Nemko Test Report: 131640-3

Applicant:
TEKO Telecom S.p.A.
Via Meucci, 24/a
I-40024 Castel S. Pietro Terme (BO)

Equipment Under Test:
(E.U.T.)
TRU8A19AWWL/AC-WS
(+ Master Unit composed by:
SUB-TRX+TPSU/AC+TPSU/48+TSPV-R+TTRC4W-S)

In Accordance With:
CFR 47, Part 27, Subpart C (Broadband AWS)
Miscellaneous Wireless Communication Services

Tested By:
Nemko Italy S.p.A..
Via Carroccio, 4
I-20046 Biassono (Italy)

G. Curioni

TESTED BY: _____ **DATE:** **18-25 September, 2009**

P. Barbieri

APPROVED BY: _____ **DATE:** **28 September, 2009**

Number of Pages: 54

Table of Contents

Section 1. Summary of Test Results

Manufacturer TEKO Telecom

Model No.: TRU8A19AWWL/AC-WS

Serial No.: 090569002

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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Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	27.50(d)	1640 Watts	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 For N/A's:

Frequency Stability testing was not performed since the E.U.T. does not contain modulation circuitry.

Section 2. General Equipment Specification

Supply Voltage Input:		120 Vac
Frequency Bands:	**Downlink:**	2110 to 2155 MHz
Frequency Bands:	**Uplink:**	1710 to 1755 MHz
Type of Modulation and Designator:		**CDMA (F9W)** ☒ **GSM (GXW)** ☐ **NADC (DXW)** ☐ **W-CDMA (F9W)** ☒ **EDGE (G7W)** ☐
Output Impedance:		50 ohms
RF Output (Rated):	**Downlink**	0.8 W 29 dBm
RF Output (Rated):	**Uplink**	0.025 W typical 4 dBm typical
Gain:	**Downlink:** **Uplink:**	34 dB 47 dB
Frequency Translation:		**F1-F1** ☐ **F1-F2** ☐ **N/A** ☒
Band Selection:		**Software** ☐ **Duplexer** ☐ **Fullband** ☒

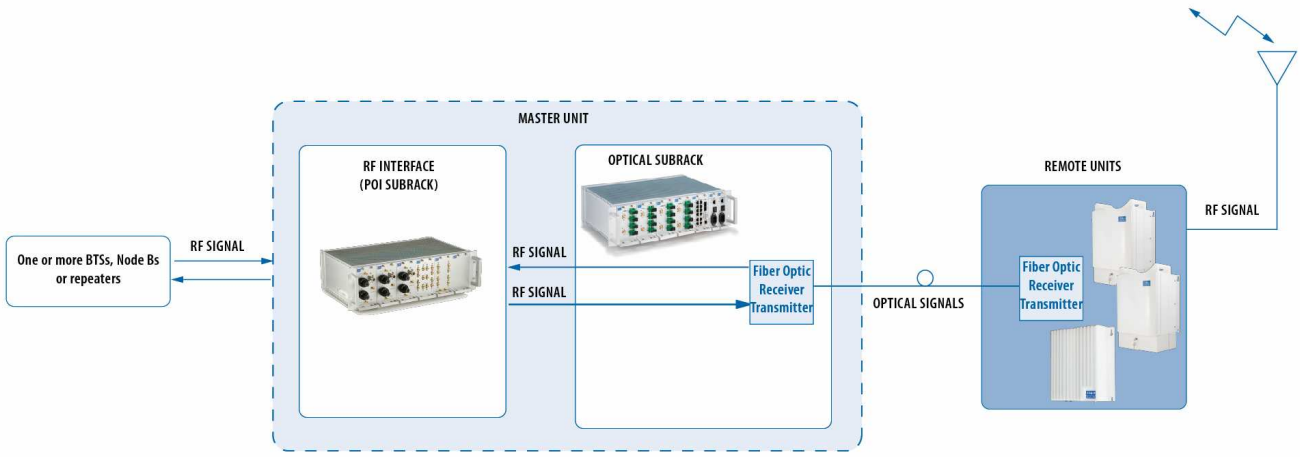
Description of EUT

The EUT is a low power multi-operator optical Remote Unit. It is used in conjunction with a Master Unit in the optical distribution system.
The EUT is a tri-band system; it is able to transport a wide frequency range simultaneously (AMPS, PCS and AWS bands). Single amplifier modules can be combined each other to obtain the following equipment:

Commercial name	*Description*	
REMOTE UNIT LOW POWER		
TRUxxxxxcL/zz-kkkj	**TRU**	Teko Telecom Remote Unit
	xxxxx =	**Operating band**: 7S: SMR700 (UL: 698-716+776-787MHz) DL: 728-757MHz) 7P: Public Safety 700 (DL: 763-775MHz; UL: 793-805MHz) 8S: SMR800 (DL: 851-869MHz; UL: 806-824MHz) 8A: AMPS (DL: 869-894MHz; UL: 824-849MHz) 9S: SMR900 (DL: 935-941MHz; UL: 896-902MHz) 19: PCS1900 (DL: 1930-1995MHz; UL: 1850-1915MHz) AW: AWS2100 (DL: 2110-2155MHz; UL: 1710-1755MHz) *and combination of these*
	c =	**RF Connector**: W: wideband D: duplexed B: bi duplexed N: no duplexed S: single connector
	L =	L: low power
	zz =	**Power supply**: AC: Power Supply: 85-264Vac, 50-60Hz 48: Power Supply: 36-72Vdc

	kkk =	**Laser version**: Without option: NO WDM Termocontrolled laser version: W21: λ = 1560,61nm W23: λ = 1558,98nm W25: λ = 1557,36nm W27: λ = 1555,75nm W29: λ = 1554,13nm W31: λ = 1552,52nm W: λ = 1550,92nm W35: λ = 1549,32nm W37: λ = 1547,72nm No termocontrolled laser version: M11: λ = 1470 ± 3 nm M12: λ = 1490 ± 3 nm M13: λ = 1510 ± 3 nm M14: λ = 1530 ± 3 nm W : λ = 1550 ± 3 nm (standard version) M16: λ = 1570 ± 3 nm M17: λ = 1590 ± 3 nm M18: λ = 1610 ± 3 nm
	j =	**Optical connector**: S: SC-APC E: E-2000

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 27.50
TESTED BY: G. Curioni	DATE: 22 September 2009

Test Results: Complies.

Measurement Data:

Direction	Modulation	Output per Channel (dBm)	Output per Channel Power (W)
Uplink	CDMA	4,17	0.0026
Downlink	CDMA	29,20	0.82
Uplink	W-CDMA	4,73	0.0029
Downlink	W-CDMA	29,23	0.82

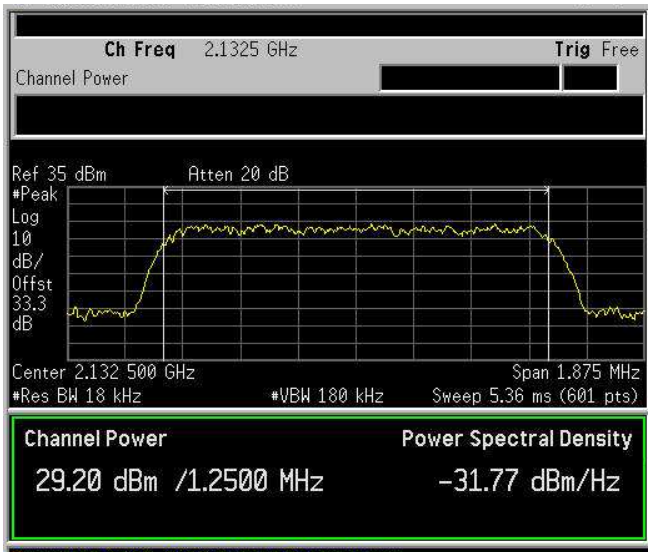
Equipment Used: 1 – 2 – 3b – 4

Measurement Uncertainty: +/- 1.9 dB

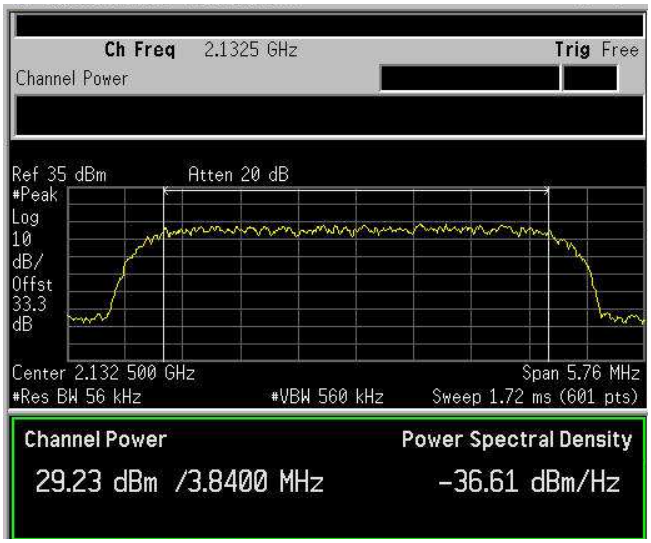
Temperature: 24 °C

Relative Humidity: 50 %

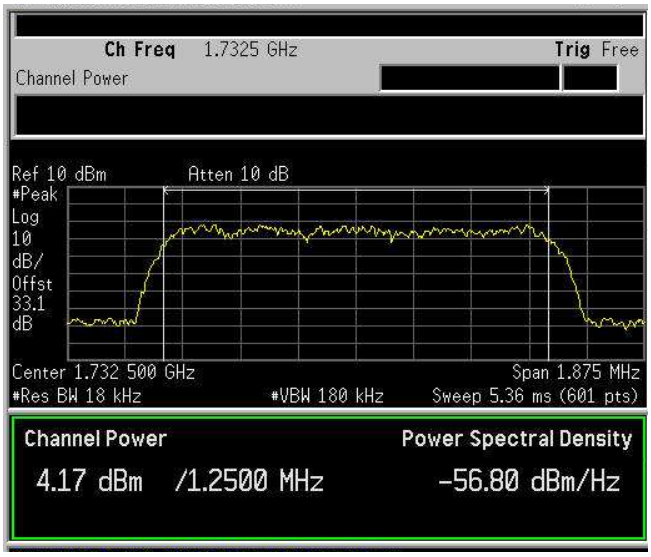
RF Power Output D.L. mod. CDMA



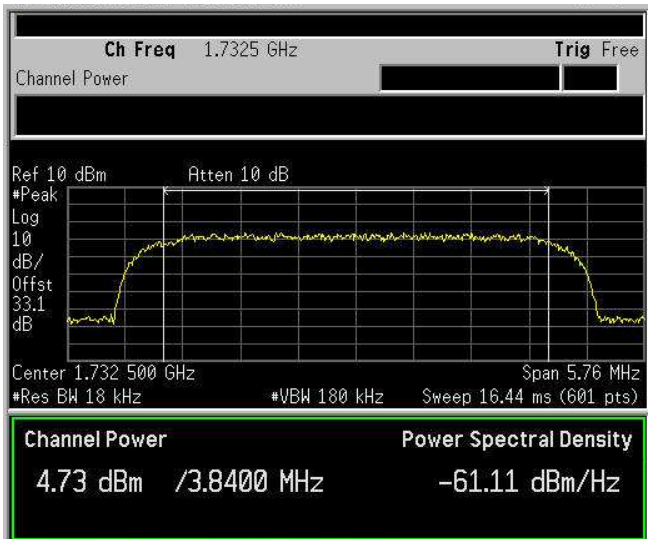
RF Power Output D.L. mod. WCDMA



RF Power Output U.L. mod. CDMA



RF Power Output U.L. mod. WCDMA



Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.1049
TESTED BY: G. Curioni	DATE: 22 September 2009

