



Nemko Test Report: 44421RUS2

Applicant: Fiber-Span
3434 Rt. 22W, Suite 140
Branchburg, NJ 08876
USA

**Equipment Under Test:
(E.U.T.)** FS42R-1719E

FCC Identifier: Q4VFS42R-1719-E

In Accordance With: **CFR 47, Part 27, Subpart C**
Miscellaneous Wireless Communication Services
AWS Repeaters

Tested By: Nemko USA, Inc.
802 N. Kealy
Lewisville, TX 75057-3136

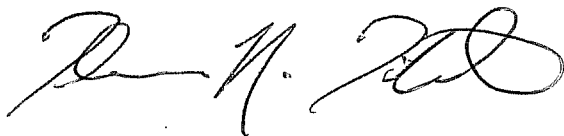
TESTED BY:



David Light, Senior Wireless Engineer

DATE: 28 April 2010

APPROVED BY:



Tom Tidwell, Telecom Direct

DATE: 04 June 2010

Number of Pages: 40

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EQUIPMENT: **FS42R-1719E**

Section 1. Summary of Test Results

Manufacturer Fiber-Span

Model No.: FS42R-1719E

Serial No.: R006330010141001

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR 47, Part 27, Subpart C.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See "Summary of Test Data".



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EQUIPMENT: FS42R-1719E**Summary Of Test Data**

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	27.50(d)(1)	3280 W EIRP	Complies
Occupied Bandwidth	2.1049	Input/Output	Complies
Spurious Emissions at Antenna Terminals	27.53(h)	-13 dBm	Complies
Field Strength of Spurious Emissions	27.53(h)	-13 dBm E.I.R.P.	Complies
Frequency Stability	27.54	Must stay in band	NA

Footnotes:

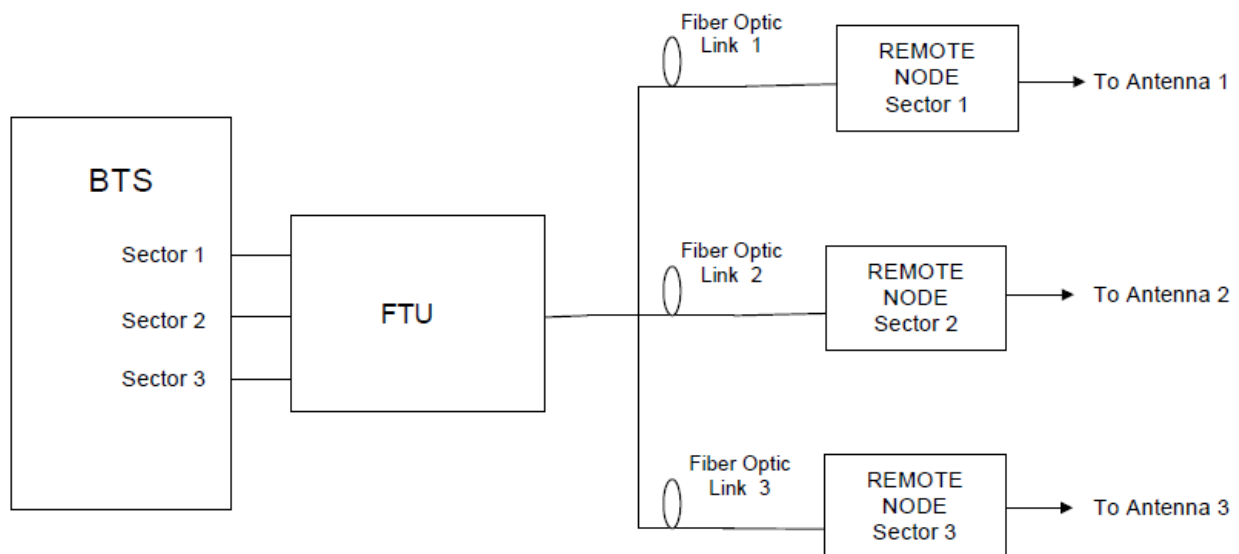
(1) Modulation characteristics were not tested since the E.U.T. processes but does not produce a modulated waveform.

EQUIPMENT: **FS42R-1719E****Section 2. General Equipment Specification**

Supply Voltage Input:					
Frequency Bands:	Downlink:	2110 to 2155 MHz			
Frequency Bands:	Uplink:	NA			
Modulation Designator(s):		(F9W) <input checked="" type="checkbox"/>	(GXW) <input checked="" type="checkbox"/>	(DXW) <input type="checkbox"/>	(G7W) <input checked="" type="checkbox"/>
System Gain:	40 dB				
Output Impedance:	50 ohms				
RF Output (Rated):	Uplink	<div style="display: flex; justify-content: space-between;"> NA W NA dBm </div>			
RF Output (Rated):	Downlink	<div style="display: flex; justify-content: space-between;"> 20 W 43 dBm </div>			
Frequency Translation:		F1-F1 <input checked="" type="checkbox"/>	F1-F2 <input type="checkbox"/>	N/A <input type="checkbox"/>	
Band Selection:		Software <input type="checkbox"/>	Duplexer <input type="checkbox"/>	Fullband <input checked="" type="checkbox"/>	

Description of EUT

The Fiber-Span fiber fed Distributed Antenna System (DAS) is a wireless optical network which can be used to expand network and capacity needs and to overcome site location constraints involving zoning issues, limited space availability or prohibitive BTS based site lease costs . It provides connectivity between a BTS site and several Remote Antenna sites through a fiber optic link. The DAS is made up of two main components; one FTU and three Remote Fiber Nodes. Shown below are the FTU and the three Remote Fiber Nodes. The FTU is located near the BTS site and the Remote Fiber Node is located at the antenna site.

System Diagram

EQUIPMENT: FS42R-1719E**Section 3. RF Power Output**

NAME OF TEST: RF Power Output	PARA. NO.: 24.232
TESTED BY: David Light	DATE: 28 April 2010

Test Results: Complies.**Measurement Data:**

Direction	Modulation	Output per Channel (dBm)	Composite Power (dBm)	Composite Power (W)
Uplink	CDMA	NA		
Downlink	CDMA	40	43	20
Uplink	EDGE	NA		
Downlink	EDGE	40	43	20
Uplink	GSM	NA		
Downlink	GSM	40	43	20
Uplink	W-CDMA	NA		
Downlink	W-CDMA	40	43	20

Equipment Used: 1036-1082-1472-1469-1824-1053**Measurement Uncertainty:** +/- 1.7 dB**Temperature:** 22 °C**Relative Humidity:** 35 %

