

| 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: | CFR 47, Part 22, Subpar 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:

.

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 nk: 869 to | 894 MHz | | | |
| Frequency Range: Upl | i nk: 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 | | | |
| | ZZ = | Power supply: AC: Power Supply: 85-264Vac, 50-60Hz 48: Power Supply: 36-72Vdc | | | |

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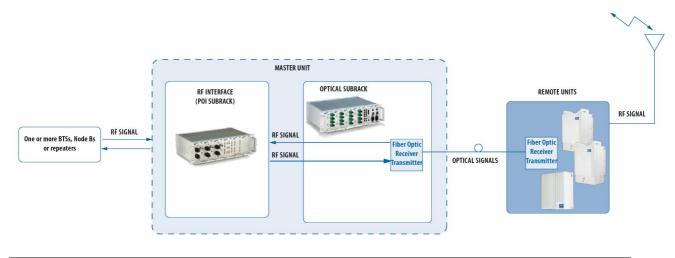
EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO .:

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| | 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: $\lambda = 1610 \pm 3 \text{ nm}$ |
| j = | Optical connector: S: SC-APC E: E-2000 |

System Diagram



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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 %

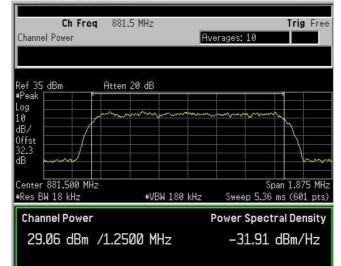
QNH: _____980 hPa

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EQUIPMENT: TRU8A19AWWL/AC-WS

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RF Power Output D.L. mod. CDMA



RF Power Output D.L. mod. TDMA



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EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

RF Power Output D.L. mod. EDGE

| Ch Fre Channel Power | : q 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

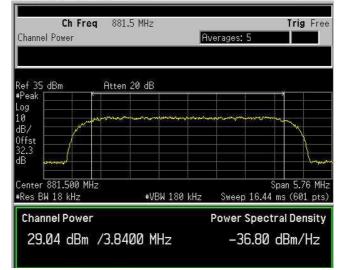


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EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

RF Power Output D.L. mod. WCDMA

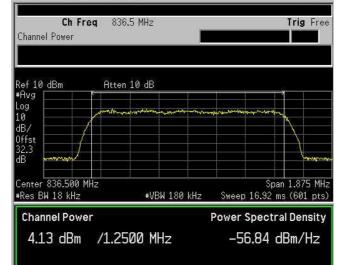


CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

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RF Power Output U.L. mod. CDMA



RF Power Output U.L. mod. TDMA



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EQUIPMENT: TRU8A19AWWL/AC-WS

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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

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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>1X10⁻⁷</u> | |
| Temperature: | _24_ °C | |
| Relative Humidity: | 50 % | |

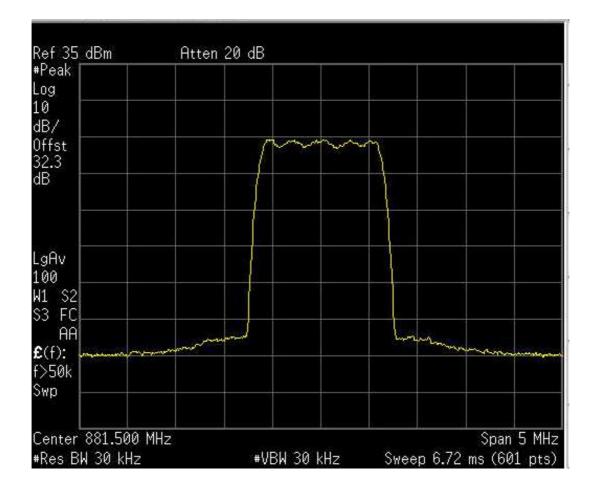
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Occupied Bandwidth CDMA - Output

Downlink



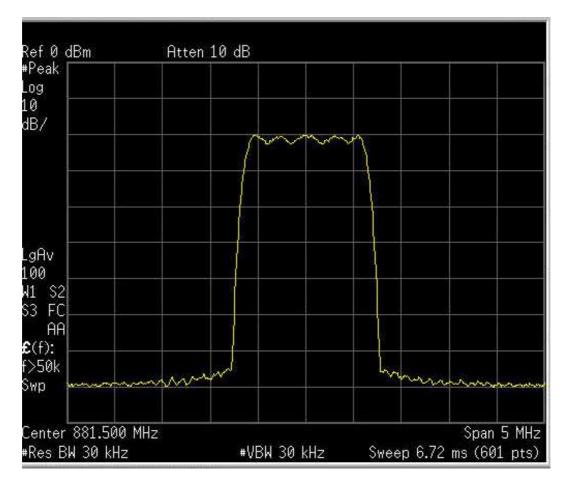
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Occupied Bandwidth

CDMA - Input Downlink



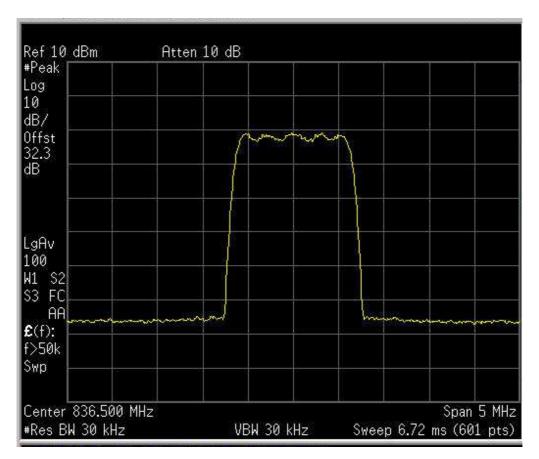
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

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Test Data – Occupied Bandwidth

CDMA - Output Uplink



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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 | | |
| £ (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 | |

