

1.9 GHZ. PCS BAND FREQUENCY USAGE

AT

MOTOROLA'S PLANTATION, FLORIDA SITE

by

Wireless Spectrum Resources, Inc.

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INTRODUCTION/OBJECTIVE -

Motorola has developed a new series of cell phones that operate in the 1.9 GHz. PCS frequency band. To insure that the phones will operate properly on a PCS system, a fixed testing facility needs to be constructed at their Plantation Florida location. Prior to ordering the equipment for this testing facility, available frequencies must be determined that could be used. To accomplished this objective, monitoring of the PCS band is necessary to identify any available frequencies that are not currently being used by PCS carriers.

On September 9, 2005, monitoring of the 1.9 GHz PCS spectrum was conducted at three locations near and in the Motorola facility by Wireless Spectrum Resources, Inc. The portion of the PCS spectrum monitored included all the frequencies used by the various carriers for their fixed sites. i.e. cell sites. The frequencies monitored are from 1930 MHz. to 1990 MHz.

PROCEDURE -

The equipment used to conduct the monitoring consisted of a Anrtisu model MS-2711D spectrum analyzer connected to a small discone antenna mounted approximately 6 feet above ground with a 8 foot RG-223 cable. The spectrum analyzer was allowed to sweep over the 60 MHz frequency band of interest for a period of at least 30 minutes with the "max hold" function activated. This allowed the cumulative recording of any and all transmissions on these frequencies during the monitoring time period. The Antrisu Spectrum Analyzer has a frequency coverage of 100 KHz to 3.0 Ghz with a typical noise level of -90 dBm. With its 25 dB internal pre-amplifier activated, this figure improves to -115 dBm. To prevent internal spurious responses, the analyzer manufacturer recommends that any signals received do not exceed a level of -30 dBm at the mixer input. If the mixer is overloaded, a warning message is indicated on the analyzer screen, along with a request to increase the input attenuation. The analyzer is equipped with a variable input attenuator which can provide up to 51 dB of attenuation.

The first monitoring site is located outside the facility building in the south east corner of the parking lot near the antenna test range. The equipment was set up and signal levels were checked. Having adequate signals, no pre-amplifier or input attenuation was needed. The equipment was allowed to record signals from 11:20 AM to 11:50 AM producing the attached plot labeled "Parking Lot".

The second monitoring site is inside the building in the Cheeta lab. Once the monitoring equipment was set up, it was noted that a very strong signal was limiting the sensitivity of the spectrum analyzer. This signal was found to be coming from transmitter that was operating in the next lab and needed to be shut down. This was accomplished after a short wait while some test were completed. In this location, very little signal was available, thus the pre-amplifier was used along with some input attenuation to prevent the overload of the analyzer's mixer providing

a overall gain of approximately 14 dB. This can be seen by the difference in the noise level shown on the attached plot labeled "Cheeta Lab". Recording of signals was conducted between 1:35 PM and 2:10 PM. Please note, the spike at approximately 1982.5 MHz resulted from the internal overload of the mixer and should be ignored.

The third monitoring site is located inside the building in the Mobile Management Lab. Signals in this area did require the addition of 2 dB of input attenuation to keep the analyzer from overloading. The pre-amplifier was not used at this site as adequate signal strength was available. Recording of signals was conducted between 2:55 PM and 3:32 PM producing in the attached plot labeled "Mobile Management Lab"

ANALYSIS/CONCLUSION -

While it would have been better to use the spectrum analyzer without any amplification or input attenuation, the signal levels in the Cheeta Lab were just too weak to provide a usable plot. The attachment labeled "comparison - Parking lot/Cheetta Lab" consists of the plot resulting from the monitoring conducted in the parking lot with an overlay of the plot resulting from the monitoring conducted in the Cheeta Lab. This comparison shows that the same signals recorded at the parking lot site were still on the air but because of the attenuation introduced by the building, the signal levels in the Cheeta Lab are at a much lower level. From this comparison of plots it appears that the building introduces approximately 20 dB of attenuation to the PCS signals in the Cheeta Lab.

