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Federal Communications Commission
Authorization and Evaluation Division
Laboratory Division
7435 Oakland Mills Road
Colombia, MD 21046

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This is to clarify that the above equipment is incapable of operating (tuning) or readily being altered by the user to operate, within the frequency bands to the Cellular Radiotelephone Service.

The frequencies in question are deleted from the ROM during manufacture, and cannot be restored through any readily available process or component such as: installation of cuts, jumper wires, resistors, diodes, or plug-in IC's; deletion of such items; or reprogramming via access codes or external devices such as a personal computer.

The receiver is incapable of converting digital cellular transmissions to analog voice audio.

Assessing the vulnerability of the receiver to possible modification

The receiver has the possibility of reducing the threshold value to discern transmissions from the Cellular Radiotelephone Service by making modification such as adding jumper wire to the RF band pass filters.

Design features that prevent modification of the receiver to receive Cellular Service

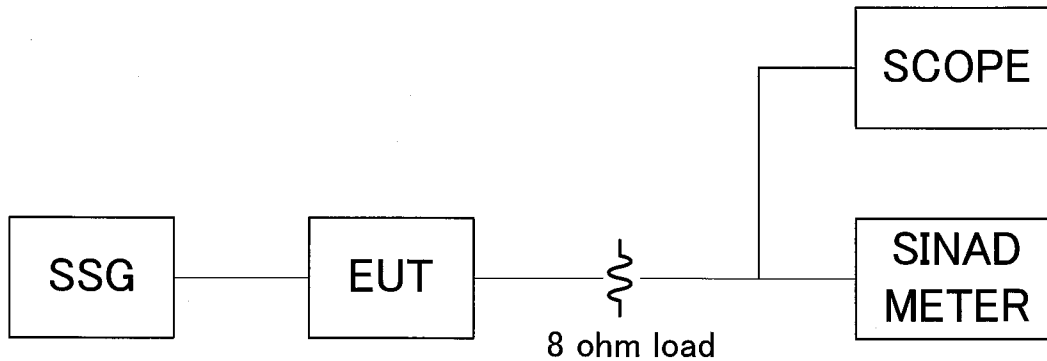
The scanning receiver is designed to prevent any attempt for the user to modify the receiver to receive transmissions from the Cellular Radiotelephone Service by using epoxy to cover the required parts of the RF circuitry including control circuits and band pass filters.

Testing method used to determine compliance with the 38 dB rejection ratio

Testing method

The 12 dB SINAD measurement method in the Cellular Radiotelephone Service used for frequencies that the receiver tunes and the signal rejection ratio gained by the measurement.

Equipment Setup Block Diagram



Measurement method

Tune the receiver to the received frequency and outputs the receiving frequency from SG to obtain its 12 dB SINAD. Then output the interference frequency to obtain its 12 dB SINAD. The signal rejection ratio is the ratio between these two SSG output levels.

The scanning receiver prevents transmissions more than 38 dB from the Cellular Radiotelephone Service from being received for the following reasons:

1. The image frequencies in the frequency range from 25 MHz to 512 MHz are shown as follows:

FR = 25 to 54 MHz, 108 to 174 MHz, 216.0025 to 225 MHz, 225.025 to 405.975 MHz, 406 to 512 MHz

$$\text{IMAGE FREQ.} = \text{FR} + 1^{\text{st}} \text{ IF} \times 2$$

$$1^{\text{st}} \text{ IF} = 1^{\text{st}} \text{ Local} - \text{FR}$$

$$1^{\text{st}} \text{ Local} = A \times 0.075$$

$$A = (\text{FR} + 380.8)/0.075 \text{ or } A = (\text{FR} + 380.7)/0.075$$

$$= A.\text{xxx} \text{ (Cut away decimal)}$$

Refer to the attached table; LOCAL OSC FREQUENCY CALCULATION

$$(25 \text{ to } 54) + (1^{\text{st}} \text{ IF} \times 2) = 786.5 \text{ to } 815.55 \text{ MHz} \text{ IMAGE FREQ.}$$

$$(132.5000 \text{ to } 174) + (1^{\text{st}} \text{ IF} \times 2) = 894.100 \text{ to } 935.55 \text{ MHz} \text{ IMAGE FREQ.}$$

$$(216.0025 \text{ to } 225) + (1^{\text{st}} \text{ IF} \times 2) = 977.5475 \text{ to } 986.55 \text{ MHz} \text{ IMAGE FREQ.}$$

$$(225.025 \text{ to } 405.915) + (1^{\text{st}} \text{ IF} \times 2) = 986.525 \text{ to } 1167.375 \text{ MHz} \quad \text{IMAGE FREQ.}$$

$$(406 \text{ to } 512) + (1^{\text{st}} \text{ IF} \times 2) = 1167.5 \text{ to } 1273.6 \text{ MHz} \quad \text{IMAGE FREQ.}$$

These image frequencies are not included within the Cellular Radiotelephone Service Frequency Band except as follows.

