



## Test Report

Prepared for: EMS Technologies Canada Ltd.

Model: A781-500

Description: Aeronautical Satcom Transceiver

Serial Number: N/A

FCC ID: K6KA781-MK4

To

FCC Part 87

Date of Issue: May 16, 2016

On the behalf of the applicant:

EMS Technologies Canada Ltd.  
400 Maple Grove Rd  
Ottawa, Ontario K2V 1B8  
Canada

Attention of:

Steven Mills, Director of Engineering  
(613)591-6040  
[Steven.Mills2@Honeywell.com](mailto:Steven.Mills2@Honeywell.com)

Prepared by  
Compliance Testing, LLC  
1724 S. Nevada Way  
Mesa, AZ 85204  
(480) 926-3100 phone / (480) 926-3598 fax  
[www.compliancetesting.com](http://www.compliancetesting.com)  
Project No: p1610046

**Alex Macon**  
Project Test Engineer

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All results of this test report relate only to the item(s) that were tested.

### Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	March 10, 2016	Alex Macon	Original Document
2.0	May 16, 2016	Amanda Reed	Updated bandwidths

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**ILAC / A2LA**

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted in the table below

Please refer to <http://www.compliancetesting.com/labscope.html> for current scope of accreditation.

Testing Certificate Number: **2152.01**



**FCC Site Reg. #349717**

**IC Site Reg. #2044A-2**

**Non-accredited tests contained in this report:**

**N/A**

## Standard Test Conditions Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing:

All tests and measurement data shown were 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, 2.1051, 2.1053, 2.1055, 2.1057 and the following individual Parts: FCC Part 87.

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

Environmental Conditions		
Temp (°C)	Humidity (%)	Pressure (mbar)
23.2	42.1	969.6

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

### EUT Description:

**Model:** A781-500

**Description:** Aeronautical Satcom Transceiver

**Firmware:** N/A

**Software:** N/A

**Serial Number:** N/A

### Additional Information:

The EUT is an aircraft based satellite communication system.

### EUT Operation during Tests

EUT was supplied 28VDC using a DC power supply. The device was controlled using a serial terminal and code provided by the manufacturer.

## Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
2.1046, 87.131	Carrier Output Power (Conducted)	Pass	
2.1051, 87.139(i)(1)	Unwanted Emissions (Transmitter Conducted)	Pass	
2.1053	Field Strength of Spurious Radiation	Pass	
2.1049, 87.139(i)(3)	Emission Masks (Occupied Bandwidth)	Pass	See FCC waiver for allowable variance
2.1047	Audio Low Pass Filter (Voice Input)	N/A	The EUT does not contain an audio input
2.1047	Audio Frequency Response	N/A	The EUT does not contain an audio input
2.1047	Modulation Limiting	N/A	The EUT does not contain an audio input
2.1055, 87.133(a)	Frequency Stability (Temperature Variation)	Pass	
2.1055, 87.133(a)	Frequency Stability (Voltage Variation)	Pass	

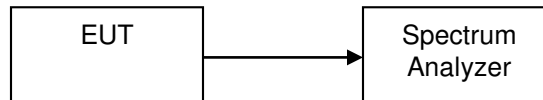
## Waivers Applied

**Carrier Output Power (Conducted)**
**Engineer:** Alex Macon

**Test Date:** March 9, 2016

**Test Procedure**

The Equipment Under Test (EUT) was connected directly to a spectrum analyzer with the RBW set to 1 MHz and the VBW set to 3 X RBW which set the RBW greater than the transmit signal ensuring there was no signal suppression while measuring a modulated signal. The average readings were taken for each modulation type and the result was then compared to the limit.

**Test Setup**

**Test Plots:** See Annex A Output Power

**AcarsC Transmitter Average Output Power**

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	46.31	42.8	60
1643.5	46.39	43.6	60
1660.5	46.24	42.1	60

**RTS600 Transmitter Average Output Power**

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	46.48	44.5	60
1643.5	46.32	43.9	60
1660.5	46.19	41.6	60

**RTS1200 Transmitter Average Output Power**

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	46.24	42.1	60
1643.5	46.23	41.9	60
1660.5	46.19	41.6	60

**RTS10500 Transmitter Average Output Power**

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	46.46	44.3	60
1643.5	46.22	41.9	60
1660.5	46.17	41.4	60

### RT05Q Transmitter Average Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	44.90	30.9	60
1643.5	46.22	41.9	60
1660.5	45.11	32.4	60

### RT1Q Transmitter Average Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	45.18	32.9	60
1643.5	46.36	43.3	60
1660.5	44.82	3.03	60

### RT2Q Transmitter Average Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	45.08	32.2	60
1643.5	46.31	42.8	60
1660.5	44.55	28.5	60

### RT45Q Transmitter Average Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	45.05	31.9	60
1643.5	45.83	38.3	60
1660.5	44.97	31.4	60

### RT1X Transmitter Average Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	45.00	31.6	60
1643.5	46.17	41.4	60
1660.5	44.88	30.8	60

### RT2X Transmitter Average Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	44.53	28.4	60
1643.5	46.36	43.3	60
1660.5	45.20	33.1	60

### RT45X Transmitter Average Output Power

Tuned Frequency (MHz)	Measured Power (dBm)	Measured Power (W)	Limit (W)
1626.5	44.83	30.4	60
1643.5	46.65	46.2	60
1660.5	44.83	30.4	60



## Conducted Spurious Emissions

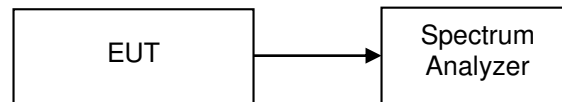
**Engineer:** Alex Macon

**Test Date:** March 10, 2016

### Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the UUT met the requirements for spurious emissions. The RBW was set according to the requirements of 87139 (i)(1). The power was corrected for the measurement RBW bandwidth. The dBc limit, the DLNA rejection, and corrected power were summed together to determine the necessary dBm value of the EUT to provide a system rejection greater than the FCC limit. This necessary value was compared to the measured value to ensure compliance to the specification, which is expressed as the margin. A negative value indicates a passing result.

