RECOMMENDATION 732

METHOD FOR STATISTICAL PROCESSING OF EARTH-STATION ANTENNA SIDE-LOBE PEAKS

(Question 40/4)

(1992)

The CCIR,

considering

a) that in determining the coordination distance or for assessing the interference between earth stations and radio-relay stations, and for coordination studies between earth stations and space stations of different satellite systems sharing the same frequency bands, it is necessary that the gain of the earth-station antenna be known in the relevant direction;

b) that in the case of interference calculations between satellite systems, it may be desirable to know the radiation characteristics of the antenna in planes other than the principal plane;

c) that in calculating mutual interference between radio-relay systems and satellite communication systems, particularly when there is more than one interference source, it is preferable that the statistical properties of antenna side-lobe levels, as well as side-lobe peaks, be known;

d) that in compiling statistical data it is necessary to exclude peaks that result from experimental error or are in other ways insignificant,

recommends

1. that the following method be used for processing measured data on side lobes of earth-station antennas:

1.1 that a side-lobe peak be defined as a local gain maximum for which an increase or a decrease in off-axis angle shows a reduction in gain level of at least 2 dB;

1.2 the angular regions within which samples are taken shall be defined as those shown in Fig. 1. A side-lobe peak exactly on the border of two angular regions or windows is included in the lower window. Within each of these windows, the level of each peak should be normalized to the geometric angular mean of the window by taking into account the slope of the reference pattern that relates to this window, thus:

$$P_i' = P - m \log\left(\frac{\sqrt{\varphi_L \cdot \varphi_H}}{\varphi_P}\right)$$

where:

P: measured peak amplitude (dB)

P_i': normalized peak amplitude (dB)

m: slope of the reference pattern

φ_L, φ_H: angular limits of sample window i

φ_P: off-axis angle of peak $P(\varphi_L < \varphi_P \leq \varphi_H)$.

The statistical data in specific angular regions is then drawn in the middle of the respective angular region;

2. that when the number of side-lobe peaks is less than 10 in the specified angular regions, side-lobe levels be evaluated following the method given below. The earth-station antenna is judged to meet the specification if, as shown in Fig. 2, the sum of the angular widths $\Delta\varphi_i$ occupied by those side-lobe peaks exceeding the reference diagram is not greater than 10% of the total sampled angular width:

$$\sum \Delta\varphi_i/\varphi \leq 10\%$$

FIGURE 1

Example of distribution of side-lobe peaks

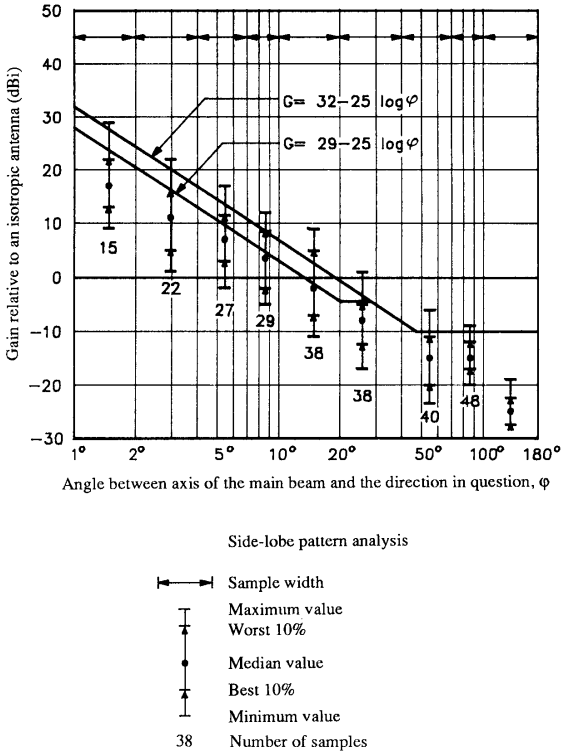
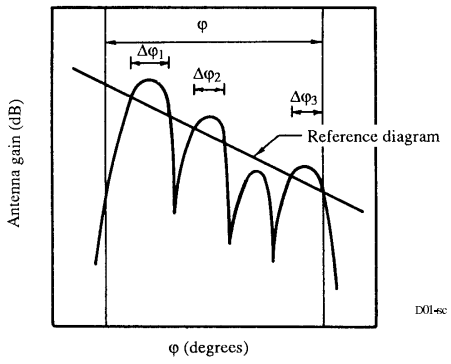


FIGURE 2

Angular width of side-lobe peaks exceeding the reference diagram