

# FCC Test Report

Product Name	Radio Identification Device
Model No.	FS12PM
FCC ID.	NBGFS12PM

Applicant	HELLA GmbH & Co. KGaA
Address	Rixbecker Strasse 75, 59552 Lippstadt, Germany

Date of Receipt	Dec. 18, 2017
Issued Date	Jan. 12, 2018
Report No.	17C0210R-RFUSP14V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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# Test Report


Issued Date: Jan. 12, 2018


Report No.: 17C0210R-RFUSP14V00



Product Name	Radio Identification Device
Applicant	HELLA GmbH & Co. KGaA
Address	Rixbecker Strasse 75, 59552 Lippstadt, Germany
Manufacturer	HELLA GmbH & Co. KGaA
Factory	1. HELLA GmbH & Co. KGaA 2. Hella Shanghai Electronics Co. Ltd (HSE)
Address	1. Römerstr. 66, 59075 Hamm 2. No. 411 Jianye Road, Pudong, Shanghai 201201, China
Model No.	FS12PM
FCC ID.	NBGFS12PM
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: 2016 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :   
 ( Senior Adm. Specialist / Joanne Lin )

Tested By :   
 ( Engineer / Nova Chu )

Approved By :   
 ( Director / Vincent Lin )

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

## 1. General Information

### 1.1. EUT Description

Product Name	Radio Identification Device
Trade Name	HELLA
Model No.	FS12PM
FCC ID	NBGFS12PM
Frequency Range	434.42 MHz
Number of Channels	1
Type of Modulation	OOK
Antenna Type	PCB loop antenna

Frequency of Each Channel:

Channel	Frequency
Channel 1:	434.42 MHz

Note:

1. The EUT is a Radio Identification Device with a built-in 434.42 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. This product has different enclosure (Metal / Plastic). DEKRA has initially checked both enclosure variants regarding the power value and found that the metal enclosure is the worst case. The test report considered the worst case variant (metal enclosure) to make sure the remaining test items.
5. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmitter
-----------	---------------------

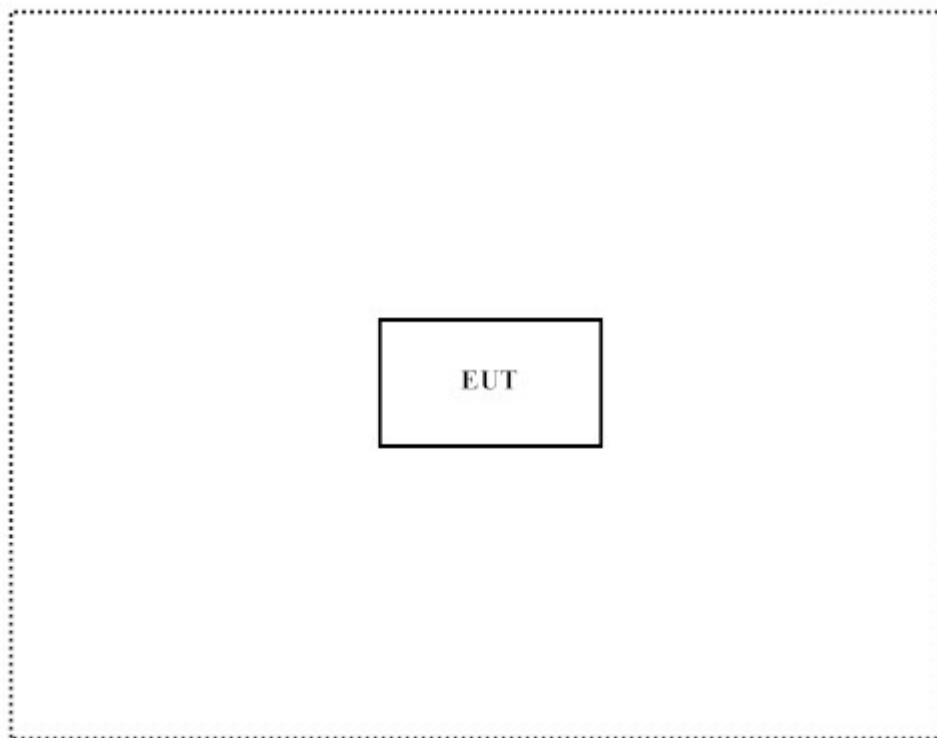
### 1.3. Tested System Details

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.	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	Push the button, start transmit continually.
3	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 DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: [http://www.dekra.com.tw/index\\_en.aspx](http://www.dekra.com.tw/index_en.aspx)

