REPORT

The test site complies with RSS-Gen, IC file no. 3482A-2
issued by an Accredited Testing Laboratory

1002
ISO/IEC 17025

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Date	Reference	Page
2017-02-24	7P00491-F22	1 (2)

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Radio measurements on Radio 2212 B5 radio equipment with FCC ID: TA8AKRC161652 and IC: 287AB-AS161652

(4 appendices)

Test object

Product name: Radio 2212 B5
Product numbers: KRC 161 652/1 and KRC 161 652/2

Summary

See appendix 1 for general information and appendix 4 for external photos.

Standard Listed part of	Compliant	Appendix
FCC CFR 47 / IC RSS-132 ISSUE 6		
2.1053 / RSS-132 5.5 Field strength of spurious radiation	Yes	2

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Appendix 1

Description of the test object

Equipment:	Radio equipment Radio 2212 B5 Product numbers: KRC 161 652/1 (without TX monitoring ports) KRC 161 652/2 (with TX monitoring ports) FCC ID TA8AKRC161652 IC: 287AB-AS161652 IC MODEL NO.: AS161652
HVIN:	AS161652
Hardware revision state:	R1A
Tested configuration:	WCDMA and LTE single RAT GSM+LTE, GSM+WCDMA and LTE+WCDMA multi RAT
Frequency bands: 3GPP B5:	TX: 869 – 894 MHz RX: 824 – 849 MHz
IBW:	25 MHz, for WCDMA and LTE 5 and 10 MHz channel bandwidth 20 MHz, for GSM and narrowband LTE 1.4 and 3 MHz channel bandwidth
Output power:	Max 80 W/ carrier for WCDMA, LTE 5 and 10 MHz channel bandwidth. Max 40 W/ carrier for narrowband LTE 1.4 and 3 MHz channel bandwidth Max 20 W/ carrier for GSM. Max 80 W/ carrier for LTE 5 MHz and 10 MHz with NB IoT in-band operation. Power dynamic range of the NB IoT carrier is +6 dB.
Antenna ports:	2 TX / 2 RX ports
RF configurations:	Single carrier, multi carrier, MIMO 2x2 and NB IoT in-band operation
RF power Tolerance:	+0.6/ - 2.0 dB
CPRI Speed	9.8 Gbit/s
Channel bandwidths:	GSM: 200 kHz WCDMA: 4.2 and 5 MHz LTE: 1.4 MHz, 3 MHz, 5 MHz and 10 MHz NB IoT in-band (LTE 5MHz and 10 MHz): 1 Resource Block (RB)
Modulations:	GSM: GMSK, AQPSK and 8PSK WCDMA: QPSK, 16QAM and 64QAM LTE: QPSK, 16QAM, 64QAM and 256QAM
Nominal supply voltage:	-48 VDC

Purpose of test

The purpose of the tests is to verify compliance to the performance characteristics specified in applicable items of FCC CFR 47 and Industry Canada RSS-132 and RSS-Gen.

Operation modes during measurements

GSM measurements were performed with the test object transmitting GMSK, AQPSK and 8PSK modulations as defined in 3GPP TS 37.141.

WCDMA measurements were performed with the test object transmitting test models as defined in 3GPP TS 37.141. Test model 1 (TM1) was used to represent QPSK. Test model 5 (TM5) to represent 16QAM modulation and Test model 6 (TM6) to represent 64QAM modulation.

LTE measurements were performed with the test object transmitting test models as defined in 3GPP TS 37.141. Test model E-TM1.1 was used to represent QPSK, test model E-TM3.2 to represent 16QAM, test model E-TM3.1 to represent 64QAM modulation and E-TM3.1A to represent 256QAM modulation.

All measurements were performed with the test object configured for maximum transmit power.

According to manufacturers declaration the only difference between the products KRC 161 652/1 and KRC 161 652/2 is that KRC 161 652/2 is equipped with TX monitoring ports and components to support external RF monitoring when needed. The KRC 161 652/1 is a depopulated version not supporting TX monitoring.

All measurements in this report has been made with KRC 161 652/2, judged to represent worst case version.

The test object was powered with -48 VDC.

References

Measurements were done according to relevant parts of the following standards:
ANSI 63.4-2014
ANSI/TIA/EIA-603-D-2010
CFR 47 part 2, October 1st , 2015
CFR 47 part 22, October 1st, 2015
3GPP TS 37.141, version 11.12.0
RSS-Gen Issue 4
RSS-132 Issue 3

Measurement equipment

	Calibration Due	SP number
Test site Tesla	2017-03	503 881
R&S ESU 40	2017-07	901 385
R&S FSQ 40	2017-07	504 143
Control computer with R&S software EMC32 version 9.15.0	-	503 899
High pass filter 1-18 GHz	2017-06	901 501
ETS Lindgren BiConiLog Antenna 3142E	2019-03	BX61914
EMCO Horn Antenna 3115	2019-12	502 175
µComp Nordic, Low Noise Amplifier	2017-12	901 545
Temperature and humidity meter, Testo 635	2017-06	504 188

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation ”SP-QD 10885”. The uncertainties are calculated with a coverage factor k=2 (95% level of confidence).
Compliance evaluation is based on a shared risk principle with respect to the measurement uncertainty.

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Delivery of test object

The test object was delivered: 2017-01-18.

Manufacturer's representative

Mikael Jansson, Ericsson AB.

Test engineers

Tomas Isbring and Andreas Johnson, SP.

Test participant

Adam Skoglund, Ericsson AB.

Appendix 1

Test frequencies used for radiated measurements

LTE TX test frequencies

EARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
2425	871.5	B_{L5}	TX bottom frequency in 5 MHz BW configuration
2525	881.5	M_L	TX band mid frequency all BW configurations
2625	891.5	T_{L5}	TX top frequency in 5 MHz BW configuration
2625	891.5 + IoT at 891.95	T_{L5+IoT}	TX top frequency in 5 MHz BW configuration with NB IoT in-band operation at resours block 3 (RB 3) in LTE carrier.
2407 2421 2593	869.7 871.1 888.3	$BIM_{L1.4}$	3 carrier TX 1.4 MHz BW bottom constellation
2425 2575 2625	871.5 886.5 891.5	TIM_{L5}	3 carrier TX 5 MHz BW top constellation
2440 2470 2510 2540 2580 2610	873.0 876.0 880.0 883.0 887.0 890.0	M6	6 carrier TX 3 MHz BW mid constellation

WCDMA TX test frequencies

UARFCN Downlink	Frequency [MHz]	Symbolic name	Comment
4357	871.4	B_W	Single carrier TX bottom frequency
4407	881.4	M_w	Single carrier TX band mid frequency
4458	891.6	T_w	Single carrier TX top frequency
4357 4382 4458	871.4 876.4 891.6	BIM_W	3 carrier TX bottom constellation
4357 4433 4458	871.4 886.6 891.6	TIM_W	3 carrier TX top constellation

Appendix 1

Multi RAT, WCDMA+LTE TX test frequencies

Symbolic name: WL1:

	Frequency [MHz]	EARFCN/ UARFCN	Bandwidth [MHz]	Test model
WCDMA	871.4	4357	5	TM5
LTE	891.5	2625	5	E-TM1.1

Symbolic name:WL2:

	Frequency [MHz]	EARFCN/ UARFCN	Bandwidth [MHz]	Test model
WCDMA	871.4	4357	5	TM5
WCDMA	876.4	4382	5	TM5
LTE	891.5	2625	5	E-TM1.1

Symbolic name: WL3:

	Frequency [MHz]	EARFCN/ UARFCN	Bandwidth [MHz]	Test model
WCDMA	871.4	4357	5	TM5
LTE	886.5	2575	5	E-TM1.1
LTE	891.5	2625	5	E-TM1.1

Multi RAT, GSM+LTE TX test frequencies

Symbolic name: GL1:

	Frequency [MHz]	EARFCN/ ARFCN	Bandwidth [MHz]	Test model
GSM	869.2	128	0.2	GMSK
LTE	872.0	2430	5.0	E-TM1.1
GSM	874.8	156	0.2	GMSK
GSM	888.2	223	0.2	GMSK
LTE	891.0	2620	5.0	E-TM1.1
GSM	893.8	251	0.2	GMSK

Symbolic name: GL2:

	Frequency [MHz]	EARFCN/ ARFCN	Bandwidth [MHz]	Test model
LTE	871.5	2625	5.0	E-TM1.1
GSM	893.6	250	0.2	GMSK
GSM	893.8	251	0.2	GMSK

Appendix 1

Multi RAT, GSM+WCDMA TX test frequencies

Symbolic name: GW1:

	Frequency [MHz]	UARFCN/ ARFCN	Bandwidth [MHz]	Test model
GSM	869.2	128	0.2	GMSK
WCDMA	872.0	4360	5.0	TM5
GSM	874.8	156	0.2	GMSK
GSM	888.2	223	0.2	GMSK
WCDMA	891.0	4455	5.0	TM5
GSM	893.8	251	0.2	GMSK

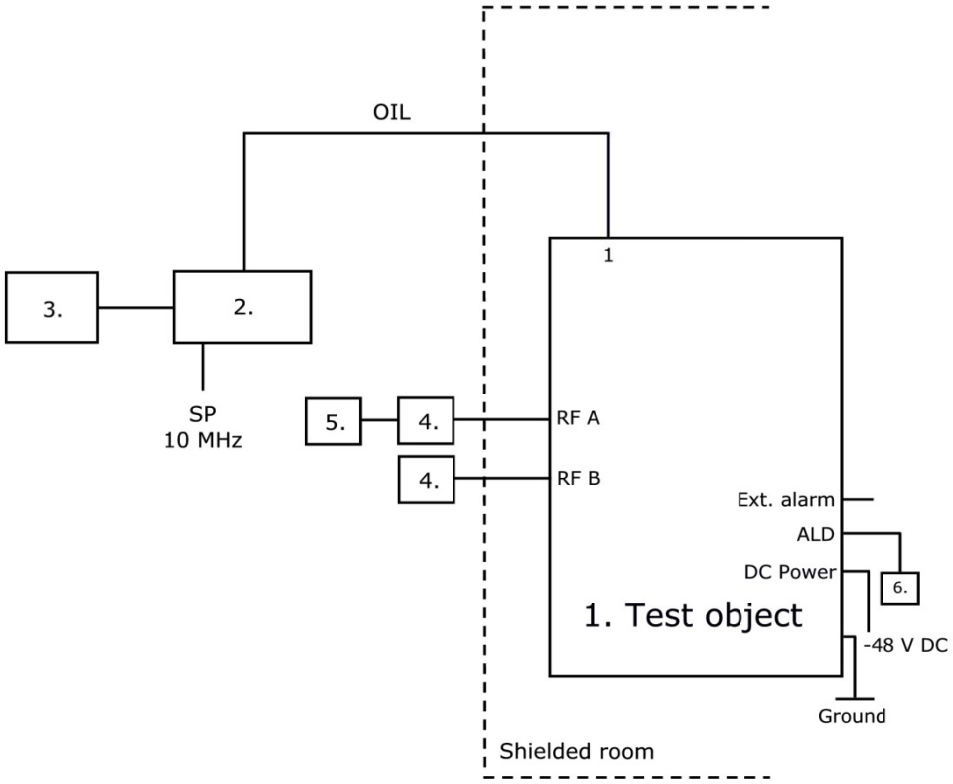
Symbolic name: GW2:

	Frequency [MHz]	UARFCN/ ARFCN	Bandwidth [MHz]	Test model
WCDMA	871.4	4357	5.0	TM5
GSM	893.6	250	0.2	GMSK
GSM	893.8	251	0.2	GMSK

All RX frequencies were configured 45 MHz below the corresponding TX frequency according the appclicable duplex offset for the operating band.

Appendix 1

Test setup:



Test object:

1.	Radio 2212 B5, KRC 161 652/2, rev. R1A, s/n: D824847240 With Radio Software: CXP 901 7316/7, rev. R64HE FCC ID: TA8AKRC161652 and IC: 287AB-AS161652

Associated equipment:

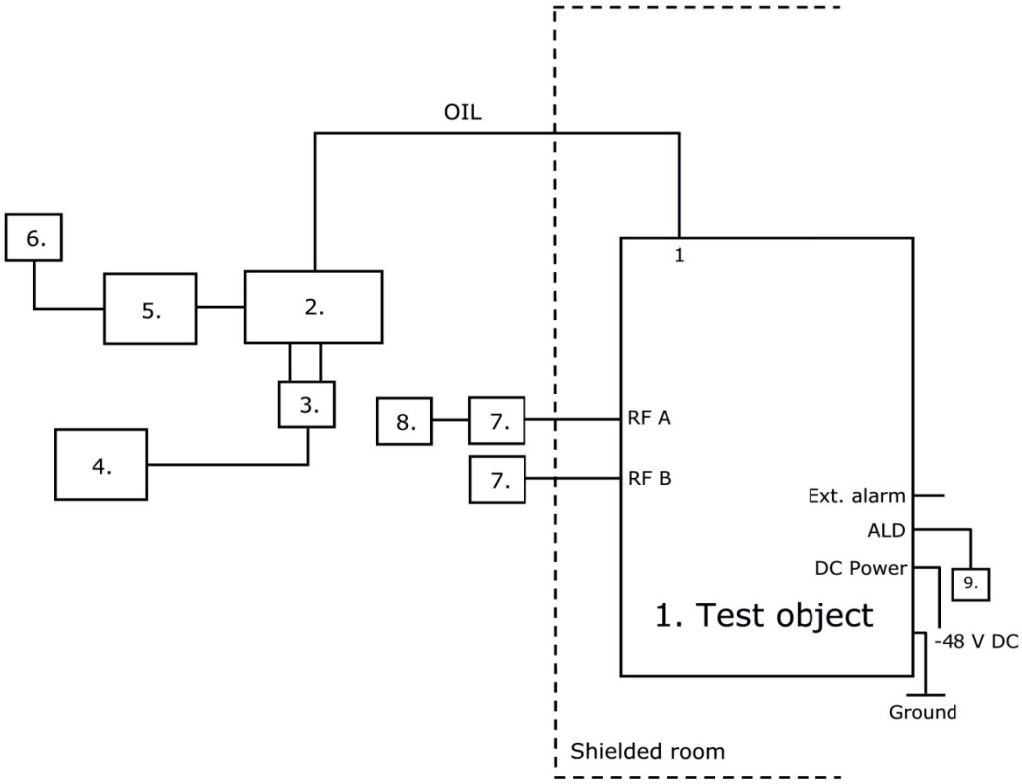
2.	Testing Equipment: CT10, LPC 102 487/1, rev. R1C, s/n: T01F375046, BAMS – 1001466800 with software CXA 104 446/1, rev. R8U

Functional test equipment:

3.	HP EliteBook 8560w, BAMS – 1001236850
4.	Attenuator/ Terminator
5.	R&S ESIB 26, SP no: 503 292for supervision purpose only
6.	Remote Control Unit, KRY 121 68/1, s/n: CSE0850824

Appendix 1

Test setup, LTE with IoT:



Test object:

1.	Radio 2212 B5, KRC 161 652/2, rev. R1A, s/n: D824847240 With Radio Software: CXP 901 7316/7, rev. R64HE FCC ID: TA8AKRC161652 and IC: 287AB-AS161652

Associated equipment:

2.	RBS 6601 Main Unit: SUP 6601, 1/BFL 901 009/4, rev. R1E, s/n: BR82691785 DUS 41 01, KDU 137 624/1, rev. R5A/A, s/n: D169766593 With software: CXP 102 051/26, rev: R23NC
3.	Switch Netgear GS108E
4.	Computer, HP EliteBook 8560w, BAMS - 1001236850
5.	Sync Box, LPC 107 043/1 s/n: A402704701
6.	GPS Active Antenna, KRE 101 2082/1
9.	Remote Control Unit, KRY 121 68/1, s/n: CSE0850824

Functional test equipment:

7.	Attenuator/ Terminator
8.	R&S ESIB 26, SP number: 503 292, for supervision purpose only

Appendix 1

Interfaces:	**Type of port:**
Power: -48VDC	DC Power
RF port A, 4.3-10 connector, combined TX/RX	Antenna
RF port B, 4.3-10 connector, combined TX/RX	Antenna
TX mon A, SMA connector, for maintenance purpose only	Antenna
TX mon B, SMA connector, for maintenance purpose only	Antenna
1, optical interface	Signal
2, optical interface, not used in this configuration	Signal
Ground wire	Ground

Appendix 2

Field strength of spurious radiation measurements according to 47 CFR 2.1053 / IC RSS-133 6.5

Date	Temperature	Humidity
2017-01-20	23 °C ± 3 °C	30 % ± 5 %
2017-01-23	22 °C ± 3 °C	27 % ± 5 %
2017-01-24	23 °C ± 3 °C	26 % ± 5 %
2017-01-25	22 °C ± 3 °C	30 % ± 5 %
2017-01-26	22 °C ± 3 °C	23 % ± 5 %

The test sites are listed at FCC, Columbia with registration number: 93866. The test site complies with RSS-Gen, Industry Canada file no. 3482A-1.

The measurements were performed with both horizontal and vertical polarization of the antenna. The antenna distance was 3 m in the frequency range 30 MHz – 9 GHz.

The measurement was performed with a RBW of 1 MHz.

A propagation loss in free space was calculated. The used formula was

$\gamma = 20\log\left(\frac{4\pi D}{\lambda}\right)$, γ is the propagation loss and D is the antenna distance.

The measurement procedure was as the following:

1. A pre-measurement is performed with peak detector. For measurement < 1 GHz the test object was measured in eight directions with the antenna at three heights, 1.0 m, 1.5 m and 2.0. For measurements > 1 GHz the test object was measured in seventeen directions with the antenna at 1.0 m height.
2. Spurious radiation on frequencies closer than 20 dB to the limit in the pre-measurement is scanned 0-360 degrees and the antenna is scanned 1- 4 m for maximum response. The emission is then measured with the RMS detector and the RMS value is reported. Frequencies closer than 10 dB to the limit when measured with the RMS detector were measured with the substitution method according to ANSI/TIA/-603-D-2010.

Appendix 2

The test set-up during the spurious radiation measurements is shown in the picture below:

Measurement equipment

Measurement equipment	SP number
Semi anechoic chamber Tesla	503 881
R&S ESU 40	901 385
EMC 32 ver. 9.15.0	503 899
ETS Lindgren BiConiLog 3142E	BX61914
ETS Lindgren Horn Antenna 3115	502 175
µComp Nordic, Low Noise Amplifier	901 545
HP Filter 1-18 GHz	901 501
Temperature and humidity meter, Testo 625	504 188

Test frequencies

WCDMA	LTE
Symbolic name	Symbolic name
B_w	B_{L5}
M_W	M_L
T_W	T_{L5}
BIM_W	T_{L5+IoT}
TIM_W	$BIM_{L1.4}$
	TIM_{L5}
	M6

WCDMA+LTE	GSM+WCDMA	GSM+LTE
Symbolic name	Symbolic name	Symbolic name
WL1	GW1	GL1
WL2	GW2	GL2
WL3		

Results

Representing worst case:

Single RAT WCDMA, symbolic name B_W, Diagram 1 a-b
Single RAT LTE, symbolic name T_{L5+IoT}, Diagram 2 a-b
Multi RAT WCDMA + LTE, symbolic name: WL1, Diagram 3 a-b
Multi RAT GSM + LTE, Symbolic name: GL1, Diagram 4a-b
Multi RAT GSM + WCDMA, Symbolic name: GW2, Diagram 5 a-b

Frequency (MHz)	Spurious emission level (dBm)	
	Vertical	Horizontal
30-9000	All emission > 20 dB below limit	All emission > 20 dB below limit

Measurement uncertainty:

3.1 dB up to 18 GHz.

Limits

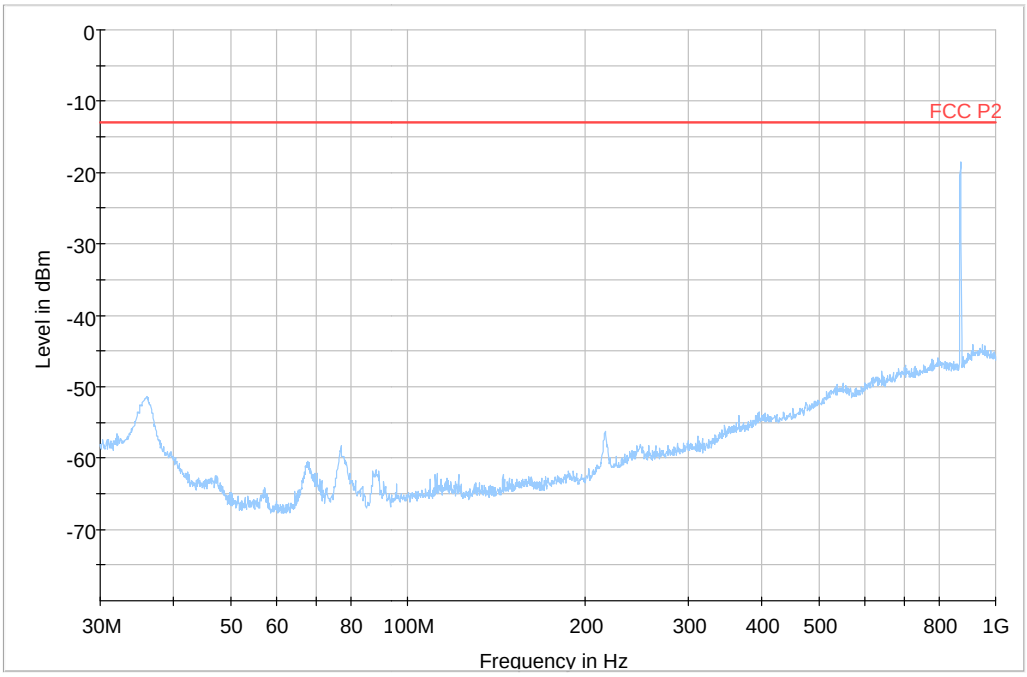
CFR 47 §22.917 and IC RSS-132 5.6

Outside a licensee's frequency band(s) of operation the power of any emission shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB, resulting in a limit of -13 dBm.

Complies?	Yes

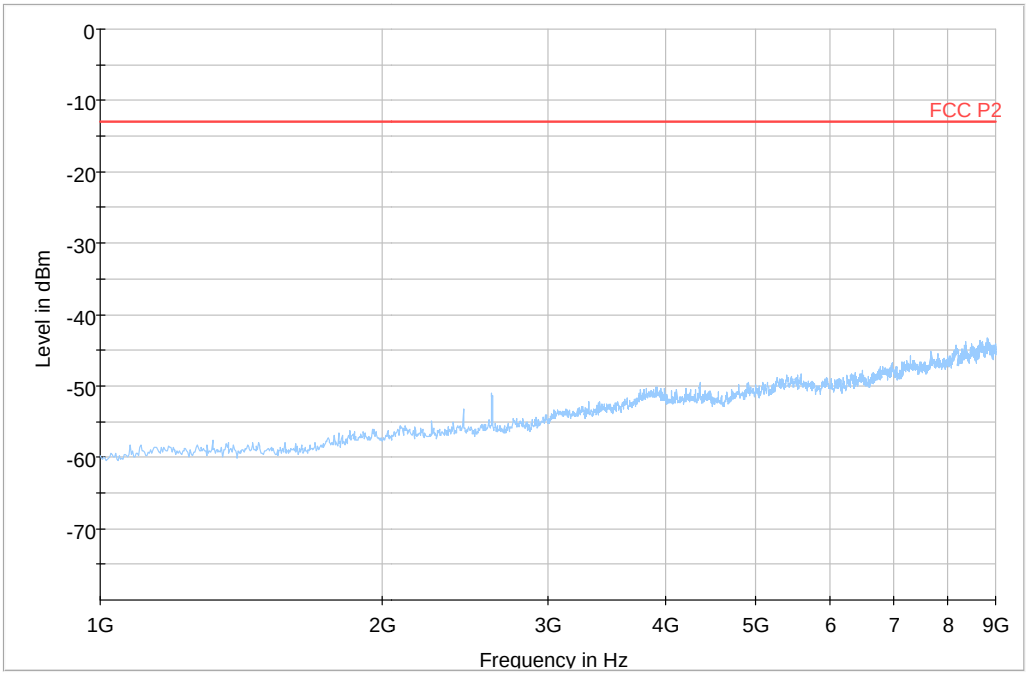
Appendix 2

Diagram 2a:



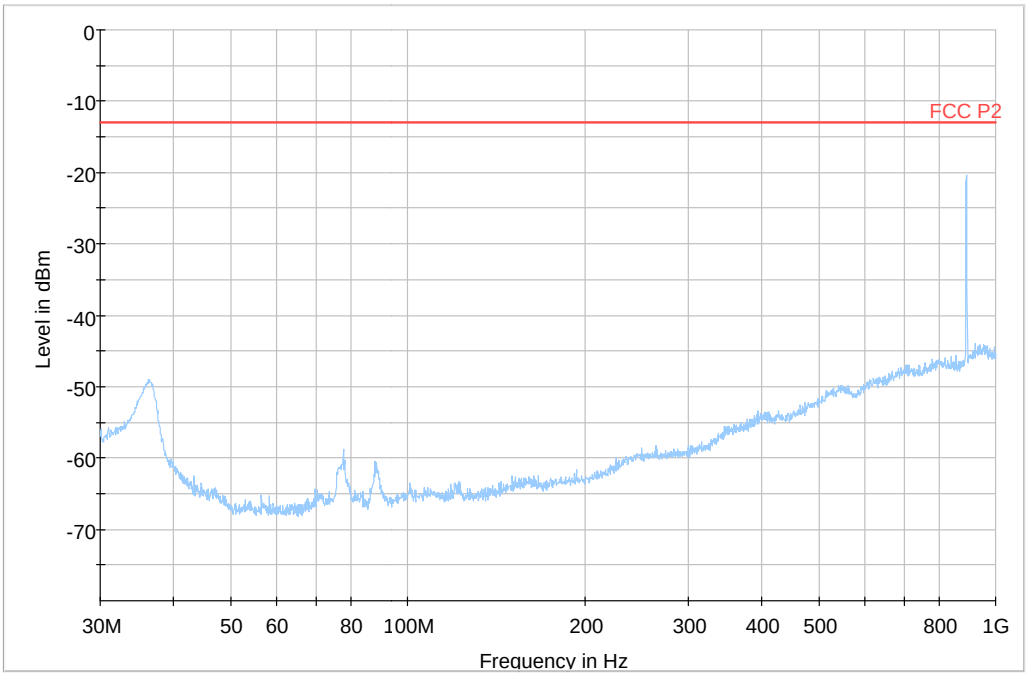
Note: The emission at 871.4 MHz is the carrier frequency and shall be ignored in the context.

Diagram 2b:



Appendix 2

Diagram 3a:



Note: The emission at 891.5 MHz is the carrier frequency and shall be ignored in the context.

Diagram 3b:

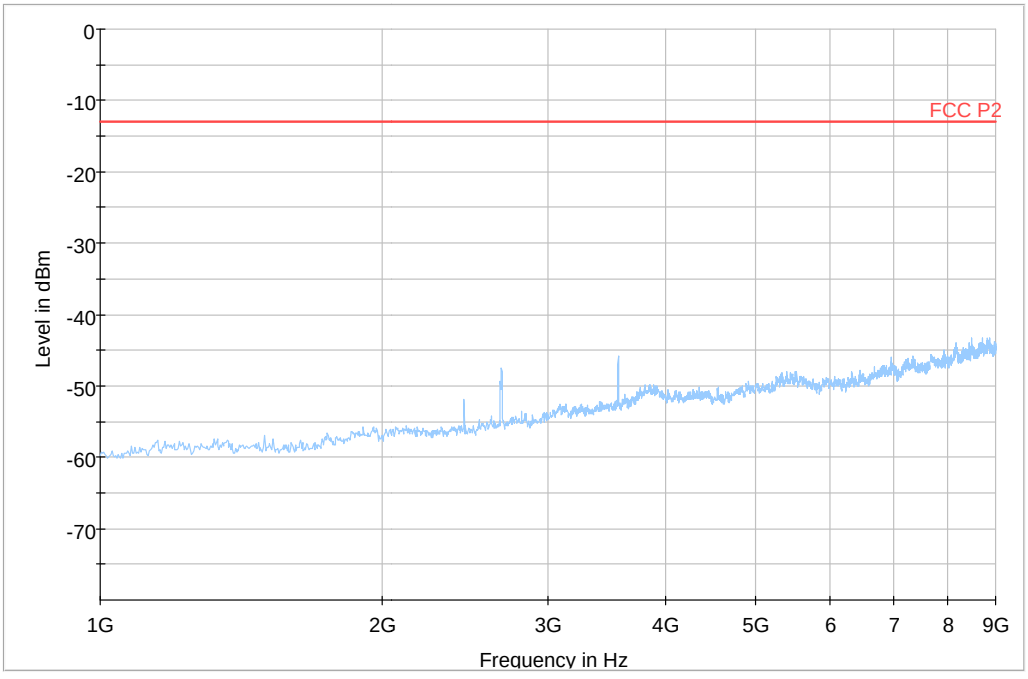
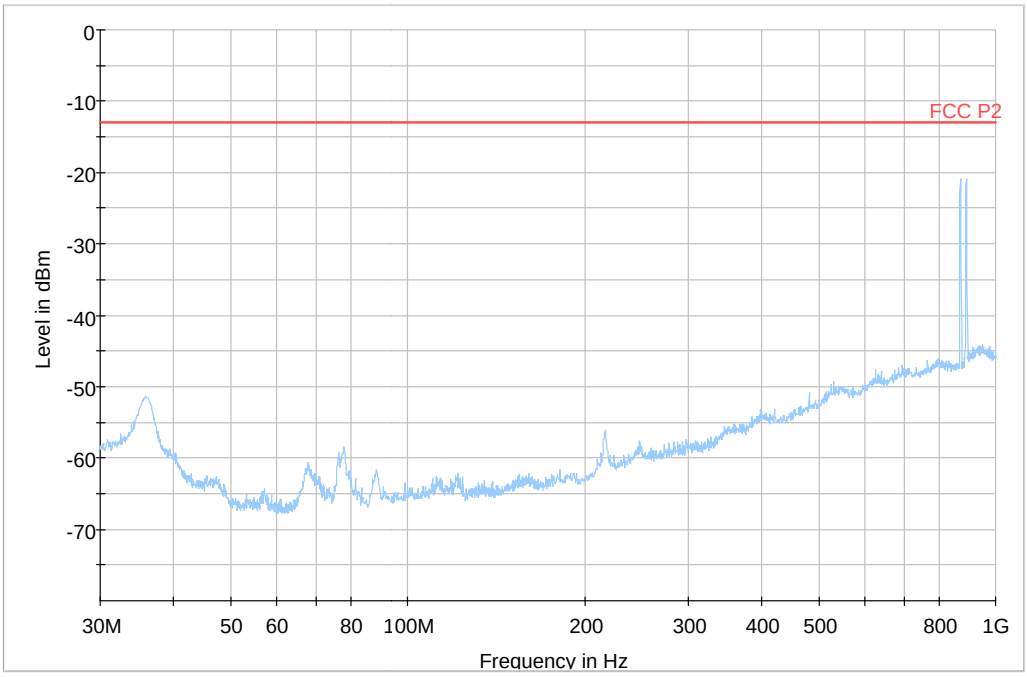
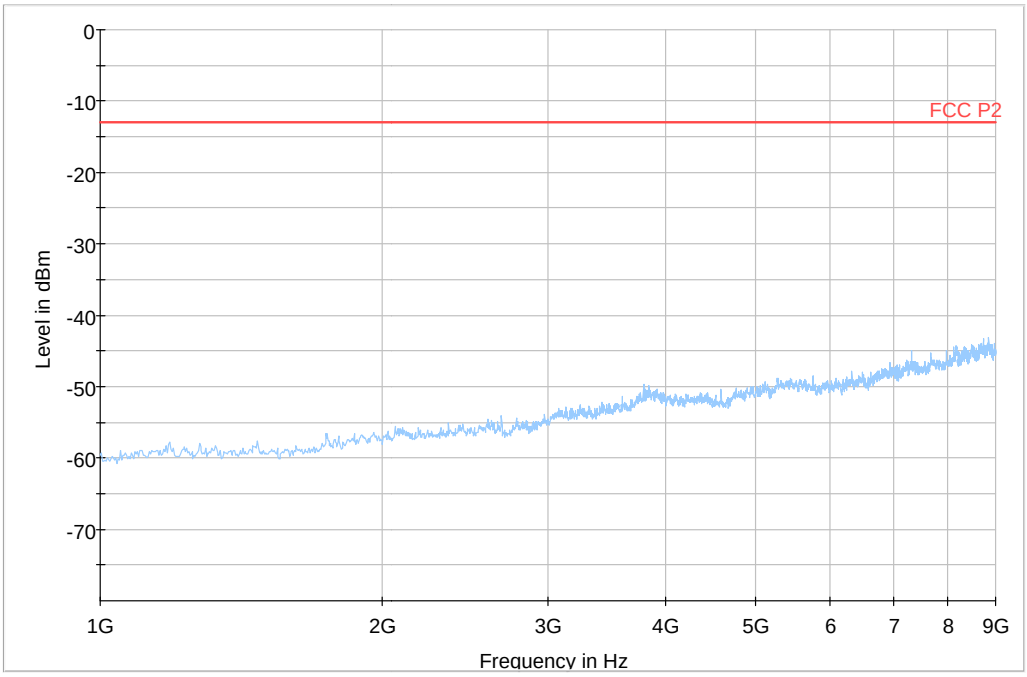


Diagram 4a:



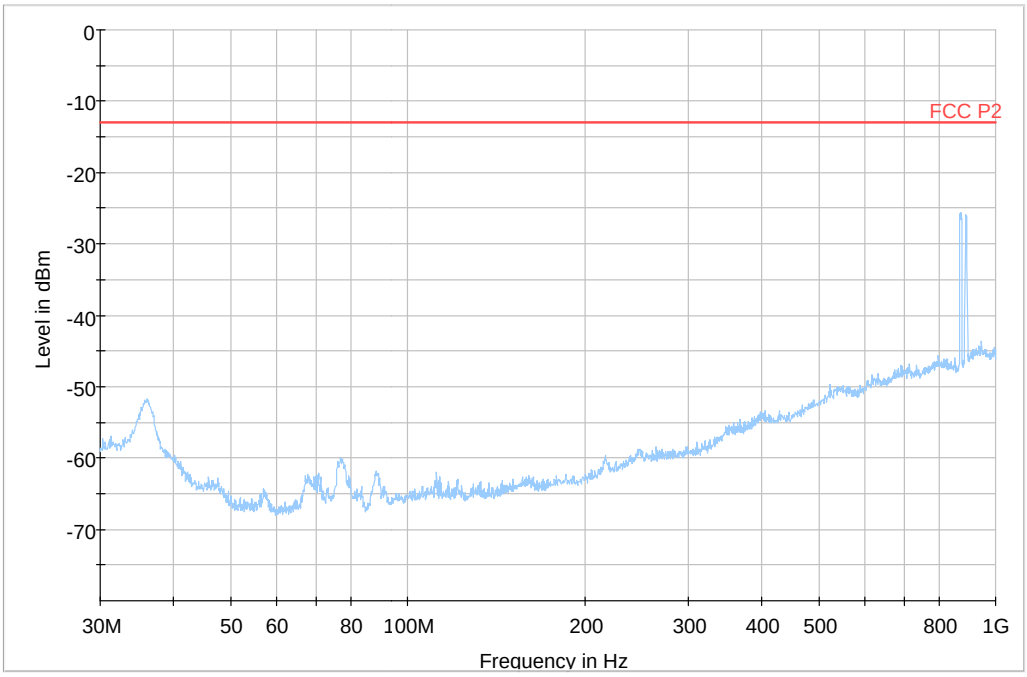
Note: The emission between 869 MHz to 894 MHz is the carrier frequency and shall be ignored in the context.

Diagram 4b:



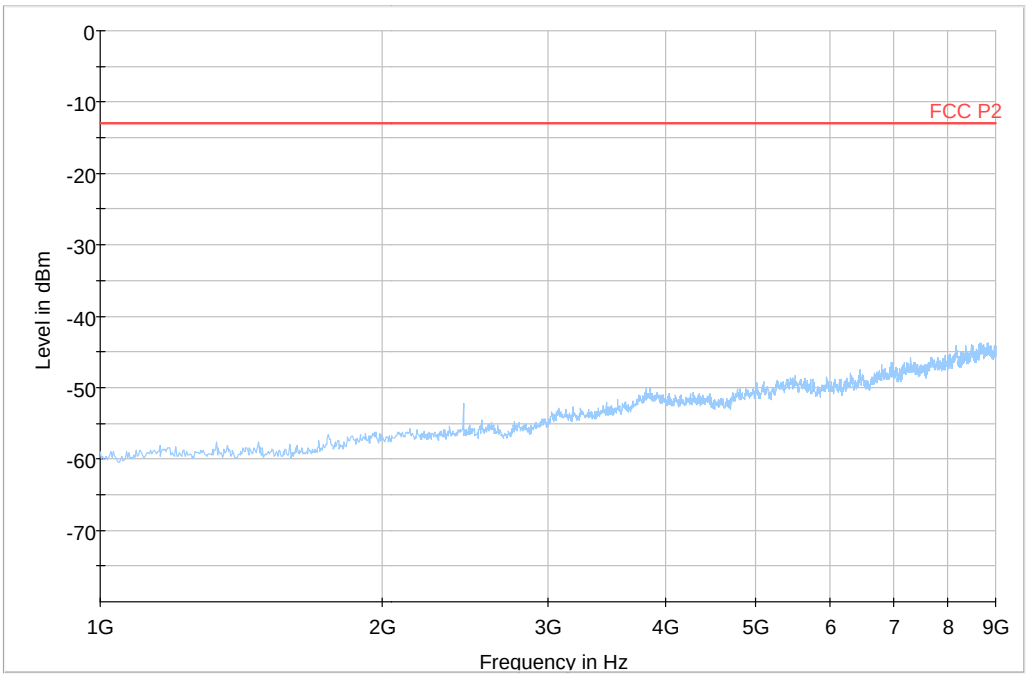
Appendix 2

Diagram 5a:



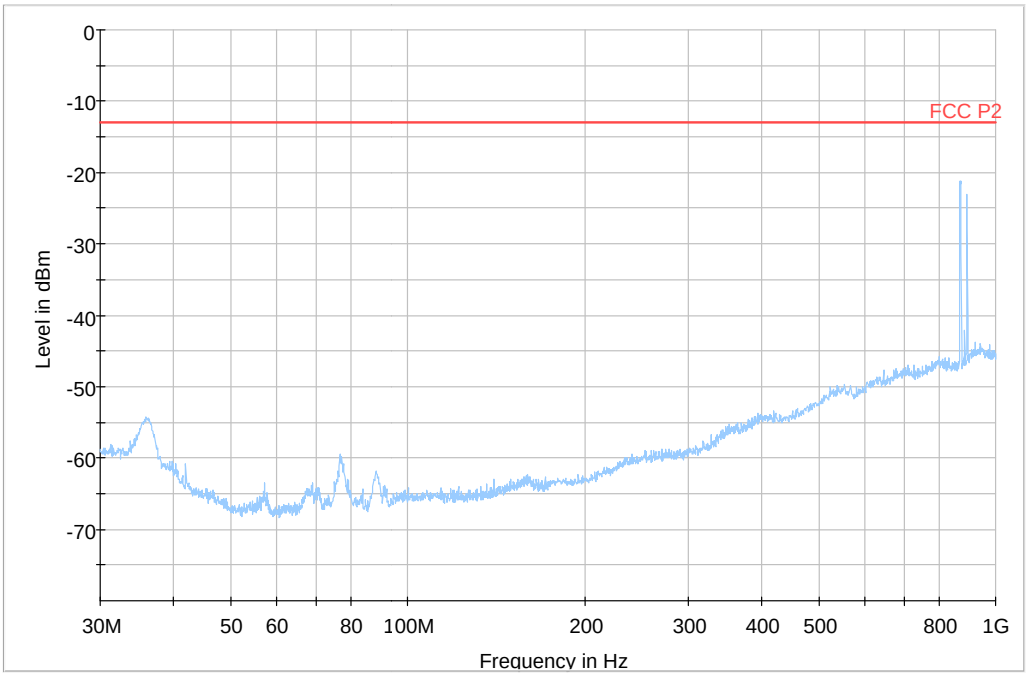
Note: The emission between 869 MHz to 894 MHz is the carrier frequency and shall be ignored in the context.

Diagram 5b:



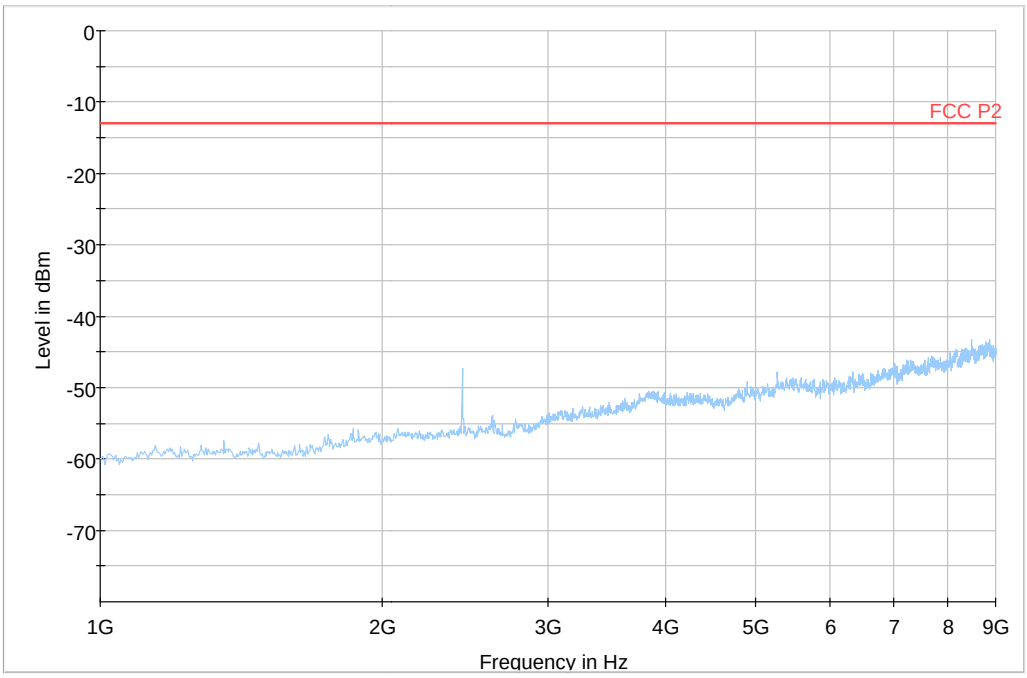
Appendix 2

Diagram 6a:



Note: The emission between 869 MHz to 894 MHz is the carrier frequency and shall be ignored in the context.

Diagram 6b:



Appendix 4

Photos of test object

Front side

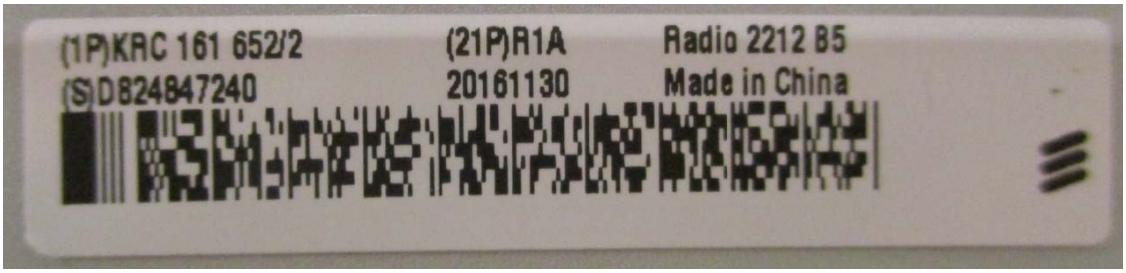
Rear side

Left side

Right side

Appendix 4

Radio label:



SFP module #1:

SFP module #2