

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name: Data Collection Terminal
Brand Name: unitech
Model No.: RH768
Model Differences: N/A
FCC ID: HLERH768BTGF
Report No.: EF/2011/B0017
Issue Date: Dec. 27, 2011
FCC Rule Part: §15.247, Cat: DSS
Prepared for: unitech electronics co., ltd.
5F, No. 136, Lane 235, Pao-Chiao Rd.,
Hsin-Tien Dist., New Taipei City, Taiwan
Prepared by: SGS Taiwan Ltd.
Electronics & Communication Laboratory
No. 134, Wu Kung Rd., Wuku Industrial Zone,
Taipei County, Taiwan



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VERIFICATION OF COMPLIANCE

Applicant: unitech electronics co., ltd.
5F, No. 136, Lane 235, Pao-Chiao Rd., Hsin-Tien Dist.,
New Taipei City, Taiwan

Product Name: Data Collection Terminal

Brand Name: unitech

Model No.: RH768

Model Different: N/A

FCC ID: HLERH768BTGF

File Number: EF/2011/B0017

Date of test: Nov. 21 2011 ~ Dec. 26, 2011

Date of EUT Received: Nov. 21 2011

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd. 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 15.247.

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

Test By:

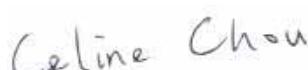


Date:

Dec. 27, 2011

Jay Lin / Engineer

Prepared By:

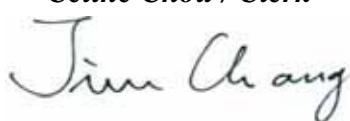


Date:

Dec. 27, 2011

Celine Chou / Clerk

Approved By:



Date:

Dec. 27, 2011

Jim Chang / Supervisor

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Version

Version No.	Date	Description
00	Dec. 27, 2011	Initial creation of document

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1. GENERAL INFORMATION

General:

Product Name:	Data Collection Terminal	
Brand Name:	unitech	
Model No.:	RH768	
Model Difference:	N/A	
Data Cable:	Model No.: 1550-602714G, Supplier: SINBON	
Power Supply:	7.4Vdc Lithium Ion battery or 12Vdc by AC/DC power adapter	
	Battery:	Model No.: 1400-900006G, Supplier: Joules Miles Co., Ltd Model No.: 204052G, Supplier: HELIX CO., LTD.
	Adapter:	Model No.: 3A-242DB12, Supplier: ENG ELECTRONICS CO., LTD.

RFID:

Frequency Range:	902.75 – 927.25MHz
Channel number:	50 channels
Modulation type:	DSB, SSB and PR-ASK
Transmit Power:	18.87 dBm (Peak)
Dwell Time:	<= 0.4s
Operating Mode:	Point-to-Point
Antenna Designation:	Patch Antenna / Gain: 3dBi

This test report applies for RFID function.

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1.1. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: HLERH768BTGF** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a Doc procedure.

1.2. 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.

Tested in accordance with FCC Public Notice DA 00-705

1.3. 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.

1.4. Special Accessories

Not available for this EUT intended for grant.

1.5. 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 EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Emissions

The EUT is placed on a 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 placed on a 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 and 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. according to the requirements in Section 8 and 13 and Subclause 8.3.1.2 of ANSI C63.4: 2003.

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2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

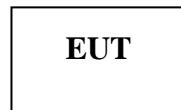


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Data Cable	Power Cord
1.	N/A					

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3. SUMMARY OF TEST RESULTS

FCC Rules	Description Of Test	Result
§15.207(a)	Conducted Emission	Compliant
§15.247(b)(1)(i)	Peak Output Power	Compliant
§15.247(a)	20dB Bandwidth	No Limit
§15.247(d)	100 KHz Bandwidth Of Frequency Band Edges	Compliant
§15.209(a) (f)	Spurious Emission	Compliant
§15.247(a)(1)	Frequency Separation	Compliant
§15.247(a)(1)(i)	Number of hopping frequency	Compliant
§15.247(a)(1)(iii)	Time of Occupancy	Compliant
§15.203	Antenna Requirement	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 receiving mode is programmed.

Channel low (902.75MHz)、mid (914.75MHz) and high (927.25MHz) are chosen for full testing.

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

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5. CONDUCTED EMISSION TEST

5.1. Standard Applicable

According to §15.207. frequency 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

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

5.2. EUT Setup

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4: 2003.
2. The EUT was plug-in the AC/DC Power adapter. The host system was placed on the center of the back edge on the test table. The peripherals was placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The spacing between the peripherals was 10 centimeters.
4. External I/O cables were draped along the edge of the test table and bundle when necessary.
5. The host system was connected with 120Vac/60Hz power source.

5.3. 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.

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5.4. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCS30	828985/004	09/23/2010	09/22/2012
LISN	Rolf-Heine	NNB-2/16Z	99012	03/31/2011	03/30/2012
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	03/31/2011	03/30/2012
Coaxial Cables	N/A	WK CE Cable	N/A	11/28/2011	11/27/2012

5.5. 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.

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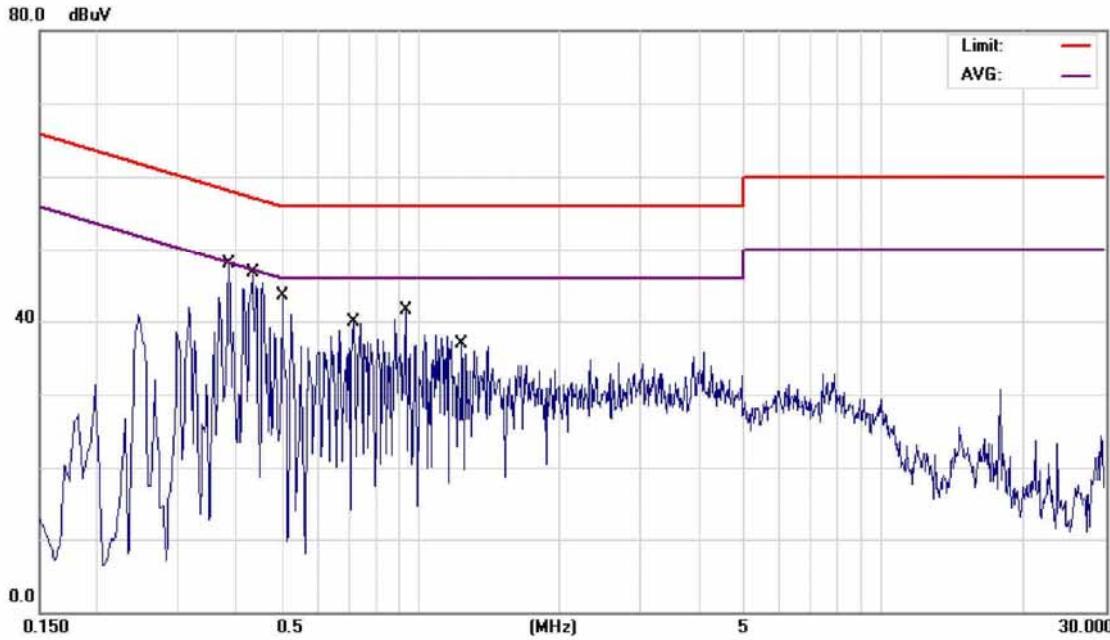
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AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	Bluetooth Mode			Test Date:	Dec. 14, 2011
Temperature:	23	Humidity:	58 %	Test By:	Jay



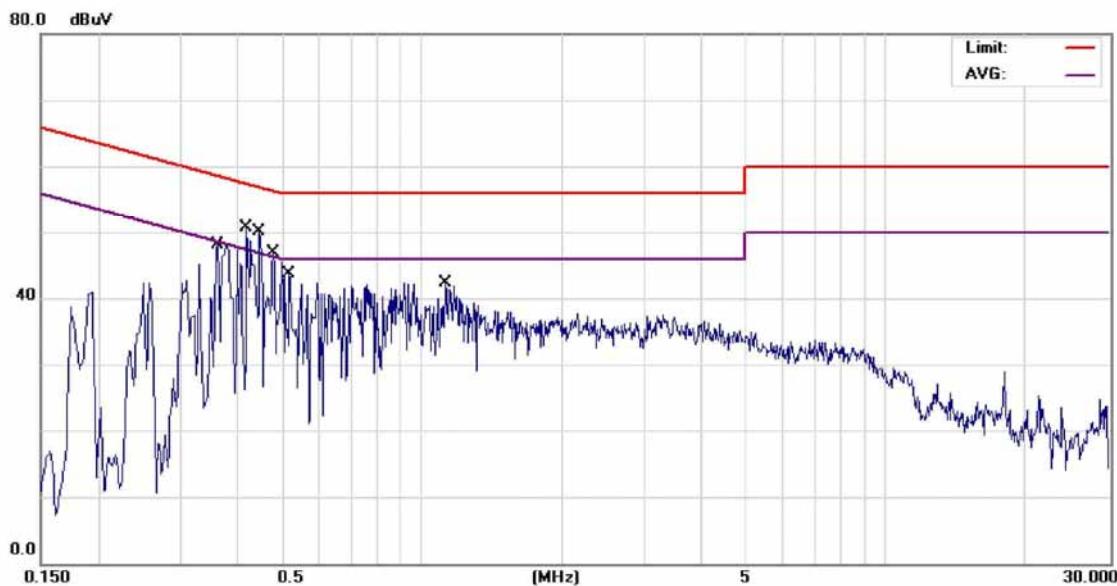
Site: SGS CONDUCTED #1	Phase: L1	Temperature: 26 °C
Limit: FCC Class B Conduction(QP)	Power: AC 110V/60Hz	Humidity: 59%
EUT: Data Collection Terminal	Distance:	Air Pressure: hpa
M/N: RH768		
Note: BT		

