

Thursday, October 11, 2007

**Federal Communications Commission Laboratory
7435 Oakland Mills Road
Columbia, MD 21046**

Re: Certification Test Results for Dickson Wizard Wireless System

Dear Ms. Elliott:

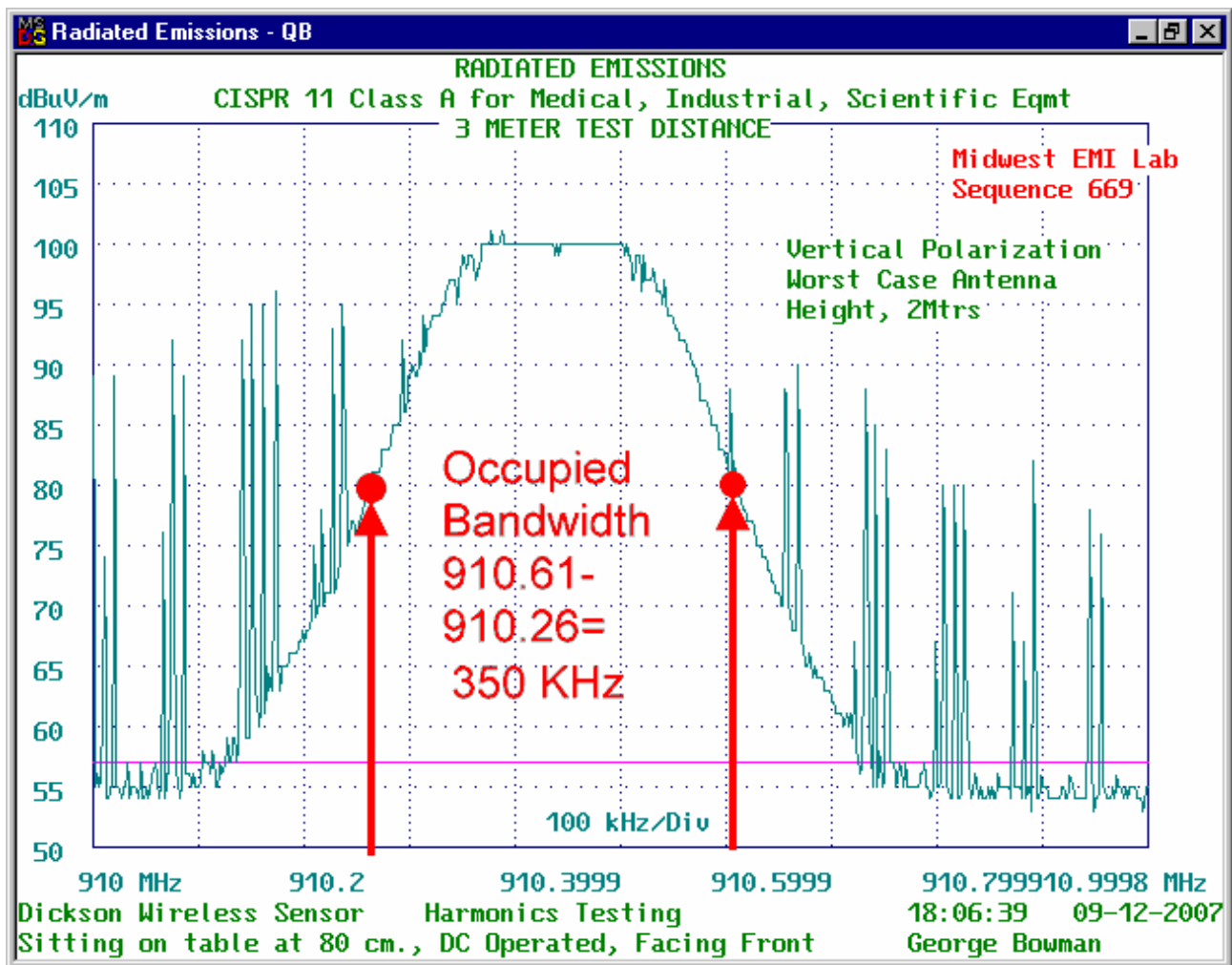
This correspondence concerns certification data for a useful wireless temperature and humidity monitoring network of devices, the Dickson Wizard Wireless System. The FCC ID for this device is VOHGC859081, Confirmation number EA942065. The FCC registration number of our laboratory is 496406, FRN 0005-8509-95. The technical contact at Dickson on this device is Mr. Dean Tjaden, Chief Engineer, Phone 630-563-45254, Dickson/Unigage Inc., 930 S. Westwood Ave, Addison, Illinois 60101 and for our laboratory is the undersigned. Test data was taken from this device in July through September, 2007. The location of the 10 meter OATS used is 7017 Miller Road, Wonder Lake, Illinois. The location of the 3 and 5 meter indoor site used is 21234 West Commercial Drive, Mundelein, Illinois. The devices derived from this submission include Dickson Instrument models WH120, and WR100 utilizing frequency hopping spread spectrum mode of operation. The sponsor group indicates that no encryption of data is utilized nor any special type of encoding.

