



**FCC CFR47 PART 15 SUBPART C  
CERTIFICATION  
TEST REPORT**

**FOR**

**SMART CARD KEY**

**MODEL NUMBER: 14ABB**

**FCC ID: HYQ14ABB**

**REPORT NUMBER: 05I3889-1, Revision B**

**ISSUE DATE: JANUARY 13, 2006**

*Prepared for*  
**DENSO CORP.**  
**1-1 SHOWA-CHO,**  
**KARIYA, AICHI 448-8661, JAPAN**

*Prepared by*  
**COMPLIANCE CERTIFICATION SERVICES**  
**561F MONTEREY ROAD,**  
**MORGAN HILL, CA 95037, USA**  
**TEL: (408) 463-0885**  
**FAX: (408) 463-0888**

**NVLAP**<sup>®</sup>  
LAB CODE:200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
A	1/4/06	Initial Issue	Thu
B	1/13/06	Clarified that transmitter is activated automatically in accordance with 15.231 (a)(2) and changed vehicle batteries to battery in section 5.4.	MH

## TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS .....	4
2. TEST METHODOLOGY .....	5
3. FACILITIES AND ACCREDITATION .....	5
4. CALIBRATION AND UNCERTAINTY .....	5
4.1. <i>MEASURING INSTRUMENT CALIBRATION</i> .....	5
4.2. <i>MEASUREMENT UNCERTAINTY</i> .....	5
5. EQUIPMENT UNDER TEST .....	6
5.1. <i>DESCRIPTION OF EUT</i> .....	6
5.2. <i>SOFTWARE AND FIRMWARE</i> .....	6
5.3. <i>WORST-CASE CONFIGURATION AND MODE</i> .....	6
5.4. <i>DESCRIPTION OF TEST SETUP</i> .....	6
5.5. <i>DESCRIPTION OF AVAILABLE ANTENNAS</i> .....	6
5.6. <i>DETAILS OF TESTED SYSTEM</i> .....	7
6. TEST AND MEASUREMENT EQUIPMENT .....	9
7. LIMITS AND RESULTS .....	10
7.1. <i>20dB BANDWIDTH</i> .....	10
7.2. <i>MAXIMUM MODULATION PERCENTAGE (M%)</i> .....	13
7.3. <i>TRANSMITTER ACTIVATION</i> .....	22
7.4. <i>RADIATED EMISSIONS</i> .....	23
7.4.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS .....	23
8. SETUP PHOTOS.....	28

## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** DENSO CORP.  
1-1 SHOWA-CHO  
KARIYA, AICHI 448-8661, JAPAN

**EUT DESCRIPTION:** SMART CARD KEY

**MODEL:** 14ABB

**SERIAL NUMBER:** 01656

**DATE TESTED:** JANUARY 03, 2006

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:



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THU CHAN  
ENGINEERING SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

Tested By:



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CHIN PANG  
EMC TECHNICIAN  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2 and FCC CFR 47 Part 15.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at <http://www.ccsemc.com>.

## 4. CALIBRATION AND UNCERTAINTY

### 4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

### 4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

## 5. EQUIPMENT UNDER TEST

### 5.1. DESCRIPTION OF EUT

The EUT is mainly used for locking or unlocking the door of the vehicle. The product sends signals using radio frequency when it receives signals from the vehicle.

Product Type Number	14ABB	
RF characteristic	Nominal frequency	314.35MHz
	Local oscillator frequency	314.35MHz SAW resonator
	Radio frequency output power	Less than 75.6dB $\mu$ V (Average level)
Antenna	Built-in type (Fixed)	
Transmitting Time	Periodic < 5 seconds	
Power Supply	Nominal supply voltage	3V DC
	Type of Battery	One lithium battery

### 5.2. SOFTWARE AND FIRMWARE

The EUT driver software installed in the host support equipment during testing was Smart05. The test utility software used during testing was BU9870FV-W.

### 5.3. WORST-CASE CONFIGURATION AND MODE

Three orthogonal orientations were investigated, X, Y and Z; the highest measured output power was in the X orientation.

### 5.4. DESCRIPTION OF TEST SETUP

The EUT is a stand-alone unit and powered by a 3 VDC battery, for the purpose of the testing an oscillator, antenna check-bench and laptop are used to control the EUT.

### 5.5. DESCRIPTION OF AVAILABLE ANTENNAS

The device uses a printed pattern antenna for transmitting.