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1 – 2 – 3b - 4

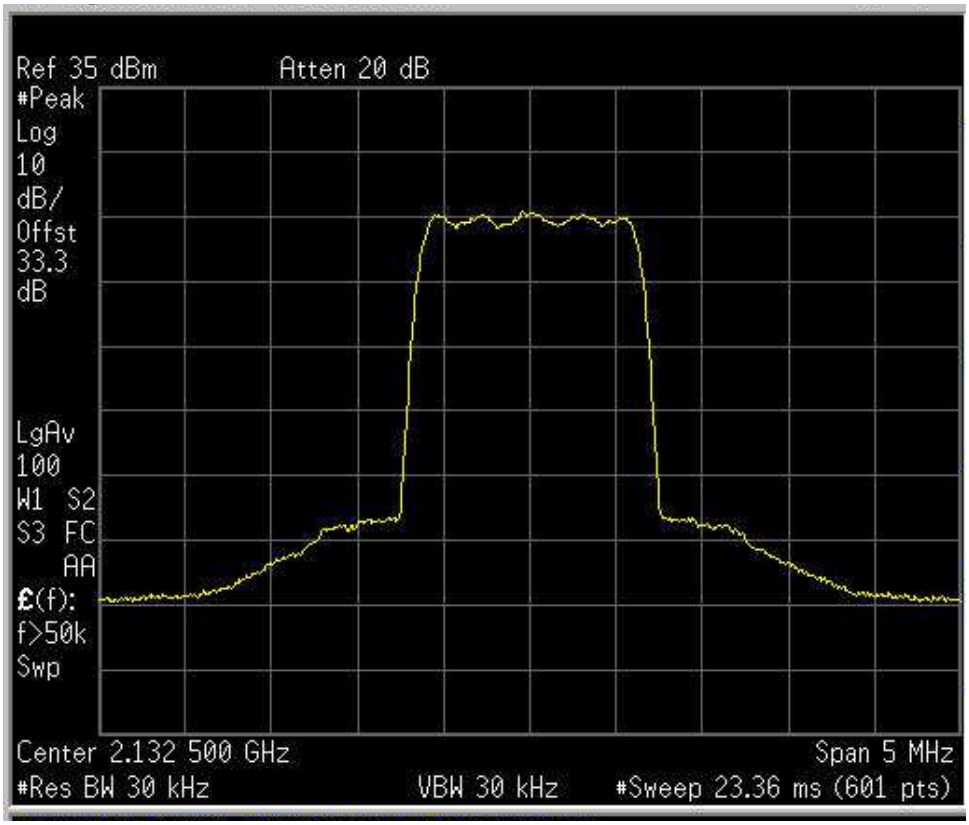
Measurement Uncertainty: $1X10^{-7}$

Temperature: 24 °C

Relative Humidity: 50 %

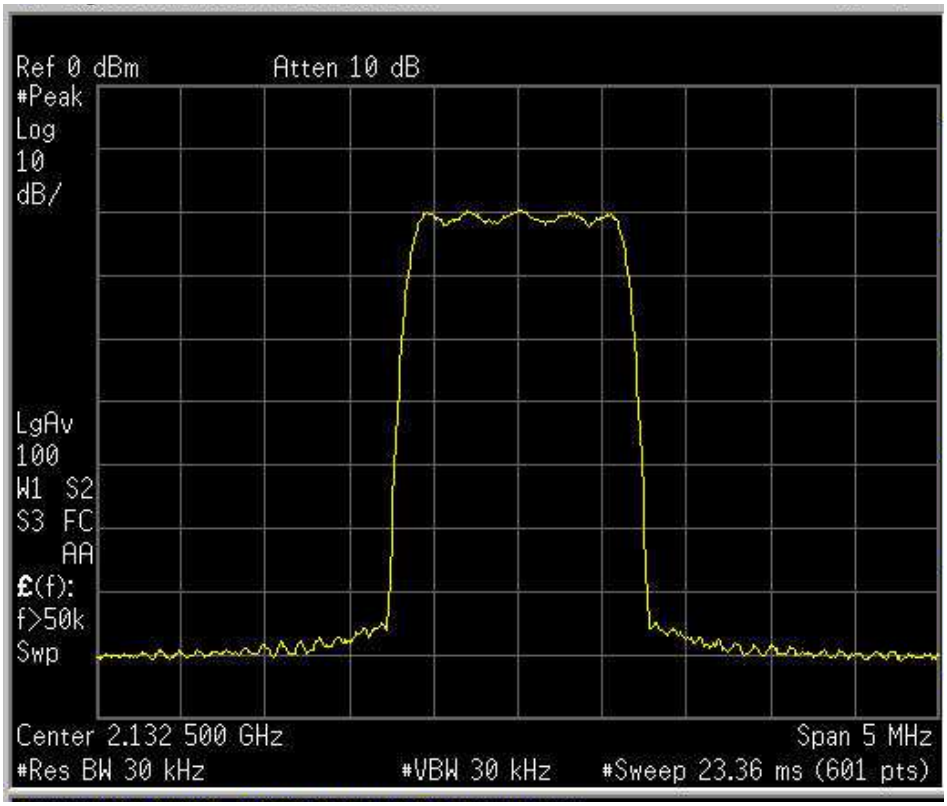
Test Data – Occupied Bandwidth

CDMA/EV-DO
Downlink
OUTPUT



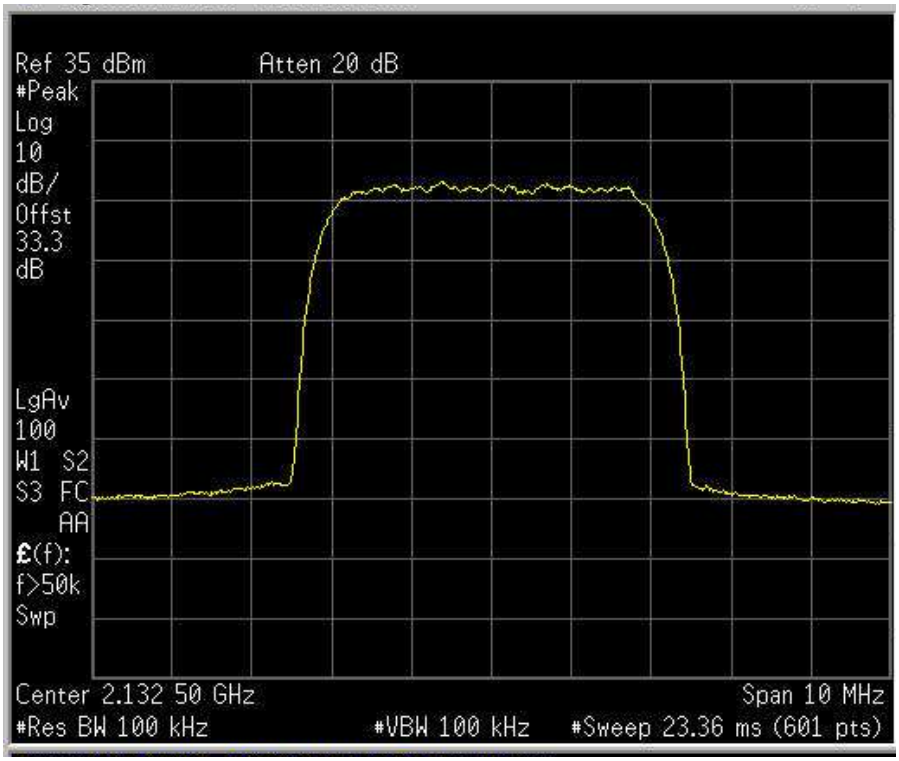
Test Data – Occupied Bandwidth

CDMA/EV-DO
Downlink
INPUT



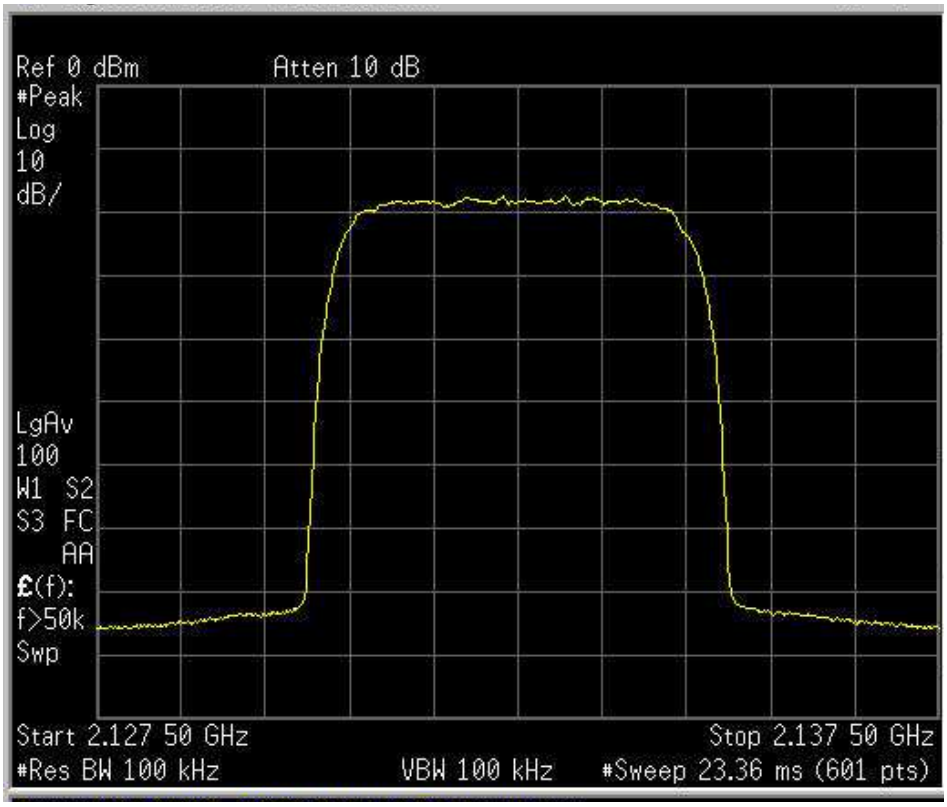
Test Data – Occupied Bandwidth

WCDMA/UMTS
Downlink
OUTPUT



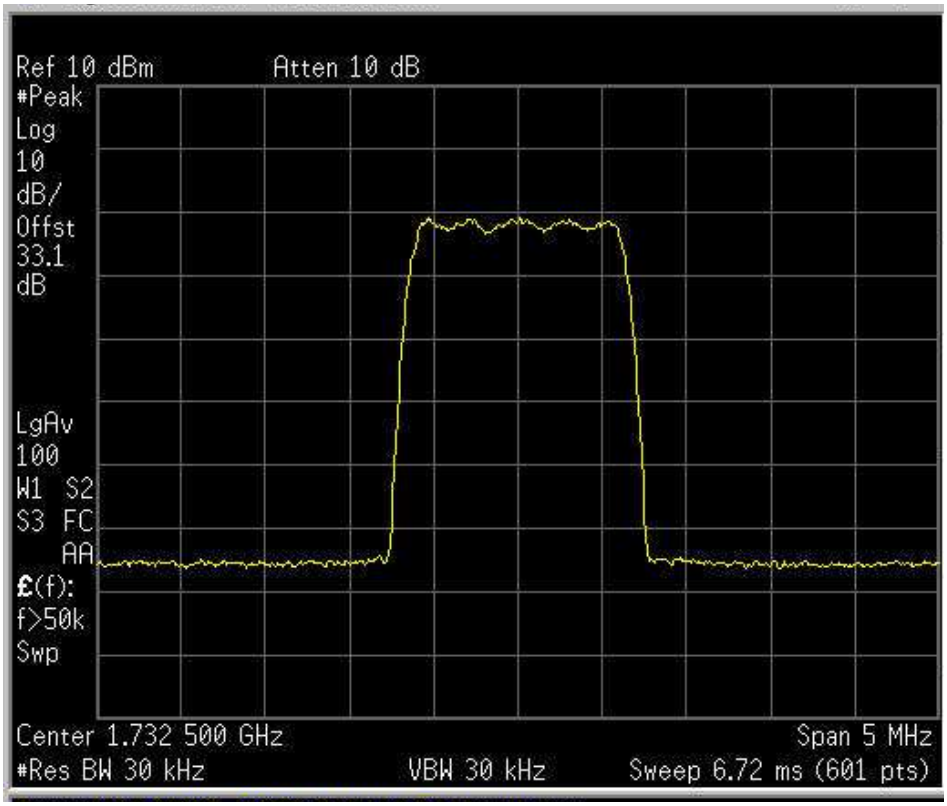
