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July 29, 2019

Harris Corp- Communication Systems
221 Jefferson Ridge Parkway,
Lynchburg, VA 24501

Dear Dave Scherer,

Enclosed is the EMC Wireless test report for compliance testing of the Harris Corp- Communication Systems, Harris RF-7800W Broadband Ethernet Radio, tested to the requirements of Title 47 of the Code of Federal Regulations (CFR), Part 90 Subpart Y for Land Mobile Radio Services.

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Mae Ramirez
Documentation Department

Reference: (\Harris Corp- Communication Systems\ EMC94059-FCC90Y RF Exposure Rev. 1)

Electromagnetic Compatibility Criteria
Test Report

for the

Harris Corp- Communication Systems
Model Harris RF-7800W Broadband Ethernet Radio

Tested under
The FCC Certification Rules
contained in
Title 47 of the CFR
Part 90 Subpart Y
Part 2.1091 KDB 447498 D01

MET Report: EMC94059-FCC90Y RF Exposure Rev. 1

July 29, 2019

Prepared For:

Harris Corp- Communication Systems
221 Jefferson Ridge Parkway,
Lynchburg, VA 24501

Prepared By:
MET Laboratories, Inc.
914 West Patapsco Avenue,
Baltimore, MD 21230

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Arsalan Hasan, Project Engineer
Electromagnetic Compatibility Lab

Mae Ramirez
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Parts 15B, 15.407, of the FCC Rules under normal use and maintenance.

Benjamin Taylor,
Wireless Manager, Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	July 29, 2019	Initial Issue.
1	November 11, 2019	TCB Updates.

Table of Contents

List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**Cal**ibration
d	**M**easurement **D**istance
dB	**D**eci**b**els
dBµA	**D**eci**b**els above one **micro**amp
dBµV	**D**eci**b**els above one **micro**volt
dBµA/m	**D**eci**b**els above one **micro**amp **per m**eter
dBµV/m	**D**eci**b**els above one **micro**volt **per m**eter
DC	**D**irect **C**urrent
E	**E**lectric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectro**s**tatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	**F**requency
FCC	**F**ederal **C**ommunications **C**ommission
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	**Hz**
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	**Kilohertz**
kPa	**Kilopa**scal
kV	**Kilovolt**
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	**Mega**hertz
µH	**Microh**enry
µ	**Microf**arad
µs	**Micros**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts **per m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Purpose of Test

An EMC evaluation was performed to determine compliance of the Harris Corp- Communication Systems Harris RF-7800W Broadband Ethernet Radio, with the requirements of Part 90 Subpart Y. All references are to the most current version of Title 47 of the Code of Federal Regulations in effect. In accordance with §2.1033, the following data is presented in support of the Certification of the Harris RF-7800W Broadband Ethernet Radio. Harris Corp- Communication Systems should retain a copy of this document which should be kept on file for at least two years after the manufacturing of the Harris RF-7800W Broadband Ethernet Radio, has been **permanently** discontinued.

B. Executive Summary

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 90, Subpart Y. All tests were conducted using measurement procedure ANSI C63.26 2015.

Title 47 of the CFR, Part 90, Subpart Y, and FCC Reference and Test Description	Compliance / Comments
90.1217 RF Exposure	Compliant

Table 1. Executive Summary of EMC Part 90Y ComplianceTesting

II. Equipment Configuration

A. Overview

MET Laboratories, Inc. was contracted by Harris Corp- Communication Systems to perform testing on the Harris RF-7800W Broadband Ethernet Radio, under Harris Corp- Communication Systems' purchase order number 67583.

This document describes the test setups, test methods, required test equipment, and the test limit criteria used to perform compliance testing of the Harris Corp- Communication Systems Harris RF-7800W Broadband Ethernet Radio.

The results obtained relate only to the item(s) tested.

