Appendix II

Test Report Cover Sheet

COMPANY NUMBER: 3506A

MODEL NUMBER: DEAC SLNK

MANUFACTURER: Tyco Safety Products -- Sensormatic

TESTED TO RADIO STANDARD SPECIFICATION NO. : RSS 210

OPEN AREA TEST SITE INDUSTRY CANADA NUMBER: 3506

FREQUENCY RANGE (or fixed frequency): 903.2 – 914.8

R.F. POWER IN WATTS: .004

FIELD STRENGTH (at what distance): _____

OCCUPIED BANDWIDTH (99% BW): 135 kHz

TYPE OF MODULATION: FSK

EMISSION DESIGNATOR (TRC-43): 135KF1D

TRANSMITTER SPURIOUS (worst case): -61dBm

RECEIVER SPURIOUS (worst case): na; transmitter on continuously

ATTESTATION: I attest that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standard(s), and that the radio equipment identified in this application has been subject to all the applicable test conditions specified in the departmental standards and all of the requirements of the standard have been met.

Signature:

Date: 26 August 27, 2002

NAME AND TITLE (Please print or Type):

Donald J. Umbdenstock Sr. Principal Engineer, Compliance Engineering

.

Note: This form must be completed and provided with the submission.

COMPANY	Sensormatic Electronics Corp. 6600 Congress Ave Boca Raton, Florida 33487
PRODUCT TESTED	Modular Device – Sync Link FCC ID: BVCDEACSLNK IC: 3506A-DEACSLNK
FCC RULES	15.207, 15.209, 15.247
TEST DATE	June 15-August 23, 2002
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. In addition, radiated emissions were measured per FCC document DA 00-705, "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems", and conducted emissions were measured per FCC document DA 00-1407, "Part 15 Unlicensed Modular Transmitter Approval".

DA 00-705 calls for conducted RF measurements. The device is manufactured with an integral antenna. To accommodate the conducted RF measurements, a unit was modified to replace the antenna with an external SMA connector. Another unmodified unit was used for radiated spurious emissions. The modified unit is a test item only and is not available for sale. 15.31 (m) calls for measurements to be made at the highest and lowest frequencies. Measurements were made at 903.2 MHz and 914.8 MHz except where frequency hopping was called for.

1.2 Test Facility

Measurements were performed at Sensormatic Electronics.

The shielded room conducted emissions measurement facility is located at Sensormatic Electronics Corporation Headquarters at 6600 Congress Avenue, Boca Raton, Florida, 33487. The radiated emissions Open Area Test Site is also located at 6600 Congress Avenue, Boca Raton, Florida 33487. These sites

have been found acceptable by and are on file with the FCC per FCC Registration Number 90925, and Industry Canada per file number IC 3506.

1.3 Test System Description.

The sync-link module is a UHF transmitter and receiver device that operates in the 860 to 930MHz region. It can be set up as either a receiver or transmitter via a dipswitch setting. It is designed to provide wireless synchronization of Sensormatic's Electronic Article Surveillance (EAS) equipment. This is accomplished by setting one sync-link module up as a transmitter; this connects to a host EAS device that supplies the sync-link with a timing reference. The sync-link takes the timing reference and modulates it onto the UHF carrier. Other EAS devices that are equipped with sync-link receivers are supplied with the timing reference from the sync-link demodulated output.

The sync-link module can be set up via dipswitch settings to work either in North America where it uses a carrier frequency of 902 – 928 MHz or in Europe where is uses 868-869 MHz carrier frequency. In North America it operates in frequency hopping mode, where it hops though a random sequence of 60 frequencies.

The product is a self-contained module including all the circuitry to generate and transmit the carrier. Contained within the device are its regulated power supply, frequency reference, and integral antenna. The only signals coming in to the transmitter are power and modulation data. The receiver provides a demodulated output routed to EAS equipment.

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

15.203,15.204,. The antenna which is a quarter wave mono-pole 24 gauge wire is soldered directly to the PCB. The PCB along with the antenna is enclosed in a plastic housing. The antenna is manufactured by Sensormatic. The gain of the antenna with reference to an isotropic radiator is -1.4 dBi.

III. Conducted Emissions

An external power supply provided the 5 Vdc input to the LISN that powered the test item. A signal generator provided the modulation. This was done in accordance with the requirements for modular approval per DA 00-1407.

Conducted emissions data are presented in Section VI "Data", Part A "Conducted Emissions". The product demonstrated compliance with the requirements of 15.207.

IV. Frequency Hopping Requirements

Section 15.247 (a)

The device contains a transmitter that modulates a carrier with data, changes carrier frequency in a pseudo-random pattern with a dwell time, channel separation, and hop count that meets the requirements of 15.247. In addition, the receiver tracks the transmitter's pseudo-random hopping sequence and demodulates the signal. Therefore the system is a true frequency hopping spread spectrum system.

Pseudo-random Frequency Hopping Sequence

The device hops through a sequence of 60 frequencies, that span from 903.2 to 914.8 MHz with a channel spacing of 200kHz. The hopping sequence is random, and the device dwells at each frequency for 350 ms.

The hopping sequence was generated by assigning a number to each frequency, in the order.

903.2 MHz #1
903.4 MHz #2
.
.
914.8 MHz #60

Each number was then written on a separate card. All 60 cards were then placed in a bucket and mixed together. Then one card at a time was drawn from the bucket and the number on the card was written down. The sequence generated along with the corresponding frequencies was then stored in the device's

flash memory. On power-up the unit will start to hop through the sequence and once completed it will repeat the same sequence over and over.

Equal Hopping Frequency Use

Since every channel is included in the hop sequence only once and the device repeats the same sequence over and over, the device spends equal time at each channel frequency on average.

System Receiver Input Bandwidth

The receiver employs 2 stages of IF filtering with each filter having a 20dB BW of 180kHz. The frequency deviation of the modulated carrier was measured to be 56kHz, this giving a total bandwidth requirement of approximately 112 kHz, derived from

$$B_T := 2(\Delta f + f_m)$$

$$B_T = 1.121 \times 10^5$$

Where fm = 60 Hz is the synch pulse repetition rate.

System Receiver Hopping Capability

The receiver stores and hops through the same sequence as does the transmitter; on power up the receiver acquires the transmitter by hopping through the sequence at a fast rate 160ms per channel. Once the receiver sees the transmitter, i.e., a valid 60 Hz pulse train is seen on the output of the demodulator, the receiver will then hop at the same rate and in the same sequence as the transmitter.

Section 15.247 (g)

In the application for which this device is going to be used, the transmitter continuously transmits a timing or synchronization signal over the RF channel. At each frequency in the hop sequence the transmitter sends out 20 sync signals, with each sync signal spaced 16.666ms apart. After sending 20 sync events the transmitter is timed to hop to the next frequency in the pseudo-random sequence. The receiver tracks the transmitter frequencies and demodulates the signal, creating a sync signal for the host equipment. This process repeats itself indefinitely, thus the system is a true frequency hopping system.

Section 15.247 (h)

Since the device is programmed to follow a set hopping sequence, regardless of potential interference and it is not programmed to scan the channels for interference, it does not have the ability to coordinate with other FHSS systems in an effort to avoid the simultaneous occupancy of individual hopping frequencies by multiple transmitters.

RF Exposure Compliance Requirements.

One transmitter is installed to cover a large number of receivers in a store. The recommended installation location is high on a pole near the check-out lanes of a store. Any persons walking by the designated pole to which the transmitter is attached will be much greater than 20 cm away. The power radiated is approximately 5 mW. Based on the low power and separation distance, the device complies with the RF exposure requirements.

V. Test 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 #**
	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
	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
X	83017	.5-26 GHz PreAmp	HP	
X	1.8 – 13 GHz HPF	High Pass Filter	Micro-Tronics	001
	Roberts Ant	Tunable Dipole Set	Compliance Design	003282
	Roberts Ant	Tunable Dipole Set	Compliance Design	003283
X	3115	Double-Riged Waveguide Horn	EMCO	3006
X	HP8562	Spectrum Analyzer	Hewlett Packard	2712A00534
X	HP8447F Opt 64	Dual Preamplifier	Hewlett Packard	2805A03473

VI. Data

Part A contains conducted emissions data; Part B contains frequency hopping data, Part C contains the radiated emissions.

Part A Conducted Emissions

Project Name	Sync Link	Filename	
EUT Name	Stand Alone	Serial Number	
Engineer	Tim Relihan	Phone Number	
Date of Test	08/23/2002 10:06:28 AM	Test Name	Conducted Emission
Reg. Staff	Don Umbdenstock		

Comments	Line In: 5 Vdc Modulation: Sig Gen

Figure 1. L1 Full Range

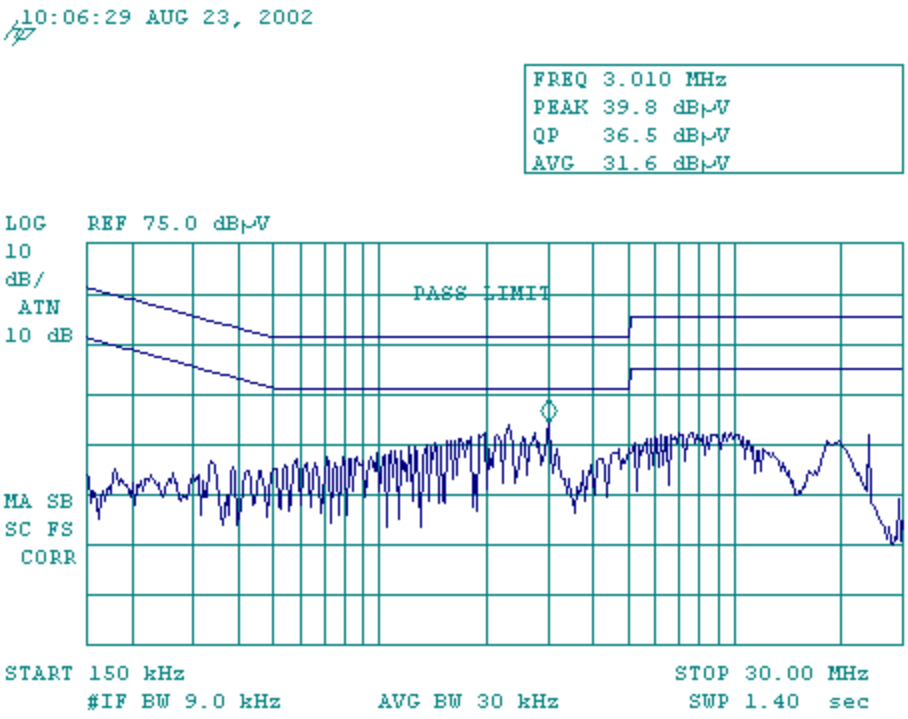
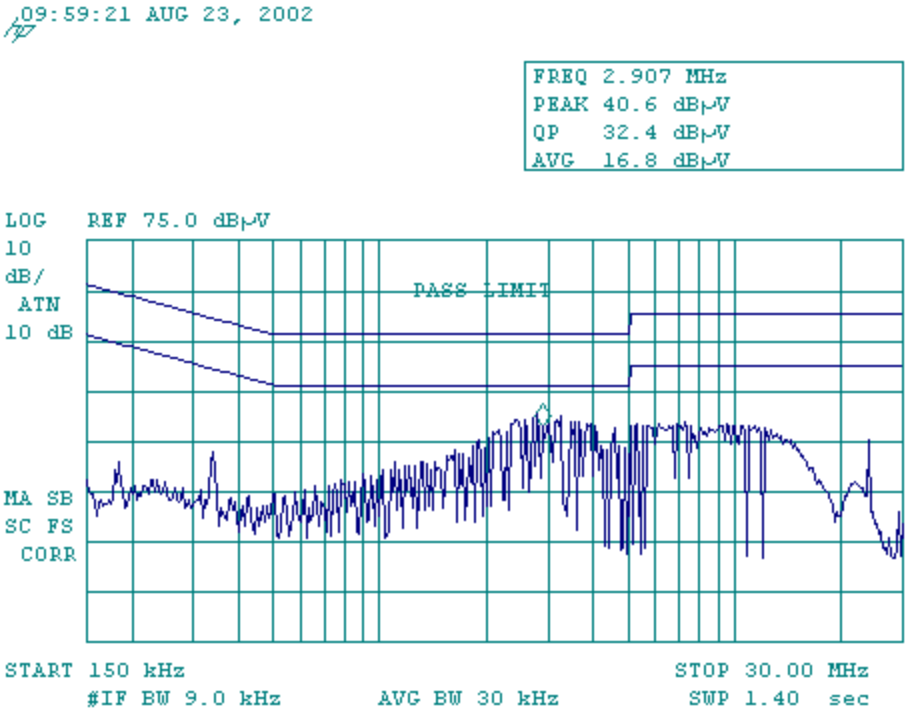


Figure 2. L2 Full Range

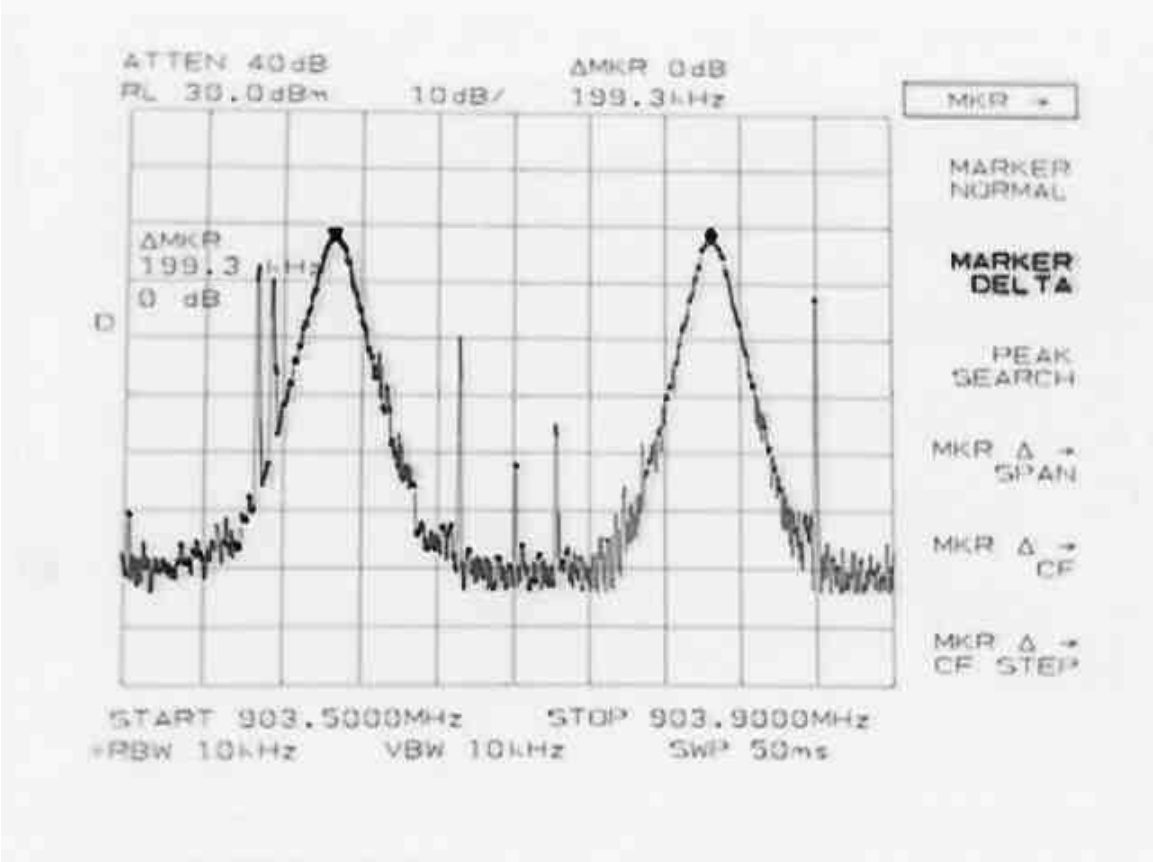


Part B Frequency Hopping Measurements

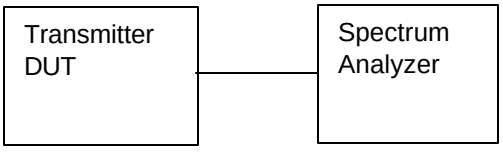
CARRIER FREQUENCY SEPARATION

RULES PART 15.247 (a)(1)

Carrier separation = 199.3 kHz



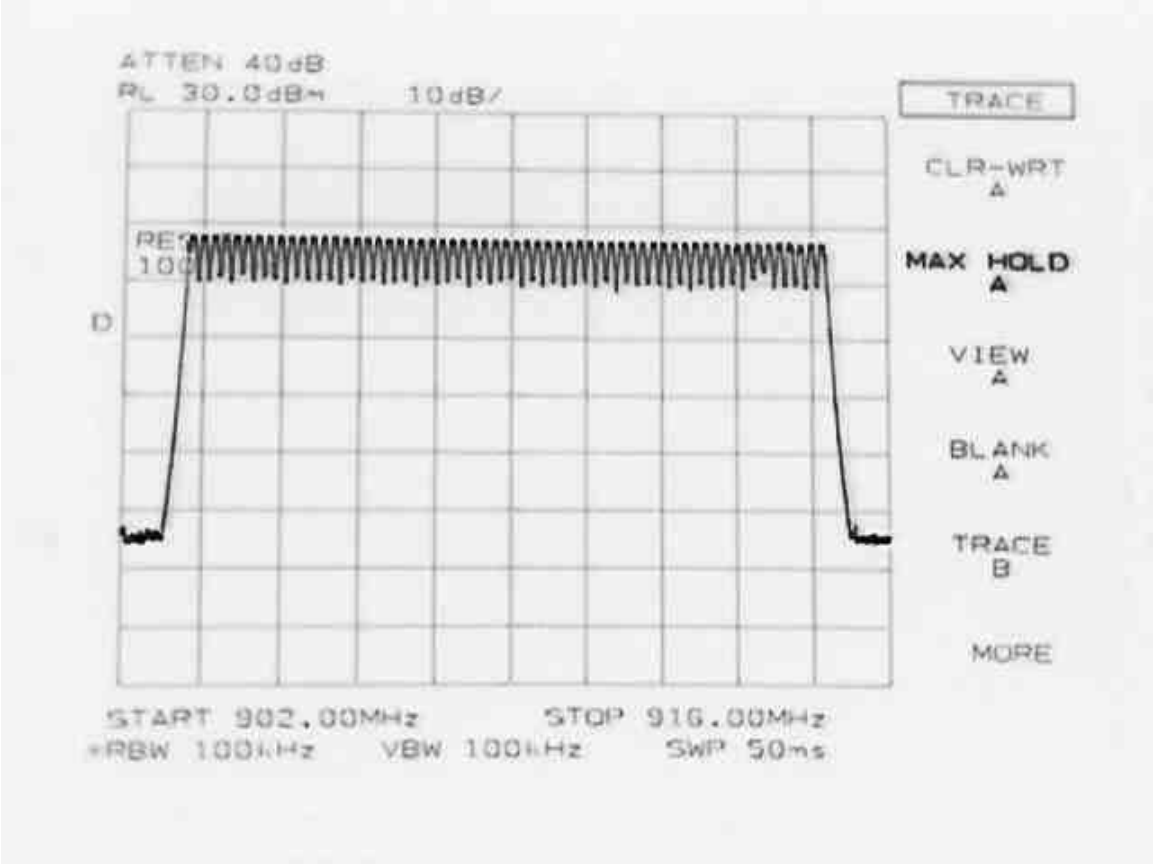
Setup:



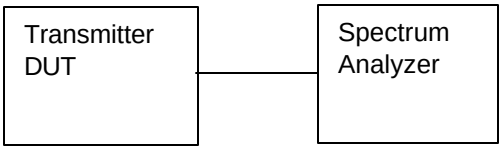
NUMBER OF HOPPING CHANNELS

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

The number of hopping channels = 60; limit , number > 25.



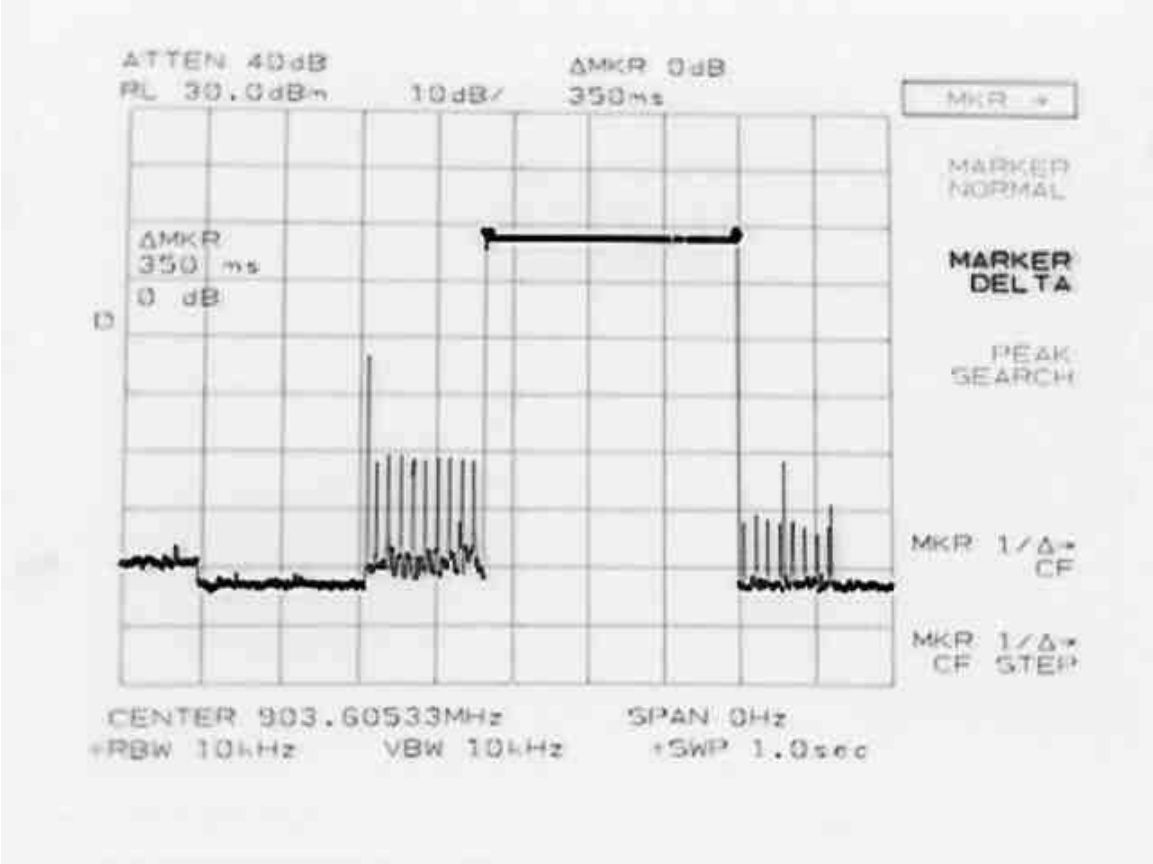
Setup:



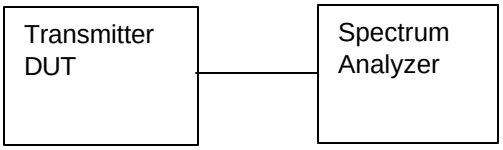
TIME OF OCCUPANCY (DWELL TIME)

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

Dwell time = 350 ms; limit = 400 ms.



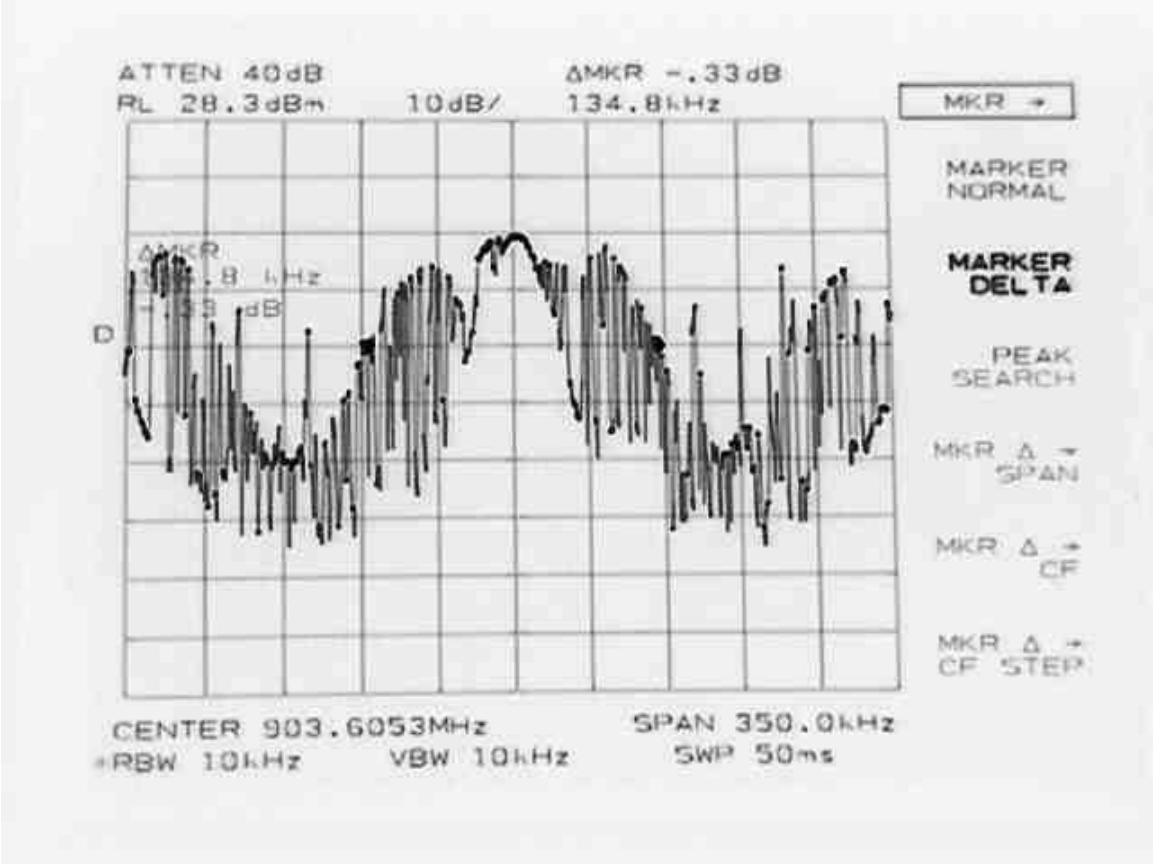
Setup:



20 DB BANDWIDTH

RULES PART 15.247 (a)(1)

20 dB bandwidth = 134.8 kHz



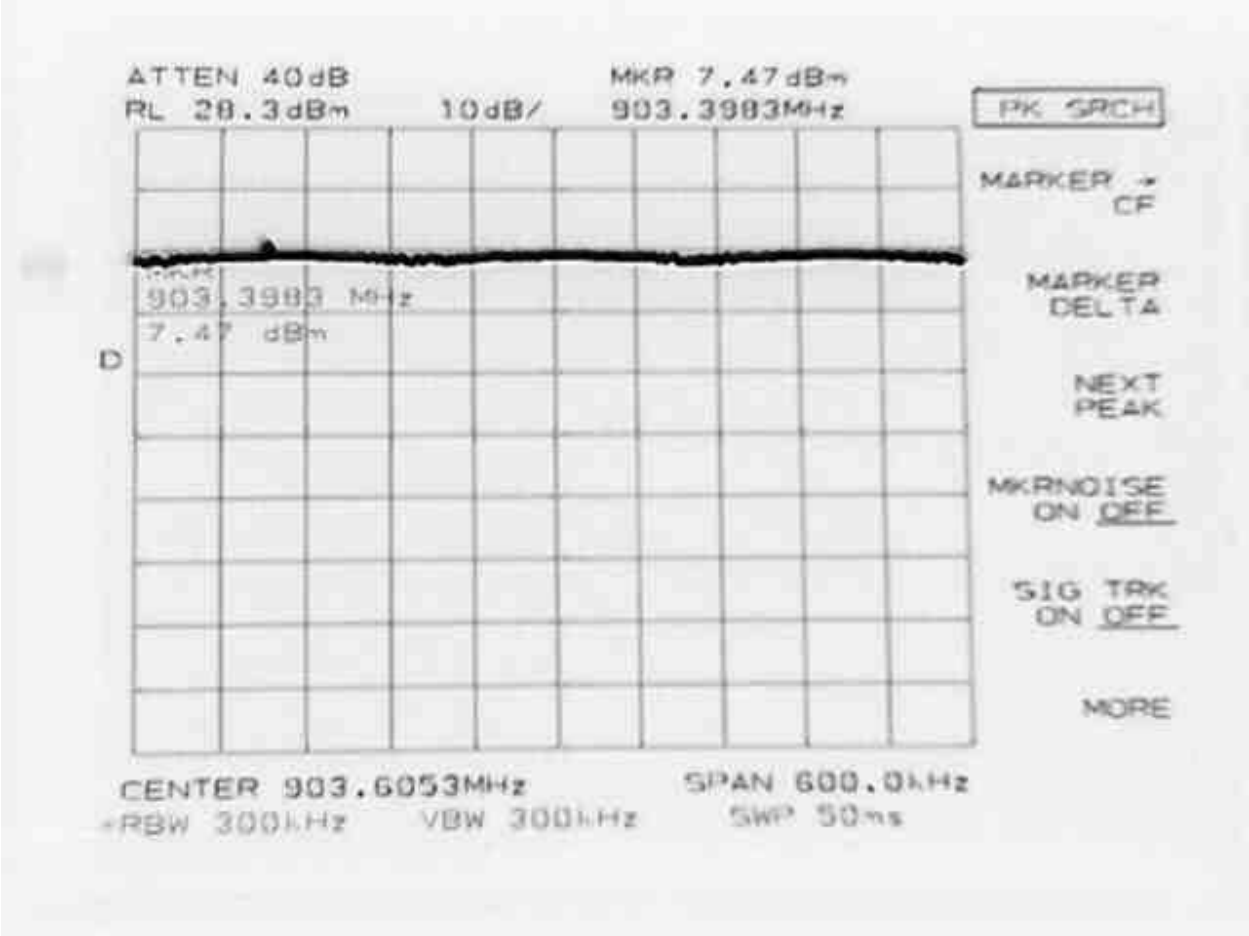
PEAK POWER OUTPUT

RULES PART 15.247 (b)

The peak conducted power is 7.47 dBm. Cable loss is 1 dB; no external attenuators were required.
The antenna gain is -1.45 dBi, therefore the peak radiated power is

7.47 + 1 - 1.45 = 7dBm or 5 mW.

The device is manufactured with only one antenna, the power of which is given above. As there is only one antenna, that antenna has a power of 5 mW compared to the limit of 250 mW, and the cable loss is only 1 dB, the device complies with the *De Facto* EIRP requirement without the need to stipulate special cable considerations.

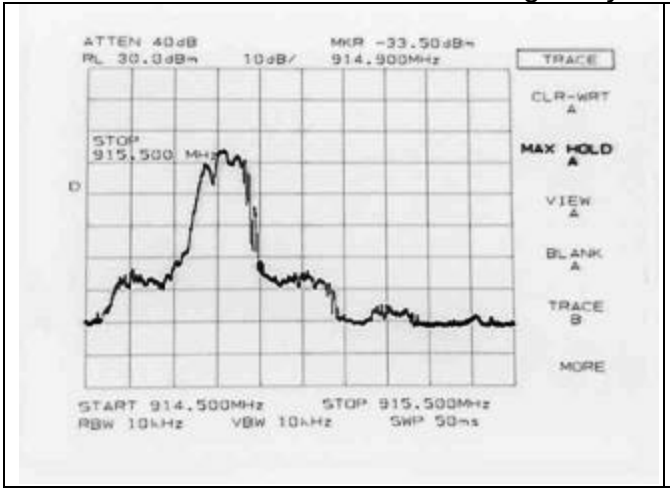


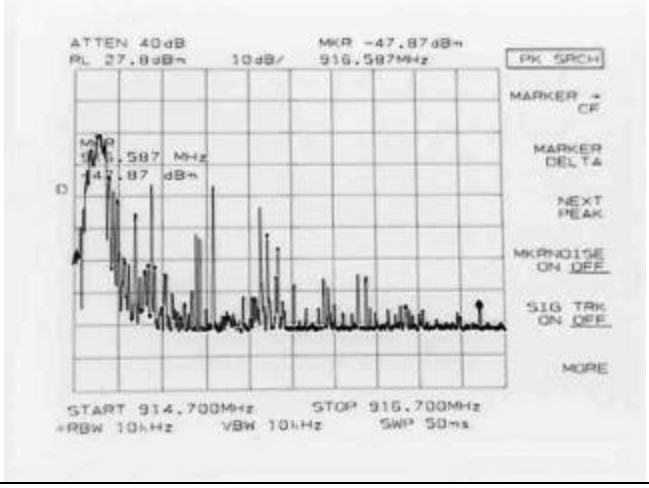
BAND-EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

RULES PART 15.247 (c)

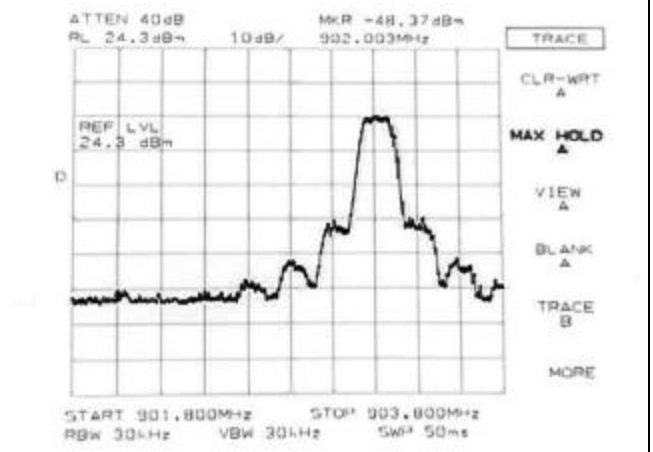
4 plots follow showing band-edge non-hopping high side, band-edge hopping high side, band-edge non-hopping low side, band-edge hopping low side. Limit: > 20 dB below highest inband signal.

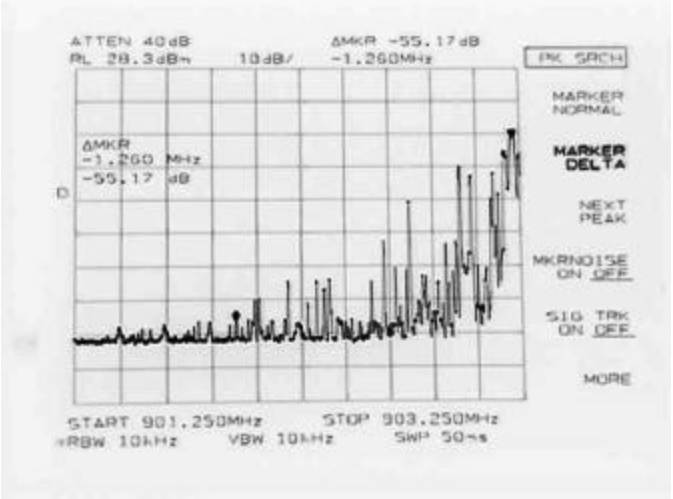
High side, non-hopping and hopping respectively. Band edge is 928 MHz; emissions are much than 40 below the inband signal by 916 MHz; noise floor by 928 MHz.



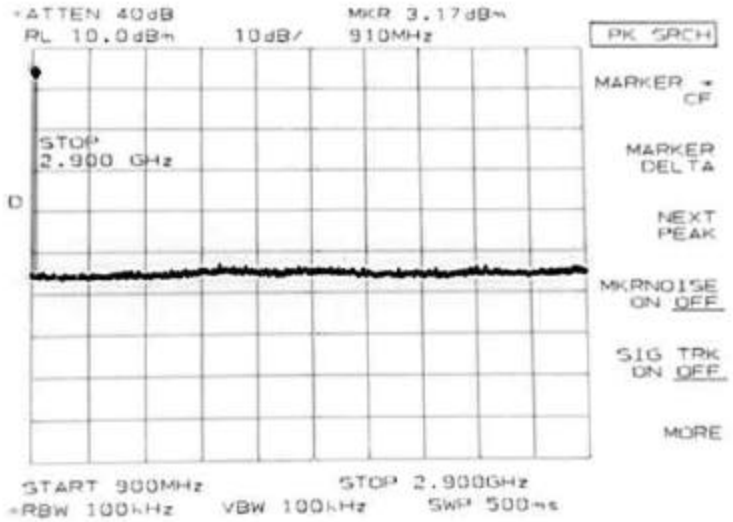


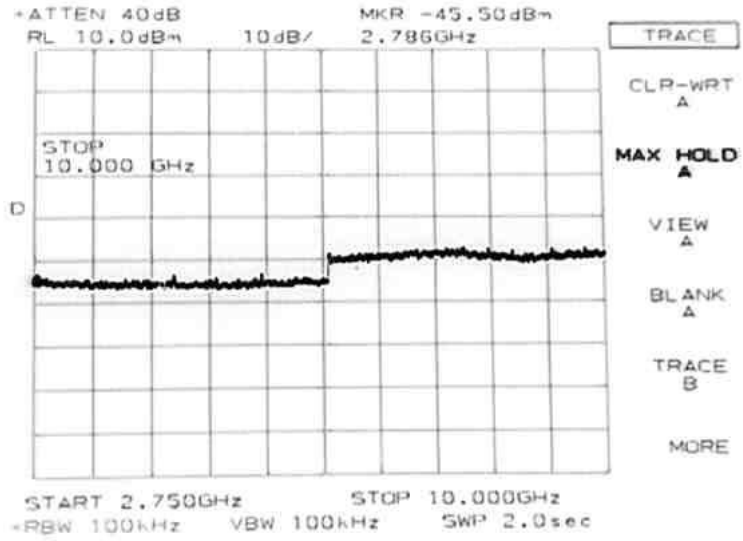
Low side, non-hopping and hopping respectively. Band edge is 902 MHz; emissions are more than 40 dB below the inband signal.





The following 2 plots shows that there are no emissions within 20 dB of the inband signal in any 100 kHz band all the way to the 10th harmonic.





Part C SPURIOUS RADIATED EMISSIONS

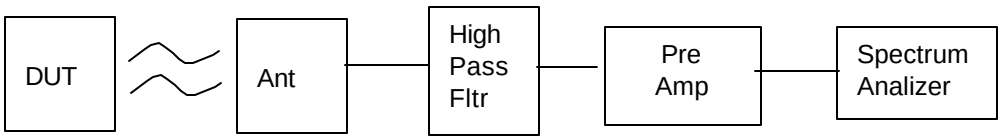
RULES PARTS 15.247 (c), 15.205, 15.209

The emission at 2709.6 MHz is the only one with measurable level that falls within the forbidden bands identified in 15.205.

Per the limits established in 15.209 for spurious emissions falling within the forbidden band, we have 18.5 dB of margin. The peak reading is < 20 dB higher than the average reading, therefore, the device complies with the requirements

Set Up

Frequency Hopping disabled to maximize signal with Turntable rotation and antenna elevation.
Frequency Hopping enabled for actual level measurement.
Antenna 1.5 meters from device under test.
Table rotated 360 degrees, antenna positioned between 1 and 4 meters.
Peak: RBW = 1 MHz, VBW = 1 MHz, max hold.
Ave: RBW = 1 MHz, VBW = 10 Hz, max hold



Frequency	Reading Peak (dBm)	Reading Ave (dBm)	Cable (dB)	Antenna (dB)	Fltr (dB)	Preamp (dB)	DCF (dB)	Level (dBm)	Limit (dBm)	Pol (H/V)	NF peak (dBm)	NF ave (dBm)
1806.4	-55	-58	4	26	1	31	3	-61	-54	H	-62	-73
2709.6	nf	-74	5.5	29	1	31	3	-72.5	-54	H	-62	-75
3612.8	nf	nf							-54			
4516.0	nf	nf							-54			
5419.2	nf	nf							-54			
6322.4	nf	nf							-54			
7225.6	nf	nf							-54			
8128.8	nf	nf							-54			
9032.0	nf	nf							-54			

Level = R(ave) + cable + antenna + Fltr - preamp - DCF
DCF = distance correction factor
= 10 log (3m/1.5m)
= 3 dB

22-Aug-02

Reference plots for frequencies below 1 GHz

Spurious emissions are more than 40 dB below the carrier for all frequencies between 30 MHz and 1 GHz, thus satisfying the requirement for being more than 20 dB below the highest in-band signal.

Project Name	Radiated Emissions EN55022 Class A , 3m	Filename	SyncLink_RadEMI_11-19-01.doc
EUT Name	Sync-Link XCVR	Serial Number	
Engineer	Tim Relihan	Phone Number	
Date of Test	11/18/01 2:52:56 PM	Test Name	Radiated Emission
Reg. Technician	Stephen Krizmanich		

Comments	Battery Operated