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KFPA Beam Offset Parameters

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1 Feed Locations

The KFPA front-end will be mounted in one of the GBT turret feed slots. All of the turret slots utilize two dowel pins to ensure repeatable location of receiver mounting plates. Because of uncertainty as to the best orientation of the KFPA feed array with respect to the GBT coordinates, four sets of dowel holes are provided in the KFPA mounting plate. Therefore, there are four possible orientations (designated A, B, C, and D) of the KFPA array when installed on the GBT. These cases are illustrated in Figures 1-4, with the coordinates of each feed relative to the boresight feed. In each case, the coordinates are in the elevation and cross-elevation directions, and in inches, and are taken from the receiver CAD drawings.

The four orientations are simple rotations, and clear symmetries exist in the feed positions and hence beam offsets. These facts used as checks on the results.

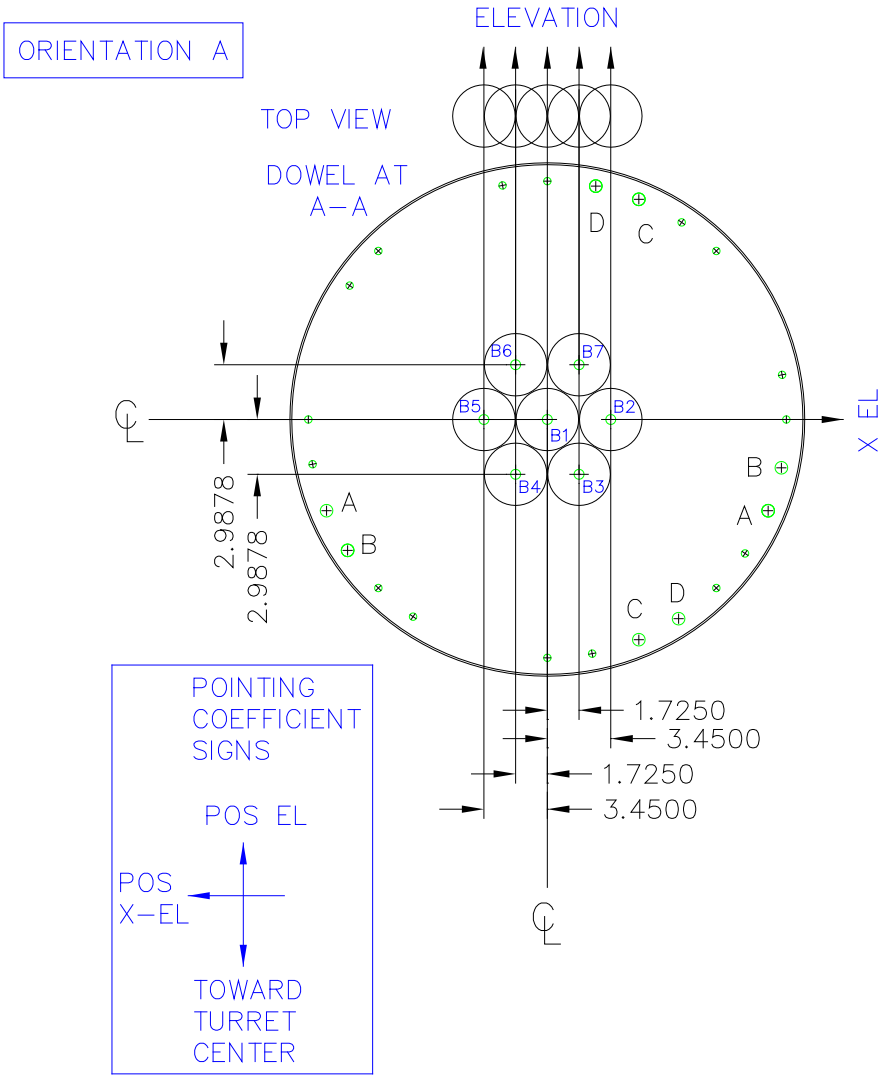

Figure 1: KFPA Orientation A. This is a top view, looking down upon the receiver mounted on the turret. At focus, the diagram top is toward the main reflector and the bottom is toward the turret center. Coordinates of the feeds are given in inches relative to the boresight feed 1.

