

EVLA MEMO 48

NEW MEXICO ARRAY PLUS KITT PEAK AND FORT DAVIS

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This is just a quick note about the advantage of using the VLBA stations at Kitt Peak (KP) and Fort Davis (FD) with the New Mexico Array. This will be demonstrated simply by showing 4 figures with UV plots. They show the current favorite NMA configuration in the four possible combinations of with and without the VLA and with and without KP and FD. All plots are to the same scale. For the NMA, the configuration is the current favorite that has the VLBA station moved away from Los Alamos. It is getting distressingly clear that we will have to move that antenna. The advantage of adding KP and FD was shown earlier in EVLA Memo 35. But the favorite configuration has changed since then because of Los Alamos. Also this memo shows the UV advantages more clearly.

KP and FD match very well to the NMA, increasing the longest baselines by about a factor of two and increasing the resolution by something in the neighborhood of 80%. The actual resolution increase will depend on the weighting scheme used and I have not calculated any beams yet. What is very attractive is that the increased resolution is achieved with UV coverage that is equivalent to what is obtained on smaller scales on the NMA. Therefore making KP and LA full NMA stations would benefit the NMA capabilities significantly.

I have not tried to develop a science case. But just note the popularity of the PT link which provides a similar resolution increase for the VLA, but only does so well over a limited range of declinations. Adding KP and FD to the NMA should be at least as popular.

The cost of making KP and FD full NMA stations is significant, but much less than the cost of building two completely new stations. A very rough guess would be that the cost of the electronics upgrades at each site would be about \$1.5M and the cost of the fiber connection might be something similar, for a total in the \$6M range. Note that KP and FD are still close enough to consider the use of the same scheme to connect them that is being used for the NMA — leasing dark fibers from small rural phone companies. There is fiber on the mountain at Kitt Peak and about 2 miles from FD (the link to McDonald Observatory), although the FD fiber is a big company, Southwest Bell. The correlator will be big enough to handle the extra stations.

It has long been appreciated that the NMA fills the UV gap between the VLBA and the VLA. If you look in detail at the UV coverage that becomes available once the NMA is built, it is found that there are significant UV holes once you get beyond the the baselines between KP, FD, and the NMA. The weakest baseline range, in terms of UV coverage, is the next step out. Therefore, it does not make much sense to convert more of the VLBA stations to full EVLA standards until the whole VLBA can be done.