## 5.6. DETAILS OF TESTED SYSTEM

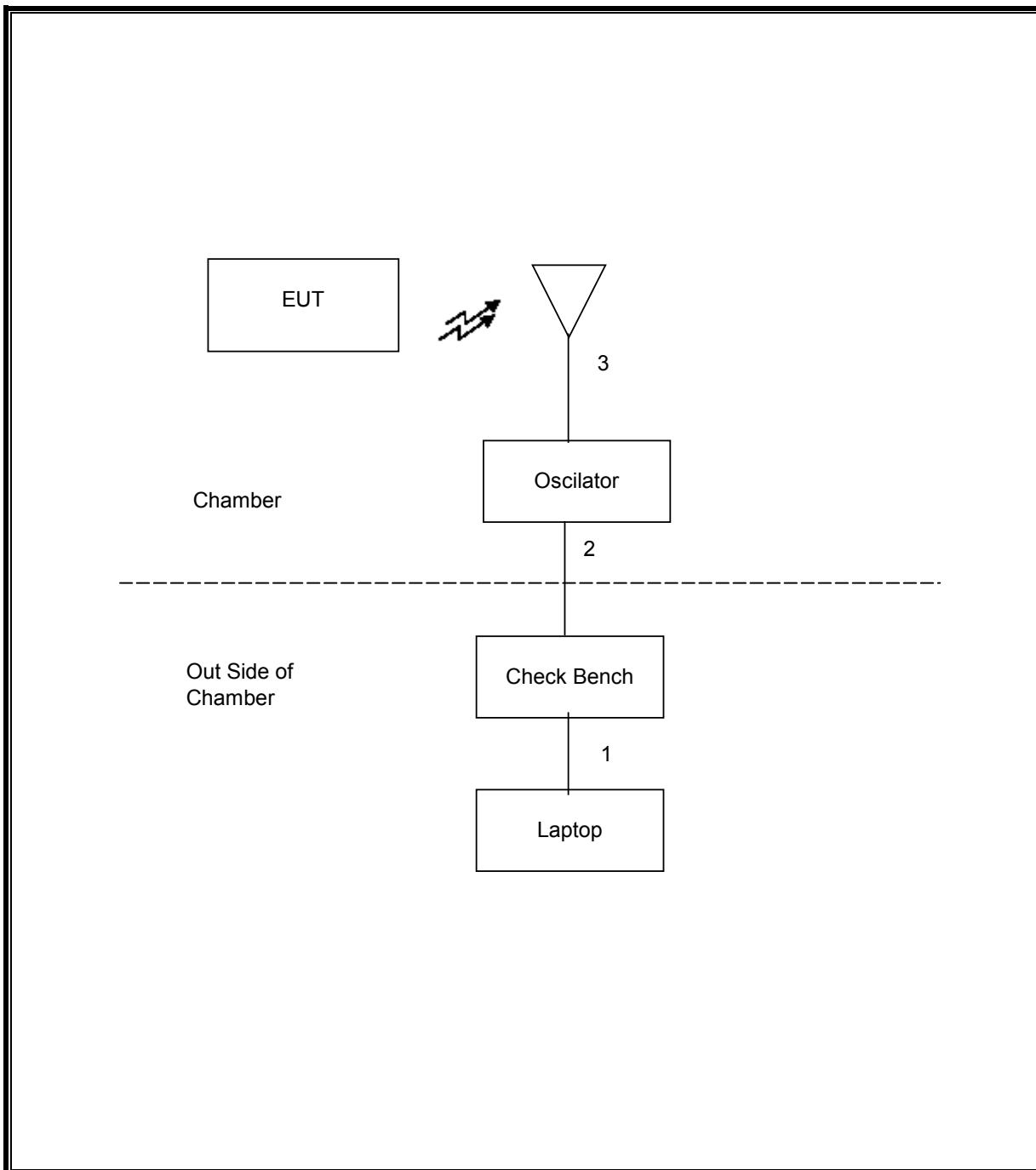
### SUPPORT EQUIPMENT & PERIPHERALS

TEST PERIPHERALS				
Device Type	Manufacturer	Model Number	Serial Number	FCC ID
Laptop	Dell	PP04S	CN-0P5792-36521-541-207F	DoC
AC Adapter	Dell	AA22-850	CN-0T2357-18291-043I	DoC
Check Bench	Denso	NA	NA	NA
Oscillator	Toyota	89991-68050	4L09	NA
Antenna ( Door Handle)	NA	NA	NA	NA

### I/O CABLES

TEST I / O CABLES								
Cable No	I/O Port	# of I/O Port	Connector Type	Type of Cable	Cable Length	Data Traffic	Bundled	Remark
1	USB	1	USB	Un-shielded	1m	Yes	No	N/A
2	Oscilator	3	Jack	Un-shielded	0.5m	No	No	N/A
3	Antenna	1	Door Handle	Un-shielded	0.5m	Yes	No	N/A

**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
Spectrum Analyzer, 26.5 GHz	HP	8593EM	3710A00205	1/6/2006
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	3/3/2006
Preamplifier, 1300 MHz	HP	8447D	1937A02062	1/7/2006
Preamplifier, 1 ~ 26.5 GHz	HP	8449B	3008A00369	8/17/2006
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	6717	4/22/2006
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E4446A	MY43360112	3/28/2006

## 7. LIMITS AND RESULTS

### 7.1. 20dB BANDWIDTH

#### LIMIT

§15.231 (c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

99% Bandwidth is just for reporting purpose.

#### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer.

20dB Bandwidth: The RBW is set to 100 KHz. The VBW is set to 100 KHz. The sweep time is coupled. Bandwidth is determined at the points 20 dB down from the modulated carrier.

