TEST REPORT

Report Number: 3073954ATL-006

June 15, 2006

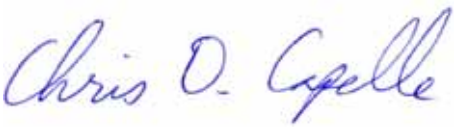
Product Designation: ServAlert 200

Standard: CFR Title 47 Part 90
RSS-119, Issue 6, March 25, 2000
ETSI EN 300 224-2 v1.1.1 (2001-01)

Tested by:
Intertek Testing Services NA Inc.
1950 Evergreen Blvd., Suite 100
Duluth, GA 30096

Client:
JTech Communication's, Inc.
6413 Congress Avenue, Suite 150
Boca Raton, FL 33487
Contact: Rich Hoo
Phone: 800.321.6221 x148
Fax: 561.997.0773

Tests performed by:



Chris D. Capelle
EMC Project Engineer

Report reviewed by:

David J. Schramm
EMC Department Manager

1.0 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 3.0. The remaining test sections are the verbatum text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complies with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

2.0 Test Summary

Section	Test Full Name	Test Date	Result
4.0	System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)		
5.0	Transmitter Information (Transmitter Information)		
6.0	Measurement of carrier power at antenna terminal (RF Power Output - Conducted)	08/25/2005	PASS
7.0	Measurement of transmitter spurious emissions at antenna terminal (Spurious Emission - Conducted)	08/29/2005	PASS
8.0	Measurement of transmitter emission bandwidth (Bandwidth Limitations)	08/29/2005	PASS
9.0	Measurement of adjacent channel power (ACP)	10/31/2005	PASS
NA	Measurement of modulation characteristics (Modulation Characteristics) was waived due to Applicable only for voice transmissions		
10.0	Measurement of carrier power using the substitution method (RF Power Output - Radiated)	10/31/2005	PASS
11.0	Measurement of transmitter radiated spurious emissions using the substitution method (Spurious Emission - Radiated)	10/25/2005	PASS
12.0	Measurement of frequency stability (Frequency Stability)	10/28/2005	PASS
13.0	Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)	09/17/2005	PASS
14.0	Radiated emissions (E-field) (Radiated Emissions)	10/26/2005	PASS
15.0	Revision History (Revision History)	06/14/2006	

3.0 Description of Equipment Under Test

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Pager Base Station	JTech Communications	ServAlert 200	N/A
AC/DC Power Adapter	Cincon Electronics Co., LTD	TR36A-13 03A03	36135-0020800

EUT receive date:	8/26/05
EUT receive condition:	good

Description of EUT provided by Client:
The EUT is designed specifically for restaurant applications to allow Chefs to instantly notify servers when orders are ready, optimizing efficiency. The system is available in three panel sizes with standard features, accessories and options to accommodate all sizes and styles of restaurants.

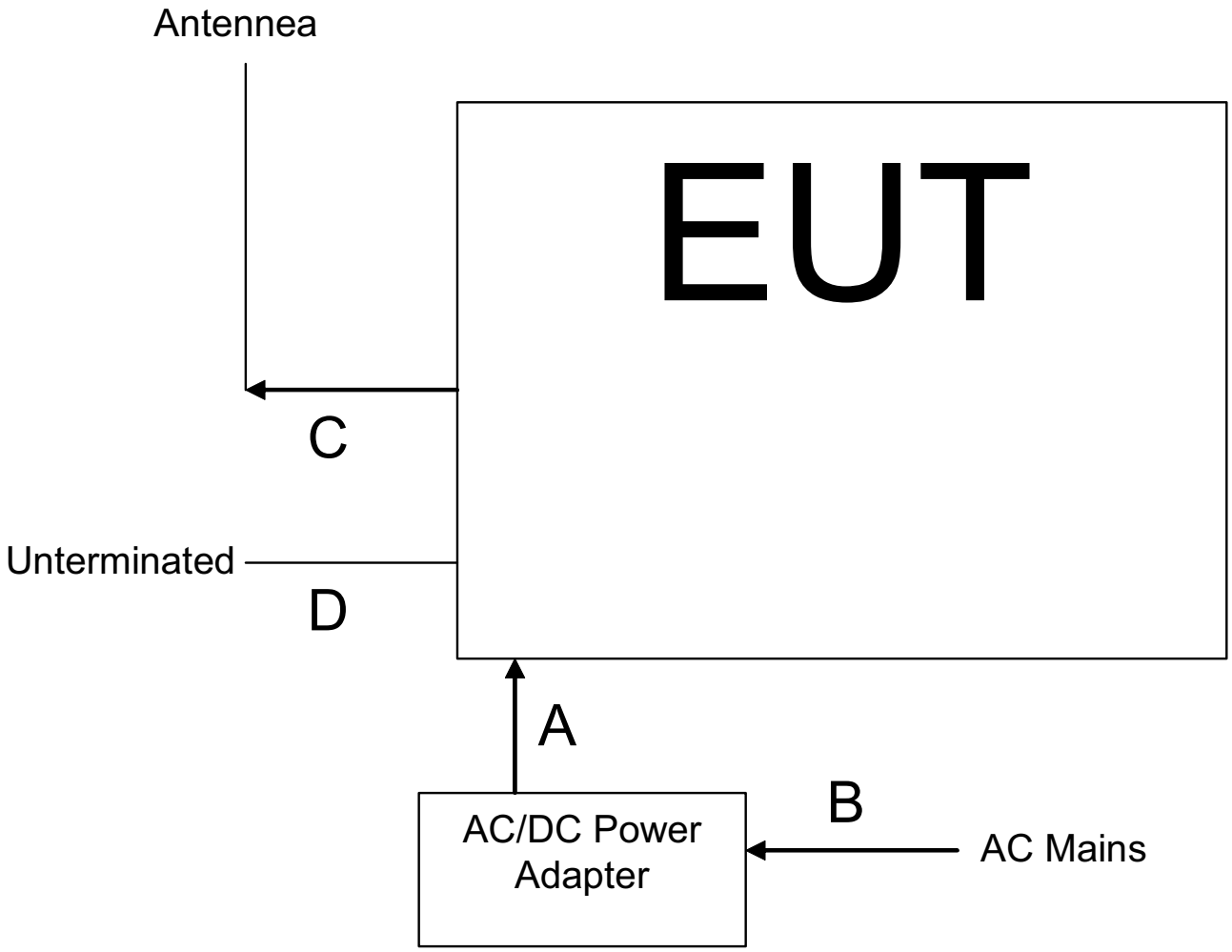
Description of EUT exercising:
EUT was powered and set to transmit 2 Watts, continuously @ 0.5 sec. on/ 1.6 sec. off intervals. EUT antennae port terminated to 50 Ohms.

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Method:

Record the details of EUTcabling, document the support equipment, and show the interconnections in a block diagram.

Photos:



Cable Interconnection & Support Equipment Diagram

4.0 System setup including cable interconnection details, support equipment and simplified block diagram. (System Setup)

Data:

EUT Cabling						
					Connection	
ID	Description	Length	Shielding	Ferrites	From	To
A	DC Power	1.5 m	no	no	AC Mains	AC/DC Power Adapter
B	AC Power	1.5 m	no	no	AC/DC Power Adapter	EUT
C	Antennea port	0 m	no	no	EUT	Antennea
D	RJ-11 port	--	--	--	Not populated during testing	

Note: Manufacturer requested RJ-11 port not be tested.

Support Equipment			
Description	Manufacturer	Model Number	Serial Number
AC/DC Power Adapter	Cincon Electronics Co., LTD.	TR36A-13 03A03	36135-0020800

5.0 Transmitter Information (Transmitter Information)

Method:

Data:

Product	Pager Base Station
EUT Model Number	ServAlert 200
EUT Serial Number	Not available
Whether quantity (>1) production is planned	Quantity production is planned.
Type(s) of Emission	12K5F1D
Maximum Transmit Time	8 Seconds
RF Output Power	33 dBm
Frequency Range	450 to 470 MHz
Antenna & Gain	Rigid monopole with right angle hinge
Detachable Antenna ?	Yes with BNC Connector
External input	None

6.0 Measurement of carrier power at antenna terminal (RF Power Output - Conducted)

Method:

Measure in accordance with Intertek Test Procedure "CCO-1 Conducted carrier power."

Applies to the following Standards:
TIA-603-A (land mobile)
FCC 47 CFR Part 2 (general)
FCC 47 CFR Part 90 (land mobile)
RSS-119 (land mobile and fixed)
EN 300 224-1 v1.3.1

PROCEDURE
a) Connect the equipment as illustrated.
B) For digital modulation devices where the modulation cannot be deleted, use standard test modulation or per standard.
C) Measure the transmitter output power during the defined duty cycle.
1) If a spectrum analyzer is used, assure that the resolution bandwidth is several times larger than the emission bandwidth of the output signal. Set the detector type and bandwidth for rms, peak or average, as specified in the standard. If the output to be measured is pulsed and pulse power is to be measured, set the spectrum analyzer on gated operation, triggered at the beginning of the pulse shape. Set video BW > 3 times resolution BW.
2) If an RF power meter is used, assure that its response bandwidth exceeds the frequency content of the output signal, taking into account any digital modulation or pulsed operation. If pulse power is to be measured, trigger the measurement on the pulse to be measured, and select either peak or average power.
d) Correct for all losses in the RF path, including cables and attenuators.
e) The value recorded in step c) is the conducted carrier output power rating. If a spectrum analyzer is used, save the screen image for reporting purposes.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

