Test Report No.8512314929

For Alvarion Ltd.

Equipment Under Test:
Broadband Wireless Access
BreezeACCESS 4900 System

From The Standards Institution
Of Israel
Industry Division
Telematics Laboratory
EMC Section

Test Report No.: 8512314929 **Page 1 of 75 Pages**
Title: Test on Broadband Wireless Access BreezeACCESS 4900 system

Order placed by:	Alvarion Ltd.
Address:	21A Habarzel str, Tel-Aviv, 69710, Israel
Sample for test selected by:	The customer
The date of test:	25 - 28/07/2005

Description of Equipment Under Test (EUT): BreezeACCESS 4900 System
Manufactured by: Alvarion Ltd.

Reference Documents:

- CFR 47 FCC: Rules and Regulations;
  Part 15. “Radio frequency devices”;
  Subpart B: “Unintentional radiators” (2002).
- Part 90. "Private Land Mobile Radio Services" (2004)
  (With May 2005 Updates).

Test Results: The EUT was found meeting with the relevant requirements of
CFR 47 FCC 15 Sections: 15.107,15.109

CFR 47 FCC Part 2 Sections 2.1046, 2.1047, 2.1049,2.1051,2.1053 2.1055
CFR 47 FCC Part 90 Sections: 90.210 (m), 90.1215 (a), (c) and (d).

This Test Report contains 75 pages and may be used only in full.	This Test Report applies only to the specimen tested and may not be applied to other specimens of the same product.

Table of Contents

1 Scope

1.1. Test item:

BreezeACCESS 4900 System.

1.2. Applicant information

Company (manufacturer): Alvarion LTD
P.O.B.: 13139
Postal code: 61131
City: Tel Aviv
Country: Israel
Telephone number: +972 3 6456262
Telefax number: +972 3 6456222

1.3. Test performance

Location: SII EMC Branch
Alvarion LTD

Purpose of test: Apparatus compliance verification in according with CFR 47 FCC Requirement

Test specification: Measurements were performed according to the customer requirements per following CFR 47 FCC sections:
Part 15 Subpart B Sections: 15.107,15.109
Part 90 Sections: 90.210 (m), 90.1215 (a), (c) and (d).
Details – see in clause 6 of presented Test Report.

Test results: This test report contains results measured on BreezeACCESS 4900 System according to the relevant requirements of CFR 47 FCC Part 15 Subpart B and Part 90.

Test performed by: Mr. Michael Feldman, Test Technician

Test report approved by: Mr.Yuri Rozenberg, Head of EMC Branch

2 BreezeACCESS 4900 system description

Types (Models): Base Station
IDU:

BS-SH	Shelf
BS-AU	Plugged-in card
BS-PS-AC/DC	Power supply AC or DC

ODU: AU-D-BS-4900-ODU Radio unit

Subscribe unit:
SU-A/E-4900-BD Complete system
IDU: Universal indoor unit, PS1073 .

BreezeACCESS 4900 is a high capacity, IP services oriented Broadband Wireless Access system.
The BreezeACCESS 4900 is digital modulated TDD system operating in 4940-4990 MHz
The system contains a base station unit and a subscriber unit.
The base station and subscriber radio are identical radio hardware.
The basic system configuration is a two-box configuration that contains

1. Indoor unit that contains a power supply and an Ethernet 10Base-T bypass.
2. Outdoor unit containing the entire radio and digital section.
3. A single CAT5 cable connecting the indoor and outdoor unit carrying the DC power and the data.

Base station Stand-alone unit and Subscriber unit are identical hardware units and system construction. The two configurations are distinguished by software application only.

3 BreezeACCESS 4900 system content

Base station includes indoor card, ODU, antenna	
AU-D-BS-4900-120/360	**Indoor Unit** (hereinafter: IDU) Includes indoor card ,ODU, antenna .
BS-SH	Indoor Shelf
BS-PS-AC	Power supply AC
BS-PS-DC	Power supply DC
BS-AU	Indoor card
AU-D/E-BS-4900-ODU	**Outdoor unit** (hereinafter: ODU) with detached antenna
Base station Stand alone	
AU-D/E-SA-4900-120/360	Complete system with detached antenna
Subscriber unit	
SU-A-4900-BD IDU, Model: PS1073	Complete system with integrated antenna

Photo # 1. Radio Unit. PWB component side

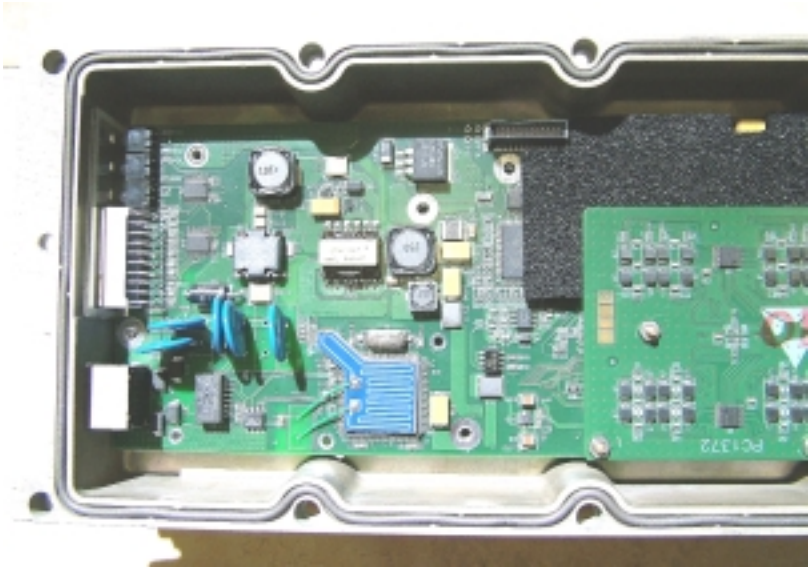


Photo # 2. Radio Unit. PCB component side (left part)

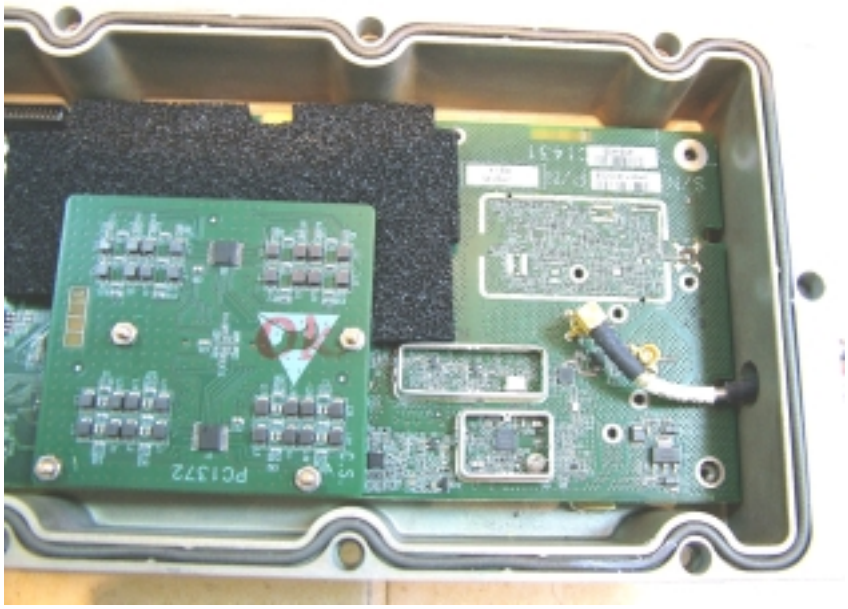


Photo # 3. Radio Unit. PCB component side (right part)

4 Test configuration:

1. For Radiated emission measurements per sec. 15.209 requirements the Subscriber Unit and the Base Station Unit were configured for tests as shown in Figures 1, 2.

2. For Radiated emission measurements per sec. 15.205 requirements the Radio unit was tested with various antennas, as shown in table below:

No.	Name	Freq. Range GHz	Gain dBi	P/N or Model	Type
1	Omni (AU)	4.9-5.1	9	AN1298	MT-462002/NV
2	Flat panel, detached (SU)	4.9-5.1	27	-----	MT-466003/N
3	Sectorial, 120deg (AU)	4.9-5.1	15	AN1268	MT-444003/NV
4	Flat panel integral	4.9-5.1	21	AN1293	

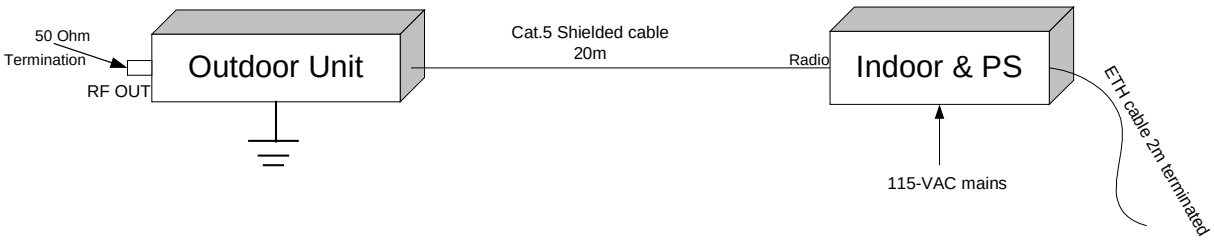


Figure 1. Subscriber Unit test setup

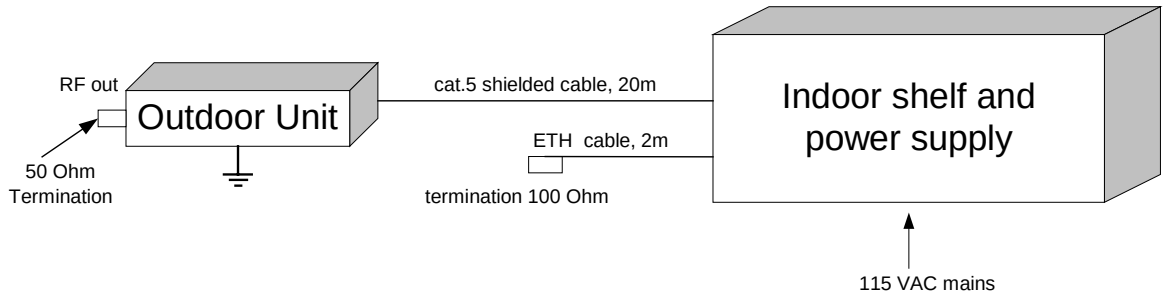


Figure 2. Base Station test setup

5 Test specification, Methods and Procedures

Test Specification:

- CFR 47 FCC: Rules and Regulations;
  Part 15. “Radio frequency devices”;
  Subpart B: “Unintentional radiators” (2002)
- CFR 47 FCC: Rules and Regulations;
  Part 90. “Private Land Mobile Radio Services" (2004).
  (with May 2005 updates)

Methods and Procedures:

- ANSI C63.4:2003: "American National Standard for Method of Measurement of Radio Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range 9 kHz to 40 GHz".

6 Measurements, examinations and derived results

6.1. Location of the Test Site:

The tests were conducted in the EMC laboratory of the Standards Institution of Israel in Tel-Aviv and at open test site located at Kibbutz Native Halamed Hai in Emek HaEla, Israel.

6.2. Normal test condition:

Temperature: 22 °C
Humidity: 50 %

6.3. Conducted emission test (per Section 15.207)

6.3.1 Requirements:

EUT's conducted emission within the band 150 kHz to 30 MHz shall not exceed value required in section 15.107 (a).

6.3.2 Tested units:

The measurements were performed on:
- Subscriber Unit - on Universal Indoor unit AC power adaptor PS 1073.
- Base Station Unit (BS-SH Shelf) on power input - AC option and DC options, in turn:
  AC option: test was conducted on 120 VAC mains to BS-SH Shelf;
  DC option: test was conducted on 120 VAC mains to auxiliary DC Power Supply (Model 33010D mfr Advice) connected to the BS-SH Shelf.

6.3.3 Test procedure:

Each EUT was placed on a non-metallic table in a shielded chamber at a height of 80 cm from the floor and 40 cm from the nearest wall.

The EUT was operated to transmitting through the customer software.
First, initial scans were performed. Final measurements were performed at the frequencies where emission exceeded the tolerance limit.

Test equipment (EMI receiver) setup was as follow:

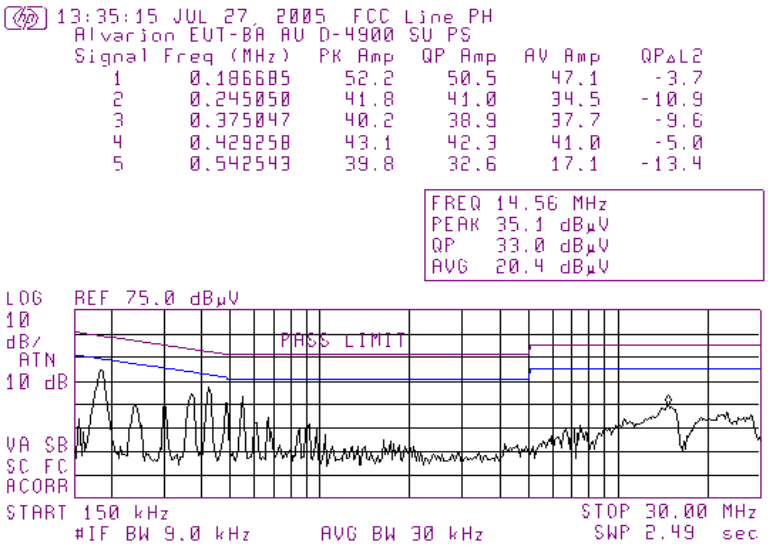
Initial scan:	
Detector type	Peak
Mode	Max hold
Bandwidth	9 kHz
Step size	Continuous sweep
Sweep time	>100 msec
Measurements	
Detector type	Quasi-peak, Avg (CISPR)
Bandwidth	9 kHz
Measurement time	200 seconds/MHz
Observation	>15 seconds

6.3.4 Test results:

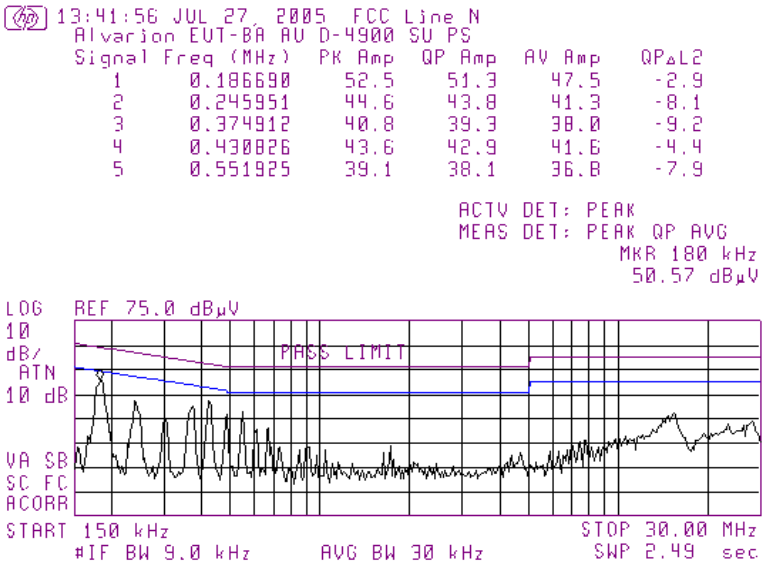
Subscriber Unit. Test results are shown in Plots #1, 2.

Base Station Unit (BS-SH Shelf, AC option). Test results are shown in Plots #3, 4.

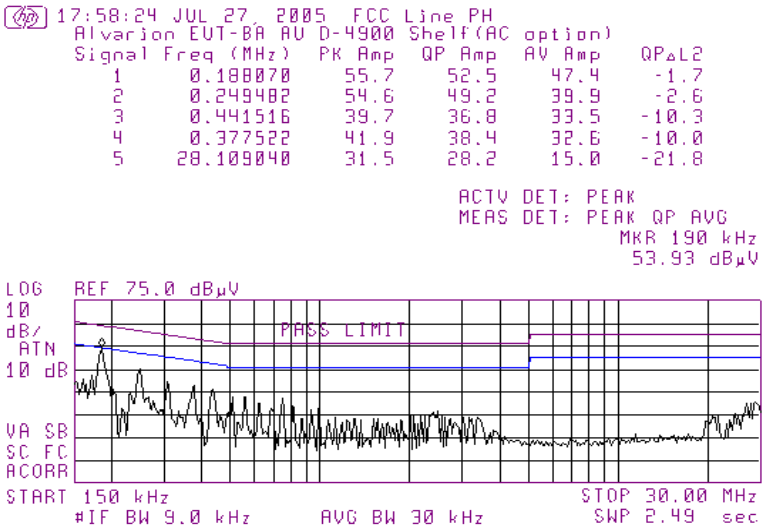
Base Station Unit (BS-SH Shelf, DC option). Test results are shown in Plots #5, 6.



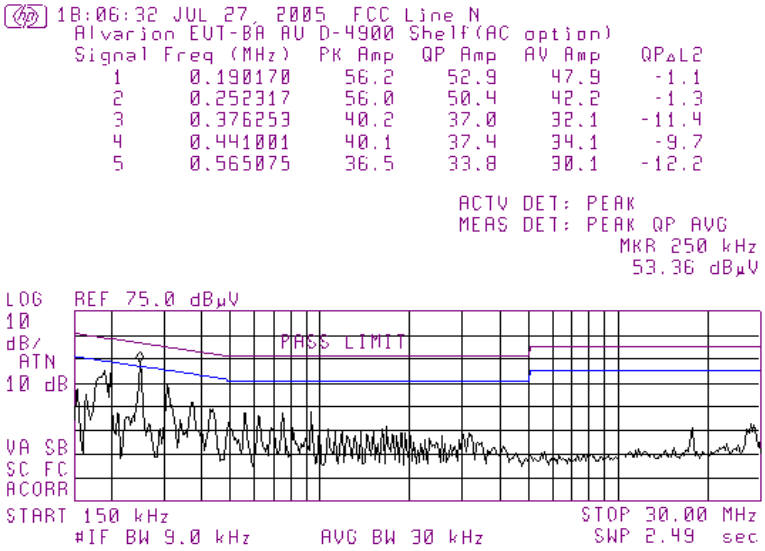
Plot # 1. Subscriber Unit
Conducted emissions measurement result on 115 VAC power line: phase



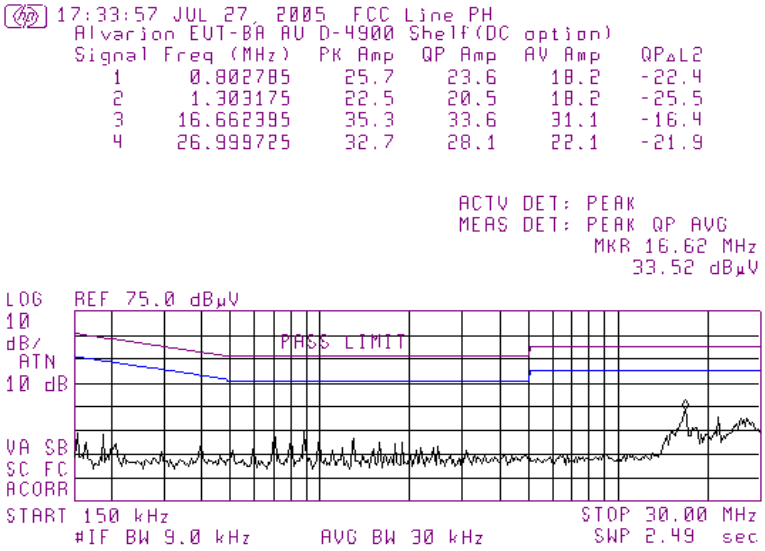
Plot # 2. Subscriber Unit
Conducted emissions measurement result on 115 VAC power line: neutral



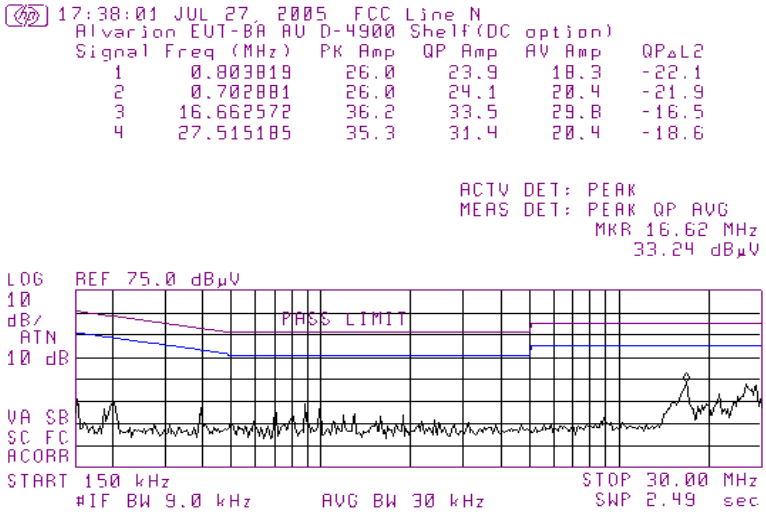
Plot # 3. Base Station Unit (BS-SH Shelf, AC option)
Conducted emissions measurement result on 115 VAC power line: phase



Plot # 4. Base Station Unit (BS-SH Shelf, AC option)
Conducted emissions measurement result on 115 VAC power line: neutral



Plot # 5. Base Station Unit (BS-SH Shelf, DC option)
Conducted emissions measurement result on 115 VAC power line: phase



Plot # 6. Base Station Unit (BS-SH Shelf, DC option)
Conducted emissions measurement result on 115 VAC power line: neutral

6.4. Radiated emission test, general requirements (per Section 15.109)

6.4.1 Requirements:

EUT's radiated emission shall not exceed value required in section 15.109.

