



Draft Standard ETSI DEN 301 893

TEST REPORT

FOR

ATHEROS COMMUNICATIONS

802.11 a/b/g ACCESS POINT

MODEL NUMBER: AR5BAP-00032

REPORT NUMBER: 03U2012-5

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Prepared for
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1. TEST RESULT CERTIFICATION

COMPANY NAME: ATHEROS COMMUNICATIONS
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EUT DESCRIPTION: 802.11a/b/g ACCESS POINT

MODEL NAME: AR5BAP-00032

DATE TESTED: JUNE 1 – JULY 24, 2003

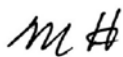
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
Draft ETSI DEN 301 893	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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:

Tested By:



MIKE HECKROTTE
CHIEF ENGINEER
COMPLIANCE CERTIFICATION SERVICES



VIEN TRANH
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. EUT DESCRIPTION

The model AR5BAP-00032 Access Point contains two radios capable of simultaneous 802.11b/g (2.4 GHz) and 802.11a (5 GHz) operation.

The AR5BAP-00032 has an average conducted output power of 18.23 dBm (67 mW) and a peak antenna gain of 4.0 dBi in the 5150 – 5350 MHz band.

The AR5BAP-00032 has an average conducted output power of 21.41 dBm (138 mW) and a peak antenna gain of 4.0 dBi in the 5470 – 5725 MHz band.

3. TEST METHODOLOGY

All tests were performed in accordance with the procedures documented in Draft ETSI DEN 301 893-1 v1.2.1 (2003-06) except the procedures documented in Draft ETSI DEN 301 893-1 v1.1.1 (2001-01) were used for transmitter and receiver spurious emissions.

4. FACILITIES AND ACCREDITATION

4.1. FACILITIES

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, CISPR Publication 16 and CISPR Publication 22.

4.2. EQUIPMENT







Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

4.3. TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
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

5. CALIBRATION AND UNCERTAINTY

5.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

5.2. MEASUREMENT UNCERTAINTY

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

RF frequency	2.0 x 10 ⁽⁻⁷⁾
RF power conducted	0.71 dB
Spurious emissions, conducted	2.8 dB
Spurious emissions, radiated	5.5 dB
Humidity	4 % RH
Temperature	0.2 deg C
Time	0.01 %

Uncertainty figures are valid to confidence level of 95% calculated according to the methods described in the ETR 028.

5.3. 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
Quasi-Peak Adapter	HP	85650A	2521A01038	7/16/04
SA Display Section	HP	85662A	2314A04793	7/16/04
SA RF Section	HP	85680A	2314A02604	7/16/04
Horn Antenna (1 - 18GHz)	EMCO	3115	6739	2/4/04
Antenna, Biconical	Eaton	94455-1	1214	3/6/04
Antenna, Log Periodic	EMCO	3146	9107-3163	3/06/04
Preamplifier	Miteq	NSP10023988	646456	4/26/04
Spectrum Analyzer	HP	8564E	3943A01643	7/22/03
High Pass Filter (4.57GHz)	FSY Microwave	FM-4570-9SS	003	N.C.R.
Spectrum Analyzer	Agilent	E4446A	US42070220	03/01/04
Power Meter	Agilent	E4416A	GB41291150	08/09/03
Power Sensor	Agilent	E9327A	US40440755	08/09/03
Temperature Chamber	Thermotron	SE 600-10-10	29800	5/29/04
Oscilloscope, 100MHz 4Ch.	HP	54601A	3106A00123	11/6/2003
Pulse Generator	Agilent	81101A	DE38900835	11/7/03
Signal Generator	HP	83732B	US34490599	4/4/2004

6. SETUP OF EQUIPMENT UNDER TEST

SETUP INFORMATION FOR TESTS

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Device Type	Manufacturer	Model	Serial Number
Laptop	Toshiba	NA	J291200E8019
Power Adapter	Toshiba	PA3083U-1ACA	0536906G
5V DC power adapter	Switching Adapter	RHC-060200-1	0319

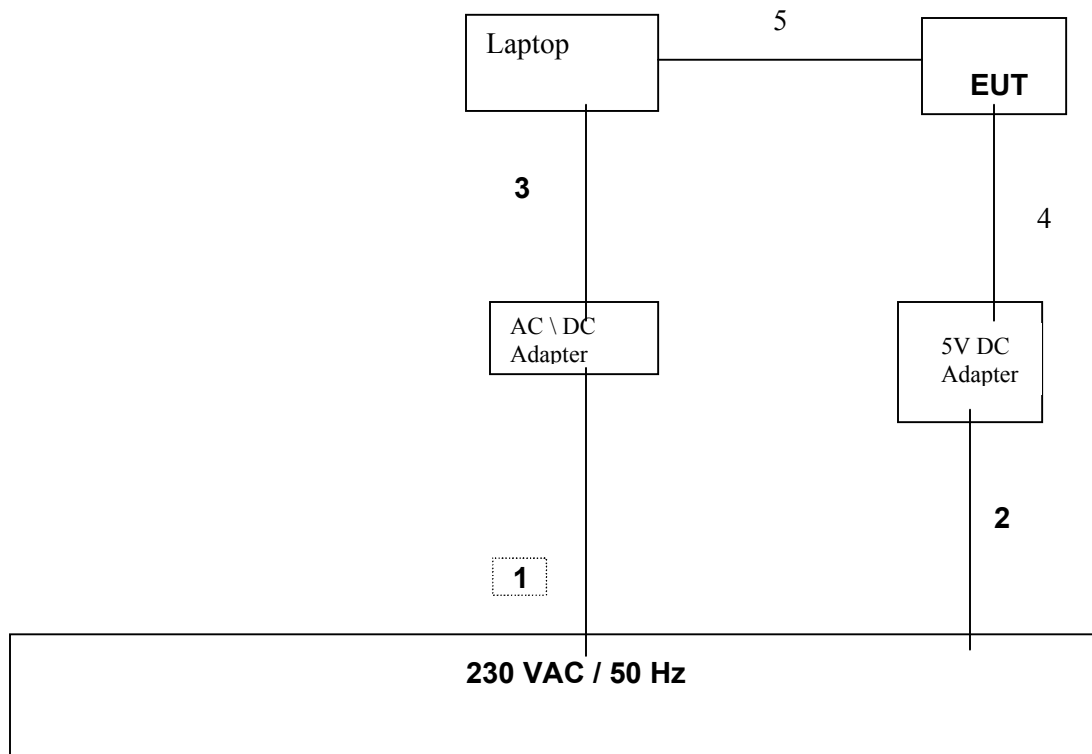
I/O CABLES

Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	2	US115V	Un-Shielded	2m	NA
2	AC	2	US115V	Un-Shielded	2m	NA
3	DC	2	DC	Un-Shielded	2m	Integral with adapter
4	DC	2	DC	Un-Shielded	2m	Integral with adapter
5	RJ45	1	RJ45	Un-Shielded	2m	NA

TEST SETUP

The EUT was controlled by the laptop via Ethernet cable.

SETUP DIAGRAM FOR TESTS



7. ETSI DEN 301 893 REQUIREMENT

7.1. CARRIER FREQUENCIES AND CHANNELIZATION

LIMIT

Draft ETSI DEN 301 893 v1.2.2 Clause 4.2.2

The actual carrier center frequency for any given channel given in Clause 1, Table 1 shall be maintained within the range of $f_c \pm 20$ ppm over Normal and Extreme conditions.

TEST PROCEDURE

Draft ETSI DEN 301 893 v1.2.2 Clause 5.3.2

RESULTS

No non-compliance noted:

25 DEG C, 230 VAC NORMAL CONDITION RESULTS

Channel Frequency (MHz)	Measured Frequency (MHz)	Delta Frequency (kHz)	20 ppm Limit (+/- kHz)	Margin (kHz)
5180	5180.002521	2.52	103.60	101.08
5200	5200.002273	2.27	104.00	101.73
5220	5220.002653	2.65	104.40	101.75
5240	5240.002522	2.52	104.80	102.28
5260	5260.002512	2.51	105.20	102.69
5280	5280.002485	2.48	105.60	103.12
5300	5300.002483	2.48	106.00	103.52
5320	5320.002372	2.37	106.40	104.03
5500	5500.00192	1.92	110.00	108.08
5520	5520.00185	1.85	110.40	108.55
5540	5540.00167	1.67	110.80	109.13
5560	5560.001549	1.55	111.20	109.65
5580	5580.00151	1.51	111.60	110.09
5600	5600.001424	1.42	112.00	110.58
5620	5620.001375	1.37	112.40	111.03
5640	5640.001347	1.35	112.80	111.45
5660	5660.001342	1.34	113.20	111.86
5680	5680.001303	1.30	113.60	112.30
5700	5700.001285	1.29	114.00	112.71

0 DEG C, 208 VAC EXTREME CONDITION RESULTS

Channel Frequency (MHz)	Measured Frequency (MHz)	Delta Frequency (kHz)	20 ppm Limit (+/- kHz)	Margin (kHz)
5180	5180.05066	50.66	103.60	52.94
5200	5200.052868	52.87	104.00	51.13
5220	5220.053802	53.80	104.40	50.60
5240	5240.055429	55.43	104.80	49.37
5260	5260.055127	55.13	105.20	50.07
5280	5280.055949	55.95	105.60	49.65
5300	5300.057233	57.23	106.00	48.77
5320	5320.057296	57.30	106.40	49.10
5500	5500.059344	59.34	110.00	50.66
5520	5520.060499	60.50	110.40	49.90
5540	5540.059819	59.82	110.80	50.98
5560	5560.060762	60.76	111.20	50.44
5580	5580.062057	62.06	111.60	49.54
5600	5600.062984	62.98	112.00	49.02
5620	5620.063749	63.75	112.40	48.65
5640	5640.063975	63.98	112.80	48.82
5660	5660.063398	63.40	113.20	49.80
5680	5680.064014	64.01	113.60	49.59
5700	5700.064972	64.97	114.00	49.03

0 DEG C, 252 VAC EXTREME CONDITION RESULTS

Channel Frequency (MHz)	Measured Frequency (MHz)	Delta Frequency (kHz)	20 ppm Limit (+/- kHz)	Margin (kHz)
5180	5180.050759	50.76	103.60	52.84
5200	5200.052909	52.91	104.00	51.09
5220	5220.05374	53.74	104.40	50.66
5240	5240.055562	55.56	104.80	49.24
5260	5260.055135	55.13	105.20	50.07
5280	5280.055901	55.90	105.60	49.70
5300	5300.056869	56.87	106.00	49.13
5320	5320.057262	57.26	106.40	49.14
5500	5500.059626	59.63	110.00	50.37
5520	5520.060521	60.52	110.40	49.88
5540	5540.059878	59.88	110.80	50.92
5560	5560.060722	60.72	111.20	50.48
5580	5580.061515	61.52	111.60	50.08
5600	5600.06312	63.12	112.00	48.88
5620	5620.063309	63.31	112.40	49.09
5640	5640.064035	64.04	112.80	48.76
5660	5660.063291	63.29	113.20	49.91
5680	5680.064368	64.37	113.60	49.23
5700	5700.064577	64.58	114.00	49.42

40 DEG C, 208 VAC EXTREME CONDITION RESULTS

Channel Frequency (MHz)	Measured Frequency (MHz)	Delta Frequency (kHz)	20 ppm Limit (+/- kHz)	Margin (kHz)
5180	5180.007719	7.72	103.60	95.88
5200	5200.007319	7.32	104.00	96.68
5220	5220.006945	6.95	104.40	97.45
5240	5240.00592	5.92	104.80	98.88
5260	5260.005773	5.77	105.20	99.43
5280	5280.004659	4.66	105.60	100.94
5300	5300.004397	4.40	106.00	101.60
5320	5320.003366	3.37	106.40	103.03
5500	5500.003785	3.78	110.00	106.22
5520	5520.003101	3.10	110.40	107.30
5540	5540.002528	2.53	110.80	108.27
5560	5560.002593	2.59	111.20	108.61
5580	5580.001513	1.51	111.60	110.09
5600	5600.001491	1.49	112.00	110.51
5620	5620.000558	0.56	112.40	111.84
5640	5640.00058	0.58	112.80	112.22
5660	5659.999133	-0.87	113.20	112.33
5680	5679.998934	-1.07	113.60	112.53
5700	5699.997761	-2.24	114.00	111.76

40 DEG C, 252 VAC EXTREME CONDITION RESULTS

Channel Frequency (MHz)	Measured Frequency (MHz)	Delta Frequency (kHz)	20 ppm Limit (+/- kHz)	Margin (kHz)
5180	5180.007983	7.98	103.60	95.62
5200	5200.007515	7.52	104.00	96.48
5220	5220.006504	6.50	104.40	97.90
5240	5240.006123	6.12	104.80	98.68
5260	5260.005644	5.64	105.20	99.56
5280	5280.004998	5.00	105.60	100.60
5300	5300.004072	4.07	106.00	101.93
5320	5320.003771	3.77	106.40	102.63
5500	5500.003733	3.73	110.00	106.27
5520	5520.002932	2.93	110.40	107.47
5540	5540.002841	2.84	110.80	107.96
5560	5560.002264	2.26	111.20	108.94
5580	5580.001748	1.75	111.60	109.85
5600	5600.001186	1.19	112.00	110.81
5620	5620.001172	1.17	112.40	111.23
5640	5640.000212	0.21	112.80	112.59
5660	5659.99949	-0.51	113.20	112.69
5680	5679.998312	-1.69	113.60	111.91
5700	5699.997881	-2.12	114.00	111.88

7.2. RF OUTPUT POWER AND TPC

LIMIT AT HIGHEST POWER LEVEL

Draft ETSI DEN 301 893 v1.2.2 Clause 4.3.2.1

RF Output Power at Highest Power Level

Frequency Range (MHz)	Mean EIRP (dBm)
5150 to 5350	23
5470 to 5725	30

LIMIT AT LOWEST POWER LEVEL

Draft ETSI DEN 301 893 v1.2.2 Clause 4.3.2.2

RF Output Power at Lowest Power Level

Frequency Range (MHz)	Mean EIRP (dBm)
5150 to 5350	17
5470 to 5725	24

TEST PROCEDURE

Draft ETSI DEN 301 893 v1.2.2 Clause 5.3.3.2

RESULTS

No non-compliance noted:

DUTY CYCLE AND CORRECTION FACTOR

Tx on = 354.7 us

Tx on + Tx off = 376.2 us

Duty Cycle x = 0.94

$10 * \log (1/x) = 0.26 \text{ dB}$

Cable Loss = 2 dB

Antenna Gain = 4.0 dBi

Duty Cycle Factor = 0.26 dB

Correction Factor = Cable Loss + Antenna Gain + Duty Cycle Factor

EIRP = Measured Power + Correction Factor

LOWER BAND AT HIGHEST POWER

Correction Factor (dB) =	6.26
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5180 MHz at Highest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	16.1	22.36	23	-0.64
Extreme 0°C, 208 VAC	15.89	22.15	23	-0.85
Extreme 0°C, 252 VAC	15.92	22.18	23	-0.82
Extreme 40°C, 208 VAC	16.21	22.47	23	-0.53
Extreme 40°C, 252 VAC	16.22	22.48	23	-0.52

5260 MHz at Highest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	16.14	22.40	23	-0.60
Extreme 0°C, 208 VAC	16.02	22.28	23	-0.72
Extreme 0°C, 252 VAC	16.04	22.30	23	-0.70
Extreme 40°C, 208 VAC	16.08	22.34	23	-0.66
Extreme 40°C, 252 VAC	16.09	22.35	23	-0.65

5320 MHz at Highest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	16.11	22.37	23	-0.63
Extreme 0°C, 208 VAC	16.09	22.35	23	-0.65
Extreme 0°C, 252 VAC	16.1	22.36	23	-0.64
Extreme 40°C, 208 VAC	16.22	22.48	23	-0.52
Extreme 40°C, 252 VAC	16.23	22.49	23	-0.51

UPPER BAND AT HIGHEST POWER

Correction Factor (dB) =	6.26
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5500 MHz at Highest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	18.58	24.84	30	-5.16
Extreme 0°C, 208 VAC	18.75	25.01	30	-4.99
Extreme 0°C, 252 VAC	18.78	25.04	30	-4.96
Extreme 40°C, 208 VAC	18.68	24.94	30	-5.06
Extreme 40°C, 252 VAC	18.69	24.95	30	-5.05

5600 MHz at Highest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	19.05	25.31	30	-4.69
Extreme 0°C, 208 VAC	19.4	25.66	30	-4.34
Extreme 0°C, 252 VAC	19.41	25.67	30	-4.33
Extreme 40°C, 208 VAC	18.26	24.52	30	-5.48
Extreme 40°C, 252 VAC	18.27	24.53	30	-5.47

