Test Data for H25VXS250
MODEL VxS-250 Video Transmitter

I. INFORMATION REQUIRED UNDER PART 2

Para.

2.1033(a) This Application for Certification is filed on form 731 with all questions answered. Confidentiality is being requested for the schematic. An application fee of $495 and a request for confidentiality fee of $145 has been sent.

2.1033(b) N/A

2.1033(c)(1) The full name and address of the applicant and manufacturer for certification is:

DTC Communications Inc.
486 Amherst St.
Nashua, NH 03063

(2) The FCC Identifier of the device is H25VXS250

(3) A copy of the operating instructions is included in the EXHIBITS.

(4) Emission: FM video and audio – Designator: 16M5F8W
Emissions calculation is included in the EXHIBITS.

(5) Frequency Range: 2450 –2500 MHz

(6) Power: 0.25 Watts at 250 mA; 10 VDC

(7) Maximum Power Rating of 316 mW

(8) A linear regulator with an output voltage of 5.0 VDC powers all stages except the final amplifier, which is powered with conditioned battery voltage.

(9) A tune-up procedure is included in the EXHIBITS.

(10) A schematic diagram is included in the EXHIBITS.

(11) A drawing and photo of the equipment identification label is included in the EXHIBITS.

(12) Photographs showing the external and internal construction of the equipment is included in the EXHIBITS.

(13) N/A

(14) Test Data as required by (46)§§(47) 2.1046 through 2.1057, inclusive, is measured in accordance with the procedure setout in (48)§ 2.1041.

(15) N/A

(16) N/A

(17) N/A

II. TEST DATA

Data required by (46)§§(47) 2.1046 through 2.1057, inclusive, is measured in Accordance with the procedures setout in (48)§ 2.1041.

RF Power Output 2.1046 (a), (c):

As required, RF power output has been measured over the band of interest. The following measurements were made after the device was adjusted per the applicable tuning procedure. The unit was terminated with a fixed 30 dB, 50 Ohm, attenuator which was then connected to an HP 437A RF power meter. Power measurements in dBm were converted to mW with the formula:

$$P_{mW} = 10^{(P_{dBm}/10)}$$

Where: P_{mW} = RF power in mW
P_{dBm} = RF power in dBm

RF Power Output Data:

Frequency	RF Power (dBm)	RF Power (mW)
2458 MHz	24.8 dBm	302 mW
2475 MHz	24.7 dBm	295 mW
2500 MHz	24.6 dBm	288 mW

The measured RF power is less than the limit allowed by the FCC, therefore, the unit complies.

Modulation Characteristics 2.1047(d):

The signal modulating the main carrier consists of a standard NTSC video signal as well as up to two audio subcarriers in the range of 6.0 – 7.5 MHz.

The NTSC video signal has a 1 Vpp maximum level and a bandwidth of 4.25 MHz maximum. The video processing circuit of the transmitter consists of a pre-emphasis network that conforms to the CCIR 405 525 line curve which is the NTSC standard. It is the content of the video signal in conjunction with the pre-emphasis network that insures that the occupied bandwidth will never exceed the limit as defined by the calculated necessary bandwidth and §90.210(b). The test signal used when measuring occupied bandwidth (75% color bars from a video pattern generator) contains high frequency content at amplitudes that far exceed that which would be received from a video camera. Even under conditions of extreme brightness, a video camera is virtually incapable of generating a signal that would cause the transmitter's occupied bandwidth to exceed that measured using the 75% color bar signal. Therefore, the 75% color bar signal represents a worse case modulation condition.

By definition, the first pair of modulation sidebands due to the audio subcarriers always occur at a frequency that is offset from the main carrier less than 50% of the authorized bandwidth. The highest modulation index achieved due to the subcarriers is M=0.1 (for the 6.0 MHz subcarrier). This modulation index results in a maximum level for the first pair of sidebands that is nominally 26 dB below the main carrier. The level of the second pair of sidebands is nominally 58 dB below the main carrier.

The response of the video modulator signal is limited by the roll-off of the video amplifier above 5 MHz.

