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FEDERAL COMMUNICATIONS COMMISSION

OFFICE OF CHIEF ENGINEER

LABORATORY DIVISION

LAUREL, MARYLAND

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June 9, 1970

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SUMMARY



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UHF TV ANTENNA PERFORMANCE

PROJECT NUMBER 2245-37

June 9, 1970

SUMMARY

This report contains performance tests and radiation patterns of the UHF loop antennae commonly provided with portable TV receivers. Comparative figures are given for a tuned dipole.

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UHF TV ANTENNA PERFORMANCE

PROJECT NUMBER 2245-37

INTRODUCTION

It has become common practice for manufacturers to provide loop antennae with their portable TV receivers for reception of UHF signals. These loops are approximately 7 to 8 inches in diameter and usually constructed so that they can be oriented to any position despite their connection on the back of the receiver to screw type antenna terminals.

Since UHF TV comparability with respect to VHF should include the performance of the receptive antenna as well as the receiver's circuit characteristics and tuning methods, it was decided to investigate the performance of such loops, since their use might be an economic expedient.

TEST METHODS

I. Loop Radiation Patterns.

The radiation patterns of the loop antenna alone were obtained at five different frequencies spaced throughout the UHF range.

They were obtained by measuring the open field strengths existing at 100 feet while rotating the loop, fed from a signal generator at a 0 dBm level via a balun, through 360 degrees.

For reference purposes, the loop was replaced with a tuned dipole and the maximum field strength at 100 feet was measured with the same input power to the balun of the dipole.

Patterns were obtained for three different planes of the loop with respect to ground: horizontal, vertical, and 45 degrees.

II. Maximum Open Field Receptive Response of Loop.

In this test the UHF loop was connected to the appropriate terminals on the rear of a TV receiver, which was set on a rotatable platform. The IF from the mixer of the receiver's front end was fed to a field strength meter used as a tuned RF voltmeter. Readings produced by signals from a tuned dipole at 100 feet were recorded for five separate frequencies throughout the UHF range. A signal generator at 0 dBm fed the dipole via a balun.

In determining the response patterns, the set was rotated in 15 degree increments and the loop then manually adjusted for maximum output at that particular set azimuth. The 0 dB reference was the magnitude produced at the IF when a tuned dipole was substituted for the loop.

III. Inside Loop Response.

In this test the TV receiver, connected as in Test II, was brought inside the Laboratory building's TV room, and maximum readings obtained for the four TV UHF signals existing in this area, Channels 14, 20, 26, and 67, by orienting the loop.

Readings were also obtained for these signals with a tuned dipole substituted for the loop.

RESULTS

The results of these tests are given in the patterns and tabulation at the end of this report.

CONCLUSIONS

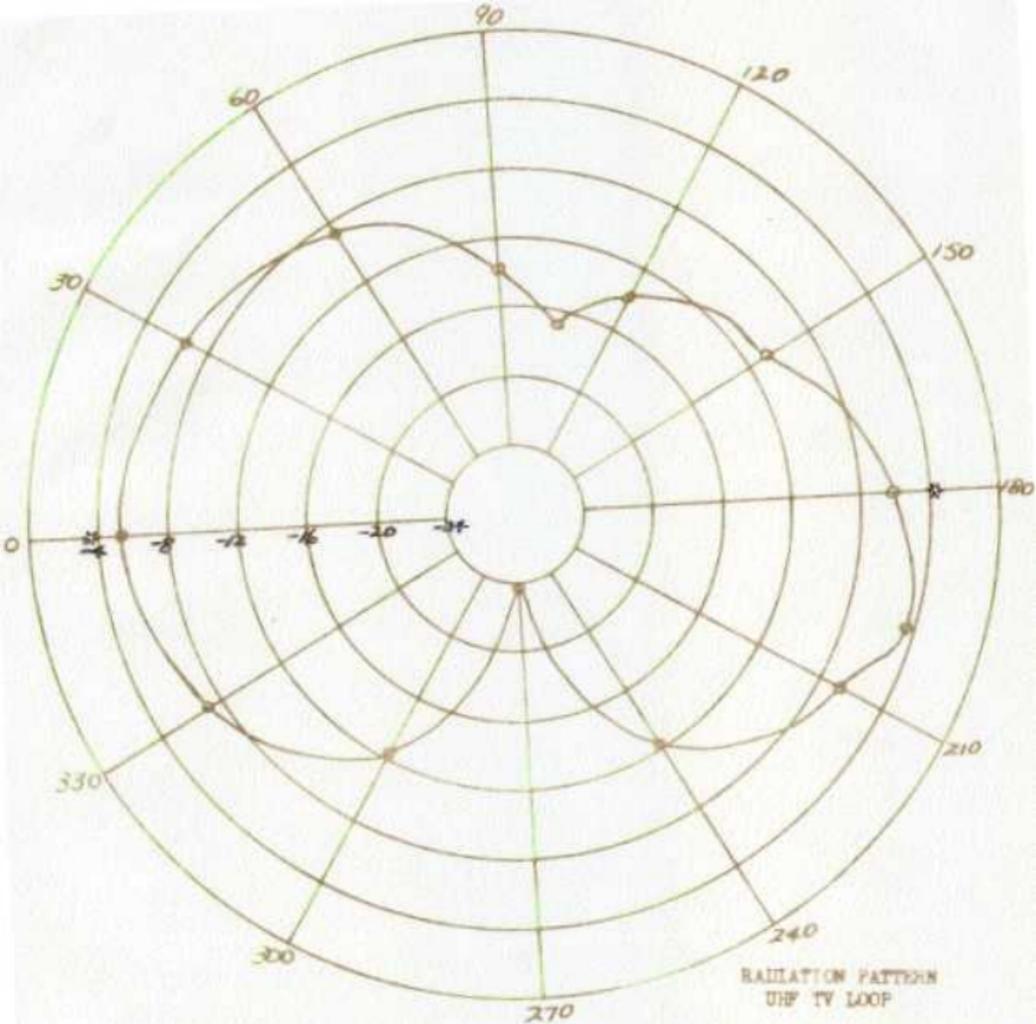
The performance of the UHF loop proved surprisingly good in comparison with a tuned dipole in this investigation, as shown by the test results. Although of fixed dimensions it produced outputs that were only slightly inferior to a tuned (adjustable) dipole on the average.

It might be observed that the superiority of a tuned dipole over the loop was more marked when the receiver was inside the Laboratory. However, this apparent superiority may be attributed in a large part to the freedom provided by our test setup for adjusting the height of the tuned dipole (with respect to the fixed loop) in the distorted field that exists inside the building or to the small size of the sample. Such freedom might not exist in an actual home installation. (It should also be noted that the loop gave a greater output for Channel 26, 545 MHz.)

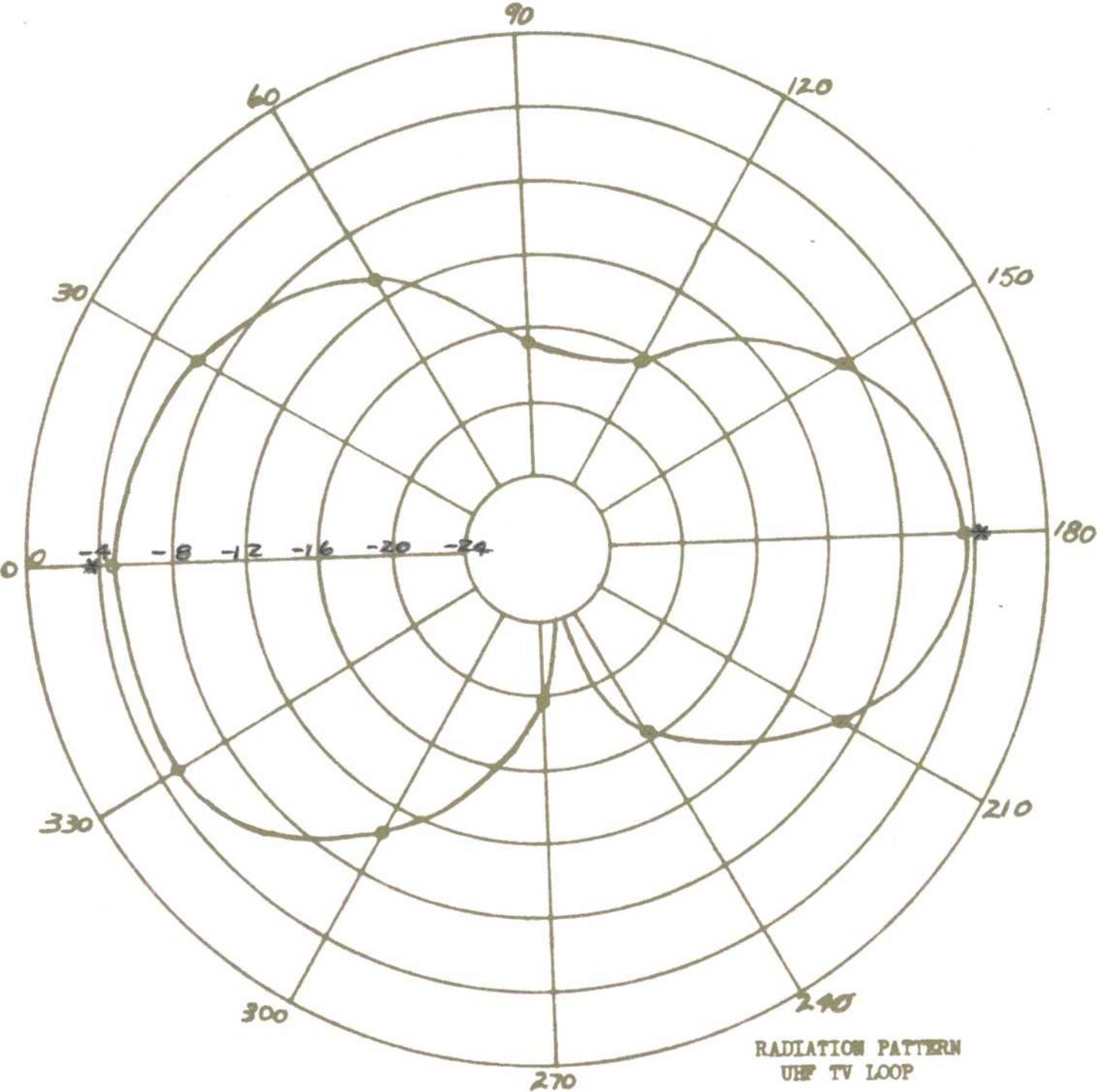
It appears that the receiver mounted UHF loop is capable of providing good reception in many UHF signal areas, and is not just an economical expediency. However, for best color results and the greatest freedom from ghosts, an outside external antenna is, of course, preferred.