+/- 0.68 dB

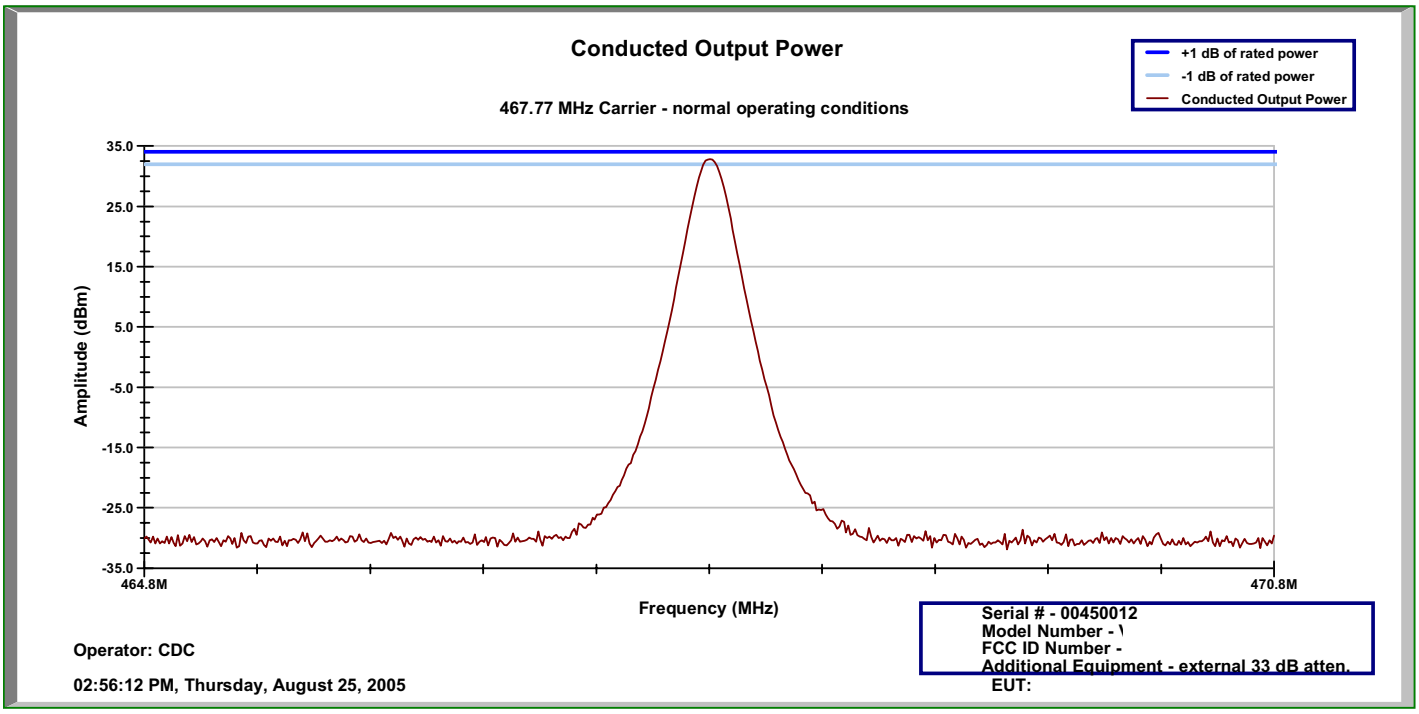
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 03 dB	Weinschel Corp	2	200003	07/06/2005	07/06/2006
Attenuator, 10 dB	Weinschel Corp	2	200007	07/06/2005	07/06/2006
Attenuator, 20 dB	Weinschel Corp	2	200001	08/08/2005	08/08/2006
Digital Pocket Weathermeter	Mannix	SAM700BAR	211896	09/07/2005	09/07/2006
EMI Receiver	Hewlett Packard	8546A	211388	07/08/2005	07/08/2006
EMI Receiver, Preselector section	Hewlett Packard	85460A	211389	07/08/2005	07/08/2006

Results: The sample tested was found to Comply.

6.0 Measurement of carrier power at antenna terminal (RF Power Output - Conducted)

Plots:



Normal Conditions Conducted Power Output

6.0 Measurement of carrier power at antenna terminal (RF Power Output - Conducted)

Data:

EUT Mode	Frequency MHz	Channel	Analyzer Bandwidth RBW/VBW MHz	Measured Power dBm		
				+60°C	+20°C	-30°C
Paging	467.776	--	0.1	31.1	32.8	32.7

TX Warmup Time: 15 minutes
Rated Load Value: 50 Ohms
Duty Cycle: 50%

Temperature: 20.5 °C
Humidity: 44%
Atmospheric Pressure: 983 mBars

The above measurements are appropriate for the following standards:

Standard	Section Number	Section Name
FCC Part 90	90.205	Power and antenna height limits
EN 300 224-1	7.2.2	Carrier Power (Conducted) Test
RSS-119	6.2	Output Power Test

7.0 Measurement of transmitter spurious emissions at antenna terminal (Spurious Emission - Conducted)

Method:

Measure in accordance with Intertek Test Procedure "CSO-1 Conducted Spurious Output Power."

Applies to the following Standards:
TIA-603-A (land mobile)
RSS-119 (land mobile & fixed)
EN 300 224-1 v1.3.1

PROCEDURE
A) Connect the equipment as illustrated and in accordance with EIA/TIA-603-A. Use a matching network as necessary to match the input impedance of the receiver.
B) Set up EUT in accordance with the manufacturer's tuning procedure at a frequency in the middle of its band.
C) If the receiver is super-regenerative, stabilize it by coupling to it an unmodulated carrier on the receiver frequency. Taking care not to overload the receiver, vary the amplitude and frequency of the stabilizing signal to obtain the highest level of the spurious emission from the receiver.
D) If the EUT is a transceiver, disable the transmitter during these tests. If the transmitter can not be disabled, a multi-pole notch filter centered at the transmit frequency is required to prevent overload of the measuring receiver/analyzer.
E) Identify and record the power of all spurious emissions.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

+/- 1.66 dB

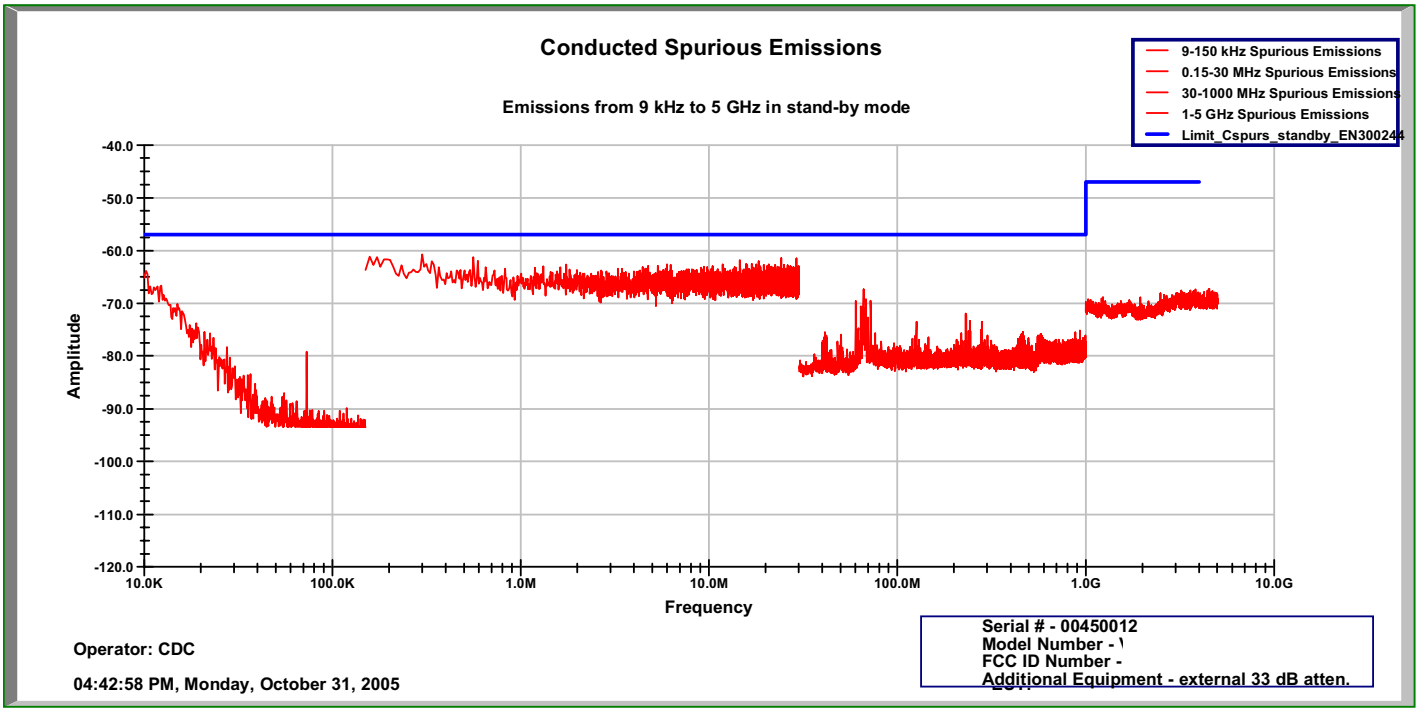
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 03 dB	Weinschel Corp	2	200005	07/06/2005	07/06/2006
Attenuator, 10 dB	Weinschel Corp	2	200007	07/06/2005	07/06/2006
Attenuator, 20 dB	Weinschel Corp	2	200001	08/08/2005	08/08/2006
EMI Receiver	Hewlett Packard	8546A	211388	07/08/2005	07/08/2006
EMI Receiver, Preselector section	Hewlett Packard	85460A	211389	07/08/2005	07/08/2006

Results: The sample tested was found to Comply.

7.0 Measurement of transmitter spurious emissions at antenna terminal (Spurious Emission - Conducted)

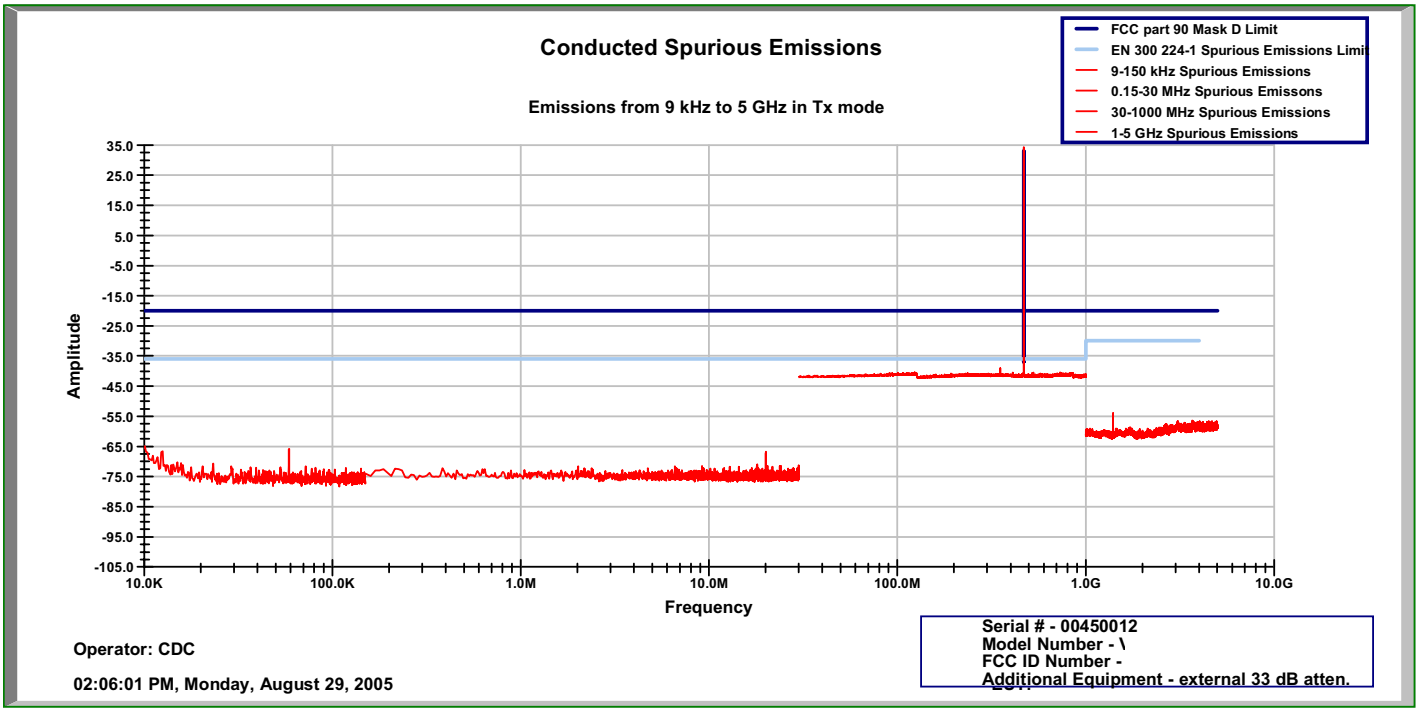
Plots:



Conducted Spurious Emissions Results - Standby

7.0 Measurement of transmitter spurious emissions at antenna terminal (Spurious Emission - Conducted)

Plots:



Conducted Spurious Emissions Results - Tx

7.0 Measurement of transmitter spurious emissions at antenna terminal (Spurious Emission - Conducted)

Data:

Receiver parameters: 100 Hz res BW; 1kHz vid BW

Conducted Spurious Emissions Measurements

Transmitting

Frequency (MHz)	Peak Level (dBm)	Limit Level (dBm)	Margin (dBm)
350.740	-39.0	-20.0	-19.0
409.450	-43.3	-20.0	-23.3
457.057	-35.4	-20.0	-15.4
526.250	-41.4	-20.0	-21.4
117.000	-52.9	-20.0	-32.9
460.821	-36.9	-20.0	-16.9
458.652	-44.8	-20.0	-24.8
458.071	-33.6	-20.0	-13.6

8.0 Measurement of transmitter emission bandwidth (Bandwidth Limitations)

Method:

Measure in accordance with Intertek Test Procedure "CCO-1 Occupied Bandwidth."

Applies to the following Standards:
TIA-603-A (land mobile)
FCC 47 CFR Part 2 (general)
FCC 47 CFR Part 90 (land mobile)
RSS-119 (land mobile/fixed)

PROCEDURE
A) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external signal generator.

B) A spectrum analyzer is recommended for these measurements. Video filtering is not used during occupied bandwidth tests.

NOTE: The bandwidth of the measuring instrument should be small when compared with the maximum allowed bandwidth in order to accurately measure the bandwidth of the transmitter with respect to the limit. Too small a bandwidth would result in inappropriate measurements in certain cases; therefore, the measuring bandwidth shall be set to a value greater than 5% of the allowed bandwidth. If no bandwidth specifications are given, use the following guidelines:

C) Supply the EUT with nominal AC voltage or install a new or fully charged battery in the EUT. Turn on the EUT and set it to any one convenient frequency within its operating range.

D) Set a reference level on the measuring instrument equal to the specified bandwidth (3 dB, 6 dB, 20 dB or occupied bandwidth) or –26 dB. (The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the un-modulated carrier, even if atypical).

E) Adjust the spectrum analyzer resolution bandwidth, sweep rate, and frequency scan with consideration to the frequencies used for modulation, so that the display is calibrated.

F) Apply worst-case modulation signal(s) and measure the frequencies of the modulated signal from the EUT where it is the specified number of dB (3, 6, 20) below the reference level set. This is the occupied bandwidth.

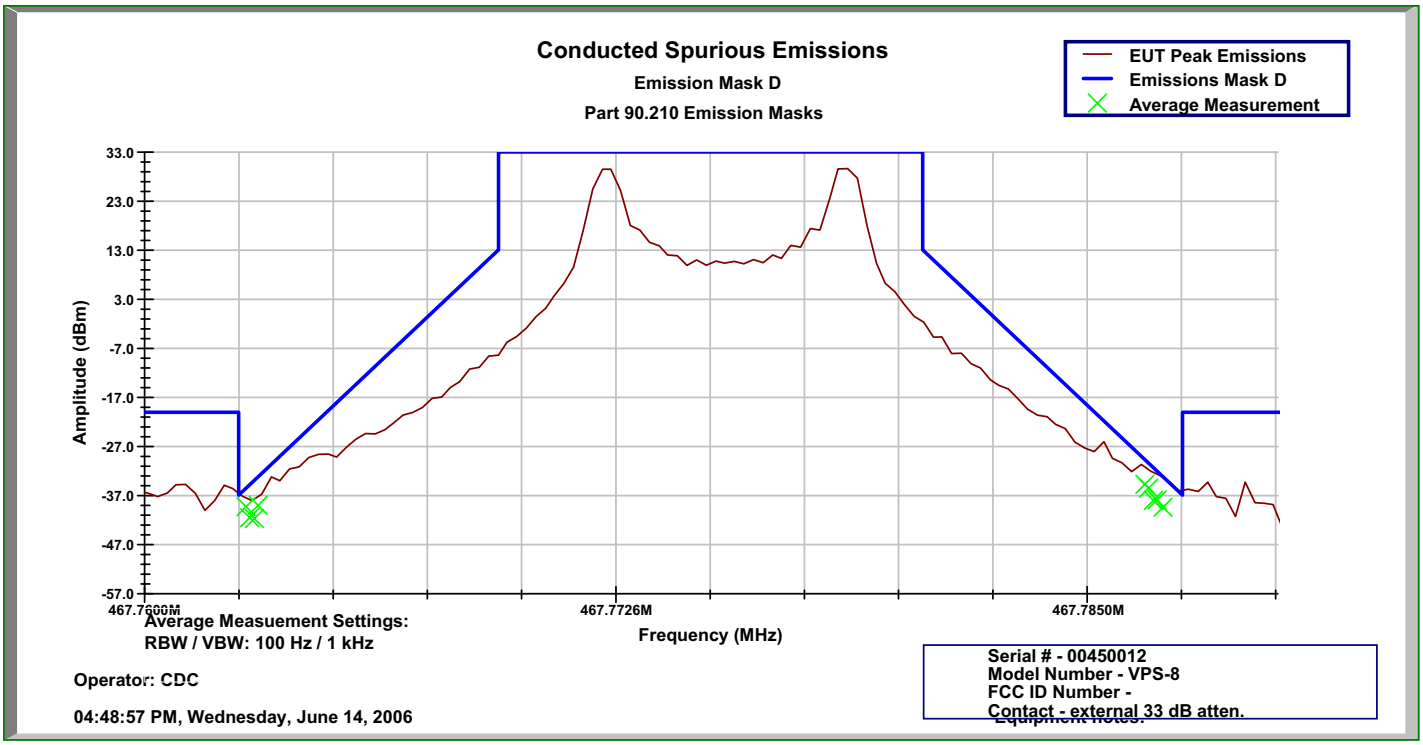
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 03 dB	Weinschel Corp	2	200005	07/06/2005	07/06/2006
Attenuator, 10 dB	Weinschel Corp	2	200007	07/06/2005	07/06/2006
Attenuator, 20 dB	Weinschel Corp	2	200001	08/08/2005	08/08/2006
EMI Receiver	Hewlett Packard	8546A	211388	07/08/2005	07/08/2006
EMI Receiver, Preselector section	Hewlett Packard	85460A	211389	07/08/2005	07/08/2006

Results: The sample tested was found to Comply.

8.0 Measurement of transmitter emission bandwidth (Bandwidth Limitations)

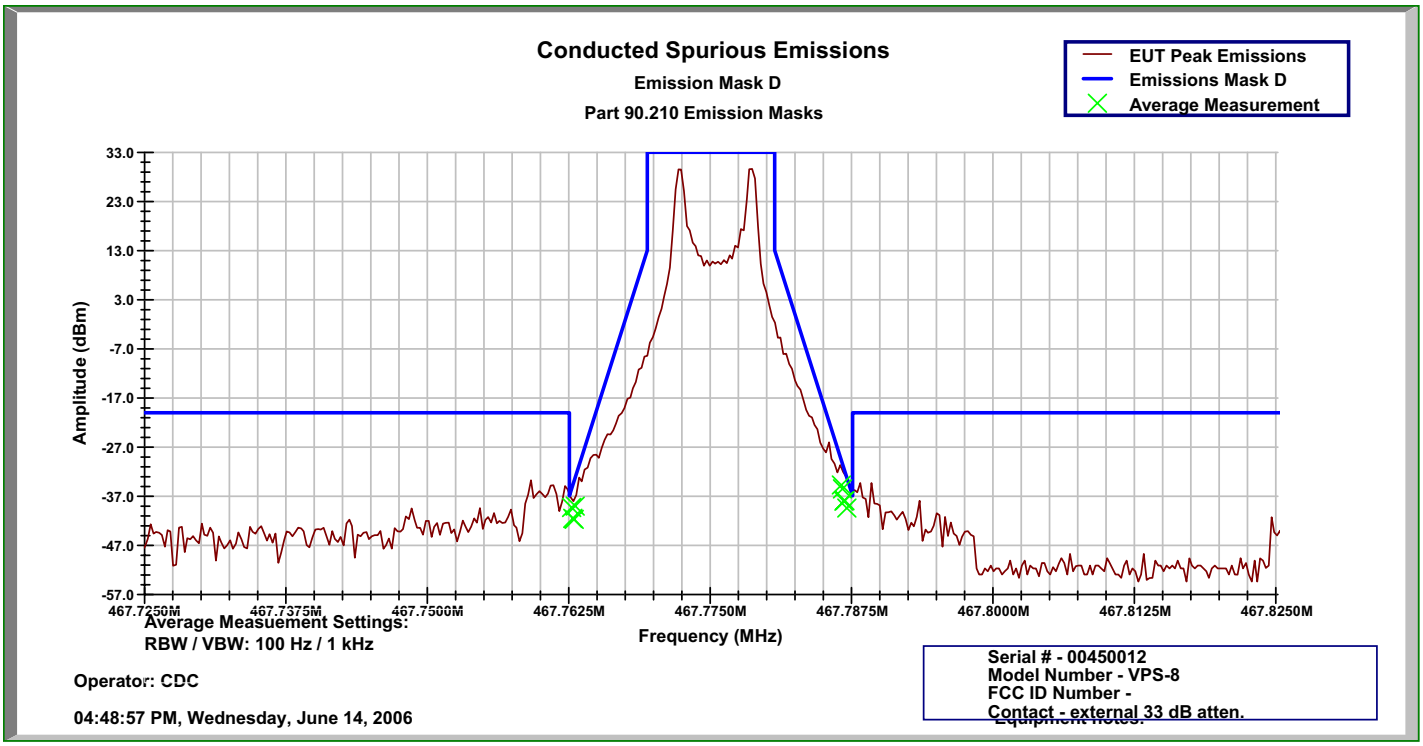
Plots:



Conducted Occupied Bandwidth (Zoom)

8.0 Measurement of transmitter emission bandwidth (Bandwidth Limitations)

Plots:



Conducted Occupied Bandwidth Emissions

8.0 Measurement of transmitter emission bandwidth (Bandwidth Limitations)

Data:

The Occupied Bandwidth of this device is 12.5 kHz.

