Beams and Coverages for the Joint Array Using Measured Pad Locations

Lee Mundy – January 31, 1999

This report summarizes the beams and uv coverages for the D, C, and B configurations of the proposed star array on Upper Harkless Flat. The assumptions and goals of the star configuration are discuss in the "Configurations for the Joint Array" memo of July 1997.

Summary of Antenna locations:

These are the antenna locations for the D, C, and B arrays as measured on the proposed Upper Harkless Flats site in July 1998. The pad names indicate the relative positions of the pads along the individual arms. The measured locations are in meters relative to the center of the star. The distance column give to total distance from the center to the pad locations. Since this part of Upper Harkless Flats is very flat, the heights of all antenna are assumed to be essentially the same.

Pad Name	Measured East (meters)	Location North (meters)	Distance (meters)
00	0.0	0.0	0.0
N1	-2.4	15.8	16.0
N2	-6.0	39.5	39.9
N3	-10.7	71.0	71.8
E1	10.2	5.1	11.4
E2	25.5	12.8	28.5
E3	45.9	23.0	51.3
SE1	10.8	-11.0	15.4
SE2	27.0	-27.4	38.5
SE3	48.6	-49.3	69.3
SW1	-7.6	-14.7	16.5
SW2	-19.0	-36.7	41.3
SW3	-34.2	-66.0	74.4
W1	-11.8	2.0	12.0
W2	-29.5	4.9	29.9
W3	-53.1	8.8	53.9

Table 1: D-Array Configuration Antenna Positions

U,V Coverages and Beams

Plots of the uv coverages and beams are given in the accompanying figures for three declination (-20, 18, and 50 degrees) for tracks both ± 5 hour and ± 2 hours from transit

Pad Name	Measured East (meters)	Location North (meters)	Distance (meters)
00	0.0	0.0	0.0
N2	-6.0	39.5	39.9
N4	-14.9	98.6	99.7
N5	-26.8	177.5	179.5
E2	25.5	12.8	28.5
E4	63.7	31.9	71.2
E5	114.7	57.4	128.2
SE2	27.0	-27.4	38.5
SE4	67.5	-68.5	96.2
SE5	121.6	-123.3	173.1
SW2	-19.0	-36.7	41.3
SW4	-47.5	-91.7	103.3
SW5	-85.6	-123.3	173.1
W2	-29.5	4.9	29.9
W4	-73.8	12.2	74.8
W5	-132.9	22.0	134.7

Table 2: C-Array Configuration Antenna Positions

(constrained to have zenith angle <73 degrees). The contour levels for the beam plots are given in the figure captions; the dashed contours are negative contours. The uv tracks are represented by dots showing the sampling of the arrray. The x and y axes in these plots are the u and v coordinates of the sample measured in kilo-wavelengths.

The following tables summarize the characteristics of the synthesize beams at an operating frequency of 100 GHz. The beams were made using natural weighting.

Note that the strongest negative sidelobes listed in the tables do NOT appear in the beam plots because they are far from beam center.

Pad Name	Measured East (meters)	Location North (meters)	Distance (meters)
00	0.0	0.0	0.0
N4	-14.9	98.6	99.7
N6	-37.3	246.6	249.4
N7	-67.1	443.8	448.9
E4	63.7	31.9	71.2
E6	159.3	79.8	178.1
E7	286.7	143.6	320.6
SE4	67.5	-68.5	96.2
SE6	168.8	-171.2	240.5
SE7	303.9	-308.2	432.8
SW4	-47.5	-91.7	103.3
SW6	-90.0	-245.0	258.3
SW7	-213.9	-412.8	464.9
W4	-73.8	12.2	74.8
W6	-184.5	30.5	187.0
W7	-332.1	55.0	336.7

Table 3: B-Array Configuration Antenna Positions

Decl.	±5 hours syn beam	of Transit sidelobes	±2 hours syn beam	of Transit sidelobes
-20	9.8 x 6.2	-5,8	9.7 x 5.9	-6,10
-5	7.2 x 6.6	-6,17	6.9 x 5.8	-6,25
18	6.6 x 5.7	-5,7	5.7 x 5.2	-6,17
55	6.3 x 5.1	-5,6	5.7 x 5.0	-5,11

