



**Nemko Test Report:** 44421RUS1

**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 24, Subpart E**  
Broadband PCS Repeaters

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

**TESTED BY:**

  
\_\_\_\_\_  
David Light, Senior Wireless Engineer

**DATE:** 27 April 2010

**APPROVED BY:**

  
\_\_\_\_\_  
Tom Tidwell, Telecom Direct

**DATE:** 04 June 2010

**Number of Pages: 39**

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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 24, Subpart E.



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".



NVLAP Lab Code 100426-0

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**Summary Of Test Data**

| NAME OF TEST                            | PARA.<br>NO. | SPEC.               | RESULT   |
|-----------------------------------------|--------------|---------------------|----------|
| RF Power Output                         | 24.232       | 100W                | Complies |
| Occupied Bandwidth                      | 2.1049       | Input/Output        | Complies |
| Spurious Emissions at Antenna Terminals | 24.238(a)    | -13 dBm             | Complies |
| Field Strength of Spurious Emissions    | 24.238(a)    | -13 dBm<br>E.I.R.P. | Complies |
| Frequency Stability                     | 24.235       |                     | NA       |

**Footnotes:**

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

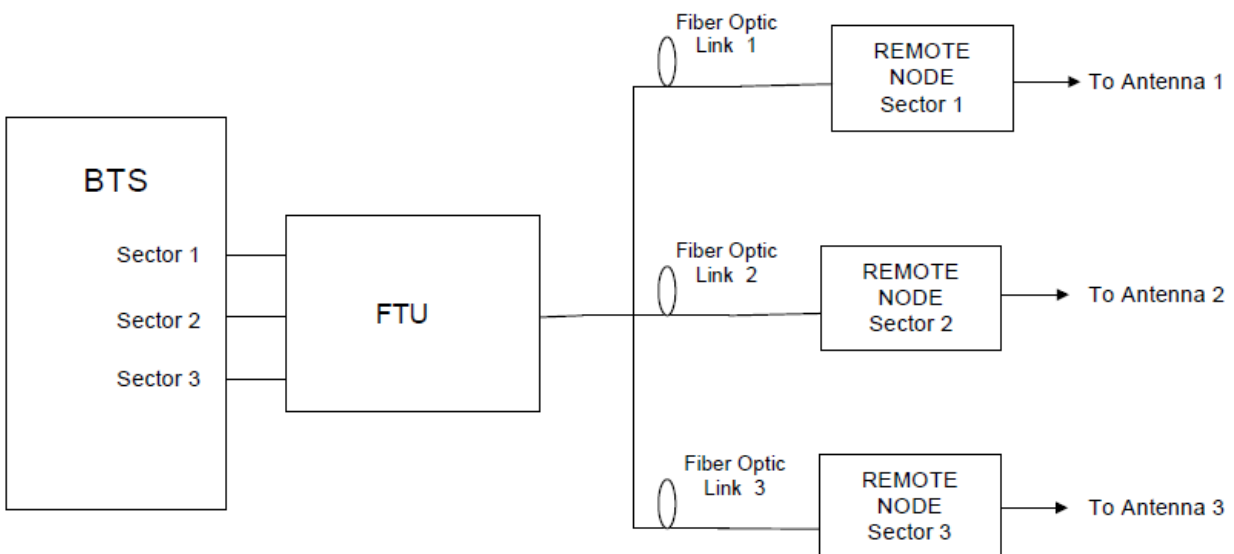
EQUIPMENT: **FS42R-1719E****Section 2. General Equipment Specification**

|                                                                                                                               |                  |                                                                                                                                                                                                                                                                                                                                                        |                                                        |
|-------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| <b>Supply Voltage Input:</b>                                                                                                  |                  |                                                                                                                                                                                                                                                                                                                                                        |                                                        |
| <b>Frequency Bands:</b>                                                                                                       | <b>Downlink:</b> | <input checked="" type="checkbox"/> Block A : 1930 – 1945 MHz<br><input checked="" type="checkbox"/> Block D : 1945 – 1950 MHz<br><input type="checkbox"/> Block B : 1950 – 1965 MHz<br><input type="checkbox"/> Block E : 1965 – 1970 MHz<br><input type="checkbox"/> Block F : 1970 – 1975 MHz<br><input type="checkbox"/> Block C : 1975 – 1990 MHz |                                                        |
| <b>Frequency Bands:</b>                                                                                                       | <b>Uplink:</b>   | <input type="checkbox"/> Block A : 1850 – 1865 MHz<br><input type="checkbox"/> Block B : 1865 – 1870 MHz<br><input type="checkbox"/> Block C : 1870 – 1885 MHz<br><input type="checkbox"/> Block D : 1885 – 1890 MHz<br><input type="checkbox"/> Block E : 1890 – 1895 MHz<br><input type="checkbox"/> Block F : 1895 – 1910 MHz                       |                                                        |
| <b>Testing was not performed on the Uplink because the Uplink is connected to a BTS only through fiber and coaxial cable.</b> |                  |                                                                                                                                                                                                                                                                                                                                                        |                                                        |
| <b>Modulation Designator(s):</b>                                                                                              |                  | <b>(F9W)</b> <input checked="" type="checkbox"/> <b>(GXW)</b> <input checked="" type="checkbox"/> <b>(DXW)</b> <input type="checkbox"/> <b>(G7W)</b> <input checked="" type="checkbox"/>                                                                                                                                                               |                                                        |
| <b>System Gain:</b>                                                                                                           |                  | 40 dB                                                                                                                                                                                                                                                                                                                                                  |                                                        |
| <b>Output Impedance:</b>                                                                                                      |                  | 50 ohms                                                                                                                                                                                                                                                                                                                                                |                                                        |
| <b>RF Output (Rated):</b>                                                                                                     | <b>Uplink</b>    | $\frac{\text{NA}}{\text{NA}} \frac{\text{W}}{\text{dBm}}$                                                                                                                                                                                                                                                                                              |                                                        |
| <b>RF Output (Rated):</b>                                                                                                     | <b>Downlink</b>  | $\frac{20}{43} \frac{\text{W}}{\text{dBm}}$                                                                                                                                                                                                                                                                                                            |                                                        |
| <b>Frequency Translation:</b>                                                                                                 |                  | <b>F1-F1</b><br><input checked="" type="checkbox"/>                                                                                                                                                                                                                                                                                                    | <b>F1-F2</b><br><input type="checkbox"/>               |
|                                                                                                                               |                  |                                                                                                                                                                                                                                                                                                                                                        | <b>N/A</b><br><input type="checkbox"/>                 |
| <b>Band Selection:</b>                                                                                                        |                  | <b>Software</b><br><input type="checkbox"/>                                                                                                                                                                                                                                                                                                            | <b>Duplexer</b><br><input checked="" type="checkbox"/> |
|                                                                                                                               |                  |                                                                                                                                                                                                                                                                                                                                                        | <b>Fullband</b><br><input 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: 27 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: 27 April 2010 |

Test Results: Complies.

Test Data: See attached plot(s).