99% Bandwidth: The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

#### RESULTS

No non-compliance noted:

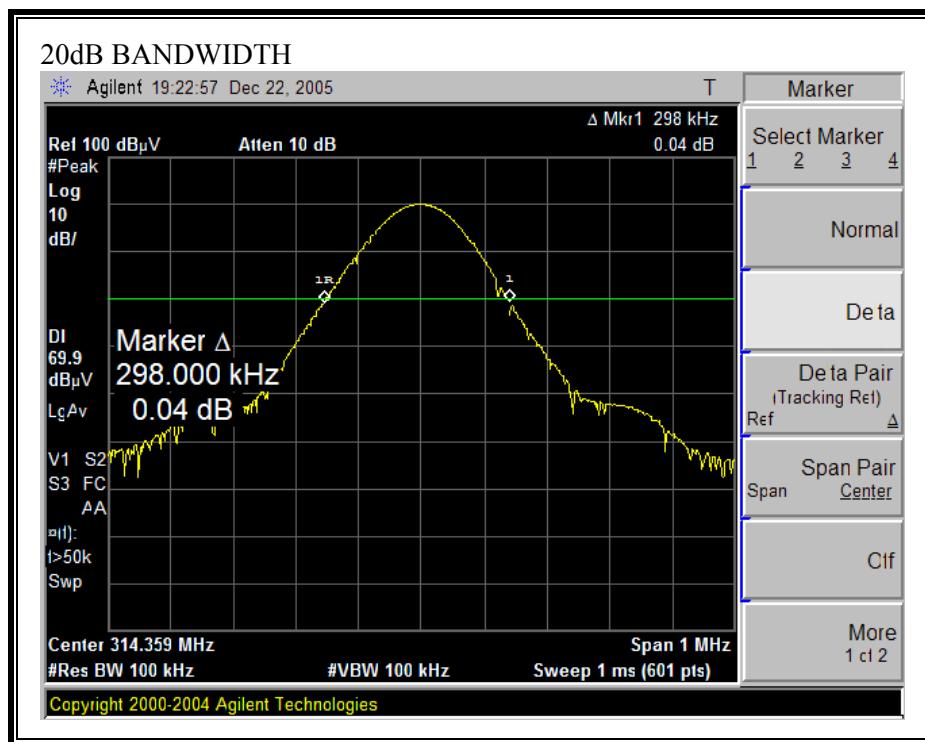
20dB Bandwidth

Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
314.35	298	785.875	-487.875

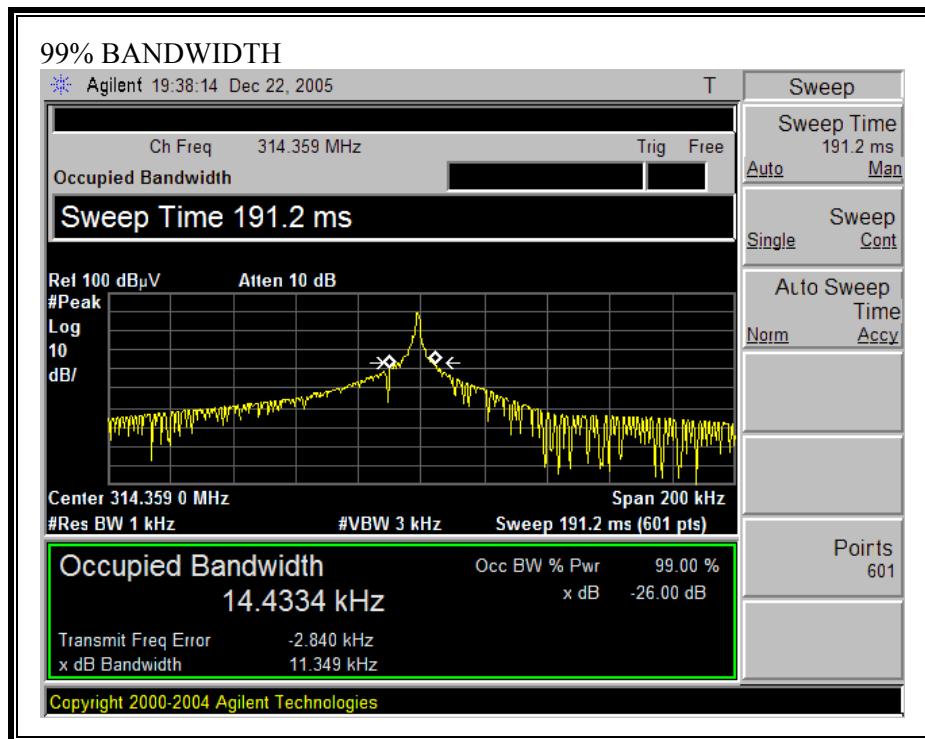
99% Bandwidth

Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Margin (kHz)
314.35	14.4334	785.875	-771.4416

## 20dB BANDWIDTH



**99% BANDWIDTH**



## 7.2. MAXIMUM MODULATION PERCENTAGE (M%)

### LIMIT

§15.35 (c) the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is coupled and the span is set to 0 Hz. The number of pulses is measured and calculated in a 100 ms scan.

