CETECOM ICT Services GmbH

Radio Satellite Communication
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Recognized by the
Federal Communications Commission and Industry Canada
Anechoic chamber registration No.: 90462 (FCC)
Anechoic chamber registration No.: 3463 (IC)
TCB ID: DE0001

Accredited by the
German Accreditation Council
DAR-Registration Number
DAT-P-176/94-D1

Accredited Bluetooth® Test Facility (BQTF)

Test report No.:	1-0778-01-02/08-A2
Applicant:	Gigaset Communications GmbH
Type:	Gigaset SX686 WIMAX 2.6 GHz
Standard:	FCC CFR 47 Part 27
FCC ID:	TVU-SX686

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1 General information

1.1 Notes

The test results of this test report relate exclusively to the test item specified in 1.5.

CETECOM ICT Services GmbH does not assume responsibility for any conclusions and generalisations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM ICT Services GmbH.

Test Laboratory Manager:

2008-11-06	Karsten Geraldy	
Date	Name	Signature

Technical responsibility for area of testing:

2008-11-06	Nicolas Stamber	
Date	Name	Signature

CETECOM
Cetecom ICT Services
Accredited Test Laboratory
Untertürkheimer Str. 6-10
D-66117 Saarbrücken

1.2 Testing laboratory

CETECOM ICT Services GmbH
Untertuerkheimer Strasse 6-10
66117 Saarbruecken
Germany

Phone	:	+ 49 (0) 681 598-0
Fax	:	+ 49 (0) 681 598-9075

State of accreditation:
The test laboratory is accredited according to DIN EN ISO/IEC 17025.
DAR-registration number: DAT-P-176/94-D1

Testing location, if different from CETECOM ICT Services GmbH: not applicable

1.3 Details of applicant

Name	:	Gigaset Communications GmbH
Street	:	Frankenstr. 2
Town	:	46395 Bocholt
Country	:	Germany
Phone	:	+49 (0) 2871 91-0
Fax	:	+49 (0) 2871 91-24 95

Contact person

Name	:	Mr. Uwe Alt
Phone	:	+49 (0) 2871 91-28 57
Fax	:	+49 (0) 2871 91 62 857
E-Mail	:	uwe.alt@siemens.com

1.4 Application details

Date of receipt of application	:	2008-10-16
Date of receipt of test item	:	2008-10-13
Date of test	:	2008-10-13 - 2008-10-20
Representations of applicant	:	Mr. Jürgen Voigt
Tes report version	:	2

Test item (EUT)

Description	:	Point to multipoint, Digital Microwave Fixed Link
Type designation	:	Gigaset SX686 WIMAX 2.6 GHz
Manufacturer	:	Gigaset Communications GmbH Frankenstr. 2 46395 Bocholt Germany

Technical data (5 MHz channel spacing)

Tx Frequency range EUT	:	2.504750 – 2.687250 GHz
Frequency EUT	:	2.504750, 2.593000, 2.687250 GHz
Channel spacing	:	5.0 MHz
Modulation	:	OFDM (with QPSK, 16QAM, 64QAM)
Radio Output Power (Average)	:	+24 dBm
Power supply U_{AC} (Nominal)	:	115.0 V
Power supply U_{AC} (Minimum)	:	97.7 V
Power supply U_{AC} (Maximum)	:	132.3 V

Technical data (10 MHz channel spacing)

Tx Frequency range EUT	:	2.507500 – 2.684500 GHz
Frequency EUT	:	2.507500, 2.596000, 2.684500 GHz
Channel spacing	:	10.0 MHz
Modulation	:	OFDM (with QPSK, 16QAM, 64QAM)
Radio Output Power (Average)	:	+24 dBm
Power supply U_{AC} (Nominal)	:	115.0 V
Power supply U_{AC} (Minimum)	:	97.7 V
Power supply U_{AC} (Maximum)	:	132.3 V

1.4.1 Operation conditions

Operation: FCC CFR 47 Part 27: Uninterrupted operation for TX

1.4.2 Equipment under test

Indoor unit

Gigaset SX686 WIMAX 2.6 GHz		

All measurements were performed with the Gigaset SX686 WIMAX 2.6 GHz with the external antenna S25015P. This combination represents the worst case.

Antenna

Name:	Product Code	Antenna gain [dBi]	cable length / attenuation
external antenna 2.5 - 2.7 GHz	S25015P	15	1 m + 2 m / 3 dB
external antenna 2.5 - 2.7 GHz	S2509P39NM	9	1 m / 1 dB

The Antenna S25015P comes with a fixed 1 m cable plus an additional 2 m piece.

1.5 Test standards

FEDERAL COMMUNICATIONS COMMISSION

CFR 47 Part 27 2007-10-01 Subpart C – Technical standards

1.6 Technical test

1.6.1 Summary of test results:

Remarks on the RF tests carried out during the assessment:

Complete RF tests for all mandatory Tx parameters.

The test report:

- [X] describes the first test
- [ ] describes an additional test
- [ ] is a verification of documents
- [ ] is only valid with the test report no.:

1.6.2 Test environment

The environmental conditions are documented especially for each test.

Normal conditions:	Temperature	+22.0 °C
	Humidity	50.0 %

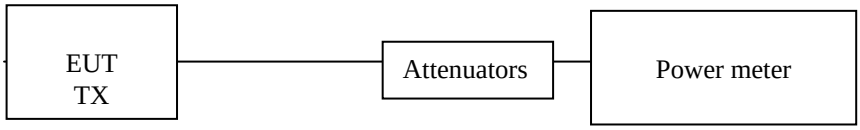
1.6.3 Measurement and test set-up

The measurement and test set-up is defined in the technical specification FCC.

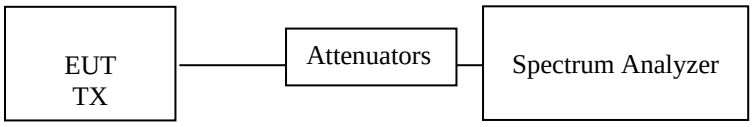
Measurement uncertainties:	Power	± 0.4 dB
	Frequency	± 0.01ppm
	Spectrum masks	± 0.4 dB; ± 0.01ppm
	Spurious emissions	± 1.4 dB; ± 0.01ppm

Test set-up

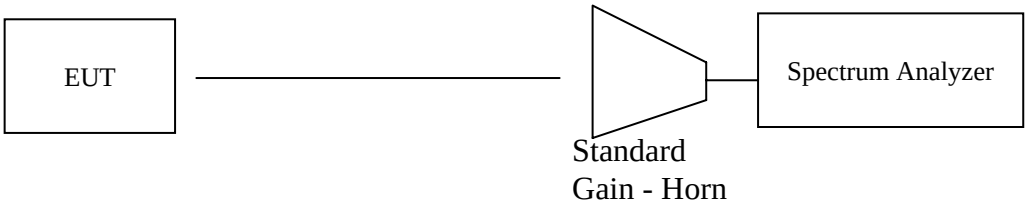
No. 1



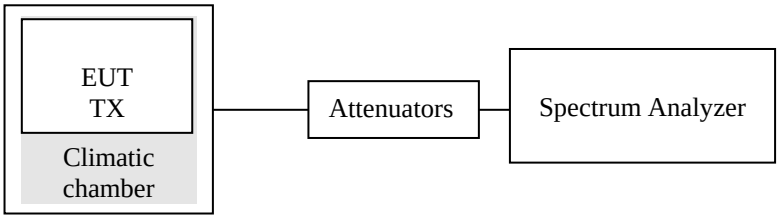
No. 2



No. 3



No. 4



1.6.4 Test equipment utilized

Test equipment	Manufacturer	Type	CETECOM Ref. No.
Spectrum analyser	Agilent	E4440A	300003812
Power meter	Hewlett Packard	E4419B	300002627
Power sensor	Hewlett Packard	R8485A	300001668
Climatic test chambers	Vötsch	VUK 04/500	300000297
Spectrum analyser	HP	HP 85660B	300000999
Analyser display	HP	HP 85662A	300002297
Quasi peak adapter	HP	HP 85650A	30000999a
RF-preselector	HP	HP 85685A	300001000
Biconical antenna	Emco	3104	300001603a
Log.-per.-antenna	Emco	3146	300001603b
Double ridge horn	Emco	3115	300001603c
Amplifier	Tron-Tech	P42-GA29	300001040
Amplifier	Hewlett Packard	83017A	300002268
Standard Gain Horn	Narda	639	300000786
Standard Gain Horn	Narda	638	300000785
Power supply	Hewlett Packard	6038A	300001174
Power supply	Zentro Elektrik	6032A	300000501
Power supply	Zentro Elektrik	6032A	300000505
Power controller	Fluke	45	300001532
RF-cable	Hewlett Packard	5061-5359	300002033
RF-cable	Insulated Wire Inc.	2-PS1401-788-2PS	300002855

1.7 Test results

1.7.1 Test result overview

This test was performed:

☐ in addition to the test report no.:

Verification of EUT:

☒ EUT is in accordance with the technical description

☐ EUT is not in accordance with the technical description

1.7.2 Test details

- Transmitter characteristics 5 MHz…….. 11
  - Conducted Output Power……..... 11
- Transmitter characteristics 10 MHz.……..... 12
  - Conducted Output Power……..... 12
- Occupied bandwidth…….…….. 13
- Spurious emissions at antenna terminals…… 17
  - 5 MHz channel spacing…….. 17
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  - 5 MHz channel spacing…….. 37
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- Frequency Stability……. 51
  - 5 MHz channel spacing…….. 51
  - 10 MHz channel spacing…… 57
- RF Exposure /Safety…….. 63

CFR 47 Part 2.1046 Measurements required: RF power output
CFR 47 Part 27.50 Power and antenna height limits, subpart (h)

Transmitter characteristics: 5 MHz channel spacing

Conducted output power

Measurement conditions:

Frequency	f_{min}	= 2.504750 GHz
Frequency	f_{nom}	= 2.593000 GHz
Frequency	f_{max}	= 2.687250 GHz
Channel spacing	CS	= 5.0 MHz
Modulation	D	= QPSK, 16QAM, 64QAM
Temperature	t	= see table
Power supply	U_{AC}	= see table
Measurement at	C'	

Test set-up: see page 8 / no. 1

Limit: 2 Watt / 33 dBm

Test measurement:

U_{Aa}	T	Modulation	Frequency	RF power
[V]	[°C]	[°C]	[GHz]	[dBm]
115.0	+22.0	QPSK	2.504750	23.7
115.0	+22.0	QPSK	2.593000	23.6
115.0	+22.0	QPSK	2.687250	23.3
115.0	+22.0	16QAM	2.504750	23.5
115.0	+22.0	16QAM	2.593000	23.4
115.0	+22.0	16QAM	2.687250	23.1
115.0	+22.0	64QAM	2.504750	23.5
115.0	+22.0	64QAM	2.593000	23.2
115.0	+22.0	64QAM	2.687250	22.9

Test result: Passed: [X] Failed: [ ]

CFR 47 Part 2.1046 Measurements required: RF power output
CFR 47 Part 27.50 Power and antenna height limits, subpart (h)

Transmitter characteristics: 10 MHz channel spacing

Conducted output power

Measurement conditions:

Frequency	f_{min}	= 2.507500 GHz
Frequency	f_{nom}	= 2.596000 GHz
Frequency	f_{max}	= 2.684500 GHz
Channel spacing	CS	= 10.0 MHz
Modulation	D	= QPSK, 16QAM, 64QAM
Temperature	t	= see table
Power supply	U_{AC}	= see table
Measurement at	C'	

Test set-up: see page 8 / no. 1

Limit: 2 Watt / 33 dBm

Test measurement:

U_{AC}	T	Modulation	Frequency	RF power
[V]	[°C]	[°C]	[GHz]	[dBm]
115.0	+22.0	QPSK	2.507500	23.6
115.0	+22.0	QPSK	2.596000	23.3
115.0	+22.0	QPSK	2.684500	22.8
115.0	+22.0	16QAM	2.507500	23.4
115.0	+22.0	16QAM	2.596000	22.8
115.0	+22.0	16QAM	2.684500	22.6
115.0	+22.0	64QAM	2.507500	23.2
115.0	+22.0	64QAM	2.596000	22.9
115.0	+22.0	64QAM	2.684500	22.4

Test result: Passed: [X] Failed: [ ]

CFR 47 Part 2.1049 Measurements required: Occupied bandwidth
CFR 47 Part 27.53 Emission limits, subpart (l) (6)

Transmitter characteristics: 5 / 10 MHz channel spacing

Measurement conditions:

Frequency	f_{nom}	= 2.593 GHz / 2.596 GHz
Channel spacing	CS	= 5.0 MHz / 10.0 MHz
Modulation	D	= QPSK, 16QAM, 64QAM
Temperature	t	= see table
Power supply	U_{AC}	= see table
Measurement at	C'	

Test set-up: see page 8 / no. 2

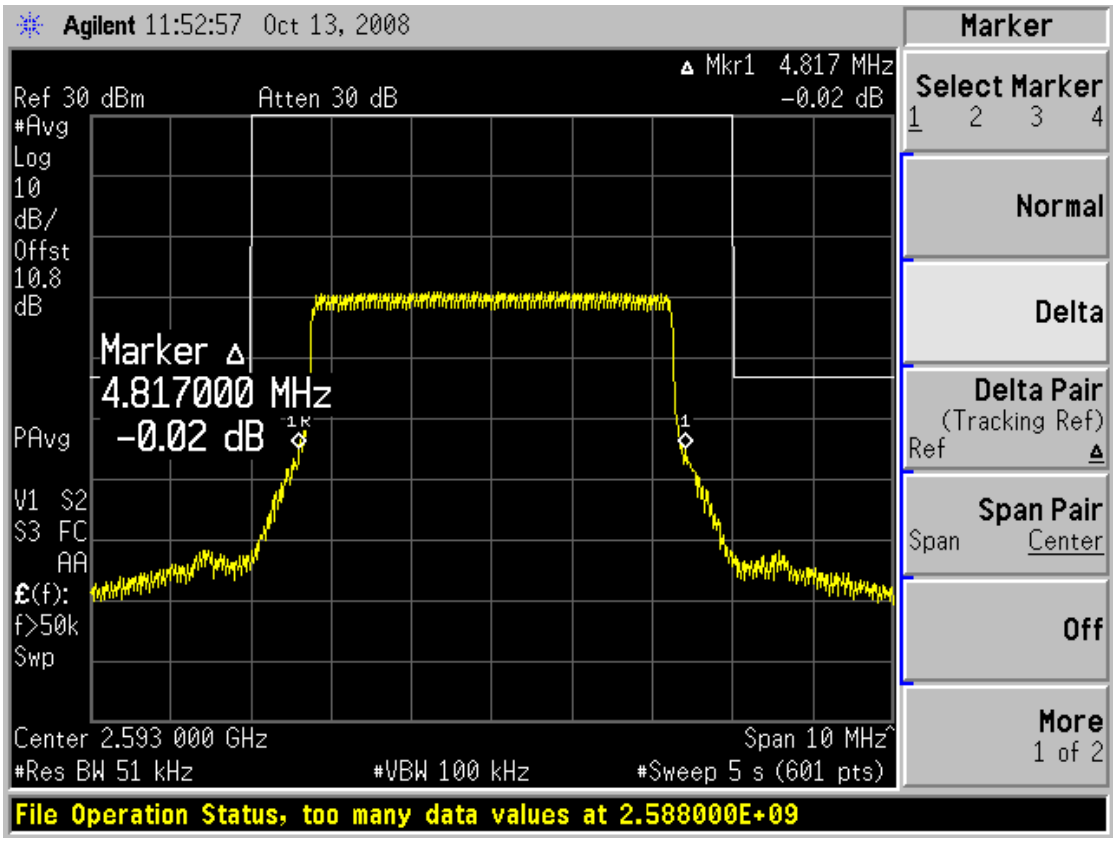
Limit: see plots

Test measurement:

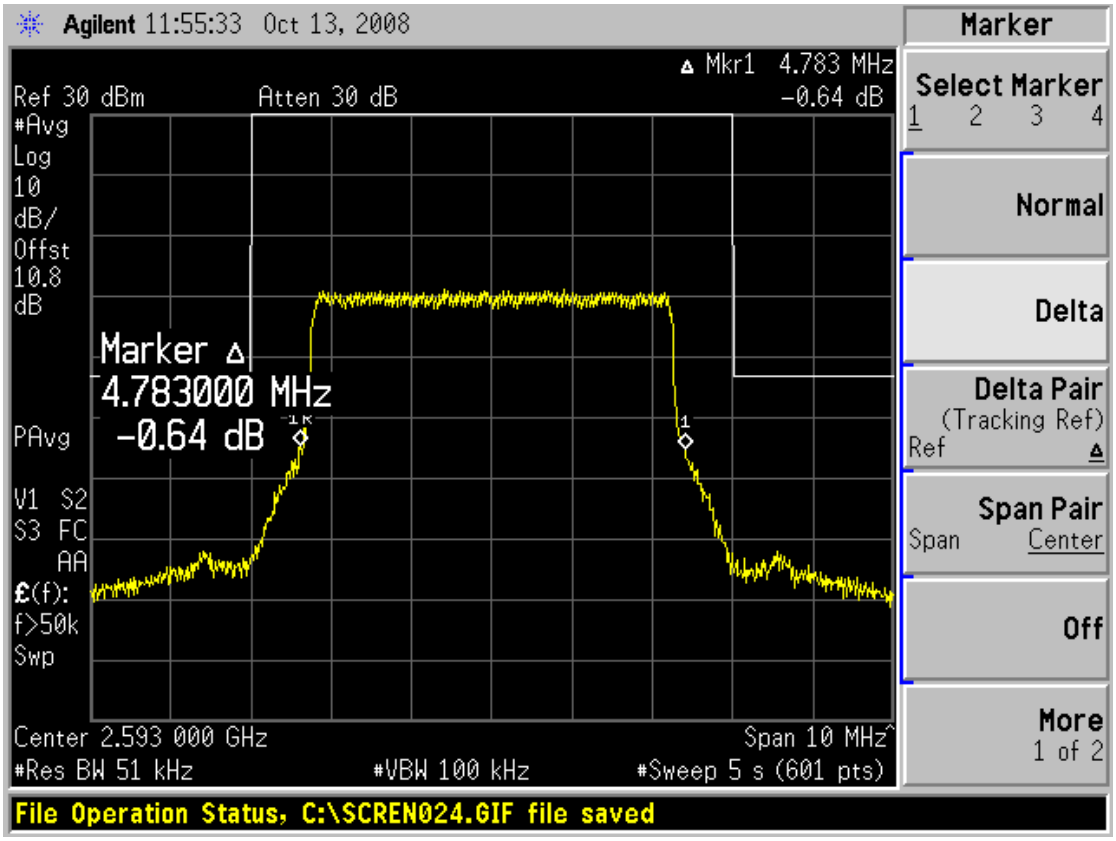
U_{AC}	T	Channel spacing	Modulation	Frequency	Occupied bandwidth	Plot
[V]	[°C]	[MHz]	[°C]	[GHz]	[MHz]	
115.0	+22.0	5	QPSK	2.593000	4.817	1
115.0	+22.0	5	16QAM	2.593000	4.783	2
115.0	+22.0	5	64QAM	2.593000	4.767	3
115.0	+22.0	10	QPSK	2.596000	9.700	4
115.0	+22.0	10	16QAM	2.596000	9.600	5
115.0	+22.0	10	64QAM	2.596000	9.570	6

Test result: Passed: [X] Failed: [ ]

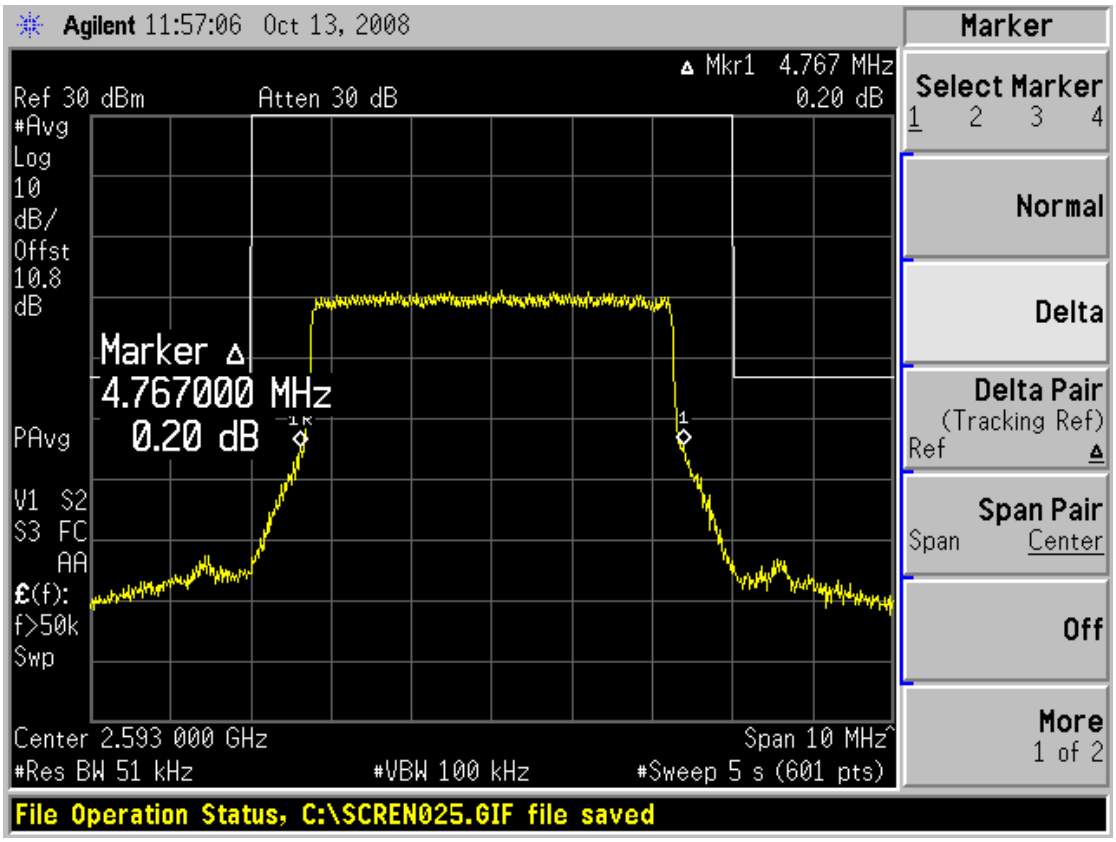
Plot 1:


Agilent 11:52:57 Oct 13, 2008
Marker
Mkr1 4.817 MHz
Ref 30 dBm
Atten 30 dB
-0.02 dB
#Avg
Log
10
dB/
Offst
10.8
dB
Marker Δ
4.817000 MHz
-0.02 dB
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Center 2.593 000 GHz
Span 10 MHz
#Res BW 51 kHz
#VBW 100 kHz
#Sweep 5 s (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, too many data values at 2.588000E+09

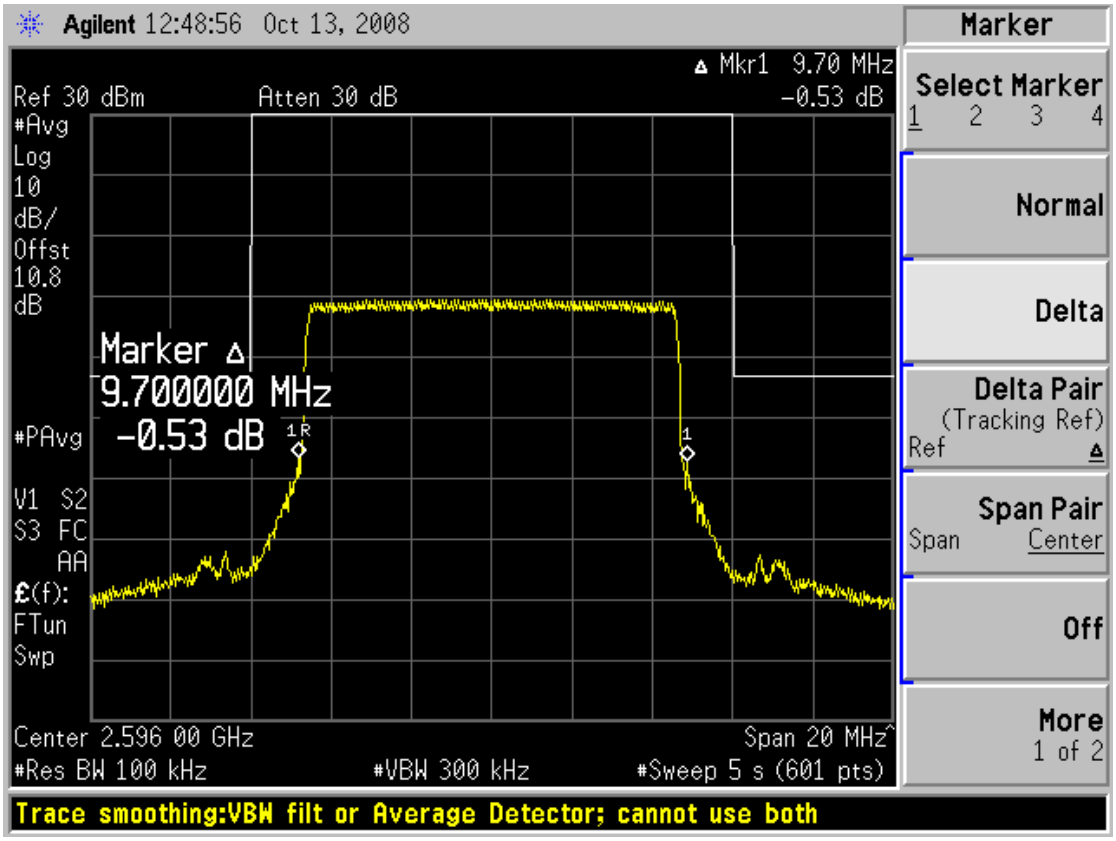
Plot 2:


Agilent 11:55:33 Oct 13, 2008
Marker
Mkr1 4.783 MHz
Ref 30 dBm
Atten 30 dB
-0.64 dB
#Avg
Log
10
dB/
Offst
10.8
dB
Marker Δ
4.783000 MHz
-0.64 dB
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Center 2.593 000 GHz
Span 10 MHz
#Res BW 51 kHz
#VBW 100 kHz
#Sweep 5 s (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, C:\SCREN024.GIF file saved

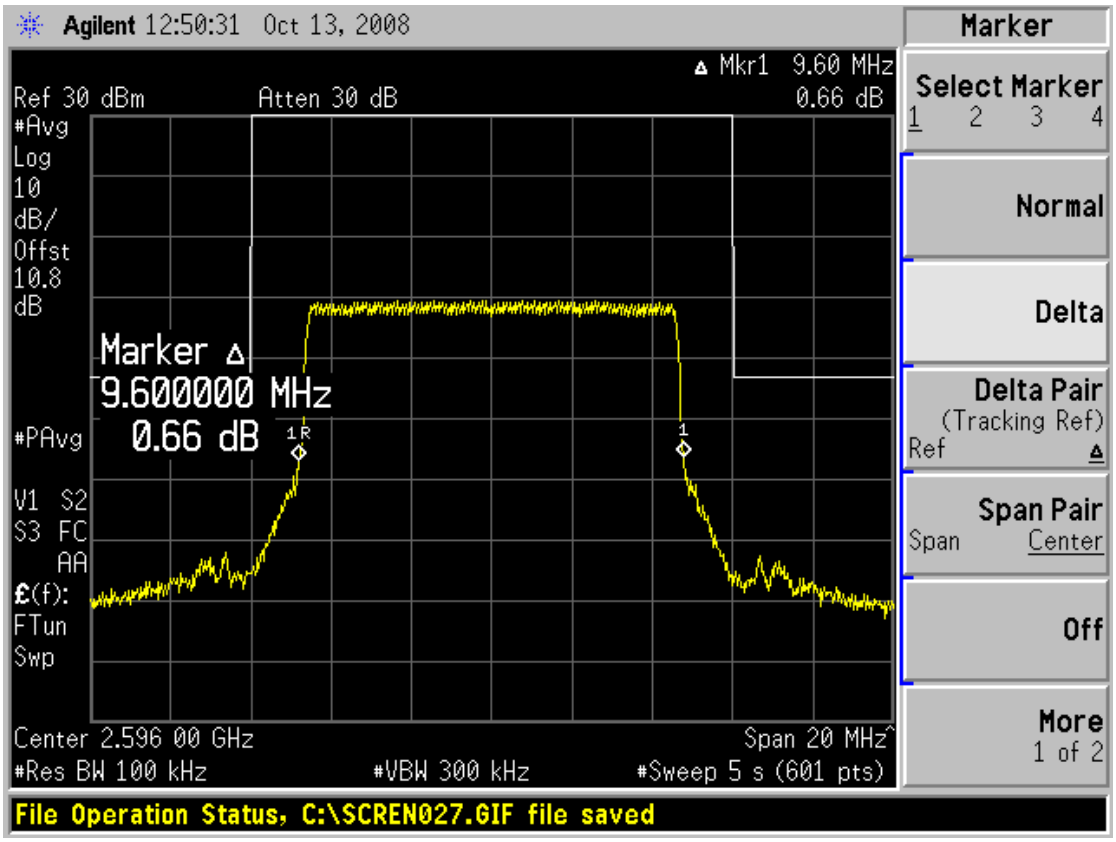
Plot 3:


Agilent 11:57:06 Oct 13, 2008
Marker
Mkr1 4.767 MHz
0.20 dB
Ref 30 dBm
Atten 30 dB
#Avg
Log
10
dB/
Offst
10.8
dB
Marker Δ
4.767000 MHz
0.20 dB
PAvg
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Center 2.593 000 GHz
Span 10 MHz
#Res BW 51 kHz
#VBW 100 kHz
#Sweep 5 s (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, C:\SCREN025.GIF file saved

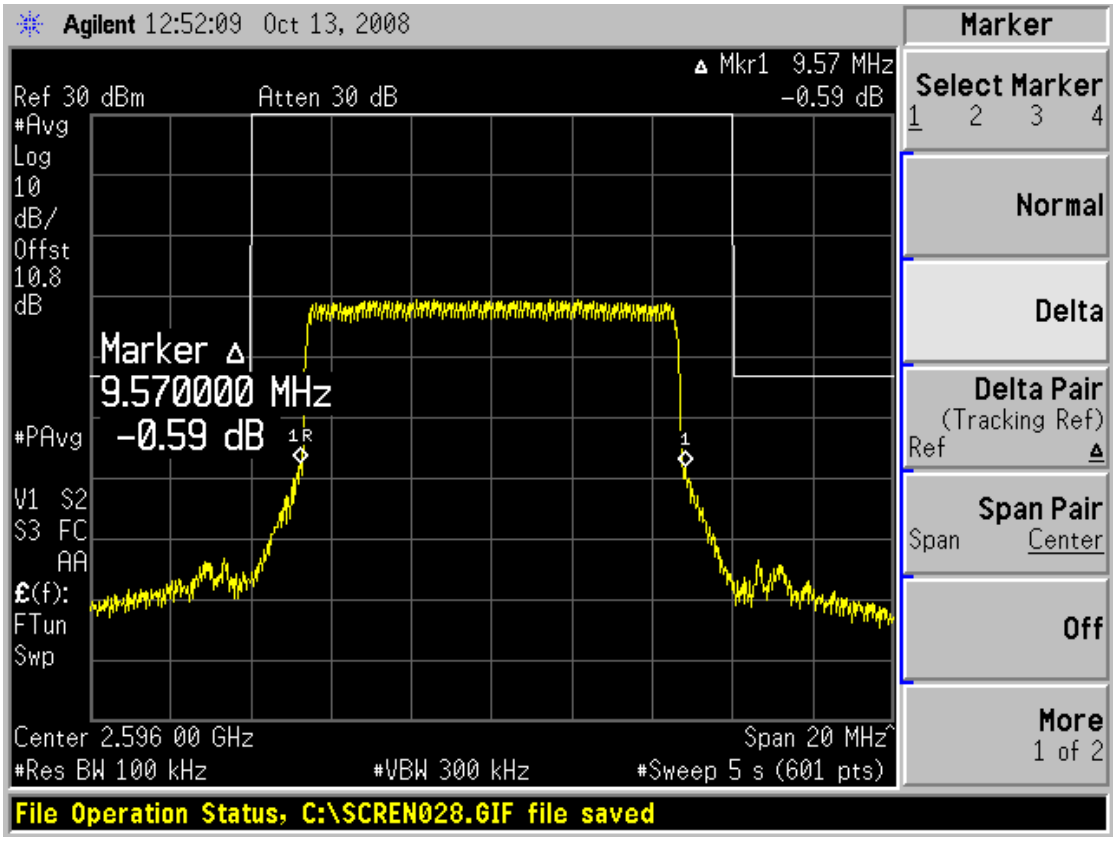
Plot 4:


Agilent 12:48:56 Oct 13, 2008
Marker
Mkr1 9.70 MHz
-0.53 dB
Ref 30 dBm
Atten 30 dB
#Avg
Log
10
dB/
Offst
10.8
dB
Marker Δ
9.700000 MHz
-0.53 dB
#PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 2.596 00 GHz
Span 20 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 s (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Trace smoothing:VBW filt or Average Detector; cannot use both

Plot 5:


Agilent 12:50:31 Oct 13, 2008
Marker
Mkr1 9.60 MHz
0.66 dB
Ref 30 dBm
Atten 30 dB
#Avg
Log
10
dB/
Offst
10.8
dB
Marker Δ
9.600000 MHz
0.66 dB
#PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 2.596 00 GHz
Span 20 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 s (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, C:\SCREN027.GIF file saved

Plot 6:


Agilent 12:52:09 Oct 13, 2008
Marker
Mkr1 9.57 MHz
-0.59 dB
Ref 30 dBm
Atten 30 dB
#Avg
Log
10
dB/
Offst
10.8
dB
Marker Δ
9.570000 MHz
-0.59 dB
#PAvg
V1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 2.596 00 GHz
Span 20 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 s (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, C:\SCREN028.GIF file saved

CFR 47 Part 2.1051 Measurements required: Spurious emissions at antenna terminals
CFR 47 Part 27.53 Emission limits, subpart (l) (2)

Transmitter characteristics: 5 MHz channel spacing

Measurement conditions:

Frequency	f_{min}	= 2.504750 GHz
Frequency	f_{nom}	= 2.593000 GHz
Frequency	f_{max}	= 2.687250 GHz
Channel spacing	CS	= 5.0 MHz
Modulation	D	= QPSK, 16QAM, 64QAM
Temperature	t	= +22.0 °C
Nominal power supply	U_{AC}	= 115.0 V
Measurement at	C'	

Test set-up: see page 8 / no. 2

Limit: see table

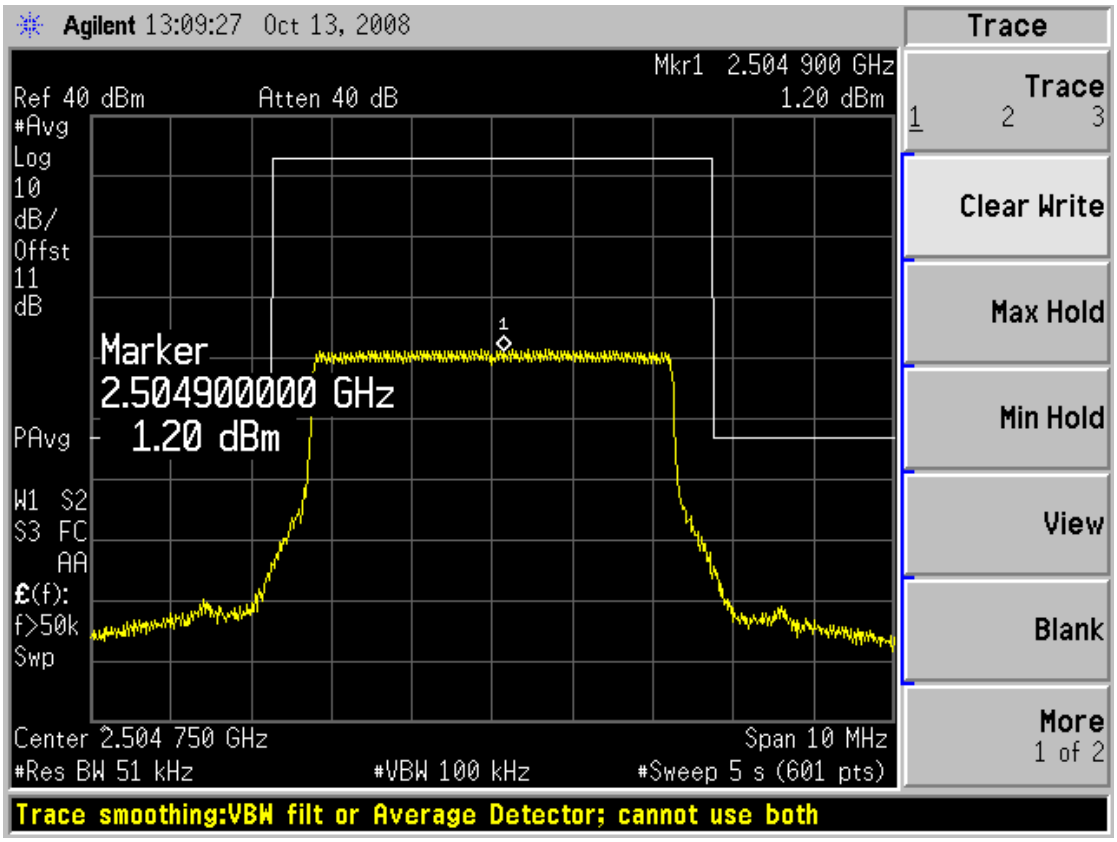
Test measurement:

Frequency Range [GHz]	$f_{carrier}$ [GHz]	Modulation	Limit [dBm]	Res. BW [MHz]	Spurious Frequency [GHz]	Emissions P [dBm]	see plot no.
0.030 – 27.000	2.504750	QPSK	-13.0	1.0	n.f.	< limit	7 / 8
0.030 – 27.000	2.593000	QPSK	-13.0	1.0	n.f.	< limit	9 / 10
0.030 – 27.000	2.687250	QPSK	-13.0	1.0	n.f.	< limit	11 / 12
0.030 – 27.000	2.504750	16QAM	-13.0	1.0	n.f.	< limit	13 / 14
0.030 – 27.000	2.593000	16QAM	-13.0	1.0	n.f.	< limit	15 / 16
0.030 – 27.000	2.687250	16QAM	-13.0	1.0	n.f.	< limit	17 / 18
0.030 – 27.000	2.504750	64QAM	-13.0	1.0	n.f.	< limit	19 / 20
0.030 – 27.000	2.593000	64QAM	-13.0	1.0	n.f.	< limit	21 / 22
0.030 – 27.000	2.687250	64QAM	-13.0	1.0	n.f.	< limit	23 / 24