A second comparison is shown in the attachment labeled "comparison - parking lot/Mobile Management Lab". This attachment consists of the parking lot plot with a overlay of the Mobile Management lab plot. From this comparison it is apparent that the Mobile Management Lab location only provides 5 to 10 dB of attenuation to the PCS signals, a lot less than in the Cheeta Lab.

Since the objective of this project is to identify unused frequencies that could be used for testing of the new cell phone units, a review of all three individual plots confirm that the same signals are found at each test site. Based on the requirement that three CDMA channels are needed at each site, with each channel requiring 1.25 MHz in bandwidth, for a total of 3.75 MHz plus any guard bands, identifying a 5 MHz band was the goal of this effort. Analysis of the measurements made in the parking lot plot, which has the strongest signal indications, two 5 MHz bands of what appear to be unused frequencies were found. One currently unused band is located in the upper part of the Verizon's "Block B" allocation, and is located from 1960 to 1965 Mhz. and the second currently unused band is located in the upper part of the Metro PCS's "Block C" allocation and is located from 1985 to 1990 Mhz.

It is recommended that Motorola apply for a experimental license for all the 1.9 Ghz PCS frequency band. This will provide you with authorization to operate anywhere in the band in case a local carrier were to change their frequency usage. It is also recommended that once the system is constructed and activated, measurements be made outside around the facility to insure

that your test signals will not interfere with the licensed carriers. Additional periodic monitoring of the PCS band should be conducted to insure that local carriers have not changed their frequency usage and could impact your testing facility. You may also want to post notices to your employees and visitors that their cell phones may not function properly in or near your facility due to testing.

Submitted by,

John L. Theimer
President
Wireless Spectrum Resources, Inc.

