EMC/RF MEASUREMENT REPORT

FCC PART 90 - RADIATED SPURIOUS EMISSIONS MEASUREMENTS

MANUFACTURER / APPLICANT	DTC COMMUNICATIONS, INC.		
DEVICE UNDER TEST (DUT)	DIGITAL MICROWAVE VIDEO TRANSMITTER (COFDM)		
DEVICE MODEL(S)	VMD-TX-100-S		
DEVICE IDENTIFIER(S)	FCC ID:	H25VMDTX100S	
DUT FREQUENCY RANGE & MODULATION BANDWIDTHS	2451.00 - 2482.50 MHz	DOMO-N, 1.25 MHz BW Mode	
	2451.25 - 2482.25 MHz	DOMO-W, 2.50 MHz BW Mode	
	2453.00 - 2480.50 MHz	DVB-T, 6 MHz BW Mode	
	2453.50 - 2480.00 MHz	DVB-T, 7 MHz BW Mode	
MAX. RF OUTPUT POWER TESTED	2454.00 - 2479.50 MHz	DVB-T, 8 MHz BW Mode	
APPLICATION TYPE	FCC Part 90 Certification		
STANDARD(S) & PROCEDURE(S)	FCC 47 CFR	Part 2.1053	
		Part 90.210	
	ANSI	TIA/EIA-603-C-2004	
FCC DEVICE CLASSIFICATION	Licensed Non-Broadcast Station Transmitter (TNB)		
DATE(S) OF EVALUATION(S)	December 22-23, 2009		
TEST REPORT SERIAL NO.	121409H25-T997-E90C		
TEST REPORT REVISION NO.	Revision 1.0	Initial Release	March 30, 2010
TEST REPORT SIGNATORIES	Jon Hughes	Report Writer	Celltech Labs Inc.
	Sean Johnston	Lab Manager	Celltech Labs Inc.
TEST LAB AND LOCATION	Celltech Compliance Testing and Engineering Laboratory		
	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada		
TEST LAB CONTACT INFO.	Tel.: 250-765-7650	Fax: 250-765-7645	
	info@celltechlabs.com	www.celltechlabs.com	

DECLARATION OF COMPLIANCE

Test Lab Information	**Name**	**CELLTECH LABS INCORPORATED**			
	Address	21-364 Lougheed Road, Kelowna, British Columbia V1X 7R8 Canada			
Test Firm Registration No.	**FCC**	714830			
Applicant Information	**Name**	**DTC COMMUNICATIONS, INC.**			
	Address	486 Amherst Street, Nashua, New Hampshire 03063 United States			
Standard(s) / Procedure(s)	**FCC**	47 CFR Part 2.1053, 90.210			
	ANSI	TIA/EIA-603-C-2004			
Device Classification(s)	**FCC**	Licensed Non-Broadcast Station Transmitter (TNB)			
Device Identifier(s)	**FCC ID:**	**H25VMDTX100S**			
Device Under Test (DUT)	Digital Microwave Video Transmitter (COFDM)				
Device Model(s) Tested	VMD-TX-100-S (S Band)				
Test Sample Serial No.	TT000991 (Identical Prototype)				
Test Sample Revision No.s	Hardware Revision No. 2		Software Revision No. 1.3		
Rated RF Output Power	100 mW Conducted				

	Mode	**Modulation**	**Bandwidth**	**Frequency Range**	**Emission Designator**
Device Modes of Operation	DOMO-N	QPSK	1.25 MHz	2451.00 - 2482.50 MHz	1M3W7D
	DOMO-W	QPSK, 16-QAM	2.50 MHz	2451.25 - 2482.25 MHz	2M5W7D
	DVB-T	QPSK, 16-QAM, 64-QAM	6 MHz	2453.00 - 2480.50 MHz	6M0W7D
			7 MHz	2453.50 - 2480.00 MHz	7M0W7D
			8 MHz	2454.00 - 2479.50 MHz	8M0W7D

Power Source(s) Tested	Energizer Lithium Battery Pack	13.5 VDC	AA x9	P/N: 4045214

This wireless device has demonstrated compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC 47 CFR Rule Parts 2, 90 and ANSI TIA/EIA-603-C-2004.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

The results and statements contained in this report pertain only to the device(s) evaluated.

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.

