Nemko Test Report:	131640-8
Applicant:	TEKO Telecom S.p.A. Via Meucci, 24/a I-40024 Castel S. Pietro Terme (BO)
Equipment Under Test: **(E.U.T.)**	TRU8S19AWWV/AC-WS (+ Master Unit composed by: SUB-TRX+TPSU/AC+TPSU/48+TSPV-R+TTRC4W-S)
In Accordance With:	**CFR 47 Part 90, Subpart I** Private Land Mobile Repeater
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: 43

Table of Contents

Section 1. Summary of Test Results

Manufacturer: TEKO Telecom

Model No.: TRU8S19AWWV/AC-WS

Serial No.: 090807002

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 Part 90, Subpart I.

☒	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".

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	90.635	1 kW ERP	Complies
Occupied Bandwidth	90.210	Input/Output	Complies
Spurious Emissions at Antenna Terminals	90.210	-13 dBm	Complies
Field Strength of Spurious Emissions	90.210	-13 dBm erp	Complies
Frequency Stability	90.213	1 ppm	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:		230 VAc
Frequency Range:	**Downlink:**	851 to 869 MHz
Frequency Range:	**Uplink:**	806 to 824 MHz
Type of Modulation and Designator:		**F3E (Voice)** ☐ **F1D** ☐ **F2D** ☐ **D7W (QAM)** ☒ **Other** ☐
Output Impedance:		50 ohms
RF Output (Rated):	**Downlink:**	20 W 43 dBm
	Uplink:	0.0025 W typical 4 dBm typical
Gain:	**Downlink:**	48 dB
	Uplink:	47 dB
Frequency Translation:		**F1-F1** ☐ **F1-F2** ☐ **N/A** ☒
Band Selection:		**Software** ☐ **Duplexer Change** ☐ **Fullband Coverage** ☒

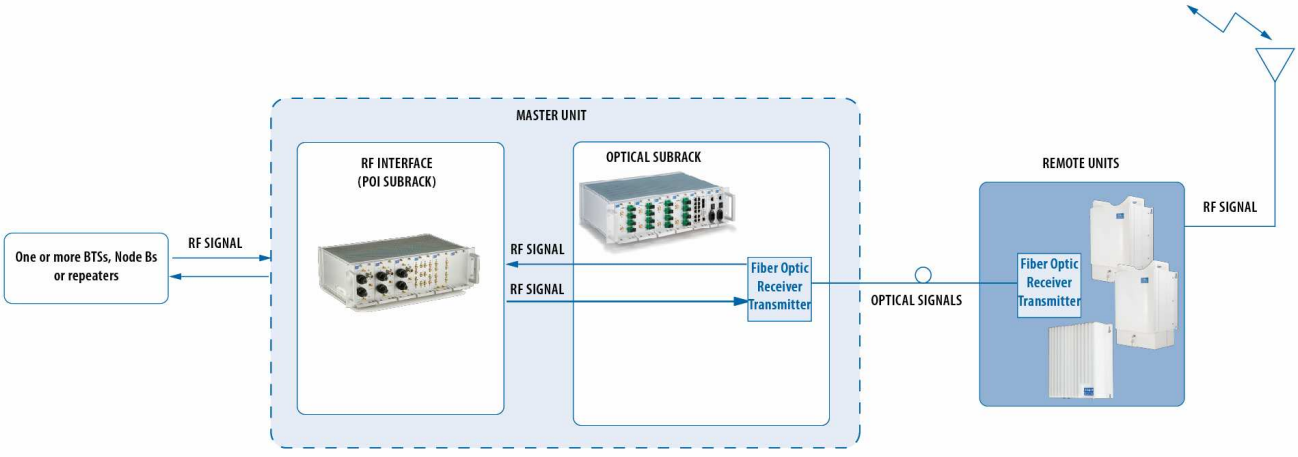
Description of EUT

The EUT is a very high 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 (SMR800, PCS and AWS bands). Single amplifier modules can be combined each other to obtain the following equipment:

Commercial name	*Description*	
REMOTE UNIT VERY HIGH POWER		
TRUxxxxxcV/zz-kkkj-r	**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
	V =	Very high power
	zz =	**Power supply**: AC: 85-264Vac, 50-60Hz

	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 M16: λ = 1570 ± 3 nm M17: λ = 1590 ± 3 nm M18: λ = 1610 ± 3 nm
	j =	**Optical connector**: S: SC-APC E: E-2000
	r =	**Redundancy:** Without option: NO redundancy 1: Power Supply 2: HPA 3: Optical Module 4: Power Supply + HPA 5: Power Supply + Optical Module 6: HPA + Optical Module 7: Power Supply + Optical Module + HPA

System Diagram



Section 3. RF Power Output

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: G. Curioni	DATE: 24 September 2009

Test Results: Complies.

Measurement Data:

Direction	Modulation	Output per Channel (dBm)	Output per Channel Power (W)
Uplink	iDEN	4,33	0.0027
Downlink	iDEN	43,08	20

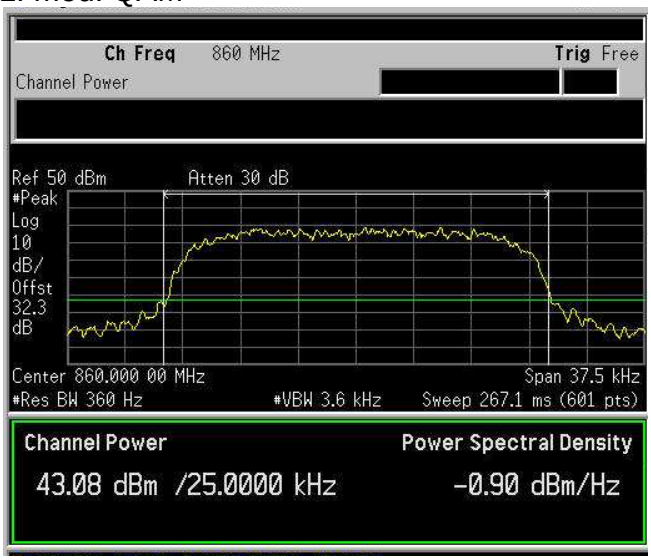
Equipment Used: 1-2-3b-4

Measurement Uncertainty: +/- 1.9 dB

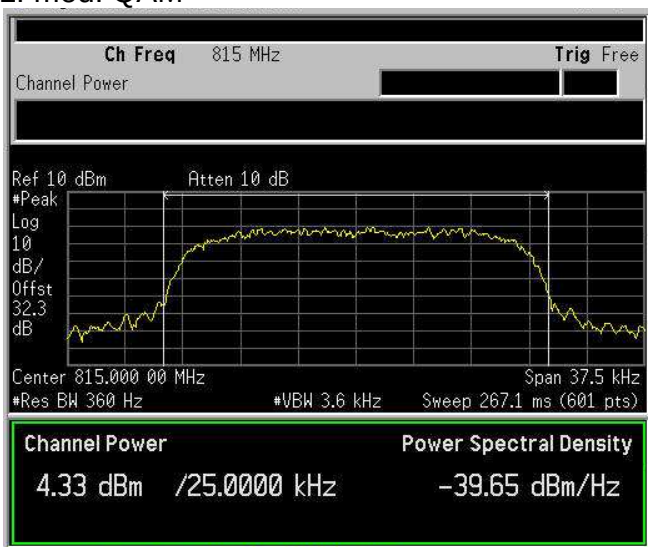
Temperature: 24 °C

Relative Humidity: 50 %

RF Power Output D.L. mod. QAM



RF Power Output U.L. mod. QAM



Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 2.989
TESTED BY: G. Curioni	DATE: 24 September 2009