Model(s) Tested:	Harris RF-7800W Broadband Ethernet Radio	
Model(s) Covered:	Harris RF-7800W Broadband Ethernet Radio	
Antennas Tested:	RF-7800W-AT202 RF-7800W-AT203 RF-7800W-AT206 RF-7800W-AT207	
Antennas Covered:	RF-7800W-AT201 RF-7800W-AT246	
EUT Specifications:	Primary Power: 52 VDC	
	FCC ID: AQZ-RF-7800W-RPG2	
	Type of Modulations:	QPSK 1/16, 16-QAM, 64-QAM, 256-QAM
	Equipment Code:	TNB
	Max. RF Output Power:	26.20 dBm (8dBi/5dBi Antenna) PTMP 26.20 dBm (13.5dBi Antenna) PTMP 26.23 dBm (26dBi/21dBi Antenna) PTP 26.21 dBm (30dBi Antenna) PTP
	EUT Frequency Ranges:	4940 – 4990 MHz
	Bandwidths:	5/10/20 MHz
Analysis:	The results obtained relate only to the item(s) tested.	
Duty Cycle Tested:	100%	
Environmental Test Conditions:	Temperature: 15-35° C	
	Relative Humidity: 30-60%	
	Barometric Pressure: 860-1060 mbar	
Type of Filing:	Original	
Evaluated by:	Arsalan Hasan	
Report Date(s):	July 10, 2019	

Table 2. EUT Summary

B. References

CFR 47, Part 90, Subpart Y	Private Land Mobile radio Services : Regulations governing licensing and use of frequencies in the 4940-4990MHz band.
ANSI C63.4:2014	Methods and Measurements of Radio-Noise Emissions from Low-Voltage Electrical And Electronic Equipment in the Range of 9 kHz to 40 GHz
ISO/IEC 17025:2005	General Requirements for the Competence of Testing and Calibration Laboratories
ANSI C63.26:2015	American National Standard for Compliance testing of Transmitters Used in Liscensed Radio Services
KDB 971168 D01 Power Meas License Digital Systems v02r02	Measurement guidance for certification of licensed digital transmitters.
KDB 662911 D01 Multiple Transmitter Output v02r01	Missions Testing of Transmitters with Multiple Outputs in the same band.

Table 3. References

C. Test Site

All testing was performed at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, MD 21230. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

Radiated Emissions measurements were performed in a 3 semi-anechoic chamber (equivalent to an Open Area Test Site). In accordance with §2.948(a)(3), a complete site description is contained at MET Laboratories.

D. Measurement Uncertainty

Test Method	Typical Expanded Uncertainty	K	Confidence Level
RF Frequencies	±4.52 Hz	2	95%
RF Power Conducted Emissions	±2.32 dB	2	95%
RF Power Conducted Spurious Emissions	±2.25 dB	2	95%
RF Power Radiated Emissions	±3.01 dB	2	95%

Table 4. Uncertainty Calculations Summary

E. Description of Test Sample

The Harris Corp- Communication Systems Harris RF-7800W Broadband Ethernet Radio, Equipment Under Test (EUT), is used to provide long-range, high-throughput Ethernet network backhaul in outdoor point-to-point and point-to-multipoint scenarios.