Test Report Approved By		**Sean Johnston**	**Lab Manager**	**Celltech Labs Inc.**

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TEST SUMMARY

Referenced Standard(s):		FCC CFR Title 47 Parts 2, 90				
Appendix	**Description of Test**	**Procedure Reference**	**Limit Reference**	**Test Start**	**Test End**	**Result**
A	Radiated TX Spurious Emissions	ANSI/TIA/EIA-603-C	§2.1053, §90.210	Dec-22, 2009	Dec-23, 2009	Pass

REVISION LOG

Revision	Description	Implemented By	Implementation Date
1.0	Initial Release	Jonathan Hughes	March 30, 2010

SIGNATORIES

Prepared By			March 30, 2010
Name/Title	Jon Hughes / Report Writer	Sean Johnston / Lab Manager	**Date**

1.0 SCOPE

This report outlines the measurements made and results collected during electromagnetic emissions testing of the DTC Communications Inc. Model: VMD-TX-100-S COFDM Transmitter FCC ID: H25VMDTX100S. The measurement results were applied against the applicable EMC requirements and limits outlined in the technical rules and regulations set forth in the Federal Communication's Commission Code of Federal Regulations Title 47 Part 2 and Part 90.

2.0 REFERENCES

2.1 Normative References

ANSI/ISO 17025:2005	General Requirements for competence of testing and calibration laboratories
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communication Equipment Measurement and Performance Standards
CFR Title 47 Part 2	Code of Federal Regulations Title 47: Telecommunication Part 2: Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
CFR Title 47 Part 90	Code of Federal Regulations Title 47: Telecommunication Part 90: Private Land Mobile Radio Services

3.0 PASS/FAIL CRITERIA

Unless otherwise noted in the Appendices, the pass/fail criteria is the limit set forth in the reference standards. The DUT is considered to have passed the requirements if the data collected during the described measurement procedure is no greater than the specified limits as defined. The pass/fail statements made in this report only apply to the unit tested.

4.0 FACILITIES AND ACCREDITATIONS

The facilities used in collecting the test results outlined in this report are located at 21-364 Lougheed Road, Kelowna, British Columbia, Canada V1X 7R8.

5.0 GENERAL INFORMATION

5.1 Applicant Information

Company Name	**DTC COMMUNICATIONS, INC.**
Address	486 Amherst St
	Nashua, New Hampshire
	United States

5.2 DUT Description

Device Type	Digital Microwave Video Transmitter (COFDM)			
Device Model(s) Tested	VMD-TX-100-S			
Test Sample Serial No.(s)	TT000991 (Identical Prototype)			
Device Identifier(s)	**FCC ID:**	H25VMDTX100S		
Co-located Transmitter(s)	None			
Power Source Tested	Energizer Lithium Battery Pack	13.5 VDC	AA x9	P/N: 4045214

5.3 Rule Part(s) & Classification(s)

Rule Part(s) Applied	**FCC**	47 CFR §2; §90
Device Classification(s)	**FCC**	Part 90 Private Land Mobile Radio Services

5.4 Mode(s) of Operation

5.4.1 COFDM Transmitter

Frequency Range(s)	Modulation Type(s)	Modulation Bandwidth	Description
2451.00 - 2482.50 MHz	QPSK	1.25 MHz	Ultra-Narrow Band
2451.25 - 2482.25 MHz	QPSK, 16-QAM	2.5 MHz	Narrow Band
2453.00 - 2480.50 MHz	QPSK, 16-QAM, 64-QAM	6 MHz	DVB-T
2453.50 - 2480.00 MHz	QPSK, 16-QAM, 64-QAM	7 MHz	DVB-T
2454.00 - 2479.50 MHz	QPSK, 16-QAM, 64-QAM	8 MHz	DVB-T

5.5 Modification(s)

None

Appendix A Radiated Spurious Emissions

A.1 REFERENCES	
Normative Reference Standard	FCC CFR 47 §2.1053, §90.210
Procedure Reference	The transmitter spurious emissions were measured in accordance with ANSI TIA/EIA Standard 603 using the substitution method on a 3-meter open area test site (OATS).

A.2 ENVIRONMENTAL CONDITIONS	
Temperature	25 +/- 5 ºC
Humidity	40 +/- 10 %
Barometric Pressure	101 +/- 3 kPa