6.4.2 Test description:

The measurements were performed at the Open Area Test Site.
The test configuration is shown in Fig.1, 2.

The EUT was arranged on a non-metallic table 0.8 m placed on the turn-table.
The measurements were performed at a 10 m measurement distance.

The Biconilog 30 MHz-2 GHz antenna was used.

The frequency range was investigated from 30 MHz to 2 GHz.

The measurements were performed at each frequency at which the signal was 10 dB below the limit or less.

The level were maximized by initially rotating turntable through 360°, varying the antenna height between 1 m and 4 m, rerouting EUT cables and changing antenna polarization from vertical to horizontal. The measuring equipment settings were:

Initial scan:	
Detector type	Peak
Mode	Max hold
Bandwidth	120 kHz
Step size	Continuous sweep
Sweep time	>1 seconds/MHz
Measurements:	
Detector type	Quasi-peak (CISPR 16)
Bandwidth	120 kHz
Measurement time	20 seconds/MHz
Observation	>15 seconds

6.4.3 Radiated emission test results: 15.209

Test results are presented in Table 1.

Table 1. Radiated emission test results 15.209
Setup includes IDU Units: SU + BS-SH Shelf, AC option
Specified limits: FCC Part 15 Subpart C Class B

Frequency (MHz)	Antenna Polariz.	Antenna Height (m)	Turn-table Angle (°)	Emission Level Note 1 (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin Note 2 (dB)	Results
119.2	V	1.20	120	31.0	43.5	12.5	Complies
160.0	V	1.20	352	24.8	43.5	18.7	Complies
250.0	H	3.02	83	43.7	46.0	2.3	Complies
500.0	H	1.71	86	29.2	46.0	16.8	Complies
600.0	H	1.34	109	32.5	46.0	13.5	Complies
750.0	H	1.20	46	38.0	46.0	8.0	Complies

Table 2. Radiated emission test results 15.209
Setup includes IDU Units: SU + BS-SH Shelf, DC option
Specified limits: FCC Part 15 Subpart C Class B

Frequency (MHz)	Antenna Polariz.	Antenna Height (m)	Turn-table Angle (°)	Emission Level Note 1 (dBμV/m)	Limit @ 3 m (dBμV/m)	Margin Note 2 (dB)	Results
58.3	V	1.20	84	31.3	40.0	8.7	Complies
69.8	V	1.20	299	31.5	40.0	8.5	Complies
78.9	V	1.20	115	31.3	40.0	8.7	Complies
250.0	H	3.15	79	42.3	46.0	3.7	Complies
400.0	H	1.59	32	29.3	46.0	16.7	Complies
600.0	H	1.20	108	31.0	46.0	15.0	Complies
750.0	H	1.20	24	38.2	46.0	7.8	Complies

Note 1: Emission level = E Reading (dBμV) + Cable loss (dB) + Antenna Factor (dB/m) + 10 dB
Where 10 dB is an extrapolation distance factor.
For Cable Loss and Antenna Factor refer to Appendix 2.

Note 2: Margin (dB) = Limit (dBμV/m) – Emission level (dBμV/m)

6.5. Radiated spurious emission (per Section 90.210(m)(6))

6.5.1 Requirements:

The levels of any unwanted emission shall not exceed value:
On any frequency removed from assigned frequency between 150% of the authorized bandwidth: 50 dB or 55+10Log(P) dB, whichever is the lesser attenuation

6.5.2 EUT configuration:

The radio unit was tested with various modes (see clause 4)
Cabinet spurious emissions test
Integral antenna emissions test

6.5.3 Test procedure:

The measurements were performed in the anechoic chamber.
The EUT was arranged on a non-metallic table 0.8 m placed on the turntable.
Measuring antennas used: Up to 18 GHz - Double Ridge **EMCO** model 3115
above 18 GHz - Alpha TRG model A361
Polarization: Vertical/Horizontal
Measurement distance = 1m.
The frequency range was investigated up to 40 GHz.
The measurements were performed in vertical and horizontal polarization, the maximum reading recorded and correspondent to power level defined by the substitution method.

6.5.4 Radiated spurious emission test results and calculation ratio:

The test results are shown in Tables ## 3, 4
The emission level was calculated as:
Signal generator level (dBm) - cable loss (dB) + antenna gain (dBi)
For measuring cable loss and antenna gain refer to Appendix 2.

Table 3. Radiated spurious emissions test results 90.210(m)(6) (2.1053)

Transmitter carrier frequency GHz	Frequency GHz	Emission level dBµV	Emission level dBm	Limit dBm	Margin	Results
4.9475	9.8924	28	-38.5	-25	13.5	Complies
	14.8404	25.8	-36.2		11.2	Complies
	19.7884	NF	NF		NF	Complies
	24.7364	NF	NF		NF	Complies
	29.6884	NF	NF		NF	Complies
	34.6397	NF	NF		NF	Complies
	39.5877	NF	NF		NF	Complies
4.9675	9.9357	28.8	-37.6	-25	12.6	Complies
	14.9043	21.5	-40.1		15.1	Complies
	19.8732	NF	NF		NF	Complies
	24.8405	NF	NF		NF	Complies
	29.8089	NF	NF		NF	Complies
	34.7767	NF	NF		NF	Complies
	39.7456	NF	NF		NF	Complies
4.9875	9.9718	29.1	-37.3	-25	12.3	Complies
	14.9589	21.3	-40.0		15.0	Complies
	19.9458	NF	NF		NF	Complies
	24.8473	NF	NF		NF	Complies
	29.9186	NF	NF		NF	Complies
	34.9049	NF	NF		NF	Complies
	39.8919	NF	NF		NF	Complies

NF – Noise floor level.

Table 4. Spurious emissions test results. 90.210(m)(6) (2.1053)
Integral antenna AN 1293 21 dBi

Transmitter carrier frequency GHz	Frequency GHz	Emission level dBµV	Emission level dBm	Limit dBm	Margin	Results
4.9475	9.8924	28.3	-38.1	-25	13.9	Complies
	14.8404	25.8	-33.4		8.4	Complies
	19.7884	NF	NF		NF	Complies
	24.7364	NF	NF		NF	Complies
	29.6884	NF	NF		NF	Complies
	34.6397	NF	NF		NF	Complies
	39.5877	NF	NF		NF	Complies
4.9675	9.9357	28.6	-37.3	-25	12.2	Complies
	14.9043	21.7	-40.2		15.2	Complies
	19.8732	NF	NF		NF	Complies
	24.8405	NF	NF		NF	Complies
	29.8089	NF	NF		NF	Complies
	34.7767	NF	NF		NF	Complies
	39.7456	NF	NF		NF	Complies
4.9875	9.9718	26.7	-35.3	-25	10.3	Complies
	14.9589	23.0	-39.0		14.0	Complies
	19.9458	NF	NF		NF	Complies
	24.8473	NF	NF		NF	Complies
	29.9186	NF	NF		NF	Complies
	34.9049	NF	NF		NF	Complies
	39.8919	NF	NF		NF	Complies

NF – Noise floor level.

6.6. Spectrum mask measurements (per Section 90.210 (m) 2.1049

6.6.1 Requirements:

Tests were performed according to FCC Part 90 sec. 90.210 (m).
Authorized frequency band: 4.940 – 4.990 GHz.
Liming according to part 90.210 ((m):

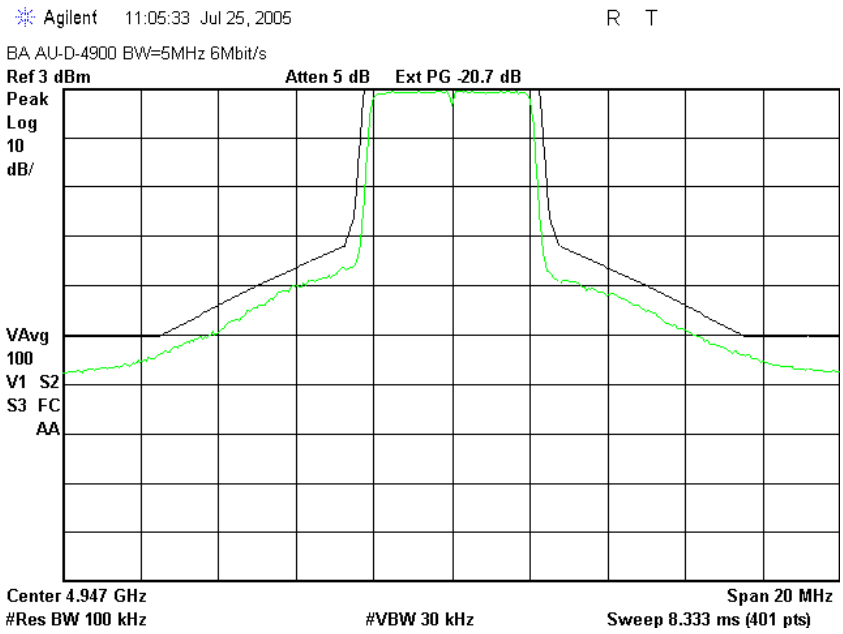
On any frequency removed from assigned frequency between 0 – 45% - 0 dB
On any frequency removed from assigned frequency between 45 – 50% - 26 dB
On any frequency removed from assigned frequency between 50 – 55% - 32 dB
On any frequency removed from assigned frequency between 55 – 100% - 40 dB
On any frequency removed from assigned frequency between 100 – 150% -50 dB
On any frequency removed from assigned frequency above 150% - 50 dB or
55 + 10 log (P) dB, whichever is the lesser attenuation.

6.6.2 Test procedure:

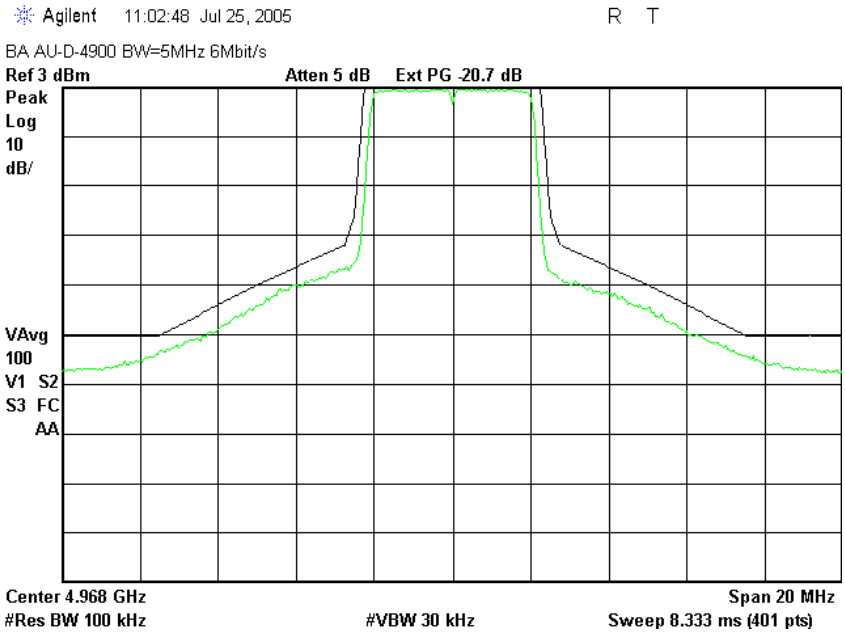
Transmitter was connected to Spectrum Analyzer (SA) via 20 dB attenuator and short cable 0.7 dB insertion loss and was accounted in SA settings.
Used RBW = 100 kHz, VBW = 30 kHz
Measurements were performed for 2 emissions bandwidth 5 MHz and 10 MHz at three frequencies each:
4.9475 GHz, 4.9675 GHz, 4.9875 GHz
With various Bit rate - 6 Mbit/s and 54 Mbit/s

6.6.3 Test results:

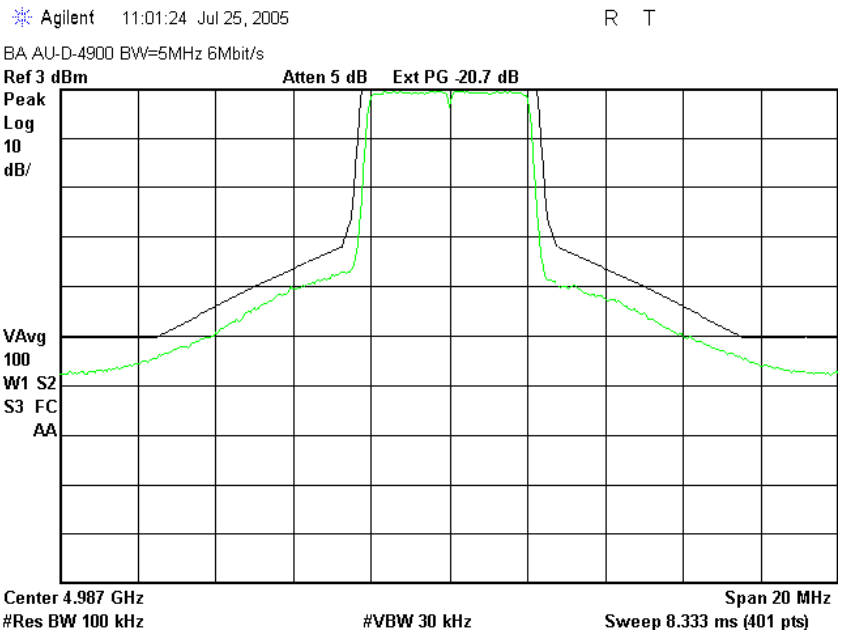
The measured results are shown in Plots #7 - #18.



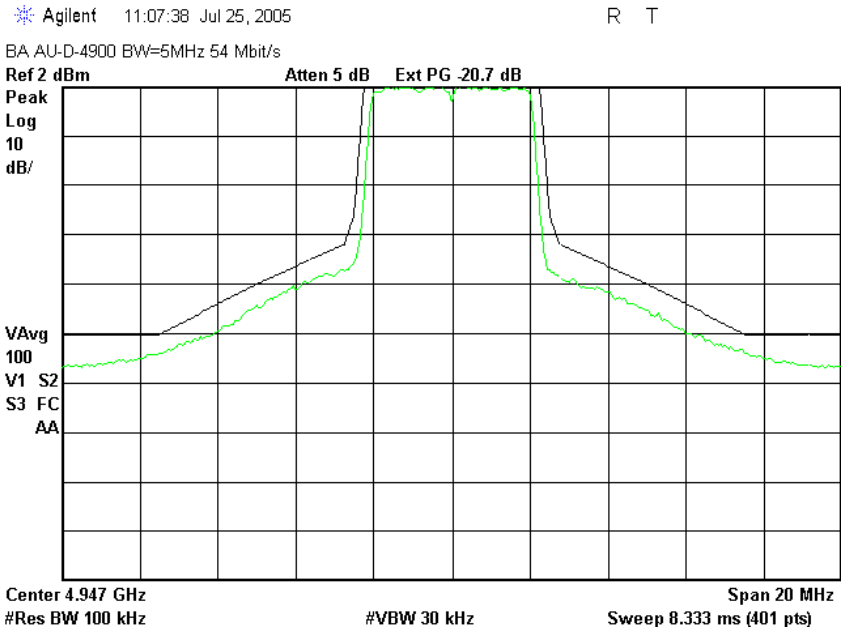
Plot # 7. LOW frequency 4.947 GHz, Bandwidth = 5 MHz, PRBS = 6 MBit/s



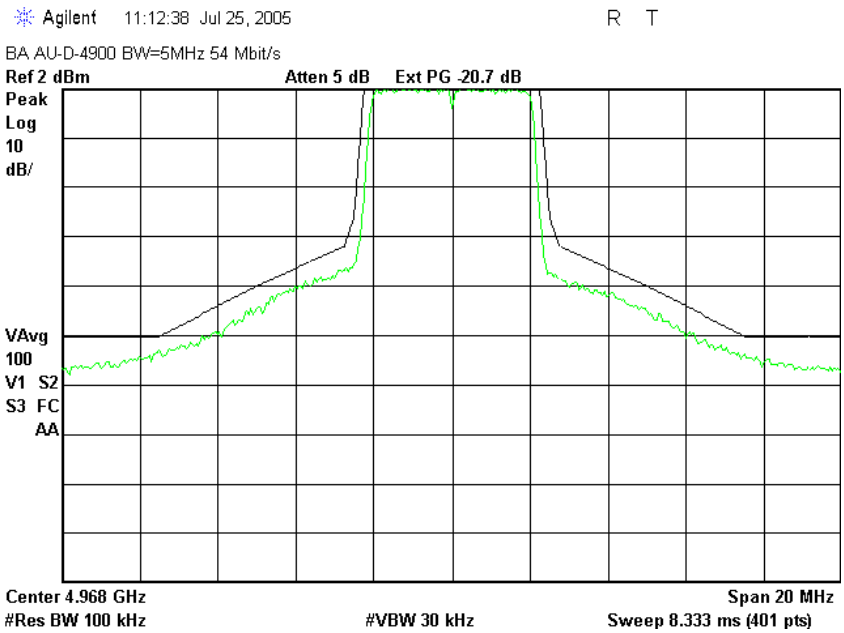
Plot # 8 MIDDLE frequency 4.968 GHz, Bandwidth = 5 MHz, PRBS = 6 MBit/s



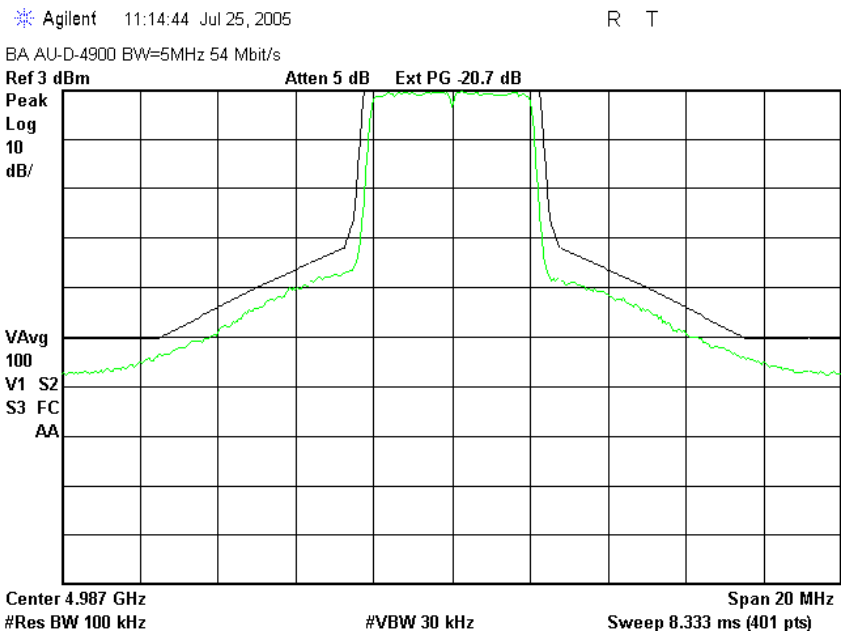
Plot # 9. HIGH frequency 4.987 GHz, Bandwidth = 5 MHz, PRBS = 6 MBit/s



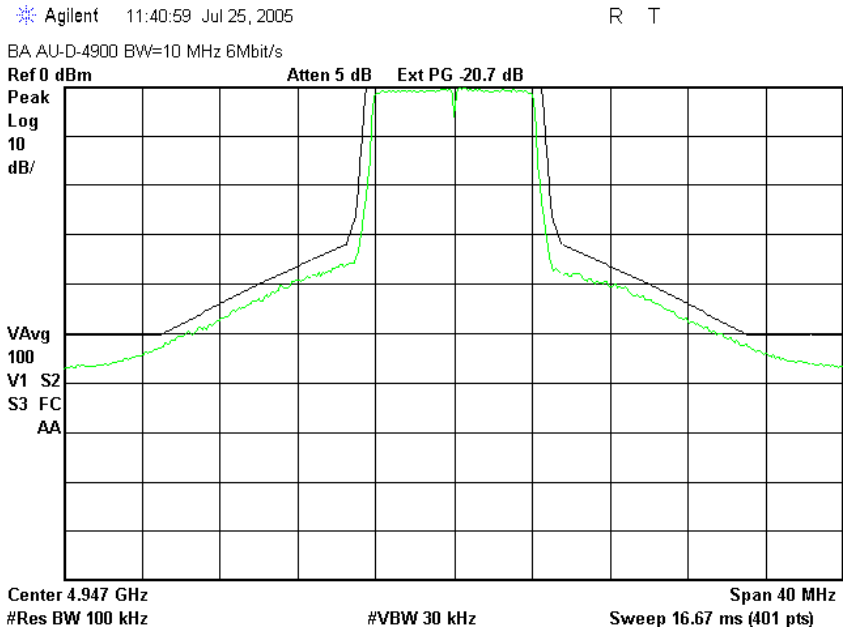
Plot # 10. LOW frequency 4.947 GHz, Bandwidth = 5 MHz, PRBS = 54 MBit/s



