FCC 47 CFR PART 15 SUBPART C AND ANSI C63.10:2013 TEST REPORT

For

IP Phone

Model: OBi2182

Data Applies To: OBi2162

Trade Name: OBIHAI

Issued for

Obihai Technology, Inc.

51 E Campbell Ave. Campbell CA 95008 United States

Issued by

Compliance Certification Services Inc.
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Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	12/15/2017	Initial Issue	All Page 83	Gloria Chang

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1. TEST REPORT CERTIFICATION

Applicant	：	Obihai Technology, Inc.
Address	：	51 E Campbell Ave. Campbell CA 95008 United States
Equipment Under Test	：	IP Phone
Model	：	OBi2182
Data Apples To	：	OBi2162
Trade Name	：	OBIHAI
Tested Date	：	September 19 ~ October 19, 2017

APPLICABLE STANDARD	
Standard	**Test Result**
FCC Part 15 Subpart C AND ANSI C63.10:2013	PASS

WE HEREBY CERTIFY THAT: The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Rueyyan Lin
Sr. Engineer

Reviewed by:

Gundam Lin
Sr. Engineer

2. EUT DESCRIPTION

Product Name	IP Phone
Model Number	OBi2182
Data Applies To	OBi2162
Identify Number	T170919S08
Received Date	September 19, 2017
Frequency Range	2402MHz to 2480MHz f = 2402 + nMHz, n = 0, …..78
Transmit Power	6.11 dBm (0.0041W)
Channel Spacing	1MHz
Channel Number	79 Channels
Transmit Data Rate	GFSK (1Mbps), π/4-DQPSK (2Mbps), 8-DPSK (3Mbps)
Type of Modulation	Frequency Hopping Spread Spectrum
Antenna Type	PCB Antenna × 1, Antenna Gain: 2.68 dBi
Power Rating	12Vdc
Test Voltage	120Vac, 60Hz
DC Power Cable Type	Non-shielded cable, 1.8 m × 1 (Non-detachable)
I/O Port	RJ-9 Port × 2, RJ-11 Port × 1, RJ-45 Port × 2, USB Port × 2, Audio Port × 1, Power Port × 1
Signal Cable	Non-shielded RJ-9 cable, 0.65m × 1 (Detachable)
Support Equipment	Telephone handset

Power Adapter:

No.	Manufacturer	Model No.	Power Input	Power Output
1	AOEM	ADS012T-W120100	100-240Vac, 0.5A, 50-60Hz	12Vdc, 1.0A

The difference of the series model

Model Number	Difference		
	WiFi	Bluetooth	Number of line keys
OBi2182	V	V	12
OBi2162	V	V	6

Remark:

1. *The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.*
2. *For more details, please refer to the User's manual of the EUT.*
3. *This submittal(s) (test report) is intended for FCC ID: 2ADXF-OBI2182 filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.*
4. *The model OBi2182 was considered the main model for testing.*

3. DESCRIPTION OF TEST MODES

The EUT (IP Phone) had been tested under operating condition.

There are three channels have been tested as following:

Channel	Frequency (MHz)
Low	2402
Middle	2441
High	2480

Conducted Emission / Radiated Emission Test (Below 1 GHz)

1. The following test modes were scanned during the preliminary test:

No.	Pre-Test Mode
1	TX Mode

2. After the preliminary scan, the following test mode was found to produce the highest emission level.

Final Test Mode		
Emission	Radiated Emission	Mode 1
	Conducted Emission	

Remark: *Then, the above highest emission mode of the configuration of the EUT and cable was chosen for all final test items.*

Radiated Emission Test (Above 1 GHz):

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.

Tested Channel	Modulation Technology	Modulation Type	Packet Type
Low, Mid, High	FHSS	GFSK	DH5
Low, Mid, High	FHSS	8-DPSK	3-DH5

Bandedge Measurement:

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.

Tested Channel	Modulation Technology	Modulation Type	Packet Type
Low, High	FHSS	GFSK	DH5
Low, High	FHSS	8-DPSK	3-DH5

Antenna Port Conducted Measurement:

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.

Tested Channel	Modulation Technology	Modulation Type	Packet Type
Low, Mid, High	FHSS	GFSK	DH5
Low, Mid, High	FHSS	8-DPSK	3-DH5

Remark：*The field strength of spurious emission was measured in the following position: EUT stand-up position(Y axis), lie-down position(X, Z axis). The worst emission was found in stand-up position(Y axis) and the worst case was recorded.*

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10:2013 and FCC CFR 47, 15.207, 15.209 and 15.247.

5. FACILITIES AND ACCREDITATION

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

NO. 989-1 Wen Shan Rd., Shang Shan Village,
Qionglin Township, Hsinchu County 30741, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.10:2013 and CISPR 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4 and CISPR 16-1-5.

5.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Taiwan	TAF

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	INDUSTRY CANADA
Japan	VCCI
Taiwan	BSMI
USA	FCC MRA

Copies of granted accreditation certificates are available for downloading from our web site, http:///www.ccsrf.com

Remark: *FCC Designation Number TW0240.*

5.3 MEASUREMENT UNCERTAINTY

The following table is for the measurement uncertainty, which is calculated as per the document CISPR 16-4-2.

PARAMETER	UNCERTAINTY
Semi Anechoic Chamber (966 Chamber_C) / Radiated Emission, 30 to 1000 MHz	+/- 3.97
Semi Anechoic Chamber (966 Chamber_C) / Radiated Emission, 1 to 18GHz	+/- 3.58
Semi Anechoic Chamber (966 Chamber_C) / Radiated Emission, 18 to 26 GHz	+/- 3.59
Semi Anechoic Chamber (966 Chamber_C) / Radiated Emission, 26 to 40 GHz	+/- 3.81
Conducted Emission (Mains Terminals), 9kHz to 30MHz	+/- 2.48

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Consistent with industry standard (e.g. CISPR 22, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than U_{CISPR} which is 3.6dB and 5.2dB respectively. CCS values (called U_{Lab} in CISPR 16-4-2) is less than U_{CISPR} as shown in the table above. Therefore, MU need not be considered for compliance.

6. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Serial No.
1	Notebook PC	IBM (Lenovo)	ThinkPad T61 7663-AS6	L3F3864

No.	Signal Cable Description
1	Non-shielded RJ-45 cable, 12m × 1

SETUP DIAGRAM FOR TESTS

EUT & peripherals setup diagram is shown in appendix setup photos.

EUT OPERATING CONDITION

1. EUT & peripherals setup diagram is shown in appendix setup photos.
2. TX Mode:
   ⇨ **Power control:** TX mode (GFSK)
   Frequency: 2402, 2441, 2480
   Power set: 19, 19, 1B
   Data Rate: 15/339 (DH5)
   TX mode (8-DPSK)
   Frequency: 2402, 2441, 2480
   Power set: 26, 26, 26
   Data Rate: 31/1021 (3-DH5)
3. All of the functions are under run.
4. Start test.

7. FCC PART 15.247 REQUIREMENTS

7.1 20dB BANDWIDTH FOR HOPPING

LIMITS

Limit: N/A

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/07/2018
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

1. The 20dB band width was measured with a spectrum analyzer connected to RF antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer. Display Line and Marker Delta functions, the 20dB band width of the emission was determined.
2. Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel.
3. RBW ≥ 1% of the 20 dB bandwidth.
4. VBW ≥ RBW.
5. Sweep = auto.

TEST RESULTS

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/13
Test Mode	TX Mode	Temp. & Humidity	26°C, 56%

Modulation Type: GFSK, CFG PKT Packet Type: 15 Packet Size: 339 (DH5)

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	Result
Low	2402	0.9546	N/A
Middle	2441	0.9548	N/A
High	2480	0.9548	N/A

Modulation Type: 8-DPSK, CFG PKT Packet Type: 31 Packet Size: 1021 (3-DH5)

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)	Result
Low	2402	1.2550	N/A
Middle	2441	1.2538	N/A
High	2480	1.2505	N/A

20dB BANDWIDTH

CH Low / GFSK

CH Middle / GFSK

CH High / GFSK

CH Low / 8-DPSK

CH Middle / 8-DPSK

CH High / 8-DPSK

7.2 MAXIMUM PEAK OUTPUT POWER

LIMITS

§15.247(b)(1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anritsu	ML2495A	1149001	12/05/2017
Power Sensor	Anritsu	MA2411B	1126148	12/05/2017
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

The transmitter output is connected to the power meter. The power meter is set to the peak power detection.

TEST RESULTS

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/13
Test Mode	TX Mode	Temp. & Humidity	26°C, 56%

Modulation Type: GFSK, CFG PKT Packet Type: 15 Packet Size: 339 (DH5)

Channel	Channel Frequency (MHz)	Maximum Peak Output Power				Result
		Measured Value		Limit		
		(dBm)	(W)	(dBm)	(W)	
Low	2402	4.70	0.0030	20.97	0.1250	PASS
Middle	2441	4.02	0.0025	20.97	0.1250	PASS
High	2480	4.75	0.0030	20.97	0.1250	PASS

Remark: *The cable assembly insertion loss of 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*

Modulation Type: 8-DPSK, CFG PKT Packet Type: 31 Packet Size: 1021 (3-DH5)

Channel	Channel Frequency (MHz)	Maximum Peak Output Power				Result
		Measured Value		Limit		
		(dBm)	(W)	(dBm)	(W)	
Low	2402	6.11	0.0041	20.97	0.1250	PASS
Middle	2441	5.54	0.0036	20.97	0.1250	PASS
High	2480	4.51	0.0028	20.97	0.1250	PASS

Remark: *The cable assembly insertion loss of 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*

7.3 AVERAGE POWER

LIMITS

None: For reporting purposes only.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anritsu	ML2495A	1149001	12/05/2017
Power Sensor	Anritsu	MA2411B	1126148	12/05/2017
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

The transmitter output is connected to the power meter. The power meter is set to the average power detection.

TEST RESULTS

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/13
Test Mode	TX Mode	Temp. & Humidity	26°C, 56%

Modulation Type: GFSK, CFG PKT Packet Type: 15 Packet Size: 339 (DH5)

Channel	Channel Frequency (MHz)	Average Power (dBm)
Low	2402	4.42
Middle	2441	3.71
High	2480	4.47

Remark: *The cable assembly insertion loss of 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*

Modulation Type: 8-DPSK, CFG PKT Packet Type: 31 Packet Size: 1021 (3-DH5)

Channel	Channel Frequency (MHz)	Average Power (dBm)
Low	2402	2.96
Middle	2441	2.24
High	2480	1.06

Remark: *The cable assembly insertion loss of 11.5 dB (including 10 dB pad and 1.5 dB cable) was entered as an offset in the power meter to allow for direct reading of power.*

7.4 HOPPING CHANNEL SEPARATION

LIMITS

§15.247(a)(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/07/2018
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of adjacent channels.
4. Measure the frequency difference of these two adjacent channels by spectrum analyzer MARK function. And then plot the result on spectrum analyzer screen.
5. Span = wide enough to capture the peaks of two adjacent channels.
6. Resolution (or IF) Bandwidth (RBW) ≥ 1% of the span.
7. Video (or Average) Bandwidth (VBW) ≥ RBW.
8. Sweep = auto.
9. Repeat above procedures until all frequencies measured were complete.

TEST RESULTS

Refer to section 7.1, 20dB bandwidth measurement, the measured channel separation should be greater than two-third of 20dB bandwidth or Minimum bandwidth.

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/13
Test Mode	TX Mode	Temp. & Humidity	26°C, 56%

Modulation Type: GFSK, CFG PKT Packet Type: 15 Packet Size: 339 (DH5)

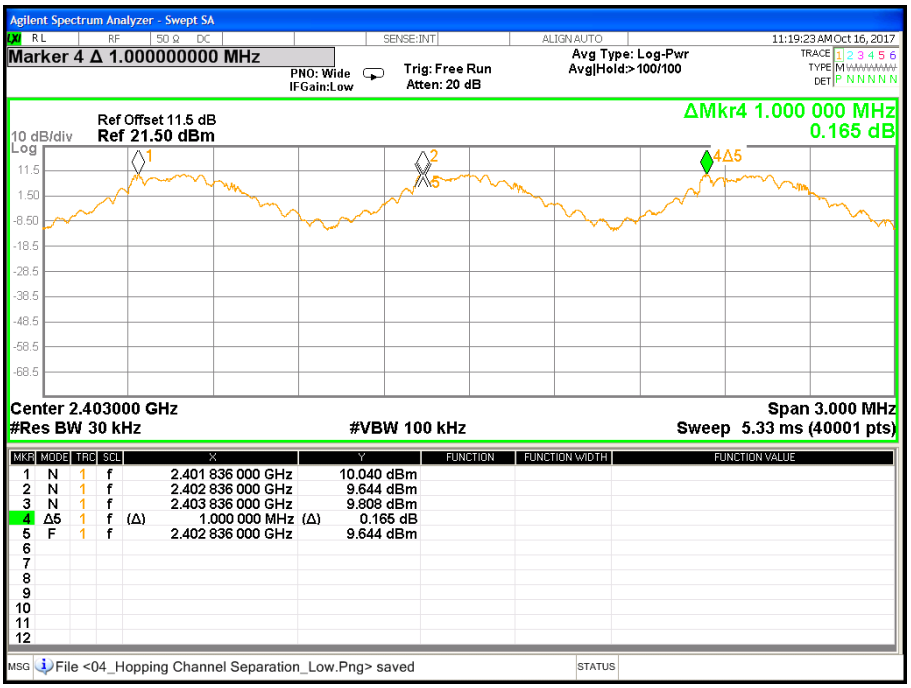
Channel	Channel Frequency (MHz)	Adjacent Hopping Channel Separation (kHz)	Two –third of 20dB bandwidth (kHz)	Minimum Bandwidth (kHz)	Result
Low	2402	1000	636.40	25	PASS
Middle	2441	1000	636.50	25	PASS
High	2480	1000	636.55	25	PASS

Modulation Type: 8-DPSK, CFG PKT Packet Type: 31 Packet Size: 1021 (3-DH5)

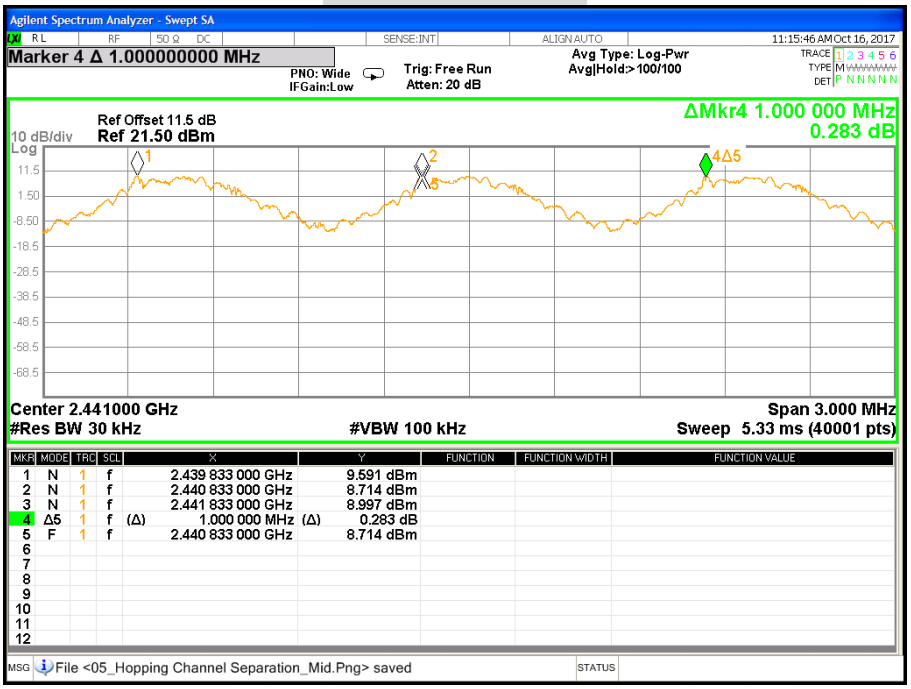
Channel	Channel Frequency (MHz)	Adjacent Hopping Channel Separation (kHz)	Two –third of 20dB bandwidth (kHz)	Minimum Bandwidth (kHz)	Result
Low	2402	1000	836.65	25	PASS
Middle	2441	1000	835.85	25	PASS
High	2480	1000	833.65	25	PASS

