

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

**Product Name:** Mouse

**Brand Name:** hp

**Model No.:** MH0GC

**Model Difference:** N/A

**FCC ID:** O62-MH0GC

**Report No.:** E2/2014/40026

**Issue Date:** May. 16, 2014

**FCC Rule Part:** §15.249

**Prepared for:** Darfon Electronics Corp.  
167, Shanying Road, Gueishan, Taoyuan 33341,  
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## VERIFICATION OF COMPLIANCE

**Applicant:** Darfon Electronics Corp.  
167, Shanying Road, Gueishan, Taoyuan 33341, Taiwan, R.O.C.

**Product Description:** Mouse

**Brand Name:** hp

**Model No.:** MH0GC

**Model Difference:** N/A

**FCC ID:** O62-MH0GC

**File Number:** E2/2014/40026

**Date of test:** Apr. 22, 2014 ~ May. 16, 2014

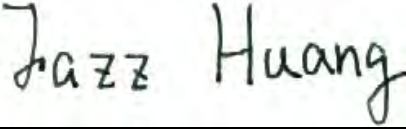
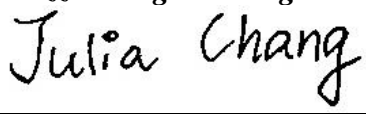

**Date of EUT Received:** Apr. 22, 2014

### We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd., Electronics & Communication Laboratory.

The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2009 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.249.

The test results of this report relate only to the tested sample identified in this report.

<b>Test By:</b>		<b>Date:</b>	May. 16, 2014
<hr/>			
	<i>Jazz Huang / Sr. Engineer</i>		
<b>Prepared By:</b>		<b>Date:</b>	May. 16, 2014
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	<i>Julia Chang / Clerk</i>		
<b>Approved By:</b>		<b>Date:</b>	May. 16, 2014
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	<i>Jim Chang / Supervisor</i>		

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## Version

Version No.	Date	Description
00	May. 16, 2014	Initial creation of document

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## 1. GENERAL INFORMATION

### 1.1. Product Description

General:

Product Name:	Mouse
Brand Name:	hp
Model No.:	MH0GC
Model Difference:	N/A
Transmit Power	95.34dBuV/m at 3m.
Operation Frequency:	2402 – 2478MHz
Channel Number:	77
Channel Space:	1MHz
Modulation Type:	GFSK
Hardware Version:	N/A
Software Version:	N/A
Power Supply:	DC3V from AA alkaline Batteries x 2
Antenna Designation:	PIFA Antenna, Gain:0.01dBi

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## 1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **O62-MH0GC** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

## 1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4:2009. Radiated testing was performed at an antenna to EUT distance 3 meters.

## 1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2009. FCC Registration Number: 628985. The address of SGS Taiwan Ltd. Electronics & Communication Laboratory 1F, No.134, Wukung Road New Taipei City TAIWAN 24803, Canada Registration Number: 4620A-5.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No.2, Keji 1st Rd., Guishan Township, Taoyuan County, Taiwan which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. FCC Registration Number: 455997. The address of SGS Taiwan Ltd. Electronics & Communication Laboratory 1F, No.134, Wukung Road New Taipei City TAIWAN 24803, IC Registration Number: 4620A-6.

## 1.5. Special Accessories

There are no special accessories used while test was conducted.

## 1.6. Equipment Modifications

There was no modification incorporated into the EUT.

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## 2. SYSTEM TEST CONFIGURATION

### 2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2. EUT Exercise

An engineering test mode (software/firmware) that applicant provided was utilized to manipulate the EUT into transmit, selection of the test channel, and modulation scheme.

### 2.3. Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7.3.1 of ANSI C63.4-2009. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz and the measurement procedure 7.3 in ANSI 63.4:2009 & 6.2.2, and 6.2.3 in ANSI 63.10:2009 is followed to carry out the test. The CISPR Quasi-Peak and Average detector mode is employed according to §15.107

#### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4-2009.

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## 2.4. Limitation

### (1) Conducted Emission

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15 – 0.5	66 - 56	56 - 46
0.5 – 5	56	46
5 - 30	60	50

### (2) Radiated Emission 15.249(a)

The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following.

Frequency (MHz)	Field strength of Fundamental	Field strength of Harmonics	Distance (m)
902 - 928	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
2400 – 2483.5	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
5725 – 5875	50 mV/m (94dBuV/m)	500 uV/m (54dBuV/m)	3
24.0 – 24.25GHz	250 mV/m (107.95dBuV/m)	2500 uV/m (67.95dBuV/m)	3

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**(3) Radiated Emission 15.249 (d)**

Emission Radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209 and as below, whichever is the lesser attenuation.

Frequency (MHz)	Field strength $\mu\text{V/m}$	Distance (m)	Field strength at 3m $\text{dB}\mu\text{V/m}$
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

**(4) Radiated Emission 15.249(e)**

For frequencies above 1000MHz, the above field strength limits are based on average limits. The peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

- Remark:
1. Emission level in  $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$
  2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
  3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of  $\xi$  15.205
  4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of  $\xi$  15.205, then the general radiated emission limits in  $\xi$  15.209 apply.

