TRANSMITTER CERTIFICATION
OF
FCC ID: KV6-TFS-SDU82155A
THALES AVIONICS
(APPLICANT)
TOP FLIGHT SATCOM
SATELLITE DATA UNIT
PART NUMBER 82155/A

TO
FEDERAL COMMUNICATIONS COMMISSION
RULE PART 87 AND CONFIDENTIALITY

TEST REPORT
(Exhibit 6a)

Any enquiries concerning this document should be addressed to:

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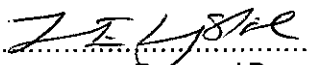

Prepared By
Jennifer Livingstone
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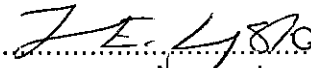
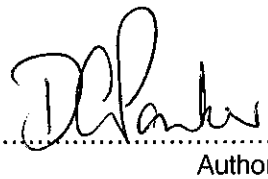


Approved
Jennifer Livingstone
(Systems Project Leader)



Authorised
David Parker
(System Design Authority)

ISSUE RECORD

	Date	By	Comments
A	19 Feb 07	Colin Appleyard	Initial Draft
B	28 Feb 07	Colin Appleyard	Include RAS6060 review comments
C	16 Mar 06	J. E Livingstone	Updates for Review Version
D	01 May 07	Colin Appleyard	Updates for Review
1	17 May 07	Colin Appleyard	Include RAS6060 review comments
2	17 Oct 07	J. E. Livingstone	Update for QFN 1832/DCN 2780

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FIGURES

TABLES

1 Introduction

1.1 Objective

1.1.1 The objective of this document is to present the list of available exhibits and present the results of testing required for FCC approval of the Thales Topflight Satcom (TFS) Satellite Data Unit (SDU).

1.1.2 The Thales Top Flight Satcom System is an BGAN Satcom System designed for use in air transport and corporate business jet aircraft. BGAN is the broadband service of Inmarsat, available with the Inmarsat I-4 series of satellites.

1.1.3 The system includes Line Replaceable Units (LRUs) provided by both Thales Avionics Ltd and EMS Satcom with Thales providing the SDU and SDU Configuration Module (SCM) LRUs and EMS providing the Diplexer/Low Noise Amplifier (DLNA) and Antenna LRUs.

1.2 Scope

1.2.1 The scope of this document is the exhibits and test results for FCC Appproval of the TFS SDU only.

1.2.2 All Exhibits, tests and measurement data presented for FCC Approval have been performed in accordance with FCC Rules and Regulations, Volume II:Part 2, Sub-part J, Sections 2.947, 2.1033 c, 2.1041, 2.1046, 2.1047, 2.1079, 2.1053, 2.1055, 2.1057 (Ref. 1.4.1) and Part 87- Aviation Services

1.3 Applicability

1.3.1 The results in this test report are applicable to SDU equipment Type 82155A only.

1.4 References

1.4.1 FCC Rules and Regulations, Volume II:Part 2, Sub-part J, United States Federal Communications Commission, Code of Federal Regulations, Parts as detailed in section 1.2.1.

1.4.2 P13B, Documentation Standard, P13B, Thales.

1.4.3 TuV Sud Report No EE615497/01 Issue 1, EMC Qualification Approval of the Thales Avionics Limited Satellite Data Unit (SDU).

1.4.4 TuV Sud Report No RO615497/01 Issue 1, Limited FCC testing of the Thales Avionics Limited Satellite Data Unit (SDU).

1.4.5 Thales Report (Radiated Emissions) Document No 103-101559

1.4.6 System Test procedures for the TopFlight System, Thales, A111/SAT001/SYSTP-001, Issue 5,

1.5 Terminology

APM	Avionics Processor Module
BGAN	Broadband Global Area Network
CCM	Channel Card Module
CFR	Code of Federal Regulations
CPM	Communications Processor Module
DLNA	Diplexer Low Noise Amplifier
EIRP	Effective Isotropic Radiated Power
FCC	Federal Communications Commission
HPA	High Power Amplifier
IL	Insertion Loss
LRU	Line Replaceable Unit
NF	Noise Figure
PFD	Power Flux Density
OCXO	Oven Controlled Crystal Oscillator
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase-Shift Keying
RF	Radio Frequency
Rx	Receive
SDU	(TopFlight) Satellite Data Unit
TFS	TopFlight Satcom
Tx	Transmit
UT	User Terminal
VDT	Verification and Debug Tool