### Test Setup



**Test Plots:** See Annex B Conducted Spurious Emissions

### RTS600

FCC Part 87 Spurious Emissions - 87.139(i)												DA 11-1104 FCC ORDER - 9.5 dB		
Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Data Input ↓		Data Input ↓		Limit (dBc)	Margin	Relaxation - Spurious		
						Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)			Corrected spur. (dBc)	Limit (dBc)	Margin
.010 - 1026.5	0.004	0.03	8.75	-135	80	40.27	31.52	-27.39	-147.66	-135	-12.66	-157.16	-135	-22.16
1026.5 - 1525	0.004	0.03	8.75	-135	80	40.27	31.52	-27.11	-147.38	-135	-12.38	-156.88	-135	-21.88
1525 - 1559	0.004	0.03	8.75	-203	120	40.27	31.52	-36.32	-196.59	-203	6.41	-206.09	-203	-3.09
1559 - 1585	1	1	0.00	-155	111	46.03	46.03	-29.92	-186.95	-155	-31.95	-196.45	-155	-41.45
1585 - 1605	1	1	0.00	-143	95	46.03	46.03	-28.4	-169.43	-143	-26.43	-178.93	-143	-35.93
1605 - 1610	1	1	0.00	-117	62	46.03	46.03	-28.4	-136.43	-117	-19.43	-145.93	-117	-28.93
1610 - 1610.6	1	1	0.00	-95	40	46.03	46.03	-28.51	-114.54	-95	-19.54	-124.04	-95	-29.04
1610.6 - 1613.8	1	1	0.00	-50	40	xx	XX	-26.86	-66.86	-50	-16.86	** -66.86	-50	-16.86
1613.8 - 1614	1	1	0.00	-95	40	46.03	46.03	-26.7	-112.73	-95	-17.73	-122.23	-95	-27.23
1614 - 1620	0.004	0.03	8.75	-70	30	40.27	31.52	-33.8	-104.07	-70	-34.07	-113.57	-70	-43.57
1620 - 1624.5	0.004	0.03	8.75	-70	20	40.27	31.52	-36.91	-97.18	-70	-27.18	-106.68	-70	-36.68
1624.5 - 1625.5	0.004	0.03	8.75	-70	10	40.27	31.52	-34.24	-84.51	-70	-14.51	-94.01	-70	-24.01
1625.5 - 1626.5	0.004	0.03	8.75	-70	1.3	40.27	31.52	-34.44	-76.01	-70	-6.01	-85.51	-70	-15.51
1626.5 - 1660	0.004	0.03	8.75	-70	1.3	40.27	31.52	-23.71	-65.28	-70	4.72	-74.78	-70	-4.78
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	xx	XX	-36.16	-38.72	-19.5	-19.22	** -38.72	-19.5	-19.22
1670 - 1735	0.004	0.03	8.75	-60	0.8	40.27	31.52	-29.74	-70.81	-60	-10.81	-80.31	-60	-20.31
1735 - 1865	0.004	0.03	8.75	-105	50	40.27	31.52	-37.05	-127.32	-105	-22.32	-136.82	-105	-31.82
1865 - 2260.5	0.004	0.03	8.75	-105	20	40.27	31.52	-36.55	-96.82	-105	8.18	-106.32	-105	-1.32
2260.5 - 3250	0.004	0.03	8.75	-105	20	40.27	31.52	-37.84	-98.11	-105	6.89	-107.61	-105	-2.61
3250 - 3330	0.004	0.03	8.75	-105	50	40.27	31.52	-28.64	-118.91	-105	-13.91	-128.41	-105	-23.41
3330 - 4000	0.004	0.03	8.75	-105	40	40.27	31.52	-37.72	-117.99	-105	-12.99	-127.49	-105	-22.49
4000 - 12000	0.004	0.03	8.75	-105	50	40.27	31.52	-20.86	-111.13	-105	-6.13	-120.63	-105	-15.63
12000 - 18000	0.004	0.03	8.75	-70	15	40.27	31.52	-35.22	-90.49	-70	-20.49	-99.99	-70	-29.99

### RTS1200

Spurious Emissions Calculation Table - A781-500												DA 11-1104 FCC ORDER - 9.5 dB		
FCC Part 87 Spurious Emissions - 87.139(i)												Relaxation - Spurious		
Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Data Input ↓		Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin
								Absolute Measured Spurious (dBm)	Corrected spur. (dBc)					
.010 - 1026.5	0.004	0.03	8.75	-135	80	45.6	36.85	-38.75	-164.35	-135	-29.35	-173.85	-135	-38.85
1026.5 - 1525	0.004	0.03	8.75	-135	80	45.6	36.85	-38.75	-164.35	-135	-29.35	-173.85	-135	-38.85
1525 - 1559	0.004	0.03	8.75	-203	120	45.6	36.85	-38.75	-204.35	-203	-1.35	-213.85	-203	-10.85
1559 - 1585	1	1	0.00	-155	111	45.8	45.80	-36.75	-193.55	-155	-38.55	-203.05	-155	-48.05
1585 - 1605	1	1	0.00	-143	95	45.8	45.80	-32.37	-173.17	-143	-30.17	-182.67	-143	-39.67
1605 - 1610	1	1	0.00	-117	62	45.8	45.80	-34.99	-142.79	-117	-25.79	-152.29	-117	-35.29
1610 - 1610.6	1	1	0.00	-95	40	45.8	45.80	-30.93	-116.73	-95	-21.73	-126.23	-95	-31.23
1610.6 - 1613.8	1	1	0.00	-50	40	XX	XX	-36.72	-76.72	-50	-26.72	** -76.72	-50	-26.72
1613.8 - 1614	1	1	0.00	-95	40	45.8	45.80	-25.67	-111.47	-95	-16.47	-120.97	-95	-25.97
1614 - 1620	0.004	0.03	8.75	-70	30	45.6	36.85	-30	-105.60	-70	-35.60	-115.10	-70	-45.10
1620 - 1624.5	0.004	0.03	8.75	-70	20	45.6	36.85	-37.53	-103.13	-70	-33.13	-112.63	-70	-42.63
1624.5 - 1625.5	0.004	0.03	8.75	-70	10	45.6	36.85	-28.76	-84.36	-70	-14.36	-93.86	-70	-23.86
1625.5 - 1626.5	0.004	0.03	8.75	-70	1.3	45.6	36.85	-33.42	-80.32	-70	-10.32	-89.82	-70	-19.82
1626.5 - 1660	0.004	0.03	8.75	-70	1.3	45.6	36.85	-19.68	-66.58	-70	3.42	-76.08	-70	-6.08
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	XX	XX	-29.62	-32.18	-19.5	-12.68	** -32.18	-19.5	-12.68
1670 - 1735	0.004	0.03	8.75	-60	0.8	45.6	36.85	-32.37	-78.77	-60	-18.77	-88.27	-60	-28.27
1735 - 1865	0.004	0.03	8.75	-105	50	45.6	36.85	-49.73	-145.33	-105	-40.33	-154.83	-105	-49.83
1865 - 2260.5	0.004	0.03	8.75	-105	20	45.6	36.85	-40.2	-105.80	-105	-0.80	-115.30	-105	-10.30
2260.5 - 3250	0.004	0.03	8.75	-105	20	45.6	36.85	-30.89	-96.49	-105	8.51	-105.99	-105	-0.99
3250 - 3330	0.004	0.03	8.75	-105	50	45.6	36.85	-51.05	-146.65	-105	-41.65	-156.15	-105	-51.15
3330 - 4000	0.004	0.03	8.75	-105	40	45.6	36.85	-51.05	-136.65	-105	-31.65	-146.15	-105	-41.15
4000 - 12000	0.004	0.03	8.75	-105	50	45.6	36.85	-20.25	-115.85	-105	-10.85	-125.35	-105	-20.35
12000 - 18000	0.004	0.03	8.75	-70	15	45.6	36.85	-44.08	-104.68	-70	-34.68	-114.18	-70	-44.18

