

ENGINEERING TEST REPORT

ON MODEL: NT 132 / 315 FTT READER

IN ACCORDANCE WITH:

CFR 47, PART 15, SUBPART B, CLASS A & SUBPART C

REPORT NO.: 9L0068EUS

TESTED FOR:

AXCESS, INC. 3208 COMMANDER DRIVE CARROLLTON, TEXAS 75006

TESTED BY:

KTL DALLAS, INC. 802 N. KEALY LEWISVILLE, TEXAS 75057-3136



NVLAP LAB CODE: 100426-0

AUGUST 1999

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This report applies only to the item/s tested and does not constitute endorsement by the United States of America.

The equipment has been tested by KTL Dallas, Inc. for verification of compliance with CFR 47, Part 15, Subpart B for Class A requirements for Digital Devices. Each unit manufactured, imported or marketed will conform to the sample(s) tested within the variations that can be expected due to quantity production and testing on a statistical basis.

BY:____

SIGNATURE

PRINTED

TITLE:

COMPANY:

Axcess, Inc. 3208 Commander Drive Carrollton, Texas 75006

DATE:

Section 1. Summary of Test Results

General:

All measurements are traceable to national standards.

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR 47, Part 15, Subpart B, for Class A Digital Devices, Paragraph Numbers 15.107 and 15.109 & Subpart C, Paragraph Numbers 15.207, 15.209 and 15.231.

The equipment was tested for conducted emissions from 0.45 MHz to 30 MHz using a 50 μ h line impedance stabilization network (L.I.S.N.) as described in ANSI C63.4-1992. Peripheral equipment was also operated through a 50 μ h L.I.S.N.

The equipment was tested for radiated emissions from 30 MHz to 1000 MHz with extension to the 10th harmonic of any fundamental clock frequency in accordance with the requirements of CFR 47, Part 15, Subpart B for Class A Digital Devices and Subpart C. Frequencies were initially identified in a large shielded room. Amplitude measurements were made on an outdoor Open Area Test Site. Details of the outdoor site are on file with the FCC.

These tests were conducted using measurement procedures of ANSI C63.4-1992.

Abstract (Subpart B):

Name Of Test	Paragraph No.	Results
Conducted Emissions	15.107	Complies
Radiated Emissions	15.109	Complies

Abstract (Subpart C):

Name Of Test	Paragraph No.	Results
Conducted Emissions	15.207	Complies
Radiated Emissions	15.209, 15.231	Complies

In the configuration tested, the E.U.T. complies with the requirements of CFR 47, Part 15, Subpart B, for Class A Digital Devices, Paragraph Numbers 15.107 and 15.109 & Subpart C, Paragraph Numbers 15.207, 15.209 and 15.231.

THIS REPORT APPLIES ONLY TO THE ITEM(S) TESTED AND DOES NOT CONSTITUTE ENDORSEMENT BY THE UNITED STATES OF AMERICA.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE: EXCLUSIONS: **NONE.**

NVLAP LAB CODE: 100426-0

TESTED BY:	Mike Sundstrom	DATE:	04/30/99
	Mike Sundstrom, EMC Technician		
APPROVED BY:		DATE:	
	Dale L. Reynolds, EMC Division Manager	_	

Section 2.	Equipment Under Test (E.U.T.)				
Manufacturer:	Axcess, Inc.				
Model No.:	NT 132 / 315 FTT Reader				
Serial No.:	0101099017				
	Production Unit	Pre-Production Unit			

The E.U.T was received on April 28, 1999, in good condition.

Description of E.U.T.:

The E.U.T. is a metal, NEMA enclosure with PCB's and FTT PCB. The intended use of the E.U.T. is to transmit and receive data from a tag and communicate with a computer through a twisted pair connection.

Clock, Oscillator, Highest Frequencies Utilized:

- (1) 5 MHz
- (2) 132 kHz (RX)
- (3) 315 MHz (TX)

E.U.T. Photographs:





Modifications Incorporated in E.U.T.:

To achieve compliance the following change(s) were made by KTL Dallas, Inc. and Axcess, Inc. during compliance testing: Two ferrites were added:

- MOD 1: A ferrite was added, (Fair Rite P/N 2643665702) to the DC power line (common mode).
- MOD 2: A ferrite was added, (Fair Rite P/N 2643801002) to Wiegand data line (FTT).

Modification Photographs:

MOD 1:



MOD 2:



Justification:

The E.U.T. was configured for testing as per typical installation. Position and bundling of cables were investigated to establish maximum amplitude of emissions.

The following combinations were investigated to establish worst case configuration:

- (1) On, no Tag (Reader TX off).
- (2) On, with Tag (Reader TX on).

Exercise Program:

The E.U.T. exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to typical use.

Exercise Mode:

- (1) Normal operation, Tag outside reader effect field (Transmit mode, Receiver idle). Known as "No Tag".
- (2) Normal operation, Tag within reader effect field (Transceiver mode, TX RX active). Known as "With Tag".

Section 3. Equipment Configuration

Equipment Configuration List:

Item	Manufacturer	Description	FCC ID:	Model No.	Part Number	Serial No.
(A)	Axcess, Inc.	Tag	None Neurotag 3.1		800-039-XXX	36273
(B)*	Axcess, Inc.	Reader	None**	NT 132/315 FTT Reader	800.035.002	0101099017
(C)*	Axcess, Inc.	Antenna Tuning Unit	None	ATU	800.009.000	None
(D)*	Ault	Transformer	None	24 V at 500 mA	D48240500A000G	None
(E)*	Axcess, Inc.	Antenna Picture Frame	None	None	800.026.009	None
(F)	Axcess, Inc.	Serial Gateway	None	None	800.017.000	None

*E.U.T.

**The compliance status of this product is being determined by the results in this report.

Inter-connection Cables:

Item	Description	Model No. / Manufacturer	Connectors	Length	Shielded	
				(m)	Yes	No
(1)	Coax (qty: 4)	RG58 / Belden	BNC	1.7	Х	
(2)	Serial	128-06 / Link	DB9	7.6		Х
(3)	Gateway	N/A / General Cable	Bare	23		Х

NOTE: Please see block diagram on the following page.

Configuration of the Equipment Under Test (E.U.T.):



Section 4. Notes

Section 5. Conducted Emissions

TESTED BY: Mike Sundstrom**DATE OF TESTS:** 04/30/99

Test Conditions:

Test Voltage: 115 Vac @ 60 Hz Temperature: 21°C Humidity: 54%

Purpose:

The tests are intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits for conducted emissions as defined by CFR 47, Part 15, Subpart B, for Class A Digital Devices, Paragraph Number 15.107 and Subpart C, Paragraph Number 15.207.

Test Results:

The E.U.T. complies.

Test # CE1 (CFR 47, Part 15, Subpart B, Class A, Paragraph Number 15.107):

The worst case emission is 45 dB μ V at 0.45 MHz on the L1 side of the line. This is 15 dB below the quasi-peak specification limit of 60 dB μ V.

Test # CE1 (CFR 47, Part 15, Subpart C, Paragraph Number 15.207):

The worst case emission is 45 dB μ V at 0.45 MHz on the Hot (L1) side of the line. This is 3 dB below the quasi-peak specification limit of 48 dB μ V.

Measurement Data:

See test data on pages 15 and 16.

Specification Limits:

CFR 47, Subpart B, 15.107:

Frequency(MHz)	Maximum Powerline Conducted RF Voltage					
	μV	dBµV				
0.45-1.705	1000	60.0				
1.705-30.0	3000	69.5				

CFR 47, Subpart C, 15.207:

Frequency(MHz)	Maximum Powerline Conducted RF Voltage						
	μV	dBµV					
0.45 - 30.0	250	48					

Method of Measurement (Procedure ANSI C63.4-1992):

Measurements were made using a spectrum analyzer with 10 kHz RBW, CISPR Quasi-Peak detector.

Broadband emissions are identified by switching the receiver detector function from Quasi-Peak to Average. If the amplitude of the emission drops by 6 dB or more then the emission is classified as broadband and the Quasi-Peak level is reduced by a factor of 13 dB.

Test Data - Conducted Emissions Test # CE1 (Subpart B):

Conducted Emissions Data (CISPR Quasi-Peak Detector) Complete X FCC (CFR 47) Preliminary Page1 of1									
Client:	AXCESS				W.O.#:	9L0068E		Date: 04/30/99	
EUT:	NT132/3	15 READE	ER (FTT)		S/N:	01010990	17	Specification: CFR47,15,B,A(15.107)	
Tech:	M.Sundst	rom			Test #:	CE1	Lab:	4 Photo ID: <u>9L0068 CE1</u>	
Equipme	Equipment Used: 213,C66,G1709,C79,099,G1504,G2619								
Configura	ation:	ON, With	n Tag (Tag	g # 3627	3)				
IF Bandv	vidth:	10kHz	Video Ba	Indwidth	N/A	De	etector:	Peak <u>X</u> CISPR	
Ambient Relative Atmosph	Ambient Temperature:21CEUT Power:X115 V.A.C.X60 HzX1 PhaseRelative Humidity:54%230 V.A.C.50 Hz3 PhaseAtmospheric Pressure:1005mbarOther								
Freq.	Meter Reading (dBuV)	Attn.	Cable Loss (dB)	Probe Factor (dB)	Corrected Reading (dBuV)	Spec.limit	Pol.	Comments:	
0.45	(ubuv) 15	(dD) 30	(dD) 0	(UD) 0	(ubuv) 45	(ubuv) 60	L1	l	
0.5	14	30	0	0	44	60	L1		
3.15	19	20	0	0	39	69.5	L1		
5.132	10	20	0	0	30	69.5	L1		
8.29	15	20	0	0	35	69.5	L1		
0.45	14	30	0	0	44	60	L2		
0.5	12	30	0	0	42	60	L2		
0.658	20	20	0	0	40	60	L2		
0.922	16	20	0	0	36	60	L2		
3.157	17	20	0	0	37	69.5	L2	ļ	
8.68	16	20	0	0	30	69.5	L2	<u> </u>]	
15.65	12	20	0	0	37	69.5	12		
10.00		20			51	00.0		Scanned 0.45MHz to 30MHz	
	Note: Verify that the IF Bandwidth is in the proper setting.								