INSIDE LOOP RESPONSE

<u>Channel</u>	<u>Video Carrier Frequency (MHz)</u>	<u>Meter Voltage (uv) Loop Dipole</u>
14	473	210
20	509	195
26	545	125
67	791	320

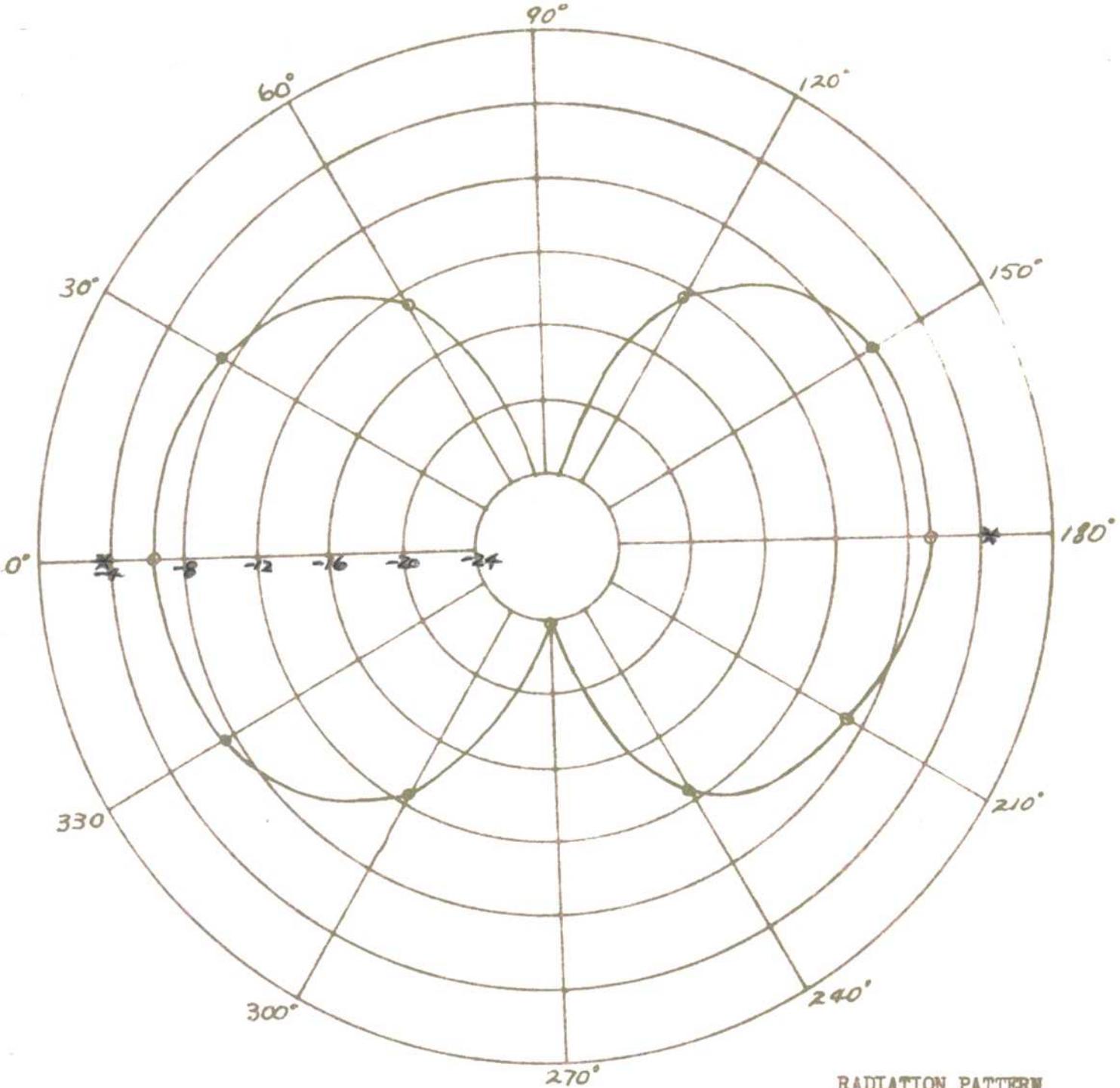


Plane of loop: *HORIZONTAL*
 Frequency: *470 MHz*
 * marks tuned dipole maximum



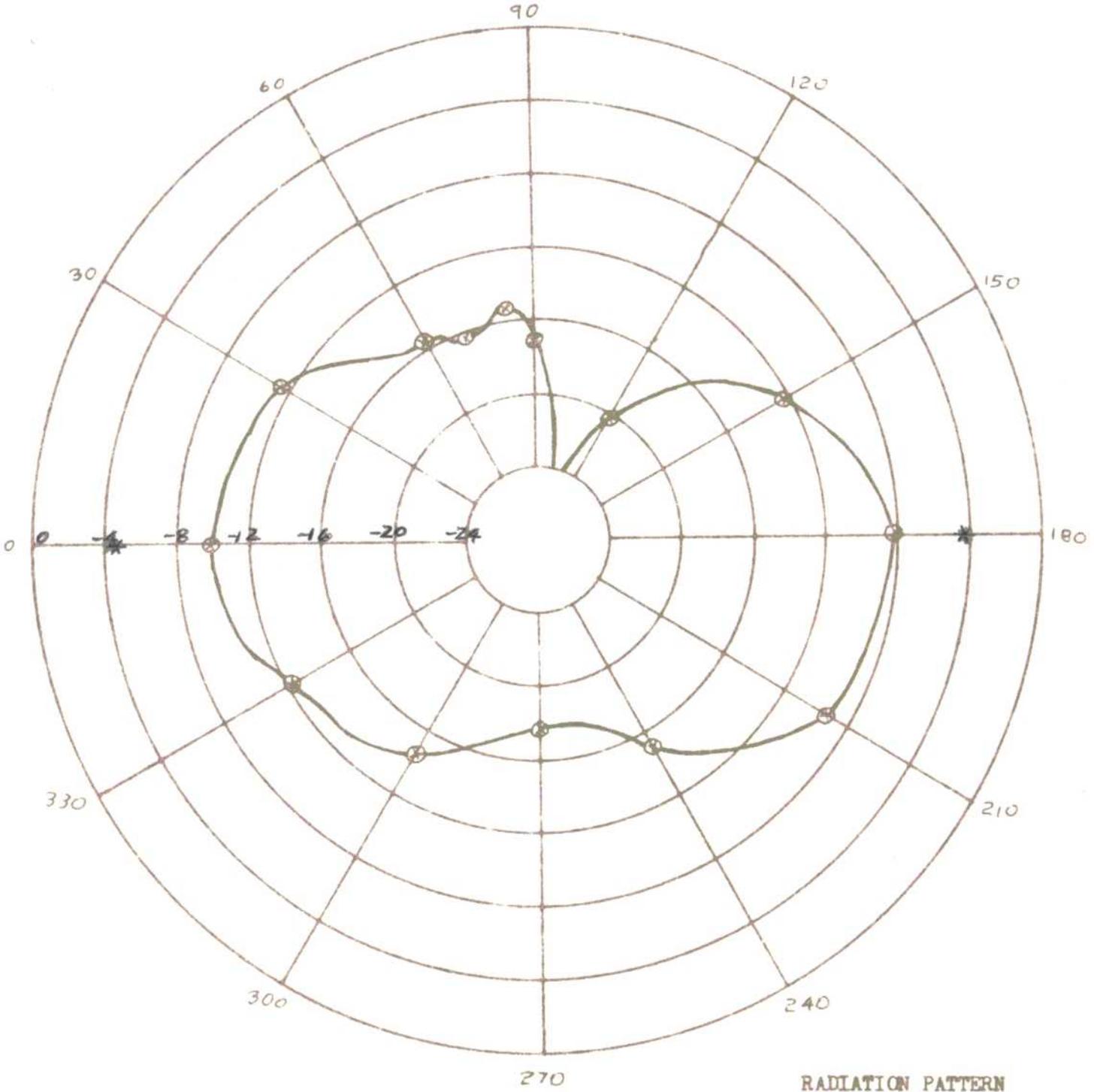
RADIATION PATTERN
UHF TV LOOP

Plane of Loop: 45°
 Frequency: 470 MHz
 * marks tuned dipole maximum



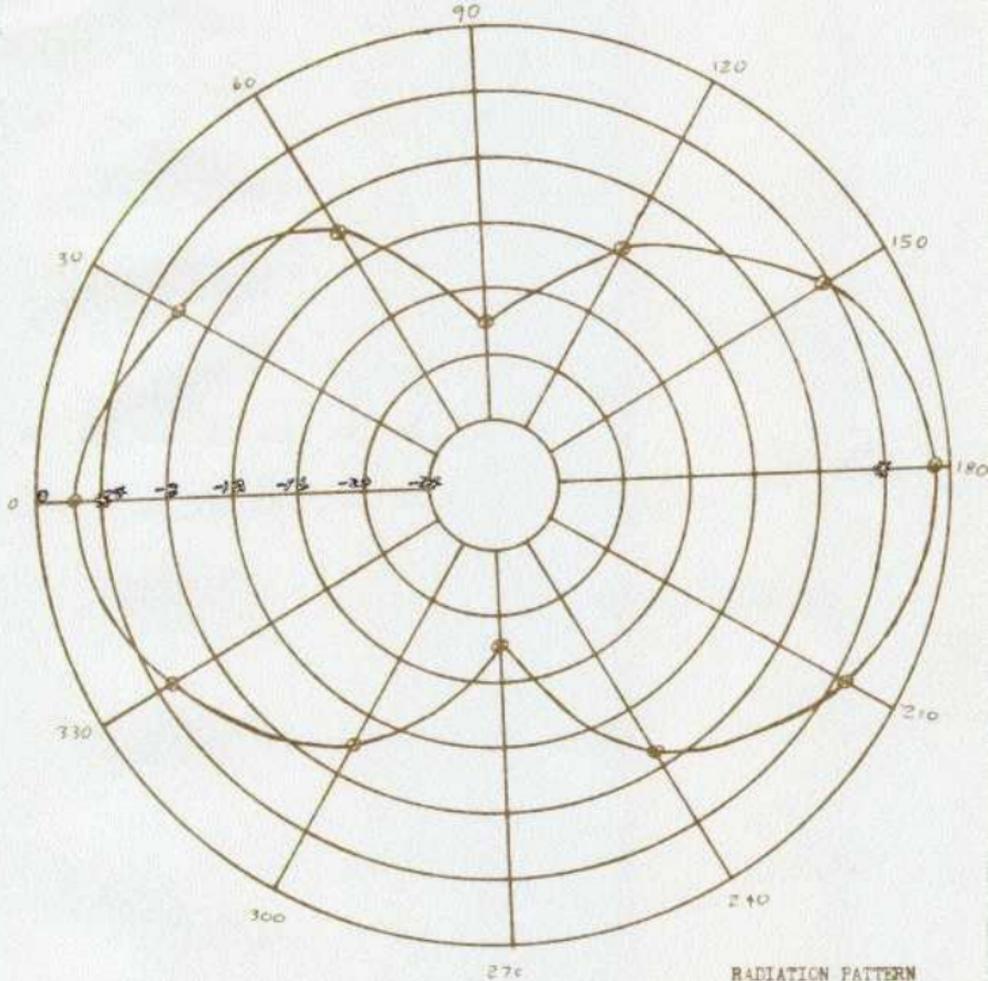
RADIATION PATTERN
UHF TV LOOP

Plane of Loop: VERTICAL
 Frequency: 470 MHz
 * marks tuned dipole maximum



RADIATION PATTERN
UHF TV LOOP

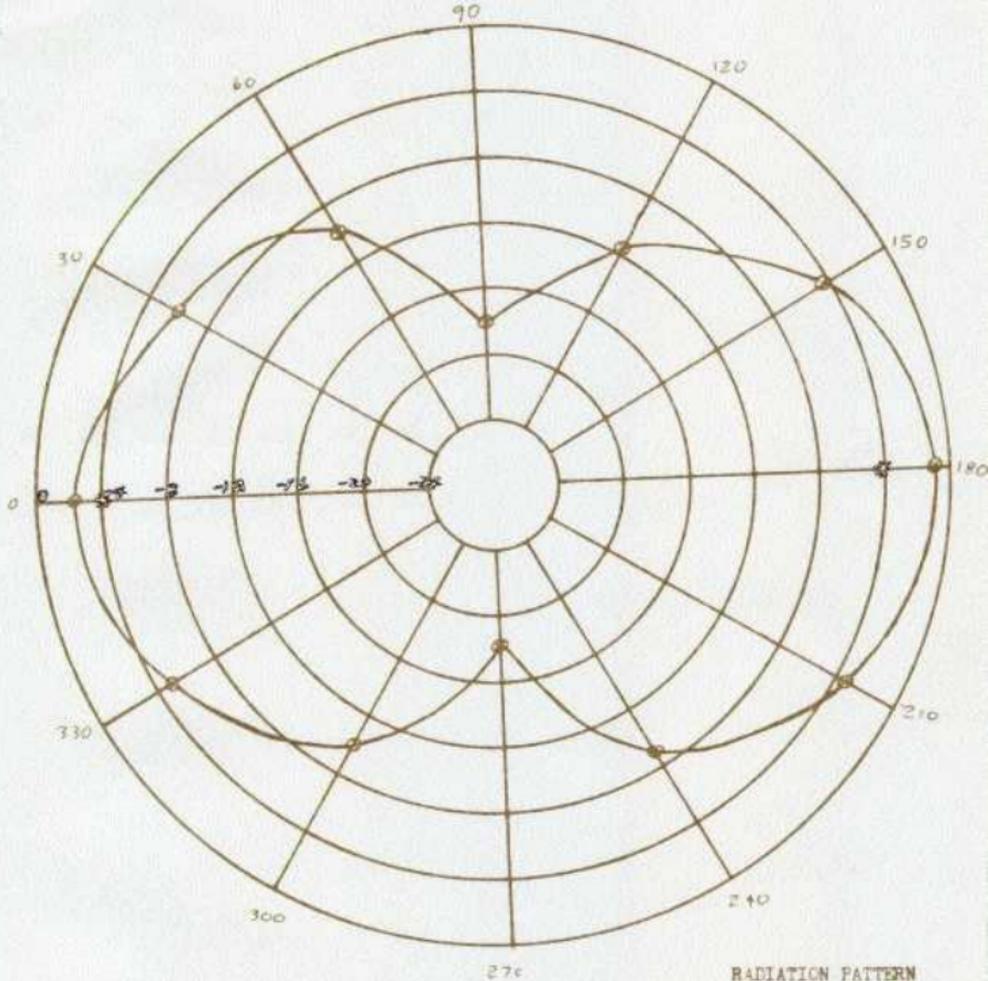
Plane of loop: *HORIZONTAL*
 Frequency: *573 MHz*
 * marks tuned dipole maximum