Test Data – Occupied Bandwidth

WCDMA/UMTS
Downlink
INPUT



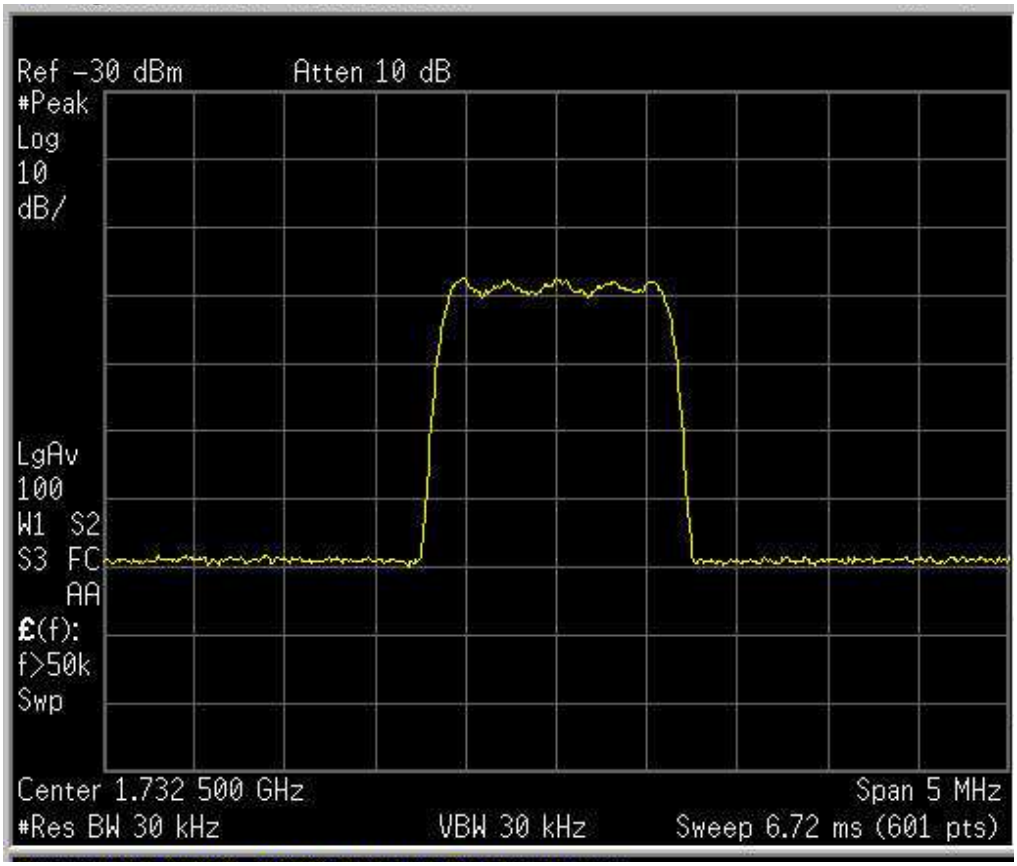
Test Data – Occupied Bandwidth

CDMA/EV-DO
Uplink
OUTPUT



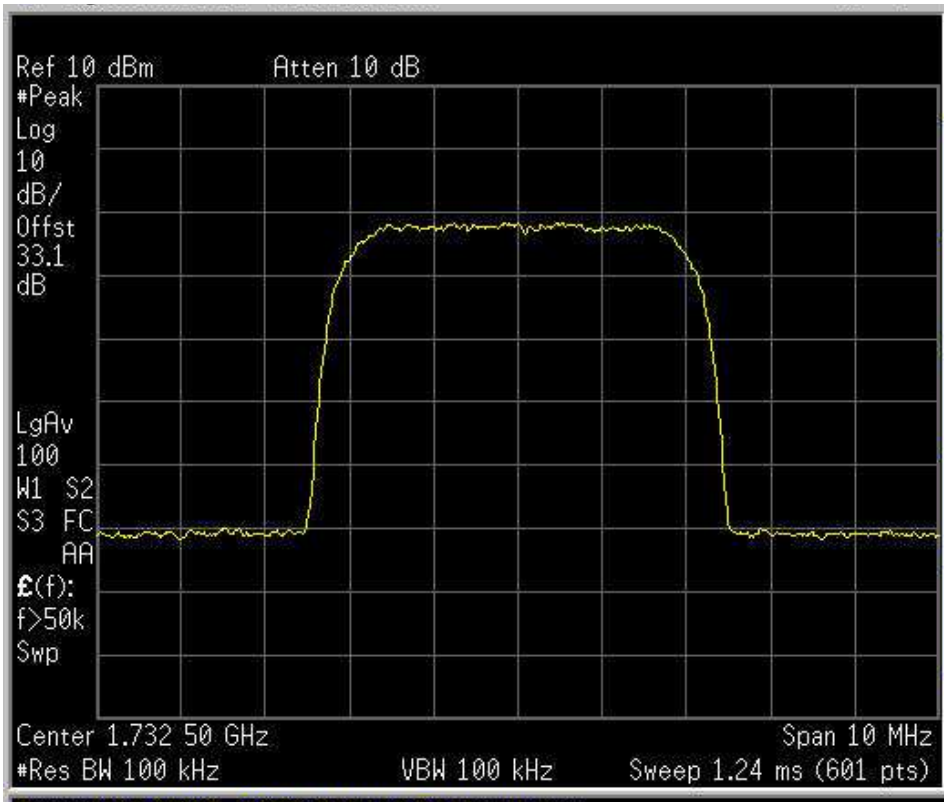
Test Data – Occupied Bandwidth

CDMA/EV-DO
Uplink
INPUT



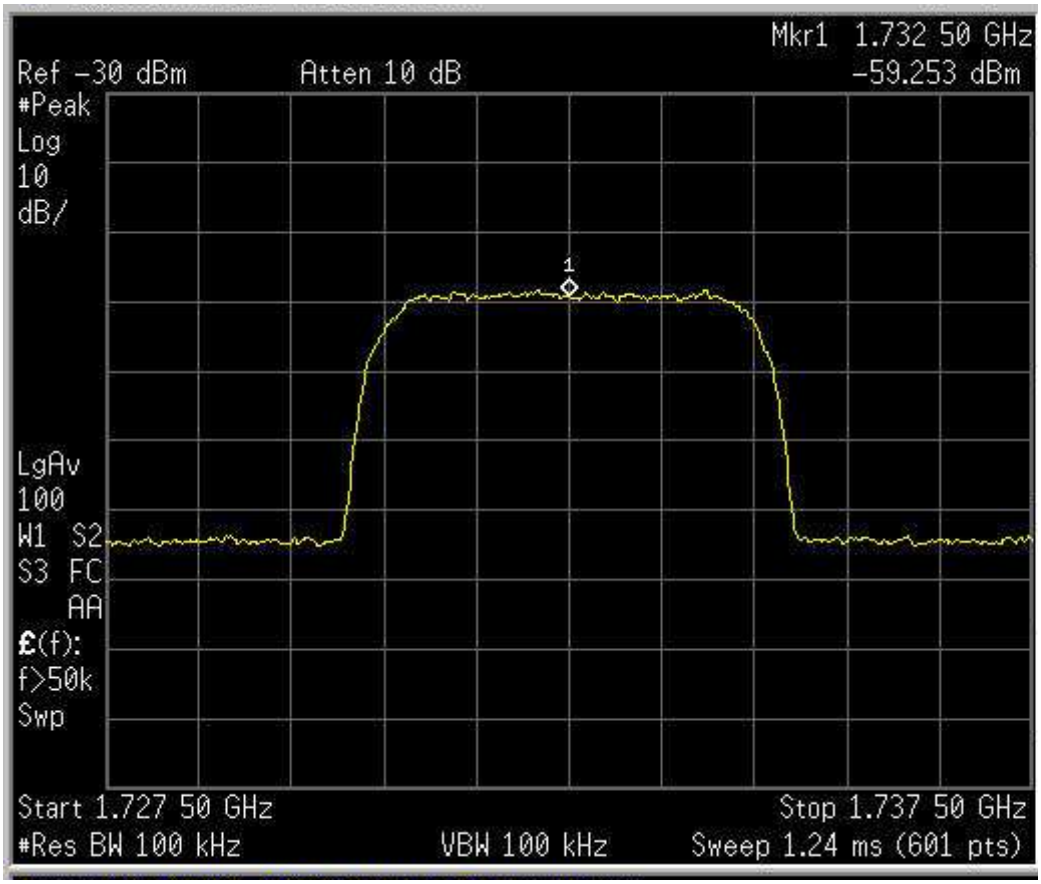
Test Data – Occupied Bandwidth

WCDMA/UMTS
Uplink
OUTPUT



Test Data – Occupied Bandwidth

WCDMA/UMTS
Uplink
INPUT



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 27.53
TESTED BY: G. Curioni	DATE: 22 September 2009