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## 2.5. Configuration of Tested System

Fig. 2-1 Radiated Emission

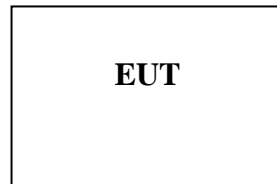


Fig. 2-2 Conducted (Antenna Port) Configuration

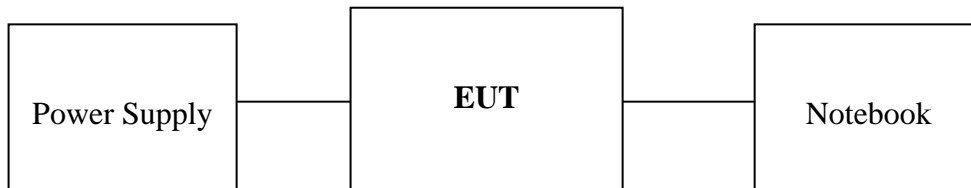


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	Notebook	Lenovo	L430	R9-YYG88	shielding	Un-shielding
2.	Power Supply	Agilent	E3640A	MY53140006	N/A	N/A

**Note:** All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.

**Grounding:** Grounding was in accordance with the manufacturer's requirements and conditions for the intended use.

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### 3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§ 15.207(a)	AC Power Line Conducted Emission	N/A
§ 15.249(a)(e)	Radiated Emission	Compliant
§ 15.249(e)	20dB band width Measurement	Compliant

### 4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.  
The EUT is staying in continuous transmitting mode.

Channel Low (2402MHz), Channel Mid (2440MHz), Channel High: (2478MHz) and Standby mode were chosen for full testing.

The field strength of radiation emission was measured as EUT stand-up position (H mode) and lie down position (E1, E2 mode) Transmitter for channel Low, Mid and High , and the worst case E2 position was reported.

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## 5. MEASUREMENT UNCERTAINTY

Test Items	Uncertainty
AC Power Line Conducted Emission	+/- 2.586 dB
20dB Bandwidth	+/- 123.36 Hz
Temperature	+/- 0.8 °C
Humidity	+/- 4.7 %
DC / AC Power Source	DC= +/- 1%, AC= +/- 0.2%

Radiated Spurious Emission:

Measurement uncertainty (Polarization : <b>Vertical</b> )	30MHz - 180MHz: +/- 3.37dB
	180MHz - 417MHz: +/- 3.19dB
	0.417GHz - 1GHz: +/- 3.19dB
	1GHz - 18GHz: +/- 4.04dB
	18GHz - 40GHz: +/- 4.04dB

Measurement uncertainty (Polarization : <b>Horizontal</b> )	30MHz - 167MHz: +/- 4.22dB
	167MHz - 500MHz: +/- 3.44dB
	0.5GHz - 1GHz: +/- 3.39dB
	1GHz - 18GHz: +/- 4.08dB
	18GHz - 40GHz: +/- 4.08dB

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

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## 6. CONDUCTED EMISSIONS TEST

### 6.1 Standard Applicable:

According to §15.207, frequency range within 150kHz to 30MHz shall not exceed the Limit table as below.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

- The lower limit shall apply at the transition frequencies
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### 6.2 Measurement Equipment Used:

SGS Conducted Emission Test Site No.A					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESCI 3	101311	2013/06/27	2014/06/26
Coaxial Cables	N/A	N30N30-1042-150cm	N/A	2014/02/07	2015/02/06
LISN	Schwarzbeck	NSLK 8127	8127-648	2013/06/17	2014/06/16
LISN	Rolf-Heine	NNB-2/16Z	99012	2014/03/26	2015/03/25
Test Software	Farad	EZ-EMC	Ver. SGS-03A2	N.C.R.	N.C.R.

### 6.3 EUT Setup:

- The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4:2009.
- The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
- The LISN was connected with 120Vac/60Hz power source.

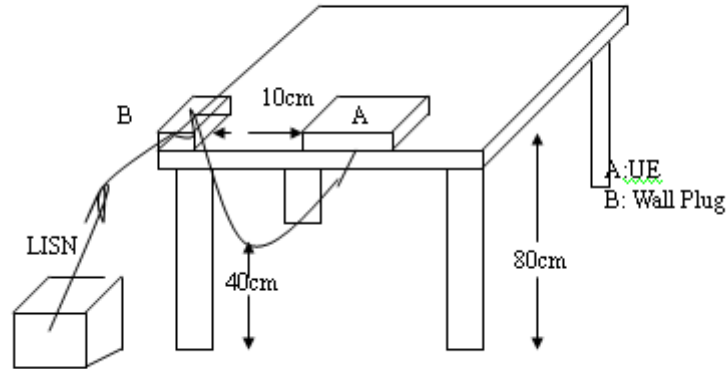
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#### 6.4. Test SET-UP (Block Diagram of Configuration)



#### 6.5. Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all phases of power being supplied by given UE are completed

#### 6.6. Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

**Test Result: N/A, this device is powered by battery.**

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## 7. RADIATED EMISSION TEST

### 7.1 Measurement Procedure

- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 The turn table shall rotate 360 degrees to determine the position of maximum emission level.
- 3 EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.
- 4 When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” is still within the 3dB illumination BW of the measurement antenna.
- 5 Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- 6 And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- 7 Repeat above procedures until all frequency of the interest measured were complete.

