Proposed 'Wildcard' Area for the Combined California Array

Debra Shepherd and Lee Mundy – June 26, 1998

A 'wildcard' area is proposed for inclusion in the EIS for the CCA. The idea is to specify in the EIS a limited area inside of which a certain number of antenna pads can be built at any location, as specified by future needs, without need for a new EIS. Why propose this?

- The most likely use for additional pads is for a compact configuration to recover flux on size scales between $20''$ and $60''$ at mm wavelengths, or to do SZ or cosmic background work.
- During the first few years when the systems may not be linked, simultaneous compact configurations may be required for the separate BIMA and OVRO arrays. In that case it is likely that more inner pads would be desirable.
- If 3-6 arcsecond resolution work becomes a strong scientific driver for the array, it may be desirable to optimize or strengthen the uv coverage in the inner part of the uv plane.
- The present EIS should attempt to cover all likely needs of the array for the next 5-8 years.

This note makes recommendations for the size and location of the wildcard area as well as the number of antenna pads that would be useful within that area.

Considerations:

We will concentrate on the potential needs for additional inner pads because of the above identified possible drivers, and because modest changes/additions in pad locations in the outer part of the array are unlikely to make significant differences in beams, uv coverages, and science. If more coverage is desired in selected outer parts of the uv plane, it is likely that hybrid arrays (B/C or C/D) or arrays combining star pads with the inner A-array remote pads will prove adequate.

The attached figure shows the central 200 meter area of the proposed CCA. The symbols represent pad locations where: D configuration pads are represented as solid dots, C configuration pads are X's, and B configuration pads are open triangles. The inner circle of 5 pads have a radial distance from the center of 16m, 11.4m, 15.4m, 16.5m, and 12m (listed clockwise from top). The OVRO 10.4m diameter antennas must be at a minimum spacing of 15m and therefore cannot populate this inner circle unless there is no antenna at the center (0,0) position. BIMA 6.1m antennas can occupy all pads.

For a 16 element CCA, the most likely compact design would move the 5 outer antennas in the D configuration closer to the center. This would require 5 additional pads which would likely be located within an 80m radius (the circle in Figure 1).

For an 8 element compact OVRO array, 4 (or possibly 5) antennas can be placed on the inner pads. Up to 4 additional pads would be useful for a very compact configuration. These could be at the same locations as for the 16 element compact array above. It is also likely that additional inner pads would be useful in optimizing an 8-element star array. In this case, 3 to 4 new pads would likely accomplish reasonable optimization.

For a 10 element compact BIMA array, 4 additional pads will be required. Their placement will likely be within 30m of the center and can probably share the pad placements of the 16 element compact CCA.

If dual independent array operation is to be sustained for an extended time (for unforeseen reasons), it is possible that duplicate stations at some locations would be desirable due to the re-use of pads in different configurations, and due to the need for short baselines if both arrays are to be in the D-configuration simultaneously. To be conservative, there might be a need for 3 new pads in the very inner part of the star and 3 to 4 pads out around the second ring of stations in the star, 30 to 40 meters out.

Note that some of these potential needs are mutually exclusive, or could be serviced by common pads. The only scenarios likely to occur in parallel are the desire for an ultra compact array and the need to run the BIMA and OVRO arrays separately from the common site. In this case, the 5 new pads for the ultra compact array may not be all in common with all the extra pads needed for dual operation.

Conclusions

Based on the considerations above, 8 wildcard pads within an 80m radius of the star center should cover foreseeable future contingencies. *It is likely that some or all of these pads would be located off of the current arms of the star so additional roads might also be needed.* Uncertainties about road requirements and the practicality of moving antennas within the inner star when most of the pads are occupied, was a significant secondary factor in settling on the 80m radius.

If it makes a strong difference to the EIS, we could cut the number of wildcard pads back to 5; this could impact our operation as dual arrays, but hopefully the dual operation period will be short. The outer radius of the wildcard areas could also be scaled back in this eventuality.