2 Information Required for Approval & Exhibits

2.1 **Name and Address of Applicant:**

Thales Avionics Limited
86 Bushey Road
Raynes Park
London, SW20 0JW

2.2 **Name and Address of Authorised Test House:**

TUV Product Service Ltd
Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
UK, PO15 5RL

2.3 **Manufacturer:**

Applicant

2.4 **FCC ID:**

KV6-TFS-SDU82155A

2.5 **Model Number:**

Satellite Data Unit 82155A

2.6 **Instruction Manual:**

See Exhibit 8

2.7 **Type of Emission:**

21K0G1D, 84K0G1D, 42K0G1D, 200KG1D

2.8 **Frequency Range MHz:**

Rx: 1525.0 to 1559.0 MHz,
Tx: 1626.5 to 1660.5 MHz

2.9 **Power Rating:**

30W, variable up to 30W for continuous operation

For Single Channel System, Nominal Power 4W (approx.)

2.10 **Voltages & Currents in all Final RF Stages:**

3 output stages with 27VDC 5A total at rated O/P power of 30W, split between each stage.

2.11 **Tune Up Procedure:**

See Exhibit 10

2.12 **Circuit Diagram and Description:**

See Exhibit 5

2.13 **Label Information:**

See Exhibit 1

2.14 **Photographs:**

See Exhibits 3 and 9

2.15 **Digital Modulation Description:**

21K0G1D, 42K0G1D, 84K0G1D, 200KG1D

2.16 **Test and Measurement Data:**

Detailed in this document and Exhibit 6

2.17 **Exhibits**

2.17.1 Table 1 lists all of the Exhibits available for FCC review and subsequent approval of the Thales Avionics Top Flight Satcom SDU.

Exhibit	Description	Thales Identifier	Thales Electronic Source
Exhibit 1	**Label**	A11/STE012/001	Master File On Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\001 Exhibit 1 - Label
Exhibit 2	**Attestation Statement**	A111/STE012/002	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\003 Exhibit 2 – Attestation Statement
Exhibit 3	**External Photos**	A111/STE012/003	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\003 Exhibit 3 - External Photos
Exhibit 4	**Block Diagram** 4a – SDU Top Level Block Diagram 4b – SDU Detailed Block Diagram 4c – CCM Block Diagram	A111/STE012/004	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\004 Exhibit 4 - Block Diagram
Exhibit 5	**Schematics** 5a – Backplane Schematics 5b – CPM Schematics 5c – APM Schematics 5d – PSM Schematics 5e – Front Panel Schematics 5f – HPA Schematics 5g – CCM Bill of Materials	A111/STE012/005	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\005 Exhibit 5 - Schematics
Exhibit 6	**Technical Report** 6a – Thales Test Report (this document) 6b – TUV Report RO615497-01 Iss 3 (RF Output Power, Occupied BW, Frequency Stability, Conducted Emissions) 6c - Conducted Emissions Results 6d – TUV Report EE615497 Issue 1 Draft A (Radiated Emissions)	A111/STE012/006 (exhibit 6a)	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\006 Exhibit 6 - Technical Reports

	6e – Thales Radiated Emissions Results Document No 103-101559		
Exhibit 7	**Test Set-Up Photographs**	A111/STE012/007	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\007 Exhibit 7 - Test Set-up Photographs
Exhibit 8	**Installation and Maintenance Manual**	TFS062/J-03/001	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\008 Exhibit 8 - User's Manual
Exhibit 9	**Internal Photos** (four parts 9a thru 9d)	A111/STE012/009	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\009 Exhibit 9 - Internal Photos
Exhibit 10	**Tune up/Parts List** 10a Tune Up Waiver Letter 10b Parts List	A111/STE012/010 (Exhibit 10b) Not Applicable, waiver letter provided	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\010 Exhibit 10 - Tune up_Parts List
Exhibit 11	**RF Exposure**	A111/STE012/011 (also TFS062/T-79/001)	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\011 Exhibit 11 - RF Exposure
Exhibit 12	**Operating Description**	A111/STE012/012	Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\012 Exhibit 12 - Operating Description
Exhibit 13	**Cover Letters** 13a – Confidentiality Request 13b – FAA Acknowledgement Letter 13c - Waiver Request Letter to FCC 13d – Inmarsat Letter of Support		Master File on Snowball:\a111_SysCI\SAT001 (TopFlight SATCOM)\003 Verification\004 Test Evidence\012 - STE-012 FCC Test Evidence\013 Exhibit 13 - Cover Letters

Table 1 - Exhibits Available for FCC Approval of Thales Avionics SDU

FCC ID: KV6-TFS-SDU82155A

3 Testing – EUT Identity and Configuration

3.1 Test Conditions and Engineering Practices

3.1.1 Unless otherwise stated in the specific measurement results the ambient temperature of the SDU was maintained within the range of 10 ºC to 40 ºC unless the particular equipment requirements specify testing over a different temperature range.

