

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

## INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C

OF

**Product Name:** ZigBee module

**Brand Name:** N/A

**Model No.:** DFZM-TS220, DFZM-TS221

**Model Difference:** Build-in Antenna & External Antenna

**FCC ID:** H79DFZM-TS220

**Report No.:** ER/2012/80027

**Issue Date:** Sep. 14, 2012

**FCC Rule Part:** §15.249  
Delta Electronics, Inc.

**Prepared for:** No 3, Tung Yuan Road, Chungli Industrial Zone,  
Taoyuan Hsien 32063, Taiwan, R.O.C.  
SGS Taiwan Ltd.  
Electronics & Communication Laboratory

**Prepared by:** No.134, Wu Kung Road, New Taipei Industrial  
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### VERIFICATION OF COMPLIANCE

**Applicant:** Delta Electronics, Inc.  
 No 3, Tung Yuan Road, Chungli Industrial Zone, Taoyuan Hsien  
 32063, Taiwan, R.O.C.

**Product Description:** ZigBee module

**FCC ID:** H79DFZM-TS220

**Brand Name:** N/A

**Model No.:** DFZM-TS220, DFZM-TS221

**Model Difference:** Build-in Antenna & External Antenna

**File Number:** ER/2012/80027

**Date of test:** Aug. 27, 2012 ~ Sep. 14, 2012

**Date of EUT Received:** Aug. 27, 2012

**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 (2003) 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.

**Test By:** Jazz Huang **Date:** Sep. 14, 2012

*Jazz Huang / Engineer*

**Prepared By:** Bondi Liu **Date:** Sep. 14, 2012

*Bondi Liu / Sr. Engineer*

**Approved By:** Jim Chang **Date:** Sep. 14, 2012

*Jim Chang / Supervisor*

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## Version

Version No.	Date	Description
00	Sep. 14, 2012	Initial creation of document

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## 1. GENERAL INFORMATION

### 1.1. Product Description

Product Name:	ZigBee module
Brand Name:	N/A
Model No.:	DFZM-TS220, DFZM-TS221
Model Difference:	Build-in Antenna & External Antenna
Operation Frequency:	2405~2480MHz
Channel number:	16 channels
Channel Spacing:	5MHz
Modulation Type:	O-QPSK
Power Supply	3.0 Vdc from Test Kit
Antenna Designation:	Dipole Antenna / 2.27 dBi for DFZM-TS220 Chip Antenna / 2.66 dBi for DFZM-TS221

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

This submittal(s) (test report) is intended for **FCC ID: H79DFZM-TS220** 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 (2003). 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. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

## 1.5. Special Accessories

Not available for this EUT intended for grant.

## 1.6. Equipment Modifications

Not available for this EUT intended for grant.

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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

The Transmitter was operated in the engineering operating mode. the Tx frequency was fixed at 5736, 5762 and 5814 MHz which were for the purpose of the measurements.

### 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 and 13 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and Average detector mode.

#### 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 C63.4-2003 .

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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

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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 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 Configuration

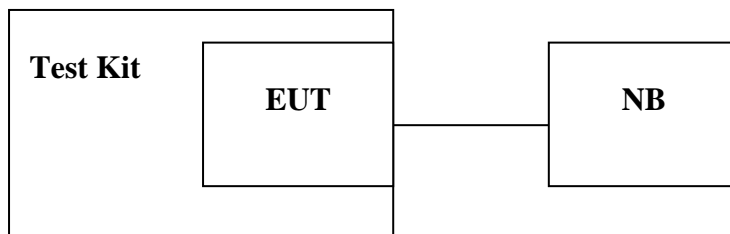


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1	Software	Smart RF Studio 7	1.9.1	N/A	N/A	N/A
2	Notebook	DELL	E5400	3704625136	N/A	1.8m
3	Test Kit	N/A	N/A	N/A	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	Conducted Emission	Compliant
§15.249(a)(d)(e)	Field Strength Measurement	Compliant
§15.215(c)	20dB band width Measurement	Compliant

### 4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receive mode is programmed.

Channel low (2405MHz)、 mid (2440MHz) and high (2480MHz) with highest data rate are chosen for full testing.

### 5. MEASUREMENT UNCERTAINTY FOR FIELD STRENGTH OF SPURIOUS RADIATION

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

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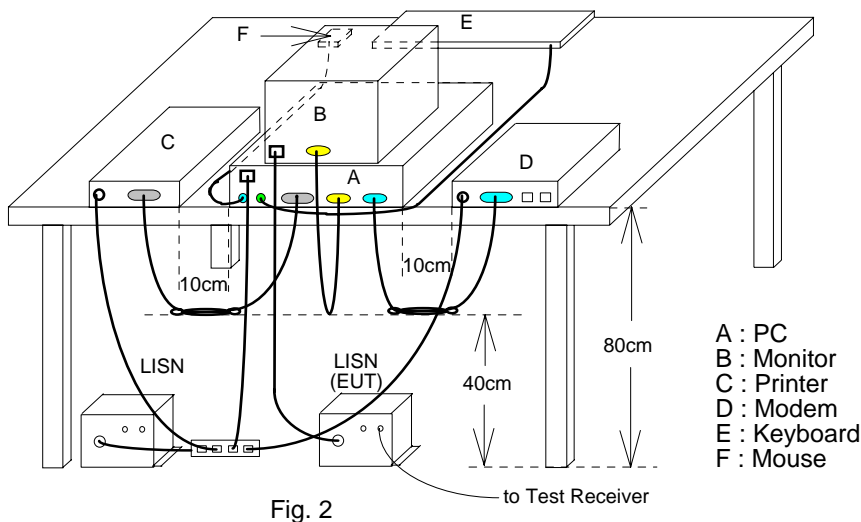
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## 6. CONDUCTED EMISSIONS TEST

### 6.1 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 frequency measured were complete.

### 6.2 Test SET-UP (Block Diagram of Configuration)



### 6.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013
EMI Receiver	R&S	ESCS 30	828985/004	09/23/2011	09/22/2012
LISN	Rolf-Heine	NNB-2/16Z	99012	03/23/2012	03/22/2013
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/23/2012	03/22/2013
Coaxial Cables	N/A	WK CE Cable	N/A	01/05/2012	01/04/2013