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Necessary bandwidth:

Per paragraph 202 of Part 2, the necessary bandwidth is calculated according to the formula

$$Bn = 2*M + 2*D$$

Where: Bn is the necessary bandwidth in MHz
M is the highest frequency that modulates the carrier 100%
D is the Peak frequency deviation

In this application:

M = 4.25 MHz
D = 4.0 MHz

Calculation of necessary bandwidth:

$$Bn = 2*M + 2*D$$
$$Bn = (2*4.25) + (2*4.0)$$
$$Bn = 16.5 \text{ MHz}$$

Therefore, the necessary bandwidth is 16.5 MHz which yields an emission designator of 16M5F8W.

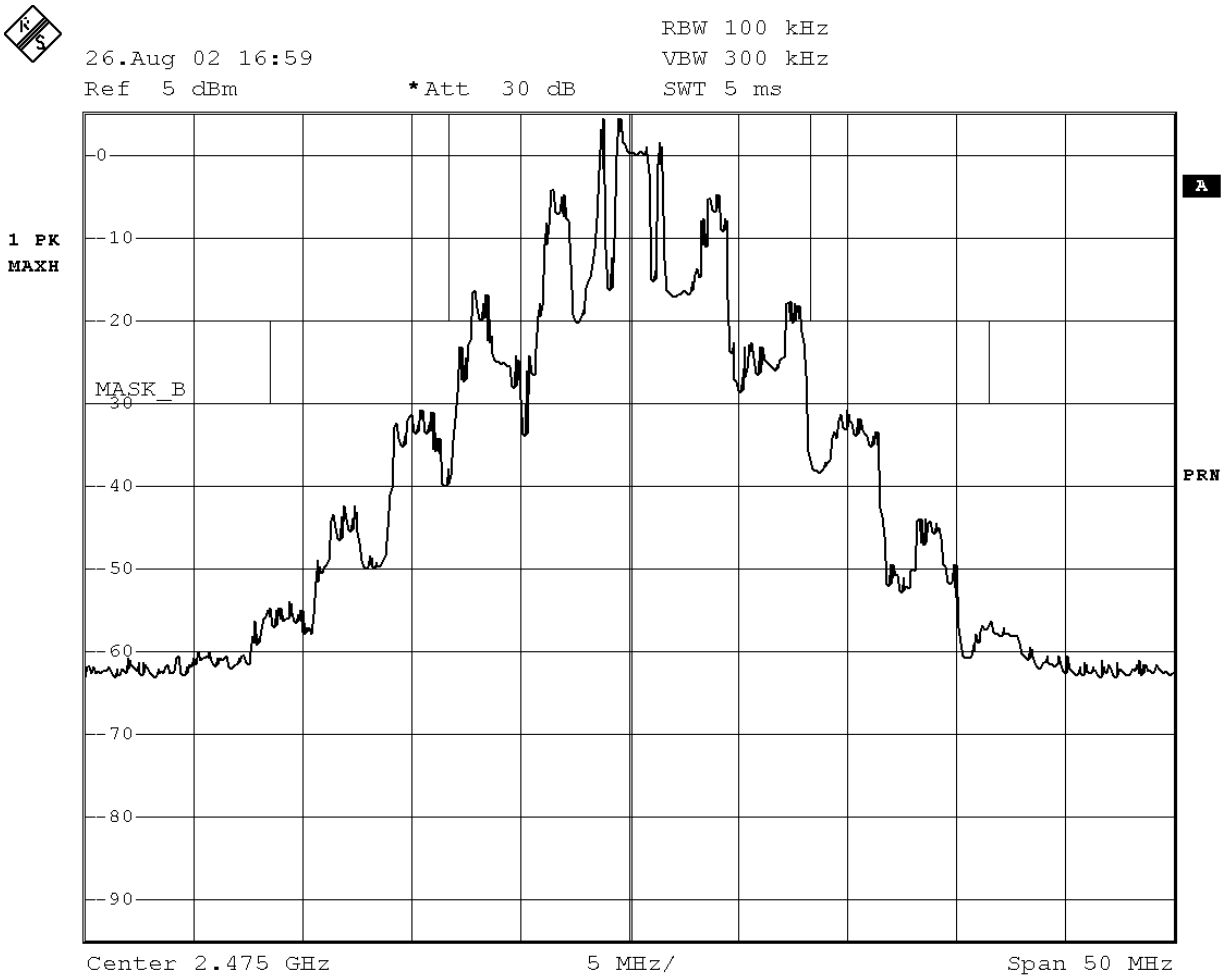
Occupied Bandwidth 2.1049(c)(4), 90.210(b):

