TEST REPORT

MOBILE MICROWAVE VIDEO TRANMITTER

FCC ID: FC3HDX2025D

MODEL: HDX-1100S

APPLICANT: VISLINK, Inc.

December 27, 2012

TABLE OF CONTENTS

SECTION 1 INTRODUCTION

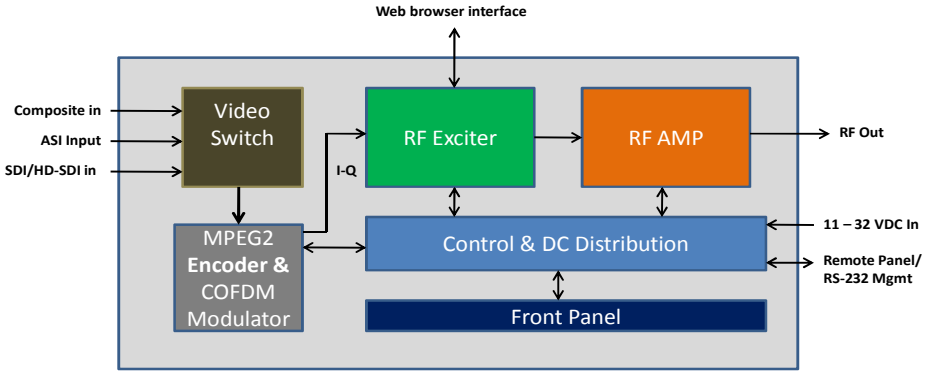
GENERAL INFORMATION – 2.1033

Applicant:	Vislink, Inc. 101 Billerica Avenue, Building 6 North Billerica, MA 01862 Tel. 978-671-5700 Attn: Sal Blatti, Compliance Manager Email: sal.blatti@vislink.com
FCC ID:	FC3HDX2025D
Installation and Operating Manual:	HDX-1100 User and Technical Manual attached
Equipment Description:	Mobile Video Transmitter – see below
Block Diagram:	See Technical Description, below
Equipment model:	HDX-1100S
Frequency Range:	2000 – 2500 MHz
FCC Part numbers:	§ 74; subpart F: 74.602(h)(4)(i)(1), (2), and (3). § 78; subpart D, 78.101, 78.102, 78.104, 78.111 § 90; subpart B, 90.2
Frequency Tolerance:	0.0005%
Emission Designators:	10M00D7W, 12M00D7W, 17M00D7W

The data provided in this document will show that the Vislink/Microwave Radio Communications HDX1100S transmitter is in compliance with 47 CFR Parts 74, 78 and 90 for use by eligible Broadcast Auxiliary, CARS, and Private Operational Fixed Point-to-Point Radio Service licensees in the 2000 – 2500MHz mobile band as provided for in the relevant FCC part number referenced above. Radiated emission tests were conducted by Intertek Testing Services in their laboratory facility in Boxborough, MA, while the part 74, 78 and 90 emission testing was conducted in the Vislink/Microwave Radio Communications facility in North Billerica, MA.
The HDX1100S was designed to comply with applicable technical regulations of § 74 subpart F, § 78 subpart D, and § 90 subpart F for the transmission of video, audio, and data by a mobile transmitter. Typical applications may include surveillance, command center operations, emergency restoration, broadcast remote and news gathering, cable TV remote and news gathering, or other video, voice and data requirements as deemed necessary and appropriate for a specific task assignment.

Technical Description:

The HDX1100 FC3HDX2025D is a compact, mobile transmitter, designed to be adaptable to a wide range of field applications; particularly those requiring ruggedized, vehicular mounted equipment. The transmitter accepts a wide range of SMPTE based video input signals, including HD-SDI, SDI, ASI, and NTSC. Raw video, audio, and data are delivered to an integral MPEG-2 Encoder which feeds a COFDM-DVB-T modulator, operating in the 2K carrier mode, to produce a 1705 carrier spectrum. I and Q outputs of the COFDM modulator are supplied directly to an RF generator and up-converted to the operating band from 2000 to 2500 MHz at an RF power level of +20dBm. A 20 dB gain RF amplifier follows the exciter to boost the final RF output power to + 40dBm (10.0 Watt). The exciter RF drive level is factory set to limit the RF output from the PA to 10 Watt for part§ 74 and § 78 or 5W for part § 90



HDX1100 Functional Block Diagram

The specific operating frequency is determined by a high stability wide band VCO. The VCO set-up voltage is controlled by a microprocessor that is factory programmed to provide channel plans in accordance with the rules as specified in part §74, 78, or 90.

Channel	Center Frequency (MHz)
1	2031.500
2	2043.500
3	2055.500
4	2067.500
5	2079.500
6	2091.500
7	2103.500
8	2458.500
9	2475.250
10	2491.750

Table 1 - HDX-1100S Factory channel plan center frequencies

Digital modulation of the COFDM carriers changes between QPSK, 16QAM, and 64QAM as determined by user bit rate requirements. The symbol rate is set to maintain the occupied bandwidth mask to be in compliance with the ETSI EN 300 744 V1.51 standards for either a 6 or 8 MHz COFDM pedestal and to be in compliance with the emission bandwidth limits as required in § 74.637(a)(2)(i), 78.103(e).

An LCD touch screen display located on the front panel of the transmitter is used to control basic transmission parameters and provide operational status of internal systems. The transmitter can also be operated from an external remote panel via hard wired RS-232 link.

Additional information may be found in the HDX-1100 User and Technical Manual, included with this application.

SECTION 2 - MEASUREMENTS

TECHNICAL DATA SUMMARY

Frequency band: Operating frequency range is 2000 – 2500 MHz

Modulation Type: COFDM; QPSK, 16QAM, 64QAM.

Licensed for: Broadcast Auxiliary Service under CFR 47 part §74: subpart F
Cable Television Relay Service under CFR 47 part §78: subpart D
PRIVATE LAND MOBILE RADIO SERVICES under CFR 47 part §90: subpart B

Channel spacing: 10, 12 or 17 MHz (see section 1.0 for details)

FCC ID: FC3HDX2025D

Equipment Description: Mobile Video Transmitter

Equipment model: HDX-1100S

Frequency Tolerance: 0.0005 %

Emission Designators: 10M00D7W, 12M00D7W, 17M0D7W

RF Power Output Measurement per 2.1046

Applicable specifications: 12 Watts (+ 40.8dBm) per §74.638(a)
20 Watts (+ 43dBm) per §78.638(a)
5 Watts (+ 37dBm) per §90.205(o)

The RF power measured 10, 12 and 17 MHz channels, as required for this application, is shown below:

Frequency Range (MHz)	Rated Transmit Power (W) Conducted	Channel Bandwidth	Frequency Tolerance	Emission Designator
2025 – 2100	+40dBm (10.0W)	12 MHz	5PPM	12M00D7W
2450 - 2500	+40dBm (10.0W)	17 MHz	5PPM	17M00D7W
2450 – 2483.5	+37dBm (5.0W)	10 MHz	5PPM	10M00D7W