### 6.4 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:** Refer to next page for measurement data and plots.

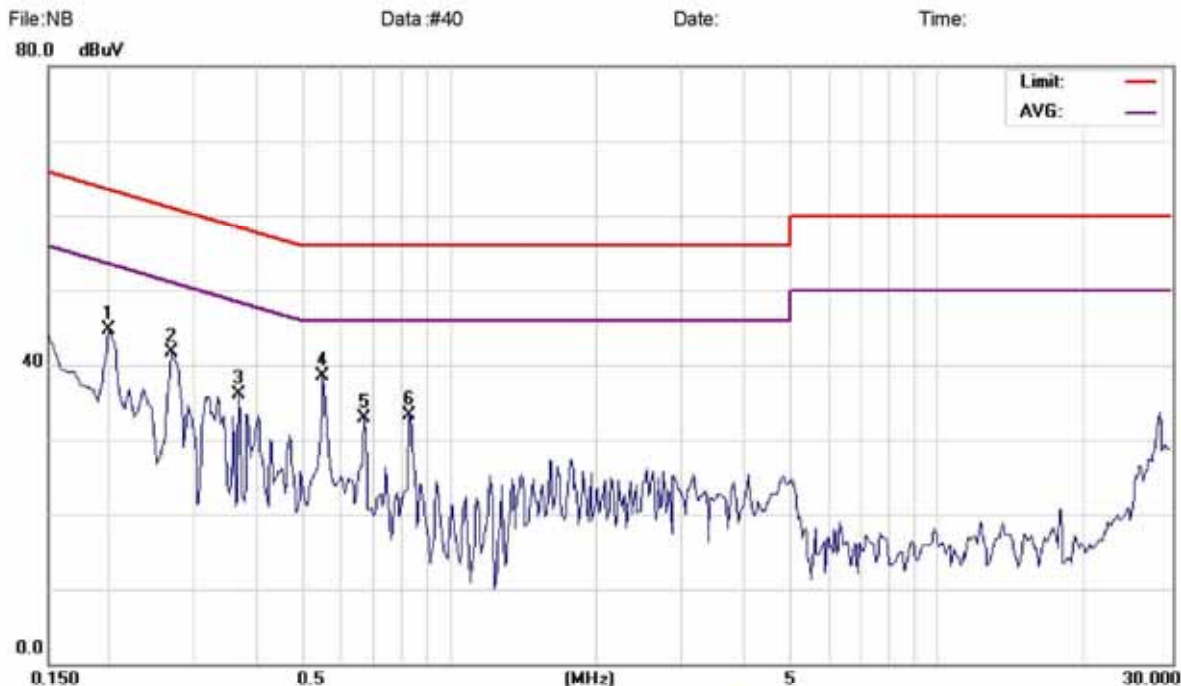
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### AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Operation Mode			Test Date:	Sep. 10, 2012
Temperature:	26	Humidity:	59 %	Test By:	Jazz



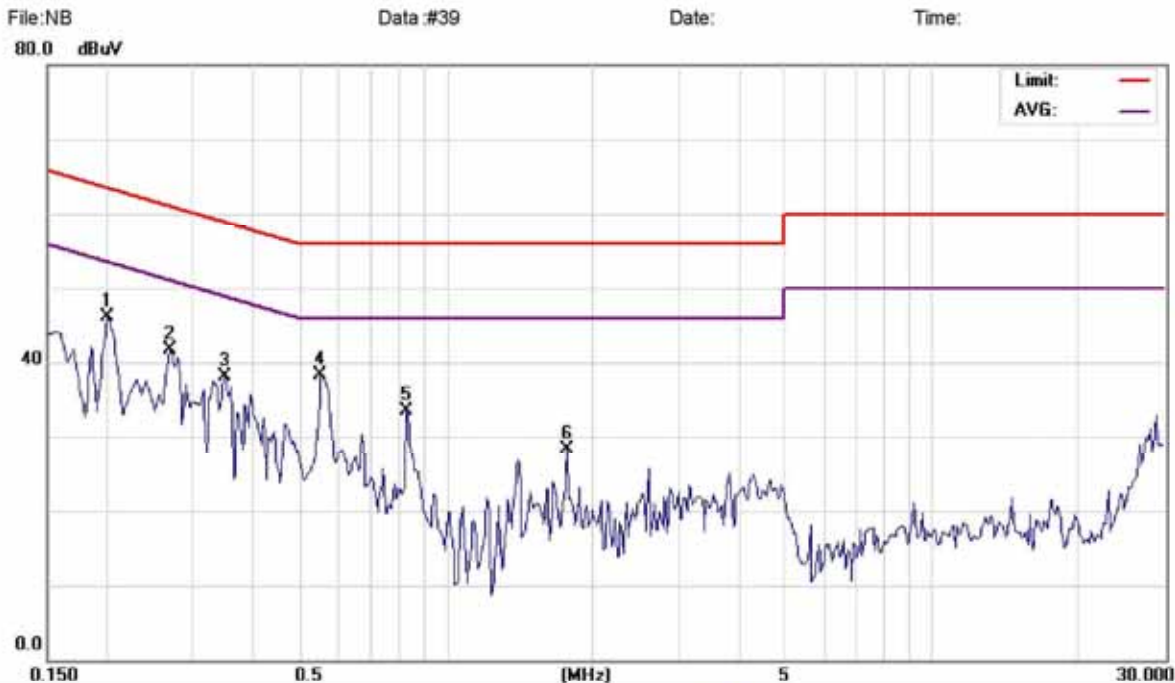
Site: ConductionRoom Phase: L1 Temperature: 24 °C  
 Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60%  
 EUT: ZigBee Distance:  
 M/N: DFZM-TS220  
 Mode: Operationmode  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.2000	44.55	0.12	44.67	63.61	-18.94	peak	
2		0.2700	41.56	0.12	41.68	61.12	-19.44	peak	
3		0.3700	35.98	0.12	36.10	58.50	-22.40	peak	
4	*	0.5500	38.37	0.12	38.49	56.00	-17.51	peak	
5		0.6700	32.81	0.12	32.93	56.00	-23.07	peak	
6		0.8300	33.10	0.12	33.22	56.00	-22.78	peak	

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File:NB Data:#39 Date: Time:  
 Site: ConductionRoom Phase: **N** Temperature: 24 °C  
 Limit: FCC Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 60%  
 EUT: ZigBee Distance:  
 M/N: DFZM-TS220  
 Mode: Operationmode  
 Note:

