IV. Technique for comparing a real pattern to ideal pattern

It is physically impossible for an antenna to have exactly this idealized radiation pattern because of the discontinuity at the maximum radiation angle if for no other reason. Some antennas which may be realized in practice may perform adequately. A method of comparing an actual pattern to the idealized one is desired.

An explanation of the "A" and "accm" columns of Table 1 leads to an intuitive method of comparison. Refer to Figure 2.

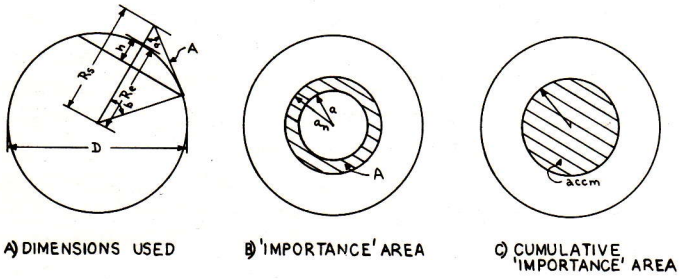

Figure 2: Geometries.

The surface area of a spherical sector (or satellite footprint) is (pi • D • h) where

D is the diameter of the sphere (Re) and
h is the depth of the slice at the center of the sector cut from the sphere. See Figure 2(a).

From trigonometry we have that

h = Re • (1 - cos b)

using the variables introduced above.

For the entire footprint we therefore have

h = Re • (1 - Re/Rs) and

Atotal = 2 • pi • Re² • (1 - Re/Rs)

The "A" values in the table are the surface areas of rings in the footprint defined by the previous radius "a" to the current radius "a" expressed as a fraction of the total footprint area. See Figure 2(b). The total footprint area in square kilometers is given at the bottom.

The "accm" value is simply the accumulated area of the surface circle described by the current "a." See Figure 2(c).

These numbers are used only to estimate the relative importance of antenna performance in the direction in question. The argument is that it is more important to

Table 1. Radiation pattern for the ideal PTSE antenna

a	S	P	dB	b	A %	accm %
0.0	800.0	0.2	-7.3	0.0	0.0	0.0
7.9	808.7	0.2	-7.2	1.0	0.1	0.1
15.5	834.1	0.2	-6.9	2.0	0.4	0.5
22.4	874.9	0.2	-6.5	3.0	0.7	1.2
28.6	929.0	0.3	-6.0	4.0	1.0	2.2
34.0	994.2	0.3	-5.4	5.0	1.2	3.4
38.6	1068.5	0.3	-4.8	6.0	1.5	4.9
42.5	1150.0	0.4	-4.1	7.0	1.8	6.7
45.8	1237.4	0.4	-3.5	8.0	2.0	8.7
48.6	1329.4	0.5	-2.9	9.0	2.3	11.0
51.0	1425.2	0.6	-2.3	10.0	2.6	13.6
53.0	1523.9	0.7	-1.7	11.0	2.9	16.5
54.7	1625.1	0.8	-1.1	12.0	3.1	19.6
56.1	1728.2	0.9	-0.6	13.0	3.4	23.0
57.3	1833.0	1.0	-0.1	14.0	3.7	26.7
58.4	1939.1	1.1	0.4	15.0	3.9	30.6
59.2	2046.2	1.2	0.9	16.0	4.2	34.8
60.0	2154.3	1.4	1.3	17.0	4.4	39.2
60.6	2263.1	1.5	1.7	18.0	4.7	43.9
61.1	2372.5	1.6	2.2	19.0	5.0	48.9
61.5	2482.4	1.8	2.5	20.0	5.2	54.1
61.8	2592.6	2.0	2.9	21.0	5.5	59.6
62.1	2703.2	2.1	3.3	22.0	5.7	65.3
62.3	2814.1	2.3	3.6	23.0	6.0	71.3
62.5	2925.1	2.5	4.0	24.0	6.2	77.6
62.6	3036.3	2.7	4.3	25.0	6.5	84.1
62.7	3147.6	2.9	4.6	26.0	6.7	90.8
62.7	3258.9	3.1	4.9	27.0	7.0	97.8
62.7	3293.2	3.2	5.0	27.3	2.2	100.0

28,486,980 Km² total area of footprint