EXHIBIT 4

FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

GRANT OF TYPE ACCEPTANCE

Television Technology Corporation
5970 West 60th Avenue
Arvada, CO 80003

Attention: Mr. John F. Rietz

Re: Application dated January 22, 1980

Name of grantee Television Technology Corporation

Equipment Type Number XL 10FM

Manufacturer Television Technology Corporation

Pursuant to the above referenced application, TYPE ACCEPTANCE of the equipment specified IS HEREBY ISSUED to the above-named GRANTEE for use under the Commission's Rules and Regulations as shown herein.

DATE OF GRANT: May 14, 1980

Note(s)	Rule(s) Part Number(s)	Frequency Range (MHz)	Input Watts	Output Watts	Frequency Tolerance	Emission
**	74	88-108	-	10	-	FMTRSLATR

Remarks:

** Provides up to two outputs. Power shown is for each output.

also 1F

C-6
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FEDERAL COMMUNICATIONS COMMISSION

FCC Form 723A
October 1977

Type Acceptance File Copy

FCC Form 731
March 1976

This form may be reproduced ONLY in accordance with the requirements on reverse side of this application.

FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

Approved By GAO
B-180227(R0351)

APPLICATION FOR EQUIPMENT AUTHORIZATION- RADIOFREQUENCY DEVICES

INSTRUCTIONS

A. Use this form as a cover sheet and attach the information required by Subpart J of Part 2, Part 15, or Part 18 of FCC Rules, enumerating the exhibits in Item 9 below.

B. Submit ONE COPY of the completed application, together with the fee required (See §§ 1.1102 and 1.1120 of FCC Rules) to Federal Communications Commission, P. O. Box 19302, Washington, D. C. 20036.

1. Application is for *(check only one box)* ☐ Certification ☒ Type Acceptance ☐ Type Approval

2. (a) Name of Applicant
Television Technology Corporation

(b) Address of Applicant (number, street, city, state, zip code)
5970 West 60th Avenue
Arvada, Colorado 80003

(c) To the attention of
John F. Rietz

3. Name and address of person to whom authorization is to be sent (if different from Item 1)

4. Name and address of manufacturer of equipment (if different from Item 1)

5. (a) Kind of equipment
Translator, FM

(b) Power Supply *(check one)* ☒ AC ☐ Battery ☐ Other *(specify)* _____

(c) Trade Name(s)
Television Technology Corporation

(d) Model Number(s) or Type Number
XL-10FM

	YES	NO
6. (a) Is this application for a modification of a previously type approved equipment or for a change in its identification?		X
(b) If "YES," state the previous identification of the equipment		

7. EQUIPMENT SPECIFICATIONS

(a) Frequency range Any Single FM radio channel 88 - 108 MHz	(b) Rated RF power output (if variable, give range) 10 watts (2 outputs)
(c) Power input to final RF amplifier (if applicable) 24 watts	(d) Rated frequency tolerance .0025%

APPLICANT SHOULD NOT USE THIS BLOCK

	ACCOUNTING CLASSIFICATION

(This form supersedes FCC Forms 722, 723, and 729.)

- over -

January, 1980

TABLE OF CONTENTS OF EXHIBITS

TABLE OF CONTENTS OF EXHIBITS CONT.'D

EXHIBIT 1

TYPE ACCEPTANCE STATEMENT 10 WATT FM RADIO TRANSLATOR

XL-10FM

A paragraph by paragraph reference is given herein, presenting the required data for type acceptance of the XL-10FM translator. Exhibits are attached to authenticate this application. If further data is required, it will be furnished upon request.

TTC requests that type acceptance of the XL-10FM include operation of the XL-10FM with only one (1) of its two (2) power amplifiers. The XL-10FM has two (2) RF 10 watt output amplifiers. Each operates completely independently of the other. When only one amplifier is required, the factory simply deletes the second amplifier module.

The unit tested in this report was operating on input channel 272 (102.3 MHz) and output channel 260 (99.9 MHz). These channels were chosen arbitrarily to provide protection to and from existing radio services, and to facilitate the measurement of possible spurious products radiated from the XL-10FM.

The results noted here are regarded as typical if not "worst case" based on our long experience as translator manufacturers, including FM translators. While input signals for tests were from a FM stereo generator (Exhibits 4A and 5), a FM stereo broadcast station (102.3 MHz) was used also as input to check translated audio quality under normal "off the air" signal input conditions. The translator output was properly terminated with a resistive type RF load.

Engineers Qualifications (Part 2.909 (d)):

See Exhibit 3.

2.983 (a):

Applicant is the manufacturer of the equipment.

2.983 (b):

See FCC form 731

2.983 (c):

Quantity production of the XL-10FM is planned.

2.983 (d): - Technical Description of Equipment:

See FCC form 731, the XL-10FM Instruction Manual, Exhibit 2 and the paragraph by paragraph summary of compliance with Part 74, sub part L of the Commissions Rules which follows.

74.1250 (c) (1) - Frequency Response (Bandwidth):

The test equipment was set-up as shown in Figure 4A. Since the translator contains limiting, a normal swept RF technique can not be used to check the frequency response. Instead, the stereo generator was modulated at a low level from 1 to 100 kHz , and the output of the XL-10FM was demodulated by a wideband receiver. No AGC is used in the front end of the unit and the response does not change when the input level is varied from 30 to 3000 uV (-30 to 60 dBmv). The data is tabulated in Exhibit 4B and plotted in Exhibit 4C.

74.1250 (c) (2) - Radio harmonics and other spurious emmissions at output terminals (74.1236 (c)) also 2.991 and 2.997:

Translator and test equipment were set-up as described in Exhibit 5, Measurements of Spurious Radiation. The XL-10FM's output products were displayed by the spectrum analyzer directly in dB below the 10 watt carrier. Below is a list of the products found and identified.

Frequency in (MHz)	Level below 10 watts (dB)	Identity
89.2	-80	Output - IF
110.6	-80	Lo 2
199.8	-78	2 x Output
299.7	-90	3 x Output
399.6	-92	4 x Output

Maximum of all others 10 to 1500 MHz: Greater than -100dB.

2.993 (and 2.997) - Field strength of spurious radiation - radiated.

The radiated spurious emissions were measured by using a dipole antenna at fifteen meters from the translator. The translator and/or antenna was rotated for a maximum reading in each case and the results therefore represent the "worst case" condition for each frequency.

The radiated spurious radiation limit was calculated at each frequency as the voltage induced in a receiving dipole in a field 60dB below that created by 10 watts radiated from a dipole and fifteen meters from the equipment. All products known to exist due to the device's makeup (channel combination, oscillator-multiplier chain, etc.) and products found during earlier measurements are investigated first. Then the spectrum is searched for other products traceable to the device under test. This reduces the possibility of overlooking products hidden by the clutter of other radio sources received in the measurement area. No other spurious signals traceable to the XL-10FM were found. See Exhibit 6, Specification Limit Calculation, spurious conducted products.

Frequency	Amplitude (uV)	Maximum Allowable (uV)
10.7	less than 1	6,673
89.2	less than 1	800
110.6	less than 1	646
199.8	22	357
299.7	17	238
399.6	87	178
499.5	15	143
599.4	43	119
699.3	2.7	102

The equipment used was a dipole antenna cut to frequency wit HP 8558B spectrum analyzer.

74.1250 (c) (3) - Frequency Stability:

The frequency determining components of the XL-10FM were tested as directed by paragraph 2.995 of the rules. The test set up and equipment used are shown in exhibit 7A. Results of measurements and calculations are tabulated in exhibit 7B. Graph, exhibit 7C, displays the tabulated data.

The crystals are calibrated by the manufacturer for operation in a series resonant circuit at 20 degrees centigrade to an accuracy of .001%. Frequency changes of the oscillators are less than .002% over the range of minus 30 to plus 50 degrees centigrade, and the combined conversion circuits contribute less change in output carrier frequency. This improved accuracy results from dual conversion circuitry because a corresponding temperature change of both oscillators causes the first and second conversions to shift their output frequencies in opposite directions. The combined conversion accuracy is well within the .005% of the output channel required by FCC rules.

There are negligible frequency changes (less than 1 Hz) when AC input power is varied 85% to 115% (117 vAC $\pm$ 15%).

74.1250 (c) (4) and 2.983 (e) with 2.985 - Power output stability (AGC):

Exhibit 8 tabulates and graphs the XL-10FM output power as a function of input signal level. The test set up and equipment used is diagramed in exhibit 4A.

EXHIBIT 1

The input signal from the signal generator was adjusted by the calibrated attenuator to 300 uV at 75 Ohms at the translator input. The translator output level controls were adjusted so that the output power read 10 watts on both amplifiers as indicated on their respective calibrated power meters. The RF power attenuators were suitable resistive loads. (VSWR less than 1.05)

The input signal was then varied 30 dB above and 10 dB below 300 uV (-10 dBmv). The translator does not exceed 10 watts under any conditions. Output power does not drop until the automatic turnoff system is triggered, causing the translator to shut down. This occurs at 20 uV (-34 dBmv). The XL-10FM has output level controls. A suitable label is silkscreened to the chassis adjacent to the controls, and is a warning against misadjustment in the field. See photo exhibit 9A for location. For the text of label see exhibit 10A.

74.1250 (c) (5) (also 74.1234 (a) (2)) - Automatic shutdown control:

The XL-10FM is in a non-radiating condition when no signal is being received on the input channel, either due to absence of a transmitter signal or failure of the receiving portion of the translator. A technical description of the operation of these circuits is found in paragraph 3.4.7, section 3 of the owners manual, exhibit 2.

