



FCC / IC Test Report

FOR:

Philips Dream Station

**Continuous Airway Pressure Device with Bluetooth Radio (LE)
in combination with
Dream Station Wi-Fi Accessory**

FCC ID: THO1116426

IC ID: 3234B-1116426, Model: 1116426

co-location with

AzureWave Technologies Wi-Fi module FCC ID: TLZ-CU288

47 CFR Part 15.247

RSS-210 Issue 8 & RSS-Gen Issue 4

TEST REPORT #: EMC_PHIL4-00-14001_15.247_BT_LE_WLAN_Module

DATE: 2015-06-17



**FCC listed
A2LA Accredited**

**IC recognized #
3462B**

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1 Assessment

Compliance of the combination of the below listed devices (i.e. of the co-location of the modular transmitters contained in those devices, respectively) was evaluated against the applicable criteria specified in FCC rules Parts 15.247 (with 15.205/15.209) of Title 47 of the Code of Federal Regulations and the relevant IC standard RSS-210 issue 8, Annex 8 (and RSS-GEN issue 4).
No deviations were ascertained.

Company	Description	Model #
Philips Respironics Inc.	Continuous Airway Pressure Device with Bluetooth modular radio (LE)	700x110 (US) 700x120 (Canada)
Philips Respironics Inc.	Wi-Fi Accessory with Wi-Fi modular radio	100700W (US) 100710W (Canada)

Responsible for Testing Laboratory:

Franz Engert			
2015-06-17	Compliance	(Compliance Manager)	
Date	Section	Name	Signature

Responsible for the Report:

Danh Le			
2015-06-17	Compliance	(EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.

CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the Test Report

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Compliance Manager:	Franz Engert
Responsible Project Leader:	Yu-Chien Ho

2.2 Identification of the Client

Client Firm/Name:	Philips Respironics Inc.
Street Address:	1740 Golden Mile Highway
City/Zip Code	Monroeville, PA 15146
Country	USA
Contact Person:	Jonathan Kurtz
Phone No.	724-387-7578
e-mail:	Jonathan.Kurtz@Philips.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Respironics Inc. (Philips Respironics)
Manufacturers Address:	1001 Murry Ridge Lane
City/Zip Code	Murrysville, PA 15668
Country	USA

3 Equipment under Test (EUT)

3.1 Specification of the Equipment under Test

Marketing Name / Model No:	CPAP Device: 700x110 (US) & 700x120 (Canada) WLAN Radio: 100700W (US) & 100710W (Canada)
HW Version :	00
FCC-ID :	THO1116426
IC-ID:	3234B-1116426 / M/N: 1116426
Product Description:	Bluetooth modular radio transmitter (BDR/EDR and LE) incorporated in the Continuous Airway Pressure Device (Philips Dream Station); Note: subject to this test / test report is the co-location of the LE (low energy) function of Bluetooth modular radio located on the mother board of the host device (the Philips Dream Station) with the Wi-Fi modular transmitter with FCC ID: TLZ-CU288 as incorporated in the Dream Station Wi-Fi Accessory (plugged in to the Dream Station);
Frequency Range / number of channels:	Bluetooth LE: Nominal band: 2400 – 2483.5; Center to center: 2402 (Ch.0) – 2480 (Ch.39), 40 channels WLAN 802.11b/g/n: Nominal band: 2400 – 2483.5; Ch. 1, 2412 MHz to Ch. 13, 2462 MHz, 11 channels.
Type(s) of Modulation:	Bluetooth: GFSK Wi-Fi: IEEE 802.11 b/g/n: CCK, BPSK, QPSK, 16QAM, 64QAM
Antenna Information as declared:	Bluetooth: internal, 1.5 dBi Wi-Fi: internal, 3.17 dBi
Max. Output Powers:	Bluetooth: 6.34 dBm, peak, conducted Wi-Fi: 22.5 dBm, pk, conducted
Power Supply/ Rated Operating Voltage Range:	host (Dream Station): AC/DC Adapter; Input:100-240V~50-60 Hz, 2.0-1.0 A; Output: 12 V, 6.67 A; the Bluetooth chip is supplied by 3.3V acc. to documentation;
operating temperature range	5- 35°C (acc. host manual)
Prototype / Production unit	Production
Other Radios included in the device:	none (the Bluetooth BDR/EDR function is part of the functional scope of the Bluetooth radio)

3.2 Identification of the Equipment Under Test (EUT)

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	JPP251765ADA8	00	B0.0.0.2061	Radiated Sample
2	SK721888	0	0	Radiated Sample

3.3 Identification of Accessory equipment

AE #	Type	Manufacturer	Model	Serial Number
1	Humidifier	Philips Respironics Inc.	DSXH	HPP10019330E7
2	AC/DC Adapter	Delta Electronics Inc.	MDS-080AAS12 A	70HW512001W

3.4 Environmental conditions during Test:

The following environmental conditions were maintained during the course of testing:
Ambient Temperature: 20-25°C
Relative humidity: 40-60%

3.5 Dates of Testing:

2015/03/09 – 2015/03/23

3.6 Testing Notes:

The EUT was set to the required test modes (channel, etc) by special test SW (EZRasp Communicator) which will not be available to end-users in production samples.

3.7 Test mode of operation with multiple modulations:

Mode	Data rate (Mbps)	Modulation scheme
Bluetooth LE	1.0	GFSK

4 Subject of Investigation

The objective of the evaluation documented in this report was to establish compliance of the EUT as described in section 3 with the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-210 Issue 8, Annex 8 of Industry Canada.

This test report is to support a request for new equipment authorization (limited single modular acc. to Part 15.212) under the **FCC ID THO1116426 and the IC certification number 3234B-1116426 / model no. 1116426.**

Specific subject to this test / test report is the co-location of the LE (low energy) function of Bluetooth modular radio located on the mother board of the host device (the Philips Dream Station) with the Wi-Fi modular transmitter with FCC ID: TLZ-CU288 as incorporated in the Dream Station Wi-Fi Accessory (plugged in to the Dream Station);

All testing was performed on the product referred to in Section 3 as EUT.

Testing procedures are based on FCC KDB558074 D01, 2014-06-05, “Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247” and ANSI C63.10:2013 for DTS systems.

The tests were performed with the EUT transmitter sets to low, mid and high channels where required. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

5 Summary of Measurement Results

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	Fail	NA	NP	Result
§15.247(e) RSS-210 A8.2(b)	Power Spectral Density	Nominal	-	☐	☐	☐	■	Complies
§15.247(a)(1) RSS-210 A8.2(a)	Emission Bandwidth	Nominal	-	☐	☐	☐	■	Complies
§15.247(b)(1) RSS-210 A8.4(4)	Maximum Conducted Output Power and EIRP	Nominal	-	☐	☐	☐	■	Complies
§15.247(d) RSS-210 A8.5	Band edge & Restricted Band Edge compliance	Nominal	-	☐	☐	☐	■	Complies
§15.247(d) §15.209 RSS-210 A8.5 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	BT LE Tx	■	☐	☐	☐	Complies
§15.207(a) RSS-Gen 8.8	AC Conducted Emissions	Nominal	-	☐	☐	☐	■	Complies

NA= Not Applicable; NP= Not Performed.

Note 1: not deemed necessary for co-location compliance verification.