Table 2 – Power measurement

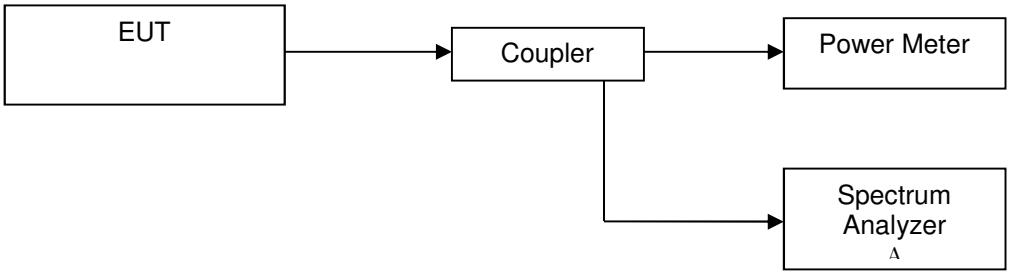


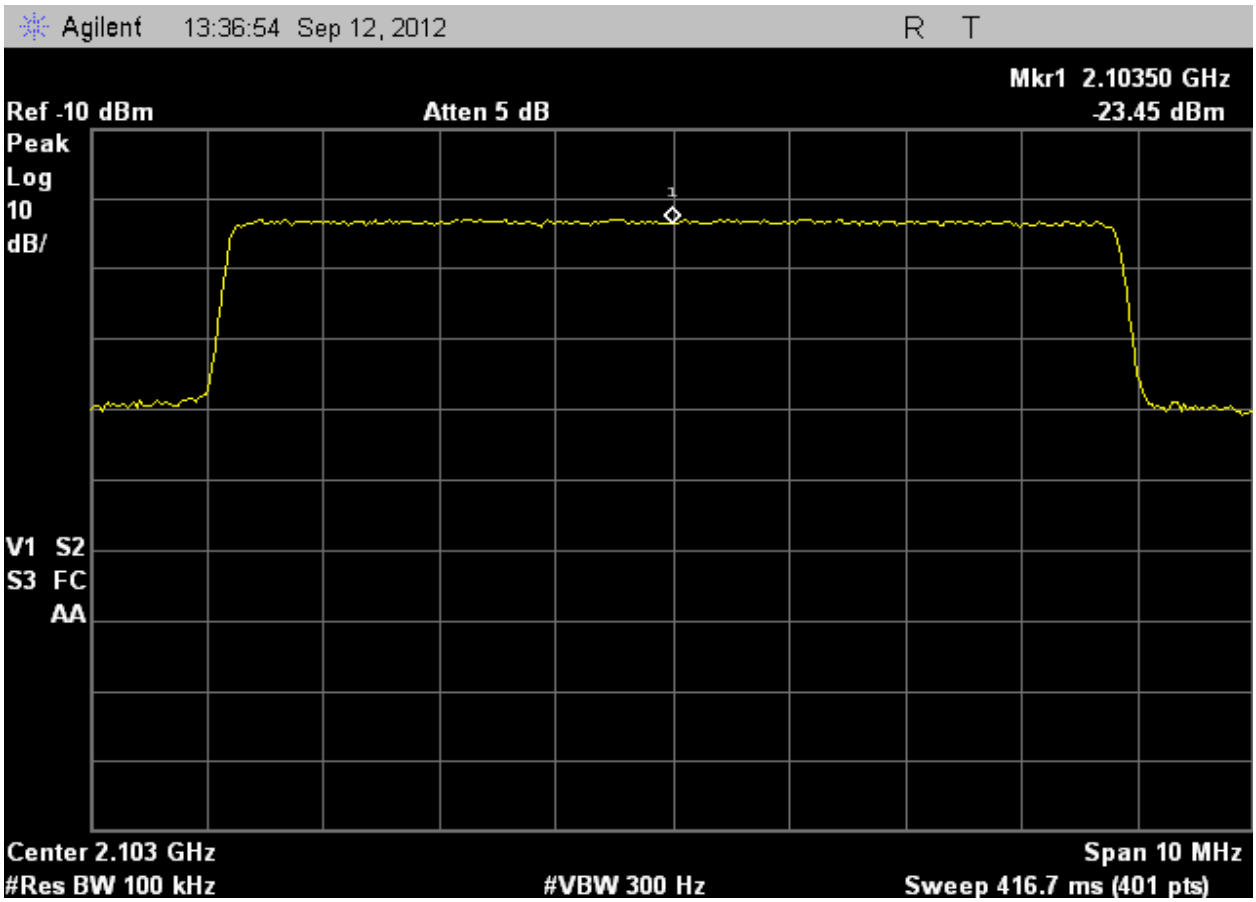
Figure 1 - Test Setup for Power Measurements

SECTION 2 A – MODULATION CHARACTERISTICS PER 2.1047

Applicable Specification: None

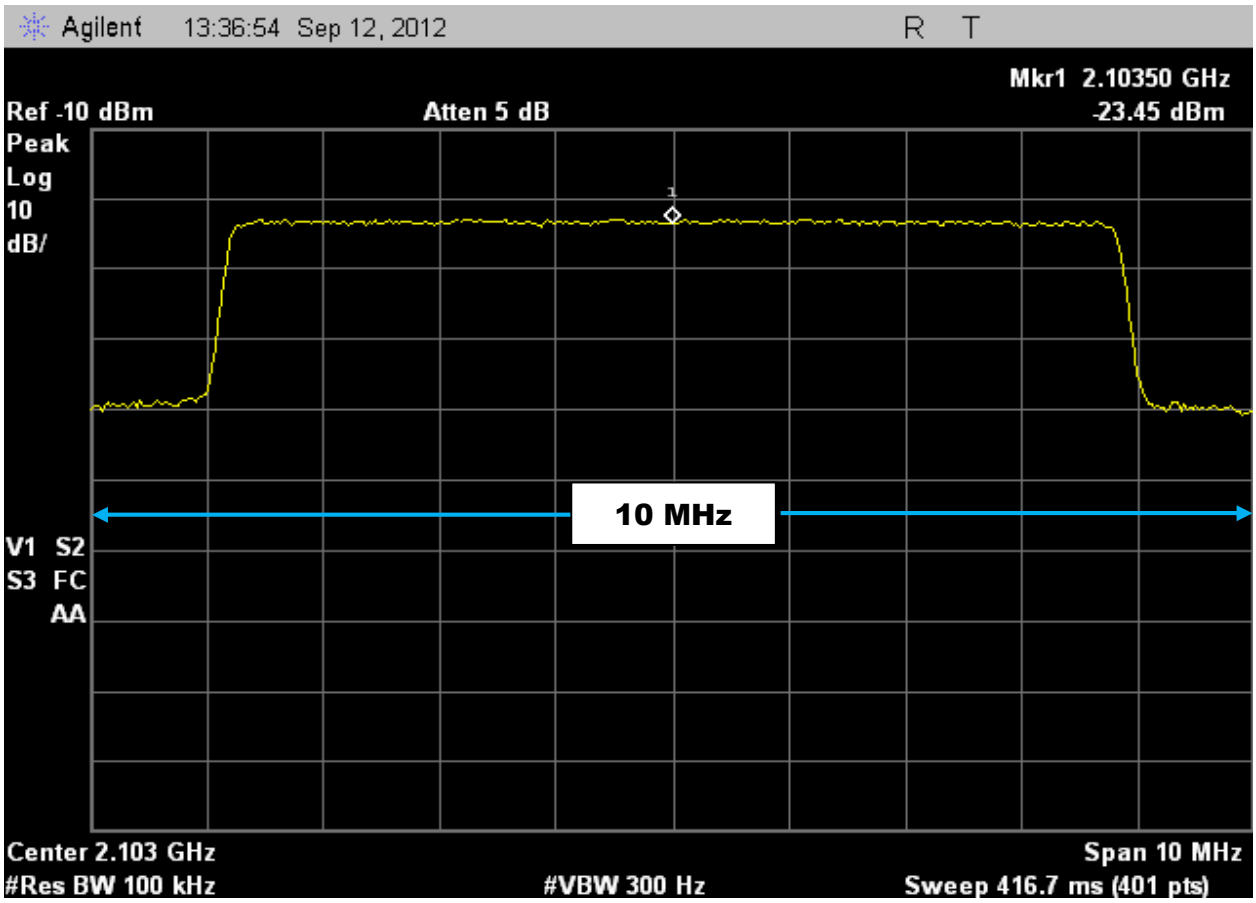
Measurement Frequency: 2103.0 MHz

Data: The unit under test is designed to be modulated by a combination of digital video, audio, and auxiliary data. The COFDM modulated spectrum shown in the image below shows compliance with the 8 MHz pedestal option in the DVB-T standard for the 2K carrier mode, per ETSI EN 300 744 V1.51. These carriers may be modulated in QPSK, 16QAM, or 64 QAM formats with no change in occupied bandwidth, as the symbol rate is fixed to maintain the same bandwidth.



SECTION 2B - OCCUPIED BANDWIDTH 2.1049

To measure the occupied bandwidth, the equipment was set up as shown below, and the transmitter was modulated with a digital COFDM pedestal of 7.61MHz (8MHz). The output of the transmitter was viewed on a spectrum analyzer. The current COFDM standard adopted by Vislink is the ETSI EN 300 744 V1.2.1 (2001-01) for framing structure, channel coding and modulation. Since the spectrum is digitally modulated, at the center frequency, calculations where performed by establishing a reference at FO (6430 MHz) and the amplitude readings where calculated from a CW signal input to the transmitter.