A.3 TEST EQUIPMENT LIST

Asset Number	Manufacturer	Model	Description	Cal. Due Date
00072	EMCO	2075	Mini-mast	n/a
00073	EMCO	2080	Turn Table	n/a
00071	EMCO	2090	Multi-Device Controller	n/a
00015	HP	E4408B	Spectrum Analyzer	23Apr10
00050	Chase	CBL-6111A	Bilog Antenna	09Apr10
00055	EMCO	3121C	Dipole Antenna	04Apr10
00034	ETS	3115	Double Ridged Guide Horn	03Apr10
00035	ETS	3115	Double Ridged Guide Horn	03Aug10
00051	HP	8566B	Spectrum Analyzer RF Section	09Apr10
00049	HP	85650A	Quasi-peak Adapter	09Apr10
00047	HP	85685A	RF Preselector	09Apr10
00006	R & S	SMR 20	Signal Generator (10MHz-40GHz)	06Apr10
00114	Amplifier Research	DC7154	Directional Coupler (0.8-4.2 GHz)	n/a
00078	Pasternack	PE2214-20	Directional Coupler (1-18 GHz)	n/a
00106	Amplifier Research	5S1G4	Power Amplifier (5W, 800MHz-4.2GHz)	n/a
00041	Amplifier Research	10W1000C	Power Amplifier (0.5 - 1 GHz)	n/a
00007	Gigatronics	8652A	Power Meter	23Apr10
00014	Gigatronics	80701A	Power Sensor	23Apr10

A.4 MEASUREMENT EQUIPMENT SETUP

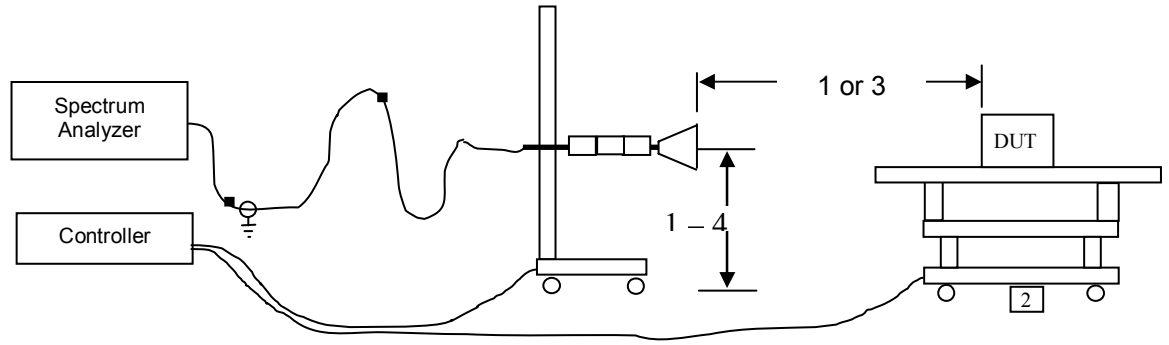
MEASUREMENT EQUIPMENT CONNECTIONS

For the field strength measurements the measurement equipment was connected as shown in A.4. A number of antennas were used to cover the applicable frequency range tested. The ranges in which each antenna was used are as follows. For the final substitutions the DUT was replaced with the appropriate antenna and fed from a CW signal source sufficient to replicate the received field strength of the emission being investigated (connection diagram A.5).

Frequency Range	RX Antenna	TX Antenna
30 MHz - 1GHz	Bilog	Dipole
1 GHz - 18 GHz	ETS 3115 Horn	ETS 3115 Horn
18 GHz – 26 GHz	Wave Line	Wave Line