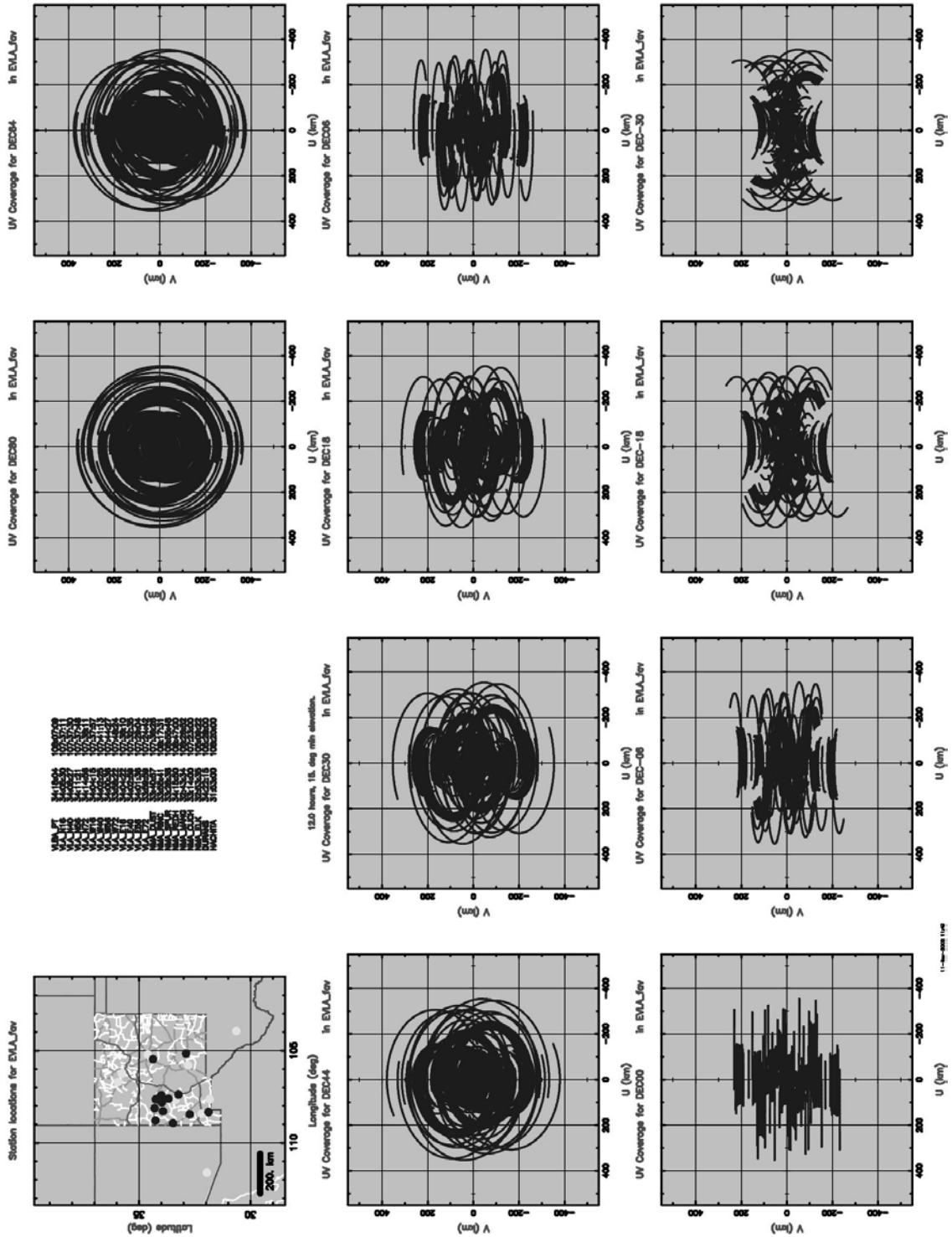


Fig. 2.— The UV coverage for just the NMA and EVLA, leaving out Kitt Peak and Fort Davis. The scale is the same as in Figure 1.

