

Report on the Radio Testing
For
SmarDTV (UK) Limited
on
Project N63
Report no. TRA-029575-02-45-05B
2nd December 2016

Report Number: TRA-029575-02-45-05B
Issue: B

REPORT ON THE RADIO TESTING OF A
SmarDTV (UK) Limited
Project N63
WITH RESPECT TO SPECIFICATION
FCC 47CFR 15.247 & IC RSS-247

TEST DATE: 25th Apr - 20th October 2016

Tested by: A Longley

A Longley
Radio Test Engineers

Written by: D Winstanley

D Winstanley
Senior Radio Test Engineer

Approved by:

J Charters
Department Manager- Radio

Date: 2nd December 2016

Disclaimers:

- [1] THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE
[2] THE RESULTS CONTAINED IN THIS DOCUMENT RELATE ONLY TO THE ITEM(S) TESTED

1 Revision Record

<i>Issue Number</i>	<i>Issue Date</i>	<i>Revision History</i>
A	20 th October 2016	Original
B	2 nd December 2016	EUT name change

2 Summary

TEST REPORT NUMBER:	TRA-029575-02-45-05B
WORKS ORDER NUMBER	TRA-029575-02
PURPOSE OF TEST:	Certification.
TEST SPECIFICATION(S):	47CFR15.247 & RSS-247
EQUIPMENT UNDER TEST (EUT):	Project N63
FCC IDENTIFIER:	DKN-AVBX1
CERTIFICATION NUMBER:	DKN-AVBX1
EUT SERIAL NUMBER:	1604210679 & 14604210698
MANUFACTURER/AGENT:	SmarDTV (UK) Limited
ADDRESS:	Beckside Design Centre Millennium Business Park Station Rd Steeton Keighley West Yorkshire BD20 6QW United Kingdom
CLIENT CONTACT:	Chris Wordley ☎ 01535 659000 ✉ chris.wordley@smardtv.com
ORDER NUMBER:	POR01251
TEST DATE:	25th Apr - 20th October 2016
TESTED BY:	A Longley Element

2.1 Test Summary

Test Method and Description	Requirement Clause		Applicable to this equipment	Result / Note
	RSS	47CFR15		
AC power line conducted emissions	Gen, 8.8	15.207	☒	Pass

Note s:

This report covers the Project N63 when all radio device are transmitting simultaneously.

The results contained in this report relate only to the items tested, in the condition at time of test, and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. Any modifications made are identified in Section 8 of this report.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 5.2 of this test report (Deviations from Test Standards).

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4 Introduction

This report TRA-029575-02-45-05B presents the results of the Radio testing on a SmarDTV (UK) Limited, Project N63 to specification 47CFR15 Radio Frequency Devices and RSS-247 Licence-exempt Radio Apparatus (All Frequency Bands): Category I Equipment.

The testing was carried out for SmarDTV (UK) Limited by Element, at the address(es) detailed below.

☒	Element Hull Unit E South Orbital Trading Park Hedon Road Hull HU9 1NJ UK	☐	Element Skelmersdale Unit 1 Pendle Place Skelmersdale West Lancashire WN8 9PN UK
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This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test & measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Elements own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

Throughout this report EUT denotes equipment under test.

FCC Site Listing:

Element is accredited for the above sites under the US-EU MRA, Designation number UK0009.

IC Registration Number(s):

Element Hull	3483A
Element North West	3930B

The test site requirements of ANSI C63.4-2014 are met up to 1GHz.

The test site SVSWR requirements of CISPR 16-1-4:2010 are met over the frequency range 1 GHz to 18 GHz.

5 Test Specifications

5.1 Normative References

- FCC 47 CFR Ch. I – Part 15 – Radio Frequency Devices.
- ANSI C63.10-2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ANSI C63.4-2014 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- Industry Canada RSS-247, Issue 1, May 2015 – Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
- Industry Canada RSS-Gen, Issue 4, November 2014 – General Requirements for Compliance of Radio Apparatus

5.2 Deviations from Test Standards

There were no deviations from the test standard.

