

FCC Test Report

Product Name : RF HUB Module
Trade Name : Strattec
Model No. : FI2-TR433UDA
FCC ID. : OHT-0071TR

Applicant : STRATTEC SECURITY CORPORATION
Address : 3333 West Good Hope Road Milwaukee, WI
53209 United States of America

Date of Receipt : Aug. 30, 2017
Issued Date : Sep. 26, 2017
Report No. : 1780549R-RFUSP20V00
Report Version : V2.0



The declaration results relate only to the samples calculated.

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Test Report Certification

Issued Date : Sep. 26, 2017
Report No. : 1780549R-RFUSP20V00



Product Name : RF HUB Module
Applicant : STRATTEC SECURITY CORPORATION
Address : 3333 West Good Hope Road Milwaukee, WI 53209 United States of America
Manufacturer : STRATTEC SECURITY CORPORATION
Model No. : FI2-TR433UDA
FCC ID. : OHT-0071TR
EUT Voltage : DC 12V
Testing Voltage : DC 12V
Trade Name : Strattec
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C 15.209: 2016
ANSI C63.4: 2009
Test Lab : Hsin Chu Laboratory
Address : No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan, R.O.C.
TEL: +886-3-582-8001 / FAX: +886-3-582-8958
Test Result : Complied

Documented By :



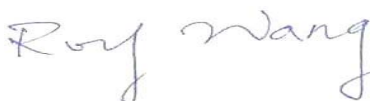
(Carol Tsai / Engineering Adm. Assistant)

Tested By :



(Scott Chang / Engineer)

Approved By :



(Roy Wang / Director)

Revision History

Report No.	Version	Description	Issued Date
1780549R-RFUSP20V00	V2.0	Initial issue of report	Sep. 26, 2017

Laboratory Information

We, **DEKRA Testing and Certification Co., Ltd.**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C.	:	TAF, Accreditation Number: 3024
USA	:	FCC, Registration Number: 0007939127
Canada	:	IC, Submission No: 181665 / IC Registration Number: 22397-1 / 22397-2 / 22397-3

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

If you have any comments, Please don't hesitate to contact us. Our test sites as below:

- 1 No. 75-2, 3rd Lin, WangYe Keng, Yonghxing Tsuen, Qionglin Shiang, Hsinchu County 307, Taiwan (R.O.C.)
TEL:+886-3-592-8858 / FAX:+886-3-592-8859 E-Mail : info.tw@dekra.com
- 2 No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan, R.O.C.
TEL: +886-3-582-8001 / FAX: +886-3-582-8958 E-Mail : info.tw@dekra.com
- 3 No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan, R.O.C.
TEL: +886-3-582-8001 / FAX: +886-3-582-8958 E-Mail : info.tw@dekra.com

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	RF HUB Module
Trade Name	Strattec
Model No.	FI2-TR433UDA
FCC ID	OHT-0071TR
Frequency Range	125 kHz
Channel Number	1

Frequency of Each Channel	
Channel	Frequency
1	125 kHz

Note:

1. This device is a RF HUB Module device included a 125 kHz transmitting function.
2. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.209.

1.2. Test Mode

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Pre-Test Mode	
TX	Mode 1: Transmit
Final Test Mode	
TX	Mode 1: Transmit

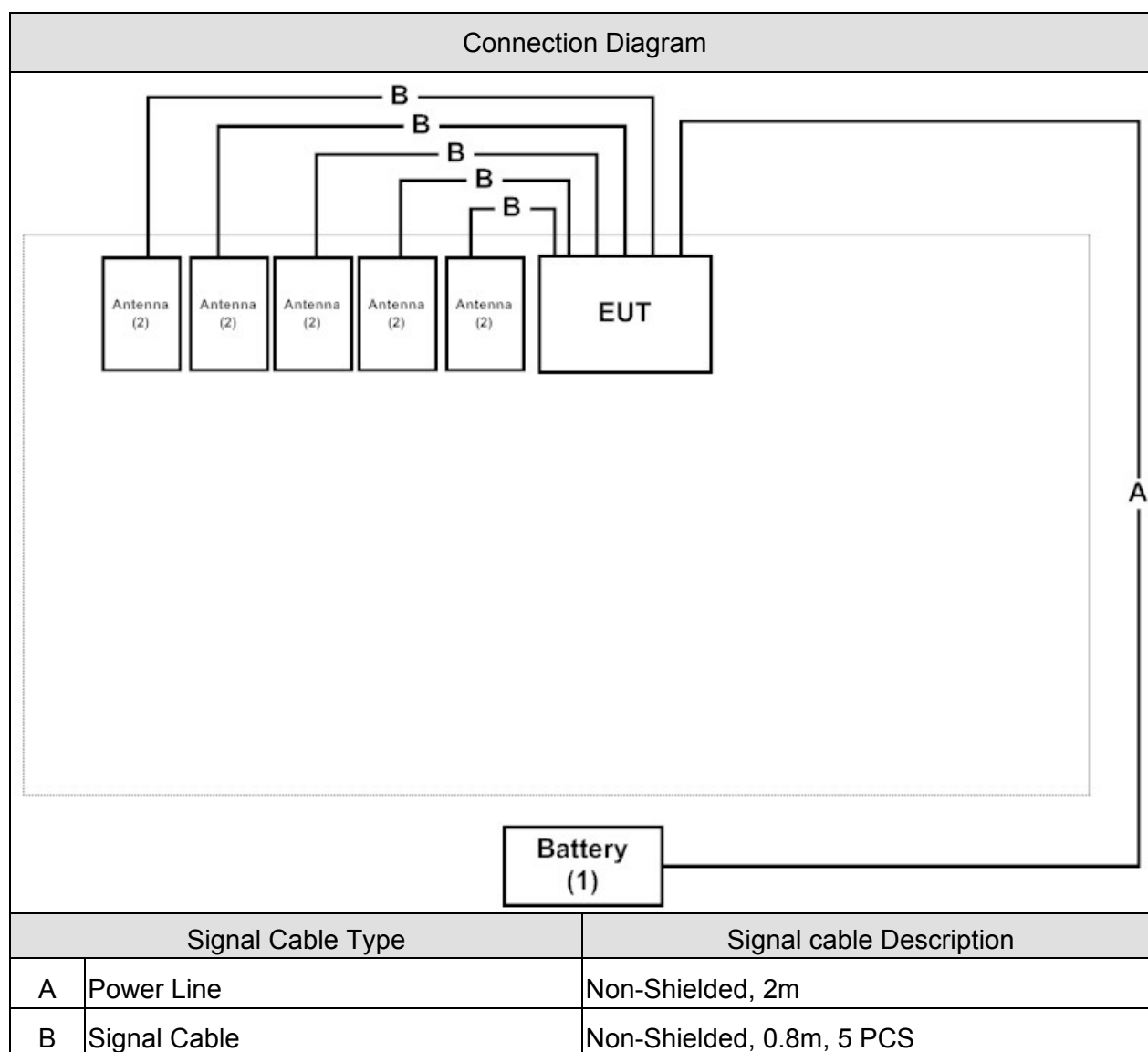
Emission	
Performed Item	Test
Conducted Emission	No
Radiated Emission	Yes
Occupied Bandwidth	Yes

1.3. Tested System Details

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

Product	Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
1 Battery	YUASA	NP7-12	N/A	DoC	--
2 Antenna*5	STRATTEC	5931812AA	N/A	DoC	--

1.4. Configuration of tested System



1.5. EUT Exercise Software

1	Setup the EUT and simulators as shown on 1.4.
2	Turn on the power.
3	The RF signal's status will continue transmit through EUT(TX).
4	Repeat the above procedure (3)

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual	Test Site
Temperature (°C)	FCC PART 15 15.209 Conducted Emission	15 - 35	25	--
Humidity (%RH)		25 - 75	45	
Barometric pressure (mbar)		860 - 1060	950-1000	
Temperature (°C)	FCC PART 15 15.209 Radiated Emission	15 -35	25	2
Humidity (%RH)		25 - 75	45	
Barometric pressure (mbar)		860 - 1060	950-1000	
Temperature (°C)	FCC PART 15 15.209 Occupied Bandwidth	15 -35	25	3
Humidity (%RH)		25 - 75	45	
Barometric pressure (mbar)		860 - 1060	950-1000	

Note: Test site information refers to Laboratory Information.

2. Conducted Emission

2.1. Test Equipment

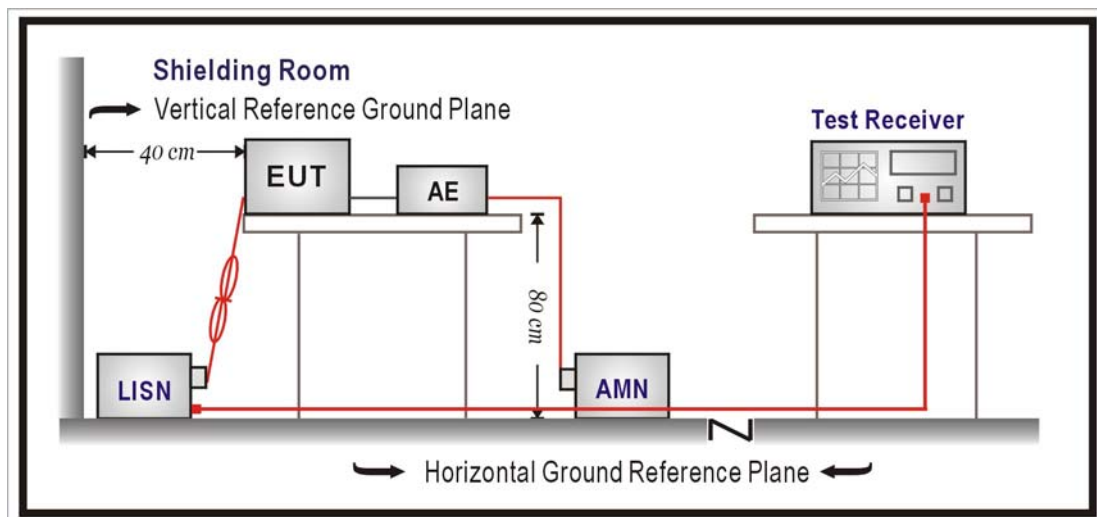
The following test equipment's are used during the test:

Conducted Emission /SR2-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Artificial Mains Network	R&S	ENV4200	848411/010	2017/02/06	2018/02/05
Test Receiver	R&S	ESCS 30	836858/022	2017/04/12	2018/04/11
LISN	R&S	ENV216	100092	2017/07/31	2018/07/30

Note: All equipment that need to calibrate are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.209 Limits		
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 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 of the interface cables must be changed according to ANSI C63.10: 2013 on conducted measurement.

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

2.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.209: 2016

2.6. Uncertainty

The measurement uncertainty is defined as ± 2.26 dB.

2.7. Test Result

EUT using DC input voltage, so the project does not have to test for testing.

3. Radiated Emission

3.1. Test Equipment

The following test equipments are used during the test:

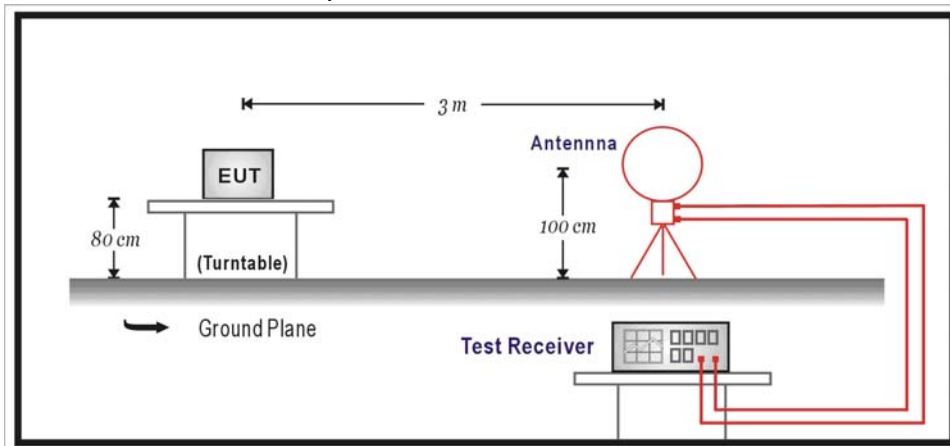
Radiated Emission /CB4-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
Signal Analyzer	R&S	FSVA40	101455	2016/11/28	2017/11/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/23	2018/01/22
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2017/03/13	2018/03/12
Bilog Antenna	Teseq	CBL6112D	23191	2017/06/28	2018/06/27
Horn Antenna	Schwarzbeck	BBHA 9120D	639	2017/06/14	2018/06/13
Horn Antenna	Schwarzbeck	BBHA 9170	202	2017/02/15	2018/02/14
Pre-Amplifier	RF Bay Inc.	LNA-1330	12162511	2017/03/09	2018/03/08
Pre-Amplifier	EMCI	EMCI 1830I	980366	2017/01/23	2018/01/22
Pre-Amplifier	MITEQ	JS44-45-8P	2014754	2016/12/26	2017/12/25

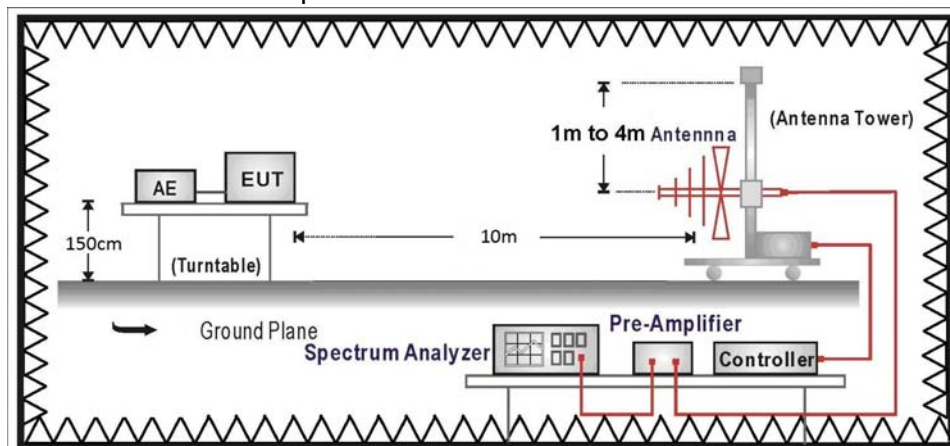
Note: 1. All equipment that need to calibrate are with calibration period of 1 year.

3.2. Test Setup

Under 30 MHz Test Setup:



Under 1GHz Test Setup:



3.3. 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 ¹	300
0.490-1.705	24000/F(kHz)	See Remark ¹	30
1.705-30	30	29.54	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.
 4. When the very low emission of EUT, the 3m measurement distance was performed. Regards to an inverse linear extrapolation 40dB/dec is adopted.

3.4. Test Procedure

Under 30 MHz Test:

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum electric field strength. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna which is 1.0 meter above ground. All X-axis, Y-axis and Z-axis polarization of the antenna are set on measurement.

The emission limit 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 limit in these three bands are based on measurements employing an average detector.

Under 1GHz Test:

The EUT and its simulators are placed on a turn table which is 0.8 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. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

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 C63.4: 2013 on radiated measurement.

On any frequency 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 below 30 MHz setting on the field strength meter is 9 kHz and above 30 MHz is 120 kHz.

3.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.209: 2016

3.6. Test Result

Product	RF HUB Module				
Test Item	Fundamental				
Test Mode	Mode 1: Transmit				
Date of Test	2017/09/01	Test Site	CB4-H		

Fundamental

Position 1

Frequency: 125 kHz					
Test Conditions	Frequency (kHz)	Reading Level (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m) @3m	Margin (dB)
X-axis	125	84.300	104.25	105.666	-1.416
Y-axis	125	64.800	84.75	105.666	-20.916
Z-axis	125	81.100	101.05	105.666	-4.616

$$\text{Emission Level (dB}\mu\text{V/m)} = \text{Reading Level (dB}\mu\text{V)} + \text{AF}_E$$

Position 2

Frequency: 125 kHz					
Test Conditions	Frequency (kHz)	Reading Level (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m)@3m	Margin (dB)
X-axis	125	79.500	99.450	105.666	-6.216
Y-axis	125	52.100	72.050	105.666	-33.616
Z-axis	125	80.800	100.750	105.666	-4.916

$$\text{Emission Level (dB}\mu\text{V/m)} = \text{Reading Level (dB}\mu\text{V)} + \text{AF}_E$$

Position 3

Frequency: 125 kHz					
Test Conditions	Frequency (kHz)	Reading Level (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m) @3m	Margin (dB)
X-axis	125	79.300	99.250	105.666	-6.416
Y-axis	125	81.300	101.250	105.666	-4.416
Z-axis	125	76.600	96.550	105.666	-9.116

$$\text{Emission Level (dB}\mu\text{V/m)} = \text{Reading Level (dB}\mu\text{V)} + \text{AF}_E$$

Product	RF HUB Module		
Test Item	Radiated Emission		
Test Mode	Mode 1: Transmit		
Date of Test	2017/09/01	2017/09/01	2017/09/01

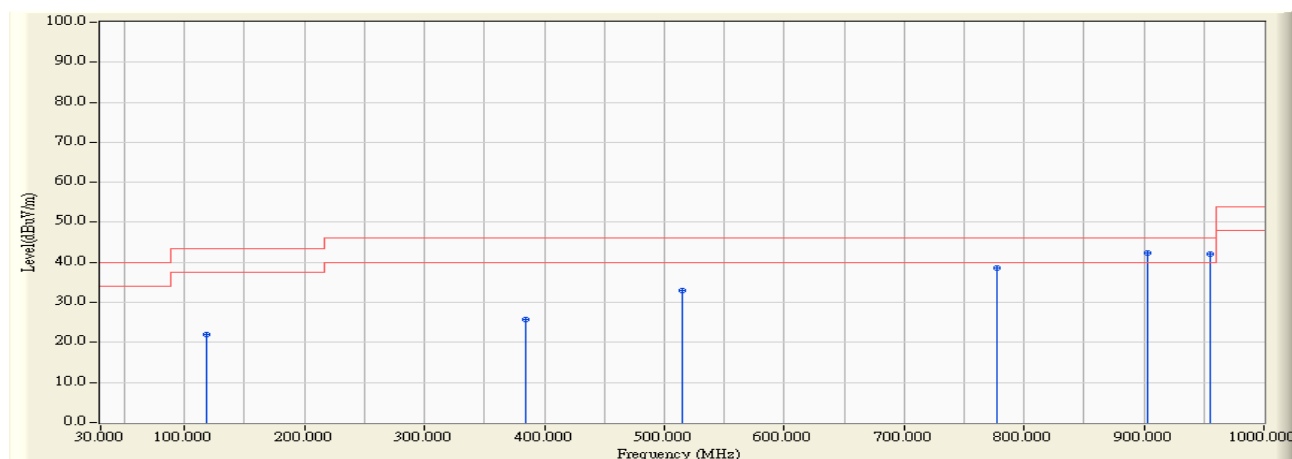
Spurious Emission (<30 MHz)

Frequency (MHz)	Reading Level (dBuV)	Emission Level (dBuV/m)	Limit (dBuV/m) @3m	Margin (dB)
0.251	42.800	62.750	99.611	-36.861
0.376	43.700	63.650	96.100	-32.450
0.501	25.100	45.050	73.604	-28.554
0.626	21.500	41.450	71.673	-30.223
8.014	15.030	34.980	69.542	-34.562
15.817	14.060	34.010	69.542	-35.532

$$\text{Emission Level (dB}\mu\text{V/m)} = \text{Reading Level (dB}\mu\text{V)} + \text{AF}_E$$

Spurious Emission (30 MHz – 1GHz):

Site : CB4-H	Time : 2017/09/05
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB4_FCC_EFS_S2_30M-1GHz_1116 - HORIZONTAL	Power : DC 12V
EUT : RF HUB Module	Note : 125 kHz

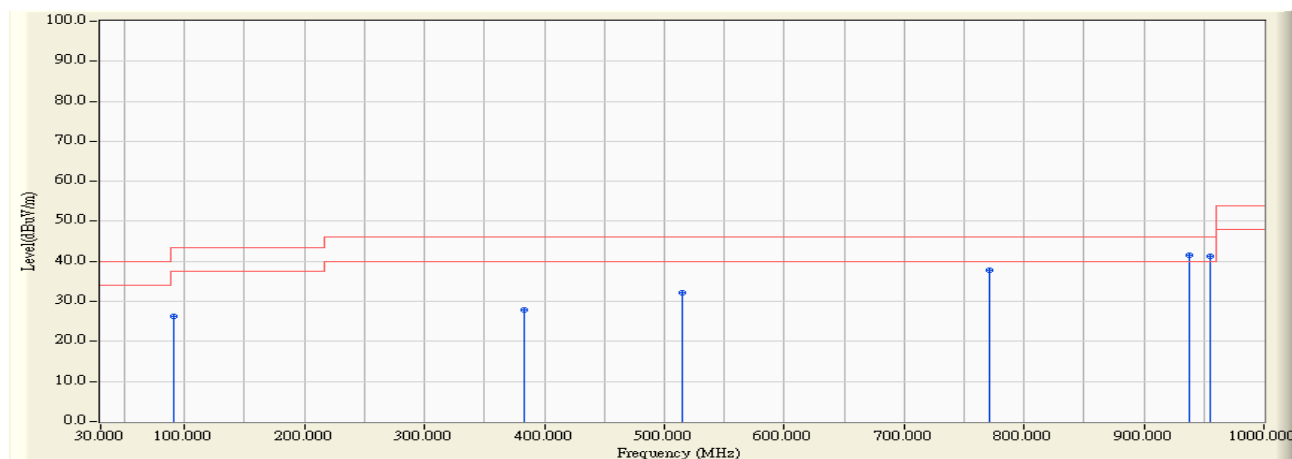


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		118.755	-20.494	42.344	21.850	-21.650	43.500	QUASIPeAK
2		384.050	-16.792	42.413	25.621	-20.379	46.000	QUASIPeAK
3		515.485	-14.206	47.119	32.913	-13.087	46.000	QUASIPeAK
4		777.385	-11.216	49.908	38.692	-7.308	46.000	QUASIPeAK
5	*	903.485	-9.662	51.956	42.294	-3.706	46.000	QUASIPeAK
6		954.895	-8.940	51.032	42.092	-3.908	46.000	QUASIPeAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB4-H	Time : 2017/09/05
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB4_FCC_EFS_S2_30M-1GHz_1116 - VERTICAL	Power : DC 12V
EUT : RF HUB Module	Note : 125 kHz



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		90.625	-25.474	51.757	26.283	-17.217	43.500	QUASIPeAK
2		383.565	-16.764	44.719	27.955	-18.045	46.000	QUASIPeAK
3		515.485	-14.206	46.494	32.288	-13.712	46.000	QUASIPeAK
4		771.565	-11.191	49.034	37.843	-8.157	46.000	QUASIPeAK
5	*	937.920	-9.198	50.652	41.454	-4.546	46.000	QUASIPeAK
6		954.895	-8.940	50.187	41.247	-4.753	46.000	QUASIPeAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

4. Occupied Bandwidth

4.1. Test Equipment

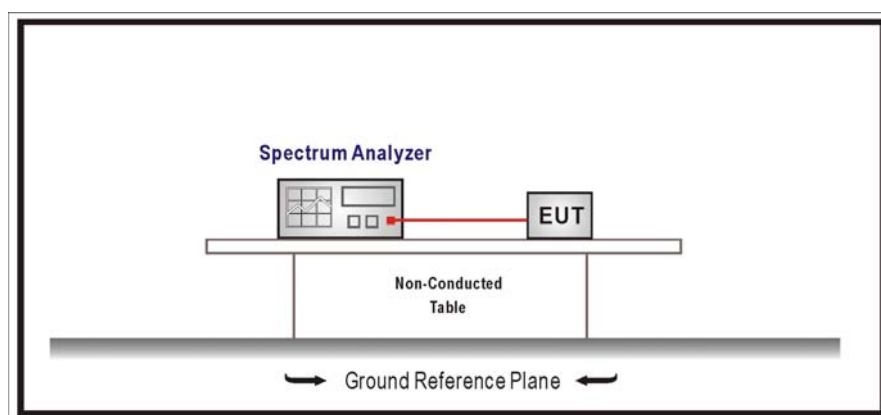
The following test equipment is used during the test:

Occupied Bandwidth / SR10-H

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Signal & Spectrum Analyzer	R&S	FSV40	101049	2018/01/22
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2018/03/12
High Speed Peak Power Meter Dual Input	Anritsu	ML2496A	1602004	2018/01/19
Pulse Power Sensor	Anritsu	MA2411B	1531043	2018/01/19
Pulse Power Sensor	Anritsu	MA2411B	1531044	2018/01/19

Note: All equipment that need to calibrate are with calibration period of 1 year.

4.2. Test Setup



4.3. Test Procedures

For 99% occupied Bandwidth, use the occupied bandwidth measurement function with the band set equal to 99% emission bandwidth.

4.4. Limits

The transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

4.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.209: 2016

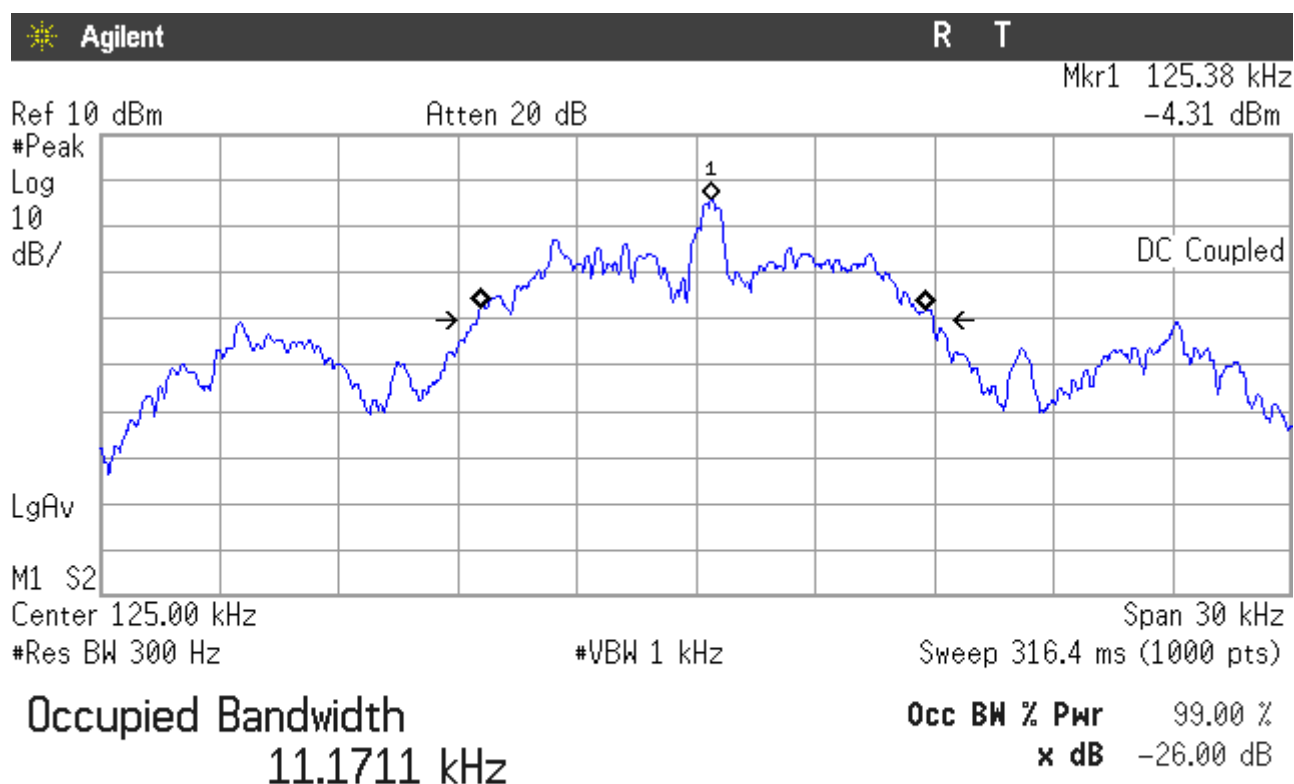
4.6. Uncertainty

The measurement uncertainty is defined as $\pm 150\text{Hz}$

4.7. Test Result

Product	RF HUB Module		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2017/09/25	Test Site	SR10-H

Frequency (kHz)	Measure Level (kHz)	Limit (kHz)	Result
125	11.1711	--	Pass



Transmit Freq Error 159.334 Hz
x dB Bandwidth 11.482 kHz

Attachment 1

➤ Test Setup Photograph

<Radiated Emission>

Test Mode : Mode 1: Transmit

Description : Front View of Radiated Emission (Under 30M)



Test Mode : Mode 1: Transmit

Description : Back View of Radiated Emission (Under 30M)



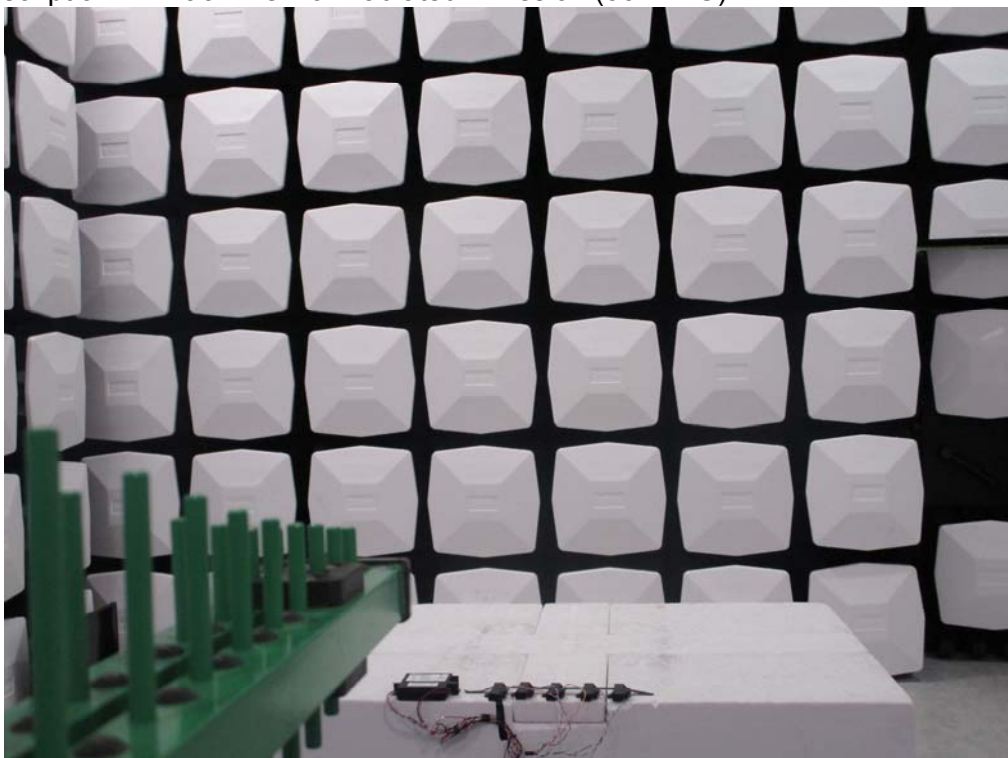
Test Mode : Mode 1: Transmit

Description : Front View of Radiated Emission (30M~1G)



Test Mode : Mode 1: Transmit

Description : Back View of Radiated Emission (30M~1G)



Attachment 2

➤ EUT External Photograph

(1) EUT Photo



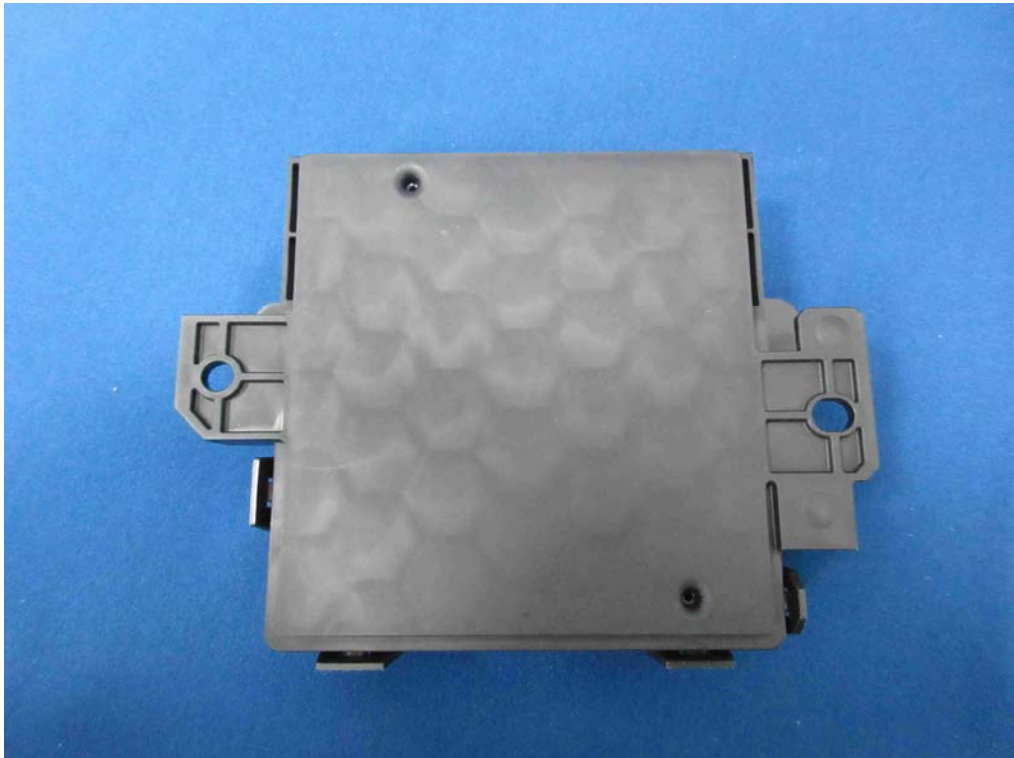
(2) EUT Photo



(3) EUT Photo



(4) EUT Photo



(5) EUT Photo



(6) EUT Photo



(7) EUT Photo



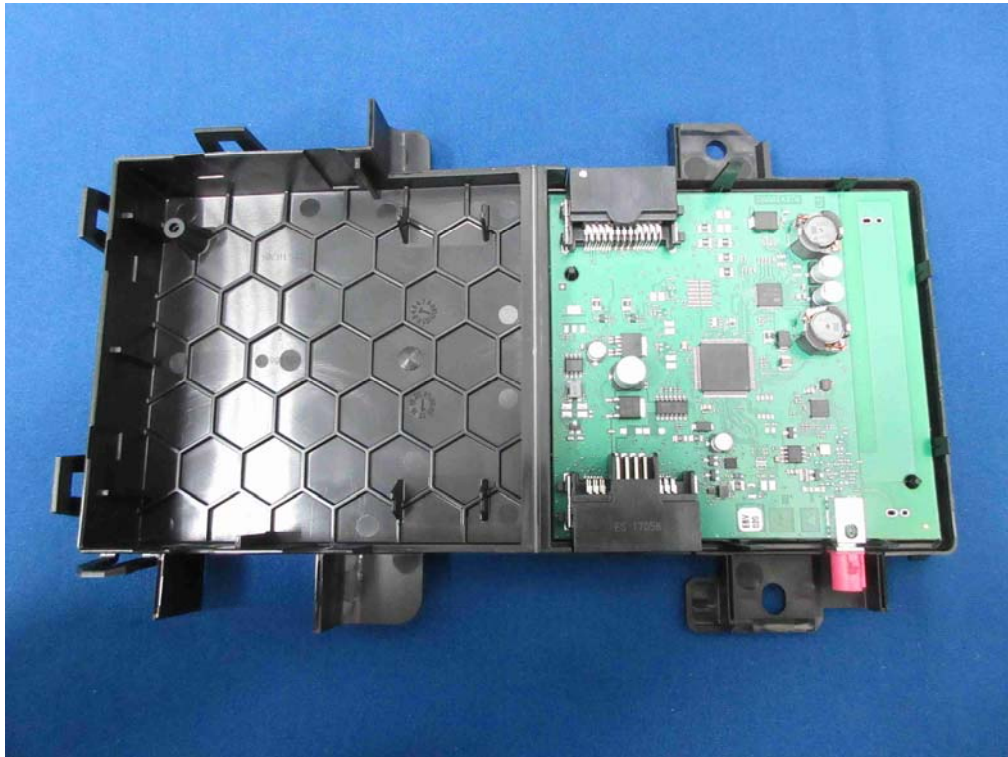
(8) EUT Photo



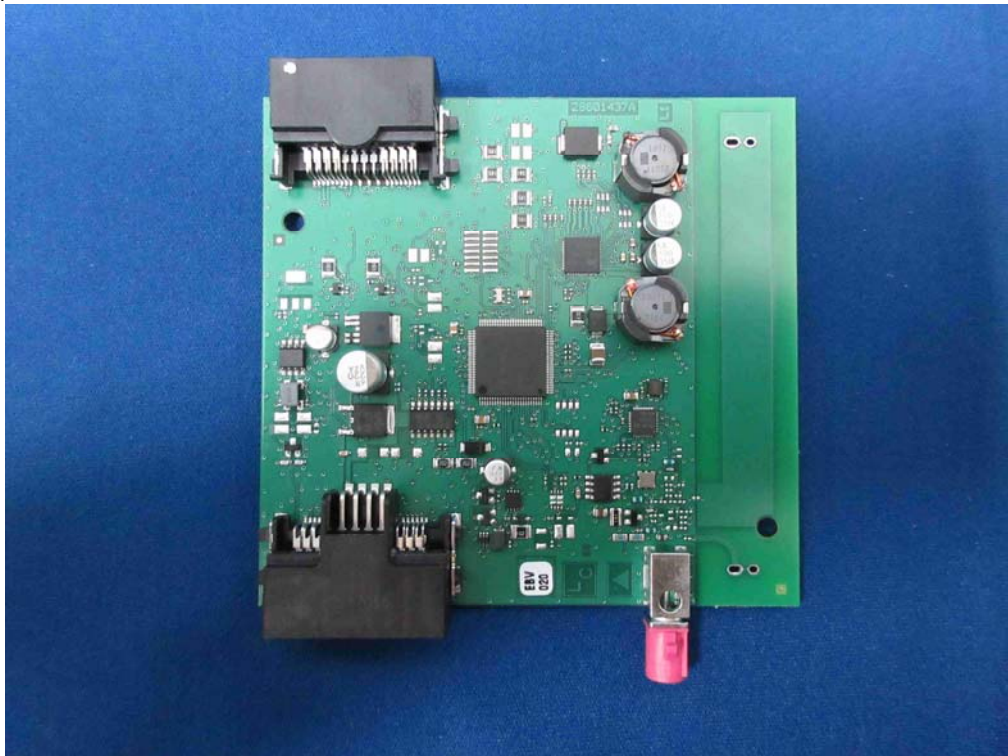
Attachment 3

➤ EUT Internal Photograph

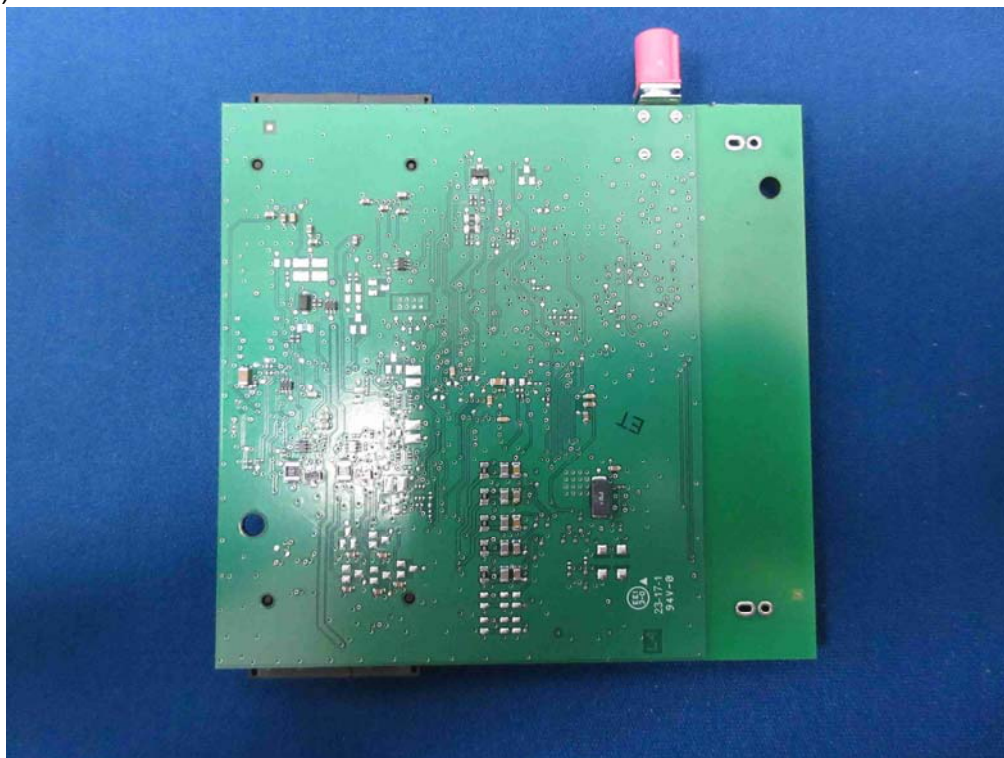
(1) EUT Photo



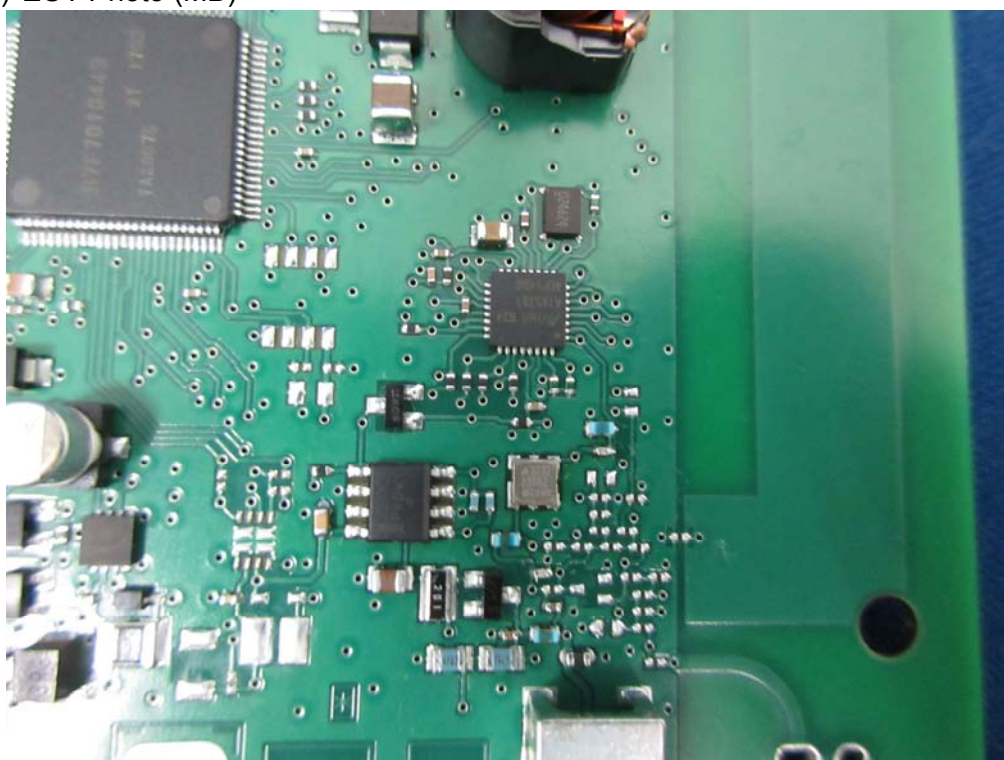
(2) EUT Photo



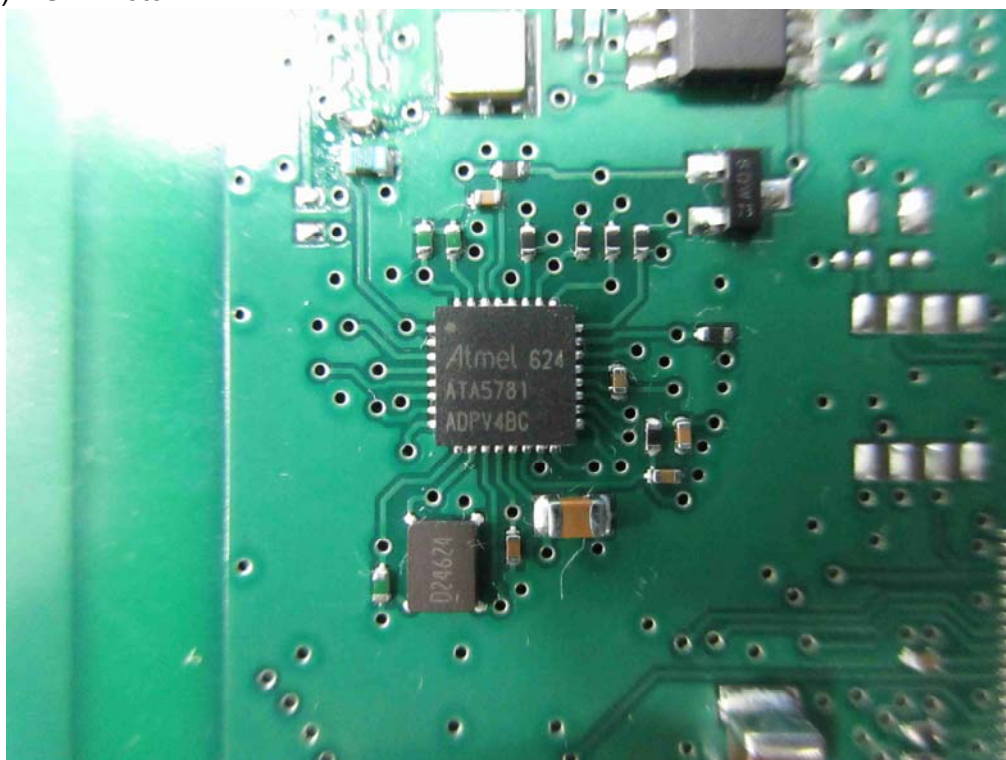
(3) EUT Photo



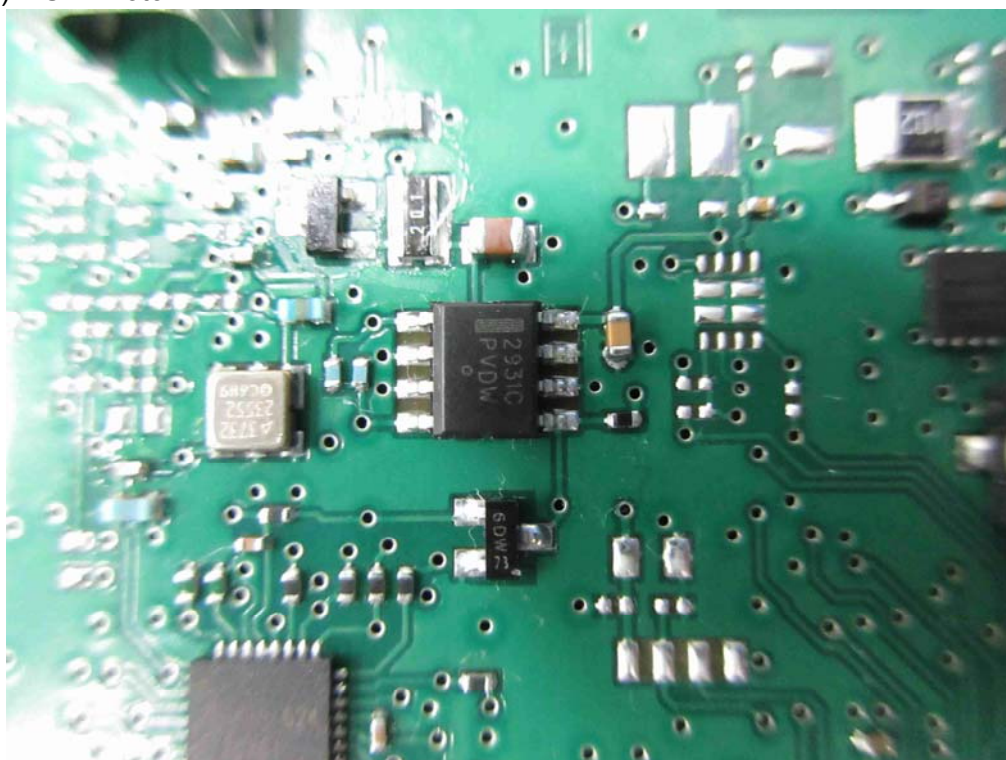
(4) EUT Photo (MB)



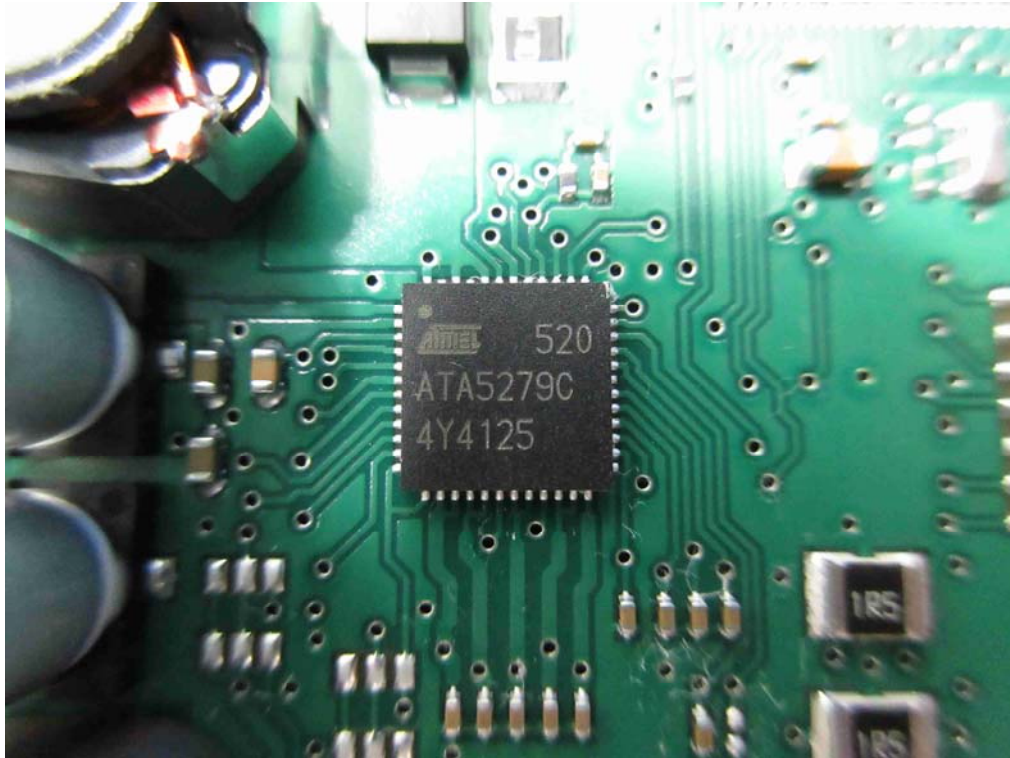
(5) EUT Photo



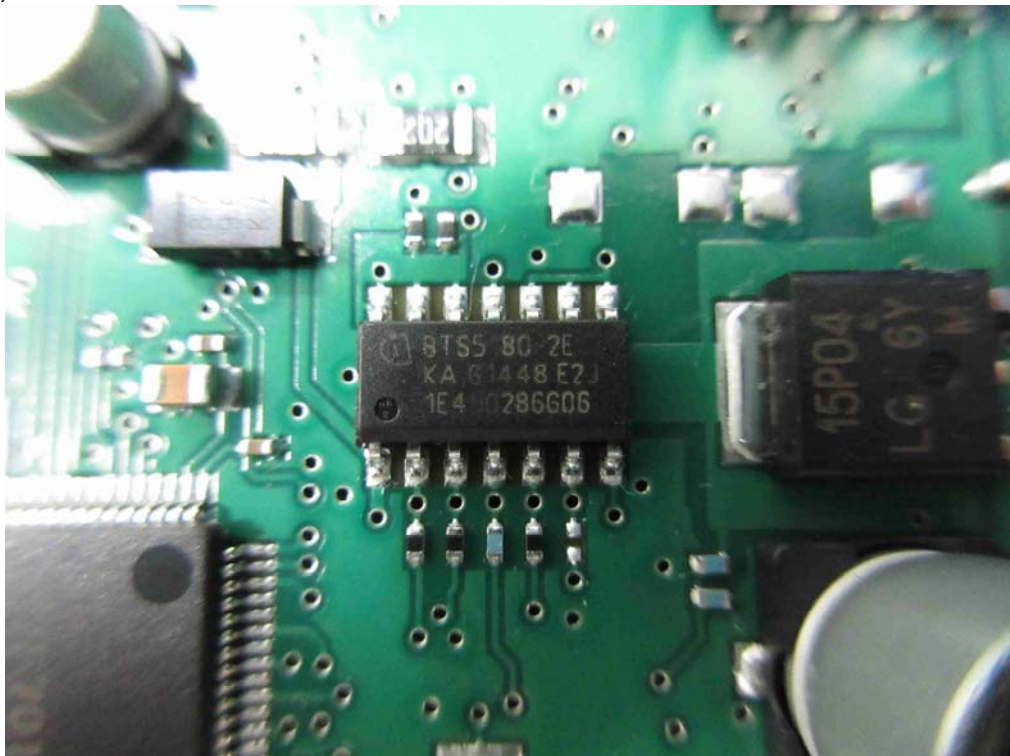
(6) EUT Photo



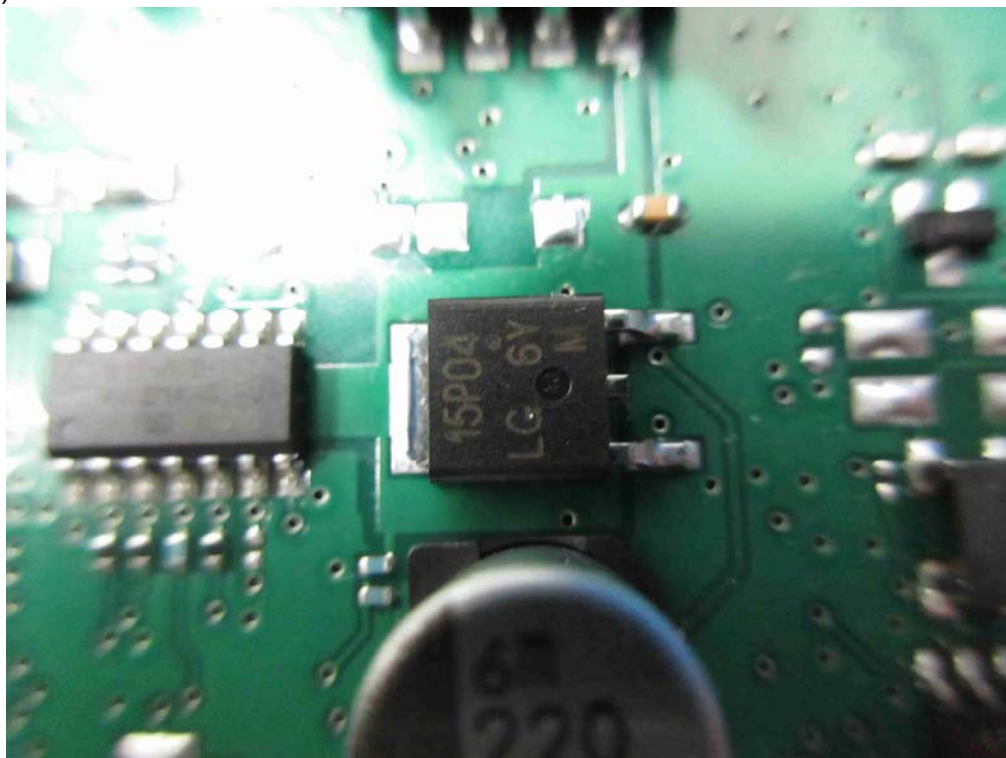
(7) EUT Photo



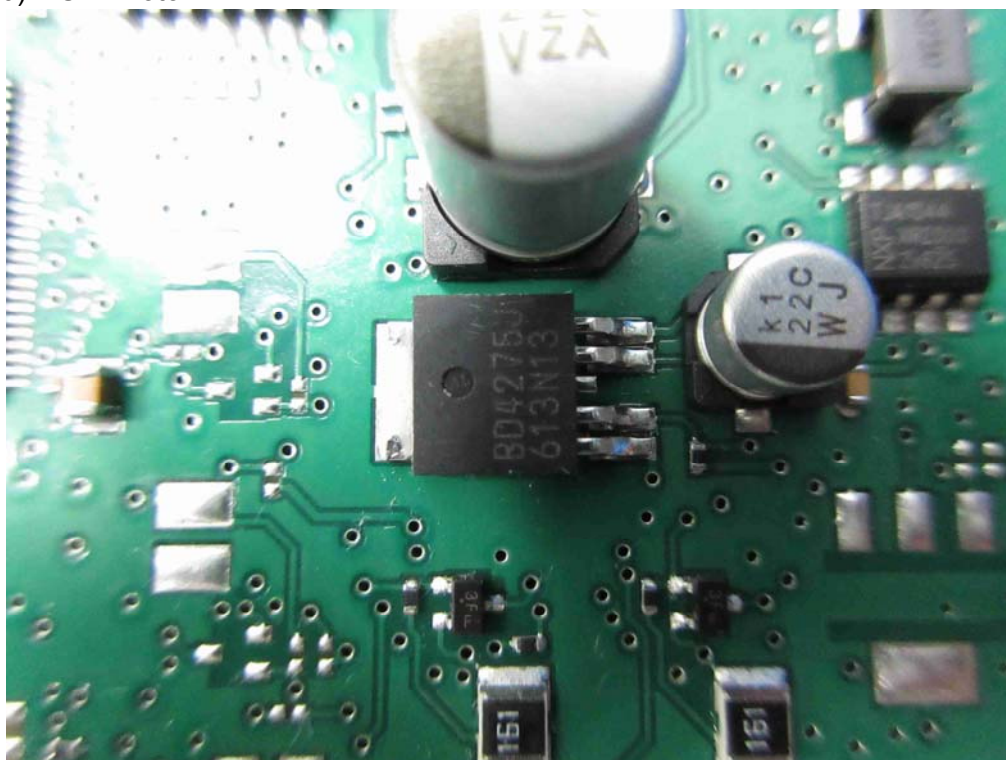
(8) EUT Photo



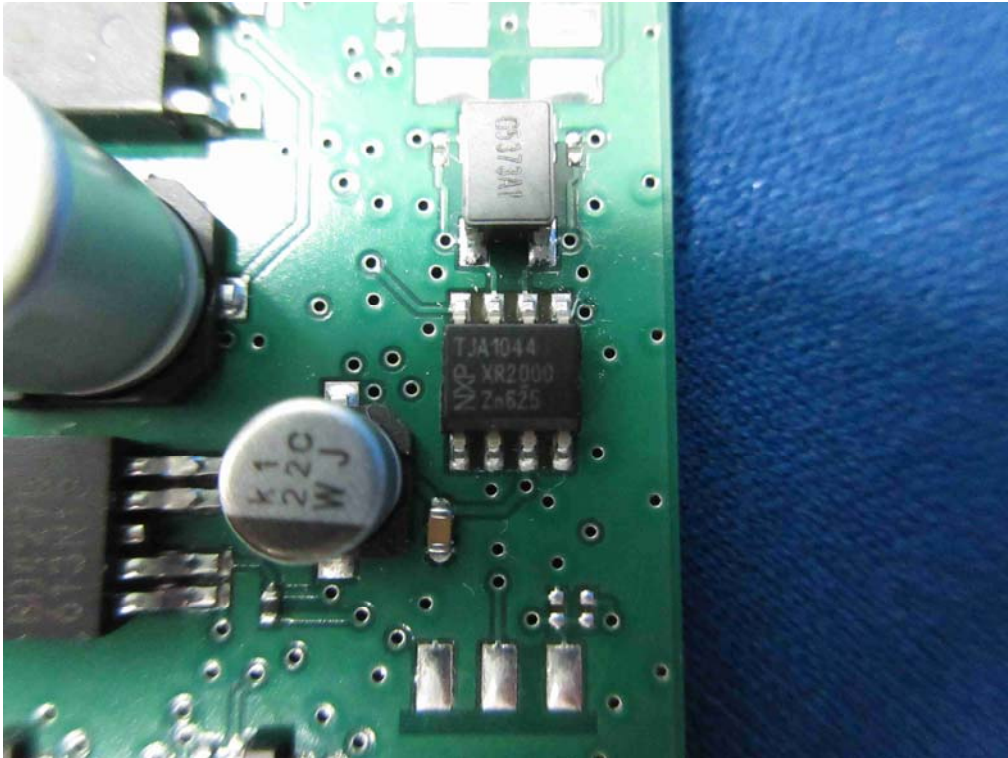
(9) EUT Photo



(10) EUT Photo



(11) EUT Photo



(12) EUT Photo

