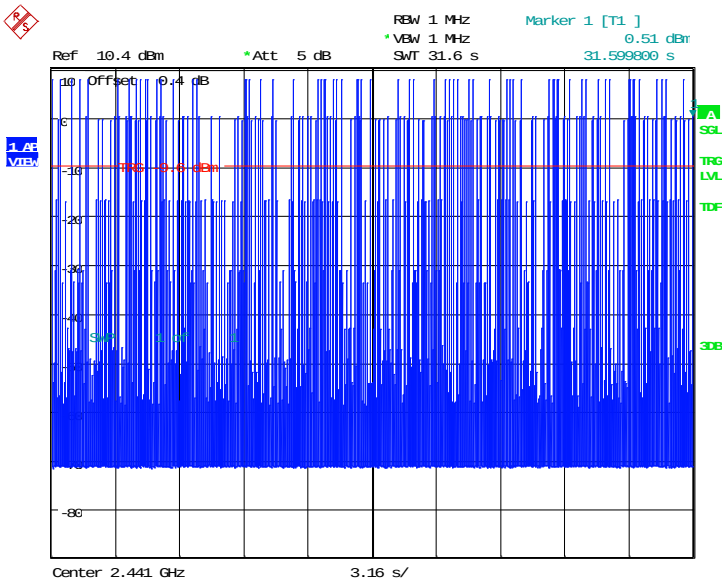


Fig.65. Number of Transmissions Measurement: Channel 39, GFSK-DH5

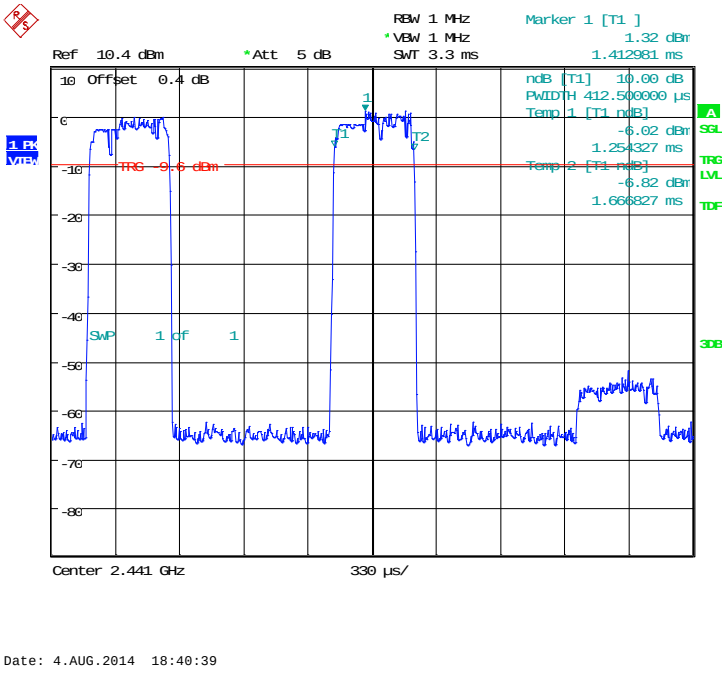


Fig.66. Time of occupancy (Dwell Time): Channel 39, π/4 DQPSK -DH1

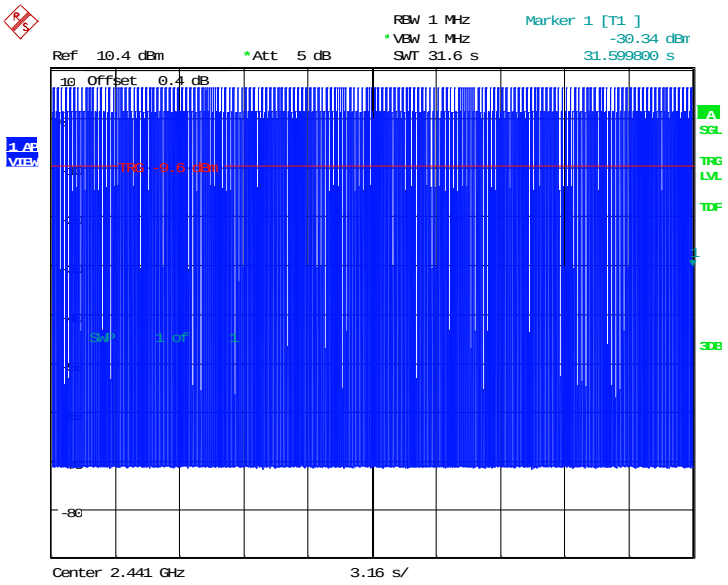


Fig.67. Number of Transmissions Measurement: Channel 39, π/4 DQPSK -DH1

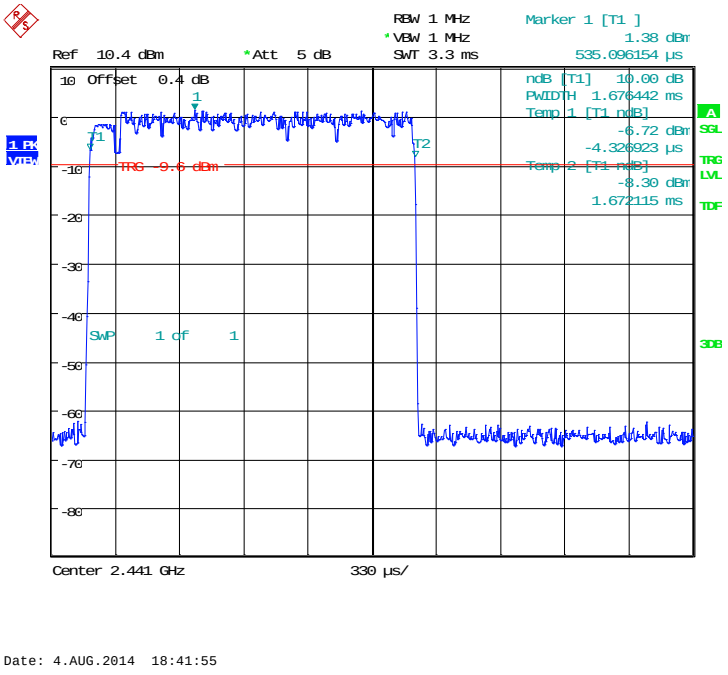


Fig.68. Time of occupancy (Dwell Time): Channel 39, π/4 DQPSK -DH3

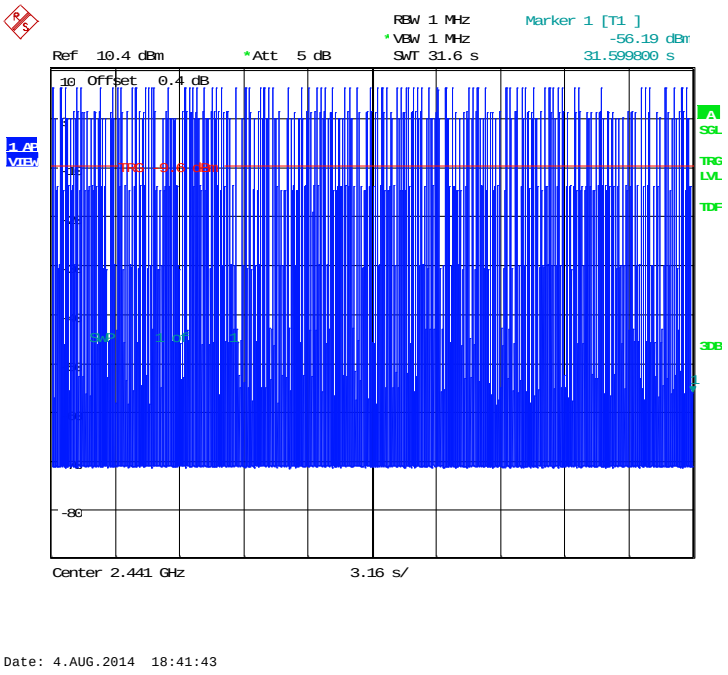


Fig.69. Number of Transmissions Measurement: Channel 39, π/4 DQPSK -DH3

