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FCC Certification Report

BriarTek, Inc.
112 East Del Ray Avenue
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Alexandria, VA 22301
Contact: Joseph Landa

Model: ORCA DSC

FCC ID: QJYORCADSC

August 5, 2009

Standards Referenced for this Report	
Part 2: 2008	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
Part 80: 2008	Stations in the Maritime Services
ANSI TIA-603-C-2004	Land Portable FM or PM Communications Equipment - Measurement and Performance Standards

Frequency Range (MHz)	Rated Power (W)	Frequency Tolerance (ppm)	Emission Designator
121.5	0.1	50	8K50F3E
156.525	0.1	2.4	32K0F3E

Report Prepared by: Dan Baltzell

Document Number: 2009196

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1 General Information

This Certification Report is prepared on behalf of **BriarTek, Inc**. in accordance with the Federal Communications Commission Rules and Regulations. The Equipment Under Test (EUT) was the **ORCA DSC, FCC ID: QJYORCADSC**.

The BriarTek, Inc. ORCA DSC is a low power Personal Locator Beacon (PLB) intended to be attached to a Personal Flotation Device (PFD) and used as an automatic alert in a man overboard occurrence, as well as to locate the personnel swept overboard in the event that he/she can no longer be tracked visually.

The device is to be used to quickly rescue personnel in close proximity of a vessel; it is water-activated and signals a digital selective calling equipped vessel's bridge to allow local search and rescue.

The ORCA DSC transmits at 156.525 MHz on VHF marine channel 70 at a rated power of 100mW. It transmits a unique Mobile Maritime Service Identifier (MMSI) number, a time stamp and a distress message. ORCA DSC also transmits on 121.5 MHz with a rated power of 100mW using FM modulation to transmit a time and unit identifier.

This application is being filed in consideration of two FCC waivers: DA 06-2113 and DA 02-287. DA 06-2113 pertains to the DSC aspect of the EUT, and DA 02-287 to the PLB aspect. The FCC granted a waiver (DA 02-287) for the ORCA (please see the waiver exhibit uploaded with this application) that waives the requirements of 47 CFR Paragraphs 80.1053(a)(4) through (7), (a)(a4), (e) and 80.1055(a)(3), 80.1055(a)(4) and 80.1055(a)(3)(4).

All measurements contained in this application were conducted in accordance with FCC Rules and Regulations CFR 47. Calibration checks are performed regularly on the instruments, and all accessories including high pass filter, coaxial attenuator, preamplifier and cables.

1.1 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located on the parking lot of Rhein Tech Laboratories, Inc. 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report submitted to and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing.

1.2 Related Submittal(s)/Grant(s)

This is an original application report.

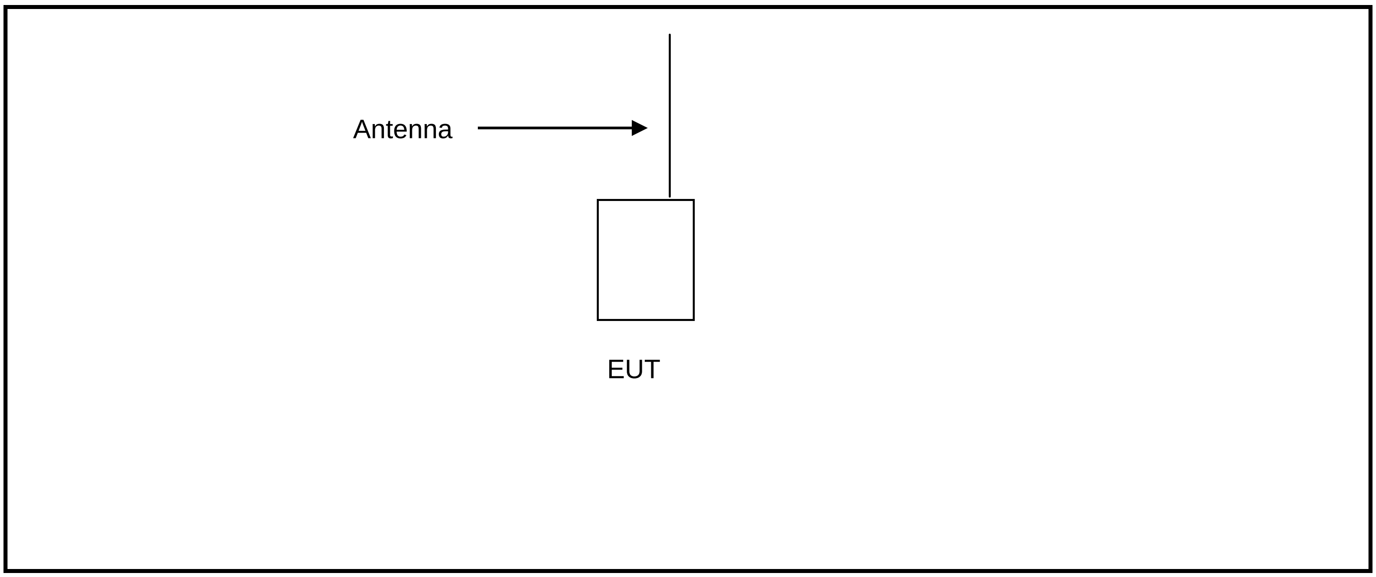
2 Tested System Details

The test samples were received on April 21, 2008 and June 5, 2009. Listed below are the identifiers and descriptions of all equipment, cables, and internal devices used with the EUT for this testing, as applicable.

Table 2-1: Equipment under Test (EUT)

Part	Manufacturer	Model	PN/SN	FCC ID	RTL Bar Code
Personal Locator Beacon	BriarTek, Inc.	ORCA DSC	N/A	QJYORCADSC	18979

Figure 2-1: Configuration of Tested System



3 Carrier Output Power; FCC Rules and Regulations Part 2 §2.1046(a); RTCM Paper 240-24004/SC119-STD, §A.4.2 (DSC)

The carrier power is the mean power delivered to the artificial antenna during one radio frequency cycle in the absence of modulation. The rated output power is the carrier power declared by the manufacturer.

3.1 Method of Measurement

ANSI TIA-603-C-2004, section 2.2.1 and RTCM Paper 240-24004/SC119-STD, §A.4.2

The transmitter shall be connected to an artificial antenna and the power delivered to this artificial antenna shall be measured. The measurements shall be made on channel 70, under normal test conditions and under extreme test conditions.