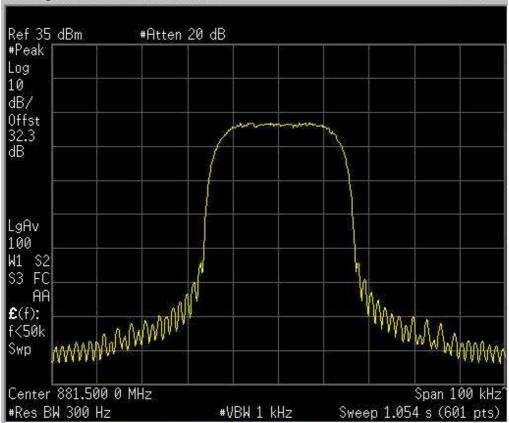
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EQUIPMENT: TRU8A19AWWL/AC-WS

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Test Data – Occupied Bandwidth

TDMA - Output Downlink



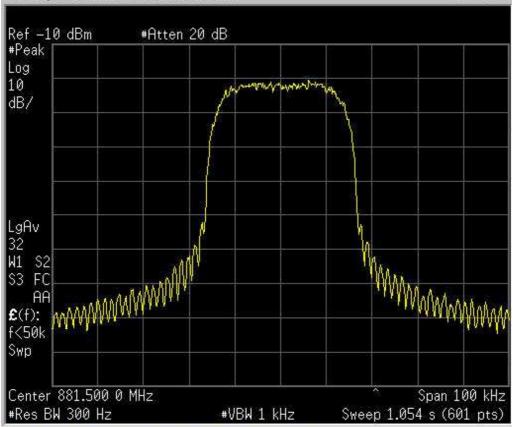
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EQUIPMENT: TRU8A19AWWL/AC-WS

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Test Data – Occupied Bandwidth

TDMA - Input Downlink



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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

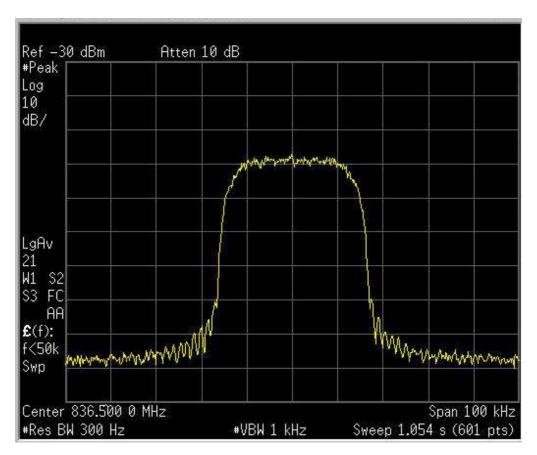
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EQUIPMENT: TRU8A19AWWL/AC-WS

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Test Data – Occupied Bandwidth

TDMA - Input Uplink



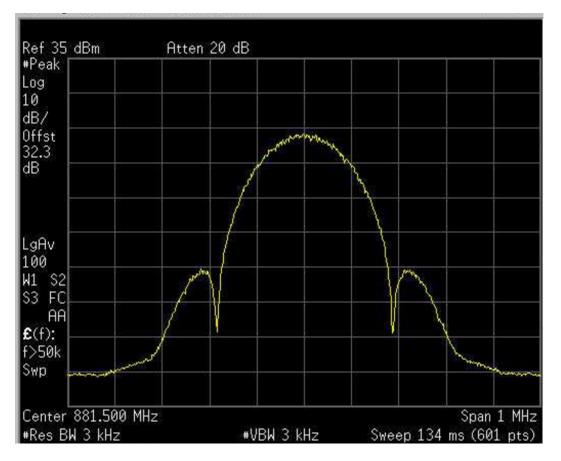
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Occupied Bandwidth EDGE - Output

Downlink

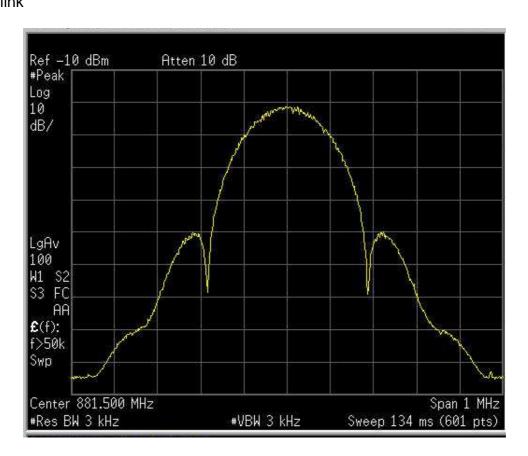


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EQUIPMENT: TRU8A19AWWL/AC-WS

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Test Data – Occupied Bandwidth EDGE - Input Downlink



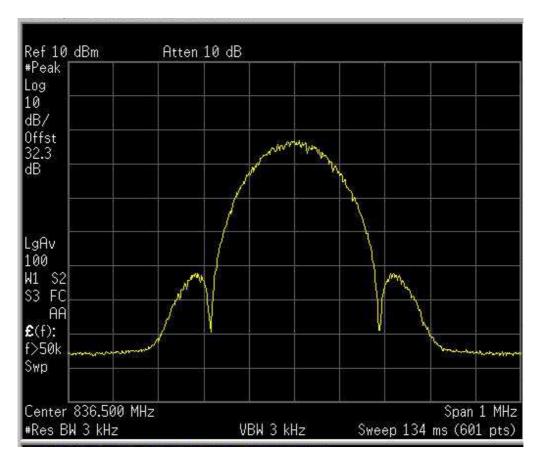
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

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Test Data – Occupied Bandwidth

EDGE - Output Uplink



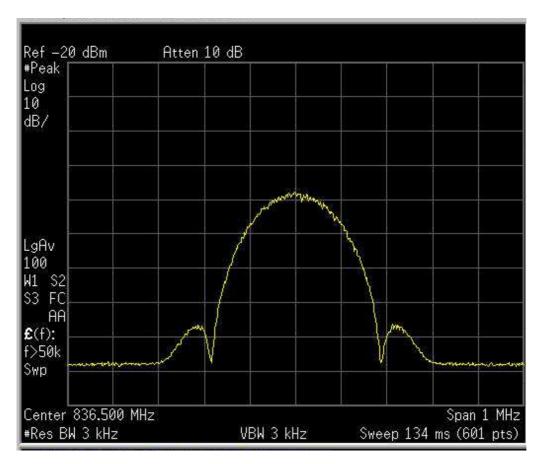
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Occupied Bandwidth