3.1.2 Unless otherwise stated the humidity levels were in the range of 10% to 90% relative humidity.

3.1.3 Prior to testing at Thales Avionics or at the authorised test house the SDU was started up in accordance with the Start Up procedures detailed in the Thales Avionics System Test Procedures SYSTP-001 Chapter 2 (Ref. 1.4.6)

3.1.4 Measurement results, unless otherwise noted, are worst case measurements.

3.2 External Equipment

3.2.1 Details of the external test equipment used in the tests are shown below.

Equipment	Part Number	Serial Number	Calibration Due
DLNA	82138A01A	4403093	N/A
Spectrum Analyser	Various	Various	Various
Attenuator	JFW50FH-030-100-2	N/A	N/A - Not used for critical measurements
RF Splitter	ZFSC-2-11SF071700429	N/A	N/A
DLNA DC Power Supply	TSX3510	CEA372901 TE10032	N/A - Not used for critical measurements
Attenuator 10dB	VAT-10	15542	N/A - Not used for critical measurements
Attenuator 15dB	RA10-2NMF15	9620	N/A - Not used for critical measurements

Table 2 External Equipment Configuration

3.3 SDU Configuration

3.3.1 Details of the SDU equipment configuration used in the tests are listed below:

SDU Part Number: 82155/A02A, serial number C10007

SDU Sub-module	Hardware	Software	Serial No.
CPM	82155/DAB001	FV2008	93370008
APM	9009304	FV2008	103
PSM	9009306	N/A	18
CCM1	9009064	R4.3.7	513
CCM2	Not fitted in this configuration		
HPA	9009305	N/A	104
BACKPLANE	82155/DBE	N/A	93380005
FILTER	82155/DHB	N/A	83410004
FRONT PANEL	82155/AV	N/A	C72524
PCI Bridge	82155/DEA	N/A	93400005
BACK PANEL	82155/BA	N/A	C72528
OCXO	82155/CV	N/A	C65662
CAPACITOR ASSEMBLY	82155/AK	N/A	C65627

Table 3 SDU Configuration

3.4 Hardware and Software Configuration Changes

3.4.1 The same SDU hardware and software configuration was maintained for all tests described herein.

4 Testing – Set Up, Procedures &Conditions

4.1 Test Dates

4.1.1 The tests were carried out over the period December 2006 to February 2007.

4.2 Test Result Summary

4.2.1 The SDU passed all required tests with the exception of some radiated emissions which were in excess of the permitted level. In addition some deviations from the test procedures were necessary. The test deviations are detailed in Section 5.

4.2.2 Details of the measurements are contained in the associated exhibits listed in Table 1.

Test	Test Report Details	Location of Result Details	Result Summary	Waiver Requested from FCC
RF Power FCC 47 CFR Parts 2.1046 & 87.131	TUV Report RO615497/01 (Exhibit 6b, Ref. 1.4.4)	Exhibit 6b	Pass	No
Occupied Bandwidth FCC 47 CFR Parts 2.1049 & 87.135	TUV Report RO615497/01 (Exhibit 6b, Ref. 1.4.4)	Exhibit 6b	Pass	No
Frequency Stability FCC 47 CFR Parts 2.1053 & 87.139.	TUV Report RO615497/01 (Exhibit 6b, Ref. 1.4.4)	Exhibit 6b	Pass	No
Conducted Emissions FCC 47 CFR parts 2.1051 & 87.139	TUV Report RO615497/01 (Exhibit 6c Ref. 1.4.4) & Thales Report A111/STE-012/006 (Exhibit 6a, this Document)	Exhibit 6c	Pass	Yes (for alternative method only)
Radiated Emissions FCC 47 CFR Parts 2.1053 & 87.139	TUV Report EE615497/01 (Exhibit 6d, Ref. 1.4.4) & Thales Report Document No 103-101559 (Exhibit 6e, Ref. 1.4.5) & Thales Report A111/STE-012/006 (Exhibit 6a, This Document)	Exhibit 6d & Exhibit 6e	Fail	Yes (for alternative method and minor infringements at 12, 21, 28 and 77 MHz