6 Measurements

6.1 Radiated Measurement Procedure

Ref: ANSI C63.10 (2013)

Section 5.4: Measurements around the EUT

Measurements shall be made at a test site that incorporates a turntable allowing EUT rotation of 0° through 360°, except where the EUT is so large that a suitable turntable is not readily available. A remotely controlled turntable shall be installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. Continuous azimuth searches shall be made. The maximum field strength at the frequency being measured shall be reported in the test report.³² See ANSI C63.4 for details of the test site, turntable, and antenna positioner. Where a continuous azimuth search cannot be made, as is the case for example where the EUT is so large that a suitable turntable is not readily available, frequency scans of the EUT field strength with both polarizations of the measuring antenna shall be made, starting with a minimum of 16 azimuth angles around the EUT, nominally spaced by 22.5°, in characterizing the EUT radio-noise profile. If directional EUT radiation patterns are suspected, especially above 1 GHz then additional and smaller azimuth angles shall be examined.

Section 5.3.2: Test distance for frequencies below 30 MHz

Radiated emissions limits are usually defined at a specific distance from the EUT. Where possible, measurements shall be made at the distance specified in the limits. This might not be possible in all cases, however, due to the physical limitations of the test facility, physical access problems at the required distance (especially for measurements that must be made in situ or on-site), or levels of ambient noise or other radiated signals present at the time and location where measurements are made. See 6.4.3 for more information about antenna selection, location, and test distance. If measurements cannot practically be made at the EUT limit distance, then they may be made at a different distance (usually closer) and extrapolated to the limit distance using one of the procedures described in 6.4.4, 6.4.5, or 7.7, depending on the EUT source and size.³¹ The test report shall specify the extrapolation method used to determine compliance of the EUT.

Section 5.3.3: Test distance for frequencies at or above 30 MHz

Measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment (see 4.3.4). Measurements shall not be performed at a distance greater than 30 m for frequencies above 30 MHz, unless it can be further demonstrated that measurements at a distance of 30 m or less are impractical. Measurements from 18 GHz to 40 GHz are typically made at distances significantly less than 3 m from the EUT. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade of distance (inverse of linear distance for field-strength measurements or inverse of linear distance-squared for power-density measurements).

ANSI C63.10 (2013)

Section 6.6.4.2: Exploratory radiated emissions measurements

Exploratory radiated measurements shall be performed at the measurement distance or at a closer distance than that specified for compliance to determine the emission characteristics of the EUT and, if applicable, the EUT configuration that produces the maximum level of emissions. The frequencies of maximum emission may be determined by manually positioning the antenna close to the EUT, and then moving the antenna over all sides of the EUT while observing a spectral display. It is advantageous to have prior knowledge of the frequencies of emissions, although this may be determined from such a near-field scan. The near-field scan shall only be used to determine the frequency but not the amplitude of the emissions. Where exploratory measurements are not adequate to determine the worst-case operating modes and are used only to identify the frequencies of the highest emissions, additional preliminary tests can be required.

Preliminary tests shall be performed following the procedures in 6.3 on a site meeting the requirements of 5.2. For emissions from the EUT, the maximum level shall be determined by rotating the EUT and its antenna through 0° to 360°. For each mode of operation required to be tested, the frequency spectrum (based on findings from exploratory measurements) shall be monitored.

Section 6.6.4.3: Final radiated emissions measurements

The final measurements are performed on a site meeting the requirements of 5.2. Using the orientation and equipment arrangement of the EUT based on the measurement results found during the preliminary (exploratory) measurements per 6.6.4.2, the EUT arrangement, appropriate modulation, and modes of operation that produce the emissions that have the highest amplitude relative to the limit shall be selected for the final measurement. The final measurement shall follow all the procedures in 6.3 with the EUT operating on frequencies per 5.6. For each mode selected, record the frequency and amplitude of the highest fundamental emission (if applicable), as well as the frequency and amplitude of the six highest spurious emissions relative to the limit. Emissions more than 20 dB below the limit do not need to be reported.

Measurements are performed with the EUT rotated from 0° to 360°; the antenna height scanned in accordance with 6.6.3.1, 6.6.3.2, or 6.6.3.3, as appropriate; and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations. Variations in cable or wire placement shall be explored to maximize the measured emissions.

NOTES

- 1— Where limits are specified by agencies for both average and peak (or quasi-peak) detection, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.
- 2—Use of waveguide and flexible waveguide may be necessary at frequencies above 10 GHz to achieve usable signal-to noise ratios at required measurement distances. If so, it may be necessary to restrict the height search of the antenna, and special care should be taken to ensure that maximum emissions are correctly measured.
- 3—All presently known devices causing emissions above 10 GHz are physically small compared with the beam-widths of typical horn antennas used for EMC measurements. For such EUTs and frequencies, it may be preferable to vary the height and polarization of the EUT instead of the receiving antenna to maximize the measured emissions.

6.2 Sample Calculations for Radiated Measurements

6.2.1 Field Strength Measurements:

Measurements from the Spectrum Analyzer/ Receiver are used to calculate the Field Strength, taking into account the following parameters:

1. Measured reading in dB μ V
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

FS (dB μ V/m) = Measured Value on SA (dB μ V)+ Cable Loss (dB)+ Antenna Factor (dB/m)

Eg:

Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/m)
1000	80.5	3.5	14	98.0

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the above equation.

6.2.2 Measurement Uncertainty

	Uncertainty in dB radiated <30MHz	Uncertainty in dB radiated 30MHz - 1GHz	Uncertainty in dB radiated > 1GHz	Uncertainty in dB Conducted measurement
standard deviation k=1	2.48	1.93	2.16	0.63
95% confidence interval in dB	4.86	3.79	4.23	1.24
95% confidence interval in dB in delta to Result	+/-2.5 dB	+/-2.0 dB	+/- 2.3dB	+/-0.7dB

7 Transmitter Spurious Emissions & Restricted Bands- Radiated

7.1 Limits:

§15.247/15.205/15.209 & RSS-210 A8.5 / RSS-Gen 8.9/ 8.10 (restricted bands)

(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
0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

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)).

*PEAK LIMIT= 74dB μ V/m

*AVG. LIMIT= 54dB μ V/m

Table 1:

Frequency of emission (MHz)	Field strength @ 3m (μ V/m)	Field strength @ 3m (dB μ V/m)
30–88	100	40dB μ V/m
88–216	150	43.5 dB μ V/m
216–960	200	46 dB μ V/m
Above 960	500	54 dB μ V/m

Table 2:

Frequency of emission (MHz)	Field strength (μV/m) / (dBuV/m)	Measurement Distance (m)
0.009–0.490	2400/F(kHz) / -----	300
0.490–1.705	24000/F(kHz) / -----	30
1.705–30.0	30 / (29.5)	30

Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements described in 5.4.

The highest (or worst-case) data rate shall be recorded for each measurement.

When testing at other than specified distance in the standard, the approach calculation by using 40 dB/decade extrapolation factor equation (4) as follow:

Conversion factor (CF) = $40 \log (D/d) = 40 \log (300\text{m} / 3\text{m}) = 80\text{dB}$

Therefore, 80 dB shall be added to the specified limit @ 30 m to convert to actual test limit @ 3m or shall be subtracted from the actual readings if the specified limit @ 30 m remains the same.

7.2 Test Conditions

Tnom: 23°C; Vnom: 120 VAC

7.3 **Test Procedure:**

Measurement according to ANSI C63.10:2013 (also refer to section 6.1 in this test report)

Analyzer Settings:

From 9 KHz – 30 MHz

RBW = 9 KHz

Detector: Peak

From 30 MHz – 1 GHz

Detector = Peak / Quasi-Peak

RBW=120 KHz (<1GHz)

Above 1 GHz

Detector = Peak / Average

RBW= 1MHz

Test mode: Modulation: GFSK.

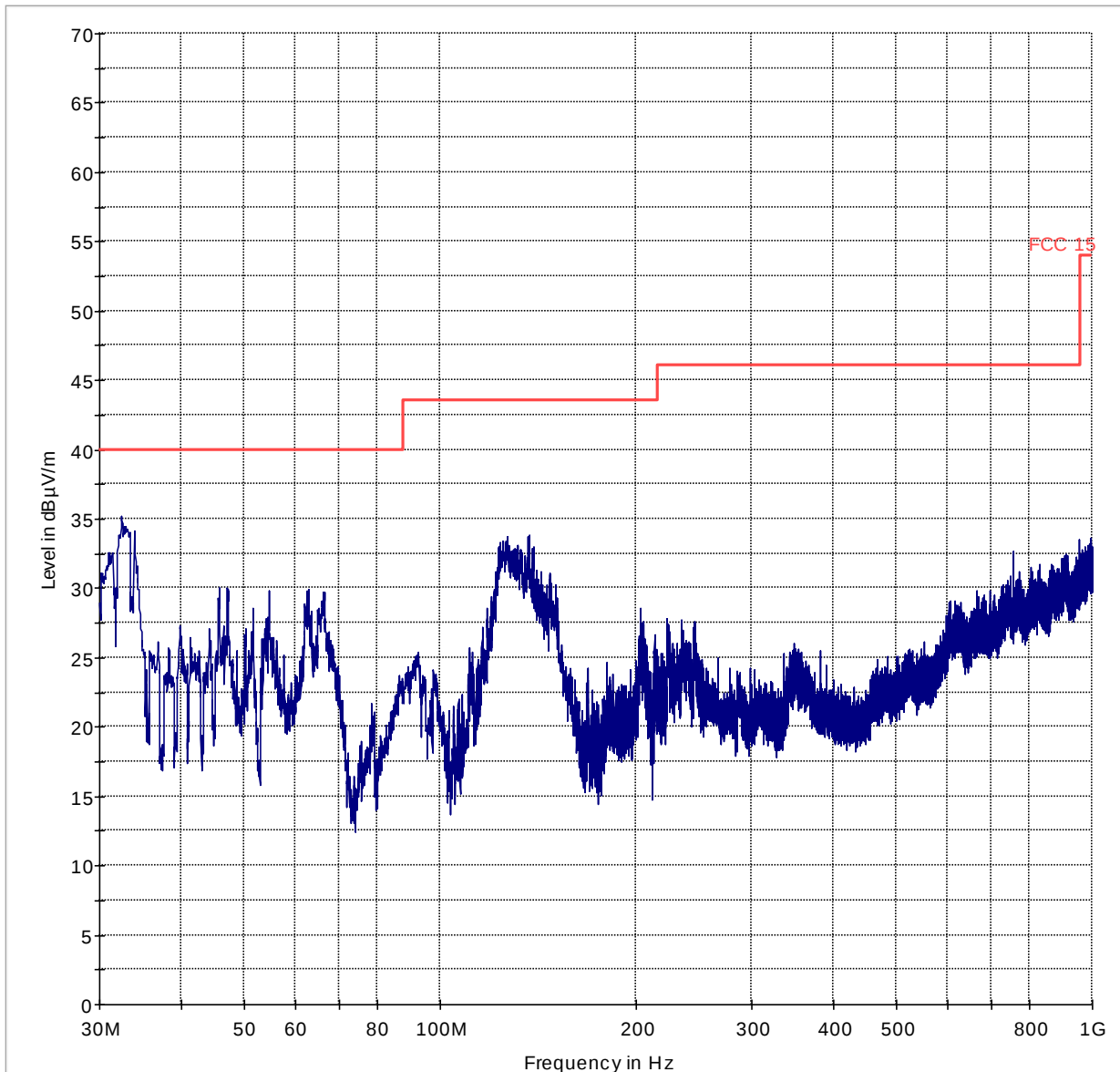
Plots reported here represent the worst case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT.

7.4 **Test Verdict:**

Pass.

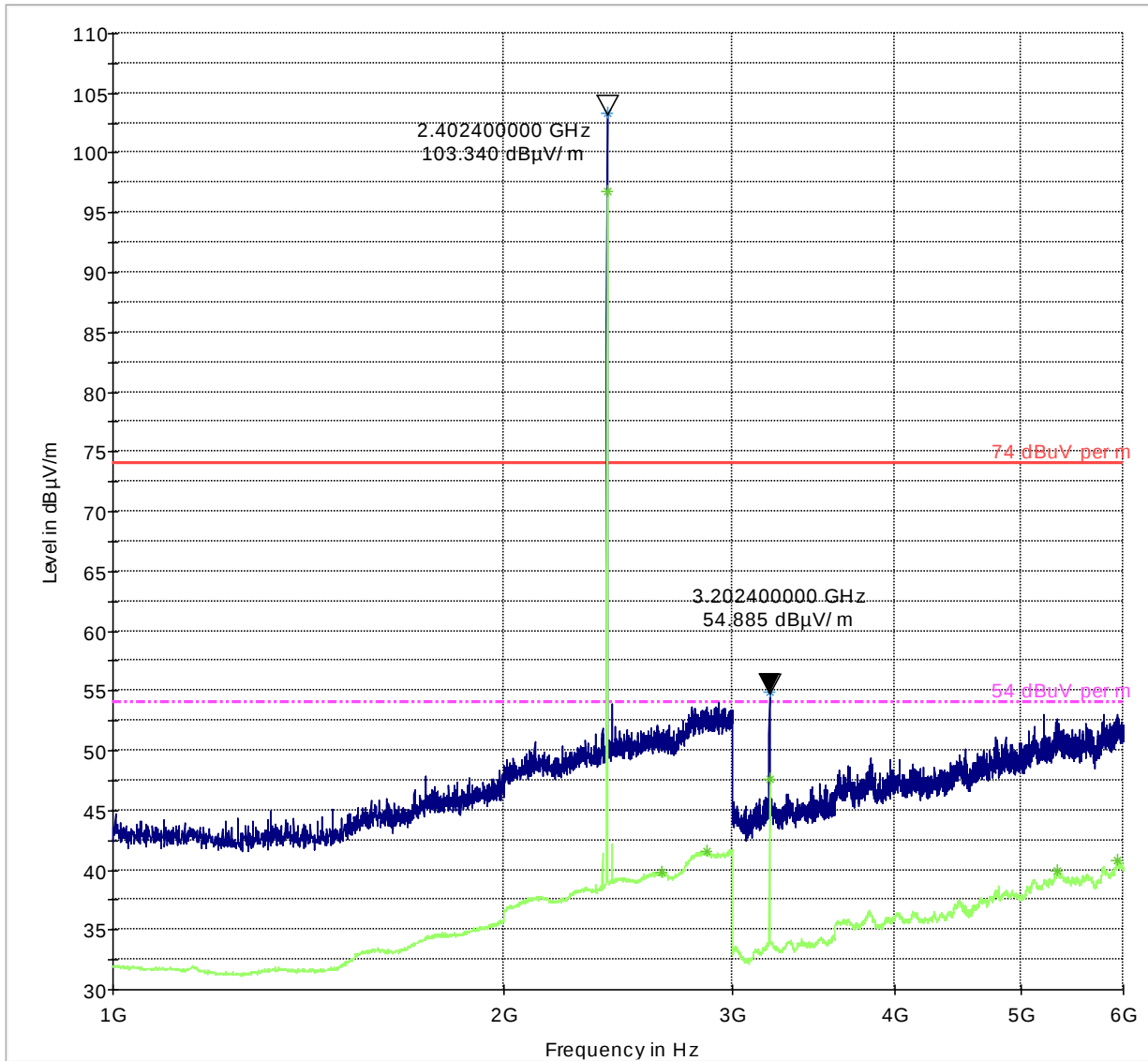
7.5 Measurement plots:

7.5.1 30 MHz – 1 GHz: Ch. 0, 2402 MHz, $\pi/4$ QPSK



— FCC 15 — Preview Result 1-PK+

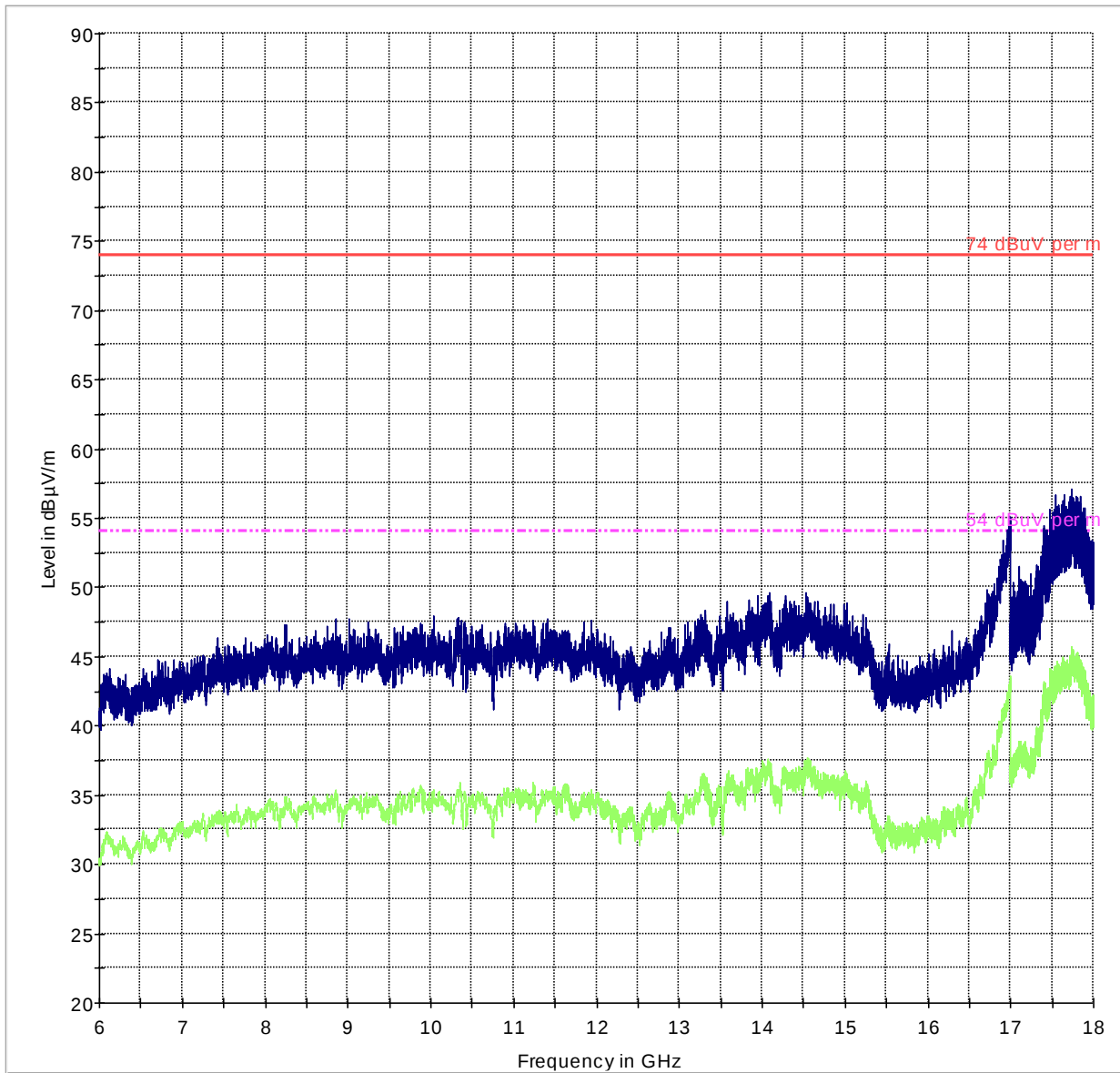
7.5.2 **1 GHz – 6 GHz: Ch. 0, 2402 MHz, $\pi/4$ QPSK**



— 74 dBuV per m	----- 54 dBuV per m
— Preview Result 1-PK+	— Preview Result 2-AVG
* Data Reduction Result 1 [3]-PK+	* Data Reduction Result 2 [3]-AVG

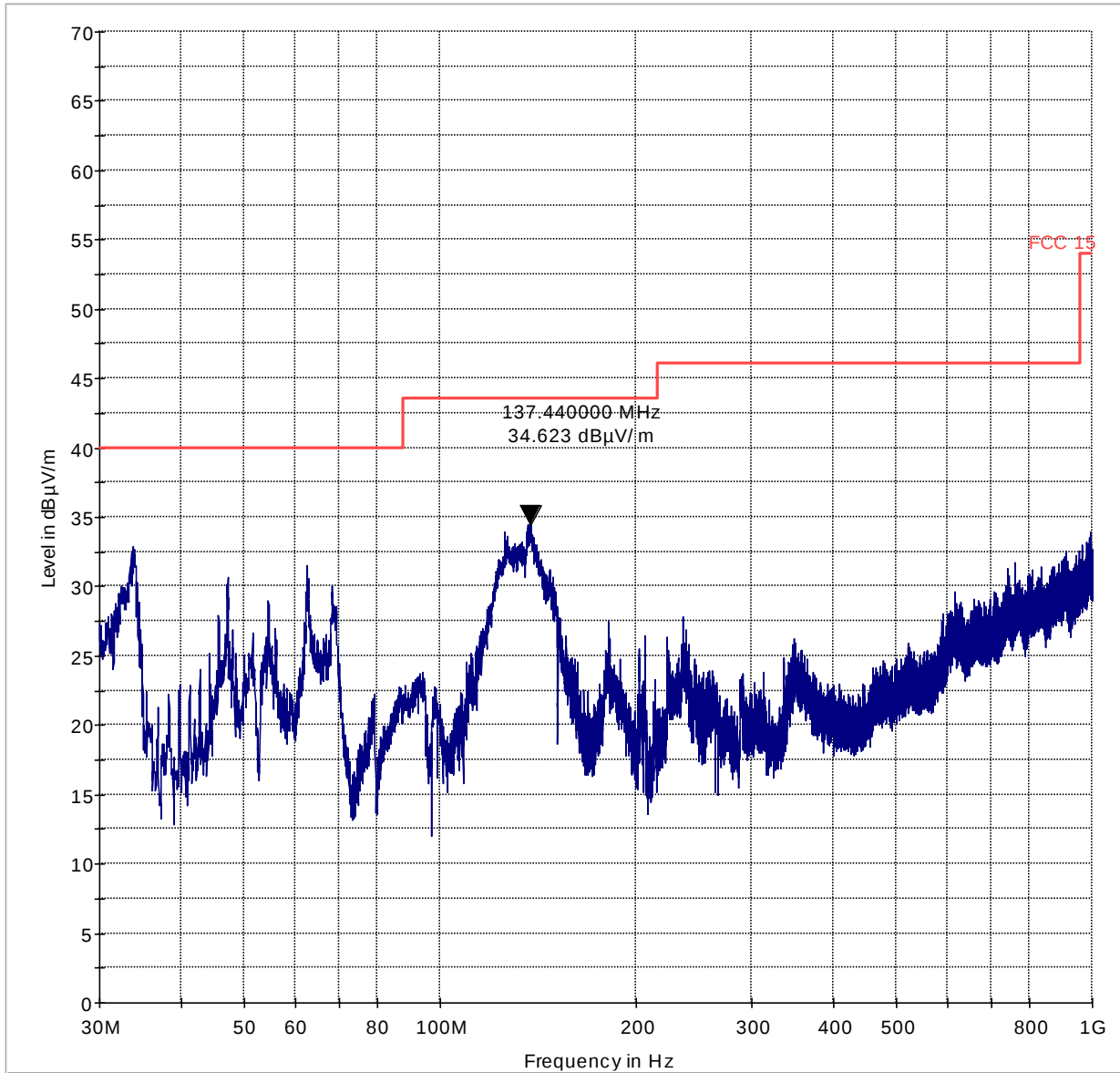
Note: Peak at 2.4024 GHz is the BT LE Ch. 0 signal.

7.5.3 6 GHz – 18 GHz: Ch. 0, 2402 MHz, $\pi/4$ QPSK



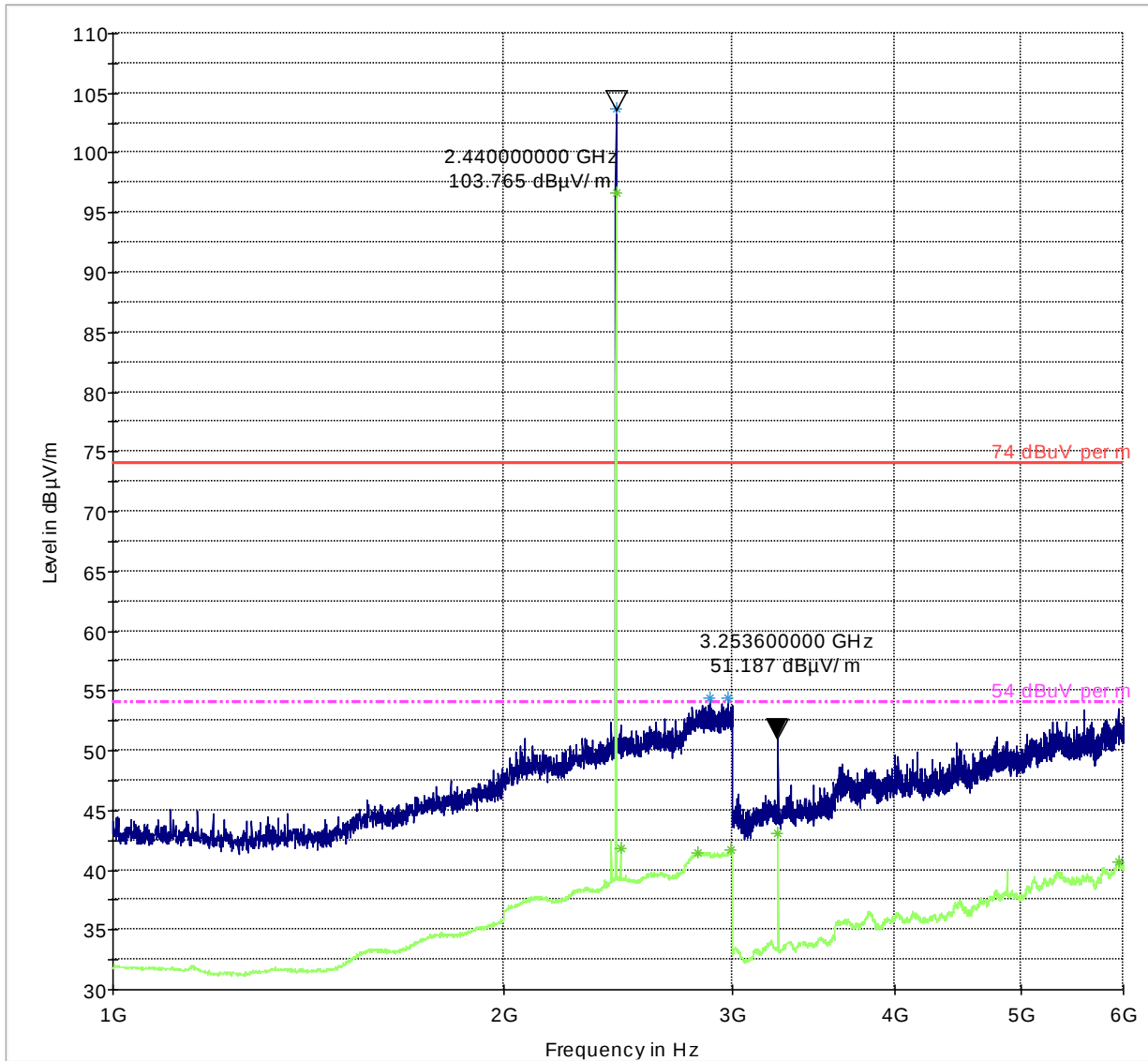
— 74 dBuV per m - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG

7.5.4 30 MHz – 1 GHz: Ch. 19, 2440 MHz, $\pi/4$ QPSK



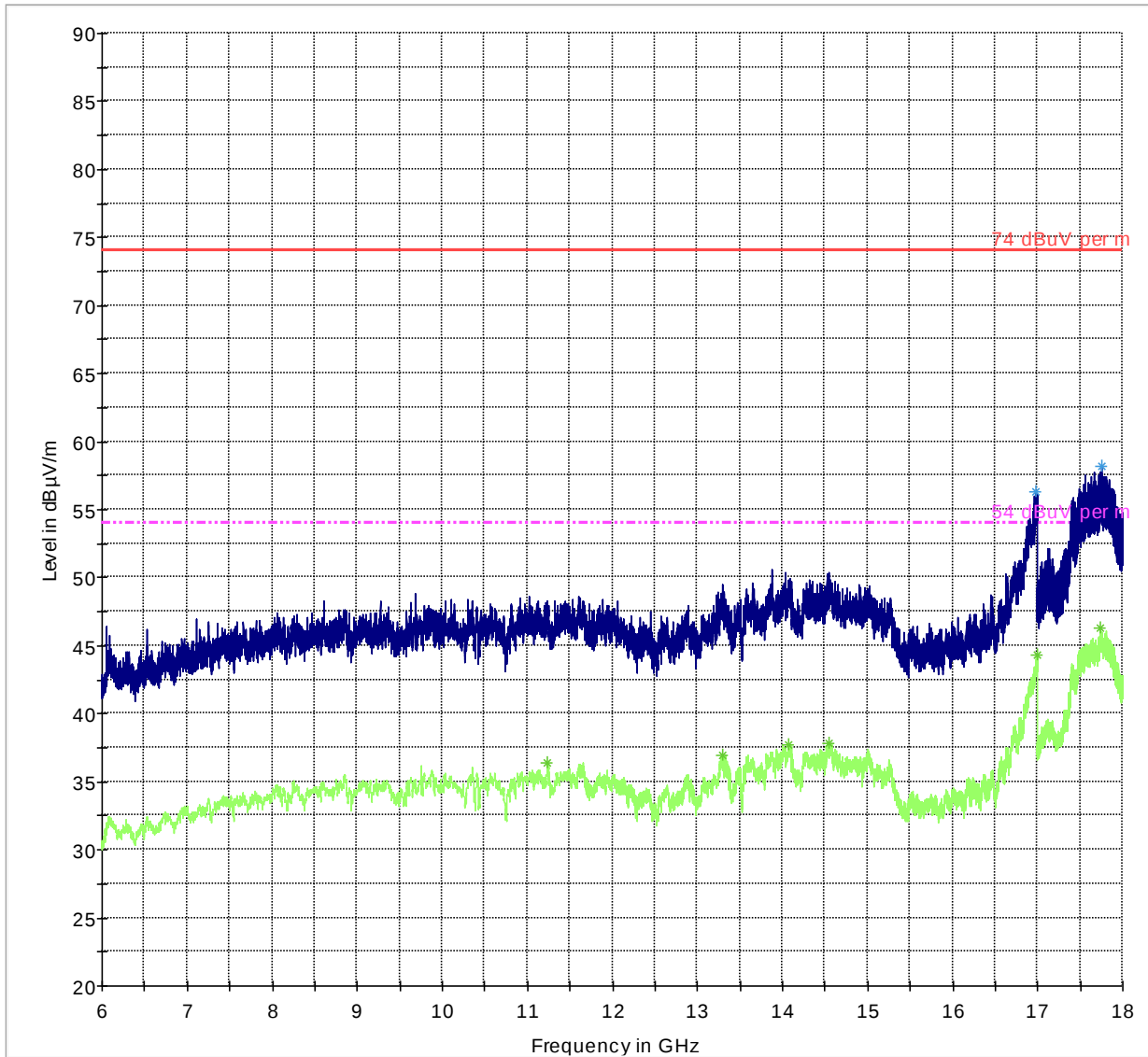
— FCC 15 — Preview Result 1-PK+

7.5.5 **1 GHz – 6 GHz: Ch. 19, 2440 MHz, $\pi/4$ QPSK**



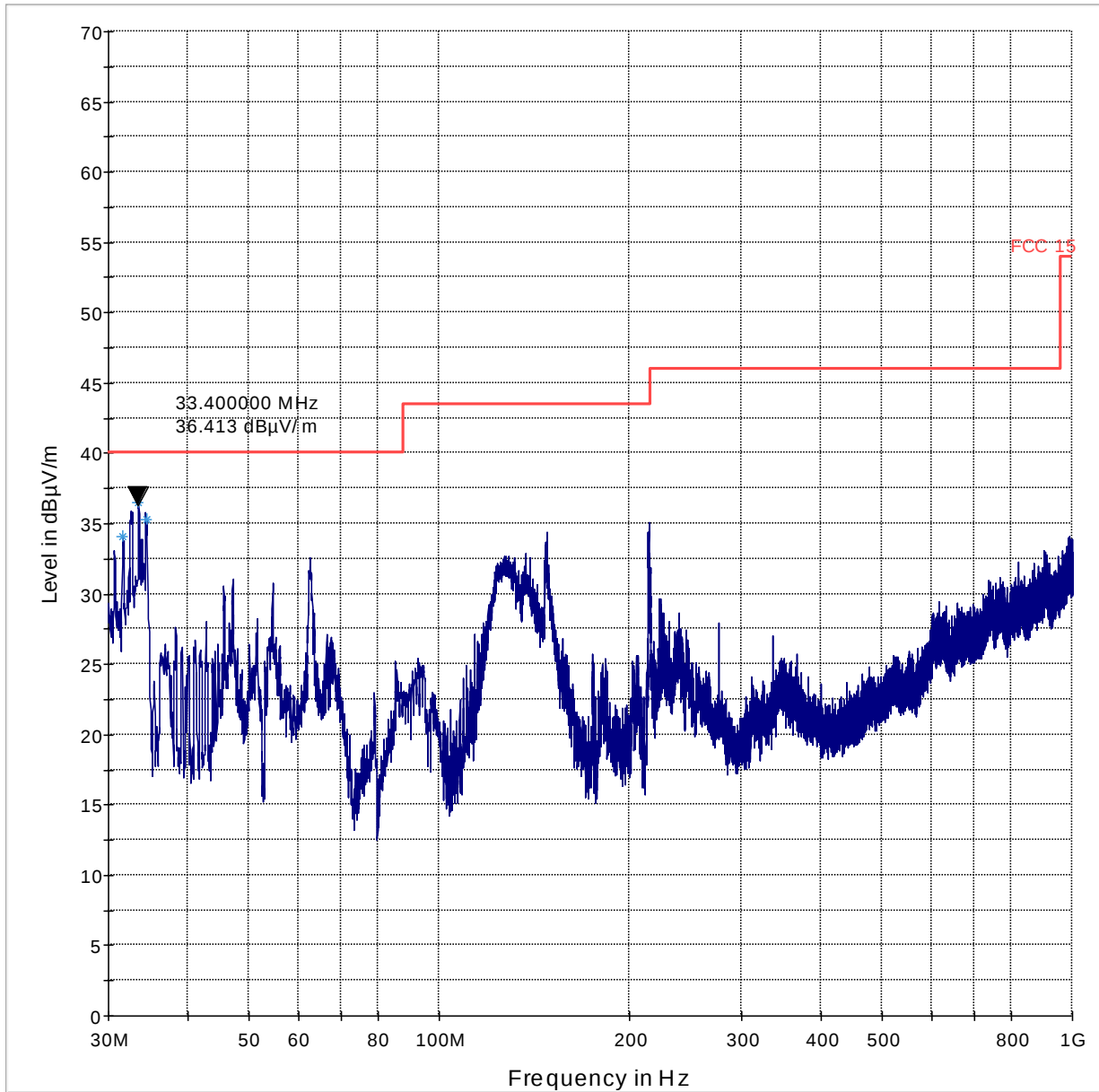
Note: Peak at 2.44 GHz is the BT LE Ch. 19 signal.

6 GHz – 18 GHz: Ch. 19, 2440 MHz, $\pi/4$ QPSK



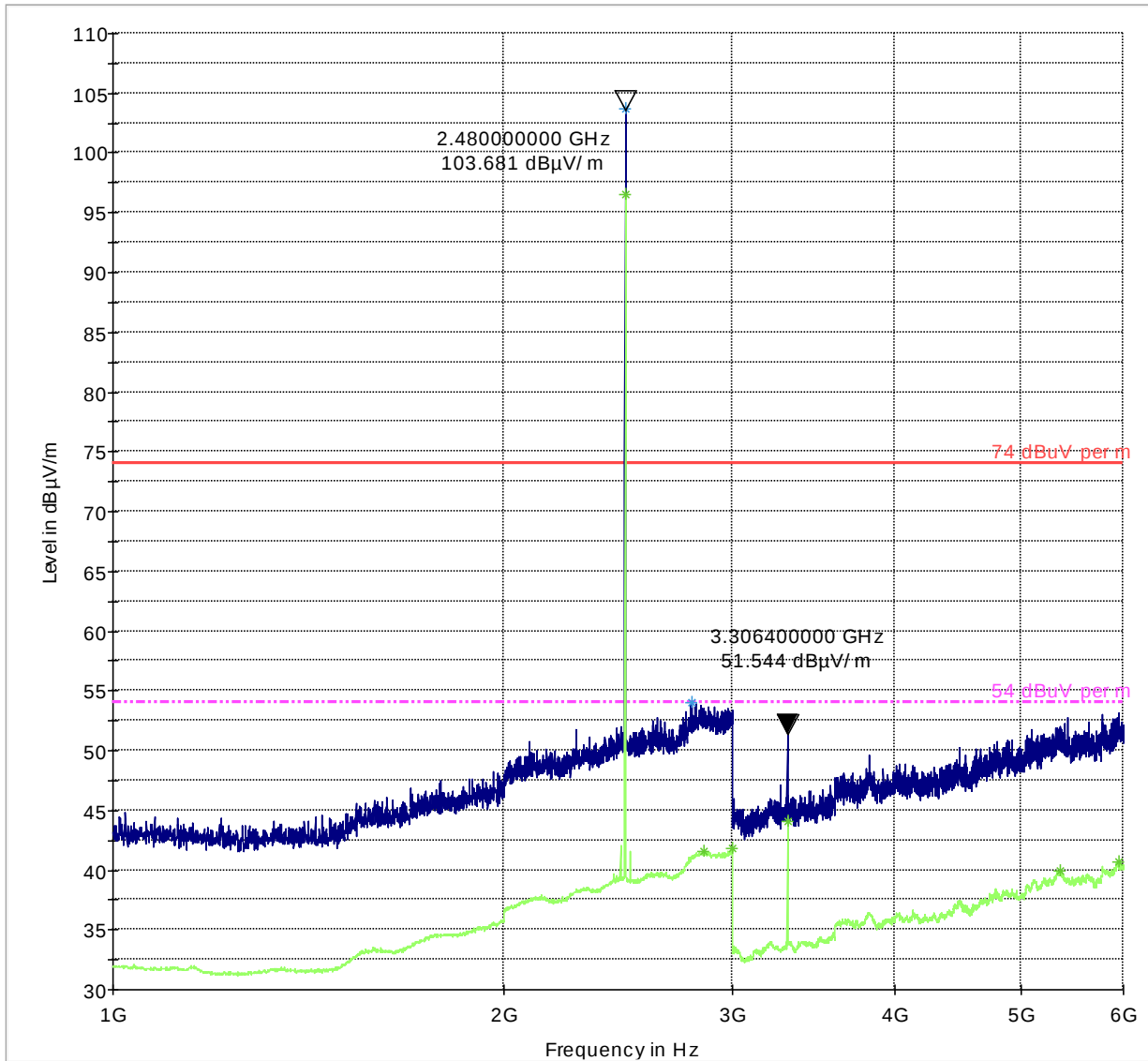
— 74 dB μ V per m	- - - 54 dB μ V per m
— Preview Result 1-PK+	— Preview Result 2-AVG
* Data Reduction Result 1 [5]-PK+	* Data Reduction Result 2 [5]-AVG