3.2 Test Data

Table 3-1: Carrier Power

Temperature (°C)	Power Measured (dBm)	Power Measured (W)	Pass/Fail
-20	20.42	0.110	Pass
20	20.50	0.112	Pass
55	20.35	0.108	Pass

3.3 Carrier Power Limit

Under normal and extreme test conditions the output power being set at maximum shall remain between 0.1 W and 0.5 W and be within ±1.5 dB of the rated output power under normal test conditions, and be within +2 dB / -3 dB of the rated output power under extreme conditions. The output power shall never drop below 0.1 W. Rated power for this device is 100 mW (20 dBm).

3.4 Carrier Power Test Equipment

Table 3-2: Test Equipment for **Carrier Power**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901356	Agilent Technologies	E9323A	Power Sensor	31764-264	11/5/09
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	11/5/09
900946	Tenney Engineering, Inc	TH65	Temperature Chamber with Humidity	11380	7/8/09

Test Personnel:

Dan Baltzell		June 5, 2009
Test Engineer	Signature	Date of Test

4 FCC Rules and Regulations Part 2 §2.1046(a): RF Conducted Power Output; Output Power Test

4.1 Test Procedure

ANSI TIA-603-C-2004, section 2.2.1

4.2 Test Data

Table 4-1: RF Power Output - Conducted

Frequency (MHz)	Power (W)
121.5 (PLB)	0.1
156.525 (DSC)	0.1

4.3 RF Conducted Power Output Test Equipment

Table 4-2: Test Equipment for **RF Power Output - Conducted**

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	7/31/09

Test Personnel (DSC):

Dan Baltzell	Daniel W. Baltzell	June 5, 2009
Test Engineer	Signature	Date of Test

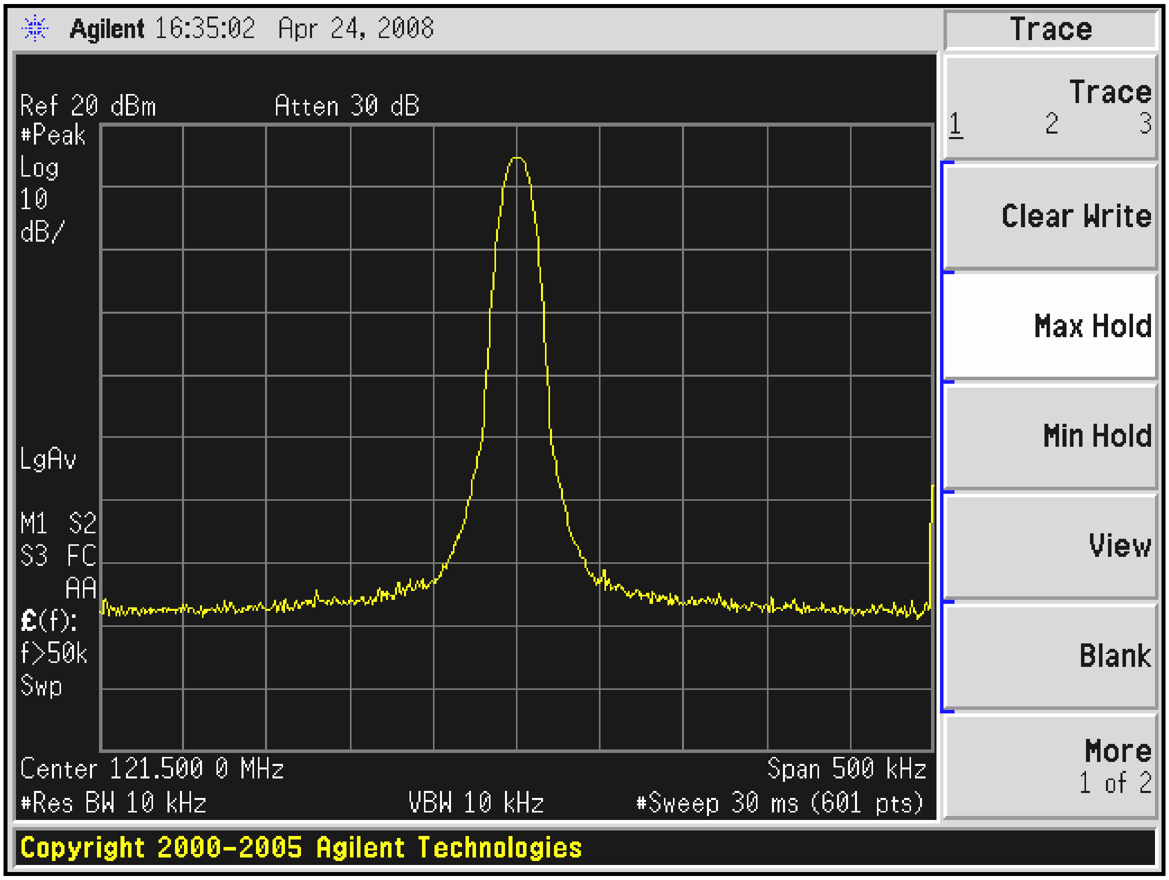
Test Personnel (PLB):

Richard B. McMurray, P.E.	Richard B. McMurray	April 24, 2008
Test Engineer	Signature	Date of Test