HOPPING CHANNEL SEPARATION

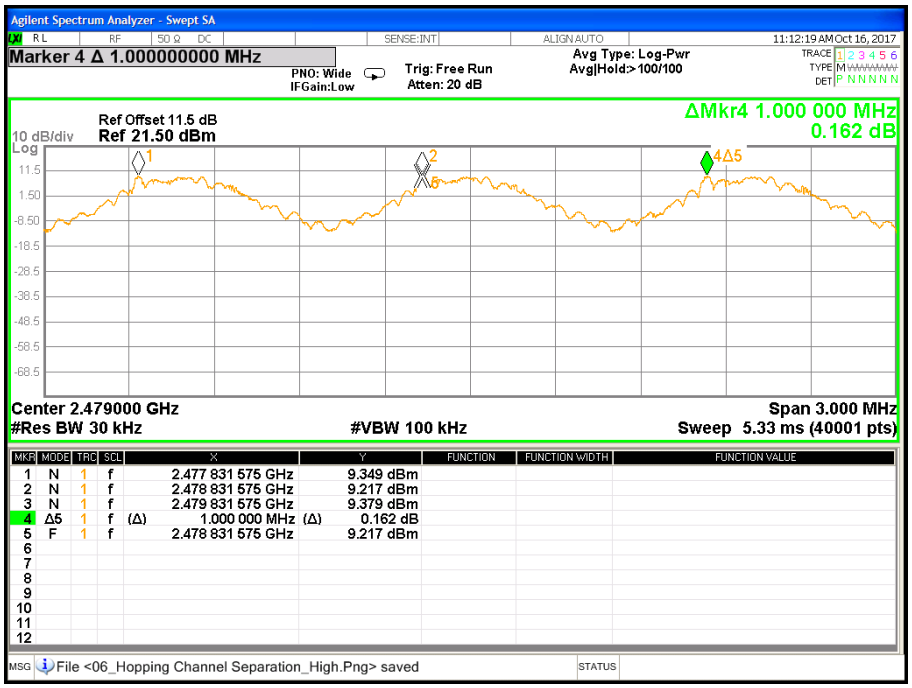
CH Low / GFSK



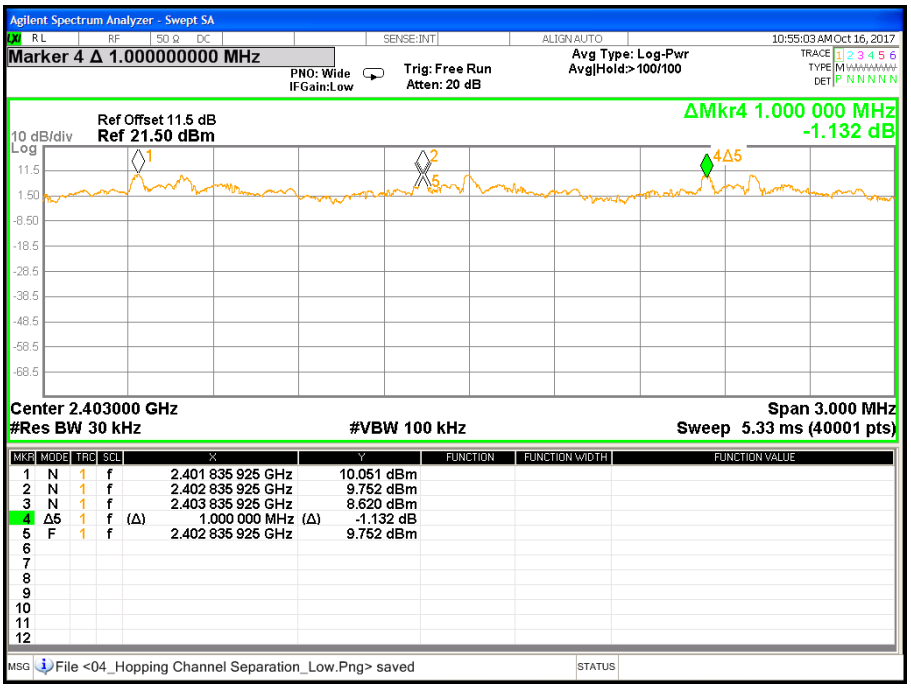
CH Middle / GFSK



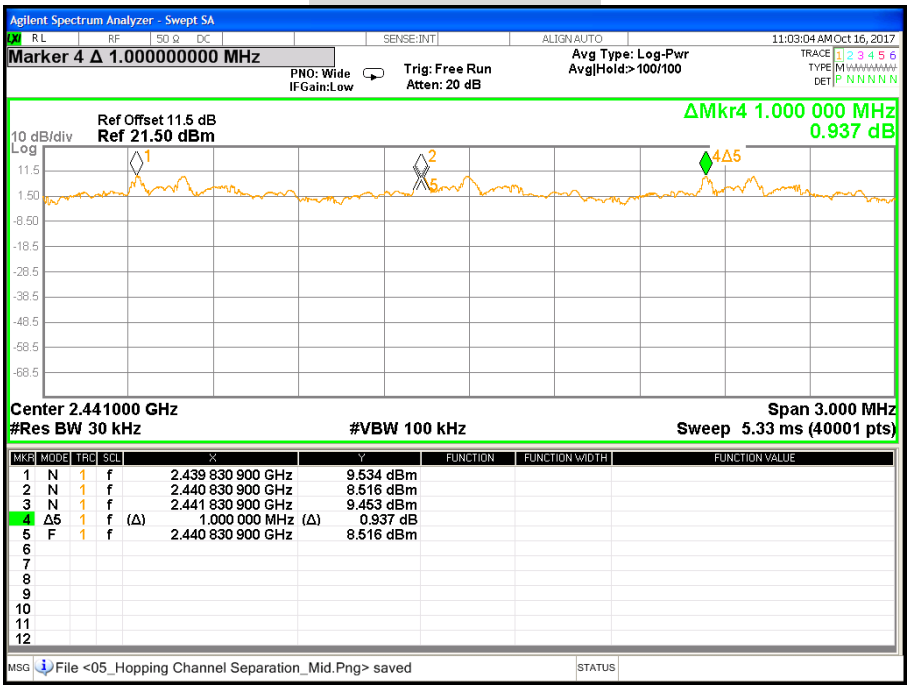
CH High / GFSK



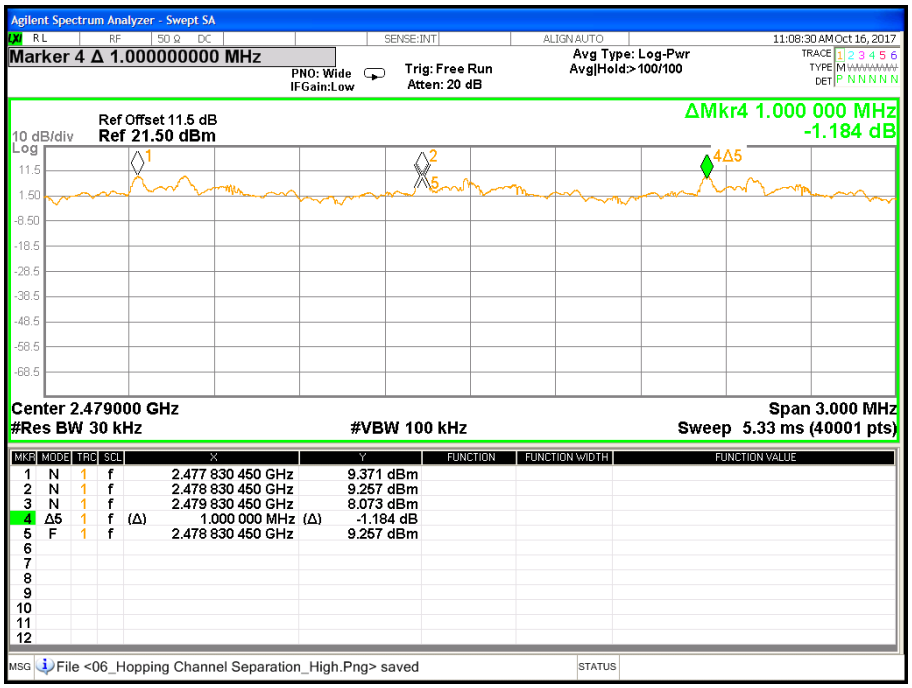
CH Low / 8-DPSK



CH Middle / 8-DPSK



CH High / 8-DPSK



7.5 NUMBER OF HOPPING FREQUENCY USED

LIMITS

§15.247(a)(1)(iii) For frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/07/2018
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Set the spectrum analyzer on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the spectrum analyzer on View mode and then plot the result on spectrum analyzer screen.
5. Span = the frequency band of operation.
6. RBW ≥ 1% of the span.
7. VBW ≥ RBW.
8. Sweep = auto.
9. Repeat above procedures until all frequencies measured were complete.

TEST RESULTS

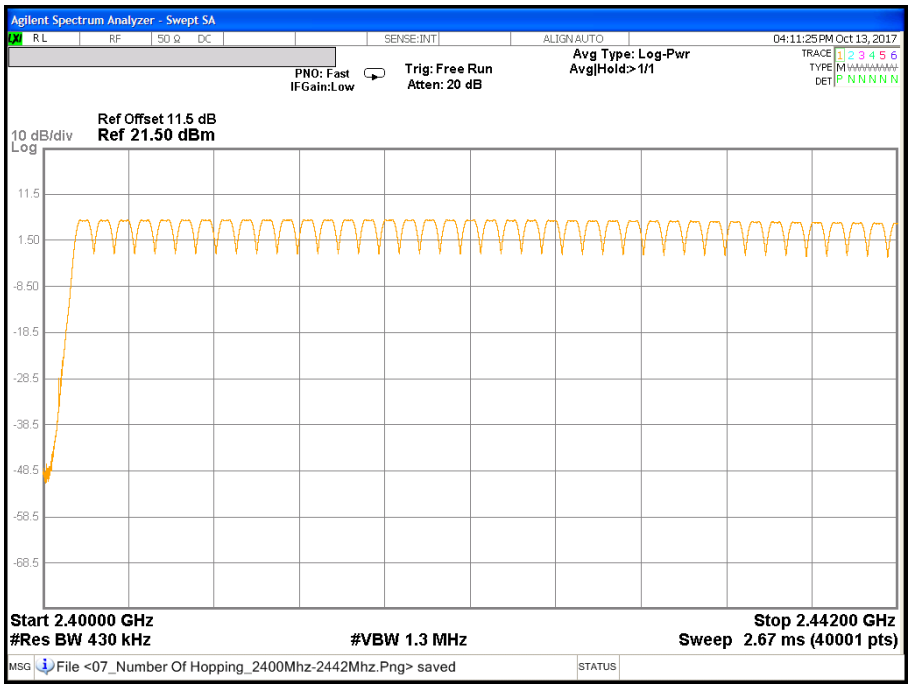
Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/13
Test Mode	TX Mode	Temp. & Humidity	26°C, 56%

Refer to the attached plot.

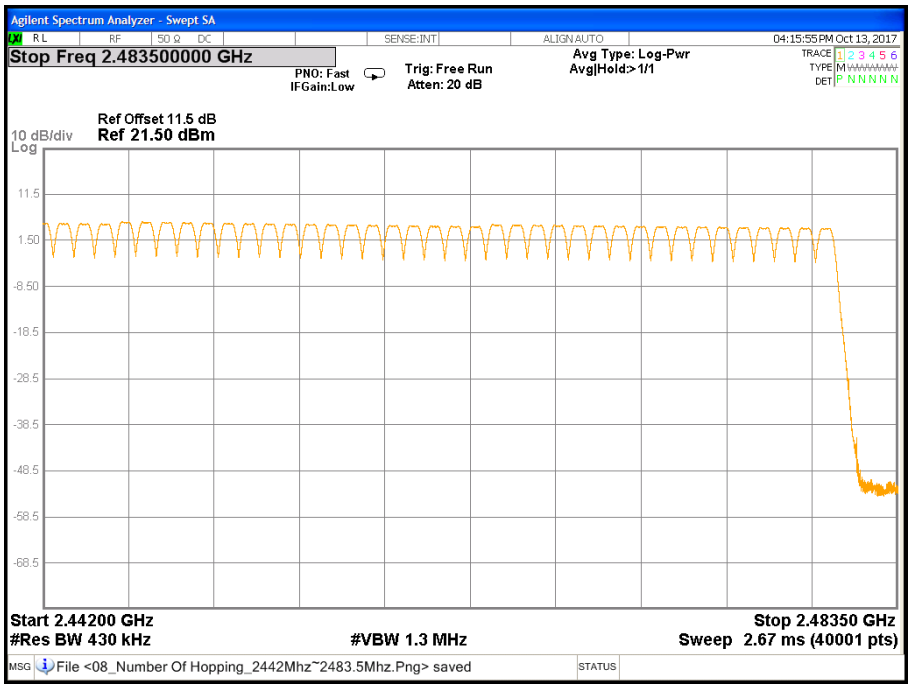
There are 79 hopping frequencies in a hopping sequence.

NUMBER OF HOPPING FREQUENCY USED

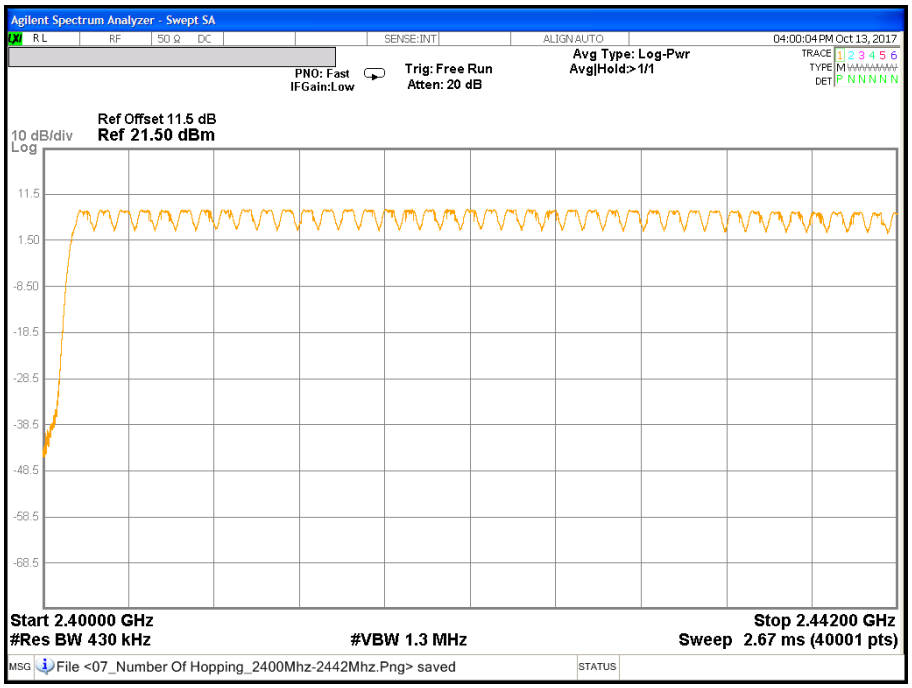
GFSK



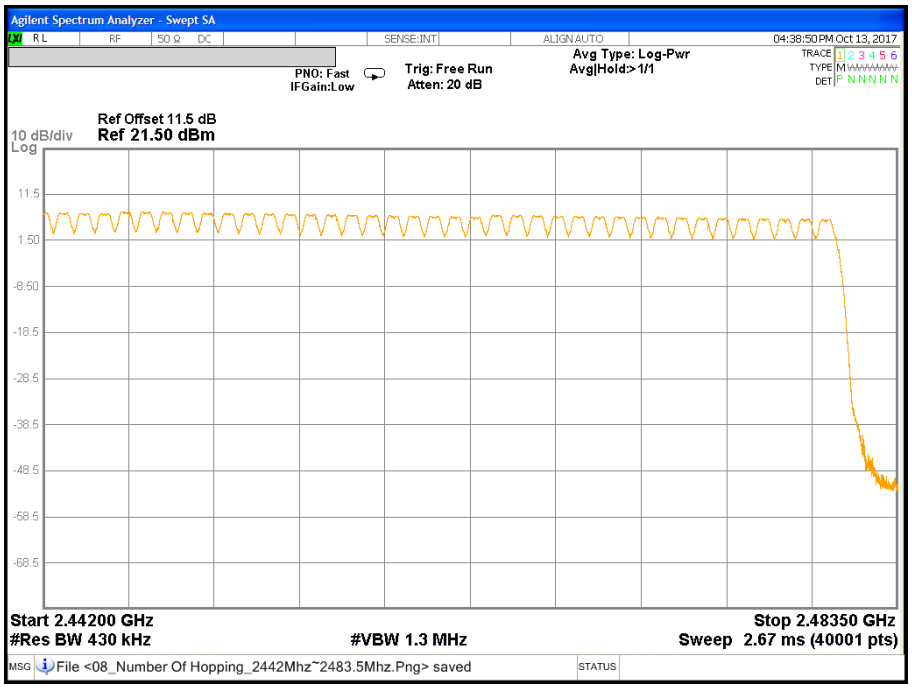
GFSK



8-DPSK



8-DPSK



7.6 DWELL TIME ON EACH CHANNEL

LIMITS

§15.247(a)(1)(iii) For frequency hopping system operating in the 2400-2483.5MHz band, the average time of occupancy on any frequency shall not be greater than 0.4 second within a 31.6 second period.

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/07/2018
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP

TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of spectrum analyzer on any frequency be measured and set spectrum analyzer to zero span mode.
4. RBW = 1 MHz.
5. VBW ≥ RBW.
6. Sweep = as necessary to capture the entire dwell time per hopping channel.
7. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
8. Repeat above procedures until all frequencies measured were complete.
9. The EUT has 3 type of payload, DH1, DH3, DH5. The hopping rate is 1600 per second.
10. The longer the payload is, the slower the hopping rate is.

TEST RESULTS

Time of occupancy on the TX channel in 31.6sec = time domain slot length × hop rate ÷ number of hop per channel × 31.6

Refer to the attached graph.

The hopping rates of Bluetooth devices change with different types of payload. The longer the payload is, the slower the hopping rate. The hopping rate scenario is defined in Bluetooth core specification.

Product Name	IP Phone	**Test By**	Rex Chiu
Test Model	OBi2182	**Test Date**	2017/10/13
Test Mode	TX Mode	**Temp. & Humidity**	26°C, 56%

Modulation Type: GFSK

Channel	**Channel Frequency (MHz)**	**Packet type**	**Dwell time (ms)**	**Time of occupancy on the TX channel in 31.6sec (ms)**	**Limit for Time of occupancy on the TX channel in 31.6sec (ms)**	**Results**
Low	2402	DH1	0.380	121.60	400	PASS
	2402	DH3	1.638	262.08	400	PASS
	2402	DH5	2.885	307.73	400	PASS
Middle	2441	DH1	0.380	121.60	400	PASS
	2441	DH3	1.638	262.08	400	PASS
	2441	DH5	2.885	307.73	400	PASS
High	2480	DH1	0.380	121.60	400	PASS
	2480	DH3	1.638	262.08	400	PASS
	2480	DH5	2.885	307.73	400	PASS

Remark:
Ch Low
DH1: 0.380 ms × (1600÷2) ÷ 79 × 31.6 = 121.60 ms
DH3: 1.638 ms × (1600÷4) ÷ 79 × 31.6 = 262.08 ms
DH5: 2.885 ms × (1600÷6) ÷ 79 × 31.6 = 307.73 ms
Ch Middle
DH1: 0.380 ms × (1600÷2) ÷ 79 × 31.6 = 121.60 ms
DH3: 1.638 ms × (1600÷4) ÷ 79 × 31.6 = 262.08 ms
DH5: 2.885 ms × (1600÷6) ÷ 79 × 31.6 = 307.73 ms
Ch High
DH1: 0.380 ms × (1600÷2) ÷ 79 × 31.6 = 121.60 ms
DH3: 1.638 ms × (1600÷4) ÷ 79 × 31.6 = 262.08 ms
DH5: 2.885 ms × (1600÷6) ÷ 79 × 31.6 = 307.73 ms

