Radio Intentional EMC Test Report: EDCS - 633847

For

C3205WMIC-A-K9

Against the following Specifications :

47CFR15

RSS-210

Cisco Systems

EMC Laboratory

170 West Tasman Drive

San Jose, CA 95134

ACCREDITED

Certificate Number : 1178-01

Author: Donald Foster
Approved By:
Title:

This report replaces any previously entered test report under EDCS - 633847

This test report has been electronically authorized and archived using the CISCO Engineering Document Control system.

Section 1: Overview

Test Summary

The samples were assessed against the tests detailed in section 3 under the requirements of the following standards:

Emission		
Specification	**Type**	**Applied To**
CFR47 Part 15.247(a)	Conducted Emissions	RF Ports
CFR47 Part 15.247(a)(2)	Conducted Emissions	RF Ports
CFR47 Part 15.247a3 (LP0002 3.10.6.2.2, RSS210)	Conducted Emissions	RF Ports
CFR47 Part 15.247b3 (LP0002 4.7.2)	Conducted Emissions	RF Ports
Conducted Spurious Emissions	Conducted Emissions	RF Ports
Radiated Spurious Emissions	Radiated Emissions	Enclosure
Restricted Bandedge Measurements	Radiated Emissions	Enclosure

Immunity		
Specification	**Type**	**Applied To**
N/A	N/A	N/A

Notes:

1) Where a specification listed on the front cover of this report has deviations from the basic standards listed above, the additional technical requirements of the specification were also assessed.
2) Measurements were made in accordance with FCC docket #: DA-00705, DA-02-2138A1 & measurement method of spurious emission tolerance to the International Telecommunication Union (ITU) Recommendation SM329
3) Where appropriate, Cisco may have substituted a later revision of a basic standard to those referenced in the specification on the front sheet of this test report. This decision was based upon improved test methodology and repeatability and/or where the newer revision represented a more stringent test.

Section 2: Assessment Information

2.1 General

The testing was performed by and for the use of Cisco systems Inc. This report must not be used to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal Government.

This report may contain data that is not enveloped by the scope of the A2LA accreditation (A2LA certificate number1178-01). Please refer to Appendix C for further details.

With regard to this assessment, the following points should be noted:

a) The results contained in this report relate only to the items tested and were obtained in the period between the date of the initial assessment and the date of issue of the report. Manufactured products will not necessarily give identical results, due to production tolerances and measurement uncertainties.

b) The apparatus was set up and exercised using the configuration and modes of operation defined in this report only.

c) Where relevant, the apparatus was only assessed using the susceptibility criteria defined in this report and the Test Assessment Plan (TAP).

d) All testing was performed under the following environmental conditions:

Temperature	15°C to 35°C (54°F to 95°F)
Atmospheric Pressure	860mbar to 1060mbar (25.4" to 31.3")
Humidity	10% to 75*%

e) All AC testing was performed at one or more of the following supply voltages:
110V 60 Hz (+/-20%)
220V 50 Hz (+/-20%)

f) Cisco Systems, Inc. is accredited by the American Association for Laboratory Accreditation (A2LA). The scope of accreditation, certificate number1178-01 is referenced in appendix C, along with further details.

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2.2 Start Date of Testing

03-Dec-2007

2.3 Report Issue Date

Cisco Systems, Inc. uses an electronic system to issue, store and control the revision of test reports. This system is called the Engineering Document Control System (EDCS). The actual report issue date is embedded into the original file on EDCS. Any copies of this report, either electronic or paper, that are not on EDCS must be considered uncontrolled

2.4 Testing facilities

This assessment was performed by:

Testing Laboratory

Cisco Systems, Inc.,
170 West Tasman Drive
San Jose, CA 95134,
USA

Registration Numbers for Industry Canada

Cisco System Site	Site Identifier
Building P, 10m Chamber	Company #: 4624-2
Building P, 5m Chamber	Company #: 4624-1
Building N, 5m Chamber	Company #: 6111
Building I, 5m Chamber	Company #: 6112

Test Engineers

Donald Foster

2.5 Equipment Assessed (EUT)

C3205WMIC-A-K9

2.6 EUT Description

The C3205WMIC-A-K9 is a standalone A radio module that is installed in the 3200 series mobile router. The end user can stack several of these radios into a single chassis and build a point to point to point network with association to both client and Master devices.

Antennas used with this assembly:

*AIR-ANT5117S-N 17dbi sector
*AIR-ANT5114P-N 14dbi patch
AIR-ANT5195P-R 9.5dbi patch
*AIR-ANT5175V-N 7.5dbi omni
AIR-ANT 5180V-N 7.5dbi omni
AIR-ANT5170P-R 7dbi patch
AIR-ANT5160V-R 6dbi omni
*AIR-ANT58G28SDA-N 28dbi
*AIR-ANT58G9VOA-N 9dbi

* Denotes the highest gain antenna that is used in the testing of each antenna type.

2.7 Justification of the worst case test configuration and mode of operation

This configuration meets the requirements for testing to the applicable countries

2.8 Scope of Assessment

Tests have been performed in accordance with the relevant Test and Assessment Plan (TAP), a copy of which is contained in Appendix F of this report, and the relevant Cisco Systems, Inc. radio test procedures (EDCS-420238). This test report may not cover all of the tests highlighted in the test plan.

2.9 Units of Measurement

The units of measurements defined in the appendices are reported in specific terms, which are test dependent. Where radiated measurements are concerned these are defined at a particular distance. Basic voltage measurements are defined in units of [dBuV]

As an example, the basic calculation for all measurements is as follows:

Emission level [dBuV] = Indicated voltage level [dBuV] + Cable Loss [dB] + Other correction factors [dB]

The combinations of correction factors are dependent upon the exact test configurations [see test equipment lists for further details] and may include:-

Antenna Factors, Pre Amplifier Gain, LISN Loss, Pulse Limiter Loss and Filter Insertion Loss..

Note: to convert the results from dBuV/m to uV/m use the following formula:-

Level in uV/m = Common Antilogarithm [(X dBuV/m)/20] = Y uV/m

2.10 Report Template Control No.

Revision: SJRIA 7.0

Section 3: Result Summary

3.1 Results Summary Table

Conducted emissions

Test Number (Spec Id)	Basic Standard	Freq Range	Test Details / Comments	Mode	Systems Tested	Result
29602 (462)	CFR47 Part 15.247b3 (LP0002 4.7.2) **Applied to:** RF Ports **Class:** N/A	5725MHz - 5850MHz	Peak Output Power: 1wattAlso complies with HKTA1039	1	1	Pass
29647 (477)	CFR47 Part 15.247a3 (LP0002 3.10.6.2.2, RSS210) **Applied to:** RF Ports **Class:** N/A	5725MHz - 5850MHz	Power Spectral DensityAlso complies with HKTA1039	1	1	Pass
29599 (652)	Conducted Spurious Emissions **Applied to:** RF Ports **Class:** N/A	30MHz - xGHz	Also complies with RSS 210, LP0002, HKTA1039	1	1	Pass
29598 (800)	CFR47 Part 15.247(a)(2) **Applied to:** RF Ports **Class:** B	5725MHz - 5850MHz	6dB Bandwidth also complies with LP0002, RSS210, HKTA1039	1	1	Pass
29596 (651)	CFR47 Part 15.247(a) **Applied to:** RF Ports **Class:** N/A	2400MHz - 5850MHz	26dB Bandwidth also complies wiht RSS 210, LP0002, HKTA1039	1	1	Pass

Radiated emissions

Test Number (Spec Id)	Basic Standard	Freq Range	Test Details / Comments	Mode	Systems Tested	Result
29604 (648)	Restricted Bandedge Measurements **Applied to:** Enclosure **Class:** B	2.4GHz - 5.825GHz	CFR47 Part 15.205,CFR47 Part 15.209,LP002, RSS210HKTA1039	1	3,5	Pass
29612 (648)	Restricted Bandedge Measurements **Applied to:** Enclosure **Class:** B	2.4GHz - 5.825GHz	CFR47 Part 15.205,CFR47 Part 15.209,LP002, RSS210HKTA1039	1	4	Pass
29621 (647)	Radiated Spurious Emissions **Applied to:** Enclosure **Class:** B	30MHz - 26.5GHz	CFR47 Part 15.109CFR47 Part 15.247, RSS-210, LP0002 HKTA1039	1	4	Pass
29607 (647)	Radiated Spurious Emissions **Applied to:** Enclosure **Class:** B	30MHz - 26.5GHz	CFR47 Part 15.109CFR47 Part 15.247, RSS-210, LP0002 HKTA1039	1	3,1,5	Pass

Section 4: Sample Details

Note: Each sample was evaluated to ensure that its condition was suitable to be used as a test sample prior to the commencement of testing. Please also refer to the “Justification for worst Case test Configuration” section of this report for further details on the selection of EUT samples.

4.1 Sample Details

Sample Number	Equipment Details	Serial Number	Part Number
S01	C3205WMIC-K9	FOC11384LT8	74-5121-02 01
S02	IBM laptop	78-WAYM9 00/01	n/a
S03	AC power adapter	11S02K6657Z1Z0ZR0645N9	02k6657
S04	Mini-PCI extender card	eng proto	proto
S05	*AIR-ANT5175V-N 7.5dbi omni	n/a	74-4283-01
S06	*AIR-ANT5114P-N 14dbi patch	n/a	n/a

S07	*AIR-ANT5117S-N 17dbi sector	n/a	n/a
S08	AIR-ANT58G9VOA-N 9dbi omni	n/a	n/a
S09	AIR-ANT58G28SDA-N 28dbi dish	n/a	n/a

The following antennas were evaluated as part of this testing process. The antennas listed reflect the maximum gain allowed for each family type of antenna:

4.2 System Details

System #	Description	Samples
1	EUT	S01
2	Support equipment	S02, S03 and S04
3	Omni antenna test setup	S01 and S05
4	Patch antenna test setup	S01 and S06
5	Sector antenna test setup	S01 and S07
6	9dbi Omni test setup	S01 and S08
7	28dbi Dish test setup	S01 and S09

4.3 Mode of Operation Details

Mode#	Description	Comments
1	Continuous transmit mode	The radio will be forced into continuous Tx mode at the appropriate frequencies with the use of the ART diag program

Section 5: Modifications

5.1 Sample Modifications Performed During Assessment

No modifications were performed during assessment.

Appendix A: Formal Test Results

Conducted emissions

Test Number: 29602	**Spec ID:** 462			
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
CFR47 Part 15.247b3 (LP0002 4.7.2)	RF Ports	N/A	5725MHz - 5850MHz	Peak Output Power: 1wattAlso complies with HKTA1039
Operating Mode	**Mode :** 1, Continuous transmit mode			
Power Input	5, DC (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	EUT	S01	☑	☐
2	Support equipment	S02, S03 and S04	☐	☑

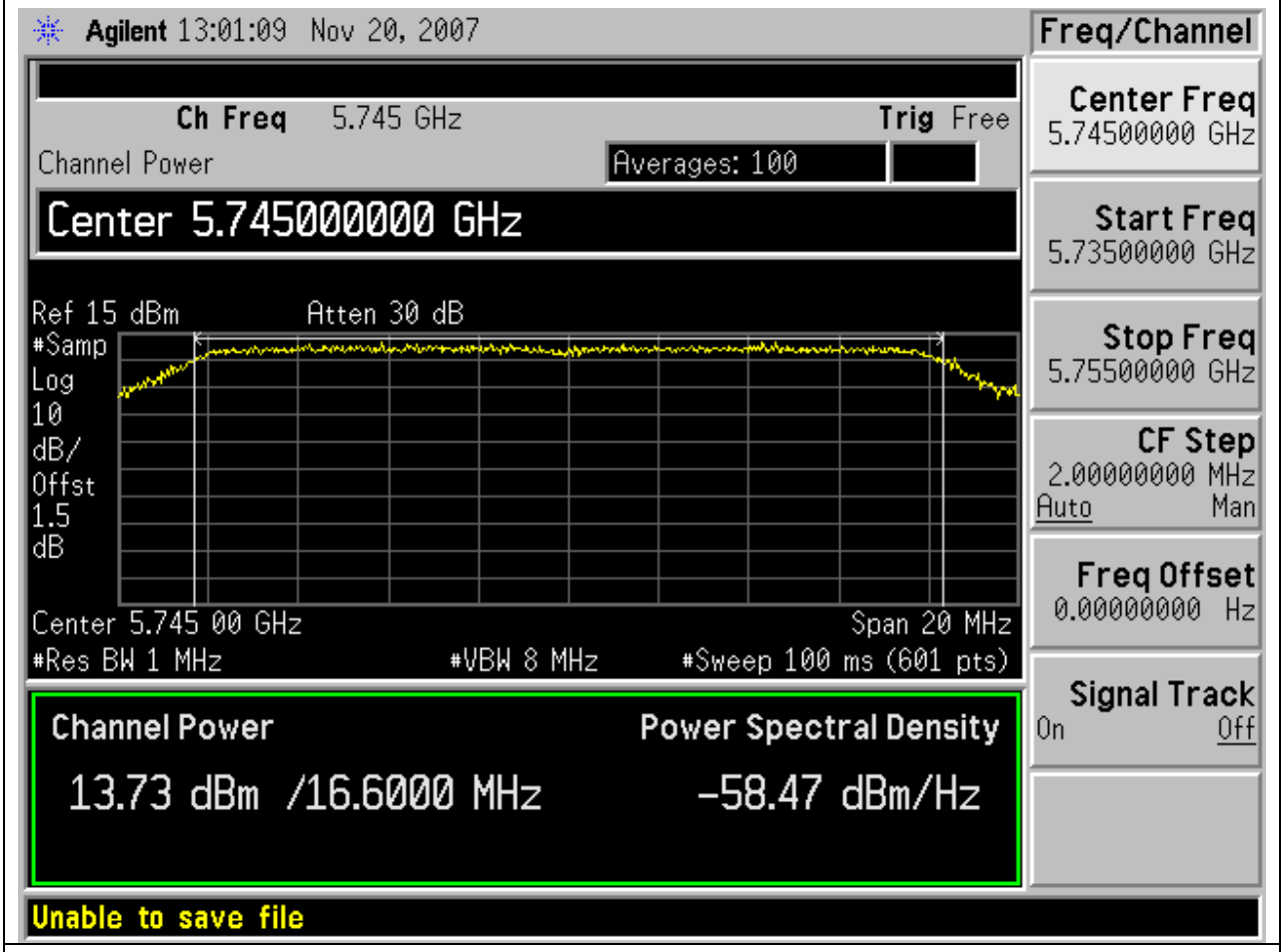
Subtest Number: 29602 - 1	**Subtest Date:** 03-Dec-2007
Engineer	Donald Foster
Lab Information	Building P, Shield Room 3
Subtest Results	
Line Under Test	[A] Antenna port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

