FCC Radio Test Report

FCC ID: KR5-BSRFV1RW0

This report concerns: Original Grant

Project No.	:	2106C224
Equipment	:	Intelligent Antenna Module
Brand Name	:	Continental
Test Model	:	BSRF-V1RWHIGH.0
Series Model	:	N/A
Applicant	:	Continental Automotive GmbH
Address	:	Siemensstrasse 12 SV C TS RBG EMC-Laboratory Regensburg Germany 93055
Manufacturer	:	Continental Automotive GmbH
Address	:	Siemensstrasse 12, 93055 Regensburg, Germany
Factory	:	Continental Automotive Systems S.R.L.
Address	:	Strada Salzburg 8, 550018 Sibiu, Romania
Date of Receipt	:	Jul. 19, 2021
Date of Test	:	Jul. 20, 2021 ~ Aug. 16, 2021
Issued Date	:	Jan. 19, 2022
Report Version	:	R01
Test Sample	:	SN: 213310000FS
Standard(s)	:	47 CFR FCC Part 22 Subpart H 47 CFR FCC Part 2 ANSI/TIA/EIA-603-E-2016 FCC KDB 971168 D01 Power Meas License Digital Systems v03r01

The above equipment has been tested and found compliance with the requirement of the relative standards by BTL Inc.

Treey Chen

Prepared by : Treey Chen

Steven Lu

Approved by : Steven Lu

TESTING CERT #5123.02

Add: No. 3 Jinshagang 1st Rd. Shixia, Dalang Town, Dongguan City, Guangdong, People's Republic of China

Tel: +86-769-8318-3000

Web: www.newbtl.com

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

The report must not be used by the client to claim product certification, approval, or endorsement by NIST, A2LA, or any agency of the U.S. Government.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.
Please note that the measurement uncertainty is provided for informational purpose only and is not use in determining the Pass/Fail results.

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Original Issue.	Sep. 30, 2021
R01	Modified the comments of TCB.	Jan. 19, 2022

1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standard(s):

FCC Part 22 Subpart H & Part 2			
Standard(s) Section	**Test Item**	**Judgment**	**Remark**
2.1046 22.913(a)(5)	Effective Radiated Power	PASS	------
22.917(a)	Band Edge Measurements	PASS	------
2.1049	Occupied Bandwidth	PASS	Note (2)(3)
2.1051 22.917(a)	Conducted Spurious Emissions	PASS	Note (2)(3)
2.1053 22.917(a)	Radiated Spurious Emissions	PASS	Note (2)(3)
-	Peak To Average Ratio	PASS	Note (2)(3)
2.1055 22.355	Frequency Stability	PASS	Note (2)(3)

Note:

(1) “N/A” denotes test is not applicable in this test report.
(2) Please refer to module report RF190315C13 with FCC ID: LHJ-BL28RW001, dated 2019-Apr-16.
(3) The test was not performed by the BTL Laboratory.

1.1 TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No. 3 Jinshagang 1st Rd. Shixia, Dalang Town, Dongguan City, Guangdong, People's Republic of China.
BTL's Test Firm Registration Number for FCC: 357015
BTL's Designation Number for FCC: CN1240

1.2 MEASUREMENT UNCERTAINTY

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2))
The BTL measurement uncertainty as below table:

A. Other Measurement:

Parameter	Uncertainty
Maximum Output Power	±0.95 dB
Temperature	±0.08 °C
Time	±0.58 %
Supply voltages	±0.3 %

Note: Unless specifically mentioned, the uncertainty of measurement has not been taken into account to declare the compliance or non-compliance to the specification.

1.3 TEST ENVIRONMENT CONDITIONS

Test Item	Temperature	Humidity	Test Voltage	Tested By
Output Power & ERP	21.4°C	47%	DC 12V	Tate Liu
Band Edge	21.4°C	47%	DC 12V	Tate Liu

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Intelligent Antenna Module				
Brand Name	Continental				
Test Model	BSRF-V1RWHIGH.0				
Series Model	N/A				
Model Difference(s)	N/A				
RF Module Model	BL28RW-001				
Hardware Version	D5				
Software Version	V15_1.15.1.21.10.30				
Power Source	Supplied from battery.				
Power Rating	DC 12V				
IEMI No.	357997640006249				
Modulation Type	EDGE/GPRS		GMSK, 8PSK		
	WCDMA/HSDPA/HSUPA		QPSK		
	LTE		QPSK,16QAM		
Max. ERP	GPRS 850		GMSK	34.57	dBm
	EDGE 850		8PSK	28.94	dBm
	WCDMA Band V		QPSK	25.64	dBm
	HSDPA Band V		QPSK	24.66	dBm
	HSUPA Band V		QPSK	24.59	dBm
	LTE	Channel Bandwidth (MHz)	QPSK (dBm)		16QAM (dBm)
	Band 5	1.4	25.99		24.94
		3	26.30		25.01
		5	26.01		24.72
		10	26.21		24.95

Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user's manual.

2. Channel List:

GSM 850				
Test Frequency ID	UARFCN	Frequency of Uplink (MHz)	UARFCN	Frequency of Downlink (MHz)
Low Range	128	824.2	137	869.2
Mid Range	190	836.6	199	881.6
High Range	251	848.8	260	893.8

WCDMA Band V				
Test Frequency ID	UARFCN	Frequency of Uplink (MHz)	UARFCN	Frequency of Downlink (MHz)
Low Range	4132	826.4	4357	871.4
Mid Range	4182	836.4	4407	881.4
High Range	4233	846.6	4458	891.6

LTE Band 5					
Test Frequency ID	Bandwidth (MHz)	N_{UL}	Frequency of Uplink (MHz)	N_{DL}	Frequency of Downlink (MHz)
Low Range	1.4	20407	824.7	2407	869.7
	3	20415	825.5	2415	870.5
	5	20425	826.5	2425	871.5
	10	20450	829	2450	874
Mid Range	1.4/3/5/10	20525	836.5	2525	881.5
High Range	1.4	20643	848.3	2643	893.3
	3	20635	847.5	2635	892.5
	5	20625	846.5	2625	891.5
	10	20600	844	2600	889

3. Table for Filed Antenna:

Main Antenna

Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
N/A	N/A	PCB	N/A	4.9	GSM 850
N/A	N/A	PCB	N/A	4.9	WCDMA Band V
N/A	N/A	PCB	N/A	4.9	LTE Band 5

Second Antenna

Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Note
N/A	N/A	PCB	N/A	-5.0	GSM 850
N/A	N/A	PCB	N/A	-5.0	WCDMA Band V
N/A	N/A	PCB	N/A	-5.0	LTE Band 5

Note: The antenna gain is provided by the manufacturer.

