Design Chart for Geodesic Parabola Antenna (Ver.2)

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Dimensions of the antenna is calculated for various f/D ratio with normalized diameter. If you want to construct an antenna in different diameter, just multiply the dimensions by scale factor of the normalized diameter and your size.

As the listed dimensions show spacing between screw holes, note that an overlap allowance (e.g., 5 mm) is required at the ends of flat-bar ribs. The original article **[1] [2]** to be referred for details of construction.

Type – I : Diameter < 1 m

Table-1 and **Figure-1** show dimensions and their definitions, respectively.

Design example – 1 :

Target diameter = 800 mm
then Scale factor = 800 / 1000 = 0.8
Target f/D = 0.5

A1 = 0.8 * 202 = 162 mm
A2 = 0.8 * 318 = 254 mm
B1 = 0.8 * 288 = 230 mm
B2 = 0.8 * 314 = 251 mm
C = 0.8 * 259 = 207 mm

Diameter	**1000 mm**						
f/D	**0.3**	**0.35**	**0.4**	**0.45**	**0.5**	**0.55**	**0.6**
A1 (mm)	181	190	196	200	202	204	205
A2 (mm)	372	349	335	325	318	313	309
B1 (mm)	284	286	287	288	288	289	289
B2 (mm)	356	340	328	320	314	310	306
C (mm)	259	259	259	259	259	259	259

Table-1 : Dimensions – Type-1

The longest required material = 2 * (A1 + A2) + 2 * 5
= 2 * (162 + 254) + 10
= 842 mm

Design example – 2 :

In reality, the length of the material may be more of a constraint than the diameter of the dish. In such cases, ribs can be designed as follows.

Target f/D = 0.5
Normalized size
The longest rib A = 2 * (A1 + A2) + 2 * 5   Note: 5 mm for holes
= 2 * (202 + 318) + 10
= 1050
(A1 + A2) = 520
Assume an available longest material = 1000 mm
then (A1 + A2) = (1000 – 10) / 2
= 495

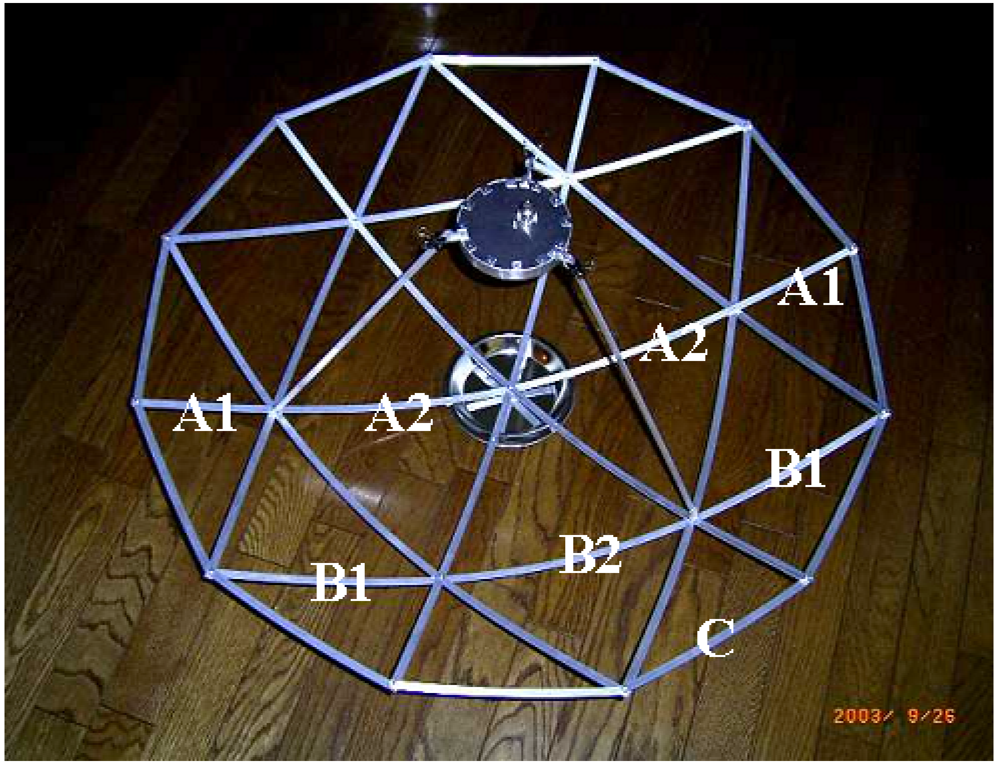

Figure –1 : Definition of dimensions – Type-I

Scale factor = 495 / 520
= 0.952

A1 = 0.952 * 202 = 192 mm
A2 = 0.952 * 318 = 303 mm
B1 = 0.952 * 288 = 274 mm
B2 = 0.952 * 314 = 299 mm
C = 0.952 * 259 = 247 mm
Diameter = 0.952 * 1000 = 952 mm

Type – II (Not recommended) : 1 m < Diameter < 2 m

Type-II of convolutional structure was devised to strengthen the inner ribs and to make the

Diameter	**1000 mm**						
f/D	**0.3**	**0.35**	**0.4**	**0.45**	**0.5**	**0.55**	**0.6**
A1 (mm)	181.2	190.4	196.1	199.8	202.3	204.1	205.4
A2 (mm)	168.9	164.2	160.2	157.2	155.0	153.2	151.8
A3 (mm)	202.8	185.2	174.6	167.6	162.8	159.4	156.9
B1 (mm)	-	-	-	-	-	-	-
B2 (mm)	-	-	-	-	-	-	-
B3 (mm)	182.1	172.6	166.1	161.6	158.3	155.8	154.0
B4 (mm)	200.1	183.6	173.5	166.9	162.3	159.0	156.5
C1 (mm)	284.1	286.2	287.3	288.0	288.3	288.6	288.7
C2 (mm)	-	-	-	-	-	-	-
C3 (mm)	178.2	169.8	164.0	159.9	157.0	154.8	153.1
D (mm)	258.8	258.8	258.8	258.8	258.8	258.8	258.8
E (mm)	-	-	-	-	-	-	-

Table-2 : Dimensions – Type-Ⅱ

segmentation more smaller than the Type-1 in a case of larger diameter antenna **[4]**. However, the springback of the mating point of two inner ribs was found to bend the middle point of the outer rib, thus deteriorating surface accuracy. The Type-II is not recommended anymore because of this reason. **Table-2** and **Figure-2** are shown as a reference to the improved Type-III.

This design is not recommended, so examples are omitted. However, similarities of the Type-Ⅰ examples are applicable to the Type-Ⅱ.

Type-III : 1 m < Diameter < 2 m

In order to improve the problem of the Type-Ⅱ and to make the outer segments smaller, i.e. better surface accuracy, the inner ribs are extended to outer rims. This modification results in better stiffness and surface accuracy. In addition, larger center-hub and another back sup-

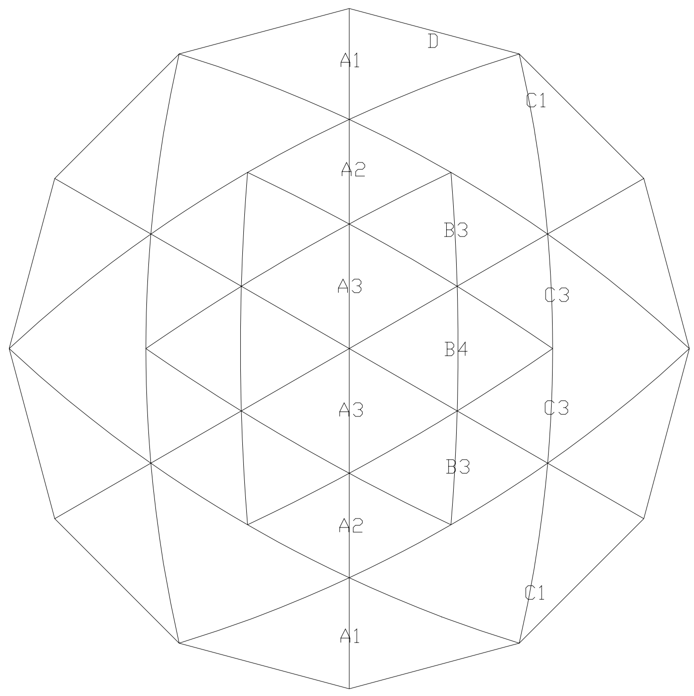

Figure –2 : Definition of dimensions – Type-II

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porting must be considered **[3] [5]**.

Table-3 and **Figure-3** show dimensions and their definitions, respectively.

.**Design example – 3 :**

Target diameter = 1800 mm

then Scale factor = 1800 / 1000 = 1.8

Target f/D = 0.5

A1 = 1.8 * 202.3 = 364.1 mm
A2 = 1.8 * 155.0 = 279.0 mm
A3 = 1.8 * 162.8 = 293.0 mm
B1 = 1.8 * 115.1 = 207.2 mm
B2 = 1.8 * 147.7 = 265.9 mm
B3 = 1.8 * 158.3 = 284.9 mm
B4 = 1.8 * 162.3 = 292.1 mm

Diameter	**1000 mm**						
f/D	**0.3**	**0.35**	**0.4**	**0.45**	**0.5**	**0.55**	**0.6**
A1 (mm)	181.2	190.4	196.1	199.8	202.3	204.1	205.4
A2 (mm)	168.9	164.2	160.2	157.2	155.0	153.2	151.8
A3 (mm)	202.8	185.2	174.6	167.6	162.8	159.4	156.9
B1 (mm)	104.3	106.5	110.3	113.1	115.1	116.5	117.6
B2 (mm)	147.8	148.6	148.5	148.2	147.7	147.3	147.0
B3 (mm)	182.1	172.6	166.1	161.6	158.3	155.8	154.0
B4 (mm)	200.1	183.6	173.5	166.9	162.3	159.0	156.5
C1 (mm)	129.2	132.6	135.1	137.0	138.4	139.5	140.3
C2 (mm)	154.9	153.6	152.2	151.0	149.9	149.1	148.4
C3 (mm)	178.2	169.8	164.0	159.9	157.0	154.8	153.1
D (mm)	122.4	124.3	125.1	125.4	125.7	125.8	125.8
E (mm)	138.6	136.8	136.0	135.6	135.4	135.3	135.2

Table-3 : Dimensions – Type-III

C1 = 1.8 * 138.4 = 249.1 mm
C2 = 1.8 * 149.9 = 269.8 mm
C3 = 1.8 * 157.0 = 282.6 mm
D = 1.8 * 125.7 = 226.3 mm
E = 1.8 * 135.4 = 243.7 mm

The longest required material = 2 * (A1 + A2 + A3) + 2 * 5
= 2 * (364.1 + 279.0 + 293.0) + 10
= 1846.2 mm

Design example – 4 :

Target f/D = 0.5

Normalized size

The longest rib A = 2 * (A1 + A2 + A3) + 2 * 5
= 2 * (202.3 + 155.0 + 162.8) + 10
= 1050.2 mm

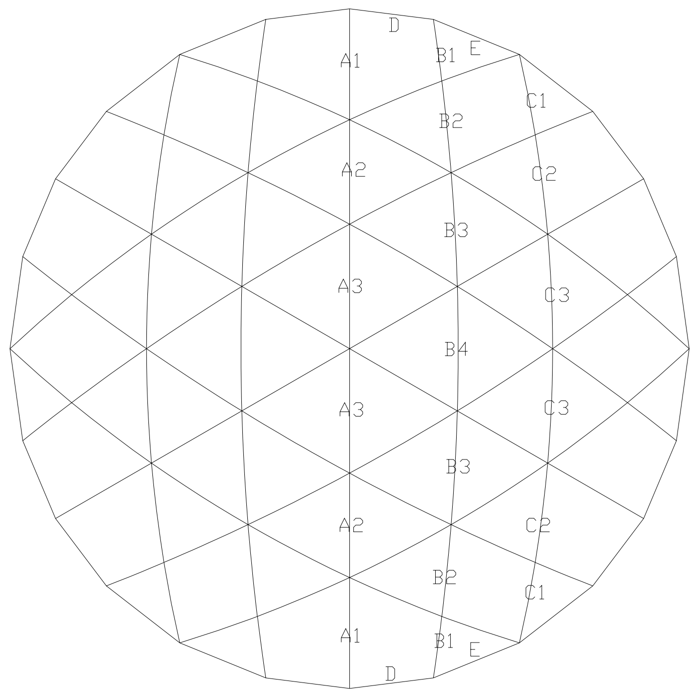

Figure –3 : Definition of dimensions – Type-III

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(A1 + A2 + A3) = 520.1 mm
Assume an available longest material = 2000 mm
then (A1 + A2 + A3) = (2000 – 10) / 2
= 995
Scale factor = 995 / 520.1
= 1.913

A1 = 1.913 * 202.3 = 387.0 mm
A2 = 1.913 * 155.0 = 296.5 mm
A3 = 1.913 * 162.8 = 311.4 mm
B1 = 1.913 * 115.1 = 220.2 mm
B2 = 1.913 * 147.7 = 282.6 mm
B3 = 1.913 * 158.3 = 302.8 mm
B4 = 1.913 * 162.3 = 310.5 mm
C1 = 1.913 * 138.4 = 264.8 mm
C2 = 1.913 * 149.9 = 286.8 mm
C3 = 1.913 * 157.0 = 300.3 mm
D = 1.913 * 125.7 = 240.5 mm
E = 1.913 * 135.4 = 259.0 mm
Diameter = 1.913 * 1000 = 1913 mm

References

[1] Yoshiyuki Takeyasu, JA6XKQ, “Geodesic Parabola Antenna,” DUBUS 2/2005.
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[2] Original photos of DUBUS 2/2005.
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[3] Matthieu CABELLIC, F4BUC, “Parabole géodésique.”
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[4] Yoshiyuki Takeyasu, JA6XKQ, “Camellia – The GeoPara-II,” 27 July 2020.
http://www.terra.dti.ne.jp/~takeyasu/GeoPara2_Camelia_2.pdf

[5] Transistor Geijutsu – Photo Gallery
http://www.terra.dti.ne.jp/~takeyasu/PhotoGallery.html

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