UltraTech
Group of Labs

Jan. 06, 2000

FEDERAL COMMUNICATIONS COMMISSION
7435 Oakland Mills Road
Columbia, MD 21046
USA

Subject: **Certification Application – Class II Permissive Change under FCC CFR 47, Parts 2 and 90 (Subpart I) - Radio Services Transmitters Operating in the frequency bands 403-405.9875 MHz and 406.125-512 MHz (12.5 kHz Channel Spacing).**

Applicant: **TEKLOGIX INC.**
Product: **OEM NARROW BAND UHF DATA TRANSCEIVER MODULE**
Model: **TRX7370**
FCC ID: **GM3TRX7370**

Dear Sir/Madam,

As appointed agent for **TEKLOGIX INC.**, we would like to submit this application for FCC Class II Permissive Change to include operation with 12.5 kHz Channel Spacing in the existing Grant (for 25 kHz Channel Spacing Operation).

The following changes in the EUT for 12.5 kHz channel spacing operation is as follows:

- Receiver's filter changes for 12.5 kHz. Re-tests were performed and found to comply with FCC Part, Subpart B – Radio Receivers. The Engineering report will be provided upon request.
- Modulation limiter is programmed for the maximum frequency deviation required to meet the 12.5 kHz Channel Spacing operation (Max. Req. Deviation: 2.5 kHz).

Based on the above alterations, only the following tests need to be performed for continuing compliance:

- Emission Mask/Emission Limitation
- Modulation Limiting
- Transient Frequency Behavior

If you have any queries, please do not hesitate to contact us by our TOLL FREE numbers:

OUR TELEPHONE NO.: 1-877-765-4173

Yours truly,

Tri Minh Luu, P. Eng.,
V.P., Engineering

TML/AK

Encl.

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UltraTech
Group of Labs

Jan. 06, 2000

TEKLOGIX INC.
2100 Meadowvale Blvd.
Mississauga, Ontario
Canada, L5N 7J9

Attn.: **Mr. Sada Dharwarkar**

Subject: **Certification Application – Class II Permissive Change under FCC CFR 47, Parts 2 and 90 (Subpart I) - Radio Services Transmitters Operating in the frequency bands 403-405.9875 MHz and 406.125-512 MHz (12.5 kHz Channel Spacing).**

Applicant: **TEKLOGIX INC.**
Product: **OEM NARROW BAND UHF DATA TRANSCEIVER MODULE**
Model: **TRX7370**
FCC ID: **GM3TRX7370**

Dear Mr. Dharwarkar,

The product sample has been tested in accordance with **FCC CFR 47, Parts 2 and 90 (Subpart I) - Radio Services Transmitters Operating in the frequency bands 403-405.9875 MHz and 406.125- 512 MHz (12.5 kHz Channel Spacing),** and the results and observation were recorded in the engineering report, Our File No.: TEK-204FTX

Enclosed you will find copies of the engineering report. If you have any queries, please do not hesitate to contact us.

Yours truly,

Tri Minh Luu, P.Eng
Vice President - Engineering

Encl.

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ENGINEERING TEST REPORT

OEM NARROW BAND UHF DATA TRANSCEIVER MODULE
Model No.: TRX7370
FCC ID: GM3TRX7370

Applicant: **TEKLOGIX INC.**
2100 Meadowvale Blvd.
Mississauga, Ontario
Canada, L5N 7J9

Tested in Accordance With

Federal Communications Commission (FCC)
CFR 47, PARTS 2 and 90 (Subpart I)

UltraTech's File No.: TEK-204FTX

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs …… Date: ……	
Report Prepared by: Mr. Tri M. Luu, P.Eng. ……. .	Tested by: Hung Trinh, EMI/RFI Technician ……..
Issued Date: Jan. 06, 2000	Test Dates: Jan 02-04, 1999

The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.