### RTS10500

Spurious Emissions Calculation Table - A781-500												DA 11-1104 FCC ORDER - 9.5 dB			
FCC Part 87 Spurious Emissions - 87.139(i)												Relaxation - Spurious			
Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)	Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin	
.010 - 1026.5	0.004	0.003	-1.25	-135	80	46.1	47.35	-24.02	-150.12	-135	-15.12	-159.62	-135	-24.62	
1026.5 - 1525	0.004	0.003	-1.25	-135	80	46.1	47.35	-30.65	-156.75	-135	-21.75	-166.25	-135	-31.25	
1525 - 1559	0.004	0.003	-1.25	-203	120	46.1	47.35	-44.69	-210.79	-203	-7.79	-220.29	-203	-17.29	
1559 - 1585	1	1	0.00	-155	111	45.88	45.88	-33.75	-190.63	-155	-35.63	-200.13	-155	-45.13	
1585 - 1605	1	1	0.00	-143	95	45.88	45.88	-30.25	-171.13	-143	-28.13	-180.63	-143	-37.63	
1605 - 1610	1	1	0.00	-117	62	45.88	45.88	-31.22	-139.10	-117	-22.10	-148.60	-117	-31.60	
1610 - 1610.6	1	1	0.00	-95	40	45.88	45.88	-30	-115.88	-95	-20.88	-125.38	-95	-30.38	
1610.6 - 1613.8	1	1	0.00	-50	40	XX	XX	-44.3	-84.30	-50	-34.30	**	-84.30	-50	-34.30
1613.8 - 1614	1	1	0.00	-95	40	45.88	45.88	-27.92	-113.80	-95	-18.80	-123.30	-95	-28.30	
1614 - 1620	0.004	0.003	-1.25	-70	30	46.1	47.35	-31.08	-107.18	-70	-37.18	-116.68	-70	-46.68	
1620 - 1624.5	0.004	0.003	-1.25	-70	20	46.1	47.35	-30.23	-96.33	-70	-26.33	-105.83	-70	-35.83	
1624.5 - 1625.5	0.004	0.003	-1.25	-70	10	46.1	47.35	-35.28	-91.38	-70	-21.38	-100.88	-70	-30.88	
1625.5 - 1626.5	0.004	0.003	-1.25	-70	1.3	46.1	47.35	-37.94	-85.34	-70	-15.34	-94.84	-70	-24.84	
1626.5 - 1660	0.004	0.003	-1.25	-70	1.3	46.1	47.35	-18.23	-65.63	-70	4.37	-75.13	-70	-5.13	
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	XX	XX	-36.9	-39.46	-19.5	-19.96	**	-39.46	-19.5	-19.96
1670 - 1735	0.004	0.003	-1.25	-60	0.8	46.1	47.35	-33.65	-80.55	-60	-20.55	-90.05	-60	-30.05	
1735 - 1865	0.004	0.003	-1.25	-105	50	46.1	47.35	-52.5	-148.60	-105	-43.60	-158.10	-105	-53.10	
1865 - 2260.5	0.004	0.003	-1.25	-105	20	46.1	47.35	-37.35	-103.45	-105	1.55	-112.95	-105	-7.95	
2260.5 - 3250	0.004	0.003	-1.25	-105	20	46.1	47.35	-42.12	-108.22	-105	-3.22	-117.72	-105	-12.72	
3250 - 3330	0.004	0.003	-1.25	-105	50	46.1	47.35	-29.67	-125.77	-105	-20.77	-135.27	-105	-30.27	
3330 - 4000	0.004	0.003	-1.25	-105	40	46.1	47.35	-25.12	-111.22	-105	-6.22	-120.72	-105	-15.72	
4000 - 12000	0.004	0.003	-1.25	-105	50	46.1	47.35	-21.13	-117.23	-105	-12.23	-126.73	-105	-21.73	
12000 - 18000	0.004	0.003	-1.25	-70	15	46.1	47.35	-44.79	-105.89	-70	-35.89	-115.39	-70	-45.39	

### AcarsC

Spurious Emissions Calculation Table - A781-500												DA 11-1104 FCC ORDER - 9.5 dB			
FCC Part 87 Spurious Emissions - 87.139(i)												Relaxation - Spurious			
Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)	Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin	
.010 - 1026.5	0.004	0.03	8.75	-135	80	45.32	36.57	-21.57	-146.89	-135	-11.89	-156.39	-135	-21.39	
1026.5 - 1525	0.004	0.03	8.75	-135	80	45.32	36.57	-22.91	-148.23	-135	-13.23	-157.73	-135	-22.73	
1525 - 1559	0.004	0.03	8.75	-203	120	45.32	36.57	-38.05	-203.37	-203	-0.37	-212.87	-203	-9.87	
1559 - 1585	1	1	0.00	-155	111	46.93	46.93	-22.31	-180.24	-155	-25.24	-189.74	-155	-34.74	
1585 - 1605	1	1	0.00	-143	95	46.93	46.93	-22.31	-164.24	-143	-21.24	-173.74	-143	-30.74	
1605 - 1610	1	1	0.00	-117	62	46.93	46.93	-22.31	-131.24	-117	-14.24	-140.74	-117	-23.74	
1610 - 1610.6	1	1	0.00	-95	40	46.93	46.93	-22.31	-109.24	-95	-14.24	-118.74	-95	-23.74	
1610.6 - 1613.8	1	1	0.00	-50	40	XX	XX	-22.67	-62.67	-50	-12.67	**	-62.67	-50	-12.67
1613.8 - 1614	1	1	0.00	-95	40	46.93	46.93	-20.98	-107.91	-95	-12.91	-117.41	-95	-22.41	
1614 - 1620	0.004	0.003	-1.25	-70	30	45.32	46.57	-29.41	-104.73	-70	-34.73	-114.23	-70	-44.23	
1620 - 1624.5	0.004	0.003	-1.25	-70	20	45.32	46.57	-29.67	-94.99	-70	-24.99	-104.49	-70	-34.49	
1624.5 - 1625.5	0.004	0.003	-1.25	-70	10	45.32	46.57	-35.3	-90.62	-70	-20.62	-100.12	-70	-30.12	
1625.5 - 1626.5	0.004	0.003	-1.25	-70	1.3	45.32	46.57	-33.88	-80.50	-70	-10.50	-90.00	-70	-20.00	
1626.5 - 1660	0.004	0.003	-1.25	-70	1.3	45.32	46.57	-24.99	-71.61	-70	-1.61	-81.11	-70	-11.11	
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	XX	XX	-38.22	-40.78	-19.5	-21.28	**	-40.78	-19.5	-21.28
1670 - 1735	0.004	0.003	-1.25	-60	0.8	45.32	46.57	-38.66	-84.78	-60	-24.78	-94.28	-60	-34.28	
1735 - 1865	0.004	0.003	-1.25	-105	50	45.32	46.57	-37.42	-132.74	-105	-27.74	-142.24	-105	-37.24	
1865 - 2260.5	0.004	0.003	-1.25	-105	20	45.32	46.57	-37.42	-102.74	-105	2.26	-112.24	-105	-7.24	
2260.5 - 3250	0.004	0.003	-1.25	-105	20	45.32	46.57	-34.15	-99.47	-105	5.53	-108.97	-105	-3.97	
3250 - 3330	0.004	0.003	-1.25	-105	50	45.32	46.57	-27.41	-122.73	-105	-17.73	-132.23	-105	-27.23	
3330 - 4000	0.004	0.003	-1.25	-105	40	45.32	46.57	-37.4	-122.72	-105	-17.72	-132.22	-105	-27.22	
4000 - 12000	0.004	0.003	-1.25	-105	50	45.32	46.57	-15.43	-110.75	-105	-5.75	-120.25	-105	-15.25	
12000 - 18000	0.004	0.003	-1.25	-70	15	45.32	46.57	-23.11	-83.43	-70	-13.43	-92.93	-70	-22.93	