Occupied Bandwidth with 8MHz COFDM Pedestal

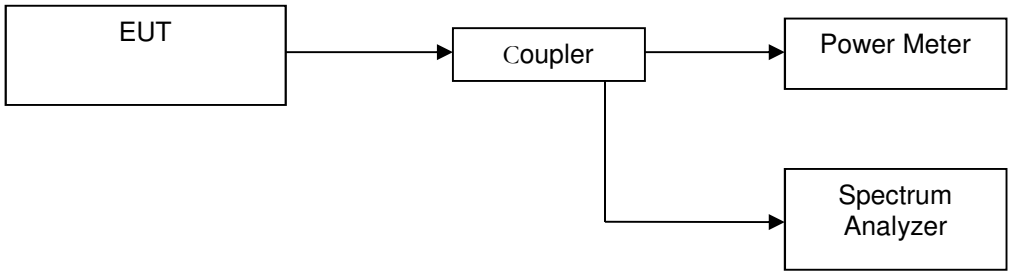


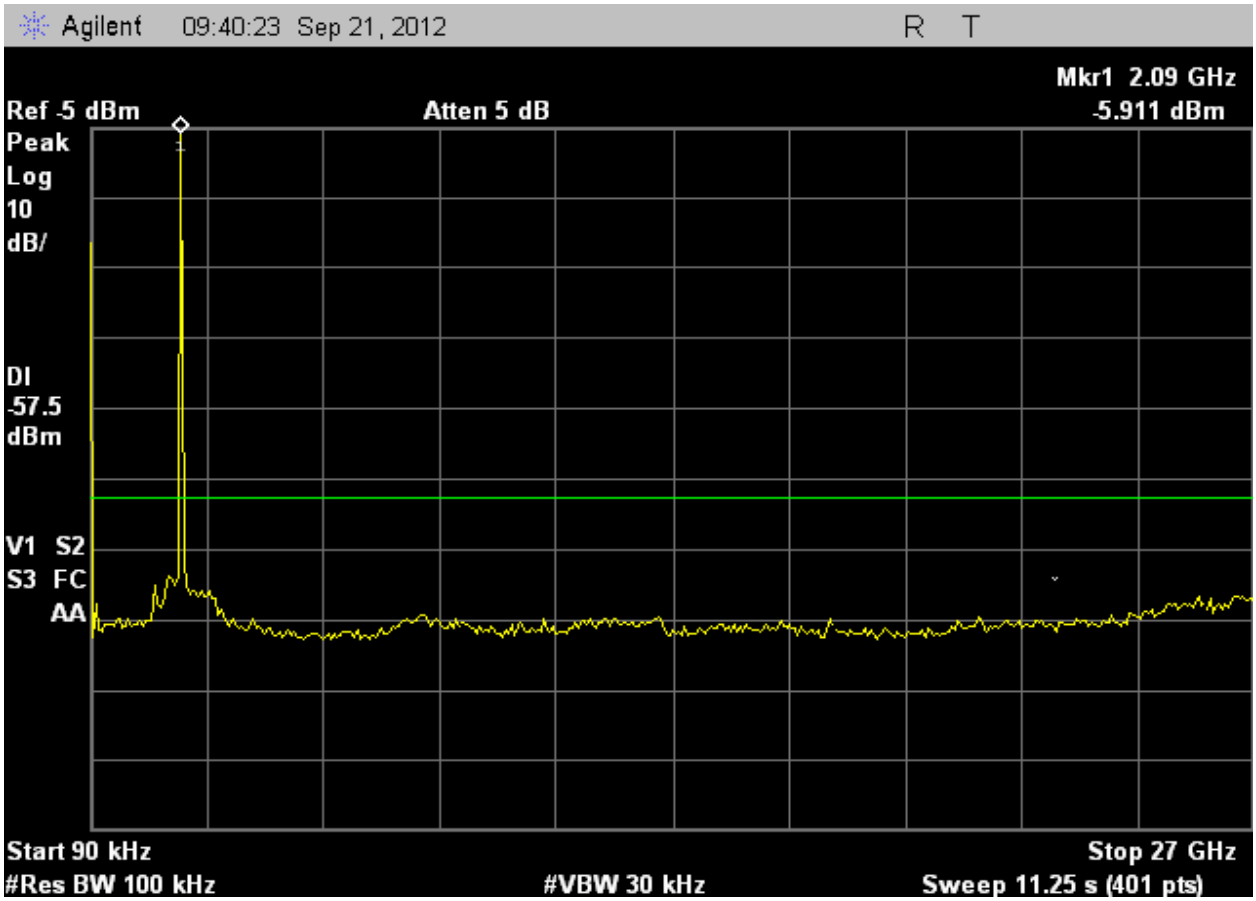
Figure 3 - Test Setup for Emission Mask, Occupied Bandwidth, and Spurious Emission Measurements

SECTION 2C SPURIOUS EMISSIONS AT THE ANTENNA TERMINAL: 2.1051

Applicable Specifications: §74.637(a)(2)(i)

On any frequency removed from the assigned frequency above 250% of the authorized bandwidth: 80 dB or 43 + 10 log (P) w, whichever is the lesser attenuation.

The Antenna conducted spurious emissions test were performed with the transmitter frequency set to 2103.5MHz, and with a measured output power of 8.4W (+39.2dBm). The spectrum analyzer was first tuned to a reference carrier level at the fundamental operating frequency. The output spectrum was then slowly scanned from 90KHz to 27GHz. Special attention was given to those frequencies that correspond to the possible harmonic and sub – harmonics.



HDX1100 (S Band) 12MHz Spurious Emission Plot RF Power = 39.2dBm / 8.4W

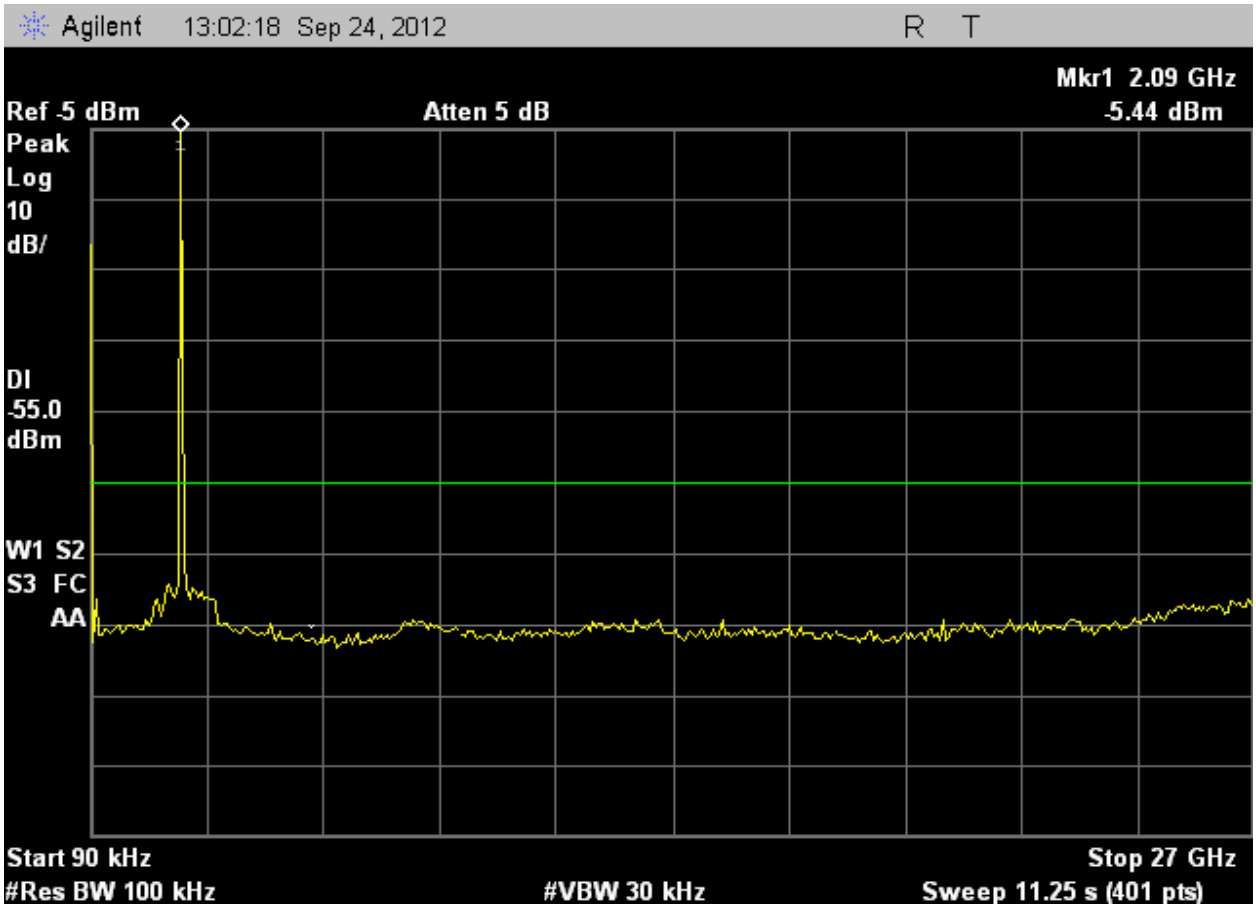
NOTE: Display line @ -57.5 dB represents the spurious limit.

The FCC limits for Spurious emissions conducted at the antenna port per CFR 47 §2.1051 has been met.

Applicable Specifications: §90.210

On any frequency removed from the assigned frequency above 250% of the authorized bandwidth: 50 dB or 43 + 10 log (P) w, whichever is the lesser attenuation.

The Antenna conducted spurious emissions test were performed with the transmitter frequency set to 2103.5MHz, and with a measured output power of 5W (+37dBm). The spectrum analyzer was first tuned to a reference carrier level at the fundamental operating frequency. The output spectrum was then slowly scanned from 90KHz to 27GHz. Special attention was given to those frequencies that correspond to the possible harmonic and sub – harmonics.



HDX1100 (S Band) 12MHz Spurious Emission Plot RF Power = 37dBm / 5W

NOTE: Display line @ -55 dB represents the spurious limit.