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

Measurement Uncertainty: 1X10<sup>-7</sup> ppm

Temperature: 22 °C

Relative Humidity: 35 %

EQUIPMENT: **FS42R-1719E**

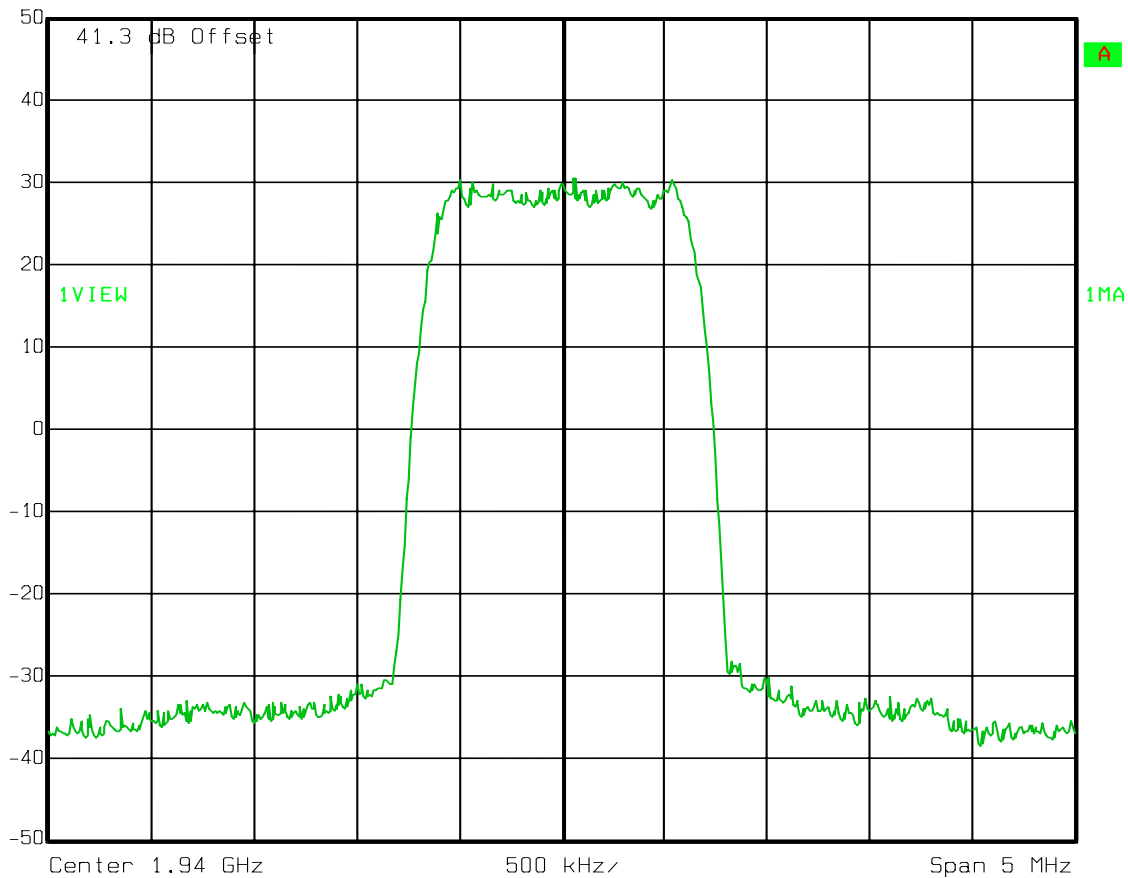
# Test Data – Occupied Bandwidth

## 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: 27.APR.2010 10:02:11

EQUIPMENT: **FS42R-1719E**

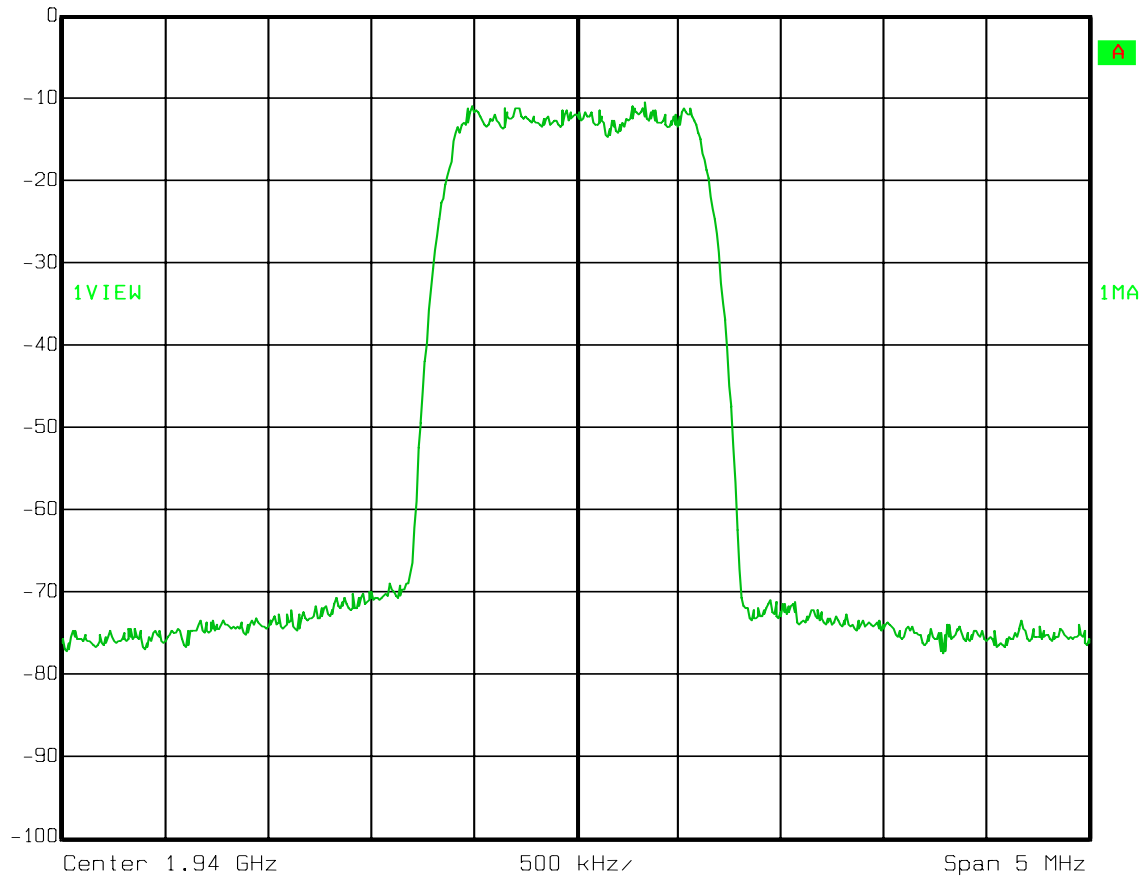
# Test Data – Occupied Bandwidth

CDMA - Input



Ref Lvl  
0 dBm

RBW 30 kHz RF Att 30 dB  
VBW 30 kHz  
SWT 14 ms Unit dBm



Date: 27.APR.2010 10:14:17

EQUIPMENT: **FS42R-1719E**

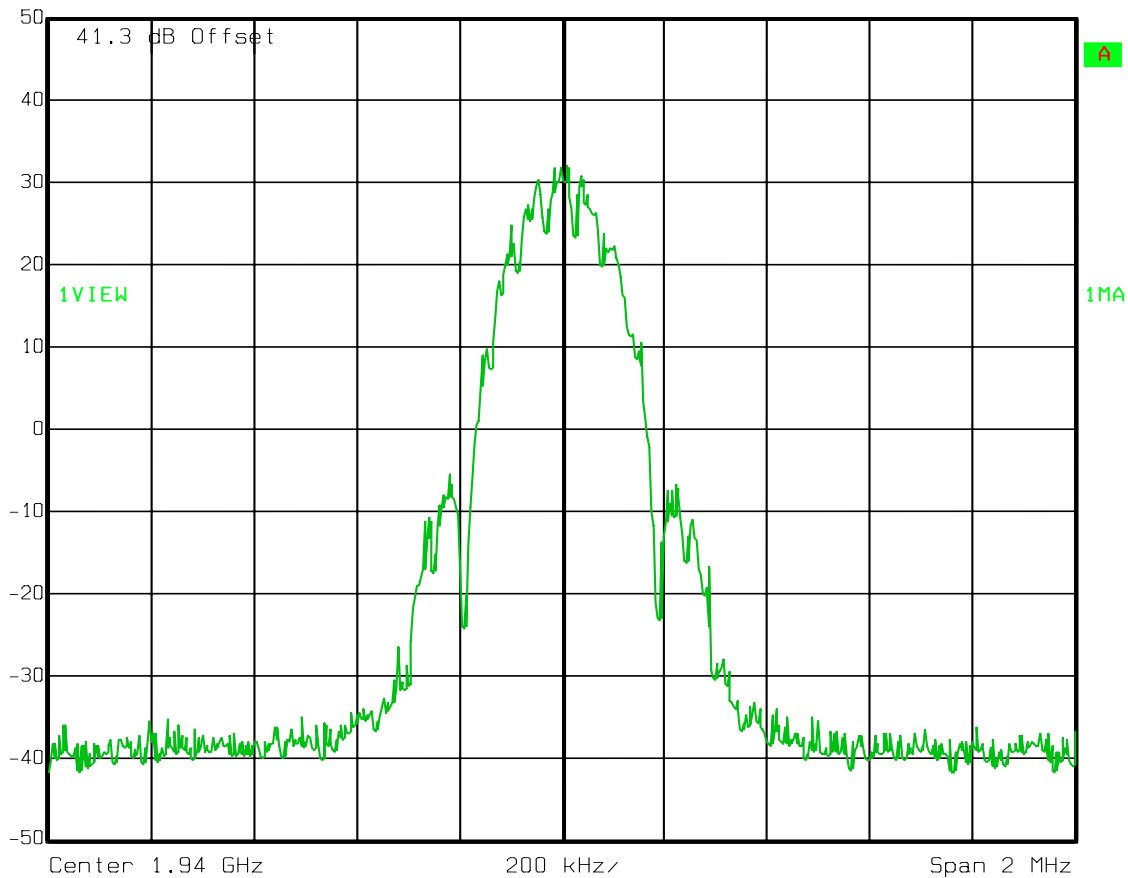
**Test Data – Occupied Bandwidth**

EDGE - Output



Ref Lvl  
50 dBm

