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Canadian Transportable VLBI Antenna (CTVA)

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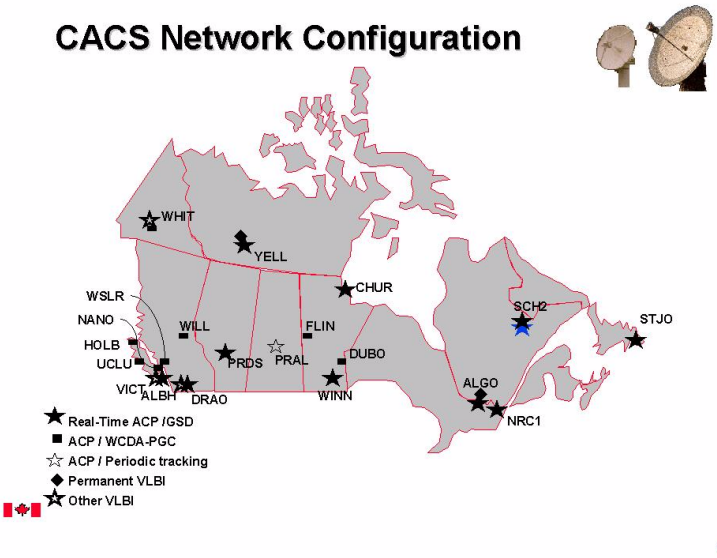
Abstract

The Canadian Transportable VLBI Antenna (CTVA) is an integral part of the activities in the Canadian VLBI Technical Development Center and has been involved in a number of S2 frequency-switched VLBI system tests. In this paper we present the CTVA specifications and discuss site preparation and antenna assembly.

1. Objectives

Provide fiducial reference for the Canadian Active Control System (CACS) and the Canadian Base Net (CBN), part of the Canadian Spatial Reference System.



Along with the Algonquin 46 m and Yellowknife 9 m antennas define a network of about 10 fiducial sites in Canada. The antenna will be co-located with CACS stations for a few months. These CACS stations should be revisited every 3-5 years.

2. Specifications

Reflector	3.6m diameter (2 panels)
Receiver (uncooled)	X band: Cassegrain (45cm sub-reflector) 8180 to 8980 Mhz
	S band: Prime focus 2210 to 2400 Mhz
Antenna SEFDs	X band: 70000
	S band: 100000
Antenna Slewing Rates	Azimuth: 150 degrees per minute
	Elevation: 60 degrees per minute
VLBI system	S2 Data Acquisition System (S2-DAS)
	S2 Record Terminal (S2-RT)
PCFS	Version : 9.4.6 (modified for S2-DAS)
Time standard	CH1-75 Transportable Hydrogen Maser
Transportability	Total weight is less than 1500kg
	Largest piece (half of reflector) 3.6mx1.8mx1m
	Heaviest part (positioner) 850kg

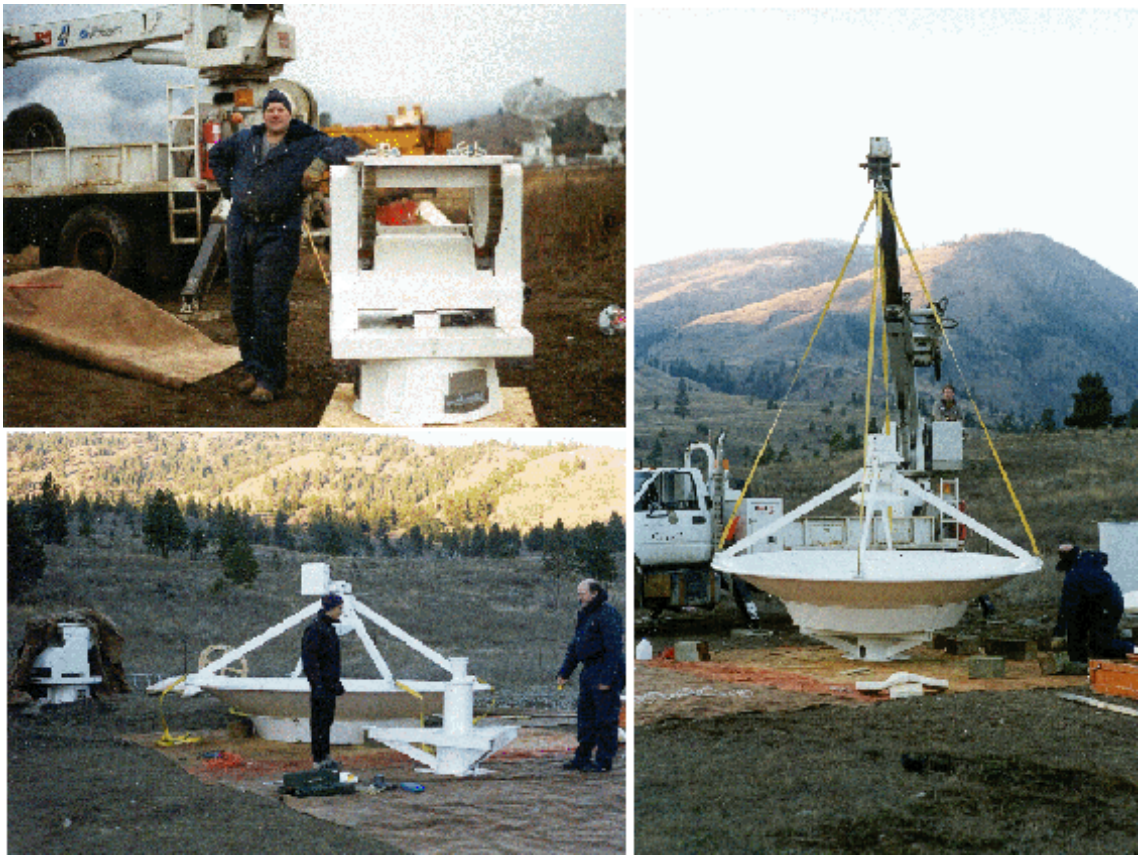
3. Site Preparation

The sites are selected so that the antenna is within few hundred metres of the GPS point and can be fixed to bedrock. A local network is established to determine relative positions between GPS and VLBI and provide a reference for measuring local stability.

The concrete pad is anchored to bedrock using 15 cm diameter steel well casing and 1 cm reinforcing steel bar. A transition ring is used to fix the antenna to the pad. It takes about 2 weeks to prepare the site and survey the local stability network.

4. Re-assembly of the Antenna

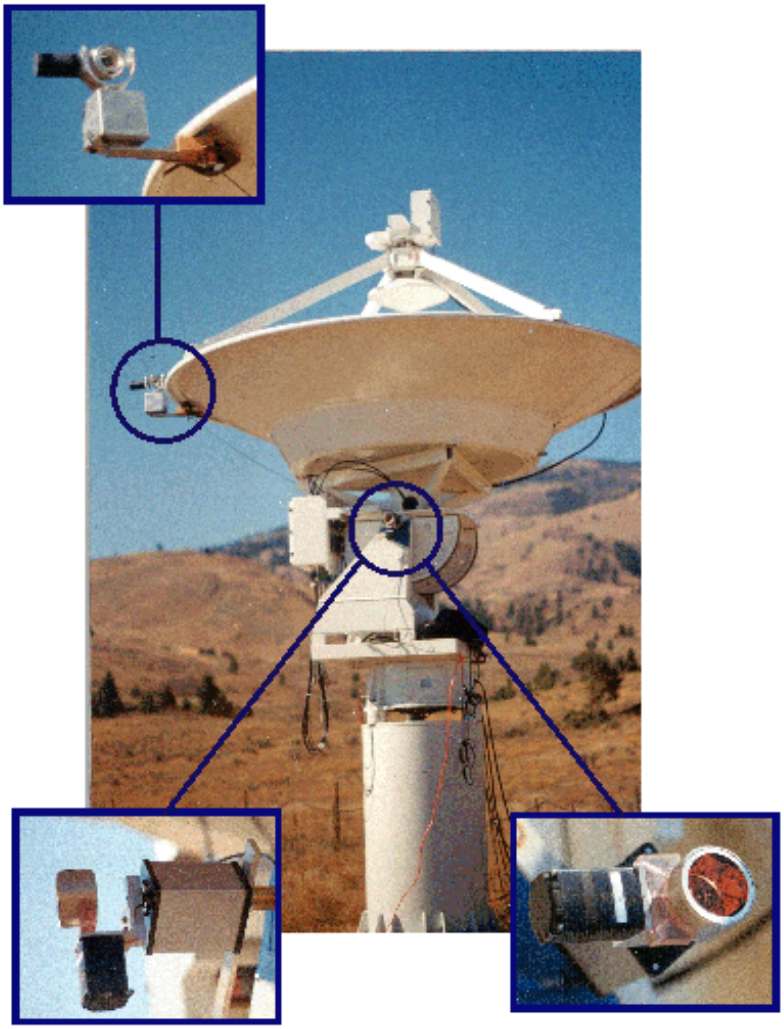
The antenna is brought to the site in many parts. With three people, it takes less than a day to re-assemble.



First, the two halves of the reflector, the quad legs, the sub-reflector and the S and X feeds are secured together on the ground. Second, the aluminum base is secured to the transition ring. Third, the positioner is secured to the base and levelled. Finally, the assembled dish is secured to the positioner.

5. Antenna Offset

The offset of the intersection of the elevation and azimuth axis with respect to the marker on the ground is determined by a precise survey method. This method uses two retro-reflectors installed on the CTVA. The marker is well defined in the local network. The same network is then used to position the two retro-reflectors defining a sphere and a circle centered at the antenna reference point. Surveys are done using high precision total station (distances 1 mm+1 ppm, angles 1"). The offset is determined with a precision of 2–3 mm.



6. Status

The CTVA is at the Dominion Radio Astrophysical Observatory (DRAO) at Penticton for system validation. Initial geodetic experiments have been performed with Algonquin and Yellowknife. See [1] for details on the experiments, data analysis method and results. Trial operations will start in April. Next site for CTVA is St-John's (STJO). Another site has been prepared at Churchill (CHUR).

References

[1] Klatt, C., *et al.* "The S2 Geodetic VLBI program in Canada: System Validation Experiments and Results", This Volume.