9.0 Measurement of adjacent channel power (ACP)

Method:

Measure in accordance with Intertek Test Procedure "ACP-1 Adjacent channel power and power ratio."

Applies to the following Standards:
TIA-603-A (land mobile)
FCC 47 CFR Part 2 (general)
FCC CFR 47 Part 90 (land mobile)
RSS-119 (land mobile and fixed)

PROCEDURE
A) Connect the equipment as illustrated. Operate the transmitter as for carrier power measurement, in accordance with FCC 47 CFR 2.1046. Consult the 8920B user manual for detailed configuration and setup instructions.
B) Which Input Port to Use. The TX Power measurement is used to calculate absolute Adjacent Channel Power. Since TX Power can only be measured using the RF IN/OUT port, you must use this port to measure ACP Level. ACP Ratio can be measured using either the RF IN/OUT or the ANT IN port.
C) When you access the ACP screen on the test set screen, it automatically starts a multi-step process for measuring ACP:
D) Measuring ACP on AM Transmitters. When measuring AM signals, the reference level must be measured on an unmodulated carrier; so the Carrier Ref field must be set to Unmod. After the reference is measured, the power in the adjacent channels must be measured with modulation. This requires the modulating signal to be turned off and on repeatedly as measurements are being calculated and displayed. Since the Test Set automatically turns AFGen1 on and off when the Carrier Ref field is set to Unmod, you must use AFGen1 and the AUDIO OUT port as the modulation source for making AM ACP measurements.

1. AF Generator 1 is turned off if the Carrier Ref field is set to Unmod.
2. The amplitude of the center frequency (Tune Freq) is measured to establish a reference.
3. AF Generator 1 is turned back on if it was previously turned off.
4. The power in each of the adjacent channels is analyzed.
5. Adjacent Channel Power is calculated and displayed. This value can be displayed as an absolute power level or as a ratio referenced to the center frequency's level.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

+/- 1.29dB

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Attenuator, 03 dB	Weinschel Corp	2	200003	07/06/2005	07/06/2006
Attenuator, 06 dB	Weinschel Corp	2	200002	07/06/2005	07/06/2006
Attenuator, 20 dB	Weinschel Corp	2	200001	08/08/2005	08/08/2006
Cable, 18 GHz, N, 118 inches	Megaphase	TM18 NKNK 118	E201	05/12/2005	05/12/2006
Spectrum Analyzer, 20 Hz to 40 GHz	Rohde & Schwarz	FSEK30	200062	01/03/2005	01/03/2006

Results: The sample tested was found to Comply.

9.0 Measurement of adjacent channel power (ACP)

Data:

Channel Bandwidth: 12.5 kHz
Channel Spacing: 20 kHz

Channel Displacement (kHz)	Channel Displacement Limit (kHz)	Delta kHz
6.7	12.5	-5.8

Note: Negative result indicated compliance

Conditions		Left Adjacent Channel Power below Carrier Power (dBc)	Right Adjacent Channel Power below Carrier Power (dBc)	Delta dB
Normal	Left	64.4	60	4.4
Extreme	Left	61	55	6
Normal	Right	64.2	60	4.2
Extreme	Right	60.1	55	5.1

Note: Positive result indicates compliance

10.0 Measurement of carrier power using the substitution method (RF Power Output - Radiated)

Method:

Measure the in accordance with Intertek Test Procedure "RPO-1 Radiated power output."

Applies to the following Standards:
TIA-603-A (land mobile)
FCC 47 CFR Part 2 (general)
FCC 47 CFR Part 90 (land mobile)
RSS-119 (land mobile and fixed)
EN 300 224-1 v1.3.1

PROCEDURE
A) Connect the equipment as illustrated. Place the transmitter to be tested on the turntable in the test site, in its normal operating position. If the transmitter is intended to be hand held, the testing must be repeated with the transmitter in three orthogonal orientations.
B) Select the larger test distance consistent with transmitter power; use 10m if possible, 3m if signal strength requires a shorter distance.
C) Place the test antenna in its vertical polarization position; use an attenuator with 6 - 10 dB loss as a matching pad between the test antenna and its cable.
D) Raise and lower the test antenna from 1 to 4m with the transmitter facing the test antenna, and record the highest received signal from the transmitter in dBmR.
E) Rotate the EUT 90 degrees if handheld, and the antenna polarization is unknown. Repeat step d). Skip this step if the EUT antenna polarization is known to be vertical.
F) Repeat steps d) and e) for seven additional readings at 45 degree interval positions of the turntable. For transmitter frequencies over 1 GHz, additional positions may be required owing to the possible directionality of the transmitter. Note the highest of each turntable angle measurement in dB as LVL(1)… LVL(8)
G) Replace the transmitter under test with a substitution antenna whose gain above that of a half-wave dipole is known to be G(dBd). Refer to the illustration below.
H) Place the center of the substitution antenna at the same location on the table as the transmitter under test, using vertical polarization for both substitution and test antennas. Connect the substitution antenna to the signal generator, using a cable with known signal loss LC. Use an attenuator with loss S as a matching pad between the substitution antenna and its cable.
I) Adjust the output frequency of the signal generator to the frequency of the transmitter, and adjust the signal level SIG to +10 dBm or highest output below that level.
J) Raise and lower the test antenna from 1 to 4m, and record the maximum signal in dBm on the spectrum analyzer as MAX.
K) Calculate the path loss PL in dB at the transmitter carrier frequency as:
PL = SIG - S - LC + G(dBd) - MAX
This calculation includes the losses from the test antenna cable and attached pad.
L) Calculate the output power of the transmitter in ERP at each turntable angle n = 1…8 according to:
dBm output power in ERP(n) = LVL(n) + PL
M) Convert dBm values to mW and average all 8 to obtain Average Radiated Power Output.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

+/- 2.04 dB

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Bilog (20MHz to 2GHz)	Chase	CBL6112B	211386	08/31/2005	08/31/2006
Antenna, Roberts Tunable Dipole (set)	Compliance Design	A100	213157	12/15/2004	12/15/2005
Cable E01 (Formerly PE7000N-N2 or N2)	Pasternack	RG214/U	E01	05/11/2005	05/11/2006
Cable, 18 GHz, N, 118 inches	Megaphase	TM18 NKNK 118	E202	05/13/2005	05/13/2006
Cable, 18 GHz, N, 394 inches	Megaphase	G919-NKNK-394	MP3	05/11/2005	05/11/2006
EMI Receiver	Hewlett Packard	8546A	211505	01/05/2005	01/05/2006
EMI Receiver, Preselector section	Hewlett Packard	85460A	211506	01/05/2005	01/05/2006
Signal Generator	Rohde & Schwarz	SMT 03	015681	04/21/2005	04/21/2006
Spectrum Analyzer, 20 Hz to 40 GHz	Rohde & Schwarz	FSEK30	200062	01/03/2005	01/03/2006

Results: The sample tested was found to Comply.

10.0 Measurement of carrier power using the substitution method (RF Power Output - Radiated)

Data:

EUT Mode	Frequency MHz	Channel	Analyzer Bandwidth RBW/VBW MHz	Measured Power dBm		
				+60°C	+20°C	-30°C
Paging	467.776	--	0.1	31.7	33.4	33.3

TX Warmup Time: 15 minutes
Rated Load Value: 50 Ohms
Duty Cycle: 50%

Temperature: 20°C
Humidity: 39%
Atmospheric Pressure: 983 mBars

The above measurements are appropriate for the following standards:

Standard	Section Number	Section Name
FCC Part 90	90.205	Power and antenna height limits
EN 300 224-1	7.2.3	Carrier Power (Conducted) Test
RSS-119	6.2	Output Power Test

11.0 Measurement of transmitter radiated spurious emissions using the substitution method (Spurious Emission - Radiated)

Method:

Measure in accordance with Intertek Test Procedure "RSE-1 Radiated spurious emissions."

Applies to the following Standards:
TIA-603-A (land mobile)
FCC 47 CFR Part 2 (general)
FCC 47 CFR Part 90 (land mobile)
RSS-119 (land mobile/fixed)
EN 300 224-1 [v1.3.1]

PROCEDURE
A) Connect the equipment as illustrated. Place the transmitter to be tested on the turntable in the test site, in its normal operating position. If the transmitter is intended to be hand held, the testing must be repeated with the transmitter in three orthogonal orientations.
B) Attach a non-radiating standard load to the antenna port, using the shortest possible interconnecting shielded cable. For devices with integral, antennas, run the test with the integral antenna operating.
C) Select the larger test distance consistent with the site noise floor; use 10m if possible, 3m if ambient noise requires a shorter distance.
D) Typical spectrum analyzer settings are given below. Refer to the table above, and the specific standard, for correct settings.
1) RBW = 10 kHz below 1 GHz, 1 MHz above 1 GHz.
2) VBW = 300 kHz below 1 GHz, 3 MHz above 1 GHz.
3) Sweep speed sufficiently slow to maintain calibration.
4) detector mode = positive peak.
E) Place the test antenna in its vertical polarization position; use an attenuator with 6 - 10 dB loss (A) as a matching pad between the test antenna and its cable.
F) The spectrum is to be scanned from the lowest RF frequency generated in the equipment to the 10th harmonic of the carrier, excepting the occupied bandwidth. Specific standards may require a different maximum frequency.
G) For each spurious emission detected, raise and lower the test antenna from 1 to 4m with the transmitter facing the test antenna, and record the highest received signal from the transmitter in dBmR. Rotate the turntable through 360 degrees to find the maximum emission value at that frequency.
H) Rotate the test antenna to its horizontal polarization position. Repeat steps g) and h).
I) Replace the transmitter under test with a substitution antenna whose gain above that of a half-wave dipole is known to be G(dBd). Refer to the illustration below.
J) Place the center of the substitution antenna at the same location on the table as the transmitter under test, using vertical polarization for both substitution and test antennas. Connect the substitution antenna to the signal generator, using a cable with known signal loss LC. Use an attenuator with loss S as a matching pad between the substitution antenna and its cable.
K) Raise the test antenna from 1m to 4m to maximize the analyzer display from the substitution antenna. At the maximum display value for each spurious frequency, adjust the signal level dBmT so that the spectrum analyzer displays the maximum signal observed in steps g) - h) above.
L) Calculate the output power of the transmitter in ERP according to:
spurious power in (dBm) = dBmT - LC - S + dBd
M) Repeat steps k) - l) for both antennas horizontally polarized. Record the spurious power separately for the vertical and horizontal polarizations.

NOTE: For FCC purposes, emissions > 20 dB below the regulatory spurious limit do not have to be determined by the substitution method. The regulatory limit for many licensed transmitters is -13 dBm or 84.4 dBuV/m at 3m.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

+/- 3.85 dB

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Bilog (20MHz to 2GHz)	Chase	CBL6112B	211386	08/31/2005	08/31/2006
Antenna, Horn, 1-18 GHz	EMCO	3115	213061	03/11/2005	03/11/2006
Cable E01 (Formerly PE7000N-N2 or N2)	Pasternack	RG214/U	E01	05/11/2005	05/11/2006
Cable E05 (Formerly HS 1500 N-N)	Huber-Suhner	Sucoflex 104PEA	E05	05/12/2005	05/12/2006
Cable E06 (Formerly HS 1500 N-SMA)	Huber-Suhner	Sucoflex 104PEA	E06 211268	05/13/2005	05/13/2006
Cable E11 (Formerly HS 7000 N-SMA)	Huber-Suhner	Sucoflex 104PEA	E11 211266	05/11/2005	05/11/2006
Cable TW2	Andrews	Cable TW2	211411	05/11/2005	05/11/2006
Cable, 18 GHz, N, 118 inches	Megaphase	TM18 NKNK 118	E202	05/13/2005	05/13/2006
Cable, 18 GHz, N, 394 inches	Megaphase	G919-NKNK-394	MP3	05/11/2005	05/11/2006
EMI Receiver	Hewlett Packard	8546A	211505	01/05/2005	01/05/2006
EMI Receiver, Preselector section	Hewlett Packard	85460A	211506	01/05/2005	01/05/2006
Preamplifier, 10 MHz to 2000 MHz, 27 dB gain	Mini-Circuits	ZKL-2	200074	10/11/2005	10/11/2006

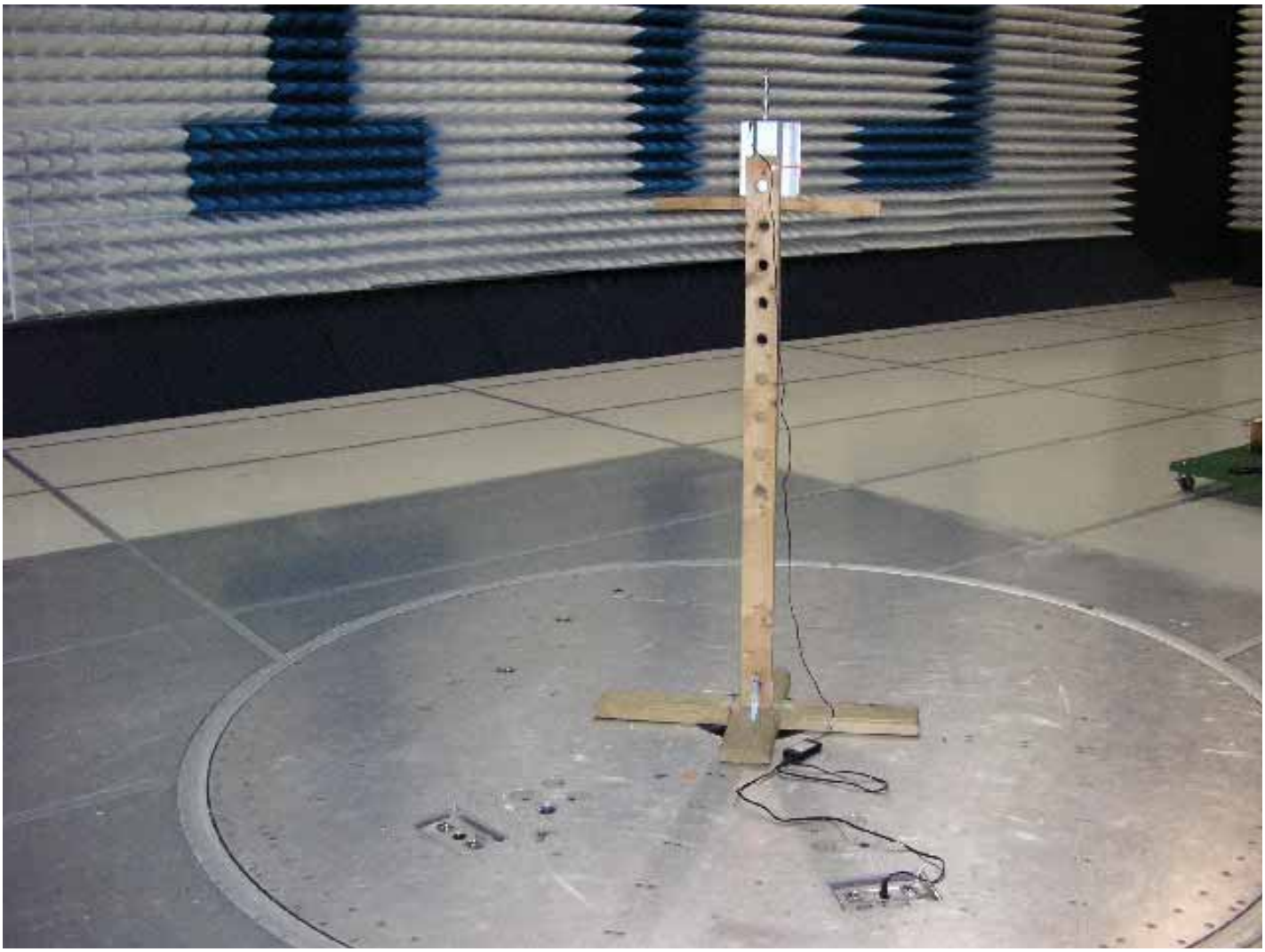
11.0 Measurement of transmitter radiated spurious emissions using the substitution method (Spurious Emission - Radiated)

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Preamplifier, 1-26 GHz	Hewlett Packard	8449B	213191	04/22/2005	04/22/2006
Spectrum Analyzer, 20 Hz to 40 GHz	Rohde & Schwarz	FSEK30	200062	01/03/2005	01/03/2006

Results: The sample tested was found to Comply.

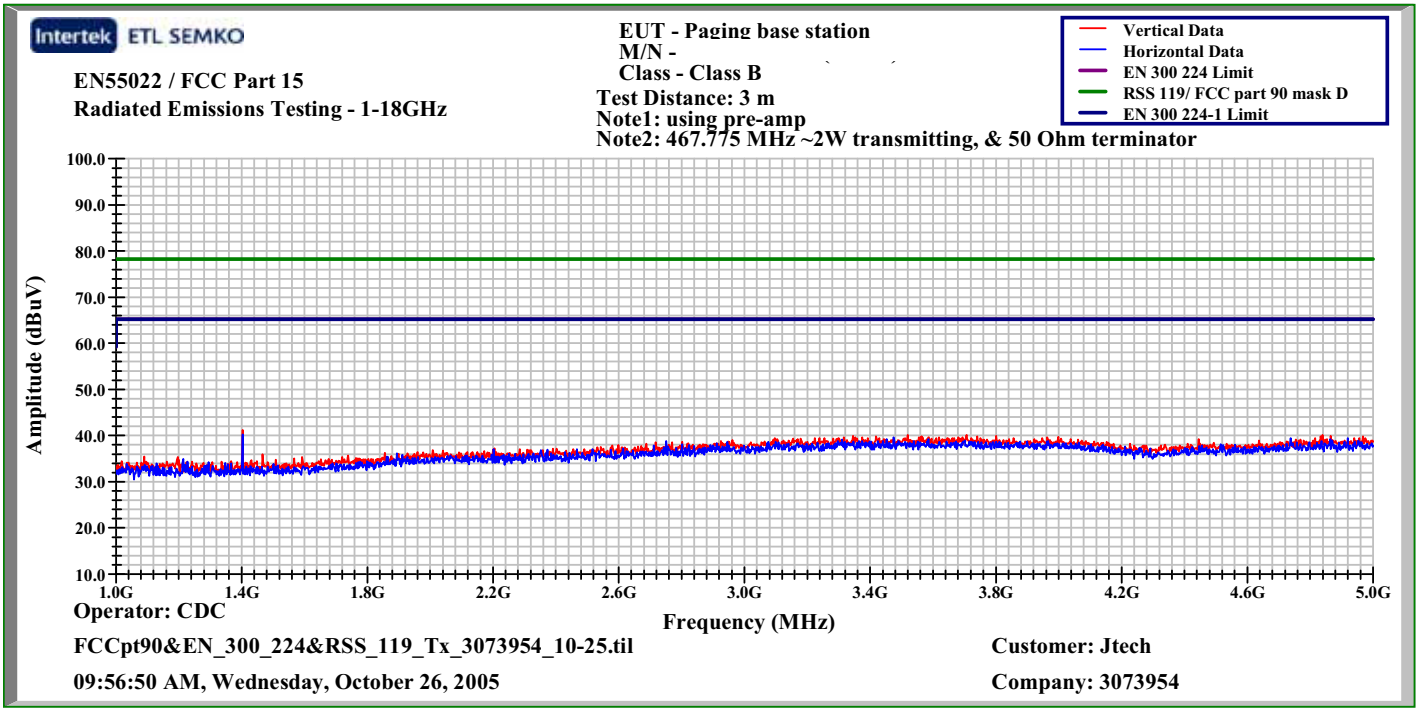
Photos:



Radiated Spurious Emissions Test Setup

11.0 Measurement of transmitter radiated spurious emissions using the substitution method (Spurious Emission - Radiated)

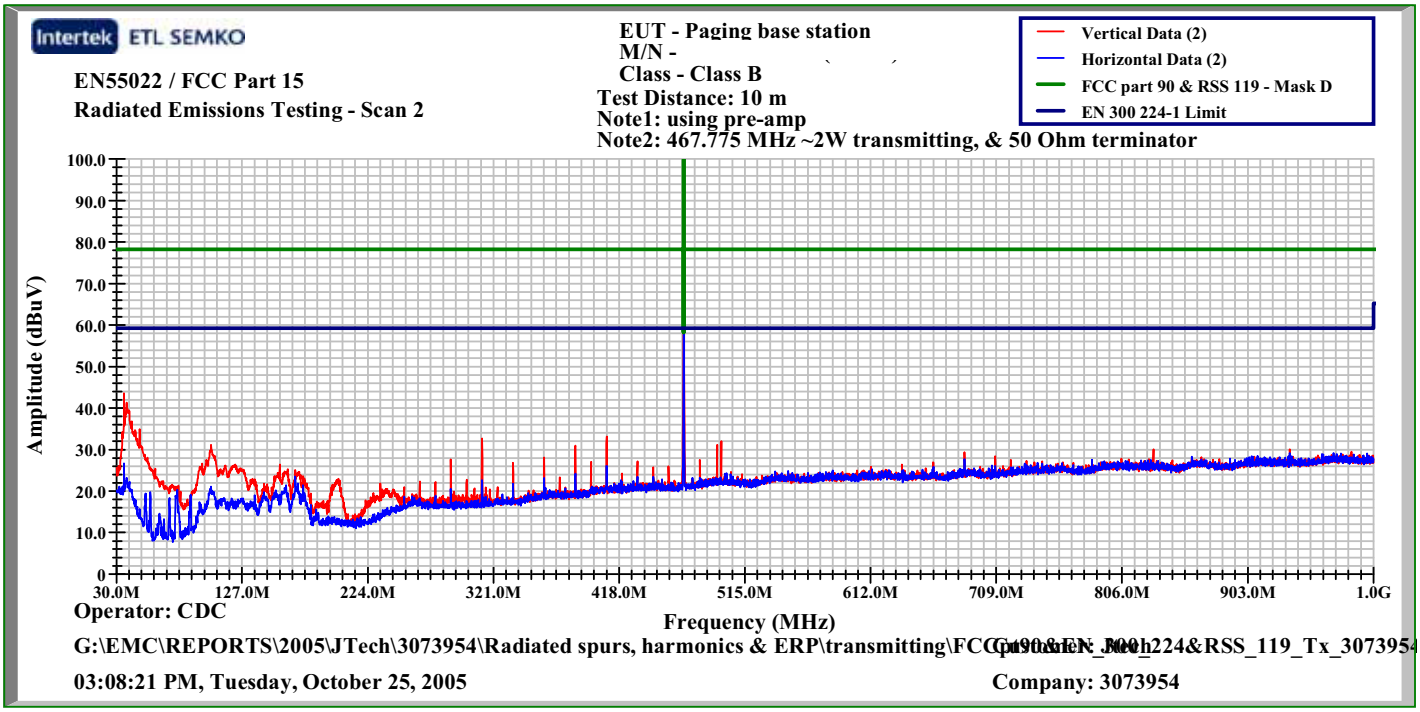
Plots:



Transmitter Radiated Spurious Emissions Results

11.0 Measurement of transmitter radiated spurious emissions using the substitution method (Spurious Emission - Radiated)

Plots:



Transmitter Radiated Spurious Emissions Results

11.0 Measurement of transmitter radiated spurious emissions using the substitution method (Spurious Emission - Radiated)

Data:

Measured values resulted in a significant margin from required limits, therefore, please refer to plots.