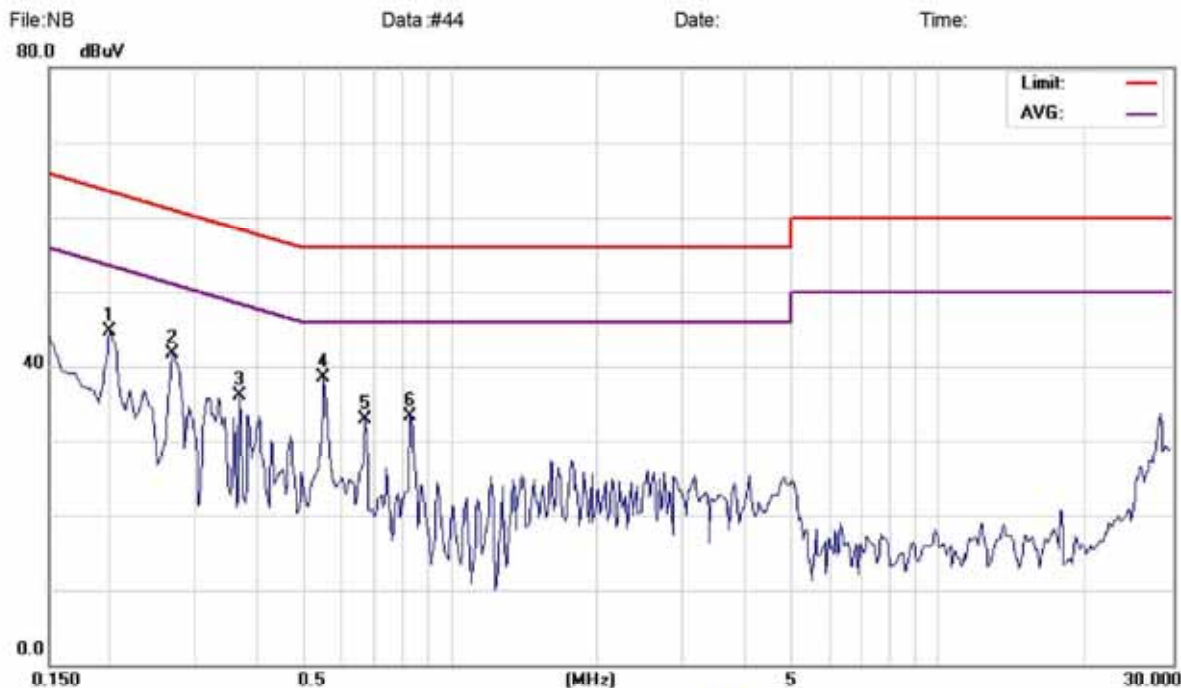
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.2000	45.98	0.13	46.11	63.61	-17.50	peak	
2		0.2700	41.48	0.13	41.61	61.12	-19.51	peak	
3		0.3500	38.05	0.12	38.17	58.96	-20.79	peak	
4		0.5500	38.17	0.12	38.29	56.00	-17.71	peak	
5		0.8300	33.28	0.13	33.41	56.00	-22.59	peak	
6		1.7800	28.06	0.15	28.21	56.00	-27.79	peak	

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Operation Mode:	Operation Mode			Test Date:	Sep. 10, 2012
Temperature:	26	Humidity:	59 %	Test By:	Jazz



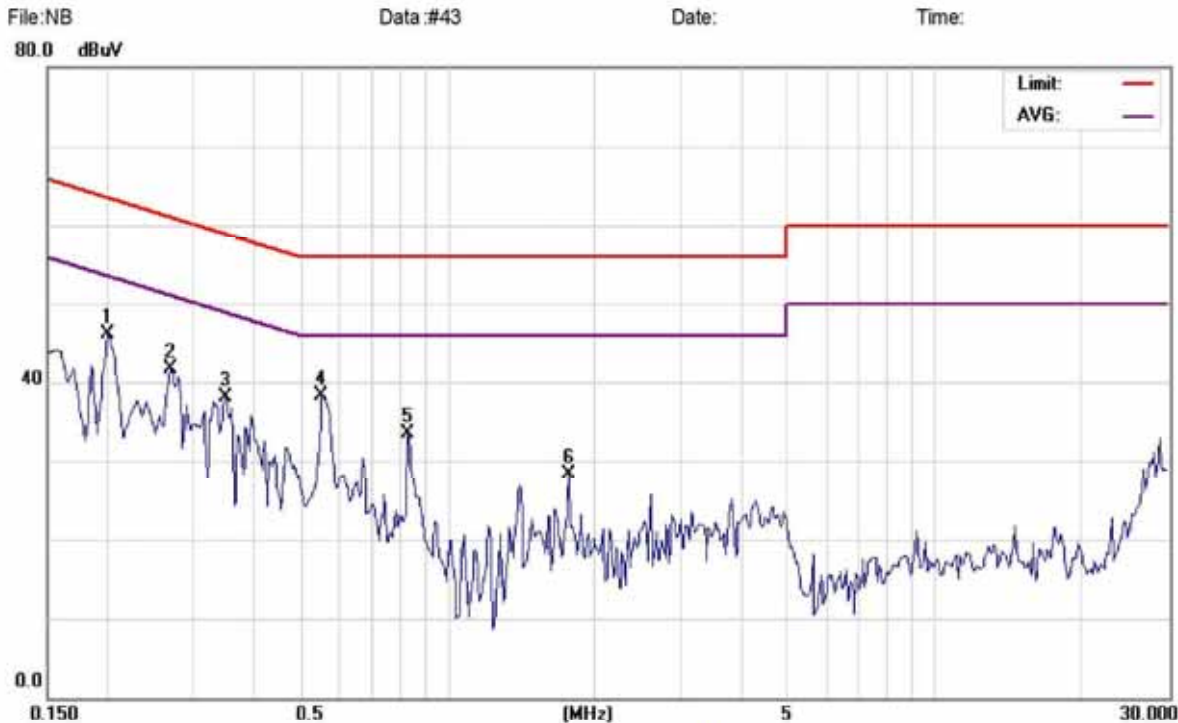
Site	ConductionRoom	Phase:	L1	Temperature:	24 °C
Limit:	FCC Class B Conduction(QP)	Power:	AC 120V/60Hz	Humidity:	60%
EUT:	ZigBee	Distance:			
M/N:	DFZM-TS221				
Mode:	Operationmode				
Note:					

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1		0.2000	44.55	0.12	44.67	63.61	-18.94	peak	
2		0.2700	41.56	0.12	41.68	61.12	-19.44	peak	
3		0.3700	35.98	0.12	36.10	58.50	-22.40	peak	
4	*	0.5500	38.37	0.12	38.49	56.00	-17.51	peak	
5		0.6700	32.81	0.12	32.93	56.00	-23.07	peak	
6		0.8300	33.10	0.12	33.22	56.00	-22.78	peak	

