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## **“Dual Xmit” Radiated Emissions Test Results**

### **Supplemental EMI Test Report on the Nortel Networks Dual Band 802.11 Access Point Models 2230 and 2230 INT**

**FCC ID: RVW2230**

**IC: 332R-2230**

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## General Information

Per a request received from the FCC, the Nortel access point radio was tested for radiated emissions in restricted bands while transmitting on both 2.4 GHz and 5 GHz at simultaneously.

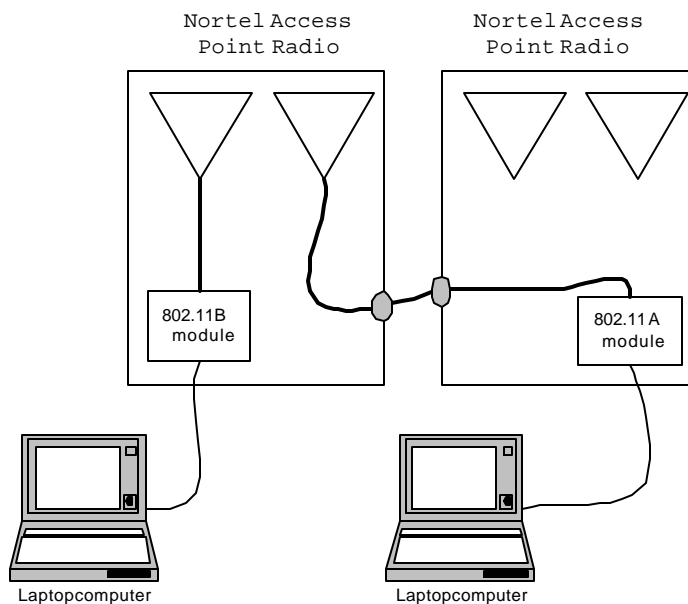
The test was conducted at Elliott Labs in Sunnyvale California, OATS #1 on 12 Jan 2004

## Test Methods

The access point was tested for out of band radiated emissions with the unit transmitting on 2.4 GHz 802.11 B, 2437 MHz and 802.11 A on 5290 MHz. These frequencies and power levels were chosen due to the fact that in normal operation, the power on the channels at the edge of the band is reduced. Since power plays a large part in the generation of the harmonics, frequencies were chosen that have a higher typical operating power level.

The unit was set to transmit at the same power level as was used in the initial radiated emissions tests and was transmitting at the maximum data rate.

Because the test software used to control the access point is not capable of commanding the access point to transmit on 802.11 A and 802.11 B at the same time, it was necessary to use two laptop computers to control two access points and jumper the 5GHz RF from one unit into the other unit. Thus, while the modules were in two different units, they transmitting antennas were in a single unit.



## Test Facilities

The certification tests were performed at:

Elliott Labs  
 684 West Maude Ave  
 Sunnyvale, CA 94086

### General:

Final radiated test measurements were taken in Jan 2004 at the Elliott Laboratories OATS #1.

The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

### Antenna, Antenna Mast and Turntable

The Horn antennas that are use to measure radiated emissions above 1000MHz are mounted on a non-conductive antenna mast equipped with a motor drive to vary the antenna height.

ANSI C63.4 specifies that the test height above the ground plane shall be 80cm unless the equipment is intended to be floor mounted. During the radiated emissions tests the equipment is positioned on a motorized turntable in conformance with the ANSI requirement.

## Equipment Lists

### Instrument Calibration

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

The following test equipment was used to perform the testing

### Elliott Test Equipment

Manufacturer	Description	Model #	Asset #	Cal interval	Last Calibrated	Cal Due
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	868	12	3/14/2003	3/14/2004
Hewlett Packard	Microwave EMI test system (SA40, 30Hz - 40GHz), system 2	84125C	1410	12	4/2/2003	4/2/2004