### RT05Q

Spurious Emissions Calculation Table - A781-500												DA 11-1104 FCC ORDER - 9.5 dB		
FCC Part 87 Spurious Emissions - 87.139(i)												Relaxation - Spurious		
Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)	Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin
.010 - 1026.5	0.004	0.03	8.75	-135	80	45.6	36.85	-20.95	-146.55	-135	-11.55	-156.05	-135	-21.05
1026.5 - 1525	0.004	0.03	8.75	-135	80	45.6	36.85	-22.11	-147.71	-135	-12.71	-157.21	-135	-22.21
1525 - 1559	0.004	0.03	8.75	-203	120	45.6	36.85	-37.2	-202.80	-203	0.20	-212.30	-203	-9.30
1559 - 1585	1	1	0.00	-155	111	45.66	45.66	-33.91	-190.57	-155	-35.57	-200.07	-155	-45.07
1585 - 1605	1	1	0.00	-143	95	45.66	45.66	-31.32	-171.98	-143	-28.98	-181.48	-143	-38.48
1605 - 1610	1	1	0.00	-117	62	45.66	45.66	-32.51	-140.17	-117	-23.17	-149.67	-117	-32.67
1610 - 1610.6	1	1	0.00	-95	40	45.66	45.66	-30.37	-116.03	-95	-21.03	-125.53	-95	-30.53
1610.6 - 1613.8	1	1	0.00	-50	40	XX	XX	-26.91	-66.91	-50	-16.91	** -66.91	-50	-16.91
1613.8 - 1614	1	1	0.00	-95	40	45.66	45.66	-27.47	-113.13	-95	-18.13	-122.63	-95	-27.63
1614 - 1620	0.004	0.03	8.75	-70	30	45.6	36.85	-30.3	-105.90	-70	-35.90	-115.40	-70	-45.40
1620 - 1624.5	0.004	0.03	8.75	-70	20	45.6	36.85	-32.86	-98.46	-70	-28.46	-107.96	-70	-37.96
1624.5 - 1625.5	0.004	0.03	8.75	-70	10	45.6	36.85	-31.38	-86.98	-70	-16.98	-96.48	-70	-26.48
1625.5 - 1626.5	0.004	0.03	8.75	-70	1.3	45.6	36.85	-32.22	-79.12	-70	-9.12	-88.62	-70	-18.62
1626.5 - 1660	0.004	0.03	8.75	-70	1.3	45.6	36.85	-24.75	-71.65	-70	-1.65	-81.15	-70	-11.15
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	XX	XX	-32.27	-34.83	-19.5	-15.33	** -34.83	-19.5	-15.33
1670 - 1735	0.004	0.03	8.75	-60	0.8	45.6	36.85	-30.74	-77.14	-60	-17.14	-86.64	-60	-26.64
1735 - 1865	0.004	0.03	8.75	-105	50	45.6	36.85	-33.29	-128.89	-105	-23.89	-138.39	-105	-33.39
1865 - 2260.5	0.004	0.03	8.75	-105	20	45.6	36.85	-32.49	-98.09	-105	6.91	-107.59	-105	-2.59
2260.5 - 3250	0.004	0.03	8.75	-105	20	45.6	36.85	-32.29	-97.89	-105	7.11	-107.39	-105	-2.39
3250 - 3330	0.004	0.03	8.75	-105	50	45.6	36.85	-25.39	-120.99	-105	-15.99	-130.49	-105	-25.49
3330 - 4000	0.004	0.03	8.75	-105	40	45.6	36.85	-32.06	-117.66	-105	-12.66	-127.16	-105	-22.16
4000 - 12000	0.004	0.03	8.75	-105	50	45.6	36.85	-15.16	-110.76	-105	-5.76	-120.26	-105	-15.26
12000 - 18000	0.004	0.03	8.75	-70	15	45.6	36.85	-30.43	-91.03	-70	-21.03	-100.53	-70	-30.53

### RT1Q

Spurious Emissions Calculation Table - A781-500												DA 11-1104 FCC ORDER - 9.5 dB		
FCC Part 87 Spurious Emissions - 87.139(i)												Relaxation - Spurious		
Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)	Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin
.010 - 1026.5	0.004	0.03	8.75	-135	80	45.12	36.37	-21.38	-146.50	-135	-11.50	-156.00	-135	-21.00
1026.5 - 1525	0.004	0.03	8.75	-135	80	45.12	36.37	-29.6	-154.72	-135	-19.72	-164.22	-135	-29.22
1525 - 1559	0.004	0.03	8.75	-203	120	45.12	36.37	-29.6	-194.72	-203	8.28	-204.22	-203	-1.22
1559 - 1585	1	1	0.00	-155	111	46.01	46.01	-34.82	-191.83	-155	-36.83	-201.33	-155	-46.33
1585 - 1605	1	1	0.00	-143	95	46.01	46.01	-33.91	-174.92	-143	-31.92	-184.42	-143	-41.42
1605 - 1610	1	1	0.00	-117	62	46.01	46.01	-31.27	-139.28	-117	-22.28	-148.78	-117	-31.78
1610 - 1610.6	1	1	0.00	-95	40	46.01	46.01	-31.24	-117.25	-95	-22.25	-126.75	-95	-31.75
1610.6 - 1613.8	1	1	0.00	-50	40	XX	XX	-27.14	-67.14	-50	-17.14	** -67.14	-50	-17.14
1613.8 - 1614	1	1	0.00	-95	40	46.01	46.01	-27.62	-113.63	-95	-18.63	-123.13	-95	-28.13
1614 - 1620	0.004	0.03	8.75	-70	30	45.12	36.37	-38.62	-113.74	-70	-43.74	-123.24	-70	-53.24
1620 - 1624.5	0.004	0.03	8.75	-70	20	45.12	36.37	-32.05	-97.17	-70	-27.17	-106.67	-70	-36.67
1624.5 - 1625.5	0.004	0.03	8.75	-70	10	45.12	36.37	-33.82	-88.94	-70	-18.94	-98.44	-70	-28.44
1625.5 - 1626.5	0.004	0.03	8.75	-70	1.3	45.12	36.37	-33.84	-80.26	-70	-10.26	-89.76	-70	-19.76
1626.5 - 1660	0.004	0.03	8.75	-70	1.3	45.12	36.37	-21.15	-67.57	-70	2.43	-77.07	-70	-7.07
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	XX	XX	-35.15	-37.71	-19.5	-18.21	** -37.71	-19.5	-18.21
1670 - 1735	0.004	0.03	8.75	-60	0.8	45.12	36.37	-30.59	-76.51	-60	-16.51	-86.01	-60	-26.01
1735 - 1865	0.004	0.03	8.75	-105	50	45.12	36.37	-33.45	-128.57	-105	-23.57	-138.07	-105	-33.07
1865 - 2260.5	0.004	0.03	8.75	-105	20	45.12	36.37	-33.06	-98.18	-105	6.82	-107.68	-105	-2.68
2260.5 - 3250	0.004	0.03	8.75	-105	20	45.12	36.37	-33.17	-98.29	-105	6.71	-107.79	-105	-2.79
3250 - 3330	0.004	0.03	8.75	-105	50	45.12	36.37	-27.89	-123.01	-105	-18.01	-132.51	-105	-27.51
3330 - 4000	0.004	0.03	8.75	-105	40	45.12	36.37	-31.43	-116.55	-105	-11.55	-126.05	-105	-21.05
4000 - 12000	0.004	0.03	8.75	-105	50	45.12	36.37	-19.19	-114.31	-105	-9.31	-123.81	-105	-18.81
12000 - 18000	0.004	0.03	8.75	-70	15	45.12	36.37	-30.53	-90.65	-70	-20.65	-100.15	-70	-30.15

**RT2Q**
**Spurious Emissions Calculation Table - A781-500**

FCC Part 87 Spurious Emissions - 87.139(i)