No.	Mk.	Freq. MHz	Reading Level dBuV	Factor dB	Measure- ment dBuV	Limit dB	Over	
							Detector	Comment
1	*	0.3860	47.76	0.12	47.88	58.15	-10.27	QP
2		0.4340	46.67	0.12	46.79	57.18	-10.39	QP
3		0.5020	43.30	0.12	43.42	56.00	-12.58	QP
4		0.7180	39.83	0.11	39.94	56.00	-16.06	QP
5		0.9300	41.46	0.11	41.57	56.00	-14.43	QP
6		1.2340	36.78	0.12	36.90	56.00	-19.10	QP

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Site: SGS CONDUCTED #1	Phase: N	Temperature: 26 °C
Limit: FCC Class B Conduction(QP)	Power: AC 110V/60Hz	Humidity: 59%
EUT: Data Collection Terminal	Distance:	Air Pressure: hpa
M/N: RH768		
Note: BT		

No.	Mk.	Freq.	Reading	Measure-	Limit	Over	Detector	Comment
			Level					
		MHz	dBuV	dB	dBuV	dB		
1		0.3620	48.00	0.16	48.16	58.68	-10.52	QP
2 *		0.4180	47.30	0.16	47.46	57.49	-10.03	QP
3		0.4180	31.52	0.16	31.68	47.49	-15.81	AVG
4		0.4460	46.29	0.16	46.45	56.95	-10.50	QP
5		0.4460	31.02	0.16	31.18	46.95	-15.77	AVG
6		0.4780	43.76	0.16	43.92	56.37	-12.45	QP
7		0.4780	29.36	0.16	29.52	46.37	-16.85	AVG
8		0.5180	43.50	0.16	43.66	56.00	-12.34	QP
9		1.1220	42.09	0.15	42.24	56.00	-13.76	QP

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6. PEAK OUTPUT POWER MEASUREMENT

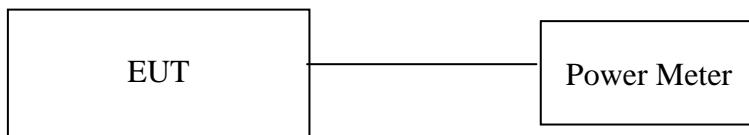
6.1. Standard Applicable

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of Section 15.247.

6.2. Measurement Equipment Used

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Power Sensor	Anritsu	MA2411B	917032	01/21/2010	01/20/2012
Power Meter	Anritsu	ML2495A	1005007	02/17/2010	02/16/2012
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2010	04/18/2012
Spectrum Analyzer	Agilent	E4440A	MY45304525	01/25/2011	01/24/2012
DC Block	Agilent	BLK-18	155452	07/05/2011	07/04/2012
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA	N/A	01/05/2011	01/04/2012
Attenuator	Mini-Circuit	BW-S6W5	001	01/05/2011	01/04/2012
Attenuator	Mini-Circuit	BW-S10W5	001	01/05/2011	01/04/2012
Attenuator	Mini-Circuit	BW-S20W5	001	01/05/2011	01/04/2012
Splitter	Agilent	11636B	N/A	01/05/2011	01/04/2012

6.3. Test Set-up:



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6.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter or spectrum. (Max peak function, >20dB bandwidth, \geq RBW)
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

6.5. Measurement Result

Peak Power

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
902.75	18.83	18.83	0.07638	1
914.75	18.87	18.87	0.07709	1
927.25	18.80	18.80	0.07586	1

Average Power

Frequency (MHz)	Reading Power (dBm)	Output Power (dBm)	Output Power (W)	Limit (W)
902.75	17.66	17.66	0.05834	1
914.75	17.48	17.48	0.05598	1
927.25	17.48	17.48	0.05598	1

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7. 20dB BAND WIDTH

7.1. Standard Applicable

For frequency hopping systems operating in the 902MHz - 928MHz no limit for 20dB bandwidth.

7.2. Measurement Equipment Used

Refer to section 6.2 for details.

7.3. Test Set-up

Refer to section 6.3 for details.

7.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=10KHz (1 % of Bandwidth.), VBW = 3*RBW, Span= 3MHz, Sweep=auto
4. Mark the peak frequency and -20dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

7.5. Measurement Result:

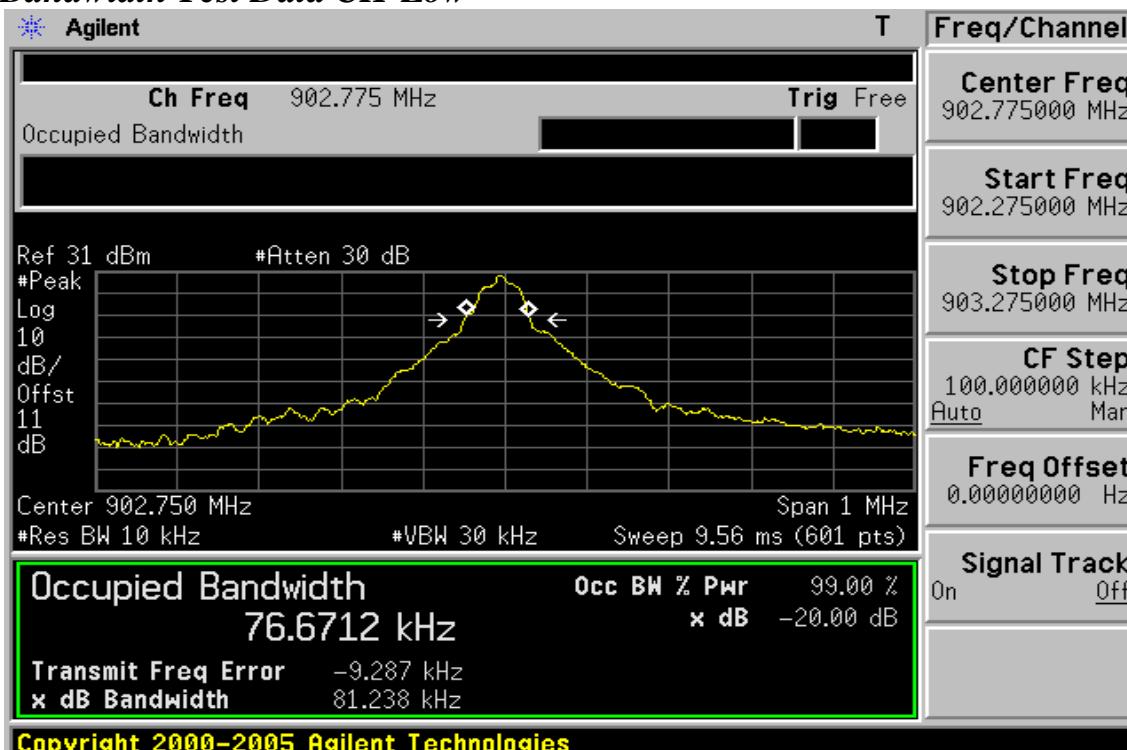
CH	Bandwidth (kHz)
Lower	81.238
Mid	79.928
Higher	80.968