Table 4 Summary of Results

4.3 RF Power Output Testing

4.3.1 The SDU was tested for RF Carrier Output Power as per:

- FCC 47 CFR Parts 2.1046 and 87.131

4.3.2 The RF Carrier Output Power testing was performed at an Authorised Test House (See Section 2.2).

4.3.3 Figure 1 shows the test configuration used for testing RF Output Power. The test procedure and test results are detailed in the Test House report (Ref. 1.4.4, Exhibit 6b).

4.3.4 The RF Output Power Test was conducted under ambient environmental conditions.

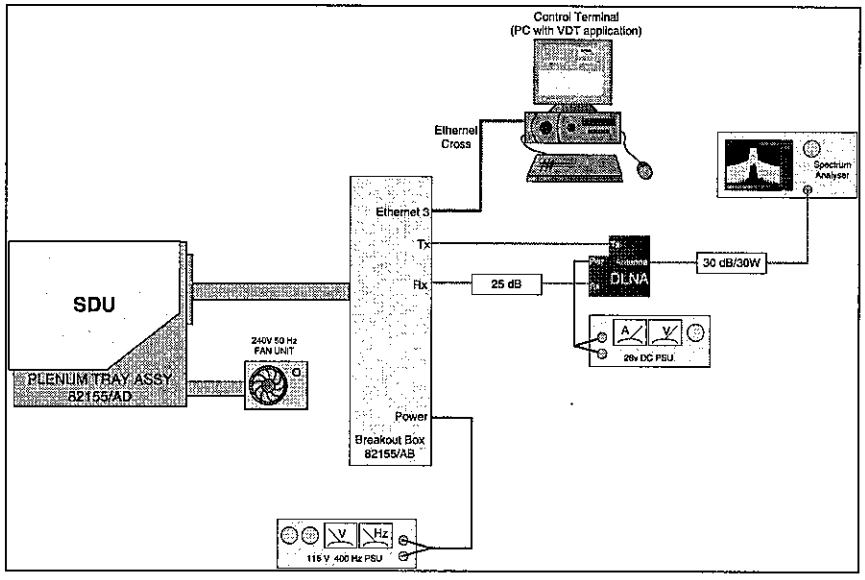

Figure 1 Configuration for RF Power and Occupied Bandwidth Testing at TUV.

4.4 Occupied Bandwidth

4.4.1 The SDU was tested for Occupied Bandwidth as per:

- FCC 47 CFR Parts 2.1049 and 87.135

4.4.2 The Occupied Bandwidth testing was performed at an Authorised Test House (See Section 2.2).

4.4.3 Figure 1 shows the test configuration used for testing RF Output Power. The test procedure and test results are detailed in the Test House report (Ref. 1.4.4, Exhibit 6b).

4.4.4 The Occupied Bandwidth test was conducted under ambient environmental conditions.

4.5 Frequency Stability

4.5.1 The SDU was tested for Frequency Stability as per

- FCC 47 CFR Parts 2.1053 and 87.139.

4.5.2 The Frequency Stability testing was performed at an Authorised Test House (See Section 2.2).

4.5.3 Figure 2 shows the test configuration used for testing Fequency Stability. The test procedure and test results are detailed in the Test House report (Ref. 1.4.4, Exhibit 6b).

4.5.4 For Frequency Stability Testing the SDU was placed in a temperature controlled chamber. Measurements of RF transmit frequency were made at temperature intervals of 10 ºC from –20 ºC to +50 ºC. The equipment was allowed to stabilise for 30 minutes at each temperature before measurements were taken.