EDGE - Input Uplink



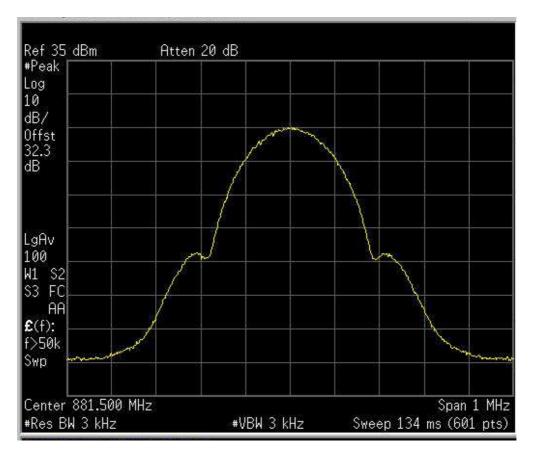
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

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Test Data – Occupied Bandwidth

GSM - Output Downlink



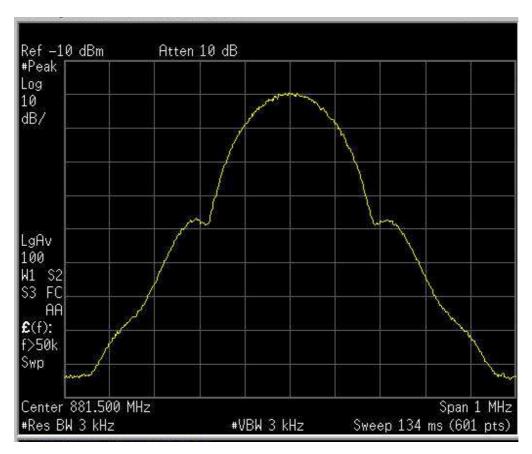
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EQUIPMENT: TRU8A19AWWL/AC-WS

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Test Data – Occupied Bandwidth

GSM - Input Downlink



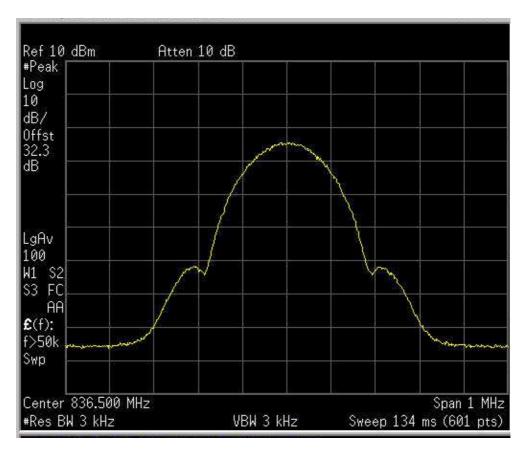
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Occupied Bandwidth

GSM - Output Uplink



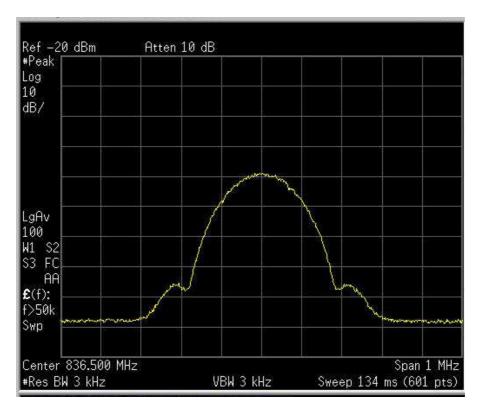
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

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Test Data – Occupied Bandwidth

GSM - Input Uplink



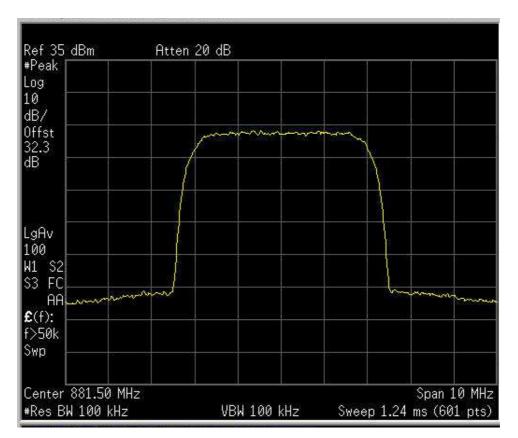
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Occupied Bandwidth WCDMA - Output

Downlink



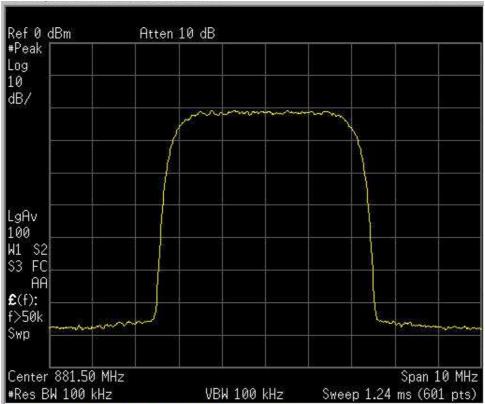
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Occupied Bandwidth WCDMA - Input

Downlink



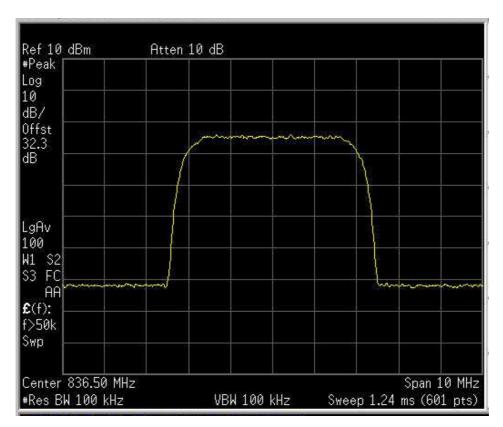
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

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Test Data – Occupied Bandwidth

