

A CASCA RAC telecon was held Monday, November 25, 2008, 5pm EST. Present were Sean Dougherty, Gil Holder, Martin Houde, Ingrid Stairs (chair), Ken Tapping, and Tracy Webb.

1) Old business.

The search to find someone within HIA to replace Ken Tapping as spectrum manager is still going on. We remind the Board that Ken was scheduled to step down from spectrum management at the end of this calendar year, and there needs to be at least 6 months' overlap to train a successor. We ask for the Board's continued support of this increasingly urgent need.

2) Reports.

A) Spectrum Management -- Ken Tapping

i) IR/Near IR Astronomy

Thanks to a lot of input from Michael Balogh and others, Canada took to the ITU (International Telecommunication Union) Working Party 7D Meeting held in October in Geneva a substantially expanded and improved document on the vulnerabilities of IR/Near IR astronomical instrumentation to interference by lasers being used for communication and other applications. The document was well received, benefited from some input from other countries, and was approved. Working Party 7D now needs to add some technical information on laser communication systems so that the last part can be added, namely the section on interference avoidance and mitigating measures.

ii) Radio Quiet Zones

A Radio Quiet Zone is more than a transmitter-free patch on the ground. It impacts aeronautical radio services that operate in line of sight and near-line-of-sight of the facilities located in the zone, and of course space activities. This touches on two important issues: radio spectrum management activities of countries other than the one operating the zone, and even safety, which is recognized as an international issue. Things become more complicated if one of the objectives of the zone is to provide spectrum access outside the frequency bands allocated to radio astronomy. Therefore, for example, discussion of a Radio Quiet Zone in Australia is an issue extending beyond Australia, and in South Africa, becomes an international issue from the ground up.

Therefore the definition and management of Radio Quiet Zones is a major discussion issue at the ITU. The main impression one gets is one of fear. Operators of radio services, particularly those with airborne or space borne elements are worried about the impact on their business and the cost of accommodating the zone in their operations. When bands outside those

allocated to radio astronomy are discussed, things get more complicated, because the transmissions are legitimate, whether they interfere with out-of-allocation radio astronomy observations or not. There is a lot of work to do here. We need to continue to define the working conditions of the zones, how they will work internationally, and who is responsible for dealing with issues.

iii) Digital TV

The transition of TV broadcasting from analogue to digital transmission has led to concerns about out-of-band access of TV bands for radio astronomy. This concern is reasonable, but taking it to the ITU is counterproductive. We all work in allocated bands, which we can use in as efficient a manner as possible for the allocated purpose. We have no rights to bands allocated to other services, and behaving internationally as though we do just discredits us and raises suspicions about other things we propose.

iv) Software-Defined Radio

These radios can operate in all sorts of modes, and in general they transmit information in packets, wherever they find blank spectrum. The proponents of these systems keep "forgetting" that radio astronomy bands are not marked by transmissions being present in them (other than those provided by Mother Nature), and that radio astronomers don't want SDR devices deciding to use radio astronomy bands for their next packet or two. Luckily there is plenty of vociferous discussion in the ITU.

v) Allocations to 3 THz

The work goes on. There is a list of everyone's favourite spectral lines that pretty well fills the spectrum. We will need to prioritize and select frequency bands. That work is starting. We won't get all of it!

vi) Broadband Over Power Lines and Ultra-Wideband Devices

Modeling interference from these systems has proved impractical and seems to be an on and off again interest in deploying these system.

vii) Iridium and GLONASS

Iridium and GLONASS have both posed interference problems for radio astronomers. The Iridium system has now moved into the safety and rescue domain rather than the public one, and that new satellites are being deployed, which, we are promised, will not be interference generators for radio astronomy. The Russians and their allies are strongly opposing any measures to put pressure on them or to bring international condemnation on them for their failure to deal fully with the interference issue as per international agreements.

