Prüfbericht - Nr.: *Test Report No.:*	**ULR-TC568819300000027F**	**Seite 1 von 38** *Page 1 of 38*

Auftraggeber: *Client:*	**ABB AB, Machines** **Elmotorgatan 2,** **Vasteras** **Sweden - 72136**
Gegenstand der Prüfung: *Test item:*	**MACHsense-R**
Bezeichnung: *Identification:*	**MSR1600** **Serien-Nr.:** *Serial No.* **B1807032**
Wareneingangs-Nr.: *Receipt No.:*	**166120185** **Eingangsdatum:** *Date of receipt:* **05.04.2019**
Prüfort: *Testing location:*	**Refer Page 3 of 38 for test facilities**
Prüfgrundlage: *Test specification:*	**FCC Part 2, Part 22H, Part 24E & Part 27** **RSS 132 Issue 3, RSS 133 Issue 6, RSS-139 Issue 2** **RSS-Gen Issue 3 & ANSI C63.26-2015**
Prüfergebnis: *Test Result:*	**Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n).** *The test items passed the test specification(s).*
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland (India) Pvt. Ltd.** 27/B, 2nd Cross Road, Electronic City Phase1, Bangalore – 560 100, India FCC Test Firm Registration No.: 496599 & ISED Test Site number.: 3466E-1

geprüft / *tested by:*

Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*
12.04.2019	Srinivasa B R Engineer	Srinivas

kontrolliert / *reviewed by:*

Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*
23.04.2020	Mahammadgouse Kaladagi Assistant Manager	

Sonstiges /*Other Aspects:* **FCC ID:2AUVY-DSG1C4V1**
IC:25660-DSG1C4V1

Abkürzungen:				***Abbreviations:***			
P(ass)	=	***entspricht Prüfgrundlage***		***P(ass)***	=	***passed***
F(ail)	=	***entspricht nicht Prüfgrundlage***		***F(ail)***	=	***failed***
N/A	=	***nicht anwendbar***		***N/A***	=	***not applicable***
N/T	=	***nicht getestet***		***N/T***	=	***not tested***

Test Summary

Test Item	FCC Clause			ISED Clause			Results
	FCC Part 22H	FCC Part 24 E	FCC Part 27	RSS 132 Issue 3	RSS 133 Issue 6	RSS 139 Issue 2	
RF power conducted	§2.1046 & §22.913(d)	§2.1046 & §24.232(d)	§2.1046 §27.50	Section 5.4	Section 6.4	Section 6.5	Pass
RF power (ERP/EIRP) – radiated mode	§22.913 (a) (5)	§24.232(c)	§27.50 (d)(4)	Section 5.4	Section 6.4 & SRSP-510 Issue 5 Section	Section 6.5	Pass
Field strength of spurious radiation	§22.917 (a)	§24.238(a)(b)	§27.53 (h)	Section 5.5	Section 6.5	Section 6.6	Pass

Note:

1. MACHsense-R has integrated with following certfied RF modules.this is a partial scope test report based on full scope testing as reported in test report numbers mentioned below.

2. Conducted RF output power verification is performed and maximum output power is within the module test results authorized under below listed FCCID, hence validity of the test results reported are verified and only Radiated spurious emission and band edge test are performed to confirm that the product MACHsense-R meets RF exposure condition when all modules are integrated and Co-located with multiple transmitters. Simultaneous operation is not supported by MACHsense-R, hence not addressed in this test report.

3. Manufacture has provided declaration in the user manual of the product (MACHsense-R) that the modules are integrated in the host product as per the module intergration rule.

Sl No.	Radio Protocol	FCC ID	IC ID	Report number	Report Issued by
1	GSM (GPRS & EGPRS)	RI7HE910	5131A-HE910	1112FR12-02	A Test lab Techno Corp
2	WCDMA Band 2 & Band 5	RI7HE910	5131A-HE910	1112FR12-02	A Test lab Techno Corp
3	WCDMA Band 4	RI7HE910	5131A-HE910	1201FR11-02	A Test lab Techno Corp
4	Wi-Fi 2.4GHz	QOQWF111	5123A-BGTWF111	266892-1	SGS Fimko Ltd

Product Category: Electronics Testing
Test Discipline: EMC Test Facility

Table of Contents

1 GENERAL REMARKS 4
1.1 Complimentary Materials 4
2 TEST SITES 5
2.1 Testing Facilities 5
2.2 List of Test and Measurement Instruments 6
3 GENERAL PRODUCT INFORMATION 7
3.1 Product Function and Intended Use 7
3.2 Ratings and System Details declared by client* 7
3.3 Measurement Uncertainty: 8
4 TEST SET-UP AND OPERATION MODE 9
4.1 Principle of Configuration Selection 9
4.2 Test Operation and Test Software 9
4.3 Test Modes – Data Rates and Modulations 9
4.4 Countermeasures to achieve EMC Compliance 9
4.5 List of frequencies 9
5 TEST METHODOLOGY 10
Radiated Emission Test 10
6 TEST RESULTS 12
6.1 Conducted Output Power 12
6.2 RF Power (ERP/EIRP) – Radiated Mode 14
6.3 Field Strength of Spurious Radiation 17
1 LIST OF TABLES 38

1 GENERAL REMARKS

1.1 Complimentary Materials

All attachments are integral part of this test report. This applies especially to the following items.

1. TEST SETUP PHOTOS

2: EUT EXTERNAL PHOTOS

3: EUT INTERNAL PHOTOS

4: FCC LABEL AND LABEL LOCATION

5: BLOCK DIAGRAM

6: SPECIFICATION OF EUT

7: SCHEMATIC DIAGRAM

8: BILL OF MATERIAL

9: USER MANUAL

10: MAXIMUM PERMISSIBLE EXPOSURE INFORMATION

2 TEST SITES

2.1 Testing Facilities

TÜV Rheinland (India) Private Limited.
27/B, 2nd Cross,
Electronic City Phase1
Bangalore – 560 100,
India

TUV Rheinland (India) Private Limited.
108 , Beside ISBR Business School,
Electronic City Phase1
Bangalore - 560 100.
India

2.2 List of Test and Measurement Instruments

Table 1: List of test and measurement instruments

Equipment	Manufacturer	Model Name	Serial Number	Firmware Versions	Calibration Due Date	Periodicity	Used for Test Items
Spectrum Analyser	Agilent Technologies	E4407B	US41192772	A.14.06	15.11.2019	Yearly	Antenna - Port Conducted Tests
USB Peak power sensor	AIMIL Ltd	55006	10231	-	22.12.2019	Yearly	
Wideband Radio Communication Tester	Rohde & Schwarz	CMW500	158345	-	17.01.2020	Yearly	
EMI Test Receiver	Rohde & Schwarz	ESU 40	100288	4.43 SP3	11.10.2019	Yearly	Spurious Radiated Emissions
RF and microwave Signal Generator	Rohde & Schwarz	SMB100A	108788		30.12.2020	Yearly	
Active loop antenna	Frankonia	LAX-10	LAX-10-800	-	15.01.2020	Yearly	
Biconical Antenna	Schwarzbeck mess - elektronik	VHBB-9124 / BBA-9106	9124-656	-	16.01.2020	Yearly	
Biconical Antenna	Schwarzbeck	VHBB-9124 / BBA-9106	01028		19.06.2020	Yearly	
Log - Periodic Antenna	Schwarzbeck mess - elektronik	VUSLP-9111B	9111B-111	-	17.01.2020	Yearly	
Log Periodic Antenna	Schwarzbeck mess-elektronik	VUSLP-9111B	9111B-324		21.06.2020	Yearly	
Broadband Horn Antenna	Frankonia	HAX-18	HAX18-802	-	17.05.2019	Yearly	
Horn Antenna	Frankonia	HAX-18	BBHA 9120F 3000		17.06.2020	Yearly	
Emission Horn Antenna	ETS Lindgren	116706	00107323	-	02.11.2019	Yearly	
10m Semi Anechoic Chamber	Frankonia	-	-	-	-	-	

Table 2: Instrument application Software versions

SL. No.	Test Type	Application software	Version
1	Radiated spurious emission measurement	EMC 32	10.50.00

3 GENERAL PRODUCT INFORMATION

3.1 Product Function and Intended Use

MACHsense-R is a data acquisition unit (DAU) has 16 high speed analog channels, 16 low speed analog channels, 4 GPI channels, 4 GPO channels, 1 RS485 port and 1 Ethernet port. EUT is powered by either 230V AC in AC power mode or +48V DC in POE mode. It also supports 2G/3G and Wi-Fi. EUT is intended to use for condition monitoring of industrial motors

Operational description:

16 High speed channels of EUT can sense +/-10V AC/DC or IEPE Accelerometer signals

16 Low speed channels can read RTD sensor

4 GPI channels can sense High or Low level of input signal

4 GPO channels can drive four HIGH/LOW outputs

The EUT supports communication facilities such as RS485, Ethernet, Wi-Fi & 2G/3G

3.2 Ratings and System Details declared by client*

Table 3: Ratings and System Details

Radio Protocol	**GSM**	**WCDMA**	**Wi-Fi 2.4GHz**
Operating Frequency band	GSM- 850 MHz & 1900 MHz	WCDMA Band2,Band 4 & Band 5	2412MHz – 2462MHz
Channel spacing	200 kHz	5 MHz	5MHz
Maximum transmitted power (Measured conducted power)	GSM 850: 30.47 dBm GSM 1900: 26.07 dBm	WCDMA Band2: 22.27 dBm WCDMA Band 4: 18.79 dBm WCDMA Band 5: 23.65 dBm	18.54 dBm
Modulation	GSM- GMSK/8PSK	WCDMA-QPSK	802.11b: CCK and DSSS 802.11g: OFDM 802.11n: OFDM
Data rates	-	-	1 to 72.2 Mbps
Number of antennas	One		One
Maximum Antenna gain	GSM 850: 1 dBi		3 dBi
	GSM 1900: 2.8 dBi		
	WCDMA band 2: 2.8 dBi		
	WCDMA band4: 2 dBi		
	WCDMA band5: 1 dBi		
Antenna type	Penta-band cellular Hinged SMA male monopole		Screw mount dipole antenna
Supply Voltage to Product	1. Universal AC mains mode : 110 VAC/ 60Hz		
	2. Power over Ethernet(POE): +48 VDC in POE mode		
Environmental conditions	-20 to +70 ºC		
Dimensions (LxWxH)	313mm X 240mm X 159mm		

Table 4: Power level setting/power class used for testing

Radio protocol	Operating band	Power class (PCL)	Power (dBm)
GSM	850	4	33
	1900	1	30
WCDMA	Band 2	3	24
	Band 4		
	Band 5		

Note: The product does not support simultaneous transmission. Conducted output power measured with respect to each protocol with single transmission chain

*__Disclaimer__: The information/data is supplied by the client and the same is considered to arrive at the final value. Any changes made apart from the specified specification, can directly impact on the tests results.

Table 5: Report No. References

SL. No.	RF Protocol / Frequency Bands	Report No.
1	GSM / WCDMA	ULR-TC568819300000027F
2	WLAN 2.4GHz	ULR-TC568819300000028F

Note: This product contains multiple radio operation, test report reference is provided in the above table

3.3 Measurement Uncertainty:

Table 6: Measurement Uncertainty

Parameter	Uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±1.5 dB
Power Spectral Density, conducted	±3 dB
Unwanted Emissions, conducted	±3 dB
SAC, radiated measurement	±6 dB
FAC, radiated measurement	±6 dB
Temperature	±3 ℃
Supply Voltages	±3 %
Time	±5 %

Note: The listsed uncertainities are the worst case uncertainity for the entire range of mesurements and are for the reporting purpose only and are not used in determining the PASS/FAIL of the results.

4 TEST SET-UP AND OPERATION MODE

4.1 Principle of Configuration Selection

- Transmission was enabled with the help of CMW 500 on low, middle & high channels of GSM & WCDMA
- Product works in both PoE & AC Mains power supplies, and the product is tested with both power supply modes.
- Only worst case results are reported in this test report. .

4.2 Test Operation and Test Software

- No special test software used for enabling the transmission/reception
  For testing of GSM (GPRS & EGPRS) & WCDMA, Test SIM has been used to establish the communication between CMW500 & EUT

4.3 Test Modes – Data Rates and Modulations

- The EUT operates through POE and power adaptor supply, testing is carried for both the modes and only worst case results are reported.

4.4 Countermeasures to achieve EMC Compliance

- None

4.5 List of frequencies

GSM/PCS – Channel plan

Frequency Band	Channel Frequency (MHz)	Low	Mid	High
GSM850	Channel No.	128	189	251
	Frequency (MHz)	824.2	836.4	848.8
PCS1900	Channel No.	512	661	810
	Frequency(MHz)	1850.2	1880	1909.8

WCDMA –Channel plan

Frequency Band	Channel Frequency (MHz)	Low	Mid	High
Band 2	Channel No.	9262	9400	9538
	Frequency (MHz)	1852.4	1880	1907.6
Band 4	Channel No.	1312	1413	1513
	Frequency (MHz)	1712.4	1732.6	1752.6
Band 5	Channel No.	4132	4182	4233
	Frequency (MHz)	826.4	836.4	846.6

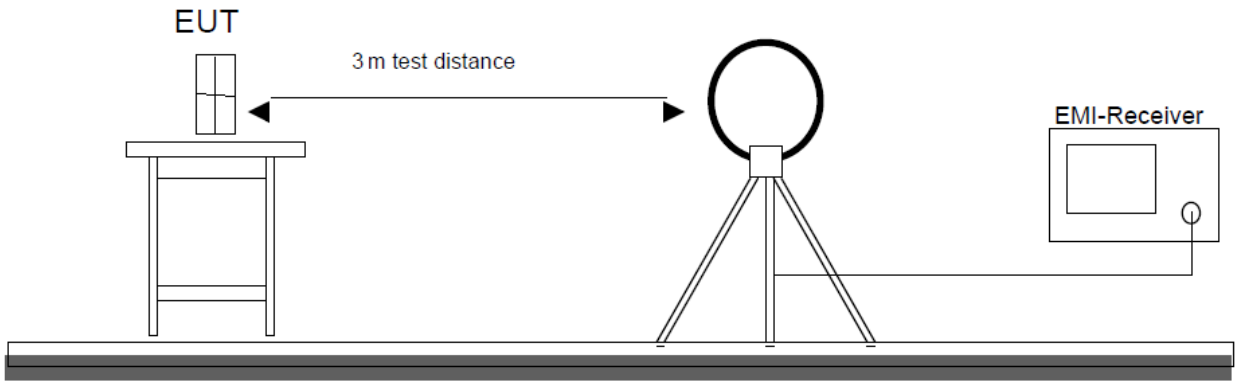
5 TEST METHODOLOGY

Radiated Emission Test

Frequency Range 9 kHz - 30 MHz

Test performed as per ANSI C63.4-2014 section 8.3

The loop Antenna was placed at 1m above the ground plane & EUT is 3 meters far from the measuring antenna. With 3m measurement distance, correction data were applied to the measured results. The test arrangement, measuring antenna guidelines and operational configurations in 8.2.1 and 8.2.2, shall be followed. The measurement antenna shall be positioned with its plane perpendicular to the ground at the Specified distance, when perpendicular to the ground plane, the lowest height of the magnetic antenna shall be 1 m above the ground and shall be positioned at the specified distance from the EUT. EUT & its associates are placed on non-conducting table of 0.8m height which is placed on the turn table, For each measurement antenna alignment, the EUT shall be rotated through 0° to 360° on a turntable. The report shall list worst case emission results, for each of the parallel & perpendicular orientations.



Frequency Range 30MHz to 10th harmonics of the highest fundamental frequency

Test performed as per ANSI C63.26-2015

ERP/EIRP Radiated Power & Radiated spurious emission test are performed as below.

All the radiated emission measurements are performed in accordance with common requirement specified in 5.5.2 and Pre-test site path loss correction factors are used to adjust the EUT emission data in place of two step substitution method (as defined in Annex B of ANSI C63.26-2015).

The equipment under test is placed on non-conductive table at 3m away from the receive antenna in accordance with above mentioned standard. Turn table is rotated through 360 degree, and receiver antenna height is varied in order to determine the level of maximum emission. The maximum emission level and position of the maximized emission is recorded with use of spectrum analyzer.

Using pre-test site path loss to determine EUT emission power:

1) EUT emission powers are calculated using the following equation:

Emission Power = EUT_{Prec} [dBm EIRP] + P_L [dB]

where

EUT_{Prec} = power of the emission measured at the test receiver during EUT measurements.

PL = path loss determined on the frequency of the EUT emission or calculated using linear interpolation between site characterization frequencies.

2) This is the level to be compared against the regulatory limit as it is the emission power referenced back to the EUT on the test site.

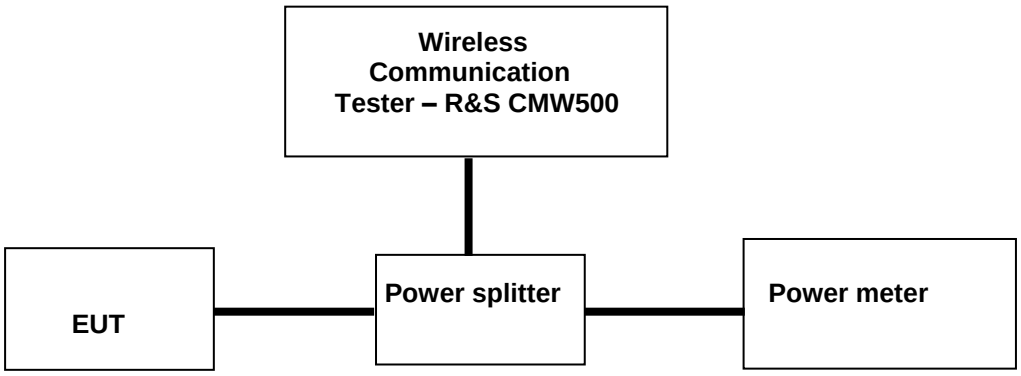
6 TEST RESULTS

6.1 Conducted Output Power

Result ***Pass***

Test Specification	FCC Part §2.1046 ,§22.913(d), §24.232(d), §27.50 RSS 132 Issue3 Section 5.4 ,RSS 133 Issue 6 Section 6.4, RSS 139 Issue 2 Section 6.5.
Test Procedure	ANSI C63.26-2015 & 971168 D01 Power Meas License Digital Systems v03r01
Measurement Bandwidth(RBW)	≥ OBW
Detector function	Peak / Average

Test Setup:



Environmental conditions:

Temperature (Norm) = + 22.3 °C RH= 62 % Supply voltage: 110 VAC, 60Hz

Note: Measurements are made as per section 5.1.3 of the KDB "971168 D01 Power Measurement License Digital Systems v03r01" is used and ANSI C63.26 section 5.2.4.2 & 5.2.3.2.

Note: Attenuator & Cable losses are included in the test results.

Measured power (dBm) = Raw (dBm) + attenuator (dB) + Cable loss (dB)

Table 7: Conducted power results-GSM

Network support	Band	Channel Number	Channel Frequency (MHz)	Measured Peak power (dBm)	Measured average power (dBm)	PAPR (dB)	Limit (dB)
GPRS	GSM850	128	824.2	30.47	28.58	1.89	≤ 13
		189	836.4	30.34	28.45	1.89	≤ 13
		251	848.8	30.37	28.48	1.89	≤ 13
	PCS1900	512	1850.2	25.59	23.71	1.88	≤ 13
		661	1880	26.07	24.18	1.89	≤ 13
		810	1909	25.14	23.26	1.88	≤ 13
EGPRS	GSM850	128	824.2	30.42	27.98	2.44	≤ 13
		189	836.4	30.43	27.62	2.81	≤ 13
		251	848.8	30.5	27.87	2.63	≤ 13
	PCS1900	512	1850.2	25.14	23.25	1.89	≤ 13
		661	1880	26.06	24.20	1.86	≤ 13
		810	1909	25.59	23.72	1.87	≤ 13

Table 8: Conducted power results-WCDMA

Band	Channel Number	Channel Frequency (MHz)	Measured Peak power (dBm)	Measured average power (dBm)	PAPR (dB)	Limit (dB)
Band 2	9262	1852.4	22.27	19.45	2.82	≤ 13
	9400	1880	22.13	19.38	2.75	≤ 13
	9538	1907.6	21.23	18.59	2.64	≤ 13
Band 4	1312	1712.4	21.91	18.79	3.12	≤ 13
	1413	1732.6	21.33	18.29	3.04	≤ 13
	1513	1752.6	21.04	17.96	3.08	≤ 13
Band 5	4132	826.4	23.25	20.45	2.8	≤ 13
	4182	836.4	23.65	20.57	3.08	≤ 13
	4233	846.4	23.47	20.51	2.96	≤ 13

6.2 RF Power (ERP/EIRP) – Radiated Mode

Result ***Pass***

Specification	§22.913 (a)(5), §24.232(c), §27.50 (d)(4) & RSS 132 Issue3 Section 5.4,RSS133 Issue6 Section 6.4 , SRSP-510 Issue5 Section 5.1.2,RSS 139 Issue2 Section 6.5
Test Procedure	ANSI C63.26-2015
Measurement Bandwidth(RBW)	100 kHz (for frequency ≤1GHz) & 1 MHz (for Frequency ≥ 1GHz)
Detector function	Peak

Test setup:

Refer section 5 of the test report

Environmental conditions:

Temperature (Norm) = + 22.3 °C RH= 62 % Supply voltage: 110 VAC, 60Hz

Note: For measurement of RF Output Power, test procedure as per “ANSI C63.26-2015 sub clause 5.5.2 and Annex B” is used.

Test Results:

Table 9: ERP/EIRP test results of GSM 850 & 1900 bands

Band	Network support	Channel	Operating Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Measured RF power (dBm)	Limit (dBm)	Margin (dB)
850	GPRS	Low	824.2	V	824.27	30.60	38.45	-7.85
				H	824.27	26.12	38.45	-12.33
		Mid	836.4	V	836.48	31.06	38.45	-7.39
				H	836.33	25.59	38.45	-12.86
		High	848.8	V	848.87	31.55	38.45	-6.90
				H	848.87	26.61	38.45	-11.84
	EGPRS	Low	824.2	V	824.27	32.44	38.45	-6.01
				H	824.27	25.63	38.45	-12.82
		Mid	836.4	V	836.33	31.91	38.45	-6.54
				H	836.33	26.40	38.45	-12.05
		High	848.8	V	848.87	31.77	38.45	-6.68
				H	848.87	27.00	38.45	-11.45
1900	GPRS	Low	1850.2	V	1850.2	24.99	33.01	-8.02
				H	1850.2	22.40	33.01	-10.61
		Mid	1880	V	1880	24.90	33.01	-8.11
				H	1880	21.81	33.01	-11.20
		High	1909.8	V	1909.8	24.84	33.01	-8.17
				H	1909.8	22.35	33.01	-10.66
	EGPRS	Low	1850.2	V	1850.2	24.86	33.01	-8.15
				H	1850.2	24.86	33.01	-8.15
		Mid	1880	V	1880	24.87	33.01	-8.14
				H	1880	21.29	33.01	-11.72
		High	1909.8	V	1909.7	24.71	33.01	-8.30
				H	1909.7	22.21	33.01	-10.80

Note:

V: Vertical

H: Horizontal

Table 10: ERP/EIRP test results of WCDMA Band 2 /Band 4 / Band 5

Band	Channel	Operating Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Measured RF power (dBm)	Limit (dBm)	Margin (dB)
Band 2	Low	1852.4	V	1851.5	17.57	33.01	-15.44
			H	1852.2	14.14	33.01	-18.87
	Mid	1880	V	1880.75	21.24	33.01	-11.77
			H	1880.75	16.37	33.01	-16.64
	High	1907.6	V	1906.7	20.14	33.01	-12.87
			H	1906.7	16.31	33.01	-16.70
Band 4	Low	1712.4	V	1713.5	18.33	30.00	-11.67
			H	1713.25	14.65	30.00	-15.35
	Mid	1732.6	V	1733.5	19.26	30.00	-10.74
			H	1733.5	14.69	30.00	-15.31
	High	1752.6	V	1753.5	19.43	30.00	-10.57
			H	1753.5	15.33	30.00	-14.67
Band 5	Low	826.4	V	825.63	15.75	38.45	-32.84
			H	825.53	13.10	38.45	-33.95
	Mid	836.4	V	836.99	15.29	38.45	-32.51
			H	836.99	13.51	38.45	-33.52
	High	846.4	V	846.98	16.46	38.45	-32.41
			H	846.98	12.17	38.45	-33.05

Note:

V: Vertical

H: Horizontal

6.3 Field Strength of Spurious Radiation

Result ***Pass***

Specification	FCC Part §2.1053, §22.917 (a), §24.238(a)(b) §27.53 (h) & RSS 132Issue 3 Section5.5,RSS 136 Issue 6 section 6.5 & RSS139 Issue 2 Section 6.6
Measurement Bandwidth (RBW)	100 kHz (for frequency ≤1GHz) & 1 MHz (for Frequency ≥ 1GHz)
Detector Function	Peak
Requirement	Attenuation below transmitter power shall not be more than -13 dBm

Test setup:

Refer section 5 of the test report

Environmental conditions:

Temperature (Norm) = + 22.3 °C RH= 62 % Supply voltage: 110 VAC, 60Hz

Note: For measurement of RF Output Power, test procedure as per “ANSI C63.26-2015 sub clause 5.5.2 and Annex B” is used.

Test Results:

Frequency range 9KHz to 1GHz

No emissions found in this frequency range

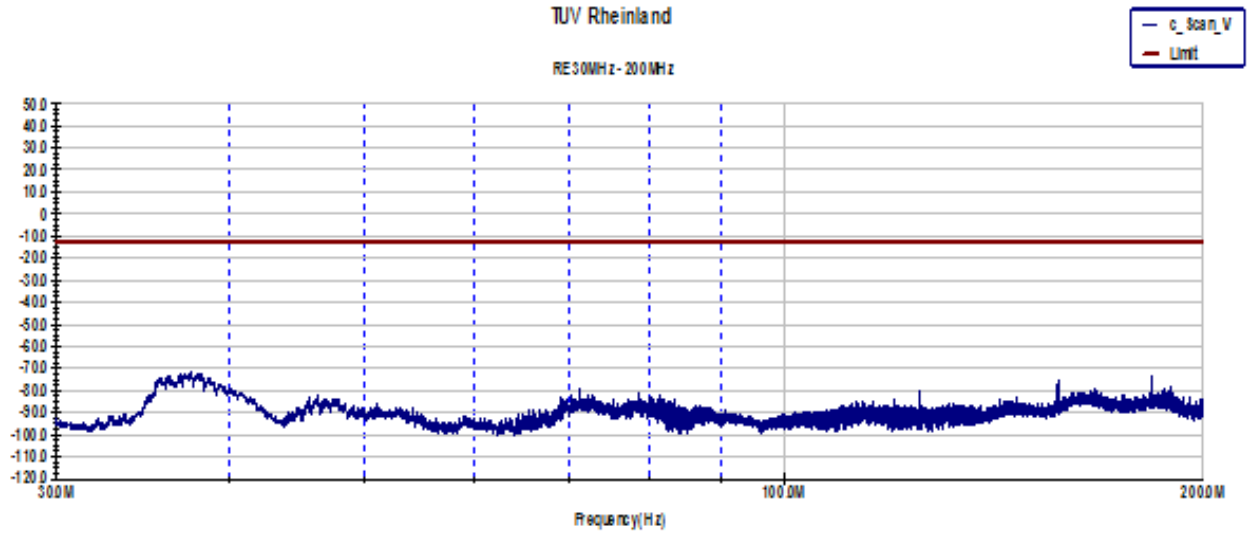
Frequency range 30MHz to 1GHz

Table 11: Test results for frequency range 30MHz to 1GHz

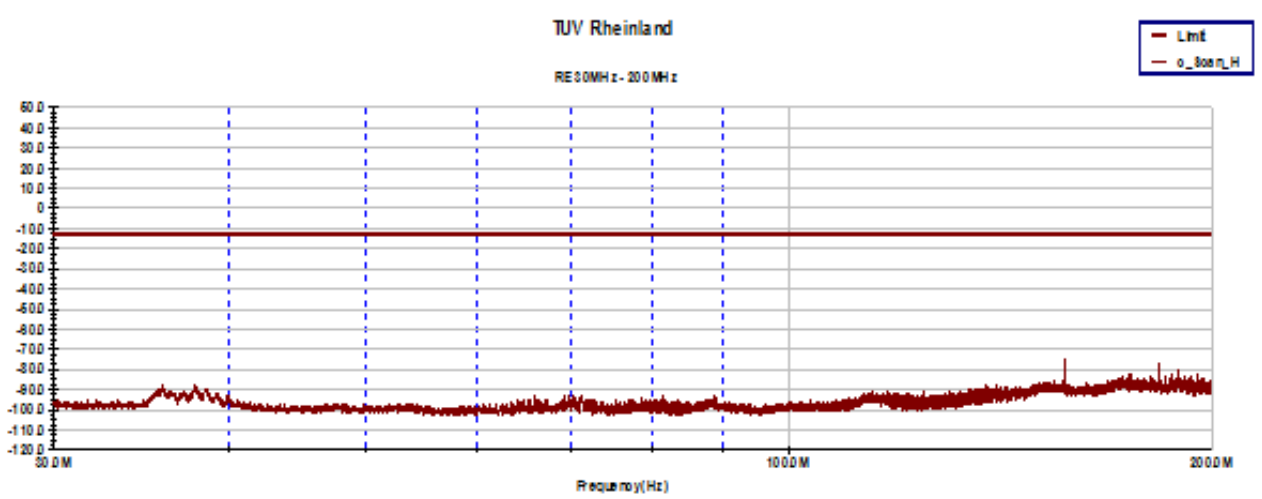
Antenna Polarization	Measured Frequency (MHz)	Measured Emission (dBm)	Limit (dBm)	Margin (dB)
Vertical	35.31	-62.21	-13.00	-49.21
	83.4	-66.21	-13.00	-53.21
	148.8	-63.31	-13.00	-50.31
	320.32	-71.68	-13.00	-58.68
	632.85	-63.52	-13.00	-50.52
	760.96	-56.05	-13.00	-43.05
	869.2	-34.49	-13.00	-21.49
	982.9	-42.09	-13.00	-29.09
Horizontal	82.5	-74.59	-13.00	-61.59
	121.26	-68.74	-13.00	-55.74
	148.5	-61.17	-13.00	-48.17
	198	-59.98	-13.00	-46.98
	288.37	-68.17	-13.00	-55.17
	649.38	-58.58	-13.00	-45.58
	869.14	-36.35	-13.00	-23.35
	887.84	-54.81	-13.00	-41.81
	982.88	-41.61	-13.00	-28.61

Test plots 1: Worst case emissions in below 1GHz

30MHz to 1GHz

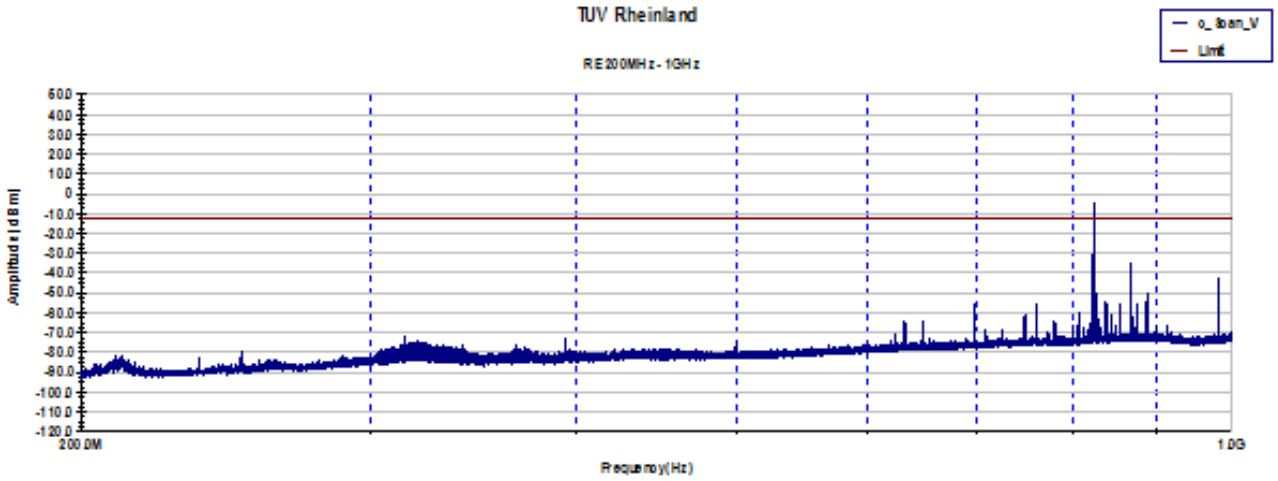


Vertical polarization

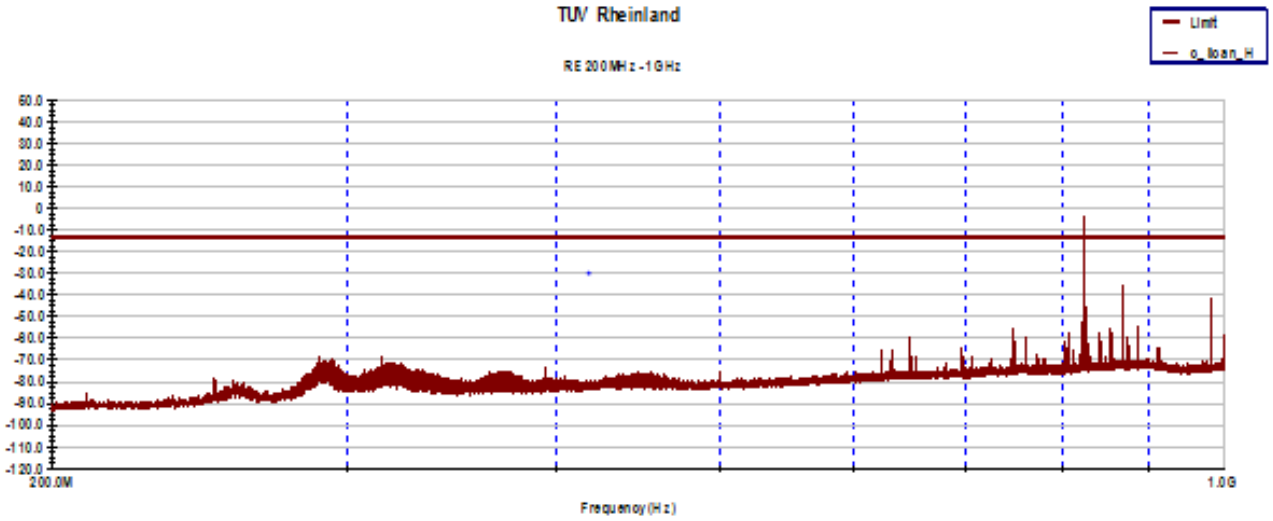


Horizontal polarization

200MHz to 1GHz



Vertical polarization



Horizontal polarization

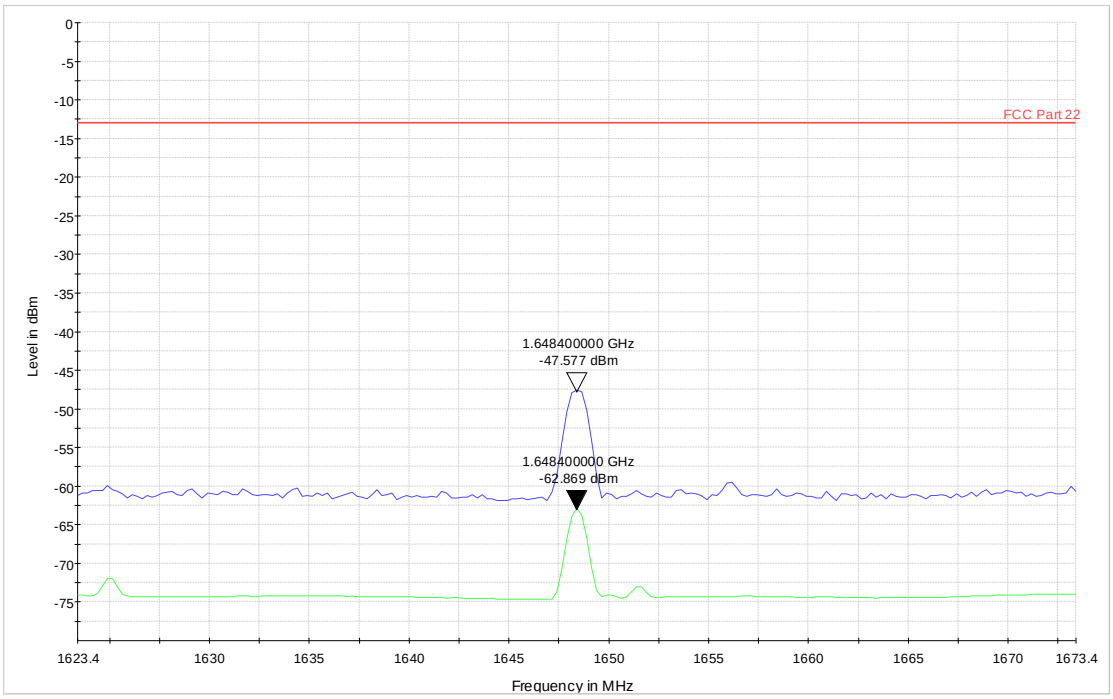
Table 12: GPRS/EGPRS test results for above 1GHz

GSM 850MHz

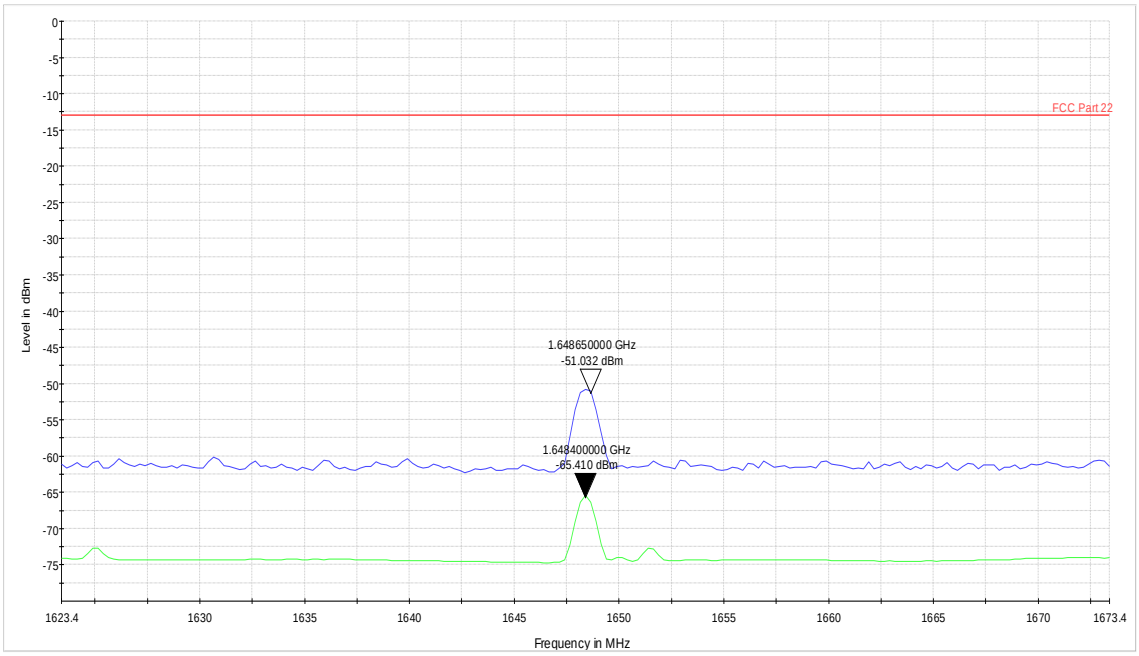
Network support	Channel	Operating Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Measured power (dBm)	Limit (dBm)	Margin (dB)
GPRS	**Low**	**824.2**	**V**	**1648.4**	**-47.57**	**-13.00**	**-34.57**
			H	**1648.4**	**-51.03**	**-13.00**	**-38.03**
			V	**2472.6**	**-14.71**	**-13.00**	**-1.71**
			H	**2472.6**	**-33.11**	**-13.00**	**-20.11**
			V	**3296.8**	**-54.07**	**-13.00**	**-41.07**
			H	**3296.8**	**-54.53**	**-13.00**	**-41.53**
	Mid	836.4	V	1672.8	-50.42	-13.00	-37.42
			H	1672.8	-54.62	-13.00	-41.62
			V	2509.2	-36.57	-13.00	-23.57
			H	2509.2	-41.03	-13.00	-28.03
			V	3345.6	No Harmonic		
			H	3345.6			
	High	848.4	V	1696.8	-52.27	-13.00	-39.27
			H	1696.8	-52.79	-13.00	-39.79
			V	2545.2	-36.01	-13.00	-23.01
			H	2545.2	-40.88	-13.00	-27.88
			V	3393.6	No Harmonic		
			H	3393.6			
EGPRS	Low	824.2	V	1648.4	-47.65	-13.00	-34.65
			H	1648.4	-40.65	-13.00	-27.65
			V	2472.6	-36.74	-13.00	-23.74
			H	2472.6	-40.65	-13.00	-27.65
			V	3296.8	-54.21	-13.00	-41.21
			H	3296.8	-55.10	-13.00	-42.10
	Mid	836.4	V	1672.8	-51.26	-13.00	-38.26
			H	1672.8	-55.92	-13.00	-42.92
			V	2509.2	-36.68	-13.00	-23.68
			H	2509.2	-41.51	-13.00	-28.51
			V	3345.6	-53.80	-13.00	-40.80
			H	3345.6	-55.49	-13.00	-42.49
	High	848.4	V	1696.8	-51.40	-13.00	-38.40
			H	1696.8	-52.21	-13.00	-39.21
			V	2545.2	-38.72	-13.00	-25.72
			H	2545.2	-43.43	-13.00	-30.43
			V	3393.6	-53.13	-13.00	-40.13
			H	3393.6	-55.31	-13.00	-42.31

Test plots 2: Worst case spurious emissions plots

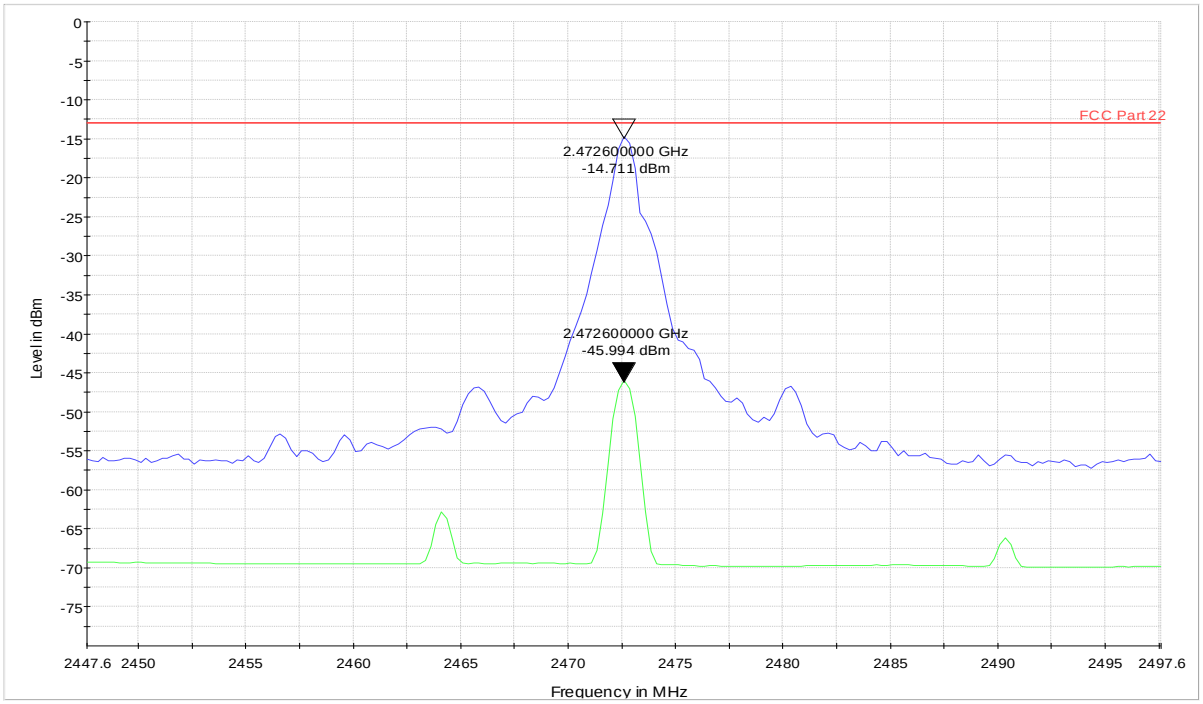
GSM 850MHz



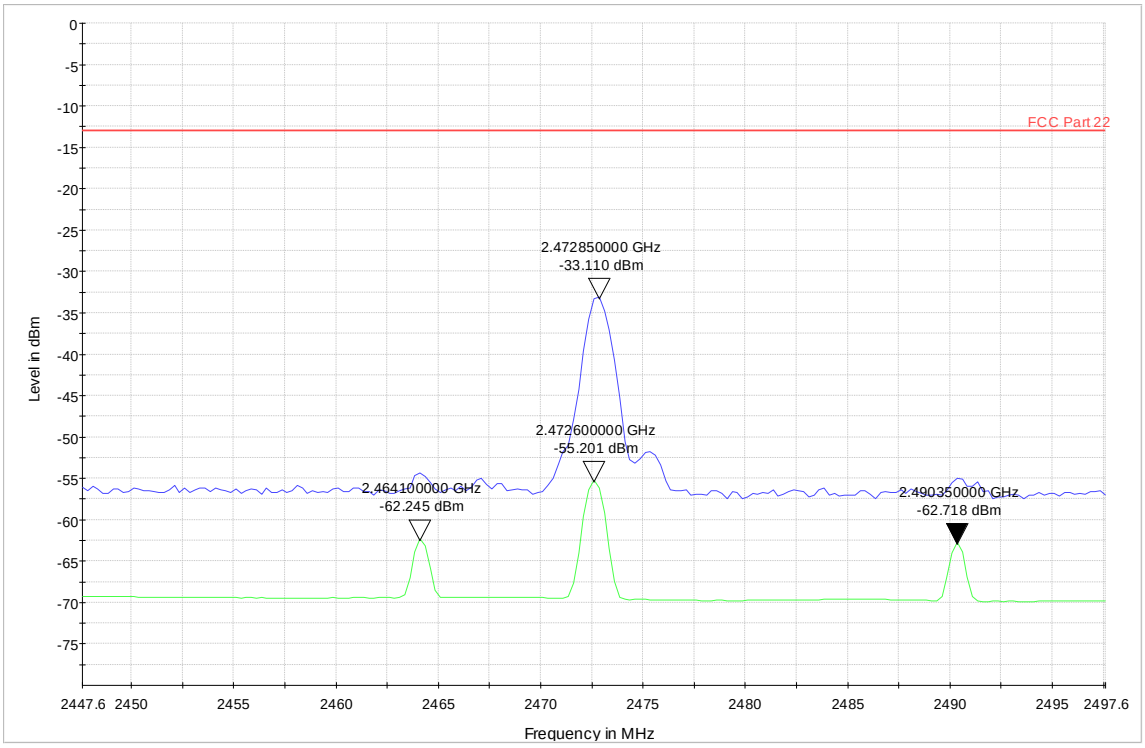
Harmonic 2 Polarization: Vertical



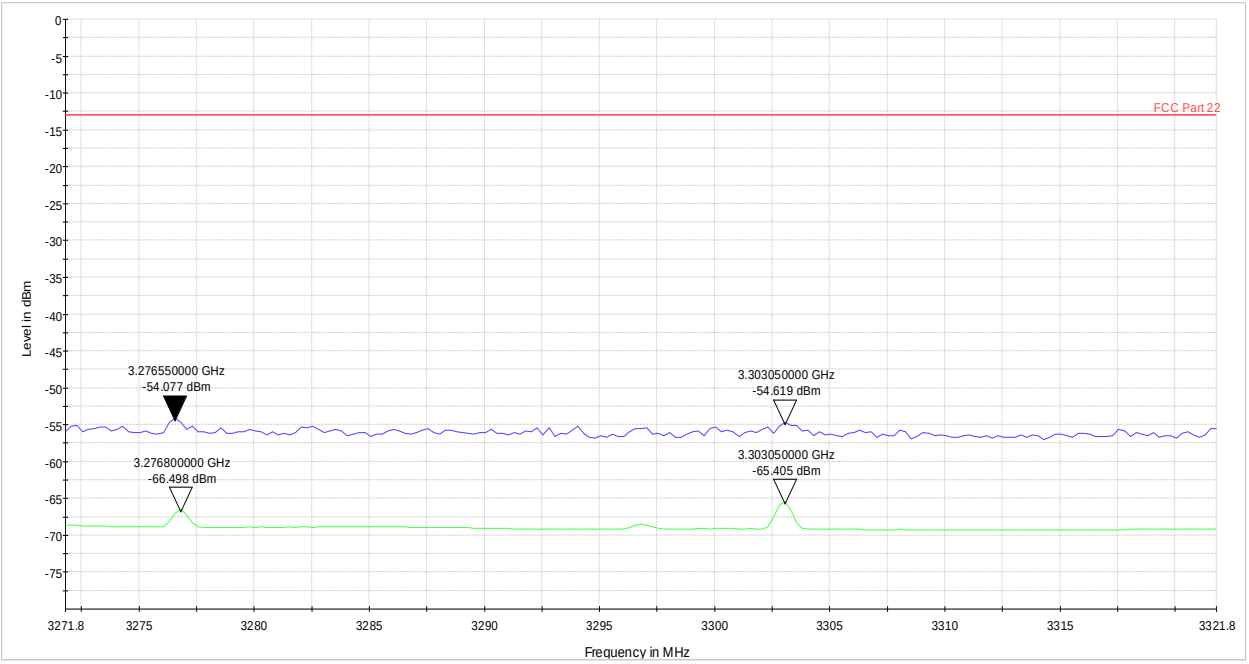
Harmonic 2 Polarization:Horizontal



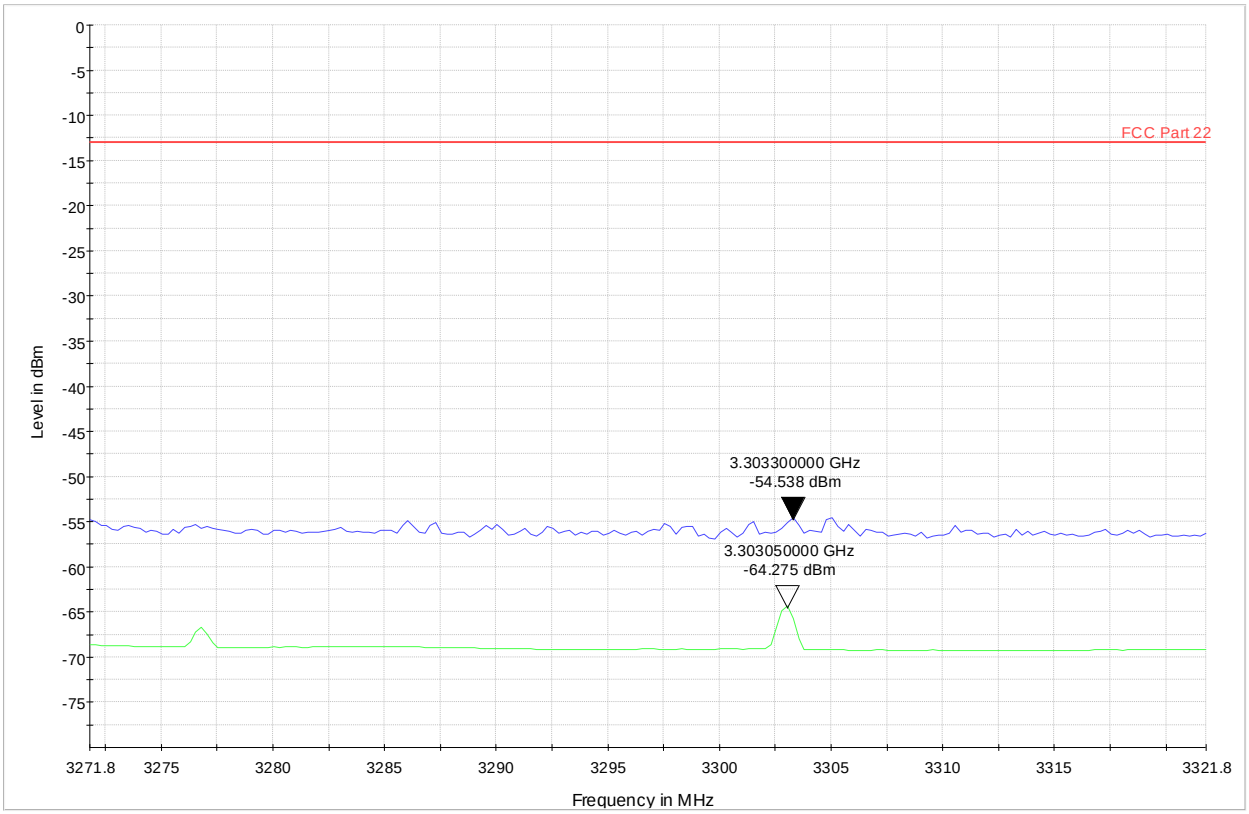
Harmonic 3 Polarization: Vertical



Harmonic 3 Polarization:Horizontal



Harmonic 4 Polarization: Vertical



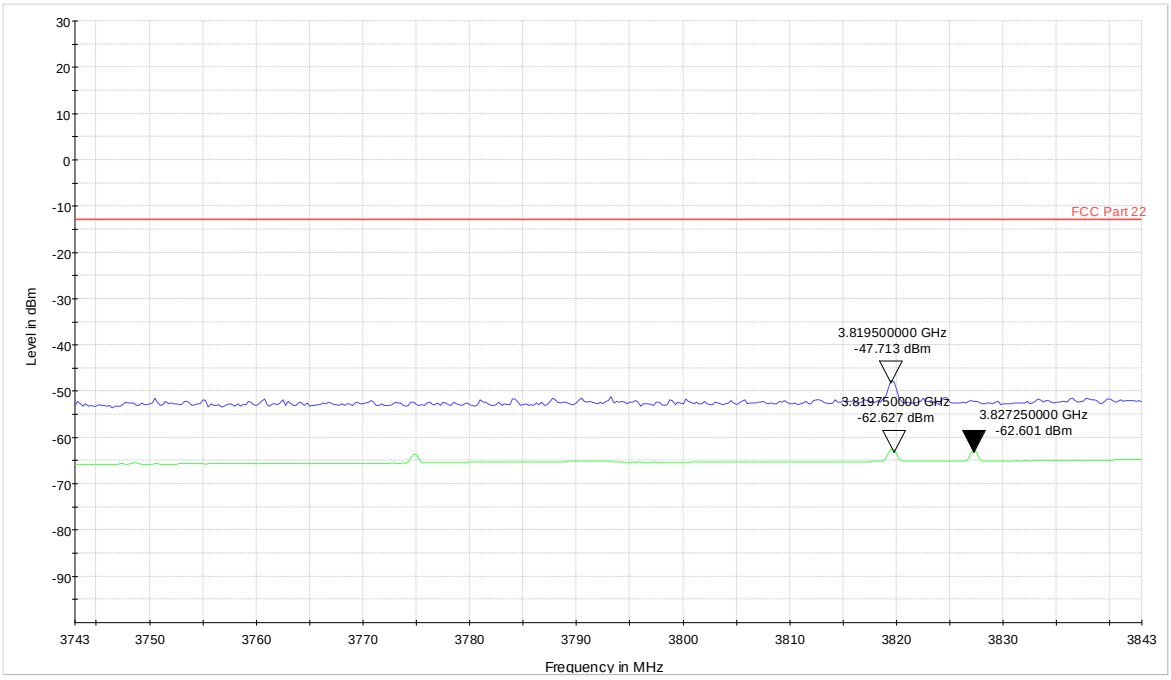
Harmonic 4 Polarization: Horizontal

GSM 1900MHz

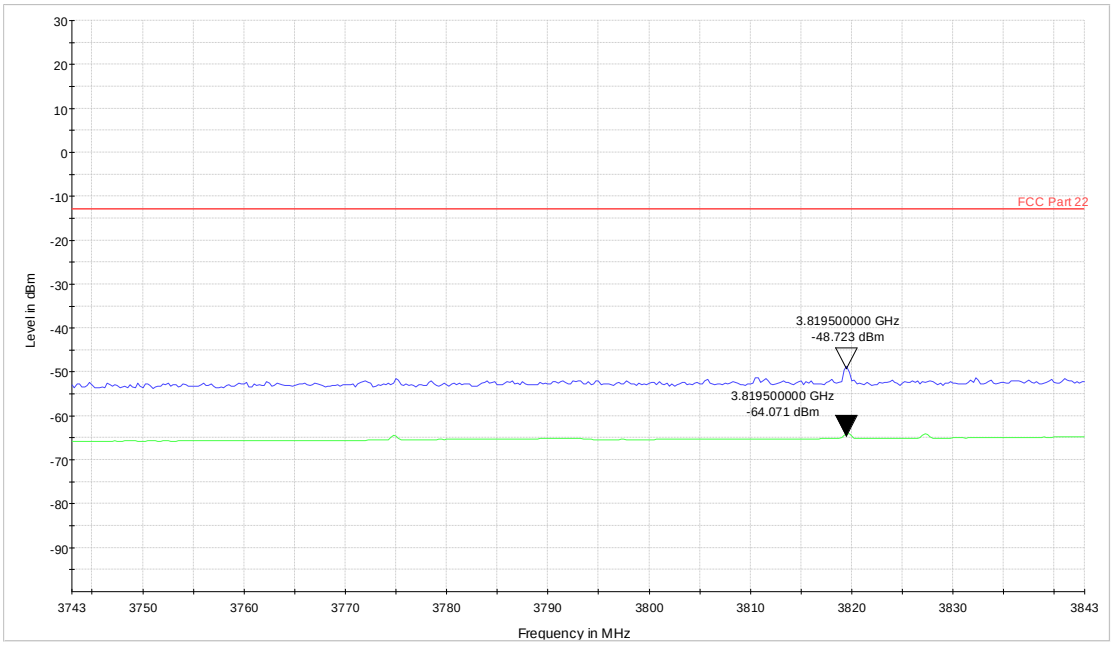
Network support	Channel	Operating Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Measured power (dBm)	Limit (dBm)	Margin (dB)
GPRS	Low	1850.2	V	3700.4	-34.16	-13.00	-35.52
			H	3700.4	-36.62	-13.00	-37.98
			V	5550.6	-34.30	-13.00	-36.00
			H	5550.6	-33.40	-13.00	-35.10
			V	7400.8	-35.17	-13.00	-34.17
			H	7400.8	-38.51	-13.00	-37.51
	Mid	1880	V	3760	-33.41	-13.00	-34.77
			H	3760	-36.15	-13.00	-37.51
			V	5640	-48.15	-13.00	-49.85
			H	5640	-48.87	-13.00	-50.57
			V	7520	No harmonic		
			H	7520			
	High	1909.8	V	3819.6	-49.16	-13.00	-50.64
			H	3819.6	-50.80	-13.00	-52.28
			V	5729.4	-31.85	-13.00	-33.02
			H	5729.4	-39.09	-13.00	-40.26
			V	7639.2	-47.20	-13.00	-45.77
			H	7639.2	-39.41	-13.00	-37.98
EGPRS	Low	1850.2	V	3700.4	-51.01	-13.00	-64.01
			H	3700.4	-51.71	-13.00	-38.71
			V	5550.6	-49.18	-13.00	-36.18
			H	5550.6	-49.78	-13.00	-36.78
			V	7400.8	-48.83	-13.00	-35.83
			H	7400.8	-48.05	-13.00	-35.05
	Mid	1880	V	3760	-50.72	-13.00	-37.72
			H	3760	-51.44	-13.00	-38.44
			V	5640	-34.19	-13.00	-21.19
			H	5640	-40.77	-13.00	-27.77
			V	7520	No harmonic		
			H	7520			
	High	**1909.8**	**V**	**3819.6**	**-47.71**	**-13.00**	**-34.71**
			H	**3819.6**	**-48.72**	**-13.00**	**-35.72**
			V	**5729.4**	**-39.22**	**-13.00**	**-26.22**
			H	**5729.4**	**-42.76**	**-13.00**	**-29.76**
			V	**7639.2**	**No Harmonic**		
			H	**7639.2**			

Test plots 3: Worst case spurious emissions plots

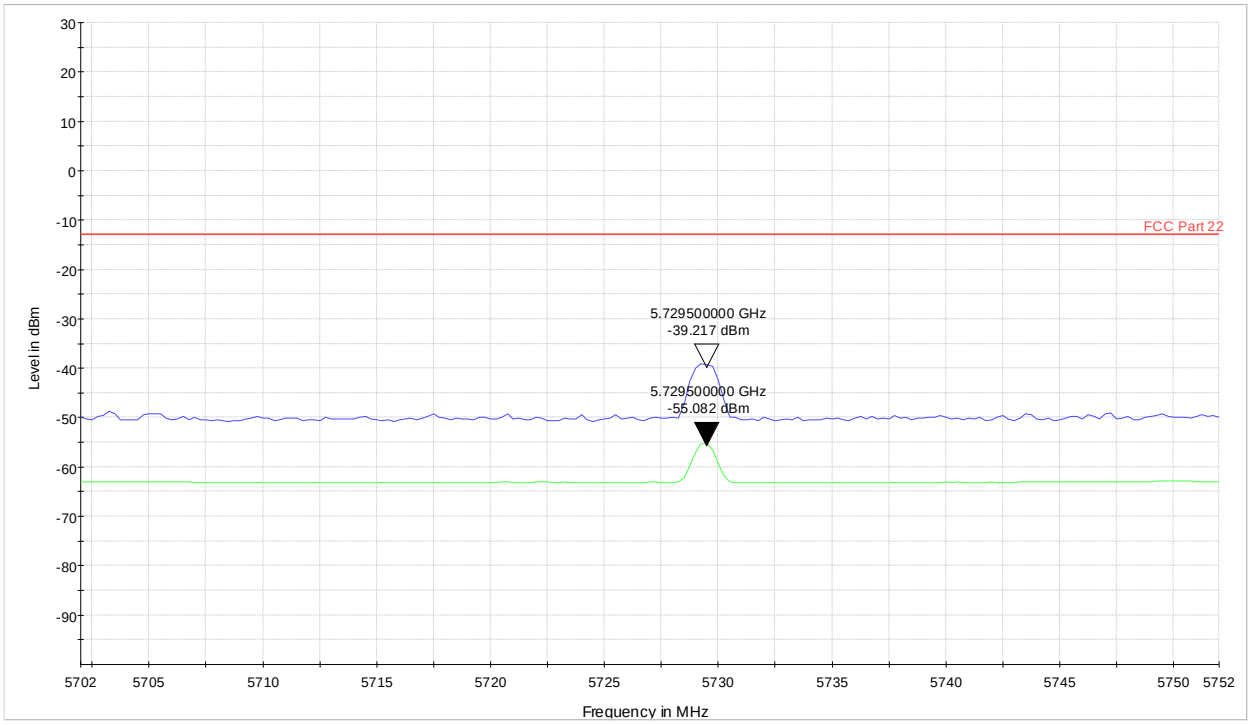
GSM 1900MHz



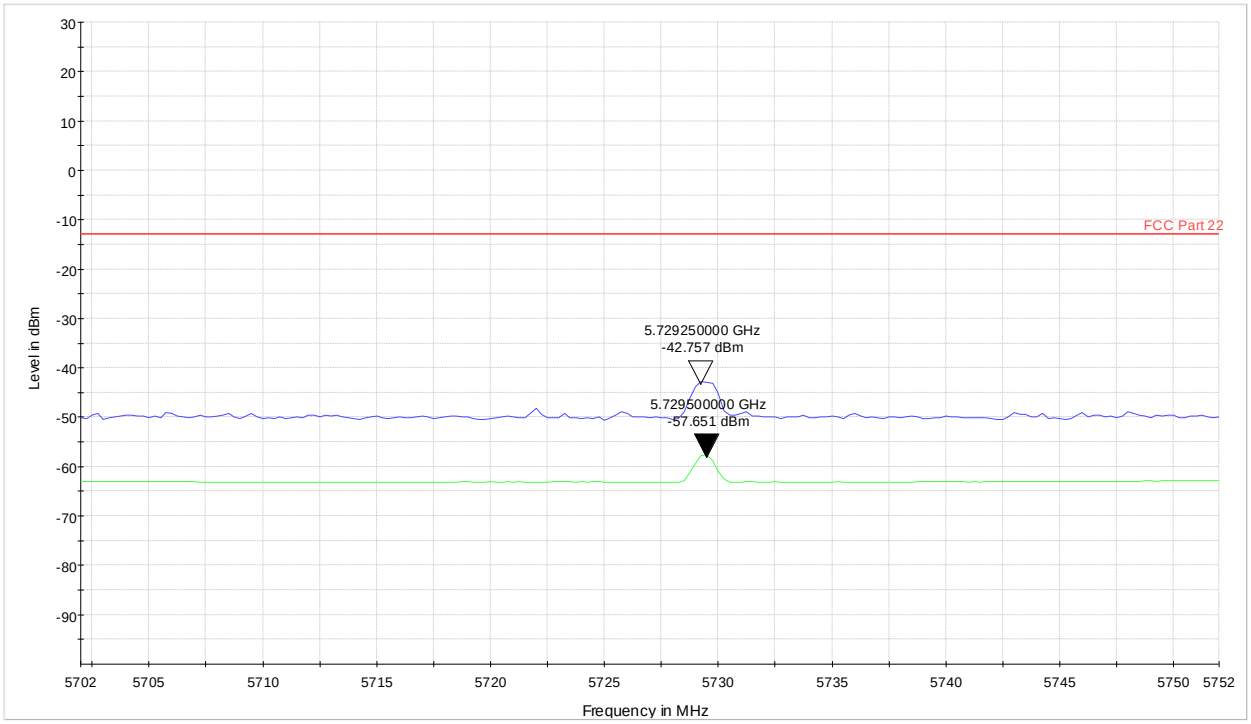
Harmonic 2 Polarization: Vertical



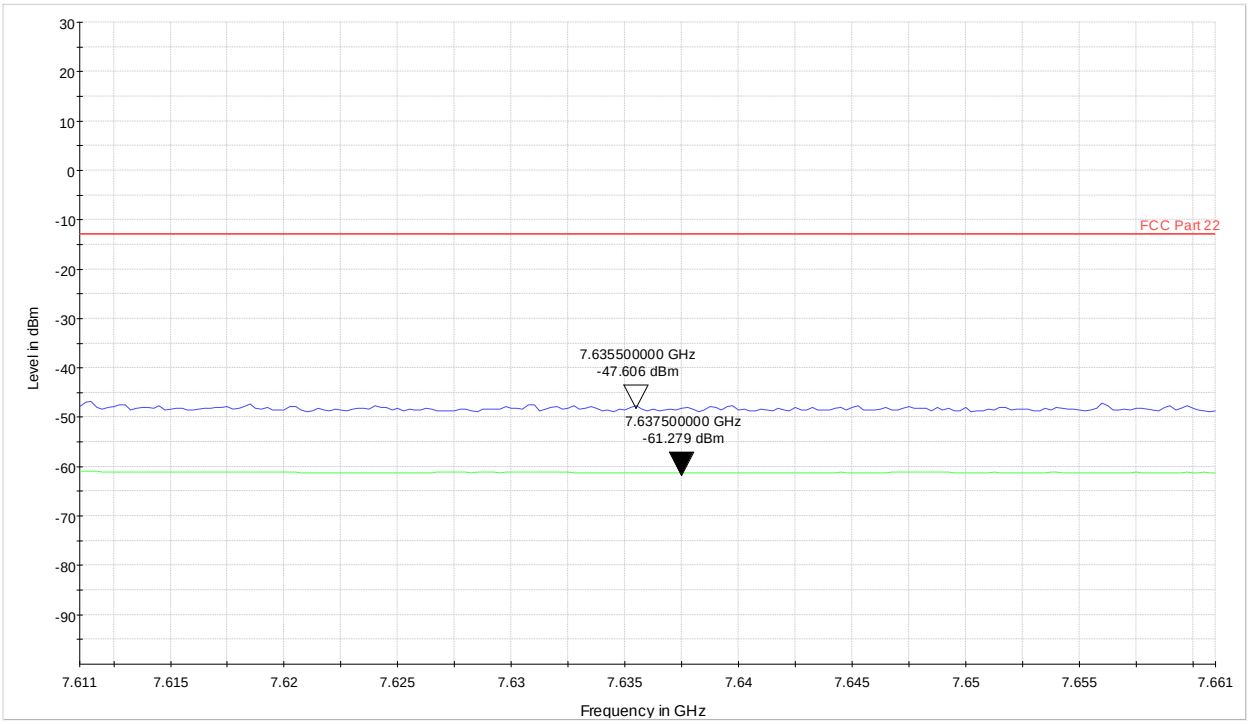
Harmonic 2 Polarization: Horizontal



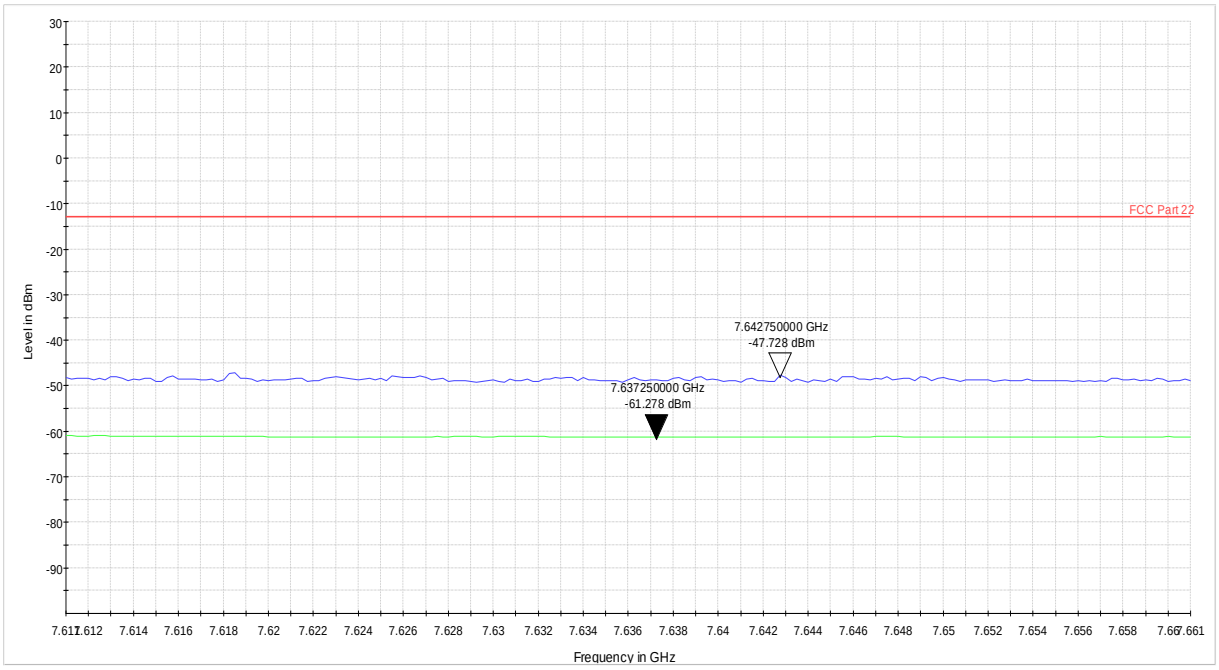
Harmonic 3 Polarization: Vertical



Harmonic 3 Polarization: Horizontal



Harmonic 4 Polarization: Vertical



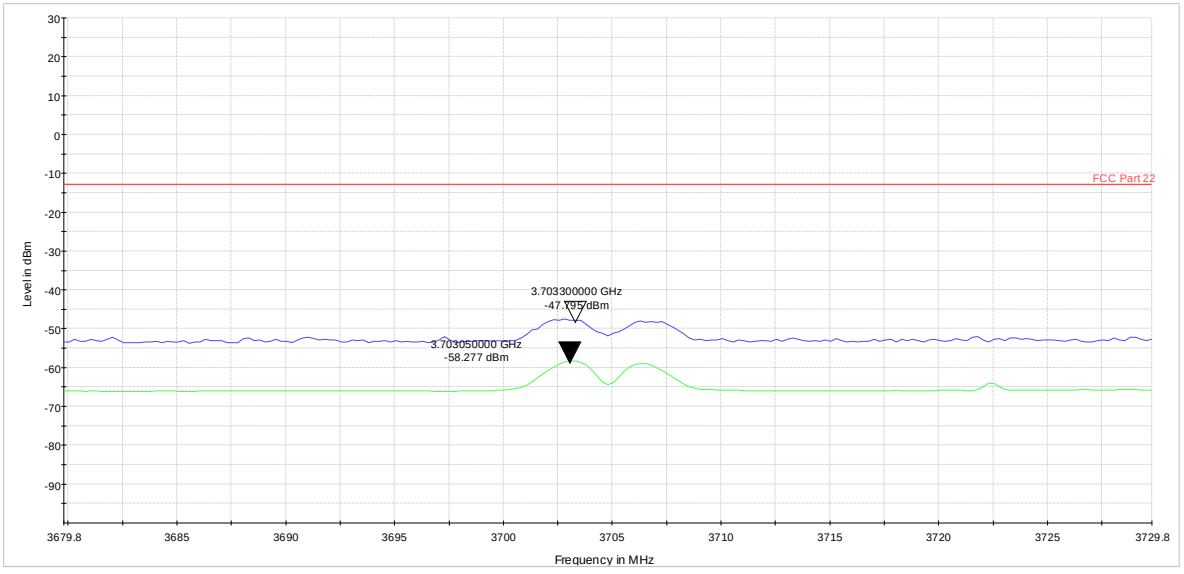
Harmonic 4 Polarization: Horizontal

Table 13: WCDMA above 1GHz Spurious emissions

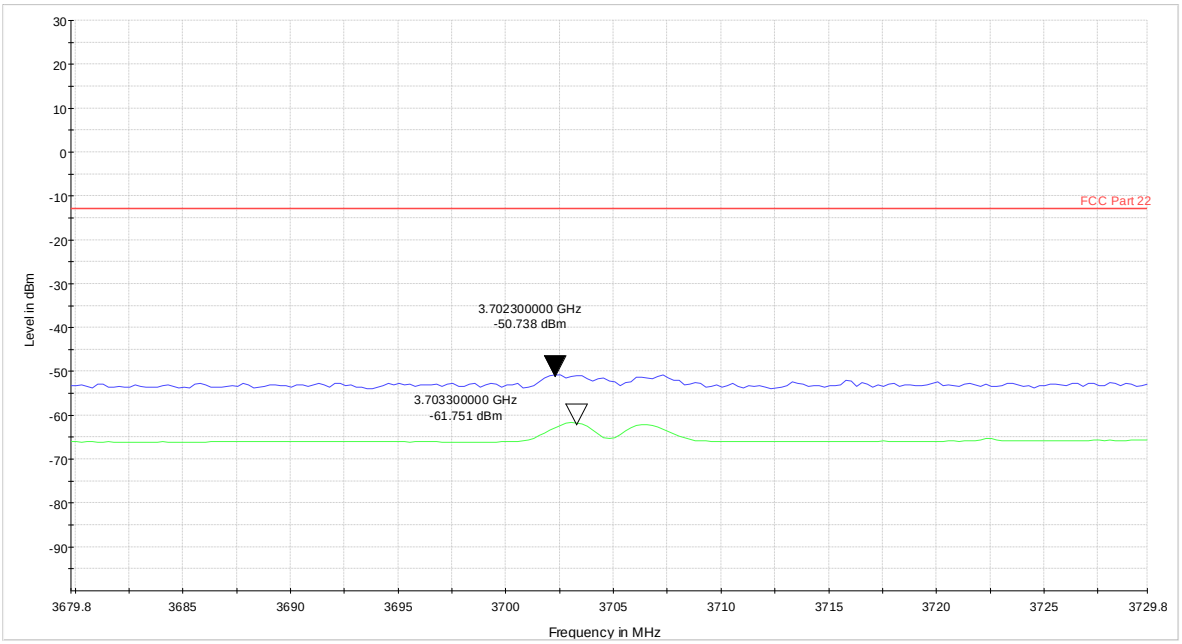
WCDMA Band 2

Band	Channel	Operating Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Measured power (dBm)	Limit (dBm)	Margin (dB)
2	Low	1852.4	**V**	**3704.8**	**-47.80**	**-13.00**	**-34.80**
			H	**3704.8**	**-50.74**	**-13.00**	**-37.74**
			V	**5557.2**	**-50.38**	**-13.00**	**-37.38**
			H	**5557.2**	**-50.10**	**-13.00**	**-37.10**
			V	**7409.6**	**-46.03**	**-13.00**	**-33.03**
			H	**7409.6**	**-61.28**	**-13.00**	**-48.28**
	Mid	1880	V	3760	-49.75	-13.00	-36.75
			H	3760	-52.03	-13.00	-39.03
			V	5640	-49.58	-13.00	-36.58
			H	5640	-49.72	-13.00	-36.72
			V	7520	No Harmonic		
			H	7520			
	High	1907.6	V	3815.2	-51.26	-13.00	-38.26
			H	3815.2	-51.16	-13.00	-38.16
			V	5722.8	-50.42	-13.00	-37.42
			H	5722.8	-49.75	-13.00	-36.75
			V	7630.4	No Harmonic		
			H	7630.4			

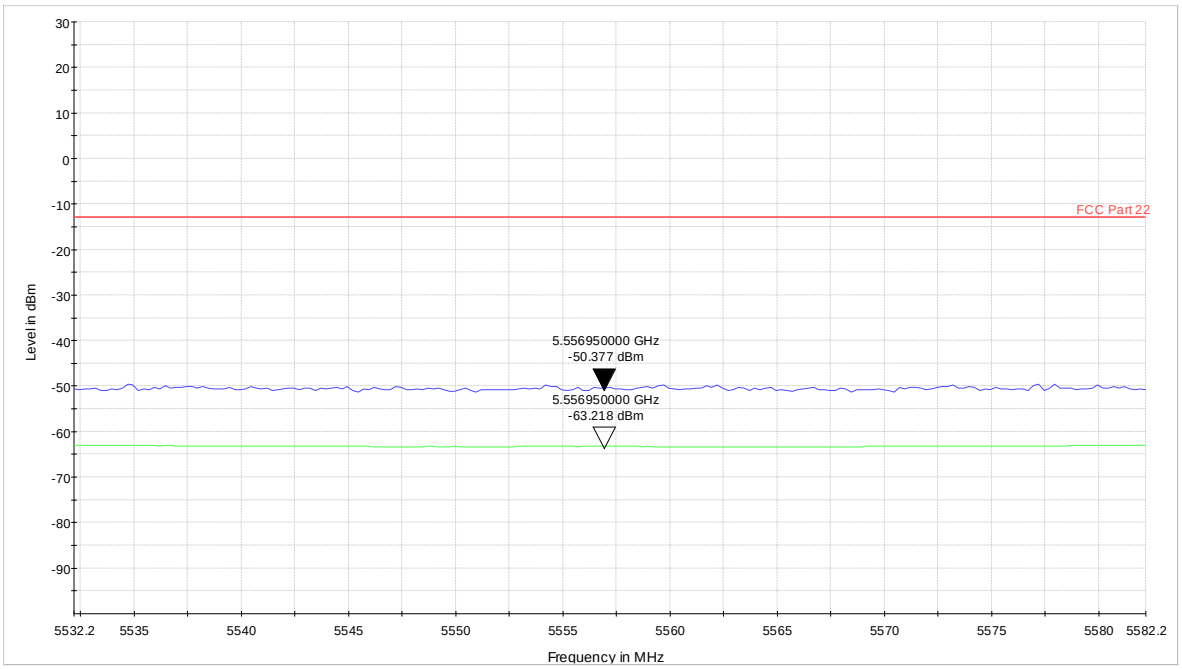
Test plots 4: Worst case spurious emissions plots WCDMA Band 2



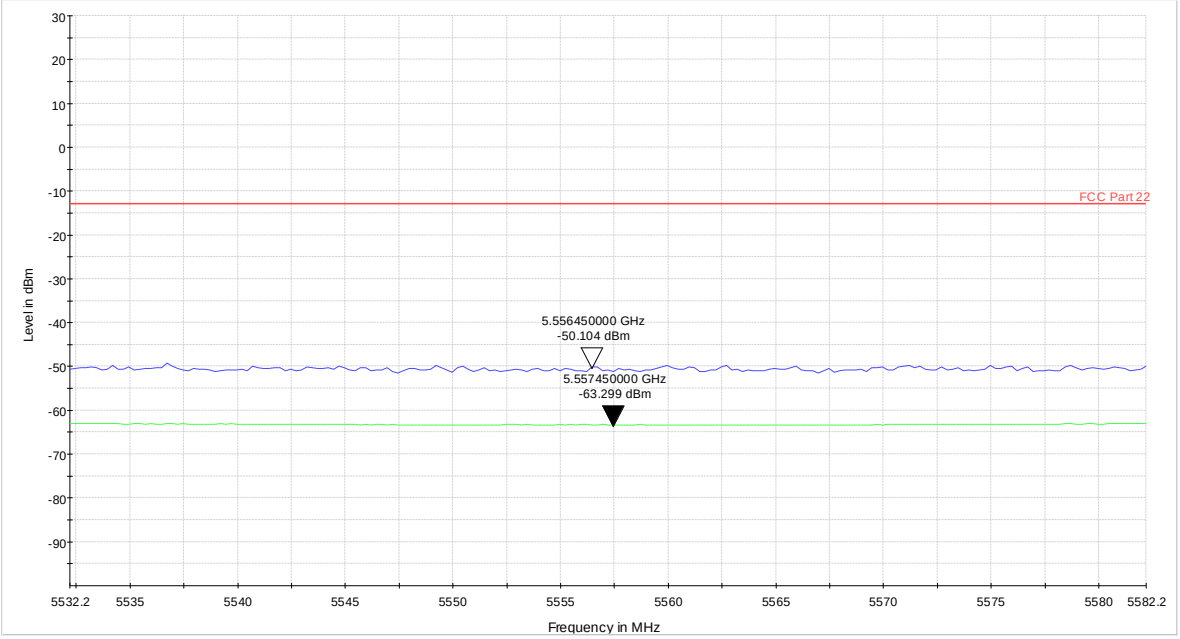
Harmonic 2 Polarization: Vertical



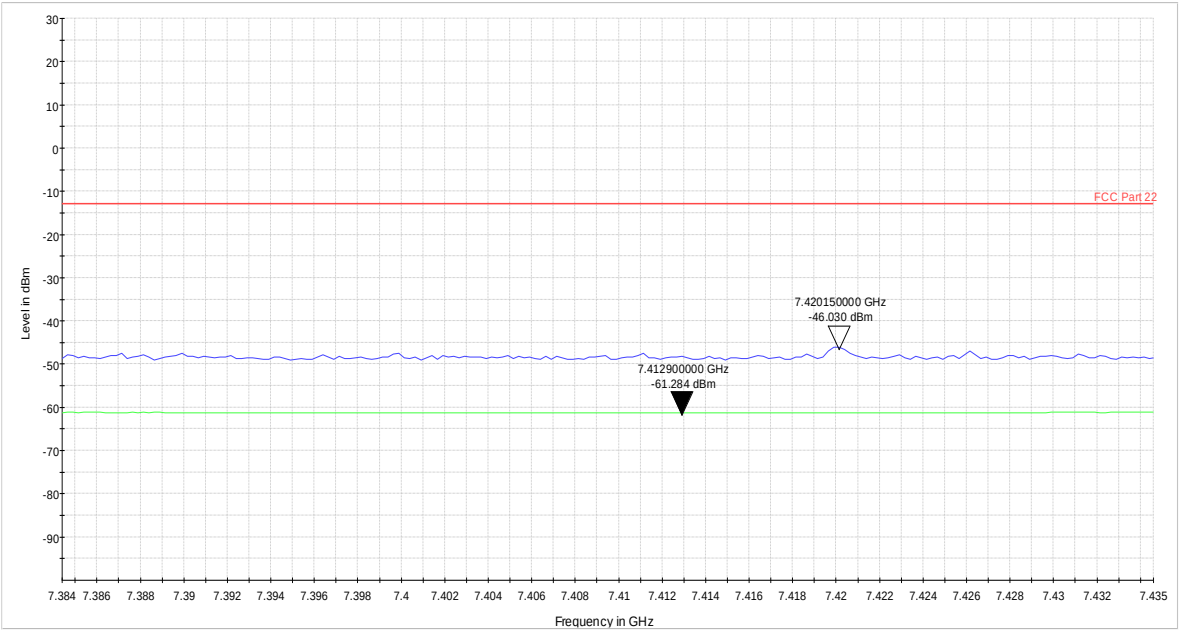
Harmonic 2 Polarization: Horizontal



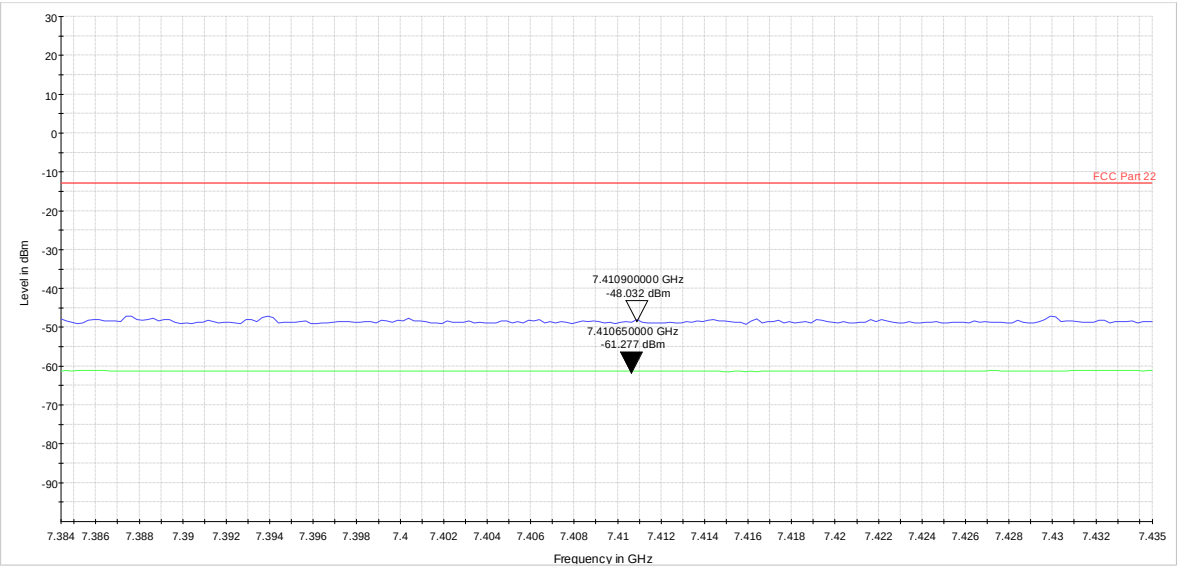
Harmonic 3 Polarization: Vertical



Harmonic 3 Polarization: Horizontal



Harmonic 4 Polarization: Vertical

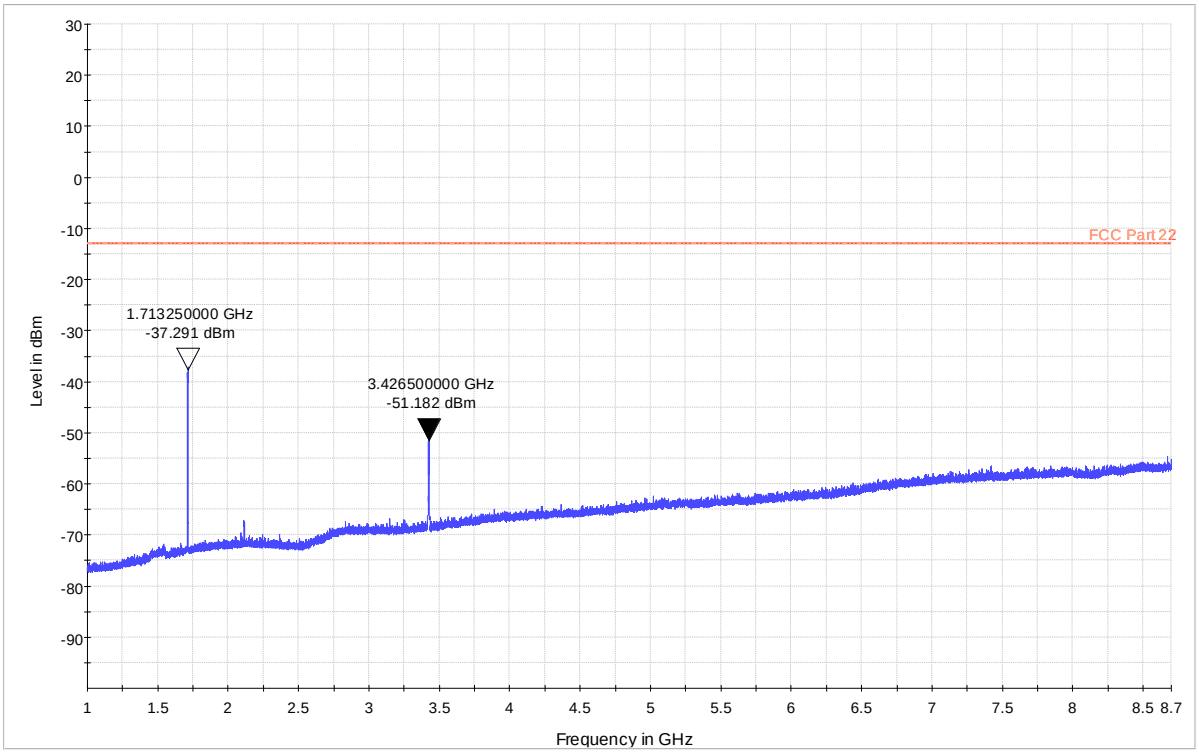


Harmonic 4 Polarization: Horizontal

WCDMA Band 4 test results

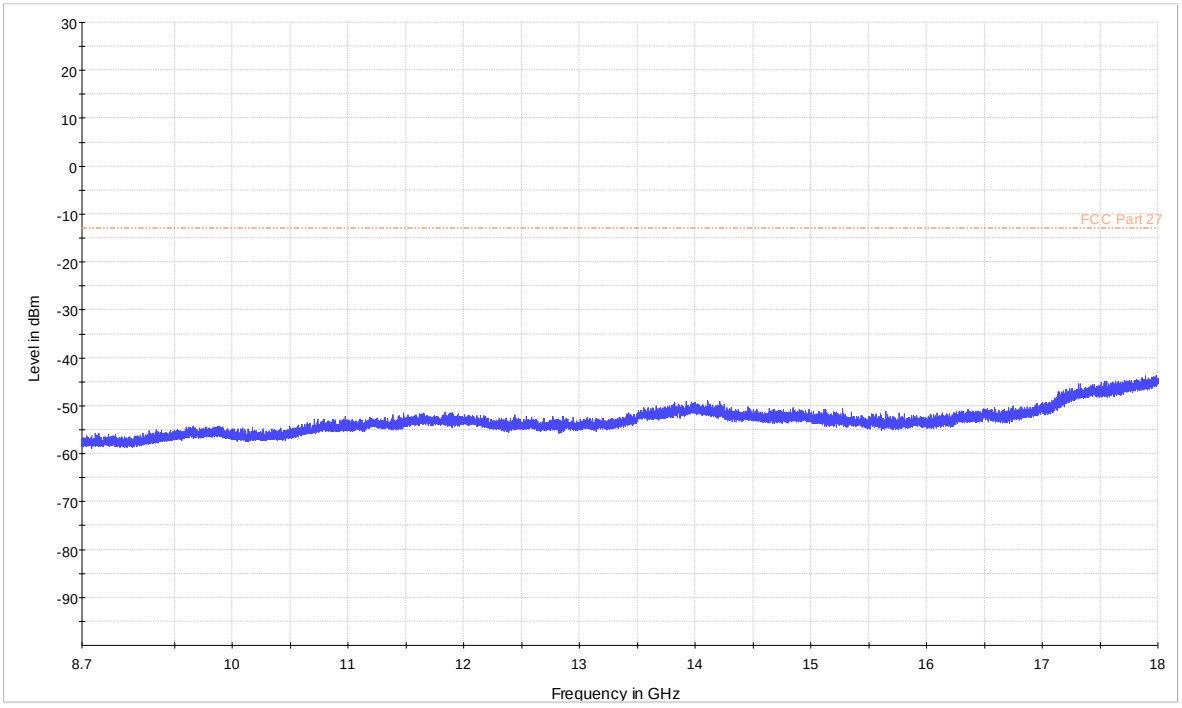
Channel	Operating Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Measured power (dBm)	Limit (dBm)	Margin (dB)
Low	**1712.4**	**V**	**3424.8**	**-51.18**	**-13.00**	**-38.18**
		H	**3424.8**	**-57.00**	**-13.00**	**-44.00**
		V	**5137.2**	**No Harmonic**		
Mid	1732.6	V	3465.2	-51.85	-13.00	-38.85
		H	3465.2	-60.61	-13.00	-47.61
		V	5197.8	No Harmonic		
		H	5197.8			
High	1752.6	V	3505.2	-54.68	-13.00	-41.68
		H	3505.2	-54.40	-13.00	-41.40
		V	5257.8	No Harmonic		
		H	5257.8			

Worstcase emission plots/WCDMA Band 4



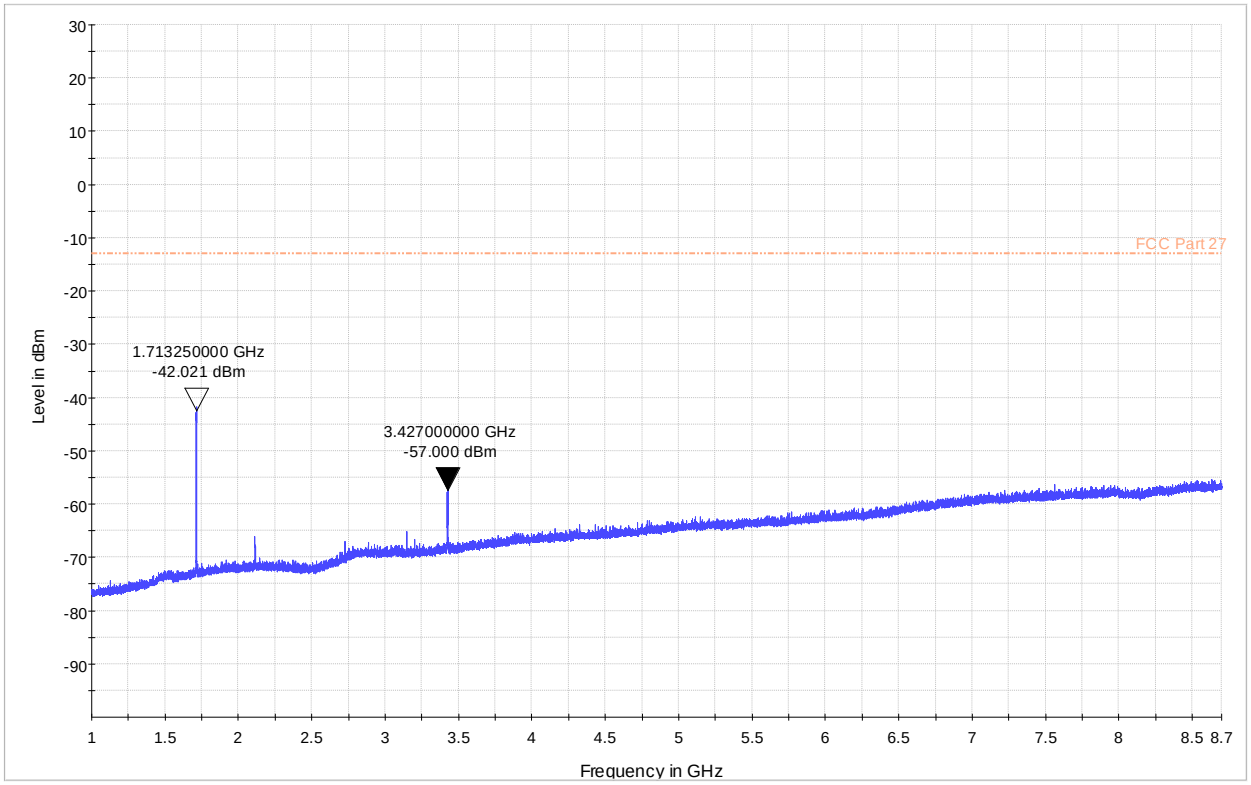
Frequency range: 1GHz to 8.7GHz

Polarization: Vertical

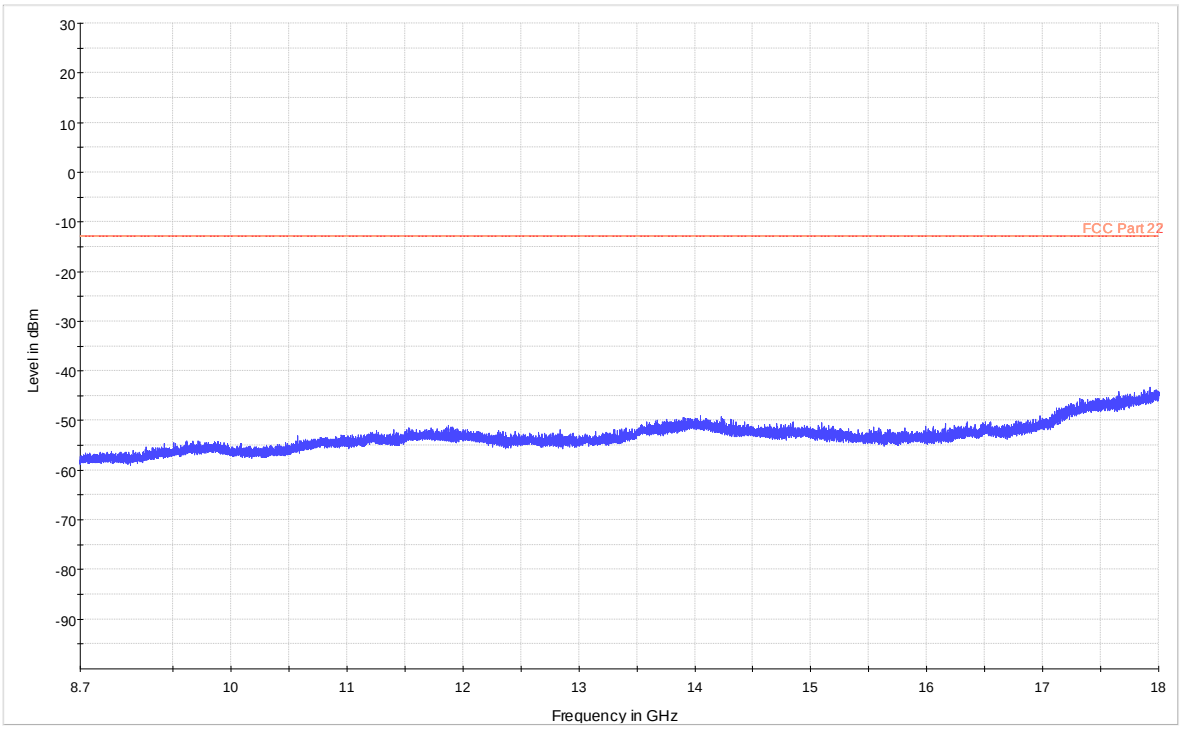


Frequency range: 8.7GHz to 18GHz

Polarization: Vertical



Frequency range: 1GHz to 8.7GHz Polarization:Horizontal

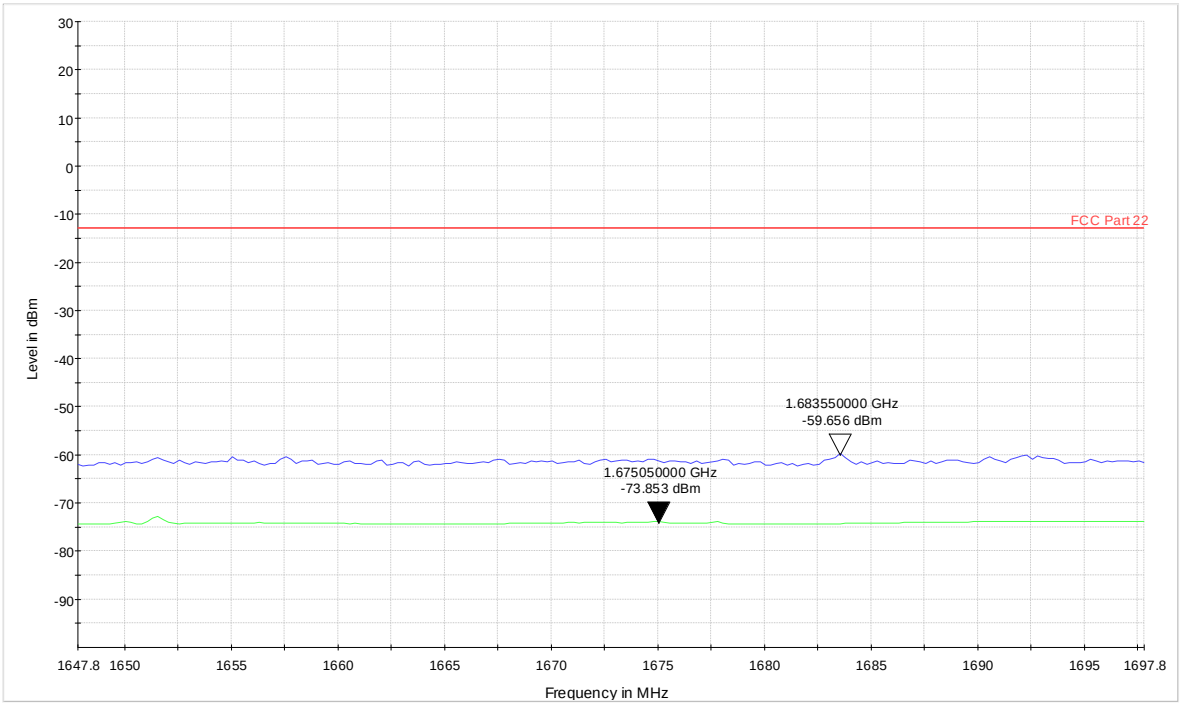


Frequency range: 8.7GHz to 18GHz Polarization:Horizontal

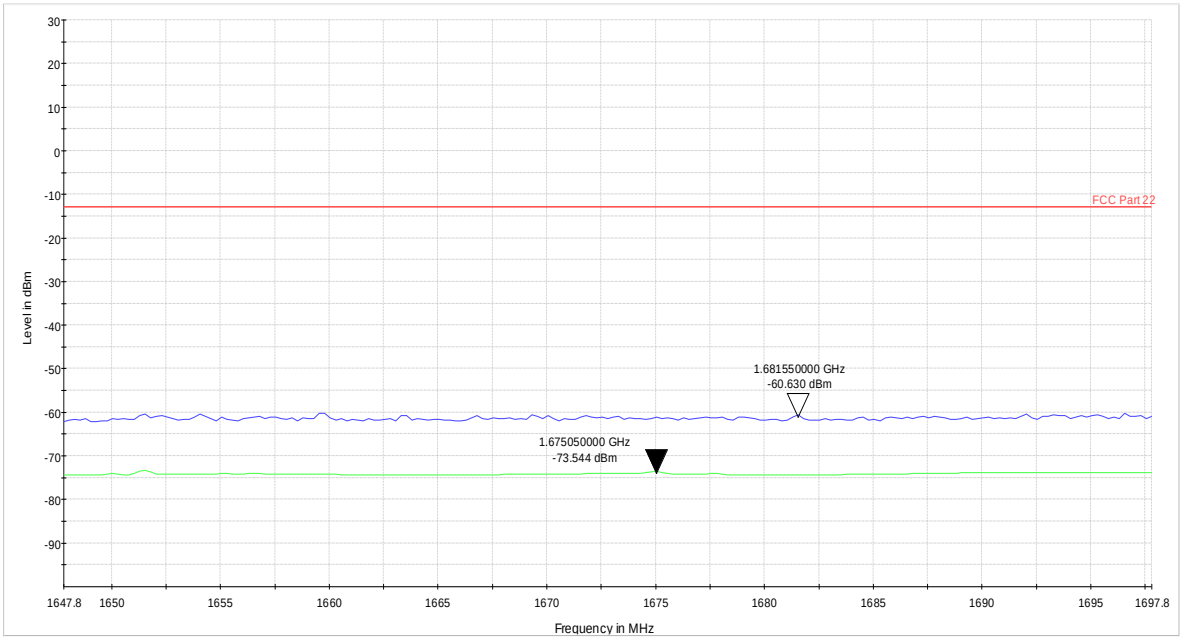
WCDMA Band 5

Channel	Operating Frequency (MHz)	Antenna Polarization	Measured Frequency (MHz)	Measured power (dBm)	Limit (dBm)	Margin (dB)
Low	826.4	V	1652.8	-59.81	-13	-46.81
		H	1652.8	-61.16	-13	-48.16
		V	2479.2	-54.94	-13	-41.94
		H	2479.2	-54.44	-13	-41.44
		V	3305.6	-53.87	-13	-40.87
		H	3305.6	-56.03	-13	-43.03
Mid	**836.4**	**V**	**1672.8**	**-59.56**	**-13**	**-46.56**
		H	**1672.8**	**-60.63**	**-13**	**-47.63**
		V	**2509.2**	**-55.47**	**-13**	**-42.47**
		H	**2509.2**	**-54.5**	**-13**	**-41.5**
		V	**3345.6**	**No Harmonic**		
		H	**3345.6**			
High	846.4	V	1692.8	-59.01	-13	-46.01
		H	1692.8	-58.91	-13	-45.91
		V	2539.2	-55.1	-13	-42.1
		H	2539.2	-55.94	-13	-42.94
		V	3385.6	No Harmonic		
		H	3385.6			

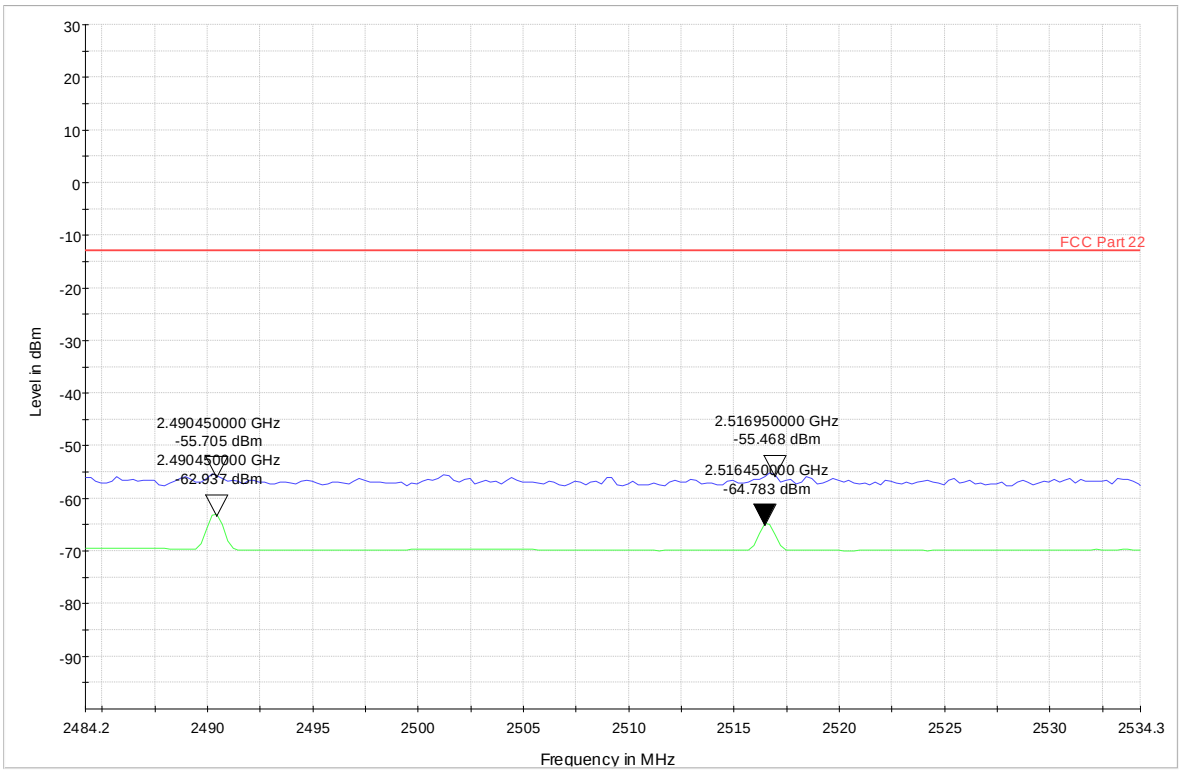
Worst case emission plots /WCDMA Band 5



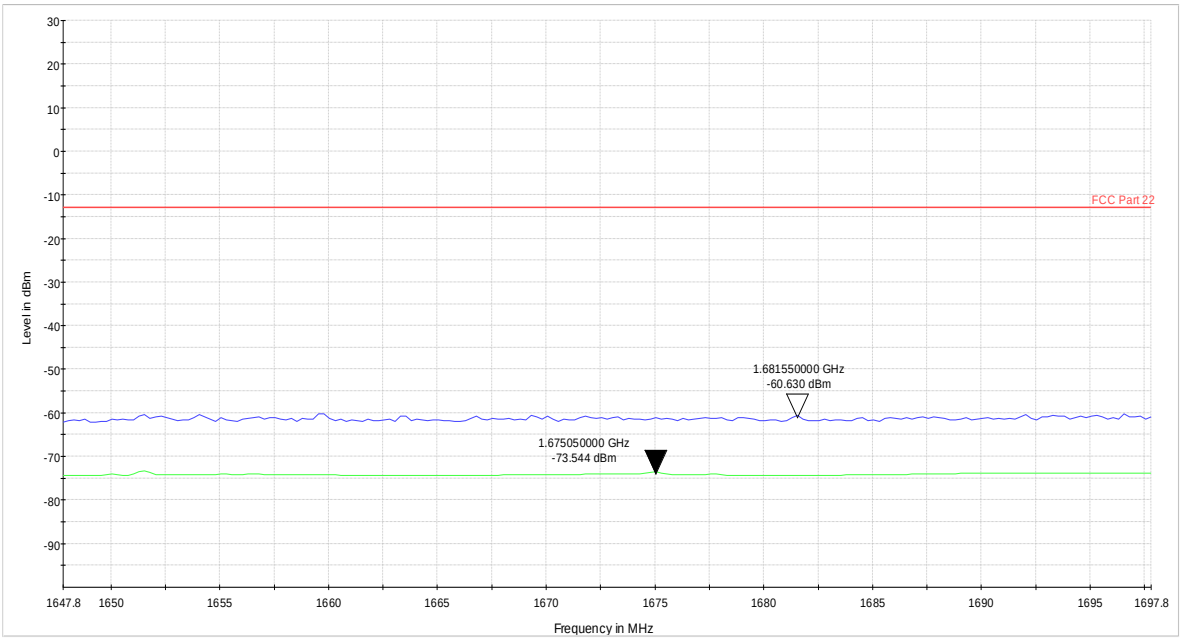
Harmonic 2 Polarization: Vertical



Harmonic 2 Polarization: Horizontal



Harmonic 3 Polarization: Vertical



Harmonic 3 Polarization: Horizontal

1 LIST OF TABLES

Table 1: List of test and measurement instruments 6
Table 2: Instrument application Software versions 6
Table 3: Ratings and System Details 7
Table 4: Power level setting/power class used for testing 8
Table 5: Report No. References 8
Table 6: Measurement Uncertainty 8
Table 7: Conducted power results-GSM 13
Table 8: Conducted power results-WCDMA 13
Table 9: ERP/EIRP test results of GSM 850 & 1900 bands 15
Table 10: ERP/EIRP test results of WCDMA Band 2 /Band 4 / Band 5 16
Table 11: Test results for frequency range 30MHz to 1GHz 18
Table 12: GPRS/EGPRS test results for above 1GHz 21
Table 13: WCDMA above 1GHz Spurious emissions 29

****END OF TEST REPORT****