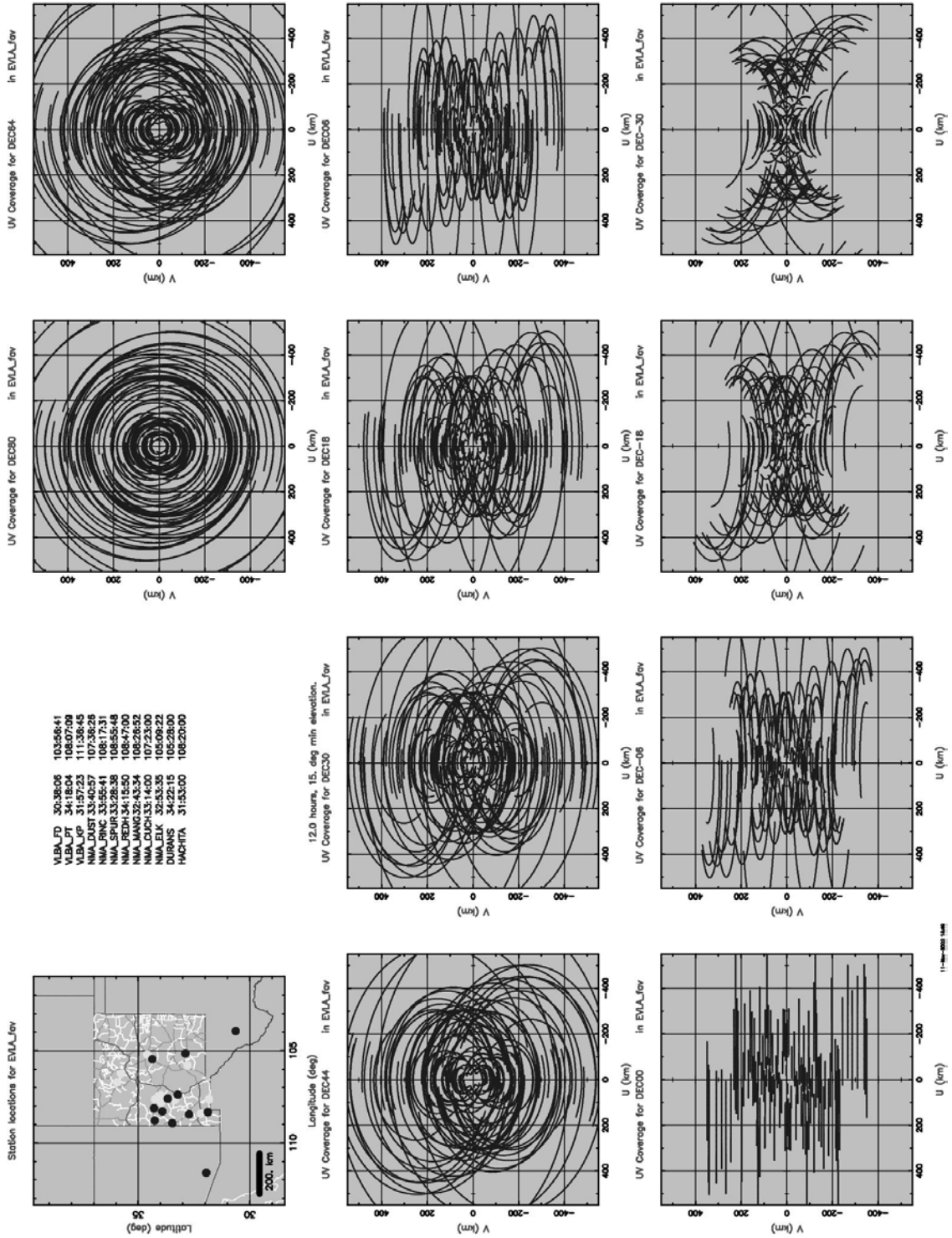


Fig. 3.— The UV coverage of the NMA plus FD and KP. The scale is the same as in Figure 1.

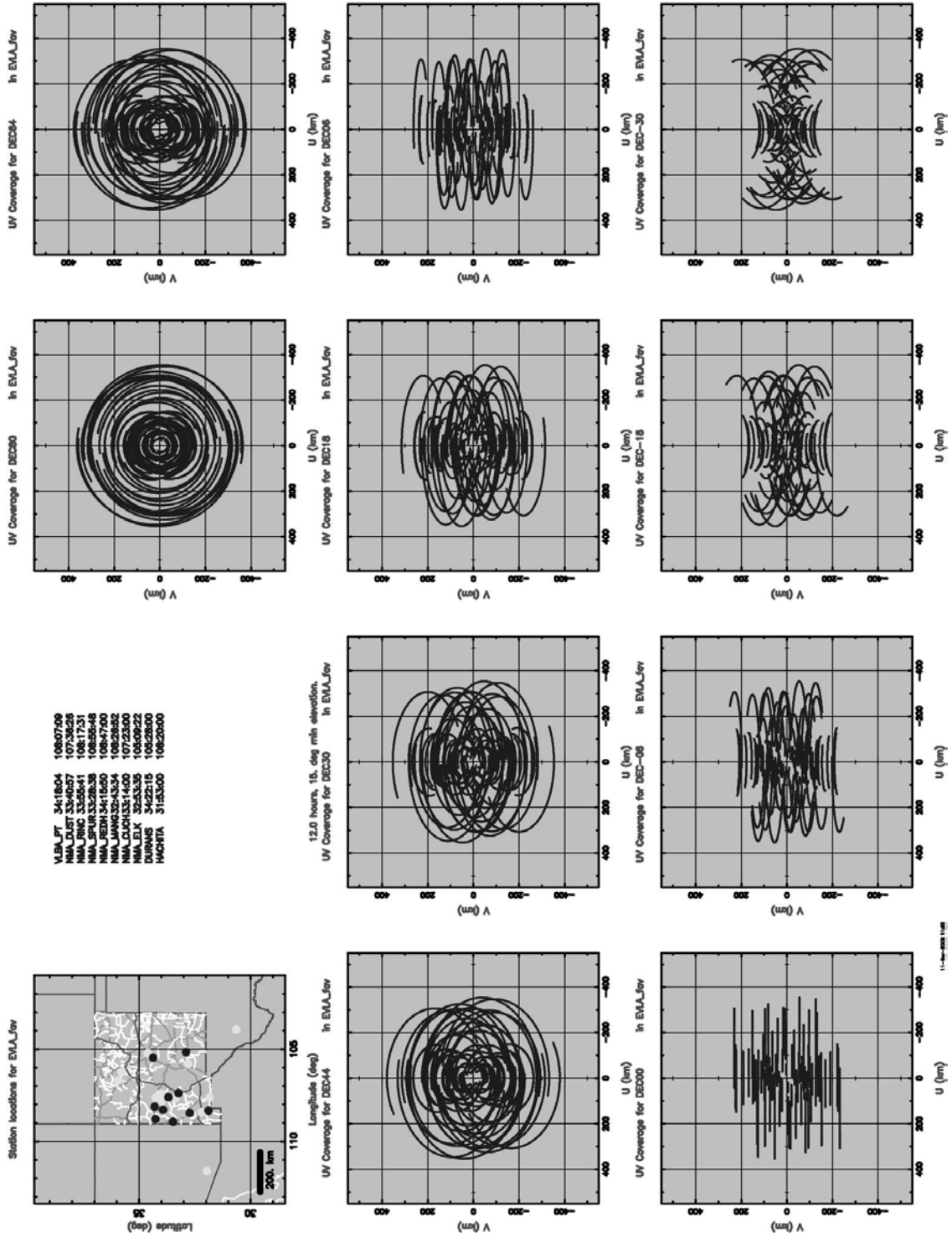


Fig. 4.— The UV coverage of just the NMA. The scale is the same as in Figure 1.