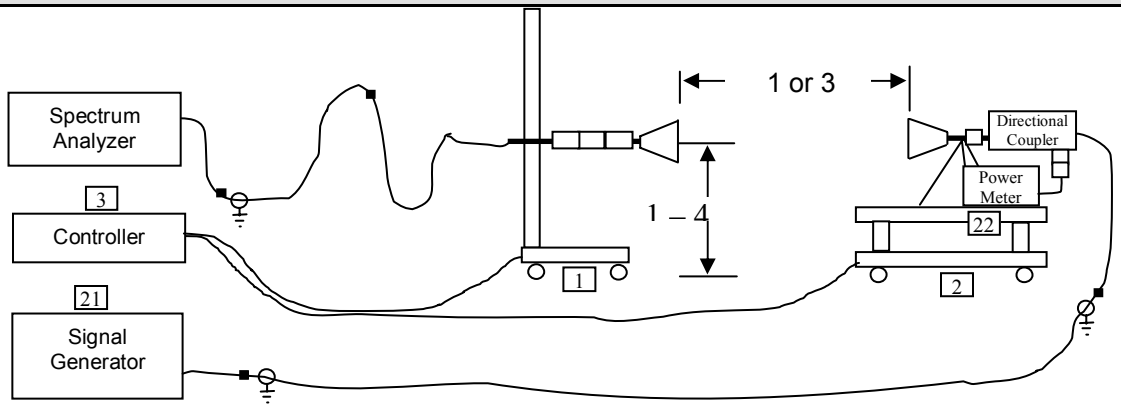
A.5 SETUP DRAWING

Figure A.5-1 - Setup Drawing – Radiated TX Spurious Emissions



A.6 SETUP DRAWING

Figure A.6-2- Setup Drawing – Signal Substitution



A.7 TEST RESULTS

Polarity	DUT Position	Distance	Substitution Antenna Type	Carrier Channel	Frequency	Corrected Field Strength	Power Applied to Substitution Antenna	Antenna Gain	EIRP Emission Level	Limit	Margin	Pass/Fail
V/H		m		MHz	MHz	dBuV/m	dBm	dBi	dBm	dBm or dBuV/m*	dB	
V	A	3	none	2451	4902	51.67				82.3	30.63	Pass
V	A	3	none	2451	7353	58.53				82.3	23.77	Pass
V	A	3	none	2451	9804	54.2				82.3	28.1	Pass
V	A	1	none	2451	12255	nf				91.9	nf	Pass
H	A	3	none	2451	4902	49				82.3	33.3	Pass
H	A	3	none	2451	7353	49.2				82.3	33.1	Pass
H	A	3	none	2451	9804	52.2				82.3	30.1	Pass
H	A	1	none	2451	12255	nf				91.9	nf	Pass
V	B	3	none	2451	4902	48				82.3	34.3	Pass
V	B	3	none	2451	7353	56.7				82.3	25.6	Pass
V	B	3	none	2451	9804	49.7				82.3	32.6	Pass
V	B	1	none	2451	12255	60.9				91.9	31	Pass
H	B	3	none	2451	4902	54.38				82.3	27.92	Pass
H	B	3	none	2451	7353	57.6				82.3	24.7	Pass
H	B	3	none	2451	9804	55.5				82.3	26.8	Pass
H	B	1	none	2451	12255	68.5				91.9	23.4	Pass
V	C	3	none	2451	4902	54.3				82.3	28	Pass
V	C	3	none	2451	7353	60.5				82.3	21.8	Pass
V	C	3	none	2451	9804	49.8				82.3	32.5	Pass
V	C	1	none	2451	12255	63.5				91.9	28.4	Pass
H	C	3	none	2451	4902	47.2				82.3	35.1	Pass
H	C	3	none	2451	7353	52.3				82.3	30	Pass
H	C	3	none	2451	9804	nf				82.3	nf	Pass
H	C	1	none	2451	12255	62.1				91.9	29.8	Pass

Notes:
1. The DUT RF port was terminated to a 50 ohm load.
2. All modes and modulations were investigated and the worst-case is reported (1.25 MHz BW, QPSK modulation).
3. The emissions reported above represent the highest emissions or noise floor measured within the frequency band of 30MHz and the 10th harmonic of the carrier. All emissions attributed to the EUT had field strengths greater than 20 dB below the theoretical limit and substitutions were not made. All other emissions were at the noise floor.

Formulae:
ERP Emission Level (dBm) = Power applied to antenna (dBm) + Antenna Gain (dBd)
Margin (dB) = Limit (dBm) – ERP Emission Level (dBm) or Theoretical Limit (dBuV/m) – Corrected Field Strength (dBuV/m)
Theoretical Limit (V/m) = SQRT(30 * P / r2) where P is the total transmitted power (W), r is measurement distance (m)

A.8 TEST RESULTS CONT…

Polarity	DUT Position	Distance	Substitution Antenna Type	Carrier Channel	Frequency	Corrected Field Strength	Power Applied to Substitution Antenna	Antenna Gain	EIRP Emission Level	Limit	Margin	Pass/Fail
V/H		m		MHz	MHz	dBuV/m	dBm	dBi	dBm	dBm or dBuV/m*	dB	
V	A	3	none	2466	4932	50.1				82.3	32.2	Pass
V	A	3	none	2466	7398	55.3				82.3	27.0	Pass
V	A	3	none	2466	9864	54.1				82.3	28.3	Pass
V	A	1	none	2466	12330	63.2				91.9	28.7	Pass
H	A	3	none	2466	4932	51.6				82.3	30.7	Pass
H	A	3	none	2466	7398	62.1				82.3	20.2	Pass
H	A	3	none	2466	9864	51.5				82.3	30.8	Pass
H	A	1	none	2466	12330	63.5				91.9	28.4	Pass
V	B	3	none	2466	4932	54.7				82.3	27.6	Pass
V	B	3	none	2466	7398	60.0				82.3	22.3	Pass
V	B	3	none	2466	9864	49.8				82.3	32.5	Pass
V	B	1	none	2466	12330	65.7				91.9	26.2	Pass
H	B	3	none	2466	4932	47.9				82.3	34.4	Pass
H	B	3	none	2466	7398	54.9				82.3	27.4	Pass
H	B	3	none	2466	9864	nf				82.3	nf	Pass
H	B	1	none	2466	12330	62.8				91.9	29.1	Pass
V	C	3	none	2466	4932	47.9				82.3	34.4	Pass
V	C	3	none	2466	7398	59.4				82.3	22.9	Pass
V	C	3	none	2466	9864	50.0				82.3	32.3	Pass
V	C	1	none	2466	12330	60.6				91.9	31.3	Pass
H	C	3	none	2466	4932	50.8				82.3	31.5	Pass
H	C	3	none	2466	7398	59.6				82.3	22.7	Pass
H	C	3	none	2466	9864	56.0				82.3	26.3	Pass
H	C	1	none	2466	12330	60.7				91.9	31.2	Pass

Notes:
1. The DUT RF port was terminated to a 50 ohm load.
2. All modes and modulations were investigated and the worst-case is reported (1.25 MHz BW, QPSK modulation).
3. The emissions reported above represent the highest emissions or noise floor measured within the frequency band of 30MHz and the 10th harmonic of the carrier. All emissions attributed to the EUT had field strengths greater than 20 dB below the theoretical limit and substitutions were not made. All other emissions were at the noise floor.

Formulae:
ERP Emission Level (dBm) = Power applied to antenna (dBm) + Antenna Gain (dBd)
Margin (dB) = Limit (dBm) – ERP Emission Level (dBm) or Theoretical Limit (dBuV/m) – Corrected Field Strength (dBuV/m)
Theoretical Limit (V/m) = SQRT(30 * P / r2) where P is the total transmitted power (W), r is measurement distance (m)

A.9 TEST RESULTS CONT…

Polarity	DUT Position	Distance	Substitution Antenna Type	Carrier Channel	Frequency	Corrected Field Strength	Power Applied to Substitution Antenna	Antenna Gain	EIRP Emission Level	Limit	Margin	Pass/Fail
V/H		m		MHz	MHz	dBuV/m	dBm	dBi	dBm	dBm or dBuV/m*	dB	
V	A	3	none	2482.5	4965	50.89				82.3	31.41	Pass
V	A	3	none	2482.5	7447.5	61.76				82.3	20.54	Pass
V	A	3	none	2482.5	9930	54.6				82.3	27.7	Pass
V	A	1	none	2482.5	12412.5	70				91.9	21.9	Pass
H	A	3	none	2482.5	4965	50.9				82.3	31.4	Pass
H	A	3	none	2482.5	7447.5	62.2				82.3	20.1	Pass
H	A	3	none	2482.5	9930	53.4				82.3	28.9	Pass
H	A	1	none	2482.5	12412.5	67.7				91.9	24.2	Pass
V	B	3	none	2482.5	4965	49.1				82.3	33.2	Pass
V	B	3	none	2482.5	7447.5	59.2				82.3	23.1	Pass
V	B	3	none	2482.5	9930	50				82.3	32.3	Pass
V	B	1	none	2482.5	12412.5	61.8				91.9	30.1	Pass
H	B	3	none	2482.5	4965	53.7				82.3	28.6	Pass
H	B	3	none	2482.5	7447.5	60				82.3	22.3	Pass
H	B	3	none	2482.5	9930	56				82.3	26.3	Pass
H	B	1	none	2482.5	12412.5	71.7				91.9	20.2	Pass
V	C	3	none	2482.5	4965	54.2				82.3	28.1	Pass
V	C	3	none	2482.5	7447.5	61.6				82.3	20.7	Pass
V	C	3	none	2482.5	9930	50.4				82.3	31.9	Pass
V	C	1	none	2482.5	12412.5	67.2				91.9	24.7	Pass
H	C	3	none	2482.5	4965	47.6				82.3	34.7	Pass
H	C	3	none	2482.5	7447.5	54.1				82.3	28.2	Pass
H	C	3	none	2482.5	9930	nf				82.3	nf	Pass
H	C	1	none	2482.5	12412.5	64.8				91.9	27.1	Pass

Notes:
1. The DUT RF port was terminated to a 50 ohm load.
2. All modes and modulations were investigated and the worst-case is reported (1.25 MHz BW, QPSK modulation).
3. The emissions reported above represent the highest emissions or noise floor measured within the frequency band of 30MHz and the 10th harmonic of the carrier. All emissions attributed to the EUT had field strengths greater than 20 dB below the theoretical limit and substitutions were not made. All other emissions were at the noise floor.

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Theoretical Limit (V/m) = SQRT(30 * P / r2) where P is the total transmitted power (W), r is measurement distance (m)

A.10 SETUP PHOTOGRAPHS

DUT TEST POSITION A

DUT TEST POSITION B

DUT TEST POSITION C

END OF DOCUMENT