EQUIPMENT: **FS42R-1719E**

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 28 April 2010

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1082-1469-1472-1824

Measurement Uncertainty: 1X10⁻⁷ ppm

Temperature: 22 °C

Relative Humidity: 35 %

EQUIPMENT: **FS42R-1719E**

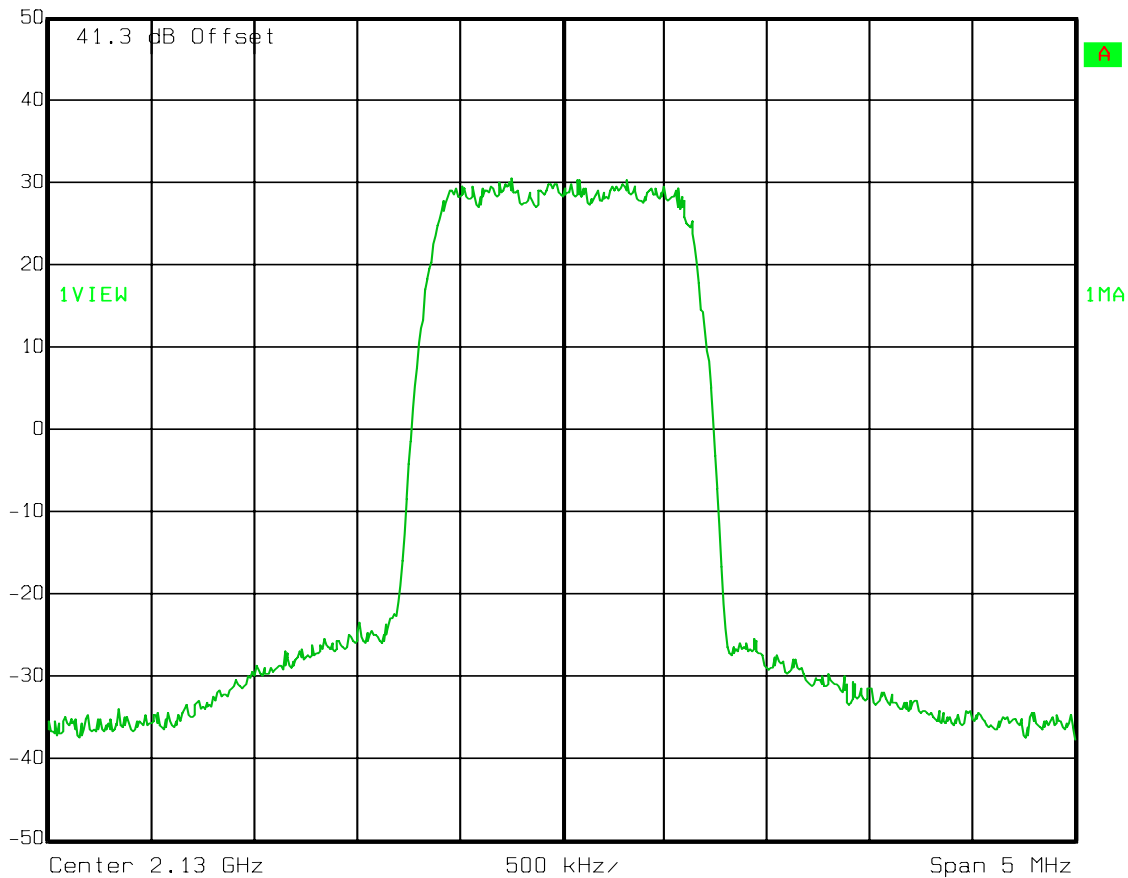
Test Data – Occupied Bandwidth

CDMA - Output



Ref Lvl
50 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	14 ms	Unit	dBm



Date: 28.APR.2010 13:55:57

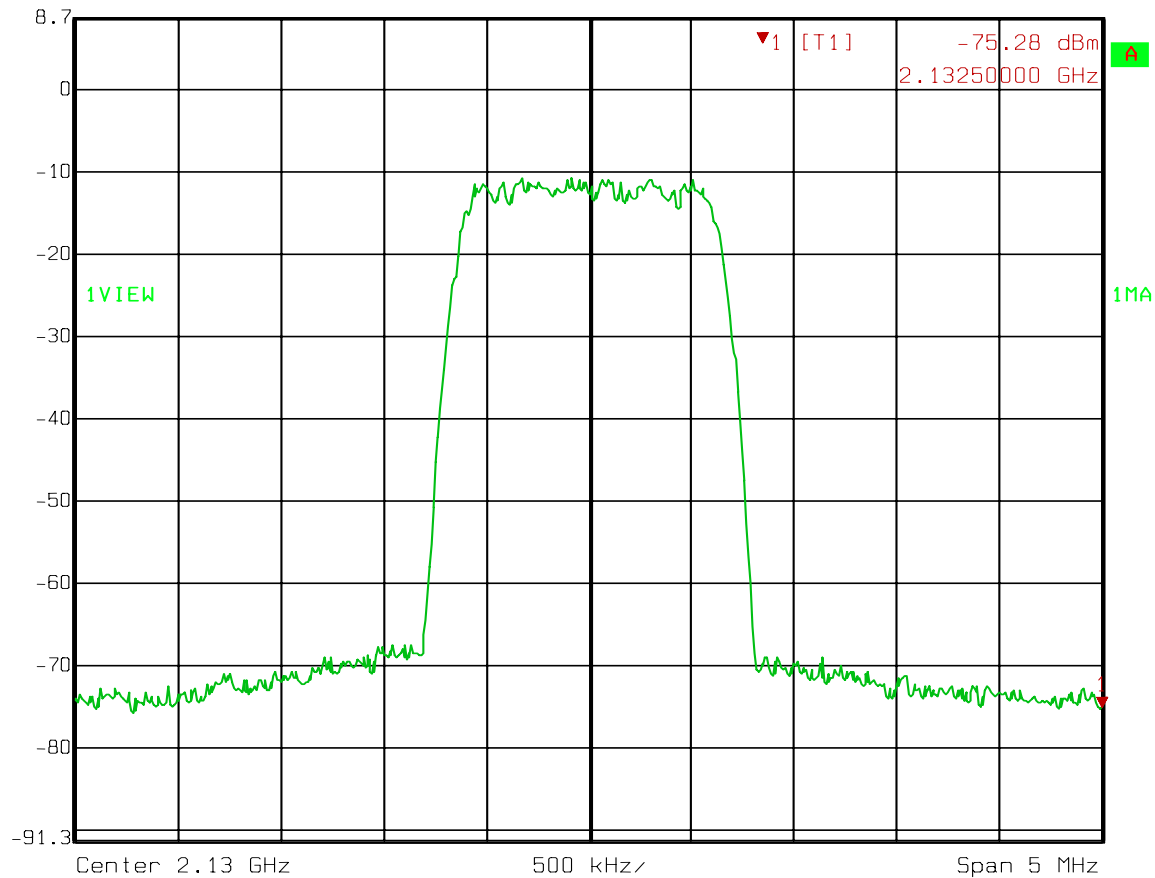
EQUIPMENT: **FS42R-1719E**

Test Data – Occupied Bandwidth

CDMA - Input



Marker 1 [T1] RBW 30 kHz RF Att 30 dB
Ref Lvl -75.28 dBm VBW 30 kHz
8.7 dBm 2.13250000 GHz SWT 14 ms Unit dBm



