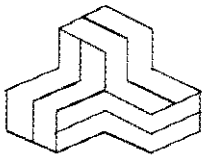
ENGINEERING TEST REPORT



PROGRAMMER
MODEL NO.: TX3021

In Accordance With

FCC PART 15, SUBPART C, PARA. 15.209
LOW POWER COMMUNICATION DEVICE TRANSMITTER
OPERATING AT 131.072 kHz

UltraTech FILE NO.: TPL4-TX

Tested for:

TELEPANEL SYSTEMS INC.
245 Riviera Drive
Markham, Ontario
Canada, L3R 5J9

Tested by:

ULTRATECH GROUP OF LABS
3000 Bristol Circle
Oakville, Ontario
Canada L6H 6G4

REPORT PREPARED BY: Dan Huynh

DATE: June 29, 1999

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1. EXHIBIT 1 - SUMMARY OF TEST RESULTS & GENERAL STATEMENT OF CERTIFICATION

FCC PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
**	Spectrum Bandwidth of a Low Power Communication Device Transmitter	Yes
15.209	Transmitter Radiated Emissions	Yes
15.107, 15.109	AC Power Conducted Emissions & Radiated Emissions for Receiver and Digital Circuit Portions	Yes (Note 1)

Note 1: The digital portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class A Digital Devices. The engineering test report can be provided upon FCC requests.

TESTIMONIAL AND STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY:

1) *THAT the application was prepared either by, or under the direct supervision of the undersigned.*

2) *THAT the measurement data supplied with the application was taken under my direction and supervision.*

3) *THAT the data was obtained on representative production units.*

4) *THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.*

Certified by:

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

DATE: June 29, 1999

2.4. RELATED SUBMITTAL(S)/GRANT

Not applicable

2.5. TEST METHODOLOGY

These tests were conducted on a sample of the equipment for the purpose of certification compliance with Code of Federal Regulations (CFR47-1991), Part 15, Subpart C, Para. 15.209, Low Power Communication Device Transmitters operating at 131.072 kHz.

Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute 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.

2.6. TEST FACILITY

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 3-10 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: September 20, 1998.

The above test site is also filed with Interference Technology International Ltd (ITI - An EC Directive on EMC).

2.7. UNITS OF MEASUREMENTS

Measurements of conducted emissions are reported in units of dB referenced to one microvolt [dB(μV)].

Measurements of radiated emissions are reported in units of dB referenced to one microvolt per meter [dB(μV)/m] at the distance specified in the report, wherever it is applicable.

3. EXHIBIT 3 - SYSTEM TEST CONFIGURATION

3.1. TEST SYSTEM DETAILS

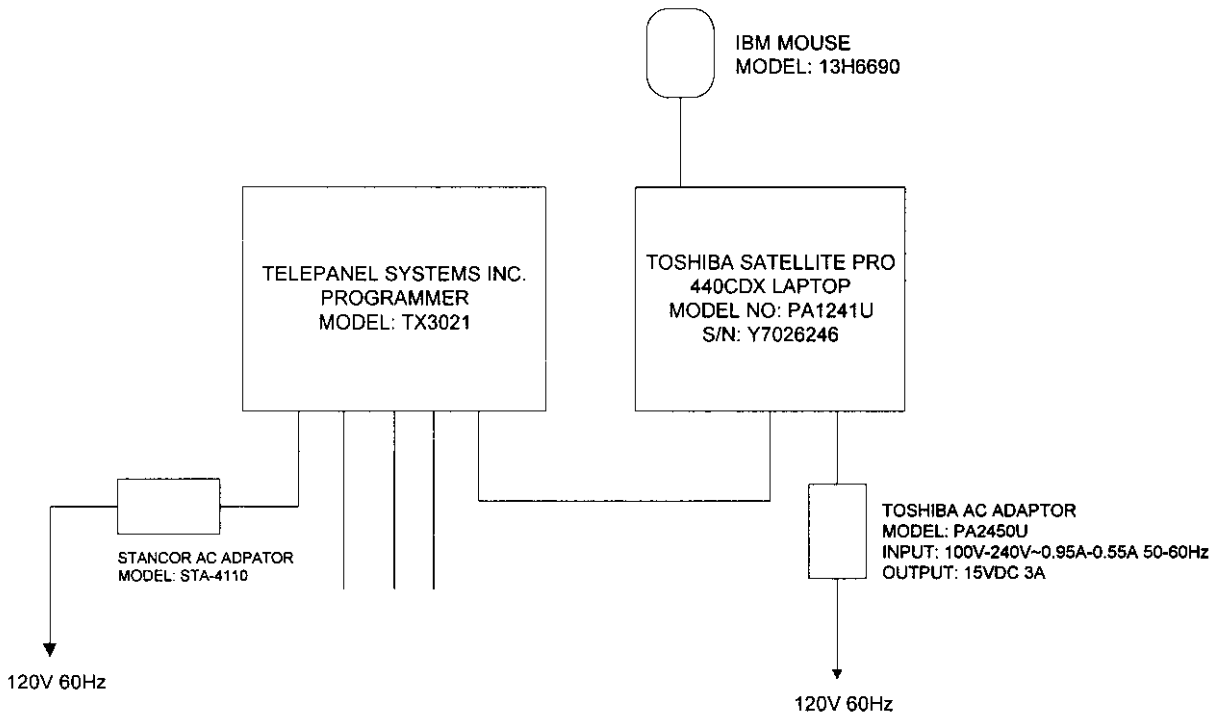
The following peripherals, FCC identifiers and types interconnecting cables were used with the EUT for testing:

EUT: TELEPANEL SYSTEMS INC., Programmer, Model: TX3021, S/N: Pre-production,
OSC. FREQ: 4.0 MHz and 4.194304 MHz
I/O Cable: All I/O cables were shielded
Power Supply Cable: Non-shielded

(1) **PERIPHERAL**: Toshiba Laptop, Model: PA1241U, S/N: Y7026246
I/O Cable: All I/O Cables were shielded
Power Supply Cable: Non-shielded

(2) **PERIPHERAL**: IBM Mouse, Model: 13H6690, S/N: 23-C569617, FCC ID: DZL210429
I/O Cable: All I/O Cables were shielded

3.2. BLOCK DIAGRAMS FOR CONDUCTED & RADIATED EMISSION MEASUREMENTS



3.4. JUSTIFICATION

No deviation, in both configuration and operation manners, different from normal operation were required.