5700 MHz at Highest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	19.08	25.34	30	-4.66
Extreme 0°C, 208 VAC	19.29	25.55	30	-4.45
Extreme 0°C, 252 VAC	19.26	25.52	30	-4.48
Extreme 40°C, 208 VAC	19.08	25.34	30	-4.66
Extreme 40°C, 252 VAC	19.1	25.36	30	-4.64

LOWER BAND AT LOWEST POWER

Correction Factor (dB) =	6.26
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5180 MHz at Lowest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	9.71	15.97	17	-1.03
Extreme 0°C, 208 VAC	9.86	16.12	17	-0.88
Extreme 0°C, 252 VAC	9.88	16.14	17	-0.86
Extreme 40°C, 208 VAC	9.83	16.09	17	-0.91
Extreme 40°C, 252 VAC	9.81	16.07	17	-0.93

5260 MHz at Lowest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	9.87	16.13	17	-0.87
Extreme 0°C, 208 VAC	9.08	15.34	17	-1.66
Extreme 0°C, 252 VAC	9.09	15.35	17	-1.65
Extreme 40°C, 208 VAC	9.13	15.39	17	-1.61
Extreme 40°C, 252 VAC	9.14	15.40	17	-1.60

5320 MHz at Lowest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	8.63	14.89	17	-2.11
Extreme 0°C, 208 VAC	9.13	15.39	17	-1.61
Extreme 0°C, 252 VAC	9.15	15.41	17	-1.59
Extreme 40°C, 208 VAC	9.03	15.29	17	-1.71
Extreme 40°C, 252 VAC	9.04	15.30	17	-1.70

UPPER BAND AT LOWEST POWER

Correction Factor (dB) = 6.26

5500 MHz at Lowest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	14.16	20.42	24	-3.58
Extreme 0°C, 208 VAC	14.61	20.87	24	-3.13
Extreme 0°C, 252 VAC	14.62	20.88	24	-3.12
Extreme 40°C, 208 VAC	14.32	20.58	24	-3.42
Extreme 40°C, 252 VAC	14.33	20.59	24	-3.41

5600 MHz at Lowest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	14.78	21.04	24	-2.96
Extreme 0°C, 208 VAC	15	21.26	24	-2.74
Extreme 0°C, 252 VAC	15.01	21.27	24	-2.73
Extreme 40°C, 208 VAC	15.05	21.31	24	-2.69
Extreme 40°C, 252 VAC	15.06	21.32	24	-2.68

5700 MHz at Lowest Power Level

Condition	Measured Power (dBm)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Normal 25°C, 230 VAC	15.08	21.34	24	-2.66
Extreme 0°C, 208 VAC	15.15	21.41	24	-2.59
Extreme 0°C, 252 VAC	15.16	21.42	24	-2.58
Extreme 40°C, 208 VAC	15.06	21.32	24	-2.68
Extreme 40°C, 252 VAC	15.07	21.33	24	-2.67

7.3. POWER DENSITY

LIMIT

Draft ETSI DEN 301 893 v1.2.2 Clause 4.3.2.1

Power Density at Highest Power Level

Frequency Range (MHz)	Mean EIRP Density Limit (dBm/MHz)
5150 to 5350	11
5470 to 5725	18

TEST PROCEDURE

Draft ETSI DEN 301 893 v1.2.2 Clause 5.3.3.2.1.3

The spectrum analyzer is equipped with a facility to measure power density in units of dBm/Hz.

The spectrum analyzer facility to measure power density was validated in accordance with CCSUT2802.

RESULTS

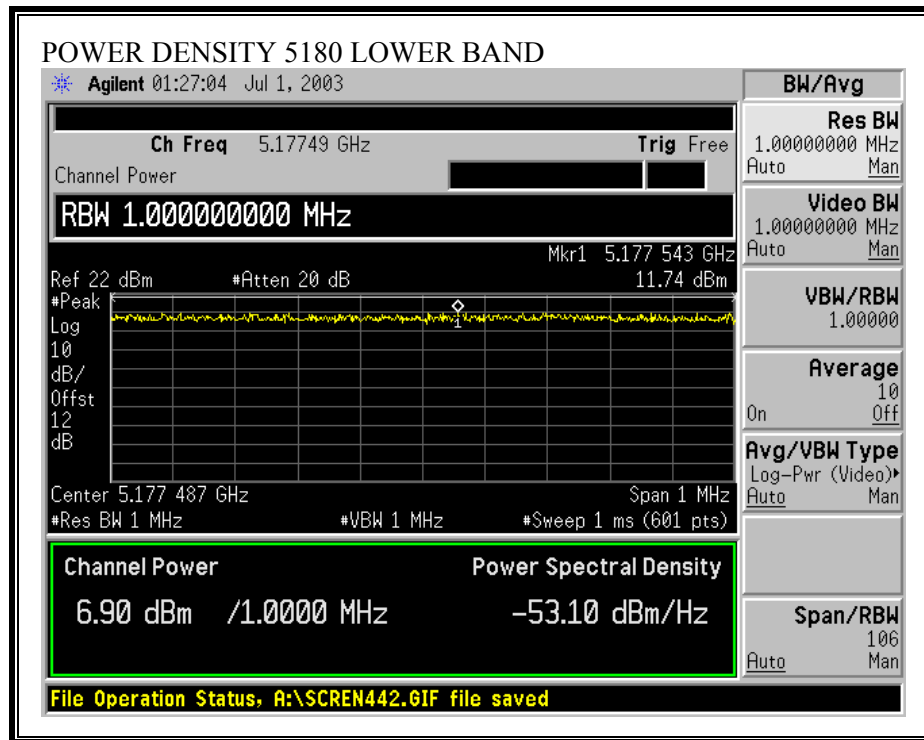
No non-compliance noted:

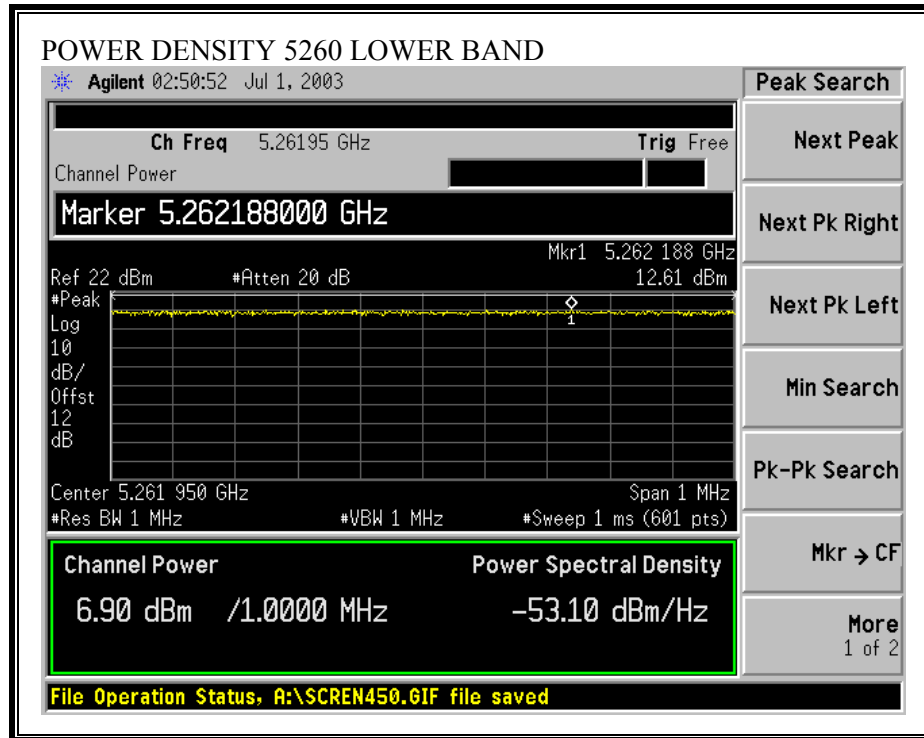
The total correction factor from measured power density in dBm/Hz to the power density EIRP in dBm/MHz is 60 (dB) + EUT Antenna Gain (dBi).

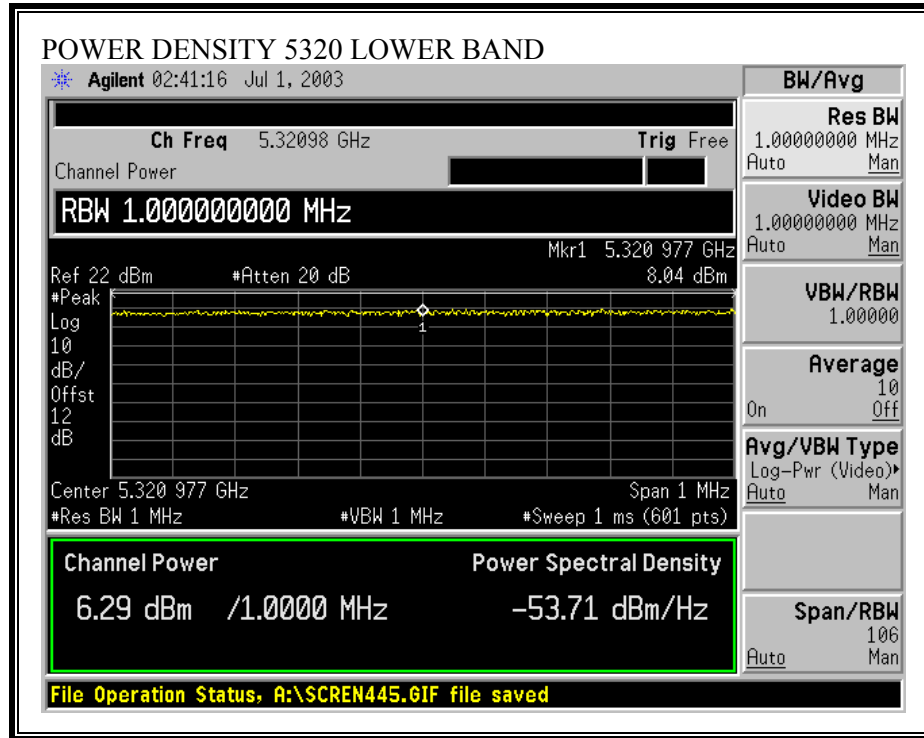
EUT Antenna Gain (dBi) =	4
--------------------------	---

Frequency (MHz)	Measured Power Density (dBm/Hz)	Power Density EIRP (dBm/MHz)	Limit EIRP (dBm/MHz)	Margin (dB)
5180	-53.1	10.90	11	-0.10
5260	-53.1	10.90	11	-0.10
5320	-53.71	10.29	11	-0.71
5500	-49.68	14.32	18	-3.68
5600	-48.78	15.22	18	-2.78
5700	-49.27	14.73	18	-3.27

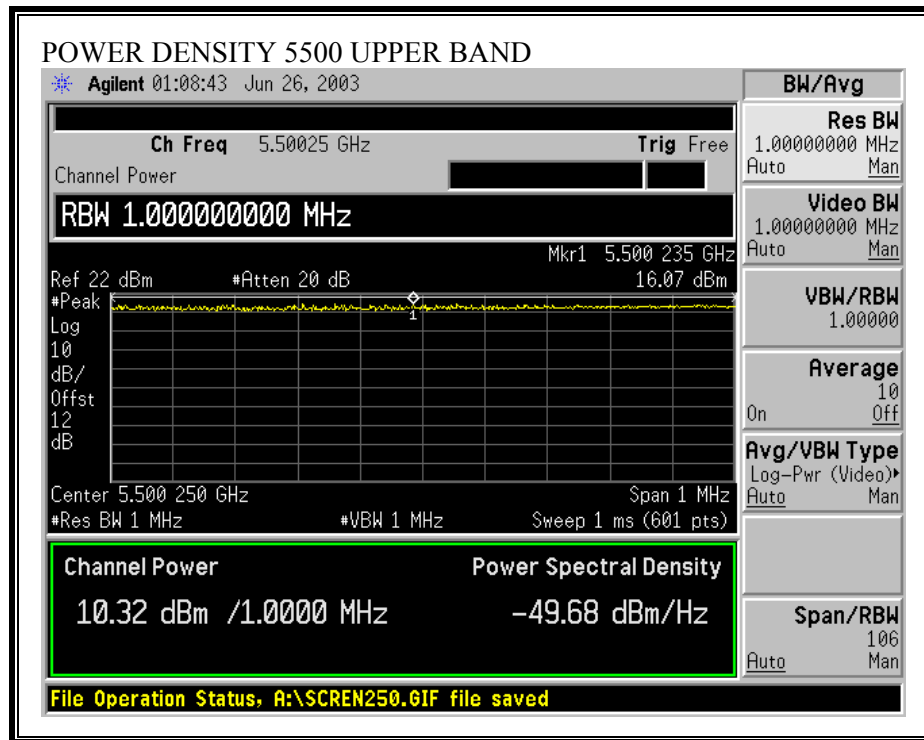
POWER DENSITY (LOWER BAND)

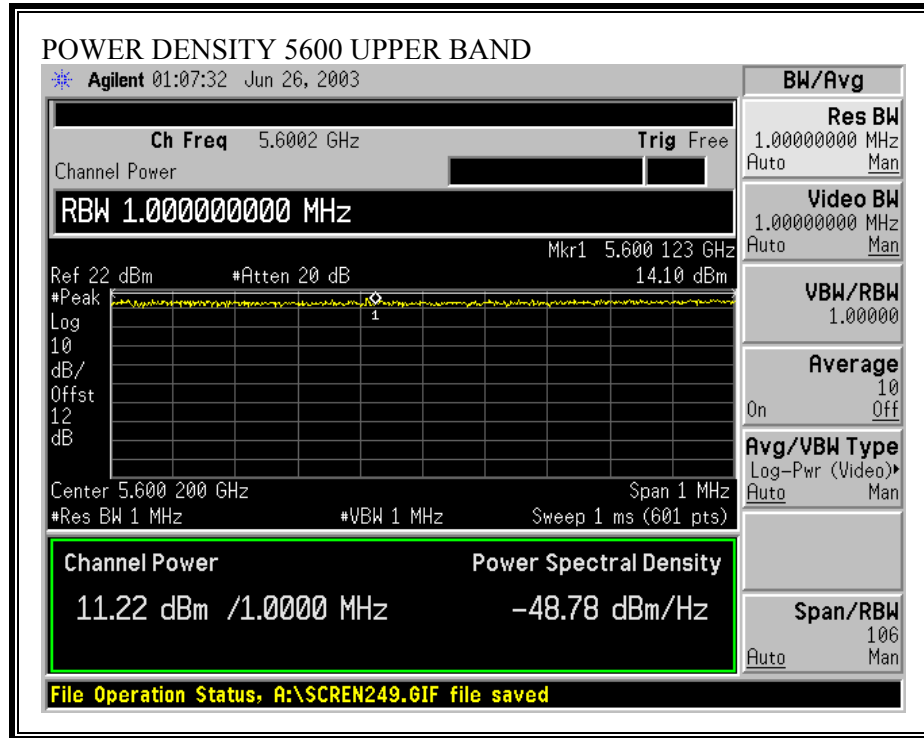


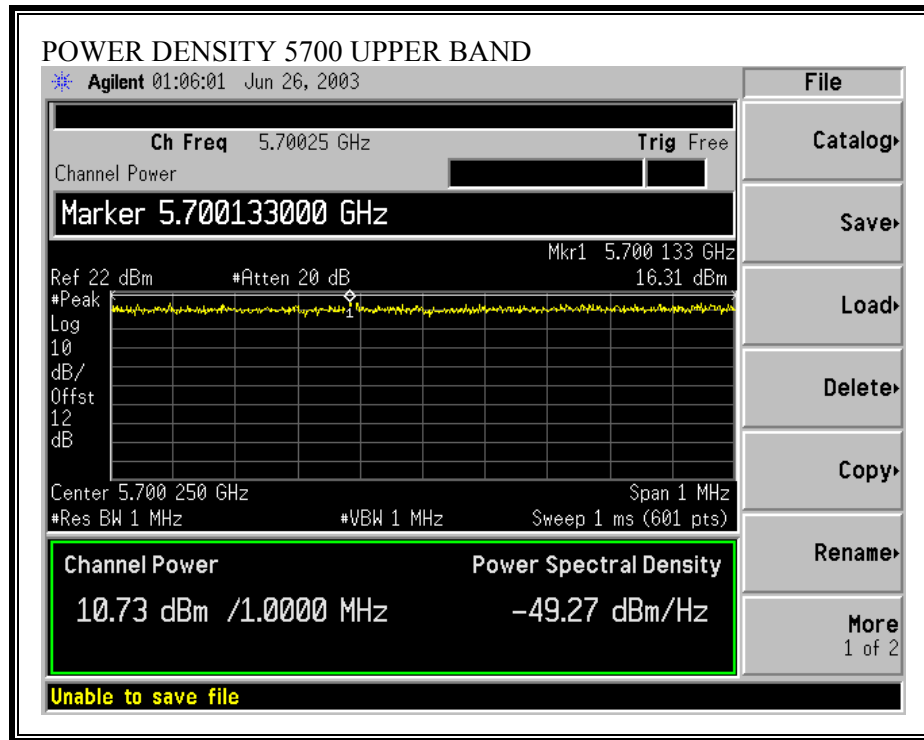




POWER DENSITY (UPPER BAND)



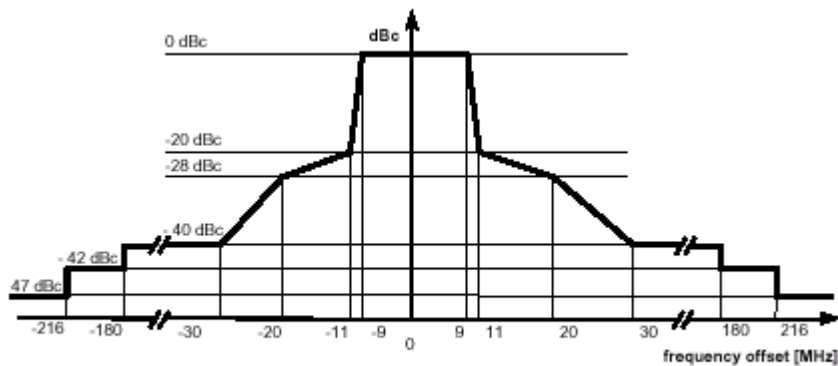




7.4. TRANSMITTER IN-BAND SPURIOUS EMISSIONS MASK

LIMIT

Draft ETSI DEN 301 893 v1.2.2 Clause 4.4.2.2, Figure 2



NOTE: dBc is the spectral density relative to the maximum spectral power density of the transmitted signal.