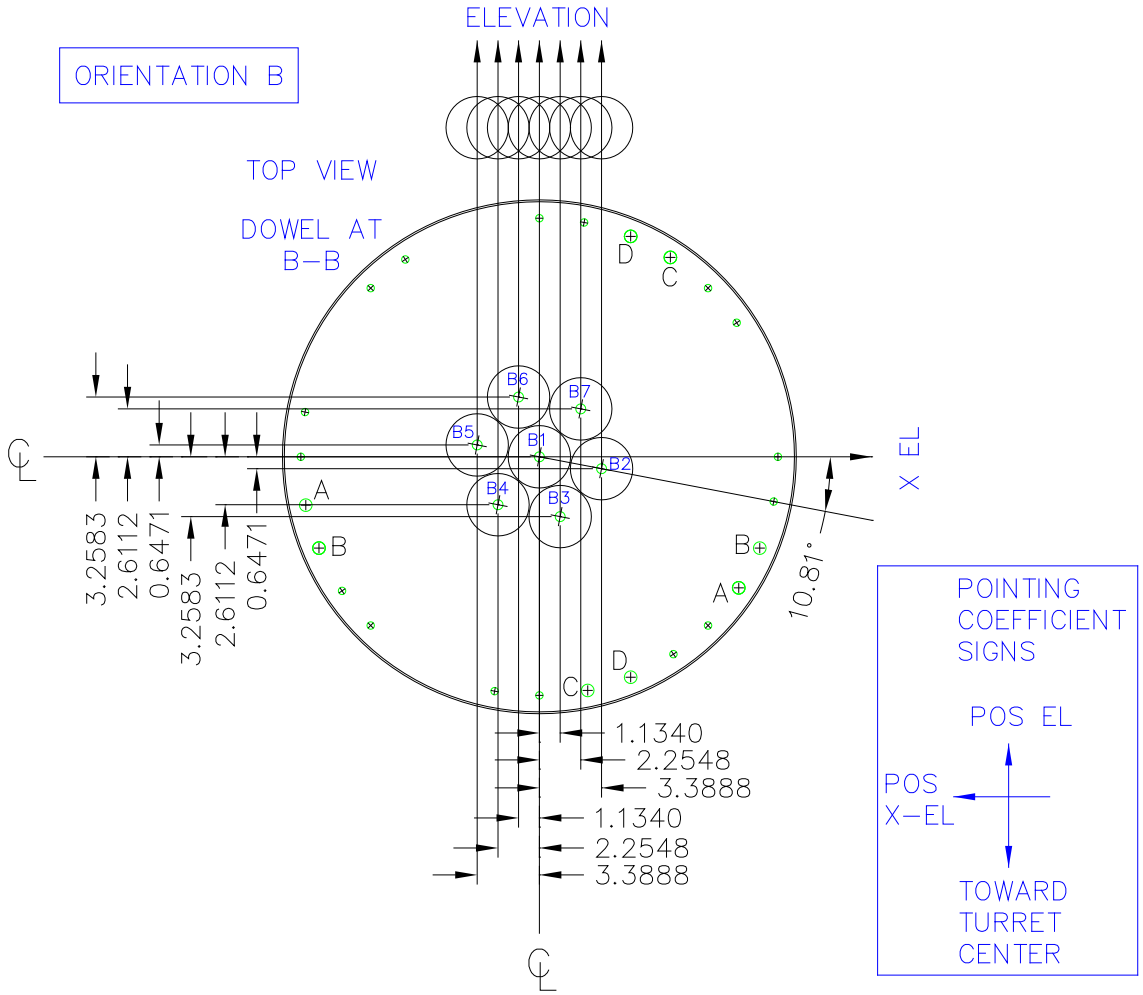

Figure 2: KFPA Orientation B. This is a top view, looking down upon the receiver mounted on the turret. At focus, the diagram top is toward the main reflector and the bottom is toward the turret center. Coordinates of the feeds are given in inches relative to the boresight feed 1.

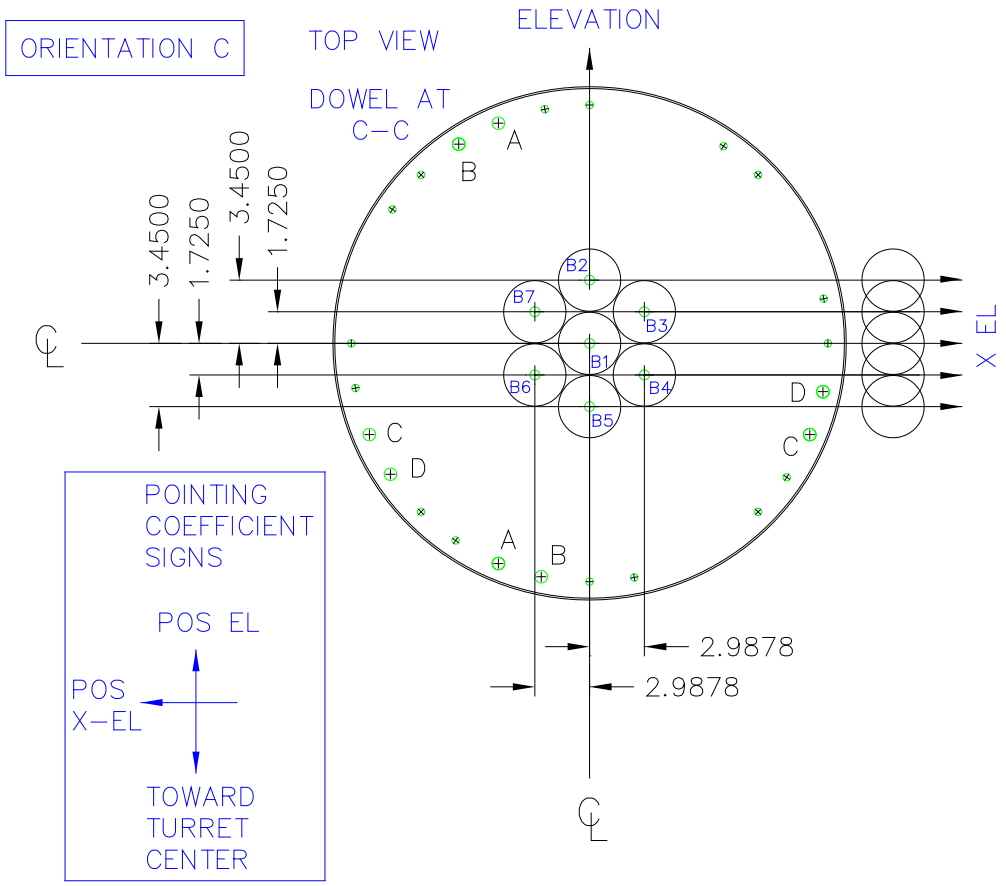

Figure 3: KFPA Orientation C. This is a top view, looking down upon the receiver mounted on the turret. At focus, the diagram top is toward the main reflector and the bottom is toward the turret center. Coordinates of the feeds are given in inches relative to the boresight feed 1.

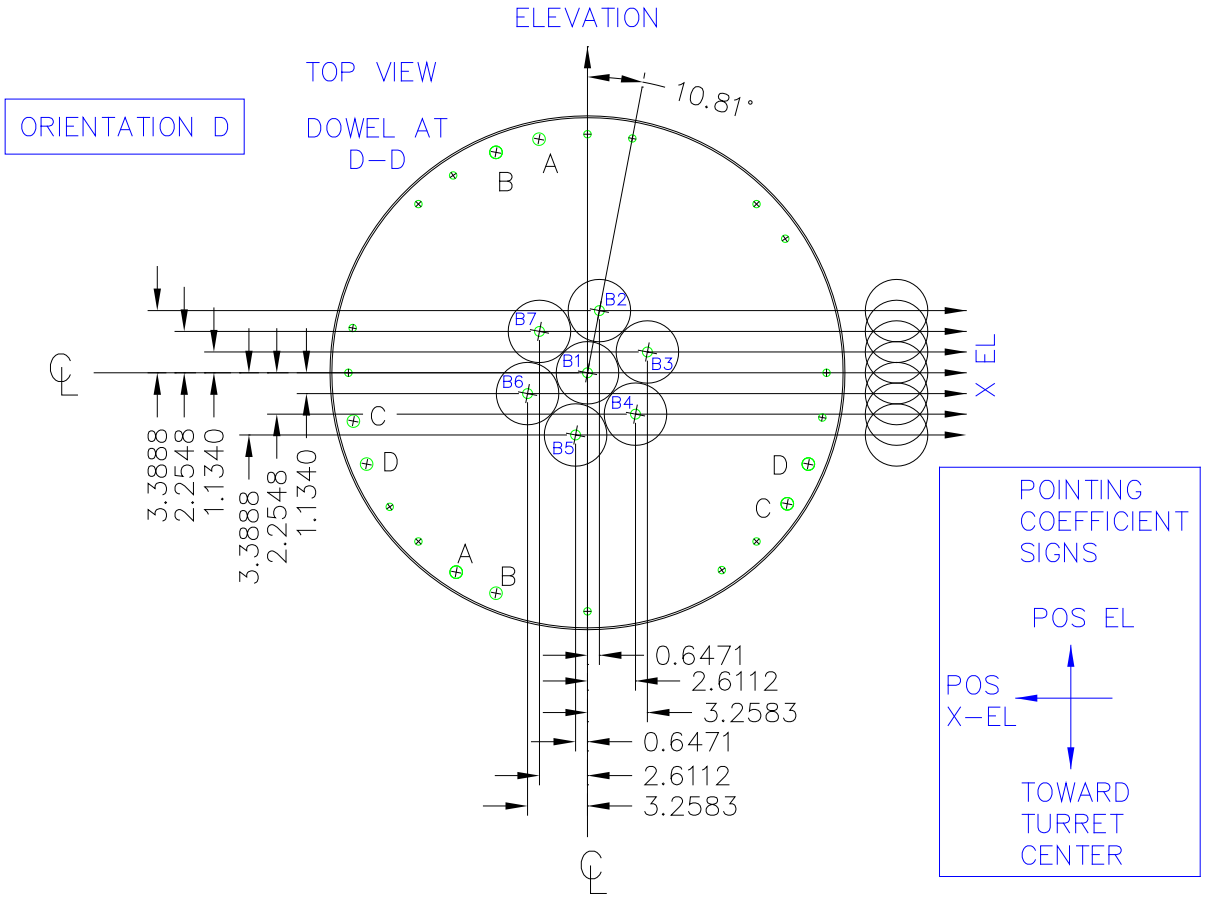

Figure 4: KFPA Orientation D. This is a top view, looking down upon the receiver mounted on the turret. At focus, the diagram top is toward the main reflector and the bottom is toward the turret center. Coordinates of the feeds are given in inches relative to the boresight feed 1.

2 Beam Offset Coefficients

The GBT pointing system needs the nominal locations of each beam in arcseconds, relative to a cardinal direction. The natural cardinal direction for the KFPA is the center of the array, the beam direction of the center (boresight) feed, so this is considered to be the (0,0) offset. The pointing plate scale for feed offsets was calculated and given in GBT Memo 155 as 26.72 arcseconds/inch in both elevation and cross-elevation directions. Later the plate scale was refined empirically by the PTCS project (see http://wwwlocal.gb.nrao.edu/ptcs/ptcspn/ptcspn42/ptcspn42.pdf) to 27.50 arcseconds/inch. This refined value is used here to calculate the nominal beam offsets given below, from the dimensions in Figures 1-4. Figure 5 illustrates the signs expected for each offset direction by the GBT pointing system. For example, a feed moved to the left and up in this diagram will have positive offsets in both elevation and cross-elevation.

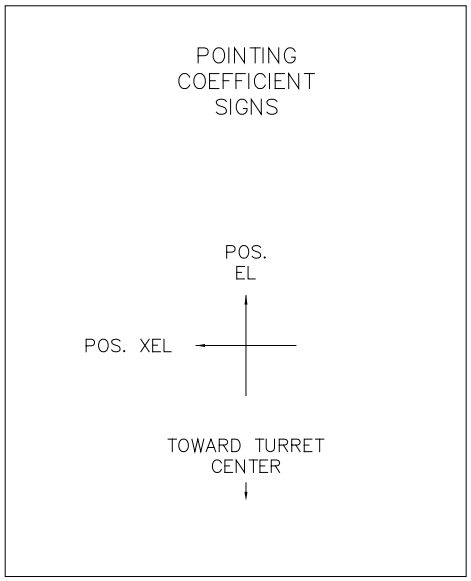

Figure 5: Diagram showing the signs of the beam offset coefficients versus feed displacements. The view is again looking down on the turret with the top toward the main reflector and the bottom toward the turret center.

3 KFPA Nominal Beam Offsets

The nominal beam offsets for each feed are given below, in arcseconds, for each receiver orientation.

Table 1
Orientation A

Beam	X-El Offset	El Offset
1	0.0	0.0
2	-94.88	0.0
3	-47.44	-82.16
4	47.44	-82.16
5	94.88	0.0
6	47.44	82.16
7	-47.44	82.16

Table 2
Orientation B

Beam	X-El Offset	El Offset
1	0.0	0.0

2	-93.19	-17.80
3	-31.19	-89.60
4	62.01	-71.81
5	93.19	17.80
6	31.19	89.60
7	-62.01	71.81

Table 3
Orientation C

Beam	X-El Offset	El Offset
1	0.0	0.0
2	0.0	94.88
3	-82.16	47.44
4	-82.16	-47.44
5	0.0	-94.88
6	82.16	-47.44
7	82.16	47.44

Table 4
Orientation D

Beam	X-El Offset	El Offset
1	0.0	0.0
2	-17.80	93.19
3	-89.60	31.19
4	-71.81	-62.01
5	17.80	-93.19
6	89.60	-31.19
7	71.81	62.01