Test Data - Conducted Emissions Test # CE1 (Subpart C):

Conducted Emissions Data (CISPR Quasi-Peak Detector) Complete X FCC (CFR 47) Preliminary Page1 of1									
Client:	AXCESS				W.O.#:	9L0068E		Date: 04/30/99	
EUT:	EUT: NT132/315 READER (FTT) S/N: 0101099017 Specification: CFR47,15,C,A(15.207)								
Tech: M.Sundstrom Test #: CE1 Lab: 4 Photo ID: 9L0068 CE1									
Equipment Used: 213,C66,G1709,C79,099,G1504,G2619									
Configur	ation:	ON, With	n Tag (Tag	g # 3627	3)				
IF Bandv	vidth:	10kHz	Video Ba	andwidth	N/A	De	etector:	Peak X CISPR	
Ambient Relative Atmosph	Ambient Temperature: 21 C EUT Power: X 115 V.A.C. X 60 Hz X 1 Phase Relative Humidity: 54 % 230 V.A.C. 50 Hz 3 Phase Atmospheric Pressure: 1005 mbar Other 0								
Freq. (MHz)	Meter Reading (dBuV)	Attn. (dB)	Cable Loss (dB)	Probe Factor (dB)	Corrected Reading (dBuV)	Spec.limit (dBuV)	Pol.	Comments:	
0.45	15	30	0	0	(dBdV) 45	48	L1		
0.5	14	30	0	0	44	48	L1		
3.15	19	20	0	0	39	48	L1		
5.132	10	20	0	0	30	48	L1		
8.29	15	20	0	0	35	48	L1		
0.45	14	20	0	0	11	10	12		
0.45	14	30	0	0	49	40	12		
0,658	20	20	0	0	40	48	L2		
0.922	16	20	0	0	36	48	L2		
3.157	17	20	0	0	37	48	L2		
8.68	16	20	0	0	36	48	L2		
10.39	12	20	0	0	32	48	L2		
15.65	17	20	0	0	37	48	L2		
								Scanned 0.45MHz to 30MHz	
│									
								1	
	Note: Verify that the IF Bandwidth is in the proper setting.								

Conducted Emissions Photographs for Test # CE1 (Subpart B) and Test # CE1 (Subpart C):

FRONT VIEW:



SIDE VIEW:



Section 6. Radiated Emissions

TESTED BY: Mike Sundstrom

Test Conditions:

Test #	Date of Test	Test Voltage	Temperature	Humidity
RE 1	04/28/99	115 Vac @ 60 Hz	19°C	50%
RE 2	04/29/99	115 Vac @ 60 Hz	17°C	48%
MW 1A	04/30/99	115 Vac @ 60 Hz	21°C	51%
RE LF	04/30/99	115 Vac @ 60 Hz	21°C	45%
RE 4	04/28/99	115 Vac @ 60 Hz	19°C	50%
RE 5	04/29/99	115 Vac @ 60 Hz	17°C	48%
MW 1	04/22/99	115 Vac @ 60 Hz	22°C	71%

Purpose:

The test is intended to demonstrate the compliance of the Equipment Under Test (E.U.T.) to the limits for radiated emissions as defined by CFR 47, Part 15, Subpart B, for Class A Digital Devices, Paragraph Number 15.109 and Subpart C, Paragraph Numbers 15.209 and 15.231.

Test Results (CFR 47, Part 15, Subpart B, Class A, Paragraph Number 15.109):

The E.U.T. complies.

Test # RE 1 and RE 2 (30 MHz to 1000 MHz):

The worst case radiated emission is 43.5 dB μ V/m at 50.0 MHz at a distance of 3 meters in the Vertical polarization. This is 5.99 dB below the quasi-peak specification limit of 49.5 dB μ V/m.

Test # MW 1A (1G Hz to 4 GHz):

The worst case microwave radiation emission is a Noise Floor reading of 47 dB μ V/m at 3.2 GHz at a distance of 3 meters in the Horizontal polarization. This is 13 dB below the average specification limit of 60 dB μ V/m.

Measurement Data:

See test data on pages 21, 24 and 26.

Frequency(MHz)	Maximum Field Strength at 3m and 10m (Unintentional)						
	3m	3m	10m	10m			
	(µV/m)	$(dB\mu V/m)$	(µV/m)	(dBµV/m)			
30 - 88	300	49.5	90	39.1			
88 - 216	500	54	150	43.5			
216 - 960	700	56.9	210	46.4			
Above 960	1000	60	300	49.5			

Specification Limits (CFR 47, Subpart B, 15.109):

Test Results (CFR 47, Part 15, Subpart C, Paragraph Numbers 15.209 and 15.231):

The E.U.T. complies.

Test # RE LF, RE 4 and RE 5 (100 kHz to 1000 MHz):

The worst case radiated emission is 47.9 dB μ V/m at 130 MHz at a distance of 3 meters in the Vertical polarization. This is 7.7 dB below the quasi-peak specification limit of 55.6 dB μ V/m.

Test # *MW* 1 (1 *G Hz to* 4 *GHz*):

The worst case microwave radiation emission is a Noise Floor reading of 47 dB μ V/m at 3.2 GHz at a distance of 3 meters in the Horizontal polarization. This is 8.6 dB below the average specification limit of 55.6 dB μ V/m.

Measurement Data:

See test data on pages 28, 30, 32 and 34.

Frequency	Maximum Field Strength								
	(Intentional)								
	Field strength	Measurement distance							
(MHz)	(µV/m)	(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							

Specification Limits (CFR 47, Subpart C, 15.209):

Specification Limits (CFR 47, Subpart C, 15.231):

Frequency	Maximum Field Strength at 3 m										
	(Intentional)										
	Fundamental	Fundamental	Spurious	Spurious							
	3 m	3 m	3 m	3 m							
(MHz)	(µV/m)	(dBµV/m)	(µV/m)	(dBµV/m)							
315	6060	75.65	606	55.65							

The spectrum was searched to the 10th harmonic of the highest fundamental clock frequencies per CFR 47, Part 15, Subpart C, Paragraph 15.209.

Method of Measurement (Procedure ANSI C63.4-1992):

The equipment was prescanned in a shielded room using a spectrum analyzer and broadband antenna. A list of frequencies was compiled for investigation in the open field. The equipment was then moved to an open area test site where amplitude measurements were made at a distance of 10 meters for Subpart B and 3 meters for Subpart C. The bandwidth was set to 100 kHz and the detector function was Peak. Any emission within 6 dB of the specification limit is remeasured using a reference tuned dipole antenna per ANSI C63.4.

For L-F radiated emissions measurements, the equipment is scanned in an anechoic chamber where amplitude measurements are made at a distance of 3 meters. The bandwidth is set to 10 kHz and the detector function is quasi-peak.

Any emission above 1 GHz was measured with horn antenna and low noise pre-amplifier at a distance of 3 meters.

Test Data - Radiated Emissions Test # RE 1 (Subpart B):