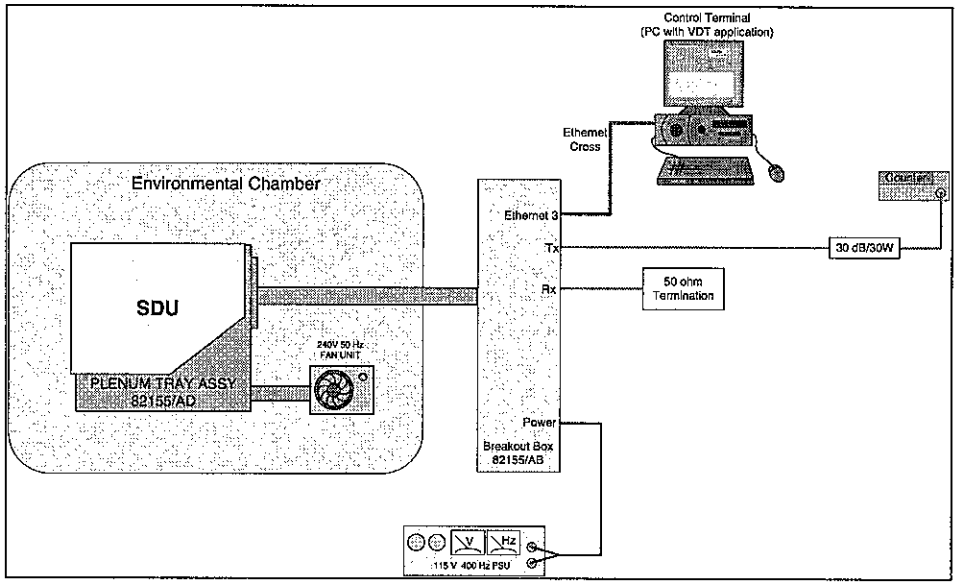

Figure 2 Configuration for Frequency Stability Testing at TUV.

4.6 Conducted Spurious Emissions

4.6.1 The SDU was tested for Conducted Emissions as per

- FCC 47 CFR Parts 2.1051 & 87.139

4.6.2 The Frequency Stability testing was performed at an Authorised Test House (See Section 2.2).

4.6.3 Figure 2 shows the test configuration used for testing Frequency Stability. The test procedure and test results are detailed in the Test House report (Ref. 1.4.4, Exhibit 6b)

4.6.4 The test house report concludes that the SDU failed to meet the requirements of Parts 2.1051 & 87.139, however by using an alternative test approach such that the test was repeated but with measurements made at an alternative SDU port, Thales have concluded that the SDU does in fact meet the requirements of 87.139.

4.6.5 Section 5.4 fully details the alternative test approach used by Thales and the justification for a waiver against this test result. Exhibit 6c contains all of the test results and spectrum plots for this alternative test approach.

4.6.6 The Conducted Spurious Emissions test was conducted under ambient environmental conditions.

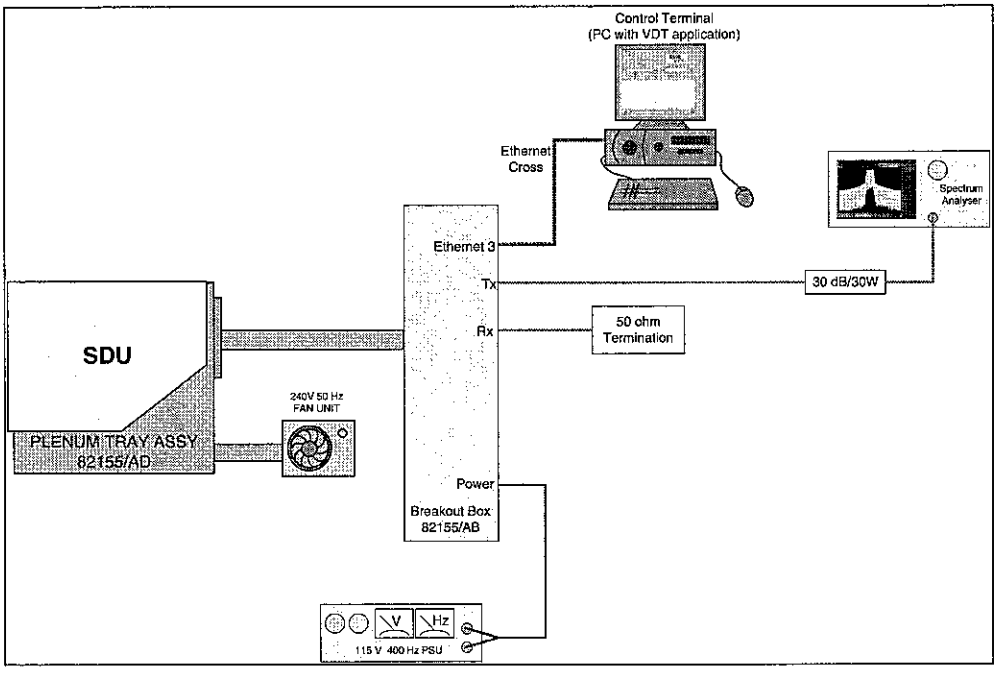

Figure 3 Configuration for Conducted Emissions Testing at TUV.

4.7 Radiated Spurious Emissions

4.7.1 The SDU was to be tested for Radiated Emissions as per:

- FCC 47 CFR Parts Parts 2.1053 & 87.139

4.7.2 On further analysis of this test requirement it was established that the limits required are not measurable for this type of equipment and that measurement of the SDU Radiated Emissions must be to a more suitable alternative specification. Thales have therefore tested and are presenting the measurement of the SDU radiated emissions to RTCA DO-160E, Section 21, Category M with extensions to the measured frequency range that cover the expectations of FCC Part 87.139.

4.7.3 The Radiated Emissions testing was performed at an Authorised Test House (See Section 2.2).

4.7.4 The Radiated Spurious Emissions test was conducted under ambient environmental conditions.

4.7.5 Figure 4 shows the test configuration used for the Radiated Emissions testing. The test procedure and test results are detailed in the Test House report (Ref.1.4.3, Exhibit 6d and Ref 1.4.5, Exhibit 6e). The conclusion from the test house report is the the SDU failed to meet the requirements of RTCA DO-160E, Section 21, Category M with emissions exceeding the Curve M limit lines slightly at 12, 20 and 77MHz.

4.7.6 Section 5.5 fully details the alternative test approach used by Thales and the justification for a waiver against the final test result.

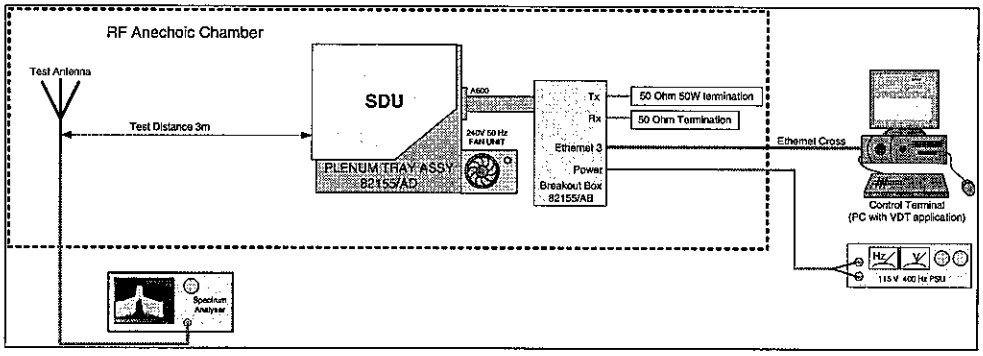

Figure 4 Configuration for Radiated Emissions.

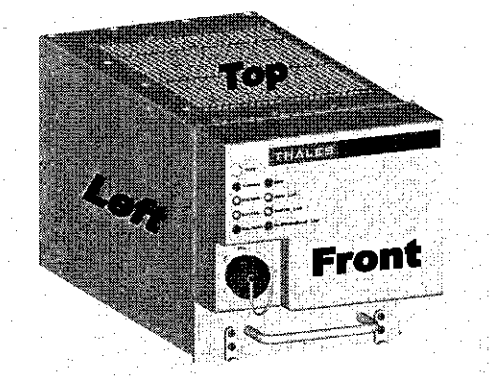

Figure 5 Face Definitions for Radiated Emissions Testing.

5 Conclusions, Deviations and Waiver Requests.

5.1 RF Output Power

5.1.1 As stated in the Test House Test Report (Ref. 1.4.4) The Thales SDU, FCC ID: KVS-TFS-SDU82155A meets the requirements of FCC 47 CFR Parts 2.1046 and 87.131 for RF Output Power.

5.2 Occupied Bandwidth

5.2.1 As stated in the Test House Test Report (Ref. 1.4.4) The Thales SDU, FCC ID: KVS-TFS-SDU82155A meets the requirements of FCC 47 CFR Parts 2.1049 and 87.135 for RF Occupied Bandwidth.