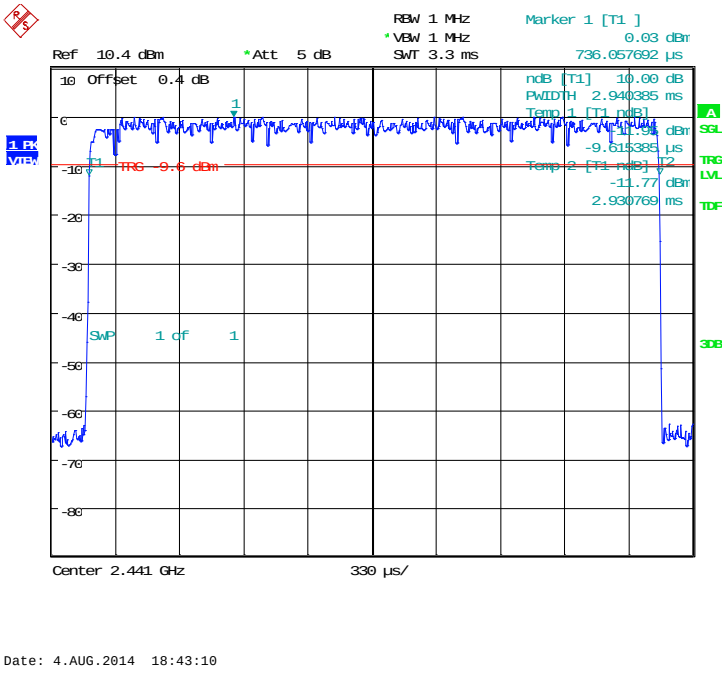


Fig.70. Time of occupancy (Dwell Time): Channel 39, π/4 DQPSK -DH5

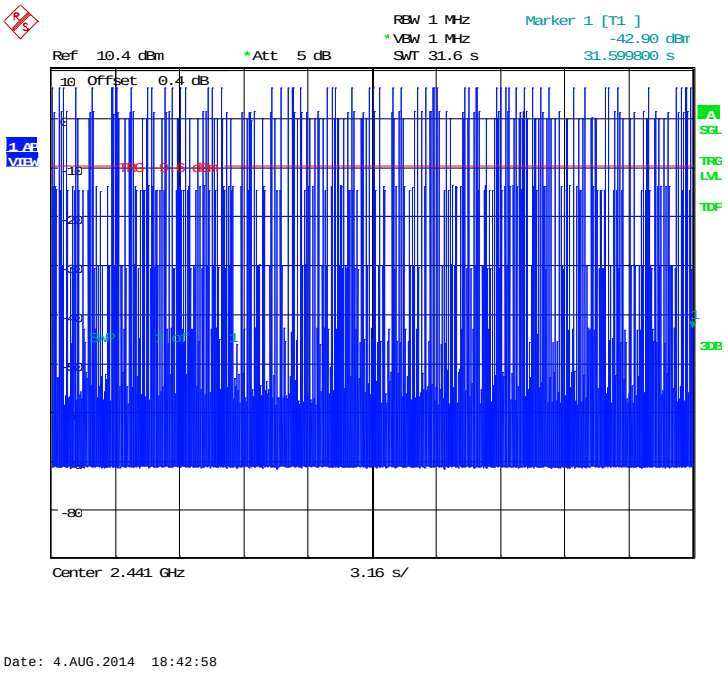


Fig.71. Number of Transmissions Measurement: Channel 39, π/4 DQPSK -DH5

A.7. 20dB Bandwidth

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a)(1)	NA *

The measurement is made according to ANSI C63.10

* Comment: This test case is not required according to the latest FCC 47 CFR Part 15.247. But the test results are necessary for “carrier frequency separation” test case, in Annex A.8.