Date: 28.APR.2010 14:06:56

EQUIPMENT: **FS42R-1719E**

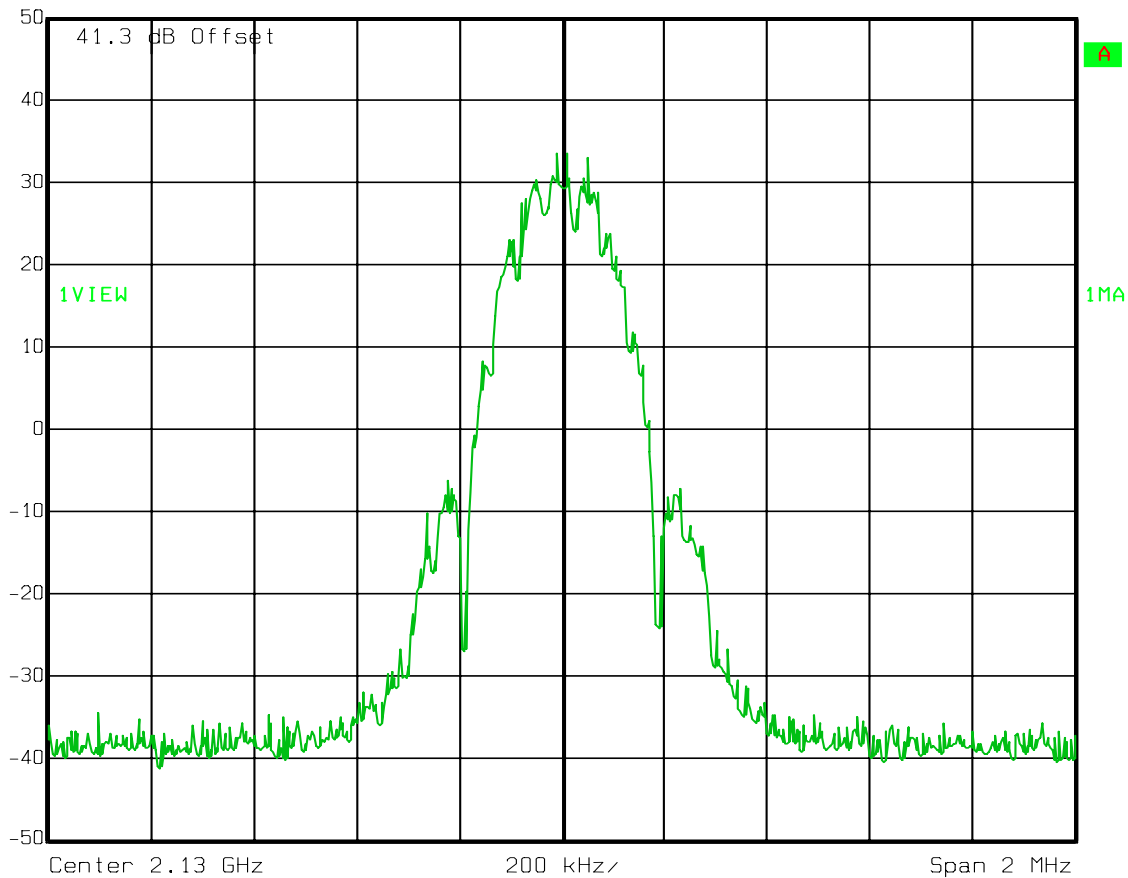
Test Data – Occupied Bandwidth

EDGE - Output



Ref Lvl
50 dBm

RBW 3 kHz RF Att 30 dB
VBW 3 kHz
SWT 560 ms Unit dBm



Date: 28.APR.2010 13:12:27

EQUIPMENT: **FS42R-1719E**

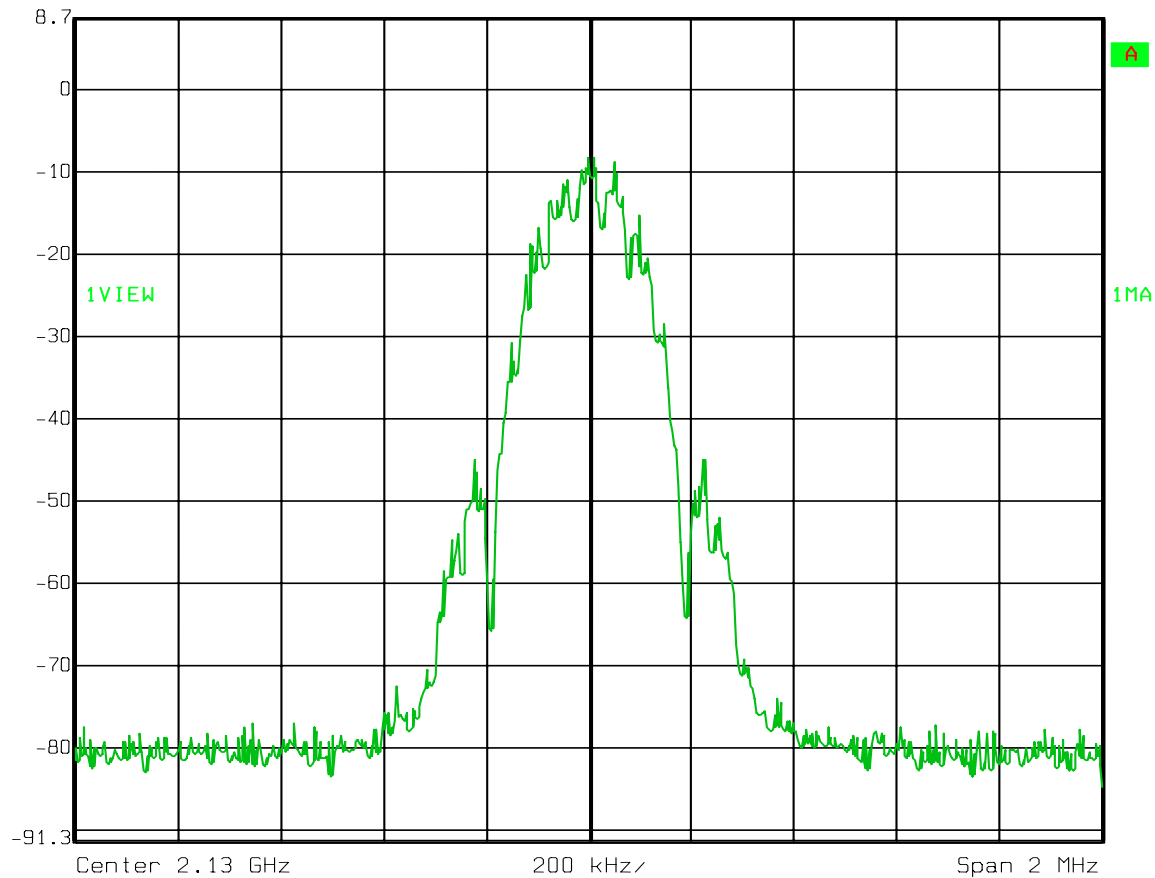
Test Data – Occupied Bandwidth

EDGE - Input



Ref Lvl
8.7 dBm

RBW	3 kHz	RF Att	30 dB
VBW	3 kHz		
SWT	560 ms	Unit	dBm



Date: 28.APR.2010 14:07:58

EQUIPMENT: **FS42R-1719E**

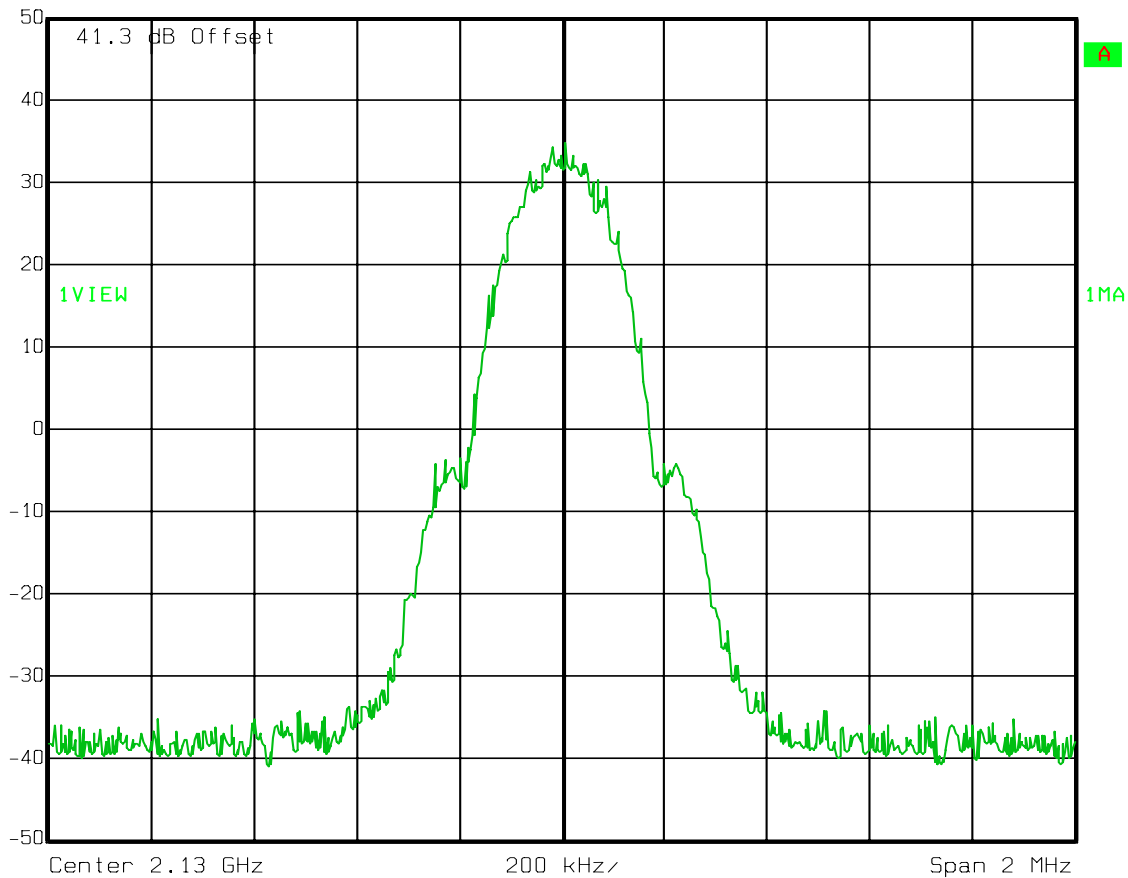
Test Data – Occupied Bandwidth

GSM - Output



Ref Lvl
50 dBm

RBW 3 kHz RF Att 30 dB
VBW 3 kHz
SWT 560 ms Unit dBm



Date: 28.APR.2010 13:07:54

EQUIPMENT: **FS42R-1719E**

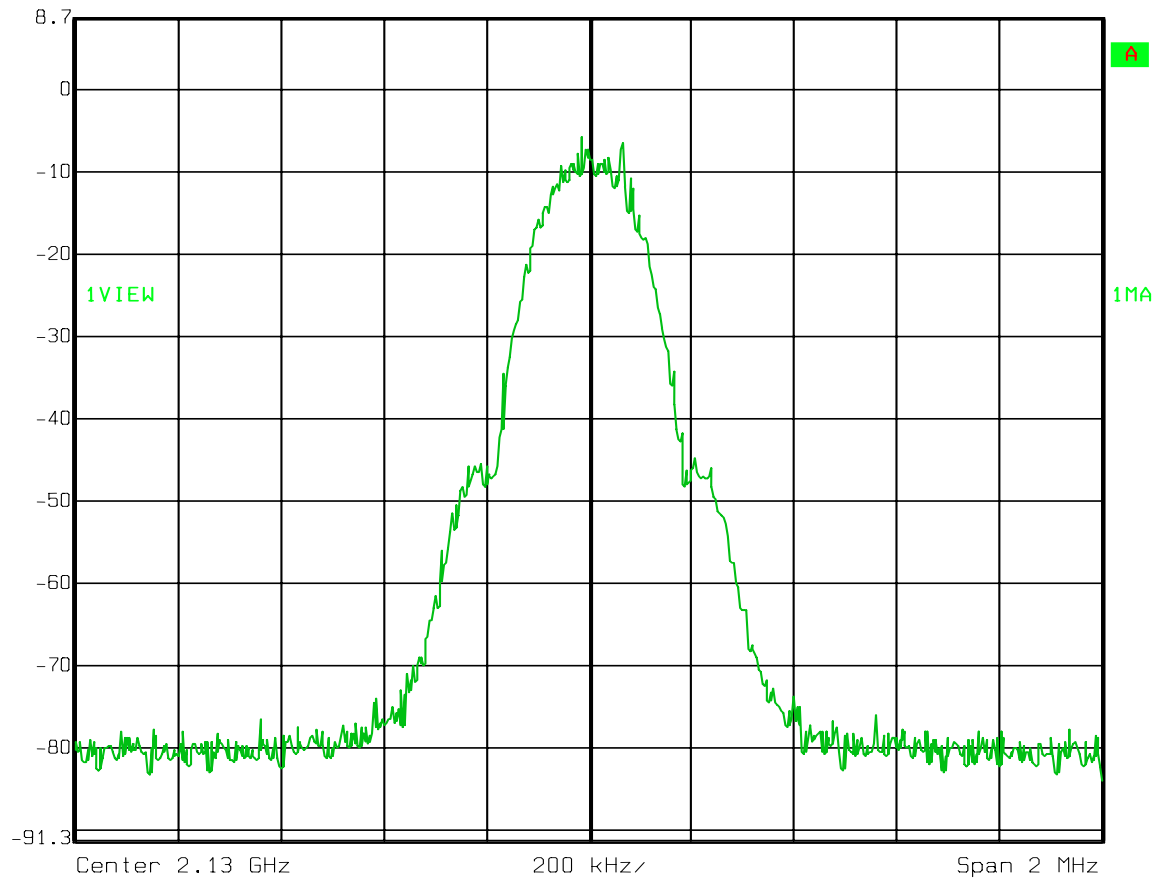
Test Data – Occupied Bandwidth

GSM - Input



Ref Lvl
8.7 dBm

RBW	3 kHz	RF Att	30 dB
VBW	3 kHz		
SWT	560 ms	Unit	dBm



Date: 28.APR.2010 14:08:35

EQUIPMENT: **FS42R-1719E**

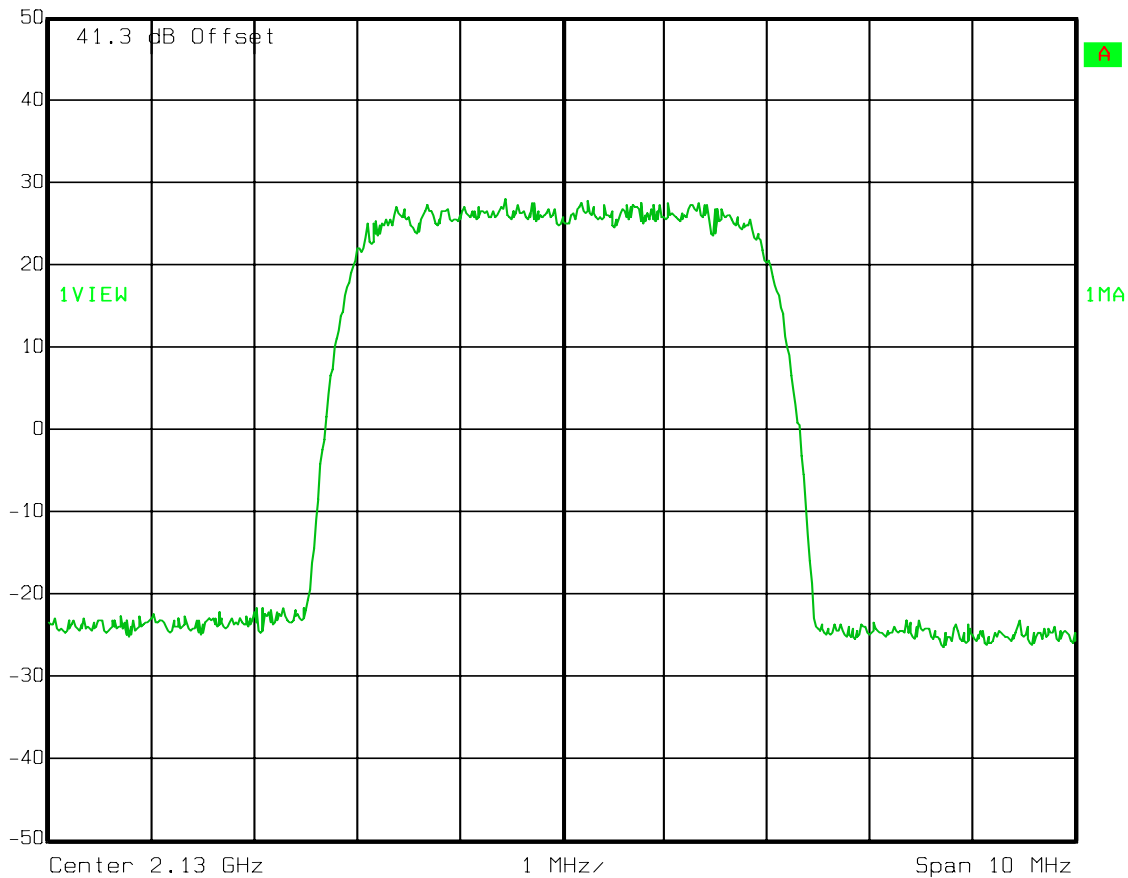
Test Data – Occupied Bandwidth

W-CDMA - Output



Ref Lvl
50 dBm

RBW 50 kHz RF Att 30 dB
VBW 50 kHz
SWT 10 ms Unit dBm



Date: 28.APR.2010 14:01:45

EQUIPMENT: **FS42R-1719E**

Test Data – Occupied Bandwidth

W-CDMA - Input

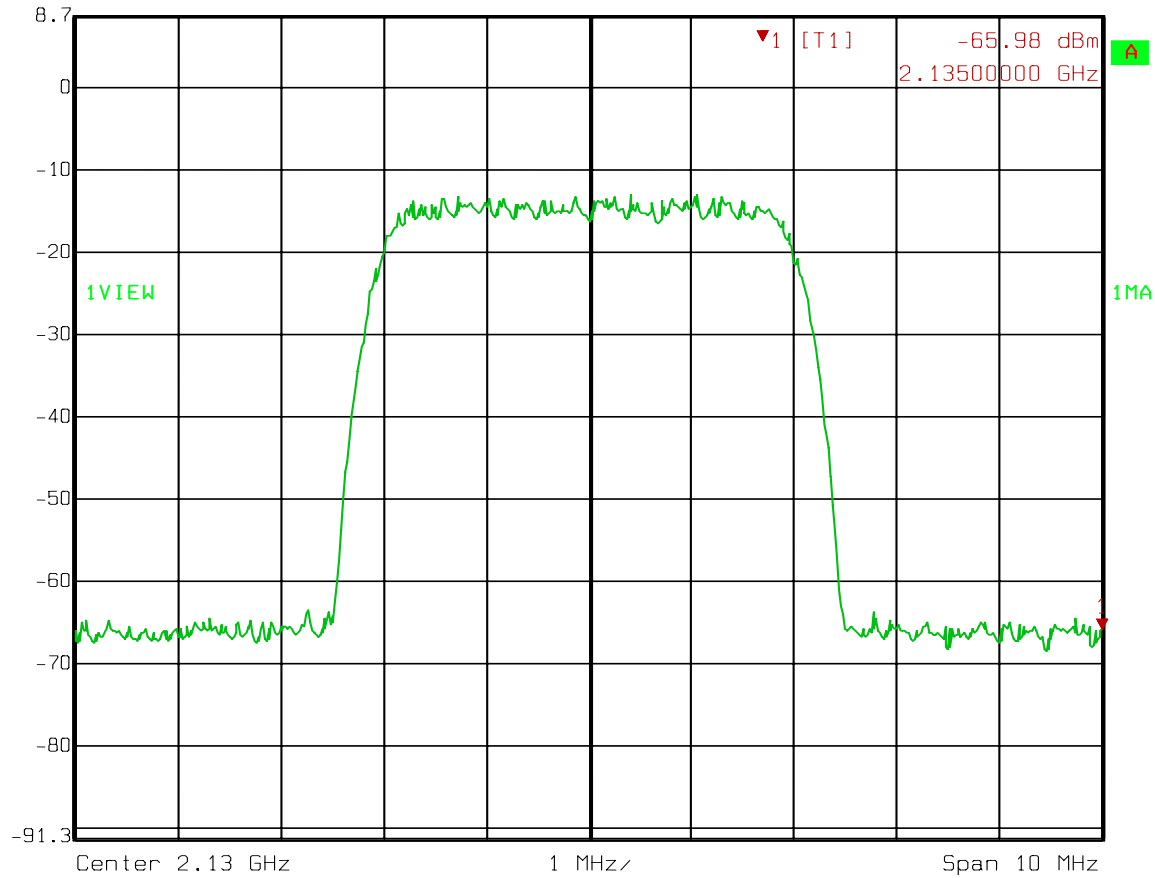


Ref Lvl
8.7 dBm

Marker 1 [T1]