WCDMA - Output Uplink



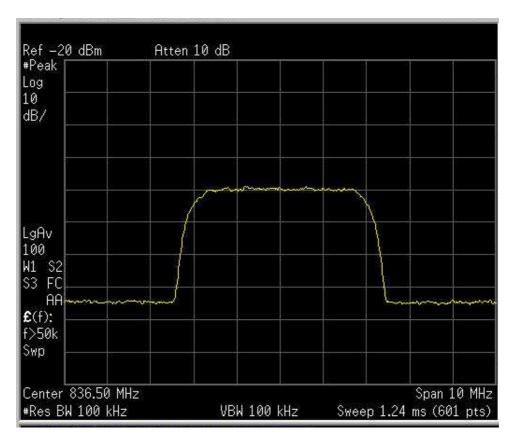
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

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 %

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EQUIPMENT: TRU8A19AWWL/AC-WS

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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 |

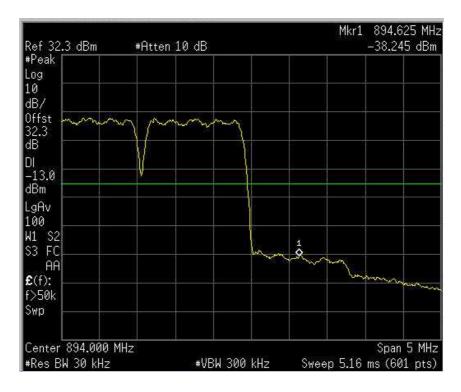
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation CDMA Downlink



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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 |

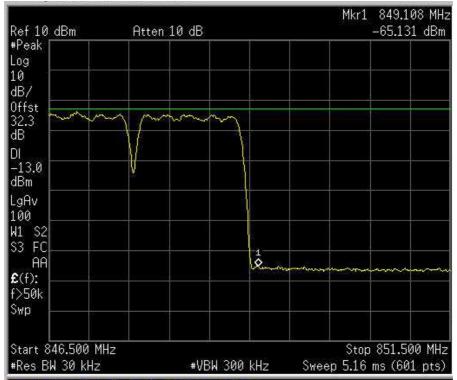
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation CDMA Uplink

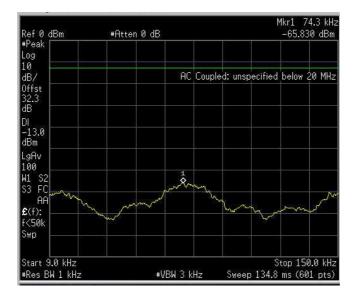


EQUIPMENT: TRU8A19AWWL/AC-WS

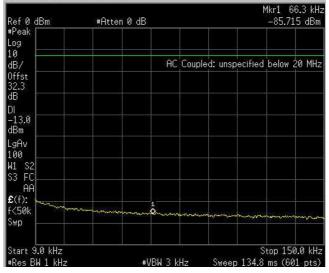
PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Spurs - CDMA - Downlink 9 -150 kHz





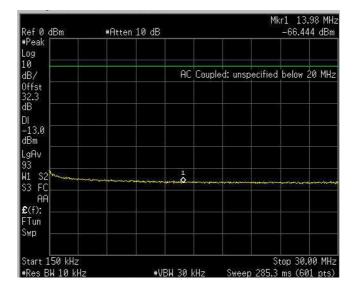


EQUIPMENT: TRU8A19AWWL/AC-WS

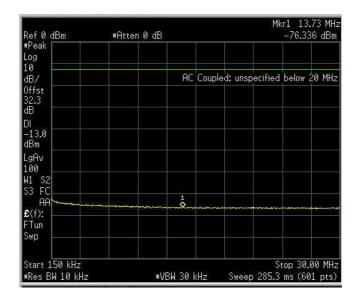
PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Spurs – CDMA – Downlink 150 kHz – 30 MHz



Spurs – CDMA – Uplink 150 kHz – 30 MHz

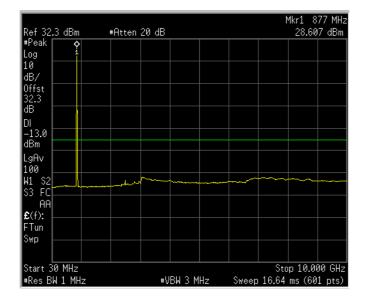


EQUIPMENT: TRU8A19AWWL/AC-WS

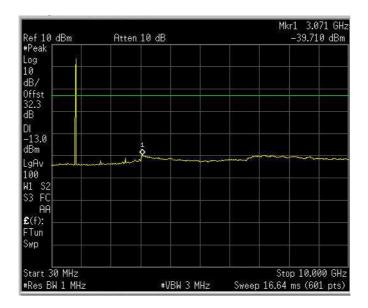
PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Spurs - CDMA - Downlink 30 MHz - 10 GHz



Spurs - CDMA - Uplink 30 MHz - 10 GHz



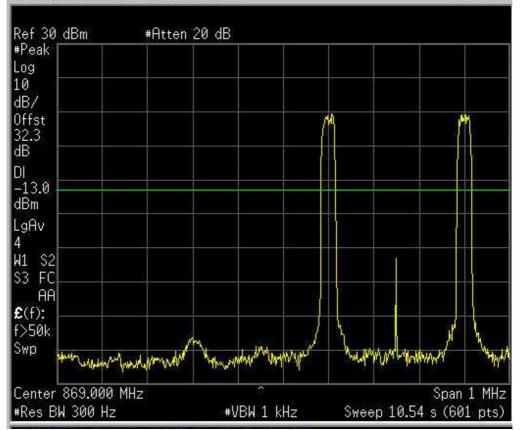
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

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

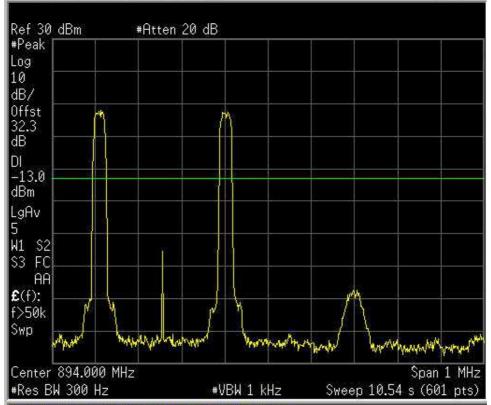
EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals Upper Bandedge Intermodulation

