

Nemko Test Rep	oort:	131640-1		
Applicant:		TEKO Telecom S.p.A. Via Meucci, 24/a I-40024 Castel S. Pietro T	Гerme (В	O)
Equipment Unde (E.U.T.)	∍r Test:	TRU8A19AWWL/AC-WS ( + Master Unit compose SUB-TRX+TPSU/AC+TI	d by	SPV-R+TTRC4W-S)
In Accordance V	Vith:	<b>CFR 47, Part 22, Subpar</b> Cellular Band Repeaters	rt H (AMI	PS Band)
Tested By:		Nemko Italy S.p.A Via Carroccio, 4 I-20046 Biassono (Italy)		
	G	. Curioni		
TESTED BY:		luvioni f	DATE:	18-25 September, 2009
	P	. Barbieri		
APPROVED BY:		Bulles Park	DATE:	28 September, 2009

Number of Pages: 92

## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

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## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

Section 1.	Summary of Test	t Results	
Manufacturer:			
Model No.:	TRU8A19AWWL/AC	-WS	
Serial No.:	090569002		
General: A	I measurements are tra	ceable to national	standards.
	re conducted on a sample compliance with CFR 47,		
N N	ew Submission	$\square$	Production Unit
С	ass II Permissive Change		Pre-Production Unit
TH	IIS TEST REPORT RELATE	ES ONLY TO THE IT	EM(S) TESTED.
THE FOLLOV	ING DEVIATIONS FROM,	ADDITIONS TO, OR	EXCLUSIONS FROM THE

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE. See "Summary of Test Data".

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## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS P

### PROJECT NO.: 131640-1

### Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	RESULT
RF Power Output	22.913(a)	500W ERP	Complies
Occupied Bandwidth	Not defined	Input/Output	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm erp	Complies
Frequency Stability	22.355	1.5 ppm	NA

#### Footnotes For N/A's:

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

## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

# Section 2. General Equipment Specification

Supply Voltage Input:	120 V	ac			
Frequency Range: Downl	i <b>nk:</b> 869 to	894 MHz			
Frequency Range: Upl	i <b>nk:</b> 824 to	849 MHz			
Type of Modulation and	CDM			EDGE	W-CDMA
Designator:	(F9V	/) (GXV		(G7W)	(F9W)
Output Impedance:	50 oh	me			
Output impedance.	50 011	115			
Downlink: RF Output (Rated):			0.8 W 29 dBr	n	
Uplink:			0.0025 W t		
Gain: Downl Uplink					
Frequency Translation:	F	1-F1	F1-F2		N/A
		-	Duployo		_
Band Selection:	So	ftware	Duplexe Change		and Coverage

# EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### **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			
	$\mathbf{L} =$	L: low power			
	<b>ZZ</b> =	Power supply: AC: Power Supply: 85-264Vac, 50-60Hz 48: Power Supply: 36-72Vdc			

# CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

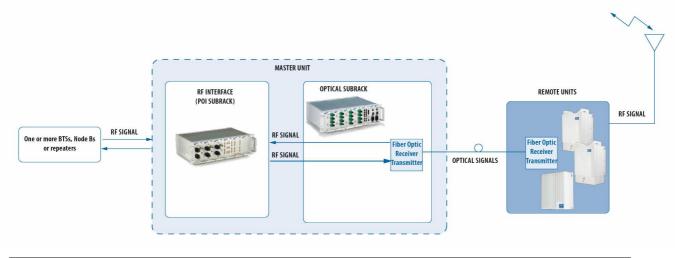
# EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO .:

### 131640-1

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

### System Diagram



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### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

### Section 3. RF Power Output

NAME OF TEST: RF Power Output

TESTED BY: G. Curioni

PARA. NO.: 22.913

DATE: 21 September 2009

Test Results: Complies.

#### Test Data:

Direction	Modulation	Output per Channel (dBm)	Output per Channel Power (W)
Uplink	CDMA	4,13	0.0025
Downlink	CDMA	29,06	0.8
Uplink	TDMA	4,33	0.0027
Downlink	TDMA	29,39	0.86
Uplink	EDGE	4,12	0.0025
Downlink	EDGE	29,71	0.9
Uplink	GSM	4,30	0.0027
Downlink	GSM	28,83	0.77
Uplink	W-CDMA	4,45	0.0028
Downlink	W-CDMA	29,04	0.8

Equipment Used: 1-2-3b-4

Measurement Uncertainty: \_\_\_\_\_\_ dB

Temperature:24 °C

**Relative Humidity:** 50 %

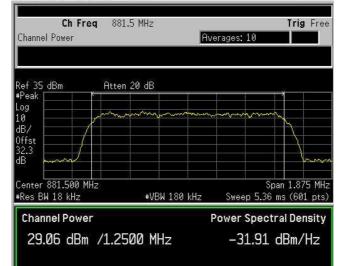
**QNH:** \_\_\_\_\_980 hPa

## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

RF Power Output D.L. mod. CDMA



RF Power Output D.L. mod. TDMA



## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

RF Power Output D.L. mod. EDGE

<b>Ch Fre</b> Channel Power	: <b>q</b> 881.5 MHz		verages: 2	Trig	Fre
Ref 35 dBm Peak	Atten 20 dE	3			
.og .0 IB/ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		·····		- mo
2.3 B					
enter 881.500 0 Res BW 3 kHz		VBW 30 kHz	Sweep 30	Span 30 8 ms (601.	
Channel Powe			Power Spe	ctral Der	isit
29.71 dBm	/200.000	0 kHz	-23.3	0 dBm/	Hz

### RF Power Output D.L. mod. GSM

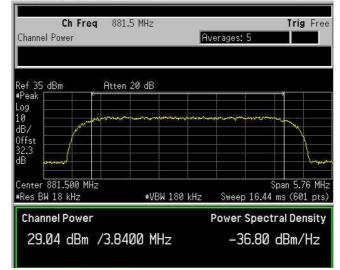


# CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

RF Power Output D.L. mod. WCDMA

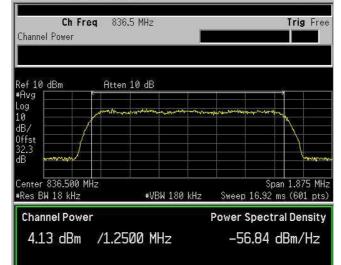


## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

RF Power Output U.L. mod. CDMA



RF Power Output U.L. mod. TDMA



# CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

## EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Ch Freq 836.5 MHz Trig Fre Channel Power Atten 10 dB Ref 10 dBm #Avg Log 10 dB, Offst Center 836.500 0 MHz #Res BW 3 kHz Span 300 kHz Sweep 97.32 ms (601 pts) #VBW 30 kHz **Channel Power Power Spectral Density** /200.0000 kHz -48.89 dBm/Hz 4.12 dBm

RF Power Output U.L. mod. EDGE

# RF Power Output U.L. mod. GSM



# CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Ch Freq 836.5 MHz Trig Fre Channel Power Ref 10 dBm Atten 10 dB #Avg Log 10 dB Center 836.500 MHz #Res BW 18 kHz Span 5.76 MHz Sweep 51.92 ms (601 pts) ₩VBW 180 kHz **Channel Power Power Spectral Density** 4.45 dBm /3.8400 MHz -61.39 dBm/Hz

RF Power Output U.L. mod. WCDMA

## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

# Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth		PARA. NO.: 2.1049
TESTED BY: G. Curioni		DATE: 21 September 2009
Test Results:	Complies.	
Test Data:	See attached plot(s).	
Equipment Used:	1-2-3b-4	
Measurement Uncertai	nty: <u>1X10<sup>-7</sup></u>	
Temperature:	_24_ °C	
Relative Humidity:	50 %	

