CHAPTER V

Discussion

In the theoretical research, the corner reflector antenna will provide elliptical polarization only in case that $90^{\circ}/\eta$ is integer where η is corner angle and dipole angle must not be 0° or 90° with respect to vertical direction. If it makes 0° angle with respect to vertical, the linearly polarized will be obtained because there is no horizontal component.

The equation (39) shows how to obtain circularly polarized wave from this kind of antenna. Such as the square corner reflector, 90° dipole distance, circular polarization will be obtained by twisting the dipole to 45° with respect to vertical line. The relation of axial ratio and dipole angle at given corner angle and dipole distance is expressed by the equation

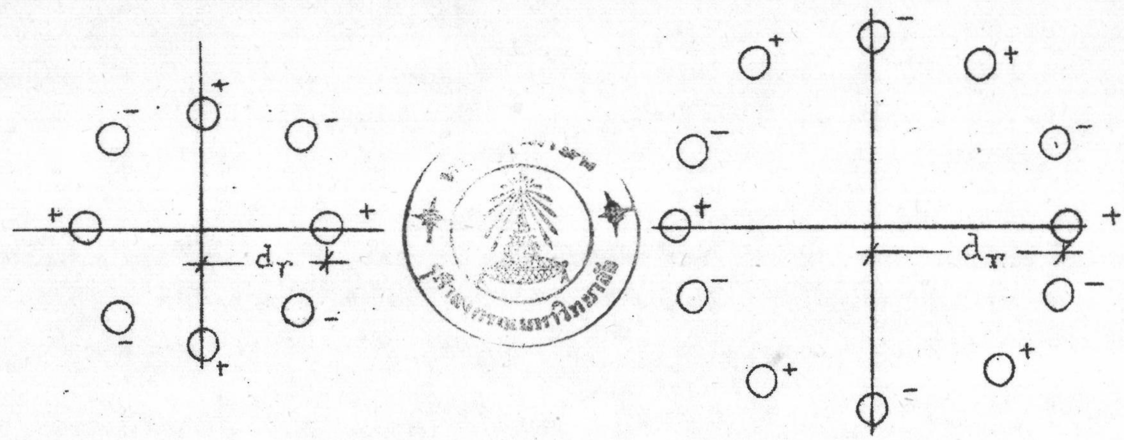
$$AR = K\cot\beta \qquad \text{if } K\cot\beta > 1$$

$$= \frac{1}{K}\tan\beta \qquad \text{if } K\cot\beta < 1$$

K is the constant depends on the dipole distance and corner angle. Fig. 2.8, Fig. 2.9 and Fig. 2.10 show the relation of dipole angle and dipole distance at given corner angle to obtain circular polarization. the curve of these figures are sharp, the regions of dipole distance which give circular polarization are narrow. Such as 30° corner angle, the region of d_r which gives circular polarization is about 190° to 250° . The dipole distance is beyond this region will not radiate electricfield or just a little. Because at that position of dipole, the electricfield from images are subtracted by each other.

and radiation pattern of dipole is K sin Θ . In the experiment, the size of reflector plates are 1.2x1.2 square meter which is minimum value for square corner reflector as dipole distance is 60 cm. The dipole distance is varied just little beyond 30 cm. The error due to finite side is not large. But the edge effects must not be neglected as treated in theory.

Because of many factors such as the transcient field, the strong wind blowing the reflector plates shifted from the adjusted angle and the reflection from the floor, these come to play a great part to cause the error in polarization patterns and they then induce different results from the theory.

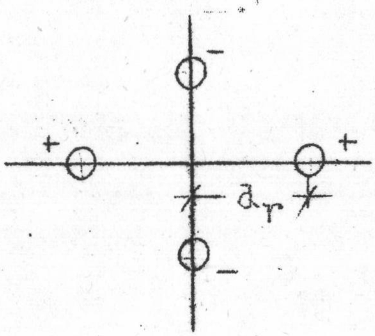


a) Array of images of horizontal dipole of 45^o corner angle.

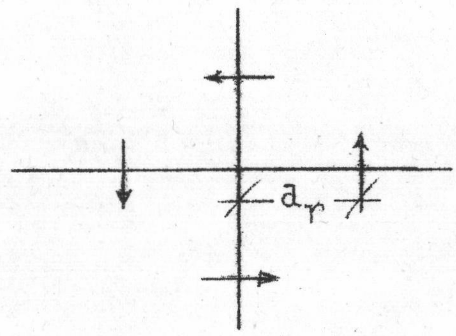
b) Array of images of horizontal dipole of 30^o corner angle.

Fig. 5.2 Arrays of dipoles.

From the results of Fig. 4.52 to Fig. 4.66 it is seen that the shape of curves from experiment are similar to those obtained from the theory. In Fig. 4.52, the left of the curves has much difference while the right has little. The difference on the left is due to the effect of mutual impedance.



a) Array of images of horizontal dipole



b) Array of images of vertical dipole

Fig. 5.1 Array of images of dipoles.

It is shown in Fig. 5.1 that the radiation resistances of vertical dipole and horizontal dipole are not the same. The mutual resistance will be reduced by increasing dipole distance d_r to lenghten the distance between dipoles. The effect of mutual impedance will also be obvious in Fig. 4.55 to Fig. 4.61 which are the curves showing the relation of axial ratio and dipole angle. The two curves come closer as the dipole distance increases.

In case of 45° and 30° corner angle, the mutual impedance still affects the axial ratio as increasing the dipole distance, because these corner angles form many images around the corner (see Fig. 5.2) the distance between images are shorter than those in 90° corner angle. To reduce this effect, dipole distance should be further extended

In theoretical research, the reflector plates are infinite plane