2.2 DESCRIPTION OF TEST MODES

Following mode(s) is (were) found to be the worst case(s) and selected for the final test.

GSM MODE			
Test Item	Available Channel	Tested Channel	Mode
Output Power & ERP	128 to 251	128, 190, 251	GPRS, EDGE
Band Edge	128 to 251	128, 251	GPRS, EDGE

WCDMA BAND V MODE			
Test Item	Available Channel	Tested Channel	Mode
Output Power & ERP	4132 to 4233	4132, 4182, 4233	WCDMA, HSDPA, HSUPA
Band Edge	4132 to 4233	4132, 4233	WCDMA, HSDPA, HSUPA

LTE BAND 5 MODE					
Test Item	Available Channel	Tested Channel	Channel Bandwidth	Modulation	Mode
Output Power & ERP	20407 to 20643	20407, 20525, 20643	1.4MHz	QPSK, 16QAM	1RB/3RB/6RB
	20415 to 20635	20415, 20525, 20635	3MHz	QPSK, 16QAM	1RB/8RB/15RB
	20425 to 20625	20425, 20525, 20625	5MHz	QPSK, 16QAM	1RB/12RB/25RB
	20450 to 20600	20450, 20525, 20600	10MHz	QPSK, 16QAM	1RB/25RB/50RB
Band Edge	20407 to 20643	20407, 20643	1.4MHz	QPSK	1RB/6RB
	20415 to 20635	20415, 20635	3MHz	QPSK	1RB/15RB
	20425 to 20625	20425, 20625	5MHz	QPSK	1RB/25RB
	20450 to 20600	20450, 20600	10MHz	QPSK	1RB/50RB

Note: For output power test, all antennas had been pre-tested, the main antenna is found to be the worst case. So all test item result of main antenna have been recorded in this report.

3. TEST RESULT

3.1 OUTPUT POWER MEASUREMENT

3.1.1 LIMIT

Mobile / Portable station are limited to 7 watts e.r.p.

3.1.2 TEST PROCEDURE

The testing follows FCC KDB 971168 v03r01 Section 5.

EIRP / ERP:

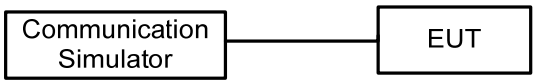
EIRP = Output Power + Antenan gain
ERP = EIPR - 2.15dBi

Output Power:

The EUT was set up for the maximum power with GSM, GPRS, EDGE, WCDMA and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

3.1.3 TEST SETUP LAYOUT

Output Power Measurement



3.1.4 TEST DEVIATION

No deviation

3.1.5 TEST RESULTS

Please refer to the APPENDIX A.

3.2 BAND EDGE MEASUREMENT

3.2.1 LIMIT

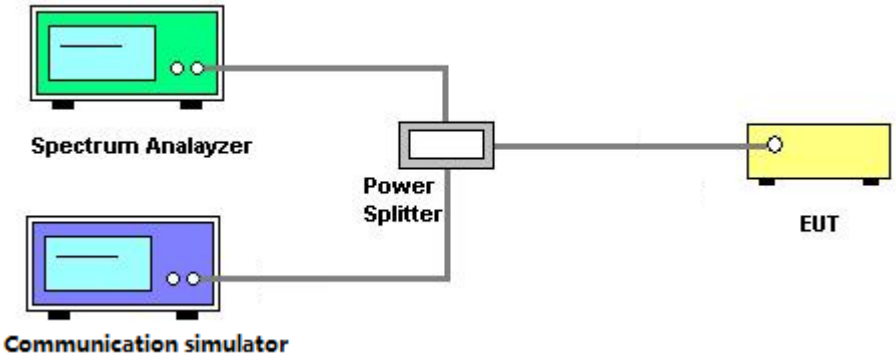
A Power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

3.2.2 TEST PROCEDURES

The testing follows FCC KDB 971168 v03r01 Section 6.

1. All measurements were done at low and high operational frequency range.
2. Record the max trace plot into the test report.

3.2.3 TEST SETUP LAYOUT



3.2.4 TEST DEVIATION

No deviation

3.2.5 TEST RESULTS

Please refer to the APPENDIX B.

4. LIST OF MEASUREMENT EQUIPMENTS

Conducted Measurement					
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Calibrated until
1	Wireless Communication Test SET	Agilent	E5515C	MY48364183	Feb. 28, 2022
2	EXA Spectrum Analyzer	Agilent	N9010A	MY50520044	Feb. 28, 2022
3	POWER SPLITTER	Mini-Circuits	ZFRSC-123-S+	331000910-1	Feb. 27, 2022
4	wideband radio communication tester	R&S	CMW500	152372	Feb. 27, 2022

Remark: “N/A” denotes no model name, serial no. or calibration specified.
All calibration period of equipment list is one year.

APPENDIX A - OUTPUT POWER

Output Power (dBm):

GSM850		128CH	190CH	251CH
		824.2MHz	836.6MHz	848.8MHz
GPRS/EDGE (GMSK)	1 Tx Slot	31.65	31.76	31.82
	2 Tx Slot	31.56	31.74	31.76
	3 Tx Slot	31.54	31.64	31.70
	4 Tx Slot	31.45	31.65	31.65
EDGE (8PSK)	1 Tx Slot	26.19	26.05	26.04
	2 Tx Slot	26.1	25.97	25.95
	3 Tx Slot	26	25.86	25.80
	4 Tx Slot	25.93	25.78	25.74

Modulation	Band	WCDMA Band V		
	Tx Channel	4132CH	4182CH	4233CH
	Frequency	826.4MHz	836.4MHz	846.6MHz
QPSK	RMC 12.2K	22.89	22.82	22.77
	RMC 64K	22.88	22.82	22.78
	RMC 144K	22.89	22.82	22.77
	RMC 384K	22.85	22.81	22.74
	HSDPA Subtest-1	21.8	21.85	21.88
	HSDPA Subtest-2	21.87	21.91	21.84
	HSDPA Subtest-3	21.37	21.41	21.44
	HSDPA Subtest-4	21.43	21.4	21.43
	HSUPA Subtest-1	21.39	21.74	21.39
	HSUPA Subtest-2	20.86	20.35	20.87
	HSUPA Subtest-3	20.45	20.03	20.47
	HSUPA Subtest-4	21.07	21.43	21.06
	HSUPA Subtest-5	21.76	21.84	21.75

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20407CH	20525CH	20643CH
				824.7MHz	836.5MHz	848.3MHz
5 / 1.4M	QPSK	1	0	22.94	23.15	23.02
		1	2	23.11	23.24	23.10
		1	5	23.02	23.15	22.99
		3	0	23.11	23.03	22.91
		3	1	23.16	23.07	23.00
		3	2	23.09	23.00	22.94
		6	0	22.12	22.10	21.96
	16QAM	1	0	21.99	21.96	21.80
		1	2	22.19	22.04	21.90
		1	5	22.14	21.98	21.76
		3	0	22.13	22.00	21.99
		3	1	22.16	22.05	21.99
		3	2	22.11	22.07	21.99
		6	0	21.05	20.94	20.84

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20415CH	20525CH	20635CH
				825.5MHz	836.5MHz	847.5MHz
5 / 3M	QPSK	1	0	23.14	23.11	23.15
		1	7	23.55	23.24	23.40
		1	14	23.25	23.07	23.11
		8	0	22.20	22.18	22.02
		8	4	22.26	22.18	21.99
		8	7	22.26	22.05	21.98
		15	0	22.23	22.17	21.94
	16QAM	1	0	21.99	21.96	22.05
		1	7	22.26	22.18	22.14
		1	14	22.04	21.97	21.93
		8	0	21.05	21.05	20.92
		8	4	21.10	21.05	20.85
		8	7	21.12	20.92	20.88
		15	0	21.13	21.08	20.93

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20425CH	20525CH	20625CH
				826.5MHz	836.5MHz	846.5MHz
5 / 5M	QPSK	1	0	22.82	22.84	22.94
		1	13	23.26	22.96	23.11
		1	24	23.08	23.00	23.04
		12	0	22.25	22.17	22.00
		12	6	22.20	22.15	21.99
		12	11	22.16	22.07	21.89
		25	0	22.15	22.17	21.93
	16QAM	1	0	21.87	21.82	21.97
		1	13	21.77	21.83	21.97
		1	24	21.85	21.73	21.91
		12	0	21.20	21.12	20.86
		12	6	21.21	21.17	20.81
		12	11	21.20	21.10	20.90
		25	0	21.10	21.14	20.87

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20450CH	20525CH	20600CH
				829.0MHz	836.5MHz	844.0MHz
5 / 10M	QPSK	1	0	23.27	23.12	23.19
		1	25	23.46	23.06	23.23
		1	49	23.24	22.92	23.13
		25	0	22.22	22.23	22.02
		25	13	22.27	22.20	22.05
		25	25	22.21	22.15	22.03
		50	0	22.22	22.15	22.02
	16QAM	1	0	22.10	21.97	22.01
		1	25	22.20	21.99	21.97
		1	49	22.10	21.86	21.86
		25	0	21.16	21.14	20.97
		25	13	21.16	21.13	20.95
		25	25	21.16	21.11	20.91
		50	0	21.19	21.11	20.95

ERP (dBm):

GSM850		128CH	190CH	251CH
		824.2MHz	836.6MHz	848.8MHz
GPRS/EDGE (GMSK)	1 Tx Slot	34.40	34.51	34.57
	2 Tx Slot	34.31	34.49	34.51
	3 Tx Slot	34.29	34.39	34.45
	4 Tx Slot	34.20	34.40	34.40
EDGE (8PSK)	1 Tx Slot	28.94	28.80	28.79
	2 Tx Slot	28.85	28.72	28.70
	3 Tx Slot	28.75	28.61	28.55
	4 Tx Slot	28.68	28.53	28.49

Modulation	Band	WCDMA Band V		
	Tx Channel	4132CH	4182CH	4233CH
	Frequency	826.4MHz	836.4MHz	846.6MHz
QPSK	RMC 12.2K	25.64	25.57	25.52
	RMC 64K	25.63	25.57	25.53
	RMC 144K	25.64	25.57	25.52
	RMC 384K	25.60	25.56	25.49
	HSDPA Subtest-1	24.55	24.60	24.63
	HSDPA Subtest-2	24.62	24.66	24.59
	HSDPA Subtest-3	24.12	24.16	24.19
	HSDPA Subtest-4	24.18	24.15	24.18
	HSUPA Subtest-1	24.14	24.49	24.14
	HSUPA Subtest-2	23.61	23.10	23.62
	HSUPA Subtest-3	23.20	22.78	23.22
	HSUPA Subtest-4	23.82	24.18	23.81
	HSUPA Subtest-5	24.51	24.59	24.50

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20407CH	20525CH	20643CH
				824.7MHz	836.5MHz	848.3MHz
5 / 1.4M	QPSK	1	0	25.69	25.90	25.77
		1	2	25.86	25.99	25.85
		1	5	25.77	25.90	25.74
		3	0	25.86	25.78	25.66
		3	1	25.91	25.82	25.75
		3	2	25.84	25.75	25.69
		6	0	24.87	24.85	24.71
	16QAM	1	0	24.74	24.71	24.55
		1	2	24.94	24.79	24.65
		1	5	24.89	24.73	24.51
		3	0	24.88	24.75	24.74
		3	1	24.91	24.80	24.74
		3	2	24.86	24.82	24.74
		6	0	23.80	23.69	23.59

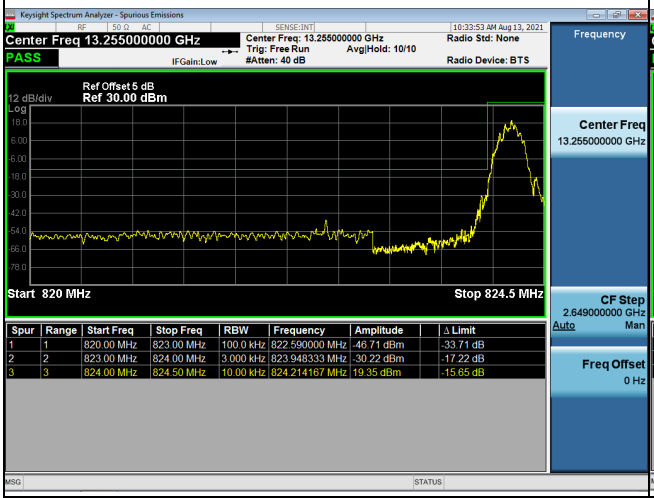
LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20415CH	20525CH	20635CH
				825.5MHz	836.5MHz	847.5MHz
5 / 3M	QPSK	1	0	25.89	25.86	25.90
		1	7	26.30	25.99	26.15
		1	14	26.00	25.82	25.86
		8	0	24.95	24.93	24.77
		8	4	25.01	24.93	24.74
		8	7	25.01	24.80	24.73
		15	0	24.98	24.92	24.69
	16QAM	1	0	24.74	24.71	24.80
		1	7	25.01	24.93	24.89
		1	14	24.79	24.72	24.68
		8	0	23.80	23.80	23.67
		8	4	23.85	23.80	23.60
		8	7	23.87	23.67	23.63
		15	0	23.88	23.83	23.68

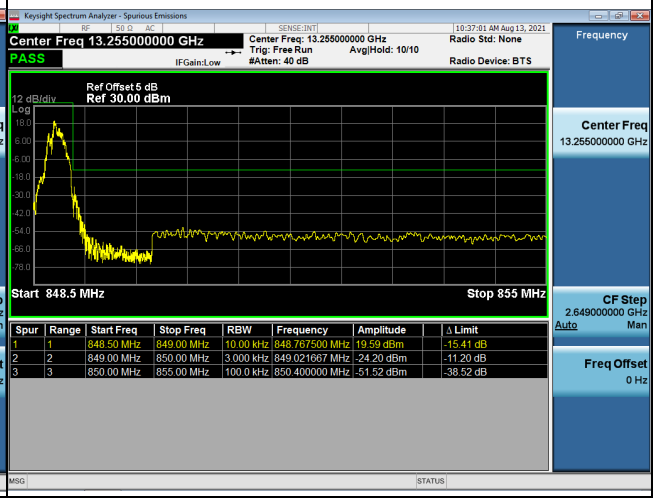
LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20425CH	20525CH	20625CH
				826.5MHz	836.5MHz	846.5MHz
5 / 5M	QPSK	1	0	25.57	25.59	25.69
		1	13	26.01	25.71	25.86
		1	24	25.83	25.75	25.79
		12	0	25.00	24.92	24.75
		12	6	24.95	24.90	24.74
		12	11	24.91	24.82	24.64
		25	0	24.90	24.92	24.68
	16QAM	1	0	24.62	24.57	24.72
		1	13	24.52	24.58	24.72
		1	24	24.60	24.48	24.66
		12	0	23.95	23.87	23.61
		12	6	23.96	23.92	23.56
		12	11	23.95	23.85	23.65
		25	0	23.85	23.89	23.62

LTE Band / BW	Modulation	RB Size	RB Offset	Low CH	Mid CH	High CH
				20450CH	20525CH	20600CH
				829.0MHz	836.5MHz	844.0MHz
5 / 10M	QPSK	1	0	26.02	25.87	25.94
		1	25	26.21	25.81	25.98
		1	49	25.99	25.67	25.88
		25	0	24.97	24.98	24.77
		25	13	25.02	24.95	24.80
		25	25	24.96	24.90	24.78
		50	0	24.97	24.90	24.77
	16QAM	1	0	24.85	24.72	24.76
		1	25	24.95	24.74	24.72
		1	49	24.85	24.61	24.61
		25	0	23.91	23.89	23.72
		25	13	23.91	23.88	23.70
		25	25	23.91	23.86	23.66
		50	0	23.94	23.86	23.70

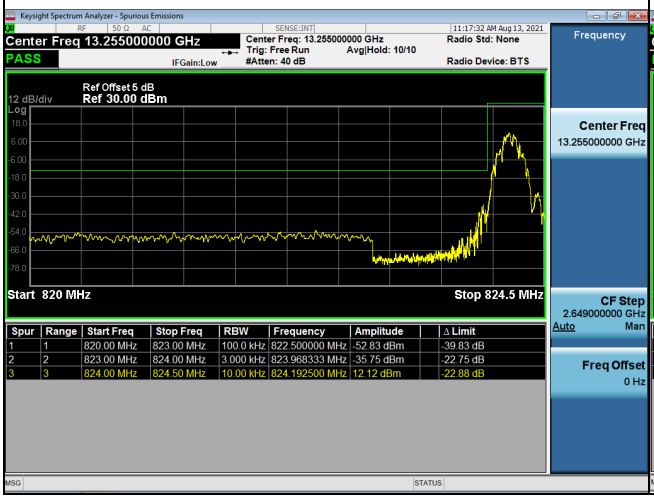
APPENDIX B - BAND EDGE

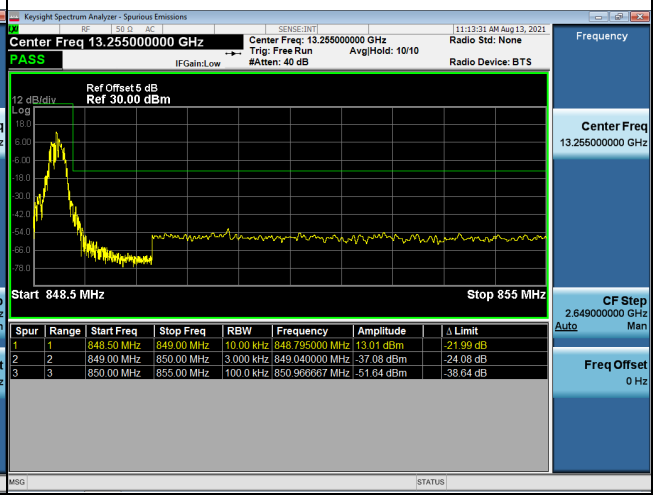
GSM850_GPRS Spectrum Plot			
Channel	128	Channel	251



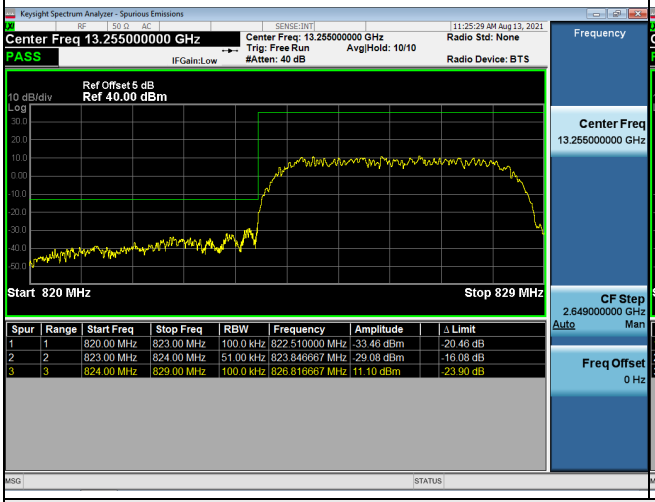


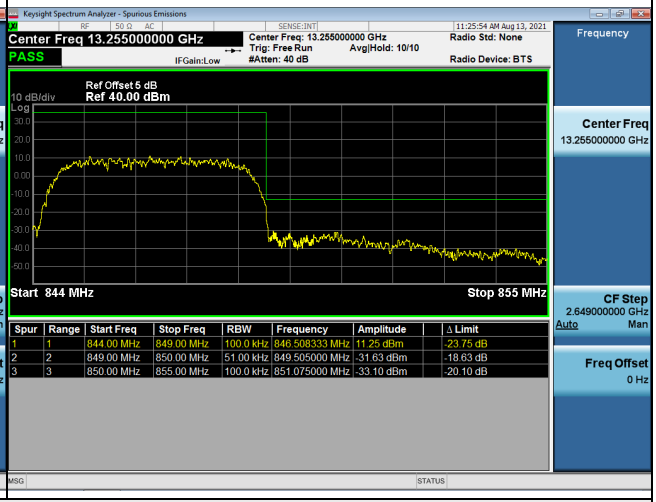
GSM850_EDGE Spectrum Plot			
Channel	128	Channel	251



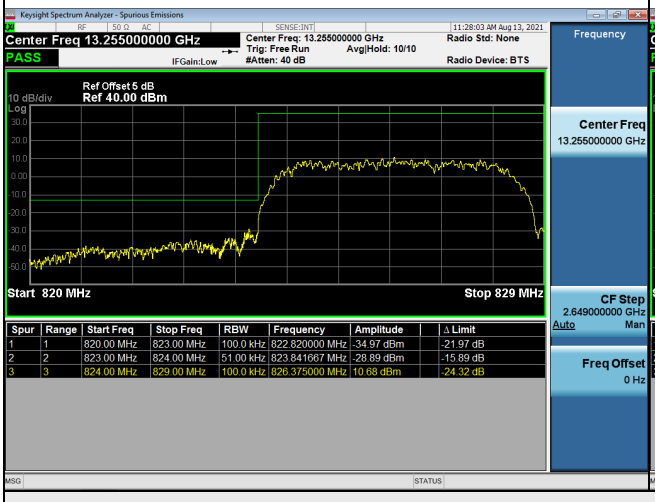


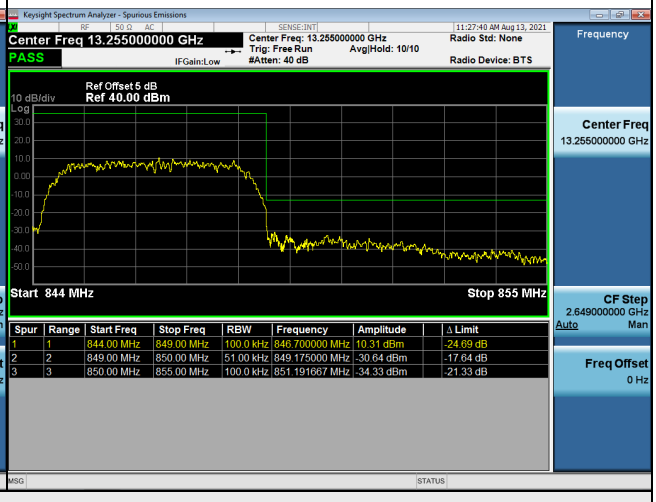
WCDMA Band V_WCDMA Spectrum Plot			
Channel	4132	Channel	4233



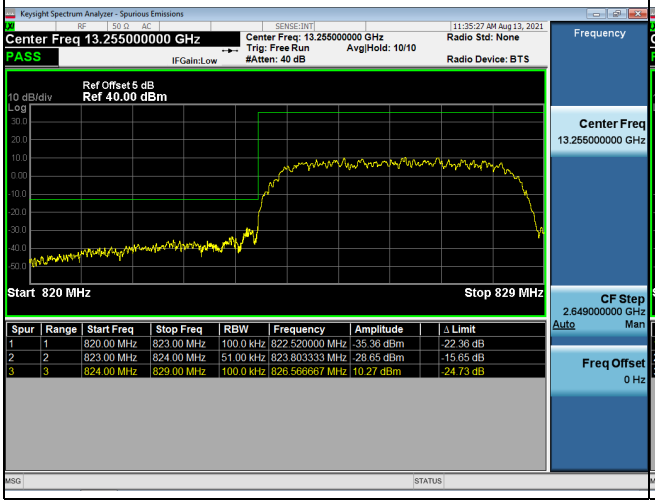


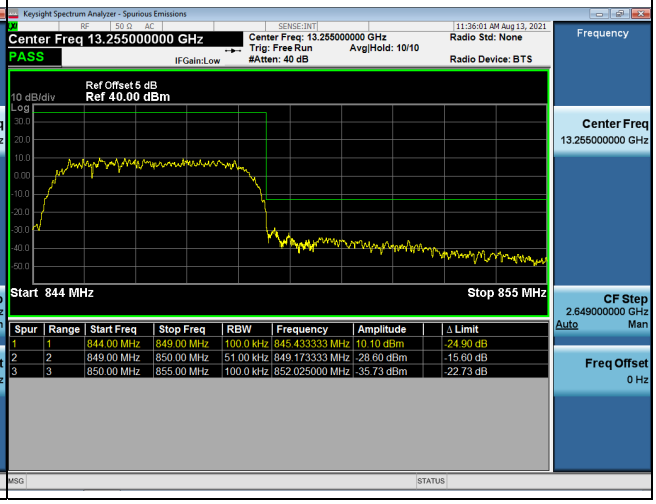
WCDMA Band V_HSDPA Spectrum Plot			
Channel	4132	Channel	4233



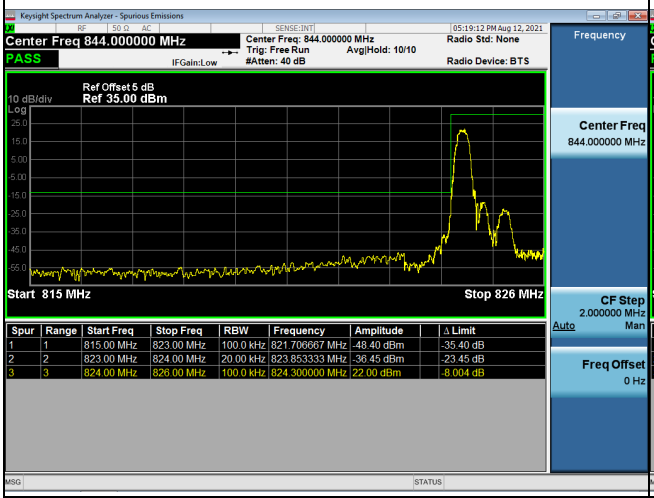


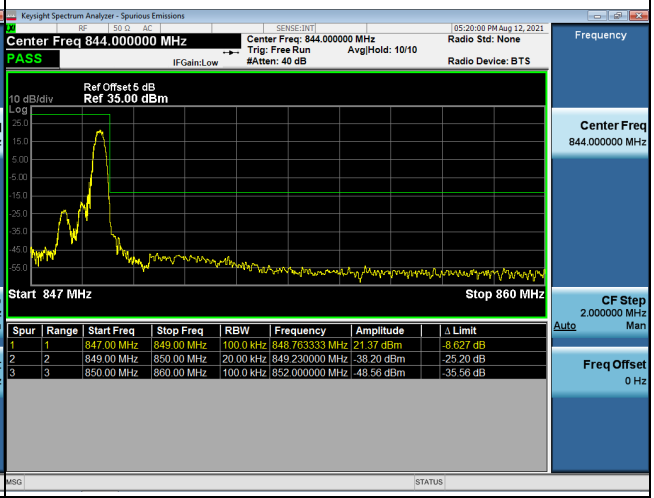
WCDMA Band V_HSUPA Spectrum Plot			
Channel	4132	Channel	4233



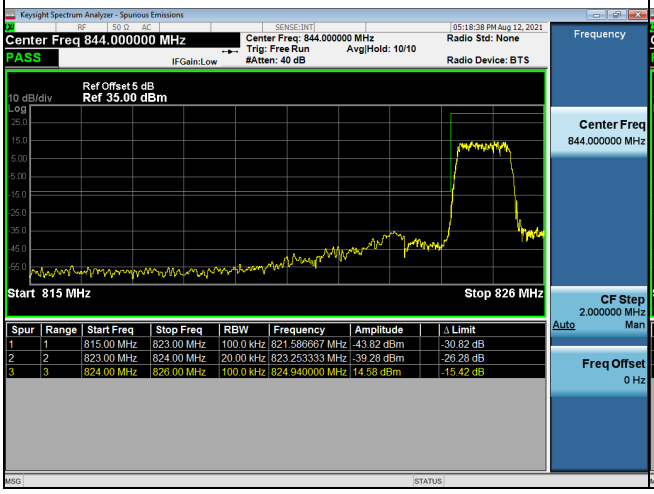


LTE Band 5_1.4M Spectrum Plot			
1RB#0		1RB#5	
Channel	20407	Channel	20643

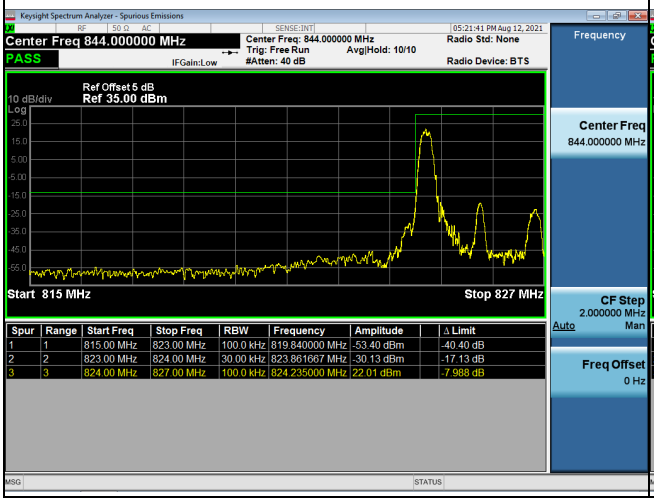


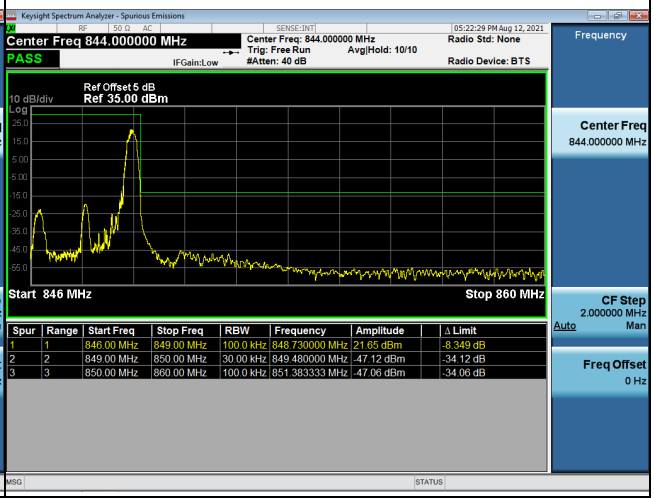


6RB#0			
Channel	20407	Channel	20643

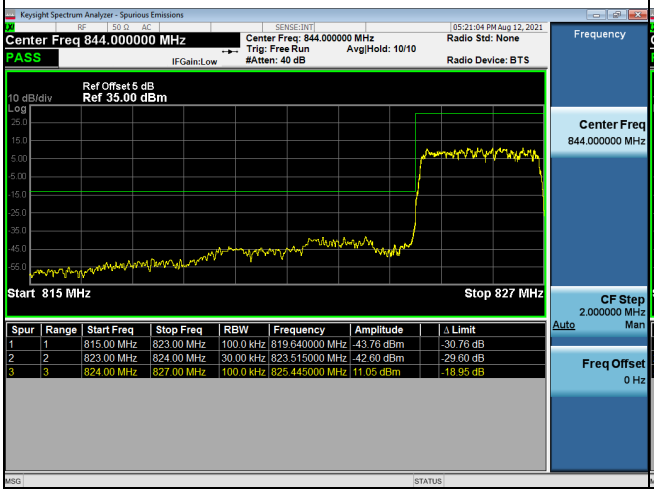


LTE Band 5_3M Spectrum Plot			
1RB#0		1RB#14	
Channel	20415	Channel	20635

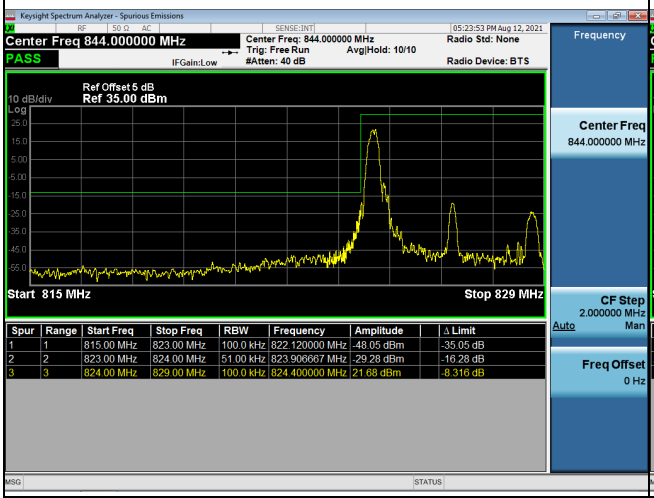


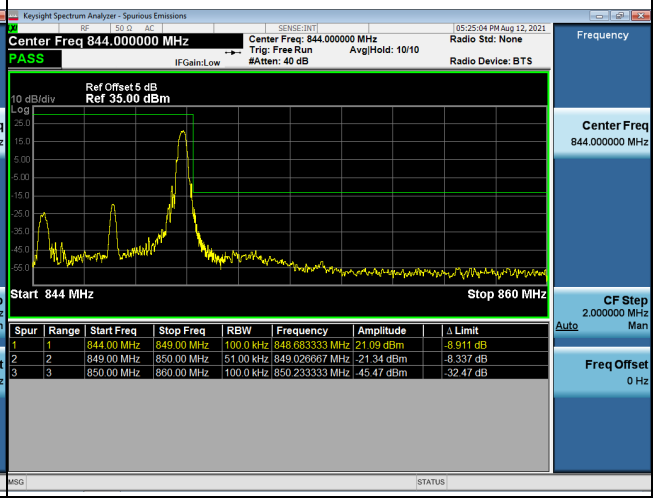


15RB#0			
Channel	20415	Channel	20635

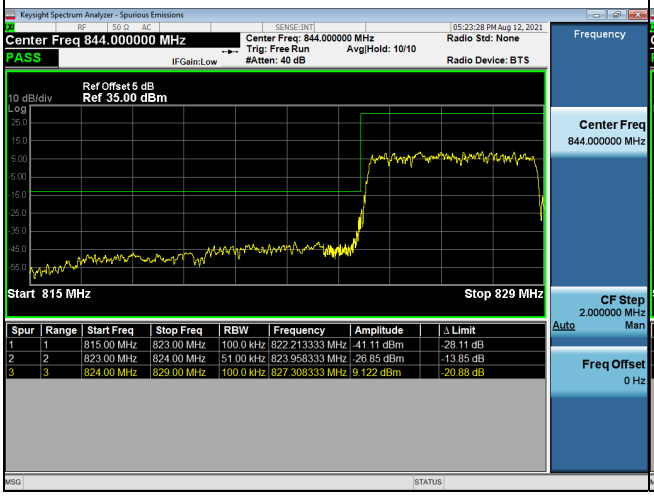


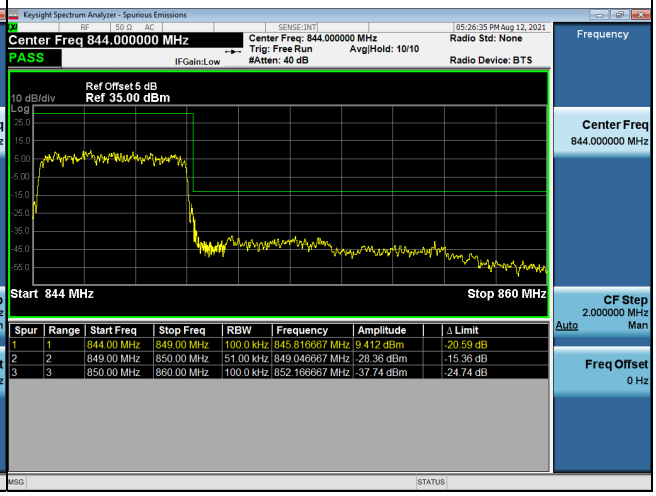
LTE Band 5_5M Spectrum Plot			
1RB#0		1RB#24	
Channel	20425	Channel	20625



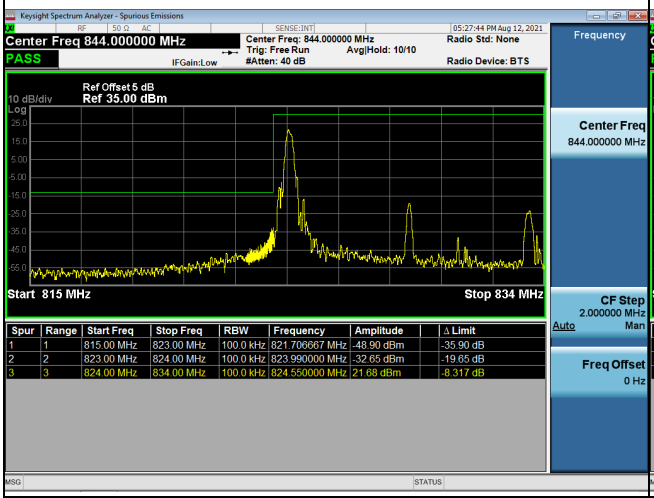


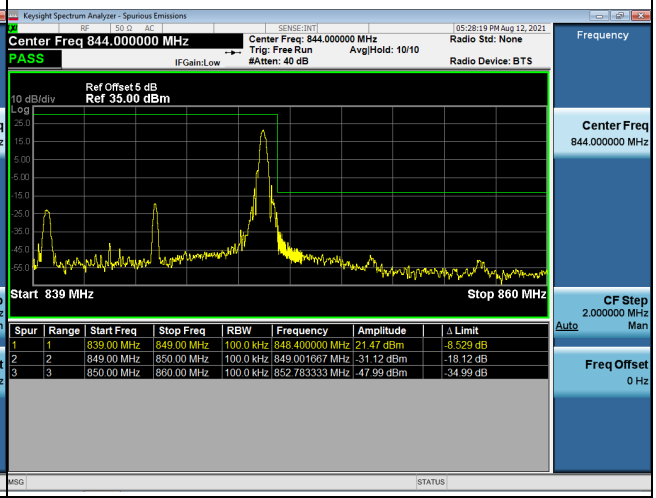
25RB#0			
Channel	20425	Channel	20625



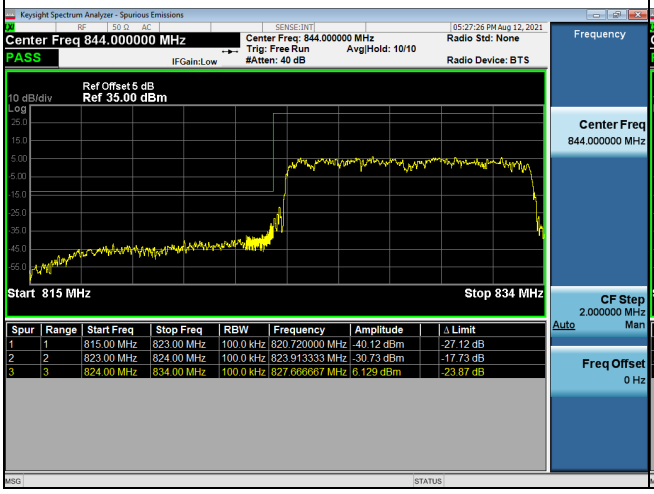


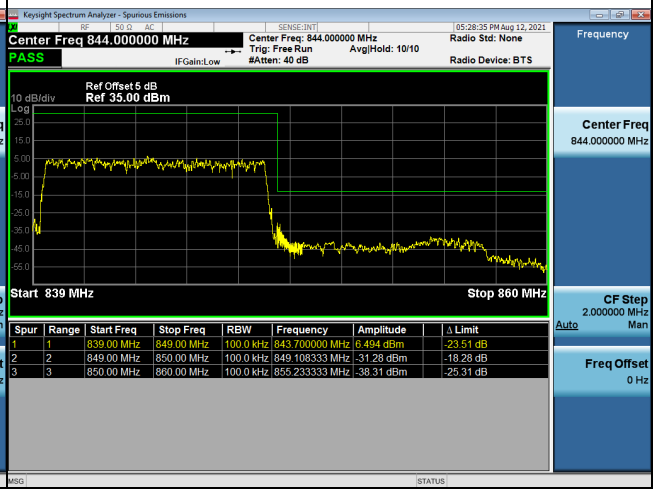
LTE Band 5_10M Spectrum Plot			
1RB#0		1RB#49	
Channel	20450	Channel	20600





50RB#0			
Channel	20450	Channel	20600





End of Test Report