5.3 Frequency Stability

5.3.1 As stated in the Test House Test Report (Ref. 1.4.4) The Thales SDU, FCC ID: KVS-TFS-SDU82155A meets the requirements of FCC 47 CFR Parts 2.1055 and 87.133 for Frequency Stability.

5.4 Conducted Spurious Emissions

5.4.1 As stated in the Test House Test Report (Ref. 1.4.4) The Thales SDU, FCC ID: KVS-TFS-SDU82155A fails to meet the requirements of FCC 47 CFR Parts 2.1051 and 87.139 for Conducted Spurious Emissions.

5.4.2 Thales have investigated the test house result further and have re-tested the SDU at the test house using an alternative method. The following paragraphs outline the justification for the use of this alternative method.

5.4.3 The requirements of FCC 47CFR Part 87.139 (i) (1) are such that the conducted spurious emissions are to be measured at the antenna output. For a transmitter delivering powers in the region of 10 dBW, these requirements are physically impossible to meet. For example, the requirement in the frequency band 1525 to 1559 MHz is stated as an attenuation of 203 dB relative to the carrier level, measured in a 4 KHz bandwidth. For a transmitter rated output of 10 dBW EIRP, this translates to an absolute power level of –163 dBm in 4 KHz, which is lower than thermal noise for temperatures above 1 degree Kelvin.

5.4.4 Thales concluded that the only practical way to measure conducted spurious was to make the measurement at the HPA output, before the DLNA, and compute the resultant spurious at the antenna by adding the attenuation of the DLNA.

5.4.5 The DLNA is purchased as part of the antenna subsystem, and is not manufactured by Thales Avionics Limited. The DLNA attenuation assumed is per the standards for a "Modified Type A" DLNA as published in ARINC Characteristic 741. It is worth noting that this is the same type of DLNA as used on many thousands of existing installations from several manufactures already approved by the FCC.

5.4.6 Exhibit 6f contains plots of the Conducted Spurious Emissions measured and the DLNA Output and Table 5 shows the calculation of new limits referred to the HPA output.

Frequency band (MHz)	Part 87 limit (dBc) (1)	DLNA rejection (dB)	Limit at HPA (dBc)	Limit translated to bandwidth used for measurements	Notes
0.01 to 1525	-135 / 4KHz	>80	-55 / 4KHz	-51 / 10 KHz	
1525 to 1559	-203 / 4KHz	>120	-83 / 4KHz	-79 / 10 KHz	
1559 to 1585	-155 / MHz	>100	-55 / MHz	-55 / MHz	
1585 to 1605	-143 / MHz	>88	-55 / MHz	-55 / MHz	
1605 to 1610	-117 / MHz	>62	-55 / MHz	-55 / MHz	
1610 to 1610.6	-95 / MHz	>40	-55 / MHz	-55 / MHz	
1610.6 to 1613.8	-80 dBW / MHz	>40	-40 dBW / MHz	-40 dBW / MHz	3
1613.8 to 1614	-95 / MHz	>40	-55 / MHz	-55 / MHz	
1614 to 1626.5	-70 / 4KHz	Decreases	-70 / 4KHz	-66 / 10 KHz	
1626.5 to 1660	-70 / 4KHz	<0.8	-70 / 4KHz	-66 / 10 KHz	2,3,4
1660 to 1670	-49.5 dBW / 20 KHz	Increases	-49.5 dBW / 20 KHz	-47.5 dBW / 30 KHz	2,3,4
1670 to 1735	-60 / 4KHz	Increases	-60 / 4KHz	-56 / 10 KHz	
1735 to 2000	-105 / 4KHz	>50	-55 / 4KHz	-51 / 10 KHz	5
2000 to 12000	-105 / 4KHz	>50	-55 / 4KHz	-51 / 10 KHz	5
12000 to 18000	-70 / 4KHz	>15	-55 / 4KHz	-51 / 10 KHz	

Notes:

1 Attenuation limit in dB relative to carrier power
2 Excludes occupied bandwidth
3 Not applicable for intermodulation products
4 Narrow band spurious signal limit 10 dB above table value
5 Spectrum analyser sweep split at 2000 MHz

Table 5 Modified Conducted Spurious Limits

5.4.7 From the results in Table 5 and the plots shown in Exhibit 6f, Thales have concluded that using this alternative method SDU FCC ID KVS-TFS-SDU82155A does meet the requirements of FCC 47 CFR Parts 2.1051 and 87.139 for Conducted Spurious Emissions.