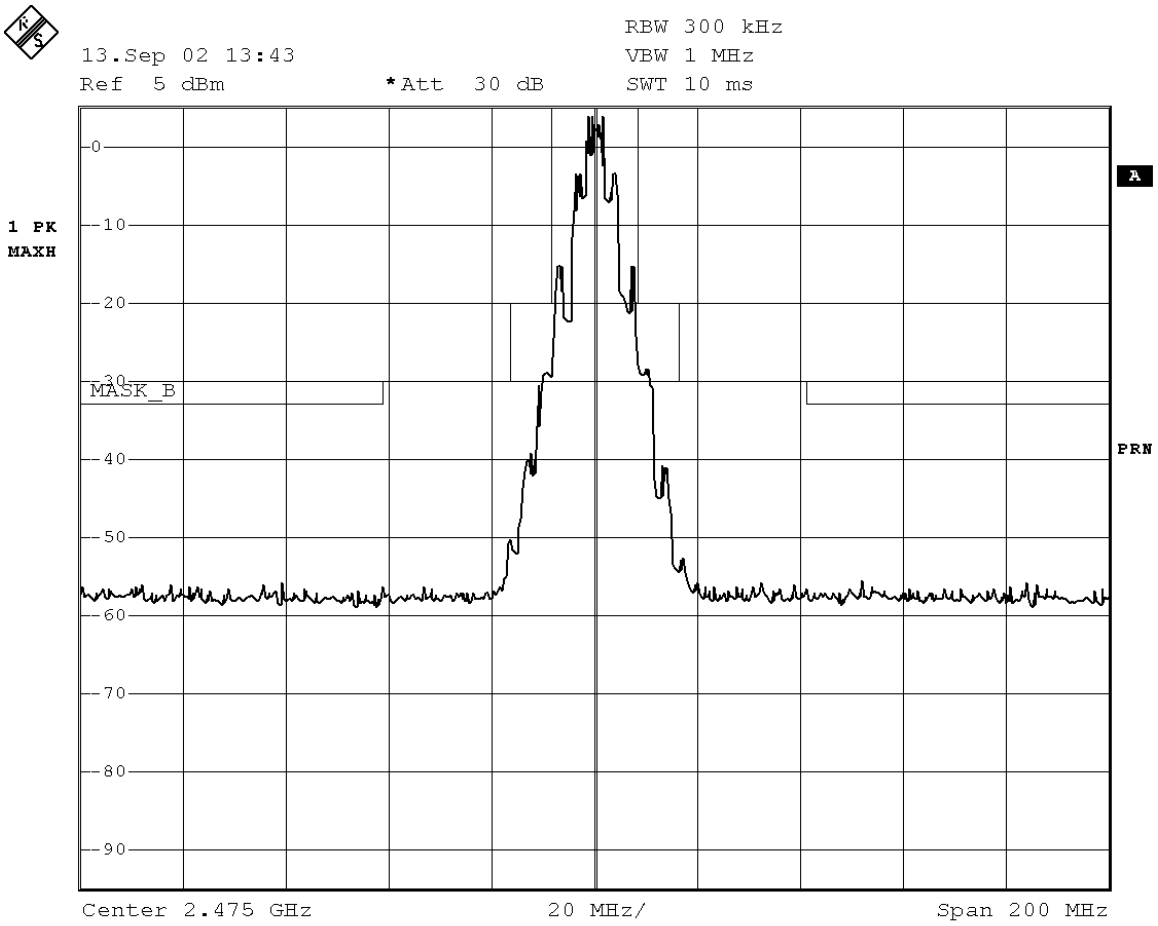
A worst case signal consisting of 75% color bars plus 7.5 MHz and 6.0 MHz subcarriers was used to modulate the transmitter.

The two following spectrum plots show the carrier with worse case modulation. The display was set for max hold in both plots. The first plot shows the spectrum in close to the carrier. The second plot is included to show the spectrum further out from the carrier to show compliance at frequency offsets up to and exceeding ±250% of authorized bandwidth.

The point where the spectrum was reduced in amplitude by 25 dB was less than ±8.25 MHz displacement from the assigned frequency. The point where the spectrum was reduced in amplitude by 35 dB was less than ±16.5 MHz displacement from the assigned frequency.

Therefore, the transmitter meets the requirements set forth in paragraph 210(b) of Part 90.




13.Sep 02 13:43
RBW 300 kHz
VBW 1 MHz
Ref 5 dBm
*Att 30 dB
SWT 10 ms
1 PK
MAXH
A
PRN
MASK_B
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.475 GHz
20 MHz/
Span 200 MHz

Conducted Spurious Emissions 2.1051, 90.210(b):

Per FCC rules Part 90, paragraph 210(b), the limit for conducted spurious emissions at a frequency offset from the assigned frequency of greater than ±250% of the authorized bandwidth (41.25 MHz) is 43 + 10log(P), where P is the output power.

In the case of a transmitter with a maximum output power of +25.0 dBm, the absolute limit is -13.0 dBm or –38.0 dB below the level of the main carrier.

The test equipment was set up as shown in the accompanying photograph. The carrier frequency was 2475.0 MHz.

Conducted Spurious Emissions:

Frequency	**Measured Level**	**FCC Limit**
2457.0 MHz	-47 dBm	-13 dBm
2460.0 MHz	-39 dBm	-13 dBm
2461.5 MHz	-33 dBm	-13 dBm
2463.0 MHz	-28 dBm	-13 dBm
2487.0 MHz	-41 dBm	-13 dBm
2488.5 MHz	-34 dBm	-13 dBm
2493.0 MHz	-44 dBm	-13 dBm
4950.0 MHz	-38 dBm	-13 dBm
7425.0 MHz	-40 dBm	-13 dBm

The frequency range from 9 kHz to 25 GHz was examined. No spurious signals less than -28 dBm were observed. A level of –28 dBm exceeds the limit by 15 dB, therefore, the unit meets the requirements for conducted spurious emissions as set forth in paragraph 210(b) of Part 90.
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FIELD STRENGTH OF SPURIOUS RADIATION 2.1053(a)(b) and 90.210(b):
(Performed by Retlif Testing Laboratories)

Test Conditions:	Standard temperature and Humidity Battery Power: 12 VDC via Battery Radiation into shielded load.
Test Equipment	See Retlif Test Instruments List
Minimum Standard	90.210(b): The power of any emission shall be attenuated below the carrier power (P) by at least (43 + 10log P) dB or 38 dB below the unmodulated carrier field strength. This equates to an absolute limit of -13.0 dBm.
Test Data	See attached report from Retlif Testing Laboratories.
Test Result	Complies.

Frequency Stability 2.1055(a)(1), (d)(2):

The declared limit for frequency stability is ±50 ppm. The unit under test meets that limit. The test sample was operated continuously during the entire testing period. At the start of the test, the unit was subjected to –30 Deg. C and allowed to stabilize for a period of one hour. During this time, the frequency was monitored to insure that the unit had indeed stabilized. During the data collection process, the unit was allowed to stabilize for a period of thirty minutes at each temperature. At each temperature, the supply voltage was varied over the entire operating range of 9.0 – 16.0 Vdc. No variation in the output frequency was observed with supply voltage variation.

Frequency Stability Data:

Nominal frequency = 2475,000,000 Hz.
Supply voltage = 12.0 Vdc.

Temperature (Deg. C)	**Measure Frequency (Hz)**	**Frequency Error (ppm)**
-30	2474,994,000	-2.4
-20	2475,000,002	0
-10	2475,001,000	0.4
0	2475,000,993	0.4
10	2474,998,597	-0.6
20	2474,996,196	-1.5
30	2474,993,774	-2.5
40	2474,994,217	-2.3
50	2474,999,283	-0.3

END OF REPORT