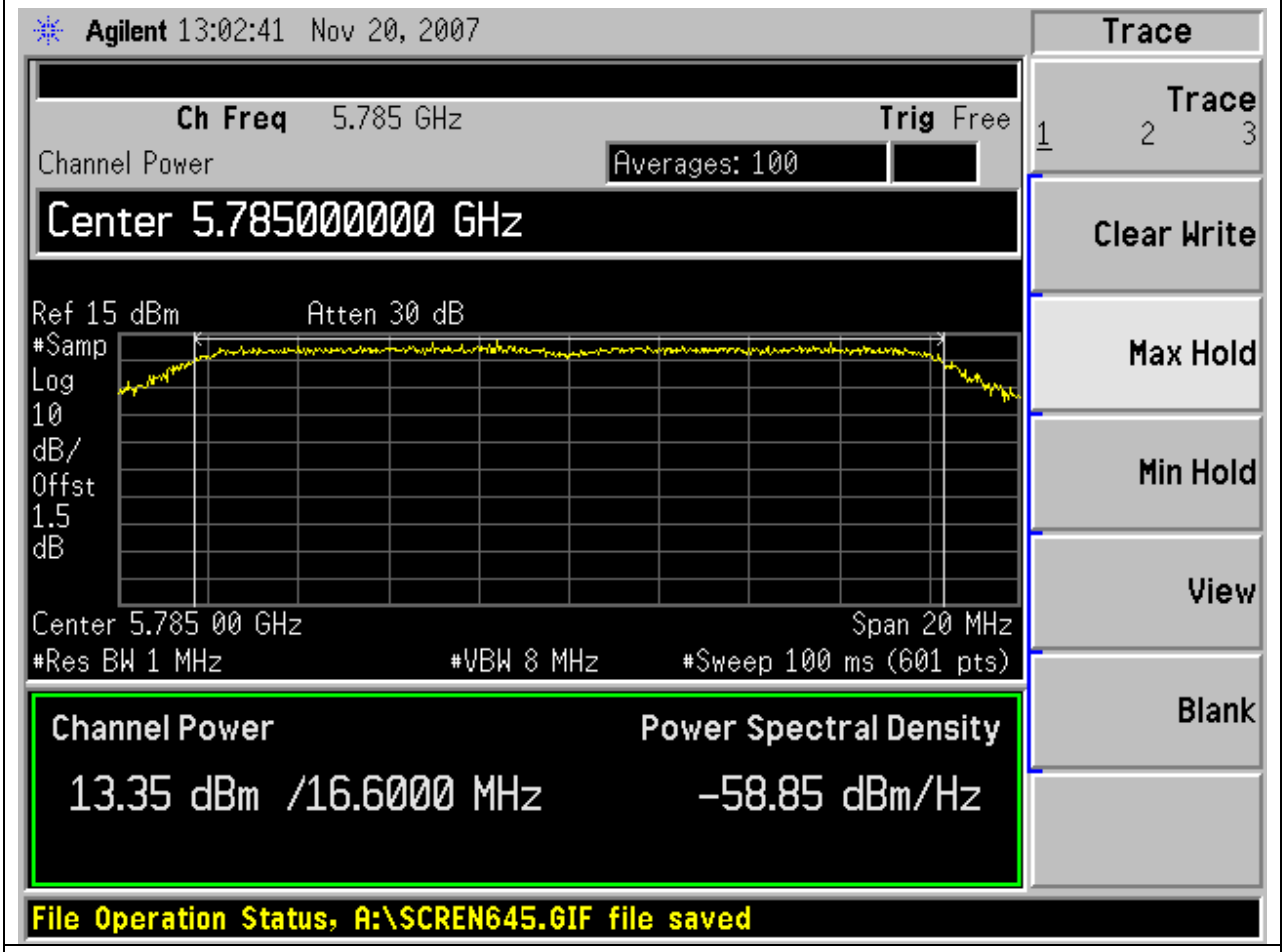
15.247: The maximum conducted output power of the intentional radiator for systems using digital modulation in the 5725-5850MHz band shall not exceed 1 Watt (30dBm). If transmitting antennas of directional gain greater than 6 dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power

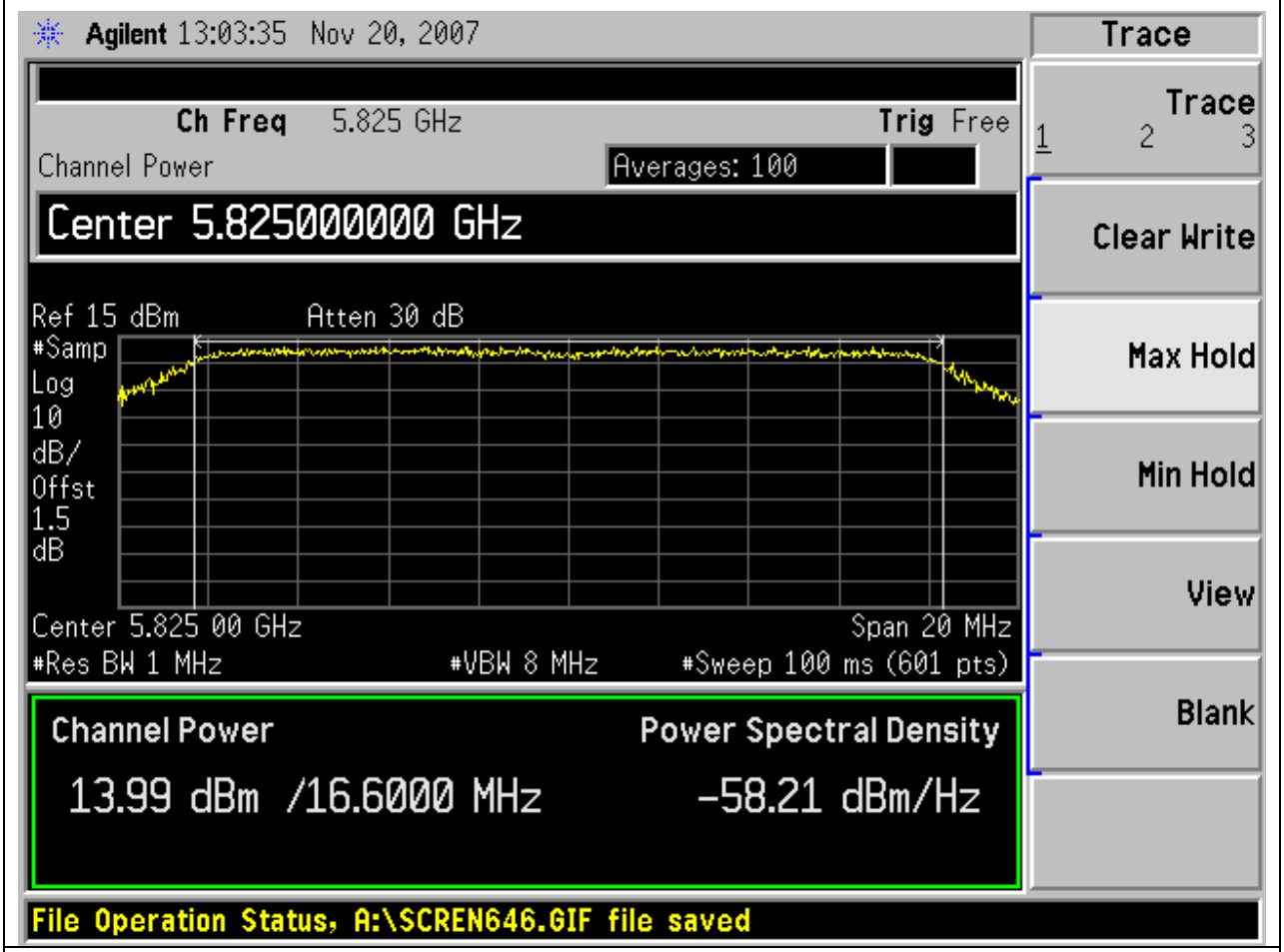
- For the 7.5 and 9 dBi Omni-directional antenna, 14dbi patch, and 17dbi sector antenna the maximum allowable output power must be reduced by 17dBi-6dbi = 11dB, for a maximum peak conducted output power of 19 dBm. For the high gain directional dish application there is no corresponding reduction in gain therefore the limit of 19dbi shall be used for all applications.

Note: The peak output power for this radio is stated at 16dbm. This value is the calibrated output directly at the radio modules antenna port. The system or systems that this module will go in employ a coaxial pigtail and RPTNC connector which is the antenna connection and has a nominal loss of 1.5db which is not subtracted from the measurements taken since it is the true antenna port. Measured values with this loss do not exceed the stated 16dbm

Frequency (MHz)	Data Rate (Mbps)	Antenna Gain (dBi)	Peak Power (dBm)	Limit (dBm)	Margin (dB)
5745	36	17	13.7	19	5.2
5785	36	17	13.4	19	5.5
5825	36	17	14	19	5.0





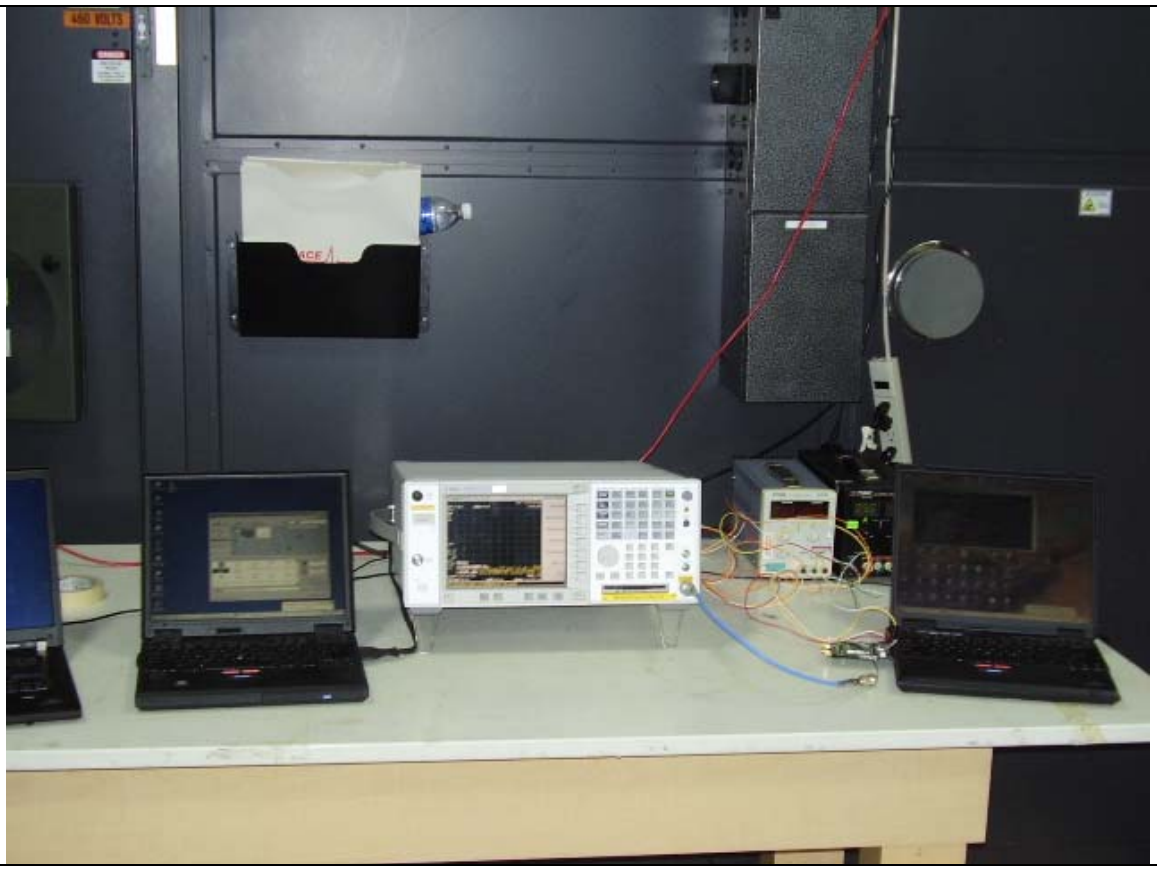


Physical Test arrangement Photograph:

Title: Conducted measurement setup

Comments on the above Photograph:

No further comments



Title: Conducted measurement setup

Comments on the above Photograph:

No further comments

Conducted emissions

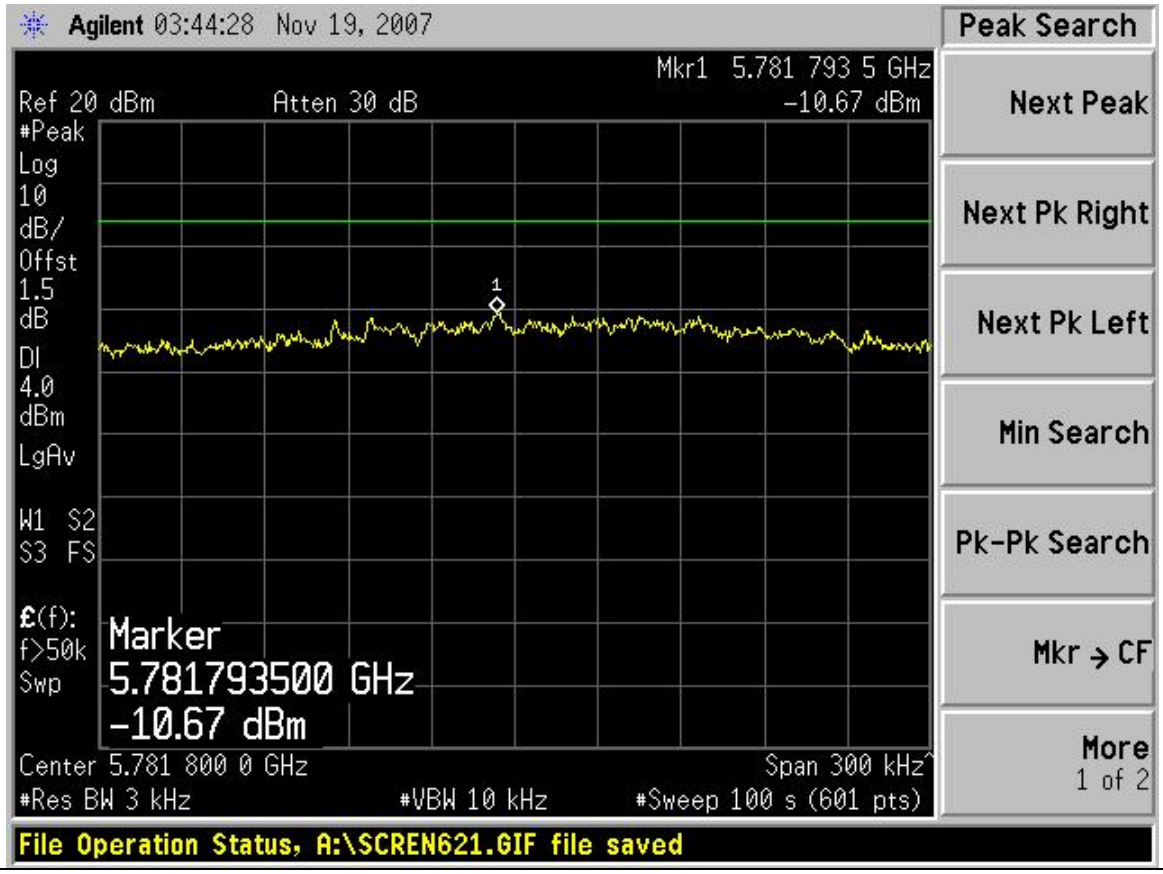
Test Number: 29647 **Spec ID:** 477				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
CFR47 Part 15.247a3 (LP0002 3.10.6.2.2, RSS210)	RF Ports	N/A	5725MHz - 5850MHz	Power Spectral DensityAlso complies with HKTA1039
Operating Mode	**Mode :** 1, Continuous transmit mode			
Power Input	5, DC (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	EUT	S01	☑	☐
2	Support equipment	S02, S03 and S04	☐	☑

