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ACCREDITED
Certificate Number 1953-01

Amendment to Test Report
R021802-01A

Company: Excel Engineering
Suite 368
3655 Torrance Blvd.
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Contact: Rocky Sawada
Product: WS900
FCC ID: OWGWS900Tx/Rx

Test Report No: R021802-01B

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General Manager

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Test Engineer

DATE: 15 June 2002
Total Pages: 19

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1.0 Summary of test results

1.1 Reason for Amended Report

The report has been amended to allow for the reporting of data for OWGWS900TX and OWGWS900RX.

1.2 Test Results

Test	Test Specification	Results
CFR 47, FCC Part 15.109	Part 15.109, Class B	Complies
CFR 47, FCC Part 15.203	Part 15.203	Complies
CFR 47, FCC Part 15.249	Part 15.249	Complies

1.3 Test Methods

1.3.1 Radiated Emissions

All measurements were taken at a distance of 3 meters using the methods outlined in ANSI/IEEE C63.4, 2001. Measurements were taken from 30MHz to 1Gz, then from 1GHz to 10GHz. All data presented is the measured results with any applicable correction factors applied via the test software. The 3 orthogonal axes of the WS900TX were examined in order to maximize the emissions.

2.0 Description

2.1 Equipment under test

The WS900 consists of the wetness sensor/transmitter module and remote receiver unit. The transmitter emits a signal only when the sensor detects moisture. The receiver picks up the signal and an alarm tone is activated. The tone stops when the transmitter stops transmitting. On the unit tested, there was no provision for non-battery powered operation.

2.1.1 Identification:

WS900Tx wetness sensor
WS900Rx wetness receiver

2.1.2 EUT received date: 14 February 2002

2.1.3 EUT tested dates: 1st, 4th, 7th, and 8th March 2002

2.1.4 Manufacturer: Excel Engineering, HK

2.1.5 Serial number:

WS900Tx wetness sensor, SN: 78
WS900Rx wetness receiver, SN: 12

2.2 Laboratory description

All testing was performed at the NCEE Lincoln facility, which is a FCC registered lab. This site has been fully described in a report submitted to the FCC, and accepted in a letter dated May 4, 2001. Laboratory environmental conditions varied slightly throughout the tests:

Relative humidity of 46 ± 5%
Temperature of 21 ± 3° Celsius

2.3 Special equipment or setup

The EUT was tested using new AAA batteries. A modified test probe was used so that the WS900Tx would continuously transmit. An actual probe was examined and no differences in the emission spectrum or emissions in excess of the limits were found to be coming from the EUT.

3.0 Test equipment used

Serial #	*Manufacturer*	*Model*	*Description*	*Last cal.*
1647	EMCO	3142B	Biconilog antenna	25-May-01
6415	EMCO	3115	DRG Horn	31-May-01
100037	Rohde & Schwarz	ESIB26	EMI Test Receiver	11-Jun-01
082001/003	Rohde & Schwarz	TS-PR18	Preamplifier	10-Aug-01
2575	Rohde & Schwarz	ES-K1	Software v1.60	N/A

4.0 Detailed Results

4.1 FCC Part 15.109 Radiated Emissions for Class 'B' devices, Rx

The WS900Rx portion was tested in its standard configuration, with new batteries. Figures 1 and 2, in Appendix A, show the test setup used. The EUT was rotated and the mast was raised from 1 meter to 4 meters to find the highest emissions. No emissions were found to be in excess of the limits for Class 'B' devices found in CFR 47, Part 15.109. The results can be seen in figures 5 and 6 in Appendix B. The highest peak values, below 1GHz, and the highest average values, above 1GHz, are shown below. The antenna on the receiver is attached via a screw that is enclosed within the case of the EUT.

Frequency MHz	Corrected Level dBµV/m	Polarisation
33.067386	27.3	H,PK
31.73374	26.61	V,PK
30	26.49	V,PK
34.000938	26.44	H,PK
33.334115	26.31	V,PK
30.800188	26.07	V,PK
30.933552	25.97	H,PK
30.400094	25.9	V,PK
34.267667	25.89	V,PK
34.534397	25.89	H,PK
31.200281	25.81	H,PK
7000	42.14	V,AV
10000	41.03	V,AV
9999	41.03	H,AV
9998.5	41.03	V,AV
9998	41.03	H,AV
9997.5	41.03	V,AV
9996	41.03	V,AV

4.2 FCC Part 15.203, Tx

The WS900Tx antenna is copper rod that is soldered to the circuit board of the EUT and is completely enclosed within the unit.

4.3 FCC Part 15.249 Radiated Emissions, Tx

The WS900Tx was tested for compliance to the limits in CFR 47, Part 15.249. Figures 3 and 4 show the setup used. Figures 7 through 10 show the plots of the results. The first 5 harmonics and the fundamental measurement are shown in the first table below, the remaining harmonics were indistinguishable from the noise floor. The second table contains the highest emissions while the EUT was not transmitting. No emissions beyond the carrier frequency exceed the general radiated emissions limit as set forth in 15.209.