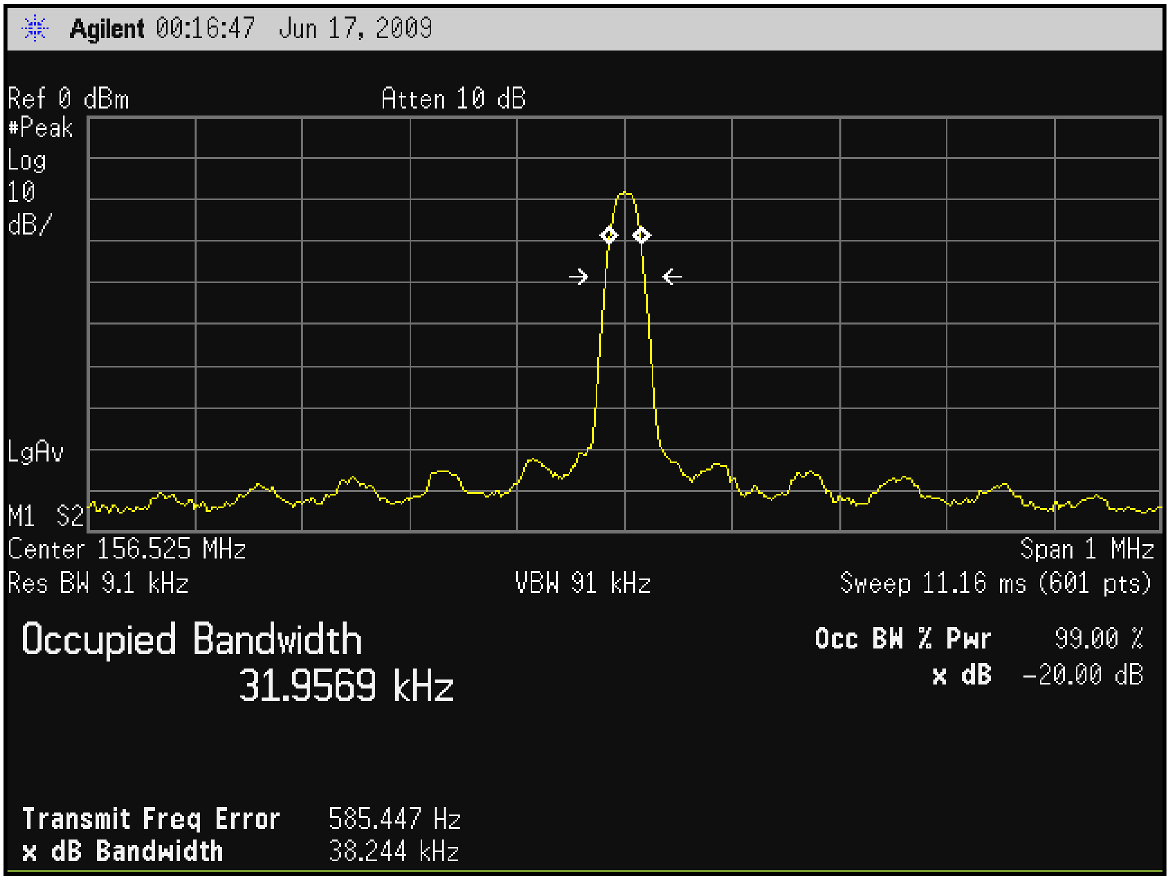
5 FCC Rules and Regulations Part 2 §2.1049: Occupied Bandwidth

5.1 Test Data

Plot 5-1: Occupied Bandwidth (PLB)



Plot 5-2: Occupied Bandwidth (DSC)



5.2 Occupied Bandwidth Test Equipment

Table 5-1: Test Equipment for Occupied Bandwidth

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	7/31/09

Test Personnel (PLB):

Richard B. McMurray, P.E.	Richard B. McMurray	April 24, 2008
Test Engineer	Signature	Date of Test

Test Personnel (DSC):

Dan Baltzell	Daniel W. Baltzell	June 17, 2009
Test Engineer	Signature	Date of Test

6 Field Strength of Spurious Radiation; FCC Rules and Regulations Part 2 §2.1053(a); RTCM Paper 240-24004/SC119-STD, §A.4.5 (DSC)

6.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.12

The spurious emissions levels were measured at 3 meters and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole.

P_d (dBm) = P_g (dBm) – cable loss (dB) + antenna gain (dB)

where:

P_d is the dipole equivalent power
P_g is the generator output power into the substitution antenna

6.2 Test Data

Table 6-1: Field Strength of Spurious Radiation Vertical Polarity (DSC)

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Corrected data (dBm)	Limit (dBm)	Margin (dB)
313.048	72.2	-37.3	4.2	1.6	-39.9	-36.0	-3.9
469.569	53.0	-51.7	5.5	1.4	-55.8	-36.0	-19.8
626.094	40.2	-60.7	6.6	1.1	-66.2	-36.0	-30.2
782.617	39.5	-58.5	7.6	0.8	-65.3	-36.0	-29.3
939.143	38.8	-59.7	8.7	1.2	-67.2	-36.0	-31.2
1095.666	30.0	-70.0	9.7	3.3	-76.4	-36.0	-40.4
1252.186	22.8	-74.6	11.0	3.9	-81.7	-36.0	-45.7
1408.709	14.9	-76.3	11.9	4.6	-83.6	-36.0	-47.6
1565.245	19.0	-72.4	11.6	5.1	-78.9	-36.0	-42.9
1721.768	15.6	-76.2	12.2	5.4	-83.0	-36.0	-47.0
1878.303	16.0	-42.9	14.7	5.8	-51.8	-36.0	-15.8

Table 6-2: Field Strength of Spurious Radiation Horizontal Polarity (DSC)

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Corrected data (dBm)	Limit (dBm)	Margin (dB)
313.048	70.7	-42.4	4.2	1.6	-45.0	-36.0	-9.0
469.569	50.9	-56.2	5.5	1.4	-60.3	-36.0	-24.3
626.094	33.2	-70.8	6.6	1.1	-76.3	-36.0	-40.3
782.617	36.9	-64.4	7.6	0.8	-71.2	-36.0	-35.2
939.143	40.0	-61.4	8.7	1.2	-68.9	-36.0	-32.9
1095.666	28.9	-71.5	9.7	3.3	-77.9	-36.0	-41.9
1252.186	21.8	-75.6	11.0	3.9	-82.7	-36.0	-46.7
1408.709	13.9	-77.2	11.9	4.6	-84.5	-36.0	-48.5
1565.245	17.2	-75.3	11.6	5.1	-81.8	-36.0	-45.8
1721.768	19.0	-74.3	12.2	5.4	-81.1	-36.0	-45.1
1878.303	26.7	-32.1	14.7	5.8	-41.0	-36.0	-5.0

Table 6-3: Field Strength of Spurious Radiation in Standby Mode (DSC)

Frequency (MHz)	Spectrum Analyzer Level (dBµV)	Signal Generator Level (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Corrected data (dBm)	Limit (dBm)	Margin (dB)
276.0	22.7	-91.6	3.2	-2.1	-96.9	-57.0	-39.9
288.0	24.7	-89.1	3.3	-2.1	-94.5	-57.0	-37.5
300.0	33.0	-80.3	3.4	-2.1	-85.9	-57.0	-28.9
312.0	21.9	-91.0	3.4	-2.1	-96.6	-57.0	-39.6
360.0	23.2	-87.7	3.4	-2.1	-93.3	-57.0	-36.3
396.0	23.8	-85.8	3.7	-2.1	-91.7	-57.0	-34.7
660.0	22.5	-82.0	2.9	-2.1	-87.0	-57.0	-30.0
708.0	21.9	-81.3	4.7	-2.1	-88.1	-57.0	-31.1

6.3 Field Strength Spurious Emission Limits

When the transmitter is in stand-by, the cabinet radiation and spurious emissions shall not exceed 2 nW.