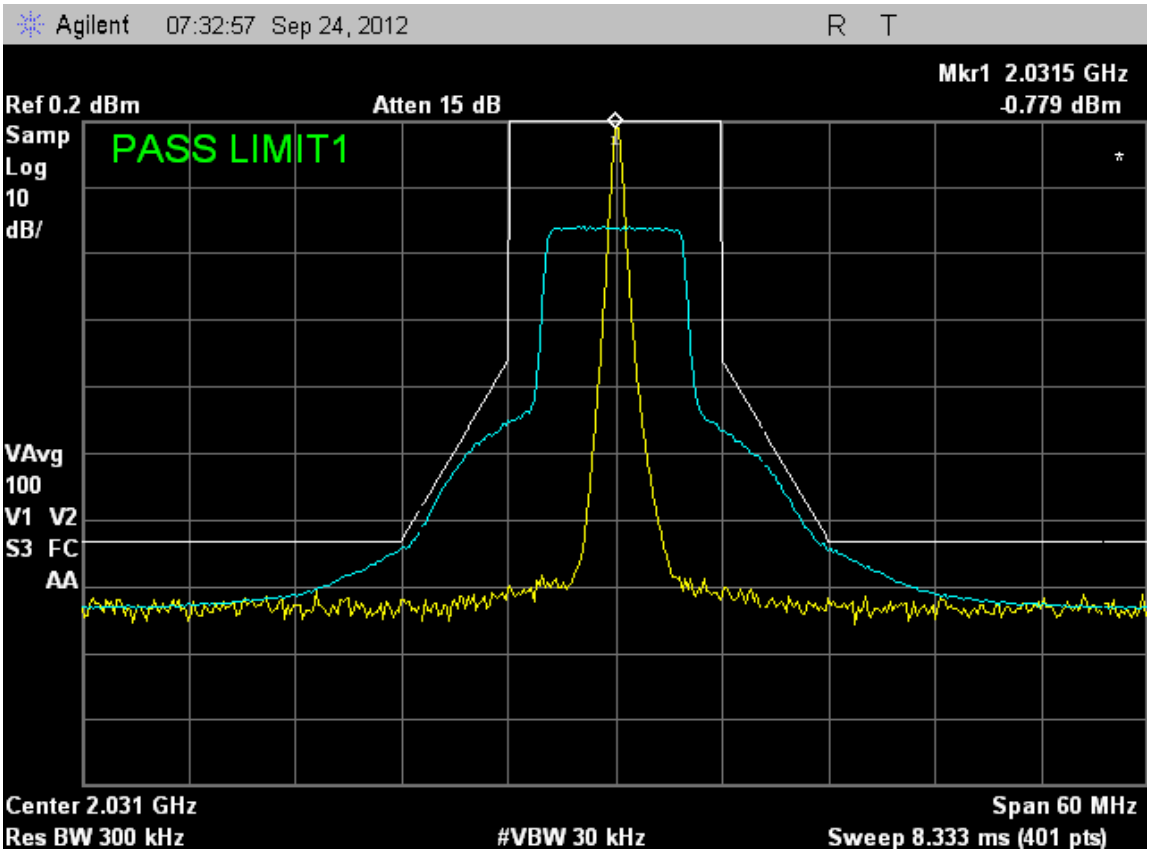
The FCC limits for Spurious emissions conducted at the antenna port per CFR 47 §2.1051 has been met.

SECTION 2D CONTINUED- EMISSION MASK PER 74.637

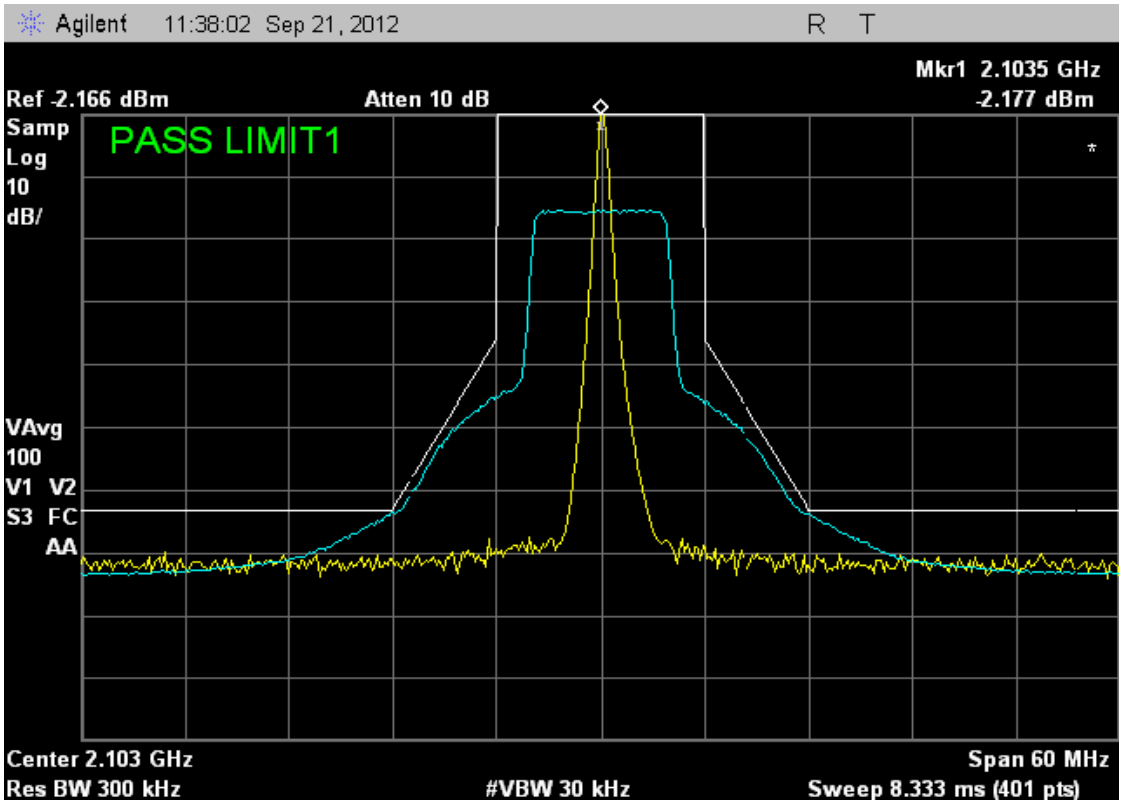
Applicable Specifications: §74.637(a)(2)(i)

(i) For operating frequencies below 15 GHz, in any 4 KHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 250 percent of the authorized bandwidth: As specified by the following equation but in no event less than 50 decibels:

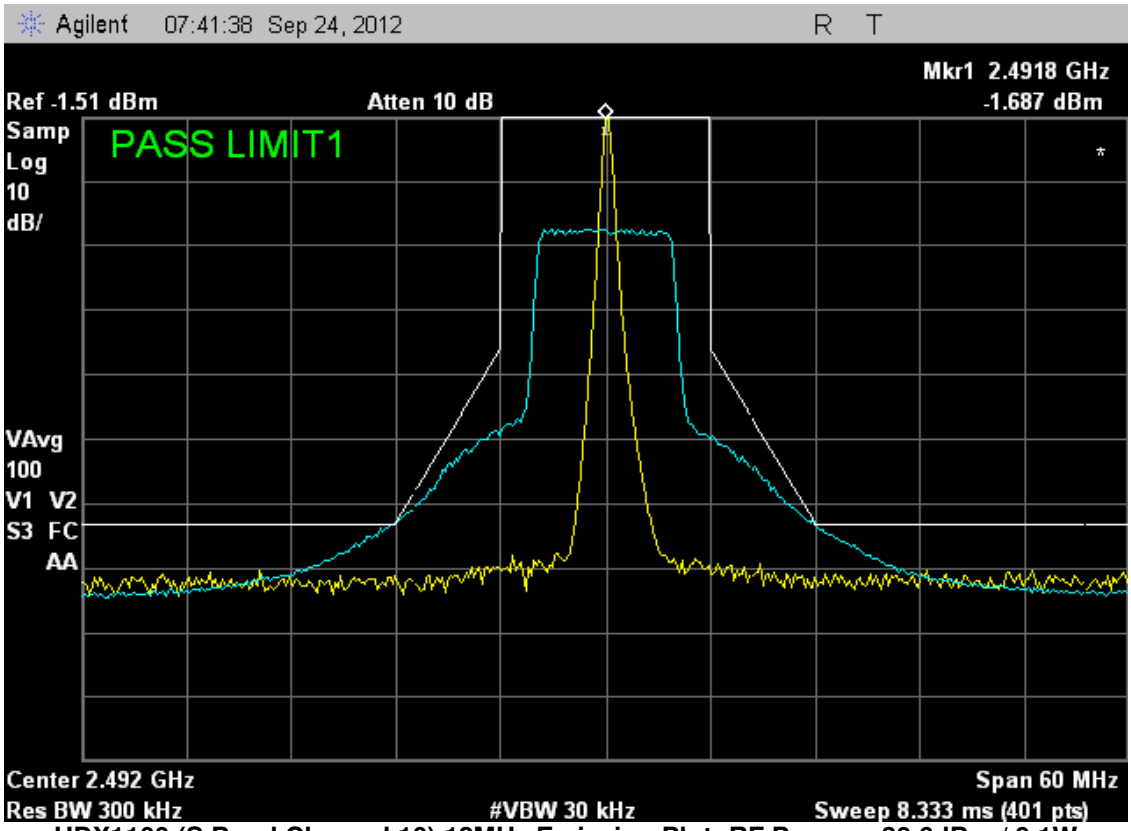
A = 35 + 0.8(P - 50) + 10 Log10 B. (Attenuation greater than 80 decibels or to an absolute power of less than -- 13dBm/1MHz is not required.) where:
A = Attenuation (in decibels) below the mean output power level.
P = Percent removed from the center frequency of the transmitter bandwidth.
B = Authorized bandwidth in MHz