Table 4: Beam Characteristics for D Array at ν=100 GHz

Decl.	±5 hours syn beam	of Transit sidelobes	±2 hours syn beam	of Transit sidelobes
-20	3.9 x 2.5	-5,8	3.9 x 2.4	-6,10
-5	2.9 x 2.6	-6,17	2.8 x 2.3	-7,25
18	2.6 x 2.3	-5,7	2.3 x 2.1	-6,17
55	2.5 x 2.0	-5,7	2.3 x 2.0	-5,12

Table 5: Beam Characteristics for C Array at ν=100 GHz

Decl.	±5 hours syn beam	of Transit sidelobes	±2 hours syn beam	of Transit sidelobes
-20	1.55 x 1.01	-5,8	1.54 x 0.95	-6,10
-5	1.15 x 1.05	-6,17	1.09 x 0.93	-6,23
18	1.06 x 0.90	-5,7	0.92 x 0.82	-6,15
55	1.00 x 0.81	-5,7	0.91 x 0.78	-6,12

Table 6: Beam Characteristics for B Array at ν=100 GHz

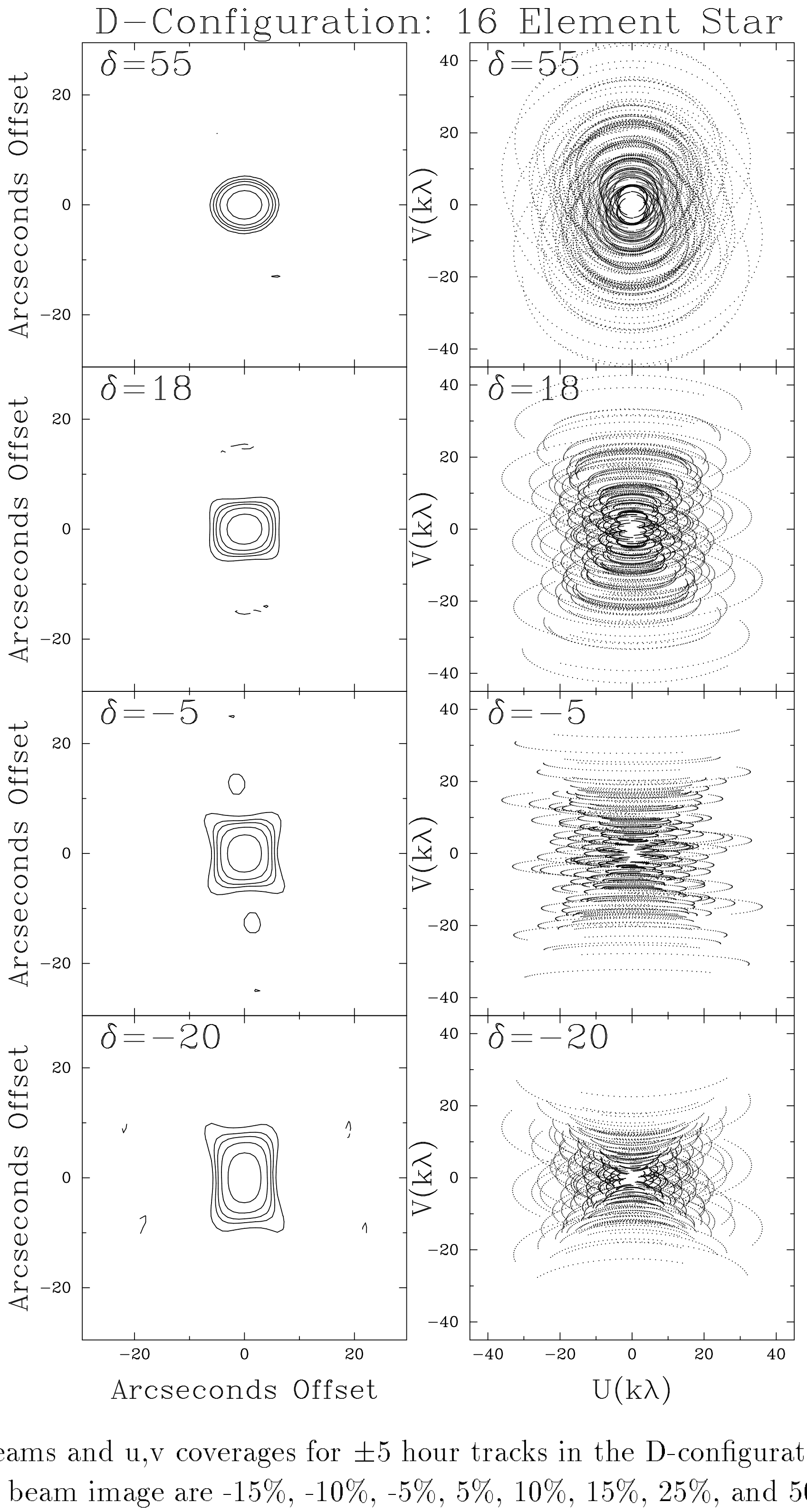

Fig. 1.— Beams and u,v coverages for ±5 hour tracks in the D-configuration. The contour levels in the beam image are -15%, -10%, -5%, 5%, 10%, 15%, 25%, and 50% of the peak.

