FCC Test Report

Product Name	Radio Identification device
Model No.	FS173NR
FCC ID.	NBGFS173NR

Applicant	Hella KGaA Hueck & Co.
Address	Rixbecker Strasse 75, 59552 Lippstadt, Germany

Date of Receipt	June 21, 2016
Issued Date	July 05, 2016
Report No.	1660450R-RFUSP14V00
Report Version	V1.0

Test Report

Issued Date : July 05, 2016
Report No. : 1660450R-RFUSP14V00

Product Name	Radio Identification device
Applicant	Hella KGaA Hueck & Co.
Address	Rixbecker Strasse 75, 59552 Lippstadt, Germany
Manufacturer	1. Hella KGaA Hueck & Co. 2. Hella Shanghai Electronics Co. Ltd (HSE)
Model No.	FS173NR
FCC ID.	NBGFS173NR
EUT Rated Voltage	DC 3V(Power by Battery)
EUT Test Voltage	DC 3V(Power by Battery)
Trade Name	HELLA
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2014 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Genie Chang

(Senior Adm. Specialist / Genie Chang)

Tested By : Jen Chen

(Assistant Engineer / Jen Chen)

Approved By :

(Director / Vincent Lin)

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1. General Information

1.1. EUT Description

Product Name	Radio Identification device
Trade Name	HELLA
Model No.	FS173NR
FCC ID	NBGFS173NR
Frequency Range	315MHz
Number of Channels	1
Antenna Type	Loop antenna on PCB

Frequency of Each Channel:

Channel	Frequency
Channel 1:	315 MHz

Note:

1. The EUT is a Radio Identification device with a built-in 315 MHz transmitter.
2. The antenna of EUT is conform to FCC 15.203
3. These tests are conducted on a sample for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.231.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit

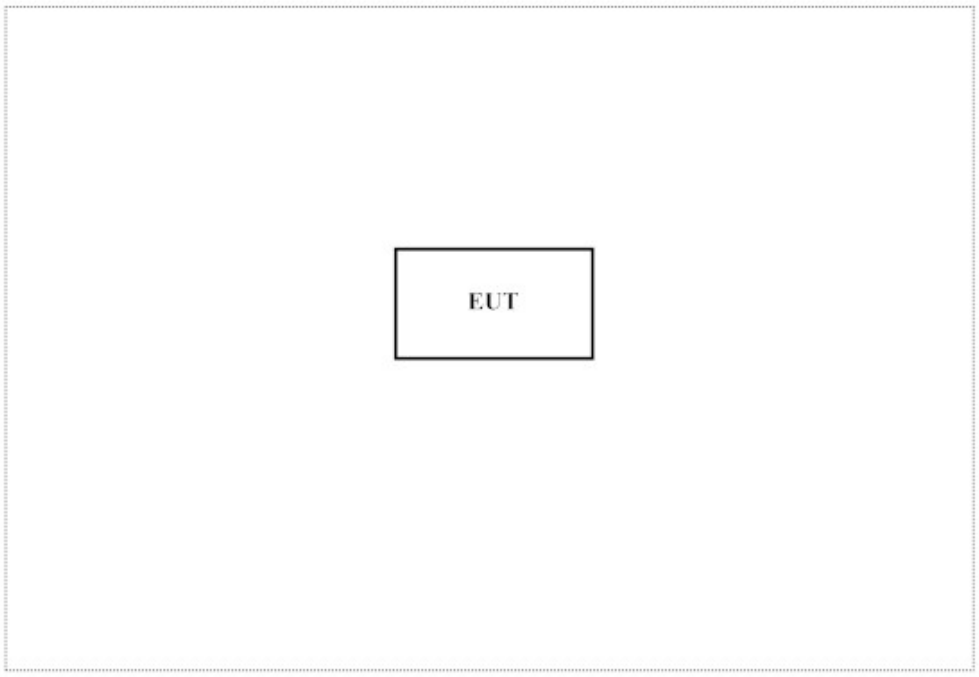
1.3. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
N/A					

Signal Cable Type	Signal cable Description
N/A	

1.4. Configuration of tested System



1.5. EUT Exercise Software

1	Setup the EUT as shown in section 1.4.
2	Install the battery.
3	Press the test button of the EUT.
4	Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site: http://www.quietek.com/chinese/about/certificates.aspx?bval=5

