Thomas N. Cokenias *EMC/RFI Specialist*
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P.O. Box 1086
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CERTIFICATION TEST REPORT FOR A 902-928 MHz TRANSCEIVER

Applicant:	Sensus Technologies Inc. 450 N. Gallitin Ave. Uniontown, PA 15401
Model:	AR4001
FCC ID:	KCH-4001-A
Operating Frequency:	903.080 MHz to 927.69 MHz
RF Output:	50,000 uV/m (94 dBuV/m) at 3 meters
FCC Rule Part:	TX: 15.205, 15.249 RX: 15.101, 15.109
Used For:	Hand-held utility meter reader
Power Source:	Battery operation only Has separate battery charging cradle when not in use
Test Location:	Compliance Consulting Services 951F Monterey Road Morgan Hill, CA 95087

All tests were performed by me or under my supervision. The Sensus AR4001 meets all emissions and modulation requirements specified under Parts 2 and 15 of the Commission's Rules.

THOMAS N. COKENIAS 28 September 1999

tel: 650 726 1263 fax: 650 726 1252 internet: trephonc@macconnect.com

EXHIBITS

EXHIBIT A: Letter Requesting Confidentiality under Sec. 0.457(d)

EXHIBIT B: Information for which Confidentiality is Requested

B1: Schematics
B2: Block Diagrams
B3: Theory of Operation

EXHIBIT C: Product Photographs

EXHIBIT D: User Manual and FCC ID Label

EXHIBIT E: Report of Measurements

EXHIBIT A: Letter Requesting Confidentiality under Sec. 0.457(d)

see attachment 40014002conf

EXHIBIT B: Information for which Confidentiality is Requested

B1: Schematics

B2: Block Diagrams

B3: Theory of Operation

EXHIBIT C: Product Photographs

- see attachments *EUTphoto*.jpg*

EXHIBIT D: User Manual and FCC ID Label

- see attachments *User manual* and *label*

EXHIBIT E: Report of Measurements

EMISSIONS TEST REPORT FOR A LOW POWER TRANSCEIVER

I. GENERAL INFORMATION

Requirement: FCC: 47CFR, Parts 2 and 15
Industry Canada: RSS-210

Applicant: Sensus Technologies Inc.
450 N. Gallitin Ave.
Uniontown, PA 15401

Product ID: KCH-4001-A

Model Numbers: AR4001

II. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

The AR4001 is a hand-held battery operated utility meter reader that uses the RF communications link to transfer meter data.

III. TEST LOCATION

All emissions tests were performed at:

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95087
Phone: 408-752-8166 Fax: 408-752-8168

CCS has site descriptions on file with the FCC for 30 m, 10m and 3m site configurations. CCS is a NVLAP accredited facility.

Radiated emissions from the digital portion of the EUT were performed on siteB, one of the 3m/10 m sites.

IV. TEST PROCEDURES

TX Radiated Emissions
Test Requirement: FCC: 15.205, 15.249(a)
Industry Canada: RSS-210

Measurement Equipment Used:

HP 8563E Spectrum Analyzer
HP8447 D Preamplifier, .1 - 1300 MHz
HP 8449 B Preamplifier, 1-26 GHz
EMCO 3146 Log Periodic antenna, 200 - 1000 MHz
ARA DRG-118/A Double Ridged Horn antenna, 1 - 18 Ghz
Flexco low loss cable, 16ft (loss: 0.85 dB/ft@ 26 GHz)

Test Set-Up

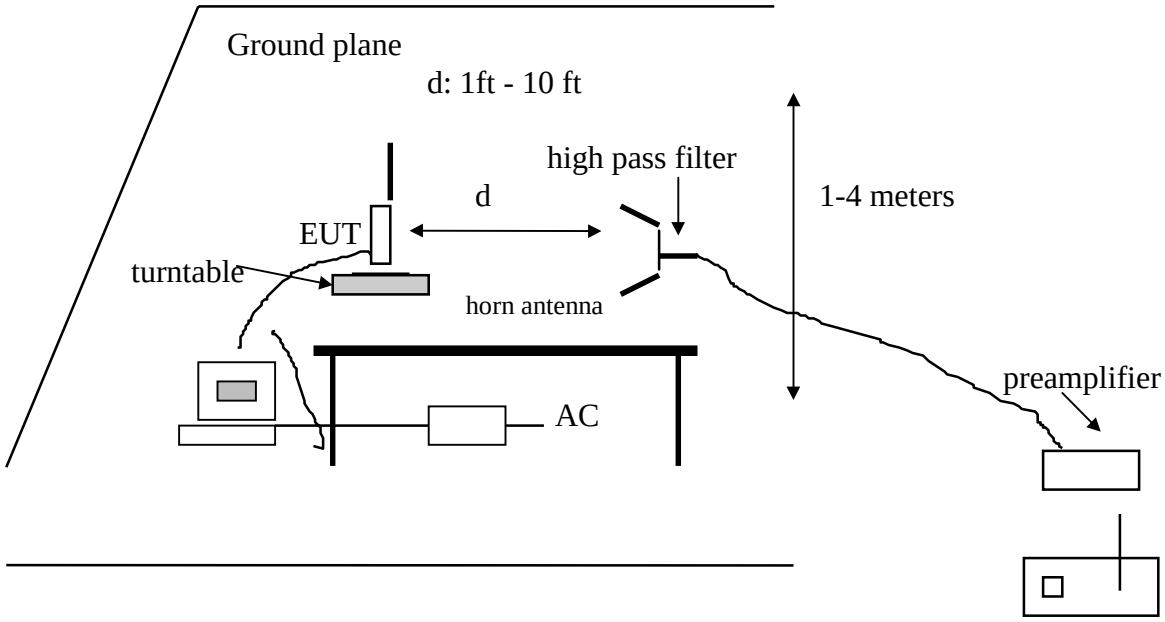


Fig. 1

Test Procedures

1. The EUT was set to MID channel and was placed on a wooden table located on the test site ground plane. The search antenna was placed 3 ft from the EUT. The EUT antenna was mounted vertically as per normal installation.

Note: The 15.249 transceiver board was tested separately outside of its meter case. The reason for this

was that the meter software was not able to sustain a steady-state transmission mode, but a stand-alone board connected to a latptop could do so. The measurements represent worst-case emissions, as there is no shadowing or shielding from the meter circuit boards and other internal assemblies.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission in the 902 - 9280 MHz frequency range.

3. Once maximum emission azimuth was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

4. Steps 1 - 3 were repeated for LOW channel and HI channel.

Test Results

PASS. Refer to tabulated test results below.

HI channel: 927.69 MHz
MID channel: 914.87 MHz
LOW channel: 903.08 MHz

TX Radiated Emission Test Results, fo - 10 fo

COMPLIANCE ENGINEERING SERVICES, INC.

Radiated Emissions
15.249

Sept 21 1999
Jesse Saldivar
B site (1.5 Meter)

Sensus Technologies
AR4001
FCC ID: KCH-4001-A
fo, MHz= 903.08

F(MHz)	READING (dBuV)		AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	HPF (dB)	TOTAL (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dB)	
	Pk/QP	Av						Pk/QP	Av	Pk/QP	Av	Pk/QP	Av
903.8QP	86		22.3	7.6	-27.4	0	0	88.5		94		-5.5	
1807.6	65	66.2	27.5	2.5	-35	-20	0	40	41.2	74	54	-34	-12.8
2709.24	62	56.2	31.7	3.5	-35	-20	0	42.2	36.4	74	54	-31.8	-17.6
3612.32	50.1	45.2	32	3.8	-35	-20	0	30.9	26	74	54	-43.1	-28
4515.4	41.1	34.9	35.2	5.6	-35	-20	0	26.9	20.7	74	54	-47.1	-33.3
5418.48	44.2	32.7	37.1	7	-35	-20	0	33.3	21.8	74	54	-40.7	-32.2
6321.56	43.5	33.7	37.1	7	-35	-20	0	32.6	22.8	74	54	-41.4	-31.2
7224.64	47	37.8	37.1	7	-35	-20	0	36.1	26.9	74	54	-37.9	-27.1
8127.72	43.6	35.4	37.1	7	-35	-20	0	32.7	24.5	74	54	-41.3	-29.5

NOTE: ALL READINGS ARE VERTICAL

DIST: Correction to extrapolate reading to 3m specification distance

1ft (0.3m) measurement distance: **-20dB**

AF: Antenna Factor

AMP: Pre-amp gain

CL: Cable loss

HPF: High pass filter insertion loss (4.6GHz)

ANALYZER SETTINGS

	Res bw	Avg. bw
PEAK(Pk):	**1MHz**	**1MHz**
AVERAGE(Avg):	**1MHz**	**10Hz**

FSY (S/N: 001)

COMPLIANCE ENGINEERING SERVICES, INC.

Radiated Emissions
15.249

Sept 21 1999
Jesse Saldivar
B site (1.5 Meter)

Sensus Technologies
AR4001
FCC ID: KCH-4001-A
fo= 914.87 MHz

F(MHz)	READING (dBuV)		AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	HPF (dB)	TOTAL (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dB)	
	Pk/QP	Av						Pk/QP	Av	Pk/QP	Av	Pk/QP	Av
914.84QP	86.8		22.3	7.57	-27	0	0	89.67		94		-4.33	
1829.7	67.87	67.6	27.5	2.5	-35	-20	0	42.87	42.6	74	54	-31.13	-11.4
2744.6	61.8	54.8	31.7	3.5	-35	-20	0	42	35	74	54	-32	-19
3659.5	49.9	44.1	32	3.8	-35	-20	0	30.7	24.9	74	54	-43.3	-29.1
4575.3	41.9	32.8	35.2	5.6	-35	-20	0	27.7	18.6	74	54	-46.3	-35.4
5489.2	43.3	28.9	37.1	7	-35	-20	0	32.4	18	74	54	-41.6	-36
6404.1	41.8	32.9	37.1	7	-35	-20	0	30.9	22	74	54	-43.1	-32
7319	46.2	37.1	37.1	7	-35	-20	0	35.3	26.2	74	54	-38.7	-27.8
8233.8	43.31	36.1	37.1	7	-35	-20	0	32.41	25.2	74	54	-41.59	-28.8

NOTE: ALL READINGS ARE VERTICAL

DIST: Correction to extrapolate reading to 3m specification distance

1ft(0.3m) measurement distance: -20 dB

AF: Antenna Factor

AMP: Pre-amp gain

CL: Cable loss

HPF: High pass filter insertion loss (4.6GHz)

FSY (S/N: 001)

ANALYZER SETTINGS

	Res bw	Avg. bw
PEAK(Pk):	**1MHz**	**1MHz**
AVERAGE(Avg):	**1MHz**	**10Hz**

COMPLIANCE ENGINEERING SERVICES, INC.

Radiated Emissions
15.249

Sept 21 1999
Jesse Saldivar
B site (1.5 Meter)

Sensus Technologies
AR4001
FCC ID: KCH-4001-A
fo, MHz= 927.69

F(MHz)	READING (dBuV)		AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	HPF (dB)	TOTAL (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dB)	
	Pk/QP	Av						Pk/QP	Av	Pk/QP	Av	Pk/QP	Av
927.7QP	86.1		22.5	7.6	-27	0	0	89.2		94		-4.8	
1855.38	64.9	67.6	27.5	2.5	-35	-20	0	39.9	42.6	74	54	-34.1	-11.4
2783.07	61.8	62	31.7	3.5	-35	-20	0	42	42.2	74	54	-32	-11.8
3710.76	51	43.7	32	3.8	-35	-20	0	31.8	24.5	74	54	-42.2	-29.5
4638.45	41.1	32.8	35.2	5.6	-35	-20	0	26.9	18.6	74	54	-47.1	-35.4
5566.14	45	31.2	37.1	7	-35	-20	0	34.1	20.3	74	54	-39.9	-33.7
6493.83	45.7	32.7	37.1	7	-35	-20	0	34.8	21.8	74	54	-39.2	-32.2
7421.52	46.8	37.7	37.1	7	-35	-20	0	35.9	26.8	74	54	-38.1	-27.2
8349.21	44.4	37.2	37.1	7	-35	-20	0	33.5	26.3	74	54	-40.5	-27.7

NOTE: ALL READINGS ARE VERTICAL

DIST: Correction to extrapolate reading to 3m specification distance

1ft (0.3m) measurement distance: **-20dB**

AF: Antenna Factor

AMP: Pre-amp gain

CL: Cable loss

HPF: High pass filter insertion loss (4.6GHz)

FSY (S/N: 001)

ANALYZER SETTINGS

	Res bw	Avg. bw
PEAK(Pk):	**1MHz**	**1MHz**
AVERAGE(Avg):	**1MHz**	**10Hz**

TX Out of Band Emissions
Test Requirement: FCC: 15.249(c)
Industry Canada: RSS 210

Measurement Equipment Used:

HP 8563E Spectrum Analyzer
Flexco low loss cable, 16ft (loss: 0.85 dB/ft@ 26 GHz)

Test Set-up

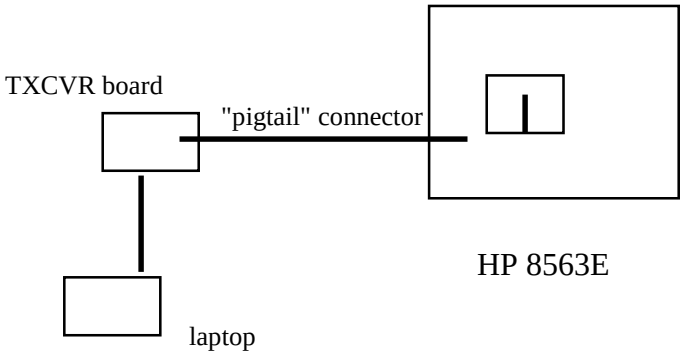


Figure 2

Test Procedures

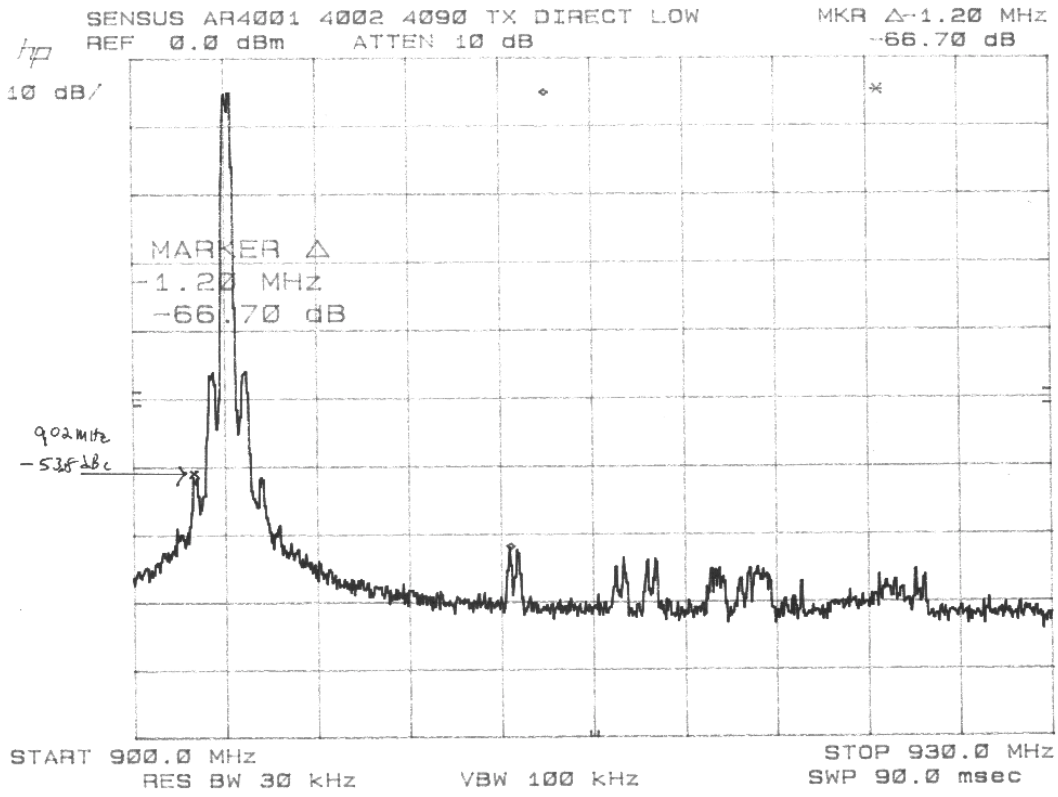
1. The EUT was configured on a test bench as shown in Figure 1. The transmitter was set to a LOW channel. While the transmitter broadcast a steady stream of data, the analyzer MAX HOLD function was used to capture the envelope of the transmission occupied bandwidth.
2. The process in (1) was repeated for MID and HI channel.

Test Results:

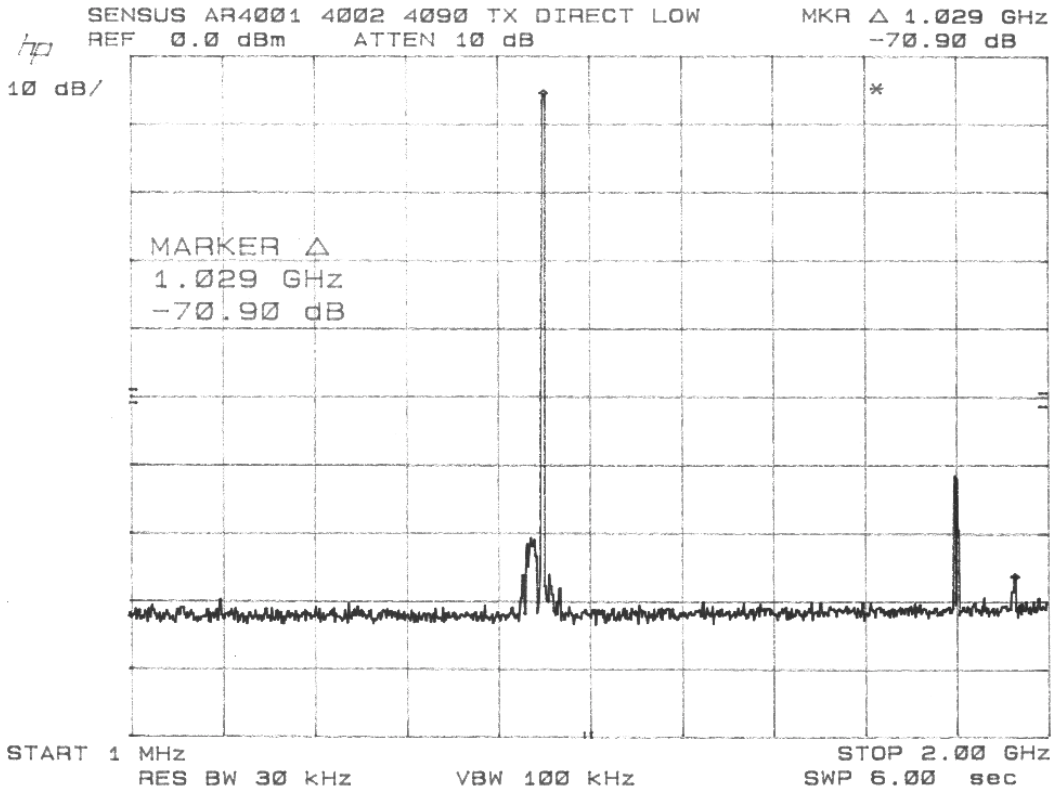
PASS. All emissions outside the band (except for harmonics, measured previously) were attenuated more than 50 dB below the level of the fundamental.

Refer to attached spectrum analyzer graphs.

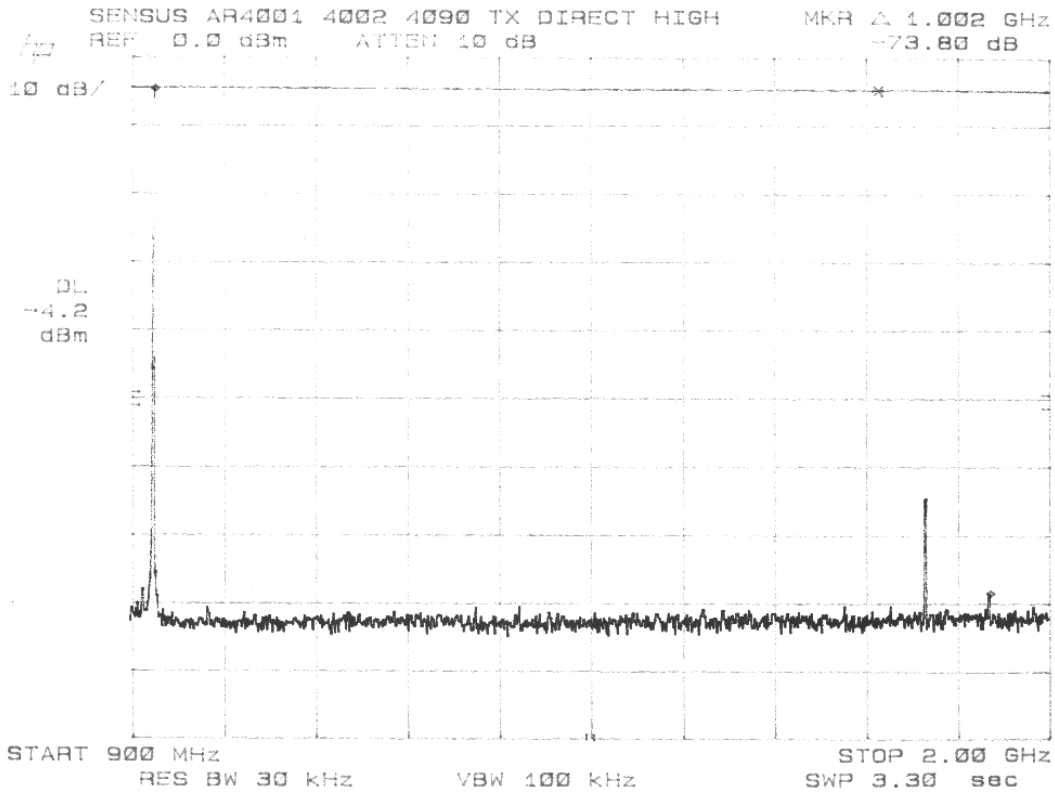
Out of Band Emissions – 903.08 MHz



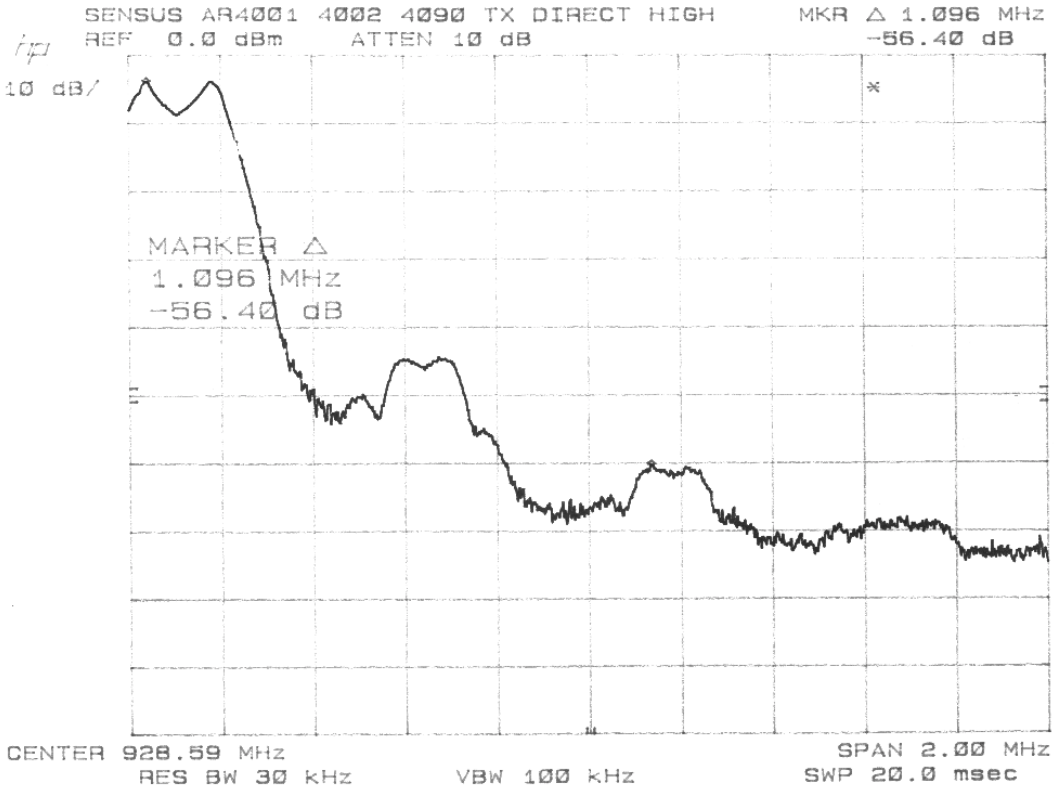
Out of Band Emissions – 903.08 MHz



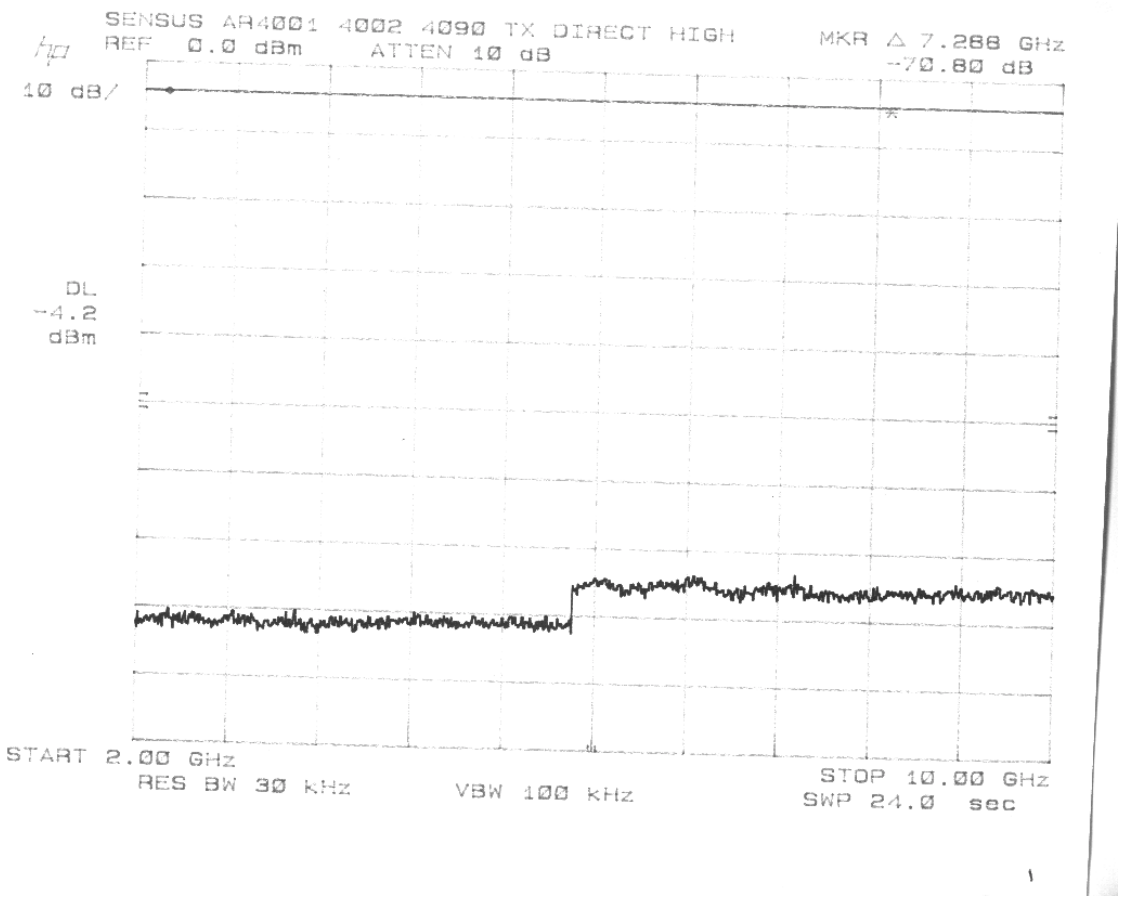
Out of Band Emissions – 927.69 MHz



Out of Band Emissions – 927.69 MHz



Out of Band Emissions – 927.69 MHz



Receiver Related Emissions
Test Requirement: FCC: 15.101, 15.109
Industry Canada: RSS 210

Per 15.101(b) for a transceiver, the transmitter portion of which is subject to certification, the receiver section is subject to verification and no data need be submitted to the Commission.

The Sensus Technologies transceiver referenced above uses an RFM "ASH" receiver, which is basically a tuned radio frequency (TRF) receiver that uses no oscillators, hence no separate measurements were made on the receiver portion of the product.

V. CERTIFICATION OF DATA

All radiated and conducted measurements described in this report were performed by, or were witnessed and supervised by, the undersigned. To the best of his knowledge and belief, test equipment calibrations, test procedures, and test data were accurate and as reported here.

T.N. COKENIAS 28 September 1999