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Site: ConductionRoom  
 Phase: N  
 Temperature: 24 °C  
 Limit: FCC Class B Conduction(QP)  
 Power: AC 120V/60Hz  
 Humidity: 60%  
 EUT: ZigBee  
 Distance:  
 M/N: DFZM-TS221  
 Mode: Operationmode  
 Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.2000	45.98	0.13	46.11	63.61	-17.50	peak	
2		0.2700	41.48	0.13	41.61	61.12	-19.51	peak	
3		0.3500	38.05	0.12	38.17	58.96	-20.79	peak	
4		0.5500	38.17	0.12	38.29	56.00	-17.71	peak	
5		0.8300	33.28	0.13	33.41	56.00	-22.59	peak	
6		1.7800	28.06	0.15	28.21	56.00	-27.79	peak	

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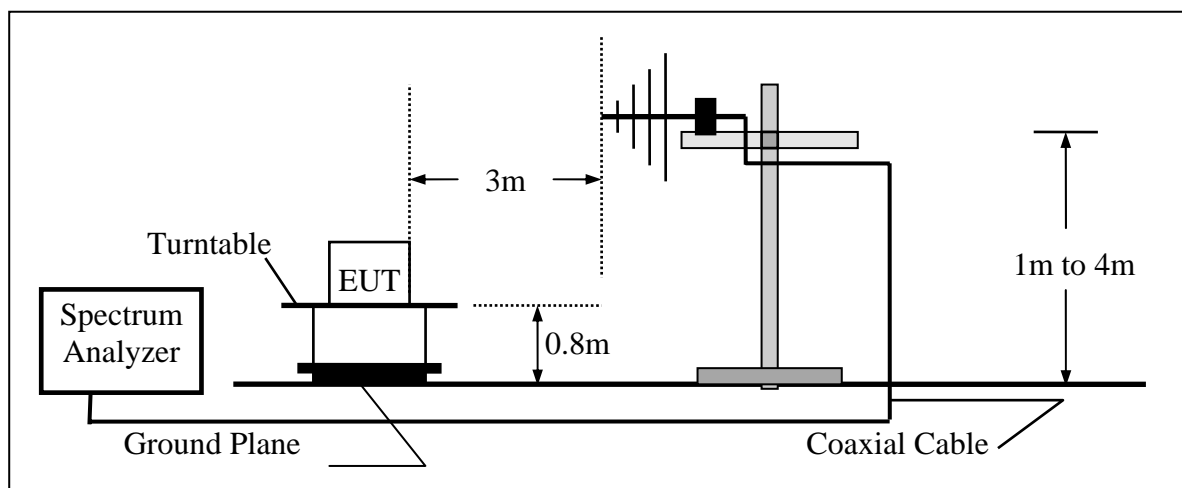
## 7. RADIATED EMISSION TEST

### 7.1 Measurement Procedure

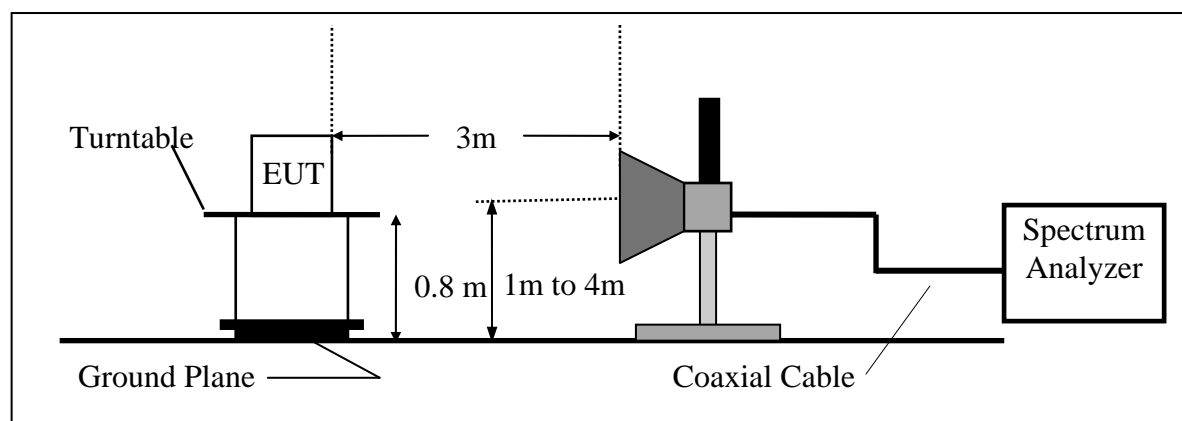
1. The EUT was placed on a turntable that is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

### 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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### 7.3 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCI7	100759	05/20/2011	05/19/2013
Spectrum Analyzer	Agilent	E4446A	MY51100003	04/15/2011	04/14/2013
EXA Spectrum Analyzer	Agilent	N9010A	MY50420195	02/15/2011	02/14/2013
Spectrum Analyzer	R&S	FSV-30	101398	10/18/2011	10/17/2013
Bilog Antenna	SCHWAZBECK	VULB9168	378	01/10/2012	01/09/2014
Horn antenna	ETS.LINDGREN	3117	123995	05/19/2011	05/18/2013
Horn Antenna	Schwarzbeck	BBHA9170	185	07/11/2011	07/10/2013
Pre-Amplifier	Agilent	8447D	2944A07676	01/04/2012	01/03/2013
Pre-Amplifier	EMC Instruments Corp.	EMC0126530	980038	01/04/2012	01/03/2013
Filter 2400-2483.5 MHz	EWT	EWT-14-0166	M2	02/28/2012	02/28/2013
Attenuator	Mini-Circuit	BW-S10W2+	004	02/28/2012	02/27/2013
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	Huber Suhner	966_Rx	9	01/04/2012	01/03/2013
3m Site NSA	SGS	966 chamber	N/A	07/15/2012	07/14/2013

### 7.4 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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## 7.5 Measurement Result

### Radiated Spurious Emission Measurement Result (DFZM-TS220)

EUT Model	:DFZM-TS220		
Operation Band	:ZigBee	Test Date	:2012-08-31
Fundamental Frequency	:2405MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX LOW MAIN	Engineer	:Jazz
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
2405.00	F	Average	42.12	4.67	46.79	94.00	-47.21
2405.00	F	Peak	86.02	4.67	90.69	114.00	-23.31

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2405MHz	Engineer	:Jazz
Operation Mode	:TX LOW MAIN	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2405.00	F	Average	42.06	5.33	47.39	94.00	-46.61
2405.00	F	Peak	84.73	5.33	90.06	114.00	-23.94

