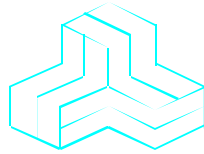


# ENGINEERING TEST REPORT



## SATELINK RF - FIBER INTERFACE MODULE

**Model No.: LNKFIB-R**

**FCC ID: H6M-LNKFIB-R**

*Applicant:* **KAVAL WIRELESS TECHNOLOGIES INC.**  
60 Gough Road  
Markham, Ontario  
Canada, L3R 8X7

*Tested in Accordance With*

**Federal Communications Commission (FCC)  
CFR 47, Parts 2, 22, 24 and 90**

**UltraTech's File No.: KTI-015FCC**

This Test report is Issued under the Authority of  
Tri M. Luu, Professional Engineer,  
Vice President of Engineering  
UltraTech Group of Labs

Date: June 08, 2001



Report Prepared by: Tri M. Luu

Tested by: Mr. Hung Trinh, EMI/RFI Technician

Issued Date: May 21, 2001

Test Dates: May 10 - May 28, 2001

*The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*

## UltraTech

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## EXHIBIT 1. SUBMITTAL CHECK LIST

Annex No.	Exhibit Type	Description of Contents	Quality Check (OK)
--	Test Report	<ul style="list-style-type: none"> <li>Exhibit 1: Submittal check lists</li> <li>Exhibit 2: Introduction</li> <li>Exhibit 3: Performance Assessment</li> <li>Exhibit 4: EUT Operation and Configuration during Tests</li> <li>Exhibit 5: Summary of test Results</li> <li>Exhibit 6: Measurement Data</li> <li>Exhibit 7: Measurement Uncertainty</li> <li>Exhibit 8: Measurement Methods</li> </ul>	OK
1	Test Report - Plots of Measurement Data	Annex 1A - I.M., 20dB BW of the Amplifier & Spurious Emissions: Plots # 1 to 126 Annex 1B – Emission Mask Plots # 1 to 30	OK OK
2	Test Setup Photos	Photos # 1 to 2	OK
3	External Photos of EUT	Photos # 1 to 5	OK
4	Internal Photos of EUT	Photos of 1 to 19	OK
5	Cover Letters	<ul style="list-style-type: none"> <li>Letter from Ultratech for Certification Request</li> <li>Letter from the Applicant to appoint Ultratech to act as an agent</li> <li>Letter from the Applicant to request for Confidentiality Filing</li> </ul>	OK OK OK
6	ID Label/Location Info	ID Label Location of ID Label	OK OK
7	Block Diagrams	Refer to Users Manual , Annex 11	OK
8	Schematic Diagrams	Schematic diagrams # 1 to 4 (SCH000000039, SCH000000046, SCH000000047 & SCH000000048)	OK
9	Parts List/Tune Up Info		None
10	Operational Description	Refer to Users Manual, Annex 11	OK
11	Users Manual		OK

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## EXHIBIT 2. INTRODUCTION

### 2.1. SCOPE

<b>Reference:</b>	FCC Parts 2, 22, 24 and 90
<b>Title:</b>	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2, 22, 24 & 90
<b>Purpose of Test:</b>	To gain FCC Certification Authorization for Radio operating in the frequency bands 1930-1990 MHz (PCS), 869-894 MHz (Base Cellular), 928-941 MHz (Paging) and 851-866 MHz (Trunking).
<b>Test Procedures:</b>	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - 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.

### 2.2. RELATED SUBMITAL(S)/GRANT(S)

None

### 2.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 2, 22, 24 , 90	1998	Code of Federal Regulations – Telecommunication
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
CISPR 22 & EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
CISPR 16-1		Specification for Radio Disturbance and Immunity measuring apparatus and methods

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## EXHIBIT 3. PERFORMANCE ASSESSMENT

### 3.1. CLIENT INFORMATION

APPLICANT	
<b>Name:</b>	KAVAL WIRELESS TECHNOLOGIES INC.
<b>Address:</b>	60 Gough Road Markham, Ontario Canada, L3R 8X7
<b>Contact Person:</b>	Mr. Alan Aslett Phone #: 905-946-3397 Fax #: 905-946-3392 Email Address: <a href="mailto:asslet@kaval.com">asslet@kaval.com</a>

MANUFACTURER	
<b>Name:</b>	KAVAL WIRELESS TECHNOLOGIES INC.
<b>Address:</b>	60 Gough Road Markham, Ontario Canada, L3R 8X7
<b>Contact Person:</b>	Mr. Alan Aslett Phone #: 905-946-3397 Fax #: 905-946-3392 Email Address: <a href="mailto:asslet@kaval.com">asslet@kaval.com</a>

### 3.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

<b>Brand Name:</b>	KAVAL WIRELESS TECHNOLOGIES INC.
<b>Product Name:</b>	SATELINK RF - FIBER INTERFACE MODULE
<b>Model Name or Number:</b>	LNKFIB-R
<b>Serial Number:</b>	Pre-production
<b>Type of Equipment:</b>	Non-broadcast Bi-directional Amplifier
<b>External Power Supply:</b>	None
<b>Transmitting/Receiving Antenna Type:</b>	Maximum 8 non-integral antennas can be used with the SatelLink LNKFIB-R bi-directional amplifier.
<b>Primary User Functions of EUT:</b>	Bi-directional amplifier for use with CDMA,GSM and TDMA radio signals.

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### 3.3. EUT'S TECHNICAL SPECIFICATIONS

<b>TRANSMITTER</b>	
<b>Equipment Type:</b>	Base station (fixed use)
<b>Intended Operating Environment:</b>	[ x ] Commercial [ x ] Light Industry & Heavy Industry
<b>Power Supply Requirement:</b>	120V 60Hz
<b>Operating Frequency Range &amp; RF Nominal Output Power:</b>	<ul style="list-style-type: none"> <li>▪ <b>1930 – 1990 MHz (PCS) WITH 15 MHz SWITCHING BAND</b></li> <li>* 1 input/output signal: 0.112 Watts</li> <li>* 2 input/output signals: 0.098 Watts</li> <li>* 3 input/output signals: 0.051 Watts</li> <li>▪ <b>869 – 894 MHz (Base Cellular)</b></li> <li>* 1 input/output signal: 0.302 Watts</li> <li>* 2 input/output signals: 0.234 Watts</li> <li>* 3 input/output signals: 0.120 Watts</li> <li>* 4 input/output signals: 0.107 Watts</li> <li>▪ <b>928 – 941 MHz (Paging)</b></li> <li>* 1 input/output signal: 0.245 Watts</li> <li>* 2 input/output signals: 0.186 Watts</li> <li>* 3 input/output signals: 0.098 Watts</li> <li>* 4 input/output signals: 0.0.81 Watts</li> <li>▪ <b>851 – 866 MHz (Trunking)</b></li> <li>* 1 input/output signal: 0.347 Watts</li> <li>* 2 input/output signals: 0.251 Watts</li> <li>* 3 input/output signals: 0.161 Watts</li> <li>* 4 input/output signals: 0.123 Watts</li> </ul> <p>Please Page 12 of Users Manual for Power Ratings for 1 to 30 signal inputs/outputs</p>
<b>Gain</b>	+28 dB nominal
<b>RF Output Impedance:</b>	50 Ohms
<b>Channel Spacing:</b>	N/A
<b>Occupied Bandwidth (99%):</b>	N/A
<b>Emission Designation*:</b>	EXTENDER
<b>Antenna Connector Type:</b>	SMA

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### 3.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	1 RF Input Port (PCS, Cellular & Paging/Trunking)	1	SMA	Shielded
2	6 RF Output Ports	1	SMA	Shielded
3	RS-232 (Note 2)	1	DB	Shielded

**NOTES:**

- (1) Ports of the EUT which in normal operation were connected to ancillary equipment through interconnecting cables via a representative interconnecting cable to simulate the input/output characteristics. RF input/output was correctly terminated to the 50 Ohm RF Load.
- (2) Ports, which are for factory/technical services uses only

### 3.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	ThinkPad Laptop
Brand name:	IBM
Model Name or Number:	2625
FCC ID:	ANOKAJIPENCP
Serial Number:	78-WWM4A
Connected to EUT's Port:	RS-232
Notes:	This laptop computer is used for technical services only; therefore, and it is used for control purpose only but not for testing.

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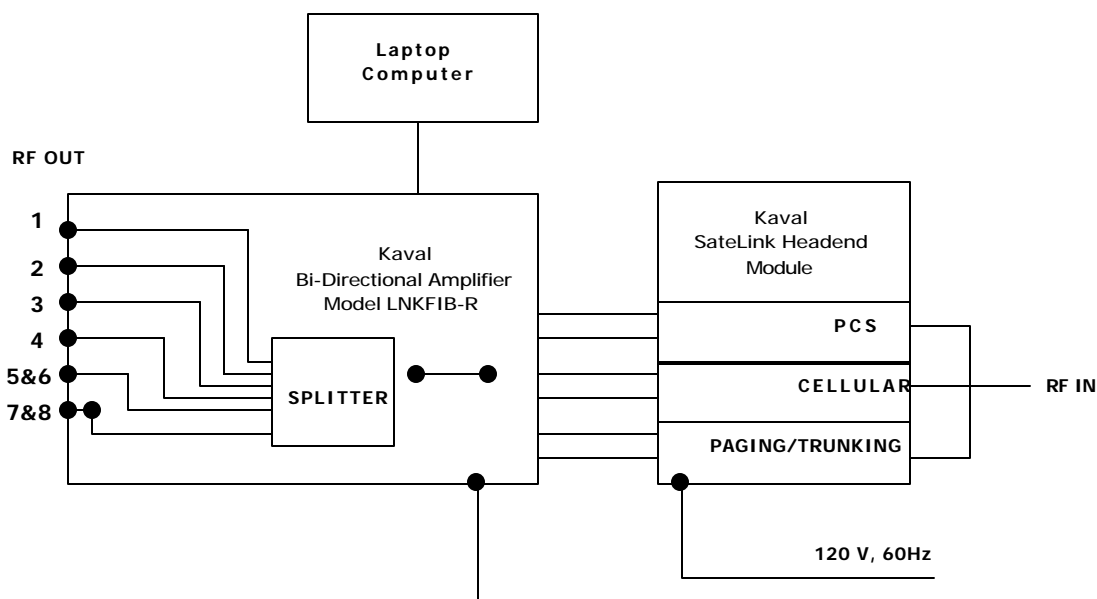
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### 3.6. TEST SETUP



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## EXHIBIT 4. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

### 4.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C
Humidity:	51%
Pressure:	102 kPa
Power input source:	120V 60Hz

### 4.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

<b>Operating Modes:</b>	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
<b>Special Test Software:</b>	Utility software provided by Kaval was used for selecting frequency bands of the amplifier.
<b>Special Hardware Used:</b>	None
<b>Transmitter Test Antenna:</b>	The EUT is tested with the transmitter antenna port terminated to a 50 Ohms RF Load.

<b>Transmitter Test Signals</b>	
<b>Frequency Band(s):</b>	Near lowest, near middle & near highest frequencies in each frequency bands that the transmitter covers:
<ul style="list-style-type: none"> <li>▪ 1930 – 1990 MHz (PCS)</li> <li>▪ 869 – 894 MHz (Base Cellular)</li> <li>▪ 928 – 941 MHz (Paging)</li> <li>▪ 851 – 866 MHz (Trunking)</li> </ul>	<ul style="list-style-type: none"> <li>▪ 1930, 1960 and 1990 MHz</li> <li>▪ 869, 881.5 and 894 MHz</li> <li>▪ 928, 934.5 and 941 MHz</li> <li>▪ 851, 858.475, 866 MHz</li> </ul>
<b>Transmitter Wanted Output Test Signals:</b>	
<ul style="list-style-type: none"> <li>▪ RF Power Output (measured maximum output power):</li> <li>▪ Normal Test Modulation</li> <li>▪ Modulating signal source:</li> </ul>	<ul style="list-style-type: none"> <li>▪ The EUT was adjusted for maximum gain output by the manufacturer.</li> <li>▪ intended for use with RF input signal sources with CDMA, GSM and TDMA modulation</li> <li>▪ Internal/external</li> </ul>

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## EXHIBIT 5. SUMMARY OF TEST RESULTS

### 5.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- 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 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: Sep. 20, 1999.

### 5.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH.	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
90.205 & 2.1046	RF Power Output	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	N/A for base station
90.213 & 2.1055	Frequency Stability	Not applicable for Amplifier since the output signal tracks input signal exactly.
90.242(b)(8) & 2.1047(a)	Audio Frequency Response	Not applicable for Amplifier since the output signal tracks input signal exactly.
90.210 & 2.1047(b)	Modulation Limiting	Not applicable for Amplifier since the output signal tracks input signal exactly.
90.209 90.210 & 2.1049	Emission Limitation & Emission Mask	The output signal tracks input signal exactly. Therefore, only comparison tests were conducted for proof.
90.210, 2.1057 & 2.1051	Emission Limits - Spurious Emissions at Antenna Terminal	Yes
90.210, 2.1057 & 2.1053	Emission Limits - Field Strength of Spurious Emissions	Yes
<p>SATELINK RF - FIBER INTERFACE MODULE, Model No.: LNKFIB-R, by KAVAL WIRELESS TECHNOLOGIES INC. has also been tested and found to comply with FCC Part 15, Subpart B - Radio Receivers and Class A Digital Devices. The engineering test report has been documented and kept in file and it is available anytime upon FCC request.</p>		

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### 5.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

### 5.4. DEVIATION OF STANDARD TEST PROCEDURES

None

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## EXHIBIT 6. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

### 6.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report

### 6.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

### 6.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4:1992 and CISPR 16-1.

### 6.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER:

The essential function of the EUT is to correctly communicate data to and from radios over RF link.

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- Assessed by ITI (UK) Competent Body, NVLAP (USA) Accreditation Body & ACA/AUSTEL (Australia), VCCI (Japan)
- Accredited by Industry Canada (Canada) under ACC-LAB (Europe/Canada MRA and APEC/Canada MRA)
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