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FCC TEST REPORT

Under
FCC Part 15D for Isochronous UPCS Devices

Prepared For :

Grandstream Networks, Inc.

4th Floor, Rainbow Technology Building #16 New West Rd, Nanshan Science & Technology Park (North District),Shenzhen, China 518057

FCC ID: YZZDP720
EUT: DECT Cordless VoIP Phone
Model: DP720

January 28, 2016 **Issue Date:**
Original Report **Report Type:**
Eric Guo **Test Engineer:** Eric Guo
Apollo Liu **Review By:** Apollo Liu / Manager

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1. General Information

1. 1 Notes

The test results of this report relate exclusively to the test item specified in 1.5. The KMO Lab does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the KMO Lab.

1. 2 Testing Laboratory

Ke Mei Ou Laboratory Co., Ltd.

ANSI-ASQ National Accreditation Board/ACLASS ISO/IEC 17025 Accredited Lab for telecommunication standards. The Registration Number is AT-1532. The testing quality system meets with ISO/IEC-17025 requirements, This approval results is accepted by MRA of ILAC.
FCC Test Site Registration Number: 962205
IC Test Site Registration Number: 4986A-2
Internet: www.kmolab.com

1. 3 Details of Applicant

Name : Grandstream Networks, Inc.
Address : 4th Floor, Rainbow Technology Building #16 New West Rd, Nanshan Science & Technology Park (North District),Shenzhen, China 518057

1. 4 Application Details

Date of Receipt of Application	: October 28, 2015
Date of Receipt of Test Item	: October 28, 2015
Date of Test	: December 14, 2015~January 28, 2016

1. 5 Test Item

Manufacturer	: Same as applicant
Address	: Same as applicant
Trade Name	: Grandstream
Model No.(Base)	: DP720
Model No.(Extension)	: N/A
Description	: DECT Cordless VoIP Phone

Additional Information

Frequency	: 1921.536~1928.448MHz
RF Power	: PP-72.61mW; FP- Ant0: 72.61mW, Ant1:93.97mW(Conducted Peak)
Number of Channels	: 5
Type of Modulation	: GFSK
Power Supply	: DC 5V/1A(Adapter model: F06US0500100A) DC 5V/1A(Adapter model: NBS05B050100VU)
Antenna	: PP-Internal (0dBi); FP-Internal Ant0&Ant1 (0dBi)

UPCS Channel	Frequency (MHz)
Upper Band Edge	1930.000
0 (Highest)	1928.448
1	1926.720
2	1924.992
3	1923.264
4 (Lowest)	1921.536
Lower Band Edge	1920.000

Requirement: FCC15.303(d),(g) Within 1920~1930 MHz band for isochronous devices.

1. 6 Test Standards

FCC Part 15D for Isochronous UPCS Devices

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

2. Technical Test

2. 1 Summary of Test Results

The EUT has been tested according to the following specifications:

FCC Rule FCC Part15, Subpart D	Test Type	Result	Notes
15.307(b)	Coordination with fixed microwave	PASS	Complies
15.307(b)	Digital Modulation Techniques	PASS	Complies
15.319(b)	Labeling requirements	PASS	Complies
15.19(a)(3)	Antenna Requirement	PASS	Complies
15.317, 15.203	Power Line Conducted Emission	PASS	Complies
15.107(a)/ 15.207(a)	Emission Bandwidth	PASS	Complies
15.323(a)	In-band emissions	PASS	Complies
15.323(d)	Out-of-band emissions	PASS	Complies
15.323(d)	Output Power and Antenna Gain	PASS	Complies
15.319(c)(e), 15.31(e)	Power Spectral Density	PASS	Complies
15.319(d)	Automatic discontinuation of transmission	PASS	Complies
15.319(f)	Carrier frequency stability	PASS	Complies
15.323(f)	Frame repetition stability	PASS	Complies
15.323(e)	Frame period and jitter	PASS	Complies
15.323(e)	Monitoring threshold, Least interfered channel	PASS	Complies
15.323(c)(2);(5); (9)	Monitoring of intended transmit window and maximum reaction time	PASS	Complies
15.323(c)(1)	Threshold monitoring bandwidth	PASS	Complies
15.323(c)(7)	Reaction time and monitoring interval	PASS	Complies
15.323(c)(1);(5); (7)	Access criteria test interval	N/A	N/A, see note 1
15.323(c)(4);(6)	Access Criteria functional test	N/A	N/A, see note 1
15.323(c)(4);(6)	Acknowledgements	PASS	Complies
15.323(c)(4)	Transmission duration	PASS	Complies
15.323(c)(3)	Dual access criteria	PASS	Complies
15.323(c)(10)	Alterative monitoring interval	N/A	N/A, see note 2

1.Only applies for equipment that transmits unacknowledged control and signaling information
2.The client declares that the tested equipment does not implement this provision
3.Not required if the Conducted Out-of-Band Emissions test is Passed

2. 2 Antenna 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.
The EUT no antenna connector for internal antenna. This is permanently attached antenna and meets the requirements of this section.

2. 3 Description of Tested Device

The DP720 is a DECT cordless VoIP phone that allows users to mobilize their VoIP network throughout any business, warehouse, retail store and residential environment. It is supported by Grandstream's DP750 DECT VoIP base station and delivers a combination of mobility and top-notch telephony performance. Up to five DP720 handsets are supported on each DP750 while each DP720 supports a range of up to 300 meters outdoors and 50 meters indoors from the base station. The DP720 touts a suite of top-notch telephony features including support for up to 10 SIP accounts per handset, full HD audio, a 3.5mm headset jack, multi-language support, a speakerphone and more. When paired with Grandstream's DP750 DECT Base Station, the DP720 offers a powerful DECT VoIP handset that allows any business or residential user to create a cordless VoIP solution.
The EUT an responding device as described in ANSI C63.17 and is designed to operate together with a DECT fixed part (i.e. a base station), which is the initiating device.

2. 4 EUT Modification

No modification by test lab.

3. Technical Characteristics Test

3. 1 Conducted Emission Test

3.1.1 Test Equipment

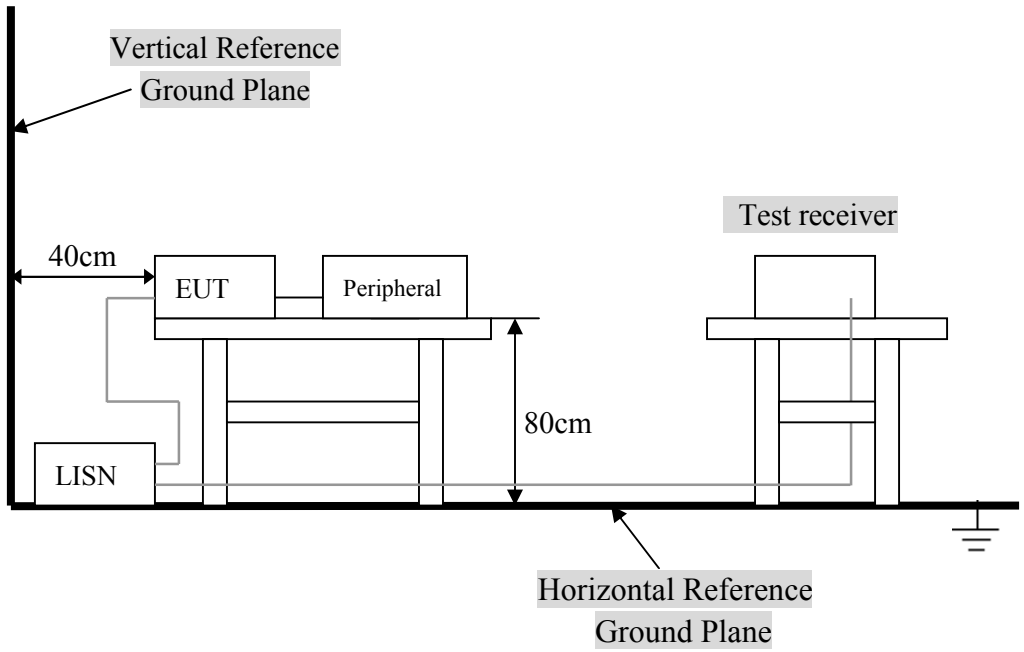
Please refer to Section 6 this report.

3.1.2 Test Procedure

For AC line conducted emission test, the EUT along with its peripherals were placed on a 1.0m (W) x 1.5m (L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN), which provided 50ohm coupling impedance for measuring instrument. The LISN housing, measuring instrument case, reference ground plane, and vertical ground plane were bounded together. The excess power cable between the EUT and the LISN was bundled.

All connecting cables of EUT and peripherals were manipulated to find the maximum emission.

3.1.3 Test Setup



For the actual test configuration, Please refer to the related items – Photos of Testing.

3.1.4 Configuration of the EUT

For emissions testing, the equipment under test (EUT) was set up to transmit continuously in burst mode with pseudo-random data to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, all cables (if any) were manipulated to produce worst-case emissions.

* Associated Antenna Descriptions: The antenna used in this product is embedded antenna.

A. EUT

Device	Manufacturer	Model #	FCC ID
DECT Cordless VoIP Phone	Same as applicant	DP720	YZZDP720

B. Internal Devices

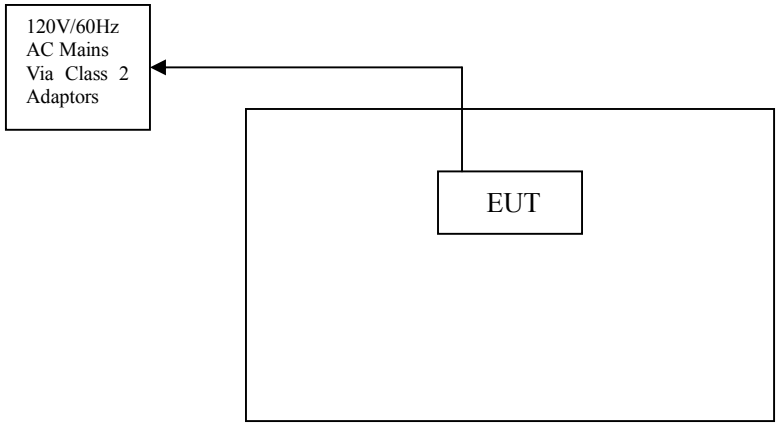
Device	Manufacturer	Model #	FCC ID
N/A			

C. Peripherals

Device	Manufacturer	Model # Serial #	FCC ID/ DoC	Cable
Printer	HP	HP930C	DoC	1.5m unshielded power cord 1.2m unshielded data cable.
Modem	GVC	N/A	DoC	1.5m unshielded power cord 1.2m unshielded data cable.
Notebook	DELL	PP10L	DoC	1.5m unshielded power cord
PC	Dell	2400n	DoC	1.5m unshielded power cord

3.1.5 EUT Operating Condition

Operating condition is according to ANSI C63.10:2013.
A. Setup the EUT and simulators as shown on follow.
B. Enable RF signal and confirm EUT active.
C. Modulate output capacity of EUT up to specification.



3.1.6 Conducted Power Line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency Range (MHz)	**Class A QP/AV**	**Class B QP/AV**
0.15 – 0.5	79/66	66-56/56-46
0.5 – 5.0	73/60	56/46
5.0 - 30	73/60	60/50

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

3.1.7 Conducted Power Line Test Result

Product	: DECT Cordless VoIP Phone	Test Mode	: Normal
Test Item	: Conducted Emission Data	Temperature	: 25 ℃
Test Voltage	: DC 5V	Humidity	: 56%RH
Test Result	: **PASS**		

The frequency spectrum from 0.15 MHz to 30 MHz was investigated. All readings are quasi -peak values with a resolution bandwidth of 9 KHz.

- Temperature : 26 ℃
- Humidity : 53 % RH

PP

Adapter model: F06US0500100A

FCC Part 15 Paragraph 15.207							
Frequency (MHz)	**Emission (dBuV) QP**	**AV**	**LINE/ NEUTRAL**	**Limit (dBuV) QP**	**AV**	**Margin (dB) QP**	**AV**
0.154	45.95	32.42	Line	65.78	55.78	-19.83	-23.36
0.154	44.67	31.59	Neutral	65.78	55.78	-21.11	-24.19
0.162	44.53	31.14	Line	65.36	55.36	-20.83	-24.22
0.170	42.91	30.78	Neutral	64.96	54.96	-22.05	-24.18
0.182	42.08	30.22	Line	64.39	54.39	-22.31	-24.17
0.178	42.98	30.84	Neutral	64.58	54.58	-21.60	-23.74

Note: NF = No Significant Peak was Found.

Adapter model: NBS05B050100VU

FCC Part 15 Paragraph 15.207							
Frequency (MHz)	**Emission (dBuV) QP**	**AV**	**LINE/ NEUTRAL**	**Limit (dBuV) QP**	**AV**	**Margin (dB) QP**	**AV**
0.170	38.55	29.13	Line	64.96	54.96	-26.41	-25.83
0.154	40.78	29.63	Neutral	65.78	55.78	-25.00	-26.15
0.182	39.61	30.04	Line	64.39	54.39	-24.78	-24.35
0.166	40.43	29.55	Neutral	65.16	55.16	-24.73	-25.61
0.494	42.42	35.22	Line	56.10	46.10	-13.68	-10.88
0.198	38.33	28.94	Neutral	63.69	53.69	-25.36	-24.75

Note: NF = No Significant Peak was Found.

FP

Adapter model: F06US0500100A

FCC Part 15 Paragraph 15.207							
Frequency (MHz)	Emission (dBuV) QP	AV	LINE/ NEUTRAL	Limit (dBuV) QP	AV	Margin (dB) QP	AV
0.154	43.45	30.52	Line	65.78	55.78	-22.33	-25.26
0.530	42.78	34.91	Neutral	56.00	46.00	-13.22	-11.09
0.166	41.43	29.72	Line	65.16	55.16	-23.73	-25.44
11.270	48.51	36.43	Neutral	60.00	50.00	-11.49	-13.57
0.534	43.34	37.45	Line	56.00	46.00	-12.66	-8.55
12.678	48.98	37.67	Neutral	60.00	50.00	-11.02	-12.33

Note: NF = No Significant Peak was Found.

Adapter model: NBS05B050100VU

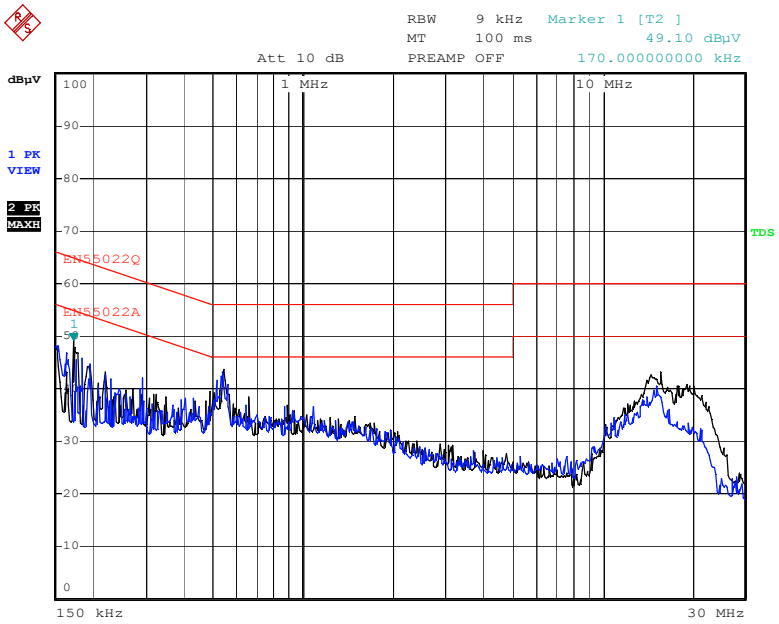
FCC Part 15 Paragraph 15.207							
Frequency (MHz)	Emission (dBuV) QP	AV	LINE/ NEUTRAL	Limit (dBuV) QP	AV	Margin (dB) QP	AV
0.154	43.43	30.69	Line	65.78	55.78	-22.35	-25.09
0.166	41.15	30.09	Neutral	65.16	55.16	-24.01	-25.07
0.166	41.48	30.01	Line	65.16	55.16	-23.68	-25.15
0.210	38.65	29.84	Neutral	63.21	53.21	-24.56	-23.37
0.178	40.07	29.98	Line	64.58	54.58	-24.51	-24.60
0.498	40.98	30.83	Neutral	56.03	46.03	-15.05	-15.20

Note: NF = No Significant Peak was Found.

Note:

1.Uncertainty in conducted emission measured is <+/ -2dB.
2.The emission levels of other frequencies were very low against the limit.
3.All Reading Levels are Quasi-Peak and Average value.
4.Emission = Meter Reading + Factor; Factor = Insertion Loss + Cable Loss.
5.Margin Value = Emission Level - Limit Value.

Conducted Emission
FCC 15.207
Test Specification: LINE&NEUTRAL
Comment:
PP:
Adapter model: F06US0500100A



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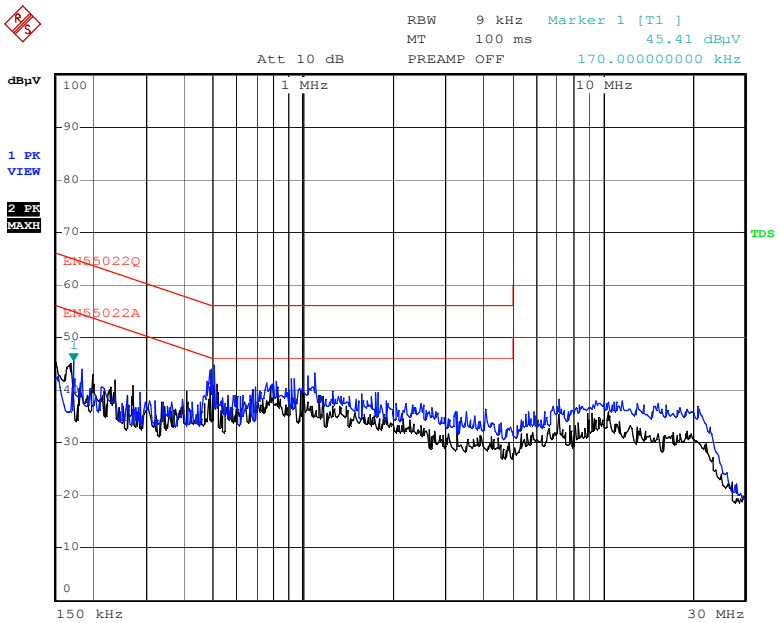
Adapter model: NBS05B050100VU



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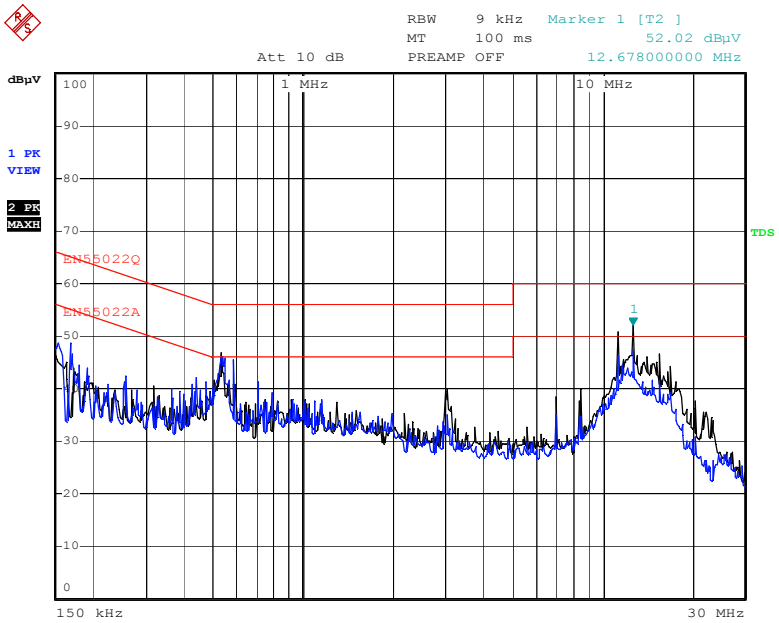
FP:

Adapter model: F06US0500100A



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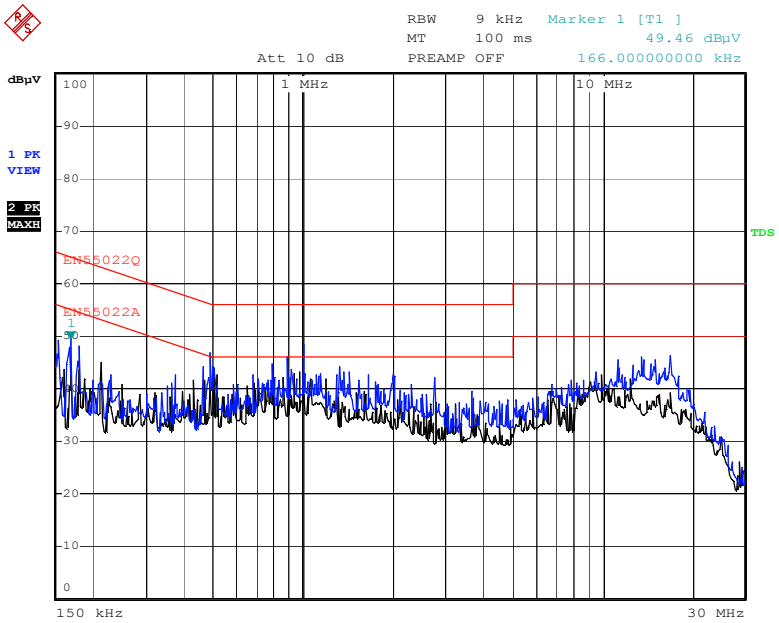

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3. 2 Occupied Bandwidth

3.2.1 Test Equipment

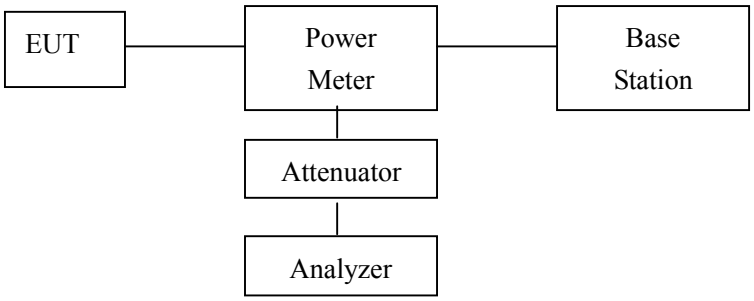
Please refer to section 6 this report.

3.2.2 Test Procedure

The width, in Hz, of the signal between two points, one below the carrier center frequency and one below the carrier center frequency, that is 26 dB down relative to the maximum level of the modulated carrier. It is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1% of the emission band-width of the device under measurement. [Extraction from 47 CFR 15, subpart D, 15.303 (C)]..

3.2.3 Test Setup

The emission bandwidth is measured in accordance with ANSI C63.17 sub-clause 6.1.3 using the setup below:



3.2.4 Configuration of The EUT

Same as section 3.1.4 of this report

3.2.5 EUT Operating Condition

Same as section 3.1.5 of this report

3.2.6 Limit

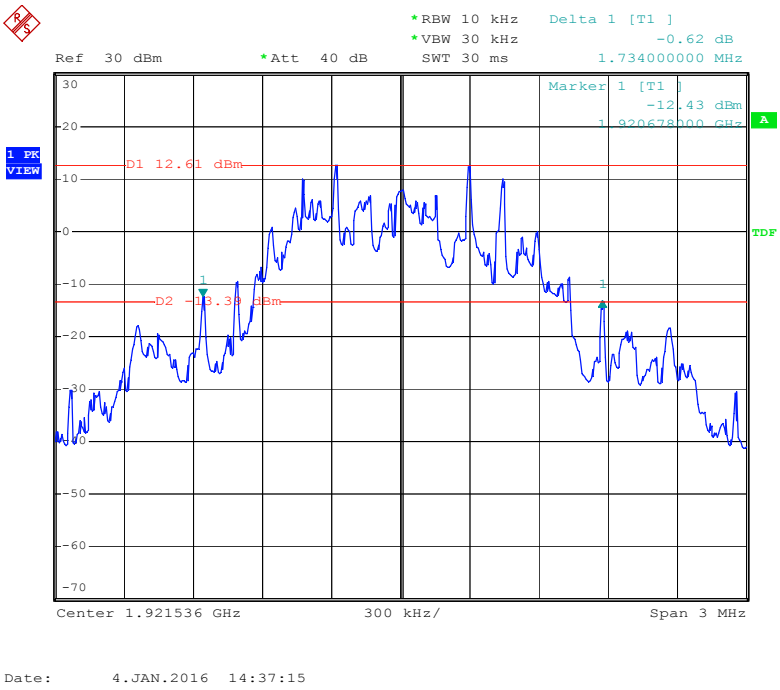
Requirements, FCC 15.323(a)
The 26 dB Bandwidth B shall be larger than 50 kHz and less than 2.5 MHz.
Requirements, RSS-213 Issue 2, clause 6.4
The 99% Bandwidth shall be larger than 50 kHz and less than 2.5 MHz.
No requirements for 6 and 12 dB Bandwidth, these values are only used for testing Monitoring Bandwidth if the Simple Compliance test fails (ANSI C63.17, clause 7.4).

3.2.7 Occupied Bandwidth Test Result

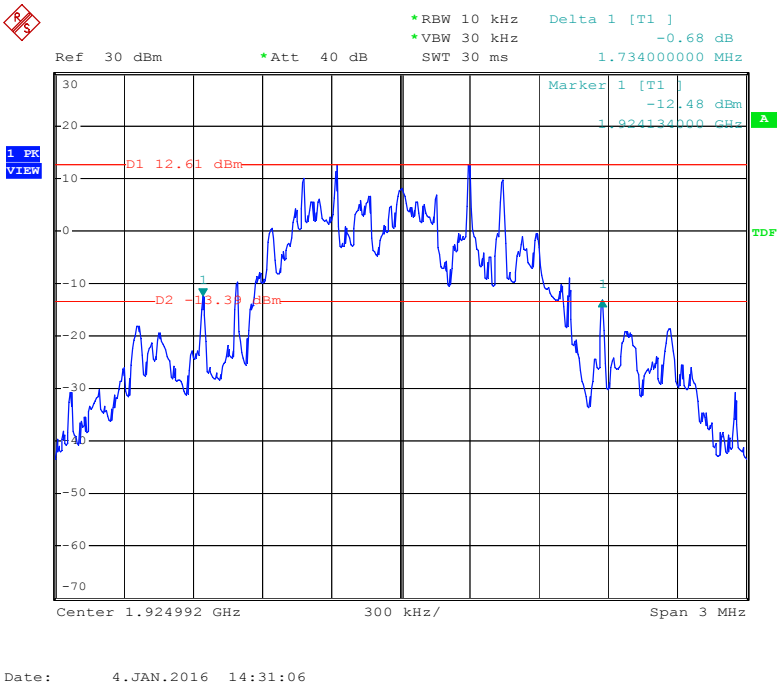
PP

Channel	Center Frequency (MHz)	26 dB Emission Bandwidth (MHz)	Limit
Low	1921.536	1.734	50 kHz < OBW <2.5 MHz
Middle	1924.992	1.734	50 kHz < OBW <2.5 MHz
High	1928.448	1.734	50 kHz < OBW <2.5 MHz

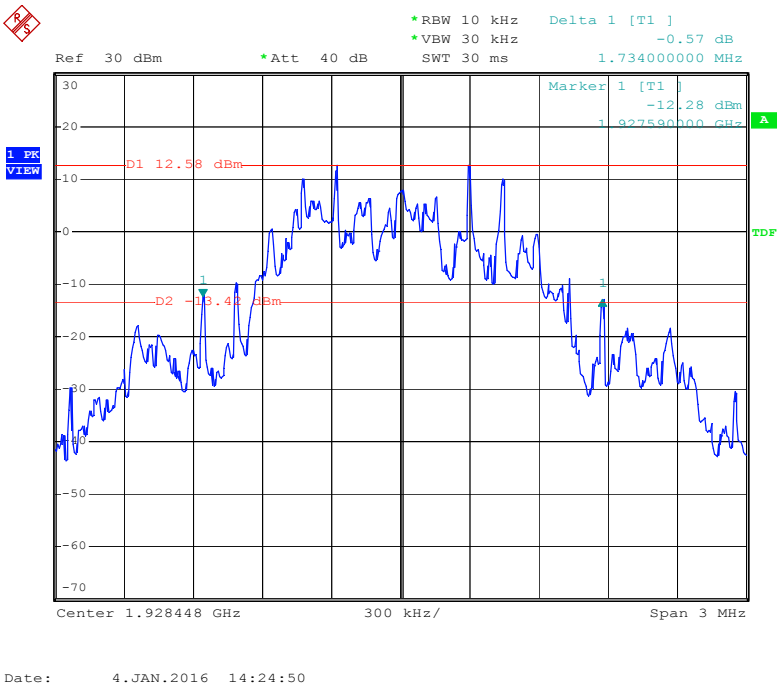
Low Channel



Mid Channel



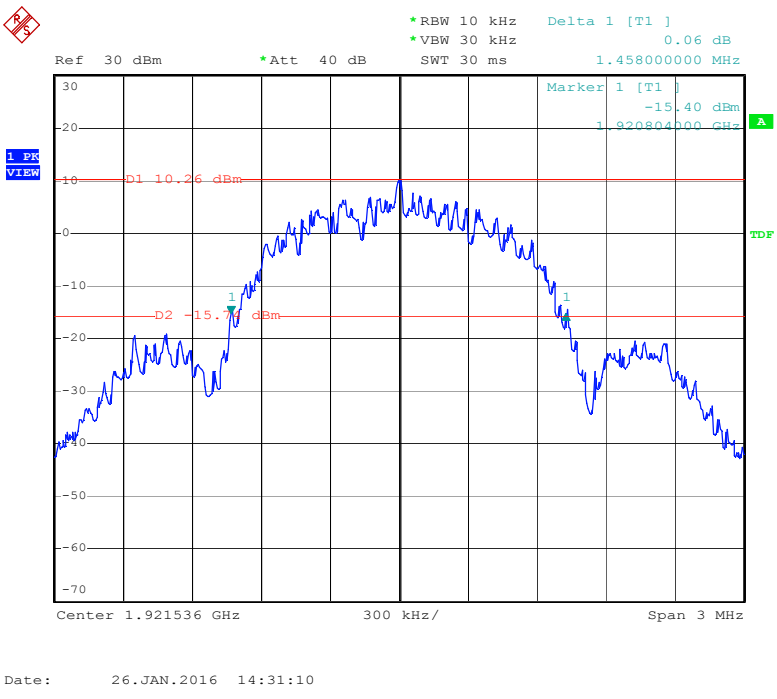
High Channel



FP
Ant 0

Channel	Center Frequency (MHz)	26 dB Emission Bandwidth (MHz)	Limit
Low	1921.536	1.458	50 kHz < OBW <2.5 MHz
Middle	1924.992	1.458	50 kHz < OBW <2.5 MHz
High	1928.448	1.458	50 kHz < OBW <2.5 MHz

Low Channel



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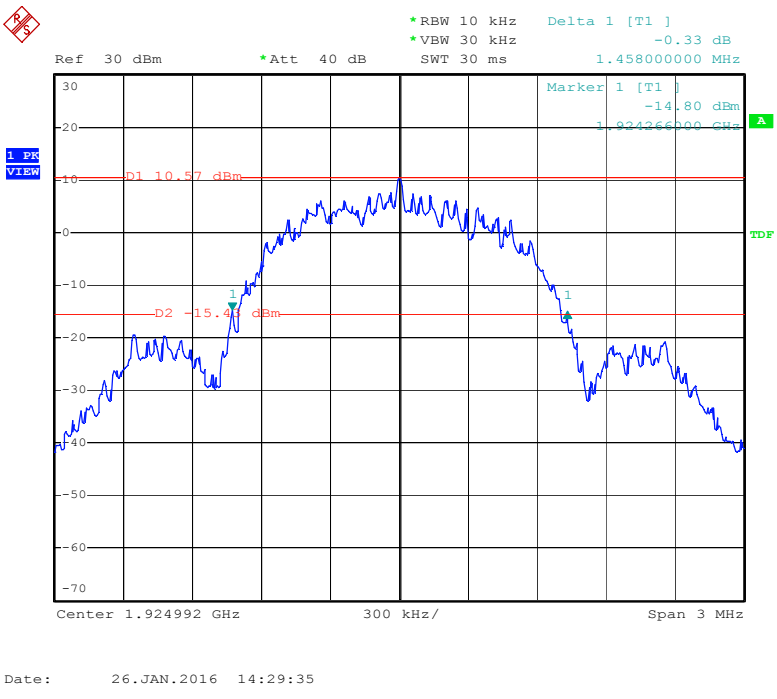
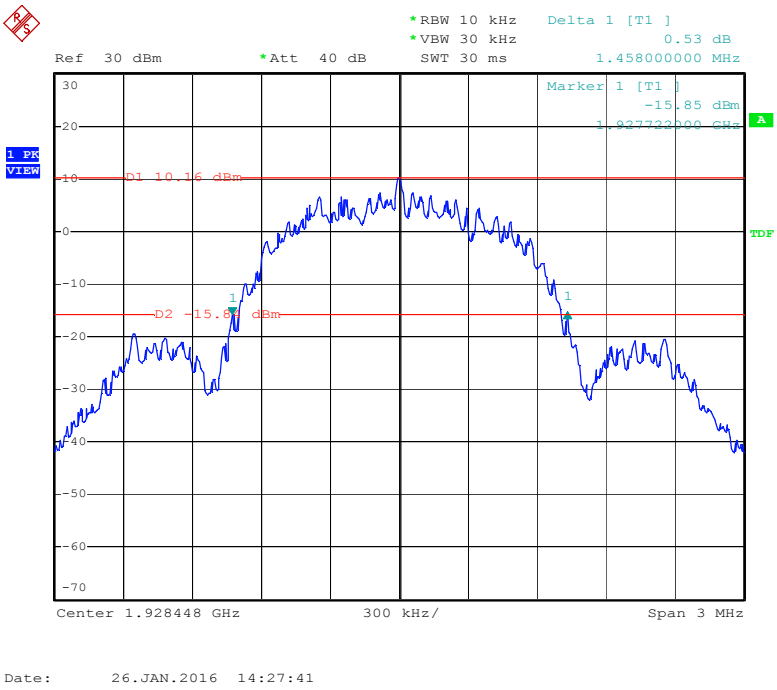


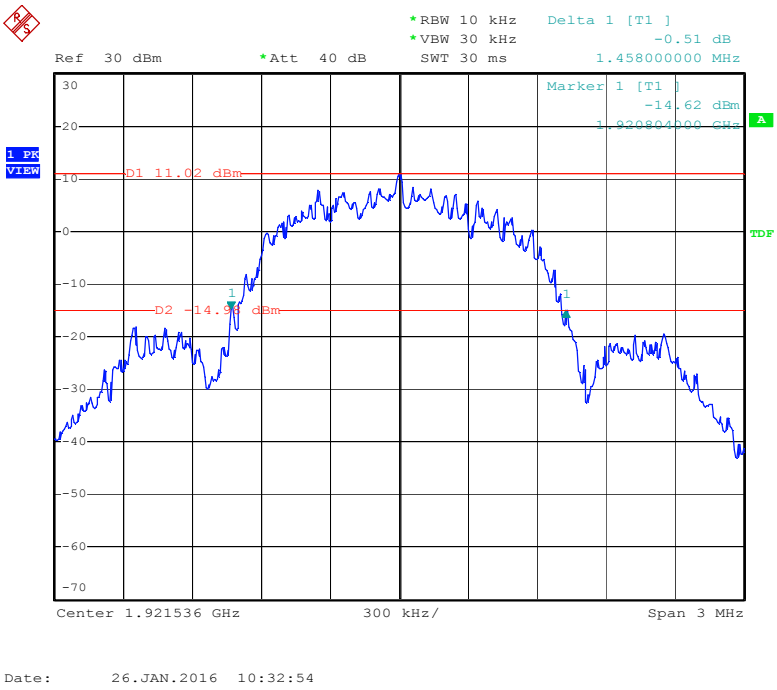
High Channel



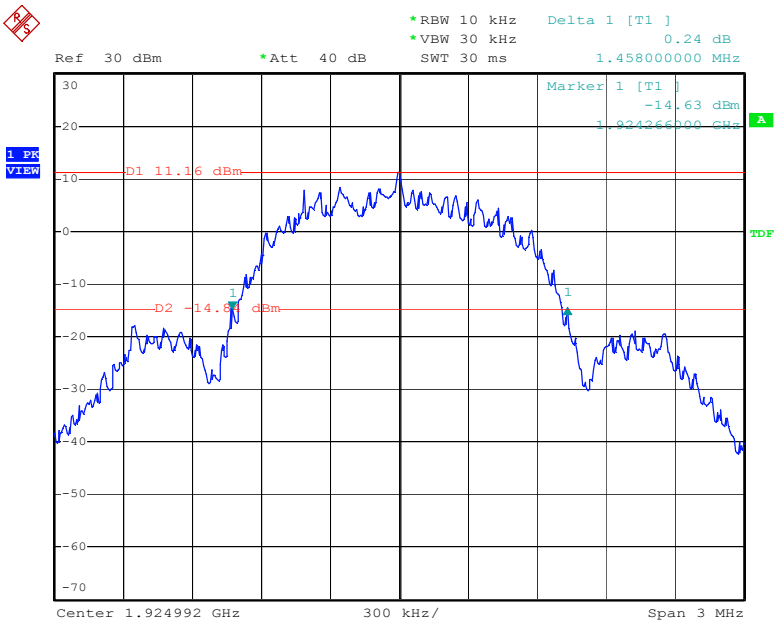
Ant 1

Channel	Center Frequency (MHz)	26 dB Emission Bandwidth (MHz)	Limit
Low	1921.536	1.458	50 kHz < OBW <2.5 MHz
Middle	1924.992	1.458	50 kHz < OBW <2.5 MHz
High	1928.448	1.458	50 kHz < OBW <2.5 MHz

Low Channel



Mid Channel



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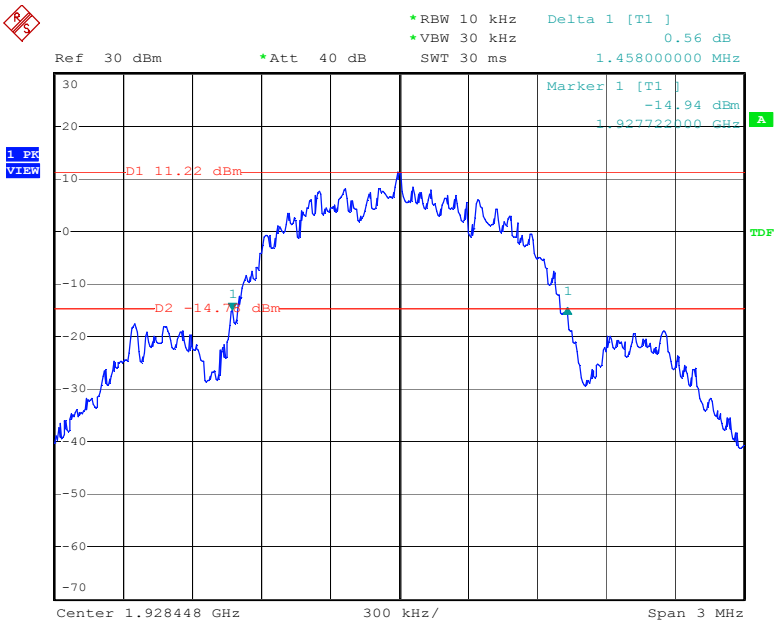
High Channel



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3. 3 RF Output Power

3.3.1 Test Equipment

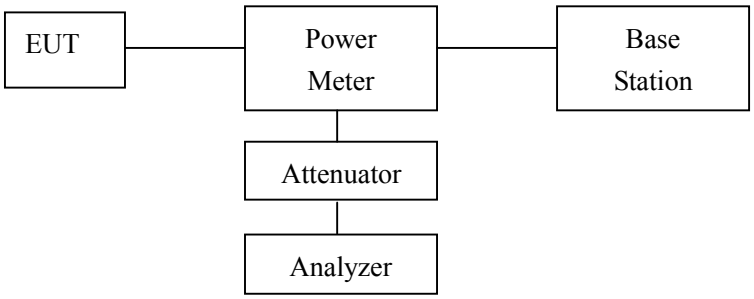
Please refer to section 6 this report.

3.3.2 Test Procedure

The peak power output as measured over an interval of time equal to the frame rate or transmission burst of the device under all conditions of modulation. Usually this parameter is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the device cannot be connected directly, alternative techniques acceptable to the Commission may be used [47 CFR 15, subpart D, 15.303].

The peak transmit power is according to ANSI C63.17-2006 §6.1.2

3.3.3 Test Setup



3.3.4 Configuration of The EUT

Same as section 3.1.4 of this report

3.3.5 EUT Operating Condition

Same as section 3.1.5 of this report

3.3.6 Limit

Conducted: 100 UW × SQRT (B) where B is measured Emission Bandwidth in Hz
The antenna gain is below 3 dBi , no reduction in transmit power is necessary.
Requirements, FCC 15.319(c)(e), RSS-213, Issue 2
Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in Hertz.
Calculation of Peak Transmit Power Limit:
Peak Transmit Power Limit = $100\mu W \times (EBW)^{1/2}$
EBW is the transmit emission bandwidth in Hz determined in the other test item:

The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

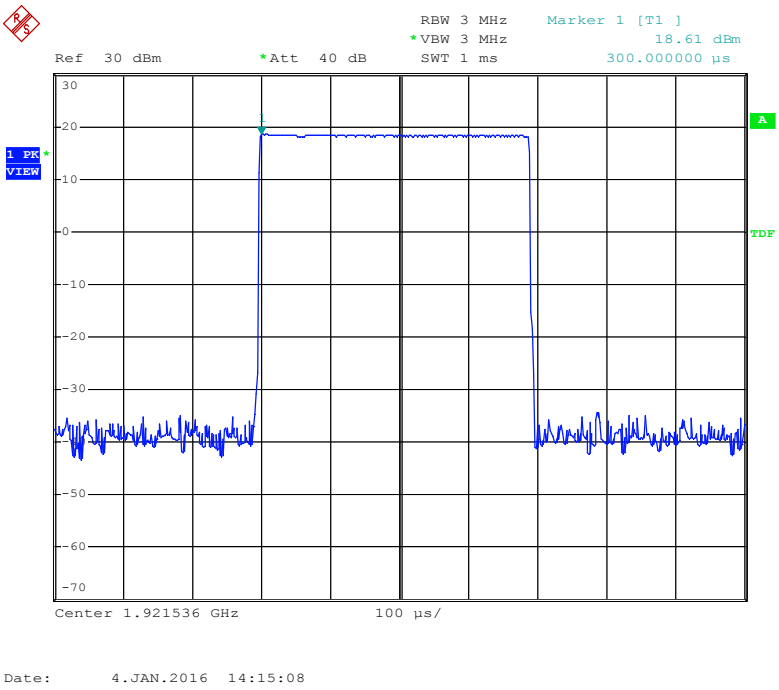
3.3.7 RF Output Power Test Result

Product	: DECT Cordless VoIP Phone	Test Mode	: CH Low ~ CH High
Test Item	: RF Output Power	Temperature	: 25 ℃
Test Voltage	: DC 2.8V/5V	Humidity	: 56%RH
Test Result	: **PASS**		

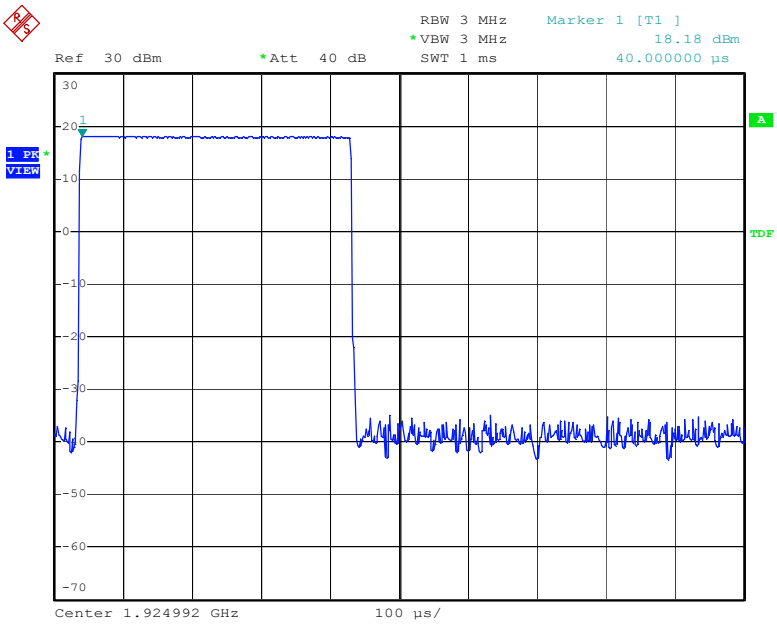
PP

Channel	Frequency (MHz)	Peak Transmit Power (dBm)	Limit (dBm)
Low	1921.536	18.61	21.20
Middle	1924.992	18.18	21.20
High	1928.448	18.21	21.20
EBW $_{\text{Low channel}}$ = 1734000 Hz, EBW $_{\text{Middle channel}}$ = 1734000 Hz, EBW $_{\text{High channel}}$ = 1734000 Hz Peak Transmit Power Limit = 100μW *(EBW) = 21.20dBm			

Low Channel



Mid Channel



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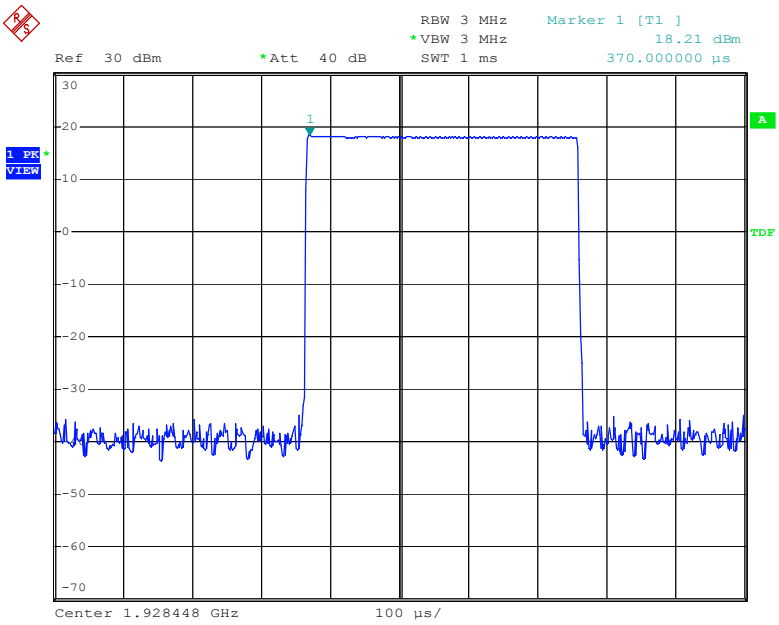
High Channel



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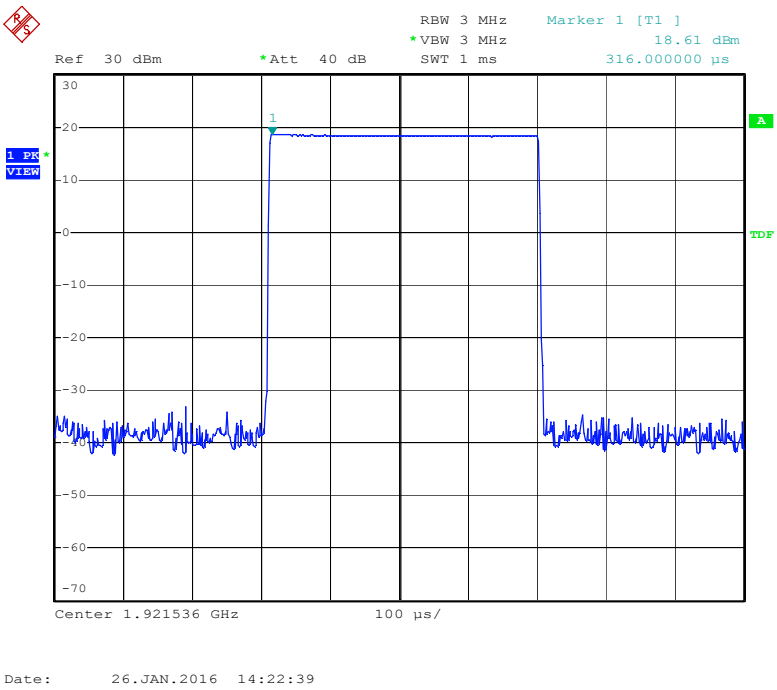
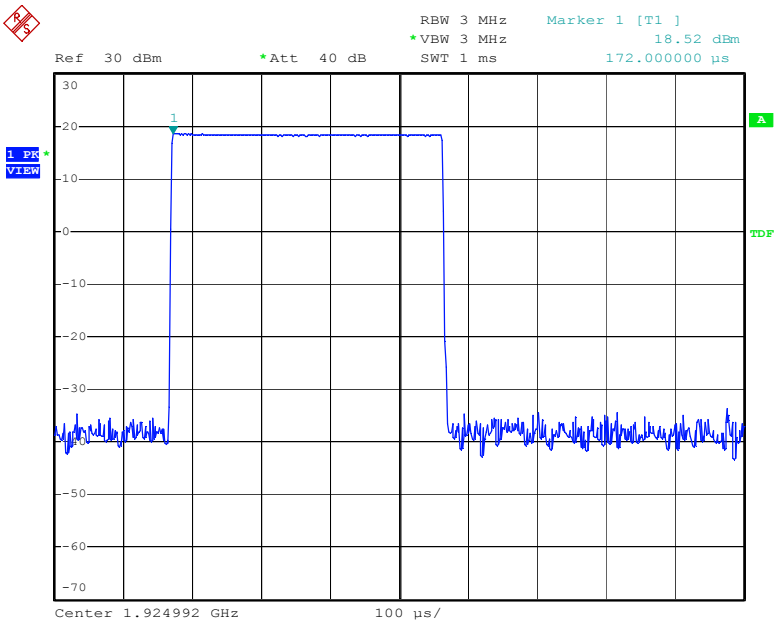
FP
Ant0

Channel	Frequency (MHz)	Peak Transmit Power (dBm)	Limit (dBm)
Low	1921.536	18.61	20.82
Middle	1924.992	18.52	20.82
High	1928.448	18.33	20.82
EBW $_{\text{Low channel}}$ = 1458000 Hz, EBW $_{\text{Middle channel}}$ = 1458000 Hz, EBW $_{\text{High channel}}$ = 1458000 Hz Peak Transmit Power Limit = 100μW *(EBW) = 20.83dBm			

Low Channel

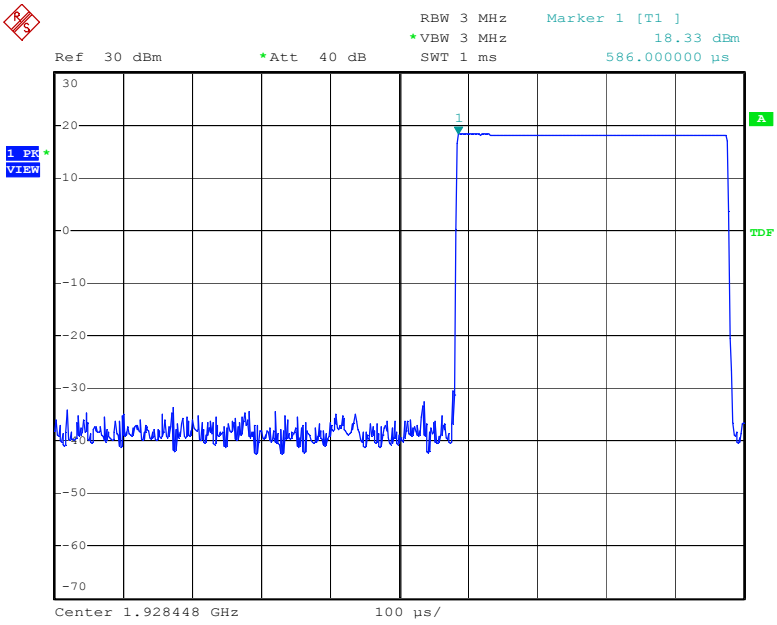


Mid Channel



Date: 26.JAN.2016 14:23:50

High Channel

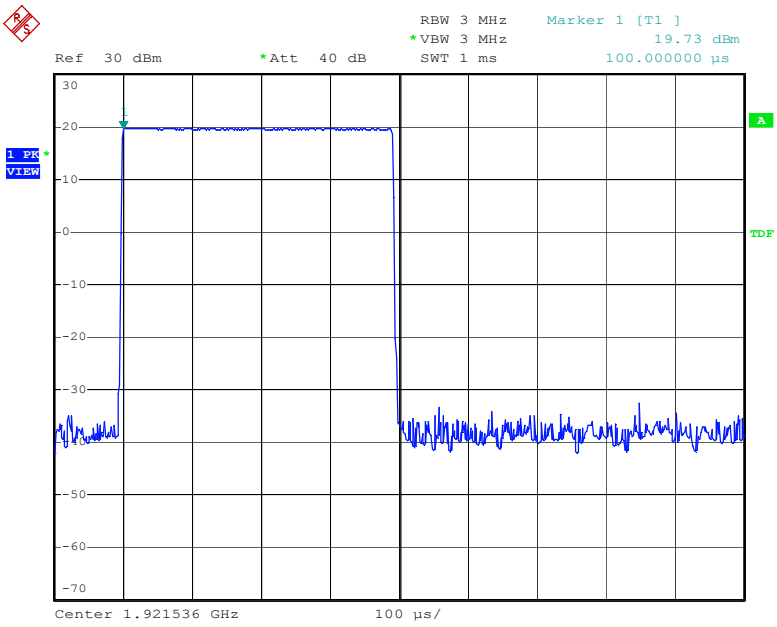


Date: 26.JAN.2016 14:24:47

Ant1

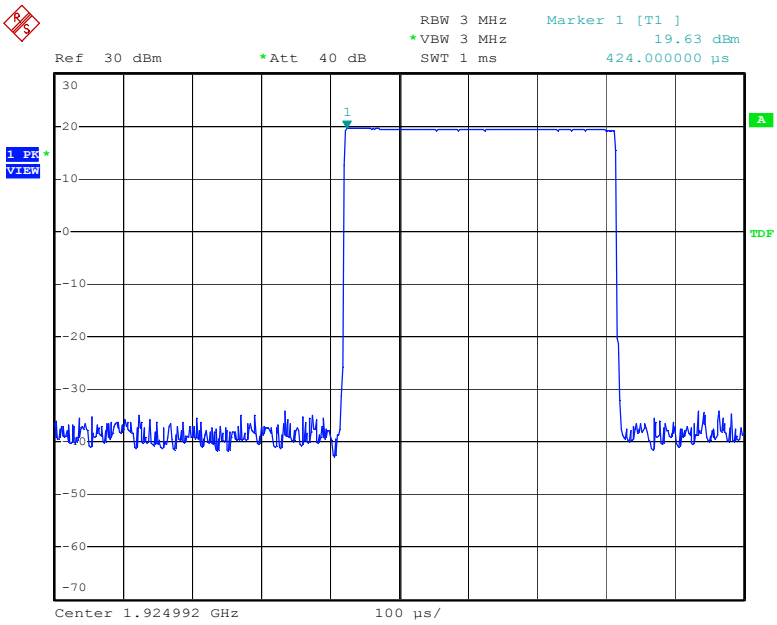
Channel	Frequency (MHz)	Peak Transmit Power (dBm)	Limit (dBm)
Low	1921.536	19.73	20.82
Middle	1924.992	19.63	20.82
High	1928.448	19.53	20.82
EBW $_{\text{Low channel}}$ = 1458000 Hz, EBW $_{\text{Middle channel}}$ = 1458000 Hz, EBW $_{\text{High channel}}$ = 1458000 Hz Peak Transmit Power Limit = 100μW *(EBW) = 20.82dBm			

Low Channel



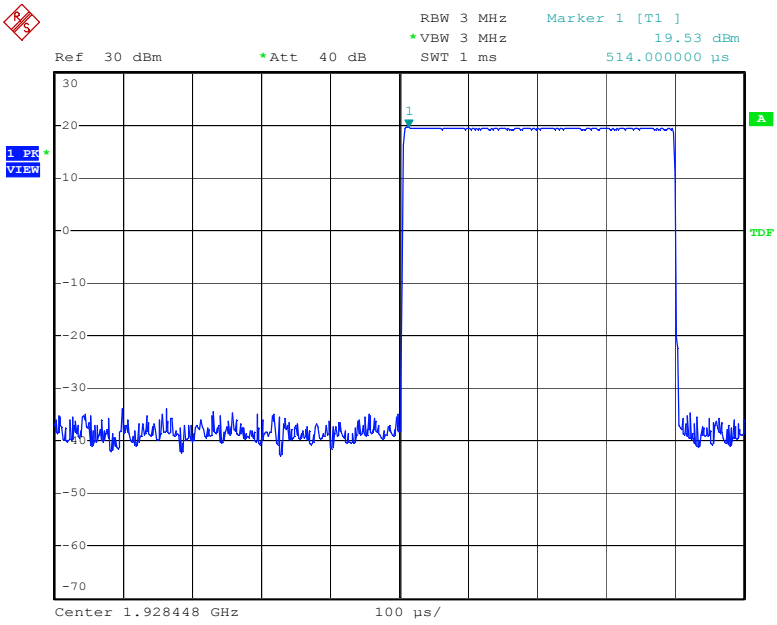
Date: 26.JAN.2016 10:23:39

Mid Channel



Date: 26.JAN.2016 10:24:45

High Channel



Date: 26.JAN.2016 10:26:41

3. 4 Power Spectral Density

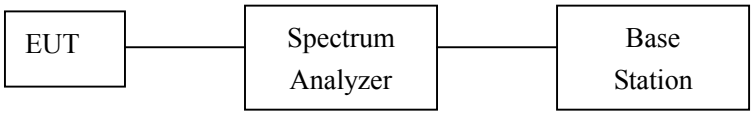
3.4.1 Test Equipment

Please refer to section 6 this report.

3.4.2 Test Procedure

The power spectral density is measured in accordance with ANSI C63.17.2006 Clause 6.1.5.

3.4.3 Test Setup



3.4.4 Configuration of The EUT

Same as section 3.1.4 of this report

3.4.5 EUT Operating Condition

Same as section 3.1.5 of this report

3.4.6 Limit

Power spectral density shall not exceed 3 mW (4.8dBm) in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

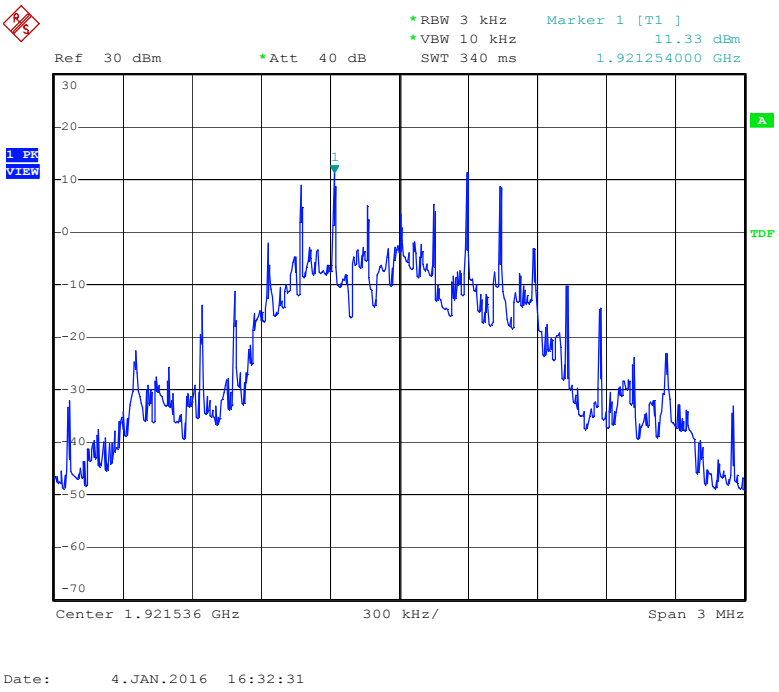
3.4.7 Power Spectral Density Test Result

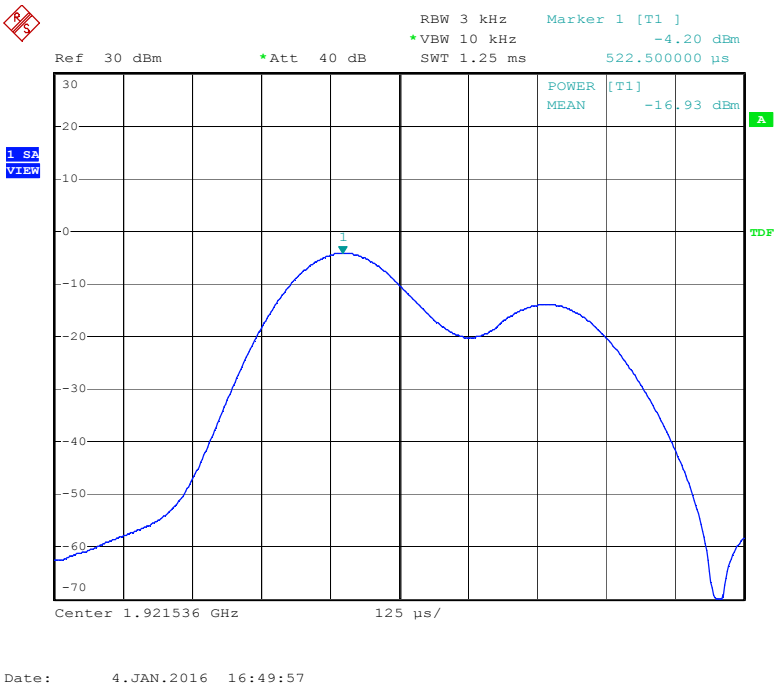
Product	: DECT Cordless VoIP Phone	Test Mode	: CH Low ~ CH High
Test Item	: Radiated Spurious Emission	Temperature	: 25 ℃
Test Voltage	: DC 2.8V/5V	Humidity	: 56%RH
Test Result	: **PASS**		

PP

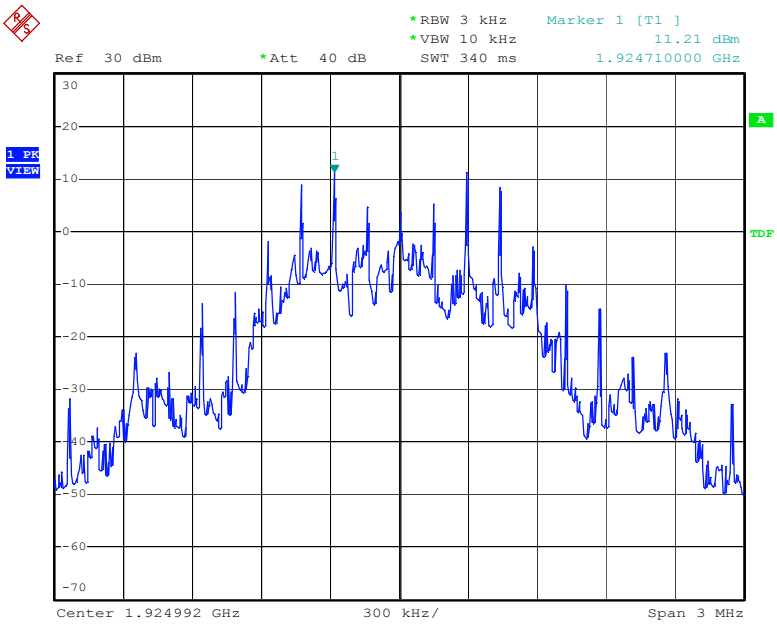
Channel	Frequency (MHz)	Power Spectral Density		Limit (mW/3kHz)	Result
		(dBm/3kHz)	(mW/3kHz)		
Low	1921.536	11.33	0.0203	3	Pass
Middle	1924.992	11.21	0.0184	3	Pass
High	1928.448	11.29	0.0178	3	Pass

Low Channel





Mid Channel



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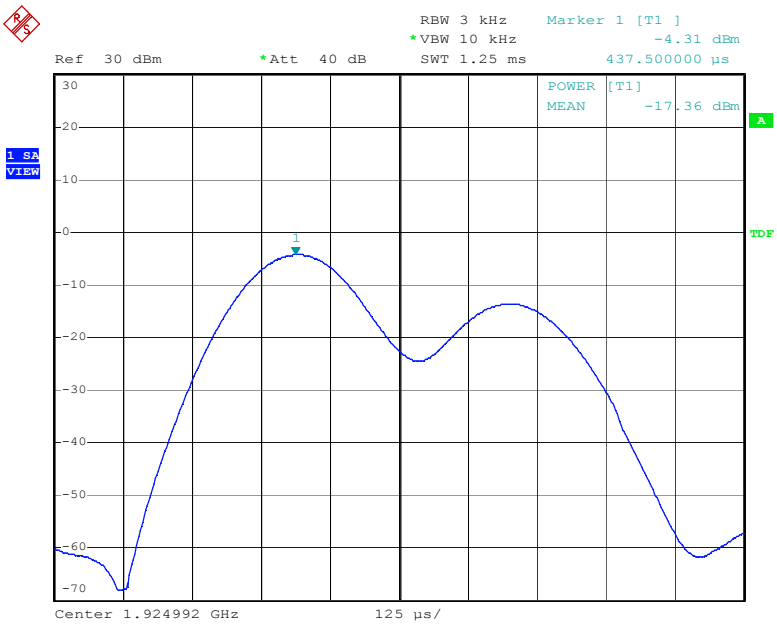
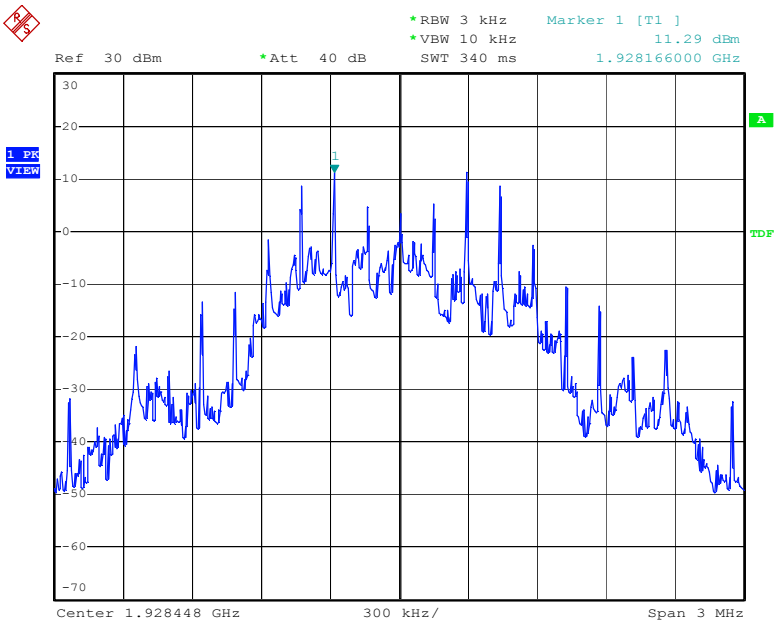


Date: 4.JAN.2016 16:51:01

High Channel



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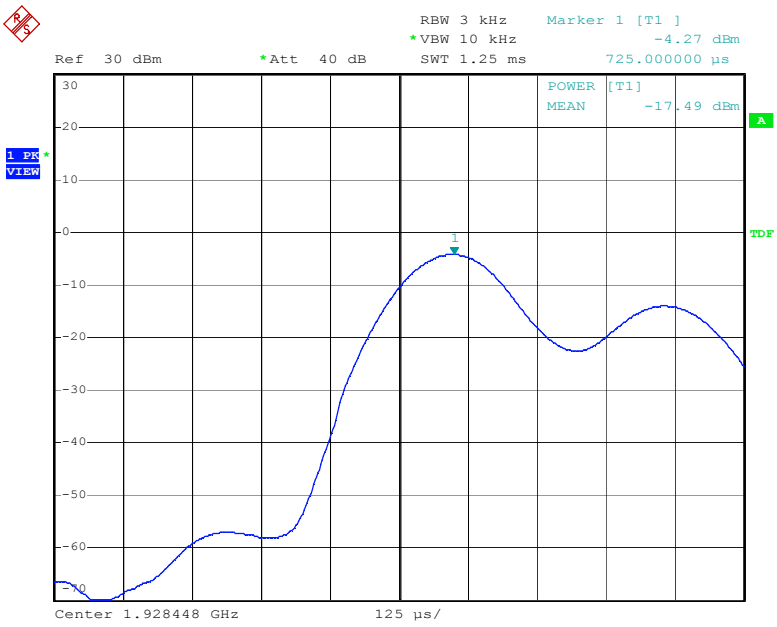
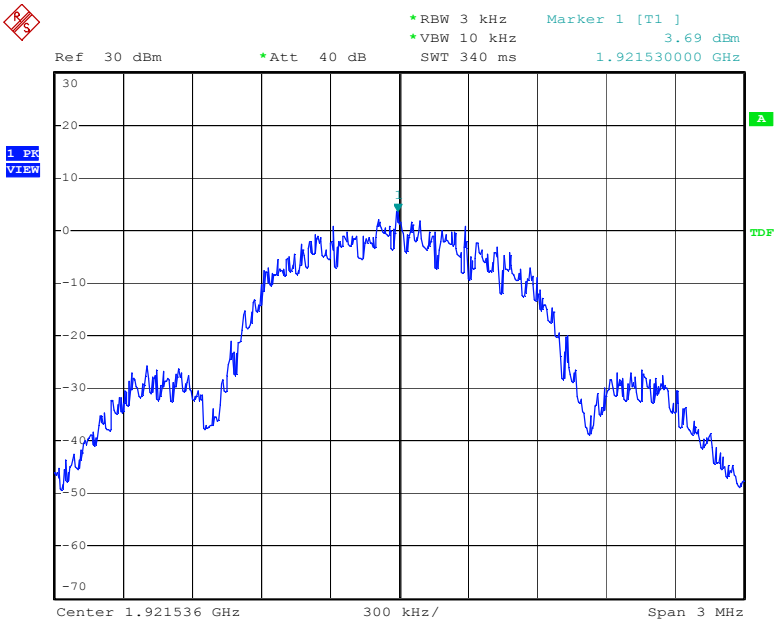


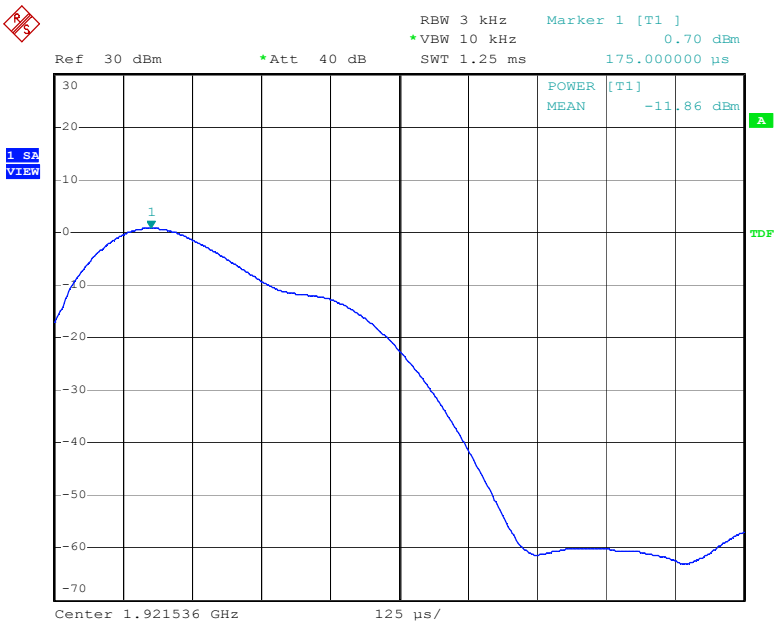
Date: 4.JAN.2016 16:58:30

FP
Ant0

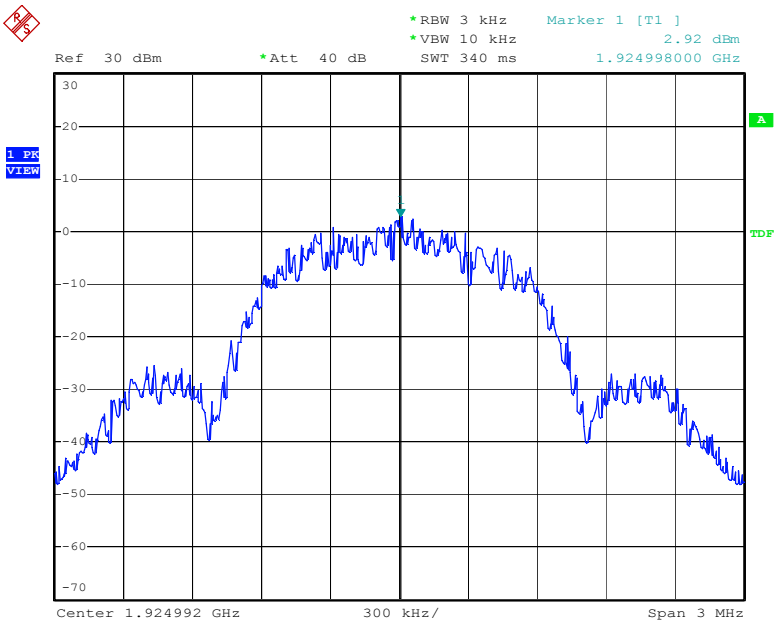
Channel	Frequency (MHz)	Power Spectral Density		Limit (mW/3kHz)	Result
		(dBm/3kHz)	(mW/3kHz)		
Low	1921.536	3.69	0.0652	3	Pass
Middle	1924.992	2.92	0.0700	3	Pass
High	1928.448	3.10	0.0695	3	Pass

Low Channel





Mid Channel



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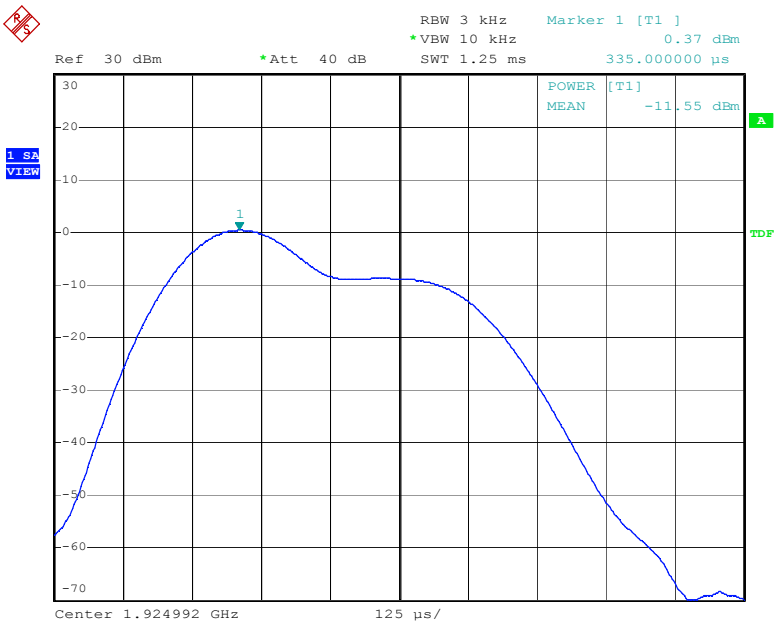
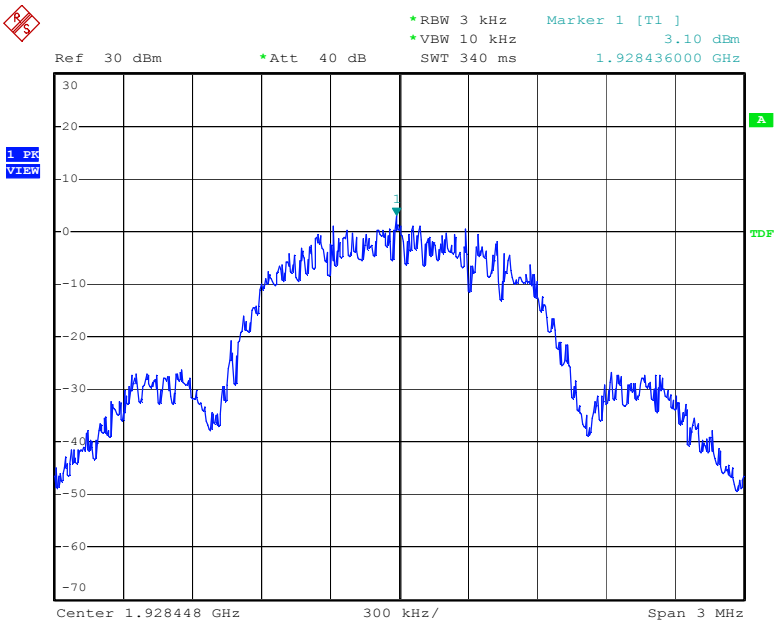


Date: 26.JAN.2016 14:42:52

High Channel



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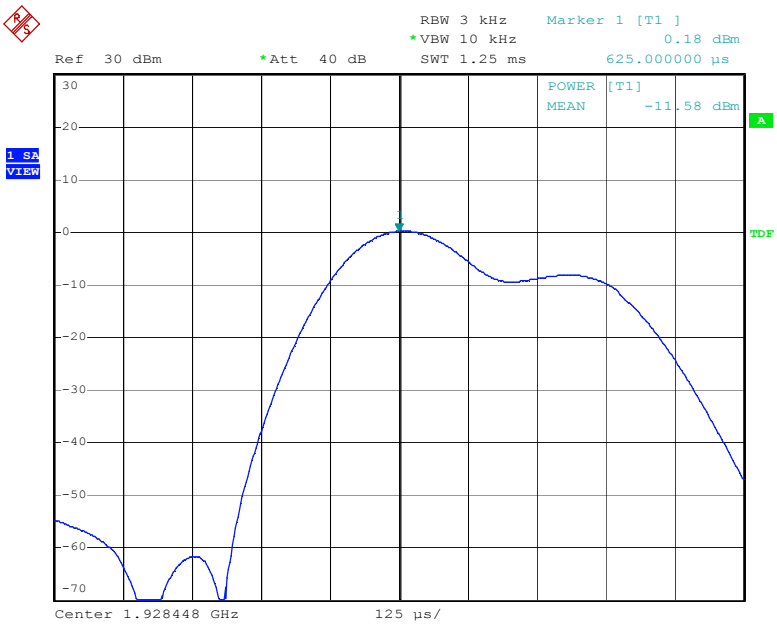
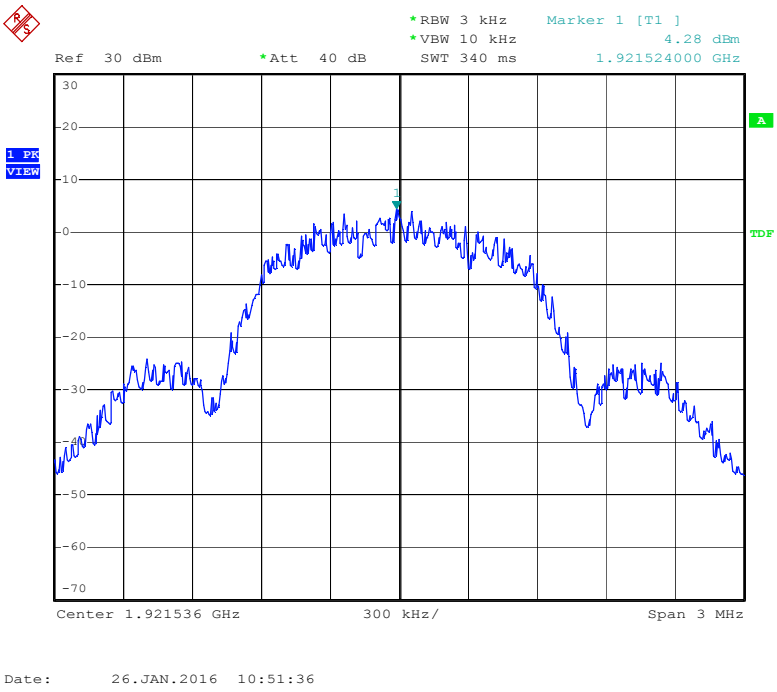


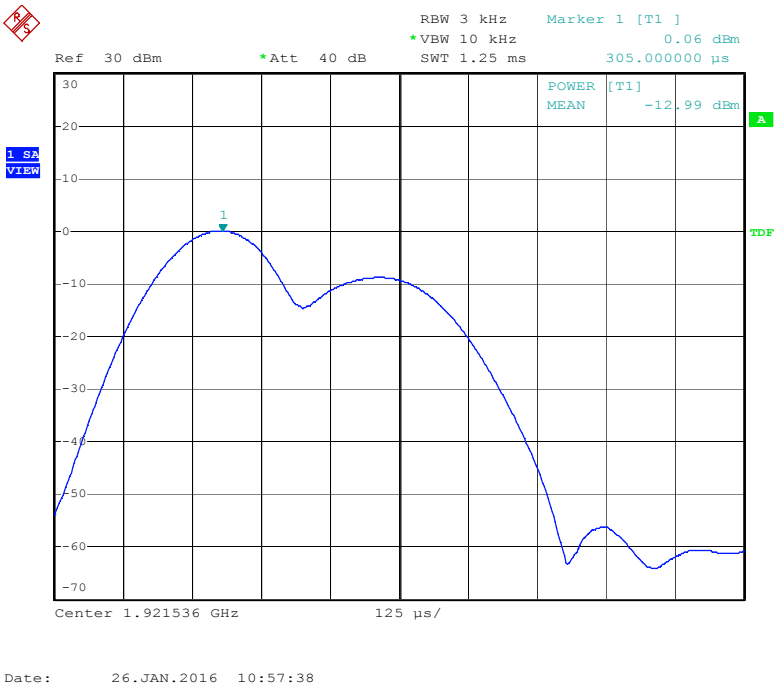
Date: 26.JAN.2016 14:46:01

Ant1

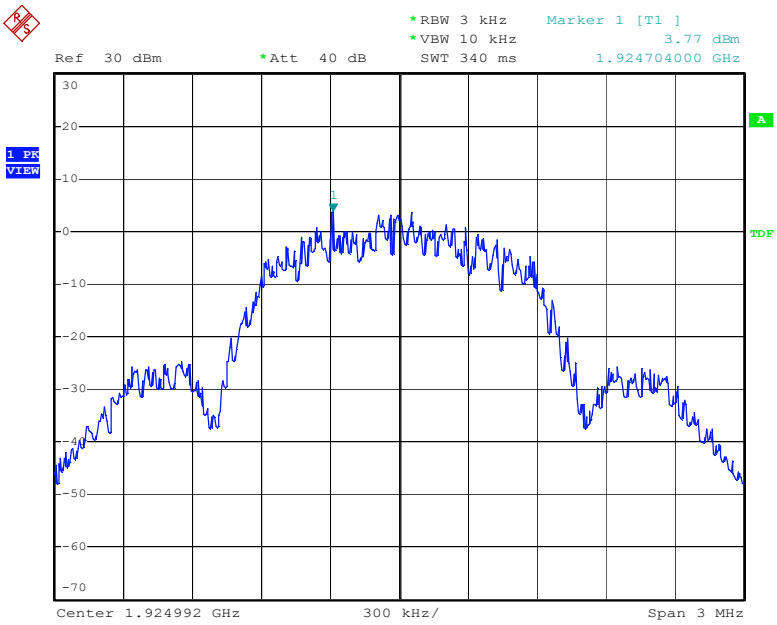
Channel	Frequency (MHz)	Power Spectral Density		Limit (mW/3kHz)	Result
		(dBm/3kHz)	(mW/3kHz)		
Low	1921.536	4.28	0.0502	3	Pass
Middle	1924.992	3.77	0.0621	3	Pass
High	1928.448	3.42	0.0488	3	Pass

Low Channel





Mid Channel



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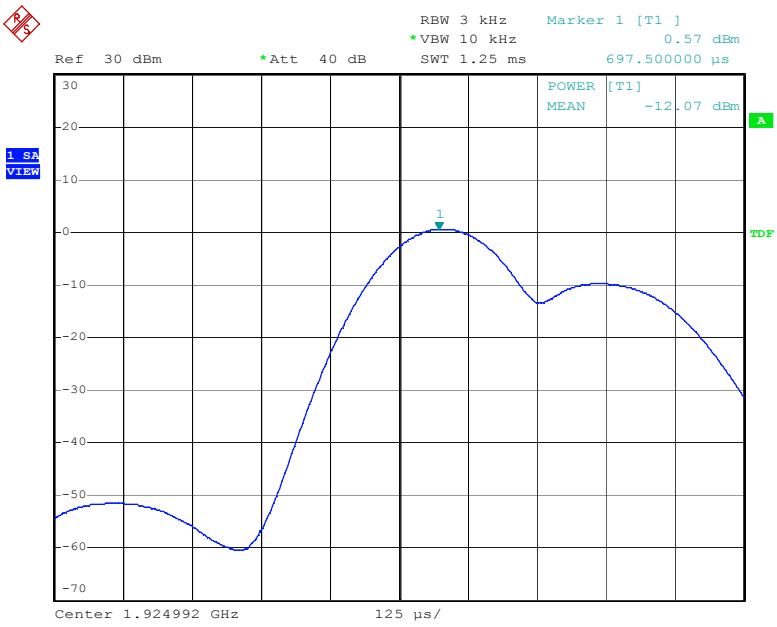

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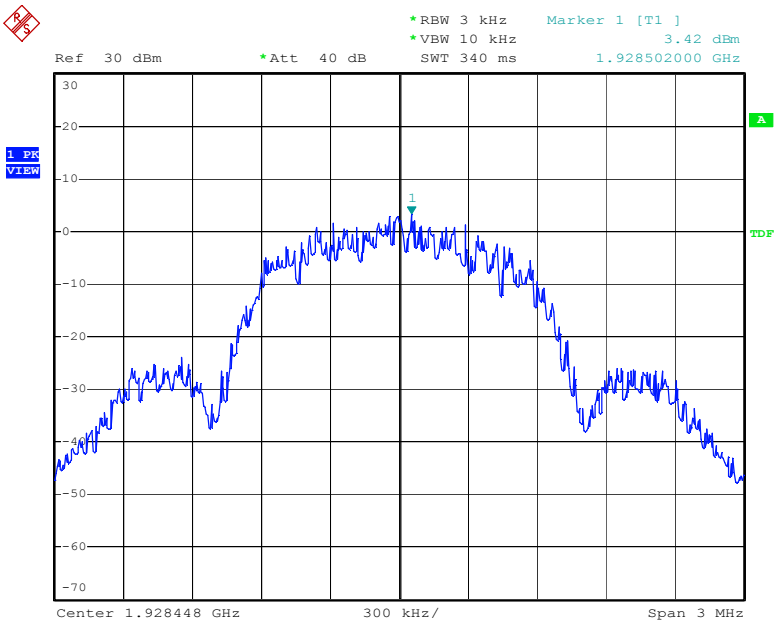
High Channel



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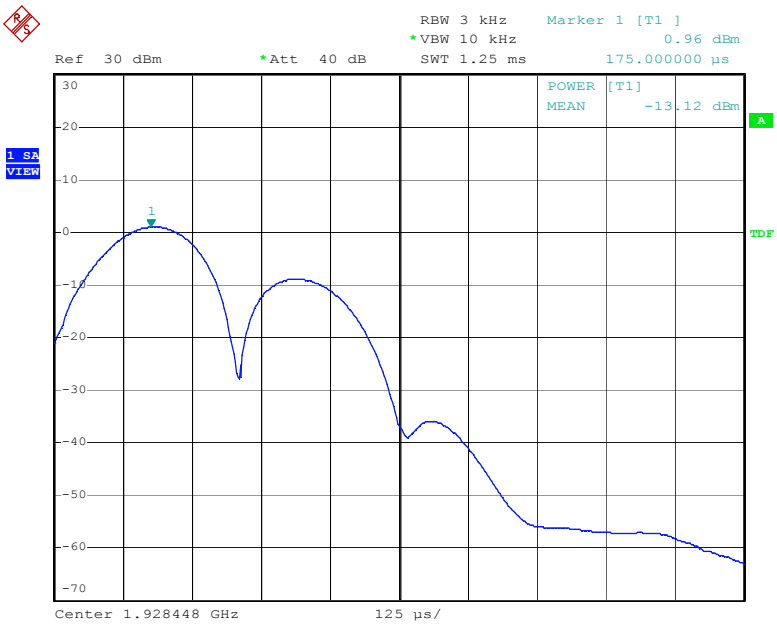


Date: 26.JAN.2016 10:56:50

3.5 Emission Inside and Outside the Sub-band

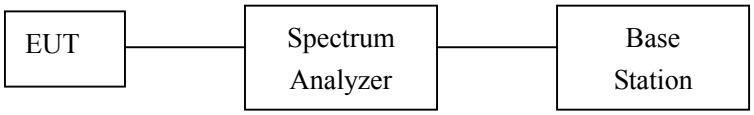
3.5.1 Test Equipment

Please refer to section 6 this report.

3.5.2 Test Procedure

According to ANSI C63.17.2006 Clause 6.1.6.

3.5.3 Test Setup



3.5.4 Configuration of The EUT

Same as section 3.1.4 of this report

3.5.5 EUT Operating Condition

Same as section 3.1.5 of this report

3.5.6 Limit

Emissions inside the sub-band must comply with the following emission mask:

a. In the bands between 1B and 2B measured from the center of the emission bandwidth the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device;
b. in the bands between 2B and 3B measured from the center of the emission bandwidth the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator;
c. in the bands between 3B and the sub-band edge the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator.

Where B = emission bandwidth

Emission Outside the sub-band shall be attenuated below a reference power of 112 mw (20.5dBm) as follows:

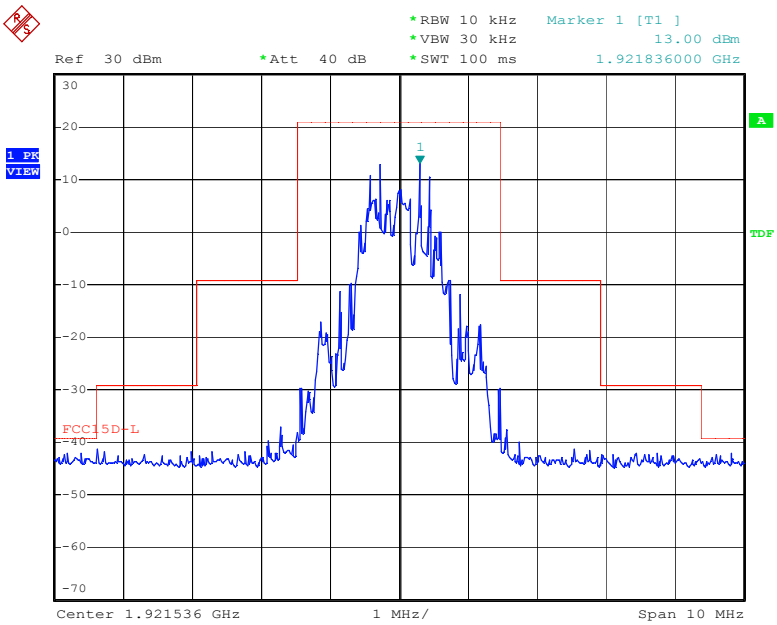
a. 30 dB between the sub-band and 1.25 MHz above or below the sub-band;
b. 50 dB between 1.25 and 2.5 MHz above or below the sub-band;
c. 60 dB at 2.5 MHz or greater above or below the sub-band.

3.5.7 Emission Inside and Outside the Sub-band Test Result

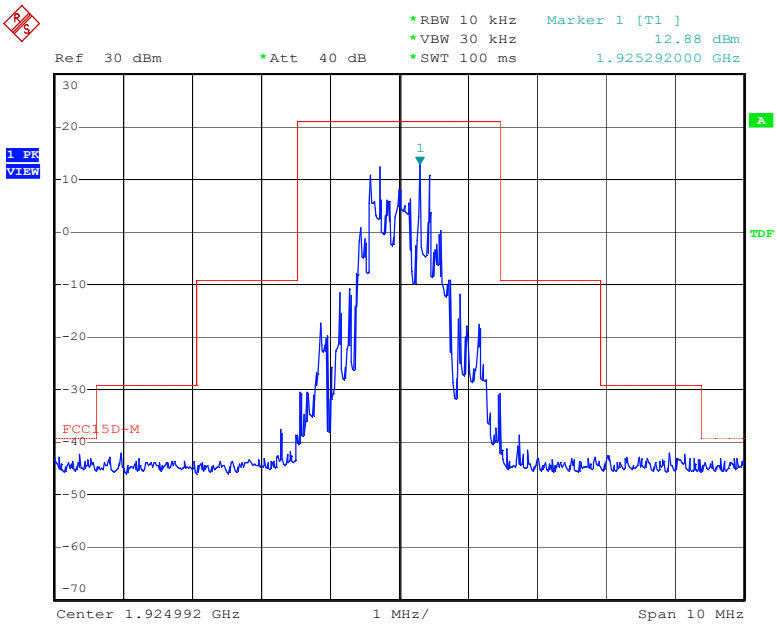
Product	: DECT Cordless VoIP Phone	Test Mode	: CH Low ~ CH High
Test Item	: Radiated Spurious Emission	Temperature	: 25 ℃
Test Voltage	: DC 2.8V/5V	Humidity	: 56%RH
Test Result	: **PASS**		

PP

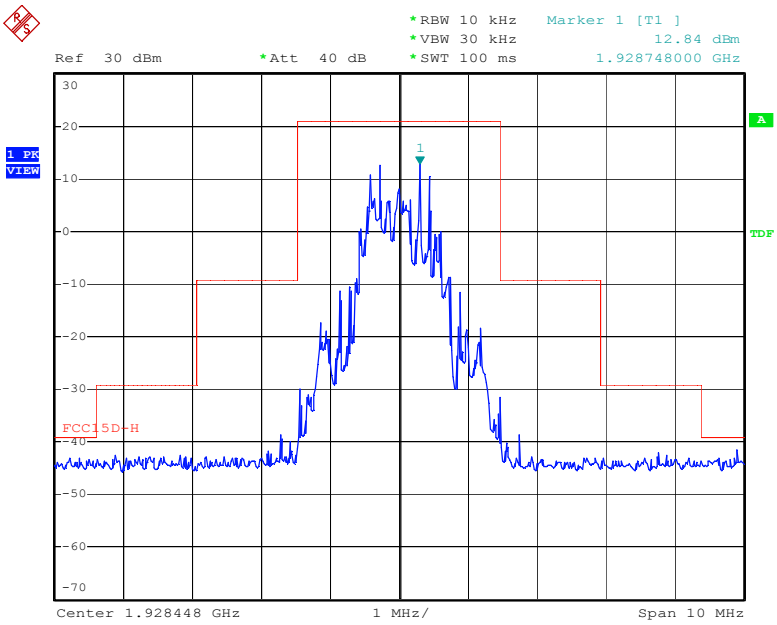
Low Channel (Unwanted Emission inside the Sub-band)



Middle Channel (Unwanted Emission inside the Sub-band)

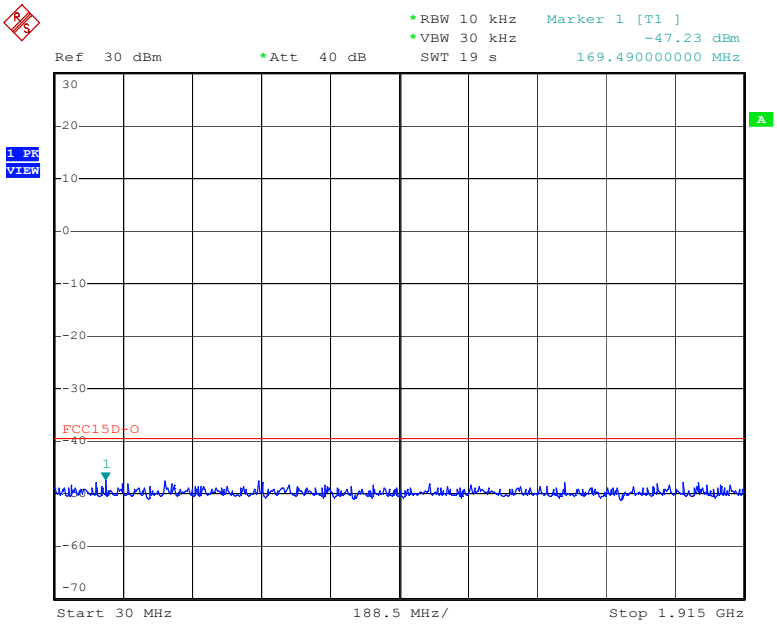


High Channel (Unwanted Emission inside the Sub-band)

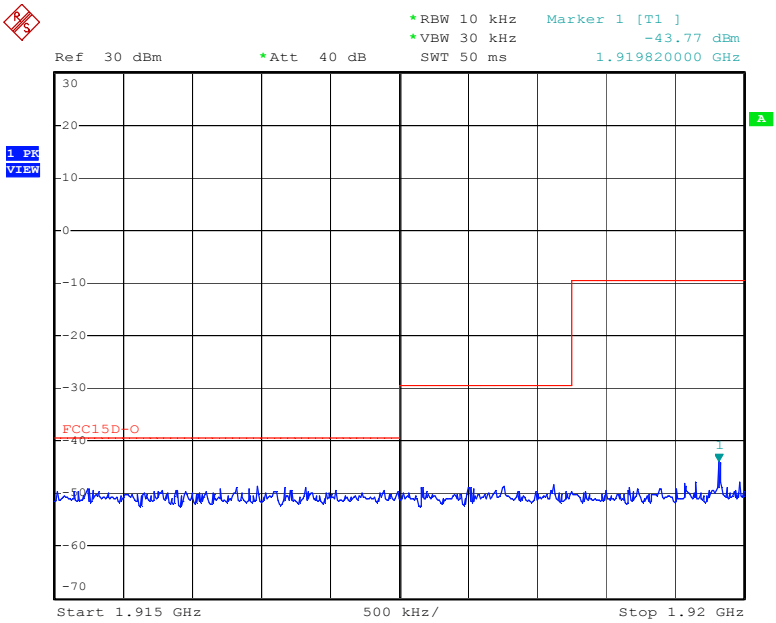


Date: 5.JAN.2016 09:20:42

Low Channel (Unwanted Emission outside the Sub-band)



Date: 5.JAN.2016 09:24:02



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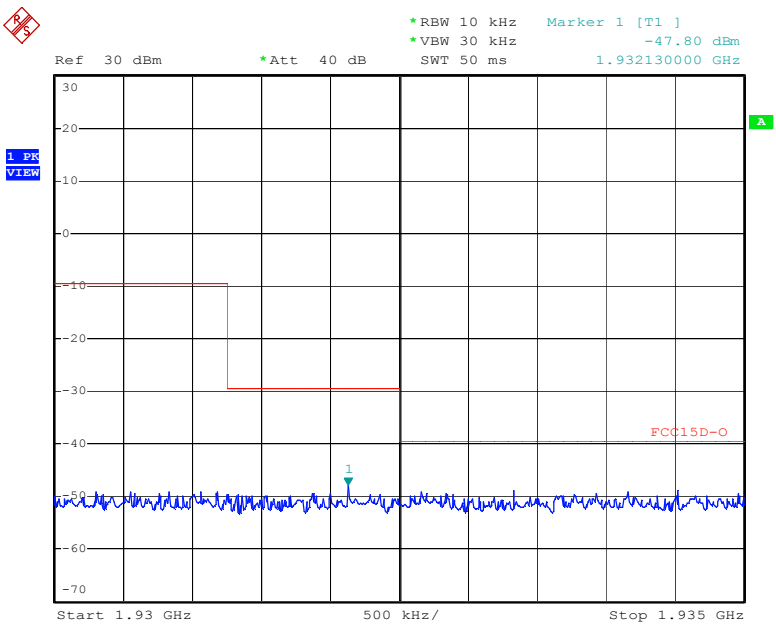

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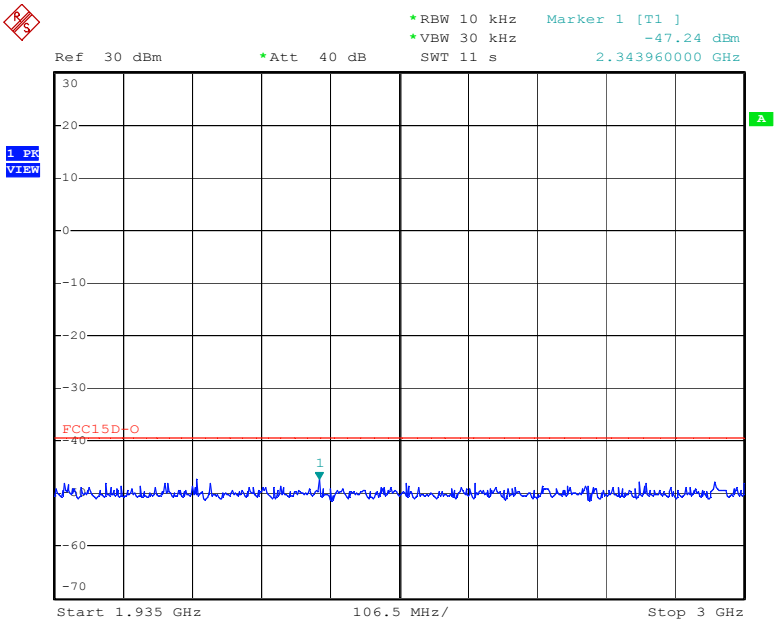

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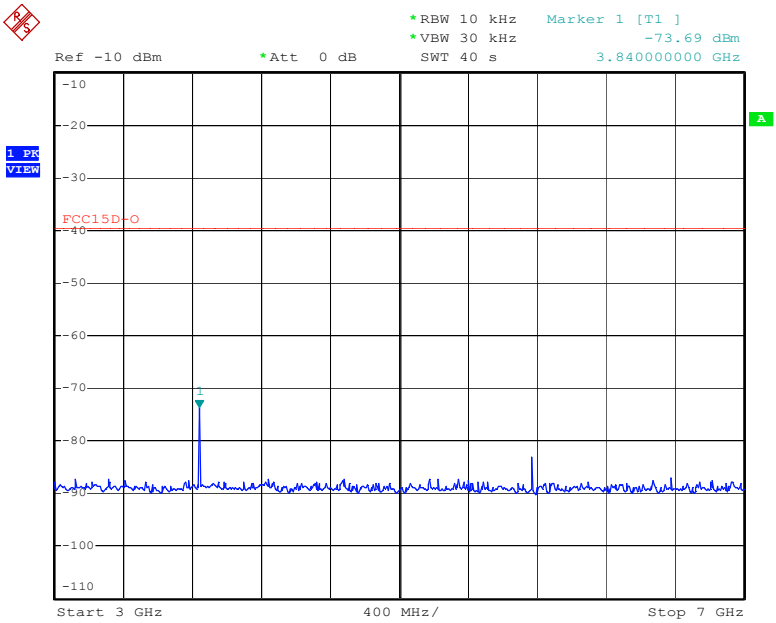

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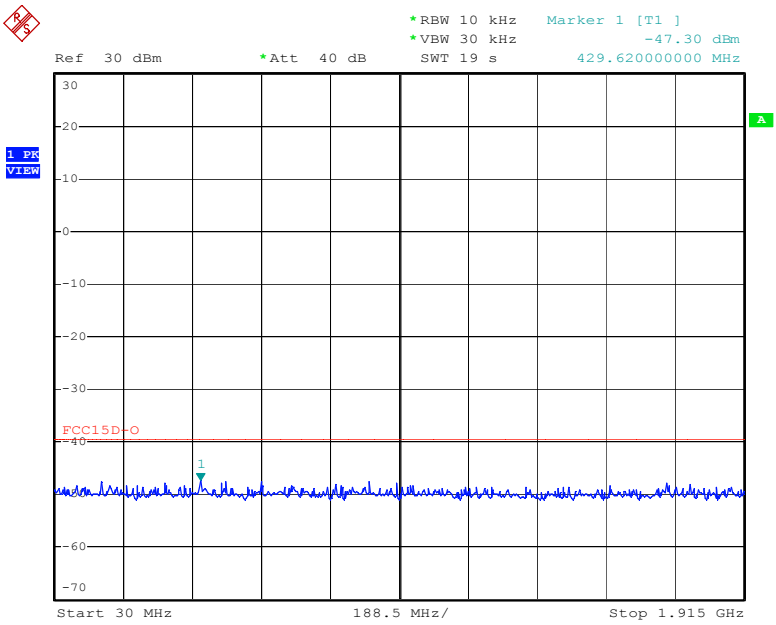
Middle Channel (Unwanted Emission outside the Sub-band)



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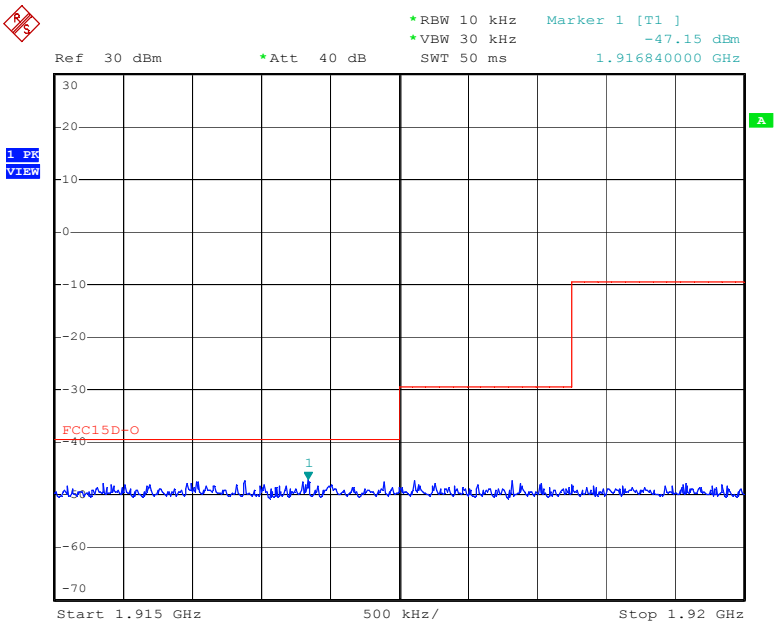

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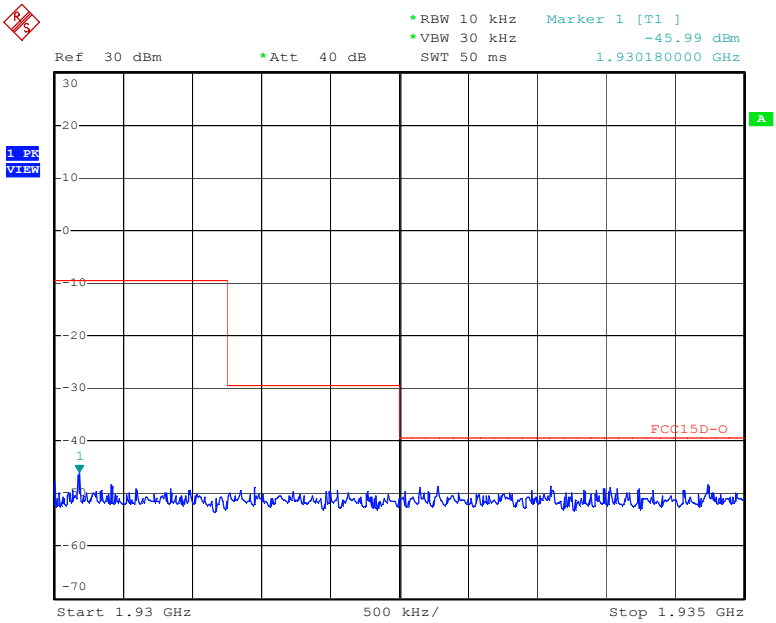

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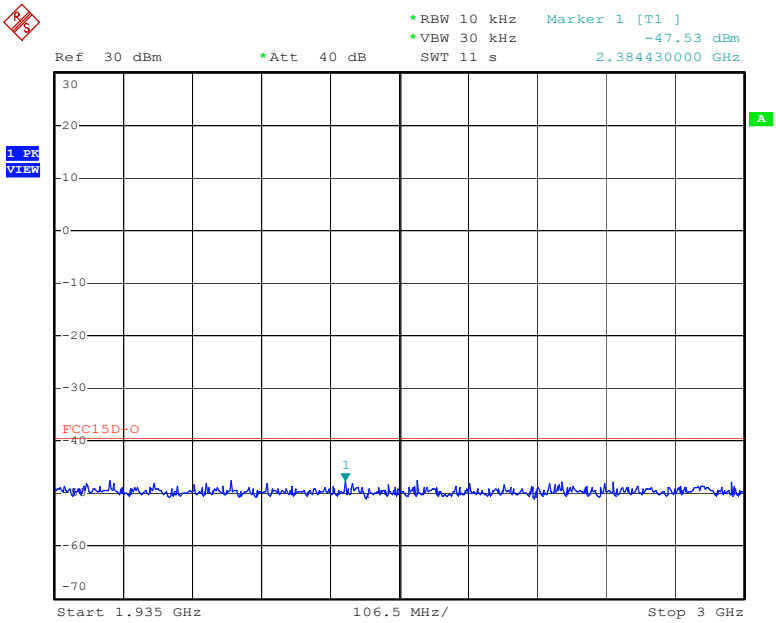

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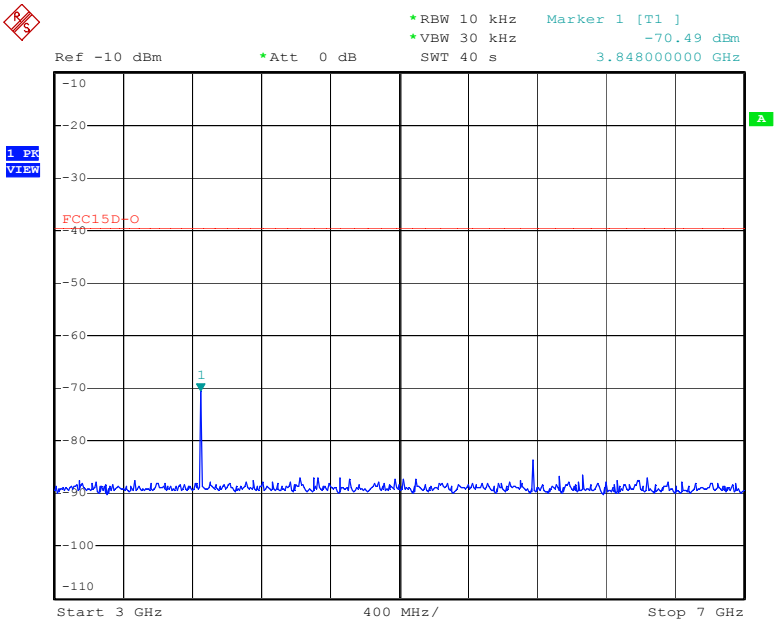

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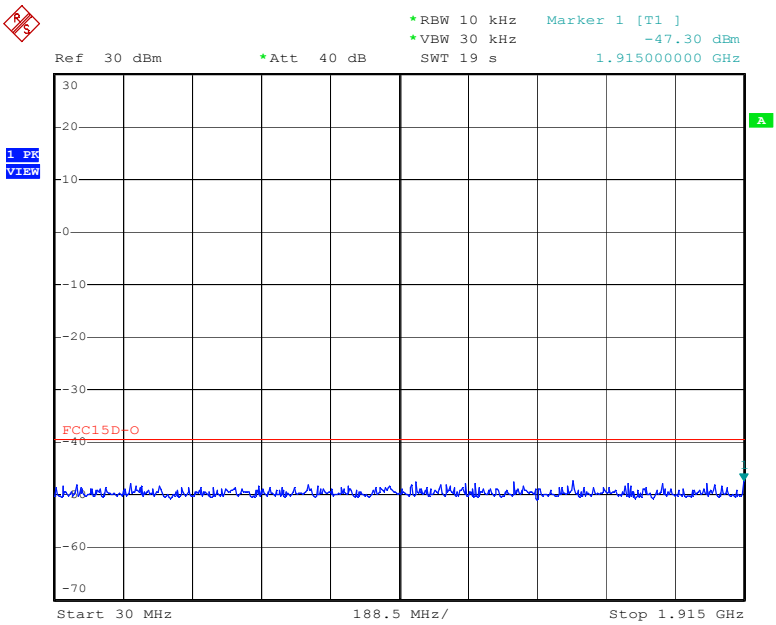
High Channel (Unwanted Emission outside the Sub-band)



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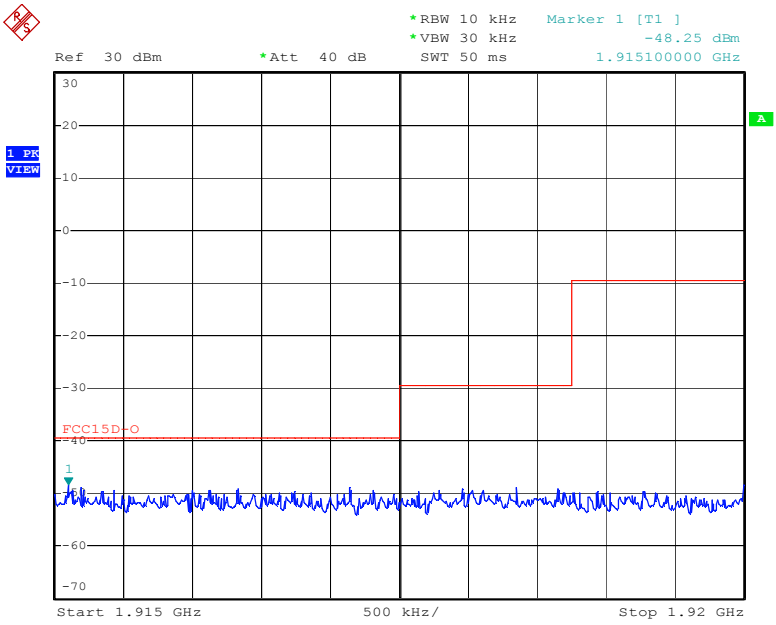

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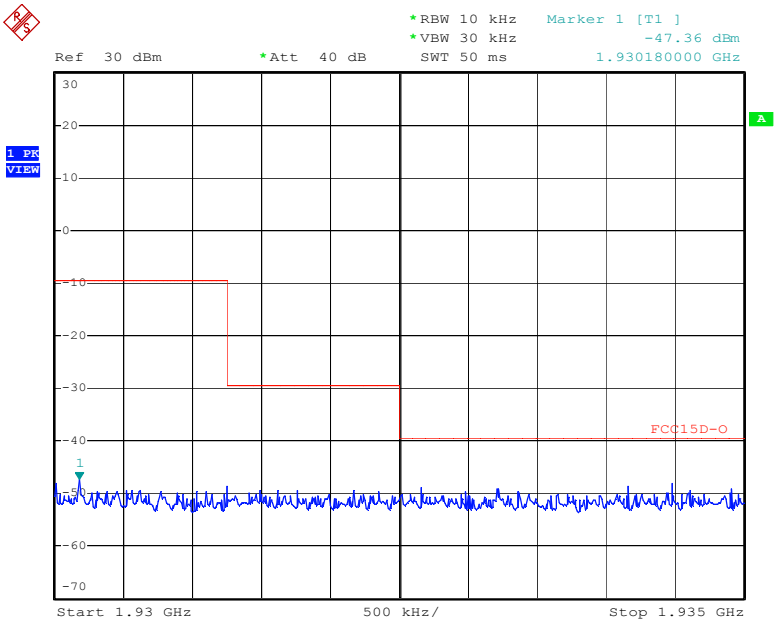

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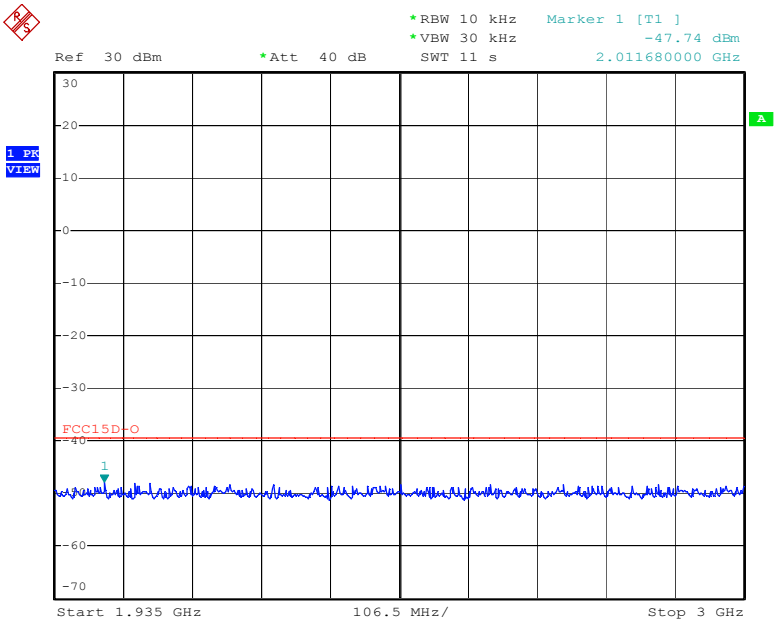

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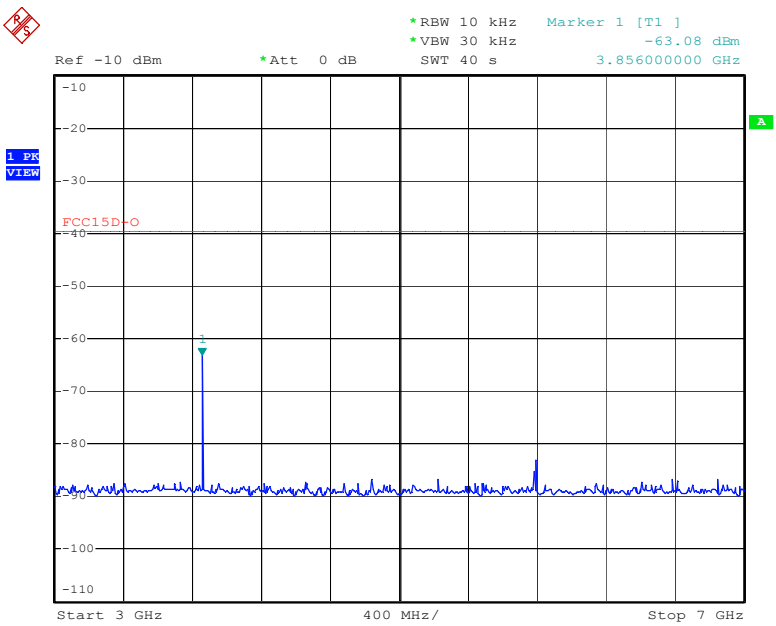

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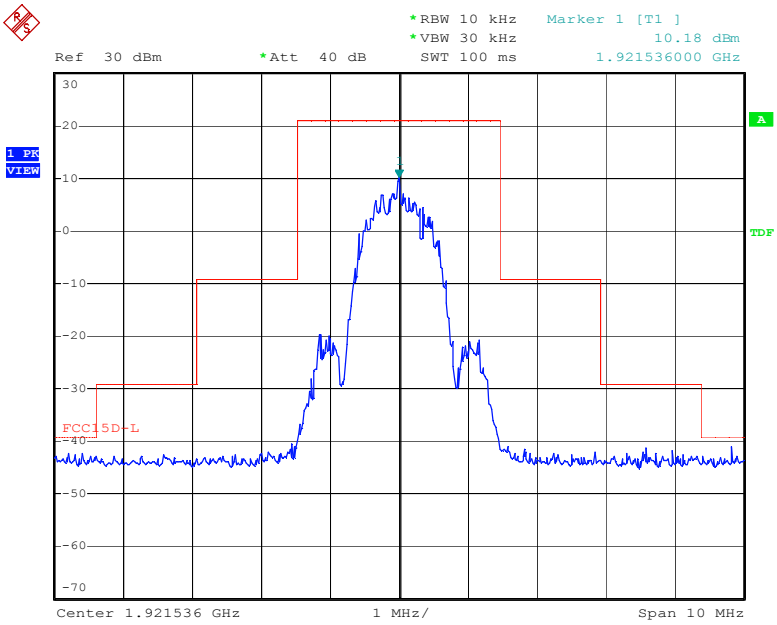
FP
Ant0

Low Channel (Unwanted Emission inside the Sub-band)



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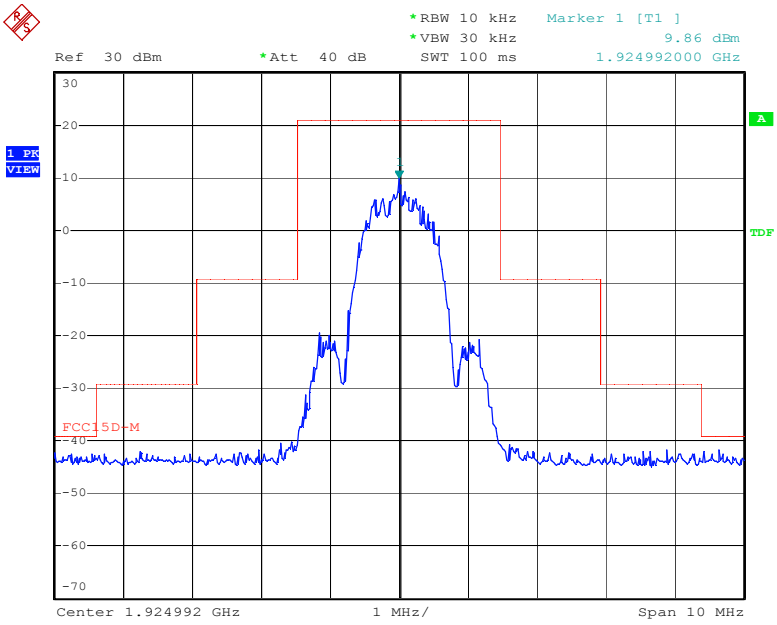
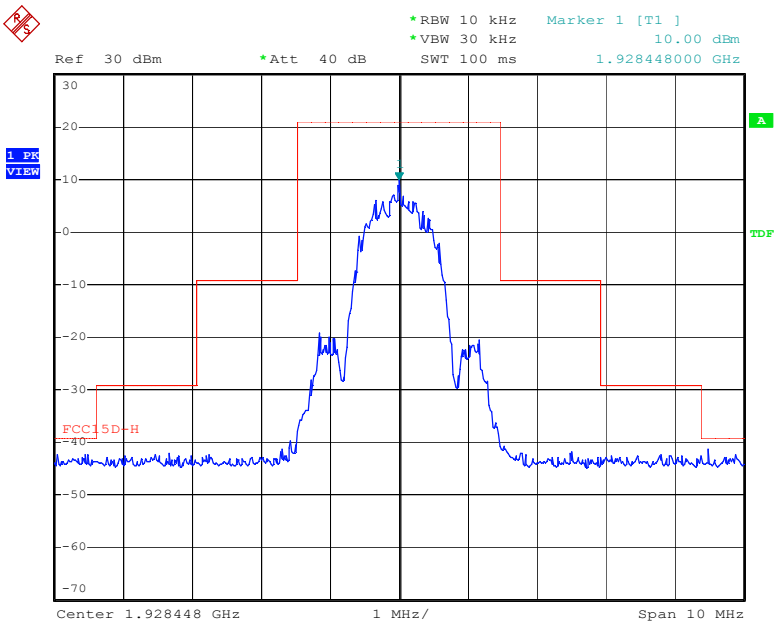
Middle Channel (Unwanted Emission inside the Sub-band)

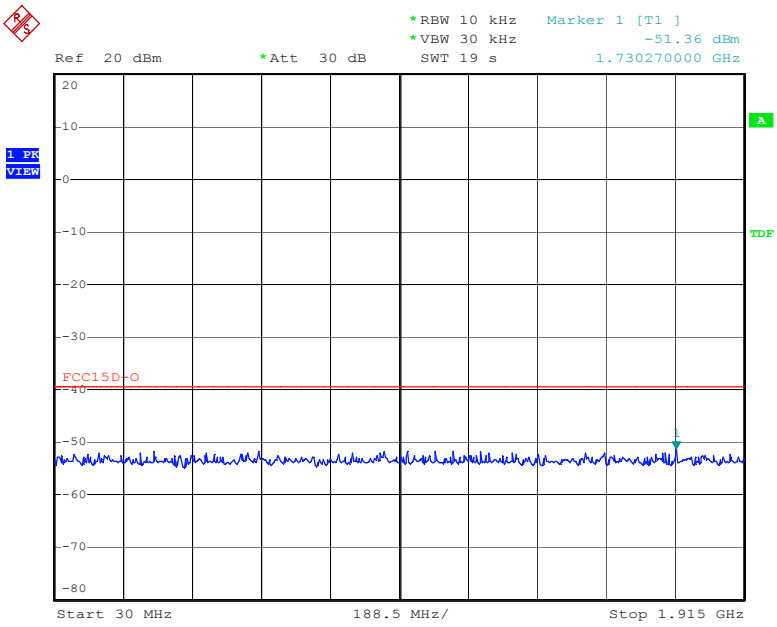


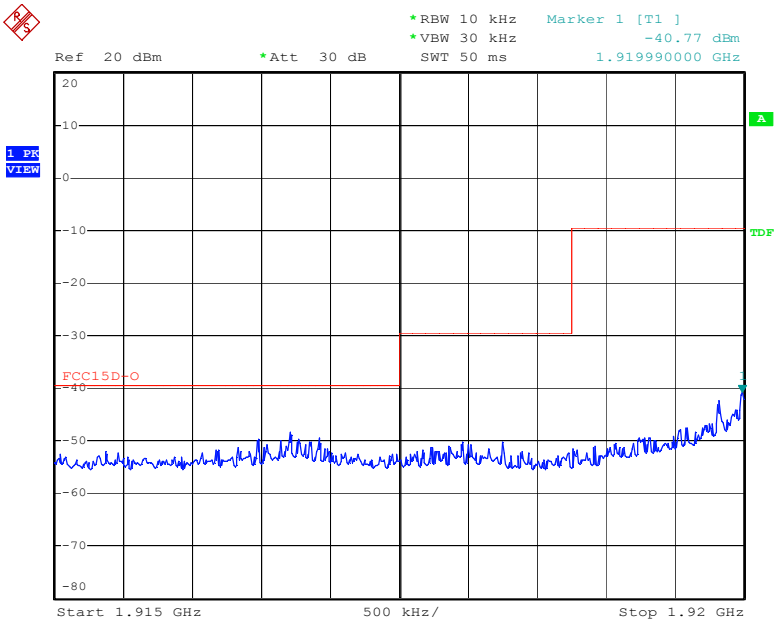
Date: 26.JAN.2016 14:58:37

High Channel (Unwanted Emission inside the Sub-band)



Low Channel (Unwanted Emission outside the Sub-band)





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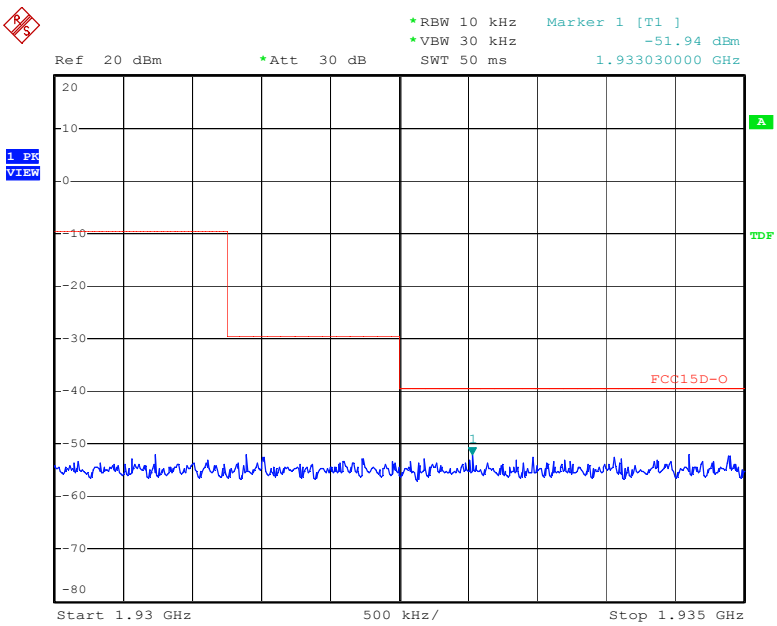

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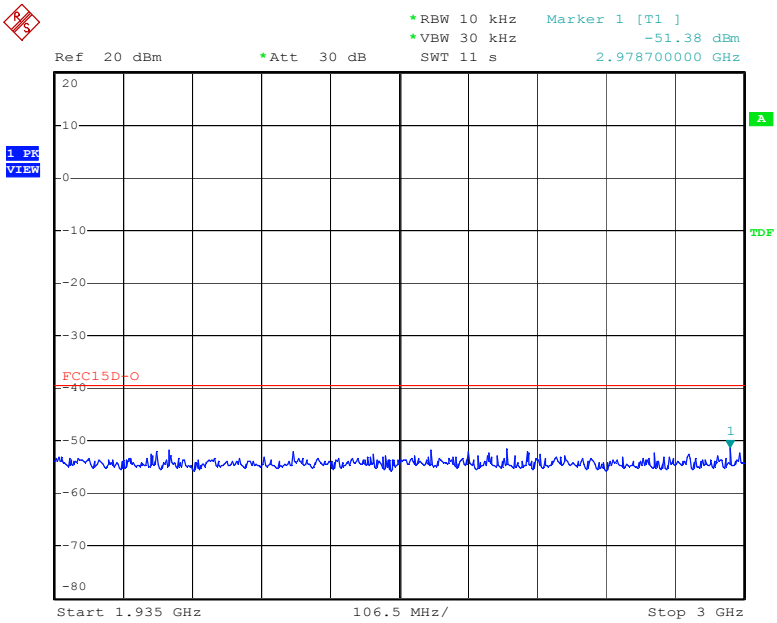

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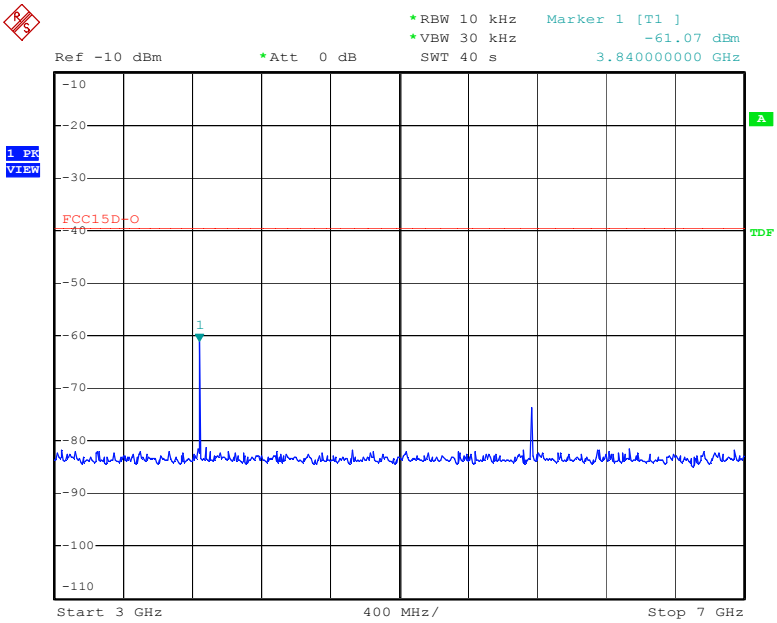

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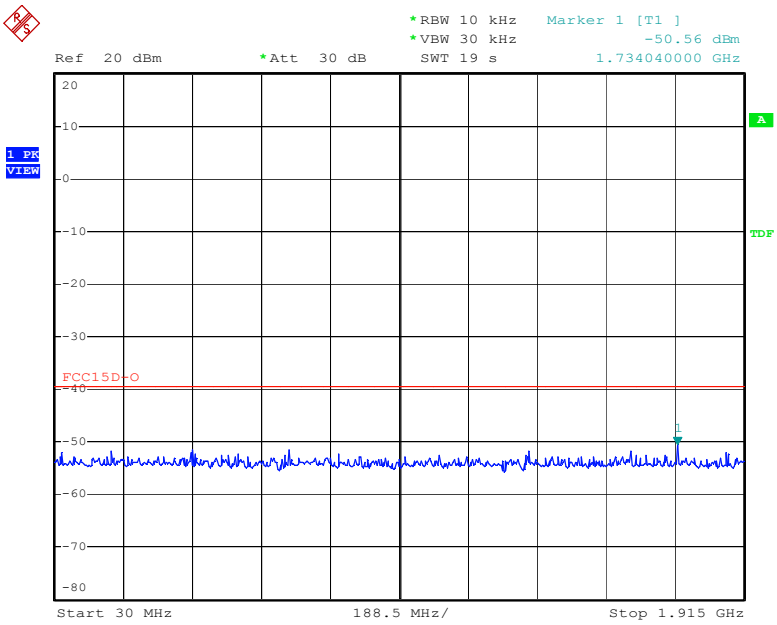
Middle Channel (Unwanted Emission outside the Sub-band)



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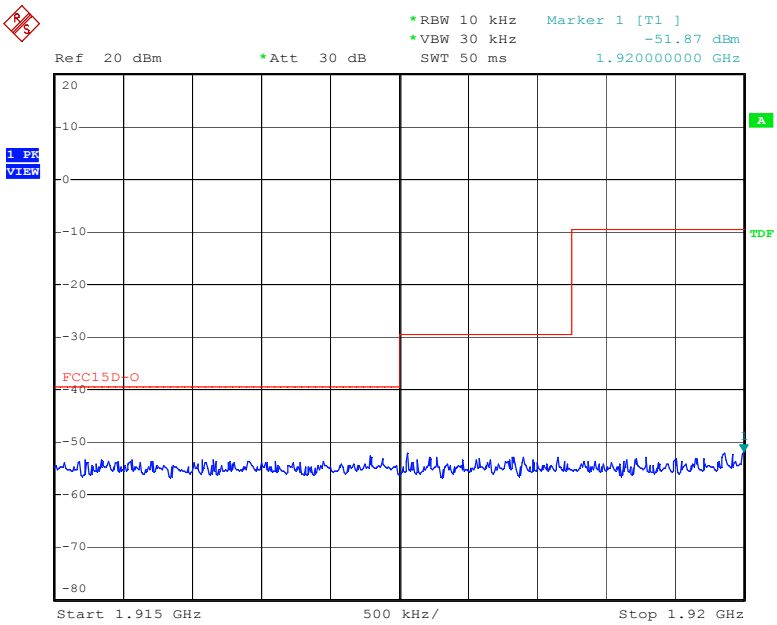

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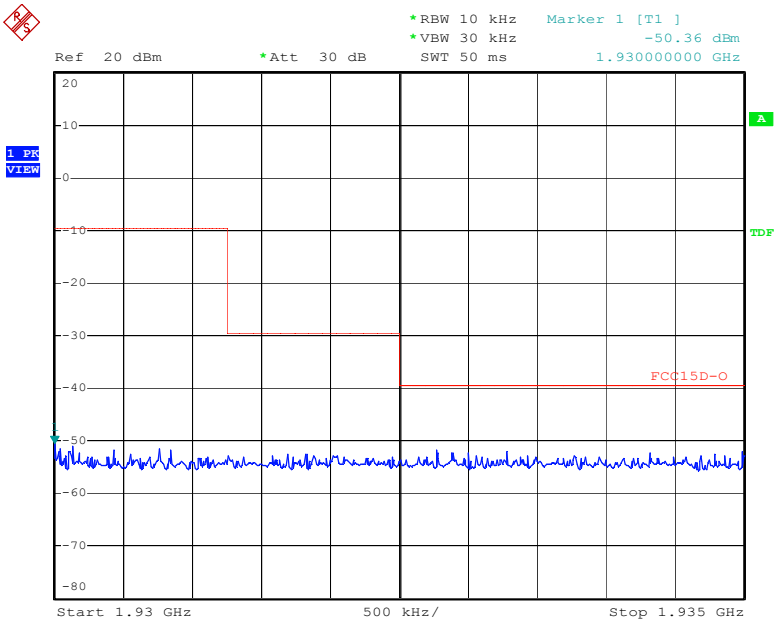

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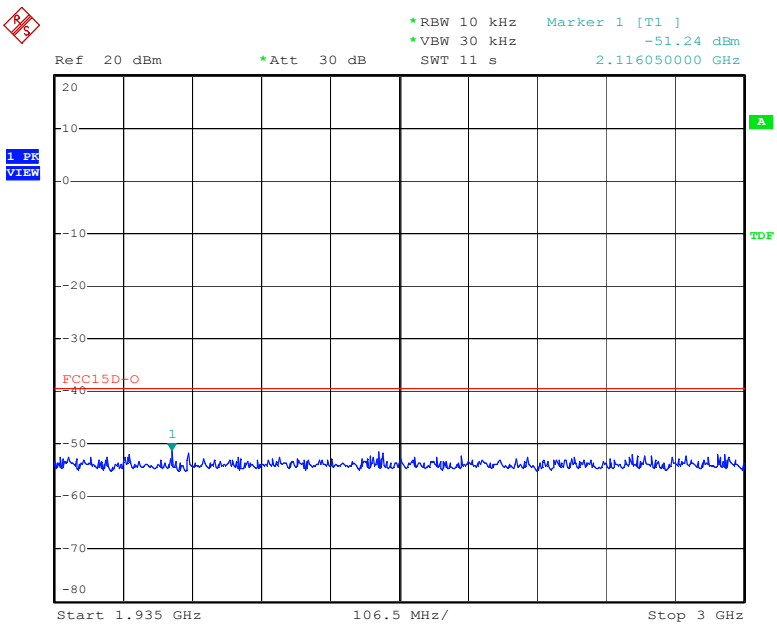

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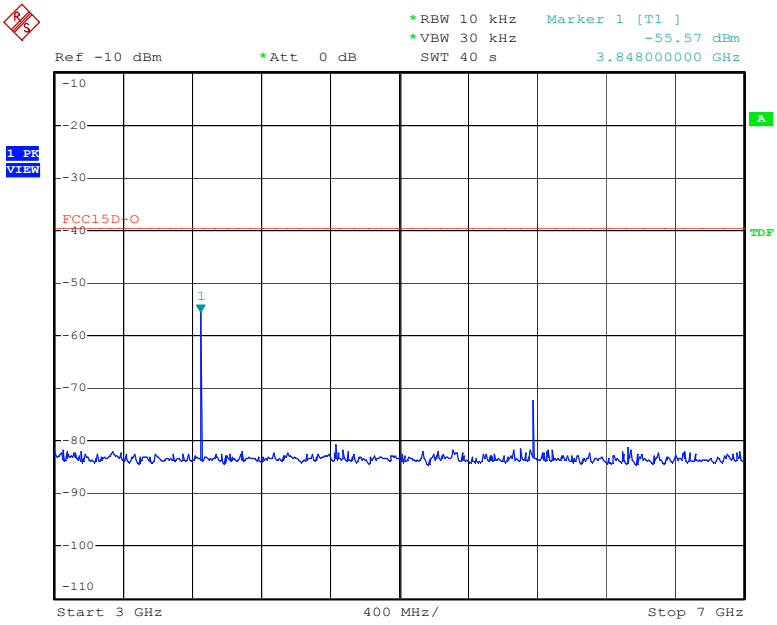

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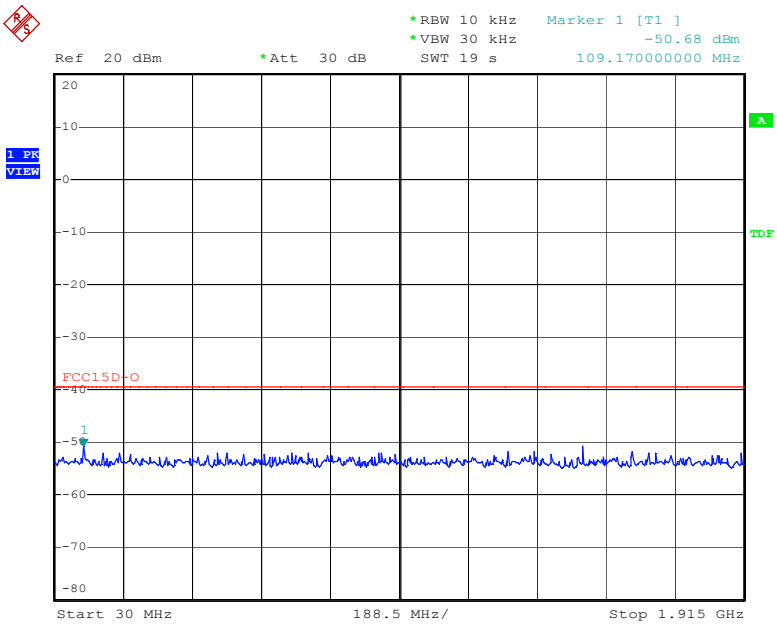
High Channel (Unwanted Emission outside the Sub-band)



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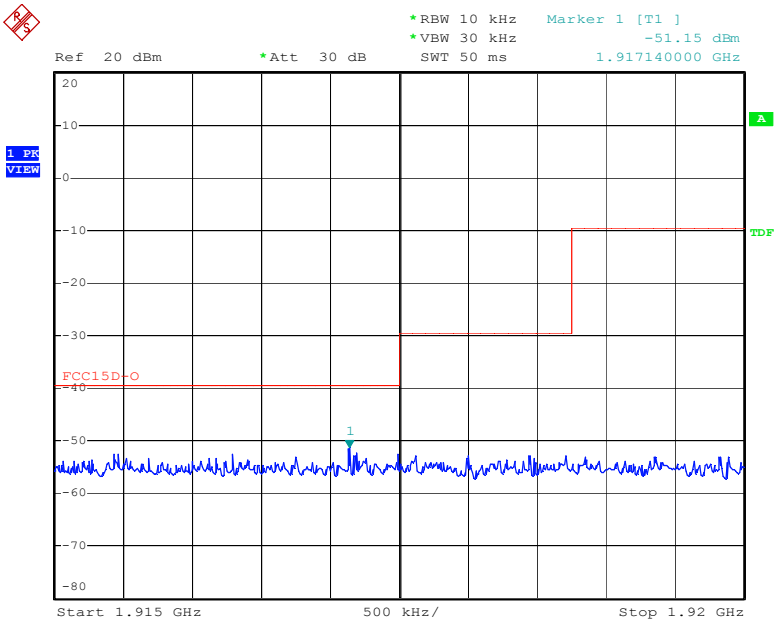

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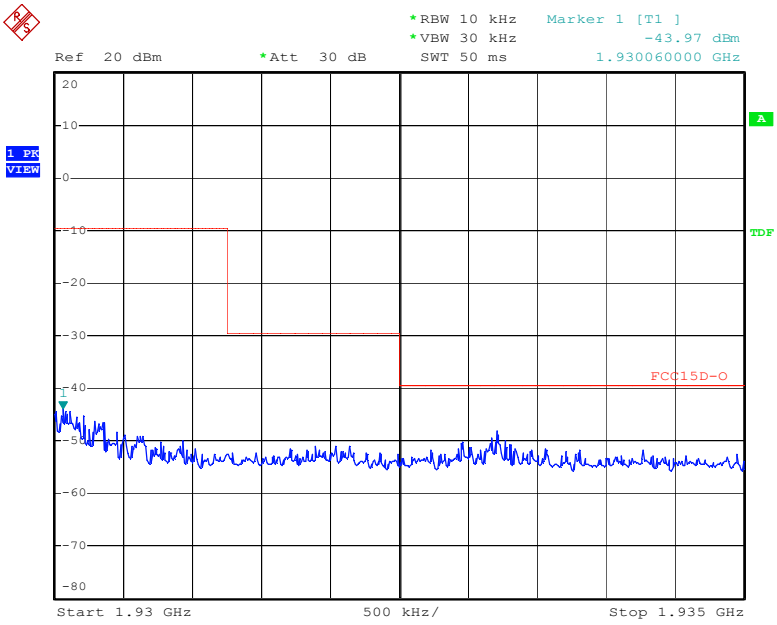

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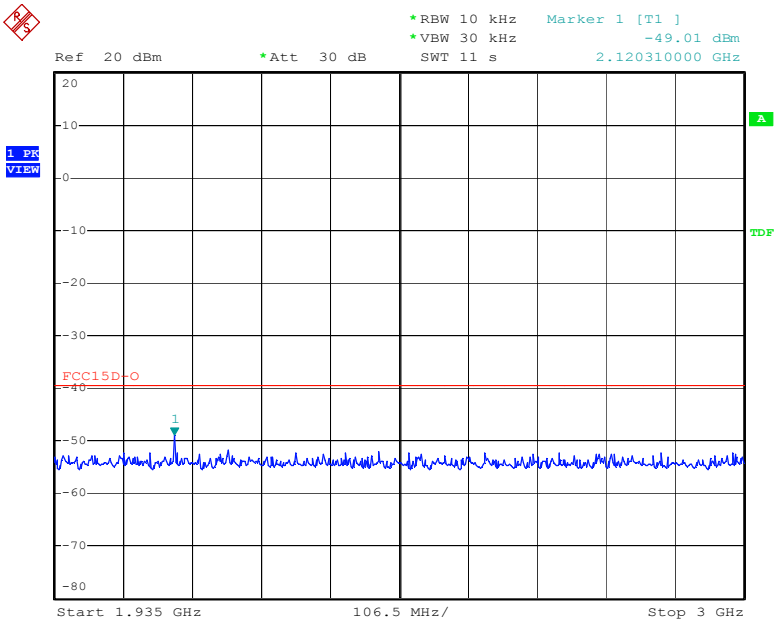

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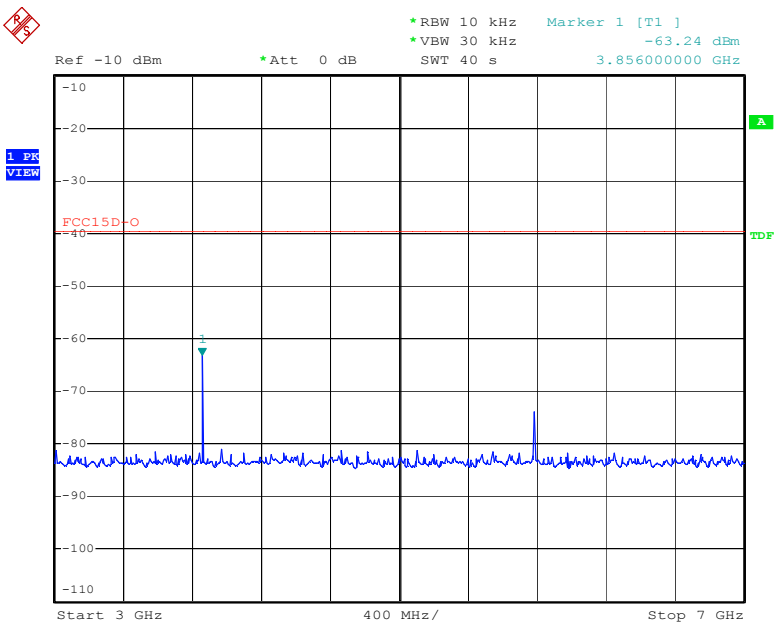

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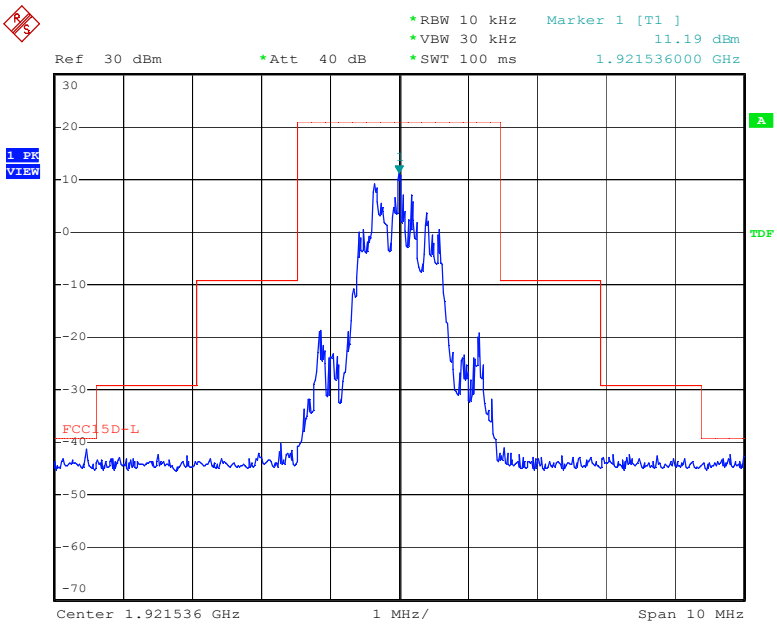
Ant1

Low Channel (Unwanted Emission inside the Sub-band)



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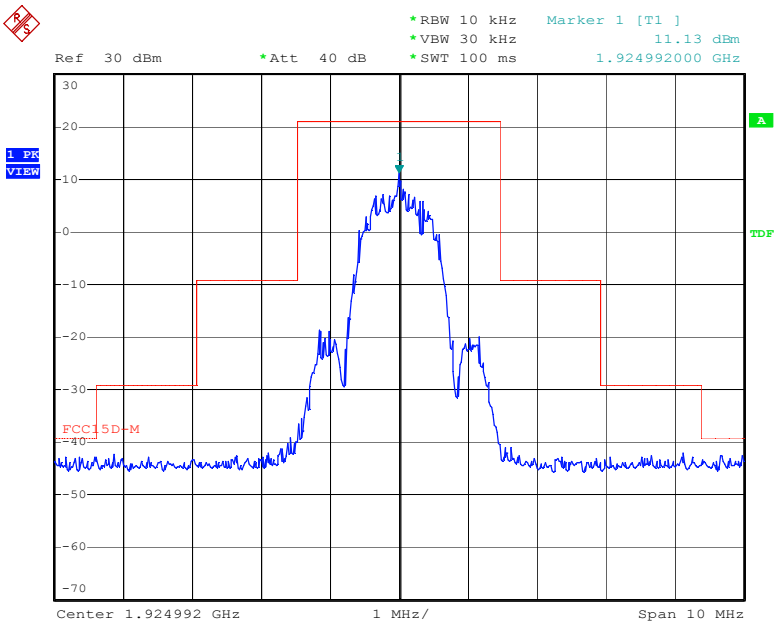
Middle Channel (Unwanted Emission inside the Sub-band)



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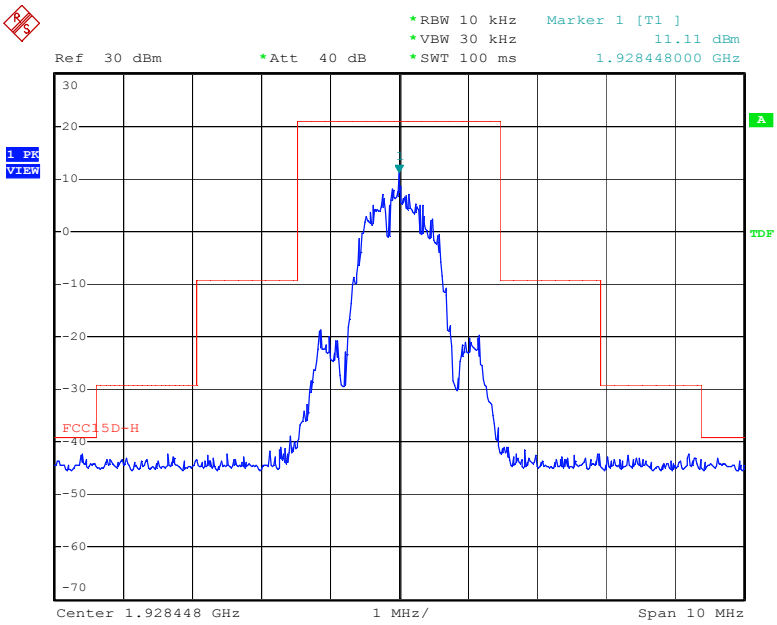
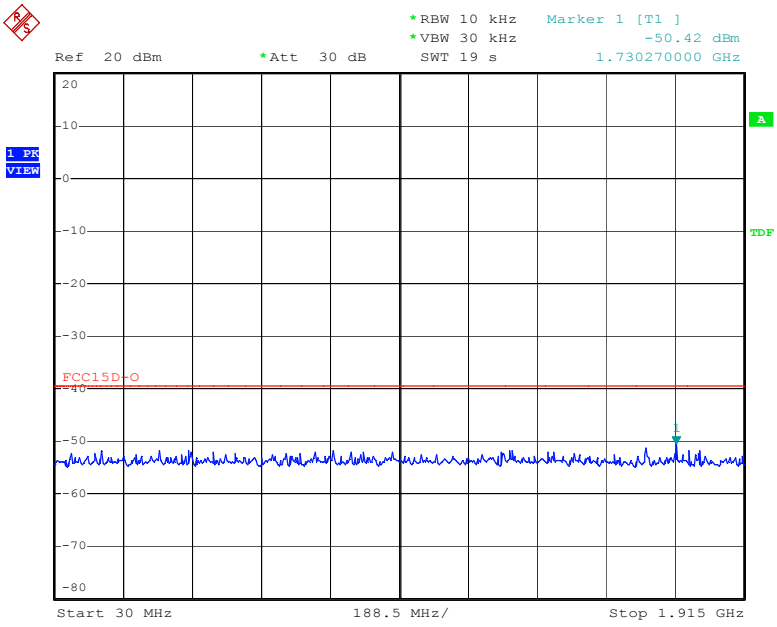
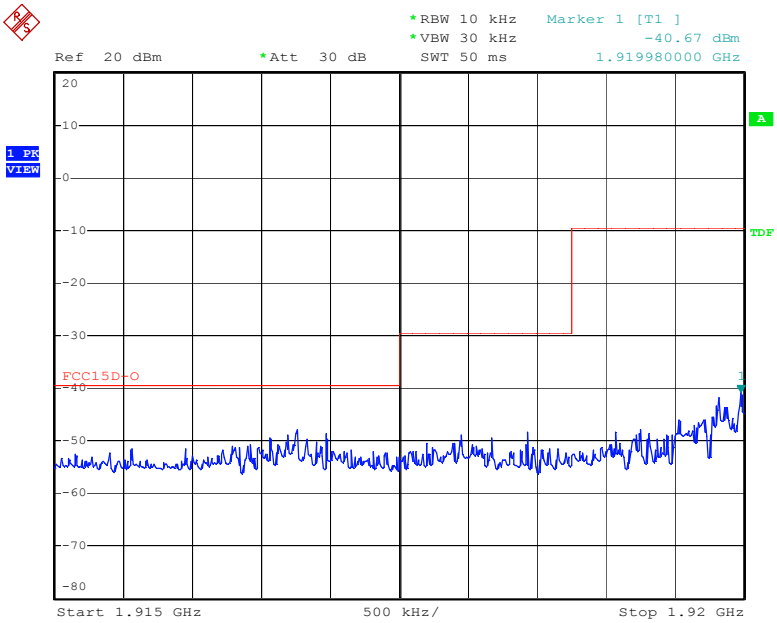
High Channel (Unwanted Emission inside the Sub-band)



Low Channel (Unwanted Emission outside the Sub-band)





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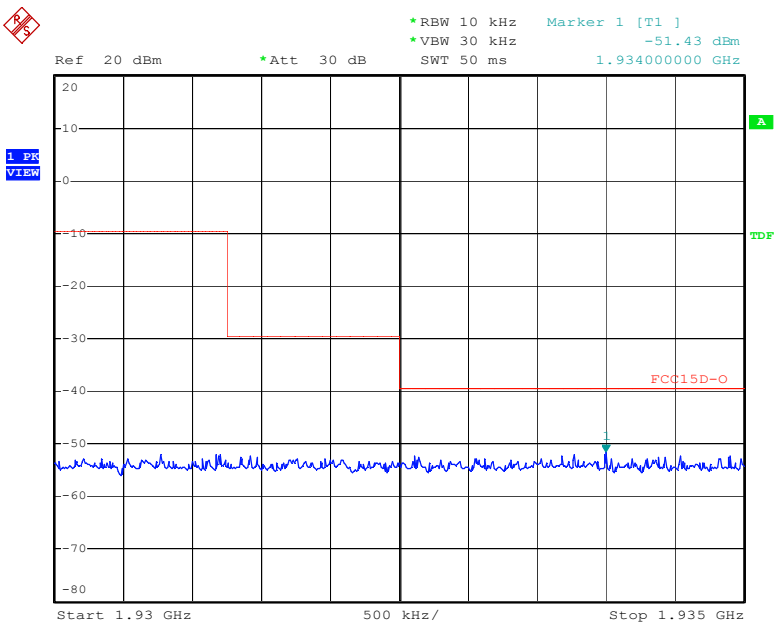

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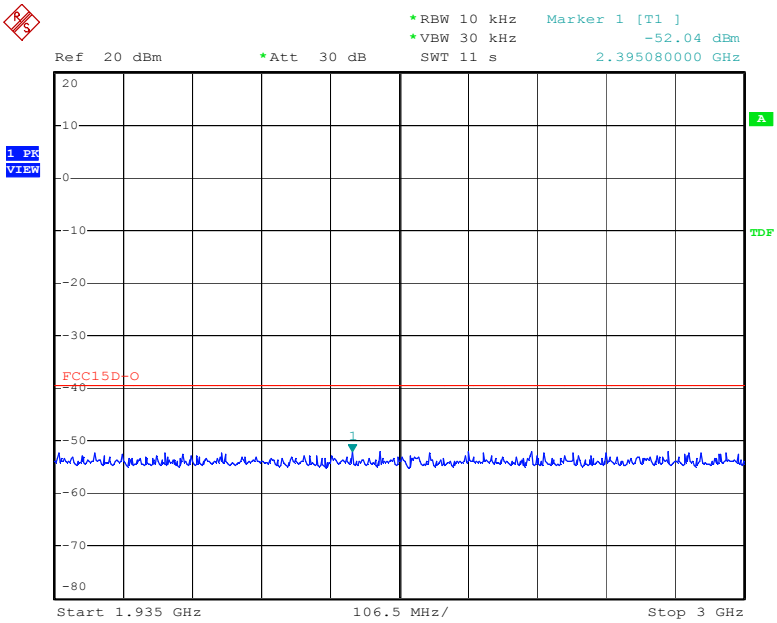

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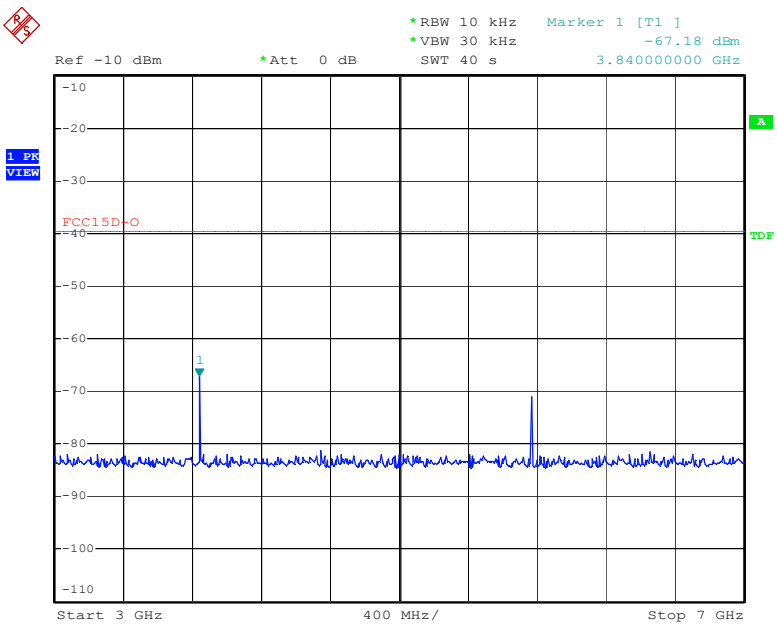

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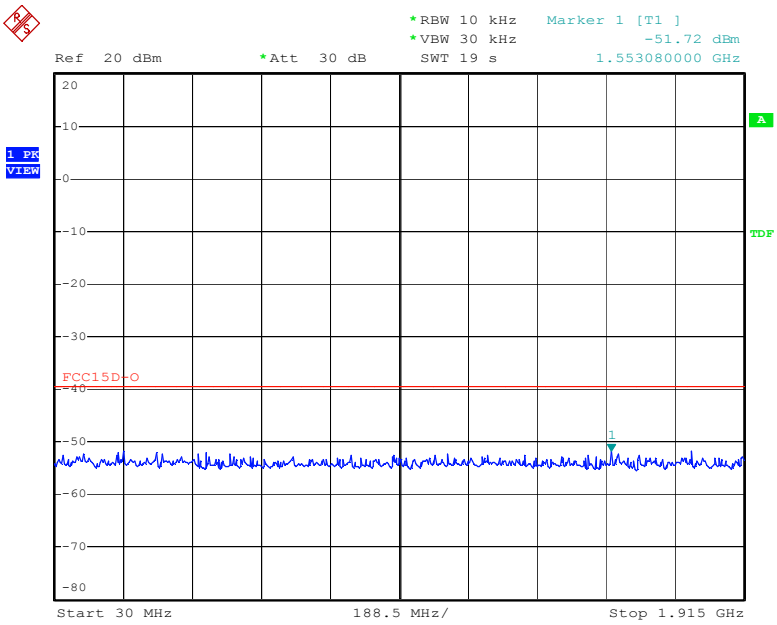
Middle Channel (Unwanted Emission outside the Sub-band)



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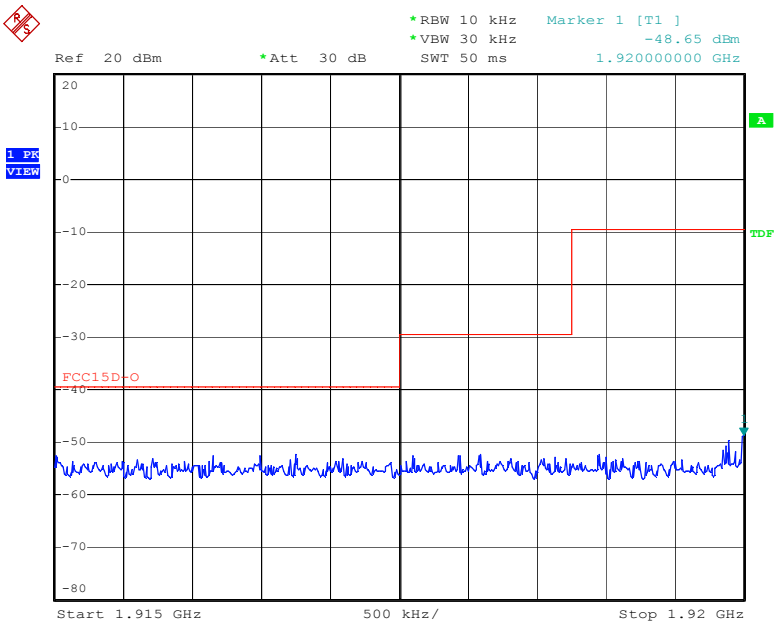

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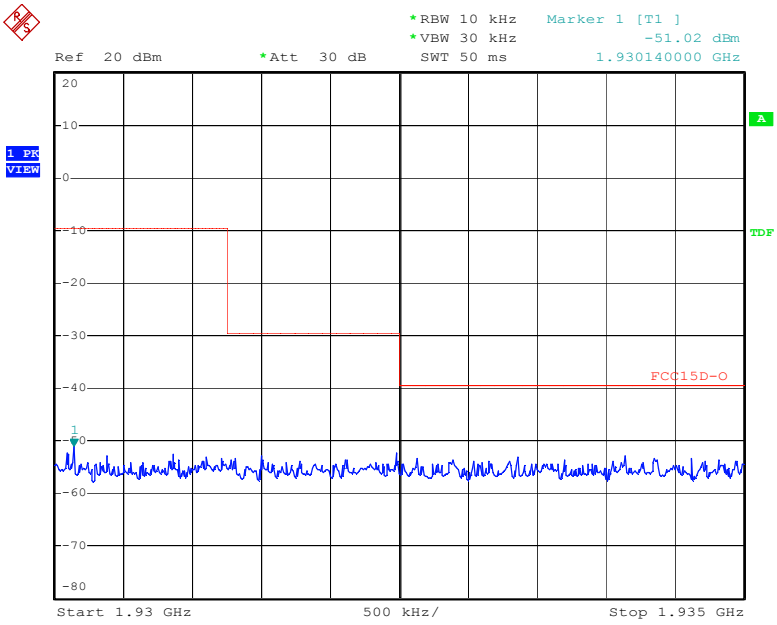

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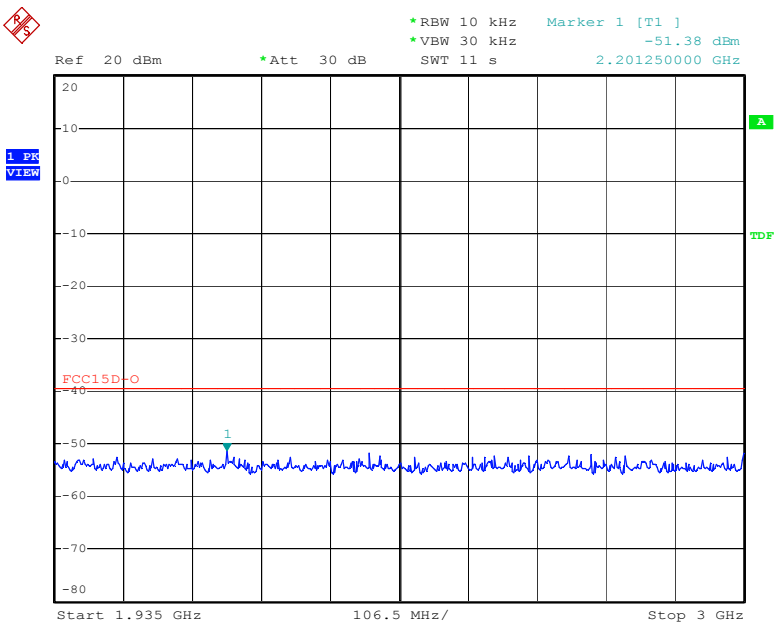

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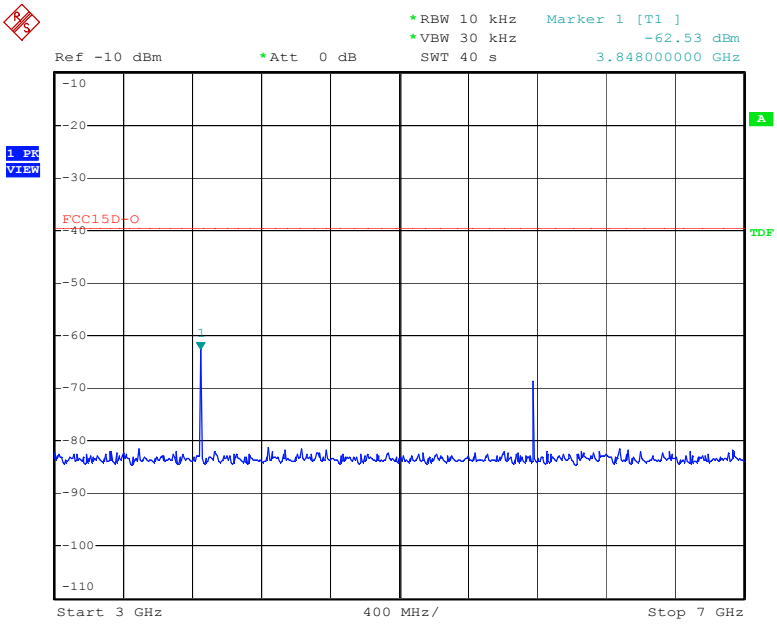

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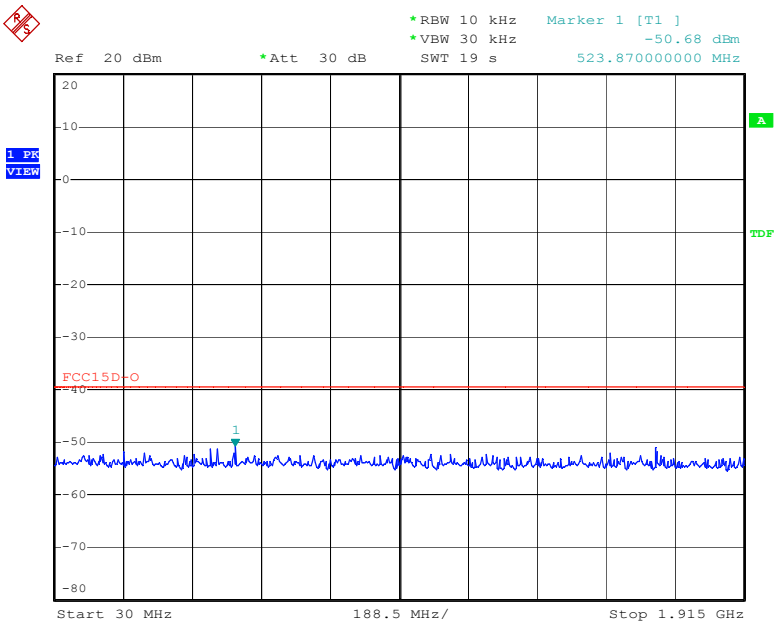
High Channel (Unwanted Emission outside the Sub-band)



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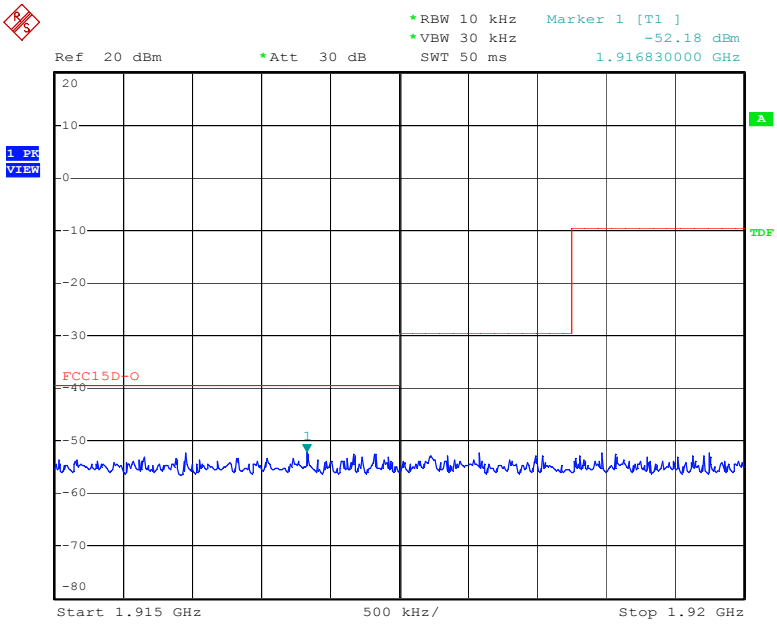

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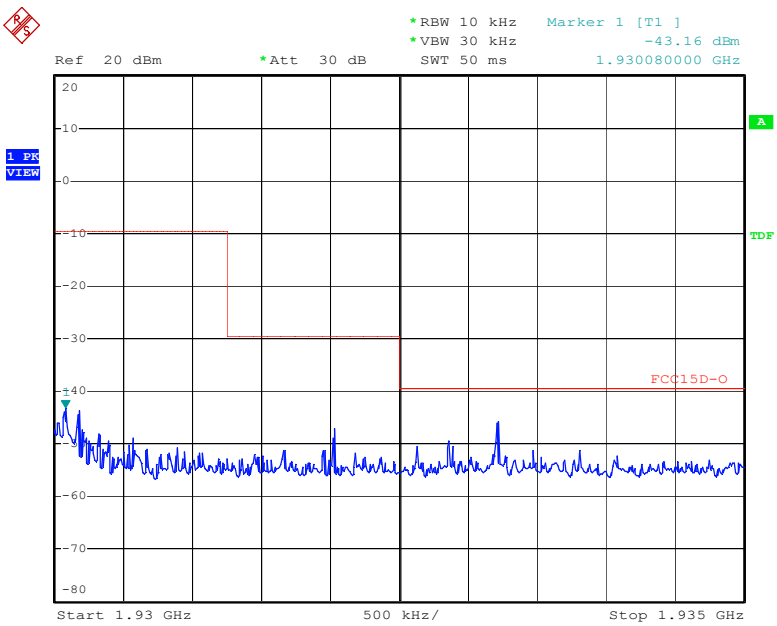

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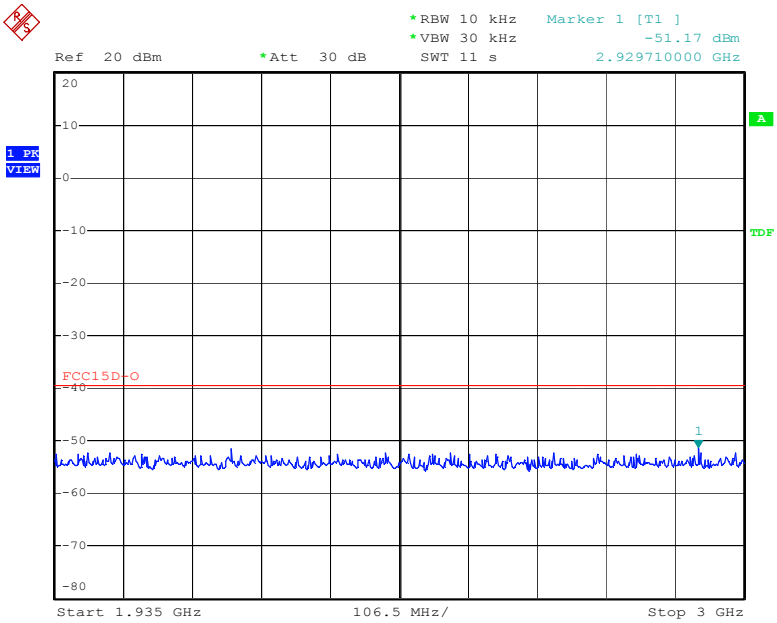

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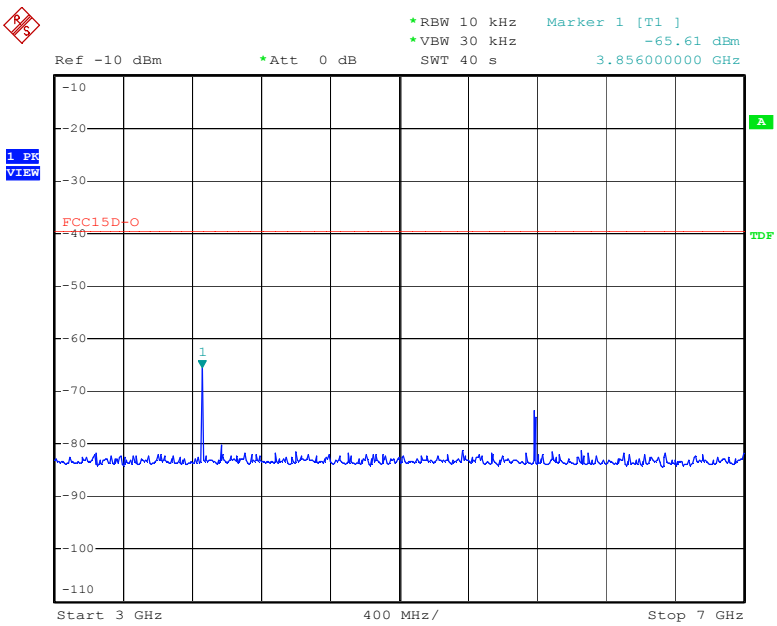


Date: 26.JAN.2016 13:15:23

3. 6 Radiated Spurious Emission

3.6.1 Test Equipment

Please refer to section 6 this report.

3.6.2 Test Procedure

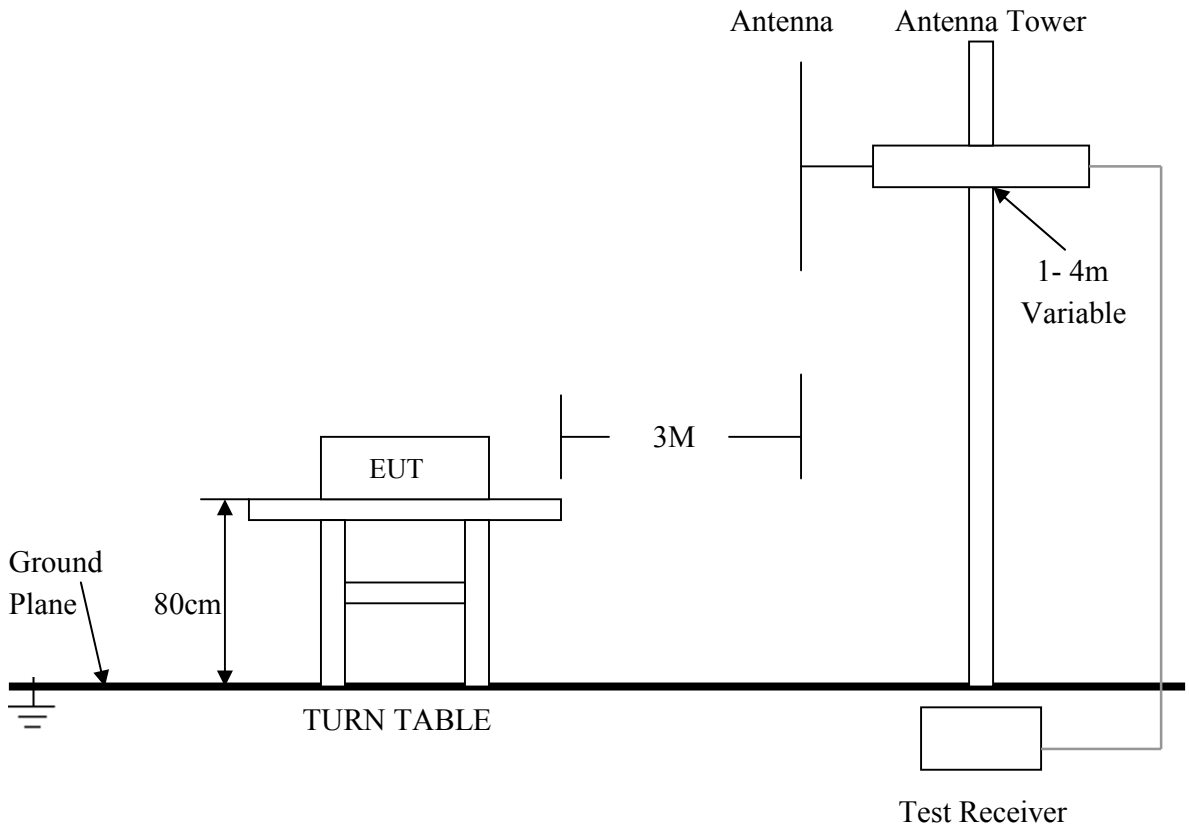
The transmitter was placed on a wooden turntable and was transmitting in a non radiating dummy load which was directly connected to the antenna connector. The battery was replaced by monitored voltage source. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna was height and polarization as well as the EUT azimuth where varied in orders to identify the maximum level of emission from the EUT. The test was performed by placing the EUT on 3 orthogonal axis. The frequency range up to tenth harmonic of the fundamental frequency was investigated. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution. All tests was performed for the lower, the middle and the highest frequency.

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the ANSI C63.17 - 2006. The specification used was the FCC 15§ 15.319(g).

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.
During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	RWB	Video B/W	IF B/W	Detector
30~1000MHz	100kHz	300kHz	120kHz	QP
Above 1GHz	1MHz	1MHz	/	PK
	1MHz	30Hz	/	AV

3.6.3 Test Setup



For the actual test configuration, please refer to the related items – Photos of Testing.

3.6.4 Configuration of The EUT

Same as section 3.1.4 of this report

3.6.5 EUT Operating Condition

Same as section 3.1.5 of this report

3.6.6 Limit

According to FCC§15.319(g), notwithstanding other technical requirements specified in this subpart, attenuation of emissions below the general emission limits in §15.209 is not required.

3.6.7 Radiated Spurious Emission Test Result

Product	: DECT Cordless VoIP Phone	Test Mode	: CH Low ~ CH High
Test Item	: Radiated Spurious Emission	Temperature	: 25 ℃
Test Voltage	: DC 2.8V/5V	Humidity	: 56%RH
Test Result	: **PASS**		

PP

Channel: Low (1921.536 MHz)

Freq. (MHz)	Emission (dBuV/m)		HORIZ / VERT	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1921.40	112.89	-	HORZ	-	-	-	-
1921.40	111.65	-	VERT	-	-	-	-
3843.10	67.66	43.79	HORZ	74.0	54.0	-6.34	-10.21
3843.10	64.13	40.26	VERT	74.0	54.0	-9.87	-13.74
5764.60	53.32	-	HORZ	74.0	54.0	-20.68	-
5764.60	49.88	-	VERT	74.0	54.0	-24.12	-
7686.30	59.45	35.58	HORZ	74.0	54.0	-14.55	-18.42
7686.30	57.61	33.74	VERT	74.0	54.0	-16.39	-20.26

Channel: Mid (1924.992 MHz)

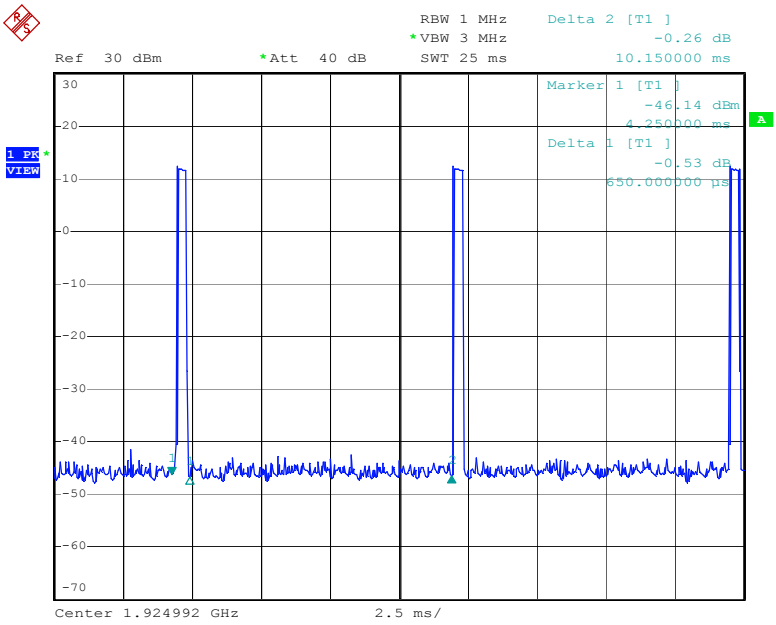
Freq. (MHz)	Emission (dBuV/m)		HORIZ / VERT	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1924.90	112.34	-	HORZ	-	-	-	-
1924.90	111.02	-	VERT	-	-	-	-
3849.80	66.13	42.26	HORZ	74.0	54.0	-7.87	-11.74
3849.80	63.55	39.68	VERT	74.0	54.0	-10.45	-14.32
5774.90	53.02	-	HORZ	74.0	54.0	-20.98	-
5774.90	49.26	-	VERT	74.0	54.0	-24.74	-
7699.60	58.88	35.01	HORZ	74.0	54.0	-15.12	-18.99
7699.60	56.95	33.08	VERT	74.0	54.0	-17.05	-20.92

Channel: High (1928.448 MHz)

Freq. (MHz)	Emission (dBuV/m)		HORIZ / VERT	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1928.40	112.36	-	HORZ	-	-	-	-
1928.40	111.10	-	VERT	-	-	-	-
3856.80	66.08	42.21	HORZ	74.0	54.0	-7.92	-11.79
3856.80	63.67	39.80	VERT	74.0	54.0	-10.33	-14.20
5785.20	52.98	-	HORZ	74.0	54.0	-21.02	-
5785.20	49.23	-	VERT	74.0	54.0	-24.77	-
7713.60	59.01	35.14	HORZ	74.0	54.0	-14.99	-18.86
7713.60	57.05	33.18	VERT	74.0	54.0	-16.95	-20.82

Note: (1) All Reading Levels below 1GHz are Quasi-Peak, above are peak and average value.
(2) Emission Level = Reading Level + Probe Factor + Cable Loss – Amplifier Factor
(3) Receiver setting (Peak Detector) : RBW=1MHz; VBW=1MHz; Span=100MHz
(4) Receiver setting (AVG Detector): RBW=1MHz; VBW=30Hz; Span=20MHz
(5) 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.
(6) AV=PK+20* lg(Duty Cycle)
Duty Cycle=Ton/Tp*100%,
Ton = 650μs,
Tp= 10.15ms
Duty Cycle = Duty cycle factor = 20lg (Duty Cycle) = -23.87

Duty Cycle



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FP
Ant0
Channel: Low (1921.536 MHz)

Freq. (MHz)	Emission (dBuV/m)		HORIZ / VERT	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1921.40	112.44	-	HORZ	-	-	-	-
1921.40	111.21	-	VERT	-	-	-	-
3843.10	66.35	40.82	HORZ	74.0	54.0	-7.65	-13.18
3843.10	63.23	37.70	VERT	74.0	54.0	-10.77	-16.30
7686.30	52.67	-	HORZ	74.0	54.0	-21.33	-
7686.30	49.02	-	VERT	74.0	54.0	-24.98	-
5764.60	58.95	33.42	HORZ	74.0	54.0	-15.05	-20.58
5764.60	57.13	31.60	VERT	74.0	54.0	-16.87	-22.40

Channel: Mid (1924.992 MHz)

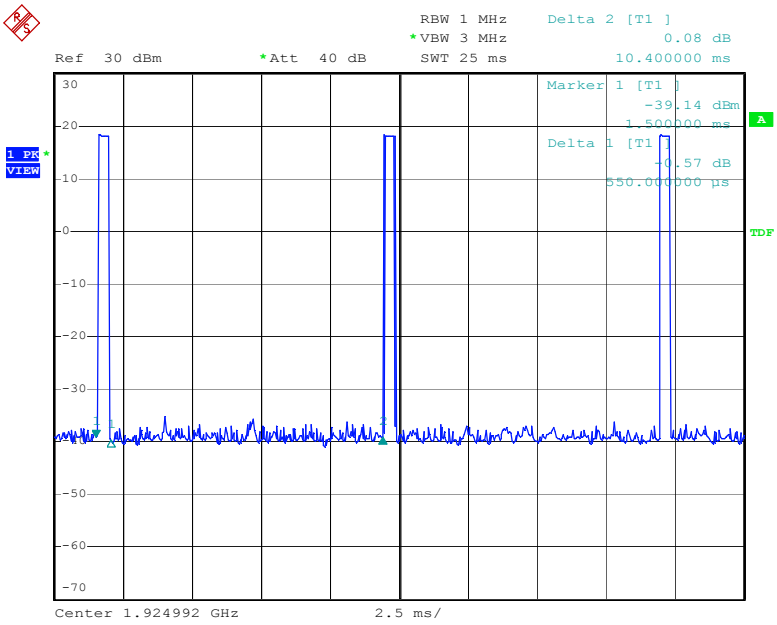
Freq. (MHz)	Emission (dBuV/m)		HORIZ / VERT	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1924.90	112.02	-	HORZ	-	-	-	-
1924.90	110.89	-	VERT	-	-	-	-
3849.80	66.22	40.69	HORZ	74.0	54.0	-7.78	-13.31
3849.80	63.13	37.60	VERT	74.0	54.0	-10.87	-16.40
7699.60	52.55	-	HORZ	74.0	54.0	-21.45	-
7699.60	49.34	-	VERT	74.0	54.0	-24.66	-
5774.90	59.05	33.52	HORZ	74.0	54.0	-14.95	-20.48
5774.90	56.89	31.36	VERT	74.0	54.0	-17.11	-22.64

Channel: High (1928.448 MHz)

Freq. (MHz)	Emission (dBuV/m)		HORIZ / VERT	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1928.40	111.93	-	HORZ	-	-	-	-
1928.40	109.99	-	VERT	-	-	-	-
3856.80	66.34	40.81	HORZ	74.0	54.0	-7.66	-13.19
3856.80	63.25	37.72	VERT	74.0	54.0	-10.75	-16.28
5785.20	52.59	-	HORZ	74.0	54.0	-21.41	-
5785.20	49.11	-	VERT	74.0	54.0	-24.89	-
7713.60	59.24	33.71	HORZ	74.0	54.0	-14.76	-20.29
7713.60	57.06	31.53	VERT	74.0	54.0	-16.94	-22.47

Note: (1) All Reading Levels below 1GHz are Quasi-Peak, above are peak and average value.
(2) Emission Level = Reading Level + Probe Factor + Cable Loss – Amplifier Factor
(3) Receiver setting (Peak Detector) : RBW=1MHz; VBW=1MHz; Span=100MHz
(4) Receiver setting (AVG Detector): RBW=1MHz; VBW=30Hz; Span=20MHz
(5) 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.
(6) AV=PK+20* lg(Duty Cycle)
Duty Cycle=Ton/Tp*100%,
Ton = 550μs,
Tp= 10.400ms
Duty Cycle = Duty cycle factor = 20lg (Duty Cycle) = -25.53

Duty Cycle



Date: 26.JAN.2016 15:39:05

Ant1
Channel: Low (1921.536 MHz)

Freq. (MHz)	Emission (dBuV/m)		HORIZ / VERT	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1921.40	113.11	-	HORZ	-	-	-	-
1921.40	111.56	-	VERT	-	-	-	-
3843.10	67.46	35.35	HORZ	74.0	54.0	-6.54	-18.65
3843.10	64.54	32.43	VERT	74.0	54.0	-9.46	-21.57
7686.30	53.19	-	HORZ	74.0	54.0	-20.81	-
7686.30	49.66	-	VERT	74.0	54.0	-24.34	-
5764.60	59.32	27.21	HORZ	74.0	54.0	-14.68	-26.79
5764.60	57.11	25.00	VERT	74.0	54.0	-16.89	-29.00

Channel: Mid (1924.992 MHz)

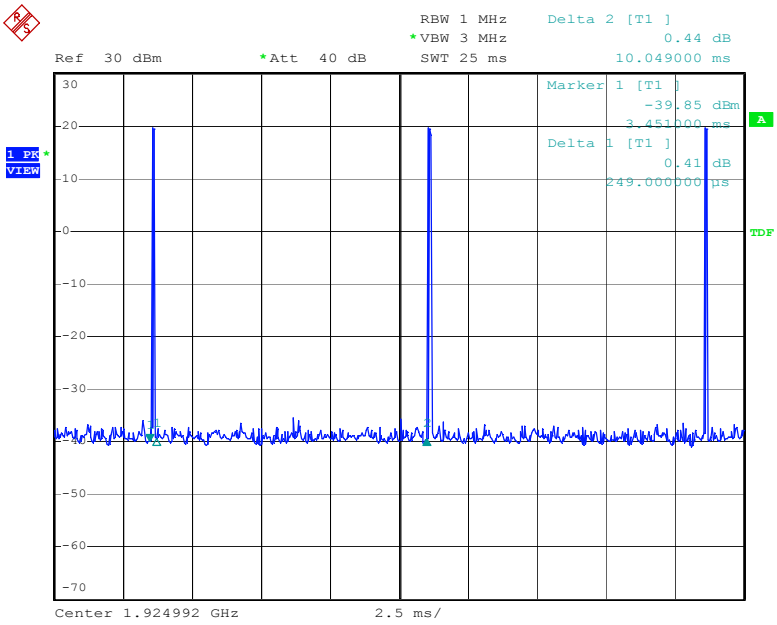
Freq. (MHz)	Emission (dBuV/m)		HORIZ / VERT	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1924.90	112.98	-	HORZ	-	-	-	-
1924.90	111.33	-	VERT	-	-	-	-
3849.80	67.25	35.14	HORZ	74.0	54.0	-6.75	-18.86
3849.80	64.56	32.45	VERT	74.0	54.0	-9.44	-21.55
7699.60	53.79	-	HORZ	74.0	54.0	-20.21	-
7699.60	49.22	-	VERT	74.0	54.0	-24.78	-
5774.90	59.87	27.76	HORZ	74.0	54.0	-14.13	-26.24
5774.90	57.03	24.92	VERT	74.0	54.0	-16.97	-29.08

Channel: High (1928.448 MHz)

Freq. (MHz)	Emission (dBuV/m)		HORIZ / VERT	Limits (dBuV/m)		Margin (dB)	
	Peak	Average		Peak	Average	Peak	Average
1928.40	112.66	-	HORZ	-	-	-	-
1928.40	111.02	-	VERT	-	-	-	-
3856.80	67.38	35.27	HORZ	74.0	54.0	-6.62	-18.73
3856.80	63.95	31.84	VERT	74.0	54.0	-10.05	-22.16
5785.20	52.89	-	HORZ	74.0	54.0	-21.11	-
5785.20	49.14	-	VERT	74.0	54.0	-24.86	-
7713.60	58.88	26.77	HORZ	74.0	54.0	-15.12	-27.23
7713.60	57.24	25.13	VERT	74.0	54.0	-16.76	-28.87

Note: (1) All Reading Levels below 1GHz are Quasi-Peak, above are peak and average value.
(2) Emission Level = Reading Level + Probe Factor + Cable Loss – Amplifier Factor
(3) Receiver setting (Peak Detector) : RBW=1MHz; VBW=1MHz; Span=100MHz
(4) Receiver setting (AVG Detector): RBW=1MHz; VBW=30Hz; Span=20MHz
(5) 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.
(6) AV=PK+20* lg(Duty Cycle)
Duty Cycle=Ton/Tp*100%,
Ton = 249μs,
Tp= 10.049ms
Duty Cycle = Duty cycle factor = 20lg (Duty Cycle) = -32.11

Duty Cycle



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3. 7 Carrier Frequency Stability

3.7.1 Test Equipment

Please refer to section 6 this report.

3.7.2 Test Procedure

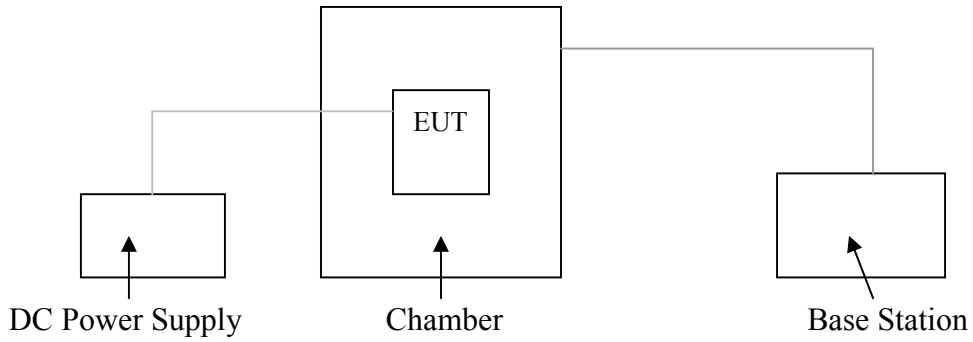
ANSI C63.17, clause 6.2.1. The Frequency Stability is measured with the CMD60. The CMD60 was logged by a computer programmed to get new readings as fast as possible (about 3 readings per second) over the noted time period or number of readings. The peak-to-peak difference was recorded and the mean value and deviation in ppm was calculated.

The Carrier Frequency Stability over Power Supply Voltage and over Temperature is measured with a Frequency Domain Analyzer in histogram mode.

Temperature	Supply Voltage
20℃	85-115% or new batteries
-20℃	Normal
+50℃	Normal

Note: Use the lowest temperature at which the EUT is specified to operate if it is above -20 ℃.

3.7.3 Test Setup



3.7.4 Configuration of The EUT

Same as section 3.1.4 of this report

3.7.5 EUT Operating Condition

Same as section 3.1.5 of this report

3.7.6 Limit

Per §15.323(f), the frequency stability of the carrier frequency of the intentional radiator shall be maintained within ±10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of −20℃ to +50℃ at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 ℃. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage

3.7.7 Frequency Stability Test Result

Product	: DECT Cordless VoIP Phone	Test Mode	: CH Low ~ CH High
Test Item	: Radiated Spurious Emission	Temperature	: 25 ℃
Test Voltage	: DC 2.8V/5V	Humidity	: 56%RH
Test Result	: **PASS**		

PP

Temperature (℃)	Voltage (V_{DC})	Channel Frequency (MHz)	Measured Frequency Offset (kHz)	Measured Frequency Offset (ppm)	Limit (ppm)
20	2.38	1924.992	6.0	3.12	±10
20	3.22	1924.992	6.0	3.12	±10
-20	2.8	1924.992	6.0	3.12	±10
50	2.8	1924.992	7.0	3.64	±10

FP
Ant0

Temperature (℃)	Voltage (V_{DC})	Channel Frequency (MHz)	Measured Frequency Offset (kHz)	Measured Frequency Offset (ppm)	Limit (ppm)
20	4.25	1924.992	2	1.04	±10
20	5.75	1924.992	2	1.04	±10
-20	5	1924.992	2	1.04	±10
50	5	1924.992	3	1.56	±10

Ant1

Temperature (℃)	Voltage (V_{DC})	Channel Frequency (MHz)	Measured Frequency Offset (kHz)	Measured Frequency Offset (ppm)	Limit (ppm)
20	4.25	1924.992	9	4.68	±10
20	5.75	1924.992	9	4.68	±10
-20	5	1924.992	9	4.68	±10
50	5	1924.992	10	5.19	±10

3. 8 FCC§15.323 (c) (e) & §15.319(f) – Specific Requirements for UPCS Device

3.8.1 Frame Repetition Stability Part15 .323 (e)

Test Procedure

According to ANSI C63.17, clause 6.2.2., The envelope of the RF signal from the EUT is detected with a Crystal Detector and the mean and standard deviation of the frame repetition frequency is then gated over 100 frames and measured with a Frequency Domain Analyzer. The frame repetition stability is 3 times the standard deviation.

Limit

Frame Repetition Stability	±10 ppm (TDMA)

Ref. FCC 15.323(e), ANSI C63.17, clause 6.2.2

Test Result

PP

Frame Repetition Stability (ppm)	Limit (ppm)	Result (Pass/Fail)
-0.35	±10	Pass

FP

Ant0

Frame Repetition Stability (ppm)	Limit (ppm)	Result (Pass/Fail)
3.74	±10	Pass

Ant1

Frame Repetition Stability (ppm)	Limit (ppm)	Result (Pass/Fail)
3.58	±10	Pass

3.8.2 Frame Period and Jitter Part15 .323 (e)

Test Procedure

According to ANSI C63.17, clause 6.2.3.

Limit

The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in these sub-bands shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number.

Frame Period	20 or 10 ms
Max Jitter	25 µs
3 times St.Dev of Jitter	12.5 µs

Test Result

PP

Max.pos. Jitter (us)	Max. neg. Jitter (us)	Frame period (us)	Limit	
			Frame Period (ms)	Jitter (µs)
0.15	-0.08	10.00000	20 or10/X	25

FP

Ant0

Max.pos. Jitter (us)	Max. neg. Jitter (us)	Frame period (us)	Limit	
			Frame Period (ms)	Jitter (µs)
0.01	-0.04	10.00000	20 or10/X	25

Ant1

Max.pos. Jitter (us)	Max. neg. Jitter (us)	Frame period (us)	Limit	
			Frame Period (ms)	Jitter (µs)
0.01	-0.04	10.00000	20 or10/X	25

Note: X is a positive whole number.

3.8.3 Lower Monitoring Threshold Part15.323 (c) (2)

Test Procedure

Measurement method according to ANSI C63.17 2006 clause 7.3.1

Limit

The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device.

The Lower Threshold is applicable for systems which have defined less than 40 duplex system access channels. The Upper Threshold is applicable for systems with more than 40 duplex system access channels and that implements the Least Interfered Channel Procedure (LIC).

Test Result

Not Applicable. For the EUT which support LIC there is no need to measure lower threshold because it is automatically met by LIC procedure.

3.8.4 Least Interfered Channel (LIC) Selection, FCC Part15.323 (c) (5)

Test Procedure

Measurement method according to ANSI C63.17 clause 7.3.2, 7.3.3, 7.3.4

If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed.

Calculation of monitoring threshold limits for isochroous devices:

Lower threshold: $T_L = -174+10Log_{10}B + M_u + P_{MAX}-P_{EUT}$ (dBm)

Upper threshold: $T_U = -174+10Log_{10}B + M_u + P_{MAX}-P_{EUT}$ (dBm)

Where: B=Emission bandwidth (Hz)

M_u =dB the threshold may exceed thermal noise (30 for T_L & 50 for T_U)

P_{MAX} =$5Log_{10}B-10$(dBm)

P_{EUT} =Transmitted power (dBm)

Limit

PP

Monitor Threshold	B (MHz)	M_U (dB)	P_{MAX} (dBm)	P_{EUT} (dBm)	Threshold (dBm)
T_L	1.734	30	21.20	18.61	-79.02
T_U	1.734	50	21.20	18.61	-59.02

FP

Ant0

Monitor Threshold	B (MHz)	M_U (dB)	P_{MAX} (dBm)	P_{EUT} (dBm)	Threshold (dBm)
T_L	1.458	30	20.82	18.61	-81.15
T_U	1.458	50	20.82	18.61	-61.15

Ant1

Monitor Threshold	B (MHz)	M_U (dB)	P_{MAX} (dBm)	P_{EUT} (dBm)	Threshold (dBm)
T_L	1.458	30	20.82	19.73	-81.27
T_U	1.458	50	20.82	19.73	-61.27

The EUT must not transmit until the interference level is less than or equal to:

Measured Threshold Level $\leq T_U$

Where: T_U =Upper threshold level

Test Result
PP

Monitor threshold	Measured Threshold Level	Limit (dBm)
Lower Threshold (dBm)	N/A	-79.02
Upper Threshold (dBm)	N/A	-59.02

FP
Ant0

Monitor threshold	Measured Threshold Level	Limit (dBm)
Lower Threshold (dBm)	N/A	-81.15
Upper Threshold (dBm)	N/A	-61.15

Ant1

Monitor threshold	Measured Threshold Level	Limit (dBm)
Lower Threshold (dBm)	N/A	-81.27
Upper Threshold (dBm)	N/A	-61.27

Note: N/A Not applicable- EUT which supports at least of 40 duplex system access channels and implements Least Interfered Channel (LIC) algorithm is permitted to use an upper monitoring threshold. Please refer to the section 4.16.2 for more details.

3.8.5 Monitoring Bandwidth, FCC Part 15.323 (c) (7)

Test Procedure
Simple Compliance Test, ANSI C63.17, clause 7.4.1
More Detailed Test, ANSI C63.17, clause 7.4.2
The test is passed if either the Simple Compliance Test or the More Detailed test is passed.
During this test the spectrum analyzer is observed visually to see if the EUT transmits or not.

Limit
The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission.

Test Result
PP

Test peformed	Observation	Verdict
Simple Compliance test, at ±30% of *B*	No transmissions	Pass
More Detailed Test, at -6 dB points	N/A	N/A
More Detailed Test, at -12 dB points	N/A	N/A

FP
Ant0 & Ant1

Test peformed	Observation	Verdict
Simple Compliance test, at ±30% of *B*	No transmissions	Pass
More Detailed Test, at -6 dB points	N/A	N/A
More Detailed Test, at -12 dB points	N/A	N/A

3.8.6 Reaction Time and Monitoring Interval

Test Procedure
ANSI C63.17, clause 7.5

Limit
The maximum reaction time must be less than 50xSQRT (1.25/emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.
If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35xSQRT (1.25/emission bandwidth in MHz) microseconds but shall not be required to be less than 35 microseconds.

Test Result
By administrative commands and out-of-operating region interference, the EUT is restricted to operate on a single carrier frequency.
Time-synchronized pulsed interference was then applied on the carrier at pulsed levels TU + UM to check that the EUT does not transmit at all. The level was raised 6 dB for part d) with 35 µs pulses.
The pulses are synchronized with the EUT timeslots and applied centered within all timeslots

PP

Pulse Width, ref. to ANSI C63.17 clause 7.5	Observation	Verdict
c) > largest of 50 µs and 50*SQRT(1.25/*B*)	No transmissions	**Pass**
d) > largest of 35 µs and 35*SQRT(1.25/*B*), and with interference level raised 6 dB	No transmissions	**Pass**

FP
Ant0 & Ant1

Pulse Width, ref. to ANSI C63.17 clause 7.5	Observation	Verdict
c) > largest of 50 µs and 50*SQRT(1.25/*B*)	No transmissions	**Pass**
d) > largest of 35 µs and 35*SQRT(1.25/*B*), and with interference level raised 6 dB	No transmissions	**Pass**

Note:: Since B is larger than 1.25 MHz the test was performed with pulse lengths of 50 µs and 35 µs

3.8.7 Time and Spectrum Window Access Procedure

Test Procedure
This requirement is only for EUTs which transmit unacknowledged control and signaling information.
Timing for EUTs using control and signaling channel type transmissions: ANSI C63.17, clause 8.1

Limit
FCC 15.323(c)(4):
Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.
FCC 15.323(c)(6):
If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available

Test Result

Access Criteria, ref. to ANSI C63.17 clause 8.1.1	Observation	Verdict
b) Check that the EUT transmits on the interference free time-slot	N/A	**N/A**
b) The EUT must terminate or pause in its repetitive transmission of the control and signalling channel on the open channel to repeat the access criteria not less frequently than every 30 s	N/A	**N/A**

If FCC 15.323(c)(6) option, **If Random Waiting Interval is NOT implemented**

Access Criteria, ref. to ANSI C63.17 clause 8.1.2	Observation	Verdict
b) Check that the EUT changes to an interference-free slot when interference is introduced on the time slot in use	N/A	**N/A**

If FCC 15.323(c)(6) option, **Only if Random Waiting Interval is implemented**

Access Criteria, ref. to ANSI C63.17 clause 8.1.3	Observation	Verdict
b-d) Check that the EUT uses random waiting interval before continuing transmission on an interfered time slot	N/A	**N/A**

Note: The tested EUT does not transmit unacknowledged control and signaling information.

3.8.8 Acknowledgements and Transmission Duration FCC Part15.323 (c) (3) & (c) (4)

Test Procedure
Acknowledgements: ANSI C63.17, clause 8.2.1
Transmission Duration: ANSI C63.17, clause 8.2.2
During the test Initial transmission without acknowledgements the signal from the EUT to the companion device is blocked by circulators in addition to the tunable attenuator.

The test Transmission time after loss of acknowledgements is performed by cutting-off the signal from the companion device by a RF switch and measuring the time until the EUT stops transmitting..

The Transmission Duration test is performed by monitoring the slot in use and measuring the time until the EUT changes to a different slot.

Limit, FCC 15.323 (c)(3) and (4)
Occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria. Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease.
Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated

Test Result
PP
Acknowledgements

Test ref. to ANSI C63.17 clause 8.2.1	Observation	Verdict
a) Initial transmission without acknowledgements	35 ms	**Pass**
c) Transmission time after loss of acknowledgements	5.0 sec	**Pass**

Transmission Duration

Test ref. to ANSI C63.17 clause 8.2.2	Observation	Verdict
b) Transmission duration on same time and frequency window	Only for initiating device that controls which time slot is used	**N/A**

FP
Ant0 &Ant1
Acknowledgements

Test ref. to ANSI C63.17 clause 8.2.1	Observation	Verdict
a) Initial transmission without acknowledgements	35 ms	**Pass**
c) Transmission time after loss of acknowledgements	5.0 sec	**Pass**

Transmission Duration

Test ref. to ANSI C63.17 clause 8.2.2	Observation	Verdict
b) Transmission duration on same time and frequency window	Only for initiating device that controls which time slot is used	**N/A**

3.8.9 Dual Access Criteria Check, FCC Part15.323 (c) (10)

Test Procedure
EUTs that does not implement the Upper Threshold: ANSI C63.17, clause 8.3.1
EUTs that implement the Upper Threshold: ANSI C63.17, clause 8.3.2
This test is required for equipment that uses the access criteria in FCC 15.323(c)(10).

Limit, FCC 15.323(c)(10)
An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

Test Result
EUTs that implements the Upper Threshold:

Test ref. to ANSI C63.17 clause 8.3.2	Observation	Verdict
b) EUT is restricted to a single carrier f1 for TDMA systems. The Test is Pass if EUT can transmit	N/A	N/A
c) d) Transmission on interference-free receive time/spectrum window	N/A	N/A
e) f) Transmission on interference-free transmit time/spectrum window	N/A	N/A
g) Transmission not possible on any time/spectrum window	N/A	N/A

3.8.10 Alternative monitoring interval for co-located devices, FCC Part 15.323 (c) (11)
An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within 1.25 MHz of the center frequency of channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.

Test Procedure
Measurement method according to ANSI C63.17 2006 clause 8.4

Test Result
The manufacturer declares that this provision is not utilized by the EUT.

3.8.11 Automatic Discontinuation of Transmission, FCC Part 15.319(f)

Test Procedure
The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. The provisions in this section are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

Test Result
Meet the requirement; please refer to the declaration provided by manufacturer.

3.8.12 Monitoring Time FCC 15.323 (c) (1)
Immediately prior to initiating transmission, devices must monitor the combined time and spectrum window in which they intend to transmit. For a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period

Test Procedure
Measurement method according to ANSI C63.17 2006 clause 7.3.4

Test Result
PP
EUT monitors the combined time and spectrum window prior to initiation of transmission. Test result is following

Interference (Refer to ANSI C63.17 clause 7.3.4)	Reaction of EUT	Results
1) Apply the interference on f1 at level TU+UM, and no interference on f2. Initiate transmission and verify the transmission on f2.	EUT transmits on f2	Pass
2) Apply the interference on f2 at level TU+UM, at the same time, no interference on f1. After about 20ms, initiate transmission and verify the transmission on f1.	EUT transmits on f1	Pass

FP
Ant0 & Ant1
EUT monitors the combined time and spectrum window prior to initiation of transmission. Test result is following

Interference (Refer to ANSI C63.17 clause 7.3.4)	Reaction of EUT	Results
1) Apply the interference on f1 at level TU+UM, and no interference on f2. Initiate transmission and verify the transmission on f2.	EUT transmits on f2	Pass
2) Apply the interference on f2 at level TU+UM, at the same time, no interference on f1. After about 20ms, initiate transmission and verify the transmission on f1.	EUT transmits on f1	Pass

3.8.13 Monitoring Antenna, FCC Part15.323 (c) (8)
The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

Test Procedure
Measurement method according to ANSI C63.17 2006 paragraph 4

Test Result
The antenna of the EUT used for transmission is the same interior antenna that used for monitoring.

3.8.14 Monitoring threshold relation FCC 15.323(c) (9)
Devices that have a power output lower than the maximum permitted under the rules can increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

Test Procedure
Measurement method according to ANSI C63.17 2006 paragraph 4

Test Result
Not apply based on 15.323 (c) (5)

3.8.15 Fair Access, FCC Part 15.323 (c) (12)
The provisions of FCC Part15.323(c)(10) or (c)(11) shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

Test Result
The manufacturer declares that this device does not use any mechanisms as provided by Part15.323 (c) (10) or (c) (11) to extend the range of spectrum occupied over space or time for the purpose of denying fail access to spectrum to other device.

4. Photos of Testing

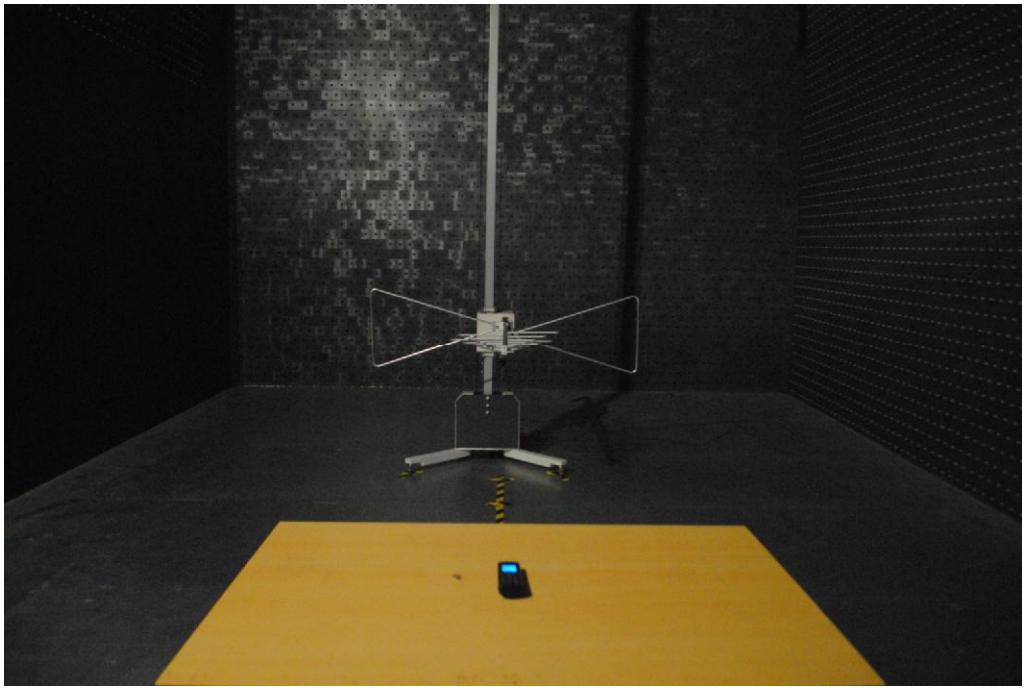
4. 1 Emission Test View

FP Conducted Emission test view

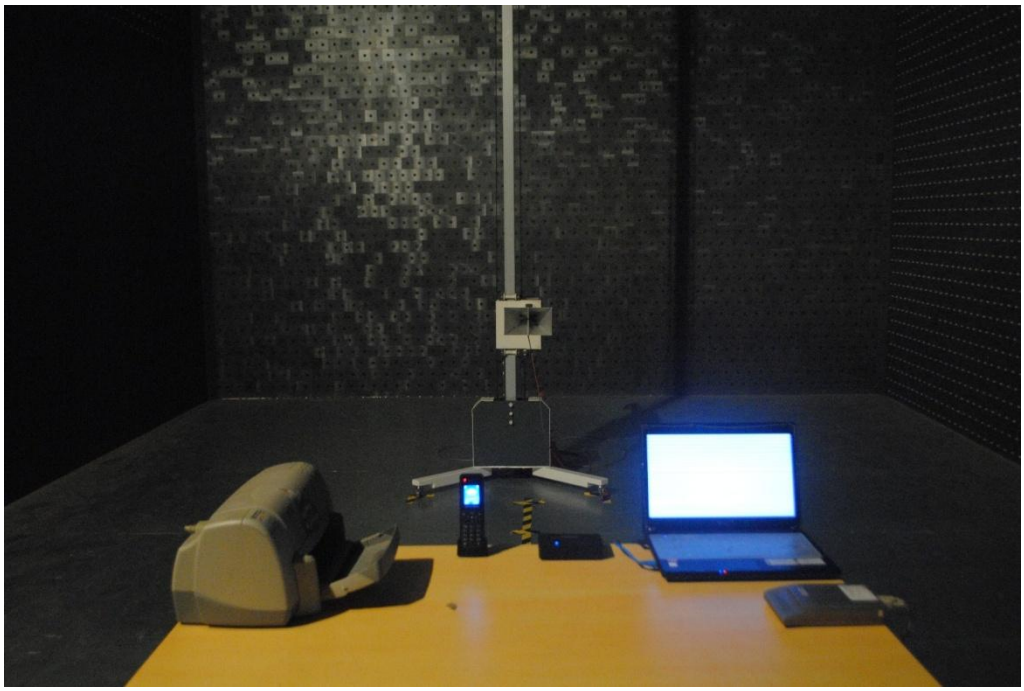

PP Conducted Emission test view


FP - Radiated Emission test view (Frequency from 30MHz to 1GHz)

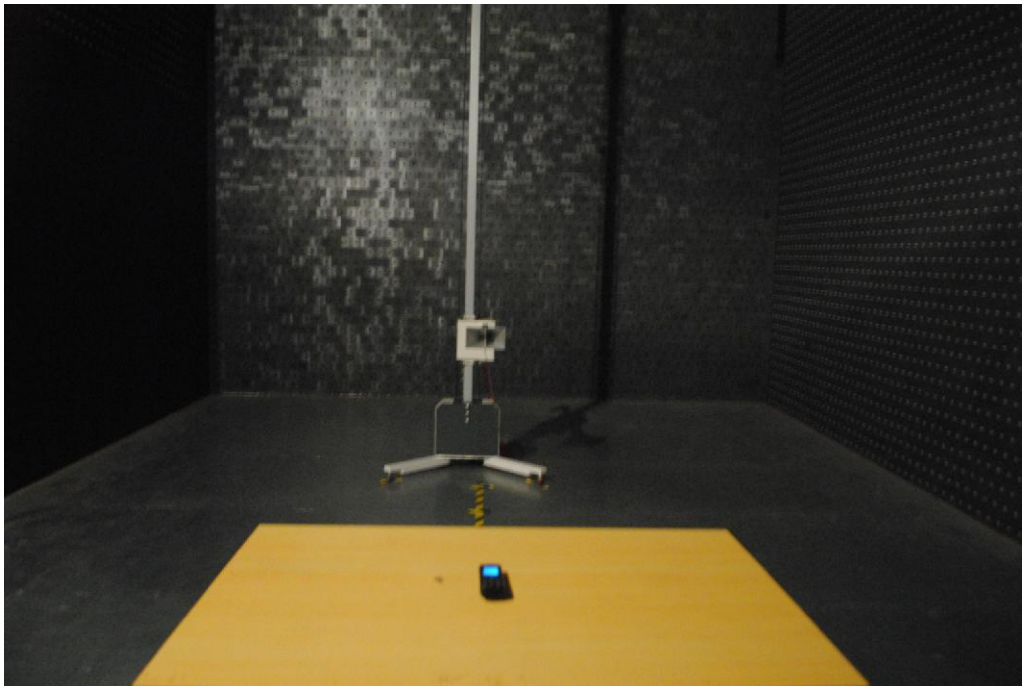
PP - Radiated Emission test view (Frequency from 30MHz to 1GHz)



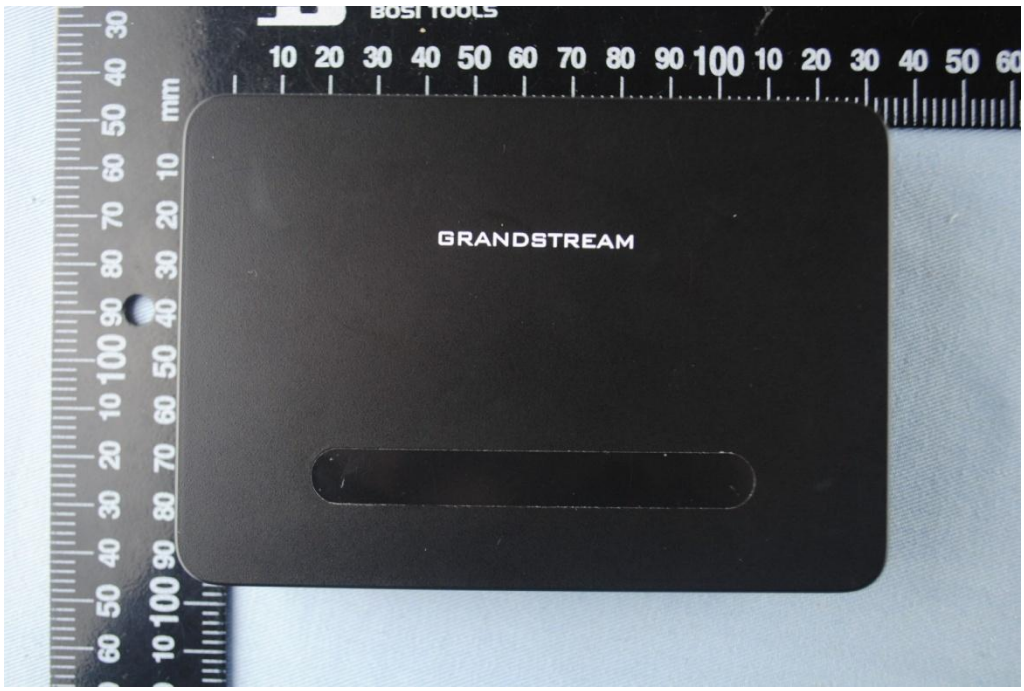
FP - Radiated Emission test view (Frequency above 1GHz)



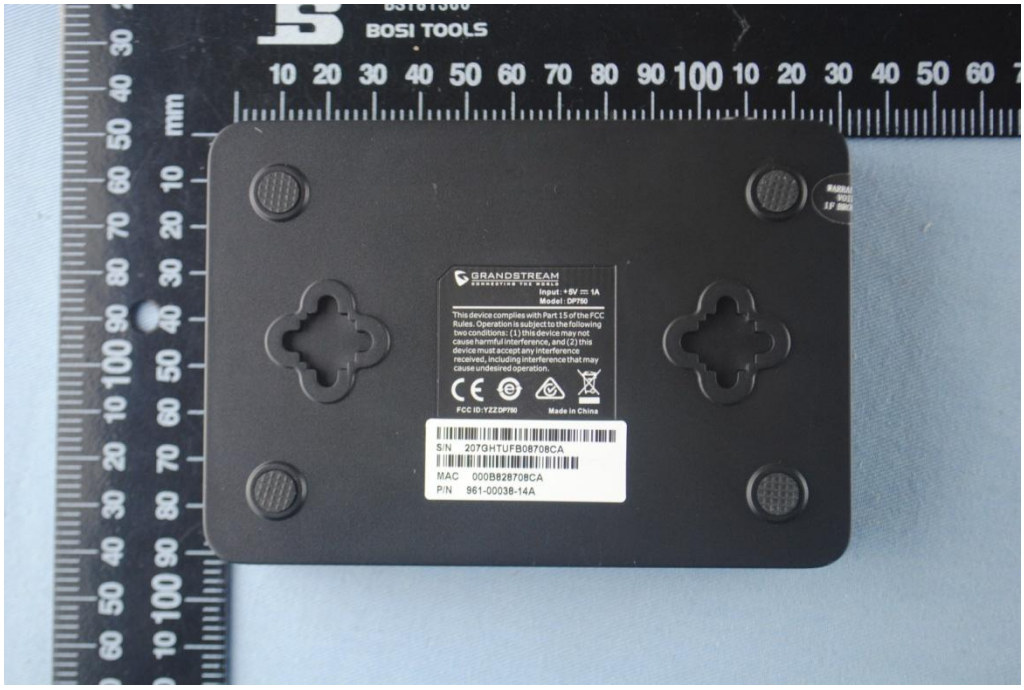
PP - Radiated Emission test view (Frequency above 1GHz)

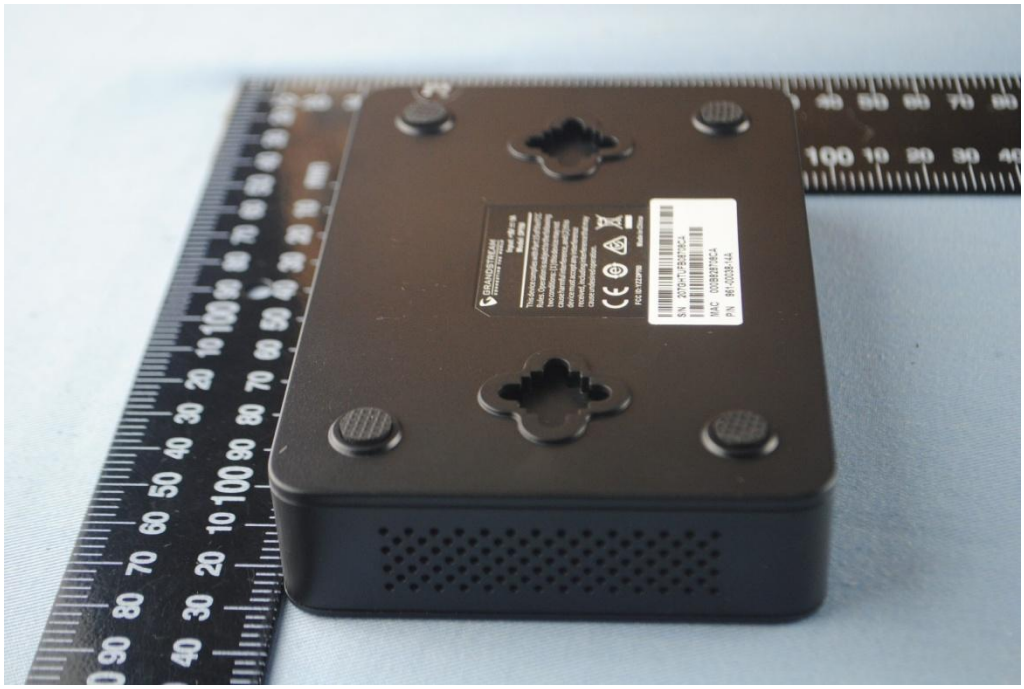


4. 2 EUT Detailed Photographs

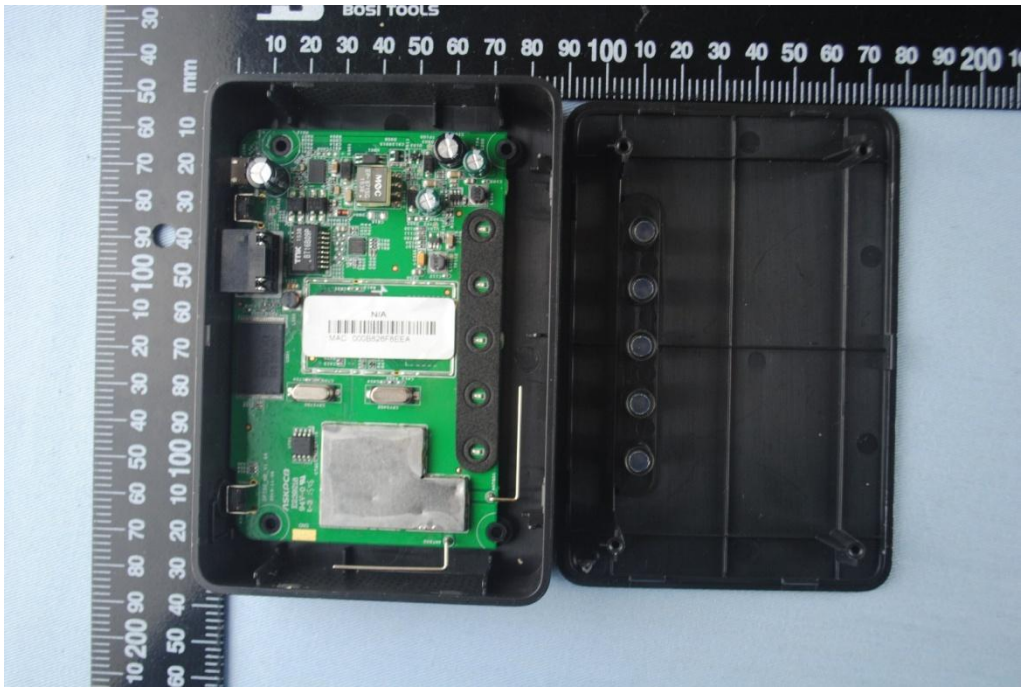
FP EUT top view



EUT bottom view

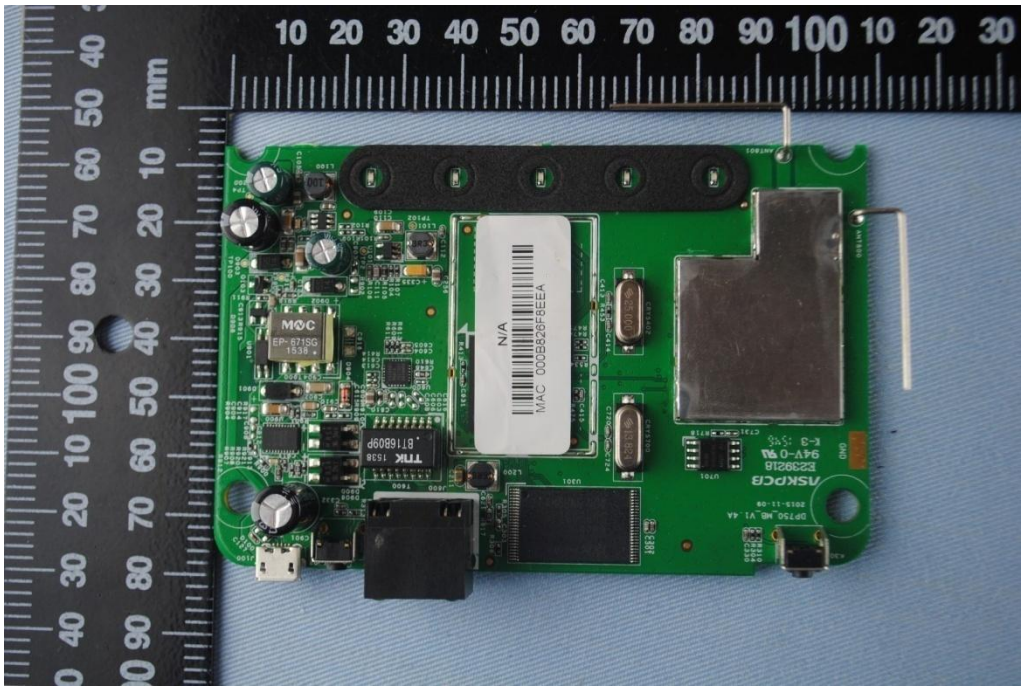


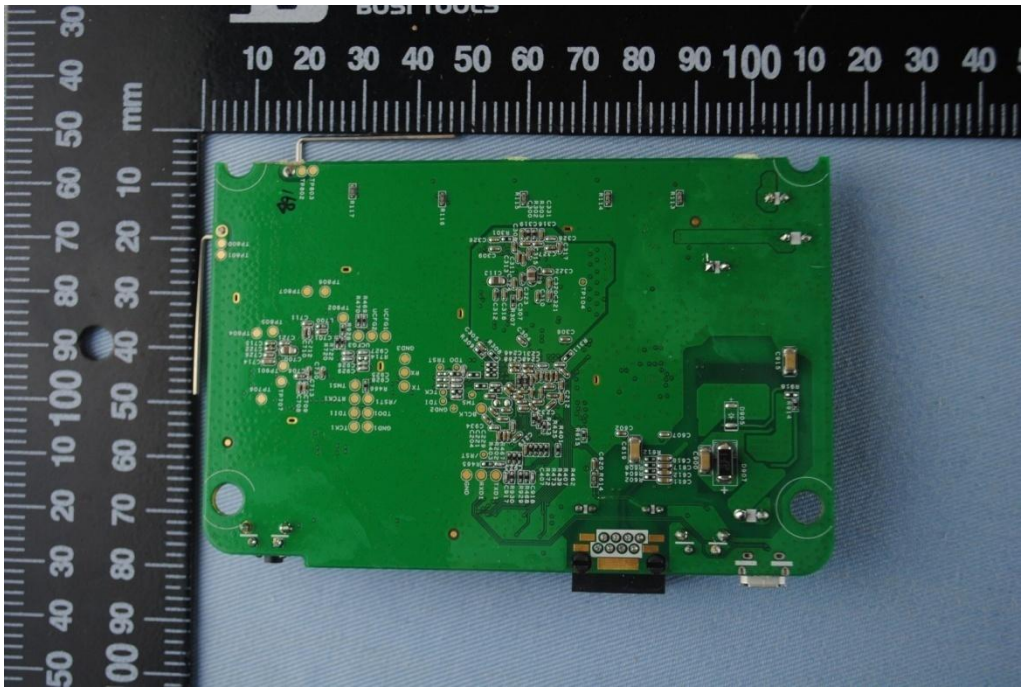


EUT inside whole view



Main board component side

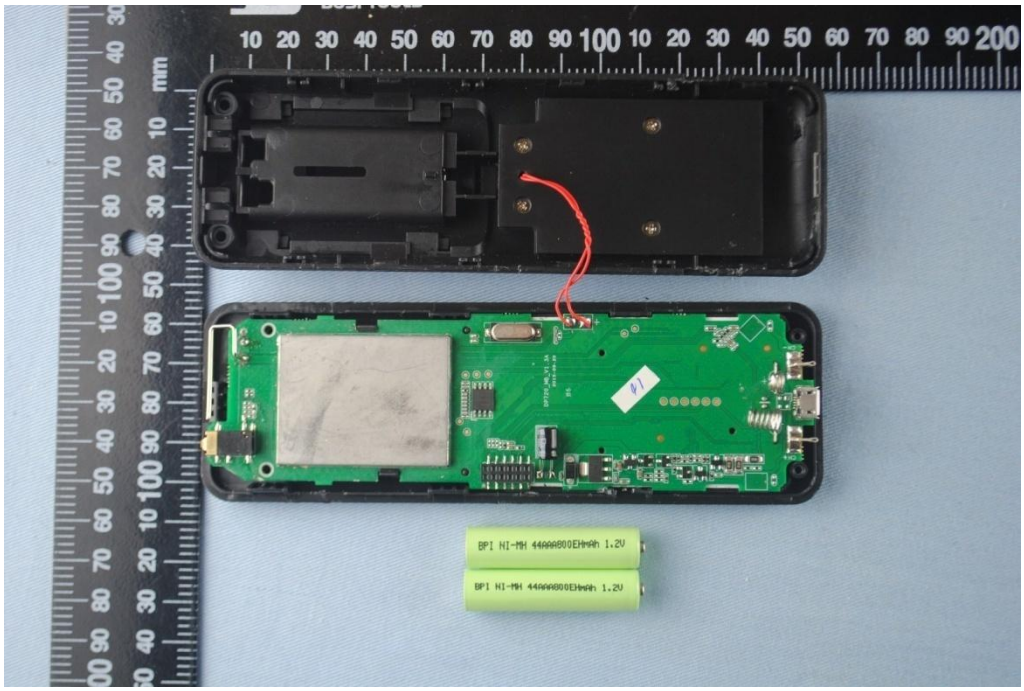


Main board solder side


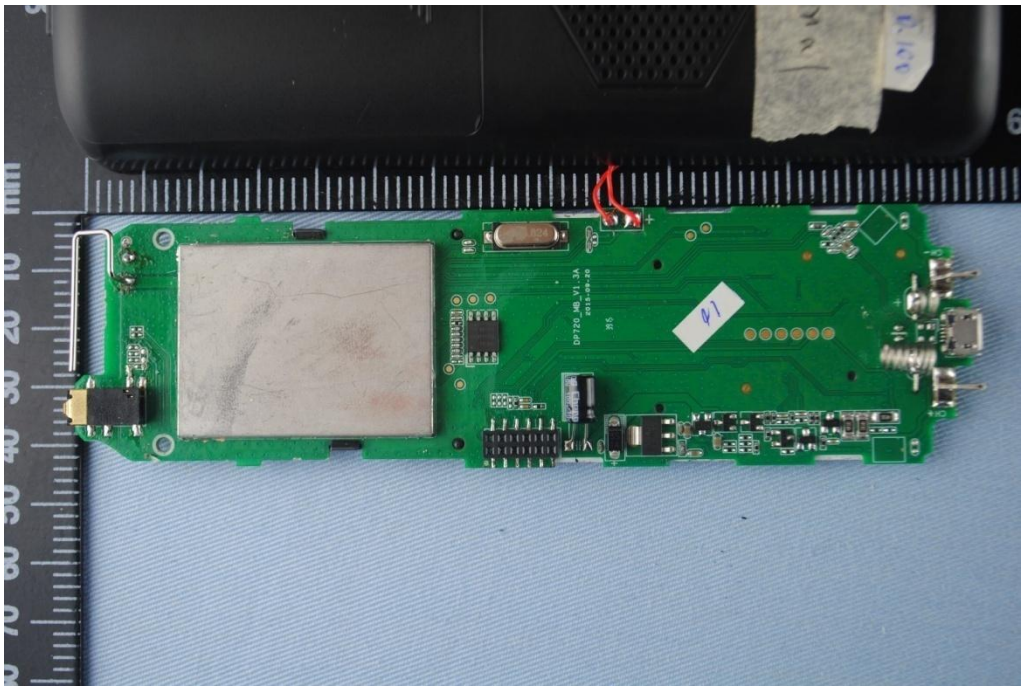
PP EUT top view

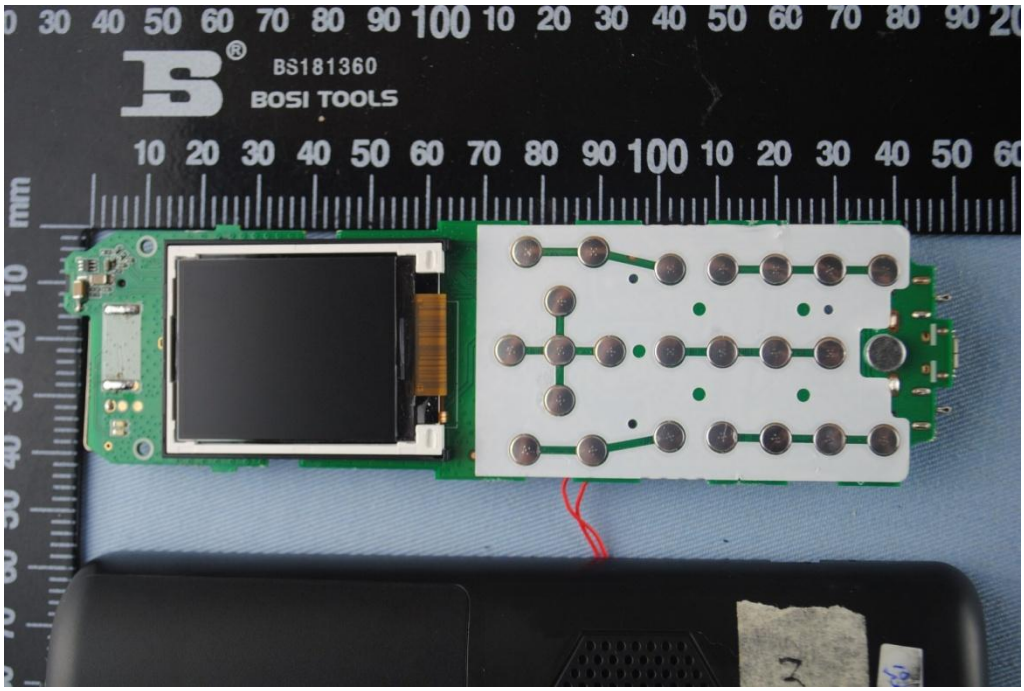
EUT bottom view

EUT inside whole view

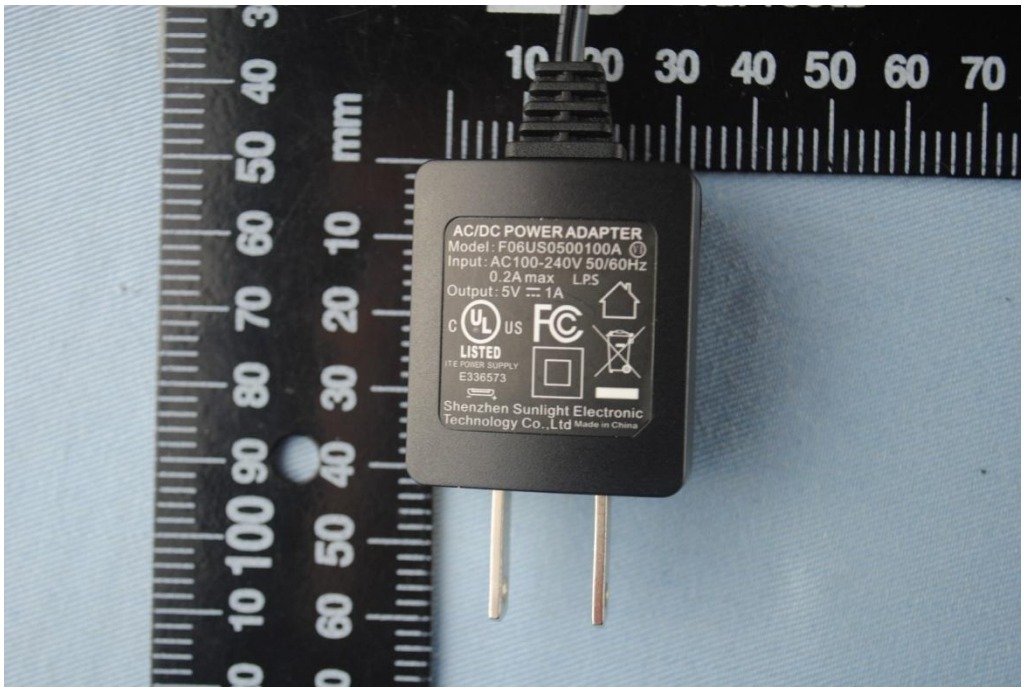


Main board component side



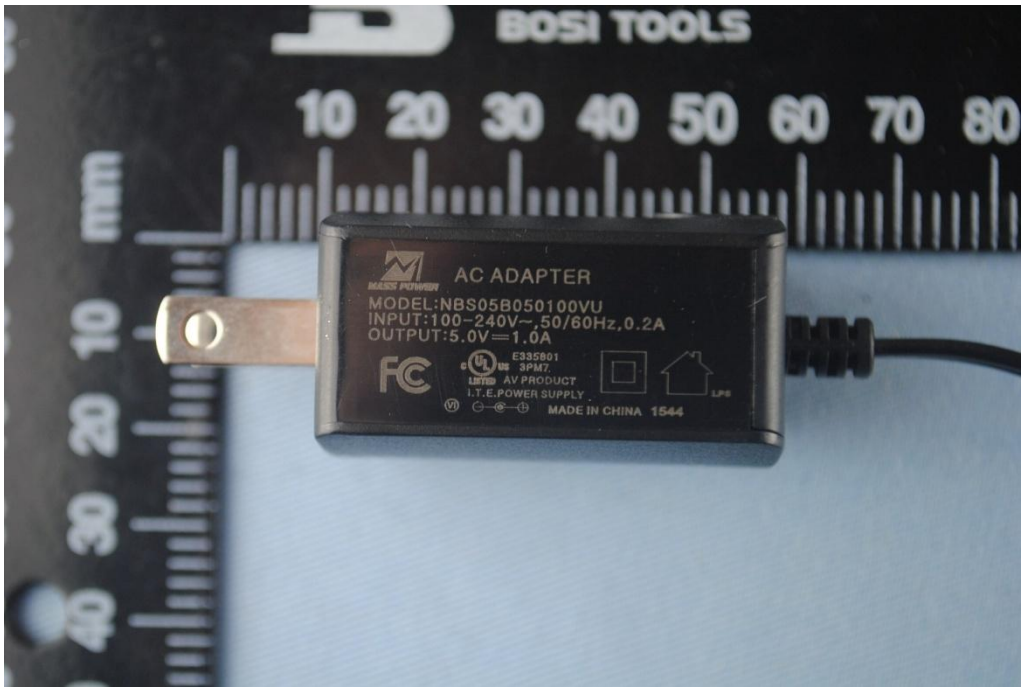
Main board solder side


FCC Adapter top view SUNLIGHT



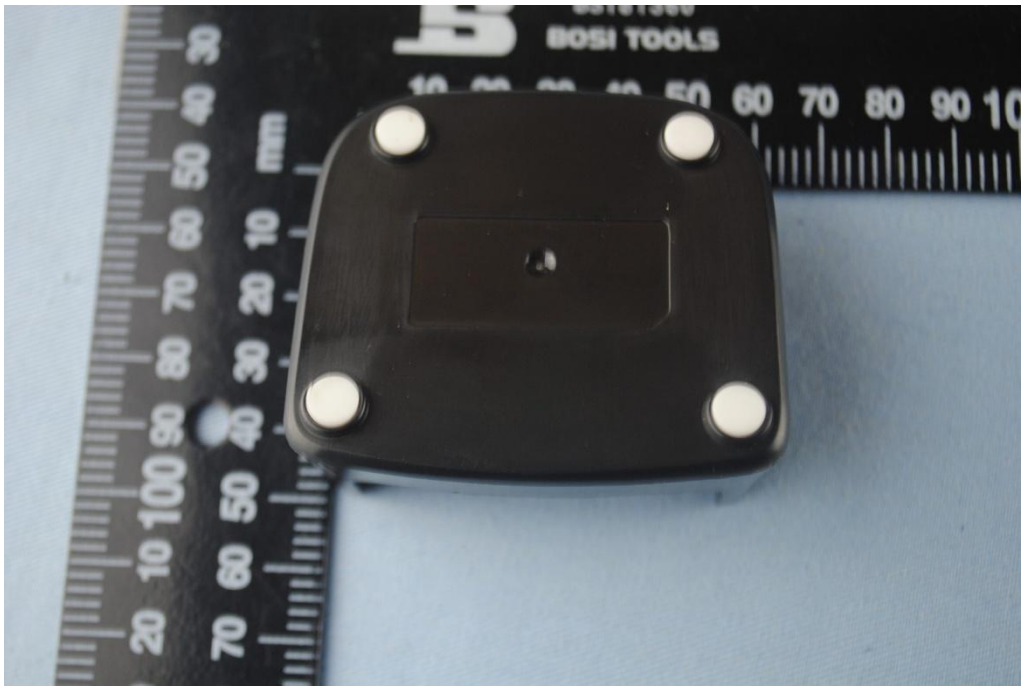
Adapter side view

FCC Adapter top view MASS

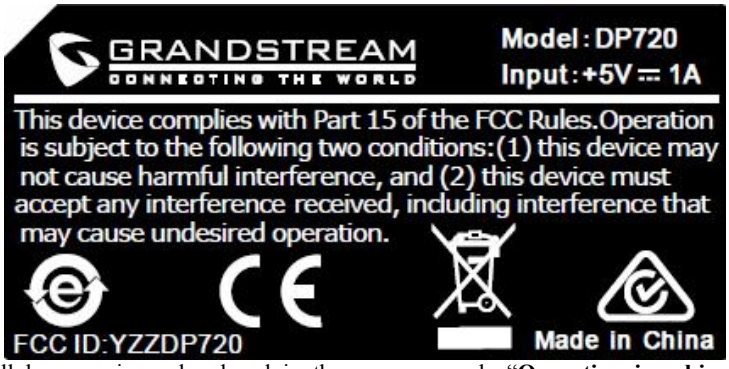


Adapter side view

Charger Base top view


Charger Base bottom view


5. FCC ID Label



The following note shall be conspicuously placed in the users manual: "**Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of this device.**"

The Label must not be a stick-on paper label. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT

6. Test Equipment

The following test equipments were used during the radiated & conducted emission test:

Equipment/ Facilities	Manufacturer	Model #	Serial No.	Due Date
Turntable	Innco systems GmbH	CT-0801	KMO-SZ114	NCR
Antenna Tower	Innco systems GmbH	MM4000-PP	KMO-SZ115	NCR
Controller	Innco systems GmbH	CO2000	KMO-SZ116	NCR
Pre-Amplifier	Agilent	87405C	KMO-SZ155	Dec.6, 2016
Pre-Amplifier	Com-Power	PAM-840	KMO-SZ156	Dec.6, 2016
Horn Antenna	Com-Power	AH-840	KMO-SZ157	Dec.6, 2016
EMI Test Receiver	Rohde & Schwarz	ESPI7	KMO-SZ002	June 27, 2016
Spectrum Analyzer	Rohde & Schwarz	FSP40	KMO-SZ003	June 27, 2016
Signal Generator	FLUKE	PM5418+Y/C	KMO-SZ020	May 27, 2016
Loop Antenna	Rohde & Schwarz	HFH2-Z2	KMO-SZ004	August 19, 2018
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	KMO-SZ005	August 27, 2018
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	KMO-SZ006	August 19, 2018
Broad-Band Horn Antenna	SCHWARZBECK	BBHA 9120D	KMO-SZ007	August 19, 2018
Broad-Band Horn Antenna	SCHWARZBECK	BBHA 9120D	KMO-SZ008	August 19, 2018
AMN	Rohde & Schwarz	ESH3-Z5	KMO-SZ009	June 27, 2016
Pulse Limiter	SCHWARZBECK	VTSD 9561-F	KMO-SZ077	Nov.29, 2016
ISN	SCHWARZBECK	NTFM 8158 CAT3	KMO-SZ070	Nov.19, 2016
ISN	SCHWARZBECK	NTFM 8158 CAT5	KMO-SZ071	Nov.19, 2016
ISN	SCHWARZBECK	NTFM 8158 CAT6	KMO-SZ072	Nov.19, 2016
KMO Shielded Room	KMO	KMO-001	KMO-SZ036	NCR
Coaxial Cable with N-Connectors	SCHWARZBECK	AK9515H	KMO-SZ037	Sep.18, 2016
AC Power Source / Analyzer	Agilent	6813B	KMO-SZ166	July 22, 2016
Power Meter	Rohde & Schwarz	OSP-B157	KMO-HK015	Nov.6, 2016
Digital Radio Communication Tester	Rohde & Schwarz	CMD60	KMO-SZ169	April 10, 2016
Universal Radio Communication Tester	Rohde & Schwarz	CMU200	KMO-SZ170	April 10, 2016
Regulatory Test System 30 MHz to 40 GHz	Rohde & Schwarz	TS8997	KMO-HK015	Nov.6, 2016
Program Control Telephone Exchanger	Excelltel	CDX8000-M	KMO-SZ221	NCR
3m Anechoic Chamber	KMO	KMO-3AC	KMO-3AC-1	Nov.12, 2016
Temperature Chamber	TABAI	PSL-4GTW	N/A	Feb.10, 2016