HDX1100 (S Band Channel 1) 12MHz Emission Plot: RF Power = 38.8dBm / 7.6W



HDX1100 (S Band Channel 7) 12MHz Emission Plot: RF Power = 39.2dBm / 8.4W



HDX1100 (S Band Channel 10) 12MHz Emission Plot: RF Power = 39.6dBm / 9.1W

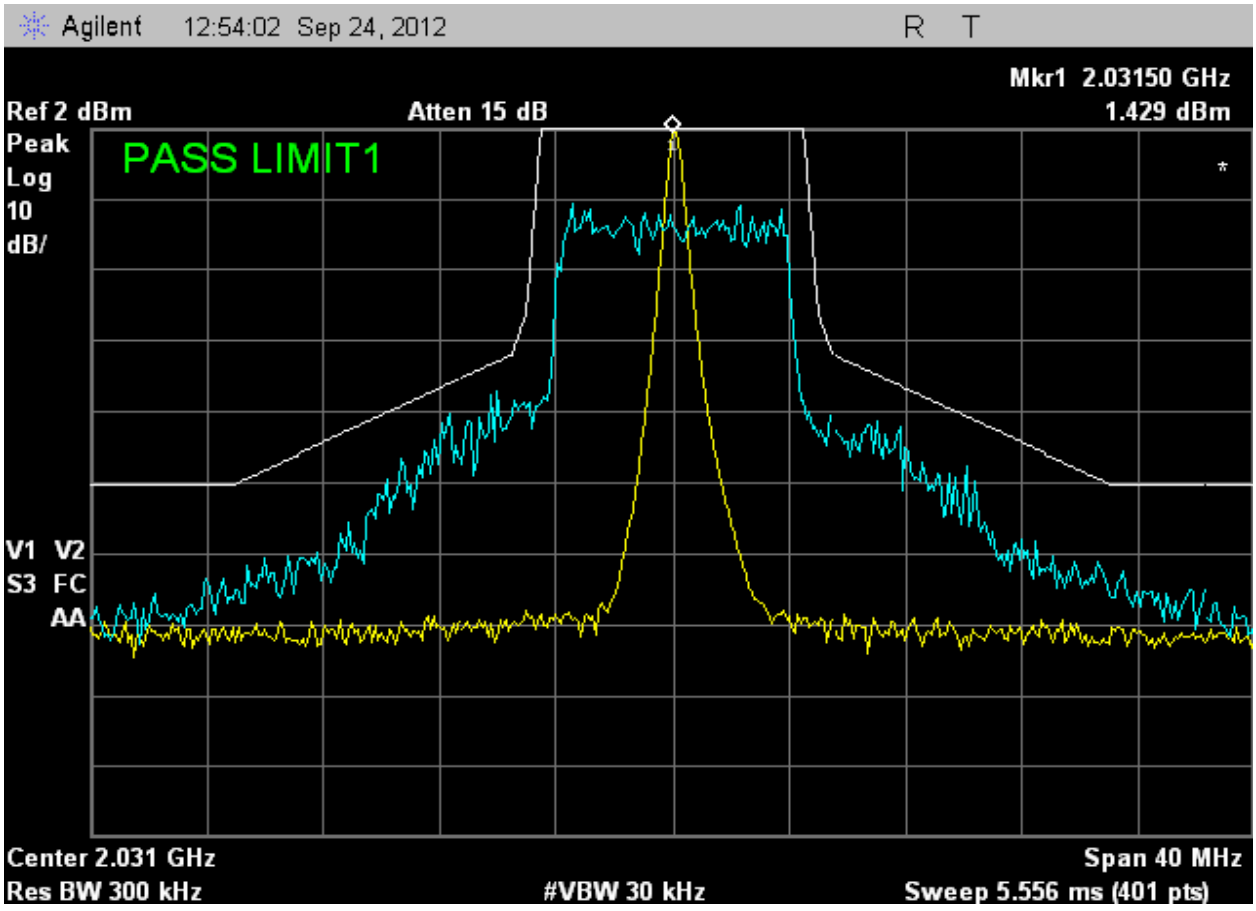
Applicable Specifications: §90.210(c)

(c) *Emission Mask C.* For transmitters that are not equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier output power (P) as follows:

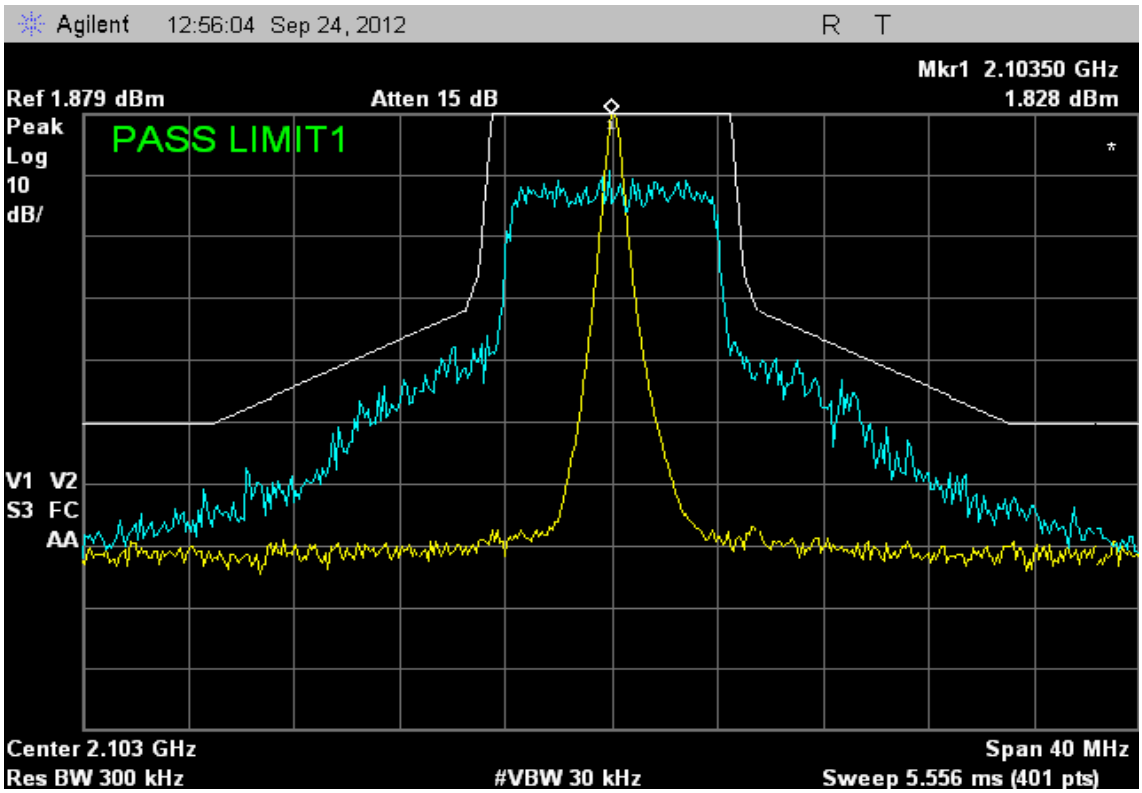
(1) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5 kHz, but not more than 10 kHz: At least 83 log (f_d /5) dB;

(2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 10 kHz, but not more than 250 percent of the authorized bandwidth: At least 29 log (f_d^2 /11) dB or 50 dB, whichever is the lesser attenuation;

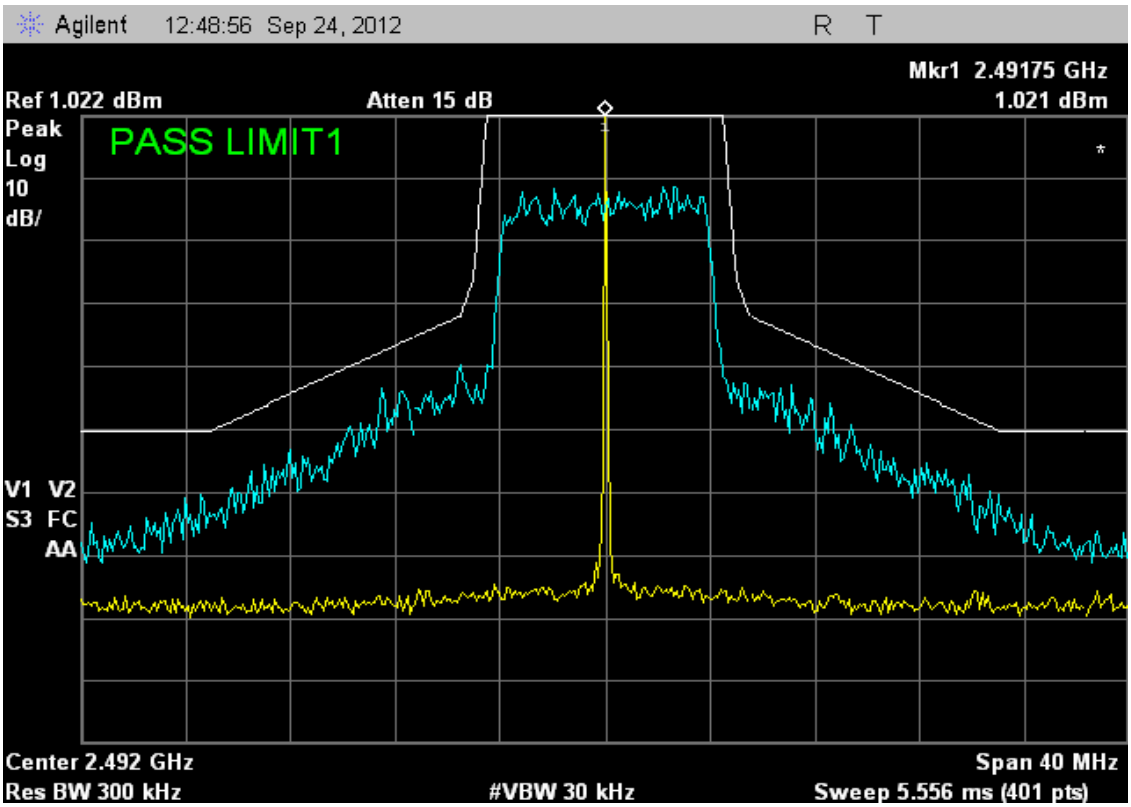
(3) On any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least 43 + 10 log (P) dB.