Site Description: Accredited by TAF  
Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd.  
Site Address: No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist.,  
New Taipei City 24457, Taiwan.  
TEL: 886-2-2602-7968 / FAX : 866-2-2602-3286  
E-Mail : [info.tw@dekra.com](mailto:info.tw@dekra.com)

FCC Accreditation Number: TW3023

## 1.7. List of Test Equipment

### For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
	EMI Test Receiver	R&S	ESR7	101602	2017.12.11	2018.12.10
	Two-Line V-Network	R&S	ENV216	101306	2017.02.16	2018.02.15
	Two-Line V-Network	R&S	ENV216	101307	2017.03.17	2018.03.16
	Coaxial Cable	Quietek	RG400_BNC	RF001	2017.05.24	2018.05.23

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

### For Conducted measurements /ASR4

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103465	2017.01.24	2018.01.23
	Power Meter	Anritsu	ML2496A	1548003	2017.12.11	2018.12.10
	Power Sensor	Anritsu	MA2411B	1531024	2017.12.11	2018.12.10
	Power Sensor	Anritsu	MA2411B	1531025	2017.12.11	2018.12.10

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek Conduction Test System V8.0.110

### For Radiated measurements /ACB1

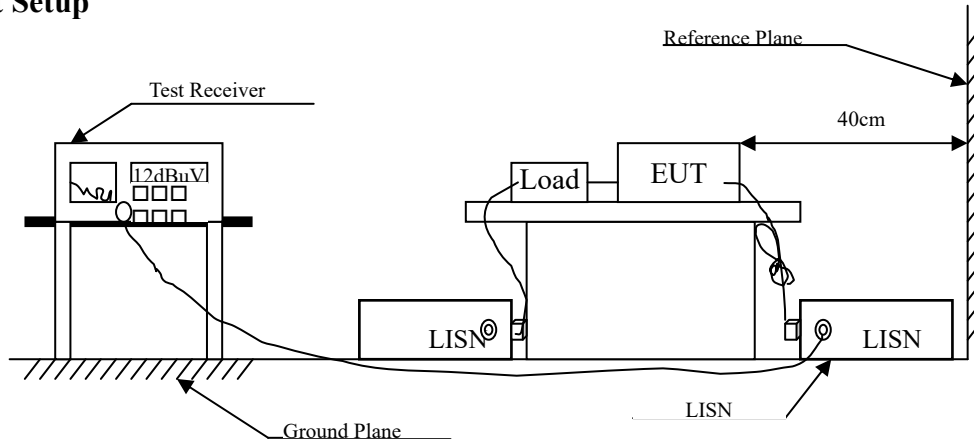
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	A.H.	SAS-562B	272	2016.03.18	2018.03.17
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-674	2017.02.13	2018.02.12
X	Horn Antenna	ETS-Lindgren	3117	00203800	2017.11.10	2018.11.09
	Horn Antenna	Com-Power	AH-840	101087	2017.05.24	2018.05.23
X	Pre-Amplifier	EMCI	EMC001330	980316	2017.05.16	2018.05.15
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2017.05.17	2018.05.16
	Pre-Amplifier	EMCI	EMC05820SE	980310	2017.05.17	2018.05.16
	Pre-Amplifier	EMCI	EMC184045SE	980314	2017.05.17	2018.05.16
	Filter	MICRO TRONICS	BRM50702	G251	2017.08.30	2018.08.29
	Filter	MICRO TRONICS	BRM50716	G188	2017.08.30	2018.08.29
X	EMI Test Receiver	R&S	ESR7	101602	2017.12.11	2018.12.10
X	Spectrum Analyzer	R&S	FSV40	101148	2017.01.24	2018.01.23
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2017.05.25	2018.05.24
	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2017.08.11	2018.08.10

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version : QuieTek EMI 2.0 V2.1.113

## 2. Conducted Emission

### 2.1. Test Setup



### 2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 Limits (dBuV)		
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.

### 2.3. Test Procedure

The EUT and Peripherals 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 refer 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 the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

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

### 2.4. Uncertainty

±2.35dB



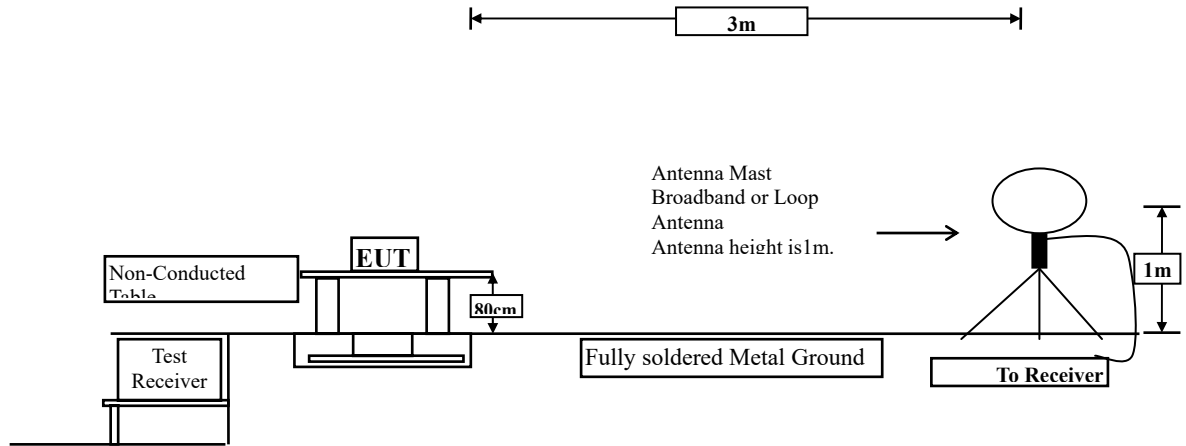
## 2.5. Test Result

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

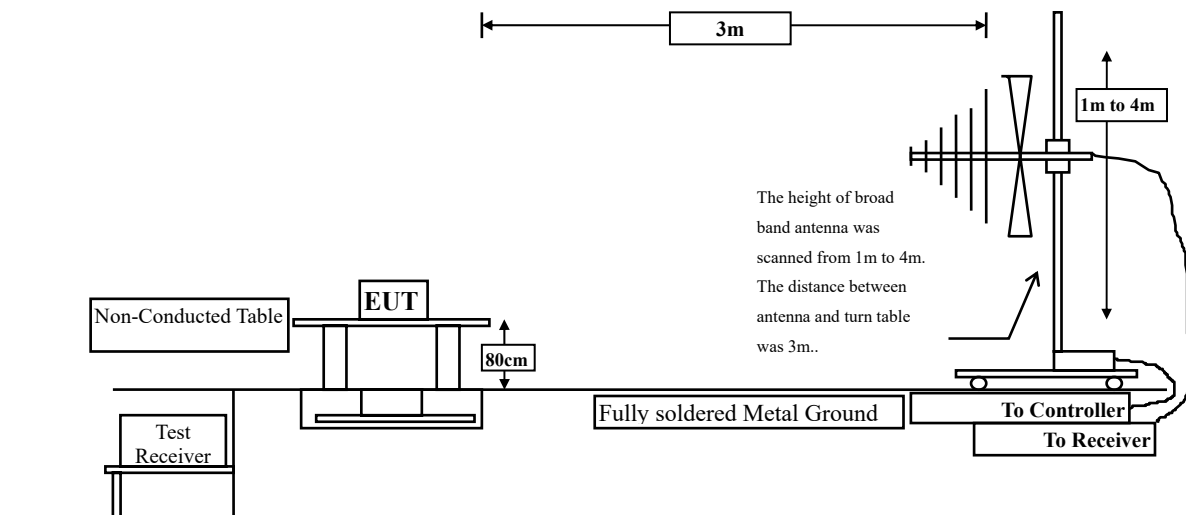
### 3. Radiated Emission

#### 3.1. Test Setup

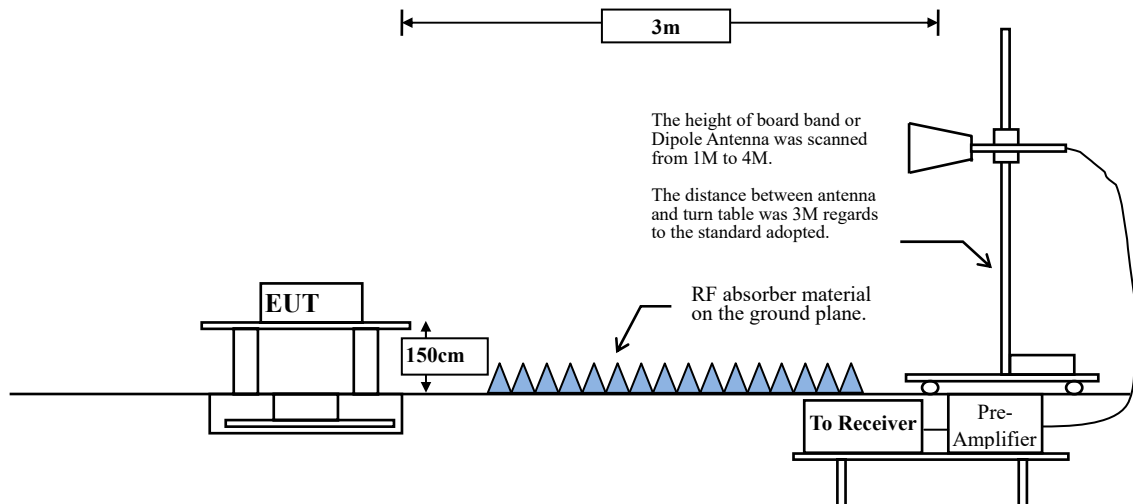
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



### 3.2. 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 (dBuV) = 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	dBuV/m	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	See Remark <sup>1</sup>	300
0.490-1.705	24000/F(kHz)	See Remark <sup>1</sup>	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 (dBuV) = 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.

### 3.3. 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 EUT was positioned such that the distance from antenna to the EUT was 3 meters.

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 an 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.

### 3.4. Uncertainty

Horizontal polarization :

30-300MHz:  $\pm 4.08$ dB ; 300M-1GHz:  $\pm 3.86$ dB ; 1-18GHz:  $\pm 3.77$ dB ; 18-40GHz:  $\pm 3.98$ dB

Vertical polarization :

30-300MHz:  $\pm 4.81$ dB ; 300M-1GHz:  $\pm 3.87$ dB ; 1-18GHz :  $\pm 3.83$ dB ; 18-40GHz:  $\pm 3.98$ dB

### 3.5. Test Result

Product	Radio Identification Device
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit (434.42MHz)
Date of Test	2018/01/10

#### Fundamental Power (X-Line)

##### Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

##### Horizontal

434.420	-6.532	90.900	84.369	-16.471	100.841
---------	--------	--------	--------	---------	---------

##### Vertical

434.420	-6.532	77.670	71.139	-29.701	100.841
---------	--------	--------	--------	---------	---------

##### Average Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

##### Horizontal

434.420	-6.532	81.900	75.369	-5.471	80.841
---------	--------	--------	--------	--------	--------

##### Vertical

434.420	-6.532	70.300	63.769	-17.071	80.841
---------	--------	--------	--------	---------	--------

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(11017.5145)=80.841 dBuV 、 Peak Limit=100.841 dBuV

Product	Radio Identification Device
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit (434.42MHz)
Date of Test	2018/01/10

### Fundamental Power (Y-Line)

#### Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

#### Horizontal

434.420	-6.532	85.510	78.979	-21.861	100.840
---------	--------	--------	--------	---------	---------

#### Vertical

434.420	-6.532	90.940	84.409	-16.431	100.840
---------	--------	--------	--------	---------	---------

#### Average Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

#### Horizontal

434.420	-6.532	75.600	69.069	-11.771	80.840
---------	--------	--------	--------	---------	--------

#### Vertical

434.420	-6.532	81.300	74.769	-6.071	80.840
---------	--------	--------	--------	--------	--------

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(11017.5145)=80.841 dBuV 、Peak Limit=100.841 dBuV

Product	Radio Identification Device
Test Item	Fundamental Radiated Emission
Test Mode	Mode 1: Transmit (434.42MHz)
Date of Test	2017/05/18

### Fundamental Power (Z-Line)

#### Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

#### Horizontal

434.420	-6.532	85.100	78.569	-22.271	100.840
---------	--------	--------	--------	---------	---------

#### Vertical

434.420	-6.532	91.240	84.709	-16.131	100.840
---------	--------	--------	--------	---------	---------

#### Average Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

#### Horizontal

434.420	-6.532	72.500	65.969	-14.871	80.840
---------	--------	--------	--------	---------	--------

#### Vertical

434.420	-6.532	81.900	75.369	-5.471	80.840
---------	--------	--------	--------	--------	--------

Note:

1. Measurement Level = Reading Level + Correct Factor
2. Average Limit=20log(11017.5145)=80.841 dBuV 、 Peak Limit=100.841 dBuV

Product	Radio Identification Device
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit (434.42MHz)
Date of Test	2017/12/30

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak</b>					
1303.260	-11.054	47.220	36.166	-37.834	74.000
1737.680	-8.910	51.200	42.290	-31.710	74.000
2172.100	-6.497	46.070	39.573	-34.427	74.000
2606.520	-5.610	47.200	41.590	-32.410	74.000
3040.940	-4.985	47.150	42.165	-31.835	74.000
3475.360	-4.850	47.090	42.240	-31.760	74.000
3909.780	-4.460	50.160	45.699	-28.301	74.000
4344.200	-3.413	48.040	44.628	-29.372	74.000
<b>Average</b>					
--					54.000

## 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.



Product	Radio Identification Device
Test Item	Harmonic Radiated Emission
Test Mode	Mode 1: Transmit (434.42MHz)
Date of Test	2017/12/30

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Vertical</b>					
<b>Peak</b>					
1303.260	-11.054	46.350	35.296	-38.704	74.000
1737.680	-8.910	49.220	40.310	-33.690	74.000
2172.100	-6.497	46.310	39.813	-34.187	74.000
2606.520	-5.610	46.520	40.910	-33.090	74.000
3040.940	-4.985	46.280	41.295	-32.705	74.000
3475.360	-4.850	47.420	42.570	-31.430	74.000
3909.780	-4.460	49.260	44.799	-29.201	74.000
4344.200	-3.413	46.290	42.878	-31.122	74.000
<b>Average</b>					
--					54.000

## Note:

- All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- Measurement Level = Reading Level + Correct Factor.
- Correct Factor = Antenna factor + Cable loss – Amplifier gain.
- The average measurement was not performed when the peak measured data under the limit of average detection.
- 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 (434.42MHz)
Date of Test	2017/12/27

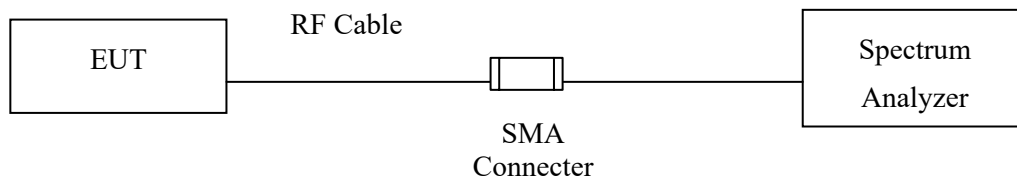
Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Quasi-Peak</b>					
145.275	-10.771	30.191	19.419	-24.081	43.500
406.754	-7.186	30.012	22.826	-23.174	46.000
544.522	-4.387	29.821	25.435	-20.565	46.000
707.594	-1.533	29.585	28.052	-17.948	46.000
869.261	0.561	34.943	35.505	-10.495	46.000
981.725	1.929	29.666	31.596	-22.404	54.000
<b>Vertical</b>					
<b>Quasi-Peak</b>					
153.710	-10.542	32.206	21.664	-21.836	43.500
257.739	-11.452	34.756	23.304	-22.696	46.000
396.913	-7.428	30.007	22.579	-23.421	46.000
538.899	-4.498	34.235	29.736	-16.264	46.000
744.145	-0.968	29.583	28.615	-17.385	46.000
869.261	0.561	32.367	32.929	-13.071	46.000

## Note:

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

## 4. Transmit time

### 4.1. Test Setup



### 4.2. 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.

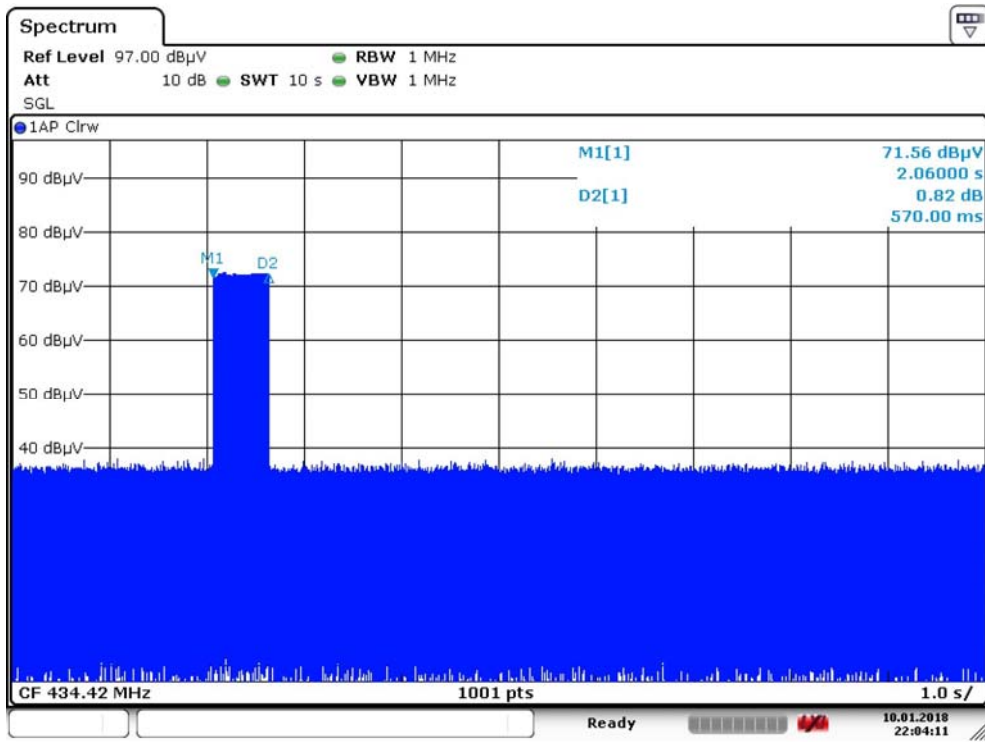
### 4.3. Uncertainty

$\pm 2.31\text{ms}$

#### 4.4. Test Result

Product            Radio Identification Device  
 Test Item         Transmit time  
 Test Mode        Mode 1: Transmit (433.47MHz)

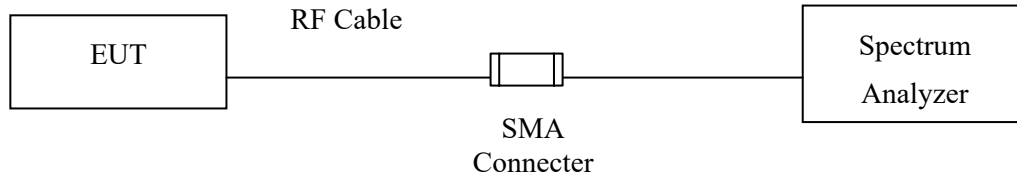
Channel No.	Frequency (MHz)	Measurement Value (Sec)	Limit (Sec)	Result
1	434.42	0.570	< 5	Pass



Date: 10. JAN. 2018 22:04:12

## 5. Occupied Bandwidth

### 5.1. Test Setup



### 5.2. 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

### 5.3. Uncertainty

$\pm 279.2\text{Hz}$

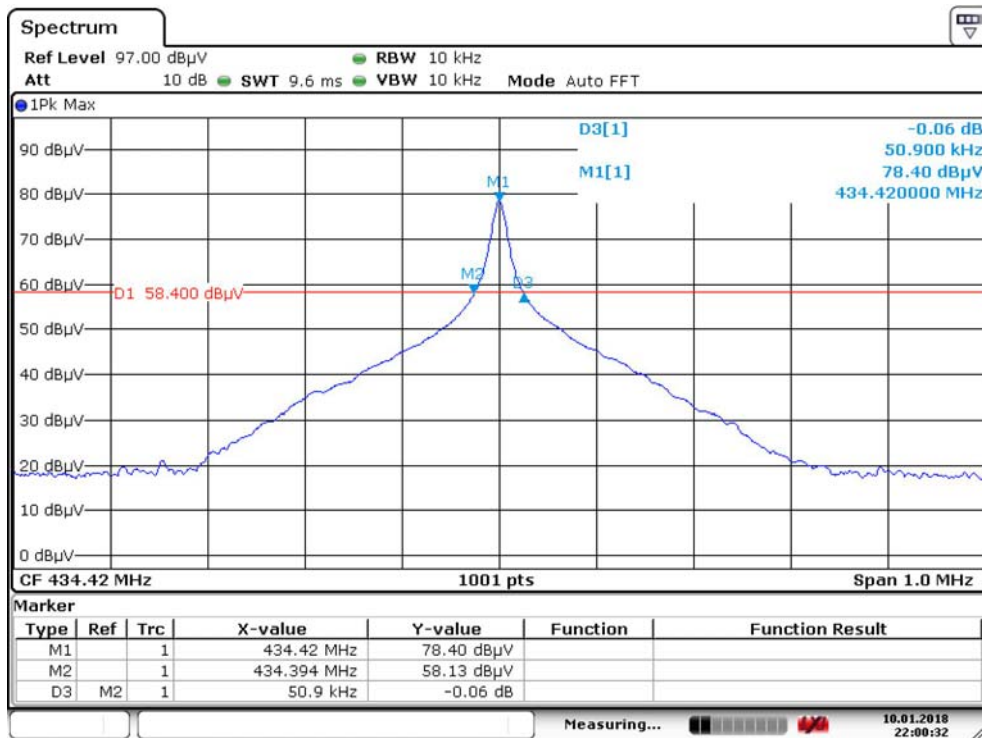
### 5.4. Test Result

Product            Radio Identification Device  
 Test Item        Occupied Bandwidth  
 Test Mode        Mode 1: Transmit (434.42MHz)

Channel No.	Frequency (MHz)	Measurement Value (MHz)	Limit (MHz)	Result
1	434.42	0.0509	1.08605	Pass

**Note: Limit = 434.42MHz \* 0.25%= 1.08605MHz**

**Figure Channel 1:**



Date: 10.JAN.2018 22:00:31