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1 – 2 – 3b - 4

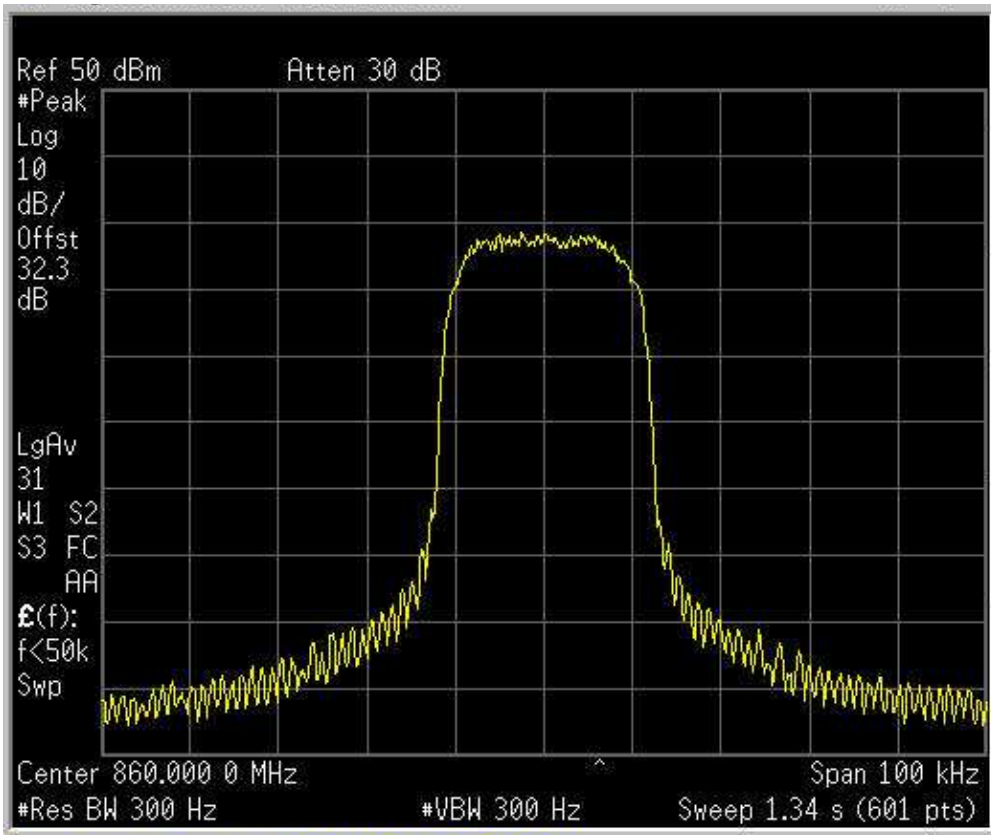
Measurement Uncertainty: $1X10^{-7}$

Temperature: 24 °C

Relative Humidity: 50 %

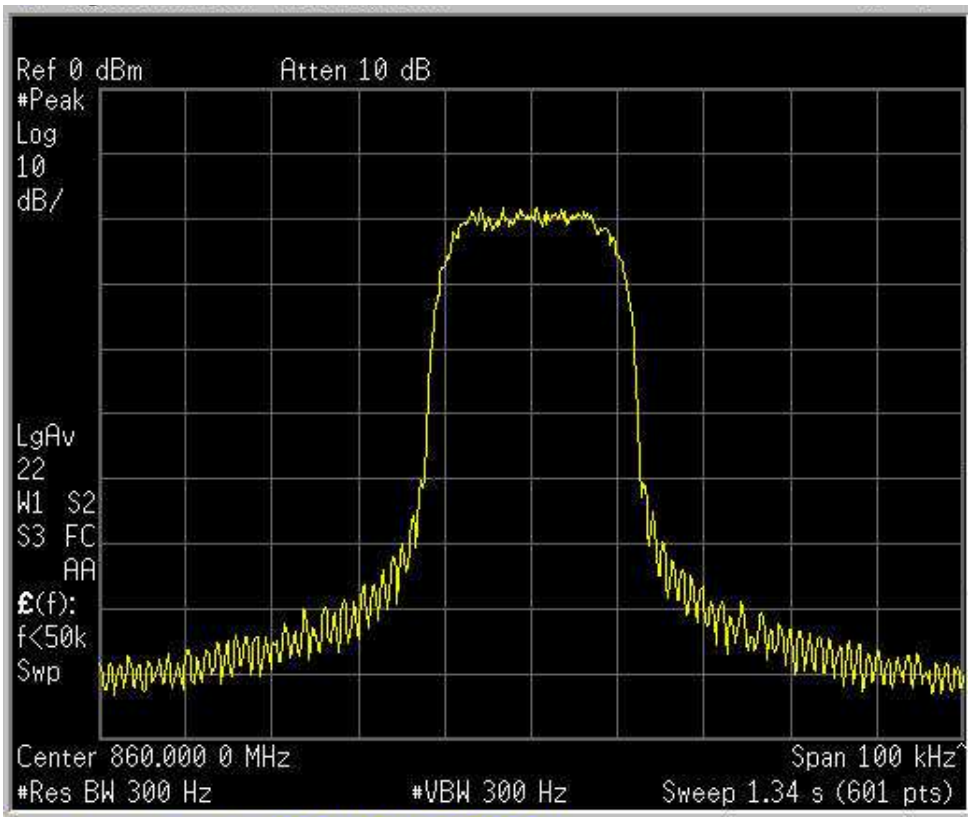
Test Data – Occupied Bandwidth

iDEN - Output
Downlink



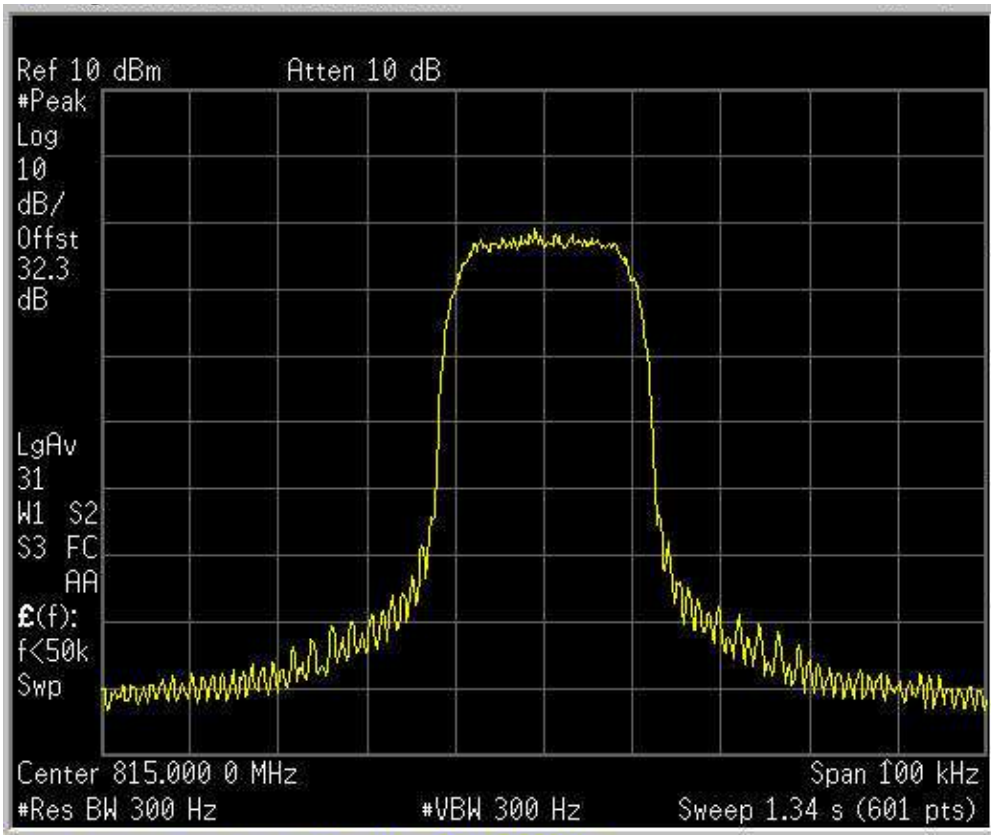
Test Data – Occupied Bandwidth