TDMA

Downlink



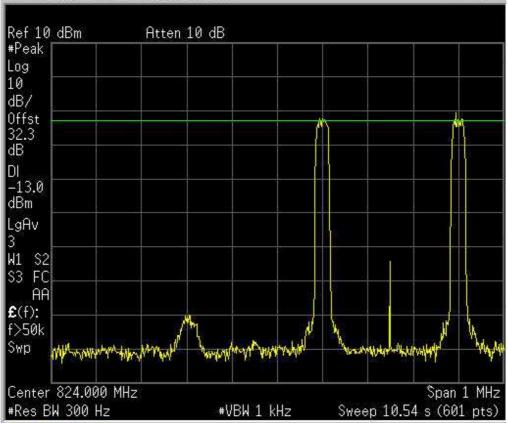
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation TDMA Uplink



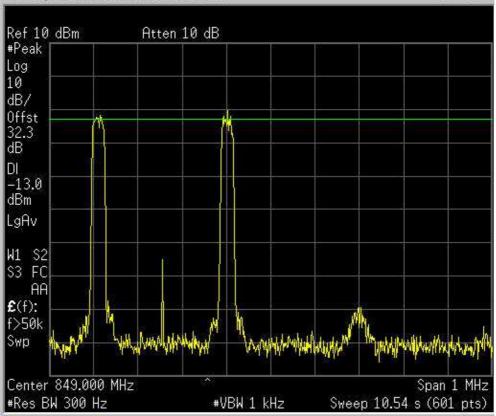
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation TDMA Uplink

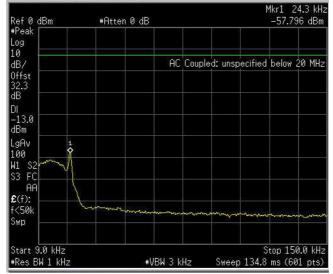


EQUIPMENT: TRU8A19AWWL/AC-WS

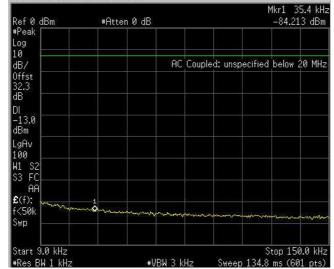
PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Spurs – TDMA – Downlink 9 – 150 kHz



Spurs – TDMA – Uplink 9 – 150 kHz

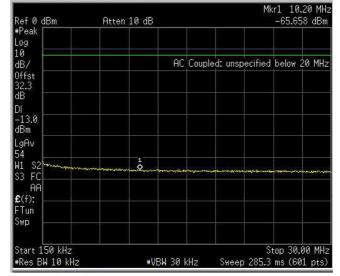


EQUIPMENT: TRU8A19AWWL/AC-WS

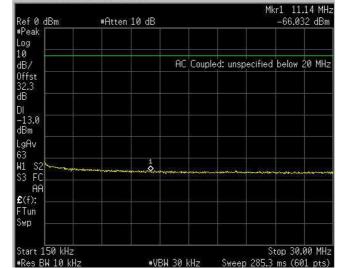
PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Spurs – TDMA – Downlink 150 kHz – 30 MHz



Spurs – TDMA – Uplink 150 kHz – 30 MHz

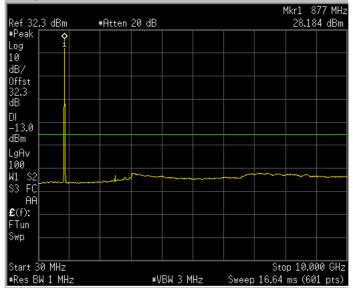


EQUIPMENT: TRU8A19AWWL/AC-WS

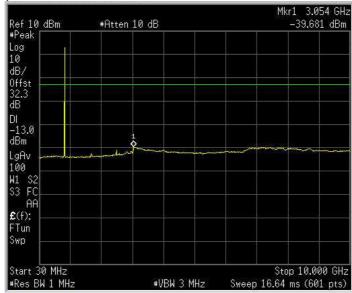
PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Spurs – TDMA – Downlink 30 MHz – 10 GHz







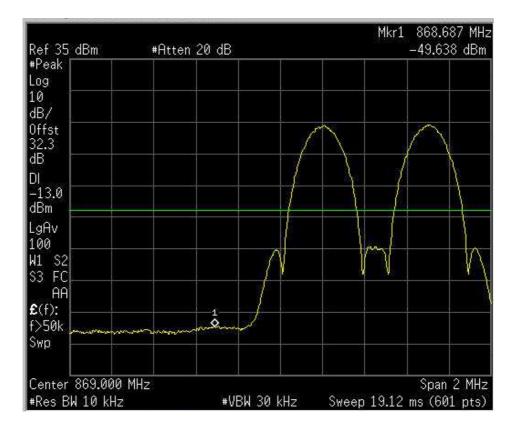
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation EDGE Downlink



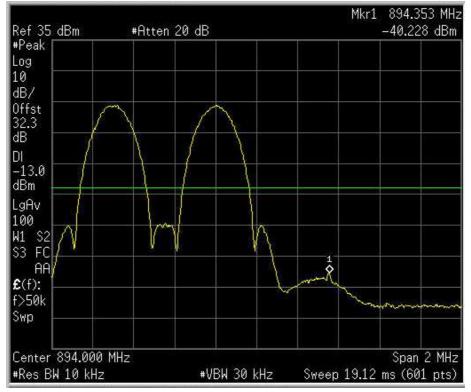
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation EDGE Downlink



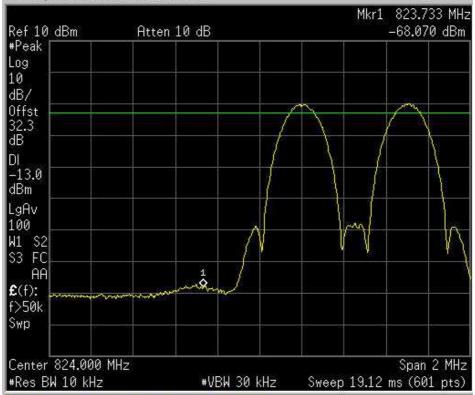
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation EDGE Uplink



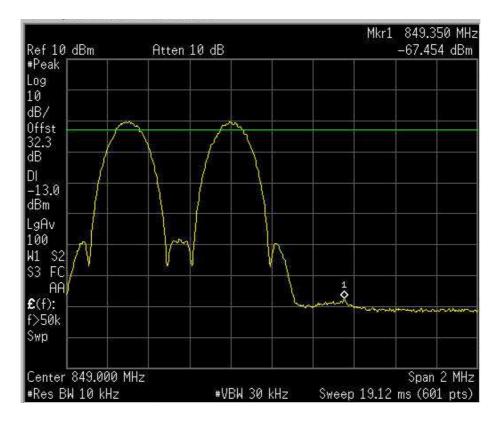
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation EDGE Uplink

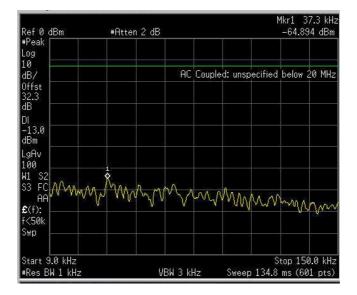


EQUIPMENT: TRU8A19AWWL/AC-WS

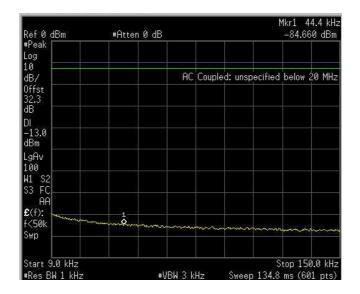
PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE – Downlink 9 – 150 kHz



Spurs – EDGE – Uplink 9 – 150 kHz

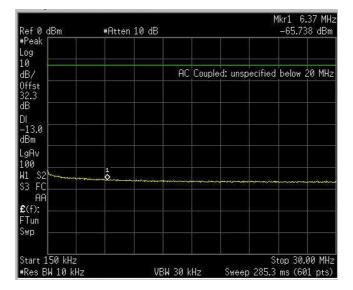


EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

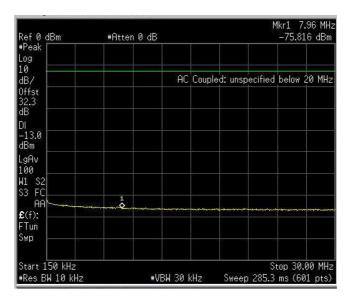
Test Data – Spurious Emissions at Antenna Terminals

Spurs – EDGE – Downlink 150 kHz – 30 MHz





150 kHz – 30 MHz

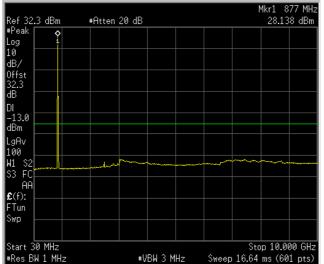


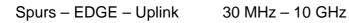
EQUIPMENT: TRU8A19AWWL/AC-WS

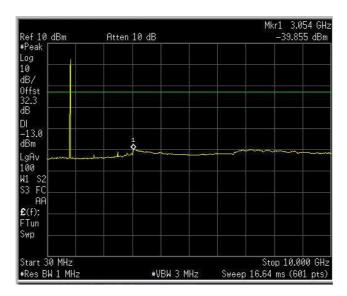
PROJECT NO.: 131640-1

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 | |
| Offst 32.3 | | 1 | \mathbb{N} | | \sim | |
| IB | | | | 1 | | |
|) -13.0 | | | | | | \ |
| dBm | | | | | | |
| .gAv | | | | | | Ţ |
| .00 11 S2 | | γ | 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, |

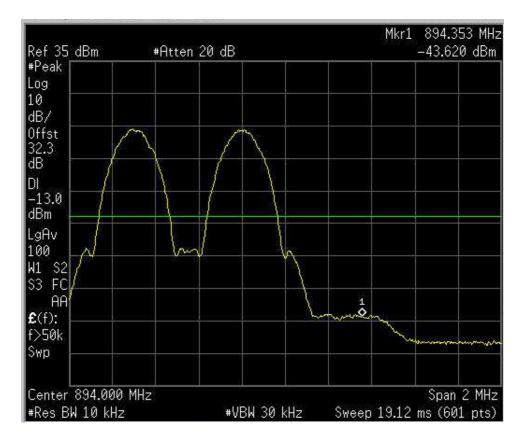
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation GSM Downlink



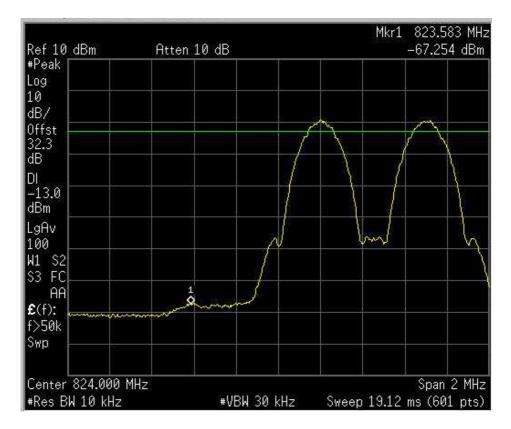
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Lower Bandedge Intermodulation GSM Uplink



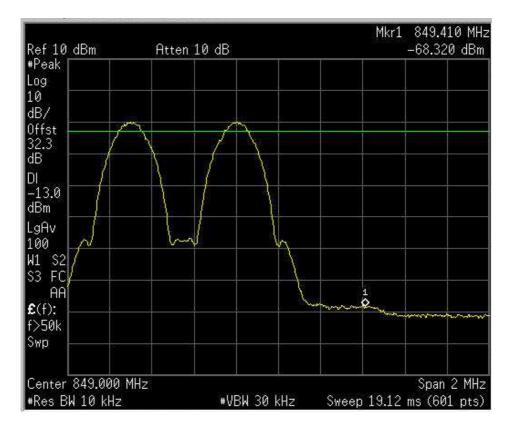
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation GSM Uplink