RADIATION PATTERN
UHF TV LOOP

Plane of Loop: *VERTICAL*
Frequency: 573 MHz

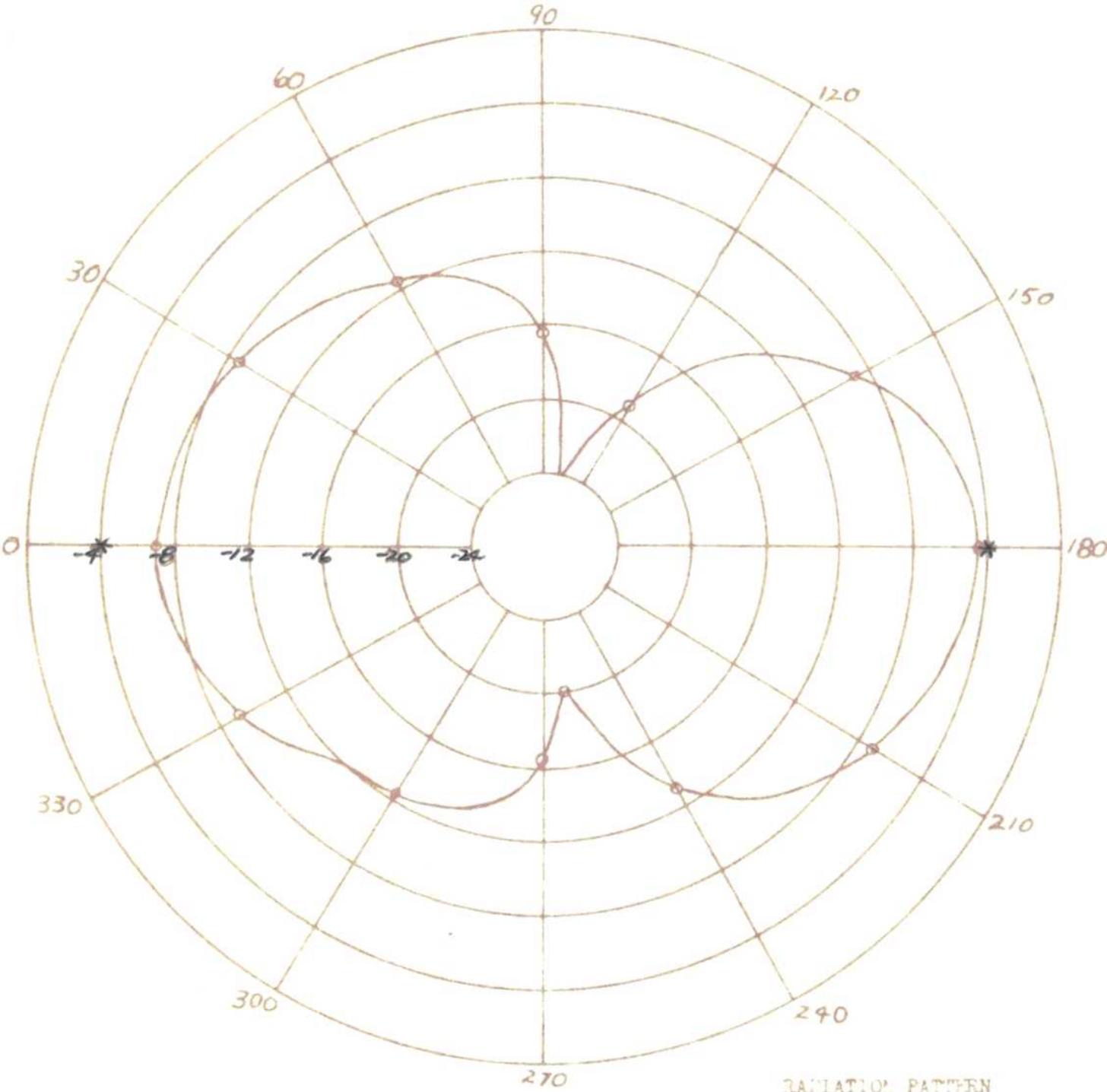
* marks tuned dipole maximum



RADIATION PATTERN
UHF TV LOOP

Plane of Loop: *VERTICAL*
Frequency: *573 MHz*

* marks tuned dipole maximum

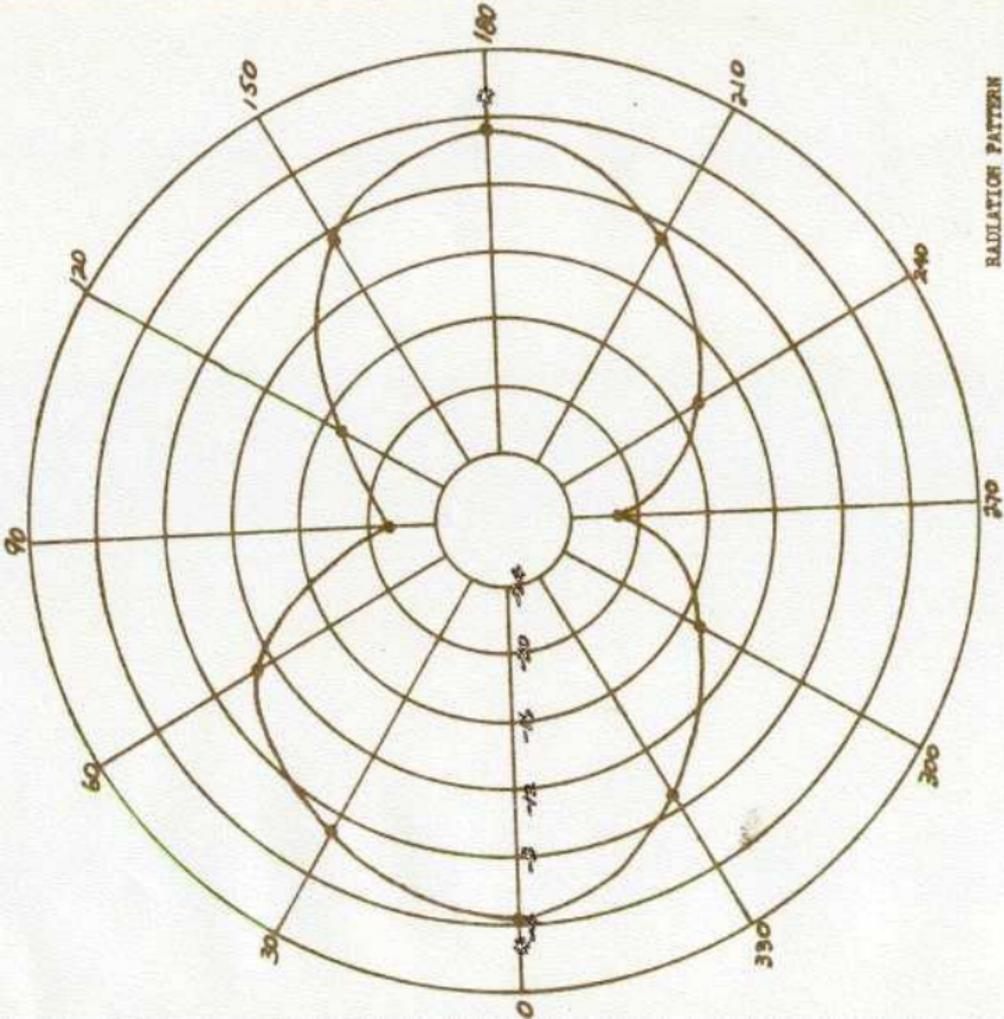


RADIATION PATTERN
 UHF TV LOOP

Plane of Loop: 45°

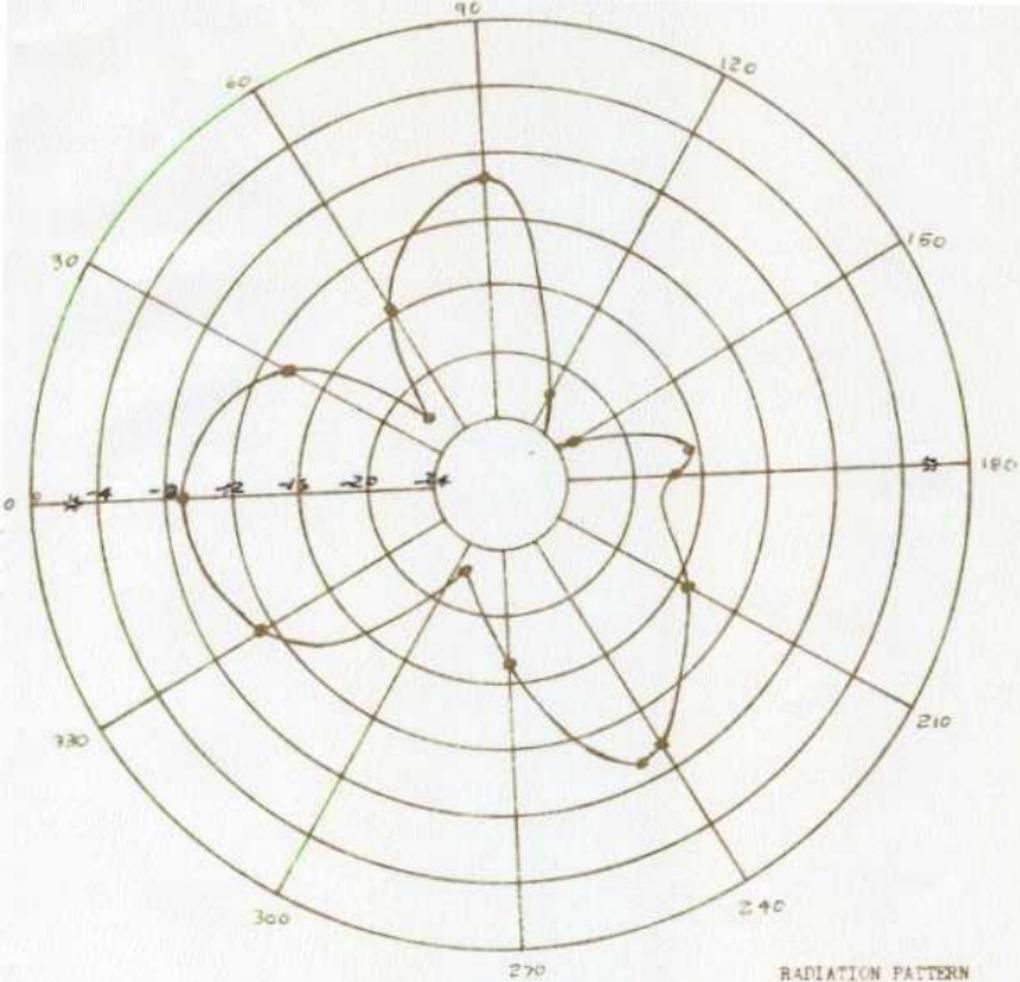