### CALCULATION:

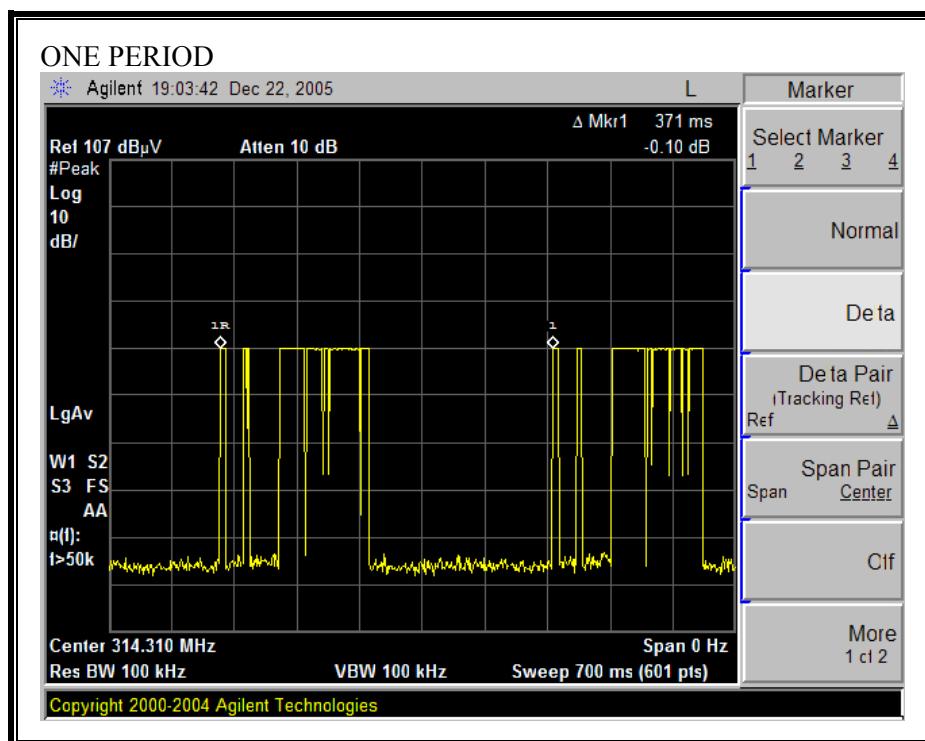
Average Reading = Peak Reading (dBuV/m) + 20log (Duty Cycle), Where Duty Cycle is  
(# of long pulses \* long pulse width) + (# of short pulses \* short pulse width) / 100 or T

### RESULTS

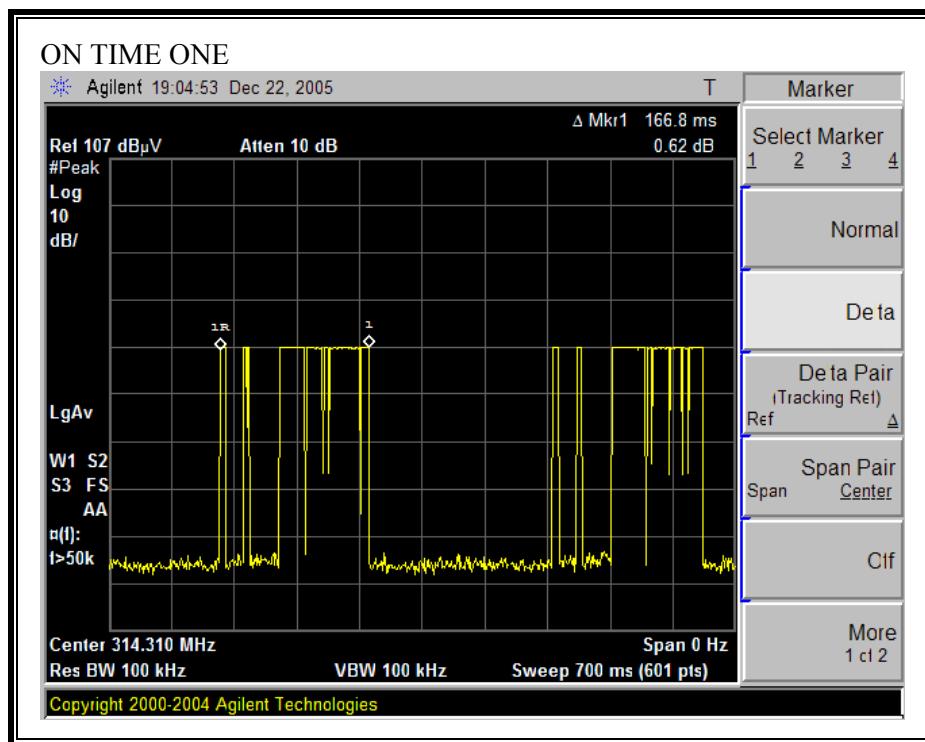
No non-compliance noted:

One Period (ms)	Long Pulse Width (ms)	# of Long Pulses	Short Width (ms)	# of Short Pulses	Duty Cycle	20*Log Duty Cycle (dB)
371	1.25	17	0.60	47	0.495	-6.12

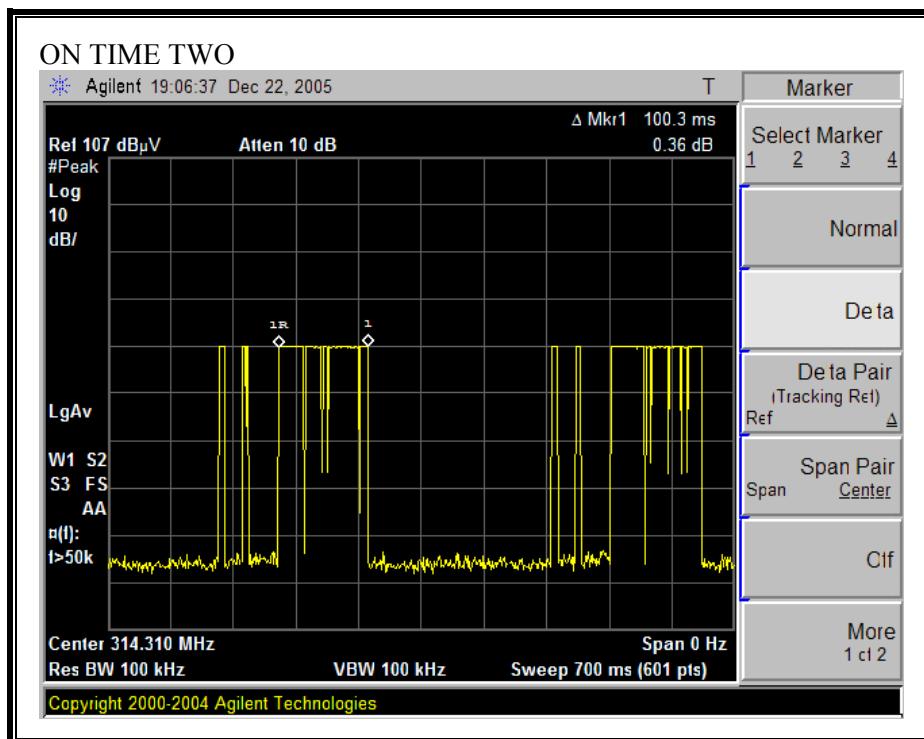
**ONE PERIOD**



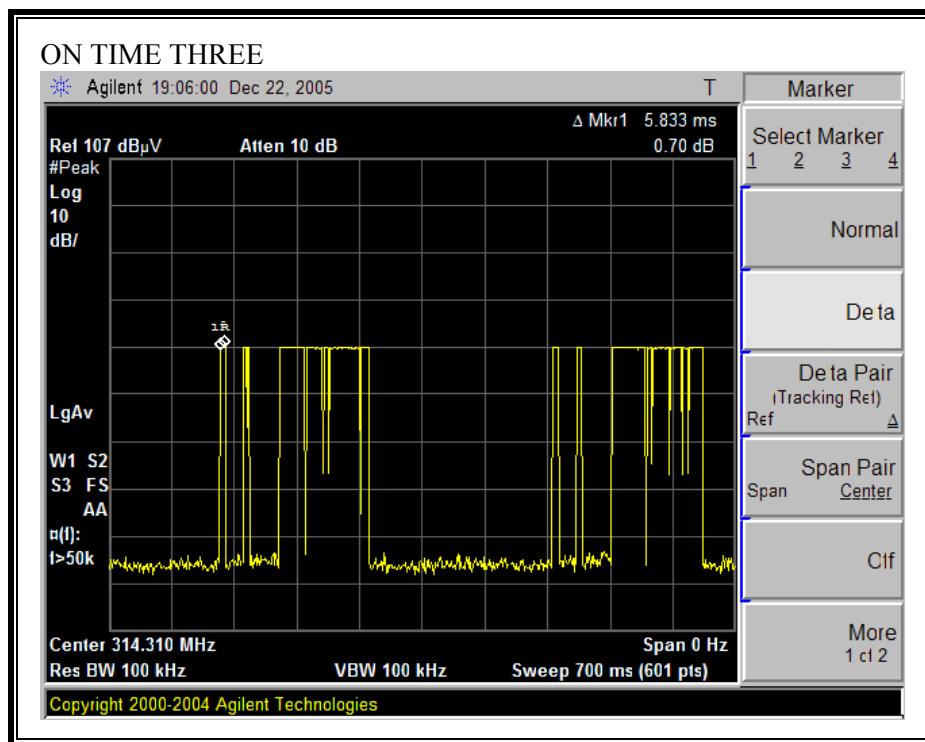
**DUTY CYCLE 1**



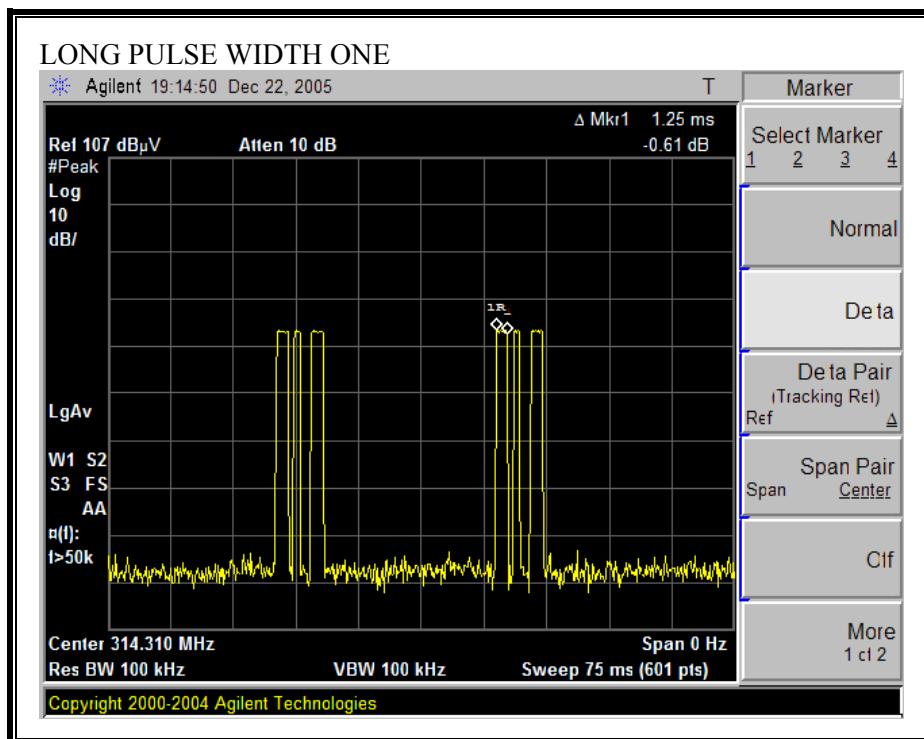
**DUTY CYCLE 2**



### DUTY CYCLE 3



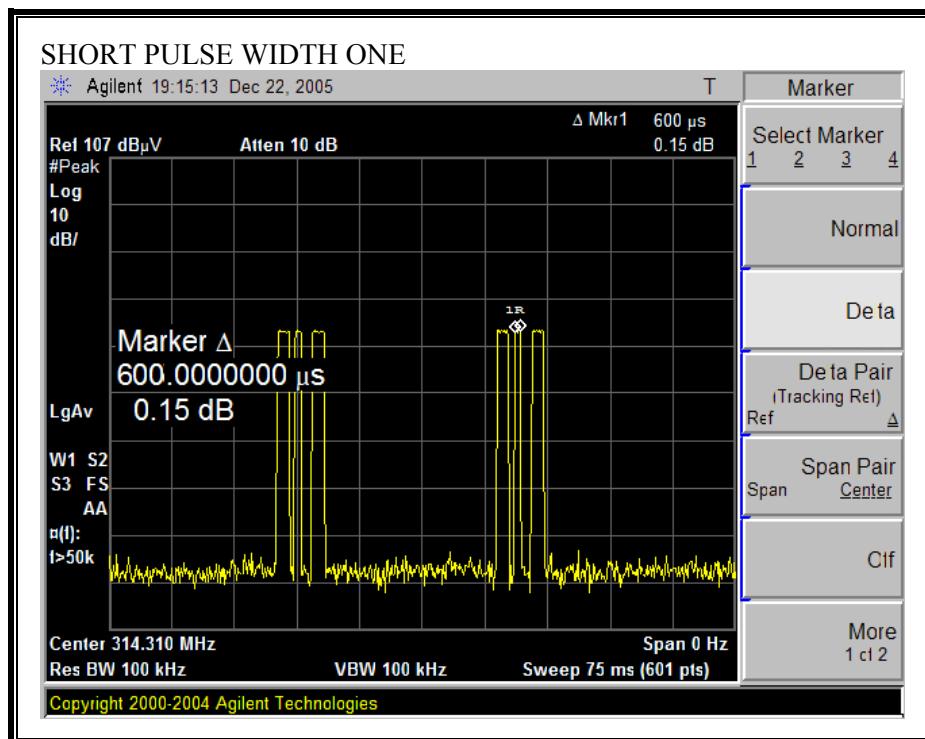
**DUTY CYCLE 4**



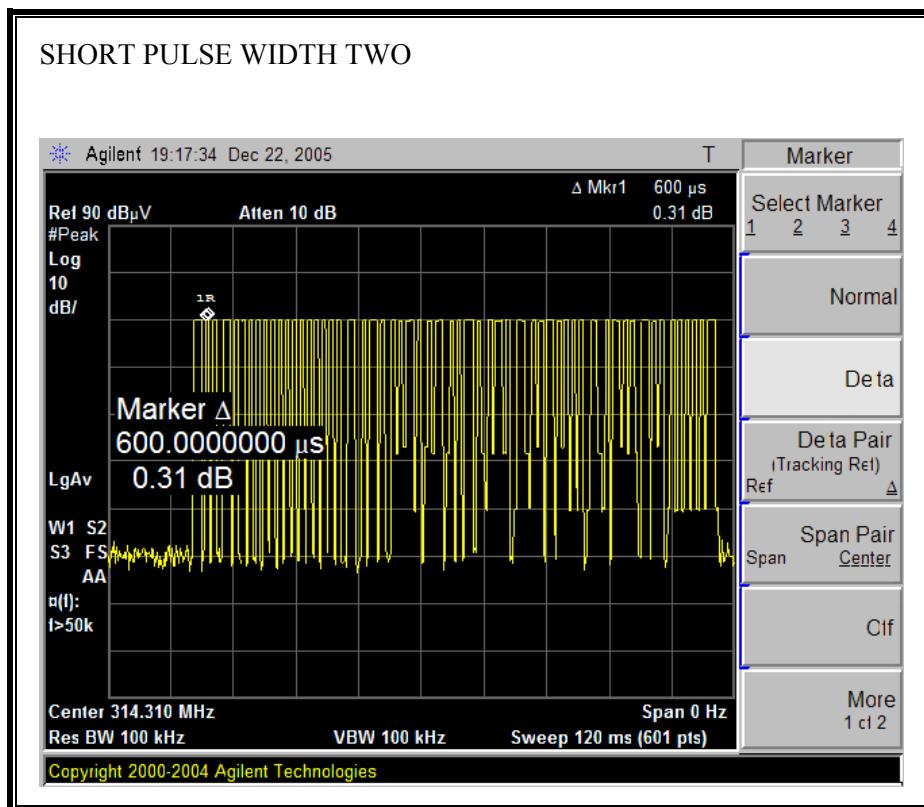
**DUTY CYCLE 5**



**DUTY CYCLE 6**



**DUTY CYCLE 7**



### 7.3. TRANSMITTER ACTIVATION

#### LIMIT

§15.231 (a) (2) a transmitter activated automatically shall cease transmission within 5 seconds after activation.