12.0 Measurement of frequency stability (Frequency Stability)

Method:

Measure in accordance with Intertek Test Procedure "Procedure Frequency Stability."

Stability with Respect to Ambient Temperature
(1) Place the de-energized EUT in the environmental temperature test chamber. For devices that are normally operated continuously, the EUT may be energized while inside the test chamber. For devices that have oscillator heaters, energize only the heater circuit while the EUT is inside the chamber. Supply the EUT with nominal AC voltage or install a new or fully charged battery in the EUT. An antenna should be connected to the antenna output connector of the EUT if possible. Use of a dummy load could affect the output frequency of the EUT. If the EUT is equipped with or uses an adjustable-length antenna, it should be fully extended.
(2) Turn the EUT on and couple its output to a frequency counter or other frequency-measuring device of sufficient accuracy, considering the frequency tolerance with which the EUT must comply. Tune the EUT to one of the number of the test frequencies. Adjust the location of the measurement antenna and the controls on the measuring instrument to obtain a suitable signal level (i.e., a level that will not overload the measuring instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
(3) Turn the EUT off and set the environmental chamber to the highest temperature specified by the procuring or regulatory agency. For devices that are normally operated continuously, the EUT may be energized while inside the test chamber. For devices that have oscillator heaters, energize only the heater circuit while the EUT is inside the chamber.
(4) Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and measure the EUT operating frequency at startup.
(5) If the EUT operates only at one operating frequency, proceed to step 6; otherwise, successively tune the EUT to each of the additional operating frequencies required and repeat step 4.
(6) Set the temperature chamber to the lowest temperature specified by the procuring or regulatory agency. Be sure to allow the environmental chamber temperature to stabilize before performing these measurements.
(7) Repeat Steps 4 and 5
(8) Prepare the final test report in accordance with clause 10 of ANSI C63.4.

Stability with Respect to Input Voltage
(1) This test may be made at ambient room temperature if it is within the range +15° to +25 °C; otherwise, an environmental temperature test chamber set for a temperature of +20 °C shall be used. If possible, connect an antenna to the output terminals of the EUT because use of a dummy load could affect the output frequency of the EUT. If the EUT is equipped with or uses an adjustable-length antenna, it should be fully extended.
(2) Supply the EUT with nominal AC voltage or install a new or fully charged battery in the EUT. Turn on the EUT and couple its output to a frequency counter.
(3) Tune the EUT to any one of the test frequencies. Adjust the location of the measurement antenna and the controls on the measuring instrument to obtain a suitable signal level (i.e., a level that will not overload the measuring instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT). Turn the EUT off and place it inside an environmental chamber. Allow sufficient time (approximately 30 min) for the chamber to stabilize at +20 °C before proceeding. Turn the EUT on and measure the EUT operating frequency at startup.
(4) If measurements on only one operating frequency is required, proceed to step 5; otherwise, successively tune the EUT to each of the additional operating frequencies and repeat step 3.
(5) If the EUT is powered from the AC powerlines, supply it with 85% nominal AC voltage and repeat steps 3 and 4 before proceeding to step 6. If the EUT is battery powered, proceed to step 7.
(6) If the EUT is powered from the AC powerlines, supply it with 115% nominal AC voltage and repeat steps 3 and 4 before proceeding to step 7.

Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Spectrum Analyzer	Hewlett Packard	8595E	213060	02/04/2005	02/04/2006

Results: The sample tested was found to Comply.

12.0 Measurement of frequency stability (Frequency Stability)

Data:

Frequency Stability Measurements

	Limits	
Standard	Norminal Conditions	Extreme Conditions
RSS 119	1.5 ppm (0.6975 kHz)	1.5 ppm (0.6975 kHz)
EN 300 224	1 kHz	1 kHz
FCC 90	2.5 ppm (1.163 kHz)	2.5 ppm (1.163 kHz)

Frequency measurements in MHz
Nominal Voltage: 120 Vac/ 60 Hz

	Voltage (percentage of nominal)					
Temp. (°C)	85%	Margin (kHz)	100%	Margin (kHz)	115%	Margin (kHz)
60			467.7758	0.2		
50			467.7758	0.2		
40			467.7758	0.2		
30			467.7758	0.2		
20	467.7755	0.1	467.7756	0	467.7755	0.1
10			467.7754	0.2		
0			467.7752	0.4		
-10			467.7753	0.3		
-20			467.7753	0.3		
-30			467.7752	0.4		

Frequency measurements in MHz
Nominal Voltage: 230 Vac/ 50 Hz

	Voltage (percentage of nominal)					
Temp. (°C)	85%	Margin (kHz)	100%	Margin (kHz)	115%	Margin (kHz)
60	467.776	0.5	467.776	0.5	467.776	0.5
50			467.7758	0.3		
40			467.7758	0.3		

13.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

Method:

Measure in accordance with Intertek Test Procedure "TFB-1 Transient frequency behavior" or "TFB-2 Transient frequency behavior."

Applies to the following Standards:
TIA-603-A (land mobile)
FCC 47 CFR Part 90 (land mobile)
RSS-119 (land mobile and fixed)

PROCEDURE
A) Connect the equipment as illustrated.
B) Connect the test receiver FM output (rear panel) to the vertical input channel of the storage oscilloscope. Connect the output of the RF peak detector to the external trigger on the storage oscilloscope. Connect the output of the RF combiner to the RF power meter.
C) Set the test receiver to measure FM deviation with the audio bandwidth set at < 50 Hz to >15,000 Hz, and tune the RF frequency to the transmitter assigned frequency.
D) Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at +/- 25 kHz deviation (using the test receiver to adjust the deviation) and set its output level to 100 dBm.
E) Key the transmitter.
F) Supply sufficient attenuation via the RF attenuator to provide an input level to the test receiver that is 40 dB below (or - 10 dBm) the test receiver maximum allowed input power (30 dBm) when the transmitter is operating at its rated power level. Note this power level on the RF power meter.
G) Unkey the transmitter.
G) Adjust the RF level of the signal generator to provide RF power into the RF power meter equal to the level noted in step f). This signal generator RF level shall be maintained throughout the rest of the measurement.
I) Disconnect the RF power meter and connect the output of the RF combiner
network to the input of the test receiver.
J) Set the horizontal sweep rate on the storage oscilloscope to 10 milliseconds per division and adjust the display to continuously view the 1000 Hz tone from the FM output. Adjust the vertical amplitude control of the oscilloscope to display the 1000 Hz at +/- 4 divisions, vertically centered on the display.
K) Adjust the oscilloscope so it will trigger on an increasing magnitude from the RF peak detector at I division from the left side of the display, when the transmitter is turned on. Set the controls to store the display.
L) Reduce the attenuation of the RF attenuator so the input to the RF peak detector and the RF combiner is increased by 30 dB when the transmitter is turned on.
M) Key the transmitter and observe the stored display. The signal at the FM output, due to the change in the ratio of power between the signal generator input power and the transmitter output power will, because of the capture effect of the test receiver, produce a change in display: For the first part of the sweep it will show the 1 kHz test signal. Then once the receiver's demodulator has been captured by the transmitter power, the display will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. The instant when the I kHz test signal is completely suppressed (including any capture time due to phasing) is considered to be ton. The trace should be maintained within the allowed divisions during the period t1 and t2. Refer to the standard requirements in section 4.0 of this procedure, and to the sample following.
N) During the time from the end of t2 to the beginning of t3 the frequency difference should not exceed the limits in section 4.0 of this procedure. The allowed limit is equal to the transmitter frequency times its regulatory frequency tolerance times ? 4 display divisions divided by 25 kHz. For example, at a transmitter assigned frequency of 500 MHz and a frequency tolerance of 5 ppm, this would be 500 MHz times 5 ppm times ?4 divisions divided by 25 kHz. This equals ± 0.4 divisions in this example. Greater vertical sensitivity may he required to view this accurately.
O) Key the transmitter and observe the stored display. The trace should be maintained within the allowed divisions after the end of t2 and remain within it until the end of the trace.
P) To test the transient frequency behavior during the period t3, the transmitter shall be keyed.
Q) Adjust the oscilloscope trigger controls so it will trigger on a decreasing magnitude from the RF peak detector, at 1 division from the right side of the display, when the transmitter is turned off. Set the controls to store the display. The moment when the 1 kHz test signal starts to rise is considered to provide toff.
R) The transmitter shall he unkeyed.
S) Observe the display. The trace should remain within the allowed divisions during the period t3. Refer to the sample following.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.

+/- 5.17%

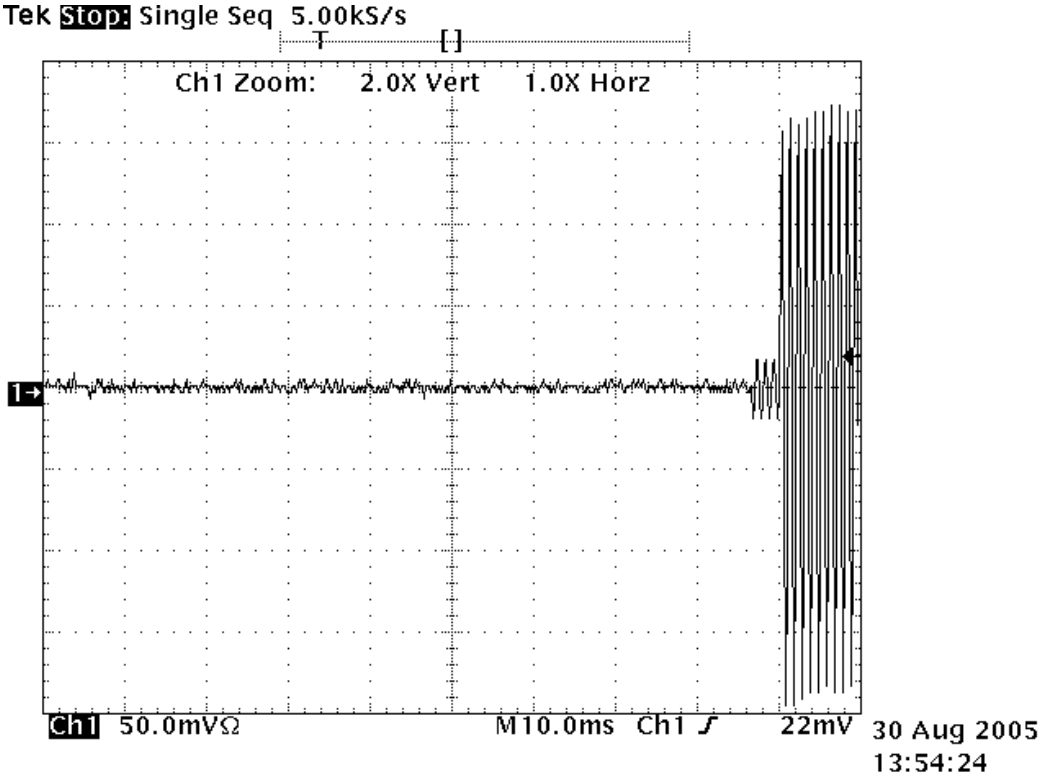
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Ditizing Oscilloscope	Tektronix	TDS-540	213179	02/23/2005	02/23/2006
Modulation Analyzer	Hewlett Packard	8901A	213050	11/24/2004	11/24/2005
Signal Generator, Synthesized RF	Fluke	6061A	213184	09/07/2005	09/07/2006

Results: The sample tested was found to Comply.

13.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

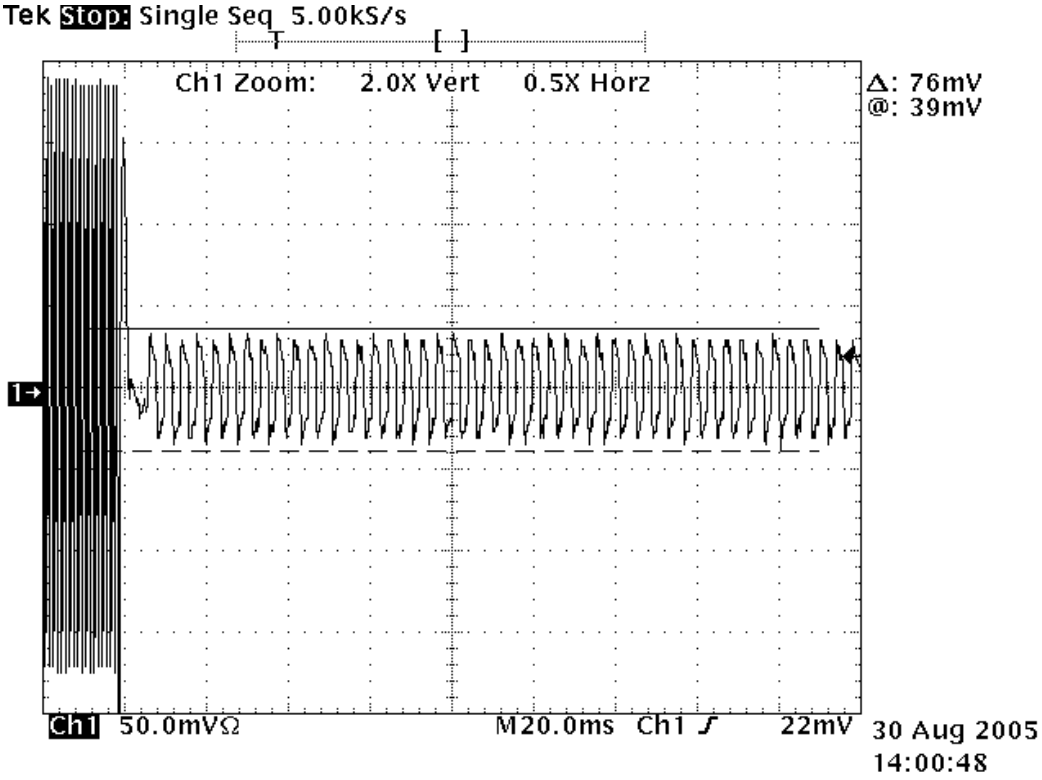
Plots:



Transmitter Transient Freq. Behavior - Turned off

13.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

Plots:



Transmitter Transient Freq. Behavior - Turned on

13.0 Measurement of transmitter transient frequency behavior (Transient Frequency Behaviour)

Data:

Refer to plots for results.

14.0 Radiated emissions (E-field) (Radiated Emissions)

Method:

Measurements in the frequency range of 30 MHz to 1000 MHz shall be performed with a quasi-peak detector instrument that meets the requirements of Section One of CISPR 16. The measuring antenna shall correlate to a balanced dipole.

Measurements of the radiated field are made with the antenna located at a distance of 3 or 10 meters from the EUT. The limit applied to the measurement shall be appropriate for the test distance. The test distance shall be indicated in the results section.

The EUT shall be arranged and connected with cables terminated in accordance with the product specification.

Exploratory tests should be carried out while varying the cable positions to determine the maximum or near-maximum emission level. During manipulation, cables shall not be placed under or on top of the system test components unless such placement is required by the inherent equipment design.

The antenna shall be adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth shall be varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) shall be varied during the measurements to find the maximum field-strength readings.

If the EUT is intended for tabletop use, it shall be placed on a table whose top is 0.8m above the ground plane. The table shall be constructed of non-conductive materials. Its dimensions are at least 1m by 1.5m, but may be extended for larger EUT.

If EUT is floor standing, the EUT was placed on a horizontal metal ground plane and isolated from the ground plane by up to 12 mm of insulating material.

Equipment setup for radiated disturbance tests shall follow the guidelines of ANSI C63.4:2003, EN 55022:1998 +A1:2000 +A2:2003, AS/NZS CISPR22:2002 and VCCI V-3 / 2000.04.

TEST SITE
The test site for radiated emissions is located at 1950 Evergreen Blvd, Suite 100, Duluth, Georgia 30096. The 10-meter semi-anechoic chamber meets the characteristics of CISPR 16-1: 1993 and ANSI C63.4: 2003. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

MEASUREMENT UNCERTAINTY
Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes. The values given are the measurement uncertainty values with an expanded uncertainty of k=2.
30 MHz to 1000 MHz at 3 meters: +/- 3.9 dB
30 MHz to 1000 MHz at 10 meters: +/- 3.6 dB
1 GHz to 18 GHz at 3 meters: +/- 4.2 dB

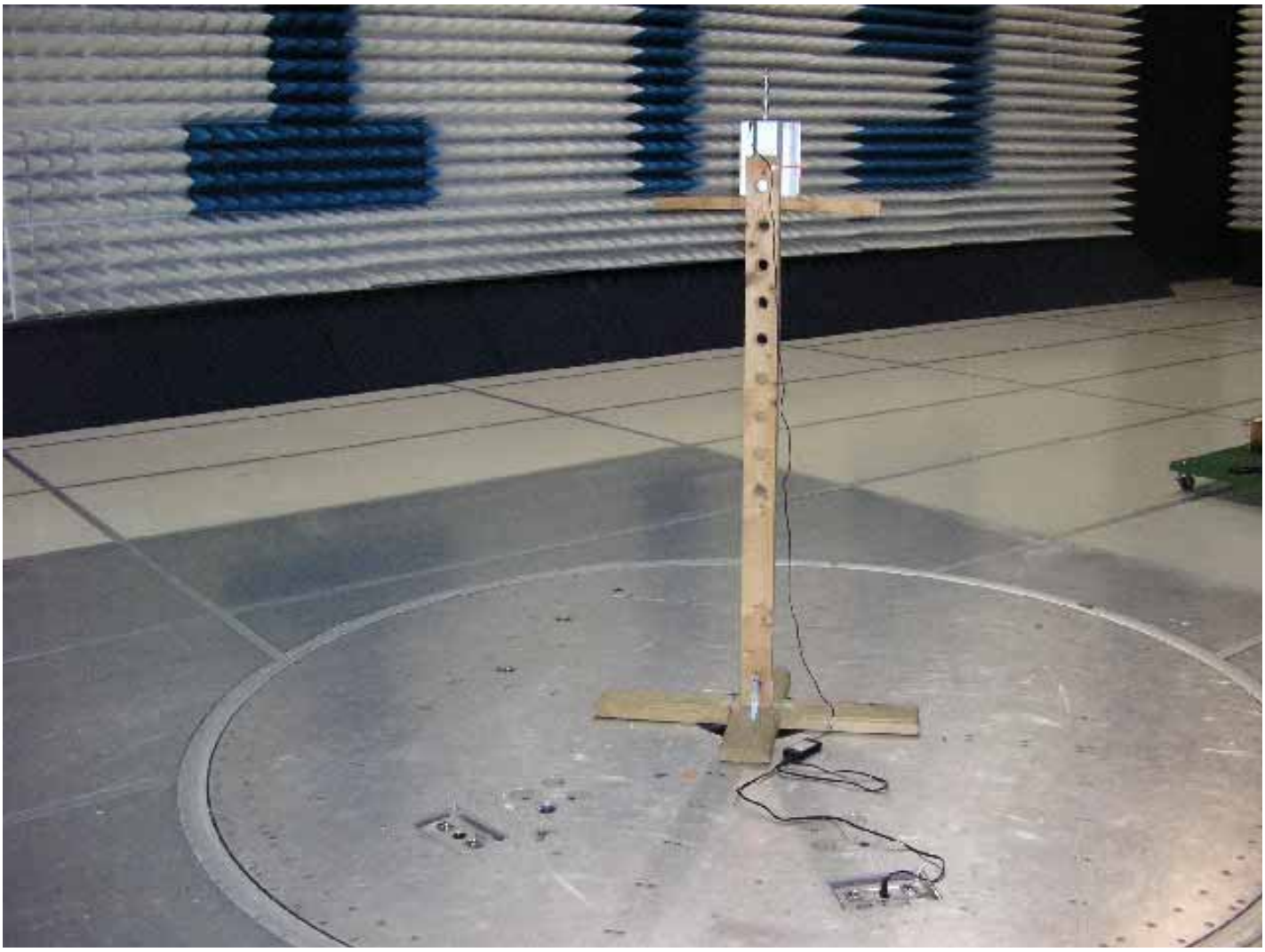
Test Equipment Used:

Description:	Manufacturer:	Model:	Asset Number:	Cal Date:	Cal Due:
Antenna, Horn, 1-18 GHz	EMCO	3115	213061	03/11/2005	03/11/2006
Cable E01 (Formerly PE7000N-N2 or N2)	Pasternack	RG214/U	E01	05/11/2005	05/11/2006
Cable E05 (Formerly HS 1500 N-N)	Huber-Suhner	Sucoflex 104PEA	E05	05/12/2005	05/12/2006
Cable E06 (Formerly HS 1500 N-SMA)	Huber-Suhner	Sucoflex 104PEA	E06 211268	05/13/2005	05/13/2006
Cable E11 (Formerly HS 7000 N-SMA)	Huber-Suhner	Sucoflex 104PEA	E11 211266	05/11/2005	05/11/2006
Cable TW2	Andrews	Cable TW2	211411	05/11/2005	05/11/2006
Cable, 18 GHz, N, 118 inches	Megaphase	TM18 NKNK 118	E202	05/13/2005	05/13/2006
Cable, 18 GHz, N, 394 inches	Megaphase	G919-NKNK-394	MP3	05/11/2005	05/11/2006
EMI Receiver	Hewlett Packard	8546A	211505	01/05/2005	01/05/2006
EMI Receiver, Preselector section	Hewlett Packard	85460A	211506	01/05/2005	01/05/2006
Preamplifier, 10 MHz to 2000 MHz, 30 dB gain	Mini-Circuits	ZKL-2	200069	01/13/2005	01/13/2006
Preamplifier, 1-26 GHz	Hewlett Packard	8449B	213191	04/22/2005	04/22/2006
Spectrum Analyzer, 20 Hz to 40 GHz	Rohde & Schwarz	FSEK30	200062	01/03/2005	01/03/2006

Results: The sample tested was found to Comply.

14.0 Radiated emissions (E-field) (Radiated Emissions)

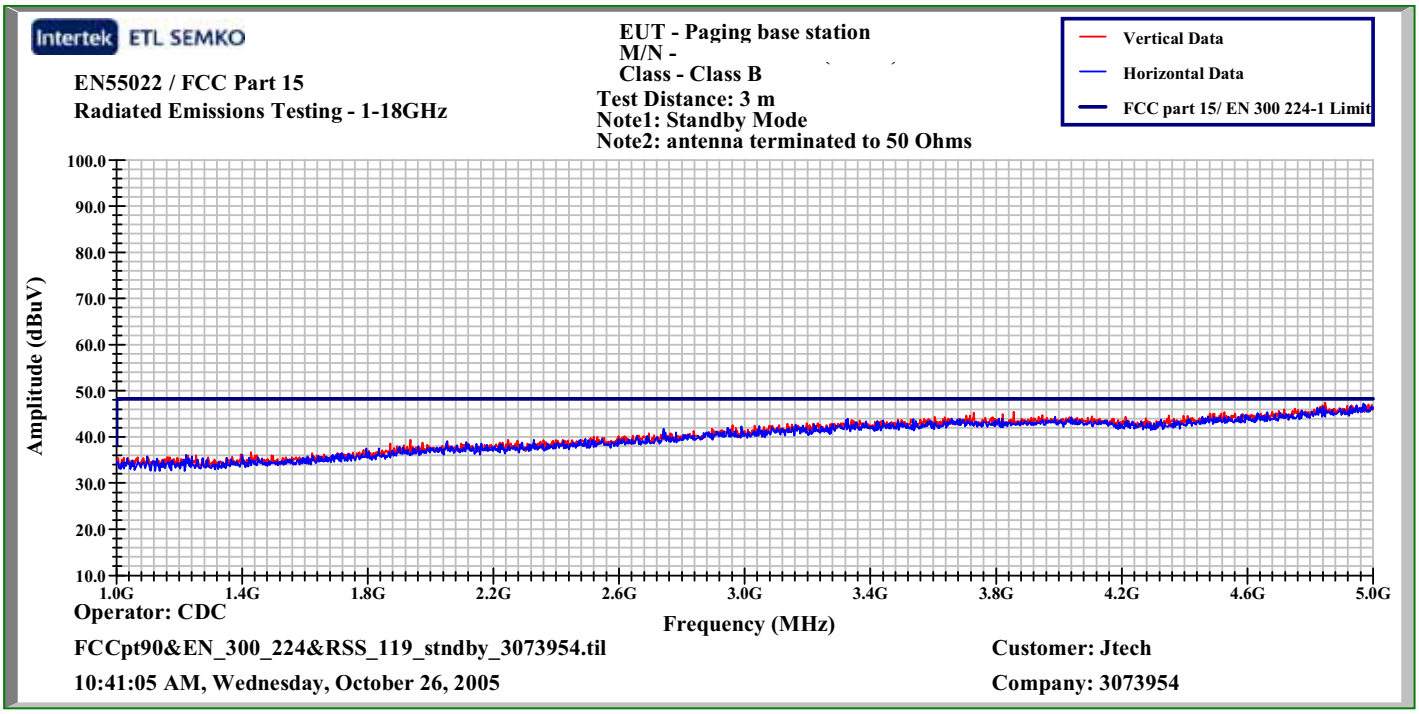
Photos:



Radiated Spurious Emissions Test Setup

14.0 Radiated emissions (E-field) (Radiated Emissions)

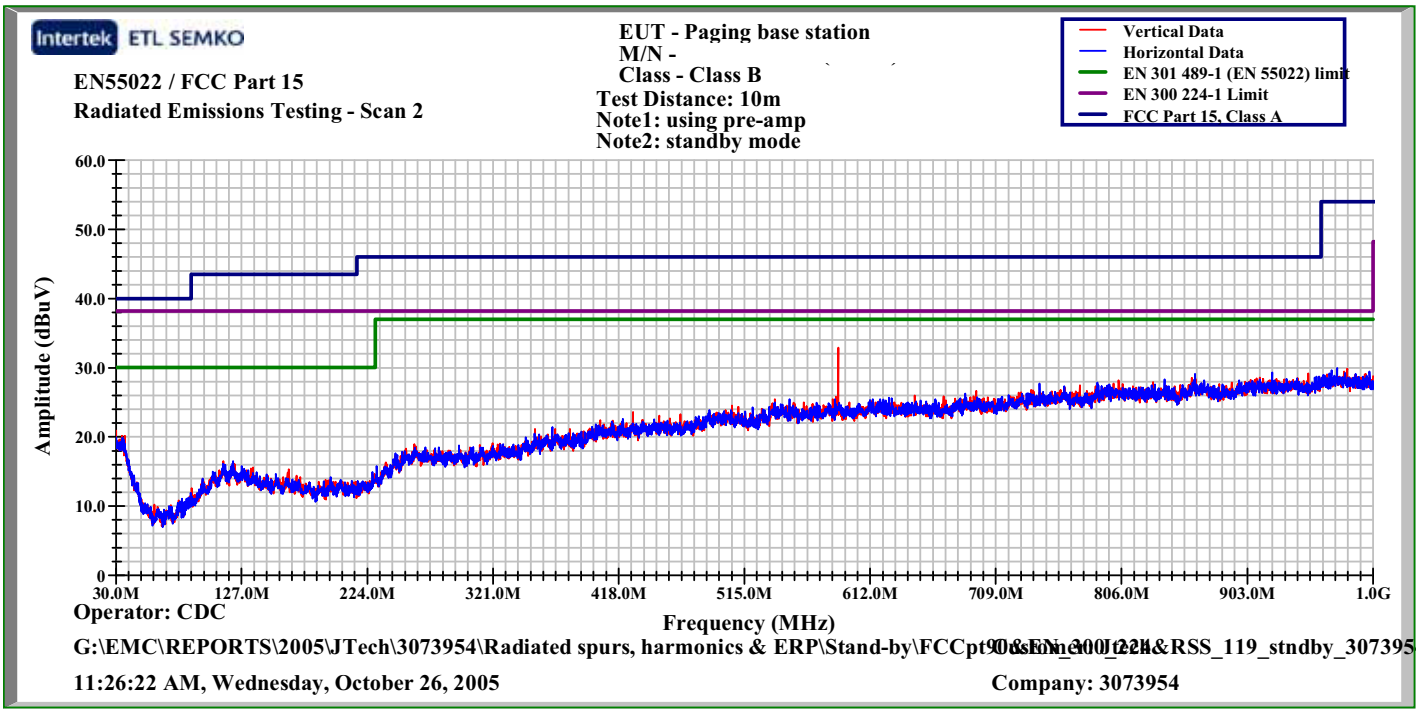
Plots:



Stand-by Radiated Spurious Emissions Results

14.0 Radiated emissions (E-field) (Radiated Emissions)

Plots:



Stand-by Radiated Spurious Emissions Results

14.0 Radiated emissions (E-field) (Radiated Emissions)

Data:

Date: 10/26/05 **Limit:** EN 300 224-1/ EN 55022 limit
Frequency Range (MHz): 30 to 1000 **Test Distance (m):** 10
Input power: 230 Vac/ 50 Hz **Modifications for compliance (y/n):** n

A	B	C	D	E	F	G	H	I
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**1_Rspur_stnby_limit**		
						Net dB(uV/m)	**Limit dB(uV/m)**	**Margin dB**
V	587.100	21.5	18.0	3.7	27.9	15.3	38.2	-22.9
V	980.000	21.4	21.5	5.1	27.6	20.4	38.2	-17.8
V	795.200	21.8	19.9	4.5	27.7	18.5	38.2	-19.7
V	429.600	22.1	17.0	3.4	27.9	14.6	38.2	-23.6
V	266.800	21.5	13.6	2.3	28.0	9.4	38.2	-28.8
V	119.400	22.1	12.1	1.4	28.0	7.6	38.2	-30.6
Calculations		G=C+D+E-F		I=G-H				

Date: 10/26/05 **Limit:** FCC Part 15/ EN 300 224-1 limit
Frequency Range (MHz): 1000 to 5000 **Test Distance (m):** 3
Input power: 230 Vac/ 50 Hz **Modifications for compliance (y/n):** n

A	B	C	D	E	F	G	H	I
Ant. Pol. (V/H)	**Frequency MHz**	**Reading dB(uV)**	**Antenna Factor dB(1/m)**	**Cable Loss dB**	**Pre-amp Factor dB**	**1_Rspur_stnby_limit**		
						Net dB(uV/m)	**Limit dB(uV/m)**	**Margin dB**
V	4834.345	17.9	32.0	17.1	35.5	31.6	48.2	-16.6
V	3855.700	23.0	31.0	13.0	35.9	31.1	48.2	-17.1
Calculations		G=C+D+E-F		I=G-H				

15.0 Revision History (Revision History)

Method:

Document the history of the report.

Data:

Revision Level	Date	Report Number	Notes
Original issue	October 31, 2005	3073954ATL-006	--
1	December 14, 2005	3073954ATL-006	Changed product name from the incorrect VPS-8 (ServAlert 100) to the correct ServAlert 200
2	June 14, 2006	3073954ATL-006	Reformated graphs in Section 8 for clarity.