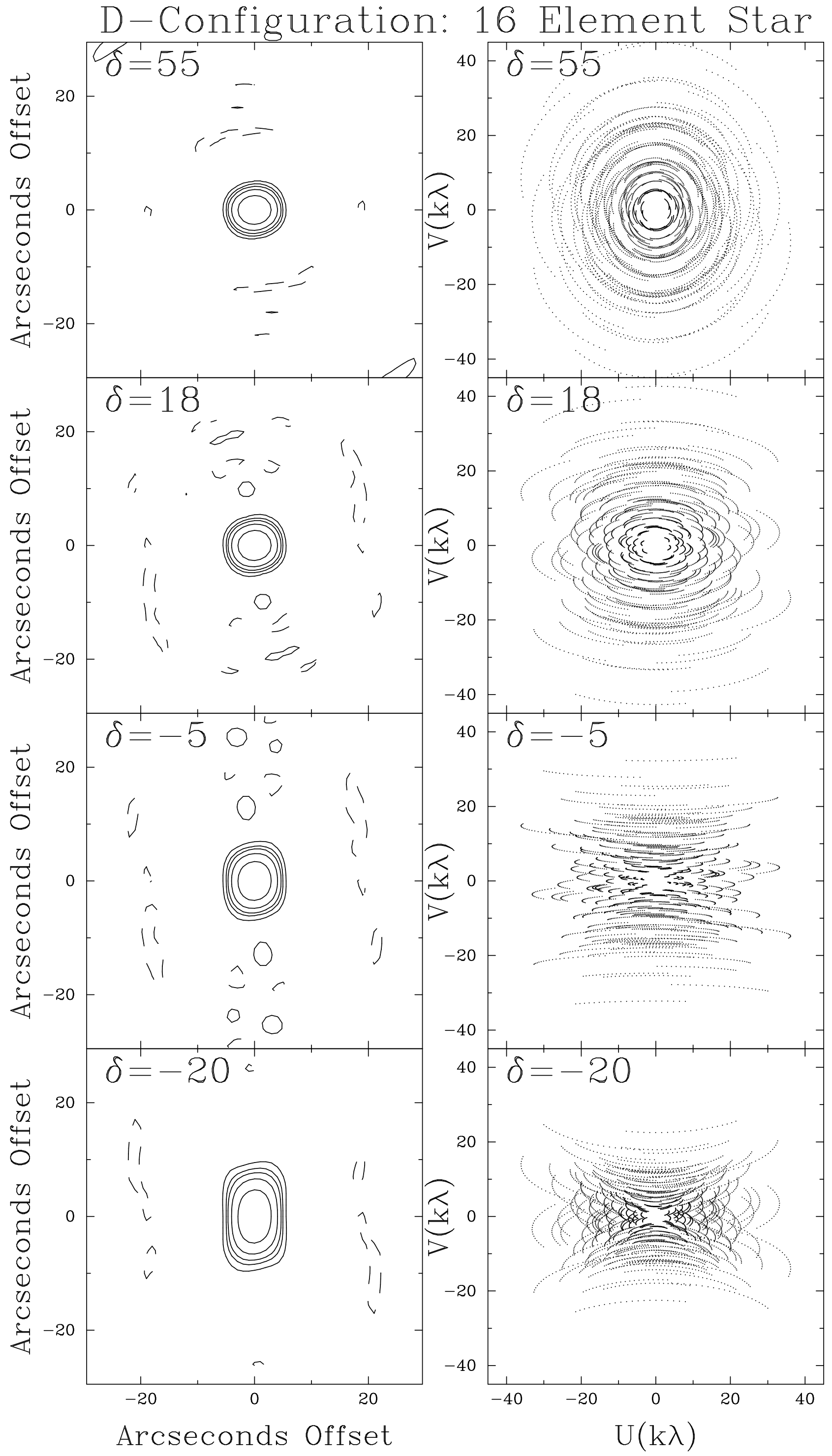

Fig. 2.— Beams and u,v coverages for ±2 hour tracks in the D-configuration. The contour levels in the beam image are -15%, -10%, -5%, 5%, 10%, 15%, 25%, and 50% of the peak.

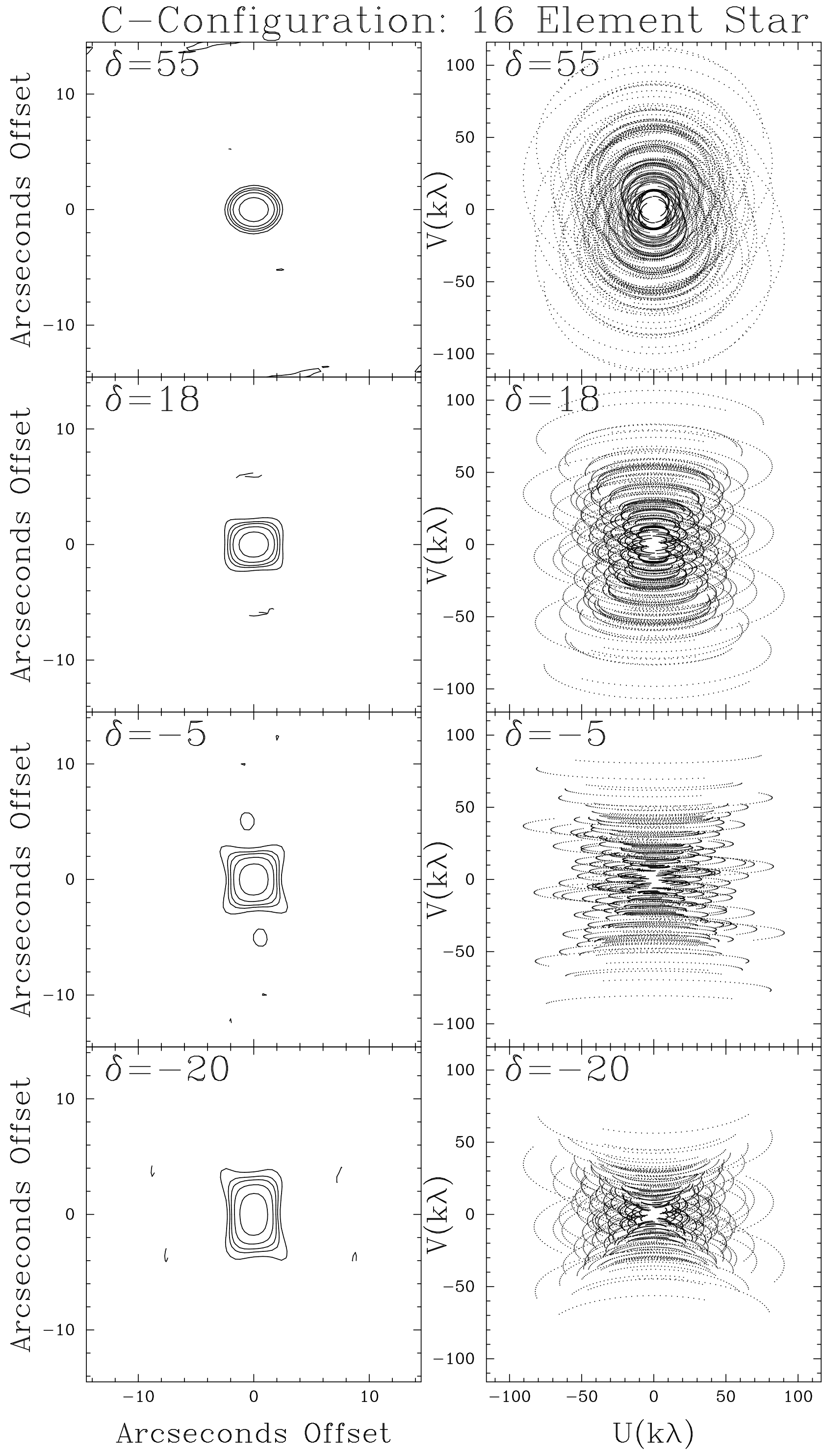

Fig. 3.— Beams and u,v coverages for ±5 hour tracks in the C-configuration. The contour levels in the beam image are -15%, -10%, -5%, 5%, 10%, 15%, 25%, and 50% of the peak.

