

ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

Product Name:	SmartTAG
Brand Name:	Cadi Scientific
Model Name:	STG-832(919), STG-832(925), STG-833(919) STG-833(925)
Model Difference:	Please see page 6
FCC ID:	VPE-STG-832
Report No.:	ER/2011/20012
Issue Date:	Mar. 10, 2011
FCC Rule Part:	§15.209
Prepared for	CADI Scientific Pte. Ltd. 31 Ubi Road 1, #03-00 Aztech Building, Singapore 408694
Prepared by	SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei County, Taiwan



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VERIFICATION OF COMPLIANCE

Applicant: CADI Scientific Pte. Ltd.
31 Ubi Road 1, #03-00 Aztech Building, Singapore 408694

Product Description: SmartTAG

Brand Name: Cadi Scientific

FCC ID: VPE-STG-832

Model No.: STG-832(919), STG-832(925), STG-833(919) STG-833(925)

Model Difference: Please see page 6

File Number: ER/2011/20013

Date of test: Feb. 15, 2011 ~ Mar. 07, 2011

Date of EUT Received: Feb. 15, 2011

We hereby certify that:

The above equipment was tested by SGS Taiwan Ltd., Electronics & Communication Laboratory. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.209.

The test results of this report relate only to the tested sample identified in this report.

Test By:



Date:

Mar. 10, 2011

Eric Su / Engineer

Prepared By:



Date:

Mar. 10, 2011

Gigi Yeh / Clerk

Approved By



Date:

Mar. 10, 2011

Jim Chang / Supervisor

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Version

Version No.	Date	Description
00	Mar. 10, 2011	Initial creation of document

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1. GENERAL INFORMATION

1.1. Product Description

Product Name:	SmartTAG
Brand Name:	Cadi Scientific
Model Name:	STG-832(919), STG-832(925), STG-833(919) STG-833(925)
Model Difference:	Please see page 6
Hardware Version	version 0.6
Software Version	version 2
Power Supply	3V form Micro Battery.

RFID:

Operating Frequency	125kHz
Transmit Power	< 105dBuV/m at 3m.
Number of Channels	1
Operating Mode	Point-to-Point
Antenna Type	A permanent fixed antenna, which is built-In, designed as an indispensable part of the EUT.
Module Type	Manchester

The EUT is compliance with RFID Standard.

This report applies for RFID.

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Product Diversity Description Table

1. Applicant's name: Cadi Scientific Pte. Ltd.

2. Original Model No.: STG-832(919), STG-832(925)

3. Series Model No.: STG-830(919), STG-830(925), STG-831(919), STG-831(925), STG-833(919), STG-833(925)

4. Diversity Description: Data packet difference, cater for the needs of the customers

1. Circuit Diagram: No
 Yes, please list.

2. PCB Layout: No
 Yes, please list.

3. Internal Component: No
 Yes, please list.

1) **STG-832(919), STG-832(925), STG-833(919), STG-833(925) mount with VEMT3700 (NPN Phototransistor, designator R5) and 100k ohm (designator R7). The designator for Q1, R6, RT1 and RT2 are empty.**

2) STG-830(919), STG-830(925), STG-831(919), and STG-831(925): the designator for R5, R7, Q1, R6, RT1 and RT2 are empty.

3) Only STG-831(919), STG-833(919), STG-831(925) and STG-833(925) come with internal passive RFID label.

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4. Appearance:

 No Yes, please list the color...etc.

1)STG-832(919/925)and

STG-833(919/925) – have metal contact (sharp teeth) at right and left hand side of the body casing.

2)STG-830(919/925) and

STG831(919/925) - without metal contact (sharp teeth) at right and left hand side of the body casing.

5. Function/Capability:

 No Yes, please list.

1)STG-830(919), STG-830(925),

STG-831(919) and STG-831(925) **do not transmit 125KHz**

2)STG-832(919),STG-832(925),

STG-833(919) and STG-833(925)

transmit 125KHz

6.Others:

 No Yes, Data packet difference, cater for the needs of the customers.

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1.2. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **VPE-STG-832** filing to comply with Section 15.209 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.

1.3. Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4. Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-4

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

1.5. Special Accessories

Not available for this EUT intended for grant.

1.6. Equipment Modifications

Not available for this EUT intended for grant.

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2. System Test Configuration

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed and continuous which was for the purpose of the measurements.

2.3. Test Procedure

2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4-2003.

2.4. Limitation

(1) Conducted Emission

According to section 15.207(a) Conducted Emission Limits is as following.

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Frequency range MHz	Limits dB (uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

1. The lower limit shall apply at the transition frequencies
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

(2) Radiated Emission

- Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:
- In the emission table above, the tighter limit applies at the band edges.
- The level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission. For intentional radiators which operate under the provisions of other Sections within this Part and which are required to reduce their unwanted emissions to the limits specified in this table, the limits in this table are based on the frequency of the unwanted emission and not the fundamental frequency. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

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Frequency (MHz)	Field strength μ V/m	Distance (m)	Field strength at 3m dB μ V/m
0.009-0.490	2400/F(KHz)	300	
0.490-1.705	24000/F(KHz)	30	
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

Limit Table:

Frequency kHz	Distance m	Limit at 300m dB μ V/m	Limit at 30m dB μ V/m	Distance Factor dB	Limit dB μ V/m at 3m
125	300	25.67	---	80	105.67
250	300	19.65	---	80	99.65
375	300	16.12	---	80	96.12
500	30	---	33.62	40	73.62
625	30	---	31.69	40	71.69
750	30	---	30.10	40	70.10
875	30	---	28.76	40	68.76
1000	30	---	27.60	40	67.60
1125	30	---	26.58	40	66.58
1250	30	---	25.67	40	65.67

Limit Calculation and transfer to 1m test distance:

If the frequency between 9 – 490KHz,

Limit = $20\log(2400/f(\text{KHz})) + 40\log(300/1)$

If the frequency between 490 KHz – 1.705MHz

Limit = $20\log(24000/f(\text{KHz})) + 40\log(30/1)$

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2.5. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

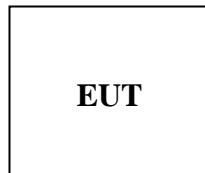


Table 2-1 Equipment Used in Tested System

Item	Equipment	Mfr/Brand	Model/ Type No.	FCC ID	Series No.	Data Cable	Power Cord
1.	N/A						

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3. Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	Conducted Emission	N/A
§15.209	Radiated Emission	Compliant

4. Description of test modes

The EUT has been tested under continuous operating condition. The Frequency 125kHz was chosen for testing.

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5. Conducted Emissions Test

5.1. Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

5.2. Test SET-UP (Block Diagram of Configuration)

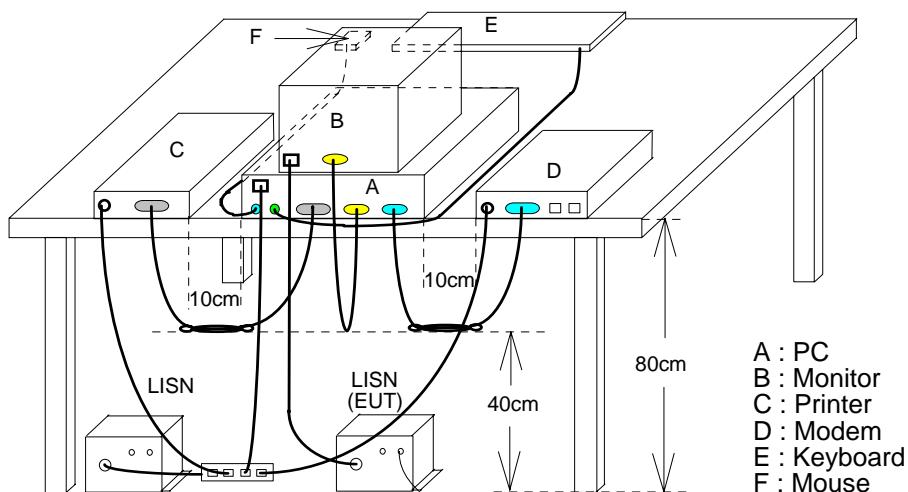


Fig. 2

5.3. Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCS30	828985/004	09/23/2010	09/22/2011
LISN	Rolf-Heine	NNB-2/16Z	99012	02/02/2011	02/01/2012
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	02/02/2011	02/01/2012
Coaxial Cables	N/A	WK CE Cable	N/A	11/28/2010	11/27/2011

5.4. Measurement Result:

N/A. 3V form Micro Battery.

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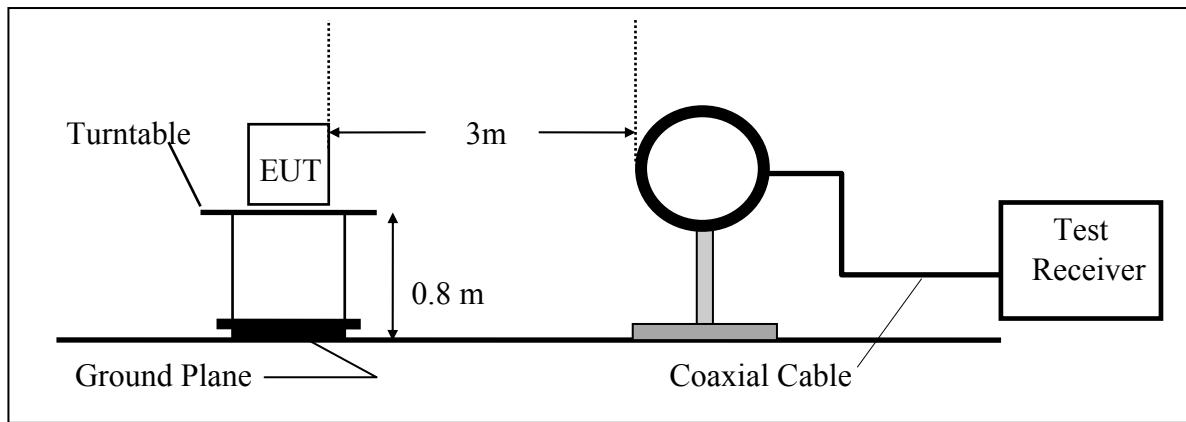
6. Radiated Emission Test

6.1. Measurement Procedure

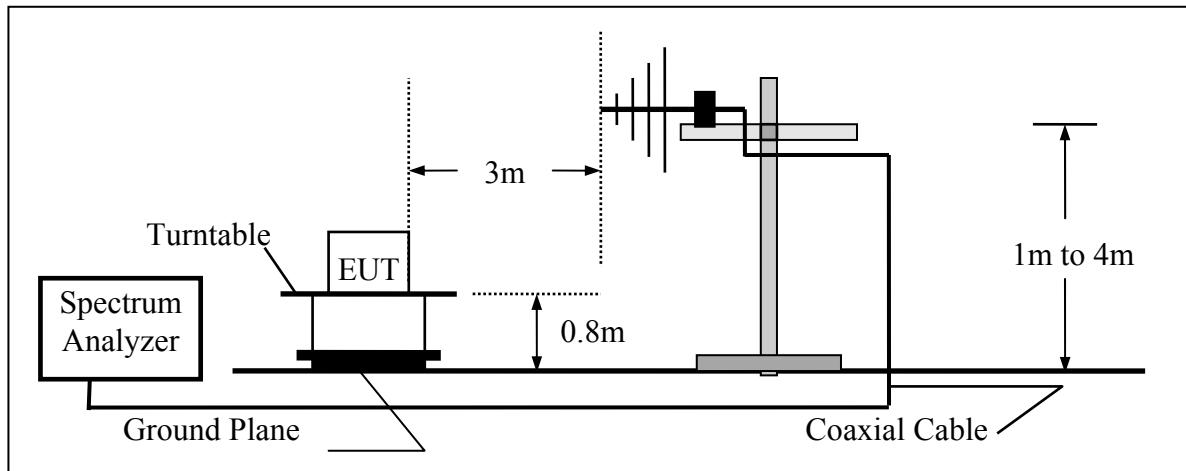
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

6.2. Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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6.3. Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP 40	100034	02/12/2011	02/11/2012
Bilog Antenna	SCHWAZBECK	VULB9160	3136	11/19/2010	11/18/2011
Horn antenna	SCHWAZBECK	BBHA 9120D	309/320	03/08/2011	03/08/2013
Pre-Amplifier	Agilent	8447D	1937A02834	11/28/2010	11/27/2011
Pre-Amplifier	Agilent	8449B	3008A01973	01/04/2011	01/05/2012
Radio Communication Analyzer	R & S	CMU200	102189	08/12/2010	08/11/2012
DC Block	Agilent	BLK-18	155452	07/05/2010	07/04/2011
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	01/05/2011	01/04/2012
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2011	01/04/2012
Loop antenna	MESSTEC	FLA30	03/10086	07/08/2009	07/07/2011
3m Site	SGS	966 chamber	N/A	09/06/2010	09/05/2011

6.4. Field Strength Calculation

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

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

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6.5. Measurement Result

Operation Mode: Transmitting Mode Test Date : Mar. 04, 2011
Fundamental Frequency: 125 KHz Test By: Eric
Temperature : 25 °C Ant. Pol: Vertical/ Horizontal
Humidity : 65 % Frequency Range: <30MHz

Freq. (KHz)	Ant.Pol. H/V	Detector			Factor (dB)	Actual FS (dBuV/m)	Limit at 3m (dBuV/m)	Safe Margin (dB)	Note
		Mode (PK/AV/QP)	Reading (dBuV)	Reading					
125.00	V	Peak	56.02	-10.60	45.42	105.67	-60.25	F	
250.00	V	Peak	--		0.00	99.65		H	
375.00	V	Peak	--		0.00	96.12		H	
500.00	V	Peak	--		0.00	73.62		H	
625.00	V	Peak	--		0.00	71.69		H	
750.00	V	Peak	--		0.00	70.10		H	
875.00	V	Peak	--		0.00	68.76		H	
1000.00	V	Peak	--		0.00	67.60		H	
1125.00	V	Peak	--		0.00	66.58		H	
1250.00	V	Peak	--		0.00	65.67		H	
125.00	H	Peak	59.09	-10.60	48.49	105.67	-57.18	F	
250.00	H	Peak	--		0.00	99.65		H	
375.00	H	Peak	--		0.00	96.12		H	
500.00	H	Peak	--		0.00	73.62		H	
625.00	H	Peak	--		0.00	71.69		H	
750.00	H	Peak	--		0.00	70.10		H	
875.00	H	Peak	--		0.00	68.76		H	
1000.00	H	Peak	--		0.00	67.60		H	
1125.00	H	Peak	--		0.00	66.58		H	
1250.00	H	Peak	--		0.00	65.67		H	

Remark :

- (1) Measuring frequencies from foundation frequency to 10th Harmonic. °
- (3) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (4) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of SPA between 9KHz to 150KHz was 300Hz, 150KHz to 30MHz was 10KHz; 30MHz to 1GHz was 100KHz.

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6.6. Measurement Result

Operation Mode: Transmitting Mode
Fundamental Frequency: 125 KHz
Temperature : 25 °C
Humidity : 65 %

Test Date : Mar. 04, 2011
Test By: Eric
Ant. Pol: Vertical/ Horizontal
Frequency Range: 30MHz-1GHz

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)
154.16	V	Peak	31.38	-13.06	18.32	43.50	-25.18
328.76	V	Peak	32.05	-12.34	19.71	46.00	-26.29
476.20	V	Peak	32.03	-8.55	23.48	46.00	-22.52
650.80	V	Peak	31.76	-4.96	26.80	46.00	-19.20
883.60	V	Peak	32.50	-1.40	31.10	46.00	-14.90
975.75	V	Peak	32.85	-0.80	32.05	54.00	-21.95
131.85	H	Peak	39.40	-14.33	25.07	43.50	-18.43
264.74	H	Peak	33.16	-13.59	30.74	46.00	-15.26
449.04	H	Peak	32.38	-8.61	23.77	46.00	-22.23
701.24	H	Peak	33.01	-4.97	28.04	46.00	-17.96
885.54	H	Peak	33.47	-1.27	31.28	46.00	-14.72

Remark :

- 1 Measuring frequencies from 30 MHz to the 1GHz .
- 2 Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak/QP detector mode.
- 3 Data of measurement within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 The IF bandwidth of SPA between 30MHz to 1GHz was 100KHz.

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