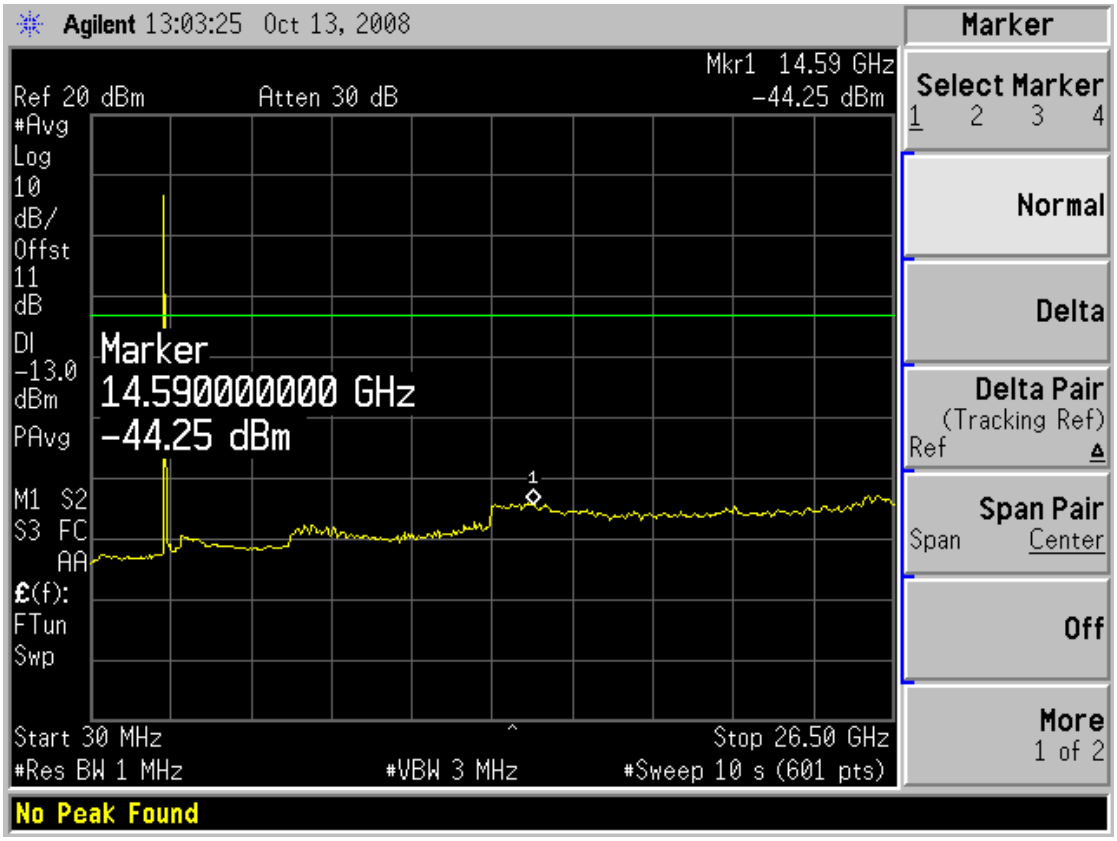
n.f. = nothing found

Test result: Passed: [X] Failed: [ ]

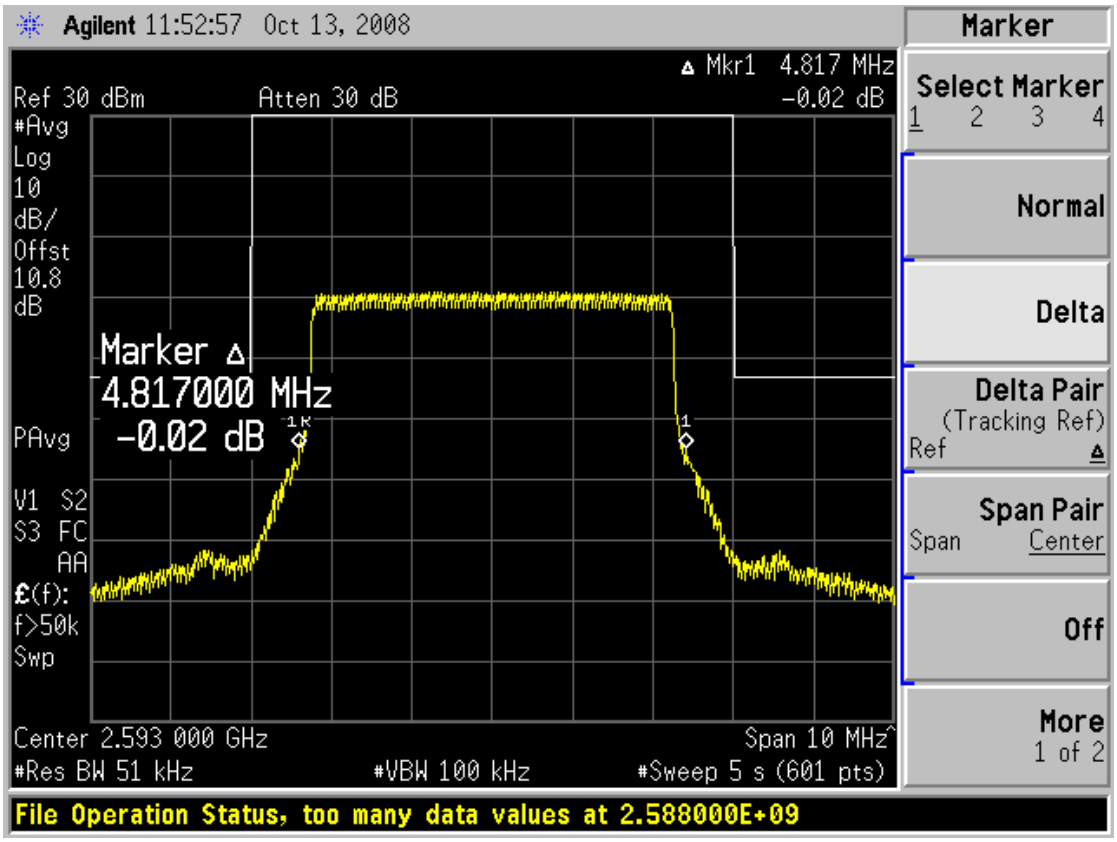
Plot 7:


Agilent 13:09:27 Oct 13, 2008
Trace
Mkr1 2.504 900 GHz
Ref 40 dBm
Atten 40 dB
1.20 dBm
#Avg
Log
10
dB/
Offst
11
dB
Marker
2.504900000 GHz
1.20 dBm
PAvg
W1 S2
S3 FC
AA
£(f):
f>50k
Swp
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
More
1 of 2
Center 2.504 750 GHz
Span 10 MHz
#Res BW 51 kHz
#VBW 100 kHz
#Sweep 5 s (601 pts)
Trace smoothing:VBW filt or Average Detector; cannot use both

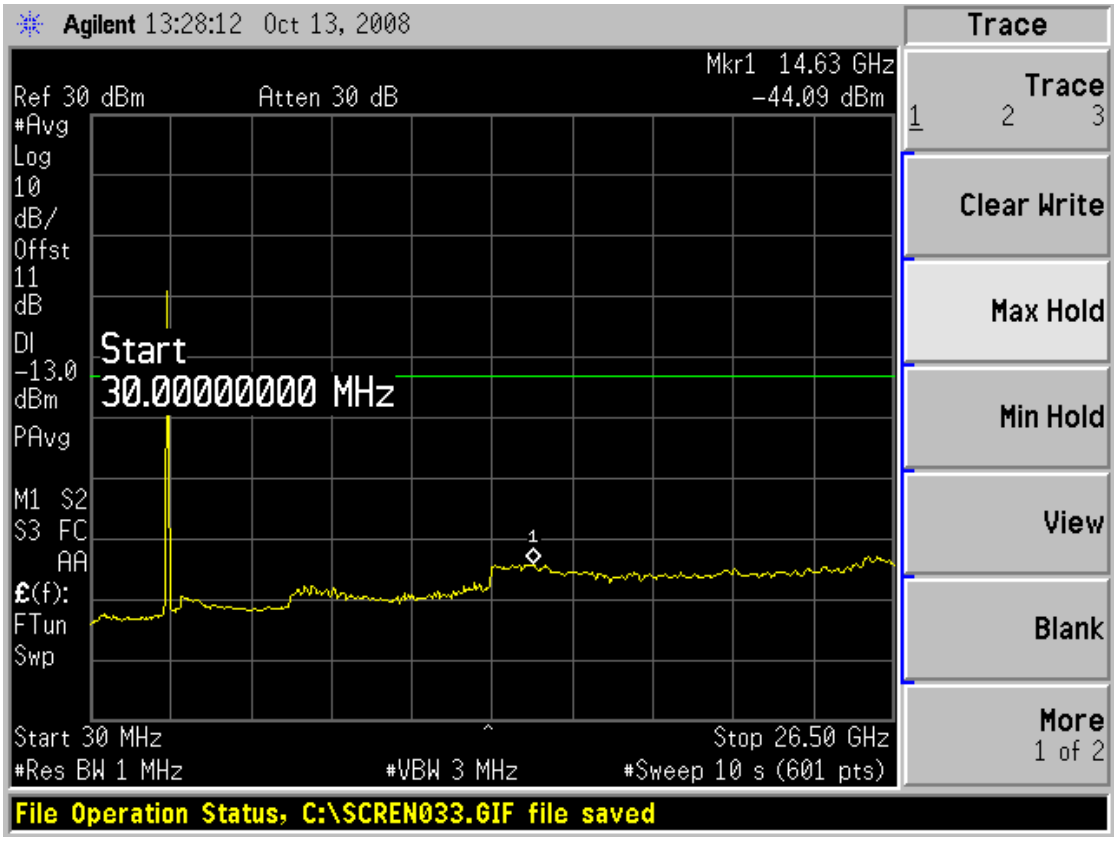
Plot 8:


Agilent 13:03:25 Oct 13, 2008
Marker
Mkr1 14.59 GHz
Ref 20 dBm
Atten 30 dB
-44.25 dBm
#Avg
Log
10
dB/
Offst
11
dB
Dl
-13.0
dBm
Marker
14.590000000 GHz
-44.25 dBm
PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Start 30 MHz
Stop 26.50 GHz
#Res BW 1 MHz
#VBW 3 MHz
#Sweep 10 s (601 pts)
No Peak Found

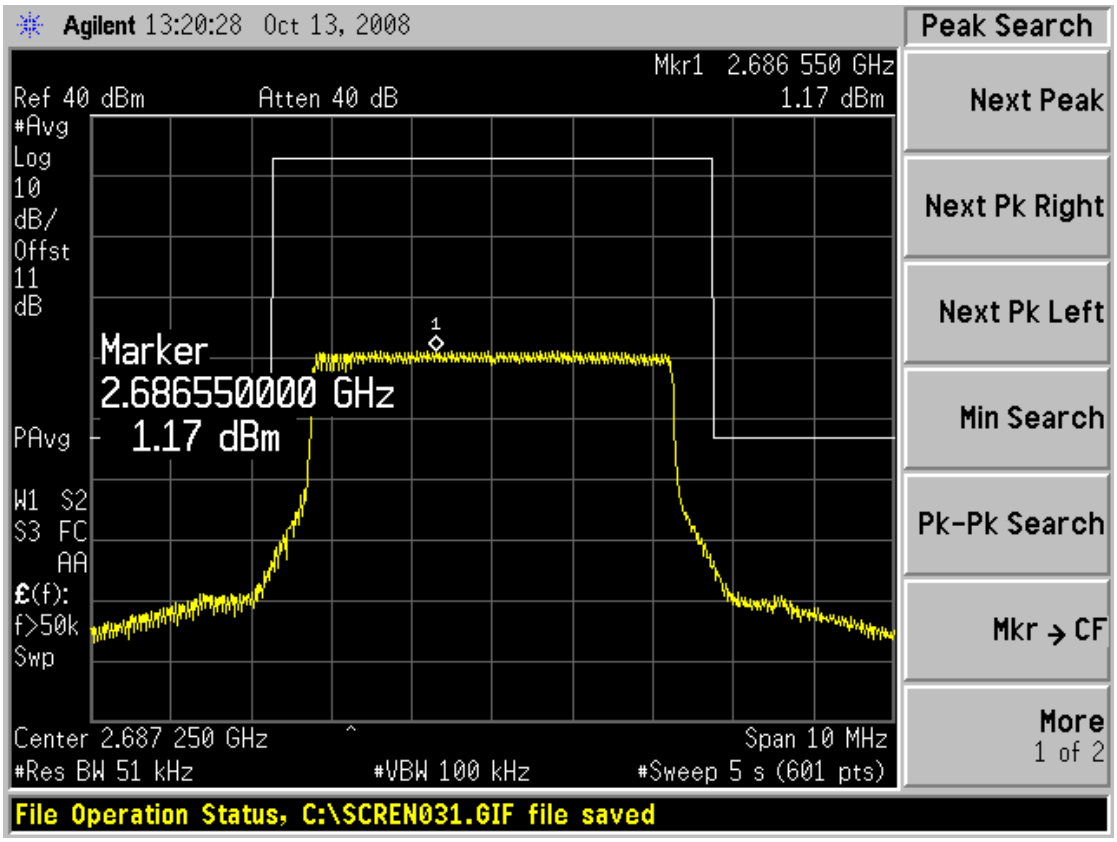
Plot 9:



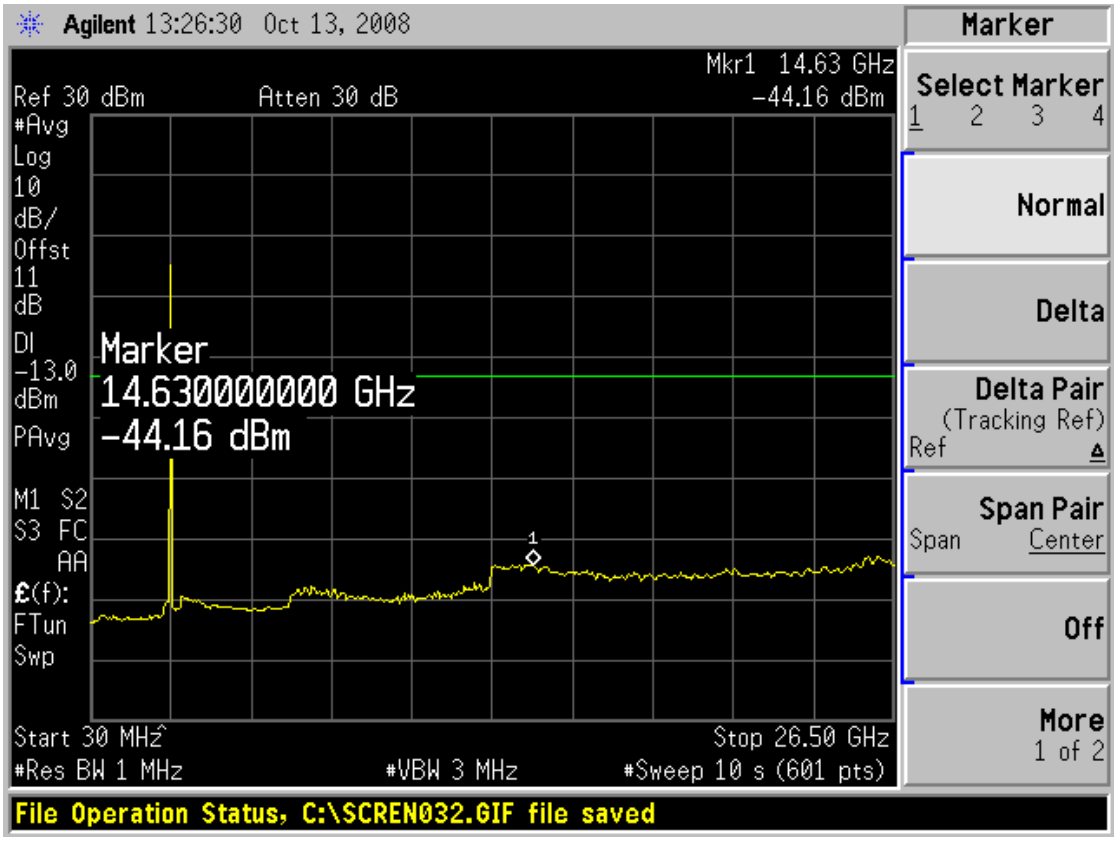
Plot 10:



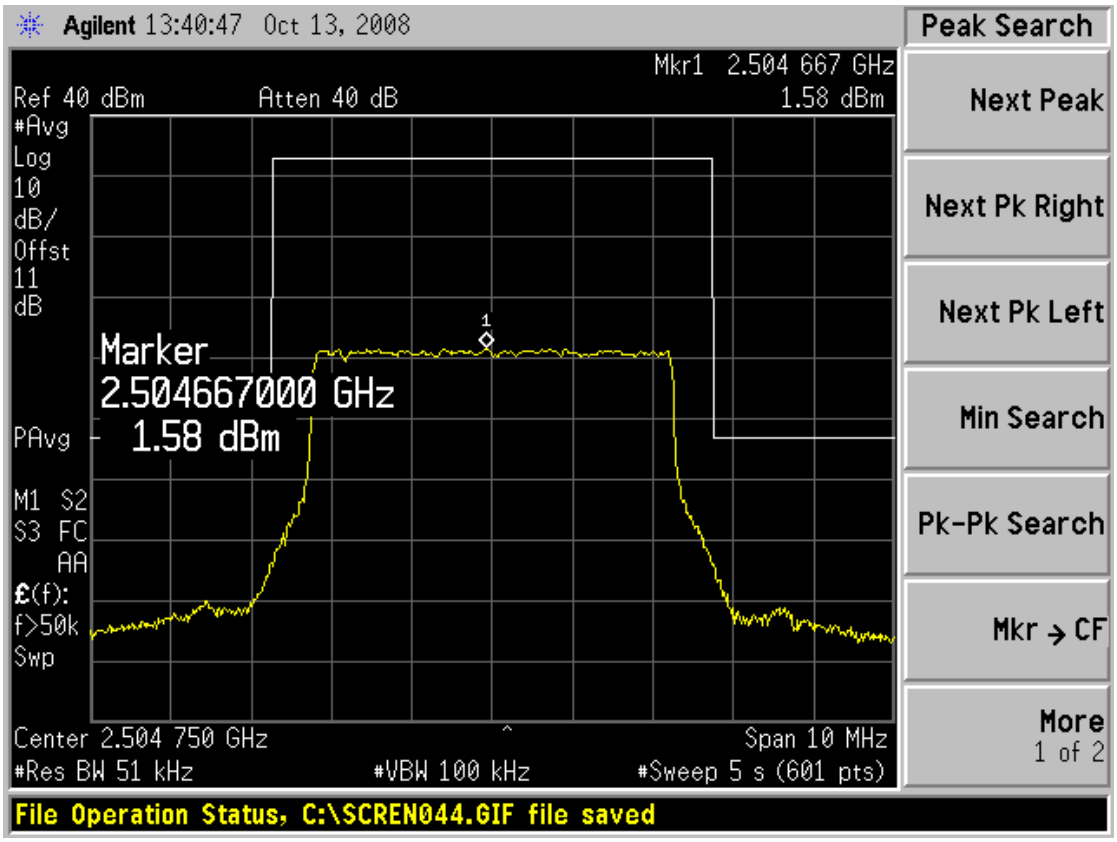
Plot 11:



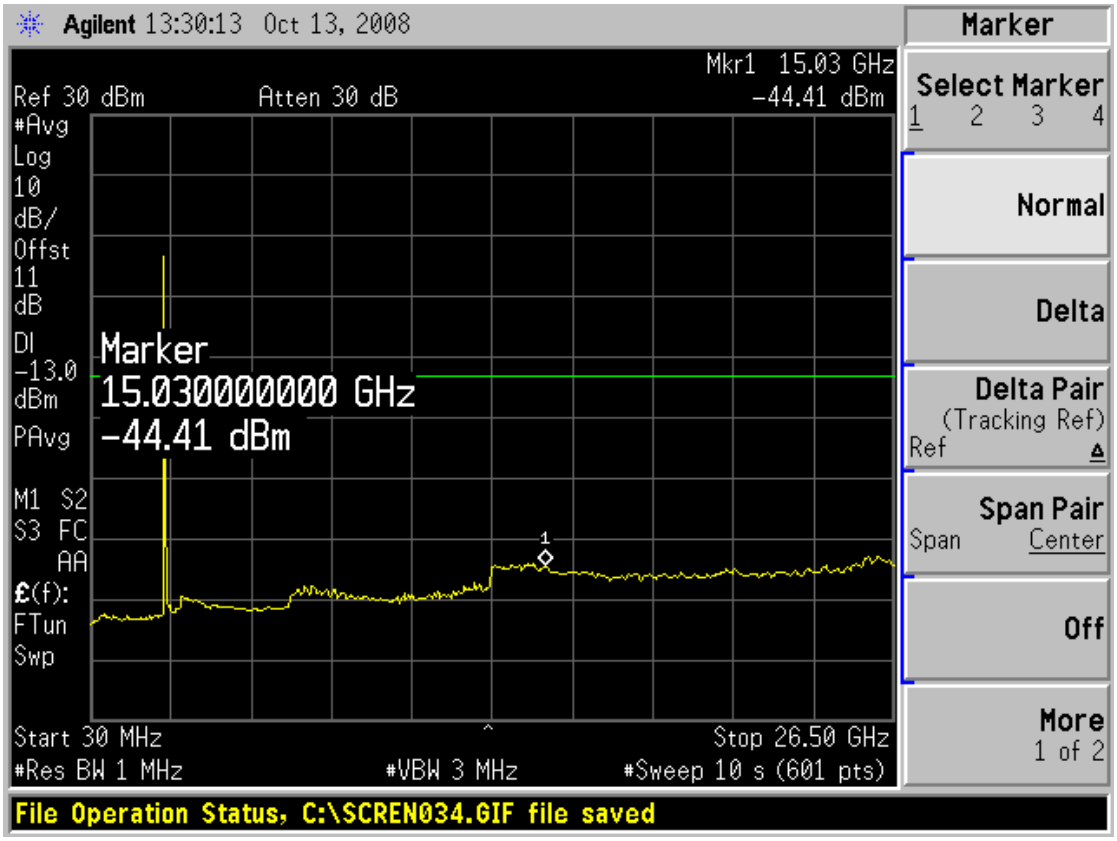
Plot 12:



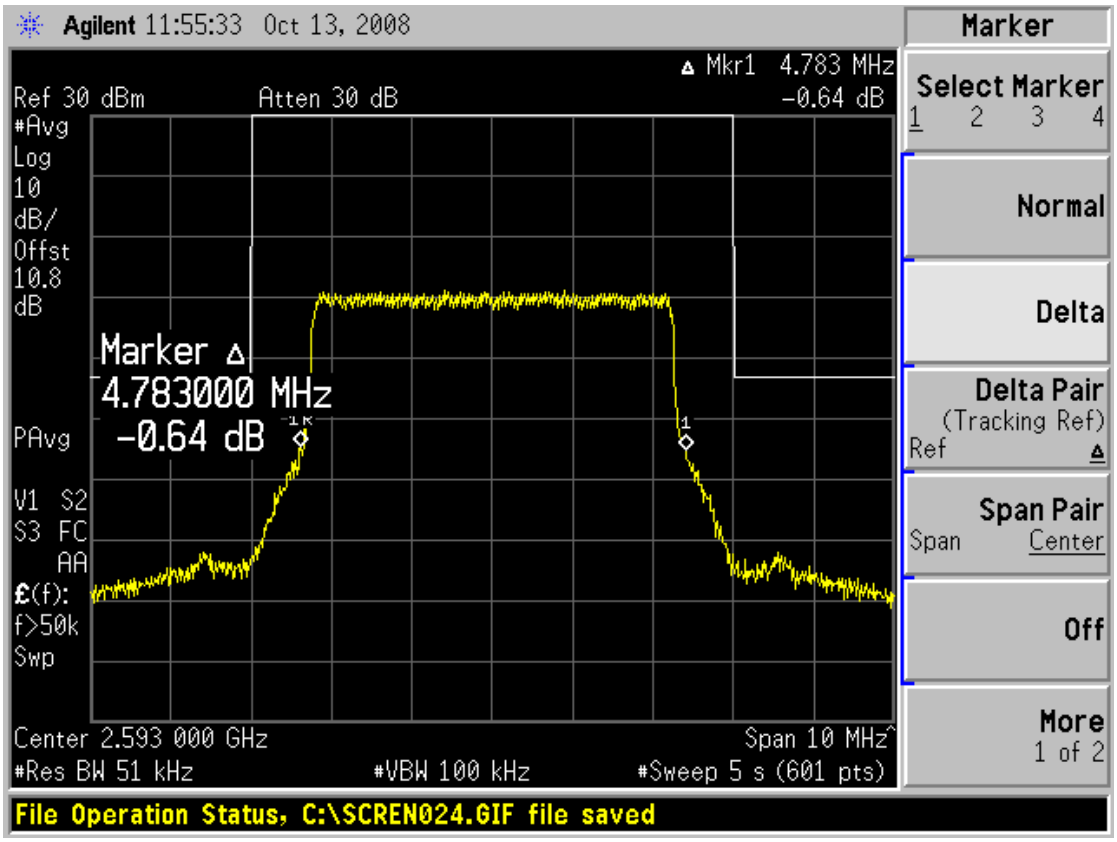
Plot 13:



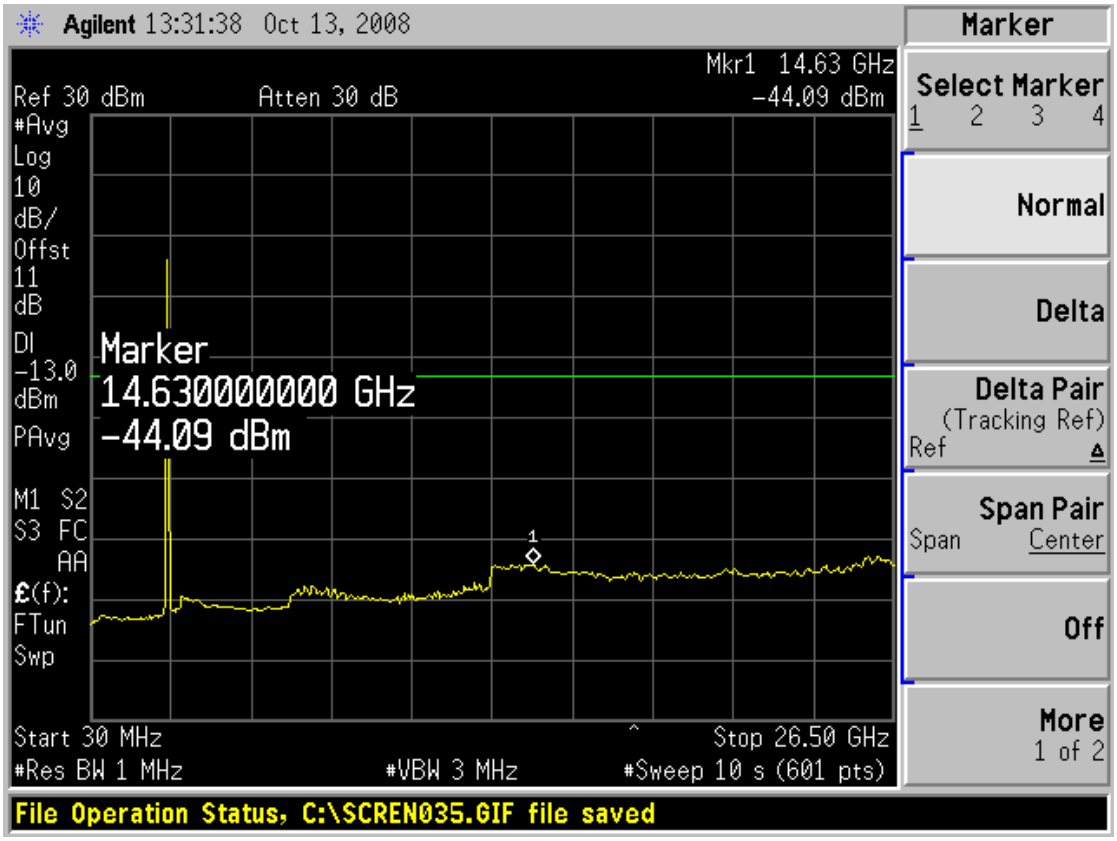
Plot 14:



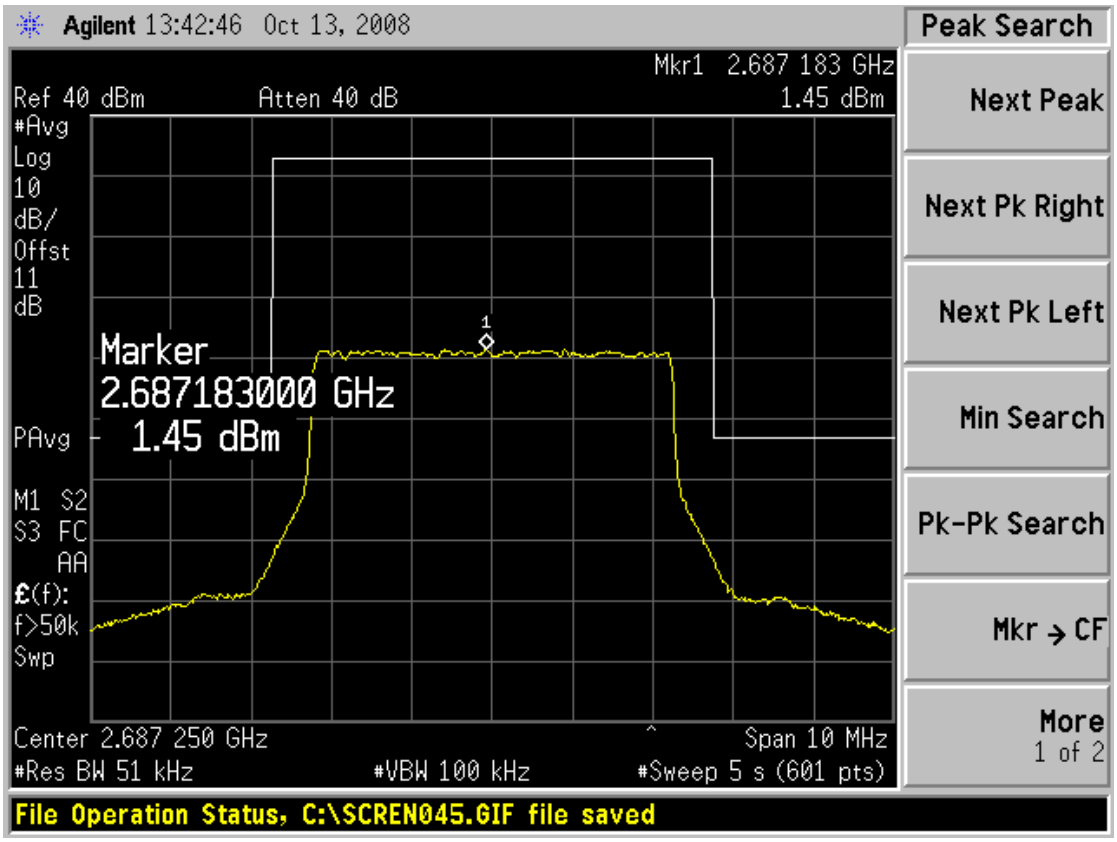
Plot 15:



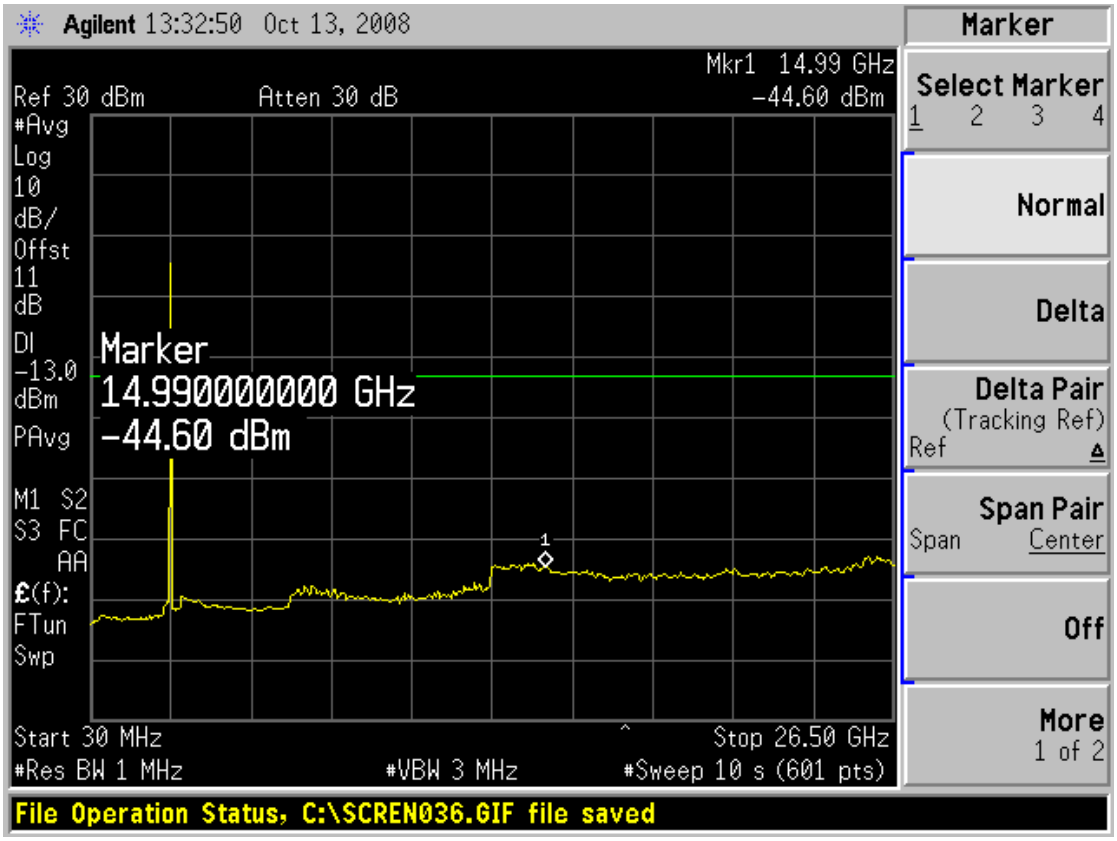
Plot 16:



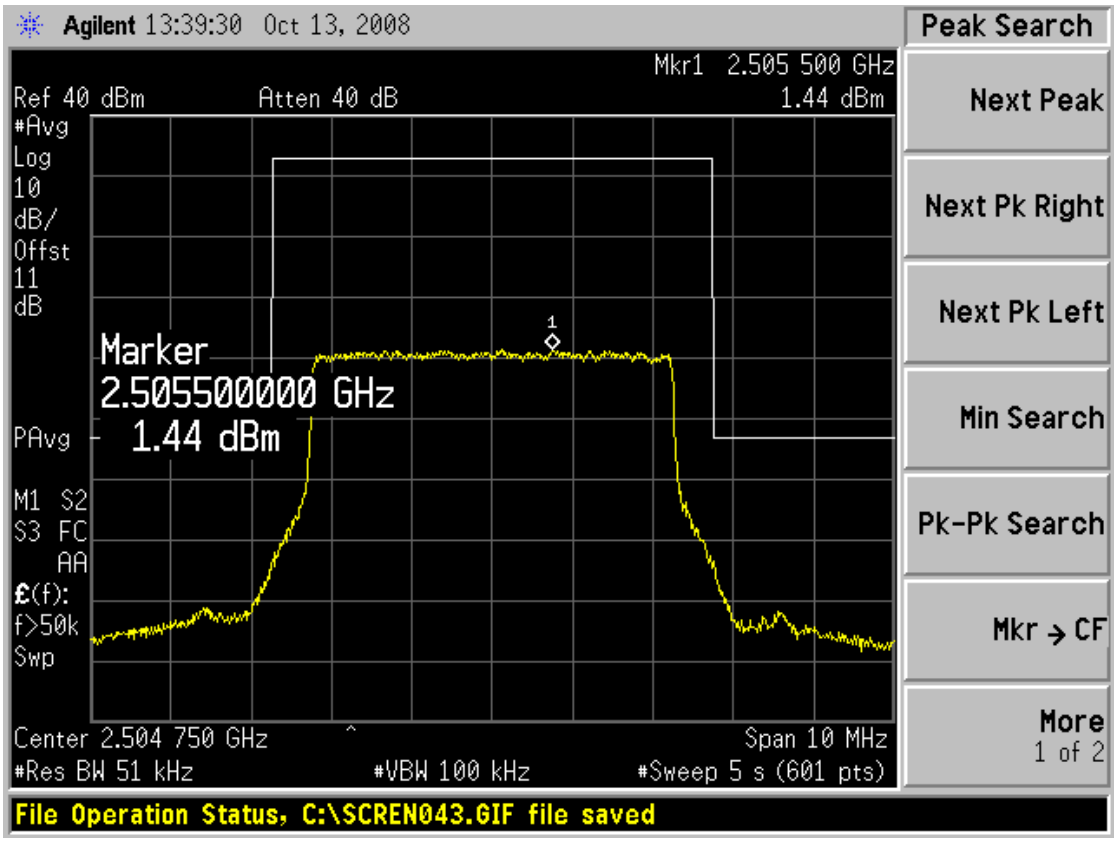
Plot 17:



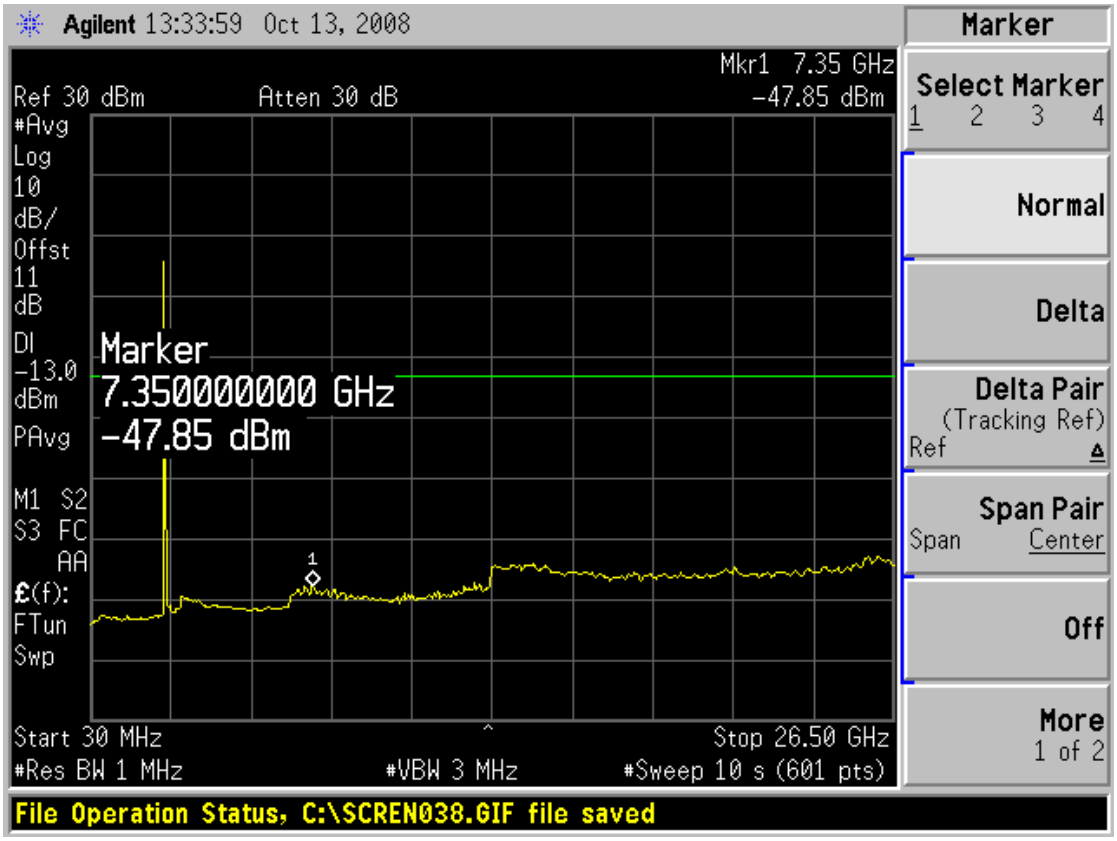
Plot 18:



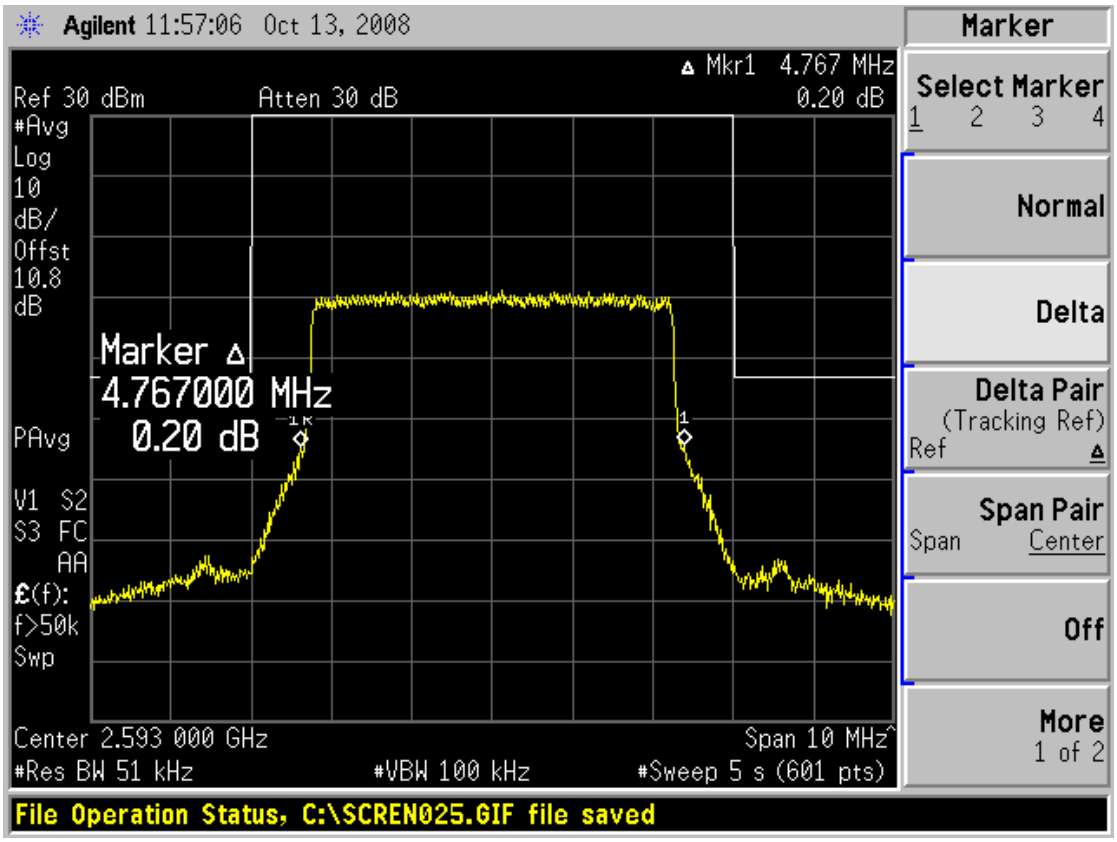
Plot 19:



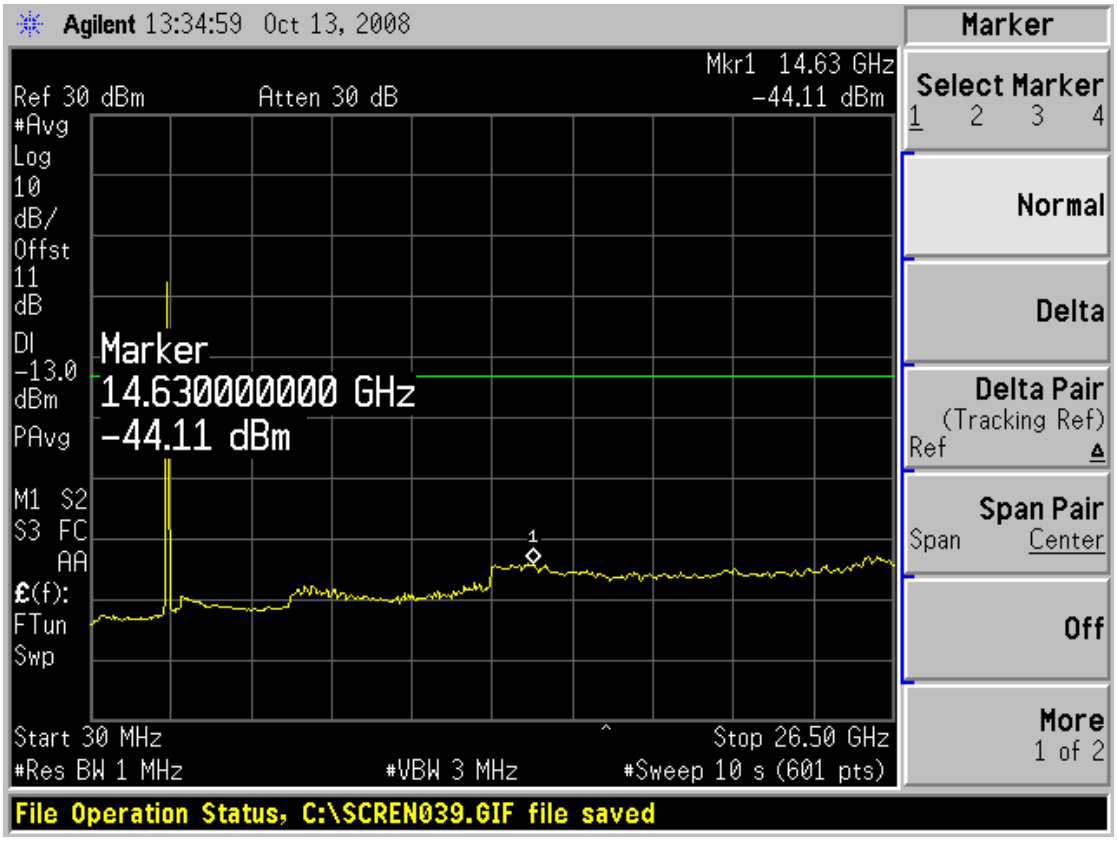
Plot 20:



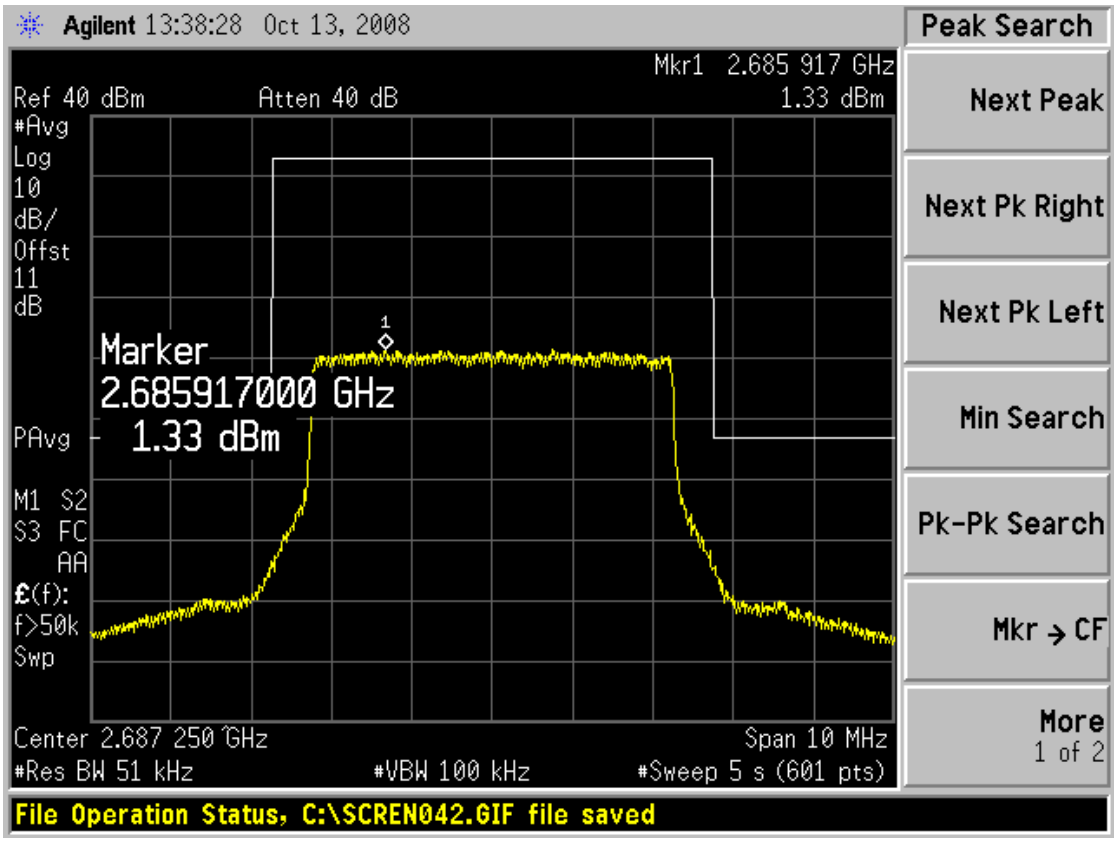
Plot 21:



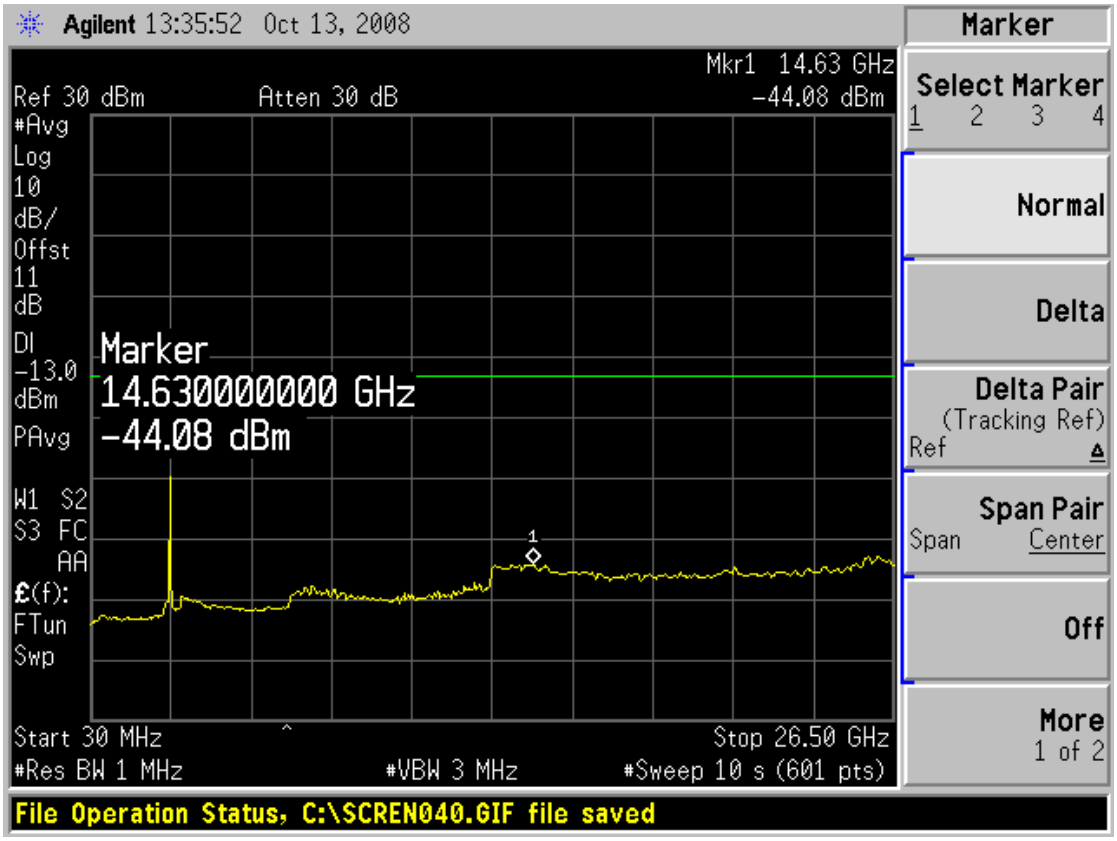
Plot 22:



Plot 23:



Plot 24:



CFR 47 Part 2.1051 Measurements required: Spurious emissions at antenna terminals
CFR 47 Part 27.53 Emission limits, subpart (l) (2)

Transmitter characteristics: 10 MHz channel spacing

Measurement conditions:

Frequency	f_{min}	= 2.507500 GHz
Frequency	f_{nom}	= 2.596000 GHz
Frequency	f_{max}	= 2.684500 GHz
Channel spacing	CS	= 10.0 MHz
Modulation	D	= QPSK, 16QAM, 64QAM
Temperature	t	= +22.0 °C
Nominal power supply	U_{AC}	= 115.0 V
Measurement at	C'	

Test set-up: see page 8 / no. 2

Limit: see table

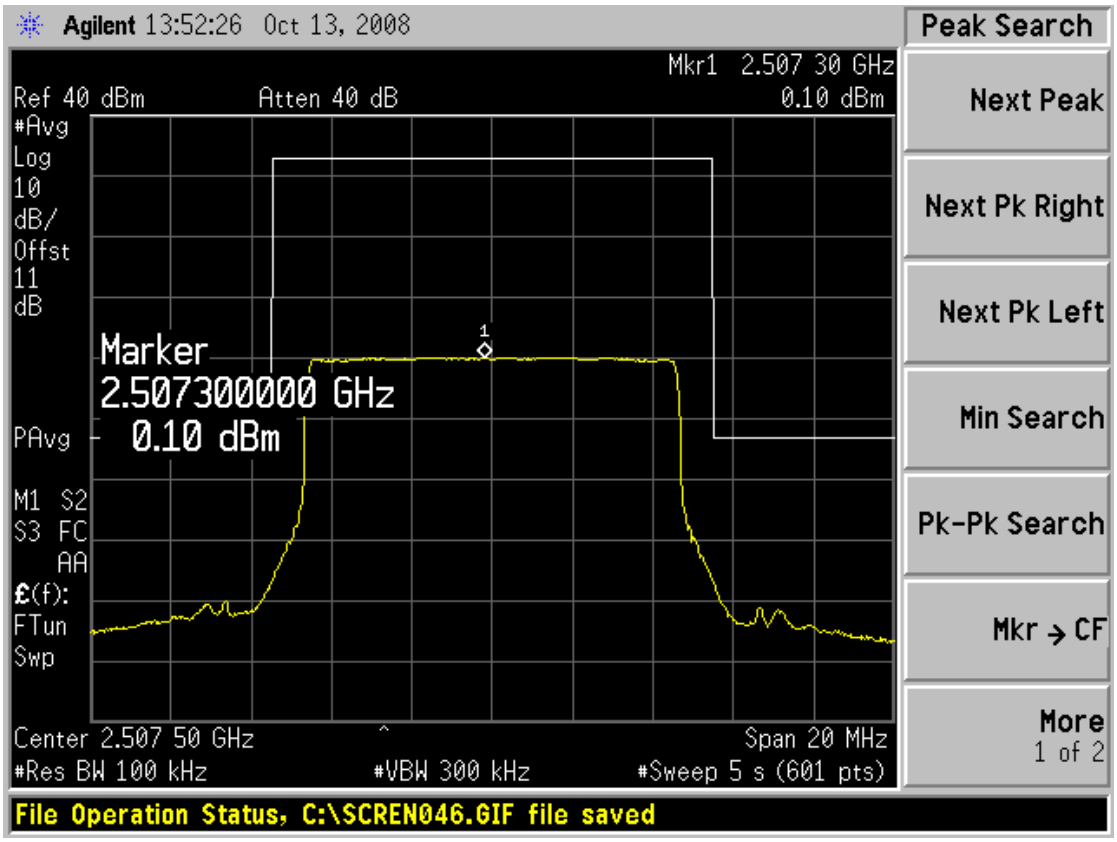
Test measurement:

Frequency Range [GHz]	$f_{carrier}$ [GHz]	Modulation	Limit [dBm]	Res. BW [MHz]	Spurious Frequency [GHz]	Emissions [dBm]	see plot no.
0.030 – 27.000	2.507500	QPSK	-13.0	1.0	n.f.	< limit	25 / 26
0.030 – 27.000	2.596000	QPSK	-13.0	1.0	n.f.	< limit	27 / 28
0.030 – 27.000	2.684500	QPSK	-13.0	1.0	n.f.	< limit	29 / 30
0.030 – 27.000	2.507500	16QAM	-13.0	1.0	n.f.	< limit	31 / 32
0.030 – 27.000	2.596000	16QAM	-13.0	1.0	n.f.	< limit	33 / 34
0.030 – 27.000	2.684500	16QAM	-13.0	1.0	n.f.	< limit	35 / 36
0.030 – 27.000	2.507500	64QAM	-13.0	1.0	n.f.	< limit	37 / 38
0.030 – 27.000	2.596000	64QAM	-13.0	1.0	n.f.	< limit	39 / 40
0.030 – 27.000	2.684500	64QAM	-13.0	1.0	n.f.	< limit	41 / 42

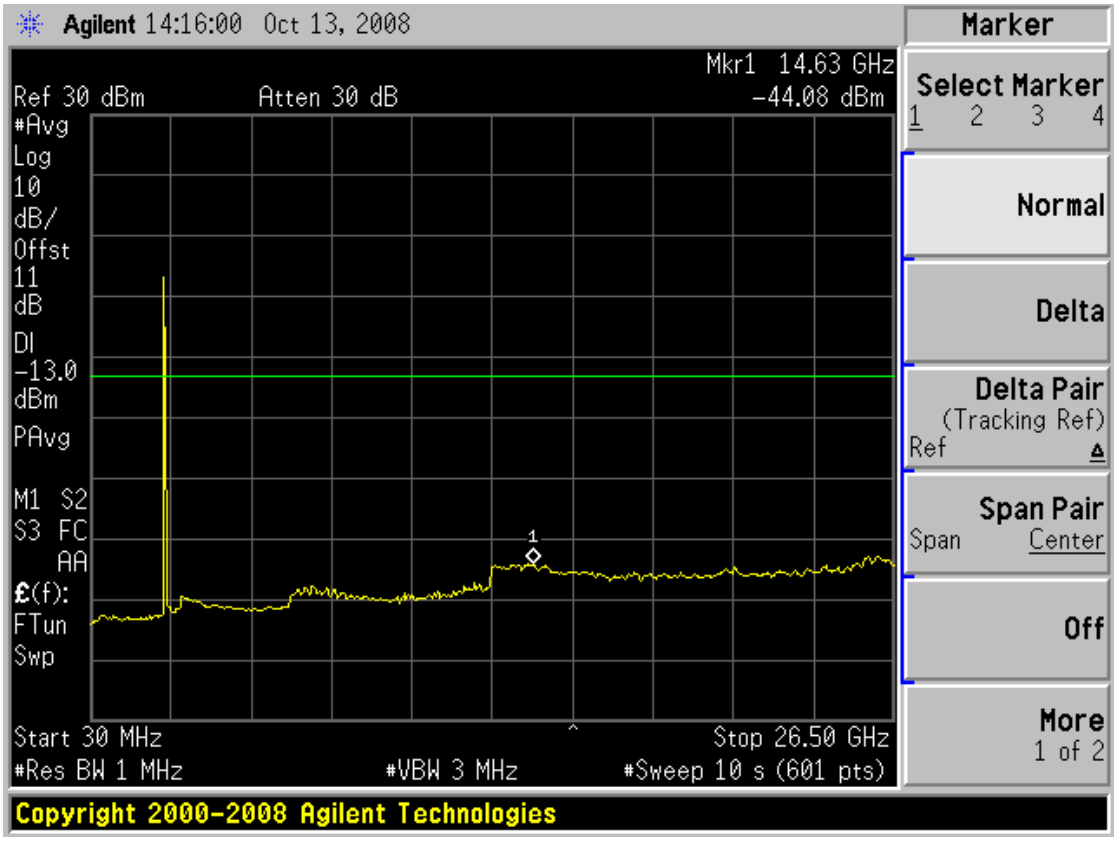
n.f. = nothing found

Test result: Passed: [X] Failed: [ ]

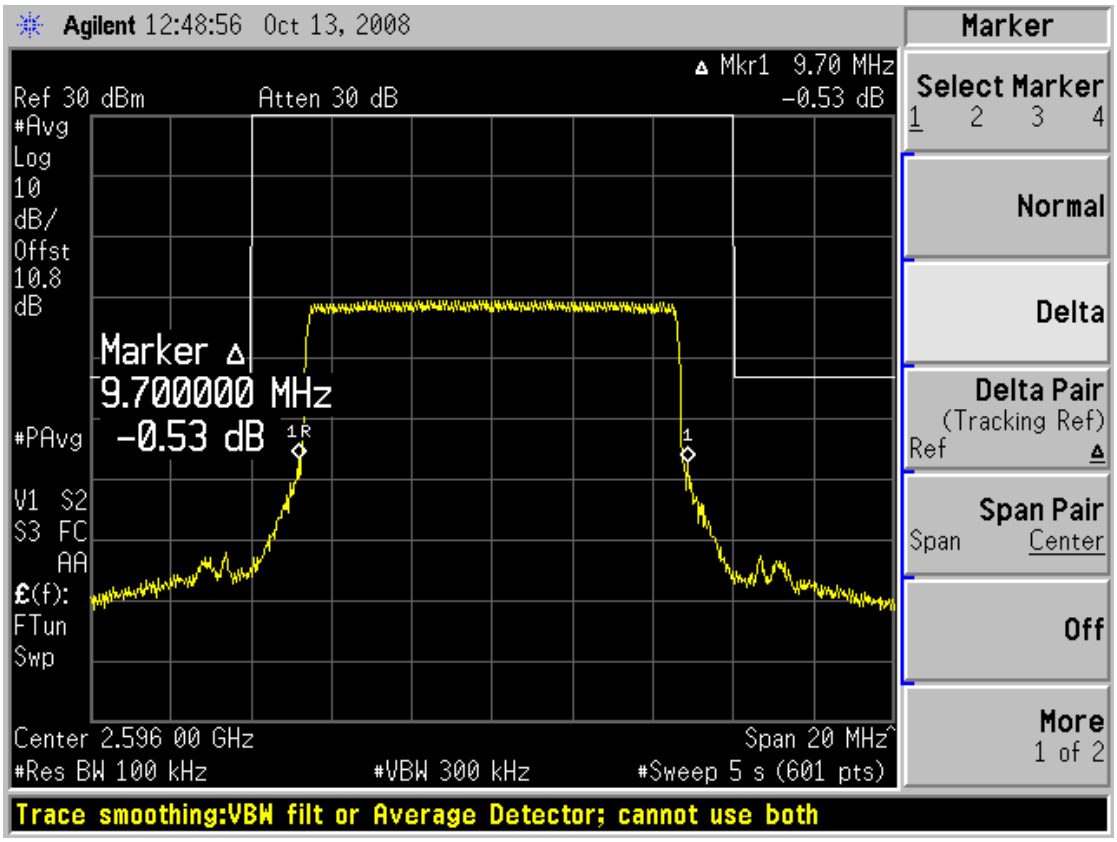
Plot 25:



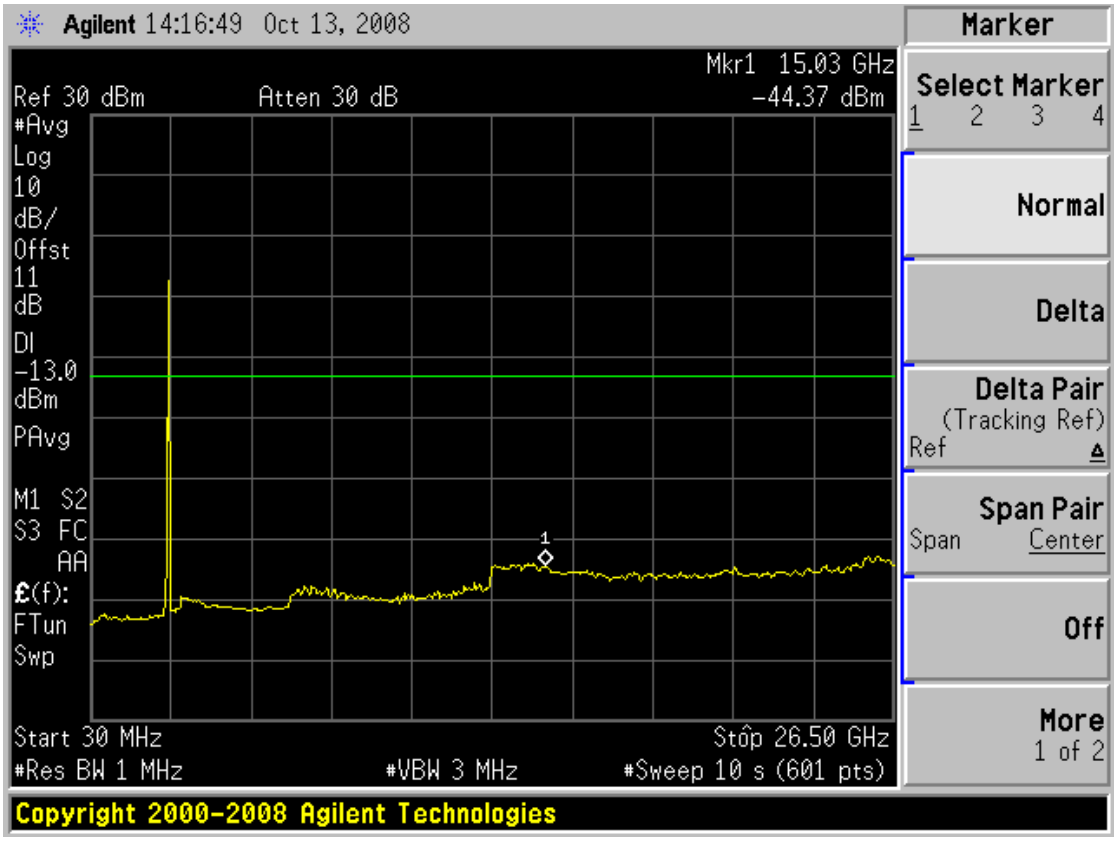
Plot 26:



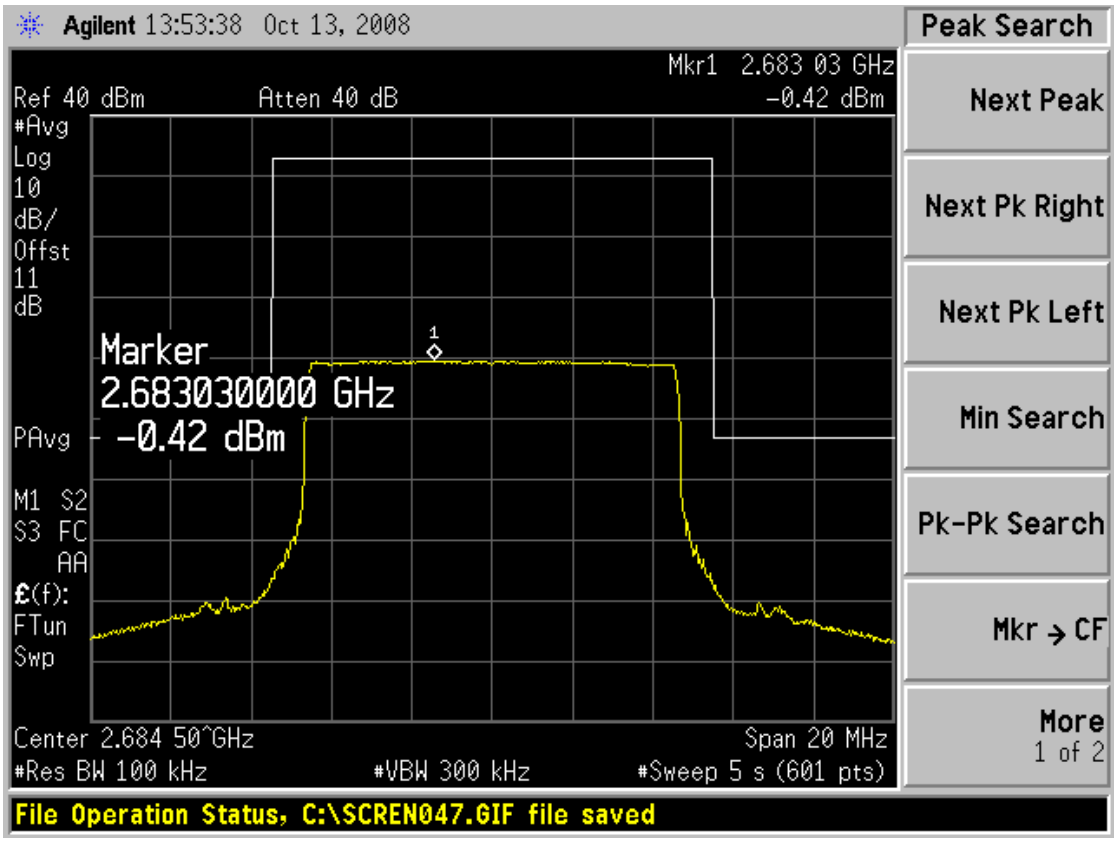
Plot 27:



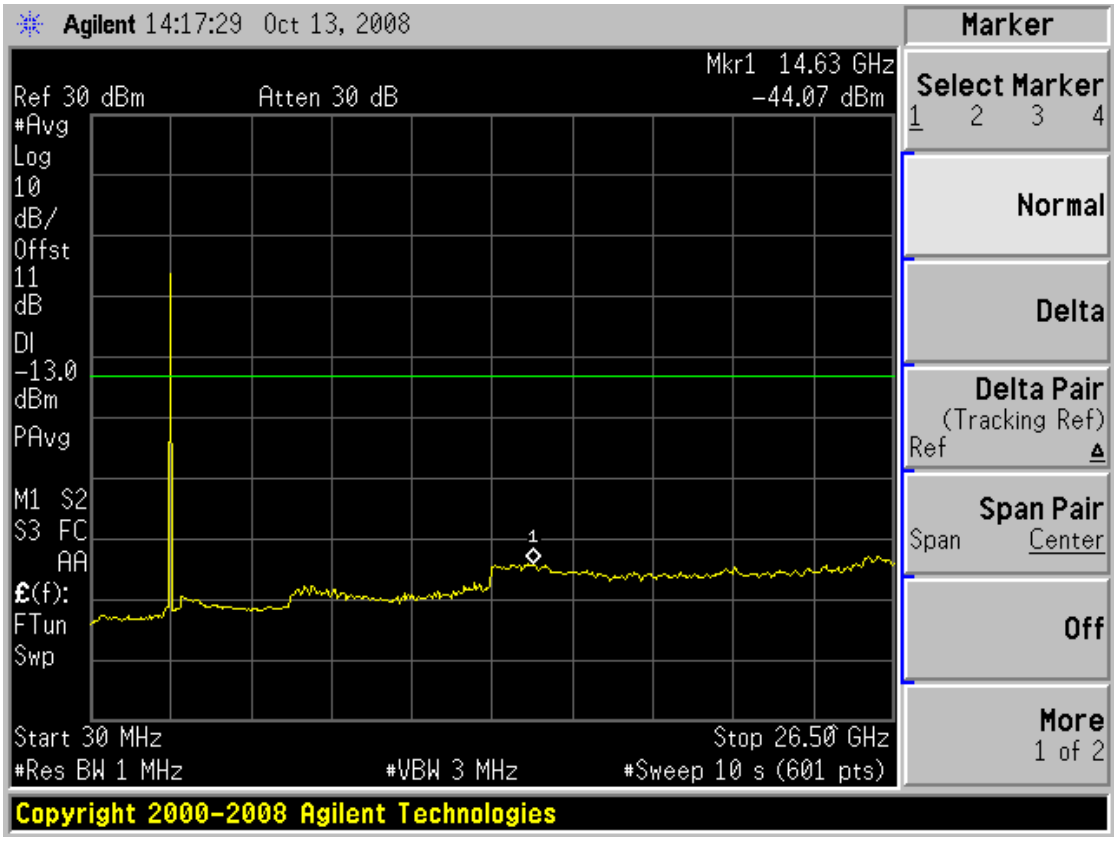
Plot 28:



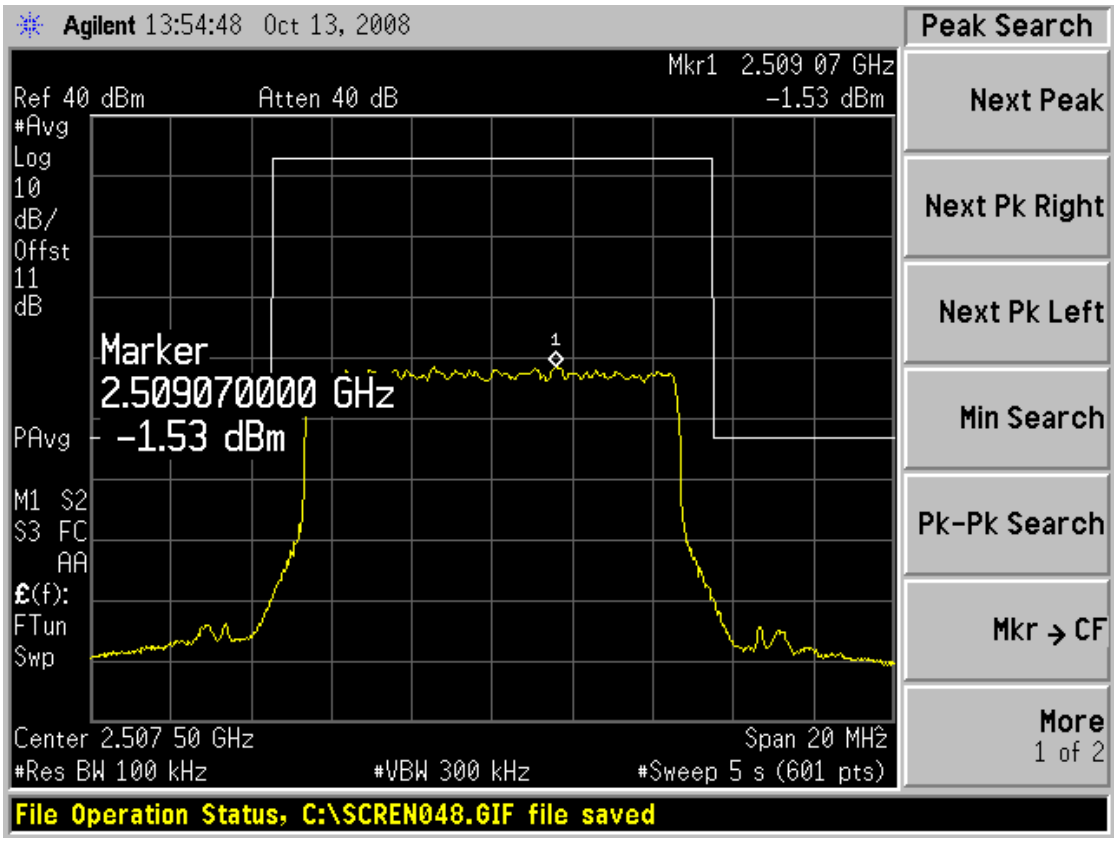
Plot 29:



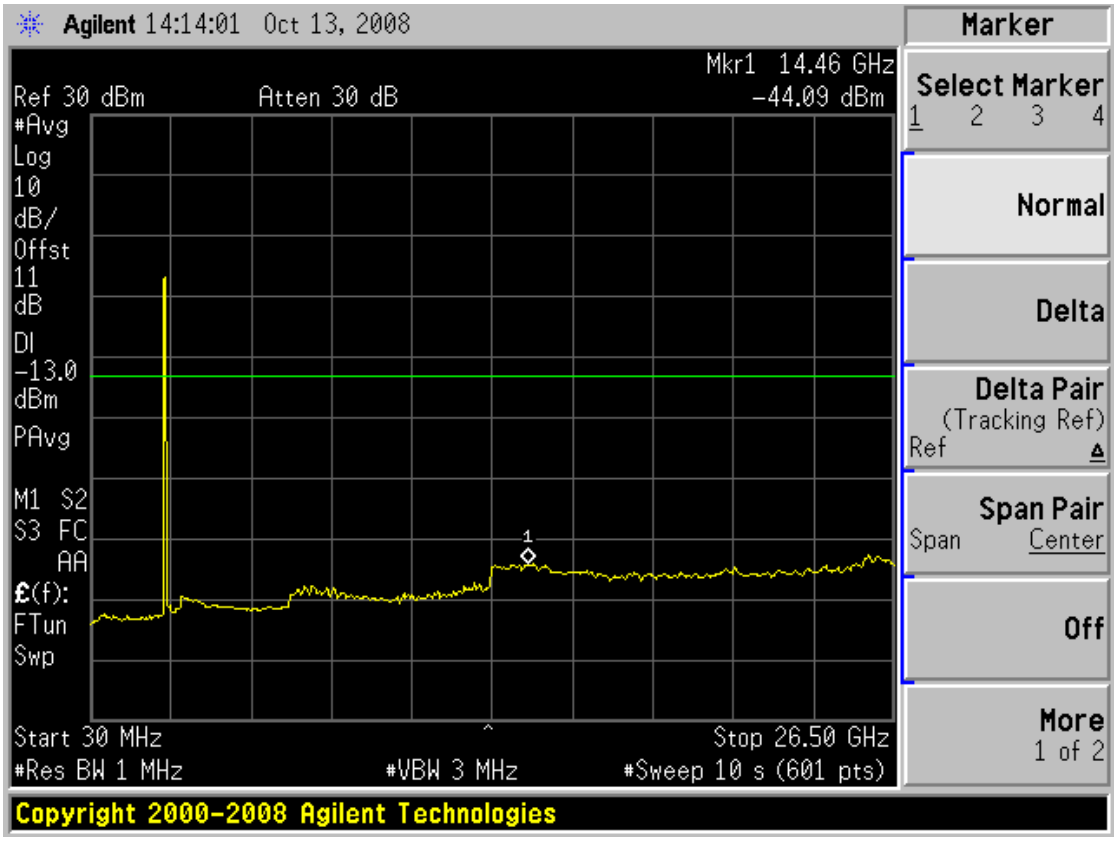
Plot 30:



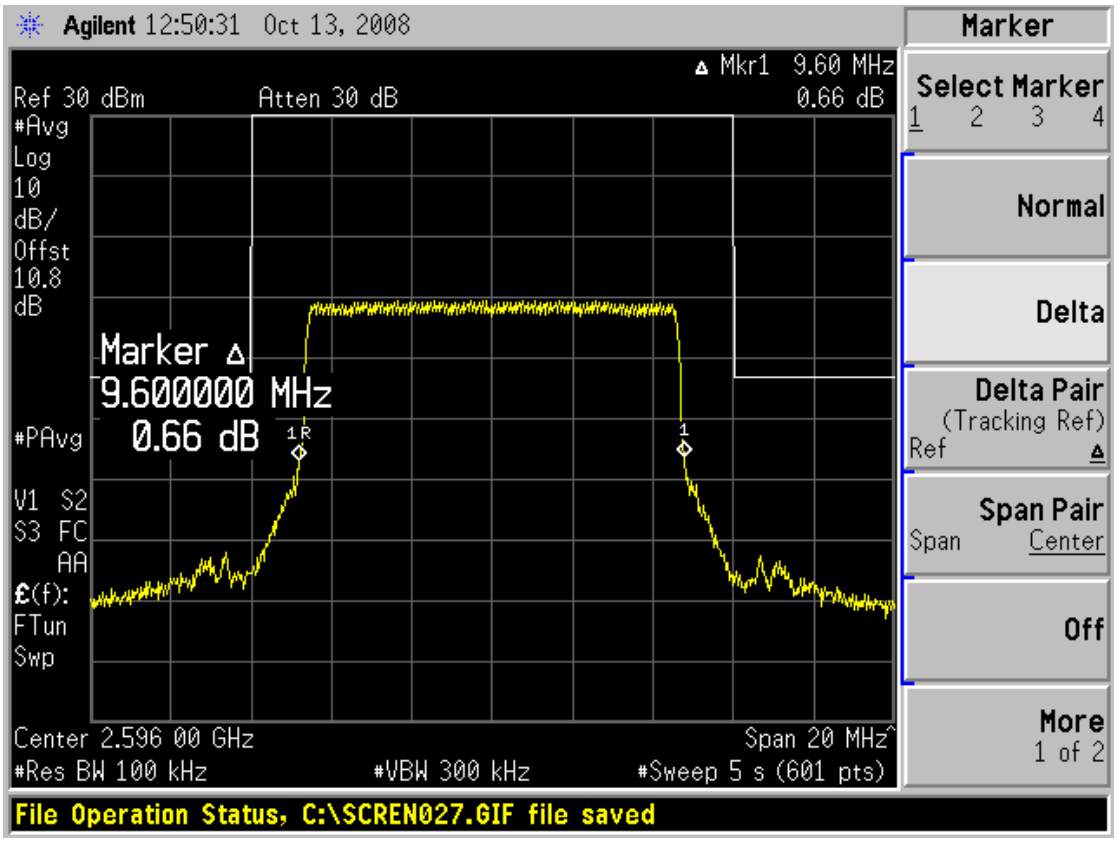
Plot 31:



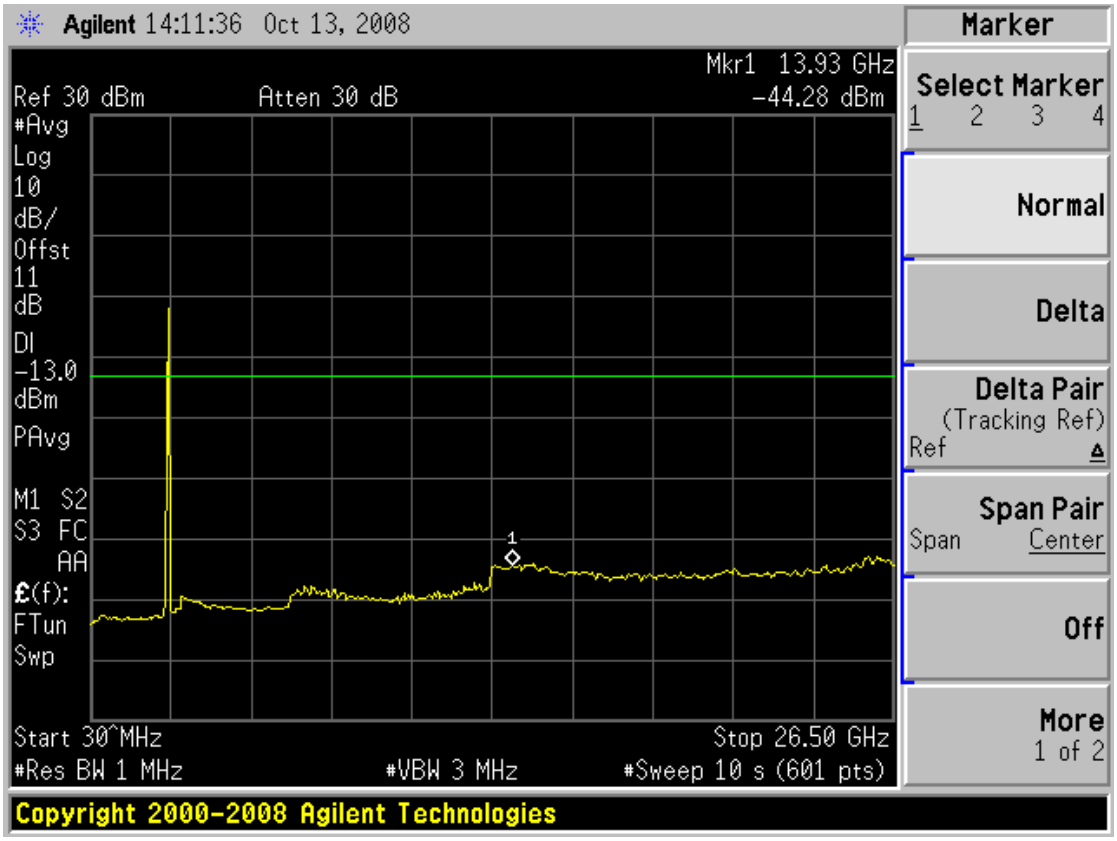
Plot 32:



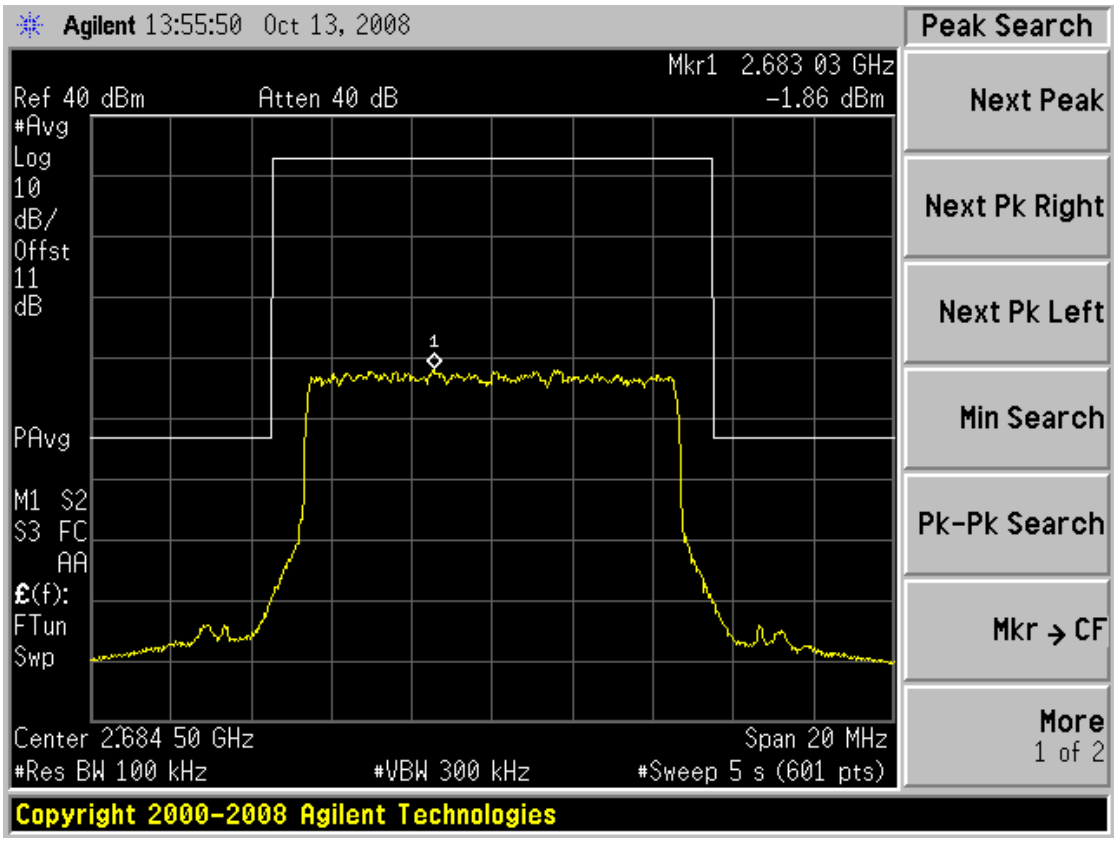
Plot 33:



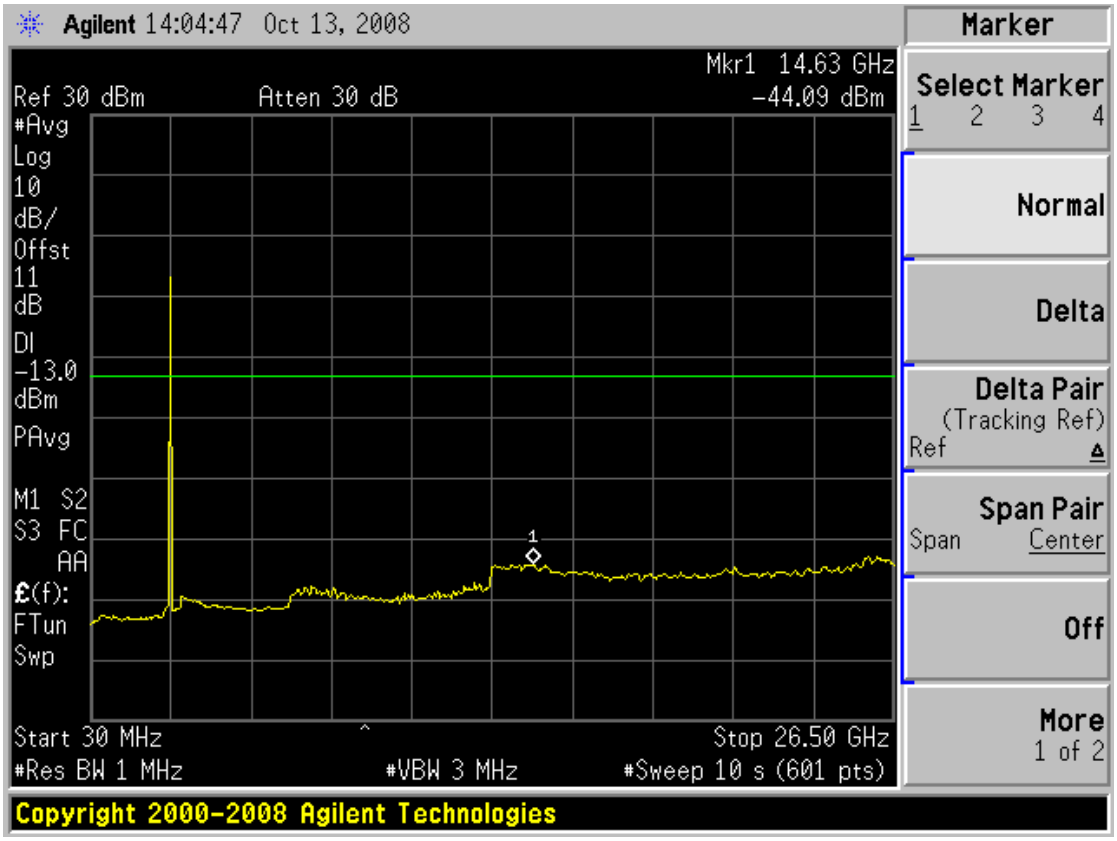
Plot 34:



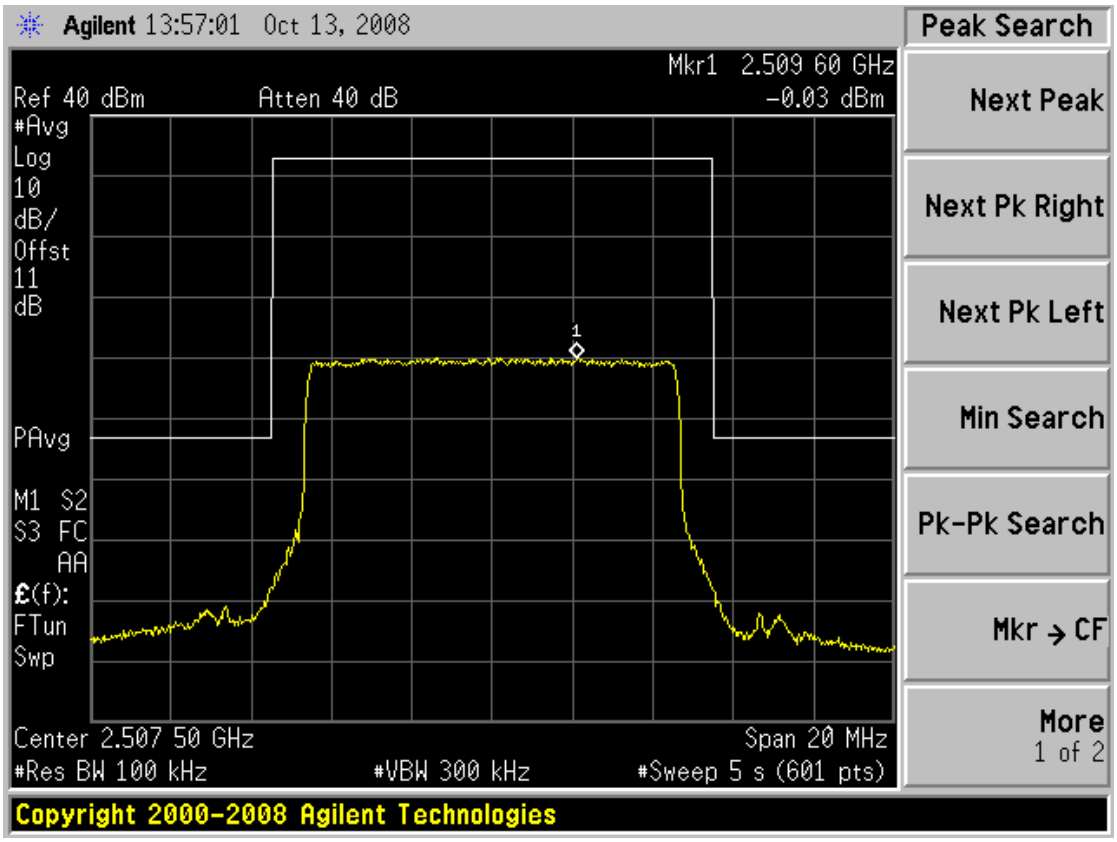
Plot 35:



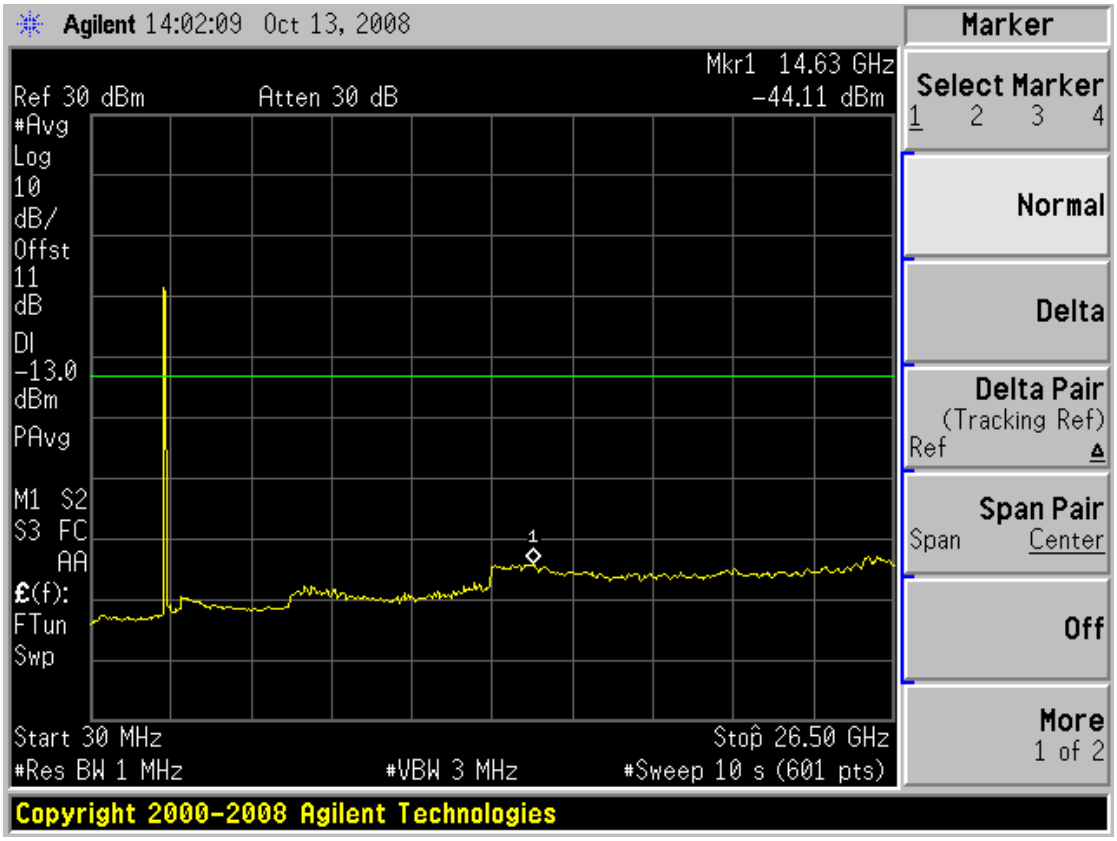
Plot 36:



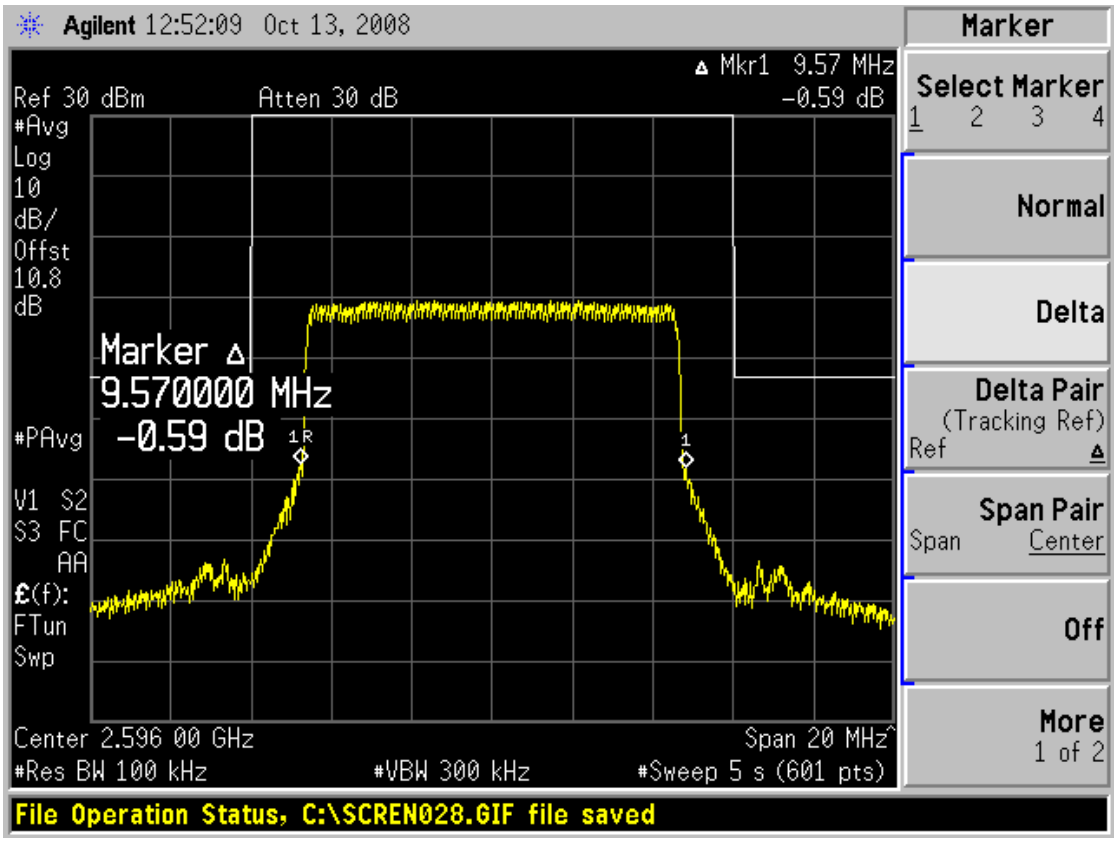
Plot 37:



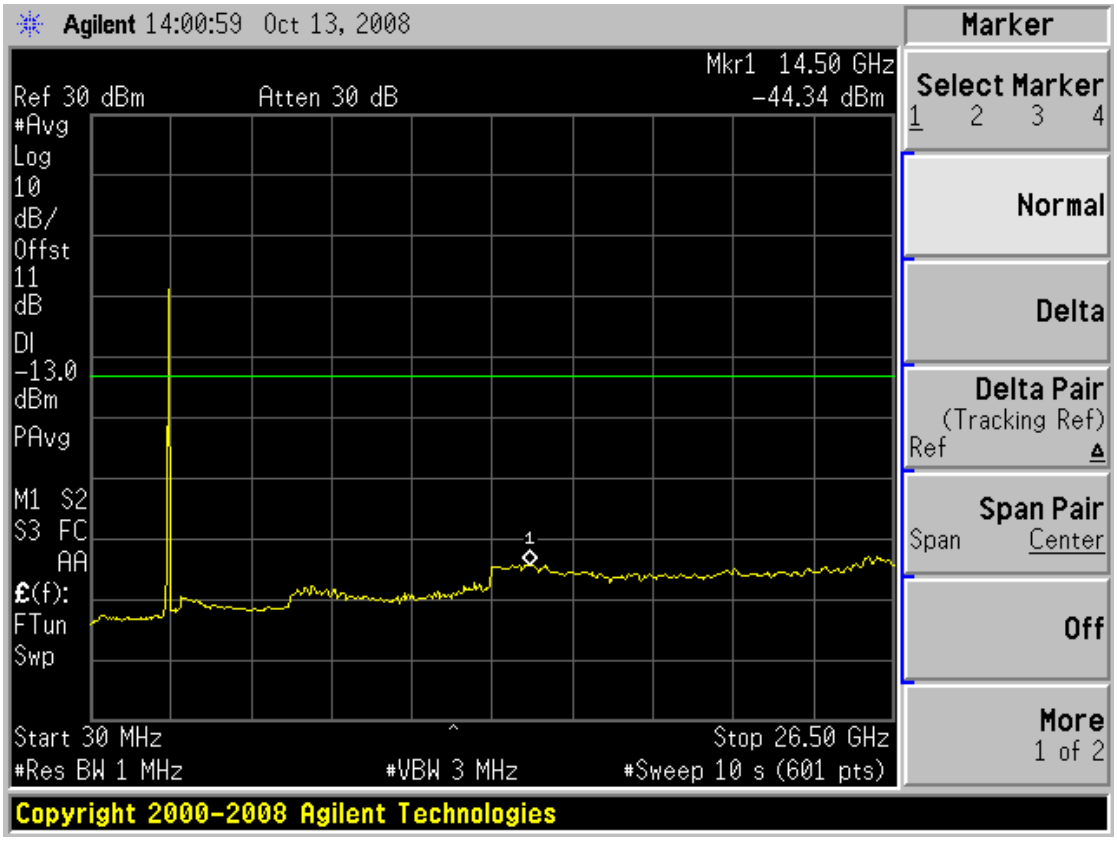
Plot 38:



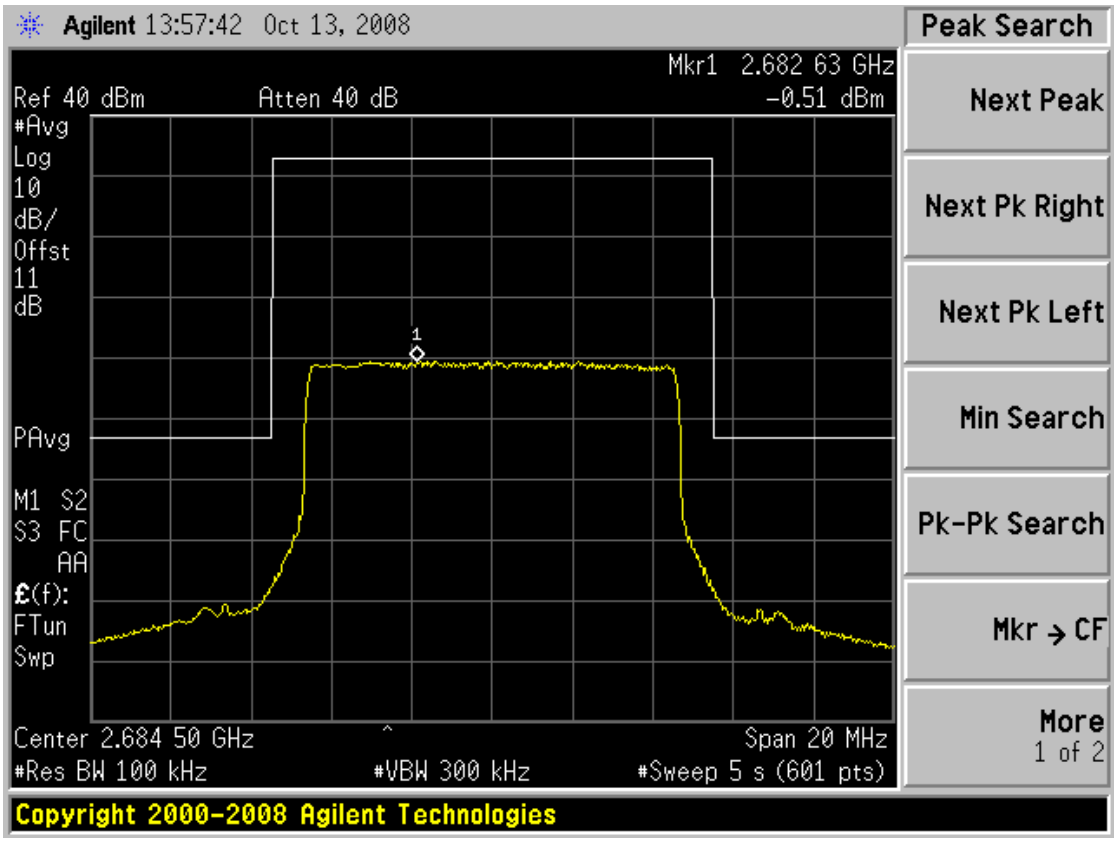
Plot 39:



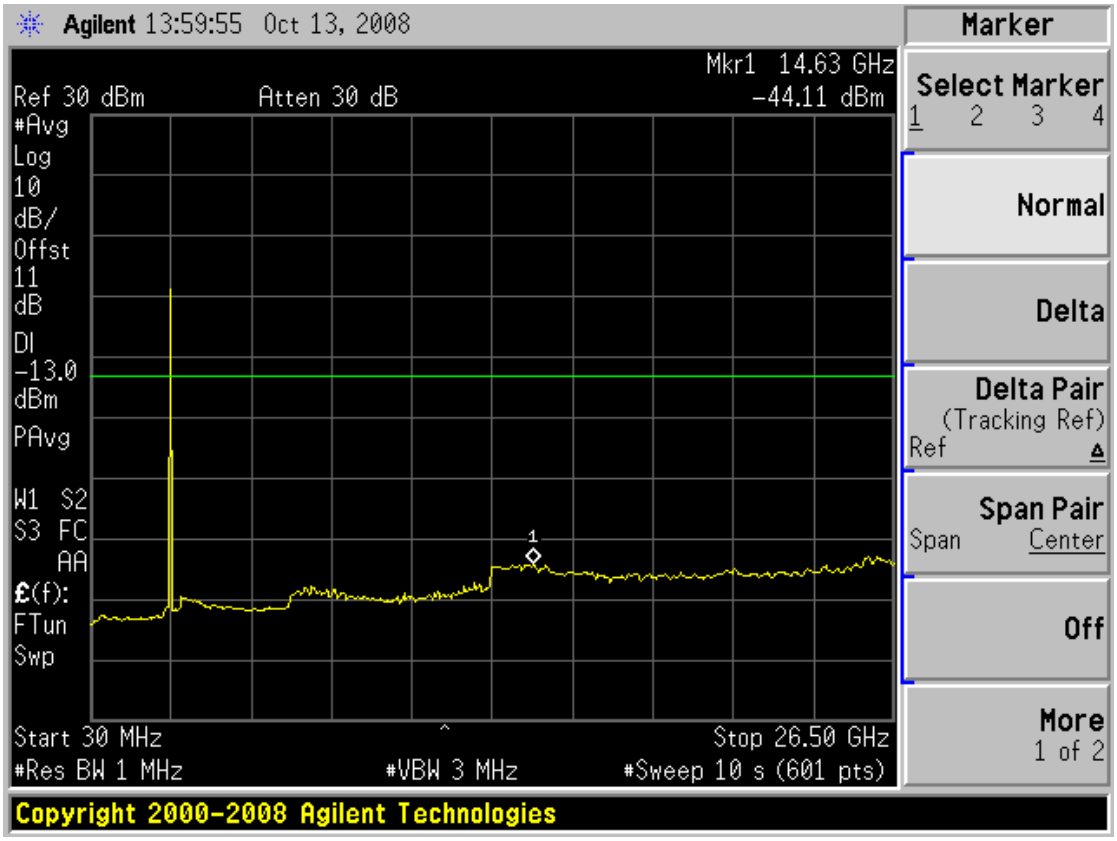
Plot 40:



Plot 41:



Plot 42:



CFR 47 Part 2.1053 Measurements required: Field strength of spurious radiation
CFR 47 Part 27.53 Emission limits, subpart (l) (2)

Transmitter characteristics: 5 MHz channel spacing

Measurement conditions:

Frequency	f_{min}	= 2.504750 GHz
Frequency	f_{nom}	= 2.593000 GHz
Frequency	f_{max}	= 2.687250 GHz
Channel spacing	CS	= 5.0 MHz
Modulation	D	= 64QAM
Temperature	t	= +22.0 °C
Nominal power supply	U_{AC}	= 115.0 V
Measurement at	C'	

Test set-up: see page 8 / no. 3

Limit: see table

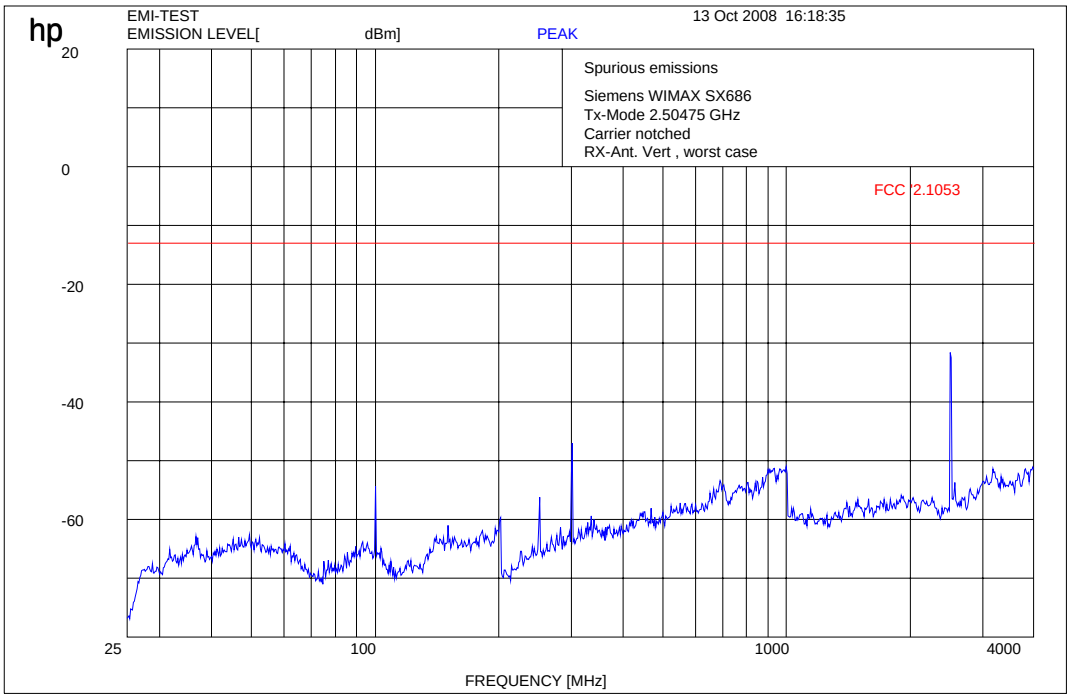
Test measurement:

Frequency Range [GHz]	$f_{carrier}$ [GHz]	Modulation	Limit [dBm]	Res. BW [MHz]	Spurious Frequency [GHz]	Emissions [dBm]	see plot no.
0.030 – 4.000	2.504750	64QAM	-13.0	1.0	n.f.	< limit	43
4.000 – 12.000	2.504750	64QAM	-13.0	1.0	n.f.	< limit	44
12.000 – 18.000	2.504750	64QAM	-13.0	1.0	n.f.	< limit	45
18.000 – 27.000	2.504750	64QAM	-13.0	1.0	n.f.	< limit	46
0.030 – 4.000	2.593000	64QAM	-13.0	1.0	n.f.	< limit	47
4.000 – 12.000	2.593000	64QAM	-13.0	1.0	n.f.	< limit	48
12.000 – 18.000	2.593000	64QAM	-13.0	1.0	n.f.	< limit	49
18.000 – 27.000	2.593000	64QAM	-13.0	1.0	n.f.	< limit	50
0.030 – 4.000	2.687250	64QAM	-13.0	1.0	n.f.	< limit	51
4.000 – 12.000	2.687250	64QAM	-13.0	1.0	n.f.	< limit	52
12.000 – 18.000	2.687250	64QAM	-13.0	1.0	n.f.	< limit	53
18.000 – 27.000	2.687250	64QAM	-13.0	1.0	n.f.	< limit	54

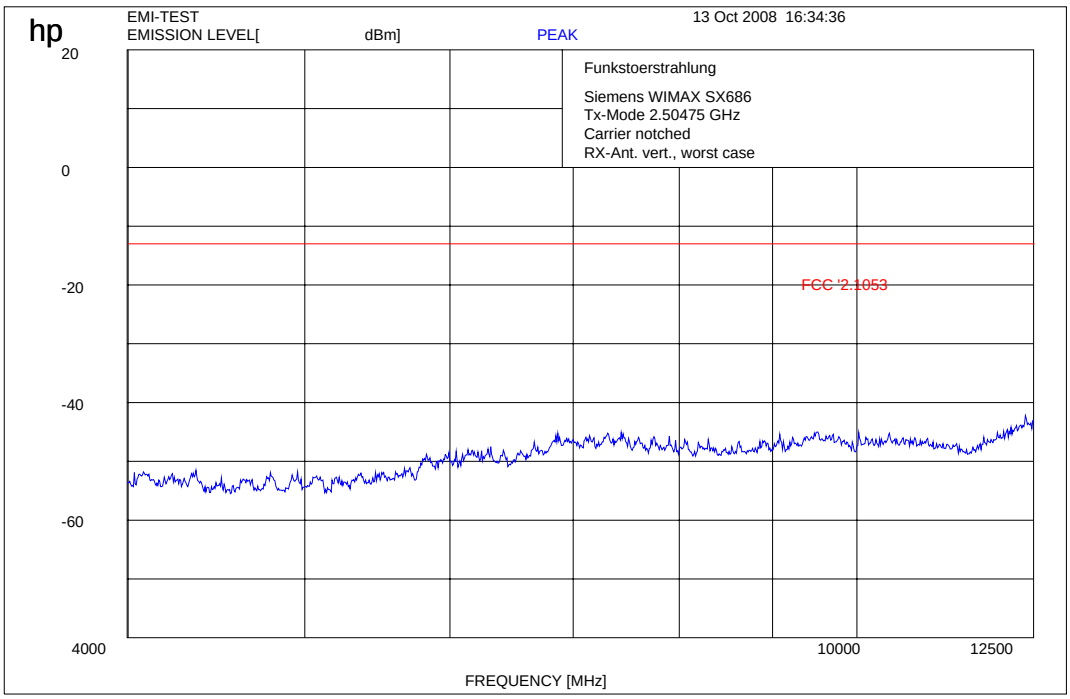
n.f. = nothing found

Test result: Passed: [X] Failed: [ ]

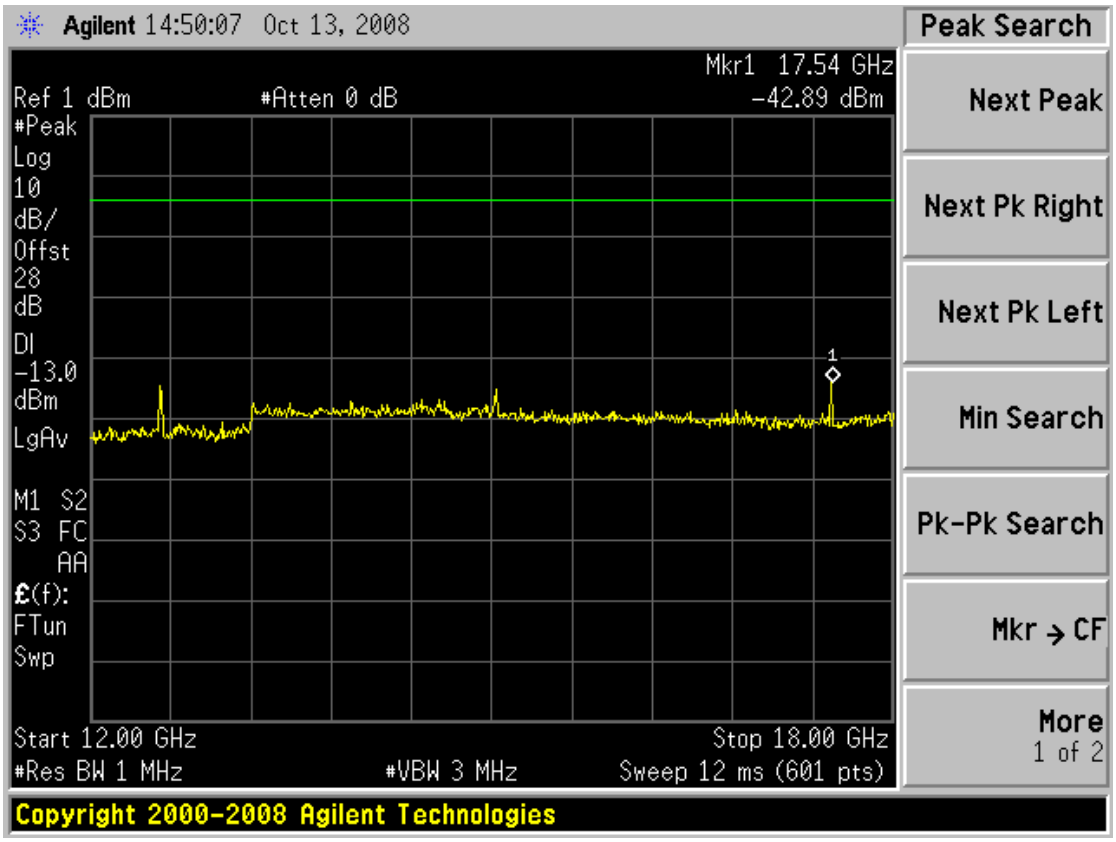
Plot 43:



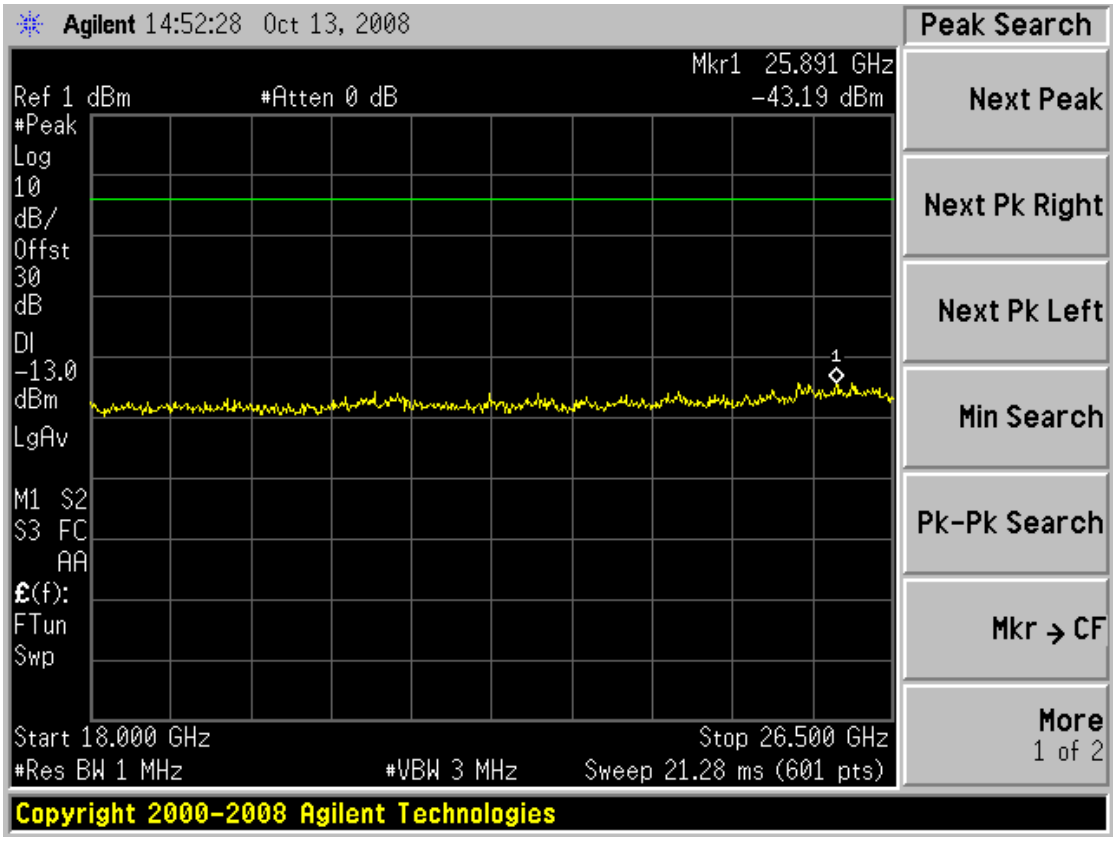
Plot 44:



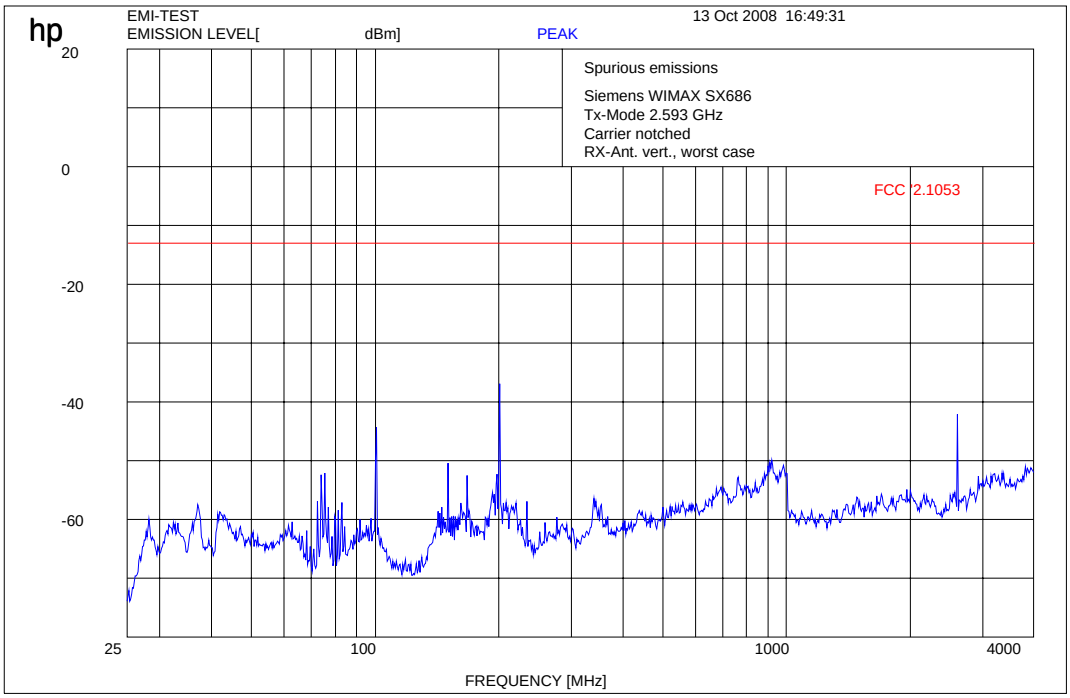
Plot 45:



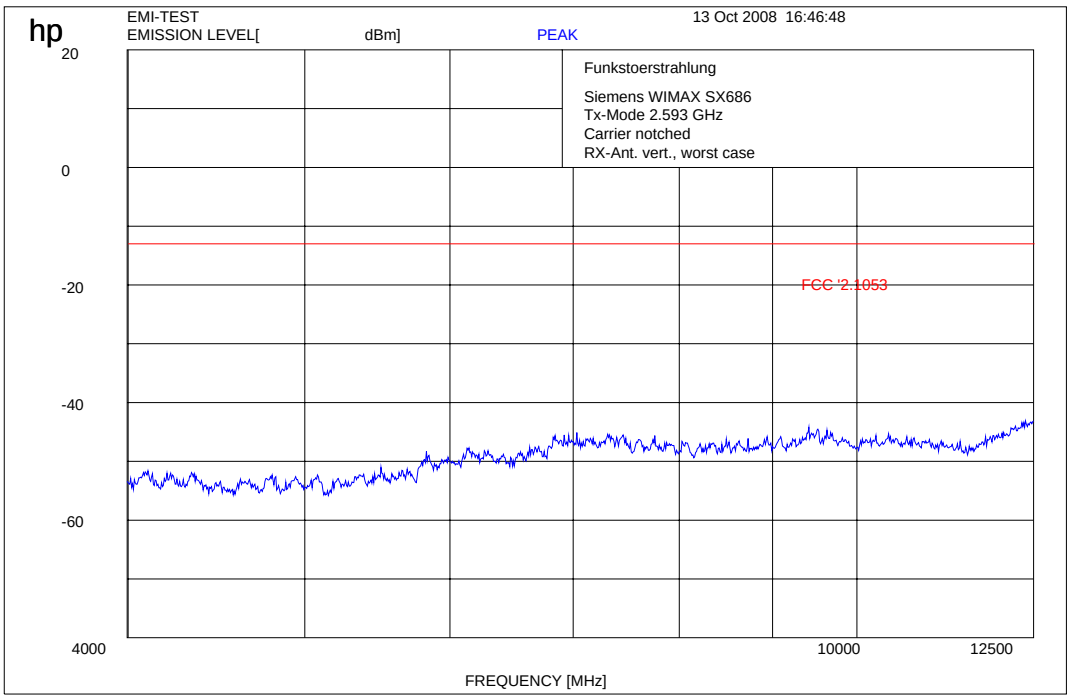
Plot 46:



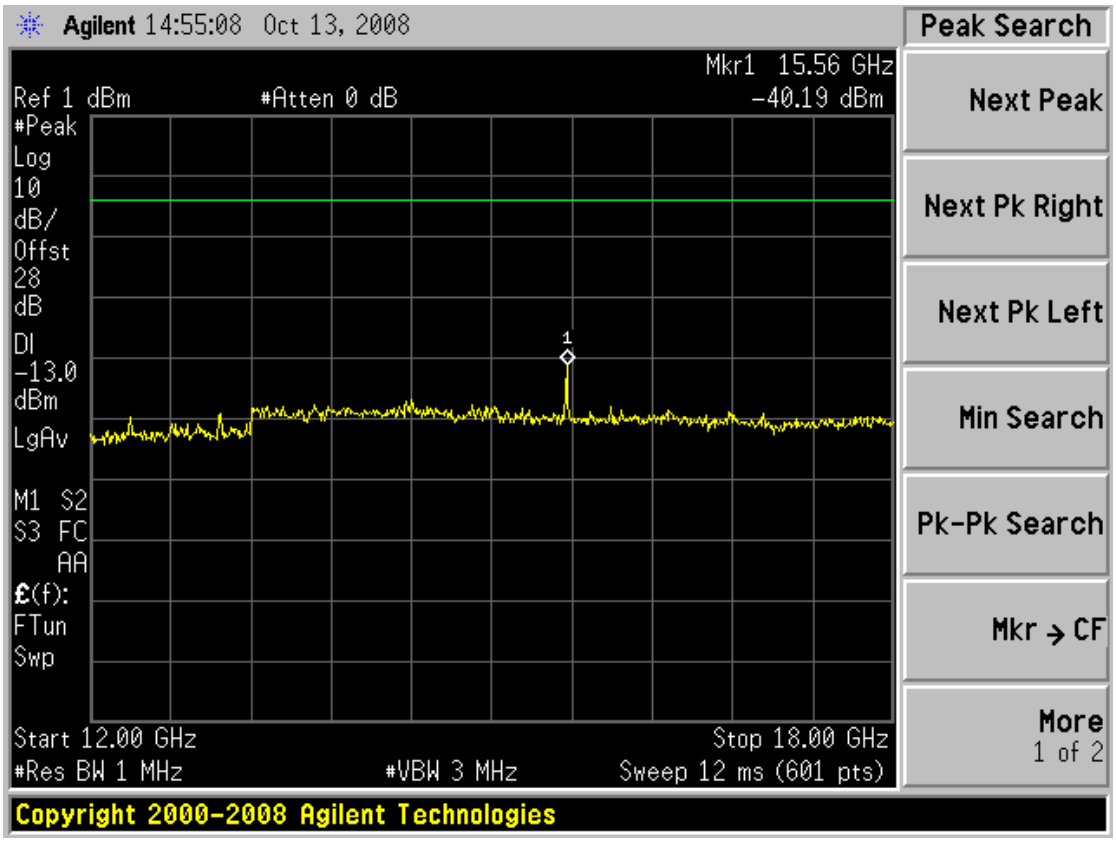
Plot 47:



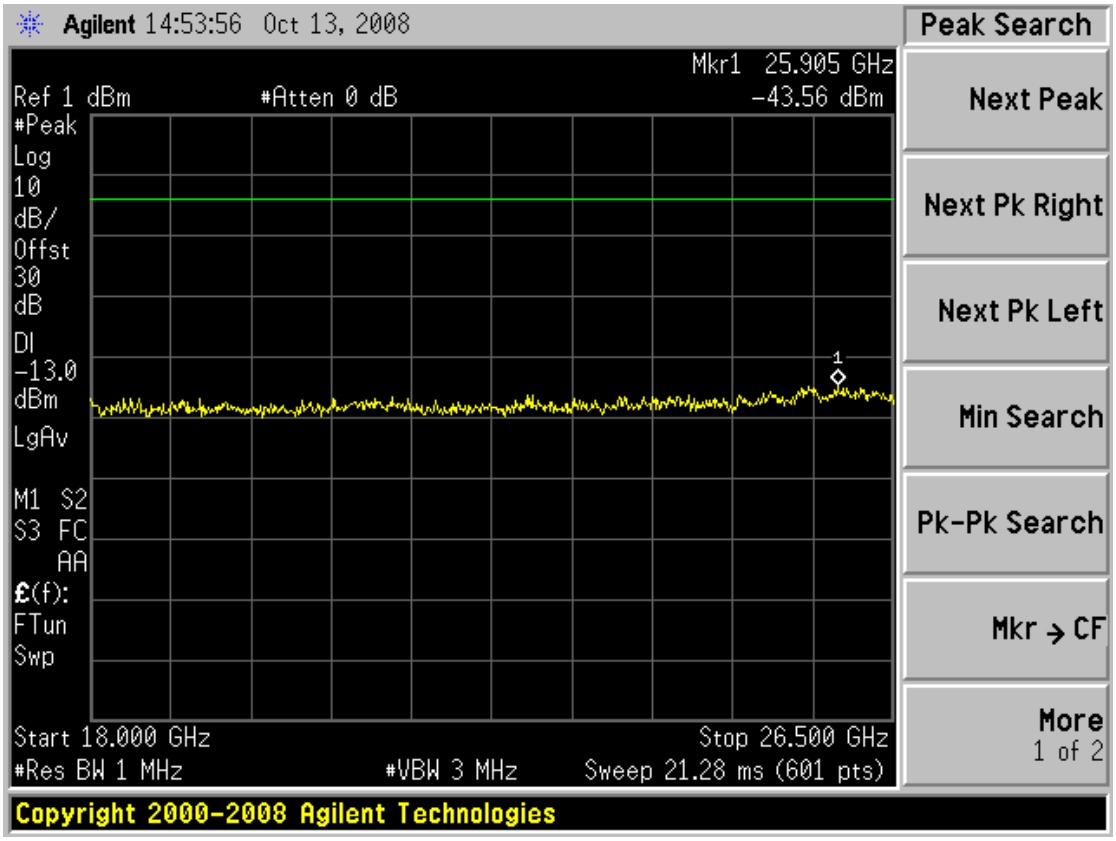
Plot 48:



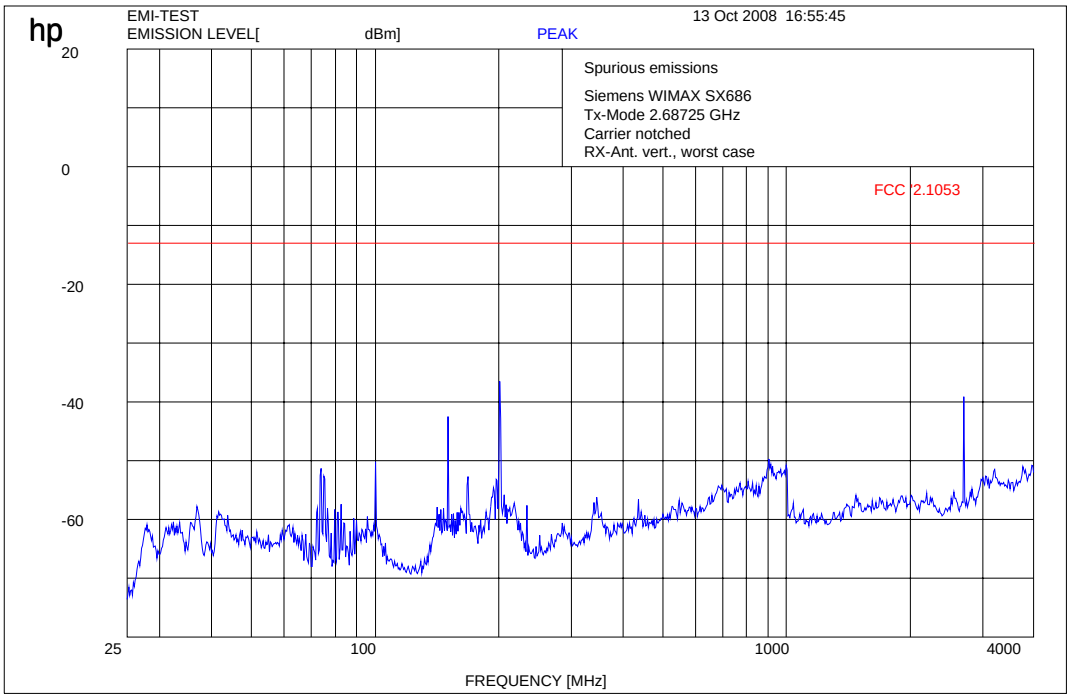
Plot 49:



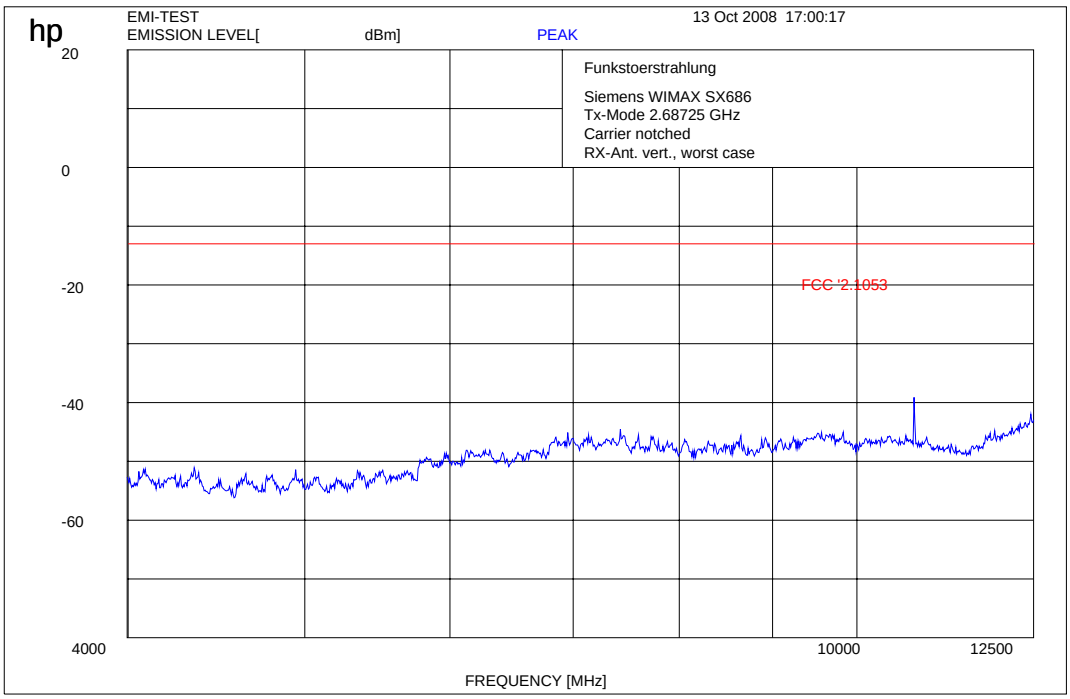
Plot 50:



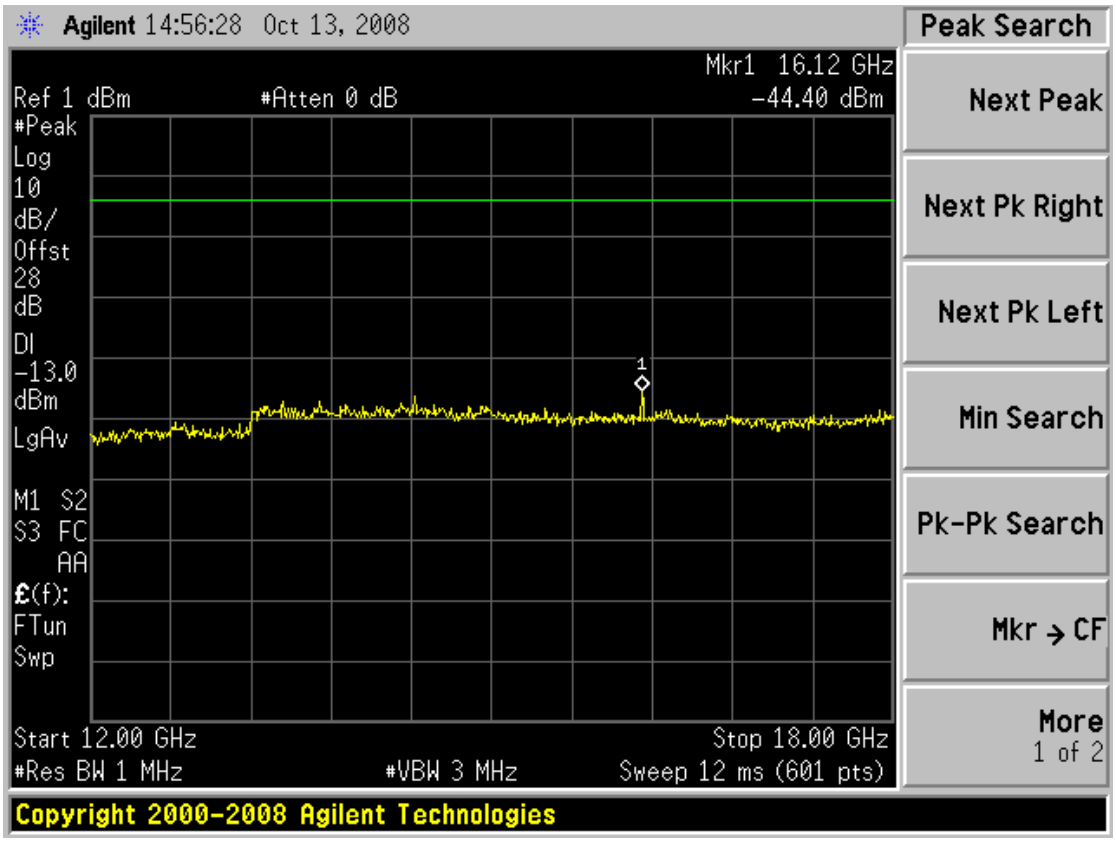
Plot 51:



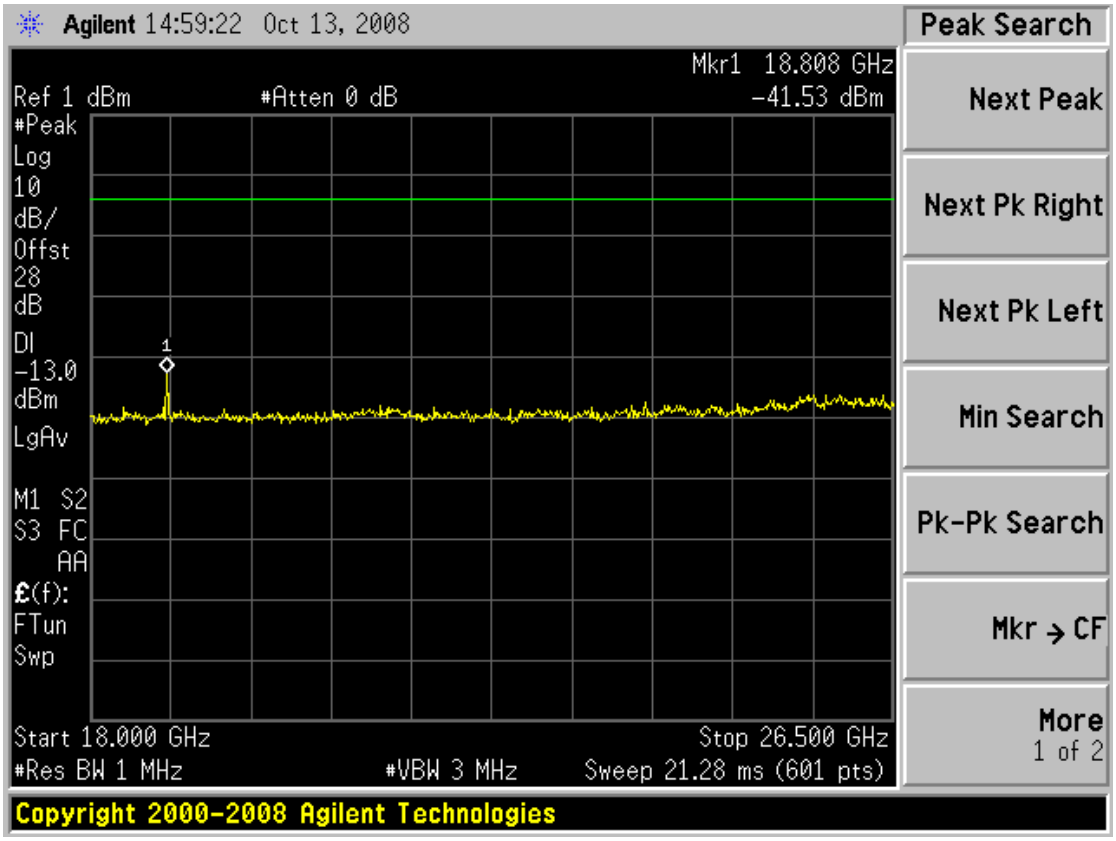
Plot 52:



Plot 53:



Plot 54:



CFR 47 Part 2.1053 Measurements required: Field strength of spurious radiation
CFR 47 Part 27.53 Emission limits, subpart (l) (2)

Transmitter characteristics: 10 MHz channel spacing

Measurement conditions:

Frequency	f_{min}	= 2.507500 GHz
Frequency	f_{nom}	= 2.596000 GHz
Frequency	f_{max}	= 2.684500 GHz
Channel spacing	CS	= 10.0 MHz
Modulation	D	= 64QAM
Temperature	t	= +22.0 °C
Nominal power supply	U_{AC}	= 115.0 V
Measurement at	C'	

Test set-up: see page 8 / no. 3

Limit: see table

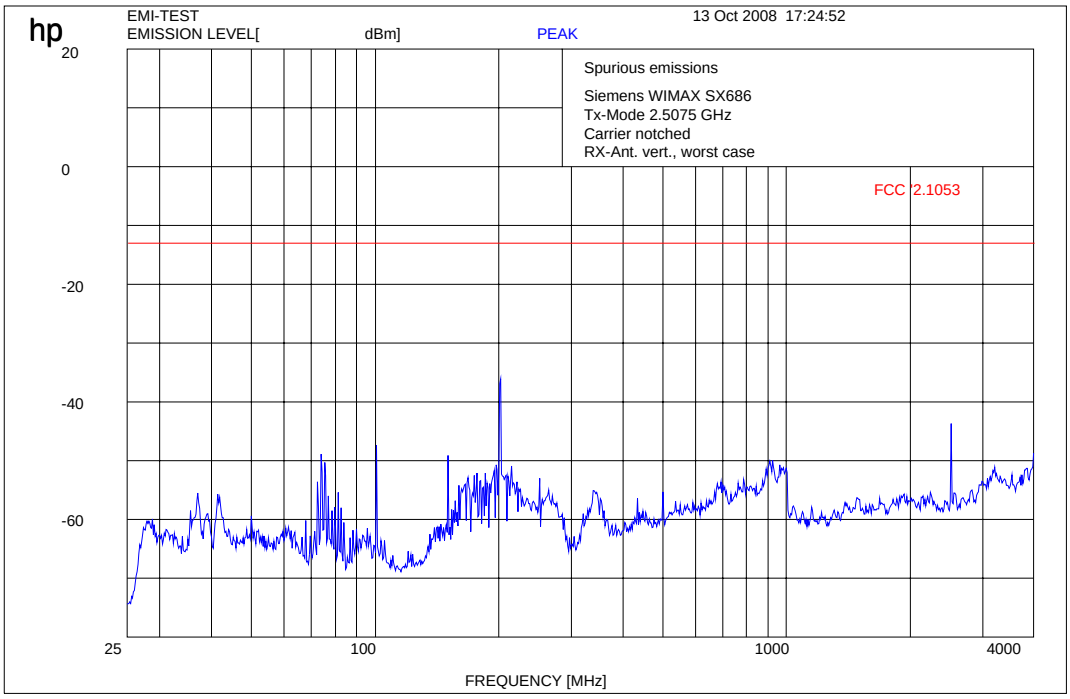
Test measurement:

Frequency Range [GHz]	$f_{carrier}$ [GHz]	Modulation	Limit [dBm]	Res. BW [MHz]	Spurious Frequency [GHz]	Emissions [dBm]	see plot no.
0.030 – 4.000	2.507500	64QAM	-13.0	1.0	n.f.	< limit	55
4.000 – 12.000	2.507500	64QAM	-13.0	1.0	n.f.	< limit	56
12.000 – 18.000	2.507500	64QAM	-13.0	1.0	n.f.	< limit	57
18.000 – 27.000	2.507500	64QAM	-13.0	1.0	n.f.	< limit	58
0.030 – 4.000	2.596000	64QAM	-13.0	1.0	n.f.	< limit	59
4.000 – 12.000	2.596000	64QAM	-13.0	1.0	n.f.	< limit	60
12.000 – 18.000	2.596000	64QAM	-13.0	1.0	n.f.	< limit	61
18.000 – 27.000	2.596000	64QAM	-13.0	1.0	n.f.	< limit	62
0.030 – 4.000	2.684500	64QAM	-13.0	1.0	n.f.	< limit	63
4.000 – 12.000	2.684500	64QAM	-13.0	1.0	n.f.	< limit	64
12.000 – 18.000	2.684500	64QAM	-13.0	1.0	n.f.	< limit	65
18.000 – 27.000	2.684500	64QAM	-13.0	1.0	n.f.	< limit	66

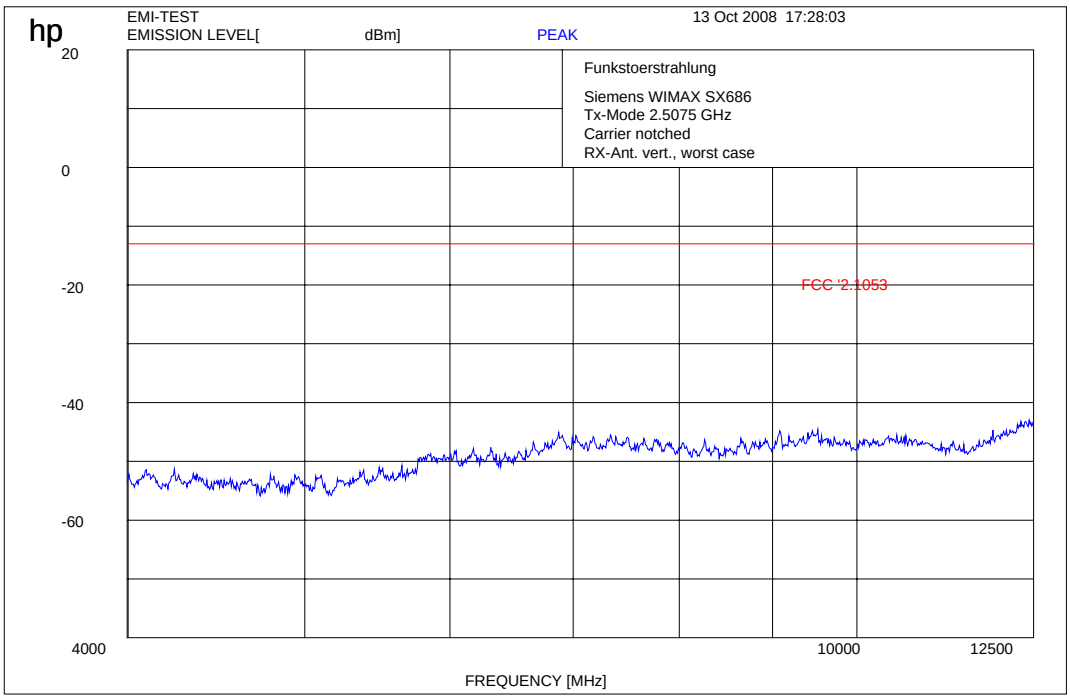
n.f. = nothing found

Test result: Passed: [X] Failed: [ ]

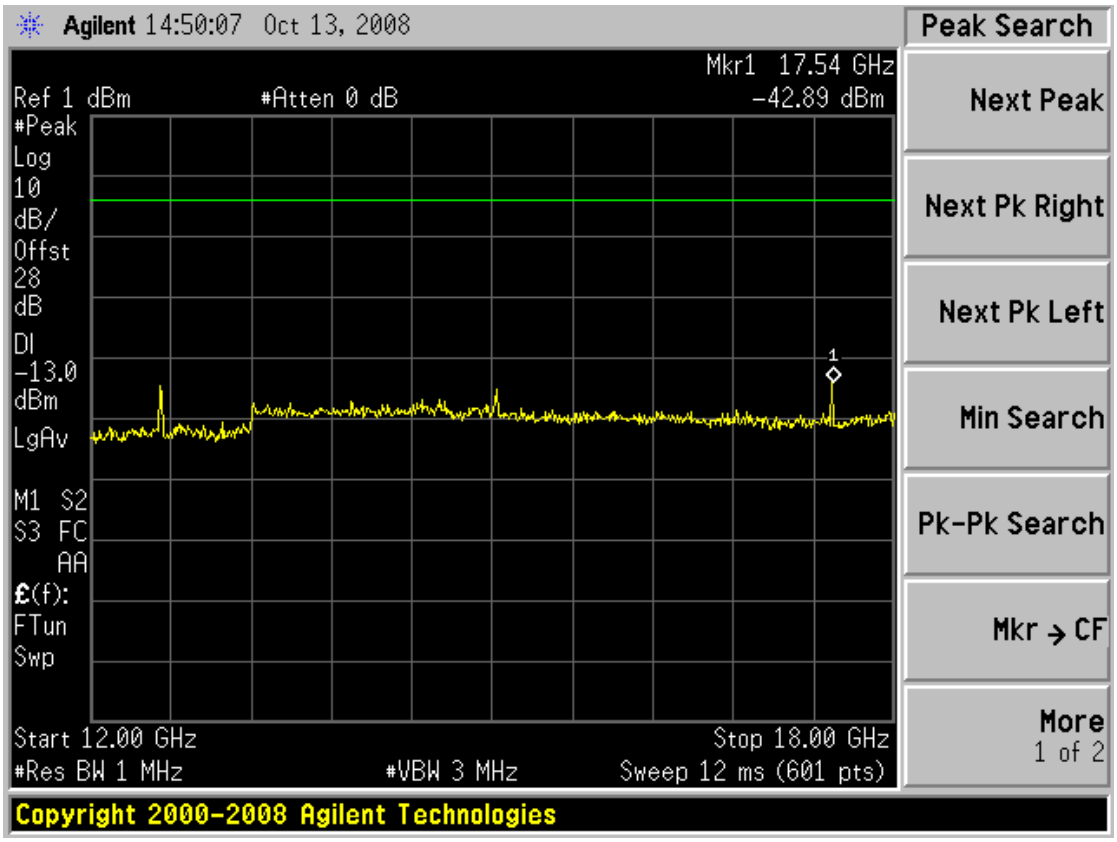
Plot 55:



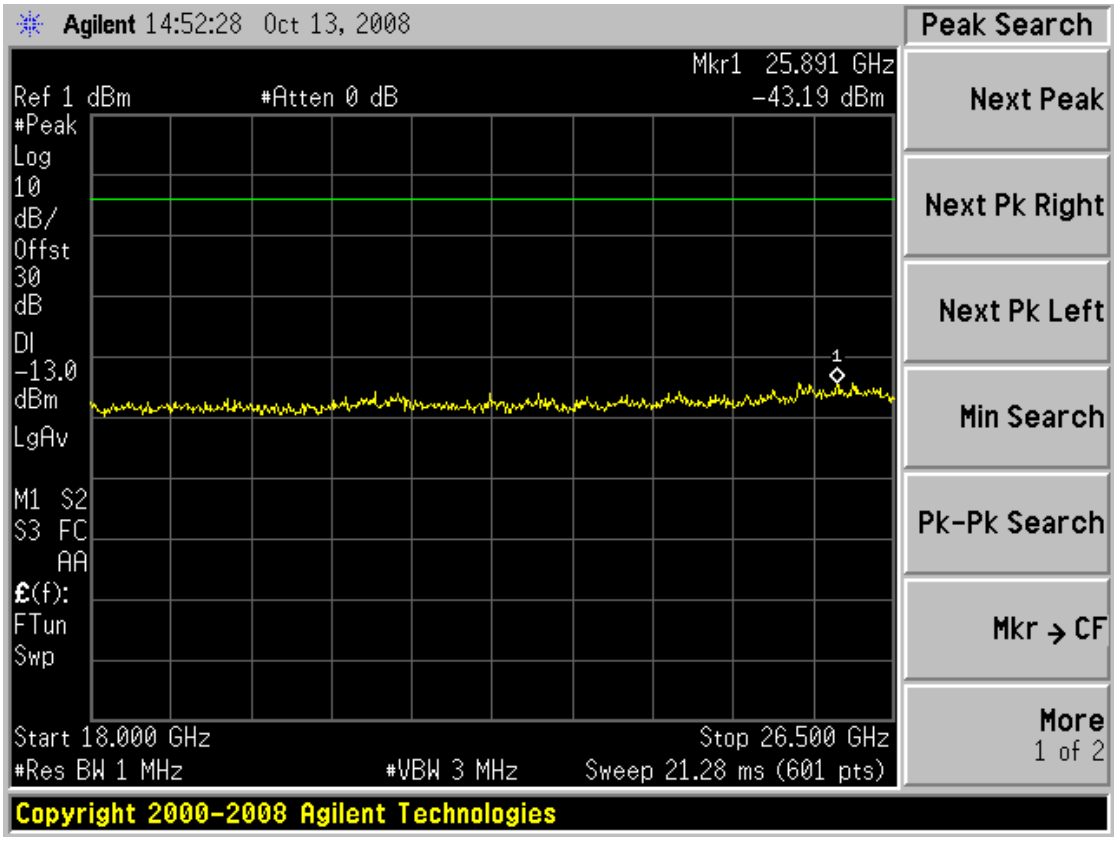
Plot 56:



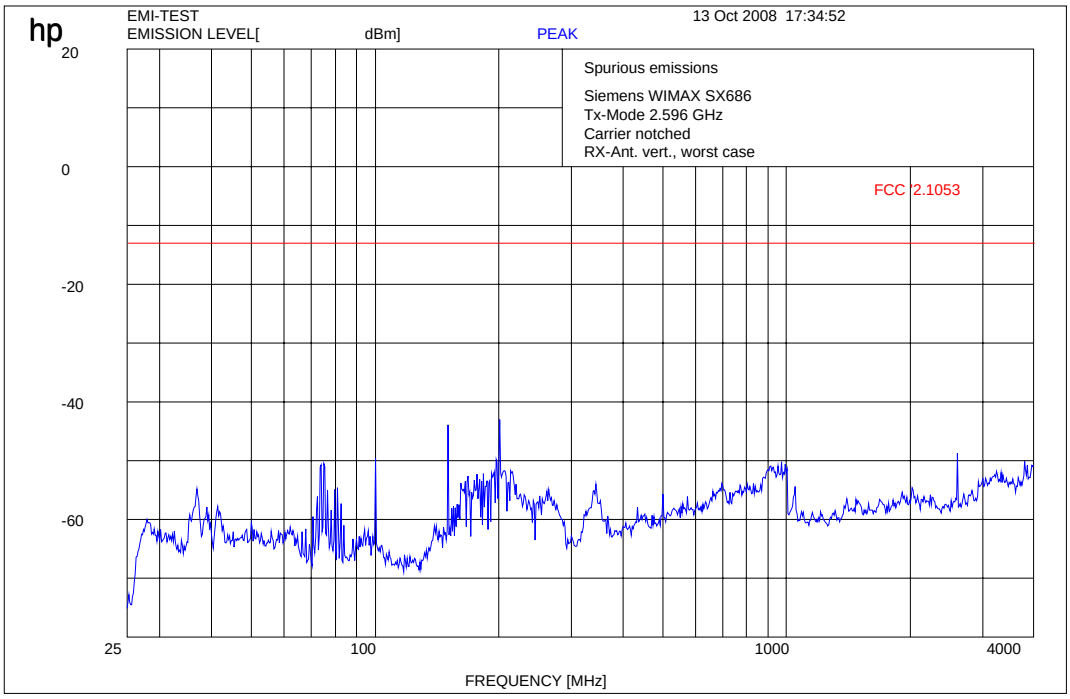
Plot 57:



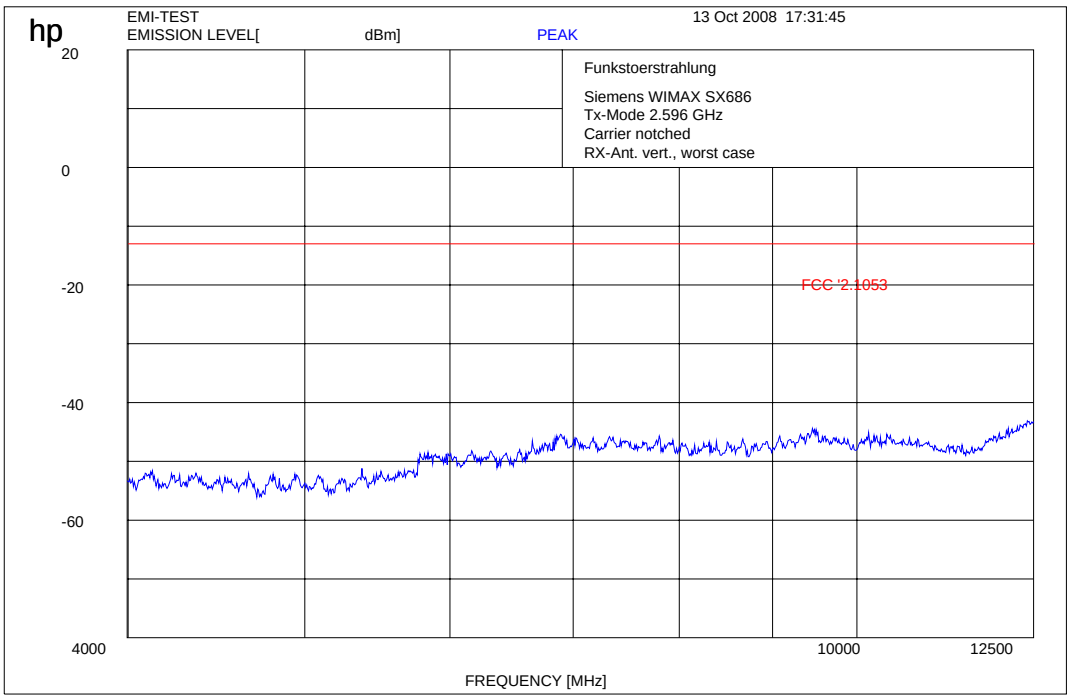
Plot 58:



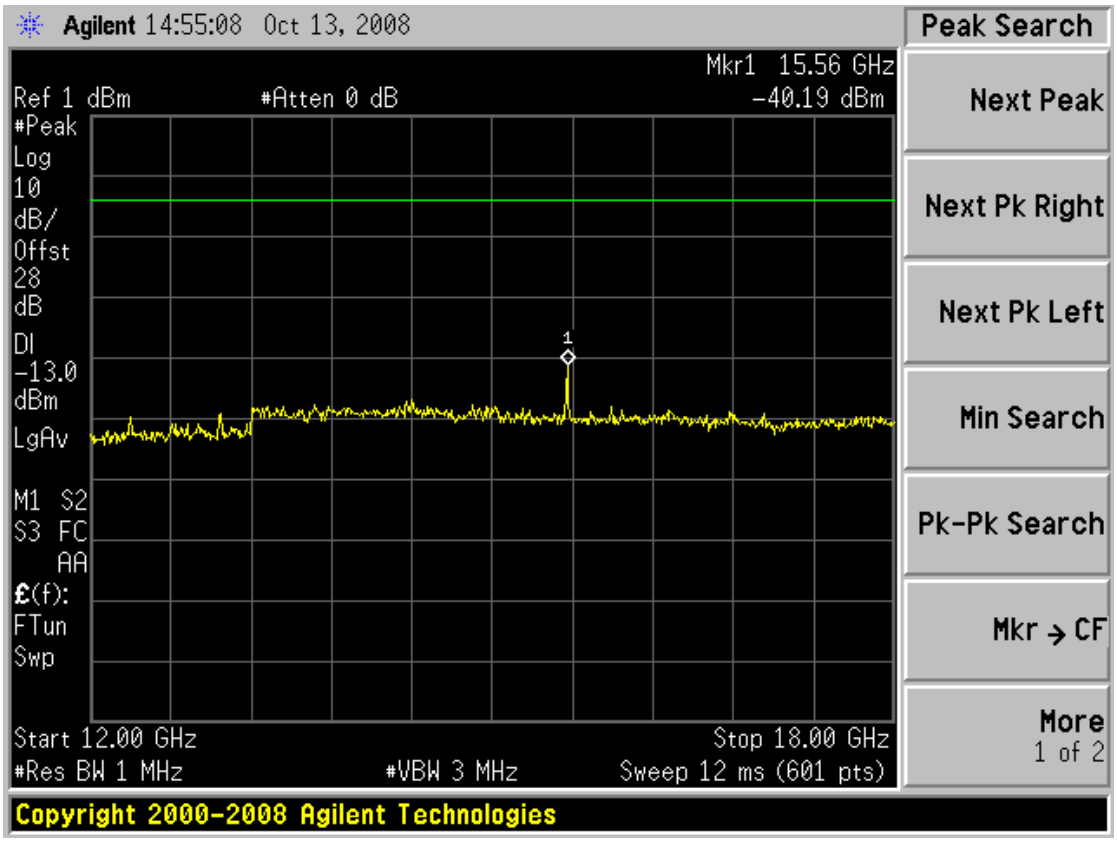
Plot 59:



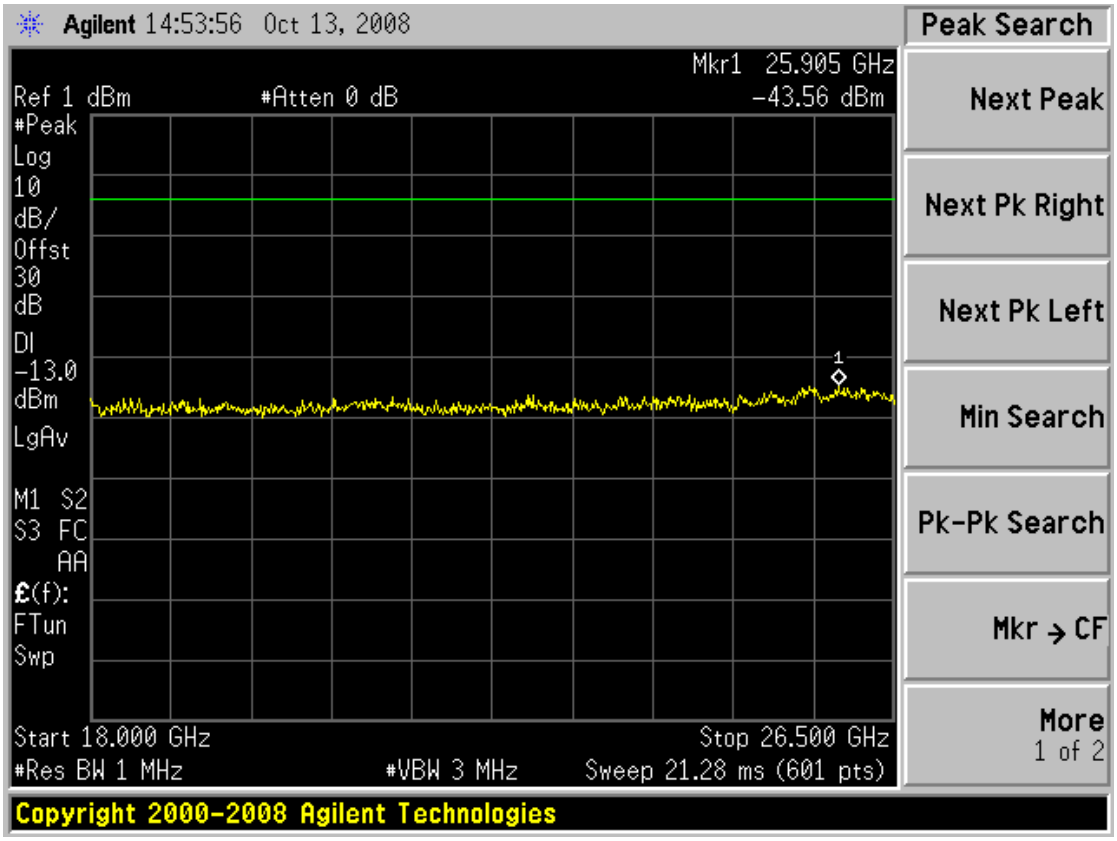
Plot 60:



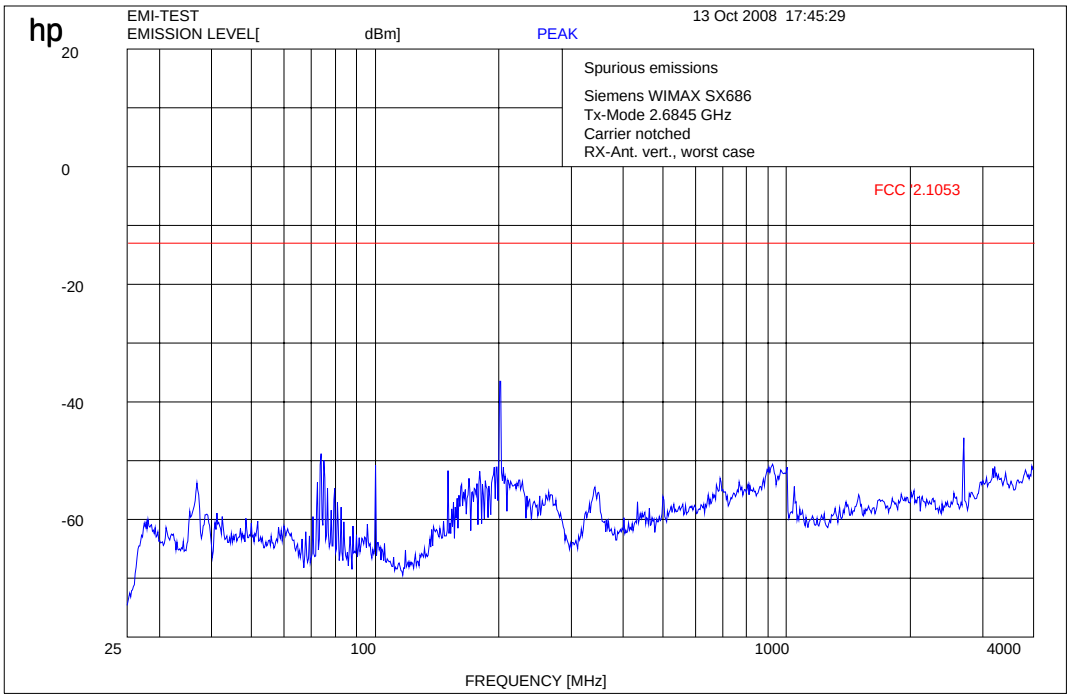
Plot 61:



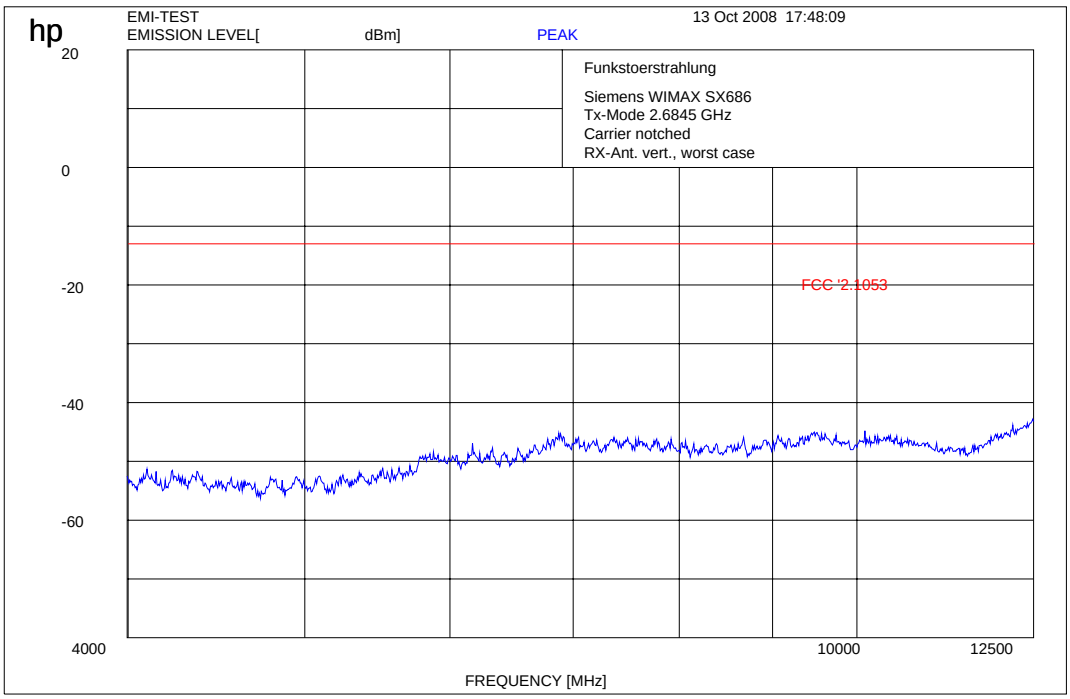
Plot 62:



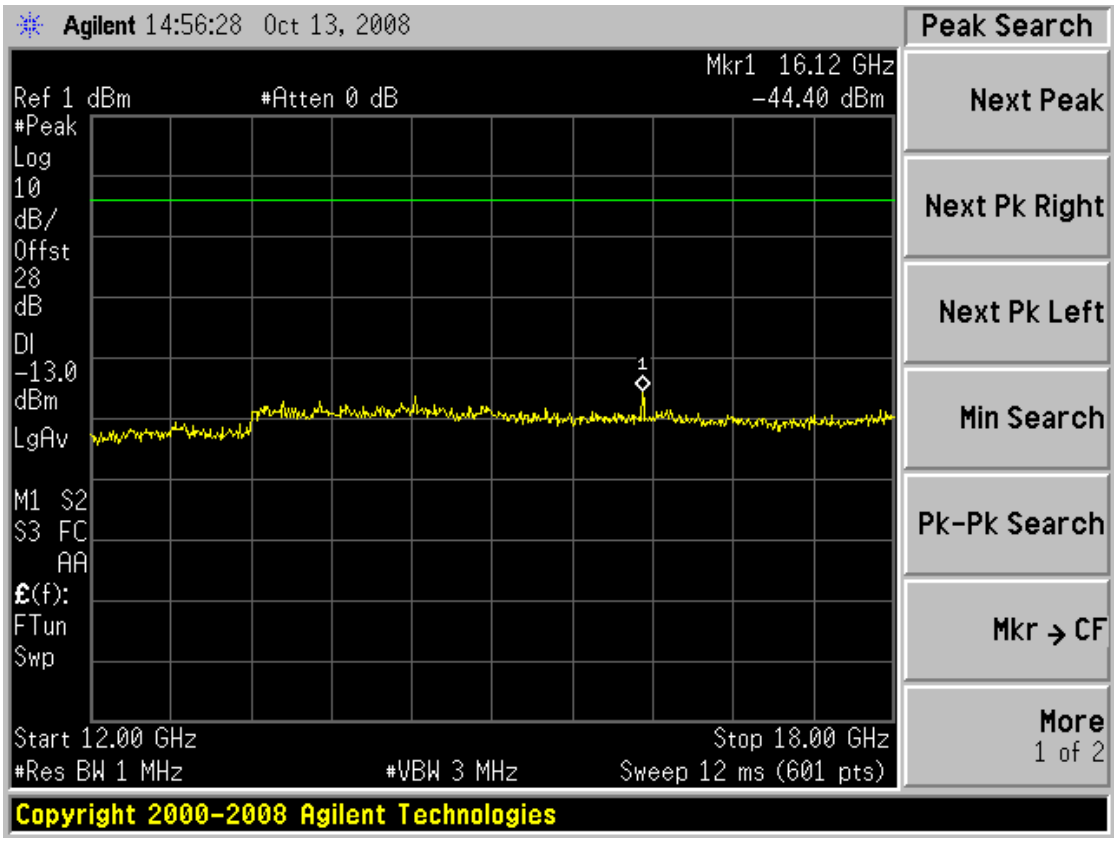
Plot 63:



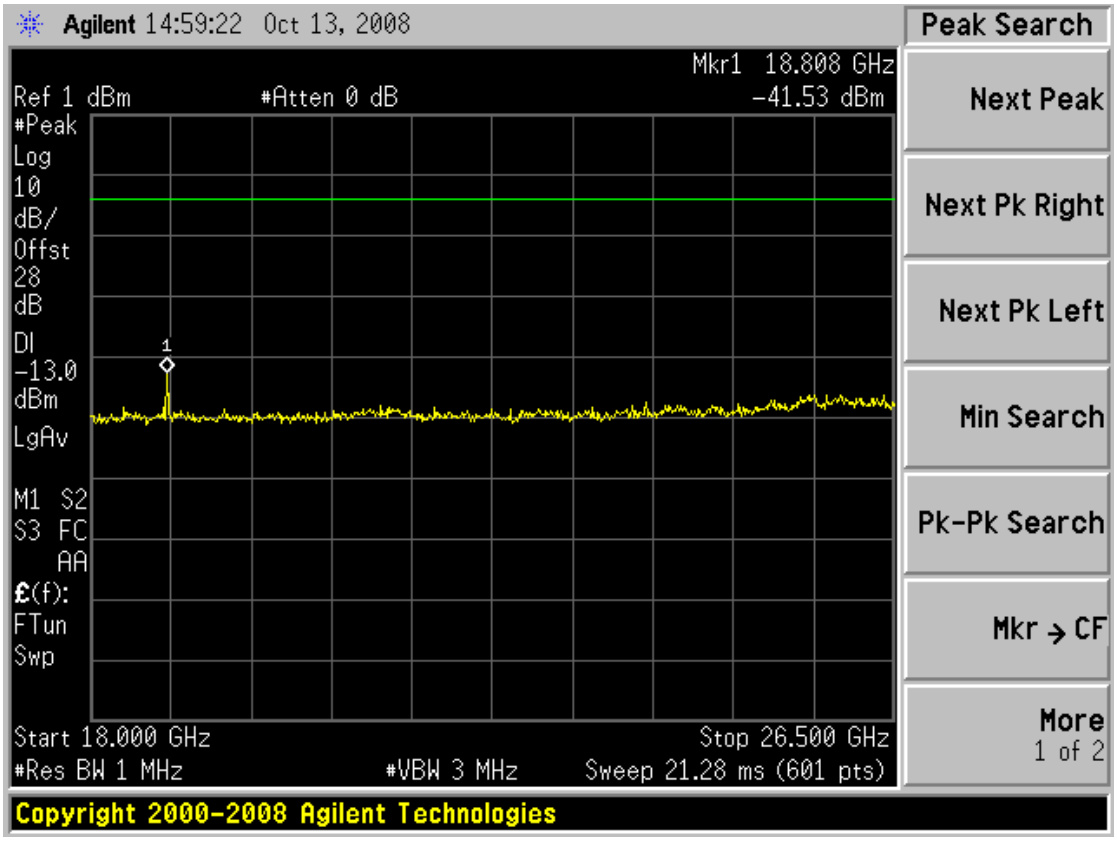
Plot 64:



Plot 65:



Plot 66:



CFR 47 Part 2.1055 Measurements required: Frequency stability
CFR 47 Part 27.54 Frequency stability

Transmitter characteristics: 5 MHz channel spacing

Measurement conditions:

Frequency	f_{nom}	= 2.593000 GHz
Channel spacing	CS	= 5.0 MHz
Modulation	D	= 64QAM
Temperature	t	= see table
Power supply	U_{AC}	= see table
Measurement at	C'	

Test set-up: see page 8 / no. 4

Limit: see plots

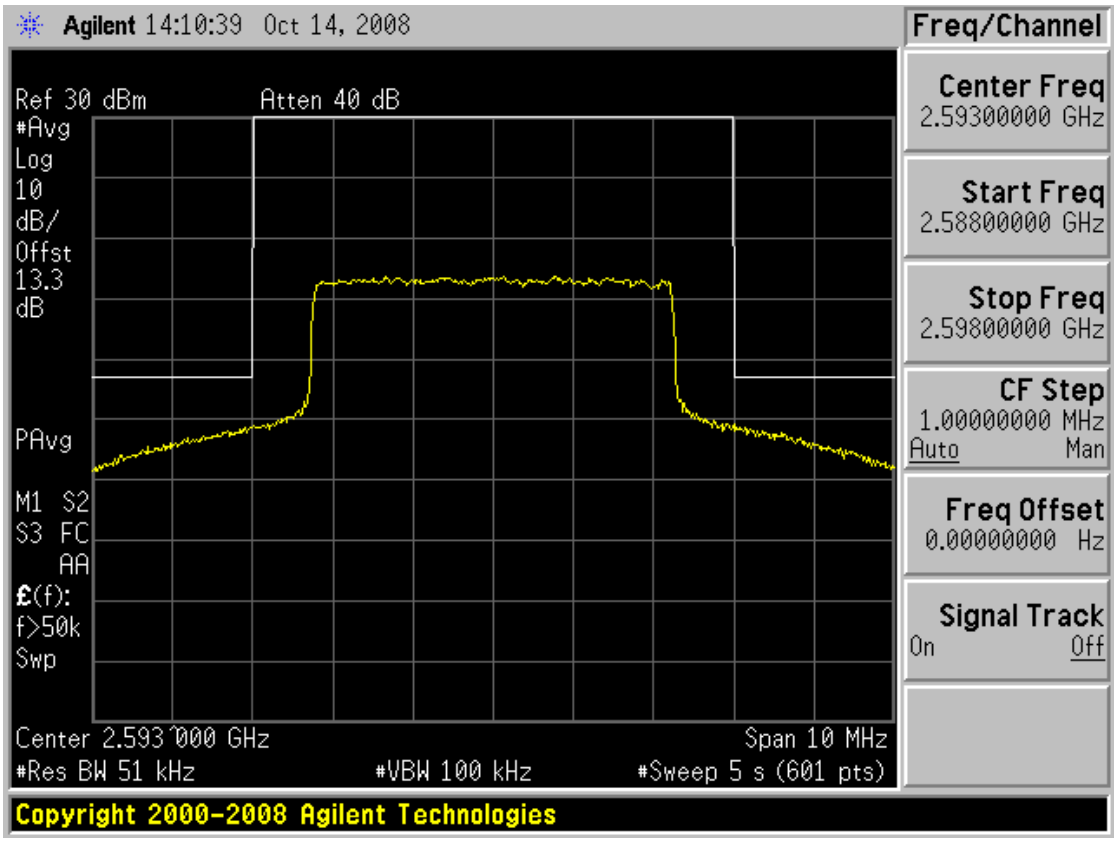
Test measurement:

U_{AC}	T	Channel spacing	Modulation	Frequency	Frequency Error	Plot
[V]	[°C]	[MHz]		[GHz]		
97 / 115 / 133	-30.0	5	64QAM	2.593000	12.18 kHz / 4.7 ppm	67
97 / 115 / 133	-20.0	5	64QAM	2.593000	10.94 kHz / 4.2 ppm	68
97 / 115 / 133	-10.0	5	64QAM	2.593000	9.12 kHz / 3.5 ppm	69
97 / 115 / 133	0.0	5	64QAM	2.593000	7.59 kHz / 2.9 ppm	70
97 / 115 / 133	10.0	5	64QAM	2.593000	5.61 kHz / 2.1 ppm	71
97 / 115 / 133	20.0	5	64QAM	2.593000	3.87 kHz / 1.5 ppm	72
97 / 115 / 133	30.0	5	64QAM	2.593000	1.14 kHz / 0.4 ppm	73
97 / 115 / 133	40.0	5	64QAM	2.593000	-0.73 kHz / -0.3 ppm	74
97 / 115 / 133	50.0	5	64QAM	2.593000	-2.23 kHz / -0.9 ppm	75

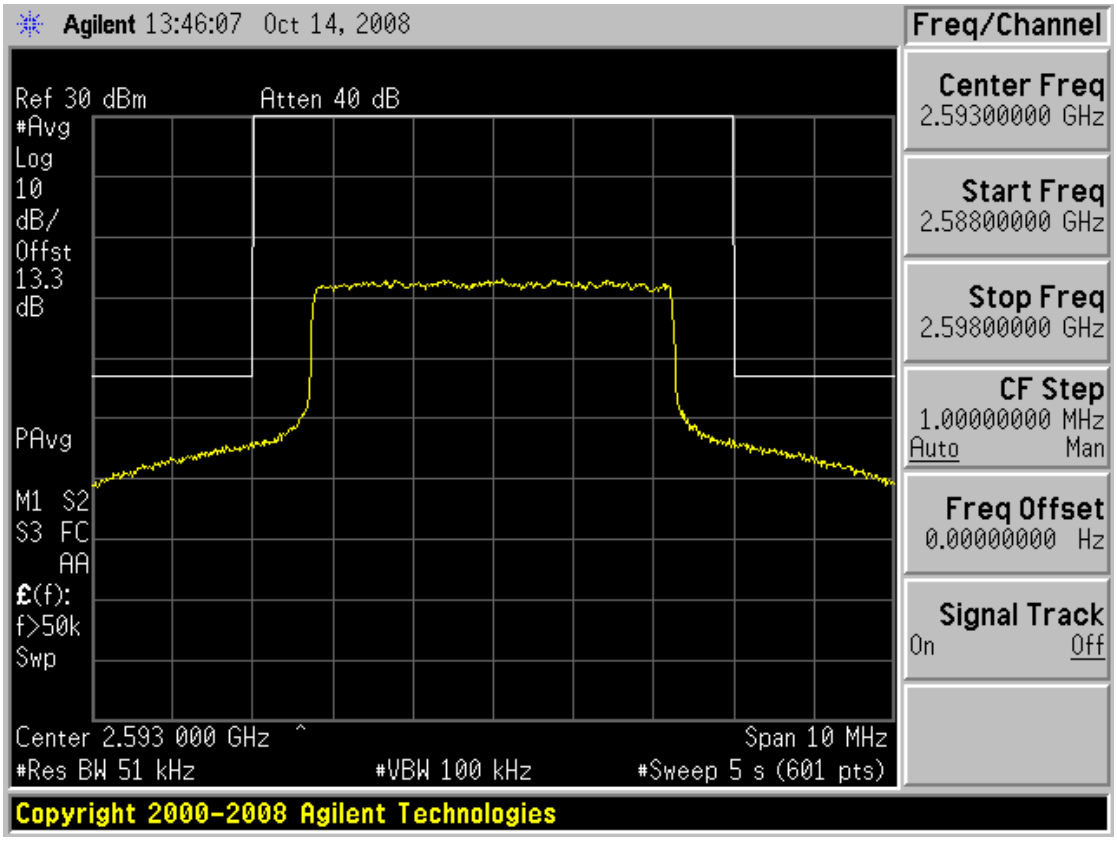
Note:
The manufacturer declared a maximum frequency deviation of 160 Hz (0.06 ppm) when the DUT is locked to the base station.

Test result: Passed: [X] Failed: [ ]

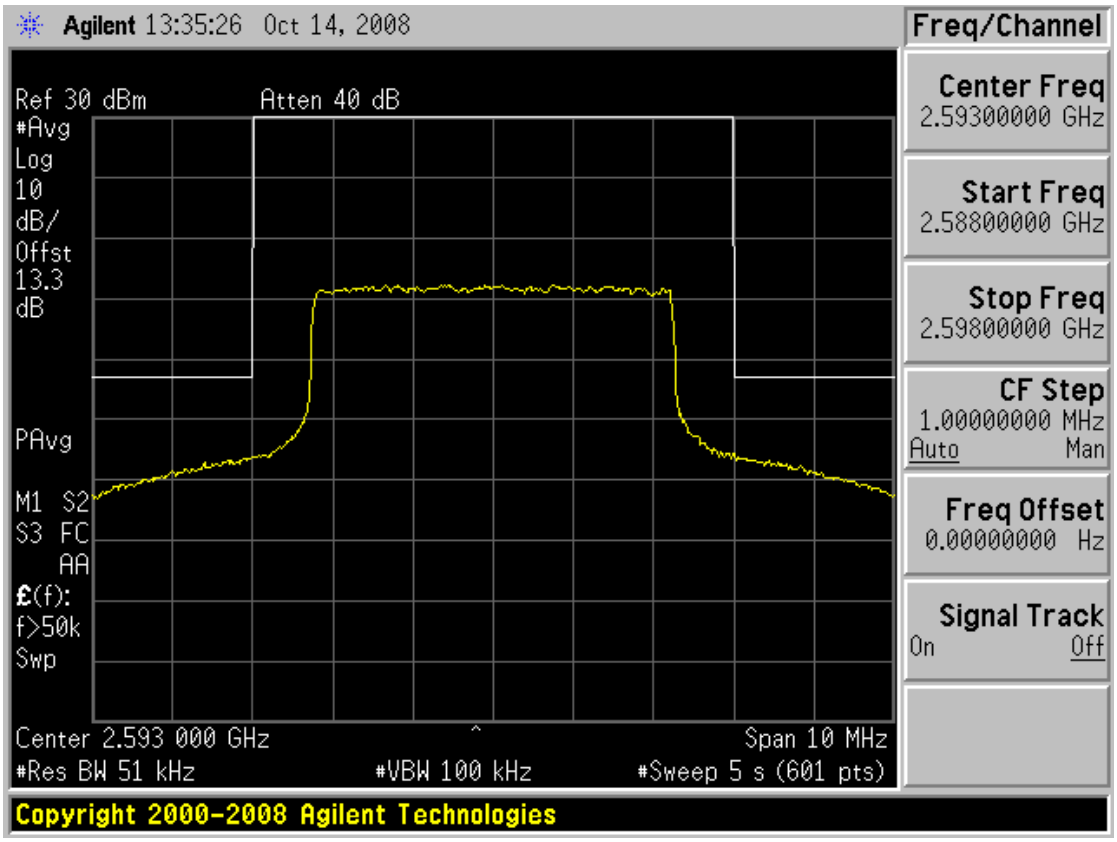
Plot 67:



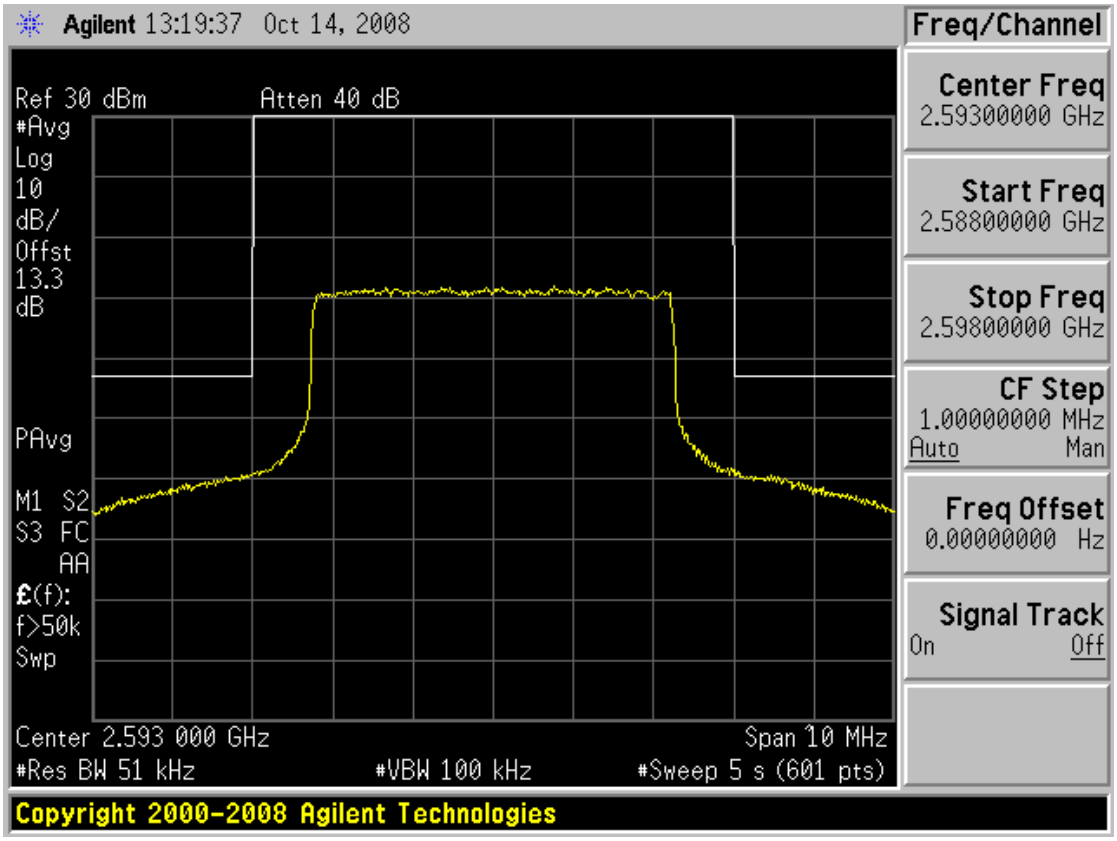
Plot 68:



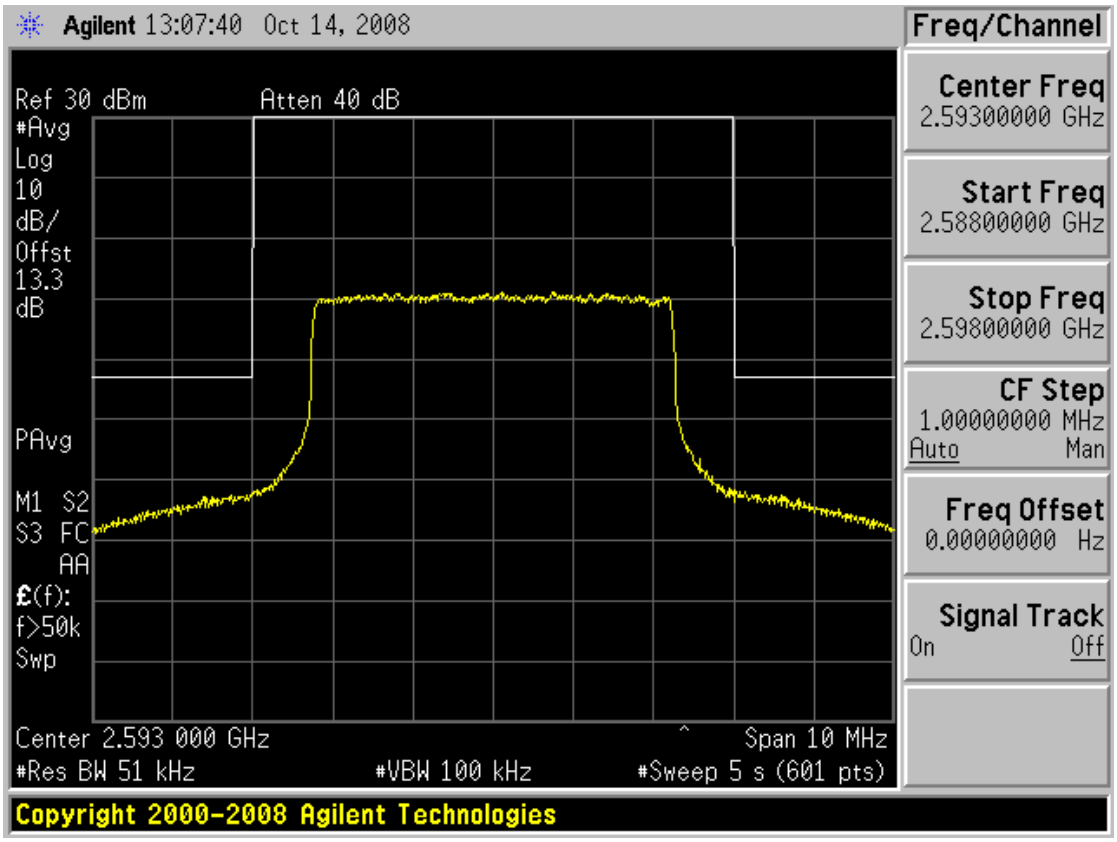
Plot 69:



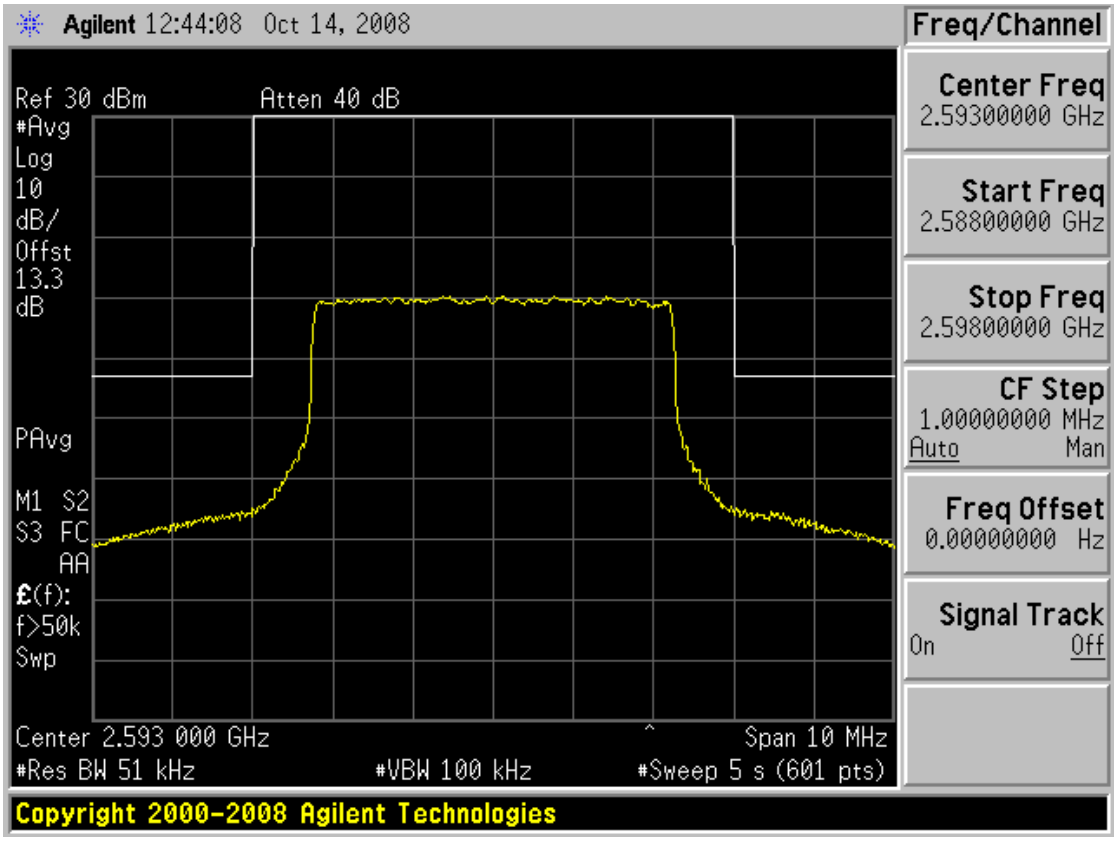
Plot 70:



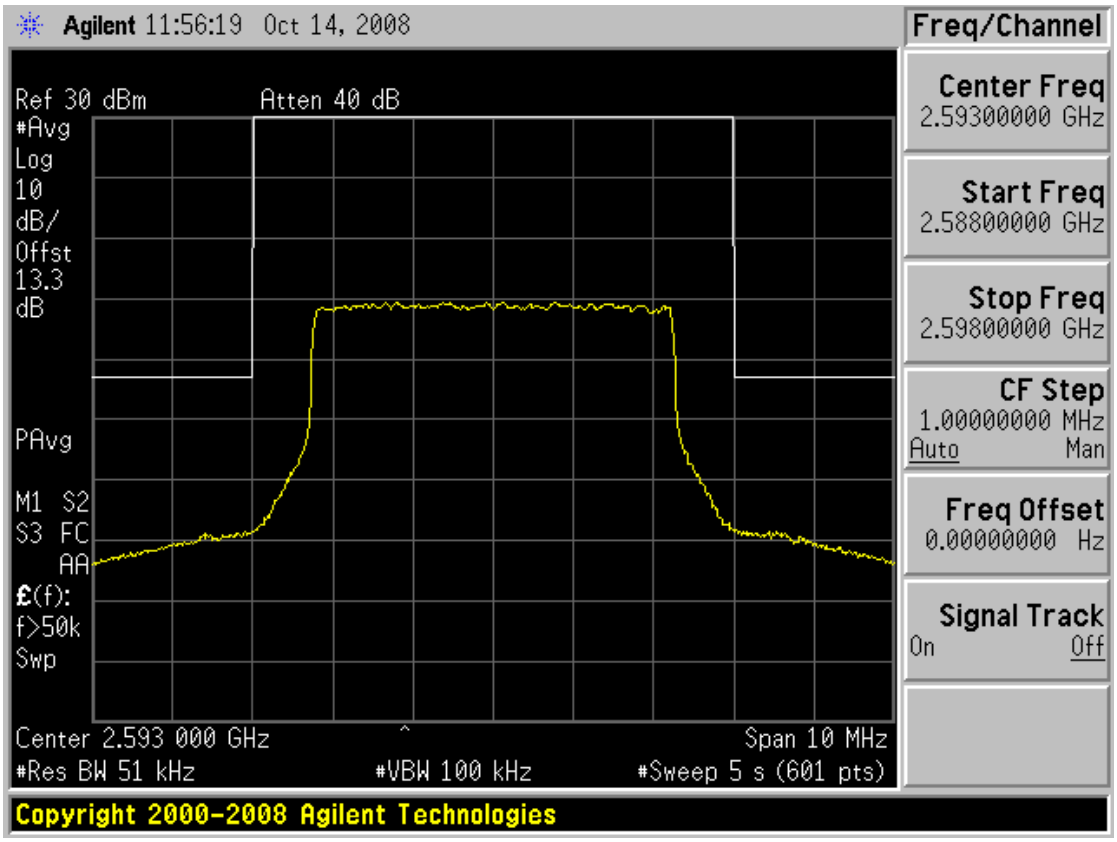
Plot 71:



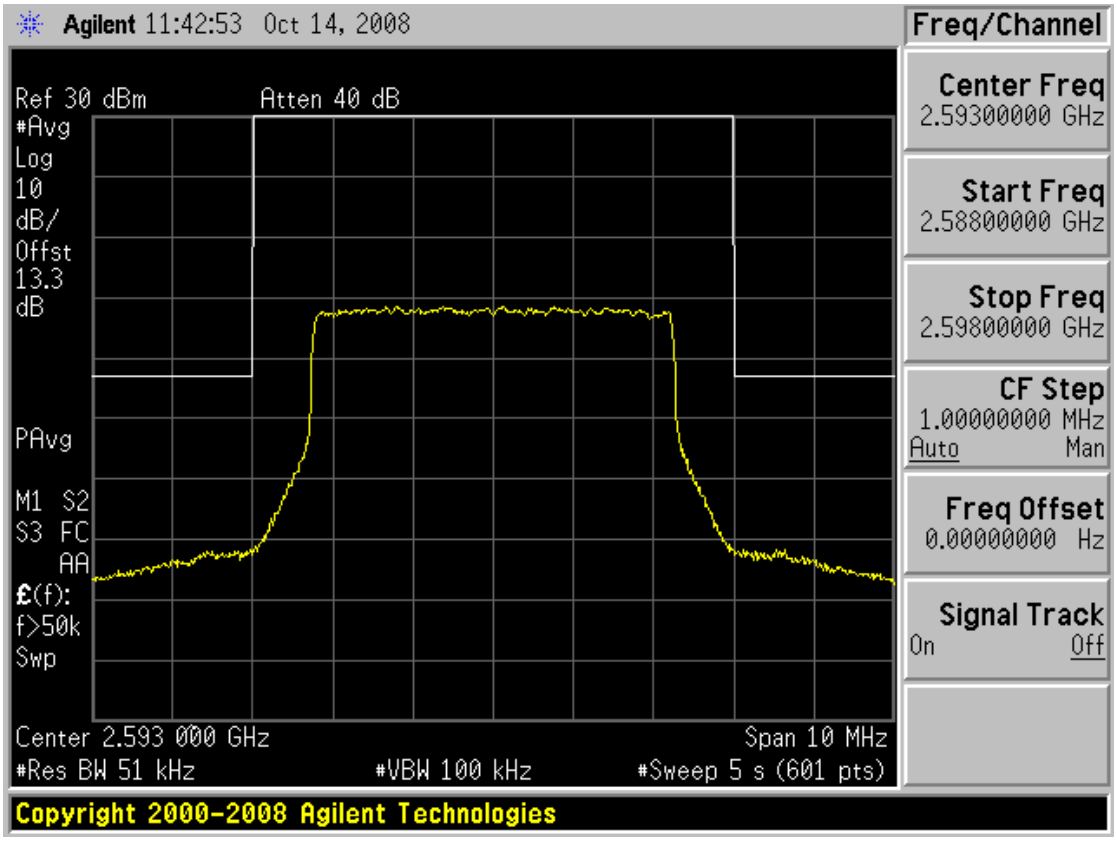
Plot 72:



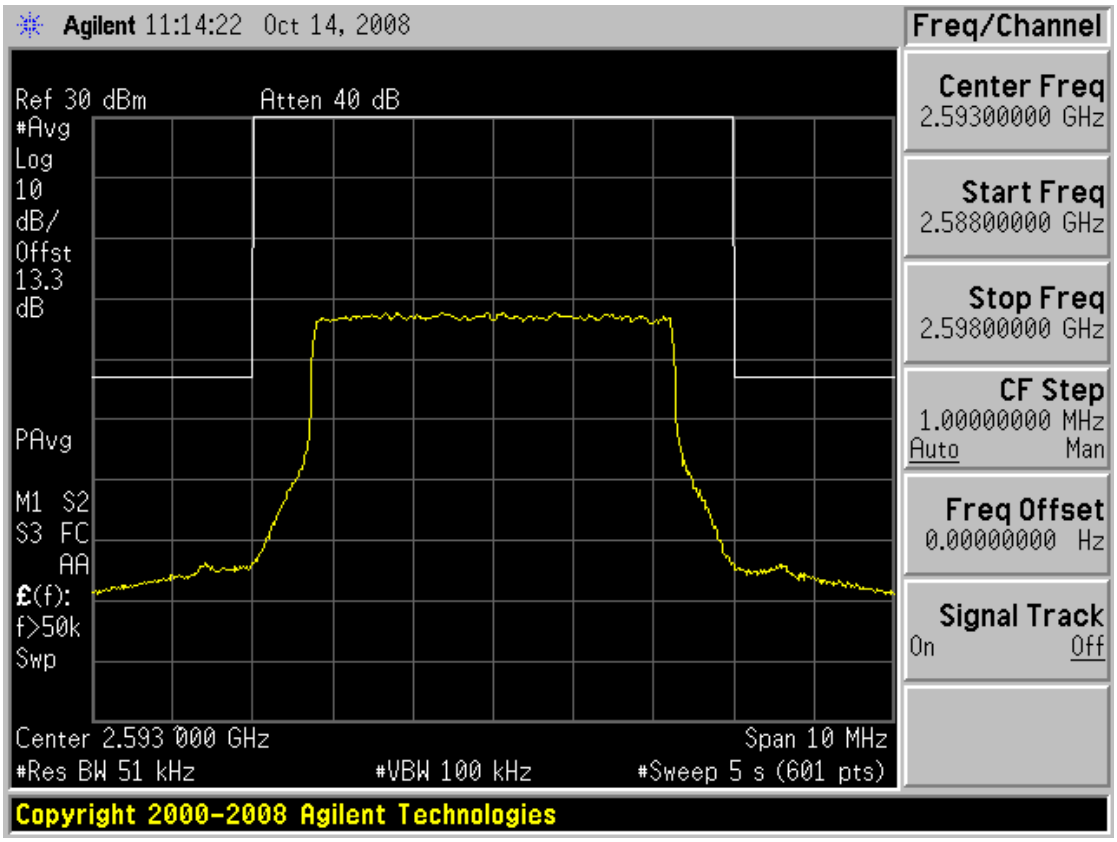
Plot 73:



Plot 74:



Plot 75:


Agilent 11:14:22 Oct 14, 2008
Ref 30 dBm
Atten 40 dB
#Avg
Log
10
dB/
Offst
13.3
dB
PAvg
M1 S2
S3 FC
AA
£(f):
f>50k
Swp
Center 2.593 000 GHz
Span 10 MHz
#Res BW 51 kHz
#VBW 100 kHz
#Sweep 5 s (601 pts)
Freq/Channel
Center Freq
2.59300000 GHz
Start Freq
2.58800000 GHz
Stop Freq
2.59800000 GHz
CF Step
1.00000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Copyright 2000-2008 Agilent Technologies

CFR 47 Part 2.1055 Measurements required: Frequency stability
CFR 47 Part 27.54 Frequency stability

Transmitter characteristics: 10 MHz channel spacing

Measurement conditions:

Frequency	f_{nom}	= 2.596000 GHz
Channel spacing	CS	= 10.0 MHz
Modulation	D	= 64QAM
Temperature	t	= see table
Power supply	U_{AC}	= see table
Measurement at	C'	

Test set-up: see page 8 / no. 4

Limit: see plot

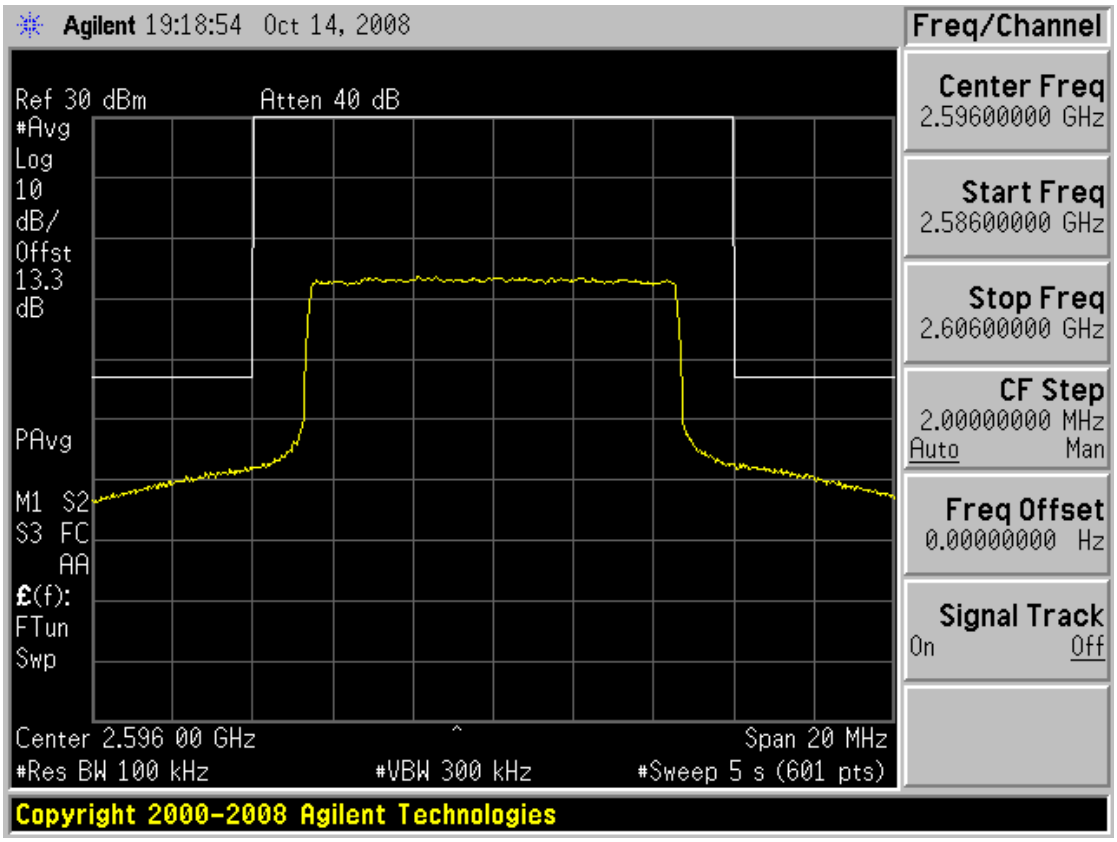
Test measurement:

U_{AC}	T	Channel spacing	Modulation	Frequency	Frequency Error	Plot
[V]	[°C]	[MHz]		[GHz]		
97 / 115 / 133	-30.0	10	64QAM	2.596000	12.23 kHz / 4.7 ppm	76
97 / 115 / 133	-20.0	10	64QAM	2.596000	11.07 kHz / 4.3 ppm	77
97 / 115 / 133	-10.0	10	64QAM	2.596000	9.27 kHz / 3.6 ppm	78
97 / 115 / 133	0.0	10	64QAM	2.596000	7.81 kHz / 3.0 ppm	79
97 / 115 / 133	10.0	10	64QAM	2.596000	5.73 kHz / 2.2 ppm	80
97 / 115 / 133	20.0	10	64QAM	2.596000	3.96 kHz / 1.5 ppm	81
97 / 115 / 133	30.0	10	64QAM	2.596000	1.52 kHz / 0.6 ppm	82
97 / 115 / 133	40.0	10	64QAM	2.596000	-0.51 kHz / -0.2 ppm	83
97 / 115 / 133	50.0	10	64QAM	2.596000	-1.97 kHz / -0.8 ppm	84

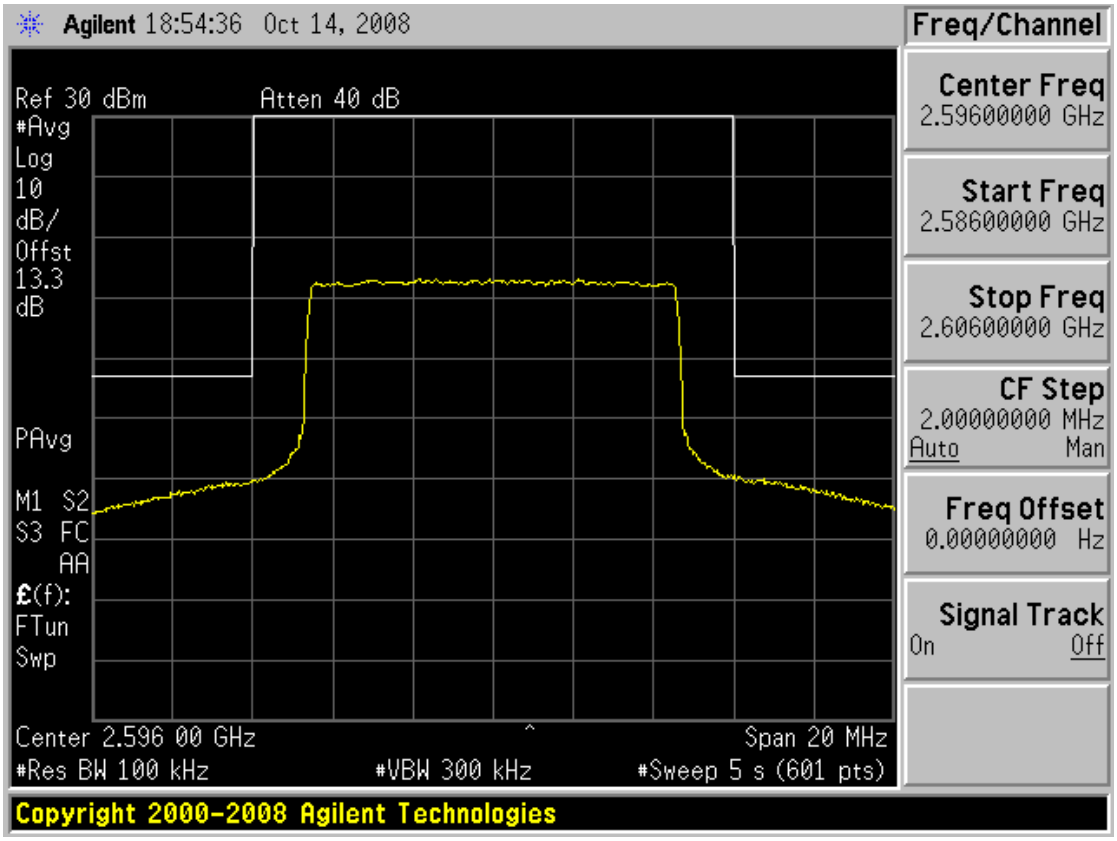
Note:
The manufacturer declared a maximum frequency deviation of 160 Hz (0.06 ppm) when the DUT is locked to the base station.

Test result: Passed: [X] Failed: [ ]

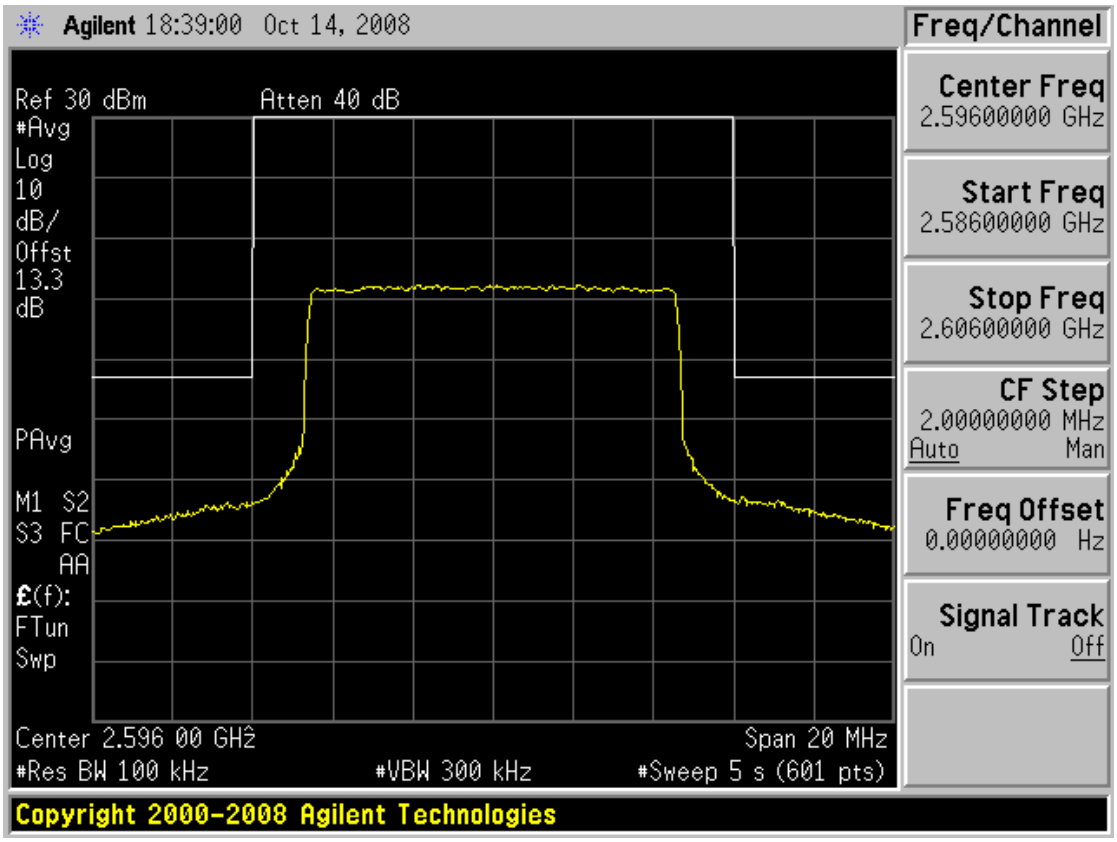
Plot 76:



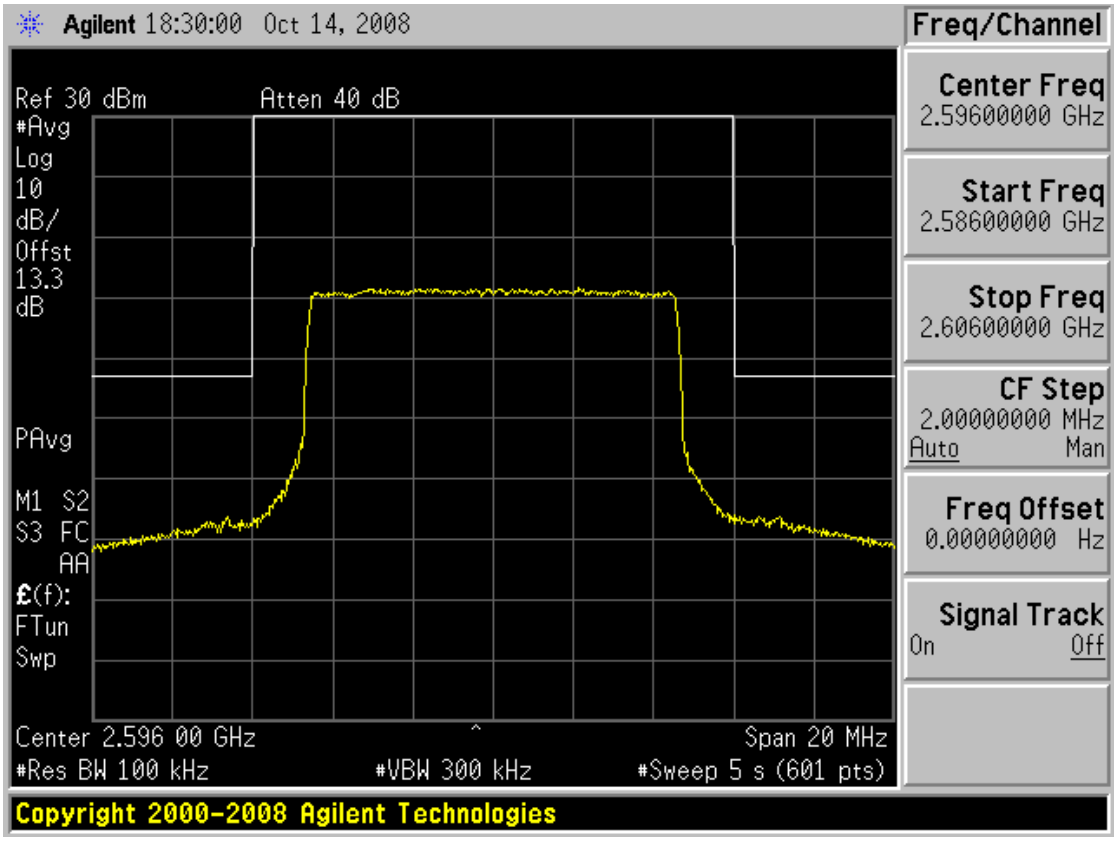
Plot 77:



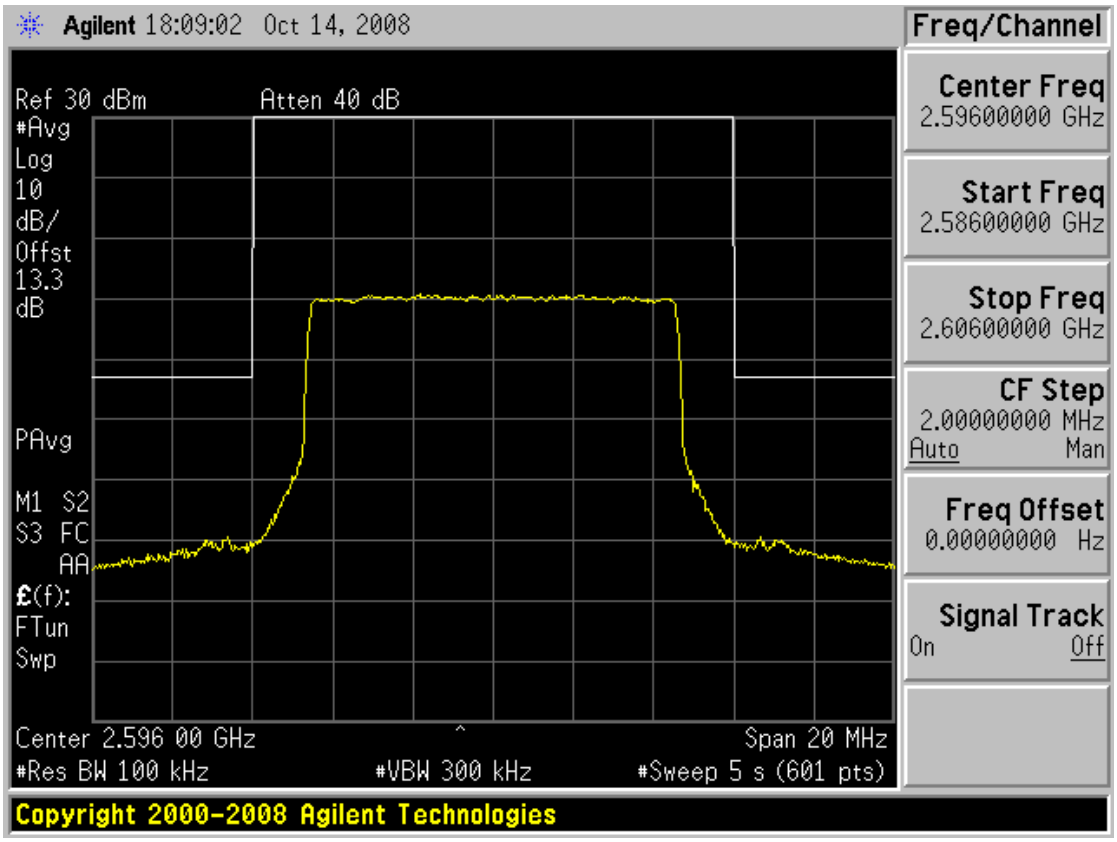
Plot 78:



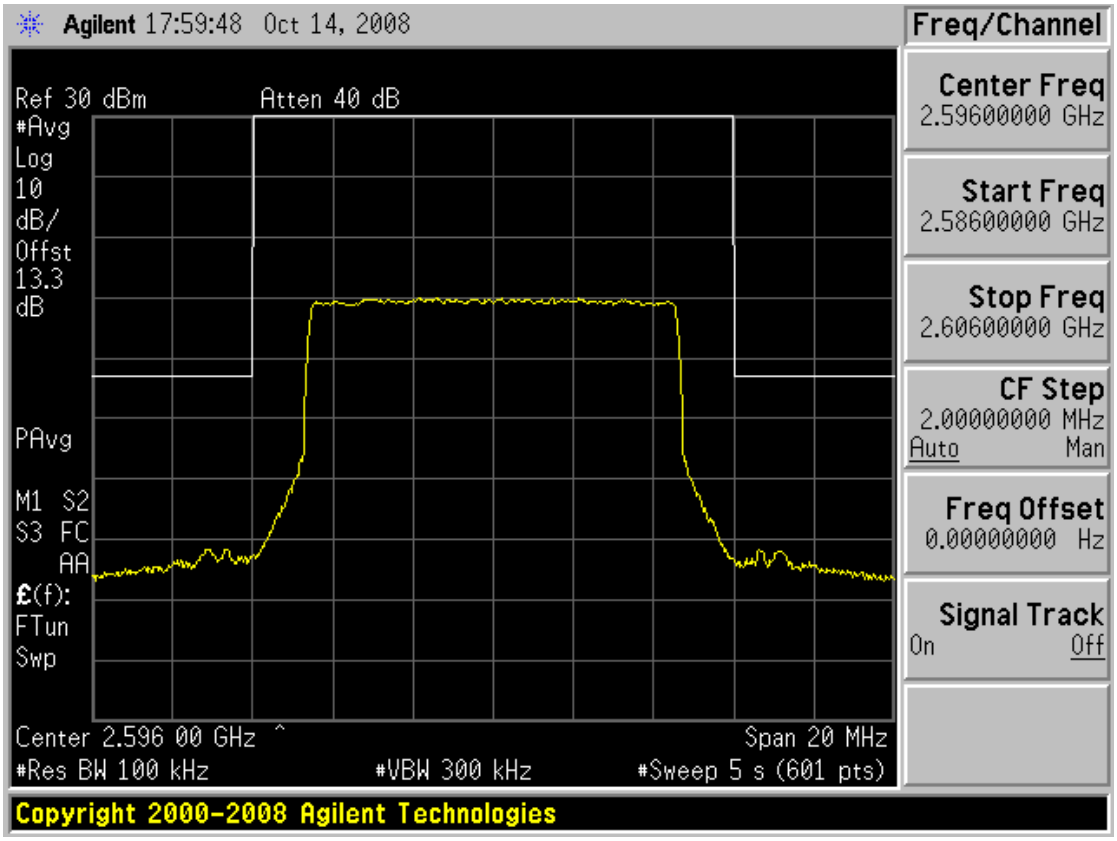
Plot 79:



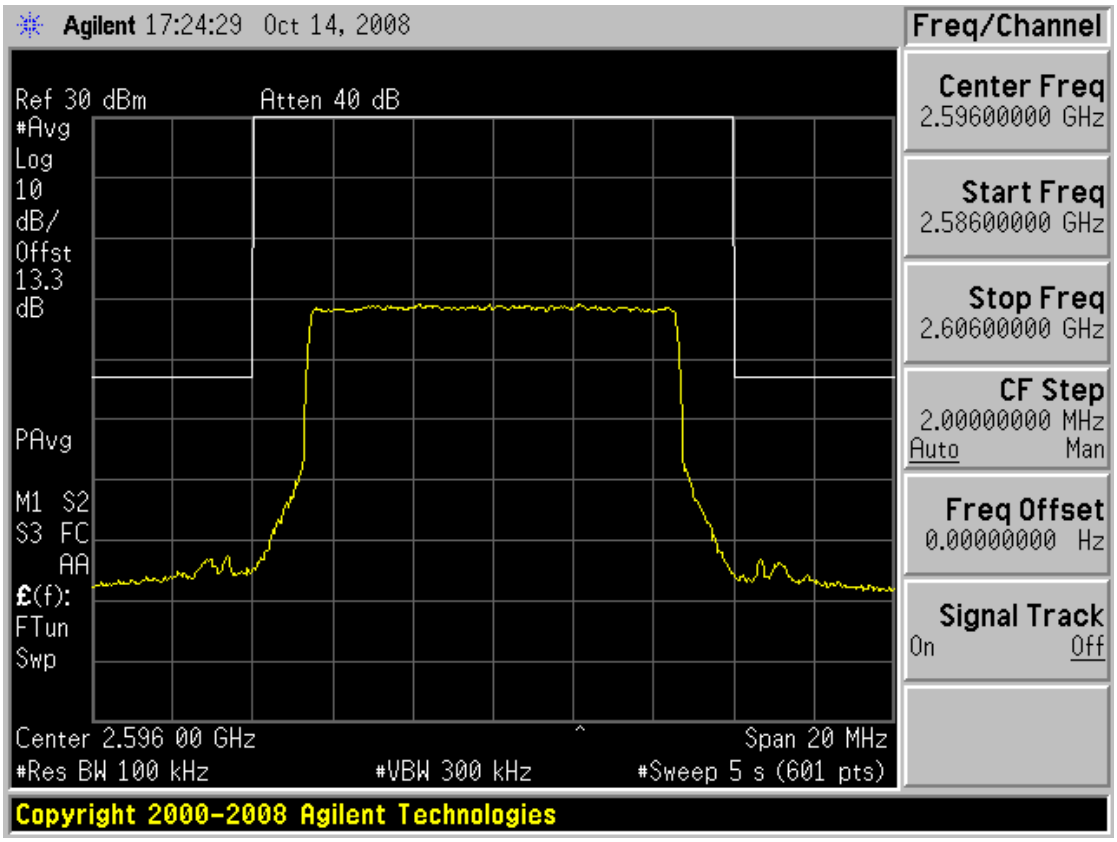
Plot 80:



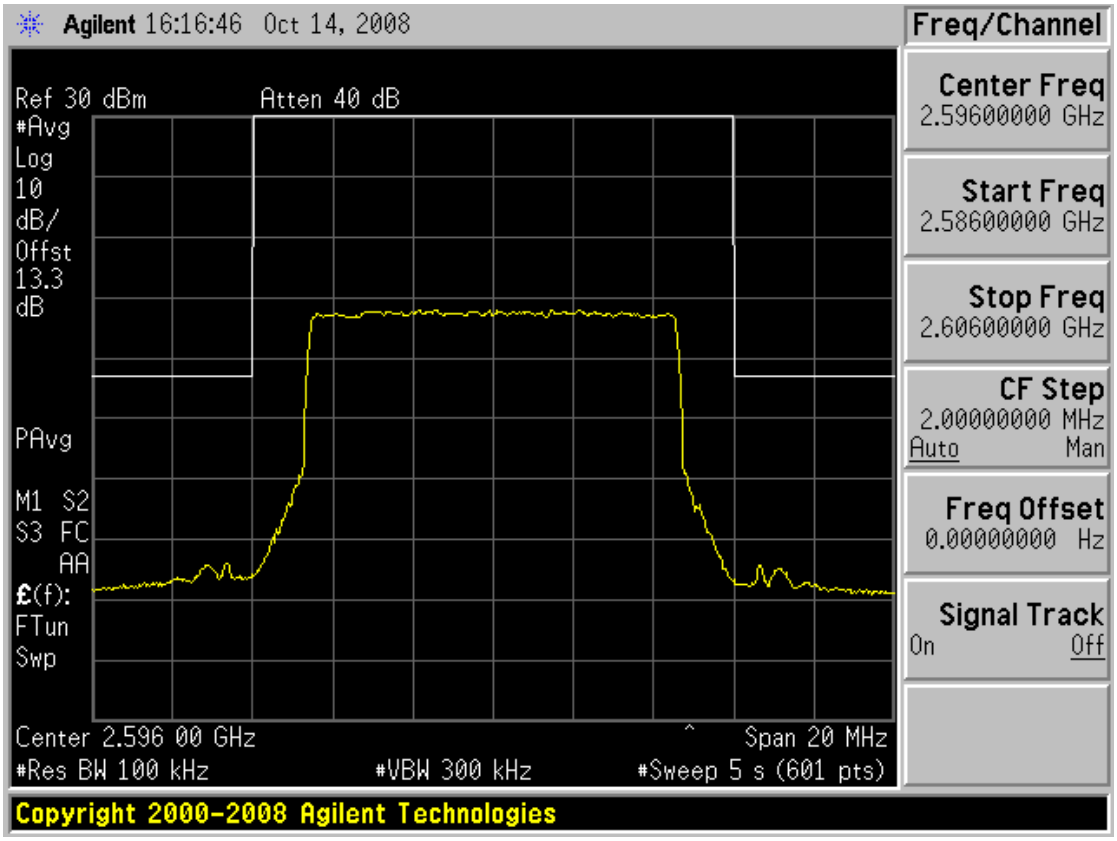
Plot 81:



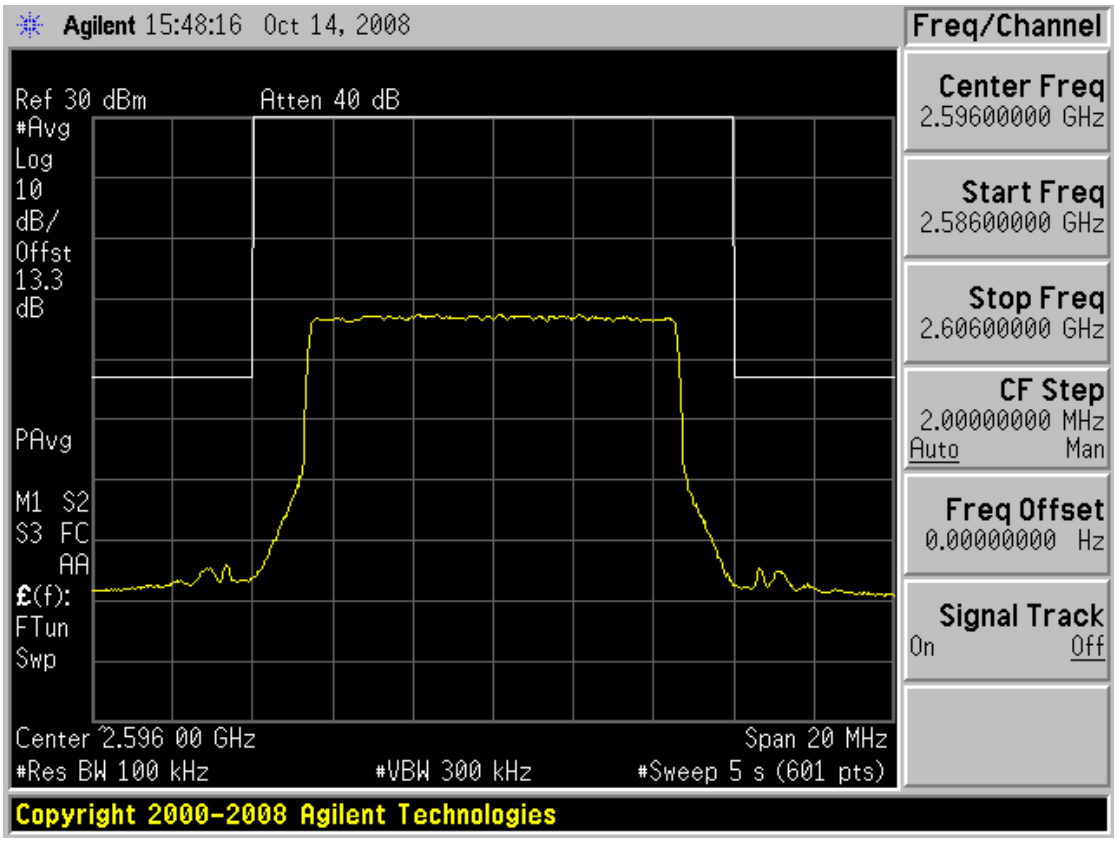
Plot 82:



Plot 83:



Plot 84:


Agilent 15:48:16 Oct 14, 2008
Freq/Channel
Ref 30 dBm
Atten 40 dB
#Avg
Log
10
dB/
Offst
13.3
dB
PAvg
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 2.596 00 GHz
Span 20 MHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 5 s (601 pts)
Center Freq
2.59600000 GHz
Start Freq
2.58600000 GHz
Stop Freq
2.60600000 GHz
CF Step
2.00000000 MHz
Auto
Man
Freq Offset
0.00000000 Hz
Signal Track
On
Off
Copyright 2000-2008 Agilent Technologies

RF Exposure / Safety

Calculation of Maximum Permissible Exposure (MPE)
based on Section 1.1307(b) Requirements

a) FCC limit is: 1mW/cm^2

b) The Wimax CPE can be configured in one of three different setups:
Setup 1: CPE with 9dBi internal antenna
Setup 2: CPE with 9dBi external desktop antenna
Setup 3: CPE with 15dBi external outdoor antenna

c) The power density produced by the EUT is:

$$S_{peak} = \frac{P_t \cdot G_t}{4\pi R^2}$$

$$S_{average} = \frac{P_t \cdot G_t \cdot dc}{4\pi R^2 \cdot 100}$$

P_t – Transmitted power 251mW (rms peak) (24dBm)
G_t – Antenna gain dependant on setup
R – Distance from transmitter
Dc – duty cycle

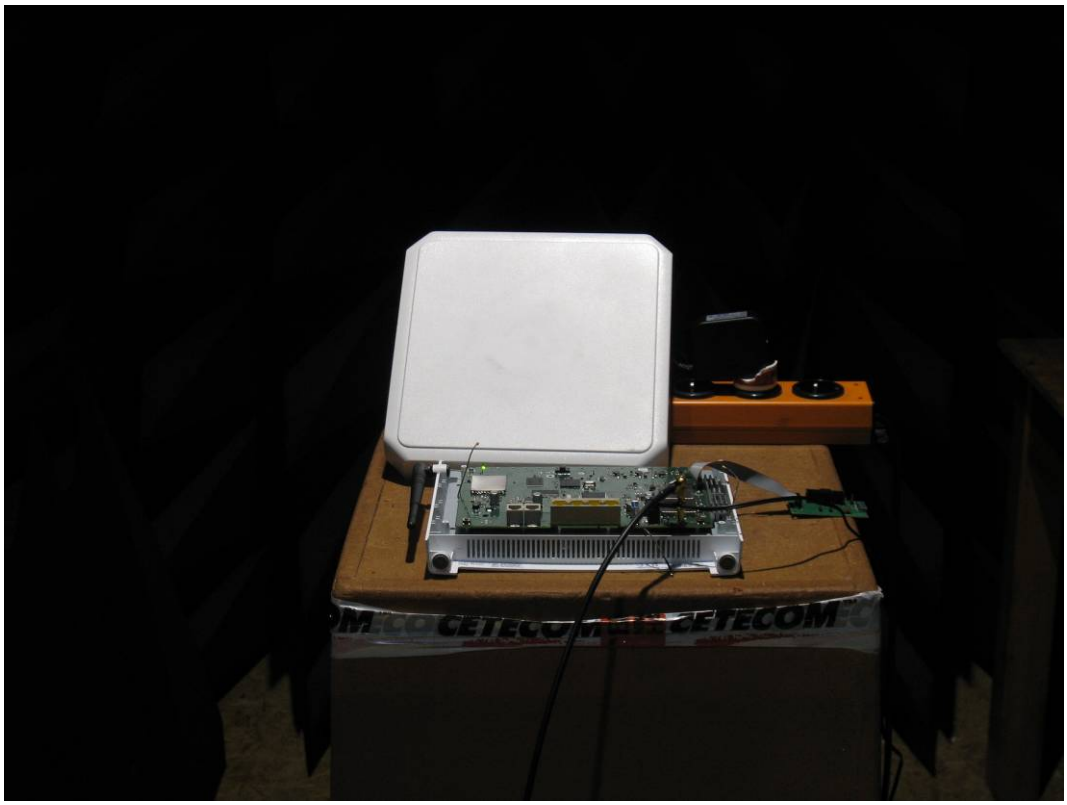
d) The power density is:

	Setup 1	**Setup 2**	**Setup 3**
P_t - Power output (rms peak) 24dBm	24dBm 251mW	24dBm 251mW	24dBm 251mW
G_t – Antenna gain	9dBi 8	9dBi - 1dB cable loss 6.3	15dBi - 1dB cable loss 25.1
Duty cycle (worst case)	100%	100%	100%
R – Distance from antenna (cm)	20	20	50
S_{peak} – peak power density (mW/cm^2)	0.40	0.31	0.2

e) S_{peak} < 1mW/cm^2

2 Photographs of the Test Setup

Photo 1



Radiated spurious emissions from 1 - 12 GHz in test chamber

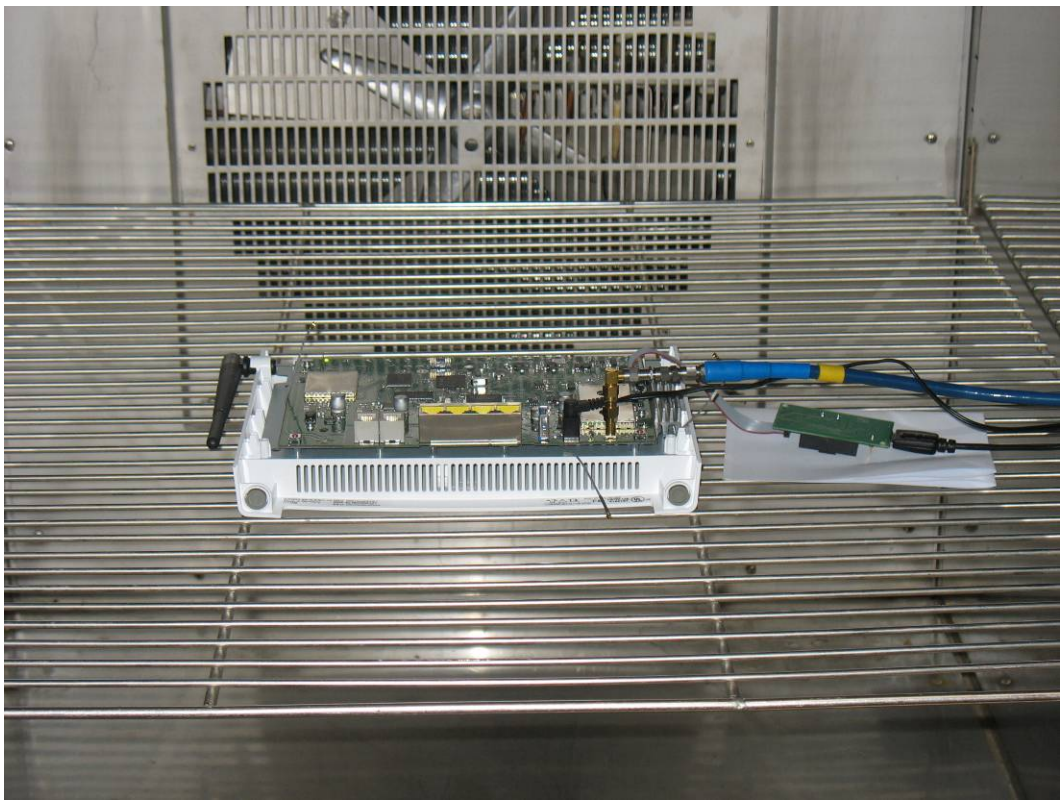
Photo 2

Radiated spurious emissions from 1 - 12 GHz in test chamber

Photo 3

Equipment for radiated spurious emission measurement from 12 GHz to 27 GHz

Photo 4



Test setup in climatic chamber for extreme temperature tests

3 External Photographs of the DUT

Photo 5

Photo 6

Photo 7

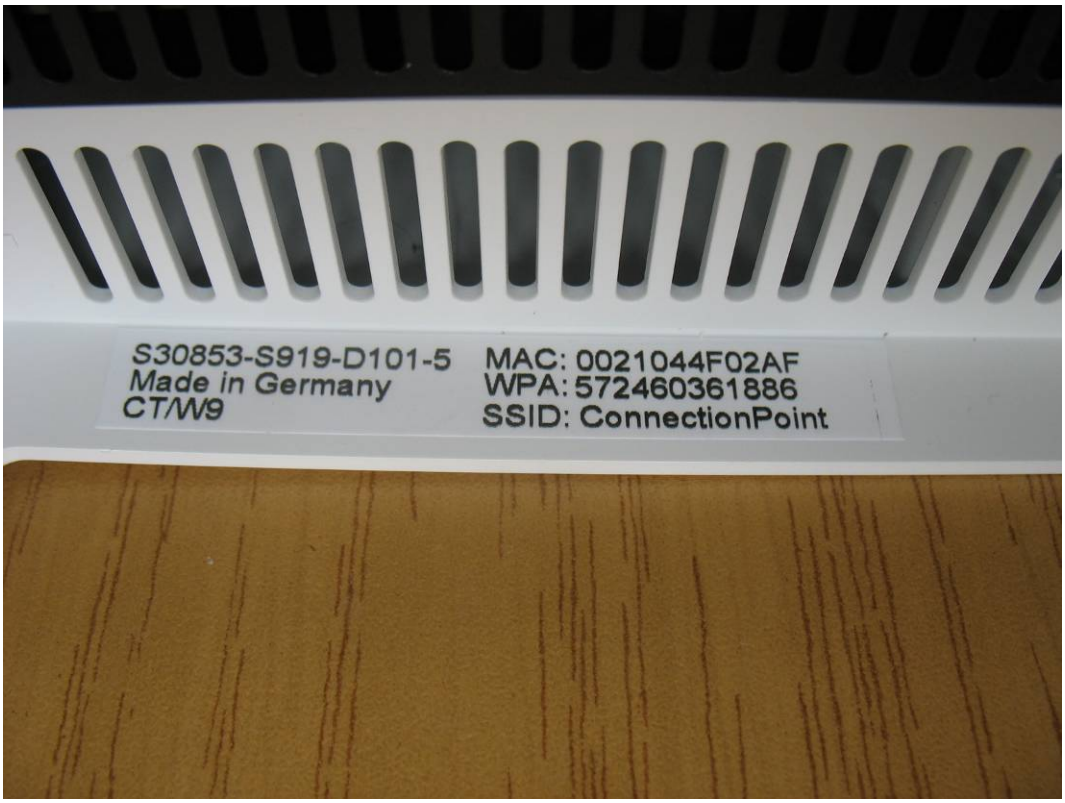


Photo 8

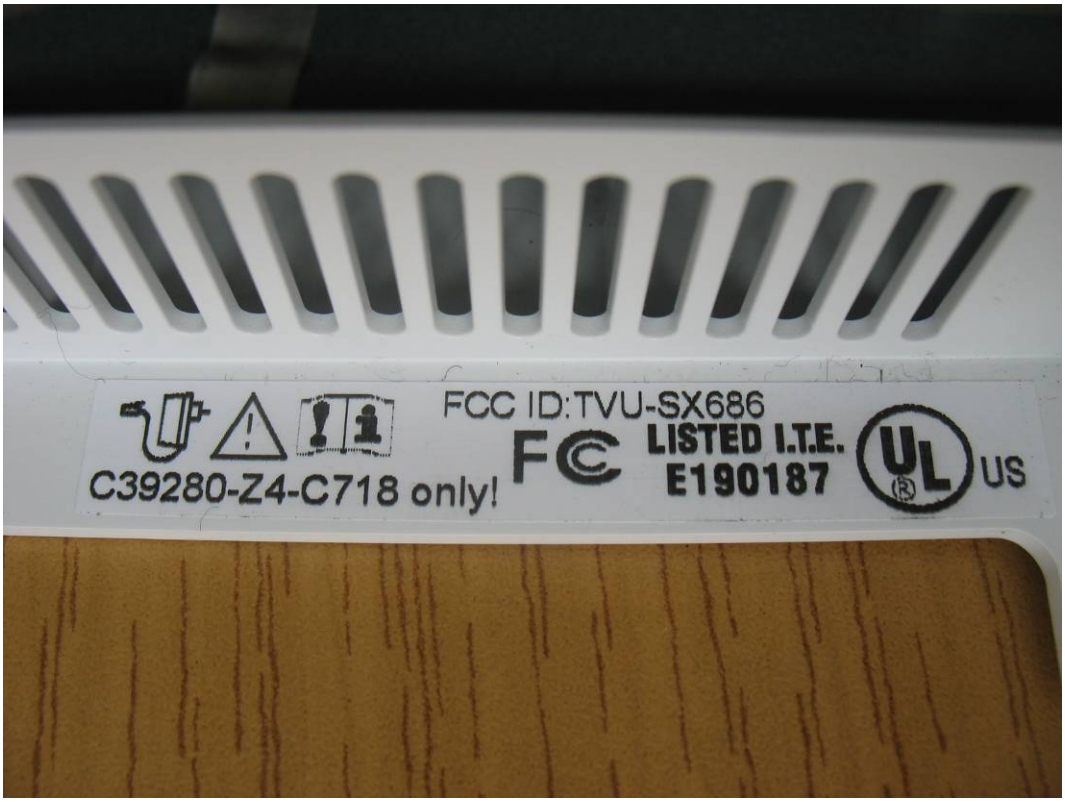


Photo 9

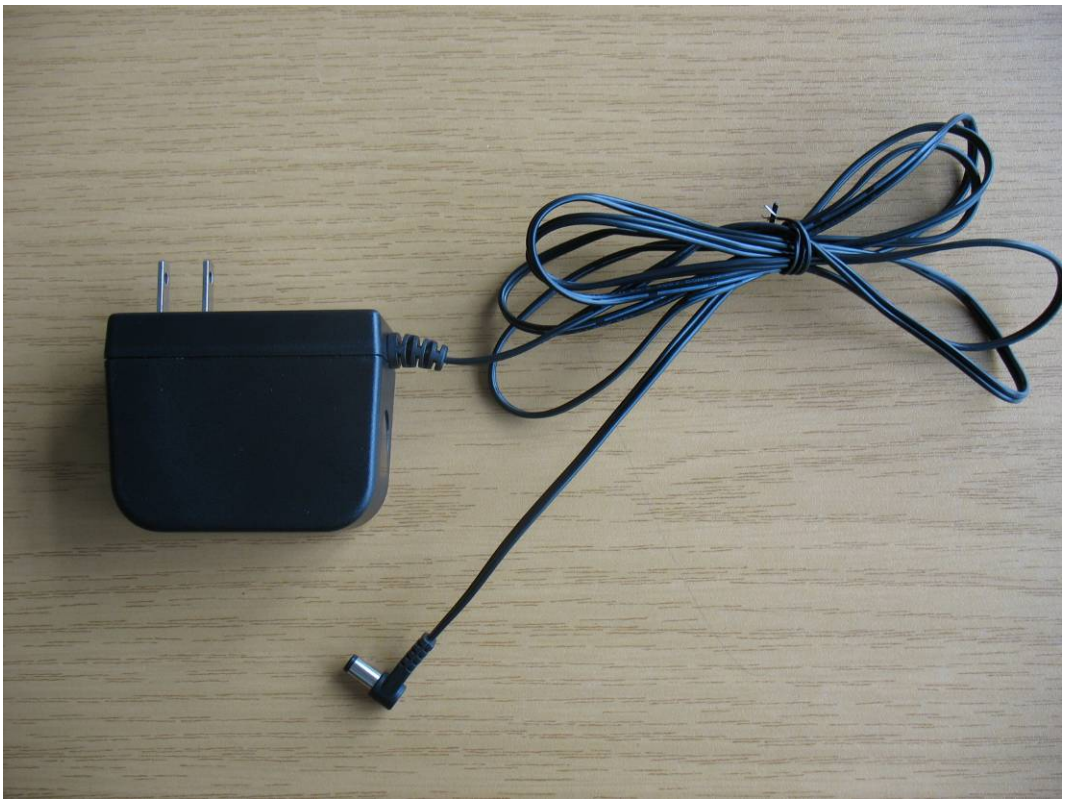


Photo 10

Photo 11

Photo 12

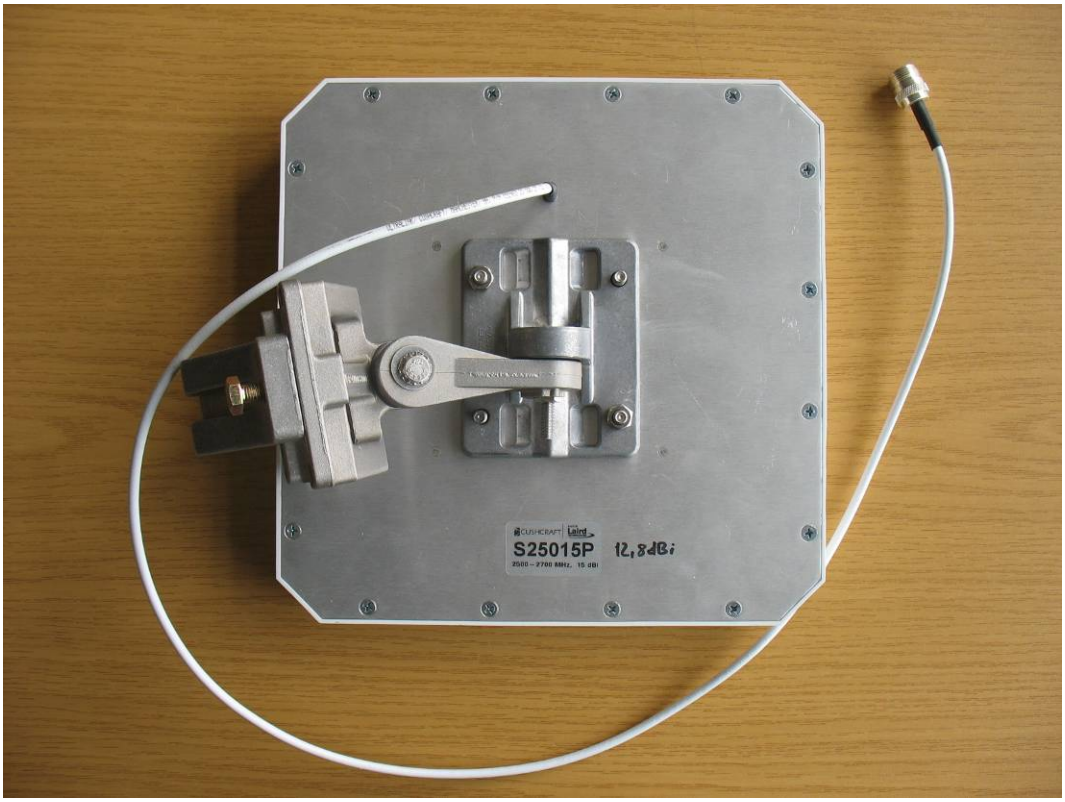


Photo 13

Photo 14

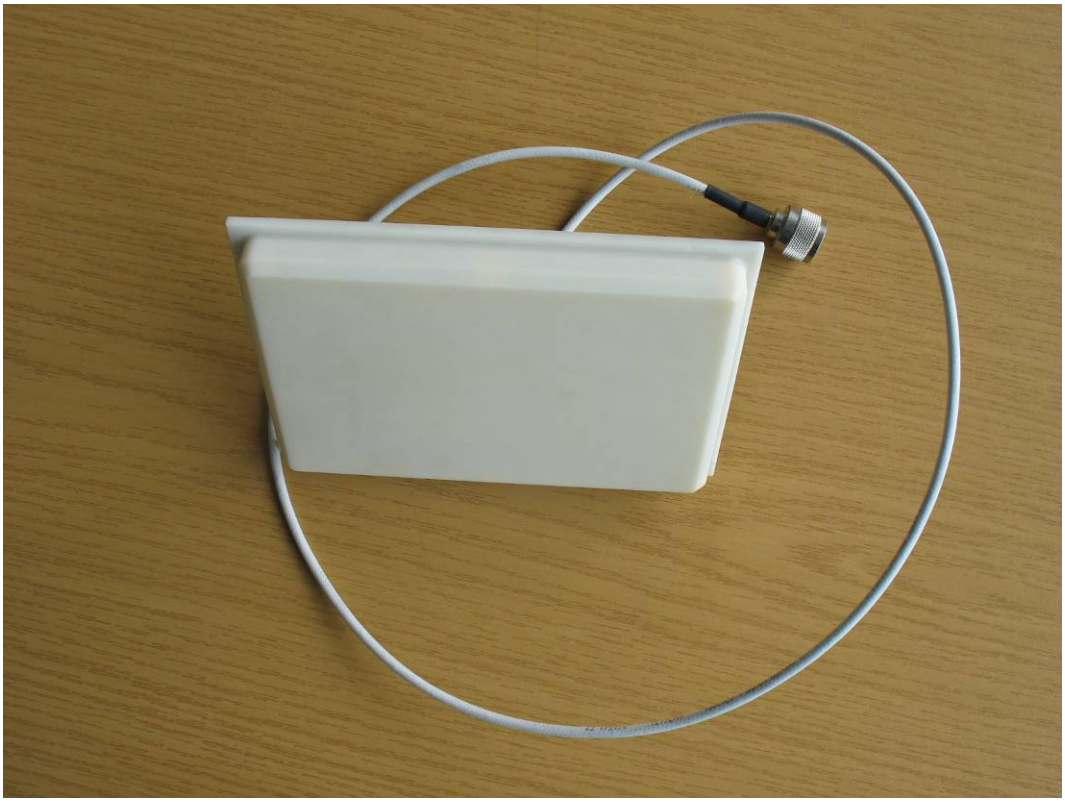
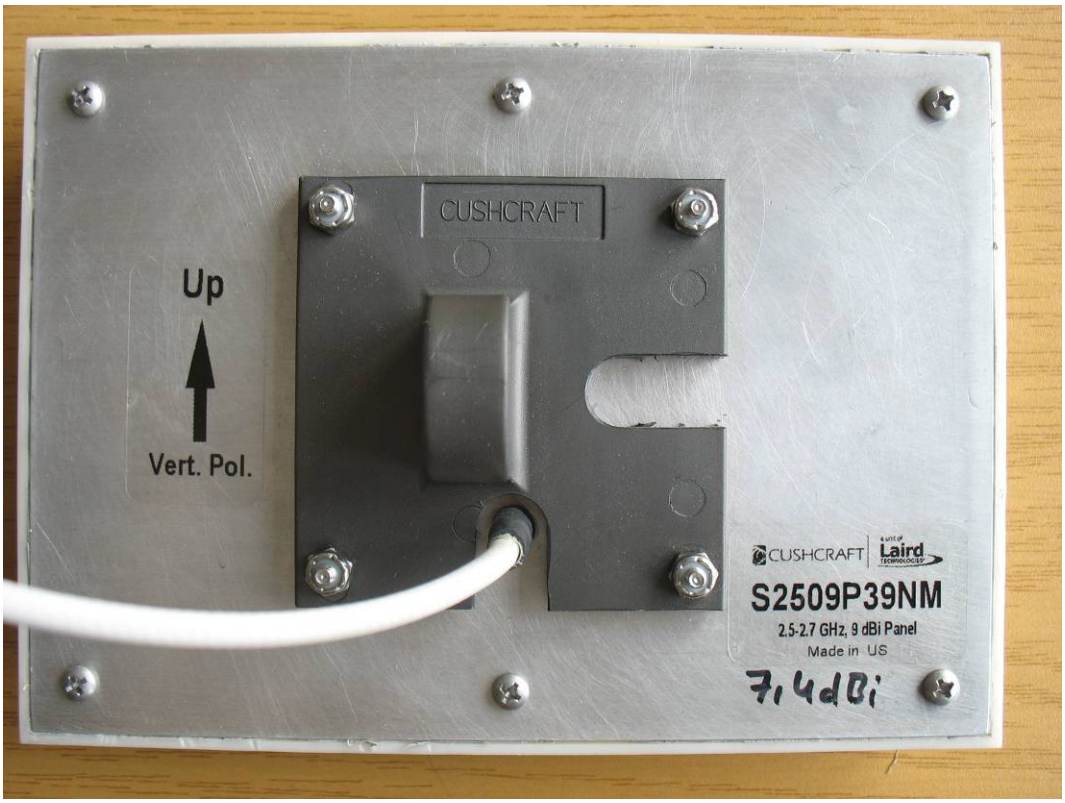


Photo 15


CUSHCRAFT
Up
Vert. Pol.
CUSHCRAFT
Laird
S2509P39NM
2.5-2.7 GHz, 9 dBi Panel
Made in US
7,4dBi

4 Internal Photographs of the DUT

Photo 16

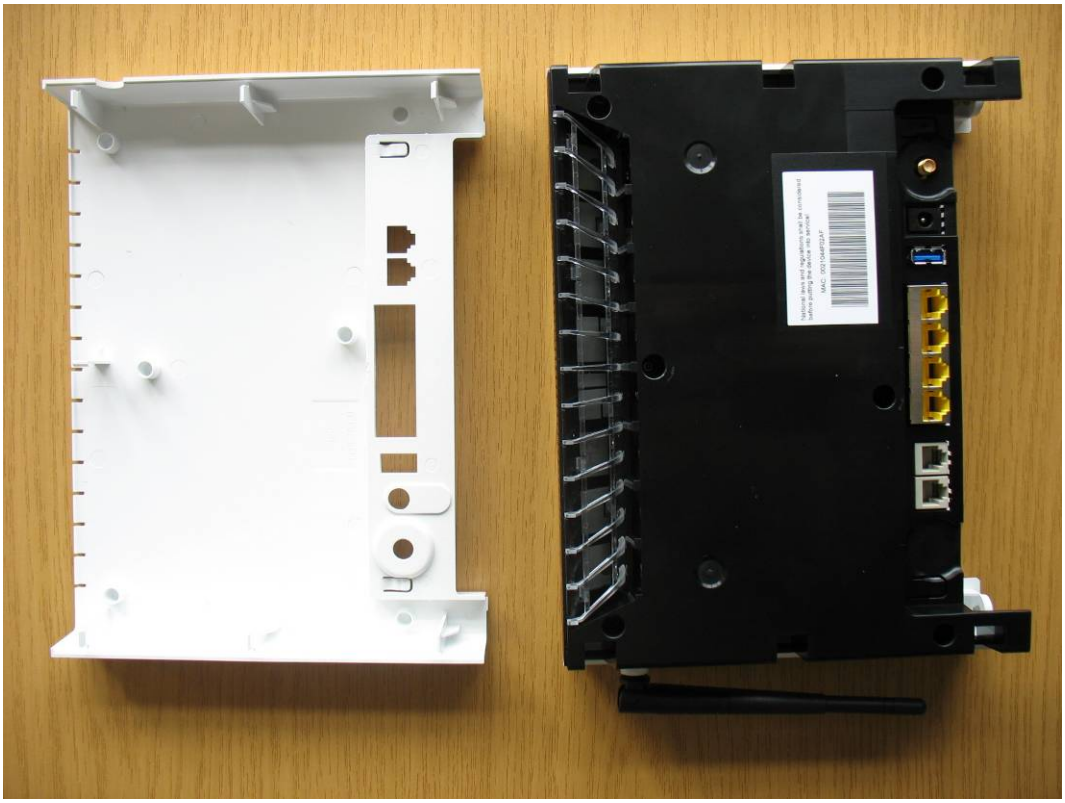


Photo 17

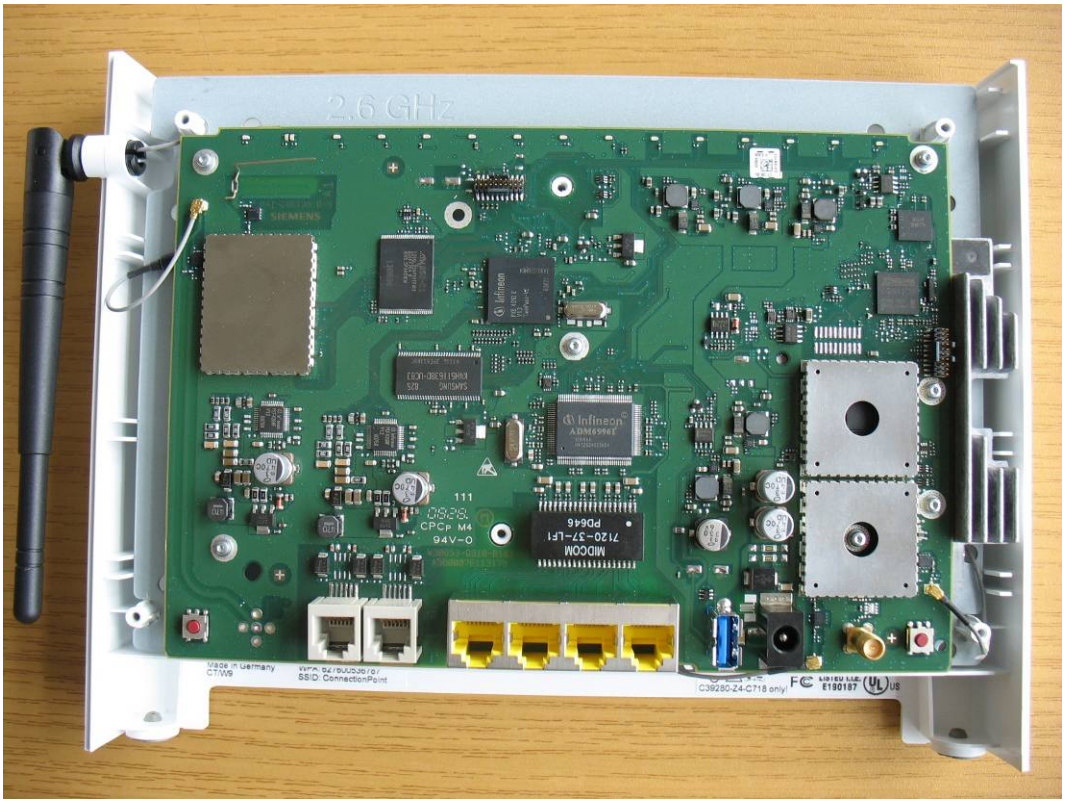


Photo 18

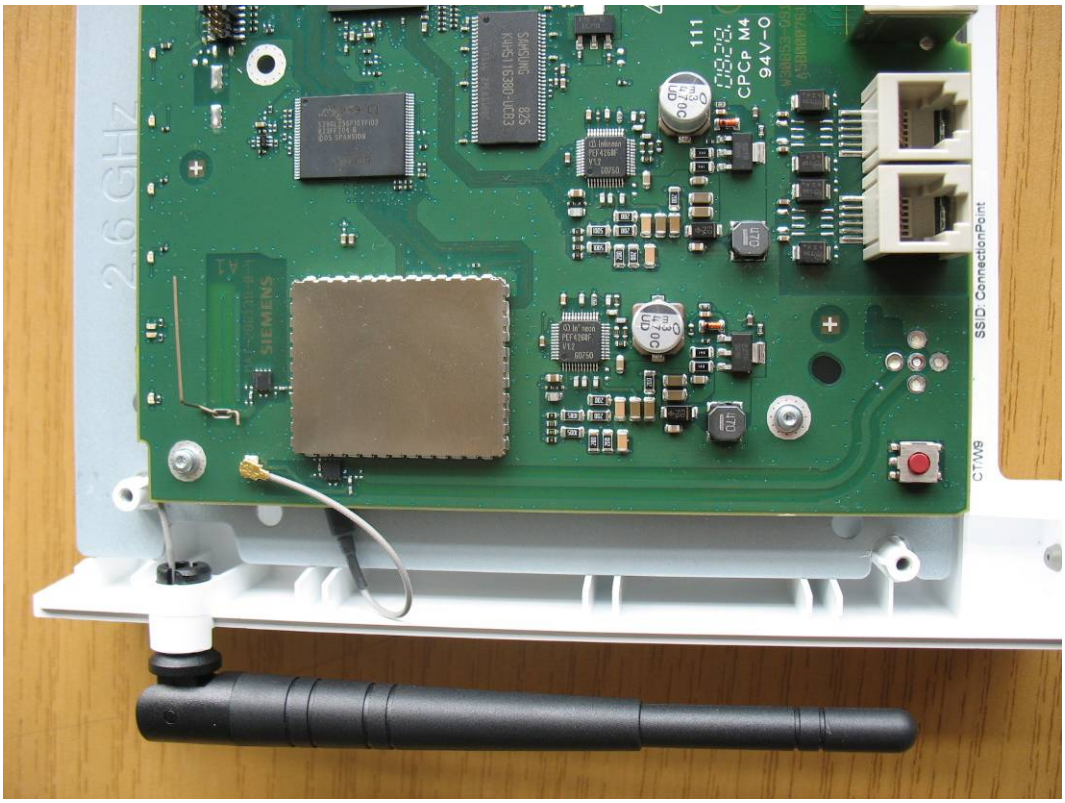


Photo 19

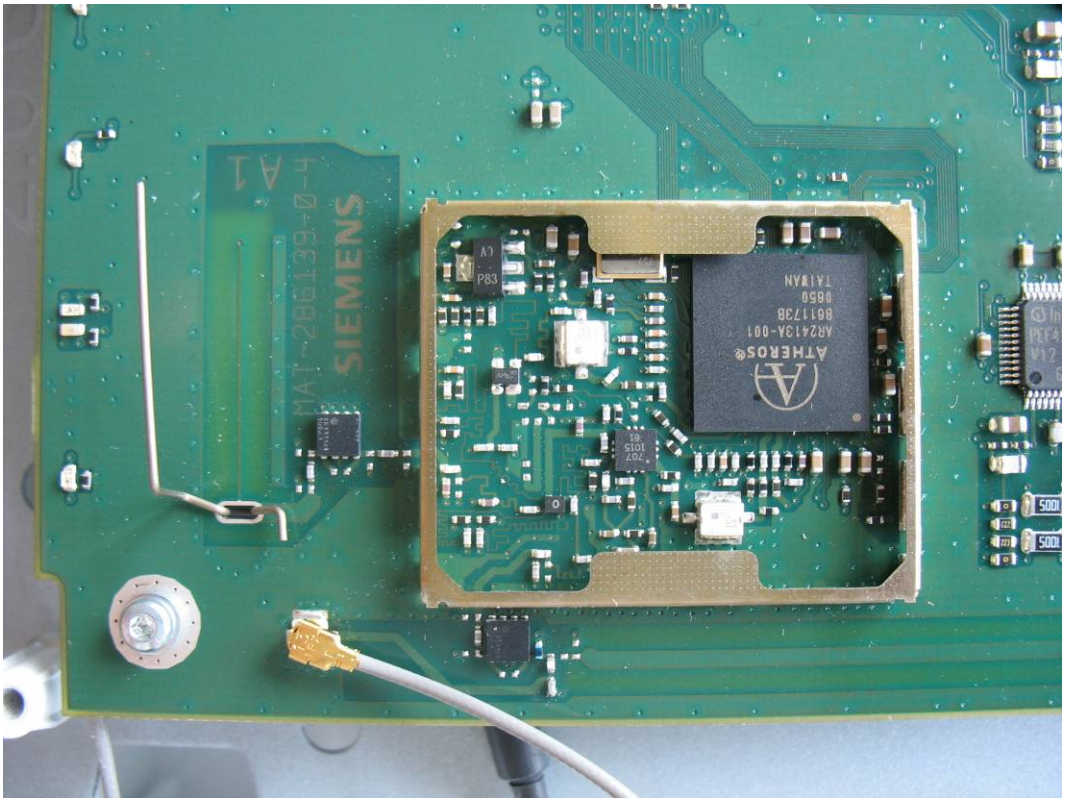


Photo 20

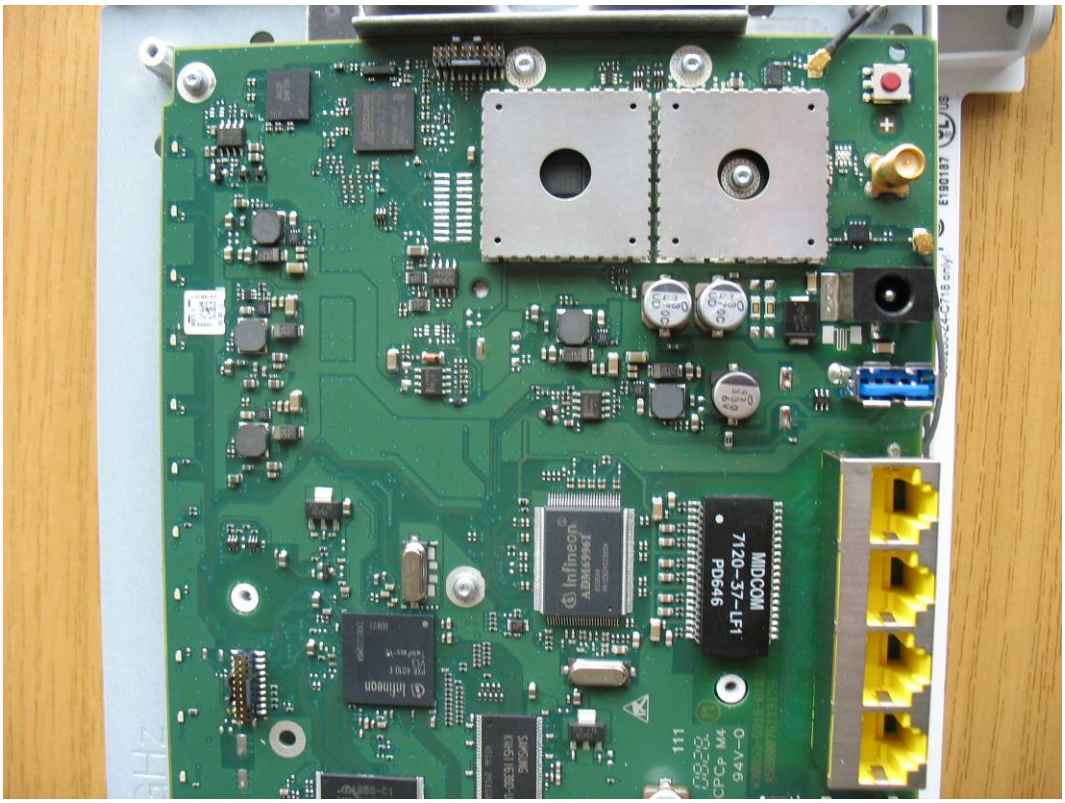


Photo 21

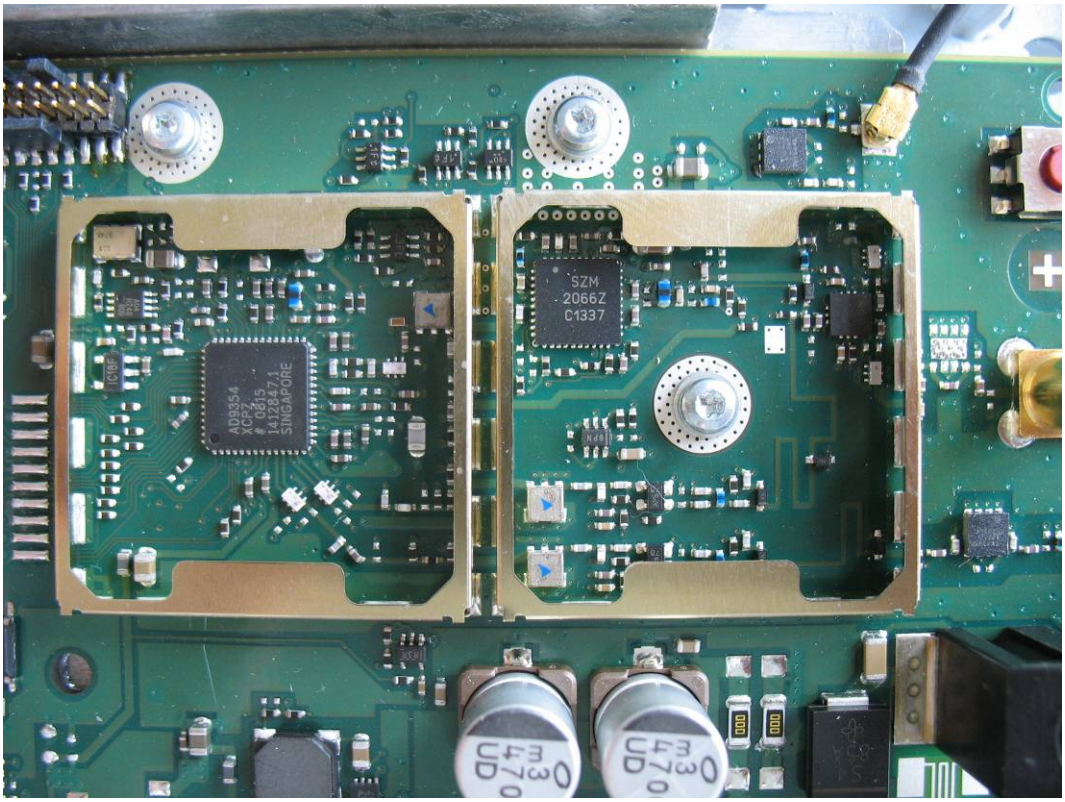


Photo 22