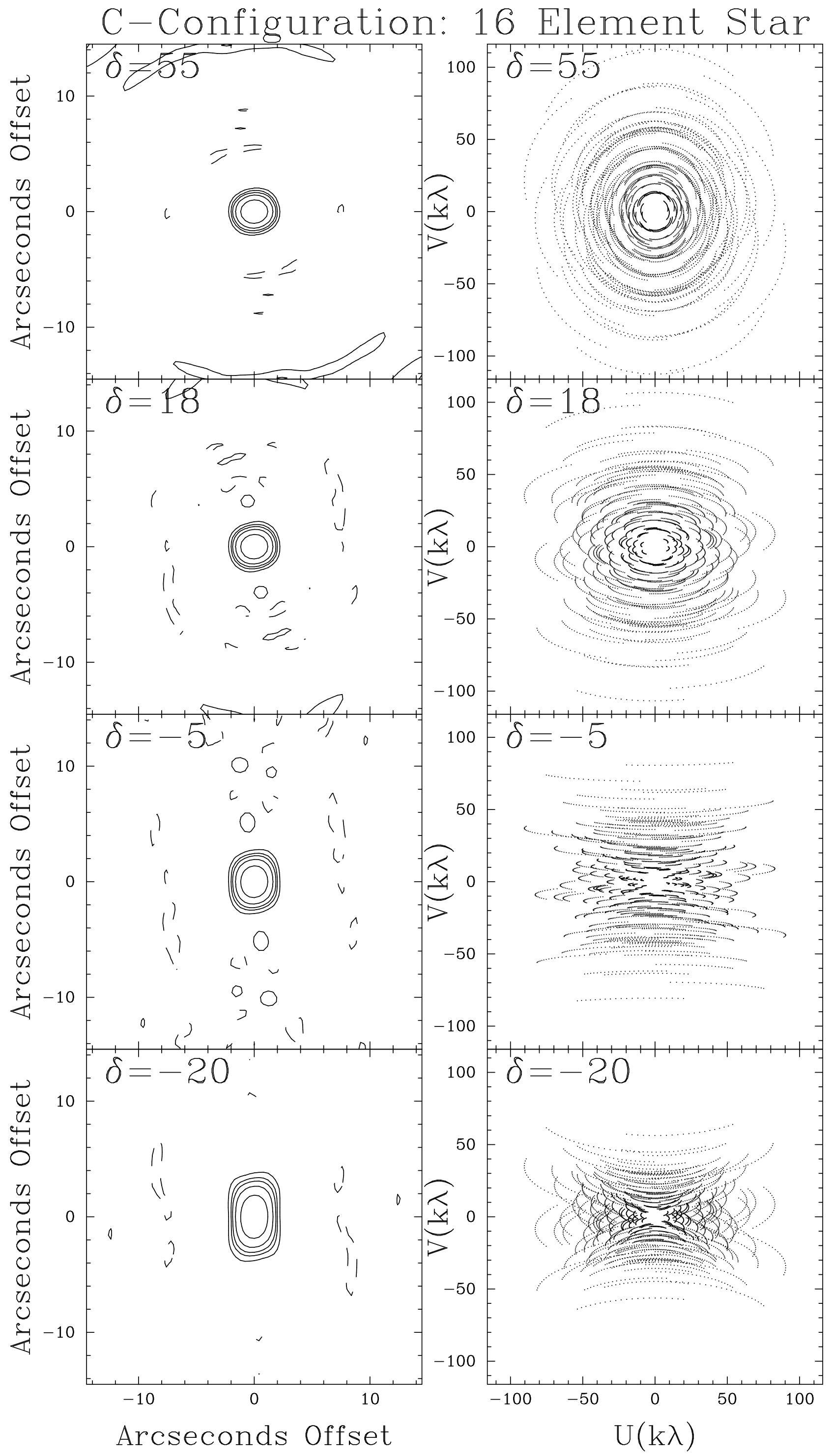

Fig. 4.— Beams and u,v coverages for ±2 hour tracks in the C-configuration. The contour levels in the beam image are -15%, -10%, -5%, 5%, 10%, 15%, 25%, and 50% of the peak.