When the transmitter is in operation the cabinet radiation and spurious emissions shall not exceed 0.25 µW.

6.4 Field Strength of Spurious Radiation Test Equipment

Table 6-4: Test Equipment for Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	12/12/10
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridges Guide Antenna (1 - 18 GHz)	2310	07/30/09
901215	Hewlett Packard	8596EM	EMC Analyzer (9 kHz – 12.8 GHz)	3826A00144	10/23/09
901365	MITEQ	JS4-00102600-41-5P	Amplifier, 0.1-26 GHz, 30dB gain	N/A	3/4/10
901131	Par Electronics	118-174	VHF Notch Filter, 118-174 MHz, 25W	NA	3/10/12
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS-09302008	RF cable, 20'	NA	10/17/09
901517	Insulated Wire Inc.	KPS-1503-360-KPS-09302008	RF cable 36"	NA	10/17/09
901158	Compliance Design, Inc.	Roberts Dipole Antenna	Adjustable Elements Dipole 25 - 1000 MHz Antennas	00401	2/11/11

Test Personnel:

Dan Baltzell		June 10-16, 2009
Test Engineer	Signature	Dates of Test

7 Conducted Spurious Emissions (DSC); RTCM Paper 240-24004/SC119-STD, §A.4.4

7.1 Test Data

Table 7-1: Conducted Spurious Emissions (DSC)

Frequency (MHz)	Spectrum Analyzer Level (dBm)	0.25 uW Limit (dBm)	Margin (dB)
313.050	-40.4	-36.0	-4.4
469.575	-40.5	-36.0	-4.5
626.100	-44.1	-36.0	-8.1
782.625	-60.6	-36.0	-24.6
939.150	-54.8	-36.0	-18.8
1095.675	-67.6	-36.0	-31.6
1252.200	-58.9	-36.0	-22.9
1408.725	-61.2	-36.0	-25.2
1565.250	-67.9	-36.0	-31.9
1721.775	-73.5	-36.0	-37.5
1878.300	-76.3	-36.0	-40.3

7.2 Conducted Spurious Limits

The power of any conducted spurious emission on any discrete frequency shall not exceed 0.25 µW.

7.3 Conducted Spurious Emissions Test Equipment

Table 7-2: Test Equipment for Conducted Spurious Emissions

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	7/31/09
901131	Par Electronics	118-174	VHF Notch Filter, 118-174 MHz, 25W	NA	3/10/12

Test Personnel:

Dan Baltzell	Daniel W. Baltzell	June 11, 2009
Test Engineer	Signature	Date of Test

8 FCC Rules and Regulations Part 2 §2.1053(a): Field Strength of Spurious Radiation (PLB)

8.1 Test Procedure

ANSI TIA-603-C-2004, Section 2.2.12

The spurious emissions levels were measured at 3 meters and the device under test was replaced by a substitution antenna connected to a signal generator. This signal generator level was then corrected by subtracting the cable loss from the substitution antenna to the signal generator, and the gain of the antenna was further corrected to a half wave dipole.

P_d(dBm) = P_g(dBm) – cable loss (dB) + antenna gain (dB)

where:

P_d is the dipole equivalent power
P_g is the generator output power into the substitution antenna

8.2 Test Data

Table 8-1: Field Strength of Spurious Radiation (PLB)

Frequency (MHz)	Polarity (H/V)	Spectrum Analyzer Level (dBµV)	Spectrum Analyzer (dBm)	Cable Loss (dB)	Notch Filter	PreAmp	Antenna Factor (dB)	Corrected data (dBµV/m)	Field Intensity µV/m @ 3m	dBc
121.510	V	95.4	-11.6	1.5	0.0	0.0	12.7	109.6	301995.2	0
243.000	V	76.8	-30.2	2.0	0.8	-39.3	12.5	52.8	436.5	-56.8
364.500	H	55.9	-51.1	2.6	0.9	-38.2	15.8	37.0	70.8	-72.6
486.000	H	51.5	-55.5	3.0	0.8	-37.6	17.9	35.6	60.3	-74.0
607.512	H	67.2	-39.8	3.3	0.8	-37.2	19.4	53.5	473.2	-56.1
729.012	H	49.8	-57.2	3.6	0.7	-36.9	20.0	37.2	72.4	-72.4
850.516	H	47.0	-60.0	3.8	1.1	-35.9	21.4	37.4	74.1	-72.2
972.016	V	45.3	-61.7	4.2	1.6	-35.6	22.3	37.8	77.6	-71.8
1093.518	H	49.6	-57.4	4.5	4.2	-35.4	23.0	45.9	197.2	-63.7
1215.022	H	42.0	-65.0	4.8	6.2	-35.4	24.3	41.9	124.5	-67.7

8.3 Field Strength of Spurious Radiation Test Equipment

Table 8-2: Test Equipment for Field Strength of Spurious Radiation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901053	Schaffner Chase	CBL6112B	Bi-Log Antenna (20 MHz - 2 GHz)	2648	12/20/08
900814	Electro-Metrics	EM-6961 (RGA-60)	Double Ridges Guide Antenna (1 - 18 GHz)	2310	03/30/09
901215	Hewlett Packard	8596EM	EMC Analyzer (9 kHz – 12.8 GHz)	3826A00144	10/17/08
901281	Rhein Tech Laboratories	PR-1040	Amplifier (10 MHz - 2 GHz)	1004	1/19/2009
901131	Par Electronics	118-174	VHF Notch Filter, 118-174 MHz, 25W	NA	2/1/2009
901422	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/5/2008
901158	Compliance Design, Inc.	Roberts Dipole Antenna	Adjustable Elements Dipole 25-1000 MHz Antennas	00401	2/4/2009

Test Personnel:

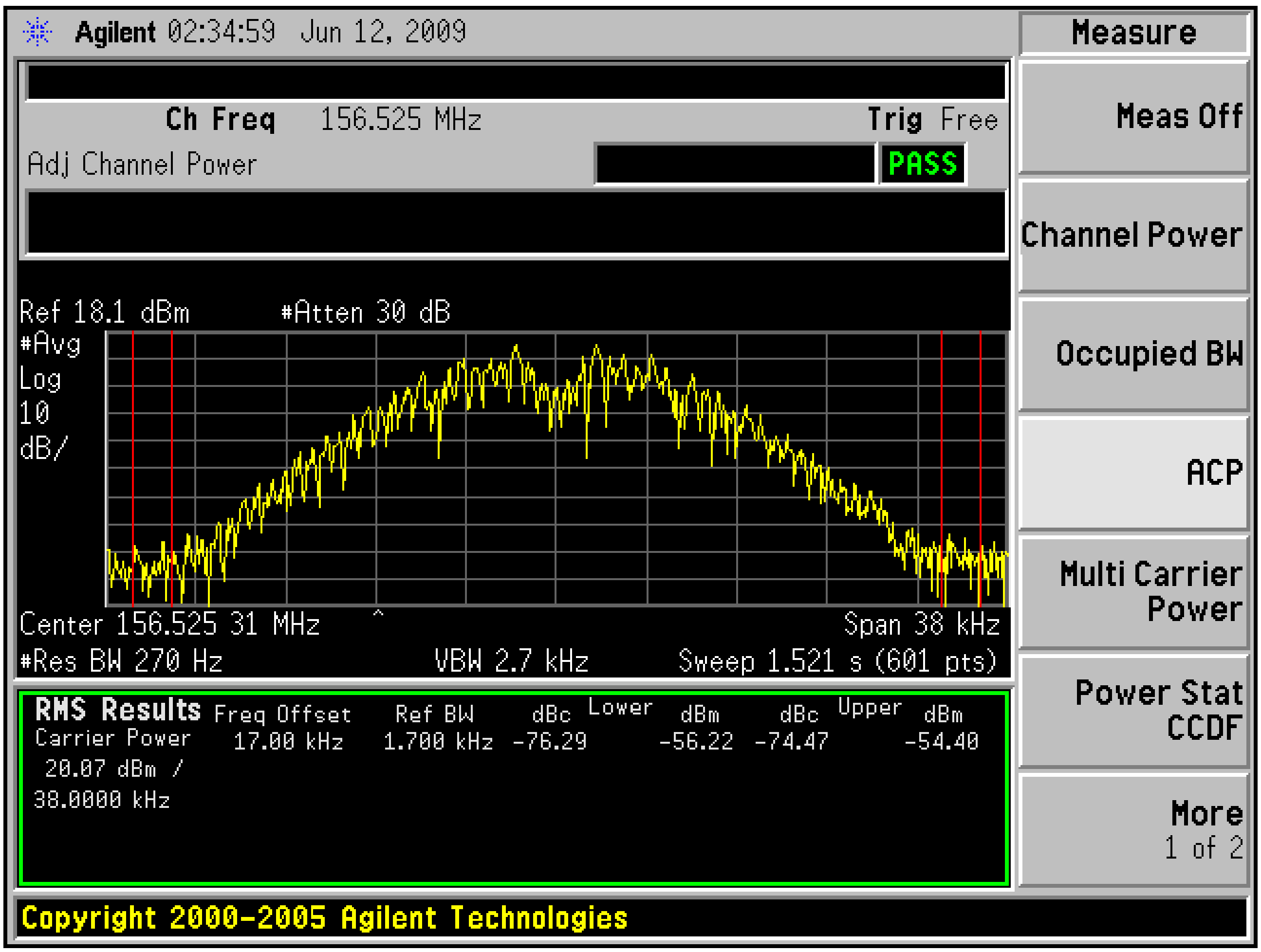
Rick McLay	[signature]	April 22, 2008
Test Engineer	Signature	Date of Test

9 Adjacent Channel Power; RTCM Paper 240-24004/SC119-STD, §A.4.3 (DSC)

The adjacent channel power is that part of the total power output of a transmitter under defined conditions of modulation which falls within a specified pass band centered on the nominal frequency of either of the adjacent channels. This power is the sum of the mean power produced by the modulation hum and noise of the transmitter.

9.1 Test Data

Plot 9-1: Adjacent Channel Power



9.2 Adjacent Channel Power Limits

The adjacent channel power shall not exceed a value of 70 dB below the carrier power of the transmitter without any need to be below 0.2 µW.

9.3 Adjacent Channel Power Test Equipment

Table 9-1: Test Equipment for Adjacent Channel Power

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	7/31/09

Test Personnel:

Dan Baltzell		June 12, 2009
Test Engineer	Signature	Date of Test

10 Transient Frequency Behavior of the Transmitter; RTCM Paper 240-24004/SC119-STD, §A.4.6 (DSC)

The transient frequency behavior of the transmitter is the variation in time of the transmitter frequency difference from the nominal frequency of the transmitter when the RF output power is switched on and off.

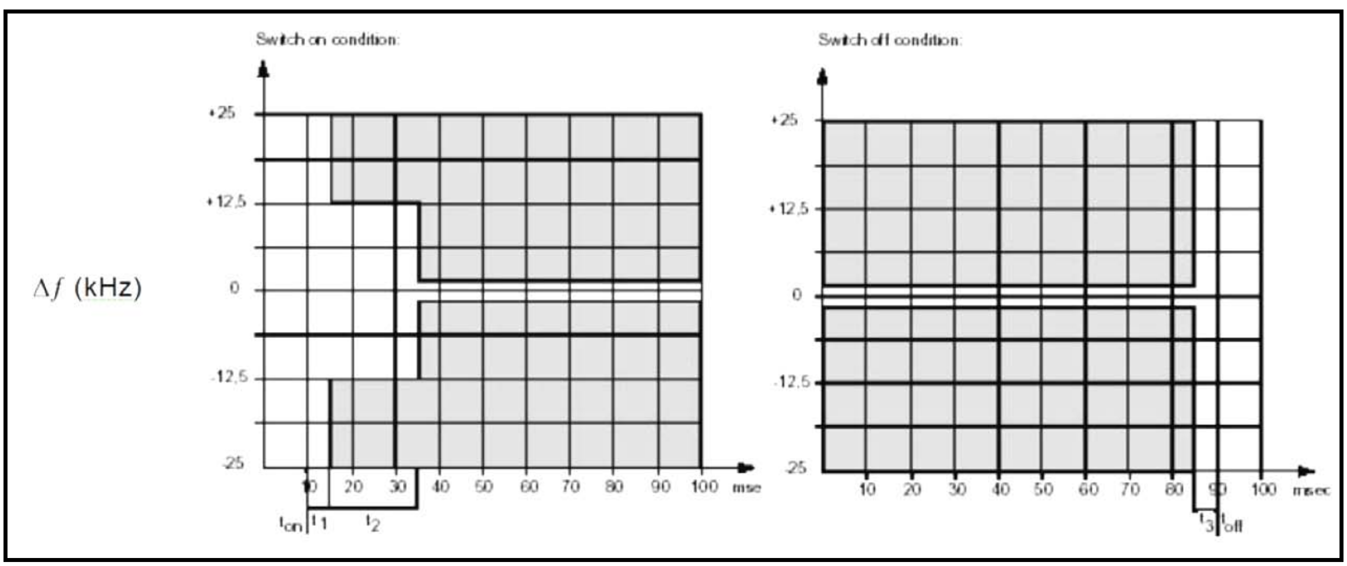
Timing:

t_{on}: According to the method of measurement described below, the switch-on instant t_{on} of a transmitter occurs when the output power, measured at the antenna terminal, exceeds 0.1% of the nominal power.
t_{off}: the switch-off instant occurs when the power falls below 0.1% of the nominal power.
t_1: Period of time starting at t_{on} and finishing according to the following table and figure.
t_2: Period of time starting at the end of t_1 and finishing according to the following table and figure.
t_3: Period of time finishing at t_{off} and starting according to the following table and figure.

Table 10-1: Transmitter Transient Timing

t1	5.0 ms
t2	20.0 ms
t3	5.0 ms
NOTE 1: During the periods t1 and t3 the frequency difference should not exceed the value of 1 channel separation. NOTE 2: During the period t2 the frequency difference should not exceed the value of half a channel separation. See figure below.	

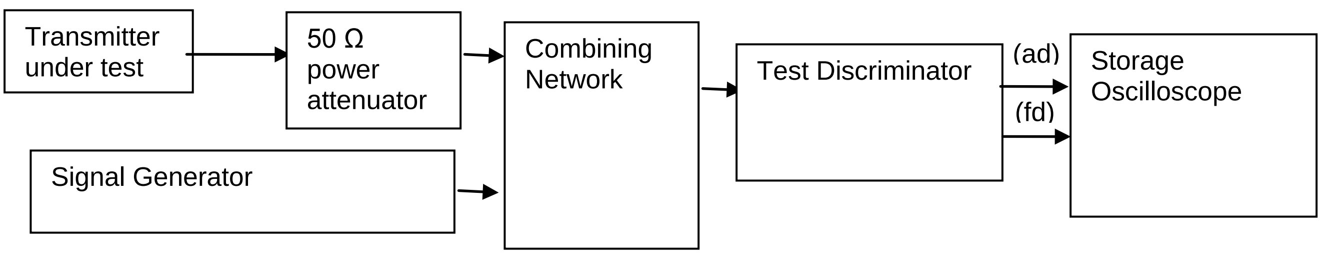
Figure 10-1: Switch on and switch off conditions



10.1 Method of Measurement

Two signals shall be connected to the test discriminator via a combining network, such that the impedance presented to the input is 50 ohms, irrespective of whether one or more test signals are applied simultaneously.

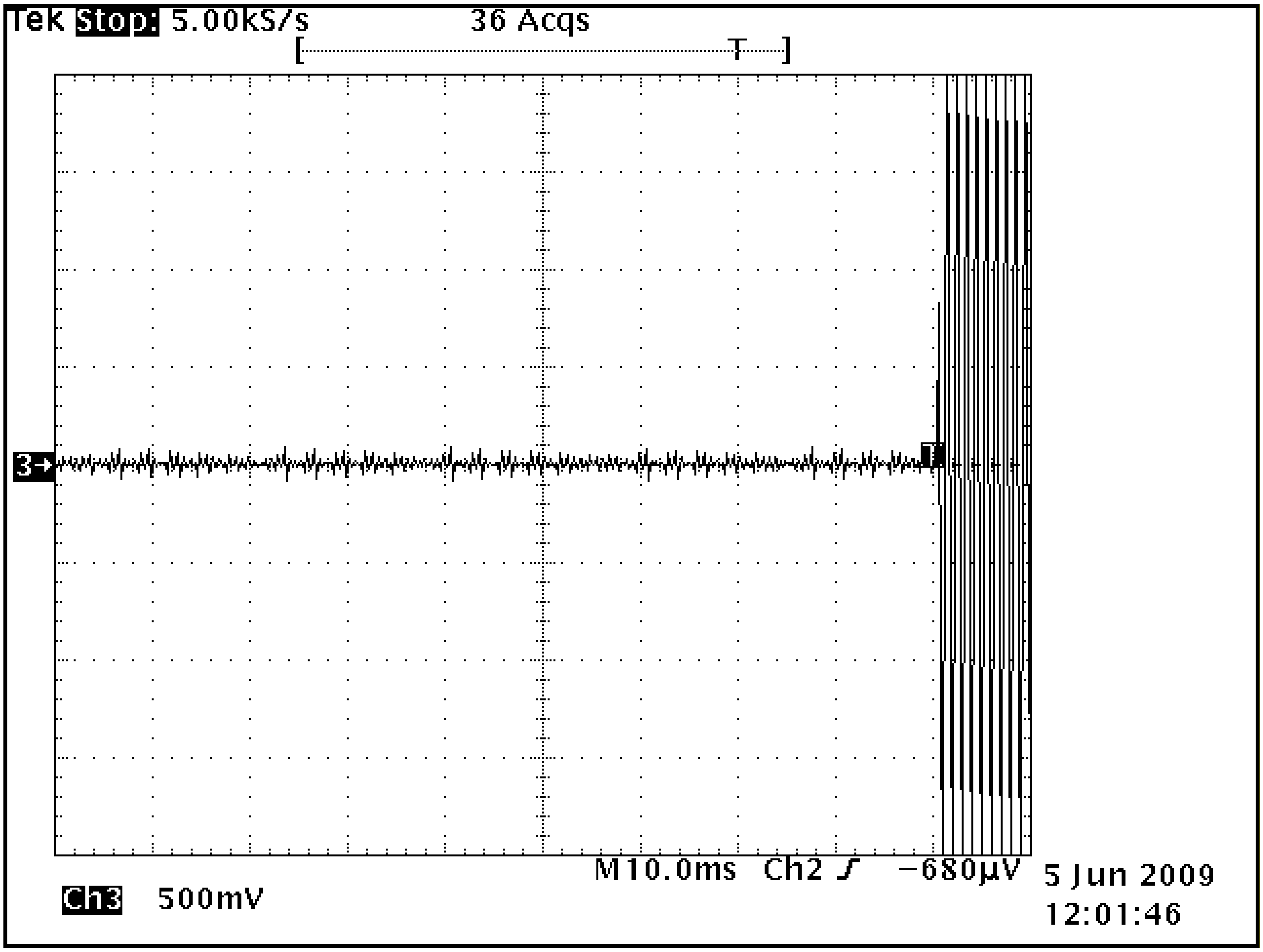
Figure 10-2: Transient Frequency Behavior Test Setup