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



Date: 27.APR.2010 09:53:39

EQUIPMENT: **FS42R-1719E**

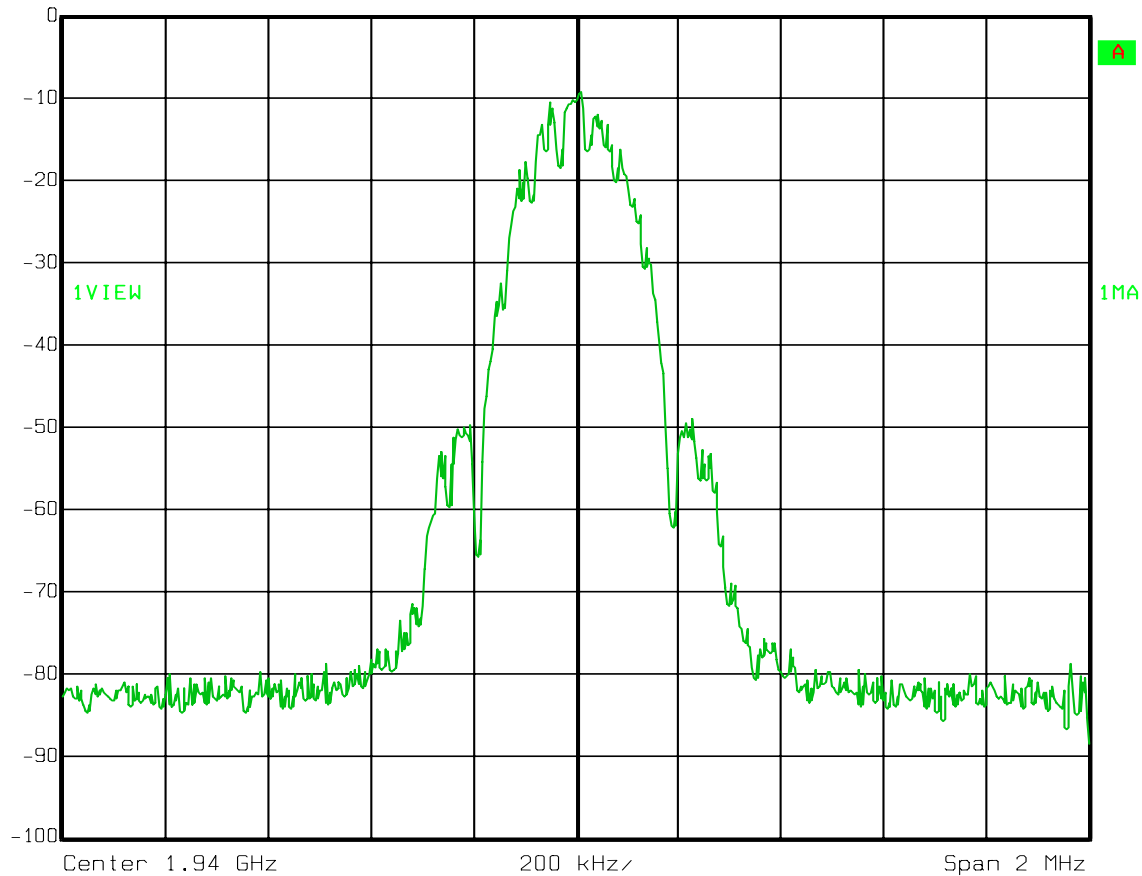
# Test Data – Occupied Bandwidth

EDGE - Input



Ref Lvl  
0 dBm

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

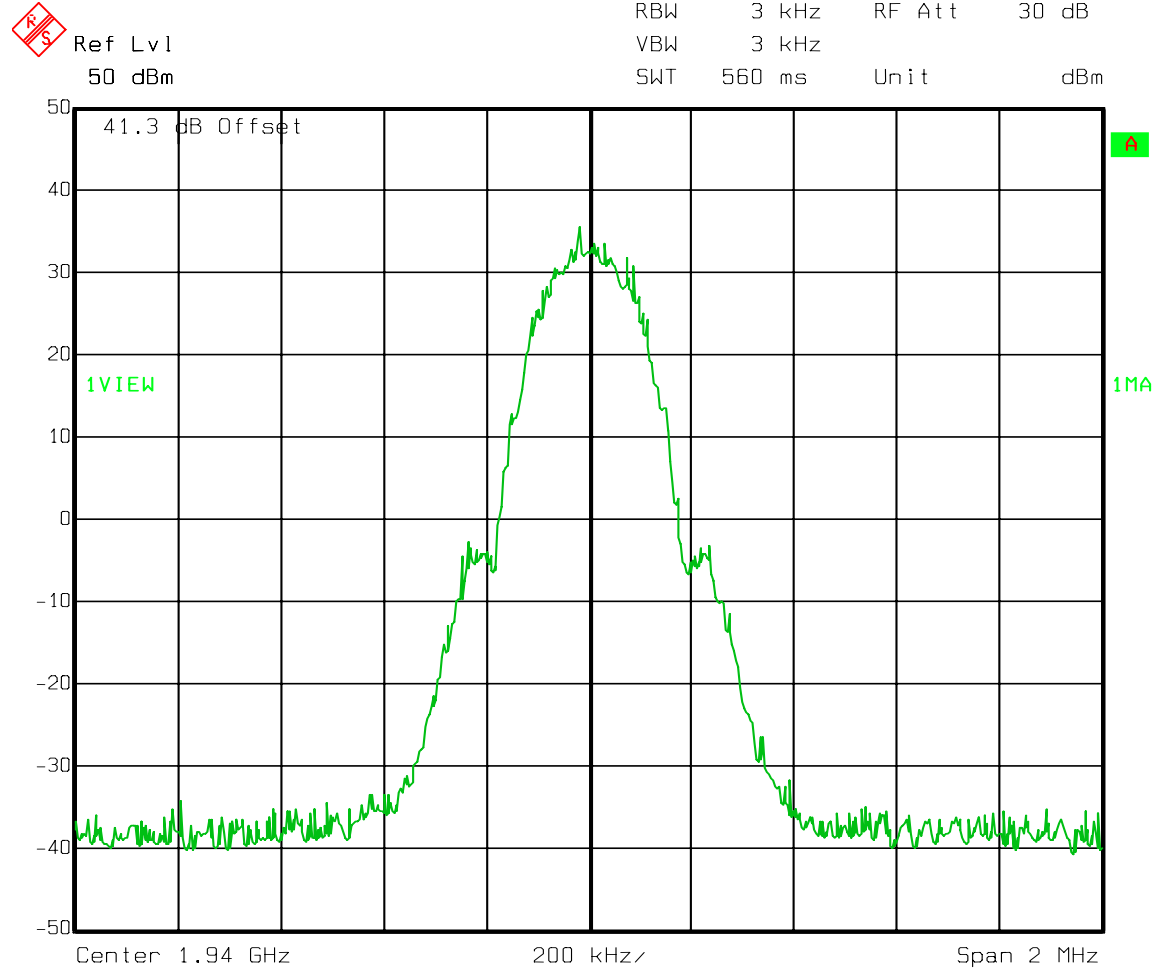


Date: 27.APR.2010 10:15:14

EQUIPMENT: **FS42R-1719E**

**Test Data – Occupied Bandwidth**

**GSM - Output**



Date: 27.APR.2010 09:46:32

EQUIPMENT: **FS42R-1719E**

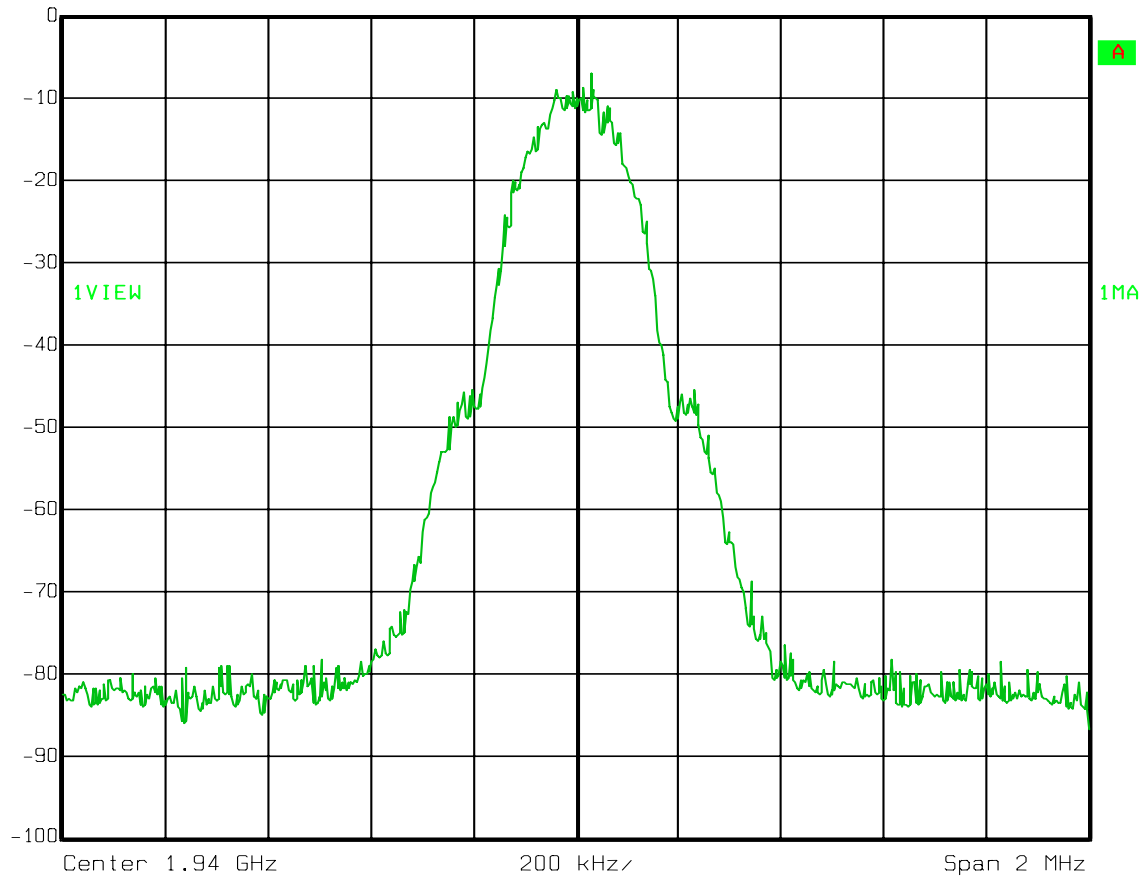
**Test Data – Occupied Bandwidth**

GSM - Input



Ref Lvl  
0 dBm

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



Date: 27.APR.2010 10:15:55

EQUIPMENT: **FS42R-1719E**

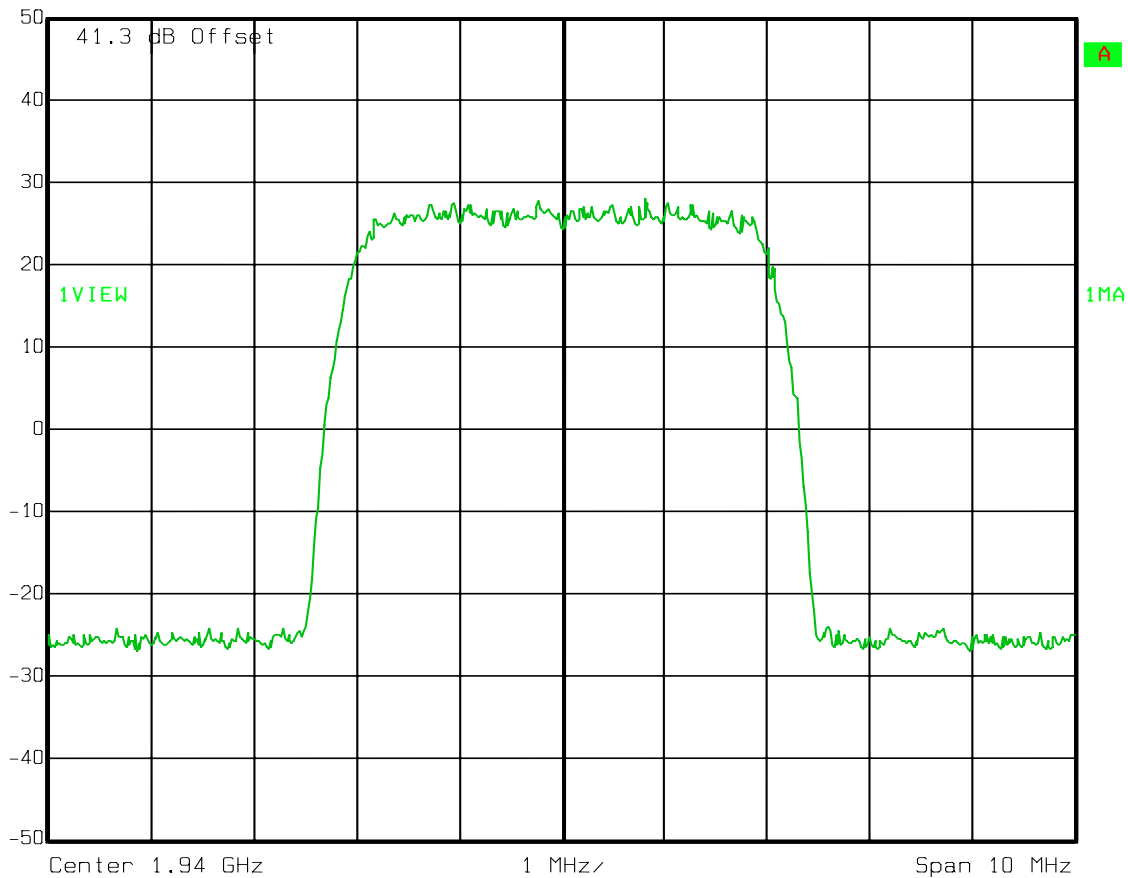
# Test Data – Occupied Bandwidth

## W-CDMA - Output



Ref Lvl  
50 dBm

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

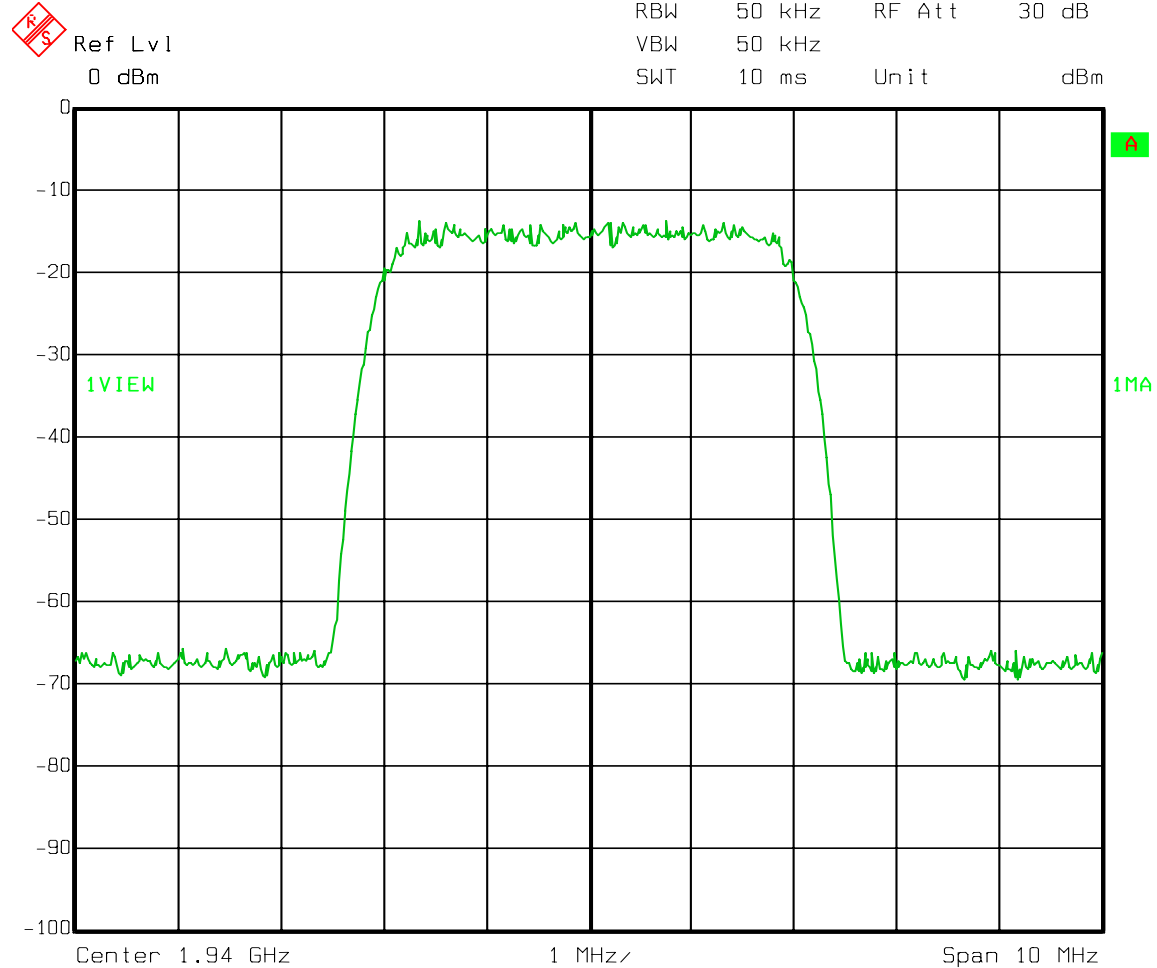


Date: 27.APR.2010 10:10:05

EQUIPMENT: **FS42R-1719E**

# Test Data – Occupied Bandwidth

W-CDMA - Input



Date: 27.APR.2010 10:13:34

## Section 5. Spurious Emissions at Antenna Terminals

|                                                      |                     |
|------------------------------------------------------|---------------------|
| NAME OF TEST: Spurious Emissions @ Antenna Terminals | PARA. NO.: 24.238   |
| TESTED BY: David Light                               | DATE: 27 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

