Company: Actiontec Electronics Inc.

Test of: T3200M

To: FCC CFR 47 Part 15 Subpart E 15.407 (DFS Bands)

Report No.: ATEC14-U13_Master Rev A

TEST REPORT

TEST REPORT

FROM

Test of: T3200M

to

To: FCC CFR 47 Part 15 Subpart E 15.407 (DFS Bands)

Test Report Serial No.: ATEC14-U13_Master Rev A

As a result of the 6 Mbyte FCC file size limitation potentially large test reports require to be split into smaller components. This document is the Master document controlling Addendum reports as listed below. This Master document combined with the Addendums demonstrate compliance to the standard.

Master Document Number	Addendum Reports
ATEC14-U13_Master	ATEC14-U13_Conducted
	ATEC14-U13_Radiated
	ATEC14-U13_DFS
	ATEC14-U2 (FCC Part 15B & ICES_003)

This report supersedes: NONE

Applicant: Actiontec Electronics Inc.
760 N Mary Avenue
Sunnyvale, California 94085
USA

Product Function: 802.11ac Bonded VDSL2 Modem Gateway with MoCA2.0

Issue Date: 1st April 2016

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.
575 Boulder Court
Pleasanton California 94566
USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com

TESTING CERT #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

Table of Contents

1. ACCREDITATION, LISTINGS & RECOGNITION

1.1. Testing Accreditation

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard ISO/IEC 17025:2005. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

ilac-MRA A2LA

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009*).

Presented this 4th day of February 2016.

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2017

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

1.2. Recognition

MiCOM Labs, Inc has widely recognized wireless testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA countries. MiCOM Labs test reports are accepted globally.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	US0159 Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	US0159 Listing #: 4143A-2 4143A-3
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	RCB 210
	VCCI	--	--	A-0012
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

EU MRA – European Union Mutual Recognition Agreement.
NB – Notified Body
APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement. Recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

Phase I - recognition for product testing
Phase II – recognition for both product testing and certification

1.3. Product Certification

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard ISO/IEC 17065:2012. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

Accredited Product Certification Body

A2LA has accredited

MICOM LABS

Pleasanton, CA

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC 17065:2012 *Requirements for bodies certifying products, processes and services*. This accreditation demonstrates technical competence for a defined scope and the operation of a management system.

Presented this 4th day of February 2016.

Senior Director of Quality & Communications
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2017

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body (TCB)

Industry Canada – Certification Body, CAB Identifier – US0159

Europe – Notified Body (NB), NB Identifier - 2280

Japan – Recognized Certification Body (RCB), RCB Identifier - 210

2. DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	22nd March 2016	
Rev A	1st April 2016	Initial release.
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Released Document History			
Master Revision	**Addendum Revision**	**Date**	**Comments**
Rev A	Rev A Conducted	1st April 2016	Initial release.
	Rev A Radiated	1st April 2016	Initial release.
	Rev A FCC Part 15B & ICES-003	1st April 2016	Initial release.

In the above table the latest report revision will replace all earlier versions.

3. TEST RESULT CERTIFICATE

Manufacturer:	Actiontec Electronics Inc 760 N Mary Avenue Sunnyvale California 94085 USA	**Tested By:**	MiCOM Labs, Inc. 575 Boulder Court Pleasanton California 94566 USA
Model:	T3200M	**Telephone:**	+1 925 462 0304
Type Of Equipment:	802.11 ab/g/n/ac	**Fax:**	+1 925 462 0306
S/N's:	GTBA6040400218 GTBA6040400221		
Test Date(s):	29 Feb. – 8th March 2016	**Website:**	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 Subpart E 15.407	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.

2. Details of test methods used have been recorded and kept on file by the laboratory.

3. Test results apply only to the item(s) tested.

A2LA ACCREDITED
TESTING CERT #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

4. REFERENCES AND MEASUREMENT UNCERTAINTY

4.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
I	KDB 662911	Oct 31 2013	Guidance for measurement of output emission of devices that employ single transmitter with multiple outputs or systems with multiple transmitters operating simultaneously in the same frequency band
II	KDB 905462 D07 v01	10th June 2015	Test guidance to demonstrate compliance for U-NII devices subject to DFS requirements.
III	KDB 926956 DO1 v01r02	17th October 2014	U-NII Device Transition Plan
IV	KDB 789033 D02 v01	6th June 2014	General UNII Test Procedures New Rules V01
V	A2LA	June 2015	R105 - Requirement's When Making Reference to A2LA Accreditation Status
VI	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices
VII	ANSI C63.4	2014	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
VIII	CISPR 22	2008	Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement
IX	ETSI TR 100 028	2001-12	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
X	FCC 06-96	Jun 3 2006	Memorandum Opinion and Order
XI	FCC 47 CFR Part 15.407	2014	Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices
XII	ICES-003	Issue 5 2012	Spectrum Management and Telecommunications; Interference-Causing Equipment Standard. Information Technology Equipment (ITE) – Limits and methods of measurement.
XIII	M 3003	Edition 3 Nov. 2012	Expression of Uncertainty and Confidence in Measurements
XIV	RSS-247 Issue 1	May 2015	Digital Transmission Systems (DTSs), Frequency Hopping System (FHSs) and Licence-Exempt Local Area Network (LE-LEN) Devices
XV	RSS-Gen Issue 4	November 2014	General Requirements and Information for the Certification of Radiocommunication Equipment
XVI	KDB 644545 D03 v01	August 14th 2014	Guidance for IEEE 802.11ac New Rules
XVII	FCC 47 CFR Part 2.1033	2014	FCC requirements and rules regarding photographs and test setup diagrams.

4.2. Test and Uncertainty Procedure

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

5. PRODUCT DETAILS AND TEST CONFIGURATIONS

5.1. Technical Details

Details	Description
Purpose:	Test of the Actiontec Electronics Inc. T3200M to FCC CFR 47 Part 15 Subpart E 15.407. Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices
Applicant:	Actiontec Electronics Inc. 760 N Mary Avenue, Sunnyvale California 94085 USA
Manufacturer:	As Applicant
Laboratory performing the tests:	MiCOM Labs, Inc. 575 Boulder Court, Pleasanton California 94566 USA
Test report reference number:	ATEC14-U13_Master Rev A
Date EUT received:	29th February 2016
Standard(s) applied:	FCC CFR 47 Part 15 Subpart E 15.407 and RSS-247
Dates of test (from - to):	29 th Feb – 8th Mar 2016
No of Units Tested:	2
Type of Equipment:	802.11 a/b/g/n/ac
Product Family Name:	Actiontec
Model(s):	T3200M
Location for use:	Indoor
Declared Frequency Range(s):	5250 - 5350 MHz; 5470 - 5725 MHz;
Primary function of equipment:	802.11ac Bonded VDSL2 Modem Gateway with MoCA2.0
Secondary function of equipment:	Residential Gateway
Type of Modulation:	OFDM
EUT Modes of Operation:	5250 - 5350 MHz: 802.11a; 802.11ac-80; 802.11n HT-20; 802.11n HT-40; 5470 - 5725 MHz: 802.11a; 802.11ac-80; 802.11n HT-20; 802.11n HT-40;
Declared Nominal Output Power (Ave):	5250 - 5350 MHz: +23 dBm 5470 - 5725 MHz: +23 dBm
Transmit/Receive Operation:	Transceiver - Half Duplex
Rated Input Voltage and Current:	AC/ DC adaptor (adaptor sold with unit) 12Vdc
Operating Temperature Range:	Declared Range 0°C to 45°C
ITU Emission Designator:	802.11a: 16M8D1D 802.11n HT-20: 18M1D1D 802.11n HT-40: 36M7D1D 802.11ac-80: 75M8D1D
Equipment Dimensions:	T3200M: 57.2mm x 184.2mm x 241.3mm / 2.3" x 7.3" x 9.5" (W x D x H)
Weight:	0.95 pounds
Hardware Rev:	AM1
Software Rev:	31.164L.02update7HW

5.2. Scope Of Test Program

Actiontec Electronics Inc T3200M

The scope of the test program was to test the Actiontec Electronics Inc. T3200M, 802.11ac Bonded VDSL2 Modem Gateway with MoCA2.0 configurations in the frequency ranges 5250 - 5350 MHz; 5470 - 5725 MHz; for compliance against the following specification:

FCC CFR 47 Part 15 Subpart E 15.407
Radio Frequency Devices; Subpart E –Unlicensed National Information Infrastructure Devices

Actiontec Electronics Inc T3200M

Left View

5.3. Equipment Model(s) and Serial Number(s)

Type	Description	Manufacturer	Model	Serial no.	Delivery Date
EUT	802.11ac Bonded VDSL2 Modem Gateway with MoCA2.0	T3200M	T3200M	GTBA6040400218	29 Feb 2016
EUT	802.11ac Bonded VDSL2 Modem Gateway with MoCA2.0	T3200M	T3200M	GTBA6040400221	29 Feb 2016

5.4. Antenna Details

Type	Manufacturer	Model	Family	Gain (dBi)	BF Gain	Dir BW	X-Pol	Frequency Band (MHz)
integral	Galtronics	Custom PCB SMT	Dipole	3.4	2.7	360	-	5150 - 5250
integral	Galtronics	Custom PCB SMT	Dipole	4.5	1.1	360	-	5250 - 5350
integral	Galtronics	Custom PCB SMT	Dipole	4.4	1.4	360	-	5470 - 5725
integral	Galtronics	Custom PCB SMT	Dipole	4.4	1.6	360	-	5725 - 5850

BF Gain - Beamforming Gain
Dir BW - Directional BeamWidth
X-Pol - Cross Polarization

5.5. Cabling and I/O Ports

Port Type	Max Cable Length	# Of Ports	Screened	Conn Type	Data Type
Ethernet	100 (4xLAN)	4	N	RJ-45	Packet Data
Ethernet	100 (4xWLAN)	4	N	RJ-45	Packet Data
USB	15m (USB 3.0)	1	Y	USB	Digital

5.6. Test Configurations

Results for the following configurations are provided in this report:

Operational Mode(s) (802.11a/b/g/n/ac)	Data Rate with Highest Power MBit/s	Channel Frequency (MHz)		
		Low	Mid	High
5250 - 5350 MHz				
802.11a	6.00	5260.00	5300.00	5320.00
802.11ac-80	29.30	--	--	5290.00
802.11n HT-20	6.50	5260.00	5300.00	5320.00
802.11n HT-40	13.50	5270.00	--	5310.00
5470 - 5725 MHz				
802.11a	6.00	5500.00	5580.00	5720.00
802.11ac-80	29.30	5530.00	5610.00	5690.00
802.11n HT-20	6.50	5500.00	5580.00	5720.00
802.11n HT-40	13.50	5510.00	5550.00	5710.00

