Intertek Testing Services

FCC Part 90 Certification

Performed on the

Repeater Amplifier
FCC ID: LTFIBR1
Model: IDR 3000
for
Ora Electronics

Date of Test: December 30, 1998 - March 18, 1999

Job #: J98034397

Total No. of Pages Contained in this Report: 12 + data pages

The results contained in this report were derived from measurements performed on the identified test samples. Any implied performance of other samples on this report is dependent on the representative of the samples tested.

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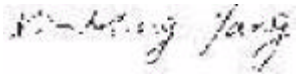

Tested By: Xi-Ming Yang, Test Engineer — Date

Approved By: C.K. Li, Engineering Manager — Date

1.1 Product Description

The Ora Electronics Model IDR 3000 is a repeater amplifier designed to work with Motorola IDEN telephones. It boosts the power of both the transmitting and receiving signals of an IDEN phone, while providing longer range and better access to the IDEN system.

Applicant and Mailing Address	Ora Electronics 9410 Owensmouth Avenue Chatsworth, California 91311
Manufacturer and Mailing Address	Same
FCC ID	LTFIBR1
Use of Product	Repeater Amplifier
Whether quantity (>1) production is planned	[X] Yes, [ ] No
Type(s) of Emission	For this is a bi-direction amplifier, the type of emission depends on IDEN phone.
Max. Allowed modulation	None
Max. Allowed deviation	None
Range of RF Input	Uplink: from -100 to -20 dBm Downlink: from -100 to -40 dBm The variation of operating power is determined by the input power level.
The dc voltage applied to and current into the several elements of the final RF amplifying device (V.A)	dc 12 -1 5V, dc 1.5A
Frequency Range	Uplink: 806 - 821 MHz Downlink: 851-866
Max. number of Channels	None
Antenna(e) & Gain	Uplink Antenna: 6 dBi Downlink Antenna: 0 dBi
Detachable antenna ?	[X]Yes, Connector Types: Uplink antenna: TNC Downlink antenna: TNC
Receiver L.O. frequency	None
External input	None

2.0 **RF Power Output**, FCC §2.985(a)

2.1 Test Procedure

The amplifier's output was connected to a power meter and spectrum analyzer through calibrated coaxial attenuator and directional coupler. The FM test signal was applied to the amplifier's input from a signal generator, and the input level was adjusted to obtain 55.4 dBm average output power.

2.2 Test Equipment

Hewlett Packard 8481A Power Sensor, 435B Power Meter
Hewlett Packard HP8566B Spectrum Analyzer, 100 Hz - 22 GHz
Tektronix 2782 Spectrum Analyzer, 100 Hz - 40 GHz

2.3 Test Results

Passes	See Exhibit 9.1 for the plots.

3.0 **Effective Radiated Power**, FCC § 90.205

Requirement: The Effective Radiated Power (ERP) must not exceed 20 Watts.

3.1 Test Procedure

The EUT was positioned on a non-conductive turntable, 0.8m above the ground plane on an open test site.

The radiated emission at the fundamental frequency was measured at 3m distance with a test antenna and spectrum analyzer. During the measurement, the resolution and video bandwidth of the spectrum analyzer were set to 100 kHz. The maximum emission was recorded with the rotation of the turntable and the raising and lowering of the test antenna. The spectrum analyzer reading was recorded.

The ERP was calculated as follows:

$$ERP_{(dBm)} = E_{(dBuV/m)} + 20 \log D - 10 \log 30 - 10 \log G - 90$$

where D = 3m, distance
G = 1.64, gain of half-wave dipole

3.2 Test Equipment

Hewlett Packard HP8566B Spectrum Analyzer
CDI Biconical Antenna

3.3 Test Results

The maximum ERP is 38.4 dBm or 7 watts.

Passes	See Exhibit 9.2 for the data sheets.

4.0 **Occupied Bandwidth**, **Bandwidth Limitation, Emission masks.** FCC §2.989(I), 90.209(b)(5), 90.210

4.1 Test Procedure

The RF output of the EUT was connected to the input of the spectrum analyzer through sufficient attenuation. The spectrum with no modulation was plotted.

The EUT was set up to transmit a FM signal and the spectrum with modulation was plotted.

4.2 Test Equipment

HP 8566B Spectrum Analyzer
Leader LFG-1300S Function Generator
Leader LMV-182 AC Millivoltmeter
Marconi 2955A Radio Communication Test Set
HP 7470A Plotter

4.3 Test Results

Passes	See Exhibit 9.3 for the plots.

5.0 **Out of Band Emissions at Antenna Terminals** , FCC §2.991

Out of Band Emissions:

The mean power of emissions must be attenuated below the mean power of the unmodulated carrier (P) on any frequency twice or more than twice the fundamental frequency by at least 43 + 10 log P dB.

5.1 Test Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The FM modulation signal was set up. Sufficient scans were also taken to show that any out-of-band emissions up to 10th harmonic for 3 fundamental frequencies: 806 MHz, 813.505 MHz, and 821.005 MHz.

5.2 Test Equipment

HP 8566B Spectrum Analyzer
Leader LFG-1300S Function Generator
Leader LMV-182 AC Millivoltmeter

5.3 Test Results

Passes	See Exhibit 9.4 for the plots.

6.0 **Field Strength of Spurious Radiation**, FCC § 2.993, §15.109

6.1 Test Procedure

A 50 ohm coaxial load was connected to the amplifier output. The amplifier was placed on a wooden turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

The spurious harmonic attenuation was calculated as the difference between E in dB(uV/m) at the fundamental frequency and at the spurious emission frequency.

The field strength at the fundamental frequency (in dBuV/m) was calculated using the formula:

$E_{dB(uV/m)} = P_{dBm} + 10 \text{ Log } 30 + 10 \text{ Log } G - 20 \text{ Log } D + 90 = 152.8 \text{ dB(uV/m)}$

where: P = the output power
G = 1.64 for the gain of half-wave dipole
D = 3m for the distance

6.2 Test Equipment

CDI B100/200/300 Biconical Antennas
EMCO 3115 Horn Antenna
HP 8566B Spectrum Analyzer
Preamplifiers

6.3 Test Results

Passes	See Exhibit 9.5 for the data sheets.

7.0 **Line Conducted Emissions**, FCC § 15.107

7.1 Test Procedure

Test procedure described in the ANSI C63.4 Standard was employed.

The EUT was connected to the DC power supply, that was connected to the AC line through the LISNs.

Both HOT and NEUTRAL leads were tested.

7.2 Test Results

Passes	See Exhibit 9.6 for the data sheets.

8.0 **Frequency Stability vs Temperature**, FCC § 2.995(a)

8.1 Test Procedure

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feedthrough attenuators. The EUT was placed inside the temperature chamber. The DC leads, RF output cable, exited the chamber through an opening After the temperature stabilized for approximately 20 minutes, the frequency of the output signal was recorded from the counter.

8.2 Test Equipment

Temperature Chamber, -50C to +100C
Hewlett Packard 5383A Frequency Counter
Tektronix 2784 Spectrum Analyzer
Goldstar DC Power Supply, GR303

8.3 Test Results

Test Result	Not applicable

9.0 **Frequency Stability vs Voltage,** FCC 2.995(d)(2)

9.1 Test Procedure

An external variable DC power supply was connected to the EUT. The frequency of the transmitter was measured for 115% of the DC nominal value and for 85% of the nominal value.

9.2 Test Equipment

Hewlett Packard 5383A Frequency Counter
Tektronix 2784 Spectrum Analyzer
Goldstar DC Power Supply, GR303

9.3 Test Results.

Test Result	Not applicable

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10.0 **Transient Frequency Behavior,** FCC 90.214

10.1 Test Procedure

Test was performed according the TIA/EIA/IS-102.CAAA, Section 2.2.18. The transmitter was continuously transmitting a modulated signal (FSK, 2400 bits/sec.). The generator was generating FM signal (1 kHz tone, 12.5 kHz deviation). Several plots were made on the FM demodulator output with the EUT turned ON and OFF.

10.2 Test Result

Test Result	Not applicable.

11.0 List of Exhibits

The following exhibits were submitted as separate attachments:

Exhibit 1 **ID Label Format**

Exhibit 2 **ID Label Location**

Exhibit 3 **Equipment Photographs**

Exhibit 4 **Block Diagram**

Exhibit 5 **Circuit Diagram**

Exhibit 6 **Theory of Operation**

Exhibit 7 **Tune-Up Procedure over the power range**

Exhibit 8 **Description of all circuitry and devices provided for fetermining and stabilizing frequency, for suppression of spurious radiation, for limiting modulation, and for limiting power.**

Exhibit 9 **This Test Report**

- *Exhibit 9.1* **RF Power Output Plots**
- *Exhibit 9.2* **Effective Radiated Power Test Data**
- *Exhibit 9.3* **Occupied Bandwidth, Bandwidth Limitation Plots**
- *Exhibit 9.4* **Spurious Emissions at Antenna Terminal Plots**
- *Exhibit 9.5* **Field Strength of Spurious Radiation Test Data**
- *Exhibit 9.6* **Line Conducted Test Data & Plots**

Exhibit 10 **Test Setup Photos**

Exhibit 11 **Instruction Manual**

Exhibit 12 **Antenna Information**