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1 – 2 – 3b - 4

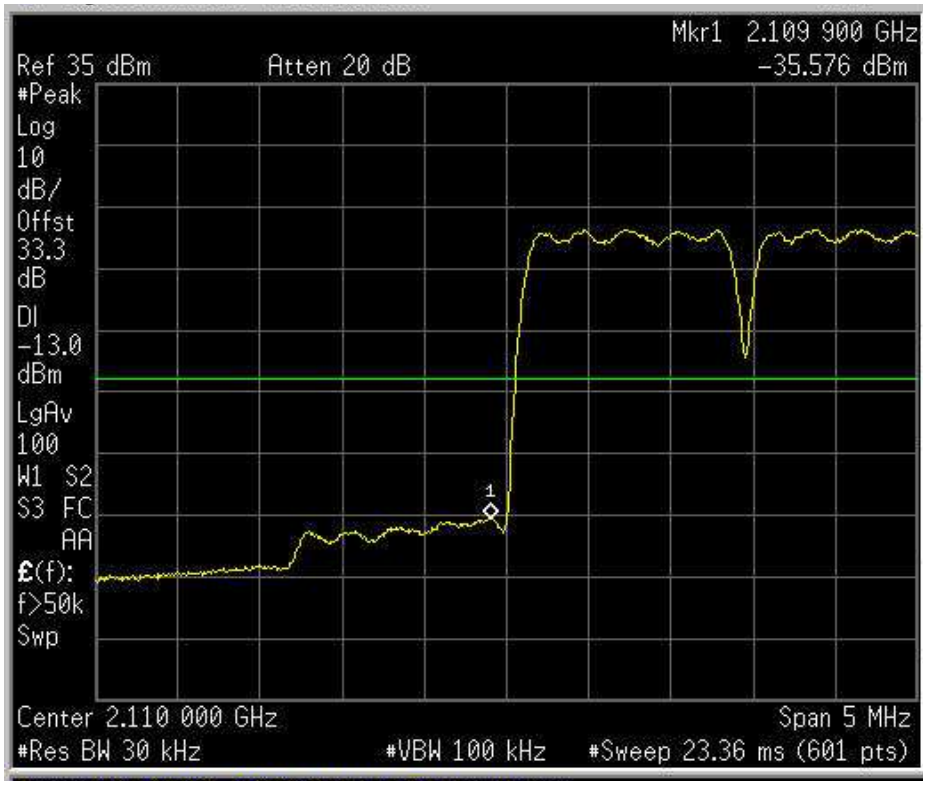
Measurement Uncertainty: +/- 1.9 dB

Temperature: 24 °C

Relative Humidity: 50 %

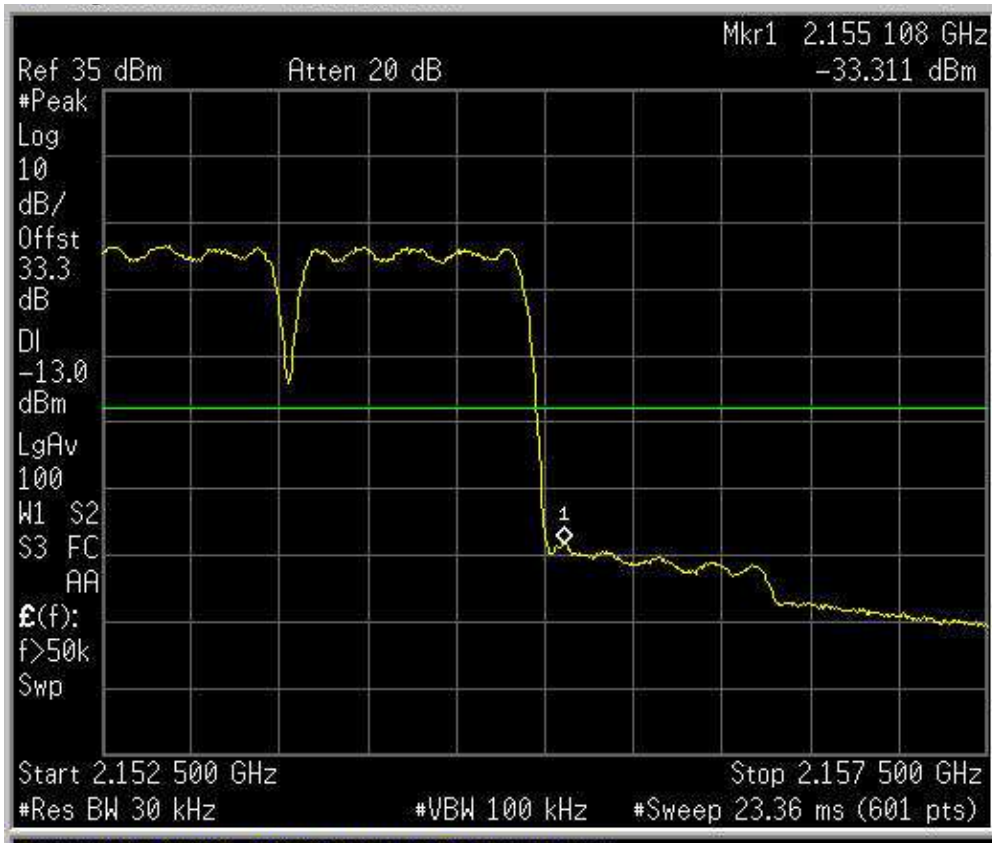
Test Data – Spurious Emissions at Antenna Terminals

CDMA/EV-DO
LOW BANDEDGE
Downlink



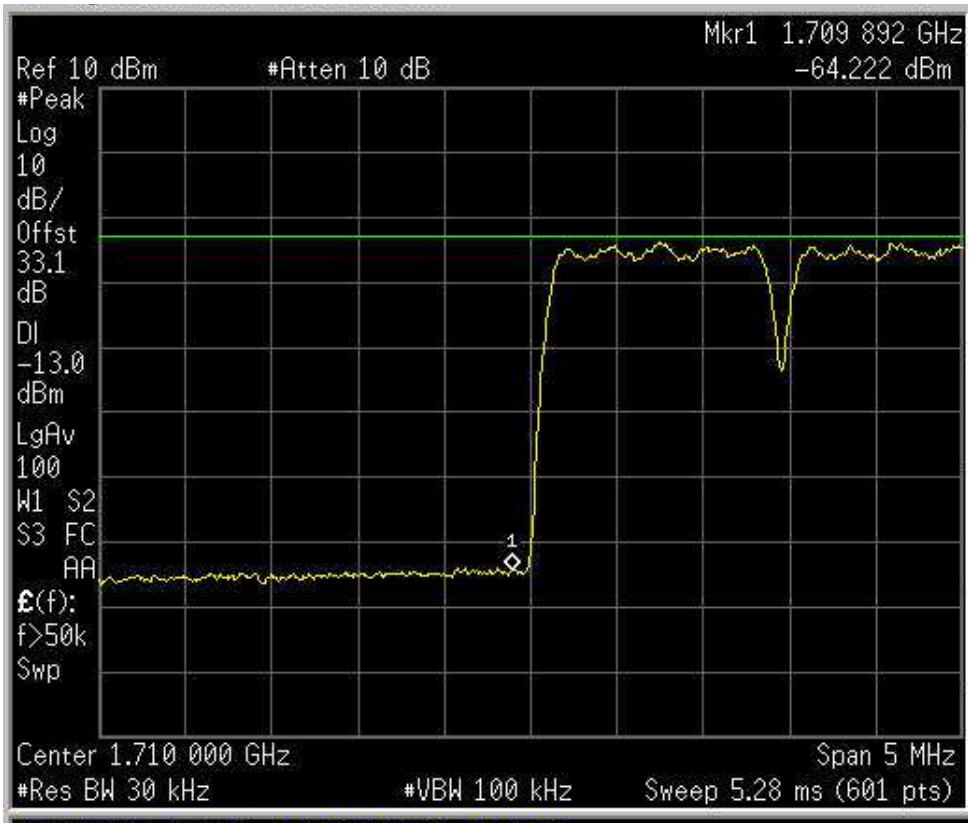
Test Data – Spurious Emissions at Antenna Terminals

CDMA/EV-DO
HIGH BAND EDGE
Downlink



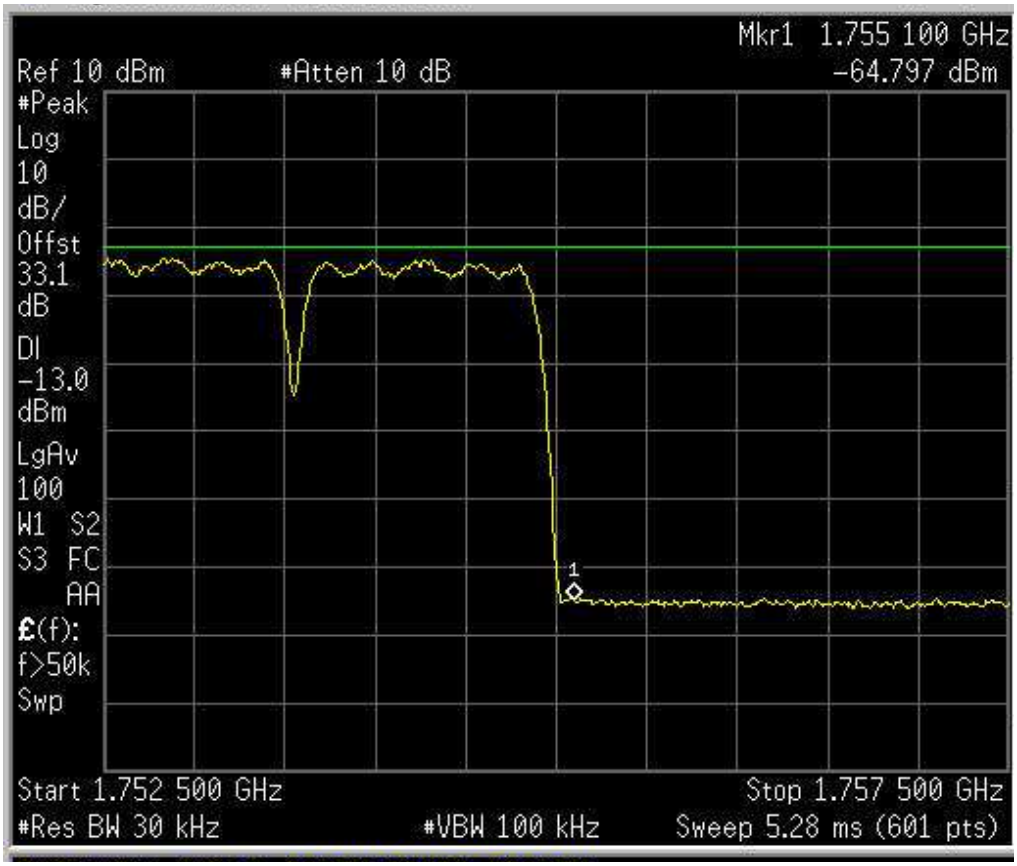
Test Data – Spurious Emissions at Antenna Terminals

CDMA/EV-DO
LOW BANDEDGE
Uplink



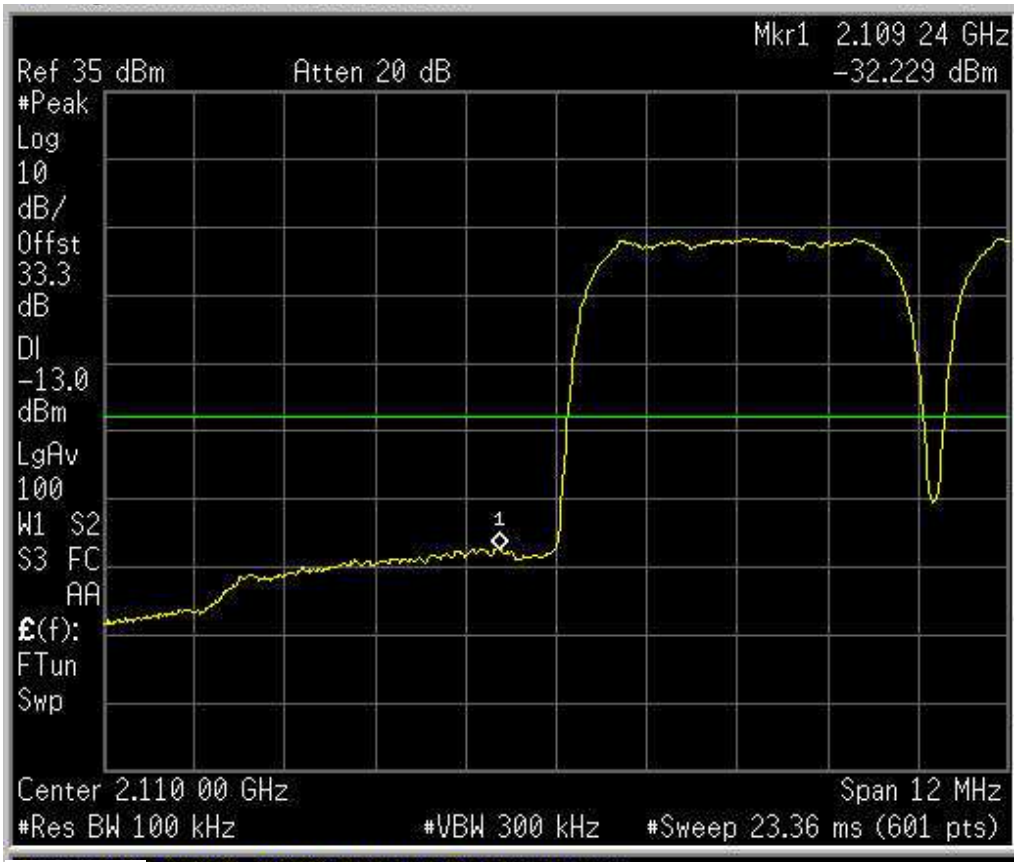
Test Data – Spurious Emissions at Antenna Terminals

