APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
findbox GmbH

SmartESL
Model No.: 210005, 220001, 220002, 220003, 220004, 220005, 220006, 220007

FCC ID: 2AJDH-210005

Prepared for	:	findbox GmbH
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Report No.	:	ATE20161073
Date of Test	:	May 31-June 1, 2016
Date of Report	:	July 10, 2016

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Description Page

Test Report Certification

Applicant	:	findbox GmbH
Manufacturer	:	findbox GmbH
EUT Description	:	SmartESL
Model No.	:	210005, 220001, 220002, 220003, 220004, 220005, 220006, 220007
Trade Mark	:	CROSLEY

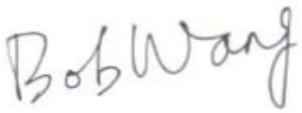
Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247: 2015
ANSI C63.10: 2013

The device described above is tested by ACCURATE TECHNOLOGY CO. LTD to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and ACCURATE TECHNOLOGY CO. LTD is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of ACCURATE TECHNOLOGY CO. LTD.

Date of Test : May 31-June 1, 2016
Date of Report: July 10, 2016

Prepared by : 
(Bob Wang, Engineer)

Approved & Authorized Signer : 
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1.Description of Device (EUT)

EUT	:	SmartESL
Model Number	:	210005, 220001, 220002, 220003, 220004, 220005, 220006, 220007 (Note: Above models are identical in schematic, structure and critical components except for model name and size. So we prepare 210005 for test only.)
Trade Mark	:	N/A
Frequency Range	:	902.5MHz-927.5MHz
Number of Channels	:	101
Antenna Gain	:	0dBi
Antenna type	:	Integral Antenna
Power Supply	:	DC 3V
Modulation mode	:	FSK
Applicant	:	findbox GmbH
Address	:	Bundesstrasse 16, Ettenheim 77955, Baden-Wuerttemberg, Germany
Manufacuter	:	findbox GmbH
Address	:	Bundesstrasse 16, Ettenheim 77955, Baden-Wuerttemberg, Germany
Date of sample received	:	May 30, 2016
Date of Test	:	May 31-June 1, 2016

1.2.Accessory and Auxiliary Equipment

N/A

1.3.Carrier Frequency of Channels

Channel	Freq (Mhz)	Channel	Freq (Mhz)	Channel	Freq (Mhz)
		34	910,750	68	919,250
1	902,500	35	911,000	69	919,500
2	902,750	36	911,250	70	919,750
3	903,000	37	911,500	71	920,000
4	903,250	38	911,750	72	920,250
5	903,500	39	912,000	73	920,500
6	903,750	40	912,250	74	920,750
7	904,000	41	912,500	75	921,000
8	904,250	42	912,750	76	921,250
9	904,500	43	913,000	77	921,500
10	904,750	44	913,250	78	921,750
11	905,000	45	913,500	79	922,000
12	905,250	46	913,750	80	922,250
13	905,500	47	914,000	81	922,500
14	905,750	48	914,250	82	922,750
15	906,000	49	914,500	83	923,000
16	906,250	50	914,750	84	923,250
17	906,500	51	915,000	85	923,500
18	906,750	52	915,250	86	923,750
19	907,000	53	915,500	87	924,000
20	907,250	54	915,750	88	924,250
21	907,500	55	916,000	89	924,500
22	907,750	56	916,250	90	924,750
23	908,000	57	916,500	91	925,000
24	908,250	58	916,750	92	925,250
25	908,500	59	917,000	93	925,500
26	908,750	60	917,250	94	925,750
27	909,000	61	917,500	95	926,000
28	909,250	62	917,750	96	926,250
29	909,500	63	918,000	97	926,500
30	909,750	64	918,250	98	926,750
31	910,000	65	918,500	99	927,000
32	910,250	66	918,750	100	927,250
33	910,500	67	919,000	101	927,500

1.4.Description of Test Facility

EMC Lab	:	Accredited by TUV Rheinland Shenzhen Listed by FCC The Registration Number is 752051 Listed by Industry Canada The Registration Number is 5077A-2 Accredited by China National Accreditation Committee for Laboratories The Certificate Registration Number is L3193
Name of Firm	:	ACCURATE TECHNOLOGY CO. LTD
Site Location	:	F1, Bldg. A, Changyuan New Material Port, Keyuan Rd. Science & Industry Park, Nanshan, Shenzhen, Guangdong P.R. China

1.5.Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	=	4.06dB, k=2

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 9, 2016	Jan. 09, 2017
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 9, 2016	Jan. 09, 2017
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 9, 2016	Jan. 09, 2017
Pre-Amplifier	Rohde&Schwarz	CBLU1183540-01	3791	Jan. 9, 2016	Jan. 09, 2017
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 14, 2016	Jan. 13, 2017
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 14, 2016	Jan. 13, 2017
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 14, 2016	Jan. 12, 2017
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 14, 2016	Jan. 13, 2017
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 9, 2016	Jan. 09, 2017
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 9, 2016	Jan. 09, 2017
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10SS	N/A	Jan. 9, 2016	Jan. 09, 2017
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375/2510-60/11SS	N/A	Jan. 9, 2016	Jan. 09, 2017

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: Transmitting mode
Low Channel: 902.5MHz
Middle Channel: 914.75MHz
High Channel: 927.5MHz
Hopping

3.2.Configuration and peripherals

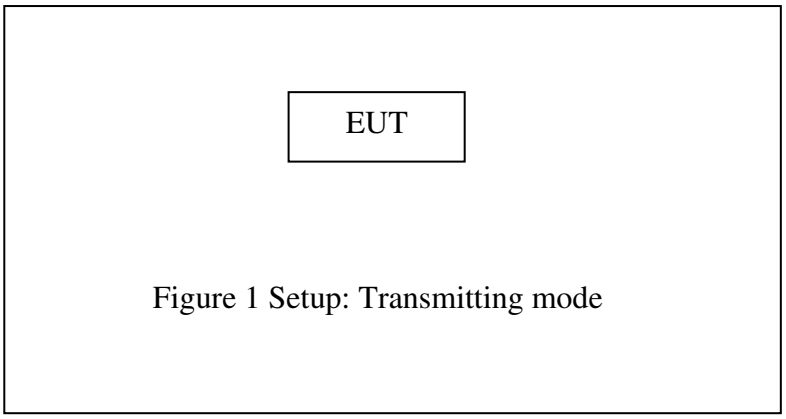


Figure 1 Setup: Transmitting mode

(EUT: SmartESL)

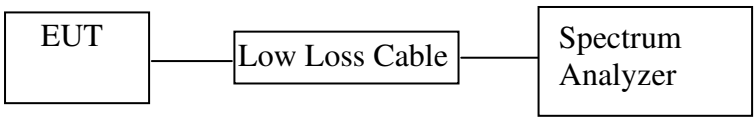
4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.207	Conducted Emission Test	N/A
Section 15.247(a)(1)	20dB Bandwidth Test	Compliant
Section 15.247(a)(1)	Carrier Frequency Separation Test	Compliant
Section 15.247(a)(1)(iii)	Number Of Hopping Frequency Test	Compliant
Section 15.247(a)(1)(iii)	Dwell Time Test	Compliant
Section 15.247(b)(1)	Maximum Peak Output Power Test	Compliant
Section 15.247(d) Section 15.209	Radiated Emission Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.203	Antenna Requirement	Compliant

Note: The power supply mode of the EUT is DC 3V, According to the FCC standard requirements, conducted emission is not applicable

5. 20DB BANDWIDTH TEST

5.1.Block Diagram of Test Setup



(EUT: SmartESL)

5.2.The Requirement For Section 15.247(a)(1)

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.3.EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4.Operating Condition of EUT

5.4.1.Setup the EUT and simulator as shown as Section 5.1.

5.4.2.Turn on the power of all equipment.

5.4.3.Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 902.5-927.5MHz. We select 902.5MHz, 914.75MHz, and 927.5MHz TX frequency to transmit.

5.5.Test Procedure

5.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

5.5.2.Set RBW of spectrum analyzer to 30 kHz and VBW to 100 kHz.

5.5.3.The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

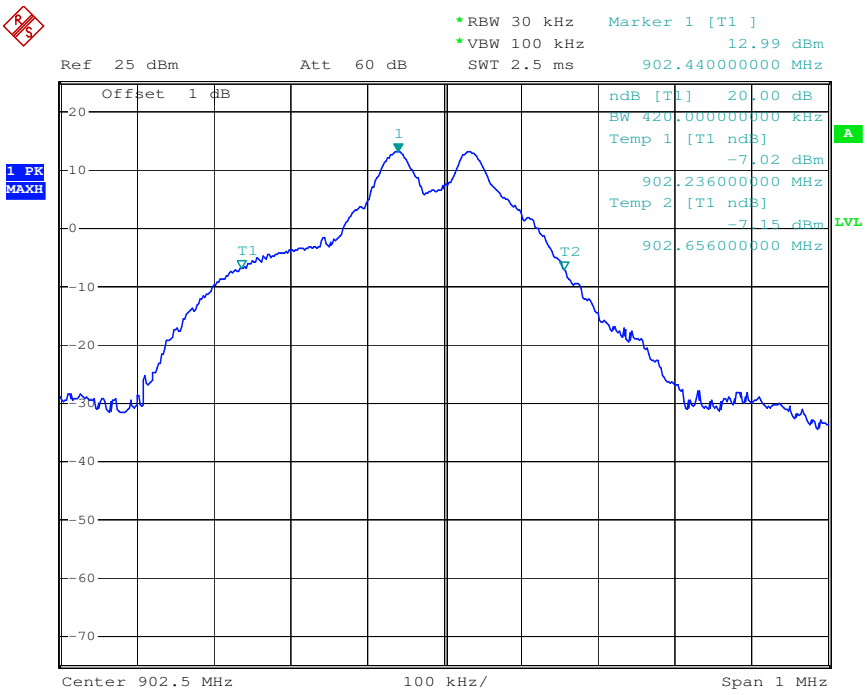
5.6.Test Result

Channel	Frequency (MHz)	FSK 20dB Bandwidth (MHz)	Result
Low	902.5	0.420	Pass
Middle	914.75	0.444	Pass
High	927.5	0.392	Pass

The spectrum analyzer plots are attached as below.

FSK Mode

Low channel



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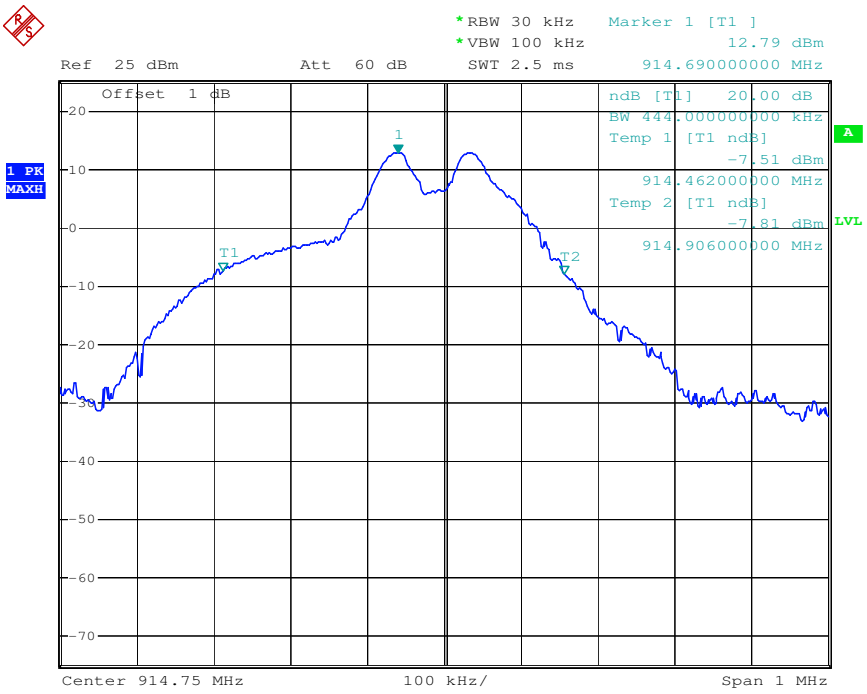
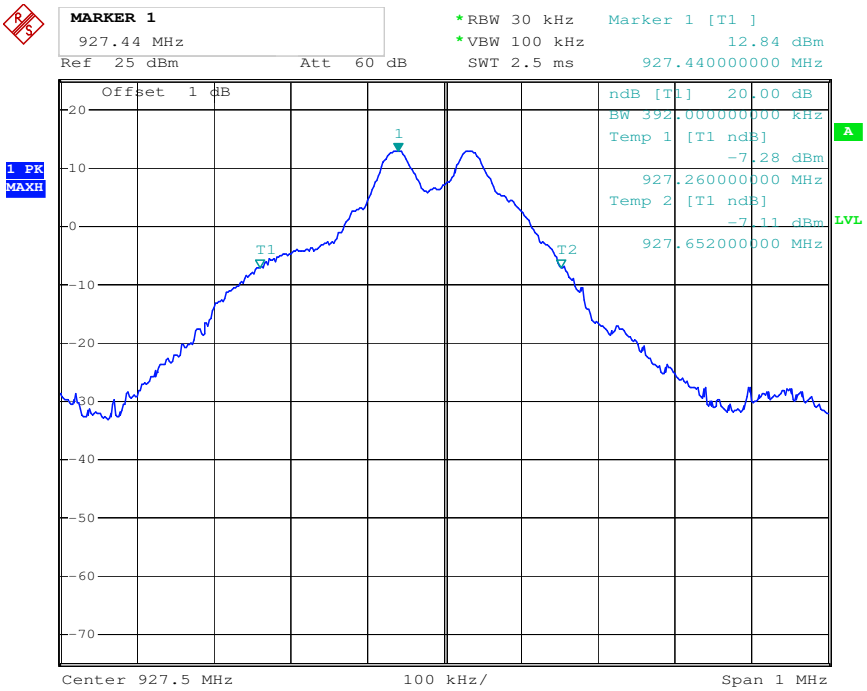
Middle channel



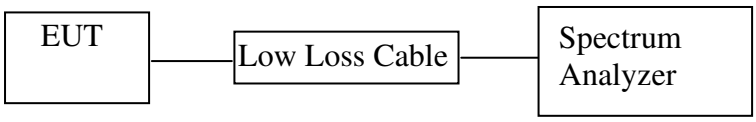
Date: 1.JUN.2016 11:19:58

High channel



6. CARRIER FREQUENCY SEPARATION TEST

6.1.Block Diagram of Test Setup



(EUT: SmartESL)

6.2.The Requirement For Section 15.247(a)(1)

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 902-928 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

6.3.EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4.Operating Condition of EUT

6.4.1.Setup the EUT and simulator as shown as Section 6.1.