## Dual Xmit, Radiated Emissions in Restricted bands

**Specifications:**

FCC Part 15 Paragraph 15.247(c)  
 IC Specification: RSS-210

**Procedure:**

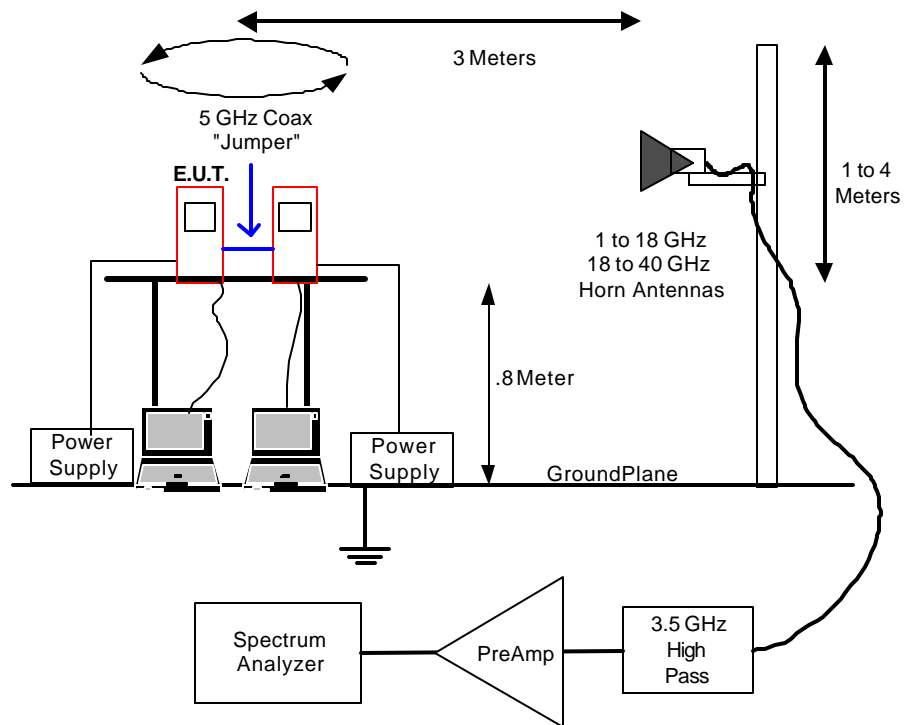
This test was conducted in a 5 meter anechoic chamber at Elliott Laboratories Fremont, California facility. The unit was placed on a rotating wooden table 80cm above the ground plane. A Horn antenna was secured to a mast 3 meters away. The unit was tested for out of band / restricted band emissions at the Low, Mid and High test channels. The UUT was configured set to transmit continuous data packets. The test equipment was configured as shown below.

The emissions up to 26 GHz were examined. Those emission falling within a restricted band were evaluated against the “restricted band emission limit” ( 54 dBμV / 74 dBμV), while those outside of a restricted band were evaluated against the “out of band emissions” limit (-20 dBc)

The EUT was rotated 360 degrees and the height of the antenna adjusted from 1 to 4 meters above the ground plane to determine the maximum level of the emission. The level of the emission was measured in two modes, “Peak” and “Average” using the following measurement bandwidths

Restricted Band Peak Measurements: RBW & VBW: 1 MHz  
 Restricted Band Average Measurements: RBW:1MHz & VBW:10 Hz.  
 All other measurements, RBW = 1MHz & VBW = 3MHz  
 video averaging on (100 samples).

The spectrum analyzer reading was corrected by the measurement software to take into account the various equipment characteristics (antenna factor, cable loss, pre-amplifier gain, HPF loss...) to obtain a final corrected measurement.



**Dual Xmit Radiated Emissions Test Setup**

<b>Support Equipment</b>
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Description	Model number	FCC ID or SN	Mfg	Power Cable
Laptop	Armada E 500	P31000T4X20DC12N2	Compaq	Laptop PS
Two Test Software	Atheros Radio Test		Atheros	
Laptop	Thinkpad 390E	SN AF-19B5R	IBM	Laptop PS
Two 48VDC AC adapter	Generic		Generic	Std Twin lead DC wire