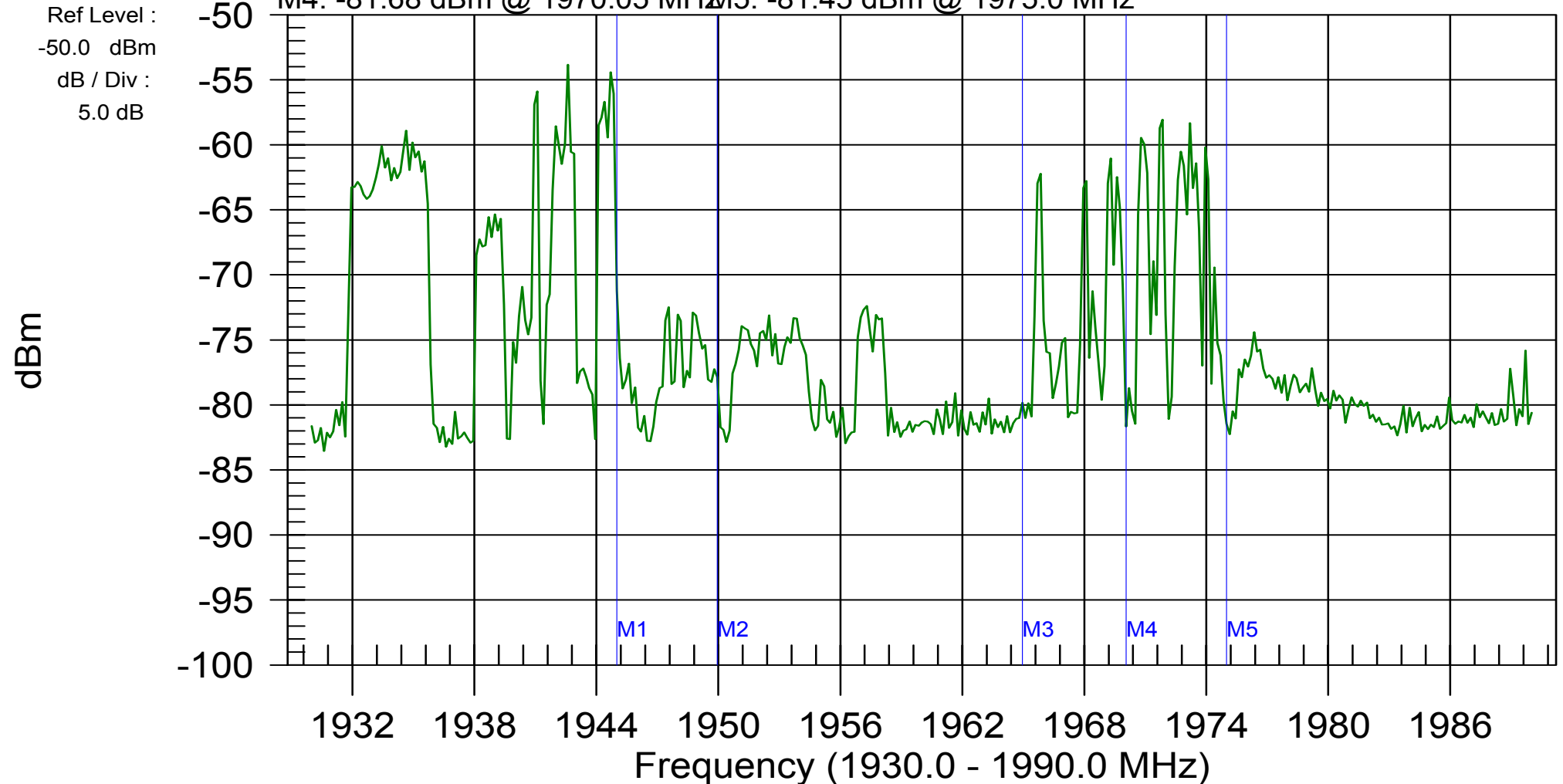
Anritsu Spectrum Analyzer

Parking Lot

M1: -71.21 dBm @ 1945.0 MHz M2: -77.86 dBm @ 1949.95 MHz M3: -79.82 dBm @ 1964.95 MHz

M4: -81.68 dBm @ 1970.05 MHz M5: -81.45 dBm @ 1975.0 MHz

Ref Level :
-50.0 dBm
dB / Div :
5.0 dB



CF: 1960.0 MHz

RBW: 30 kHz

MaxHold: ON

Min Sweep Time: 1.00 Milli Sec

Date: 09/09/2005

Model: MS2711D

SPAN: 60.00 MHz

VBW: 100 kHz

Attenuation: 0 dB

Detection: Pos. Peak

Time: 10:55:48

Serial #: 00446040

Anritsu Spectrum Analyzer

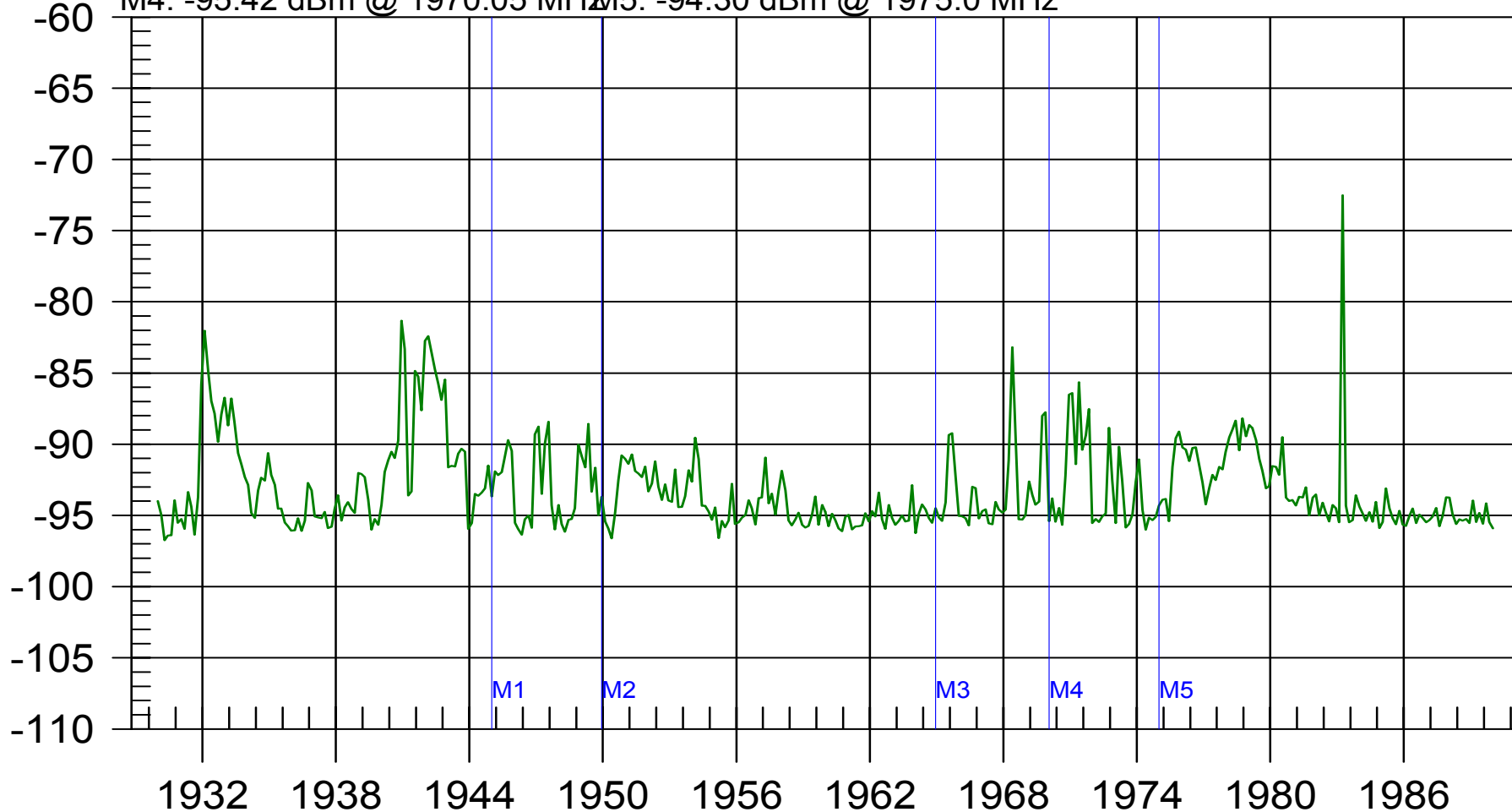
Cheeta Lab

M1: -93.66 dBm @ 1945.0 MHz M2: -93.68 dBm @ 1949.95 MHz M3: -94.51 dBm @ 1964.95 MHz