CDMA/EV-DO
HIGH BAND EDGE
Uplink



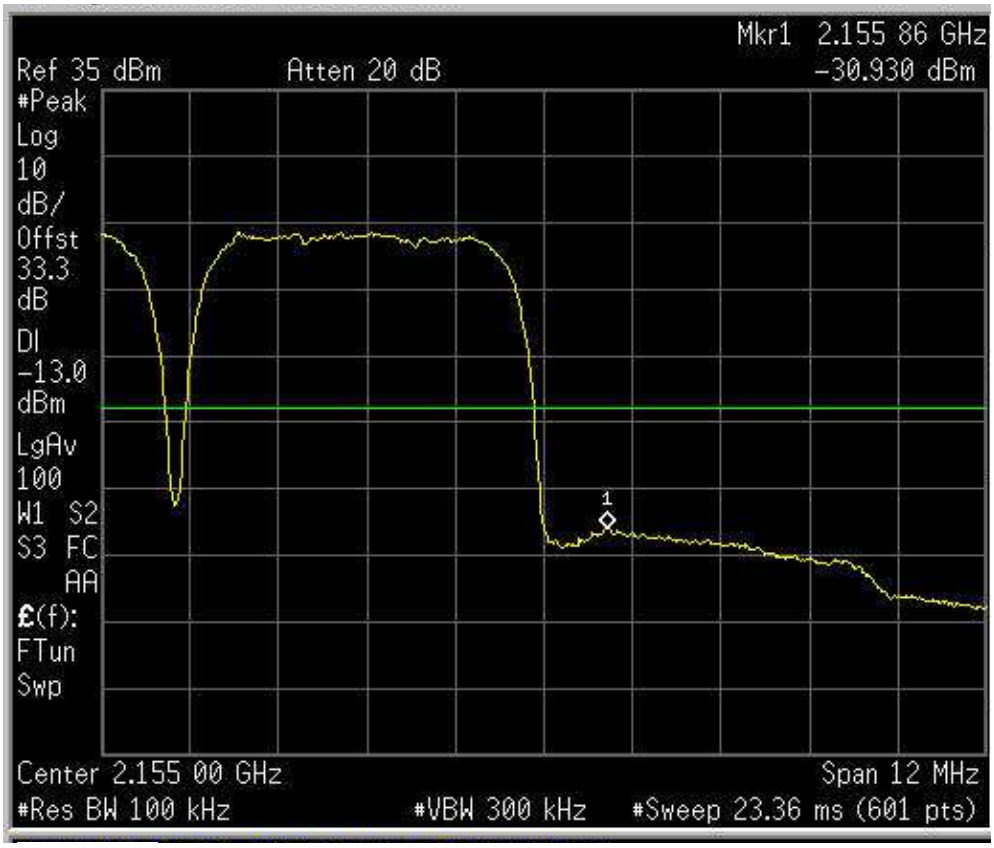
Test Data – Spurious Emissions at Antenna Terminals

WCDMA/UMTS
LOW BANDEDGE
Downlink



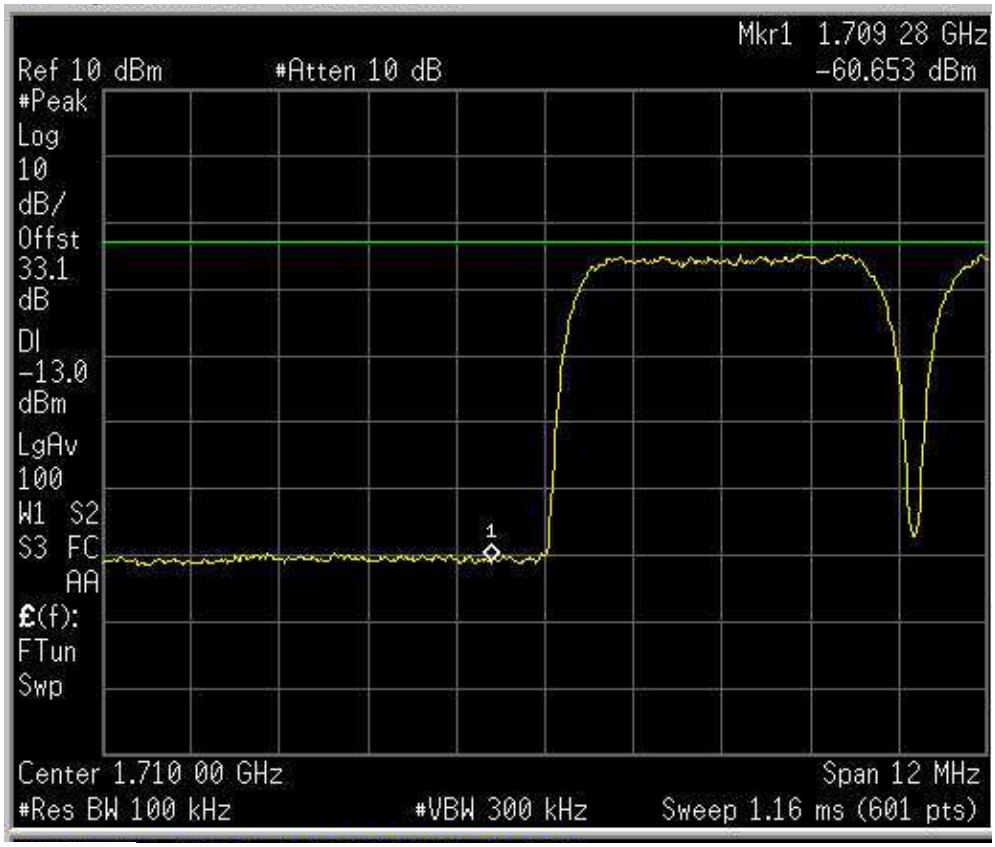
Test Data – Spurious Emissions at Antenna Terminals

WCDMA/UMTS
HIGH BAND EDGE
Downlink



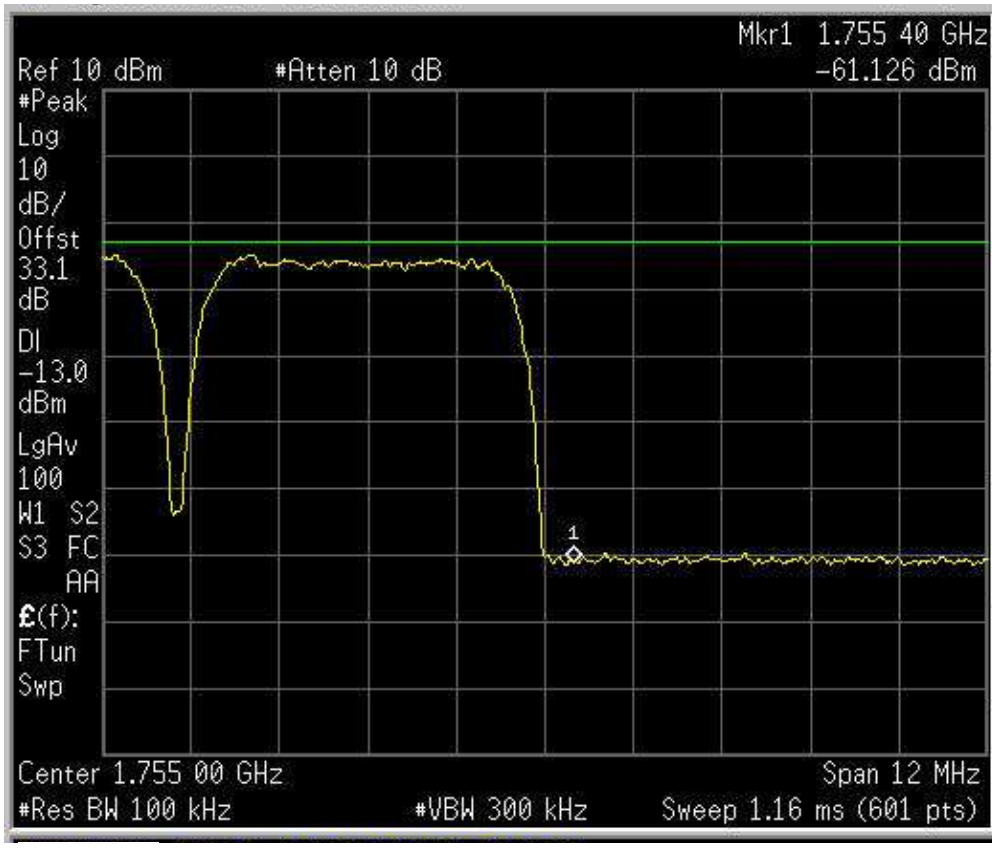
Test Data – Spurious Emissions at Antenna Terminals

