TEST REPORT

ELETTRONIKA S.r.l FM TRANSMITTER TECHNICAL REPORT

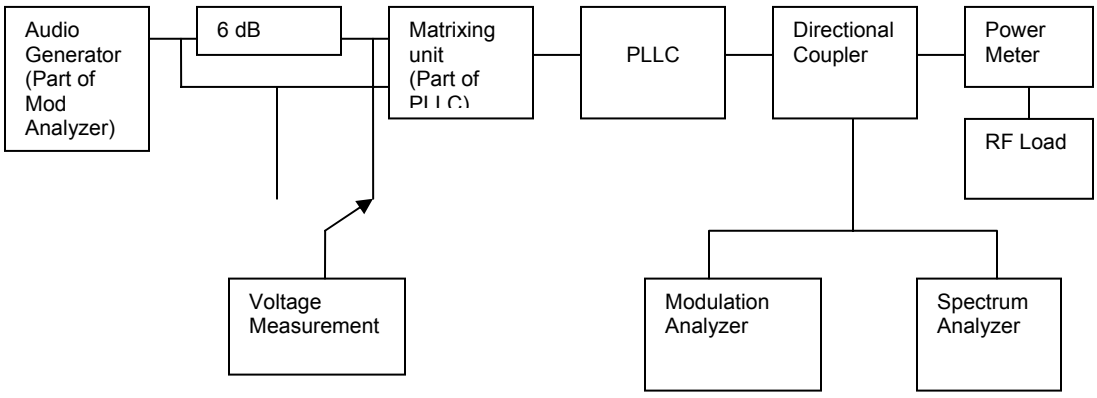
INTRODUCTION

The following information is provided to verify the technical performance of the PLLC FM transmitter. The following information is supplied for FM broadcast service according to applicable portions of Part 2 and Part 73 of the FCC rules and regulations

1. Power Output Measurements as indicated by FCC Rule Part 2.1046 and.
2. Frequency stability measurements associated with variations in ambient temperature and with variations in line voltage as specified by 73.1545.
3. Demodulated Amplitude versus Frequency response measurements of the transmitter compliant with the Engineering charts identified in 73.333.
4. Occupied BW of the FM signal as specified by FCC Rule Part 73.297, 73.317, 73.319, 73.322, and 73.1570.
5. Measurement of conducted harmonics and spurs outside its assigned channel as specified by FCC Rule Part 73.317.
6. Measurement of cabinet radiation of spurs and harmonics as specified in FCC Rule 2.1053 and 2.1057.
7. Measurements of voltage and current to final amp stage as outlined in FCC Rule 2.1033.

Measurements were conducted at power output levels of 30 watts and 5 watts and constitute the range of power for which type certification is sought.

FIGURE 1--TEST EQUIPMENT CONFIGURATION



The test equipment used for the measurements on the next few pages is listed at the back of this exhibit. All test equipment had been calibrated prior to the use of the equipment by the supplier of the test equipment.

RF Power Output Stability vs Line Voltage

The equipment was configured as shown in Figure 1. The loss through the RF output cable and directional coupler and attenuator was calibrated at the carrier frequency of 98 MHz. The audio generator was not energized. The transmitter was energized at room temperature at an initial power output of 30 watts. Power was read on the Bird 4391A Power Meter and a reference level was established on the Advantest R131 Spectrum Analyzer. The line voltage was varied from 94 volts to 126 volts using a variac to adjust

the voltage. The test was repeated at an output power of 6 watts. The data is tabulated on the next page.

RF Power	Power Supply		RF Power	Power Supply
30W	$94V_{ac}$		6W	$94V_{ac}$
30W	$110V_{ac}$		6W	$110V_{ac}$
30W	$126V_{ac}$		6W	$126V_{ac}$

RF Power Output Stability vs Temperature

The equipment was configured as shown in Figure 1. The loss through the RF output cable and directional coupler and attenuator was calibrated at the carrier frequency of 98 MHz. The audio generator was not energized. The transmitter was energized at room temperature at a power output of 35 watts. Power was read on the Bird 4391A Power Meter and a reference level was established on the Advantest R131 Spectrum Analyzer. Next the temperature was varied from 0 C to +50 C. Data at the extreme temperature limits and at room temperature was recorded regarding power output. The transmitter was adjusted to 6 watts and the procedure was repeated.

RF Power	Temperature		RF Power	Temperature
35W	0°C		5W	0°C
35W	25°C		6W	25°C
36W	50°C		6W	50°C

FRQUENCY STABILITY

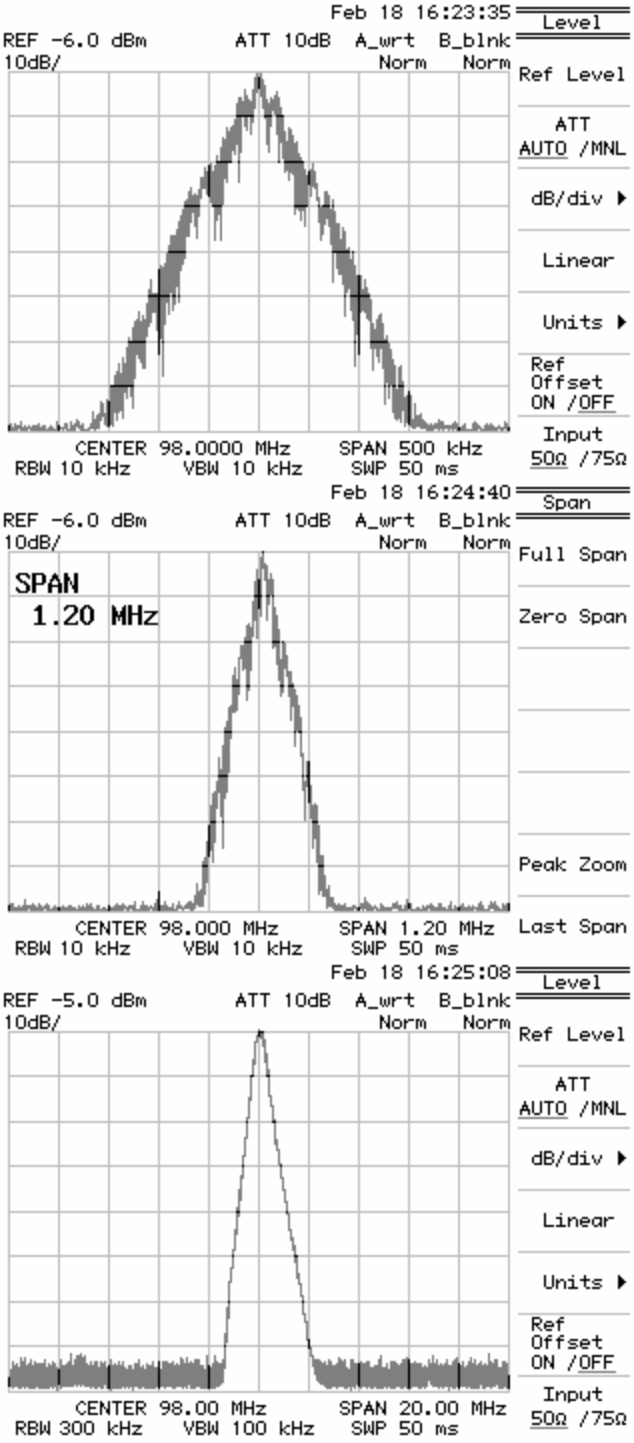
The equipment was configured as shown in Figure 1. The loss through the RF output cable and directional coupler and attenuator was calibrated at the carrier frequencies of 98 MHz. The audio generator was not energized. The transmitter was energized at room temperature at a power output of 30 watts. Power was read on the Bird 4391A Power Meter and a reference level was established on the Advantest R131 Spectrum Analyzer. The line voltage was varied from 94 volts to 126 volts. The output frequency was read on the spectrum analyzer. The results are tabulated below.

RF Frequency	Power Supply
98,0000010MHz	$94V_{ac}$
98,0000010MHz	$110V_{ac}$
98,0000010MHz	$126V_{ac}$

CONDUCTED EMISSION

Two configurations have been considered: Stereophonic and Monophonic

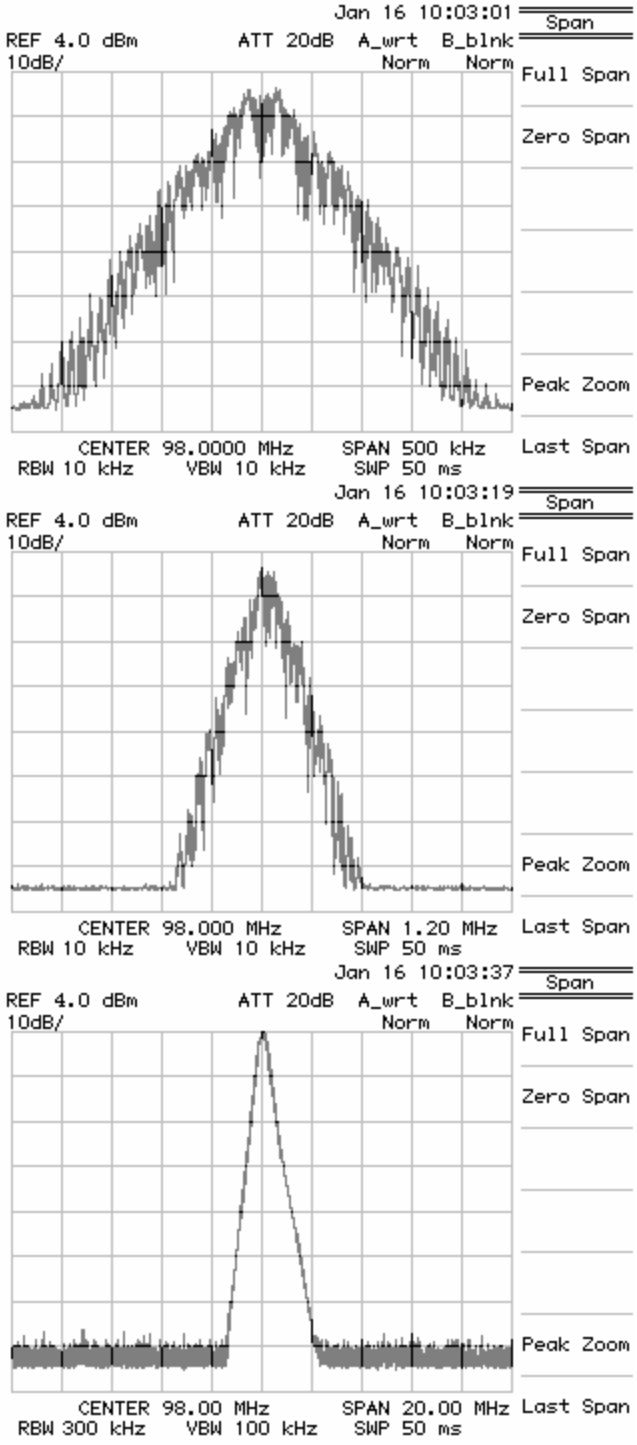
STEREOPHONIC MODE
The pilot was set to 9% (6.75 kHz deviation) and 15kHz was injected into the Left (or Right) input with the main channel and the stereo channel at 28.5kHz deviation. The transmitter was energized at 30 watts RF output power and the conducted emission levels were recorded on the Advantest R131 Spectrum Analyzer.



As can be seen in the above graphs, in the stereophonic mode, the emissions meet the requirements as outlined in FCC Rule 73.317. The rule stipulates emissions between 120 kHz and 240 kHz from the carrier frequency are -25 dB or better, emissions between 240 kHz and 600 kHz from the carrier are -35 dB or better, and emissions greater than 600 kHz from the carrier are at least 43 + 10 log P_o, or -67 dB referenced to the unmodulated carrier (top of the screen for these graphs).

STEREOPHONIC MODE PLUS SCA

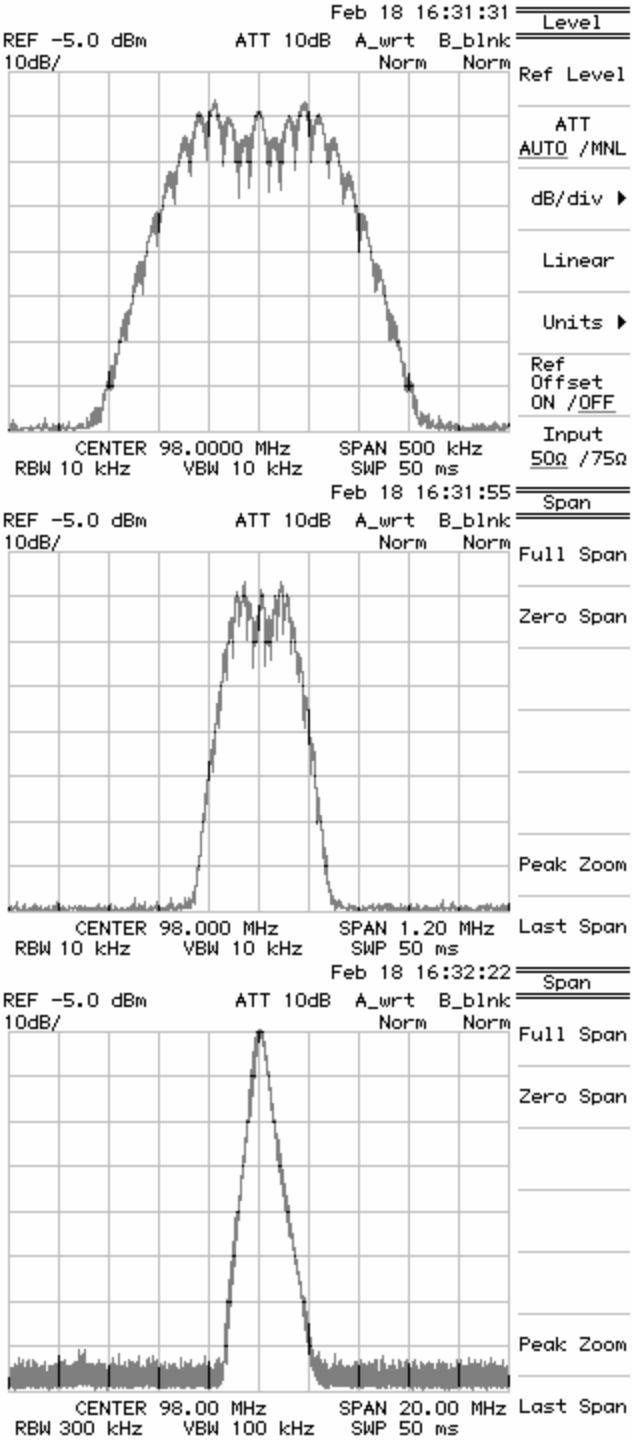
In this case, an SCA channel has been added to the stereo channel. A frequency of 67 kHz is applied to the SCA input and its sub-carrier is modulated at 15% (11.15kHz). The 15 kHz applied to the left (right) channel is adjusted to obtain 70% modulation (52.5kHz).



As can be seen in the above graphs, the combined stereo and SCA channel emissions meet the requirements as outlined in FCC Rule 73.317. The rule stipulates emissions between 120 kHz and 240 kHz from the carrier frequency are -25 dB or better, emissions between 240 kHz and 600 kHz from the carrier are -35 dB or better, and emissions greater than 600 kHz from the carrier are at least 43 + 10 log P_o, or -67 dB referenced to the unmodulated carrier (top of the screen for these graphs).

Monophonic Mode

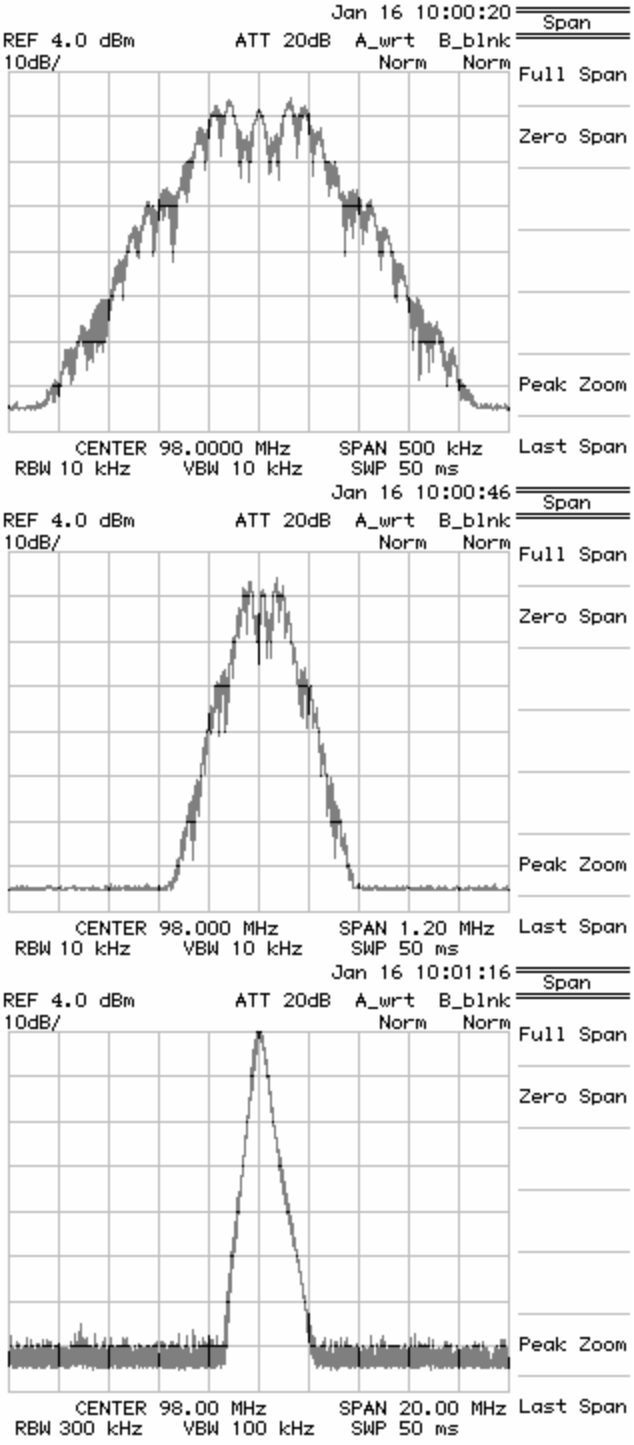
For the Monophonic case, 15kHz has been applied to the Mono input with 85% modulation (63.75kHz deviation).



As can be seen in the above graphs, the monophonic mode emissions meet the requirements as outlined in FCC Rule 73.317. The rule stipulates emissions between 120 kHz and 240 kHz from the carrier frequency are -25 dB or better, emissions between 240 kHz and 600 kHz from the carrier are -35 dB or better, and emissions greater than 600 kHz from the carrier are at least 43 + 10 log P_o, or -67 dB referenced to the unmodulated carrier (top of the screen for these graphs).

MONOPHONIC MODE PLUS SCA

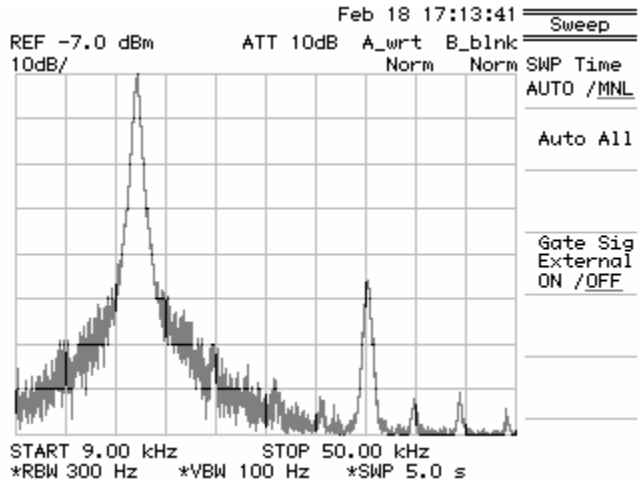
Again for the monophonic case, using the SCA channel, a 67kHz signal is sent to the SCA input and its sub-carrier is modulated at 15% (11.25kHz). The 15kHz is reduced to 52.5kHz.



As can be seen in the above graphs, the monophonic mode emissions meet the requirements as outlined in FCC Rule 73.317. The rule stipulates emissions between 120 kHz and 240 kHz from the carrier frequency are -25 dB or better, emissions between 240 kHz and 600 kHz from the carrier are -35 dB or better, and emissions greater than 600 kHz from the carrier are at least 43 + 10 log P_o, or -67 dB referenced to the unmodulated carrier (top of the screen for these graphs).

PILOT FREQUENCY AND 38 kHz LEVEL

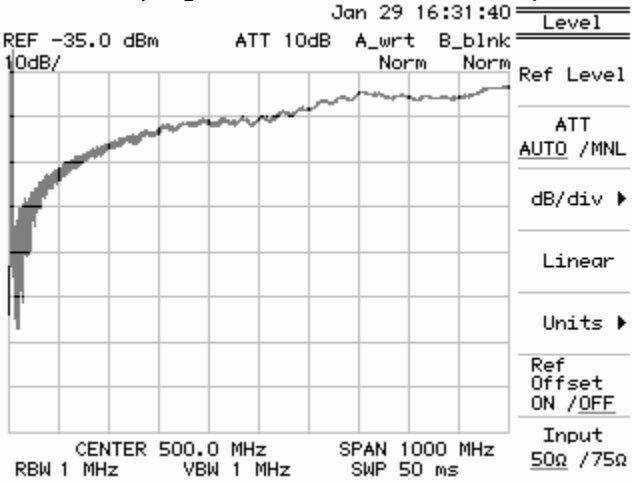
The frequency of the pilot tone was measured to be 19.000 kHz. Its deviation was set at 7.5 kHz, using the FMAB. The deviation of the subcarrier of the pilot tone (38kHz) must be no more than 0.75kHz. This is measured by means of the FMAB, and confirmed by using the spectrum analyzer in order to display the subcarrier level. The photo below demonstrates the frequency to be 37.98 kHz and the amplitude is 46 dB relative to the pilot frequency.



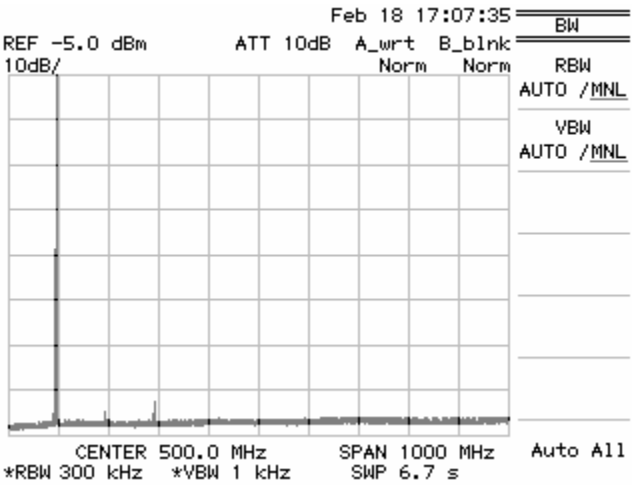
CONDUCTED HARMONICS

Conducted harmonics are sampled in the output transmission line and converted to the corrected value (using the directional coupler coupling value and cable loss) and then compared to the power output of the unit under test.

The graph shown below is the coupling factor of the directional coupler versus frequency.



The graph shown below is the measured spectrum showing the fundamental frequency and the harmonic levels before correction.



The correction factor and measured level are used to find the actual level.

HARMONIC	MEASURED LEVEL	CORRECTION FACTOR	CORRECTED VALUE
2th 196 MHz	75dB	-5.8	-80.8dB
3rd 294 MHz	-72dB	-9.2	-81.2dB
4th 392 MHz	<-80dB	-10.9	<-90.9dB
5th 490 MHz	<-80dB	-11.1	<-91.1dB
6th 588 MHz	<-80dB	-14.1	<-94.1dB
7th 686 MHz	<-80dB	-16.5	<-96.5dB
8th 784 MHz	<-80dB	-17.0	<-97.0dB
9th 882 MHz	<-80dB	-16.5	<-96.5dB
10th 980 MHz	<-80dB	-18.9	<-98.9dB

All levels measured are below the level described by 43+ 10 log Pout (or 67 dB).

Audio Frequency Response and Pre-emphasis curve Verification

Frequency Response characteristics were measured using the equipment configured in Figure 1. Measurements were recorded from the R&S FMAB without de-emphasis and the results are tabulated on the graph below.

Federal Communications Commission § 73.333

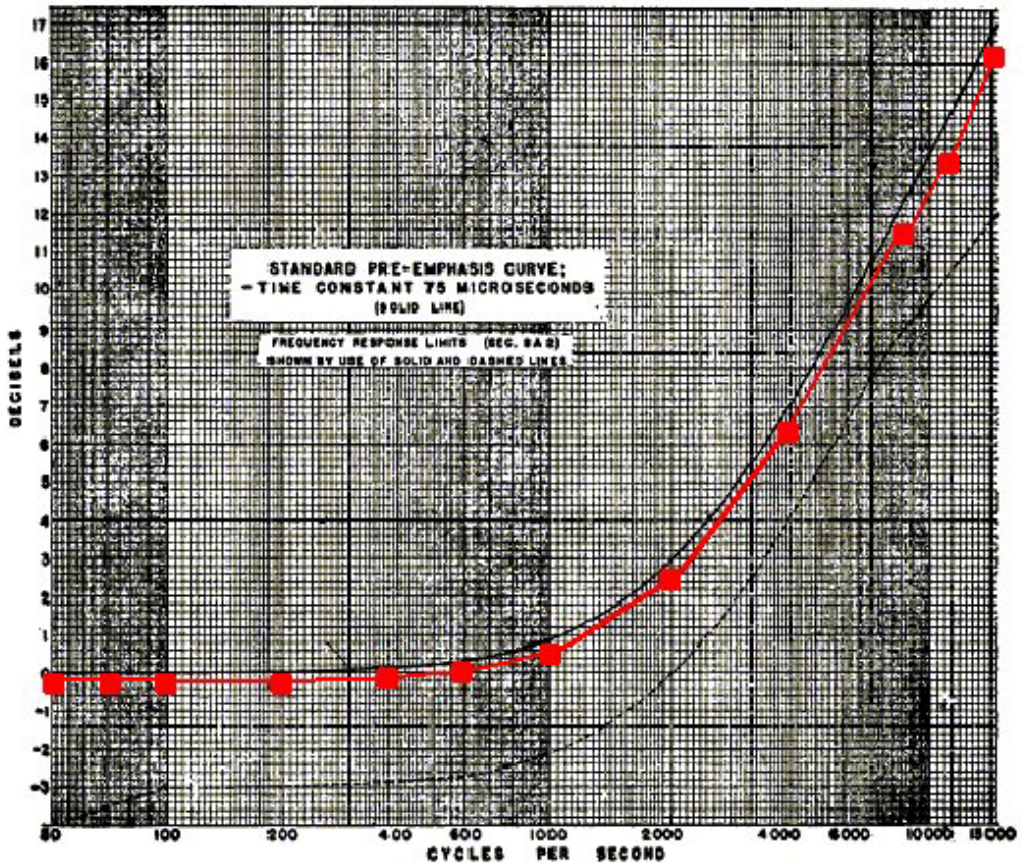


FIGURE 2

VOLTAGES AND CURRENTS TO FINAL AMPLIFIERS

Final amplifier DC voltage and current measurements were made with the transmitter operating at 30 watts output power and at 5 watts output power.. Voltage measurements were made using a Fluke 77 meter. Current measurements were made using the transmitter meter. The power supply voltage was measured as 28 volts for each operational point.

Output Power = 30W
Voltage = 28.0V
Current = 2.0A
Final amplifier DC power input = 28 x2 = 56 watts

Output Power = 5W
Voltage = 28.0V
Current = 0.4A
Final amplifier DC power input = 28 x0.4 = 11.2 watts

CABINET RADIATION

The test equipment was configured as shown below in Figure 2. The transmitter was operated at 30 watts with a carrier frequency of 108 MHz as this was the worst case frequency for these measurments. The laboratory environment limited the measurement range for the field strength measurements to 3 meters. The measured field strength intensity, cable loss, and antenna gain characteristics at the fundamental frequency and at each of the harmonics of the carrier frequency were taken into account in order to accurately assess the level of the signal radiated from the cabinet. Knowing these factors, the radiated power assuming a half-wave dipole would replace the transmitter was calculated and compared to the RF power output of 30 watts. The table showing the measured results and calculated values is provided below.

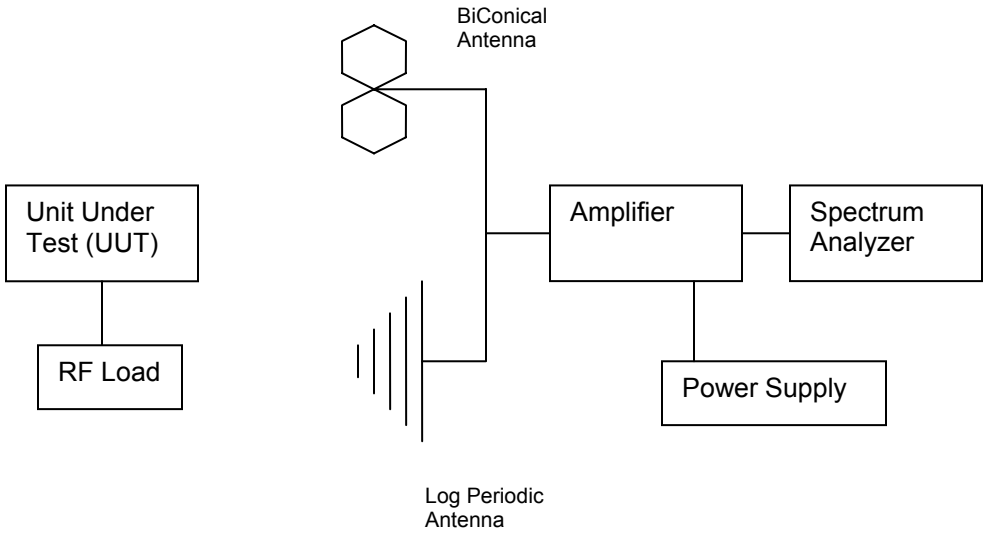


Figure 2 Cabinet Radiation Equipment Configuration

Cabinet Radiation for PLLC

Frequency MHZ	Measured FS dBuV/m	FS (Voltage) V/m	Equivalent Radiated Power watts	Power dBm	Relative to Pout of 30 watts dB
108	77	0.007080	1.97E-07	-37.1	82.1
216	40	0.000100	9.82E-12	-80.1	125.1
324	47	0.000224	2.19E-11	-76.6	121.6
432	61	0.001122	3.09E-10	-65.1	110.1
540	65	0.001778	4.97E-10	-63.0	108.0
648	50	0.000316	1.09E-11	-79.6	124.6
756	50	0.000316	8.02E-12	-81.0	126.0
864	51	0.000355	7.73E-12	-81.1	126.1
972	52	0.000398	7.69E-12	-81.1	126.1
1080	52	0.000398	6.23E-12	-82.1	127.1

The results of this indicate that the radiation meets the FCC rule of cabinet radiation that must be 60 dB or better.

EQUIPMENT LIST

The following test equipment was used in the various test equipment configurations or to create calibration of equipment at various frequencies. All equipment was known to be in good working order and the supplier of the equipment stipulated the equipment was within the calibration period.

Equipment	Manufacturer	Model
Spectrum Analyzer	Advantest	R3131
Modulation Analyzer	Rohde&Schwarz	FMAB
RF Power Meter	Bird	4391A
Humidifier	Cuoghi	NEB-5000
Thermal detector	CAREL	IR32c
Humidity detector	CAREL	S90HP
Thermal Chamber (-20°C / 60°C)	Assembled by COTER	No Model Number
Test Load	Elettronika	No model number
Directional Coupler	Elettronika	No model number