3.5. EUT OPERATING CONDITION

Software provided by TELEPANEL SYSTEMS INC. to set the EUT to transmit and receive at desired channel frequency.

3.6. SPECIAL ACCESSORIES

No special accessories were required.

3.7. EQUIPMENT MODIFICATIONS

To achieve compliance, the following change(s) were made by UltraTech's test house during compliance testing:

Not required.

4. EXHIBIT 4 - TEST DATA

4.1. 26 DB BANDWIDTH

PRODUCT NAME: **Programmer, Model No.: TX3021**

FCC REQUIREMENTS:

The spectrum of the RF signal shall be entirely in FCC permitted band and shall not spread out in the restricted band.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23 °C
- Relative humidity: 43 %

POWER INPUT: 120V 60Hz.

TEST EQUIPMENT:

- EMI Receiver System/Spectrum Analyzer, Hewlett Packard, Model 8546A, Input +25dBm max., 9KHz-5.6GHz, 50 Ohms, built-in Peak, Quasi-Peak & Average Detectors, Pre-Amplifier and Tracking Signal Generator. This System includes: (1) HP 85460A RF Filter Section, S/N: 3448A00236 and (2) HP 85462A Receiver RF Section/Display, S/N: 3520A00248.
- **Spectrum Analyzer**, Advantest, Model R3271, S/N: 15050203, 100 Hz to 32 GHz)
- **Microwave Amplifier**, HP, Model 83017A, Frequency Range 1 to 26.5 GHz, 34-38 dBdB gain nominal.
- **Active Loop Antenna**, Emco, Model 6507, SN 8906-1167, Frequency Range 1 KHz - 30 MHz, @ 50 Ohms
- **Log Periodic/Bow-Tie Antenna**, Emco, Model 3143, SN 1029, 20 - 1000 MHz, @ 50 ohms.

TEST RESULTS: Conforms.

TEST PERSONNEL: Mr. Vinh K. Ngo, RFI Technician

DATE: March 22, 1999

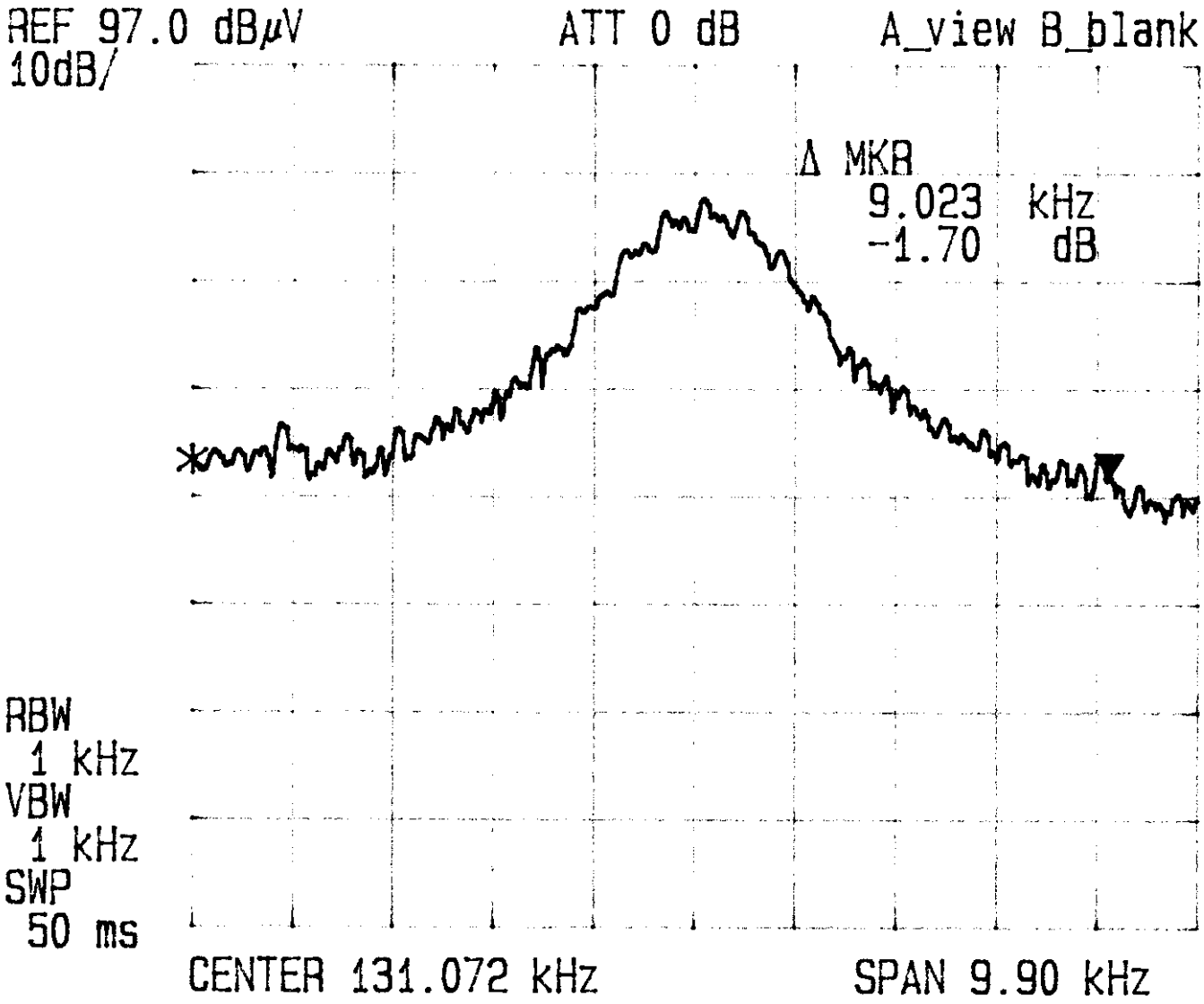
MEASUREMENT DATA:

26 dB BW = 0.009 MHz

See attached plot for detailed OBW measurements. No RF signal was found to be spread out in the adjacent restricted bands,

TELEPANEL - TX 3021

26 dB BANDWIDTH



4.2. TRANSMITTER RADIATED EMISSIONS, FCC CFR 47, PARA. 15.209

PRODUCT NAME: **Programmer, Model No.: TX3021**

FCC REQUIREMENTS:

- The rf spectrum carrier shall not fall inside the restricted bands specified in the following table.