7.5.6 30 MHz – 1 GHz: Ch. 39, 2480 MHz, $\pi/4$ QPSK



— FCC 15 — Preview Result 1-PK+ * Data Reduction Result 1 [2]-PK+

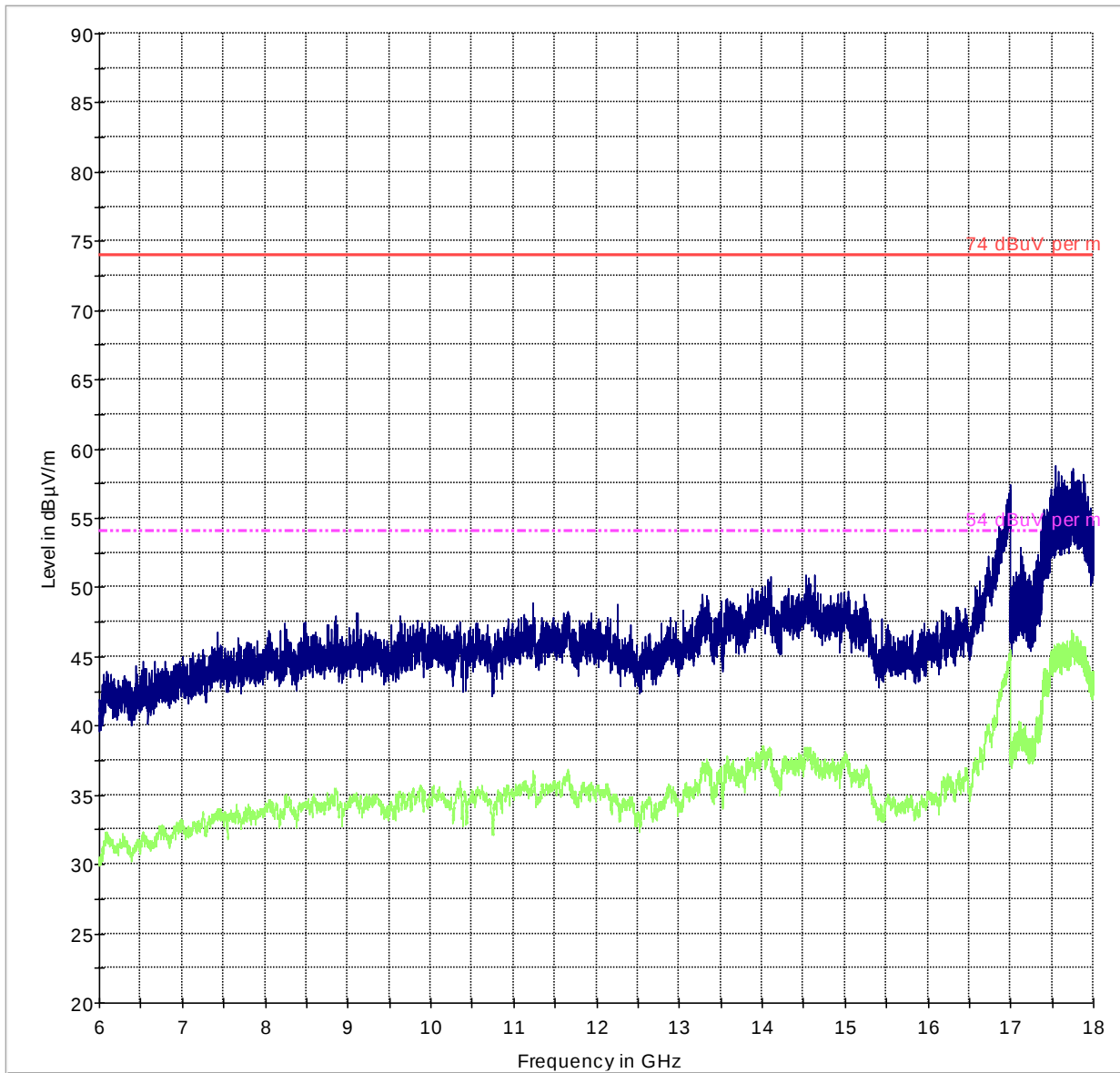
7.5.7 **1 GHz – 6 GHz: Ch. 39, 2480 MHz, $\pi/4$ QPSK**



— 74 dBuV per m
— Preview Result 1-PK+
* Data Reduction Result 1 [3]-PK+
- - - 54 dBuV per m
— Preview Result 2-AVG
* Data Reduction Result 2 [3]-AVG

Note: Peak at 2.48 GHz is the BT LE Ch. 39 signal.

7.5.8 6 GHz – 18 GHz: Ch. 39, 2480 MHz, $\pi/4$ QPSK

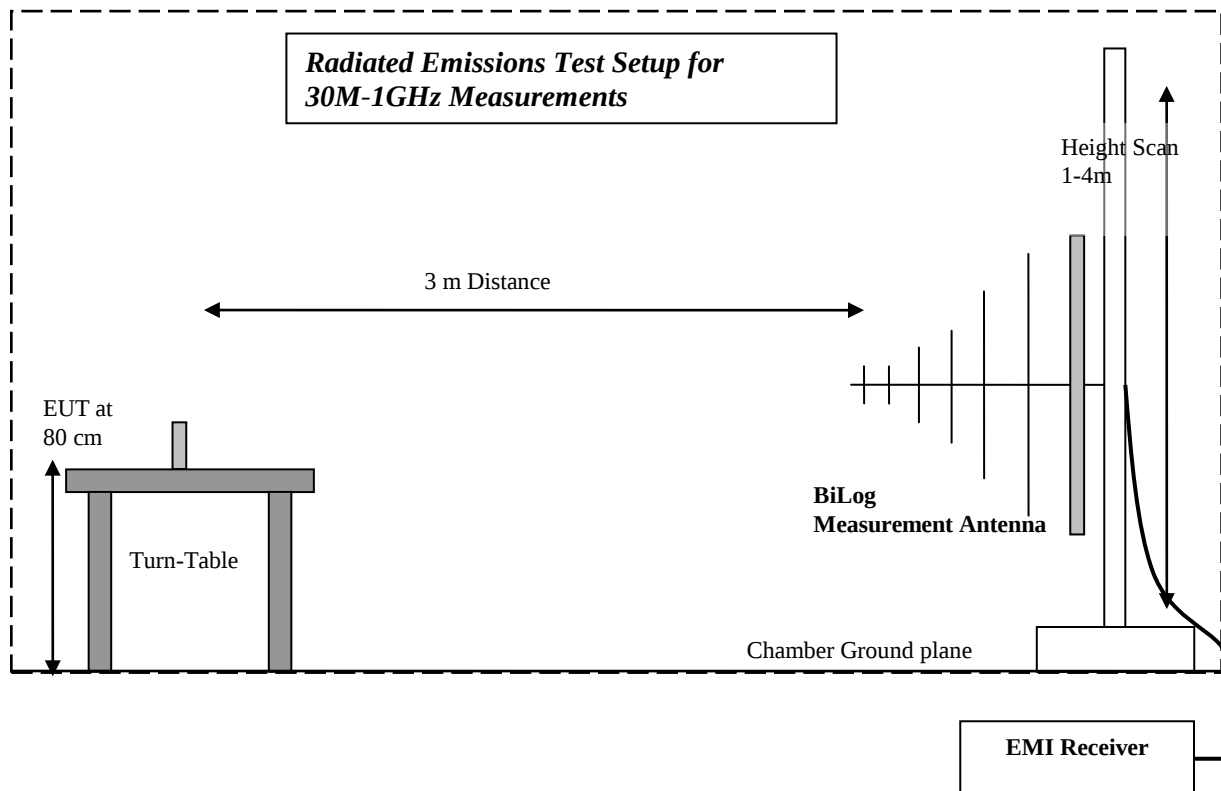


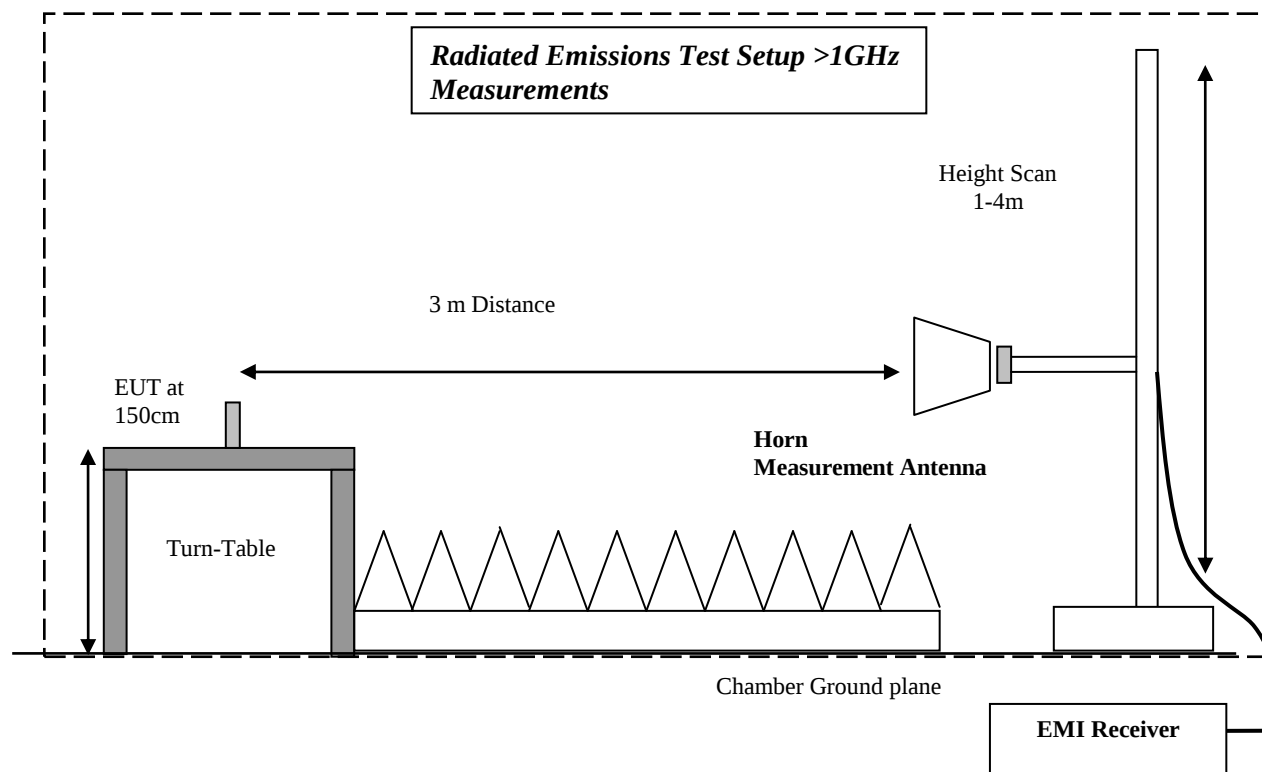
— 74 dBuV per m - - - 54 dBuV per m — Preview Result 1-PK+ — Preview Result 2-AVG

8 Test Equipment and Ancillaries used for tests

No.	Equipment Name	Manufacturer	Type/model	Serial No.	Cal Date	Cal Interval
3m Semi- Anechoic Chamber:						
X	Turn table	EMCO	2075	N/A	N/A	N/A
X	MAPS Position Controller	ETS Lindgren	2092	0004-1510	N/A	N/A
X	Antenna Mast	EMCO	2075	N/A	N/A	N/A
X	Relay Switch Unit	Rohde&Schwarz	RSU	338964/001	N/A	N/A
X	EMI Receiver/Analyzer	Rohde&Schwarz	ESU 40	100251	Sep 2013	2 Year
X	1500MHz HP Filter	Filtek	HP12/1700	14c48	N/A	N/A
X	2800 MHz HP Filter	Filtek	HP12/2800	14C47	N/A	N/A
X	Pre-Amplifier	Miteq	JS40010260	340125	N/A	N/A
X	Binconilog Antenna	EMCO	3141	0005-1186	Apr 2012	4 Years
X	Horn Antenna	EMCO	3115	35114	Mar 2012	4 Years
Other Equipment						
	Spectrum Analyzer	Rohde&Schwarz	FSU 8	200256	Jun 2013	2 Years
X	Spectrum Analyzer	Rohde&Schwarz	FSU 26.5	100189	Jun 2013	2 Years
	Spectrum Analyzer	Rohde&Schwarz	FSU 26.5	200065	Jun 2013	2 Years
	Vector Signal Generator (Interferer)	Rohde&Schwarz	SMU200A	101935	Feb 2015	2 Years
	Signal Generator (Blocker)	Rohde&Schwarz	SMP04	100151	Jun 2013	2 Years
X	Fast Power Detector 5Ms/s	ETS Lindgren	7002-006	00160034	Sep 2014	2 Years
X	Temperature Sensor	Dickson	SM320	0929600	Apr 2014	2 Years
X	Temperature Chamber	Test Equity	115	150384	N/A	N/A
	Vector Signal generator (Interferer)	Keysight	EE4438C	MY45094596	Jun 2013	2 Years
	WLAN AP (companion device)	Rhode&Schwarz	CMW500	125754	Jun 2013	2 Years
	WLAN AP (companion device)	Cisco	Aironet 1260	FTX1553E037	N/A	N/A
X	DC Power Supply	HP	E3610A	KR83023316	N/A	N/A

9 Test Setup Diagram:





Test Report #: EMC_PHIL4-007-
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10 Revision History

Date	Report Name	Changes to report	Report prepared by
2015-04-20	EMC_PHIL4- 007_14001_15.247_BT_LE_WLAN_Module	1 st Version	Yu-Chien Ho