



FCC / ISED Test Report

FOR:
NetraDyne, Inc.

Model Name:
DRI-128

Product Description:
Intelligent Driving Monitoring System Smart Connected Dash Cam

FCC ID: 2AM8R-DRI128
IC ID: 23098-DRI128

Applied Rules and Standards:
47 CFR Part 15.247 (DSS)
RSS-247 Issue 2 (FHSs) & RSS-Gen Issue 4

REPORT #: EMC_NETRA_002_17001_15.247_ISED_BT_DSS

DATE: 01/25/2018



A2LA Accredited

IC recognized #
3462B-2

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1 Assessment

The following device as further described in section 3 of this report was evaluated for radiated spurious emissions in simultaneous transmission of unlicensed and cellular radios according to criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

Company	Description	Model #
NetraDyne, Inc.	Intelligent Driving Monitoring System Connected Dash Cam	DRI-128

Responsible for Testing Laboratory:

01/25/2018	Compliance	James Donnellan (Lab Manager)	
Date	Section	Name	Signature

Responsible for the Report:

01/25/2018	Compliance	Issa Ghanma (EMC Engineer)	
Date	Section	Name	Signature

The test results of this test report relate exclusively to the test item specified in Section 3.
CETECOM Inc. USA 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 CETECOM Inc. USA.

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
Lab Manager:	James Donnellan
Responsible Project Leader:	Josephine Mena

2.2 Identification of the Client

Applicant's Name:	NetraDyne, Inc.
Street Address:	4350 Executive DR., suite 150
City/Zip Code	San Diego, CA 92127
Country	USA
Contact Person:	Sandeep Pandya
Phone No.	8582455169
e-mail:	Sandeep.pandya@netradyne.com

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Applicant
Manufacturers Address:	-----
City/Zip Code	-----
Country	-----

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No	DRI-128
HW Version	RevD
SW Version	0.2.1
FCC-ID	2AM8R-DRI128
IC-ID:	23098-DRI128
FWIN:	0.2.1
HVIN:	RevD
PMN:	Driver i
Product Description	Intelligent Driving Monitoring System Smart Connected Dash Cam
Module Information	
Module Name:	Jetson TX-1
Module Number:	900-82180-0001-000
FCC ID:	VOB-P2180
IC ID:	7361A-P2180
Frequency Range / number of channels:	Nominal band: 2400 MHz – 2483.5 MHz Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 78), 79 Channels
Type(s) of Modulation:	Bluetooth Basic/EDR: GFSK, $\pi/4$ DQPSK, 8DPSK
Modes of Operation:	Hopping
Antenna Information as declared:	FXP831 Patch Antenna, Internal Frequency :2.4 ~ 2.5GHz, Peak Gain: 2.5dBi(Free space) 3.0dBi(Plastic)
Max. declared output Powers form modular grant:	Conducted Power 0.012 Watts
Power Supply/ Rated Operating Voltage Range:	Low 10.5 VDC, Nominal 12 VDC, High 14.5 VDC
Operating Temperature Range	-20° to 55° C
Other Radios included in the device:	Cellular, GPS, BLE 4.0, WLAN(Wi-Fi)2.4 and 5GHz

Sample Revision	☐ Prototype Unit; ☒ Production Unit; ☐ Pre-Production
EUT Dimensions	20X8X8cm
Weight	300 grams
EUT Diameter	☒ < 60 cm ☐ Other _____

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	16300054	RevD	0.2.1	Radiated Measurements

3.3 Accessory Equipment (AE) details

AE #	Comments
1	Superstar 12V Car Battery

3.4 Test Sample Configuration

Set-up #	EUT / AE used for set-up	Comments
1	EUT #1 + AE #1	Radiated Measurements

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Comments
Op.1	BT Co-Transmission	Tera Term tool used to configure the EUT to the highest power and duty cycle. The internal antenna was connected.

3.6 Justification for Worst Case Mode of Operation

During the testing process the EUT was tested with transmitter sets on low, mid and high channels, and 98% duty cycle Co-Transmit with LTE band 2 (The highest conducted output power of Cellular radio from modular grant).

For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 Issue 2 of ISED Canada.

This test report is to support a request for new equipment authorization under the:

- FCC ID: 2AM8R-DRI128
- IC ID: 23098-DRI128

The conducted module test data can be obtained under the FCC Filing ID: VOB-P2180 / IC ID: 7361A-P2180.

Testing procedures are based on ANSI C63.10:2013 including section 7 for FHSS systems.

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(b)(1) RSS-247 5.4(b)	Maximum Peak Conducted Output Power	Nominal	-	☐	☐	☒	Note 1 Note 3 Complies
§15.247(d) RSS-247 5.5 RSS-Gen 8.10	Band Edge Compliance	Nominal	-	☐	☐	☒	Note 1 Note 3 Complies
§15.247(a)(1) RSS-247 5.1(b)	Spectrum Bandwidth	Nominal	-	☐	☐	☒	Note 1 Note 3 Complies
§15.247(a)(1) RSS-247 5.1(b)	Carrier Frequency Separation	Nominal	-	☐	☐	☒	Note 1 Note 3 Complies
§15.247(a)(1) RSS-247 5.1(d)	Number of Hopping Channels	Nominal	-	☐	☐	☒	Note 1 Note 3 Complies
§15.247(a)(1)(iii) RSS-247 5.1(d)	Time of occupancy	Nominal	-	☐	☐	☒	Note 1 Note 3 Complies
§15.247(d) §15.209 (a) RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	GFSK	☒	☐	☐	Complies
§15.207(a) RSS-Gen 8.8	AC Conducted Emissions	-	-	☐	☒	☐	Note 2 Complies

Note1: NA= Not Applicable; NP= Not Performed.

Note2: Device does not connect to AC main power.

Note3: Leveraged from module certification FCC Filing ID: VOB-P2180 / IC ID: 7361A-P2180

6 Measurements

6.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

9 kHz to 30MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

6.2 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25°C
- Relative humidity: 40-60%

