Canadian VLBI Technology Development Center

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Abstract

The Canadian Technology Development Center has developed an "end-to-end" geodetic VLBI system built on S2 equipment. The development of this system has led to an operational IVS network. Development work continues to streamline operations and improve S2 instrumentation.

1. Introduction

The Canadian VLBI Technology Development Center is a collaborative effort of the Space Geodynamics Laboratory (SGL), the Geodetic Survey Division of Natural Resources Canada (GSD/NRCan) and the Dominion Radio Astrophysical Observatory (DRAO) of the Herzberg Institute for Astrophysics of the National Research Council of Canada, (DRAO/HIA/NRC).

2. S2 VLBI Geodesy

The S2 VLBI observation program continued in 2004 as the operational "E3" IVS observing network. The "E3" Network consists of Algonquin, Yellowknife, the Canadian Transportable VLBI Antenna (CTVA), Kokee Observatory, Svetloe Observatory, and the Transportable Integrated Geodetic Observatory (TIGO) located in Concepcion, Chile. Initially, the small network size limited the contribution to EOP determination, however the addition of Svetloe Observatory mid–year has improved EOP determination and network robustness.

3. S2 VLBI Data Acquisition System (S2-DAS)

The S2 VLBI data acquisition system is being jointly developed by SGL and GSD. The S2-DAS is designed to accommodate up to four VLBA/Mark IV type single sideband baseband converters (BBCs), each with a local oscillator (LO) independently frequency switchable under computer control. The objective of the development of the S2-DAS is to enable high sensitivity group delay measurements without appealing to a more costly parallel IF/baseband sub-system.

The DAS Operating System (DASOS) has seen extensive development in the past few years. Further software development continues to improve robustness and efficiency. Improved self-testing capabilities and further refinements are currently being tested and will be included in the next official release.

4. S2 VLBI Correlator

The Canadian Correlator is a six station correlator (expandable to ten stations) using S2 playback terminals and is designed to handle S2 frequency–switched bandwidth synthesis data. Recent activity has focussed on the development of visualization and statistical analysis software to enhance system performance monitoring.

The Correlator was developed both for geodetic and astronomy observations, particularly the "Highly Advanced Laboratory for Communications and Astronomy" (HALCA) satellite which

was an orbiting VLBI antenna. Correlator staff was cut to one person as a result of the end of HALCA operations. After clearing the backlog of astronomy observations, the correlator was able to clear the backlog of S2-geodetic sessions. The turnaround time for a typical E3 session is now approximately 15 days.

5. Canadian Transportable VLBI Antenna (CTVA)

The CTVA is a 3.6m radio telescope acquired to facilitate densification of the terrestrial reference frame in remote regions. The antenna will be collocated with GPS elements of the Canadian Active Control System (CACS) to provide fiducial station positions. The GSD is responsible for CTVA system development.

The CTVA spent all of 2004 in St. John's, Newfoundland. CTVA uses a group of local university and college students for all observing operations.

The CTVA communication system was upgraded in late 2004. High–speed Internet, web—based cameras, and automated site monitoring will improve site reliability and safety. As the CTVA is now being used in TRF solutions and combinations, accurate eccentricity information was provided to IVS analysts.

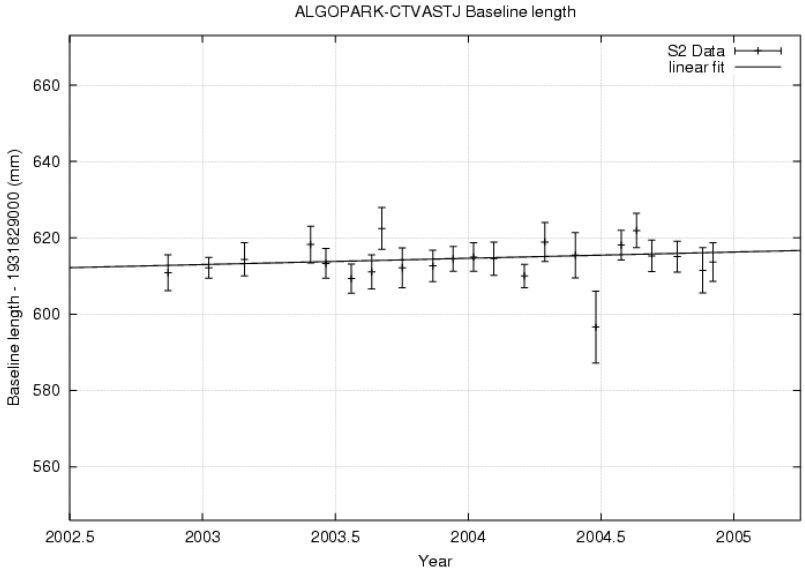

Figure 1. CTVA-ARO Baseline repeatability, wrms 3.5 mm

6. S2 Geodetic Experiment Scheduling, Operations and Analysis

The "E3" network continues to contribute with monthly EOP sessions using 5-6 stations. The EOP results are comparable to R4 sessions but have slightly greater uncertainty due to network configuration and sensitivity. Gilcreek, Alaska will begin to operate in the winter months when Yellowknife Antenna is stowed for winter, keeping the E3 network at 6 stations year–round in 2005.