

Towards Optics Design for the Next Generation Very Large Array

Sivasankaran Srikanth
National Radio Astronomy Observatory
Central Development Laboratory, 1180 Boxwood Estate Road,
Charlottesville, VA 22903, USA
E-mail: ssrikant@nrao.edu

The science goals set by the Science Working Group for the ngVLA include study of star and planet formation, imaging the Milky Way and nearby galaxies, study of galaxy formation, cosmology etc. In order to achieve these targeted studies, the ngVLA proposal calls for about 300 antennas spread over a large geographical area, mainly in the western New Mexico region. The proposed array will consist of a compact core comprising of about 30% of the total with the rest on long baselines and some on the outer core. The sensitivity goal calls for 10 times that of the VLA, with antenna aperture in the 12 to 25-meter range. The goal is to provide continuous frequency coverage from 10-50 GHz and 75-116 GHz with maximum sensitivity and option to cover down to 1.2 GHz with some marginal performance reduction.

This paper will discuss some options for the optics design of the antenna taking into account performance, cost, accessibility to the receivers for maintenance purposes, and receiver distribution in the focal plane. The baseline design will use an 18-meter parabolic main reflector. For the secondary reflector, an off-axis design is being considered. In addition to the advantages of higher gain, low near-in sidelobes, lower antenna temperature, minimized standing waves, etc., this design will provide sufficient real estate for accommodating the receiver cryostats. In an on-axis design, it may not be possible to install all the receivers within the subreflector profile on an 18-m antenna such as being proposed. The importance of size, opening angle of the subreflector and its impact on the types and sizes of feeds will be discussed. The pros and cons of different geometries of dual-offset reflector designs will be presented with performance comparisons.

Figure 1. shows an 18-m Gregorian antenna with a 3.2-m subreflector. The beam patterns of the antenna at 1.2 GHz are shown in Figure 2. Other geometries will be discussed during the presentation.

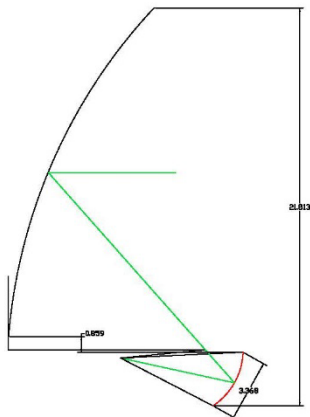


Fig 1. 18-m Gregorian antenna.

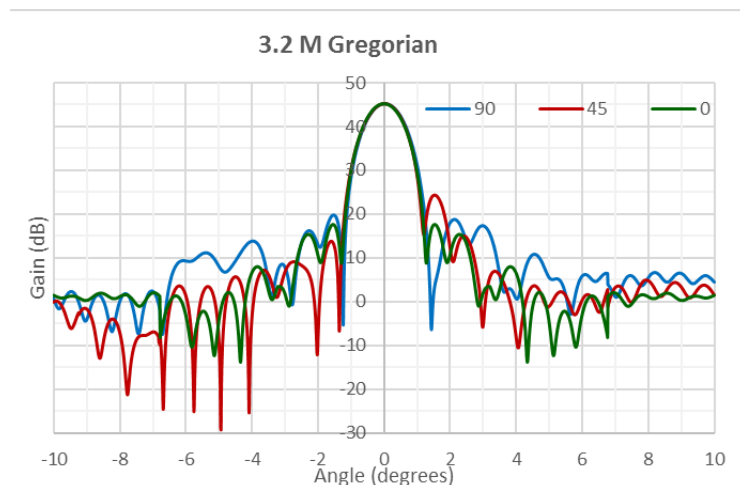


Fig 2. Antenna beam at 1.2 GHz.

