FCC ID: TYQ-K663S232

Intentional Radiator Test Report

Test Standards:
FCC Part 15.225 (Subpart C – Intentional Radiators)

Equipment Under Test:	RFID Spring Card
Model Number:	K663S-232
Serial Number:	N/A
Prepared for:	SpringCard SAS PARC GUTENBERG 2 VOIE LA CARDON 91120 PALAISEAU FRANCE
Tested by:	Bob Cole
Prepared by:	Amy Jones
Verified and Approved by:	Bob Cole Authorized Signatory

EMCE Engineering, Inc.
44366 S. Grimmer Blvd.
Fremont, CA 94538

NVLAP Testing Lab Code 200092-0

ACCREDITED BY THE NATIONAL VOLUNTARY LABORATORY
ACCREDITATION PROGRAM FOR THE SPECIFIC SCOPE
OF ACCREDITATION UNDER LAB CODE #: 200092-0

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- This report contains data that are not covered by the NVLAP accreditation, specifically, test method EN 61000-4-3 Radiated RF Immunity.

FCC ID: TYQ-K663S232

Test Report Revision History

Report Format	*Report Version*	*Description*	*Issue Date*
EMCE-TRF-RFID_FCC	1.0	Original	10-25-2016

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EXHIBITS

FCC ID: TYQ-K663S232

ADMINISTRATIVE INFORMATION

.

Test Laboratory: Facility No. registered through NVLAP:	EMCE Engineering 44366 S. Grimmer Blvd. Fremont, CA 94538 USA Tel : 510-490-4307, Fax : 510-490-3441
	NVLAP Lab Code: 200092-0
	Test Site: FCC : US5291, IC : 3324A
Applicant Name :	SpringCard SAS
Applicant Contact Name :	Denis Pietersoone - President
Application Purpose :	Original
EUT Description :	RFID
Product Name :	RFID Spring Card
Model Number :	K663S-232
Serial Number :	N/A
Applied Requirements :	47 CFR §15.207, 15.209, 15.225: 2010
FCC ID :	TYQ-K6635232
IC :	
RF Operating Frequency (ies)	13.56 MHz
Modulation	AM modulation
Emission Designator	-
Receipt of EUT :	9-20-2016
Date of Testing :	9-23-2016 - 9-25-2016
Tested By :	Bob Cole
Test Report Approved By (CTO	Bob Cole
Test Report Number :	4256-1
Test Report Issue Date :	10-25-2016
Test Report Prepared By:	Amy Jones
Test Report Reviewed By:	Bob Cole

The tests listed in this report have been completed to demonstrated compliance to the CFR 47 Section 15.225.

2.0 EUT AND ACCESSORY INFORMATION

EUT				
Model name:	*K663S232*			
Description:	*RFID Spring Card*			
Manufacturer:	*SpringCard SAS*			
Support Equipment				
Description	***Model Number***	***Serial Number***	***Manufacturer***	***Power Cable Description***
Netbook PC	*Acer Aspire*	*NUSH6AA001241 025337600*	*Acer*	*Unshielded / 1.5 Meter*

Cable Description				
From	***To***	***Length (Meters)***	***Shielded (Y/N)***	***Ferrite Loaded (Y/N)***
EUT	*Netbook*	*0.5*	*Y*	*N*

3.0 SUMMARY OF TEST RESULTS

Test Standard	Description	Pass / Fail
47 CFR Part 15.225: 2010		
15.203	Antenna Requirement	Pass
15.207(a)	Conducted Emissions Voltage	Pass
15.225(a)	Limit in the band of 13.553 – 13.567 MHz	Pass
15.225(b)	Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz	Pass
15.225(c)	Limit in the band of 13.110 – 13.410 MHz and 13.710 – 14.010 MHz	Pass
15.225(d), 15.209	Limit outside the band of 13.110 – 14.010 MHz	Pass
15.225(e)	Frequency Stability	Pass
ANSI C63.4: 2009 PS: All measurement uncertainties are not taken into consideration for all presented test result.		

PASS The EUT passed that particular test.
FAIL The EUT failed that particular test.
N/A Not Applicable due to product type.