Frequency: 573 MHz

* marks tuned dipole maximum



RADIATION PATTERN
 USE TV LOOP

Plane of Loop: VERTICAL
 Frequency: 681 MHz
 + marks tuned dipole maximum

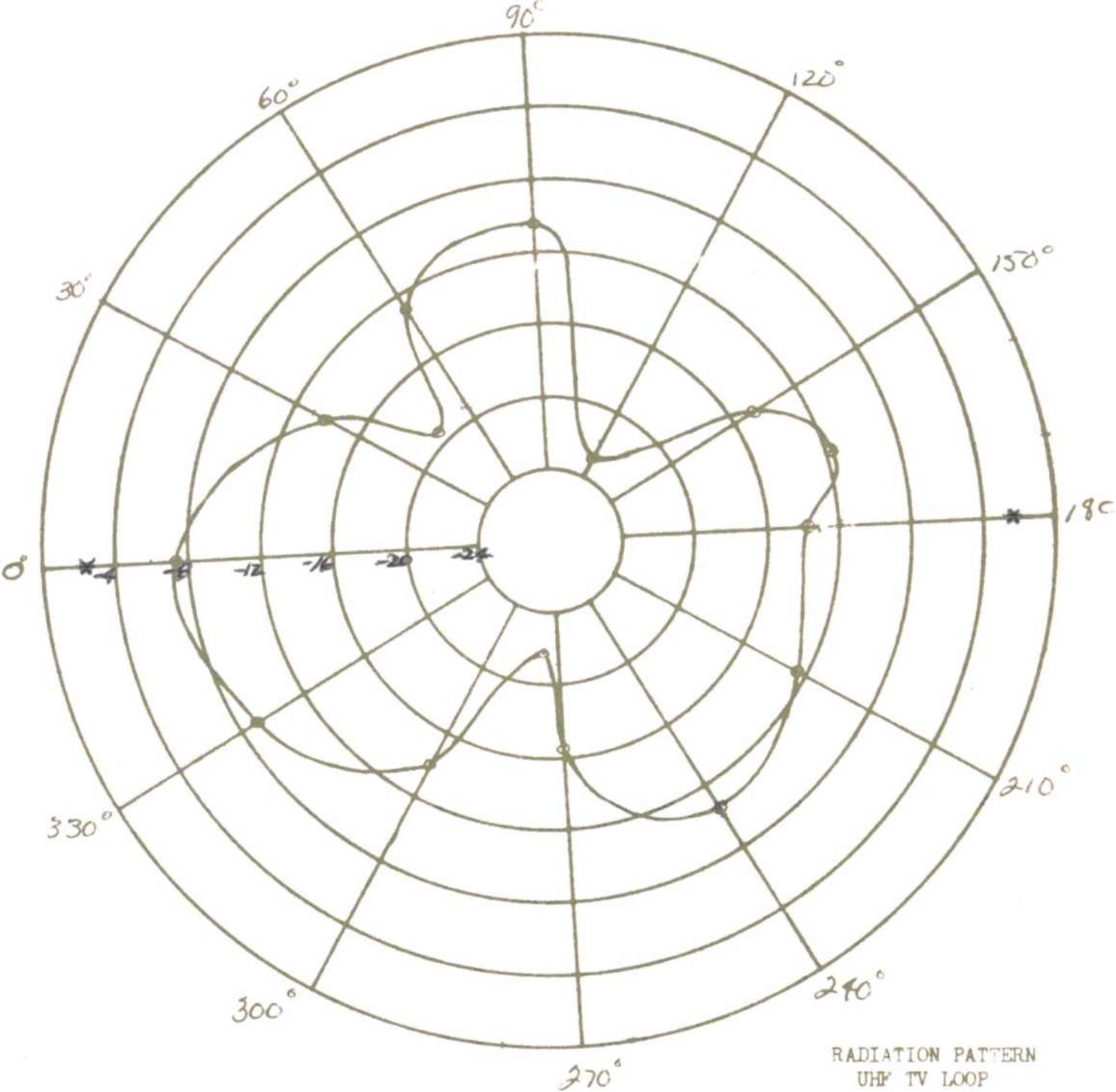


RADIATION PATTERN
UHF TV LOOP

Plane of Loop: **HORIZONTAL**

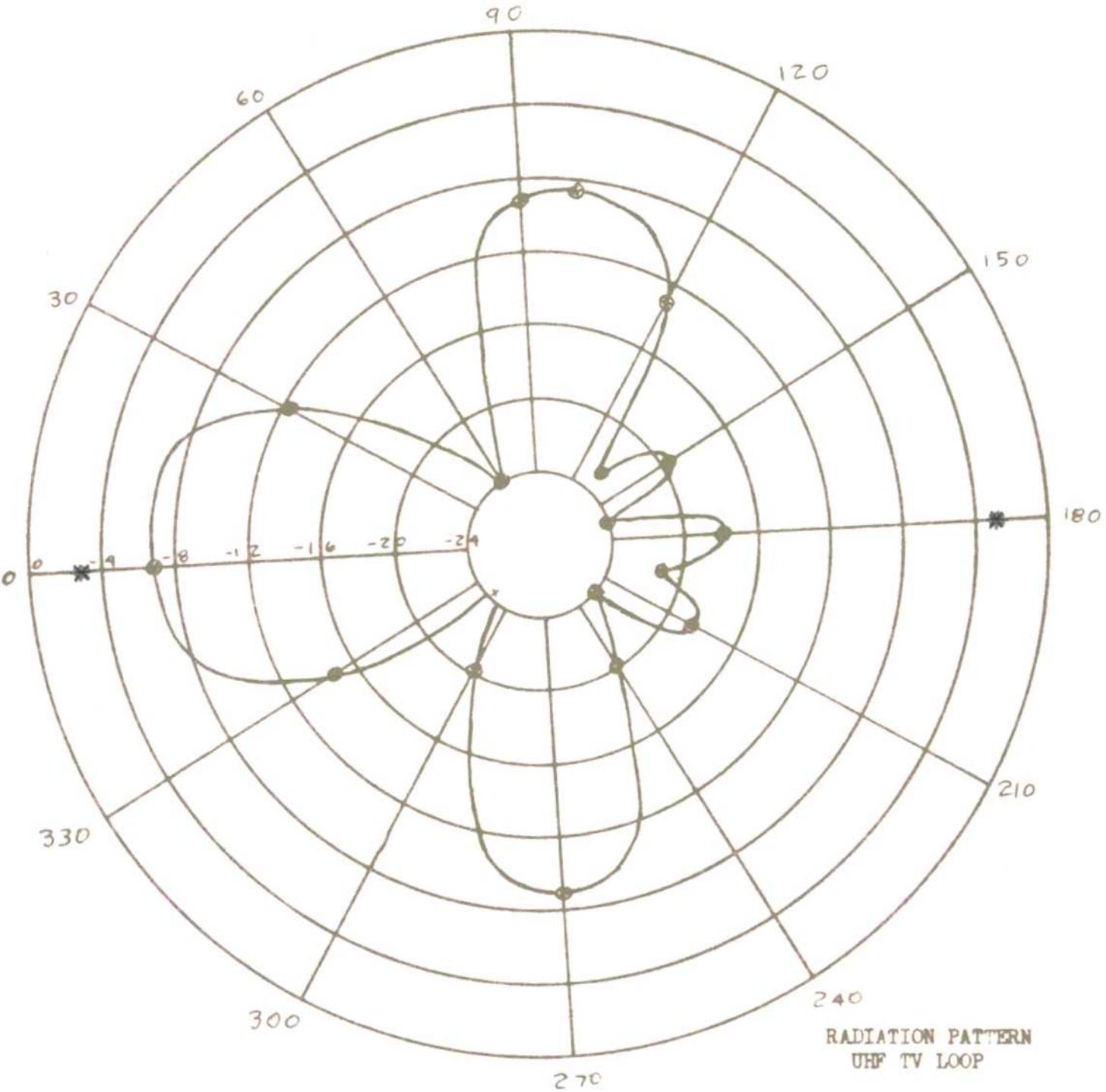
Frequency: **601 MHz**

* marks tuned dipole maximum



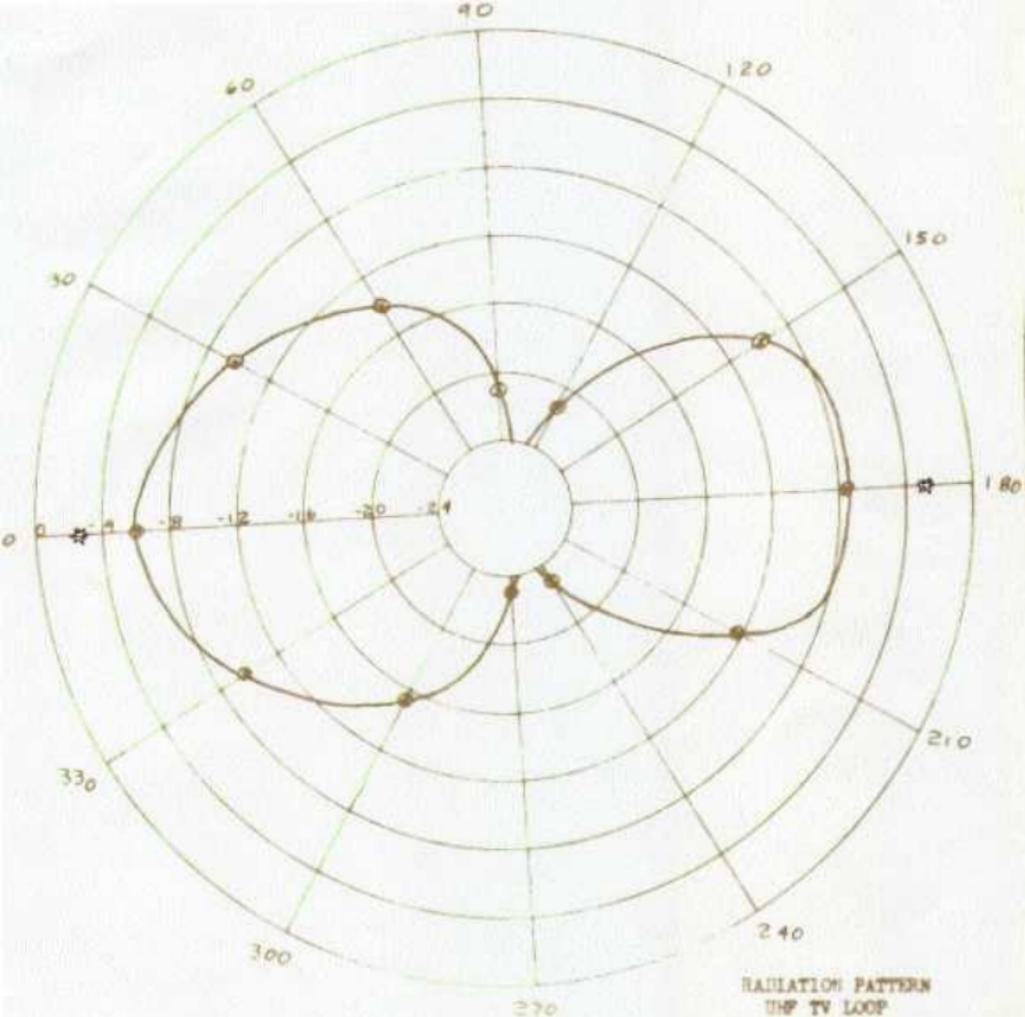
RADIATION PATTERN
UHF TV LOOP

Plane of Loop: 45°
 Frequency: 681 MHz
 * marks tuned dipole maximum



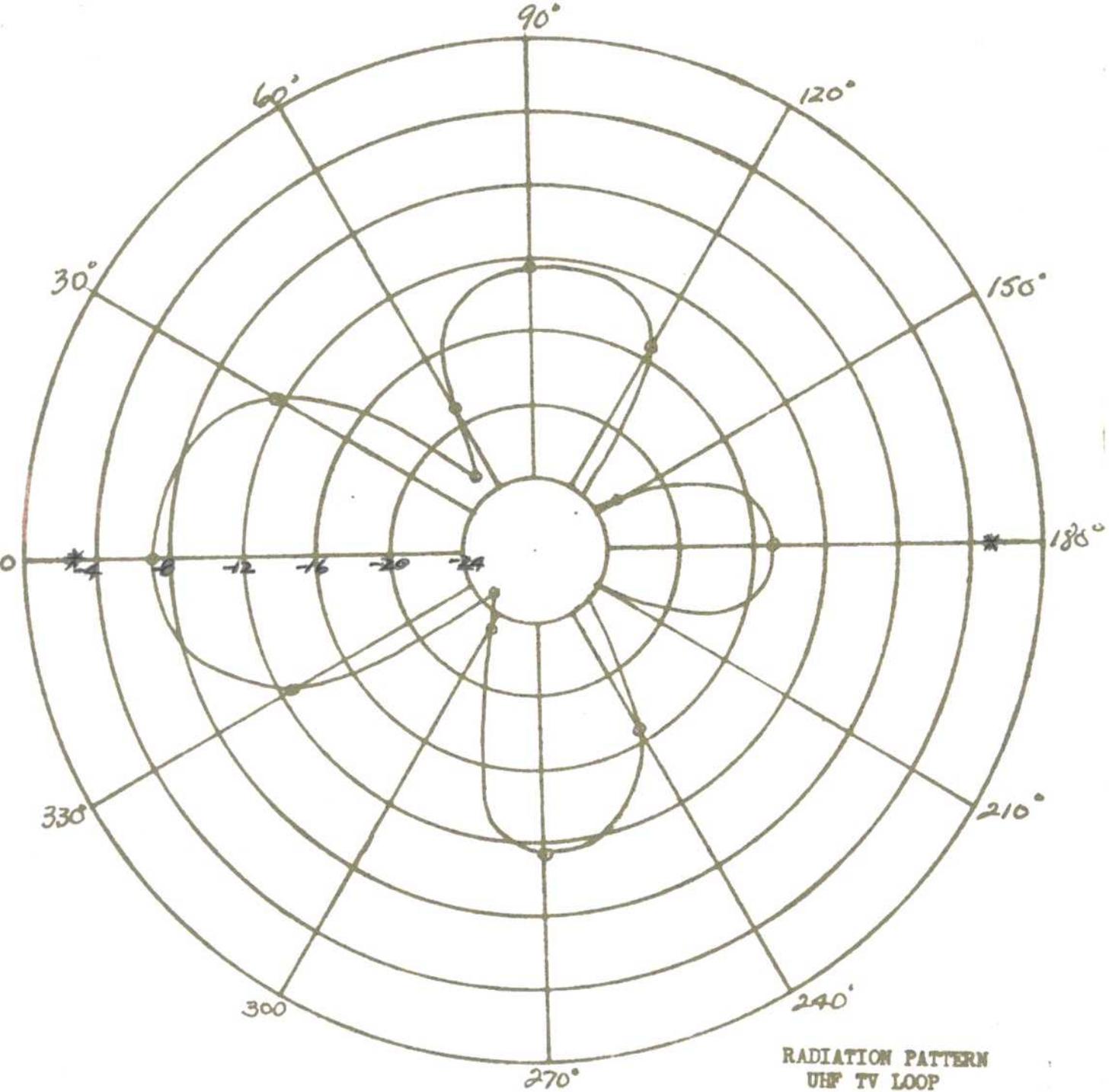
RADIATION PATTERN
UHF TV LOOP

Plane of Loop: *HORIZONTAL*
 Frequency: *780 MHz*
 * marks tuned dipole maximum

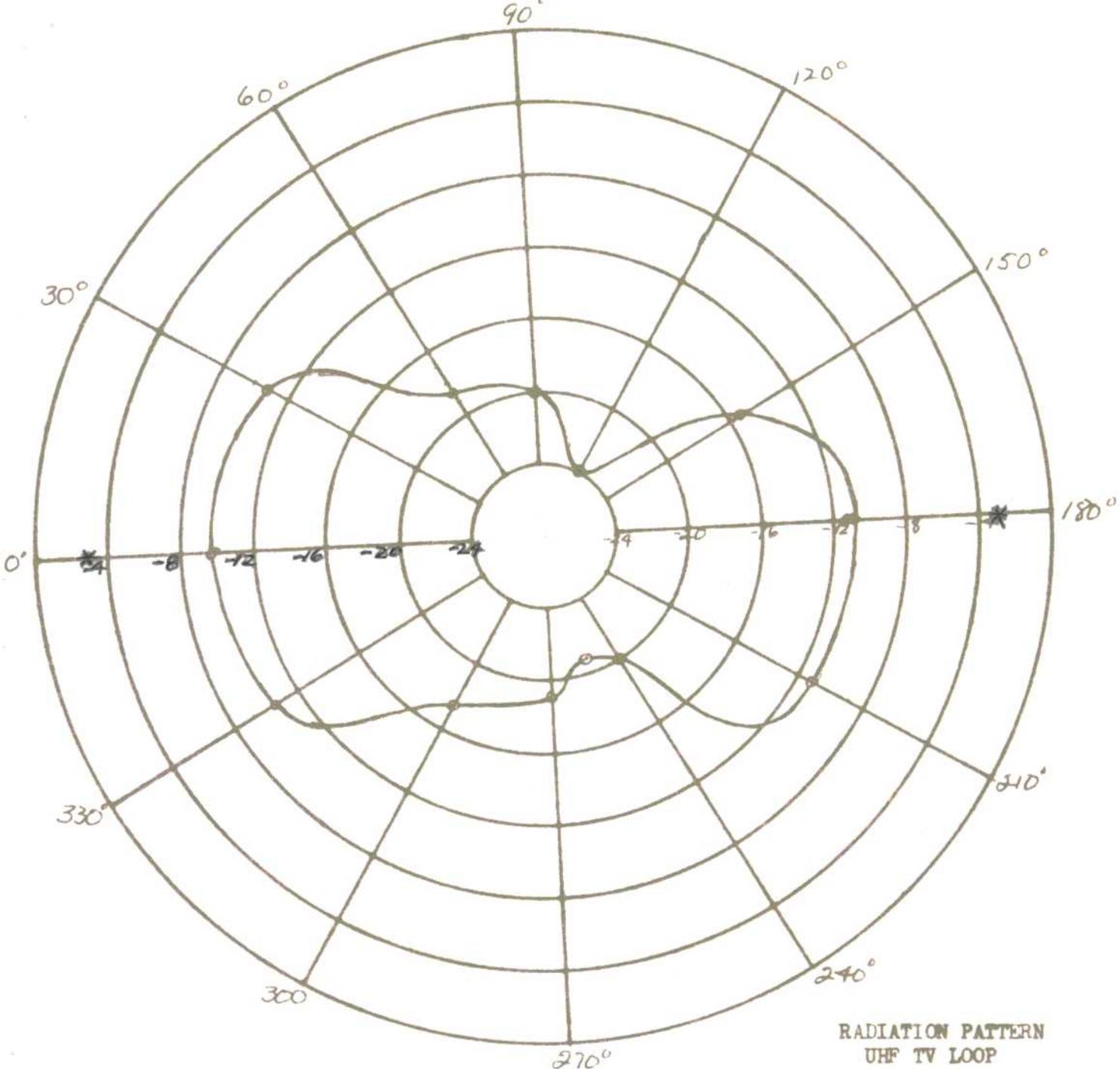


RADIATION PATTERN
UHF TV LOOP

Plane of Loop: **VERTICAL**
 Frequency: **780 MHz**
 * same tuned dipole maximum

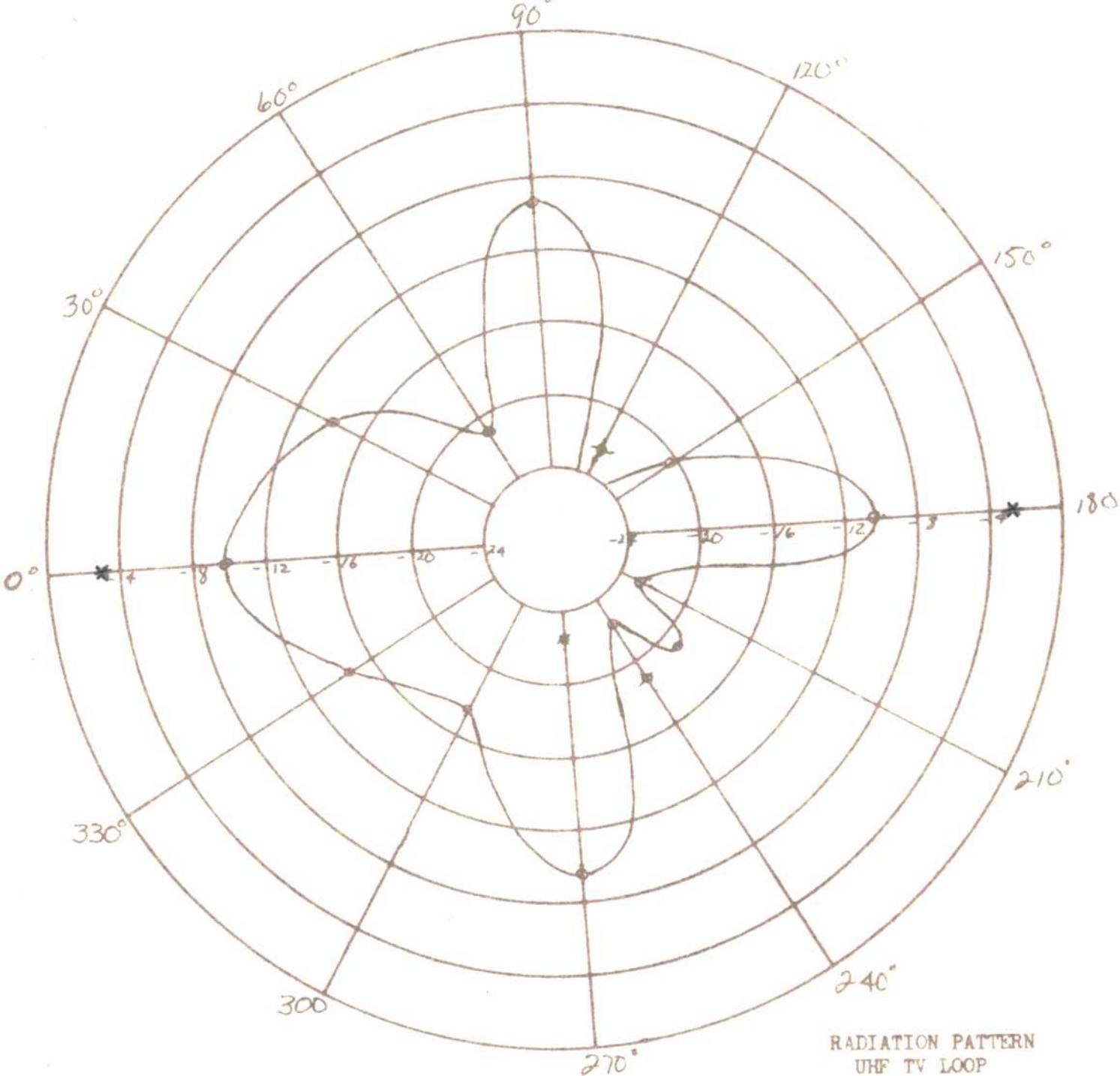


Plane of Loop: 45°
 Frequency: 780 MHz
 * marks tuned dipole maximum



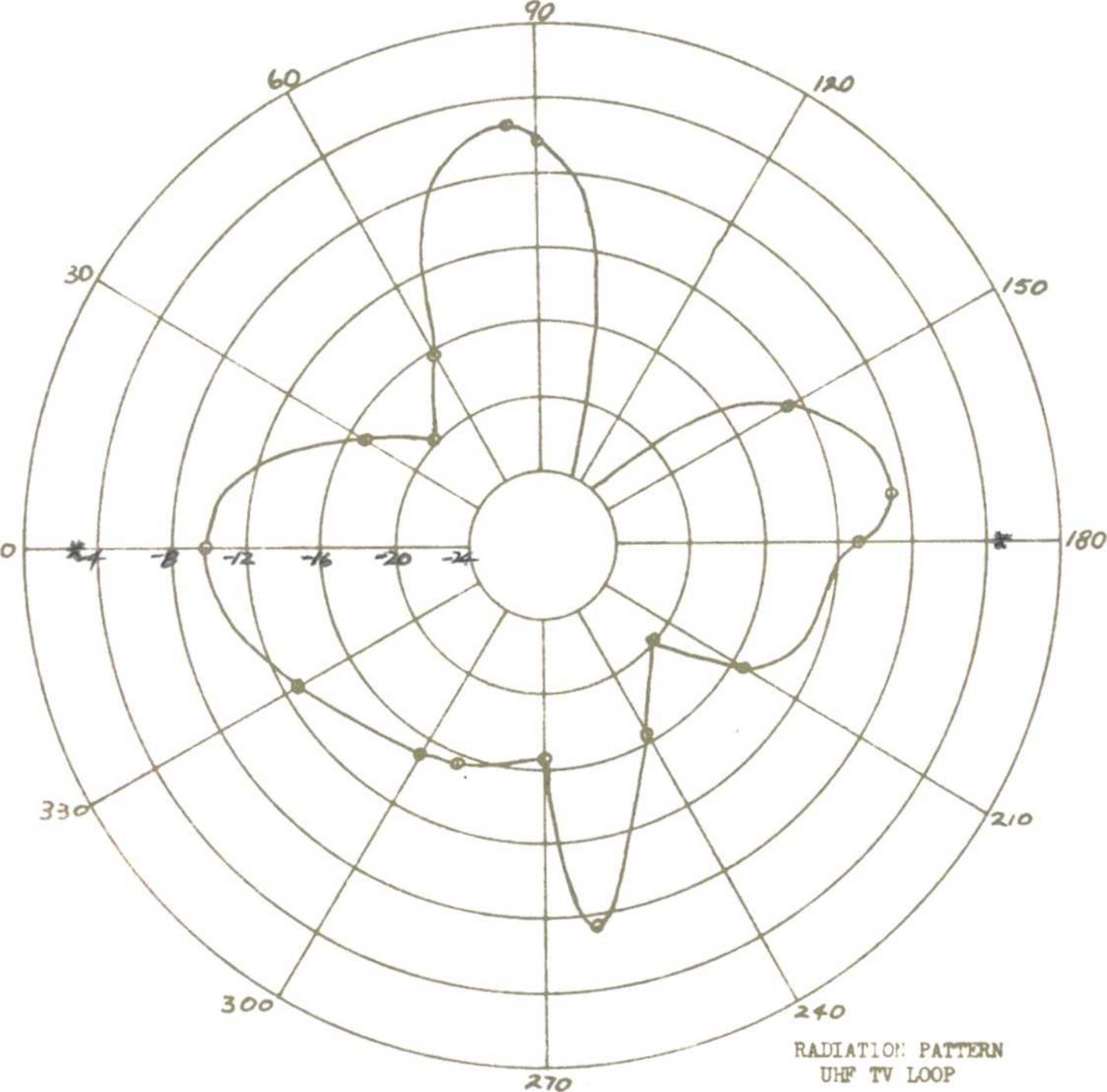
RADIATION PATTERN
 UHF TV LOOP

Plane of loop: **VERTICAL**
 Frequency: **683 MHz**
 * marks tuned dipole maximum



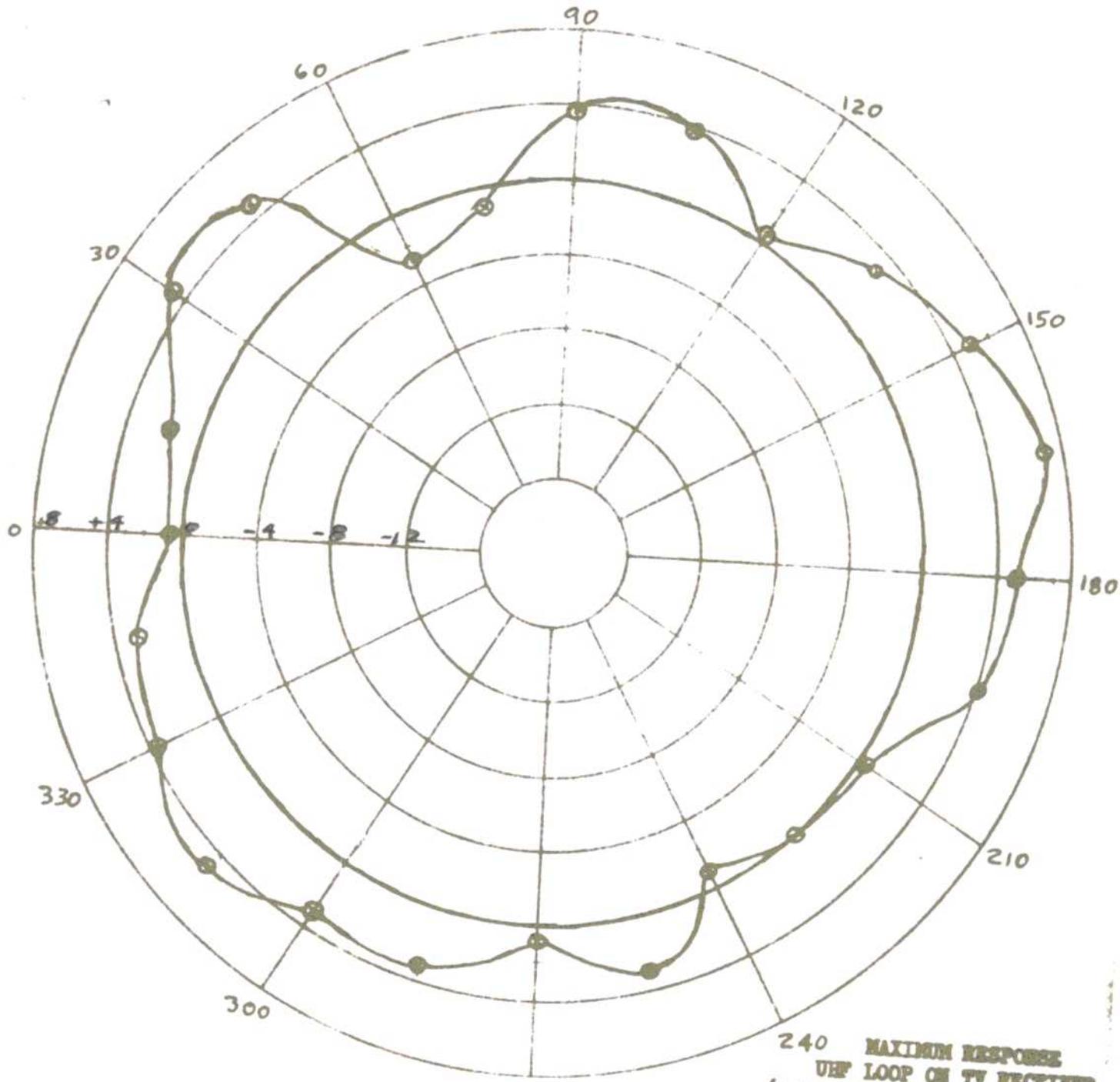
Plane of Loop: 45°
 Frequency: **883 MHz**