6 Glossary of Terms

§	denotes a section reference from the standard, not this document
AC	Alternating Current
ANSI	American National Standards Institute
BW	bandwidth
C	Celsius
CFR	Code of Federal Regulations
CW	Continuous Wave
dB	decibel
dBm	dB relative to 1 milliwatt
DC	Direct Current
DSSS	Direct Sequence Spread Spectrum
EIRP	Equivalent Isotropically Radiated Power
ERP	Effective Radiated Power
EUT	Equipment Under Test
FCC	Federal Communications Commission
FHSS	Frequency Hopping Spread Spectrum
Hz	hertz
IC	Industry Canada
ITU	International Telecommunication Union
LBT	Listen Before Talk
m	metre
max	maximum
MIMO	Multiple Input and Multiple Output
min	minimum
MRA	Mutual Recognition Agreement
N/A	Not Applicable
PCB	Printed Circuit Board
PDF	Portable Document Format
Pt-mpt	Point-to-multipoint
Pt-pt	Point-to-point
RF	Radio Frequency
RH	Relative Humidity
RMS	Root Mean Square
Rx	receiver
s	second
SVSWR	Site Voltage Standing Wave Ratio
Tx	transmitter
UKAS	United Kingdom Accreditation Service
V	volt
W	watt
Ω	ohm

7 Equipment Under Test

7.1 EUT Identification

- Name: Project N63
- Serial Number: 1604210679 & 14604210698
- Model Number: S60
- Software Revision: Not Applicable
- Build Level / Revision Number: Not Applicable

7.2 System Equipment

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

Sample No.	Description	Model No.	Serial No.
S08	EUT 12 Vdc Power Adapter	EADP-40MB A	HBBD45F00A7
S11	Lenovo ThinkPad	E560	34546
S14	Thurlby Thandar Audio Generator	TF215	045441
S15	LG TV	M227WDL	002MAAK4P824
S17	Channel Master DVR	CM-7500TB1	R5YFKZ00228D
S27	Dlink USB to Ethernet adapter	DUB-E100	Q8041AA002873

7.3 EUT Mode of Operation

7.3.1 Transmission

RF4CE and Wi-Fi transmitter control was via commands sent from a PC. The commands provided by the manufacturer setup the device into a permanent transmit mode. The commands allowed adjustment of operating frequency and power.

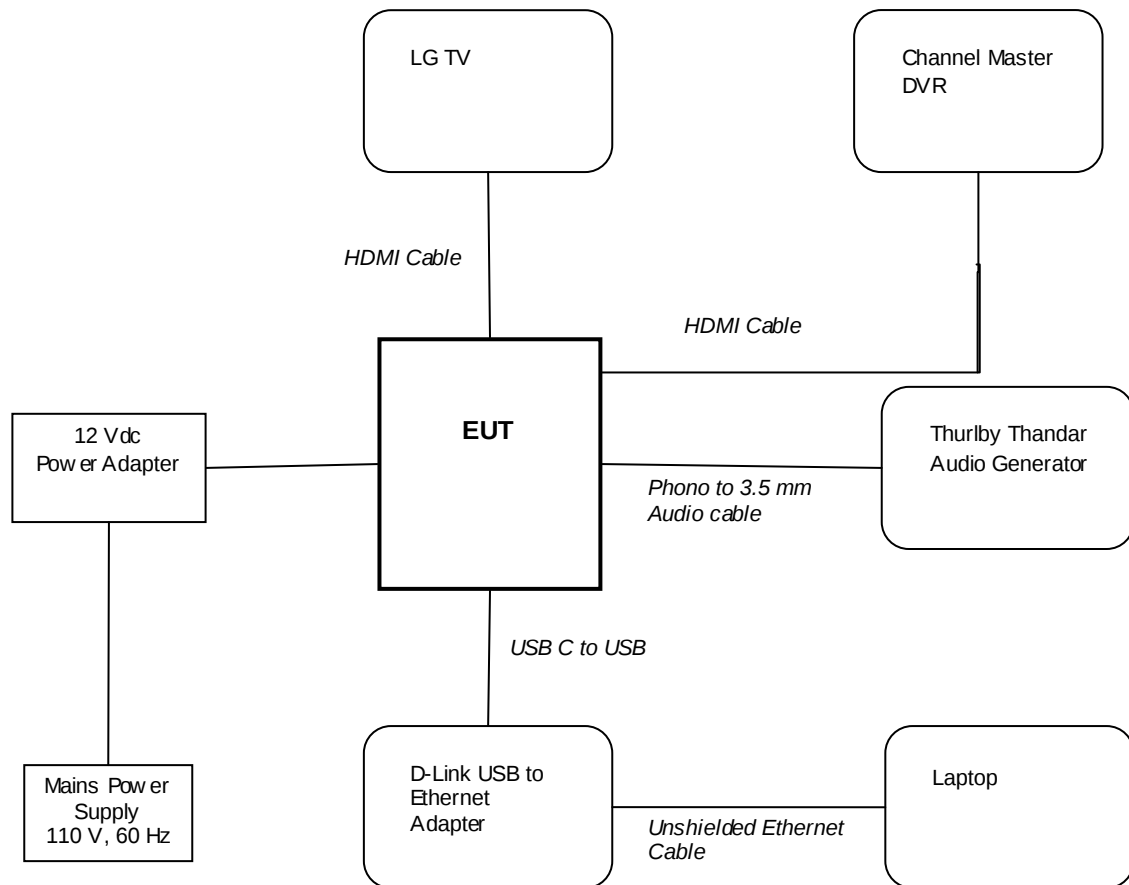
8 Modifications

No modifications were performed during this assessment.

9 EUT Test Setup

9.1 Block Diagram

The following diagram shows basic EUT interconnections with cable type and cable lengths identified:



10 General Technical Parameters

10.1 Normal Conditions

The E U T was tested under the normal environmental conditions of the test laboratory, except where otherwise stated. The normal power source applied 110 V ac, 60 Hz, from the mains.

10.2 Varying Test Conditions

There are no specific frequency stability requirements for the type of device. The results contained in this report demonstrate that the occupied bandwidth is contained within the authorised band and the manufacturer has declared sufficient frequency stability (refer to section 7.4).

Variation of supply voltage is required to ensure stability of the declared output power. During carrier power testing the following variations were made:

	<i>Category</i>	<i>Nominal</i>	<i>Variation</i>
☒	Mains	110 V ac +/-2 %	85 % and 115 %
☐	Battery	New battery	N/A

11 AC power-line conducted emissions

11.1 Definition

Line-to-ground radio-noise voltage that is conducted from all of the EUT current-carrying power input terminals that are directly (or indirectly via separate transformers or power supplies) connected to a public power network.

11.2 Test Parameters

Test Location:	Element Hull
Test Standard and Clause:	ANSI C63.10-2013, Clause 6.2
EUT Channels / Frequencies Measured:	See Section 7
Deviations From Standard:	None
Measurement BW:	9 kHz
Measurement Detectors:	Quasi-Peak and Average, RMS

Environmental Conditions (Normal Environment)

Temperature: 21°C	+15 °C to +35 °C (as declared)
Humidity: 46 % RH	20 % RH to 75 % RH (as declared)
Supply: 110 V ac	

11.3 Test Limit

A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz, shall not exceed the limits in Table 3.

Table 3 – AC Power Line Conducted Emission Limits

Frequency (MHz)	Conducted limit (dB μ V)	
	Quasi-Peak	Average**
0.15 to 0.5	66 to 56	56 to 46
0.5 to 5	56	46
5 to 30	60	50

*The level decreases linearly with the logarithm of the frequency.

**A linear average detector is required.

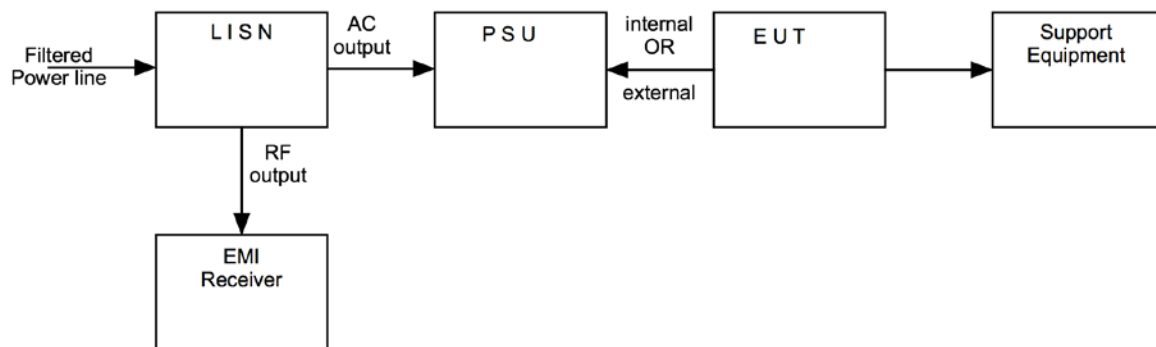
11.4 Test Method

With the EUT setup in a screened room, as per section 9 of this report and connected as per Figure ii, the power line emissions were measured on a spectrum analyzer / EMI receiver.

AC power line conducted emissions from the EUT are checked first by preview scans with peak and average detectors covering both live and neutral lines. A spectrum analyzer is used to determine if any periodic emissions are present.

Formal measurements using the correct detector(s) and bandwidth are made on frequencies identified from the preview scans. Final measurements were performed with EUT set at its maximum duty in transmit and receive modes.

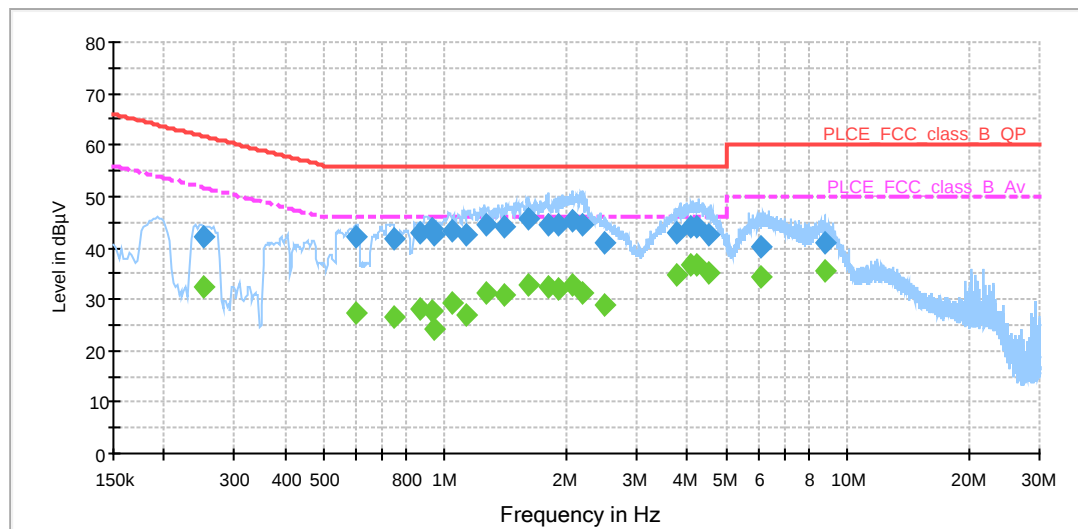
Figure ii Test Setup



11.5 Test Equipment

Equipment Type	Manufacturer	Equipment Description	Element No	Due For Calibration
Analyser/Receiver	Rohde & Schwarz	ESCI 7	RFG715	2017-10
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	RFG674	11Apr 2017
LISN/AMN	Rohde & Schwarz	ESH3-Z5	RFG189	02Aug2017

11.6 Test Results



Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.250800	42.2	15000.0	9.000	GND	L1	10.2	19.6	61.7
0.602550	42.1	15000.0	9.000	GND	L1	10.3	13.9	56.0
0.743800	41.6	15000.0	9.000	GND	L1	10.3	14.4	56.0
0.867475	43.0	15000.0	9.000	GND	L1	10.3	13.0	56.0
0.925675	43.6	15000.0	9.000	GND	L1	10.3	12.4	56.0
0.942900	42.4	15000.0	9.000	GND	N	10.3	13.6	56.0
1.043075	43.3	15000.0	9.000	GND	L1	10.3	12.7	56.0
1.124525	42.7	15000.0	9.000	GND	L1	10.3	13.3	56.0
1.266875	44.5	15000.0	9.000	GND	L1	10.4	11.5	56.0
1.397825	44.2	15000.0	9.000	GND	L1	10.4	11.8	56.0
1.616200	45.5	15000.0	9.000	GND	L1	10.4	10.5	56.0
1.813350	44.6	15000.0	9.000	GND	L1	10.4	11.4	56.0
1.921625	44.3	15000.0	9.000	GND	N	10.4	11.7	56.0
2.075375	45.2	15000.0	9.000	GND	L1	10.4	10.8	56.0
2.198075	44.4	15000.0	9.000	GND	N	10.4	11.6	56.0
2.495750	40.9	15000.0	9.000	GND	L1	10.5	15.1	56.0
3.775300	43.1	15000.0	9.000	GND	L1	10.6	12.9	56.0
4.097100	44.1	15000.0	9.000	GND	L1	10.6	11.9	56.0
4.233750	44.1	15000.0	9.000	GND	L1	10.6	11.9	56.0
4.525600	42.6	15000.0	9.000	GND	L1	10.7	13.4	56.0
6.087500	40.3	15000.0	9.000	GND	N	10.7	19.7	60.0
8.843500	40.9	15000.0	9.000	GND	N	11.0	19.1	60.0

Frequency (MHz)	Average (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.250800	32.5	15000.0	9.000	GND	L1	10.2	19.2	51.7
0.602550	27.2	15000.0	9.000	GND	L1	10.3	18.8	46.0
0.743800	26.7	15000.0	9.000	GND	L1	10.3	19.3	46.0
0.867475	27.9	15000.0	9.000	GND	L1	10.3	18.1	46.0
0.925675	27.7	15000.0	9.000	GND	L1	10.3	18.3	46.0
0.942900	24.3	15000.0	9.000	GND	N	10.3	21.7	46.0
1.043075	29.1	15000.0	9.000	GND	L1	10.3	16.9	46.0
1.124525	27.1	15000.0	9.000	GND	L1	10.3	18.9	46.0
1.266875	31.3	15000.0	9.000	GND	L1	10.4	14.7	46.0
1.397825	30.9	15000.0	9.000	GND	L1	10.4	15.1	46.0
1.616200	32.6	15000.0	9.000	GND	L1	10.4	13.4	46.0
1.813350	32.5	15000.0	9.000	GND	L1	10.4	13.5	46.0
1.921625	32.2	15000.0	9.000	GND	N	10.4	13.8	46.0
2.075375	33.0	15000.0	9.000	GND	L1	10.4	13.0	46.0
2.198075	31.4	15000.0	9.000	GND	N	10.4	14.6	46.0
2.495750	28.9	15000.0	9.000	GND	L1	10.5	17.1	46.0
3.775300	34.8	15000.0	9.000	GND	L1	10.6	11.2	46.0
4.097100	36.6	15000.0	9.000	GND	L1	10.6	9.4	46.0
4.233750	36.7	15000.0	9.000	GND	L1	10.6	9.3	46.0
4.525600	35.2	15000.0	9.000	GND	L1	10.7	10.8	46.0
6.087500	34.2	15000.0	9.000	GND	N	10.7	15.8	50.0
8.843500	35.7	15000.0	9.000	GND	N	11.0	14.3	50.0

12 Measurement Uncertainty

Calculated Measurement Uncertainties

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95 % confidence:

[1] Radiated spurious emissions

Uncertainty in test result (30 MHz to 1 GHz) = **4.6 dB**

Uncertainty in test result (1 GHz to 18 GHz) = **4.7 dB**

[2] AC power line conducted emissions

Uncertainty in test result = **3.4 dB**