<b>Test Conditions</b>
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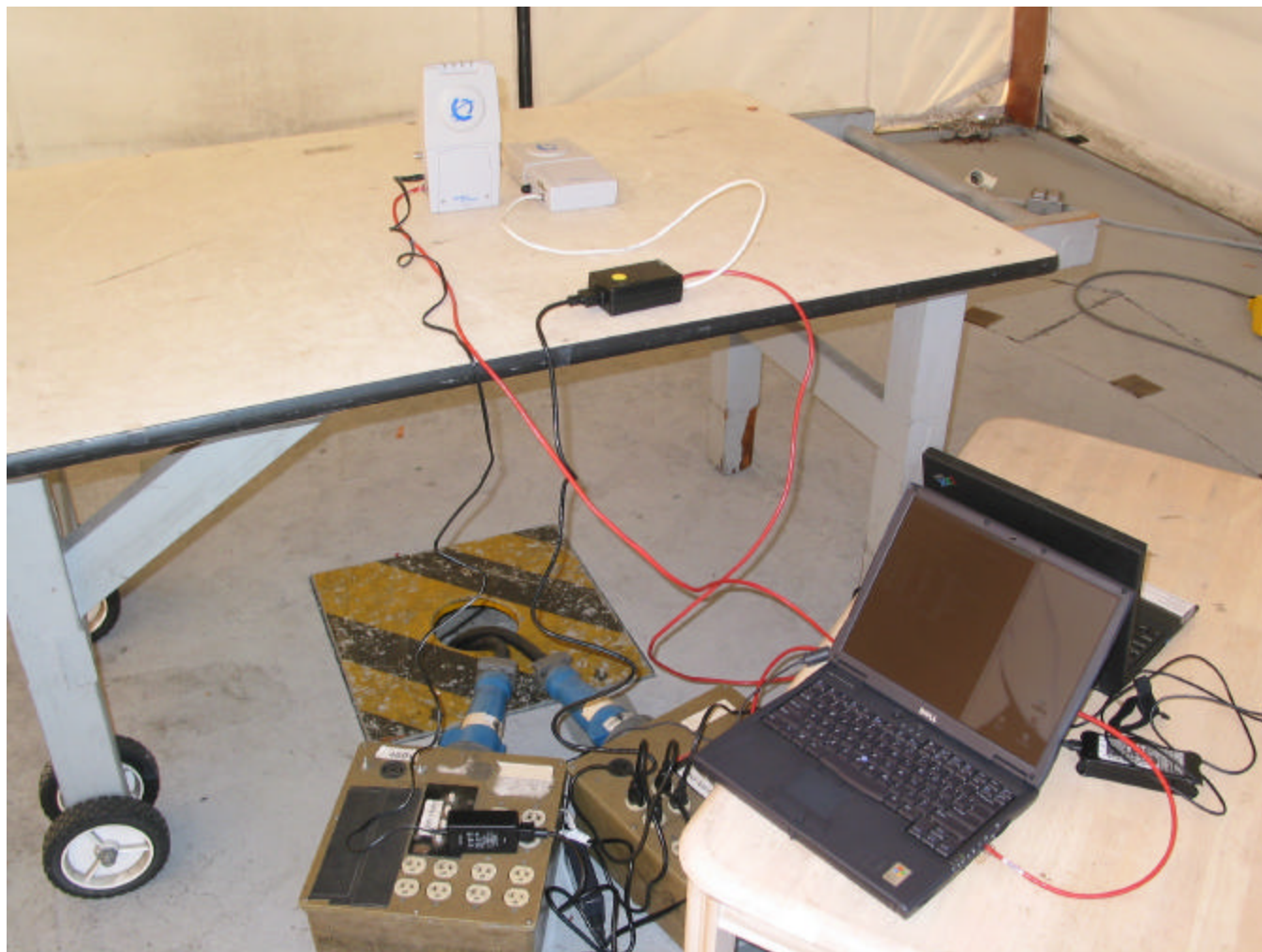
<b>Temperature</b>	Approx 13C	<b>Humidity:</b>	Approx 40%
<b>ATM pressure</b>	Approx 1005 mBar	<b>Grounding:</b>	None
<b>Tested By</b>	Chris Byleckie, David Waitt,	<b>Date of Test:</b>	12 Jan 2004
<b>Test Reference</b>	FCC Part 15.205		
<b>Setup Method</b>	ANSI C63.4		
<b>Tested Range</b>	1 GHz to 40 GHz		
<b>Test Voltage</b>	120 VAC / 60 Hz		
<b>Modifications</b>	No modifications were made to the unit		

**Test Results:**

The levels of the detected emissions are below. No emissions other than harmonics of the fundamental signals were detected. Additionally, no emissions above 16 GHz were detected.

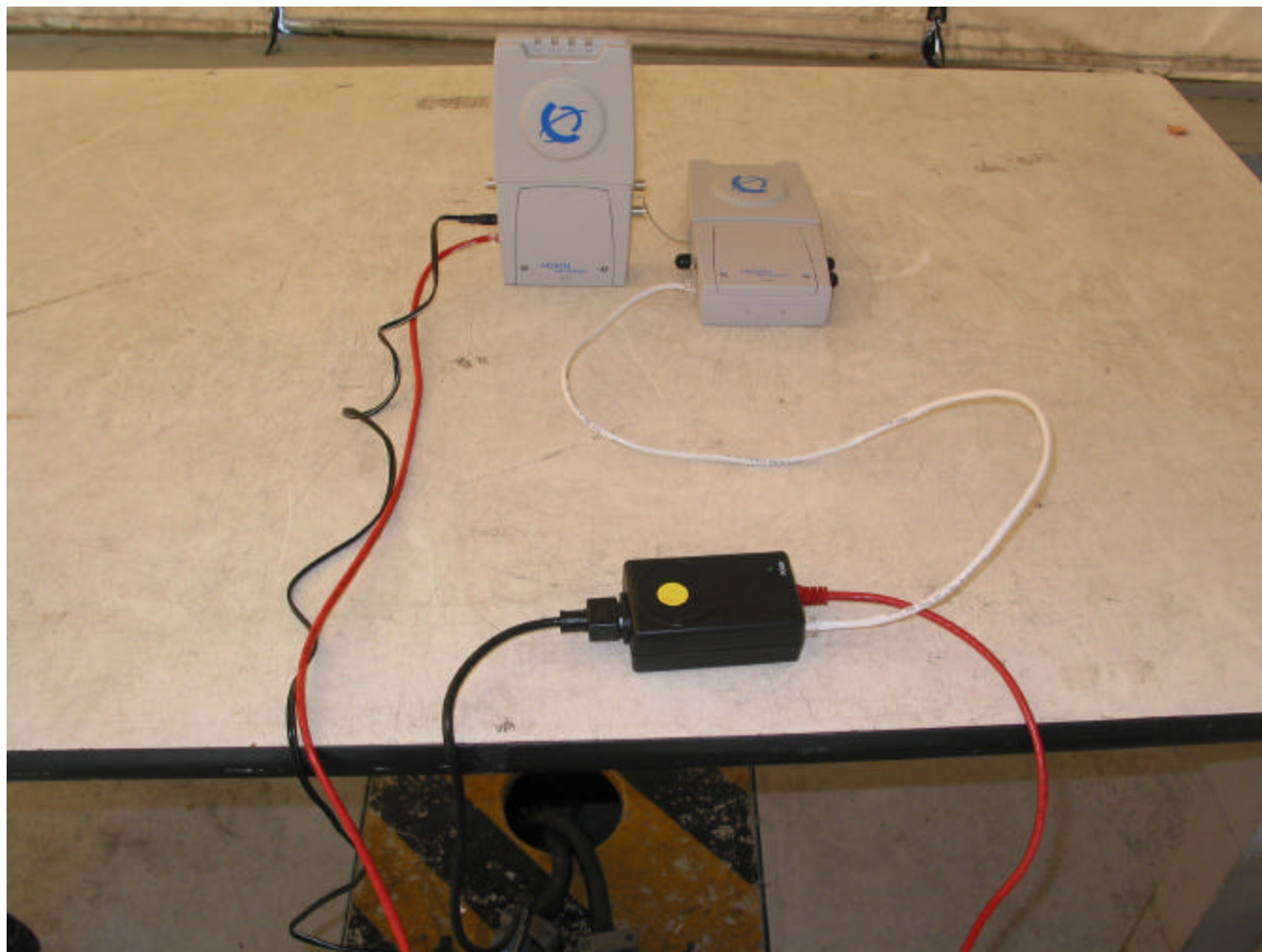
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
802.11b fundamental - 2437MHz							
4824.000	60.8	v	74.0	-13.2	Pk	350	1.4
4824.000	38.6	v	54.0	-15.4	Avg	350	1.4
7311.000	53.7	v	74.0	-20.3	Pk	37	1.0
7311.000	38.4	v	54.0	-15.6	Avg	37	1.0
4824.000	56.4	h	74.0	-17.6	Pk	325	1.0
4824.000	42.6	h	54.0	-11.4	Avg	325	1.0
7311.000	52.2	h	74.0	-21.8	Pk	223	1.5
7311.000	42.5	h	54.0	-11.5	Avg	223	1.5
802.11a fundamental - 5290MHz							
15687.00	54.7	v	74.0	-19.3	Pk	107	1.0
15687.00	43.1	v	54.0	-10.9	Avg	107	1.0
15687.00	60.2	h	74.0	-13.8	Pk	295	1.0
15687.00	47.8	h	54.0	-6.2	Avg	295	1.0

## Test Setup Photos

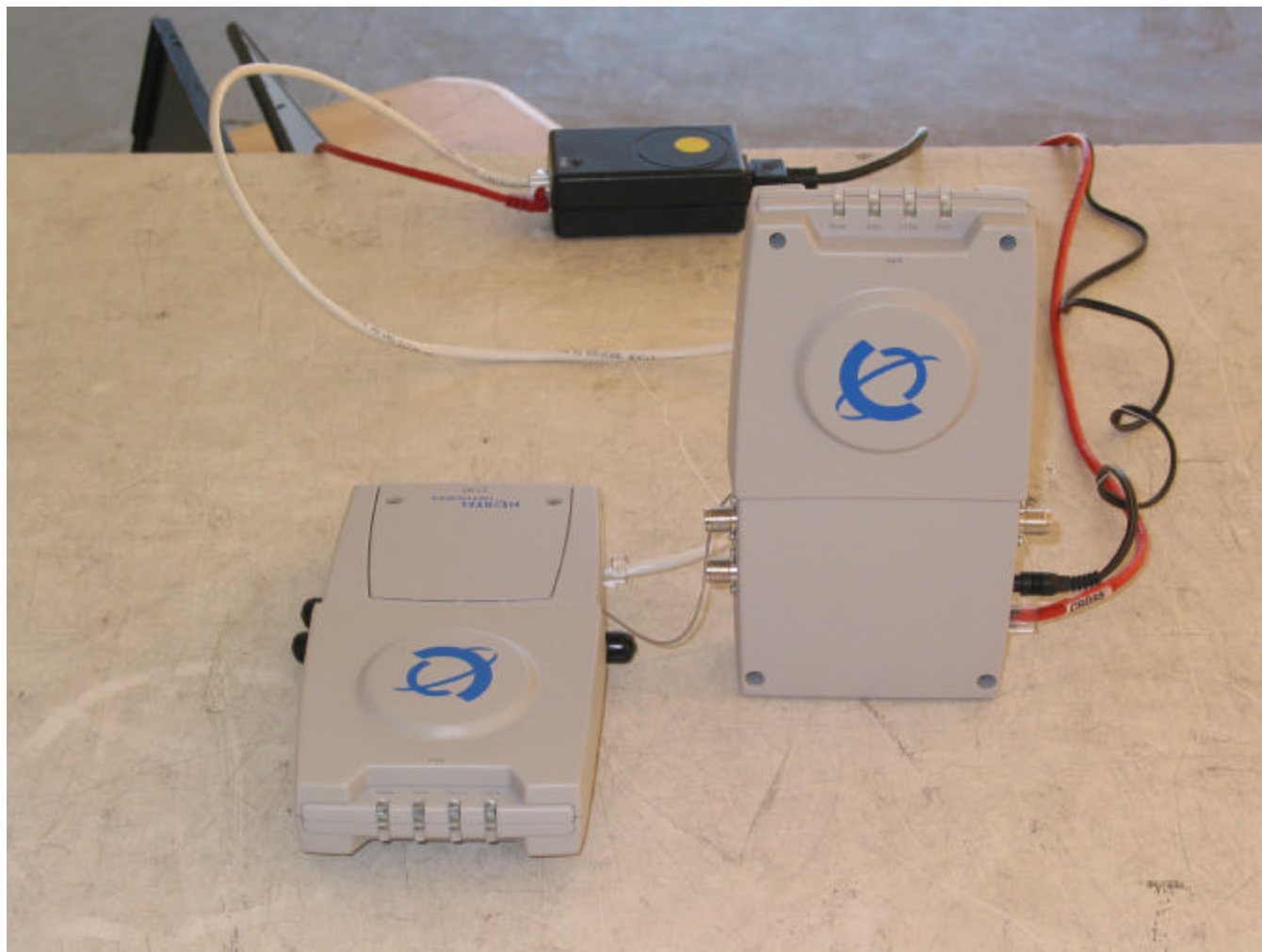


**Dual Xmit, Radiated Emissions Test Setup**  
(One unit is laying on its side so as to not interfere with the radiating pattern of the antennas in the unit that is standing.)

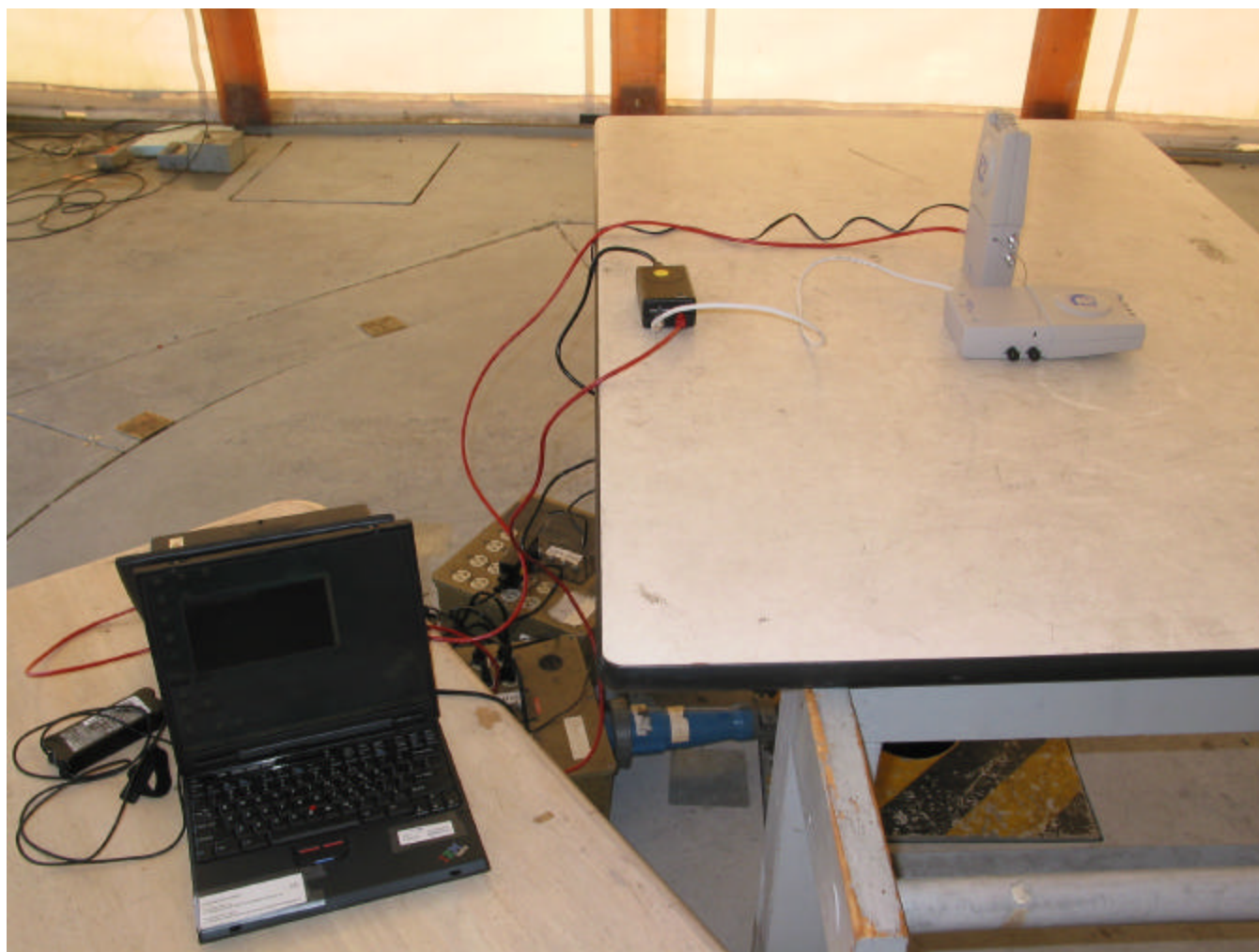




**Dual Xmit Radiated Emissions test setup**



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