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APPLICANT: TAE KWANG INDUSTRIAL CO., LTD.

FCC ID: BESFRS-1600

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GENERAL_INFORMATION_REQUIRED
FOR_TYPE_ACCEPTANCE

2.983 (a,b,c) TAE KWANG INDUSTRIAL CO., LTD. will manufacture the
FCCID: BESFRS-1600 FAMILY RADIO SERVICES 14 CHANNEL
TRANSCEIVER in quantity, for use under FCC RULES
PART 95.

2.983 (d) TECHNICAL_DESCRIPTION

2.983 (d) (1) Type of Emission: 10K8F3E
95.629

$$B_n = 2M + 2DK$$

$$M = 3000$$

$$D = 2.4K$$

$$B_n = 2(3.0) + 2(2.4) = 10.8K$$

Authorized Bandwidth 12.5KHz

2.983 (d) (2) Frequency Range: 1. 462.5625 8. 467.5625
95.627 2. 462.5875 9. 467.5875
3. 462.6125 10. 467.6125
4. 462.6375 11. 467.6375
5. 462.6625 12. 467.6625
6. 462.6875 13. 467.6875
7. 462.7125 14. 467.7125 MHz

2.983 (d) (3) Power Output shall not exceed 0.500Watts effective
95.637 radiated power. There can be no provisions for
95.647 increasing the power.

2.983 (d) (4) Maximum Output Power Rating: 500 milliWatts
95.637 effective radiated power.

95.645 The antenna is an intergral part to the unit, it cannot
be removed without rendering the unit inoperative. In
order to remove the antenna the case must unscrewed,
then the PCB assemblies must be removed then the
antenna can be removed.

2.983 (d) (5) DC Voltages and Current into Final Amplifier:

FINAL AMPLIFIER ONLY

Vce = 4.5 Volts DC Ice = 0.12A.

Pin = 0.54 Watts

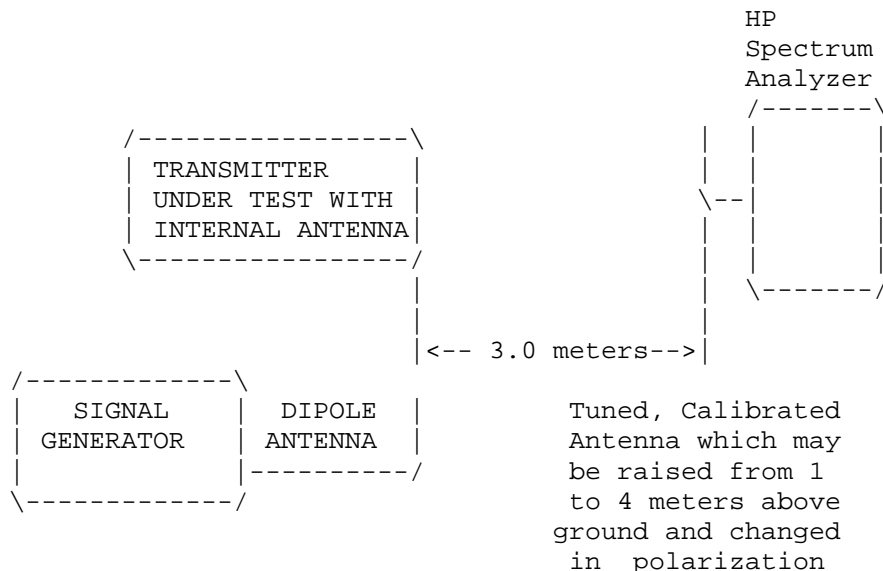
2.983 (d) (6) Function of each electron tube or semiconductor
device or other active circuit device:

SEE EXHIBIT 6.

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- 2.983(d) (7) Complete Circuit Diagrams: The circuit diagram is included as EXHIBIT 5A-5B of this report. The block diagrams are included as EXHIBIT 4 of this report.
- 2.983(d) (8) Instruction book. A draft copy of the instruction manual is included as EXHIBIT 10A-10F.
- 2.983 (d) (9) Tune-up procedure. The tune-up procedure is included as EXHIBIT 9.
- (10) Description of all circuitry and devices provided for determining and stabilizing frequency is given in EXHIBIT 10A-10F. The crystal specifications are included as PAGES NA.
- 2.983 (d)(11) Description of any circuits or devices employed for suppression of spurious radiation, for limiting modulation, and for limiting power will be 8A-8B.
- (12) Digital modulation. This unit does not use digital modulation.
- 2.983(e) The data required by 2.985 through 2.997 is submitted below.
- 2.985(a) RF_power_output.
- 95.637 RF power is measured by measuring the radiated power at 3 meters and then replacing the transmitter with a signal generator to determine the effective radiated power. The ERP shall not exceed 0.500 Watts.
MEASURED POWER OUTPUT = 500 milliWatts ERP

R.F. POWER OUTPUT
TEST SET UP



Equipment placed 1 meter above ground on a rotatable platform.

2.987(a)(b) Modulation_characteristics:

AUDIO_FREQUENCY_RESPONSE

The audio frequency response was measured in accordance with TIA/EIA Specification 603. The audio frequency response curve is shown on the next page. The audio signal was fed into a dummy microphone circuit and into the microphone connector. The input required to produce 30 percent modulation level was measured. See Exhibit 11.

2.987(b) 1 Audio_input_versus_modulation

The audio input level needed for a particular percentage of modulation was measured in accordance with TIA/EIA Specification 603. The audio input curves versus modulation are on the following pages. Curves are provided for audio input frequencies of 300, 1000, and 3000 Hz. See Exhibit 12.

95.635(b) Post Limiter Filter The filter must be between the modulation limiter and the modulated stage. At any frequency between 3 & 20KHz the filter must have an attenuation of $60\log(f/3)$ greater than the attenuation at 1KHz. See the plot in Exhibit 13.

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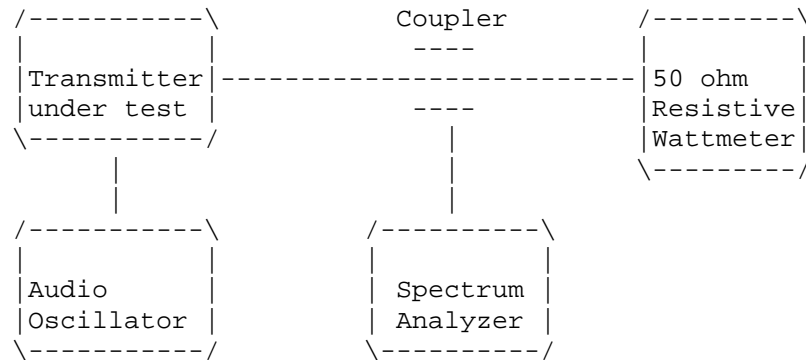
2.989(c) EMISSION BANDWIDTH:
95.633(b)(1)(3)(7)

Data in the plots shows that the sidebands from greater than 50% to 100% of the authorized bandwidth must be attenuated by at least 25dB and from 100 to 250% the sidebands must be attenuated by at least 35dB. Beyond 250% the sidebands must be attenuated by at least $43 + \log_{10}(TP)$. The transmitter was modulated with 2500 Hz, adjusted for 50% modulation plus 16 dB. The spectrum analyzer was set with the unmodulated carrier at the top of the screen. The test procedure diagram and occupied bandwidth PLOTS follow.

Radiotelephone transmitter with modulation limiter.

Test procedure diagram

OCCUPIED BANDWIDTH MEASUREMENT



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2.991 Not Applicable, no antenna terminal allowed.

2.993(a)(b) UNWANTED_RADIATION:
95.635(b)(7)

REQUIREMENTS: Emissions must be attenuated by at least the following below the output of the transmitter.

$$43 + 10\log(TP) = 43 + 10\log(0.5) = 40.00\text{dB}$$

TEST DATA:

EMISSION FREQ. MHz	METER READING @ 3m dBuV	COAX LOSS dB	ACF dB	FIELD STRNGTH dBuV/m	ATT. dB	MARGIN dB	ANT.
462.56	103.50	1.60	18.44	123.54	0.00	0.00	V
925.14	41.80	2.90	24.10	68.80	54.74	14.74	V
1387.00	27.10	1.00	25.55	53.65	69.89	29.89	V
1850.25	25.20	1.01	27.40	53.61	69.93	29.93	H
2312.83	24.20	1.08	28.78	54.06	69.48	29.48	V
2775.37	31.50	1.15	29.94	62.58	60.96	20.96	H
3237.95	23.10	1.22	31.09	55.41	68.13	28.13	H
3700.51	23.20	1.29	32.25	56.74	66.80	26.80	H
4163.05	22.80	1.35	33.18	57.34	66.20	26.20	H
4625.62	16.90	1.42	33.70	52.03	71.51	31.51	H

MARGIN = (Field strength of Fund - 40dB) - FS OF EMISSION

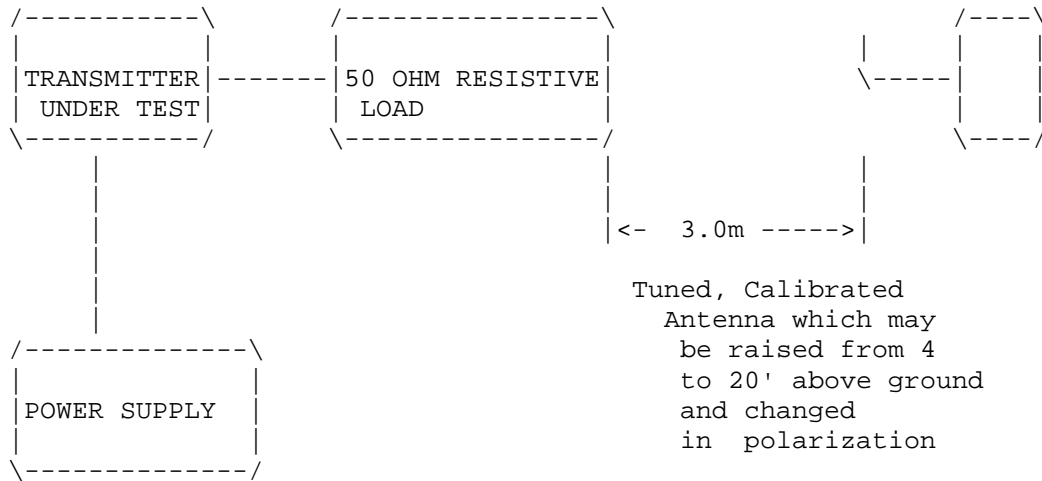
METHOD OF MEASUREMENT: The procedure used was C63.4-1992 for intentional radiators. The spectrum was scanned from 30 to at least the tenth harmonic of the fundamental using a HP model 8566B spectrum analyzer, an Eaton model 94455-1 Biconical Antenna, ElectroMetrics antennas models TDA, TDS-25-1, TDS-25-2 and RGA-180. Measurements were made at the open field test site of TIMCO ENGINEERING INC. located at 6051 N.W. 19th Lane, Gainesville, FL. 32605.

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2.993(a)(b) UNWANTED_RADIATION:
95.631(b)(8)(9)

Method of Measuring Radiated Spurious Emissions

Hewlett Packard
Spectrum
Analyzer
HP8566B



Tuned, Calibrated
Antenna which may
be raised from 4
to 20' above ground
and changed
in polarization

Equipment placed 4' above ground
on a rotatable platform.

2.995(a)(b)(d) Frequency_stability:

Temperature and voltage tests were performed to verify that the frequency remains within the 0.00025%, 2.5 ppm specification limit. The test was conducted as follows: The transmitter was placed in the temperature chamber at 25 degrees C and allowed to stabilize for one hour. The transmitter was keyed ON for one minute during which four frequency readings were recorded at 15 second intervals. The worse case number was taken for temperature plotting. The assigned channel frequency was considered to be the reference frequency. The temperature was then reduced to -30 degrees C after which the transmitter was again allowed to stabilize for one hour. The transmitter was keyed ON for one minute, and again frequency readings were noted at 15 second intervals. The worst case number was recorded for temperature plotting. This procedure was repeated in 10 degree increments up to + 50 degrees C.

Readings were also taken at plus and minus 15% of the battery voltage of 4.5 VDC.

MEASUREMENT DATA:

Assigned Frequency (Ref. Frequency): 462.562 500

TEMPERATURE_C	FREQUENCY_MHz	PPM
REFERENCE_____	462.562 500	00.00
-20_____	462.561 620	-1.90
-10_____	462.563 340	+1.82
0_____	462.563 310	+1.75
+10_____	462.562 990	+1.05
+20_____	462.563 070	+0.20
+30_____	462.561 920	-1.25
+40_____	462.561 520	-2.12
+50_____	462.561 460	-2.25

20c BATT. End-Point 4.5V/dc 462.562 900 +0.86

RESULTS OF MEASUREMENTS: The maximum frequency variation over the temperature range was 1.82 to -2.25 ppm. The maximum frequency variation with voltage was +0.86ppm.

- 2.983(f) Photo_or_Drawing_of_Label:
See EXHIBIT 2.
- 2.983(g) Photos_of_Equipment:
See EXHIBIT 3A-3D.
- 2.999 Measurement_Procedures_for_Type_Acceptance:

Measurement techniques have been in accordance
with EIA specifications and the FCC requirements.
- 2.909 Certification_of_Technical_Data_by_Engineers

We, the undersigned, certify that the enclosed
measurements and enclosed data are true and
correct.

S.S. Sanders
Engineer

LIST_OF_TEST_EQUIPMENT

1. Spectrum Analyzer: Hewlett Packard 8566B - Opt 462, w/
preselector 85685A, & Quasi-Peak Adapter HP 85650A, & HP
8449B - OPT H02 Cal. 6/26/98
2. Signal Generator, Hewlett Packard 8640B, cal. 10/1/98
3. Eaton Biconnical Antenna Model 94455-1
20-200 MHz Serial No. 0997 Cal. 5/15/98
4. Electro-Metric Dipole Kit, 20-1000 MHz, Model TDA-30 10/15/98
5. Electro-Metric Horn 1-18 GHz, Model RGA-180, Cal. 8/15/98
6. Electro-Metric Antennas Model TDA-30/1-4, Cal. 10/15/98
7. Electro-Metric Line Impedance Stabilization Network Model
No. EM-7821, Serial No. 101; 100KHz-30MHz 50uH. Cal. 11/19/98
8. Electro-Metric Line Impedance Stabilization Network Model
No. EM-7820, Serial No. 2682; 10KHz-30MHz 50uH. Cal. 11/19/98
9. Special low loss cable was used above 1 GHz
10. Tenney Temperature Chamber

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