TEST REPORT

Report Number: 3060676.011
Project Number: 3060676
September 13, 2004

Evaluation of the Sonance ST2 Remote Control Transmitter

FCC ID:
Canada IC ID:

For
Sonance

Test Performed by:	Test Authorized by:
Intertek	Sonance
7250 Hudson Blvd. Suite 100	212 Avendia Fabricante
Oakdale, MN 55128	San Clemente, CA 92672

Prepared by: _____ Date: September 13, 2004
Uri Spector

Approved by: _____ Date: September 13, 2004
Norman Shpilsher

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1.0 GENERAL DESCRIPTION

1.1 Related Submittals Grants

This is single application of the *Sonance ST2 Remote Control Transmitter* for Certification under FCC Part 15, Subpart C.
There are no other simultaneous applications.
The Receiver portion will be verified under Declaration of Conformity.

1.2 Product Description

ST2 Remote Control Transmitter is a RF remote control operating in 433.82MHz. The intended use of the *ST2 Remote Control Transmitter* is to generate and transmit a RF signal to control window opener. The *ST2 Remote Control Transmitter* powered at 4.2VDC from Lithium internal rechargeable battery.

Antenna Description:

Integrated antenna

Sample Submitted: June 11, 2004
Test Work Started: June 11, 2004
Test Work Completed: September 13, 2004

1.3 Test Methodology

Emission measurements were performed according to the procedures in ANSI C63.4-2000. All field strength radiated emissions measurements were performed in the semi-anechoic chamber, and for each scan, the procedure for maximizing emissions in Appendices D and E were followed. All field strength 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 test site facility used to collect the radiated and conducted measurement data is located at 7250 Hudson Blvd., Suite 100, Oakdale, Minnesota. This test facility has been fully described in a report dated on March 2003 submitted to FCC. Please reference the site registration number: 90706, dated April 18, 2003.

2.0 SYSTEM TEST CONFIGURATION

2.1 Justification

N/A

2.2 EUT Setup

For simplicity of testing, the transmitter was wired to transmit continuously

2.3 EUT Exercising Software

N/A

2.4 Special Accessories

Sonance battery charger using HON-KWANG AC Adapter model: HK-CH03-A06.
USB port.

Note: According to the manufacturers' specification, the ST2 remote control transmitter will not operate while it is connected to a PC's USB port. In addition, the ST2 will not be able to sync with a PC's USB port while it is transmitting a command. The USB port is only used to download software (by an RTI dealer). Therefore, USB cable was not connected to the ST2 remote control transmitter during testing.

2.5 Equipment Modification

No modifications were installed during the testing.

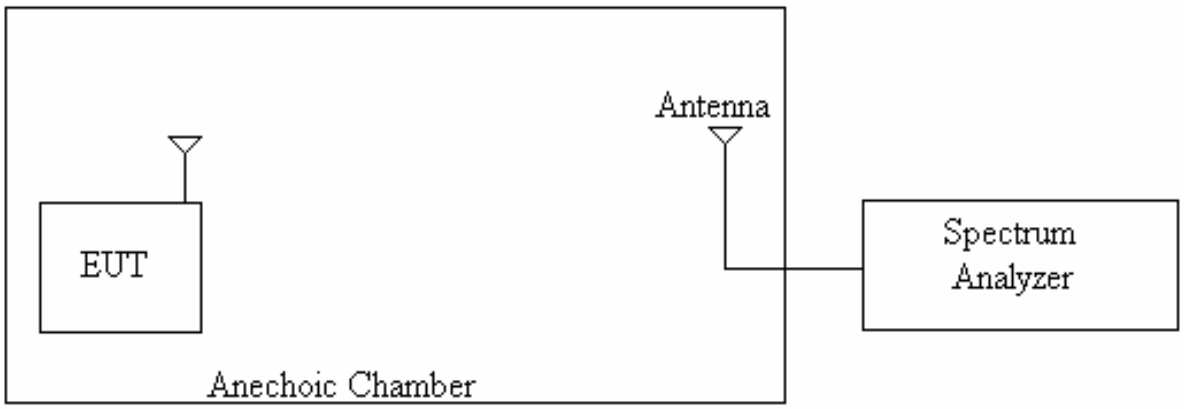
2.6 Support Equipment List and Description

N/A

2.7 Test Configuration Block Diagrams

The EUT was setup as tabletop equipment.
The EUT was powered at 4.2VDC from Lithium internal rechargeable battery. The battery was fully charged prior to testing.

Field Strength Measurements



3.0 TEST RESULTS

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

The EUT is intended for operation under the requirements of Part 15 Subpart C. Specific test requirements include the following:

47 CFR 15.231(a)(1)	Transmitting Time
47 CFR 15.231(b)	Field Strength of Fundamental and Spurious Emissions
47 CFR 15.231(c)	Bandwidth of Emissions

The EUT should comply with requirements of Part 15 Subpart B:

47 CFR 15.109, Class B	Radiated Emissions
47 CFR 15.107, Class B	Line Conducted Emissions

3.1 Transmitting Time, FCC 15.231(a)(1)

The transmitter transmitted continuously while the activation button was pressed. According to FCC Part 15.231(a)(1) a manually operated transmitter should stop transmitting within 5 sec after release the activation button. The transmitter was deactivates automatically less then 1 sec after releasing the activation button.

3.2 Field Strength of Fundamental and Spurious Emissions, FCC 15.231(b)

Field Strength of Fundamental and Spurious Emissions measurements were made at Fundamental frequency of 433.82MHz; Spurious Emissions were tested up to 4.5GHz (10th harmonic).

The Tables 3-2-1 shows the Field Strength of Fundamental Radiation. Also see Graphs ##3-2-1, 3-2-2, & 3-2-3. The Table 3-2-2 shows Field Strength of Spurious Emissions for ST2 Remote Control Transmitter.

Date:	6/11/2004
Company:	Remote Technologies
Model:	ST2, Remote Control Transmitter
Test Engineer:	Uri Spector
Standard:	FCC Part 15.231(b)
Test Site:	3 m Anechoic Chamber
Note:	Readings below 1GHz were taken with RBW 100kHz and above 1GHz with RBW 1MHz
	Measurements of fundamental frequency using procedure for Average Value