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2440MHz	Engineer	:Jazz
Operation Mode	:TX MID MAIN	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
2440.00	F	Average	42.14	4.85	46.99	94.00	-47.01
2440.00	F	Peak	86.45	4.85	91.30	114.00	-22.70

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2440MHz	Engineer	:Jazz
Operation Mode	:TX MID MAIN	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2440.00	F	Average	41.81	5.70	47.51	94.00	-46.49
2440.00	F	Peak	82.94	5.70	88.64	114.00	-25.36

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480MHz	Engineer	:Jazz
Operation Mode	:TX HIGH MAIN	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
2480.00	F	Average	42.19	5.23	47.42	94.00	-46.58
2480.00	F	Peak	85.54	5.23	90.77	114.00	-23.23

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480MHz	Engineer	:Jazz
Operation Mode	:TX HIGH MAIN	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2480.00	F	Average	41.70	6.25	47.95	94.00	-46.05
2480.00	F	Peak	79.56	6.25	85.81	114.00	-28.19

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2405 MHz	Engineer	:Jazz
Operation Mode	:BAND EDGE LOW	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
2366.43	S	Average	32.82	4.72	37.54	54.00	-16.46
2366.43	S	Peak	46.75	4.72	51.47	74.00	-22.53
2390.00	E	Average	32.80	4.68	37.48	54.00	-16.52
2390.00	E	Peak	45.45	4.68	50.13	74.00	-23.87

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2405 MHz	Engineer	:Jazz
Operation Mode	:BAND EDGE LOW	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2352.35	S	Average	32.88	5.11	37.99	54.00	-16.01
2352.35	S	Peak	46.55	5.11	51.66	74.00	-22.34
2390.00	E	Average	32.72	5.30	38.02	54.00	-15.98
2390.00	E	Peak	45.50	5.30	50.80	74.00	-23.20

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480MHz	Engineer	:Jazz
Operation Mode	:BAND EDGE HIGH	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
2483.50	E	Average	32.81	5.26	38.07	54.00	-15.93
2483.50	E	Peak	48.22	5.26	53.48	74.00	-20.52
2515.50	S	Average	32.53	5.27	37.80	54.00	-16.20
2515.50	S	Peak	46.77	5.27	52.04	74.00	-21.96

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480MHz	Engineer	:Jazz
Operation Mode	:BAND EDGE HIGH	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2483.50	E	Average	32.62	6.29	38.91	54.00	-15.09
2483.50	E	Peak	44.45	6.29	50.74	74.00	-23.26
2517.60	S	Average	32.50	6.23	38.73	54.00	-15.27
2517.60	S	Peak	46.19	6.23	52.42	74.00	-21.58

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### Radiated Spurious Emission Measurement Result (DFZM-TS221)

EUT Model	:DFZM-TS221		
Operation Band	:ZigBee	Test Date	:2012-08-31
Fundamental Frequency	:2405MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX LOW MAIN	Engineer	:Jazz
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
2405.00	F	Average	86.35	4.65	91.00	94.00	-3.00
2405.00	F	Peak	90.30	4.65	94.95	114.00	-19.05

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2405MHz	Engineer	:Jazz
Operation Mode	:TX LOW MAIN	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2405.00	F	Average	87.11	5.33	92.44	94.00	-1.56
2405.00	F	Peak	92.99	5.33	98.32	114.00	-15.68

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2441MHz	Engineer	:Jazz
Operation Mode	:TX MID MAIN	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
2441.00	F	Average	84.37	4.85	89.22	94.00	-4.78
2441.00	F	Peak	89.70	4.85	94.55	114.00	-19.45

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2440MHz	Engineer	:Jazz
Operation Mode	:TX MID MAIN	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2441.00	F	Average	86.59	5.70	92.29	94.00	-1.71
2441.00	F	Peak	91.01	5.70	96.71	114.00	-17.29

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480MHz	Engineer	:Jazz
Operation Mode	:TX HIGH MAIN	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
2480.00	F	Average	83.07	5.24	88.31	94.00	-5.69
2480.00	F	Peak	88.24	5.24	93.48	114.00	-20.52

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480MHz	Engineer	:Jazz
Operation Mode	:TX HIGH MAIN	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2480.00	F	Average	83.50	6.24	89.74	94.00	-4.26
2480.00	F	Peak	89.07	6.24	95.31	114.00	-18.69

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2405MHz	Engineer	:Jazz
Operation Mode	:BANDEDGE LOW	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
2390.00	E	Average	29.79	4.68	34.47	54.00	-19.53
2390.00	E	Peak	41.53	4.68	46.21	74.00	-27.79

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2405MHz	Engineer	:Jazz
Operation Mode	:BANDEDGE LOW	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2390.00	E	Average	31.27	5.30	36.57	54.00	-17.43
2390.00	E	Peak	41.90	5.30	47.20	74.00	-26.80

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480MHz	Engineer	:Jazz
Operation Mode	: BANDEDGE HIGH	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
2483.50	E	Average	43.81	5.26	49.07	54.00	-4.93
2483.50	E	Peak	54.50	5.26	59.76	74.00	-14.24

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480MHz	Engineer	:Jazz
Operation Mode	:BANDEDGE HIGH	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
2483.50	E	Average	43.80	6.29	50.09	54.00	-3.91
2483.50	E	Peak	54.15	6.29	60.44	74.00	-13.56

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### Radiated Spurious Emission Measurement Result (DFZM-TS220)

EUT Model	:DFZM-TS220		
Operation Band	:ZigBee	Test Date	:2012-08-31
Fundamental Frequency	:2405 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX LOW	Engineer	:Jazz
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
48.43	S	Peak	50.04	-13.88	36.16	40.00	-3.84
108.57	S	Peak	55.22	-15.90	39.32	43.50	-4.18
499.48	S	Peak	37.06	-9.60	27.46	46.00	-18.54
533.43	S	Peak	39.87	-8.92	30.95	46.00	-15.05
798.24	S	Peak	32.86	-4.22	28.64	46.00	-17.36
929.19	S	Peak	33.31	-2.29	31.02	46.00	-14.98
4810.00	H	Average	21.86	9.63	31.49	54.00	-22.51
4810.00	H	Peak	34.96	9.63	44.59	74.00	-29.41
7215.00	H	---					
9620.00	H	---					
12025.00	H	---					
14430.00	H	---					
16835.00	H	---					
19240.00	H	---					
21645.00	H	---					