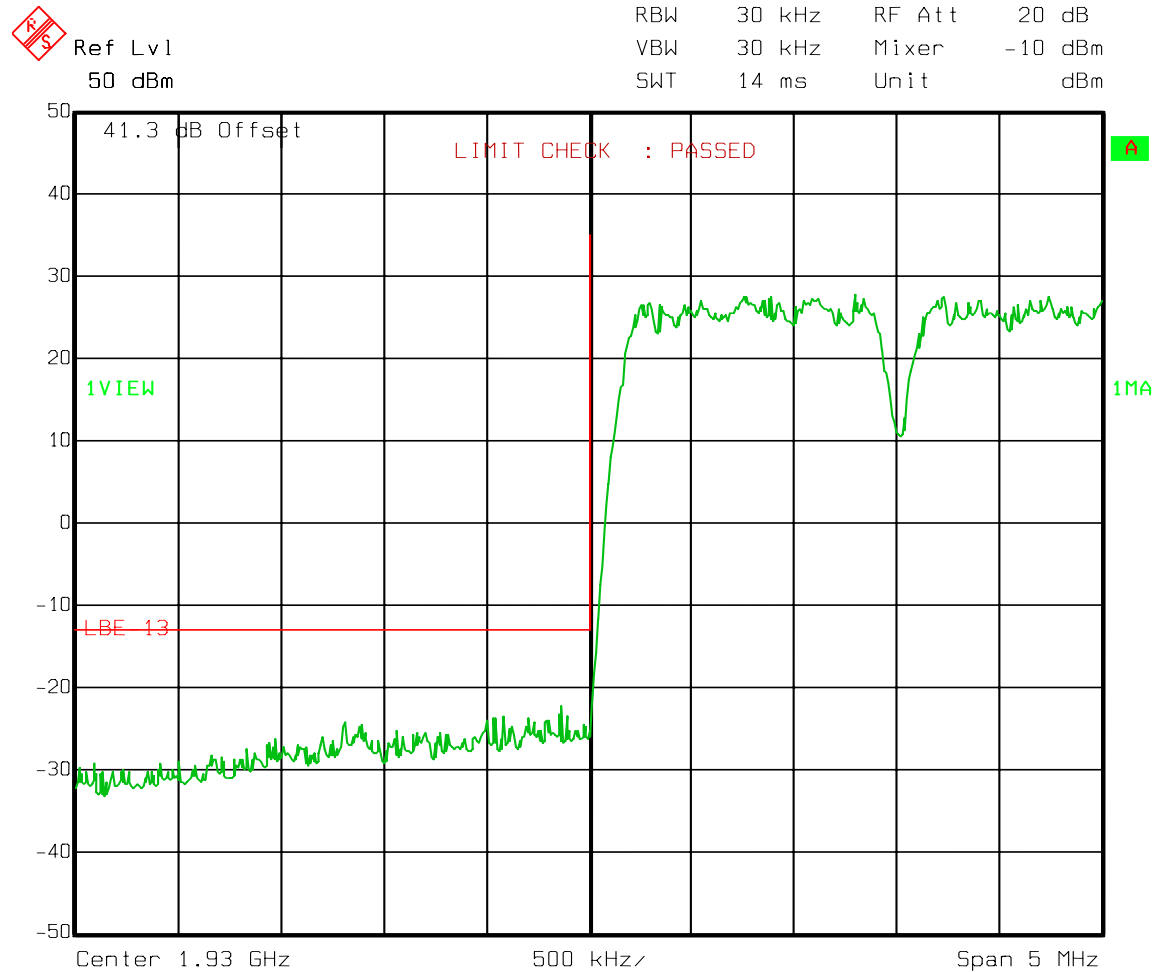
Relative Humidity: 35 %

EQUIPMENT: **FS42R-1719E**

# Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation

CDMA

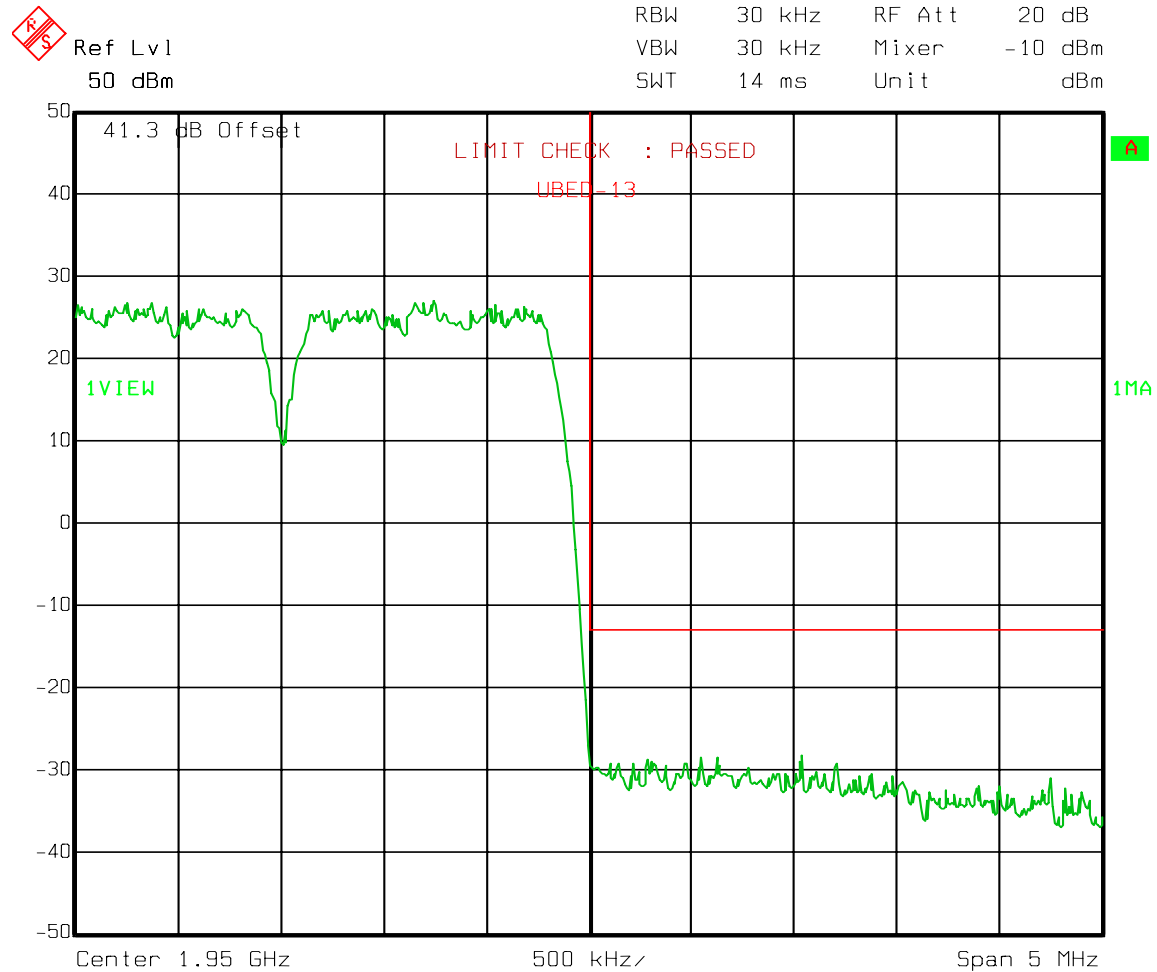


Date: 27.APR.2010 09:59:38

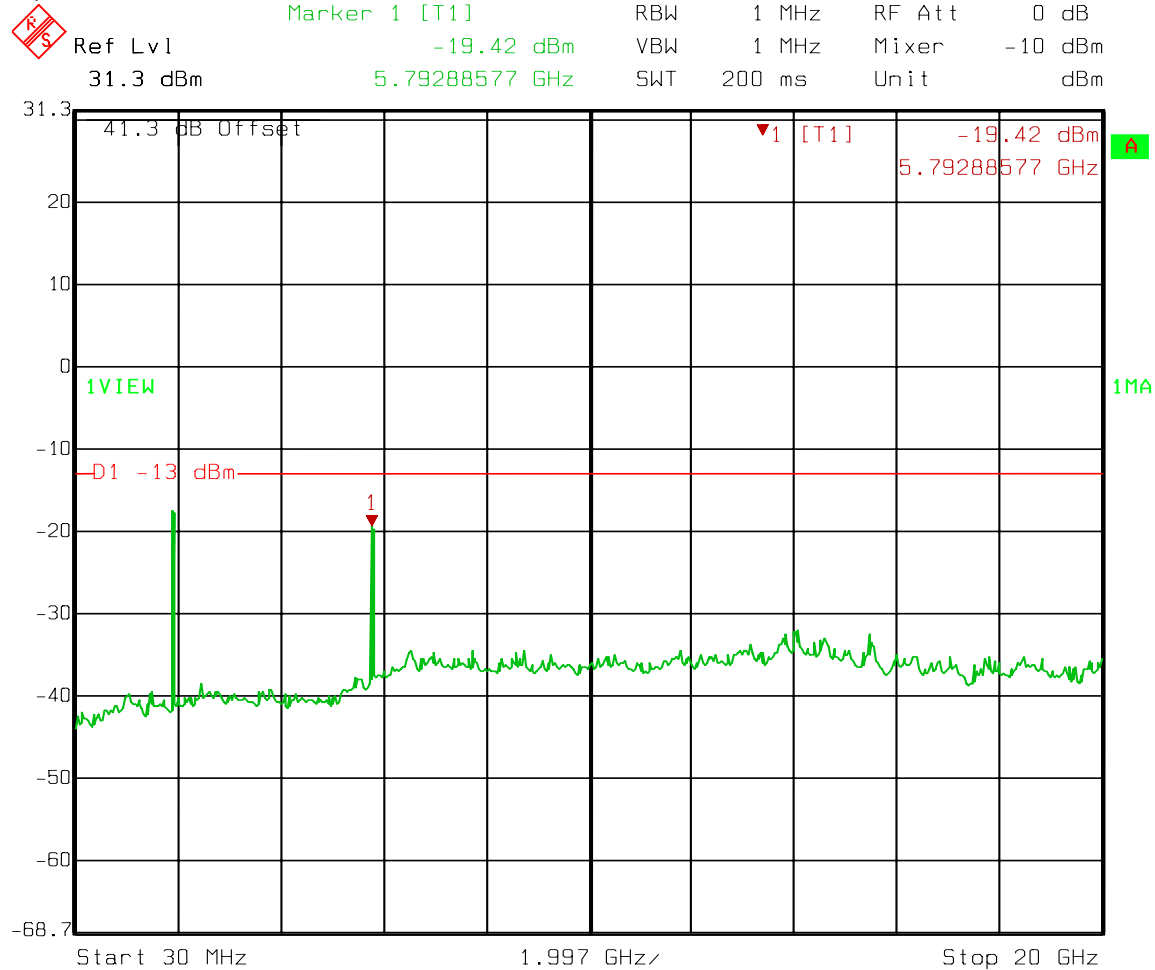
EQUIPMENT: **FS42R-1719E****Test Data – Spurious Emissions at Antenna Terminals**

Upper Bandedge Intermodulation

CDMA



Date: 27.APR.2010 10:00:48

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

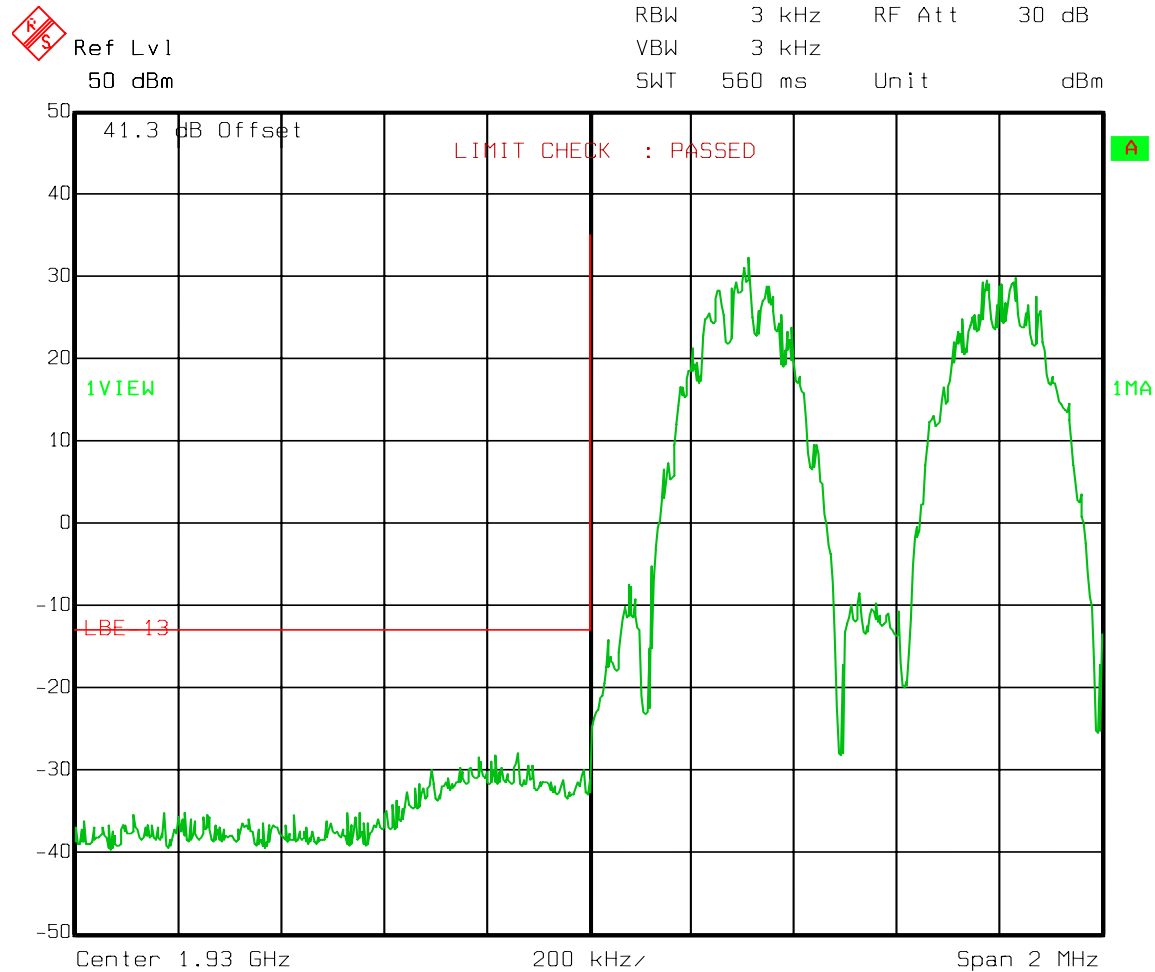
Date: 27.APR.2010 10:03:09

Carrier notched.