It is assumed that the additional of pads outside of this area will require new EIS statements but we consider the need for additional pads at larger radii to be less probable.

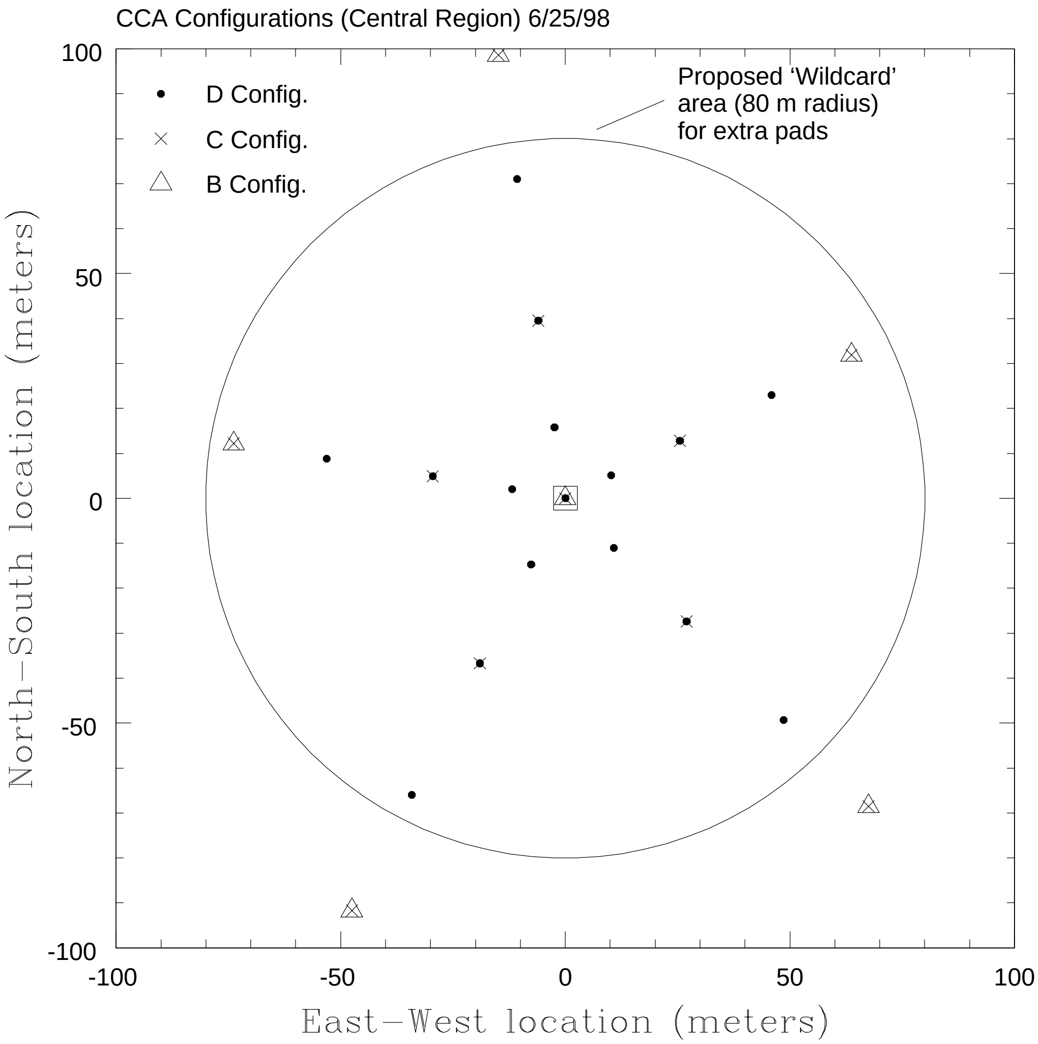

Fig. 1.— The inner 200 meter area of the Combined California Array. The large circle represents the proposed area, within which 8 antenna pads can be placed at any location. Actual locations will be defined at at later time.