CLIENT NA	ME:	AXCE	SS					W.O.#:	: 910068e	DATE:	04/28/99
EUT MODE	L:	NT 132	2 / 315 Re	ader (FTT)		SERIAL #:	01010990	17	TIME:	0730
EUT CONFI	G.:	ON. W	ith Tag (]	Tag # 3627	(3)		-			TECH.:	M.SUNDSTROM
TEST SPECI	FICAT	ION	FCC A F	RAD 3M	- /				TEST N	UMBER	RE 1
ROD ANT #	ŀ		CABLE	#	4C	DETE	CT TYPE	PEAK	LOCAT	ION	COATS
BICON ANT	#·	2021	PREAM	тр. <u>#</u> .	308	RES	$RW(kH_2)$	100	DISTAN	VCE(m)	3
LOG ANT #		2021		D#	181	VIDE	$O BW (kH_2)$	100		U TAGE	115 VAC
LOO ANT.	т. #.	2020	ATTEN	ιτπ 	N/A	TEME	O D W (RHZ).	100		$EO(U_2)$	60
DIDOLE AN	. н . т. <u>4</u> .		DETEC	.#. TOD#.	1N/A		(ueg. C).	19			01006% DE 1 DAD EM
DIPULE AN	1 #:	12-4	DETEC	IOK#:	2407		DITT (%):	50			9100080 RE I KAD. EM.
Emission	Ant.	Det.	Meter	Antenna	Path	KF	Corrected	Spec.	CK/SL	Pass	Notes
Frequency	Pol.	Atten.	Reading	Factor	Loss	Gain	Reading	Limit	Delta	Fail	
(MHz)	(H/V)	(dB)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Marginal	
30.0	V	0.0	44.0	12.9	2.4	25.0	34.3	49.5	-15.22	Pass	
30.9	V	0.0	45.0	12.9	2.4	25.0	35.3	49.5	-14.22	Pass	
31.1	V	0.0	44.0	12.8	2.4	25.0	34.2	49.5	-15.28	Pass	
31.5	V	0.0	49.0	12.8	2.4	25.0	39.2	49.5	-10.28	Pass	
31.6	V	0.0	48.0	12.8	2.4	25.0	38.2	49.5	-11.28	Pass	
31.8	V	0.0	47.0	12.8	2.4	25.0	37.2	49.5	-12.28	Pass	
32.2	V	0.0	47.0	12.8	2.4	25.0	37.2	49.5	-12.34	Pass	
32.5	v	0.0	50.0	12.8	2.4	25.0	40.2	49.5	-9.34	Pass	
33.7	v	0.0	50.0	12.0	2.1	25.0	40.1	49.5	-9.4	Pass	
33.0	V	0.0	51.0	12.7	2.4	25.0	40.1	40.5	-7.4	Dass	
24.7	V	0.0	52.0	12.7	2.4	25.0	41.1	49.5	-0.4	T ass	
34.7	V	0.0	52.0	12.7	2.4	25.0	42.0	49.3	-7.40	Pass	
34.9	V	0.0	51.0	12.7	2.4	25.0	41.0	49.5	-8.46	Pass	
35.2	V	0.0	50.0	12.6	2.4	25.0	40.0	49.5	-9.52	Pass	
37.2	V	0.0	49.0	12.4	2.4	25.0	38.8	49.5	-10.72	Pass	
40.4	V	0.0	54.0	12.1	2.4	25.0	43.5	49.5	-6.02	Pass	
40.8	V	0.0	50.0	12.1	2.4	25.0	39.5	49.5	-10.02	Pass	
42.5	V	0.0	47.0	12.1	2.4	25.0	36.4	49.5	-13.06	Pass	
45.0	V	0.0	42.0	12.0	2.4	25.0	31.4	49.5	-18.12	Pass	
47.5	V	0.0	48.0	12.1	2.4	25.0	37.4	49.5	-12.06	Pass	
50.0	V	0.0	53.0	12.1	3.4	24.9	43.5	49.5	-5.99	Pass	
52.5	V	0.0	52.0	11.7	3.4	24.9	42.1	49.5	-7.39	Pass	
55.0	V	0.0	51.0	11.1	3.4	24.9	40.5	49.5	-8.99	Pass	
57.5	V	0.0	50.0	10.7	3.4	24.9	39.1	49.5	-10.39	Pass	
60.0	v	0.0	53.0	10.1	3.4	24.9	41.5	49.5	-7.99	Pass	
62.5	v	0.0	53.0	10.1	3.4	24.9	41.5	49.5	-8.05	Pass	
65.0	V	0.0	56.0	10.0	2.4	24.0	44.4	40.5	-0.05	Daga	
65.0	v	10.0	30.0	10.0	2.4	24.9	44.4	49.5	-5.14	T ass	OB C2407
03.0	V	10.0	44.0	10.0	3.4	24.9	42.4	49.5	-/.14	Pass	QP 02407
70.0	V	0.0	55.0	9.8	3.6	24.9	43.5	49.5	-6.02	Pass	
72.5	V	0.0	54.0	9.7	3.6	24.9	42.3	49.5	-7.16	Pass	
75.0	V	0.0	54.0	9.4	3.6	24.9	42.1	49.5	-7.37	Pass	
80.0	V	0.0	47.0	9.1	3.9	24.9	35.1	49.5	-14.44	Pass	
82.5	V	0.0	40.0	9.2	3.9	24.9	28.2	49.5	-21.3	Pass	
85.0	V	0.0	54.0	9.5	3.9	24.9	42.4	49.5	-7.09	Pass	
87.5	V	0.0	52.0	9.6	3.9	24.9	40.6	49.5	-8.95	Pass	
110.0	V	0.0	52.0	10.9	4.4	24.9	42.4	54.0	-11.64	Pass	
112.5	V	0.0	53.0	11.0	4.4	24.9	43.4	54.0	-10.56	Pass	
115.0	V	0.0	47.0	11.1	4.4	24.9	37.6	54.0	-16.44	Pass	
117.5	V	0.0	52.0	11.2	4.4	24.9	42.6	54.0	-11.36	Pass	
120.0	V	0.0	54.0	11.3	4.4	24.9	44.8	54.0	-9.22	Pass	
122.5	v	0.0	52.0	11.4	4.4	24.9	42.9	54.0	-11.1	Pass	
125.0	v	0.0	50.0	11.6	40	24.9	41.6	54.0	_12.4	Pase	
123.0	v	0.0	52.0	11.0	4.0	24.0	42.7	54.0	10.29	Doog	
127.3	V	0.0	56.0	11./	4.9	24.9	43.7	54.0	-10.28	r dSS Dasa	
130.0	V	0.0	50.0	11.9	4.9	24.9	47.9	54.0	-0.1	Pass	
132.5	V	0.0	51.0	12.0	4.9	24.9	43.0	54.0	-10.96	Pass	
135.0	V	0.0	52.0	12.2	4.9	24.9	44.2	54.0	-9.75	Pass	
137.5	V	0.0	40.0	12.4	4.9	24.9	32.4	54.0	-21.61	Pass	

Test Data - Radiated Emissions Test # RE 1 (Subpart B) (Continued):

Emission	Ant.	Det.	Meter	Antenna	Path	RF	Corrected	Spec.	CR/SL	Pass	Notes
Frequency	Pol.	Atten.	Reading	Factor	Loss	Gain	Reading	Limit	Delta	Fail	
(MHz)	(H/V)	(dB)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Marginal	
140.0	V	0.0	51.0	12.6	4.9	24.8	43.6	54.0	-10.37	Pass	
142.5	V	0.0	40.0	12.6	4.9	24.8	32.6	54.0	-21.41	Pass	
145.0	V	0.0	50.0	12.5	4.9	24.8	42.5	54.0	-11.47	Pass	
147.5	V	0.0	46.0	12.5	4.9	24.8	38.5	54.0	-15.51	Pass	
150.0	V	0.0	52.0	12.4	5.4	24.8	44.9	54.0	-9.07	Pass	
152.5	V	0.0	46.0	12.4	5.4	24.8	39.0	54.0	-15.03	Pass	
155.0	V	0.0	44.0	12.5	5.4	24.8	37.0	54.0	-16.97	Pass	
157.5	V	0.0	41.0	12.5	5.4	24.8	34.1	54.0	-19.93	Pass	
160.0	V	0.0	43.0	12.6	5.4	24.8	36.2	54.0	-17.81	Pass	
162.5	V	0.0	39.0	12.6	5.4	24.8	32.2	54.0	-21.83	Pass	
165.0	v	0.0	36.0	12.6	5.4	24.8	29.1	54.0	-24.86	Pass	
170.0	v	0.0	36.0	12.0	5.4	24.8	29.1	54.0	-24.91	Pass	
172.5	V	0.0	39.0	12.5	5.4	24.0	32.3	54.0	-21.65	Pass	
175.0	V	0.0	40.0	12.0	5.4	24.0	33.7	54.0	-20.26	Pase	
175.0	•	0.0	40.0	13.1	5.4	24.0	55.7	54.0	-20.20	1 455	
20.0	и	0.0	47.0	12.0	2.4	25.0	27.2	40.5	12.22	Doog	
30.0	п	0.0	47.0	12.9	2.4	25.0	37.3	49.5	-12.22	F dSS Doce	
24.0	п	0.0	44.0	12.0	2.4	25.0	34.2	49.3	-13.20	F dSS Door	
34.9	п	0.0	47.0	12.7	2.4	25.0	37.0	49.3	-12.40	Pass	
37.0	H	0.0	46.0	12.5	2.4	25.0	35.9	49.5	-13.62	Pass	
40.0	H	0.0	50.0	12.1	2.4	25.0	39.5	49.5	-10.02	Pass	
42.5	H	0.0	48.0	12.1	2.4	25.0	37.4	49.5	-12.06	Pass	
50.0	H	0.0	53.0	12.1	3.4	24.9	43.5	49.5	-5.99	Pass	
52.5	H	0.0	53.0	11.7	3.4	24.9	43.1	49.5	-6.39	Pass	
57.5	H	0.0	46.0	10.7	3.4	24.9	35.1	49.5	-14.39	Pass	
60.0	Н	0.0	54.0	10.1	3.4	24.9	42.5	49.5	-6.99	Pass	
62.5	Н	0.0	54.0	10.0	3.4	24.9	42.5	49.5	-7.05	Pass	
65.0	Н	0.0	58.0	10.0	3.4	24.9	46.4	49.5	-3.14	Pass	
65.0	Н	0.0	42.0	10.0	3.4	24.9	30.4	49.5	-19.14	Pass	QP G2407
70.0	Н	0.0	53.0	9.8	3.6	24.9	41.5	49.5	-8.02	Pass	
75.0	Н	0.0	55.0	9.4	3.6	24.9	43.1	49.5	-6.37	Pass	
80.0	Н	0.0	50.0	9.1	3.9	24.9	38.1	49.5	-11.44	Pass	
85.0	Н	0.0	55.0	9.5	3.9	24.9	43.4	49.5	-6.09	Pass	
87.5	Н	0.0	50.0	9.6	3.9	24.9	38.6	49.5	-10.95	Pass	
100.0	Н	0.0	50.0	10.7	4.4	24.9	40.2	54.0	-13.84	Pass	
105.0	Н	0.0	54.0	10.8	4.4	24.9	44.3	54.0	-9.74	Pass	
110.0	Н	0.0	54.0	10.9	4.4	24.9	44.4	54.0	-9.64	Pass	
112.5	Н	0.0	57.0	11.0	4.4	24.9	47.4	54.0	-6.56	Pass	
115.0	Н	0.0	57.0	11.1	4.4	24.9	47.6	54.0	-6.44	Pass	
117.5	Н	0.0	54.0	11.2	4.4	24.9	44.6	54.0	-9.36	Pass	
120.0	Н	0.0	53.0	11.3	4.4	24.9	43.8	54.0	-10.22	Pass	
122.5	Н	0.0	56.0	11.4	4.4	24.9	46.9	54.0	-7.1	Pass	
125.0	Н	0.0	45.0	11.6	4.9	24.9	36.6	54.0	-17.4	Pass	
125.0	Н	0.0	42.0	11.6	4.9	24.9	33.6	54.0	-20.4	Pass	QP G2407
127.5	Н	0.0	36.0	11.7	4.9	24.9	27.7	54.0	-26.28	Pass	
130.0	Н	0.0	44.0	11.9	49	24.9	35.9	54.0	-18.1	Pass	
135.0	н	0.0	46.0	12.2	4.9	24.9	38.2	54.0	-15.75	Pass	
140.0	н	0.0	47.0	12.6	4.9	24.8	39.6	54.0	-14 37	Pass	
145.0	н	0.0	48.0	12.5	49	24.8	40.5	54.0	-13.47	Pass	
150.0	Н	0.0	46.0	12.3	5.4	24.8	38.9	54.0	-15.07	Pass	
100.0		0.0			2.1		23.7	21.0	10.07	- 400	
<u> </u>			1								Scanned 30MHz to 300MHz
1	1		1			1	1	1			