5.4.8 Thales are therefore requesting a waiver against the test method used for the measurement of the SDU FCC ID KVS-TFS-SDU82155A Conducted Spurious Emissions.

5.5 Radiated Emissions

5.5.1 As described in Section 4.7 the SDU Radiated Emissions were tested using an alternative method by the TUV Test house and to the requirements of RTCA DO160E, Section 21 Curve M. The following paragraphs outline the justification for the use of this alternative method.

5.5.2 The requirements for radiated emissions have the same practical problem as for conducted emissions described above.

5.5.3 The FCC test procedure for emissions radiated from the equipment case and interconnecting cables is specified in 2.1053 "Measurements Required: Field Strength of Spurious Radiation." These procedures require demonstration of compliance with the same emissions limits specified in 87.139(i)(1). However, the limits of 87.139(i)(1) were designed to align with the requirements of RTCA DO-210D "Minimum Operational Performance Standards for Geosynchronous Orbit Aeronautical Mobile Satellite Services (AMSS) Avionics" (MOPS). This resulted in a change from the

previous FCC attenuation limits of 83 dB (below 1559 MHz) and 55 dB (above 1559 MHz) to attenuations now as high as 203 dBc in the receive band (1525-1559 MHz).

5.5.4 These new FCC requirements are appropriate at the antenna port, since the system is duplex and uses a single antenna. Most of the receiver/transmitter isolation to achieve this attenuation is provided by the DLNA. Other attenuation requirements in the MOPS were established to protect any GPS receiver antenna mounted nearby on the aircraft and to protect radio astronomy. These limits assumed the satcom antenna could exhibit in excess of 12 dB gain at these frequencies.

5.5.5 However, there is no practical reason to require these same attenuations from the equipment case and interconnecting cables. The equipment and cables are located internal to the aircraft fuselage, and the field strength of any spurious emission is not amplified by the gain of the antenna. None of the other electronic equipment that may be installed in the aircraft is tested to the levels of 87.139(i)(1).

5.5.6 Thales Avionics Limited is therefore requesting a waiver of 87.139(i)(1) as applied to the field strength measurements of equipment and interconnecting cables specified in 2.1053. Thales Avionics Limited is requesting that the FCC accept measurements made to the standard radiated field strength procedures and limits for equipment and interconnecting cables for equipment installed internal to aircraft fuselage as specified in RTCA DO-160D, Section 21, Category M, with an extension in the measured frequency range from 6 GHz to 18 GHz. The limit line in this region was extended from 6 GHz on the same slope as at 6GHz and below.

5.5.7 The test house plots and report contained in Exhibits G and H respectively indicate that the SDU meets the radiated emissions requirements of DO-160D, Section 21, Category M for electronic equipment installed internal to the fuselage, including in the extended frequency range from 6 GHz to 18 GHz, with the exception of minor exceedances in the region of 12, 20 and 77 MHz.

5.5.8 The emissions that do not meet the requirements are considered to be at levels and frequencies that will not cause inteference to other equipment. Thales are also therefore requesting a waiver against the test criteria used for this measurement requirement.

Note – Rockwell Collins submission for FAA Approval in August 2006 for their High Speed Data transceiver HST-2110 FCC-ID AJK8222231 and HST-212- FCC-ID AJK8222233 also included a request for a waiver against the test criteria used for Radiated and Conducted Emissions on a similar basis.

6 Testimonial and Statement of Certification

The Thales Avionics Ltd Satellite Data Unit Type Number 82155A (FCC ID: KV6-TFS-SDU82155A) has been tested in accordance with the requirements contained in the appropriate Commission regulations. To the best of my knowledge these tests were performed using measurement procedures consistent with industry or Commission standards and demonstrate that the Satellite Data Unit Type Number 82155A complies with the appropriate standards. Each unit manufactured, imported or marketed, as defined in the Commission's regulations, will conform to the samples within the variations that can be expected due to quantity production and testing on a statistical basis. I hereby certify that the tests described in this report were performed at my direction and under my supervision, and that the results and test data contained in this report truly and accurately show the performance of the Satellite Data Unit Type Number 82155A. I further certify that the ancillary information contained herein accurately reflects the design, installation requirements, alignment procedures and operational instructions of and for this equipment.

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C. Appleyard
(Technical Consultant, Certifying Engineer)

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J. Livingstone
(Systems Project Leader)

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David Parker
(System Design Authority)