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2405 MHz	Engineer	:Jazz
Operation Mode	:TX LOW	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
107.60	S	Peak	55.88	-16.01	39.87	43.50	-3.63
138.64	S	Peak	50.23	-13.20	37.03	43.50	-6.47
346.22	S	Peak	43.40	-11.73	31.67	46.00	-14.33
515.00	S	Peak	28.77	-9.30	19.47	46.00	-26.53
666.32	S	Peak	35.36	-6.27	29.09	46.00	-16.91
798.24	S	Peak	32.49	-4.22	28.27	46.00	-17.73
4810.00	H	Average	21.82	9.66	31.48	54.00	-22.52
4810.00	H	Peak	34.92	9.66	44.58	74.00	-29.42
7215.00	H	---					
9620.00	H	---					
12025.00	H	---					
14430.00	H	---					
16835.00	H	---					
19240.00	H	---					
21645.00	H	---					

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2440 MHz	Engineer	:Jazz
Operation Mode	:TX MID	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
48.43	S	Peak	50.13	-13.88	36.25	40.00	-3.75
107.60	S	Peak	56.44	-16.01	40.43	43.50	-3.07
495.60	S	Peak	37.09	-9.63	27.46	46.00	-18.54
530.52	S	Peak	39.14	-8.98	30.16	46.00	-15.84
799.21	S	Peak	30.21	-4.21	26.00	46.00	-20.00
933.07	S	Peak	32.10	-2.26	29.84	46.00	-16.16
4880.00	H	Average	21.52	10.16	31.68	54.00	-22.32
4880.00	H	Peak	34.60	10.16	44.76	74.00	-29.24
7320.00	H	---					
9760.00	H	---					
12200.00	H	---					
14640.00	H	---					
17080.00	H	---					
19520.00	H	---					
21960.00	H	---					

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2440 MHz	Engineer	:Jazz
Operation Mode	:TX MID	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
48.43	S	Peak	41.83	-13.88	27.95	40.00	-12.05
106.63	S	Peak	55.37	-16.09	39.28	43.50	-4.22
174.53	S	Peak	48.44	-13.76	34.68	43.50	-8.82
499.48	S	Peak	35.76	-9.60	26.16	46.00	-19.84
666.32	S	Peak	33.04	-6.27	26.77	46.00	-19.23
798.24	S	Peak	33.91	-4.22	29.69	46.00	-16.31
4880.00	H	Average	21.95	10.11	32.06	54.00	-21.94
4880.00	H	Peak	35.47	10.11	45.58	74.00	-28.42
7320.00	H	---					
9760.00	H	---					
12200.00	H	---					
14640.00	H	---					
17080.00	H	---					
19520.00	H	---					
21960.00	H	---					

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480 MHz	Engineer	:Jazz
Operation Mode	:TX HIGH	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
48.43	S	Peak	50.04	-13.88	36.16	40.00	-3.84
107.60	S	Peak	55.14	-16.01	39.13	43.50	-4.37
495.60	S	Peak	36.50	-9.63	26.87	46.00	-19.13
533.43	S	Peak	39.81	-8.92	30.89	46.00	-15.11
661.47	S	Peak	34.80	-6.35	28.45	46.00	-17.55
929.19	S	Peak	32.16	-2.29	29.87	46.00	-16.13
4960.00	H	Average	21.37	10.05	31.42	54.00	-22.58
4960.00	H	Peak	35.91	10.05	45.96	74.00	-28.04
7440.00	H	---					
9920.00	H	---					
12400.00	H	---					
14880.00	H	---					
17360.00	H	---					
19840.00	H	---					
22320.00	H	---					

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EUT Model	:DFZM-TS220	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480 MHz	Engineer	:Jazz
Operation Mode	:TX HIGH	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
107.60	S	Peak	56.75	-16.01	40.74	43.50	-2.76
139.61	S	Peak	51.45	-13.13	38.32	43.50	-5.18
495.60	S	Peak	35.35	-9.63	25.72	46.00	-20.28
667.29	S	Peak	32.31	-6.25	26.06	46.00	-19.94
798.24	S	Peak	34.91	-4.22	30.69	46.00	-15.31
960.23	S	Peak	30.13	-2.06	28.07	54.00	-25.93
4960.00	H	Average	21.79	9.90	31.69	54.00	-22.31
4960.00	H	Peak	33.66	9.90	43.56	74.00	-30.44
7440.00	H	---					
9920.00	H	---					
12400.00	H	---					
14880.00	H	---					
17360.00	H	---					
19840.00	H	---					
22320.00	H	---					

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### Radiated Spurious Emission Measurement Result (DFZM-TS221)

EUT Model	:DFZM-TS221		
Operation Band	:ZigBee	Test Date	:2012-08-31
Fundamental Frequency	:2405 MHz	Temp./Humi.	:27.7 deg_C / 62 RH
Operation Mode	:TX LOW	Engineer	:Jazz
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
48.43	S	Peak	45.96	-13.88	32.08	40.00	-7.92
142.52	S	Peak	44.79	-12.89	31.90	43.50	-11.60
499.48	S	Peak	36.77	-9.60	27.17	46.00	-18.83
531.49	S	Peak	35.15	-8.97	26.18	46.00	-19.82
621.70	S	Peak	34.38	-7.09	27.29	46.00	-18.71
798.24	S	Peak	30.93	-4.22	26.71	46.00	-19.29
4810.00	H	Average	22.88	9.61	32.49	54.00	-21.51
4810.00	H	Peak	35.77	9.61	45.38	74.00	-28.62
7215.00	H	---					
9620.00	H	---					
12025.00	H	---					
14430.00	H	---					
16835.00	H	---					
19240.00	H	---					
21645.00	H	---					

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2405 MHz	Engineer	:Jazz
Operation Mode	:TX LOW	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
48.43	S	Peak	40.18	-13.88	26.30	40.00	-13.70
139.61	S	Peak	42.46	-13.13	29.33	43.50	-14.17
288.02	S	Peak	44.05	-12.86	31.19	46.00	-14.81
495.60	S	Peak	33.68	-9.63	24.05	46.00	-21.95
671.17	S	Peak	29.80	-6.17	23.63	46.00	-22.37
796.30	S	Peak	36.12	-4.24	31.88	46.00	-14.12
4810.00	H	Average	22.05	9.64	31.69	54.00	-22.31
4810.00	H	Peak	35.24	9.64	44.88	74.00	-29.12
7215.00	H	---					
9620.00	H	---					
12025.00	H	---					
14430.00	H	---					
16835.00	H	---					
19240.00	H	---					
21645.00	H	---					