 DA 11-1104 FCC ORDER - 9.5 dB  
 Relaxation - Spurious

Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)	Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin
.010 - 1026.5	0.004	0.03	8.75	-135	80	42.83	34.08	-24.08	-146.91	-135	-11.91	-156.41	-135	-21.41
1026.5 - 1525	0.004	0.03	8.75	-135	80	42.83	34.08	-25.98	-148.81	-135	-13.81	-158.31	-135	-23.31
1525 - 1559	0.004	0.03	8.75	-203	120	42.83	34.08	-38.94	-201.77	-203	1.23	-211.27	-203	-8.27
1559 - 1585	1	1	0.00	-155	111	46.15	46.15	-35.06	-192.21	-155	-37.21	-201.71	-155	-46.71
1585 - 1605	1	1	0.00	-143	95	46.15	46.15	-34.44	-175.59	-143	-32.59	-185.09	-143	-42.09
1605 - 1610	1	1	0.00	-117	62	46.15	46.15	-39.97	-148.12	-117	-31.12	-157.62	-117	-40.62
1610 - 1610.6	1	1	0.00	-95	40	46.15	46.15	-30.48	-116.63	-95	-21.63	-126.13	-95	-31.13
1610.6 - 1613.8	1	1	0.00	-50	40	XX	XX	-27.4	-67.40	-50	-17.40	** -67.40	-50	-17.40
1613.8 - 1614	1	1	0.00	-95	40	46.15	46.15	-27.28	-113.43	-95	-18.43	-122.93	-95	-27.93
1614 - 1620	0.004	0.03	8.75	-70	30	42.83	34.08	-33.81	-106.64	-70	-36.64	-116.14	-70	-46.14
1620 - 1624.5	0.004	0.03	8.75	-70	20	42.83	34.08	-36.78	-99.61	-70	-29.61	-109.11	-70	-39.11
1624.5 - 1625.5	0.004	0.03	8.75	-70	10	42.83	34.08	-37.32	-90.15	-70	-20.15	-99.65	-70	-29.65
1625.5 - 1626.5	0.004	0.03	8.75	-70	1.3	42.83	34.08	-35.34	-79.47	-70	-9.47	-88.97	-70	-18.97
1626.5 - 1660	0.004	0.03	8.75	-70	1.3	42.83	34.08	-18.86	-62.99	-70	7.01	-72.49	-70	-2.49
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	XX	XX	-36.76	-39.32	-19.5	-19.82	** -39.32	-19.5	-19.82
1670 - 1735	0.004	0.03	8.75	-60	0.8	42.83	34.08	-25.73	-69.36	-60	-9.36	-78.86	-60	-18.86
1735 - 1865	0.004	0.03	8.75	-105	50	42.83	34.08	-41.43	-134.26	-105	-29.26	-143.76	-105	-38.76
1865 - 2260.5	0.004	0.03	8.75	-105	20	42.83	34.08	-40.96	-103.79	-105	1.21	-113.29	-105	-8.29
2260.5 - 3250	0.004	0.03	8.75	-105	20	42.83	34.08	-33.94	-96.77	-105	8.23	-106.27	-105	-1.27
3250 - 3330	0.004	0.03	8.75	-105	50	42.83	34.08	-29.81	-122.64	-105	-17.64	-132.14	-105	-27.14
3330 - 4000	0.004	0.03	8.75	-105	40	42.83	34.08	-43.91	-126.74	-105	-21.74	-136.24	-105	-31.24
4000 - 12000	0.004	0.03	8.75	-105	50	42.83	34.08	-18.32	-111.15	-105	-6.15	-120.65	-105	-15.65
12000 - 18000	0.004	0.03	8.75	-70	15	42.83	34.08	-40.02	-97.85	-70	-27.85	-107.35	-70	-37.35

**RT45Q**
**Spurious Emissions Calculation Table - A781-500**

FCC Part 87 Spurious Emissions - 87.139(i)

 DA 11-1104 FCC ORDER - 9.5 dB  
 Relaxation - Spurious

Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)	Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin
.010 - 1026.5	0.004	0.03	8.75	-135	80	39.1	30.35	-18.26	-137.36	-135	-2.36	-146.86	-135	-11.86
1026.5 - 1525	0.004	0.03	8.75	-135	80	39.1	30.35	-18.05	-137.15	-135	-2.15	-146.65	-135	-11.65
1525 - 1559	0.004	0.03	8.75	-203	120	39.1	30.35	-40.08	-199.18	-203	3.82	-208.68	-203	-5.68
1559 - 1585	1	1	0.00	-155	111	45.08	45.08	-31.24	-187.32	-155	-32.32	-196.82	-155	-41.82
1585 - 1605	1	1	0.00	-143	95	45.08	45.08	-33.06	-173.14	-143	-30.14	-182.64	-143	-39.64
1605 - 1610	1	1	0.00	-117	62	45.08	45.08	-30.82	-137.90	-117	-20.90	-147.40	-117	-30.40
1610 - 1610.6	1	1	0.00	-95	40	45.08	45.08	-30.04	-115.12	-95	-20.12	-124.62	-95	-29.62
1610.6 - 1613.8	1	1	0.00	-50	40	XX	XX	-32.9	-72.90	-50	-22.90	** -72.90	-50	-22.90
1613.8 - 1614	1	1	0.00	-95	40	45.08	45.08	-29.16	-114.24	-95	-19.24	-123.74	-95	-28.74
1614 - 1620	0.004	0.03	8.75	-70	30	39.1	30.35	-35.79	-104.89	-70	-34.89	-114.39	-70	-44.39
1620 - 1624.5	0.004	0.03	8.75	-70	20	39.1	30.35	-37.29	-96.39	-70	-26.39	-105.89	-70	-35.89
1624.5 - 1625.5	0.004	0.03	8.75	-70	10	39.1	30.35	-37.62	-86.72	-70	-16.72	-96.22	-70	-26.22
1625.5 - 1626.5	0.004	0.03	8.75	-70	1.3	39.1	30.35	-36.99	-77.39	-70	-7.39	-86.89	-70	-16.89
1626.5 - 1660	0.004	0.03	8.75	-70	1.3	39.1	30.35	-22.02	-62.42	-70	7.58	-71.92	-70	-1.92
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	XX	XX	-37.81	-40.37	-19.5	-20.87	** -40.37	-19.5	-20.87
1670 - 1735	0.004	0.03	8.75	-60	0.8	39.1	30.35	-30.75	-70.65	-60	-10.65	-80.15	-60	-20.15
1735 - 1865	0.004	0.03	8.75	-105	50	39.1	30.35	-44.08	-133.18	-105	-28.18	-142.68	-105	-37.68
1865 - 2260.5	0.004	0.03	8.75	-105	20	39.1	30.35	-38.4	-97.50	-105	7.50	-107.00	-105	-2.00
2260.5 - 3250	0.004	0.03	8.75	-105	20	39.1	30.35	-39.2	-98.30	-105	6.70	-107.80	-105	-2.80
3250 - 3330	0.004	0.03	8.75	-105	50	39.1	30.35	-32.01	-121.11	-105	-16.11	-130.61	-105	-25.61
3330 - 4000	0.004	0.03	8.75	-105	40	39.1	30.35	-42.44	-121.54	-105	-16.54	-131.04	-105	-26.04
4000 - 12000	0.004	0.03	8.75	-105	50	39.1	30.35	-22.48	-111.58	-105	-6.58	-121.08	-105	-16.08
12000 - 18000	0.004	0.03	8.75	-70	15	39.1	30.35	-39.05	-93.15	-70	-23.15	-102.65	-70	-32.65

**RT1X**

**Spurious Emissions Calculation Table - A781-500**

FCC Part 87 Spurious Emissions - 87.139(i)

DA 11-1104 FCC ORDER - 9.5 dB  
Relaxation - Spurious

Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)	Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin	
.010 - 1026.5	0.004	0.03	8.75	-135	80	44.97	36.22	-21.67	-146.64	-135	-11.64	-156.14	-135	-21.14	
1026.5 - 1525	0.004	0.03	8.75	-135	80	44.97	36.22	-23.97	-148.94	-135	-13.94	-158.44	-135	-23.44	
1525 - 1559	0.004	0.03	8.75	-203	120	44.97	36.22	-40.22	-205.19	-203	-2.19	-214.69	-203	-11.69	
1559 - 1585	1	1	0.00	-155	111	46.21	46.21	-31.76	-188.97	-155	-33.97	-198.47	-155	-43.47	
1585 - 1605	1	1	0.00	-143	95	46.21	46.21	-29.33	-170.54	-143	-27.54	-180.04	-143	-37.04	
1605 - 1610	1	1	0.00	-117	62	46.21	46.21	-31.2	-139.41	-117	-22.41	-148.91	-117	-31.91	
1610 - 1610.6	1	1	0.00	-95	40	46.21	46.21	-29.47	-115.68	-95	-20.68	-125.18	-95	-30.18	
1610.6 - 1613.8	1	1	0.00	-50	40	xx	XX	-32.42	-72.42	-50	-22.42	**	-72.42	-50	-22.42
1613.8 - 1614	1	1	0.00	-95	40	46.21	46.21	-27	-113.21	-95	-18.21	-122.71	-95	-27.71	
1614 - 1620	0.004	0.03	8.75	-70	30	44.97	36.22	-33.54	-108.51	-70	-38.51	-118.01	-70	-48.01	
1620 - 1624.5	0.004	0.03	8.75	-70	20	44.97	36.22	-33.46	-98.43	-70	-28.43	-107.93	-70	-37.93	
1624.5 - 1625.5	0.004	0.03	8.75	-70	10	44.97	36.22	-36.45	-91.42	-70	-21.42	-100.92	-70	-30.92	
1625.5 - 1626.5	0.004	0.03	8.75	-70	1.3	44.97	36.22	-35.67	-81.94	-70	-11.94	-91.44	-70	-21.44	
1626.5 - 1660	0.004	0.03	8.75	-70	1.3	44.97	36.22	-17.2	-63.47	-70	6.53	-72.97	-70	-2.97	
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	xx	XX	-35.35	-37.91	-19.5	-18.41	**	-37.91	-19.5	-18.41
1670 - 1735	0.004	0.03	8.75	-60	0.8	44.97	36.22	-32.58	-78.35	-60	-18.35	-87.85	-60	-27.85	
1735 - 1865	0.004	0.03	8.75	-105	50	44.97	36.22	-44.71	-139.68	-105	-34.68	-149.18	-105	-44.18	
1865 - 2260.5	0.004	0.03	8.75	-105	20	44.97	36.22	-22.45	-87.42	-105	17.58	-96.92	-105	8.08	
2260.5 - 3250	0.004	0.03	8.75	-105	20	44.97	36.22	-30.65	-95.62	-105	9.38	-105.12	-105	-0.12	
3250 - 3330	0.004	0.03	8.75	-105	50	44.97	36.22	-32.77	-127.74	-105	-22.74	-137.24	-105	-32.24	
3330 - 4000	0.004	0.03	8.75	-105	40	44.97	36.22	-44.29	-129.26	-105	-24.26	-138.76	-105	-33.76	
4000 - 12000	0.004	0.03	8.75	-105	50	44.97	36.22	-15.85	-110.82	-105	-5.82	-120.32	-105	-15.32	
12000 - 18000	0.004	0.03	8.75	-70	15	44.97	36.22	-40.14	-100.11	-70	-30.11	-109.61	-70	-39.61	

**RT2X**

**Spurious Emissions Calculation Table - A781-500**

FCC Part 87 Spurious Emissions - 87.139(i)

DA 11-1104 FCC ORDER - 9.5 dB  
Relaxation - Spurious

Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)	Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin	
.010 - 1026.5	0.004	0.03	8.75	-135	80	42.86	34.11	-23.42	-146.28	-135	-11.28	-155.78	-135	-20.78	
1026.5 - 1525	0.004	0.03	8.75	-135	80	42.86	34.11	-25.88	-148.74	-135	-13.74	-158.24	-135	-23.24	
1525 - 1559	0.004	0.03	8.75	-203	120	42.86	34.11	-39.2	-202.06	-203	0.94	-211.56	-203	-8.56	
1559 - 1585	1	1	0.00	-155	111	45.95	45.95	-31.6	-188.55	-155	-33.55	-198.05	-155	-43.05	
1585 - 1605	1	1	0.00	-143	95	45.95	45.95	-30.01	-170.96	-143	-27.96	-180.46	-143	-37.46	
1605 - 1610	1	1	0.00	-117	62	45.95	45.95	-30.88	-138.83	-117	-21.83	-148.33	-117	-31.33	
1610 - 1610.6	1	1	0.00	-95	40	45.95	45.95	-29.47	-115.42	-95	-20.42	-124.92	-95	-29.92	
1610.6 - 1613.8	1	1	0.00	-50	40	xx	XX	-32.52	-72.52	-50	-22.52	**	-72.52	-50	-22.52
1613.8 - 1614	1	1	0.00	-95	40	45.95	45.95	-26.95	-112.90	-95	-17.90	-122.40	-95	-27.40	
1614 - 1620	0.004	0.03	8.75	-70	30	42.86	34.11	-32.29	-105.15	-70	-35.15	-114.65	-70	-44.65	
1620 - 1624.5	0.004	0.03	8.75	-70	20	42.86	34.11	-33.29	-96.15	-70	-26.15	-105.65	-70	-35.65	
1624.5 - 1625.5	0.004	0.03	8.75	-70	10	42.86	34.11	-35.99	-88.85	-70	-18.85	-98.35	-70	-28.35	
1625.5 - 1626.5	0.004	0.03	8.75	-70	1.3	42.86	34.11	-32.82	-76.98	-70	-6.98	-86.48	-70	-16.48	
1626.5 - 1660	0.004	0.03	8.75	-70	1.3	42.86	34.11	-20.4	-64.56	-70	5.44	-74.06	-70	-4.06	
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	xx	XX	-36.33	-38.89	-19.5	-19.39	**	-38.89	-19.5	-19.39
1670 - 1735	0.004	0.03	8.75	-60	0.8	42.86	34.11	-28.87	-72.53	-60	-12.53	-82.03	-60	-22.03	
1735 - 1865	0.004	0.03	8.75	-105	50	42.86	34.11	-38.46	-131.32	-105	-26.32	-140.82	-105	-35.82	
1865 - 2260.5	0.004	0.03	8.75	-105	20	42.86	34.11	-36.21	-99.07	-105	5.93	-108.57	-105	-3.57	
2260.5 - 3250	0.004	0.03	8.75	-105	20	42.86	34.11	-34.29	-97.15	-105	7.85	-106.65	-105	-1.65	
3250 - 3330	0.004	0.03	8.75	-105	50	42.86	34.11	-26.2	-119.06	-105	-14.06	-128.56	-105	-23.56	
3330 - 4000	0.004	0.03	8.75	-105	40	42.86	34.11	-26.96	-109.82	-105	-4.82	-119.32	-105	-14.32	
4000 - 12000	0.004	0.03	8.75	-105	50	42.86	34.11	-18.62	-111.48	-105	-6.48	-120.98	-105	-15.98	
12000 - 18000	0.004	0.03	8.75	-70	15	42.86	34.11	-34.75	-92.61	-70	-22.61	-102.11	-70	-32.11	

**RT45X**
**Spurious Emissions Calculation Table - A781-500**

FCC Part 87 Spurious Emissions - 87.139(i)

DA 11-1104 FCC ORDER - 9.5 dB

Relaxation - Spurious

Freq. (MHz)	RBW	RBW Used	RBW Correction	Limit (dBc)	Filter Rejection	Measured carrier Power	Corrected Power	Absolute Measured Spurious (dBm)	Corrected spur. (dBc)	Limit (dBc)	Margin	Corrected spur. (dBc)	Limit (dBc)	Margin
.010 - 1026.5	0.004	0.03	8.75	-135	80	40.27	31.52	-27.39	-147.66	-135	-12.66	-157.16	-135	-22.16
1026.5 - 1525	0.004	0.03	8.75	-135	80	40.27	31.52	-27.11	-147.38	-135	-12.38	-156.88	-135	-21.88
1525 - 1559	0.004	0.03	8.75	-203	120	40.27	31.52	-36.32	-196.59	-203	6.41	-206.09	-203	-3.09
1559 - 1585	1	1	0.00	-155	111	46.03	46.03	-29.92	-186.95	-155	-31.95	-196.45	-155	-41.45
1585 - 1605	1	1	0.00	-143	95	46.03	46.03	-28.4	-169.43	-143	-26.43	-178.93	-143	-35.93
1605 - 1610	1	1	0.00	-117	62	46.03	46.03	-28.4	-136.43	-117	-19.43	-145.93	-117	-28.93
1610 - 1610.6	1	1	0.00	-95	40	46.03	46.03	-28.51	-114.54	-95	-19.54	-124.04	-95	-29.04
1610.6 - 1613.8	1	1	0.00	-50	40	xx	XX	-26.86	-66.86	-50	-16.86	** -66.86	-50	-16.86
1613.8 - 1614	1	1	0.00	-95	40	46.03	46.03	-26.7	-112.73	-95	-17.73	-122.23	-95	-27.23
1614 - 1620	0.004	0.03	8.75	-70	30	40.27	31.52	-33.8	-104.07	-70	-34.07	-113.57	-70	-43.57
1620 - 1624.5	0.004	0.03	8.75	-70	20	40.27	31.52	-36.91	-97.18	-70	-27.18	-106.68	-70	-36.68
1624.5 - 1625.5	0.004	0.03	8.75	-70	10	40.27	31.52	-34.24	-84.51	-70	-14.51	-94.01	-70	-24.01
1625.5 - 1626.5	0.004	0.03	8.75	-70	1.3	40.27	31.52	-34.44	-76.01	-70	-6.01	-85.51	-70	-15.51
1626.5 - 1660	0.004	0.03	8.75	-70	1.3	40.27	31.52	-23.71	-65.28	-70	4.72	-74.78	-70	-4.78
1660 - 1670	0.02	0.03	1.76	-19.5	0.8	xx	XX	-36.16	-38.72	-19.5	-19.22	** -38.72	-19.5	-19.22
1670 - 1735	0.004	0.03	8.75	-60	0.8	40.27	31.52	-29.74	-70.81	-60	-10.81	-80.31	-60	-20.31
1735 - 1865	0.004	0.03	8.75	-105	50	40.27	31.52	-37.05	-127.32	-105	-22.32	-136.82	-105	-31.82
1865 - 2260.5	0.004	0.03	8.75	-105	20	40.27	31.52	-36.55	-96.82	-105	8.18	-106.32	-105	-1.32
2260.5 - 3250	0.004	0.03	8.75	-105	20	40.27	31.52	-37.84	-98.11	-105	6.89	-107.61	-105	-2.61
3250 - 3330	0.004	0.03	8.75	-105	50	40.27	31.52	-28.64	-118.91	-105	-13.91	-128.41	-105	-23.41
3330 - 4000	0.004	0.03	8.75	-105	40	40.27	31.52	-37.72	-117.99	-105	-12.99	-127.49	-105	-22.49
4000 - 12000	0.004	0.03	8.75	-105	50	40.27	31.52	-20.86	-111.13	-105	-6.13	-120.63	-105	-15.63
12000 - 18000	0.004	0.03	8.75	-70	15	40.27	31.52	-35.22	-90.49	-70	-20.49	-99.99	-70	-29.99



## Field Strength of Spurious Radiation

Engineer: Alex Macon

Test Date: March 10, 2016

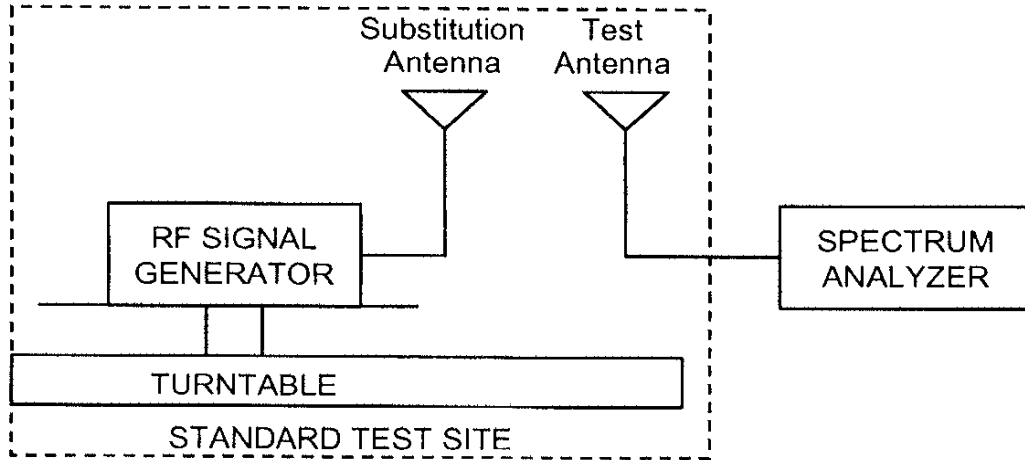
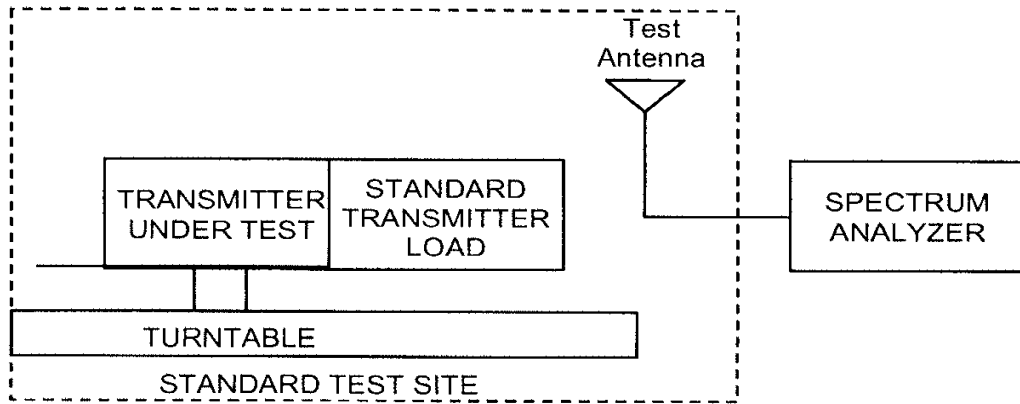
### Test Procedure

1. Connect the equipment as illustrated
2. Adjust the spectrum analyzer for the following settings:
  - a. Resolution Bandwidth 100 kHz (<1 GHz), 1 MHz (> 1GHz).
  - b. Video Bandwidth  $\geq 3$  times Resolution Bandwidth, or 30 kHz
  - c. Sweep Speed  $\leq 2000$  Hz/second
  - d. Detector Mode = Mean or Average Power
3. Place the transmitter to be tested on the turntable in the standard test site. The transmitter is transmitting into a non-radiating load that is placed on the turntable. The RF cable to this load should be of minimum length.
4. For each spurious measurement the test antenna should be adjusted to the correct length for the frequency involved. This length may be determined from a calibration ruler supplied with the equipment. Measurements shall be made from the lowest radio frequency generated in the equipment to the tenth harmonic of the carrier, except for the region close to the carrier equal to  $\pm$  the test bandwidth (see section 1.3.4.4).
5. For each spurious frequency, raise and lower the test antenna from 1 m to 4 m to obtain a maximum reading on the spectrum analyzer with the test antenna at horizontal polarity. Repeat this procedure to obtain the highest possible reading. Record this maximum reading.
6. Repeat step E) for each spurious frequency with the test antenna polarized vertically.
7. Reconnect the equipment as illustrated.
8. Keep the spectrum analyzer adjusted as in step B).
9. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter. At lower frequencies, where the substitution antenna is very long, this will be impossible to achieve when the antenna is polarized vertically. In such case the lower end of the antenna should be 0.3 m above the ground.
10. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.
11. Repeat step J) with both antennas vertically polarized for each spurious frequency.
12. Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps J) and K) by the power loss in the cable between the generator and the antenna and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna.
13. The levels recorded in step L) are absolute levels of radiated spurious emissions in dBm. The radiated spurious emissions in dB can be calculated by the following:
  - a. Radiated spurious emissions dB =  $10\log_{10}(\text{TX power in watts}/0.001) - \text{the levels in step I)}$

*NOTE: It is permissible that other antennas provided can be referenced to a dipole.*



### Test Setup



Test Plots: See Annex C Radiated Spurious Emissions

## Emission Masks (Occupied Bandwidth)

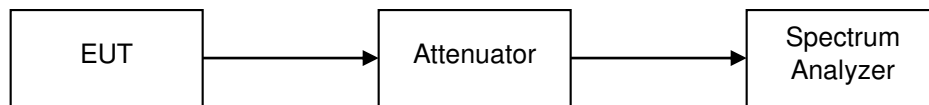
**Engineer:** Alex Macon

**Test Date:** March 11, 2016

### Test Procedure

The EUT was connected directly to a spectrum analyzer to verify that the EUT meets the required emissions mask. A reference level plot is provided to verify that the peak power was established prior to testing the mask. The transmitter is digital modulation therefore no data input is required to measure the emission mask. The RBW was set as close as possible to 1% of the occupied bandwidth to ensure accurate readings.

### Test Setup



**Test Plots:** See Annex D Emission Masks

## Frequency Stability (Temperature Variation)

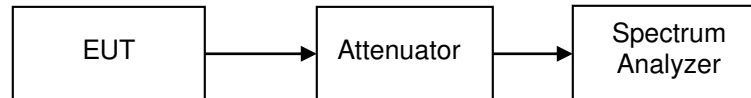
**Engineer:** Alex Macon

**Test Date:** March 12, 2019

### Test Procedure

The EUT was placed in an environmental test chamber and the RF output was connected directly to a frequency counter. The temperature was varied from  $-30^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  in  $10^{\circ}\text{C}$  increments. After a sufficient time for temperature stabilization the RF output frequency was measured.

### Test Setup



**Test Plots:** See Annex E Frequency Stability

**Frequency Stability (Voltage Variation)**

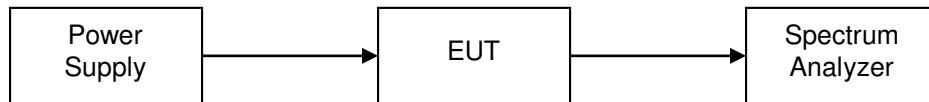
**Engineer:** Alex Macon

**Test Date:** March 12, 2016

**Test Procedure**

The EUT was placed in a temperature chamber at  $20\pm 5^{\circ}\text{C}$  and connected directly to a spectrum analyzer. The power supply voltage to the EUT was varied from 85% to 115% of the nominal value and the RF output was measured. This was measured with both a 400 Hz 115 VAC supply and a variable DC voltage source.

**Test Setup**



**Test Plots:** See Annex E Frequency Stability

## Necessary Bandwidth and Emission Bandwidth

Engineer: Alex Macon

Test Date: March 12, 2016

### BPSK

Modulation = 840HG1D

Necessary Bandwidth Calculation:

Signal States (S)	=		2
Data Rate (D)	=	0.6	
Constant Factor (K)	=	0.7	
Necessary Bandwidth (B <sub>N</sub> ), kHz	=		$2 * D * K / \text{LOG}_2(S)$

Modulation = 1K68G1D

Necessary Bandwidth Calculation:

Signal States (S)	=		2
Data Rate (D)	=	1.2	
Constant Factor (K)	=	0.7	
Necessary Bandwidth (B <sub>N</sub> ), kHz	=		$2 * D * K / \text{LOG}_2(S)$

## QPSK

Modulation = 6K80G1E

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	8.4
Constant Factor (K)	=	0.81
Necessary Bandwidth (B <sub>N</sub> ), kHz	=	2*D*K / LOG <sub>2</sub> (S)

Modulation = 10K5G1D

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	10.5
Constant Factor (K)	=	1.
Necessary Bandwidth (B <sub>N</sub> ), kHz	=	2*D*K / LOG <sub>2</sub> (S)

Modulation = 25K0G7W

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	33.6
Constant Factor (K)	=	0.74
Necessary Bandwidth (B <sub>N</sub> ), kHz	=	2*D*K / LOG <sub>2</sub> (S)

Modulation = 50K0G7W

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	67.2
Constant Factor (K)	=	0.74
Necessary Bandwidth (B <sub>N</sub> ), kHz	=	2*D*K / LOG <sub>2</sub> (S)

Modulation = 100KG7W

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	134.4
Constant Factor (K)	=	0.74
Necessary Bandwidth (B <sub>N</sub> ), kHz	=	2*D*K / LOG <sub>2</sub> (S)

Modulation = 200KG7W

Necessary Bandwidth Calculation:

Signal States (S)	=	4
Data Rate (D)	=	302.4
Constant Factor (K)	=	0.66
Necessary Bandwidth (B <sub>N</sub> ), kHz	=	2*D*K / LOG <sub>2</sub> (S)

**QAM**

Modulation = 50K0D7W

Necessary Bandwidth Calculation:

Signal States (S)	=	16
Data Rate (D)	=	134.4
Constant Factor (K)	=	0.74
Necessary Bandwidth (B <sub>N</sub> ), kHz	=	2*D*K / LOG <sub>2</sub> (S)

Modulation = 100KD7W

Necessary Bandwidth Calculation:

Signal States (S)	=	16
Data Rate (D)	=	268.8
Constant Factor (K)	=	0.74
Necessary Bandwidth (B <sub>N</sub> ), kHz	=	2*D*K / LOG <sub>2</sub> (S)

Modulation = 200KD7W

Necessary Bandwidth Calculation:

Signal States (S)	=	16
Data Rate (D)	=	604.8
Constant Factor (K)	=	0.66
Necessary Bandwidth (B <sub>N</sub> ), kHz	=	2*D*K / LOG <sub>2</sub> (S)

## Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna, Amplified	ARA	DRG-118/A	i00271	5/8/14	5/8/16
Bilog Antenna	Teseq	CBL 6111Dk	i00349	10/8/15	10/8/16
EMI Analyzer	Agilent	E7405A	i00379	2/11/16	2/11/17
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	11/26/13	11/26/16
Horn Antenna	ETS Lindgren	3115	i00273	05/08/14	05/08/16
Horn Antenna	ETS Lindgren	3116	i00085	01/29/15	01/29/17
Spectrum Analyzer	Agilent	E4407B	i00331	09/18/15	09/18/16

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT