

Percomm Technologies Inc.

e80/1100

Report of Measurements

per

CFR47, FCC Part 15, Subpart B and FCC Part 24 Subpart D

Revision 1.1

March 6, 2003

Approval		
Checked By:	<hr/> Robert Stirling, P.Eng.	<hr/> Date

Protocol Labs, Abbotsford BC, Canada
FCC Registration Number 96437
Industry Canada Registration Number IC3384

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FCC CFR47 Part 15/B Report of Measurements**Testing Details:**

TESTED BY: Bruce Balston

WRITTEN BY: Craig Long

TEST CONDITIONS: Temperature and Humidity: 16°C, 60%

TEST VOLTAGE: Internal Battery and external power supply at 120 Vac, 60 Hz

Test Facilities:

Protocol Labs
 28945 McTavish Rd.
 Abbotsford BC, Canada, V4X 2E7

FCC Registration Number 96437
 Industry Canada Registration Number IC3384

Test Equipment List:

EMISSIONS:

Device	Model Number	Serial No.	Last Cal.	Next Cal
Antenna	EMCO 3141 Bilog	1127	09/26/02	09/26/03
Antenna	EMCO 3105 Horn	2024	10/30/02	10/30/02
Antenna	EMCO 3115 Horn	9005-3429	10/31/02	10/31/02
Antenna	Electro-metrics LPA-30	563	01/07/03	01/07/04
Signal Generator	Hewlett Packard 8652A	2913A00373	09/05/02	09/05/03
Signal Generator	Wavetek 2002A	9362081	01/05/03	01/05/04
Amplifier	Amplifier Research 30W1000M7	22606	N/A	N/A
Amplifier	Hewlett Packard	2512A00824	09/13/02	09/13/03
Signal Generator	Hewlett Packard 8672A	1930A00890	01/14/03	01/14/04
Spectrum Analyzer	Hewlett Packard 8566B	2241A02102	01/13/03	01/13/04
RF-Preselector	Hewlett Packard 85685A	3107A01222	01/10/03	01/10/04
Quasi-Peak Adapter	Hewlett Packard 85650A	2043A00240	01/13/03	01/13/04
Tower	Rhientech Labs	Custom	N/A	N/A
Turntable	Protocol	Custom	N/A	N/A

Testing Details

COMPANY TESTING: Percomm Technologies Inc.

CONTACT PERSON: Radu I. Oprea

PHONE NUMBER: 604-293-5217

ADDRESS:

Equipment Under Test:THE TEST SYSTEM: EUT: Two Way Pager

Manufacturer: Percomm Technologies Inc.
Model Name: E80 Two Way Pager
Model Number: 1100
Serial Number: XAAB3B223K

Antenna Type: Internal

Auxiliary Equipment: AC Power Adapter

Manufacturer: Merry King Enterprises Co.
Part Number: MKD-350500500

Auxiliary Equipment: Serial Cable

Manufacturer: Weison
Part Number: Percomm Custom cable

Test Software: Hermes_Jan21

TEST SETUP: The EUT was setup in its normal operating mode for the duration of the FCC part 15 testing. The EUT was placed in full transmit mode for the duration of FCC part 24 testing.

EUT Description: The EUT is a two-way pager and has an internal permanently attached antenna. The serial cable can only be attached when the AC Adapter is not connected and vice versa.

CABLING:

Cable	Name	Ferrite	Shielded
Power Cable	AC Adapter Power cable	No	No
Serial Cable	Serial Interface Cable	No	No

TEST SUMMARY:

Test	Standard	Description	Result
Conducted Emissions	FCC15.107 Class B Limits	The Conducted Emissions are measured on the phase and Neutral Power lines in the 0.15 - 30.0 MHz range.	Complies
Radiated Emissions	FCC15.109 Class B Limits	The Radiated Emissions are measured above 30 MHz.	Complies
Radiated Spurious	FCC 2.103/ 2.1053/ 24.133	The radiated emissions are measured up to the 10 th Harmonic	Complies
Spurious Emissions at Antenna Terminal	FCC 2.1035/ 2.1051/ 24.132	The radiated emissions are measured in the 30-1000Mhz range	Complies

MODIFICATIONS:

This unit requires no modifications for it to pass.

CONCLUSION:

e80/1100 tested complies with the requirements of FCC CFR47 part 15/B and FCC Part 24 subpart D.

Part 1- Conducted Emission Testing

DATE: February 18, 2003

TEST STANDARD: FCC CFR47, Part 15, Subpart B

DEVICE DESCRIPTIONS: As described in the Equipment Under Test Section, above.

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus.

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyzer, Peak detector. Any emissions that are close to the limit are measured using a test receiver and CISPR Quasi-Peak detector.

CABLING DETAILS: The EUT was set up using the manufacturer's specified normal cabling configuration.

CABLING:

Cable	Name	Ferrite	Shielded
Power Cable	AC Adapter Power cable	No	No
Serial Cable	Serial Interface Cable	No	No

MINIMUM STANDARD: Class B Limits:

Frequency (MHz)	Maximum Level (dB μ V) Quasi-Peak	Maximum Level (dB μ V) Average
0.15 - 0.50	66-56 (Log Delta)	56-46 (Log Delta)
0.50 - 5.00	56	46
5.00 - 30.0	60	50

MODIFICATIONS: No modifications were required for the devices to pass the test.

MEASUREMENT DATA: See Appendix B for Plots,

EMISSIONS DATA: See Tables 1 and 2 in Appendix B for corresponding frequencies.

PERFORMANCE: Complies.

The tests were performed at 120 Vac, 60 Hz

Part 2- Radiated Emission Testing

DATE: February 19, 2003

TEST STANDARD: FCC CFR47, Part 15, Subpart B section 15.109 Class B
FCC Part 24 Subpart D

DEVICE DESCRIPTIONS: Refer to the Equipment Under Test Section, above, for EUT Descriptions.

TEST SETUP: The equipment was set up in a 3-meter open field test site. Emissions in both horizontal and vertical polarizations were measured while rotating the EUT on a turntable to maximize the emissions signal strength and the results recorded on the attached plots.

CABLING DETAILS: The EUT was set up using the manufacturer's specified normal cabling configuration.

CABLE DESCRIPTIONS:

Cable	Name	Ferrite	Shielded
Power Cable	AC Adapter Power cable	No	No
Serial Cable	Serial Interface Cable	No	No

MINIMUM STANDARD: Class B Limits:

Frequency (MHz)	Maximum Field Strength dBuV/m at 3m
30 - 88	39.0
88 - 216	43.5
216 - 960	46.5
960 - up	49.5

MEASUREMENT DATA: See Appendix B for Plots, The blue trace represents all emissions, including ambient noise. 'All Suspects' are marked in purple. FCC Class B limits are marked in solid purple.

EMISSIONS DATA: See Table 3,4 and 5 in Appendix B for corresponding frequencies.

PERFORMANCE: Complies.

Part 4- Spurious Emission Testing

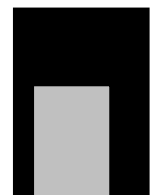
DATE:	February 19 and 20, 2002
TEST STANDARD:	FCC CFR47, Part 2, 103, and 1053, and Part 24, Subpart D 133
DEVICE DESCRIPTIONS:	Refer to the Equipment Under Test Section, above, for EUT Descriptions.
TEST SETUP:	The equipment was set up at a 3 m measurement distance, and. Spurious emissions we measured in both horizontal and vertical polarization's with signal strength and the results recorded on the attached graph and tables.
CABLING DETAILS:	The EUT was set up using the manufacturer's specified normal cabling configuration.
MINIMUM STANDARD:	<p>1 Watts ERP is the maximum limit. Spurious Attenuation = $43 + 10\log(\text{Power})\text{dB}$.Power is specified in Watts.(363 mW) The Spurious limit is 38.59 dBc.</p> $\text{ERP} = (\text{S/G} - \text{loss}) + (\text{G}_{\text{SUB}} - \text{G}_d)$ $\text{ERP} = (\text{S/G} - \text{loss}) + [(20\log F - \text{AF}_S - 31.94) - (20\log F - \text{AF}_D - 31.94)]$ <p> ERP = Effective Radiated Power S/G = Signal Generator Reading Loss = Cable Loss to Substitution Antenna G_{SUB} = Substitution Antenna Gain G_d = Ideal Dipole Gain AF_{SUB} = Antenna Factor for Substitution Antenna AF_D = Antenna Factor for Ideal Dipole </p>
MEASUREMENT DATA:	See Appendix B for Graphs and Data
EMISSIONS DATA:	See Table 2 Spurious Emissions in Appendix B, for corresponding frequencies.
EUT ORIENTATION:	The EUT was tested in three orientation's to represent how the EUT can be oriented by the end user. Harmonic 9 is the maximun at position A, Harmonic 1,2,6,7,10 are at there maximun values at position B, harmonic 3,4,5,8 are at there maximun values at position C.



Bottom of the Pager
Facing the Antenna (A)



LCD Display
Facing Antenna
(B)



LCD Display
Facing Antenna
(C)

MEASUREMENT PROCEDURE: The radiated emissions test was performed according to TIA/EIA-603-A. The substitution method in section 2.1.1.2 was used. A bilog and horn antenna located 3 meters away from the transmitter picks up any signal radiated from the transmitter. A spectrum analyzer covering the necessary frequency range is used to detect and measure any radiation picked up by the antenna. The testing procedure is repeated for both horizontal and vertical polarizations of the receiving antenna. Relative signal strength is indicated on the spectrum analyzer connected to this antenna. And the cable losses, amplifier gains and antenna correction factor are added to calculate the signal strength. Actual measurements are recorded on the attached graphs.

PERFORMANCE: Complies.

Appendix B: Photos



Emissions Test Setup Front View (Pager only)



Emissions Test Setup front View (Pager with Serial Cable)



Emissions Test Setup front View (Pager with Power Supply)

Appendix C: Measurement Data and Plots

Measurement Data

Conducted Emissions:

Table 1: Line 1 CISPR FCC Class A

Frequency (MHz)	Peak (dBμV)	DelLim-Pk (dB)
0.1864	44.4	-9.7
0.1934	43.2	-10.6
0.1721	43.7	-11.1
0.6533	34.9	-11.1
0.1659	43.9	-11.2

Table 2: Line 2 CISPR FCC Class A

Frequency (MHz)	Peak (dBμV)	DelLim-Pk (dB)
0.1557	50.0	-5.6
0.1685	48.8	-6.2
0.1615	48.0	-7.3
0.1825	45.6	-8.7
0.1844	43.7	-10.5

Table 3: Total Radiated Emissions for the Pager with Serial cable.

Frequency (MHz)	Pol	Height (cm)	Angle (deg)	Un Corr Pk (dB)	Tot Corr (dB)	Peak (dBμV/m)	DelLim-Pk (dB)
985.038002	Vert	150	240	7.90	28.83	36.74	-17.26
414.680951	Vert	170	270	7.10	19.16	26.26	-19.74
322.558436	Vert	150	295	6.10	17.11	23.21	-22.79
138.206232	Vert	180	270	10.50	10.12	20.62	-22.88
230.424850	Vert	180	260	6.50	13.62	20.12	-25.88

Table 4: Total Radiated Emissions for the Pager with AC adapter.

Frequency (MHz)	Pol	Height (cm)	Angle (deg)	Un Corr Pk (dB)	Tot Corr (dB)	Peak (dBμV/m)	DelLim-Pk (dB)
414.731057	Vert	200	235	11.00	19.16	30.16	-15.84
984.971524	Vert	250	270	6.60	28.83	35.43	-18.57

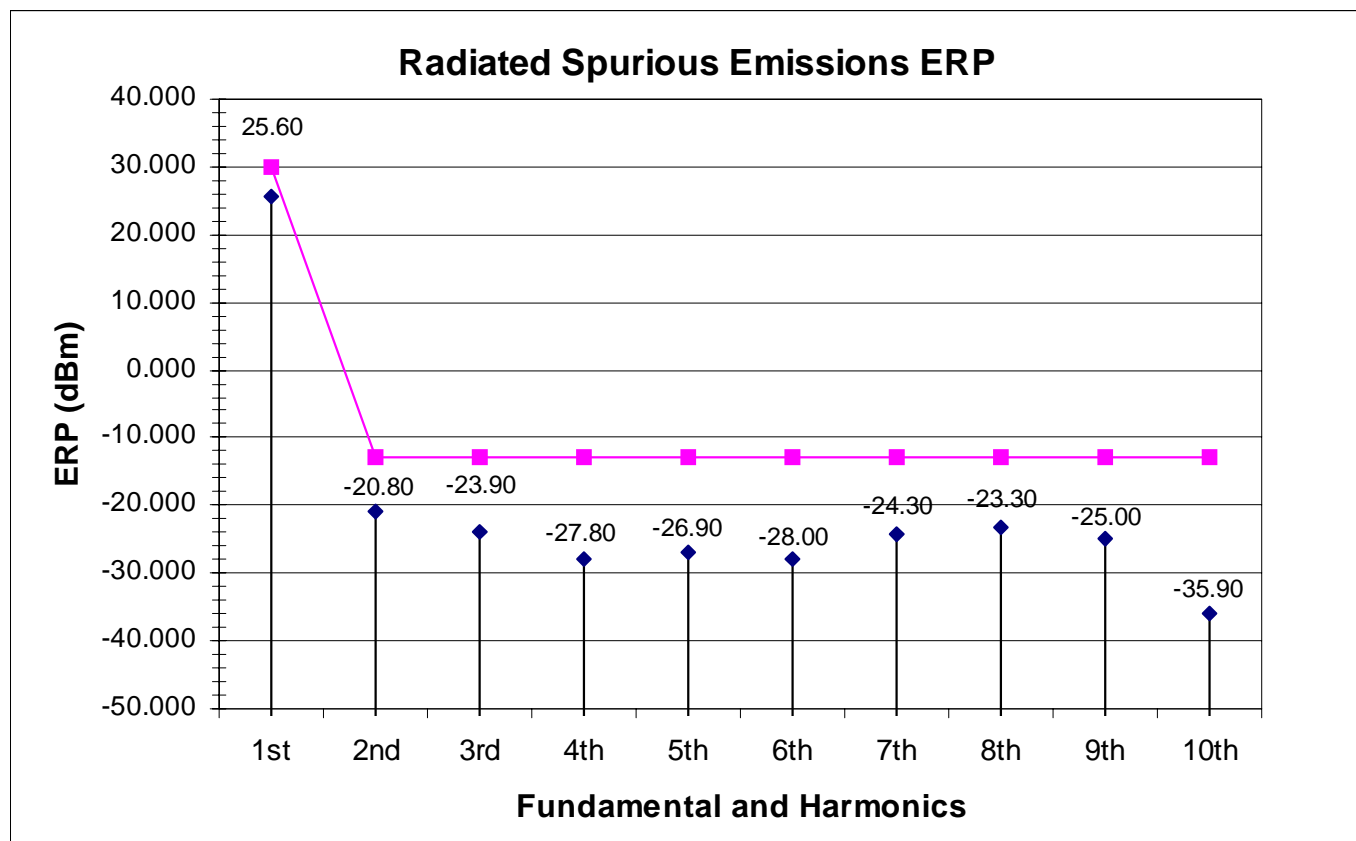
Table 5: Total Radiated Emissions for the Pager

Frequency (MHz)	Pol	Height (cm)	Angle (deg)	Un Corr Pk (dB)	Tot Corr (dB)	Peak (dBμV/m)	DelLim-Pk (dB)
984.996746	Vert	120	65	7.60	28.84	36.44	-17.56
414.742090	Vert	190	45	7.60	19.16	26.76	-19.24

Table 6: Radiated Spurious Emissions 901.5 MHz

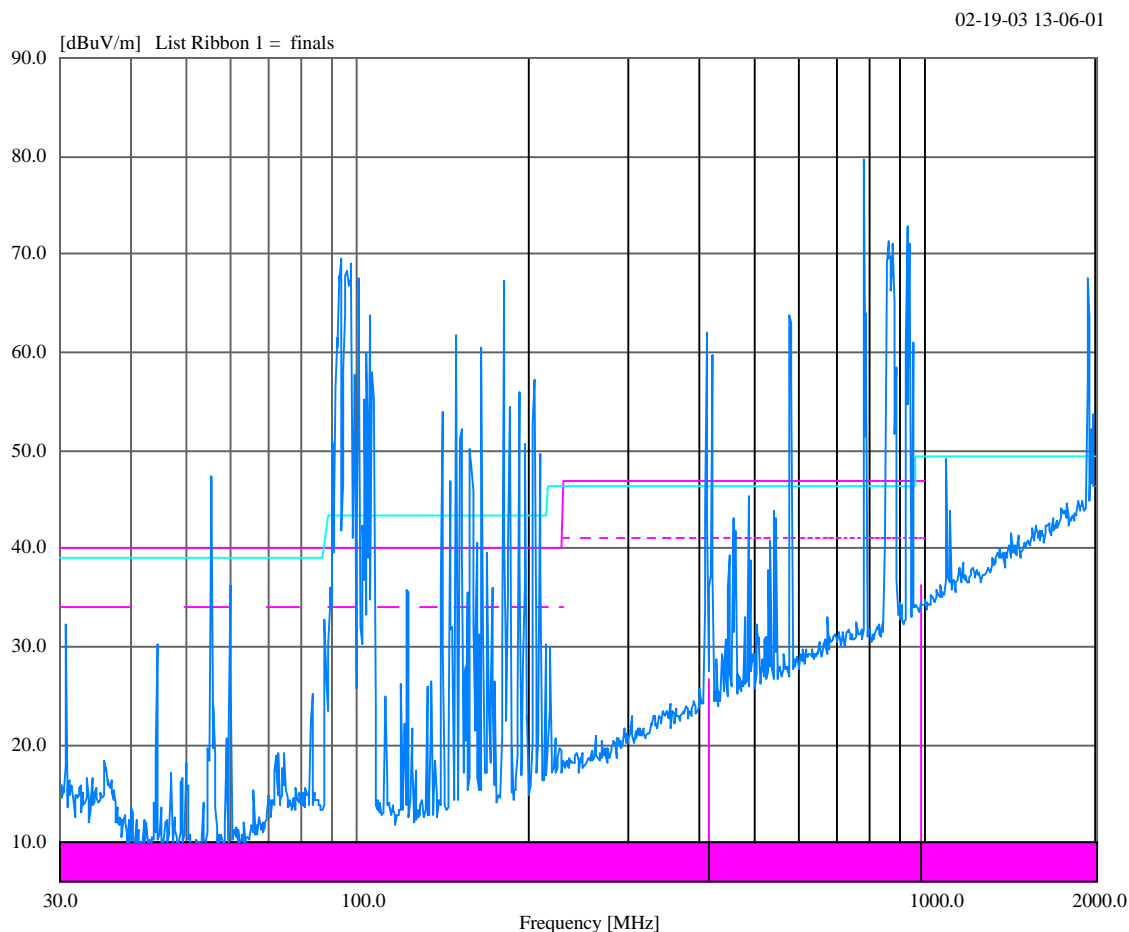
	Frequency (MHz)	Polarity	Uncor Pk (dBμV)	Tot Corr (dB)	Peak (dBμV/m)	S/G dBm	Loss dBm	Subs AF dBm	Dipole AF dBm	ERP dBm	dBc
1	901.5	V	97.2	27.8	125	19.4	0.0	22.8	29.3	25.6	-
2	1803.0	V	41.3	35.93	77.23	-27.3	0.0	28.6	35.3	-20.8	-46.4
3	2704.5	H	62.7	7.28	69.98	-30.0	1.7	31.2	38.8	-23.9	-49.5
4	3606.0	H	51.5	14.63	66.13	-33.0	2.1	33.5	41.4	-27.8	-53.4
5	4507.5	H	47	18.81	65.81	-33.0	2.6	34.6	43.3	-26.9	-52.5
6	5409.0	H	36.5	28.69	65.19	-33.0	2.8	36.5	44.8	-28.0	-53.6
7	6310.5	V	44.4	29.98	74.38	-31.0	3.0	37.1	46.2	-24.3	-49.9
8	7212.0	H	43.3	30.15	73.45	-30.0	3.1	38.4	47.4	-23.3	-48.9
9	8113.5	H	36.8	35.81	72.61	-30.0	4.0	39.2	48.4	-25.0	-50.6
10	9015.0	H	21.5	38.69	60.19	-38.0	4.8	40.1	49.3	-35.9	-61.5

(No other measurable spurious emissions)



Plot Radiated Spurious (901.5 MHz)

Emissions Plots



- FCC Limit
- - - 10 dB below FCC Limit
- CISPR Limit
- - - 10 dB below CISPR Limit



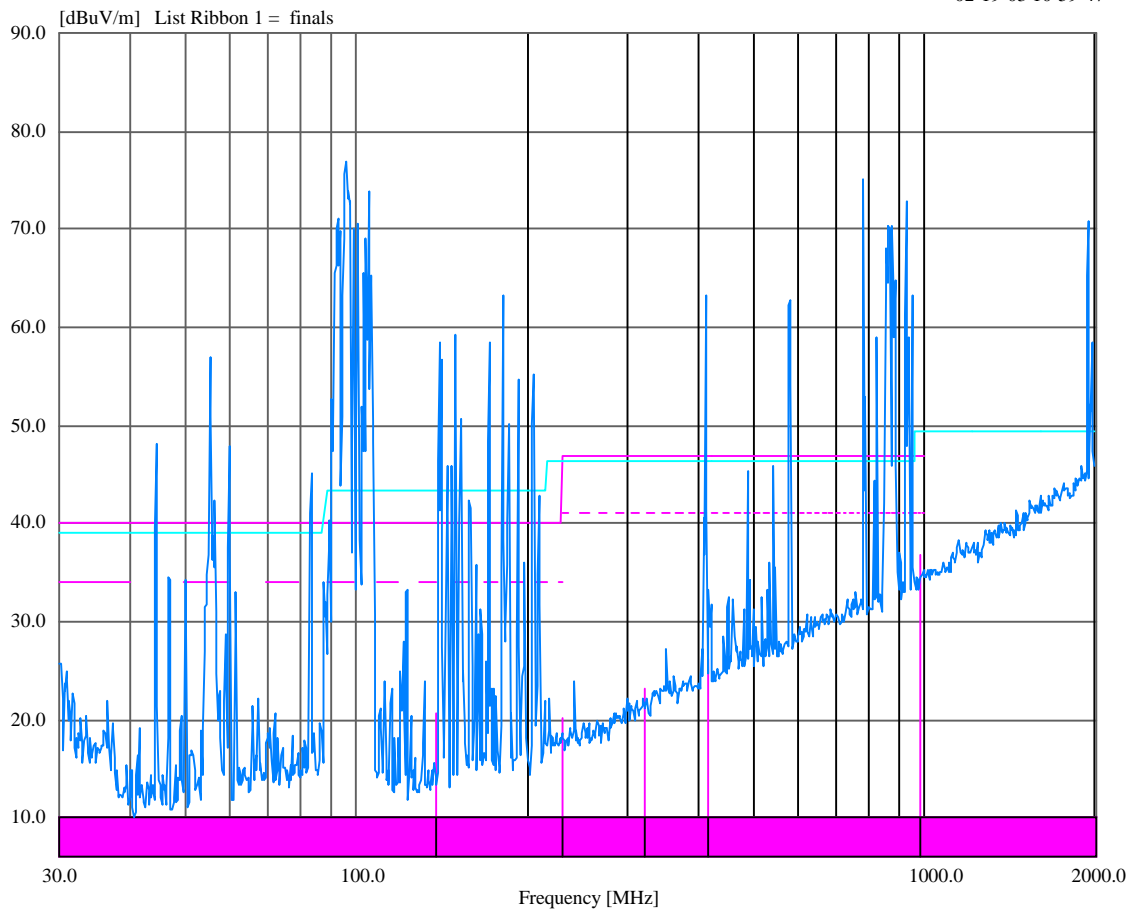
(Dark Blue Traces) All Emissions including ambient noise.



(Vertical Pink Line) – Markings of each Suspect Frequency
("X") – indicates Quasi-Peak

Radiated Emission E80/1100 Only

02-19-03 10-59-47



— FCC Limit

- - - 10 dB below FCC Limit

— CISPR Limit

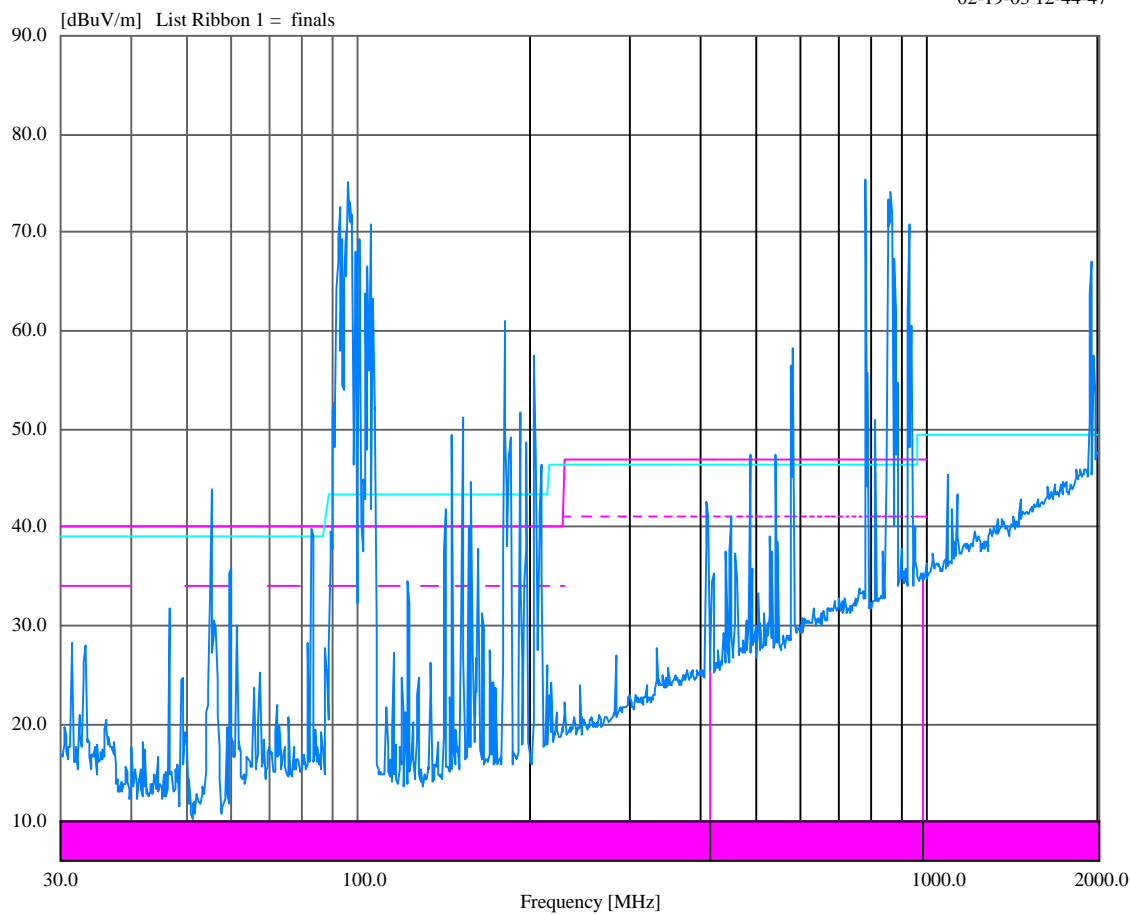
- - - 10 dB below CISPR Limit

(Dark Blue Traces) All
Emissions including
ambient noise.

(Vertical Pink Line) –
Markings of each Suspect
Frequency
("X") – indicates Quasi-
Peak

Radiated Emission E80/1100 with AC Adapter

02-19-03 12-44-47



— FCC Limit

- - - 10 dB below FCC Limit

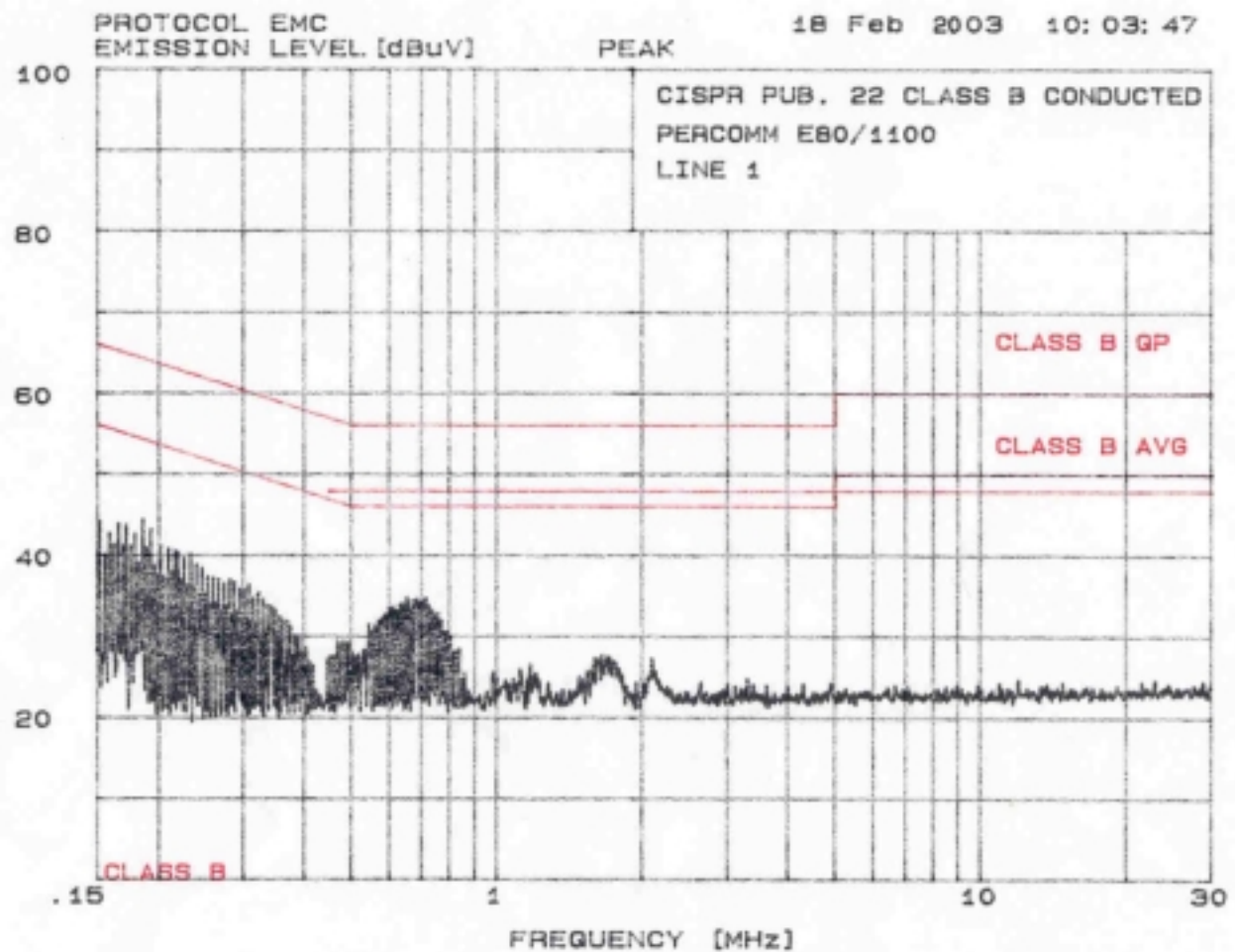
— CISPR Limit

- - - 10 dB below CISPR Limit

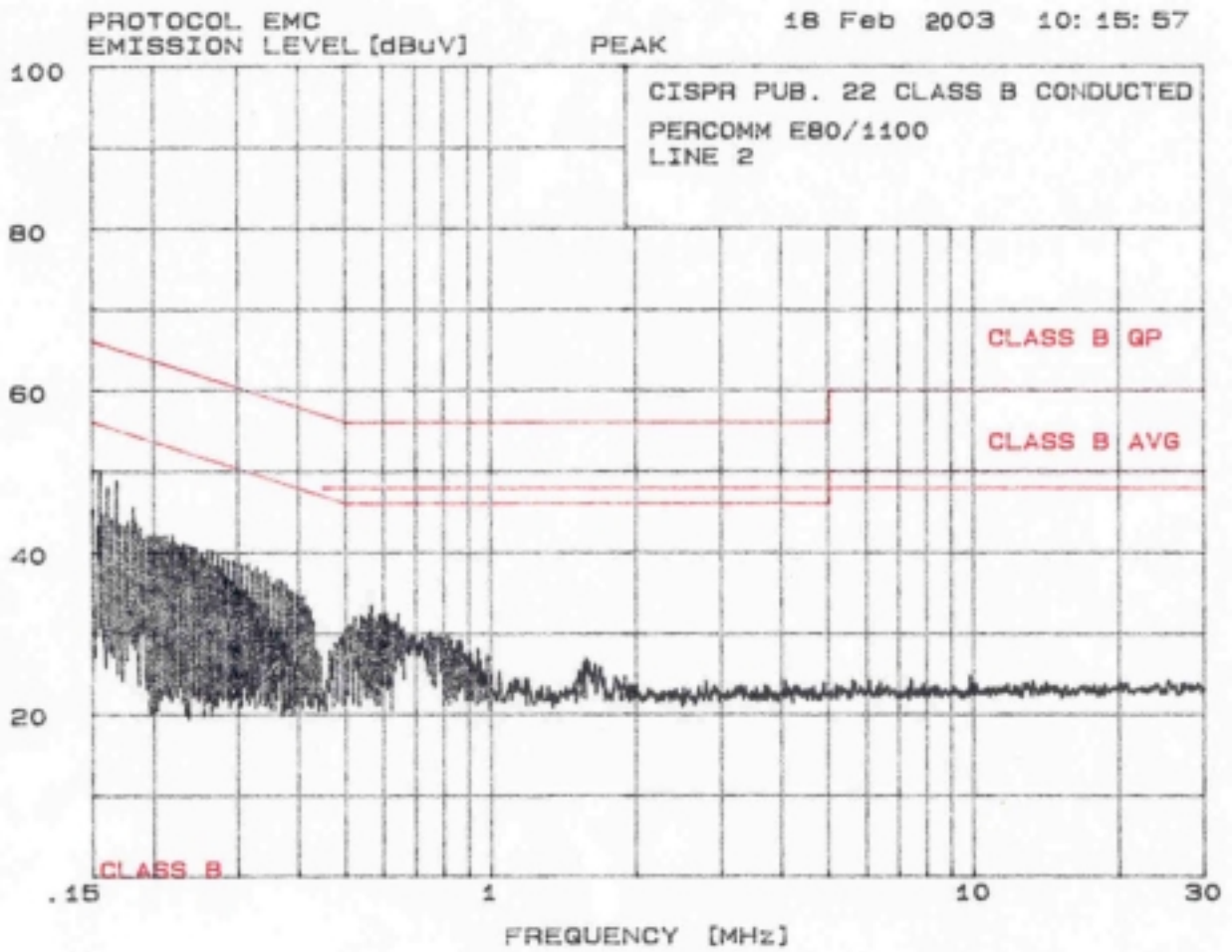
(Dark Blue Traces) All
Emissions including
ambient noise.

(Vertical Pink Line) –
Markings of each Suspect
Frequency
("X") – indicates Quasi-
Peak

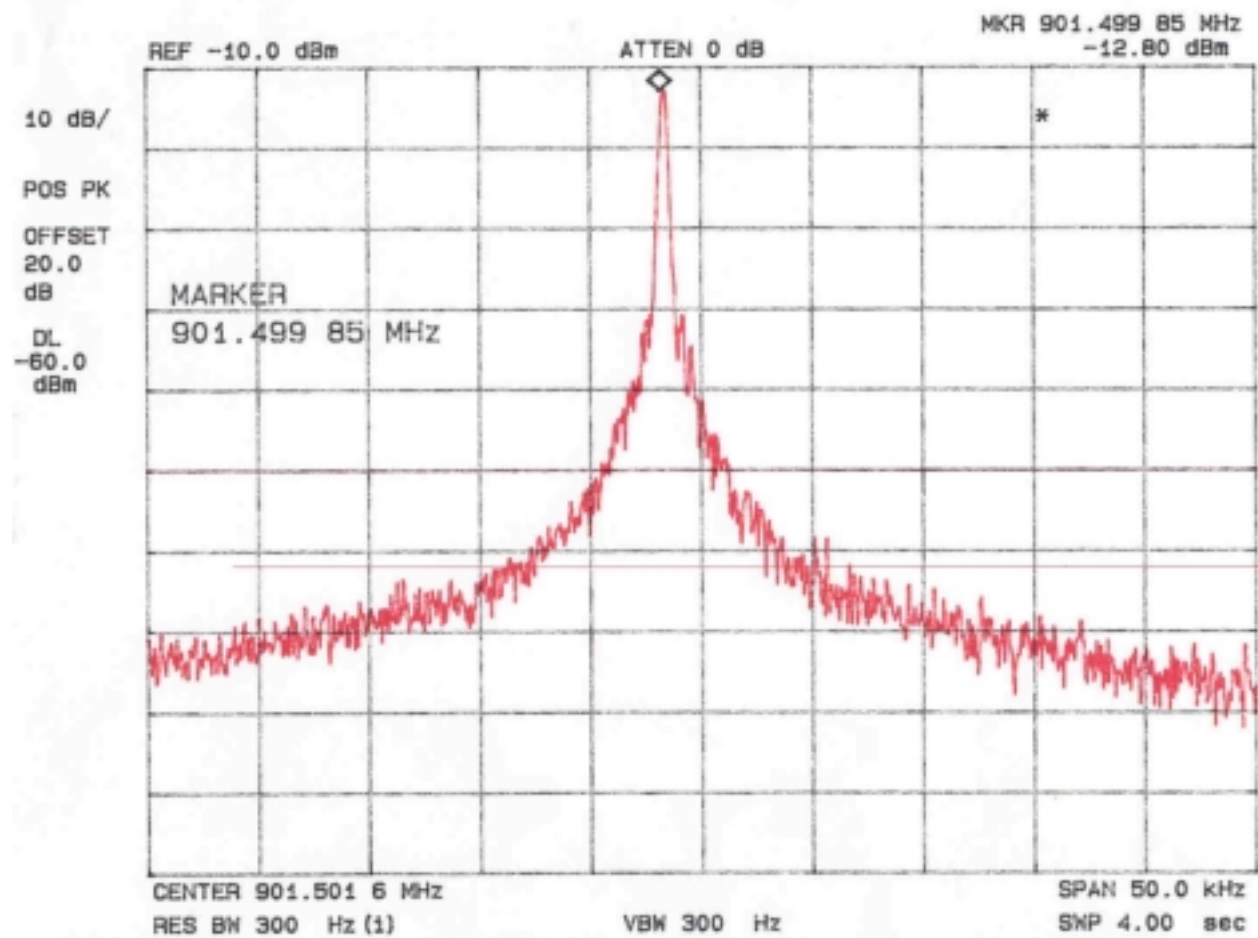
Radiated Emission E80/1100 with Serial Cable



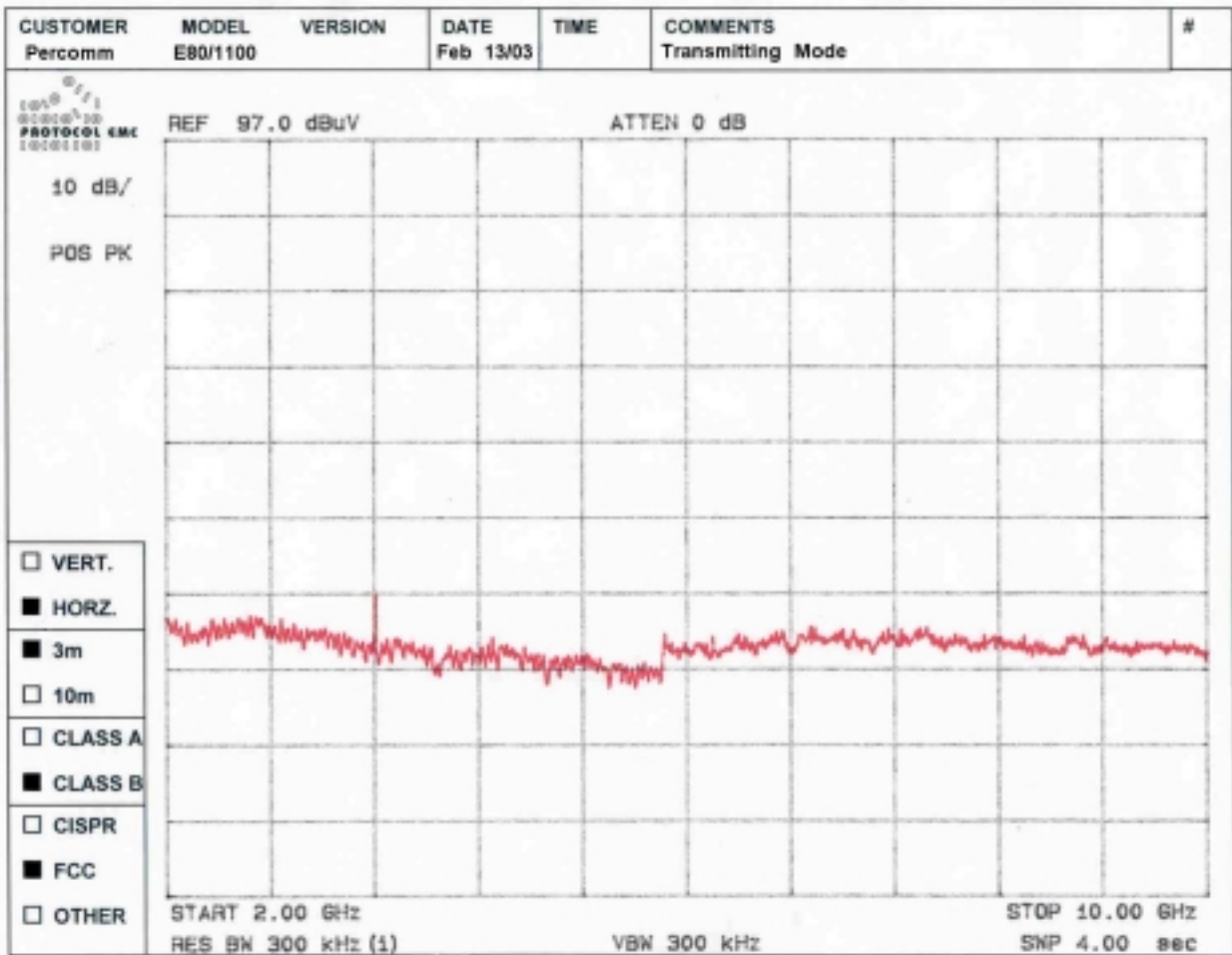
Line 1 Conducted



Line 1 Conducted

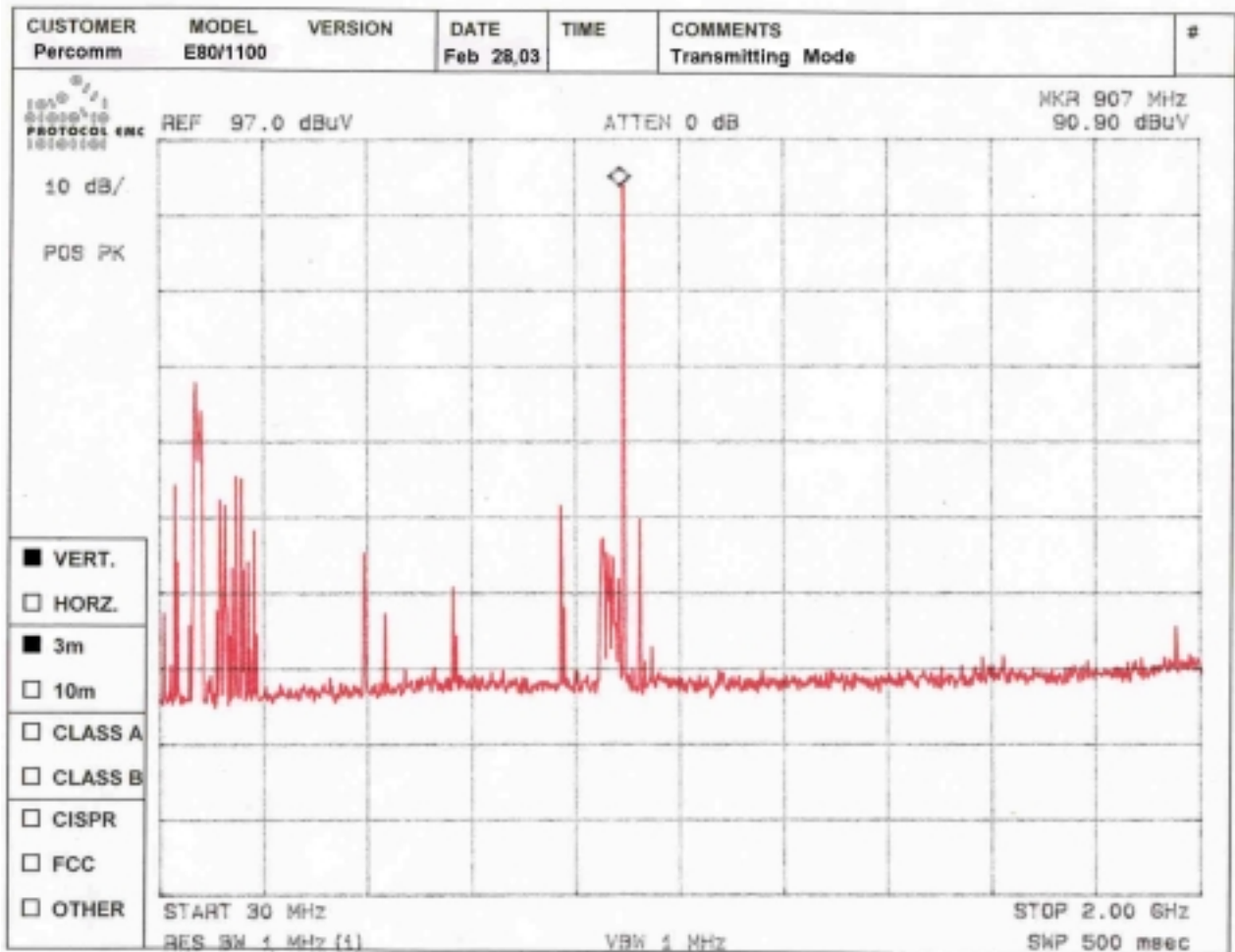


901.5 Bandedge



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901.5 High Band Spurious



901.5 Low Band Spurious