UltraTech

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2 and 90 (Subpart 90): 1999
Title	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 & 90
Purpose of Test:	To renew the FCC Certification to include 12.5 kHz Channel Spacing operation in the existing Grant for 25 kHz Channel Spacing Operation in the frequency bands 403-405.9875 MHz and 406.125-512 MHz
Test Procedures	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

1.2. RELATED SUBMITAL(S)/GRANT(S)

None

1.3. NORMATIVE REFERENCES

***Note**: When the international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.*

Publication	YEAR	Title
FCC CFR Parts 0-19, 80-End	1998	Code of Federal Regulations – Telecommunication
ANSI C63.4	1992	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
CISPR 22 & EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1		Specification for Radio Disturbance and Immunity measuring apparatus and methods

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT:	
Name:	TEKLOGIX INC.
Address:	2100 Meadowvale Blvd. Mississauga, Ontario Canada, L5N 7J9
Contact Person:	Mr. Sada Dharwarkar Phone #: 905-813-9900 Fax #: 905-812-6301 Email Address: N/A

MANUFACTURER:	
Name:	DATARADIO COR. LTD.
Address:	299 Johnson Ave.,Box 1249 Waseca, MN 56093-0514 USA
Contact Person:	Mr. Mark A. Christensen Director of Engineering Phone #: 507-835-6249

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name	TEKLOGIX INC.
Product Name	OEM NARROW BAND UHF DATA TRANSCEIVER MODULE
Model Name or Number	TRX7370
Serial Number	Pre-production sample
Type of Equipment	Radio Communication Equipment
External Power Supply	None
Transmitting/Receiving Antenna Type	Non-integral
Primary User Functions of EUT:	To provide through-air data communication link

2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Portable, Mobile and Base station (fixed use)
Intended Operating Environment:	Commercial, light industry & heavy industry
Power Supply Requirement:	7.2 Vdc Nominal
RF Output Power Rating:	2.0 Watts max.
Operating Frequency Range:	406.1-430 MHz and 450-470 MHz
RF Output Impedance:	50 Ohms
Channel Spacing:	12.5 kHz
Occupied Bandwidth (99%):	8.4 kHz
Emission Designation*:	9K8F1D
Oscillator Frequencies:	17.5 MHz, L.O.: 52.95 MHz (High Side)
Antenna Connector Type:	SMA at the OEM Data Radio Module
Antenna Description:	Not applicable.

* For an average case of commercial telephony, the Necessary Bandwidth is calculated as follows:

1. For FM Digital Modulation:

(e) Channel Spacing = 12.5 kHz, D = 2.5 KHz max., K = 1, Level of FM Modulation = 4
M = DataRate in kb/s/Level of FM = 9.6/4 kb/s
B_n = 2M + 2DK = 2(9.6/4) + 2(2.5)(1) = **9.8KHz**
emission designation: 9K8F1D

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	RF IN/OUT	1	SMA	Shielded

NOTES:

NOTES:

1. ***Ports of the EUT which in normal operation*** *were connected to ancillary equipment through interconnecting cables via a representative interconnecting cable to simulate the input/output characteristics. RF input/output was correctly terminated to the 50 Ohm RF Load.*
2. ***The TRX7370 Radio Module was tested by itself (interconnect with a test jig).***
3. ***Ports which are not connected to cables during normal intended operation*** *(for factory/technical services uses only)*

2.5. SPECIAL CHANGES ON THE EUT'S HARDWARE/SOFTWARE FOR TESTING PURPOSES

None

2.6. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

2.6.1. Test Configuration #1: Teklogix TRX7370 by itself interconnecting with a test jig using a non-shielded ribbon cable.

Ancillary Equipment # 1	
Description:	Teklogix test Jig
Brand name:	N/A
Model Name or Number:	N/A
Serial Number:	N/A
Cable Length & Type:	½foot ribbon cable between the test jig and the radio module 1 foot coaxial cable from the RF SMA connector to 50 Ohm Load

Ancillary Equipment # 2	
Description:	50 Ohm RF Load
Brand name:	Coaxial Dynamics
Model Name or Number:	4050
Serial Number:	N/A
Cable Length & Type:	6 feet, coaxial
Connected to EUT's Port:	RF Port

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	7.2 Vdc Nominal applied to the radio

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	Transmit & receive RF signal with the RF signal FM (4 level) modulated with internal random data at 9600 b/s (maximum data rate for 12.5 KHz Channel Spacing operation).
Special Test Software:	Teklogix Window utility software is used to operate the radio and to change the radio parameters.
Special Hardware Used:	None

Transmitter Test Signals:	
Frequencies: 403-405.9875 MHz and 406.125-512 MHz	Near lowest, near middle & near highest frequencies each frequency bands that the transmitter covers: ▪ 403 MHz ▪ 450 MHz ▪ 512 MHz
Transmitter Wanted Output Test Signals: ▪ RF Power Output (measured maximum output power): ▪ Normal Test Modulation ▪ Modulating signal source:	 ▪ 2.1 Watts ▪ FM (4 Level) with a random data source at 9600 b/s (maximum data rate for 12.5 KHz Channel Spacing operation) ▪ Internal

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).