HDX1100 (S Band Channel 1) 12MHz Emission Plot: RF Power = 38.8dBm / 7.6W



HDX1100 (S Band Channel 7) 12MHz Emission Plot: RF Power = 39.2dBm / 8.4W



HDX1100 (S Band Channel 10) 12MHz Emission Plot: RF Power = 39.6dBm / 9.1

SECTION 2E - FREQUENCY STABILITY OVER TEMPERATURE & VOLTAGE- 2.1055

The HDX1100S TRANSMITTER (FC3HDX2025D) was set-up to transmit CW signal. The measurement was made at the antenna port using a microwave frequency counter. Measurements were made to determine the transmitter frequency stability over the temperature range -20º C to +50 ºC. The transmitter was allowed to stabilize a minimum of 30 minutes before measurement.
Measurements were also made to determine transmitter frequency stability versus primary supply variation of the DC input voltage range of 18V to 36V.

- The Measurement Frequency was 2103.5MHz

Temperature	Measure Frequency (Hz)	Δ (PPM)	Δ (%)
-20º C	2103500600	0.09	0.000009
-10º C	2103500400	0.06	0.000006
0º C	2103500300	0.05	0.000005
+10º C	2013500200	0.03	0.000003
+20º C	2103500100	0.02	0.000002
+30º C	2013499900	0.02	0.000002
+40º C	2103499800	0.03	0.000003
+50º C	2103499600	0.06	0.000006

Voltage	Measure Frequency (Hz)	Δ (PPM)	Δ (%)
18	2103500200	0.03	0.000003
19	2103500200	0.03	0.000003
20	2103500200	0.03	0.000003
21	2103500100	0.02	0.000002
22	2103500100	0.02	0.000002
23	2103500100	0.02	0.000002
24	2103500100	0.02	0.000002
25	2103500100	0.02	0.000002
26	2103500100	0.02	0.000002
27	2103500100	0.02	0.000002
28	2103500100	0.02	0.000002
29	2103500100	0.02	0.000002
30	2103500100	0.02	0.000002
31	2103500100	0.02	0.000002
32	2103500100	0.02	0.000002
33	2103500000	0.00	0.000000
34	2103499900	0.02	0.000002
35	2103499900	0.02	0.000002
36	2103499900	0.02	0.000002

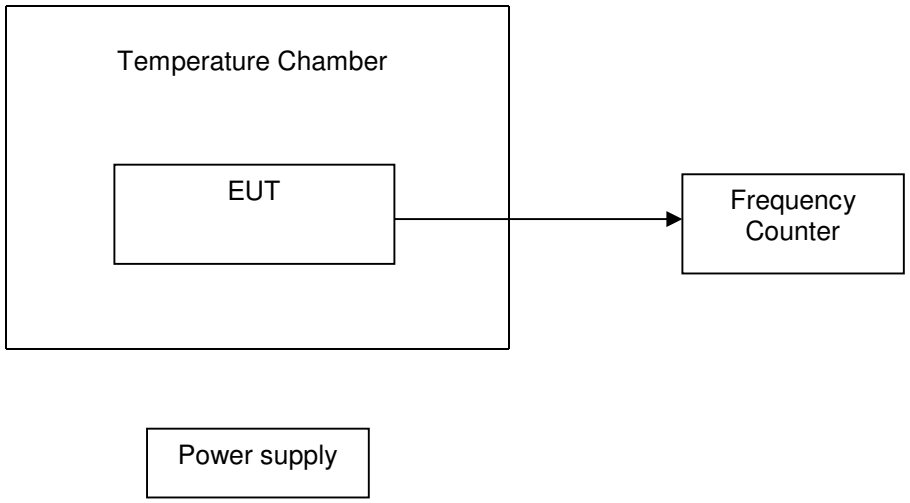


Figure 4 - Test Setup for Frequency Stability Measurements

SECTION 2D - FIELD STRENGTH OF SPURIOUS RADIATION 2.1053

The case radiated spurious emission tests were conducted by Intertek Testing Services, Boxborough Massachusetts. Please refer to section 2.0 of the attached report document, Report 100371377BOX-001. This report represents spurious emissions observed and calculated to be acceptable according to rule part: 2.153 and FCC Part 15, subpart B.

QUALITY SYSTEM ISO 9000

Certificate of Registration

nqa global assurance

This is to certify that the Quality Management System of:

VISLINK - MRC

101 Billerica Avenue, Building #6
North Billerica, MA 01862

applicable to:

Design, manufacture, sale and service of microwave radio systems

has been assessed and approved by
National Quality Assurance, U.S.A., against the provisions of:

ISO 9001: 2008

For and on behalf
of NQA, USA, Acton, MA 01720

ANAB ACCREDITED

Certificate Number: 10076
EAC Code: 19
First Issued: March 22, 1995
Valid Until: September 20, 2015
Reissued: September 20, 2012

Page 1 of 1

This approval is subject to the company maintaining its system to the required standard, which will be monitored by NQA, USA, an accredited organization under the ANSI-ASQ National Accreditation Board.

SECTION 4 TRANSMITTER DESCRIPTION

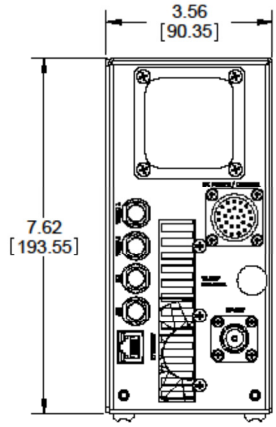
The Kamelyon™ HDX-1100 Mobile Digital Video Transmitter is a lightweight and rugged unit that is suited for mobile and aircraft environments; where constant vibration, shock, temperature swings, and humidity are expected. Common applications include live video feeds for law enforcement, fire, public safety and other agency surveillance tasks.

The HDX-1100 includes an H.264/MPEG-4 encoder to provide standard or high definition video (SD or HD), using DVB-T/ COFDM in the 2K carrier mode. Video inputs may be SD or HD in NTSC or PAL formats, plus two audio signals and an RS-232 data channel.

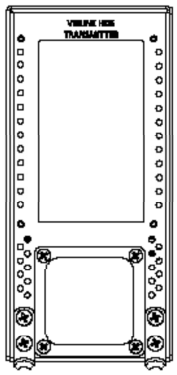
The amplifier operates at 8 to 10W in the high power mode, or 2W in the low power mode.

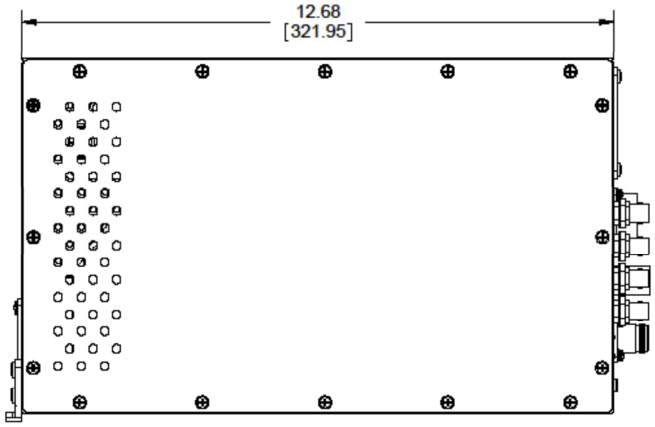
The HDX-1100 includes a touch screen maintenance interface or an optional remote panel (RCU). Service personnel may configure the transmitter module with a PC using a web browser.