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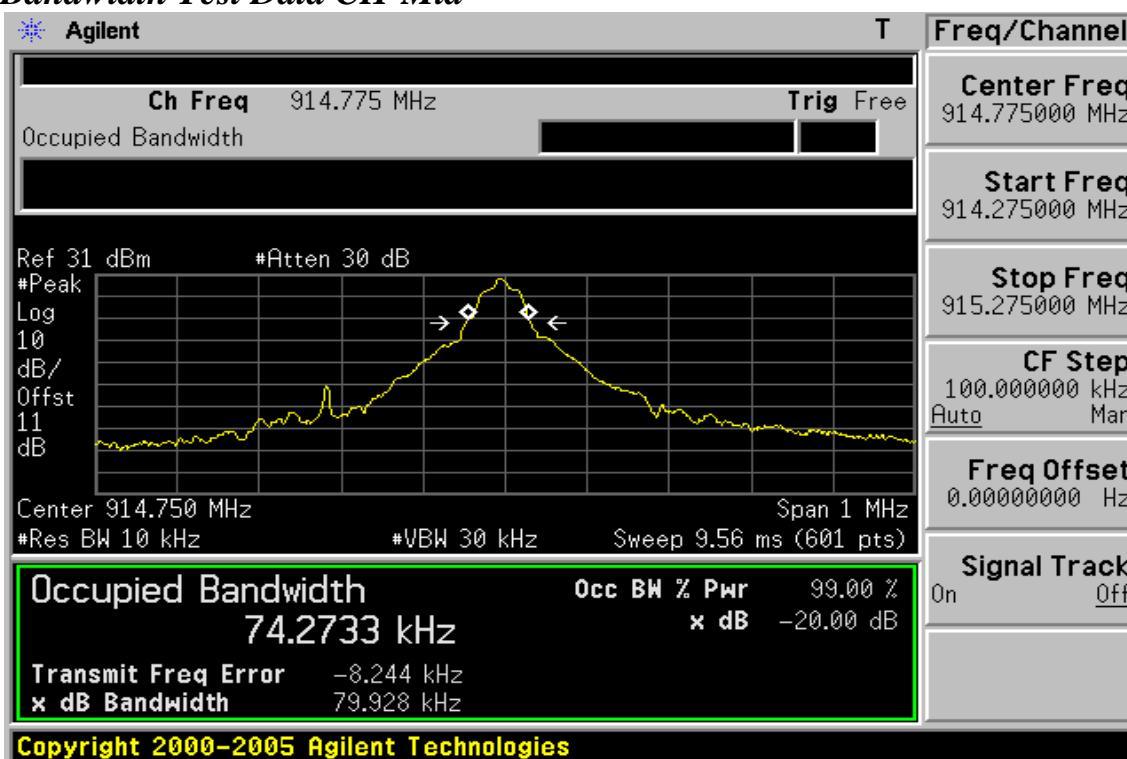
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20dB Bandwidth Test Data CH-Low



20dB Bandwidth Test Data CH-Mid



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20dB Bandwidth Test Data CH-High

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8. 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

8.1. Standard Applicable

According to §15.247(d), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in 15.209(a).

8.2. Measurement Equipment Used

8.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

8.2.2. Radiated emission:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP 40	100034	03/30/2011	03/29/2012
Bilog Antenna	SCHWAZBECK	VULB9160	3136	11/19/2011	11/18/2012
Horn antenna	SCHWAZBECK	BBHA 9120D	309/320	01/22/2010	01/21/2012
Pre-Amplifier	Agilent	8447D	1937A02834	11/28/2011	11/27/2012
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2011	01/04/2012
Radio Communication Analyzer	R & S	CMU200	102189	08/12/2010	08/11/2012
DC Block	Agilent	BLK-18	155452	01/05/2011	01/04/2012
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	SUCOFLEX 104PEA-10M	10m	01/05/2011	01/04/2012
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2011	01/04/2012
3m Site	SGS	966 chamber	N/A	07/15/2011	07/14/2012

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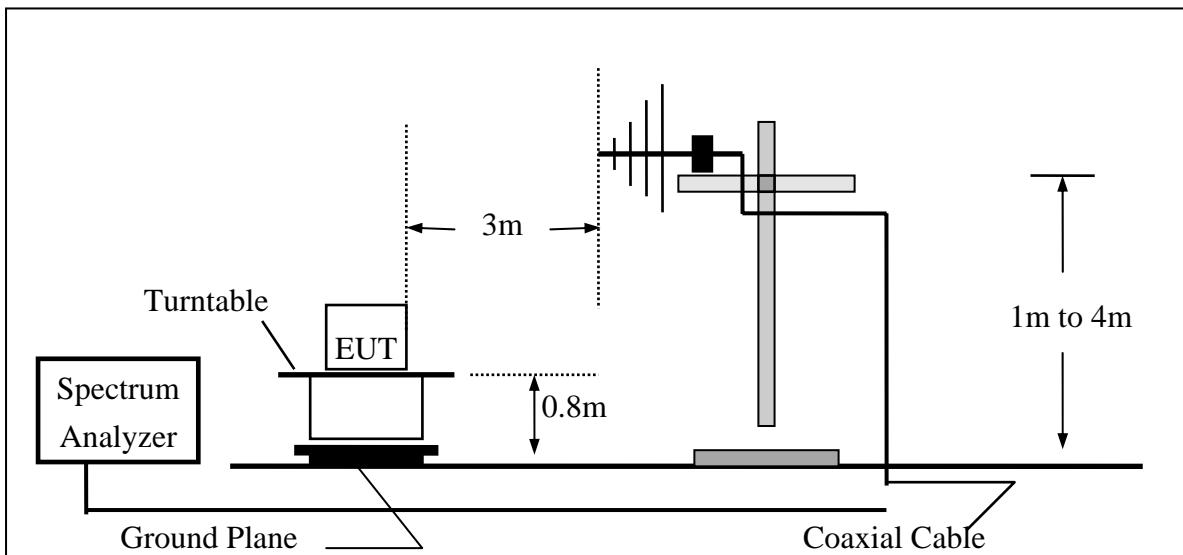
8.3. Test SET-UP:

8.3.1. Conducted Emission at antenna port:

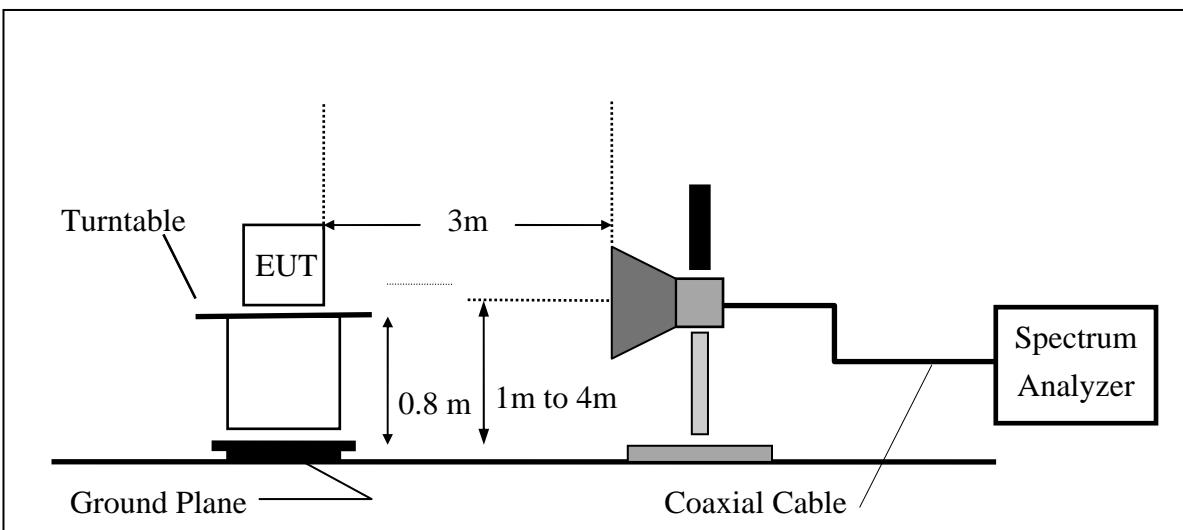
Refer to section 6.3 for details.

8.3.2. Radiated emission:

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



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



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8.4. Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=3MHz, Sweep = auto
5. Mark Peak, 902MHz – 902.765MHz and 927.26MHz – 928MHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.
7. Radiated Emission refer to section 9.

8.5. 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:

$$FS = RA + AF - AG$$

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

8.6. Measurement Result

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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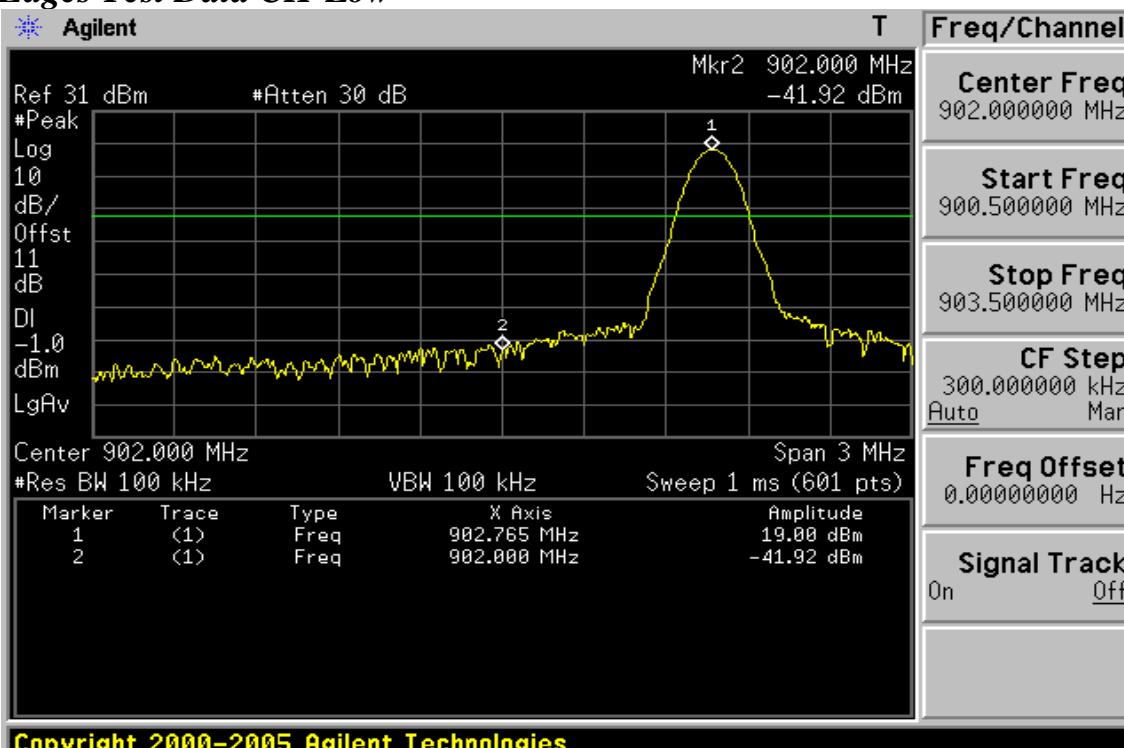
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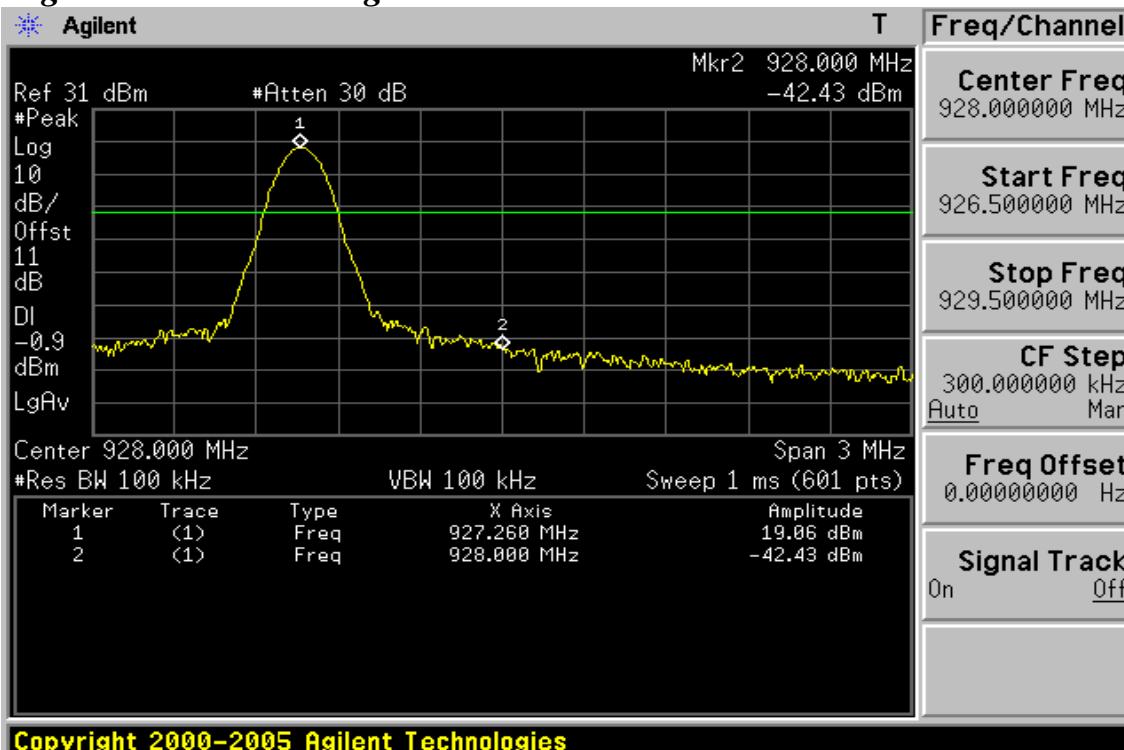
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Band Edges Test Data CH-Low



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Band Edges Test Data CH-High



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9. SPURIOUS RADIATED EMISSION TEST

9.1. Standard Applicable

According to §15.247(c), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

9.2. Measurement Equipment Used:

9.2.1. Conducted Emission at antenna port:

Refer to section 6.2 for details.

9.2.2. Radiated emission:

Refer to section 7.2 for details.

9.3. Test SET-UP:

9.3.1. Conducted Emission at antenna port:

Refer to section 6.3 for details.

9.3.2. Radiated emission:

Refer to section 7.3 for details.

9.4. 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 measured were complete.

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9.5. 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	

9.6. Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

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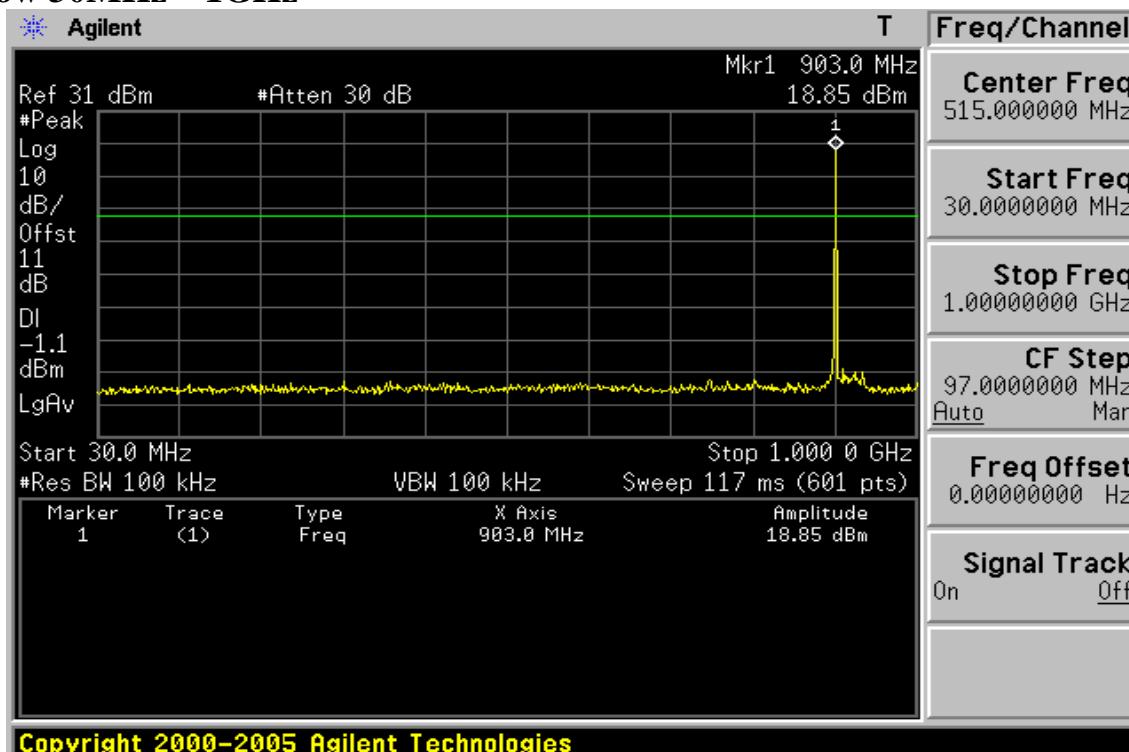
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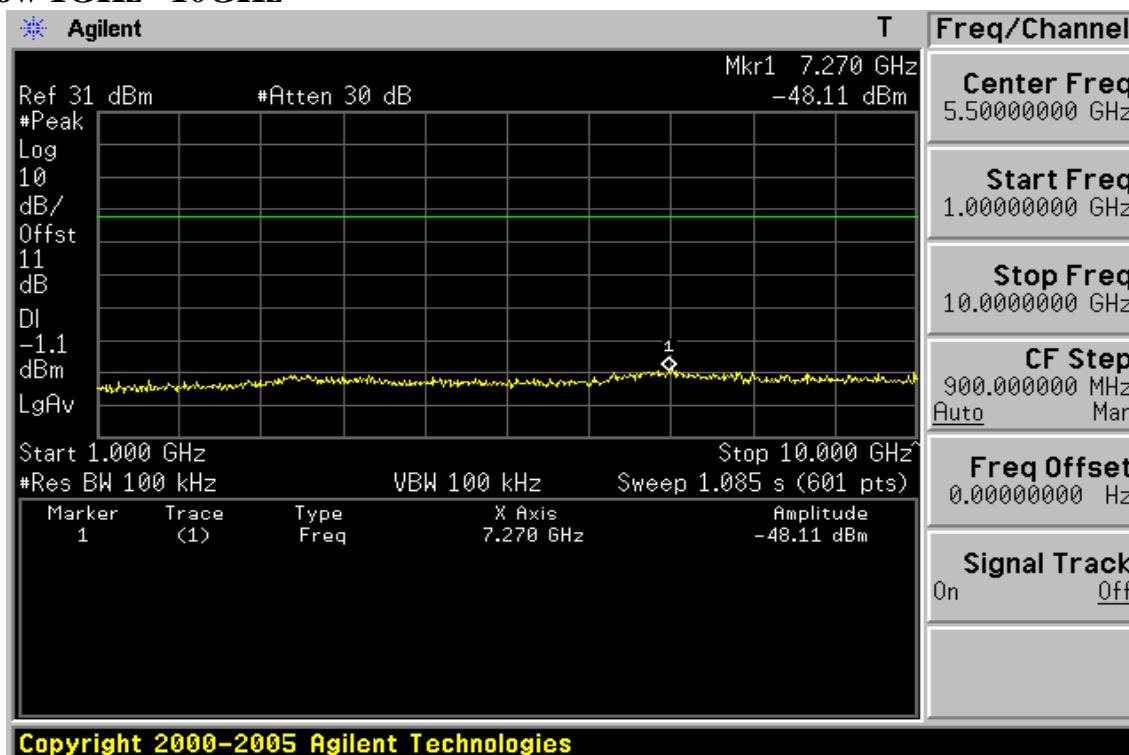
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Conducted Spurious Emission Measurement Result

Ch Low 30MHz – 1GHz



Ch Low 1GHz – 10GHz



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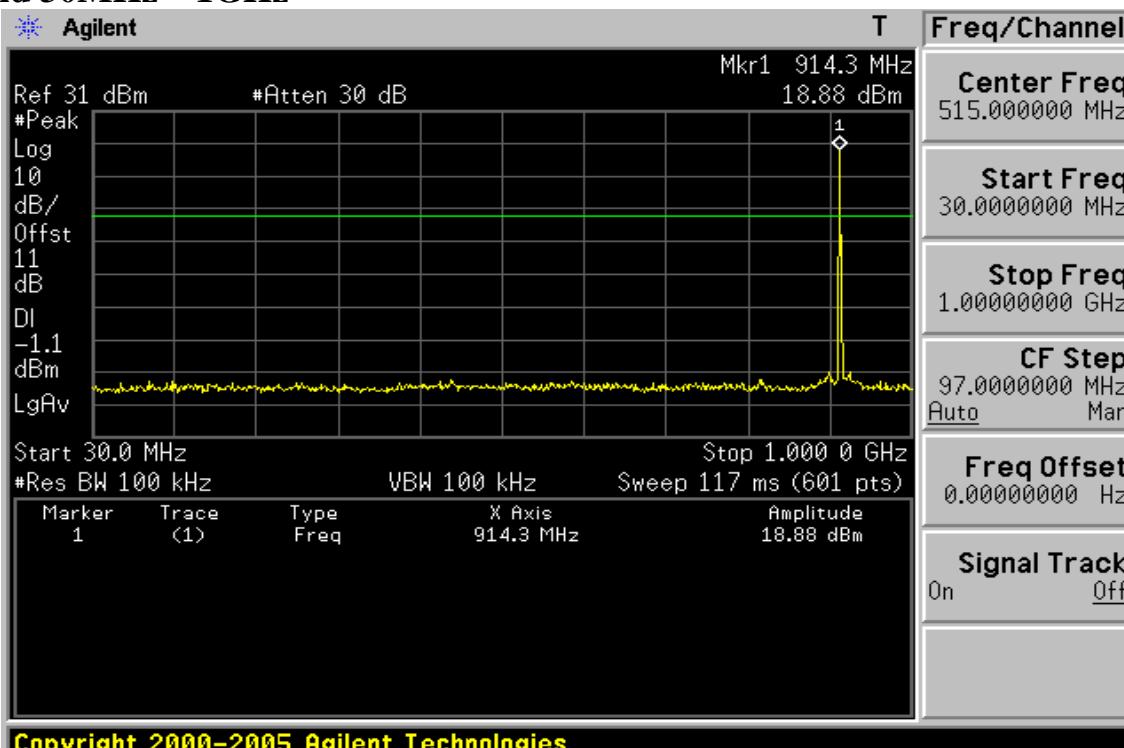
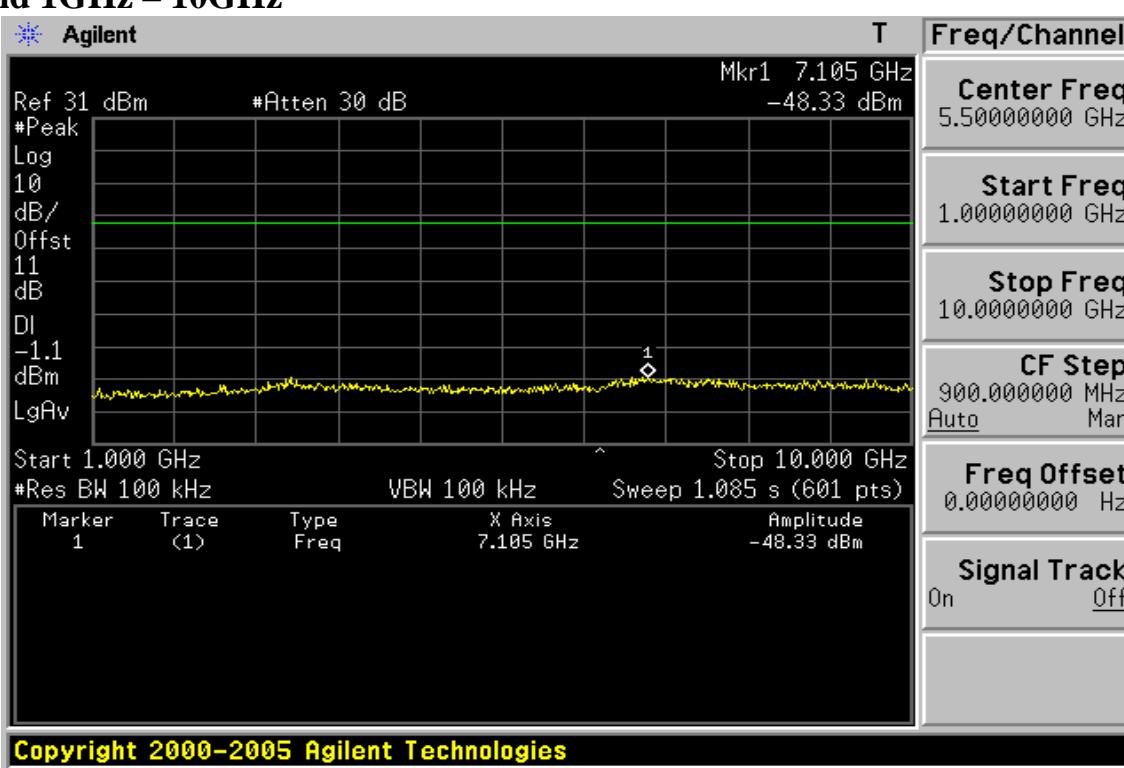
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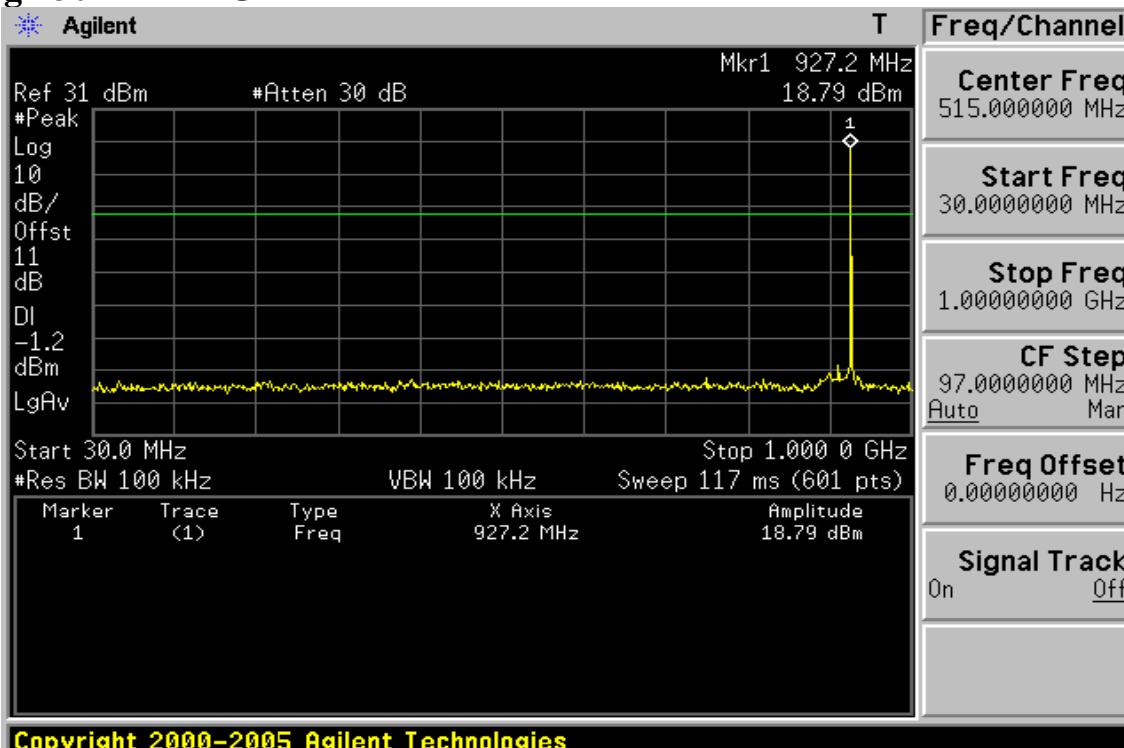
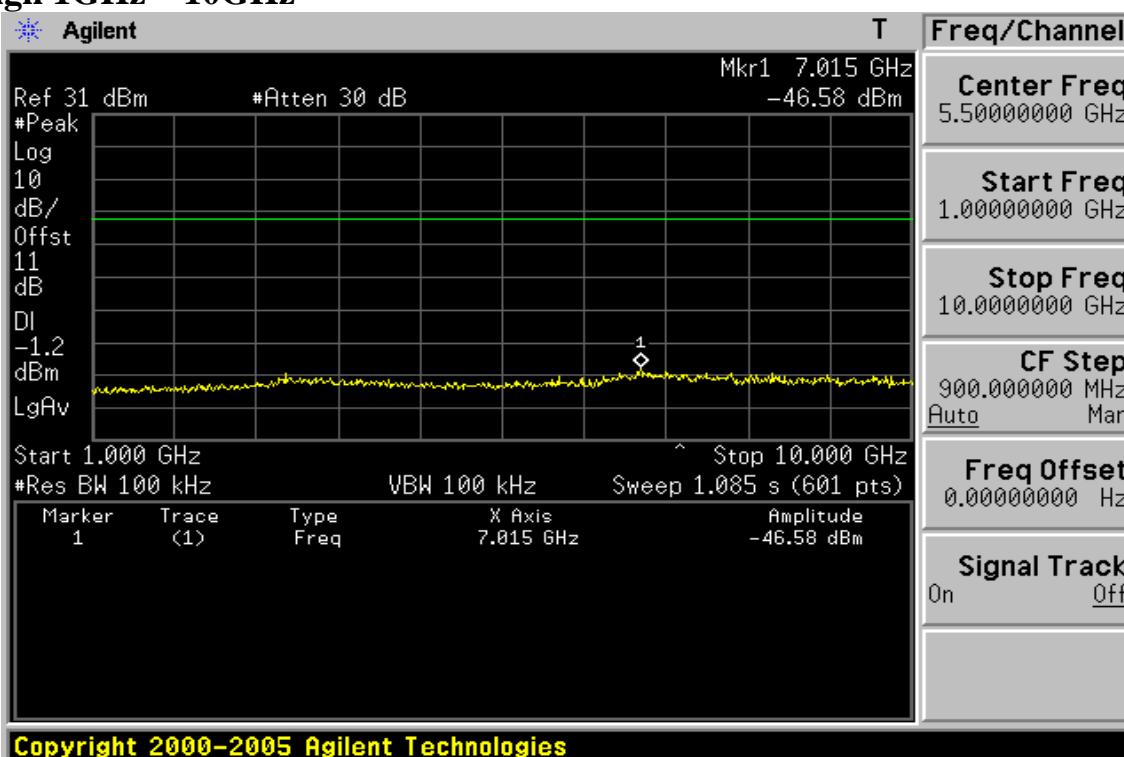
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Ch Mid 30MHz – 1GHz