WCDMA/UMTS
LOW BANDEDGE
Uplink



Test Data – Spurious Emissions at Antenna Terminals

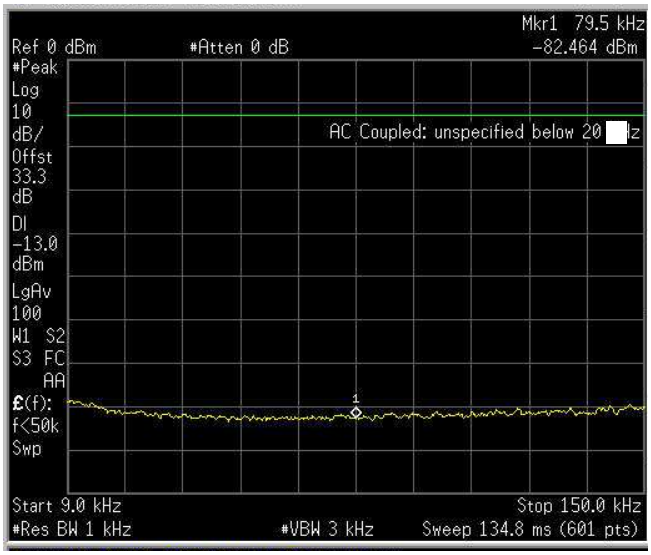
WCDMA/UMTS
HIGH BAND EDGE
Uplink



Test Data – Spurious Emissions at Antenna Terminals

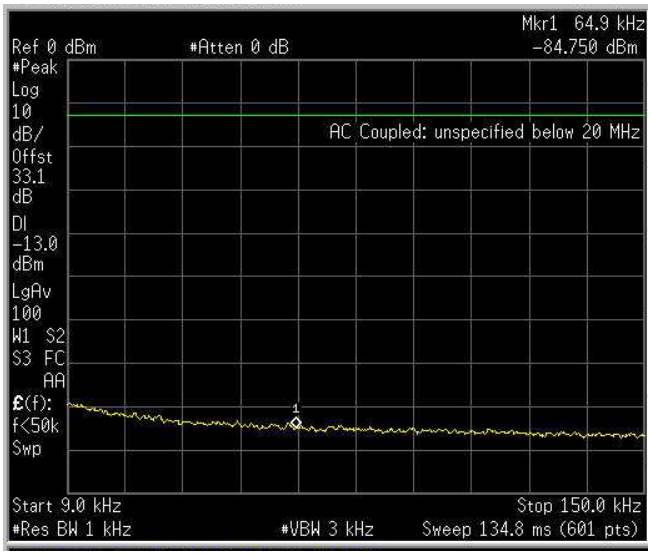
CDMA/EV-DO
SPURS
Downlink

9 – 150 kHz



CDMA/EV-DO
SPURS
Uplink

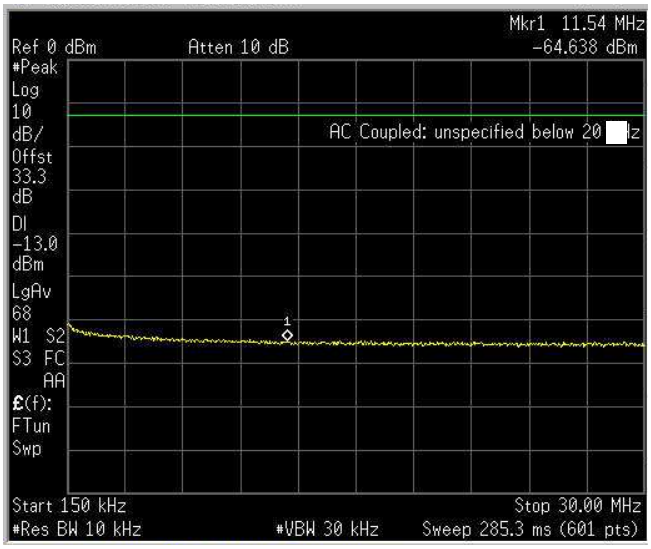
9 – 150 kHz



Test Data – Spurious Emissions at Antenna Terminals

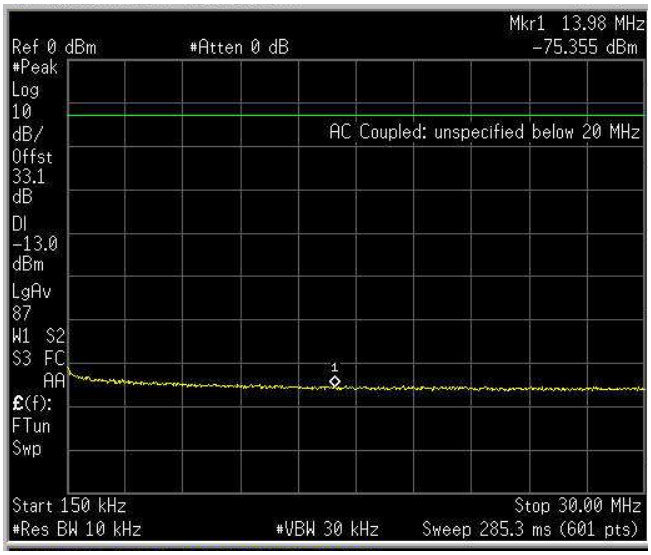
CDMA/EV-DO
SPURS
Downlink

150 kHz – 30 MHz



CDMA/EV-DO
SPURS
Uplink

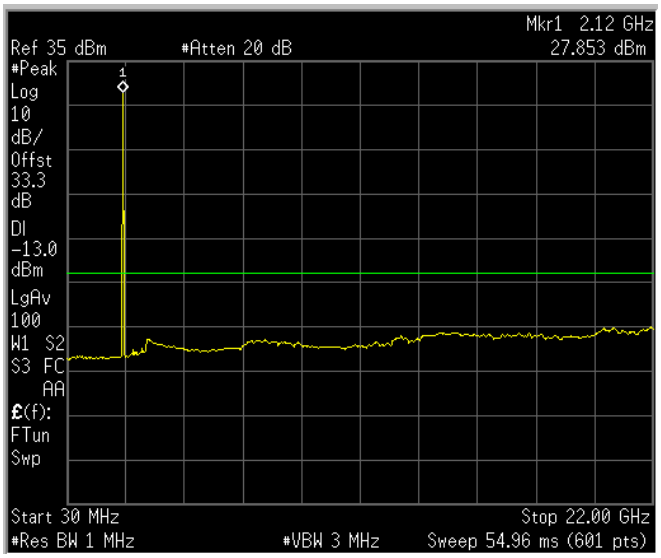
150 kHz – 30 MHz



Test Data – Spurious Emissions at Antenna Terminals

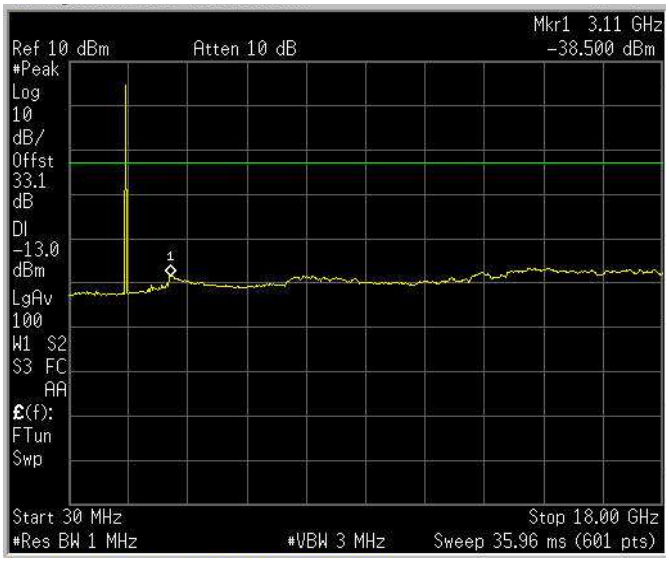
CDMA/EV-DO
SPURS
Downlink

30 MHz – 22 GHz



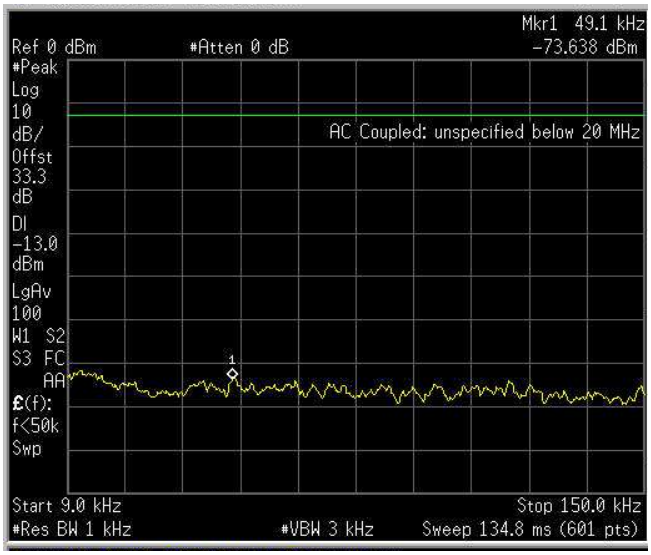
CDMA/EV-DO
SPURS
Uplink

30 MHz – 18 GHz

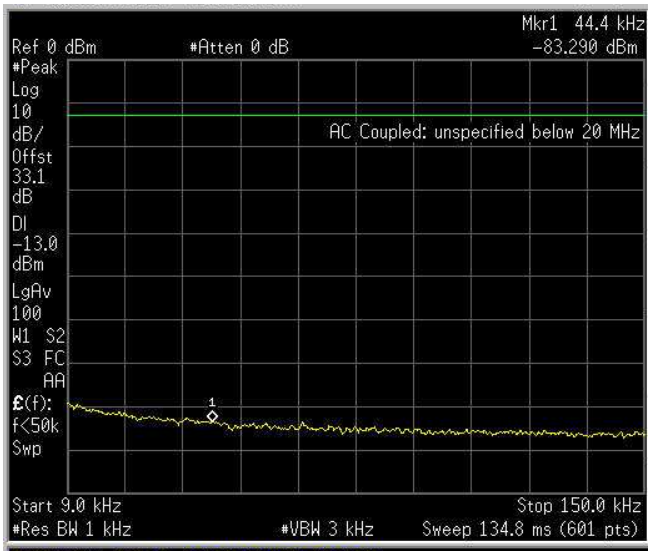


Test Data – Spurious Emissions at Antenna Terminals

WCDMA/UMTS
SPURS
Downlink 9 – 150 kHz

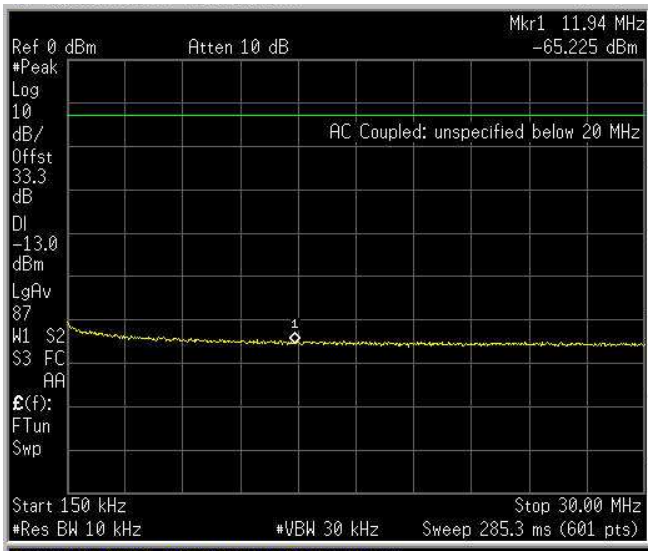


WCDMA/UMTS
SPURS
Uplink 9 – 150 kHz

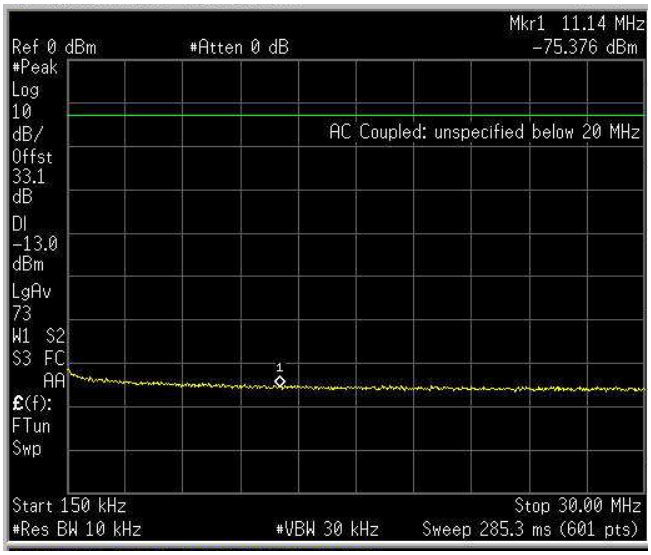


Test Data – Spurious Emissions at Antenna Terminals

WCDMA/UMTS
SPURS
Downlink 150 kHz – 30 MHz

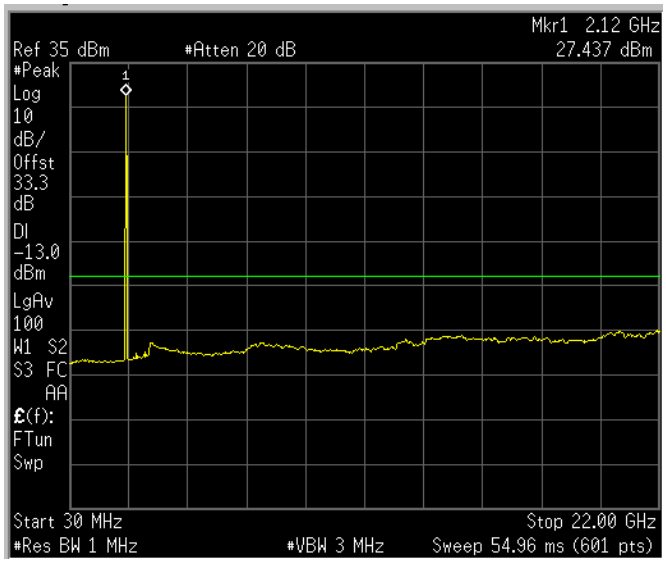


WCDMA/UMTS
SPURS
Uplink 150 kHz – 30 MHz

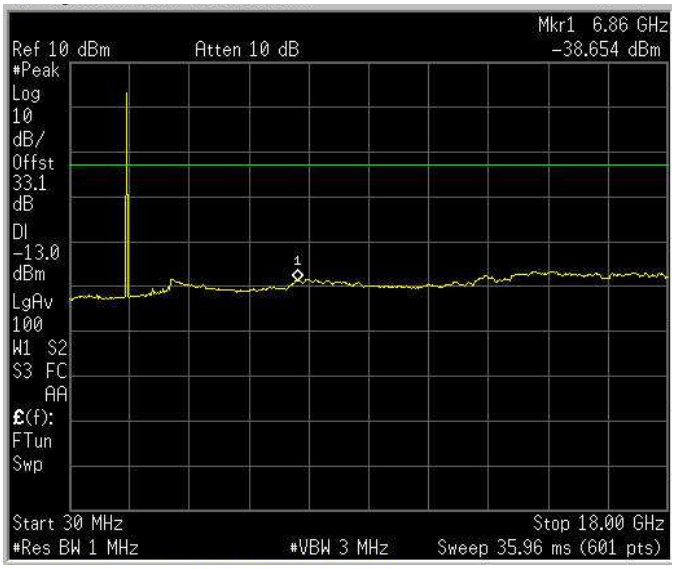


Test Data – Spurious Emissions at Antenna Terminals

WCDMA/UMTS
SPURS
Downlink 30 MHz – 22 GHz



WCDMA/UMTS
SPURS
Uplink 30 MHz – 18 GHz



Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 27.53
TESTED BY: David Light	DATE: 22 September 2009

Test Results: Complies.

Test Data: The spectrum was searched from 30 MHz to the tenth harmonic of the carrier. There were no emissions detected above the noise floor which was at least 20 dB below the specification limit.

AWS band - Master/remote 120/120 Vac			
Frequency range	D.L. & U.L.	Result [dBm] Max. field strength pol. V/H	Limit
30 – 1000 MHz	78.6 MHz	-69.4 dBm H	-13 dBm
1 – 22 GHz		negligible	-13dBm

AWS band - Master/remote 48 Vdc/120 Vac			
