Algonquin Radio Observatory

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Abstract

The Algonquin Radio Observatory (ARO) is situated in Algonquin provincial park, about 250 km north of Ottawa and is operated by the Geodetic Survey Division (GSD) of Natural Resources Canada as a primary site for the Canadian Spatial Reference System.

The antenna is involved in a large number of international geodetic VLBI sessions each year and is a key site in the ongoing Canadian S2 developments. The ARO antenna is the most sensitive IVS Network Dish.

This report summarizes recent activities at the Algonquin Radio Observatory.

Figure 1. Algonquin Radio Observatory 46m Antenna

1. Overview

The ARO 46 m antenna was used in the first successful VLBI experiment in 1967 and was involved as early as 1968 in geodesy, when the baseline length between the ARO and a telescope in Prince Albert, Saskatchewan was measured to be 2143 km (sigma=20m).

The GSD also maintains a permanent GPS monitoring station at Algonquin which is used by all IGS Analysis Centers as a fiducial reference. The site acts as a primary location for the Canadian Spatial Reference System (CSRS), and ensures global consistency for reference frame users in Canada. Absolute gravity observations are available for the site which is located on the stable Precambrian Canadian Shield. A Satellite Laser Ranging observation campaign was conducted in 1993. Local site stability has been monitored regularly using a high-precision network.

2. Site Improvements

No major improvements were made to the ARO antenna this year. Two new GPS pillars were installed at the site.

3. General Specifications

- Latitude : N 45° 57' 19.812"
- Longitude : E 281° 55' 37.055"
- Elevation : 260.42m
- Reflector : 46m diameter with first 36.6m made of 0.634cm steel plates surrounded by 4.6m of steel mesh.
- Foci : S and X band at prime focus. Gregorian capability with 3m elliptical subreflector.
- Focal length : 18.3m (prime focus)
- Focal ratio : f/D = 0.4 for full surface and 0.5 for solid surface.
- Surface accuracy : 0.32cm for solid portion and 0.64 for mesh.
- Beamwidth : 3.0 arcmin at 3cm wavelength (10GHz)
- Azimuth speed : 24 degrees per minute
- Elevation speed : 5 degrees per minute
- Receiver : S and X cryogenic receiver.
- VLBI equipment : VLBA4 with thin tape drive and Mark 5 Disk recorder. S2 DAS and RT.
- PCFS version : 9.7.7
- Time standard : NR Maser
- GPS receiver : BenchMark
- Timing receiver : CNS clock

4. Antenna Survey

The antenna is surrounded by a high stability network consisting of thirteen concrete piers. This network has been precisely measured five times to obtain the geodetic tie between the VLBI, the GPS, and the SLR reference points with a precision of a few mm. The VLBI antenna itself requires a special indirect survey since the reference point cannot be accessed directly. Previous surveys were reanalyzed with refined models in 2005.

5. Algonquin Operations

In the summer of 2005, alarm software was installed which allowed remotely monitored operations. Since that time ARO has operated with fewer staff during observations.

In December, a major snowfall resulted in a prolonged power failure resulting in the absence of ARO for several sessions.

Algonquin Radio Observatory is involved in several International VLBI networks. Geodetic VLBI activities are summarized below.

5.1. Sessions Performed January 1, 2005 - December 31, 2005

Session Type	Number of Sessions
R4	45
E3	11
R&D	9
T2	3
CONT	14
RVD	4
Total	86