- Radiated Emissions were performed at the Ultratech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

  The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SIT 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: Sep. 20, 1998.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH.	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
90.205 & 2.985	RF Power Output	Yes
90.213 & 2.995	Frequency Stability	Note (1)
90.242(b)(8) & 2.987(a)	Audio Frequency Response	Not applicable for data radio
90.210 & 2.987(b)	Modulation Limiting	Yes
90.209 90.210 & 2.989	Emission Limitation & Emission Mask	Yes
90.210, 2.997 & 2.991	Emission Limits - Spurious Emissions at Antenna Terminal	Note (1)
90.210, 2.997 & 2.993	Emission Limits - Field Strength of Spurious Emissions	Note (1)
90.214	Transient Frequency Behavior	Yes

Note (1): Not required to be repeated due to nature of changes

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 7 of this report

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 6 for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4:1992 and CISPR 16-1.

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUACTURER:

The essential function of the EUT is to correctly communicate data to and from radios over RF link.

5.5. RF POWER OUTPUT @ FCC 2.985 & 90.205

5.5.1. Limits @ FCC 90.205

Please refer to FCC CFR 47, Part 90, Subpart I, Para. 90.205 for specification details.

5.5.2. Method of Measurements

FCC @ 2.985 – The rf output power of the transmitter was measured at the RF output terminals when the transmitter is adjusted by the manufacturer in accordance with the tune-up procedure to give the values of the current and voltage on the circuit elements specified in 2.983(d)(5). The electrical characteristics of the radio frequency load attached to the output terminals was 50 Ohms.

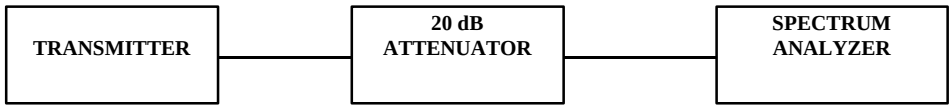
The detailed test method is as follows:

- *The transmitter terminal was coupled to the Spectrum Analyzer through a 20 dB attenuator*
- *Power of the transmitter channel near the lowest, middle and highest of each frequency block/band were measured using the power meter, and the reading was corrected by added the calibrated attenuator's attenuation value and cable loss.*
- *The RF Output was turned on with standard modulation applied.*

5.5.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz

5.5.4. Test Arrangement



5.5.5. Test data

TRANSMITTER CHANNEL OUTPUT	FUNDAMENTAL FREQUENCY (MHz)	MEASURED PEAK POWER (Watts)	PEAK POWER RATING (Watts)
Lowest	403	2.1	2.0
Middle	450	2.1	2.0
Highest	512	2.0	2.0

***EIRP Measurements**: -Appropriate antenna type, and adjustment of power output for effective radiated power (ERP) to meet FCC limits will be performed by the manufacturer at location of installation.*

5.6. MODULATION LIMITING @ FCC 2.987(B) & 90.210

5.6.1. Limits @ FCC 2.987(b) and 90.210

The EUT shall be installed with a modulation limiter which limits the deviation of the FM carrier less than manufacturer's setting provided that the rf output spectrum must meet the required MASK

Recommendation:

- 2.5 kHz for 12.5 kHz Channel Spacing ,

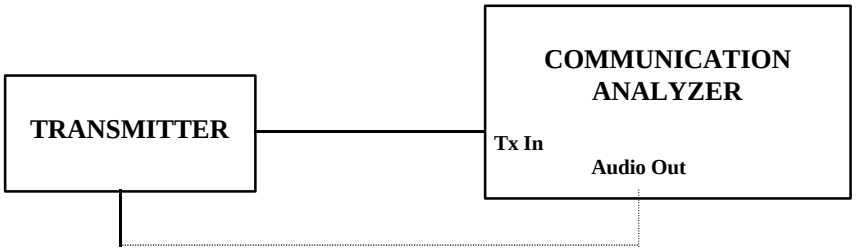
5.6.2. Method of Measurements

For Data Transmitter with Maximum Frequency Deviation set by Factory:- The EUT was set at maximum frequency deviation, and its peak frequency deviation was then measured using EUT's internal random data source.

5.6.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Communication Analyzer	Rohde & Schawrz	SMF02	879988/057	400 kHz - 1000 MHz including AF & RF Signal Generators, SINAD, DISTORTION, DEVIATION meters and etc

5.6.4. Test Arrangement



5.6.5. Test data

5.6.5.1. Data Modulation Limiting: FM modulation with random data and Modulation Limiter set at a Maximum Frequency Deviation (Factory Setting).

DATA BAUD RATE	PEAK DEVIATION (KHz)	MAXIMUM LIMIT (KHz)
9600	±2.5 kHz	No Limit

5.7. EMISSION LIMITATION & EMISSION MASK @ FCC 2.989, 90.208 & 90.210

5.7.1. Limits @ FCC 90.209 & 90.210

Emissions shall be attenuated below the mean output power of the transmitter as follows:

FREQUENCY RANGE (MHz)	Maximum Authorized BW (KHz)	CHANNEL SPACING (KHz)	Recommended FREQ. DEVIATION (KHz)	FCC APPLICABLE MASK
403-512	11.25	12.5	2.5	90.210(d): Mask D –Data

5.7.2. Method of Measurements

FCC CFR 47, Para. 2.989 - Out-of-Band Emissions:

For Channel Spacing less than or equals to 12.5 kHz: RBW ≥ 100 Hz, VBW ≥ 100 Hz and SWEEP TIME = AUTO).

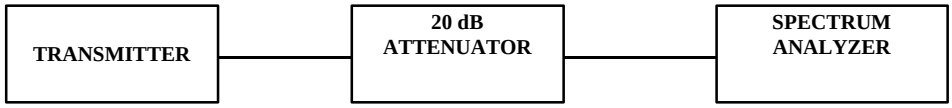
The transmitter was operated at a full rated power output, and modulated as follows:

Digital Modulation Through a Data Input Port:- Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the Emission Masks shall be shown for operation with any devices used for modifying the spectrum when such devices are operational at the discretion of the user.

5.7.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
Spectrum Analyzer/ EMI Receiver	Hewlett Packard	HP 8593EM	3412A00103	9 kHz – 26.5 GHz
Attenuator(s)	Bird	..	…	DC – 22 GHz

5.7.4. Test Arrangement



5.7.5. Test data

Conform. Please refer to the plots below for detailed information.

5.7.6. Plots

Please refer to Plots # 1, 2 and 3 in Exhbit 7 for Emission Mask Measurements

Plots # 4 , 5 & 6 in Exhbit 7 show the 99% occupied bandwidth at lowest and highest frequencies.

5.8. TRANSIENT FREQUENCY BEHAVIOR @ 90.214

5.8.1. Limits

Transient frequencies must be within the maximum frequency difference limits during the time intervals indicated:

Transient Frequency Behavior for equipment Designed to Operate on 12.5 kHz Channels

	All Equipment	
Time Interval [1,2]	**Maximum Frequency Difference [3]**	**421 to 512 MHz**
t1[4]	± 12.5 KHz	10.0 ms
t2	± 6.25 KHz	25.0 ms
t3[4]	± 12.5 KHz	10.0 ms

(1) ton: the instant when a 1 KHz test signal is completely suppressed, including any capture time due to phasing.
t1: tme period immediately after ton
t2: time period after t1
t3: time period from the instant when the transmitter is turned off until toff
toff: the instant when the 1 KHz test signal starts to rise.

(2) During the time from the end of t2 to the beginning of t3, the frequency difference must not exceed the limits specified in @ 90.213

(3) Difference between the actual transmitter frequency and assigned transmitter frequency.

(4) If the transmitter carrier output power rating is 6 watts or less, the frequency difference during this time period may exceed the maximum frequency difference for this time period.

5.8.2. Method of Measurements

Refer to efer to ANSI/TIA/EIA - 603 - 1992, Sec. 2.2.19, Page 83

1. Connect the transmitter under tests as shown in the above block diagram
2. Set the signal generator to the assigned frequency and modulate with a 1 kHz tone at ±12.5 kHz deviation and its output level to be 50 dB below the transmitter rf output at the test receiver end.
3. Set the horizontal sweep rate on the storage scope to 10 milliseconds per division and adjust the display to continuously view the 1000 Hz tone from the Demodulator Output Port (DOP) of the Test Receiver. Adjust the vertical scale amplitude control of the scope to display the 1000 Hz at ±4 divisions vertical Center at the display.
4. Adjust the scope so it will trigger on an increasing magnitude from the RF trigger signal of the transmitter under test when the transmitter was turned on. Set the controls to store the display.
5. The output at the DOP, due to the change in the ratio of the power between the signal generator input power and transmitter output power will, because of the capture effect of the test receiver, produce a change in display: For the first part of the sweep it will show the 1 kHz test signal. Then once the receiver's demodulator has been captured by the transmitter power, the display will show the frequency difference from the assigned frequency to the actual transmitter frequency versus time. The instant when the 1 kHz test signal is completely

suppressed (including any capture time due to phasing) is considered to be t_{on}. The trace should be maintained within the allowed divisions during the period t_1 and t_2.

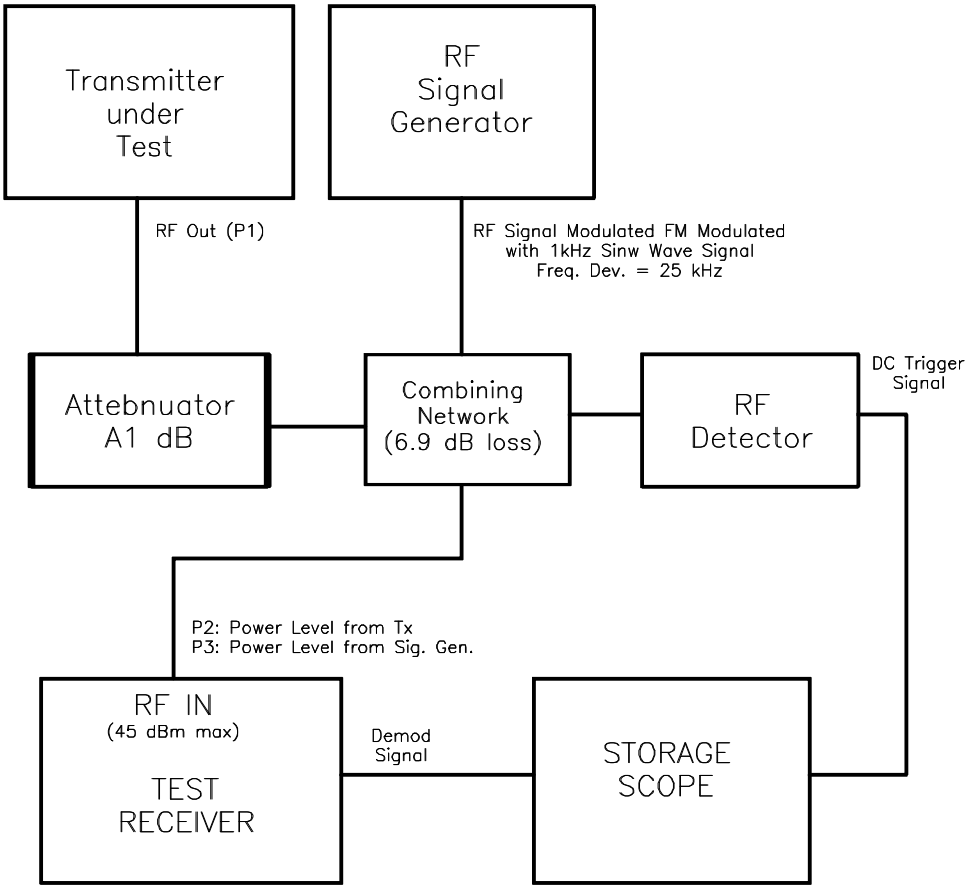
6. During the time from the end of t_2 to the beginning of t_3 the frequency difference should not exceed the limits set by the FCC in Part 90.214 and the outlined in the Carrier Frequency Stability sections. The allowed limit is equal to FCC frequency tolerance limits specified in FCC 90.213.
7. Repeat the above steps when the transmitter was turned off for measuring t_3.

5.8.3. Test Equipment List

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range
RF Synthesized Signal Generator	Fluke	6061A	…	10 kHz – 1GHz 13 dBm output max. @ 50 Ohms
Communication Analyzer (Test Receiver)	Rohde & Schwarz	SMFP2	879988/057	400 GHz including SINAD, S/N, Modulation meters, AF & RF signal generators and etc....
Network Combiner	Mini-circuit	15542	…	DC to 22 GHz (7 dB insertion loss)
Digital Storage Scope	Phillips	3320A	DQ 646	DC - 5 MHz
67297 RF Detector,	Herotex	DZ122-553	63400	..

5.8.4. Test Arrangement

The following drawings show details of the test setup for radiated emissions measurements



5.8.5. Test Data

- Attenuator A1 = 40 dB
- Measured Transmitter RF Output P1: 33 dBm
- Measured Transmitter RF Output P2 @ Standard Test Receiver (Max. RF IN: 45 dBm): -13 dBm
- Measured Signal generator Output P3 @ Standard Test Receiver (Max. RF IN: 45 dBm): -27 dBm

5.8.5.1. Test Configuration #1: Unmodulated

Time Interval	Transient Frequency	Transient Frequency Limit
t1 (10 mS) SWITCH ON CONDITION	<12.5 kHz within t1	no limit for RF Output PWR < 6 Watts
t2 (25 mS) SWITCH ON CONDITION	0 Hz	6.25 kHz
After t2 (10 mS) SWITCH ON CONDITION	0 Hz	FCC Limit = ± 604.5 Hz (0.00015% @403 MHz)
Before t3 (10 mS) SWITCH OFF CONDITION	0 Hz	FCC Limit = ± 604.5 (0.00015% @403 MHz)
t3 (10 mS) SWITCH OFF CONDITION	<12.5 kHz within t3	no limit for RF Output PWR < 6 Watts

5.8.5.2. Test Configuration #2: 4 Level FM digital modulation with 9600 b/s random data, , Freq. Dev.: 2.5 KHz

Time Interval	Transient Frequency	Transient Frequency Limit
t1 (10 mS) SWITCH ON CONDITION	<12.5 kHz within t1	no limit for RF Output PWR < 6 Watts
t2 (25 mS) SWITCH ON CONDITION	0 Hz	6.25 kHz
After t2 (10 mS) SWITCH ON CONDITION	0 Hz	FCC Limit = ± 604.5 Hz (0.00015% @403 MHz)
Before t3 (10 mS) SWITCH OFF CONDITION	0 Hz	FCC Limit = ± 604.5 (0.00015% @403 MHz)
t3 (10 mS) SWITCH OFF CONDITION	<12.5 kHz within t3	no limit for RF Output PWR < 6 Watts

5.8.6. Plots

Please refer to Plots #7 & #8 in Exhbit 7 for detailed information of measurements.

EXHIBIT 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

6.1. LINE CONDUCTED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Line Conducted)	PROBABILITY DISTRIBUTION	UNCERTAINTY (dB)	
		9-150 kHz	0.15-30 MHz
EMI Receiver specification	Rectangular	±1.5	±1.5
LISN coupling specification	Rectangular	±1.5	±1.5
Cable and Input Transient Limiter calibration	Normal (k=2)	±0.3	±0.5
Mismatch: Receiver VRC Γ_1 = 0.03 LISN VRC Γ_R = 0.8(9 kHz) 0.2 (30 MHz) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	±0.2	±0.3
System repeatability	Std. deviation	±0.2	±0.05
Repeatability of EUT	--	--	--
Combined standard uncertainty	Normal	±1.25	±1.30
Expanded uncertainty U	Normal (k=2)	±2.50	±2.60

Sample Calculation for Measurement Accuracy in 150 kHz to 30 MHz Band:

$u_c(y) = \sqrt{\sum_{I=1}^{m} u_i^2(y)} = \pm \sqrt{(1.5^2 + 1.5^2)/3 + (0.5/2)^2 + (0.05/2)^2 + 0.35^2} = \pm 1.30$ dB

$U = 2u_c(y) = \pm 2.6$ dB

6.2. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivit	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC Γ_1 = 0.2 Antenna VRC Γ_R = 0.67(Bi) 0.3 (Lp) Uncertainty limits 20Log(1±$\Gamma_1\Gamma_R$)	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k=2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB

EXHIBIT 7. PLOTS OF MEASUREMENTS