Table # 3-2-1

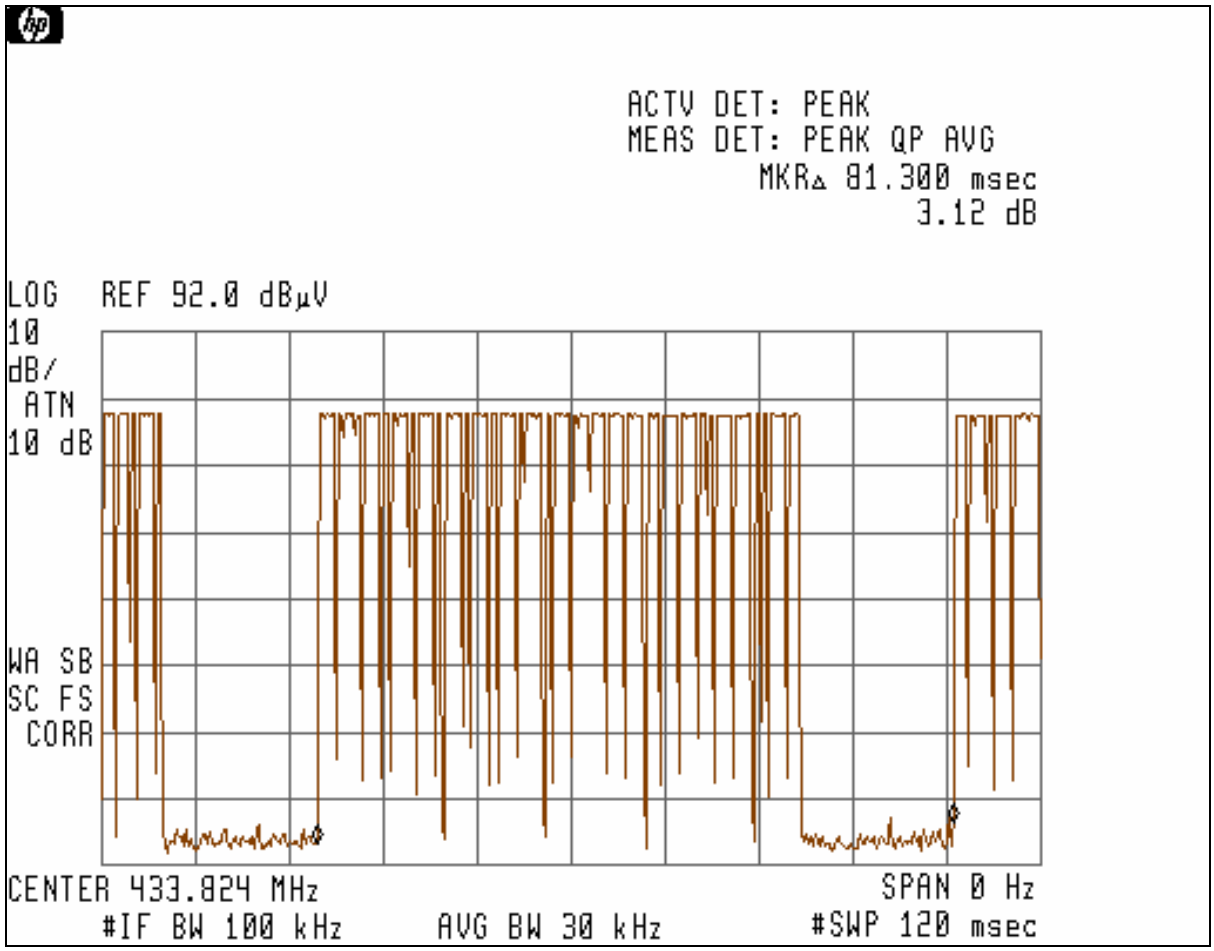
Frequency	Antenna	Antenna	Ant Factor	Amplifier	Peak Reading	Avg Factor	Net at 3m.	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	(dB/m)	Gain (dB)	dBµV	dB	dBµV/m	dBµV/m	dB	
433.82	V	116	19.2	0.0	68.0	8.3	78.9	80.8	-1.9	
433.82	H	216	19.2	0.0	65.6	8.3	76.5	80.8	-4.3	

Calculation of the Average Value Factor:

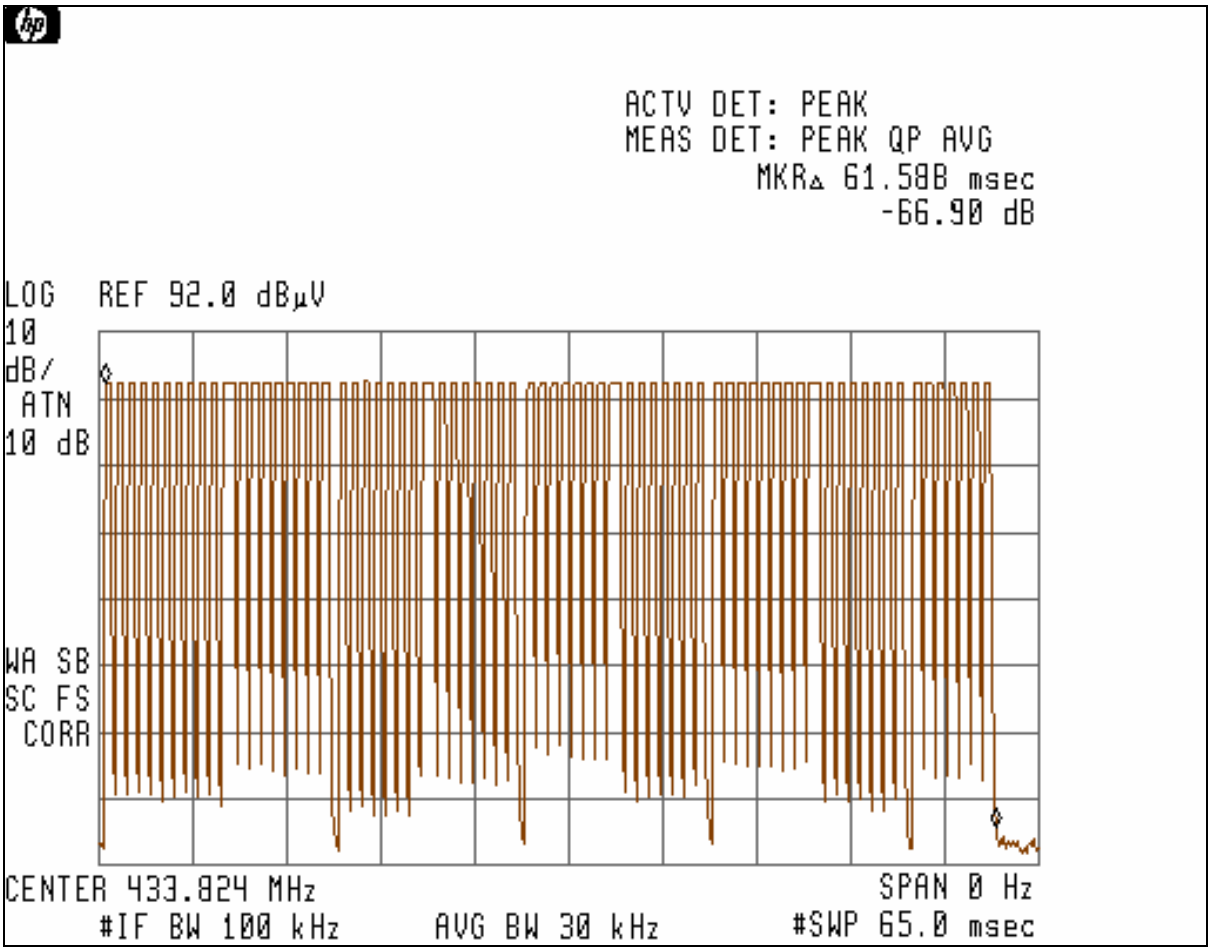
Average Factor= 20Log(On air/Pulse Train)=20Log(4*0.825)+(68*0.412)/81.3=20Log0.385= -8.3dB

Pulse train=81.3msec (see Graph 3-2-1)
"Wide pulses": 4 each of 0.825msec (see Graphs ##3-2-2 & 3-2-3)
"Regular pulses": 68 each of 0.412msec (see Graphs ##3-2-2 & 3-2-3)

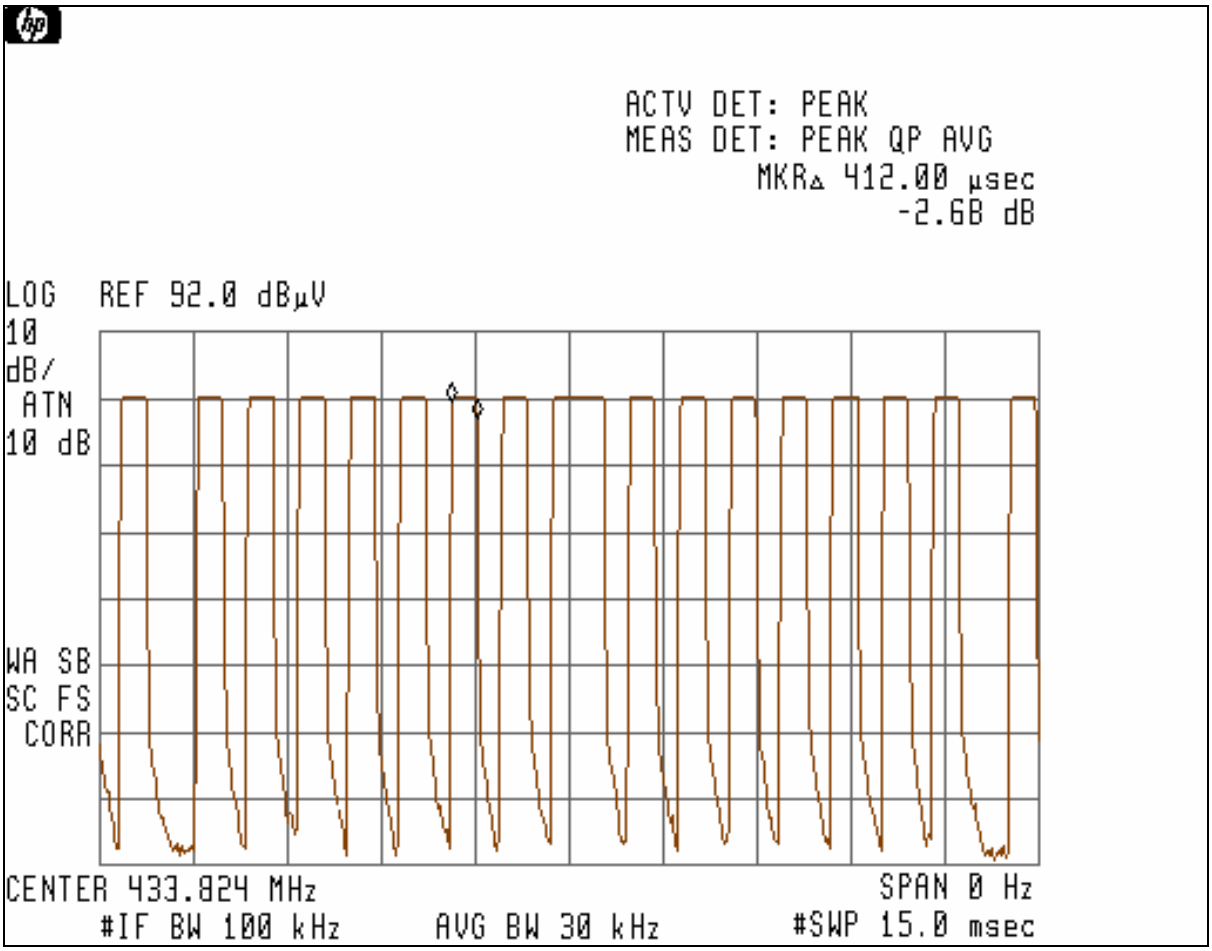
Graph 3-2-1


ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 81.300 msec
3.12 dB
LOG REF 92.0 dBµV
10
dB/
ATN
10 dB
WA SB
SC FS
CORR
CENTER 433.824 MHz
SPAN 0 Hz
#IF BW 100 kHz
AVG BW 30 kHz
#SWP 120 msec

Graph 3-2-2


ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 61.588 msec
-66.90 dB
LOG REF 92.0 dBµV
10
dB/
ATN
10 dB
WA SB
SC FS
CORR
CENTER 433.824 MHz
SPAN 0 Hz
#IF BW 100 kHz
AVG BW 30 kHz
#SWP 65.0 msec

Graph 3-2-3


ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 412.00 µsec
-2.68 dB
LOG REF 92.0 dBµV
10
dB/
ATN
10 dB
WA SB
SC FS
CORR
CENTER 433.824 MHz
SPAN 0 Hz
#IF BW 100 kHz
AVG BW 30 kHz
#SWP 15.0 msec

Radiated Emissions

Date: 6/11/2004
Company: Remote Technologies
Model: ST2, Remote Control Transmitter
Test Engineer: Uri Spector
Standard: FCC Part 15.231(b)
Test Site: 3 m Anechoic Chamber
Note: Readings below 1GHz were taken with RBW 100kHz and above 1GHz with RBW 1MHz; and VBW 1Hz - Average Readings

Table # 3-2-2

Frequency	Antenna	Antenna	Ant Factor	Amplifier	Reading	Net at 3m.	Limit	Margin	Comments
MHz	Polarity	Hts(cm)	(dB/m)	Gain (dB)	dBμV	dBμV/m	dBμV/m	dB	
867.64	V	127	24.7	0.0	16.4	41.1	60.8	-19.7	1
867.64	H	169	24.7	0.0	19.9	44.6	60.8	-16.2	1
1300.00	V	100	28.3	33.3	36.2	31.2	60.8	-29.6	2
1300.00	H	250	28.3	33.3	36.7	31.7	60.8	-29.1	2
1735.00	V	100	30.5	34.9	35.0	30.6	60.8	-30.2	2
1735.00	H	198	30.5	34.9	33.0	28.6	60.8	-32.2	2
2169.00	V	100	32.8	34.1	30.6	29.3	60.8	-31.5	2
2169.00	H	162	32.8	34.1	29.2	27.9	60.8	-33.0	2
2454.00	V	100	33.9	34.1	43.4	43.2	60.8	-17.6	2
2454.00	H	100	33.9	34.1	38.1	37.9	60.8	-22.9	2
3961.00	V	100	39.0	32.5	42.1	48.6	60.8	-12.2	2
3961.00	H	100	39.0	32.5	35.6	42.1	60.8	-18.7	2

Comments: 1. Readings of Spurious Emissions were taken with Quasi-peak detector
3. Readings above 1GHz were taken with RBW 1MHz &VBW 1Hz

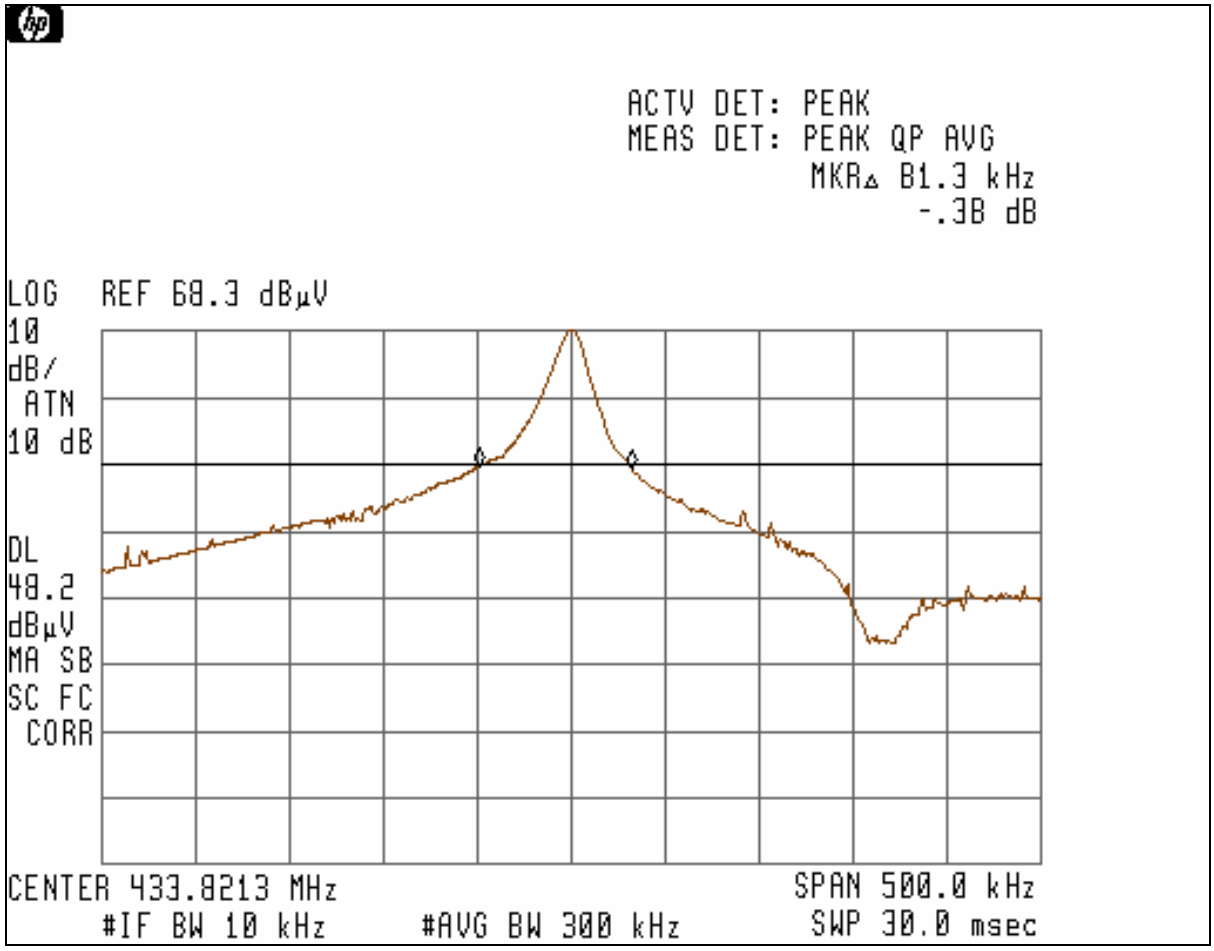
3.3 Bandwidth of Emissions, FCC 15.231(c)

Bandwidth of Emissions measurements was made for frequency of 433.821MHz.

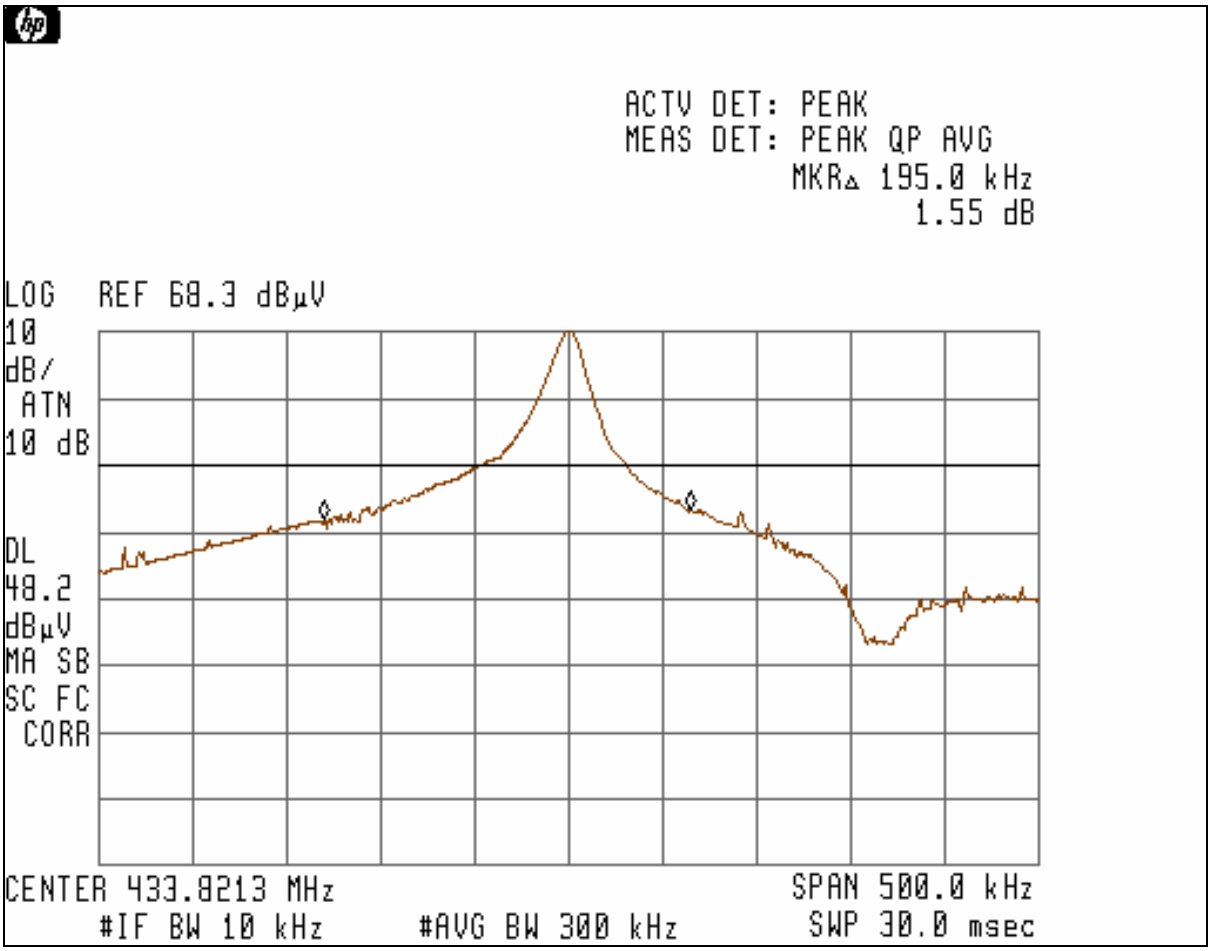
Bandwidth of Emissions at –20dB level was measured at 81.3kHz.
Bandwidth of Emissions at 99% power level was measured at 195kHz.
The maximum allowed level is 433.821MHz x 0.25% = 1084.5kHz

The # 3-3-1 shows the Bandwidth of Emissions at –20dB level.
The # 3-3-2 shows the Bandwidth of Emissions at 99% power level (for reference).

Graph 3-3-1



Graph 3-3-2


ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 195.0 kHz
1.55 dB
LOG REF 68.3 dBµV
10
dB/
ATN
10 dB
DL
48.2
dBµV
MA SB
SC FC
CORR
CENTER 433.8213 MHz
#IF BW 10 kHz
#AVG BW 300 kHz
SPAN 500.0 kHz
SWP 30.0 msec

3.4 Radiated Emissions, FCC 15.109, Class B (ST2 remote control transmitter)

The EUT (ST2 remote control transmitter) as a digital device was tested according to FCC Part 15.109, Class B in frequency range from 30MHz to 1GHz; emissions at transmitter fundamental frequency and 2nd harmonic were excluded from the Table.
The EUT was tested also for FCC Part 15, Subpart B in charging mode (see Section 3.4.1).

The Table 3-4-1 shows the Field Strength of Radiated Emissions from 30MHz to 1GHz.

Radiated Emissions

Date:	06-11-2004
Company:	Remote Technologies
Model:	ST2 Remote Control Transmitter
Test Engineer:	Uri Spector
Standard:	FCC Part 15.109, Class B
Test Site:	3m Anechoic Chamber, 3m measurement distance
Note:	The table shows the worst case radiated emissions
	All measurements were taken using a CISPR peak detector

Table # 3-4-1

Frequency	Antenna	Antenna	Ant Factor	Total QP	QP Limit	Margin
MHz	Polarity	Hts(cm)	(dB1/m)	dBμV/m	dBμV/m	dB
80.90	V	100	8.4	26.4	40.0	-13.6
124.60	V	100	13.7	26.5	43.5	-17.0
221.60	V	100	12.7	29.5	46.0	-16.5
245.80	V	100	14.1	29.2	46.0	-16.8
374.40	V	100	17.8	32.1	46.0	-13.9
30.04	H	100	20.6	27.9	40.0	-12.2
131.59	H	100	23.8	25.8	43.5	-17.7
233.70	H	100	13.4	30.8	46.0	-15.2
332.90	H	100	16.7	29.2	46.0	-16.8
384.40	H	100	18.0	29.9	46.0	-16.1

3.4.1 Line Conducted Emissions, FCC 15.107 & Radiated Emissions FCC 15.109, Class B (ST2 remote control charger)

The ST2 remote control charger was tested according to FCC Part 15.109 Radiated Emissions and FCC Part 15.107, Class B Line Conducted Emissions. The Table 3-4-2 shows Radiated Emissions data from 30MHz to 1000MHz. Table 3-4-3 & Graphs ## 3-4-1 & 3-4-2 show the Line Conducted Emissions from 150kHz to 30MHz. Testing was performed on the Sonance battery charger using HON-KWANG AC Adapter model: HK-CH03-A06 in charging mode.

Radiated Emissions		**Date:**	09-13-2004
Company:	Sonance		
Model:	ST2 Remote Control Charger		
Test Engineer:	Uri Spector		
Standard:	FCC Part 15, Class B		
Test Site:	3m Anechoic Chamber, 3m measurement distance		
Note:	The table shows the worst case radiated emissions		
	All measurements were taken using a CISPR Quasi-peak detector		

Table # 3-4-2

Frequency	Antenna			Total QP	QP Limit	Margin	Comments
MHz	Polarity	Hts(cm)	Factor (dB1/m)	dBµV/m	dBµV/m	dB	
30.00	V	100	20.6	27.2	40.0	-12.8	
36.90	V	230	16.6	28.0	40.0	-12.0	
51.55	V	100	9.5	27.3	40.0	-12.7	
115.10	V	100	13.3	30.5	43.5	-13.0	
123.50	V	100	13.7	24.9	43.5	-18.6	
141.60	V	100	13.2	19.9	43.5	-23.6	
30.00	H	112	20.6	27.5	40.0	-12.5	
36.90	H	123	16.6	25.2	40.0	-14.8	
51.55	H	230	9.5	20.0	40.0	-20.0	
115.10	H	129	13.3	20.5	43.5	-23.0	
123.50	H	100	13.7	20.6	43.5	-22.9	
141.60	H	100	13.2	19.5	43.5	-24.0	

TILE Instrument Control System EMI Measurement Software

Conducted Emissions **Date:** 9/13/2004

Company: Sonance
Model: ST2 Remote Control Charger
Test Engineer: Uri Spector
Standard: FCC Par 15, Class B
Note: The table shows the worst case conducted emissions
All measurements were taken using a CISPR Quasi-peak detector

Table # 3-4-3

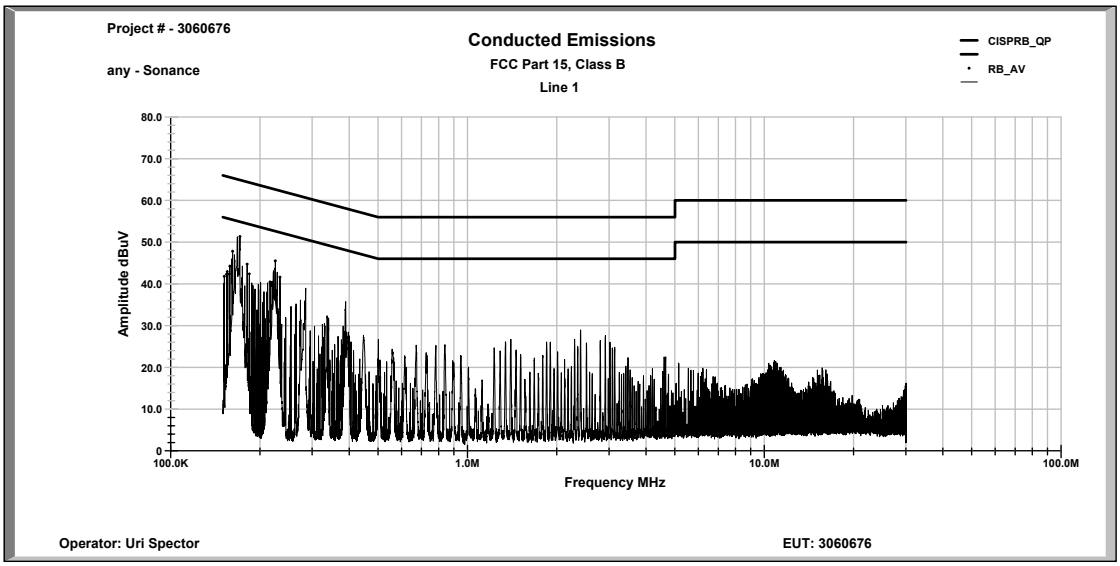
Line 1

Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	QP Margin dB	AVG Limit dBµV	AVG Margin dB
151.24 KHz	49.6	13.1	65.9	55.9	-16.3	-42.8
151.76 KHz	39.7	13.4	65.9	55.9	-26.2	-42.5
152.25 KHz	39.9	14.1	65.9	55.9	-26.0	-41.8
162.15 KHz	45.6	33.6	65.4	55.4	-19.7	-21.8
162.58 KHz	46.2	34.7	65.3	55.3	-19.2	-20.7
166.5 KHz	53.7	42.6	65.1	55.1	-11.4	-12.6
166.97 KHz	54.1	43.0	65.1	55.1	-11.0	-12.1
177.41 KHz	38.7	24.2	64.6	54.6	-25.9	-30.4
179.39 KHz	38.0	19.9	64.5	54.5	-26.5	-34.6
222.43 KHz	47.4	36.7	62.7	52.7	-15.3	-16.1
223.95 KHz	47.8	37.1	62.7	52.7	-14.9	-15.6
228.07 KHz	42.8	31.6	62.5	52.5	-19.7	-20.9

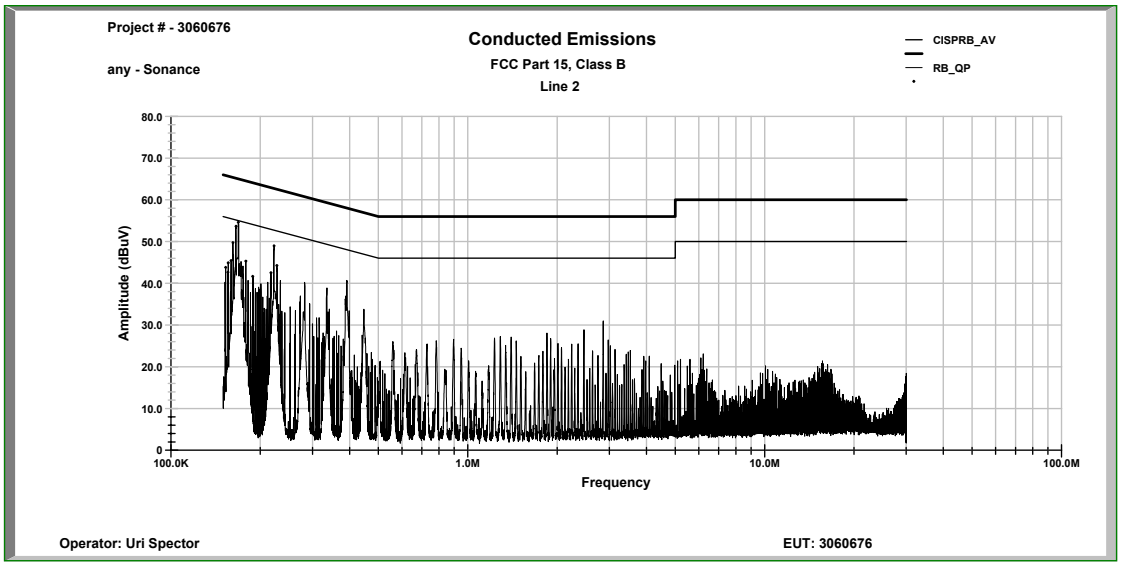
Line 2

Frequency	QP dBµV	AVG dBµV	QP Limit dBµV	QP Margin dB	AVG Limit dBµV	AVG Margin dB
152.17 KHz	38.8	13.8	65.9	55.9	-27.1	-42.1
154.08 KHz	39.0	16.5	65.8	55.8	-26.7	-39.3
154.08 KHz	46.4	16.3	65.8	55.8	-19.4	-39.4
164.07 KHz	49.5	38.2	65.3	55.3	-15.8	-17.0
166.46 KHz	53.6	42.5	65.1	55.1	-11.5	-12.6
167.78 KHz	54.1	43.1	65.1	55.1	-11.0	-12.0
168.13 KHz	53.9	42.9	65.1	55.1	-11.1	-12.1
178.21 KHz	38.1	22.4	64.6	54.6	-26.4	-32.1
188.42 KHz	34.8	6.6	64.1	54.1	-29.3	-47.5
223.05 KHz	47.6	37.1	62.7	52.7	-15.1	-15.6
223.11 KHz	47.7	37.1	62.7	52.7	-15.0	-15.6
223.13 KHz	47.7	37.1	62.7	52.7	-15.0	-15.6

Graph # 3-4-1



Graph # 3-4-2



3.5 Test Procedure

Field Strength Measurements

The EUT was placed on a non-conductive table 0.8m above the ground plane inside the Anechoic Chamber. The table was centered on a motorized turntable, which allows 360-degree rotation. The measurement antenna was positioned at 3m distance. The Bicono-Log antenna was used in frequency range from 30MHz to 1GHz, and the Horn antenna was used in frequency range above 1GHz. The radiated emissions were maximized by configuring the EUT through its placement in three orthogonal axes, by rotating the EUT, by changing antenna polarization, and by changing antenna height from 1 to 4m. Method of the direct Field Strength Calculation is shown in Section 3.6.

3.6 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 emissions reading on the EMI Receiver.
The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

Where: FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB(m^{-1})
AG = Amplifier Gain in dB

Assume a receiver reading of 48.1 dB(μV) is obtained. The antenna factor of 7.4 dB(m^{-1}) and cable factor of 1.6 dB is added and amplifier gain of 16.0 dB is subtracted giving field strength of 41.1 dB(μV/m).

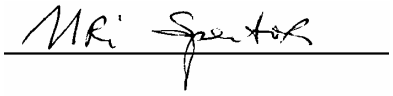
RA = 48.1 dB(μV)
AF = 7.4 dB(m^{-1})
CF = 1.6 dB
AG = 16.0 dB
FS = RA + AF + CF - AG
FS = 48.1 + 7.4 + 1.6 – 16.0
FS = 41.1 dB(μV/m)

In the tables the Cable correction factors are included to the Antenna Factors.

Tested by:

Uri Spector
EMC Project Engineer
Intertek ETL SEMKO

Signature



Date: September 13, 2004

4.0 TEST EQUIPMENT

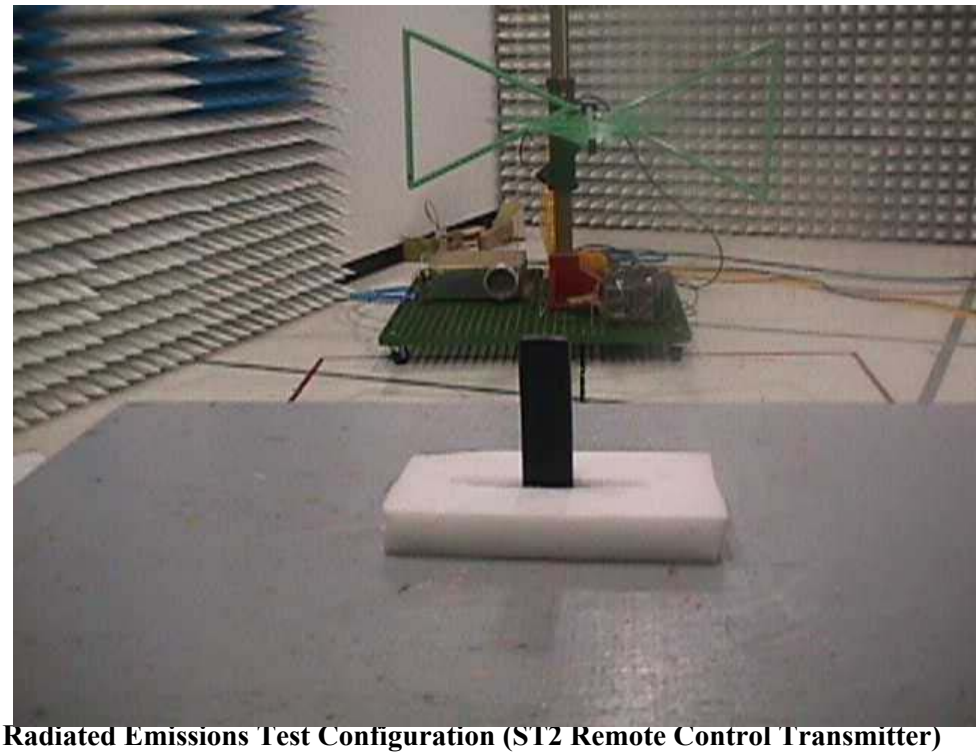
Receivers/Spectrum Analyzers

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
HP85462A Receiver RF Section	3549A00306	01/04	01/05	X
HP85460A RF Filter Section	3448A00276	01/04	01/05	X
Advantest Spectrum Analyzer R3271A	55050084	06/01/04	06/01/05	X

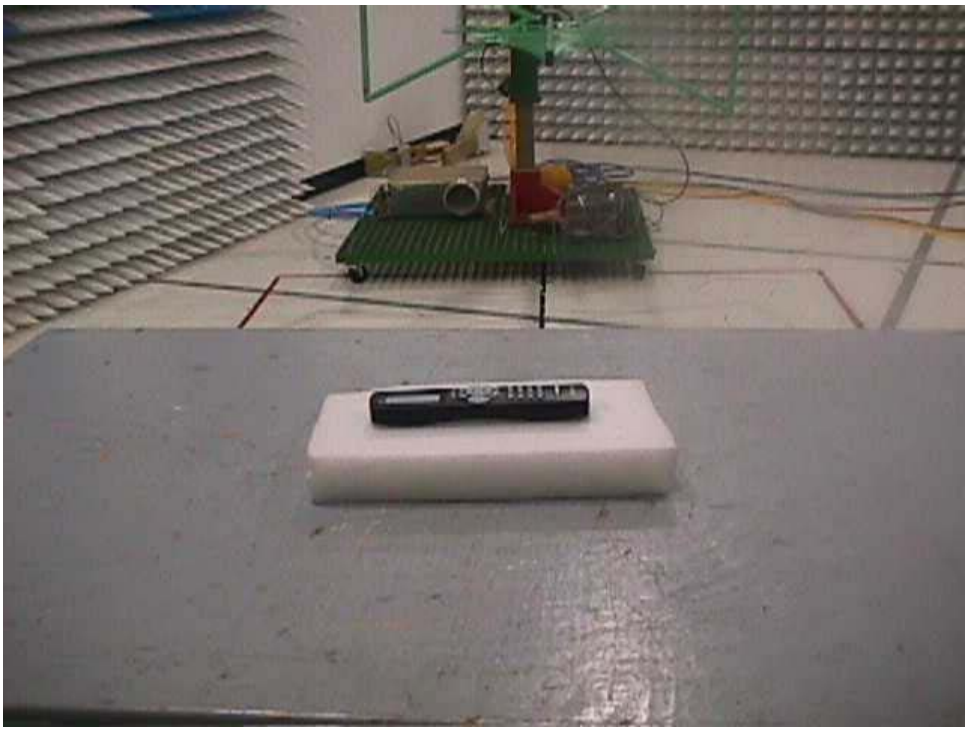
Antennas/Pre-Amplifiers

DESCRIPTION	SERIAL NO.	LAST CAL	CAL DUE	USED
Schaffner-Chase Bicono-Log Antenna	2468	01/04	01/05	X
EMCO Horn Antenna 3115	9507-4513	12/03	12/04	X
HP 83017A Pre-Amplifier	3123A00475	05/04	05/05	X

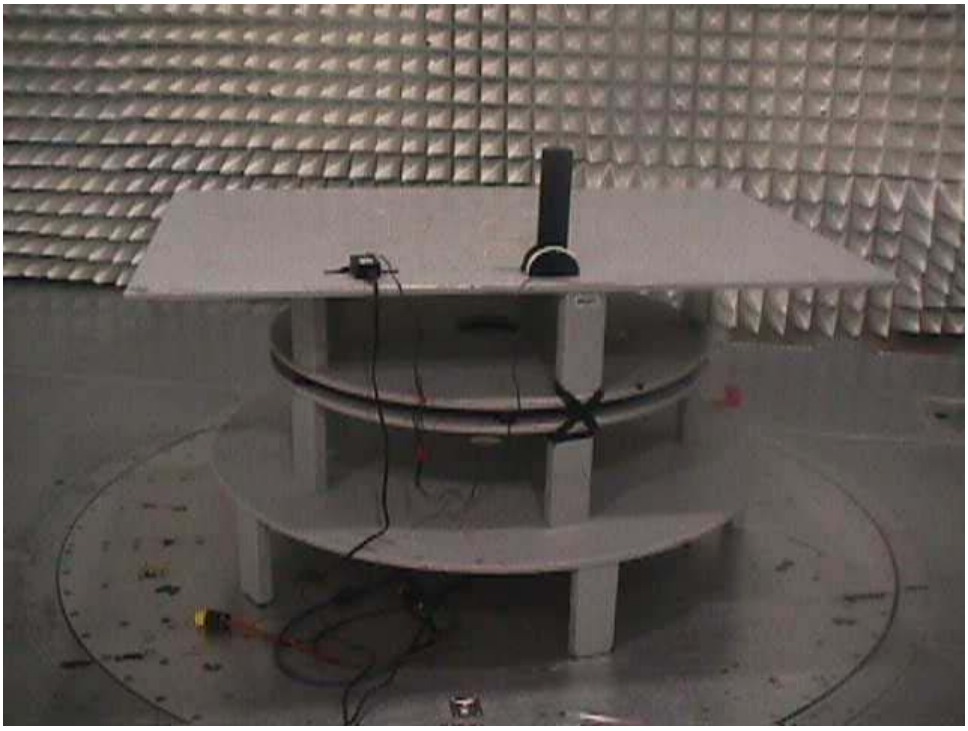
EXHIBIT 1
CONFIGURATION PHOTOS



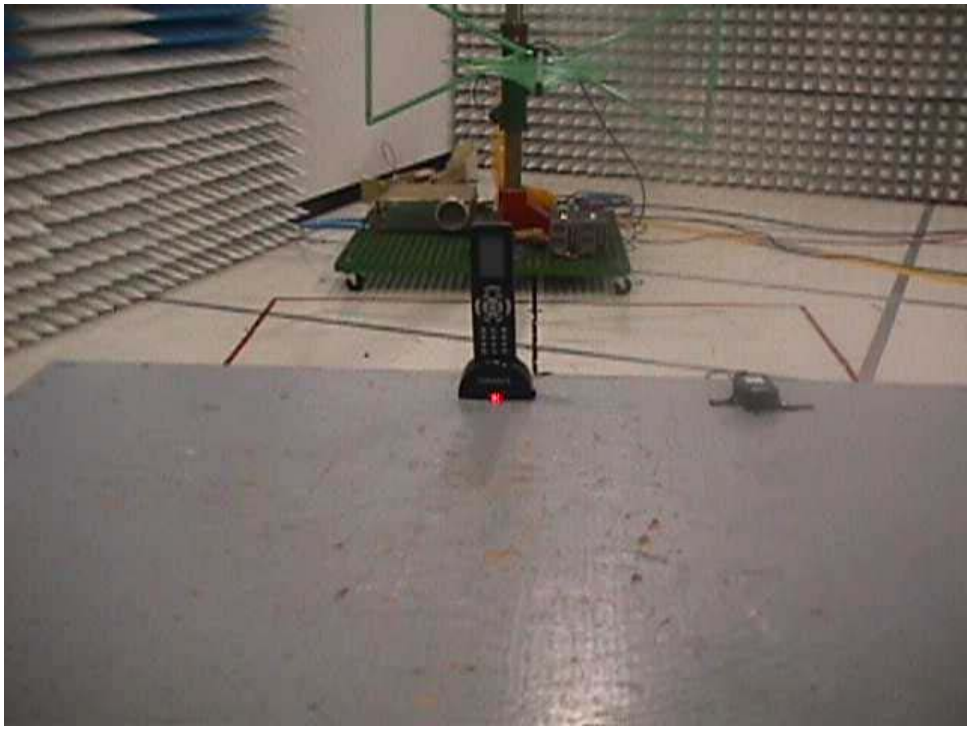
Radiated Emissions Test Configuration (ST2 Remote Control Transmitter)



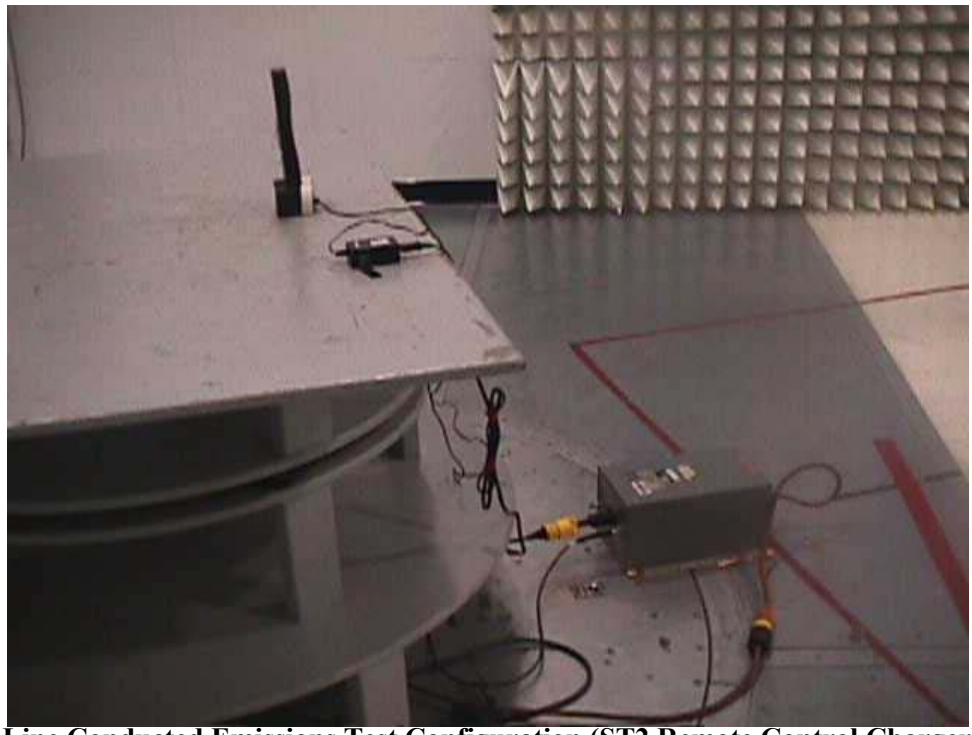
Radiated Emissions Test Configuration (ST2 Remote Control Transmitter)



Radiated Emissions Test Configuration (ST2 Remote Control Charger)



Radiated Emissions Test Configuration (ST2 Remote Control Charger)



Line Conducted Emissions Test Configuration (ST2 Remote Control Charger)

Line Conducted Emissions Test Configuration (ST2 Remote Control Charger)