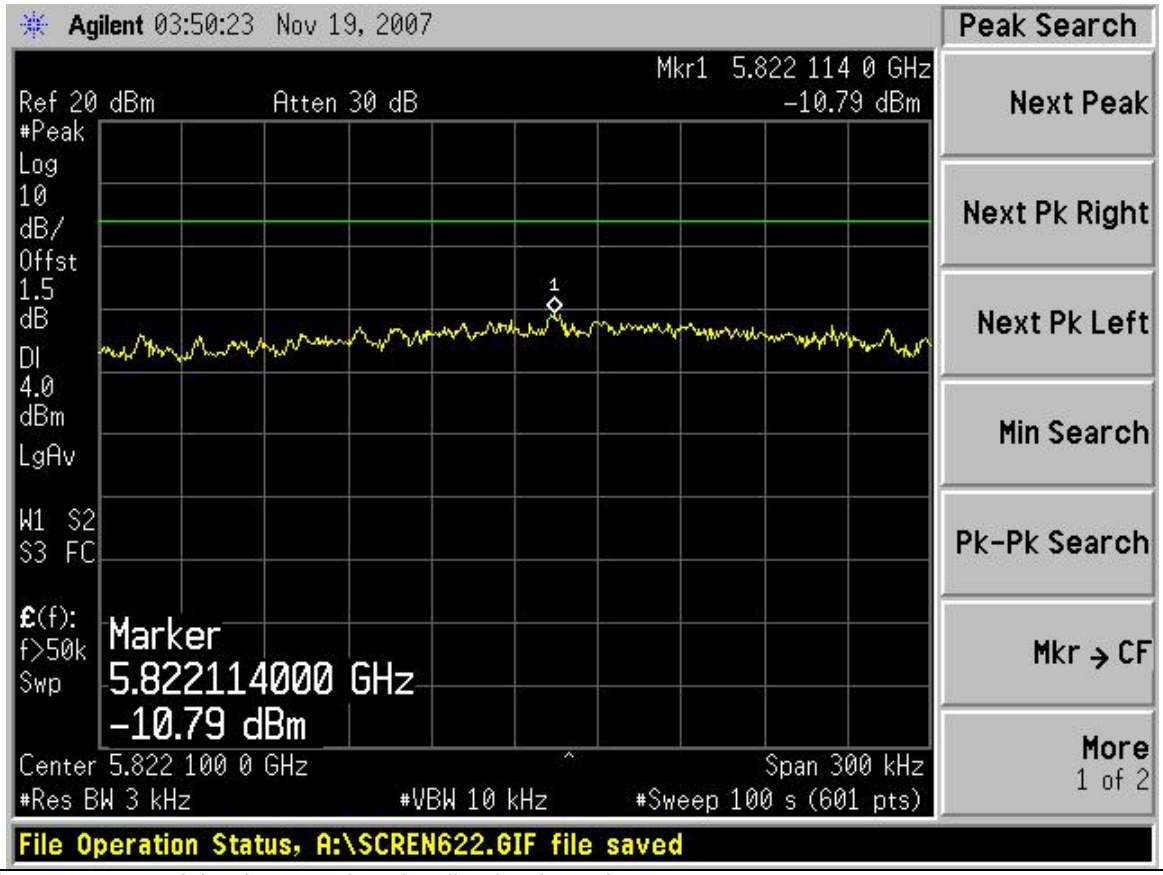
Subtest Number: 29647 - 1	**Subtest Date:** 04-Dec-2007
Engineer	Donald Foster
Lab Information	Building P, Shield Room 3
Subtest Results	
Line Under Test	[A] Antenna port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

Frequency (MHz)	**Data Rate (Mbps)**	**PSD (dBm/kHz)**	**Limit (dBm/kHz)**	**Margin (dB)**
5745	36	-10.8	8.0	18.8
5785	36	-10.6	8.0	18.6
5825	36	-10.7	8.0	18.7

Power spectral Density for 5.785GHz at 36 mb and 16dbm

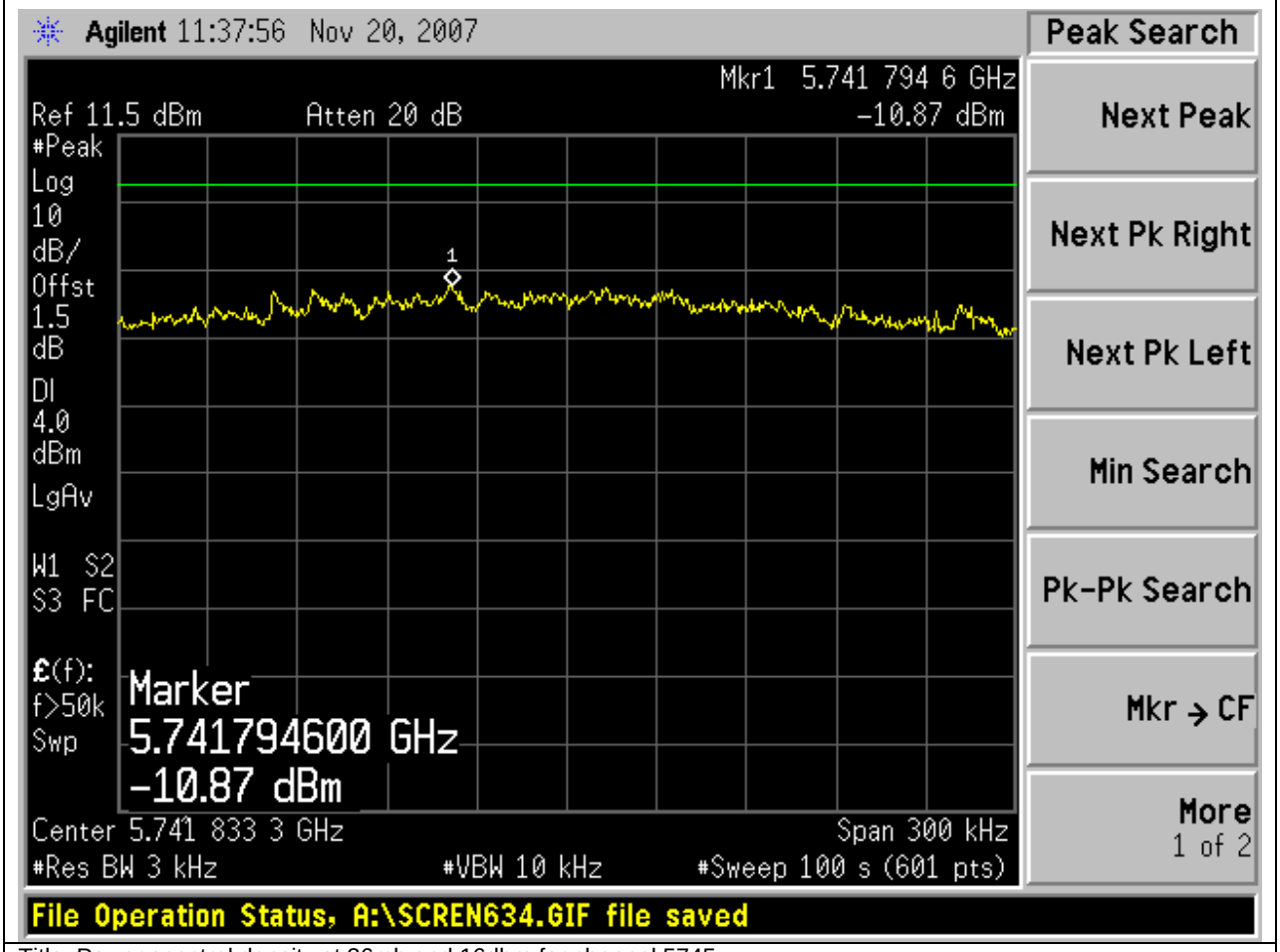


Power spectral Density for 5.825GHz at 36 mb and 16dbm



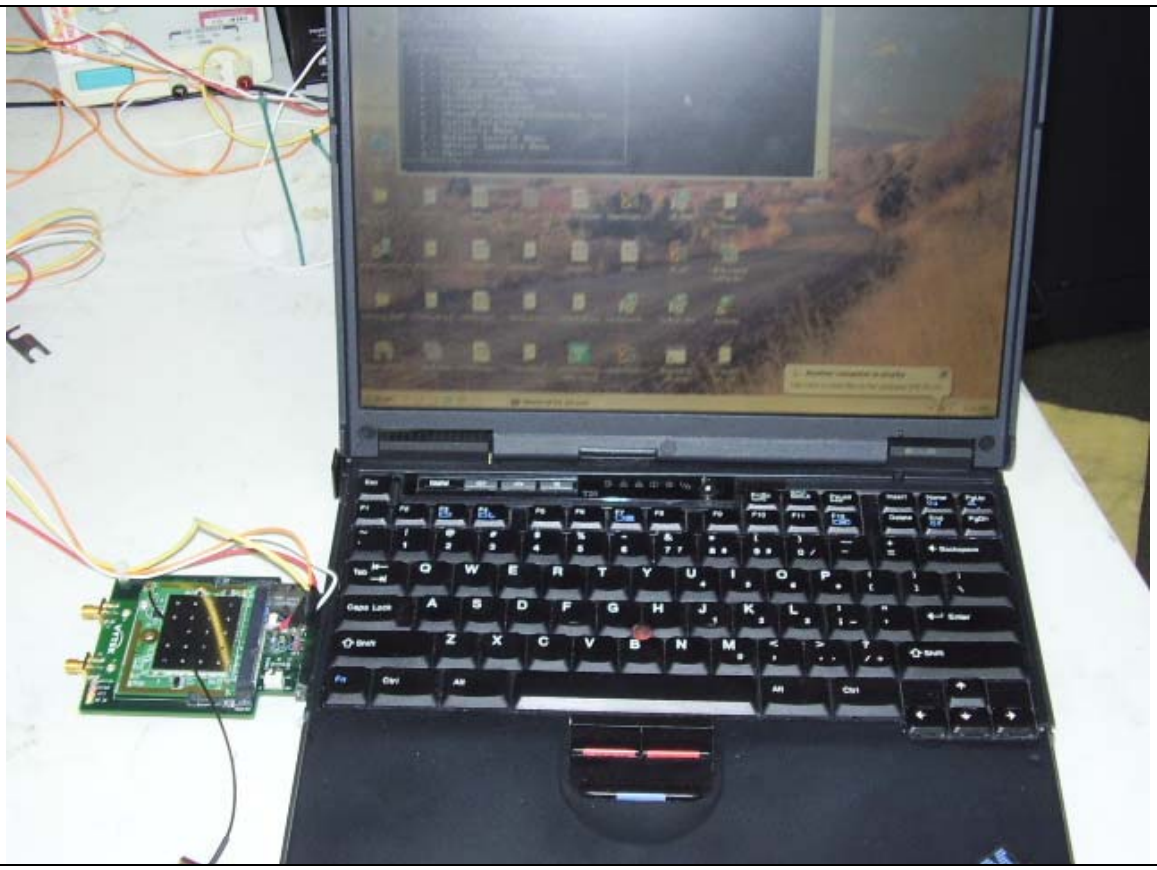
Title: Power spectral density at 36mb and 16dbm for channel 5745

Power spectral Density for 5.745GHz at 36 mb and 16dbm



Title: Power spectral density at 36mb and 16dbm for channel 5745

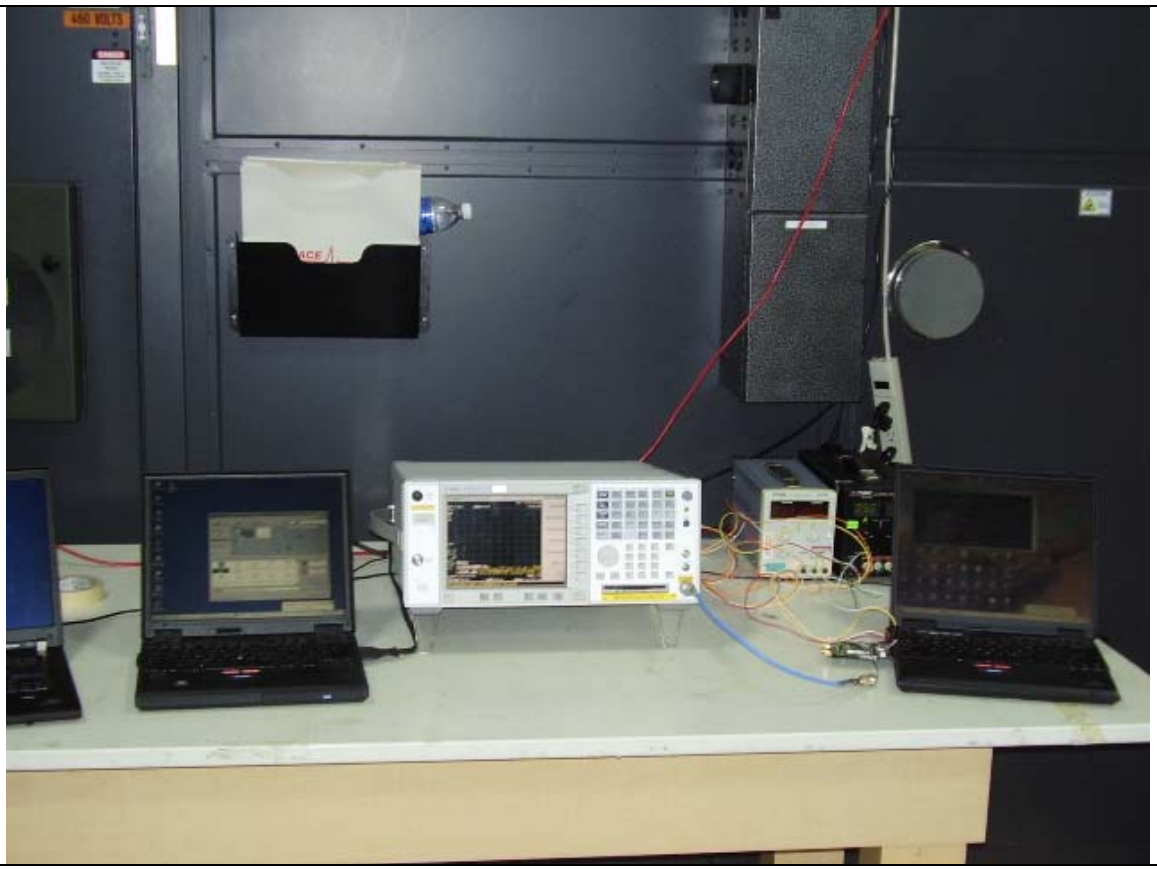
Physical Test arrangement Photograph:



Title: Conducted measurement test setup

Comments on the above Photograph:

No further comments



Title: Conducted measurement test setup

Comments on the above Photograph:

No further comments

Conducted emissions

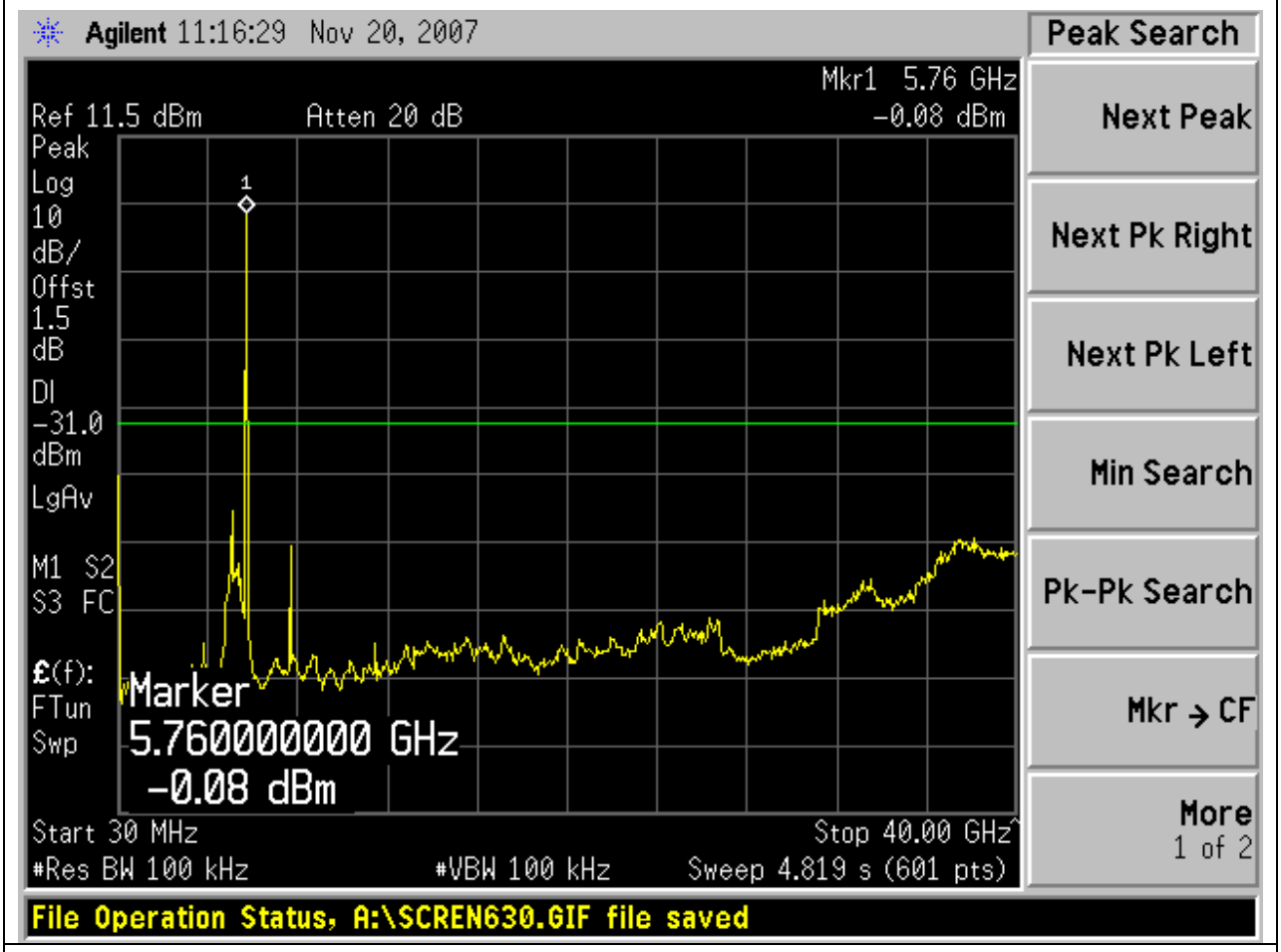
Test Number: 29599 **Spec ID:** 652				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
Conducted Spurious Emissions	RF Ports	N/A	30MHz - xGHz	Also complies with RSS 210, LP0002, HKTA1039
Operating Mode	**Mode :** 1, Continuous transmit mode			
Power Input	5, DC (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

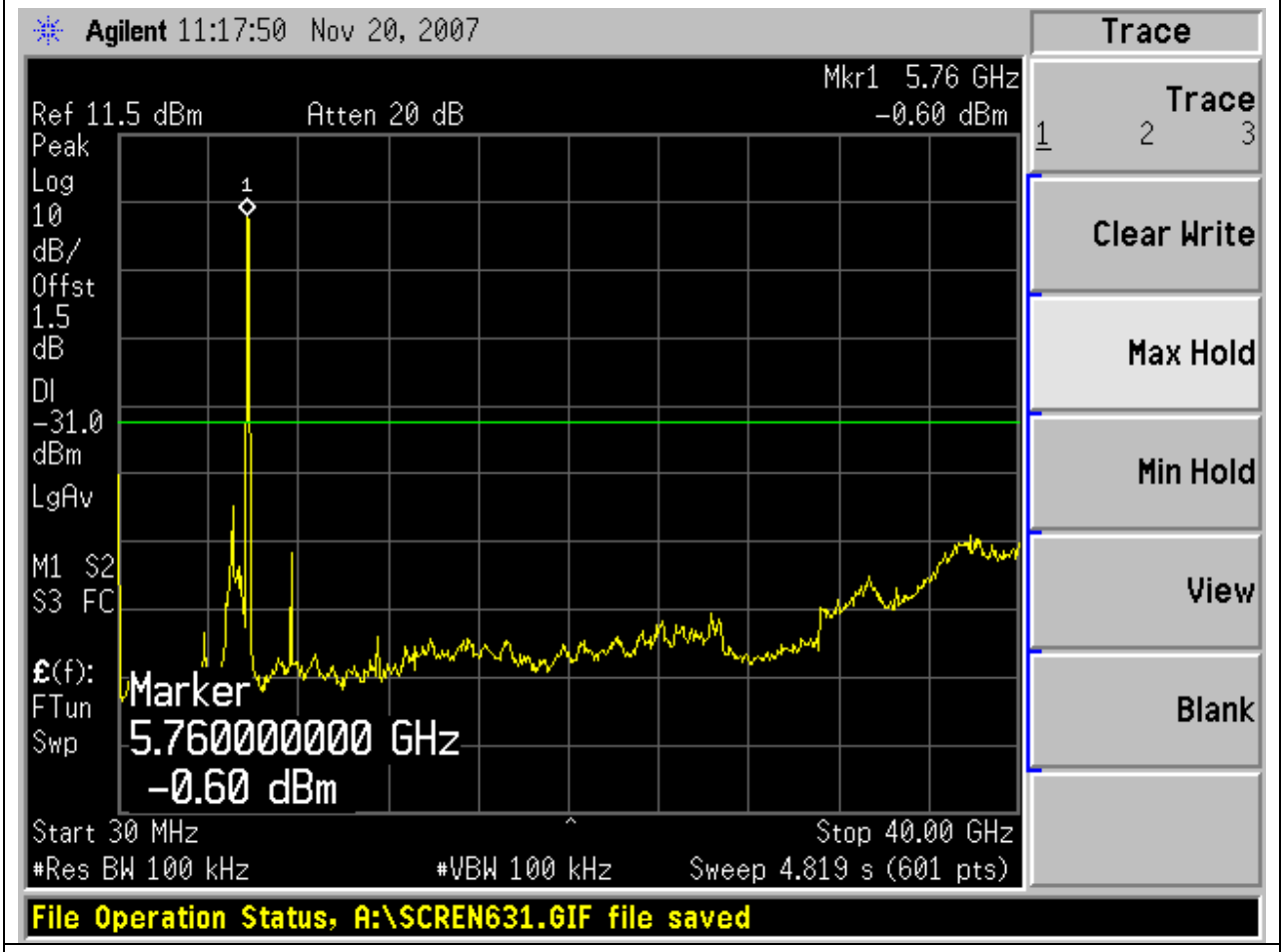
System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	EUT	S01	☑	☐
2	Support equipment	S02, S03 and S04	☐	☑

Subtest Number: 29599 - 1	**Subtest Date:** 03-Dec-2007
Engineer	Donald Foster
Lab Information	Building P, Shield Room 3
Subtest Results	
Line Under Test	[A] Antenna port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

Frequency (MHz)	**Data Rate (Mbps)**	**Conducted Spurs**
5745	36	>30dBc
5785	36	>30dBc
5825	36	>30dBc

Conducted spurious emissions at 36 mbps and 16dbm for channel 5745





Conducted spurious emissions at 36 mbps and 16dbm for channel 5785

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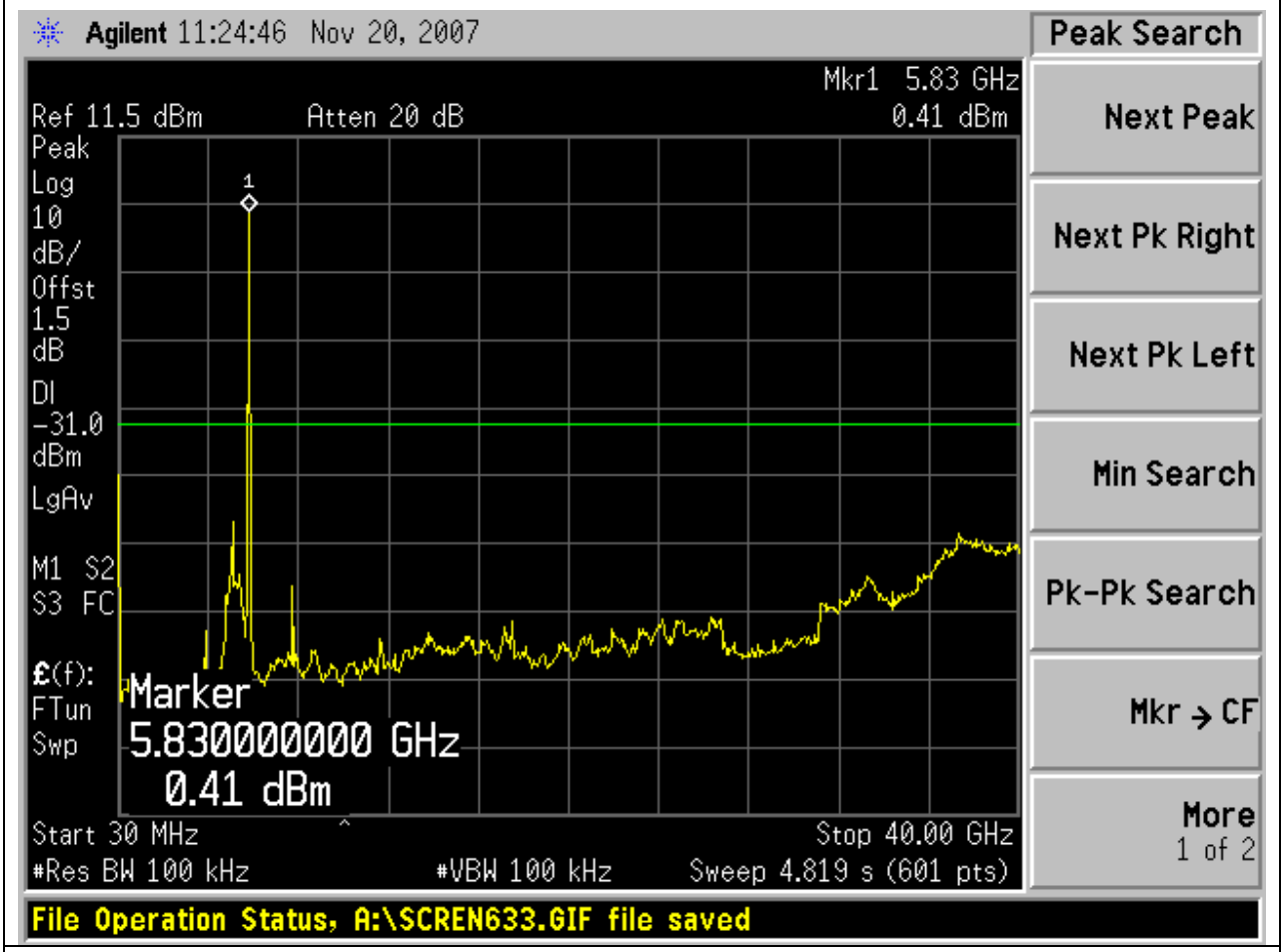
Conducted spurious emissions at 36 mbps and 16dbm for channel 5825