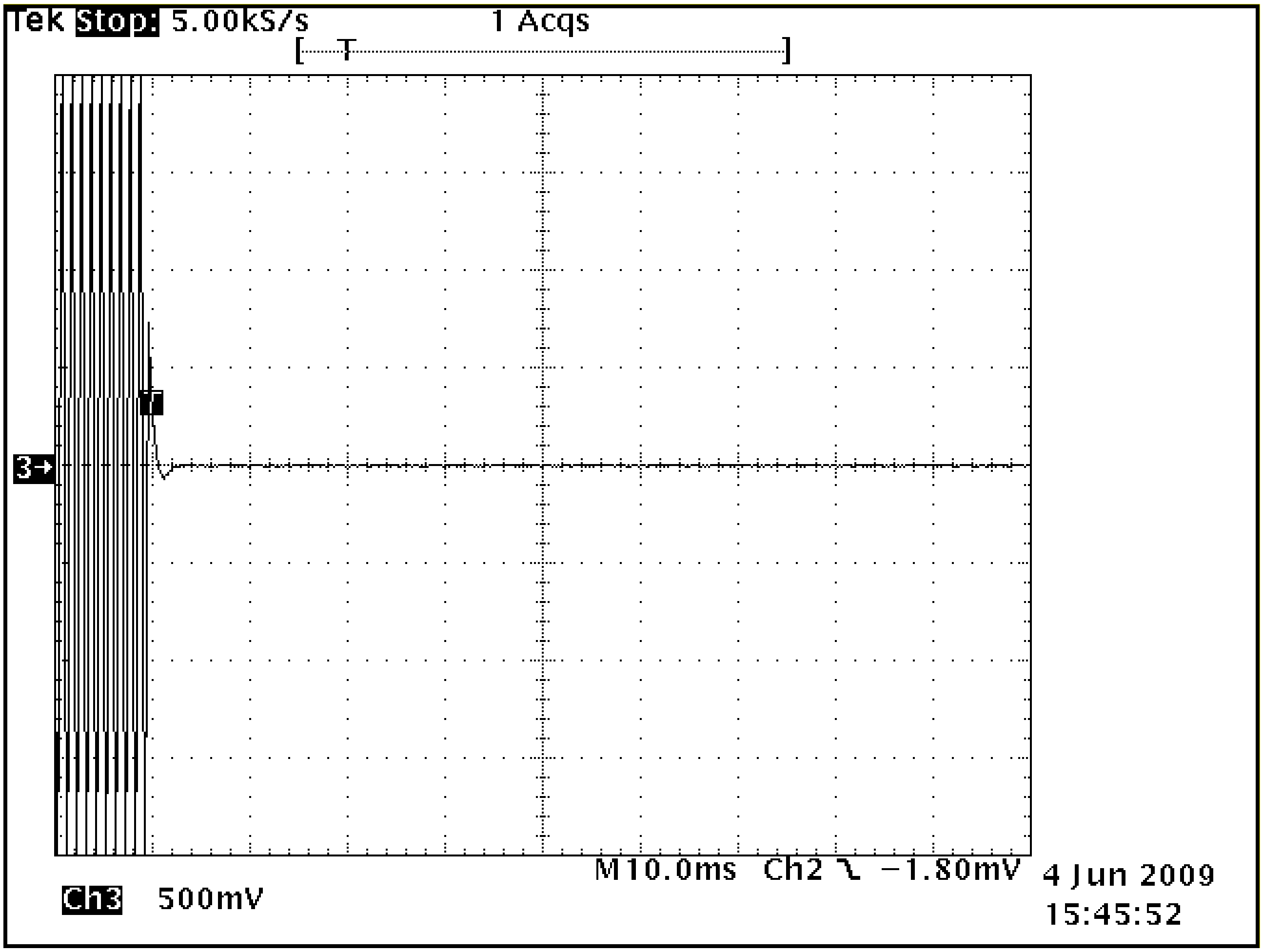
The transmitter shall be connected to a 50 ohm power attenuator. A test signal generator shall be connected to the second input of the combining network. The test signal shall be adjusted to the nominal frequency of the transmitter. The test signal shall be modulated by a frequency of 1 kHz with a deviation of ±25 kHz. The test signal level shall be adjusted to correspond to 0.1% of the power of the transmitter under test measured at the input of the test discriminator. This level shall be maintained throughout the measurement. The amplitude difference (ad) and the frequency difference (fd) output of the test discriminator shall be connected to a storage oscilloscope. The storage oscilloscope shall be set to display the channel corresponding to the (fd) input up to ±25 kHz. The storage oscilloscope shall be set to a sweep rate of 10 ms/div. and set so that the triggering occurs at one division from the left edge of the display. The display shall show the 1 kHz test signal continuously. The storage oscilloscope shall then be set to trigger on the channel corresponding to the amplitude difference (ad) input at a low input level, rising. The transmitter shall then be switched on, without modulation, to produce the trigger pulse and a picture on the display. The result of the change in the ratio of power between the test signal and the transmitter output will, due to the capture ratio of the test discriminator, produce two separate sides on the picture, one showing the 1 kHz test signal, the other the frequency difference of the transmitter versus time. The moment when the 1 kHz test signal is completely suppressed is considered to provide t_{on}. The period of time t_1 and t_2 as defined in Table 10-1 shall be used to define the appropriate template. The result shall be recorded as frequency difference versus time. The transmitter shall remain switched on. The storage oscilloscope shall be set to trigger on the channel corresponding to the amplitude difference (ad) input at a high input level, decaying and set so that the triggering occurs at 1 division from the right edge of the display. The transmitter shall then be switched off. The moment when the 1 kHz test signal starts to rise is considered to provide $t_{off.}$ The period of time t_3 as defined in Table 10-1 shall be used to define the appropriate template. The result shall be recorded as frequency difference versus time.