6.4.2.Turn on the power of all equipment.

6.4.3.Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 902.5-927.5MHz. We select 902.5MHz, 914.75MHz, and 927.5MHz TX frequency to transmit.

6.5.Test Procedure

6.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

6.5.2.Set RBW of spectrum analyzer to 100 kHz and VBW to 100 kHz. Adjust Span to 500kHz.

6.5.3.Set the adjacent channel of the EUT maxhold another trace.

6.5.4.Measurement the channel separation

6.6.Test Result

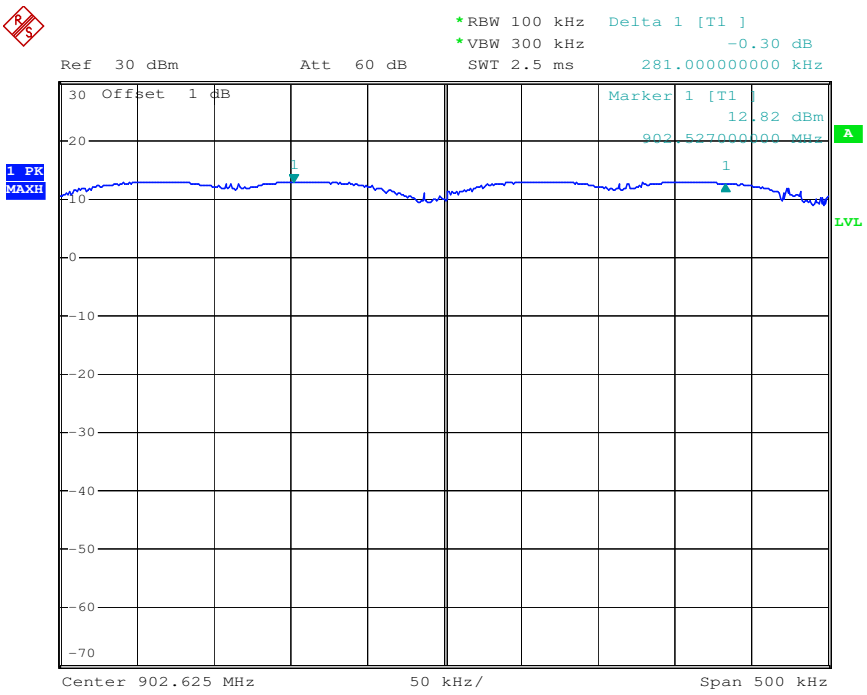
FSK

Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	902.5	0.281	At least 25KHz or 2/3*20dB bandwidth(0.280MHz)	PASS
	902.6			
Middle	914.65	0.281	At least 25KHz or 2/3*20dB bandwidth(0.296MHz)	PASS
	914.75			
High	927.4	0.280	At least 25KHz or 2/3*20dB bandwidth(0.261MHz)	PASS
	927.5			

The spectrum analyzer plots are attached as below.

FSK Mode

Low channel



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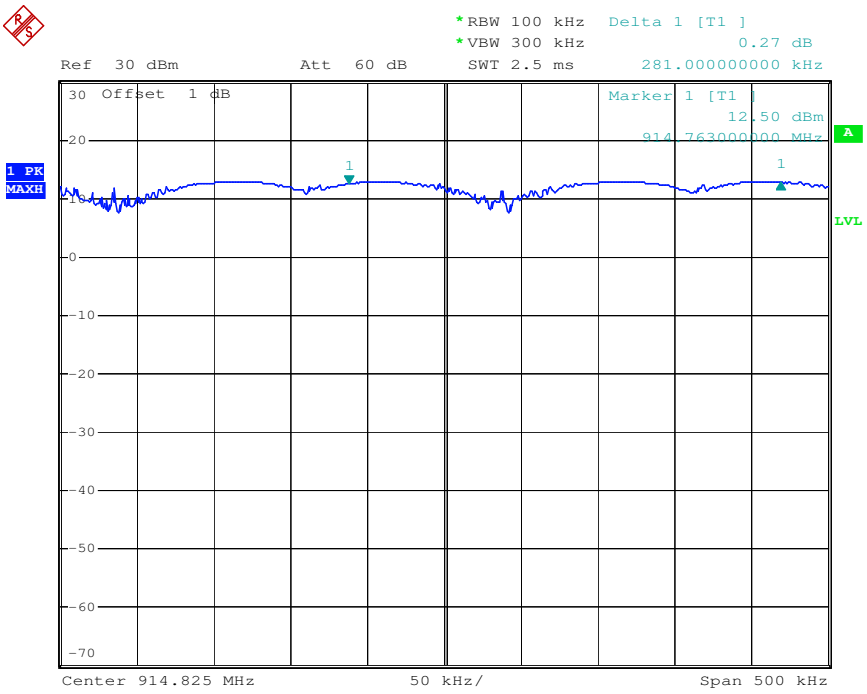
Middle channel



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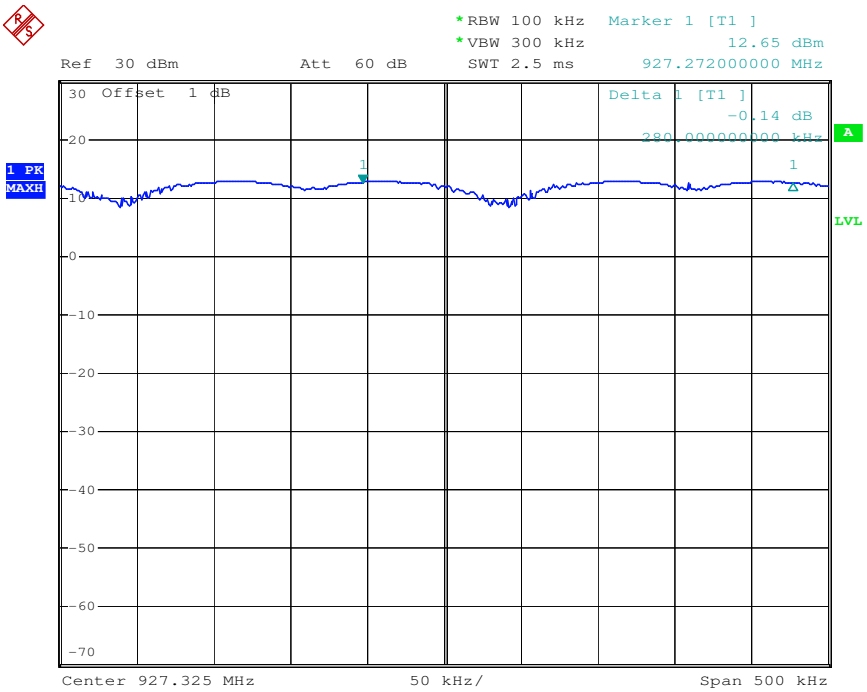
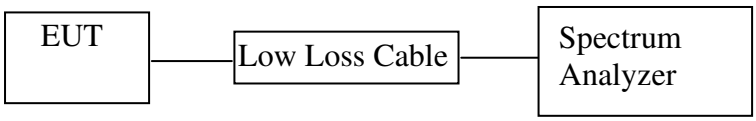
High channel



7. NUMBER OF HOPPING FREQUENCY TEST

7.1.Block Diagram of Test Setup



(EUT: SmartESL)

7.2.The Requirement For Section 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 902-928 MHz band shall use at least 15 channels.

7.3.EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4.Operating Condition of EUT

7.4.1.Setup the EUT and simulator as shown as Section 7.1.

7.4.2.Turn on the power of all equipment.

7.4.3.Let the EUT work in TX (Hopping on) modes measure it.

7.5.Test Procedure

7.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.5.2.Set the spectrum analyzer as Span=83.5MHz, RBW=100 kHz, VBW=300 kHz.

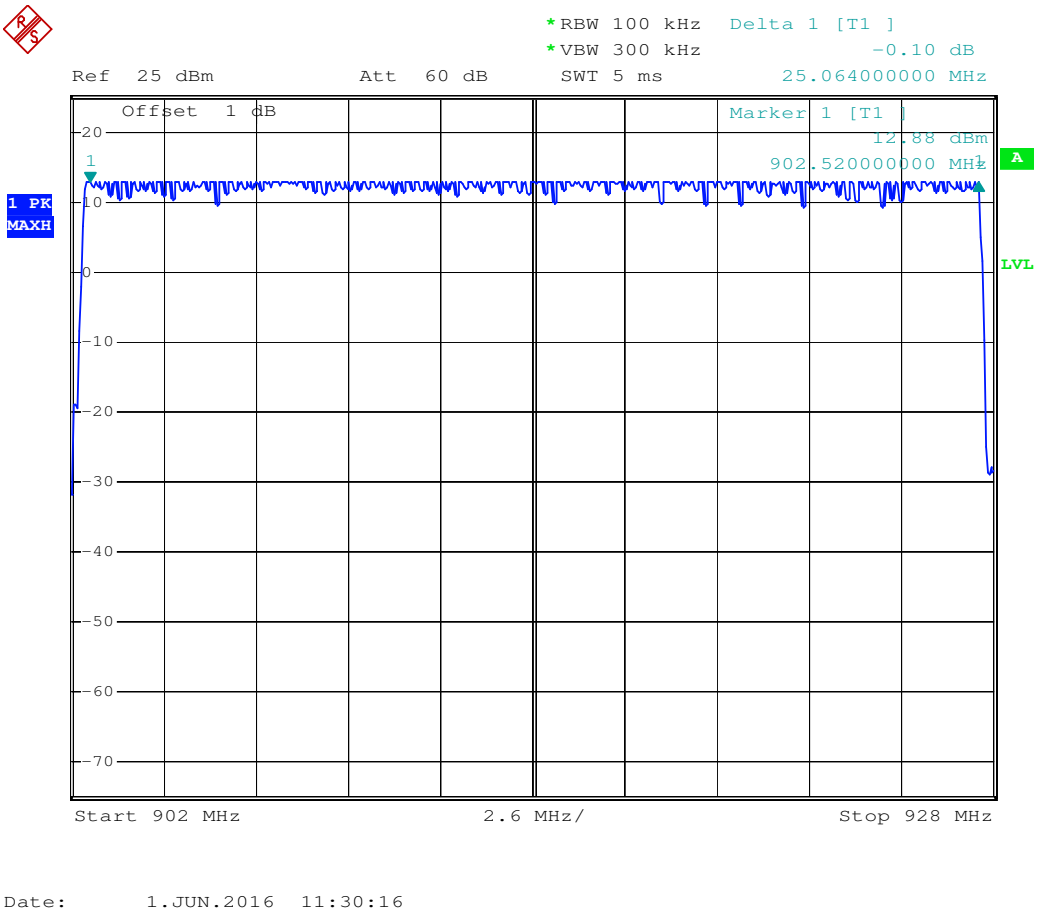
7.5.3.Max hold, view and count how many channel in the band.

7.6.Test Result

Total number of hopping channel	Measurement result(CH)	Limit(CH)
	101	⩾15

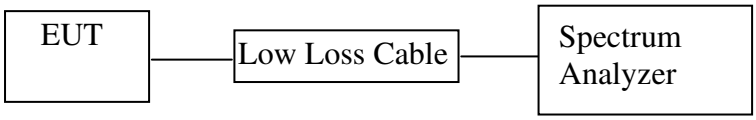
The spectrum analyzer plots are attached as below.

Number of hopping channels(FSK)



8. DWELL TIME TEST

8.1.Block Diagram of Test Setup



(EUT: SmartESL)

8.2.The Requirement For Section 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 902-928 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

8.3.EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4.Operating Condition of EUT

8.4.1.Setup the EUT and simulator as shown as Section 8.1.

8.4.2.Turn on the power of all equipment.

8.4.3.Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 902.5-927.5MHz. We select 902.5MHz, 914.75MHz, and 927.5MHz TX frequency to transmit.

8.5.Test Procedure

8.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

8.5.2.Set center frequency of spectrum analyzer = operating frequency.

8.5.3.Set the spectrum analyzer as RBW=100kHz, VBW=300kHz, Span=0Hz, Adjust Sweep=20s. Get the pulse time.

8.5.4.Repeat above procedures until all frequency measured were complete.

8.6.Photos of Dwel time Measurement

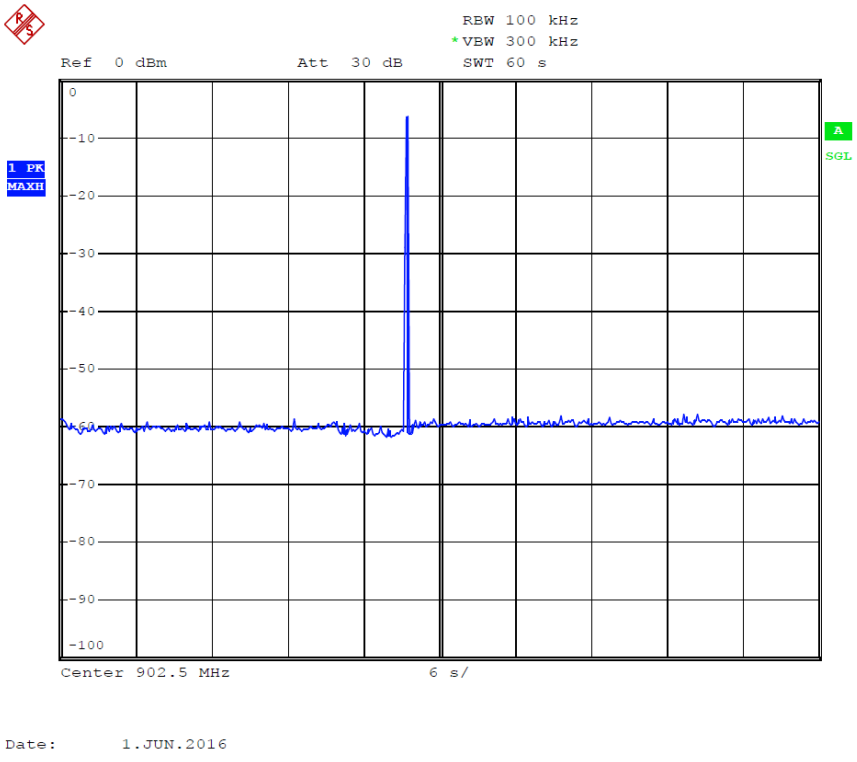
In the connection mode RFID uses 101 channels,As defined in 15.247,a 1 I,the limit for time of occupancy is 0.4s over time of 20s.

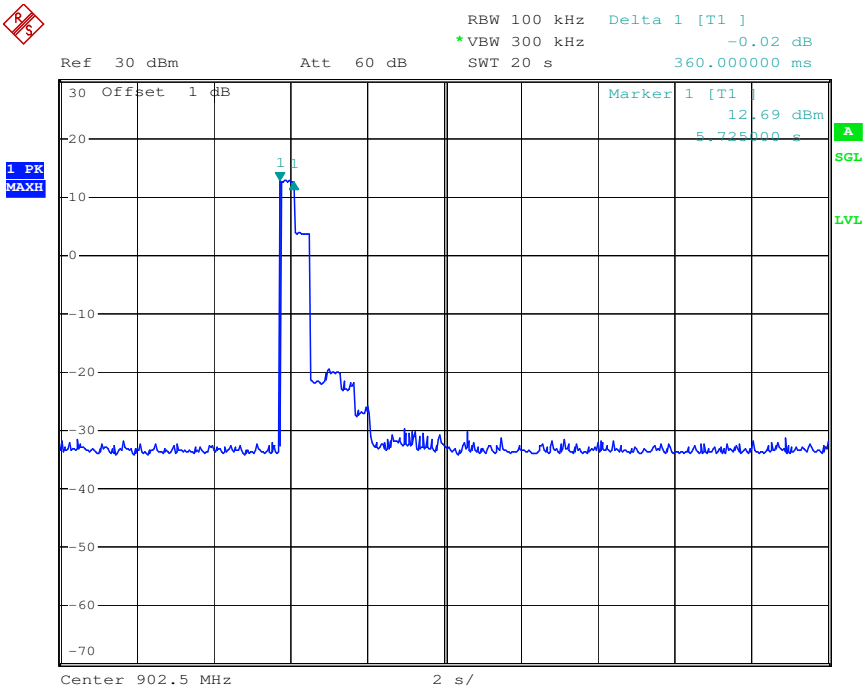
8.7.Test Result

Modulation Mode	Channel Frequency (MHz)	Occupied time for each channel (ms)	Dwell time (ms)	Limit (ms)	Verdict
FSK	902.5	360	242.4	400	Pass

Note:

The number of occupied channels per second	1/60=0.017(number/sec)
The total number of occupied channels per second	101*1/60=1.683(number/sec)
Occupied time for each channel	360ms
Dwell time per second	101*1/60*360=606ms
Dwell time for 0.4second	101*1/60*360*0.4=242.4ms





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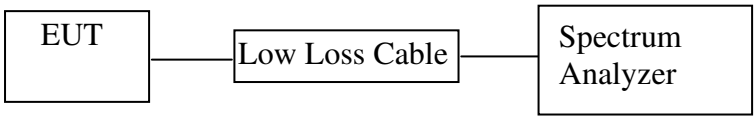
9. MAXIMUM PEAK OUTPUT POWER TEST

9.1.Block Diagram of Test Setup



(EUT: SmartESL)

9.2.The Requirement For Section 15.247(b)(1)

Section 15.247(b)(1): For frequency hopping systems operating in the 902-928 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 902-928 MHz band: 0.125 watts.

9.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.4.Operating Condition of EUT

9.4.1.Setup the EUT and simulator as shown as Section 9.1.

9.4.2.Turn on the power of all equipment.

9.4.3.Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 902.5-927.5MHz. We select 902.5MHz, 914.75MHz, and 927.5MHz TX frequency to transmit.

9.5.Test Procedure

9.5.1.The transmitter output was connected to the spectrum analyzer through a low loss cable.

9.5.2.Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz for FSK mode

9.5.3.Set RBW of spectrum analyzer to 3MHz and VBW to 3MHz for other mode

9.5.4.Measurement the maximum peak output power.

9.6.Test Result

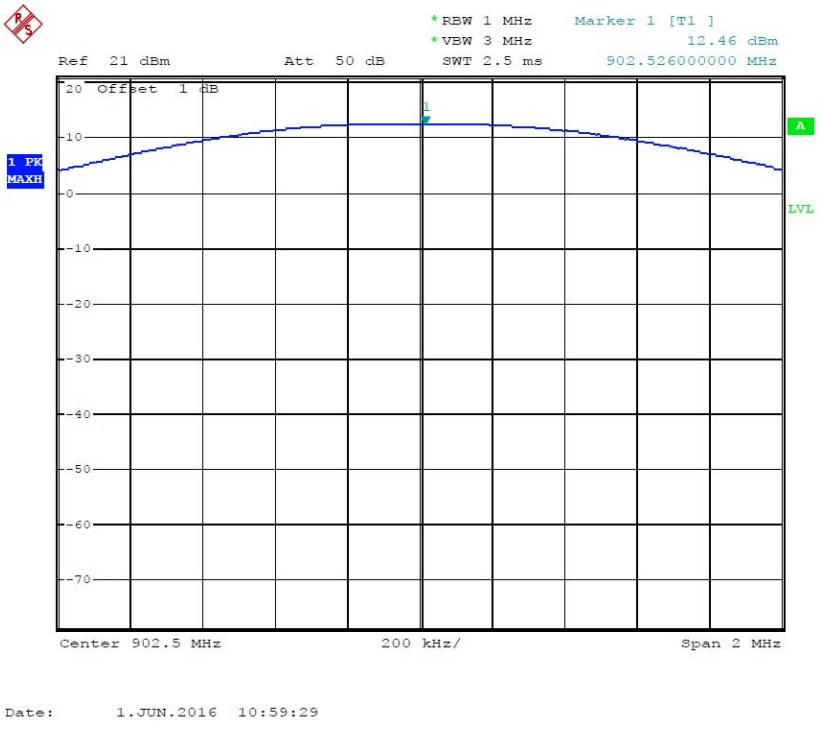
FSK Mode

Channel	Frequency (MHz)	Peak Output Power (dBm/W)	Limits dBm / W
Low	902.5	12.46/0.0177	20.97/ 0.125
Middle	914.75	12.59/0.0182	20.97/ 0.125
High	927.5	12.82/0.0191	20.97/ 0.125

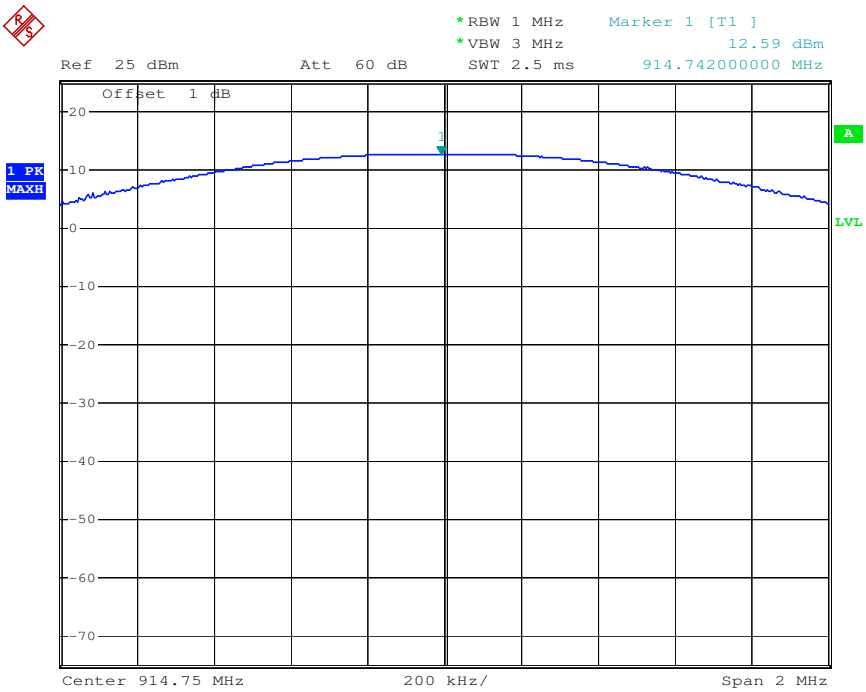
The spectrum analyzer plots are attached as below.

FSK Mode

Low channel



Middle channel



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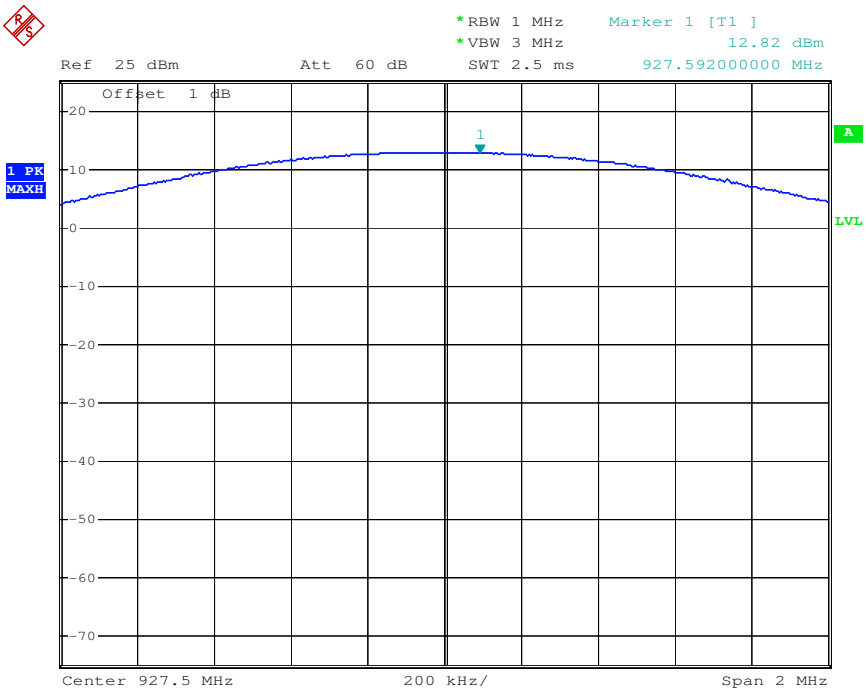
High channel



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10. RADIATED EMISSION TEST

10.1. Block Diagram of Test Setup

10.1.1. Block diagram of connection between the EUT and peripherals

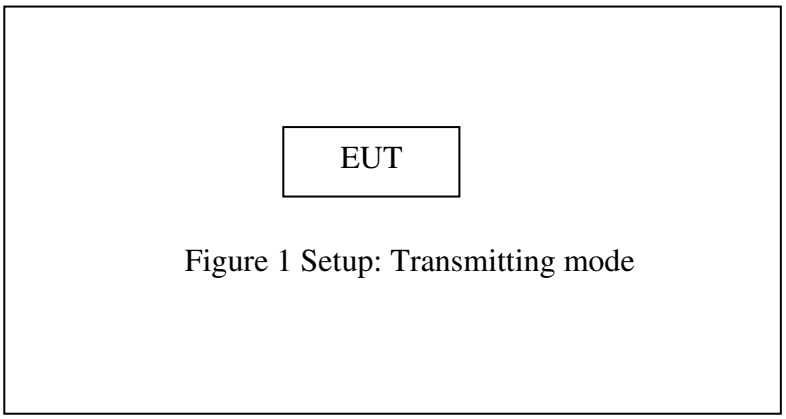
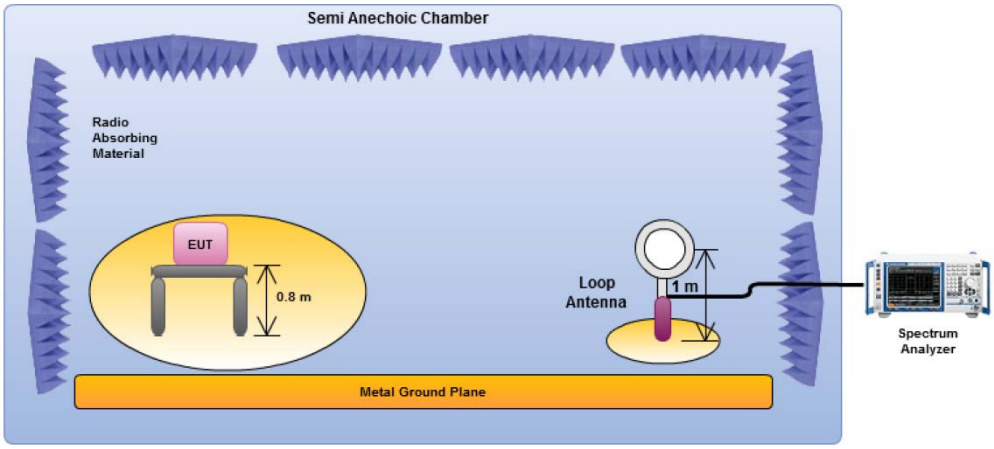


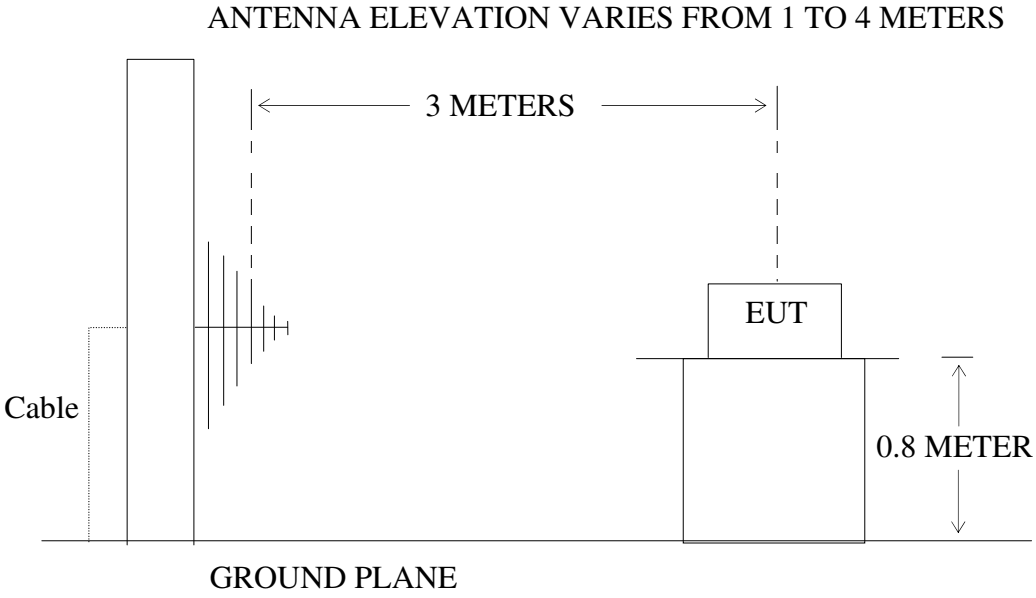
Figure 1 Setup: Transmitting mode

10.1.2. Semi-Anechoic Chamber Test Setup Diagram

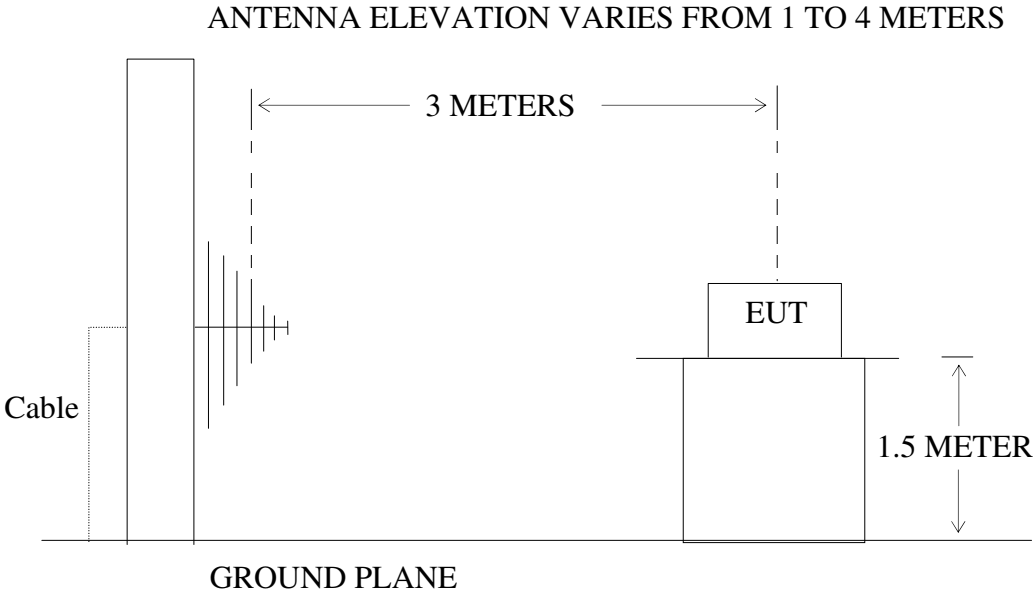
Below 30MHz



30MHz-1GHz



Above 1GHz



10.2.The Limit For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging

over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

10.3.Restricted bands of operation

10.3.1.FCC Part 15.205 Restricted bands of operation

(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
[1]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	2690-2900	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	([2])
13.36-13.41			

[1]Until February 1, 1999, this restricted band shall be 0.490-0.510
[2]Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

10.4.Configuration of EUT on Measurement

The equipment is installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.5.Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground(Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

10.6.The Field Strength of Radiation Emission Measurement Results

Below 1GHz

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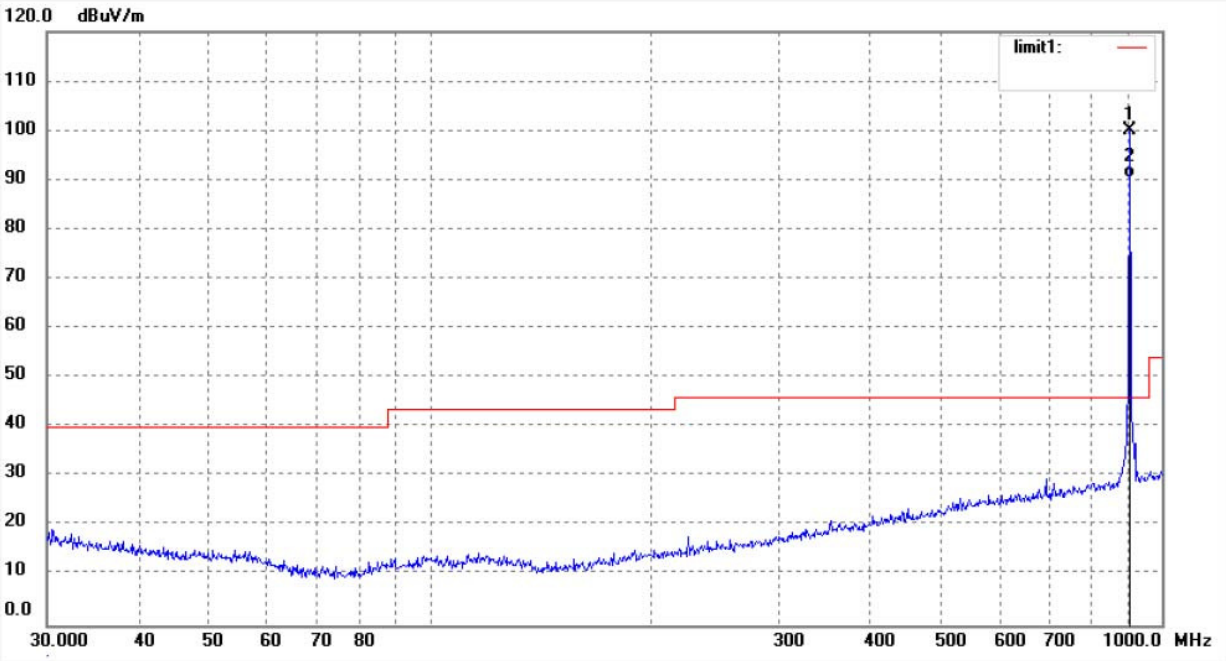
Job No.: STAR2015 #1268	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 2016-5-31
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 19:38:26
EUT: SmartESL	Engineer Signature: STAR
Mode: TX 902.5MHz	Distance: 3m
Model: 210005	
Manufacturer: Findbox GmbH	

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	902.5000	98.81	1.30	100.11	114.00	-13.89	peak			
2	902.5000	89.04	1.30	90.34	94.00	-3.66	AVG			

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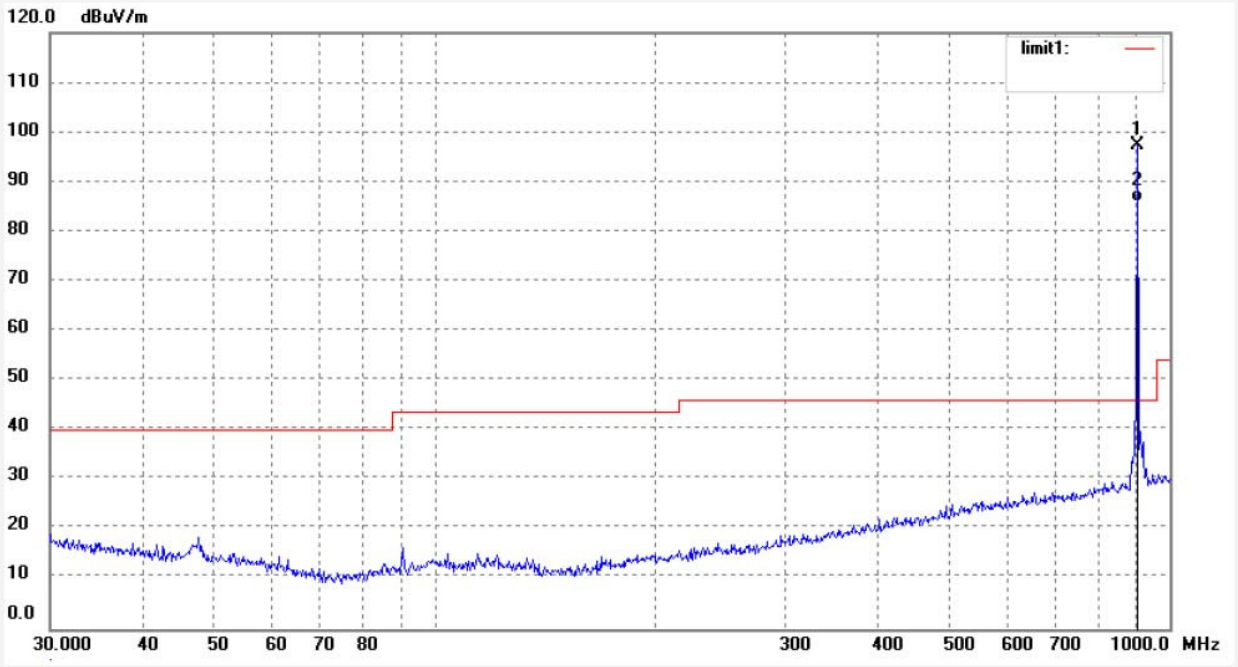
Job No.: STAR2015 #1267
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: SmartESL
Mode: TX 902.5MHz
Model: 210005
Manufacturer: Findbox GmbH

Polarization: Vertical
Power Source: DC 6V
Date: 2016-5-31
Time: 19:36:57
Engineer Signature: STAR
Distance: 3m

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	902.5000	96.13	1.30	97.43	114.00	-16.57	peak			
2	902.5000	84.76	1.30	86.06	94.00	-7.94	AVG			

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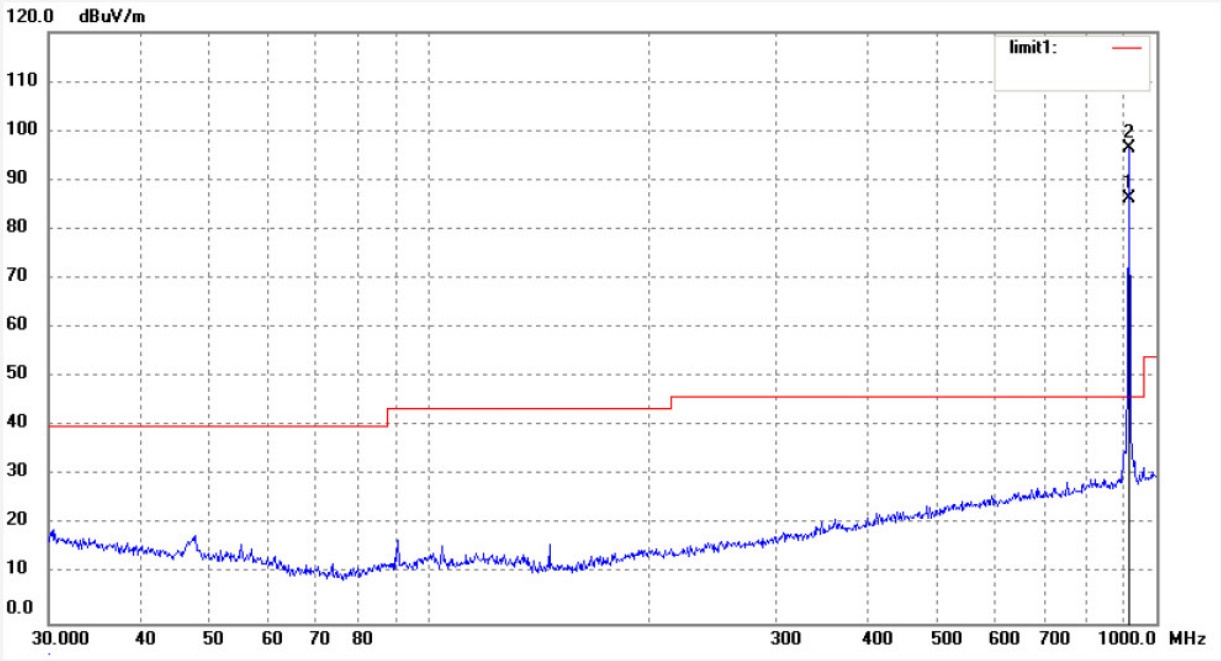
Job No.: STAR2015 #1266	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 2016-5-31
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 19:33:19
EUT: SmartESL	Engineer Signature: STAR
Mode: TX 914.75MHz	Distance: 3m
Model: 210005	
Manufacturer: Findbox GmbH	

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	914.7500	84.75	1.49	86.24	114.00	-27.76	peak			
2	914.7500	95.05	1.49	92.12	94.00	-1.88	peak			

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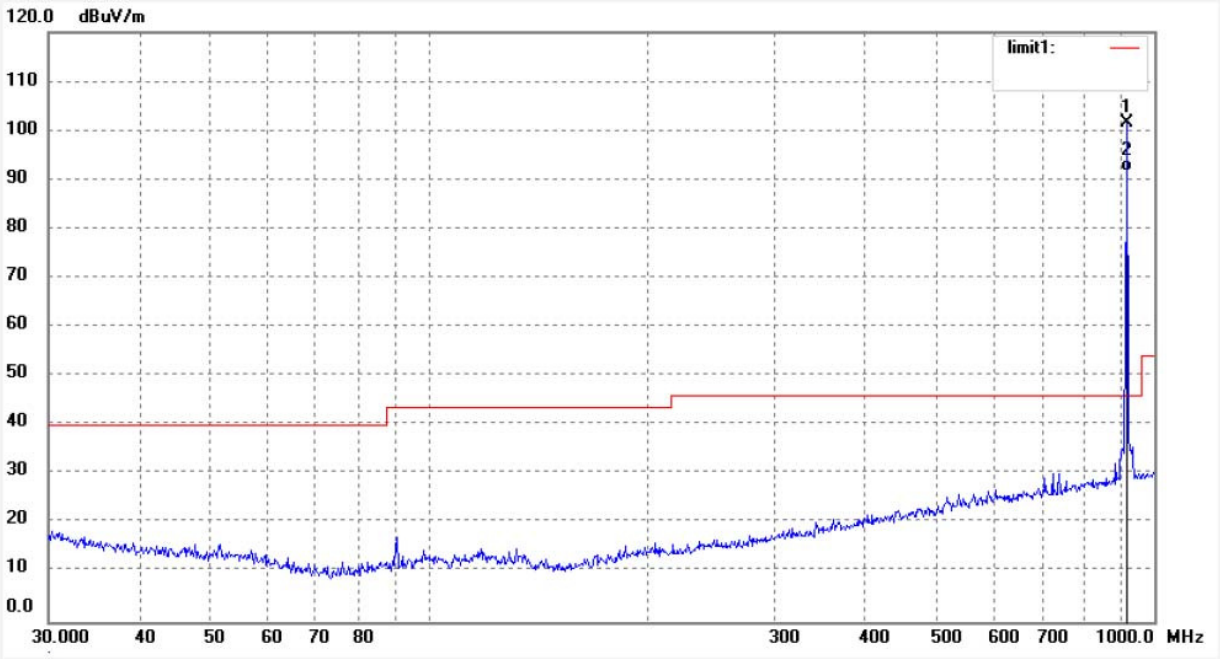
Job No.: STAR2015 #1265
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: SmartESL
Mode: TX 914.75MHz
Model: 210005
Manufacturer: Findbox GmbH

Polarization: Horizontal
Power Source: DC 6V
Date: 2016-5-31
Time: 19:32:32
Engineer Signature: STAR
Distance: 3m

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	914.7500	99.92	1.49	101.41	114.00	-12.59	peak			
2	914.7500	90.10	1.49	91.59	94.00	-2.41	AVG			

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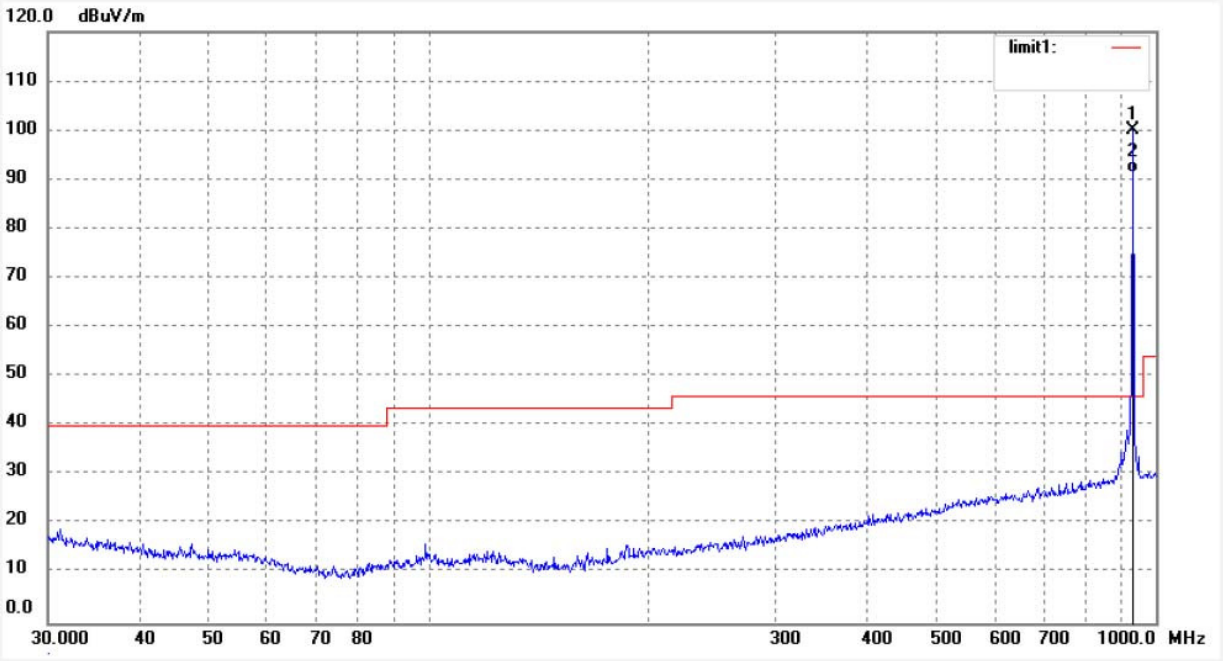
Job No.: STAR2015 #1264	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 2016-5-31
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 19:29:39
EUT: SmartESL	Engineer Signature: STAR
Mode: TX 927.5MHz	Distance: 3m
Model: 210005	
Manufacturer: Findbox GmbH	

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	927.5000	98.31	1.82	100.13	114.00	-13.87	peak			
2	927.5000	89.46	1.82	91.28	94.00	-2.72	AVG			

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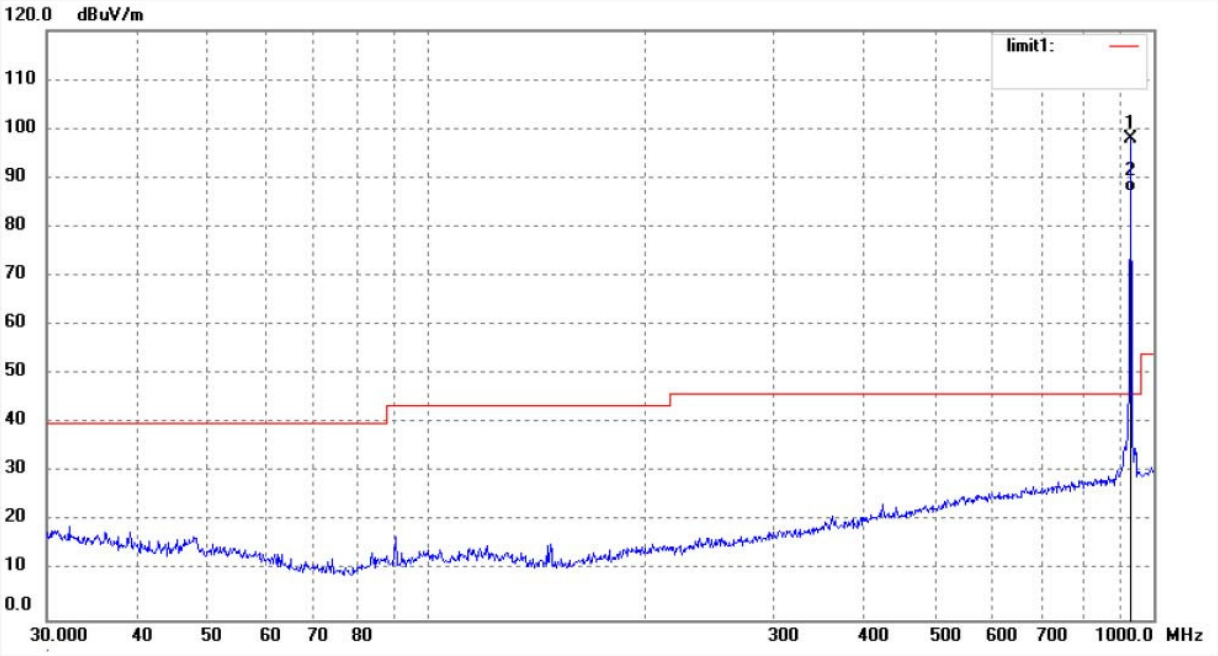
Job No.: STAR2015 #1263	Polarization: Vertical
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 2016-5-31
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 19:28:42
EUT: SmartESL	Engineer Signature: STAR
Mode: TX 927.5MHz	Distance: 3m
Model: 210005	
Manufacturer: Findbox GmbH	

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	927.5000	96.16	1.82	97.98	114.00	-16.02	peak			
2	927.5000	85.22	1.82	87.04	94.00	-6.96	AVG			

Above 1GHz

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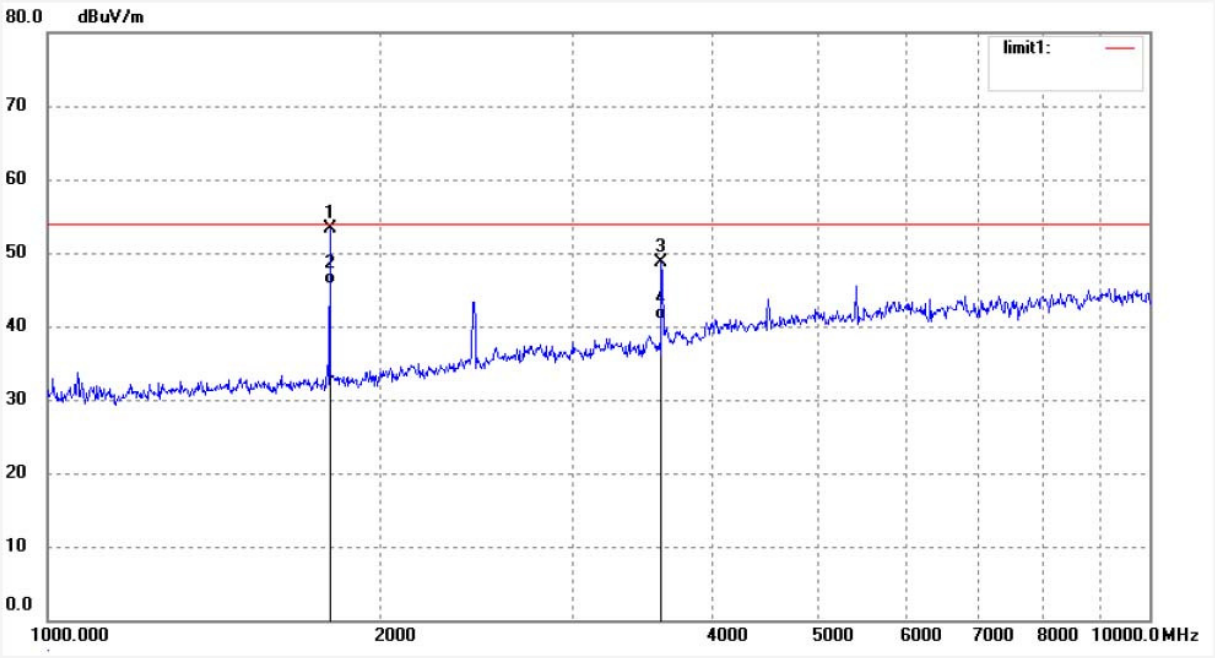
Job No.: STAR2015 #1256	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 2016-5-31
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 19:10:45
EUT: SmartESL	Engineer Signature: STAR
Mode: TX 902.5MHz	Distance: 3m
Model: 210005	
Manufacturer: Findbox GmbH	

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	1805.000	63.35	-10.01	53.34	74.00	-20.66	peak			
2	1805.000	55.71	-10.01	45.70	54.00	-8.30	AVG			
3	3610.000	51.43	-2.77	48.66	74.00	-25.34	peak			
4	3610.000	43.68	-2.77	40.91	54.00	-13.09	AVG			

Note: Average measurement with peak detection at No.2

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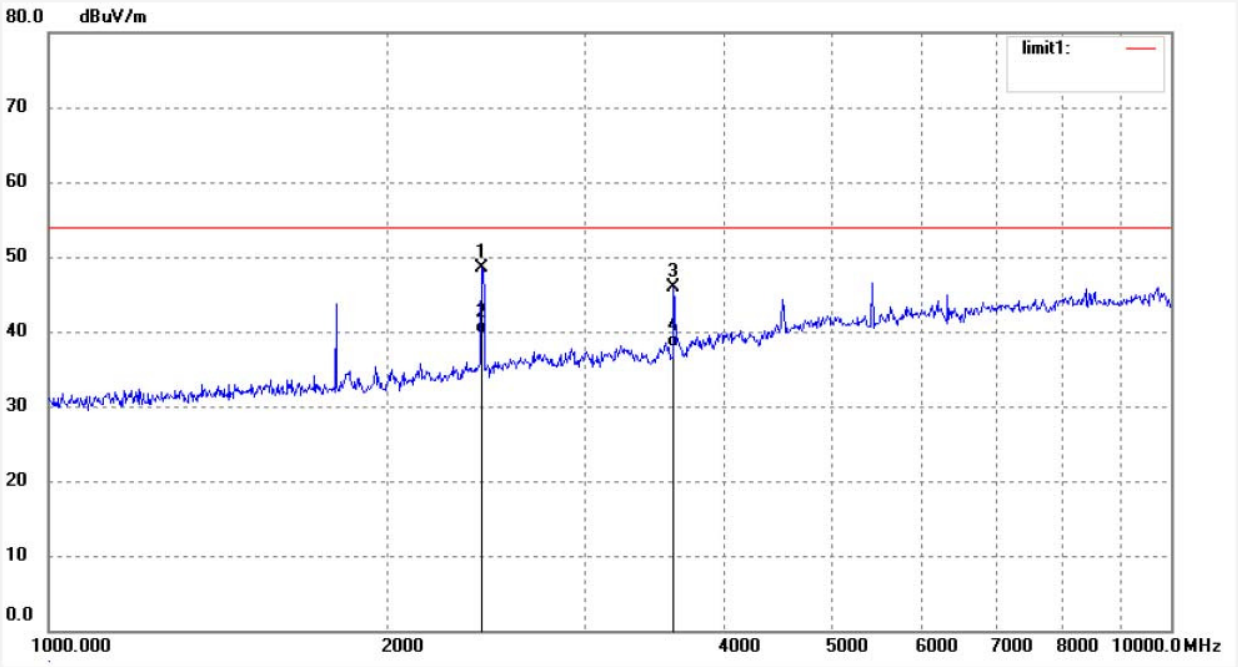
Job No.: STAR2015 #1257
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: SmartESL
Mode: TX 902.5MHz
Model: 210005
Manufacturer: Findbox GmbH

Polarization: Vertical
Power Source: DC 6V
Date: 2016-5-31
Time: 19:11:32
Engineer Signature: STAR
Distance: 3m

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2707.500	55.91	-7.38	48.53	74.00	-25.47	peak			
2	2707.500	47.17	-7.38	39.79	54.00	-14.21	AVG			
3	3610.000	48.59	-2.77	45.82	74.00	-28.18	peak			
4	3610.000	40.58	-2.77	37.81	54.00	-16.19	AVG			

Note: Average measurement with peak detection at No.2

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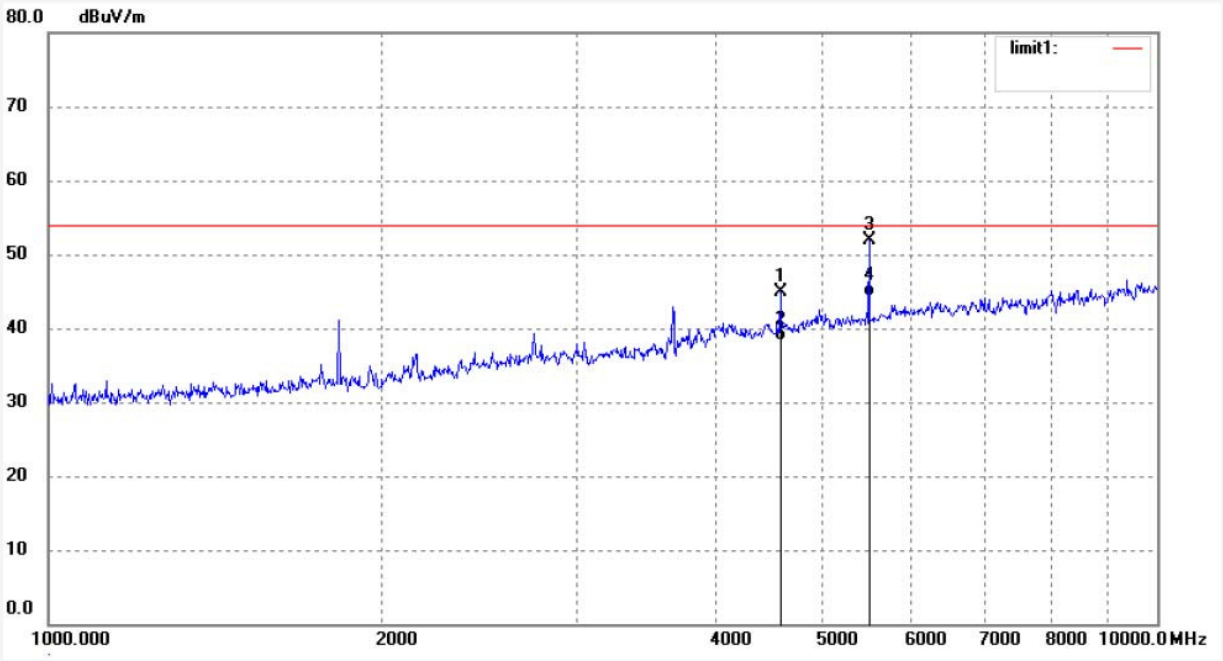
Job No.: STAR2015 #1258
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: SmartESL
Mode: TX 914.75MHz
Model: 210005
Manufacturer: Findbox GmbH

Polarization: Vertical
Power Source: DC 6V
Date: 2016-5-31
Time: 19:17:15
Engineer Signature: STAR
Distance: 3m

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	4573.750	46.04	-1.19	44.85	74.00	-29.15	peak			
2	4573.750	39.57	-1.19	38.38	54.00	-15.62	AVG			
3	5488.500	50.66	1.18	51.84	74.00	-22.16	peak			
4	5488.500	43.04	1.18	44.22	54.00	-9.78	AVG			

Note: Average measurement with peak detection at No.2

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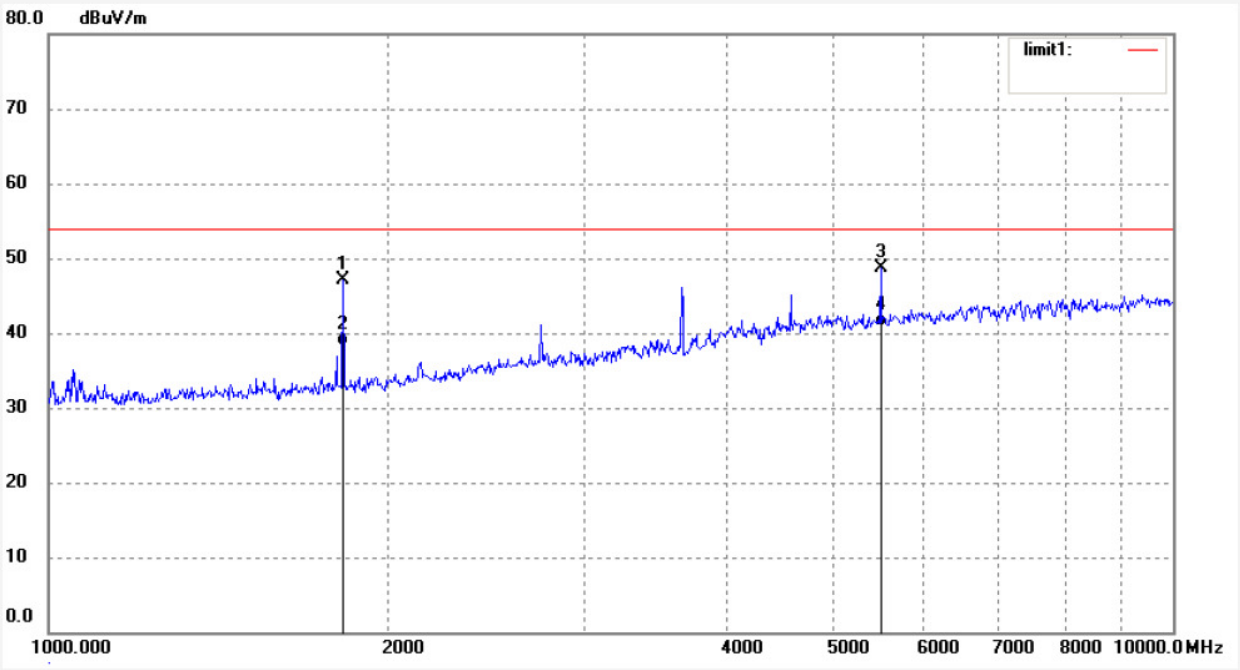
Job No.: STAR2015 #1259	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 6V
Test item: Radiation Test	Date: 2016-5-31
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 19:18:43
EUT: SmartESL	Engineer Signature: STAR
Mode: TX 914.75MHz	Distance: 3m
Model: 210005	
Manufacturer: Findbox GmbH	

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	1829.500	56.81	-9.75	47.06	74.00	-26.94	peak			
2	1829.500	48.00	-9.75	38.25	54.00	-15.75	AVG			
3	5488.500	47.59	1.18	48.77	74.00	-25.23	peak			
4	5488.500	39.74	1.18	40.92	54.00	-13.08	AVG			

Note: Average measurement with peak detection at No.2

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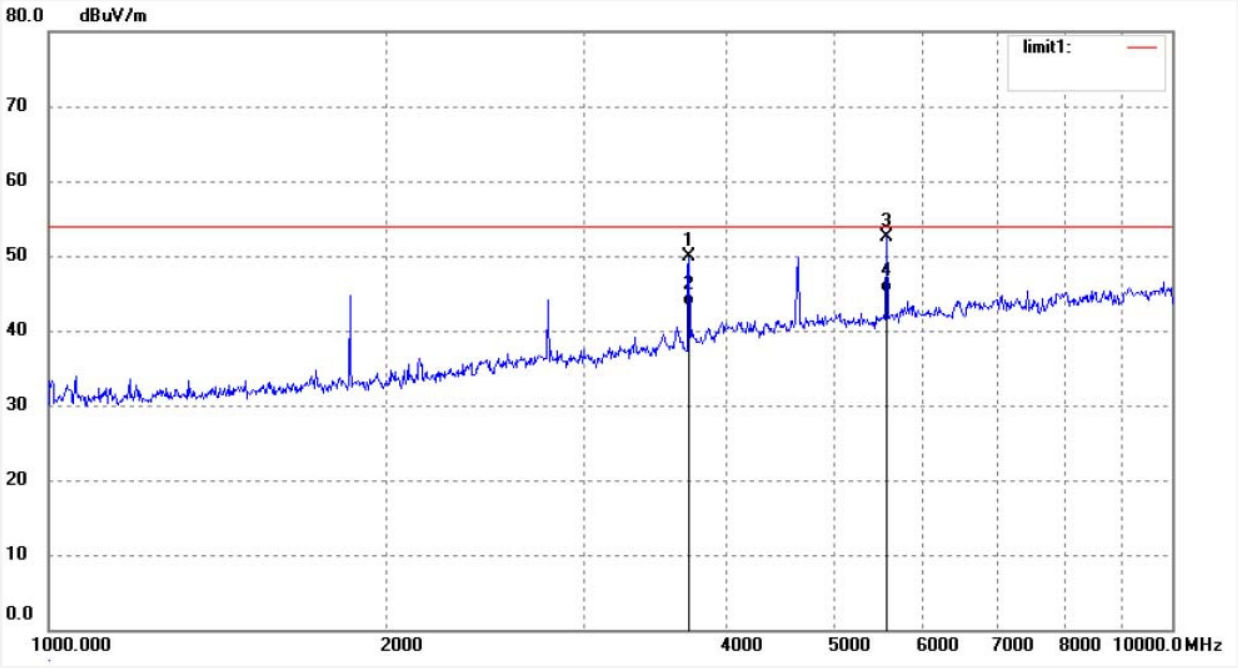
Job No.: STAR2015 #1261
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: SmartESL
Mode: TX 927.5MHz
Model: 210005
Manufacturer: Findbox GmbH

Polarization: Horizontal
Power Source: DC 6V
Date: 2016-5-31
Time: 19:23:32
Engineer Signature: STAR
Distance: 3m

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	3710.000	52.19	-2.37	49.82	74.00	-24.18	peak			
2	3710.000	45.62	-2.37	43.25	54.00	-10.75	AVG			
3	5565.000	51.22	1.38	52.60	74.00	-21.40	peak			
4	5565.000	43.71	1.38	45.09	54.00	-8.91	AVG			

Note: Average measurement with peak detection at No.2

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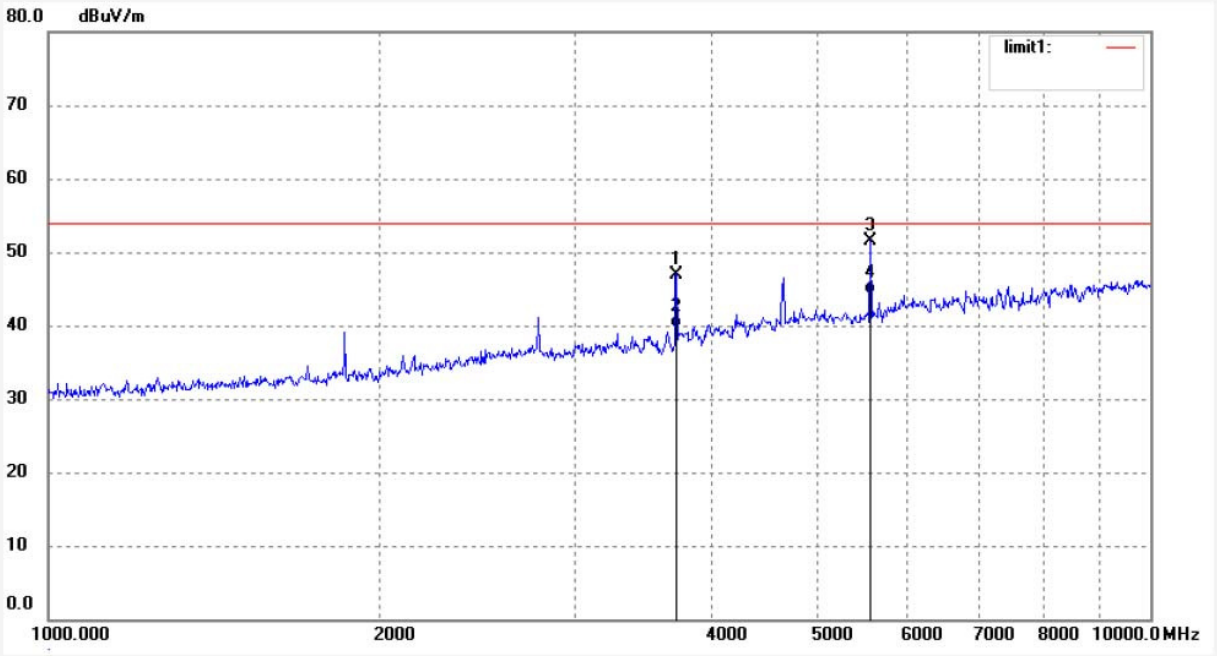
Job No.: STAR2015 #1262
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: SmartESL
Mode: TX 927.5MHz
Model: 210005
Manufacturer: Findbox GmbH

Polarization: Vertical
Power Source: DC 6V
Date: 2016-5-31
Time: 19:25:32
Engineer Signature: STAR
Distance: 3m

Note: Report NO.:ATE20161073

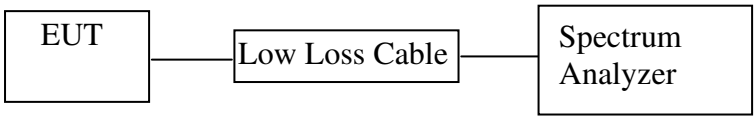


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	3710.000	49.37	-2.37	47.00	74.00	-27.00	peak			
2	3710.000	42.06	-2.37	39.69	54.00	-14.31	AVG			
3	5565.000	50.05	1.38	51.43	74.00	-22.57	peak			
4	5565.000	43.00	1.38	44.38	54.00	-9.62	AVG			

Note: Average measurement with peak detection at No.2

11.BAND EDGE COMPLIANCE TEST

11.1.Block Diagram of Test Setup



(EUT: SmartESL)

11.2.The Requirement For Section 15.247(d)

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

11.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

11.4.Operating Condition of EUT

11.4.1.Setup the EUT and simulator as shown as Section 11.1.

11.4.2.Turn on the power of all equipment.

11.4.3.Let the EUT work in TX (Hopping off, Hopping on) modes measure it. The transmit frequency are 902.5-927.5MHz. We select 902.5MHz, 927.5MHz TX frequency to transmit.

11.5.Test Procedure

11.5.1.The transmitter output was connected to the spectrum analyzer via a low loss cable.

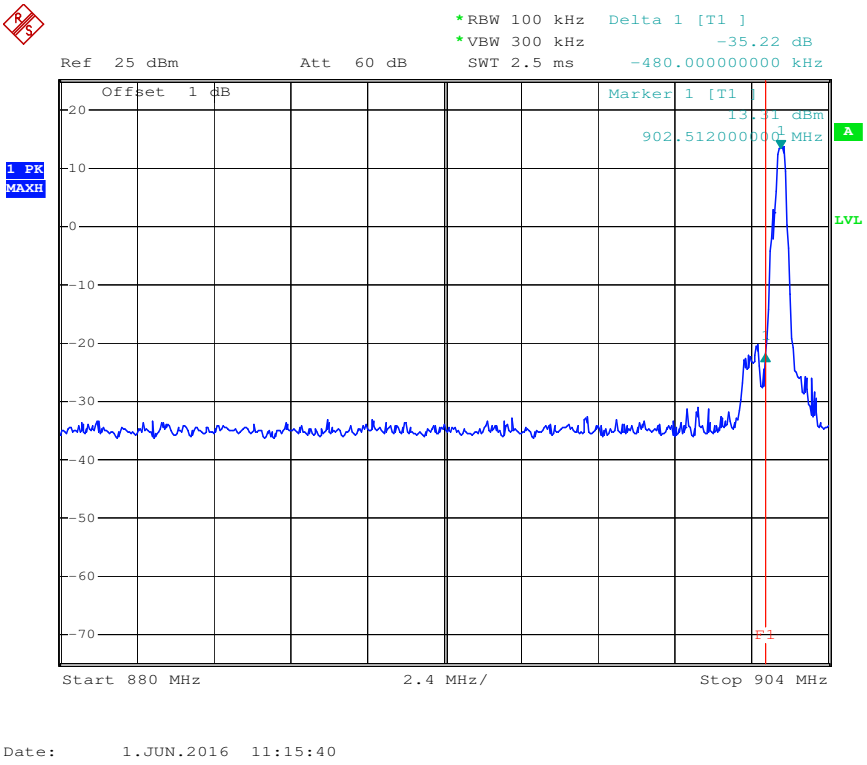
11.5.2.Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz with convenient frequency span including 100 kHz bandwidth from band edge.

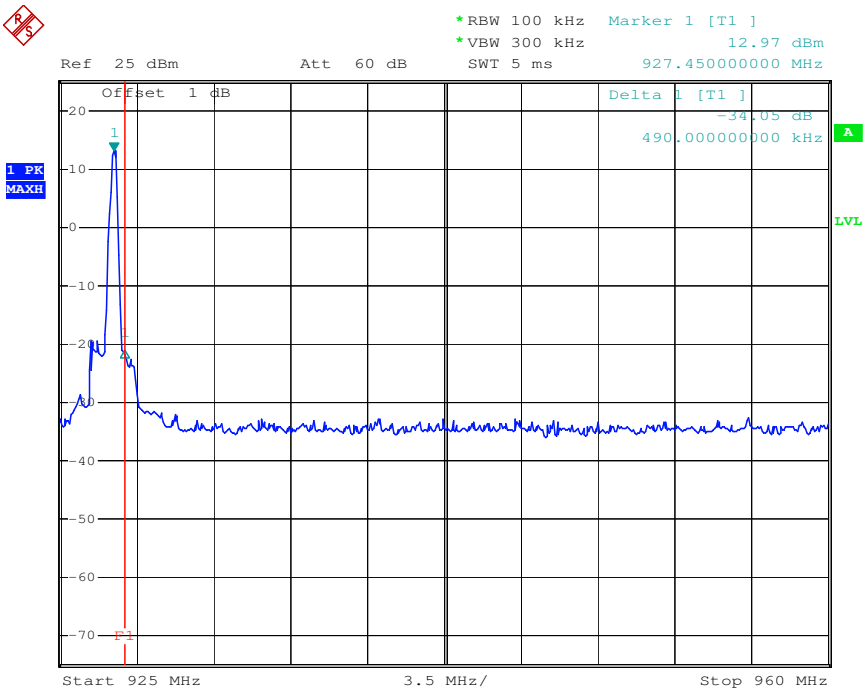
11.5.3.The band edges was measured and recorded.

11.6.Test Result

Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
FSK		
902.5	-35.22	> -20dBc
927.5	-34.05	> -20dBc

FSK





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Radiated Band Edge Result

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

   Result = Reading + Corrected Factor
3. Display the measurement of peak values.

Test Procedure:

The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. The EUT was tested in 3 orthogonal planes.

Let the EUT work in TX (Hopping off, Hopping on) modes measure it.
We select 902.5MHz, 927.5MHz TX frequency to transmit(Hopping off mode).
We select 902.5-927.5MHz TX frequency to transmit(Hopping on mode).

During the radiated emission test, the spectrum analyzer was set with the following configurations:
1.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
2.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
3.All modes of operation were investigated and the worst-case emissions are reported.

Hopping mode

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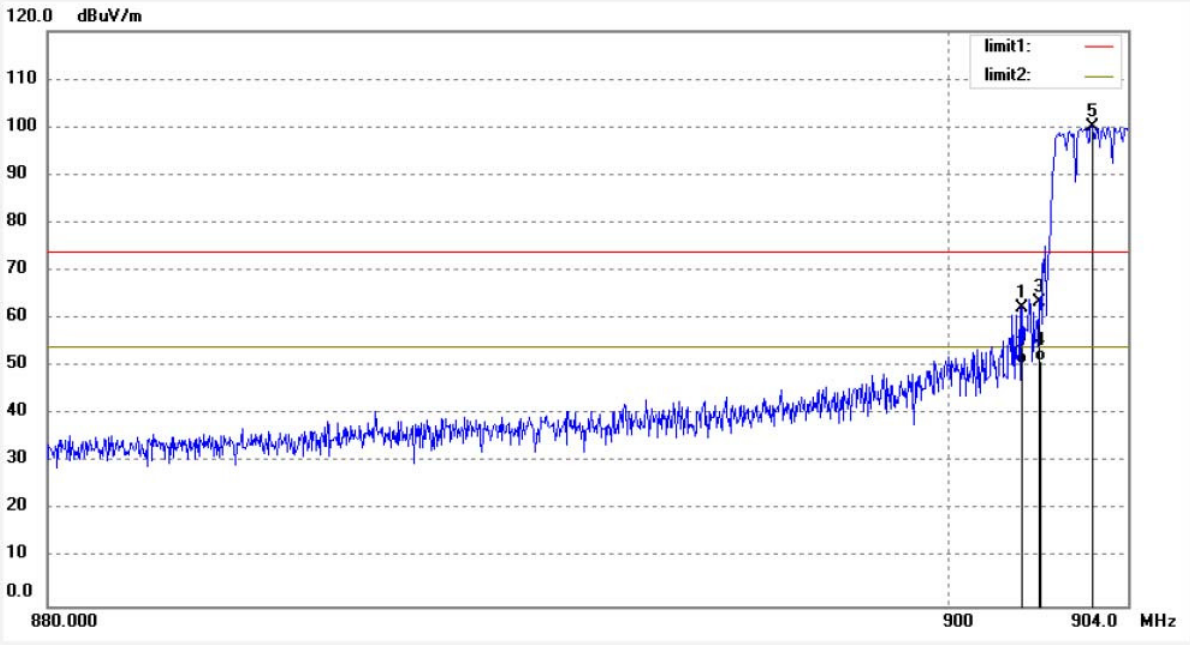
Job No.: STAR2015 #1269	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 16/06/01/
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 11/51/37
EUT: SmartESL	Engineer Signature: STAR
Mode: HOPPING	Distance: 3m
Model: 210005	
Manufacturer: Findbox GmbH	

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	901.6240	60.98	1.28	62.26	74.00	-11.74	peak			
2	901.6240	49.40	1.28	50.68	54.00	-3.32	AVG			
3	902.0000	62.31	1.28	63.59	74.00	-10.41	peak			
4	902.0000	50.00	1.28	51.28	54.00	-2.72	AVG			
5	903.2078	98.63	1.30	99.93	74.00	25.93	peak			

Note: Average measurement with peak detection at No.2, 4, 6, 8

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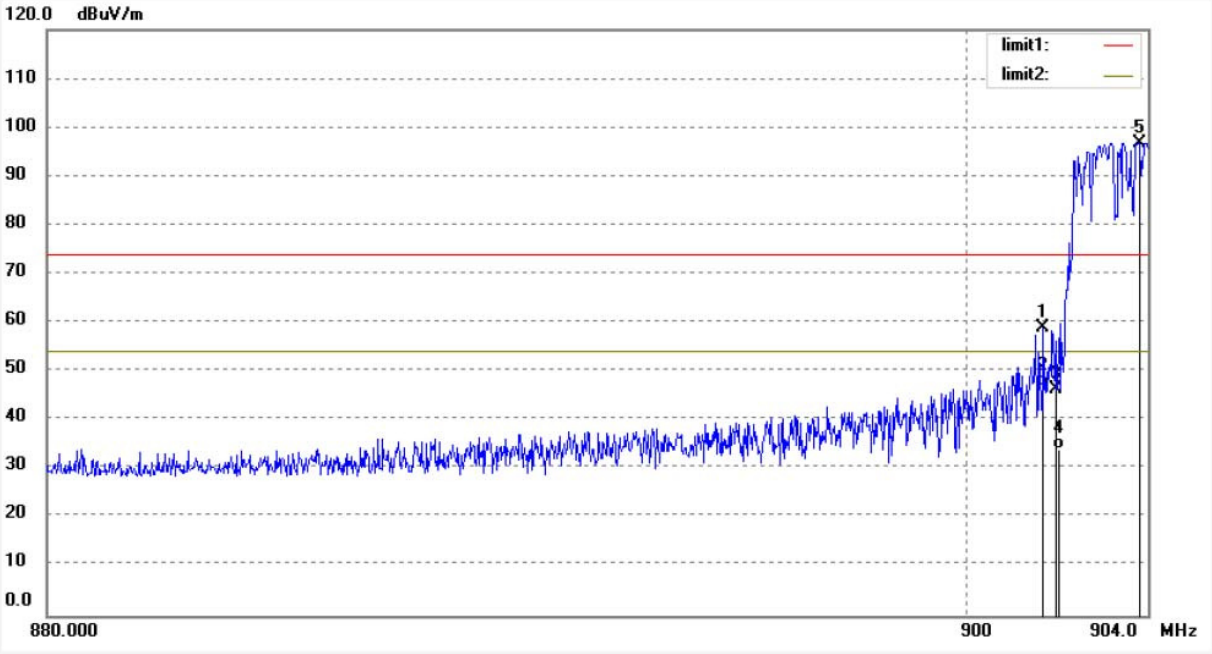
Job No.: STAR2015 #1270	Polarization: Vertical
Standard: FCC PK	Power Source: DC 6V
Test item: Radiation Test	Date: 16/06/01/
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 11/54/35
EUT: SmartESL	Engineer Signature: STAR
Mode: HOPPING	Distance: 3m
Model: 210005	
Manufacturer: Findbox GmbH	

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	901.6960	57.62	1.28	58.90	74.00	-15.10	peak			
2	901.6960	45.61	1.28	46.89	54.00	-7.11	AVG			
3	902.0000	44.97	1.28	46.25	74.00	-27.75	peak			
4	902.0000	32.71	1.28	33.99	54.00	-20.01	AVG			
5	903.8079	95.53	1.30	96.83	74.00	22.83	peak			

Note: Average measurement with peak detection at No.2, 4, 6, 8

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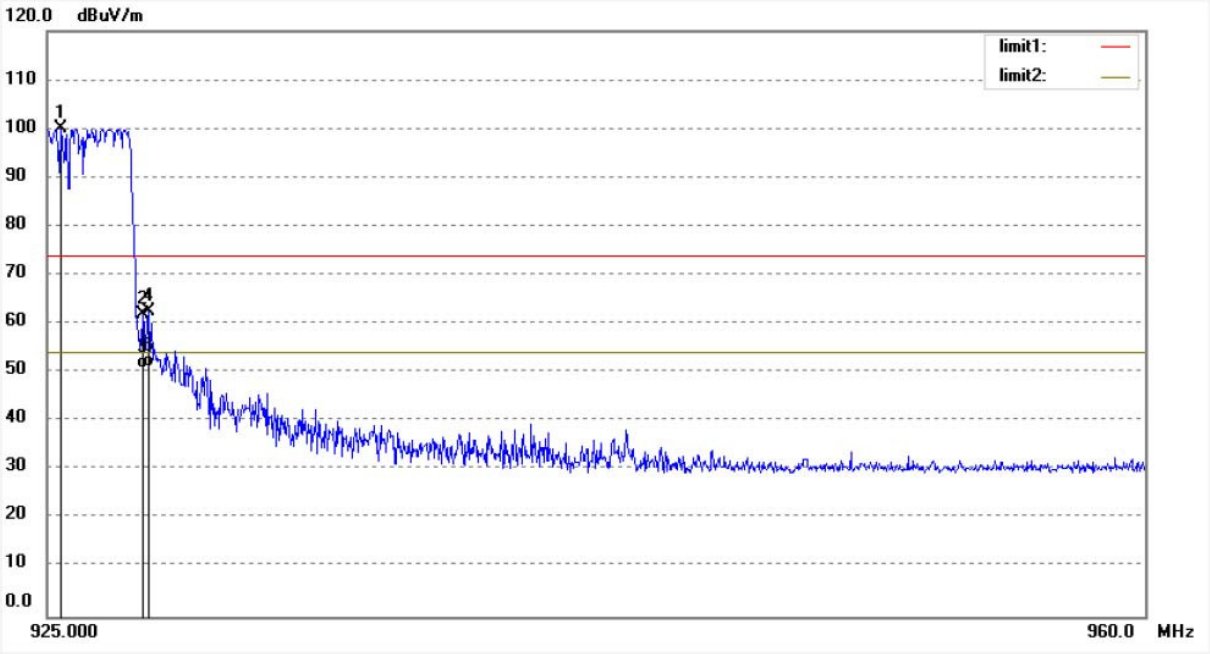
Job No.: STAR2015 #1271
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: SmartESL
Mode: HOPPING
Model: 210005
Manufacturer: Findbox GmbH

Polarization: Horizontal
Power Source: DC 6V
Date: 16/06/01/
Time: 11/57/08
Engineer Signature: STAR
Distance: 3m

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	925.4200	98.19	1.73	99.92	74.00	25.92	peak			
2	928.0000	60.04	1.80	61.84	74.00	-12.16	peak			
3	928.0000	49.06	1.80	50.86	54.00	-3.14	AVG			
4	928.2200	60.64	1.80	62.44	74.00	-11.56	peak			
5	928.2200	49.40	1.80	51.20	54.00	-2.80	AVG			

Note: Average measurement with peak detection at No.2, 4, 6, 8

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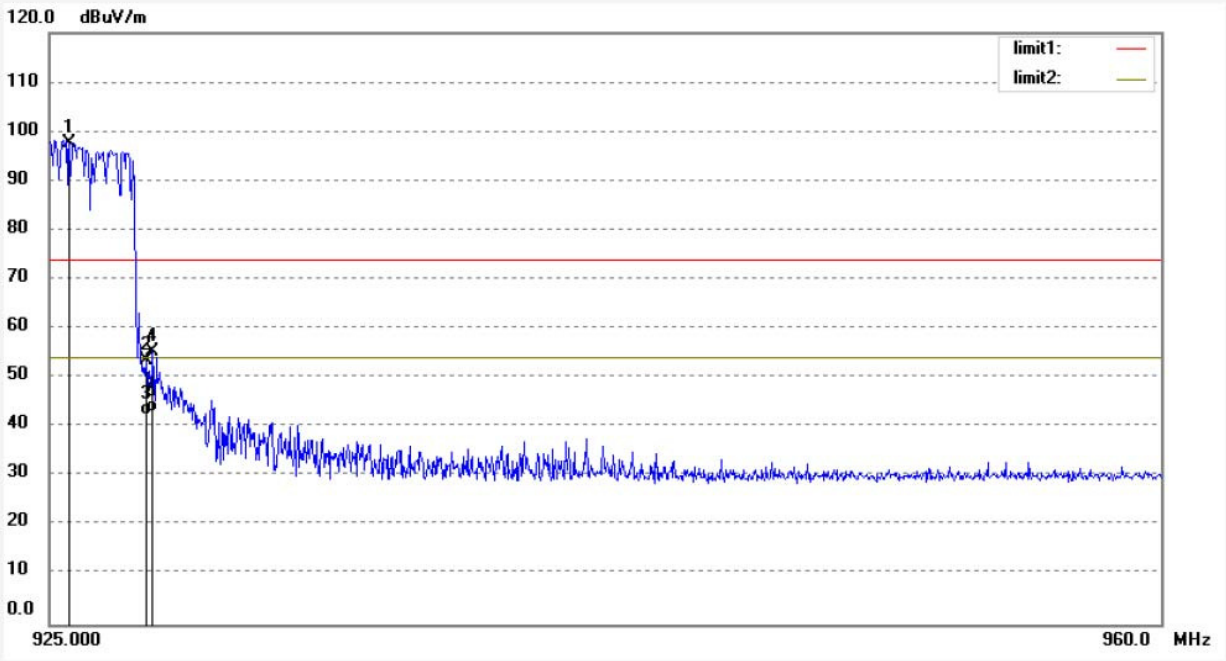
Job No.: STAR2015 #1272
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: SmartESL
Mode: HOPPING
Model: 210005
Manufacturer: Findbox GmbH

Polarization: Vertical
Power Source: DC 6V
Date: 16/06/01/
Time: 11/58/16
Engineer Signature: STAR
Distance: 3m

Note: Report NO.:ATE20161073



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	925.6300	95.83	1.73	97.56	74.00	23.56	peak			
2	928.0000	51.80	1.80	53.60	74.00	-20.40	peak			
3	928.0000	40.71	1.80	42.51	54.00	-11.49	AVG			
4	928.2200	53.46	1.80	55.26	74.00	-18.74	peak			
5	928.2200	41.26	1.80	43.06	54.00	-10.94	AVG			

Note: Average measurement with peak detection at No.2, 4, 6, 8

12. ANTENNA REQUIREMENT

12.1. The Requirement

According to Section 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.

12.2. Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 0dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.