iDEN - Input
Downlink



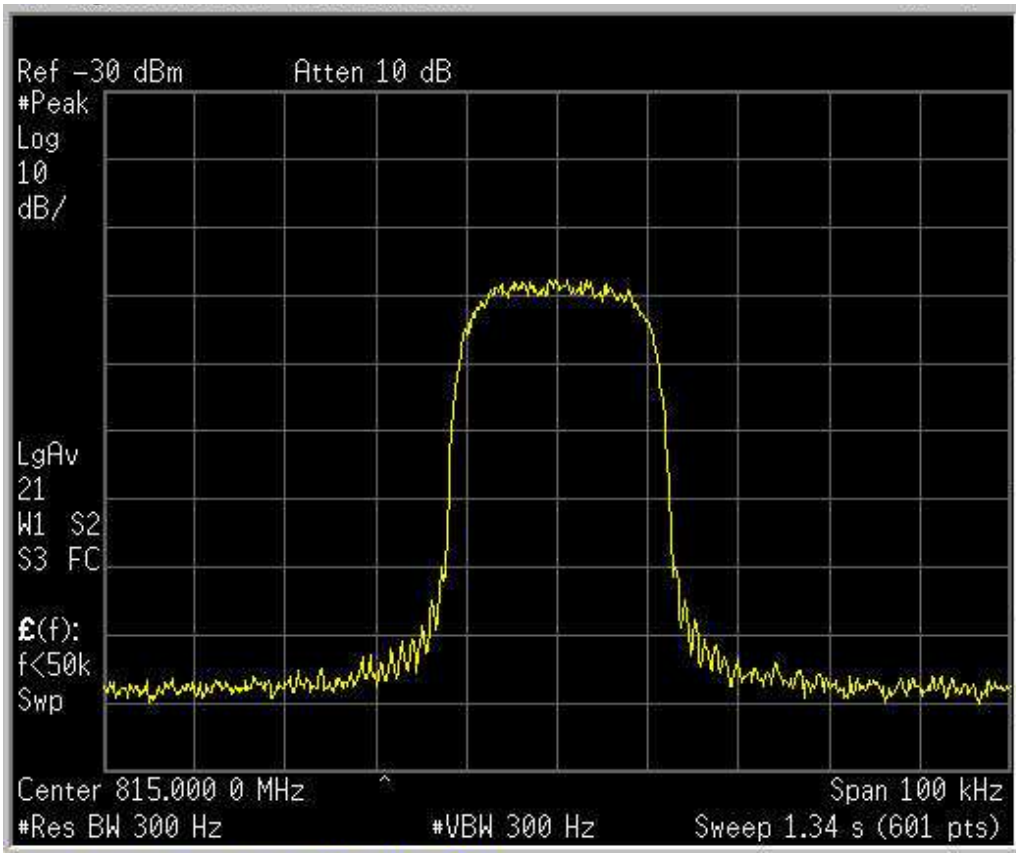
Test Data – Occupied Bandwidth

iDEN - Output
Uplink



Test Data – Occupied Bandwidth

iDEN - Input
Uplink



Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.991
TESTED BY: G. Curioni	DATE: 24 September 2009

Test Results: Complies.

Test Data: See attached plot(s).