Figure 2: Transmit spectral power mask.

TEST PROCEDURE

Draft ETSI DEN 301 893 v1.1.1 Clause 5.3.4.2

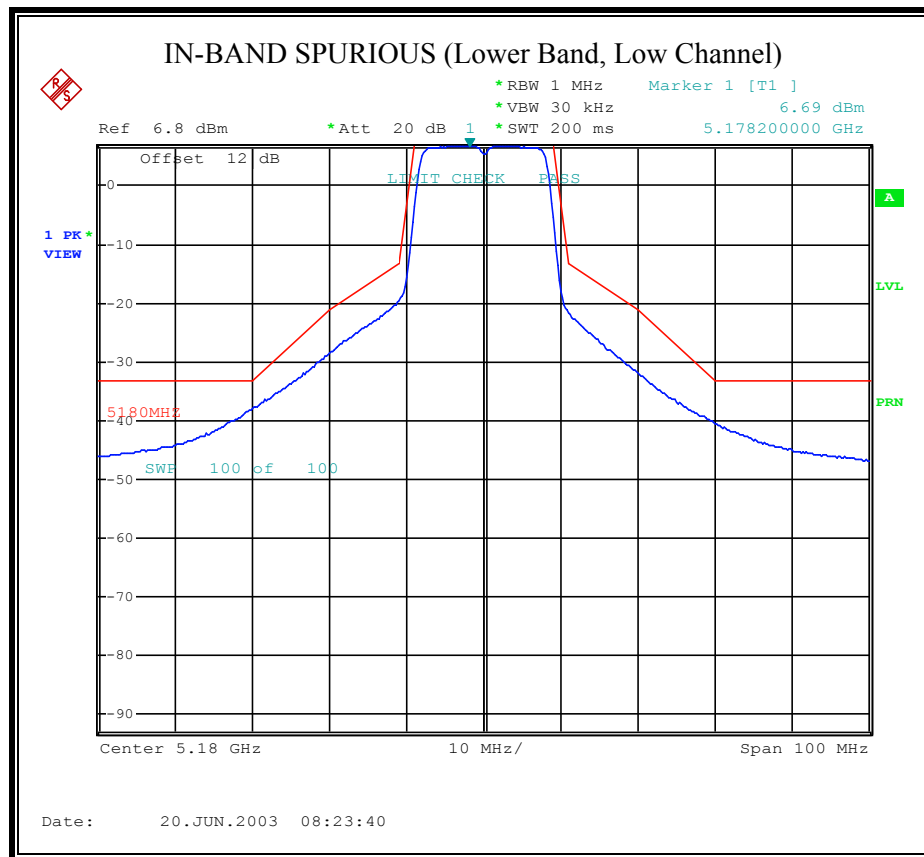
TEST PROTOCOL

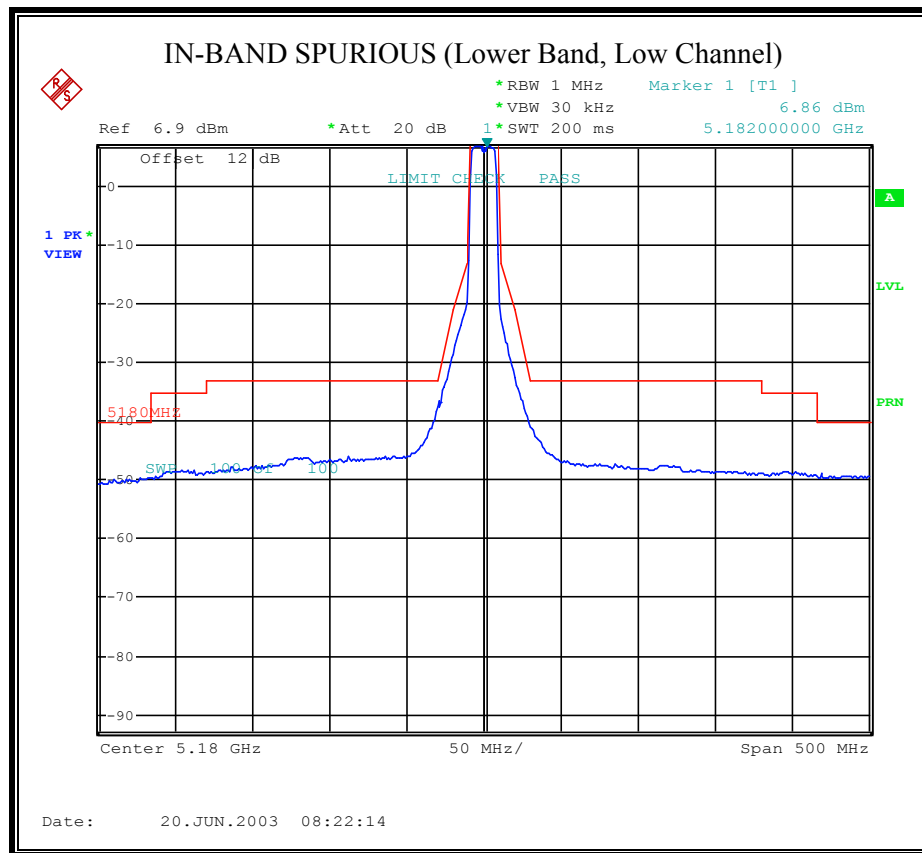
Conducted measurements were performed.

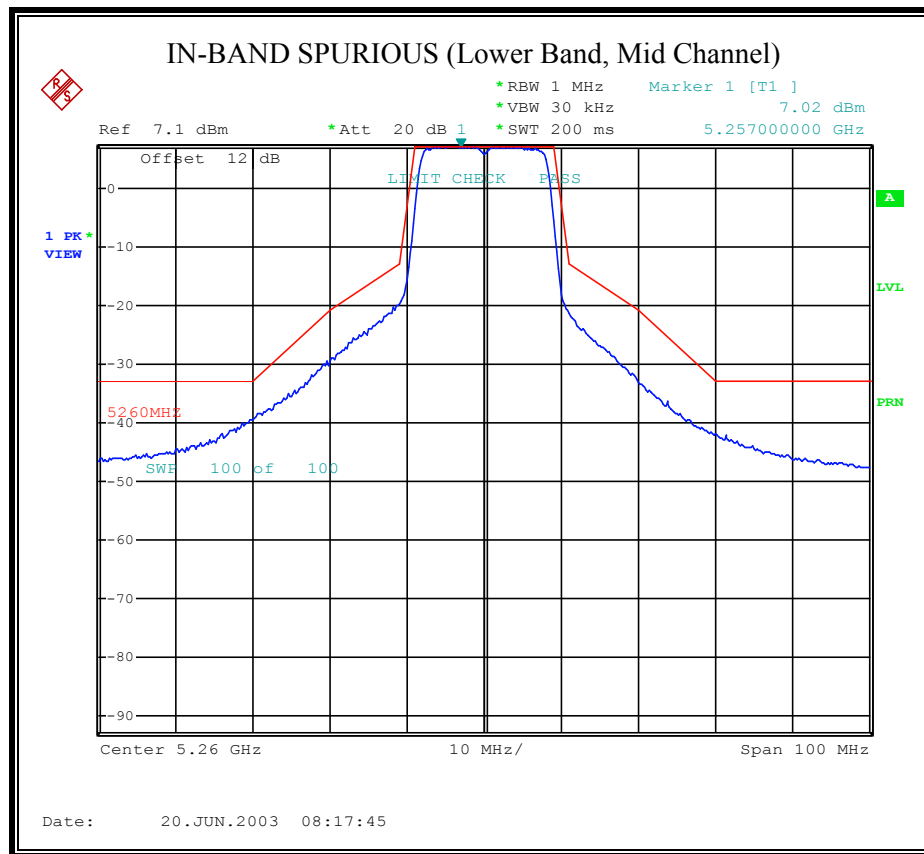
RESULTS

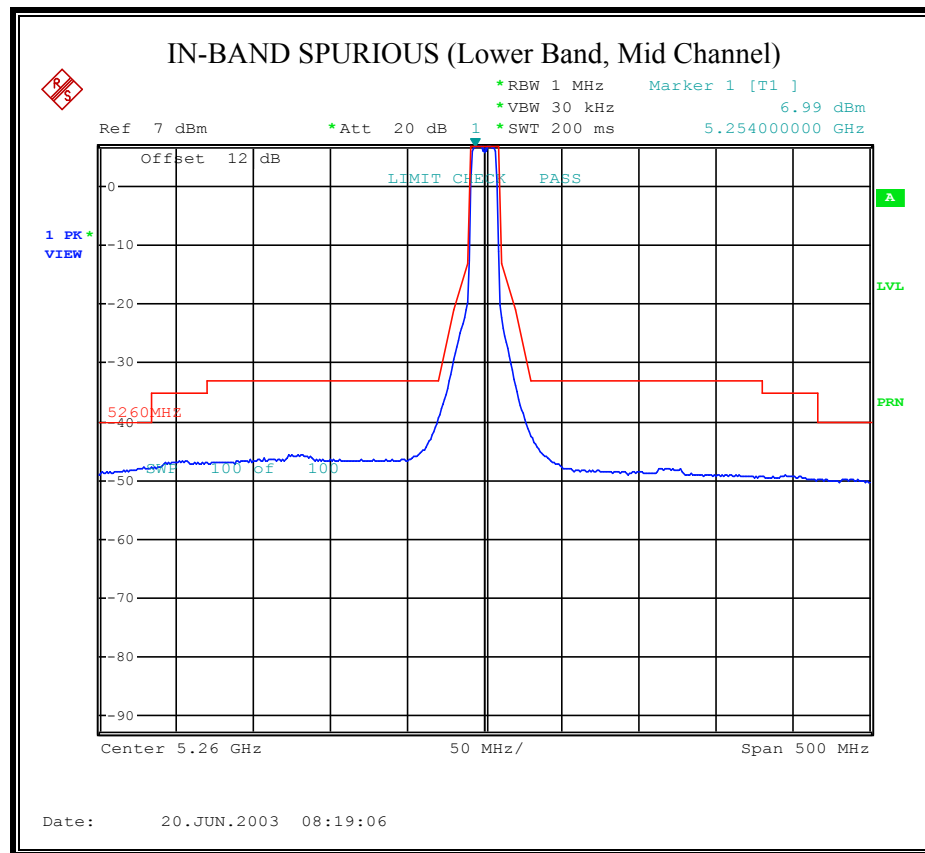
No non-compliance noted:

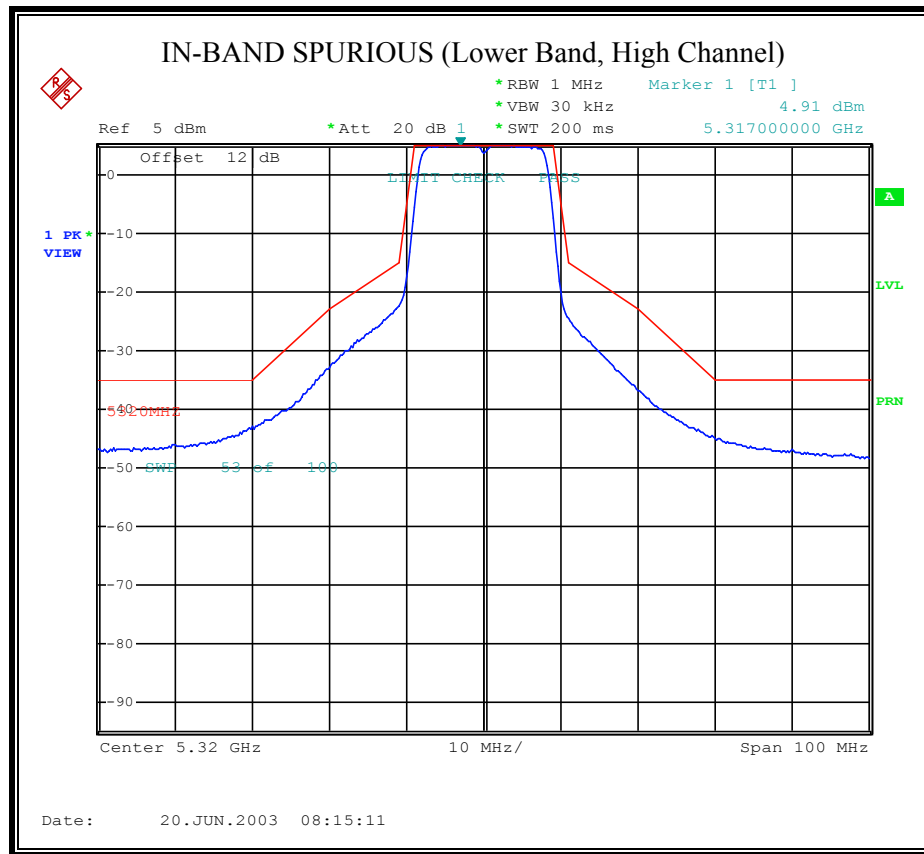
IN-BAND SPURIOUS EMISSIONS, LOWER BAND

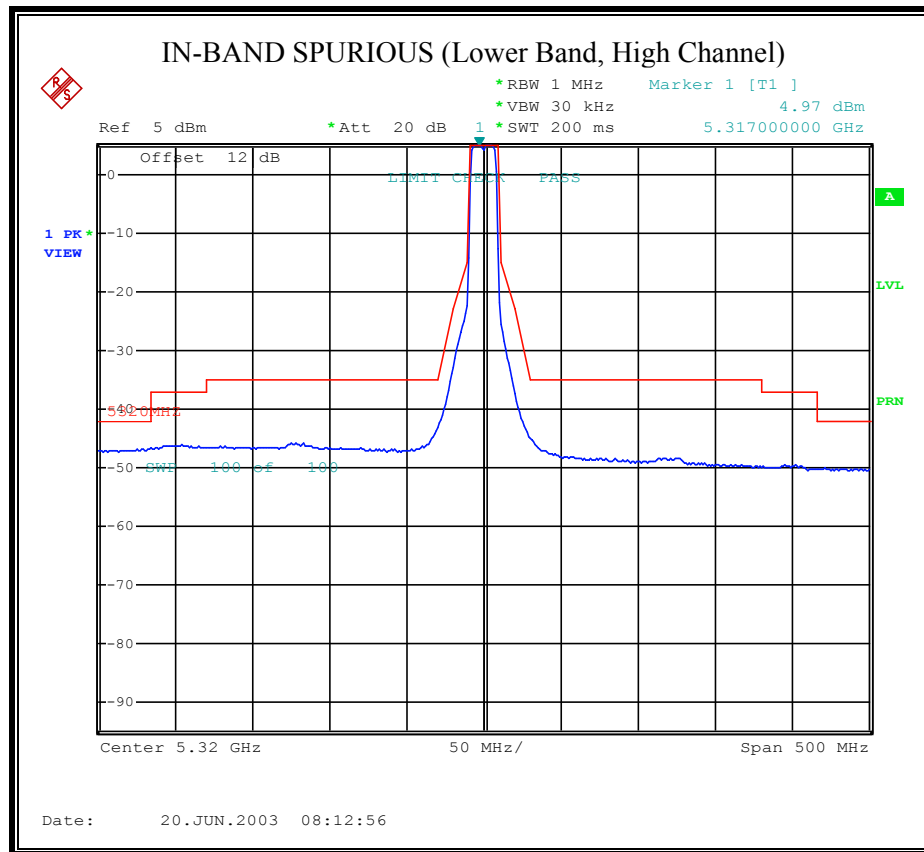




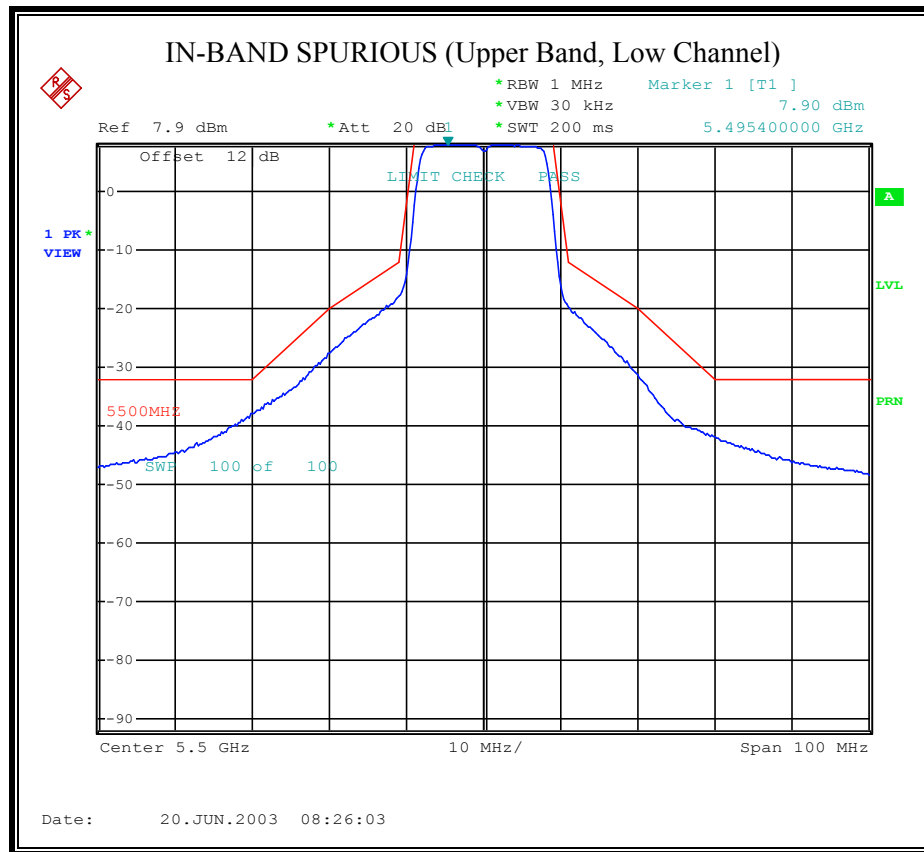


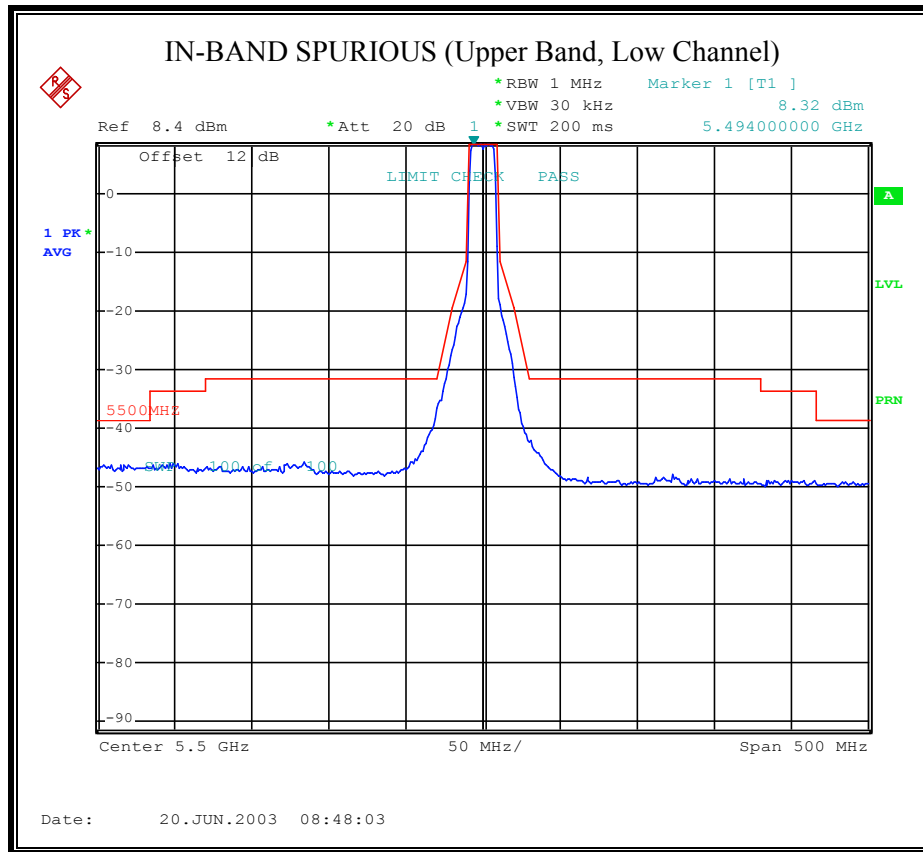


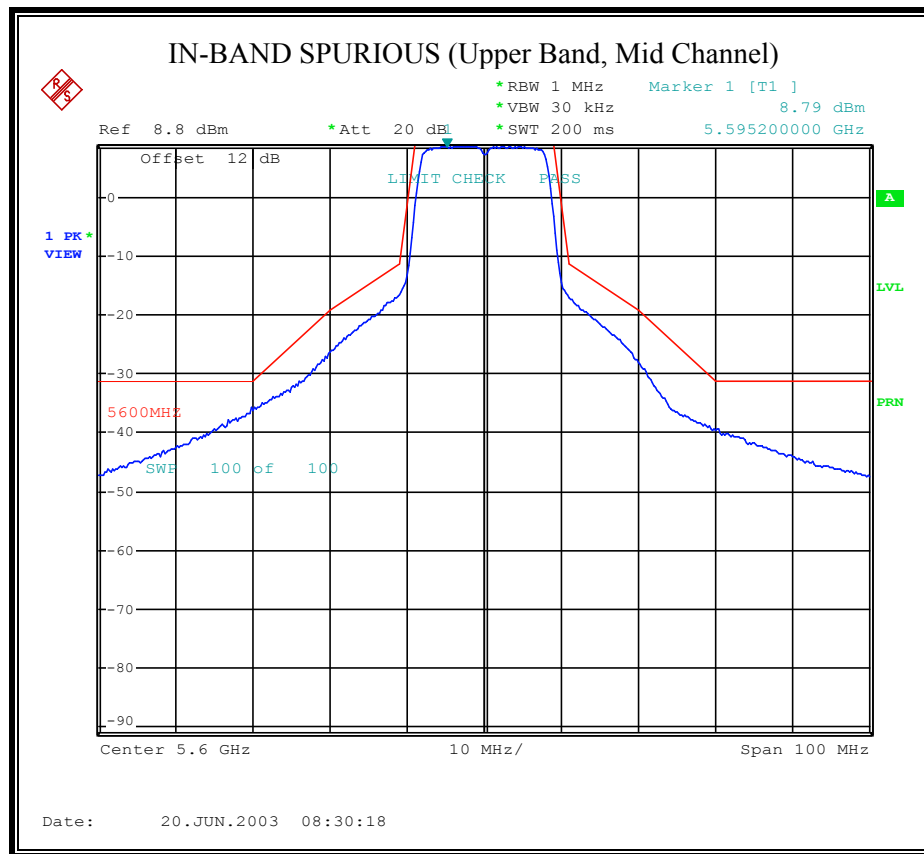


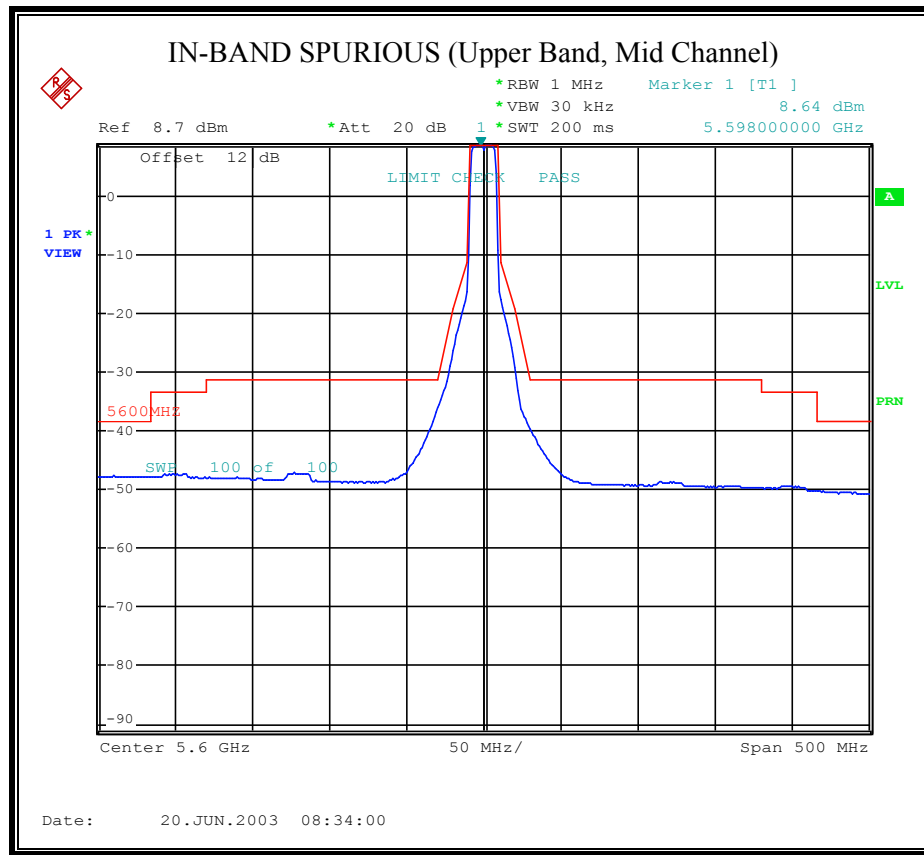


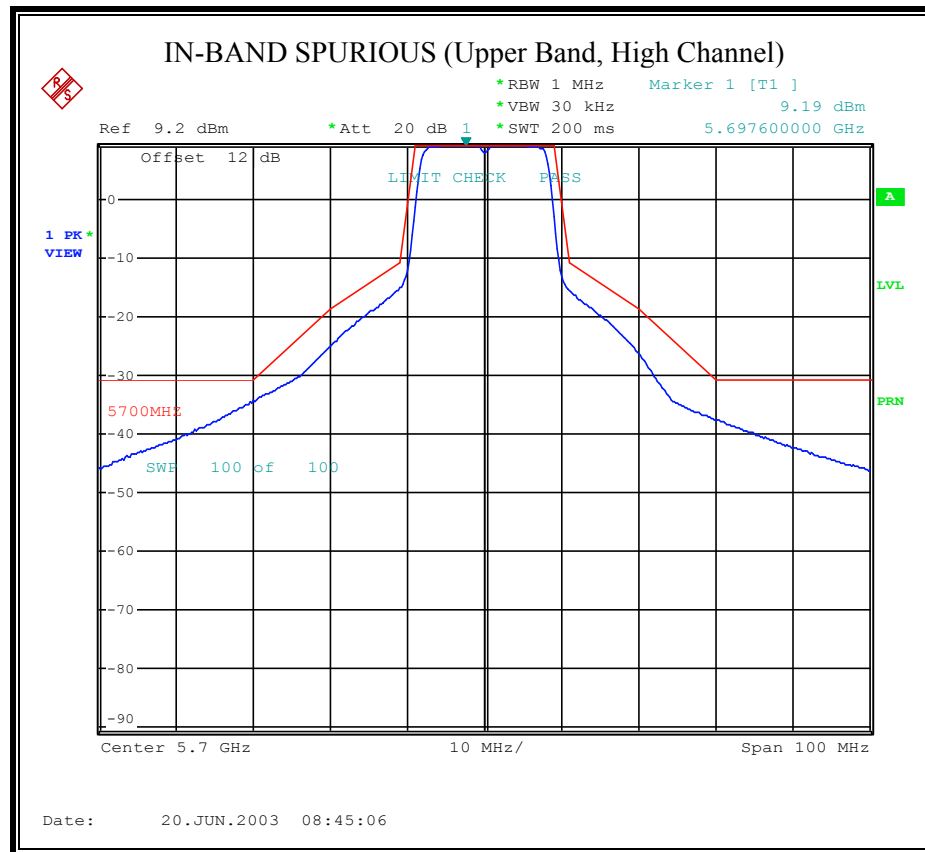
IN-BAND SPURIOUS EMISSIONS, UPPER BAND

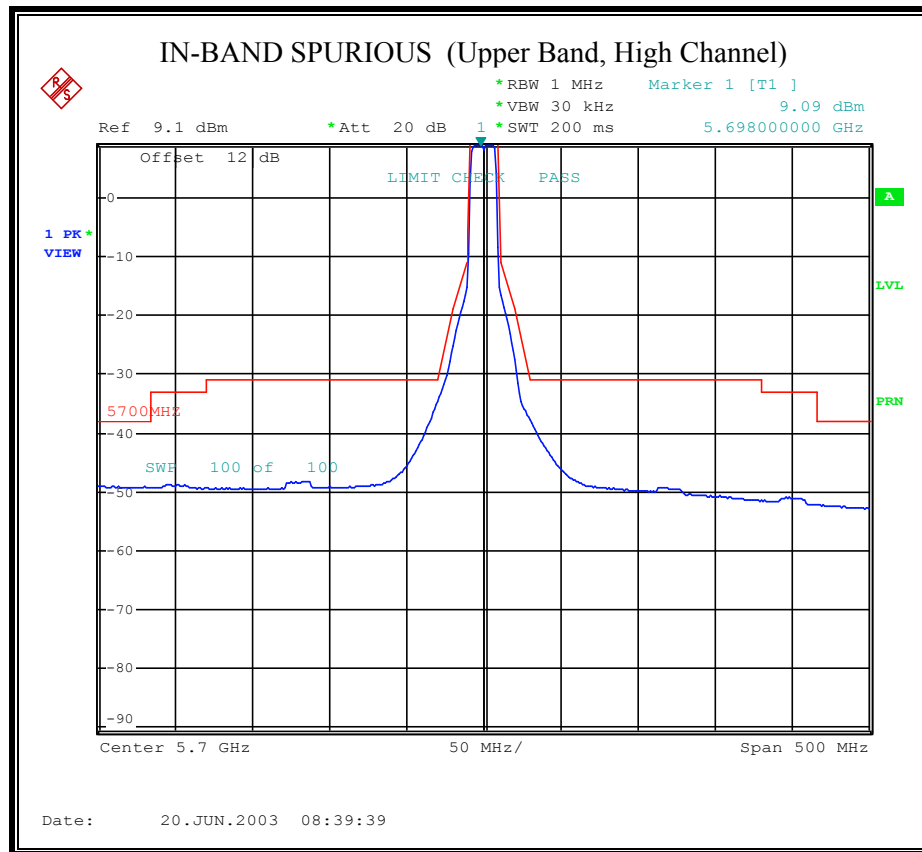












7.5. TRANSMITTER SPURIOUS EMISSIONS

LIMIT

Draft ETSI DEN 301 893 v1.1.1 Clause 4.4.1.2, Table 3

Frequency Range (MHz)	Maximum Power, ERP (dBm)	Bandwidth (kHz)
47 to 74	-54	100
74 to 87.5	-36	100
87.5 to 118	-54	100
118 to 174	-36	100
174 to 230	-54	100
230 to 470	-36	100
470 to 862	-54	100
862 to 1000	-36	100
Frequency Range (GHz)	Maximum Power, ERP (dBm)	Bandwidth (MHz)
1 to 5.15	-30	1
5.35 to 5.47	-30	1
5.725 to 26.5	-30	1