Auxiliary Procedure (Setting on Spectrum to capture the reading of emission level):

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for  $f \geq 1$  GHz, 100 kHz for  $f < 1$  GHz

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

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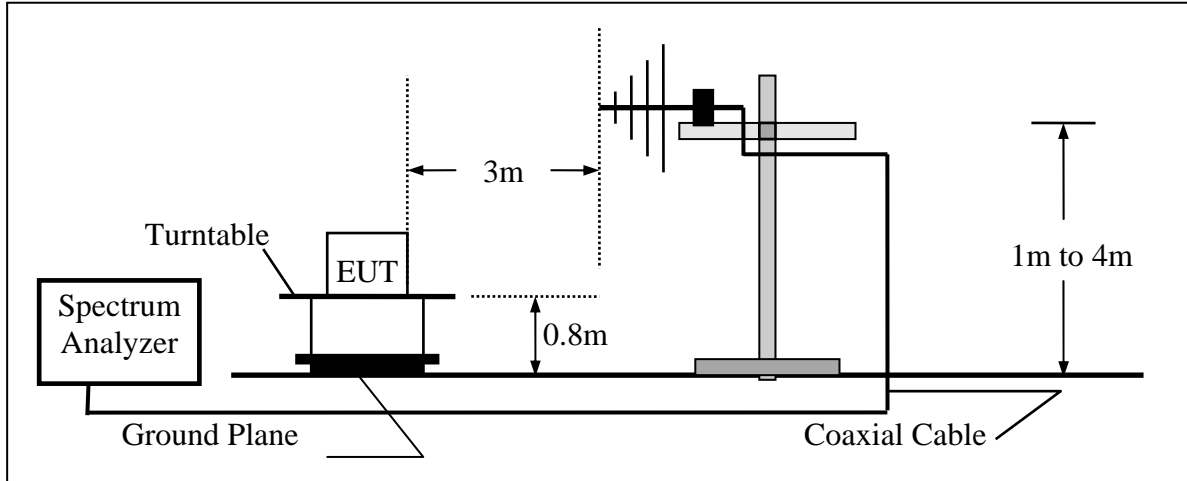
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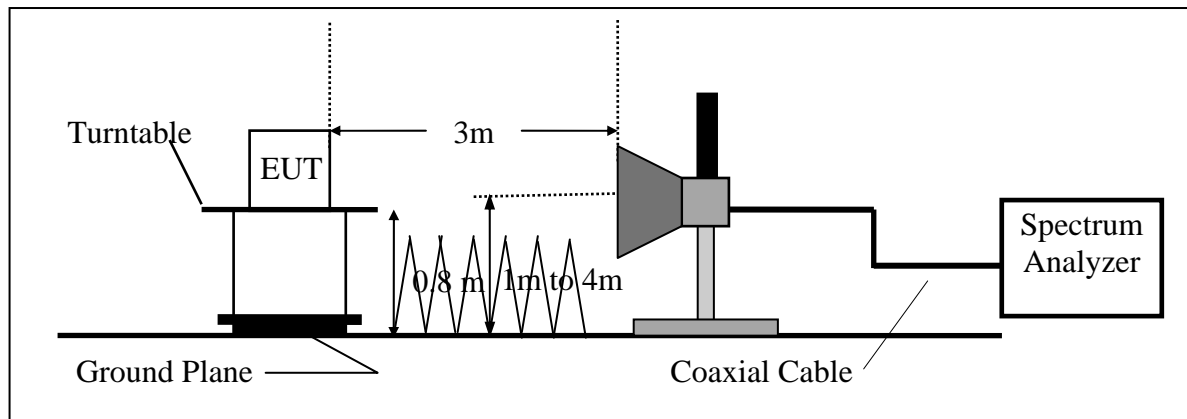


## 7.2. Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



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**7.1 Measurement Equipment Used:**