Frequency range	D.L. & U.L.	Result [dBm] Max. field strength pol. V/H	Limit
30 – 1000 MHz	33.9 MHz 92.2 MHz 103.8 MHz 150.5 MHz	-51.3 dBm H -63.6 dBm H -64.2 dBm V -50.0 dBm V	Limit: -13 dbm
1 – 22 GHz		negligible	Limit: -13 dBm

Equipment Used: 5 – 6 – 7 – 8 – 9 -10 – 11 – 12 - 13

Measurement Uncertainty: +/-5 dB

Temperature: 24 °C

Relative Humidity: 50 %

RBW=VBW=100 kHz below 1000 MHz
RBW=VBW=1 MHz above 1000 MHz
Peak detector

Section 7. Filter Frequency Response

NAME OF TEST: Filter Frequency Response	PARA. NO.: 2-11-04/EAB/RF
TESTED BY: G. Curioni	DATE: 23 January 2010

Test Results: Complies.

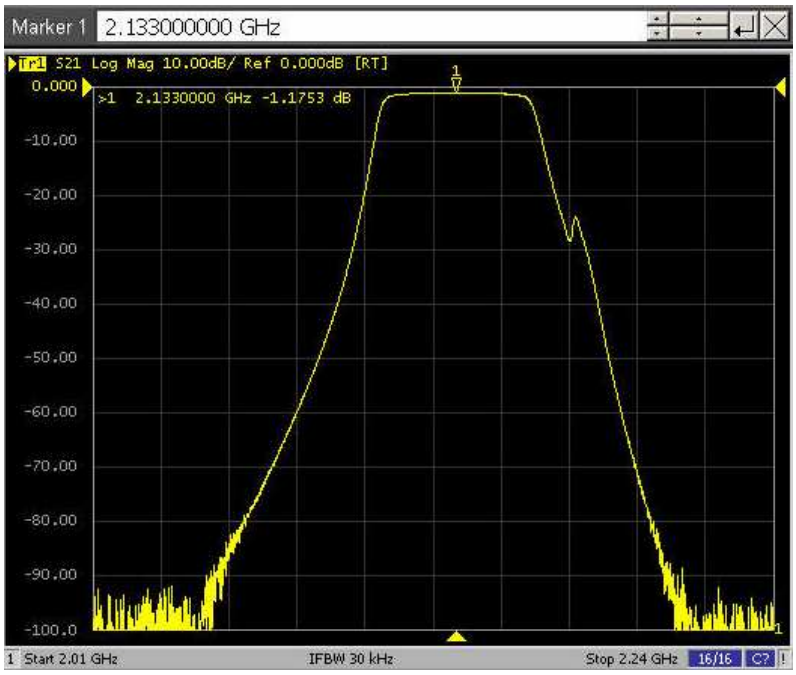
Test Data: See attached plot(s).

Equipment Used: 3a

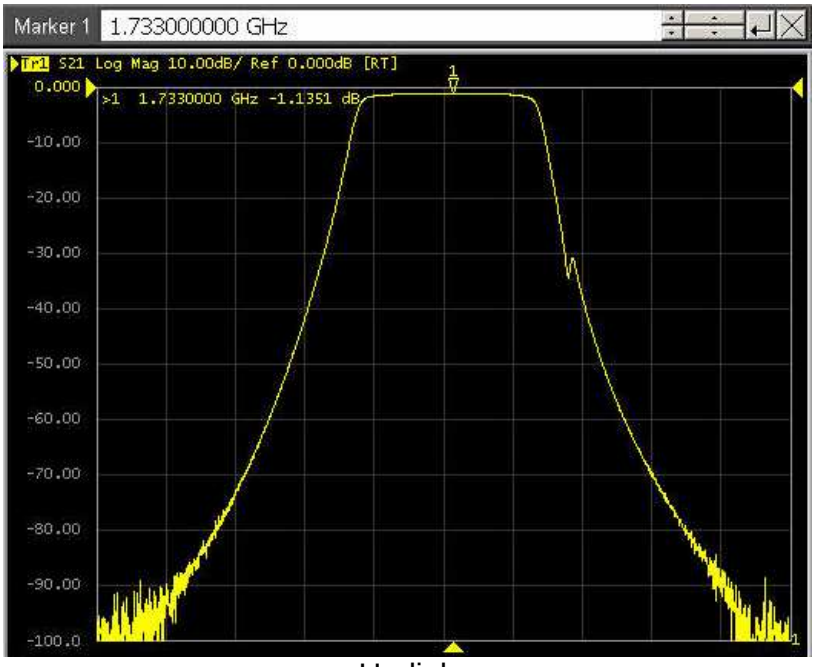
Measurement Uncertainty: +/-1,9 dB

Temperature: 24 °C

Relative Humidity: 55 %



Down-link



Up-link

Section 8. Test Equipment List

Identification number	***Description***	***Manufacturer model***	***s/n***	***Cal. Due***
1	Vector Signal Generator	Agilent H.P. E4438C	MY45094485	July 2010
2	Spectrum Analyzer	Agilent H.P. E4440A	US40420470	December 2009
3a	Network Analyzer	Agilent H.P E5062A	MY44101829	November 2012
3b	Network Analyzer	Hewlett Packard 8753D	3410A04850	March 2010
4	2xcables+directional coupler+dummyload			

Client's property

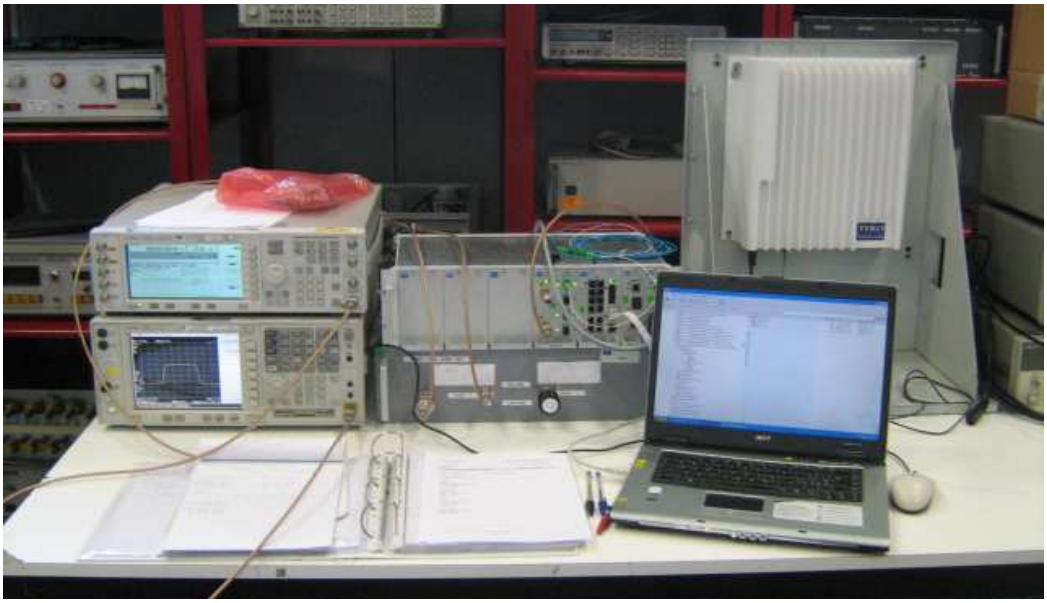
Coupling Factor 2xcables+directiona l coupler+dummyload	AWS	UL 1732.5 DL 2132.5	33.1 dB 33.3 dB	

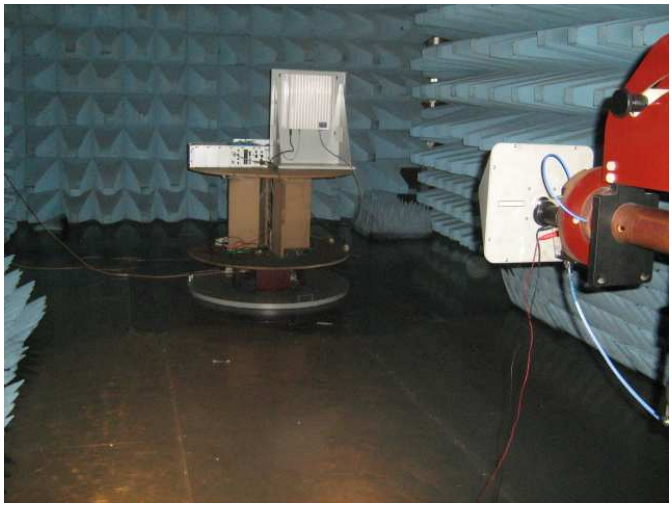
Identification number	***Equipment***	***Manufacturer***	***Model***	***Serial N°***	***Cal. due***
5	Trilog Broadband Antenna	Schwarzbeck	VULB 9163	VULB 9163-286	04/2010
6	Bilog antenna	Schwarzbeck	STLP 9148-123	123	09/2011
7	Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	05/2011
8	Spectrum Analyzer 9kHz-40GHz	R&S	FSEK	848255/005	09/2010
9	Controller	EMCO	2090	9511-1099	NSC
10	Antenna Tower	EMCO	2071-2	9601-1940	NSC
11	Turning table Controller	EMCO	1061-1.521	9012-1508	NSC
12	Semi-anechoic chamber	Nemko	3m semi-anechoic chamber	70	04/2010
13	Trilog Broadband Antenna	Siemens	3m control room	3	NSC