-65.98 dBm
2.13500000 GHz

RBW 50 kHz RF Att 30 dB
VBW 50 kHz
SWT 10 ms Unit dBm



Date: 28.APR.2010 14:06:08

EQUIPMENT: **FS42R-1719E**

Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 28 April 2010

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1036-1082-1472-1469-1824-1053

Measurement Uncertainty: +/- 1.7 dB

Temperature: 22 °C

Relative Humidity: 35 %

EQUIPMENT: **FS42R-1719E**

Test Data – Spurious Emissions at Antenna Terminals

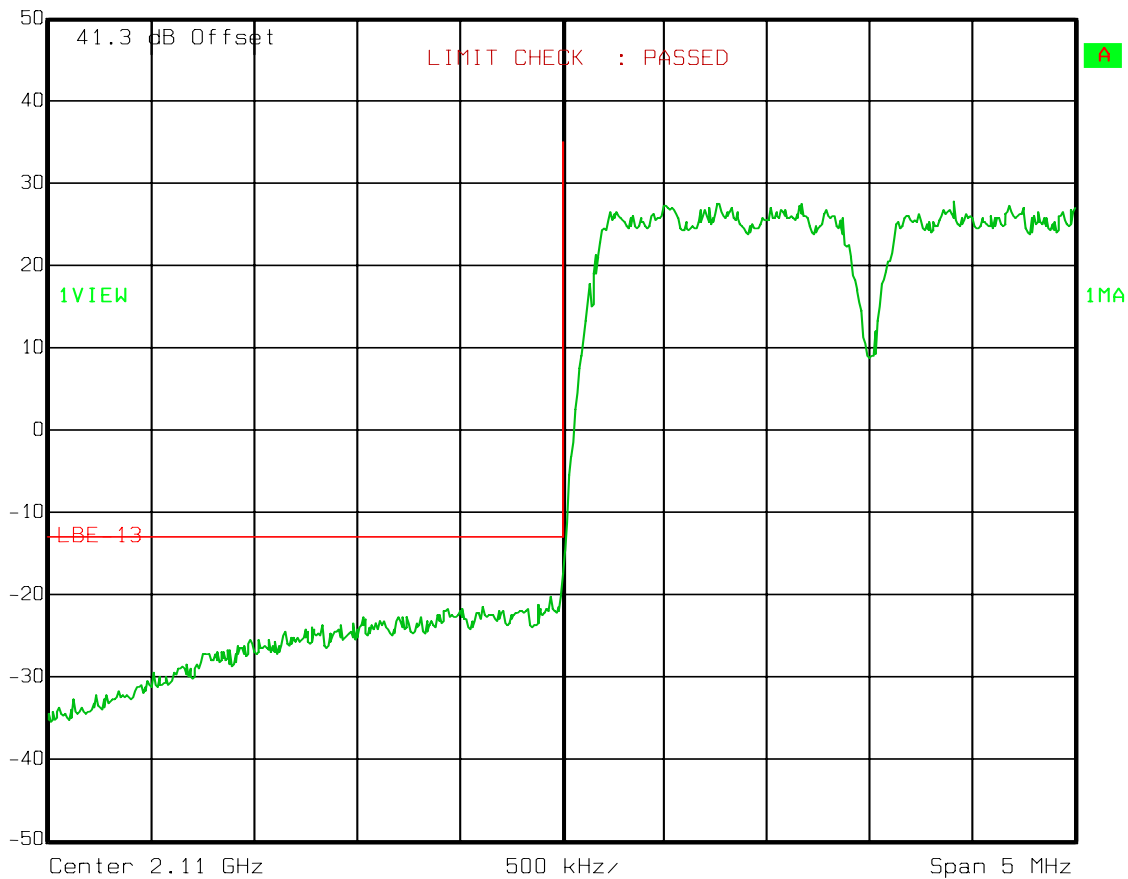
Lower Bandedge Intermodulation

CDMA



Ref Lvl
50 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	14 ms	Unit	dBm



Date: 28.APR.2010 13:53:54

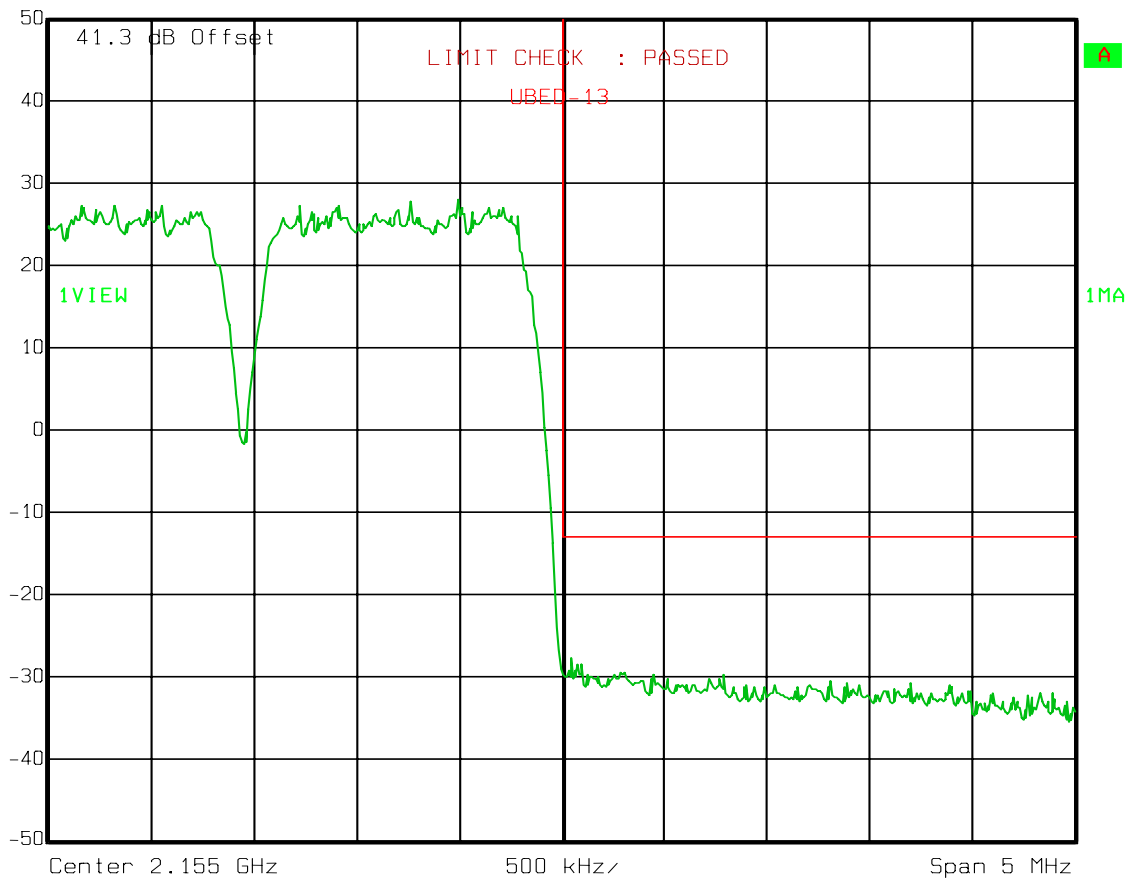
EQUIPMENT: **FS42R-1719E****Test Data – Spurious Emissions at Antenna Terminals**

Upper Bandedge Intermodulation

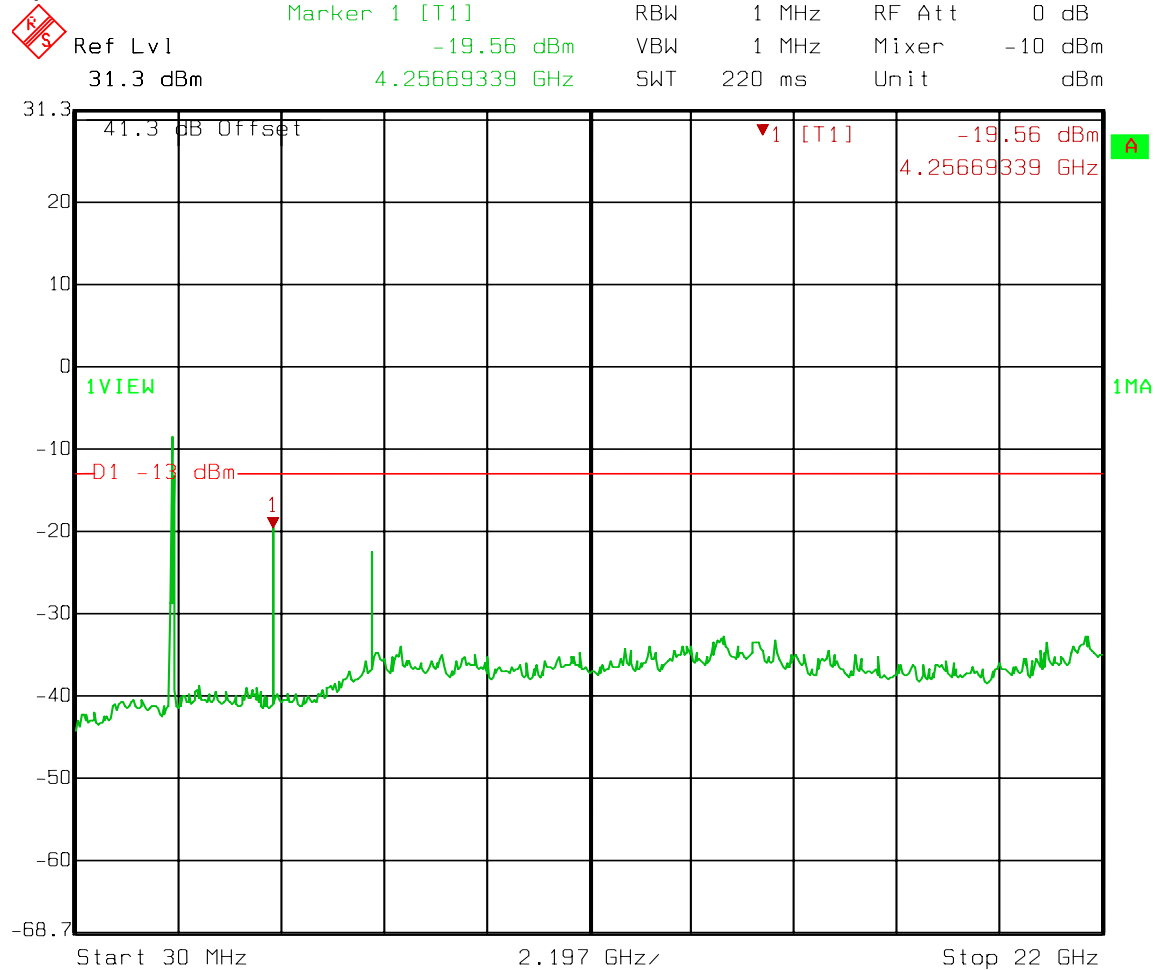
CDMA

Ref Lvl
50 dBm

RBW	30 kHz	RF Att	20 dB
VBW	30 kHz	Mixer	-10 dBm
SWT	14 ms	Unit	dBm



Date: 28.APR.2010 13:54:55

EQUIPMENT: **FS42R-1719E****Test Data – Spurious Emissions at Antenna Terminals****Spurs – CDMA**

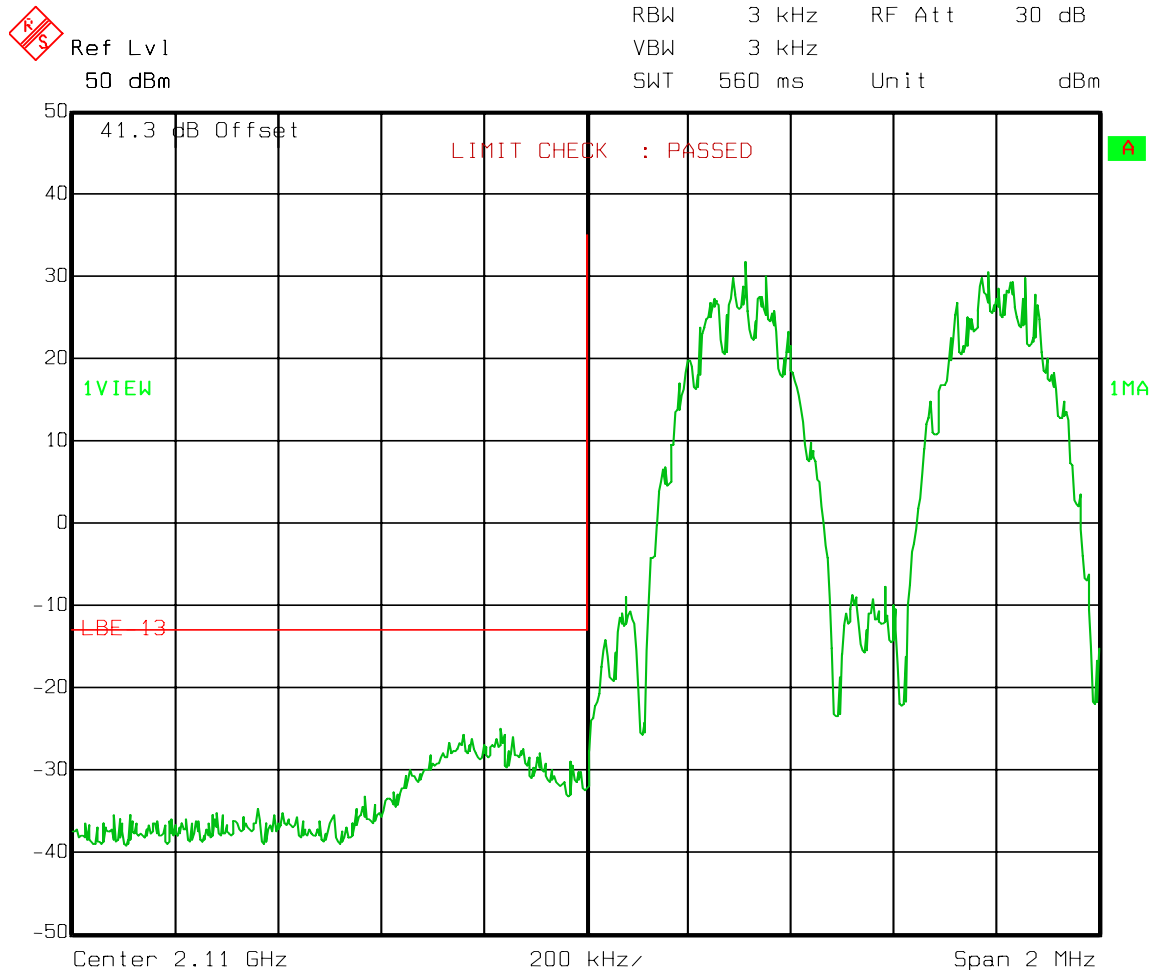
Date: 28.APR.2010 13:56:48

Carrier notched.

EQUIPMENT: **FS42R-1719E**

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
EDGE

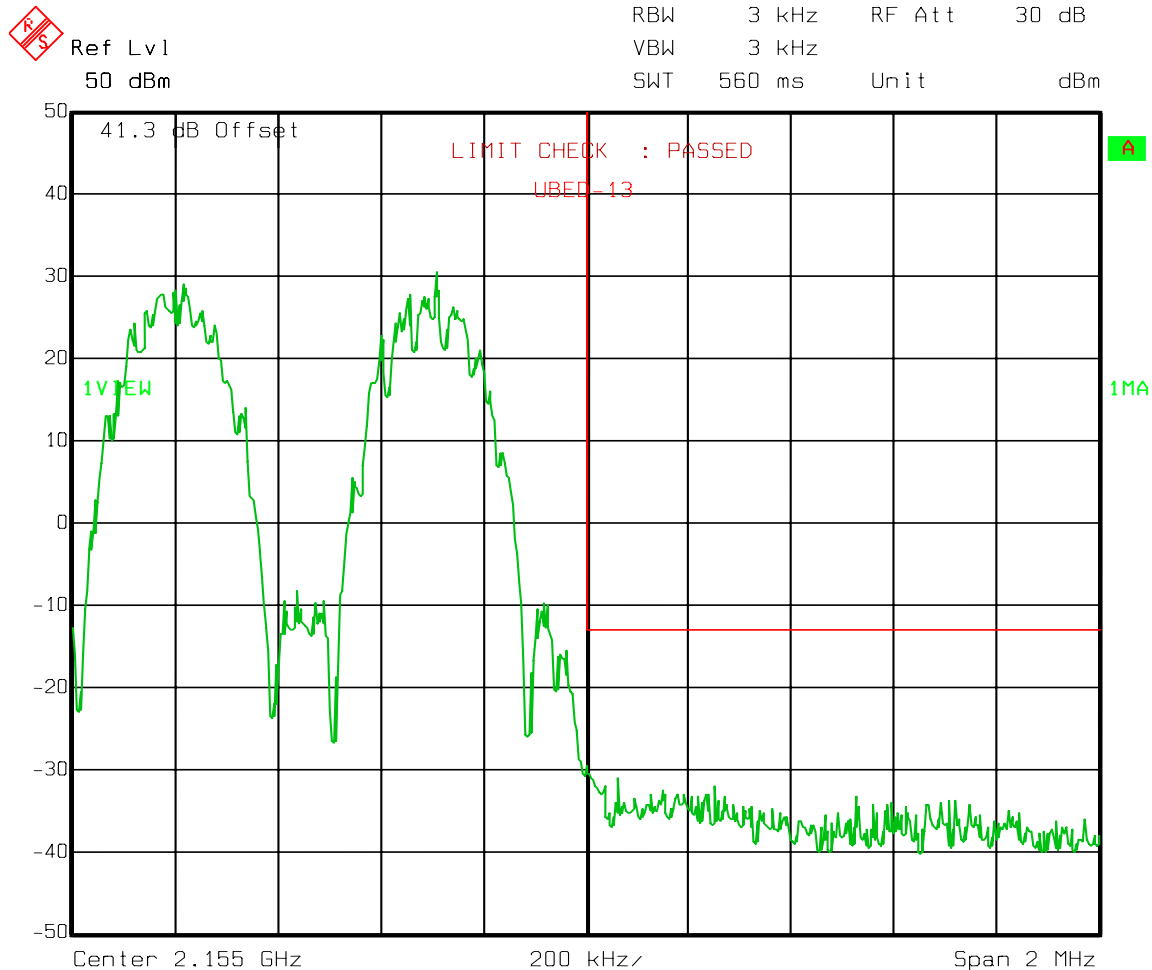


Date: 28.APR.2010 13:11:08

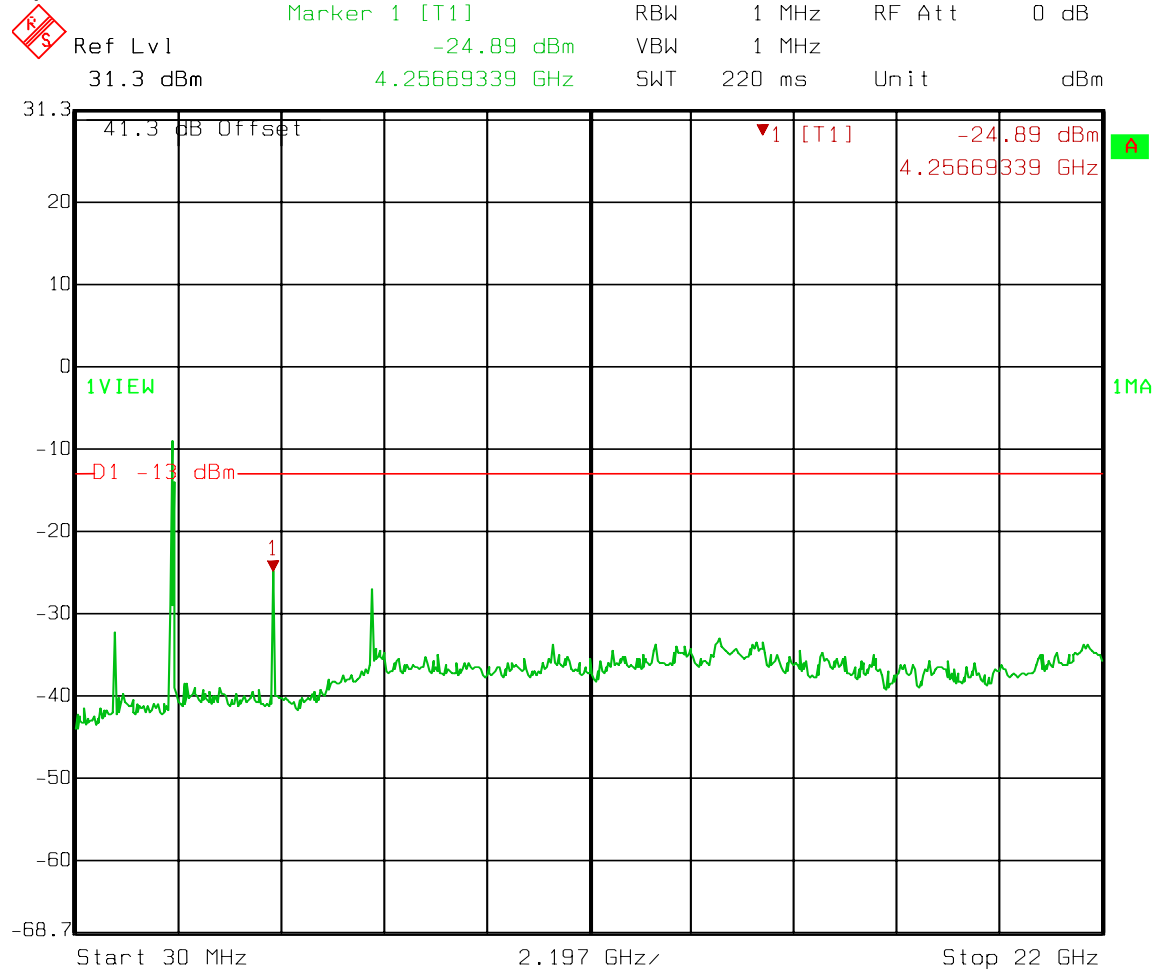
EQUIPMENT: **FS42R-1719E**

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
EDGE



Date: 28.APR.2010 13:11:49

EQUIPMENT: **FS42R-1719E****Test Data – Spurious Emissions at Antenna Terminals****Spurs – EDGE**

Date: 28.APR.2010 13:13:31

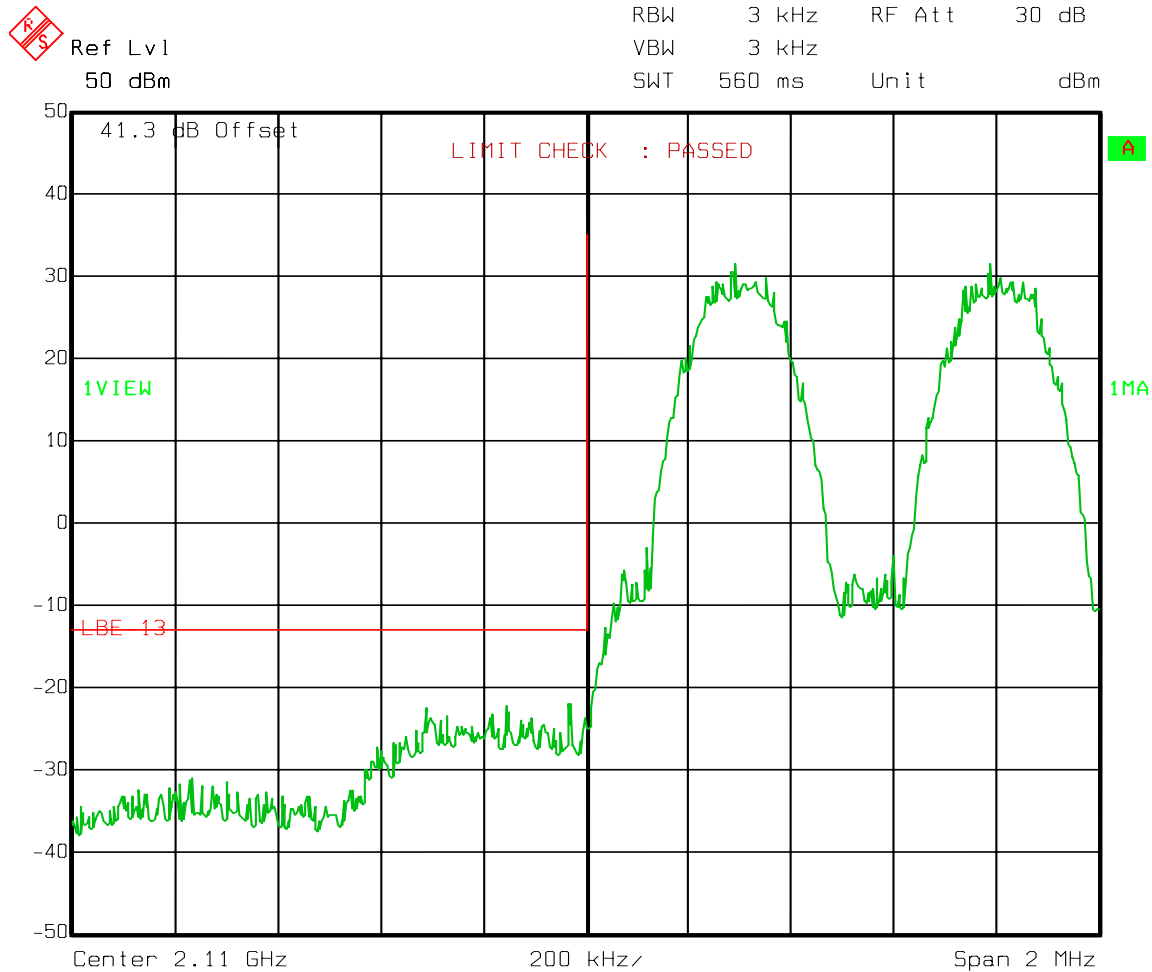
Carrier notched

EQUIPMENT: **FS42R-1719E**

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

GSM



Date: 28.APR.2010 13:05:34

EQUIPMENT: **FS42R-1719E**

Test Data – Spurious Emissions at Antenna Terminals

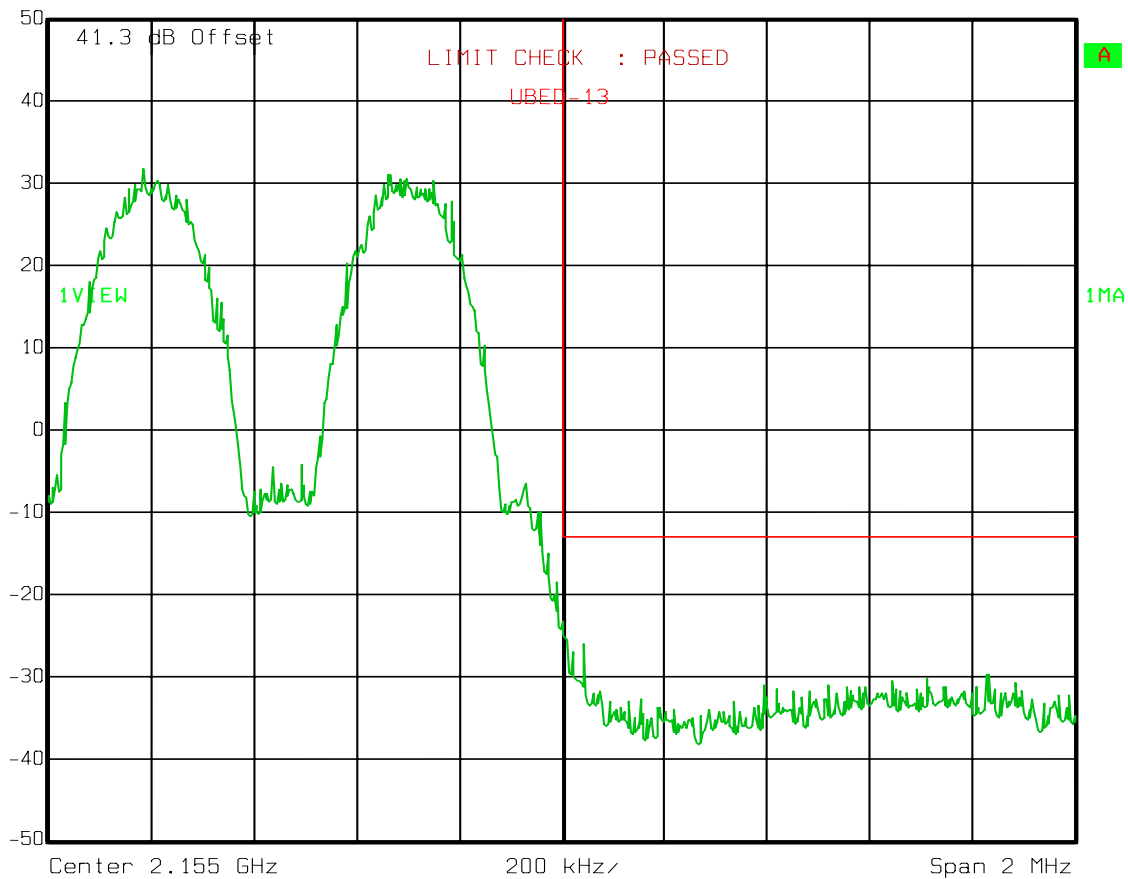
Upper Bandedge Intermodulation

GSM



Ref Lvl
50 dBm

RBW 3 kHz RF Att 30 dB
VBW 3 kHz
SWT 560 ms Unit dBm

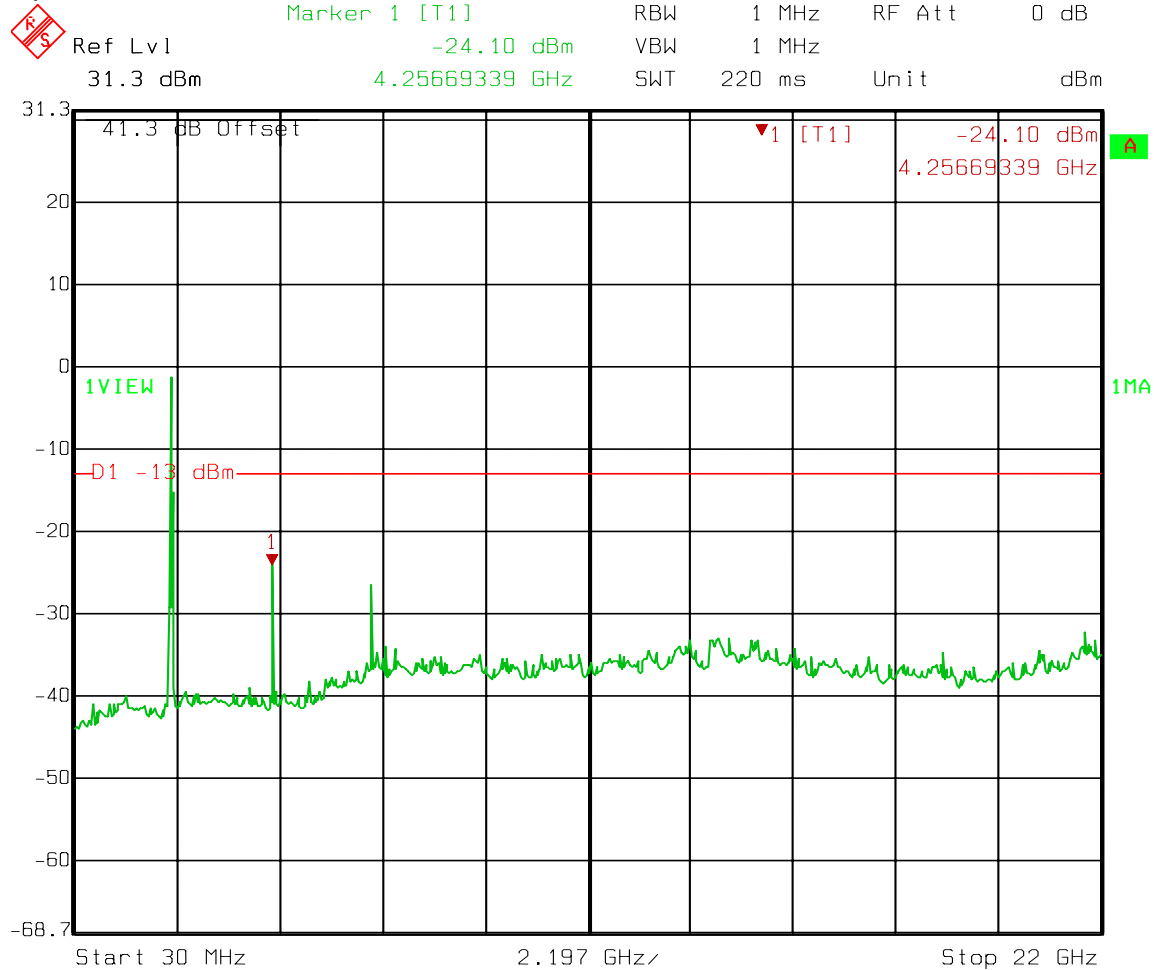


Date: 28.APR.2010 13:06:41

EQUIPMENT: **FS42R-1719E**

Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM



Date: 28.APR.2010 13:08:56

EQUIPMENT: **FS42R-1719E**

Test Data – Spurious Emissions at Antenna Terminals

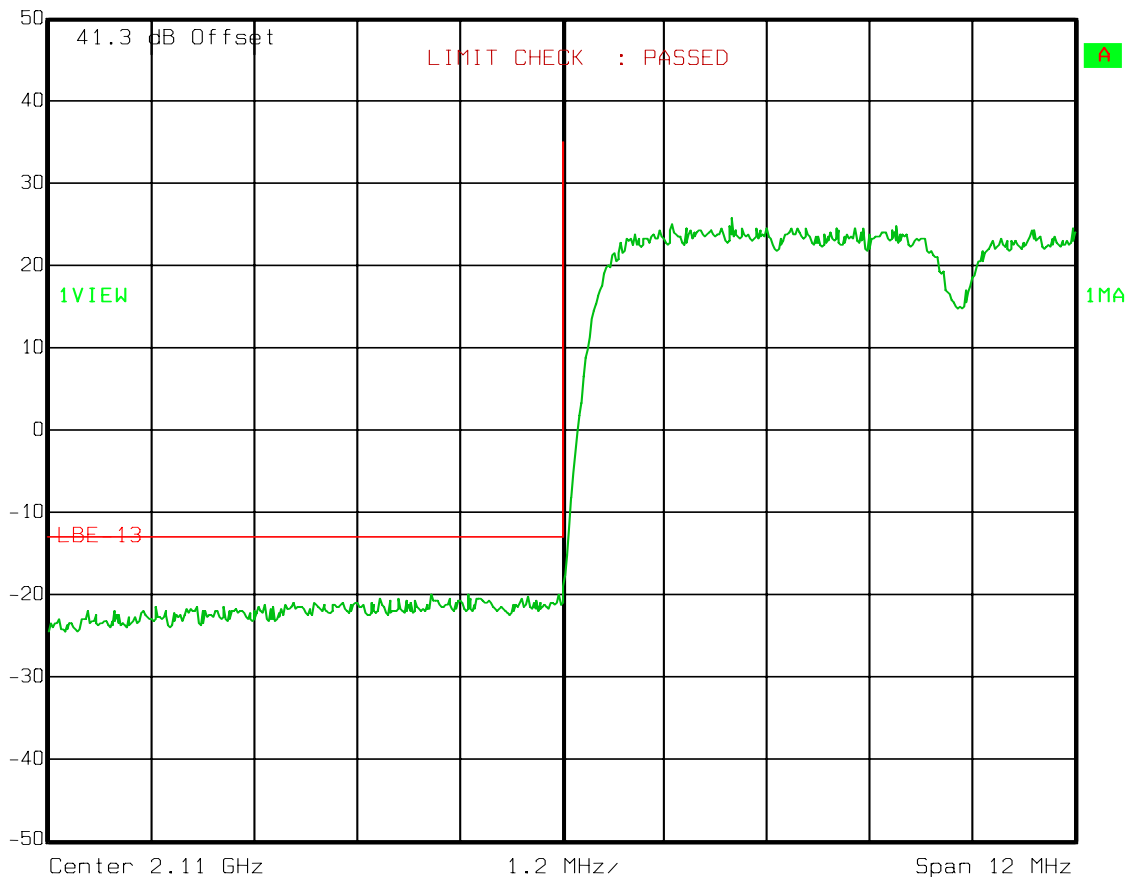
Lower Bandedge Intermodulation

W-CDMA



Ref Lvl
50 dBm

RBW 50 kHz RF Att 30 dB
VBW 50 kHz
SWT 12 ms Unit dBm

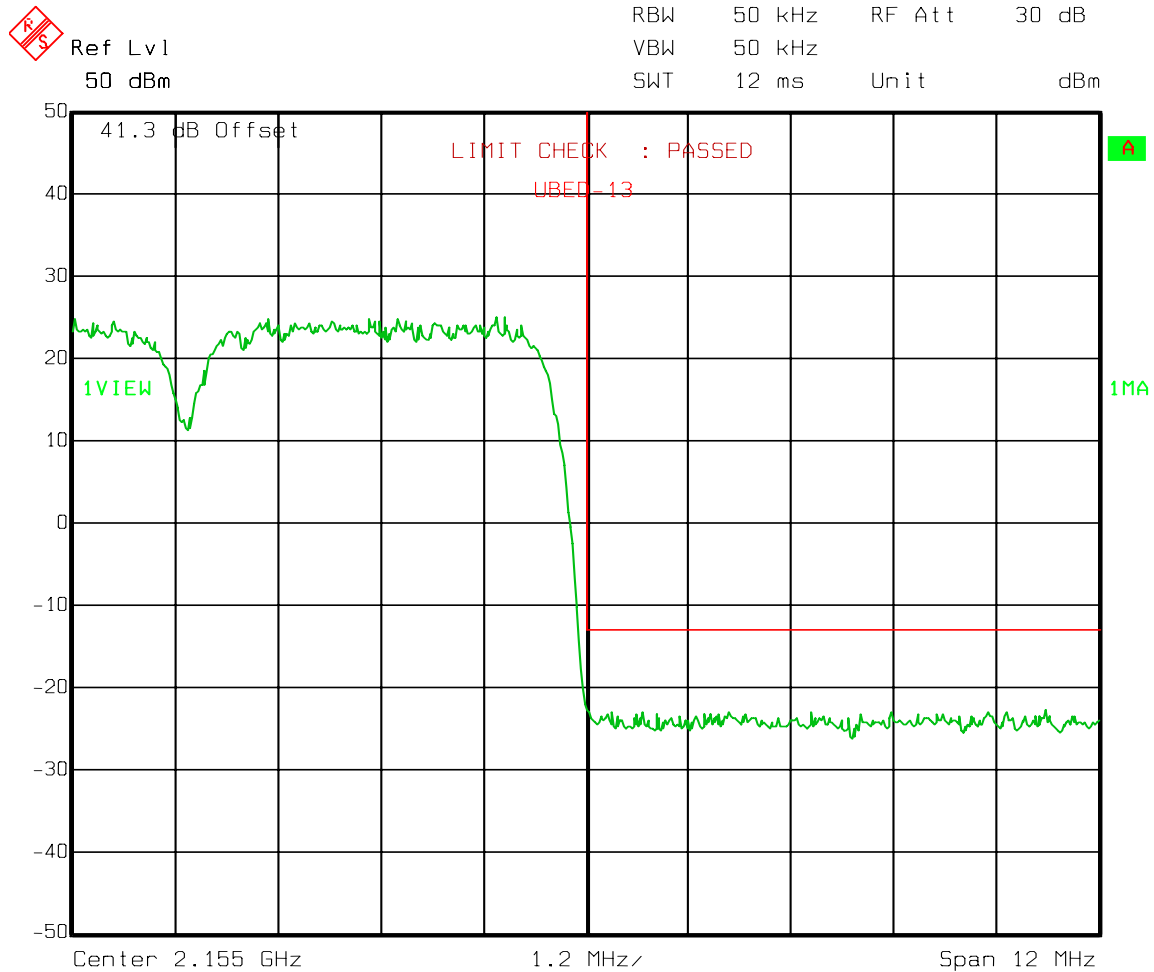


Date: 28.APR.2010 14:00:04

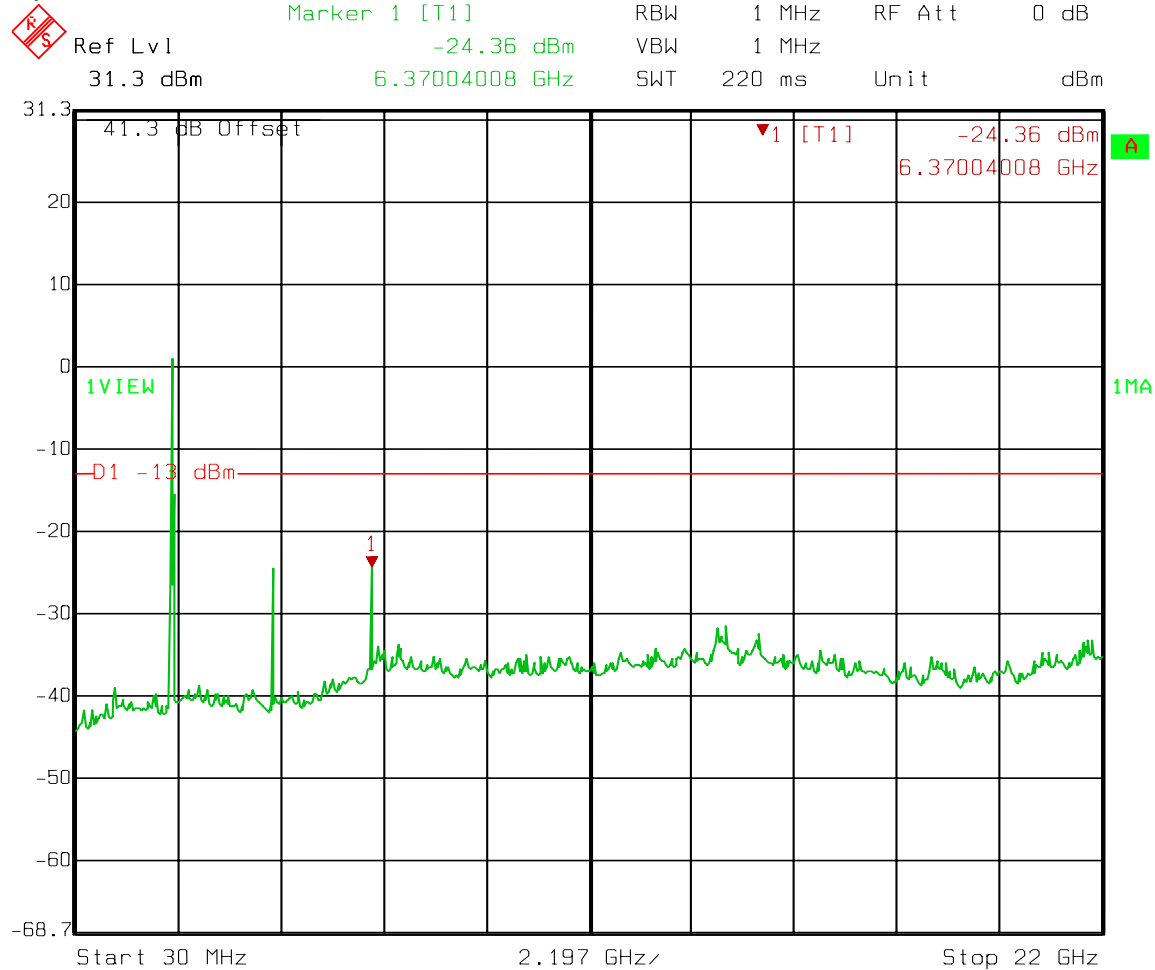
EQUIPMENT: **FS42R-1719E****Test Data – Spurious Emissions at Antenna Terminals**