The equipment under test consists of two portions, the Dickson Wireless Sensor/Logger powered by batteries (2 AA cell) and a remote wireless transmitter/receiver pair (Transceiver) powered locally by an AC power adapter. The transceiver is linked to a Dell laptop by a USB interface. The system utilizes the band from 902-928 Mhz in a multifrequency hopping mode controlled by a fundamental crystal and the host transmitter/receiver system occupying the same band. The remote unit will wake up once every logging period (1minute to 15 minute) and take a reading. If it is time to transmit to the base unit (once every 5,10 or 15 minutes) it will send a packet for no more than 100ms and go back to sleep.

The Dell laptop is powered by its approved Dell universal power adapter with multiple approvals including FCC. The host transmitter/receiver system is also powered by a wall outlet power source having FCC and other approvals. The device is used in residences, office buildings, warehouses, and corporate buildings where it desired to sense and control temperature and humidity. Since no wires are involved with the sensor, it can rapidly record information on trouble spots in buildings requiring added environmental controls. When used in many areas at the same time, a map of temperature and humidity can be generated for the whole working environment allowing rapid improvement for the comfort of office workers.

The period of transmission in operation is extremely short since the system is expected to work for months or years in application. For testing purposes the duration of transmission was greatly lengthened to allow capture of the envelope of the waveform. The repetition rate of transmission was also greatly increased to allow 2 second operation rather than the normal 5 minute cycle time. The pulse width of this waveform is normally <100 milliseconds and comprises an encode message using a

unique code defined by the logger chipset used. The host receiver may detect such a transmission and if it is a match to an internal code, will log the information into memory and display both temperature and humidity either on a tabular or graphical screen. Any coding is done internally to the complimentary chipsets being used.



The sponsor group and Midwest EMI Associates have determined the certification standard that is needed to be complied with is Part 15.231. In use the device complies with all relevant portions of 15.231 section (a) that allows 12500 uV/m at 910 Mhz or 82 dBuV/m for the fundamental. The transmission repetition rate is such that 5 minutes between transmissions is only required. Using the maximum allowable relaxation under the standard (15.35 (b)), 20 dB is added to the fundamental resulting in a total allowed transmission of 102 dBuV/m. The device complies with 15.231 (a) Items 1 (no manual activation is possible), 2, and 3 while item 4 is not relevant to this application. Part 15.231 (a) Item 5 may apply to this device. The device complies with section 15.231 (b) (above 470 Mhz) and the fundamental was tested in accordance with Items 15.231 (b) 1, 2 and 3 exclusively in PEAK MODE while computations are shown here for the relaxations in accordance with calculated average detecting mode.

Calculation of Item (c) of 15.231 (b) (Occupied Bandwidth):

The fundamental of the transmitter was measured on our 3 meter indoor site and is shown here:

The fundamental frequency was measured at 910.45 Mhz. The 20 dB down occupied bandwidth (20 dB down) is 350 KHz and measured as a percent is .0384% meeting the FCC requirement of .5%. This was taken with the frequency hopping system in a rest state. Due to the very short transmission period (even after increasing it greatly) some artifacts not associated with the bandwidth measurement are evident from multiple retracings necessary to recreate the full waveform.

[This and any other data taken on the 3 or 10 meter site used a Tek 2712 with EMC option SN B022981. The antenna used is a linearly polarized Antenna Research LPB 2520 SN 1151. A 20 dB calibrated preamp, Minicircuits ZKL-2R7 SN D111502, 3 dB matching pad and 61 feet of RG214 cable is also utilized that has been calibrated using a Tektronix TR503 SN B010531 and Tektronix 2755 analyzer SN B020147. The number of points of calibration for this antenna is 1200.]

Calculation of Relaxation (15.231 (b) (2))

The FCC allows a quasi peak or average detector to be used for measurement of emissions. In this case, Midwest EMI Associates takes the peak level and calculates the average based on the worst case emissions profile of the device. The coding of the waveform occupies a .1 second time period in a 5 minute duration. The average of this sequence is $20 \log (.1/(60*5)) = -70\text{dB}$. The FCC allowed relaxation limit is 20 dB.

Schematic of Sensor Logger (Remote Station)

The schematic of the Sensor Logger is shown in the PDF file "SensorLoggersch.pdf".

Schematic of Transciever (Base Station)

The schematic of the receiver is shown in the PDF file "Receiver&repeatersch.pdf".

Temperature Testing

The sponsor group provides here a snapshot of the accuracy of their total system in the tabular data and graph on the next page under temperature variations. The stated operating temperature range of the device is -20 to 122 degrees F.

31-Aug-07

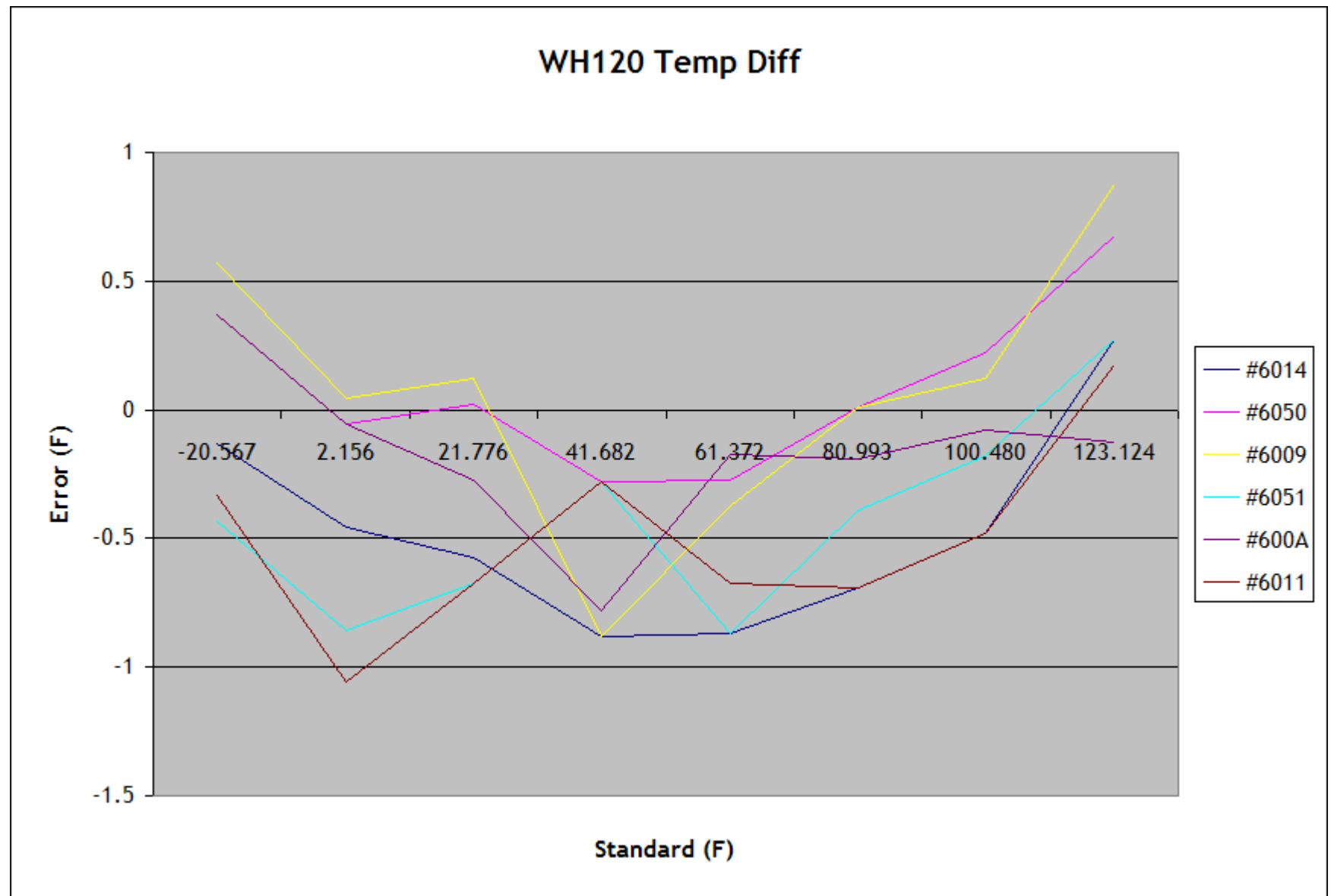
WIRELESS SYSTEM LOGGERS

WH120 Calibration Data and Temperature Curve Data

All readings are in Deg F

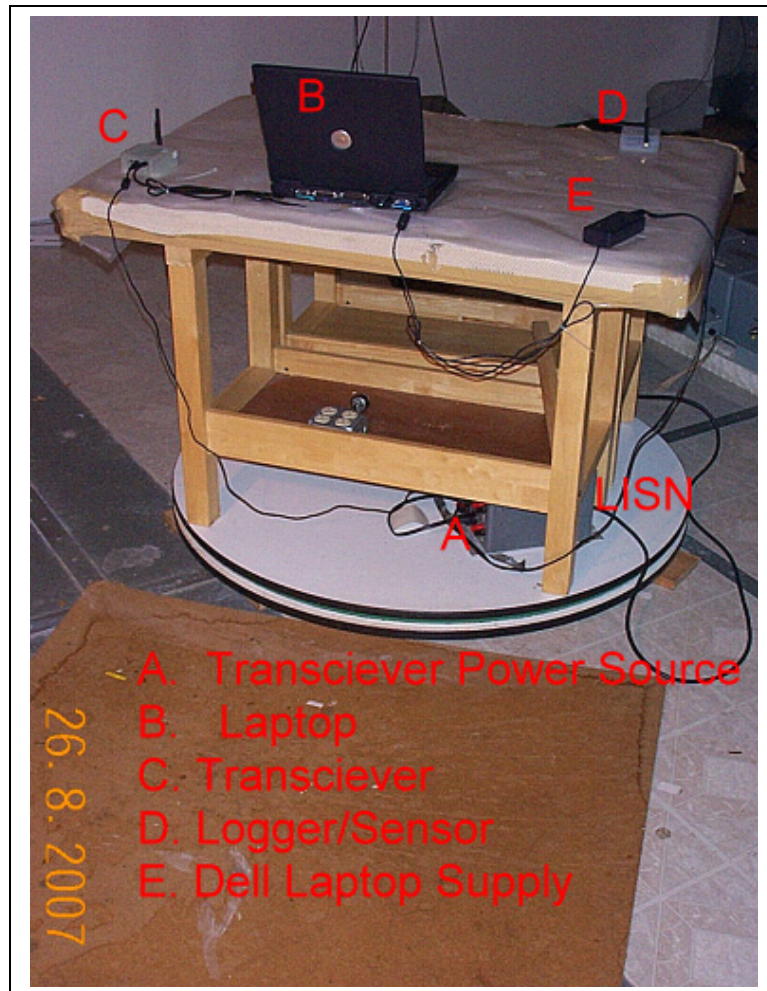
		Unit		Unit		Unit		Unit		Unit		Unit	
Hart (Std)		#6014	Diff	#6050	Diff	#6009	Diff	#6051	Diff	#600A	Diff	#6011	Diff

-20.567	-20.7	-0.133	-20.2	0.367	-20.0	0.567	-21.0	-0.433	-20.2	0.367	-20.9	-0.333
2.156	1.7	-0.456	2.1	-0.056	2.2	0.044	1.3	-0.856	2.1	-0.056	1.1	-1.056
21.776	21.2	-0.576	21.8	0.024	21.9	0.124	21.1	-0.676	21.5	-0.276	21.1	-0.676
41.682	40.8	-0.882	41.4	-0.282	40.8	-0.882	41.4	-0.282	40.9	-0.782	41.4	-0.282
61.372	60.5	-0.872	61.1	-0.272	61.0	-0.372	60.5	-0.872	61.2	-0.172	60.7	-0.672
80.993	80.3	-0.693	81.0	0.007	81.0	0.007	80.6	-0.393	80.8	-0.193	80.3	-0.693
100.480	100.0	-0.48	100.7	0.22	100.6	0.12	100.3	-0.18	100.4	-0.08	100.0	-0.48
123.124	123.4	0.276	123.8	0.676	124.0	0.876	123.4	0.276	123.0	-0.124	123.3	0.176



General Description of Measurements Taken

The measurements taken consist of 3 meter harmonics measurements taken in Mundelein, 3 meter radiated emissions measurements also taken in Mundelein and 10 meter OATS measurements taken in Wonder Lake. It was necessary to use three separate antenna systems, two of which use similar equipment except for the length of cable and one that uses a horn antenna on the 3 meter site for high frequency harmonic measurements. The three and ten meter sites both use a CC Moore antenna mast model DAPM4/6 that allows extension of the antenna to either 1-4 or 1-6 meters, the 10 meter site uses a CC Moore 3 meter metal turntable while the 3 meter site uses a 2 meter dielectric turntable model DTT-4. The height above the ground plane on a purely wooden table is 80 cm. in either case.



Both sites make quasipeak measurements using a Tektronix 2712 with EMC option [10 meter site spectrum analyzer is SN B022981. The ten meter site utilizes 100 feet of LMR-4-UL Ultraflex coaxial cable and Minicircuits ZKL-2R7 preamp. For high frequency measurements, a horn antenna is used, Antenna Research Model DRG-118/A S/N 1281 and is used with a 30 dB preamplifier, Tiger Microelectronics, Model TGWA02183020, SN 0310WA051 used with 20 feet of Astrolab 32055 ultraflexible microwave cable.

Data taken on the three and 10 meter sites are taken using identical bands, 25-75 Mhz (Band 1), 75-175 Mhz (Band 2), 170-300 Mhz (Band 3), and 300 to 640 Mhz (Band 4) and 620-1000 Mhz (Band 5). Separate data sets were taken at both the three and ten meter sites.

The EUT was tested as a system comprising Remote Sensor/Logger (see Picture Label D), Local Transceiver (see Picture Label C), Dell Laptop (see Picture Label B), Power source for local transceiver (see Picture Label A) and Dell laptop power source (see Picture Label E). The photo shows the orientation at the Mundelein 3 meter site.

The repetition rate was increased to the maximum possible via special sponsor group software and the sweep rate adjusted to the slowest necessary to capture peak emissions from the EUT. The turntable was rotated and antenna height adjusted to obtain the worst case composite radiated emissions from these devices.

System Data – 3 Indoor & 10 meter OATS FCC Class B Emissions

All radiated emissions data and pictures from either the Mundelein or OATS site is shown in files “Dickson Wireless Sensor – OATS Site Pictures”, “Dickson Wireless Sensor Project – Fundamental and Harmonics”, “Pictures from Mundelein 3 Meter Site”,

“Dickson FCC Radiated Emissions Data”, and “Dickson FCC Conducted Emissions Data.

Analysis of Data – 10 Meter OATS site

All data is judged by comparison with the ambient emissions data. In Bands 1 through 3, the comparison is best made using OATS data because the noise level of the OATS site is much lower than that of the indoor site. In Bands 4 and 5, the comparison is best made using the 3 meter indoor site because of the high congestion of UHF TV carriers in Northeast Illinois serving Chicago, Milwaukee and Rockford. Description below may apply to either location.

When compared in Band 1, the ambient shows TV channels 2 (Chicago) with HDTV sideband, 3 (Madison), and 4 (Milwaukee). Other frequencies were individually checked and found not to be due to the EUT. The antenna height found to produce the highest emissions was 2 meters.

When compared in Band 2, the ambient shows TV Channel 5 (Chicago), FM Band (88-108 Mhz), sporadic airplane emissions from 110-145 Mhz, police and weather repeaters at 158 and 162 Mhz and various other common carriers. When the EUT emissions were checked against the ambient, all emissions were judged to be from the ambient. The antenna height found to produce highest emissions was 3 meters.

When compared in Band 3, the ambient shows TV channels 7 (Chicago) with HDTV sideband, 9 (Chicago), 10 (Milwaukee), 11 (Chicago), 12 (Milwaukee), and 13 (Rockford). There were no emissions close to the limit above this range to 300 Mhz. Other emissions were judged to be from the ambient.

When compared in Band 4, the ambient shows numerous UHF TV stations and heavy congestion due to spectrum allocations and HDTV sidecarriers. On the date of the test the conditions were warm and clear, optimum for reception of distant signals. Signal diagrams were overlayed and individual outliers checked and found not to be due to the EUT.

When compared in Band 5, the ambient shows numerous UHF TV stations and again heavy congestion due to spectrum allocations for UHF and HDTV sidecarriers, the cell phone band and individual digital repeater stations. Signal diagrams were overlayed and individual outliers checked and found not to be due to the EUT.

Data from the 3 and 10 meter sites agreed with each other and no EUT emissions were found other than the intentional radiator at 910.45 Mhz which continued during the scans.

Harmonics Data Results

Harmonics data taken from the Dickson wireless system were tested on the 3 meter site in Mundelein using the Biconilog LPB 2520 and Antenna Research Horn antennas. When reviewed none of the emissions from the harmonics exceeded the level of 82 dBuV/m.

Conducted Emissions Scan

Results of the conducted emissions scan are shown in the file "Dickson Conducted.pdf". The sponsor group elected to meet FCC level B conducted emissions. The data shows that the power source for the wireless transceiver meets the regulation using 120VAC, 60 Hz.

Thank you for your review of our submitted data.

Sincerely,



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Dates of Expiration for Calibration of Equipment Used in this Investigation

<u>Description</u>	<u>Serial Number</u>	<u>Expiration</u>
Tek2756P Spectrum Analyzer	BO20224	26 Mar 08
Wavetek 2520A RF Generator	0222011	30 Mar 08
Tektronix TDS 420 Oscilloscope	B021212	24 Mar 08
EMCO 3109 Power Biconical (1/3/10 Meters)	9011-2504	17 Mar 08
Solar Line Impedance Stabilization Network	8028-50-TS-24-BNC	20 Mar 08
Solar VDE Filter Network	8907-250-TS-24-BP	20 Mar 08
Tektronix 2712 Spectrum Analyzer (Quasipeak)		B022520
Tektronix 2712 Spectrum Analyzer (Quasipeak)	B022981	24 Mar 08
C. C. Moore Automated Mast Assembly Model DAPM4/6		N/A
C. C. Moore Automated Turntable Model DTT-4		N/A
Antenna Research LPB2520	1152	20 Mar 08
Behlman Power Pass 50 Hz AC Source (50, 60, 400 Hz)	0005	N/A
California Instruments WP1251 AC Source (50, 60 Hz)		N/A
California Instruments 5001ix High Power Source	HK52945	25 Mar 08
Tektronix 2755	B020147	30 Mar 08
Antenna Research Model DRG-118/A	S/N 1281 (Horn)	10 Jan 08
Tiger Microelectronics, Model TGWA02183020, SN 0310WA051		20 Feb 08