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

Lower Bandedge Intermodulation

EDGE

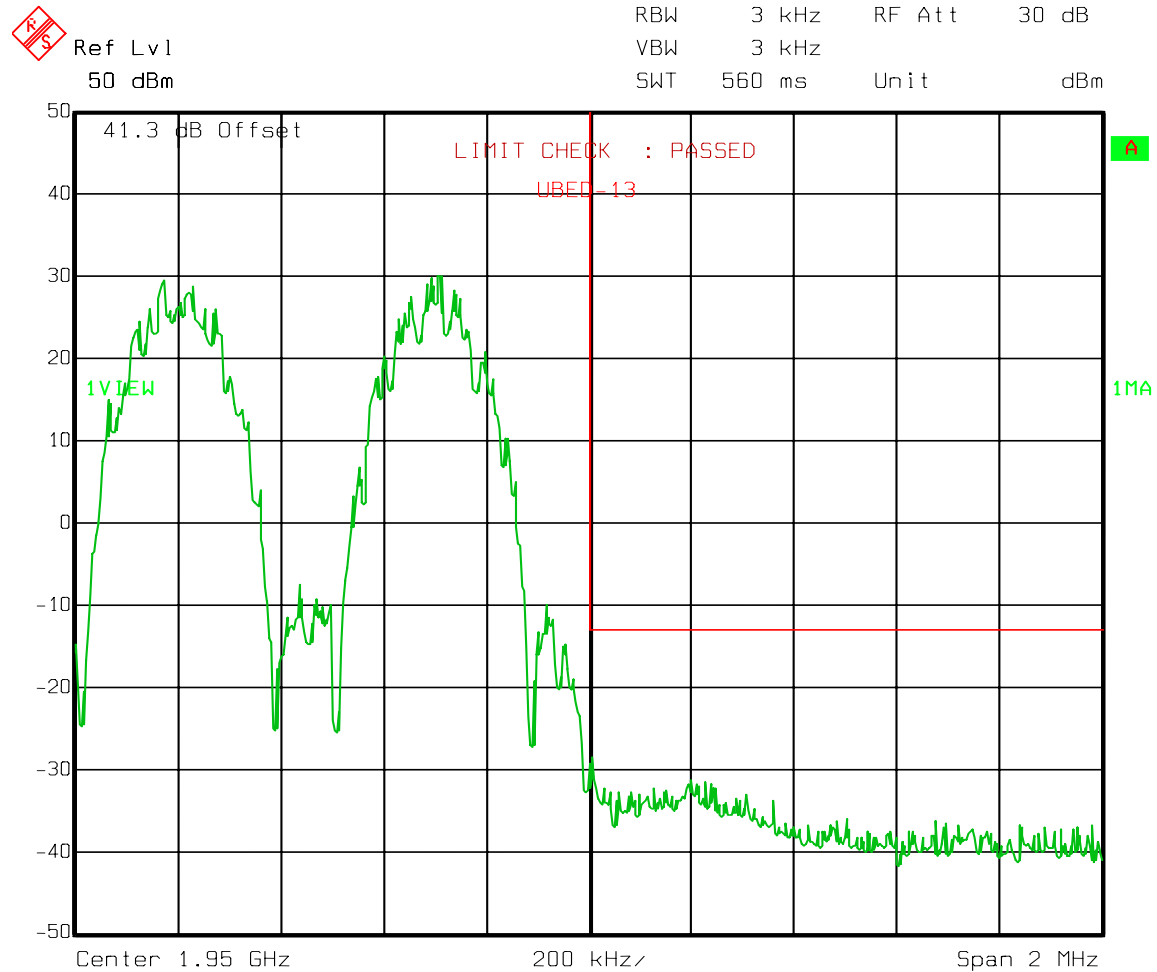


Date: 27.APR.2010 09:51:11

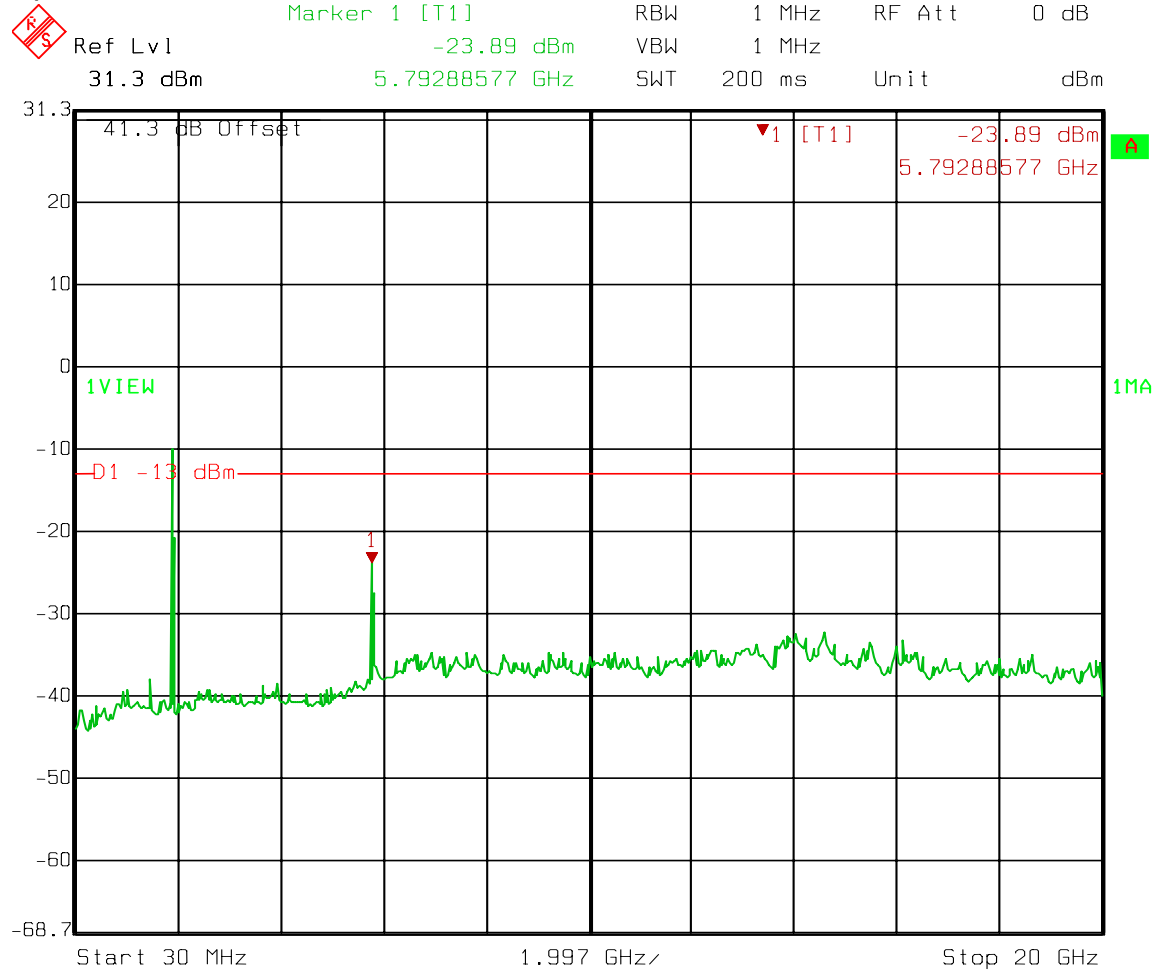
EQUIPMENT: **FS42R-1719E**

# Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation  
EDGE



Date: 27.APR.2010 09:52:24

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

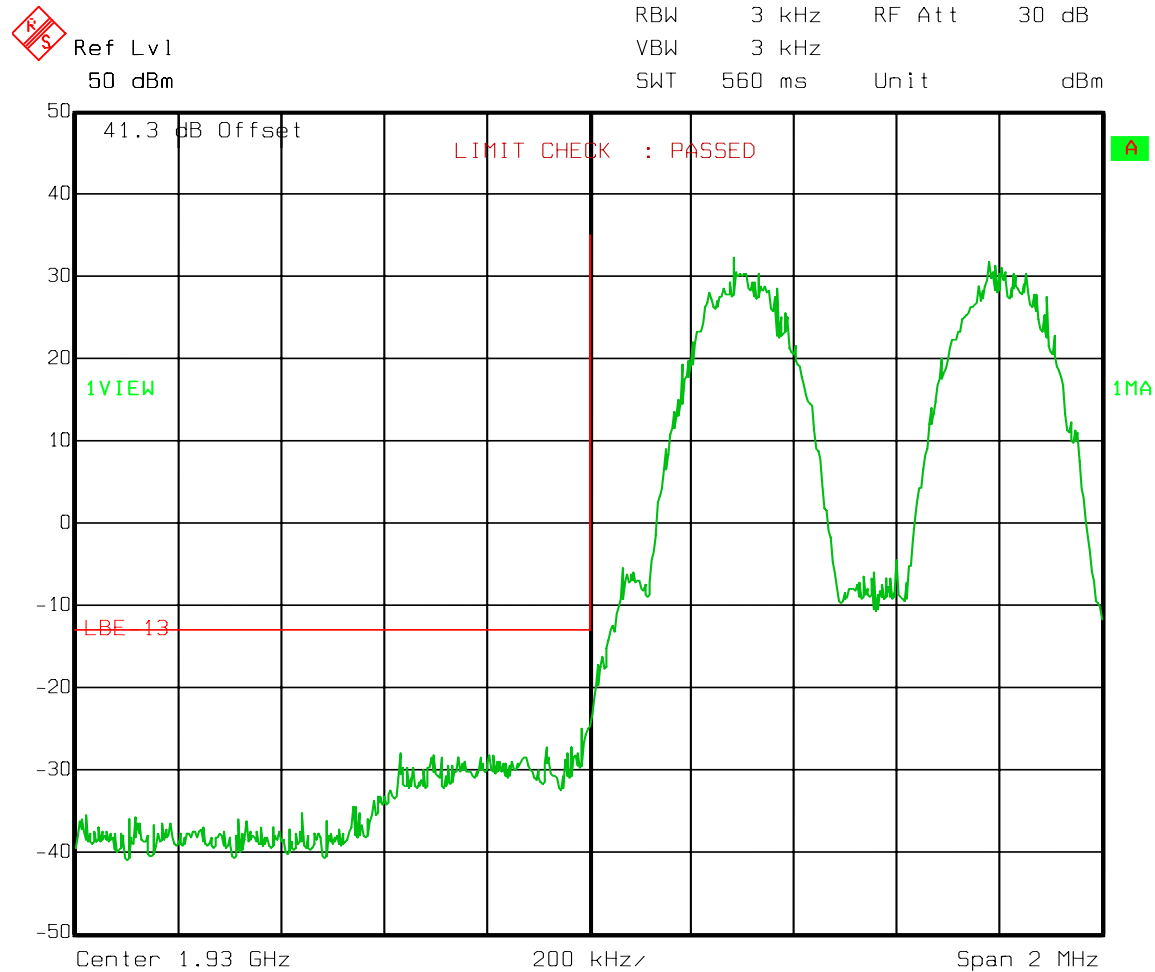
Date: 27.APR.2010 09:54:47

Carrier notched