M4: -95.42 dBm @ 1970.05 MHz M5: -94.30 dBm @ 1975.0 MHz

Ref Level :
-60.0 dBm
dB / Div :
5.0 dB

dBm



CF: 1960.0 MHz

RBW: 30 kHz

MaxHold: ON

Min Sweep Time: 1.00 Milli Sec

Date: 09/09/2005

Model: MS2711D

SPAN: 60.00 MHz

VBW: 100 kHz

Time: 13:16:07

Serial #: 00446040

Attenuation: 9 dB

Detection: Pos. Peak

Preamplifier ON

Anrtisu Spectrum Analyzer

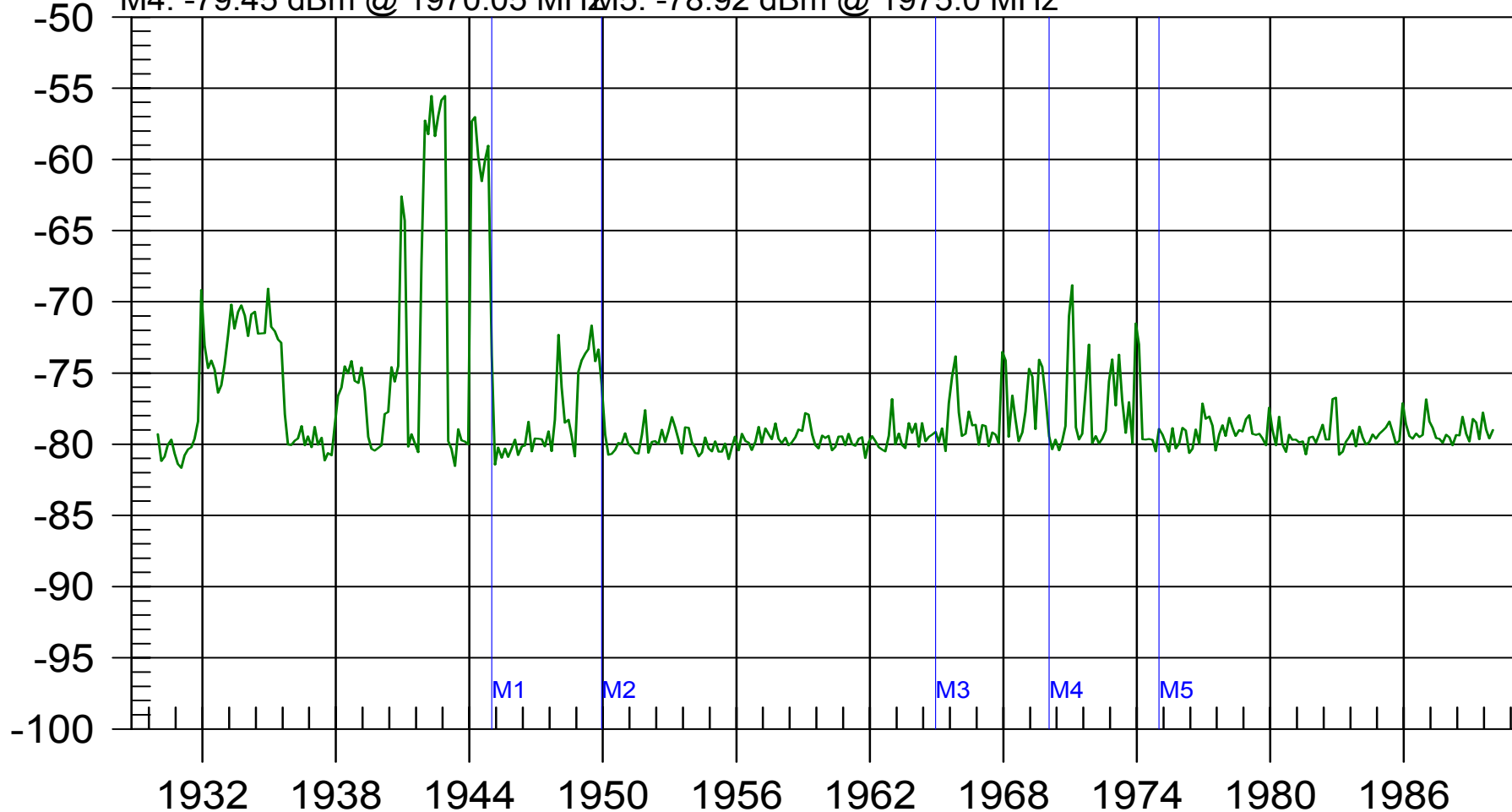
Mobile Management Lab

M1: -73.76 dBm @ 1945.0 MHz M2: -75.81 dBm @ 1949.95 MHz M3: -79.14 dBm @ 1964.95 MHz

M4: -79.45 dBm @ 1970.05 MHz M5: -78.92 dBm @ 1975.0 MHz

Ref Level :
-50.0 dBm
dB / Div :
5.0 dB

dBm



CF: 1960.0 MHz

RBW: 30 kHz

MaxHold: ON

Min Sweep Time: 1.00 Milli Sec

Date: 09/09/2005

Model: MS2711D

SPAN: 60.00 MHz

VBW: 100 kHz

Attenuation: 2 dB

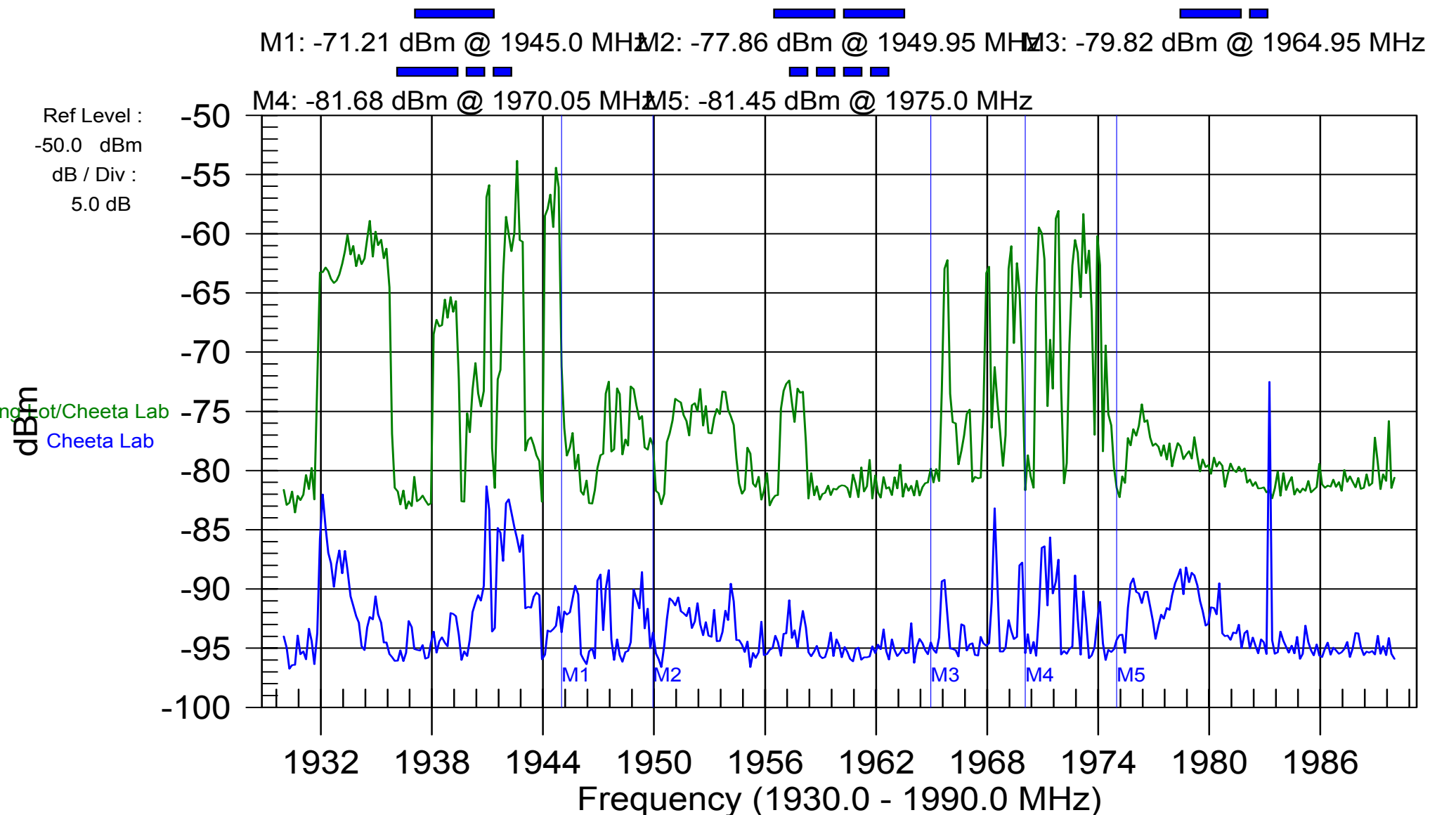
Detection: Pos. Peak

Time: 14:39:35

Serial #: 00446040

Anritsu Spectrum Analyzer

Comparaison -Parking Lot/Cheeta Lab



CF: 1960.0 MHz

RBW: 30 kHz

MaxHold: ON

Min Sweep Time: 1.00 Milli Sec

Date: 09/09/2005

Model: MS2711D

SPAN: 60.00 MHz

VBW: 100 kHz

Attenuation: 0 dB

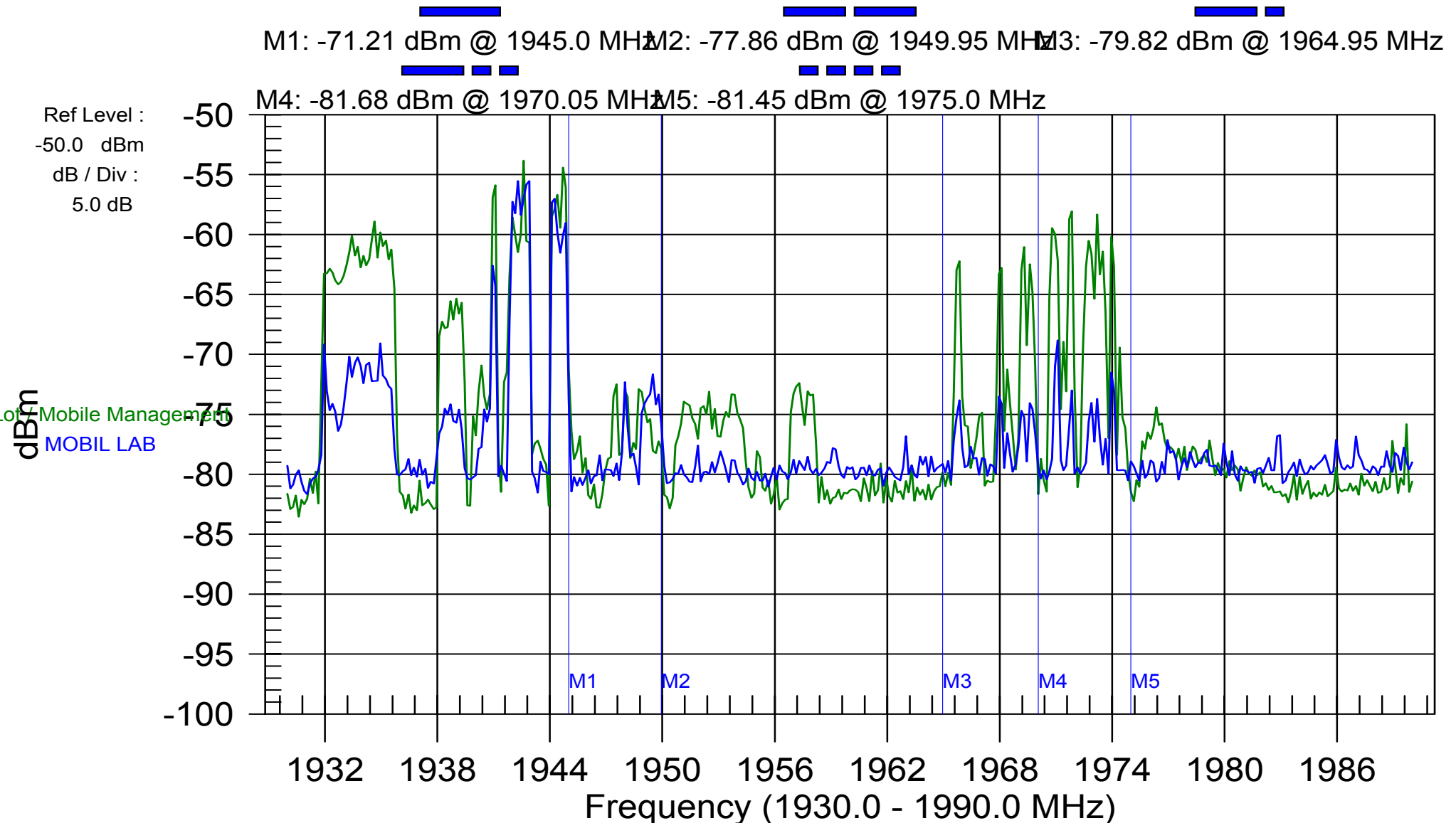
Detection: Pos. Peak

Time: 10:55:48

Serial #: 00446040

Anritsu Spectrum Analyzer

comparaison - Parking Lot / Mobile Management Lab



CF: 1960.0 MHz

RBW: 30 kHz

MaxHold: ON

Min Sweep Time: 1.00 Milli Sec

Date: 09/09/2005

Model: MS2711D

SPAN: 60.00 MHz

VBW: 100 kHz

Attenuation: 0 dB

Detection: Pos. Peak

Time: 10:55:48

Serial #: 00446040