6.3 Dates of Testing:

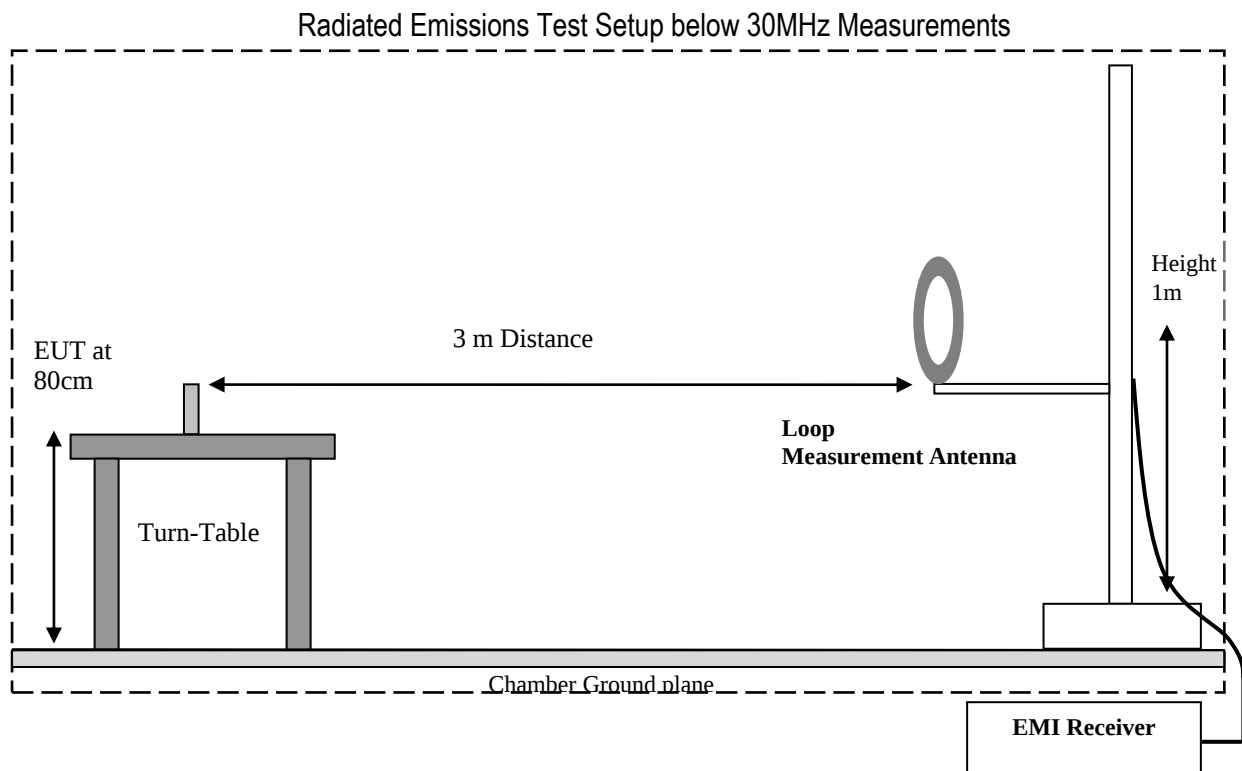
11/22/2017 – 12/04/2017

7 Measurement Procedures

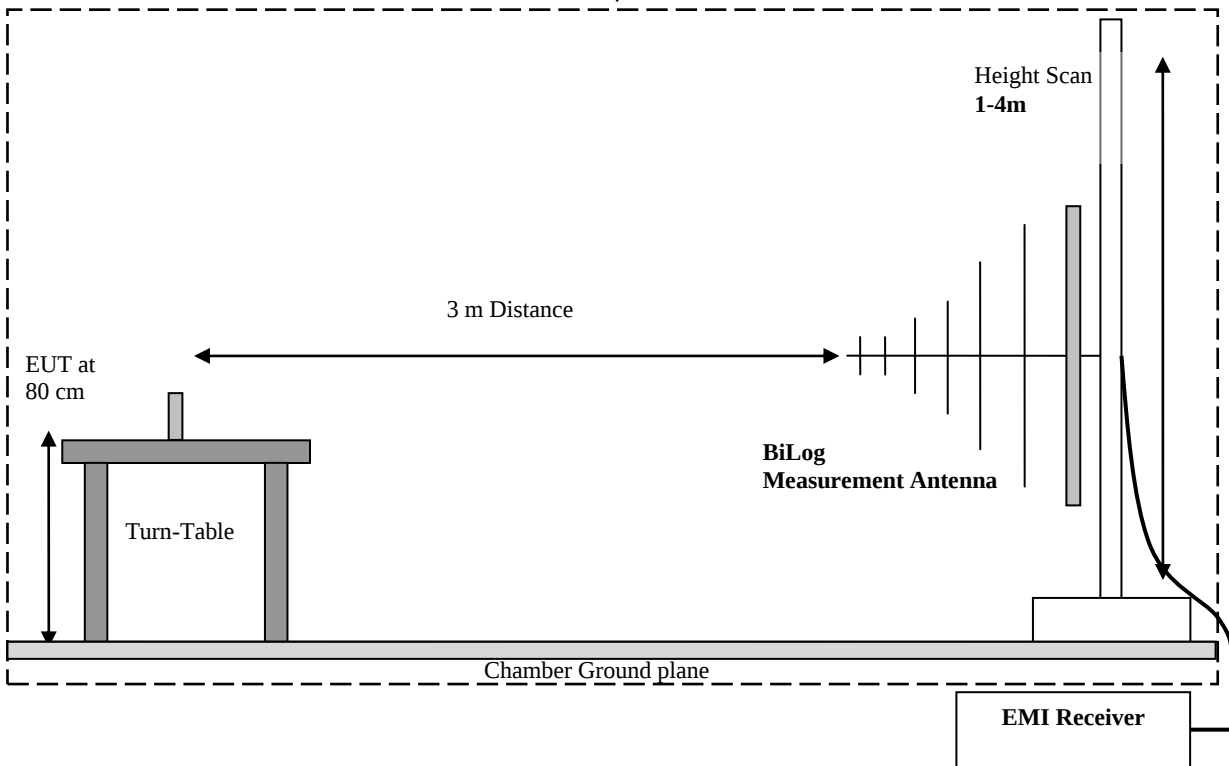
7.1 Radiated Measurement

The radiated measurement is performed according to: ANSI C63.10 (2013)

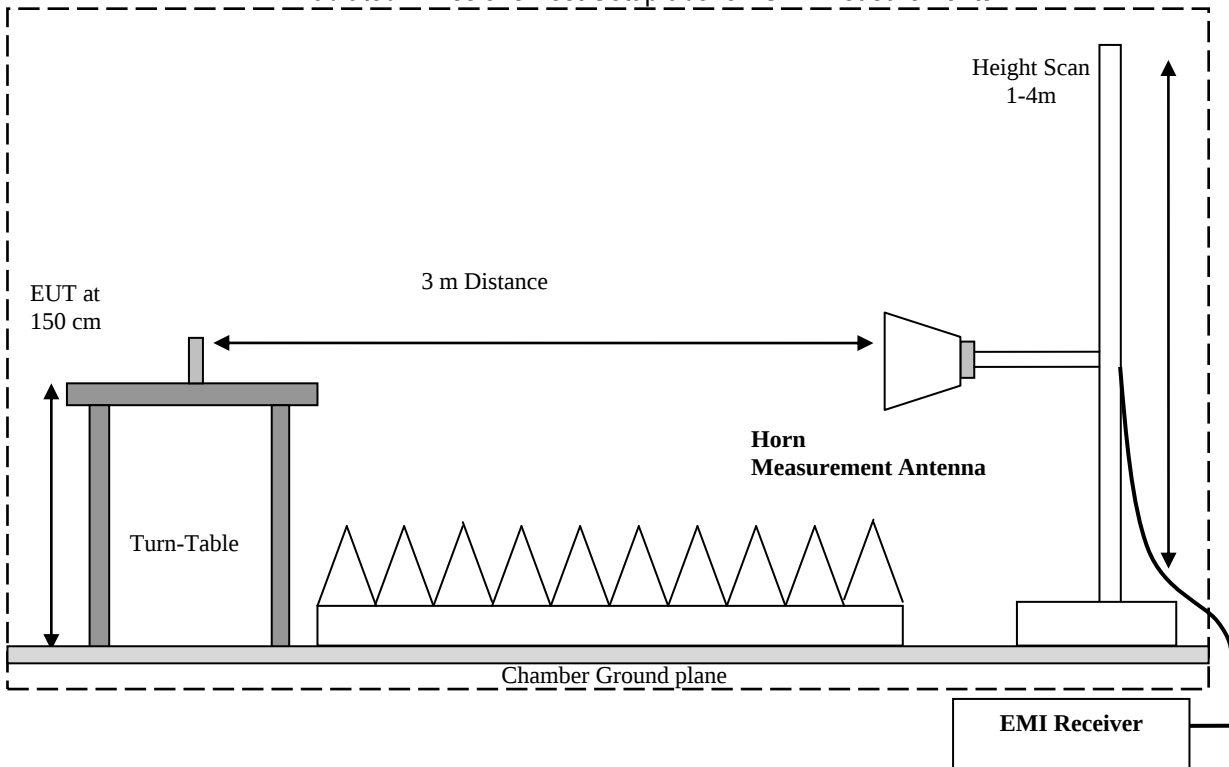
- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dB μ V
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

$$\text{FS (dB}\mu\text{V/m)} = \text{Measured Value on SA (dB}\mu\text{V)} - \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$$

Example:

Frequency (MHz)	Measured SA (dB μ V)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dB μ V/m)
1000	80.5	3.5	14	98.0

8 Test Result Data

8.1 Transmitter Spurious Emissions and Restricted Bands

8.1.1 Measurement according to ANSI C63.10

Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector = Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW = 120 KHz (<1 GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1MHz

Plots reported here represent the worst case emissions for horizontal and vertical antenna polarizations and for three orientations of the EUT. Unless mentioned otherwise, the emissions outside the limit lines in the plots are from the transmit signal.

8.1.2 Limits: FCC 15.247(d)/15.209(a) /RSS-Gen 6.13

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).
- PEAK LIMIT= 74dB μ V/m
- AVG. LIMIT= 54dB μ V/m
- Except as shown in CFR 47 Part 15.205 paragraph (d), only spurious emissions are permitted in any of the frequency bands listed below

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements described in 5.4.

The highest (or worst-case) data rate shall be recorded for each measurement.

For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation as follow:

Conversion factor (CF) = $40 \log (D/d) = 40 \log (300 \text{ m} / 3 \text{ m}) = 80 \text{ dB}$

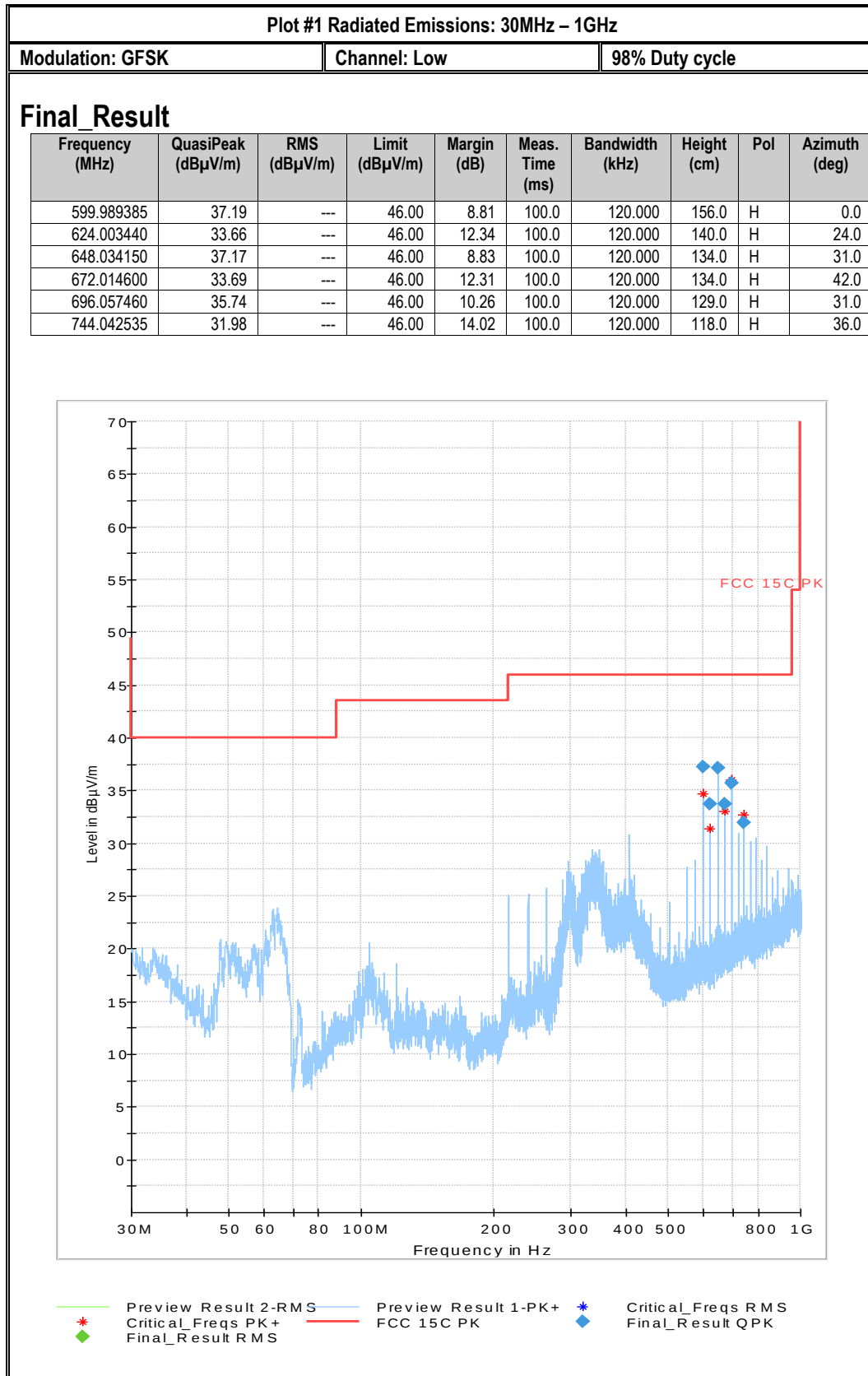
8.1.3 Test conditions and setup:

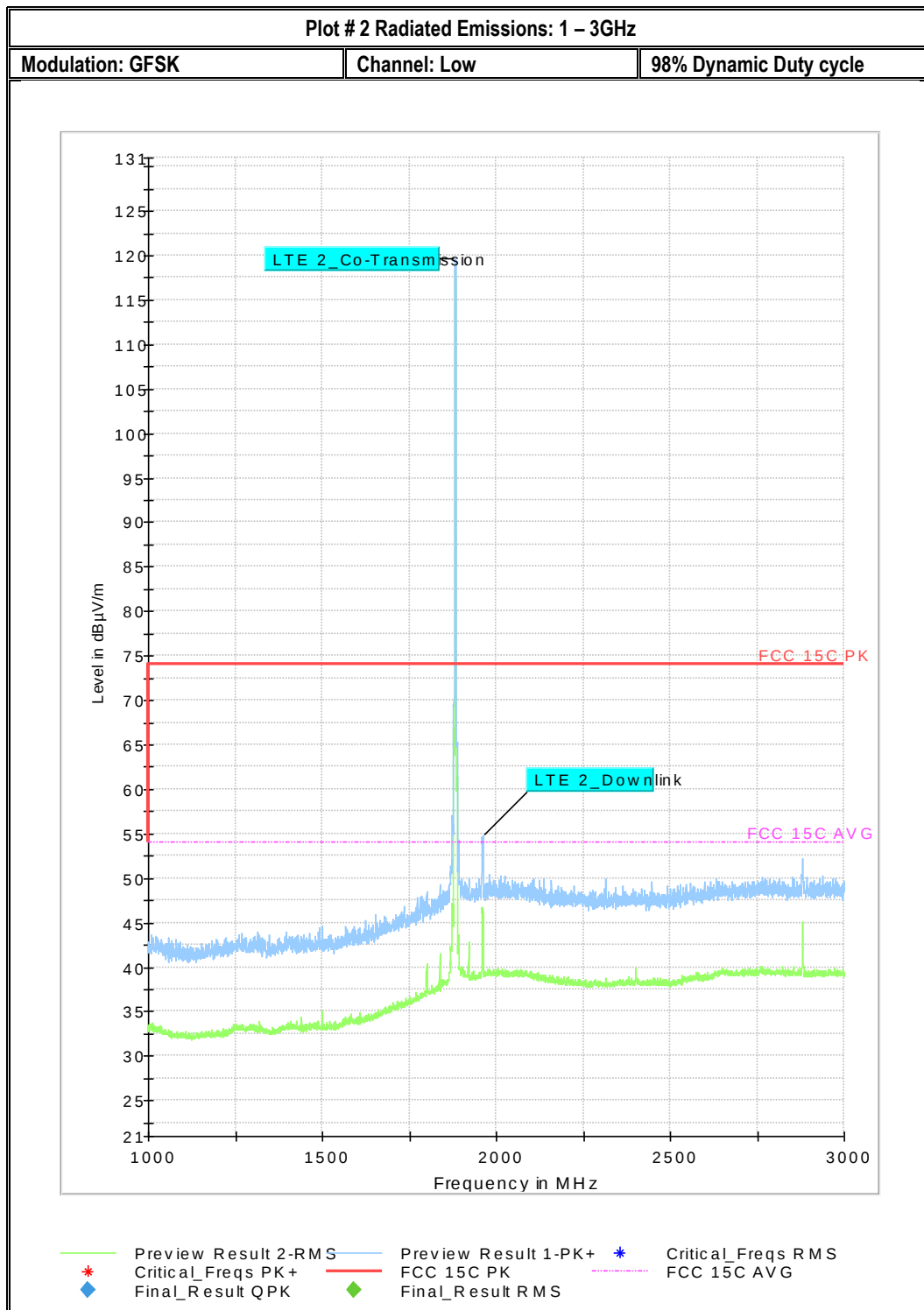
Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23° C	1	GFSK continuous fixed channel Co-Transmission with Cellular LTE2 Mid channel	Vehicle 12 VDC

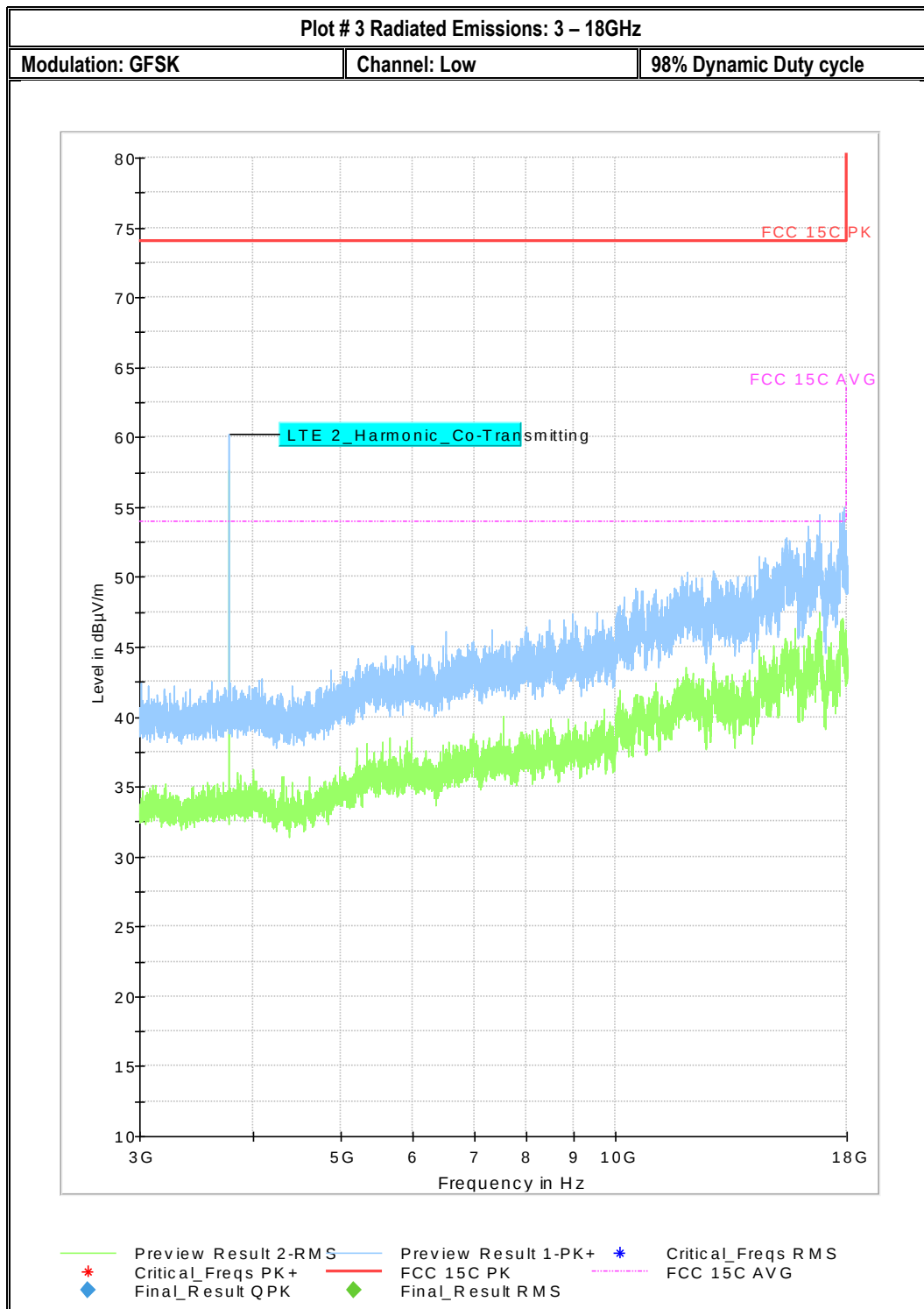
8.1.4 Measurement result:

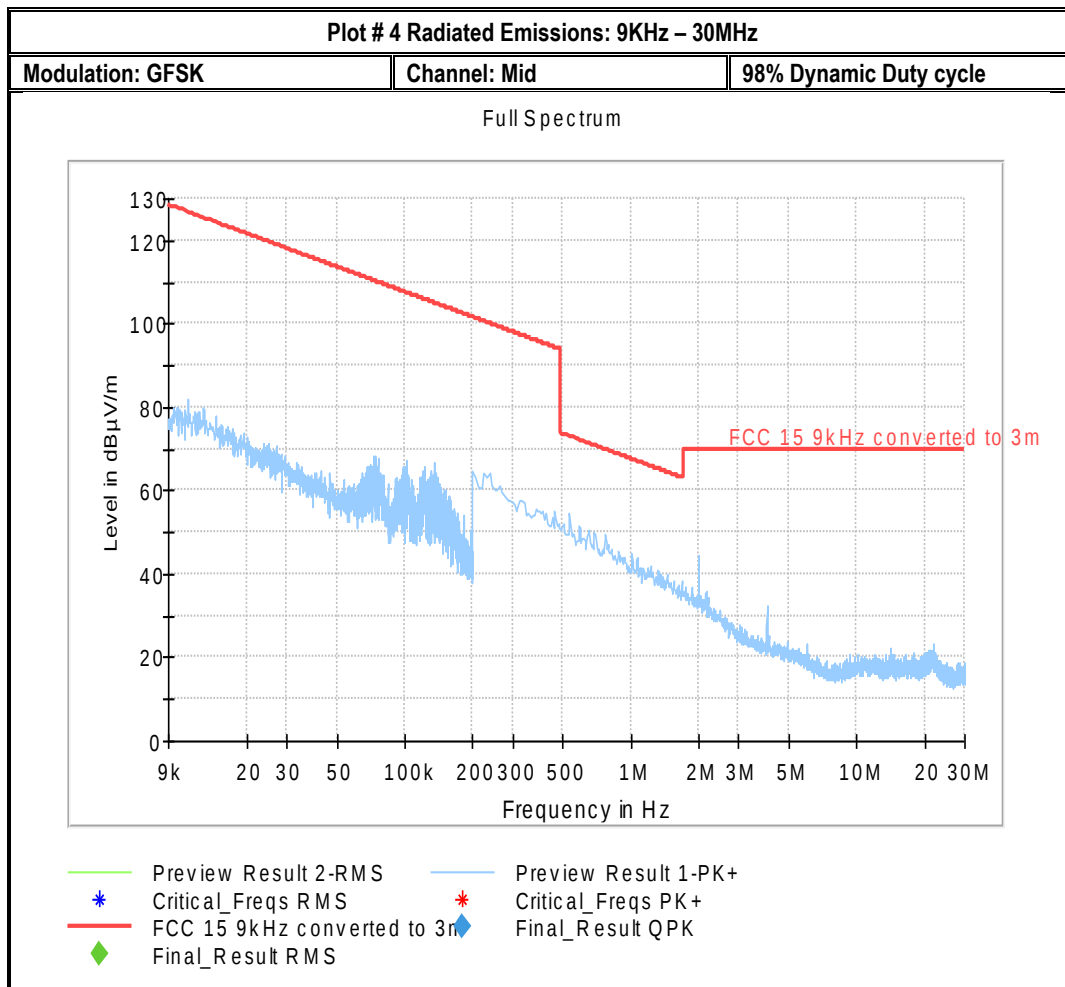
Plot #	Channel #	Scan Frequency	Limit	Result
1 – 3	Low	30 MHz – 18 GHz	See section 8.1.2	Pass
4 – 8	Mid	9 kHz – 40 GHz	See section 8.1.2	Pass
9 – 11	High	30 MHz – 18 GHz	See section 8.1.2	Pass

8.1.5 Measurement Plots:









Plot #5 Radiated Emissions: 30MHz – 1GHz

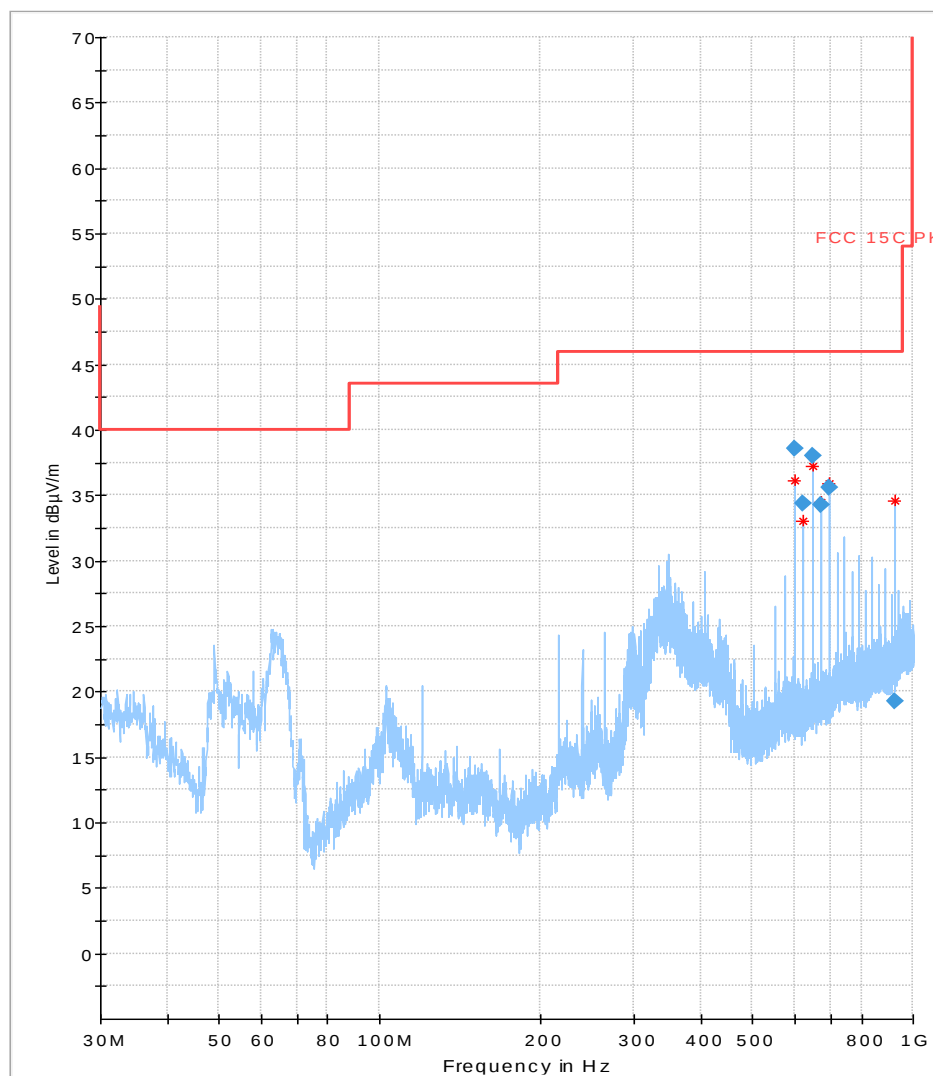
Modulation: GFSK

Channel: Mid

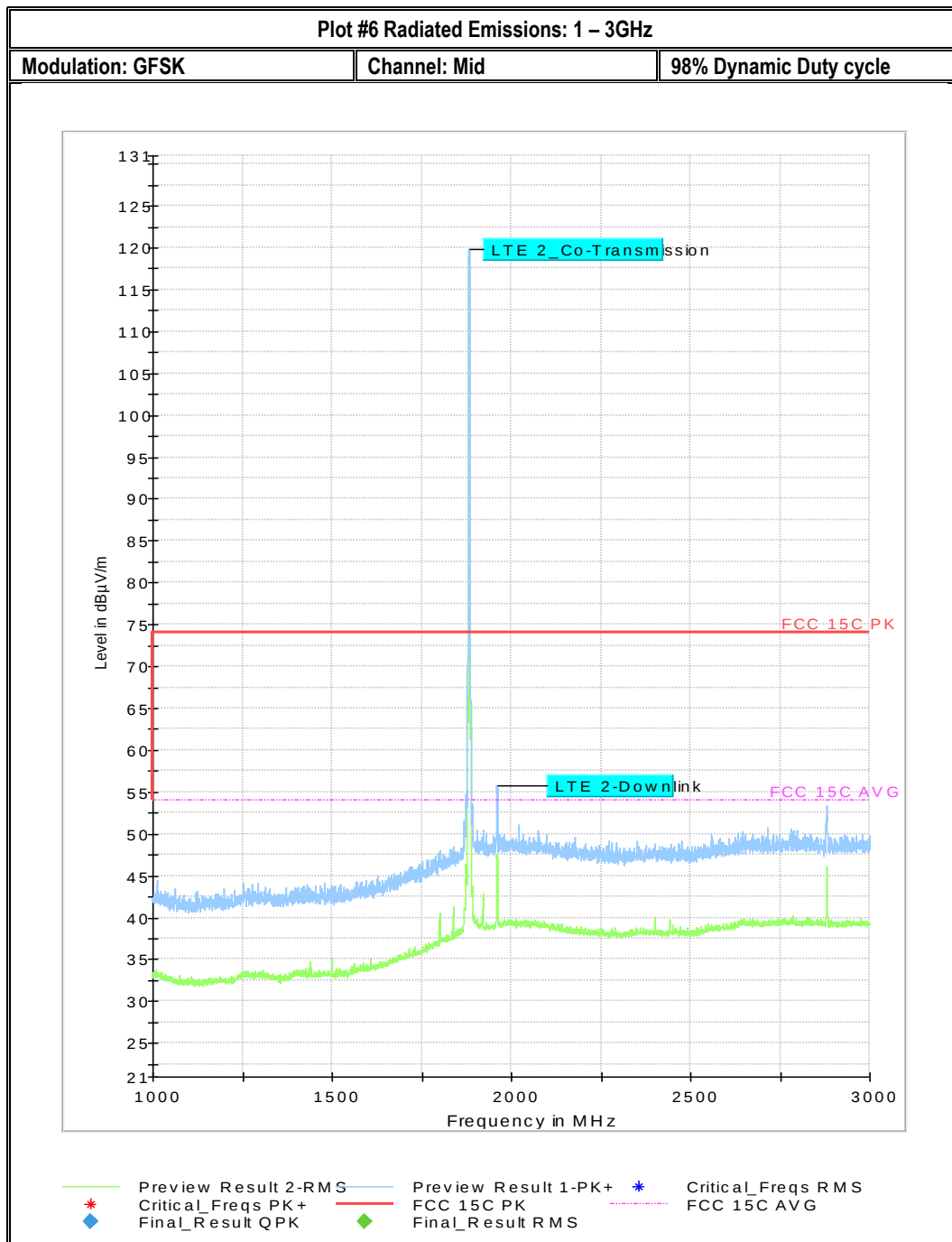
98% Dynamic Duty cycle

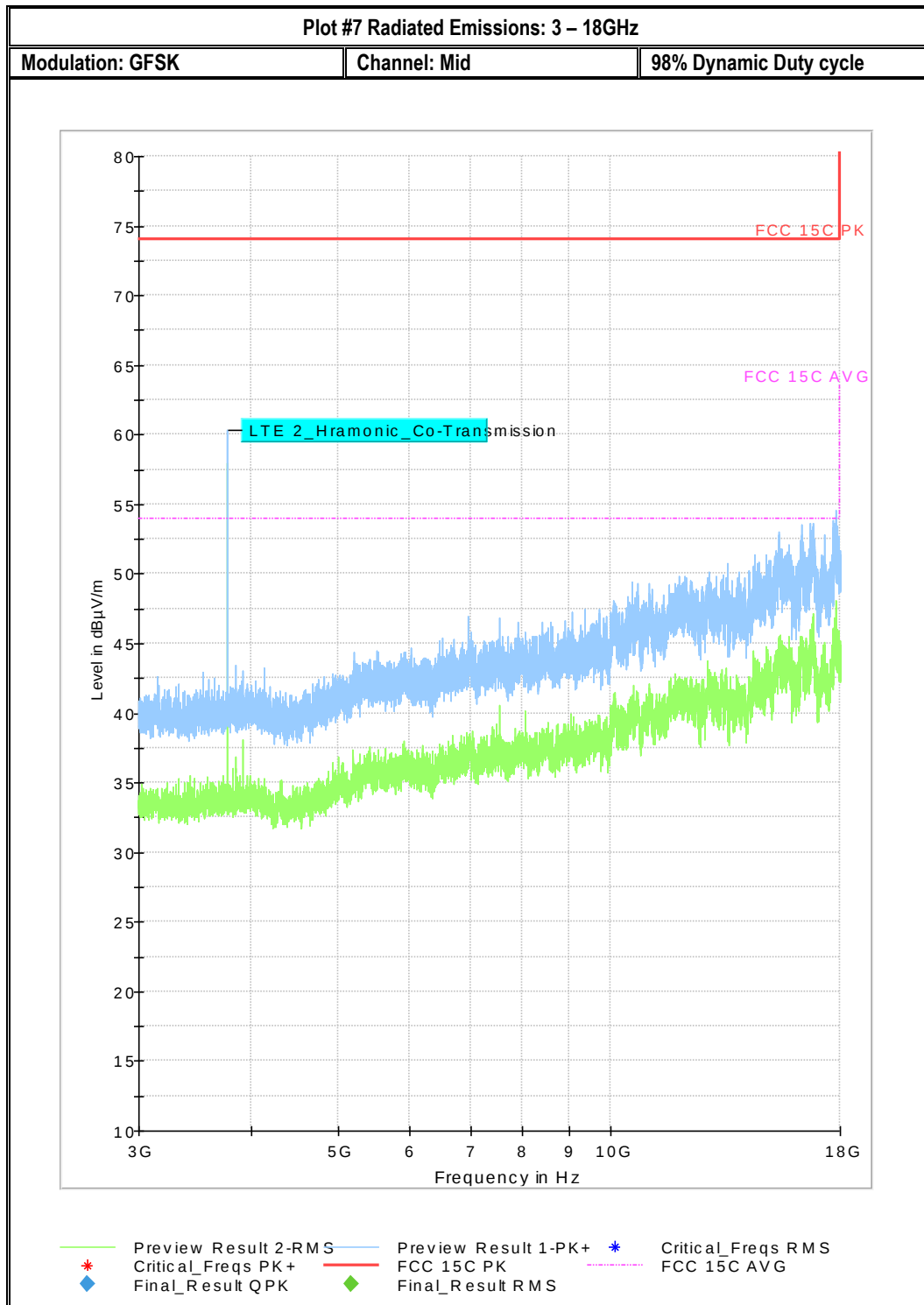
Final_Result

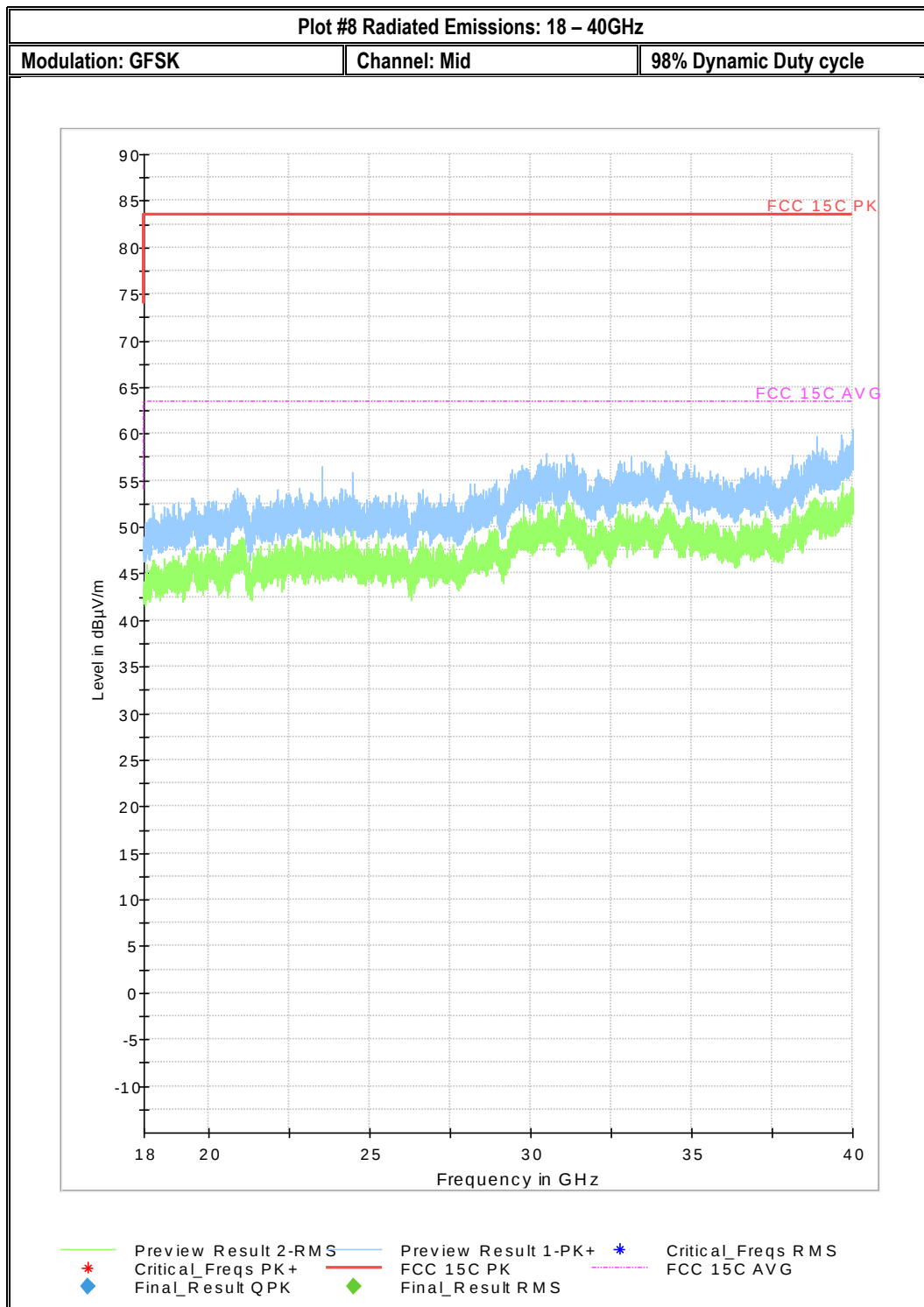
Frequency (MHz)	QuasiPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
600.020410	38.57	---	46.00	7.43	100.0	120.000	155.0	H	343.0
624.012095	34.42	---	46.00	11.58	100.0	120.000	143.0	H	0.0
648.044895	38.01	---	46.00	7.99	100.0	120.000	134.0	H	2.0
672.003215	34.30	---	46.00	11.70	100.0	120.000	139.0	H	5.0
696.042385	35.57	---	46.00	10.43	100.0	120.000	124.0	H	25.0
923.622450	19.28	---	46.00	26.72	100.0	120.000	300.0	V	12.0



◆ Preview Result 2-RMS
◆ Critical_Freqs PK+
◆ Final_Result RMS
— Preview Result 1-PK+
— FCC 15C PK
* Critical_Freqs RMS
◆ Final_Result QPK







Plot #9 Radiated Emissions: 30MHz – 1GHz

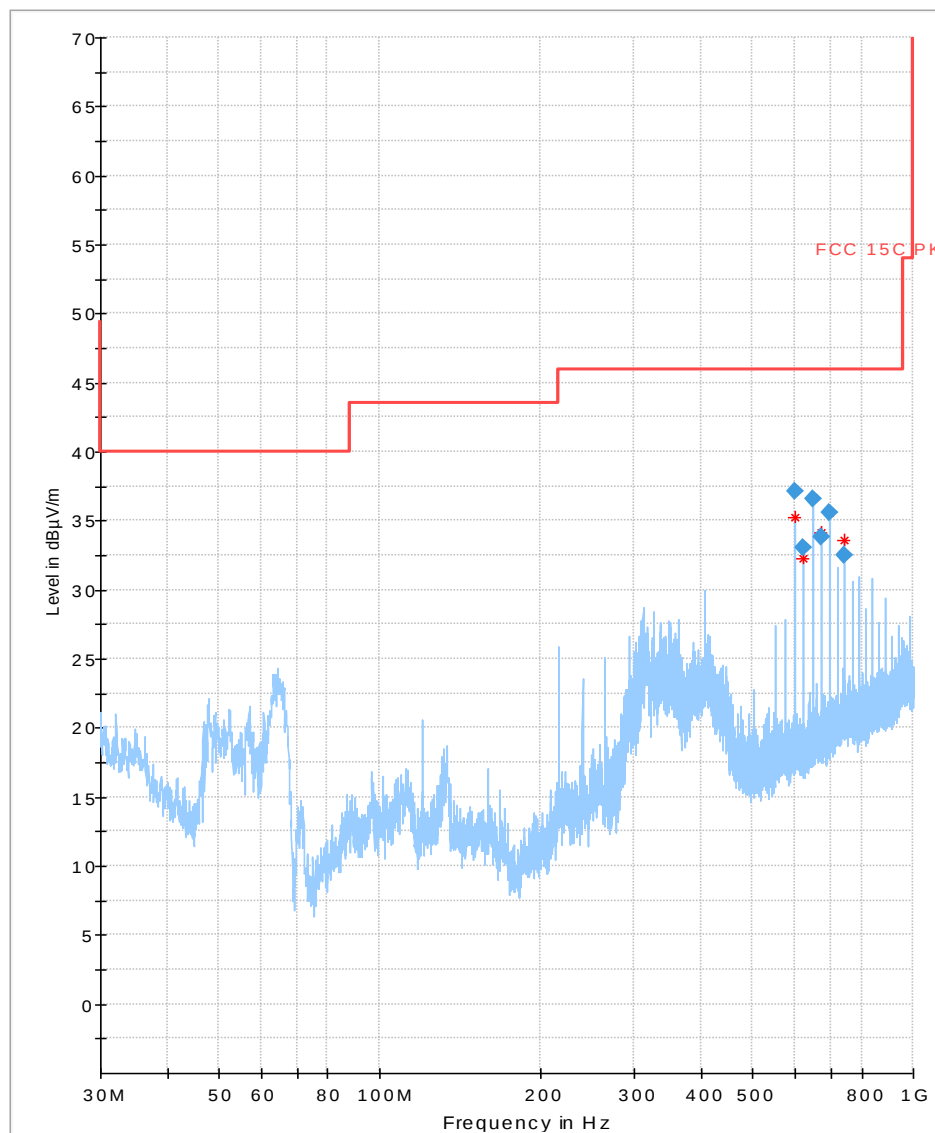
Modulation: GFSK

Channel: High

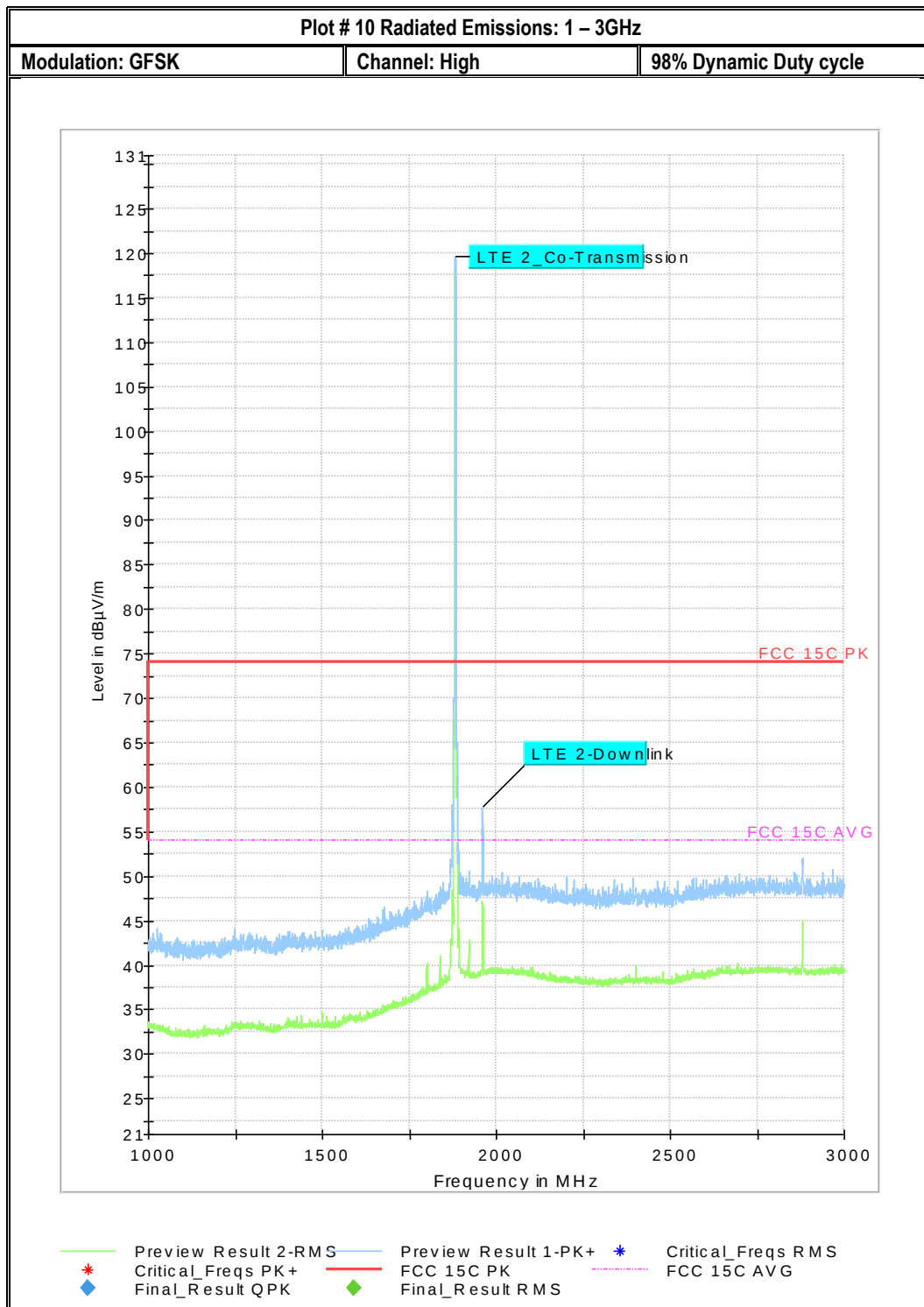
98% Dynamic Duty cycle

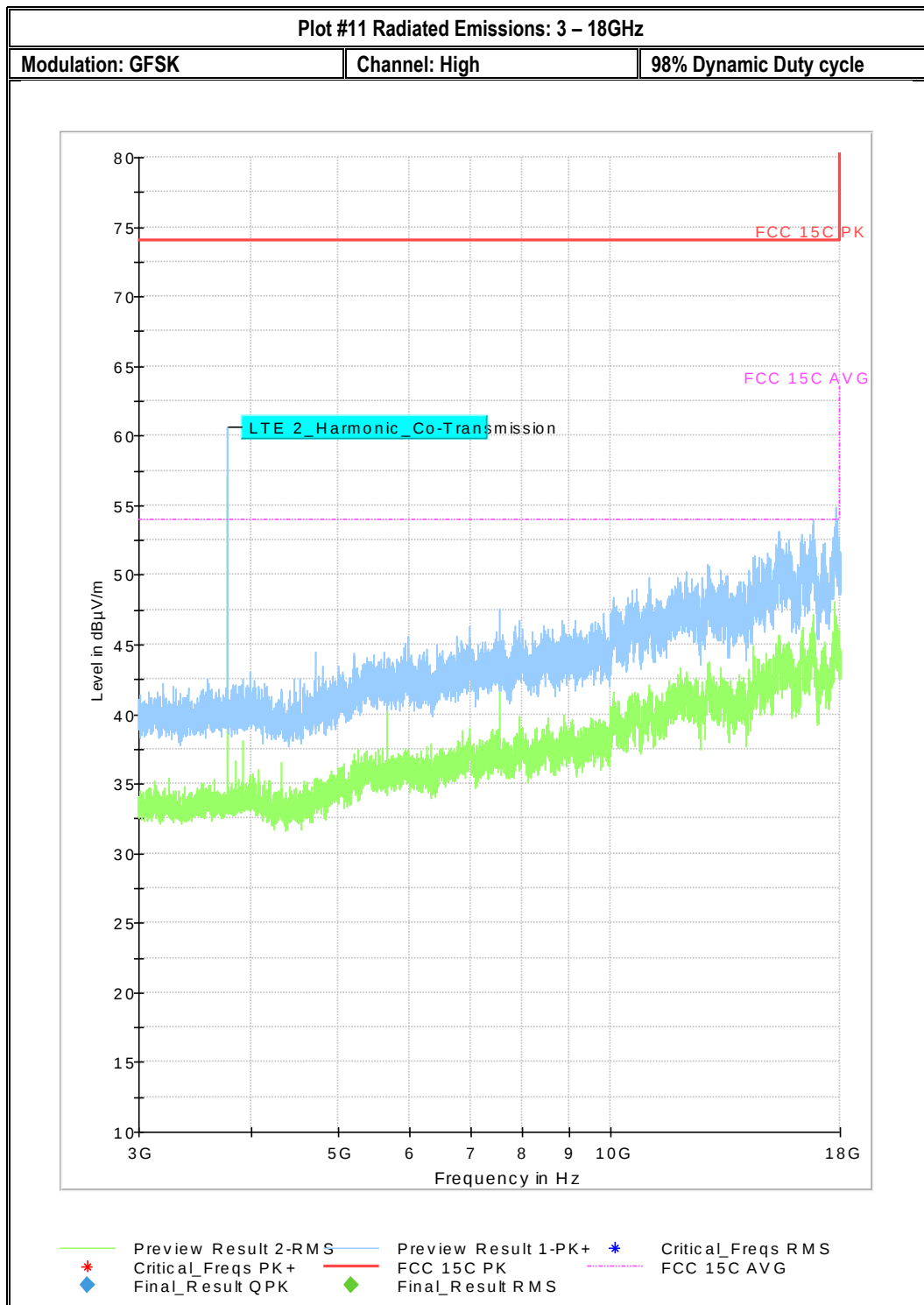
Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	RMS (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
599.996735	37.18	---	46.00	8.82	100.0	120.000	155.0	H	13.0
623.994640	33.09	---	46.00	12.91	100.0	120.000	139.0	H	15.0
648.001120	36.61	---	46.00	9.39	100.0	120.000	139.0	H	14.0
672.004605	33.81	---	46.00	12.19	100.0	120.000	137.0	H	22.0
696.039555	35.56	---	46.00	10.44	100.0	120.000	124.0	H	28.0
744.034320	32.49	---	46.00	13.51	100.0	120.000	100.0	H	-15.0



◆ Preview Result 2-RMS
* Critical_Freqs PK+
◆ Final_Result RMS
— Preview Result 1-PK+
— FCC 15C PK
◆ Critical_Freqs RMS
◆ Final_Result QPK





9 Test setup photos

Setup photos are included in supporting file name: "EMC_NETRA_002_17001_FCC_ISED_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
PASSIVE LOOP ANTENNA	LOOP ANTENNA	ETS LINDGREN	6512	00164698	3 YEARS	08/08/2017
CBL 6141B BILOG ANTENNA	BOLOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
3117 HORN ANTENNA	HORN ANTENNA	ETS LINDGREN	3117	00167061	3 YEARS	08/08/2017
3116C HORN ANTENNA	HORN ANTENNA	ETS LINDGREN	3116C	00166821	3 YEARS	09/24/2017
SPECTRUM ANALYZER FSU26	SIGNAL ANALYZER	R&S	FSU26	200065	2 YEARS	03/07/2017
CMU200	UNIVERSAL RADIO COMMUNICATION	R&S	CMU200	121673	2 YEARS	06/07/2017
CMW500	WIDEBAND RADIO COMMUNICATION	R&S	CMW500	125231	2 YEARS	10/07/2017
FSV	SIGNAL ANALYZER	R&S	FSV 40	101022	2 YEARS	07/05/2017
DIGITAL BAROMETER	COMPACT DIGITAL BAROMETER	CONTROL COMPANY	35519-055	91119547	1 YEARS	06/05/2017
TM320	THRMOMETER HUMIDIY	DICKSON	TM320	16253639	1 YEARS	11/02/2017

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 Revision History

Date	Report Name	Changes to report	Report prepared by
01/25/2018	EMC_NETRA_002_17001_15.247_ISED_BT_DSS	Initial Version	Issa Ghanma