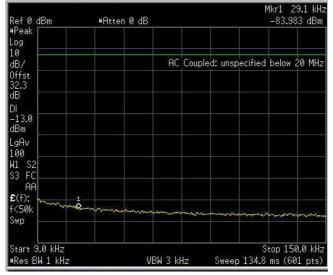


EQUIPMENT: TRU8A19AWWL/AC-WS

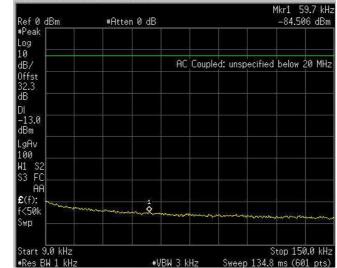
PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM – Downlink 9 – 150 kHz





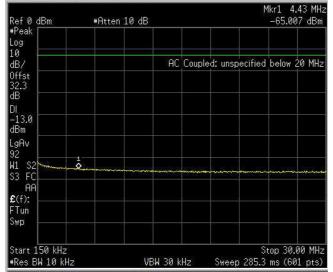


EQUIPMENT: TRU8A19AWWL/AC-WS

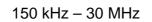
PROJECT NO.: 131640-1

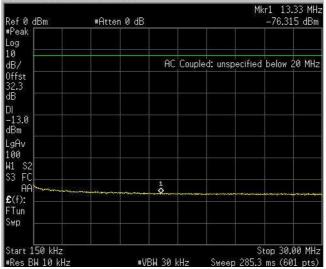
Test Data – Spurious Emissions at Antenna Terminals

Spurs – GSM – Downlink 150 kHz – 30 MHz



Spurs – GSM – Uplink



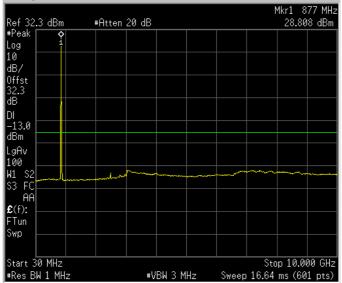


EQUIPMENT: TRU8A19AWWL/AC-WS

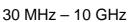
PROJECT NO.: 131640-1

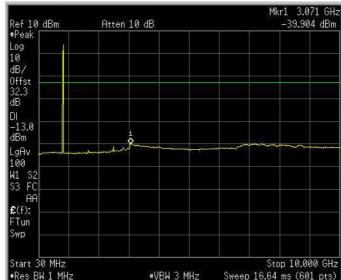
Test Data – Spurious Emissions at Antenna Terminals

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 | |
| | | | | | | |

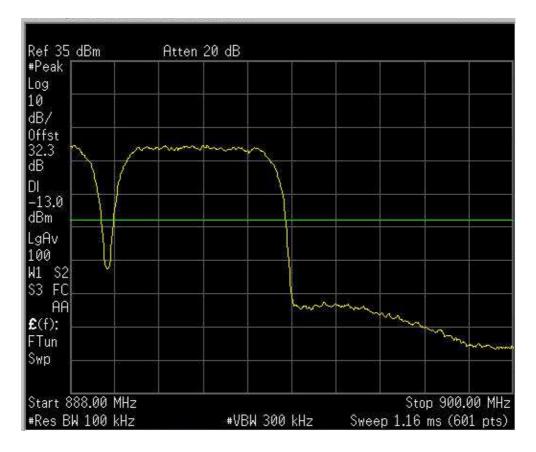
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

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

| | | | | 823.00 M |
|---------------|-------------|-----------|------------|-----------------|
| f 10 dBm | Atten 10 dB | | | -60.258 dE |
| 'eak | | | | |
| g | | | | |
| | | | | |
| 37 | | | | |
| fst 📃 | | | | |
| .3 | | m | minum | my i |
| | | | | - + f |
| | | | | γ |
| 20 | | | | $\rightarrow +$ |
| 3.0 | | | | 1 6 |
| 3m | | | | |
| Av | | 147 1 | | 11 |
| 10 | | | | |
| S2 | | | | P |
| FC | | | | |
| 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: |

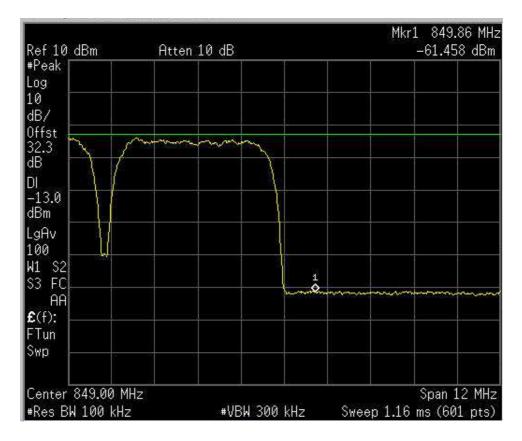
CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Upper Bandedge Intermodulation W-CDMA Uplink

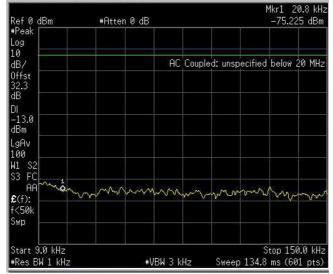


EQUIPMENT: TRU8A19AWWL/AC-WS

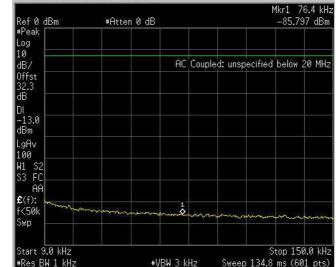
PROJECT NO.: 131640-1

Test Data – Spurious Emissions at Antenna Terminals

Spurs – W-CDMA – Downlink 9 – 150 kHz



Spurs – W-CDMA – Uplink 9 – 150 kHz

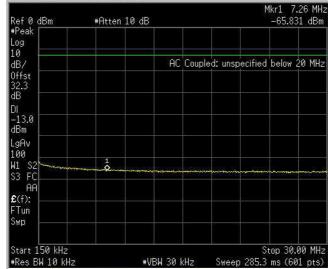


EQUIPMENT: TRU8A19AWWL/AC-WS

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 |
|------------------|--------|------------------|
| | | |

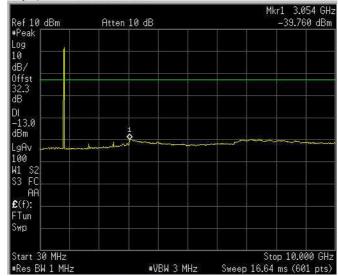
| Ref 0 dBm #Peak | #Atten 0 dB | | | | -76.0 | |
|--------------------|-------------|---------------|--|-----------|-------|-------|
| Log | | | | | | |
| 10 | | | | | 12 12 | |
| dB/ | | HC | Coupled: un | specified | below | 20 MI |
| Offst | | | | | | |
| 32.3 dB | | | | | | |
| | | | | | | |
| DI -13.0 | | | | | | |
| dBm | | | | | | |
| LgAv | | | | | | |
| 82 | | | | | | |
| W1 S2 | | | | | | |
| \$3 FC | | - 28 | | | | |
| AA | | | | | | |
| £ (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

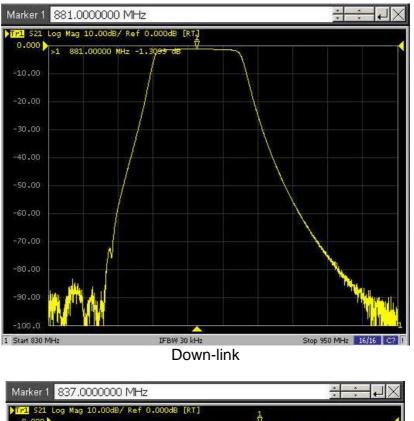
24 °C

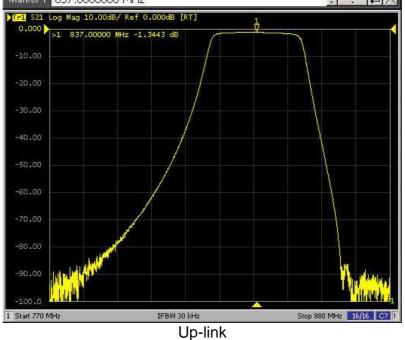
| NAME OF TEST: Filter Frequency Response | | PARA. NO.: 2-11-04/EAB/RF | |
|---|-----------------------|------------------------------|--|
| TESTED BY: G. Curioni | | DATE: 23 January 2010 | |
| Test Results: | Complies. | | |
| Test Data: | See attached plot(s). | | |
| Equipment Used: 3a Measurement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

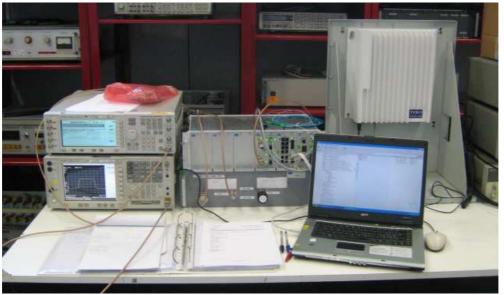
Property of Nemko Italy

CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

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

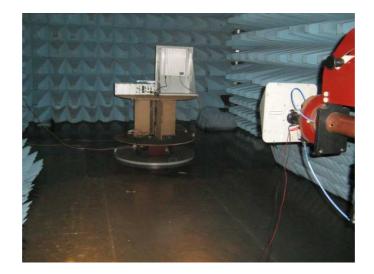
Section 9. PHOTOS

SETUP



CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS





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MASTER

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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.

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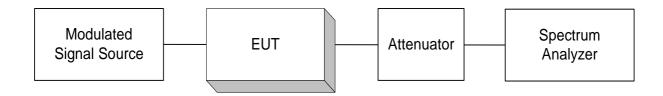
EQUIPMENT: TRU8A19AWWL/AC-WS PROJECT NO.: 131640-1

ANNEX B - TEST DIAGRAMS

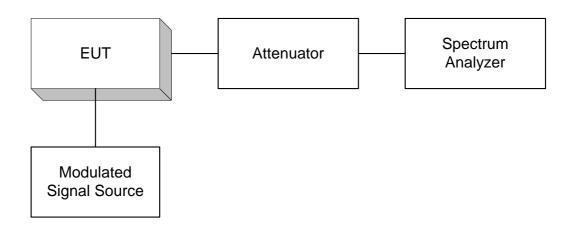
EQUIPMENT: TRU8A19AWWL/AC-WS

PROJECT NO.: 131640-1

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



Para. No. 2.989 - Occupied Bandwidth

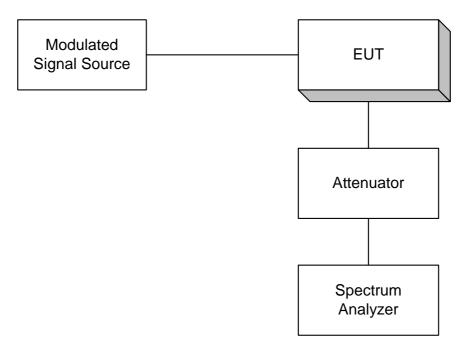


CFR 47, PART 22, SUBPART H CELLULAR BAND REPEATERS

EQUIPMENT: TRU8A19AWWL/AC-WS

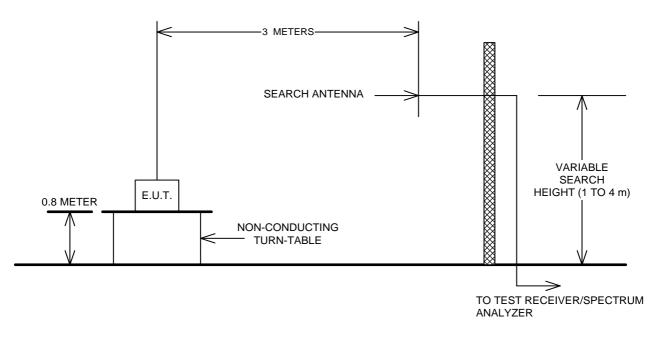
PROJECT NO.: 131640-1

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

