

AN UPDATE ON THE GBT METROLOGY SYSTEM

Constantikes, K. T.

National Radio Astronomy Observatory

The Green Bank Telescope (GBT) is a offset-Gregorian design 100 meter aperture telescope with design goal of operation at 115GHz. Achieving the required pointing, focus, and efficiency for such a large instrument at these frequencies is a non-trivial task, made even more challenging by our desire to achieve these goals over most operating environments, e.g., all times of day. The Green Bank Precision Telescope Control System (PTCS) project has made significant improvement in GBT beyond the as-delivered performance. Improvements in hand include order-of-magnitude improvement in blind focus and pointing. Improvements to collimation and wavefront error are underway.

Current approaches are semi-empirical, using astronomical data and models driven by information about the pose of the GBT and environmental data. While the value of this approach is manifest (see our other presentation: Pointing and Focusing the GBT), we also are pursuing a direct metrological approach. Direct measurement of parameters associated with structural distortions may be needed to achieve the GBT design goals. For example, while collimation can be improved via observations, there are benefits to a direct measurement of the position and pose of the subreflector in a coordinate system tied to the primary reflector.

GBT development has from its inception included a metrology program based upon laser ranging and trilateration position measurements. As a result of these prior efforts in instrument development and actual experience, we are updating our approach. Changes being considered include major modifications to the laser rangefinder design, inclusion of angle measuring instruments (including autocollimation), a new approach to the system geometry, and addition of some other specialized instruments.

We will present our notional system design and details about the new instruments. We are currently proceeding with prototype instrument fabrication and test as well as system studies to determine if the notional system will plausibly meet overall system requirements. Data regarding error budgets, system sensitivities, and instrument performance will be included if possible.

Abstract Submission Form

2004 National Radio Science
Meeting

Abstract: constantikes25085

Date Received: September 24, 2004

1. (a) Kim Constantikes
NRAO
PO Box 2
Rt 28/92
Green Bank, WV
24944 USA
kconstan@nrao.edu
- (b) 304-456-2325
- (c) 304-456-2200
2. J - Radio Astronomy
3. (a)
4. I - Invited Paper, Program
chair: Padin
5. FOR SESSION: Mirror
Fabrication, Alignment and
Metrology for Radio
Telescopes Comm J, Session
chair: Steve Padin