5.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:
1. NONE

5.8. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:
1. NONE

6. TEST SUMMARY

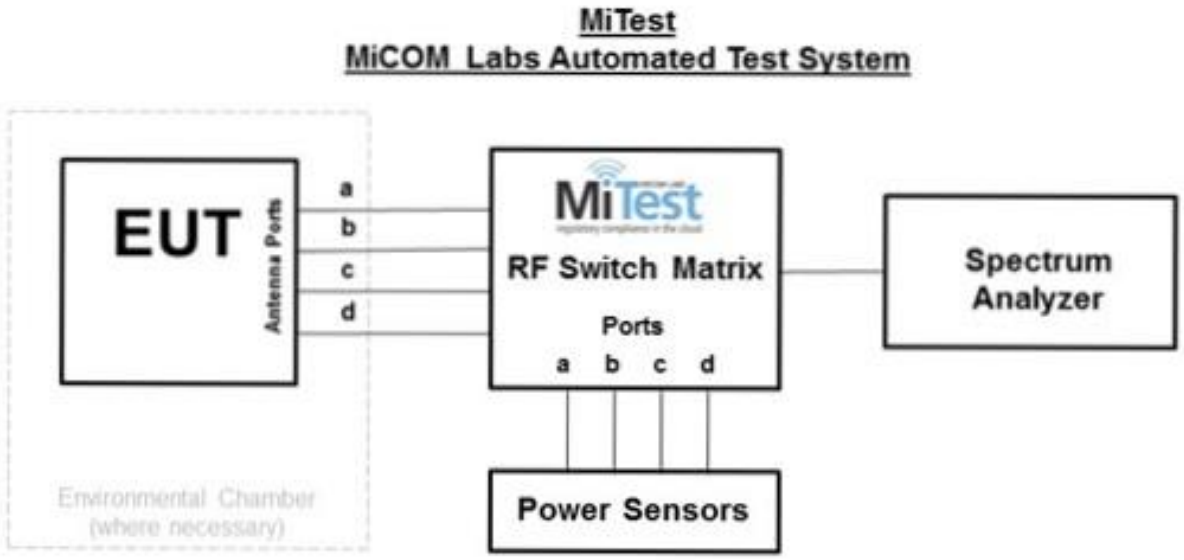
List of Measurements

Test Header	Result
Conducted	See report ATEC14-U13_Conducted
(a) Peak Transmit Power	Complies
(a) 26 dB & 99% Bandwidth	Complies
(a)(5) Power Spectral Density	Complies
(h)(1) Transmit Power Control (TPC)	Not Tested
(h)(2) Dynamic Frequency Selection (DFS)	See report ATEC14-U13_DFS
(ii) Channel Availability Check	Complies
(a) Initial CAC	Complies
(b) Beginning CAC	Complies
(c) End CAC	Complies
(iii) Channel Close / Transmission Time	Complies
(iv) Non-Occupancy Period	Complies
Probability of Detection	Complies
Detection Bandwidth	Complies
Radiated	See report ATEC14-U13_Radiated
i).. Restricted Band Emissions	Complies
ii).. Restricted Band-Edge Emissions	Complies
Digital Emissions	See Report ATEC14-U2 Part 15B & ICES-003
15.209 Digital Emissions	Complies
AC Wireline Emissions	See Report ATEC14-U2 Part 15B & ICES-003
15.207 AC Wireline Emissions	Complies

7. TEST EQUIPMENT CONFIGURATION(S)

7.1. Conducted

Conducted RF Emission Test Set-up(s)
The following tests were performed using the conducted test set-up shown in the diagram below.
1. Peak Transmit Power
2. 26 dB & 99% Bandwidth
3. Power Spectral Density



Conducted Test Measurement Setup

A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
127	Power Supply	HP	6674A	US36370530	Cal when used
158	Barometer/Thermometer	Control Company	4196	E2846	01 Dec 2016
248	Resistance Thermometer	Thermotronics	GR2105-02	9340 #1	21 Oct 2016
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	27 Aug 2016
376	USB 10MHz - 18GHz Average Power Sensor	Agilent	U2000A	MY51440005	23 Oct 2016
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	04 Aug 2016
381	4x4 RF Switch Box	MiCOM Labs	MiTest RF Switch Box	MIC002	18 Jun 2016
419	Laptop with Labview Software	Lenova	W520	TS02	Not Required
420	USB to GPIB Interface	National Instruments	GPIB-USB HS	1346738	Not Required
435	USB Wideband Power Sensor	Boonton	55006	8730	31 Jul 2016
440	USB Wideband Power Sensor	Boonton	55006	9178	25 Sep 2016
441	USB Wideband Power Sensor	Boonton	55006	9179	25 Sep 2016
442	USB Wideband Power Sensor	Boonton	55006	9181	25 Sep 2016
445	PoE Injector	D-Link	DPE-101GL	QTAH1E2000625	Not Required
460	Dell Computer	Dell	Optiplex330	BC944G1	Not Required
461	Spectrum Analyzer	Agilent	E4440A	MY46185537	13 Aug 2016
74	Environmental Chamber Chamber 3	Tenney	TTC	12808-1	30 Sep 2016
RF#2 GPIB#1	GPIB cable to Power Supply	HP	GPIB	None	Not Required
RF#2 SMA#1	EUT to Mitest box port 1	Flexco	SMA Cable port1	None	18 Jun 2016
RF#2 SMA#2	EUT to Mitest box port 2	Flexco	SMA Cable port2	None	18 Jun 2016
RF#2 SMA#3	EUT to Mitest box port 3	Flexco	SMA Cable port3	None	18 Jun 2016
RF#2 SMA#4	EUT to Mitest box port 4	Flexco	SMA Cable port4	None	18 Jun 2016
RF#2 SMA#SA	Mitest box to SA	Flexco	SMA Cable SA	None	18 Jun 2016
RF#2 USB#1	USB Cable to Mitest Box	Dynex	USB Cable	None	Not Required