Rear View



Front View





SECTION 4 TRANSMITTER BLOCK DIAGRAMS AND SCHEMATICS

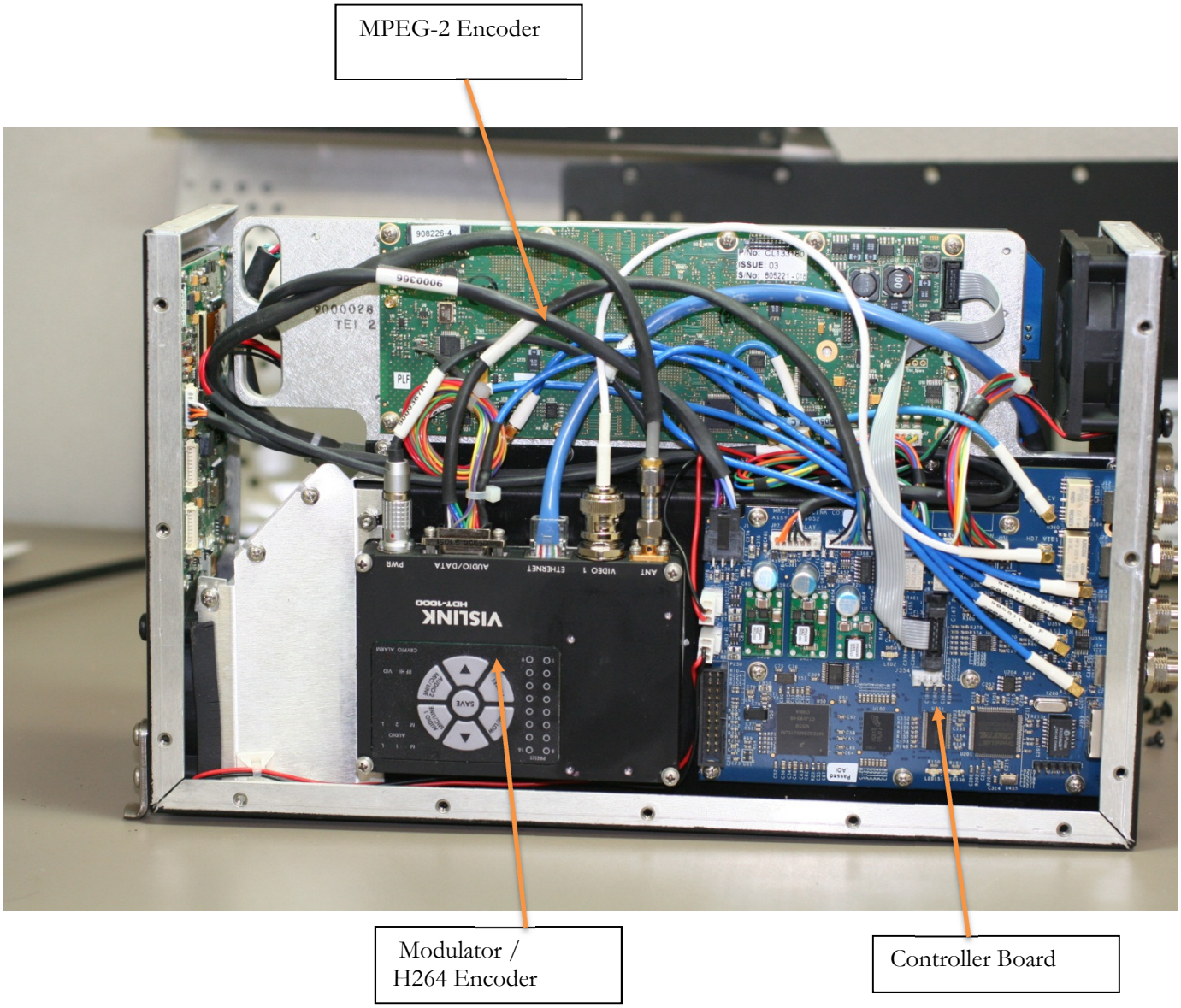
HDX1100 TX BOARD LEVEL SCHEMATICS

Note: The board level schematics have been submitted as an attachment and protected under a declaration of confidentiality

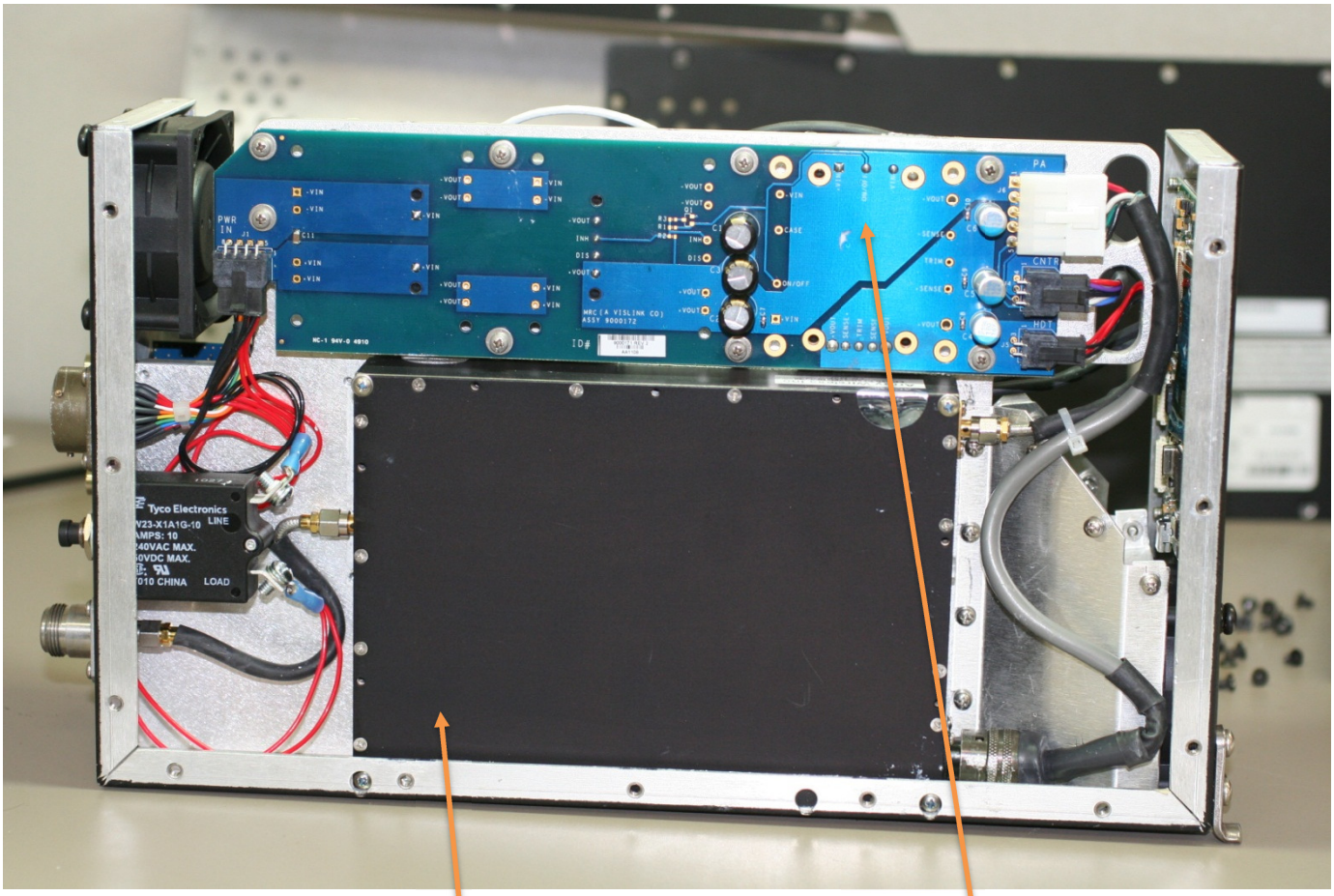
FC3HDX20252D
HDX1100 TRANSMITTER PHOTOS
MANUFACTURERS PART # 9000390

FC3HDX2025D
FRONT PANEL VIEW

FC3HDX2025D
INTERNAL VIEW
(Modulator side)