SGS 966 Chamber No.C					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
EMI Test Receiver	R&S	ESU 40	100363	2014/04/12	2015/04/11
Loop Antenna	ETS-Lindgren	6502	00143303	2014/01/16	2015/01/15
Broadband Antenna	TESEQ	CBL 6112D	35240	2014/01/17	2015/01/16
Horn Antenna	ETS-Lindgren	3117	00143272	2014/01/27	2015/01/26
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170-184	2014/01/23	2015/01/22
Horn Antenna	ETS-Lindgren	3160-09	00117911	2014/01/22	2015/01/21
Horn Antenna	ETS-Lindgren	3160-10	00117783	2014/01/22	2015/01/21
Pre Amplifier	R&S	SCU-18	10204	2014/03/26	2015/03/25
Pre Amplifier	R&S	SCU-26	100780	2014/03/26	2015/03/25
Pre Amplifier	R&S	SCU-40	100356	2014/03/26	2015/03/25
Pre Amplifier	EMC Instruments	EMC330	980096	2014/03/26	2015/03/25
Pre Amplifier	EMC Instruments	EMC184045	980135	2014/01/24	2015/01/23
Coaxial Cable	Huber+Suhner	RG 214/U	W21.03	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	RG 214/U	W22.03	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17413/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17404/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17394/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17386/4	2014/03/26	2015/03/25
Coaxial Cable	Huber+Suhner	SUCCOFLEX 104	MY17388/4	2014/03/26	2015/03/25
Attenuator	WOKEN	218FS-10	HY-151	2014/01/06	2015/01/05
Communication Tester	R&S	CMW500	131121	2014/01/16	2015/01/15
Communication Tester	Anritsu	MT8820C	6201107337	2014/04/23	2015/04/22
Controller	MF	MF-7802	N/A	N.C.R.	N.C.R.
Antenna Master	MF	N/A	N/A	N.C.R.	N.C.R.
Turn Table	MF	N/A	N/A	N.C.R.	N.C.R.
Site NSA	SGS	966 Chamber C	SAC-C	2014/03/05	2015/03/04
Site VSWR	SGS	966 Chamber C	SAC-C	2014/04/10	2015/04/09
Test Software	World-Pallas	Dr. E	V 3.0 Lite	N.C.R.	N.C.R.

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## 7.2 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

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### 7.3 Measurement Result

#### Radiated Spurious Emission Measurement Result (MAIN)

Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:Main Ch LOW	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2401.63	F	Peak	83.01	3.17	86.19	114.00	-27.82
2401.63	F	Average	46.21	3.17	49.38	94.00	-44.62

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:Main Ch LOW	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
2401.62	F	Peak	92.17	3.17	95.34	114.00	-18.66
2401.62	F	Average	51.80	3.17	54.97	94.00	-39.03

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2440 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:Main Ch Mid	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2439.93	F	Peak	83.25	3.26	86.50	114.00	-27.50
2439.93	F	Average	50.79	3.26	54.05	94.00	-39.95

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2440 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:Main Ch Mid	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2439.65	F	Peak	89.96	3.26	93.22	114.00	-20.78
2439.65	F	Average	53.77	3.26	57.03	94.00	-36.97

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2478 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:Main Ch High	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---” : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
2478.27	F	Peak	80.31	3.34	83.66	114.00	-30.34
2478.27	F	Average	46.04	3.34	49.38	94.00	-44.62

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2478 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:Main Ch High	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
2478.29	F	Peak	89.70	3.34	93.04	114.00	-20.96
2478.29	F	Average	50.45	3.34	53.79	94.00	-40.21

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**Radiated Spurious Emission Measurement Result**

Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:TX	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
44.55	S	Peak	49.92	-23.95	25.97	40.00	-14.03
99.84	S	Peak	55.58	-23.19	32.40	43.50	-11.10
153.19	S	Peak	43.75	-23.00	20.74	43.50	-22.76
336.52	S	Peak	42.44	-17.93	24.51	46.00	-21.49
602.30	S	Peak	32.18	-12.41	19.77	46.00	-26.23
847.71	S	Peak	31.03	-9.87	21.16	46.00	-24.84
2388.00	S	Peak	43.24	3.13	46.37	74.00	-27.63
2388.00	S	Average	25.92	3.13	29.05	54.00	-24.95
4804.00	H	Peak	49.62	0.37	50.00	74.00	-24.00
4804.00	H	Average	34.71	0.37	35.08	54.00	-18.92
7206.00	H	Peak	47.36	4.69	52.05	74.00	-21.95
7206.00	H	Average	32.17	4.69	36.86	54.00	-17.14
9608.00	H	Peak	--	--	--	--	--
12010.00	H	Peak	--	--	--	--	--
14412.00	H	Peak	--	--	--	--	--
16814.00	H	Peak	--	--	--	--	--
19216.00	H	Peak	--	--	--	--	--
21618.00	H	Peak	--	--	--	--	--
24020.00	H	Peak	--	--	--	--	--

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2402 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:TX	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
93.05	S	Peak	48.71	-24.20	24.51	43.50	-18.99
256.01	S	Peak	38.16	-19.75	18.41	46.00	-27.59
303.54	S	Peak	40.51	-18.81	21.70	46.00	-24.30
336.52	S	Peak	52.77	-17.93	34.84	46.00	-11.16
571.26	S	Peak	32.64	-12.49	20.14	46.00	-25.86
805.03	S	Peak	31.27	-9.87	21.40	46.00	-24.60
2382.00	S	Peak	49.94	3.11	53.05	74.00	-20.95
2382.00	S	Average	26.63	3.11	29.74	54.00	-24.26
4804.00	H	Peak	50.70	0.37	51.07	74.00	-22.93
4804.00	H	Average	34.80	0.37	35.17	54.00	-18.83
7206.00	H	Peak	43.66	4.69	48.35	74.00	-25.65
7206.00	H	Average	31.87	4.69	36.56	54.00	-17.44
9608.00	H	Peak	--	--	--	--	--
12010.00	H	Peak	--	--	--	--	--
14412.00	H	Peak	--	--	--	--	--
16814.00	H	Peak	--	--	--	--	--
19216.00	H	Peak	--	--	--	--	--
21618.00	H	Peak	--	--	--	--	--
24020.00	H	Peak	--	--	--	--	--

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2440 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:TX	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

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Freq.	Note	Detector	Spectrum	Factor	Actual	Limit	Margin
MHz	F/H/E/S	Mode	Reading Level	dB	FS	@3m	dB
		PK/QP/AV	dBμV		dBμV/m	dBμV/m	
62.98	S	Peak	61.34	-29.20	32.15	40.00	-7.85
103.72	S	Peak	60.53	-22.67	37.86	43.50	-5.64
206.54	S	Peak	41.62	-23.78	17.84	43.50	-25.66
336.52	S	Peak	42.90	-17.93	24.97	46.00	-21.03
643.04	S	Peak	31.48	-11.65	19.83	46.00	-26.17
893.30	S	Peak	31.46	-9.11	22.36	46.00	-23.64
2142.00	S	Peak	43.69	2.26	45.95	74.00	-28.05
2142.00	S	Average	28.44	2.26	30.70	54.00	-23.30
4880.00	H	Peak	50.41	0.41	50.82	74.00	-23.18
4880.00	H	Average	35.61	0.41	36.02	54.00	-17.98
7320.00	H	Peak	44.95	4.86	49.82	74.00	-24.18
7320.00	H	Average	32.43	4.86	37.29	54.00	-16.71
9760.00	H	Peak	--	--	--	--	--
12200.00	H	Peak	--	--	--	--	--
14640.00	H	Peak	--	--	--	--	--
17080.00	H	Peak	--	--	--	--	--
19520.00	H	Peak	--	--	--	--	--
21960.00	H	Peak	--	--	--	--	--
24400.00	H	Peak	--	--	--	--	--

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2440 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:TX	Engineer	:Aken
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Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

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Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
93.05	S	Peak	49.85	-24.20	25.64	43.50	-17.86
256.01	S	Peak	38.45	-19.75	18.70	46.00	-27.30
336.52	S	Peak	52.54	-17.93	34.61	46.00	-11.39
352.04	S	Peak	43.19	-17.31	25.88	46.00	-20.12
644.01	S	Peak	31.92	-11.61	20.31	46.00	-25.69
845.77	S	Peak	31.71	-9.81	21.91	46.00	-24.09
2372.00	S	Peak	42.41	3.08	45.49	74.00	-28.51
2372.00	S	Average	26.69	3.08	29.77	54.00	-24.23
4880.00	H	Peak	52.75	0.41	53.16	74.00	-20.84
4880.00	H	Average	34.98	0.41	35.39	54.00	-18.61
7320.00	H	Peak	43.97	4.85	48.82	74.00	-25.18
7320.00	H	Average	31.55	4.85	36.40	54.00	-17.60
9760.00	H	Peak	--	--	--	--	--
12200.00	H	Peak	--	--	--	--	--
14640.00	H	Peak	--	--	--	--	--
17080.00	H	Peak	--	--	--	--	--
19520.00	H	Peak	--	--	--	--	--
21960.00	H	Peak	--	--	--	--	--
24400.00	H	Peak	--	--	--	--	--

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2478 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:TX	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:VERTICAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq.	Note	Detector Mode	Spectrum Reading Level	Factor	Actual FS	Limit @3m	Margin
MHz	F/H/E/S	PK/QP/AV	dBμV	dB	dBμV/m	dBμV/m	dB
35.82	S	Peak	38.95	-19.03	19.91	40.00	-20.09
100.81	S	Peak	52.04	-23.05	28.99	43.50	-14.51
191.99	S	Peak	57.67	-24.06	33.61	43.50	-9.89
336.52	S	Peak	42.45	-17.93	24.52	46.00	-21.48
561.56	S	Peak	32.03	-12.28	19.75	46.00	-26.25
811.82	S	Peak	31.19	-9.69	21.50	46.00	-24.50
2366.00	S	Peak	41.12	3.06	44.18	74.00	-29.82
2366.00	S	Average	26.75	3.06	29.81	54.00	-24.19
4956.00	H	Peak	48.68	0.60	49.27	74.00	-24.73
4956.00	H	Average	35.96	0.60	36.56	54.00	-17.44
7434.00	H	Peak	45.99	5.01	51.00	74.00	-23.00
7434.00	H	Average	31.75	5.01	36.76	54.00	-17.24
9912.00	H	Peak	--	--	--	--	--
12390.00	H	Peak	--	--	--	--	--
14868.00	H	Peak	--	--	--	--	--
17346.00	H	Peak	--	--	--	--	--
19824.00	H	Peak	--	--	--	--	--
22302.00	H	Peak	--	--	--	--	--
24780.00	H	Peak	--	--	--	--	--

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Operation Band	:2.4G	Test Date	:2014-05-09
Fundamental Frequency	:2478 MHz	Temp./Humi.	:27.4deg_C/47RH
Operation Mode	:TX	Engineer	:Aken
EUT Pol.	:E2 Plan	Measurement Antenna Pol.	:HORIZONTAL

Actual FS(dBμV/m) = SPA. Reading level(dBμV) + Factor(dB)

Factor(dB) = Antenna Factor(dBμV/m) + Cable Loss(dB) – Pre\_Amplifier Gain(dB)

Note : “F” : denotes Fundamental Frequency. ; “H” : denotes Harmonic Frequency.

“E” : denotes Band Edge Frequency. ; “S” : denotes Spurious Frequency.

“---“ : denotes Noise Floor.

Freq. MHz	Note F/H/E/S	Detector Mode PK/QP/AV	Spectrum Reading Level dBμV	Factor dB	Actual FS dBμV/m	Limit @3m dBμV/m	Margin dB
93.05	S	Peak	48.81	-24.20	24.61	43.50	-18.89
135.73	S	Peak	40.22	-21.79	18.43	43.50	-25.07
303.54	S	Peak	40.37	-18.81	21.57	46.00	-24.43
336.52	S	Peak	52.76	-17.93	34.83	46.00	-11.17
384.05	S	Peak	36.55	-16.40	20.15	46.00	-25.85
915.61	S	Peak	33.14	-9.14	24.00	46.00	-22.00
2362.00	S	Peak	42.17	3.37	45.54	74.00	-28.46
2362.00	S	Average	26.40	3.37	29.77	54.00	-24.23
2490.00	H	Peak	47.95	3.37	51.32	74.00	-22.68
2490.00	H	Average	28.85	3.37	32.22	54.00	-21.78
7434.00	H	Peak	49.67	0.60	50.27	74.00	-23.73
7434.00	H	Average	34.71	0.60	35.31	54.00	-18.69
9912.00	H	Peak	--	--	--	--	--
12390.00	H	Peak	--	--	--	--	--
14868.00	H	Peak	--	--	--	--	--
17346.00	H	Peak	--	--	--	--	--
19824.00	H	Peak	--	--	--	--	--
22302.00	H	Peak	--	--	--	--	--
24780.00	H	Peak	--	--	--	--	--

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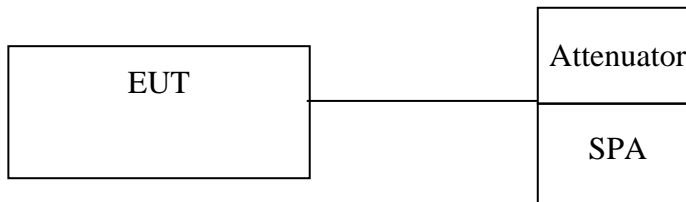
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## 8. 20 dB BAND WIDTH MEASUREMENT

### 8.1 Measurement Procedure

- 1 Place the EUT on the table and set it in transmitting mode.
- 2 Set the spectrum analyzer Frequency = fundamental frequency, RBW=100 kHz, VBW = 300 kHz, Span= 5MHz, Sweep=auto, and Max hold for 20dB test.
- 3 Mark the max reading.
- 4 Repeat above procedures until all frequency measured were complete.

### 8.2. Test SET-UP (Block Diagram of Configuration)



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**8.3. Measurement Equipment Used:**

SGS Conducted Room					
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due
Spectrum Analyzer	Agilent	N9010A	MY53400256	2013/10/26	2014/10/25
Power Meter	Anritsu	ML2496A	1326001	2013/06/28	2014/06/27
Power Sensor	Anritsu	MA2411B	1315048	2013/06/28	2014/06/27
Power Sensor	Anritsu	MA2411B	1315049	2013/06/28	2014/06/27
Signal Generator	R&S	SMR40	100210	2014/01/13	2015/01/12
Signal Generator	R&S	SMC100A	10920	2013/05/23	2014/05/22
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	2	2014/01/06	2015/01/05
Coaxial Cable 30cm	WOKEN	00100A1F1A195C	3	2014/01/06	2015/01/05
Coaxial Cable 80cm	WOKEN	00100A1F1A185C	1	2014/01/06	2015/01/05
DC Block	Mini-Circuits	BLK-18-S+	4	2014/01/06	2015/01/05
DC Block	PASTERNAK	PE8210	5	2014/01/06	2015/01/05
Splitter	RF-LAMBAD	RFLT2W1G18G	11-JSPF412-019	2014/01/06	2015/01/05
Splitter	WOKEN	NA	DOM35LW1A2	2014/01/06	2015/01/05
Attenuator	Mini-Circuits	BW-S10W2+	6	2014/01/06	2015/01/05
Attenuator	WOKEN	218FS-10	7	2014/01/06	2015/01/05
Temperature Chamber	TERCHY	MHK-120LK	1020582	2013/06/19	2014/06/18
Communication Tester	R&S	CMW500	131121	2014/01/16	2015/01/15
Communication Tester	Anritsu	MT8820C	6201107337	2014/04/24	2015/04/23
DC Power Supply	HOLA	DP-3003	001	N.C.R.	N.C.R.

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#### 8.4. Measurement Results:

##### 20dB Bandwidth:

Frequency MHz	20dB Bandwidth (MHz)
2402	1.763
2440	1.960
2478	2.063

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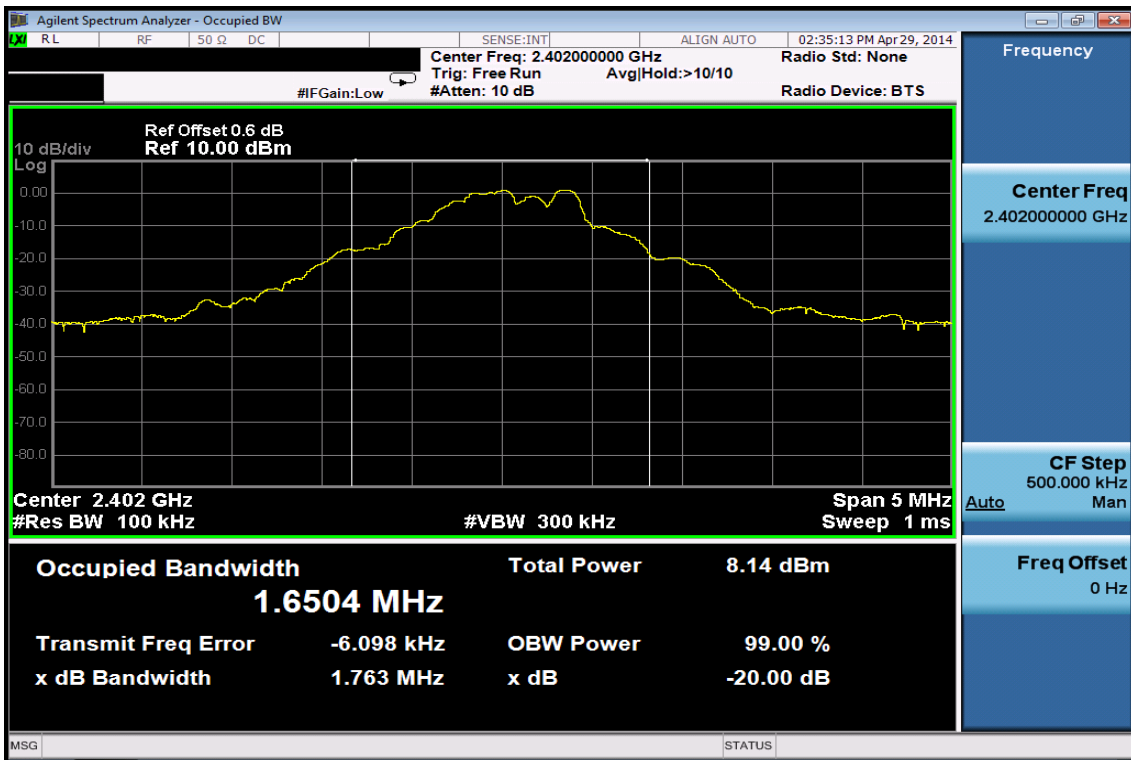
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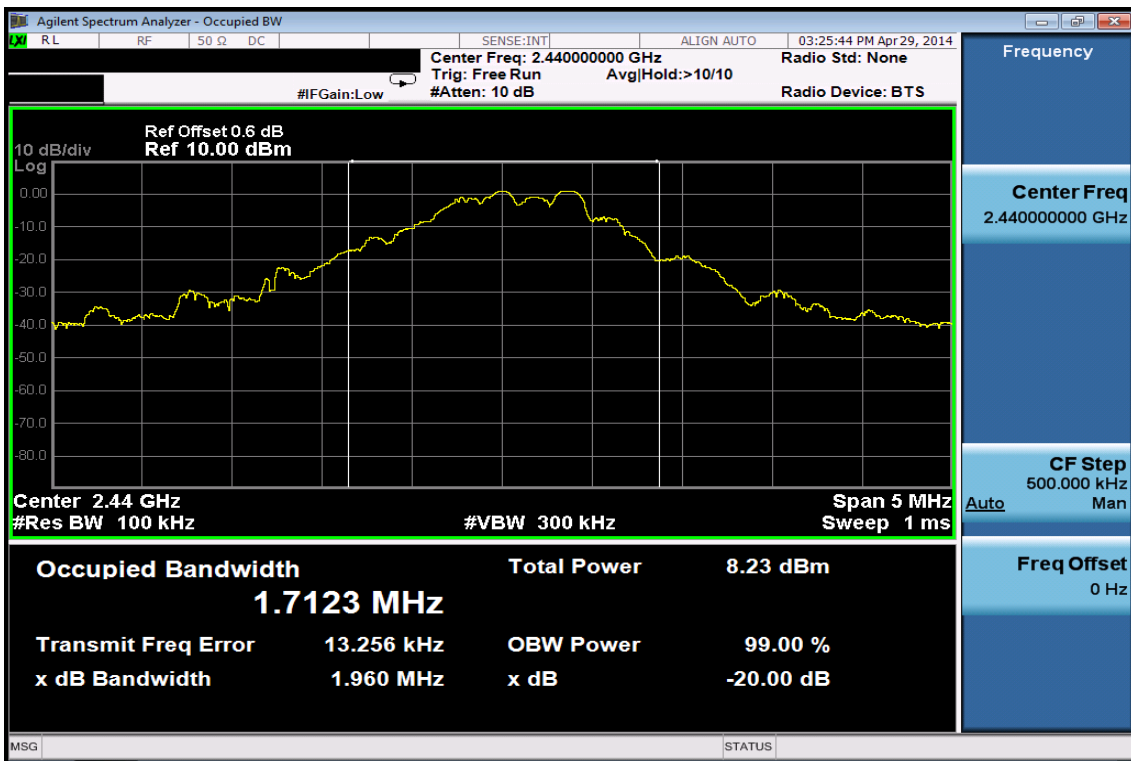
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### 20dB Bandwidth Test Data CH-Low



