FCC CFR47 PART 15 CERTIFICATION

TEST REPORT

FOR

BLUETOOTH PORTABLE PROTOCOL ANALYZER

MODEL: MerlinMobile

FCC ID: KH7BT005UAA-X

REPORT NUMBER: 02U1432-1

ISSUE DATE: AUGUST 2, 2002

Prepared for
COMPUTER ACCESS TECHNOLOGY CORPORATION
2403 WALSH AVENUE
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USA

Prepared by
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1. TEST RESULT CERTIFICATION

COMPANY NAME: COMPUTER ACCESS TECHNOLOGY CORPORATION
2403 WALSH AVENUE
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CONTACT PERSON: KEN KIMURA / MGF. ENGINEERING MANAGER

TELPHONE NO: (408) 727-6600

EUT DESCRIPTION: BLUETOOTH PORTABLE PROTOCOL ANALYZER

MODEL NAME: MerlinMobile

DATE TESTED: JULY 31 – AUGUST 1, 2002

TYPE OF EQUIPMENT	INTENTIONAL RADIATOR
EQUIPMENT TYPE	2.4GHz TRANSCEIVER
MEASUREMENT PROCEDURE	ANSI 63.4 / 1992, TIA/EIA 603
PROCEDURE	CERTIFICATION
FCC RULE	CFR 47 PART 15 Subpart C

Compliance Certification Services, Inc. tested the above equipment for compliance with the requirement set forth in CFR 47, PART 15 Subpart C. The equipment in the configuration described in this report, shows the measured emission levels emanating from the equipment do not exceed the specified limit.

Note: This document reports conditions under which testing was conducted and results of tests performed. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document.

Approved & Released For CCS By:

STEVE CHENG
EMC ENGINEERING MANAGER
COMPLIANCE CERTIFICATION SERVICES

Tested By:

KERWIN CORPUZ
ASSOCIATE EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

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2. EUT DESCRIPTION

The CATC Merlin Mobile Bluetooth Protocol Analyzer is a Wireless Frequency Hopping Spread Spectrum that operates on the 2400 – 2483.5 MHz band. The Bluetooth Protocol Analyzer blends powerful piconet traffic recording and analysis abilities with compact, easily transportable PC Card technology. Merlin Mobile is a development and test tool for products using the Bluetooth wireless technology. Merlin Mobile non-intrusively monitors piconet traffic and records and displays captured Bluetooth data. This unit provides a power output of –1.3 dBm (0.741 mW) and includes a 2.4 GHz OMNI Directional external antenna with a 2 dBi gain.

3. TEST METHODOLOGY

Both conducted and radiated testing were performed according to the procedures documented on chapter 13 of ANSI C63.4 and FCC CFR 47 2.1046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055 and 2.1057.

4. TEST FACILITY

The open area test sites and conducted measurement facilities used to collect the radiated data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5. ACCREDITATION AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200065-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (reference no: 31040/SIT (1300B3) and 31040/SIT (1300F2))

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5.5. Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP*	FCC Part 15, CISPR 22, AS/NZS 3548,IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11, CNS 13438	200065-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	1300
Japan	VCCI	CISPR 22 Two OATS and one conducted Site	R-1014, R-619, C-640
Norway	NEMKO	EN50081-1, EN50081-2, EN50082-1, EN50082-2, IEC61000-6-1, IEC61000-6-2, EN50083-2, EN50091-2, EN50130-4, EN55011, EN55013, EN55014-1, EN55104, EN55015, EN61547, EN55022, EN55024, EN61000-3-2, EN61000-3-3, EN60945, EN61326-1	ELA 117
Norway	NEMKO	EN60601-1-2 and IEC 60601-1-2, the Collateral Standards for Electro-Medical Products. MDD, 93/42/EEC, AIMD 90/385/EEC	ELA-171
Taiwan	BSMI	CNS 13438	SL2-IN-E-1012
Canada	Industry Canada	RSS210 Low Power Transmitter and Receiver	IC2324 A,B,C, and F

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6. CALIBRATION AND UNCERTAINTY

6.1. Measuring Instrument Calibration

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

6.2. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

Radiated Emission	
30MHz – 200 MHz	+/- 3.3dB
200MHz – 1000MHz	+4.5/-2.9dB
1000MHz – 2000MHz	+4.6/-2.2dB
Power Line Conducted Emission	
150kHz – 30MHz	+/-2.9

Any results falling within the above values are deemed to be marginal.

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6.3. Test and Measurement Equipment

The following test and measurement equipment was utilized for the tests documented in this report:

TEST AND MEASUREMENT EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due Date
Spectrum Analyzer	HP	8566B	2140A01296	5/23/03
Preamplifier	HP	8447D	2944A06589	8/10/02
Bilog Antenna	Chase	CBL6112B	2586	8/2/02
Line Filter	Lindgren	LMF-3489	497	N.C.R.
LISN	Fisher Custom Communication	LISN-50/250-25-2	2023	8/2/02
EMI Test Receiver	Rohde & Schwarz	ESHS 20	827129/006	4/17/03
Spectrum Analyzer	HP	8593EM	3710A00205	6/11/03
Preamplifier (1 - 26.5GHz)	MITEQ	NSP2600-44	646456	4/26/03
Horn Antenna (1 - 18GHz)	EMCO	3115	6739	1/31/03
Horn Antenna (18 - 26GHz)	Antenna Research Associates	MWH 1826/B	1013	7/26/02
High Pass Filter (4.57GHz)	FSY Microwave	FM-4570-9SS	003	N.C.R.

7. SUPPORT EQUIPMENT / EUT SETUP

The following peripheral support equipment was utilized to operate the equipment under test:
* Was use for ITE devices minimum configuration requirement:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Device Type	Manufacturer	Model	Serial Number	FCC ID
PC Laptop (1)	Fujitsu	P/N:CP008465	94868122	DoC
PC Laptop (2)	Gateway 2k	Solo 2300	BC297292070	DoC
* Mouse	HP	M-S34	LZB75062022	DZL211029
* Modem	HAYES	07-00038	A30200153492	BFJ9D907-00038
* Printer	JCM Gold	GP965	20001149	DoC

The following setup was used to operate the equipment under test:

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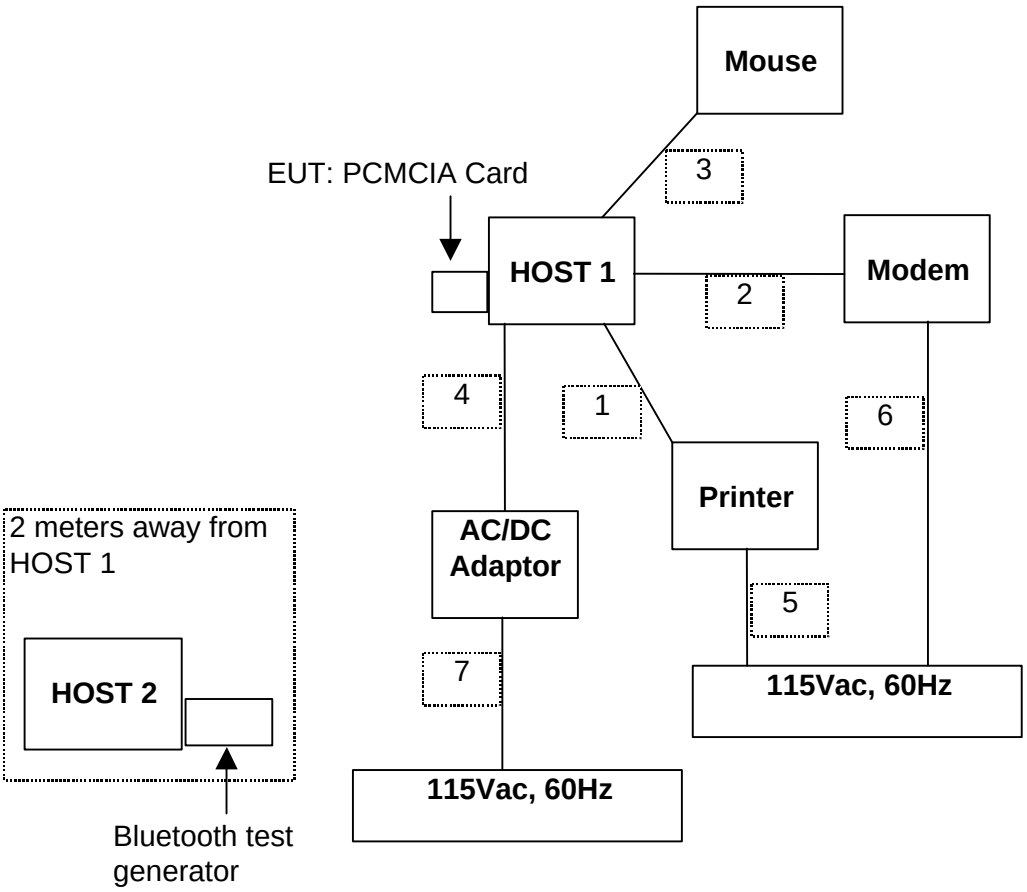
SETUP DIAGRAM FOR DIGITAL DEVICE TESTS



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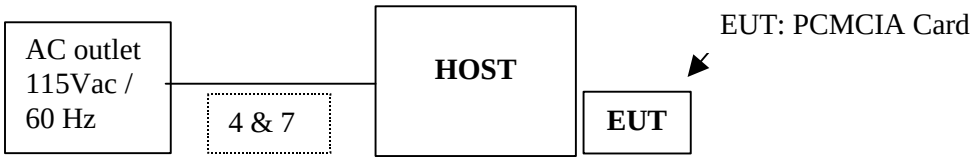
SETUP DIAGRAM FOR TRANSMITTER TESTS



I/O CABLES

TEST I / O CABLES								
Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	Parallel	1	DB25	Sielded	1.5m	No	Yes	N/A
2	RS232	1	DB9	Sielded	1m	No	No	N/A
3	Mouse	1	PS/2	Drain-Wire	2m	Yes	No	N/A
4	DC	1	USA	Un-Shielded	1.5m	No	Yes	N/A
5	AC	1	USA	Un-Shielded	1.8m	No	No	N/A
6	AC	1	USA	Un-Shielded	2m	No	No	N/A
7	AC/DC	1	USA	Un-Shielded	1m	No	Yes	N/A

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8. APPLICABLE RULES AND BRIEF TEST RESULT

§15.247 (a) (1) – HOPPING FREQUENCY SEPERATION

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Spec limit: >552 kHz (20 dB bandwidth)
Test result: No non-compliance noted.

Limit	*Measured Separation*
>552 kHz	*2.04 MHz*

§15.247 (a) (1) (ii) – NUMBER OF HOPPING FREQUENCIES

Frequency hopping should be at least 15 non-over-lapping channels with 75 MHz bandwidth minimum.

Inquiry sequence with 32 hopping frequency.

Test result: No non-compliance noted.

Limit	*Measured Hopping Frequencies*
32	*32*

§15.247 (a) (1) (ii) - BANDWIDTH LIMITATION

(a) (1) (ii) The maximum 20 dB bandwidth of the hopping channel is 1 MHz.

Spec limit: < 1 MHz.
Test result: No non-compliance noted.

Channel	*Frequency (MHz)*	*Bandwidth(MHz)*
LOW	*2402*	*0.552*
MID	*2441*	*0.617*
HIGH	*2480*	*0.714*

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§15.247 (b) (1) - POWER OUTPUT

(b) The maximum peak output power of the intentional radiator shall not exceed the following:
(1) For frequency hopping systems operating in the 2400-2483.5 MHz or 5725-5850 MHz band, and all direct sequence systems: 1 watt.

Spec limit: As specified above, 1W maximum.
Test result: No non-compliance noted.

Channel	*Frequency (MHz)*	*Output Power (watt)*
LOW	*2402*	*0.0007413 (-1.30 dBm)*
MID	*2441*	*0.0006607 (-1.80 dBm)*
HIGH	*2480*	*0.0006025 (-2.20 dBm)*

§15.247 (c) – SPURIOUS EMISSION

(c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test result: No non-compliance noted. See section 9.6 and 9.7.

§15.247 (d) and§15.247 (f) - PEAK POWER SPECTRAL DENSITY

(d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.
(f) The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

Spec limit: < 8dBm.
Test result: No non-compliance noted.

Channel	*Frequency (MHz)*	*Results (dBm)*
LOW	*2402*	*-14.10*
MID	*2441*	*-15.10*
HIGH	*2480*	*-14.30*

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§15.205- RESTRICTED BANDS OF OPERATIONS

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

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

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

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

Spec limit: As specified above,.
Test result: No non-compliance noted. See section 9.9 Radiated Emission.

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§15.207- CONDUCTED LIMITS

(a) For an intentional radiator, which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 450 kHz to 30 MHz shall not exceed 250 microvolts. Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminals.

FCC 15.207

FREQUENCY RANGE	FIELD STRENGTH (Microvolts)	FIELD STRENGTH (dBuV)/QP
450kHz-30MHz	250	48

Spec limit: As specified above.
Test result: No non-compliance noted.

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§15.209- RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS

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

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

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

FCC PART 15.209

MEASURING DISTANCE OF 3 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Spec limit: As specified above.
Test result: No non-compliance noted.

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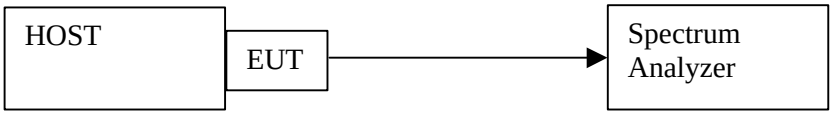
9. TEST SETUP, PROCEDURE AND RESULT

9.1. HOPPING FREQUENCY SEPARATION

TEST SETUP

Detector Function Setting of Test Receiver

Center Frequency (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
2441	☒ Peak	☒ 100 kHz	☒ 100 kHz



TEST PROCEDURE

Connect the Eut's antenna port to the Spectrum Analyzer's input port.
Set frequency span to at least 10 MHz. Let EUT to complete the pseudorandom hopping frequency then set marker delta to measure the separation between each hopping frequency.

RESULT

No non-compliance noted. See plot below.

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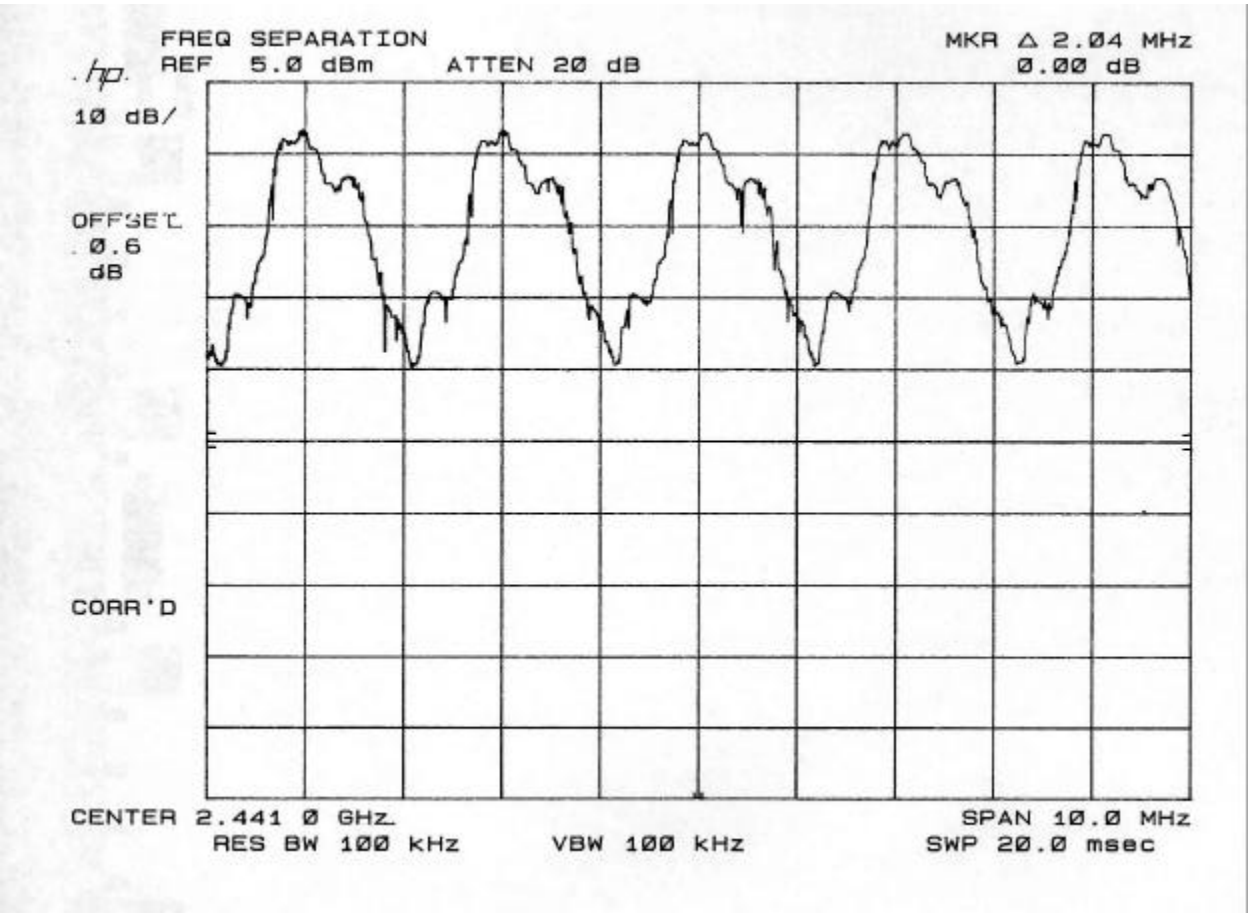

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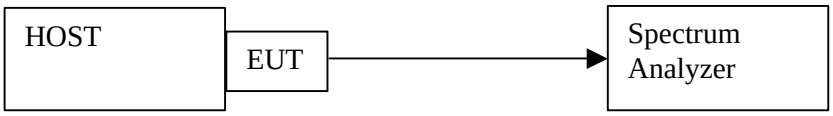
9.2. NUMBER OF HOPPING FREQUENCIES

TEST SETUP

Detector Function Setting of Test Receiver

Center Frequency (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
2441	☒ Peak	☒ 1 MHz	☒ 1 MHz



TEST PROCEDURE

Connect the Eut's antenna port to the Spectrum Analyzer's input port.
Set frequency span to at least 100 MHz. Let EUT to complete the pseudorandom hopping frequency then set trace A to maximum hold. Record data by plotting graph.

RESULT

No non-compliance noted. See plot below.

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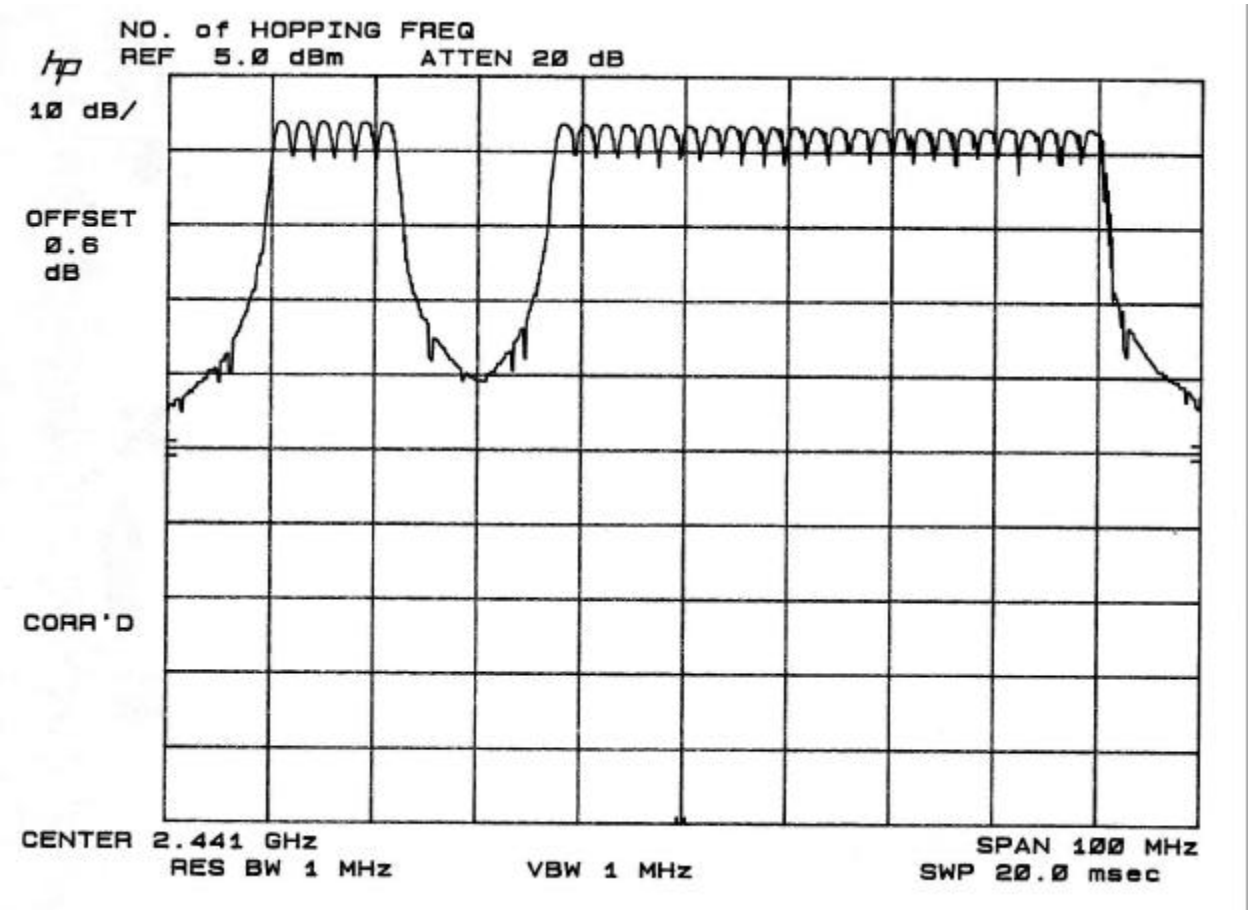

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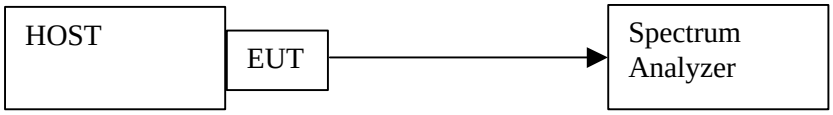
9.3. 20 dB BANDWIDTH MEASUREMENT

TEST SETUP

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	☒ Peak	☒ 10 kHz	☒ 10 kHz



TEST PROCEDURE

The transmitter output port was connected to the spectrum analyzer input port. The bandwidth of the fundamental frequency was measured by a spectrum analyzer with 10 kHz RBW and 10 kHz VBW.

The EUT does not have a function of stop-hopping mode and measurements were taken at a normal hopping mode. The spectrum analyzer was set to the lowest channel of the EUT with TRACE at MAXHOLD. Repeated test with mid and high channels.

RESULT

No non-compliance noted. See plots below.

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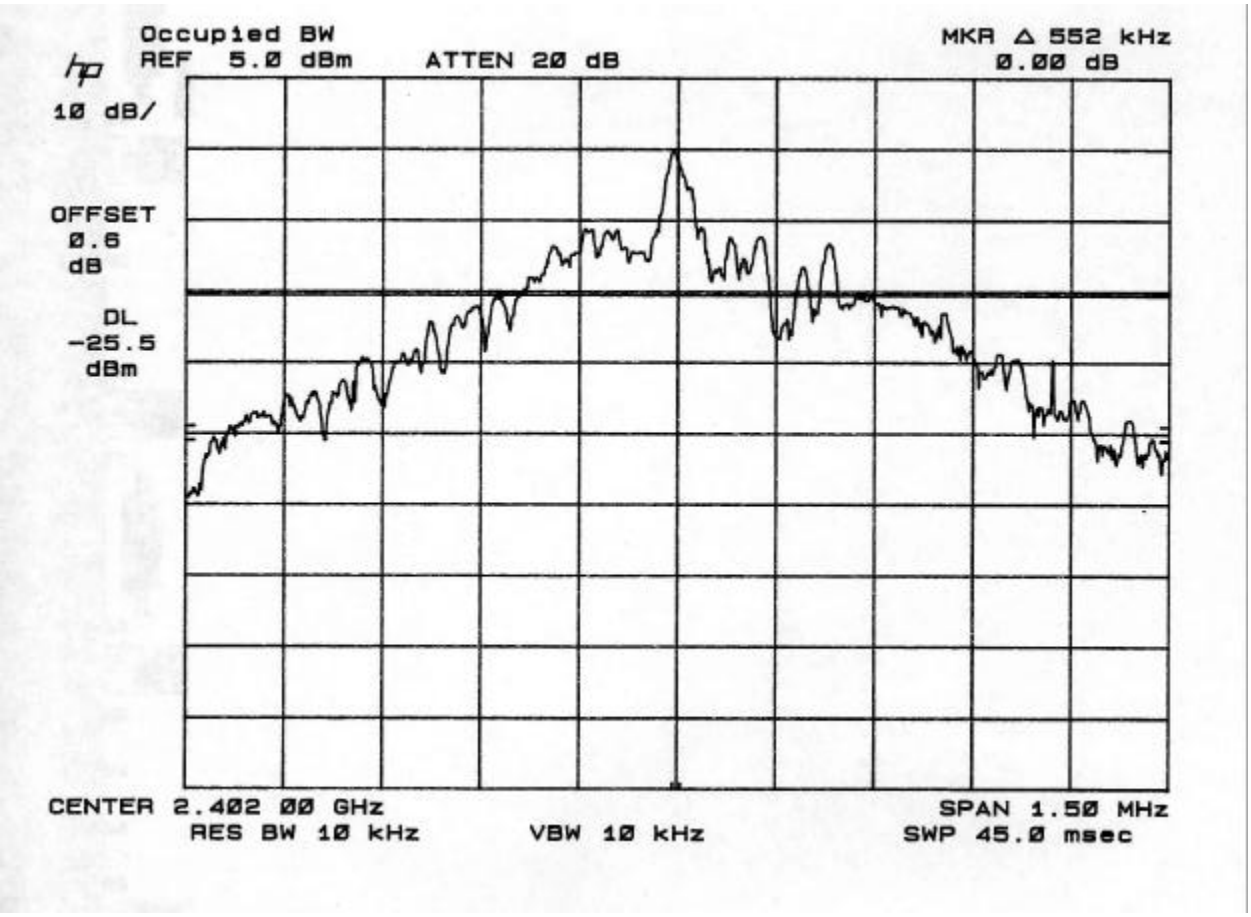
LOW CHANNEL



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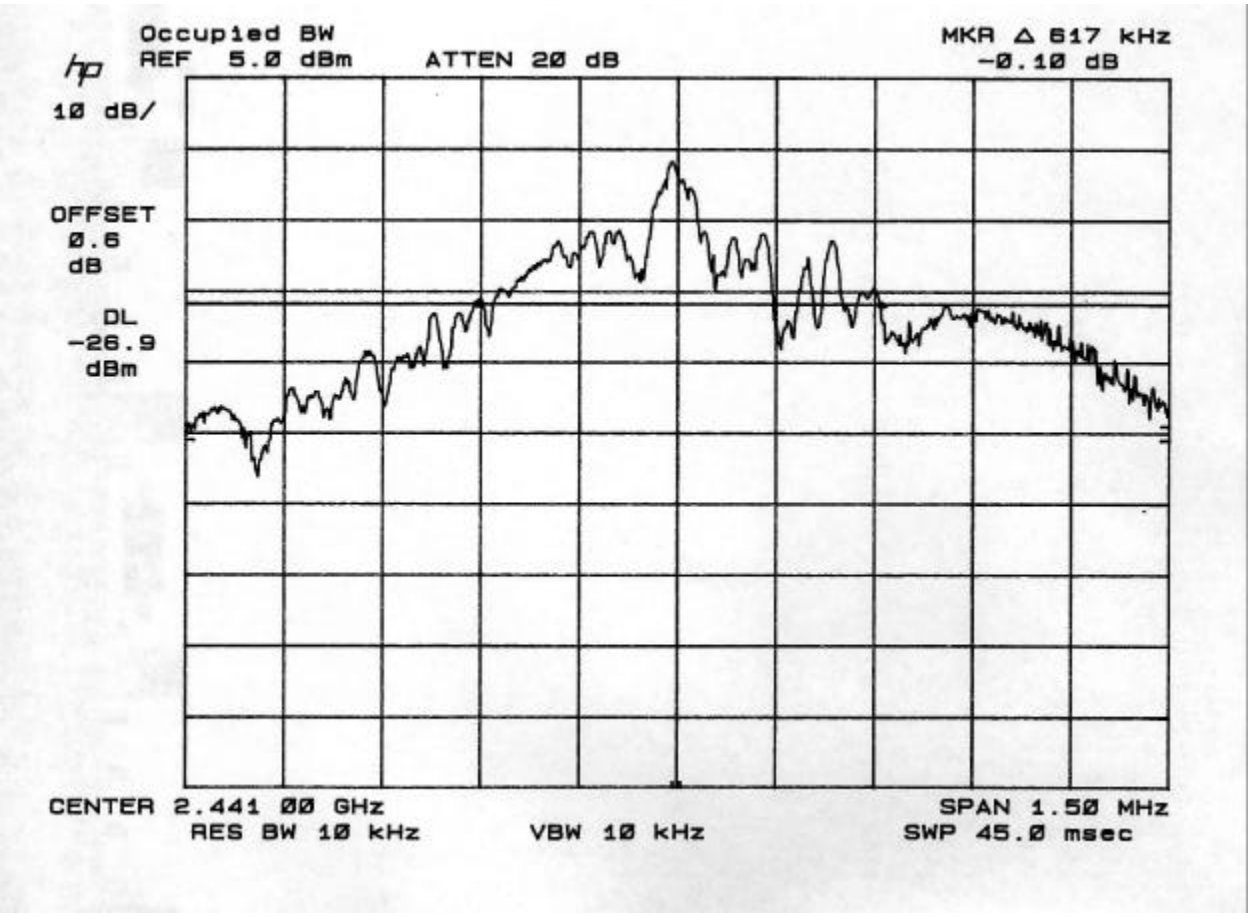
MID CHANNEL



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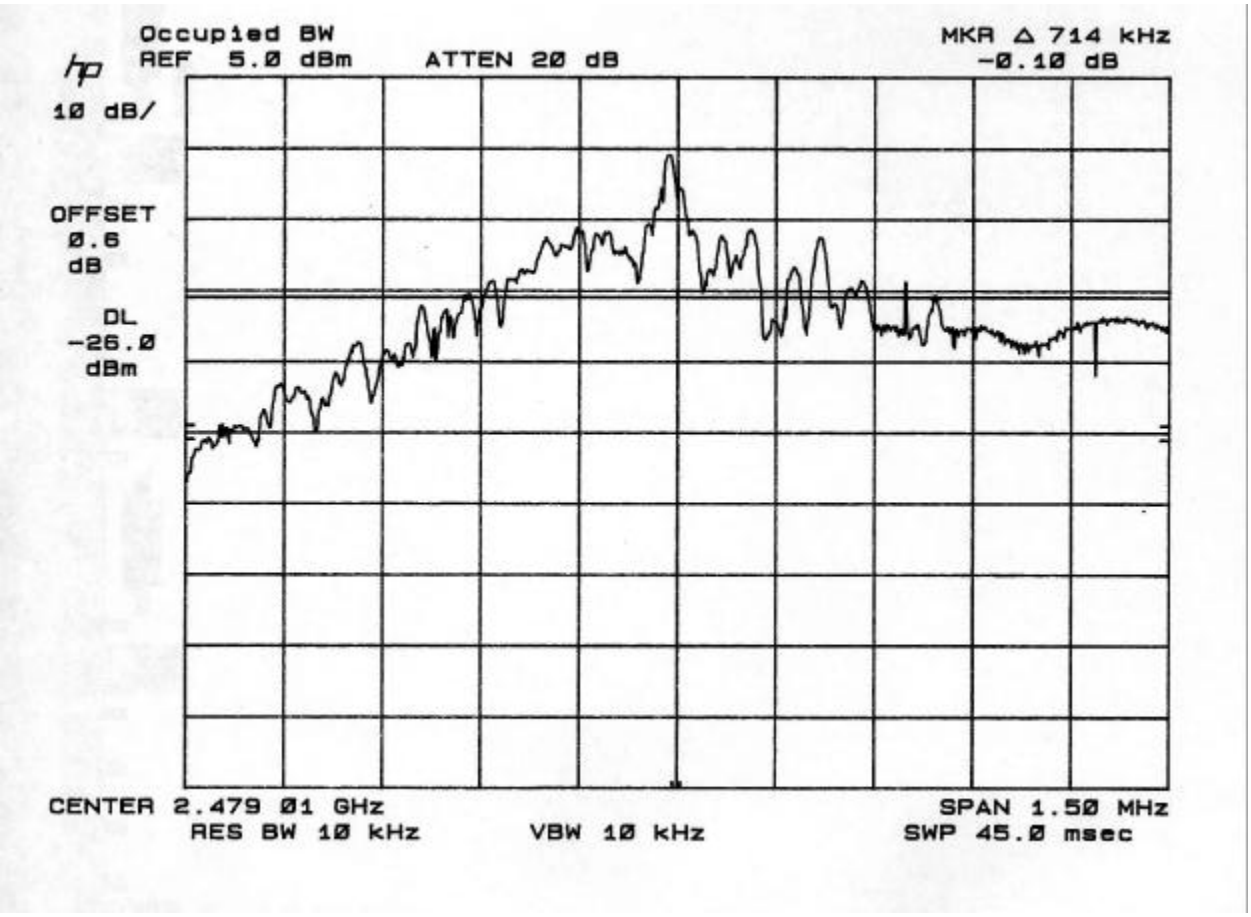
HIGH CHANNEL



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9.4. DWELL TIME IN DATA MODE

The dwell time of 0.3797s within a 30 second period in data mode is independent from the packet type (packet length). The calculation for a 30 second period is a follows:

Dwell time = time slot length * hop rate / number of hopping channels *30s
Example for a DH1 packet (with a maximum length of one time slot)
Dwell time = 625 µs * 1600 1/s / 79 * 30s = 0.3797s (in a 30s period)
For multi-slot packet the hopping is reduced according to the length of the packet.
Example for a DH5 packet (with a maximum length of five time slots)
Dwell time = 5 * 625 µs * 1600 * 1/5 *1/s / 79 * 30s = 0.3797s (in a 30s period)
This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for all Bluetooth devices.
Therefore, all Bluetooth devices **comply** with the FCC dwell time requirement in the data mode.
This was checked during the Bluetooth Qualification tests.

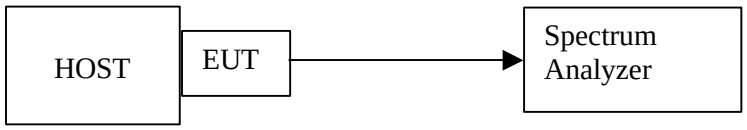
The Dwell time in hybrid mode is approximately 2.6 mS (in a 12.8s period)

9.5. PEAK POWER OUTPUT

TEST SETUP

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	☒ Peak	☒ 3 MHz	☒ 3 MHz



TEST PROCEDURE

The EUT is configured on a test bench as shown above in a continuously transmitting / receiving mode. While the transceiver started, the analyzer MAX HOLD function is used to capture the emissions and a plot is made with the marker at the peak emission.

The EUT does not have a function of stop-hopping mode and measurements were taken at a normal hopping mode. The spectrum analyzer was set to the lowest channel of the EUT with TRACE at MAXHOLD. Repeated test with mid and high channels.

Channel	*Frequency (MHz)*	*Output Power (watt)*
LOW	*2402*	*0.0007413 (-1.30 dBm)*
MID	*2441*	*0.0006607 (-1.80 dBm)*
HIGH	*2480*	*0.0006025 (-2.20 dBm)*

See plot below:

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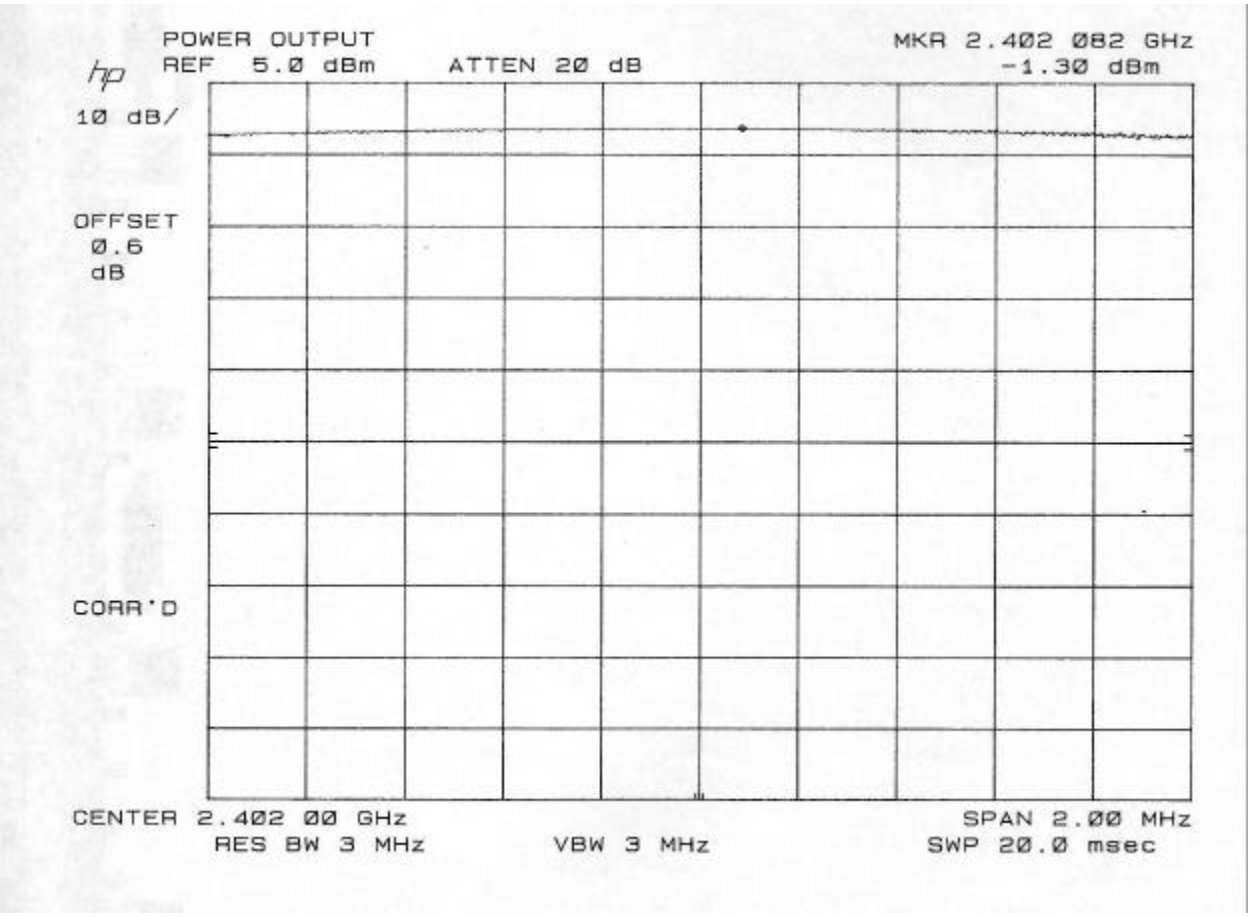
POWER OUTPUT PLOT @ LOW CHANNEL



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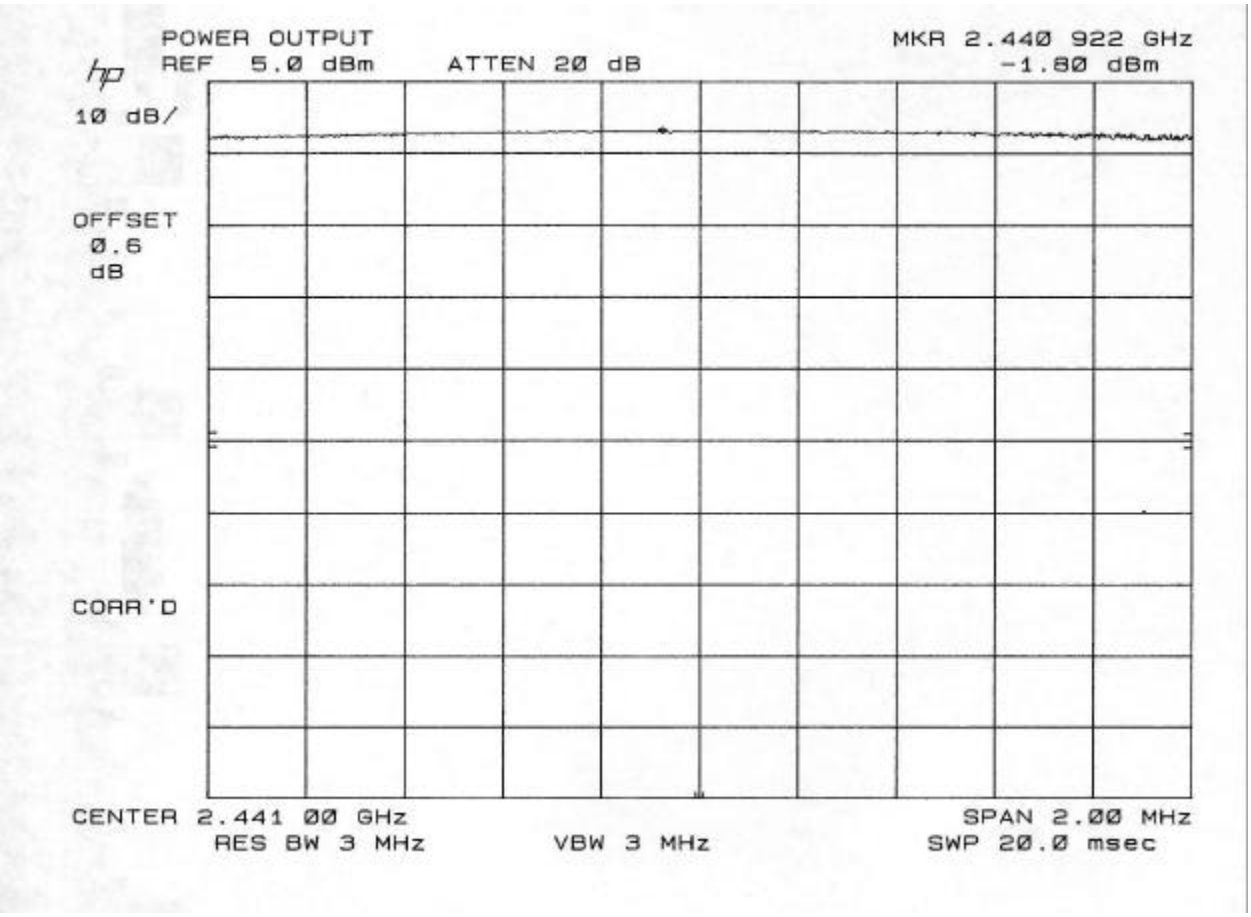
POWER OUTPUT PLOT @ MID CHANNEL



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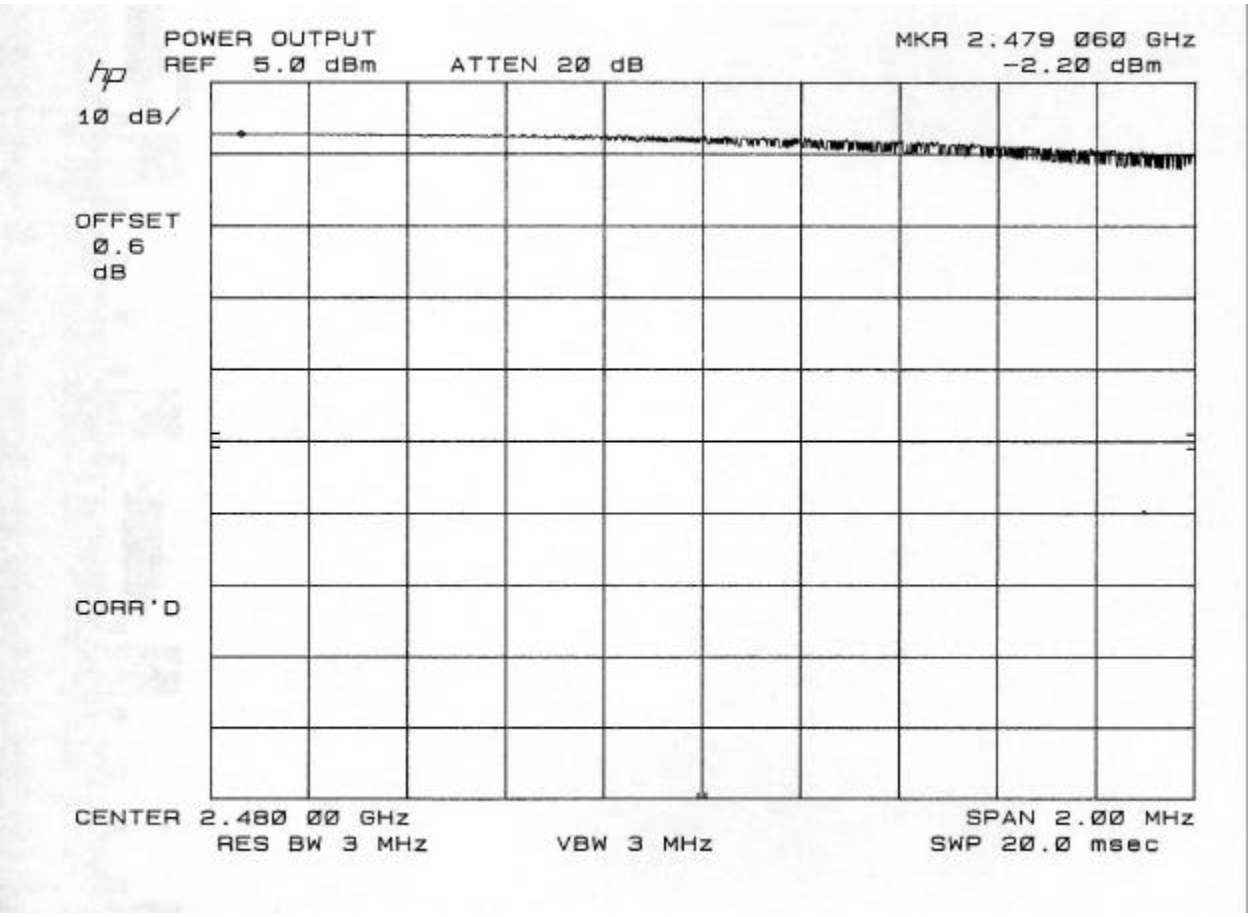
POWER OUTPUT PLOT @ HIGH CHANNEL



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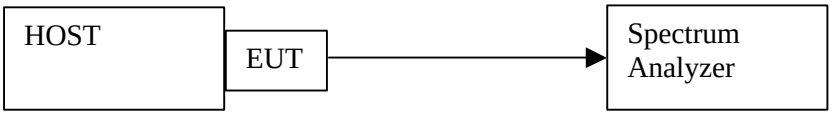
9.6. CONDUCTED SPURIOUS EMISSION

TEST SETUP

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
15 - 25000	☒ Peak	☒ 100 kHz	☒ 100 kHz



TEST PROCEDURE

Connect the Eut's antenna port to the Spectrum Analyzer's input port. Investigate the entire frequency of the carrier frequency, up to the tenth harmonic.

The EUT does not have a function of stop-hopping mode and measurements were taken at a normal hopping mode.

RESULT

No non-compliance noted. See plots below.

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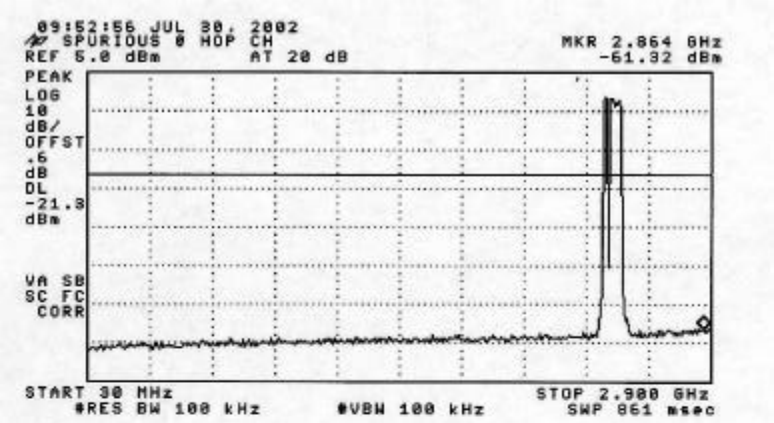
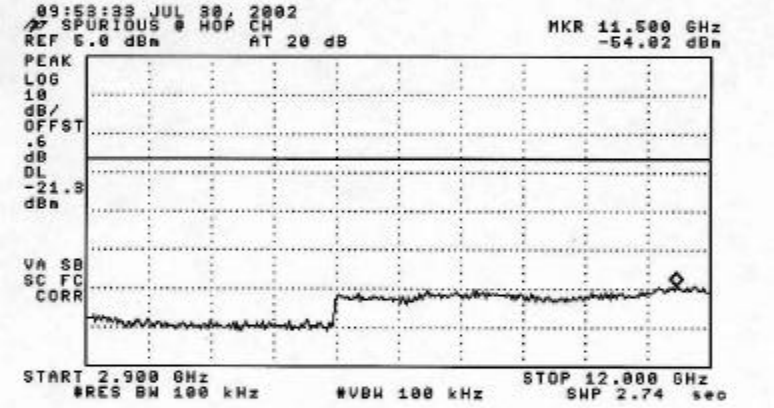
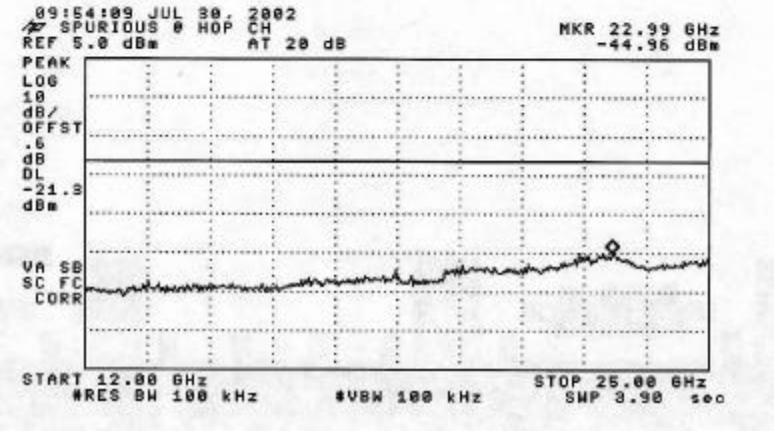
HOPPING CHANNEL



30 – 2900 MHz PLOT



2.9 – 12 GHz PLOT



12 – 25 GHz PLOT

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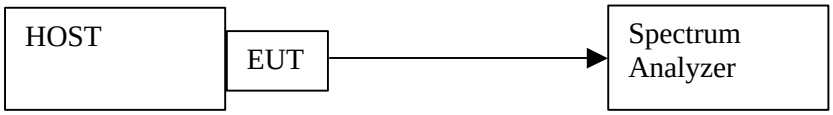
9.7. RESTRICTED BAND EDGE MEASUREMENT

TEST SETUP

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	☒ Peak ☐ Average	☒ 100 KHz ☐ 1 MHz	☒ 100 KHz ☐ 10 Hz



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer input. The resolutions and video bandwidth were set to 100kHz. Set the Display Line 20 dB down from the peak of fundamental. The lower and upper band edge of the EUT is investigated.

The EUT does not have a function of stop-hopping mode and measurements were taken at a normal hopping mode.

RESULT

No non-compliance noted. See plots below.

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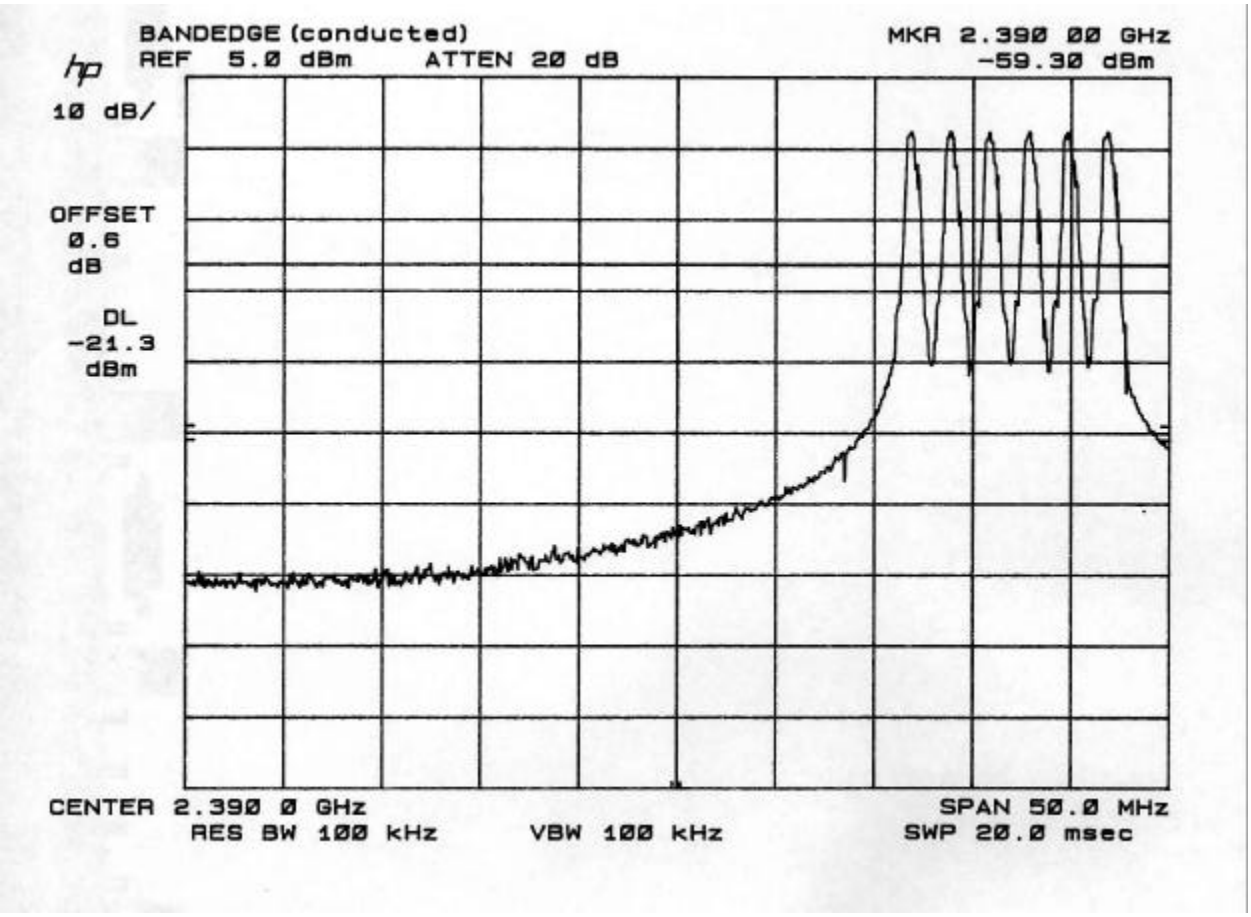
BANDEDGE @ HOPPING CHANNEL
MARKER SET TO LOW END



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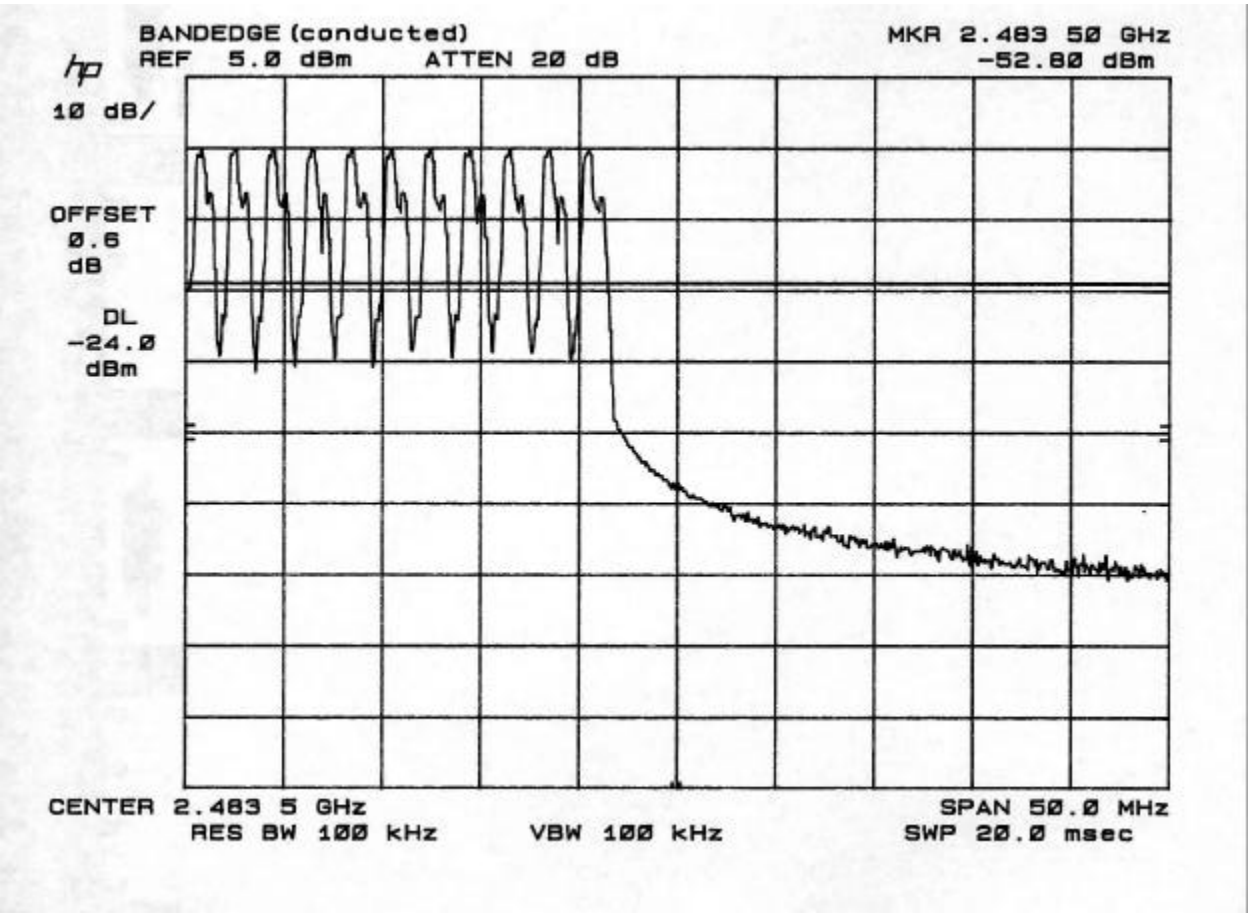
BANDEDGE @ HOPPING CHANNEL
MARKER SET TO HIGH END



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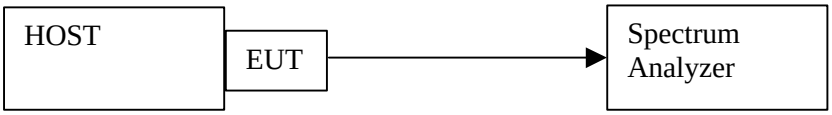
9.8. PEAK POWER SPECTRAL DENSITY

TEST SETUP

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
Above 1000	☒ Peak	☒ 3 kHz	☒ 3 kHz



TEST PROCEDURE

The transmitter output port was connected to the spectrum analyzer input port. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 3 kHz VBW, set sweep time=span/3kHz. The power spectral density was measured and recorded. The sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

The EUT does not have a function of stop-hopping mode and measurements were taken at a normal hopping mode. The spectrum analyzer was set to the lowest channel of the EUT with TRACE at MAXHOLD. Repeated test with mid and high channels.

Result:

No non-compliance noted. See plot below.

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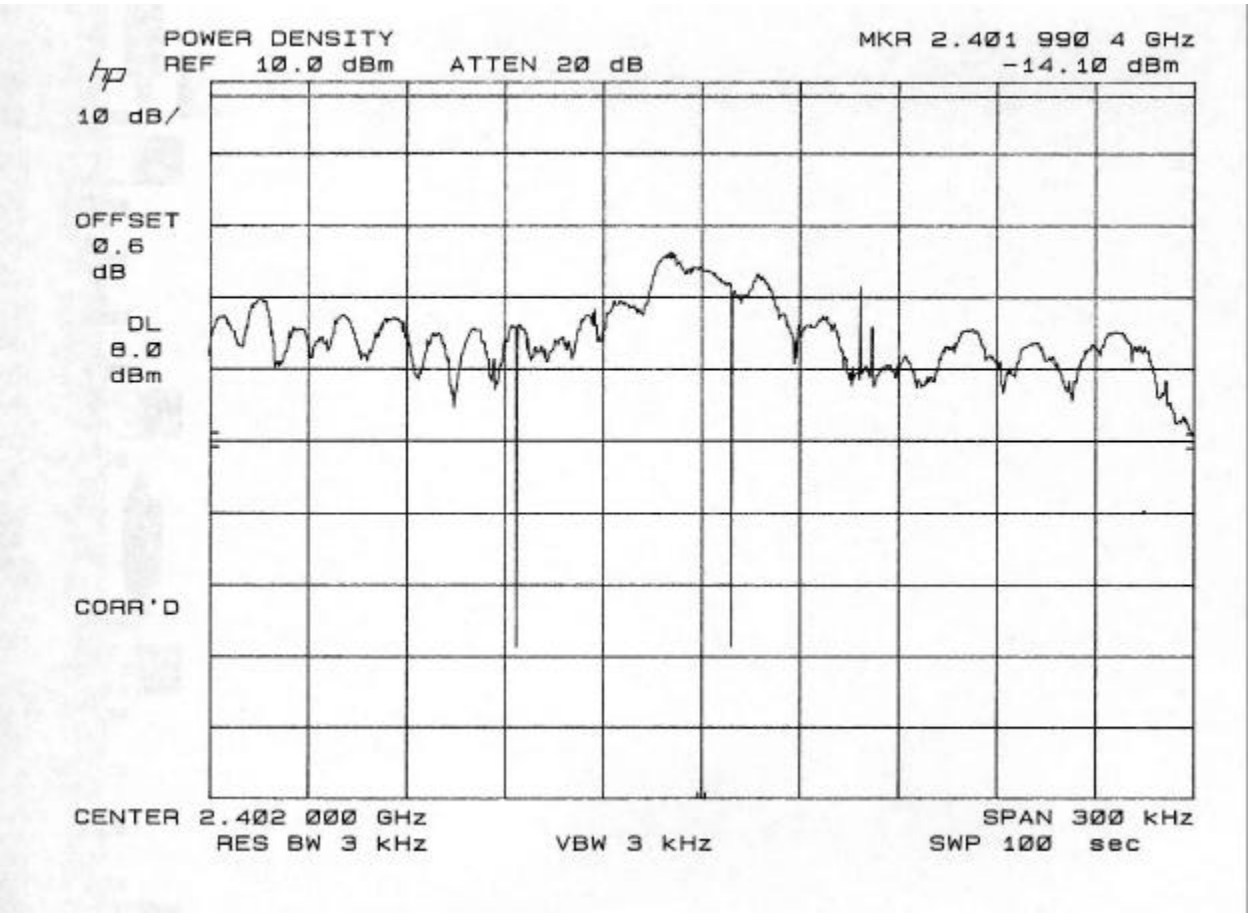
LOW CHANNEL



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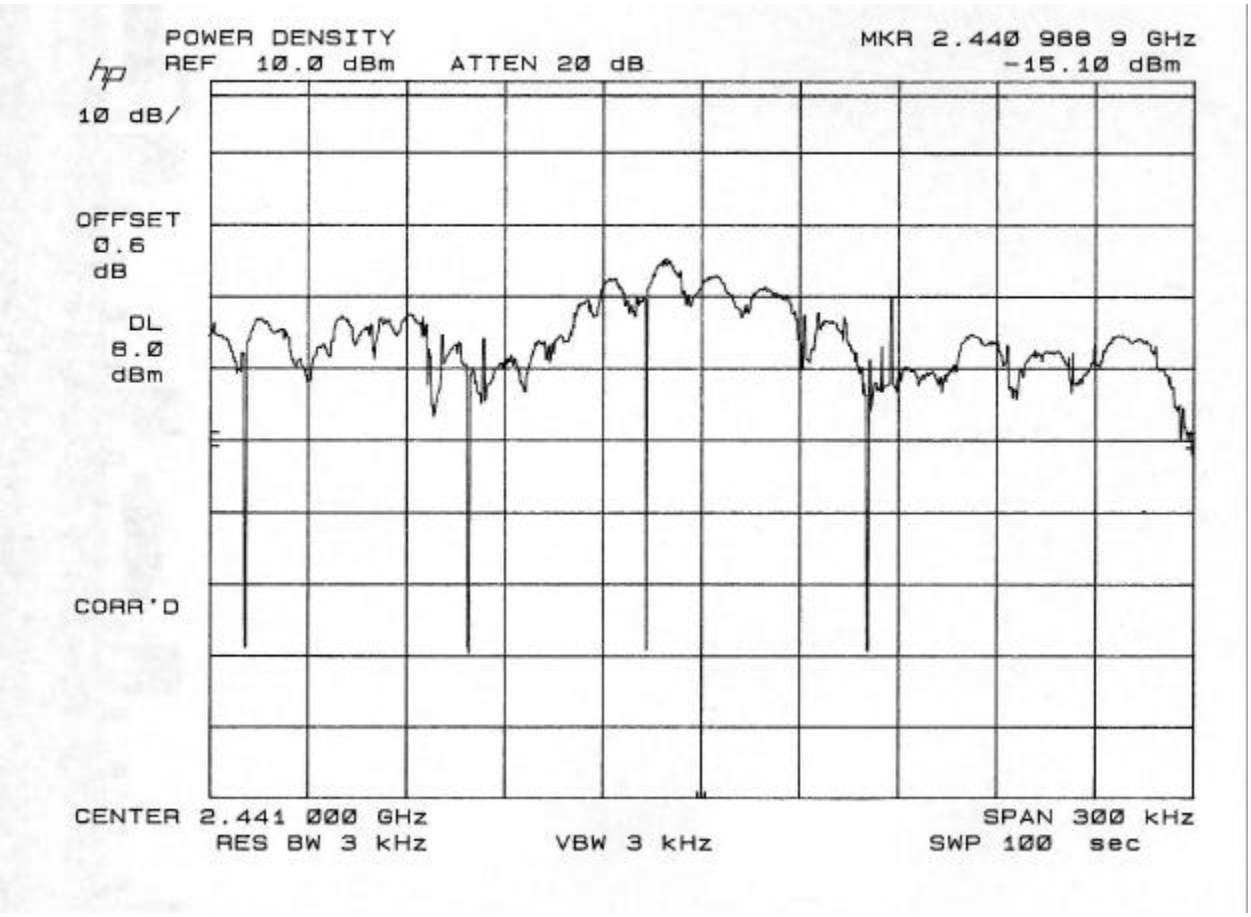
MID CHANNEL



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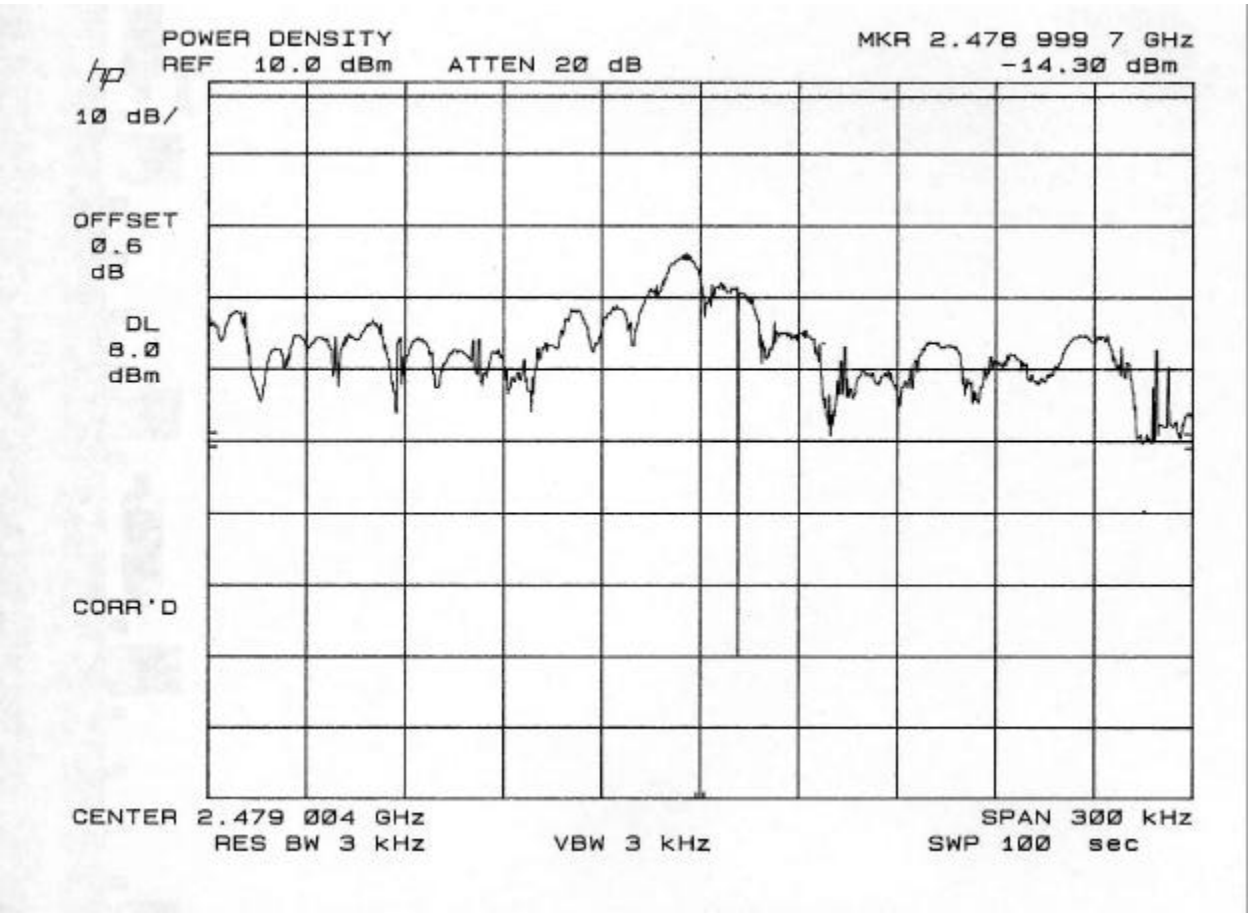
HIGH CHANNEL



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9.9. RADIATED EMISSION

9.9.1. RADIATED EMISSION AND RESTRICTED BANDS

TEST SETUP

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
30 to 1000	☒ Peak ☒ Quasi Peak	☒ 100 KHz ☒ 1 MHz	☒ 100 KHz ☒ 1 MHz
Above 1000	☒ Peak ☒ Average	☒ 1 MHz ☒ 1 MHz	☒ 1 MHz ☒ 10 Hz

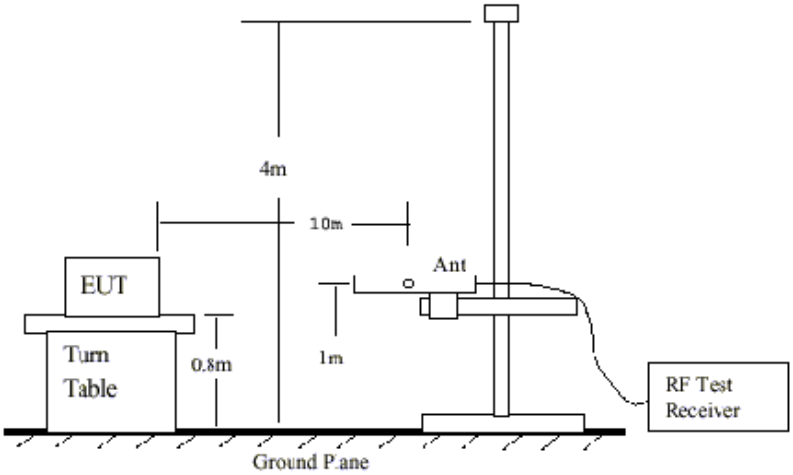

Fig 1: Radiated Emission Measurement 30 to 1000 MHz

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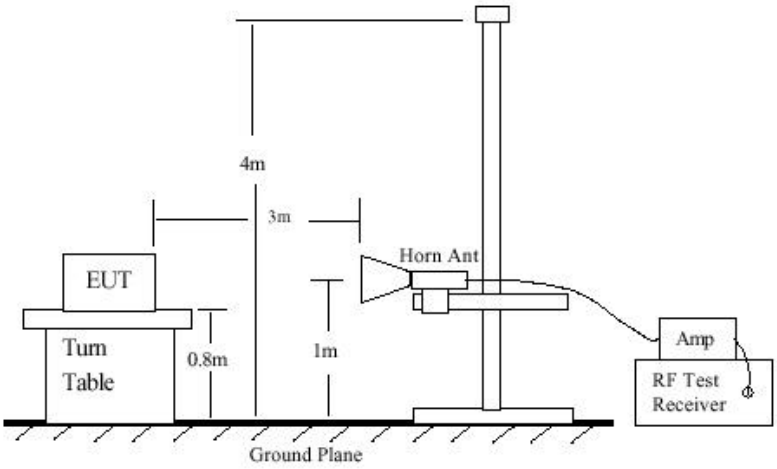

Fig 2: Radiated Emission Above 1000 MHz

TEST PROCEDURE

1. The EUT was placed on the turntable 0.8 meter above ground in 3 meter open area test site.
2. Set the resolution bandwidth to 100KHz in the test receiver and select Peak function to scan the frequency below 1 GHz.
3. Shift the interference-receiving antenna located in antenna tower upwards and downwards between 1 and 4 meters above ground and find out the local peak emission on frequency domain.
4. Locate the interference-receiving antenna at the position where the local peak reach the maximum emission.
5. Rotate the turntable and stop at the angle where the measurement device has maximum reading.
6. Shift the interference-receiving antenna again to detect the maximum emission of the local peak.
7. If the reading of the local peak under Peak function is lower than limit by 6dB, then Quasi Peak detection is not needed and this reading should be recorded. And if it is higher than Peak limit, then the test is fail. Others, switch the receiver to Quasi Peak

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function, set the resolution bandwidth to 100kHz and repeat the procedures (3)~(6). If the reading is lower than limit, this reading should be recorded, otherwise, the test is fail.
8. Set the resolution and video bandwidth of the spectrum analyzer to 1MHz and repeat procedures (3)~(6) for frequency band from 1 GHz to 10 times carrier frequency.
9. If the reading for the local peak is lower than the Average limit, no further testing is needed in this local peak and this reading should be recorded. If it is higher than Average limit but lower than Peak limit, then set the resolution bandwidth to 1MHz and video bandwidth to 10Hz. Repeat procedures (3)~(6). If the maximum reading is lower than Average limit, then this reading should be recorded. If it is higher, then the test is fail.

RESULT

No non-compliance noted. See data below.

COMPLIANCE Certification Services

FCC, VCCI, CISPR, CE, AUSTEL, NZ
UL, CSA, TUV, BSMI, DHHS, NVLAP

561F MONTEREY ROAD, SAN JOSE, CA 95037-9001
PHONE: (408) 463-0885 FAX: (408) 463-0888

Project #:	02U1228-1
Report #:	020501B1
Date& Time:	05/01/02 3:06 PM
Test Engr:	KERWIN CORPUZ

Company:	Computer Access Technologies Corp.
EUT Description:	Bluetooth Portable Protocol Analyzer (M/N:MerlinMobile)
Test Configuration :	EUT/Laptop/Mouse/Printer
Type of Test:	FCC 15.209
Mode of Operation:	Inquiry/Hopping Channels

<< Main Sheet

Freq. (MHz)	Reading (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Level (dBuV/m)	Limit FCC_B	Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)	Mark (P/Q/A)
460.07	46.80	16.73	4.97	29.59	38.91	46.00	-7.09	3mV	180.00	1.00	P
227.43	48.90	10.61	3.19	29.01	33.70	46.00	-12.30	3mV	0.00	1.00	P
166.28	48.00	9.72	2.72	29.32	31.11	43.50	-12.39	3mH	180.00	1.50	P
307.19	45.40	13.17	3.84	28.86	33.55	46.00	-12.45	3mH	300.00	1.50	P
282.64	45.70	12.68	3.64	28.85	33.17	46.00	-12.83	3mH	200.00	1.50	P
137.65	46.40	11.12	2.48	29.44	30.57	43.50	-12.93	3mH	90.00	1.50	P
6 Worst Data											

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COMPLIANCE CERTIFICATION SERVICES, INC.

Radiated Emissions 07/26/02
FCC 15.205 Kerwin Corpuz
C-site (1.0 Meter)

Computer Access Technology Corp.
2.4 GHz Bluetooth Portable Protocol Analyzer with external antenna (M/N: MerlinMobile)

fo = 2402 MHz (low channel) ***Inquiry/Hopping Channels mode***

FREQ (MHz)	READING (dBuV)		AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	HPF (dB)	RESULT (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dB)	
	Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg
4804*	41.2	30.5	33.8	4	36.1	9.54	1	34.36	23.66	74	54	-39.6	-30.3
7206*	45.3	32.9	37.1	5	36.3	9.54	1	42.56	30.16	74	54	-31.4	-23.8
9608*	43.4	32.3	38.5	5.9	35.6	9.54	1	43.66	32.56	74	54	-30.3	-21.4
12010*	45	34.2	39.3	6.5	36.3	9.54	1	45.96	35.16	74	54	-28	-18.8
14412*	49	37.5	41.5	7.5	38.3	9.54	1	51.16	39.66	74	54	-22.8	-14.3
16814*	48.5	38.3	41.9	8.5	38.7	9.54	1	51.66	41.46	74	54	-22.3	-12.5
19216*	51.2	40.1	32.1	9.4	39.5	9.54	1	44.66	33.56	74	54	-29.3	-20.4
21618*	52.6	41.8	32.5	10.2	38.2	9.54	1	48.56	37.76	74	54	-25.4	-16.2
24020*	54.3	42.2	32.5	11.1	39.3	9.54	1	50.06	37.96	74	54	-23.9	-16

fo = 2441 MHz (mid channel) ***Inquiry/Hopping Channels mode***

FREQ (MHz)	READING (dBuV)		AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	HPF (dB)	RESULT (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dB)	
	Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg
4882*	41.2	30.5	33.8	4	36.1	9.54	1	34.36	23.66	74	54	-39.6	-30.3
7323*	45.3	32.9	37.1	5	36.3	9.54	1	42.56	30.16	74	54	-31.4	-23.8
9764*	43.4	32.3	38.5	5.9	35.6	9.54	1	43.66	32.56	74	54	-30.3	-21.4
12205*	45	34.2	39.3	6.5	36.3	9.54	1	45.96	35.16	74	54	-28	-18.8
14646*	49	37.5	41.5	7.5	38.3	9.54	1	51.16	39.66	74	54	-22.8	-14.3
17087*	48.5	38.3	41.9	8.5	38.7	9.54	1	51.66	41.46	74	54	-22.3	-12.5
19528*	51.2	40.1	32.1	9.4	39.5	9.54	1	44.66	33.56	74	54	-29.3	-20.4
21969*	52.6	41.8	32.5	10.2	38.2	9.54	1	48.56	37.76	74	54	-25.4	-16.2
24410*	54.3	42.2	32.5	11.1	39.3	9.54	1	50.06	37.96	74	54	-23.9	-16

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fo = 2480 MHz (high channel) ***Inquiry/Hopping Channels mode***

FREQ (MHz)	READING (dBuV)		AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	HPF (dB)	RESULT (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dB)	
	Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg
4960*	41.2	30.5	33.8	4	36.1	9.54	1	34.36	23.66	74	54	-39.6	-30.3
7440*	45.3	32.9	37.1	5	36.3	9.54	1	42.56	30.16	74	54	-31.4	-23.8
9920*	43.4	32.3	38.5	5.9	35.6	9.54	1	43.66	32.56	74	54	-30.3	-21.4
12400*	45	34.2	39.3	6.5	36.3	9.54	1	45.96	35.16	74	54	-28	-18.8
14880*	49	37.5	41.5	7.5	38.3	9.54	1	51.16	39.66	74	54	-22.8	-14.3
17360*	48.5	38.3	41.9	8.5	38.7	9.54	1	51.66	41.46	74	54	-22.3	-12.5
19840*	51.2	40.1	32.1	9.4	39.5	9.54	1	44.66	33.56	74	54	-29.3	-20.4
22320*	52.6	41.8	32.5	10.2	38.2	9.54	1	48.56	37.76	74	54	-25.4	-16.2
24800*	54.3	42.2	32.5	11.1	39.3	9.54	1	50.06	37.96	74	54	-23.9	-16

NOTE: * Measured noise floor (worse case vertical), horizontal (H) and vertical (V)
DIST: extrapolate reading from 3m specification distance to 1m measurement distance = **-9.54dB**
AF: Antenna Factor
AMP: Pre-amp gain
CL: SMA cable loss (12ft)
HPF: FSY High pass filter insertion loss (4.57GHz; S/N:003)

ANALYZER SETTINGS	RES BW	AVG BW
Peak(Pk):	1MHz	1MHz
Average(Avg):	1MHz	10Hz

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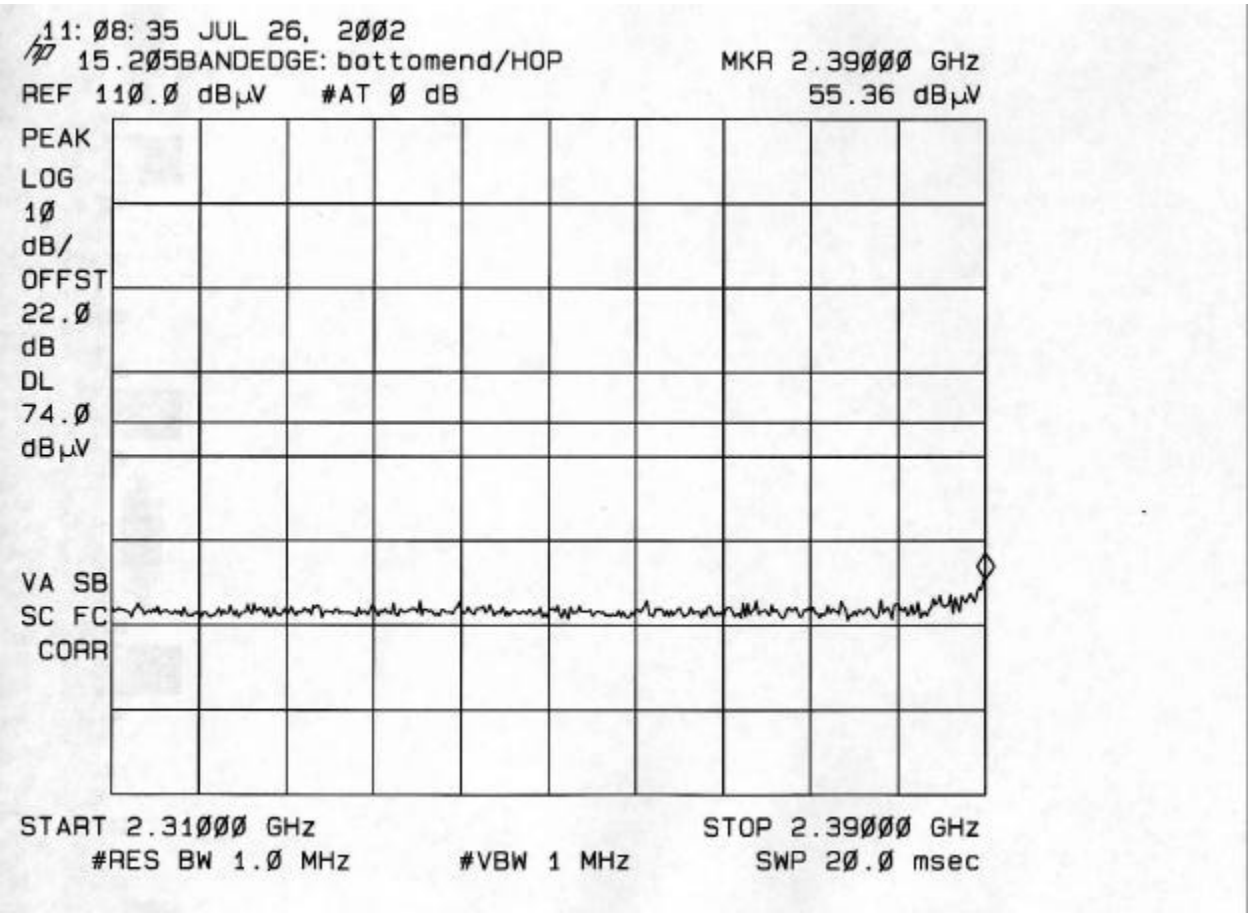
RESTRICTED BANDEDGE: 2310 – 2390 MHz and 2483.5 – 2500 MHz

BOTTOM BANDEDGE @ HOPPING CHANNEL



PEAK DETECTOR

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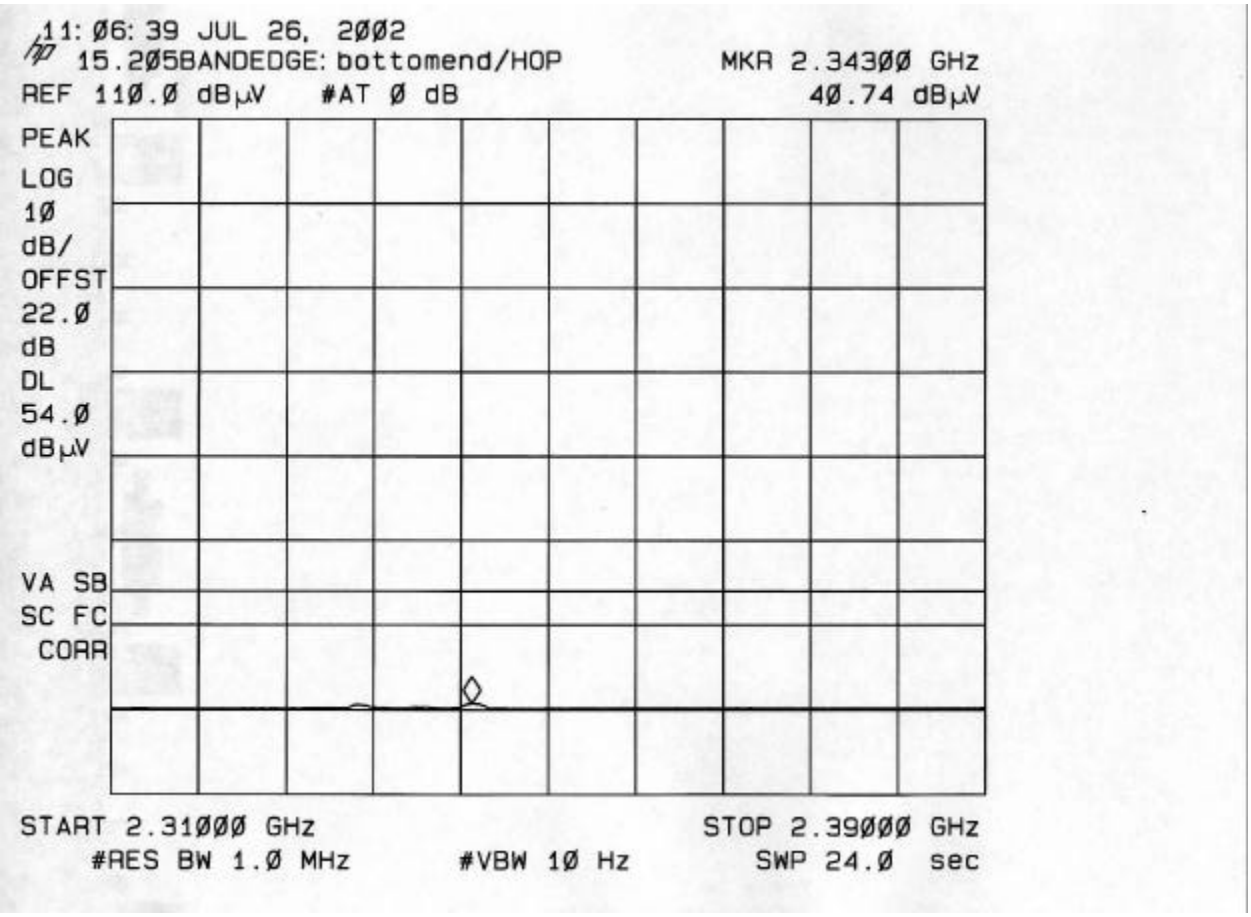

AVERAGE DETECTOR

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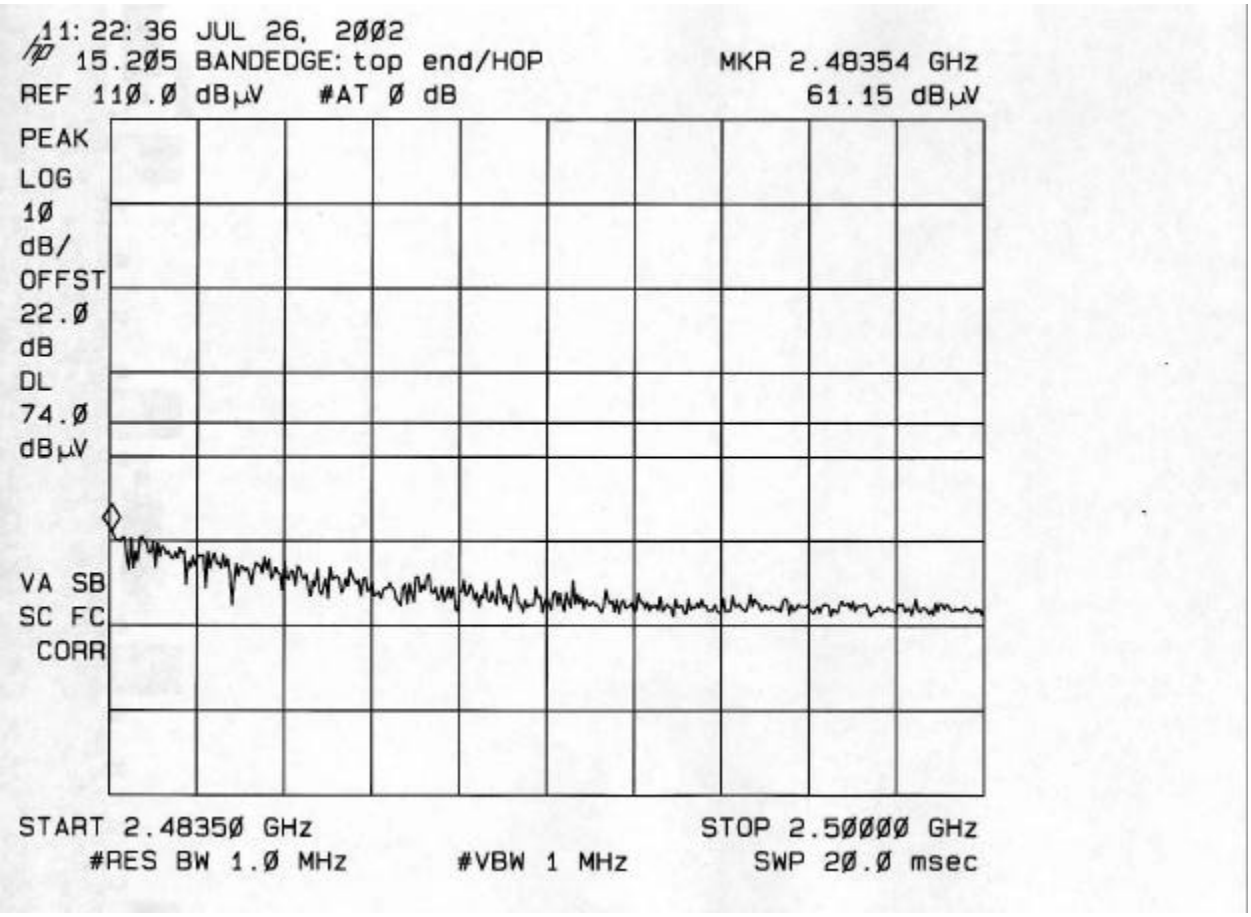
TOP BANDEDGE @ HOPPING CHANNEL



PEAK DETECTOR

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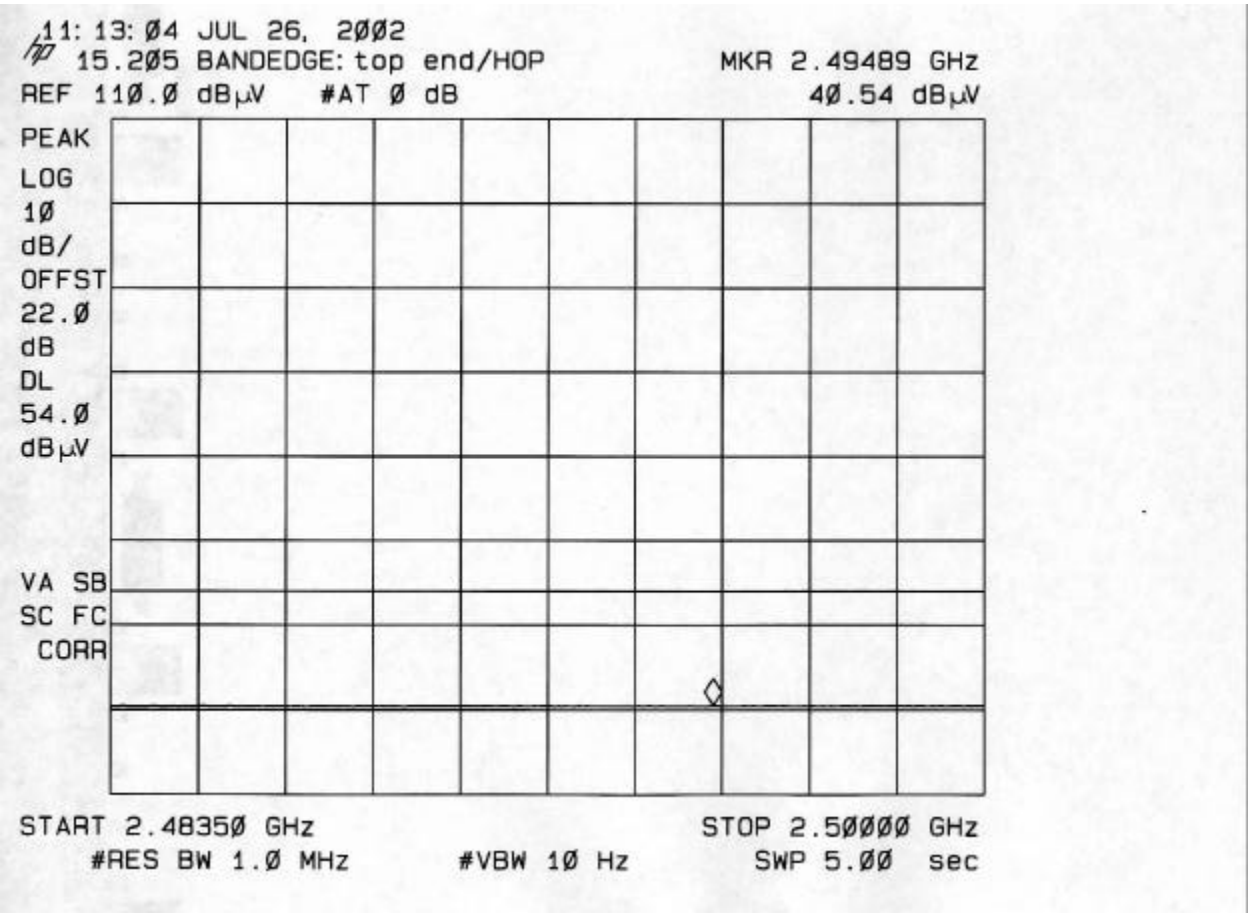

AVERAGE DETECTOR

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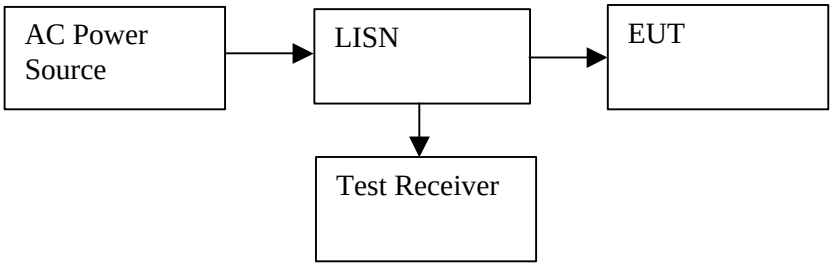
9.10. POWER LINE CONDUCTED EMISSION

TEST SETUP

Detector Function Setting of Test Receiver

Frequency Range (MHz)	Detector Function	Resolution Bandwidth	Video Bandwidth
450 KHz to 30 MHz	☐ Peak ☒ Quasi Peak	☒ 10 KHz	☒ 10 KHz



TEST PROCEDURE

1. The EUT was placed on a wooden table 80 cm above the horizontal ground plane and 40 cm away from the vertical ground plane. The EUT was set to transmit / receive in a continuous mode.

2. Conducted disturbance was measured between the phase lead and the ground, and between the neutral lead and the ground. The frequency 0.450 - 30 MHz was investigated.

RESULT

No non-compliance noted. See Line Conduction plot

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.48	30.77	--	--	0.00	48.00	--	-17.23	--	L1
0.53	31.14	--	--	0.00	48.00	--	-16.86	--	L1
0.59	29.81	--	--	0.00	48.00	--	-18.19	--	L1
0.47	29.29	--	--	0.00	48.00	--	-18.71	--	L2
0.53	29.79	--	--	0.00	48.00	--	-18.21	--	L2
0.59	27.83	--	--	0.00	48.00	--	-20.17	--	L2
6 Worst Data									

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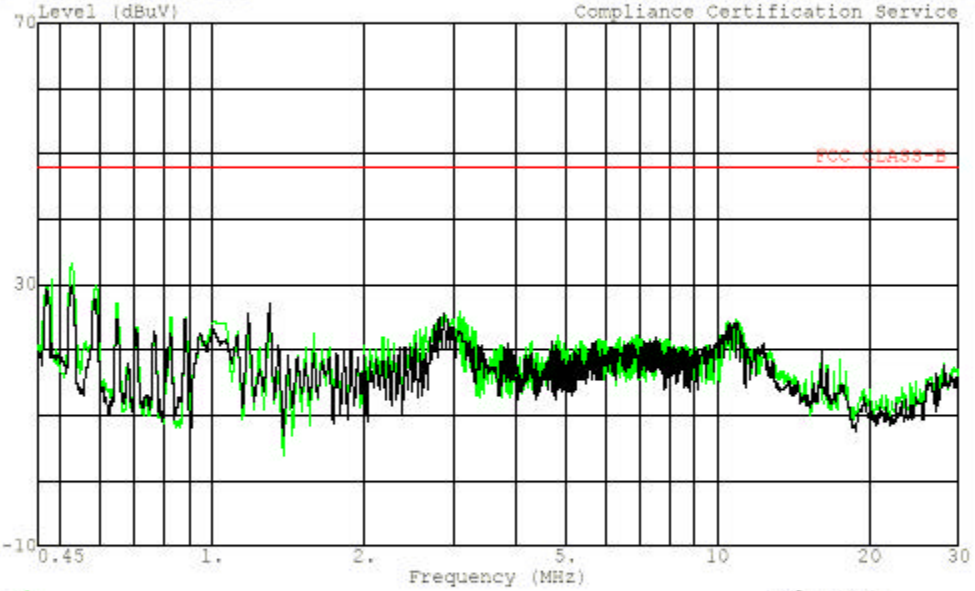
COMPLIANCE Engineering Services, Inc.
561F Monterey Road,
San Jose, CA 95037 USA
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 7 File#: LC.EMI Date: 05-02-2002 Time: 09:40:31
Compliance Certification Service



Trace: 3 Ref Trace:
Project # : 02U1228-1
Test Engineer: Kerwin Corpuz
Company : Computer Access Technology Corp.
EUT : Bluetooth Portable Protocol Analyzer
: model: MerlinMobile
Test Config : EUT/Laptop/Mouse/Printer
Type of Test : FCC 15.207
Mode of Op. : Inquiry/Hopping Channels
: PEAK: L1(Green), L2 (Black)
: 115Vac, 60Hz

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9.11. SETUP PHOTOS

Radiated Emission below 1 GHz measurement

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Conducted Emission measurement

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Radiated Emission above 1 GHz measurement

Radiated Emission above 18 GHz measurement

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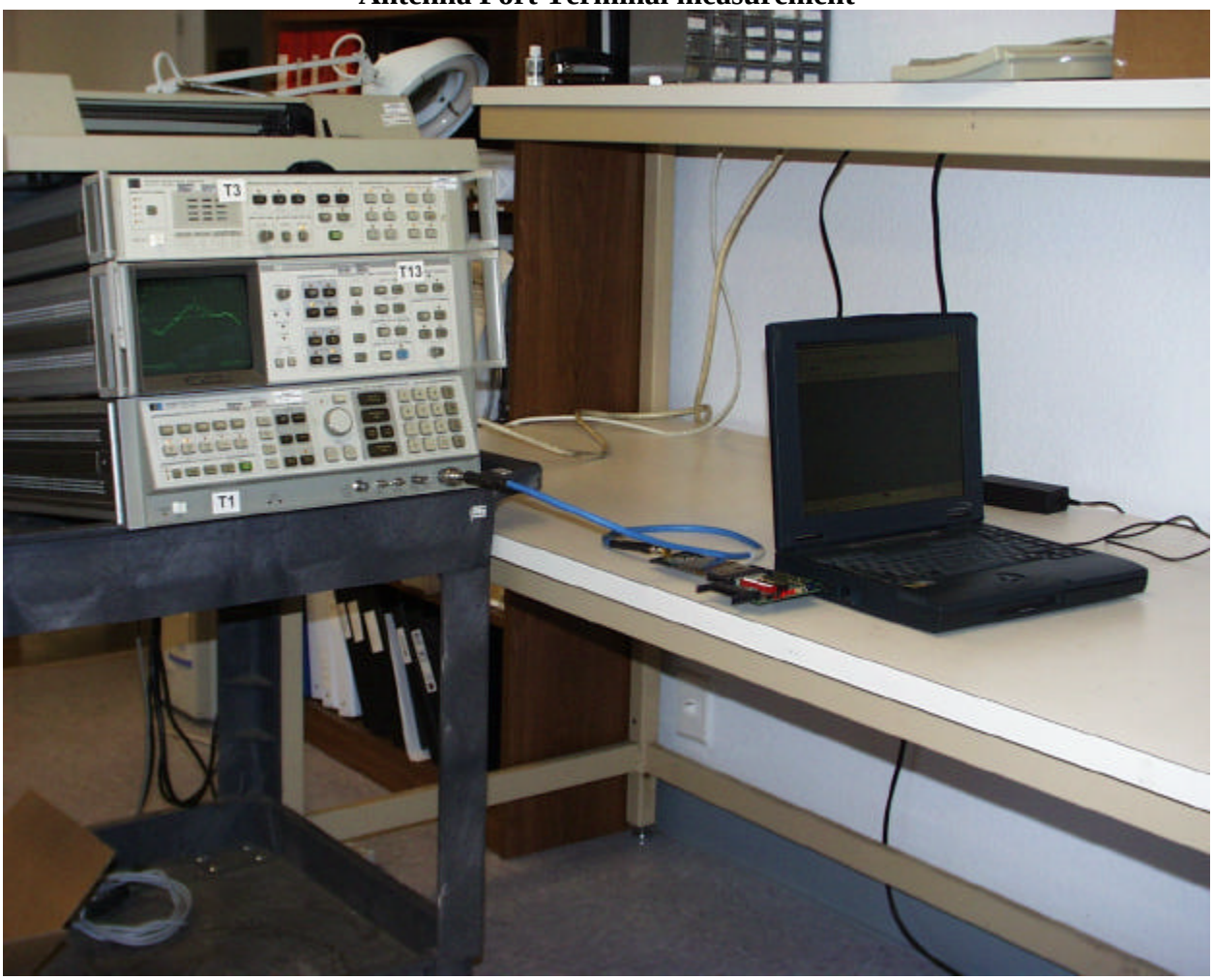
Antenna Port Terminal measurement



END OF REPORT

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