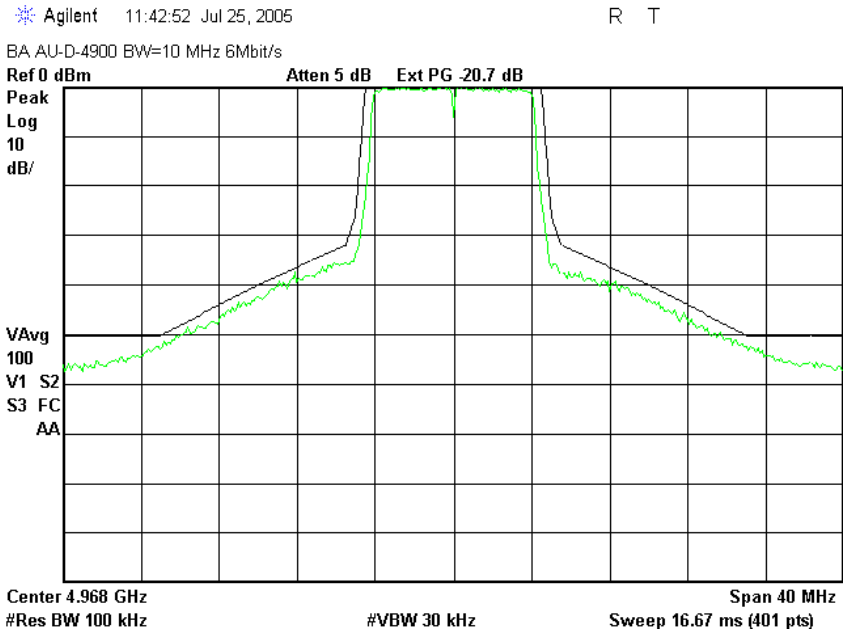
Plot # 11. MIDDLE frequency 4.968 GHz, Bandwidth = 5 MHz, PRBS = 54 MBit/s



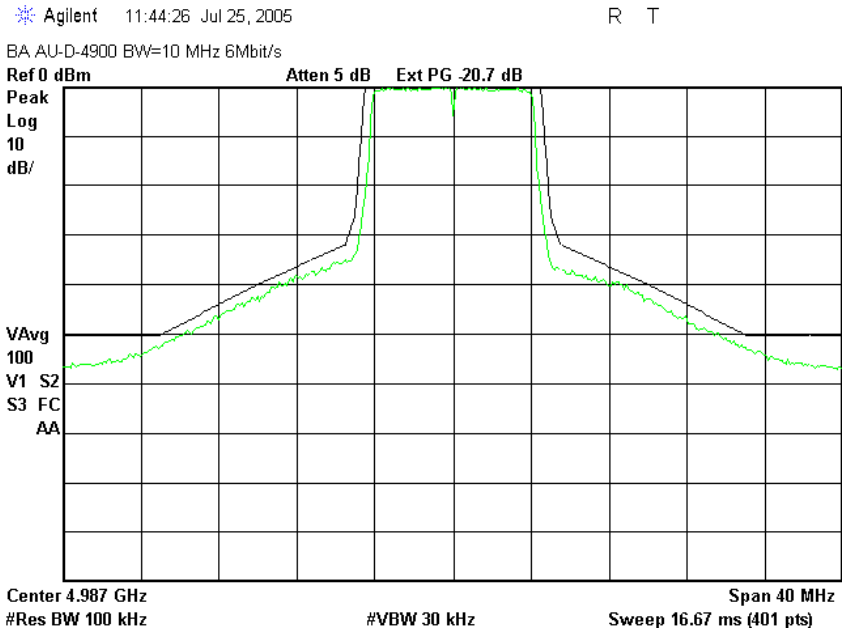
Plot # 12. HIGH frequency 4.987 GHz, Bandwidth = 5 MHz, PRBS = 54 MBit/s



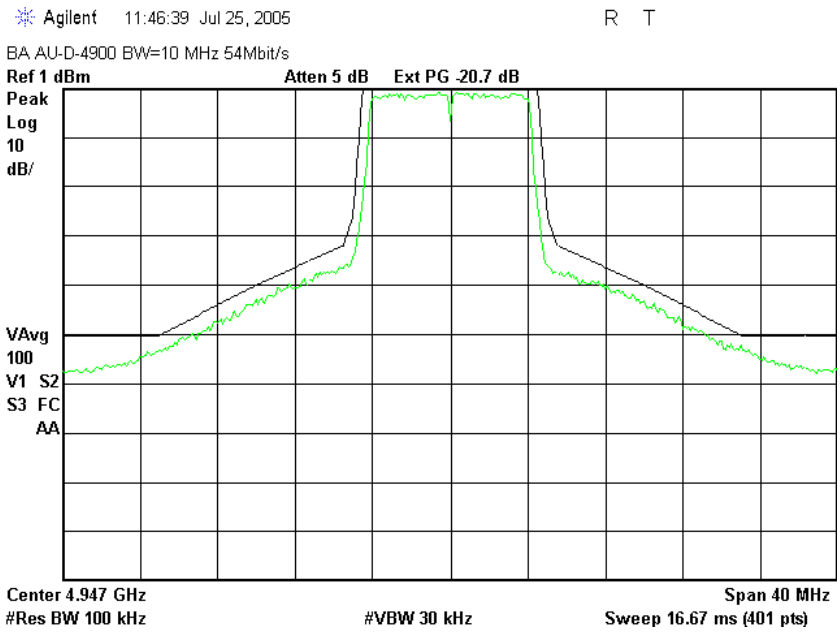
Plot # 13. LOW frequency 4.947 GHz, Bandwidth = 10 MHz, PRBS = 6 MBit/s



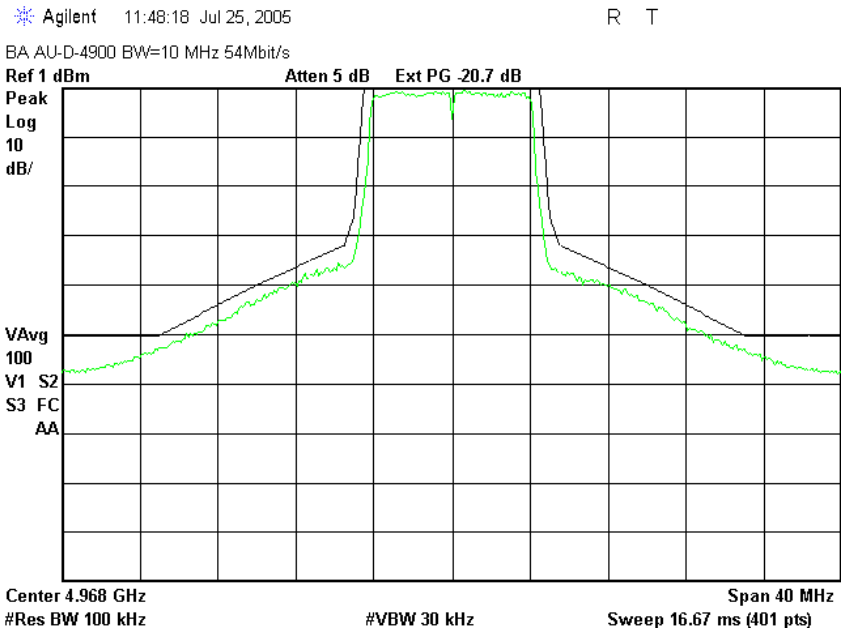
Plot # 14. MIDDLE frequency 4.968 GHz, Bandwidth = 10 MHz, PRBS = 6 MBit/s



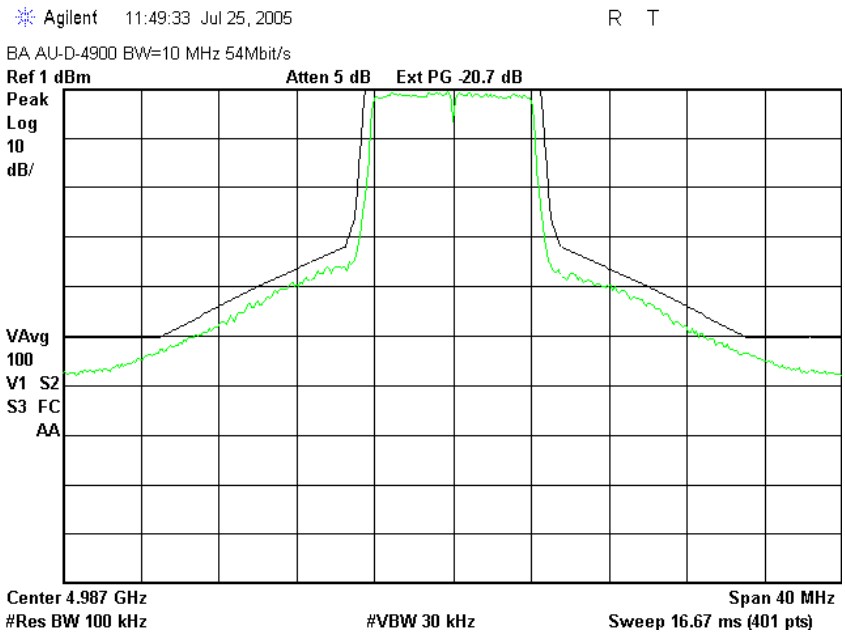
Plot # 15. HIGH frequency 4.987 GHz, Bandwidth = 10 MHz, PRBS = 6 MBit/s,



Plot # 16. LOW frequency 4.947 GHz, Bandwidth = 10 MHz, PRBS = 54 MBit/s,



Plot # 17. HIGH frequency 4.968 GHz, Bandwidth = 10 MHz, PRBS = 54 MBit/s



Plot # 18. HIGH frequency 4.987 GHz, Bandwidth = 10 MHz, PRBS = 54 MBit/s

6.7. Conducted spurious emissions measurements (per Section 90.210 (m), (6))

6.7.1 Requirements:

Tests were performed according to FCC Part 90 sec. 90.210 (m), (6).
Applicable frequency band: 4.940 – 4.990 GHz.
On any frequency removed from the assigned frequency between above 150% of the authorized bandwidth: 50 dBc.
Limit line was calculated from carrier plot and found – 41 dBm.
(For calculation example see plot # 19)

6.7.2 Test procedure:

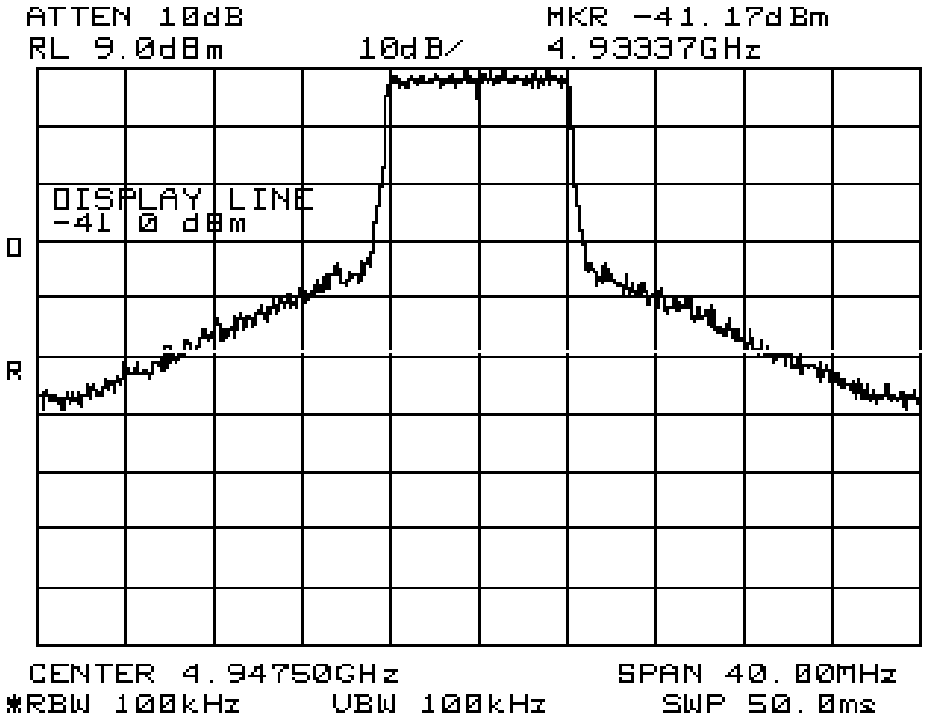
Measurements were performed at three carrier frequencies,
Bandwidth = 10 MHz , PRBS = 54 Mbit/s.

Tested frequency range: from 1 MHz to 40 GHz.

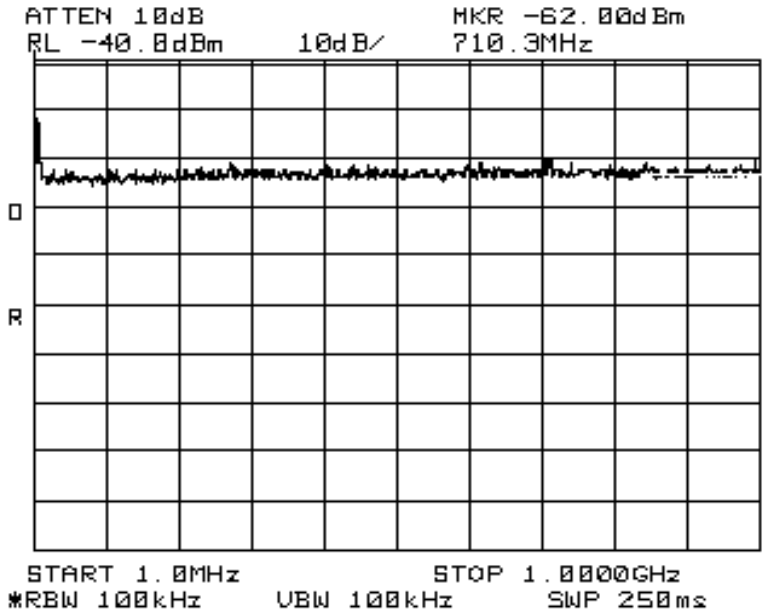
6.7.3 Test results:

The measured results are shown in Plots #19 - #33.

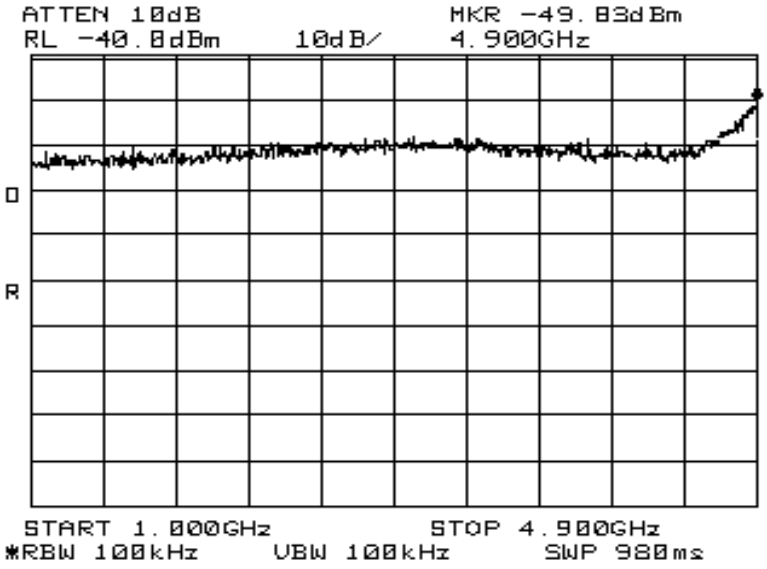
Limit calculation is: 9.0 dBm – 50 dB = - 41.0 dBm



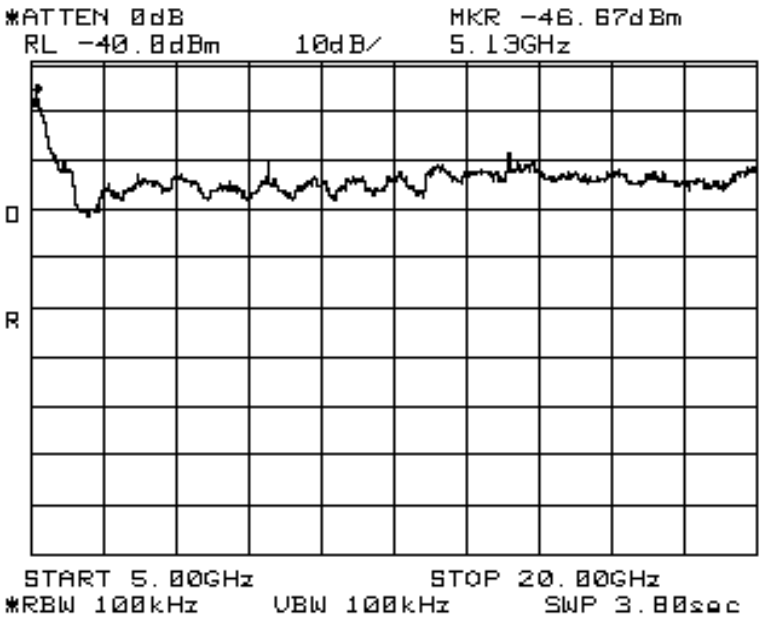
Plot # 19. Carrier, LOW frequency 4.9475 GHz,



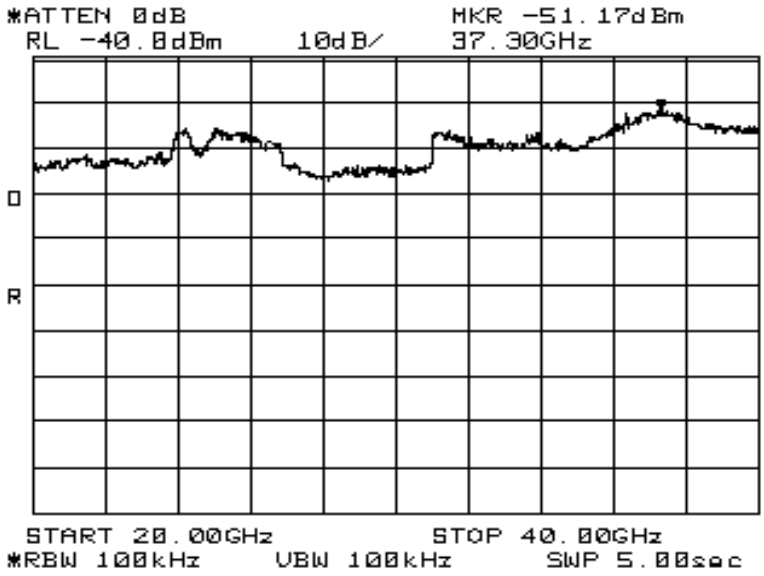
Plot # 20. LOW frequency 4.9475 GHz, frequency range: 1 MHz – 1 GHz
CE limit = - 41 dBm



Plot # 21. LOW frequency 4.9475 GHz, frequency range: 1 GHz – 4.9 GHz
CE limit = - 41 dBm

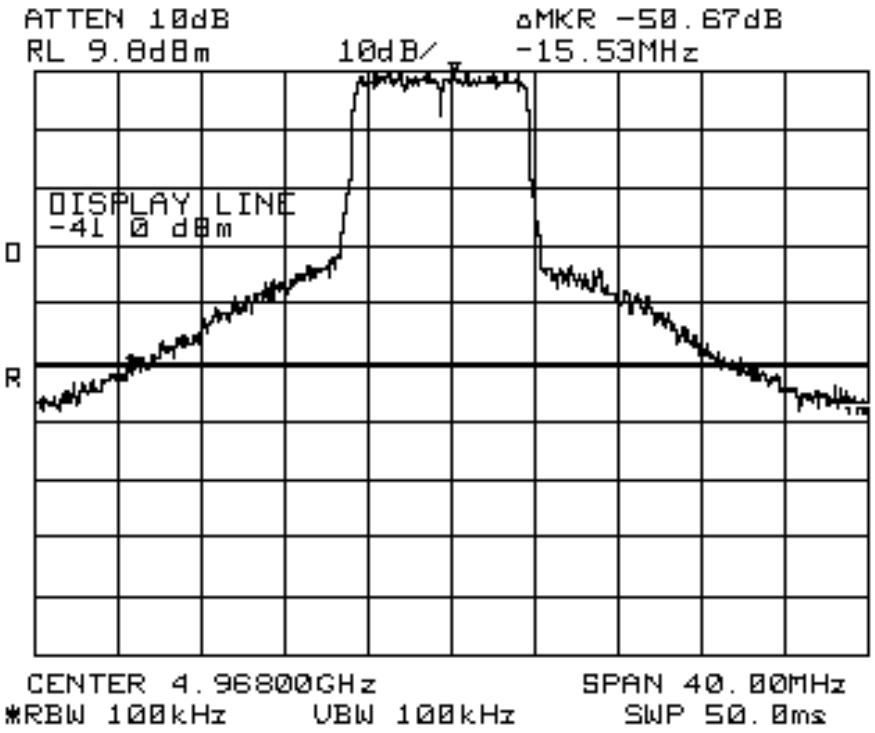


Plot # 22. LOW frequency 4.9475 GHz, frequency range: 5 GHz – 20 GHz
CE limit = - 41 dBm

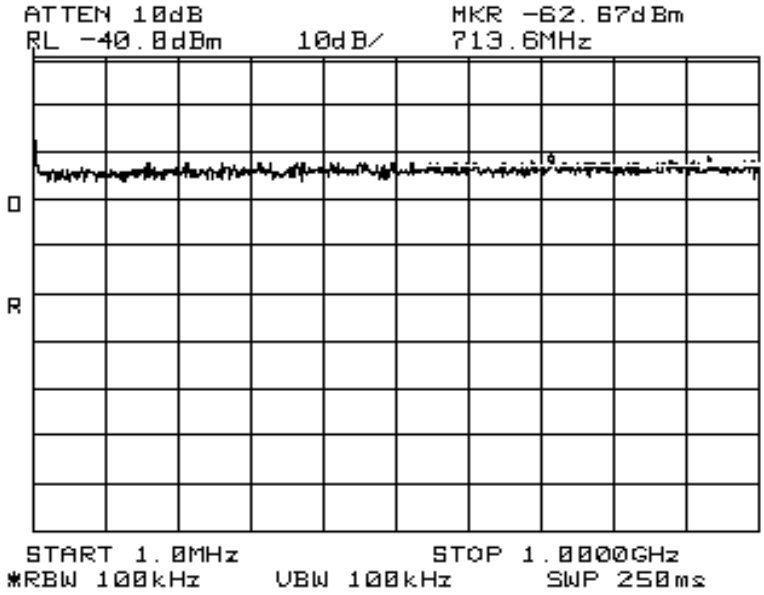


Plot # 23. LOW frequency 4.9475 GHz, frequency range: 20 GHz – 40 GHz
CE limit = - 41 dBm

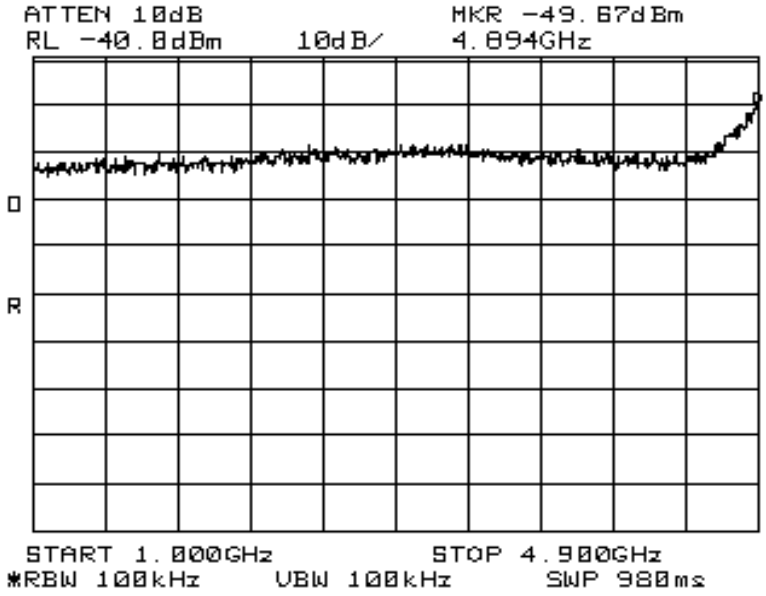
Limit calculation is: 9.0 dBm – 50 dB = - 41.0 dBm



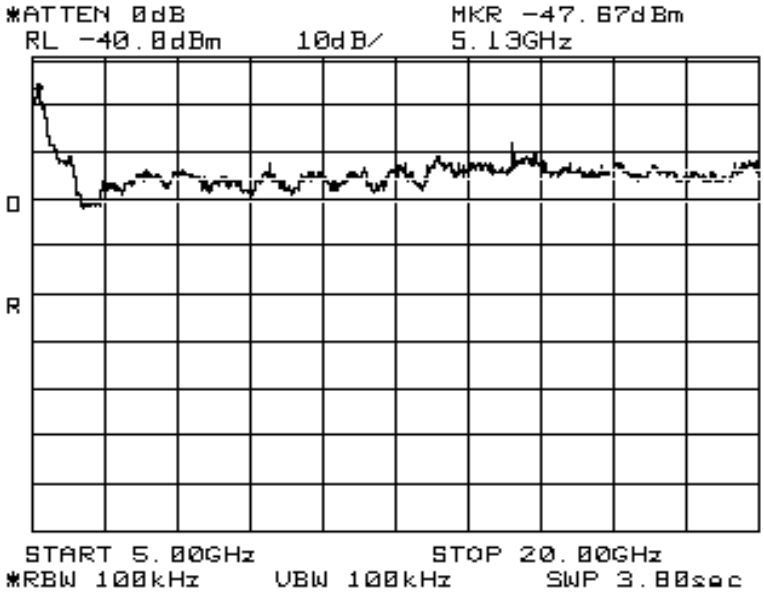
Plot # 24. Carrier, MIDDLE frequency 4.9675 GHz



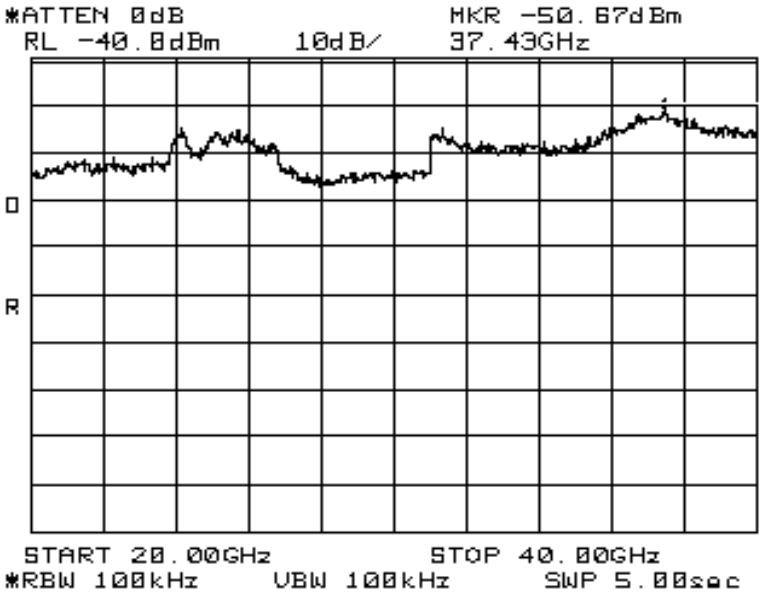
Plot # 25. MIDDLE frequency 4.9675 GHz, frequency range: 1 MHz – 1 GHz
CE limit = - 41 dBm



Plot # 26. MIDDLE frequency 4.9675 GHz, frequency range: 1 GHz – 4.9 GHz
CE limit = - 41 dBm

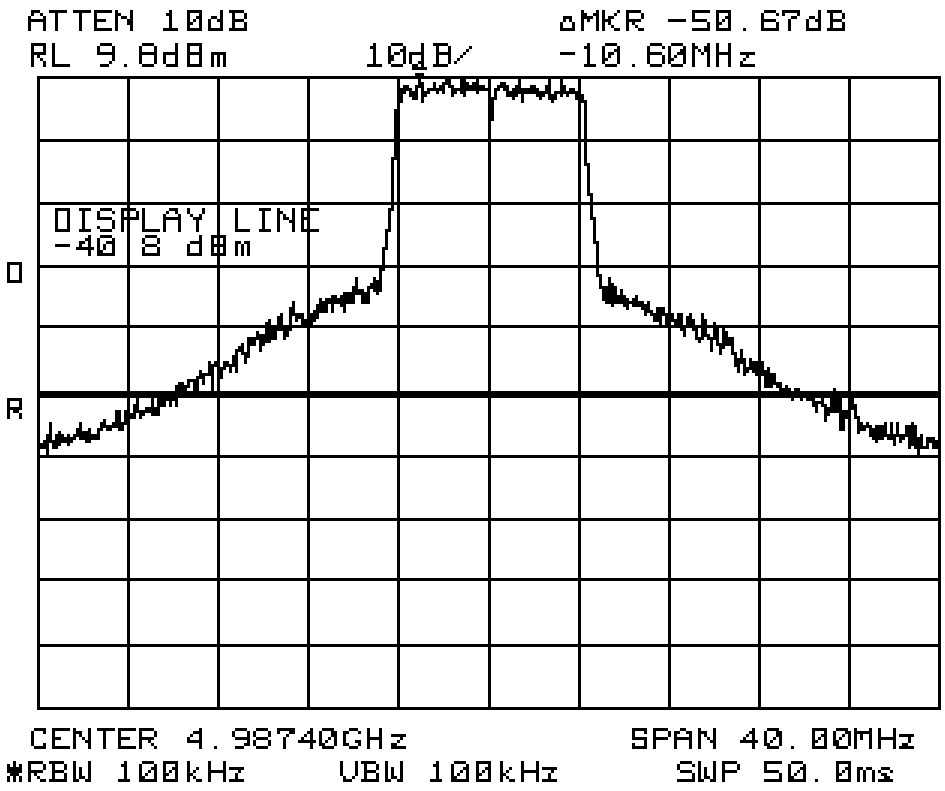


Plot # 27. MIDDLE frequency 4.9675 GHz, frequency range: 5 GHz – 20 GHz
CE limit = - 41 dBm

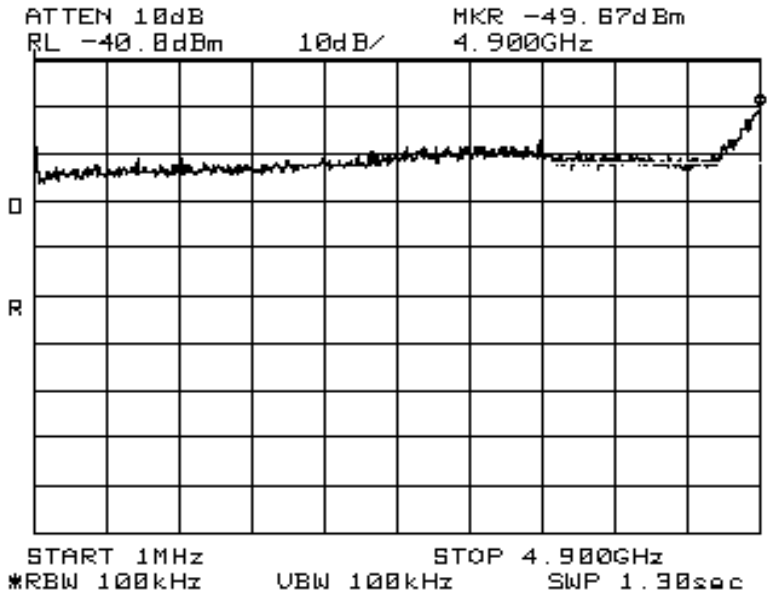


Plot # 28. MIDDLE frequency 4.9675 GHz, frequency range: 20 GHz – 40 GHz
CE limit = - 41 dBm

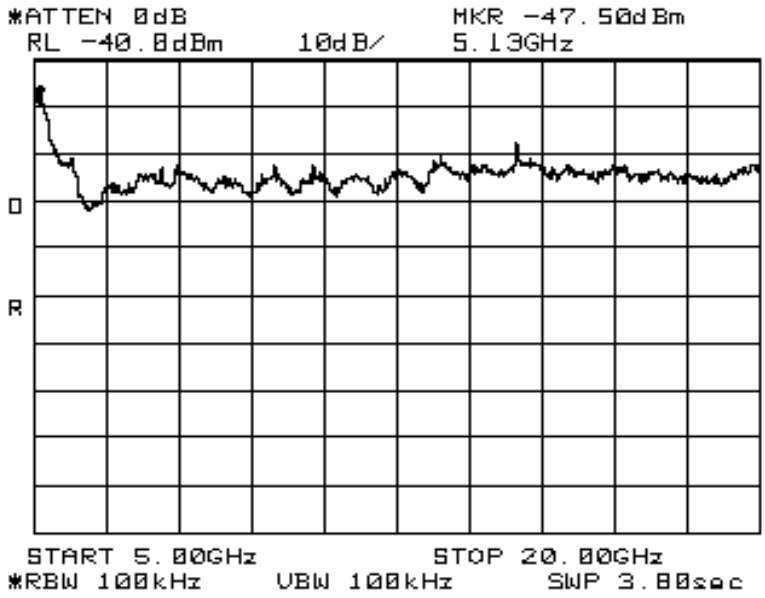
Limit calculation is: 9.8 dBm – 50 dB = - 41.8 dBm



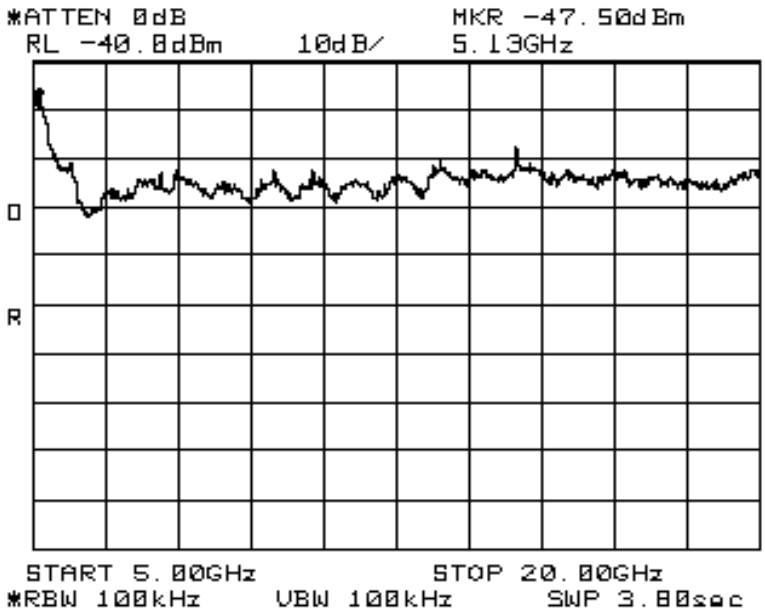
Plot # 29. Carrier, HIGH frequency 4.9875 GHz,



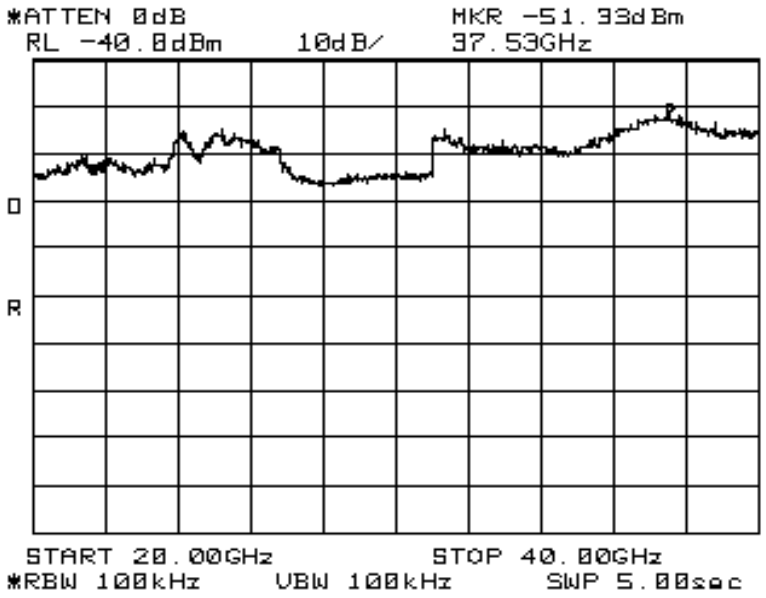
Plot # 30. HIGH frequency 4.9875 GHz, frequency range: 1 MHz – 1 GHz
CE limit = - 41 dBm



Plot # 31. HIGH frequency 4.9875 GHz, frequency range: 1 GHz – 4.9 GHz
CE limit = - 41 dBm



Plot # 32. HIGH frequency 4.9875 GHz, frequency range: 5 GHz – 20 GHz
CE limit = - 41 dBm



Plot # 33. HIGH frequency 4.9875 GHz, frequency range: 20 GHz – 40 GHz
CE limit = - 41 dBm

6.8. Peak transmit power measurements (per Section 90.1215 (a)) 2.1046

6.8.1 Requirements:

Tests were performed according to FCC Part 90 sec. 90.1215 (a).
Authorized frequency band: 4.940 – 4.990 GHz.

The peak transmit power limit according to table from sec. 90.1215 (a) is :
27 dBm(5MHz BW) and 30dBm (10MHz BW) .
Using antenna 27dBi gain , the output power will be reduced by 1dB

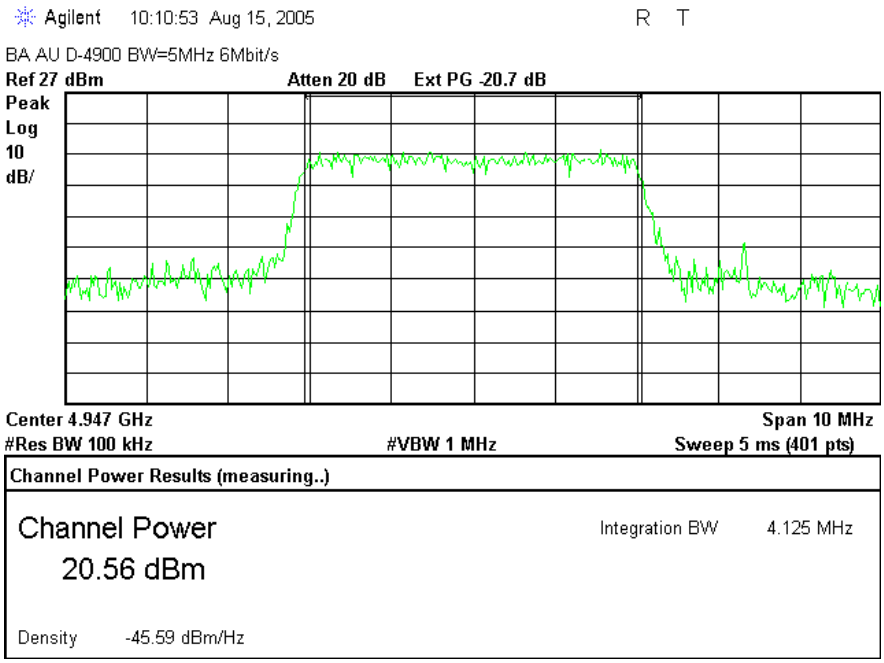
6.8.2 Test procedure:

Measurements were performed at three carrier frequencies and two (6, 54 Mbit/s) bit rates. The peak transmit power was measures as a conducted emission over any interval of continuous transmission calibrated in terms of an rms-equivalent voltage.

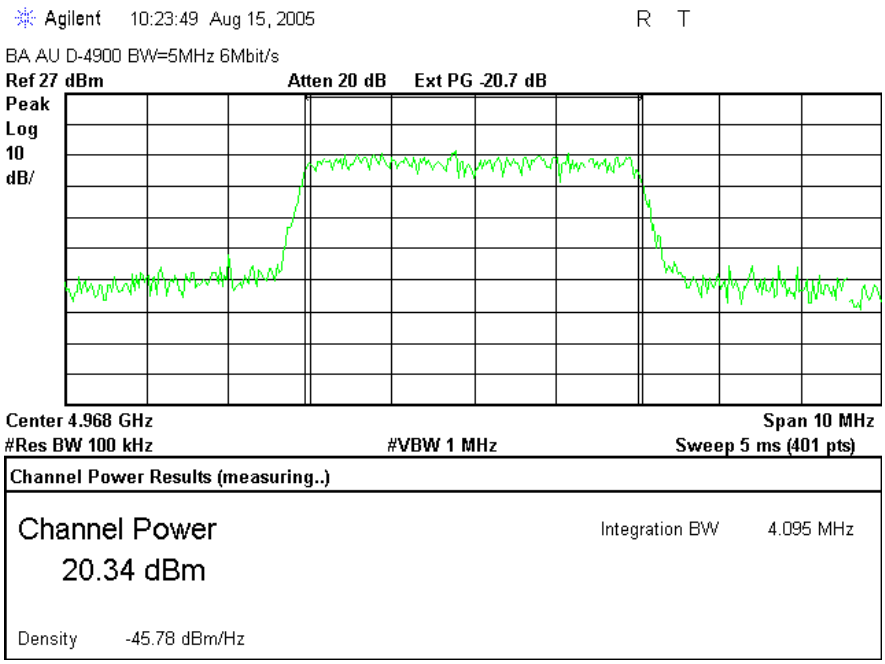
6.8.3 Test results:

The measured results are shown in Plots #34 - #45 and Table below:

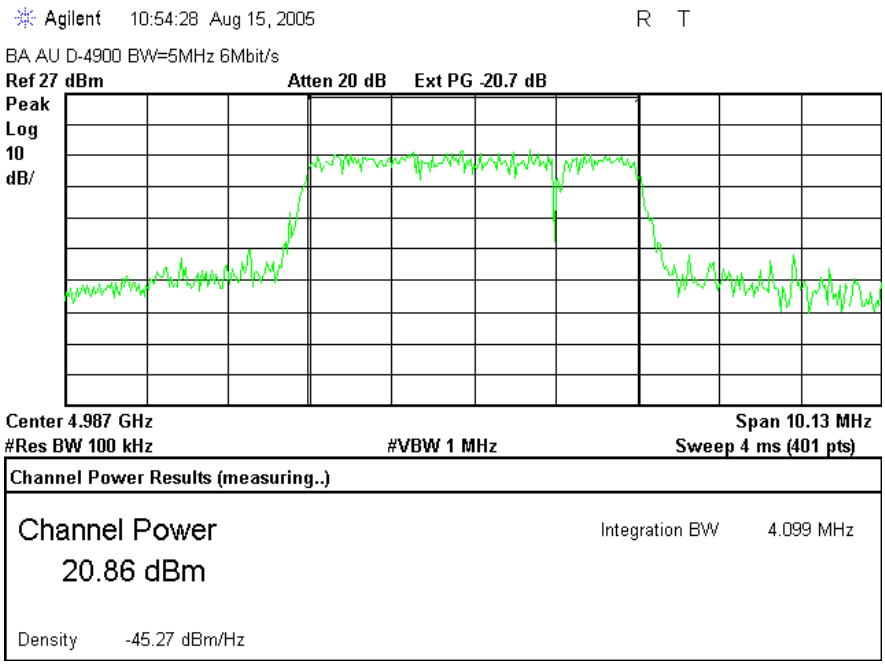
BW, MHz	PRBS, Mbit/s	Frequency, GHz	Occupied BW, MHz	Peak transmit power dBm
5	6	4.947	4.125	20.56
		4.968	4.095	20.34
		4.987	4.099	20.86
	54	4.947	4.070	20.56
		4.968	4.046	21.07
		4.987	4.048	20.68.
10	6	4.947	8.186	20.78
		4.968	8.163	20.64
		4.987	8.219	21.91
	54	4.947	8.220	20.98
		4.968	8.228	20.76
		4.987	8.286	21.99



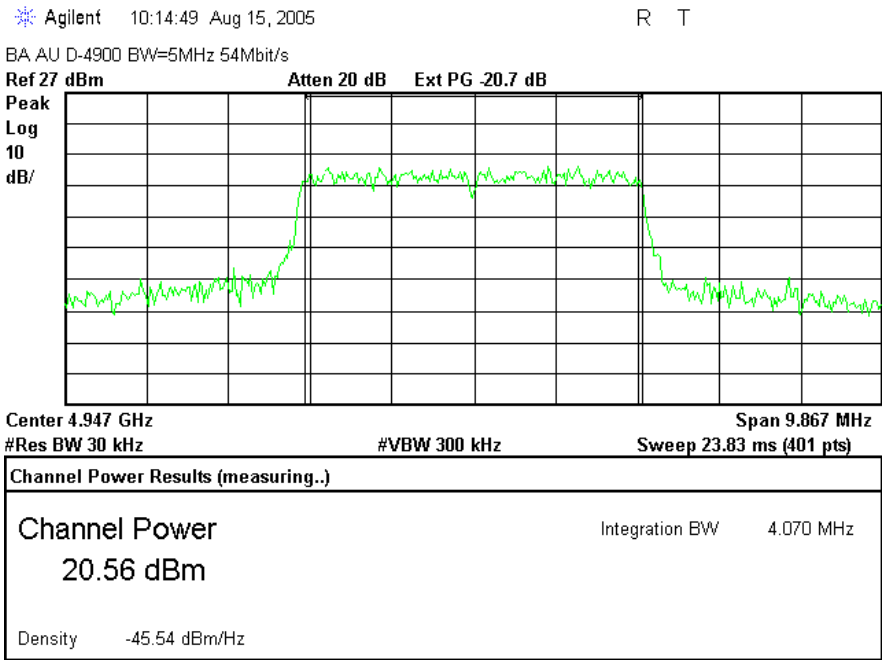
Plot # 34. LOW frequency 4.947 GHz, Bandwidth = 5 MHz, PRBS = 6 MBit/s



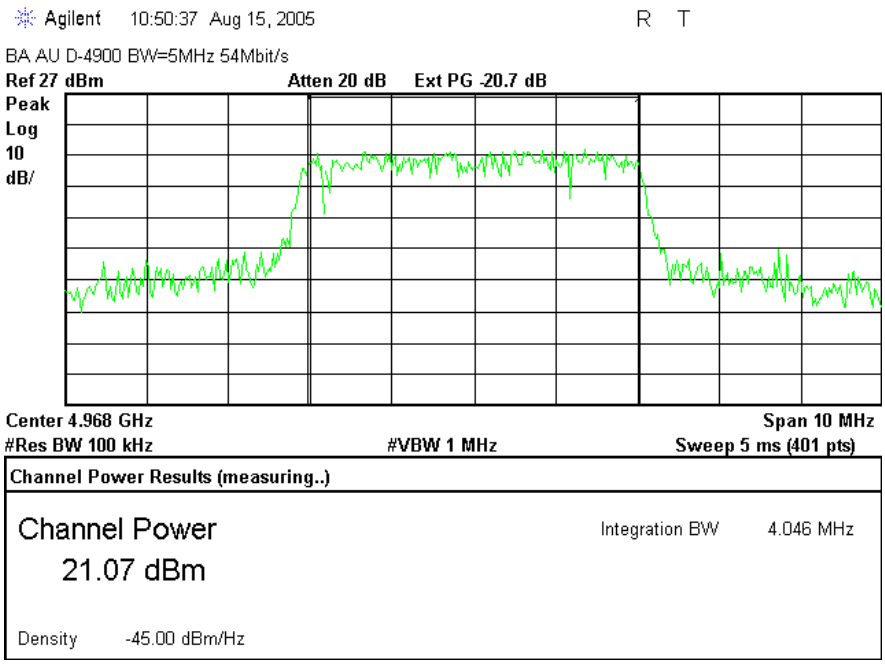
Plot # 35. MIDDLE frequency 4.968 GHz, Bandwidth = 5 MHz, PRBS = 6 MBit/s



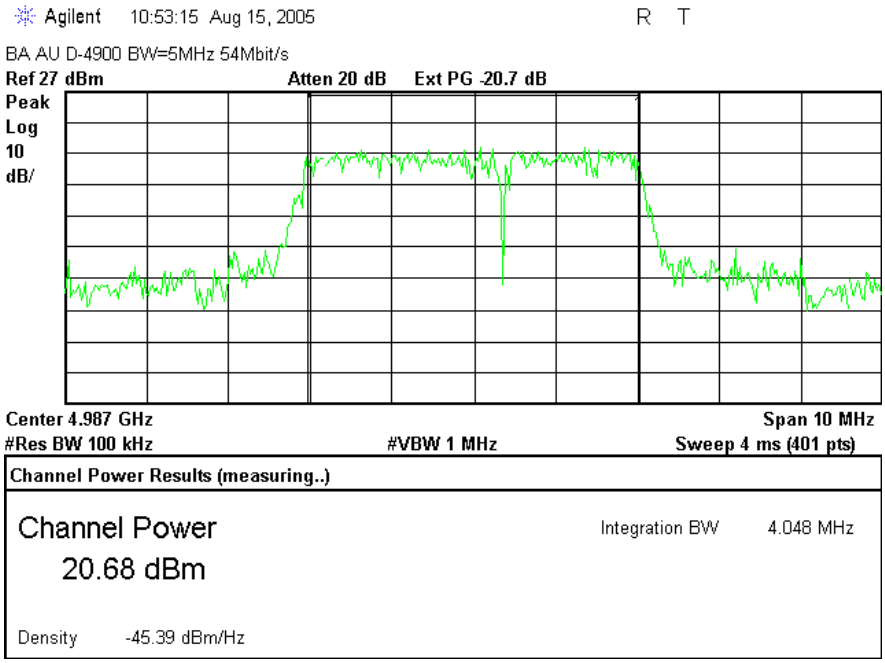
Plot # 36. HIGH frequency 4.987 GHz, Bandwidth = 5 MHz, PRBS = 6 MBit/s



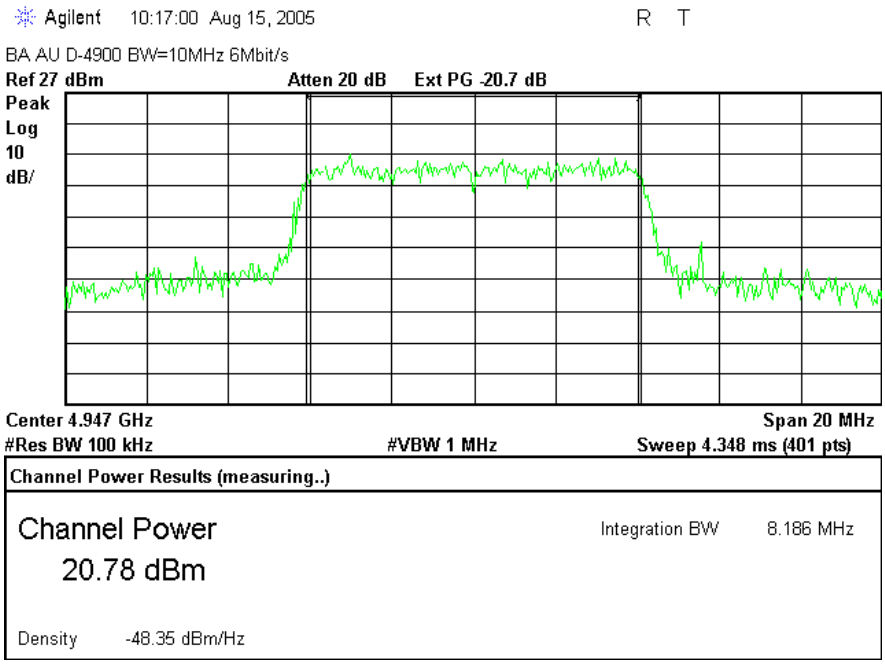
Plot # 37. LOW frequency 4.947 GHz, Bandwidth = 5 MHz, PRBS = 54 MBit/s,



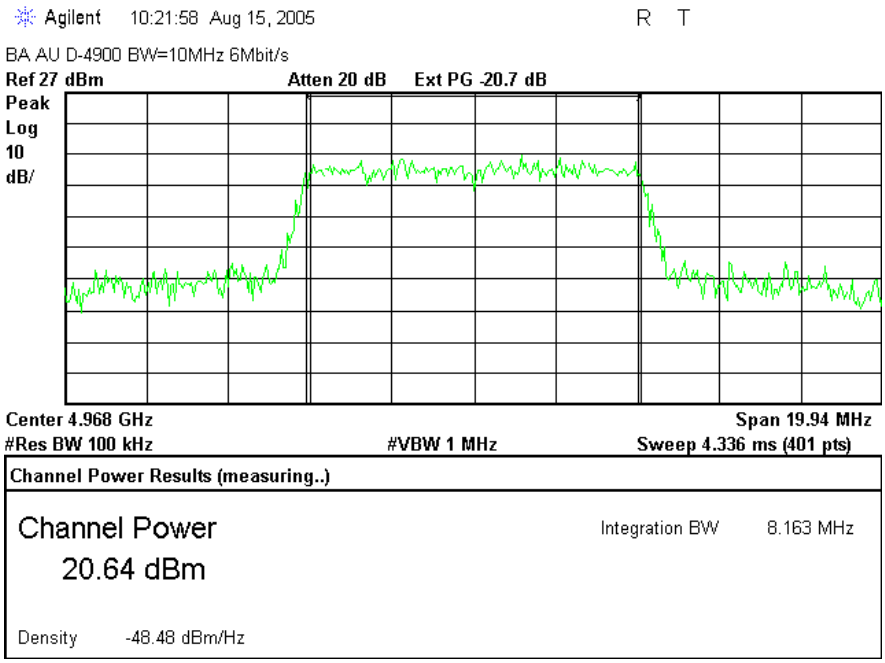
Plot # 38. MIDDLE frequency 4.968 GHz, Bandwidth = 5 MHz, PRBS = 54 MBit/s



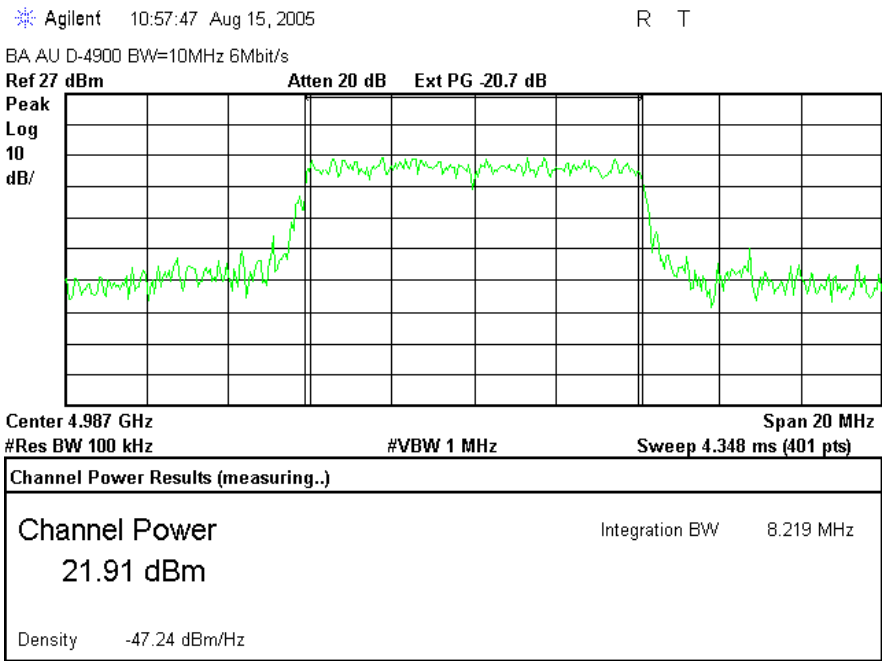
Plot # 39. HIGH frequency 4.987 GHz, Bandwidth = 5 MHz, PRBS = 54 MBit/s



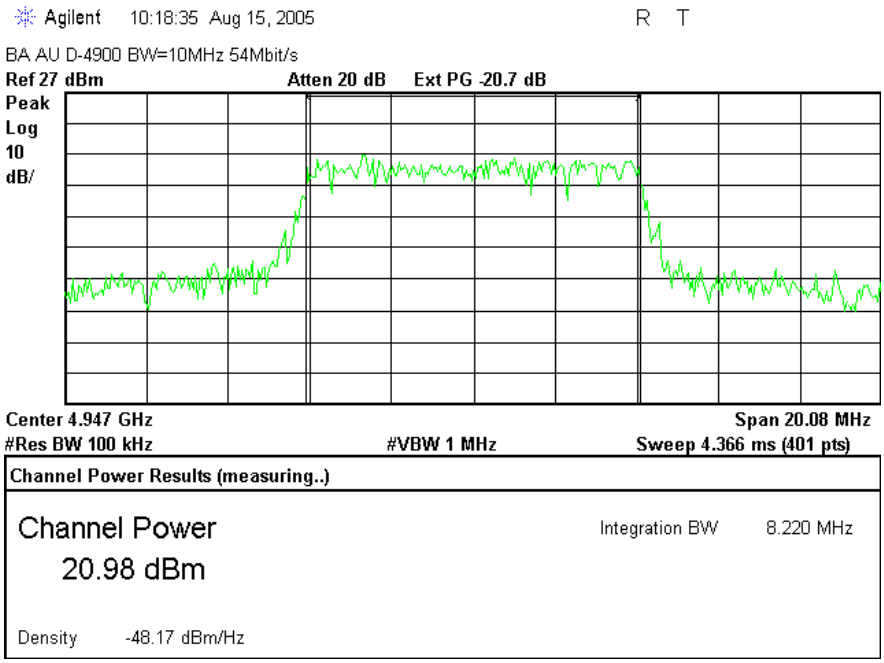
Plot # 40. LOW frequency 4.947 GHz, Bandwidth = 10 MHz, PRBS = 6 MBit/s



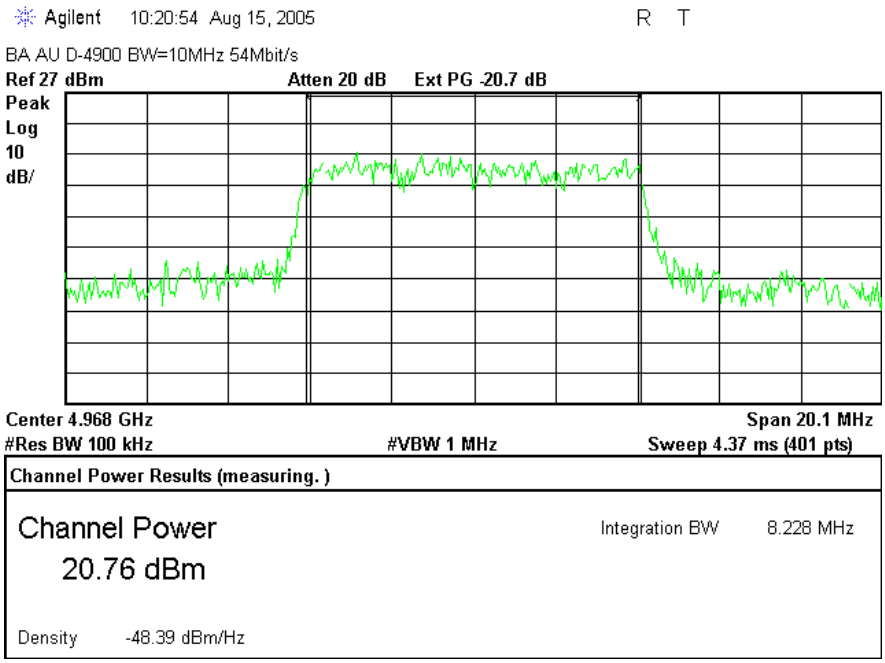
Plot # 41. MIDDLE frequency 4.968 GHz, Bandwidth = 10 MHz, PRBS = 6 MBit/s



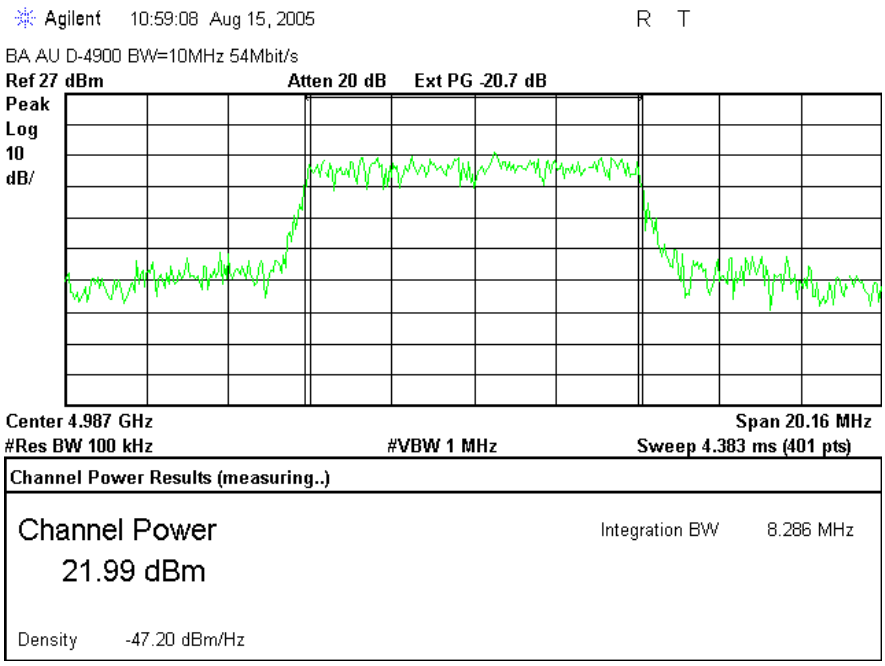
Plot # 42. HIGH frequency 4.987 GHz, Bandwidth = 10 MHz, PRBS = 6 MBit/s



Plot # 43. LOW frequency 4.947 GHz, Bandwidth = 10 MHz, PRBS = 54 MBit/s



Plot # 44. MIDDLE frequency 4.967 GHz, Bandwidth = 10 MHz, PRBS = 54 MBit/s



Plot # 45. HIGH frequency 4.987 GHz, Bandwidth = 10 MHz, PRBS = 54 MBit/s

6.9. Frequency Stability (per Section 90.213 (a) (d)) 2.1055

Frequency accuracy vs. temperature, for f_0 = 4962.5MHz

Temperature (^{0}C)	*Frequency (MHz)*	*Deviation (ppm)*
+50	*4962.498975*	*-0.21*
+40	*4962.498630*	*-0.28*
+30	*4962.497633*	*-0.48*
+20	*4962.496520*	*-0.70*
+10	*4962.495720*	*-0.86*
0	*4962.496900*	*-0.62*
-10	*4962.497325* *4962.498135*	*-0.54* *-0.38*
-20	*4962.497450* *4962.497953*	*-0.51* *-0.41*
-30	*4962.497406* *4962.497810*	*-0.52* *-0.44*

Note: heaters are operational for -10^{0}C, -20^{0}C, and -30^{0}C.

Frequency stability vs. voltage variation at 20^{0}C, for f_0 = 4962.5MHz

Voltage (Vac)	*Frequency (MHz)*	*Deviation (ppm)*
93.5	*4962.496425*	*-0.72*
110	*4962.496520*	*-0.70*
126.5	*4962.496672*	*-0.67*

The frequency accuracy/stability was measured at the antenna port using the frequency counter function of a spectrum analyzer.

6.10. Peak power spectral density (per Section 90.1215 (a), (d)) 2.1046

6.10.1 Requirements:

Tests were performed according to FCC Part 90 sec. 90.1215 (a), (d).
Applicable frequency band: 4.940 – 4.990 GHz.

Calculated peak power spectral density limit was reduced from 21 dBm/MHz to 20 dBm/MHz by amount maximum used antenna gain 27 dBi that exceed 26 dBi.
Measurements were performed at three carrier frequencies and 2 bit rates.
Maximum output power –22 dBm
Maximum power for all antennas (decelerated by customer) is presented in table below:

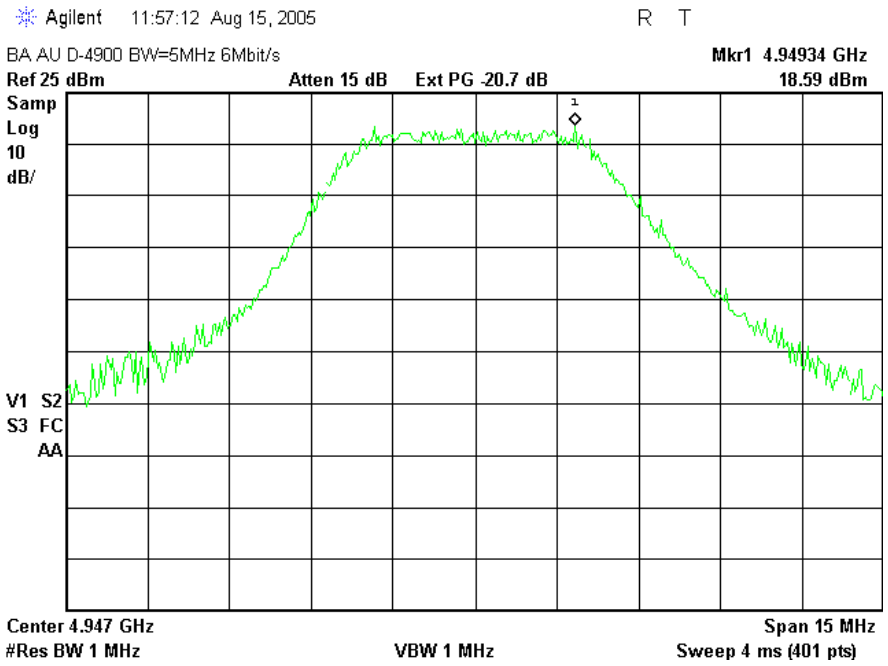
6.10.2 Test procedure:

The peak power spectral density test was performed at direct connection.
Measurements were conducted with Max hold and Peak search functions of SA over a
1 MHz bandwidth.

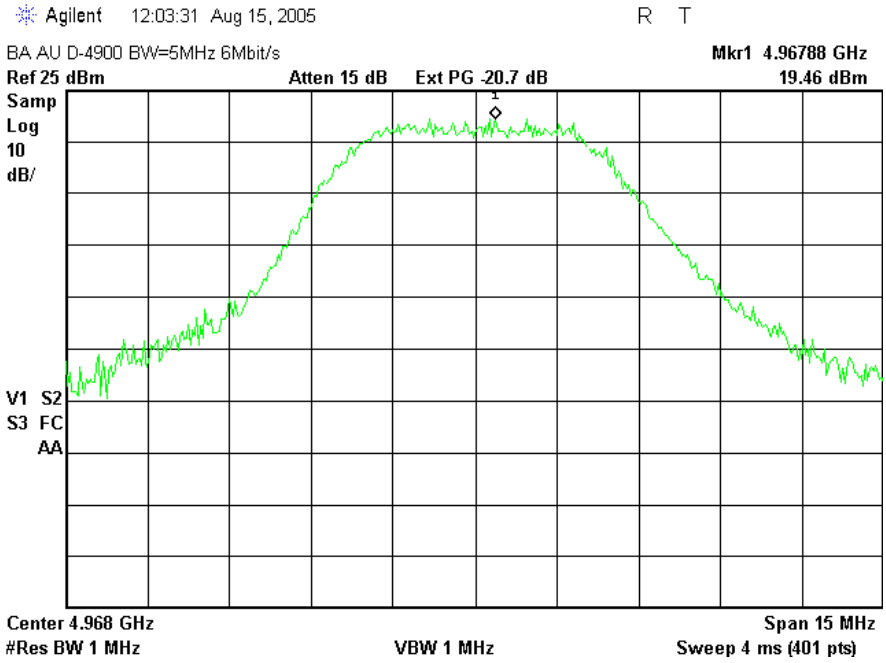
6.10.3 Test results:

The measured results are shown in Plots #46 - #58 and Table below:

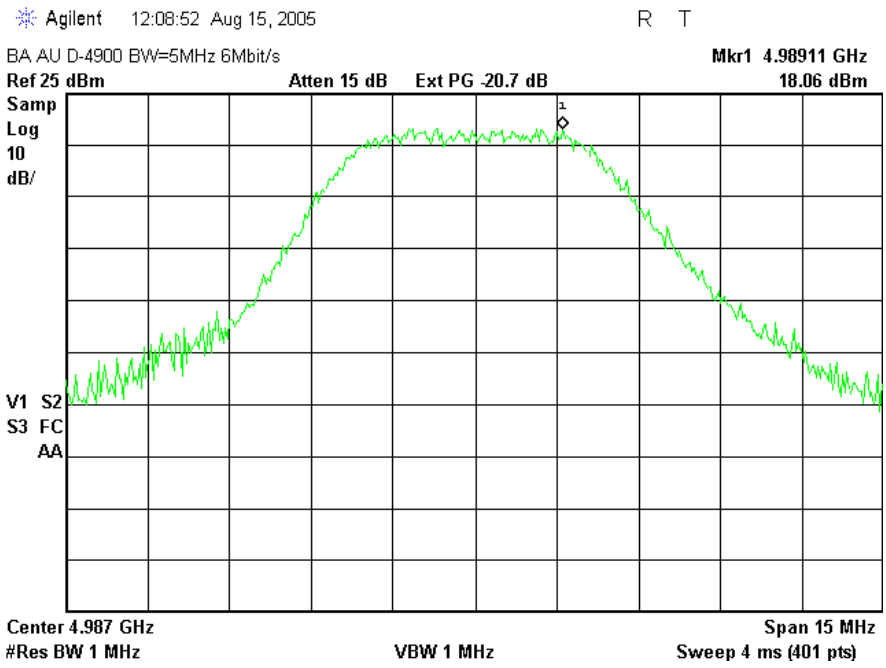
BW, MHz	PRBS Mbit/s	Frequency, GHz	Peak power spectral density, dBm/MHz	Calculated peak power spectral density limit, dBm/MHz
5	6	4.947	18.59	20
		4.968	19.46	
		4.987	18.06	
	54	4.947	18.57	
		4.968	19.31	
		4.987	19.24	
10	6	4.947	17.15	
		4.968	17.47	
		4.987	17.44	
	54	4.947	17.38	
		4.968	17.69	
		4.987	18.32	



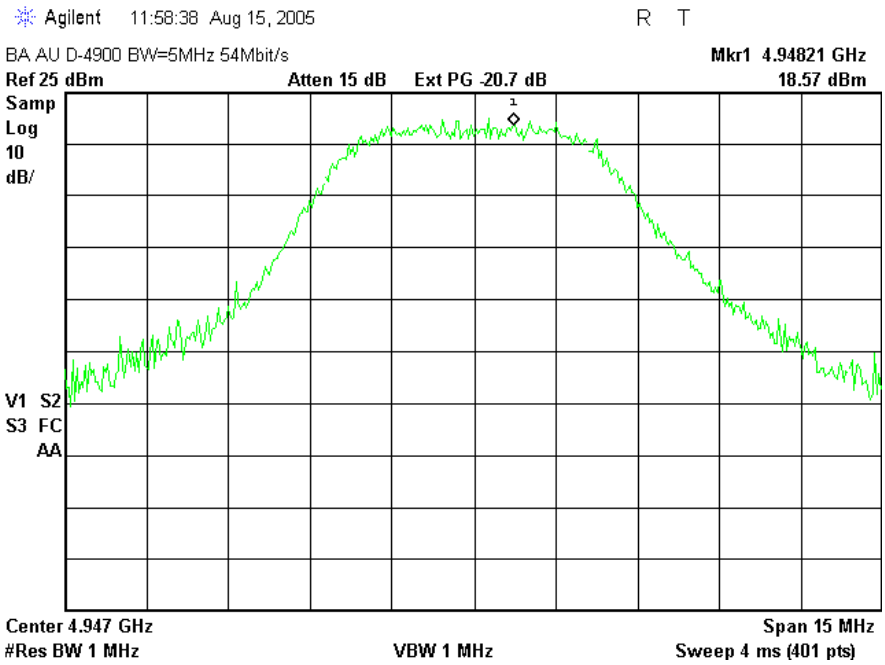
Plot # 46. LOW frequency 4.947 GHz, Bandwidth = 5 MHz, PRBS = 6 MBit/s



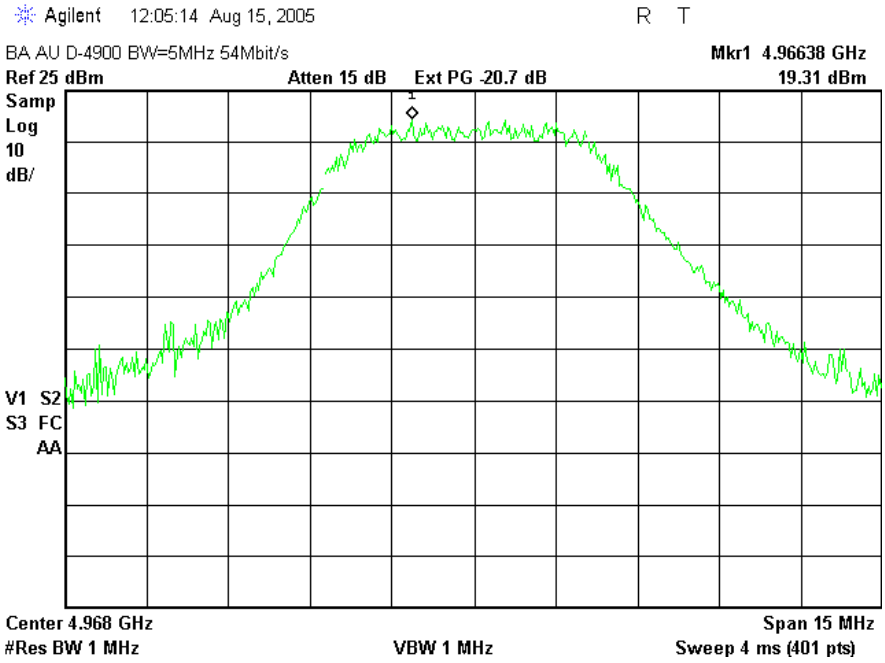
Plot # 47. MIDDLE frequency 4.968 GHz, Bandwidth = 5 MHz, PRBS = 6 MBit/s



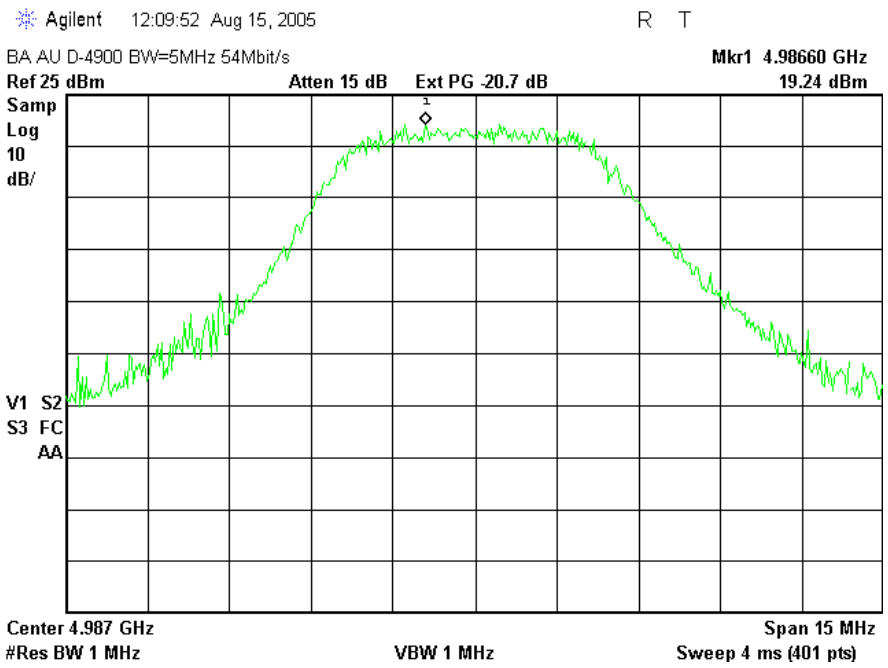
Plot # 48. HIGH frequency 4.987 GHz, Bandwidth = 5 MHz, PRBS = 6 MBit/s



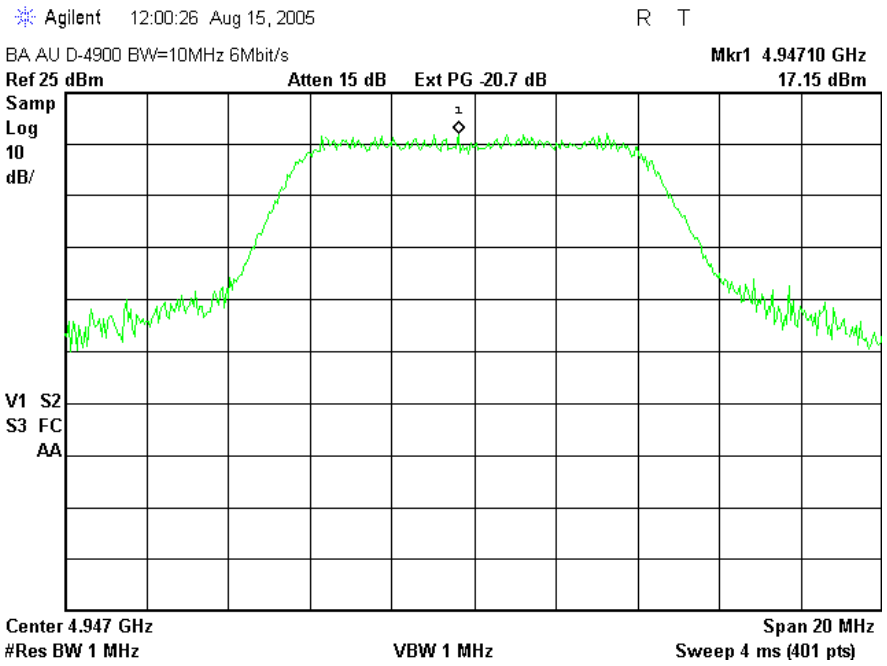
Plot # 49. LOW frequency 4.947 GHz, Bandwidth = 5 MHz, PRBS = 54 MBit/s



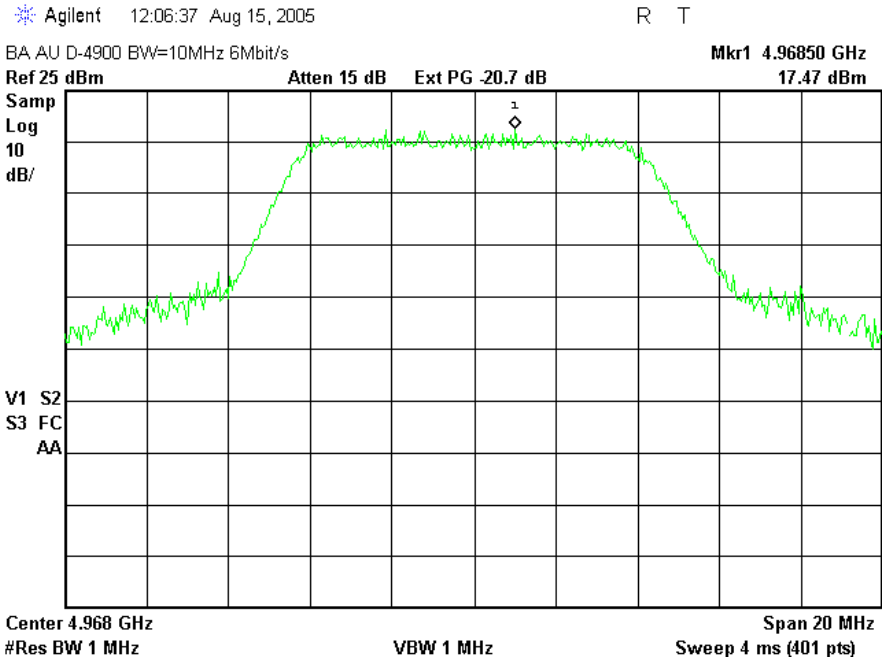
Plot # 50. MIDDLE frequency 4.968 GHz, Bandwidth = 5 MHz, PRBS = 54 MBit/s



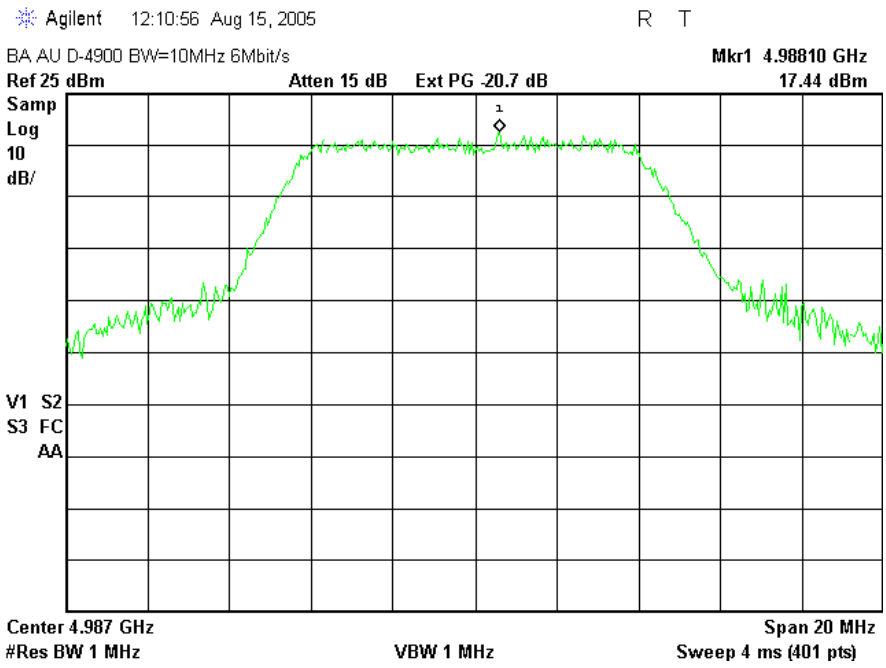
Plot # 51. HIGH frequency 4.987 GHz, Bandwidth = 5 MHz, PRBS = 54 MBit/s



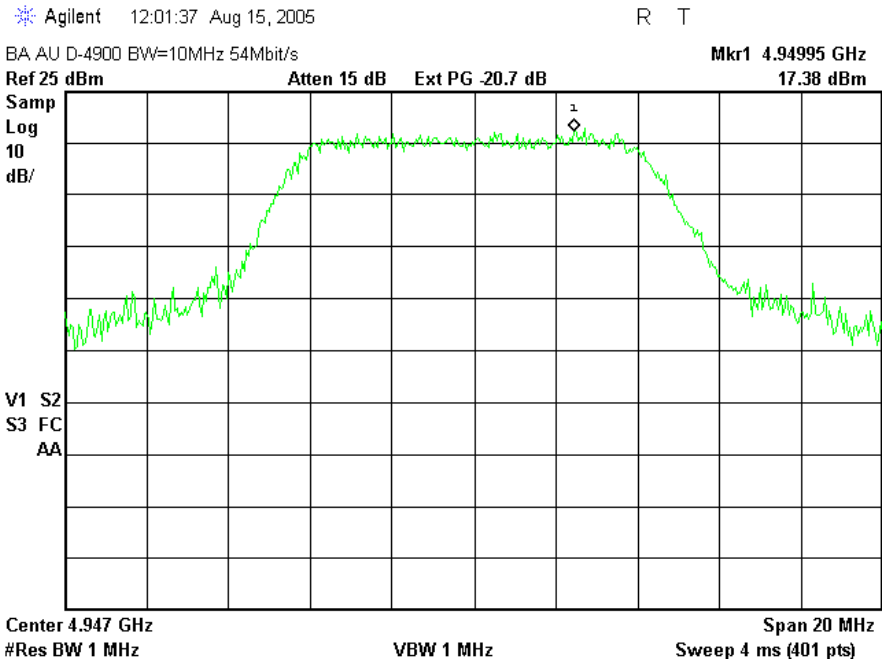
Plot # 52. LOW frequency 4.947 GHz, Bandwidth = 10 MHz, PRBS = 6 MBit/s



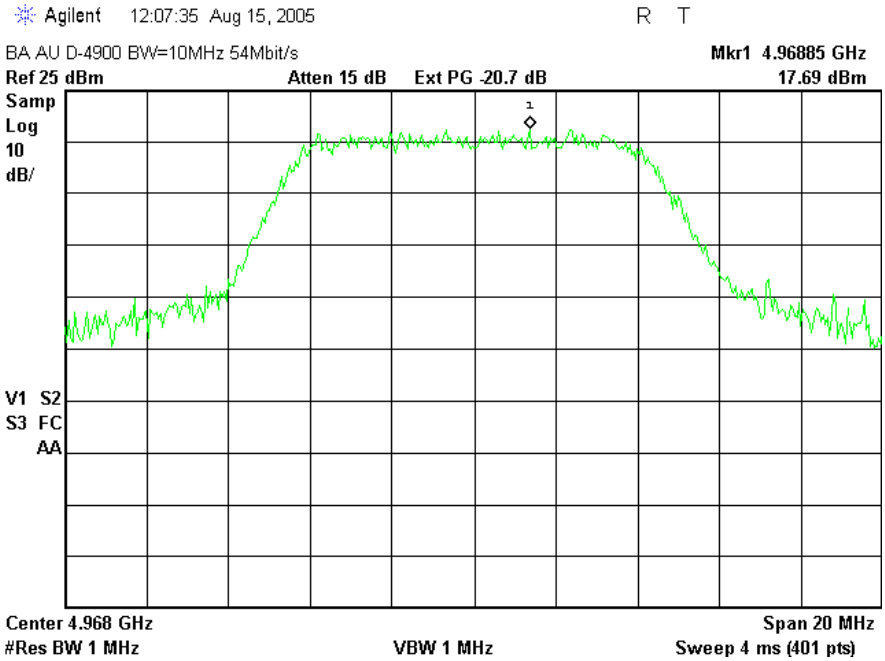
Plot # 53. MIDDLE frequency 4.968 GHz, Bandwidth = 10 MHz, PRBS = 6 MBit/s



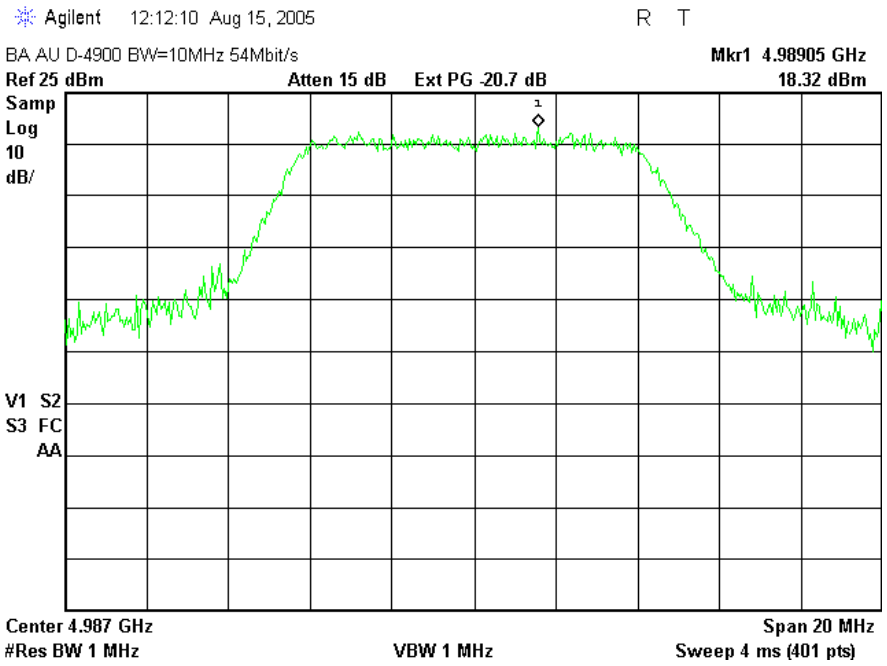
Plot # 54. HIGH frequency 4.987 GHz, Bandwidth = 10 MHz, PRBS = 6 MBit/s



Plot # 55. LOW frequency 4.947 GHz, Bandwidth = 10 MHz, PRBS = 54 MBit/s



Plot # 56. MIDDLE frequency 4.968 GHz, Bandwidth = 10 MHz, PRBS = 54 MBit/s



Plot # 57. HIGH frequency 4.987 GHz, Bandwidth = 10 MHz, PRBS = 54 MBit/s

6.11. Occupied bandwidth measurements 90.210m 2.1049

6.11.1 Requirements:

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power.

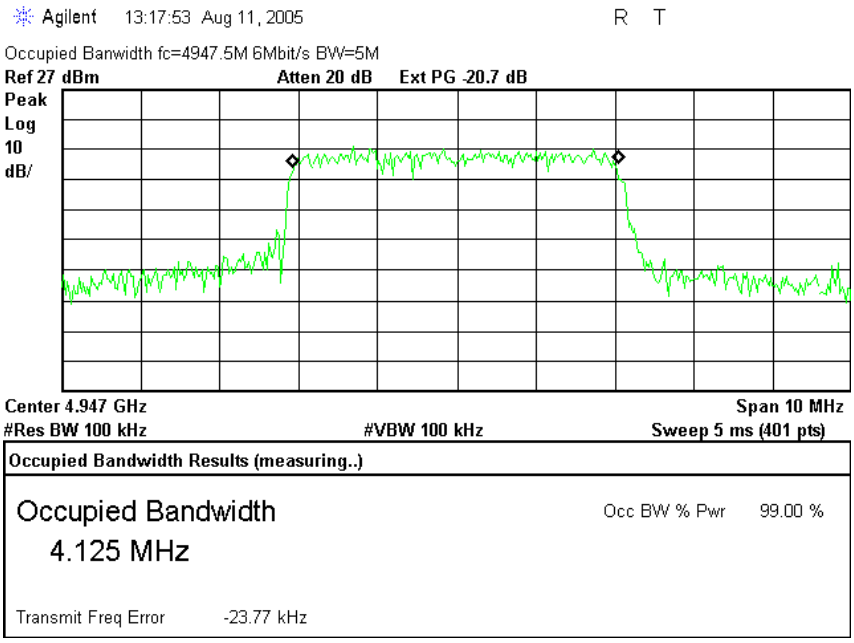
6.11.2 Test procedure

The occupied bandwidth test was performed at direct connection.
Measurements were conducted with Occupied bandwidth functions of SA.

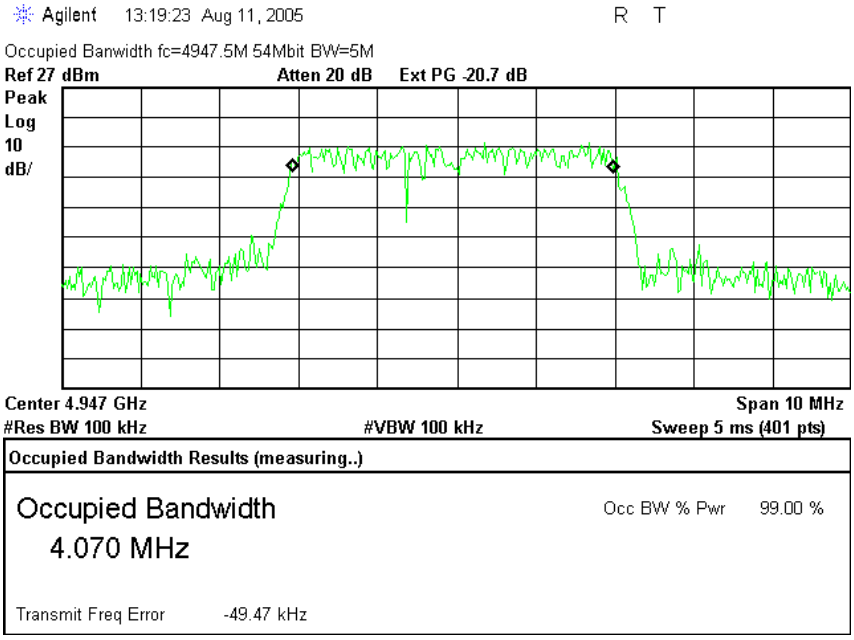
6.11.3 Test results:

The measured results are shown in Plots #58 - #69 and Table below

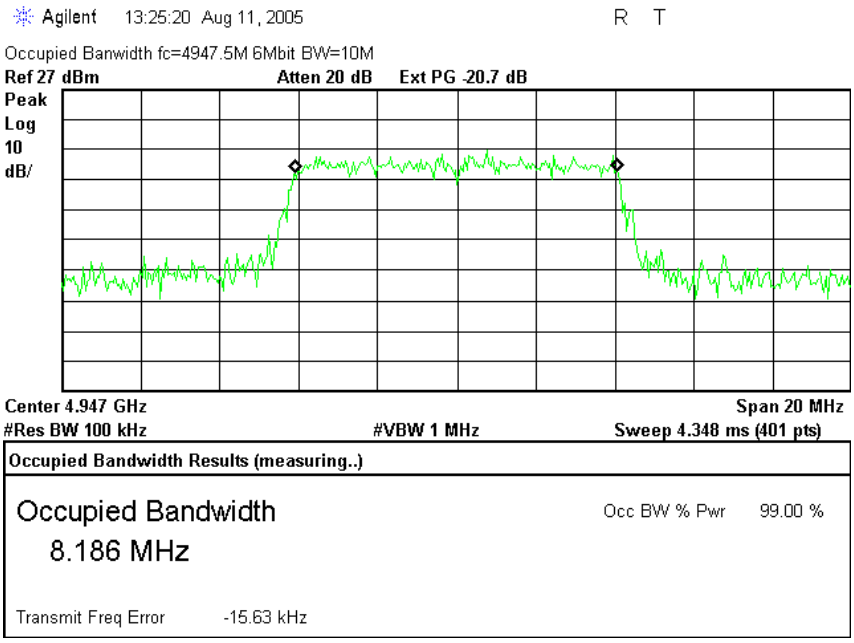
Carrie frequency. MHz	Emission bandwidth MHz	Bit rate Mbit/s	Occupied bandwidth MHz
49475	5	6	4.125
		54	4.070
	10	6	8.186
		54	8.220
49675	5	6	4.095
		54	4.046
	10	6	8.163
		54	8.228
49875	5	6	4.099
		54	4.070
	10	6	8.186
		54	8.220



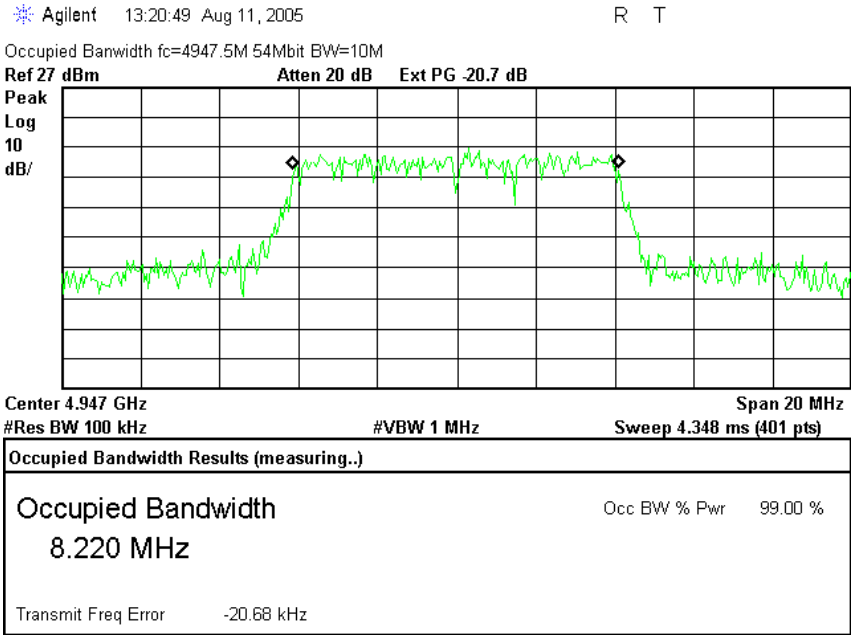
Plot #58. LOW frequency 4.947 GHz, Bandwidth = 5 MHz, PRBS = 6 Mbit/s



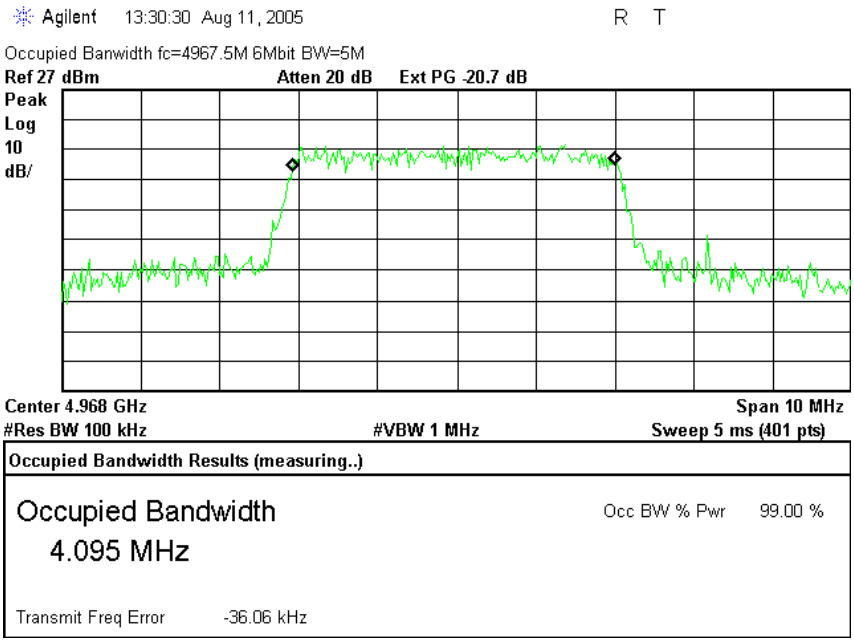
Plot # 59. LOW frequency 4.947 GHz, Bandwidth = 5 MHz, PRBS = 54 Mbit/s



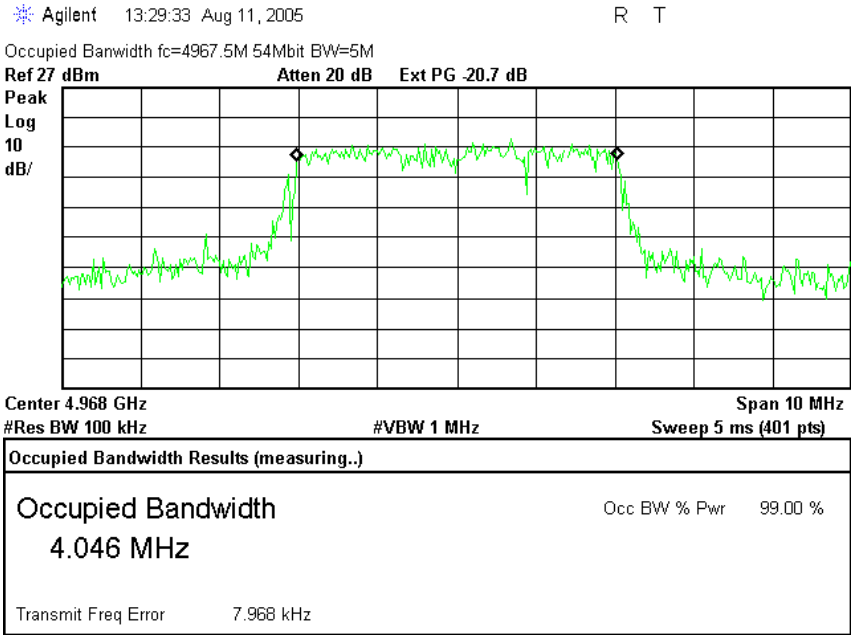
Plot # 60. LOW frequency 4.947 GHz, Bandwidth = 10 MHz, PRBS = 6 Mbit/s



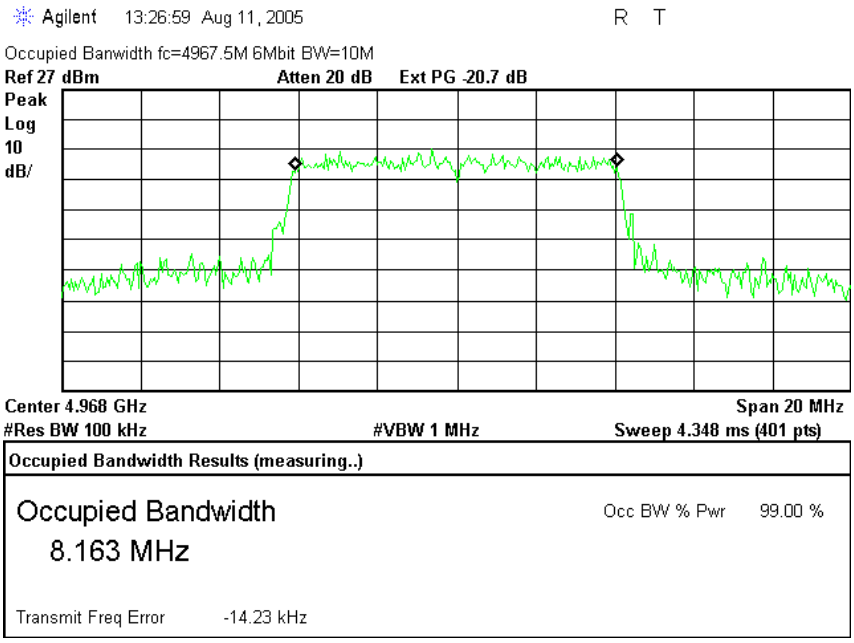
Plot # 61. LOW frequency 4.947 GHz, Bandwidth = 10 MHz, PRBS = 54 Mbit/s



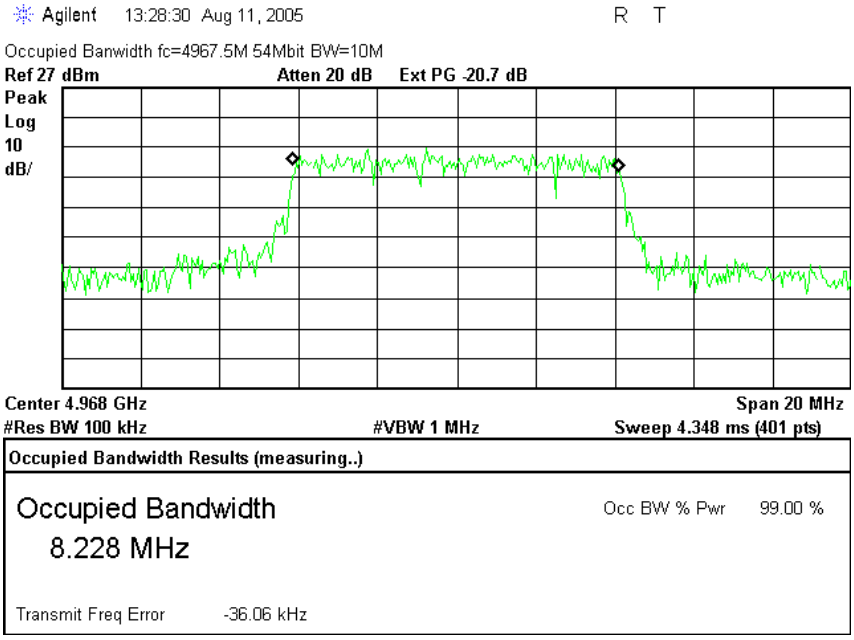
Plot # 62. Middle frequency 4.968 GHz, Bandwidth = 5 MHz, PRBS = 6 Mbit/s



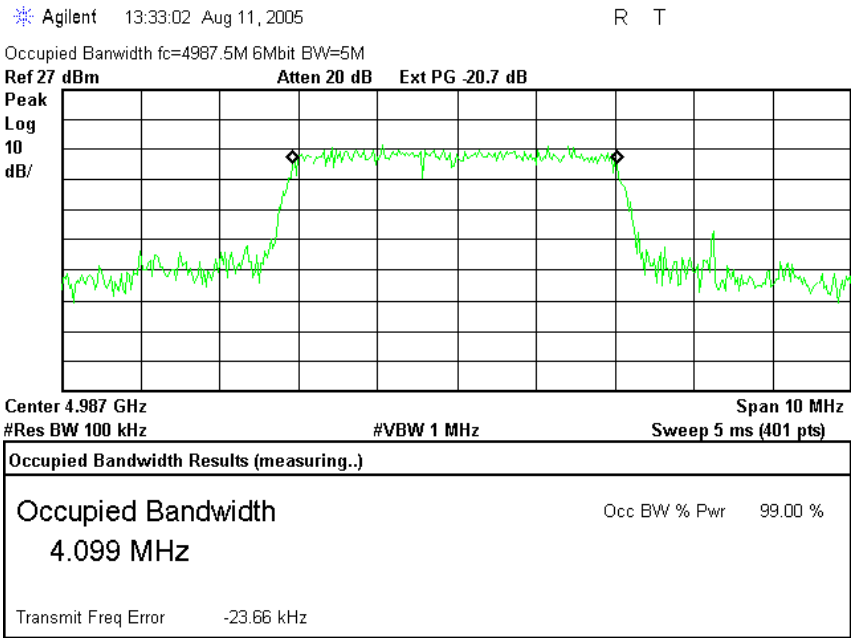
Plot # 63. Middle frequency 4.968 GHz, Bandwidth = 5 MHz, PRBS = 54 Mbit/s