$$(108 \text{ to } 132.49166) + (1^{\text{st}} \text{ IF} \times 2) = 869.550 \text{ to } 893.95834 \text{ MHz} \quad \text{IMAGE FREQ.}$$

Test Results 108 to 132.4875 MHz

Frequency range (MHz)	Cellular frequency range included (MHz)	Received frequency (MHz)	Interference frequency (MHz)	Signal rejection ratio (MHz)	Equation for interference frequency reception (MHz)
108.000	869.550	108.000	869.550	61	$\text{FR} + (\text{IF} \times 2) = 869.550$
to	to	124.000	885.500	60	$\text{FR} + (\text{IF} \times 2) = 885.500$
132.49166	893.95834	132.4875	893.95834	60	$\text{FR} + (\text{IF} \times 2) = 893.95834$

The above test results indicate that all the signal rejection ratios for the Cellular Radiotelephone Frequency Service Band are higher than 38 dB.

- The image frequencies in the frequency range from 764 to 1300 MHz are shown as follows:

FR = 764 to 823.9875 MHz, 851 to 868.9875 MHz, 896 to 960 MHz, 1240 to 1300 MHz

$$\text{IMAGE FREQ.} = \text{FR} - 1^{\text{st}} \text{ IF} \times 2$$

$$1^{\text{st}} \text{ IF} = \text{FR} - 1^{\text{st}} \text{ Local}$$

$$1^{\text{st}} \text{ Local} = A \times 0.075$$

$$A = (\text{FR} - 380.8)/0.075$$

$$= A.\text{xxx} \text{ (Cut away decimal)}$$

$$(764 \text{ to } 823.9875) - (1^{\text{st}} \text{ IF} \times 2) = 2.35 \text{ to } 62.3625 \text{ MHz} \quad \text{IMAGE FREQ.}$$

$$(851 \text{ to } 868.9875) - (1^{\text{st}} \text{ IF} \times 2) = 89.35 \text{ to } 107.3625 \text{ MHz} \quad \text{IMAGE FREQ.}$$

$$(896 \text{ to } 960) - (1^{\text{st}} \text{ IF} \times 2) = 134.35 \text{ to } 198.3 \text{ MHz} \quad \text{IMAGE FREQ.}$$

$$(1240 \text{ to } 1300) - (1^{\text{st}} \text{ IF} \times 2) = 478.4 \text{ to } 538.4 \text{ MHz} \quad \text{IMAGE FREQ.}$$

These image frequencies are not included within the Cellular Radiotelephone Service Frequency Band.

Other rejection results

Test Results (1)

Frequency range (MHz)	Cellular frequency range included (MHz)	Received frequency (MHz)	Interference frequency (MHz)	Signal rejection ratio (dB)	Equation for interference frequency reception (MHz)
25.000 to 29.145	836.500 to 848.895	25.000 to 29.145	836.500 to 848.895	72	$1^{\text{st}} \text{ Lo} \times 3 - 1^{\text{st}} \text{ IF} = 836.500$ to $1^{\text{st}} \text{ Lo} \times 3 - 1^{\text{st}} \text{ IF} = 848.895$
35.830 to 44.140	869.075 to 893.890	35.830 to 40.000 44.140	869.075 881.500 893.890	79 81 81	$1^{\text{st}} \text{ Lo} \times 3 - 1^{\text{st}} \text{ IF} = 869.075$ $1^{\text{st}} \text{ Lo} \times 3 - 1^{\text{st}} \text{ IF} = 881.500$ $1^{\text{st}} \text{ Lo} \times 3 - 1^{\text{st}} \text{ IF} = 893.890$
221.605 to 225.000	824.0025 to 830.775	221.605 to 225.000	824.0025 to 830.775	72 70	$1^{\text{st}} \text{ Lo} \times 2 - 1^{\text{st}} \text{ IF} = 824.0025$ to $1^{\text{st}} \text{ Lo} \times 2 - 1^{\text{st}} \text{ IF} = 830.775$

$$1^{\text{st}} \text{ IF} = 1^{\text{st}} \text{ Local} - \text{FR}$$

$$1^{\text{st}} \text{ Local} = A \times 0.075$$

$$A = (\text{FR} + 380.8)/0.075$$

$$= A.\text{xxx} \text{ (Cut away decimal)}$$

Test Results (2)

Frequency range (MHz)	Cellular frequency range included (MHz)	Received frequency (MHz)	Interference frequency (MHz)	Signal rejection ratio (dB)	Equation for interference frequency reception (MHz)
849.000 to 859.6875	838.300 to 848.9875	849.000 to 859.6875	838.300 to 848.9875	82 81	$\{(\text{FR} \times 2) - 2^{\text{nd}} \text{ IF}\}/2 = 838.300$ to $\{(\text{FR} \times 2) - 2^{\text{nd}} \text{ IF}\}/2 = 848.9875$
866.800 to 868.9875	824.000 to 826.1875	866.800 to 868.9875	824.000 to 826.1875	42 42	$\text{FR} - (2^{\text{nd}} \text{ IF} \times 2) = 824.000$ to $\text{FR} - (2^{\text{nd}} \text{ IF} \times 2) = 826.1875$
894.000 to 904.6875	883.300 to 893.9875	894.000 to 904.6875	883.300 to 893.9875	80 78	$\{(\text{FR} \times 2) - 2^{\text{nd}} \text{ IF}\}/2 = 883.300$ to $\{(\text{FR} \times 2) - 2^{\text{nd}} \text{ IF}\}/2 = 893.9875$
911.800 to 936.7875	869.000 to 893.9875	911.800 920.000 936.7875	869.000 877.200 893.9875	43 43 42	$\text{FR} - (2^{\text{nd}} \text{ IF} \times 2) = 869.000$ $\text{FR} - (2^{\text{nd}} \text{ IF} \times 2) = 877.200$ $\text{FR} - (2^{\text{nd}} \text{ IF} \times 2) = 893.9875$

The above test results indicate that all the signal rejection ratios for the Cellular Radiotelephone Service Frequency Band are higher than 38 dB.

FR DENOTES Frequency received

Receiving band (FR step)	Freq. step (kHz)	Receiving freq. FR (MHz)	1 st Local PLL 1/ VCO 1 or VCO 2 (MHz)	2 nd Local PLL 2/VCO 3 (MHz)	3 rd Local X'tal (MHz)
VHF Low	10	25.0000 – 27.4050	A = (FR + 380.800)/0.075	2 nd Local = 1 st IF – 21.4	20.9450
	5	27.4100 – 29.7000	= A.xxx (Cut away decimal)		
	10	29.7100 – 49.8300	1 st Local = A x 0.075		
	5	49.8350 – 54.0000	1 st IF = 1 st Local – FR		
VHF High	8.33	108.0000 – 136.99166		2 nd Local = 1 st IF – 21.4	20.9450
	5	137.0000 – 137.9950			
	12.5	138.0000 – 143.9875			
	5	144.0000 – 147.9950			
	12.5	148.0000 – 150.7875			
	5	150.8000 – 150.8450			
	7.5	150.8525 – 154.4975			
	5	154.5150 – 154.6400			
	7.5	154.6500 – 156.2550		2 nd Local = 1 st IF – 21.3975	20.9425
	25	156.2750 – 157.4500		2 nd Local = 1 st IF – 21.4	20.9450
	7.5	157.4700 – 161.5725		2 nd Local = 1 st IF – 21.3975	20.9425
	5	161.6000 – 161.9750		2 nd Local = 1 st IF – 21.4	20.9450
	12.5	162.0000 – 174.0000			
	5	216.0025 – 224.9950		2 nd Local = 1 st IF – 21.4025	20.9475
UHF Low	6.25	225.0000 – 316.49375		2 nd Local = 1 st IF – 21.4	20.9450
	6.25	316.5000 – 316.79375	A = (FR + 380.700)/0.075		
	6.25	316.8000 – 337.89375	A = (FR + 380.800)/0.075		
	6.25	337.9000 – 338.09375	A = (FR + 380.700)/0.075		
	6.25	338.1000 – 339.29375	A = (FR + 380.800)/0.075		
	6.25	339.3000 – 359.49375	A = (FR + 380.700)/0.075		
	6.25	359.5000 – 379.99375	A = (FR + 380.800)/0.075		
	12.5	380.0000 – 380.7125	//		
	12.5	380.7250 – 380.8000	A = (FR + 380.700)/0.075		
	12.5	380.8125 – 400.0000	A = (FR + 380.800)/0.075		
	12.5	400.0125 – 405.9750	A = (FR + 380.700)/0.075		
	12.5	405.9875 – 419.9875	A = (FR + 380.800)/0.075		
	5	420.0000 – 450.0000	//		
	6.25	450.00625 – 469.99375	//		
	12.5	470.0000 – 512.0000	//		
UHF High	3.125	764.0000 – 766.996875	A = (FR – 380.800)/0.075	2 nd Local = 1 st IF – 21.4	20.9450
	3.125	773.0000 – 775.996875	= A.xxx (Cut away decimal)		
	3.125	794.0000 – 796.996875	1 st Local = A x 0.075		
	3.125	803.0000 – 805.996875	1 st IF = FR – 1 st Local		
	12.5	806.0000 – 823.9875			
	12.5	849.0000 – 868.9875			
	12.5	894.0000 – 939.9875			
	6.25	940.0000 – 960.0000			
	6.25	1240.0000 – 1300.0000			

IF FREQUENCY

1st IF: 380.6500 – 380.86875 MHz

2nd IF: 21.3975 MHz/21.4000 MHz/21.4025 MHz

3rd IF: 455 kHz

Label Requirement

The scanning receiver has a label affixed to the product shown on the attached drawing of the model label, which reads as follows:

WARNING: MODIFICATION OF THIS DEVICE TO RECEIVE CELLULAR RADIOTELEPHONE
SERVICE SIGNALS IS PROHIBITED UNDER FCC RULES AND FEDERAL LAW.

Based on the above, we hereby attest that the equipment in question compiles fully with the provisions of §15.121 of FCC Rules.



M. Ishizuka, Chief Engineer