Radiated Emissions Photographs for Test # RE 1 (Subpart B):

FRONT VIEW:



REAR VIEW:



Test Data - Radiated Emissions Test # RE 2 (Subpart B):

CLIENT NA	ME:	AXCES	SS			DATE:	04/29/99				
EUT MODE	L:	NT 132	2 / 315 Re	ader (FTT)		SERIAL #:	01010990	17	TIME:	0730
EUT CONFI	G.:	ON, W	ith Tag (T	Cag # 3627	3)					TECH.:	M.SUNDSTROM
TEST SPECI	FICAT	ION:	FCC A F	RAD 3M					TEST N	UMBER:	RE 2
ROD ANT. #	:		CABLE	#:	4C	DETECT. TYPE: <u>PEAK</u> LOCATION:				ION:	C OATS
BICON ANT	. #:	2021	PREAM	P. #:	398	RES. I	3W (kHz):	100	DISTAN	NCE (m):	3
LOG ANT.	#:	2026	LIMITE	R#	181	VIDE	O BW (kHz):	100	EUT VC	DLTAGE:	115 VAC
HORN ANT.	#:		ATTEN.	#:	N/A	TEMP	. (deg. C):	17	EUT FR	EQ. (Hz):	60
DIPOLE AN	DIPOLE ANT #: DETECTOR#:			FOR#:	2407	HUMI	DITY (%):	48	PHOTO	ID:	910068e RE 2 RAD. EM.
Emission	Ant.	Det.	Meter	Antenna	Path	RF	Corrected	Spec.	CR/SL	Pass	Notes
Frequency	Pol.	Atten.	Reading	Factor	Loss	Gain	Reading	Limit	Delta	Fail	
(MHz)	(H/V)	(dB)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Marginal	
300.1	V	0.0	20.0	20.9	5.3	24.7	21.5	56.9	-35.39	Pass	
305.0	V	0.0	19.0	20.1	5.3	24.7	19.7	56.9	-37.22	Pass	
314.9	V	0.0	56.0	19.3	5.3	24.7	55.9	56.9	-1.04	Marginal	FUNDAMENTAL(F1)
317.5	V	0.0	30.0	18.4	5.3	24.7	29.0	56.9	-27.86	Pass	
322.1	V	0.0	24.0	17.6	5.3	24.7	22.2	56.9	-34.69	Pass	
325.0	V	0.0	30.0	17.4	5.3	24.7	28.0	56.9	-28.89	Pass	
629.8	V	0.0	44.0	20.5	11.7	24.8	51.4	56.9	-5.48	Pass	(F2)
975.0	V	0.0	21.0	24.0	15.7	25.0	35.6	60.0	-24.38	Pass	NOISE FLOOR
300.1	Н	0.0	22.0	20.9	5.3	24.7	23.5	56.9	-33.39	Pass	
305.0	Н	0.0	21.0	20.1	5.3	24.7	21.7	56.9	-35.22	Pass	
310.0	Н	0.0	26.0	19.3	5.3	24.7	25.9	56.9	-31.04	Pass	
314.9	Н	0.0	62.0	19.3	5.3	24.7	61.9	56.9	4.96	Fail	(F1)
335.0	Н	0.0	27.0	17.0	5.3	24.7	24.6	56.9	-32.29	Pass	
629.8	Н	0.0	45.0	20.5	11.7	24.8	52.4	56.9	-4.48	Pass	(F2)
944.7	Н	0.0	27.0	23.2	15.1	25.0	40.2	56.9	-16.71	Pass	(F3)
											Scanned 300MHz to 1000MHz

Legend:

- F1 Fundamental Tx
- F2 Second Harmonic
- F3 Third Harmonic Signal

These are intentional signals and are addressed under CFR 47, Subpart C, 15.231(b) which follow(s) in the Test Data for Test # RE 4 and Test # RE 5 page 30 and 33.

KTL Dallas, Inc.

EQUIPMENT: NT 132 / 315 FTT READER

Radiated Emissions Photographs for Test # RE 2 (Subpart B):

FRONT VIEW:



REAR VIEW:



Test Data – Microwave Radiated Emissions Test # MW 1A (Subpart B):

Microwave Radiated Emissions Data											
Complete X Preliminary Page	1_of_1_										
Client: AXCESS Test #: MW 1A W.O.#: 9L006	BE										
EUT: <u>NT 132/315 READER (FTT)</u> S/N: <u>0101099017</u> Photo ID: <u>9L006</u>	BEMW1										
Technician: M.Sundstrom Specification: CFR 47,15.109(b) Lab: C OATS Date: 04/	30/99										
Equipment Used: G2624,CF32,G2230,CF33,494											
Configuration: ON With Tag (Tag # 36273)											
Bandwidth: <u>1MHz</u> Video Bandwidth: <u>1MHz</u> Antenna Distance <u>3</u> m Detector:											
Climatic Conditions:EUT Power:X 115 V.A.C.X 60 HzX PeakTemperature:21 C208 V.A.C.50 HzAverageRelative Humidity:51 %230 V.A.C.3 Phase3 PhaseAtmospheric Pressure:1005 mbarOtherX 1 Phase3 Phase											
Freq. Meter Antenna Cable RF Conver. Corrected Spec. Pol. Comm (GHz) (dBuV) (dB) (dB) (dB) (dB) (dB) (dB) (dBuV/m) (dBuV/m) (dBuV/m)	ents:										
1 30 23.1 3.9 18.66 0 38 60 V N.F.											
2.488 38 29.1 6.48 17.67 0 56 60 V AMBIE	NT										
4 25 31.8 6.61 17.5 0 46 60 V N.F.											
1 244 42 24 1 4 63 18 7 0 52 60 H AMBIE	NT										
2.488 45 29.1 6.48 17.67 0 63 60 H AMBIE	NT										
3.2 27 30.6 6.63 17.34 0 47 60 H N.F.											
Scanned 1GHz to 4GHz											

Radiated Emissions Photographs for Test # MW 1A (Subpart B):

FRONT VIEW:



REAR VIEW:





Test Data – Radiated Emissions Test # RE LF (Subpart C):

Radiated Emissions FCC												
Com Prelin	plete ninary	X						Page 1 of 1				
Client:	AXCESS	3			W.O.#:	9L0068E		Date: 04/30/99				
EUT:	NT 132/3	315 READ	ER (FTT)	S/N:	01010990	17	Specification: CFR47,15.209,15.231				
Tech [.]	M Sunds	strom			Test #·	RELE	l ah	ANC 2 Photo ID: 91 0068 RE LE				
			00007				Lab					
Equipme	Equipment Used. 099,079,02037 Antenna Distance. 3 Meters											
Configuration: ON WITH TAG (Tag # 36273)												
IF Bandwidth: <u>10kHz</u> Video Bandwidth <u>N/A</u> Detector: Peak <u>X</u> Quasi Peak												
Ambient Temperature: 21 C EUT Power: X 115 V.A.C. X 60 Hz X 1 Phase Relative Humidity: 45 % 230 V.A.C. 50 Hz 3 Phase Atmospheric Pressure: 1005 mbar Other												
Freq.	Meter Reading	Attenuation	Cable Loss	Antenna Factor	Corrected Reading	Spec.limit (dBuV)	Pol.	Comments:				
(MHZ)	(dBuV)	(dB)	(dB)	(dB)	(dBuV)	FCC	V					
0.1318	12	10	0	-2.4	19.6	89.10	V					
0.394	16	10	0	-2.4	23.6	86.09	V					
0.657	14	10	0	-2.4	21.6	76.53	V					
3.16	10	10	0	-2.4	17.6	69.5	V					
3.288	15	10	0	-2.4	22.6	69.5	V					
5.788	13	10	0	-2.4	20.6	69.5	V					
5.92	14	10	0	-2.4	21.6	69.5	V					
13.82	13	10	0	-2.4	20.6	69.5	V					
13.947	15	10	0	-2.4	22.6	69.5	V					
20.13	14	20	0	-2.4	31.0	69.5	V					
20.20	14	20	0	-2.4	33.6	69.5	V					
20.79	16	20	0	-2.4	33.6	69.5	v	<u> </u>]				
21.05	16	20	0	-2.4	33.6	69.5	V					
	Scanned 100kHz to 30MHz											
								<u> </u>]				
								I				
	Note: Verify that the IF Bandwidth is in the proper setting.											