Equipment Used: 1 – 2 – 3b - 4

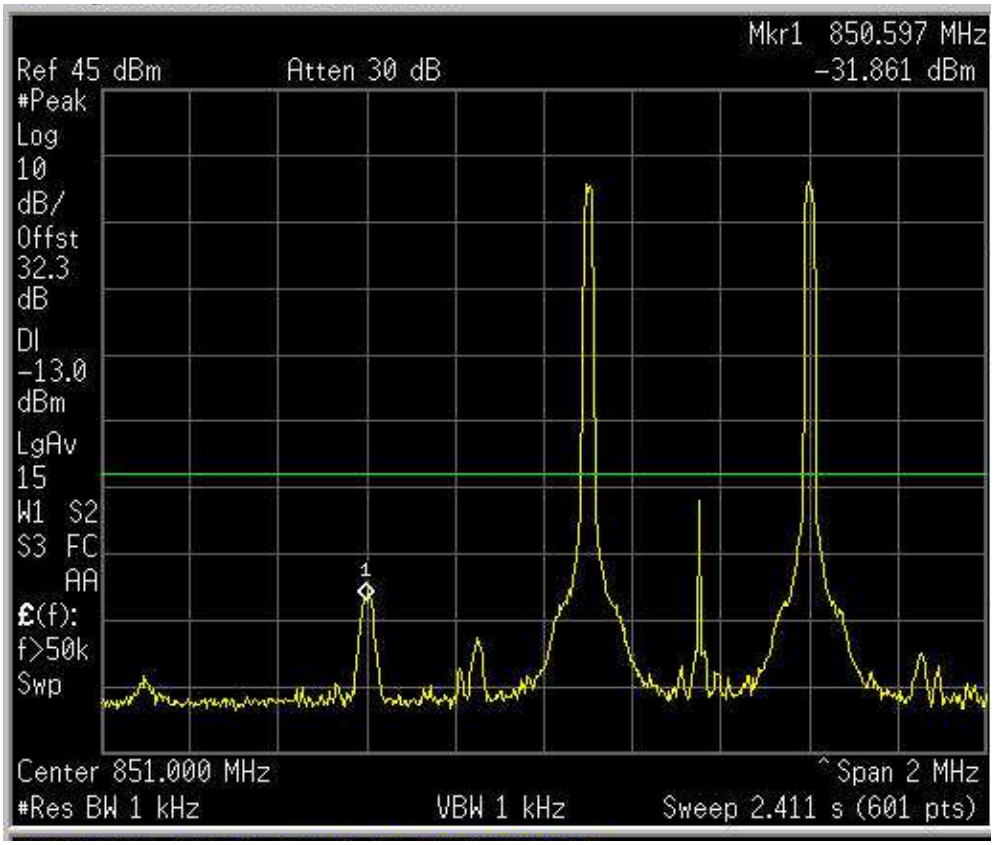
Measurement Uncertainty: +/- 1.9 dB

Temperature: 24 °C

Relative Humidity: 50 %

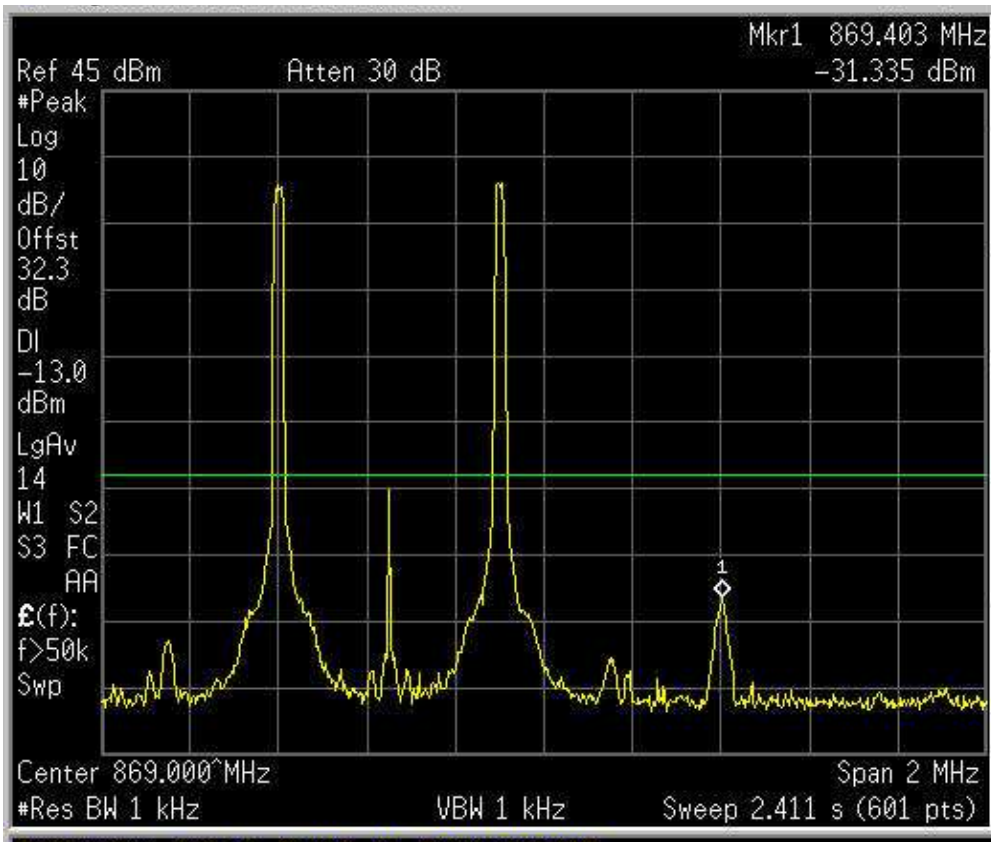
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
iDEN
Downlink



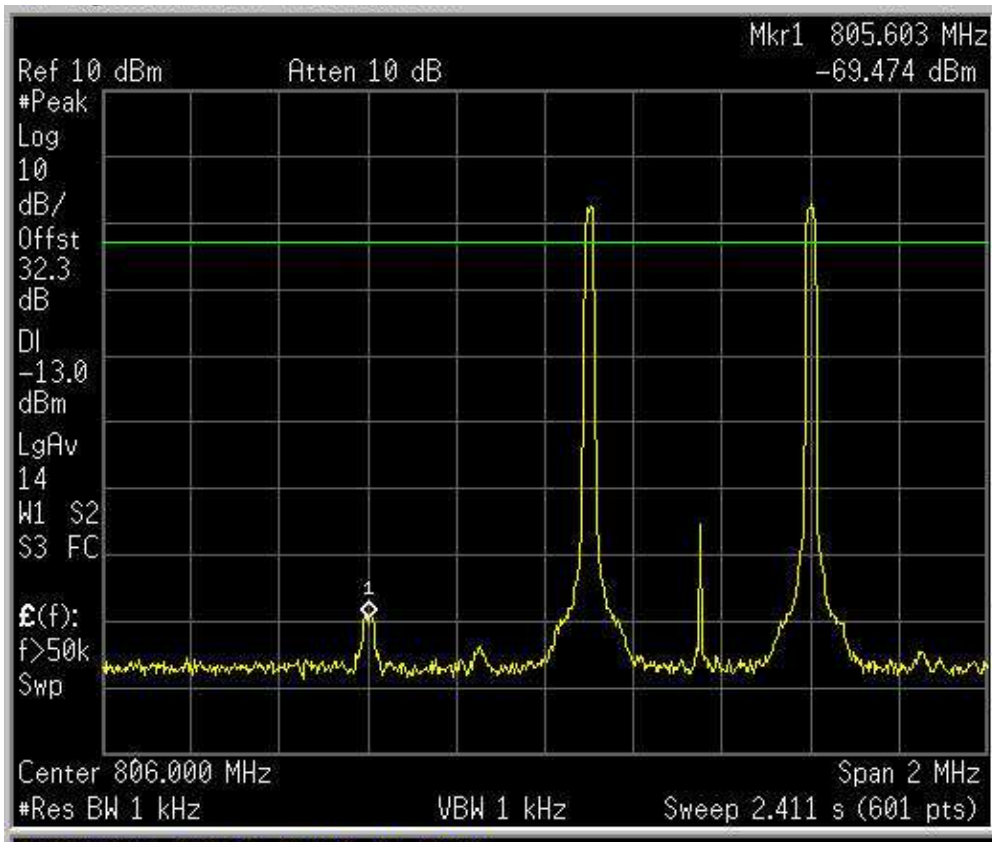
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
iDEN
Downlink



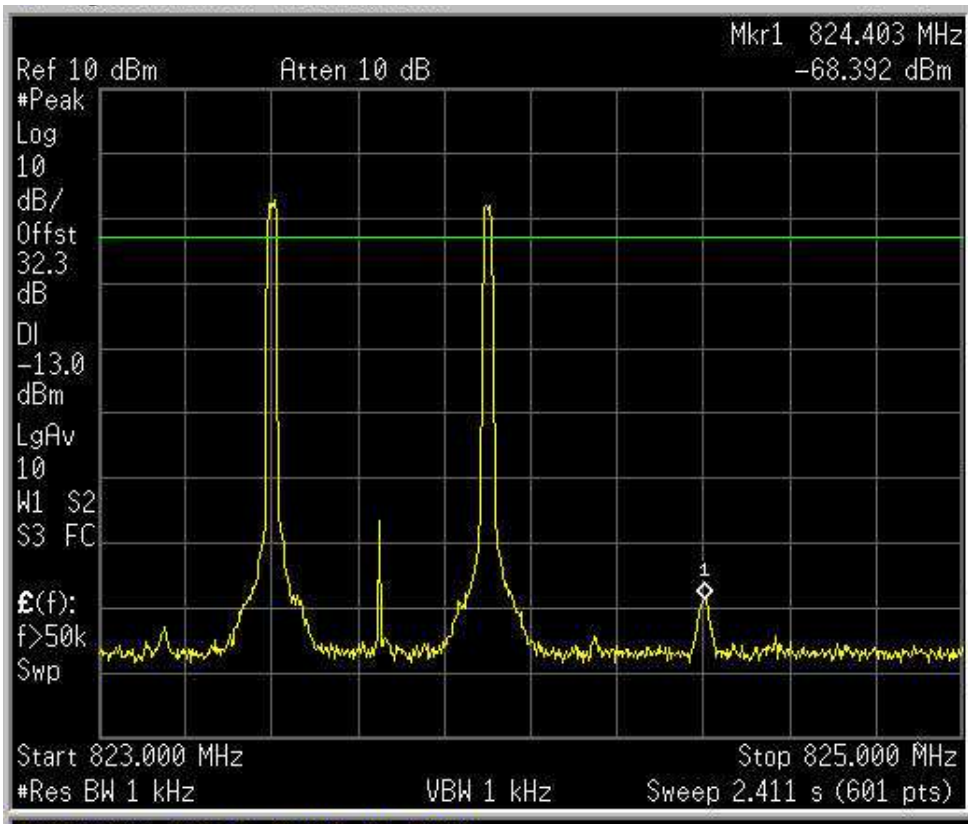
Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation
iDEN
Uplink