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site: http://www.quietek.com/

Site Description: File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 92195

Site Name: Quietek Corporation
Site Address: No.5-22, Ruishukeng,
Linkou Dist. New Taipei City 24451,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

2. Conducted Emission

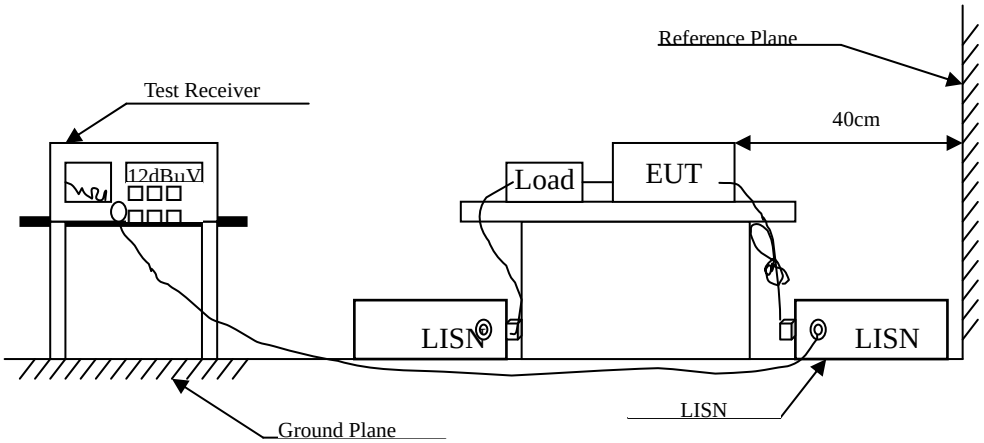
2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2015	
	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2016	Peripherals
	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2016	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar, 2016	EUT
	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2016	
	No.1 Shielded Room				

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked by “X” are used to measure the final test results.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 Limits (dBμV)		
Frequency MHz	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks : In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231

2.6. Uncertainty

± 2.26 dB

2.7. Test Result

Owing to the DC operation of EUT, this test item is not performed.

3. Radiated Emission

3.1. Test Equipment

The following test equipments are used during the radiated emission test:

Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.
☒Site # 3	X	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep, 2015
	X	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun, 2016
	X	EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun, 2016
	X	Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun, 2016
	X	Coaxial signal switch	Arnist	MP59B/ 6200798682	Jun, 2016

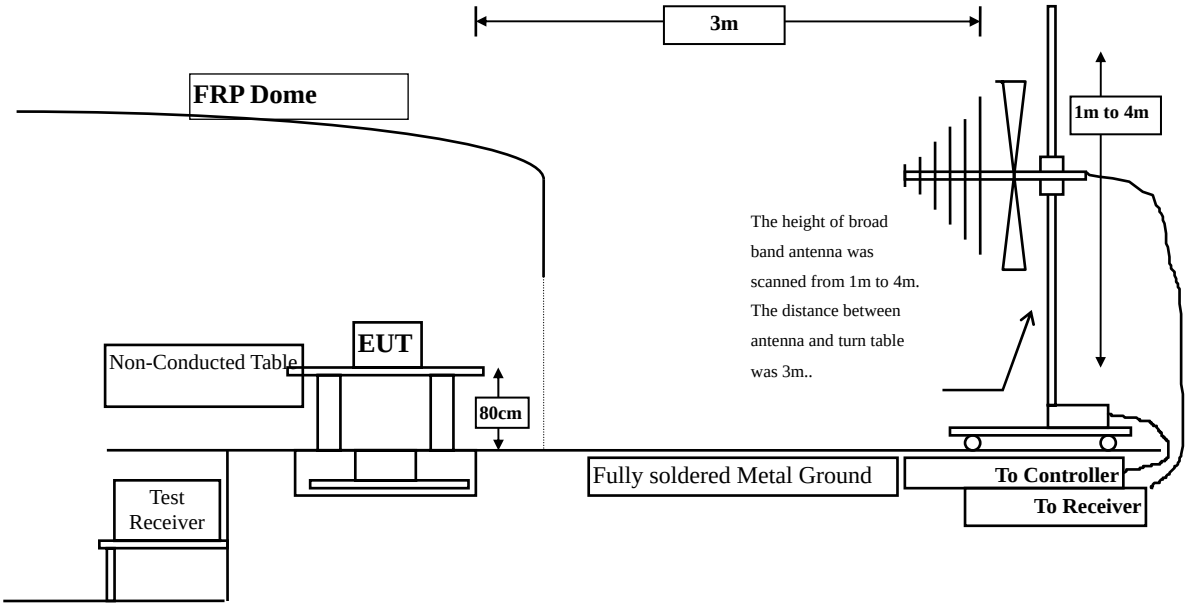
Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.
☒CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct, 2015
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar, 2016
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan, 2016
	X	Horn Antenna	TRC	AH-0801/95051	Aug, 2015
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan, 2016
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul, 2016
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul, 2016

Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

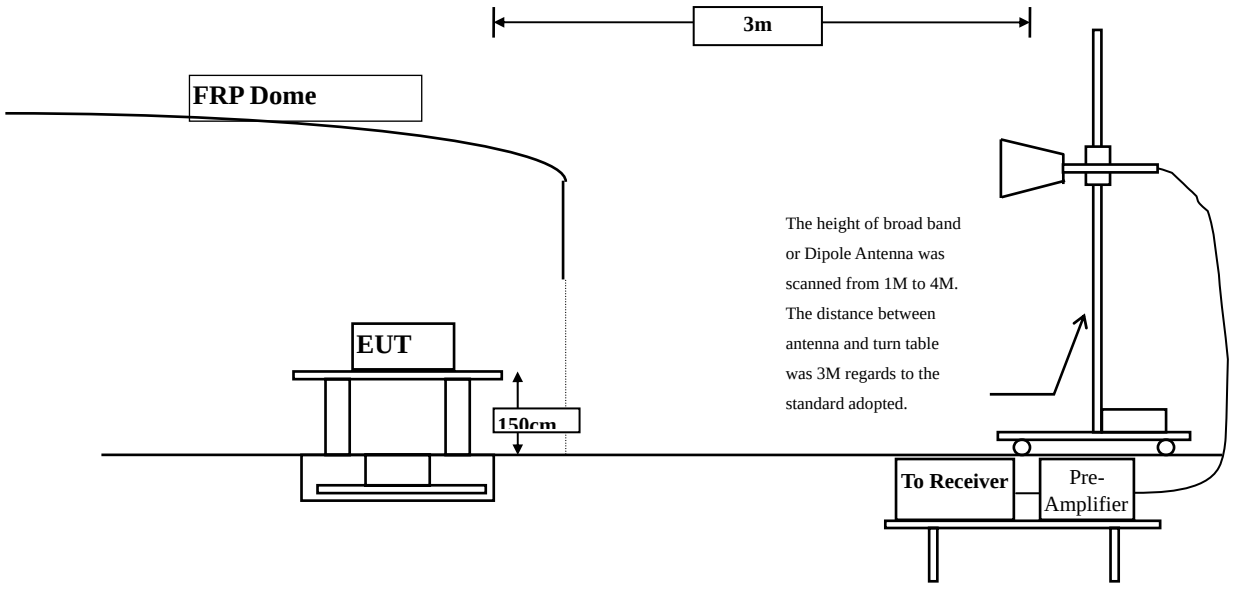
2. The test instruments marked with “X” are used to measure the final test results.

3.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



3.3. Limits

➢ Fundamental and Harmonics Emission Limits

Fundamental Frequency MHz	Field Strength of Fundamental	Field Strength of Spurious Emission
40.66-40.70	2250	225
70-130	1250	125
130-174	1250-3750	125-375
174-260	3750	375
260-470	3750-12500	375-1250
above 470	12500	1250

Remarks : 1. RF Voltage (dBμV) = 20 log RF Voltage (uV)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. The emission limit in this paragraph is based on measurement instrumentation employing an average detector.

➢ Spurious electric field strength limits

FCC Part 15 Subpart C Paragraph 15.209 Limits			
Frequency MHz	uV/m	dBμV/m	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	See Remark[1]	300
0.490-1.705	24000/F(kHz)	See Remark[1]	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remarks : 1. RF Voltage (dBμV) = 20 log RF Voltage (uV)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4. Test Procedure

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground,when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10, 2013 on radiated measurement.

On the field strength of fundamental and harmonics, the limits shown are based on measuring equipment employing a average detector function. As an alternative, compliance with the limits may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.

On the field strength of spurious electric, on any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function.

When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

The bandwidth The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

3.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231

3.6. Uncertainty

± 3.8 dB below 1GHz

± 3.9 dB above 1GHz

3.7. Test Result

Product	Radio Identification device		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2016/06/28	Test Site	No.3 OATS

Fundamental Power (X-Line)

Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Limit dBµV/m
Horizontal					
315.000	-9.826	91.250	81.424	-14.199	95.623
Vertical					
315.000	-9.826	67.450	57.624	-37.999	95.623

Average Detector:

Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Limit dBµV/m
Horizontal					
315.000	-9.826	81.430	71.604	-4.019	75.623
Vertical					
315.000	-9.826	57.430	47.604	-28.019	75.623

Note:

1. Correct factor = Antenna Factor + Cable Loss – Pre-amplifier Gain
2. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
3. Limit=20dB+(20log(41.667(315)-7083.333))

Product	Radio Identification device		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2016/06/28	Test Site	No.3 OATS

Fundamental Power (Y-Line)

Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Limit dBµV/m
Horizontal					
315.000	-9.826	81.610	71.784	-23.839	95.623
Vertical					
315.000	-9.826	88.400	78.574	-17.049	95.623

Average Detector:

Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Limit dBµV/m
Horizontal					
315.000	-9.826	71.910	62.084	-13.539	75.623
Vertical					
315.000	-9.826	77.400	67.574	-8.049	75.623

Note:

1. Correct factor = Antenna Factor + Cable Loss – Pre-amplifier Gain
2. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
3. Limit=20dB+(20log(41.667(315)-7083.333))

Product	Radio Identification device		
Test Item	Fundamental Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2016/06/28	Test Site	No.3 OATS

Fundamental Power (Z-Line)

Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV/m	Margin dB	Limit dBμV/m
Horizontal					
315.000	-9.826	72.580	62.754	-32.869	95.623
Vertical					
315.000	-9.826	88.410	78.584	-17.039	95.623

Average Detector:

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV/m	Margin dB	Limit dBμV/m
Horizontal					
315.000	-9.826	62.900	53.074	-22.549	75.623
Vertical					
315.000	-9.826	78.740	68.914	-6.709	75.623

Note:

1. Correct factor = Antenna Factor + Cable Loss – Pre-amplifier Gain
2. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.
3. Limit=20dB+(20log(41.667(315)-7083.333))

Product	Radio Identification device		
Test Item	Harmonic Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2016/06/23	Test Site	No.3 OATS

Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Harmonic Radiated Emission						
Horizontal						
Peak						
1260.000	-10.518	48.820	38.302	-35.698	74.000	54.000
1575.000	-10.271	46.330	36.059	-37.941	74.000	54.000
1890.000	-7.519	46.830	39.311	-34.689	74.000	54.000
2205.000	-6.825	45.780	38.955	-35.045	74.000	54.000
2520.000	-5.945	46.010	40.065	-33.935	74.000	54.000
2835.000	-5.682	45.030	39.347	-34.653	74.000	54.000
3150.000	-5.509	45.550	40.042	-33.958	74.000	54.000
Horizontal						
Average						
--						

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	Radio Identification device		
Test Item	Harmonic Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2016/06/23	Test Site	No.3 OATS

Frequency MHz	Correct Factor dB	Reading Level dBµV	Measurement Level dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Harmonic Radiated Emission						
Vertical						
Peak						
1260.000	-10.518	46.350	35.832	-38.168	74.000	54.000
1575.000	-10.271	46.530	36.259	-37.741	74.000	54.000
1890.000	-7.519	45.730	38.211	-35.789	74.000	54.000
2205.000	-6.825	45.690	38.865	-35.135	74.000	54.000
2520.000	-5.945	45.260	39.315	-34.685	74.000	54.000
2835.000	-5.682	45.340	39.657	-34.343	74.000	54.000
3150.000	-5.509	45.200	39.692	-34.308	74.000	54.000
Vertical						
Average						
--						

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product	Radio Identification device		
Test Item	General Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2016/06/28	Test Site	No.3 OATS

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
Quasi-Peak					
111.536	-14.132	40.875	26.743	-16.757	43.500
294.290	-10.366	35.714	25.349	-20.651	46.000
472.826	-6.271	35.574	29.303	-16.697	46.000
645.739	-3.267	29.506	26.239	-19.761	46.000
770.855	-1.289	34.380	33.090	-12.910	46.000
947.986	0.948	40.646	41.593	-4.407	46.000
Vertical					
Quasi-Peak					
134.029	-11.874	39.452	27.579	-15.921	43.500
245.087	-11.982	33.772	21.789	-24.211	46.000
396.913	-7.865	36.160	28.295	-17.705	46.000
567.014	-4.501	32.688	28.187	-17.813	46.000
746.957	-1.513	40.642	39.129	-6.871	46.000
949.391	0.963	39.377	40.340	-5.660	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

4. Transmit time

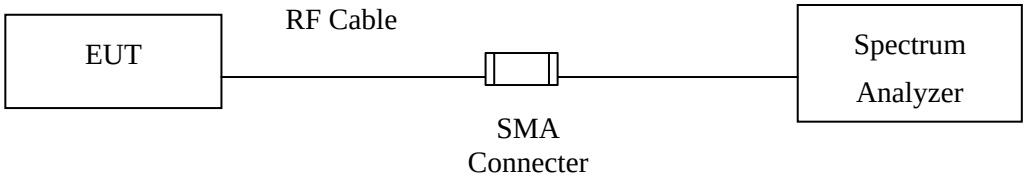
4.1. Test Equipment

The following test equipment are used during the test:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2016
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2016
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note: 1. All equipments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

4.2. Test Setup



4.3. Limits

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
A transmitter activated automatically shall cease transmission within 5 seconds after activation.

4.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231

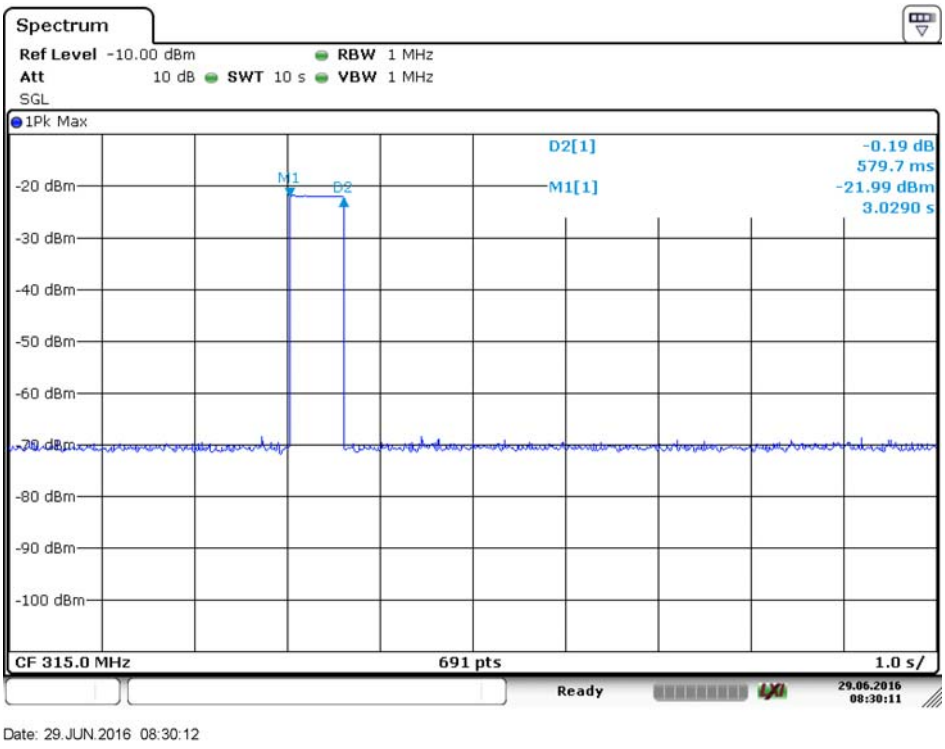
4.5. Uncertainty

± 25ms

4.6. Test Result

Product	Radio Identification device		
Test Item	Transmit time		
Test Mode	Mode 1: Transmit		
Date of Test	2016/06/28	Test Site	No.3 OATS

Channel No.	Frequency (MHz)	Measurement Value (Sec)	Limit (Sec)	Result
1	315	0.579	< 5	Pass



5. Occupied Bandwidth

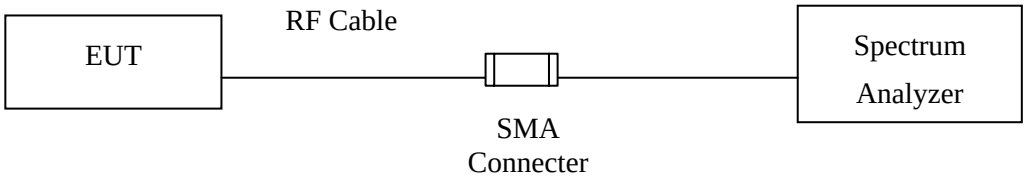
5.1. Test Equipment

The following test equipment are used during the test:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2016
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2016
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2016

Note: 1. All equipments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

5.2. Test Setup



5.3. Limits

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900MHz, 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

5.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.231

5.5. Uncertainty

± 150Hz

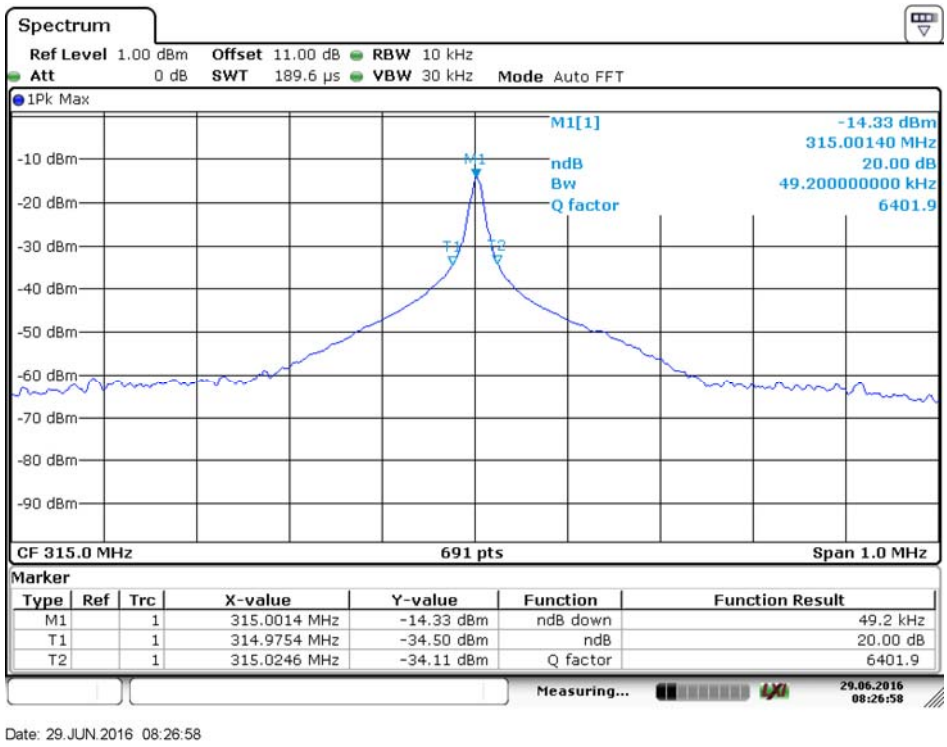
5.6. Test Result

Product	Radio Identification device		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2016/06/28	Test Site	No.3 OATS

Channel No.	Frequency (MHz)	Measurement Value (MHz)	Limit (MHz)	Result
1	315	0.049	0.7875	Pass

Note: Limit = 315MHz * 0.25%= 0.7875MHz

Figure Channel 1:



Attachment 1 : EUT Test Photographs

Attachment 2 : EUT Detailed Photographs