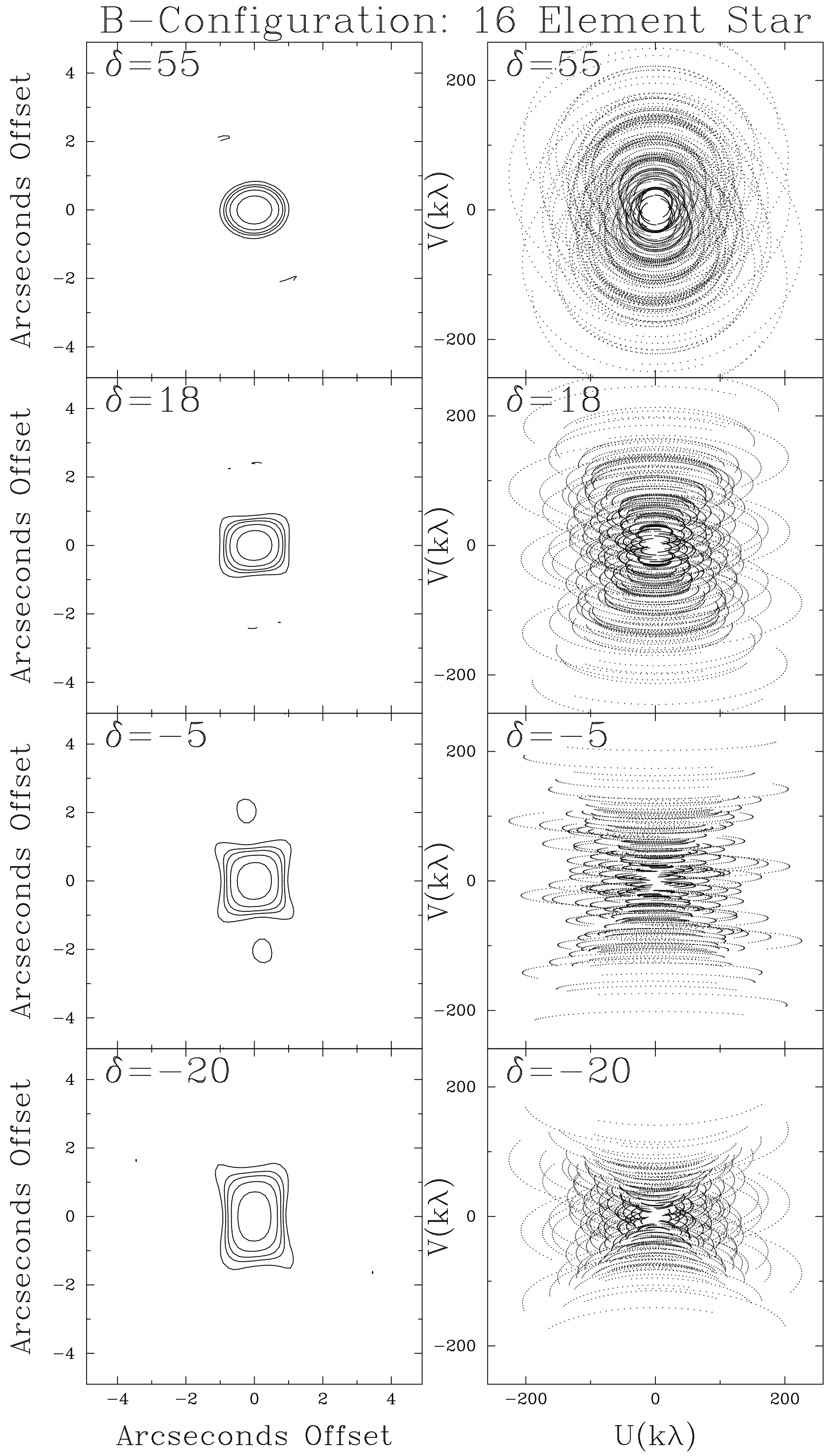

Fig. 5.— Beams and u,v coverages for ±5 hour tracks in the B-configuration. The contour levels in the beam image are -15%, -10%, -5%, 5%, 10%, 15%, 25%, and 50% of the peak.

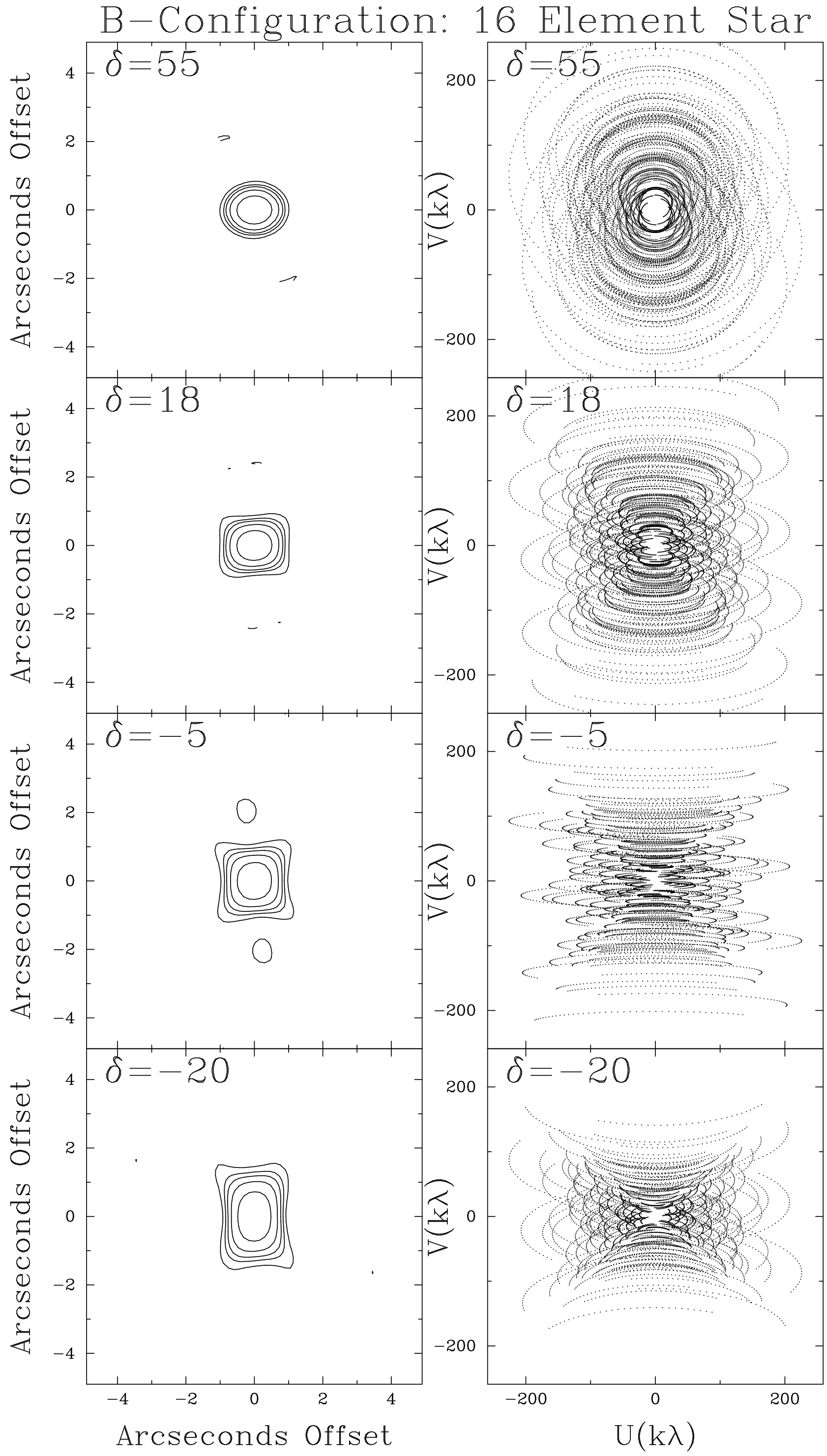

Fig. 6.— Beams and u,v coverages for ±2 hour tracks in the B-configuration. The contour levels in the beam image are -15%, -10%, -5%, 5%, 10%, 15%, 25%, and 50% of the peak.