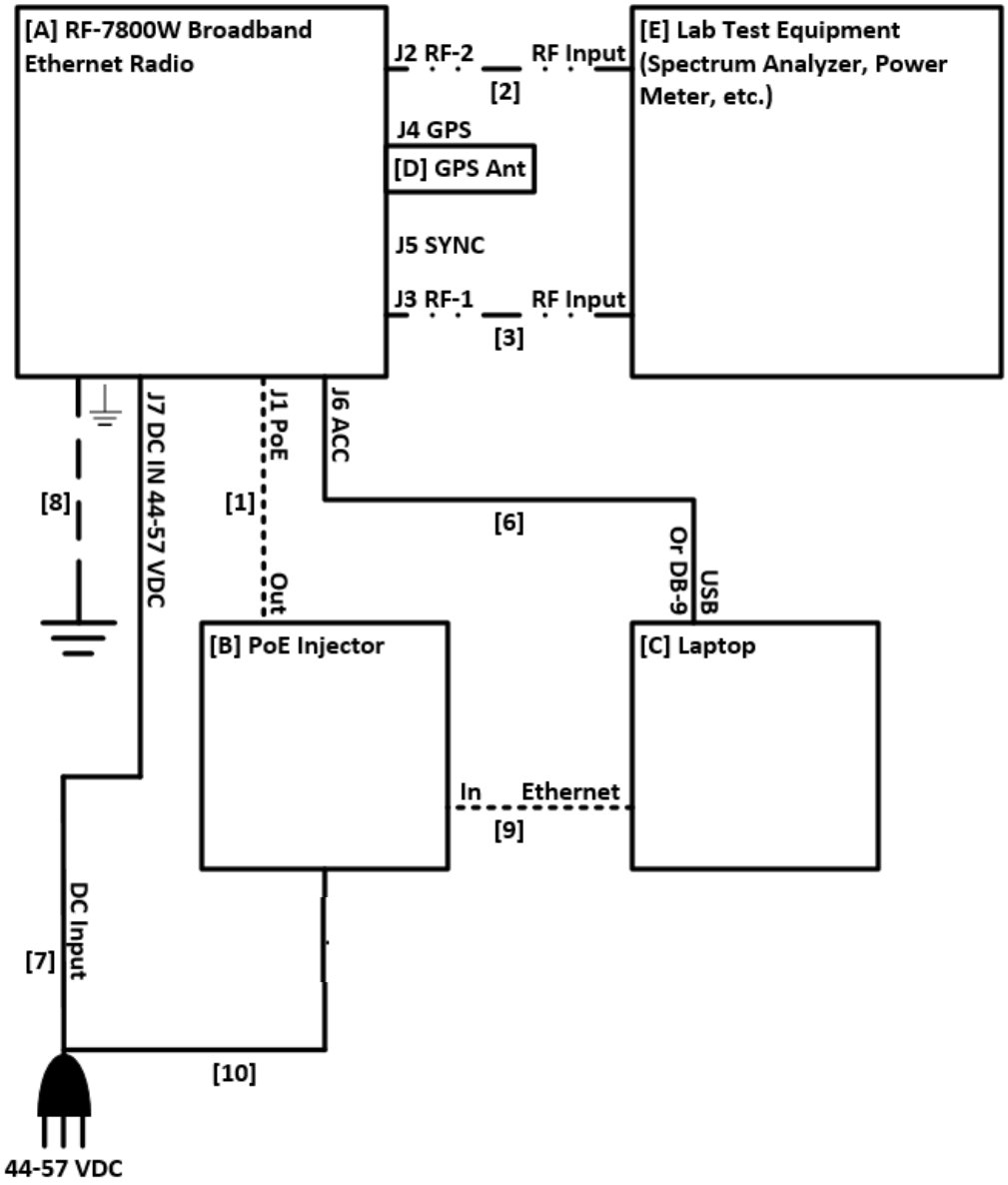

Figure 1. Block Diagram of Test Configuration

F. Equipment Configuration

The EUT was set up as outlined in Figure 1 and 2. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Slot #	Name / Description	Model Number	Part Number	Serial Number	Rev. #
A		Broadband Ethernet Radio	RF-7800W-RP500	12069-5010-01	A01067 or A01056	T502C

Table 5. Equipment Configuration

G. Support Equipment

Support equipment necessary for the operation and testing of the EUT is included in the following list.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
B	DC PoE Injector	L-Com		Not Applicable
C	Laptop	Panasonic	CF-29/CF-31	Not Applicable
D	GPS Antenna	Harris	12069-3160-01	Not Applicable
E	Lab Test Equipment (Spectrum Analyzer)			
F	Lab Test Equipment (Signal Generator)			
G	2-way Splitter	Narda	4314B-2	Not Available
H	30 dB Attenuator	Narda	Micro-Pad 4779-30	Not Available
K	N[M]-to-SMA[F] Adaptor			Not Available
L	N[F]-to-SMA[F] Adaptor			Not Available
M	SMA[M]-to-SMA[M] Adaptor			Not Available
N	Circulator	Narda	4924	Not Available
O	50 Ohm Terminator			Not Available

The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

Table 6. Support Equipment

H. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty	Length as tested (m)	Max Length (m)	Shielded? (Y/N)	Termination Box ID & Port Name
1	J1 PoE	Power over Ethernet (Cat6)	1	~30	90	Yes	B.Out
2	J2 RF-2	Coaxial RF (SMA[M]-to-SMA[M])	2	0.91	0.5	Yes	E.RF Input
3	J3 RF-1	Coaxial RF (SMA[M]-to-SMA[M])	2	0.91	0.5	Yes	E.RF Input
4	J4 GPS	Direct connection to GPS Antenna (refer to Ref ID *D*)	1	N/A	N/A	N/A	D
5	J5 SYNC	Unused, future use	-	N/A	N/A	N/A	N/A
6	J6 ACC	Configuration/Monitoring (Serial Communications)	1	15	90	Yes	C.USB Or C.DB-9
7	J6 DC IN 44-57 VDC	DC Power	1		90	Yes	
8	⏚	Ground Strap	1	0.5	0.5	N/A	Ground
9	In	Ethernet (Cat6)	1	3	100 minus length of Ref ID *1*	Yes	C.Ethernet
10	N/A	DC Input (Barrel Connector)	1	1.8	2	No	44-57 V
11	N/A	Coaxial RF (SMA[M]-to-SMA[M])	3	1	N/A	Yes	N/A

Table 7. Ports and Cabling Information

I. Mode of Operation

Emissions:

The RF-7800W Broadband Ethernet Radio will be put into constant transmit mode and its RF transmissions will be measured on the lab test equipment (Spectrum Analyzer, Power Meter, etc.).

J. Method of Monitoring EUT Operation

Consistent with the Mode of Operation section above, there needs to be a means of continuously monitoring the operation of the EUT.

Emissions:

1. RF transmissions will be present on the lab test equipment (Spectrum Analyzer, Power Meter, etc.).
2. RF transmissions will not be present on the lab test equipment (Spectrum Analyzer, Power Meter, etc.).

K. Modifications

a) Modifications to EUT

No modifications were made to the EUT.

b) Modifications to Test Standard

No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Harris Corp- Communication Systems upon completion of testing.

L. Antenna Key

The plots in this report reference the antennas' physical description. This table has been added in order to reference the antennas' model numbers.

Physical Description	Antenna	Type	Gain	Mode of Operation
1' Panel	RF-7800W-AT201	Panel	21 dBi	Point-to-Point (only)
2' Panel	RF-7800W-AT202	Panel	26 dBi	Point-to-Point (only)
3' Parabolic	RF-7800W-AT203	Dish	30 dBi	Point-to-Point (only)
8 Omni	RF-7800W-AT206	Omni	8 dBi	Point-to-Multipoint (only)
5 Omni	RF-7800W-AT246	Omni	5 dBi	Point-to-Multipoint (only)
90 degree sector	RF-7800W-AT207	Sector	13.5 dBi	Point-to-Multipoint (only)

Table 8. Antenna Key

III. Electromagnetic Compatibility Criteria for Intentional Radiators

Electromagnetic Compatibility Criteria for Intentional Radiators

§ 90.1217 Maximum Permissible Exposure

Test Requirement(s): **§90.1217:** Licensees and manufacturers are subject to the radiofrequency radiation exposure requirements specified in §§1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

RF Exposure Requirements: **§1.1307(b)(1) and §1.1307(b)(2):** Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

RF Radiation Exposure Limit: **§1.1310:** As specified in this section, the Maximum Permissible Exposure (MPE) Limit shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in Sec. 1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of Sec. 2.1093 of this chapter.

MPE Limit: EUT's operating frequencies @ 4940 – 4990 MHz; **Limit for Uncontrolled exposure: 1 mW/cm^2 or 10 W/m^2**

$S = PG / 4\pi R^2$ or $R = \sqrt{(PG / 4\pi S)}$

where, S = Power Density (mW/cm^2)
P = Power Input to antenna (mW)
G = Antenna Gain (numeric value)
R = Distance (cm)

For Antenna Gain → dBi = 10log(Numeric)

Test Results:

Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Antenna Gain (dBi)	Antenna Gain (Numeric)	Power Density (mW/cm2)	Limit (mW/cm2)	Margin	Distance (cm)	Result
4980	26.2	416.8693	8	6.309	1	1	0	14.47056	Pass
4980	26.2	416.8693	13.5	22.387	1	1	0	27.25857	Pass
4980	26.23	419.7589	26	398.107	1	1	0	115.3467	Pass
4980	26.21	417.8303	30	1000.000	1	1	0	182.3917	Pass

Table 9: Maximum Permissible Exposure Calculations

End of Report