10.2 Test Data

Plot 10-1: Off Time



Plot 10-2: On Time



10.3 Transient Frequency Behavior Limits

During the periods of time t1 and t3, the frequency difference shall not exceed ±25 kHz. The frequency difference after the end of t2 shall be within the limit of the frequency error of 1.5 kHz. During the period of time t2, the frequency difference shall not exceed ±12.5 kHz. Before the start of t3, the frequency difference shall be within the limit of the frequency error of 1.5 kHz.

10.4 Transient Frequency Behavior Test Equipment

Table 10-2: Test Equipment for Transient Frequency Behavior

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901118	Hewlett Packard	HP8901B	Modulation Analyzer (150 kHz - 1300 MHz)	2406A00178	9/09/09
900917	Hewlett Packard	8648C	Signal Generator	3537A01741	9/10/09
901000	Pasternak	PE 2003	Power divider	N/A	Not Required
901214	Hewlett Packard	HP8471D (.0001-2 GHz)	Diode Detector	2952A-19822	9/8/09
901514	Tektronix	TDS7404B	Oscilloscope	B010161	9/16/09
900819	Weinschel Corp	2	10 dB Attenuator; 5 W	BF0830	12/3/09

Test Personnel:

Dan Baltzell	Daniel W. Baltzell	June 4, 2009
Test Engineer	Signature	Date of Test

11 Frequency Error; RTCM Paper 240-24004/SC119-STD, §A.4.1 (DSC)

The frequency error is the difference between the measured carrier frequency and its nominal value.

11.1 Method of Measurement

The carrier frequency shall be measured in the absence of modulation, with the transmitter connected to an artificial antenna and tuned to channel 70. Measurements shall be made under normal test conditions and under extreme test conditions.

11.2 Test Data

Table 11-1: Frequency Error

Temperature (°C)	Frequency Measured (MHz)	Frequency Error (Hz)	Pass/Fail
-20	156.525311	311	Pass
20	156.525300	300	Pass
55	156.525378	378	Pass

11.3 Frequency Error Limit

The frequency error shall be within ±1.5 kHz

11.4 Frequency Error Test Equipment

Table 11-2: Test Equipment for Frequency Error

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901300	Agilent Technologies	53131A (225 MHz)	Universal Frequency Counter	MY40001345	6/30/10
900946	Tenney Engineering, Inc.	TH65	Temperature Chamber with Humidity	11380	7/8/09

Test Personnel:

Dan Baltzell	Daniel W. Baltzell	June 8, 2009
Test Engineer	Signature	Date of Test

12 Residual Modulation of the Transmitter; RTCM Paper 240-24004/SC119-STD, §A.4.7 (DSC)

The residual modulation of the transmitter is the ratio, in dB, of the demodulated RF signal in the absence of wanted modulation, to the demodulated RF signal produced when the normal test modulation is applied.

12.1 Method of Measurement

The normal test modulation shall be applied to the transmitter. The high frequency signal produced by the transmitter shall be applied, via an appropriate coupling device, to a linear demodulator with a de-emphasis network of 6 dB per octave. The time constant of this de-emphasis network shall be at least 750 µs. The signal shall be measured at the demodulator output using and rms voltmeter. The modulation shall then be switched off and the level of the residual audio frequency signal at the output shall be measured again.

12.2 Test Data

Absence of wanted modulation = 0.55 V
Normal test modulation = 3.212 V

20 log (0.55/3.212)= -35.3 dB

12.3 Residual Modulation Limit

The residual modulation shall not exceed -40 dB

12.4 Residual Modulation Test Equipment

Table 12-1: Test Equipment for Residual Modulation

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901118	Hewlett Packard	HP8901B	Modulation Analyzer 150kHz-1300MHz	2406A00178	9/09/09
901514	Tektronix	TDS7404B	Oscilloscope	B010161	9/16/09

Test Personnel:

Dan Baltzell		June 5, 2009
Test Engineer	Signature	Date of Test

13 Frequency Error (Demodulated DSC Signal); RTCM Paper 240-24004/SC119-STD, §A.4.8 (DSC)

13.1 Method of Measurement

The transmitter shall be connected to the artificial antenna and a suitable FM demodulator. The transmitter shall be set to channel 70. The transmitter shall be set to transmit a continuous B- or Y- state. The measurement shall be performed by measuring the demodulated output, for both the continuous B- and Y- state. The measurements shall be carried out under normal test conditions and extreme test conditions.

13.2 Test Data

Table 13-1: Frequency Error Test Data

Temperature (°C)	B State Measured (kHz)	Y State Measured (kHz)	Pass/Fail
-20	2100.398	1300.302	Pass
20	2100.409	1300.315	Pass
55	2100.446	1300.324	Pass

13.3 Frequency Error Limit

The measured frequency from the demodulator at any time for the B- state shall be within 2100 Hz 10 Hz and for the Y-state within 1300 Hz 10 Hz.

13.4 Frequency Error Test Equipment

Table 13-2: Test Equipment for Frequency Error

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901118	Hewlett Packard	HP8901B	Modulation Analyzer (150 kHz - 1300 MHz)	2406A00178	9/09/09
900946	Tenney Engineering, Inc	TH65	Temperature Chamber with Humidity	11380	7/8/09

Test Personnel:

Dan Baltzell		June 8, 2009
Test Engineer	Signature	Date of Test

14 Modulation Index for DSC; RTCM Paper 240-24004/SC119-STD, §A.4.9 (DSC)

This test measures the modulation index in the B and Y states.

14.1 Method of Measurement

The transmitter shall be set to transmit continuous B and the Y signals. The frequency deviations shall be measured.

14.2 Test Data

Table 14-1: Modulation Index Test Data

State	Deviation Measured (kHz)	Tone Measured (kHz)	Modulation Index	Pass/Fail
B	4.179	2.100409	1.99	Pass
Y	2.738	1.300315	2.106	Pass

14.3 Modulation Index Limit

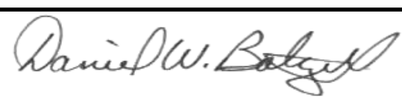
The modulation index shall be 2.0 ± 0.2

14.4 Modulation Index Test Equipment

Table 14-2: Test Equipment for Modulation Index

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due
901118	Hewlett Packard	HP8901B	Modulation Analyzer (150 kHz – 1300 MHz)	2406A00178	9/09/09

Test Personnel:

Dan Baltzell		June 4, 2009
Test Engineer	Signature	Date of Test