KTL Dallas, Inc.

EQUIPMENT: NT 132 / 315 FTT READER

Radiated Emissions Photograph for Test # RE LF (Subpart C):

FRONT VIEW:



Test Data – Radiated Emissions Test # RE 4 (Subpart C):

CLIENT NA	ME:	AXCE	SS					W.O.#:	910068e	DATE:	04/28/99
EUT MODE	L:	NT 132	2 / 315 Re	ader (FTT)		SERIAL #:	01010990	17	TIME:	0730
EUT CONFI	G.:	ON, W	ith Tag (1	Tag # 3627	3)		-	-		TECH.:	M.SUNDSTROM
TEST SPECI	FICAT	ION:	FCC 15.	231 3M (T	x 315 N	(Hz)			TEST N	UMBER:	RE 4
ROD ANT #	ŧ.		CABLE	#·	4C	DETE	CT. TYPE	PEAK	LOCAT	ION	COATS
BICON ANT	· #·	2021	PREAM	л. Р#∙	398	RES	BW (kHz)	100	DISTAN	VCE (m)	3
LOG ANT	 ⊭∙	2021		R#	181	VIDE	O BW (kHz)	100	FUT VO	U TAGE	115 VAC
HOPN ANT	". #•	2020	ATTEN	#•	N/A	TEME	C D W (RHZ).	100	FUTED	$EO(H_2)$	60
DIDOL E AN	.π. T#•		DETEC	.π. ΓΩΡ#•	2407		(ueg. C).	50	DUOTO		01006% PE 4 PAD EM
DIFULE AN	1 #.	12-4	DETEC	10K#.	2407		DITT (%).	50	FHOTO	D.	910008e KE 4 KAD. EWI.
Emission	Ant.	Det.	Wieter	Amenna	Path	KF	D	spec.	CK/SL	Pass	notes
Frequency	Pol.	Atten.	Reading	Factor	Loss	Gain	Reading	Limit	Delta	Fail	
(MHz)	(H/V)	(dB)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Marginal	
30.0	V	0.0	44.0	12.9	2.4	25.0	34.3	55.6	-21.32	Pass	
30.9	V	0.0	45.0	12.9	2.4	25.0	35.3	55.6	-20.32	Pass	
31.1	V	0.0	44.0	12.8	2.4	25.0	34.2	55.6	-21.38	Pass	
31.5	V	0.0	49.0	12.8	2.4	25.0	39.2	55.6	-16.38	Pass	
31.6	V	0.0	48.0	12.8	2.4	25.0	38.2	55.6	-17.38	Pass	
31.8	V	0.0	47.0	12.8	2.4	25.0	37.2	55.6	-18.38	Pass	
32.2	V	0.0	47.0	12.8	2.4	25.0	37.2	55.6	-18.44	Pass	
32.5	V	0.0	50.0	12.8	2.4	25.0	40.2	55.6	-15.44	Pass	
33.7	v	0.0	50.0	12.0	2.4	25.0	40.1	55.6	-15.5	Pass	
33.0	v	0.0	51.0	12.7	2.1	25.0	41.1	55.6	-14.5	Pass	
34.7	V	0.0	52.0	12.7	2.4	25.0	42.0	55.6	13 56	Dass	
24.0	V	0.0	51.0	12.7	2.4	25.0	42.0	55.6	-13.50	I ass	
25.2	V	0.0	50.0	12.7	2.4	25.0	41.0	55.6	-14.30	F ass	
35.2	V	0.0	50.0	12.0	2.4	25.0	40.0	55.0	-15.62	Pass	
37.2	V	0.0	49.0	12.4	2.4	25.0	38.8	55.6	-16.82	Pass	
40.4	V	0.0	54.0	12.1	2.4	25.0	43.5	55.6	-12.12	Pass	
40.8	V	0.0	50.0	12.1	2.4	25.0	39.5	55.6	-16.12	Pass	
42.5	V	0.0	47.0	12.1	2.4	25.0	36.4	55.6	-19.16	Pass	
45.0	V	0.0	42.0	12.0	2.4	25.0	31.4	55.6	-24.22	Pass	
47.5	V	0.0	48.0	12.1	2.4	25.0	37.4	55.6	-18.16	Pass	
50.0	V	0.0	53.0	12.1	3.4	24.9	43.5	55.6	-12.09	Pass	
52.5	V	0.0	52.0	11.7	3.4	24.9	42.1	55.6	-13.49	Pass	
55.0	V	0.0	51.0	11.1	3.4	24.9	40.5	55.6	-15.09	Pass	
57.5	V	0.0	50.0	10.7	3.4	24.9	39.1	55.6	-16.49	Pass	
60.0	V	0.0	53.0	10.1	3.4	24.9	41.5	55.6	-14.09	Pass	
62.5	V	0.0	53.0	10.0	3.4	24.9	41.5	55.6	-14.15	Pass	
65.0	v	0.0	56.0	10.0	3.4	24.9	44.4	55.6	-11.24	Pass	
65.0	v	10.0	44.0	10.0	3.1	24.9	42.4	55.6	-13.24	Pass	OP G2407
70.0	V	0.0	55.0	0.8	3.4	24.9	43.5	55.6	12.12	Dass	Q1 02407
70.0	V	0.0	54.0	9.0	2.6	24.9	43.3	55.6	12.12	T ass	
75.0	V V	0.0	54.0	9./	2.0	24.9	42.3	55.6	-13.20	r dSS Dece	
/5.0	V	0.0	54.0	9.4	3.0	24.9	42.1	55.0	-13.47	Pass	
80.0	V	0.0	47.0	9.1	3.9	24.9	35.1	55.6	-20.54	Pass	
82.5	V	0.0	40.0	9.2	3.9	24.9	28.2	55.6	-27.4	Pass	
85.0	V	0.0	54.0	9.5	3.9	24.9	42.4	55.6	-13.19	Pass	
87.5	V	0.0	52.0	9.6	3.9	24.9	40.6	55.6	-15.05	Pass	
110.0	V	0.0	52.0	10.9	4.4	24.9	42.4	55.6	-13.24	Pass	
112.5	V	0.0	53.0	11.0	4.4	24.9	43.4	55.6	-12.16	Pass	
115.0	V	0.0	47.0	11.1	4.4	24.9	37.6	55.6	-18.04	Pass	
117.5	V	0.0	52.0	11.2	4.4	24.9	42.6	55.6	-12.96	Pass	
120.0	V	0.0	54.0	11.3	4.4	24.9	44.8	55.6	-10.82	Pass	
122.5	V	0.0	52.0	11.4	4.4	24.9	42.9	55.6	-12.7	Pass	<u> </u>
125.0	V	0.0	50.0	11.6	4.9	24.9	41.6	55.6	-14	Pass	
127.5	v	0.0	52.0	11.7	49	24.9	43.7	55.6	-11 88	Pass	
130.0	v	0.0	56.0	11.7	49	24.9	47.9	55.6	-77	Pass	
132.5	v	0.0	51.0	12.0	49	24.9	43.0	55.6	-12.56	Pace	h
132.5	V	0.0	52.0	12.0		24.0	44.2	55.6	11 25	Doog	l
155.0	v	0.0	52.0	12.2	4.7	∠4.7	44.2	55.0	-11.33	r dSS	1

Test Data – Radiated Emissions Test # RE 4 (Subpart C) (Continued):

Emission	Ant.	Det.	Meter	Antenna	Path	RF	Corrected	Spec.	CR/SL	Pass	Notes
Frequency	Pol.	Atten.	Reading	Factor	Loss	Gain	Reading	Limit	Delta	Fail	
(MHz)	(H/V)	(dB)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Marginal	
137.5	V	0.0	40.0	12.4	4.9	24.9	32.4	55.6	-23.21	Pass	
140.0	V	0.0	51.0	12.6	4.9	24.8	43.6	55.6	-11.97	Pass	
142.5	V	0.0	40.0	12.6	4.9	24.8	32.6	55.6	-23.01	Pass	
145.0	V	0.0	50.0	12.5	4.9	24.8	42.5	55.6	-13.07	Pass	
147.5	v	0.0	46.0	12.5	49	24.8	38.5	55.6	-17.11	Pass	
150.0	v	0.0	52.0	12.0	5.4	24.8	44.9	55.6	-10.67	Pass	
152.5	v	0.0	46.0	12.1	5.4	24.8	39.0	55.6	-16.63	Pass	
152.0	V	0.0	40.0	12.4	5.4	24.0	37.0	55.6	-18 57	Pase	
157.5	V	0.0	41.0	12.5	5.4	24.0	34.1	55.6	-21.53	Pase	
157.5	V	0.0	41.0	12.5	5.4	24.0	26.2	55.6	-21.33	T d55	
162.5	V	0.0	43.0	12.0	5.4	24.0	30.2	55.6	-19.41	T d55	
162.3	V	0.0	26.0	12.0	5.4	24.0	32.2	55.6	-23.43	F ass Dass	
103.0	V	0.0	30.0	12.0	5.4	24.8	29.1	55.0	-20.40	Pass	
170.0	V	0.0	30.0	12.5	5.4	24.8	29.1	55.6	-20.51	Pass	
172.5	V	0.0	39.0	12.8	5.4	24.8	32.3	55.6	-23.25	Pass	
175.0	v	0.0	40.0	13.1	5.4	24.8	33.7	55.6	-21.86	Pass	
20.0		0.0	45.0	10.0	<u> </u>	25.0	07.0		10.22	D	
30.0	H	0.0	47.0	12.9	2.4	25.0	37.3	55.6	-18.32	Pass	
31.1	Н	0.0	44.0	12.8	2.4	25.0	34.2	55.6	-21.38	Pass	
34.9	Н	0.0	47.0	12.7	2.4	25.0	37.0	55.6	-18.56	Pass	
37.0	Н	0.0	46.0	12.5	2.4	25.0	35.9	55.6	-19.72	Pass	
40.0	Н	0.0	50.0	12.1	2.4	25.0	39.5	55.6	-16.12	Pass	
42.5	Н	0.0	48.0	12.1	2.4	25.0	37.4	55.6	-18.16	Pass	
50.0	Н	0.0	53.0	12.1	3.4	24.9	43.5	55.6	-12.09	Pass	
52.5	Н	0.0	53.0	11.7	3.4	24.9	43.1	55.6	-12.49	Pass	
57.5	Н	0.0	46.0	10.7	3.4	24.9	35.1	55.6	-20.49	Pass	
60.0	Н	0.0	54.0	10.1	3.4	24.9	42.5	55.6	-13.09	Pass	
62.5	Н	0.0	54.0	10.0	3.4	24.9	42.5	55.6	-13.15	Pass	
65.0	Н	0.0	58.0	10.0	3.4	24.9	46.4	55.6	-9.24	Pass	
65.0	Н	0.0	42.0	10.0	3.4	24.9	30.4	55.6	-25.24	Pass	OP G2407
70.0	Н	0.0	53.0	9.8	3.6	24.9	41.5	55.6	-14.12	Pass	2 • - • •
75.0	Н	0.0	55.0	9.4	3.6	24.9	43.1	55.6	-12.47	Pass	
80.0	н	0.0	50.0	9.1	3.0	24.9	38.1	55.6	-17.54	Pass	
85.0	н	0.0	55.0	9.5	3.9	24.9	43.4	55.6	-12.19	Pass	
87.5	н	0.0	50.0	9.6	3.0	24.9	38.6	55.6	-17.05	Pase	
100.0	п Ц	0.0	50.0	10.7	3.7	24.9	40.2	55.6	-17.03	Dase	
105.0	п п	0.0	54.0	10.7	4.4	24.9	40.2	55.6	-13.44	Doco	
110.0	п п	0.0	54.0	10.0	4.4	24.9	44.3	55.6	11.34	Doco	
110.0	п	0.0	57.0	10.9	4.4	24.9	44.4	55.6	-11.24 Q 16	I dSS Dece	
112.3	п U	0.0	57.0	11.0	4.4	24.9	47.4	55.0	-0.10	F dSS Decco	
113.0	п	0.0	54.0	11.1	4.4	24.9	47.0	55.0	-0.04	Pass	
11/.5	H	0.0	54.0	11.2	4.4	24.9	44.0	55.0	-10.96	Pass	
120.0	H	0.0	55.0	11.5	4.4	24.9	43.8	55.6	-11.82	Pass	
122.5	H	0.0	56.0	11.4	4.4	24.9	46.9	55.6	-8./	Pass	
125.0	H	0.0	45.0	11.6	4.9	24.9	36.6	55.6	-19	Pass	00 60105
125.0	H	0.0	42.0	11.6	4.9	24.9	33.6	55.6	-22	Pass	QP G2407
127.5	H	0.0	36.0	11.7	4.9	24.9	27.7	55.6	-27.88	Pass	
130.0	Ĥ	0.0	44.0	11.9	4.9	24.9	35.9	55.6	-19.7	Pass	
135.0	Н	0.0	46.0	12.2	4.9	24.9	38.2	55.6	-17.35	Pass	
140.0	Н	0.0	47.0	12.6	4.9	24.8	39.6	55.6	-15.97	Pass	
145.0	Н	0.0	48.0	12.5	4.9	24.8	40.5	55.6	-15.07	Pass	
150.0	Н	0.0	46.0	12.4	5.4	24.8	38.9	55.6	-16.67	Pass	
											Scanned 30MHz to 300MHz

Test Data – Radiated Emissions Test # RE 5 (Subpart C):

CLIENT NA	ME:	AXCE	SS			DATE:	04/29/99				
EUT MODE	L:	NT 132	2 / 315 Re	ader (FTT)		SERIAL #:	01010990	17	TIME:	0730
EUT CONFI	G.:	ON, W	ith Tag (T	Tag # 3627	3)		-			TECH.:	M.SUNDSTROM
TEST SPECI	FICAT	ION:	FCC 15.	231 3M (T	°x 315 N	(Hz)			TEST N	UMBER:	RE 5
ROD ANT. #	ŧ:		CABLE	#:	4C	DETE	CT. TYPE:	PEAK	LOCAT	ION:	C OATS
BICON ANT	. #:	2021 PREAMP. #: 398 RES. BW (kHz): 100 DISTANCE (m):									3
LOG ANT.	#:	2026 LIMITER# 181 VIDEO BW (kHz): 100 EUT								DLTAGE:	115 VAC
HORN ANT.	#:		ATTEN.	#:	N/A	TEMP	. (deg. C):	17	EUT FR	EQ. (Hz):	60
DIPOLE AN	OLE ANT #: DETECTOR#: 2					HUMIDITY (%): 48 PHOTO ID:				ID:	910068e RE 5 RAD. EM.
Emission	Ant.	Det.	Meter	Antenna	Path	RF	Corrected	Spec.	CR/SL	Pass	Notes
Frequency	Pol.	Atten.	Reading	Factor	Loss	Gain	Reading	Limit	Delta	Fail	
(MHz)	(H/V)	(dB)	(dBuV)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Marginal	
300.1	V	0.0	20.0	20.9	5.3	24.7	21.5	55.6	-34.09	Pass	
305.0	V	0.0	19.0	20.1	5.3	24.7	19.7	55.6	-35.92	Pass	
314.9	V	0.0	56.0	19.3	5.3	24.7	55.9	75.6	-19.74	Pass	FUNDAMENTAL(F1)
317.5	V	0.0	30.0	18.4	5.3	24.7	29.0	55.6	-26.57	Pass	
322.1	V	0.0	24.0	17.6	5.3	24.7	22.2	55.6	-33.39	Pass	
325.0	V	0.0	30.0	17.4	5.3	24.7	28.0	55.6	-27.59	Pass	
629.8	V	0.0	44.0	20.5	11.7	24.8	51.4	55.6	-4.18	Pass	(F2)
975.0	V	0.0	21.0	24.0	15.7	25.0	35.6	55.6	-19.98	Pass	NOISE FLOOR
300.1	Н	0.0	22.0	20.9	5.3	24.7	23.5	55.6	-32.09	Pass	
305.0	Н	0.0	21.0	20.1	5.3	24.7	21.7	55.6	-33.92	Pass	
310.0	Н	0.0	26.0	19.3	5.3	24.7	25.9	55.6	-29.74	Pass	
314.9	Н	0.0	62.0	19.3	5.3	24.7	61.9	75.6	-13.74	Pass	(F1)
335.0	Н	0.0	27.0	17.0	5.3	24.7	24.6	55.6	-30.99	Pass	
629.8	Н	0.0	45.0	20.5	11.7	24.8	52.4	55.6	-3.18	Pass	(F2)
944.7	Н	0.0	27.0	23.2	15.1	25.0	40.2	55.6	-15.41	Pass	(F3)
											Scanned 300MHz to 1000MHz

Legend:

- F1 Fundamental Tx
- F2 Second Harmonic
- F3 Third Harmonic Signal

These are intentional signals and are addressed under CFR 47, Subpart C, 15.231(b) which follow(s) in the Test Data for Test # RE 4 and Test # RE 5 page 30 and 33.

KTL Dallas, Inc.

EQUIPMENT: NT 132 / 315 FTT READER

Radiated Emissions Photographs for Test # RE 4 and Test # RE 5 (Subpart C):

FRONT VIEW:



REAR VIEW:



The test set-up for Test # RE 4 and Test # RE 5 was identical to the test set-up for Test # RE 3.