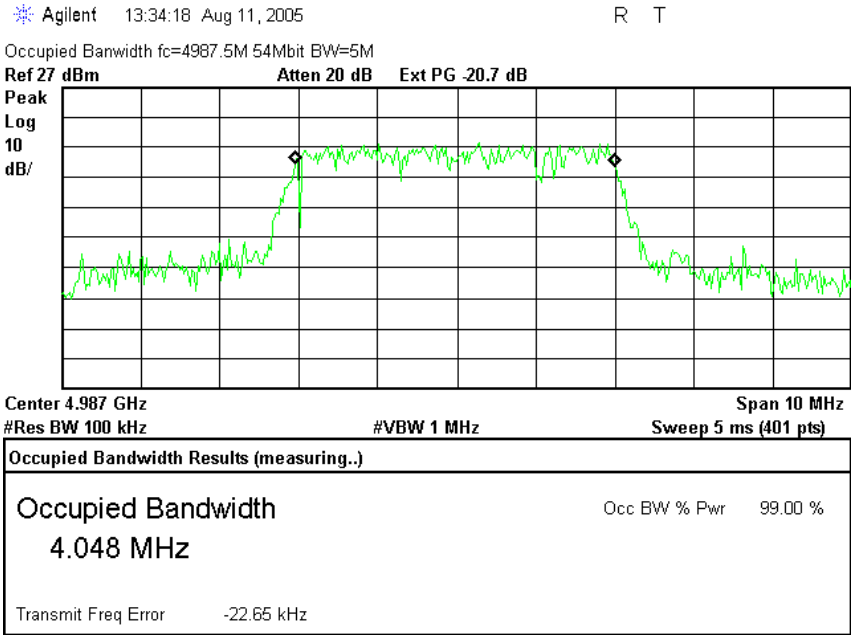
Plot # 64. Middle frequency 4.968 GHz, Bandwidth = 10 MHz, PRBS = 6 Mbit/s



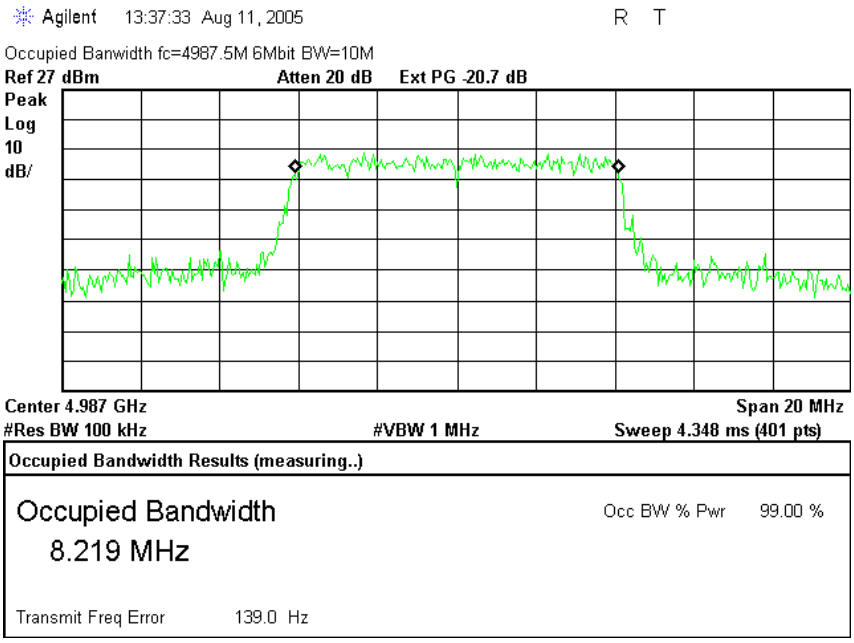
Plot # 65. Middle frequency 4.968 GHz, Bandwidth = 10 MHz, PRBS = 54 Mbit/s



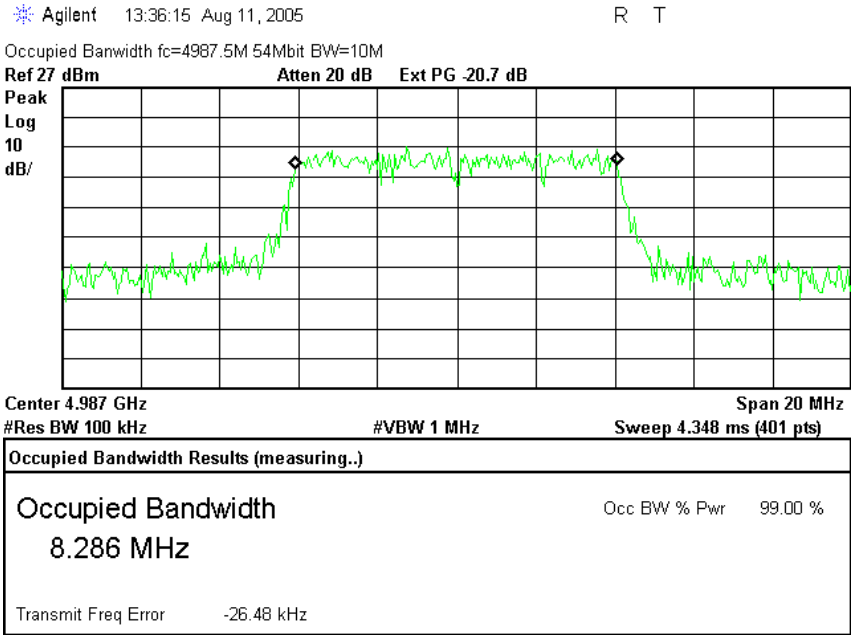
Plot # 66. HIGH frequency 4.987 GHz, Bandwidth = 5 MHz, PRBS = 6 Mbit/s



Plot # 58. HIGH frequency 4.987 GHz, Bandwidth = 5 MHz, PRBS = 54 Mbit/s



Plot # 68. HIGH frequency 4.987 GHz, Bandwidth = 10 MHz, PRBS = 6 Mbit/s



Plot # 69. HIGH frequency 4.987 GHz, Bandwidth = 10 MHz, PRBS = 54 Mbit/s

6 Compliance with specification

Test	FCC / Part / Section	Test result
Radiated emission	Part15 Sec.15.209	Complies
Conducted emission	Part 15 Sec.15.207	Complies
Radiated emission – general requirements	Part 90 Sec. 90.210 (m)(6)	Complies
Emission mask	Part 90 Sec. 90.210 (m)	Complies
Conducted spurious emissions	Part 90 Sec. 90.210 (m) (6)	Complies
Peak transmit power	Part 90 Sec. 90.1215 (a) (c)	Complies
Peak power spectral density	Part 90 Sec. 90. 1215 (d)	Complies
Frequency Stability	Part 90 Sec. 90.213	Complies

Telematics Laboratory

1 August 2005

Approved by: Yuri Rozenberg

Position: Head of EMC Branch

Tested by: Michael Feldman

Position: Testing Technician

7 Appendix 1: Test equipment used

All measurements equipment is on SII calibration schedule with a recalibration interval not exceeding one year.

Instrument	Manufac-turer	Model	Serial No.	Last calibration date	Next calibration date
Spectrum analyzer 9 KHz-26.5 GHz	HP	E4407B	US40241729	07/05	07/06
Spectrum analyzer 9 KHz-40 GHz	HP	8565E	3517A00347	07/05	07/06
Antenna Double Ridge 1-18 GHz	EMCO	3115	SII4873	03/05	03/06
Antenna Standard Gain Horn 18-40 GHz	WILTRON	Alpha TRG A361	861A/590	01/04	01/05
LISN 9 kHz – 30 MHz	FCC	LISN-50/250-32-4-16	SII 5023	05/05	05/06
Transient limiter 0.009-200 MHz	HP	11947A	31074A3105	05/05	05/06
Attenuator 20 dB	HP	8491B	3929M50394	05/05	05/06
Spectrum analyzer:	Agilent	8546E	S/N A01837	05/05	05/06

8 Appendix 2: Antenna Factor and Cable Loss

Antenna Factor
Standard Gain Horn 26 – 40 GHz Alpha TRG Model A361

Point	Frequency (MHz)	Antenna Factor (dB/m)
1	26000	35.22
2	27000	35.40
3	28000	35.52
4	29000	35.64
5	30000	35.76
6	31000	35.90
7	32000	36.07
8	33000	36.16
9	34000	36.31
10	35000	36.46
11	36000	36.60
12	37000	36.74
13	38000	36.93
14	39000	37.21
15	40000	37.28

ETS

Gain and Antenna Factors for Double Ridged Guide Antenna
Manufactured by EMC Test Systems
Model Number: 3115 Serial Number: 5802
1.0 Meter Calibration Polarization: Horizontal

Frequency (MHz)	Antenna Factor (dB/m)	Gain Numeric	Gain dBi
1000	24.3	3.86	5.9
1500	25.6	6.48	8.1
2000	27.9	6.83	8.3
2500	28.9	8.43	9.3
3000	30.7	7.97	9.0
3500	32.0	8.06	9.1
4000	33.0	8.38	9.2
4500	32.9	10.91	10.4
5000	34.1	10.16	10.1
5500	34.8	10.51	10.2
6000	35.2	11.38	10.6
6500	35.4	12.79	11.1
7000	36.4	11.83	10.7
7500	37.3	10.90	10.4
8000	37.5	12.05	10.8
8500	37.9	12.36	10.9
9000	38.2	12.86	11.1
9500	38.3	14.04	11.5
10000	38.7	14.25	11.5
10500	38.5	16.26	12.1
11000	38.8	16.87	12.3
11500	39.5	15.41	11.9
12000	39.3	17.96	12.5
12500	39.1	20.03	13.0
13000	40.2	16.83	12.3
13500	41.2	14.53	11.6
14000	41.9	13.20	11.2
14500	41.3	16.27	12.1
15000	39.6	26.07	14.2
15500	38.1	39.49	16.0
16000	38.4	39.12	15.9
16500	39.8	29.81	14.7
17000	41.6	20.97	13.2
17500	44.8	10.55	10.2
18000	46.5	7.57	8.8

Specification compliance testing factor (1.0 meter spacing) to be added to receiver meter reading in dBV to convert to field intensity in dBV/meter. Calibrated 07 Oct 02 (DD/MM/YYYY). Calibration per ARP 958.

ETS

Gain and Antenna Factors for Double Ridged Guide Antenna
Manufactured by EMC Test Systems
Model Number: 3115 Serial Number: 5802
1.0 Meter Calibration Polarization: Vertical

Frequency (MHz)	Antenna Factor (dB/m)	Gain Numeric	Gain dBi
1000	24.1	4.11	6.1
1500	25.6	6.48	8.1
2000	27.9	6.83	8.3
2500	28.9	8.47	9.3
3000	30.6	8.18	9.1
3500	31.9	8.24	9.2
4000	33.0	8.45	9.3
4500	32.8	11.14	10.5
5000	34.0	10.34	10.1
5500	34.8	10.40	10.2
6000	35.1	11.67	10.7
6500	35.4	12.86	11.1
7000	36.3	11.92	10.8
7500	37.3	10.95	10.4
8000	37.4	12.15	10.8
8500	37.8	12.58	11.0
9000	38.2	13.01	11.1
9500	38.2	14.21	11.5
10000	38.5	14.79	11.7
10500	38.6	16.05	12.1
11000	38.8	16.93	12.3
11500	39.3	16.19	12.1
12000	39.1	18.46	12.7
12500	39.1	20.28	13.1
13000	40.1	17.19	12.4
13500	41.1	14.85	11.7
14000	41.8	13.55	11.3
14500	41.3	16.25	12.1
15000	39.6	25.78	14.1
15500	38.0	39.54	16.0
16000	38.3	39.73	16.0
16500	39.6	31.52	15.0
17000	41.3	22.72	13.6
17500	44.5	11.49	10.6
18000	46.5	7.69	8.9

Specification compliance testing factor (1.0 meter spacing) to be added to receiver meter reading in dBV to conve
to field intensity in dBV/meter. Calibrated 07 Oct 02 (DD/MM/YYYY). Calibration per ARP 958.

9 Appendix 3: Test configuration illustration

Photo # 4. EUT layout

Photo # 5.
Base Station + Subscriber Unit
Radiated emission test on open site. Rear view

Photo # 6.
Base Station + Subscriber Unit
Radiated emission test on open site. Front view

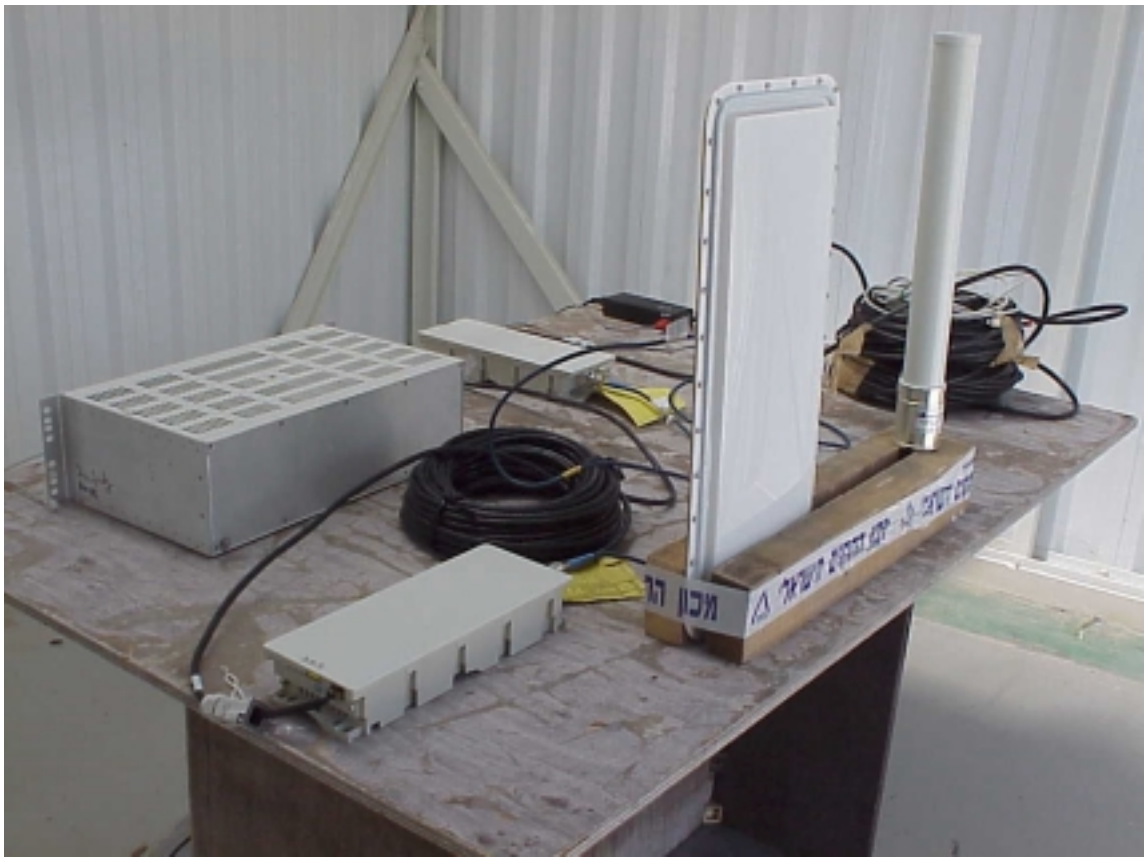


Photo # 7.
Base Station + Subscriber Unit
Radiated emission test on open site. Front / side / overall view

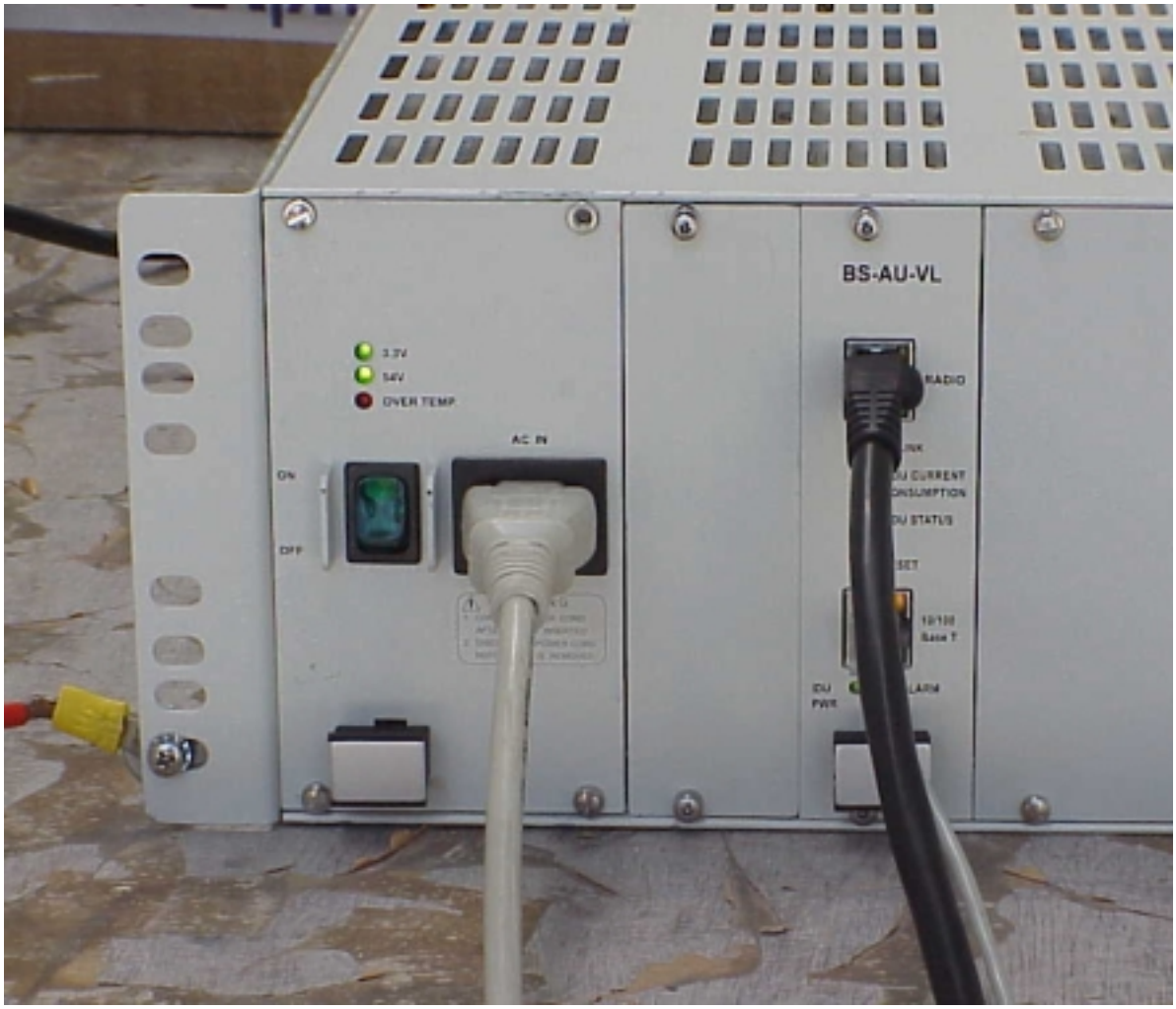


Photo # 8.
Base Station – part of front panel view

Photo # 9. Cabinet spurious emission test

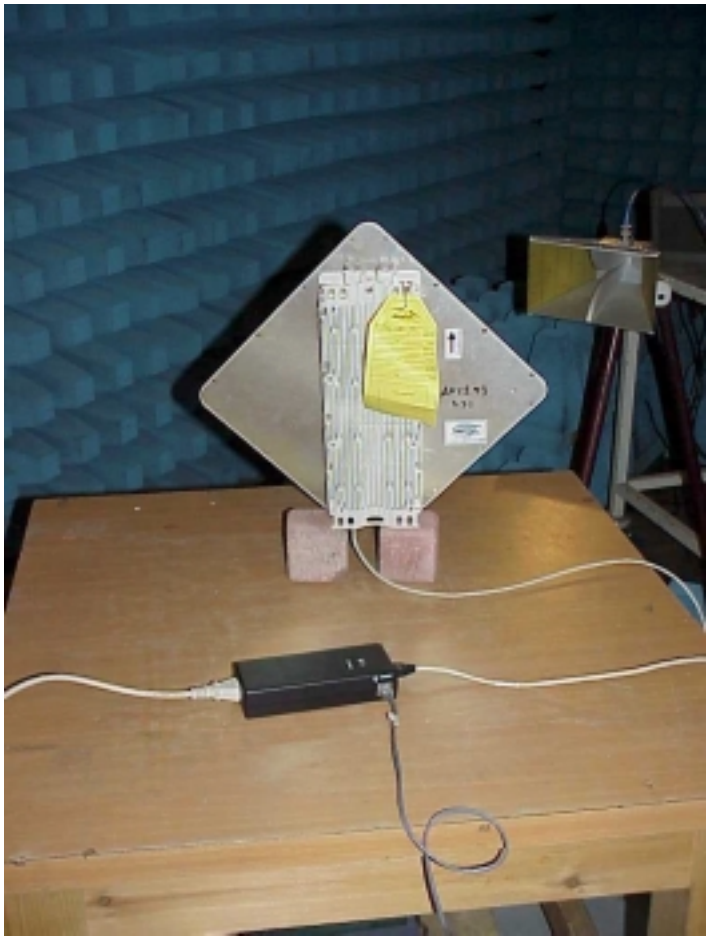


Photo # 10. Radio unit with integral antenna, AN1293
Spurious emission test