	Frequency MHz	Level dBµV/m	Polarisation	Detector	Limit dBµV/m	Margin dB
Fund.	907.740	90.2	HOR	QP	93.98	3.78
Harm.	1815.500	49.68	VER	AV	53.98	4.3
	2723.500	53.79	VER	AV	53.98	0.19
	3631.000	53.55	VER	AV	53.98	0.43
	4539.000	50.76	HOR	AV	53.98	3.22
	6354.500	42.76	VER	AV	53.98	11.22

Frequency MHz	Level dBµV/m	Polarisation	Detector	Limit dBµV/m	Margin dB
2723.500	53.79	VER	AV	53.98	0.19
3631.000	53.55	VER	AV	53.98	0.43
4539.000	50.76	HOR	AV	53.98	3.22
1815.500	49.68	VER	AV	53.98	4.3
893.580	45	HOR	QP	46	1
6354.500	42.76	VER	AV	53.98	11.22
7000.000	42.14	VER	AV	53.98	11.84
9078.000	42.03	VER	AV	53.98	11.95
879.459	41.7	HOR	QP	46	4.3
9985.500	41.26	VER	AV	53.98	12.72
9986.000	41.26	VER	AV	53.98	12.72
921.960	41.2	VER	QP	46	4.8
865.752	39.29	HOR	PK	46	6.71
907.315	39.17	HOR	PK	46	6.83
865.431	37.77	HOR	PK	46	8.23
879.709	35.33	HOR	PK	46	10.67
936.192	32.22	HOR	PK	46	13.78
908.637	31.96	HOR	PK	46	14.04

All measurement results are located in the corresponding interval with a probability of approximately 95% (coverage factor k=2). The interval for these measurements is U_x (expanded uncertainty).

Radiated Emissions, 30MHz – 1GHz, 3m distance: U_x = +/- 3.4 dB

Radiated Emissions, 1GHz – 4GHz, 3m distance: U_x = +/- 3.6 dB

Appendix A

Test setup photos

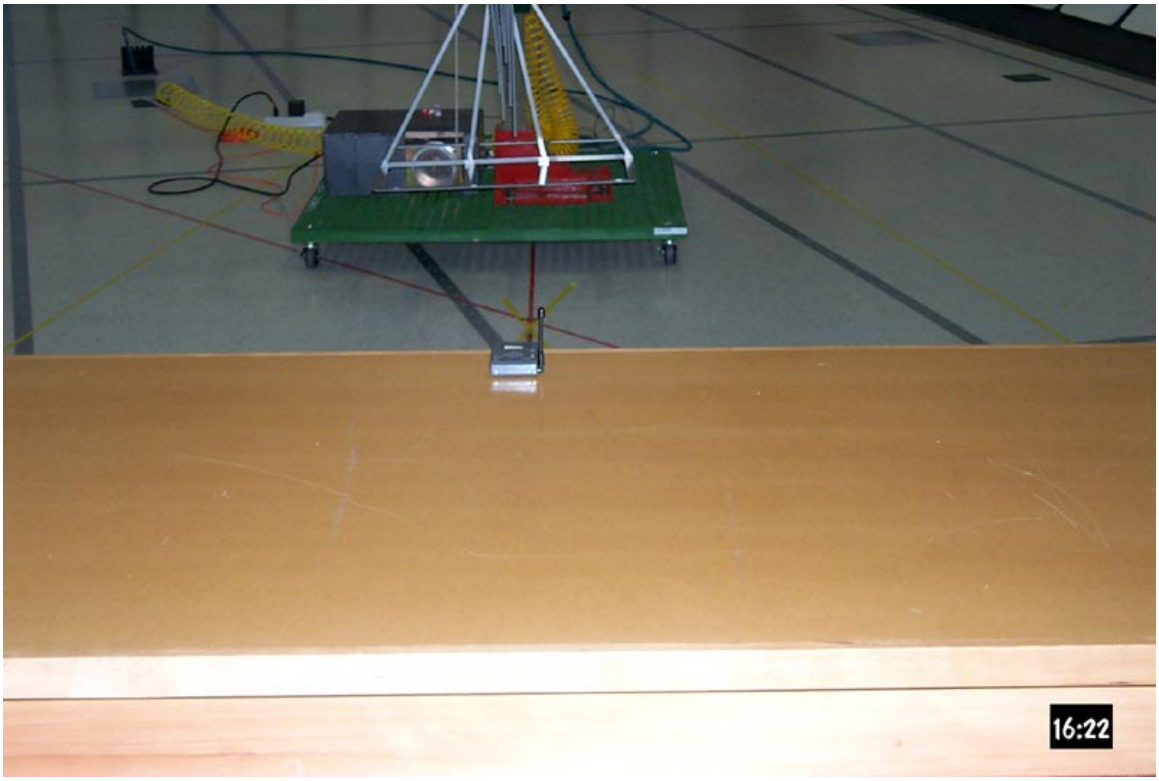

Figure 1 WS900Rx, Test setup

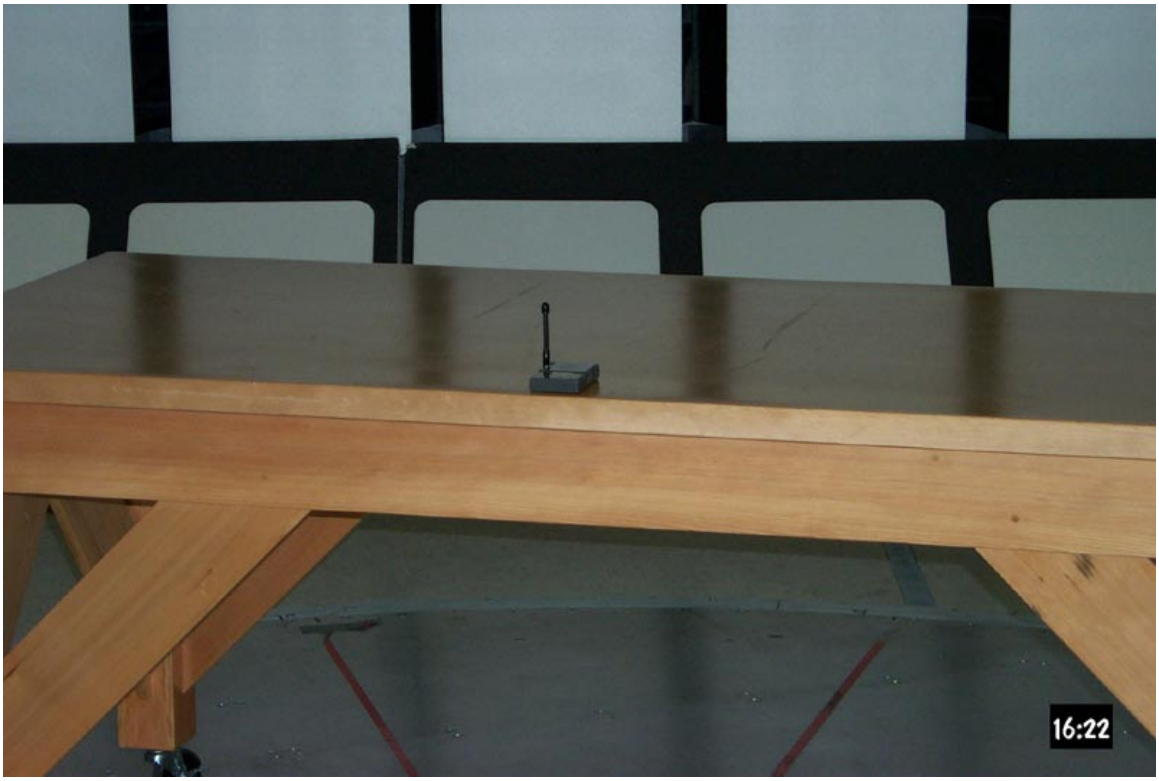

Figure 2 WS900Rx, Test setup

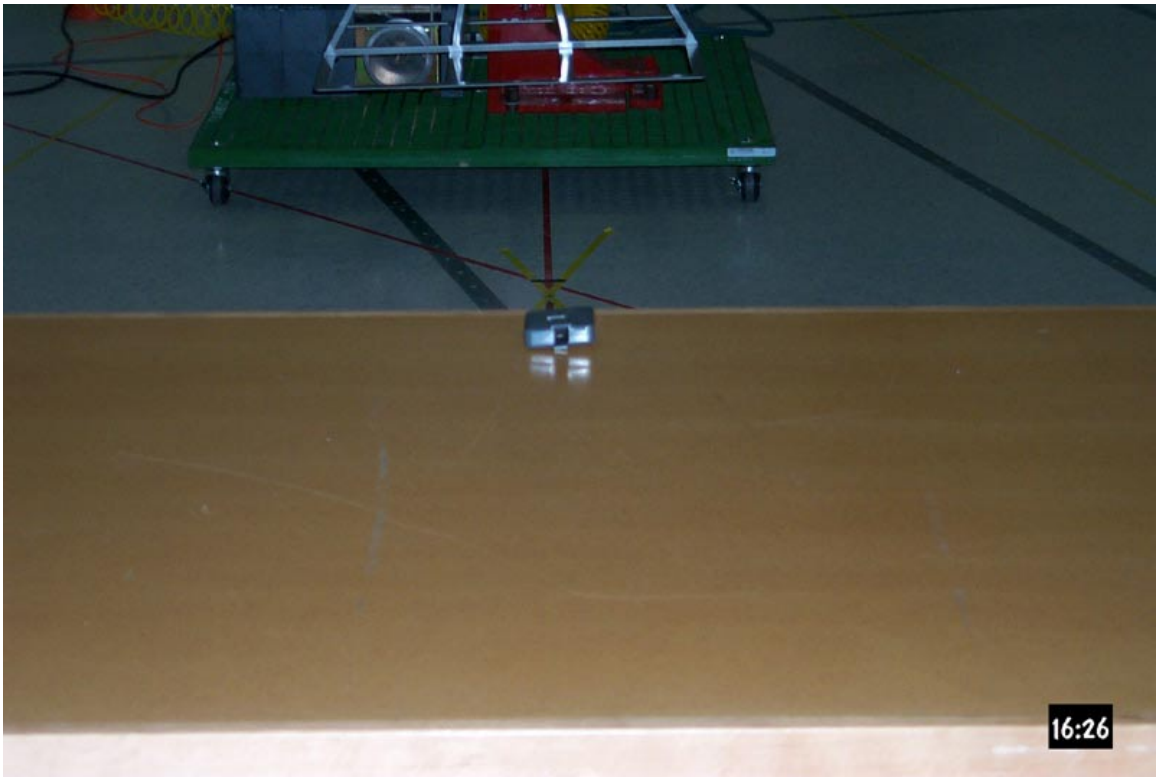

Figure 3 WS900Tx, Test setup

Figure 4 WS900Tx, Test setup

Appendix B

Emissions peak values

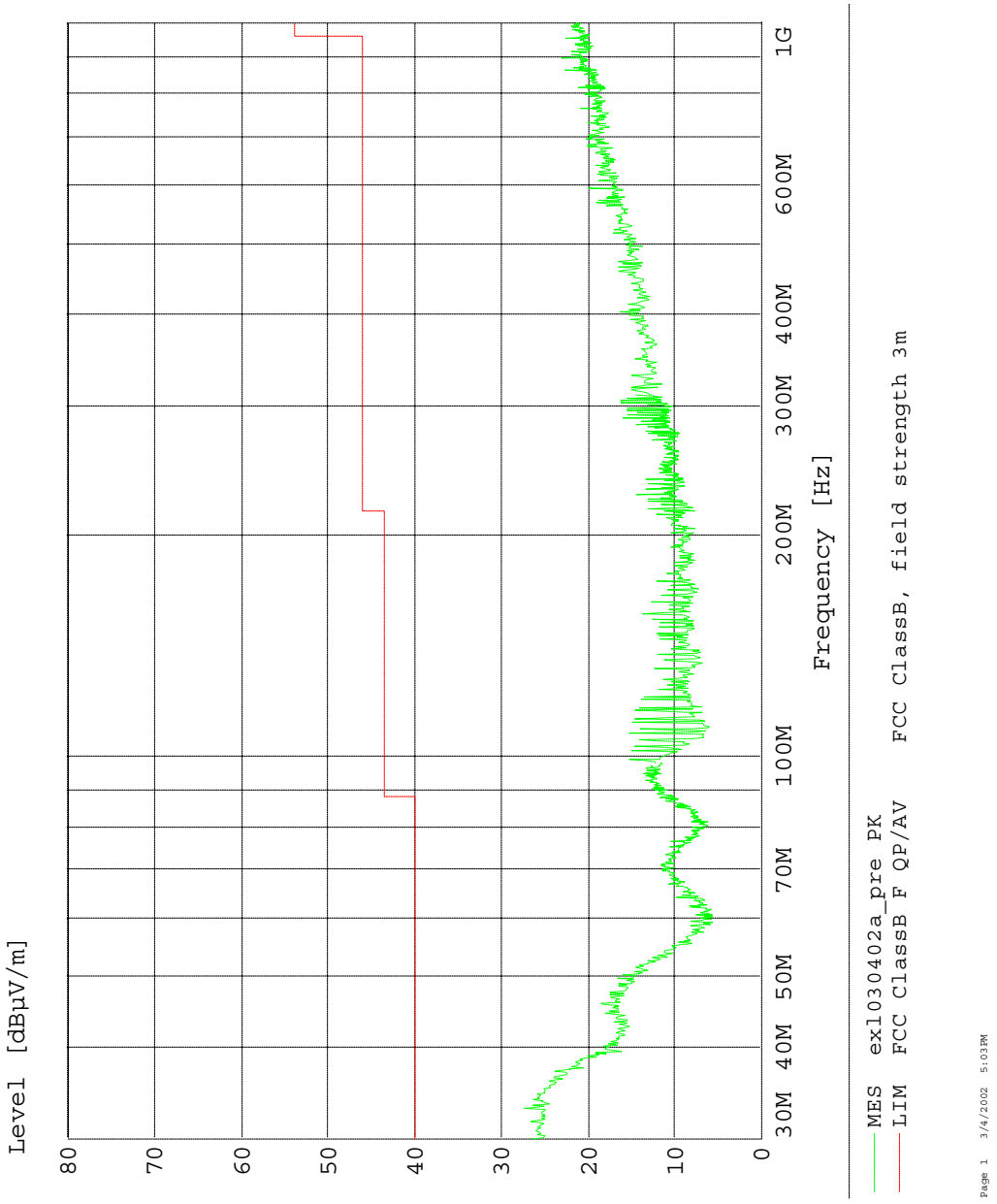

Figure 5 WS900Rx, Radiated Emissions 30MHz - 1GHz

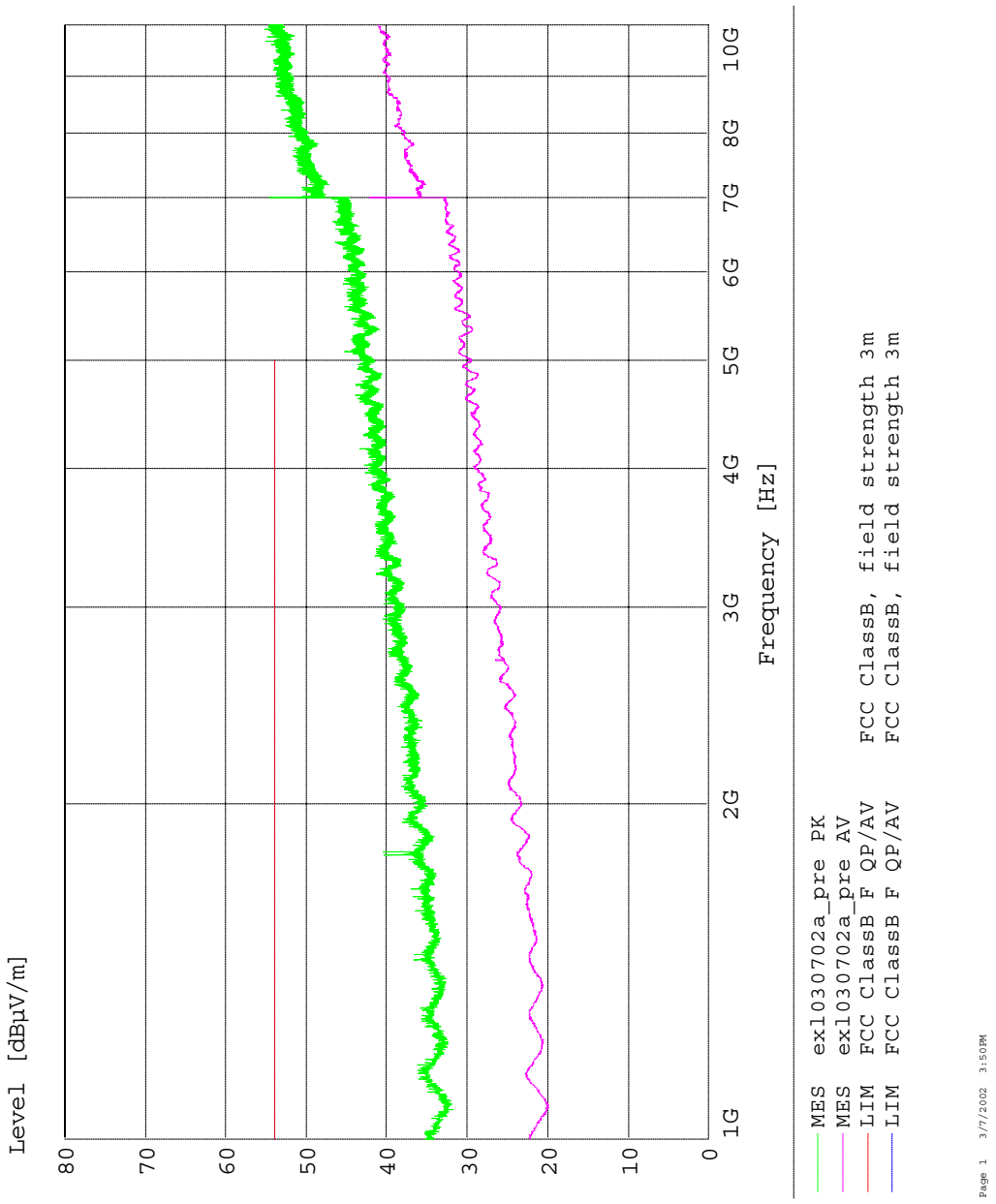

Figure 6 WS900Rx, Radiated Emissions 1GHz - 10GHz

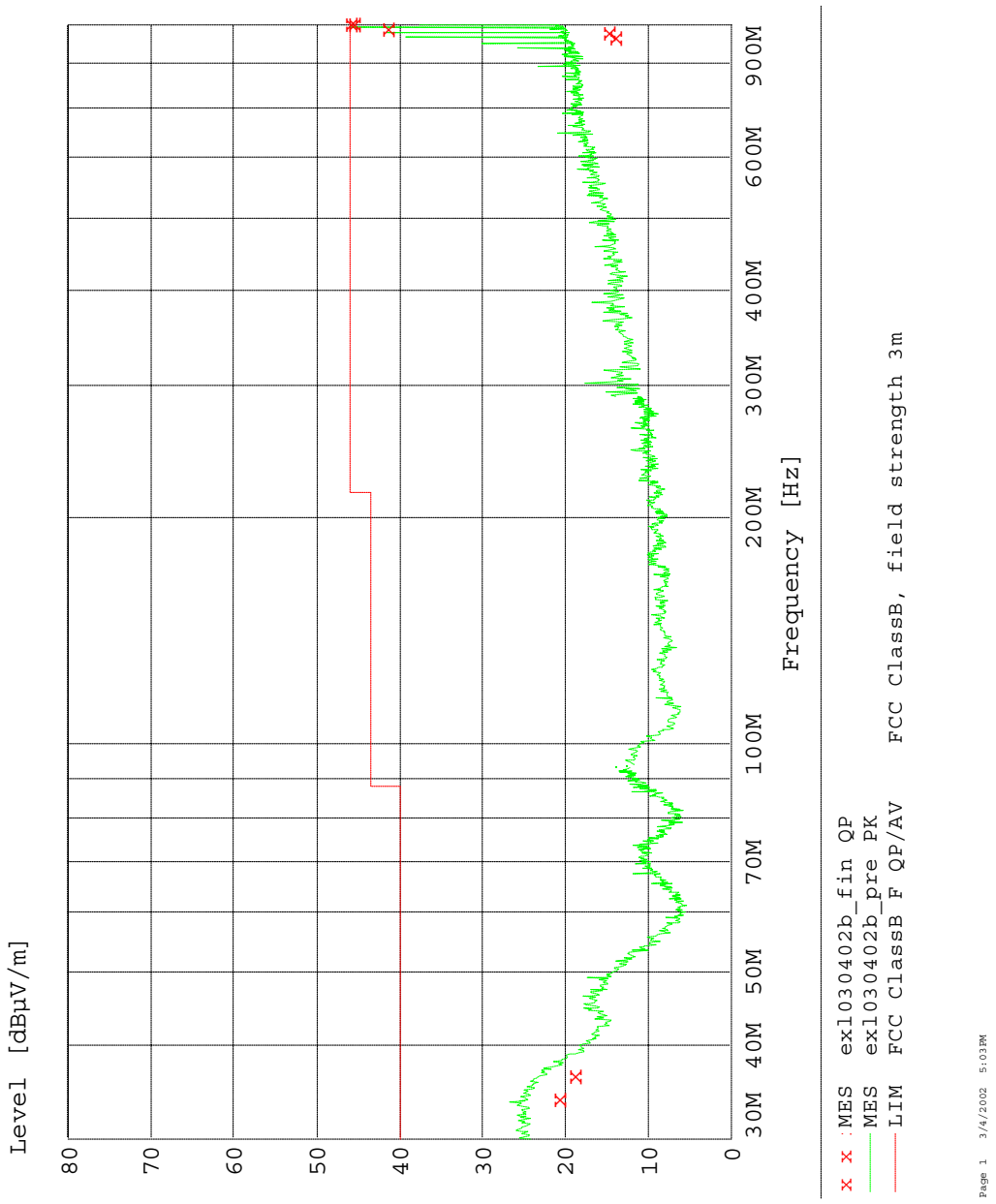

Figure 7 WS900Tx, Radiated Emissions 30MHz - 900MHz

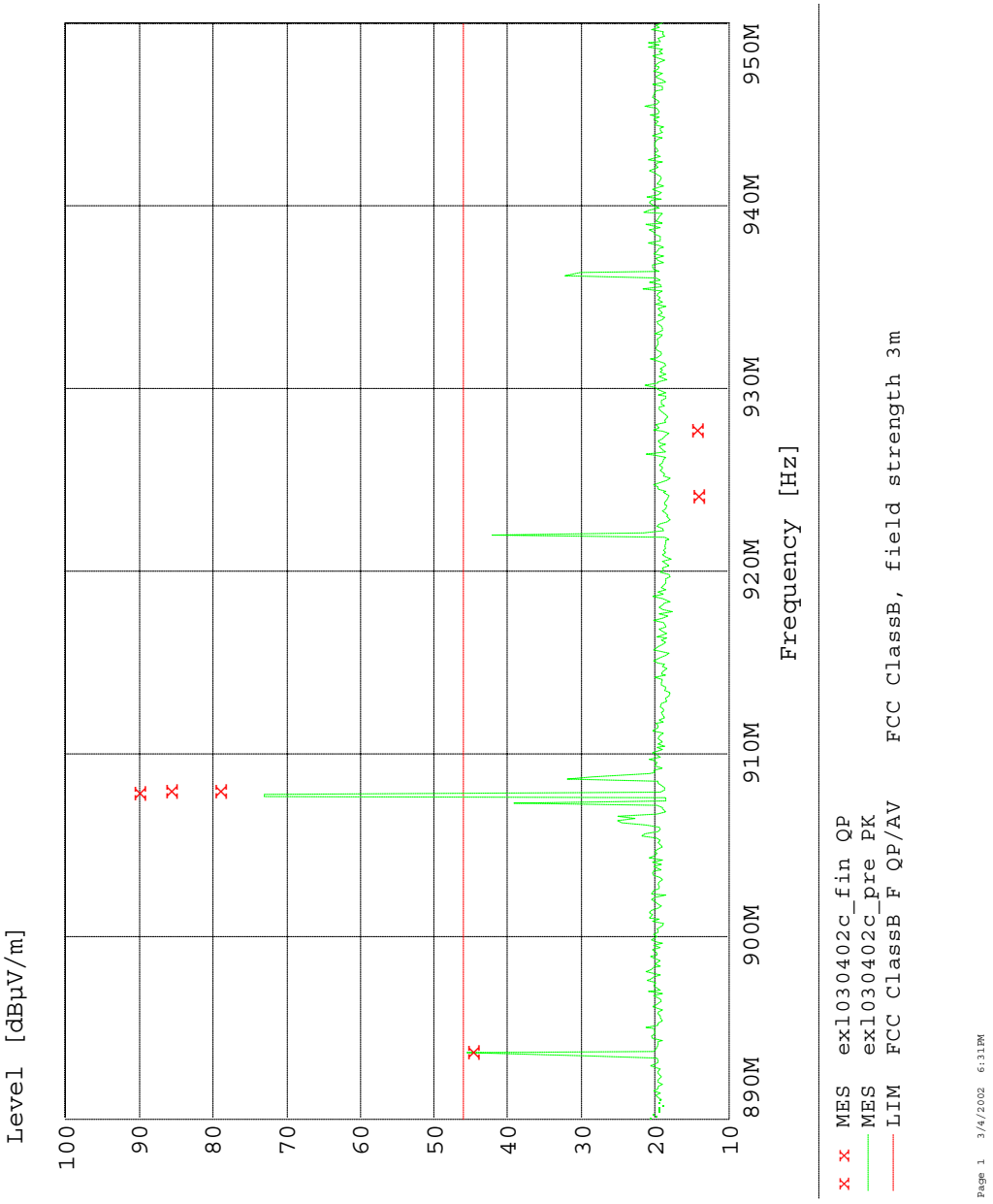

Figure 8 WS900Tx Radiated Emissions 890MHz - 950MHz

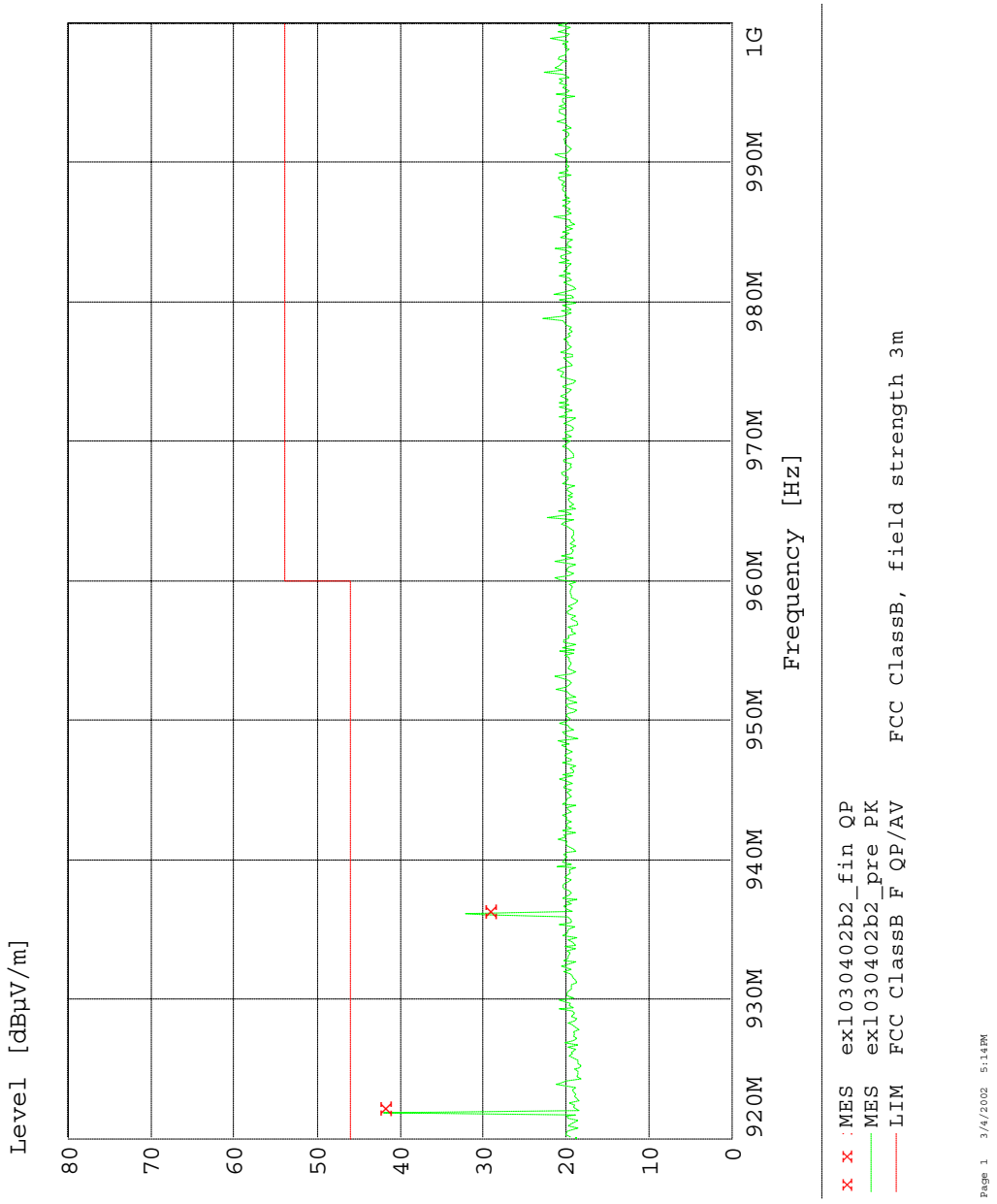

Figure 9 WS900Tx, Radiated Emissions 920MHz - 1GHz

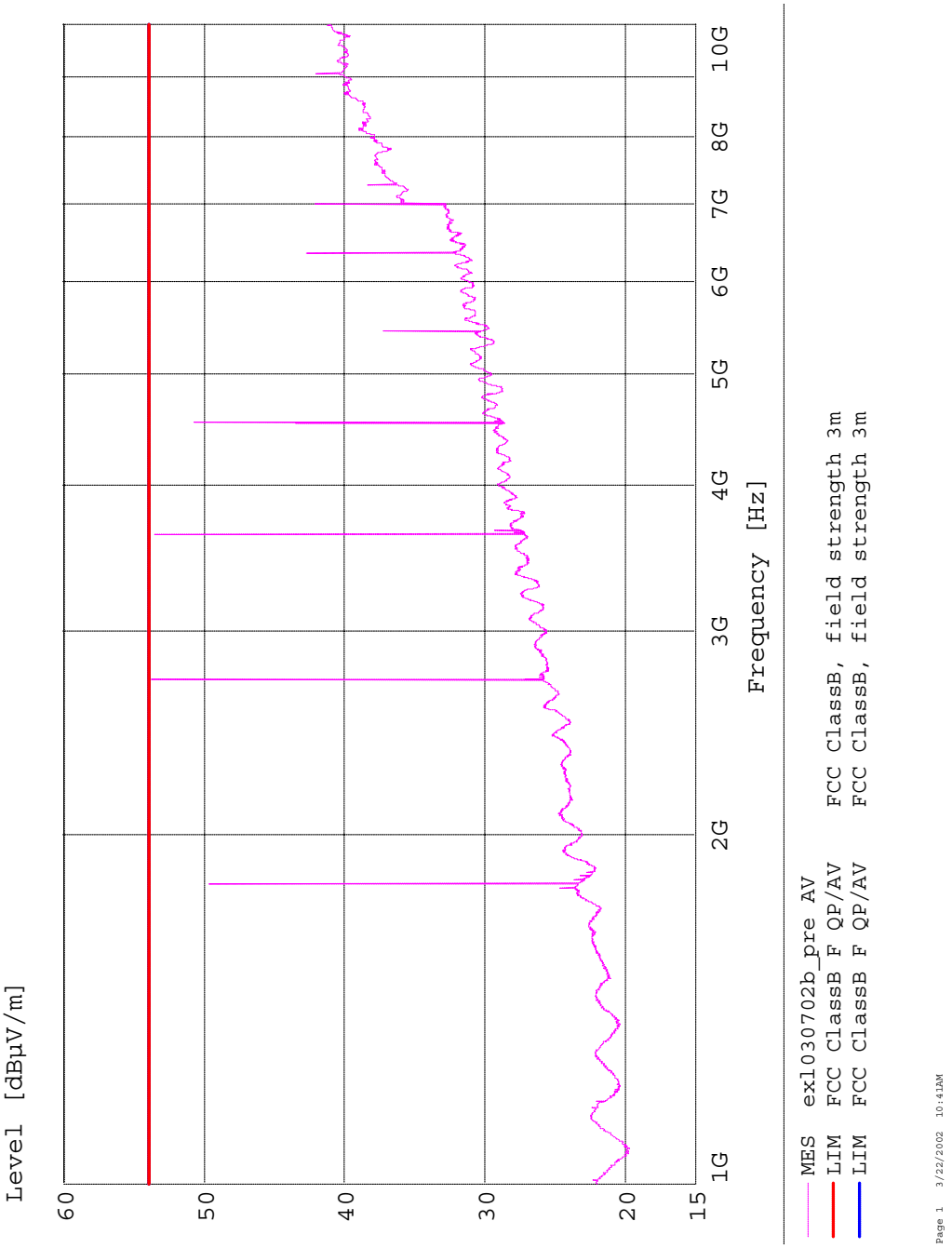

Figure 10 WS900Tx, Radiated Emissions 1GHz - 10GHz

Appendix C

External photos

Figure 11 WS900Tx with test probe

Figure 12 Back of WS900Tx with test probe

Figure 13 WS900Rx, front

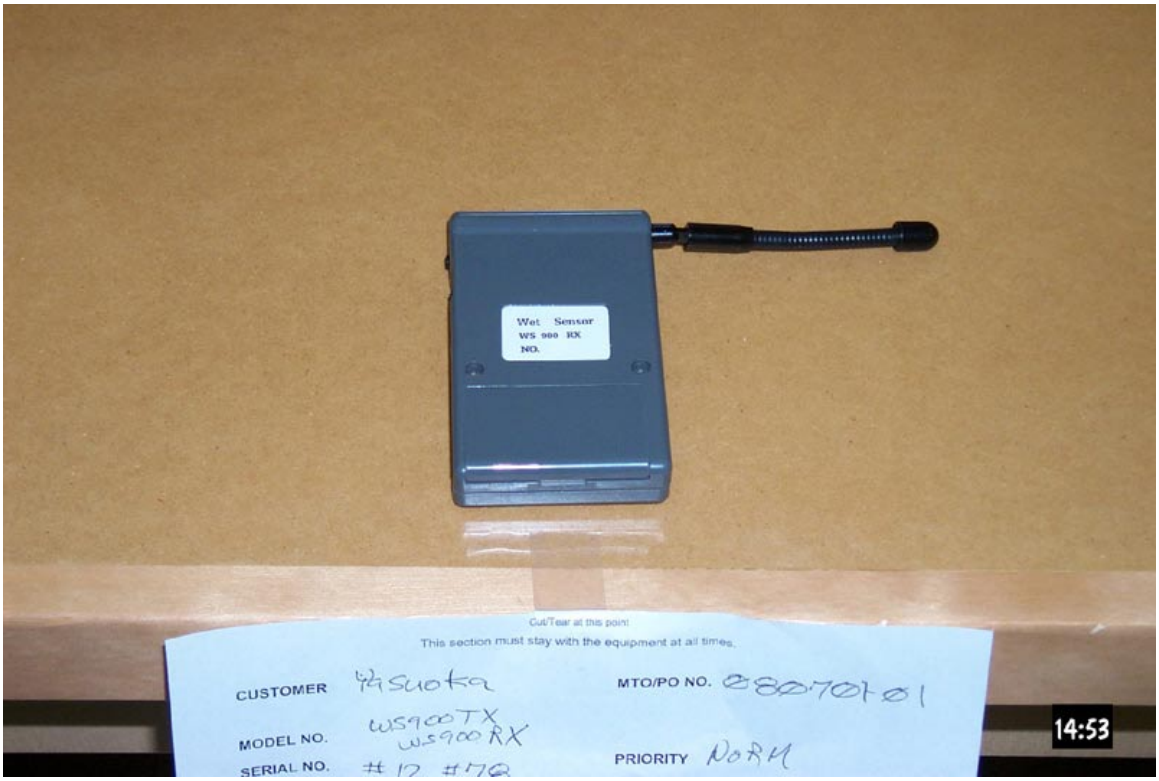

Figure 14 ES900Rx, back