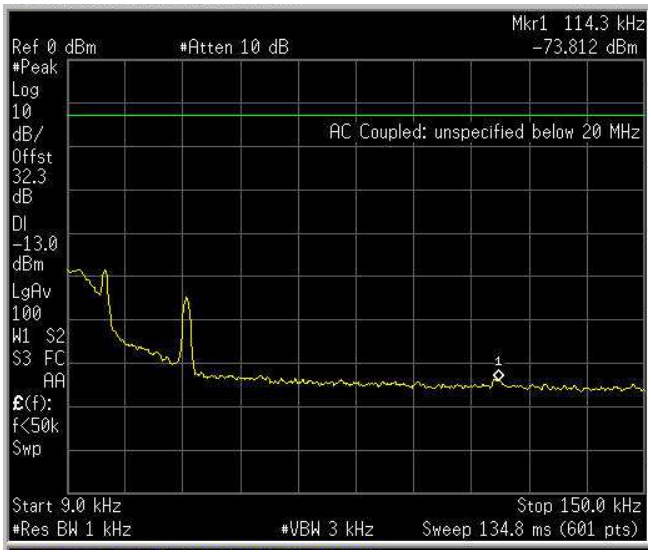
Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation
iDEN
Uplink

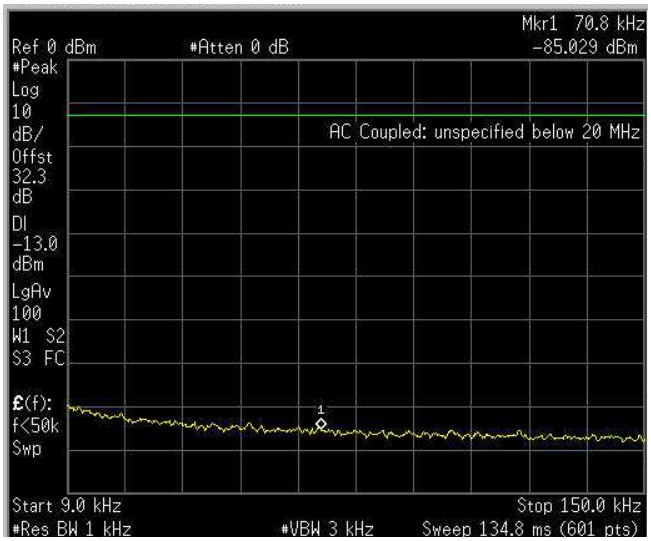


Test Data – Spurious Emissions at Antenna Terminals

Spurs
Downlink 9 – 150 kHz
IDEN

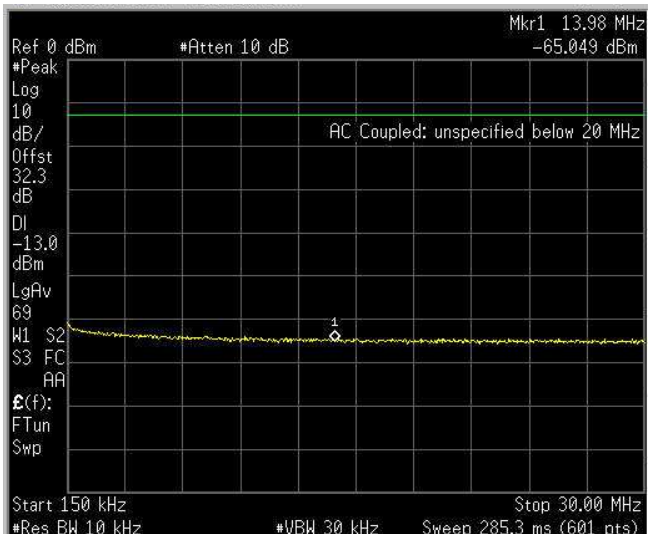


Spurs
Uplink 9 – 150 kHz
IDEN

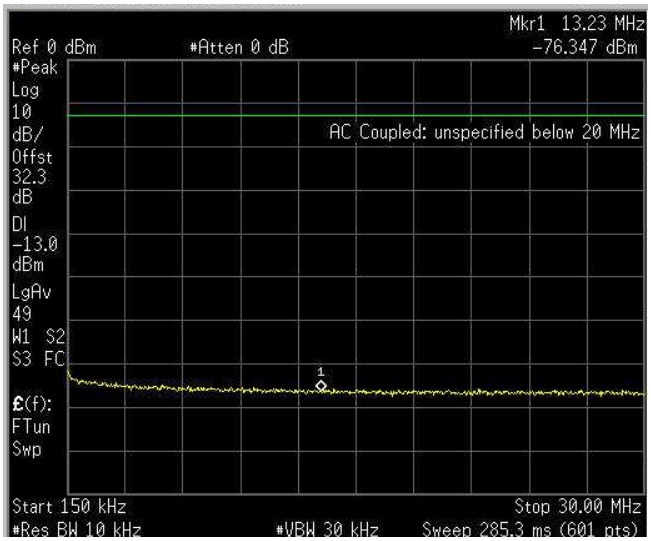


Test Data – Spurious Emissions at Antenna Terminals

Spurs
Downlink 150 kHz – 30 MHz
IDEN

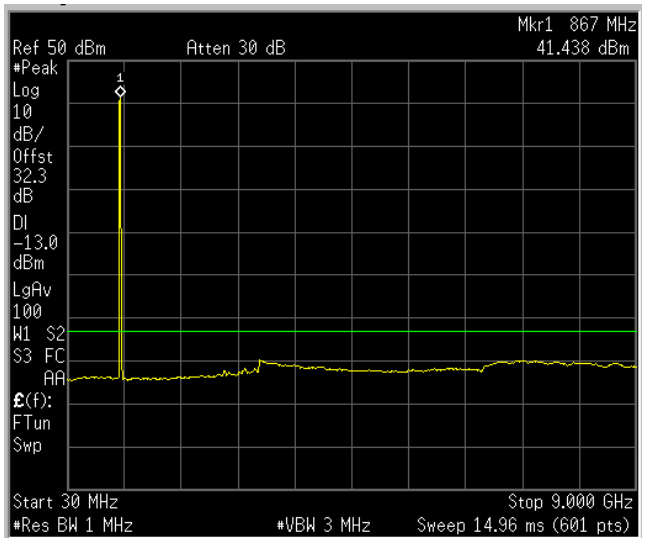


Spurs
Uplink 150 kHz – 30 MHz
IDEN

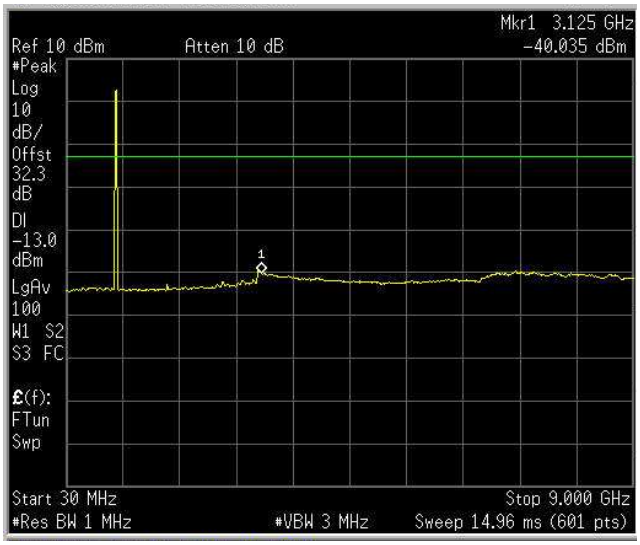


Test Data – Spurious Emissions at Antenna Terminals

Spurs
Downlink 30 MHz – 10 GHz
IDEN



Spurs
Uplink 30 MHz – 10 GHz
IDEN



Section 6. Field Strength of Spurious Emissions

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.993
TESTED BY: G. Curioni	DATE: 24 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 of -13 dBm.

SMR800 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	-68.8 dBm H	-13 dBm
1 – 10 GHz		negligible	-13dBm

SMR800 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 88.3 MHz 103.08MHz	-51.6 dBm H -64.9 dBm V -60.4 dBm V	Limit: -13 dbm
1 – 10 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 %

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.

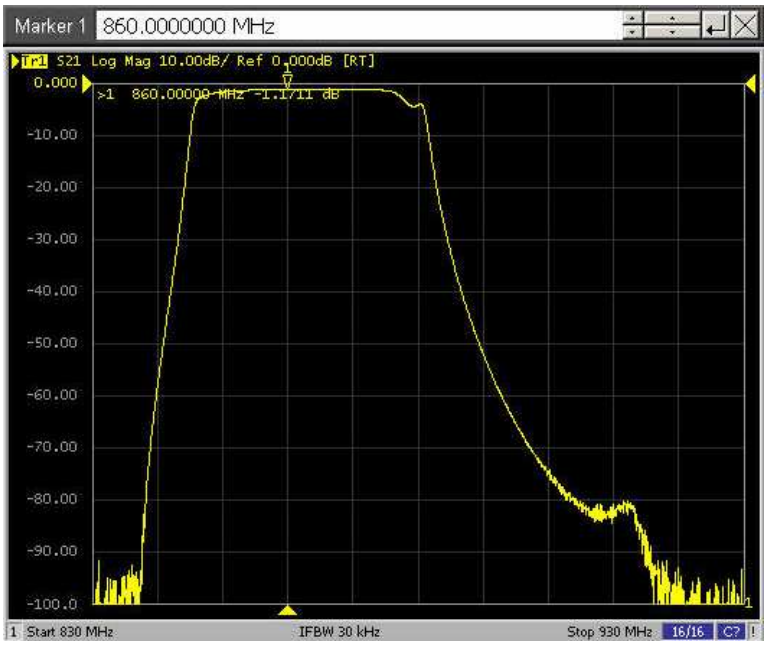
Test Data: See attached plot(s).

Equipment Used: 3a

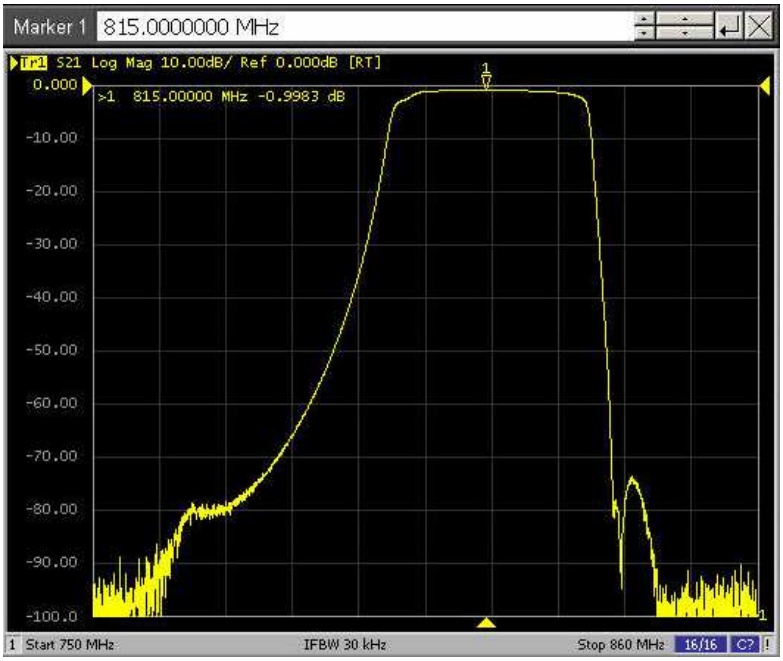
Measurement Uncertainty: +/-1,9 dB

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			

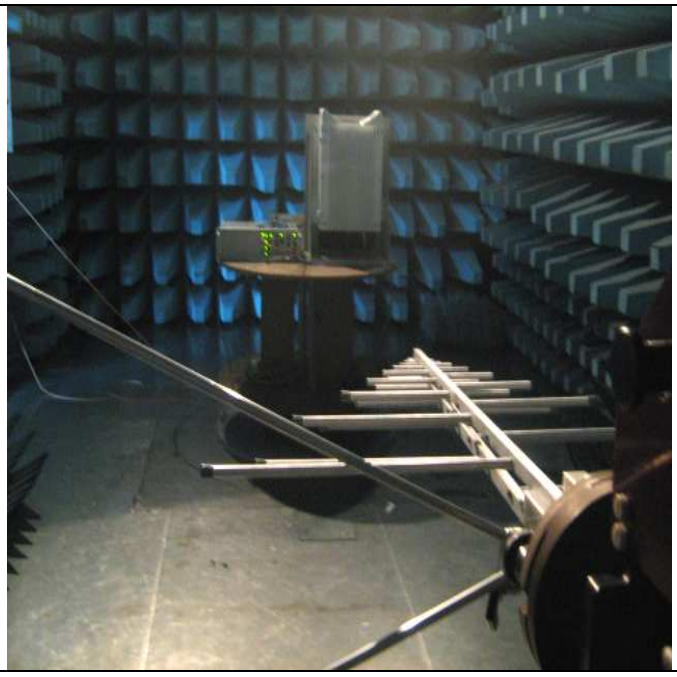
Client's property

Coupling Factor 2xcables+directiona l coupler+dummyload	SMR800	UL 815.0 DL 869.0	32.3 dB 32.3 dB	

