Intertek Testing Services
ETL SEMKO

Test Report

StatSIGNAL Systems, Inc.

FCC Part 15 Application
For
Certification
(Low Power Transmitter)

ICON Meter Interface

Models: ICON170

FCC ID: PK9ICON170

June 17, 2002

Prepared by: _____ FOR GL Date: 7/24/02
Grace Lin, Sr. Project Engineer

Reviewed by: _____ Date: 7/24/02
David J. Schramm, EMC Team Leader

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1 General Description

1.1 Product Description

The Hardware Integration is done through the StatSignal's iModule board, which incorporates a microprocessor and a RF transmitter/receiver to provide RF communications (either directly or indirectly) to and from a Site Controller. To complete the integration, the ICON Meter Interface, was added to the iModule board to provide power to the StatSignal's iModule and UI1203 data, clock and power failure signals.

The communication protocol between the iModule and the ICON meter is the UI1203 protocol. The iModule will wrap the UI1203 protocol into the SOS OEA protocol using the **"Transport Data Command"** to communicate over the RF Network.

The antenna is an integral part of the transceiver. It is a PC trace configured in a "fat U" with no grounding.

1.2 Related Submittals/Changes

There are no related submittals for this application.

1.3 Test Methodology

Radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in a semi-anechoic chamber. The procedures for maximizing emissions as described in this report were followed. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The Duluth 10-meter chamber site is located at 1950 Evergreen Blvd., Suite 100, Duluth, Georgia. The test site is a 10-meter semi-anechoic chamber. The site meets the characteristics of CISPR 16-1: 1993 and ANSI C63.4: 1992. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

1.5 Test Equipment List

The following test equipment was used during testing:

Duluth Test Equipment				
Description	Make	Model	Serial #	Cal Date
EMI Receiver	HP	8546A	3410A00173	3/28/02
RF Filter Selector	HP	85460A	3448A00203	3/28/02
Spectrum Analyzer	HP	8566B	2344A05843	12/03/01
Amplifier	HP	8447D	2648A04926	2/22/02
PreAmplifier	HP	8449B	3008A00989	10/24/01
Horn Antenna	AH Systems	SAS200/571	246	1/13/02
Refrad Comb Gen.	EMCO	4630B	1162	10/11/00**
Cable	N/A	Cable TW2	ITS# 211411	12/07/01
Cable	N/A	Cable N2	ITS# 211999a2	12/07/01
LISN	Solar	8012-50-R-24-BNC	912469	8/27/01
Cable	N/A	Cable TT4	ITS# 211404	12/07/01

***All calibrations are on 12-month cycles unless otherwise indicated.**

****The EMCO 4630B is on a 24-month calibration cycle.**

2 System Test Configuration

2.1 Justification

During testing, the transmitter was mounted to a wood post, which enabled the engineer to maximize emissions through its placement.

The device was powered from 240Vac, 60Hz.

2.2 EUT Exercising Software

There was no special software to exercise the device. For simplicity of testing, the EUT was configured to transmit continuously.

2.3 Special Accessories

There are no special accessories necessary for compliance of this product.

2.4 Equipment Modification

Any modifications installed previous to testing by Lifeline Systems Inc. will be incorporated in each production model sold/leased in the United States.

There were no modifications installed by Intertek Testing Services.

2.5 Support Equipment List and Description

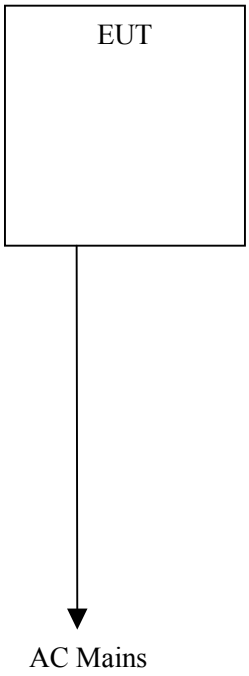
There was no support equipment required to operate the EUT.

Cables:

(1) AC mains, 8 ft, unshielded.

2.6 Test Configuration Block Diagram

Figure 2.6 Configuration of Tested System



3 Emission Results

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables the emissions are included.

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

Where FS = Field Strength in dBµV/m

RA = Receiver Amplitude (including preamplifier) in dBµV

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

FS = RR + LF

Where FS = Field Strength in dBµV/m

RR = RA - AG in dBµV

LF = CF + AF in dB

Assume a receiver reading of 52.0 dBµV is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBµV/m. This value in dBµV/m was converted to its corresponding level in µV/m.

RA = 52.0 dBµV/m

AF = 7.4 dB RR = 23.0 dBµV

CF = 1.6 dB LF = 9.0 dB

AG = 29.0 dB

FS = RR + LF

FS = 23 + 9 = 32 dBµV/m

Level in µV/m = Common Antilogarithm [(32 dBµ/V/m)/20] = 39.8 µV/m

3.2 Radiated Emission Test Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

Judgement: Passed by 5.4 dB

Readings under 1GHz are Peak

Readings over 1GHz are Peak

Test Personnel: David Schramm

Grace Lin (Signed for by David Schramm)

Date: 7/24/02

Table 3-1: Radiated Emissions

Company: **StatSIGNAL Systems, Inc.**
Model: **ICON170**
Project No.: **3023350**
Date: 04/12/02
Standard: FCC15
Class: Group: None
Notes:

Tested by: Grace Lin
Location: Duluth
Detector: HP8546
Antenna: CHAS2622
PreAmp: None
Cable(s): CABLEN2 CABLETW3
Distance: **3**

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Average Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB
V	916.520	69.7	20.3	4.1	0.0	6.0	88.1	94.0	-5.9
H	916.520	55.8	20.3	4.1	0.0	6.0	74.2	94.0	-19.8

Company: **StatSIGNAL Systems, Inc.**
Model: **ICON170**
Project No.: **3023350**
Date: 04/12/02
Standard: FCC15
Class: Group: None
Notes:

Tested by: Grace Lin
Location: Duluth
Detector: HP8546A, HP8566B
Antenna: AH571
PreAmp: Hp1-26g
Cable(s): CABLETW3 hs_7000_sma_n
Distance: **3**

Ant. Pol. (V/H)	Frequency MHz	Reading dB(uV)	Antenna Factor dB(1/m)	Cable Loss dB	Pre-amp Factor dB	Average Factor dB	Net dB(uV/m)	Limit dB(uV/m)	Margin dB	
V	1833.025	15.7	28.8	5.2	0.0	6.0	43.7	54.0	-10.3	
H	1833.025	15.4	28.8	5.2	0.0	6.0	43.4	54.0	-10.6	
V	2749.535	17.8	30.7	6.1	0.0	6.0	48.6	54.0	-5.4	
H	2749.535	15.6	30.7	6.1	0.0	6.0	46.4	54.0	-7.6	
V	3666.000	35.3	32.4	7.8	36.6	0.0	38.9	54.0	-15.1	NF
H	3666.000	34.6	32.4	7.8	36.6	0.0	38.2	54.0	-15.8	NF
V	4582.500	34.8	34.0	8.7	36.5	0.0	41.1	54.0	-12.9	NF
H	4582.500	35.3	34.0	8.7	36.5	0.0	41.6	54.0	-12.4	NF
V	5499.000	33.4	35.1	9.4	36.0	0.0	41.9	54.0	-12.1	NF
H	5499.000	33.2	35.1	9.4	36.0	0.0	41.7	54.0	-12.3	NF
V	6415.500	32.6	37.0	9.5	36.5	0.0	42.6	54.0	-11.4	NF
H	6415.500	32.8	37.0	9.5	36.5	0.0	42.8	54.0	-11.2	NF
HP8566B										
V	7332.000	36.4	37.6	10.6	36.4	0.0	48.1	54.0	-5.9	NF
H	7332.000	35.7	37.6	10.6	36.4	0.0	47.4	54.0	-6.6	NF
V	8284.500	35.8	37.1	9.2	36.9	0.0	45.2	54.0	-8.8	NF
H	8284.500	35.6	37.1	9.2	36.9	0.0	45.0	54.0	-9.0	NF
V	9165.000	35.8	39.0	10.5	36.9	0.0	48.4	54.0	-5.6	NF
H	9165.000	35.2	39.0	10.5	36.9	0.0	47.8	54.0	-6.2	NF

NF: Noise Floor

3.3 Line Conducted Emission Test Data

Table 3-2 Conducted Emissions

Company: **StatSIGNAL Systems, Inc.**
Model: **Icon Meter**
Job No.: **3023350**
Date: 04/09/02
Standard: FCC15
Class: B Group: None
Notes: 240V, 60Hz

Tested by: Grace Lin
Location: Duluth
Detector: HP8546
Cable(s): CABLETT4
Limiter: no

Frequency MHz	Reading Side A dB	Reading Side B dB	Attenuator Factor dB	System Loss dB	Qausi-Peak		
					Net dB(uV)	Limit dB(uV)	Margin dB
16.200	27.9	28.2	0.0	1.2	29.4	48.0	-18.6
18.106	27.3	28.9	0.0	1.3	30.2	48.0	-17.8
23.826	29.0	26.6	0.0	1.3	30.3	48.0	-17.7
25.728	37.8	36.2	0.0	1.3	39.1	48.0	-8.9
27.633	35.7	35.2	0.0	1.3	37.0	48.0	-11.0
29.535	34.3	34.2	0.0	1.3	35.6	48.0	-12.4

4 Transmitter Information

This miscellaneous information includes details of the test procedures, measured bandwidth, and calculation of factors such as pulse desensitization and averaging factor.

4.1 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services in the measurements of transmitters operating under FCC Part 15 rules.

The transmitting equipment under test (EUT) is attached to a wooden post at approximately one meter in height above the ground plane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode or average mode (see attached data table). If peak measurements are taken for comparison with the average limit, they are corrected by measuring the duty cycle of the equipment under test and subtracting the corresponding average factor in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in section 4.3.

The frequency range scanned is from the lowest radio frequency signal generated, but not lower then 9kz in the device up to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line-conducted emissions, the range scanned is 450 KHz to 30 MHz.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Measurements were made as described in ANSI C63.4: 1992.

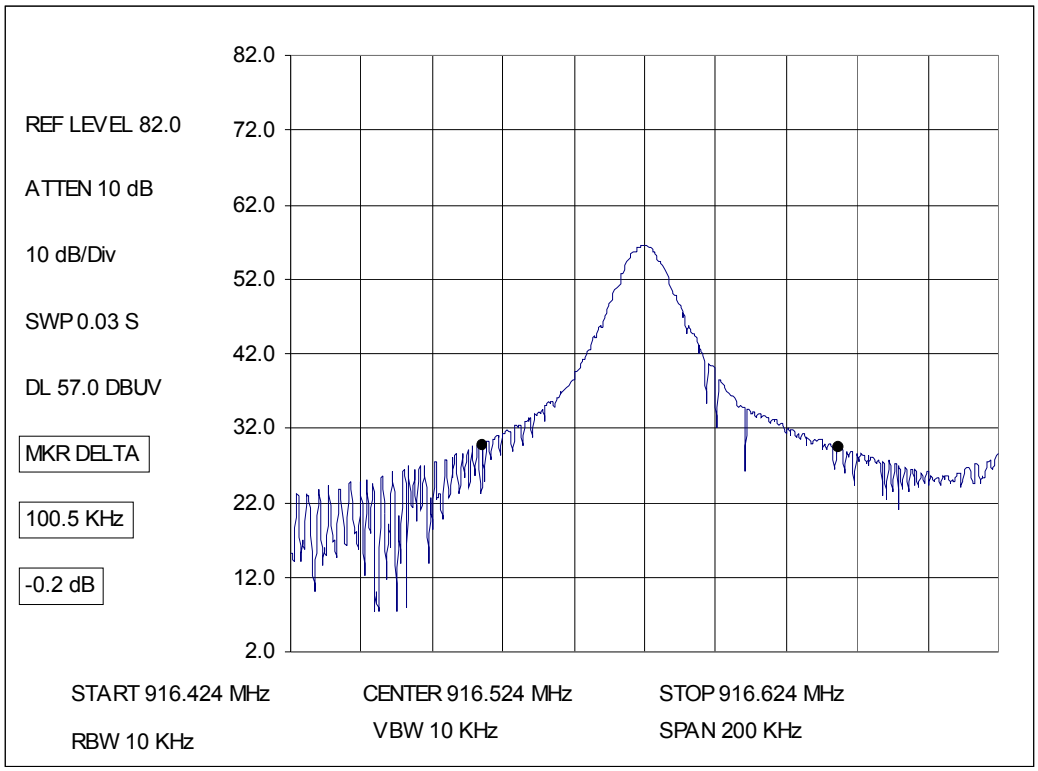
The resolution bandwidth used for measurement of radiated signal strength was 100 KHz or greater below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor readings in the forbidden bands and above 1 GHz, signals may be acquired at a distance of one meter or less. All measurements are taken at three meters unless otherwise noted on the data tables.

Frequency Stability is not specified for this device.

4.2 Measured Bandwidth

The plot on this page shows the fundamental emission when modulated with a worst-case bit sequence. From the plot, the bandwidth is observed to be **105 kHz,** at 26 dBc



4.3 Calculation of Average Factor

Averaging factor in dB = 20 log (duty cycle)

The specification for output field strengths in accordance with FCC Part 15 specifies measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation. The duty cycle is measured by placing the spectrum analyzer in zero span (receiver mode) and linear mode at maximum bandwidth (3 MHz at 3 dB down) and viewing the resulting time domain signal output from the analyzer on a Tektronix oscilloscope. The oscilloscope is used because of its superior time base and triggering facilities.

During testing, a worst-case duty cycle of 51.45 ms was observed. A plot of the worst-case duty cycle as observed during testing is included on this page.

Therefore, the averaging factor is found by 20 $\log_{10}$ (51.45/100) = **-5.7 dB**.