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

Lower Bandedge Intermodulation

GSM

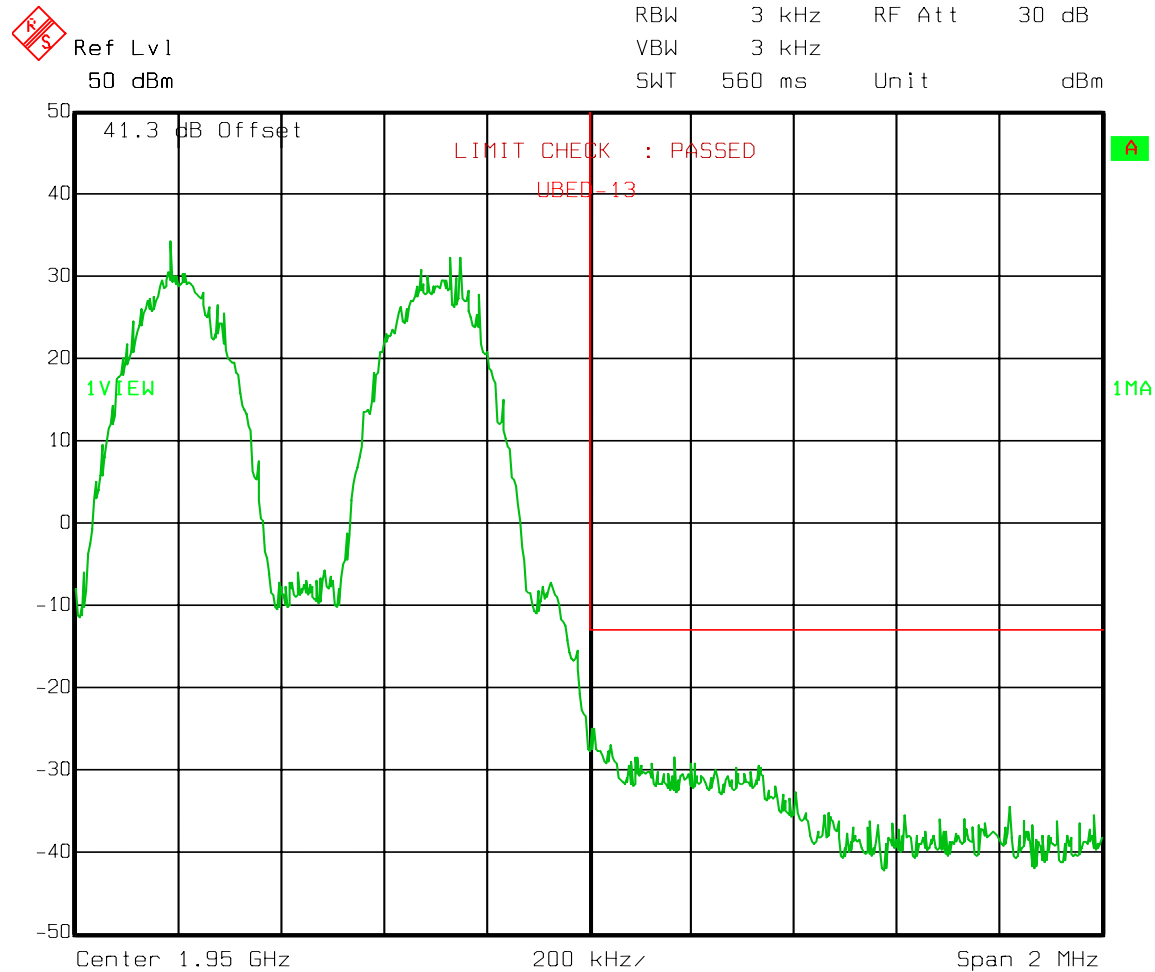


Date: 27.APR.2010 09:43:46

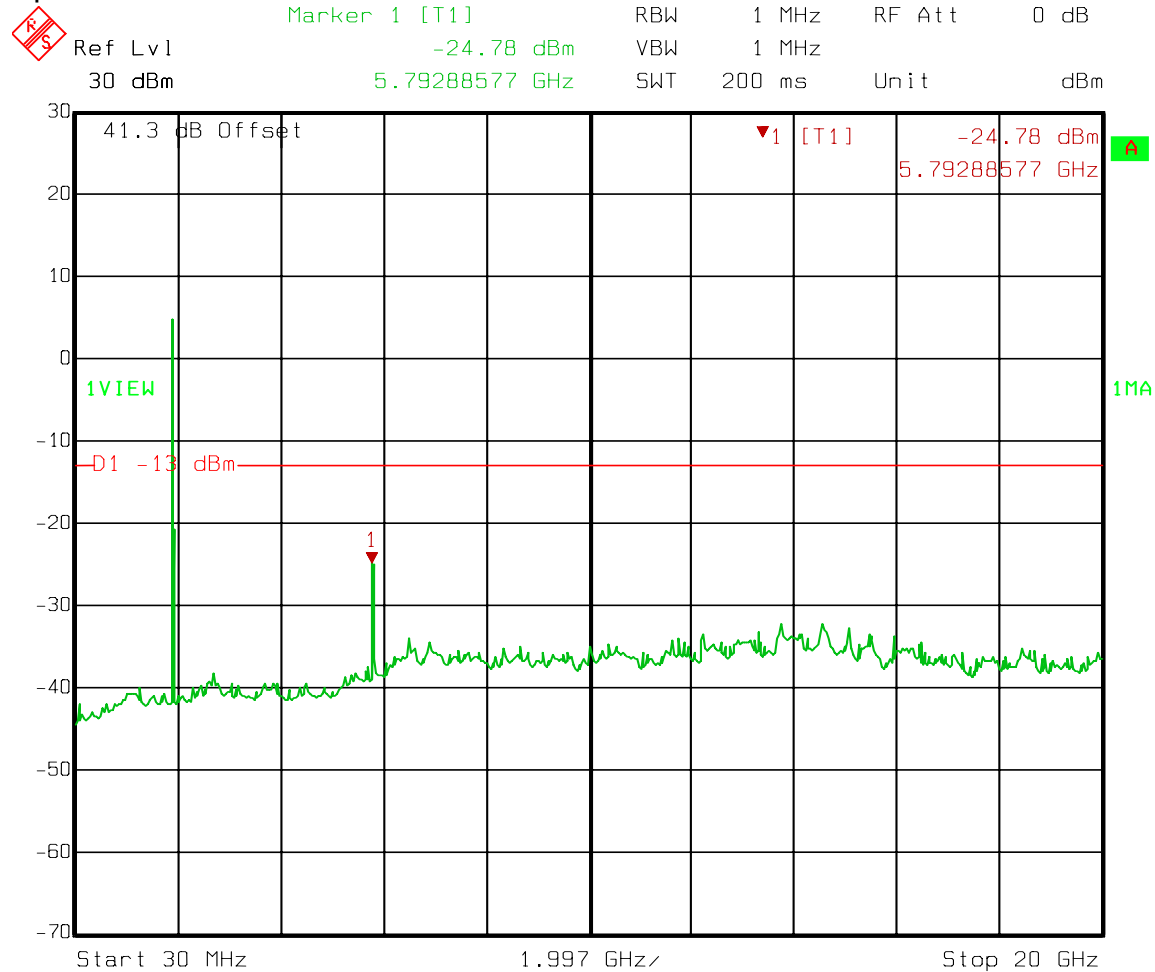
EQUIPMENT: **FS42R-1719E****Test Data – Spurious Emissions at Antenna Terminals**

Upper Bandedge Intermodulation

GSM



Date: 27.APR.2010 09:45:02

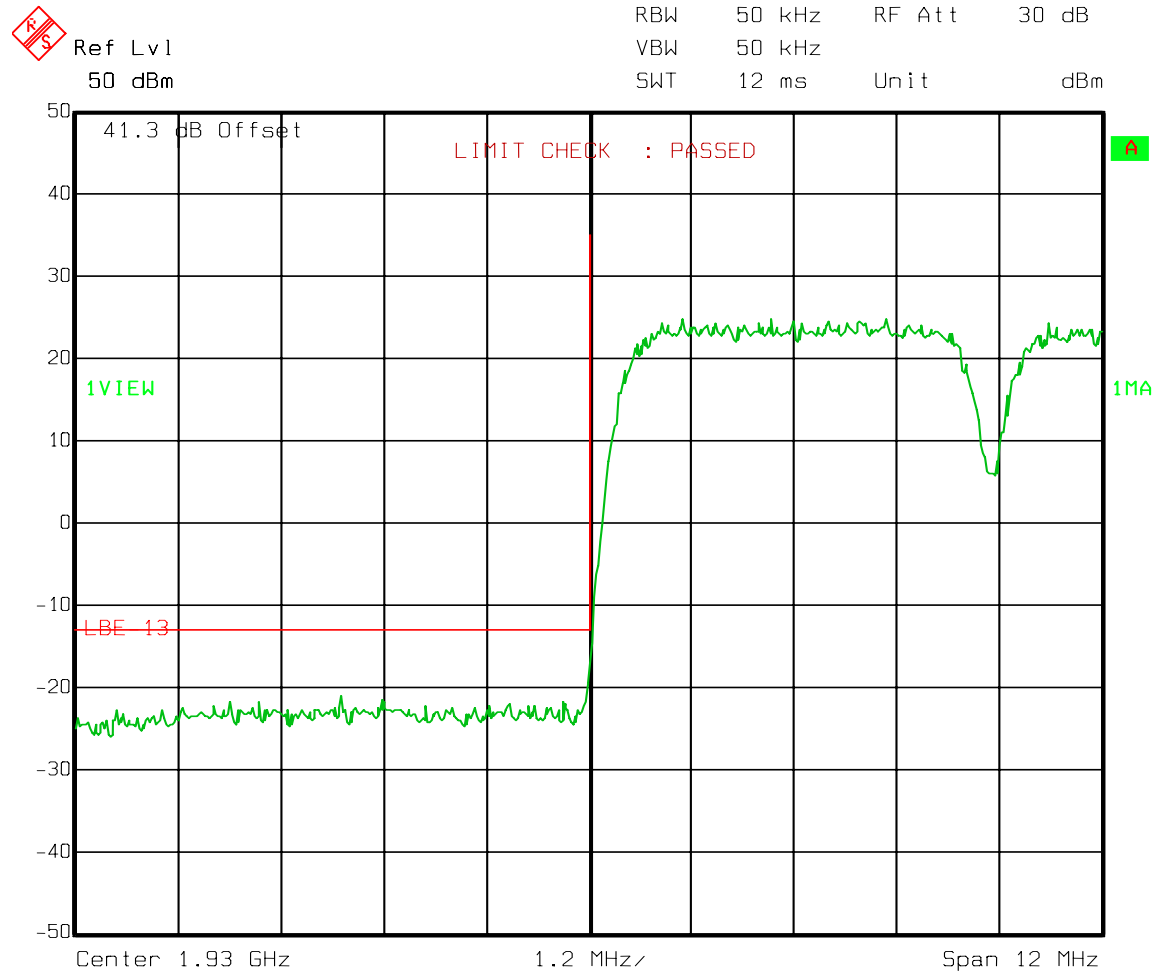
EQUIPMENT: **FS42R-1719E****Test Data – Spurious Emissions at Antenna Terminals****Spurs – GSM**