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2440 MHz	Engineer	:Jazz
Operation Mode	:TX MID	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
48.43	S	Peak	46.01	-13.88	32.13	40.00	-7.87
138.64	S	Peak	43.55	-13.20	30.35	43.50	-13.15
499.48	S	Peak	37.32	-9.60	27.72	46.00	-18.28
532.46	S	Peak	36.79	-8.95	27.84	46.00	-18.16
680.87	S	Peak	31.16	-6.02	25.14	46.00	-20.86
798.24	S	Peak	30.38	-4.22	26.16	46.00	-19.84
4880.00	H	Average	22.76	10.16	32.92	54.00	-21.08
4880.00	H	Peak	36.50	10.16	46.66	74.00	-27.34
7320.00	H	---					
9760.00	H	---					
12200.00	H	---					
14640.00	H	---					
17080.00	H	---					
19520.00	H	---					
21960.00	H	---					

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2440 MHz	Engineer	:Jazz
Operation Mode	:TX MID	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
48.43	S	Peak	39.64	-13.88	25.76	40.00	-14.24
141.55	S	Peak	43.81	-12.98	30.83	43.50	-12.67
291.90	S	Peak	43.47	-12.76	30.71	46.00	-15.29
384.05	S	Peak	39.91	-11.23	28.68	46.00	-17.32
499.48	S	Peak	34.51	-9.60	24.91	46.00	-21.09
797.27	S	Peak	31.70	-4.24	27.46	46.00	-18.54
4880.00	H	Average	21.92	10.11	32.03	54.00	-21.97
4880.00	H	Peak	34.58	10.11	44.69	74.00	-29.31
7320.00	H	---					
9760.00	H	---					
12200.00	H	---					
14640.00	H	---					
17080.00	H	---					
19520.00	H	---					
21960.00	H	---					

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480 MHz	Engineer	:Jazz
Operation Mode	:TX HIGH	Measurement Antenna Pol.	:VERTICAL
EUT Pol.	:E2 PLAN		

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
48.43	S	Peak	46.46	-13.88	32.58	40.00	-7.42
137.67	S	Peak	45.51	-13.28	32.23	43.50	-11.27
480.08	S	Peak	37.04	-9.81	27.23	46.00	-18.77
531.49	S	Peak	34.59	-8.97	25.62	46.00	-20.38
661.47	S	Peak	32.78	-6.35	26.43	46.00	-19.57
935.98	S	Peak	33.51	-2.23	31.28	46.00	-14.72
4960.00	H	Average	25.64	10.04	35.68	54.00	-18.32
4960.00	H	Peak	36.57	10.04	46.61	74.00	-27.39
7440.00	H	---					
9920.00	H	---					
12400.00	H	---					
14880.00	H	---					
17360.00	H	---					
19840.00	H	---					
22320.00	H	---					

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EUT Model	:DFZM-TS221	Test Date	:2012-08-31
Operation Band	:ZigBee	Temp./Humi.	:27.7 deg_C / 62 RH
Fundamental Frequency	:2480 MHz	Engineer	:Jazz
Operation Mode	:TX HIGH	Measurement Antenna Pol.	:HORIZONTAL
EUT Pol.	:E2 PLAN		

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
48.43	S	Peak	40.15	-13.88	26.27	40.00	-13.73
141.55	S	Peak	42.94	-12.98	29.96	43.50	-13.54
284.14	S	Peak	43.60	-12.94	30.66	46.00	-15.34
384.05	S	Peak	39.71	-11.23	28.48	46.00	-17.52
495.60	S	Peak	34.77	-9.63	25.14	46.00	-20.86
799.21	S	Peak	32.21	-4.21	28.00	46.00	-18.00
4960.00	H	Average	22.18	9.89	32.07	54.00	-21.93
4960.00	H	Peak	35.65	9.89	45.54	74.00	-28.46
7440.00	H	---					
9920.00	H	---					
12400.00	H	---					
14880.00	H	---					
17360.00	H	---					
19840.00	H	---					
22320.00	H	---					

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## 8. 20 dB BAND WIDTH MEASUREMENT

### 8.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set ETU normal operating mode.
3. Set SPA Center Frequency = fundamental frequency, RBW = 100kHz, VBW = 300kHz, Span = 5MHz.
4. Set SPA Max hold. Mark peak, -20dB.

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

Same as 7.2 Radiated Emission Measurement.

### 8.3 Measurement Equipment Used:

Same as 7.3 Radiated Emission Measurement.

### 8.4 Measurement Results:

2405 Channel = 2.821MHz

2440 Channel = 2.813MHz

2480 Channel = 2.825MHz

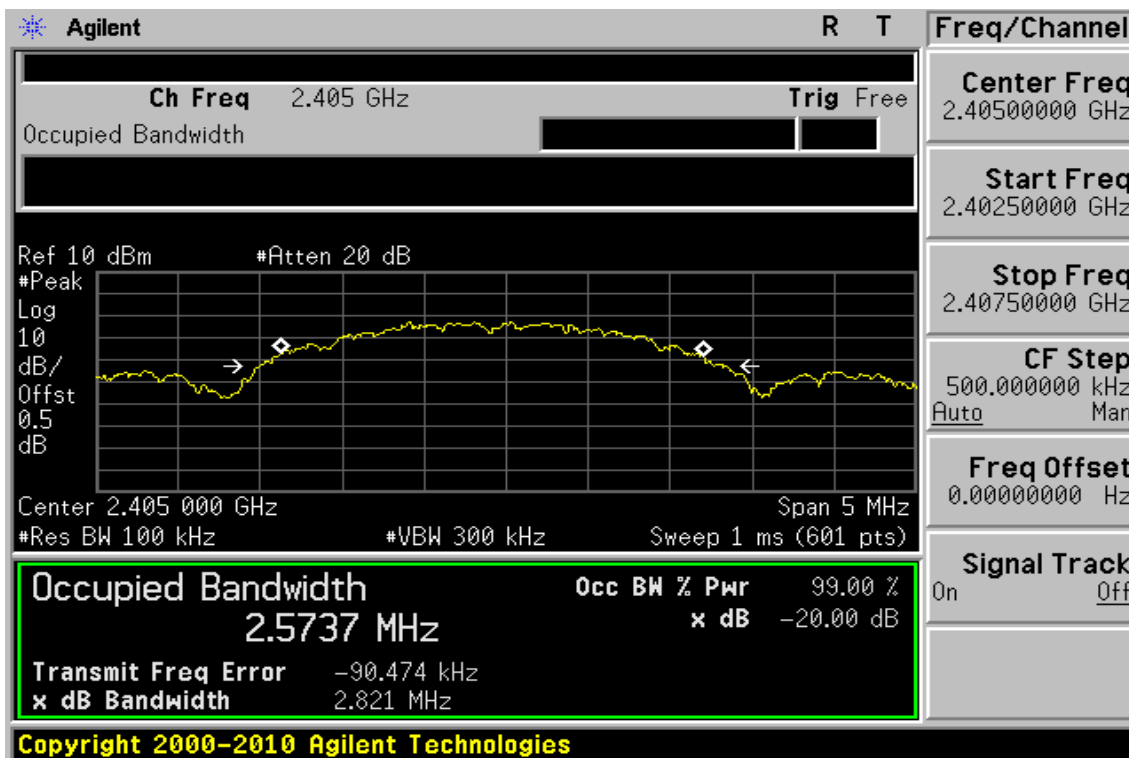
Refer to attached data chart.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