* marks tuned dipole maximum

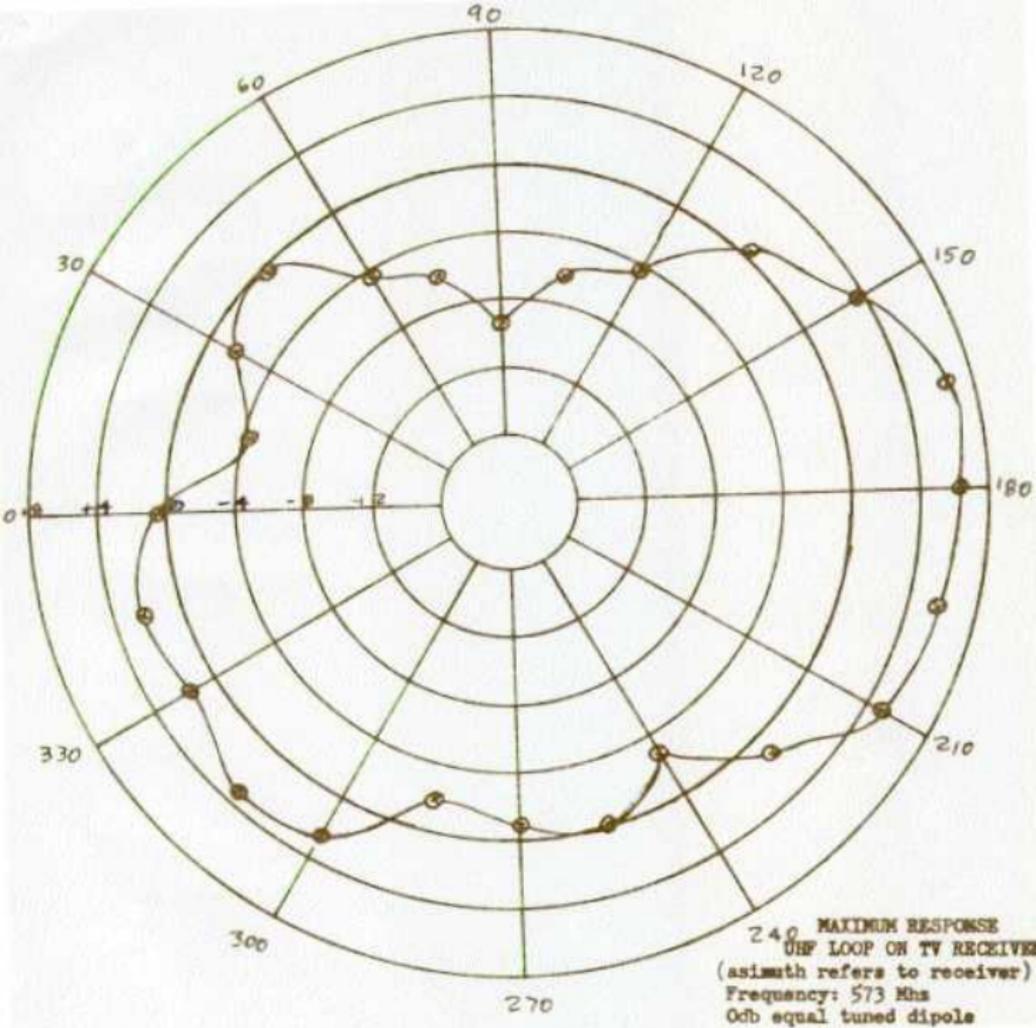


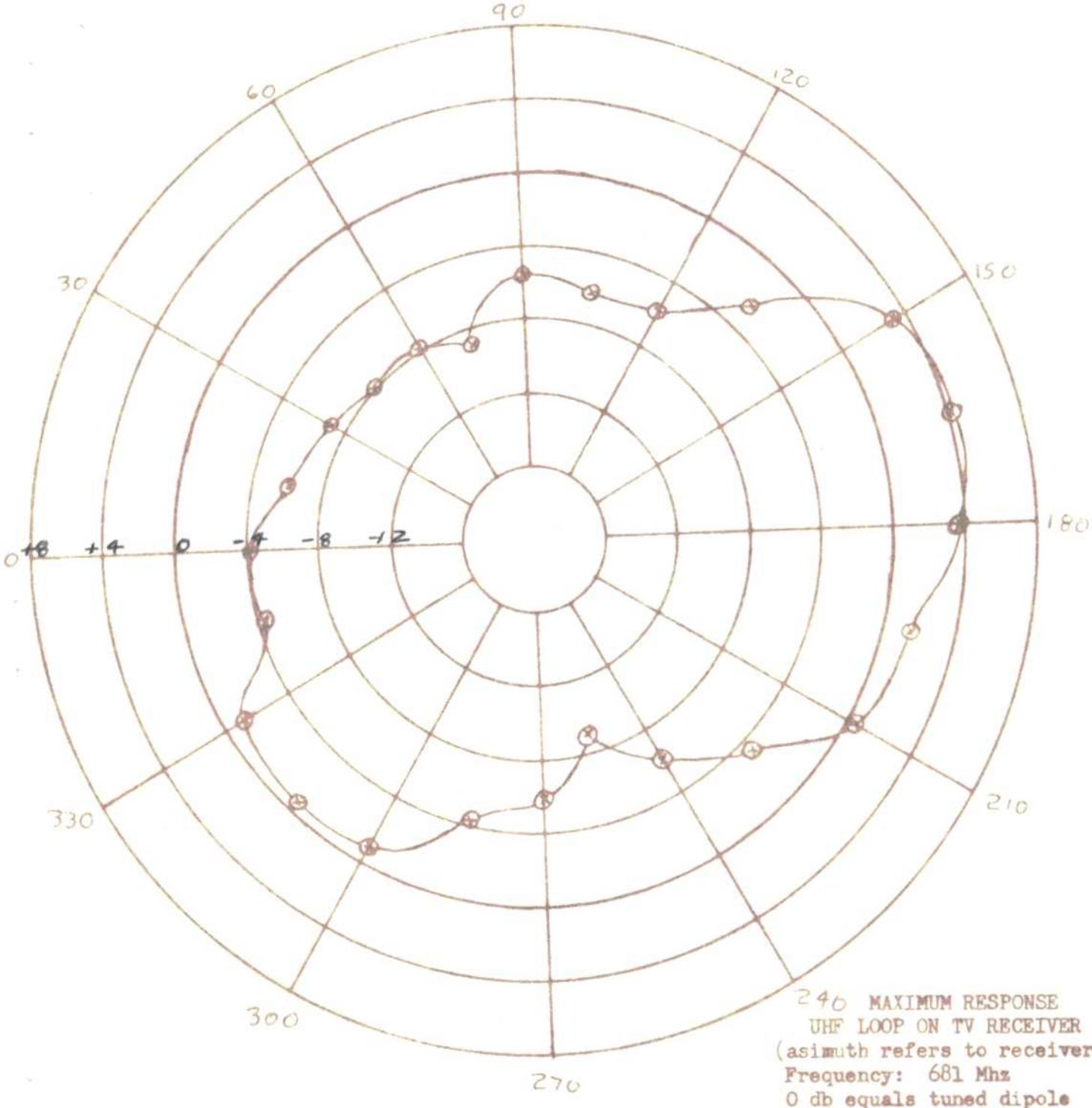
RADIATION PATTERN
UHF TV LOOP

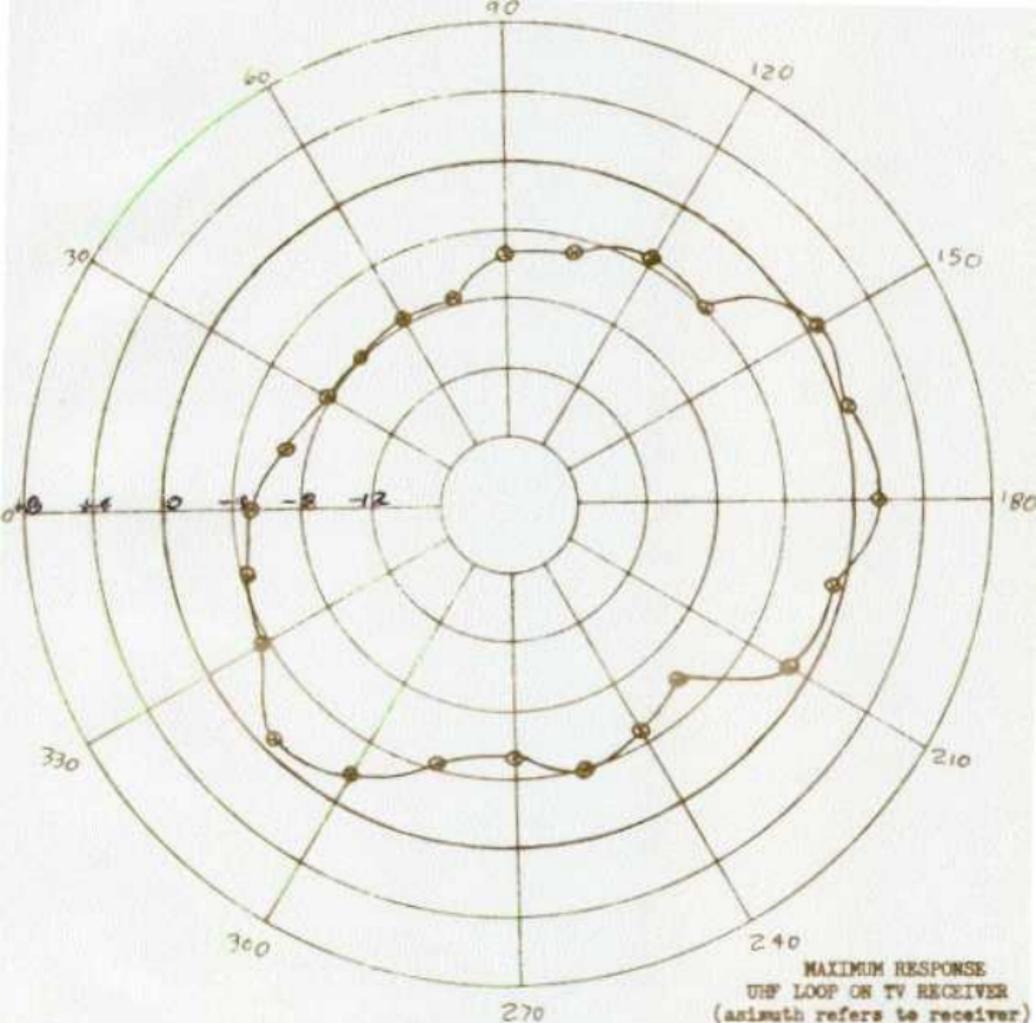
Plane of Loop: *HORIZONTAL*
 Frequency: *883 MHz*
 * marks tuned dipole maximum



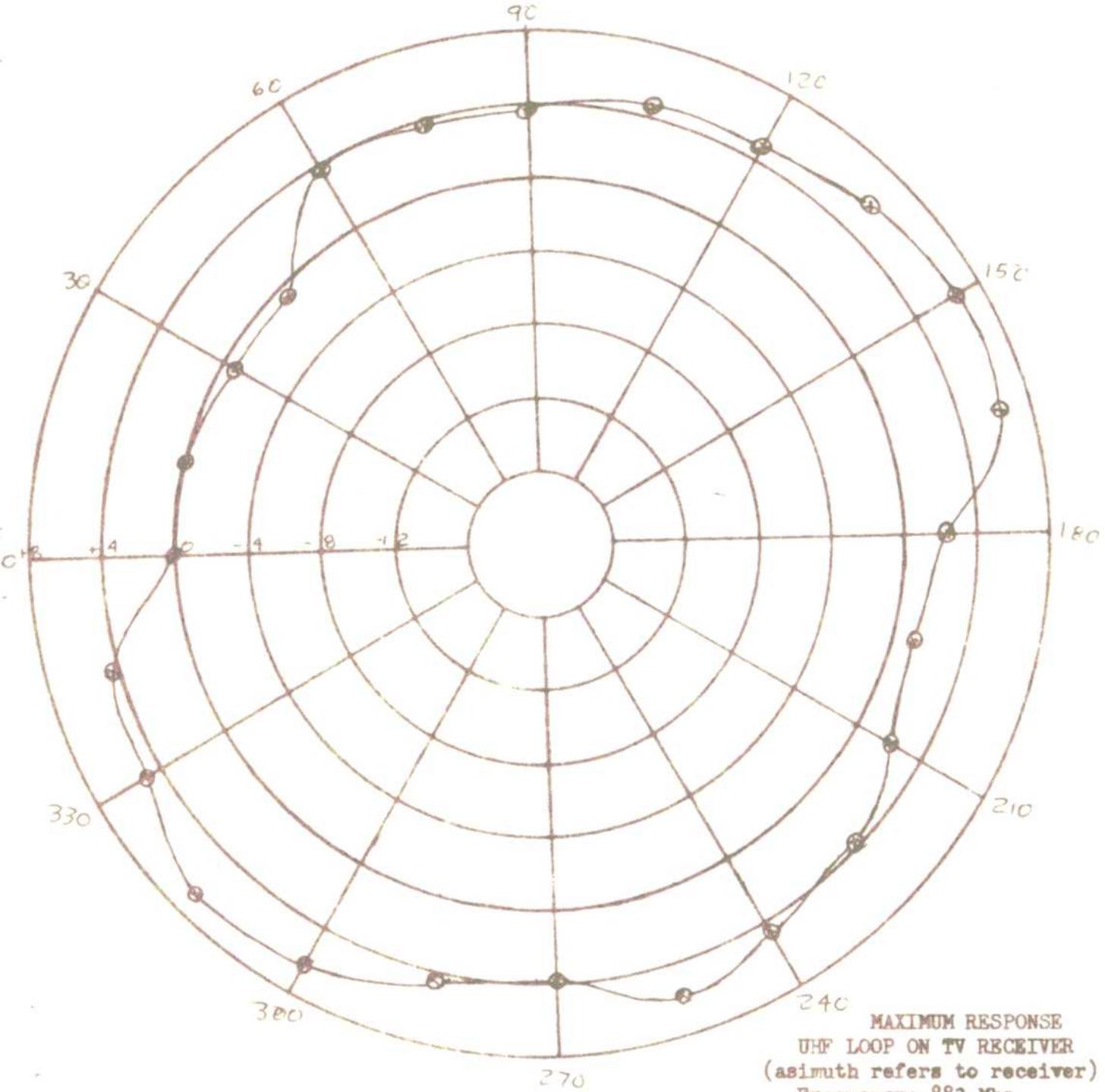
240 MAXIMUM RESPONSE
 UHF LOOP ON TV RECEIVER
 (Azimuth refers to receiver)
 Frequency: 470 Mc
 0 db equals tuned dipole







MAXIMUM RESPONSE
 UHF LOOP ON TV RECEIVER
 (azimuth refers to receiver)
 Frequency: 780 Mhz
 0 db equals tuned dipole



MAXIMUM RESPONSE
 UHF LOOP ON TV RECEIVER
 (azimuth refers to receiver)
 Frequency: 883 Mhz
 0 db equals tuned dipole