Upper Bandedge Intermodulation

W-CDMA



Date: 28.APR.2010 14:00:58

EQUIPMENT: **FS42R-1719E****Test Data – Spurious Emissions at Antenna Terminals****Spurs – W-CDMA**

Date: 28.APR.2010 14:02:31

EQUIPMENT: FS42R-1719E**Section 6. Field Strength of Spurious**

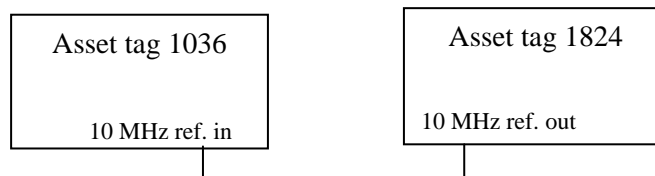
NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 24.238
TESTED BY: David Light	DATE: 28 April 2010

Test Results: Complies.**Test Data:** There were no emissions detected within 20 dB of the specification limit of -13 dBm EIRP. The spectrum was searched from 30 MHz to 22 GHz.**Analyzer Settings:** RBW/VBW = 1 MHz, Peak detector**Equipment Used:** 1464-1484-1485-993-1016-1824**Measurement Uncertainty:** +/-1.7 dB**Temperature:** 23 °C**Relative Humidity:** 40 %

EQUIPMENT: FS42R-1719E**Section 7. Test Equipment List**

Asset Tag	Description	Manufacturer	Model	Serial #	Last Cal	Next Cal
993	Antenna, Horn	A.H. Systems	SAS-200/571	162	09-Sep-2009	09-Sep-2011
1016	Preamplifier	Hewlett Packard	8449A	2749A00159	23-Jun-2009	23-Jun-2010
1036	Spectrum Analyzer	Rohde & Schwarz	FSEK30	830844/006	10-Jan-2009	10-Jan-2011
1082	Cable, 2m	Astrolab	32027-2-29094-72TC		CBU	NA
1464	Spectrum Analyzer	Hewlett Packard	8563E	3551A04428	27-Feb-2009	27-Feb-2011
1469	Attenuator, 10 db, DC 18 Ghz	MCL Inc.	BW-S10W2 10db-2WDC		CBU	NA
1472	Attenuator, 20dB, DC 18 Ghz	Omni Spectra	20600-20db		CBU	NA
1484	Cable	Storm	PR90-010-072		23-Jun-2009	23-Jun-2010
1485	Cable	Storm	PR90-010-216		23-Jun-2009	23-Jun-2010
1824	Signal Gen.	Rohde & Schwarz	SMIQ03B	8354671007	1-Sept-09	1-Sept-10
1053	Signal Gen.	Rohde & Schwarz	SMIQ03	DE22081	29-Sept-09	29-Sept-10

* The FEK30 spectrum analyzer is calibrated on a 2 year cycle and, per manufacturer recommendation, is used with an external frequency reference (asset tag 1824) in all test setup arrangements that require asset 1036 as shown below.



ANNEX A - TEST DETAILS

EQUIPMENT: **FS42R-1719E**

NAME OF TEST: RF Power Output

PARA. NO.: 2.1046

Minimum Standard: Para. No.24.232. Base stations are limited to 1640 watts peak E.I.R.P. with an antenna height up to 300 meters HAAT. In no case may the peak output power of a base station transmitter exceed 100 watts.

Method Of Measurement:

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter or spectrum analyzer. Power output is measured with the maximum rated input level.

Integral Antenna:

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

EQUIPMENT: **FS42R-1719E**

NAME OF TEST: Occupied Bandwidth

PARA. NO.: 2.1049

Minimum Standard: Input/Output

Method Of Measurement:

CDMA

Spectrum analyzer settings:

RBW=VBW=30 kHz

Span: 5 MHz

Sweep: Auto

GSM / EDGE

RBW=VBW= 3 kHz

Span: 1 MHz

Sweep: Auto

TDMA

RBW=VBW= 1 kHz

Span: 1 MHz

Sweep: Auto

W-CDMA

RBW=VBW= 100 kHz

Span: 10 MHz

Sweep: Auto

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 24.238**Minimum Standard:**

Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Method Of Measurement:

Spectrum analyzer settings:

CDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 30 kHz (< 1MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: 6 Sweeps

GSM / EDGE

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: Disabled

TDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 3 kHz (< 1 MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: Disabled

W-CDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 100 kHz (< 1MHz from Band Edge)
VBW: \geq RBW
Sweep: Auto
Video Avg: 6 Sweeps

To demonstrate compliance at band edges the frequency of the input signal is set to the lowest and highest assigned channel and the center frequency of the spectrum analyzer is set to the upper and lower edges of the appropriate frequency block.

EQUIPMENT: FS42R-1719E**NAME OF TEST: Field Strength of Spurious Radiation PARA. NO.: 24.238**

Minimum Standard: Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least $43 + 10 \log (P)$ dB.

Method of Measurement TIA/EIA-603-1992

The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna is fed with a signal at the spurious frequency. The level of the signal is adjusted to repeat the previously measured level. The resulting eirp is the signal level fed to the reference antenna corrected for gain referenced to an isotropic radiator.

EQUIPMENT: FS42R-1719E**NAME OF TEST: Frequency Stability****PARA. NO.: 2.1055**

Minimum Standard: Para. No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method Of Measurement:

Frequency Stability With Voltage Variation

The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10 MHz ref, in of the signal generator. With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

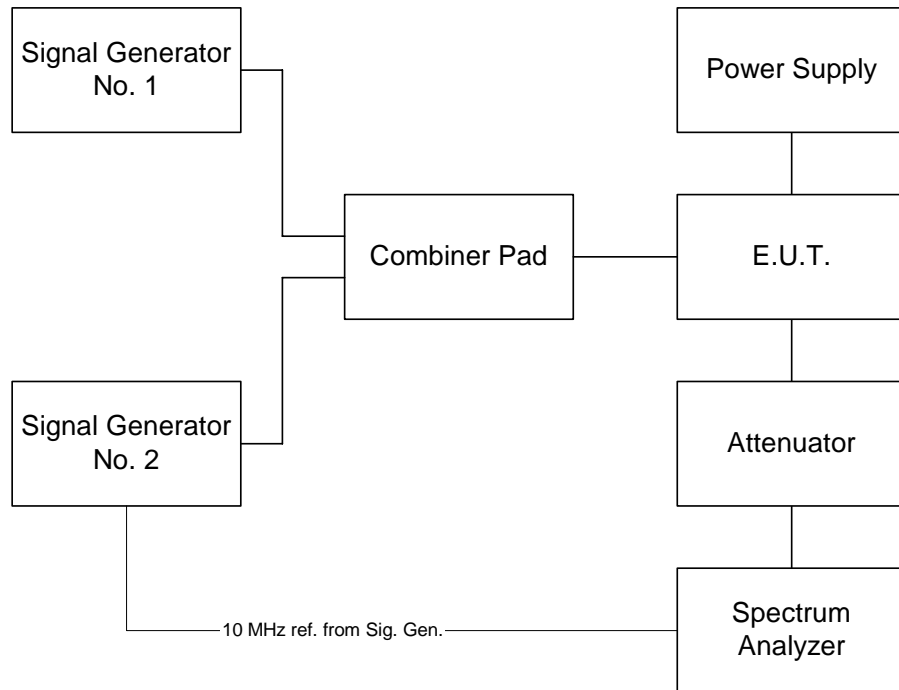
Frequency Stability With Temperature Variation

The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

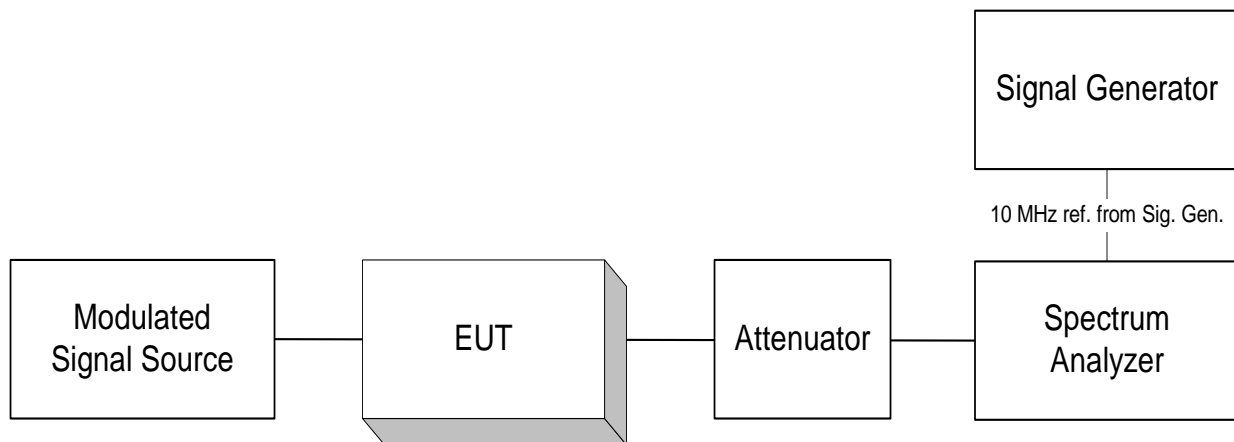
ANNEX B - TEST DIAGRAMS

EQUIPMENT: **FS42R-1719E**

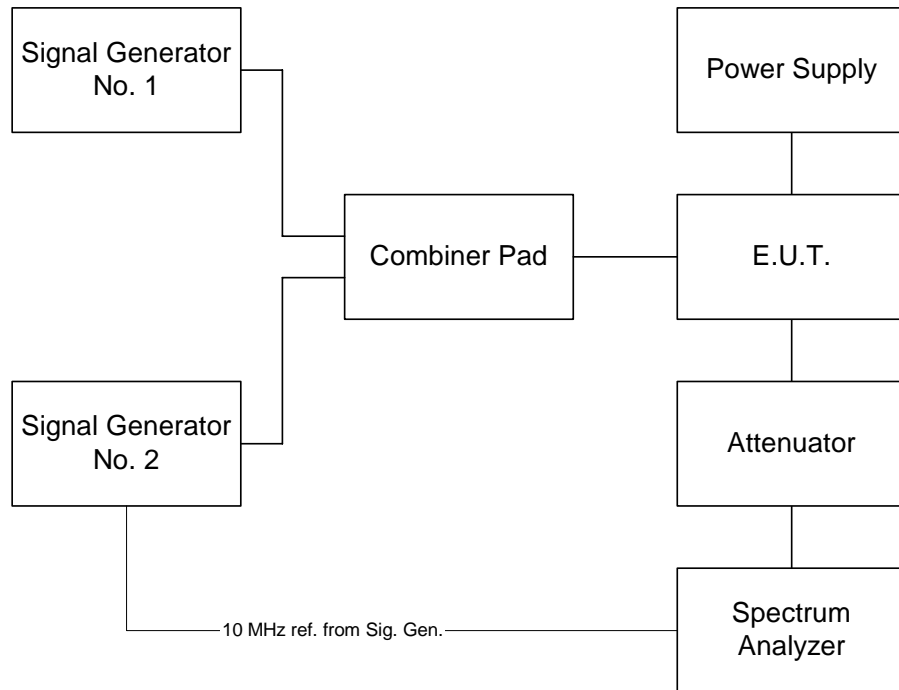
Para. No. 2.985 - R.F. Power Output



Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation