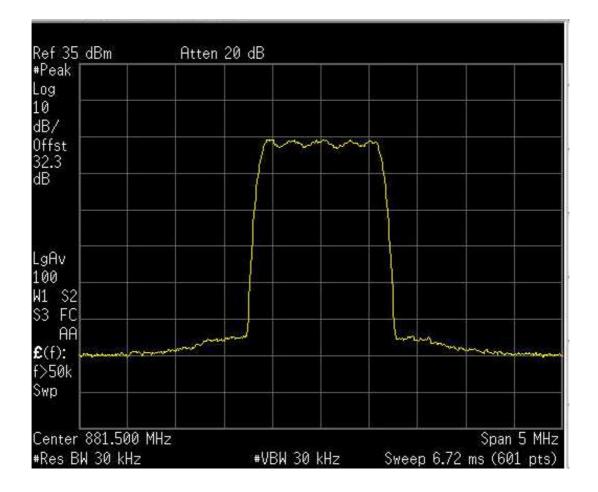
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

Test Data – Occupied Bandwidth CDMA - Output

Downlink



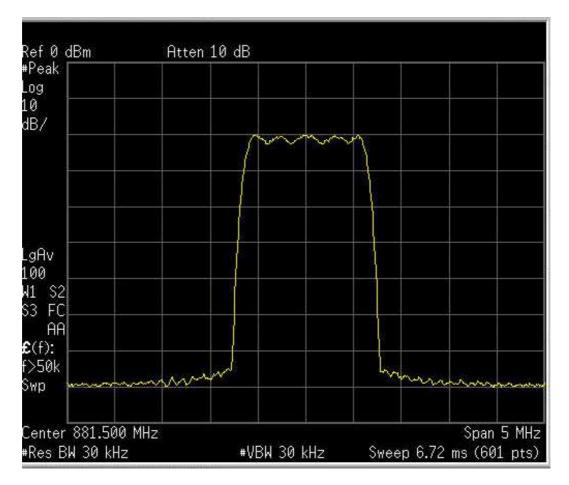
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

## Test Data – Occupied Bandwidth

CDMA - Input Downlink



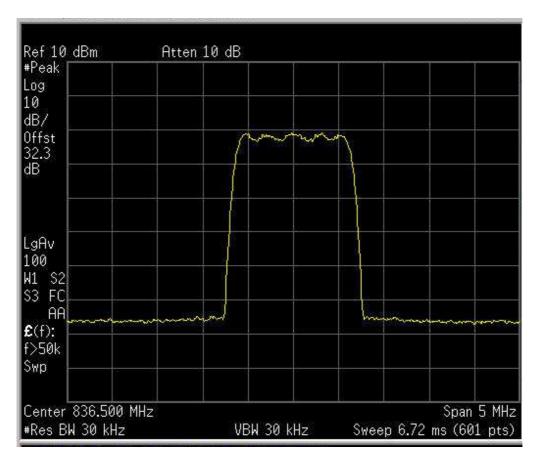
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

### Test Data – Occupied Bandwidth

CDMA - Output Uplink



## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS

# PROJECT NO.: 131640-1

### Test Data – Occupied Bandwidth

CDMA - Input Uplink

Ref -20 dBm	Atten 10 dB	118
#Peak Log		
10 dB/		
LgAv		
100 W1 S2		
S3 FC		
<b>£</b> (f): f>50k	- Induced I have been a second	
Swp		
Center 836.500 M	Hz Span 5	5 MHz
#Res BW 30 kHz	VBW 30 kHz Sweep 6.72 ms (601	

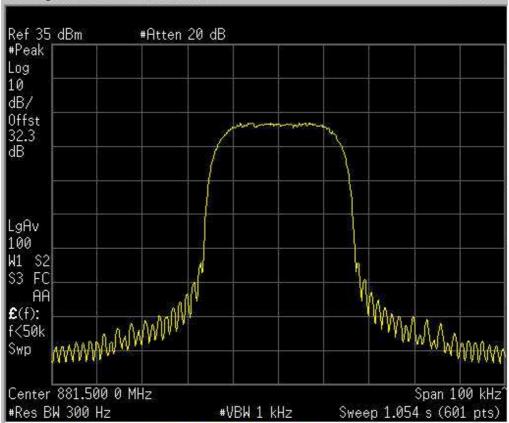
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

### Test Data – Occupied Bandwidth

TDMA - Output Downlink



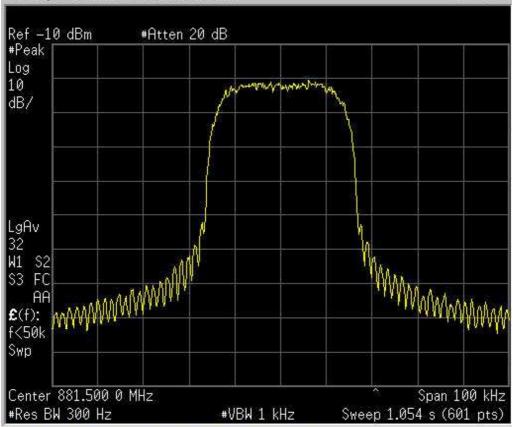
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

### Test Data – Occupied Bandwidth

TDMA - Input Downlink



## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Ref 10 dBm Atten 10 dB #Peak Log 10 dB/ Offst 32.3 dB LgAv 62 W1 S2 MMMMMMMMM S3 FC MAMANAWAWAW AA £(f): f<50k Swp Center 836.500 0 MHz Span 100 kHz #Res BW 300 Hz #VBW 1 kHz Sweep 1.054 s (601 pts)

#### Test Data – Occupied Bandwidth

TDMA - Output Uplink

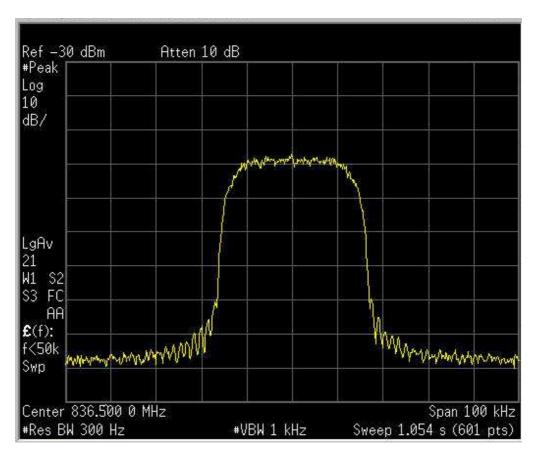
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

### Test Data – Occupied Bandwidth

TDMA - Input Uplink



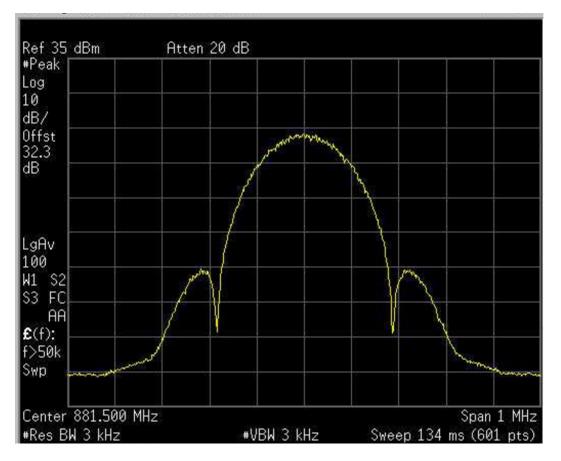
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