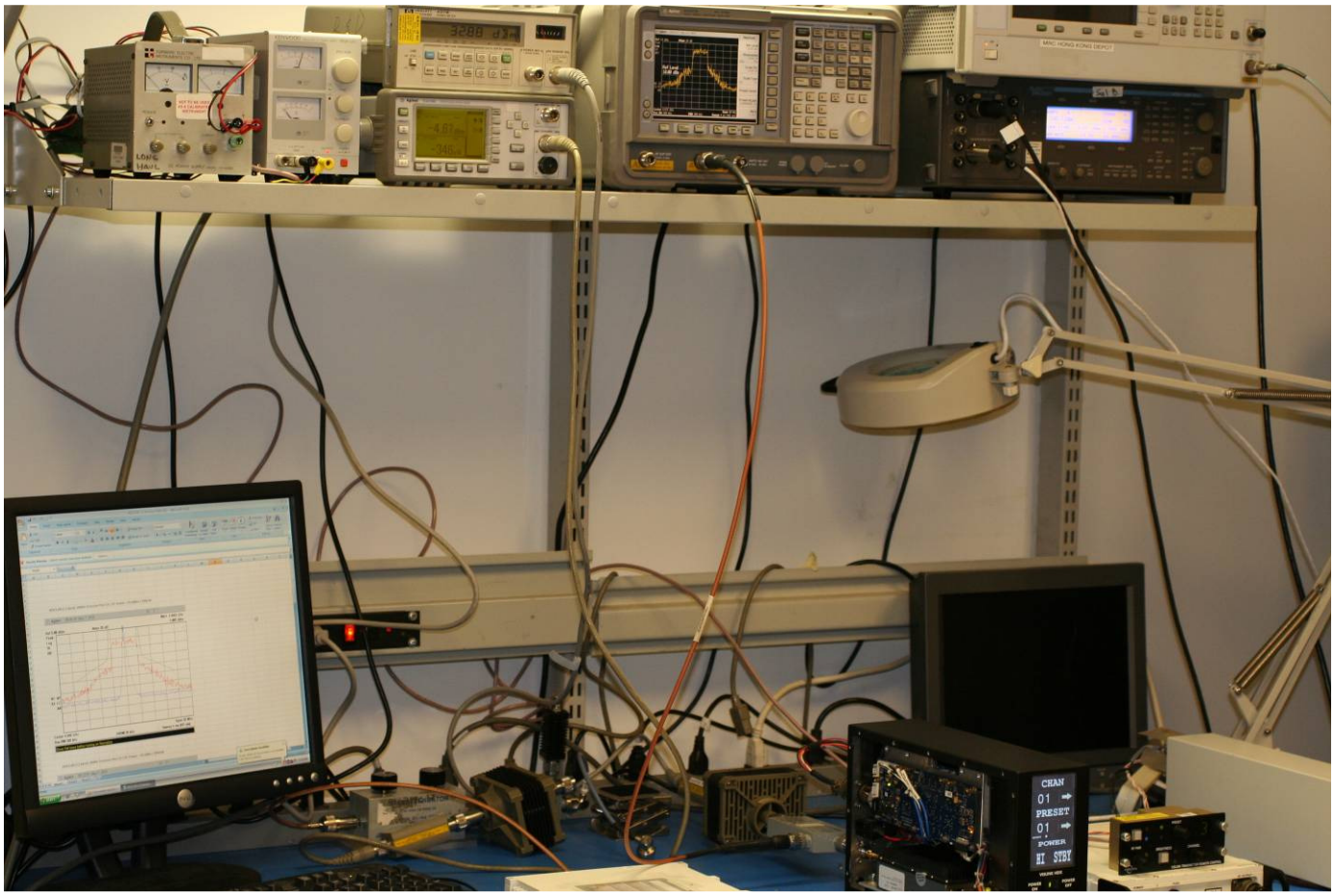


FC3HDX2025D
INTERNAL VIEW
(Power Amp side)



FC3 HDX064D
REAR VIEW

SECTION 5 - TEST SET UP PHOTOS



TEST EQUIPMENT LIST

MODEL	SERIAL #	DESCRIPTION	MANUFACTURER
FLK52	33624-65	THERMOMOTER	FLUKE
E4419B	MY45101749	POWER METER	HP
8481B	00389	POWER SENSSOR	HP
T30C	22779-06	TEMP. CHAMBER	TENNEY
FLK177	95210385	MULTIMETER	FLUKE
5350B	33625-269	FREQ. COUNTER	HP
E4407B	MY44210942	SPECTRUM ANALYZER	HP

Temperature chamber output power and frequency stability

6 Operating in Safety

Guidelines for safe operation are derived from OET bulletin 65, August 1997, as recommended by the Federal Communications Commission (FCC).

WARNING *High levels of RF power are present in the unit. Exposure to RF or microwave power can cause burns and may be harmful to health. Remove power from the unit before disconnecting any RF cables and before inspecting damaged cables and/or antennas. Avoid standing in front of high gain antennas (such as a dish antenna) and never look into the open end of a waveguide or cable where RF power may be present.*

The HDX-1000, operated without an antenna will not create RF energy exceeding 1.0 mW/cm^2, the FCC limit for exposure. Connecting an antenna to the unit greatly enhances the potential for harmful exposure, and you must maintain a certain distance from the radiator. The following table shows the Maximum Permissible Exposure (MPE) safe distances from the antenna.

Antenna Gain (dB1)	0	2	3	5	11
Safe Distance (cm)	4	6	6	8	15
Safe Distance (in)	1.57	2.36	2.36	3.15	5.9

Note Hazardous RF radiation limits and recommended distances may vary by country. Observe all applicable state and federal regulations when using this transmitter.

To perform calculations to understand the safe exposure margin (MPE), use the following formula suggested by OET 65. The calculations provided are for common antennas often used in the mobile microwave environment.

Calculating MPE

EIRP = P * (10 ^ (G / 10)) = (antilog of G/10) * P

P = RF power delivered to the antenna in mW
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna in centimeters
S = MPE in mW/cm² (milliwatts per square centimeters)

Conversions

dBi to numeric gain = Antilog (dBi/10)
Feet to centimeters = Feet * 30.48
Centimeters to Feet = cm * .0328
4 π = 12.57

User Input

RF power delivered to the antenna = Watts

Antenna gain (referenced to isotropic antenna) = dBi
Distance from the center of radiation = Feet

Calculation steps:

1. [P] RF power input. Watts to milliwatts = Watts * 1000
2. [G] Antenna gain dBi. Numeric gain = Antilog (dBi/10)
3. [EIRP] Multiply P * G
4. [R] Centimeters to feet = Centimeters * .0328
5. Square R
6. Multiply $R^2 * 4\pi$
7. [S] Divide ($R^2 * 4\pi$) into EIRP

   S = Power Density in milliwatts per square centimeters.

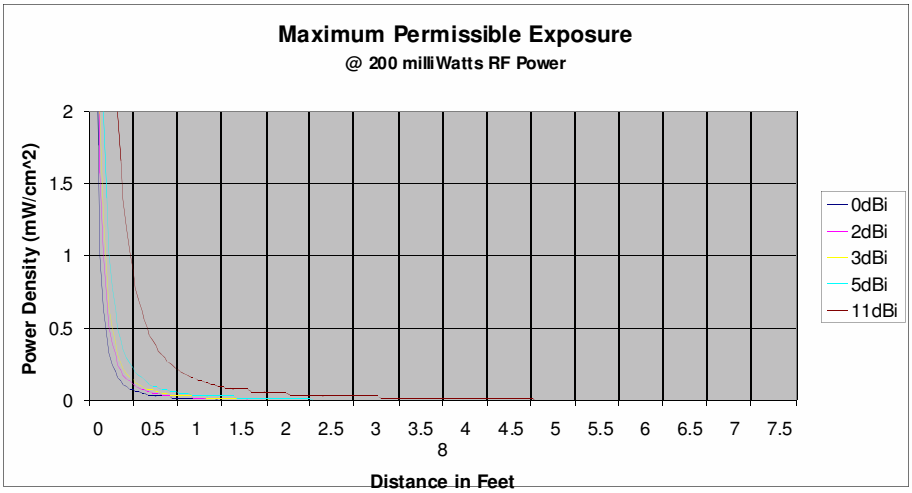
Note At frequencies above 1500 MHz, S must not be greater than 1.

Reference

FCC OET Bulletin 65, August 1997 - Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields

SECTION 7 RADIATION HAZARD WARNING

The figure to the right is a typical graph for a Vislink HDX-1000 Transmitter and shows the permissible exposure distance for various antennas. Graphs and data will vary, based on the actual transmitter, output power, frequency, and antenna utilized. One plot provides the permissible output of the transmitter for digital modulation, and the other plot for analog modulation.



Vislink, in accordance with the requirements set forth by the FCC, provides this information as a guide to the user and assumes the users of this equipment are licensed and qualified to operate the equipment per the guidelines and recommendations contained within the product user guides and in accordance with any FCC rules that may apply.

SECTION 7 TEST FACILITIES

TEST FACILITIES:

Vislink / MICROWAVE RADIO COMMUNICATIONS 978-671-5700
101 Billerica Avenue
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Intertek Testing Services
70 Codman Hill Road 978-635-8615
Boxborough, MA 01719

Prepared by: Sal Blatti
Compliance Manager

THE MANUFACTURER HEREBY DECLARES THAT IT WILL TAKE ALL MEASURES TO INSURE THE COMPLIANCE OF THE PRODUCT DETAILED IN THIS TECHNICAL FILE WITH THE FCC

Sal Blatti
Compliance Manager

APPENDIX A - RADIO CHARACTERISTICS

RF SPECIFICATIONS

The RF specifications of the HDX1100 will be as follows:

RF OUTPUT

- Connector: Type N female
- Impedance: 50 Ohms
- Return loss: 17 dB minimum (output)
- Output stability: ± 1.0 dB, - 20° to + 55° C
- Harmonics: ≤ 60 dBc
- PA protection: Capable of operation into infinite VSWR, no time limit.
- Frequency Step Size: 250 KHz
- RF power output: 10W (part 74 and 78)

- RF power output: 5W (part 90)

INPUT POWER

- DC Voltage: 18 - 32 VDC
- DC Power: HDX-1100S: 120W
- Protection: Reverse and overvoltage protection is provided.

NOTE: Additional details are in the User and Technical Manual, attached to this report.

APPENDIX B - FCC LABEL LOCATION

List of Attachments and Exhibits to this Application

Applicant: Vislink, Inc.

FCC ID: FC3HDX2025D

1) Letter of Transmittal
2) Confidentiality Request pursuant to FCC § 0.457 and 0.459
3) Report 100371377BOX-001 prepared by Intertek Testing Services, Boxborough Massachusetts
4) FC3HDX2025D Test Report dated December 27, 2012 by Vislink