Modulation Type: 8-DPSK

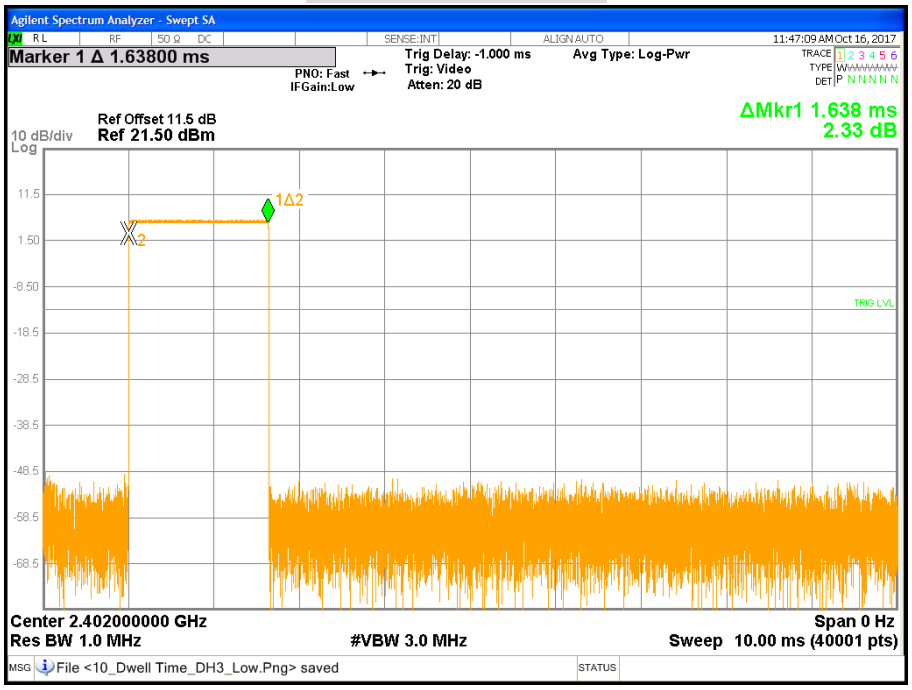
Channel	Channel Frequency (MHz)	Packet type	Dwell time (ms)	Time of occupancy on the TX channel in 31.6sec (ms)	Limit for Time of occupancy on the TX channel in 31.6sec (ms)	Results
Low	2402	DH1	0.380	121.60	400	PASS
	2402	DH3	1.638	262.08	400	PASS
	2402	DH5	2.885	307.73	400	PASS
Middle	2441	DH1	0.380	121.60	400	PASS
	2441	DH3	1.638	262.08	400	PASS
	2441	DH5	2.885	307.73	400	PASS
High	2480	DH1	0.380	121.60	400	PASS
	2480	DH3	1.638	262.08	400	PASS
	2480	DH5	2.885	307.73	400	PASS

Remark:
Ch Low
DH1: 0.380 ms × (1600÷2) ÷ 79 × 31.6 = 121.60 ms
DH3: 1.638 ms × (1600÷4) ÷ 79 × 31.6 = 262.08 ms
DH5: 2.885 ms × (1600÷6) ÷ 79 × 31.6 = 307.73 ms
Ch Middle
DH1: 0.380 ms × (1600÷2) ÷ 79 × 31.6 = 121.60 ms
DH3: 1.638 ms × (1600÷4) ÷ 79 × 31.6 = 262.08 ms
DH5: 2.885 ms × (1600÷6) ÷ 79 × 31.6 = 307.73 ms
Ch High
DH1: 0.380 ms × (1600÷2) ÷ 79 × 31.6 = 121.60 ms
DH3: 1.638 ms × (1600÷4) ÷ 79 × 31.6 = 262.08 ms
DH5: 2.885 ms × (1600÷6) ÷ 79 × 31.6 = 307.73 ms

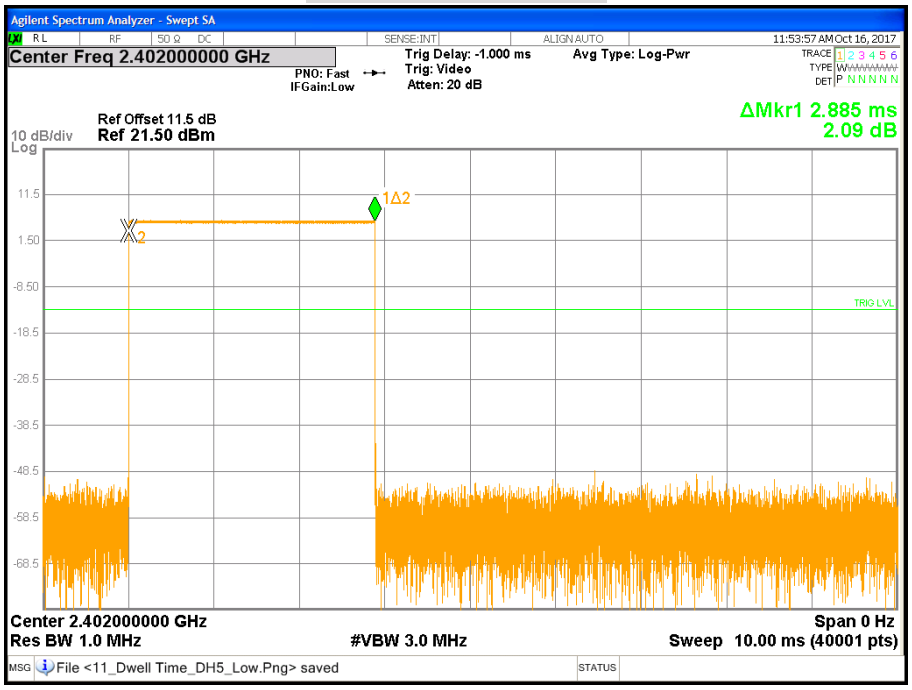
DWELL TIME ON EACH PAYLOAD

DH1 CH Low / GFSK

DH3 CH Low / GFSK

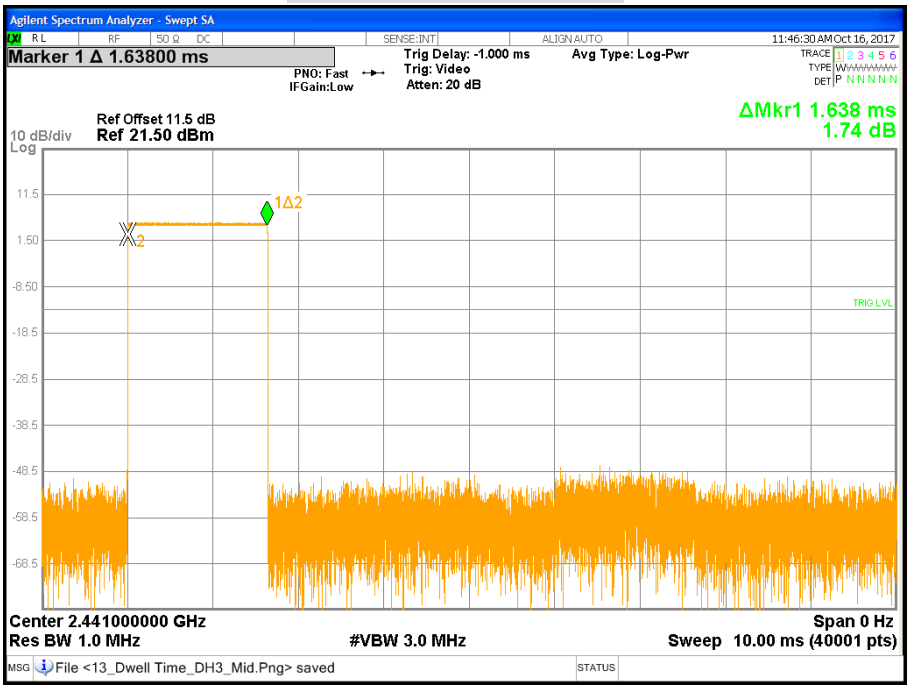


DH5 CH Low / GFSK

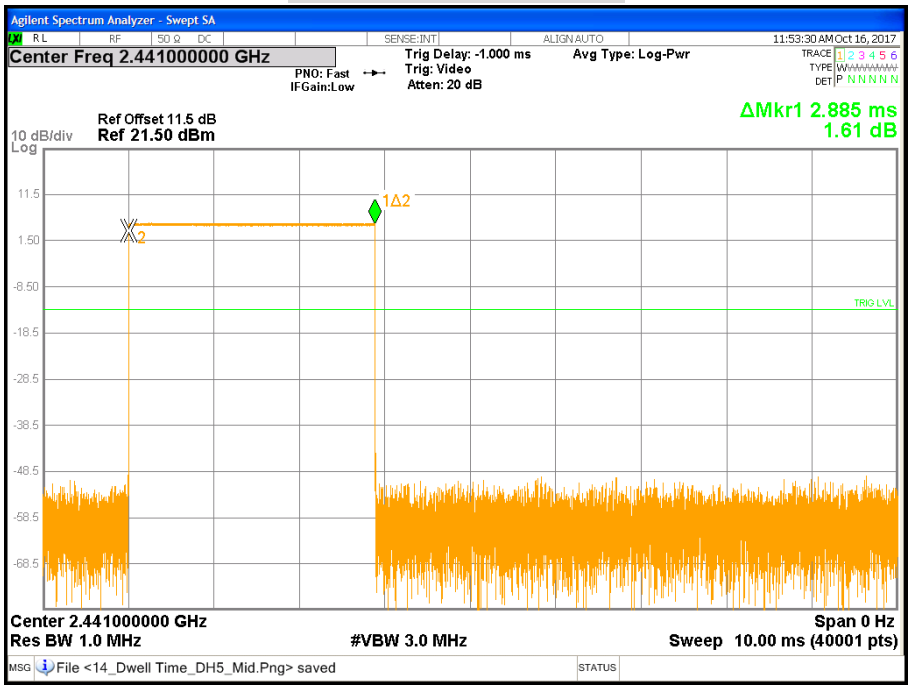


DH1 CH Middle / GFSK

DH3 CH Middle / GFSK

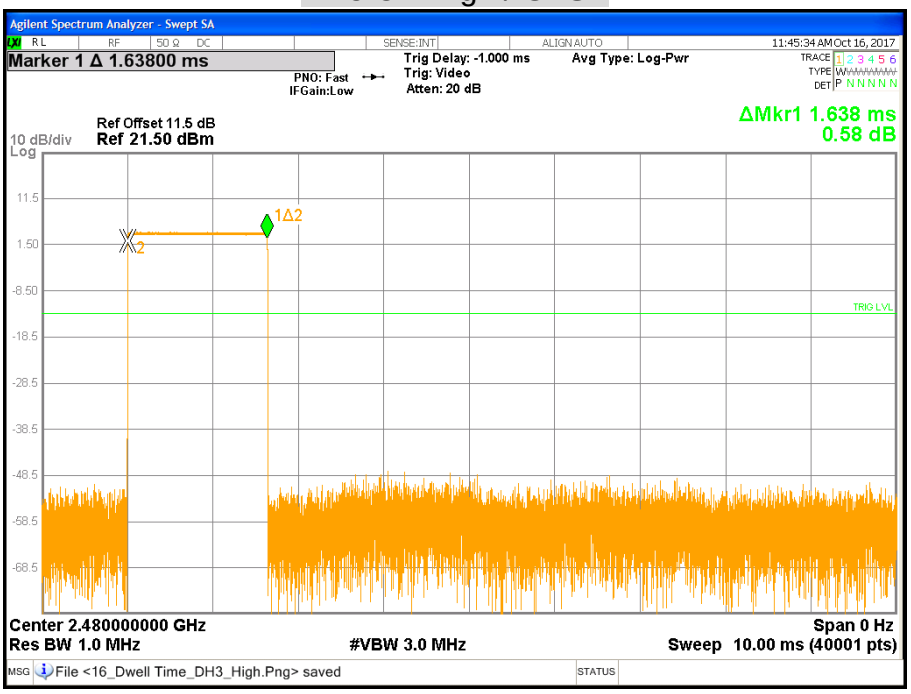


DH5 CH Middle / GFSK

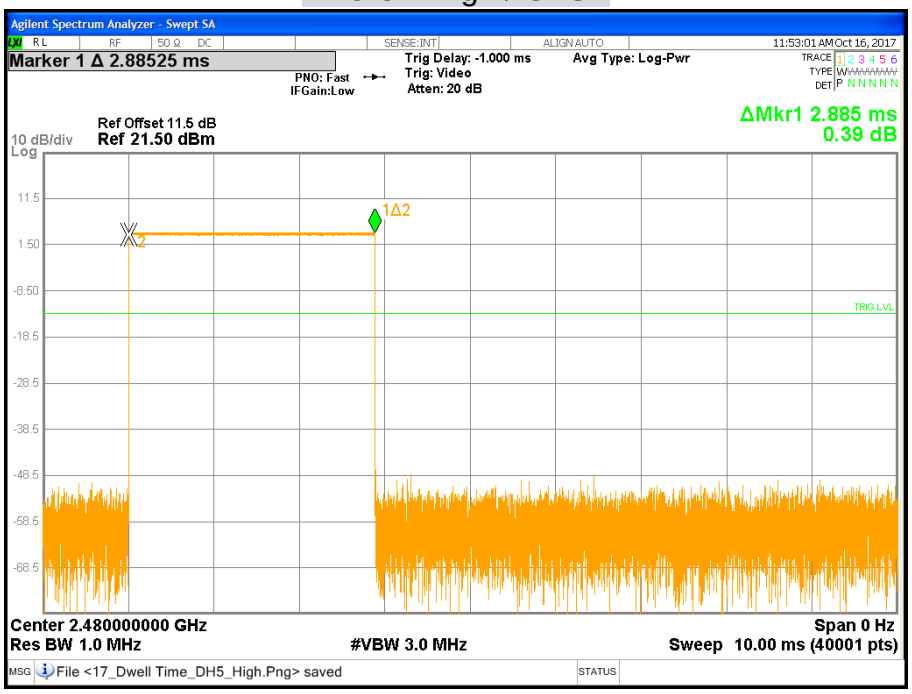


DH1 CH High / GFSK

DH3 CH High / GFSK



DH5 CH High / GFSK



DH1 CH Low / 8-DPSK

DH3 CH Low / 8-DPSK

DH5 CH Low / 8-DPSK

DH1 CH Middle / 8-DPSK

DH3 CH Middle / 8-DPSK

DH5 CH Middle / 8-DPSK

DH1 CH High / 8-DPSK

DH3 CH High / 8-DPSK

DH5 CH High / 8-DPSK

7.7 CONDUCTED SPURIOUS EMISSION

LIMITS

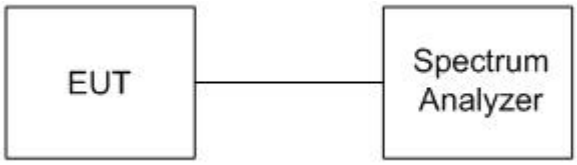
§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the and that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. 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)).

TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
EXA Signal Analyzer	Agilent	N9010A	MY52220817	03/07/2018
Test S/W	N/A			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP



TEST PROCEDURE

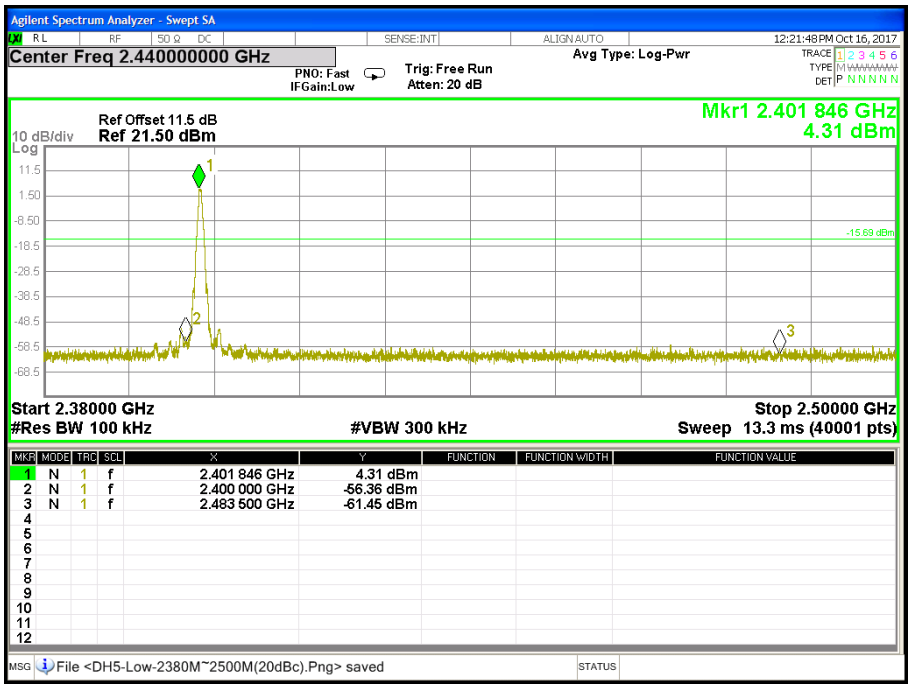
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.
The spectrum from 30 MHz to 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

TEST RESULTS

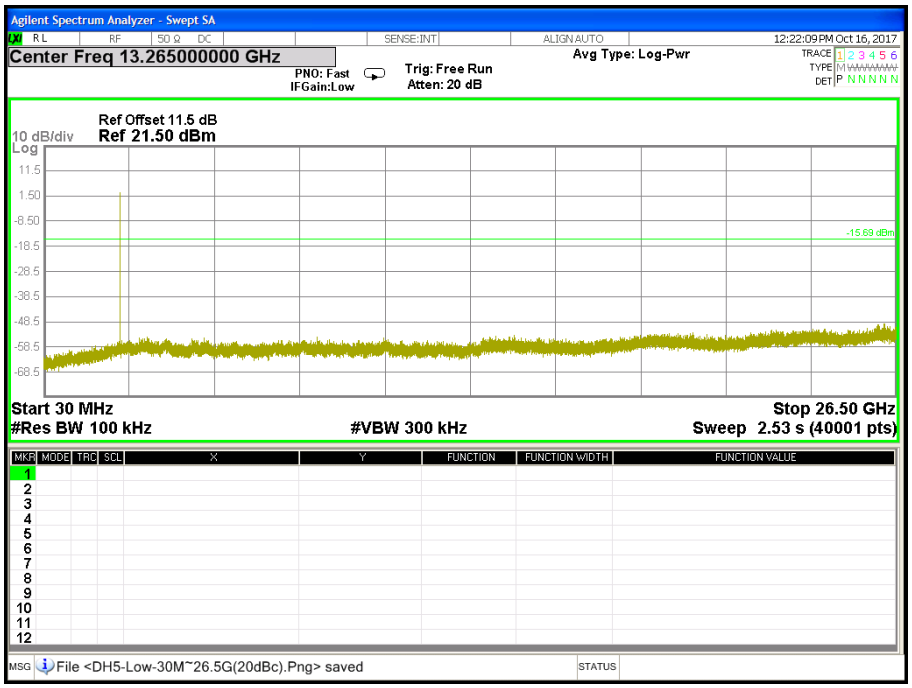
Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/13
Test Mode	TX Mode	Temp. & Humidity	26°C, 56%

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

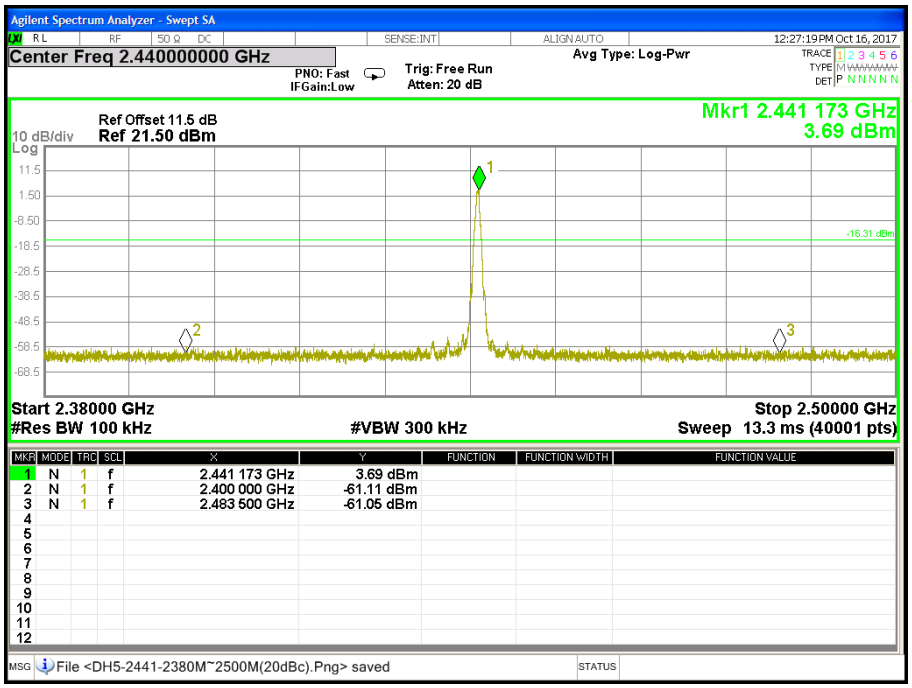
CH Low (2.38GHz ~ 2.5GHz / GFSK)



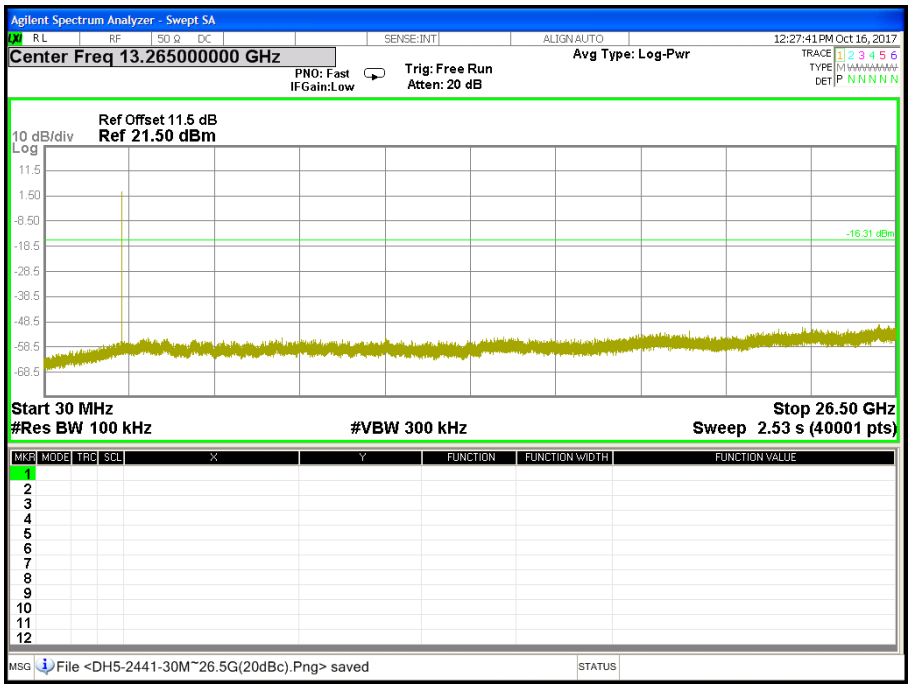
CH Low (30MHz ~ 26.5GHz / GFSK)



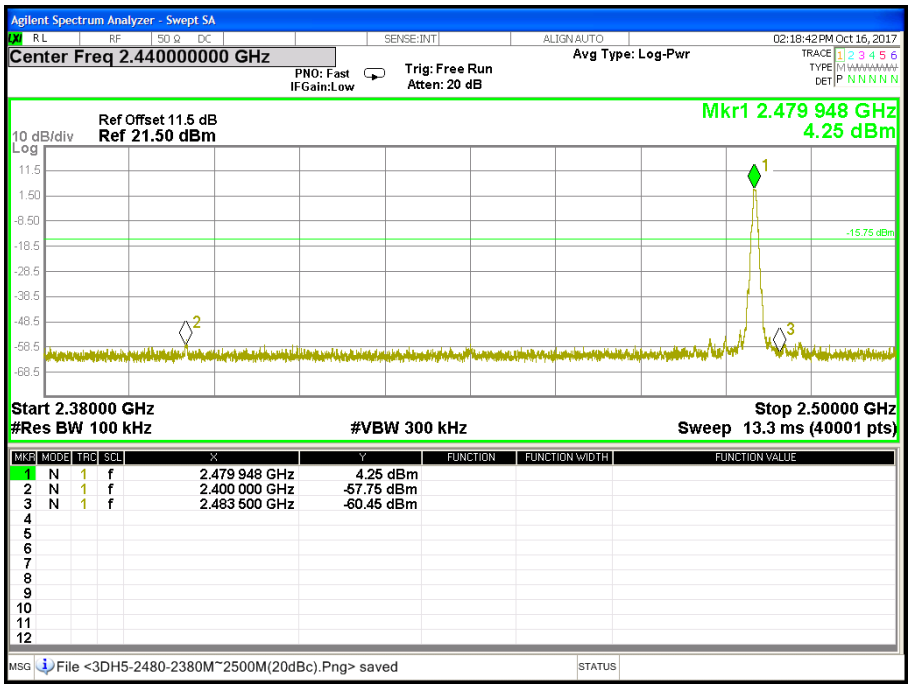
CH Middle (2.38GHz ~ 2.5GHz / GFSK)



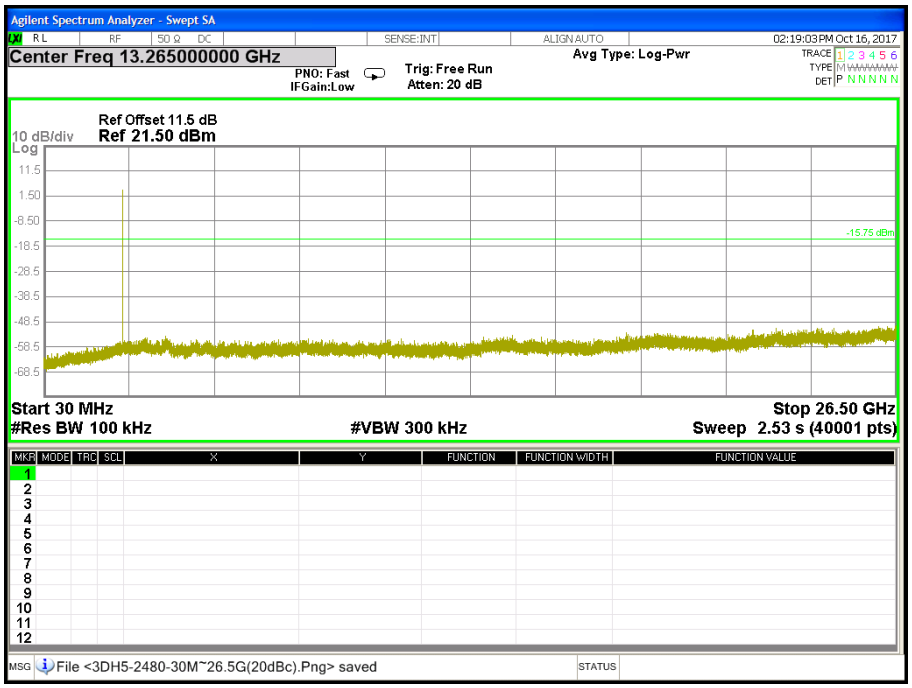
CH Middle (30MHz ~ 26.5GHz / GFSK)



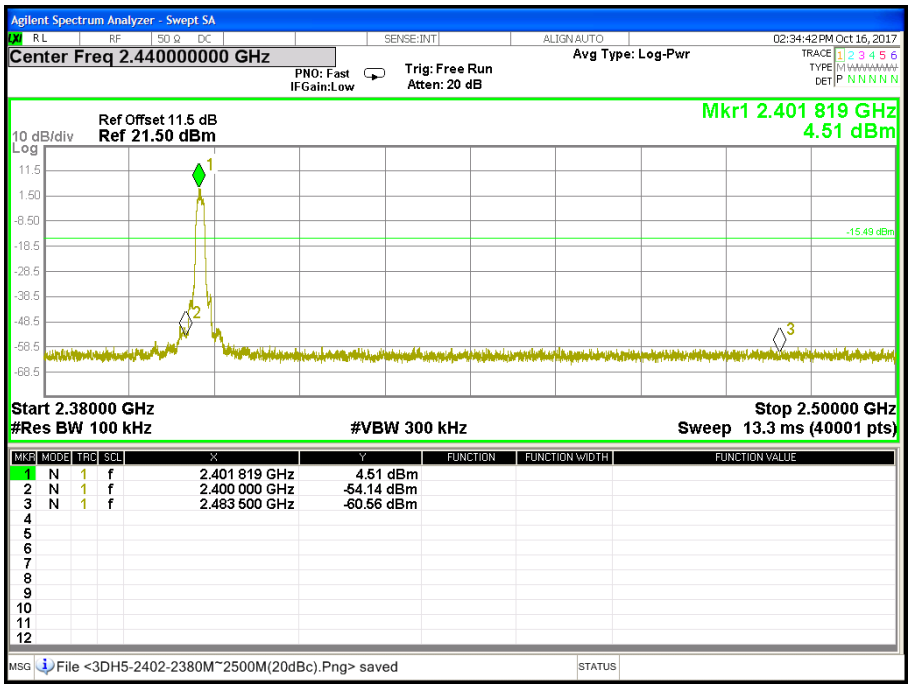
CH High (2.38GHz ~ 2.5GHz / GFSK)



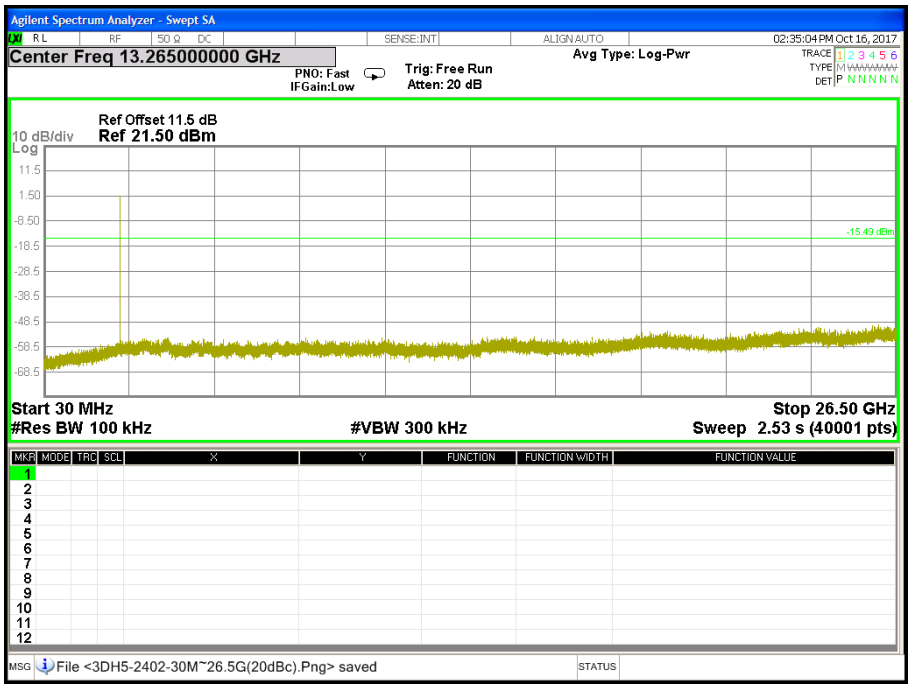
CH High (30MHz ~ 26.5GHz / GFSK)



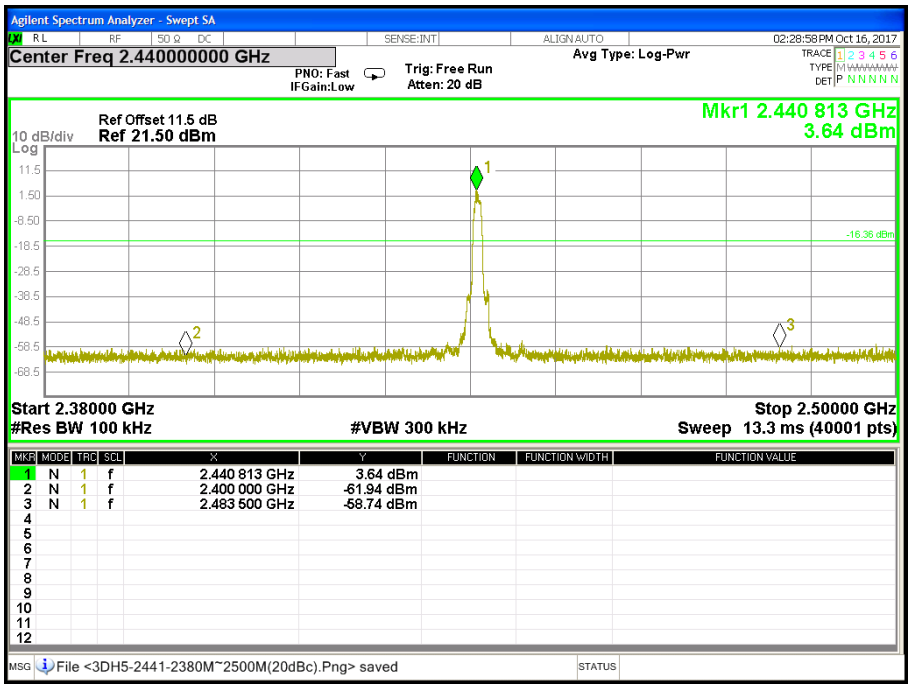
CH Low (2.38GHz ~ 2.5GHz / 8-DPSK)



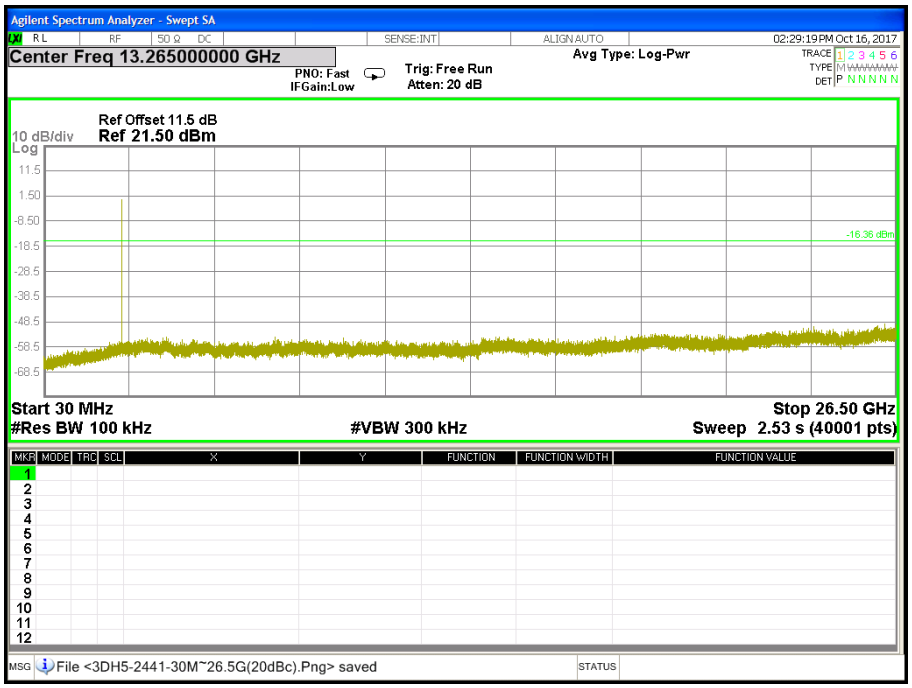
CH Low (30MHz ~ 26.5GHz / 8-DPSK)



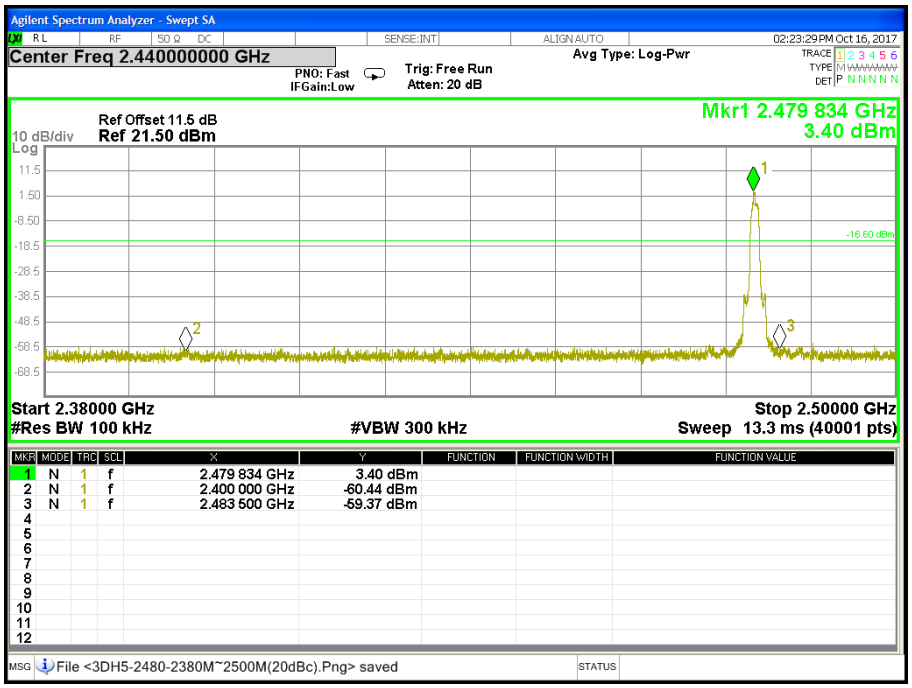
CH Middle (2.38GHz ~ 2.5GHz / 8-DPSK)



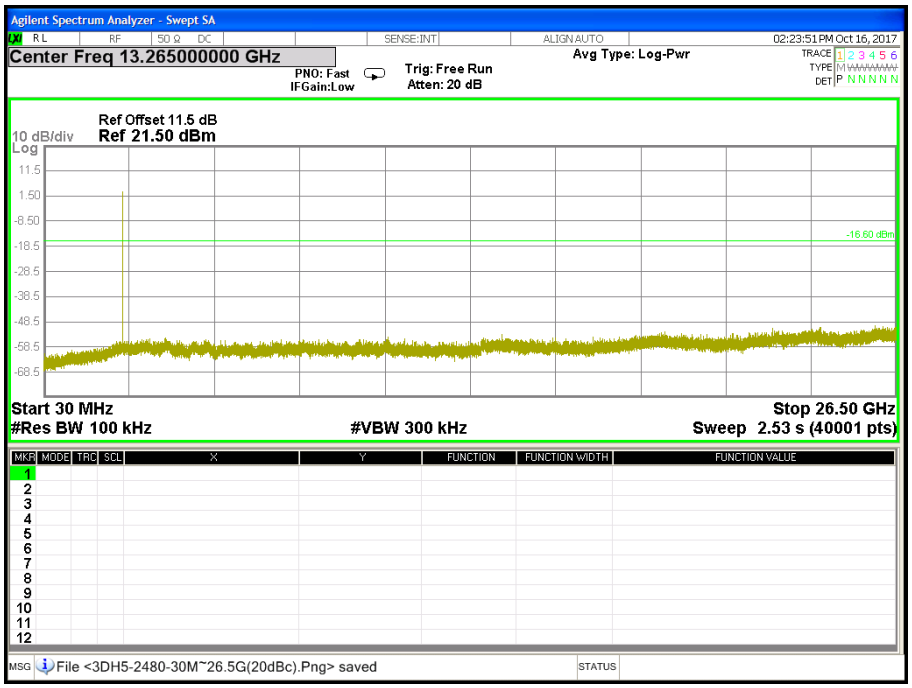
CH Middle (30MHz ~ 26.5GHz / 8-DPSK)



CH High (2.38GHz ~ 2.5GHz / 8-DPSK)

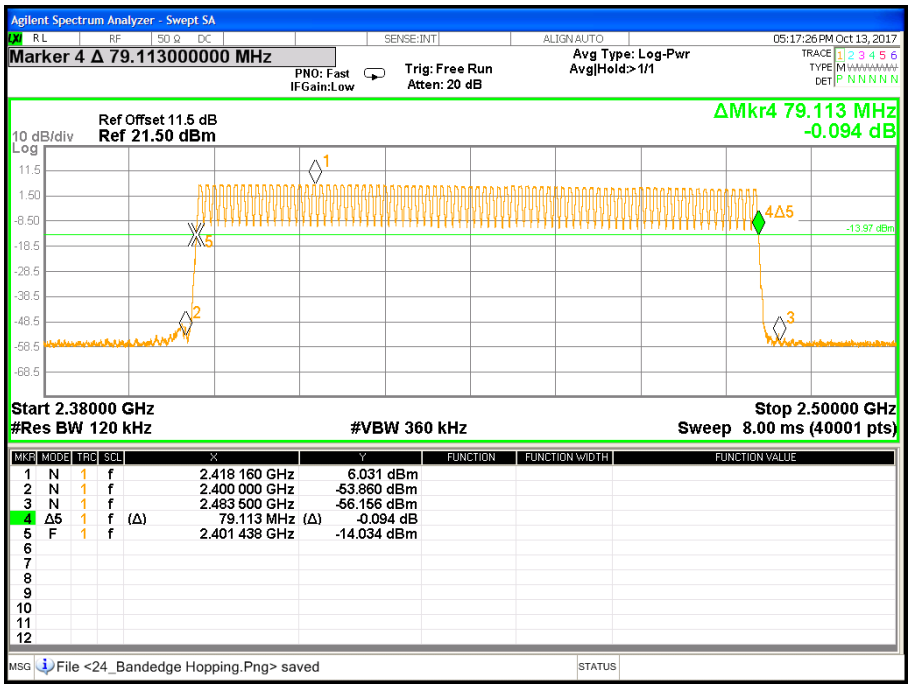


CH High (30MHz ~ 26.5GHz / 8-DPSK)

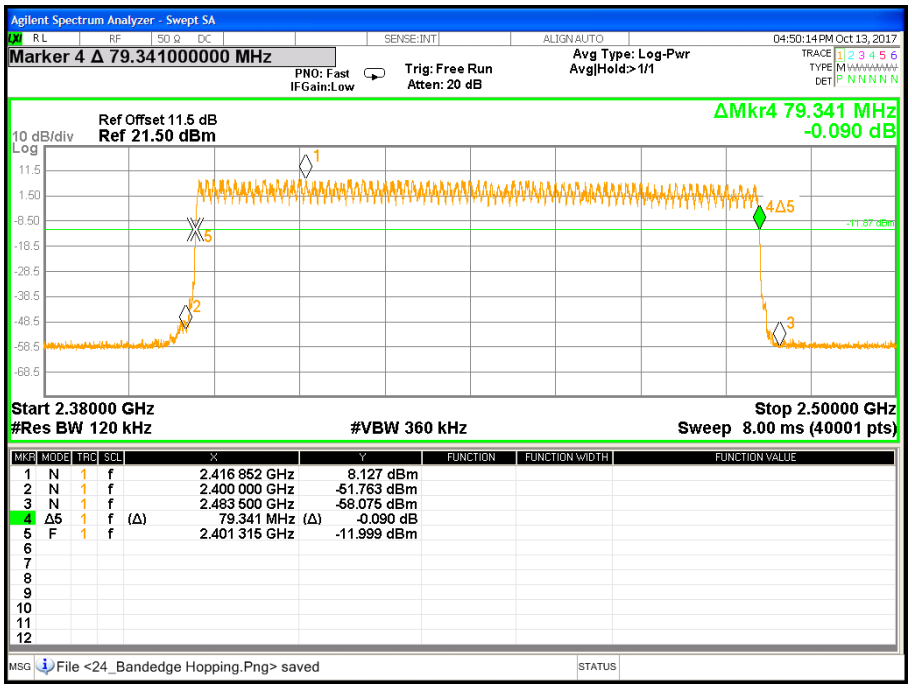


CONDUCTED MEASUREMENT HOPPING BAND EDGES

Hopping / GFSK



Hopping / 8-DPSK



7.8 RADIATED EMISSION

LIMITS

(1) According to § 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]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	2655 - 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 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 -335.4	3600 - 4400	([2])
13.36 - 13.41			

Remark:
1. Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
2. Above 38.6

(2) According to § 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

(3) According to § 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (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

Remark: ***Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.*

(4) According to § 15.209 (b) in the emission table above, the tighter limit applies at the band edges.

TEST EQUIPMENT

Radiated Emission / 966Chamber_C

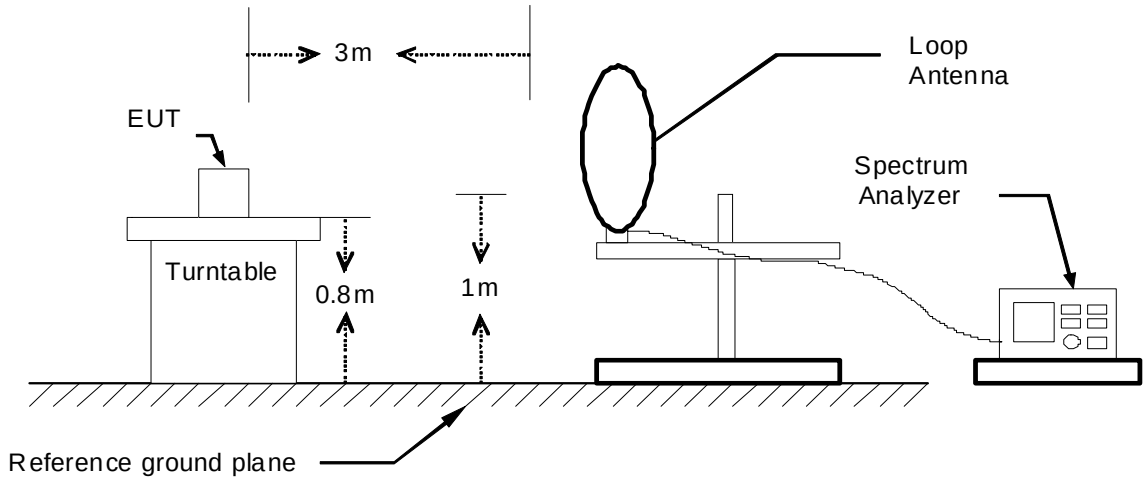
Name of Equipment	Manufacture	Model	Serial Number	Calibration Due
Spectrum Analyzer	Agilent	E4446A	MY48250064	04/19/2018
EMI Test Receiver	Rohde & Schwarz	ESCI	100782	06/11/2018
Bi-log Antenna	TESEQ	CBL 6112D	35404	08/06/2018
Broad-Band Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-285	04/24/2018
Pre-Amplifier	EMCI	EMC001625	980243	04/10/2018
Pre-Amplifier	COM-POWER	PAM-118A	551043	04/10/2018
Double Ridged Guide Horn Antenna	ETS・LINDGREN	3117	00078732	07/05/2018
Horn Antenna	COM-POWER	AH-840	03077	12/01/2017
Loop Antenna	COM-POWER	AL-130	121060	05/14/2018
Test S/W	E3.815206a			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

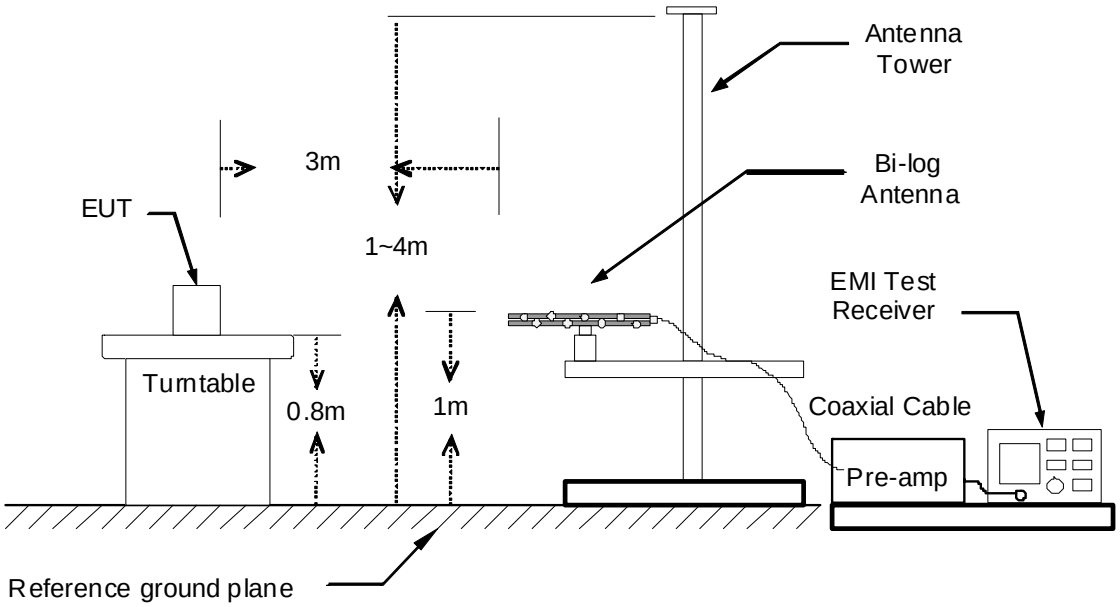
TEST SETUP

The diagram below shows the test setup that is utilized to make the measurements for emission below 1GHz.

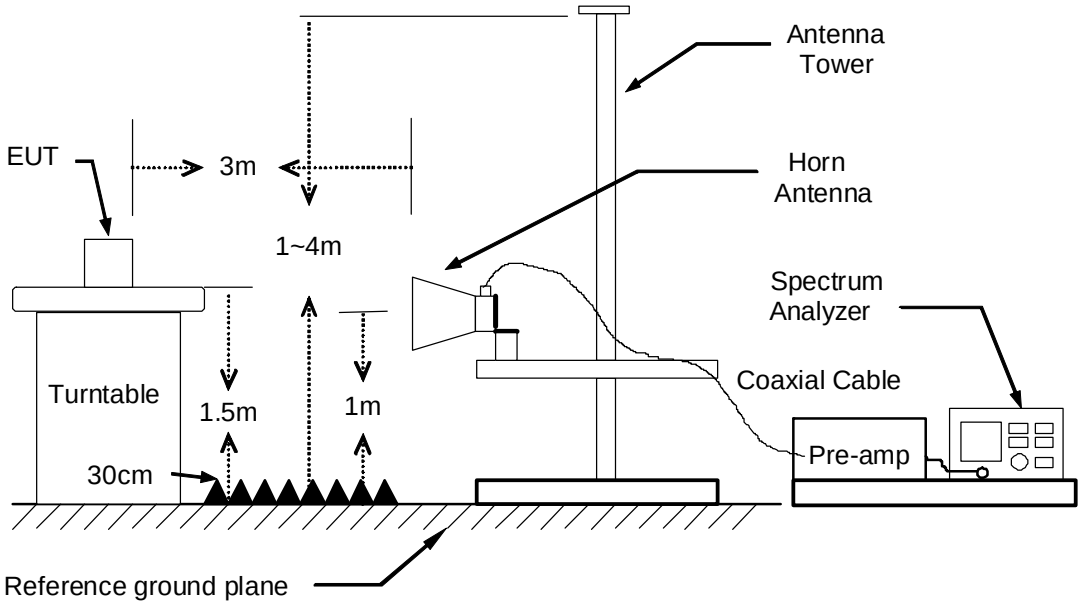
9kHz ~ 30MHz



30MHz ~ 1GHz



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



TEST PROCEDURE

1. The EUT was placed on the top of a rotating table 0.8 and 1.5 meters above the ground. The table was rotated 360 degrees to determine the position of the highest radiation.
2. While measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. While measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna.
3. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
4. 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 table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Remark:

1. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.*
2. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.*
3. *The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.*

TEST RESULTS

Below 1 GHz (9kHz ~ 30MHz)

No emission found between lowest internal used/generated frequency to 30MHz.

Below 1 GHz (30MHz ~ 1GHz)

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/12
Test Mode	Mode 1	Temp. & Humidity	25°C, 50%

966Chamber_C at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
83.35	39.89	-10.67	29.22	40.00	-10.78	122	200	Peak
250.19	41.30	-5.40	35.90	46.00	-10.10	250	100	Peak
375.32	43.74	-3.04	40.70	46.00	-5.30	207	200	Peak
625.58	41.04	1.05	42.09	46.00	-3.91	128	200	Peak
675.05	31.90	1.40	33.30	46.00	-12.70	130	100	Peak
750.71	35.98	2.38	38.36	46.00	-7.64	197	100	Peak
875.84	39.56	2.79	42.35	46.00	-3.65	166	100	Peak

966Chamber_C at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
55.22	43.65	-11.36	32.29	40.00	-7.71	319	100	Peak
250.19	38.59	-5.40	33.19	46.00	-12.81	183	200	Peak
375.32	44.85	-3.04	41.81	46.00	-4.19	165	200	Peak
511.12	34.79	-0.20	34.59	46.00	-11.41	315	100	Peak
625.58	38.95	1.05	40.00	46.00	-6.00	94	100	Peak
750.71	33.50	2.38	35.88	46.00	-10.12	325	100	Peak
875.84	37.55	2.79	40.34	46.00	-5.66	315	100	Peak

Remark:

1. *Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit.*
2. *Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Loss (dB) – PreAmp.Gain (dB)*
3. *Result (dBuV/m) = Reading (dBuV) + Correction Factor (dB/m)*
4. *Margin (dB) = Remark result (dBuV/m) - Quasi-peak limit (dBuV/m).*

Above 1 GHz

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/11 2017/10/12
Test Mode	GFSK TX / CH Low	Temp. & Humidity	25°C, 50%

966Chamber_C at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	51.42	-6.49	44.93	74.00	-29.07	346	200	Peak
1874.00	55.93	-5.67	50.26	74.00	-23.74	44	200	Peak
4815.00	41.52	2.74	44.26	74.00	-29.74	61	100	Peak
5484.00	42.43	3.92	46.35	74.00	-27.65	231	200	Peak
6396.00	40.10	8.31	48.41	74.00	-25.59	182	100	Peak
7728.00	40.80	9.88	50.68	74.00	-23.32	126	100	Peak
8544.00	40.58	11.40	51.98	74.00	-22.02	99	200	Peak

966Chamber_C at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	53.36	-6.49	46.87	74.00	-27.13	329	200	Peak
1876.00	57.59	-5.67	51.92	74.00	-22.08	345	200	Peak
4923.00	41.67	3.02	44.69	74.00	-29.31	3	100	Peak
5916.00	41.62	5.41	47.03	74.00	-26.97	343	100	Peak
6468.00	39.69	8.23	47.92	74.00	-26.08	353	200	Peak
7572.00	41.55	9.90	51.45	74.00	-22.55	339	200	Peak
8508.00	40.33	11.36	51.69	74.00	-22.31	122	200	Peak

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Average test would be performed if the peak result were greater than the average limit.*
3. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
4. *Result = Reading + Correction Factor*
   Margin = Result – Limit
   Remark Peak = Result(PK) – Limit(PK)
   Remark AVG = Result(AV) – Limit(AV)

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/11 2017/10/12
Test Mode	GFSK TX / CH Middle	Temp. & Humidity	25°C, 50%

966Chamber_C at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	52.20	-6.49	45.71	74.00	-28.29	353	200	Peak
1876.00	54.93	-5.67	49.26	74.00	-24.74	39	200	Peak
5085.00	41.87	3.34	45.21	74.00	-28.79	117	100	Peak
5907.00	40.47	5.38	45.85	74.00	-28.15	302	200	Peak
6348.00	39.30	8.36	47.66	74.00	-26.34	180	100	Peak
7704.00	41.24	9.88	51.12	74.00	-22.88	18	200	Peak
8400.00	40.89	11.05	51.94	74.00	-22.06	88	100	Peak

966Chamber_C at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	52.62	-6.49	46.13	74.00	-27.87	336	200	Peak
1874.00	57.76	-5.67	52.09	74.00	-21.91	342	200	Peak
5136.00	41.77	3.42	45.19	74.00	-28.81	359	200	Peak
5898.00	41.46	5.35	46.81	74.00	-27.19	211	100	Peak
6432.00	39.55	8.27	47.82	74.00	-26.18	257	200	Peak
7752.00	41.23	9.87	51.10	74.00	-22.90	5	100	Peak
8592.00	40.43	11.46	51.89	74.00	-22.11	197	200	Peak

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Average test would be performed if the peak result were greater than the average limit.*
3. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
4. *Result = Reading + Correction Factor*
   Margin = Result – Limit
   Remark Peak = Result(PK) – Limit(PK)
   Remark AVG = Result(AV) – Limit(AV)

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/11 2017/10/12
Test Mode	GFSK TX / CH High	Temp. & Humidity	25°C, 50%

966Chamber_C at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	52.13	-6.49	45.64	74.00	-28.36	0	200	Peak
1874.00	55.56	-5.67	49.89	74.00	-24.11	41	200	Peak
5280.00	41.43	3.62	45.05	74.00	-28.95	150	200	Peak
5880.00	40.89	5.29	46.18	74.00	-27.82	261	100	Peak
6480.00	39.38	8.22	47.60	74.00	-26.40	235	100	Peak
7728.00	41.03	9.88	50.91	74.00	-23.09	255	200	Peak
8544.00	40.83	11.40	52.23	74.00	-21.77	347	200	Peak

966Chamber_C at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	52.65	-6.49	46.16	74.00	-27.84	330	200	Peak
1876.00	57.70	-5.67	52.03	74.00	-21.97	339	200	Peak
5052.00	41.73	3.29	45.02	74.00	-28.98	156	100	Peak
5565.00	41.76	4.17	45.93	74.00	-28.07	324	100	Peak
6312.00	39.86	8.39	48.25	74.00	-25.75	355	200	Peak
7632.00	41.10	9.89	50.99	74.00	-23.01	273	100	Peak
8580.00	40.89	11.45	52.34	74.00	-21.66	241	100	Peak

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Average test would be performed if the peak result were greater than the average limit.*
3. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
4. *Result = Reading + Correction Factor*
   Margin = Result – Limit
   Remark Peak = Result(PK) – Limit(PK)
   Remark AVG = Result(AV) – Limit(AV)

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/11 2017/10/12
Test Mode	8-DPSK TX / CH Low	Temp. & Humidity	25°C, 50%

966Chamber_C at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	51.24	-6.49	44.75	74.00	-29.25	0	200	Peak
1876.00	55.97	-5.67	50.30	74.00	-23.70	43	200	Peak
4740.00	42.12	2.55	44.67	74.00	-29.33	37	200	Peak
5877.00	41.64	5.27	46.91	74.00	-27.09	222	200	Peak
6312.00	39.26	8.39	47.65	74.00	-26.35	51	100	Peak
7716.00	40.68	9.88	50.56	74.00	-23.44	259	200	Peak
8676.00	40.71	11.56	52.27	74.00	-21.73	101	200	Peak

966Chamber_C at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	53.64	-6.49	47.15	74.00	-26.85	332	200	Peak
1876.00	58.07	-5.67	52.40	74.00	-21.60	345	200	Peak
5055.00	41.71	3.30	45.01	74.00	-28.99	0	200	Peak
5685.00	41.35	4.59	45.94	74.00	-28.06	236	100	Peak
6384.00	38.46	8.32	46.78	74.00	-27.22	228	100	Peak
7752.00	41.07	9.87	50.94	74.00	-23.06	287	200	Peak
8544.00	40.29	11.40	51.69	74.00	-22.31	67	100	Peak

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Average test would be performed if the peak result were greater than the average limit.*
3. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
4. *Result = Reading + Correction Factor*
   Margin = Result – Limit
   Remark Peak = Result(PK) – Limit(PK)
   Remark AVG = Result(AV) – Limit(AV)

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/11 2017/10/12
Test Mode	8-DPSK TX / CH Middle	Temp. & Humidity	25°C, 50%

966Chamber_C at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	51.74	-6.49	45.25	74.00	-28.75	10	200	Peak
1874.00	55.43	-5.67	49.76	74.00	-24.24	42	200	Peak
5385.00	42.12	3.77	45.89	74.00	-28.11	319	100	Peak
5838.00	42.47	5.14	47.61	74.00	-26.39	46	200	Peak
6144.00	39.16	8.56	47.72	74.00	-26.28	0	200	Peak
7644.00	40.58	9.89	50.47	74.00	-23.53	211	200	Peak
8676.00	40.77	11.56	52.33	74.00	-21.67	300	200	Peak

966Chamber_C at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	52.79	-6.49	46.30	74.00	-27.70	329	200	Peak
1876.00	57.71	-5.67	52.04	74.00	-21.96	340	200	Peak
4980.00	41.86	3.17	45.03	74.00	-28.97	21	200	Peak
5985.00	40.57	5.66	46.23	74.00	-27.77	86	200	Peak
6228.00	39.80	8.48	48.28	74.00	-25.72	0	100	Peak
7728.00	40.53	9.88	50.41	74.00	-23.59	172	200	Peak
8520.00	41.00	11.37	52.37	74.00	-21.63	291	200	Peak

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Average test would be performed if the peak result were greater than the average limit.*
3. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
4. *Result = Reading + Correction Factor*
   Margin = Result – Limit
   Remark Peak = Result(PK) – Limit(PK)
   Remark AVG = Result(AV) – Limit(AV)

Product Name	IP Phone	Test By	Rex Chiu
Test Model	OBi2182	Test Date	2017/10/11 2017/10/12
Test Mode	8-DPSK TX / CH High	Temp. & Humidity	25°C, 50%

966Chamber_C at 3Meter / Horizontal

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	51.39	-6.49	44.90	74.00	-29.10	0	200	Peak
1876.00	55.47	-5.67	49.80	74.00	-24.20	37	200	Peak
5010.00	41.22	3.23	44.45	74.00	-29.55	183	200	Peak
5940.00	40.90	5.50	46.40	74.00	-27.60	97	200	Peak
6528.00	38.95	8.23	47.18	74.00	-26.82	262	100	Peak
7776.00	41.52	9.87	51.39	74.00	-22.61	138	100	Peak
8556.00	40.34	11.42	51.76	74.00	-22.24	344	100	Peak

966Chamber_C at 3Meter / Vertical

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
1500.00	52.63	-6.49	46.14	74.00	-27.86	319	200	Peak
1874.00	57.46	-5.67	51.79	74.00	-22.21	342	200	Peak
5049.00	41.45	3.29	44.74	74.00	-29.26	37	100	Peak
5952.00	41.31	5.54	46.85	74.00	-27.15	166	100	Peak
6372.00	38.81	8.33	47.14	74.00	-26.86	22	100	Peak
7740.00	41.84	9.88	51.72	74.00	-22.28	215	200	Peak
8508.00	40.91	11.36	52.27	74.00	-21.73	16	200	Peak

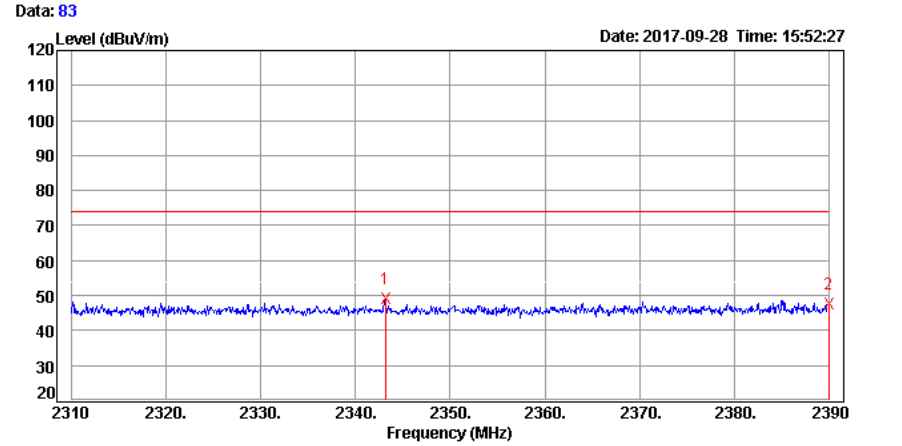
Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Average test would be performed if the peak result were greater than the average limit.*
3. *Measurements above show only up to 6 maximum emissions noted, or would be lesser, with " N/A " remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
4. *Result = Reading + Correction Factor*
   Margin = Result – Limit
   Remark Peak = Result(PK) – Limit(PK)
   Remark AVG = Result(AV) – Limit(AV)

Restricted Band Edges

Detector Mode: Peak **Polarity: Horizontal**

CH Low / GFSK



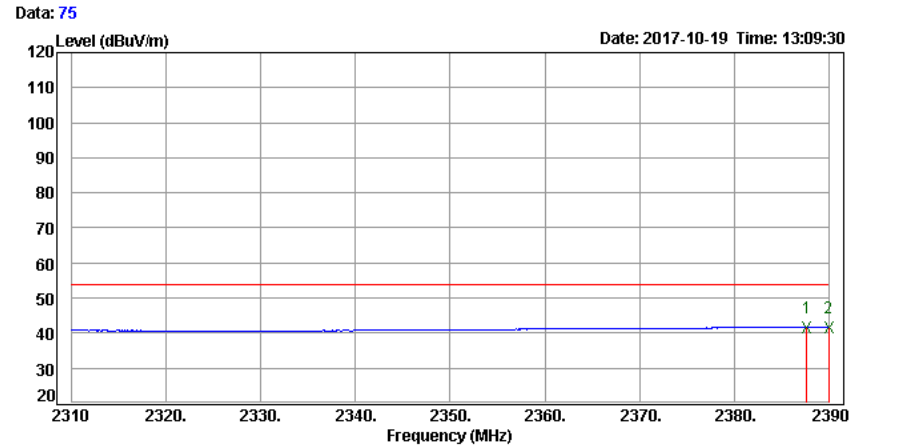
Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2343.12	53.38	-4.12	49.26	74.00	-24.74			Peak
2390.00	51.36	-3.95	47.41	74.00	-26.59			Peak

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(PK)

Detector Mode: Average **Polarity: Horizontal**

CH Low / GFSK

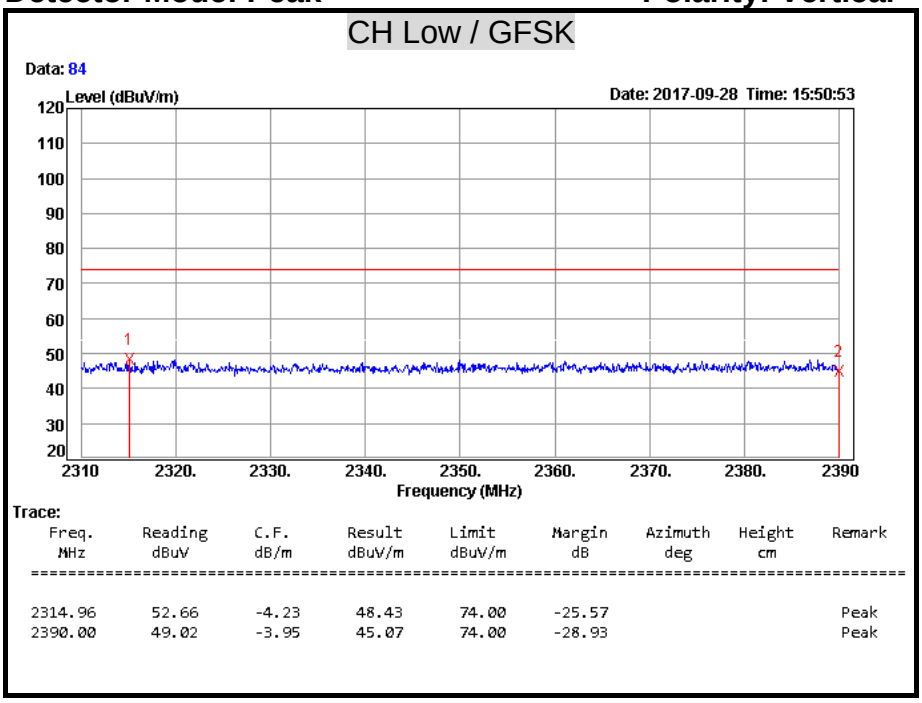


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2387.68	45.61	-3.96	41.65	54.00	-12.35			Average
2390.00	45.54	-3.95	41.59	54.00	-12.41			Average

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark AVG = Result(AV) – Limit(AV)

Detector Mode: Peak **Polarity: Vertical**

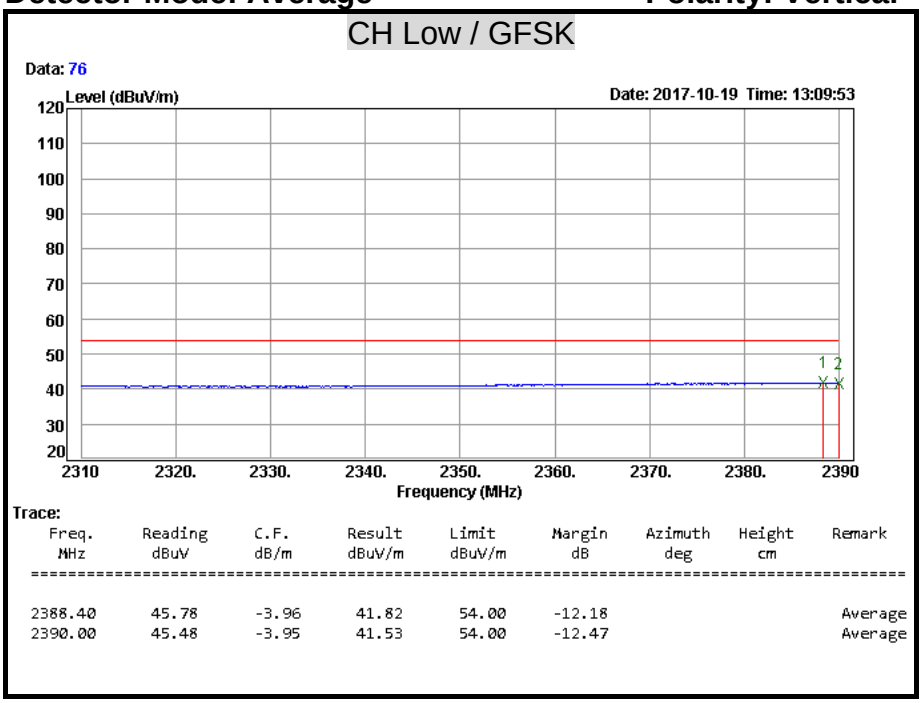


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2314.96	52.66	-4.23	48.43	74.00	-25.57			Peak
2390.00	49.02	-3.95	45.07	74.00	-28.93			Peak

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(PK)

Detector Mode: Average **Polarity: Vertical**

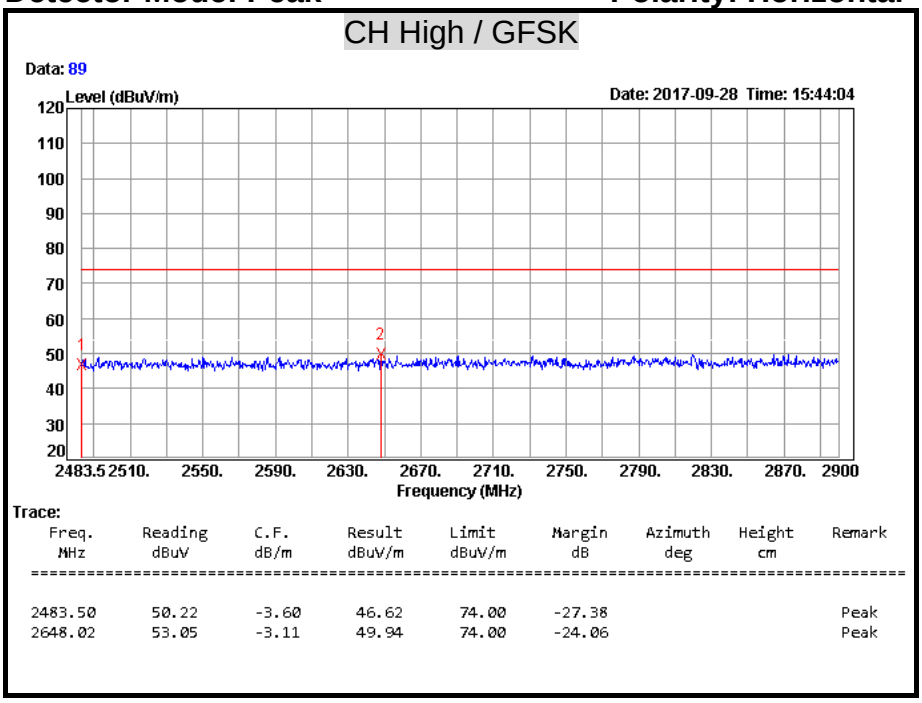


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2388.40	45.78	-3.96	41.82	54.00	-12.18			Average
2390.00	45.48	-3.95	41.53	54.00	-12.47			Average

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark AVG = Result(AV) – Limit(AV)

Detector Mode: Peak **Polarity: Horizontal**

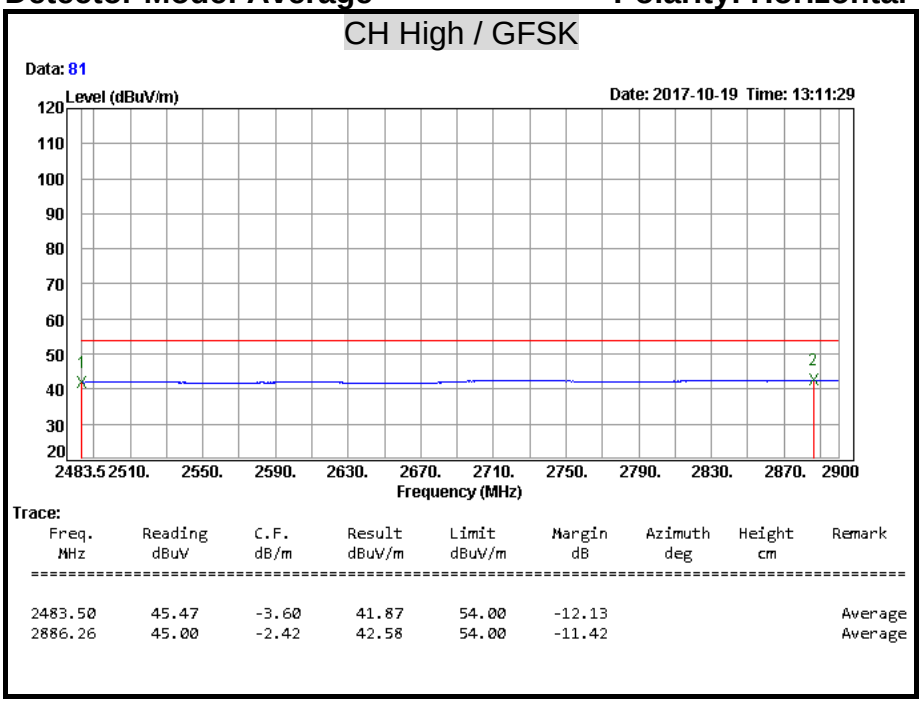


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2483.50	50.22	-3.60	46.62	74.00	-27.38			Peak
2648.02	53.05	-3.11	49.94	74.00	-24.06			Peak

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(PK)

Detector Mode: Average **Polarity: Horizontal**

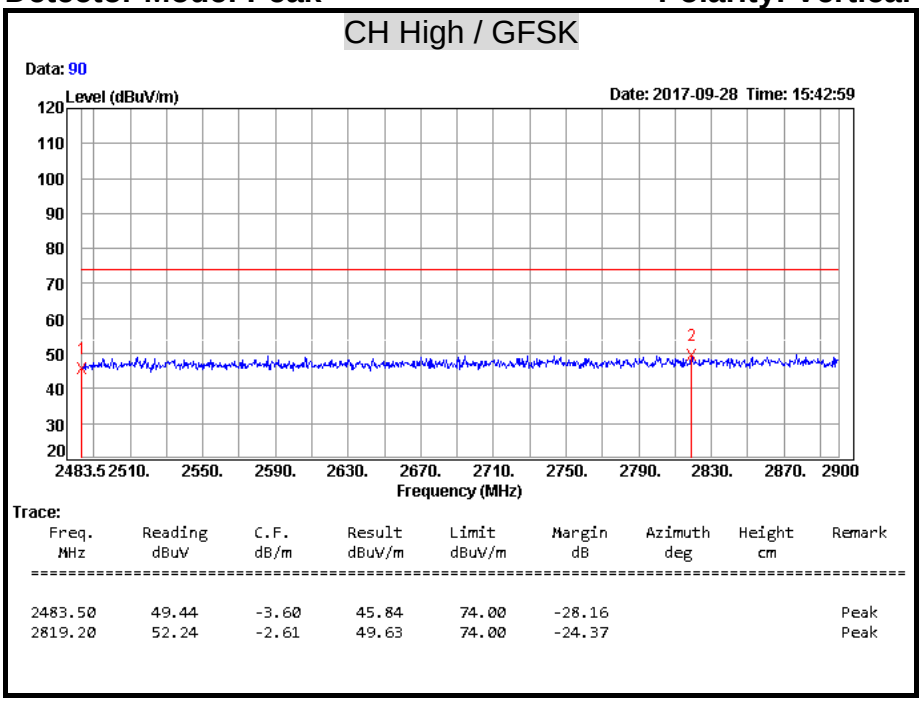


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2483.50	45.47	-3.60	41.87	54.00	-12.13			Average
2886.26	45.00	-2.42	42.58	54.00	-11.42			Average

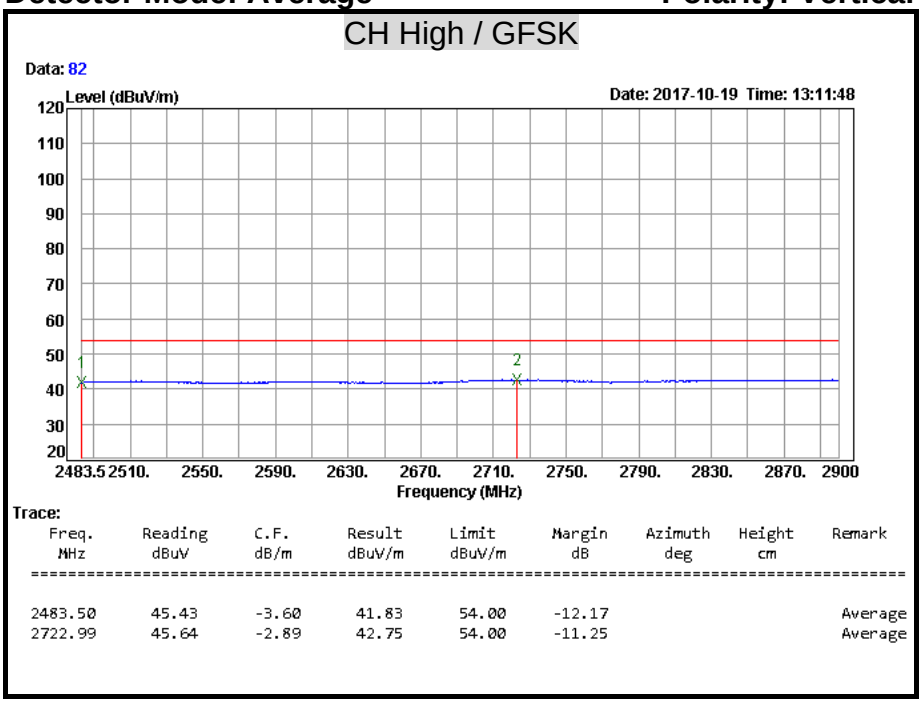
Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark AVG = Result(AV) – Limit(AV)

Detector Mode: Peak **Polarity: Vertical**



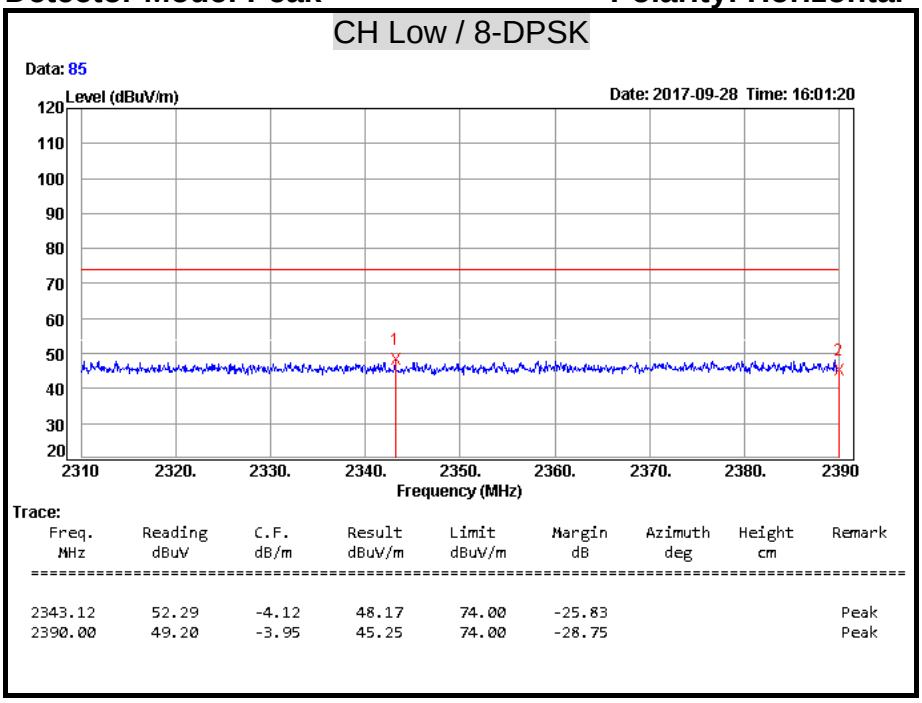
Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(PK)

Detector Mode: Average **Polarity: Vertical**



Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark AVG = Result(AV) – Limit(AV)

Detector Mode: Peak **Polarity: Horizontal**

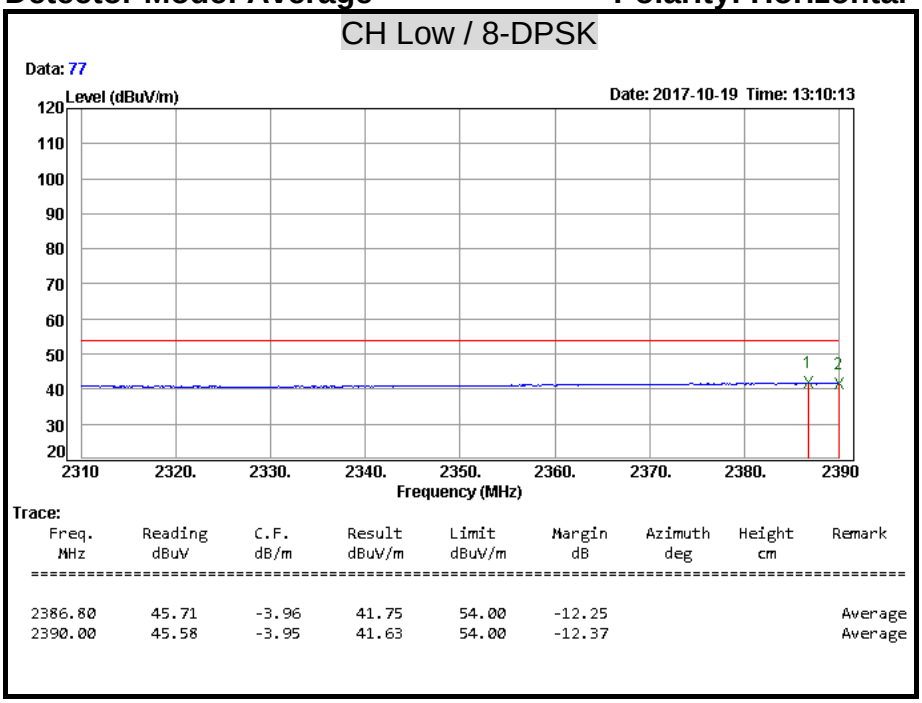


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2343.12	52.29	-4.12	48.17	74.00	-25.83			Peak
2390.00	49.20	-3.95	45.25	74.00	-28.75			Peak

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(PK)

Detector Mode: Average **Polarity: Horizontal**

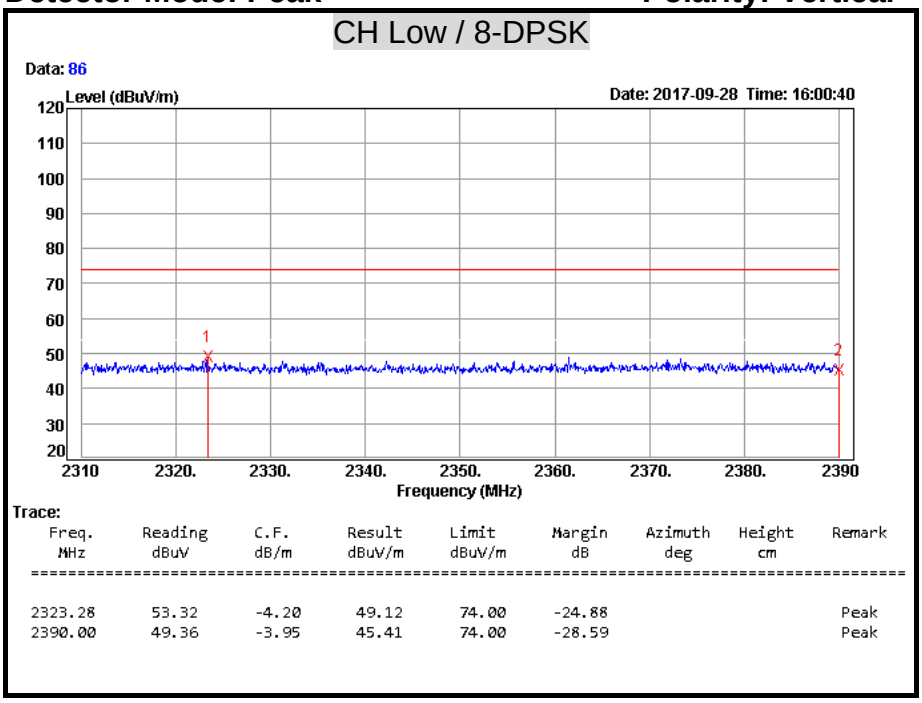


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2386.80	45.71	-3.96	41.75	54.00	-12.25			Average
2390.00	45.58	-3.95	41.63	54.00	-12.37			Average

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark AVG = Result(AV) – Limit(AV)

Detector Mode: Peak **Polarity: Vertical**

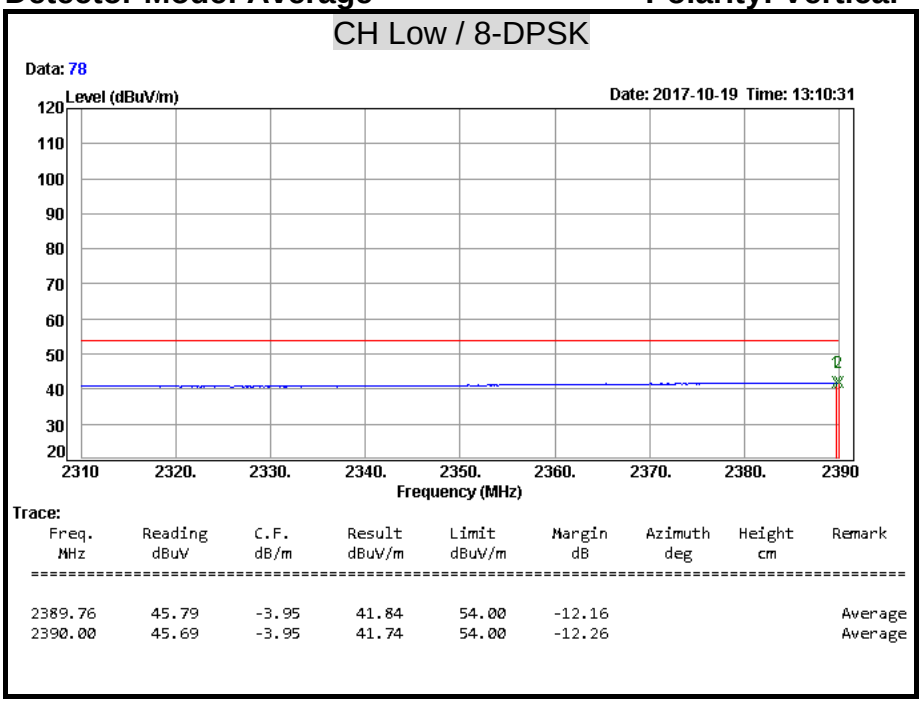


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2323.28	53.32	-4.20	49.12	74.00	-24.88			Peak
2390.00	49.36	-3.95	45.41	74.00	-28.59			Peak

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(PK)

Detector Mode: Average **Polarity: Vertical**

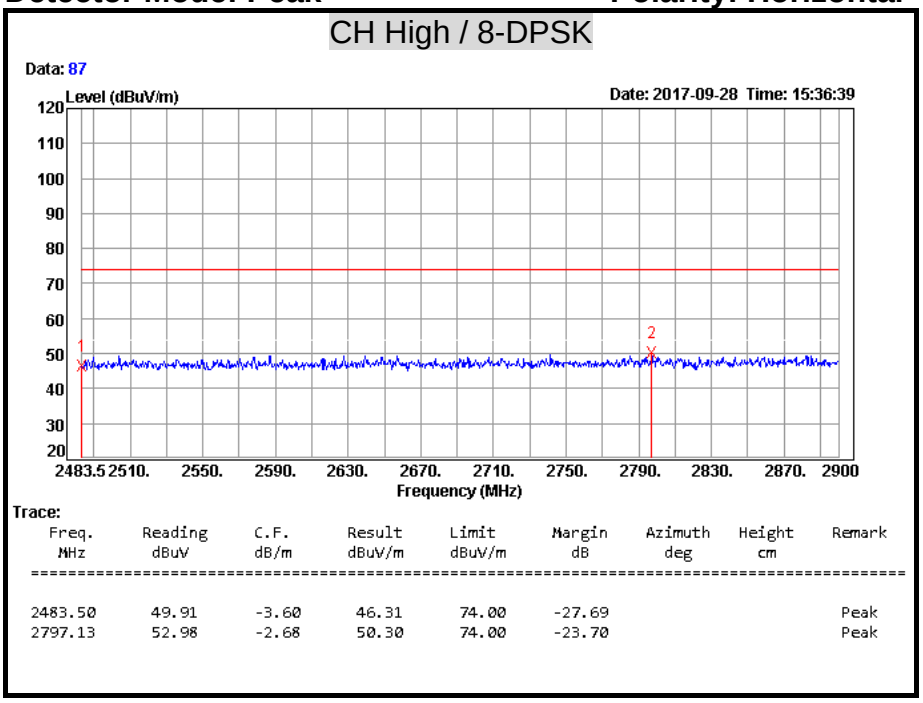


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2389.76	45.79	-3.95	41.84	54.00	-12.16			Average
2390.00	45.69	-3.95	41.74	54.00	-12.26			Average

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark AVG = Result(AV) – Limit(AV)

Detector Mode: Peak **Polarity: Horizontal**

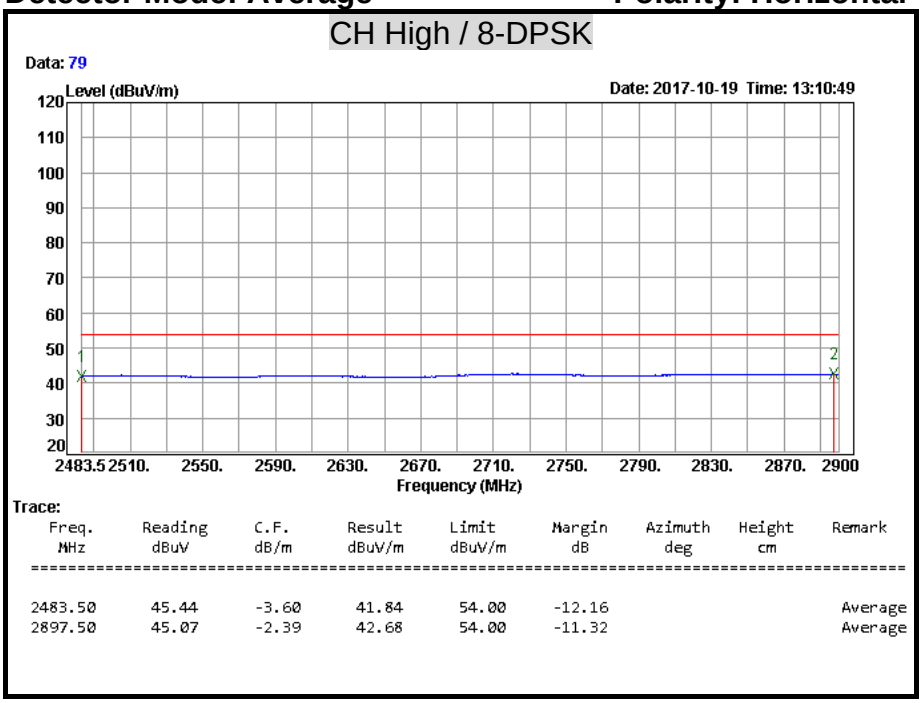


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2483.50	49.91	-3.60	46.31	74.00	-27.69			Peak
2797.13	52.98	-2.68	50.30	74.00	-23.70			Peak

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(PK)

Detector Mode: Average **Polarity: Horizontal**

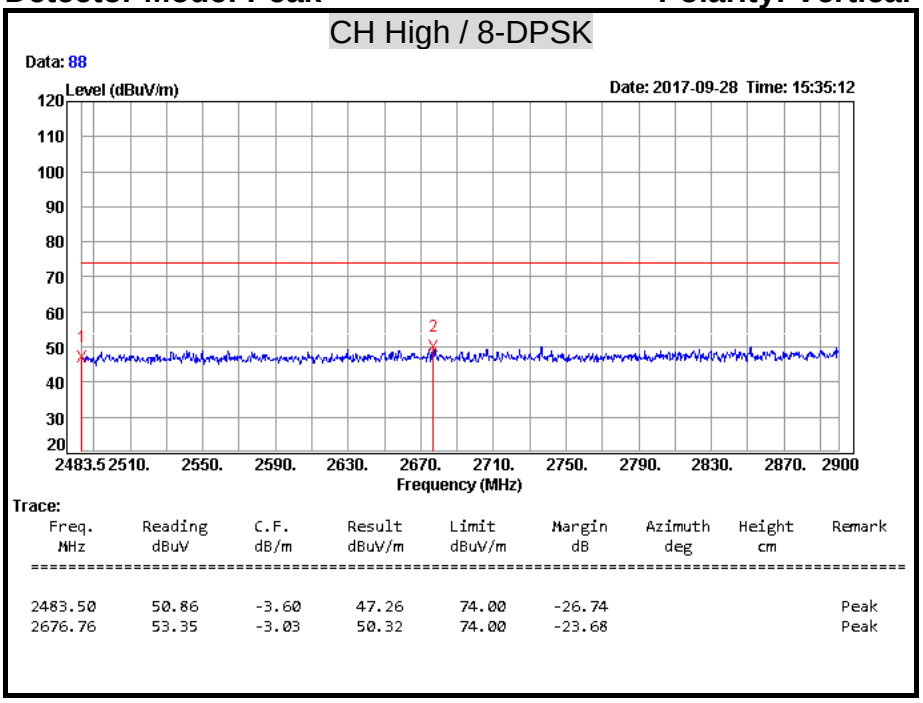


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2483.50	45.44	-3.60	41.84	54.00	-12.16			Average
2897.50	45.07	-2.39	42.68	54.00	-11.32			Average