### 20dB Bandwidth Test Data CH-Mid



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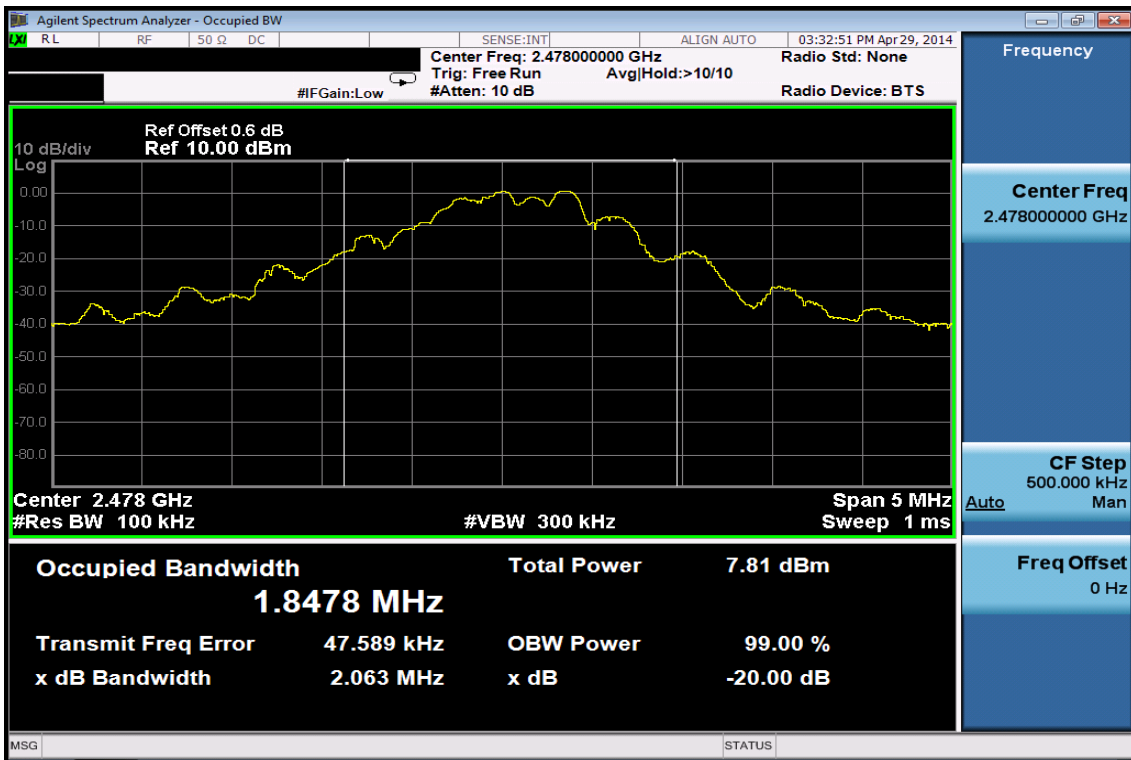
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### 20dB Bandwidth Test Data CH- High



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