74.1250 (c) (6) and 2.985 (a) - Final radio frequency amplifier parameters and metering:

Each RF stage has two CTC 2N6199/B25-28 transistors rated at 25 watts, Class C, at 28 vdc. Operating in the XL-10FM, the collector-emitter voltage is 24.0 volts 1.0 A or typically 24.0 watts input for 10 watts output. Stage efficiency is about 42%. Appropriate heat sinking and the parameters stated insure operation well within the manufacturer's ratings.

The metering circuits provided in the XL-10FM enable the owner/operator to monitor and adjust the translator for proper operation. He is provided a set of test readings (exhibit 2, page I) to use as a standard for his specific unit.

Power reading is separately calibrated against an external standard. Should this metering fail, the translator's power output may be determined by the indirect method. (exhibit 2, sec. 4.6) The efficiency factor is 42%.

EXHIBIT 1

74.1250 (c) (7) - Station identification:

The XL-10FM has provision for code keyer/identifier. See exhibit 2, section 3.13 for description of the keyer. The keyer provides a 500 Hz nominal audio tone which amplitude modulates both outputs a minimum of 30%. See exhibit 10 showing the amplitude modulation of the output. Should the originating station provide translator station identification, the code keyer is disconnected.

74.1250 (c) (8) - Construction practices:

Wiring, shielding and construction is in accordance with accepted principles of good engineering practice. Apparatus is constructed on a manufactured aluminum chassis suitably finished to resist corrosion and modularized for RF shielding between subassemblies.

2.983 (f) and 2.1003 - Name plate and identification labels:

A rear panel photograph, exhibit 9B, shows the location of the identification label of the XL-10FM. It contains all the information required by paragraph 2.1003. The text of the label is shown in exhibit 10B.

2.983 (g) - Photographs of equipment:

See exhibits 9A, 9B, 9C, 9D, 9E, 9F, 9G, 9H, 9I, and 9J.

Television Technology Corporation

5970 West 60th Avenue · Arvada, Colorado 80003
(303) 423-1652 / TWX 910-936-0396

January 22, 1980

EXHIBIT 3

ENGINEER'S QUALIFICATION

I, Jon Sawyer, do hereby certify that the attached information was prepared by me or under my direction.

My qualifications as a competent engineer include the following:

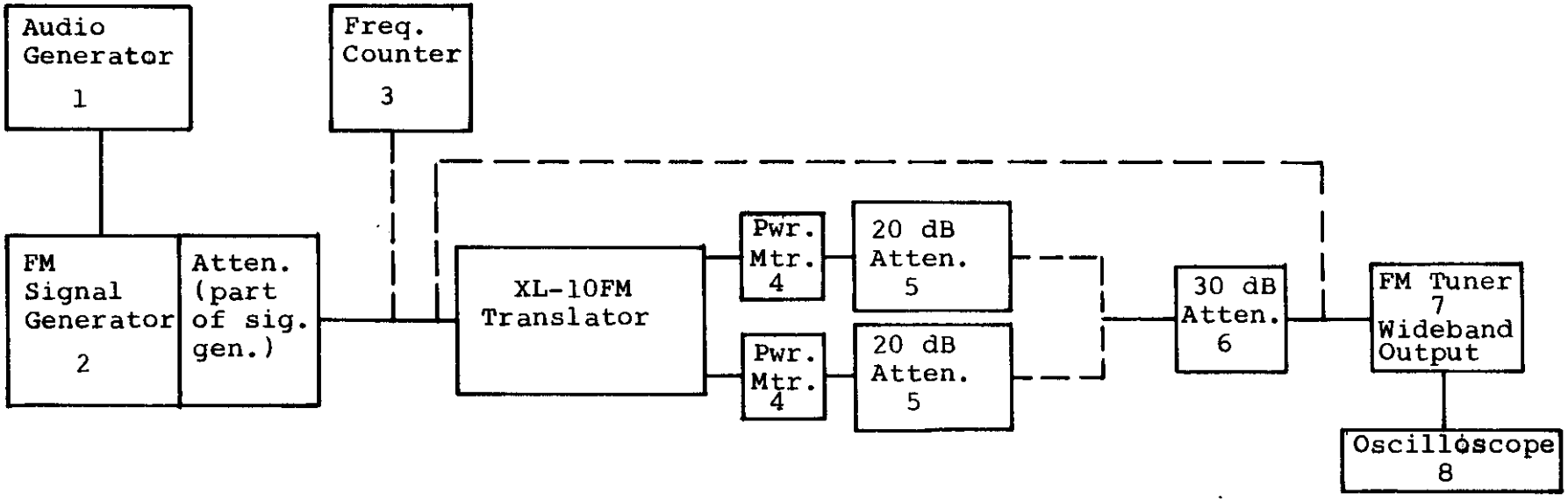
1. Four years plus graduate study in Electrical Engineering at George Washington University and the University of Colorado.

2. Five years original circuit design of VHF/UHF converters, amplifiers, power amplifiers and control circuitry.

3. I am a member of IEEE Broadcasting Society.

Jon Sawyer

JS/sk



1. Audio Generator, Sound Technology, Model 1400A s/n103-01312
2. FM Signal Generator, Sound Technology, Model 1000A s/n 125-09501
3. Frequency Counter, Hewlett Packard, Model 5382A s/n 1408A00783
4. Power Meter, Bird, Model 4337
5. RF Attenuator, TTC, 20 Watt, 20 dB, SWR 1.05
6. Attenuator, Blonder Tongue, Model 4121
7. FM Tuner, Kenwood, Model KT8300 s/n 510953
8. Oscilloscope, Tetronix, Model 465

EXHIBIT 4A

EQUIPMENT USED TO DETERMINE TRANSLATOR BANDWIDTH AND AGC CHARACTERISTICS

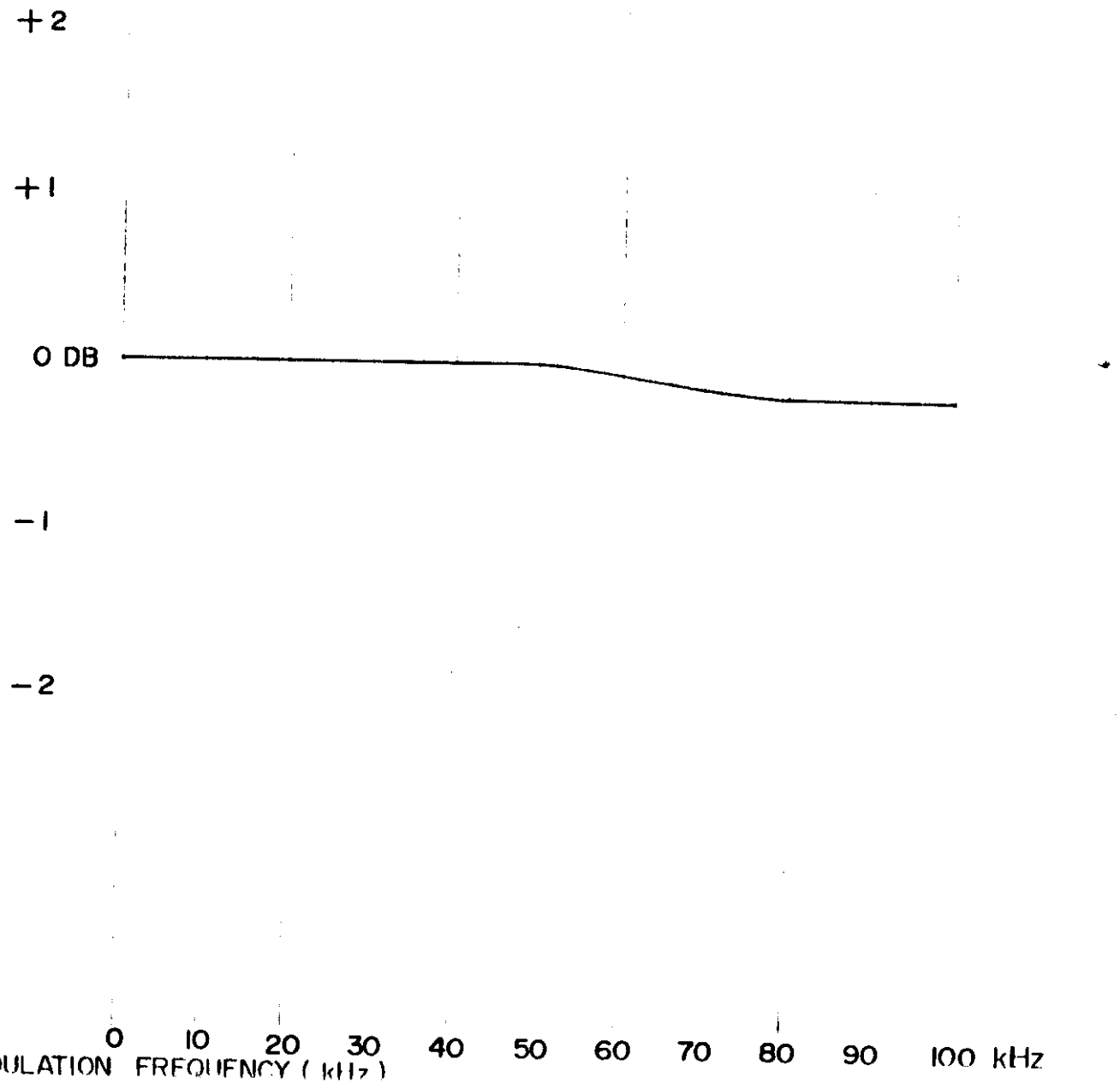
EXHIBIT 4B

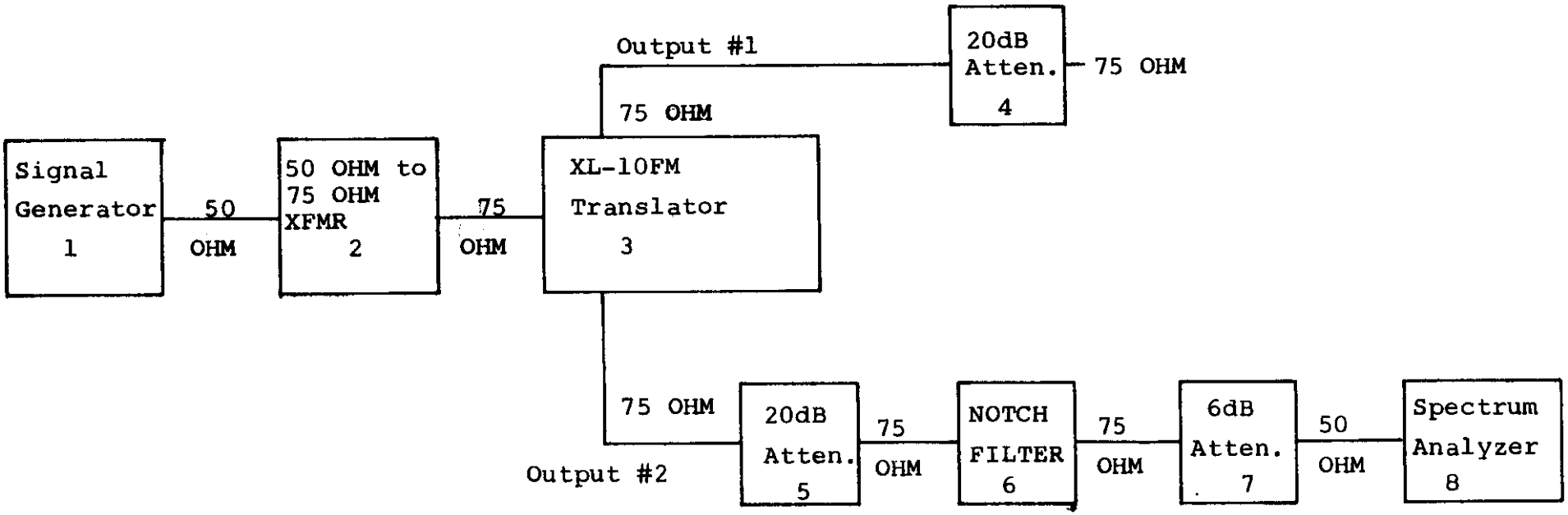
TABULATED DATA OF TRANSLATOR RESPONSE OVER CHANNEL

Modulation Frequency (kHz)	Generator/ Receiver Back to Back (mV P-P)	Generator/ Receiver through XL-10FM (mV P-P)	Translator Response (mV P-P)
1	104	104	0
5	104	104	0
10	104	104	0
20	104	104	0
35	100	100	0
50	96	96	0
75	88	86	-2 (-.2 dB)
100	74	72	-2 (-.2 dB)

EXHIBIT-4C

PLOT OF TRANSLATOR RESPONSE OVER CHANNEL





1. Signal Generator, Sound Technology, Model 1000A s/n 125-09507
2. 50 Ohm to 75 Ohm Transformer, Wide Band Engineering, Model 4-65 s/n 11375
3. Translator, XL-10FM
4. 20dB 75 Ohm 20 Watt Attenuator, PPA-20-20 s/n none
5. 20dB 75 Ohm 20 Watt Attenuator PPA-20-20 s/n none
6. Notch Filter, Jerrold, TFM-2 s/n none
7. 6dB 75 to 50 Ohm Attenuator, s/n none
8. Spectrum Analyzer, Hewlett-Packard 8559A s/n 1909A00167
   with 182T Main Frame s/n 1910A03658

EXHIBIT 5

OUTPUT MEASUREMENTS OF SPURIOUS RADIATION

EXHIBIT 6

SPECIFICATION LIMIT CALCULATION - SPURIOUS RADIATION

The specification limit of the measured voltage was calculated as follows:

REFERENCE DATA FOR RADIO ENGINEERS (Fifth Edition) Pages 25 - 7 (15)

For a dipole, the field strength is:

$$\mathcal{E} = \sqrt{49.2\, P_t}/R$$

Where
R is radius in meters
P_t is in watts

If R = 15 meters, Then:

$$\mathcal{E} = \frac{7}{15}\sqrt{P_t} = .47\sqrt{P_t} \quad \text{Volts/Meter}$$

and

For 10 Watts Output

$$\mathcal{E} = .47\ \sqrt{10} = 1.48 \text{ Volts/Meter}$$

The limit for $\mathcal{E}$ is 60dB below 1.48 Volts/Meter.

This is: $\frac{1.48 \text{ Volts}}{1000}$/ Meter = $\frac{1480 \text{ millivolts}}{1000}$/Meter

The maximum allowable is:

Max. = 1.48 mv/Meter

Power intercepted by a receiving antenna (P_r) in a field intensity of P Watts/Sq. Meter is: (Page 25 - 8)

$$P_r = P \text{ (Antenna Area)}$$

$$= P\, G_r \lambda^2 / 4\pi$$

$$P = \frac{4\pi P_r}{G_r \lambda^2}$$

Substitute

$$P = \frac{\mathcal{E}^2}{120\pi} \quad \text{and} \quad P_r = \frac{E^2}{Z}$$

Where
E is voltage delivered to load Z

$$\frac{\mathcal{E}^2}{120} = \frac{4\pi}{G_r \lambda^2} \quad \frac{E^2}{Z}$$

EXHIBIT 6

SPECIFICATION LIMIT CALCULATION - SPURIOUS RADIATION

$$\mathcal{E}^2 = \frac{480\,\pi^2\,E^2}{G_r\,\lambda^2\,Z}$$

$$\mathcal{E} = \frac{21.9\,\pi\,E}{\lambda\sqrt{G_r\;Z}}$$

For Z = 75 ohms, and G_r (Dipole) = 1.64, and noting $\lambda f = 300$ (f in MHz):

$$\mathcal{E} = \frac{21.9\,\pi\,f\;E}{\sqrt{1.64\quad x\quad 75}\;(300)}$$

$$= \frac{21.9\quad f\;E}{11.1\quad (300)} = .02066\;f\;E$$

Therefore:

$$\mathcal{E} = .02066\;f\;E$$

Using the maximum allowable value for field strength of $\mathcal{E}$ = 2.2 Millivolts/Meter:

$$\frac{1.48}{.02066} = f\,E_{max} = 71.4$$

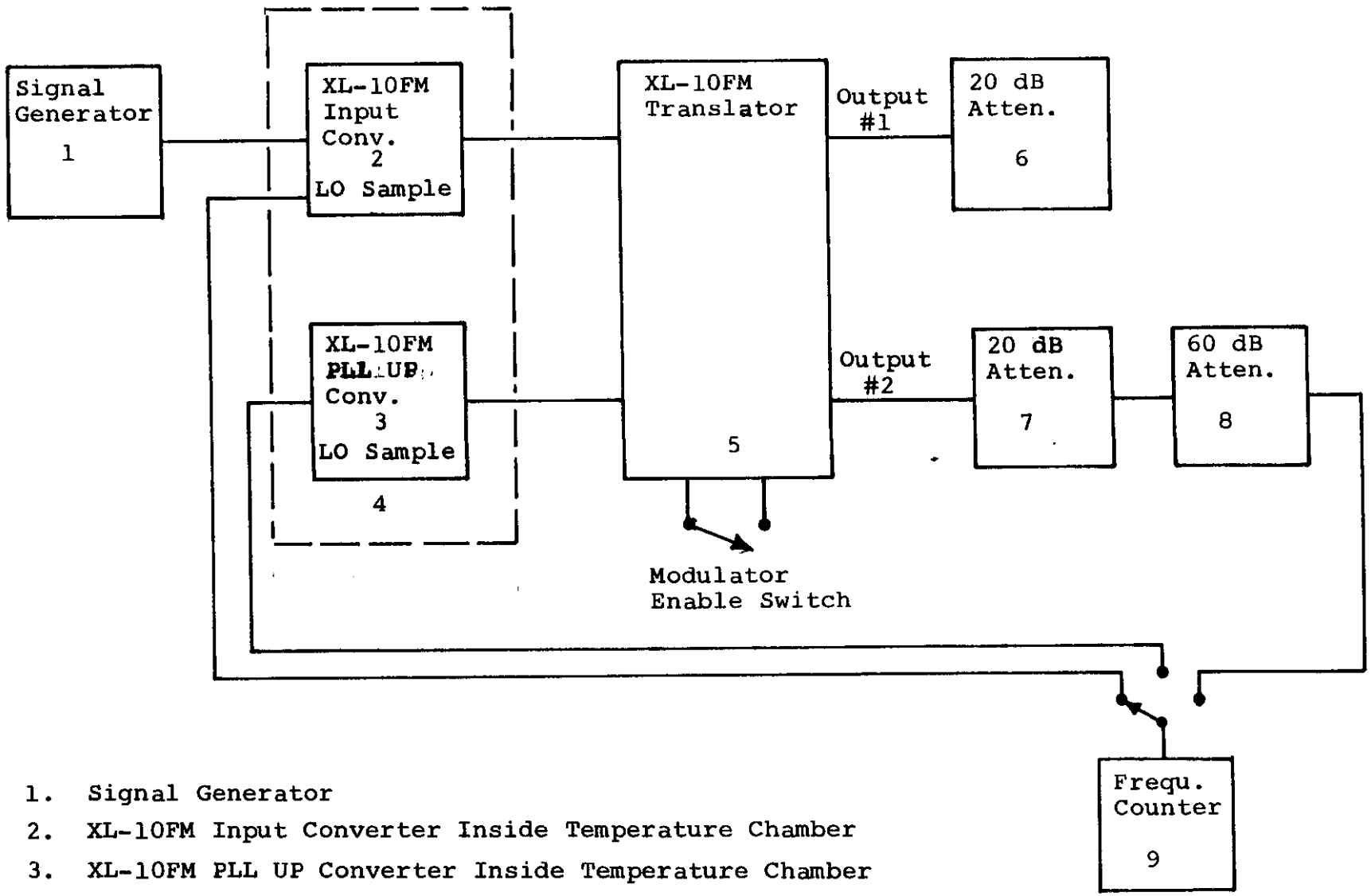
Therefore:

The maximum voltage measured with a dipole at any one frequency is:

$$E_{max} = \frac{71.400}{f}\ uV$$

EXHIBIT 7A

EQUIPMENT SETUP FOR TRANSLATOR FREQUENCY OVER TEMPERATURE



1. Signal Generator
2. XL-10FM Input Converter Inside Temperature Chamber
3. XL-10FM PLL UP Converter Inside Temperature Chamber
4. Temperature Chamber, Delta Design, Model 6545W s/n 387
5. XL10FM Translator
6. 20 dB 75 Ohm 20 Watt Attenuator
7. 20 dB 75 Ohm 20 Watt Attenuator
8. 60 dB 75 Ohm to 50 Ohm Attenuator
9. Frequency Counter, Hewlett Packard, Model 5382A s/n 1408A00783

FREQUENCY DRIFT VS TEMPERATURE CHANGE

Input Channel 272 102.3
IF 10.7 MHz
Output Channel 260 99.9

Local OSC 1 = 113.0 MHz
Local OSC 2 = 110.6 MHz

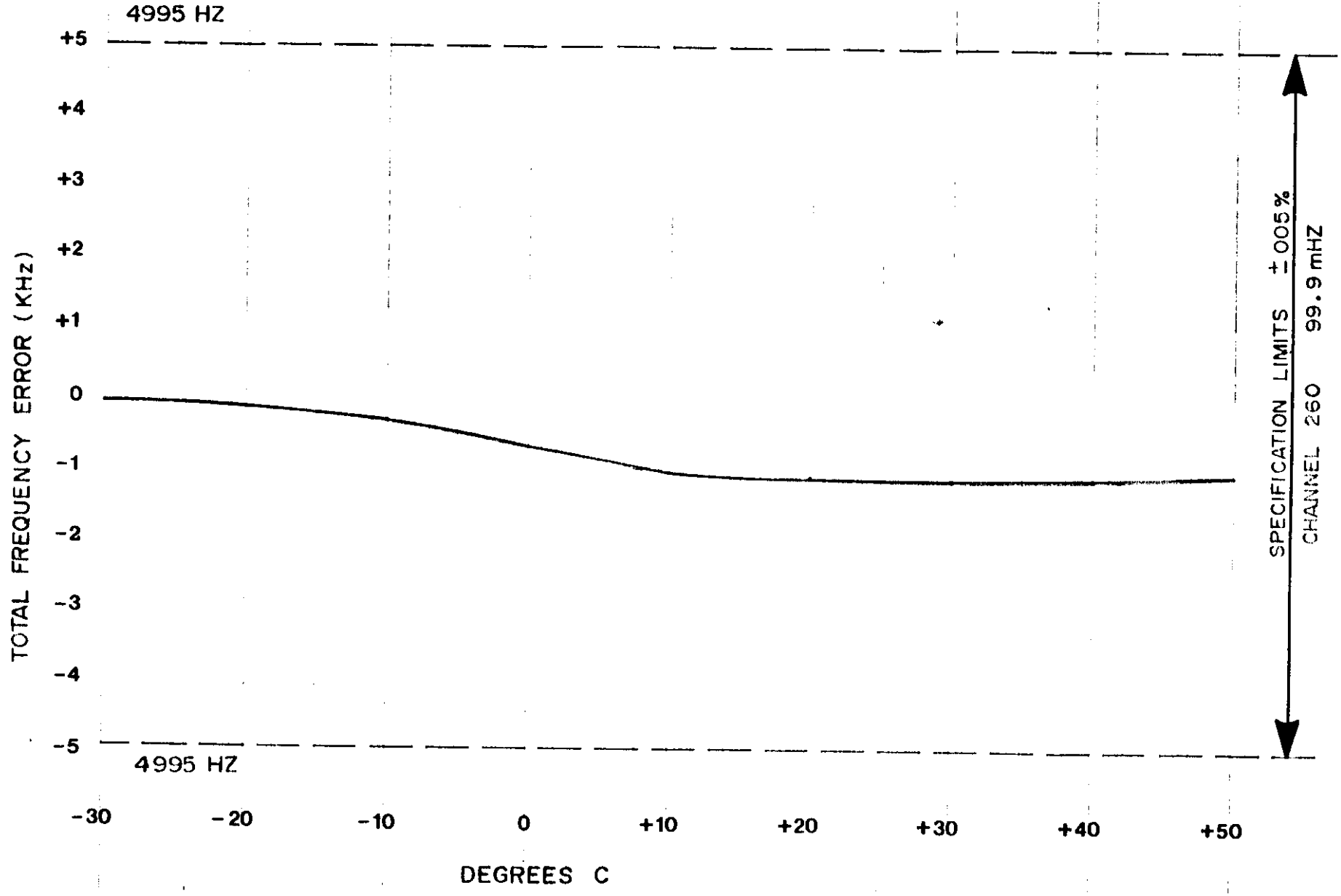
C	INJ1 Measured F 75	INJ1 Ref. 20 C Δ f (Hz)	INJ2 Measured	INJ2 Ref. 20 C Δ f (Hz)	Combined Output Ref 20 C (Hz)	Absolute Output Δ f Ref. 93.9 MHz* (Hz)
50	112.999	-370	110.59869	-360	+10	-1060
40	112.99980	-320	110.59867	-380	-60	-1130
30	112.99991	-210	110.59875	-300	-90	-1160
20	113.00012	0 (Ref)	110.59905	0 (Ref)	0 (Ref)	-1070
10	113.00045	+330	110.59940	+350	+20	-1050
0	113.00073	+610	110.60002	+970	+360	-710
-10	113.00087	+750	110.60055	+1500	+750	-320
-20	113.00082	+700	110.60066	+1610	+910	-160
-30	113.00038	+260	110.60029	+1240	+980	-90

* REF = +2190 Hz @ 20 C as follows:

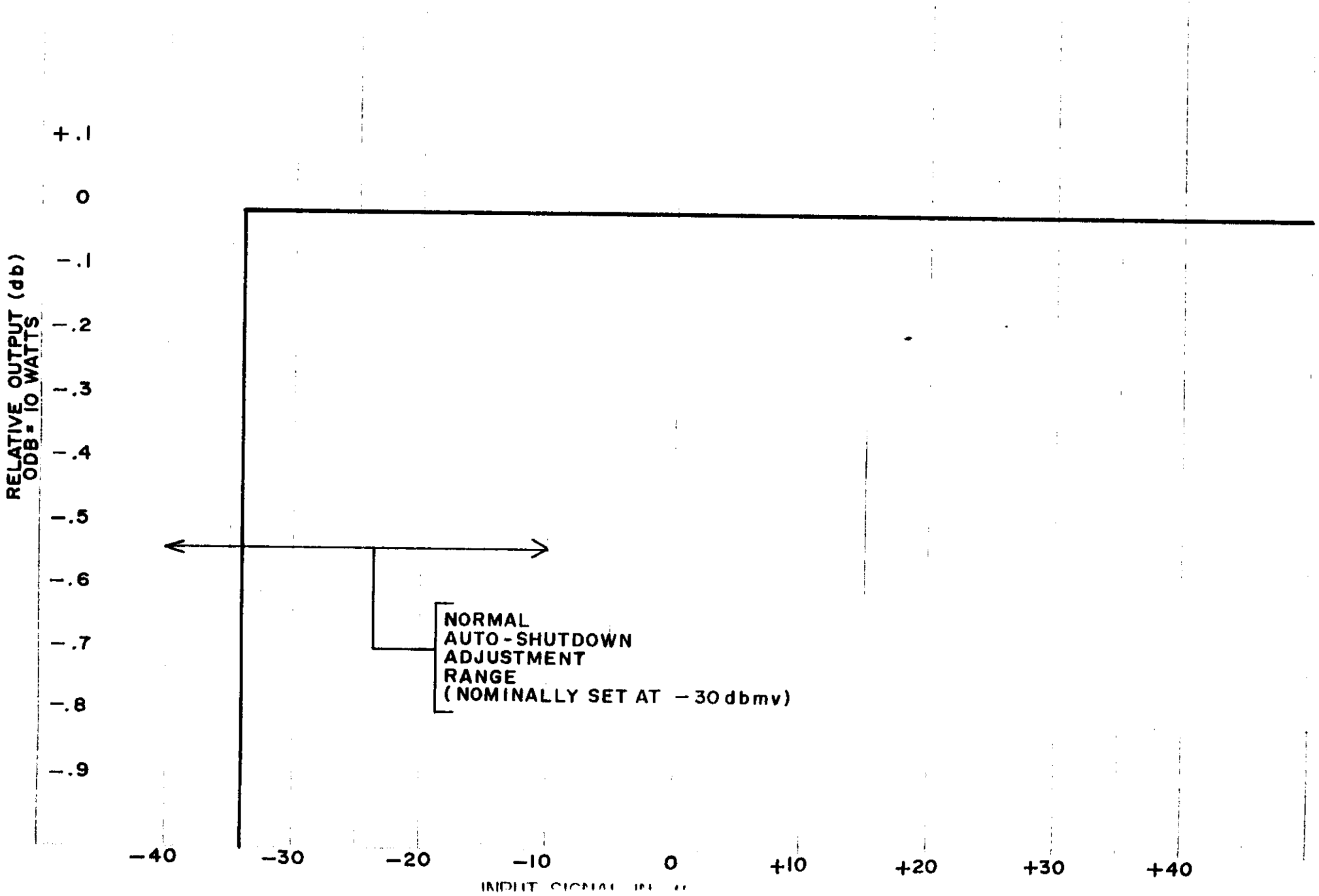
Input Channel 203 = 102.3 MHz
OSC I @ 20 C = 112.00012 MHz
IF 10.7 Nominal = 10.70012 MHz
OSC 2 @ 20 C = 110.59905 MHz
Output Channel 260 = 99.89893 MHz
Output Channel 260 @ Zero Deviation = 99.9 MHz
Combined Oscillator Injection error @ 20 C = -1070

Total frequency deviation % = $\frac{f\ max - f\ min}{f\ min}$ = .00097%

EXHIBIT 7C
XL-10FM
FREQUENCY DEVIATION VS TEMPERATURE



OUTPUT POWER VARIATION AS A FUNCTION OF INPUT SIGNAL VARIATION
EXHIBIT 8



APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
500 WATT FM TRANSLATOR

EXHIBIT 5a PAGE 1

FCC Reference PARTS 2.985 and 74.1235

RF POWER OUTPUT

POWER kW	Ep VOLTS	Ip AMPS	INPUT kW	EFFICIENCY %
0.50	48.0	15.3	734.4	68

Method:
The translator was operated at the power output indicated by the through-line wattmeter.

Test Equipment Used:
Load Resistor, Electro Impulse 500 Watt
Wattmeter, Bird Type 43
Wattmeter Element, Bird 500B

APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
500 WATT FM TRANSLATOR

EXHIBIT 5b

FCC Reference PART 2.987

MODULATION CHARACTERISTIC

Measurements were conducted according to the prescribed procedure in preparation for type acceptance application for the model XL10FM translator, bearing FCC ID BKS9A3XL10FM. Grant dated May 14, 1980.

The original test data for the XL10FM has been purged from the FCC files. A copy of this type acceptance application along with a copy of the grant certificate is attached as Exhibit 4.

APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
500 WATT FM TRANSLATOR

EXHIBIT 5c PAGE 1

FCC Reference PARTS 2.991, 2.997, 2.999, 2.989, 74.1236 and 73.317

Conditions of Modulation: 85% modulation by a 15kHz tone.

OCCUPIED BANDWIDTH
(No evidence of spurius products were present in the vicinity of the carrier)

HARMONICS

1st	2nd	3rd	4th	5th	6th	>7th
>80dB	>80dB	>80dB	>80dB	>80dB	>80dB	>80dB

Specifications:

From 120 to 240kHz	-25dB below the level of the unmodulated carrier.
From 240 to 600kHz	-35dB below the level of the unmodulated carrrer.
Above 600kHz	- the value is 43 + 10 log (power in watts) dB below the level of the unmodulated carrier, in this case 67.77dB.

Method:
The translator was operated at maximum rated power into the 50 ohm load. The unmodulated carrier was set for a full scale reference on the Spectrum Analyzer from the Bird Sample Element. A 15KHz tone, modulating at 85%, was then turned on. See Exhibit 5c1. A trap was then tuned for minimum signal into the analyzer at the operating frequency. The reference level was raised 30dB to clearly show the 10.7MHz IF products from the XL10FM to be greater than -80dB from the full scale reference. See Exhibit 5c2. No other spurious products were noted above the noise floor, except harmonics. With a correction factor to account for, the frequency response of the Bird Sample Element, all harmonics up to the tenth harmonic were found to be below -80dB from the full scale reference as described above. See Exhibit 5c3.

Test Equipment Used:
Spectrum Analyzer, Hewlett Packard 8591E
Load Resistor, Electro Impulse 500W
Trap, Channel Master
Oscillator, Sound Technology
Wattmeter, Bird Type 43
Wattmeter Element, Bird 500B

APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
500 WATT FM TRANSLATOR

IBIT 5c1

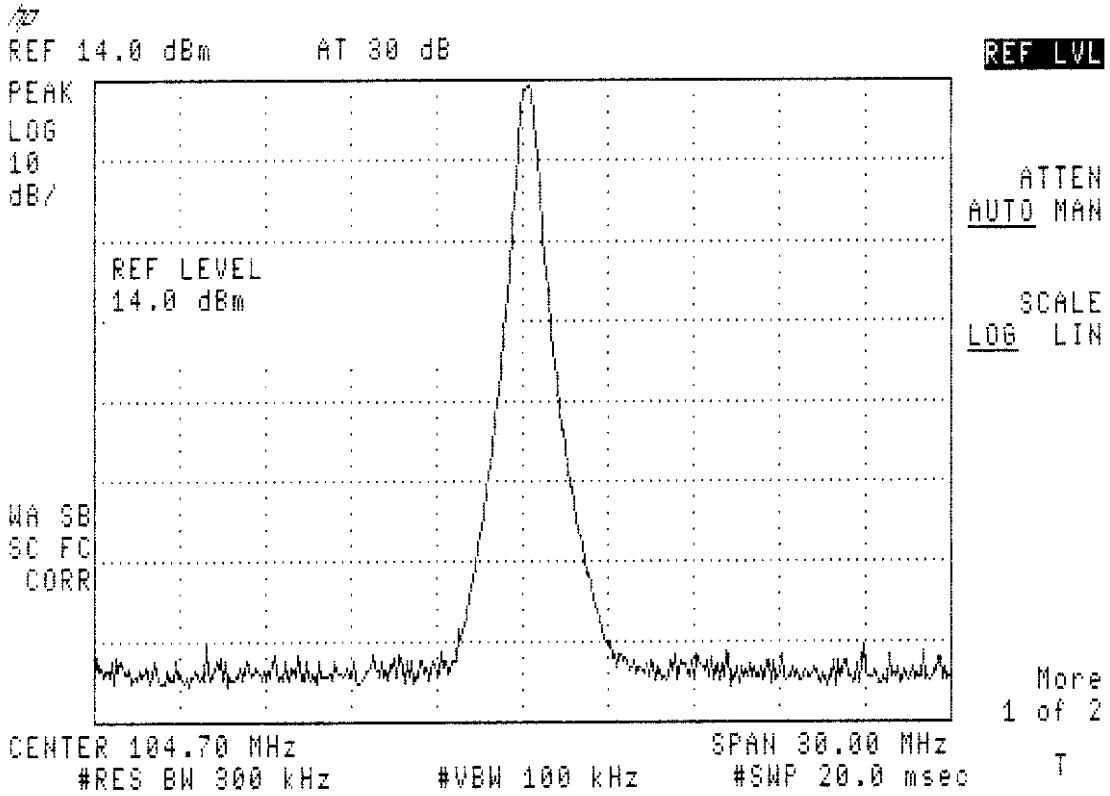
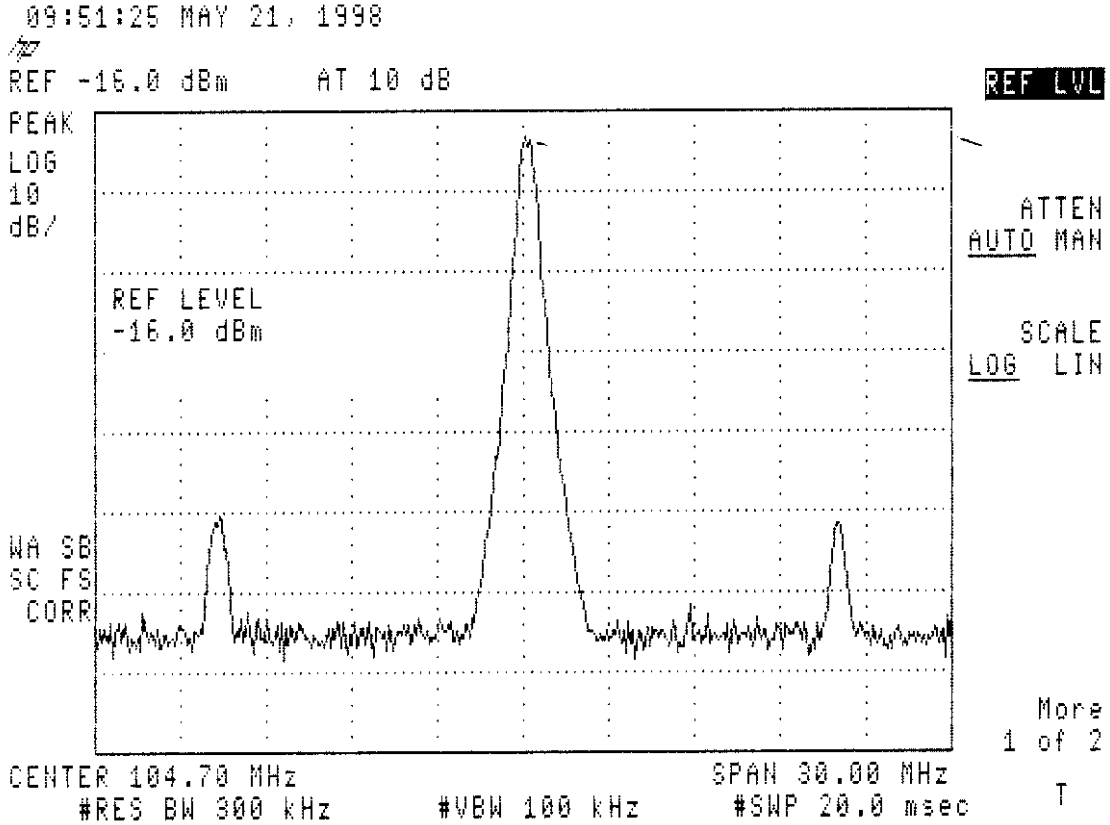
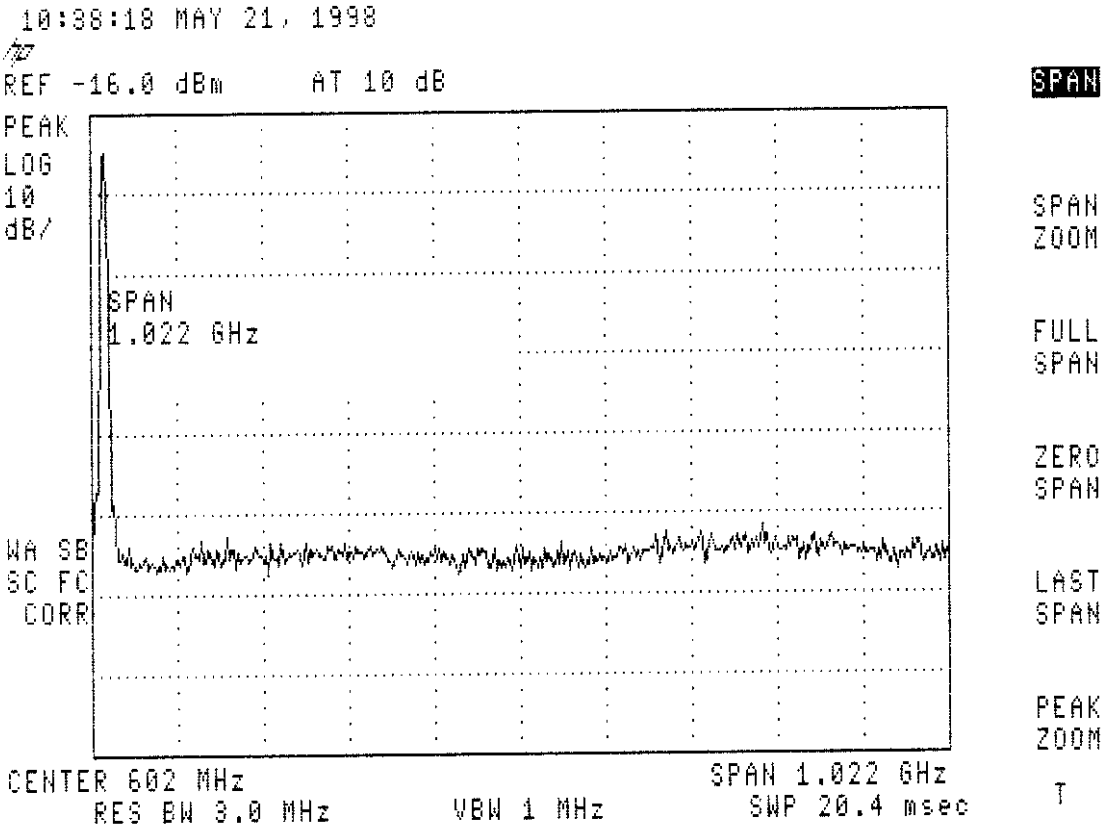


EXHIBIT 5c2



PLICATION FOR TYPE ACCEPTANCE
S9A3XL500FM
0 WATT FM TRANSLATOR

IBIT 5c3



APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
500 WATT FM TRANSLATOR

EXHIBIT 5d

FCC Reference PARTS 2.993, 2.997 and 2.999

FIELD STRENGTH OF RADIATION

FREQUENCY MHz	LEVEL dBM	PATH LOSS dB	FIELD STRENGTH dBM	ATTENUATION dBC
98.65		22.0	54.77(REF)	0
295.95	-50	31.6	-25.72	82.5

Method:
The 8090X exciter generated the test signal. The exciter was operated at reduced power and terminated into a 50 ohm test load, with a tee connector inserted before the load. The third branch of the tee connector fed a short wire which radiated the test signal. Reception of the test signal by the translator was by way of a dipole antenna. The translator output was fed into a 500 watt test load. Testing was conducted at the 500 watt operating level. The spectrum analyzer receiving antennas were dipoles with ground planes cut to approximately the length appropriate for the frequency under test. The receiving antenna in use was connected directly to the spectrum analyzer by a short length of 50 ohm cable having negligible loss. The distance from the translator to the receiving antenna was 10 feet. The translator was rotated for evaluation of radiation from the front, rear and one side. The receiving antenna was polarized for maximum signal. Only the maximum signal resulting from the rotation was logged. Calculated antenna gain for the radiating element (translator) was 2.15dB +3dB, including the ground plane.

Test Equipment Used:
Spectrum Analyzer, Hewlett Packard 8591E
Load Resistor, Electro Impulse 500W
Oscillator, Sound Technology
Antennas, Larcan-TTC
Exciter, Larcan-TTC 8090X

EXHIBIT 5d PAGE 2

Cabinet Radiation

Observations were made while the transmitter was operating at rated 500W into a test load, via a short interconnecting cable. The receive antenna, a ½ wave dipole with a gain of 2.2 dB, was interconnected to the spectrum analyzer with another short interconnect cable of negligible loss. At a distance of three meters, the transmitter cabinet was evaluated for radiated RF energy at the operating frequency from the front, rear, and sides. Since the front showed the greatest amount of radiated power, further detailed measurements were limited to the front.

The reference received signal is expressed in dBm rather that volts per meter because the analyzer used for the measurements is calibrated in dBm. The following table was used to determine the required analyzer measurement in dBm to meet the 54 dB attenuation specification.

Transmitter, Larcan-TTC XLS500FM

Transmitter power:	500 Watts	
Distance from TX:	3 meters	
Frequency:	104.9 MHz	
Antenna gain:	2.2 dB	(½ £ dipole)

The field strength reference level is calculated as follows:

$$E = \frac{7\sqrt{P}}{R}$$

E = field intensity
P = transmitter power
R = distance from the TX

The above equation yields the following calculations

Reference field strength,	E =	52.17 V/m
or in dBµV/m,	E =	154.35 dBµV/m
(20 * log(E) * 1,000,000)		

The minimum attenuation specification is 54 dB.

Allowable field strength:	Ea =	100.35 dBµV/m
(Reference field strength - 54dB)		

Subtract a constant given by K = 20log(f) - (antenna gain) - 29.8

	K =	8.42 dBµV/m
The worst case reading should be:	Vr =	91.93 dBµV
subtract 107dB to convert to dBm:	Vr =	**-15.07 dBm**

EXHIBIT 5d

Results:

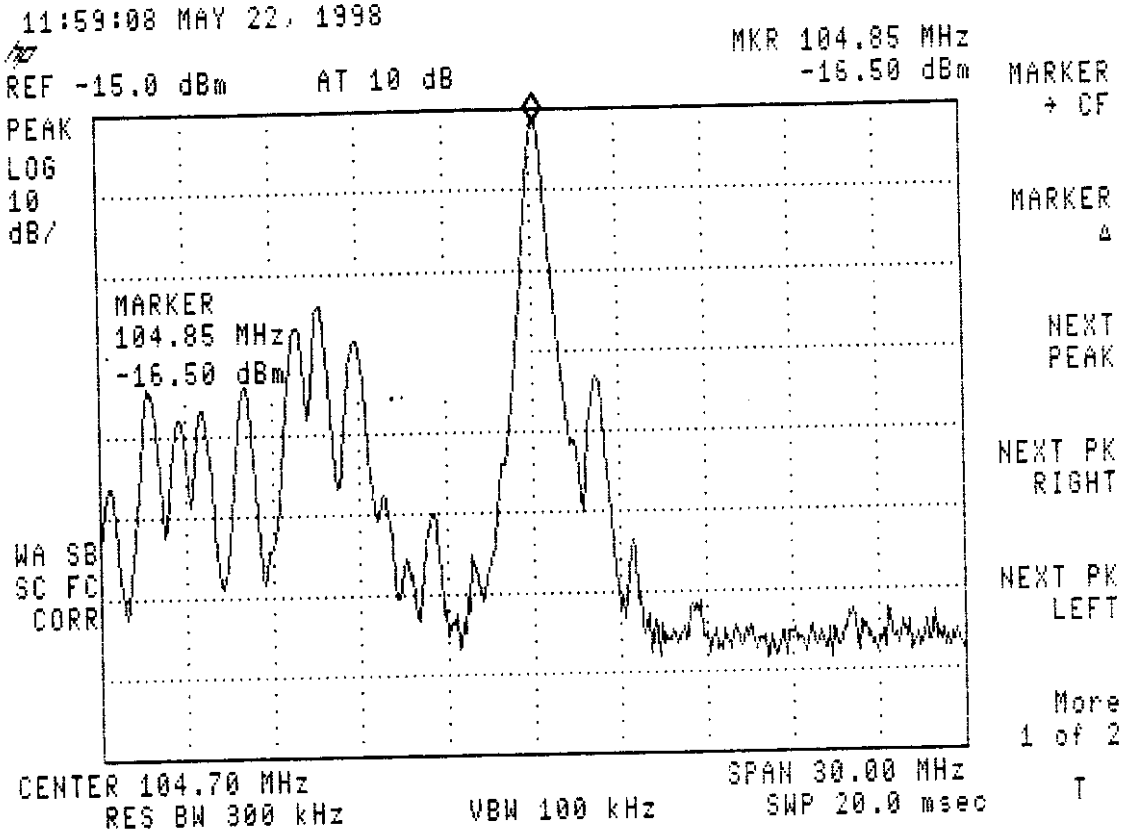
Measured frequency	Measured level @ 3m	
104.9 MHz	-16.50 dBm	see Figure 5d1
209.8 MHz	-52.79 dBm	see Figure 5d2
314.7 MHz	-59.21 dBm	see Figure 5d3
419.6 MHz	-70.92 dBm	see Figure 5d4

Test equipment used:

Analyzer, HP8591E
Exciter, Larcan-TTC 8090X
Load Resistor, Electron Impulse
Oscillator, Sound Technology
Antenna, ½ £ dipole trimmed to measure harmonics

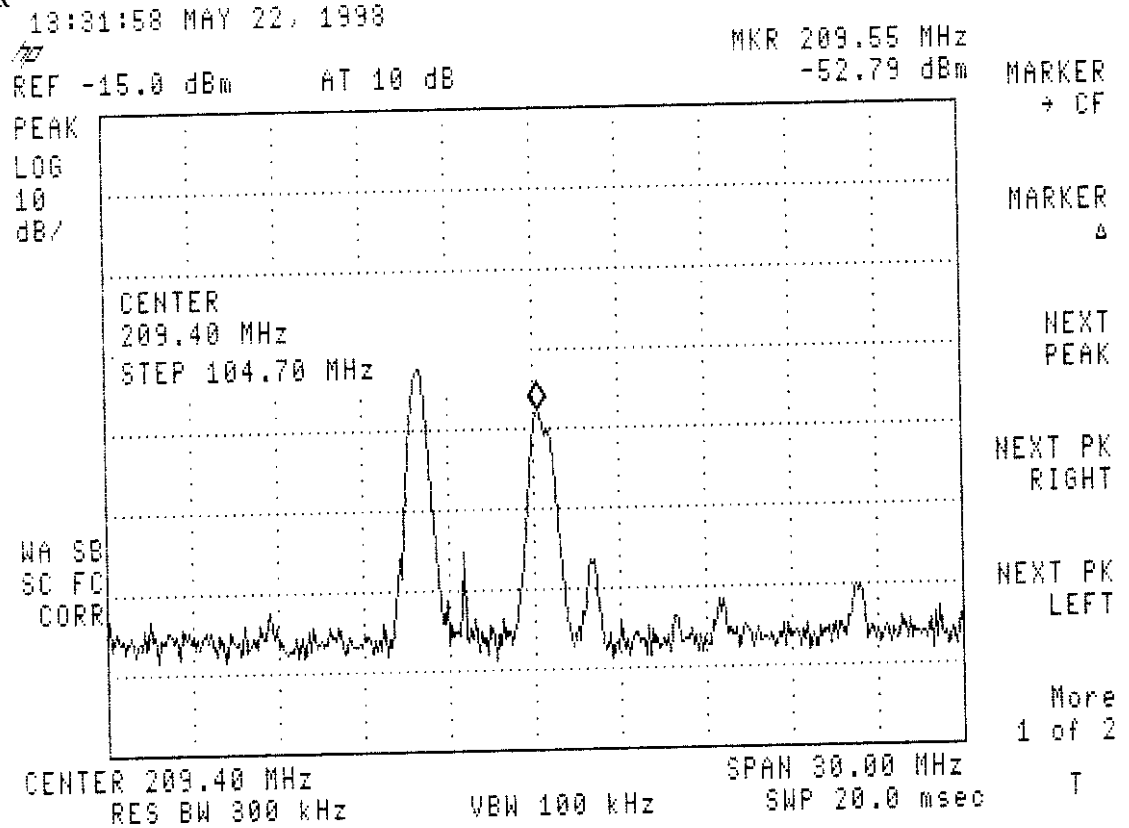
PLICATION FOR TYPE ACCEPTANCE
S9A3XL500FM
0 WATT FM TRANSLATOR

HIBIT 5d1

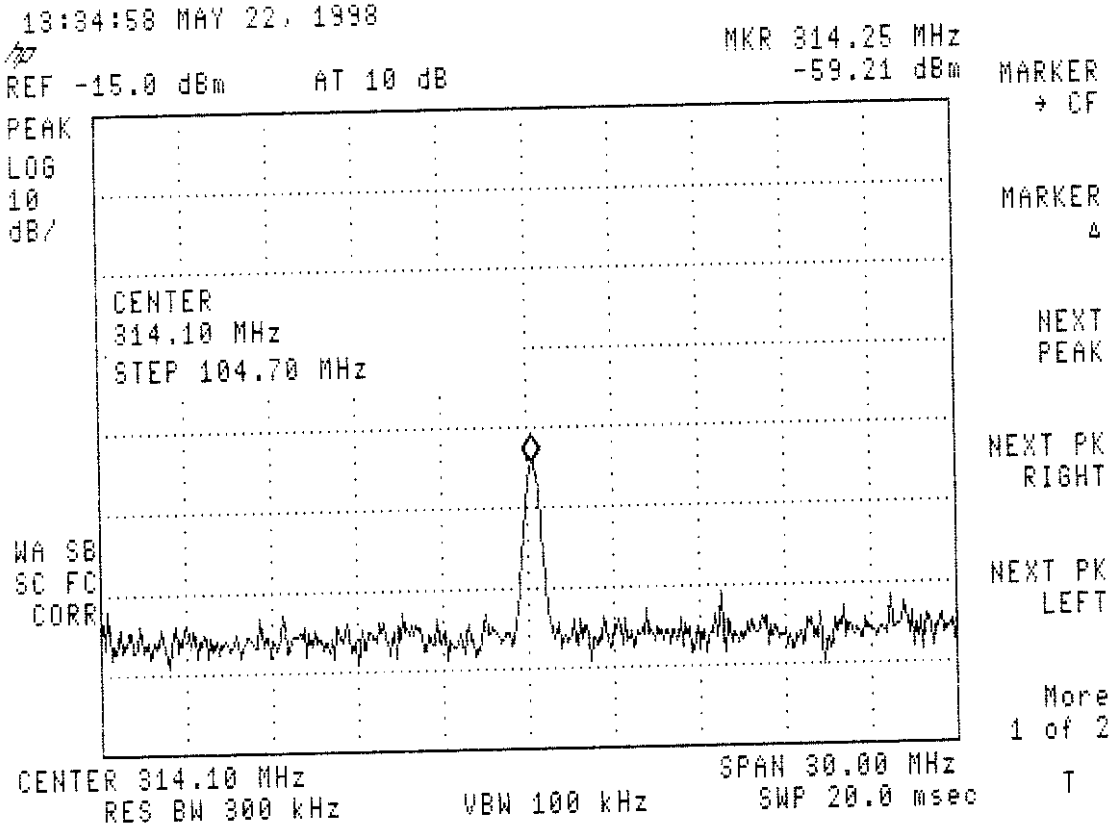


PLICATION FOR TYPE ACCEPTANCE
S9A3XL500FM
0 WATT FM TRANSLATOR

XBIT 5d2



XHIBIT 5d3



APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
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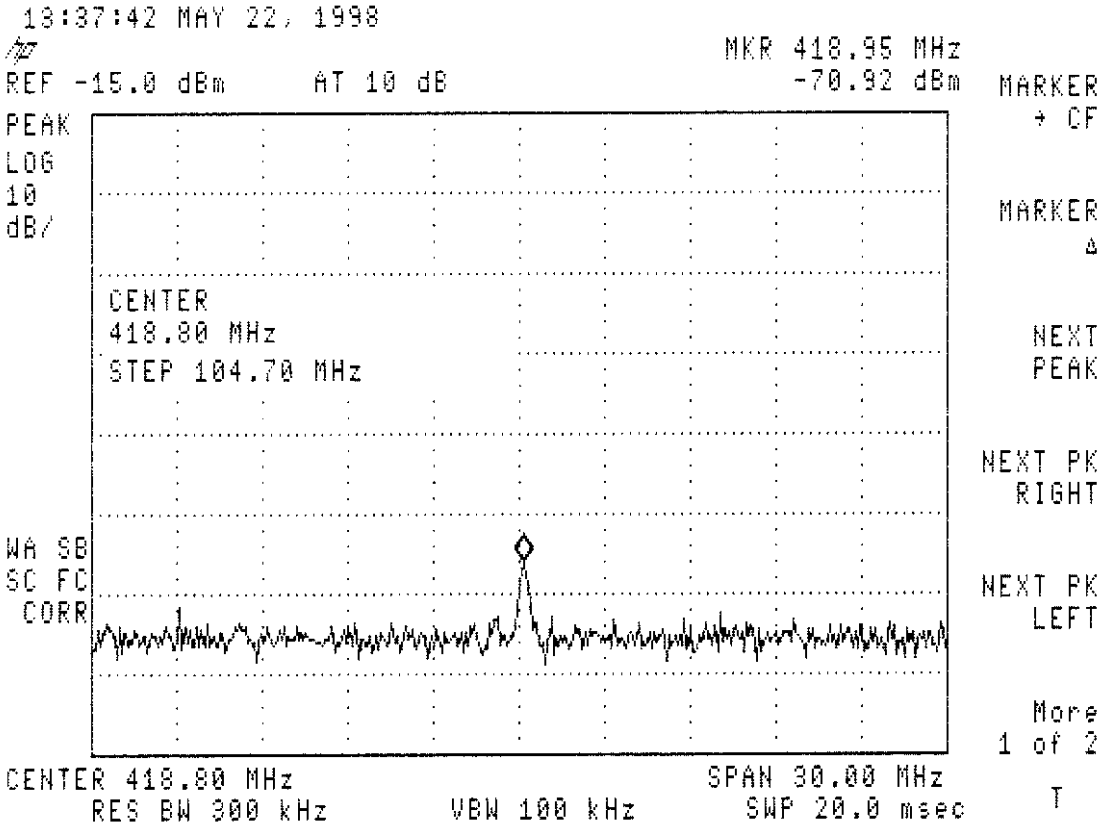
EXHIBIT 5d4



APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
500 WATT FM TRANSLATOR

EXHIBIT 5e

FCC Reference PARTS 2.995, 2.999 and 73.1545

Measurements were conducted according to the prescribed procedure in preparation for type acceptance application for the model XL10FM translator, bearing FCC ID BKS9A3XL10FM. Grant dated May 14, 1980.

The original test data for the XL10FM has been purged from the FCC files. A copy of this type acceptance application along with a copy of the grant certificate is attached as Exhibit 4.

APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
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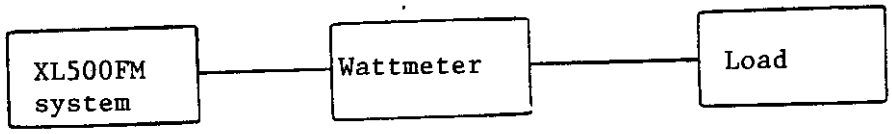
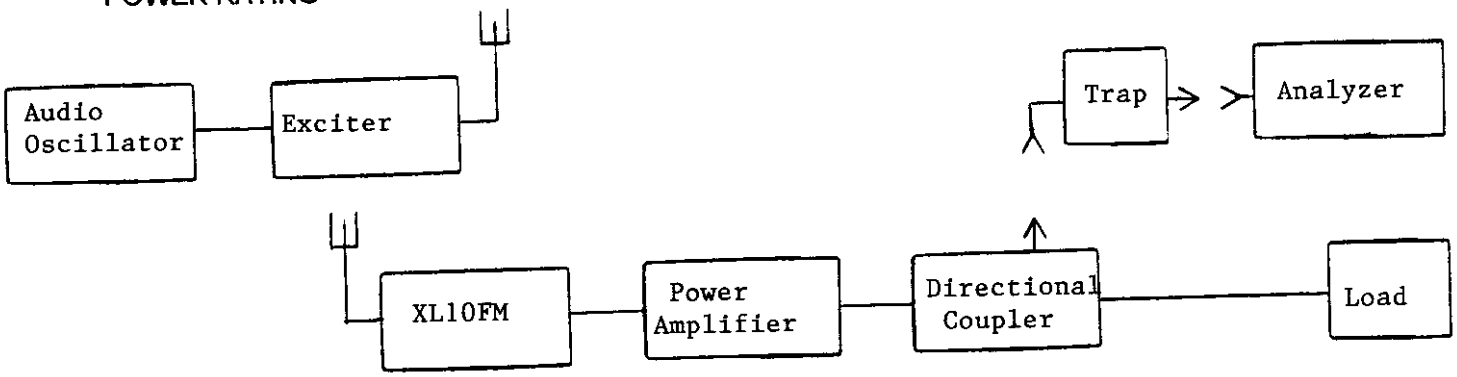
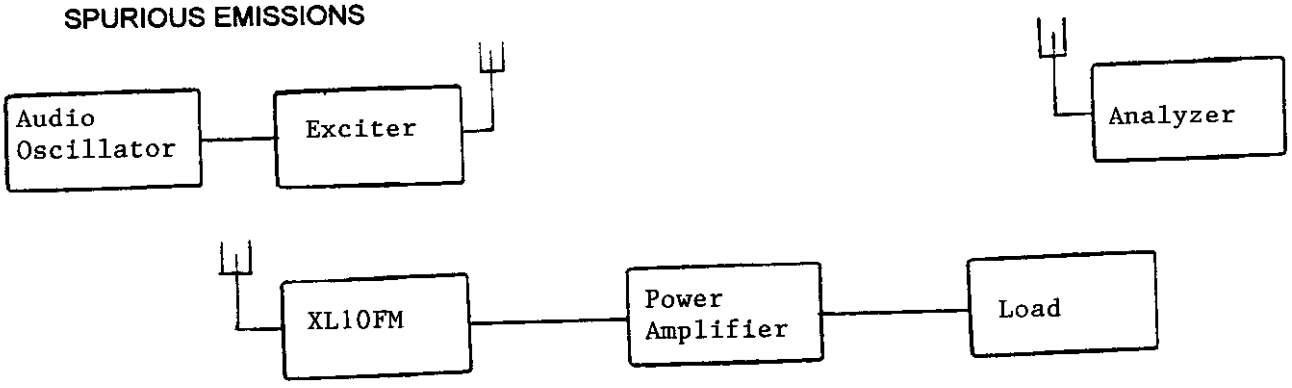
EXHIBIT 5f



POWER RATING



SPURIOUS EMISSIONS



CABINET RADIATION

APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
500 WATT FM TRANSLATOR

EXHIBIT 6

ACTIVE DEVICES AND FUNCTION LIST

MODULE: INPUT CONVERTER MODULE #6900-2000

DEVICE	TYPE	FUNCTION
Q201	J309	Amplifer
Q202	U310	Amplifier
Q203, Q204	MPSH10	Amplifier
Q204, Q205	U310(matched pair)	Balanced Mixer
X201		Crystal

MODULE: IF AMPLIFIER BOARD #6900-3025

DEVICE	TYPE	FUNCTION
IC301, IC302, IC303	CA3054	Differential Amplifier
IC304	CA3240	Current to Voltage Coverter
IC305	LM335	Temperature Sensor
Q301, Q302	2N5109	Amplifier
Q303	2N3904	Emitter Follower

MODULE: PLL UPCONVERTER BOARD #6900-4025

DEVICE	TYPE	FUNCTION
IC401, IC402, IC403	MC1596	Mixer
IC404, IC405	CA3240	Voltage Follower
IC406	78L15	Positive Voltage Regulator
Q401, Q402, Q403	2N3906	Emitter Follower
Q404, Q407		
Q405, Q406	MPSH10	Crystal Oscillator
Q408, Q409	BF964	Amplifier
Q410	2N5109	Amplifier
Q411	U310	Voltage Controlled Oscillator
X401		Crystal

MODULE: METERING/INTERFACE BOARD #6900-6025

DEVICE	TYPE	FUNCTION
IC601, IC603, IC604	LM357	Amplifier
IC602	MC1309	Stereo Multiplex Decoder
IC605	78L12	Positive Voltage Regulator

APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
500 WATT FM TRANSLATOR

EXHIBIT 6

ACTIVE DEVICES AND FUNCTION LIST

MODULE: 10 WATT FM AMPLIFIER #6900-8000

DEVICE	TYPE	FUNCTION
IC801	CA3140	Voltage Comparator
Q801	2N6197	Class 'B' Amplifier
Q802, Q803	2N6199	Class 'B' Amplifier
Q804, Q805, Q806	2N3904	Emitter Follower

MODULE: 500 WATT FM AMPLIFIER #4501-1000

DEVICE	TYPE	FUNCTION
IC101	LM35	Temperature Sensor
Q101, Q102	BLF278	Amplifier

MODULE: FRONT PANEL BOARD #4501-1125

DEVICE	TYPE	FUNCTION
Q1	2N3906	Switch
U1, U2	MC14044	Quad Flip-Flop
U3	MC14531	Parity Tree
U4	MC14538	One Shot Reset
U5, U6	MC14066	Metering Switch
U7	7661	Switch Mode Power Supply
U8	LM324	Comparator
U9	ICL7136	A to D Converter
U10	MC14070	Decimal Point Driver
U11	LM358	Voltage Comparator
U12, U13	MC14049	Status Indicator

MODULE: CONTROL BOARD #4501-1325

DEVICE	TYPE	FUNCTION
Q1	2N3904	Switch
Q2, Q3, Q4	MPSA56	Amplifier
U1, U2	TL084	Amplifier
U3, U6	LM324	Amplifier
U4	7812	Positive Voltage Regulator
U5	MC34182	Current Mirror
U7	LM339	Voltage Comparator
U8	7824	Positive Voltage Regulator
U9, U10, U11, U12	MC14093	Pulse Generator

APPLICATION FOR TYPE ACCEPTANCE
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EXHIBIT 6

DEVICE	TYPE	FUNCTION
U13	LM311	Over Voltage Comparator
U14	LM358	Amplifier
U15, U16	7661	Switch Mode Power Supply

APPLICATION FOR TYPE ACCEPTANCE
BKS9A3XL500FM
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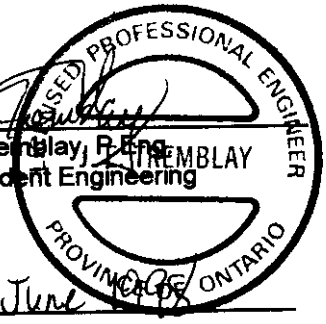
EXHIBIT 12

This equipment has been tested in accordance with the requirements contained in the appropriate FCC regulations. These tests were performed using measurement procedures consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards. Quantity production of the BKS9A3XL500FM is planned.

I, John Tremblay, do hereby certify that the attached information was prepared by me or under my direction.



John E Tremblay, P.Eng.
Vice-President Engineering

19 June 2008
Date