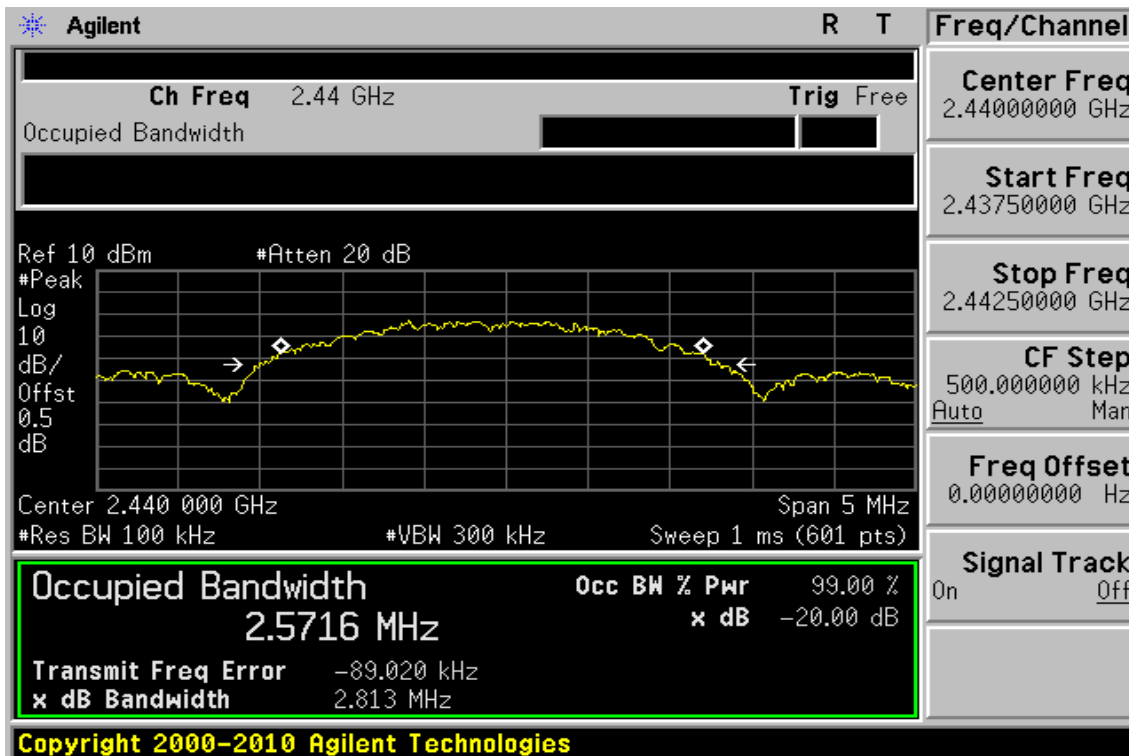
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**20dB Bandwidth Test Data CH-Low**



**20dB Bandwidth Test Data CH-Mid**

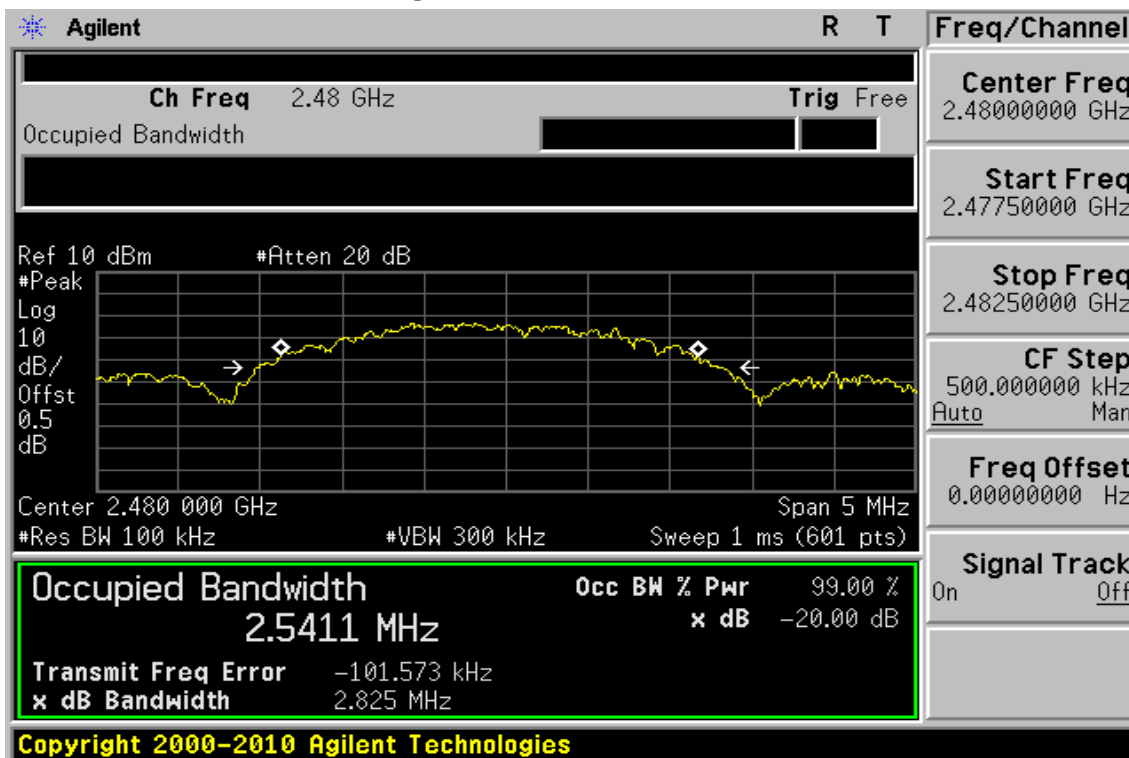


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**20dB Bandwidth Test Data CH-High**



~ End of Report ~

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