Property of Nemko Italy

Section 9. PHOTOS

SETUP





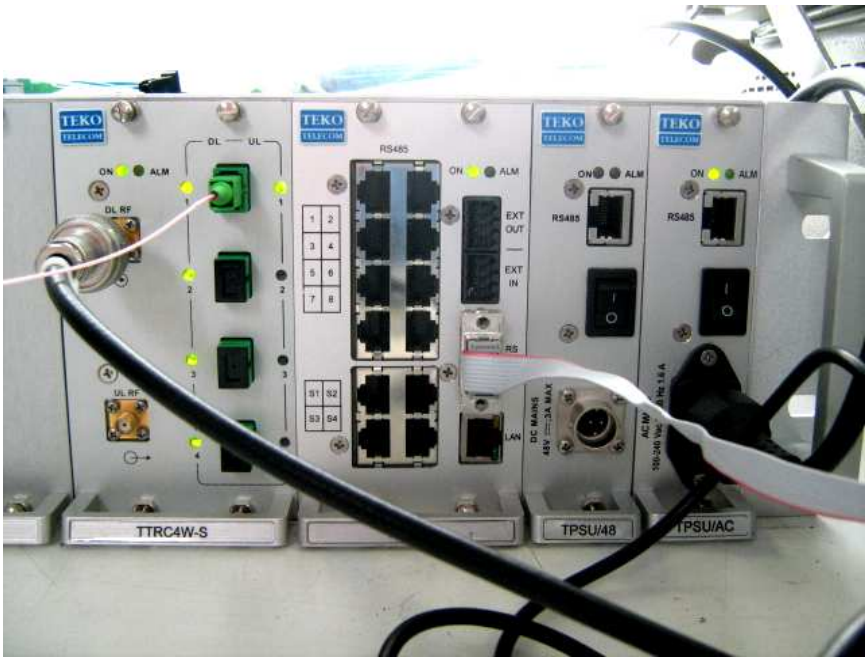
REMOTE


TEKO
TELECOM
EXT
IN
MADE IN ITALY
Model: TRU8A19AWWL/AC-WS
Frequency 824 ÷ 894MHz
Range: 1850 ÷ 1995MHz
1710 ÷ 2155MHz


CLASS 1
LASER PRODUCT
AC MAINS
(100-240V~; 50-60Hz; 1.5A)

MASTER


28V ⎓ ; 10A MAX
+ −
RS485


TEKO
DL
UL
ON
ALM
DL RF
UL RF
RS485
EXT OUT
EXT IN
LAN
TTRC4W-S
TPSU/48
TPSU/AC

ANNEX A - TEST DETAILS

NAME OF TEST: RF Power Output	**PARA. NO.: 2.1046**

Minimum Standard: Para. No.27.53(d)(1). The power of each fixed or base station transmitting in the 2110-2155 MHz band and located in any county with population density of 100 or fewer persons per square mile, based upon the most recently available population statistics from the Bureau of the Census, is limited to a peak equivalent isotropically radiated power (EIRP) of 3280 watts. The power of each fixed or base station transmitting in the 2110-2155 MHz band from any other location is limited to a peak EIRP of 1640 watts. A licensee operating a base or fixed station utilizing a power of more than 1640 watts EIRP must coordinate such operations in advance with all Government and non-Government satellite entities in the 2025-2110 MHz band. Operations above 1640 watts EIRP must also be coordinated in advance with the following licensees within 120 kilometers (75 miles) of the base or fixed station: all Broadband Radio Service (BRS) licensees authorized under Part 27 in the 2155-2160 MHz band and all AWS licensees in the 2110-2155 MHz band.

Method Of Measurement:

Detachable Antenna:
The channel power integrated across the carrier's bandwidth at antenna terminals is measured using a 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.

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= 50 kHz
Span: 10 MHz
Sweep: Auto

NAME OF TEST: Spurious Emission at Antenna Terminals PARA. NO.: 27.53

Minimum Standard: Para. No.27.53(h) For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (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: ≥ 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: ≥ RBW
Sweep: Auto
Video Avg: Disabled

TDMA

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

W-CDMA

RBW: 1 MHz (> 1 MHz from Band Edge)
RBW: 50 kHz (< 1MHz from Band Edge)
VBW: ≥ 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.

NAME OF TEST: Field Strength of Spurious Radiation PARA. NO.: 27.53

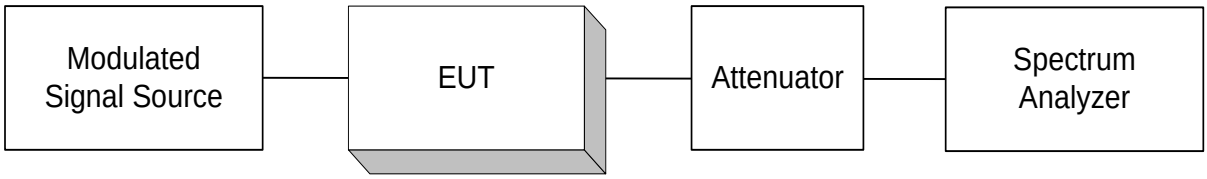
Minimum Standard: Para. No.27.53(h) For operations in the 1710-1755 MHz and 2110-2155 MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 43 + 10 log10 (P) dB.

Method of Measurement TIA/EIA-603-1992

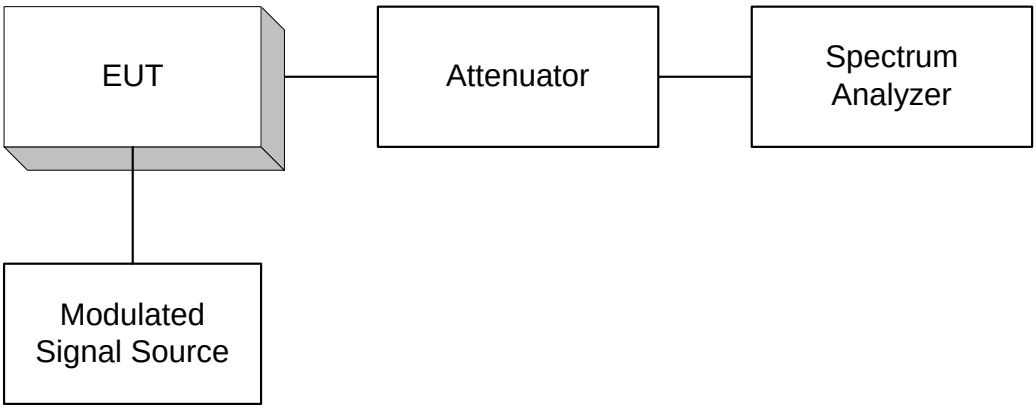
The antenna substitution method is used to determine the equivalent radiated power at spurious frequencies. The spurious emissions are measured at a distance of 3 meters. The EUT is then replaced with a reference substitution antenna with a known gain referenced to an isotropic radiator. This antenna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

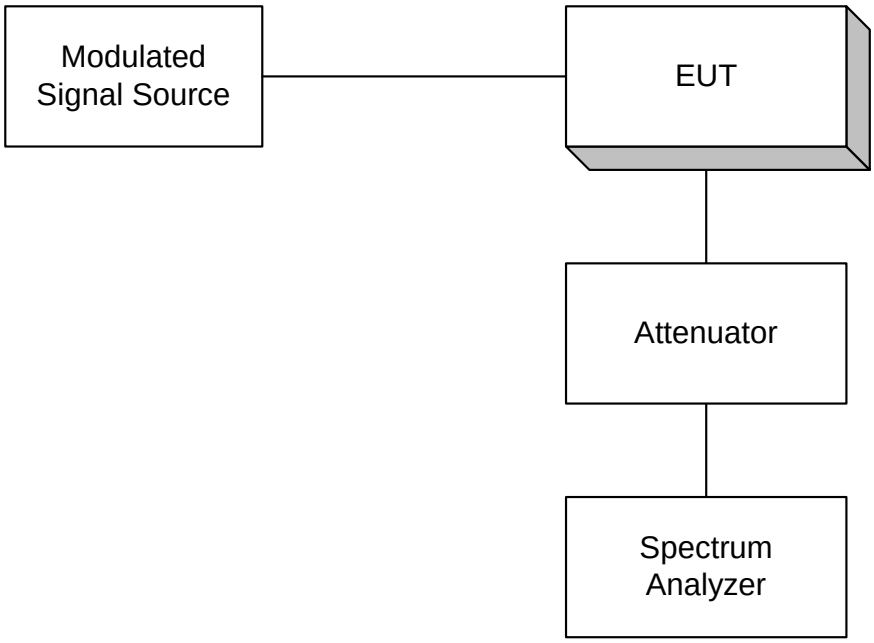
Para. No. 2.985 - R.F. Power Output



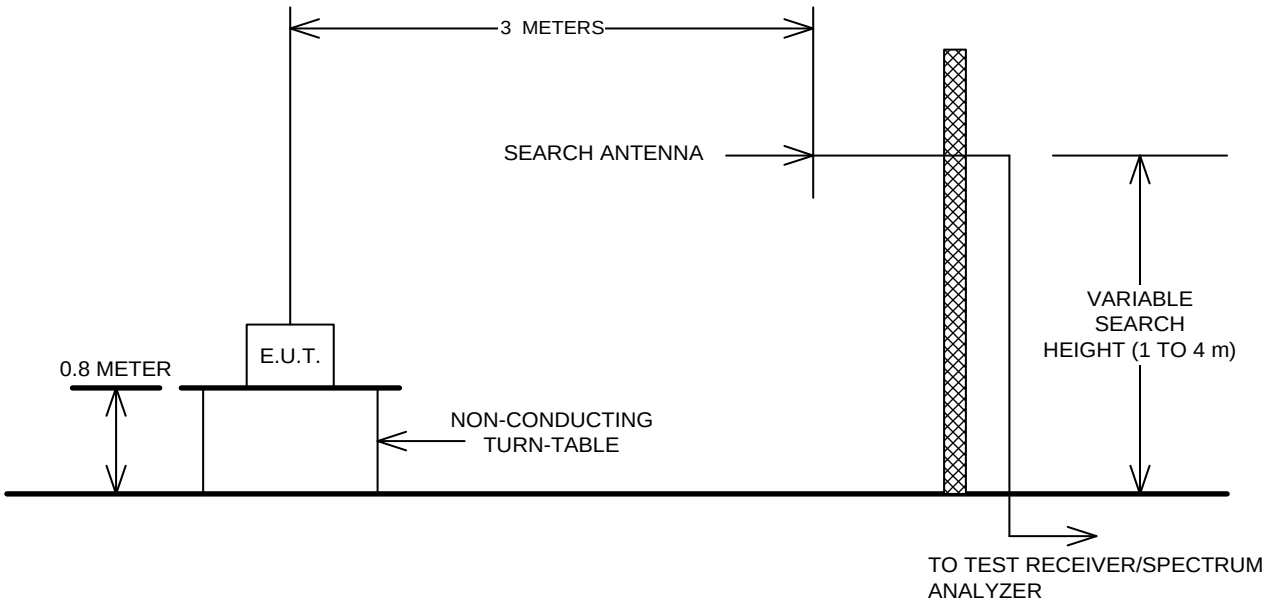
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability