

**KTL Test Report:** 0R02546

**Applicant:** Elcombe Systems Limited  
359 Terry Fox Drive  
Kanata, Ontario  
K2K 2P4

**Equipment Under Test:  
(E.U.T.)** ESL 560 Series Wireless Smoke Detector

**In Accordance With:** **FCC Part 15, Subpart C**  
For Low Power Transmitters Operating Periodically  
In The Band 40.66 - 40.77 MHz And Above 70 MHz

**Tested By:** KTL Ottawa Inc.  
3325 River Road, R.R. 5  
Ottawa, Ontario K1V 1H2

**Authorized By:**  
  
R. Grant, Wireless Group Manager

**Date:**

**Total Number of Pages:** 18

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## **Section 1. Summary of Test Results**

### **General**

**All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.231. All tests were conducted using measurement procedure ANSI C63.4-1992. Radiated emissions are made on an open area test site. A description of the test facility is on file with the FCC.

New Submission

Production Unit

Class II Permissive Change

Pre-Production Unit

D	S	C
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Equipment Code

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



**NVLAP LAB CODE: 100351-0**

TESTED BY: \_\_\_\_\_ DATE: \_\_\_\_\_  
Kevin Carr, Technologist

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This report applies only to the items tested.

*EQUIPMENT: ESL 560 Series Wireless Smoke Detector*

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**Summary Of Test Data**

<b>Name of Test</b>	<b>Para. Number</b>	<b>Results</b>
Transmission Requirements	15.231(a)	Complies
Radiated Emissions	15.231(b)	Complies
Occupied Bandwidth	15.231(c)	Complies
Frequency Tolerance	15.231(d)	Not Applicable
Periodic Alternate Field Strength Requirements	15.231(e)	Not Applicable
Powerline Conducted Emissions	15.207	Not Applicable

**Footnotes For N/A's:**

The E.U.T. is battery powered.  
The E.U.T. does not transmit in the band specified by 15.231(d).

**Test Conditions:**

**Indoor**                      Temperature: 24 °C  
   Humidity: 40 %

**Outdoor**                     Temperature: 24 °C  
   Humidity: 40 %

*EQUIPMENT: ESL 560 Series Wireless Smoke Detector*

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**Section 2. Equipment Under Test (E.U.T.)**

**General Equipment Information**

<b>Manufacturer:</b>	Elcombe Systems Ltd.
<b>Model No.:</b>	562ST
<b>Serial No.:</b>	None
<b>Date Received In Laboratory:</b>	June 19, 2000
<b>KTL Identification No.:</b>	Items #1 & #4
<b>Frequency Range:</b>	173.225 MHz (Fixed)
<b>Operating Frequency(ies) of Sample:</b>	173.224 MHz
<b>Type of Emission:</b>	FSK
<b>Emission Designator:</b>	40K0F1D
<b>Supply Power Requirement:</b>	Two, 3 Volt Lithium 123A Batteries
<b>Duty Cycle Calculation:</b>	Not Applicable

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### **Section 3.       Transmission Requirements**

**Para. No.: 15.231(a)**

<b>Test Performed By:</b> Kevin Carr	<b>Date of Test:</b> June 19, 2000
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**Minimum Standard:**       15.231(a) Continuous transmissions such as voice, video or data transmissions are not permitted.

15.231(a)(1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds after being released.

15.231(a)(2) A transmitter activated automatically shall cease transmission within 5 seconds of activation.

15.231(a)(3) Periodic transmissions at regular pre-determined intervals are not permitted. However polling or supervisory transmissions to determine system integrity of transmitters used in security or safety applications are allowed if the periodic rate of transmission does not exceed one transmission of not more than one second duration per hour for each transmitter.

15.231(a)(4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm.

**Test Results:**               Complies.

**Test Data:**                 Compliance was determined by verification of technical specifications and a functional test on the equipment.

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**Rationale for Compliance with Transmission Requirements**

- 15.231(a)(1) :** No provision for manual transmission.
- 15.231(a)(2) :** The E.U.T. transmits for 2.5 sec every minute during the alarm condition.
- 15.231(a)(3) :** No periodic transmission outside of the alarm condition.
- 15.231(a)(4) :** The E.U.T. transmits for 2.5 sec every minute during the alarm condition.

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**Section 4. Radiated Emissions**

Para. No.: 15.231(b)

<b>Test Performed By:</b> Kevin Carr	<b>Date of Test:</b> June 19, 2000
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**Minimum Standard:**

**Permissible Field Strength Limits (Momentarily Operated Devices)**

Fundamental Frequency (MHz)	Field Strength of Fundamental Microvolts/Meter at 3 meters; (watts)	Field Strength of Unwanted Emissions Microvolts/Meter at 3 meters; (watts)
40.66 - 40.70	2,250	225
70-130	1, 250	125
130-174	1,250 to 3,750*	125 to 375
174-260 (note 1)	3,750	375
260-470 (note 1)	3,750 to 12,500*	375 to 1,250
Above 470	12,500	1,250

**Notes:**

# Use quasi-peak or averaging meter.	For 130 - 174 MHz: FS (microvolts/m) = (56.82 x F) - 6136
* Linear interpolation with frequency F in MHz	For 260 - 470 MHz: FS (microvolts/m) = (41.67 x F) - 7083

Any emissions that fall within the restricted bands of 15.205 shall not exceed the following limits:

Frequency (MHz)	Field Strength (µV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

**Test Results:** Complies. The worst-case emission level is 63.2 dBµV/m @ 3m at 173.22 MHz. This is 8.2 dB below the specification limit.

**Test Data:** See attached table.  
 Above 1 GHz a spectrum analyzer and low noise amplifier are used to measure emission levels. The spectrum analyzer resolution bandwidth was set to 1 MHz and video bandwidth was 3 MHz.

In the case of handheld equipment, the E.U.T. is rotated in three planes to obtain worst-case results.



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**Test Data - Radiated Emissions**

Test Distance (meters) : 3		Range: A Tower		Receiver: ESVP H.P. 8565E		RBW(kHz): 120 kHz 1 MHz		Detector: CISPR Q-Peak Peak	
Freq. (MHz)	Ant. *	Pol. (V/H)	RCVD Signal (dBµV/m)	Ant. Factor (dB)**	Amp. Gain (dB)***	Dist. Corr. (dB)	Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
173.22	E/D3	V	41.4	15.3			56.7	71.4	14.7
173.22	E/D3	H	47.9	15.3			63.2	71.4	8.2
346.44	E/D3	V	9.0	22.2			31.2	51.4	20.2
346.44	E/D3	H	8.2	22.2			30.4	51.4	21.0
519.66	E/D4	V	6.3	28.0			34.3	51.4	17.1
519.66	E/D4	H	6.3	28.0			34.3	51.4	17.1
692.88	E/D4	V	7.4	31.2			38.6	51.4	12.8
692.88	E/D4	H	6.9	31.2			38.1	51.4	13.3
866.1	E/D4	V	9.0	33.7			42.7	51.4	8.7
866.1	E/D4	H	6.0	33.7			39.7	51.4	11.7
1039.0	Hrn2	V	51.0	29.7	-48.2		32.5	54.0	21.5
1039.0	Hrn2	H	52.9	29.7	-48.2		34.4	54.0	19.6
1212.6	Hrn2	V	56.0	30.1	-48.0		38.1	54.0	15.9
1212.8	Hrn2	H	54.9	30.1	-48.0		37.0	54.0	17.0
1385.9	Hrn2	V	57.0	30.5	-48.0		39.5	54.0	14.5
1386.1	Hrn2	H	56.3	30.5	-48.0		38.8	54.0	15.2
1559.1	Hrn2	V	56.6	31.3	-47.9		40.0	54.0	14.0
1559.2	Hrn2	H	57.8	31.3	-47.9		41.2	54.0	12.8
1732.2	Hrn2	V	57.3	32.5	-48.0		41.8	51.4	9.6
1732.2	Hrn2	H	56.6	32.5	-48.0		41.1	51.4	10.3

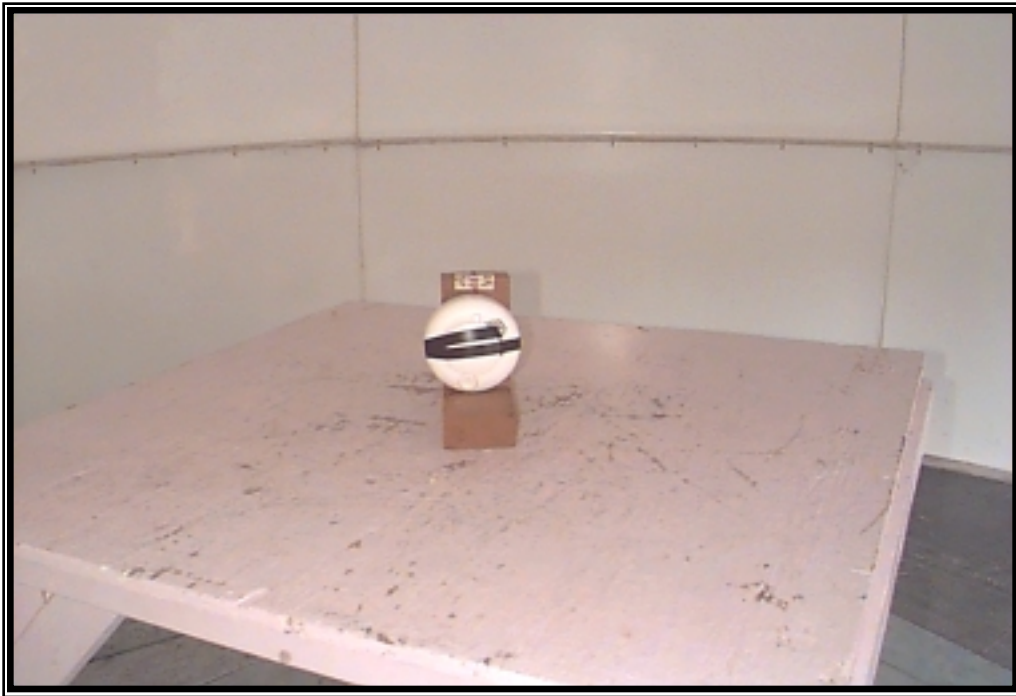
**Notes:**  
 B/C = Biconical, B/L = Biconilog, L/P = Log-Periodic, H = Horn, D/P = Dipole  
 \* Re-measured using dipole antenna.  
 \*\* Includes cable loss when amplifier is not used.  
 \*\*\* Includes cable loss.  
 ( ) Denotes failing emission level.  
 N.D. = Not Detected

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**Radiated Photographs (Worst Case Configuration)**

**Front View**



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**Section 5. Occupied Bandwidth**

**Para. No.: 15.231(c)**

<b>Test Performed By:</b> Kevin Carr	<b>Date of Test:</b> June 19, 2000
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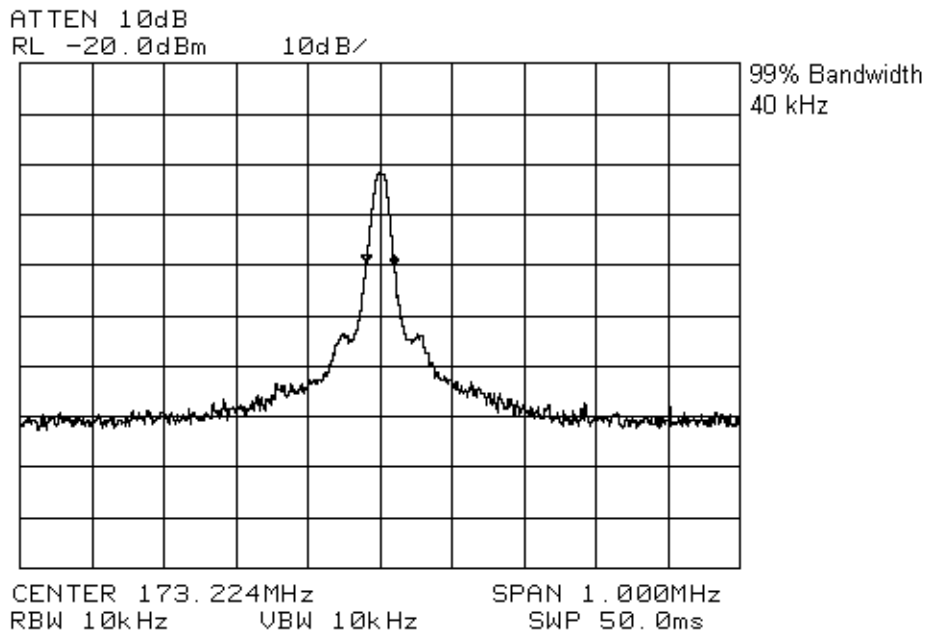
**Minimum Standard:** 15.231(c) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

**Test Results:** Complies. See attached graph.

**Test Data:** See attached graph.

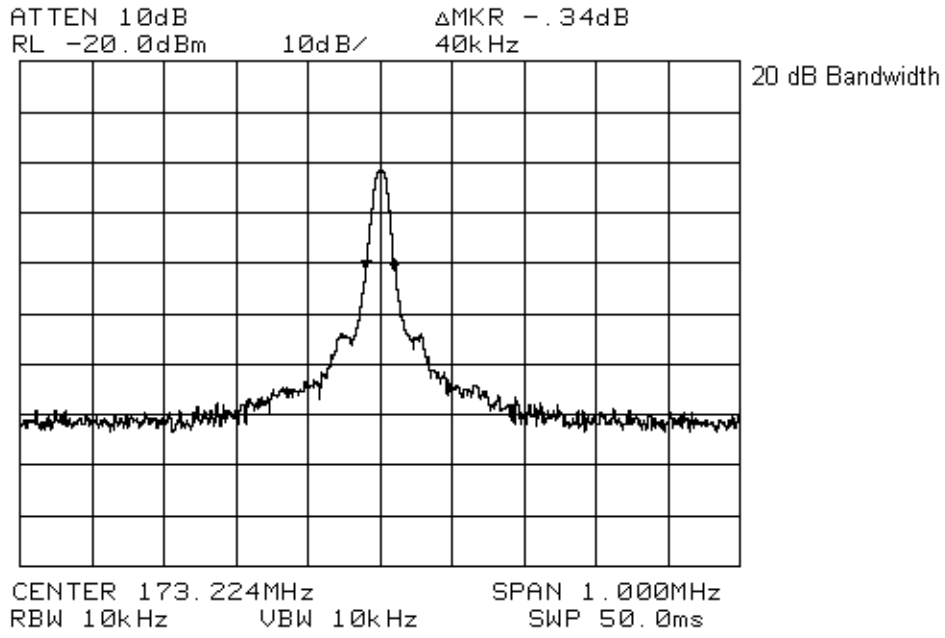
EQUIPMENT: ESL 560 Series Wireless Smoke Detector

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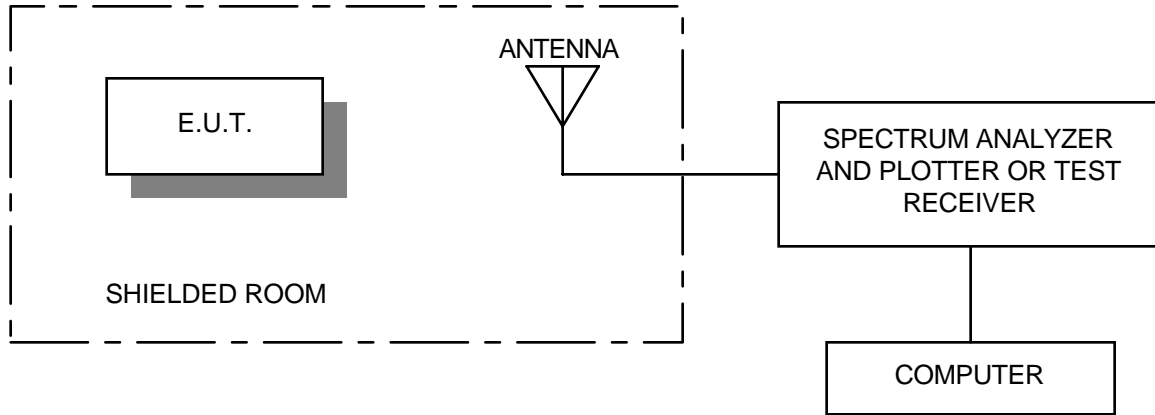
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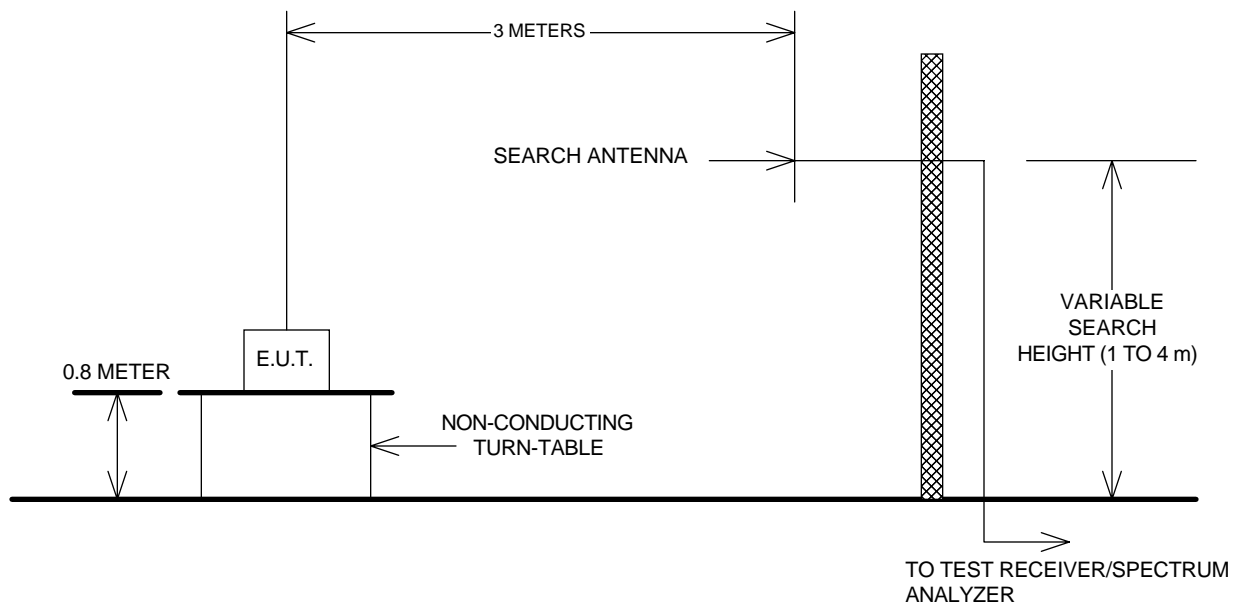
EQUIPMENT: ESL 560 Series Wireless Smoke Detector

## Section 6. Block Diagrams

### Radiated Prescan



### Outdoor Test Site For Radiated Emissions

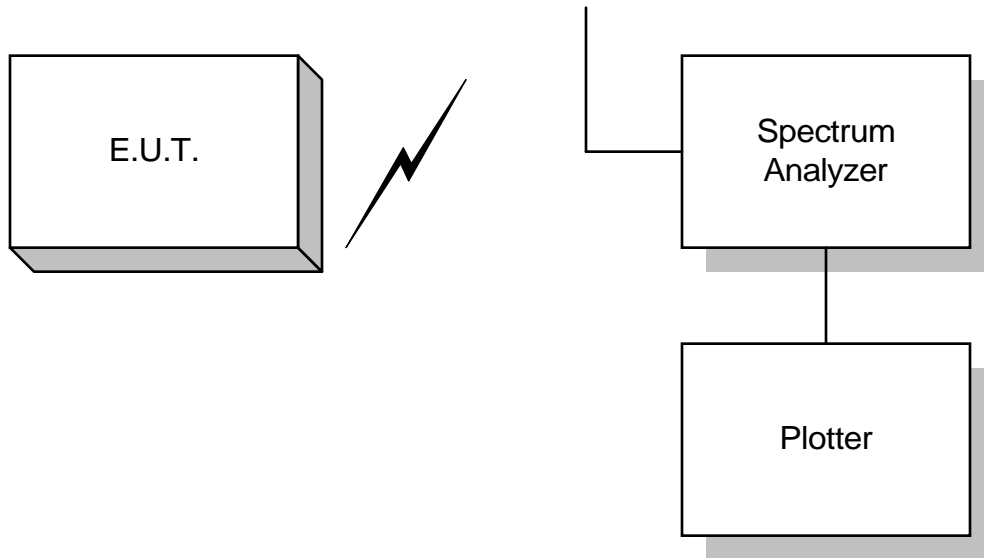


The spectrum was searched up to the 10th harmonic of the fundamental frequency of operation.

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**Occupied Bandwidth**



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**Section 7. Test Equipment List**

<b>CAL CYCLE</b>	<b>EQUIPMENT</b>	<b>MANUFACTURER</b>	<b>MODEL</b>	<b>SERIAL</b>	<b>LAST CAL.</b>	<b>NEXT CAL.</b>
1 Year	Spectrum Analyzer	Hewlett Packard	8564E	3846A01407	May 31/99	Nov. 30/00
1 Year	Receiver	Rohde & Schwarz	ESVP	892661/014	April 5/00	April 5/01
1 Year	Horn Antenna	EMCO #2	3115	4336	Nov. 11/99	Nov. 11/00
1 Year	Dipole Antenna Set	EMCO #2	3121C	FA001349	June 27/99	June 27/00
1 Year	RF AMP	JCA	1-2 GHz	FA001498	May 31/00	May 31/01

NA: Not Applicable  
NCR: No Cal Required  
COU: CAL On Use



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**Annex A**

**Restricted Bands**

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**Section A                      Restricted Bands of Operation**

(a) Except as shown in paragraph (d) of this section , only spurious emissions are permitted in any of the frequency bands listed below:

<b>MHz</b>	<b>MHz</b>	<b>MHz</b>	<b>GHz</b>
0.090 - 0.110	16.42-16.423	399.9-410	4.5-5.15
0.49 - 0.51	16.69475-16.69525	608-614	5.35-5.46
2.1735 - 2.1905	16.80425-16.80475	960-1240	7.25-7.75
3.020 - 3.026	25.5-25.67	1300-1427	8.025-8.5
4.125 - 4.128	37.5-38.25	1435-1626.6	9.0-9.2
4.17725 - 4.17775	73-74.6	1645.5-1646.5	9.3-9.5
4.20725 - 4.20775	74.8-75.2	1660-1710	10.6-12.7
6.215 - 6.218	108-121.94	1718.8-1722.2	13.25-13.4
6.31175 - 6.31225	123-138	2220-2300	14.47-14.5
8.291 - 8.294	149.9-150.05	2310-2390	15.35-16.2
8.362 - 8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625 - 8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425 - 8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29 - 12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975 - 12.52025	240-285	3345.8-3358	36.43-36.5
12.57675 - 12.57725	322-335.4	3600-4400	Above 38.6
13.36 - 13.41			