TEST PROCEDURE

Draft ETSI DEN 301 893 v1.1.1 Clause 5.3.3.2

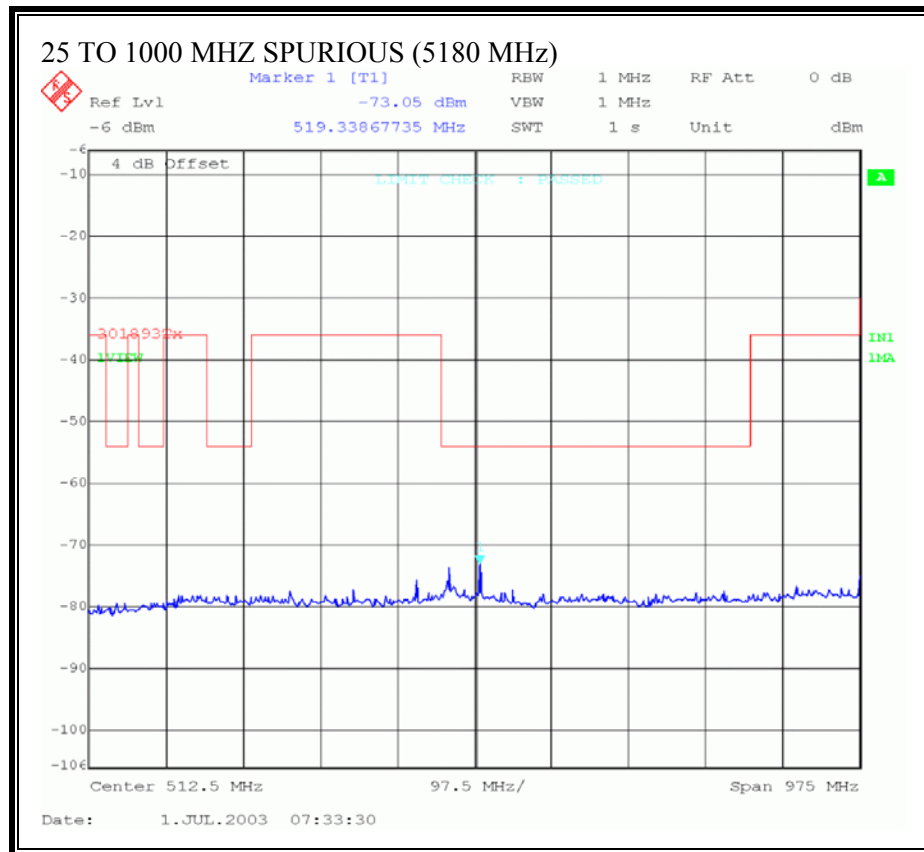
TEST PROTOCOL

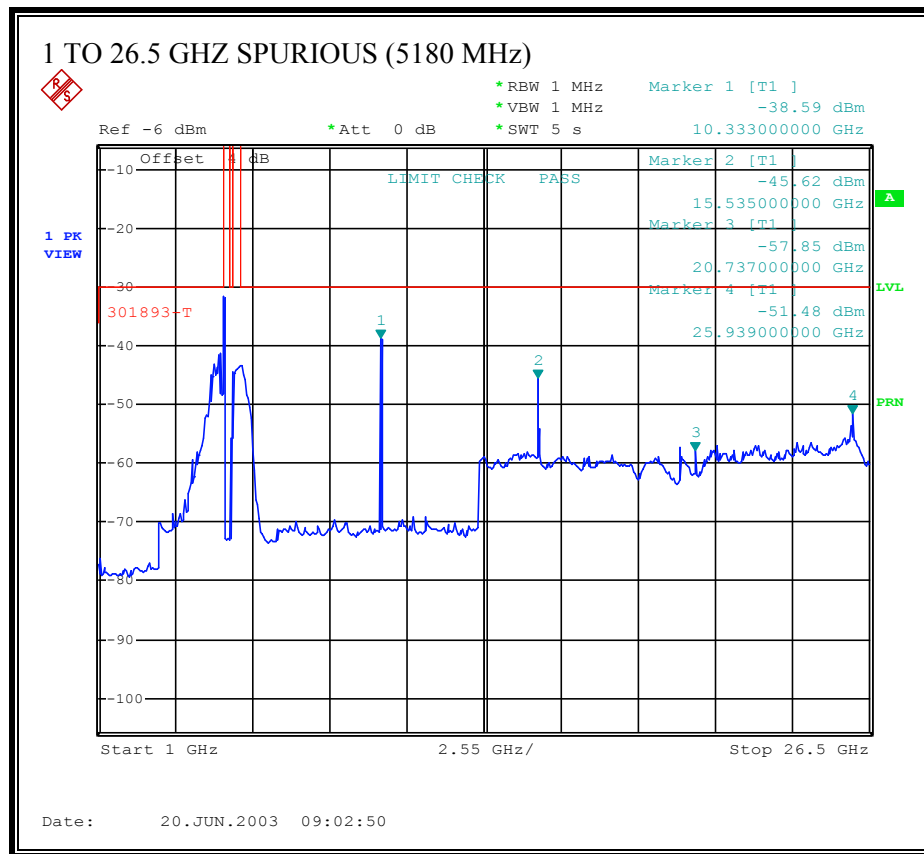
Conducted measurements were performed at 5180, 5520 and 5700 MHz.

RESULTS

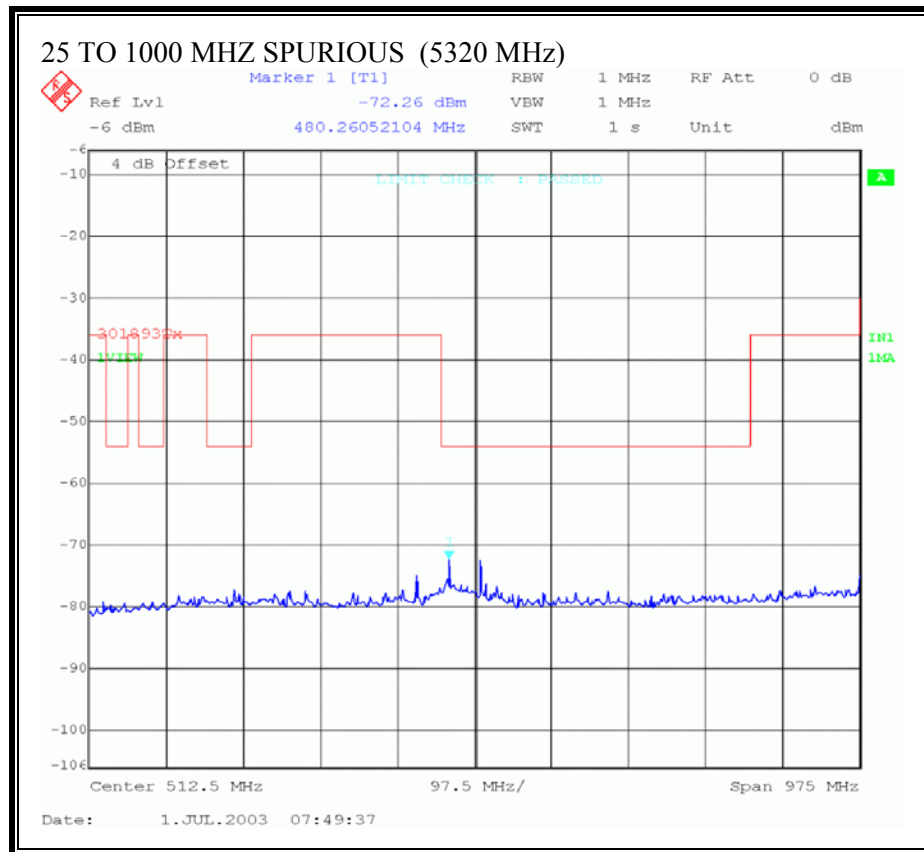
No non-compliance noted:

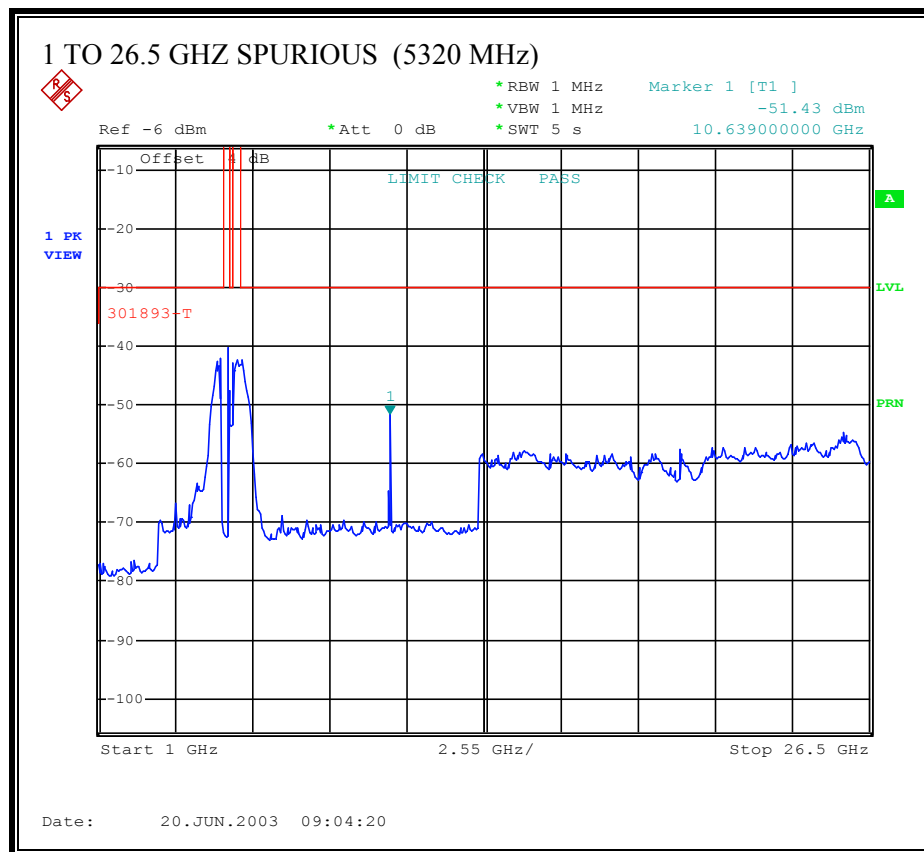
CONDUCTED SPURIOUS EMISSIONS, 5180 MHZ



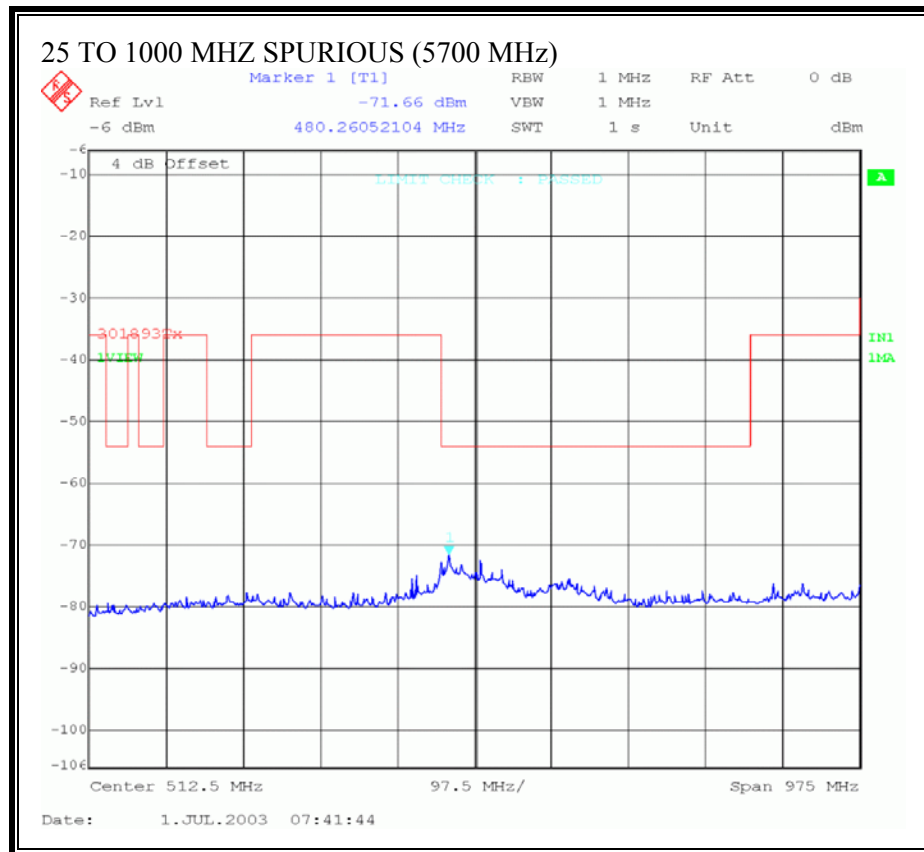


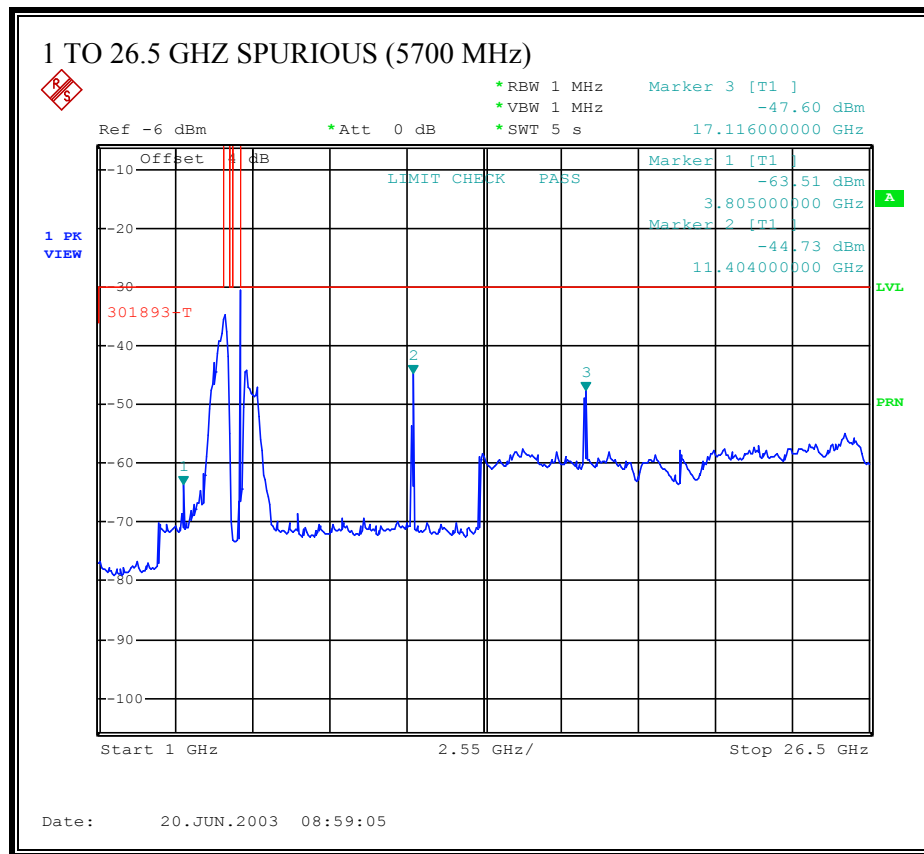
CONDUCTED SPURIOUS EMISSIONS, 5320 MHZ





CONDUCTED SPURIOUS EMISSIONS, 5700 MHZ





7.6. RECEIVER SPURIOUS EMISSIONS

LIMIT

Draft ETSI DEN 301 893 v1.1.1 Clause 4.5.2, Table 4

Frequency Range	Maximum Power, ERP	Measurement Bandwidth
25 MHz to 1 GHz	-57 dBm	100 kHz
1 to 26.5 GHz	-47 dBm	1 MHz

TEST PROCEDURE

Draft ETSI DEN 301 893 v1.1.1 Clause 5.3.5.2

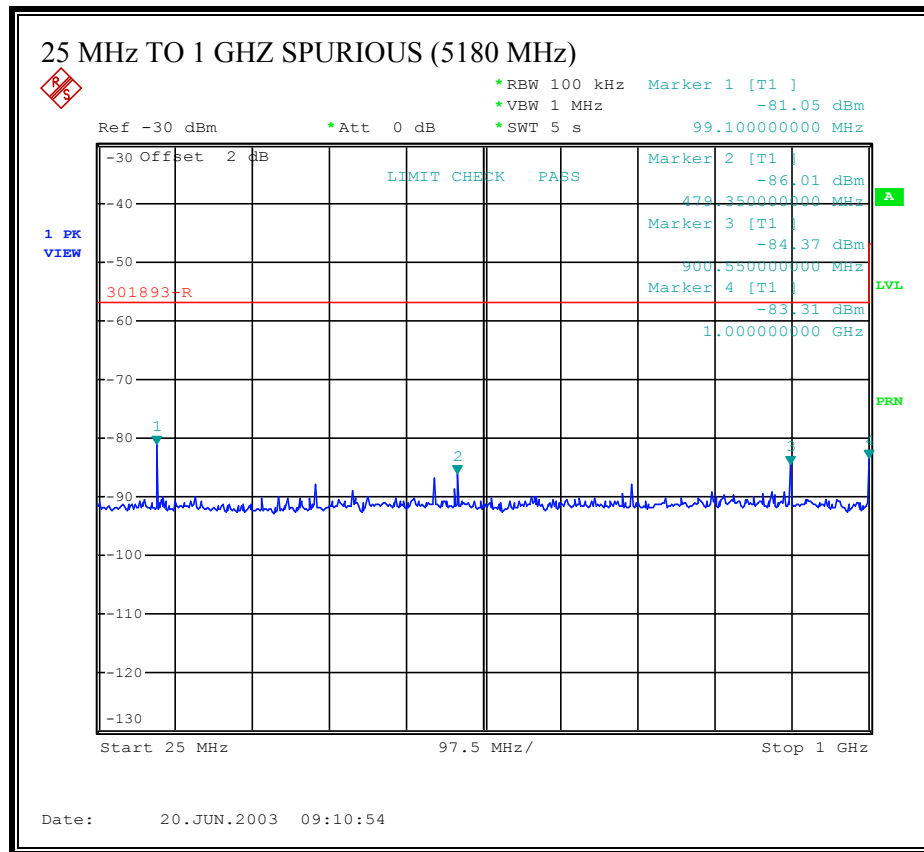
TEST PROTOCOL

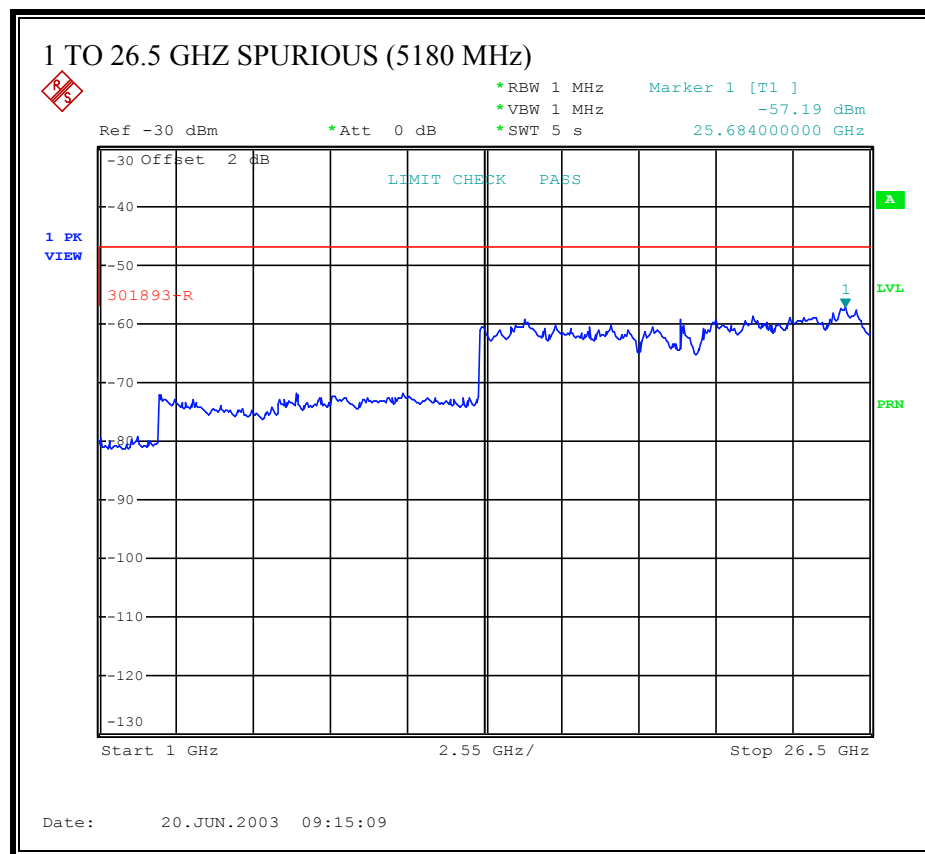
Conducted measurements were performed at 5180, 5520 and 5700 MHz.

RESULTS

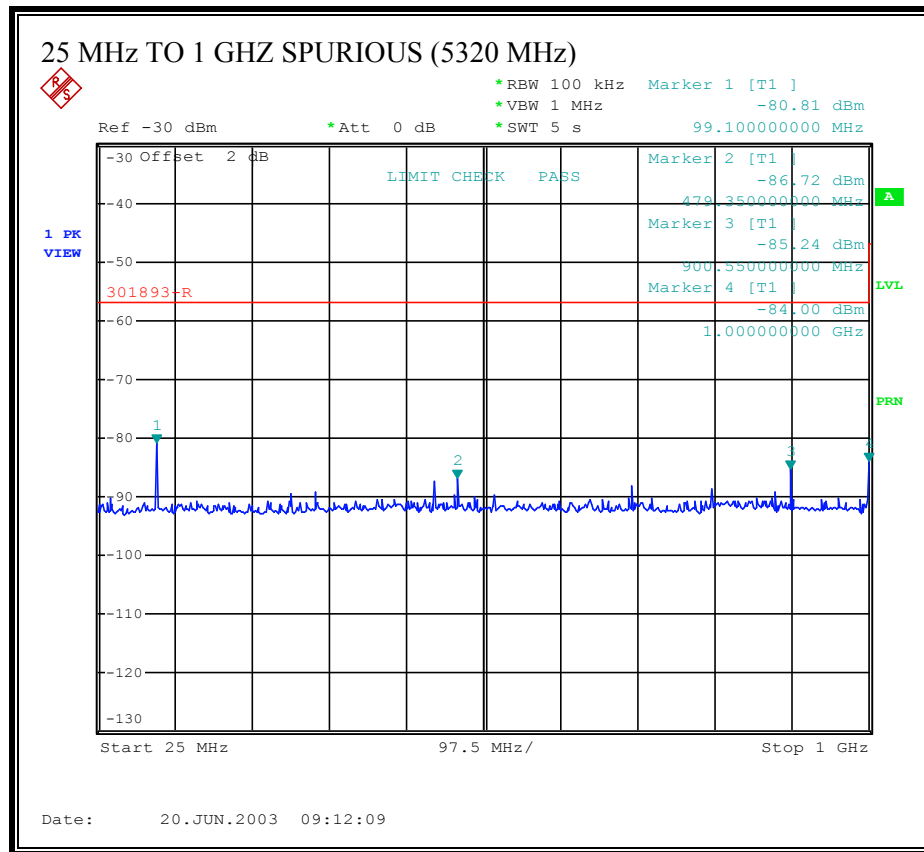
No non-compliance noted:

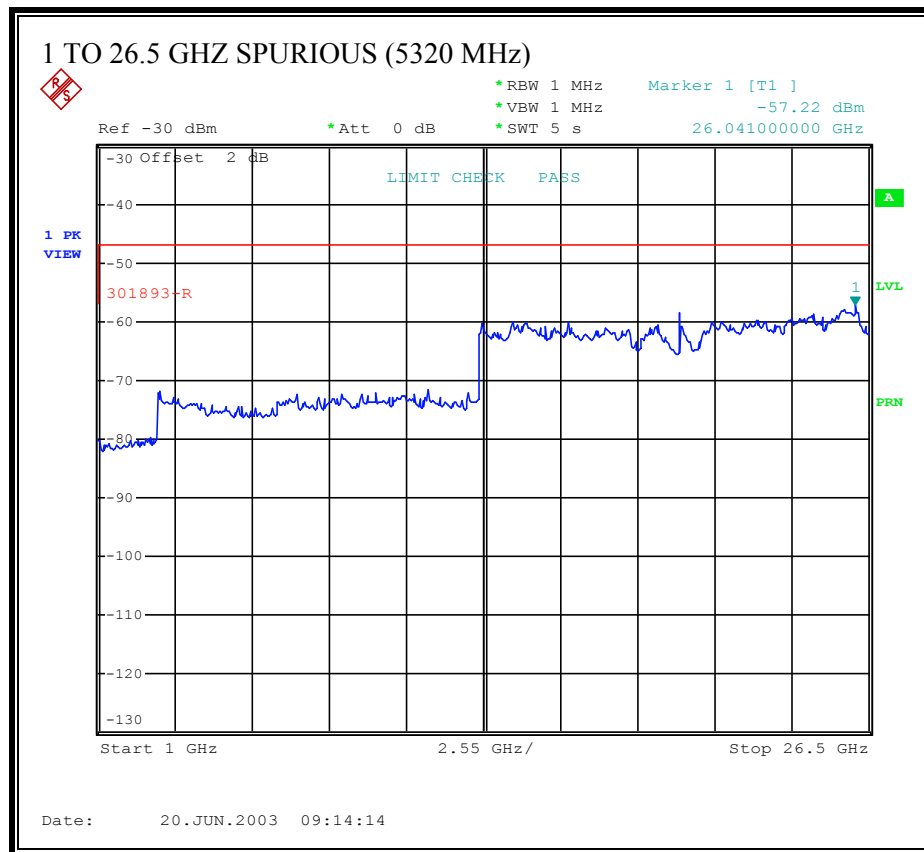
CONDUCTED SPURIOUS EMISSIONS, 5180 MHz



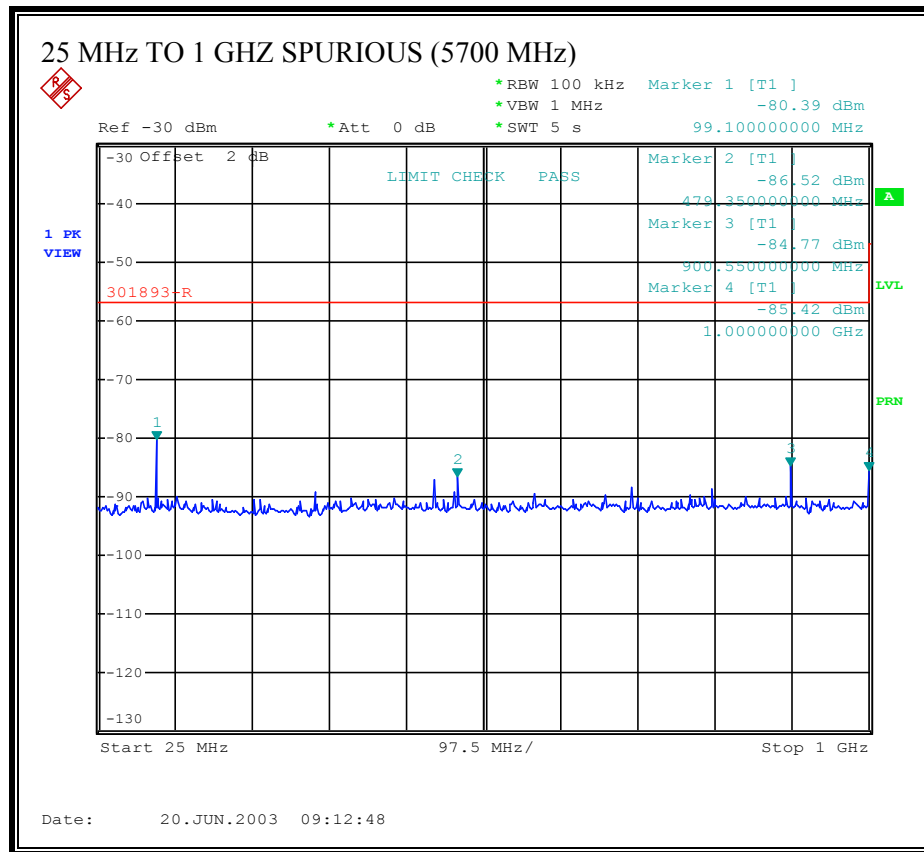


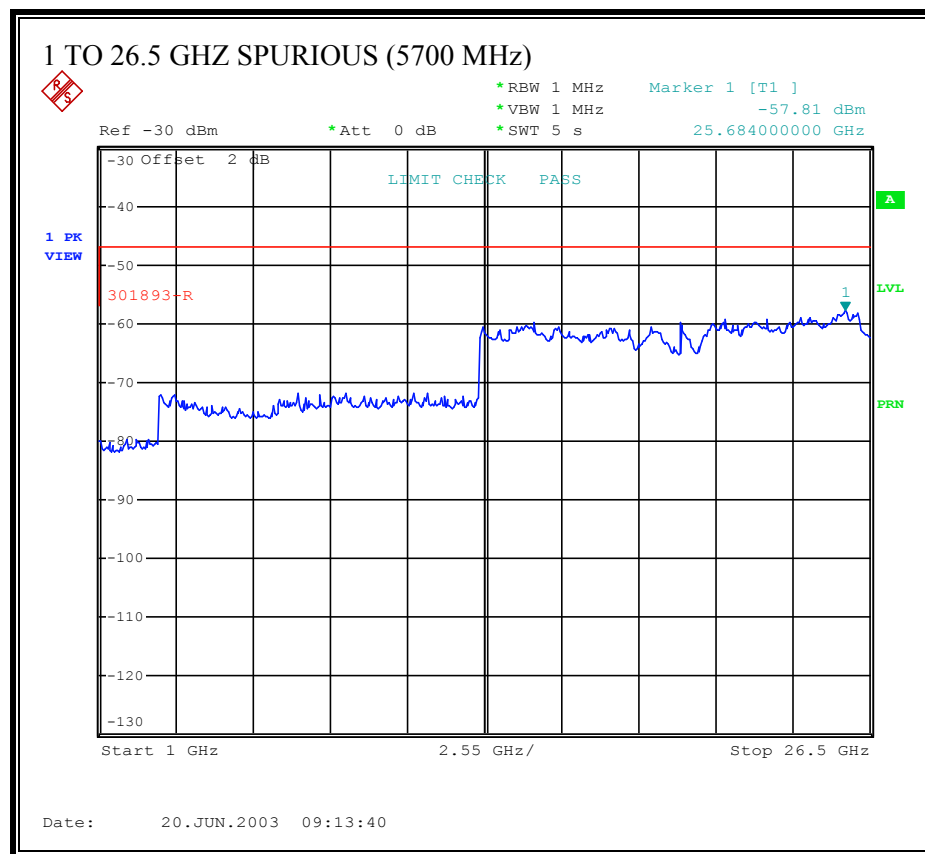
CONDUCTED SPURIOUS EMISSIONS, 5320 MHz





CONDUCTED SPURIOUS EMISSIONS, 5700 MHz





7.7. DYNAMIC FREQUENCY SELECTION

LIMITS

Draft ETSI DEN 301 893 Clause 4.6

Master device

Parameter	Value
Non-Occupancy Period	30 minutes

Draft ETSI DEN 301 893 Clause 4.6.1 and Appendix D

Table D.2: Interference Threshold Values, Master

Maximum Transmit Power	Value (see note)
> 200 mW (> 23 dBm)	-64 dBm
< 200 mW (< 23 dBm)	-62 dBm
Note: This is the level at the input of the receiver assuming a 0 dBi receive antenna.	

Draft ETSI DEN 301 893 Clause 4.6.2, 4.6.3, 4.6.4 and Appendix D

Table D.1: DFS Requirement Values

Parameter	Value
Channel Availability Check Time	60 s
Channel Move Time	10 s
Channel Closing Transmission Time	260 ms

RADAR PARAMETERS

Table D.4: Parameters of DFS Test Signals

Radar Test Signal	Pulse Repetition Frequency PRF (pps)	Pulse Width W (us)	Number of Pulses per Burst	Burst Period B (sec)
Radar Signal 1	700	1	18	10
Radar Signal 2	1800	1	10	2
Radar Signal 3	330	2	70	60

TEST PROCEDURE

Draft ETSI DEN 301 893 v1.2.2 Clause 5.3.7

Performance is measured at an active channel frequency of 5260 MHz. The radar signal is centered at 5263 MHz.

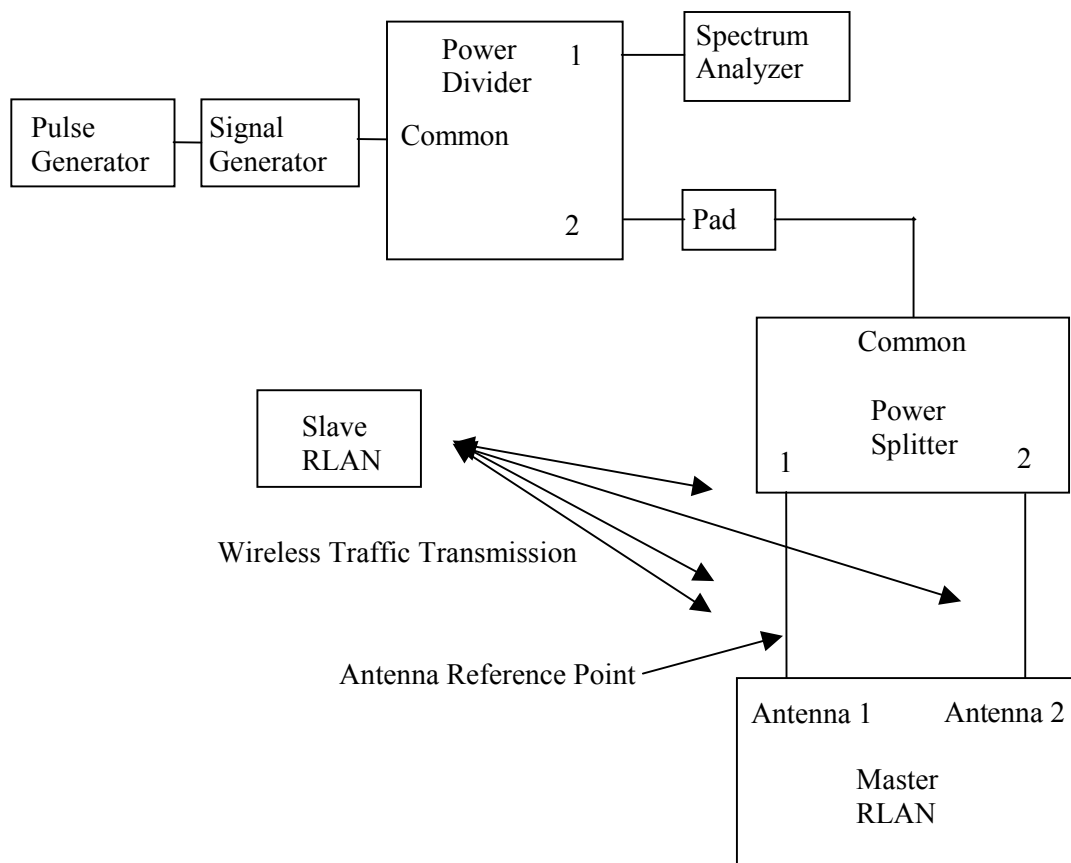
Measurement of the channel availability check time is made using an ETSI Type 3 radar signal.

Measurement of the non-occupancy period is made by generating an ETSI Type 3 radar burst on the active channel, then this channel is monitored for a period of 30 minutes.

One laptop PC is connected to the AP via a wired Ethernet connection. A separate laptop PC is used as a host computer for the Station. The AP and the Station transmit output levels are set to normal operating conditions. Traffic consists of a streaming audio file containing a song. The file is streamed from the Station laptop to the AP laptop via a wireless connection between the AP and the Station.

The file is sent from the Station to the AP, and the audio output of the AP laptop is monitored.

TEST SETUP FOR DFS MEASUREMENTS



The radar signal is fed to the Access Point (Master RLAN) via a coaxial connection. The analyzer reference level offset is adjusted such that the radar signal as displayed on the analyzer is calibrated for the amplitude of the radar signal at the test cable connected to the Antenna Reference Point. The AP traffic as displayed on the analyzer is not calibrated for amplitude. In the time domain, the display of both signals is calibrated. The pad value is selected such that the radar signal is displayed at a higher level than the AP traffic, to allow the radar to be easily distinguished.

A wireless network connection is established between the Access Point and a Station (Slave RLAN). The Station with its normal antenna forms one end of this link, and the Station is situated near the Access Point such that stray coupling from the Access Point forms the other end. This facilitates the interpretation of the analyzer display since only the radar signal and the AP traffic are displayed above the analyzer noise floor.

RESULTS

No non-compliance noted:

INTERFERENCE DETECTION THRESHOLD

For an interference threshold level of -64 dBm and an EUT antenna gain of 4 dBi, the required radar amplitude at the Antenna Reference Point is -60 dBm.

The insertion loss of the test cable connected to the Antenna Reference Point is 1.7 dB, therefore the required radar amplitude at the test cable is -58.3 dBm. The radar amplitude at the test cable is adjusted so that it is less than or equal to this required amplitude threshold.

CHANNEL AVAILABILITY CHECK TIME RESULTS

If a radar signal is detected during the channel availability check then the EUT displays a message stating that radar was detected.

Timing of Radar Burst	EUT Display	Spectrum Analyzer Display
Within 1 to 6 second window	Detected	No RLAN transmissions at 5260 MHz
Within 54 to 60 second window	Detected	No RLAN transmissions at 5260 MHz

CHANNEL MOVE TIME RESULTS

Radar Type	Channel Move Time (s)	Limit (s)
1	0.02929	10
2	0.036	10
3	0	10

CHANNEL CLOSING TRANSMISSION TIME RESULTS

The width of a single AP packet is 280 us.

With Radar type 1 there are 6 AP packets during the channel move time, so the aggregate transmission time is $6 * 280 \text{ us} = 1.68 \text{ ms}$.

With Radar type 2 there are 5 AP packets during the channel move time, so the aggregate transmission time is $5 * 280 \text{ us} = 1.4 \text{ ms}$.

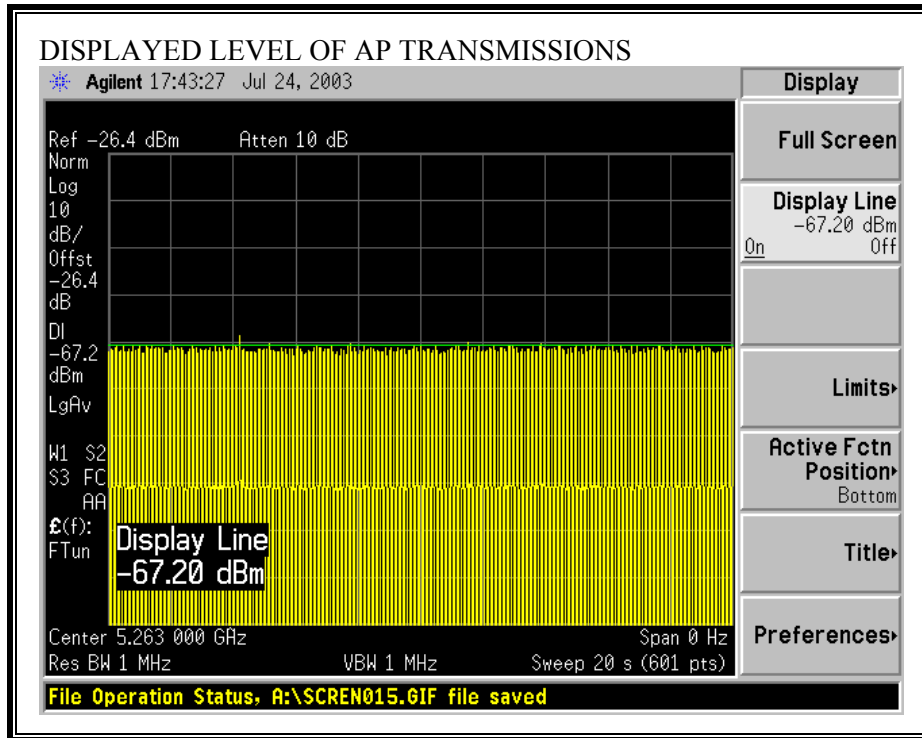
With Radar type 3 there is no AP traffic during the channel move time.

Radar Type	Channel Closing Transmission Time (ms)	Limit (ms)	Margin (ms)
1	1.68	260	258.3
2	1.4	260	258.6
3	0	260	260.0

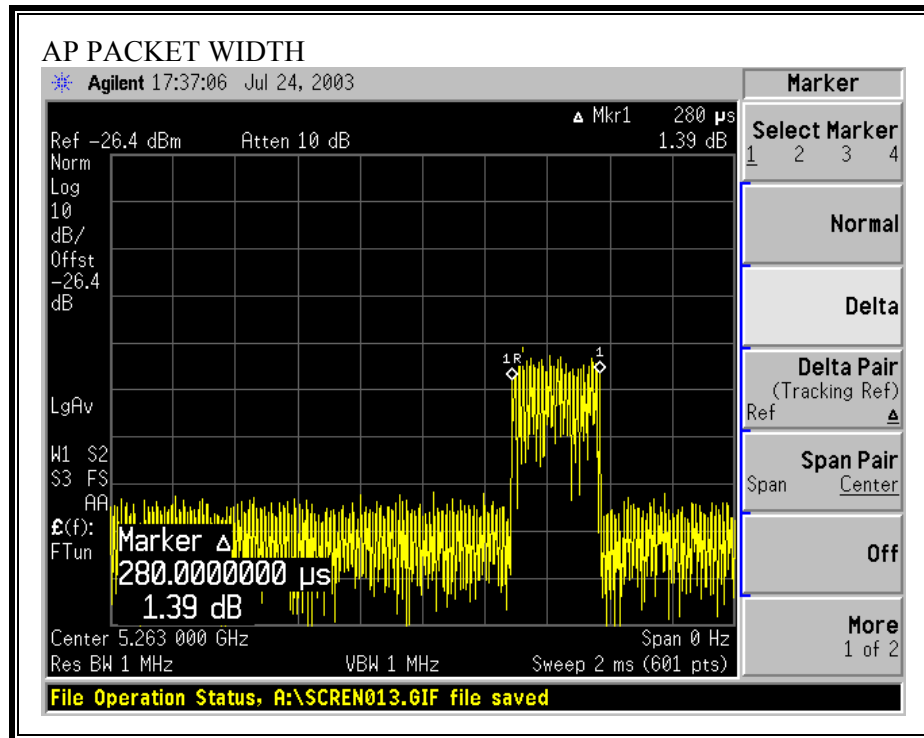
NON-OCCUPANCY PERIOD RESULTS

No EUT transmissions were observed on the previously active channel during the 30 minute observation time.

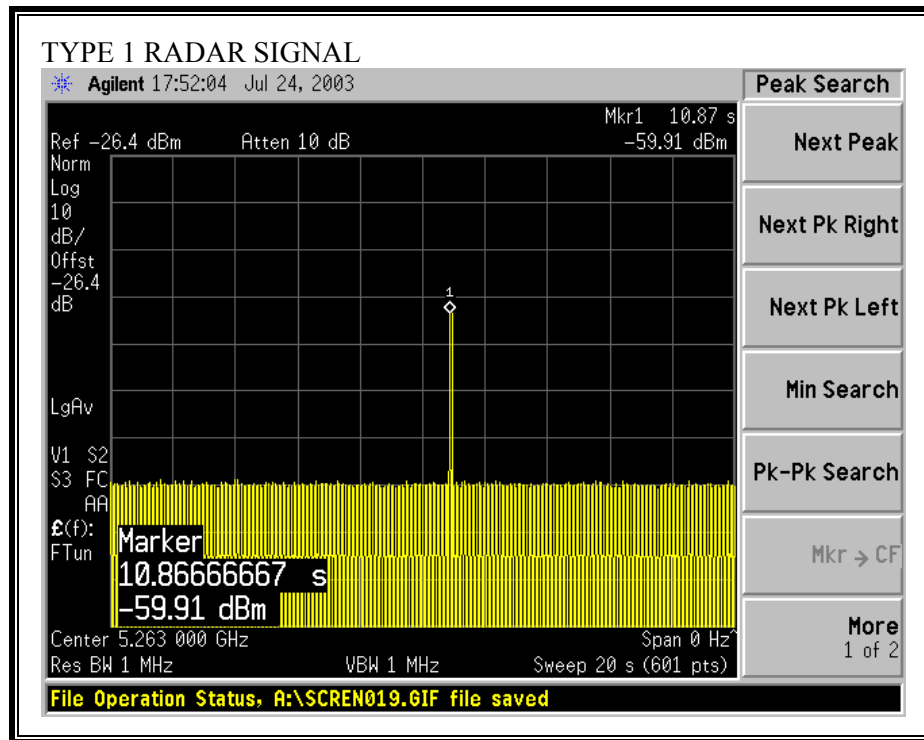
AP (MASTER) SIGNAL

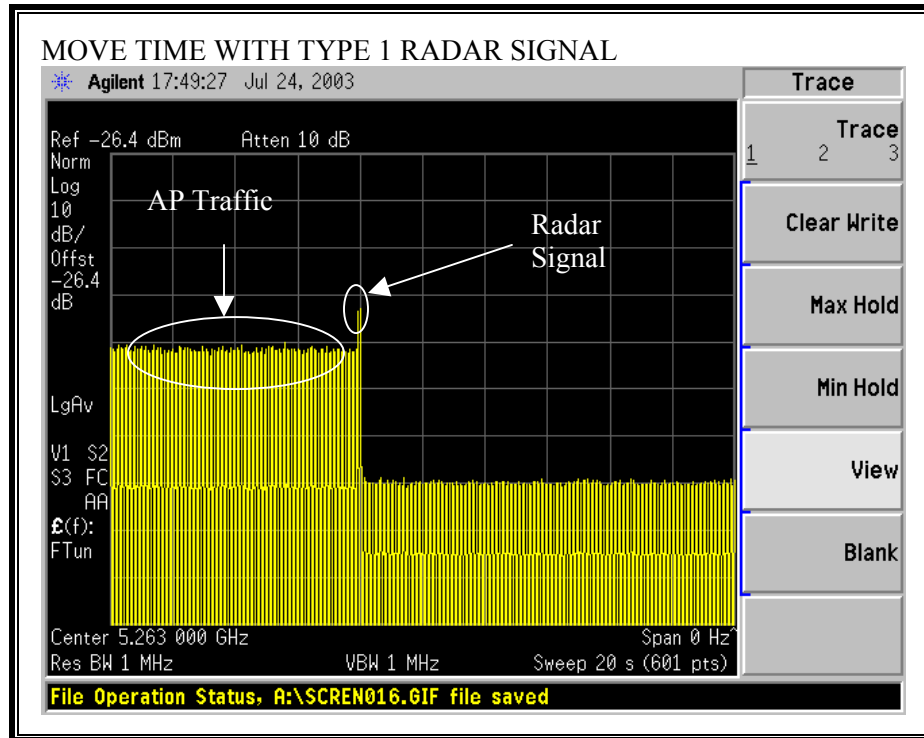


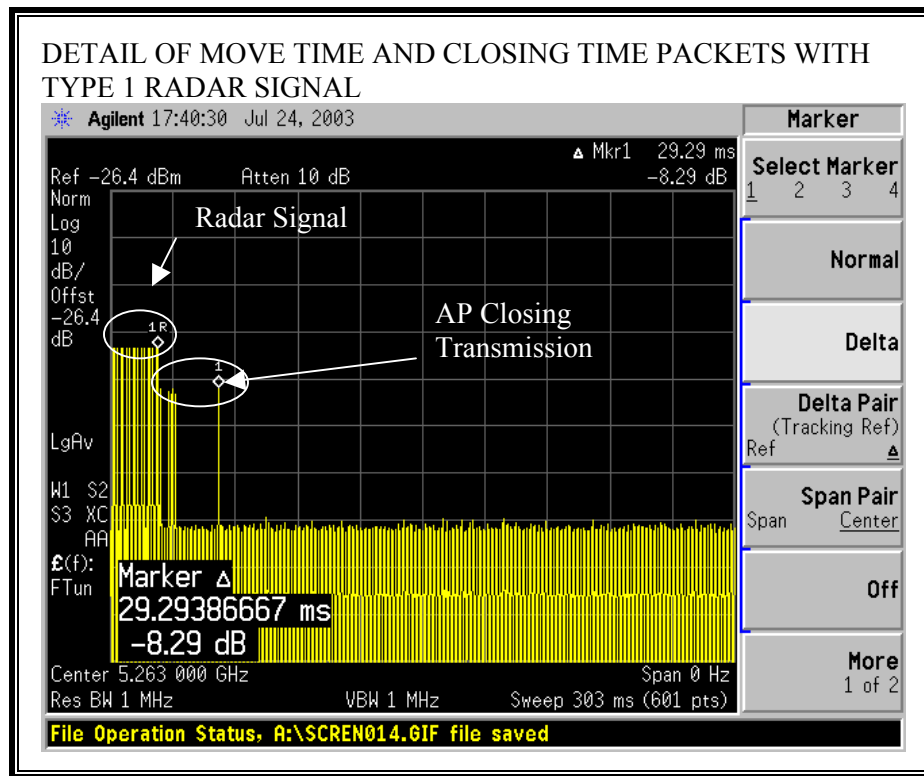
WIDTH OF SINGLE AP PACKET DURING MOVE TIME



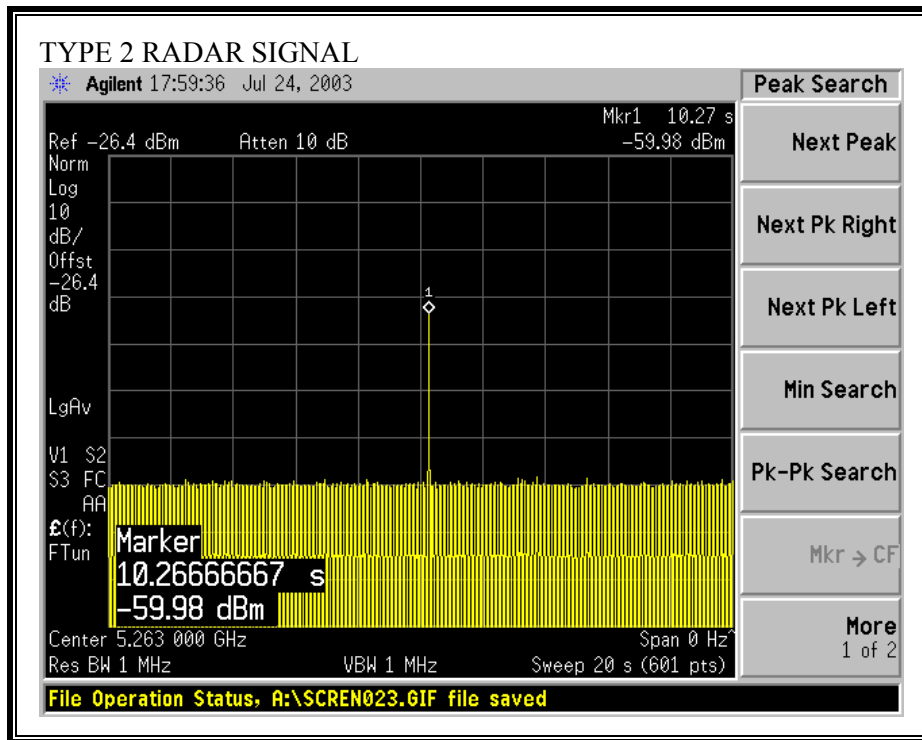
TYPE 1 RADAR SIGNAL DETECTION THRESHOLD LEVEL

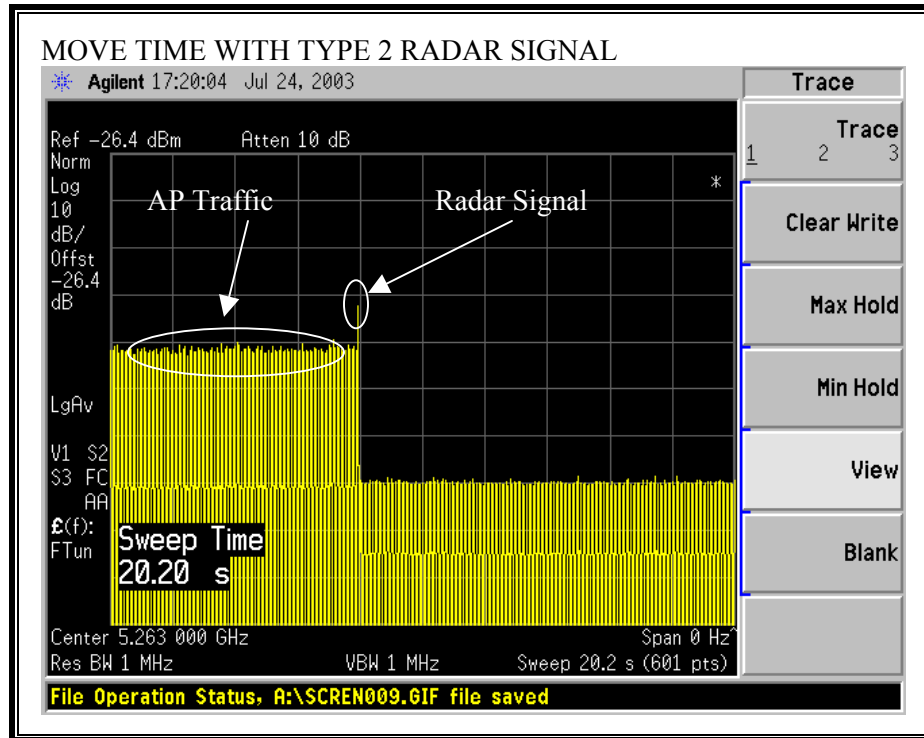


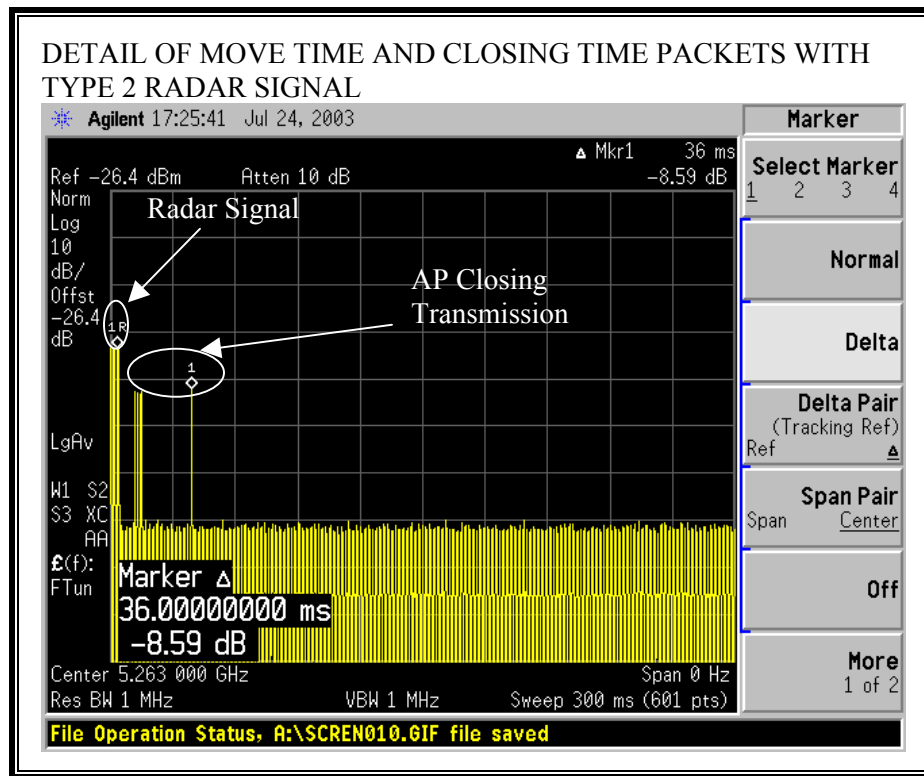




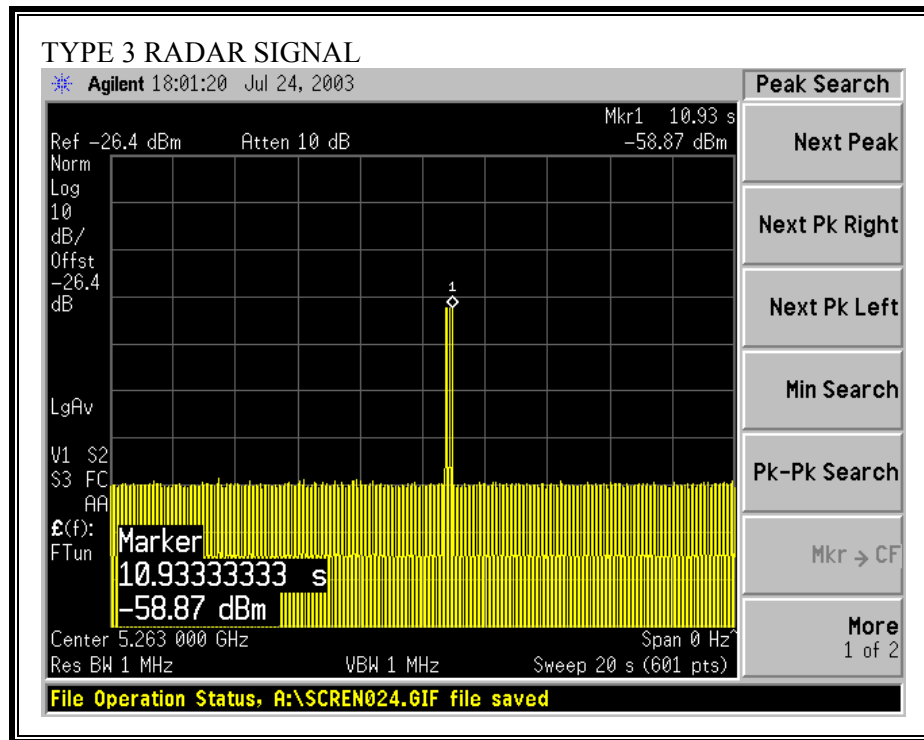
TYPE 2 RADAR SIGNAL DETECTION THRESHOLD LEVEL

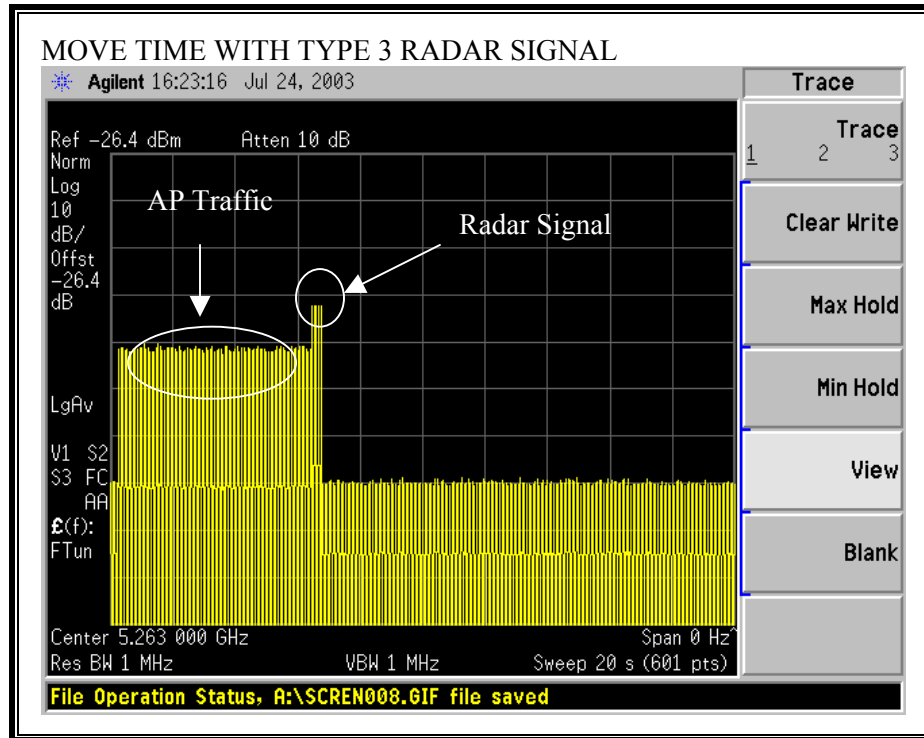


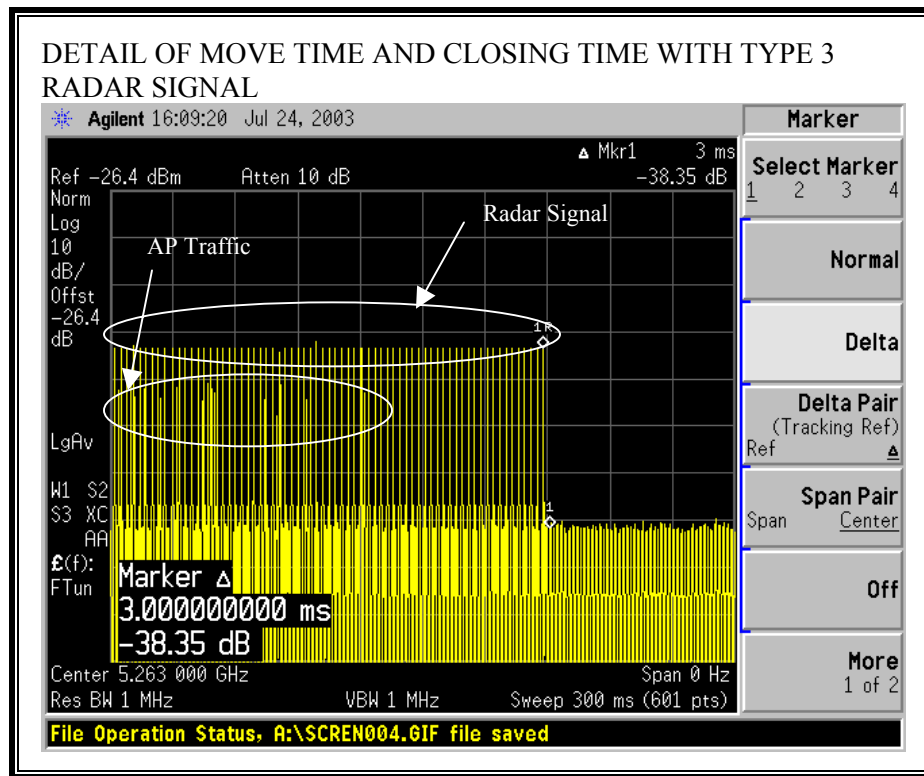




RADAR SIGNAL TYPE 3 DETECTION THRESHOLD LEVEL





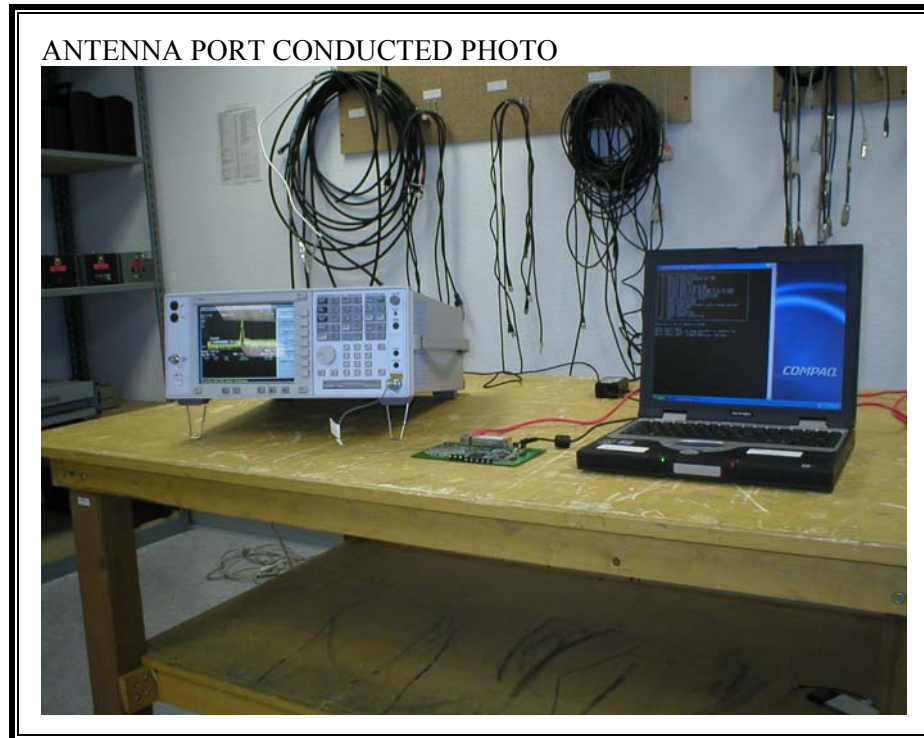


All AP traffic ceases prior to the end of the radar burst, therefore the Move Time is 0 sec and the Closing Transmission Time is 0 ms.

Note: The marker delta display of the channel move time for the Type 3 radar is limited by the time domain resolution of the spectrum analyzer display. The reference marker is set at the last spectrum analyzer “bin” of the radar signal and the delta marker is set at the first spectrum analyzer “bin” after the radar signal. Since no AP traffic is observed after the radar signal, the actual move time is 0 msec.

8. SETUP PHOTOS

RF CONDUCTED MEASUREMENT AT ANTENNA PORT



RF CONDUCTED MEASUREMENT OVER NORMAL AND EXTREME CONDITIONS



END OF REPORT