Test Data – Radiated Emissions Test # MW 1 (Subpart C):

Microwave Radiated Emissions Data											
Complete	X	Prelimina	ary						Page <u>1</u> of <u>1</u>		
Client: AX	CESS					Test #: <u>MW</u> 1	1	W.O.#	: <u>9L0068E</u>		
EUT: <u>N</u> T	132/315	READER (FTT)			S/N: 01010	099017	Photo ID): 9L0068EMW1		
Technicia	n: <u>M.Sur</u>	ndstrom		Specifi	cation: <u>CF</u>	R 47,15.231	Lab: <u>C C</u>	DATS D	Date: 04/30/99		
Equipmer	nt Used:	G2624,CF	-32,G223	0,CF33,49)4						
Configura	Configuration: ON With Tag (Tag # 36273)										
Bandwidth: <u>1MHz</u> Video Bandwidth: <u>1MHz</u> Antenna Distance <u>3</u> m Detector:											
Climatic Conditions:EUT Power:X 115 V.A.C.X 60 HzX PeakTemperature:21 C208 V.A.C.50 HzAverageRelative Humidity:51 %230 V.A.C.50 HzAverageAtmospheric Pressure:1005 mbarOtherX 1 Phase3 Phase											
Freq. (GHz)	Meter Reading (dBuV)	Antenna Factor (dB)	Cable Loss (dB)	RF Gain (dB)	Conver. Factor	Corrected Reading (dBuV/m)	Spec. Limit (dBuV/m)	Pol.	Comments:		
1	30	23.1	3.9	18.66	0	38	55.6	V	N.F.		
2.488	38	29.1	6.48	17.67	0	56	55.6	V	AMBIENT		
4	25	31.8	6.61	17.5	0	46	55.6	V	N.F.		
1 244	12	24.1	4.63	18.7	0	52	55.6	н			
2 488	45	29.1	6.48	17.67	0	63	55.6	 H			
3.2	27	30.6	6.63	17.34	0	47	55.6	H	N.F.		
							Scanned ²	1GHz to	4GHz		
			SHEETS\MI		REV 030597	7					

KTL Dallas, Inc.

EQUIPMENT: NT 132 / 315 FTT READER

Radiated Emissions Photographs for Test # MW 1 (Subpart C):

REAR VIEW:



FRONT VIEW:



Section 7. Sample Calculations

Conducted Emissions:

If the Quasi-Peak to Average ratio is greater than 6 dB, then the emission is classified as broadband and its Quasi-Peak level is reduced by 13 dB for comparison to the limit.

i.e. Quasi-Peak level = $40 \text{ dB}\mu\text{V}$ Average level = $34 \text{ dB}\mu\text{V}$ Corrected level = $40 - 13 = 27 \text{ dB}\mu\text{V}$

Radiated Emissions:

Emissions are measured at a distance of 10 meters and corrected for antenna factor and cable loss.

i.e. Received Signal = $25 \text{ dB}\mu \text{V} @ 100 \text{ MHz}$ Antenna Factor & Cable Loss = 9.8 dBField Intensity = $25 + 9.8 = 34.8 \text{ dB}\mu \text{V/m} @ 10 \text{ m}$

Section 8. Block Diagrams

Conducted Emissions:



Radiated Prescan:





Outdoor Test Site for Radiated Emissions:

The spectrum was scanned per CFR 47, Part 15, Subpart A, Paragraph Number 15.33.

Section 9. Test Equipment List

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items is typically 12 months from the calibration date shown.