Date: 27.APR.2010 09:49:06

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

Lower Bandedge Intermodulation

W-CDMA

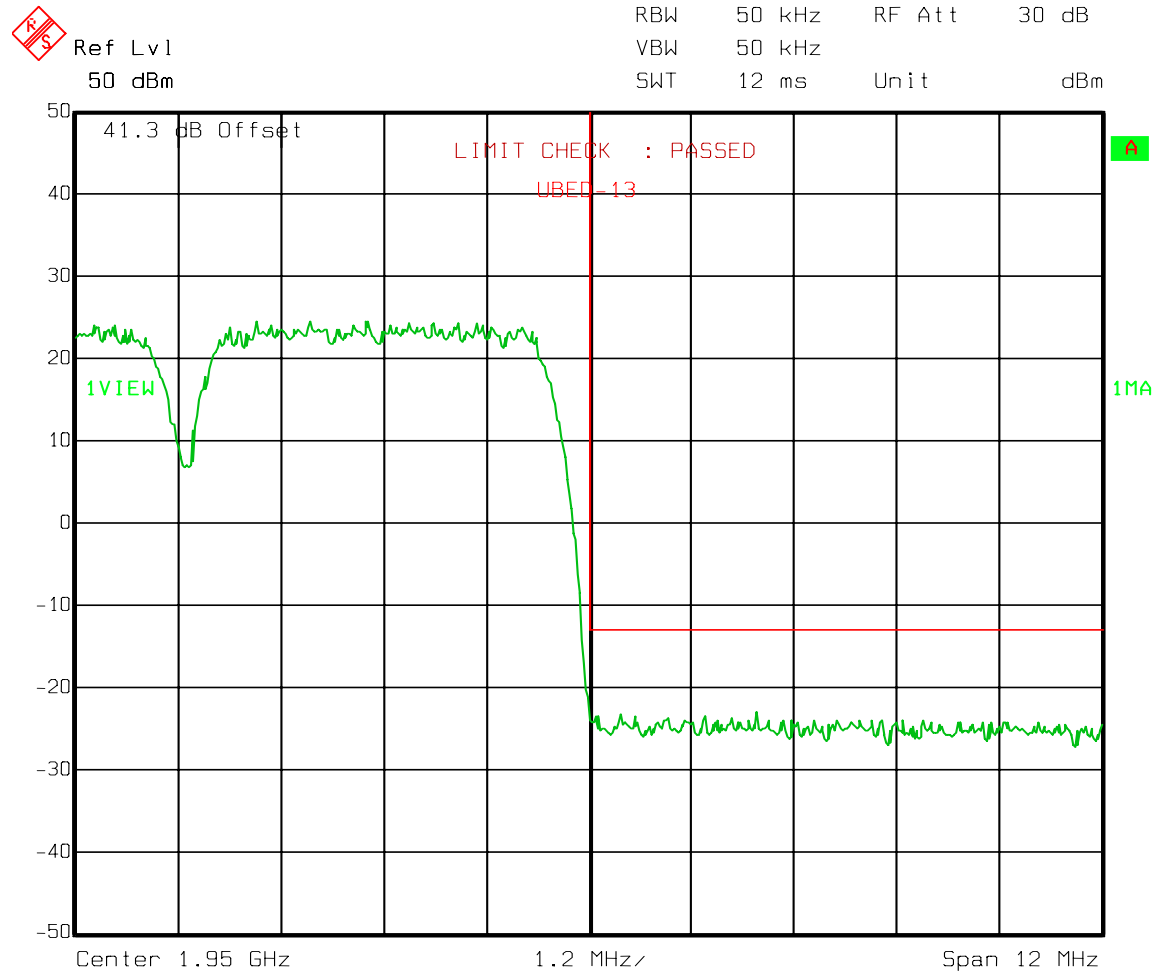


Date: 27.APR.2010 10:06:46

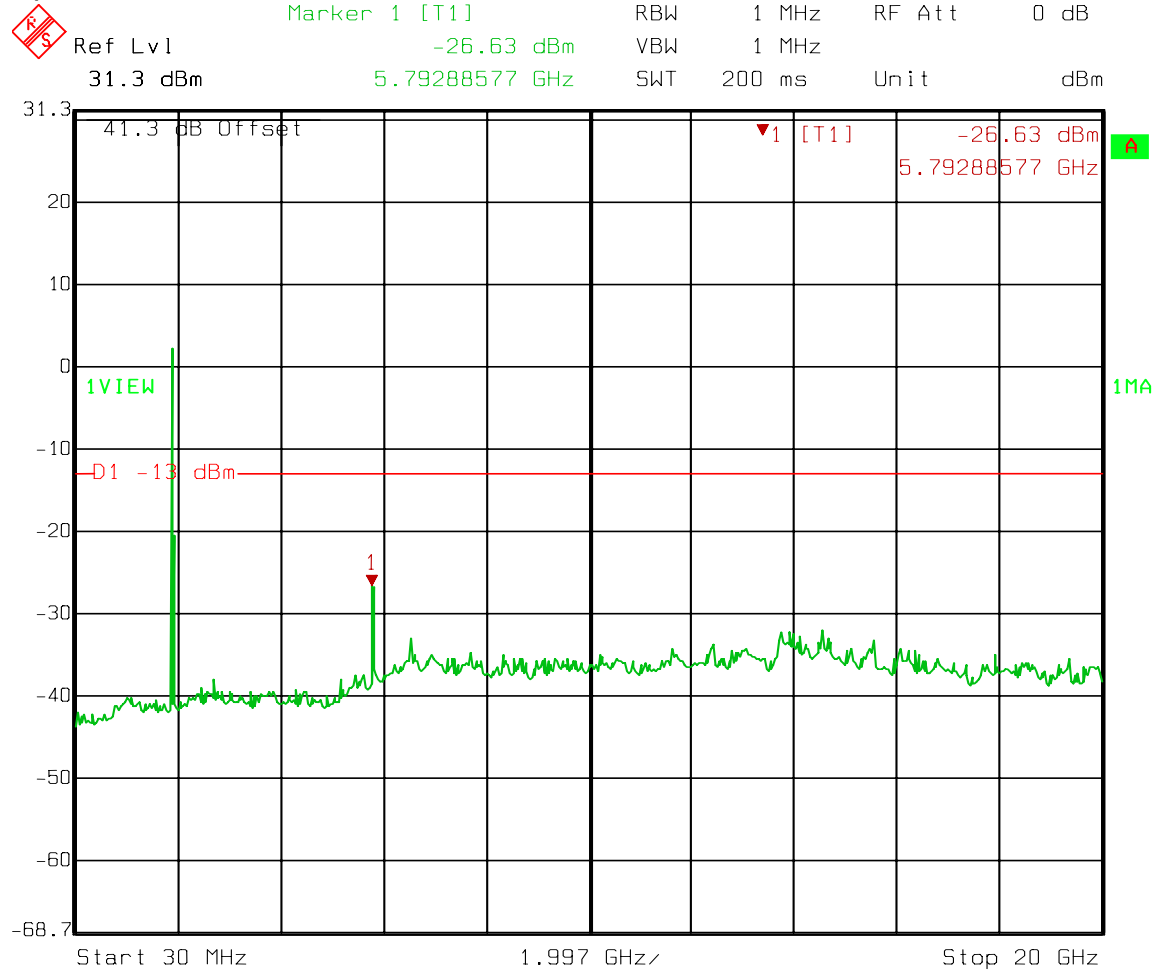
EQUIPMENT: **FS42R-1719E****Test Data – Spurious Emissions at Antenna Terminals**

Upper Bandedge Intermodulation

W-CDMA



Date: 27.APR.2010 10:08:42

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

Date: 27.APR.2010 10:11:29

**Section 6. Field Strength of Spurious**

|                                                    |                     |
|----------------------------------------------------|---------------------|
| NAME OF TEST: Field Strength of Spurious Emissions | PARA. NO.: 24.238   |
| TESTED BY: David Light                             | DATE: 27 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 20 GHz.

**Analyzer Settings:** RBW/VBW = 1 MHz, Peak detector

**Equipment Used:** 1464-1484-1485-993-1016-1824

**Measurement Uncertainty:** +/-1.7 dB

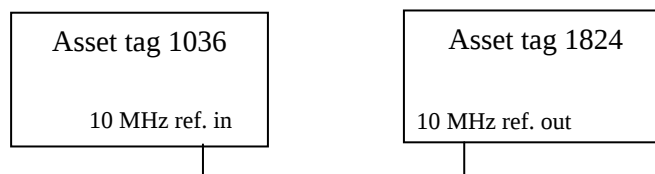
**Temperature:** 23 °C

**Relative Humidity:** 40 %

**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 & Schwartz | 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.



**Nemko USA, Inc.**

CFR 47, PART 24, SUBPART E  
BROADBAND PCS REPEATERS  
PROJECT NO.: **44421RUS1**

*EQUIPMENT:* **FS42R-1719E**

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## **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.

|                                                           |                          |
|-----------------------------------------------------------|--------------------------|
| <b>NAME OF TEST: Field Strength of Spurious Radiation</b> | <b>PARA. NO.: 24.238</b> |
|-----------------------------------------------------------|--------------------------|

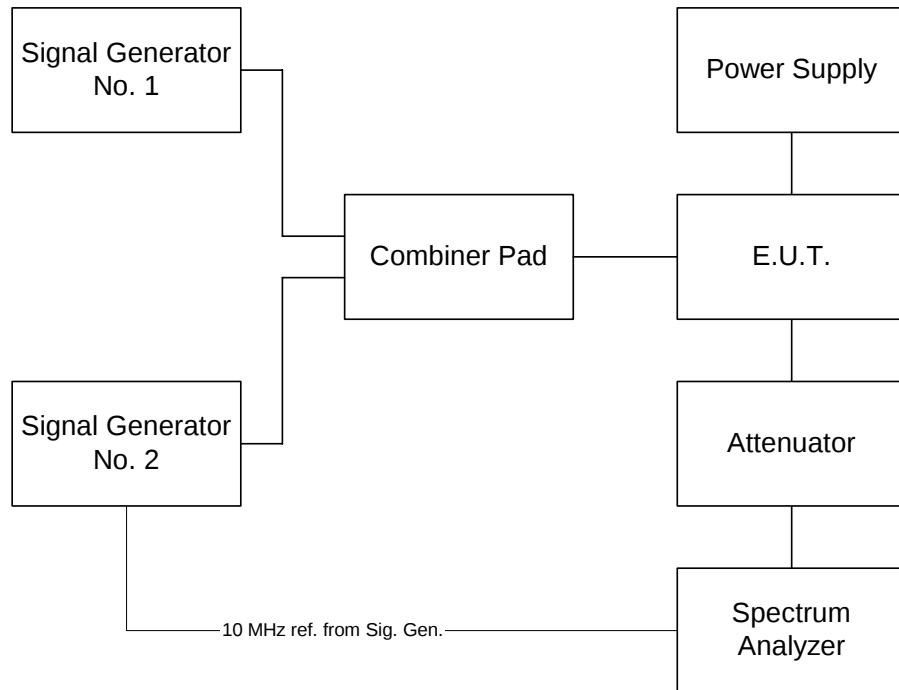
**Minimum Standard:** Para. No.24.238(a). On any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power by at least  $43 + 10 \log (P)$  dB.

**Method of Measurement** TIA/EIA-603-1992

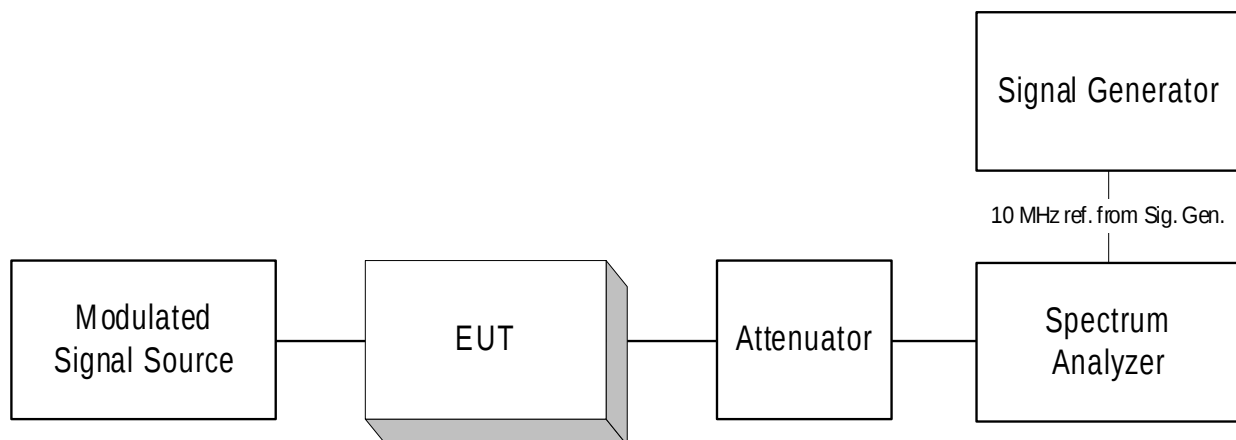
The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna 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.

## **ANNEX B - TEST DIAGRAMS**

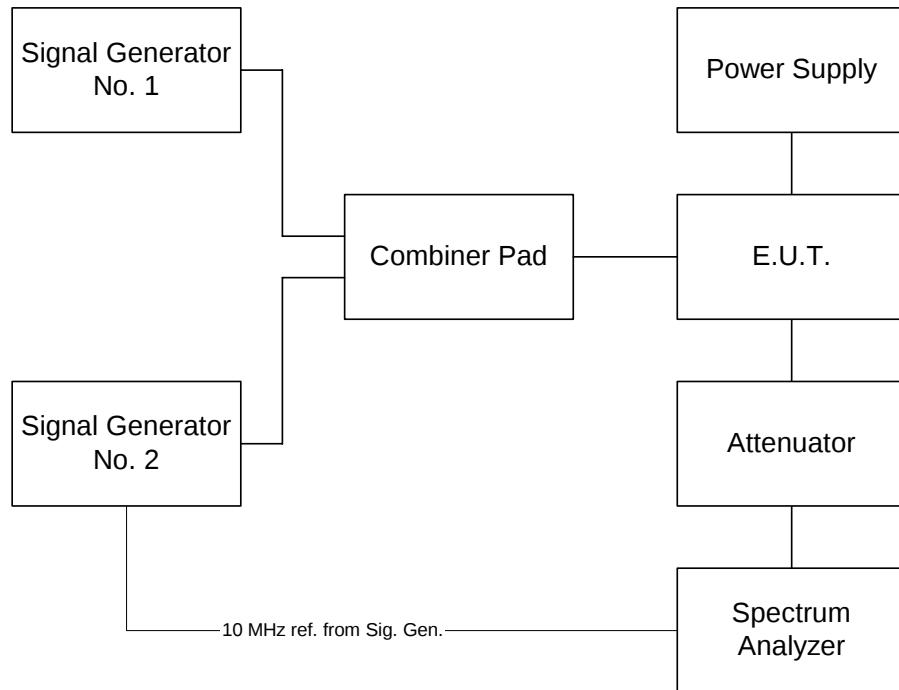
**Para. No. 2.985 - R.F. Power Output**



**Para. No. 2.989 - Occupied Bandwidth**



**Para. No. 2.991 Spurious Emissions at Antenna Terminals**



**Para. No. 2.993 - Field Strength of Spurious Radiation**