7.2. DFS - Conducted

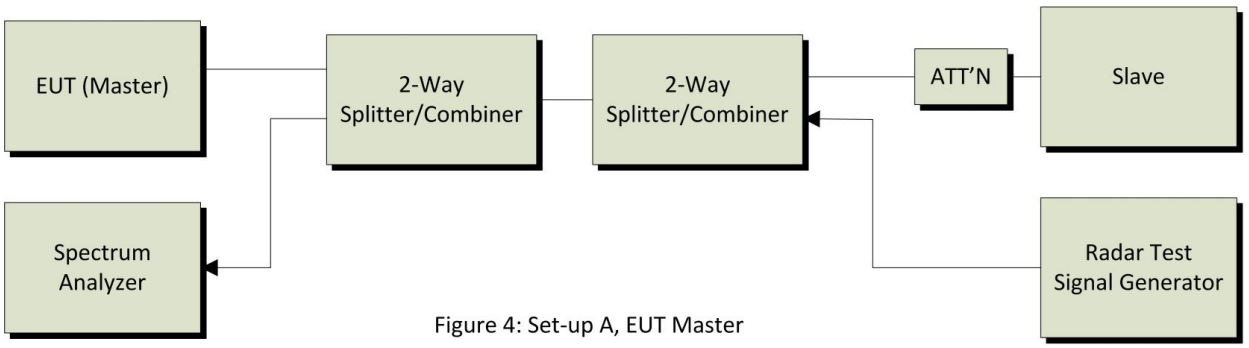


Figure 4: Set-up A, EUT Master

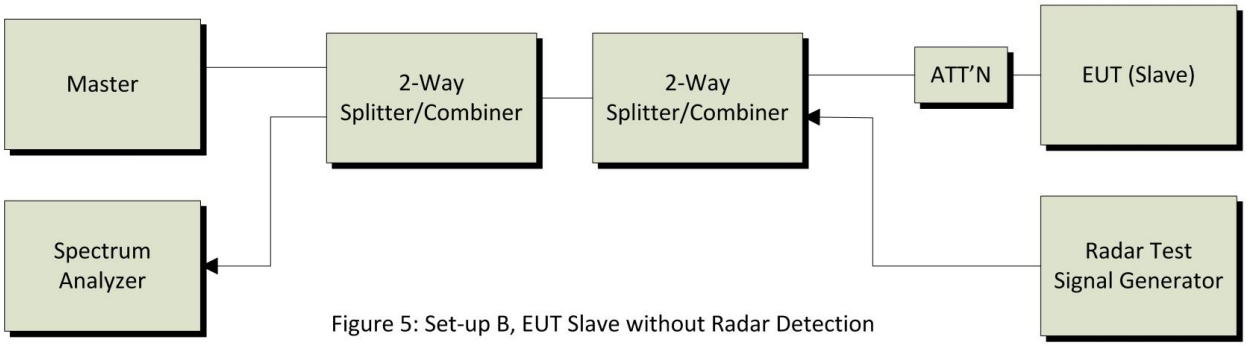


Figure 5: Set-up B, EUT Slave without Radar Detection

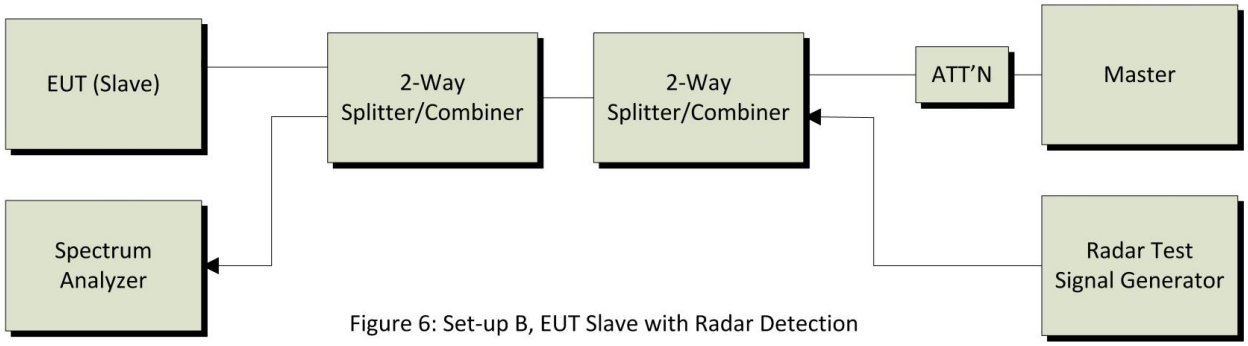


Figure 6: Set-up B, EUT Slave with Radar Detection

A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

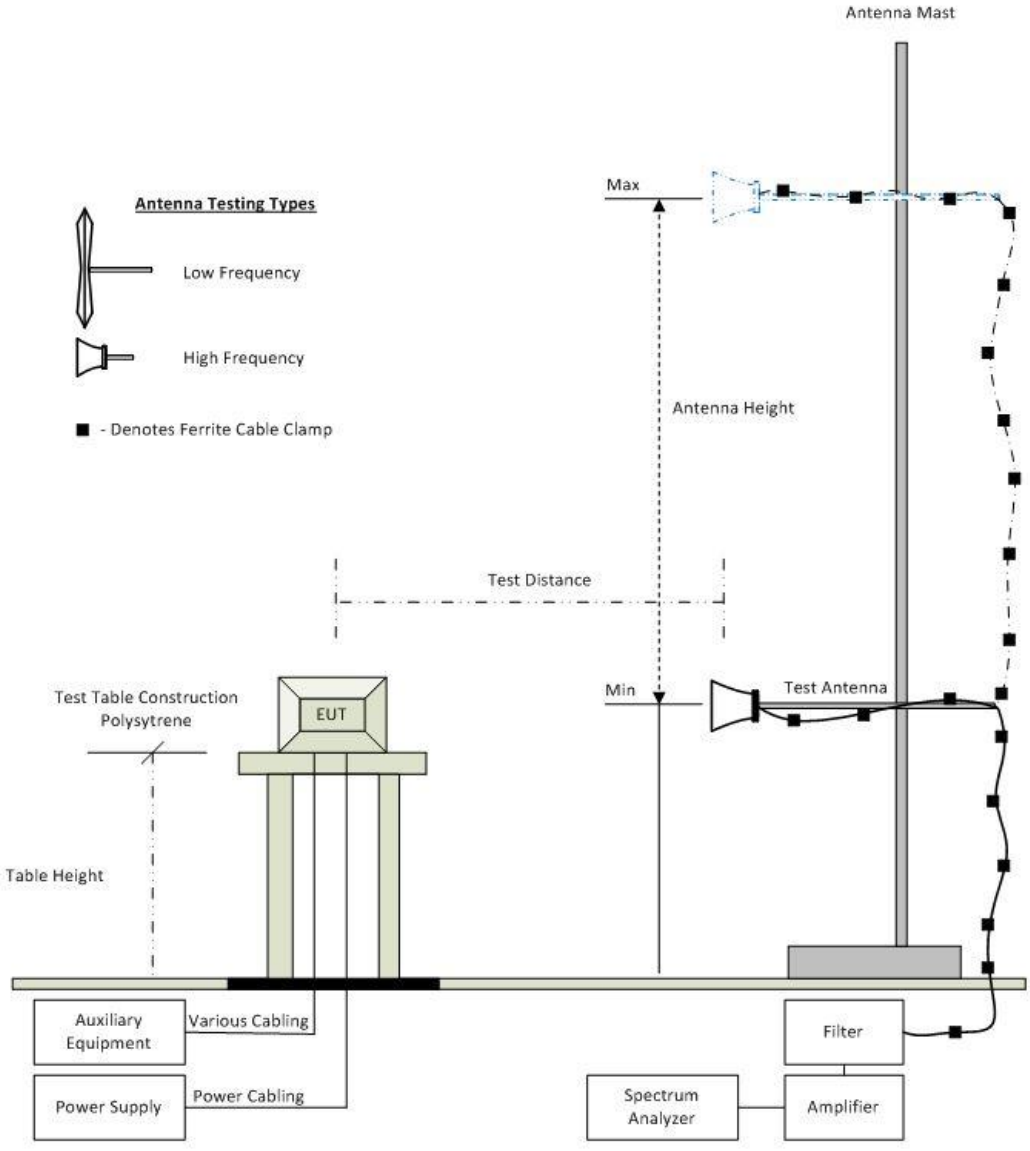
Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Thermometer	Control Company	4196	E2846	01 Dec 2016
193	Receiver 20 Hz to 7 GHz	Rhode & Schwarz	ESI 7	838496/007	17 Apr 2016
299	Test Software DFS Test System	Aeroflex	DFS test Software	V2.4.0	Not Required
359	DFS System	Aeroflex	PXI-1042	300001/004	18 Jun 2016
417	Laptop for DFS with DFS software	Lenova	W520	DFS	Not Required
418	PCI-e interface card	National Instruments	Express 8360	174AAC5	Not Required
422	Splitter/Combiner	Pasternack	PE 2031	001	Cal when used
71	Spectrum Analyser 9KHz-50GHz	HP	8565E	3425A00181	06 Aug 2016
DFS PCIe#1	PCIe cable for Aeroflex	National Instruments	PCIe cable	None	Not Required
DFS SMA#1	SMA Cable for DFS	Megaphase	SMA Cable	None	Cal when used
DFS SMA#2	SMA Cable for DFS	Megaphase	SMA Cable	None	Cal when used
DFS SMA#3	SMA Cable for DFS	Megaphase	SMA Cable	None	Cal when used
DFS SMA#4	SMA Cable for DFS	Megaphase	SMA Cable	None	Cal when used

7.3. Radiated Spurious Emission Test Set-up > 1 GHz

The following tests were performed using the radiated test set-up shown in the diagram below.

10.7 Radiated Spurious Emissions (1 – 10 GHz)
10.8 Radiated Digital Emissions (0.03 – 1 GHz)

Radiated Emission Measurement Setup



Radiated Emission Test Setup

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Thermometer	Control Company	4196	E2846	01 Dec 2016
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CY101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	27 Aug 2016
301	5470 to 5725 MHz Notch Filter	Microtronics	RBC50704	001	18 Aug 2016
302	5150 to 5350 MHz Notch Filter	Microtronics	BRC50703	002	18 Aug 2016
303	5725 to 5875 MHz Notch filter	Microtronics	BRC50705	003	18 Aug 2016
330	Variac 0-280 Vac	Staco Energy Co	3PN1020B	0546	Cal when used
336	Active loop Ant 10kHz to 30 MHz	EMCO	EMCO 6502	00060498	23 Sep 2016
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	15 Aug 2016
341	900MHz Notch Filter	EWT	EWT-14-0199	H1	18 Aug 2016
342	2.4 GHz Notch Filter	EWT	EWT-14-0203	H1	18 Aug 2016
343	5.15 GHz Notch Filter	EWT	EWT-14-0200	H1	18 Aug 2016
344	5.35 GHz Notch Filter	EWT	EWT-14-0201	H1	18 Aug 2016
345	5.46 GHz Notch Filter	EWT	EWT-14-0202	H1	18 Aug 2016
346	1.6 TO 10GHz High Pass Filter	EWT	EWT-57-0112	H1	18 Aug 2016
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	26 Oct 2016
377	Band Rejection Filter 5150 to 5880MHz	Microtronics	BRM50716	034	18 Aug 2016
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	04 Aug 2016
393	DC - 1050 MHz Low Pass Filter	Microcircuits	VLFX-1050	N/A	08 Oct 2016
396	2.4 GHz Notch Filter	Microtronics	BRM50701	001	18 Aug 2016
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	24 Mar 2016
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	10 Oct 2016
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	28 May 2016
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required

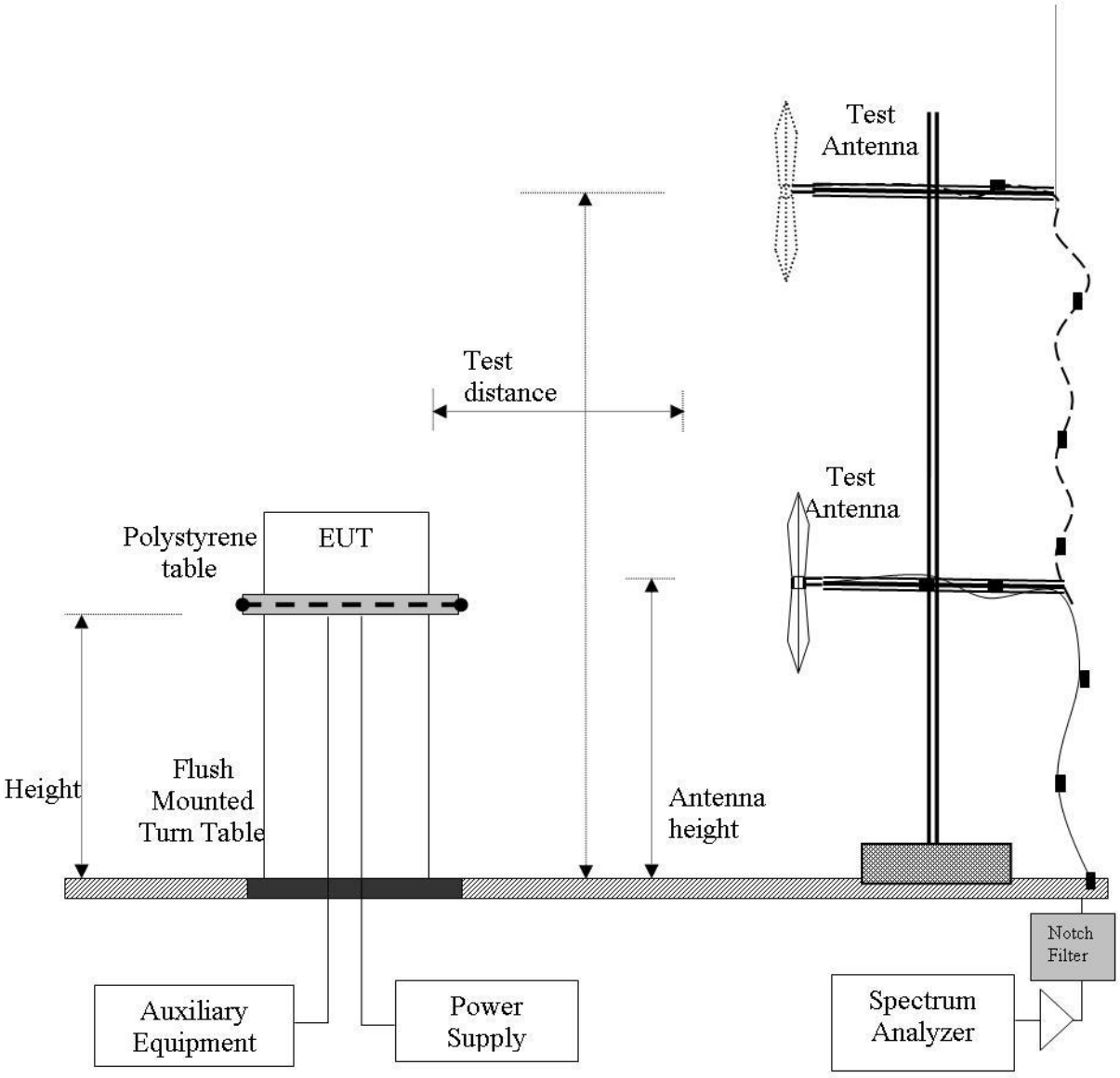
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
447	Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0.73	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	25 Mar 2016
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	25 Mar 2016
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	25 Mar 2016
465	Low Pass Filter DC-1000 MHz	Mini-Circuits	NLP-1200+	VUU01901402	18 Aug 2016
466	Low Pass Filter DC-1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	18 Aug 2016
467	2495 to 2650 MHz notch filter	MicroTronics	BRM50709	011	18 Aug 2016
468	Low pass filter	Mini Circuits	SLP-550	None	18 Aug 2016
469	Low pass filter	Mini Circuit	SLP-1000	None	18 Aug 2016
470	High Pass filter	Mini Circuits	SHP-700	None	18 Aug 2016
476	Low Pass dc-2200MHz filter	Mini Circuits	15542 NLP-2400+	VUU13801345	18 Aug 2016
480	Cable - Bulkhead to Amp	SRC Haverhill	157-157-3050360	480	11 Aug 2016
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-151-3050787	481	11 Aug 2016
482	Cable - Amp to Antenna	SRC Haverhill	157-157-3051574	482	11 Aug 2016
502	Test Software for Radiated Emissions	EMISoft	Vasona	Version 5 Build 59	Not Required
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used
CC05	Confidence Check	MiCOM	CC05	None	02 Jun 2016
VLF-1700	Low pass filter DC-1700 MHz	Mini Circuits	VLF-1700	None	30 Mar 2016

7.4. Digital Emissions Test Set-up (0.03 – 1 GHz)

The following tests were performed using the conducted test set-up shown in the diagram below.

1. Section 6.1.2.13

Digital Emission Measurement Setup – Below 1 GHz



Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Thermometer	Control Company	4196	E2846	01 Dec 2016
170	Video System Controller for Semi Anechoic Chamber	Panasonic	WV-CY101	04R08507	Not Required
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	27 Aug 2016
301	5470 to 5725 MHz Notch Filter	Microtronics	RBC50704	001	18 Aug 2016
302	5150 to 5350 MHz Notch Filter	Microtronics	BRC50703	002	18 Aug 2016
303	5725 to 5875 MHz Notch filter	Microtronics	BRC50705	003	18 Aug 2016
330	Variac 0-280 Vac	Staco Energy Co	3PN1020B	0546	Cal when used
336	Active loop Ant 10kHz to 30 MHz	EMCO	EMCO 6502	00060498	23 Sep 2016
338	Sunol 30 to 3000 MHz Antenna	Sunol	JB3	A052907	15 Aug 2016
341	900MHz Notch Filter	EWT	EWT-14-0199	H1	18 Aug 2016
342	2.4 GHz Notch Filter	EWT	EWT-14-0203	H1	18 Aug 2016
343	5.15 GHz Notch Filter	EWT	EWT-14-0200	H1	18 Aug 2016
344	5.35 GHz Notch Filter	EWT	EWT-14-0201	H1	18 Aug 2016
345	5.46 GHz Notch Filter	EWT	EWT-14-0202	H1	18 Aug 2016
346	1.6 TO 10GHz High Pass Filter	EWT	EWT-57-0112	H1	18 Aug 2016
373	26III RMS Multimeter	Fluke	Fluke 26 series III	76080720	26 Oct 2016
377	Band Rejection Filter 5150 to 5880MHz	Microtronics	BRM50716	034	18 Aug 2016
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	04 Aug 2016
393	DC - 1050 MHz Low Pass Filter	Microcircuits	VLFX-1050	N/A	08 Oct 2016
396	2.4 GHz Notch Filter	Microtronics	BRM50701	001	18 Aug 2016
397	Amp 10 - 2500MHz	MiCOM Labs	Amp 10 - 2500 MHz	NA	24 Mar 2016
399	ETS 1-18 GHz Horn Antenna	ETS	3117	00154575	10 Oct 2016
406	Amplifier for Radiated Emissions	MiCOM Labs	40dB 1 to 18GHz Amp	0406	28 May 2016
410	Desktop Computer	Dell	Inspiron 620	WS38	Not Required
411	Mast/Turntable Controller	Sunol Sciences	SC98V	060199-1D	Not Required

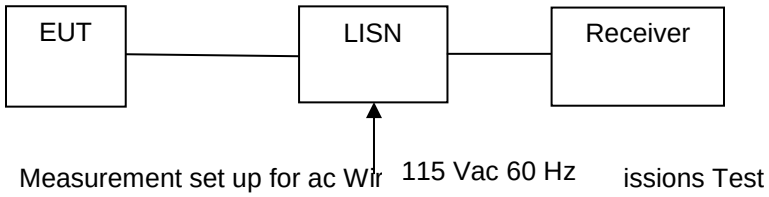
412	USB to GPIB Interface	National Instruments	GPIB-USB HS	11B8DC2	Not Required
413	Mast Controller	Sunol Science	TWR95-4	030801-3	Not Required
414	DC Power Supply 0-60V	HP	6274	1029A01285	Cal when used
415	Turntable Controller	Sunol Sciences	Turntable Controller	None	Not Required
416	Gigabit ethernet filter	ETS-Lingren	Gigafoil 260366	None	Not Required
447	Rad Emissions Test Software	MiCOM	Rad Emissions Test Software Version 1.0.73	447	Not Required
462	Schwarzbeck cable from Antenna to Amplifier.	Schwarzbeck	AK 9513	462	25 Mar 2016
463	Schwarzbeck cable from Amplifier to Bulkhead.	Schwarzbeck	AK 9513	463	25 Mar 2016
464	Schwarzbeck cable from Bulkhead to Receiver	Schwarzbeck	AK 9513	464	25 Mar 2016
465	Low Pass Filter DC-1000 MHz	Mini-Circuits	NLP-1200+	VUU01901402	18 Aug 2016
466	Low Pass Filter DC-1500 MHz	Mini-Circuits	NLP-1750+	VUU10401438	18 Aug 2016
467	2495 to 2650 MHz notch filter	MicroTronics	BRM50709	011	18 Aug 2016
468	Low pass filter	Mini Circuits	SLP-550	None	18 Aug 2016
469	Low pass filter	Mini Circuit	SLP-1000	None	18 Aug 2016
470	High Pass filter	Mini Circuits	SHP-700	None	18 Aug 2016
476	Low Pass dc-2200MHz filter	Mini Circuits	15542 NLP-2400+	VUU13801345	18 Aug 2016
480	Cable - Bulkhead to Amp	SRC Haverhill	157-157-3050360	480	11 Aug 2016
481	Cable - Bulkhead to Receiver	SRC Haverhill	151-151-3050787	481	11 Aug 2016
482	Cable - Amp to Antenna	SRC Haverhill	157-157-3051574	482	11 Aug 2016
502	Test Software for Radiated Emissions	EMISoft	Vasona	Version 5 Build 59	Not Required
87	Uninterruptible Power Supply	Falcon Electric	ED2000-1/2LC	F3471 02/01	Cal when used
CC05	Confidence Check	MiCOM	CC05	None	02 Jun 2016
VLF-1700	Low pass filter DC-1700 MHz	Mini Circuits	VLF-1700	None	30 Mar 2016

7.5. ac Wireline Emission Test Set-up

The following tests were performed using the conducted test set-up shown in the diagram below.

1. Section 6.1.3 ac Wireline Conducted Emissions

Conducted Test Set-Up Pictorial Representation



Measurement set up for ac Wir issions Test

A full system calibration was performed on the test station and any resulting system losses (or gains) were taken into account in the production of all final measurement data.

Asset#	Description	Manufacturer	Model#	Serial#	Calibration Due Date
158	Barometer/Thermometer	Control Company	4196	E2846	01 Dec 2016
184	Pulse Limiter	Rhode & Schwarz	ESH3Z2	357.8810.52	13 Apr 2016
190	LISN (two-line V-network)	Rhode & Schwarz	ESH3Z5	836679/006	29 Oct 2016
287	Rohde & Schwarz 40 GHz Receiver	Rhode & Schwarz	ESIB40	100201	27 Aug 2016
307	BNC-CABLE	Megaphase	1689 1GVT4	15F50B002	13 Apr 2016
316	Dell desktop computer workstation with Vasona	Dell	Desktop	WS04	Not Required
351	Data Impedance Stabilization Network	Teseq	ISN T800	24809	30 Nov 2016
372	AC Variable PS	California Instruments	1251P	L06951	Cal when used
378	Rohde & Schwarz 40 GHz Receiver with Generator	Rhode & Schwarz	ESIB40	100107/040	04 Aug 2016
388	LISN (3 Phase) 9kHz - 30MHz	Rohde & Schwarz	ESH2-Z5	892107/022	30 Oct 2016
ADAPT SMA#1	SMA Cable	Megaphase	SMA Cable #1	None	13 Aug 2016

8. MEASUREMENT AND PRESENTATION OF TEST DATA

The measurement and graphical data presented in this test report was generated automatically using state-of-the-art technology creating an easy to read report structure. Numerical measurement data is separated from supporting graphical data (plots) through hyperlinks. Numerical measurement data can be reviewed without scrolling through numerous graphical pages to arrive at the next data matrix.

Plots have been relegated into the Appendix 'Graphical Data'.

Test and report automation was performed by MiTest. MiTest is an automated test system developed by MiCOM Labs. MiTest is the first cloud based modular test system enabling end-to-end automation of regulatory compliance testing for conducted RF testing.

The MiCOM Labs "MiTest" Automated Test System" (Patent Pending)

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