FCC CFR 47, Part 15, Subpart C, Para. 15.205(a) - Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	162.0125 - 167.17	2310 - 2390	9.3 - 9.5
0.49 - 0.51	167.72 - 173.2	2483.5 - 2500	10.6 - 12.7
2.1735 - 2.1905	240 - 285	2655 - 2900	13.25 - 13.4
8.362 - 8.366	322 - 335.4	3260 - 3267	14.47 - 14.5
13.36 - 13.41	399.9 - 410	3332 - 3339	14.35 - 16.2
25.5 - 25.67	608 - 614	3345.8 - 3358	17.7 - 21.4
37.5 - 38.25	960 - 1240	3600 - 4400	22.01 - 23.12
73 - 75.4	1300 - 1427	4500 - 5250	23.6 - 24.0
108 - 121.94	1435 - 1626.5	5350 - 5460	31.2 - 31.8
123 - 138	1660 - 1710	7250 - 7750	36.43 - 36.5
149.9 - 150.05	1718.8 - 1722.2	8025 - 8500	Above 38.6
156.7 - 156.9	2200 - 2300	9000 - 9200	

- Fundamental and Spurious/harmonic emissions shall not exceed the limits specified in the following table:

FCC CFR 47, Part 15, Subpart C, Para. 15.209(a)
-- Field Strength Limits within Restricted Frequency Bands --

FREQUENCY (MHz)	FIELD STRENGTH LIMITS (microvolts/m)	DISTANCE (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23 °C
- Relative humidity: 43 %

POWER INPUT:

120V 60Hz.

TEST EQUIPMENT:

- EMI Receiver System/Spectrum Analyzer, Hewlett Packard, Model 8546A, Input +25dBm max., 9KHz-5.6GHz, 50 Ohms, built-in Peak, Quasi-Peak & Average Detectors, Pre-Amplifier and Tracking Signal Generator. This System includes: (1) HP 85460A RF Filter Section, S/N: 3448A00236 and (2) HP 85462A Receiver RF Section/Display, S/N: 3520A00248.
- **Spectrum Analyzer**, Advantest, Model R3271, S/N: 15050203, 100 Hz to 32 GHz)
- **Microwave Amplifier**, HP, Model 83017A, Frequency Range 1 to 26.5 GHz, 34-38 dBdB gain nominal.
- **Active Loop Antenna**, Emco, Model 6507, SN 8906-1167, Frequency Range 1 KHz - 30 MHz, @ 50 Ohms
- **Log Periodic/Bow-Tie Antenna**, Emco, Model 3143, SN 1029, 20 - 1000 MHz, @ 50 ohms.

METHOD OF MEASUREMENTS:

Refer to **ANSI 63.4-1992, Para. 8** for detailed radiated emissions measurement procedures.

Applies to harmonics/spurious that fall in the restricted bands listed in Section 15.205. the maximum permitted average field strength is listed in Section 15.209. A Pre-Amp and highpass filter are used for this measurement.

For measurement below 1 GHz, set RBW = 100 KHz, VBW $\geq$ 100 KHz, SWEEP=AUTO.

For measurement above 1 GHz, set RBW = 1 MHz, VBW = 1 MHz (Peak)

If the emission is pulsed, modified the unit for continuous operation, then use the settings above for measurements, then correct the reading by subtracting the peak-average correction factor derived from the appropriate duty cycle calculation. See Section 15.35(b) and (c).

FCC CFR 47, Para. 2.997 - Frequency spectrum to be investigated

The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10th harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC CFR 47, Para. 2.993 - Field Strength Spurious Emissions

(a) Measurements was made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.989(c) as appropriate. For equipment operating on frequencies below 1 GHz, an Open Field Test is normally required, with the measuring instrument antenna located in the far field at all test frequencies. In event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

(b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:

(1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
(2) All equipment operating on frequencies higher than 25 MHz
(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
(4) Other types of equipment as required, when deemed necessary by the Commission.

TEST RESULTS: Conforms.

TEST PERSONNEL: Mr. Vinh K. Ngo, RFI Technician

DATE: March 22, 1999

MEASUREMENT DATA

RADIATED EMISSIONS MEASUREMENTS @ 3 METERS

TEST CONFIGURATION

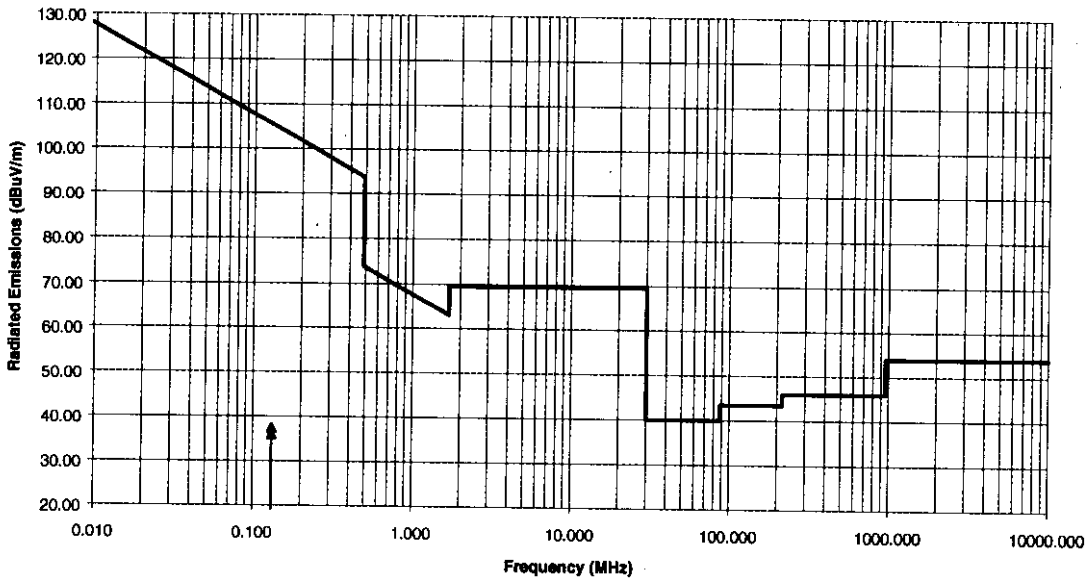
- *For measuring radiated emissions at frequencies below 1 GHz, the Spectrum Analyzer was set as 100 KHz RBW, VBW ≥ RBW, SWEEP TIME: AUTO, PEAK DETECTOR.*
- *For measuring radiated emissions at frequencies above 1 GHz, the Spectrum Analyzer was set as 1 MHz RBW, VBW ≥ RBW, SWEEP TIME: AUTO, PEAK DETECTOR.*
- *The following measurements were the worst cases when the radiating antenna was placed in both horizontal and vertical polarization.*
- ***RF Average Level:** the average rf levels were calculated by subtracting the Peak readings added by the duty cycle correction factor.* ***DUTY CYCLE FACTOR = $20LOG_{10}$(0.66) = - 3.6 dB***

CHANNEL FREQUENCY TESTED: 131.072 kHz
FULL RATED POWER: 0.01 mW

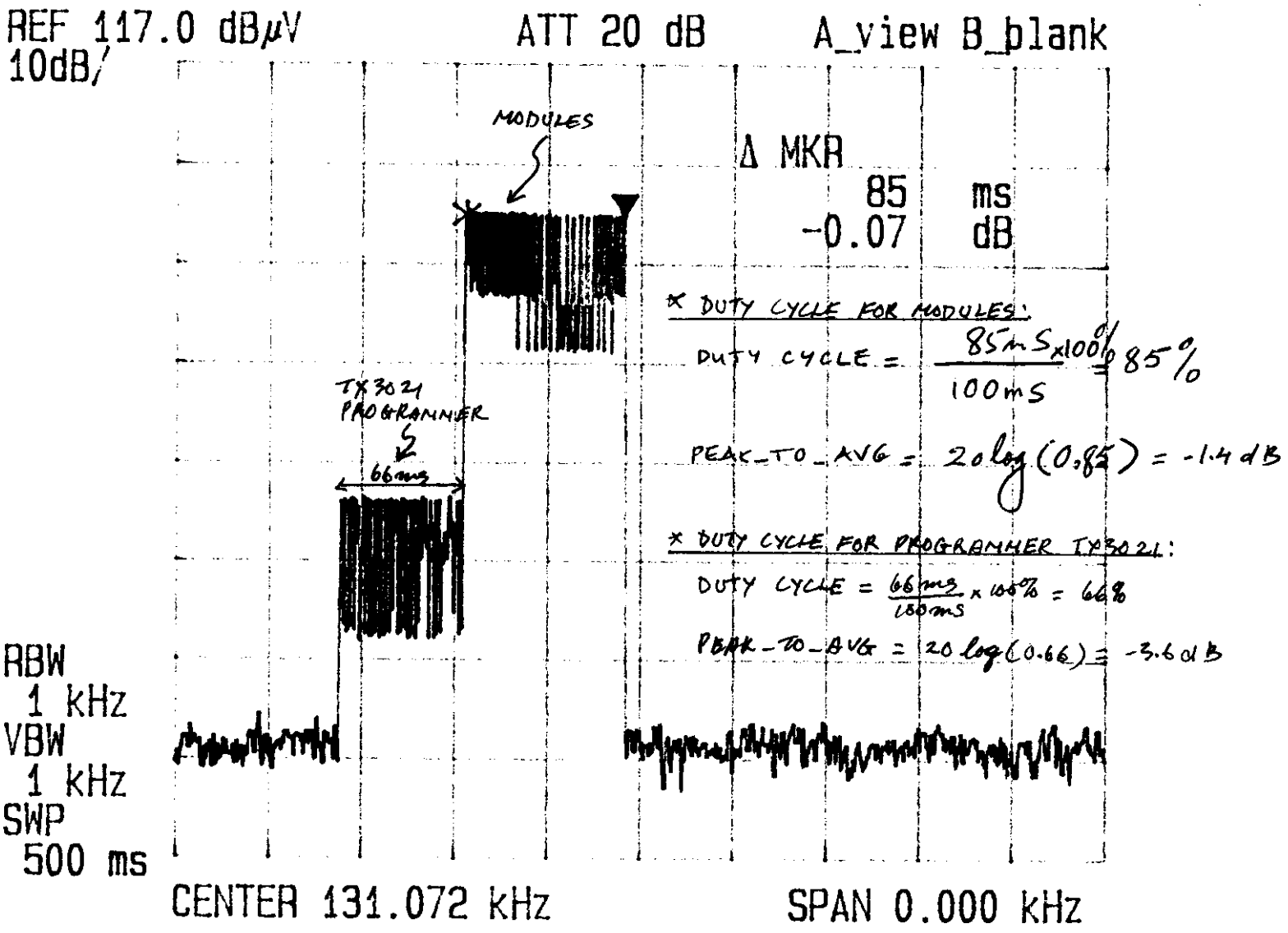
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	*LIMIT @ 3M 15.209 (dBuV/m)	LIMIT MARGIN (dB)	PASS/ FAIL
0.131	40.92	37.32	V	105.3	-68.0	PASS
0.131	39.42	35.82	H	105.3	-69.5	PASS
No other significant emissions were found in the frequency range from 130 kHz to 1 GHz						

* The limit at 300 M was converted to 3 M limit using $20\log(300/3)^2$ factor.

Transmitter Radiated Emissions Measurements at OFTS @ 3 Meters
Telepanel Systems Inc.
Programmer, Model TX3021
TRANSMIT Freq.: 131.072 kHz



TELEPANEL - TX3021 w/ ESL MODULE, N/D: 5420



* DUTY CYCLE FOR MODULES:

DUTY CYCLE = $\frac{85ms}{100ms} \times 100\% = 85\%$

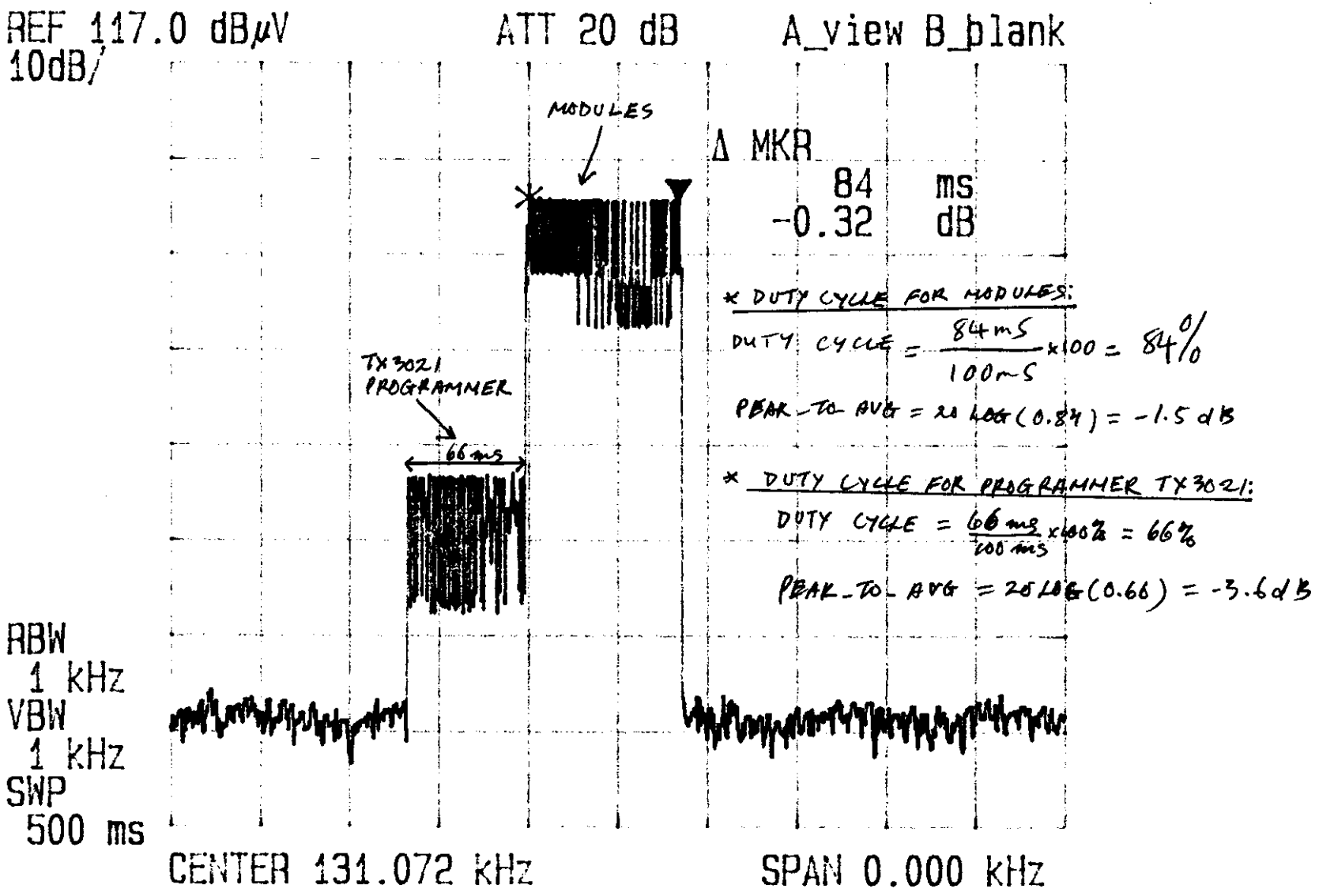
PEAK_TO_AVG = $20 \log(0,85) = -1.4$ dB

* DUTY CYCLE FOR PROGRAMMER TX3021:

DUTY CYCLE = $\frac{66ms}{100ms} \times 100\% = 66\%$

PEAK_TO_AVG = $20 \log(0.66) = -3.6$ dB

TELEPANEL - TX3021 w/ ESL MODULE, N/O: 9430



* DUTY CYCLE FOR MODULES:

DUTY CYCLE = $\frac{84\,mS}{100\,mS} \times 100 = 84\%$

PEAK-TO-AVG = 20 LOG (0.84) = -1.5 dB

* DUTY CYCLE FOR PROGRAMMER TX3021:

DUTY CYCLE = $\frac{66\,ms}{100\,ms} \times 100\% = 66\%$

PEAK-TO-AVG = 20 LOG (0.66) = -3.6 dB

4.3. AC POWERLINE CONDUCTED EMISSIONS, FCC CFR 47, PARA. 15.107(A)

PRODUCT NAME: **Programmer, Model No.: TX3021**

NAME OF TEST: **AC Powerline Conducted Emissions.**

FCC LIMIT:

The RF voltage conducted back onto the public utility lines shall not exceed 250 μV or 48.0 dBμV measured from 450 KHz to 30 MHz.

CLIMATE CONDITION:

Standard Temperature and Humidity:

- Ambient temperature: 23 °C
- Relative humidity: 43 %

POWER INPUT:

120V 60Hz.

TEST EQUIPMENT:

1. HP 8593EM EMI Receiver/Spectrum Analyzer, Frequency Range: 9 kHz-26.5GHz, with built-in Peak, Quasi-Peak and Average Detectors.
2. HP 11947A Transient Limiter, HP, Model 11947A, Frequency Range: 9KHz-200MHz, Attenuation: 10dB HP.
3. HP 7475 Plotter
4. EMCO 3825/2 LISN, Frequency Range: 9KHz-200MHz
5. RF Shielded Enclosure (16x20x12 feet)

METHOD OF MEASUREMENTS:

Refer to ANSI C63.4-1992.

TEST RESULTS: Conforms.

TEST PERSONNEL: Mr. Vinh K. Ngo, RFI Technician

DATE: March 22, 1999

MEASUREMENT DATA

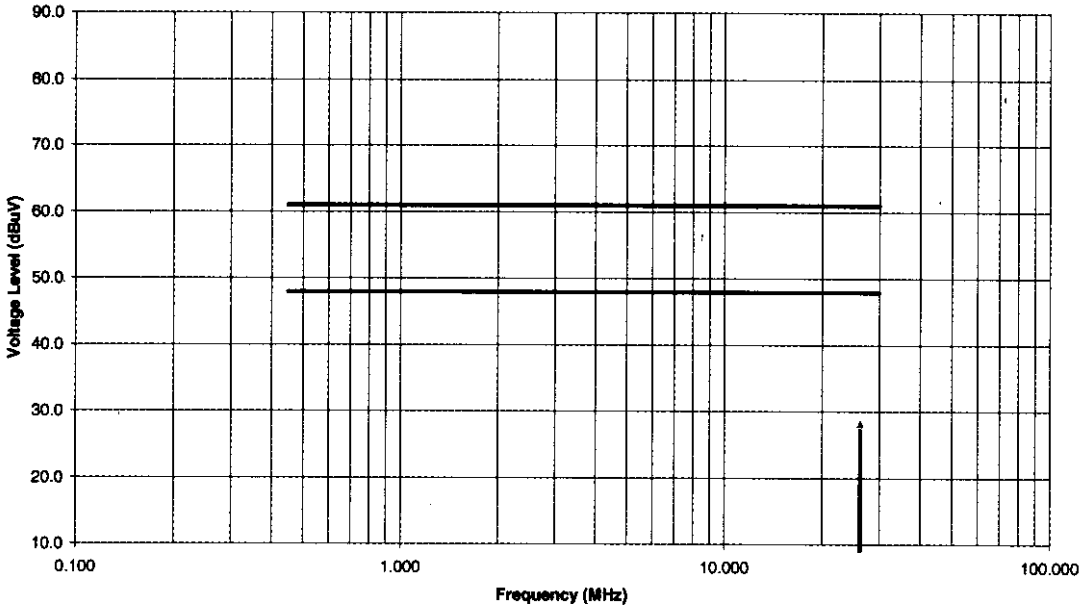
AC POWER-LINE CONDUCTED EMISSIONS

REMARKS

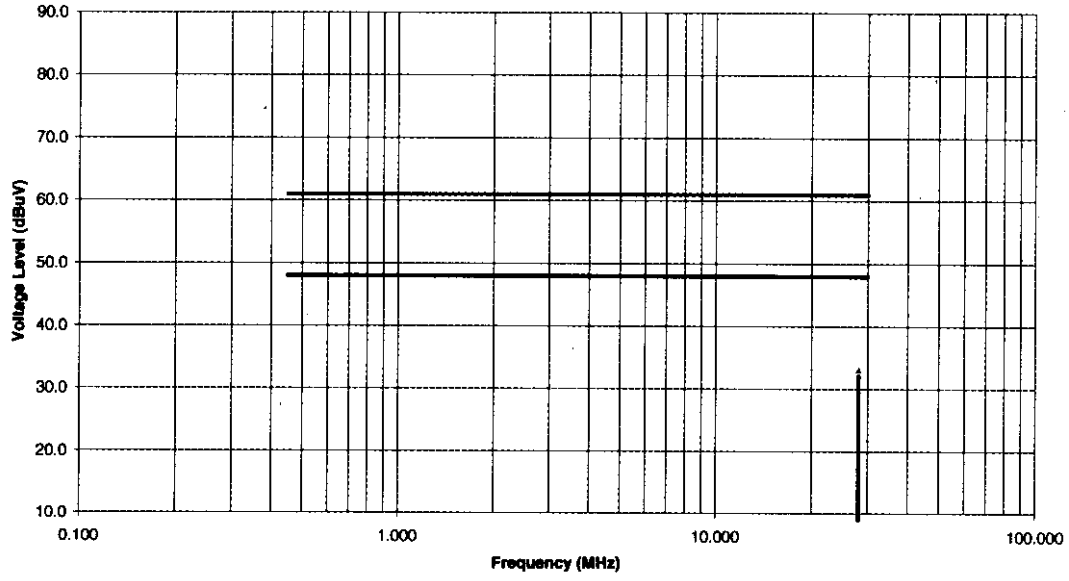
- ***All rf emissions from 450 KHz to 30 MHz were scanned, and eight highest emission levels were recorded. See attached plots.***
- ***P: Peak Detector, 10 KHz RBW, VBW ≥ RBW***
- ***Q: CISPR QUASI-PEAK, 9 KHz RBW, VBW ≥ RBW***
- ***QP/BB: for broadband emission (QP level - AVG level > 6 dB); the recorded level was QP level less 13 dB.***

FREQUENCY (MHz)	RF LEVEL (dBuV)	RECEIVER DETECTOR (P/QP/AVG)	QP/NB LIMIT (dBuV)	QP/BB LIMIT (dBuV)	MARGIN (dB)	PASS/ FAIL	LINE TESTED (L1/L2)
26.159	28.3	QP	48.0	61.0	-19.7	PASS	L1
28.130	33.2	QP	48.0	61.0	-14.8	PASS	L2

AC Conducted Emissions - Line #1 (Hot)
Ultratech Engineering Labs Inc.
Telepanel Systems Inc., TX3021



AC Conducted Emissions - Line #2 (Neutral)
Ultratech Engineering Labs Inc.
Telepanel Systems Inc., TX3021



UltraTech
Engineering Labs Inc.

POWER-LINE CONDUCTED EMISSIONS MEASUREMENTS

APPLICANT: TELEPANEL
PRODUCT: TX 3021
MODEL:

EMI Detector: [✓] Peak [✓] Quasi Peak [✓] Average Temp.: ____ °C, Humidity: ____ %
Line Tested: L1, Input Voltage: 120, Tested by: VENK Test Date: MARCH 27/99
Comments:

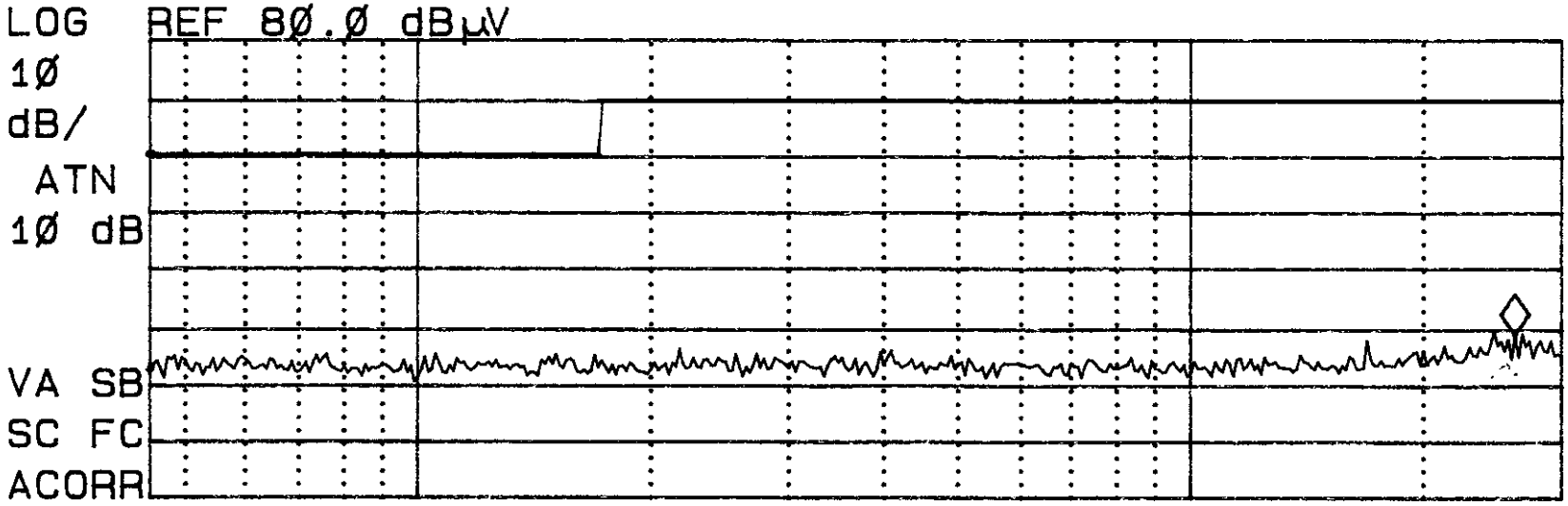
Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp	QP∆L1
1	26.159360	31.4	28.3	26.2	-41.2

MARKER → HIGH

MARKER → CF

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 26.12 MHz
28.49 dBµV

NEXT PEAK



NEXT PK RIGHT

NEXT PK LEFT

More 1 of 3

START 450 kHz
STOP 30.00 MHz
IF BW 9.0 kHz
AVG BW 30 kHz
SWP 1.33 sec

UltraTech Engineering Labs Inc.

POWER-LINE CONDUCTED EMISSIONS MEASUREMENTS

APPLICANT: TELEPANEL
PRODUCT: TX 2021
MODEL:

EMI Detector: [M] Peak [M] Quasi Peak [V] Average Temp.: ____ °C, Humidity: ____ %
Line Tested: L2, Input Voltage: 120, Tested by: VINH Test Date: MARCH 22/99
Comments:

hp

Signal	Freq (MHz)	PK Amp	QP Amp	AV Amp	QP∆L1
1	28.13Ø34Ø	35.Ø	33.2	32.2	-36.3

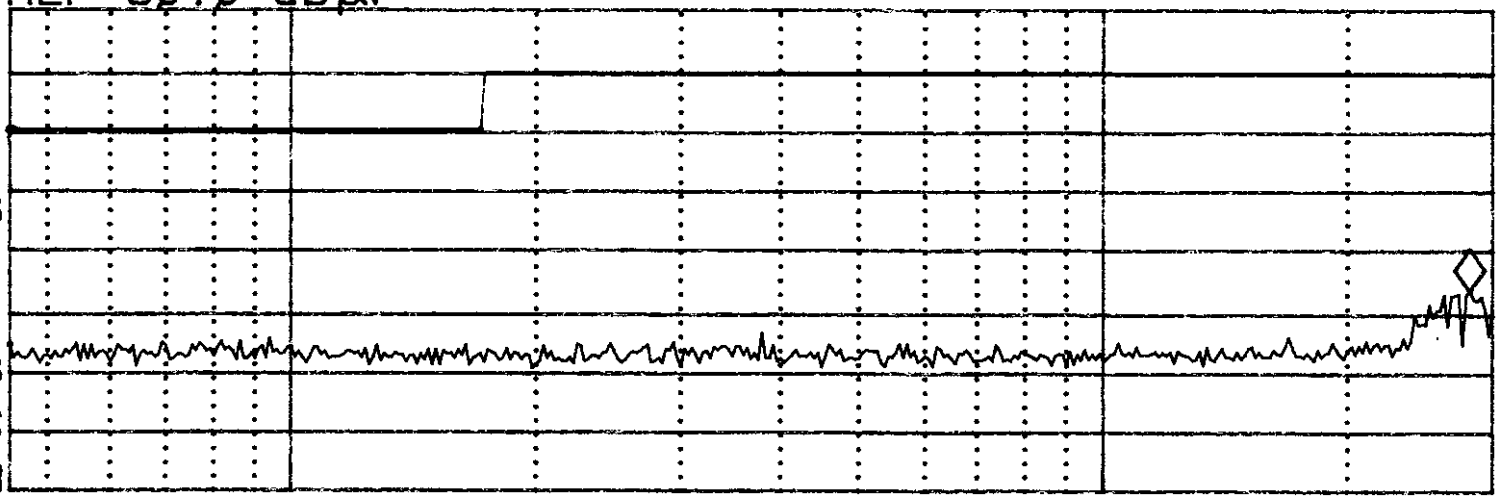
MARKER → HIGH

MARKER → CF

START 45Ø kHz

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 28.13 MHz
33.27 dBµV

NEXT PEAK



NEXT PK RIGHT

NEXT PK LEFT

More 1 of 3

START 45Ø kHz
IF BW 9.Ø kHz
AVG BW 3Ø kHz
STOP 3Ø.ØØ MHz
SWP 1.33 sec

5. EXHIBIT 5 - GENERAL TEST PROCEDURES

5.1. AC POWERLINE CONDUCTED EMISSIONS MEASUREMENTS - GENERAL TEST METHOD

- AC Powerline Conducted Emissions were performed in the shielded room, 16'(L) by 12'(W) by 12'(H).
- Conducted power-line measurements were made over the frequency range from 450 KHz to 30 MHz to determine the line-to-ground radio noise voltage which was conducted from the EUT power-input terminals that were directly connected to a public power network.
- The EUT normally received power from another device that connects to the public utility ac power lines, measurements would be made on that device with the EUT in operation to ensure that the device continues to comply with the appropriate limits while providing the EUT with power.
- If the EUT was operates only from internal or dedicated batteries, with no provisions for connection to the public utility ac power lines, ac power-line conducted measurements are not required.
- Table-top devices were placed on a platform of nominal size 1 m by 1.5m raised 80 cm above the conducting ground plane.
- The EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the power source. All unused 50-Ohm connectors of the LISN was terminated in 50-ohm when not connected to the measuring instruments.
- The line cord of the EUT connected to one LISN which was connected to the measuring instrument. Those power cords for the units of devices not under measurement were connected to a separate multiple ac outlets. Drawings and photographs of typically conducted emission test setups were shown in the Test Report. Each current-carrying conductor of the EUT shall be individually tested.
- The EUT was normally operated with a ground (safety) connection, the EUT was connected to the ground at the LISN through a conductor provided in the lead from the ac power mains to the LISN.
- The excess length of the power cord was folded back and forth in an 8-shape on a wooden strip with a vertical prong located on the top of the LISN case.
- The EUT was set-up in its typical configuration and operated in its various modes as described in 3.2 of the test report.
- A preliminary scan was made by using spectrum analyzer system with the detector function set to PEAK mode (10 KHz RBW, VBW $\geq$ RBW), frequency span 450KHz-30MHz.
- The maximum conducted emission for a given mode of operation was found by using the following step-by-step procedure:

  Step1. Monitor the frequency range of interest at a fixed EUT azimuth.

  Step2. Manipulate the system cables and peripheral devices to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.

  Step3. The effects of various modes of operation is examined. This is done by varying equipment operation modes as step 2 is being performed.

  Step4. After completing step 1 through 3, record EUT and peripheral device configuration, mode of operation, cable configuration, signal levels and frequencies for final test.

- Each highest signal level at the maximized test configuration was zoomed in a small frequency span on the spectrum analyzer's display (the manipulation of cables and peripheral devices and EUT operation modes might have to be repeated to obtain the highest signal level with the spectrum analyzer set to PEAK detector mode 10 KHz RBW and VBW ≥ RBW). The spectrum analyzer was then set to CISPR QUASI-PEAK detector mode (9 KHz RBW, 1 MHz VBW) and the final highest RF signal level and frequency was record.

- ***Broad-band ac Powerline conducted emissions***:- If the EUT exhibits ac Powerline conducted emissions that exceed the limit with the instrument set to the quasi-peak mode, then measurements should be made in the average mode. If the amplitude measured in the quasi-peak mode is at least 6 dB higher than the amplitude measured in the average mode, the level measured in quasi peak mode may be reduced by 13 dB before comparing it to the limit.

5.2. ELECTRICAL FIELD RADIATED EMISSIONS MEASUREMENTS - GENERAL TEST METHOD

- The radiated emission measurements were performed at the UltraTech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario. The Attenuation Characteristics of OFTS have been filed to FCC.

- Radiated emissions measurements were made using the following test instruments:

    1) Calibrated EMCO active loop antenna in the frequency range from 10 KHz to 1 MHz
    2) Calibrated EMCO biconilog antenna in the frequency range from 30 MHz to 2000 MHz.
    3) Horn Antennas:
        a) Horn Antenna, Emco, Model 3115, 1 – 18 GHz
        b) Horn Antenna, Emco, Model 3160-09, 18-26.5GHz
        c) Horn Antenna, Emco, Model 3160-10, 26.5-40GHz
        d) Mixer, Tektronix, P/N 118-0098-00, 18-26.5GHz
        e) Mixer, Tektronix, P/N 119-0098-00, 26.5-40GHz
    4) Calibrated Advantest spectrum analyzer and pre-selector/pre-amplifier. In general, the spectrum analyzer would be used as follows:

        – The rf electric field levels were measured with the spectrum analyzer set to PEAK detector (1 KHz RBW and 1 KHz VBW for frequency below 30 MHz, 100 KHz RBW and VBW ≥ RBW for Frequency below 1 GHz and 1 MHz RBW and 1 MHz VBW for frequency greater than 1 GHz).

        – If any rf emission was observed to be a broadband noise, the spectrum analyzer's CISPR QUASI-PEAK detector (120 KHz RBW and 1MHz VBW) was then set to measure the signal level.

        – If the signal being measured was narrowband and the ambient field was broadband, the bandwidth of the spectrum analyzer was reduced.

- The EUT was set-up in its typical configuration and operated in its various modes as described in 3.2 of the test report.

- The frequencies of emissions was first detected. Then the amplitude of the emissions was measured at the specified measurement distance using required antenna height, polarization, and detector characteristics.

- During this process, cables and peripheral devices were manipulated within the range of likely configuration.

- For each mode of operation required to be tested, the frequency spectrum was monitored. Variations in antenna heights (from 1 meter to 4 meters above the ground plane), antenna polarization (horizontal plane and vertical plane), cable placement and peripheral placement (each variable within bounds specified elsewhere) were explored to produce the highest amplitude signal relative to the limit.

The maximum radiated emission for a given mode of operation was found by using the following step-by-step procedure:

Step1: Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.

Step2: Manipulate the system cables to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.

Step3: Rotate the EUT 360 degrees to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat Step 2. Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.

Step4: Move the antenna over its full allowed range of travel (1 to 4 meters) to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to Step 2 with the highest amplitude observation and proceed.

Step5: Change the polarization of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarization. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.

Step6: The effects of various modes of operation is examined. This is done by varying the equipment modes as steps 2 through 5 are being performed.

Step7: After completing steps 1 through 6, record the final highest emission level, frequency, antenna polarization and detector mode of the measuring instrument.

Calculation of Field Strength:

The field strength is calculated by adding the calibrated antenna factor and cable factor, and subtracting the Amplifier gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where	FS	=	Field Strength
	RA	=	Receiver/Analyzer Reading
	AF	=	Antenna Factor
	CF	=	Cable Attenuation Factor
	AG	=	Amplifier Gain

Example: If a receiver reading of 60.0 dBμV is obtained, the antenna factor of 7.0 dB/m and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:.

Field Level in dBμV/m = 60 + 7.0 + 1.0 - 30 = 38.0 dBμV/m.

Field Level in μV/m = $10^{(38/20)}$ = 79.43 μV/m.

Notes: The frequency and amplitude of at least six highest conducted emissions relative to the limit are recorded unless such emissions are more than 20 dB below the limit. If less than six emissions are within 20dB of the limit, the background or receiver noise level shall be reported at representative frequencies.

6. EXHIBIT 6 - INFORMATION RELATED TO EQUIPMENT UNDER TESTS

6.1. FCC ID LABELING AND SKETCH OF FCC LABEL LOCATION

Refer to the attached sheets

6.2. PHOTOGRAPHS OF EQUIPMENT UNDER TEST

Refer to the attached photographs

6.3. SYSTEM BLOCK DIAGRAM(S)

Refer to the attached sheets

6.4. SCHEMATIC DIAGRAMS

Refer to the attached sheets

6.5. USER'S MANUAL WITH "FCC INFORMATION TO USER STATEMENTS"

Refer to the attached Users' manual