$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	KTL ID	<u>Nomenclature</u>	<u>Manufacturer</u>	Serial Number	<u>Calibration</u>
C4C C O.A.I.S. Cable Set 07/2/199 C66 RG223 Cable (10 meter) 08/07/98 C79 RG223 Cable (10 meter) 08/07/99 C79 RG223 Cable (12.0 meters) 01/29/99 CF32 Cable (4.6 meter) 01/29/99 099 Rcceiver Polarad ESH2 09/22/98 181 Limiter Fischer FCC-45013-1.2 NSN 02/05/99 213 LISN (10 kHz - 100 MHz) 8120 11/04/98 398 Preamplifier, 25dB (30 MHz - 1.5 GHz) ICC 398 06/18/98 494 Horn Antenna A.H. Systems (30 MHz - 1.5 GHz) 162 CBU G1504 Limiter Fischer 7930-5.0 197 11/16/98 G1709 High Pass Filter Solar 7930-5.0 197 11/16/98 G2021 Biconical Antenna (20 MHz - 230 MHz) 2052 01/21/99 G2026 Antenna, LP Antenna, LP SAS 200/510 121 01/25/99 G2301 RF Amplifier ICC 421 04/26/99 G230 RF Anplifier	040		Model Number		Date
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	C4C	C O.A. I.S. Cable Set			07/27/99
C10 (10 meter) 000000000000000000000000000000000000	C66	RG223 Cable			08/07/98
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		(10 meter)			
(12.0 meters) 01/29/99 CF32 Cable (1 meter) 01/29/99 CF33 Cable (4.6 meter) 09/22/98 099 Receiver Polarad ESH2 879342/005 07/06/99 181 Limiter Fischer Fischer NSN 02/05/99 213 LISN (10 kHz - 100 MHz) 8120 8120350 11/04/98 398 Preamplifier, 25dB (30 MHz - 1.5 GHz) LNA25 8120 06/18/98 494 Horn Antenna A.H. Systems AAS-200/571 162 CBU G1504 Limiter Fischer Fischer 184 02/05/99 G1709 High Pass Filter Solar 197 11/16/98 7930-5.0 2052 0 01/21/99 01/25/99 G2021 Biconical Antenna (20 MHz - 230 MHz) 2052 121 01/25/99 G2026 Antenna, LP A.H. Systems SAS 200/510 121 01/25/99 G2037 Active Monopole Antenna SAS 200/510 121 04/26/99 G2230 RF Amplifier ICC LC 4	C79	RG223 Cable			08/07/99
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		(12.0 meters)			
(1 meter) 09/22/98 CF33 Cable (4.6 meter) 09/22/98 099 Receiver Polarad ESH2 879342/005 07/06/99 181 Limiter Fischer FCC-45013-1.2 NSN 02/05/99 213 LISN (10 kHz – 100 MHz) Schwarzbeck 8120 8120350 11/04/98 398 Preamplifier, 25dB (30 MHz - 1.5 GHz) LNA25 8120 06/18/98 494 Horn Antenna A.H. Systems SAS-200/571 162 CBU G1504 Limiter Fischer FCC-45013-1.2 184 02/05/99 G1709 High Pass Filter Solar 7930-5.0 197 11/16/98 G2021 Biconical Antenna (20 MHz - 230 MHz) 2052 01/21/99 01/21/99 G2026 Antenna, LP A.H. Systems SAS 200/510 121 01/25/99 G2037 Active Monopole Antenna SAS 200/510 843710/0001 04/01/99 G2230 RF Amplifier ICC 10 kHz - 3.5 GHz) R4131D 0350640 11/04/98 G2619 Spectrum Analyzer (10 kHz - 3.5 GHz) R4131D	CF32	Cable			01/29/99
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		(1 meter)			
	CF33	Cable			09/22/98
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$		(4.6 meter)			
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	099	Receiver	Polarad ESH2	879342/005	07/06/99
FCC-45013-1.2 213 LISN (10 kHz – 100 MHz) Schwarzbeck 8120 8120350 11/04/98 398 Preamplifier, 25dB (30 MHz - 1.5 GHz) ICC 398 06/18/98 494 Horn Antenna A.H. Systems SAS-200/571 162 CBU G1504 Limiter Fischer FCC-45013-1.2 184 02/05/99 G1709 High Pass Filter Solar 7930-5.0 197 11/16/98 G2021 Biconical Antenna (20 MHz - 230 MHz) 2052 01/21/99 G2026 Antenna, LP A.H. Systems SAS-200/510 121 01/25/99 G2037 Active Monopole Antenna A.H. Systems 718 08/27/98 G2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz ESVS 30 843710/0001 04/01/99 G2619 Spectrum Analyzer (10 kHz - 3.5 GHz) R4131D 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 98562E 3551A04428 10/05/98	181	Limiter	Fischer	NSN	02/05/99
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$			FCC-45013-1.2		
(10 kHz - 100 MHz) 8120 398 Preamplifier, 25dB (30 MHz - 1.5 GHz) ICC 398 06/18/98 494 Horn Antenna A.H. Systems 162 CBU G1504 Limiter Fischer 184 02/05/99 G1709 High Pass Filter SAS-200/571 11/16/98 G2021 Biconical Antenna SAS-200/540 496 01/21/99 (20 MHz - 230 MHz) 2052 0 01/25/99 G2026 Antenna, LP A.H. Systems 121 01/25/99 G2037 Active Monopole Antenna SAS 200/550-1 0 08/27/98 G2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 (10 kHz - 3.5 GHz) R4131D 3551A04428 10/05/98	213	LISN	Schwarzbeck	8120350	11/04/98
398 Preamplifier, 25dB (30 MHz - 1.5 GHz) ICC LNA25 398 06/18/98 494 Horn Antenna A.H. Systems SAS-200/571 162 CBU G1504 Limiter Fischer FCC-45013-1.2 184 02/05/99 G1709 High Pass Filter Solar 7930-5.0 197 11/16/98 G2021 Biconical Antenna (20 MHz - 230 MHz) SAS-200/540 496 01/21/99 G2026 Antenna, LP A.H. Systems 200/550 121 01/25/99 G2037 Active Monopole Antenna SAS 200/550-1 718 08/27/98 G2230 RF Amplifier ICC LN1-5 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz ESVS 30 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest (10 kHz - 3.5 GHz) 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 9564E 3551A04428 10/05/98		(10 kHz – 100 MHz)	8120		
(30 MHz - 1.5 GHz) LNA25 494 Horn Antenna A.H. Systems SAS-200/571 162 CBU G1504 Limiter Fischer 184 02/05/99 G1709 High Pass Filter Solar 197 11/16/98 G2021 Biconical Antenna (20 MHz - 230 MHz) 2052 0 0 G2026 Antenna, LP A.H. Systems SAS-200/510 121 01/25/99 G2037 Active Monopole Antenna SAS 200/550-1 5 0 0 G2037 Receiver (20-1000 MHz) Rhode & Schwarz ESVS 30 843710/0001 04/01/99 G2619 Spectrum Analyzer (10 kHz - 3.5 GHz) R4131D 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 9562 3551A04428 10/05/98	398	Preamplifier, 25dB	ICC	398	06/18/98
494 Horn Antenna A.H. Systems SAS-200/571 162 CBU G1504 Limiter Fischer FCC-45013-1.2 184 02/05/99 G1709 High Pass Filter Solar 7930-5.0 197 11/16/98 G2021 Biconical Antenna (20 MHz - 230 MHz) SAS-200/540 496 01/21/99 G2026 Antenna, LP A.H. Systems SAS-200/510 121 01/25/99 G2037 Active Monopole Antenna C2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98		(30 MHz - 1.5 GHz)	LNA25		
G1504 Limiter SAS-200/571 0 G1709 High Pass Filter Solar 197 11/16/98 G2021 Biconical Antenna (20 MHz – 230 MHz) SAS-200/540 496 01/21/99 G2026 Antenna, LP A.H. Systems 121 01/25/99 G2037 Active Monopole Antenna A.H. Systems 718 08/27/98 G2230 RF Amplifier ICC 421 04/26/99 LN1-5 LN1-5 00350640 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 (10 kHz - 3.5 GHz) R4131D 3551A04428 10/05/98	494	Horn Antenna	A.H. Systems	162	CBU
G1504 Limiter Fischer FCC-45013-1.2 184 02/05/99 G1709 High Pass Filter Solar 7930-5.0 197 11/16/98 G2021 Biconical Antenna (20 MHz - 230 MHz) SAS-200/540 496 01/21/99 G2026 Antenna, LP A.H. Systems SAS-200/510 121 01/25/99 G2037 Active Monopole Antenna SAS 200/550-1 718 08/27/98 G2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz ESVS 30 843710/0001 04/01/99 G2619 Spectrum Analyzer (10 kHz - 3.5 GHz) Advantest R4131D 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 9563E 3551A04428 10/05/98			SAS-200/571		
G1709 High Pass Filter Solar 197 11/16/98 G2021 Biconical Antenna SAS-200/540 496 01/21/99 (20 MHz – 230 MHz) 2052 01/21/99 01/25/99 G2026 Antenna, LP A.H. Systems 121 01/25/99 G2037 Active Monopole Antenna A.H. Systems 718 08/27/98 G2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 (10 kHz - 3.5 GHz) R4131D 3551A04428 10/05/98	G1504	Limiter	Fischer	184	02/05/99
G1709 High Pass Filter Solar 197 11/16/98 G2021 Biconical Antenna (20 MHz - 230 MHz) SAS-200/540 2052 496 01/21/99 G2026 Antenna, LP A.H. Systems SAS-200/510 121 01/25/99 G2037 Active Monopole Antenna C2230 Active Monopole Antenna A.H. Systems SAS 200/550-1 718 08/27/98 G2037 Active Monopole Antenna A.H. Systems SAS 200/550-1 718 04/26/99 G2030 RF Amplifier ICC 421 04/26/99 LN1-5 ESVS 30 00350640 11/04/98 G2619 Spectrum Analyzer (10 kHz - 3.5 GHz) Relett Packard 9562E 3551A04428 10/05/98			FCC-45013-1.2		
G2021 Biconical Antenna (20 MHz – 230 MHz) SAS-200/540 2052 496 01/21/99 G2026 Antenna, LP A.H. Systems SAS-200/510 121 01/25/99 G2037 Active Monopole Antenna C2230 Active Monopole Antenna A.H. Systems SAS 200/550-1 718 08/27/98 G2037 Active Monopole Antenna A.H. Systems SAS 200/550-1 718 04/26/99 G2230 RF Amplifier ICC 421 04/26/99 LN1-5 IN1-5 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz ESVS 30 843710/0001 04/01/99 G2619 Spectrum Analyzer (10 kHz - 3.5 GHz) Advantest R4131D 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 9563E 3551A04428 10/05/98	G1709	High Pass Filter	Solar	197	11/16/98
G2021 Biconical Antenna (20 MHz – 230 MHz) SAS-200/540 2052 496 01/21/99 G2026 Antenna, LP A.H. Systems SAS-200/510 121 01/25/99 G2037 Active Monopole Antenna A.H. Systems SAS 200/550-1 718 08/27/98 G2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz ESVS 30 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98			7930-5.0		
(20 MHz – 230 MHz) 2052 G2026 Antenna, LP A.H. Systems 121 01/25/99 G2037 Active Monopole Antenna A.H. Systems 718 08/27/98 G2037 Active Monopole Antenna A.H. Systems 718 04/26/99 G2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 (10 kHz - 3.5 GHz) R4131D 3551A04428 10/05/98	G2021	Biconical Antenna	SAS-200/540	496	01/21/99
G2026 Antenna, LP A.H. Systems 121 01/25/99 G2037 Active Monopole Antenna A.H. Systems 718 08/27/98 G2037 Active Monopole Antenna A.H. Systems 718 08/27/98 G2230 RF Amplifier ICC 421 04/26/99 LN1-5 LN1-5 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98		(20 MHz – 230 MHz)	2052		
G2037 Active Monopole Antenna A.H. Systems SAS-200/510 718 08/27/98 G2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98	G2026	Antenna, LP	A.H. Systems	121	01/25/99
G2037 Active Monopole Antenna A.H. Systems 718 08/27/98 G2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98			SAS-200/510		
G2230 RF Amplifier ICC 421 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98	G2037	Active Monopole Antenna	A.H. Systems	718	08/27/98
G2230 RF Amplifier ICC 421 04/26/99 LN1-5 LN1-5 LN1-5 04/26/99 G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 (10 kHz - 3.5 GHz) R4131D 10/05/98 8563E 3551A04428 10/05/98	G2220		SAS 200/550-1	121	04/25/00
G2407 Receiver (20-1000 MHz) Rhode & Schwarz ESVS 30 843710/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98 8563E 8563E 00350640 11/04/98	G2230	RF Amplifier		421	04/26/99
G2407 Receiver (20-1000 MHz) Rhode & Schwarz 843/10/0001 04/01/99 G2619 Spectrum Analyzer Advantest 00350640 11/04/98 (10 kHz - 3.5 GHz) R4131D 10/05/98 8563E 10/05/98	C2407	D (20, 1000 MH)		942710/0001	04/01/00
G2619 Spectrum Analyzer (10 kHz - 3.5 GHz) Advantest R4131D 00350640 11/04/98 G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98	62407	Receiver (20-1000 MHZ)	ESVS 20	843/10/0001	04/01/99
G2019 Spectrum Analyzer Advantest 00550640 11/04/98 (10 kHz - 3.5 GHz) R4131D 10/05/98 G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98 8563E 8563E 10/05/98 10/05/98 10/05/98	C2610	Spectrum Analyzer	ESVS SU Adventest	00250640	11/04/09
G2624 Spectrum Analyzer Hewlett Packard 3551A04428 10/05/98 \$\$263E \$\$263E	02019	$(10 \text{ kH}_2 - 3.5 \text{ GH}_2)$	Auvantest R/121D	00530640	11/04/98
02024 Spectrulli Alialyzer liewieu rackaru 5551A04428 10/05/98	G2624	(10 KHZ - 5.5 OHZ) Spectrum Analyzer	Hawlatt Packard	3551 \ 0///28	10/05/98
A101E	02024	Spectrum Analyzer	8563F	JJJ1A04420	10/03/20

Test Equipment List (Continued):

The listing below indicates the test equipment utilized for the test (s). Calibration interval on all items is typically 12 months from the calibration date shown.

KTL ID	<u>Nomenclature</u>	<u>Manufacturer</u>	Serial Number	Calibration
		Model Number		Date
		LAB # 4		
		(INDOOR)		
		ANECHOIC CHAMBER		
	Antenna Tripod	Polarad		CNR
		HFU-2		
		SITE C O.A.T.S.		
		(OPEN AREA TEST SITE)		
		30 Meter Site		
	Turntable Flush Mounted,	A.H. Systems		CNR
	Metal Covered, 12 Foot	(Automated)		
	Antenna Mast, 5 Foot	ICC		CNR
		(Automated)		

Calibration interval on all items is typically 12 months from the calibration date shown. Where relevant, measuring equipment is subjected to in-service checks between testing. Should any measurement equipment be utilized beyond its scheduled calibration date, the measuring equipment is subjected to in-service checks prior to use. KTL shall notify clients promptly, in writing, of identification of defective measuring equipment that casts doubt on the validity of results given in this report.

Legend:

- CNR Calibration not required
- N/A Not applicable
- CBU Calibrated before use