4.0 MODIFICATIONS

There were no modifications installed by EMCE Engineering.

Any modifications installed previous to testing by the Manufacturer will be incorporated in each production model sold or leased.

5.0 TEST RESULTS

5.1 Antenna Requirement

Requirement(s): 47 CFR §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

a) Antenna must be permanently attached to the device.
b) Antenna must use a unique type of connector to attach to the device.
c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

1) The RFID antenna is integral to the main board permanently to the device which meets the requirement (See Internal Photographs submitted as another Exhibit).

FCC ID: TYQ-K663S232

5.2 Conducted Emissions Voltage

Requirement(s): 47 CFR §15.207

Requirement:

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

Procedures:

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. "Ave" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.5dB.
4. Environmental Conditions

Temperature	24ºC
Relative Humidity	45%
Atmospheric Pressure	1010mbar

Test Date : 9-29-2016

Tested By : Bob Cole

Results: Pass

FCC ID: TYQ-K663S232

FCC Part 15.207 Line Conducted Emissions
120V / 60 Hz - Line 1
150kHz – 30 MHz

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 •

Customer:	**Springcard SAS**		
Specification:	**EN55022 B COND QP Spec**		
Work Order #:	**4256-1**	Date:	9/29/2016
Test Type:	**Conducted Emissions**	Time:	12:34:50 PM
Equipment:	**RFID**	Sequence#:	1
Manufacturer:	Springcard SAS	Tested By:	Bob Cole
Model:	K663S232		120V 60Hz
S/N:	N/A		

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

Transducer Legend:

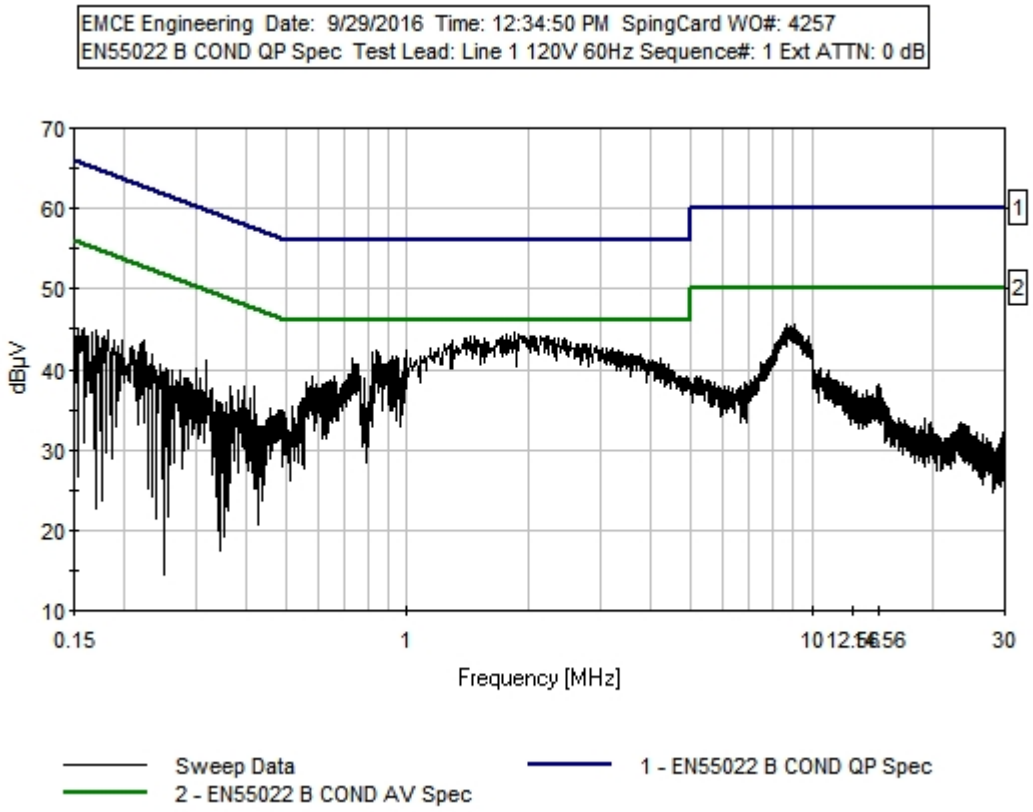
T1=25' LMR #001	T2=HP 11947A Trans. Limiter TL1
T3=EMCO 3810-2 LISN S/N 9807-1988	

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: Line 1

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	1.848M	33.9	+0.1	+9.9	+0.6		+0.0	44.5	56.0	-11.5	Line
2	1.767M	33.7	+0.1	+9.9	+0.6		+0.0	44.3	56.0	-11.7	Line
3	1.893M	33.7	+0.1	+9.9	+0.6		+0.0	44.3	56.0	-11.7	Line
4	1.748M	33.7	+0.1	+9.9	+0.5		+0.0	44.2	56.0	-11.8	Line
5	2.136M	33.6	+0.1	+9.9	+0.6		+0.0	44.2	56.0	-11.8	Line
6	2.199M	33.6	+0.1	+9.9	+0.6		+0.0	44.2	56.0	-11.8	Line

FCC ID: TYQ-K663S232



FCC ID: TYQ-K663S232

FCC Part 15.207 Line Conducted Emissions
120V / 60 Hz - Line 2
150kHz – 30 MHz

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 •

Customer:	**Springcard SAS**		
Specification:	**EN55022 B COND QP Spec**		
Work Order #:	**4256-1**	Date:	9/29/2016
Test Type:	**Conducted Emissions**	Time:	12:59:01 PM
Equipment:	**RFID**	Sequence#:	3
Manufacturer:	Springcard SAS	Tested By:	Bob Cole
Model:	K663S232		120V 60Hz
S/N:	N/A		

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

Transducer Legend:

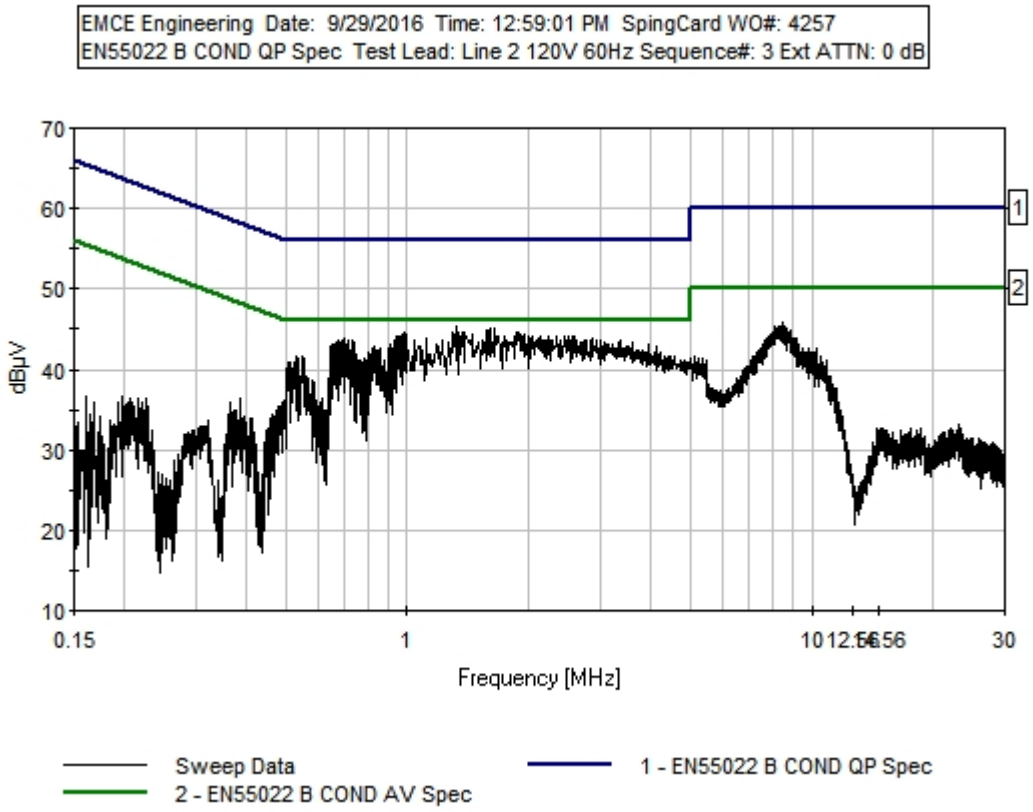
T1=25' LMR #001 T2=HP 11947A Trans. Limiter TL1
T3=EMCO 3810-2 LISN S/N 9807-1988

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Lead: Line 2

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBµV	Spec dBµV	Margin dB	Polar Ant
1	1.325M	34.8	+0.1	+9.9	+0.5		+0.0	45.3	56.0	-10.7	Line
2	1.604M	34.6	+0.1	+9.9	+0.5		+0.0	45.1	56.0	-10.9	Line
3	1.649M	34.6	+0.1	+9.9	+0.5		+0.0	45.1	56.0	-10.9	Line
4	1.568M	34.4	+0.1	+9.9	+0.5		+0.0	44.9	56.0	-11.1	Line
5	1.388M	34.2	+0.1	+9.9	+0.5		+0.0	44.7	56.0	-11.3	Line
6	1.370M	34.0	+0.1	+9.9	+0.5		+0.0	44.5	56.0	-11.5	Line

FCC ID: TYQ-K663S232



5.3 Radiated Emission < 30MHz (9kHz - 30MHz, H-Field)

Requirement(s): 47 CFR §15.225

Procedures: **For < 30MHz,** Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 3 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the centre of the loop. The measuring bandwidth was set to 10 kHz. (Note: During testing the receive antenna was rotated about its axis to maximize the emission from the EUT.)

The limit is converted from microvolt/meter to decibel microvolt/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude (dBµV/m) + ACF (dB) + Cable Loss (dB) – Distance Correction Factor

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/-6dB.
4. Environmental Conditions

Temperature	24ºC
Relative Humidity	45%
Atmospheric Pressure	1010mbar

Test Date : 9-26-2016

Tested By : Bob Cole

Results: Pass

FCC ID: TYQ-K663S232

FCC Part 15.209 Radiated Emissions
9 kHz – 30 MHz

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 •

Customer: **Springcard SAS**
Specification: **15.209 9k-30M FCC Limits II**
Work Order #: **4256-1** Date: 9/26/2016
Test Type: **Radiated Scan** Time: 2:30:18 PM
Equipment: **RFID** Sequence#: 3
Manufacturer: **Springcard SAS** Tested By: Bob Cole
Model: **K663S232**
S/N: N/S

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

Transducer Legend:

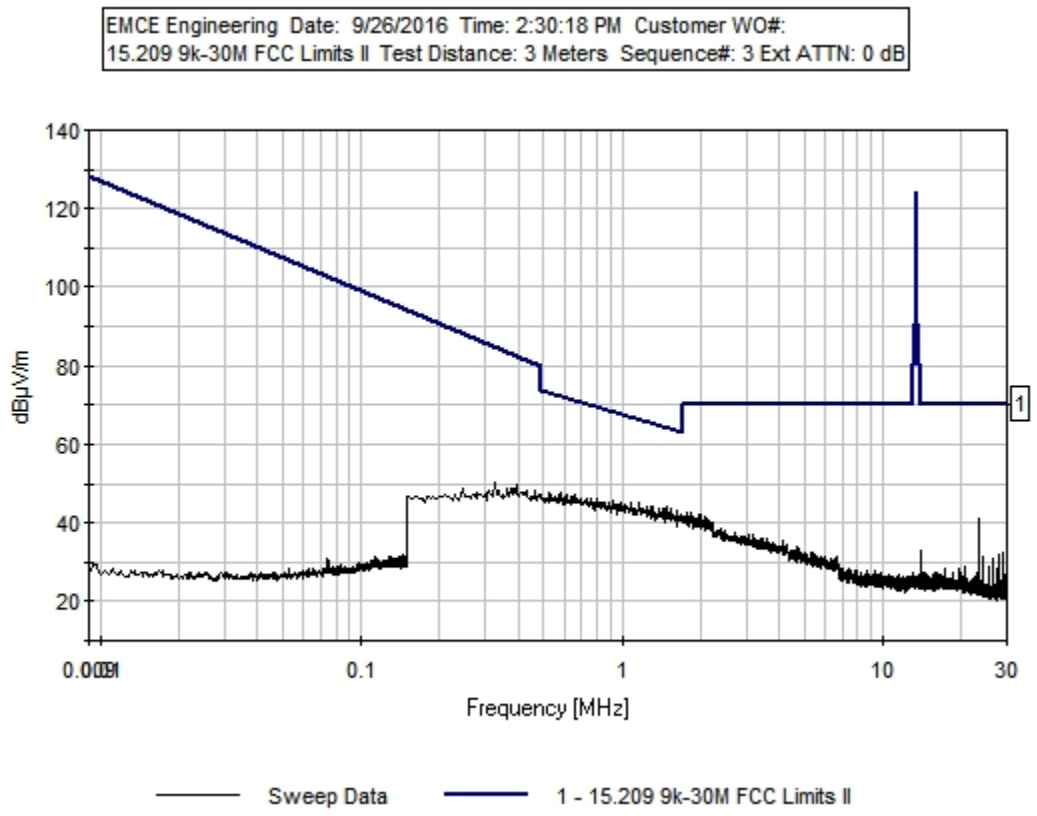
T1=25' LMR #001	T2=8447 Pre-Amp Asset 377
T3=ComPower Loop AL-130R	T4=dBuA - dBuV Conversion

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	1.478M	57.6	+0.1	+27.4	-37.6	+51.5	+0.0	44.2	64.2	-20.0	Paral
2	1.466M	57.2	+0.1	+27.4	-37.6	+51.5	+0.0	43.8	64.3	-20.5	Paral
3	1.164M	58.8	+0.1	+27.5	-37.5	+51.5	+0.0	45.4	66.3	-20.9	Paral
4	1.311M	57.9	+0.1	+27.5	-37.6	+51.5	+0.0	44.4	65.3	-20.9	Paral
5	23.320M	55.0	+0.1	+27.1	-38.2	+51.5	+0.0	41.3	70.0	-28.7	Paral
6	2.376M	52.0	+0.1	+27.4	-37.7	+51.5	+0.0	38.5	70.0	-31.5	Paral
7	2.466M	51.6	+0.1	+27.4	-37.7	+51.5	+0.0	38.1	70.0	-31.9	Paral
8	2.728M	51.0	+0.1	+27.4	-37.7	+51.5	+0.0	37.5	70.0	-32.5	Paral
9	2.412M	50.9	+0.1	+27.4	-37.7	+51.5	+0.0	37.4	70.0	-32.6	Paral
10	3.179M	50.6	+0.1	+27.3	-37.8	+51.5	+0.0	37.1	70.0	-32.9	Paral

FCC ID: TYQ-K663S232



FCC ID: TYQ-K663S232

5.4 Radiated Emissions > 30 MHz (30MHz – 1 GHz, E-Field)

Requirement(s): 47 CFR §15.209; 47 CFR §15.225(d)

Procedures: **For > 30MHz,** Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 10 meter away from the measuring antenna. The Log periodic antenna was positioned 1 meter above the ground from the centre of the antenna. The measuring bandwidth was set to 120 kHz. (Note: During testing the receive antenna was raise from 1~4 meters to maximize the emission from the EUT.)

The limit is converted from microvolt/meter to decibel microvolt/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude (dBµV/m) + ACF (dB) + Cable Loss(dB) – Distance Correction Factor

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/-6dB.
4. Environmental Conditions

Temperature	24°C
Relative Humidity	45%
Atmospheric Pressure	1010mbar

Test Date : 9-23-2016

Tested By : Bob Cole

Results: Pass

FCC ID: TYQ-K663S232

FCC Part 15B Radiated Emissions
30 MHz – 1 GHz

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 •

Customer: **Springcard SAS**
Specification: **EN55022B RADIATED**
Work Order #: **4256-1** Date: 9/23/2016
Test Type: **Radiated Scan** Time: 1:15:46 PM
Equipment: **RFID** Sequence#: 2
Manufacturer: Springcard SAS Tested By: Bob Cole
Model: K663S232
S/N: N/S

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

Transducer Legend:

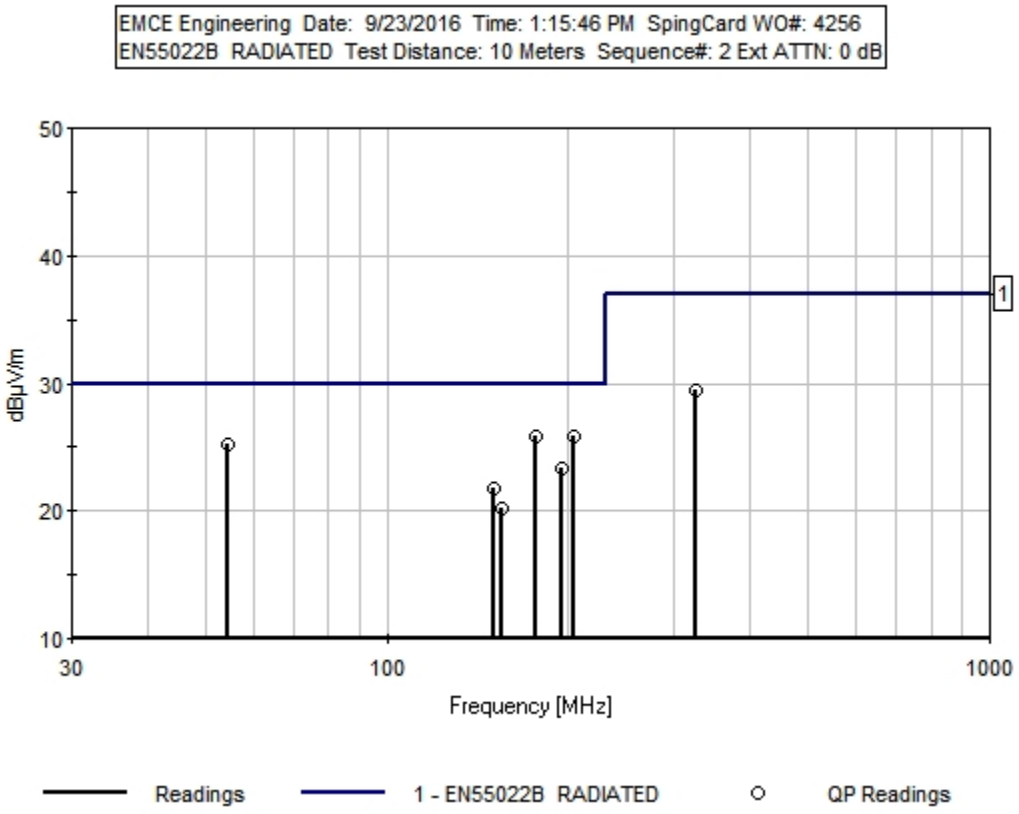
T1=25' LMR #001	T2=8447 Pre-Amp Asset 377
T3=Sunol JB6 S/N A42610 2016	

Ext Attn: 0 dB

Measurement Data: Reading listed by margin. Test Distance: 10 Meters

#	Freq	Rdng	T1	T2	T3		Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	203.932M	40.9	+0.1	+26.9	+11.8		+0.0	25.9	30.0	-4.1	Vert
	QP						283				125
2	176.677M	41.1	+0.1	+26.8	+11.5		+0.0	25.9	30.0	-4.1	Horiz
	QP						217				128
3	54.255M	44.2	+0.1	+26.9	+7.8		+0.0	25.2	30.0	-4.8	Horiz
	QP						98				140
4	194.613M	38.1	+0.1	+26.9	+12.0		+0.0	23.3	30.0	-6.7	Vert
	QP						94				120
5	325.595M	42.1	+0.2	+27.0	+14.2		+0.0	29.5	37.0	-7.5	Horiz
	QP						180				145
6	150.124M	35.6	+0.1	+26.7	+12.8		+0.0	21.8	30.0	-8.2	Vert
	QP						177				119
7	154.533M	34.2	+0.1	+26.7	+12.6		+0.0	20.2	30.0	-9.8	Horiz
	QP						182				124

FCC ID: TYQ-K663S232



5.5 Frequency Stability

Requirement(s): 47 CFR §15.225(e)

Procedures: Frequency Stability was measured according to 47 CFR §2.1055. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz. A voltmeter was used to monitor when varying the voltage.

Limit: ±0.01% of 13.5589 MHz = 1355 Hz

Environmental Conditions	Temperature	24°C
	Relative Humidity	45%
	Atmospheric Pressure	1010mbar

Test Date : 9-23-2016

Tested By : Bob Cole

Results: Pass

FCC ID: TYQ-K663S232

Frequency Stability versus Temperature: The Frequency tolerance of the carrier signal shall be maintained within ± 0.01% of the operating frequency over a temperature variation of -20ºC to +50ºC at normal supply voltage.

Reference Frequency: 13.559975 MHz

Temperature (ºC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
50	13.559888	87	<0.01	Pass
40	13.559895	80	<0.01	Pass
30	13.559858	117	<0.01	Pass
20	Reference (13.559975 MHz)			
10	13.559871	104	<0.01	Pass
0	13.559901	74	<0.01	Pass
-10	13.559870	105	<0.01	Pass
-20	13.559844	131	<0.01	Pass

Frequency Stability versus Input Voltage: The Frequency tolerance of the carrier signal shall be maintained within ± 0.01%, the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage at 20ºC environmental temperature.

Carrier Frequency: 13.559975 MHz at 20°C at 5VDC

Measured Voltage ±15% of nominal (DC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
4.25	13.559992	17	<0.01	Pass
5.75	13.559994	19	<0.01	Pass

5.6 Fundamental Field Strength Test Result

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/-6dB.
4. Environmental Conditions

Temperature	24°C
Relative Humidity	45%
Atmospheric Pressure	1010mbar

Test Date : 9-23-2016

Tested By : Bob Cole

Results: Pass

Test Requirement:

13.56MHz
(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

FCC ID: TYQ-K663S232

Peak Output Power
Per CFR 47, Section 15.225

Test Location: EMCE Engineering •44366 S. Grimmer Blvd • Fremont, CA 94538 •

Customer: **Springcard SAS**
Specification: **RFID FCC Mask 10 Meter**
Work Order #: **4256-1** Date: 9/25/2016
Test Type: **Radiated Scan** Time: 9:17:05 PM
Equipment: **RFID** Sequence#: 1
Manufacturer: Springcard SAS Tested By: Bob Cole
Model: K663S232
S/N: N/A

***Test Equipment*:**

Function	S/N	Calibration Date	Cal Due Date	Asset #

***Equipment Under Test* (* = EUT):**

Function	Manufacturer	Model #	S/N

Support Devices:

Function	Manufacturer	Model #	S/N

Test Conditions / Notes:

Sweep Range = 6

Transducer Legend:

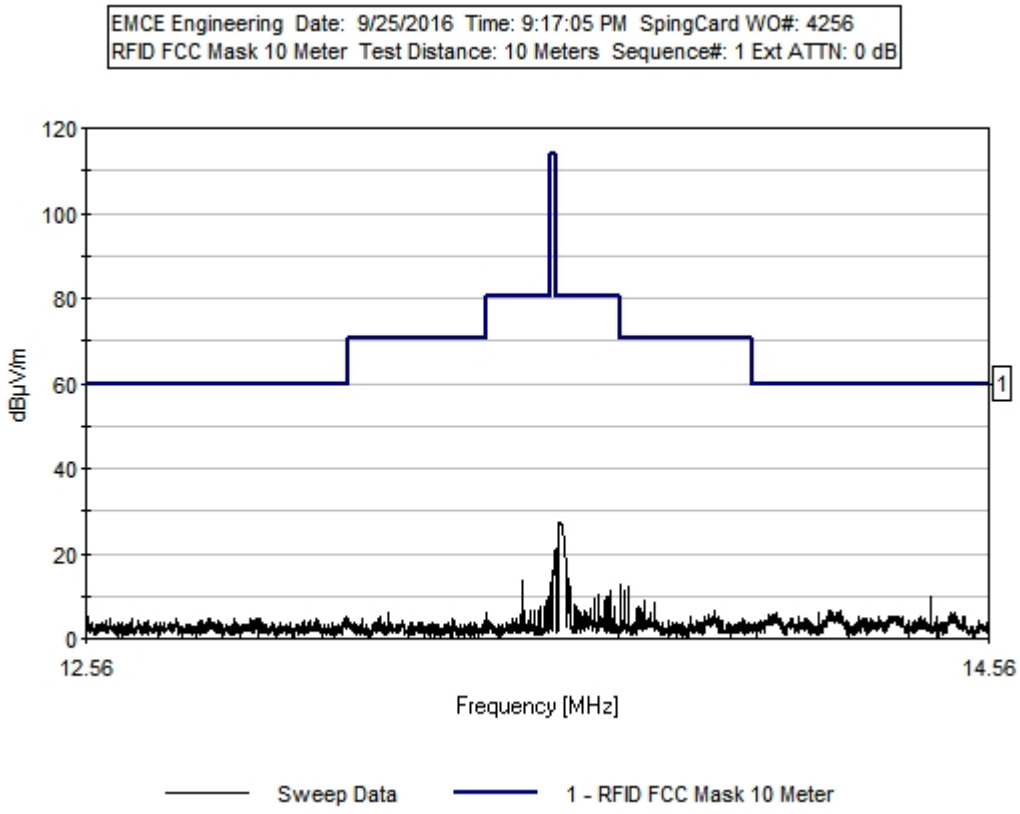
T1=8447 Pre-Amp Asset 377	T2=25' LMR #001
T3=dBuA - dBuV Conversion	T4=ComPower Loop AL-130R

Ext Attn: 0 dB

Measurement Data: Reading listed by amplitude. Test Distance: 10 Meters

#	Freq MHz	Rdng dBµV	T1 dB	T2 dB	T3 dB	T4 dB	Dist Table	Corr dBµV/m	Spec dBµV/m	Margin dB	Polar Ant
1	13.572M	40.2	+27.3	+0.0	+51.5	-37.1	+0.0	27.3	80.5	-53.2	X (ho
2	13.726M	25.3	+27.3	+0.0	+51.5	-37.1	+0.0	12.4	70.5	-58.1	X (ho
3	13.717M	24.2	+27.3	+0.0	+51.5	-37.1	+0.0	11.3	70.5	-59.2	X (ho
4	14.421M	22.9	+27.3	+0.0	+51.5	-37.1	+0.0	10.0	60.0	-50.0	X (ho
5	14.185M	19.4	+27.3	+0.0	+51.5	-37.1	+0.0	6.5	60.0	-53.5	X (ho
6	14.210M	19.3	+27.3	+0.0	+51.5	-37.1	+0.0	6.4	60.0	-53.6	X (ho

FCC ID: TYQ-K663S232



6.0 TEST EQUIPMENT

Equipment Calibration Data

Equipment	S/N	Cal Date	Cal Due Date
ETS Empower USB Power Sensor	14I000-48SNO051	6-8-2016	6-8-2017
R&S FSV40-B160 Signal Analyzer	101424	6-20-2016	6-20-2017
HP 8449B PreAmp	3008A02190	6-2-2016	6-2-2017
EMCO 3816/2 LISN	9809-1089	8-12-2016	8-12-2017
Sunol Sciences JB6 Antenna	A042610	6-15-2016	1-30-2017
R&S SMU-200 Sig. Gen.	8364A91	1-28-2016	1-28-2017
Amplifier Research FP7006	123059	2-17-2016	2-17-2017
A. H. Systems DRG Horn Antenna SAS-200/571	236	6-13-2016	6-13-2017
HP 8447F PreAmp	N/S	6-2-2016	6-2-2017
TESEQ ESD Simulator NSG 438	211	8-16-2016	8-16-2017
Isotropic Field Strength Probe	N/S	2-17-2016	2-17-2017

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