

FCC CERTIFICATION INFORMATION

The P1804-2-24 customer premises transceiver made by TSI is a single integrated unit design using a single antenna for both transmit and receive. The transceiver is designed to interface with cable modems (not supplied by TSI). The transceiver receives RF input from the modem , up converts, amplifies, and transmits the signal to the base station.

The following information is in accordance with FCC Rules, 47CFR Part 2.

2.1033(c)1 Applicant: TranSystem Inc.

2.1033(c)2 FCC ID: OUPP1804-2

2.1033(c)3 Installation instructions are found in attached document.

2.1033(c)4 Emission type is dependent on IF input to EUT. Refer to Table 1 below.

2.1033(c)5 Frequency range: 2644-2686 MHz

2.1033(c)6 Range of Operating Power

0 - 24 dBm (dependent on input from indoor cable modem unit)

2.1033(c)7 Maximum Power Rating

24.4 dBm

2.1033(c)8 Applied voltages and currents into the final transistor elements

Refer to schematics accompanying this application

2.1033(c)10 Circuit and Functional Block Diagram, Description of Circuitry

Refer to separate attachment

2.1033(c)11 FCC ID Label

Refer to separate attachment

2.1033(c)12 Product Photographs

Refer to separate attachment

2.1033(c)13 Description of Modulation System

128 - 2560 kbps QPSK and
160 - 2560 kbps 16QAM

2.1033(c)14 Test Data per 2.1046 – 2.1057

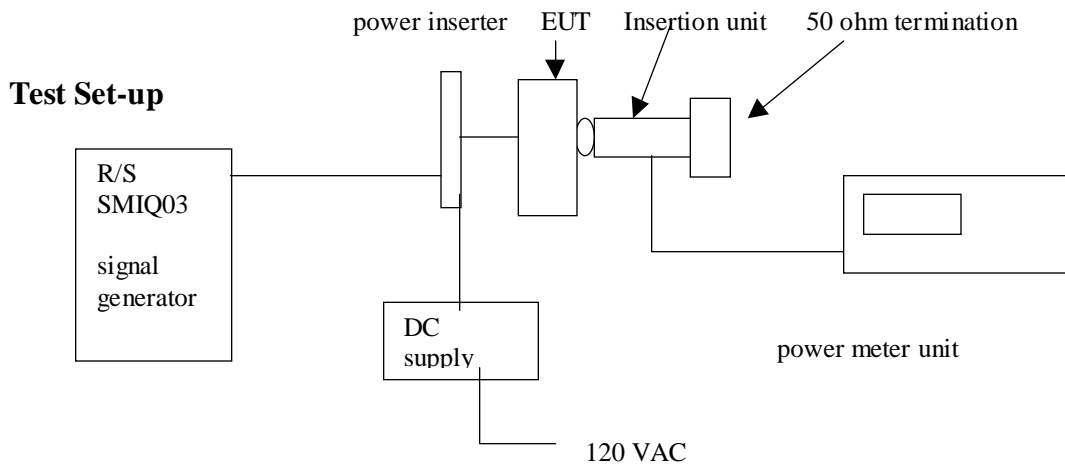
2.1055 RF Output Power Measurements

Measurement equipment used:

Rohde&Schwarz NRVS Power Meter model DE12101

Rohde&Schwarz Insertion Unit model DE3366B

Rohde&Schwarz I/Q signal generator model SMIQ03



NOTE: "Insertion unit" is directional coupler used with power meter to measure forward power.

Test Procedures

Signal generator was set to IF frequency for maximum RF output at desired frequency.
Maximum RF output power was obtained with 128 QPSK modulation

RF output frequency = (2621 + IF) MHz

Test Results

| IF Frequency | IF power | RF output | RF output |
|--------------|----------|-----------|-----------|
| 26 MHz | 0.2 dBm | 2647 MHz | 24.4 dBm |
| 44 MHz | 0 dBm | 2665 MHz | 24.4 dBm |
| 62 MHz | 0.9 dBm | 2683 MHz | 24.4 dBm |

Section 2.1047 Modulation Characteristics

Measurement Equipment Used:

Rohde&Schwarz NRVS Power Meter model DE12101

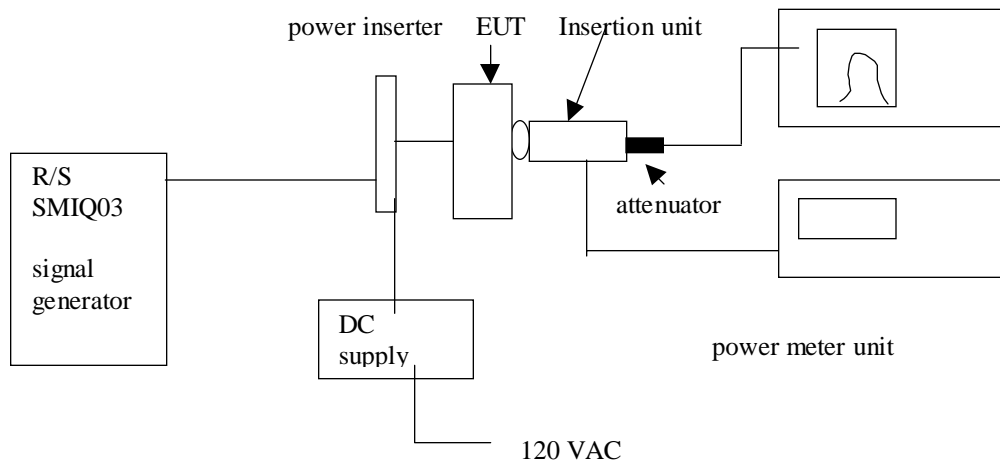
Rohde&Schwarz Insertion Unit model DE3366B

Rohde&Schwarz I/Q signal generator model SMIQ03

HP 8593EM spectrum analyzer

13dB coaxial attenuation

Test Set-up:



Test Procedures:

For the various modulations IF power and frequency were set to produce maximum output power without exceeding the mask limits of 21.908(a).

Test Results

Refer to QPSK masks and 16QAM plots in separate attachment. Description of plots is found in Table 1 below.

NOTE: Spectrum analyzer REF OFFST was entered incorrectly. The reference level offset should be 13 dB atten + 2.1 cable loss = 15.1 dB. Reference levels are actually 3 dB higher than shown on the plots.

Limits

Out -of-band emissions limits, digital modulation, section 21.908(a):

At 6MHz channel edge: attenuated -25 dB licensed average 6 MHz channel power

From edge to 250 kHz : attenuated along a slope to at least -40 dB

Beyond 250 kHz removed: attenuated along a slope to at least -60 dB at 3 MHz removed

Per section 21.908(e):

Attenuation in dB (below "flat top") = $A + 10\log(RBW1/RBW2)$

A = attenuation specified (25, 40, 60 dB)

RBW1 = Resolution bandwidth for flat top measurement (relative)

RBW2 = Resolution bandwidth for spectral point measurement (relative)

TABLE 1 Modulation, Spectrum Analyzer Plots

| Plot No. | fo, MHz | fo Out, dBm | Modulation | Symbol rate | BW, kHz | Emission Designator |
|-------------|---------|-------------|------------|-------------|---------|---------------------|
| QAM | | | | | | |
| 34,35 | 2644.2 | 24.4 | 16QAM | 160 kbps | | 200KD7W |
| 36,37 | 2685.8 | 24.4 | 16QAM | 160 kbps | | 200KD7W |
| 38,39 | 2644.3 | 24.5 | 16QAM | 320 kbps | | 400KD7W |
| 40,41 | 2685.8 | 24.4 | 16QAM | 320 kbps | | 400KD7W |
| 42,43 | 2644.5 | 24.3 | 16QAM | 640 kbps | | 800KD7W |
| 44,45 | 2685.6 | 23.7 | 16QAM | 640 kbps | | 800KD7W |
| 46,47 | 2645.0 | 23.2 | 16QAM | 1280 kbps | | 1M60D7W |
| 48,49 | 2685.1 | 23.7 | 16QAM | 1280 kbps | | 1M60D7W |
| 50,51 | 2645.6 | 18.4 | 16QAM | 2560 kbps | | 3M0D7W |
| 52,53 | 2683.4 | 21.8 | 16QAM | 2560 kbps | | 3M0D7W |
| QPSK | | | | | | |
| 54,55 | 2644.2 | 24.3 | QPSK | 128 kbps | | 160KG7W |
| 56,57 | 2685.9 | 23.9 | QPSK | 128 kbps | | 160KG7W |
| 58,59 | 2644.2 | 24.3 | QPSK | 160 kbps | | 200KG7W |
| 60,61 | 2685.9 | 24.3 | QPSK | 160 kbps | | 200KG7W |
| 62,63 | 2644.3 | 24.3 | QPSK | 320 kbps | | 400KG7W |
| 64,65 | 2685.8 | 24.4 | QPSK | 320 kbps | | 400KG7W |
| 66,67,68 | 2644.4 | 24.5 | QPSK | 512 kbps | | 640KG7W |
| 69,70 | 2685.7 | 23.8 | QPSK | 512 kbps | | 640KG7W |
| 71,72 | 2644.6 | 24.5 | QPSK | 640 kbps | | 800KG7W |
| 73,74 | 2685.6 | 23.3 | QPSK | 640 kbps | | 800KG7W |
| 75,76 | 2644.9 | 24.6 | QPSK | 800 kbps | | 1M00G7W |
| 77,78 | 2685.4 | 24.0 | QPSK | 800 kbps | | 1M00G7W |
| 79,80,81 | 2644.9 | 19.0 | QPSK | 1280 kbps | | 1M60G7W |
| 82,83 | 2685.2 | 19.0 | QPSK | 1280 kbps | | 1M60G7W |
| 84,85 | 2645.0 | 19.0 | QPSK | 1544 kbps | | 1M93G7W |
| 86,87 | 2684.8 | 19.0 | QPSK | 1544 kbps | | 1M93G7W |
| 88,89 | 2645.3 | 19.0 | QPSK | 2048 kbps | | 2M40G7W |
| 90,91 | 2684.7 | 18.0 | QPSK | 2048 kbps | | 2M40G7W |
| 92,93 | 2645.6 | 18.0 | QPSK | 2560 kbps | | 3M0G7W |
| 94, 95 | 2684.4 | 18.0 | QPSK | 2560 kbps | | 3M0G7W |

Section 2.1049 Occupied Bandwidth

Measurement Equipment Used:

Rohde&Schwarz I/Q signal generator model SMIQ03
 HP 8593EM spectrum analyzer
 10dB coaxial attenuator
 3 ft Flexco low loss cable

Test Procedures

1. Set RF generator to produce desired modulation
2. Set analyzer RES BW = VID BW = 10 kHz
3. Set display line to -20 dBc, measure bandwidth

Test Results

Refer to occupied bandwidth plots in separate attachment. Description of plots is found in Table 2 below.

TABLE 2 Occupied bandwidth, Spectrum Analyzer Plots

| Modulation | Plot number |
|------------|-------------|
| 128 QPSK | 96 |
| 160 QPSK | 97 |
| 320 QPSK | 98 |
| 512 QPSK | 99 |
| 640 QPSK | 100 |
| 800 QPSK | 101 |
| 1280 QPSK | 102 |
| 1544 QPSK | 103,104 |
| 2048 QPSK | 105 |
| 2560 QPSK | 106 |

Section 2.1051 Spurious and Harmonic Emissions at Antenna Terminals

Measurement Equipment Used:

Rohde&Schwarz I/Q signal generator model SMIQ03
 HP 8593EM spectrum analyzer
 10dB coaxial attenuator
 3 ft Flexco low loss cable

Test Procedures

Section 21.908(e) requires all emissions removed from the channel edge by more than 3 MHz must be attenuated at least 60 dB below the channel emission flat top.

1. Set modulation to CW (worst case harmonic level production)
2. Set spectrum analyzer to TX output center frequency, RES BW = 100 kHz, VID BW = 100 Hz.
3. Use analyzer PEAK SEARCH to find flat top peak.
4. Set DISPLAY LINE to a level 60 dB below flat top peak
5. Record transmitter output spectrum from 1 MHz to 10th harmonic of TX output frequency
6. Plot/photograph spectrum analyzer data

NOTE: Internal analyzer noise floor exceeded -60 dBc level when continuous sweep measurements were attempted to 26.5 GHz. Therefore, additional measurements were performed at each transmitter harmonic frequency, using a frequency span of approximately 50 MHz, and a resolution bandwidth of 10 kHz. The lower span and lower REW BW resulted in noise floor below -60 dBc level.

Test Results

Refer to spurious emissions plots in separate attachment. Description of plots is found in Table 3 below.

TABLE 3 Spurious Output, Spectrum Analyzer Plots

| Description of Plot | Plot No. |
|---|----------|
| | |
| Spurious output, fo = 2644 MHz Reference | 1 |
| Spurious output, fo = 2644 MHz, Harmonics 2-10 | 2 - 11 |
| Spurious output, fo = 2666 MHz Reference | 12 |
| Spurious output, fo = 2666 MHz, Harmonics 2-10 | 13-22 |
| Spurious output, fo = 2685.83 MHz Reference | 23 |
| Spurious output, fo = 2685.83 MHz, Harmonics 2-10 | 24-33 |

Section 2.1053 Field Strength of Spurious and Harmonic Radiation

Measurement Equipment Used:

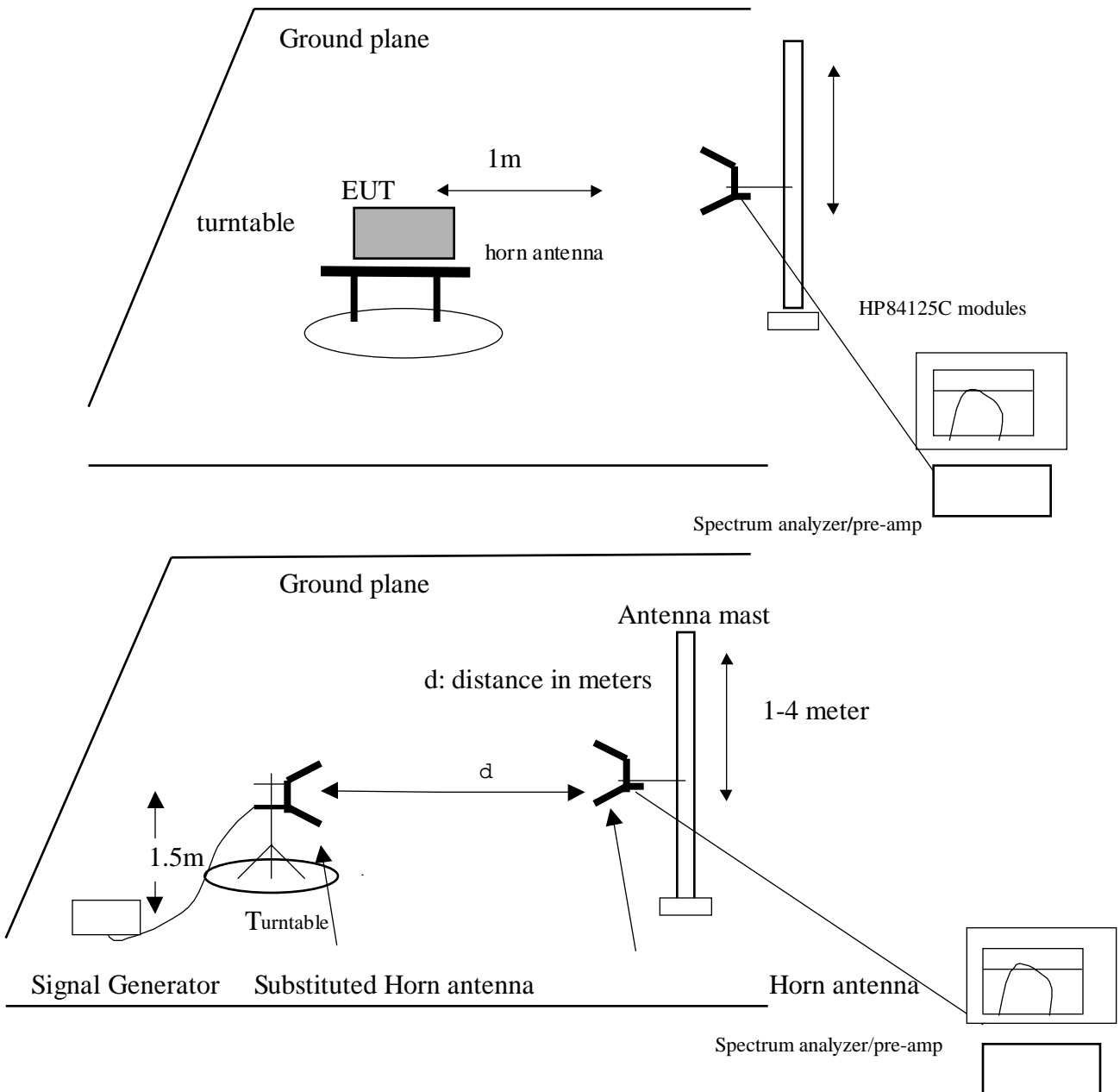
HP 8595EM Spectrum Analyzer

EMCO 3115 Horn antenna, 1- 18 GHz

Antenna Research Associates MWH 1826/B, 18 - 26.5 GHz

HP 8449D pre-amplifier

Test Set-Up



Minimum Requirement

The magnitude of each spurious and harmonic emission detected as being radiated from the EUT must be at a level more than 60 dB below the emission flat top.

Test Method

The antenna output port of the EUT was terminated with a 50 ohm load. With the transmitter operating at full power, the EUT was rotated 360° and the search antenna was raised and lowered in both polarities, all in an attempt to maximize the levels of the received emission for each harmonic and spurious emission up to 10 fo.

Test Results

Pass. Refer to separate attachment for data spread sheet. Worst-case margin is -3.25 dB.

2.1055 Frequency StabilityLimit: Frequency v Temperature

-30 to +50C: +/- .001% limit (10 ppm)

Limit: Frequency v Supply Voltage Variation

85% - 115%: +/- .001% (10 ppm)

The frequency determining circuit for the radio is a TCXO (U31, p8 schematic) :

Manufacturer: Raltron Electronics Corporation

Model Type: RTXT-681

Frequency: 35.593750 MHz

Frequency Stability: ± 2.5 ppm over temperature range -30C to + 75C

Refer to separate attachment for frequency stability data.