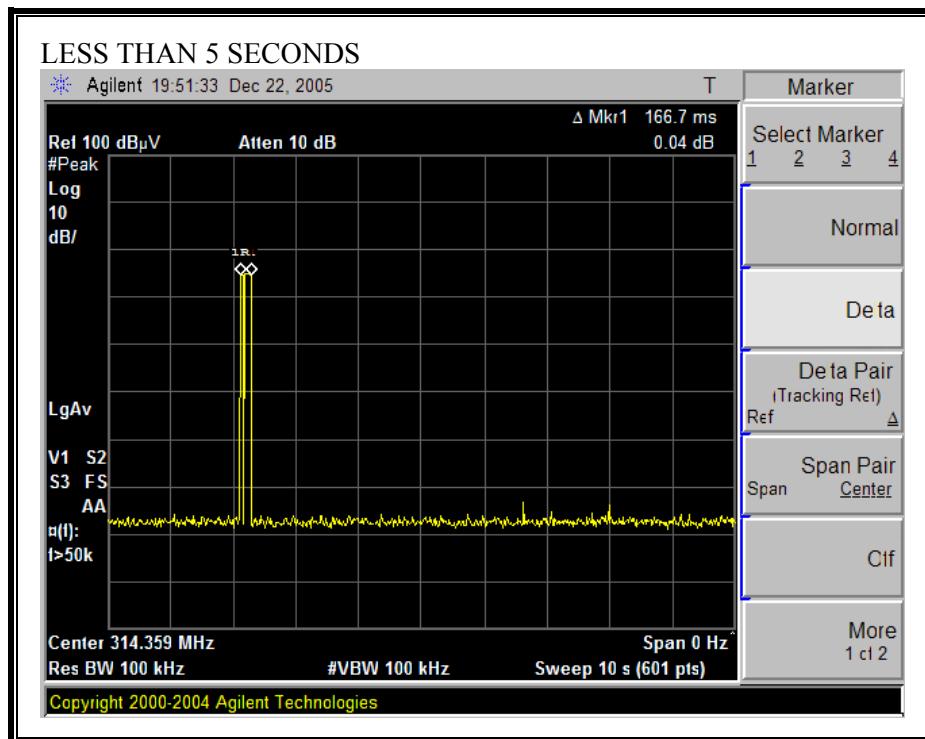
#### TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer or radiated field strength. The RBW is set to 100 kHz and the VBW is set to 100 kHz. The sweep time is set to 10 seconds and the span is set to 0 Hz.

#### RESULTS

No non-compliance noted:

Transmission begins approximately 2.1 seconds after activation and transmission ceases approximately 2.2667 seconds after activation.



## 7.4. RADIATED EMISSIONS

### 7.4.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

#### LIMITS

§15.231 (b) In addition to the provisions of § 15.205, the field strength of emissions from Intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental Frequency Spurious Emissions (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 <sup>1</sup>	125 to 375 <sup>1</sup>
174 - 260	3,750	375
260 - 470	3,750 to 12,500 <sup>1</sup>	375 to 1,250 <sup>1</sup>
Above 470	12,500	1,250

<sup>1</sup>Linear interpolation

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) 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:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

### **TEST PROCEDURE**

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

**FUNDAMENTAL, HARMONICS AND SPURIOUS EMISSIONS 30 – 1000 MHz**

<b>COMPLIANCE</b> Certification Services														
FCC, VCCI, CISPR, CE, AUSTEL, NZ UL, CSA, TUV, BSMI, DHHS, NVLAP														
561F MONTEREY ROAD, SAN JOSE, CA 95037-9001 PHONE: (408) 463-0885 FAX: (408) 463-0888														
<b>Project #:</b> 05U3889-1 <b>Report #:</b> 060103 Chamber <b>Date &amp; Time:</b> 01/03/06 <b>Test Engr:</b> Chin Pang														
<b>Company:</b> DENSO <b>EUT Description:</b> Smart Card Key <b>Test Configuration:</b> EUT only <b>Type of Test:</b> FCC 15.231b <b>Mode of Operation:</b> Transmitting														
M% = ((t1+t2+t3+...)/T) * 100% = 49.45%						Av Reading = Pk Reading + 20*log(M%) 20 * log (M%) = -6.12								
Freq. (MHz)	Pk Rdg (dBuV)	Av Rdg (dBuV)	AF (dB)	Closs (dB)	Pre-amp (dB)	Pk Level (dBuV/m)	Av Level (dBuV/m)	Pk Limit FCC_B	Av Limit FCC_B	Pk Margin (dB)	Avg Margin (dB)	Pol (H/V)	Az (Deg)	Height (Meter)
X-Position ( EUT Lay down )														
314.35	88.00	81.88	17.00	1.82	27.01	79.81	73.69	95.58	75.58	-15.77	-1.89	3mH	0.00	1.00
314.35	72.00	65.88	17.00	1.82	27.01	63.81	57.69	95.58	75.58	-31.77	-17.89	3mV	0.00	2.00
Y-Position ( EUT Standup )														
314.35	81.00	74.88	17.00	1.82	27.01	72.81	66.69	95.58	75.58	-22.77	-8.89	3mH	0.00	1.00
314.35	85.40	79.28	17.00	1.82	27.01	77.21	71.09	95.58	75.58	-18.37	-4.49	3mV	0.00	2.00
Z-Position ( EUT Side Lay down )														
314.35	82.00	75.88	17.00	1.82	27.01	73.81	67.69	95.58	75.58	-21.77	-7.89	3mH	0.00	1.00
314.35	83.75	77.63	17.00	1.82	27.01	75.56	69.44	95.58	75.58	-20.02	-6.14	3mV	0.00	2.00
Worst Position:														
628.72	50.10	43.98	22.65	2.83	28.35	47.23	41.11	75.58	55.58	-28.35	-14.47	3mH	0.00	1.00
628.72	42.40	36.28	22.65	2.83	28.35	39.53	33.41	75.58	55.58	-36.05	-22.17	3mV	0.00	2.00
943.05	41.60	35.48	22.65	2.83	27.61	39.47	33.35	75.58	55.58	-36.11	-22.23	3mH	0.00	1.00
943.05	40.54	34.42	22.65	2.83	27.61	38.41	32.29	75.58	55.58	-37.17	-23.29	3mV	0.00	2.00

**HARMONICS AND SPURIOUS EMISSIONS ABOVE 1GHz**

01/03/06 High Frequency Measurement Compliance Certification Services, Morgan Hill Open Field Site																																																																																																																																																																																																																																																																																																																																																					
Test Engr: Chin Pang Project #: 05I3889-1 Company: Denso EUT Descrip.: Smart Card Key EUT M/N: 14ABB Test Target: FCC 15.231 Mode Oper: TX																																																																																																																																																																																																																																																																																																																																																					
<b>Test Equipment:</b> <table border="1"> <tr> <td>EMCO Horn 1-18GHz</td> <td>Pre-amplifier 1-26GHz</td> <td>Pre-amplifier 26-40GHz</td> <td colspan="3">Horn &gt; 18GHz</td> <td>Limit</td> </tr> <tr> <td>T73; S/N: 6717 @3m</td> <td>T34 HP 8449B</td> <td></td> <td></td> <td></td> <td></td> <td>FCC 15.205</td> </tr> <tr> <td colspan="6">Hi Frequency Cables</td> <td></td> </tr> <tr> <td>2 foot cable</td> <td>3 foot cable</td> <td>4 foot cable</td> <td>12 foot cable</td> <td>HPF</td> <td>Reject Filter</td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>3_Vien</td> <td></td> <td>12_Vien</td> <td></td> <td></td> <td></td> </tr> </table>															EMCO Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz			Limit	T73; S/N: 6717 @3m	T34 HP 8449B					FCC 15.205	Hi Frequency Cables							2 foot cable	3 foot cable	4 foot cable	12 foot cable	HPF	Reject Filter										3_Vien		12_Vien																																																																																																																																																																																																																																																																																																
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(V/H)	1.257	3.0	48.5	42.4	24.7	1.4	-37.5	0.0	0.0	37.1	31.0	75.6	55.6	-38.5	-24.6	H	1.572	3.0	52.4	46.3	25.8	1.6	-37.0	0.0	0.0	42.8	36.7	74	54	-31.2	-17.3	H	1.886	3.0	48.0	41.9	26.9	1.8	-36.4	0.0	0.0	40.2	34.1	75.6	55.6	-35.3	-21.5	H	2.200	3.0	47.8	41.7	27.8	1.9	-35.9	0.0	0.0	41.7	35.5	74	54	-32.3	-18.5	H	2.515	3.0	48.3	42.2	28.6	2.1	-35.3	0.0	0.0	43.7	37.6	75.6	55.6	-31.9	-18.0	H	2.828	3.0	47.5	41.4	29.7	2.2	-34.9	0.0	0.0	44.5	38.4	74	54	-29.5	-15.6	H	3.143	3.0	47.2	41.1	30.6	2.4	-34.5	0.0	0.0	45.6	39.5	75.6	55.6	-30.0	-16.1	V	1.257	3.0	47.6	41.5	24.7	1.4	-37.5	0.0	0.0	36.2	30.1	75.6	55.6	-39.4	-25.5	V	1.572	3.0	47.8	41.7	25.8	1.6	-37.0	0.0	0.0	38.2	32.1	74	54	-35.8	-21.9	V	1.886	3.0	46.0	39.9	26.9	1.8	-36.4	0.0	0.0	38.2	32.1	75.6	55.6	-37.3	-23.5	V	2.200	3.0	45.8	39.7	27.8	1.9	-35.9	0.0	0.0	39.7	33.5	74	54	-34.3	-20.5	V	2.515	3.0	46.0	39.9	28.6	2.1	-35.3	0.0	0.0	41.4	35.3	75.6	55.6	-34.2	-20.3	V	2.828	3.0	45.2	39.1	29.7	2.2	-34.9	0.0	0.0	42.2	36.1	74	54	-31.8	-17.9	V	3.143	3.0	45.6	39.5	30.6	2.4	-34.5	0.0	0.0	44.0	37.9	75.6	55.6	-31.6	-17.7	V																																																	f 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## 8. SETUP PHOTOS

### **RADIATED RF MEASUREMENT SETUP FOR PORTABLE CONFIGURATION**



Y-AXIS PHOTO





**END OF REPORT**