COMPANY	Sensormatic Electronics Corp. 951 Yamato Road Boca Raton, Florida
PRODUCT TESTED	Digital Microwave System FCC ID: BVCDMS915
FCC RULES	15.207, 15.209, 15.247
TEST DATE	October 3-27, 2000
SUBMITTED BY	Donald J. Umbdenstock

INDEX

I. Summary of Results

47 CFR 15.207	CONDUCTED EMISSIONS	COMPLIES
47 CFR 15.209	RADIATED EMISSIONS	COMPLIES
47 CFR 15.247	FREQUENCY HOPPING	COMPLIES

II. General Information

1.1 Test Methodology

Both conducted and radiated emissions testing were performed according to the procedures in ANSI C63.4-1992, and the requirements of 15.31, 15.33, 15.35, 15.207, 15.209 and 15.247. Radiated emissions measurements below 30 MHz were performed at a distance of 5 meters and the results extrapolated to the distance specified per 15.31 and 15.209.

1.2 Test Facility

Measurements per 15.207 and 15.209 were performed at Sensormatic Electronics Corporation; measurements per 15.247 were performed at Timco Engineering , Inc. The Timco Report is attached as Section VII, Part C.

The shielded room conducted emissions measurement facility is located at Sensormatic Electronics Corporation Headquarters at 951 Yamato Road, Boca Raton, Florida, 33431. The radiated emissions site is located at Sensormatic Electronics Corporation manufacturing location, 6600 Congress Avenue, Boca Raton, Florida 33487. These sites have been found acceptable by and are on file with the FCC per FCC letter 31040/SIT 1300F2.

1.3 Test System Description.

The DMS system consists of a power pack and separate antennas. The power pack consists an RF module, IF FM Detector module, E-Field Generator module, Processor module, Alarm module and external low voltage transformer. The modules are enclosed in metallic cans that are virtually hermetically sealed and include port decoupling. This design feature reduces the spurious emissions into the noise floor.

The system produces an RF field and electrostatic field. The RF is propagated from a pair of antennas consisting of the following configurations: dual helixes, dish, or patch antennas. The electrostatic field is established between various radiating elements and ground. The installation configurations are fully described in the Set-Up and Service Guide exhibit.

The product tested was a pre-production unit built to production drawings.

15.203. The product is professionally installed and tuned, thus it is compliant with the requirements of this clause.

15.204. The gain of each antenna including the required cable with reference to an isotropic radiator is as follows:

Dual helix:	+2.5 dB
Dish:	+1.8 dB
Patch:	-3.0 dB

All antennas are manufactured by Sensormatic.

III. Conducted Emissions

Conducted emissions data are presented in Section VII “Data”, Part A “Conducted Emissions”. The product demonstrated compliance with the requirements of 15.207. The product was tested at 120 V, 60 Hz.

IV. Electrostatic Field Radiated Emissions

Of the several electrostatic field radiator configurations, the worst case configuration was determined to be the vortex bar. Radiated emissions data for this configuration are presented in Section VII "Data", Part B1 "Electrostatic Field Radiated Emissions". The product demonstrated compliance with the requirements of 15.209. Radiated emissions measurements were performed at 5 meters. Propagation loss was determined measuring the emissions at 5 and 10 meters and extrapolating the results to 300 meters as required.

Maximum radiation was determined by first assessing symmetry while applying incremental rotation of the turntable. The product exhibited quadrant symmetry. Measurements were taken at radials of 22.5° throughout one quadrant; the measurement antenna was rotated for maximum pickup about the vertical axis of the measurement antenna at each radial. The maximum emission was determined to be with the measurement loop antenna in the vertical polarization, perpendicular to the plane of the vortex bar.

The product was tested at input voltages to the transformer ranging from 102 – 138 V, 60 Hz with no measurable change in transmitter output.

V. Frequency Hopping Requirements

As stated earlier, the data for the 15.247 requirements are included in the Timco Report, included as Section VII, Part C of this report. Compliance issues not requiring measurements are presented below. The following information has been extracted from the original Grant (FCC ID:BVC8V4EADX) issued for this product in 1991.

Pseudorandom Frequency Hopping Sequence.
The random numbers used in the pseudorandom sequence was generated using the *congruential* method.

Equal Hopping Frequency Use.
Each of the 60 frequencies is used equally in that a "fixed list" of 60 channels is continuously repeated. The list of frequencies is fixed in that the sequence of the hopping channels is not shuffled or scrambled prior to each cycle.

System Receiver Hopping Capability, System Receiver Input Bandwidth.
The receiver tracks the transmitter using LO injection coupled from the transmitter. It also has the same filters as the transmitter; therefore, it shifts frequencies in synchronization with the transmitter and has the same bandwidth.

RF Exposure Compliance Requirements.
This product is installed in entrances to stores. Persons entering the store walk by the pedestals and pods, and are only briefly exposed to a low level signal from the closest antenna. The power pack delivers 125 mW or 21 dBm to each antenna. The antennas in the pedestals and pods have a gain of +2.5 dB. The person passing through the entrance will experience less than 250 mW for a moment, much less than the exposure experienced by a cell phone user with a phone in close proximity to a person for longer periods of time. The patch antenna is located in the floor and radiates less than 63 mW, an even lower exposure. Locations of the antennas are provided in the Installation Guide Exhibit.

VI. LIST OF MEASURING EQUIPMENT

The equipment used for determining compliance of the Ultra Post system with the requirements of 15.207 and 15.209 is marked with an "X" in the first column of the table below.

	Model	Description	Vendor	Serial #
X	ALP -70	Loop Antenna	Electro Metrics	163
X	3110B	Biconnical Antenna	Electro Metrics	1017
X	3146	Log Periodic Antenna	EMCO	3909
	3825/2	Line Imp Stable Network	EMCO	1562
X	3816/2NM	Line Imp Stable Network	EMCO	9703 1064
	6060B	Frequency Generator	Giga-tronics	5850202
	FM2000	Isotropic Field Monitor	Amplifier Research	15171
	FP2000	Isotropic Field Probe	Amplifier Research	15214
	888	Leveler	Amplifier Research	14998
	75A220	Low Band Amplifier	Amplifier Research	15208
	10W1000A	High Band Amplifier	Amplifier Research	15138
	PEFT Junior	EFT Generator	Haefely Trench	083 180-16
	PEFT Junior	Capacitive Cable Clamp	Haefely Trench	083-078-31
	NSG435	ESD Simulator	Schaffner	1197
	NSG431	ESD Simulator	Schaffner	1267
X	HP8591EM	EMC Analyzer	Hewlett - Packard	3520A00190
		Power Source	Pacific Instruments	
	F-2031	EM Injection Clamp	Fischer Cust. Comm.	30
	FCC-801-M3-16	Coupling Decoupling Nwk	Fischer Cust. Comm.	58
	FCC-801-M3-16	Coupling Decoupling Nwk	Fischer Cust. Comm.	59
	F-33-1	RF Current Probe	Fischer Cust. Comm.	304
	EM 7600	Transient Limiter	Electro-Metrics	187
	Roberts Ant	Tunable Dipole Set	Compliance Design	003282
	Roberts Ant	Tunable Dipole Set	Compliance Design	003283
	HP8594E	Spectrum Analyzer	Hewlett Packard	3246A00300
X	HP8447F Opt 64	Dual Preamplifier	Hewlett Packard	2805A03473

VII. Data

Part A contains conducted emissions data; Part B contains electrostatic field radiated emissions data, Part C is the Timco Report.

Part A **Conducted Emissions**

Project Name	Conducted Emissions FCC Class B	Filename	DMS915_CondEMI_10-2-00.doc
EUT Name	DMS 915	Serial Number	3407574
Engineer	Guillermo Padula	Part Number	0309-0047-01 Rev C0
Date of Test	10/02/2000 5:06:35 PM	Test Name	Conducted Emissions
Reg. Technician	Stephen Krizmanich	Reviewer	Don Umbdenstock

Comments	Line In 120Vac, 60hz; FCC Class B 48dBuV Limit: Domestic Universal Xfmr with 2' line cord; Xfmr is placed on 4" insulator on chamber floor beneath table; low voltage line cord is 40'; E-Field voltage is 1200VPP. DMS alarm is connected.

Signal List

Signal	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	Avg Amp (dBuV)	FCC Class B Limits (dBuV)	Comments
1	4.000550	40.83	39.87	30.70	48.00	Complies
2	4.267623	40.65	39.46	28.93	48.00	Complies
3	1.438270	39.44	38.76	31.96	48.00	Complies
4	4.399678	38.81	37.38	25.54	48.00	Complies
5	4.133968	39.27	37.32	26.34	48.00	Complies
6	3.866980	38.60	36.73	24.81	48.00	Complies

Figure 1. L1 Full Range

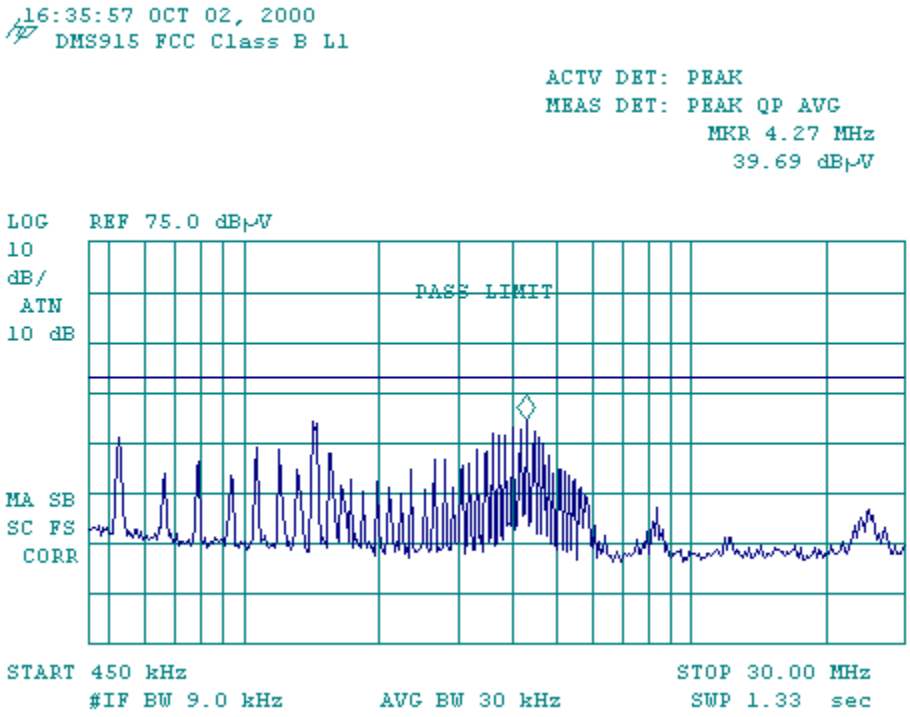
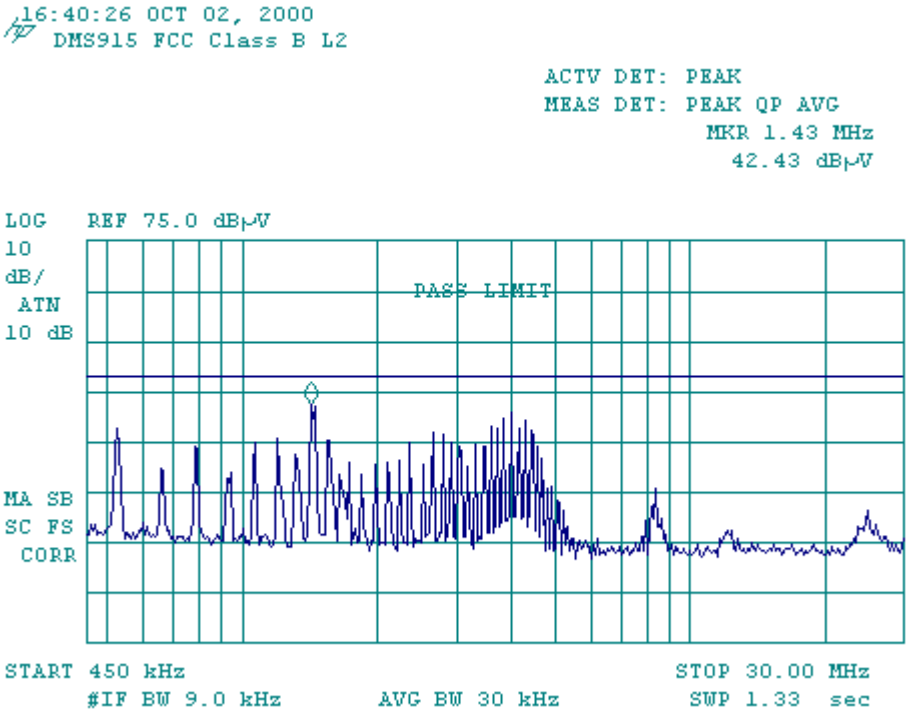


Figure 2. L2 Full Range



Part B-1
Radiated Emissions <30 MHz

Frequency (kHz)	Reading dB	Ant Fac dB	DCF dB	Actual dBuV/m	Limit dBuV/m	Comments
111.5	25.5					Antenna @ 5m
111.5	10.5					Antenna @ 10m
111.5	28.2	57.8	-92.5	-6.5	26.7	Antenna @ 5m
223	NF	52.1	-92.5	NF	20.6	Antenna @ 5m
334.5	NF	48.6	-92.5	NF	17.1	Antenna @ 5m
446	NF	46	-92.5	NF	14.6	Antenna @ 5m
557.5	Ambient	44	-40.5	Ambient	32.7	Antenna @ 5m
669	Ambient	42.6	-40.5	Ambient	31.1	Antenna @ 5m
780.5	Ambient	41.4	-40.5	Ambient	29.8	Antenna @ 5m
892	Ambient	41	-40.5	Ambient	28.6	Antenna @ 5m
1003.5	Ambient	40.9	-40.5	Ambient	27.6	Antenna @ 5m

Notes: Measurements taken in peak detector, 9 kHz BW, 48 kHz Span
NF = noise floor, < -2 dB

Dist_Corr_Factor = 20 log(Test Dist / 300)P = 20 P log (Test Dist / 300)
DCF(300) = -92.5
DCF(30) = -40.5

Where P is the roll-off exponent. P is found as follows:
P = (Level(at Distance 1) - Level(at Distance 2)) / 20 log (Distance 2 / Distance 1)
=(25.5-10)/(20*log(10/5))
= 2.6

Project Name	DMS 915 R
Engineer	Guillermo Padula
Date of Test	09/14/2000
Type of Test	Radiated Emissions 47CFR15.209
Reg. Technician	Claude Daoust
Proj. Ldr	Don Umbdenstock

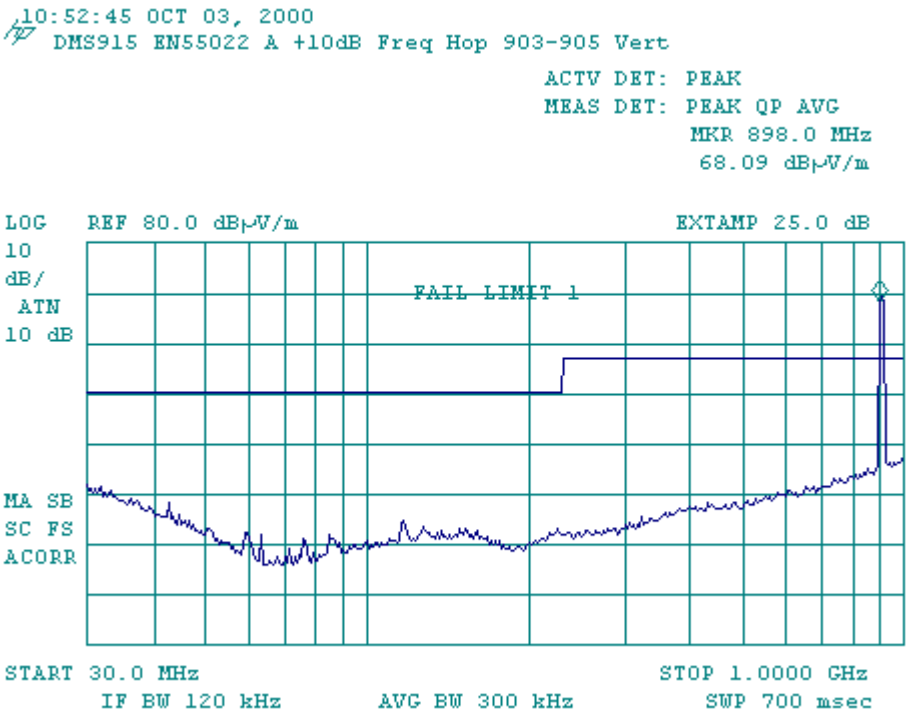
Part B-2
Radiated Emissions >30 MHz

In the frequency band of 30-1000 MHz, no spurious emissions were found. The plot below from an uncalibrated chamber graphically depicts that the only emission present was the carrier; the rest of the band is the noise floor. This is the same result achieved on the OATS. The emissions in the frequency band > 1Ghz is presented in the Timco Report in Part C.

Project Name	Radiated Emissions Class A +10dB	Filename	DMS915_RadEMI_Chamber_10-3-00.doc
EUT Name	DMS915	Serial Number	3407574
Engineer	Guillermo Padula	Phone Number	0309-0047-01 Rev C0
Date of Test	10/03/2000 10:56:20 AM	Test Name	Radiated Emissions
Reg. Technician	Stephen Krizmanich		

Comments	45dB Filter @ 905Mhz Placed in recieve Antenna line before amplifier. E-Field voltage 1216VPP.

Figure 1.



Part C

GENERAL: This report shall NOT be reproduced except in full without the written approval of TIMCO ENGINEERING, INC.

APPLICANT: Sensormatic

TEST EQUIPMENT LIST

1. Spectrum Analyzer: Hewlett Packard 8566B, with preselector HP 85685A, & Quasi-Peak Adapter HP 8565OA, & HP 8449B OPT H02 Cal. 10/1/00

2. Eaton Biconnical Antenna Model 94455-1
   20-200 MHz Serial No. 0997 Cal. 9/17/00

3. Electro-Metric Dipole Kit, 20-1000 MHz, Model TDA 25 cal. 5/15/00

4. Electro-Metric Horn 1-18 GHz, Model RGA-180, Cal. 9/24/00

5. Electro-Metrics EM 6950 Log-Periodic Antenna Cal: 9/3/00

6. Electro-Metric Horn 1-18 GHz, Model RGA-180

7. Systron Donner Horn Model No. DBE-520-20 18-26GHz

8. Electro-Metric Line Impedance Stabilization Network Model No. EM-7021, 50uH. Cal: 5/21/00

9. Peak Power Meter HP 8900C With Peak Power Sensor HP 84811A

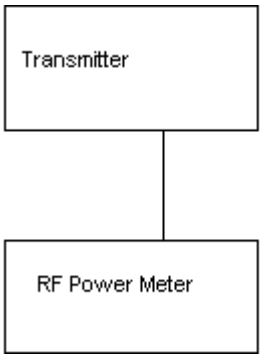
10. Insulated Wire Company, Low loss coaxial cable. 10 Ft.

POWER OUTPUT: The RF power output was measured at the RF output connector of the DUT.

RULES PART NUMBER: 15.247(b)

MEASUREMENT: 125 mWatts or 21 dBm @ 903 MHz

Equipment Setup



HOPPING CHANNEL CARRIER SEPARATION

RULES PART NUMBER: 15.247 (1)

MEASUREMENT: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW)=3 kHz and the video bandwidth (VBW) =30 kHz and the span set as shown on a plot as exhibit #: 1

REQUIREMENTS: Carriers separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

NAME OF TEST: 20.0 dB BANDWIDTH

RULES PART NUMBER: 15.247(a)(1)(i)

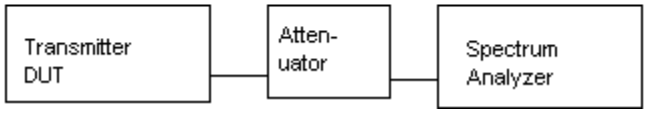
REQUIREMENTS: For FH systems in the 902-928 MHz band the 20 dB BW must be less than 250 kHz and use at least 50 hopping frequencies.

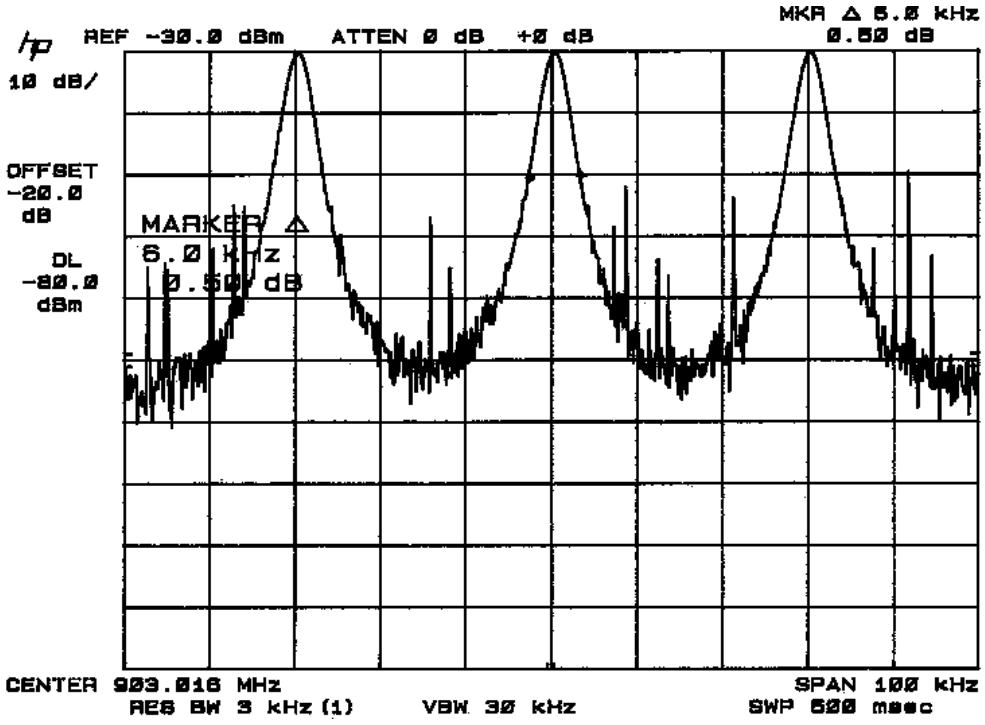
MEASUREMENT: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW)=3 kHz and the video bandwidth (VBW) =30 kHz and the span set as shown on a plot as exhibit # 1.

The channel separation is 30 kHz.

The 20.0 dB bandwidth measured at 903 MHz was 6 kHz.

20 dB Bandwidth Test Setup





20 dB Bandwidth Exhibit # 1

ANTENNA CONDUCTED EMISSIONS:

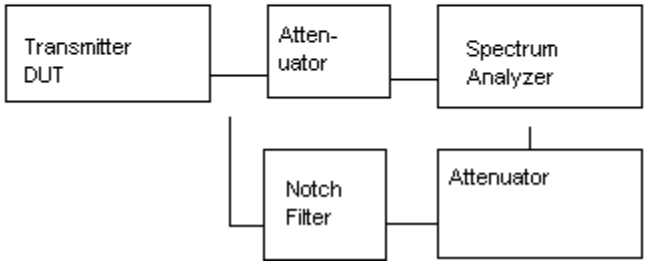
RULES PART NUMBER: 15.247(c)

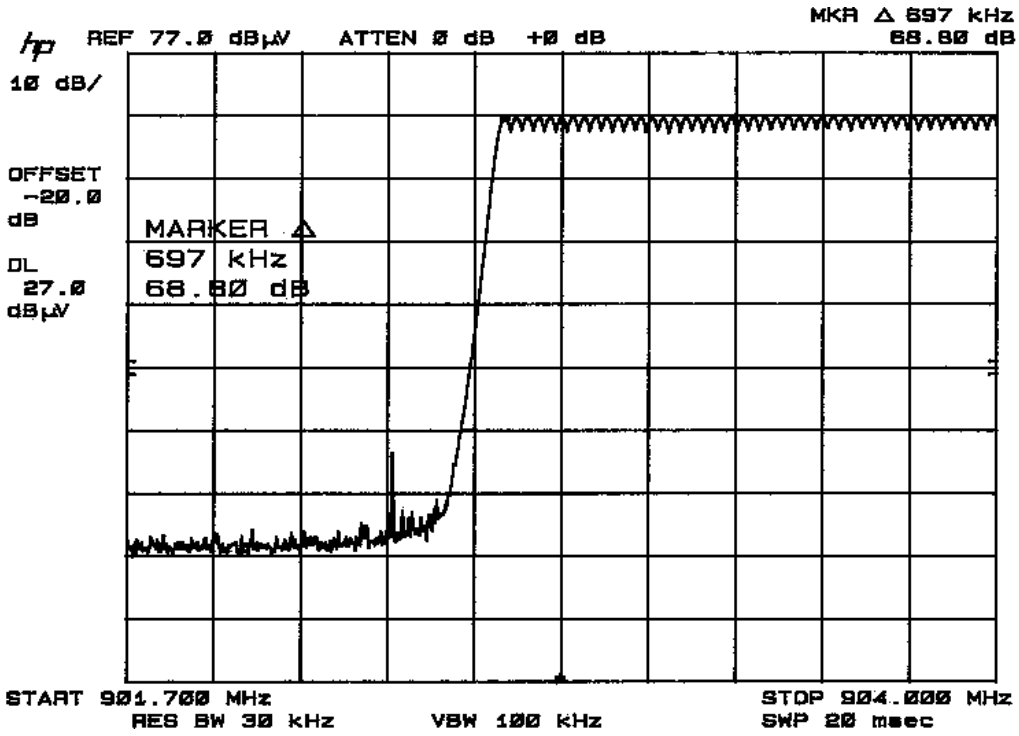
The RBW=30 kHz, VBW=100 kHz and the span set as per exhibit #2.

REQUIREMENTS: In any 100 kHz bandwidth outside frequency band in which the SS intentional radiator is operating, the radio frequency power that is produced by the transmitter shall be 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power

MEASUREMENT: per exhibit # 2

Spurious Emissions at
Antenna Terminals





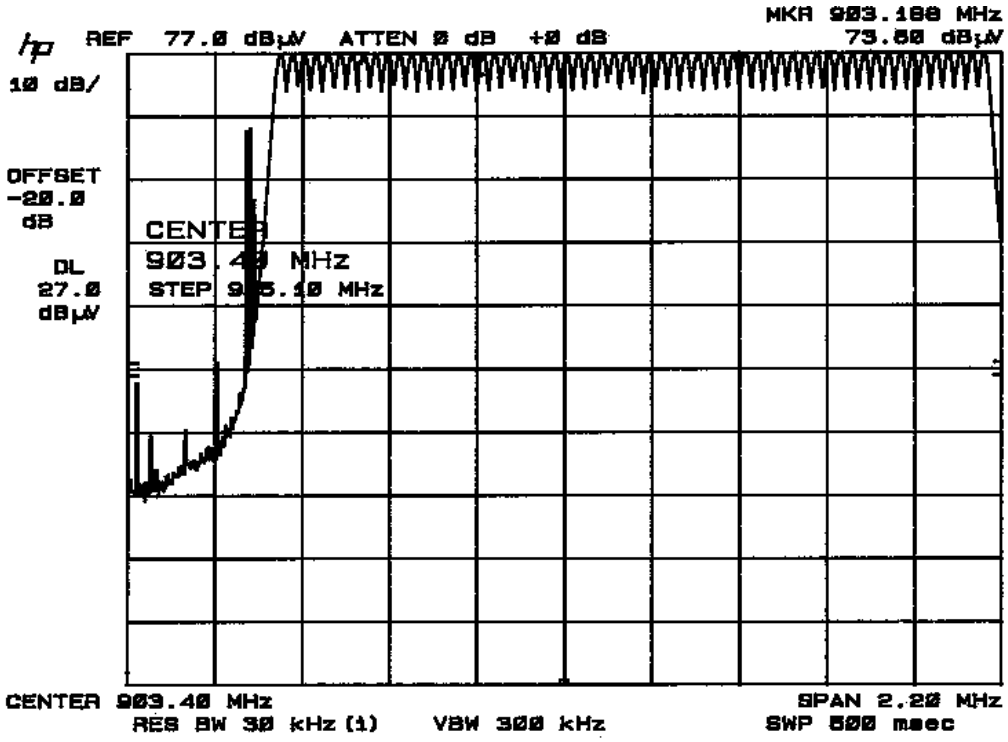
15.247 (c) Exhibit # 2

NUMBER OF HOPPING FREQUENCIES

RULES PART NUMBER: 15.247 (a)(1)(i)

REQUIREMENTS: If the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies.
MEASUREMENT: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 30 kHz and the video bandwidth (VBW) = 300 kHz and the span set as shown on a plot as exhibit # 3.

The number of hopping frequencies is 60.



Number of Hopping Frequencies Exhibit # 3

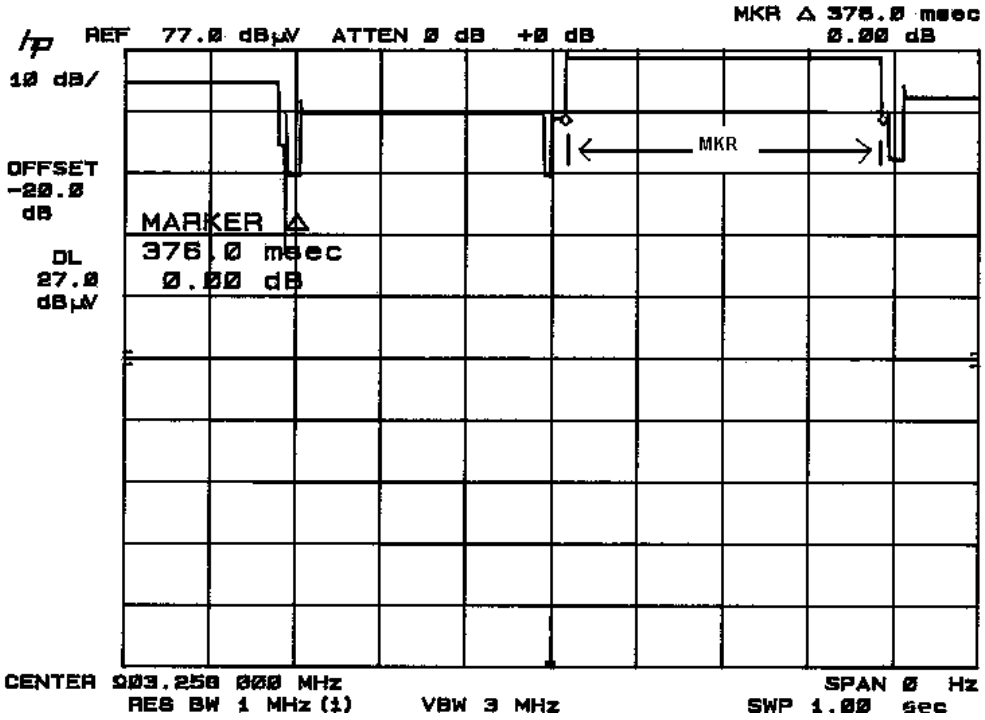
DWELL TIME:

RULES PART NUMBER: 15.247 (a)(1)(i)

REQUIREMENTS: The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a ten second period.

MEASUREMENT: The measurements were made with the spectrum analyzer's resolution bandwidth (RBW) = 1 MHz and the video bandwidth (VBW) = 3 MHz and the span set as shown on a plot as exhibit # 4.

The dwell time is determined to be 376 mseconds

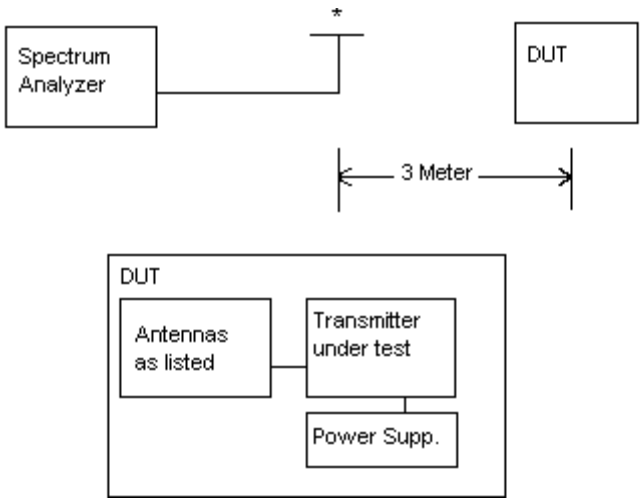


Dwell Time Exhibit # 4

RADIATION INTERFERENCE:

RULES PART NUMBER 15.205 (c), 15.209 (a)

MEASUREMENTS: The test procedure used was ANSI STANDARD C63.4-1992 using a HEWLETT PACKARD spectrum analyzer with a preselector. The bandwidth (RBW) of the spectrum analyzer was 100 kHz up to 1GHz and 1.0MHz above 1GHz with an appropriate sweep speed. The VBW above 1.0 GHz was = 3.0 MHz. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The ambient temperature of the UUT was 85 F & with a humidity of 27%.



* Calibrated antenna which can be raised from 1 to 4 Meters.

All models of this device used exactly the same electronics and RF package. Only the type and configuration of the antennas changed.

Setup #1 Dual helical antennas wound on polycarbonate forms in floor standing kiosk.

All measurements taken at 3 Meters

Tuned Freq. MHz	Emission Freq. MHz	Meter Reading dBuV	Cable Loss dB	ACF dB	Field Strength dBuV	Limit dBuV
904	904.06	89.5	2.9	24.18	116.58	137.0
	1808	none *	2.0	27.24		54.0
	2710	none *	2.1	29.77		54.0
	3616	none *	2.3	32.04		54.0
	4522	none *	2.4	33.59		54.0
	5420	none *	2.5	34.6		54.0
	6330	none *	2.7	35.62		54.0
	7234	none *	2.8	36.64		54.0
	8138	none *	3.0	37.58		54.0
	9042	none *	3.1	38.19		54.0

* less than 12 dBuV as this is the noise floor level.

Setup #2: Dual helical antennas wound on polycarbonate forms in wall mounted assemblies.

All measurements taken at 3 Meters

Tuned Freq. MHz	Emission Freq. MHz	Meter Reading dBuV	Cable Loss dB	ACF dB	Field Strength dBuV	Limit dBuV
904	904.06	93.0	2.9	24.18	120.08	137.0
	1808	none *	2.0	27.24		54.0
	2710	none *	2.1	29.77		54.0
	3616	none *	2.3	32.04		54.0
	4522	none *	2.4	33.59		54.0
	5420	none *	2.5	34.6		54.0
	6330	none *	2.7	35.62		54.0
	7234	none *	2.8	36.64		54.0
	8138	none *	3.0	37.58		54.0
	9042	none *	3.1	38.19		54.0

* less than 12 dBuV as this is the noise floor level.


Setup 3: Dual helical antennas on ceramic form ceiling mounted

Setup #3: Dual Helical antennas wound on ceramic forms mounted in ceiling.

All measurements taken at 3 Meters

Tuned Freq. MHz	Emission Freq. MHz	Meter Reading dBuV	Cable Loss dB	ACF dB	Field Strength dBuV	Limit dBuV
904	904.06	90.7	2.9	24.18	117.78	137.0
	1808	20.1	2.0	27.24	49.34	54.0
	2710	none *	2.1	29.77		54.0
	3616	none *	2.3	32.04		54.0
	4522	none *	2.4	33.59		54.0
	5420	none *	2.5	34.6		54.0
	6330	none *	2.7	35.62		54.0
	7234	none *	2.8	36.64		54.0
	8138	none *	3.0	37.58		54.0
	9042	none *	3.1	38.19		54.0

* less than 12 dBuV as this is the noise floor level.

Setup 4: Patch antenna floor mounted.

Setup #4 Patch antennas floor mounted.

All measurements taken at 3 Meters

Tuned Freq. MHz	Emission Freq. MHz	Meter Reading dBuV	Cable Loss dB	ACF dB	Field Strength dBuV	Limit dBuV
904	904.06	82.50	2.9	24.18	109.58	137.0
	1808	none *	2.0	27.24		54.0
	2710	none *	2.1	29.77		54.0
	3616	none *	2.3	32.04		54.0
	4522	none *	2.4	33.59		54.0
	5420	none *	2.5	34.6		54.0
	6330	none *	2.7	35.62		54.0
	7234	none *	2.8	36.64		54.0
	8138	none *	3.0	37.58		54.0
	9042	none *	3.1	38.19		54.0

* less than 12 dBuV as this is the noise floor level.

Setup 5: Dish antennas on floor standing pedestals.

Setup #5 Dish antennas in floor standing pedestals.

All measurements taken at 3 Meters

Tuned Freq. MHz	Emission Freq. MHz	Meter Reading dBuV	Cable Loss dB	ACF dB	Field Strength dBuV	Limit dBuV
904	904.06	90.50	2.9	24.18	117.58	137.0
	1808	none *	2.0	27.24		54.0
	2710	none *	2.1	29.77		54.0
	3616	none *	2.3	32.04		54.0
	4522	none *	2.4	33.59		54.0
	5420	none *	2.5	34.6		54.0
	6330	none *	2.7	35.62		54.0
	7234	none *	2.8	36.64		54.0
	8138	none *	3.0	37.58		54.0
	9042	none *	3.1	38.19		54.0

* less than 12 dBuV as this is the noise floor level.

Measurements were made at the open air test site of TIMCO ENGINEERING INC. located at 849 NW State Road 45, Newberry FL 32669.

We, the undersigned, certify that the enclosed measurements and enclosed data are true and correct.

Mario R. de Aranzeta
Engineer