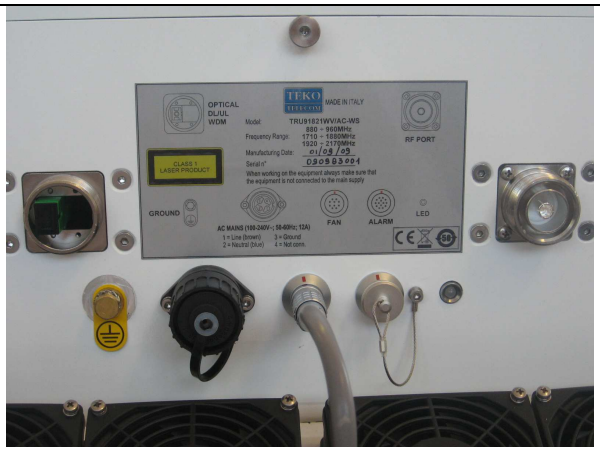
Identification number	***Equipment***	***Manufacturer***	***Model***	***Serial N°***	***Cal. due***
5	Trilog Broadband Antenna	Schwarzbeck	VULB 9163	VULB 9163-286	04/2010
6	Bilog antenna	Schwarzbeck	STLP 9148-123	123	09/2011
7	Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	05/2011
8	Spectrum Analyzer 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

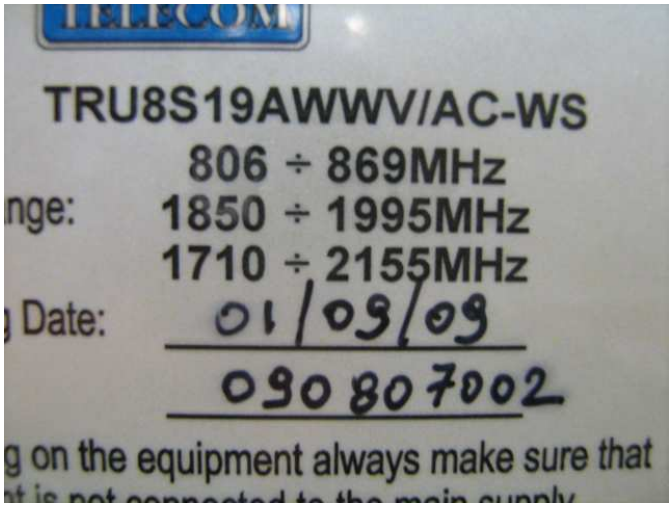
Section 9. PHOTOS

SETUP



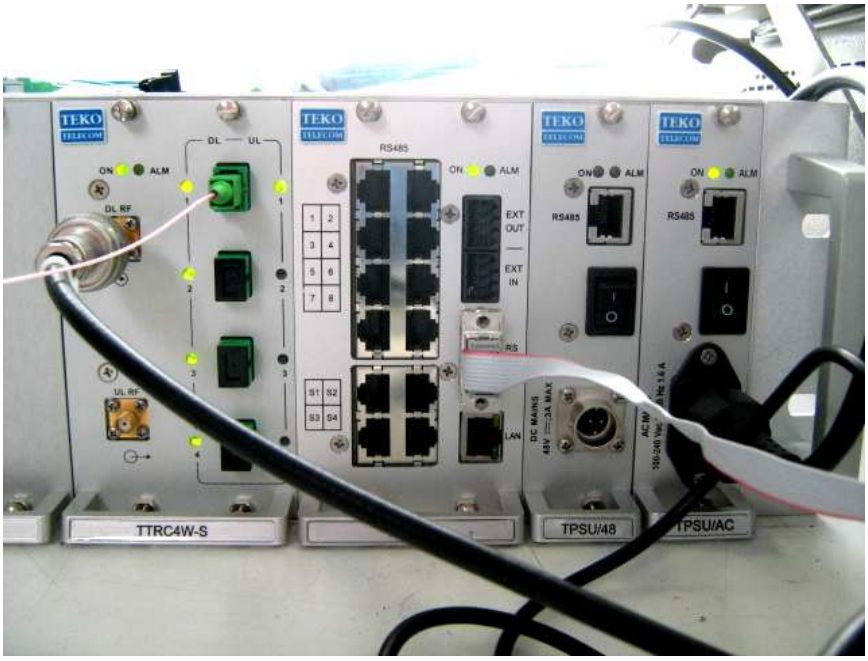
REMOTE


OPTICAL
DUAL
WDM
TELECOM
MADE IN ITALY
Model:
TRU91821WV/AC-WS
880 ÷ 960MHz
1710 ÷ 1880MHz
1920 ÷ 2170MHz
Manufacturing Date:
01/09/09
Serial n°
090883004
When working on the equipment always make sure that the equipment is not connected to the main supply
CLASS 1
LASER PRODUCT
RF PORT
GROUND
AC MAINS (100-240V~ 50-60Hz; 12A)
1 = Line (brown)
2 = Neutral (blue)
3 = Ground
4 = Not conn.
FAN
ALARM
LED


TELECOM
TRU8S19AWWV/AC-WS
806 ÷ 869MHz
nge: 1850 ÷ 1995MHz
1710 ÷ 2155MHz
Date: 01/09/09
090807002
g on the equipment always make sure that

MASTER


28V ⎓ ; 10A MAX
+ −
RS485


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

ANNEX A - TEST METHODOLOGIES

NAME OF TEST: RF Power Output	**PARA. NO.: 2.985**

Minimum Standard: Para. No. 90.205(a). The maximum allowable station ERP is dependent upon the stations HAAT and required service area and will be authorized in accordance with Table 1 of 90.205(d).

Method Of Measurement:

Detachable Antenna:
The peak power at antenna terminals is measured using an in-line peak power meter. 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: Spurious Emissions at Antenna Terminals **PARA. NO.: 2.991**

Minimum Standard: 90.210, Table 1

Table 1

Frequency Band (MHz)	Mask for equipment with Low Pass Filter	Mask for equipment without Low Pass Filter
Below 25	A or B	A or C
25 - 50	B	C
72 - 76	B	C
150 - 174	B, D or E	C, D or E
150 Paging only	B	C
220 - 222	F	F
421 - 512	B, D or E	C, D or E
450 paging only	B	H
806 - 821/ 851 - 866	B	G
821 - 824/ 866 - 869	B	H
896 - 901/ 935 - 940	I	J
902 - 928	K	K
929 - 930	B	G
Above 940	B	C
All other bands	B	C

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dBµV/m@3m	82.2 dBµV/m@3m
D,J	-20dBm	77.4 dBµV/m@3m	75.2 dBµV/m@3m
E,F,K	-25dBm	72.4 dBµV/m@3m	70.2 dBµV/m@3m

Test Method: RBW: 1% of emission bandwidth in the 0 - 1 GHz range.
1 MHz at frequencies above 1 GHz.
VBW: $\Rightarrow$ RBW

The spectrum is searched up to 10 times the fundamental frequency.

NAME OF TEST: Occupied Bandwidth	**PARA. NO.: 2.989**

Minimum Standard: Not defined. Input/Output

Method Of Measurement:

Analog

Spectrum analyzer settings:
RBW=VBW=300 Hz
Span: 100 kHz
Sweep: Auto

iDEN

RBW=VBW= 300 Hz
Span: 100 kHz
Sweep: Auto

NAME OF TEST: Field Strength of Spurious **PARA. NO.: 2.993**

Minimum Standard: Para. No. 90.210, see table 1 for applicable mask.

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.

MASK	Spurious Limit	FS Limit Below 1 GHz	FS Limit Above 1 GHz
A,B,C,G,H,I	-13dBm	84.4 dBµV/m@3m	82.2 dBµV/m@3m
D,J	-20dBm	77.4 dBµV/m@3m	75.2 dBµV/m@3m
E,F,K	-25dBm	72.4 dBµV/m@3m	70.2 dBµV/m@3m

NAME OF TEST: Frequency Stability **PARA. NO.: 2.995**

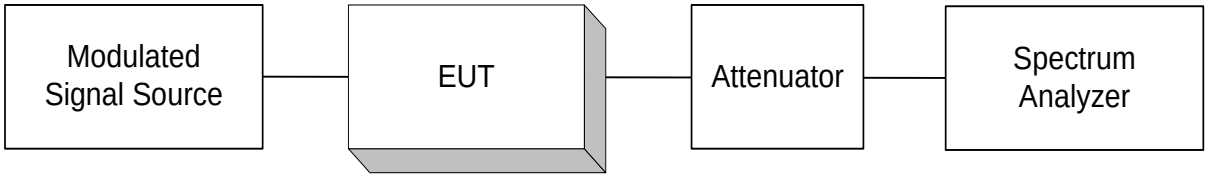
Minimum Standard: Para. No. 990.213. The transmitter carrier frequency shall remain within the assigned frequency below in ppm.

Table 2

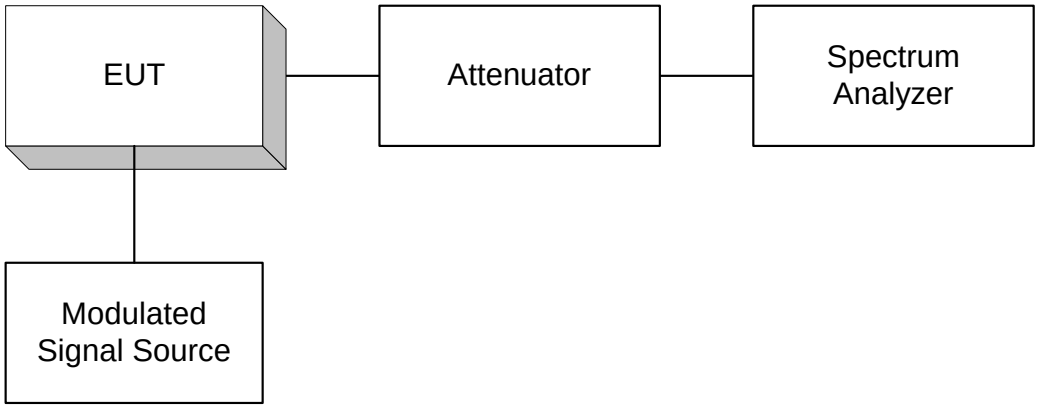
Frequency Band (MHz)	Fixed And Base Stations	Mobile Stations	
		> 2 Watts o/p pwr	< 2 Watts o/p pwr
Below 25	100	100	200
25 - 50	20	20	50
72 - 76	5	-	50
150 - 174	5	5	5
220 - 222	0.1	1.5	1.5
421 - 512	2.5	5	5
806 - 821	1.5	2.5	2.5
821 - 824	1.0	1.5	15
851 - 866	1.5	2.5	2.5
866 - 869	1.0	1.5	1.5
869 - 901	0.1	1.5	1.5
902 - 928	2.5	2.5	2.5
929 - 930	1.5	-	-
935 - 940	0.1	1.5	1.5
1427 - 1435	300	300	300
Above 2450	-	-	-

ANNEX B - TEST DIAGRAMS

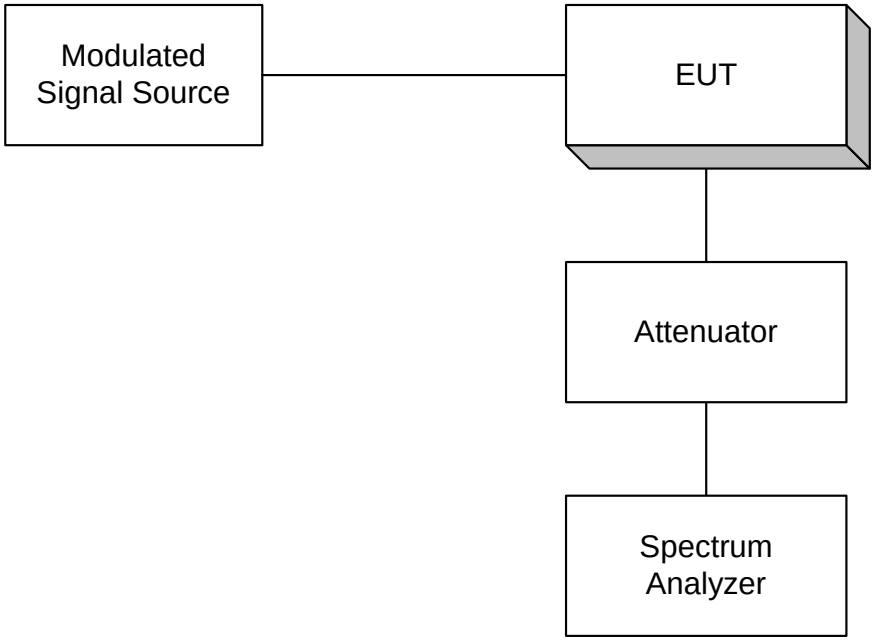
Para. No. 2.985 - R.F. Power Output



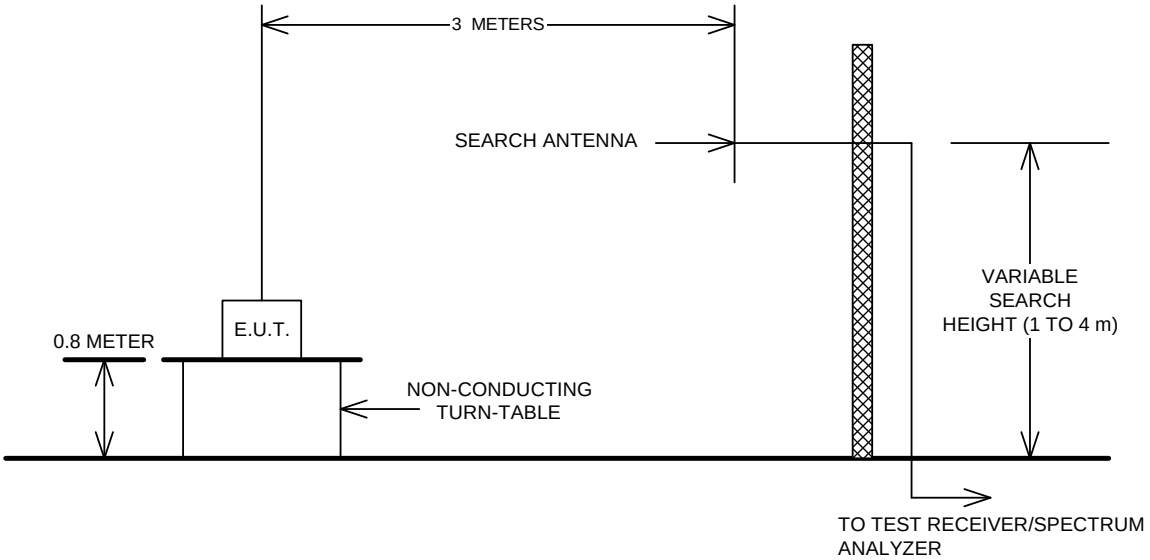
Para. No. 2.989 - Occupied Bandwidth



Para. No. 2.991 - Spurious Emissions at Antenna Terminals



Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability