Canadian VLBI Technology Development Center

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Abstract

The Canadian VLBI Technology Development Center (TDC) is actively involved in theoretical studies to define recommendations for the VLBI2010 system. In addition, two development programs at the Dominion Radio Astrophysical Observatory (DRAO) are of potential interest to VLBI2010. Composite antennas that are light, stiff and cost-effective are being developed for the SKA, and a state-of-the-art correlator is being developed for the EVLA.

1. Introduction

The Canadian TDC is a collaborative effort of the National partners interested in the advancement of VLBI technology, namely 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).

A number of the activities of the Canadian TDC were discontinued this year due to the cessation of VLBI operations in Canada. These include the development and maintenance of the S2 VLBI system and the Canadian Transportable VLBI antenna (CTVA).

2. VLBI2010 Committee

Activity within the Canadian TDC is now focussed primarily on supporting recommendations for IVS's VLBI2010. This is being done through Bill Petrachenko's participation as chairman of the V2C. In addition to his leadership role, he has taken an active interest in the feasibility of generating source structure corrections, in particular, the alignment of images at different frequency bands. Simulations are ongoing. He also made significant contributions to defining recommendations for VLBI2010 antenna slew parameters. In collaboration with Toni Searle of NRCan, schedules were generated to test the dependence of position accuracy on source switching interval. These schedules were then processed through the Monte Carlo Simulators at TU Wien by Joerg Wresnik and Andrea Pany and at NASA GSFC by Dan MacMillan. Using the results, it was possible to develop relations between performance and slew parameters to provide a theoretical backing for the VLBI2010 slew parameter recommendation.

3. DRAO Activities

DRAO has a long history of participation in VLBI beginning with the first ever successful fringes in 1967. Expertise exists in a number of relevant disciplines from innovative antenna/feed/receiver design to the design and implementation of large complex digital systems.

Of particular interest to VLBI2010 are the composite antennas being designed for the Square Kilometer Array (SKA) project. These are 12 m antennas based on composite materials that are light, stiff and cost effective. Under the leadership of Dean Chalmers and Gordon Lacy, a first prototype antenna (10 m) was produced in the summer of 2007. Both holography and a laser scanning system verified that the antenna surface is good to at least 15 GHz. A second prototype

is expected in spring of 2008. As a result of process development, a significant improvement in surface accuracy is expected.

In addition to the SKA antenna development effort, DRAO, under the leadership of Brent Carlson and Dave Fort, is producing the correlator for the EVLA project. It is one of the most ambitious radio interferometry correlators ever conceived, handling, in real time, 32 stations at a maximum data rate of 96 Gbps per antenna. Although primarily intended for connected element interferometry, it was also designed to be VLBI capable. An adaptation of the EVLA design capable of handling VLBI2010 requirements has been investigated.

Figure 1. Ten meter prototype composite antenna at DRAO being prepared for holographic testing.