Measurement Results:

For GFSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.72	822.12	NA
39	Fig.73	865.38	NA
78	Fig.74	865.38	NA

Forπ/4 DQPSK

Channel	20dB Bandwidth (kHz)		Conclusion
0	Fig.75	1259.62	NA
39	Fig.76	1259.62	NA
78	Fig.77	1259.62	NA

Conclusion: NA

Test graphs as below:

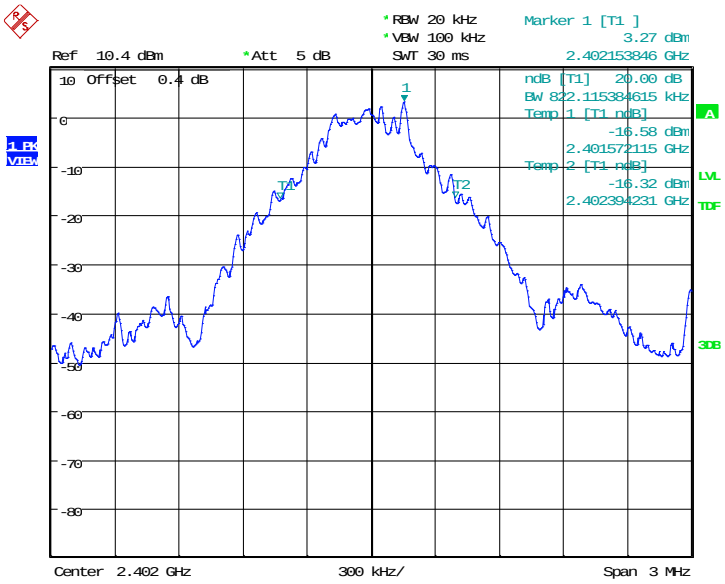


Fig.72. 20dB Bandwidth: GFSK, Channel 0

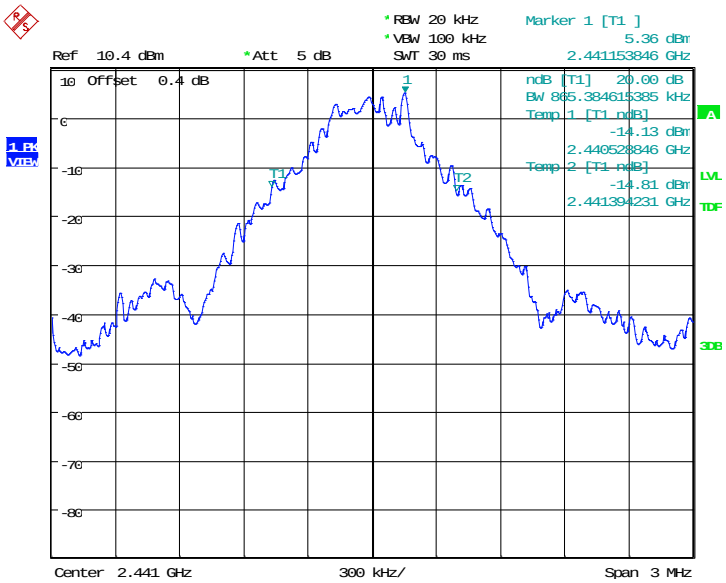


Fig.73. 20dB Bandwidth: GFSK, Channel 39

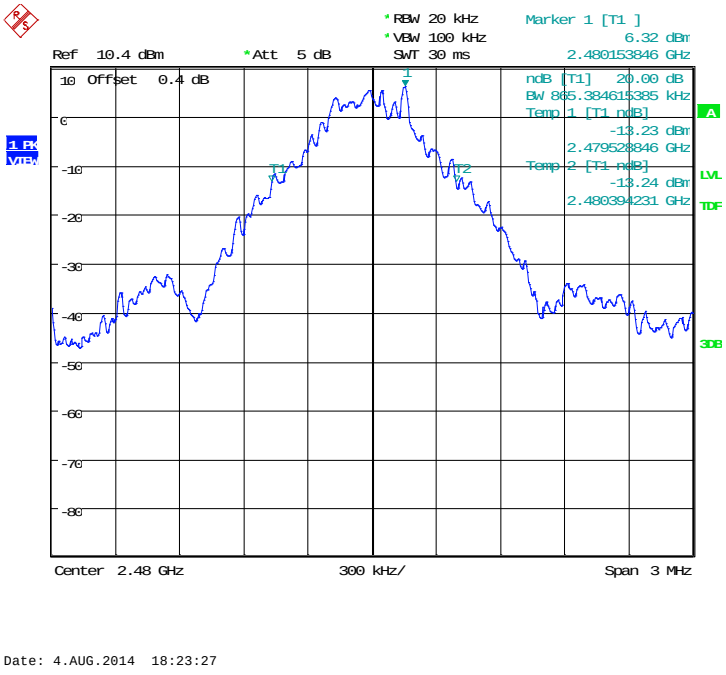


Fig.74. 20dB Bandwidth: GFSK, Channel 78

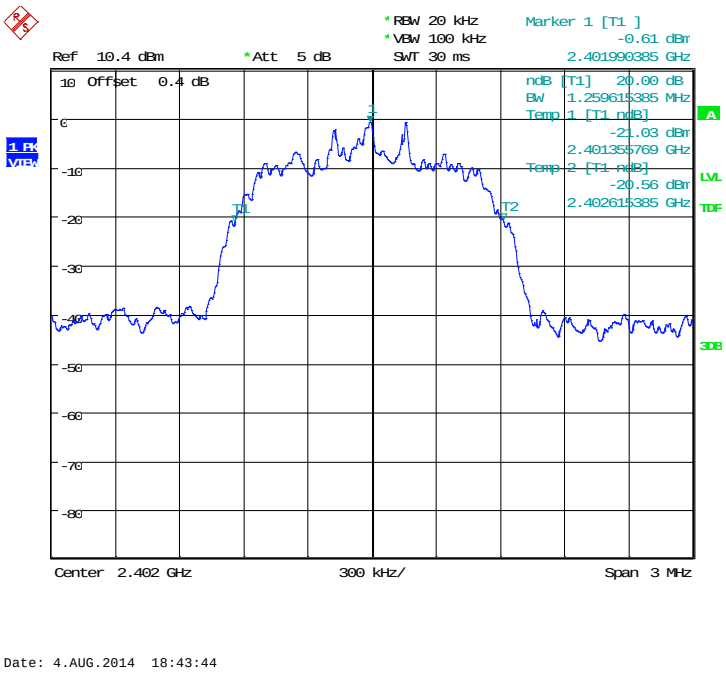


Fig.75. 20dB Bandwidth: π/4 DQPSK, Channel 0

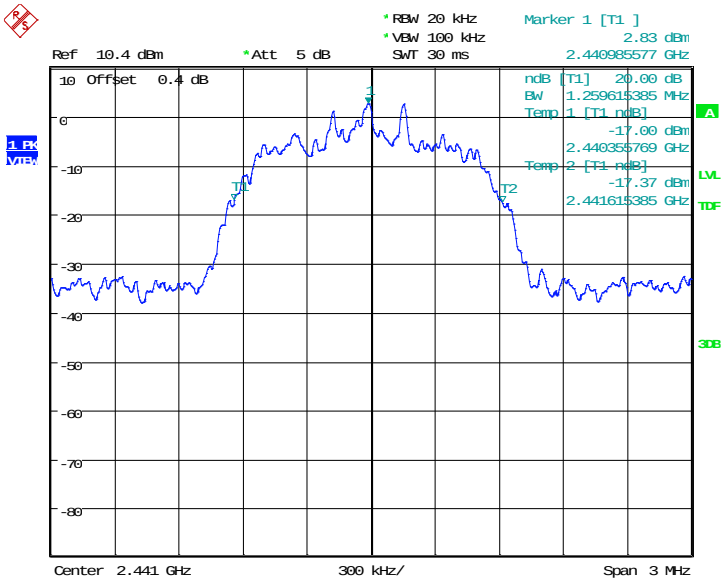


Fig.76. 20dB Bandwidth: π/4 DQPSK, Channel 39

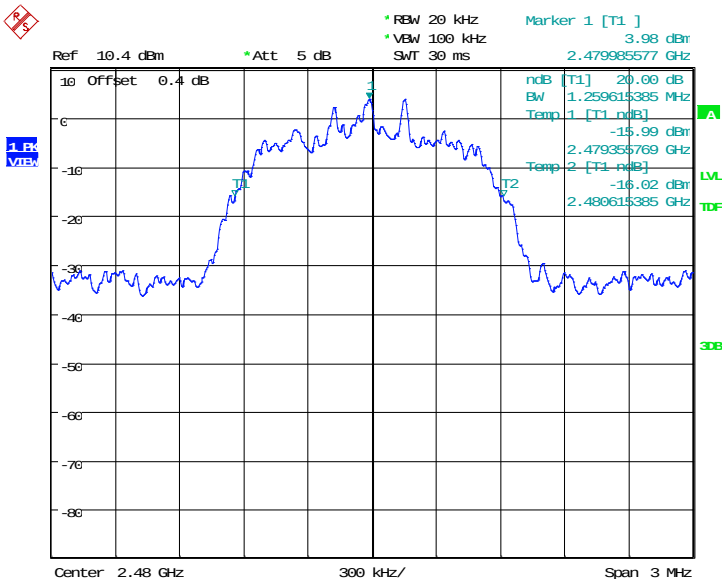


Fig.77. 20dB Bandwidth: π/4 DQPSK, Channel 78

A.8. Carrier Frequency Separation

Measurement Limit:

Standard	Limit(kHz)
FCC 47 CFR Part 15.247(a)(1)	over 25 kHz or (2/3) * 20dB bandwidth

The measurement is made according to ANSI C63.10

* Comment: This limit should be over 25 kHz or (2/3) * 20dB bandwidth, whichever is greater.

Measurement Result:

For GFSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.78	826.92	P

For π/4 DQPSK

Channel	Carrier frequency separation (kHz)		Conclusion
39	Fig.79	985.58	P

Conclusion: PASS

Test graphs as below:

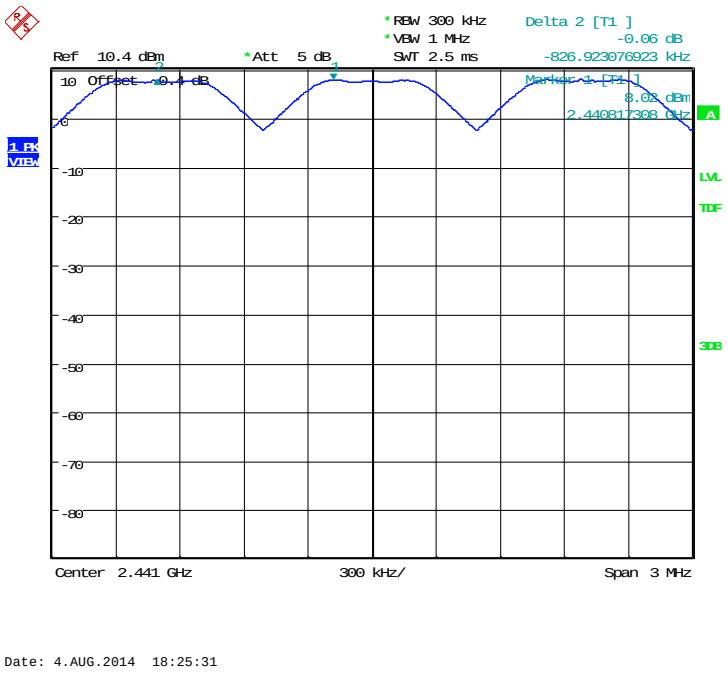


Fig.78. Carrier frequency separation measurement: GFSK, Channel 39

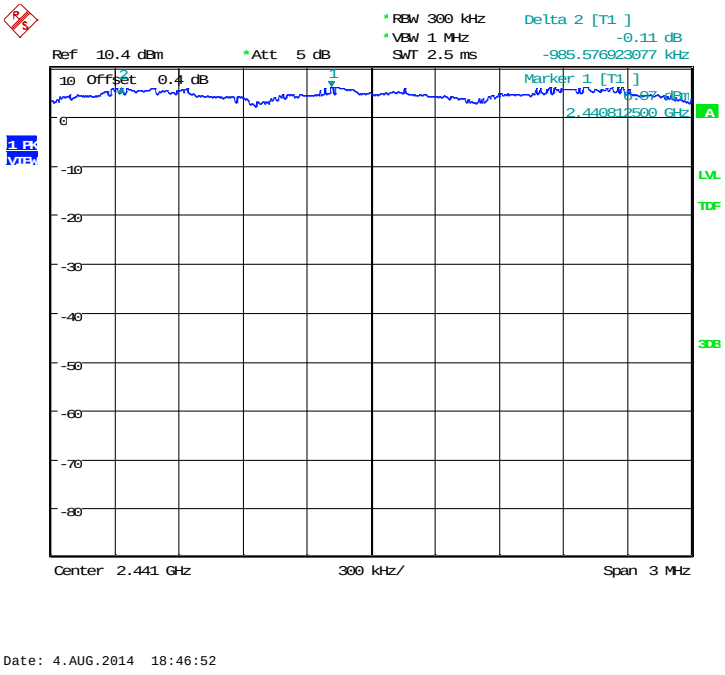


Fig.79. Carrier frequency separation measurement: π/4 DQPSK, Channel 39

A.9. Number of Hopping Channels

Measurement Limit:

Standard	Limit
FCC 47 CFR Part 15.247(a) (1)(iii)	At least 15 non-overlapping channels

The measurement is made according to ANSI C63.10

Measurement Result:

For GFSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.80	79	P
40~78	Fig.81		

Forπ/4 DQPSK

Channel	Number of hopping channels		Conclusion
0~39	Fig.82	79	P
40~78	Fig.83		

Conclusion: PASS

Test graphs as below:

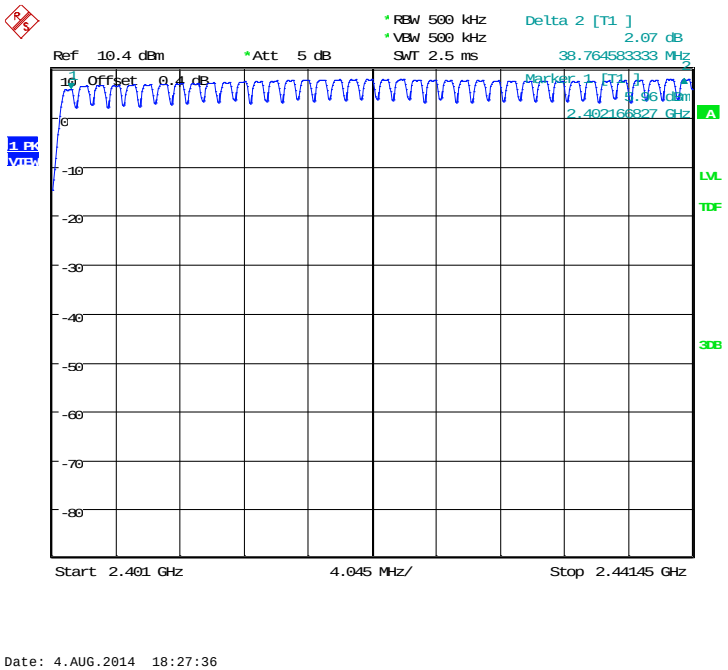


Fig.80. Number of hopping frequencies: GFSK, Channel 0 - 39

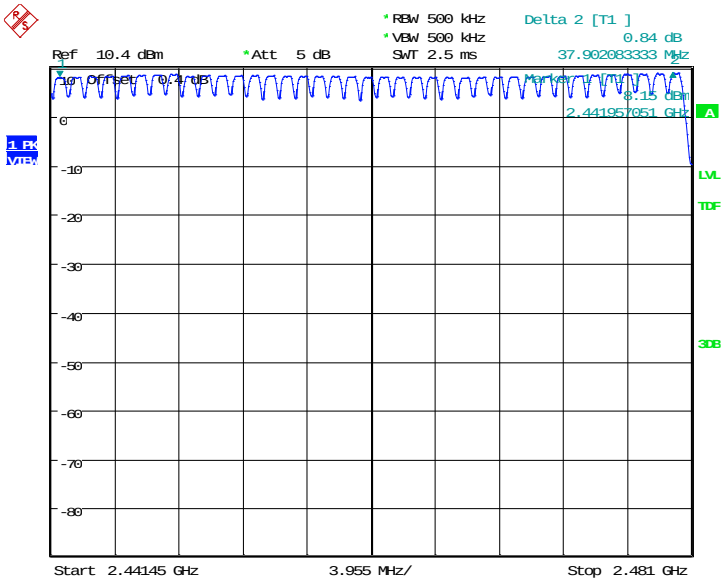


Fig.81. Number of hopping frequencies: GFSK, Channel 40 - 78

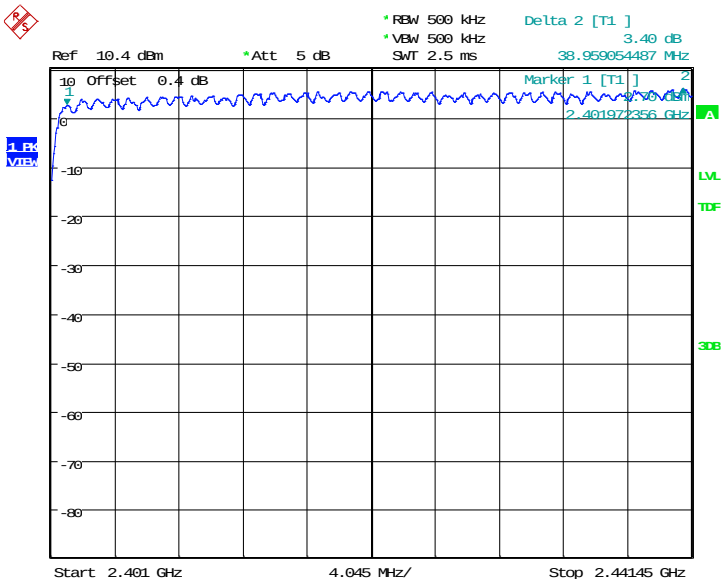


Fig.82. Number of hopping frequencies: π/4 DQPSK, Channel 0 - 39

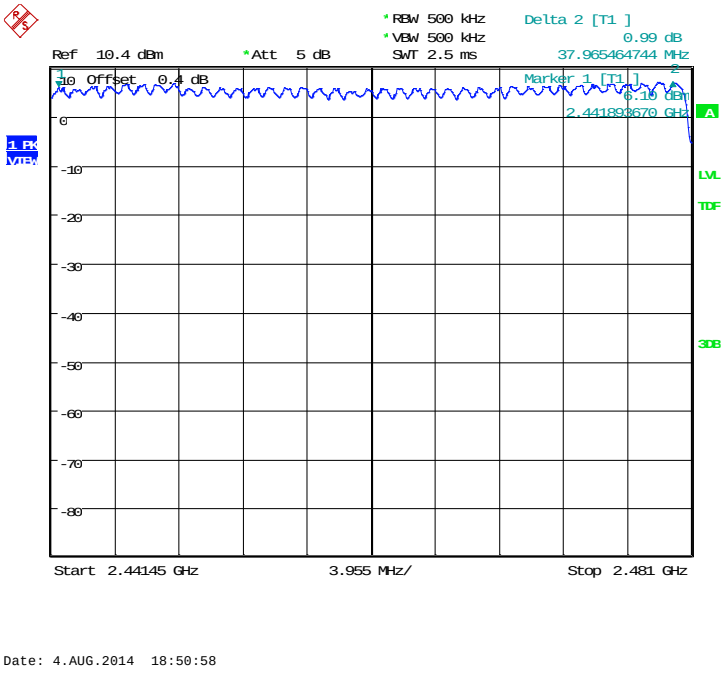


Fig.83. Number of hopping frequencies: π/4 DQPSK, Channel 40 - 78

A.10. AC Powerline Conducted Emission

Test Condition

Voltage（V）	Frequency（Hz）
120	60

The measurement is made according to ANSI C63.10

Measurement Method:

The EUT is connected to the travel adapter, and travel adapter is connected to the LISN directly. EUT is under test mode, and the modulation method is GFSK.

Measurement Result and limit:

Bluetooth (Quasi-peak Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Conclusion
0.15 to 0.5	66 to 56	P
0.5 to 5	56	
5 to 30	60	
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

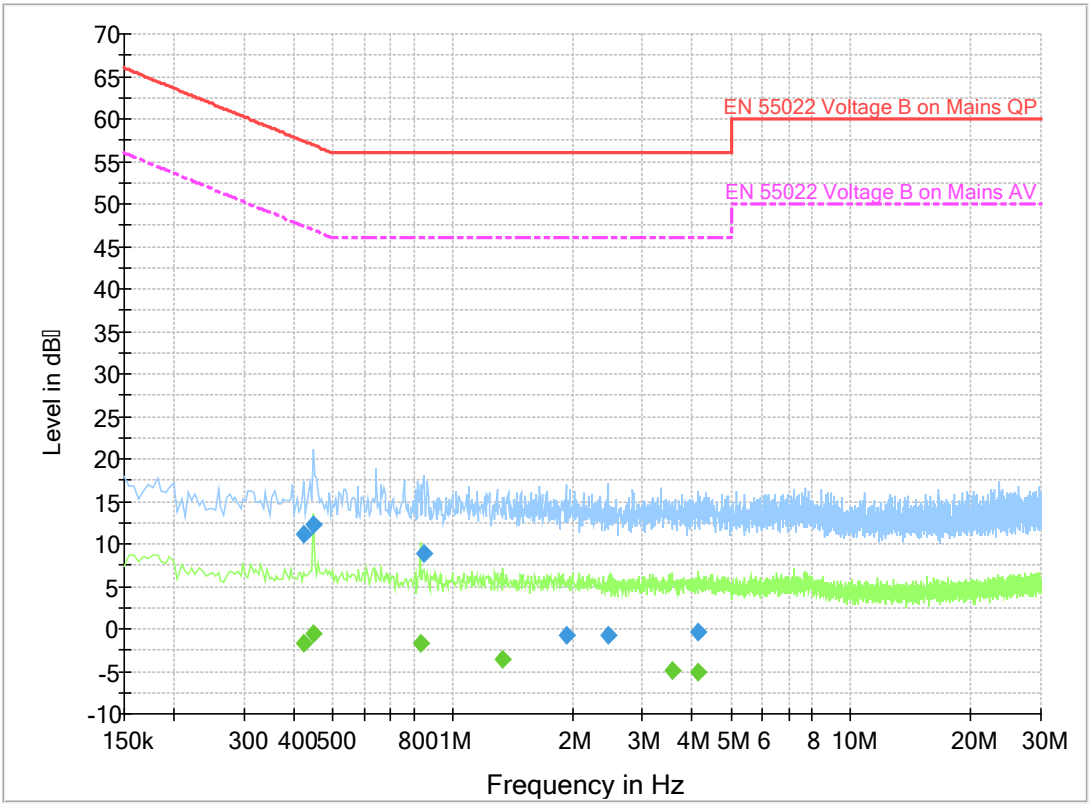
Bluetooth (Average Limit)

Frequency range (MHz)	Quasi-peak Limit (dBμV)	Conclusion
0.15 to 0.5	56 to 46	P
0.5 to 5	46	
5 to 30	50	
NOTE: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.		

Conclusion: PASS

Test graphs as below:

Traffic



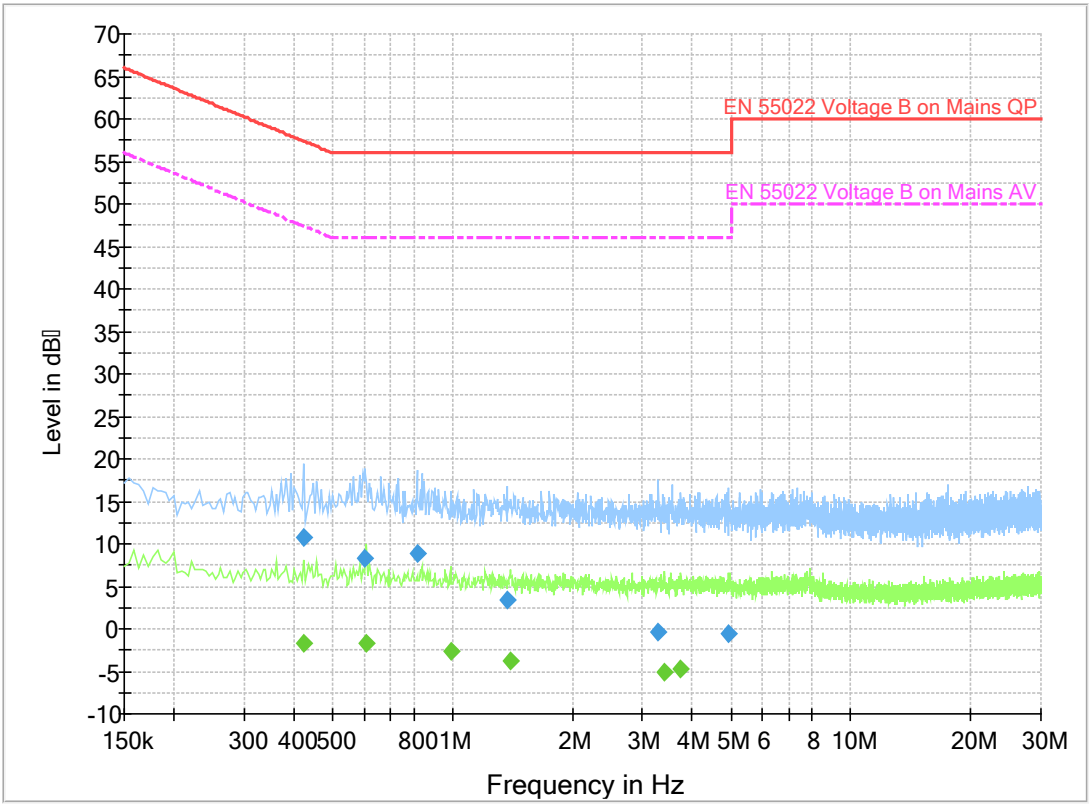
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.424500	11.1	2000.0	9.000	On	L1	10.1	46.2	57.4	
0.447000	12.3	2000.0	9.000	On	L1	10.1	44.6	56.9	
0.847500	8.9	2000.0	9.000	On	L1	10.0	47.1	56.0	
1.927500	-0.7	2000.0	9.000	On	N	9.8	56.7	56.0	
2.458500	-0.8	2000.0	9.000	On	N	9.8	56.8	56.0	
4.128000	-0.4	2000.0	9.000	On	L1	9.8	56.4	56.0	

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.424500	-1.7	2000.0	9.000	On	L1	10.1	49.1	47.4	
0.447000	-0.5	2000.0	9.000	On	L1	10.1	47.4	46.9	
0.829500	-1.6	2000.0	9.000	On	L1	10.0	47.6	46.0	
1.338000	-3.6	2000.0	9.000	On	L1	9.9	49.6	46.0	
3.556500	-4.8	2000.0	9.000	On	L1	9.8	50.8	46.0	
4.128000	-5.0	2000.0	9.000	On	L1	9.8	51.0	46.0	

Idle:



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.424500	10.8	2000.0	9.000	On	L1	10.1	46.6	57.4	
0.604500	8.2	2000.0	9.000	On	L1	10.1	47.8	56.0	
0.816000	9.0	2000.0	9.000	On	L1	10.0	47.0	56.0	
1.374000	3.3	2000.0	9.000	On	L1	9.9	52.7	56.0	
3.291000	-0.4	2000.0	9.000	On	L1	9.8	56.4	56.0	
4.942500	-0.5	2000.0	9.000	On	L1	9.7	56.5	56.0	

Final Result 2

Frequency (MHz)	Average (dBµV)	Meas. Time	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)	Comment
0.424500	-1.7	2000.0	9.000	On	L1	10.1	49.0	47.4	
0.609000	-1.6	2000.0	9.000	On	L1	10.1	47.6	46.0	
0.991500	-2.6	2000.0	9.000	On	L1	9.9	48.6	46.0	
1.396500	-3.9	2000.0	9.000	On	L1	9.9	49.9	46.0	
3.412500	-5.1	2000.0	9.000	On	N	9.8	51.1	46.0	
3.745500	-4.8	2000.0	9.000	On	L1	9.8	50.8	46.0	

A.11 RECEIVER RADIATION EMISSION

Reference

FCC: CFR Part 15.109, 2.1053

A.11.1 Method of Measurement

The measurement procedure in ANSI C63.10-2009 is used. The EUT is placed on a 80cm height non-conductive table locating on the center of turntable. From 30MHz-1GHz, the measurement distance is 10m. For frequency range above 1GHz, the measurement distance is 3m.

The EUT is measured with travel charger and the operating mode is idle without CMU200's signaling.

A.11.2 Method of Measurement

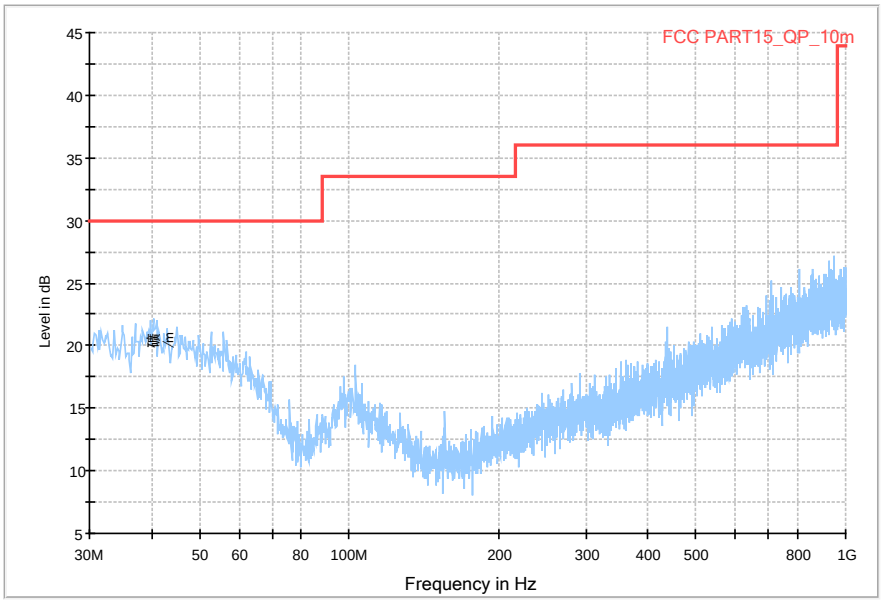
Frequency of Emission (MHz)	Limit (dBμV/m)	Measurement Distance (m)
30-88	30	10
88-216	33.5	10
216-960	36	10
960-1000	44	10
>1000	54	3

A. 11.3 Measurement results

IF bandwidth: 120 kHz

Idle Mode: 30MHz-1GHz

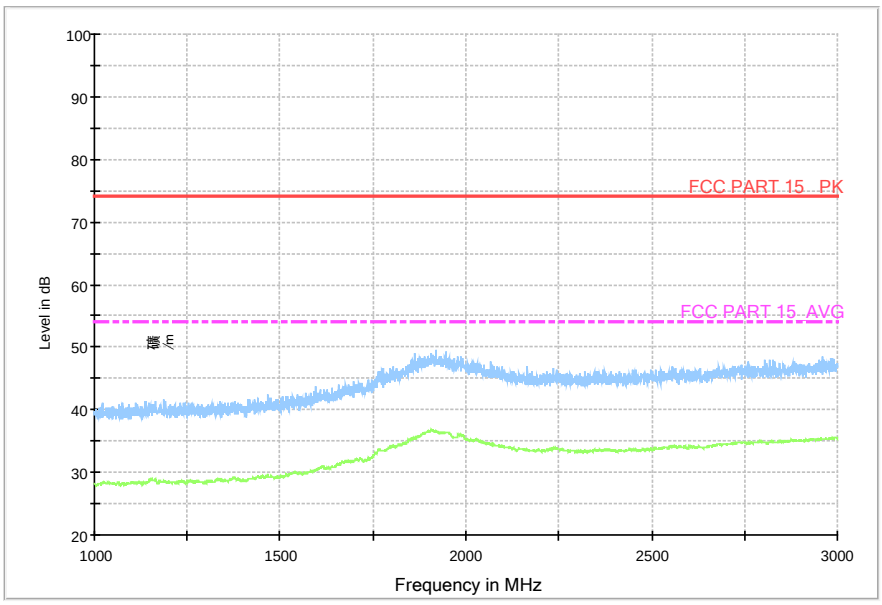
Normal RE_30M-1GHz_10m



RBW / VBW 1 MHz

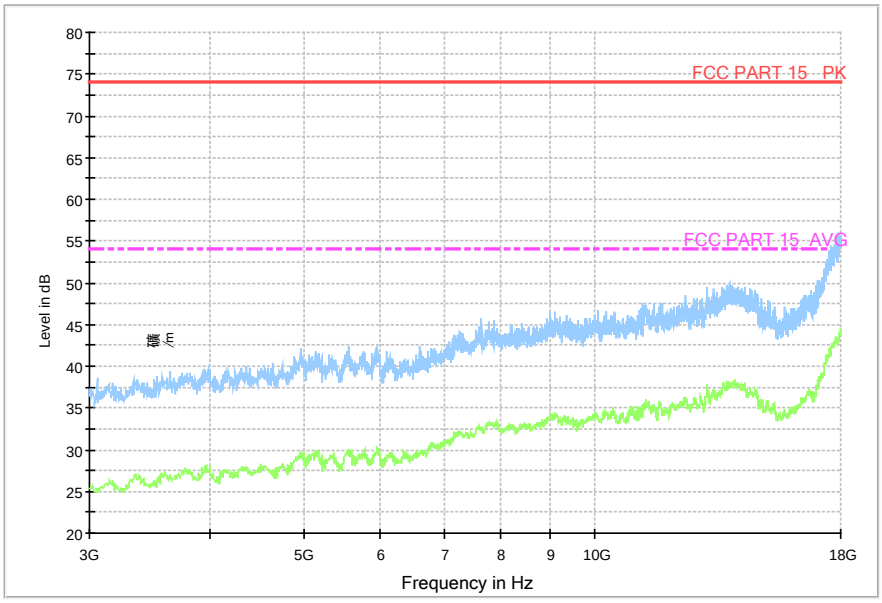
Idle Mode: 1GHz-3GHz

RE_BT_1G-3GHz



RBW / VBW 1 MHz

Idle Mode: 3GHz-18GHz



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