Ch Mid 1GHz – 10GHz


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Ch High 30MHz – 1GHz

Ch High 1GHz – 10GHz


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Radiated Spurious Emission Measurement Result (below 1GHz)

Operation Band	:RFID	Test Date	:2011-12-26
Fundamental Frequency	:902.75 MHz	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Jazz
EUT Pol.	:E2	Measurement Antenna Pol.	:VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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	Spectrum Reading Level	Factor dB	Actual	Limit	Safe
					FS dB μ V	dB μ V/m	dB μ V/m
214.30	S	Peak	47.32	-14.82	32.50	43.50	-11.00
292.87	S	Peak	52.55	-12.05	40.50	46.00	-5.50
312.27	S	Peak	49.32	-11.49	37.83	46.00	-8.17
426.73	S	Peak	40.40	-9.70	30.70	46.00	-15.30
623.64	S	Peak	37.01	-5.89	31.12	46.00	-14.88
676.02	S	Peak	34.16	-4.88	29.28	46.00	-16.72
1805.50	H	Peak	37.96	3.43	41.39	74.00	-32.61
2708.25	---						
3611.00	---						
4513.75	---						
5416.50	---						
6319.25	---						
7222.00	---						
8124.75	---						
9027.50	---						

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Operation Band	:RFID	Test Date	:2011-12-26
Fundamental Frequency	:902.75	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX LOW	Engineer	:Jazz
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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	Spectrum Reading Level	Factor dB	Actual	Limit	Safe
					FS dB μ V	dB μ V/m	dB μ V/m
175.50	S	Peak	44.83	-13.26	31.57	43.50	-11.93
292.87	S	Peak	51.08	-12.05	39.03	46.00	-6.97
312.27	S	Peak	51.26	-11.49	39.77	46.00	-6.23
370.47	S	Peak	41.46	-10.63	30.83	46.00	-15.17
526.64	S	Peak	33.57	-8.26	25.31	46.00	-20.69
676.02	S	Peak	34.19	-4.88	29.31	46.00	-16.69
1805.50	H	Peak	35.40	4.00	39.40	74.00	-34.60
2708.25	---						
3611.00	---						
4513.75	---						
5416.50	---						
6319.25	---						
7222.00	---						
8124.75	---						
9027.50	---						

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Operation Band :RFID
 Fundamental Frequency :914.75 MHz
 Operation Mode :TX MID
 EUT Pol. :E2

Test Date :2011-12-27
 Temp./Humi. :27 deg_C / 66 RH
 Engineer :Jazz
 Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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	Spectrum Reading Level	Factor dB	Actual	Limit	Safe
					FS dB μ V	dB μ V/m	dB μ V/m
214.30	E	Peak	47.46	-14.82	32.64	43.50	-10.86
214.30	E	Peak	47.46	-14.82	32.64	43.50	-10.86
292.87	E	Peak	49.51	-12.05	37.46	46.00	-8.54
409.27	E	Peak	40.93	-10.12	30.81	46.00	-15.19
509.18	E	Peak	38.82	-8.51	30.31	46.00	-15.69
623.64	E	Peak	36.60	-5.89	30.71	46.00	-15.29
1829.50	H	Peak	38.06	3.59	41.65	74.00	-32.35
2744.25	---						
3659.00	---						
4573.75	---						
5488.50	---						
6403.25	---						
7318.00	---						
8232.75	---						
9147.50	---						

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Operation Band :RFID
Fundamental Frequency :914.75MHz
Operation Mode :TX MID
EUT Pol. :E2
Test Date :2011-12-26
Temp./Humi. :27 deg_C / 66 RH
Engineer :Jazz
Measurement Antenna Pol. :HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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	Spectrum Reading Level	Factor dB	Actual	Limit	Safe
					FS dB μ V	dB μ V/m	dB μ V/m
292.87	S	Peak	50.04	-12.05	37.99	46.00	-8.01
312.27	S	Peak	49.13	-11.49	37.64	46.00	-8.36
370.47	S	Peak	41.54	-10.63	30.91	46.00	-15.09
409.27	S	Peak	34.82	-10.12	24.70	46.00	-21.30
565.44	S	Peak	33.47	-7.46	26.01	46.00	-19.99
676.02	S	Peak	35.41	-4.88	30.53	46.00	-15.47
1829.50	H	Peak	36.67	3.98	40.65	74.00	-33.35
2744.25	---						
3659.00	---						
4573.75	---						
5488.50	---						
6403.25	---						
7318.00	---						
8232.75	---						
9147.50	---						

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Operation Band :RFID
Fundamental Frequency :927.25 MHz
Operation Mode :TX HIGH
EUT Pol. :E2
Test Date :2011-12-26
Temp./Humi. :27 deg_C / 66 RH
Engineer :Jazz
Measurement Antenna Pol. :VERTICAL

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

Factor(dB) = Antenna Factor(dB μ V/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	Spectrum Reading Level	Factor dB	Actual	Limit	Safe
					FS dB μ V	dB μ V/m	dB μ V/m
189.08	S	Peak	46.05	-14.87	31.18	43.50	-12.32
214.30	S	Peak	47.54	-14.82	32.72	43.50	-10.78
292.87	S	Peak	48.44	-12.05	36.39	46.00	-9.61
409.27	S	Peak	40.21	-10.12	30.09	46.00	-15.91
526.64	S	Peak	37.31	-8.26	29.05	46.00	-16.95
623.64	S	Peak	36.61	-5.89	30.72	46.00	-15.28
1854.50	H	Peak	36.05	3.72	39.77	74.00	-34.23
2781.75	---						
3709.00	---						
4636.25	---						
5563.50	---						
6490.75	---						
7418.00	---						
8345.25	---						
9272.50	---						

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Operation Band	:RFID	Test Date	:2011-12-27
Fundamental Frequency	:927.25	Temp./Humi.	:27 deg_C / 66 RH
Operation Mode	:TX HIGH	Engineer	:Jazz
EUT Pol.	:E2	Measurement Antenna Pol.	:HORIZONTAL

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

Factor(dB) = Antenna Factor(dB μ V/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	Spectrum Reading Level	Factor dB	Actual	Limit	Safe
					FS dB μ V	dB μ V/m	dB μ V/m
175.50	S	Peak	44.38	-13.26	31.12	43.50	-12.38
292.87	S	Peak	50.51	-12.05	38.46	46.00	-7.54
312.27	S	Peak	49.40	-11.49	37.91	46.00	-8.09
370.47	S	Peak	41.55	-10.63	30.92	46.00	-15.08
565.44	S	Peak	33.62	-7.46	26.16	46.00	-19.84
663.41	S	Peak	33.40	-5.15	28.25	46.00	-17.75
1854.50	H	Peak	36.00	3.92	39.92	74.00	-34.08
2781.75	---						
3709.00	---						
4636.25	---						
5563.50	---						
6490.75	---						
7418.00	---						
8345.25	---						
9272.50	---						

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10. FREQUENCY SEPARATION

10.1. Standard Applicable

According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the $2/3 \times 20$ dB bandwidth of the hopping channel, whichever is greater.

10.2. Measurement Equipment Used:

Refer to section 6.2 for details.

10.3. Test Set-up:

Refer to section 6.3 for details.

10.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel .
4. Set the spectrum analyzer as RBW, VBW=100KHz, Adjust Span to 5 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

10.5. Measurement Result:

Channel separation (MHz)	Limit	Result
0.5	≥ 25 KHz or 20dB bandwidth	PASS

Note: Refer to next page for plots.

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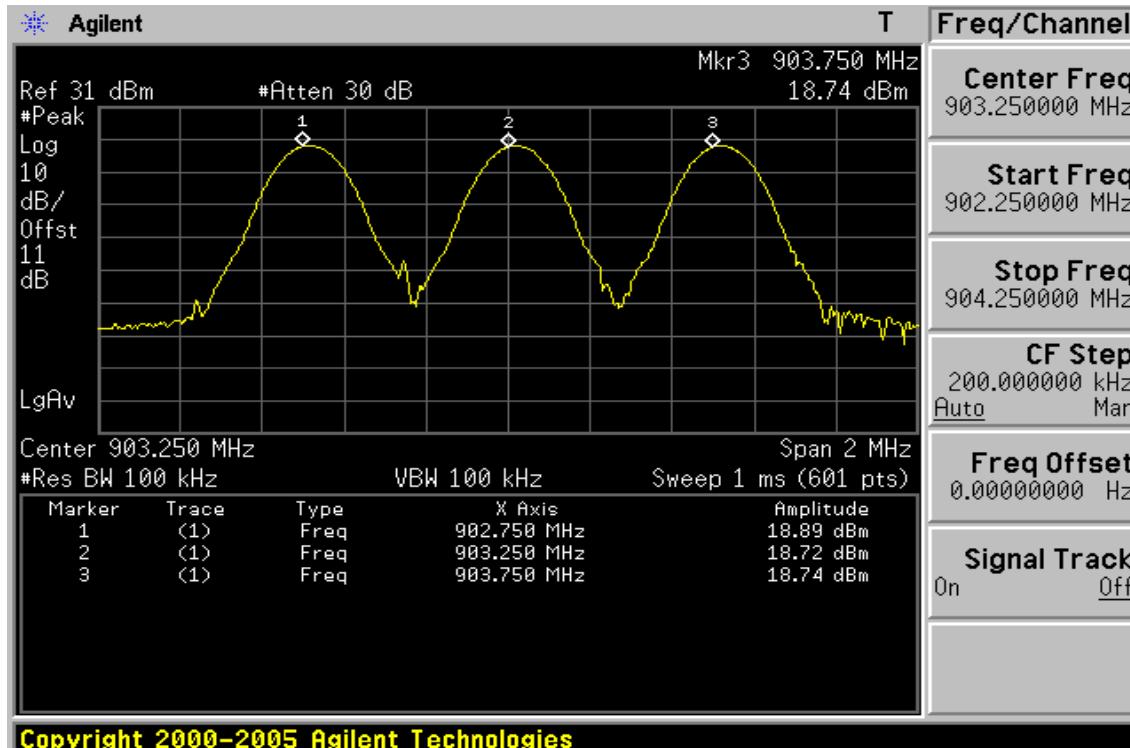
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Frequency Separation Test Data



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11. NUMBER OF HOPPING FREQUENCY

11.1. Standard Applicable

According to §15.247(a)(1)(i), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

11.2. Measurement Equipment Used:

Refer to section 6.2 for details.

11.3. Test Set-up:

Refer to section 6.3 for details.

11.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=902MHz, Stop =928MHz, Sweep = auto.
4. Set the spectrum analyzer as RBW=100KHz, VBW=300KHz.
5. Max hold, view and count how many channel in the band.

11.5. Measurement Result:

Note: Refer to next page for plots.

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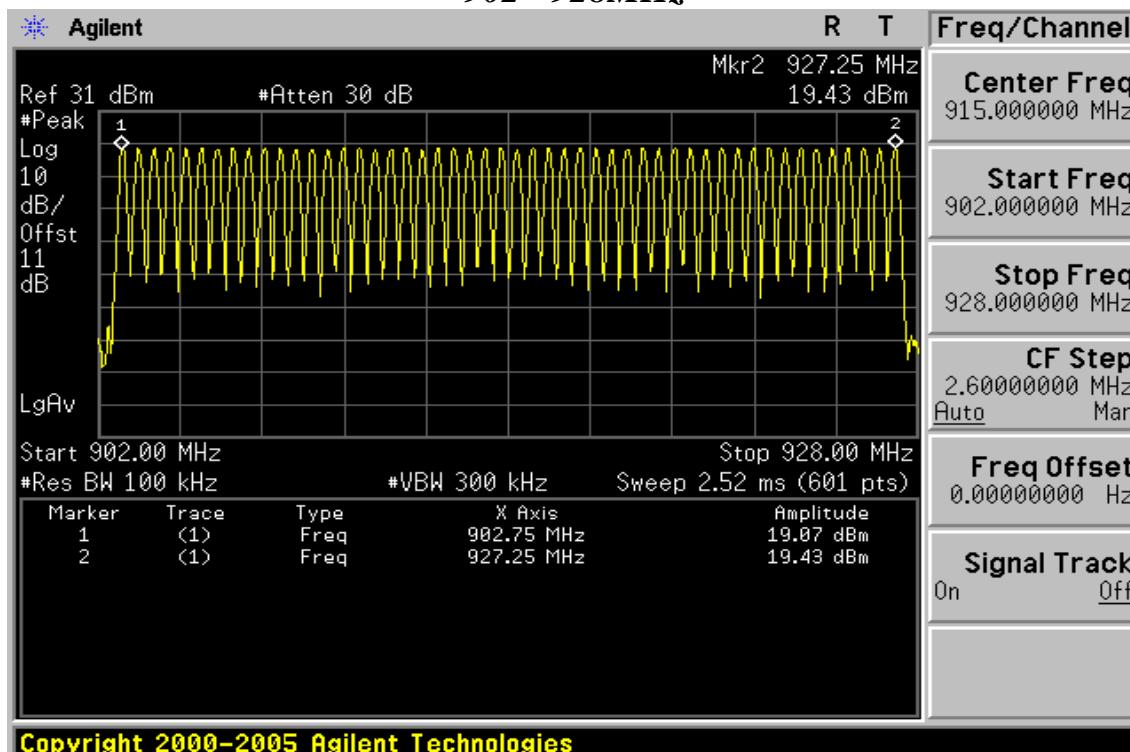
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Channel Number**902 - 928MHz**

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12. TIME OF OCCUPANCY (DWELL TIME)

12.1. Standard Applicable

According to §15.247(a)(1)(i), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

12.2. Measurement Equipment Used:

Refer to section 6.2 for details.

12.3. Test Set-up:

Refer to section 6.3 for details.

12.4. Measurement Procedure:

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW = 1MHz, VBW = 3MHz, Span = 0Hz , Adjust Sweep = 2~7ms.
5. Repeat above procedures until all frequency measured were complete.
- 6.

12.5. Measurement Result

$$\text{A period time} = 0.4 \text{ (s)} * 50 = 20 \text{ (s)}$$

$$\text{CH Low: Time slot} = 1996 \text{ (ms)} * (0.15/50) * 20 = 119.76 \text{ (ms)}$$

$$\text{CH Mid: Time slot} = 1996 \text{ (ms)} * (0.15/50) * 20 = 119.76 \text{ (ms)}$$

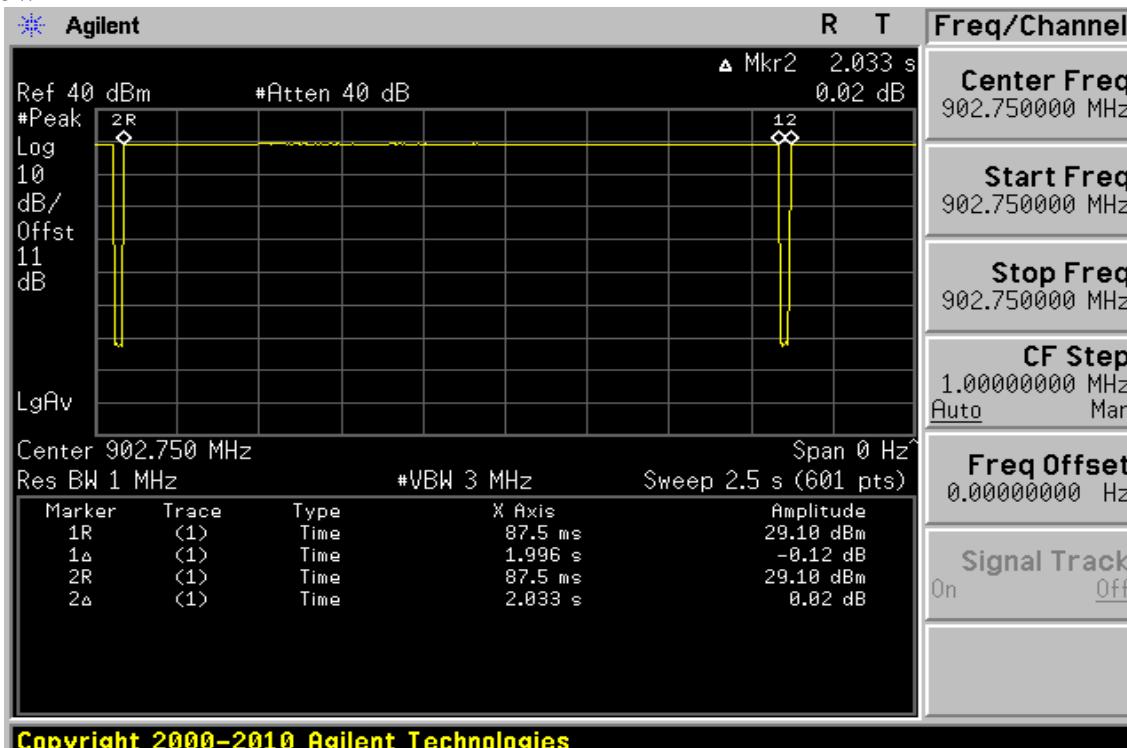
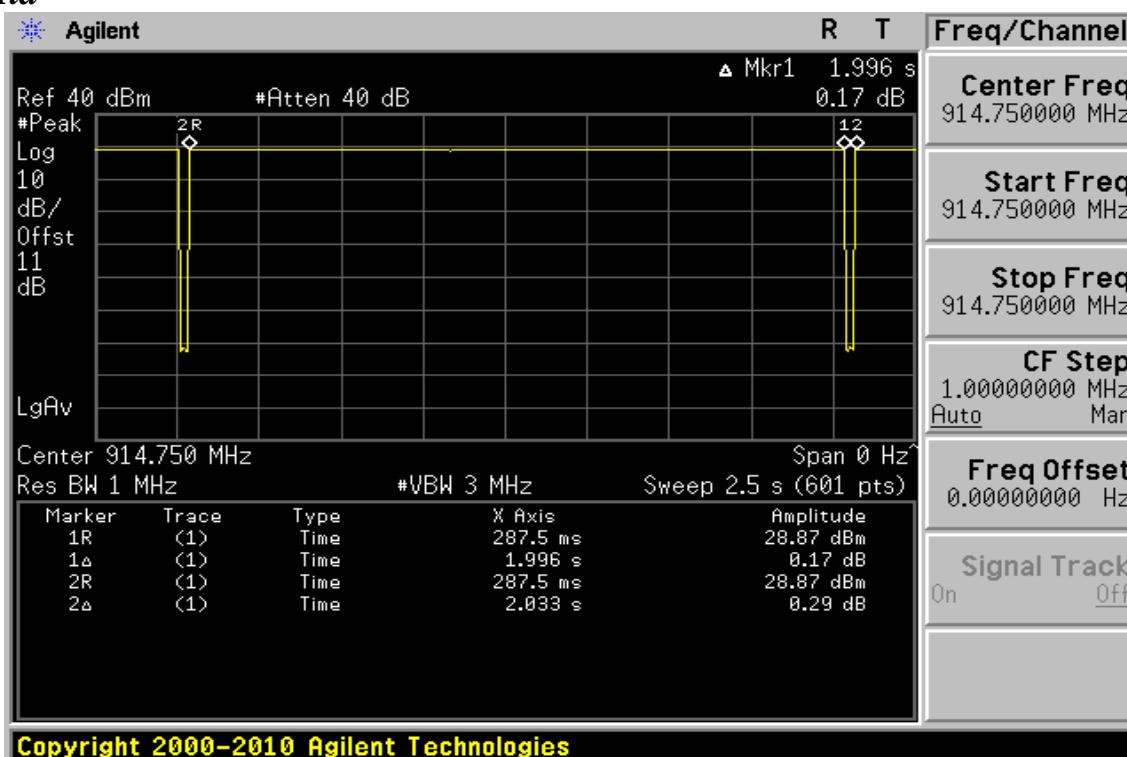
$$\text{CH High: Time slot} = 1996 \text{ (ms)} * (0.15/50) * 20 = 119.76 \text{ (ms)}$$

Note: Refer to next page for plots.

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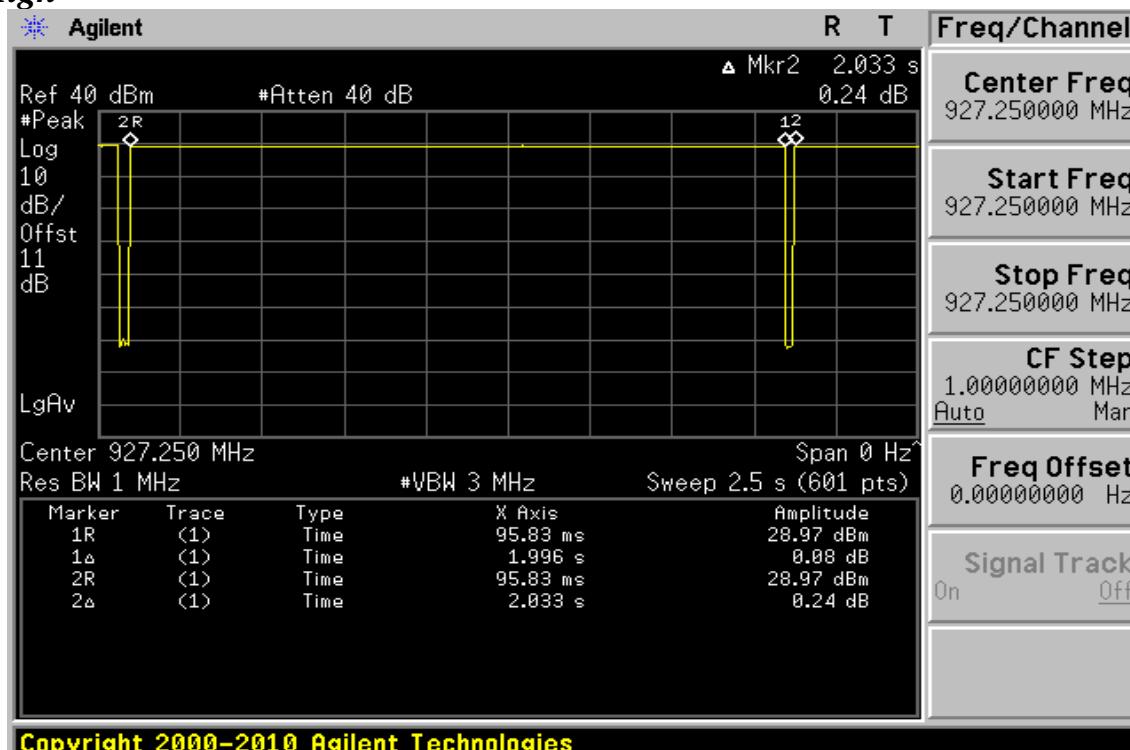
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CH-Low

CH-Mid


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CH-High


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13. ANTENNA REQUIREMENT

13.1. Standard Applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by the responsible party shall be used with the device.

13.2. Antenna Connected Construction

The directional gains of antenna used for transmitting is 3 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Please see EUT photo for details.

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