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark AVG = Result(AV) – Limit(AV)

Detector Mode: Peak **Polarity: Vertical**

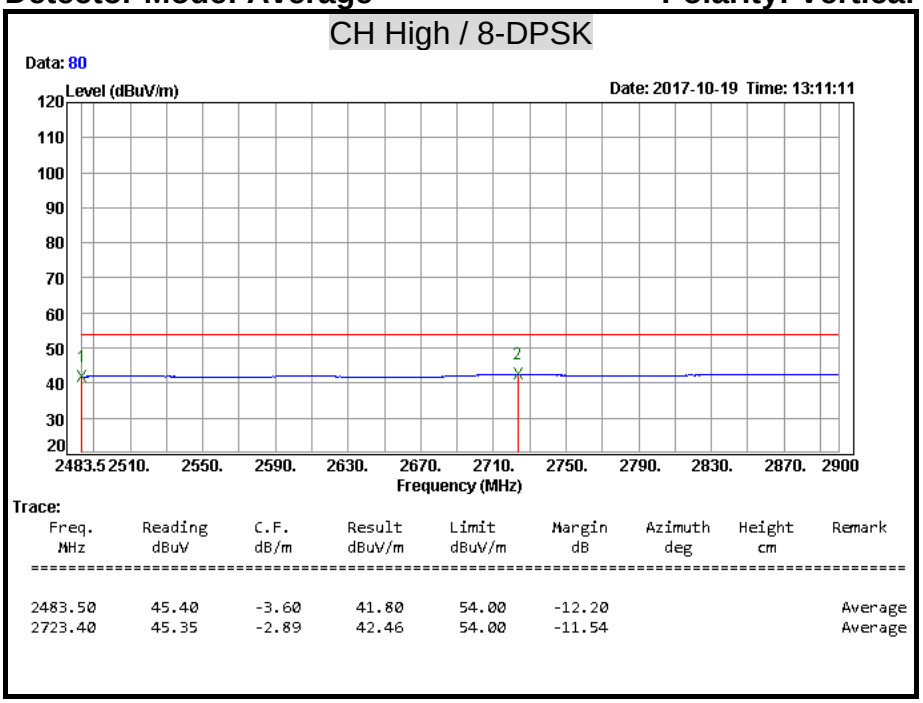


Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2483.50	50.86	-3.60	47.26	74.00	-26.74			Peak
2676.76	53.35	-3.03	50.32	74.00	-23.68			Peak

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark Peak = Result(PK) – Limit(PK)

Detector Mode: Average **Polarity: Vertical**



Trace:

Freq. MHz	Reading dBuV	C.F. dB/m	Result dBuV/m	Limit dBuV/m	Margin dB	Azimuth deg	Height cm	Remark
2483.50	45.40	-3.60	41.80	54.00	-12.20			Average
2723.40	45.35	-2.89	42.46	54.00	-11.54			Average

Remark: *Result = Reading + Correction Factor*
Margin = Result – Limit
Remark AVG = Result(AV) – Limit(AV)

7.9 CONDUCTED EMISSION

LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) 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 limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

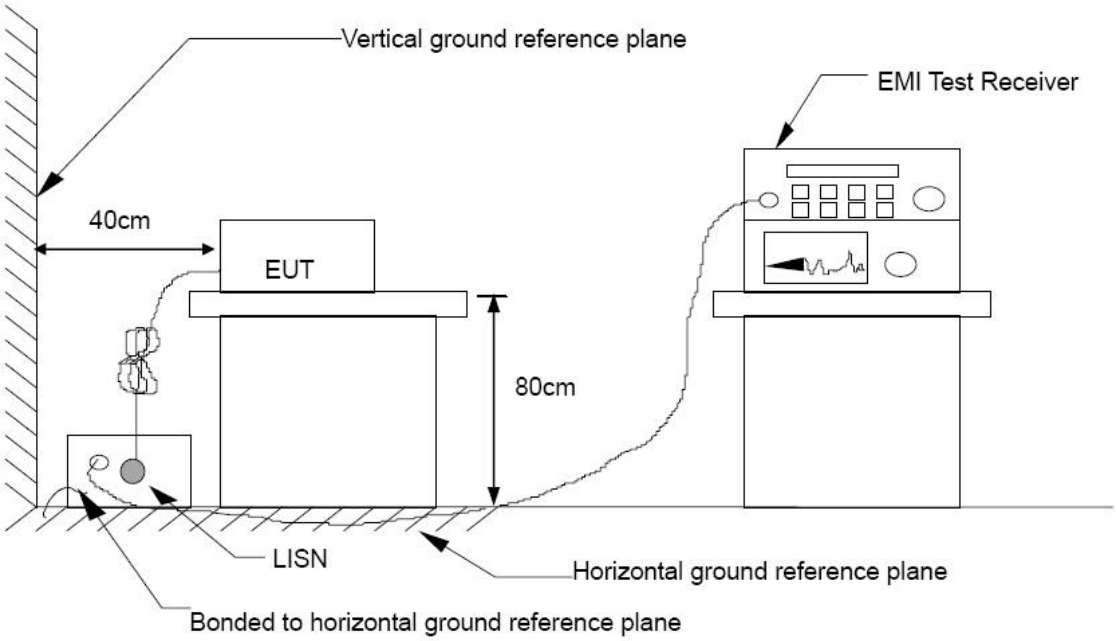
Frequency Range (MHz)	Conducted Limit (dBμv)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5.00	56	46
5.00 - 30.0	60	50

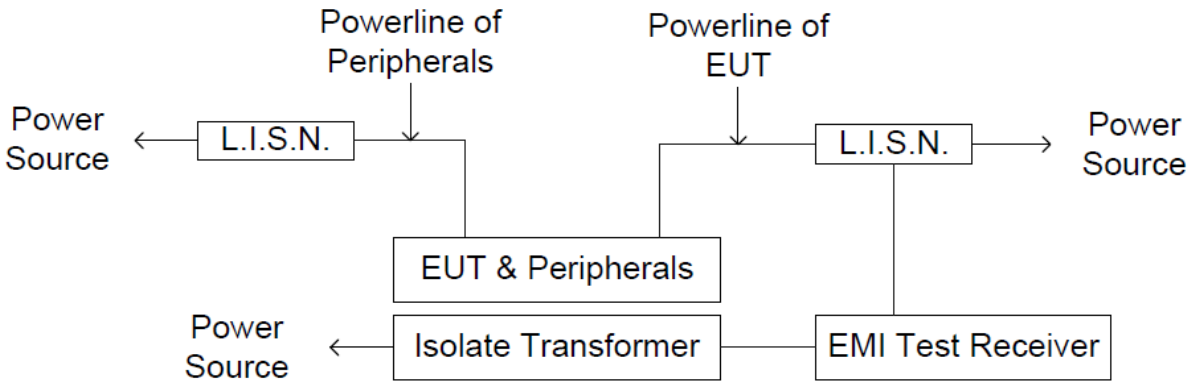
TEST EQUIPMENT

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N	Schwarzbeck	NSLK 8127	8127465	08/14/2018
L.I.S.N	Schwarzbeck	NSLK 8127	8127473	03/12/2018
EMI Test Receiver	Rohde & Schwarz	ESHS 30	838550/003	10/25/2017
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100111	06/26/2018
Test S/W	E3.815206a			

Remark: *Each piece of equipment is scheduled for calibration once a year.*

TEST SETUP





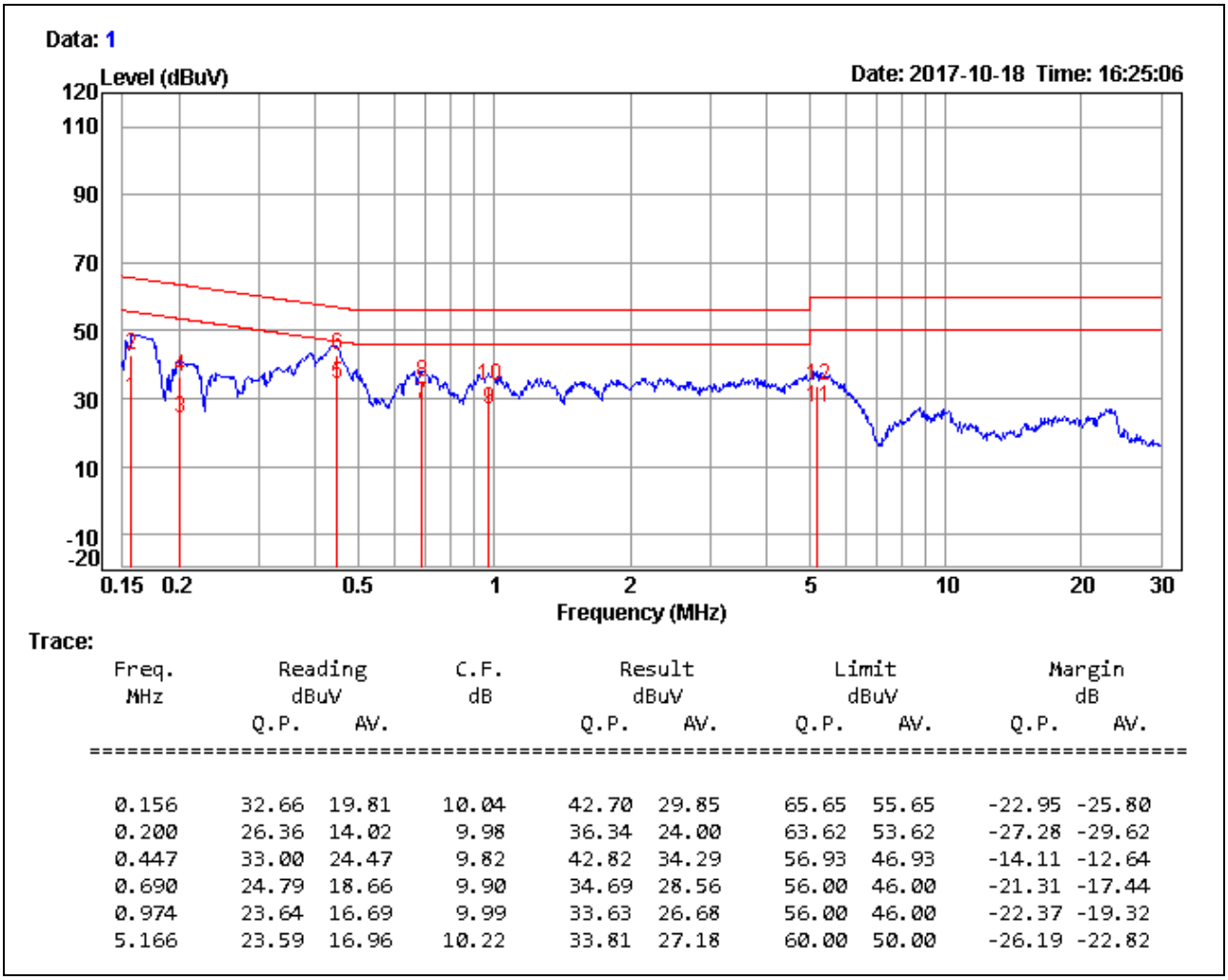
TEST PROCEDURE

The basic test procedure was in accordance with ANSI C63.10:2013.
The test procedure is performed in a 4m × 3m × 2.4m (L×W×H) shielded room.
The EUT along with its peripherals were placed on a 1.0m (W) × 1.5m (L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN is 0.8 m. Where a mains flexible cord was provided by the manufacturer shall be 1 m long, or if in excess of 1 m, the excess cable was folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

TEST RESULTS

Product Name	IP Phone	Test By	Waternil Guan
Test Model	OBi2182	Test Date	2017/10/18
Test Mode	Mode 1	Temp. & Humidity	28.9°C, 52%

LINE



Trace:

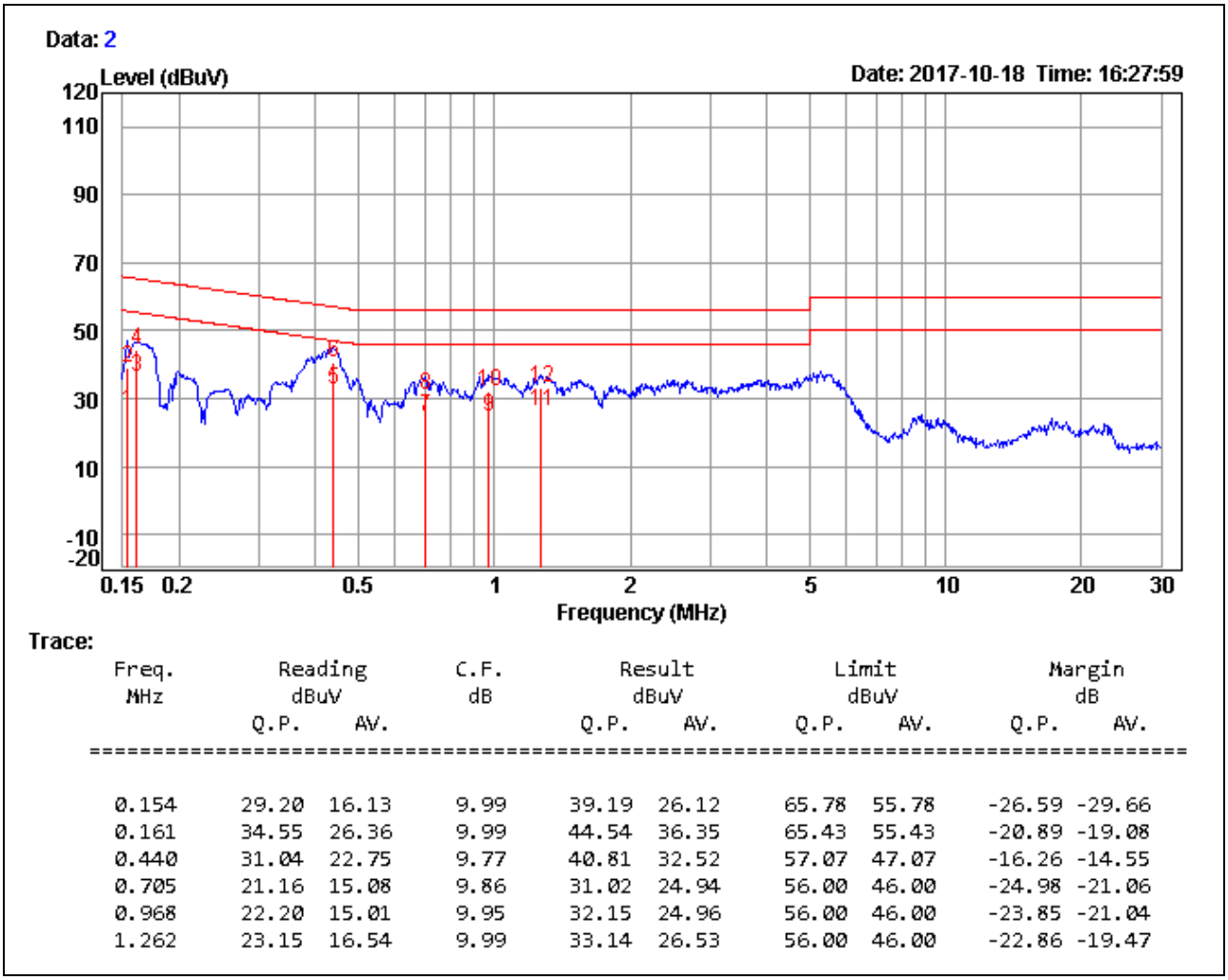
Freq. MHz	Reading dBuV Q.P.	Reading dBuV AV.	C.F. dB	Result dBuV Q.P.	Result dBuV AV.	Limit dBuV Q.P.	Limit dBuV AV.	Margin dB Q.P.	Margin dB AV.
0.156	32.66	19.81	10.04	42.70	29.85	65.65	55.65	-22.95	-25.80
0.200	26.36	14.02	9.98	36.34	24.00	63.62	53.62	-27.28	-29.62
0.447	33.00	24.47	9.82	42.82	34.29	56.93	46.93	-14.11	-12.64
0.690	24.79	18.66	9.90	34.69	28.56	56.00	46.00	-21.31	-17.44
0.974	23.64	16.69	9.99	33.63	26.68	56.00	46.00	-22.37	-19.32
5.166	23.59	16.96	10.22	33.81	27.18	60.00	50.00	-26.19	-22.82

Remark:

1. *Correction Factor = Insertion loss + Cable loss*
2. *Emission level = Reading Value + Correction factor*
3. *Margin value = Emission level – Limit value*

Product Name	IP Phone	Test By	Waternil Guan
Test Model	OBi2182	Test Date	2017/10/18
Test Mode	Mode 1	Temp. & Humidity	28.9°C, 52%

NEUTRAL



Trace:

Freq. MHz	Reading dBuV Q.P.	Reading dBuV AV.	C.F. dB	Result dBuV Q.P.	Result dBuV AV.	Limit dBuV Q.P.	Limit dBuV AV.	Margin dB Q.P.	Margin dB AV.
0.154	29.20	16.13	9.99	39.19	26.12	65.78	55.78	-26.59	-29.66
0.161	34.55	26.36	9.99	44.54	36.35	65.43	55.43	-20.89	-19.08
0.440	31.04	22.75	9.77	40.81	32.52	57.07	47.07	-16.26	-14.55
0.705	21.16	15.08	9.86	31.02	24.94	56.00	46.00	-24.98	-21.06
0.968	22.20	15.01	9.95	32.15	24.96	56.00	46.00	-23.85	-21.04
1.262	23.15	16.54	9.99	33.14	26.53	56.00	46.00	-22.86	-19.47

Remark:

1. *Correction Factor = Insertion loss + Cable loss*
2. *Emission level = Reading Value + Correction factor*
3. *Margin value = Emission level – Limit value*