# **Test Data – Occupied Bandwidth** EDGE - Output

Downlink

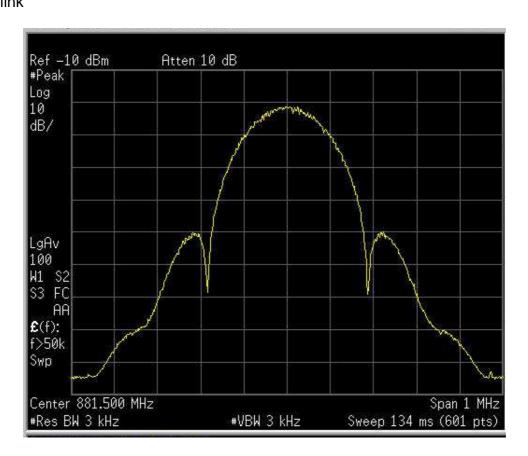


## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

**Test Data – Occupied Bandwidth** EDGE - Input Downlink



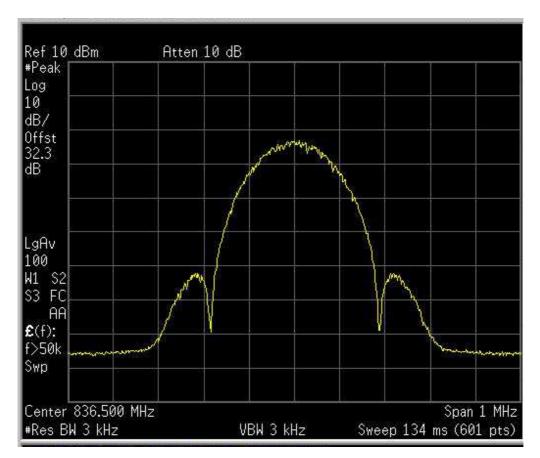
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

# Test Data – Occupied Bandwidth

EDGE - Output Uplink



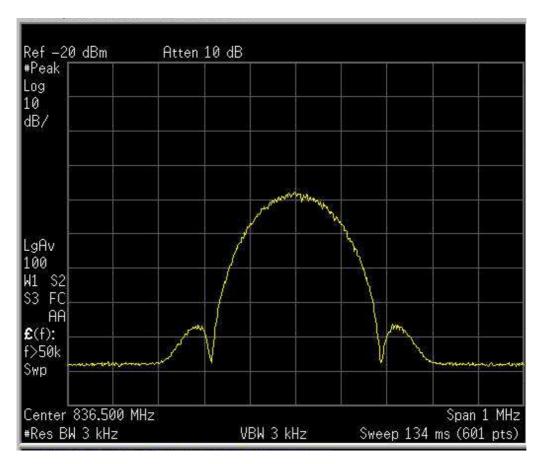
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

### Test Data – Occupied Bandwidth

EDGE - Input Uplink



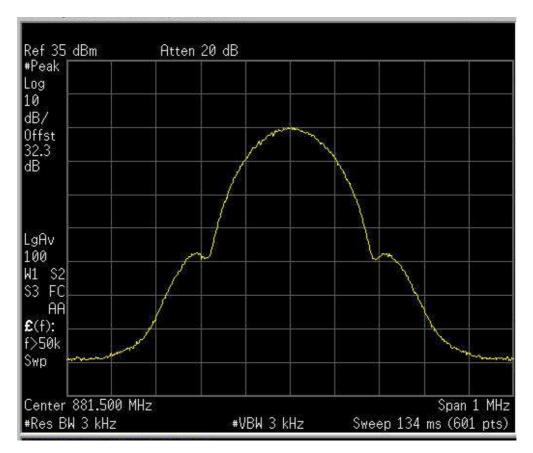
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

# Test Data – Occupied Bandwidth

GSM - Output Downlink



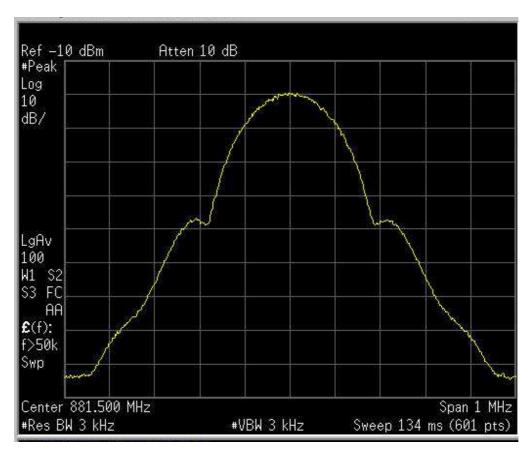
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

### Test Data – Occupied Bandwidth

GSM - Input Downlink



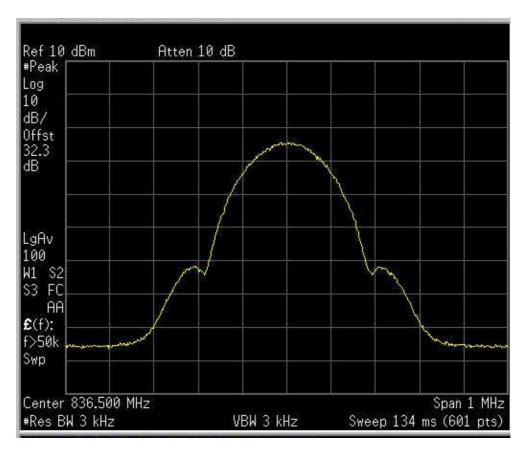
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

## Test Data – Occupied Bandwidth

GSM - Output Uplink



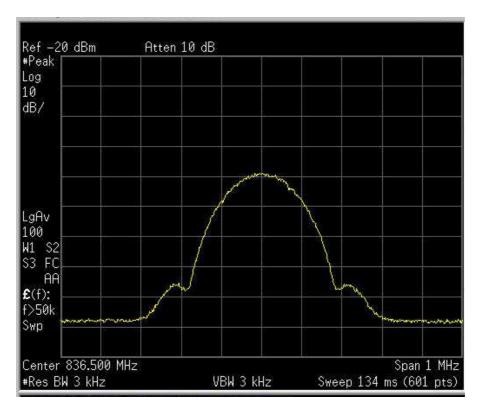
# CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

### Test Data – Occupied Bandwidth

GSM - Input Uplink



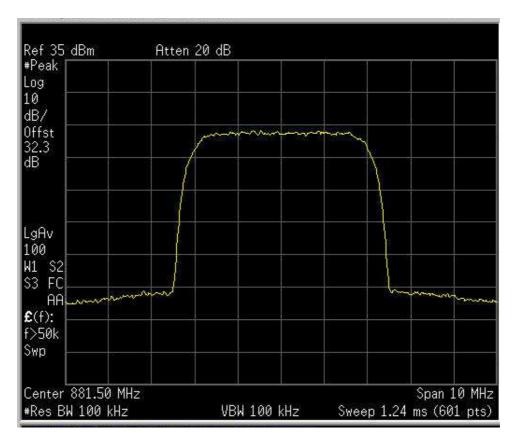
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

### **Test Data – Occupied Bandwidth** WCDMA - Output

Downlink



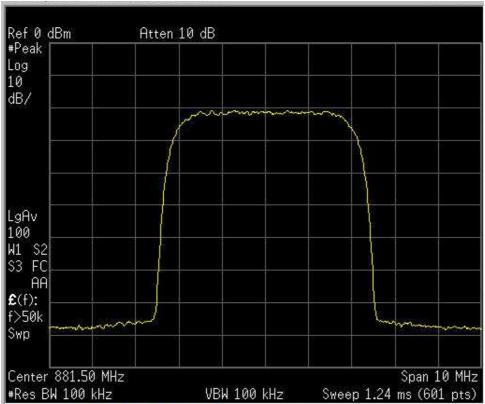
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Occupied Bandwidth WCDMA - Input

Downlink



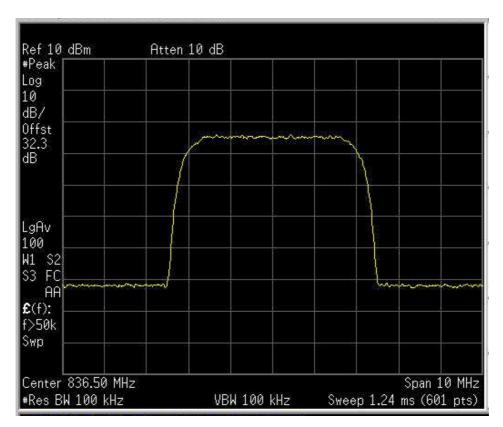
# CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

# Test Data – Occupied Bandwidth

WCDMA - Output Uplink



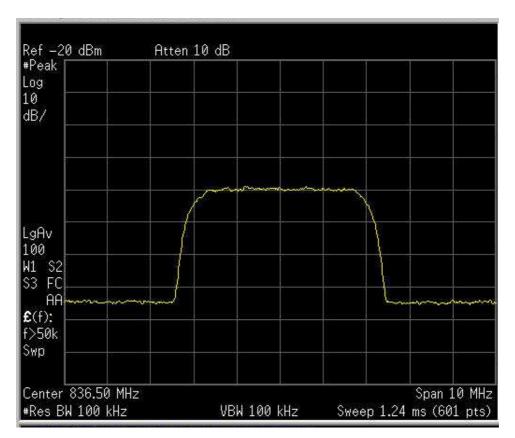
## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

# Test Data – Occupied Bandwidth

WCDMA - Input Uplink



# CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

## Section 5. Spurious Emissions at Antenna Terminals

NAME OF TEST:Spurious Emissions @ Antenna TerminalsPARA. NO.: 22.917TESTED BY:G. CurioniDATE: 21 September 2009

Test Results: Complies.

Test Data:See attached plot(s).

Equipment Used: 1-2-3b-4

Measurement Uncertainty: <u>+/- 1.9</u> dB

Temperature:24 °C

**Relative Humidity:** 50 %

### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation CDMA Downlink

32.3 dBm	#Atten 10 dB	Mkr1 867.692 –46.885 d
eak		
1		
/		
st		many man
3		
3.0		
m		
λv		
ð		
S2		
FC		
AA	1	
F):	montomen	
50k		
D		
nter 869.000	MHz	Span 5 t
s BW 30 kHz		0 kHz Sweep 5.16 ms (601 p

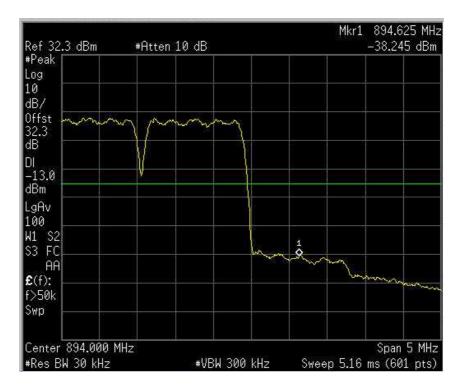
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation CDMA Downlink



### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation CDMA Uplink

Ref 10 dBm	Atten 10 dB		Mkr1	823.892 Mi -64.730 dBi
#Peak		1. -		
Log				
10				
dB/				
Offst 32.3		m	m	m
dB		1		1
DI I				
-13.0				
dBm		_8		
LgAv		Į.		
100				
W1 S2 S3 FC		1		
AA		2		
£(f):		×		
f>50k				
Swp				
Center 824.000 MH	lz	- <u>b:</u>		Span 5 MH
#Res BW 30 kHz	#VBW 300	) kHz	Sweep 5.16	ms (601 pts

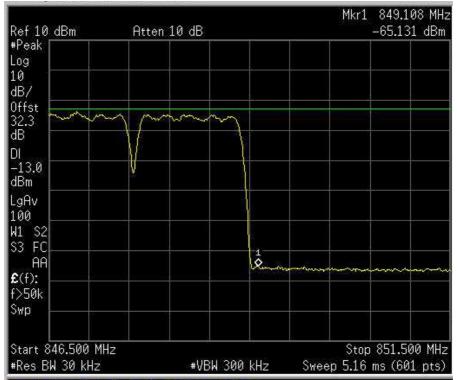
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation CDMA Uplink

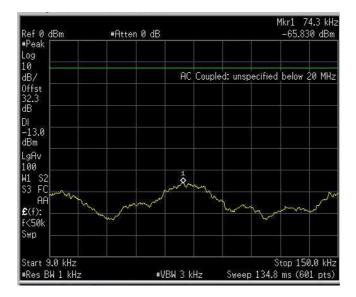


#### EQUIPMENT: TRU8A19AWWL/AC-WS

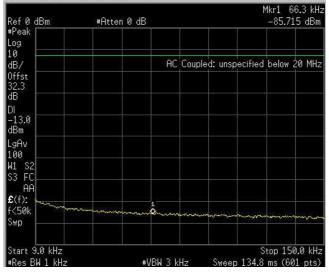
PROJECT NO.: 131640-1

### Test Data – Spurious Emissions at Antenna Terminals

Spurs - CDMA - Downlink 9 -150 kHz





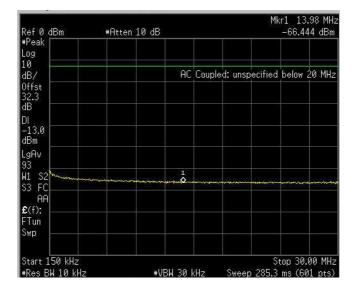


#### EQUIPMENT: TRU8A19AWWL/AC-WS

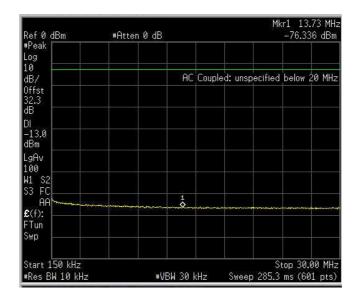
PROJECT NO.: 131640-1

### Test Data – Spurious Emissions at Antenna Terminals

Spurs – CDMA – Downlink 150 kHz – 30 MHz



Spurs – CDMA – Uplink 150 kHz – 30 MHz

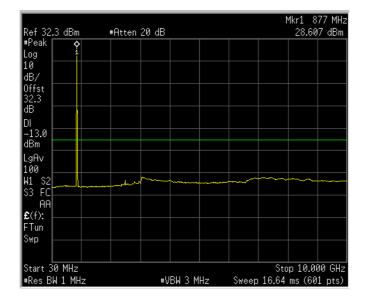


#### EQUIPMENT: TRU8A19AWWL/AC-WS

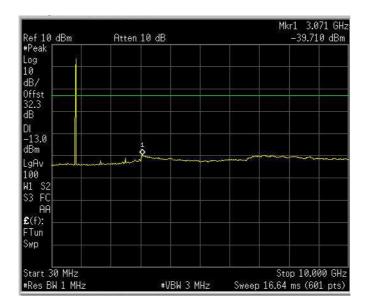
PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Spurs - CDMA - Downlink 30 MHz - 10 GHz



Spurs - CDMA - Uplink 30 MHz - 10 GHz



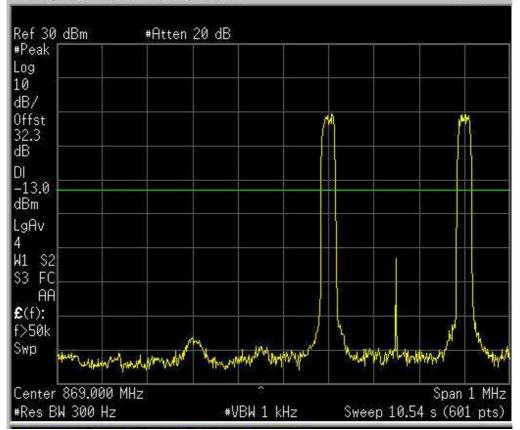
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### **Test Data – Spurious Emissions at Antenna Terminals** Lower Bandedge Intermodulation TDMA

Downlink



### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

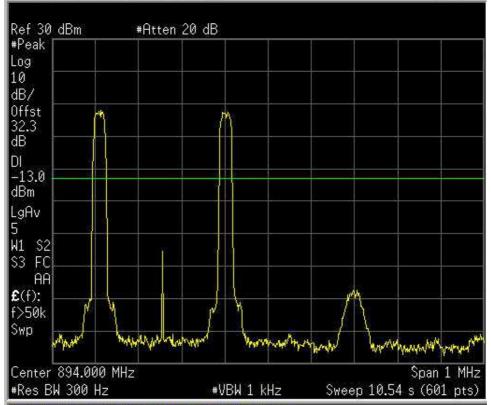
#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

## **Test Data – Spurious Emissions at Antenna Terminals** Upper Bandedge Intermodulation

TDMA

Downlink



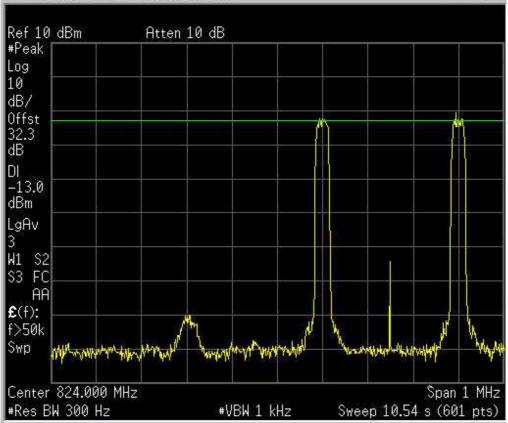
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation TDMA Uplink



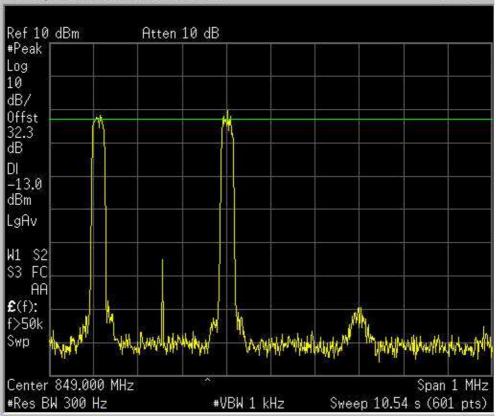
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

### Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation TDMA Uplink

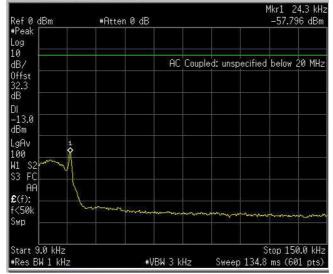


### EQUIPMENT: TRU8A19AWWL/AC-WS

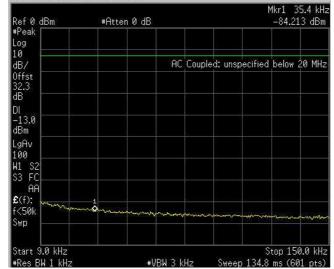
PROJECT NO.: 131640-1

### Test Data – Spurious Emissions at Antenna Terminals

Spurs – TDMA – Downlink 9 – 150 kHz



#### Spurs – TDMA – Uplink 9 – 150 kHz

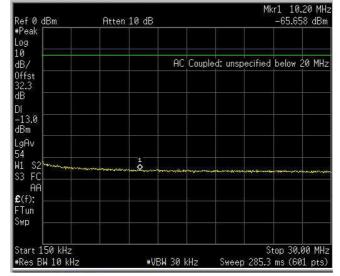


#### EQUIPMENT: TRU8A19AWWL/AC-WS

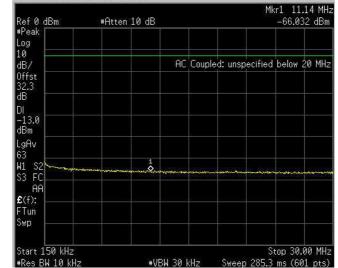
PROJECT NO.: 131640-1

### Test Data – Spurious Emissions at Antenna Terminals

Spurs – TDMA – Downlink 150 kHz – 30 MHz



#### Spurs – TDMA – Uplink 150 kHz – 30 MHz

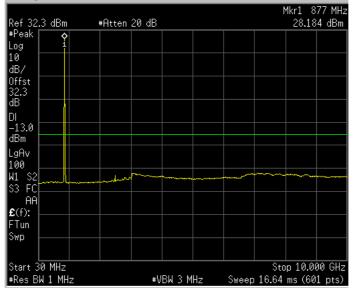


#### EQUIPMENT: TRU8A19AWWL/AC-WS

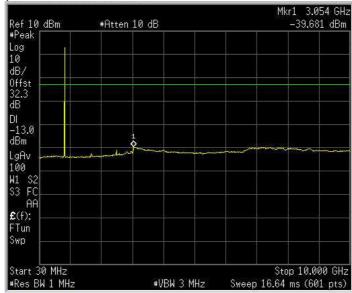
PROJECT NO.: 131640-1

### Test Data – Spurious Emissions at Antenna Terminals

Spurs – TDMA – Downlink 30 MHz – 10 GHz







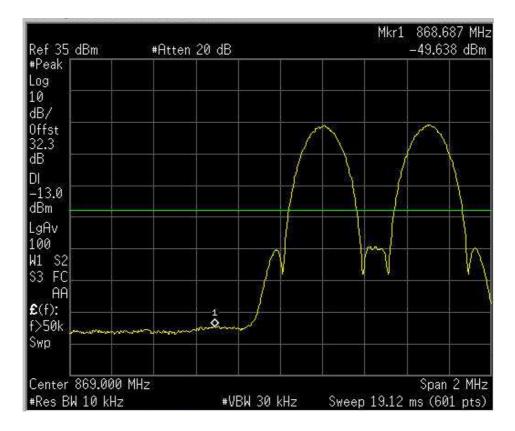
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation EDGE Downlink



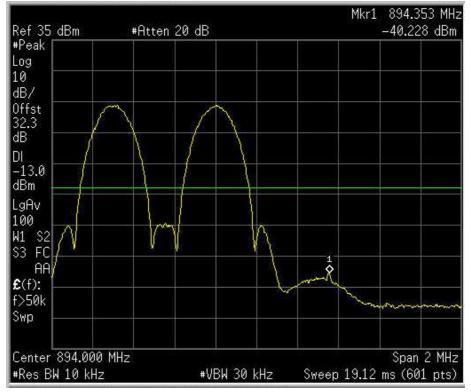
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation EDGE Downlink



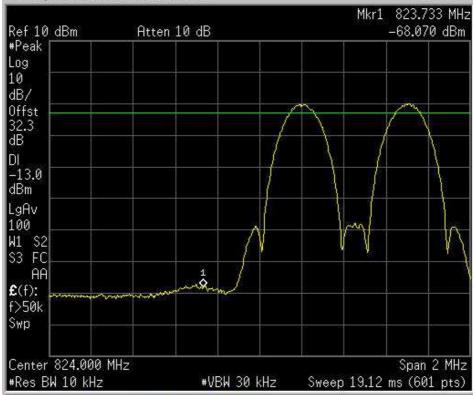
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation EDGE Uplink



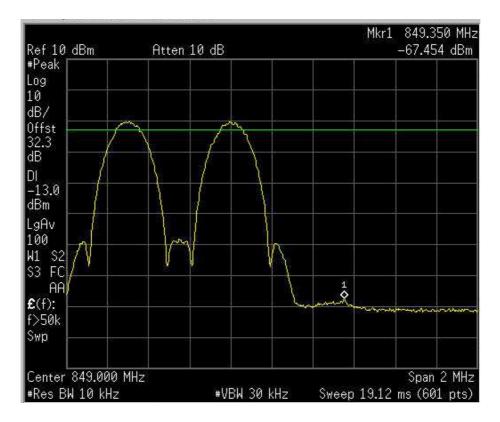
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation EDGE Uplink

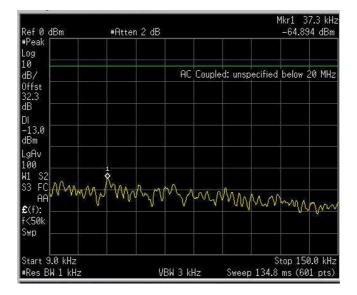


#### EQUIPMENT: TRU8A19AWWL/AC-WS

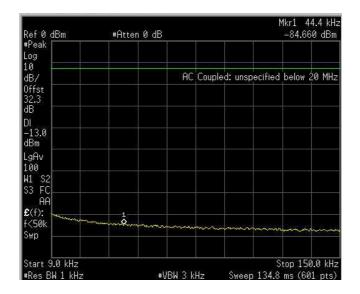
PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE – Downlink 9 – 150 kHz



Spurs – EDGE – Uplink 9 – 150 kHz

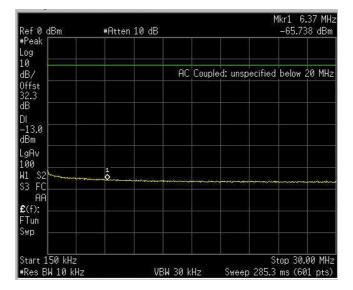


### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

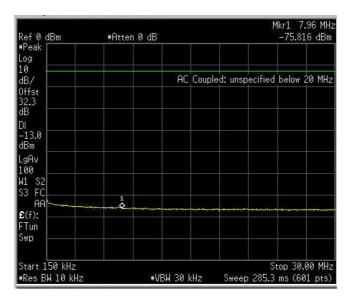
### Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE – Downlink 150 kHz – 30 MHz





150 kHz – 30 MHz

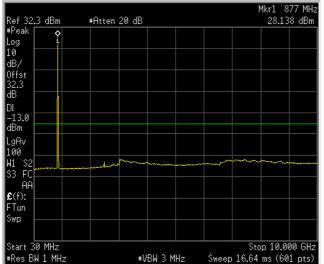


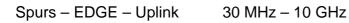
### EQUIPMENT: TRU8A19AWWL/AC-WS

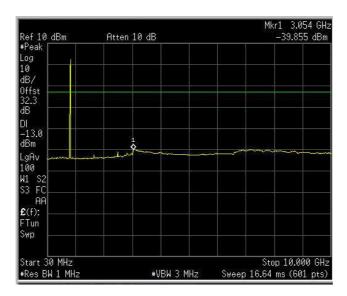
PROJECT NO.: 131640-1

# Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE – Downlink 30 MHz – 10 GHz







### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation GSM Downlink

Ref 35 dBm	#Atten 20 dB				868.59 -46.79	
#Peak				1		
_og 10						
1B/		2			1000 W	
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IB				1		
)  -13.0						\
dBm						
.gAv						Ţ
.00 11 S2		$\gamma$	Y	wy		-14
3 FC						
AA	1					
S(f): >50k					Ì	
Swp name	www.wW					
Center 869.000				1010	Span	
ŧRes BW 10 kHz	#VBM	30 kHz	Смеер	19.12 r	ns (601	. pts,

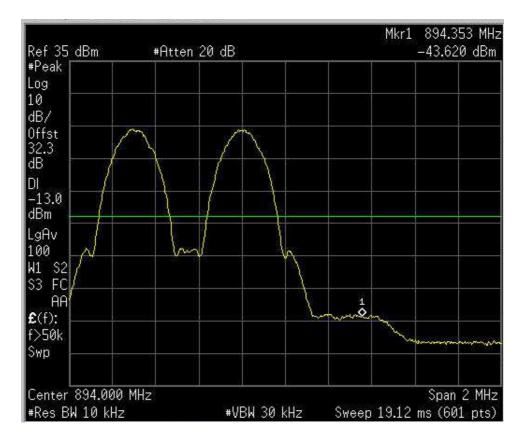
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation GSM Downlink



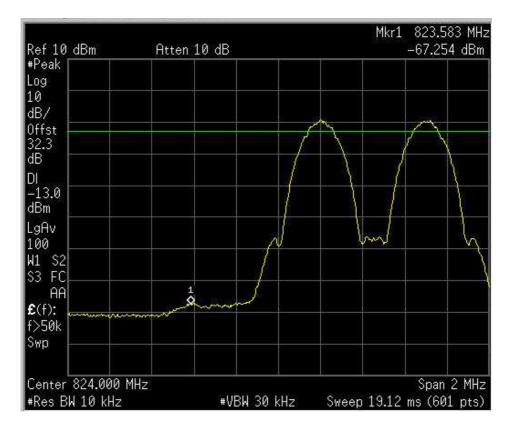
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation GSM Uplink



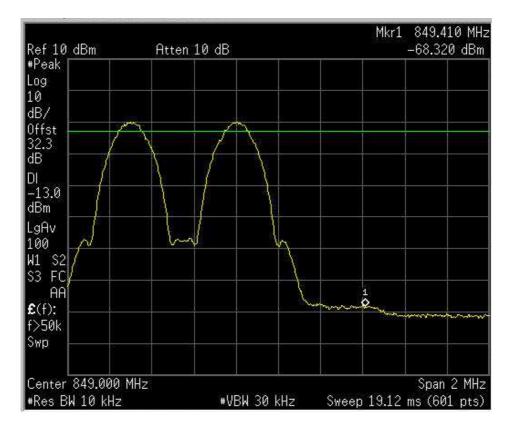
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation GSM Uplink

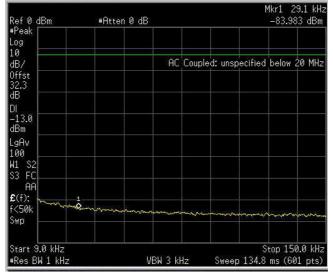


### EQUIPMENT: TRU8A19AWWL/AC-WS

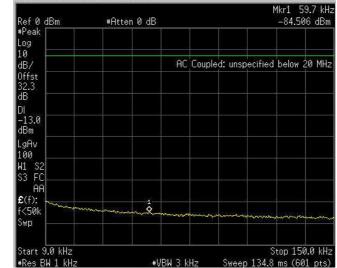
PROJECT NO.: 131640-1

### Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM – Downlink 9 – 150 kHz





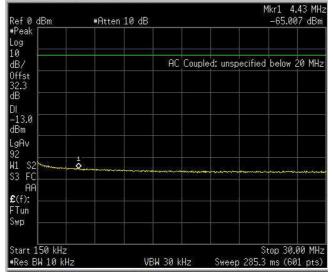


### EQUIPMENT: TRU8A19AWWL/AC-WS

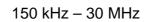
PROJECT NO.: 131640-1

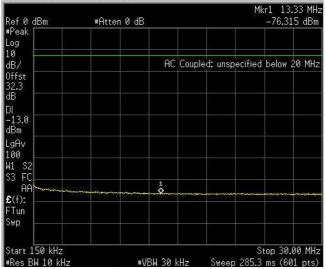
## Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM – Downlink 150 kHz – 30 MHz



Spurs – GSM – Uplink



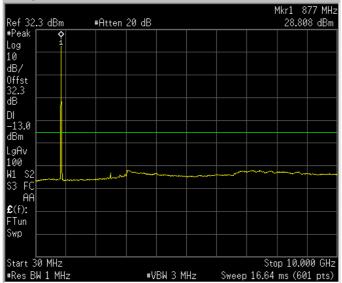


#### EQUIPMENT: TRU8A19AWWL/AC-WS

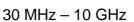
PROJECT NO.: 131640-1

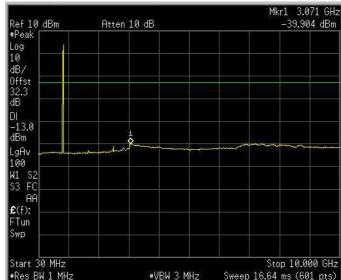
## Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM – Downlink 30 MHz – 10 GHz









### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation W-CDMA Downlink

ef 35 dBm Peak	Atten					
ig						
) 3/						
fst						
2.3			/	mon		4
3			1			$\langle   \rangle$
13.0			-1	-		+
3m						
iAv						
)0						
. S2 3 FC			Í			N.
AA			1			
(f):		man	mind			
Fun min	morent					
/p q					2	

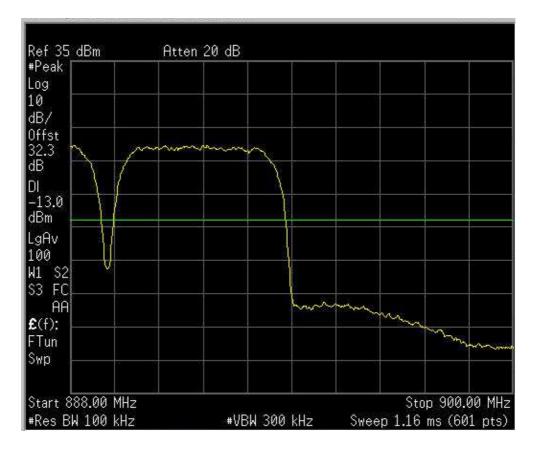
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation W-CDMA Downlink



### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation W-CDMA Uplink

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f 10 dBm	Atten 10 dB			-60.258 dE
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20				$\rightarrow +$
3.0				1 6
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AA		- June De		
f):				
un				
'p				
	LIG-C			
nter 824.00 M				Span 12 M
es BW 100 kHz	z #VB	W 300 kHz	Sweep 1.16	ms (601 pt:

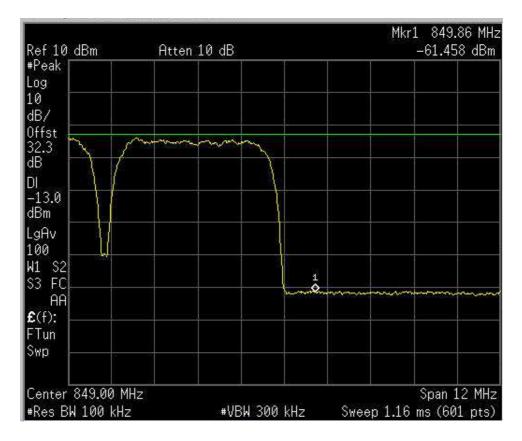
### CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation W-CDMA Uplink

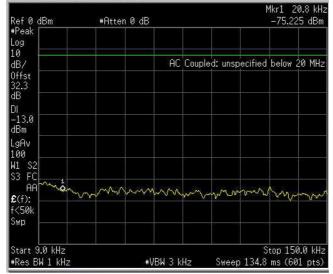


#### EQUIPMENT: TRU8A19AWWL/AC-WS

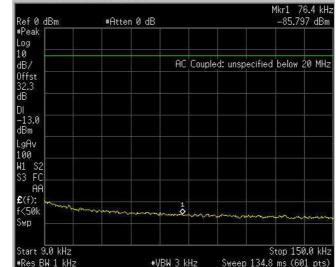
PROJECT NO.: 131640-1

### Test Data – Spurious Emissions at Antenna Terminals

Spurs – W-CDMA – Downlink 9 – 150 kHz



Spurs – W-CDMA – Uplink 9 – 150 kHz

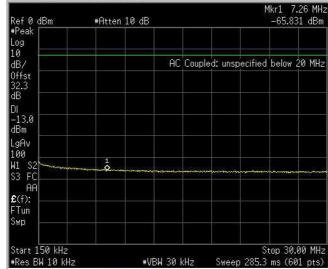


#### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

### Test Data – Spurious Emissions at Antenna Terminals

Spurs – W-CDMA – Downlink 150 kHz – 30 MHz



Spurs – W-CDMA –	Uplink	150 kHz – 30 MHz

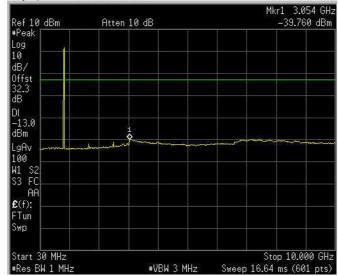
Ref 0 dBm #Peak	#Atten 0 dB				-76.0	
Log						
10					12 12	
dB/		HC	Coupled: un	specified	below	20 MI
Offst						
32.3 dB						
DI -13.0						
dBm						
LgAv						
82						
W1 S2						
\$3 FC		- 28				
AA						
<b>£</b> (f):		- markers and	Jane and State and State and State and State			
FTun						
Swp		2				

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### Mkr1 877 MHz 27.706 dBm Ref 32.3 dBm #Peak #Atten 20 dB Log 10 dΒ Offst -13.0 gA 00 Ы1 \$3 FC AA £(f): -Tun òwр Stop 10.000 GHz Sweep 16.64 ms (601 pts) Start 30 MHz #Res BW 1 MHz #VBW 3 MHz





## Test Data – Spurious Emissions at Antenna Terminals

Spurs – W-CDMA – Downlink 30 MHz – 10 GHz

### EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

#### Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious	PARA. NO.: 22.917
TESTED BY: G. Curioni	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 of -13 dBm.

AMPS band - Master/remote 120/120 Vac					
Frequency range	D.L. & U.L.	Result [dBm] Max. field strength pol. V/H	Limit		
30 – 1000 MHz			-13 dBm		
	78.6 MHz	-67.8 dBm H			
1 – 10 GHz			-13dBm		
		negligible			

AMPS 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			Limit: -13 dbm		
	33.9 MHz	-51.4 dBm H			
	92.2 MHz	-63.5 dBm H			
	102.0 MHz	-62.7 dBm V			
	152.4 MHz	-51.3 dBm V			
1 – 10 GHz			Limit: -13 dBm		
		negligible			

EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

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

Measurement Uncertainty: <u>+/-5</u> dB

Temperature:24°C

**Relative Humidity:** 55 %

## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

# Section 7. Filter Frequency Response

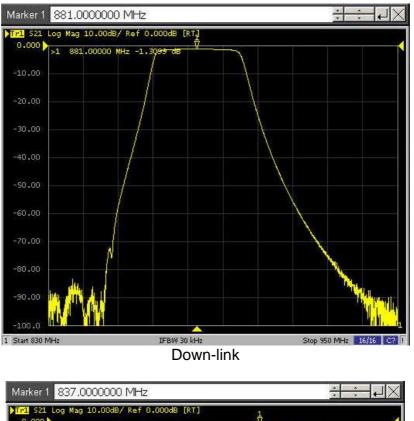
24 °C

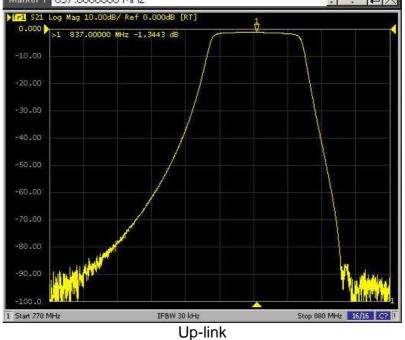
NAME OF TEST: Filter Frequency Response		PARA. NO.: 2-11-04/EAB/RF	
TESTED BY: G. Curioni		DATE: 23 January 2010	
Test Results:	Complies.		
Test Data:	See attached plot(s).		
Equipment Used: 3a Measurement Uncertainty: <u>+/-1,9</u> dB			

Temperature:

Relative Humidity:55 %

### EQUIPMENT: TRU8A19AWWL/AC-WS





# EQUIPMENT: TRU8A19AWWL/AC-WS

## PROJECT NO.: 131640-1

# 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	AMPS	UL 836.5	32.3 dB	
		DL 881.5	32.3 dB	
2xcables+directiona				
coupler+dummyload				

# EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

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

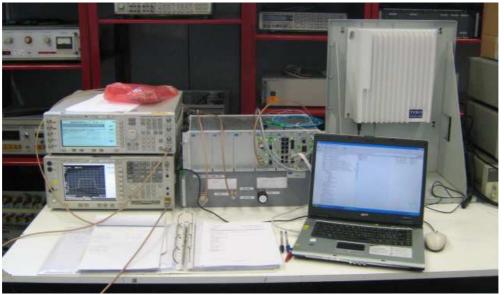
Property of Nemko Italy

## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

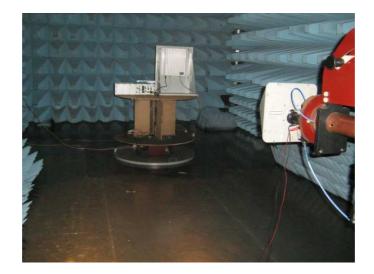
## Section 9. PHOTOS

SETUP



## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS





## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

## EQUIPMENT: TRU8A19AWWL/AC-WS



## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS



MASTER

## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

# EQUIPMENT: TRU8A19AWWL/AC-WS





## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

# ANNEX A - TEST DETAILS

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

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

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

#### 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 a dipole. 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 erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

### EQUIPMENT: TRU8A19AWWL/AC-WS

### PROJECT NO.: 131640-1

### NAME OF TEST: Occupied Bandwidth

### PARA. NO.: 2.1049

Minimum Standard: Not defined (Input/Output)

#### Method Of Measurement:

#### <u>CDMA</u>

Spectrum analyzer settings: RBW=VBW=30 kHz Span: 5 MHz Sweep: Auto

#### <u>GSM / EDGE</u>

RBW=VBW= 3 kHz Span: 1 MHz Sweep: Auto

### <u>TDMA</u>

RBW=VBW= 1 kHz Span: 1 MHz Sweep: Auto

#### W-CDMA

RBW=VBW= 100 kHz Span: 10 MHz Sweep: Auto

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### NAME OF TEST: Spurious Emission at Antenna PARA. NO.: 2.1051 Terminals

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power.

### Method Of Measurement:

### Method Of Measurement:

Spectrum analyzer settings:

### <u>CDMA</u>

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

### <u>GSM / EDGE</u>

### <u>TDMA</u>

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

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

### NAME OF TEST: Field Strength of Spurious Radiation PARA. NO.: 2.1053

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power.

### 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 a dipole. 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 erp is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

#### NAME OF TEST: Frequency Stability

### PARA. NO.: 2.1055

Minimum Standard:

Para. No. 22.355. The transmitter carrier frequency shall remain within the tolerances given in Table C-1.

Table C-1				
Freq. Range (MHz)	Base, fixed	Mobile > 3 W	Mobile ≤ 3 W	
821 to 896	1.5	2.5	2.5	

#### 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.

## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

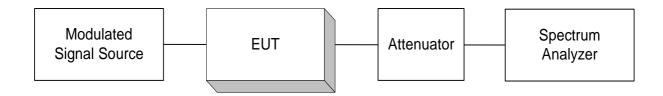
EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

# ANNEX B - TEST DIAGRAMS

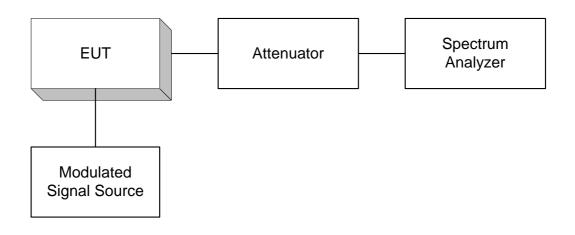
## EQUIPMENT: TRU8A19AWWL/AC-WS

## PROJECT NO.: 131640-1

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



### Para. No. 2.989 - Occupied Bandwidth

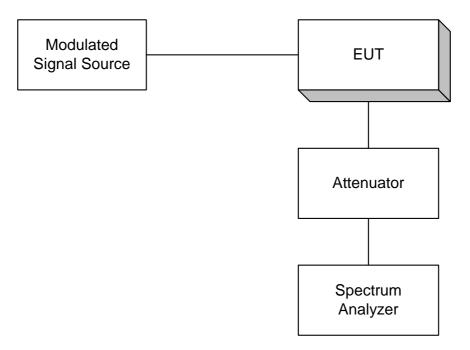


## CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

## EQUIPMENT: TRU8A19AWWL/AC-WS

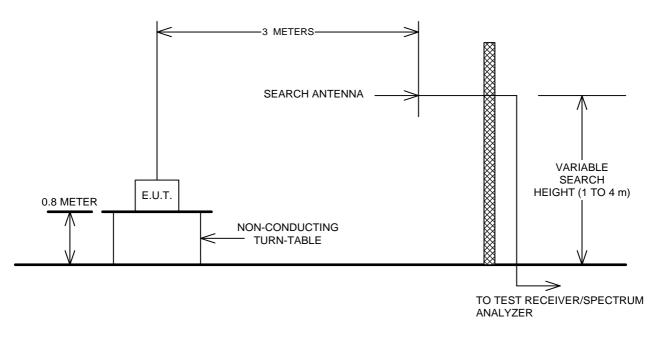
PROJECT NO.: 131640-1

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



### EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1



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

Para. No. 2.995 - Frequency Stability