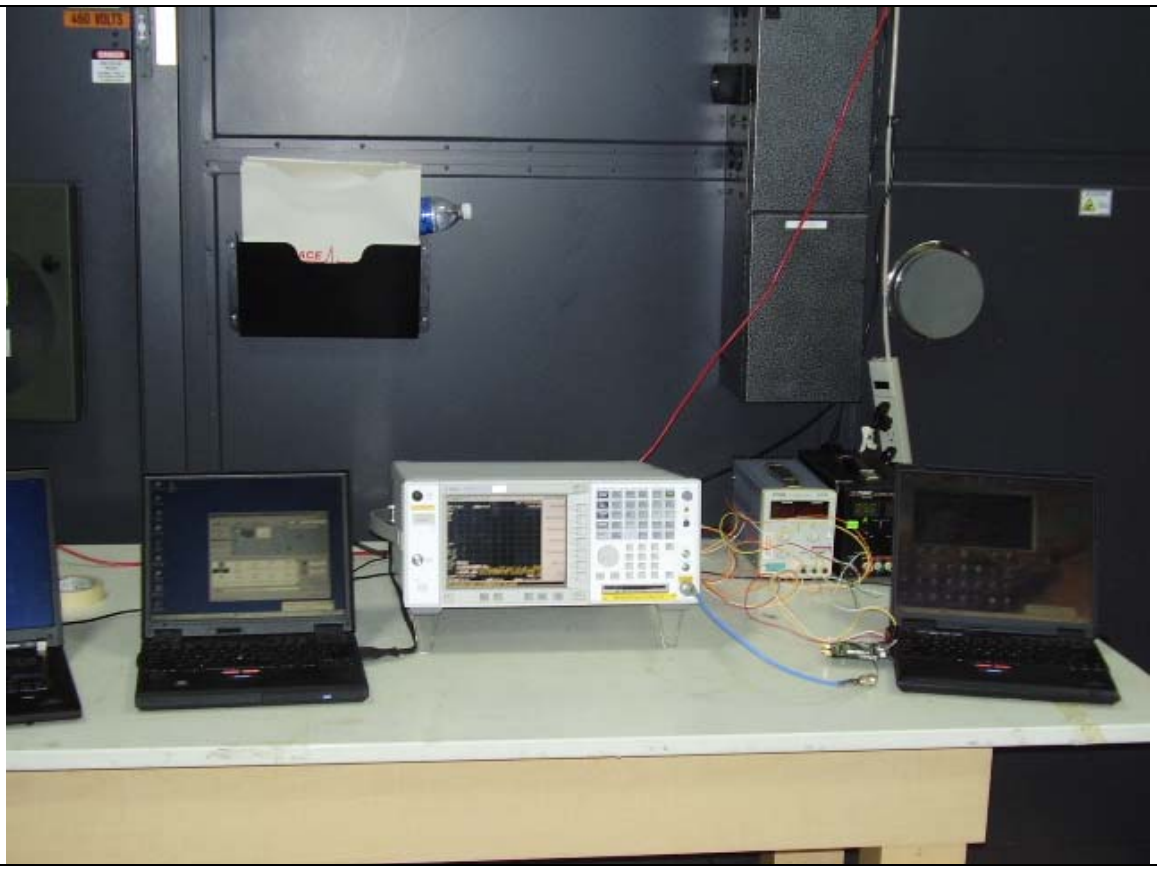


Physical Test arrangement Photograph:

Title: Conducted measurement setup

Comments on the above Photograph:

No further comments



Title: Conducted measurement setup

Comments on the above Photograph:

No further comments

Conducted emissions

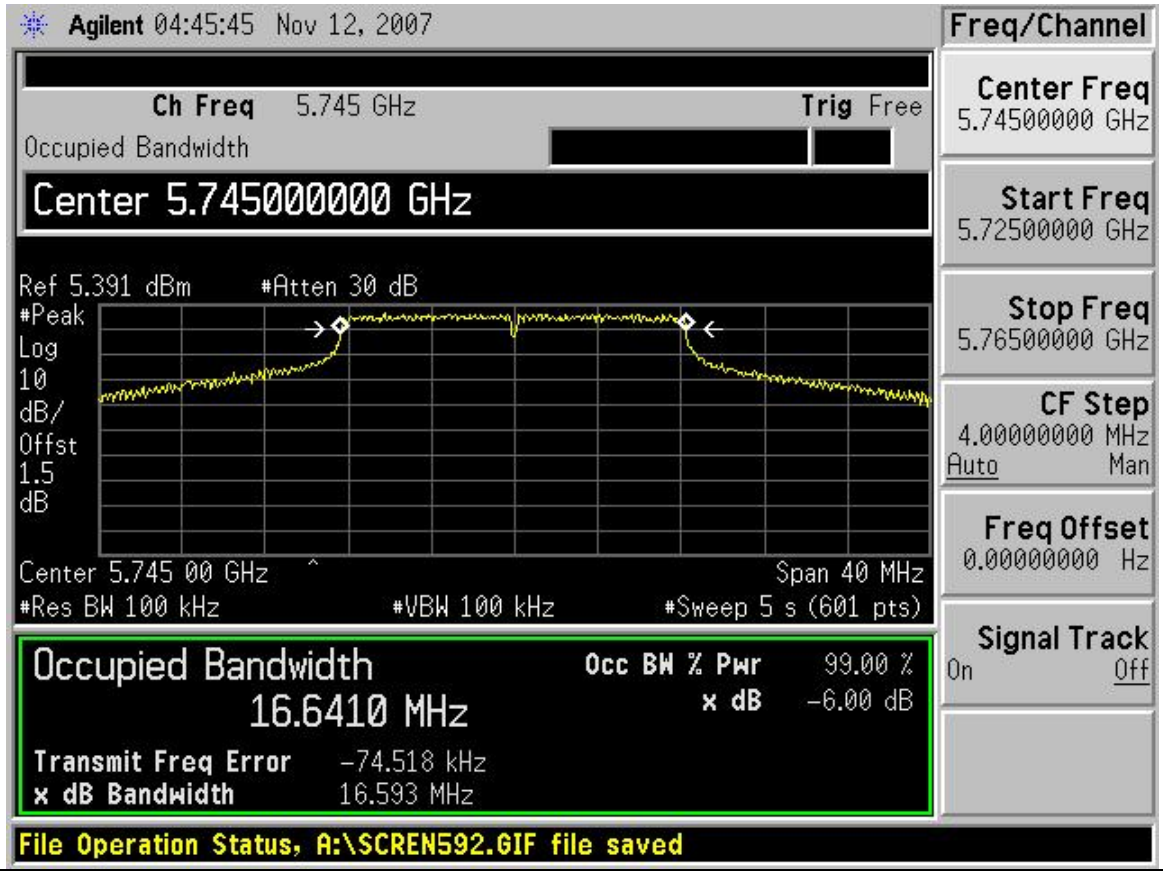
Test Number: 29598 **Spec ID:** 800				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
CFR47 Part 15.247(a)(2)	RF Ports	B	5725MHz - 5850MHz	6dB Bandwidth also complies with LP0002, RSS210, HKTA1039
Operating Mode	**Mode :** 1, Continuous transmit mode			
Power Input	5, DC (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	EUT	S01	☑	☐
2	Support equipment	S02, S03 and S04	☐	☑

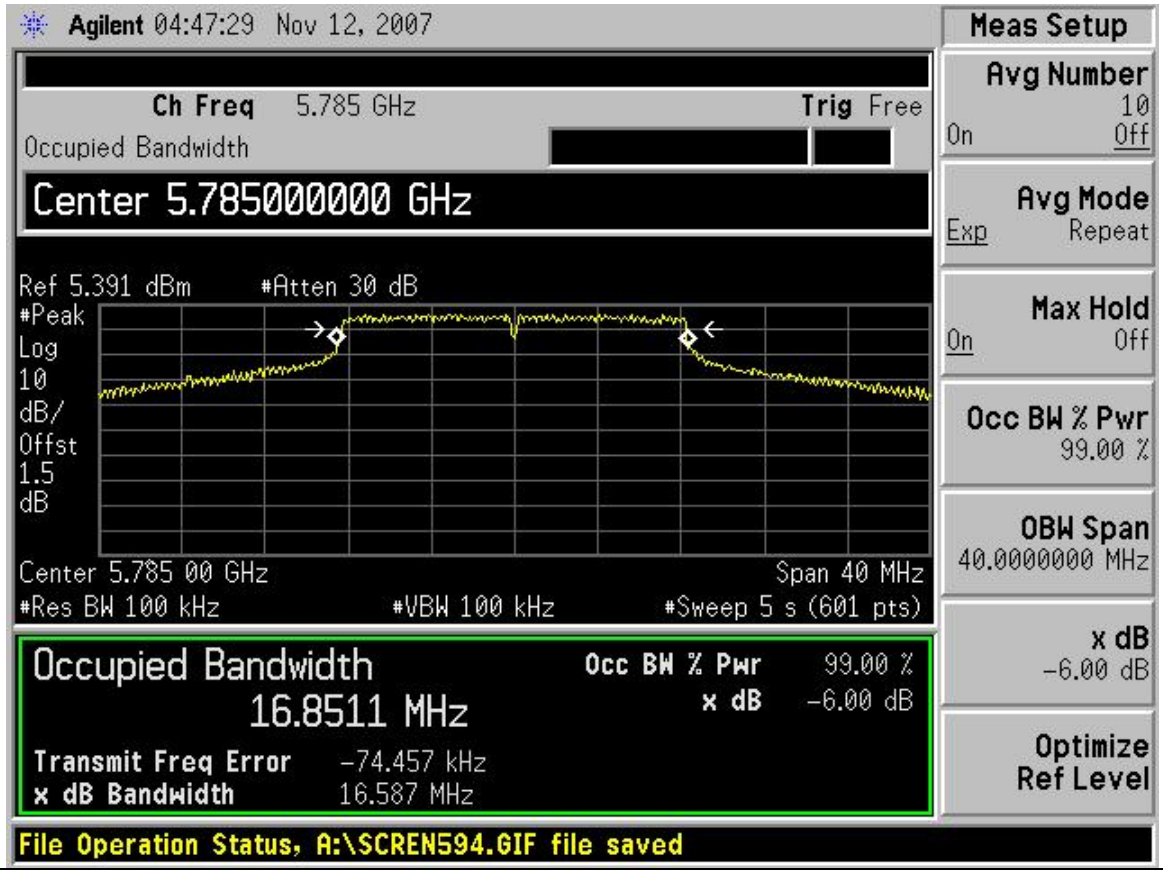
Subtest Number: 29598 - 1	**Subtest Date:** 03-Dec-2007
Engineer	Donald Foster
Lab Information	Building P, Shield Room 3
Subtest Results	
Line Under Test	[A] Antenna port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

Frequency (MHz)	**Data Rate (Mbps)**	**6dB BW (MHz)**	**Limit (kHz)**	**Margin (kHz)**
5745	36	16.6	>500	16100
5785	36	16.58	>500	16000
5825	36	16.6	>500	16100

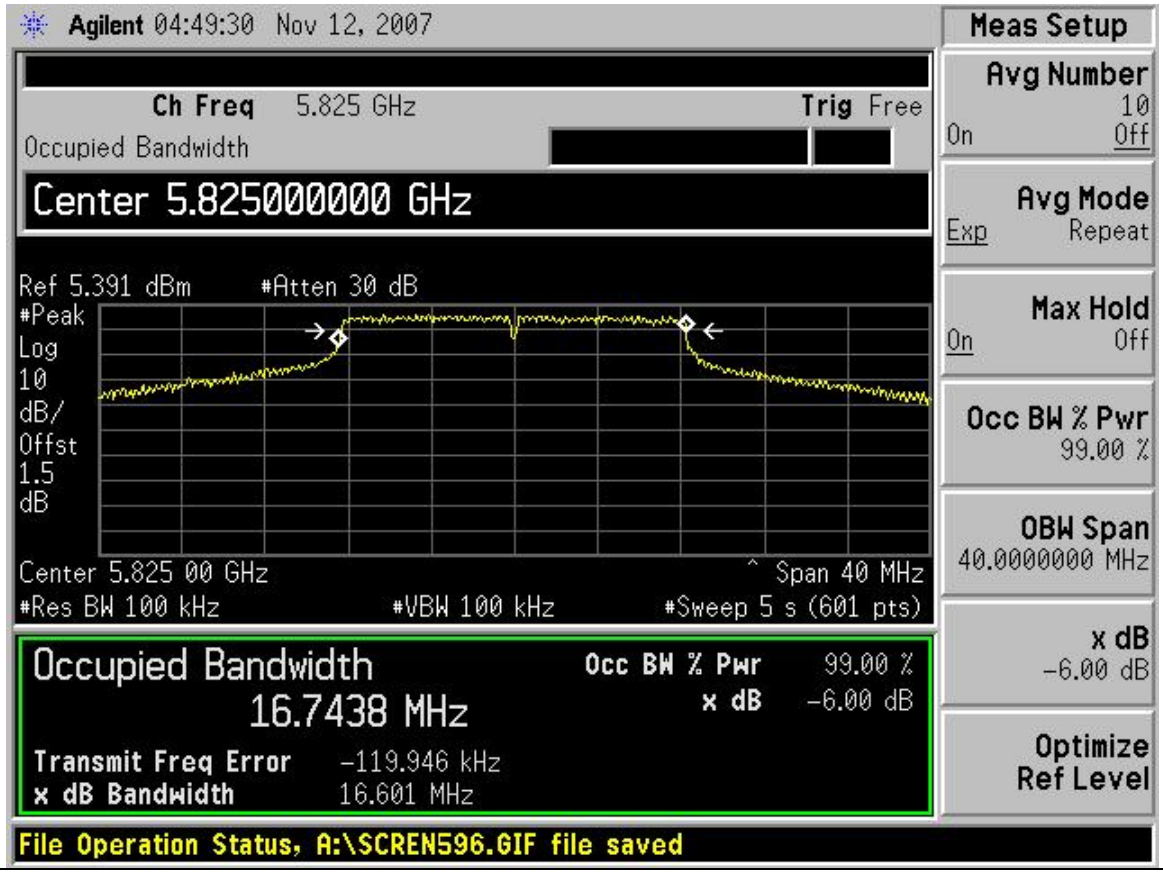
6db bandwidth at 5.745 GHz 36mb and 16dbm



6db bandwidth at 5.785 GHz 36mb and 16dbm



6db bandwidth at 5.825 GHz 36mb and 16dbm

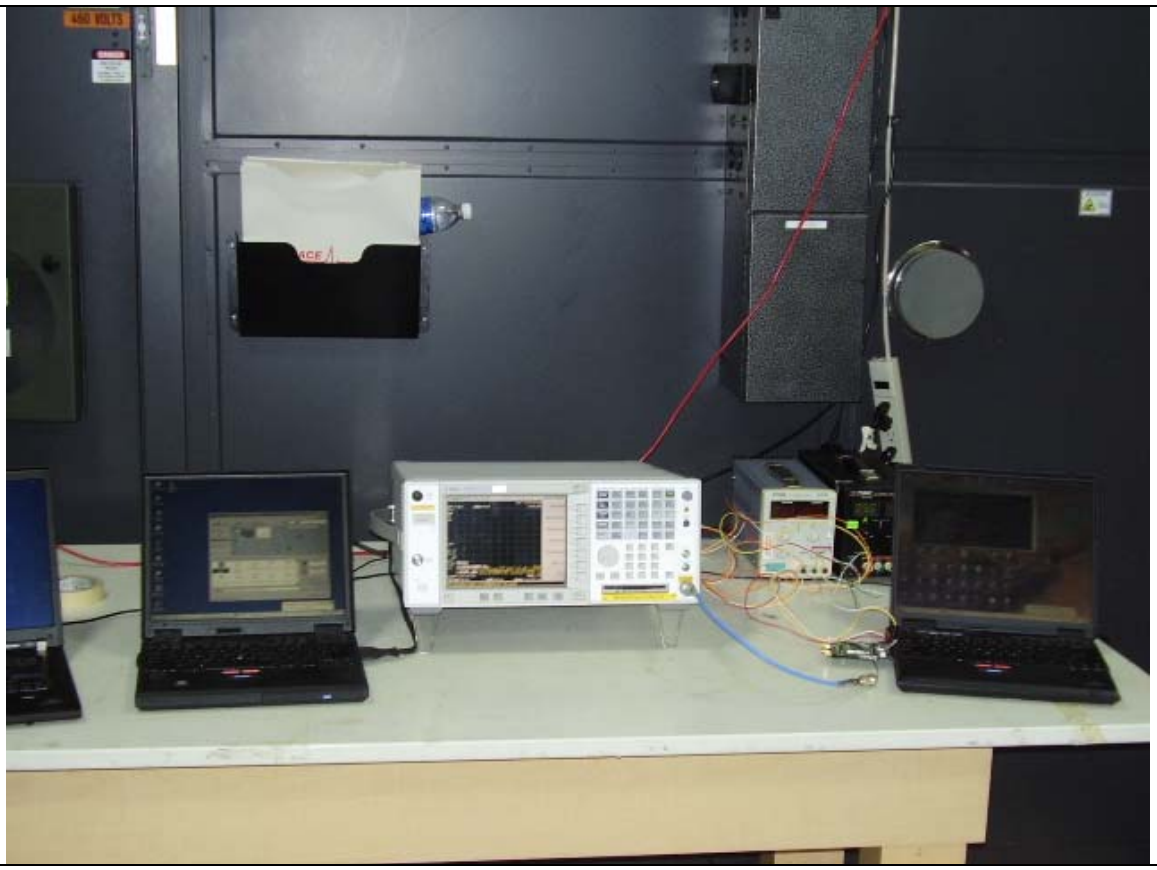


Physical Test arrangement Photograph:

Title: Conducted measurement setup

Comments on the above Photograph:

No further comments



Title: Conducted measurement setup

Comments on the above Photograph:

No further comments

Conducted emissions

Test Number: 29596 **Spec ID:** 651				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
CFR47 Part 15.247(a)	RF Ports	N/A	2400MHz - 5850MHz	26dB Bandwidth also complies wiht RSS 210, LP0002, HKTA1039
Operating Mode	**Mode :** 1, Continuous transmit mode			
Power Input	5, DC (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

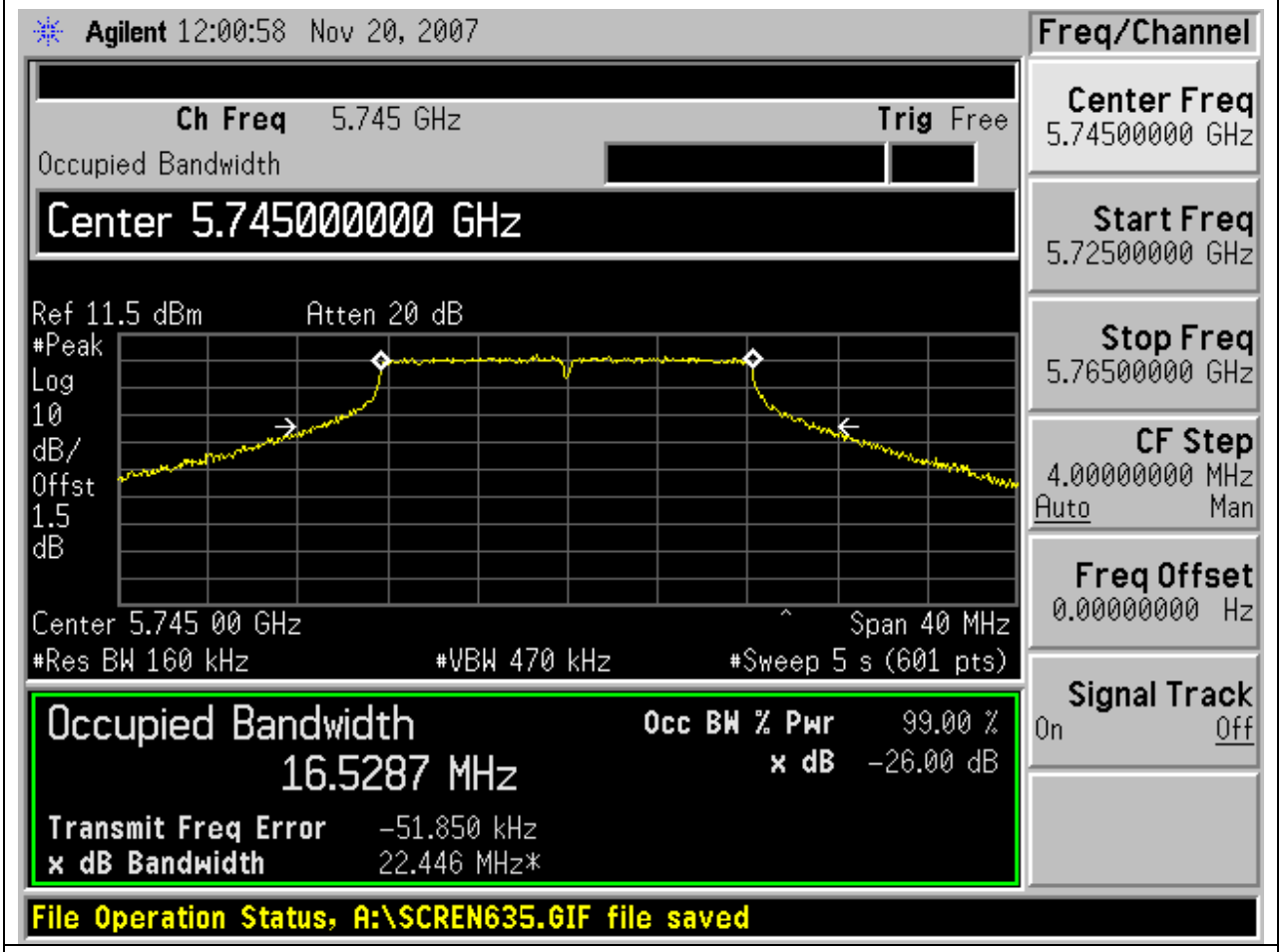
System Number	**Description**	**Samples**	**System under test**	**Support equipment**
1	EUT	S01	☑	☐
2	Support equipment	S02, S03 and S04	☐	☑

Subtest Number: 29596 - 2	**Subtest Date:** 03-Dec-2007
Engineer	Donald Foster
Lab Information	Building P, Shield Room 3
Subtest Results	
Line Under Test	[A] Antenna port
Transducer	Direct
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

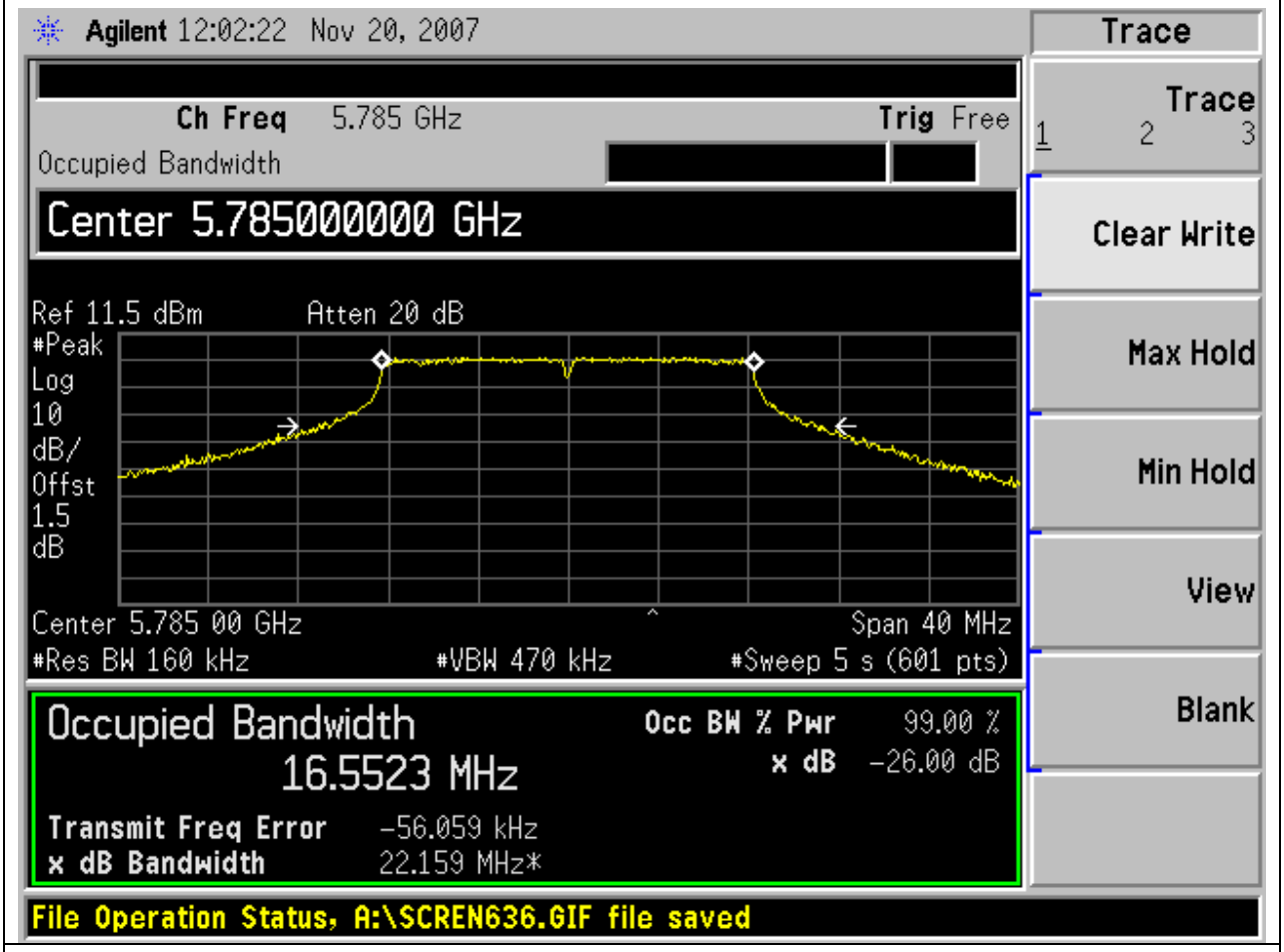
99% and 26dB Bandwidth

Frequency (MHz)	Data Rate (Mbps)	26dB BW (MHz)	99% BW (MHz)
5745	36	22.12	16.54
5785	36	22.36	16.52
5825	36	22.11	16.53

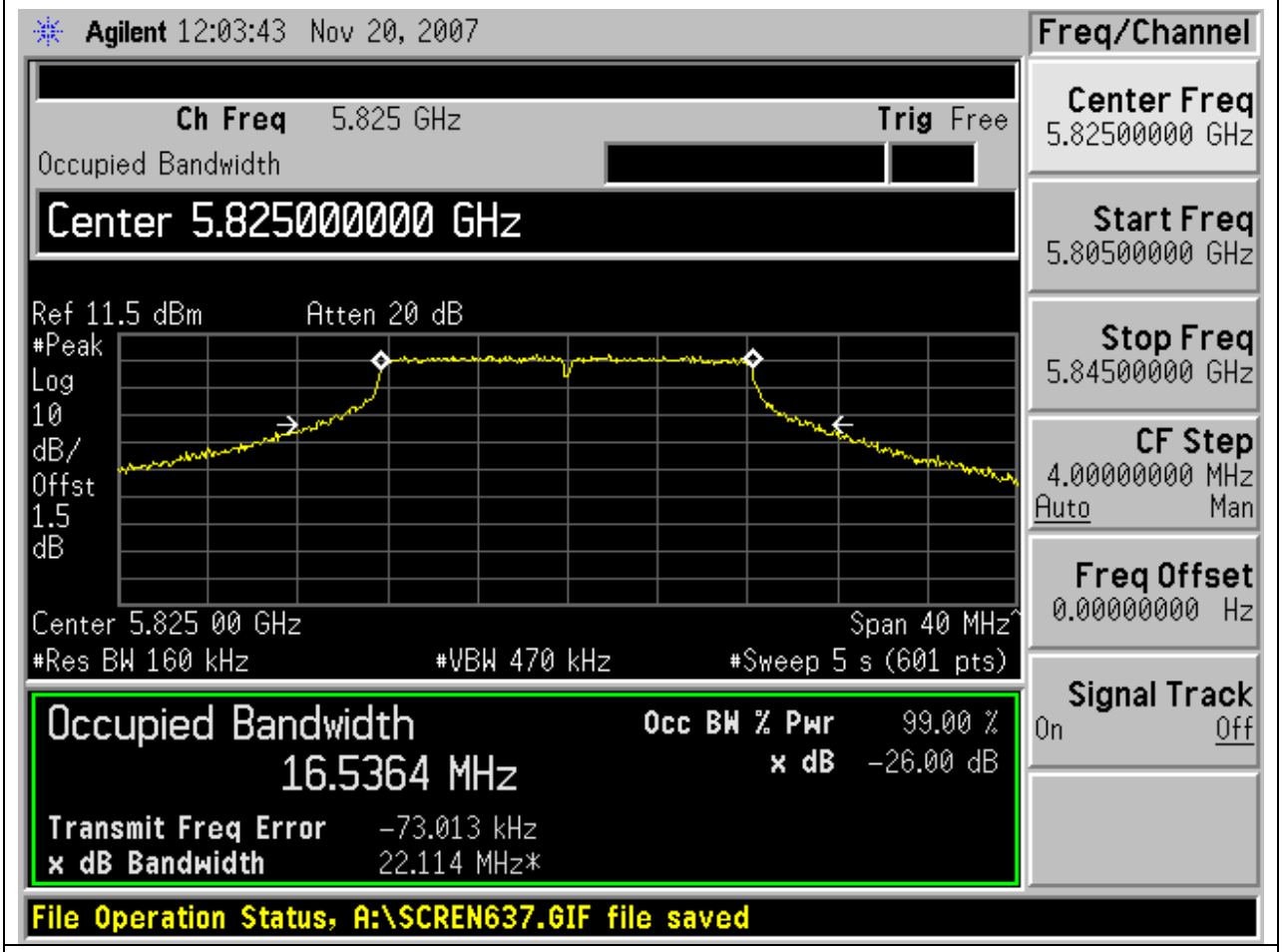
26db bandwidth for 5.745GHz. 36mb and 16dbm



26db bandwidth for 5.785GHz. 36mb and 16dbm



26db bandwidth for 5.825GHz. 36mb and 16dbm

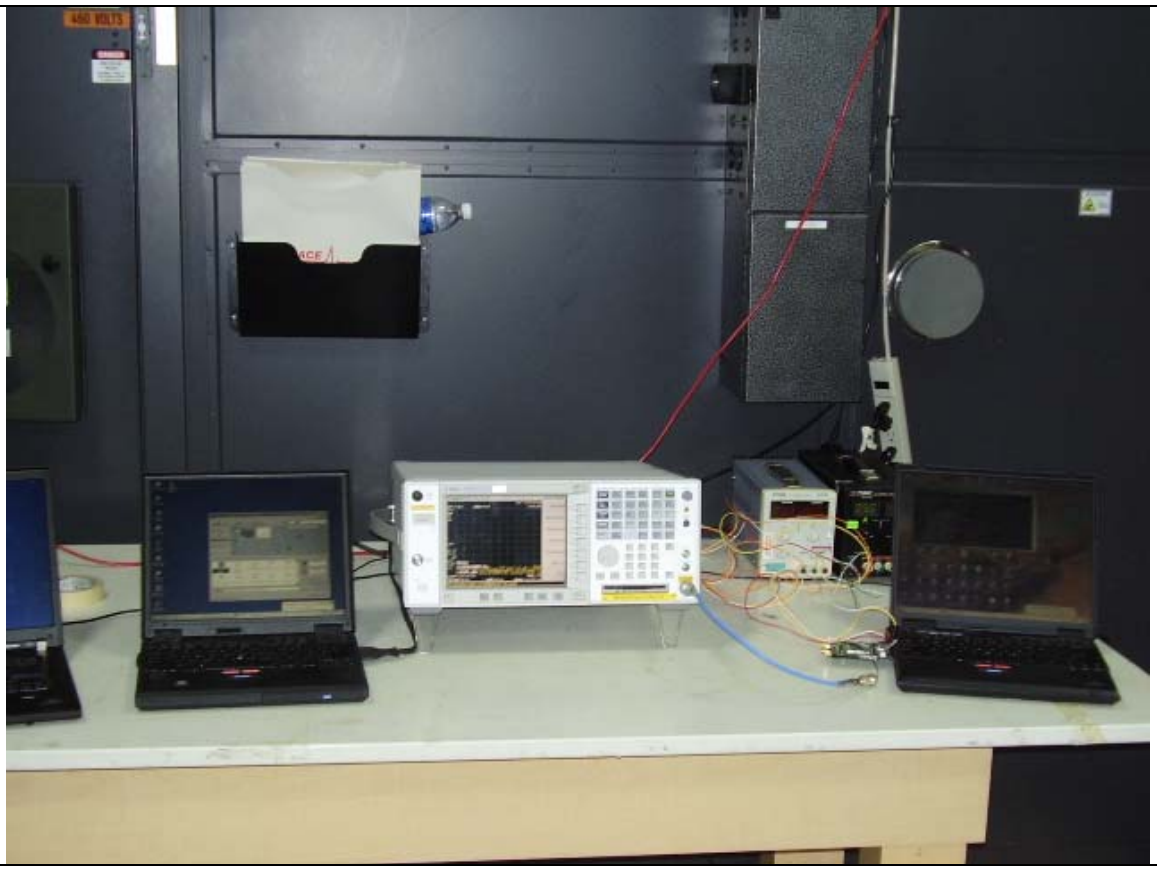


Physical Test arrangement Photograph:

Title: Conducted measurement test setup

Comments on the above Photograph:

No further comments



Title: Conducted measurement test setup

Comments on the above Photograph:

No further comments

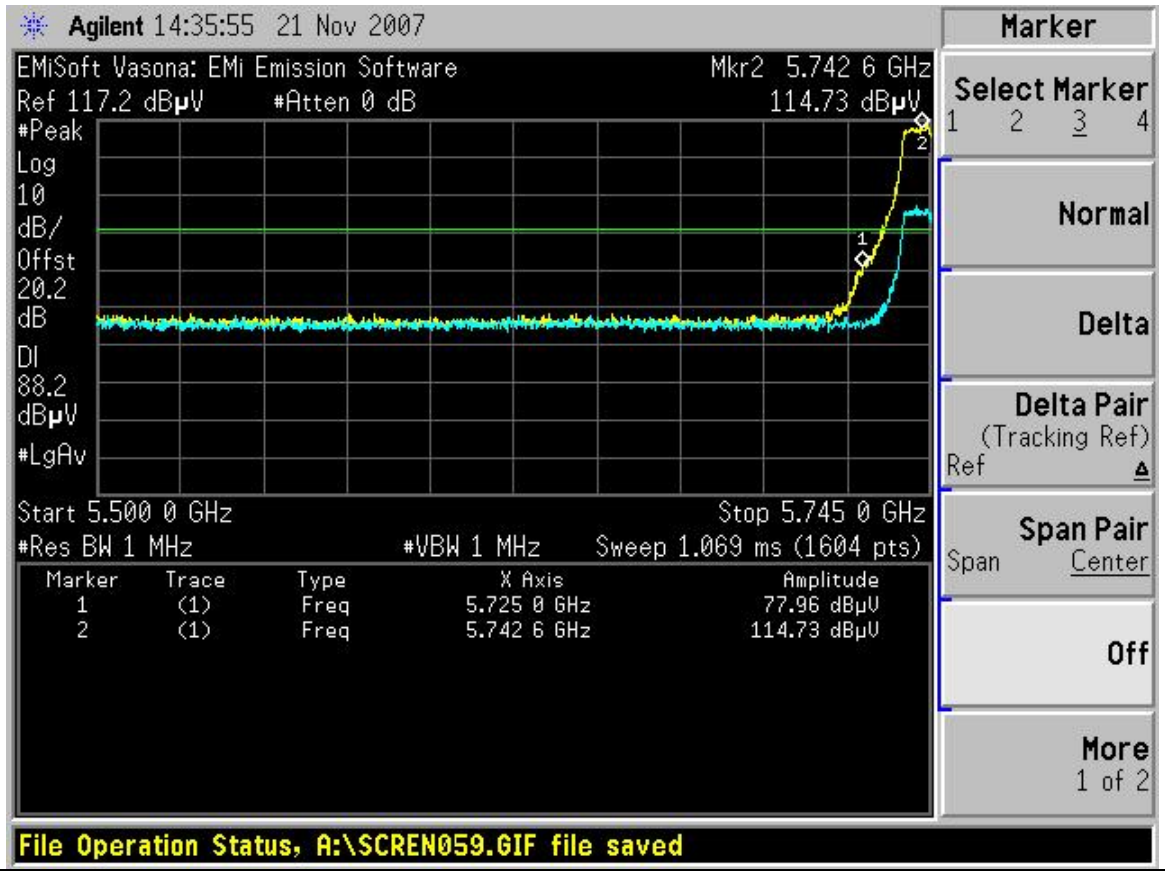
Radiated emissions

Test Number: 29604 **Spec ID:** 648				
Basic Standard	**Applied to**	**Class**	**Freq Range**	**Test Details / Comments**
Restricted Bandedge Measurements	Enclosure	B	2.4GHz - 5.825GHz	CFR47 Part 15.205,CFR47 Part 15.209,LP002, RSS210HKTA1039
Operating Mode	**Mode :** 1, Continuous transmit mode			
Power Input	5, DC (+/-20%)			
Overall Result	Pass			
Comments	No further comments			
Deviation	There were no deviations from the specification			

System Number	**Description**	**Samples**	**System under test**	**Support equipment**
2	Support equipment	S02, S03 and S04	☐	☑
3	Omni antenna test setup	S01 and S05	☑	☐
4	Patch antenna test setup	S01 and S06	☑	☐
5	Sector antenna test setup	S01 and S07	☑	☐
6	9dbi Omni antenna test setup	S01 and S08	☑	☐
7	28dbi Dish antenna test setup	S01 and S09	☑	☐

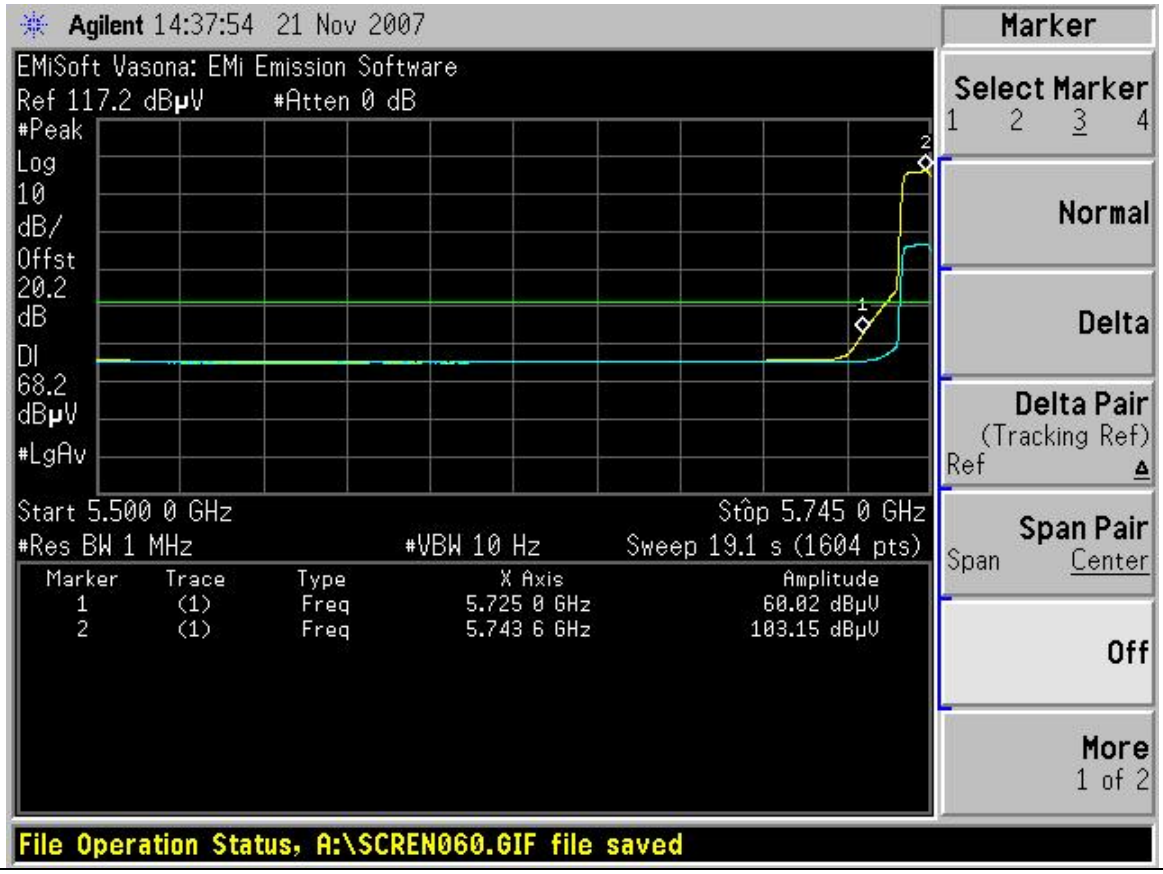
Subtest Number: 29604 - 1	**Subtest Date:** 03-Dec-2007
Engineer	Donald Foster
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	N/A
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

17dbi sector antenna 5.745GHz. bandedges at 36mbps and 16dbm Peak



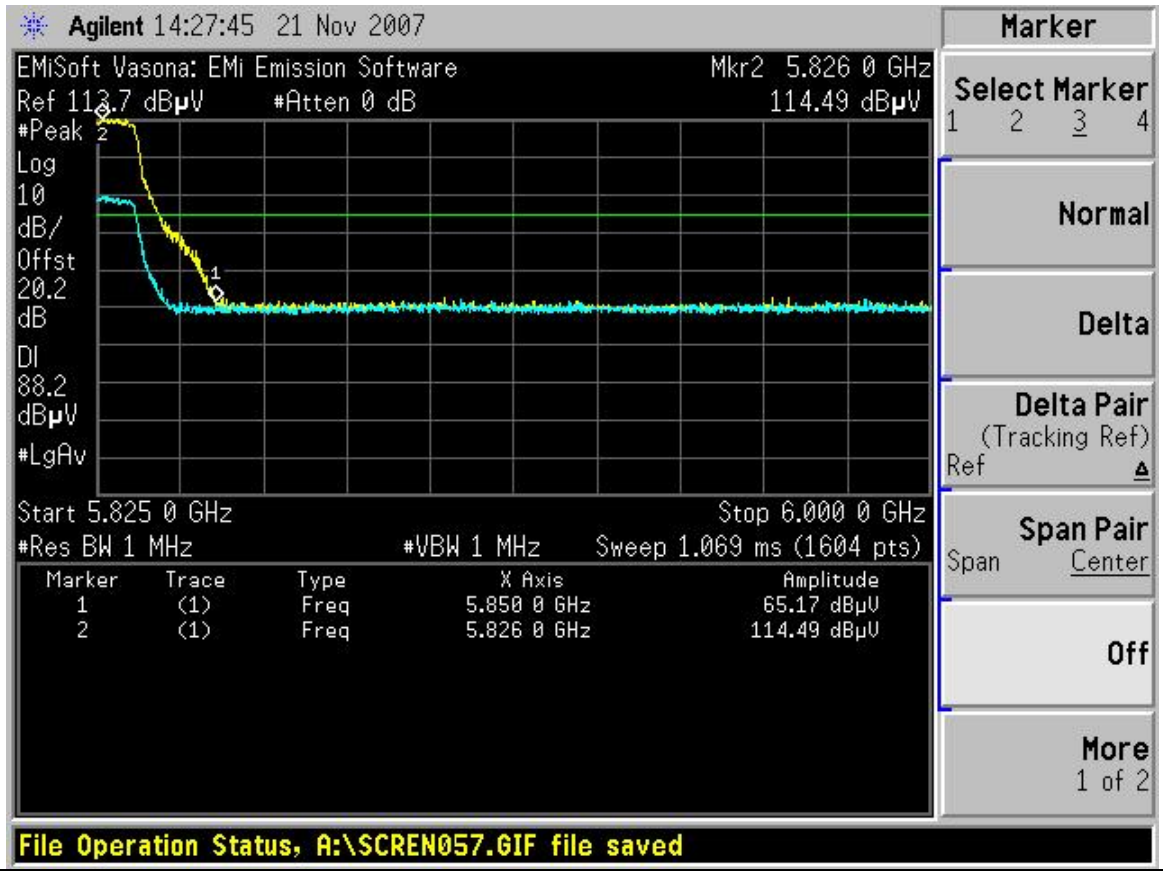
Title: 17dbi sector antenna bandedges at 36mbps and 16dbm

17dbi sector antenna 5.745GHz. bandedges at 36mbps and 16dbm Ave



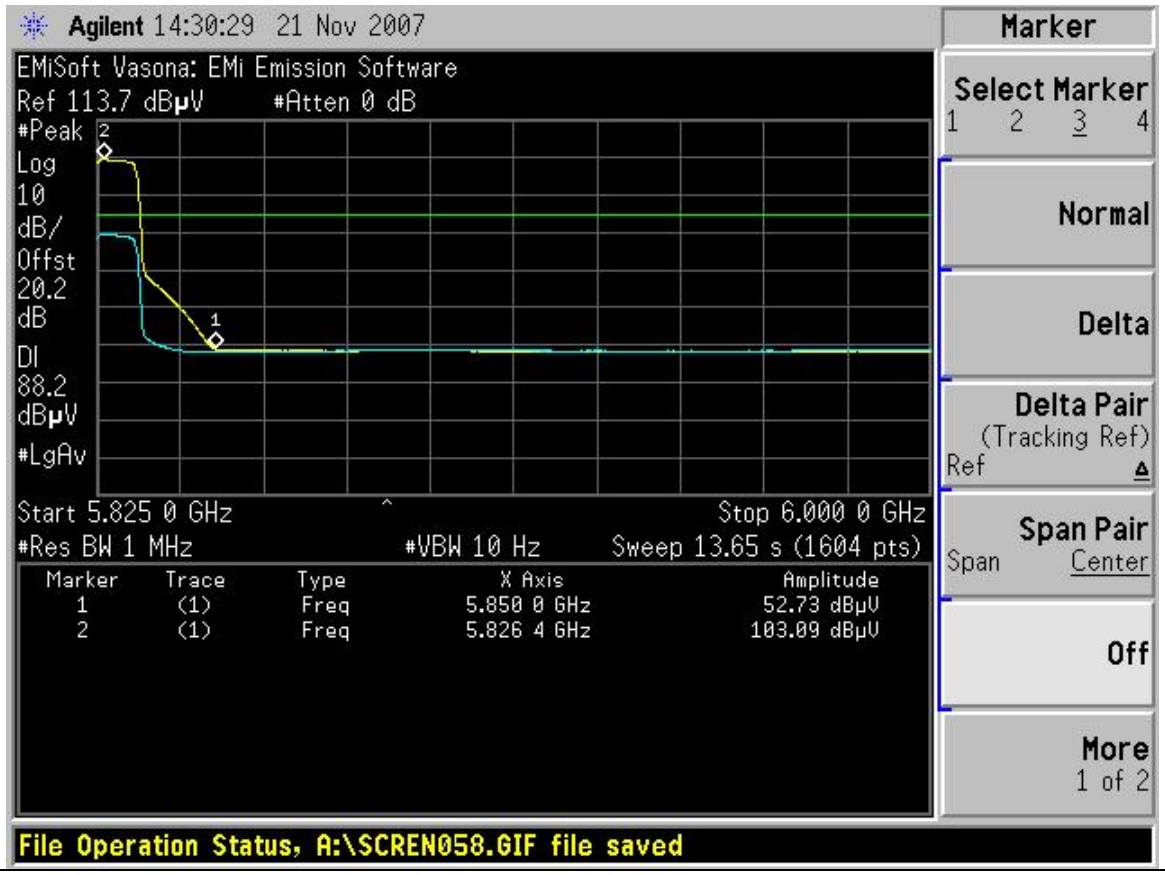
Title: 17dbi sector antenna bandedges at 36mbps and 16dbm

17dbi sector antenna 5.825 GHz. bandedges at 36mbps and 16dbm Peak



Title: 17dbi sector antenna bandedges at 36mbps and 16dbm

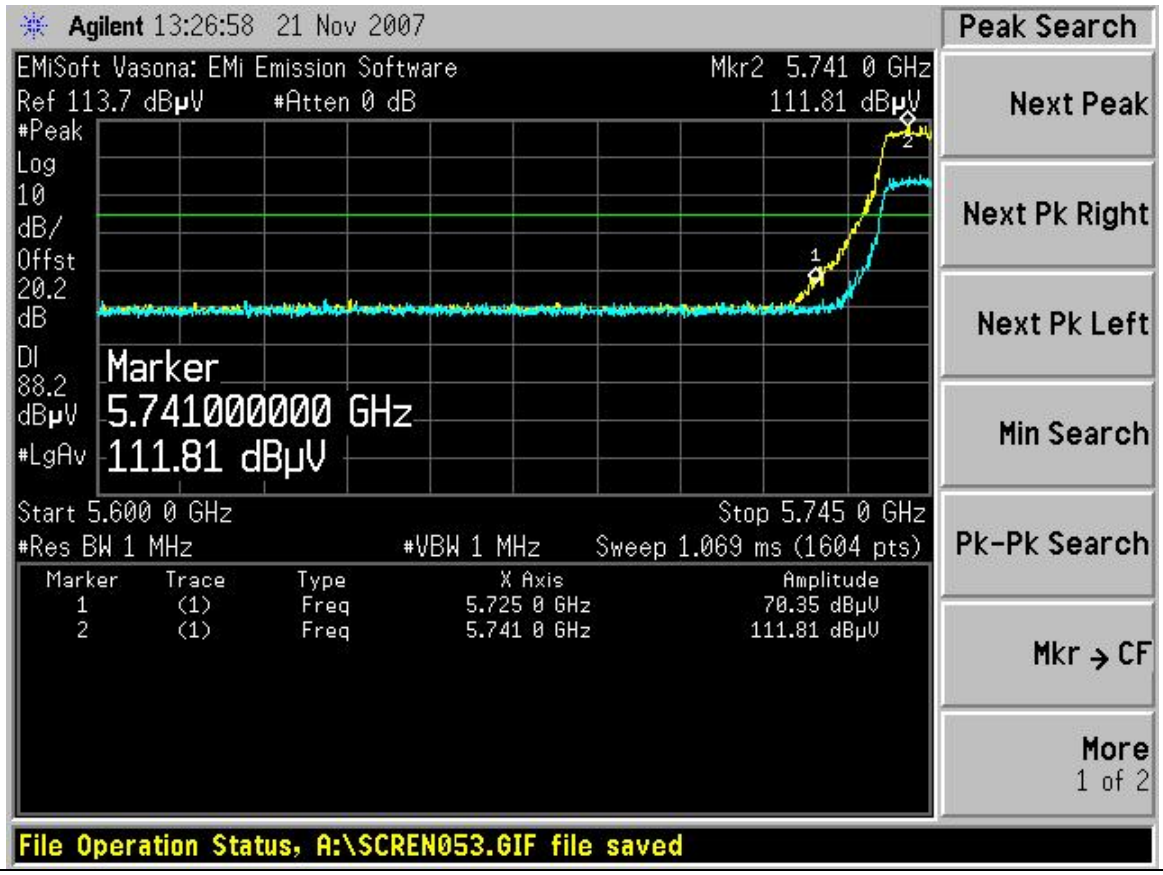
17dbi sector antenna 5.825GHz. bandedges at 36mbps and 16dbm Ave



Title: 17dbi sector antenna bandedges at 36mbps and 16dbm

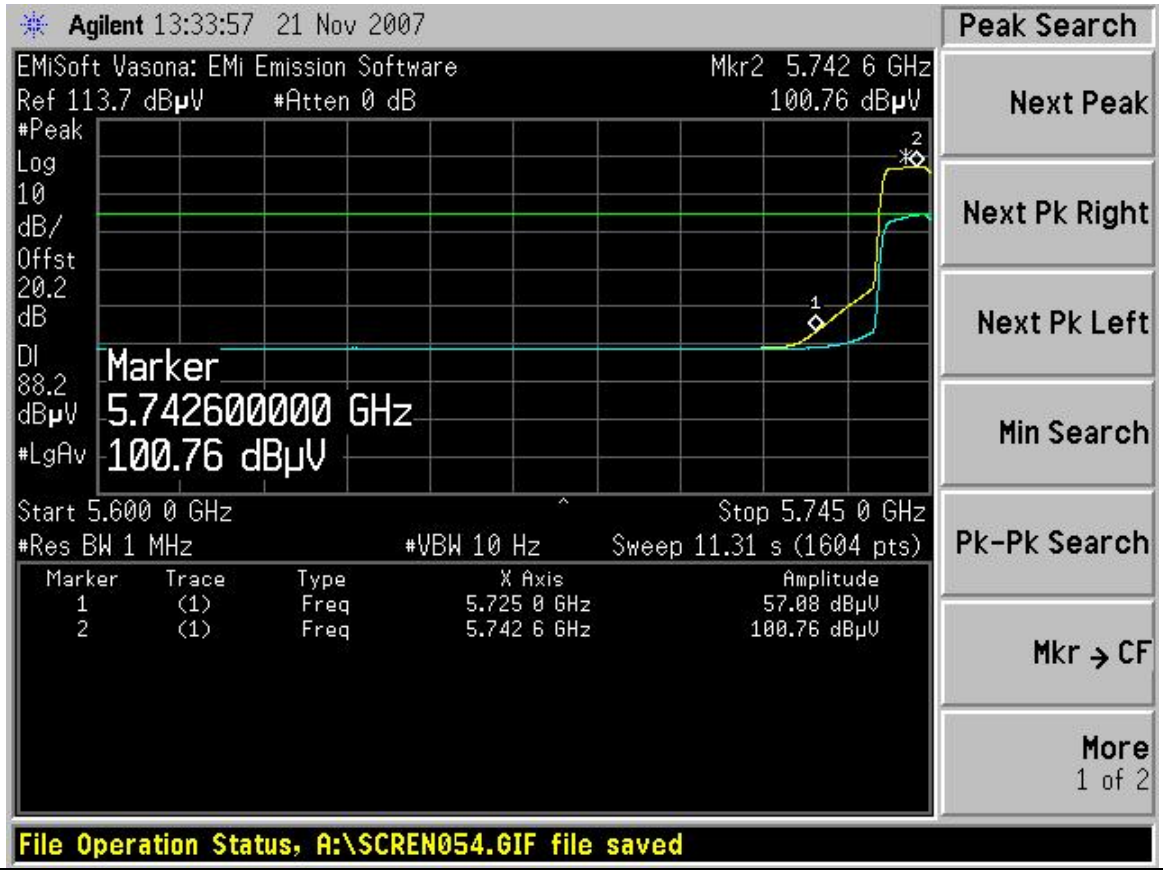
Subtest Number: 29604 - 2	**Subtest Date:** 03-Dec-2007
Engineer	Donald Foster
Lab Information	Building P, 10m Anechoic
Subtest Results	
Subtest Title	N/A
Subtest Result	Pass
Highest Frequency	N/A
Lowest Frequency	N/A
Comments on the above Test Results	No further comments

7.5dbi Omni antenna 5.745GHz. bandedges at 36mbps and 16dbm Peak



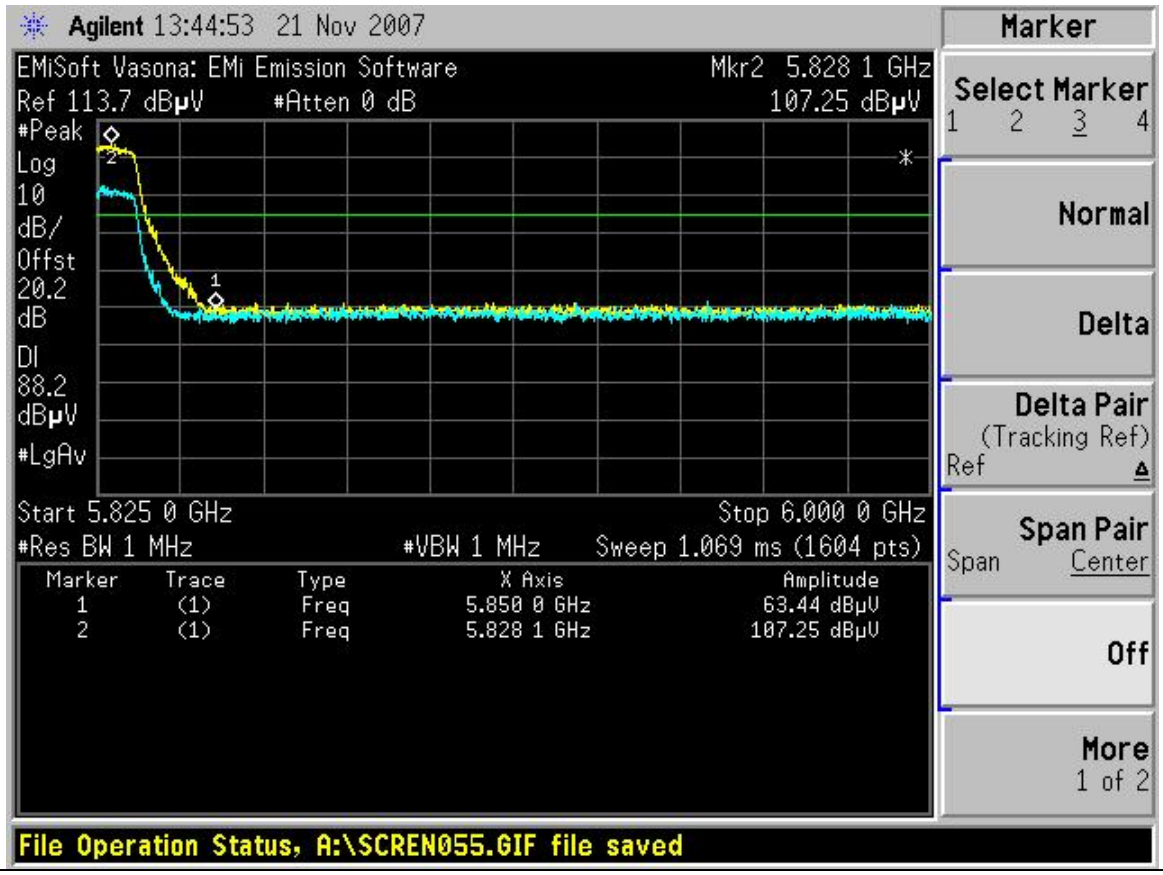
Title: 7.5dbi Omni antenna bandedges at 36mbps and 16dbm

7.5dbi Omni antenna 5.745GHz. bandedges at 36mbps and 16dbm Ave



Title: 7.5dbi Omni antenna bandedges at 36mbps and 16dbm

7.5dbi Omni antenna 5.825GHz. bandedges at 36mbps and 16dbm Peak



Title: 7.5dbi Omni antenna bandedges at 36mbps and 16dbm