B) JCMT -- Martin Houde

i) SCUBA-2 achieved first light in August. It arrived at the JCMT in March and on-sky commissioning started in June. It is mounted with the engineering-grade arrays which have only ~40% of useful pixels. The science-grade arrays are scheduled for delivery in April and August 2009, with installation to follow. There are still a number of issues that need to be solved before SCUBA-2 can be used for real operation. Those include instability of base temperature, higher noise level than that of lab tests, saturation at 450 micron, etc. Commissioning is making good progress and scan maps of planets and strong sources are feasible. Pointing and focus are being tested with the engineering arrays.

ii) HARP has 12 of its 16 receptors working. MRAO is constructing some spare mixers, with which we hope to fix at least 3 of the non-working receptors. The mixer replacement has been postponed to February 2009. The remaining 12 receptors are working mostly well, except at certain frequencies (most notably at 13CO/C18O) when one or two receptors may show higher noise and sometimes bad baselines. There are still some calibration issues, but most standard spectra come in as expected within 15% of uncertainty.

iii) RxA is generally working well. Intermittent baseline problem are reported occasionally and maybe related to ACSIS. As the receive ages, investigation to increase the reliability of RxA is on going.

iv) RxW(D) now has two working channels and has been reinstalled on the telescope. Alignment of the two channels and other on-sky commissioning are on going, pending on good weather.

v) RxW(B) has a broken mixer, but repairs were postponed in order to get the D-band mixers back on the telescope. The one working channel is mostly used for eSMA tests.

vi) The eSMA was officially dedicated on 11/12/08. Some early science results with observations at 230GHz have been reported. Fringes have once been obtained at B band, but there are still a number of problems partly related to RxW(B), which need to be solved.

vii) Miscellaneous. Despite a variety of technical issues, things are really going well at the JCMT, with low fault rates and a lot of data rolling in. The data reduction pipeline has been greatly improved during this semester and pipeline reduced data are now available at the CADC.

The Nearby Galaxies JCMT Legacy Survey has used up the allocated time for its HARP observations, and first science paper has been submitted to the ApJ. The Gould Belt and Spectral Legacy Surveys are also progressing. All survey teams

found that more HARP time are needed to reach the original science goal, partly due to the dead receptors in HARP, and partly due to underestimating of overheads with HARP observations in the original proposals.

C) ALMA – Tracy Webb

1. Construction progress

Everything appears to be moving forward. The Array Operations Site (AOS) and Operations Support Facility (OSF) are complete with move in (i.e., power/heating/furniture) scheduled for the end of 2008.

There are 11 antennas on-site for assembly. A number of front ends and correlators are in the process of being delivered and installed. The transporter was delivered in Feb 2008. The first fringes in Chile are expected in the first quarter of 2009 (fringes were already produced at the ALMA Testing Facility in 2007).

The start of the commissioning of the antennas is expected in Feb 2010 with early science expected in Aug/Sept 2011. The early science decision point will be Feb 2009, with a call for early science proposals shortly thereafter. Full science operations is expected in 2013.

An ALMA Development Working Group has been struck (chaired by Andrew Blain; Chris Wilson is a member) to look at future developments for the facility. These will be science driven and include improvements such as additional receiver bands, improved time resolution/mapping speed/software, extended or VLBI baseline capabilities, wider bandwidths, additional numbers of antennas (unlikely), etc. There will be some support available for people who wish to take leave or a sabbatical from their home institution to contribute to the Commissioning and Science Verification. This is expected to be available from mid-2009 and leaves of 3 months to 1 year are recommended.

2. Operations Planning

An ALMA Operations Plan exists: 125 pages, Version D, as of end of 2007. This outlines the operations tree and the required level of support at the ALMA Regional Centers (ARCS). Note that Canada is part of the NA ARC in Charlottesville. The Core Science Support includes help with proposal writing and submission, program implementation, data quality assurance, data reduction help, and Astronomer-on-Duty at the OSF. ALMA is currently assessing the manpower needed to meet these requirements. Enhanced Services include activities such as summer schools, workshops, and enhanced archive services.

3. Funding Situation

The original MOU between NRAO and NRC established that Canada would contribute 7.25% of NA share of Chilean operations costs (this is 2.72% of global costs). This will be an in-cash contribution to NSF and will cover development costs. We will also contribute 7.25% to the legal and business services for NA partners in Chile. The steady-state cost (as of roughly 2013) will be 1.24M USD (2006). We are also responsible for 7.25% of the NA operations budget, which will be an in-kind contribution. This covers software/hardware support and ARC operations support (details as yet undecided). Obvious contributions include support astronomers, CASA support, archive support, and Band-3 support. The steady-state cost of this is ~574K. We expect roughly 4 HIA employees contributing at ~25% to NA ARC support, and perhaps another equivalent 2 people at full-time involved in software and hardware support.

We have a seat on the Board that approves the annual budget. HIA will assign a Lead for Canadian ALMA operations. Canada will have the opportunity to propose and participate in future design projects.

At present, there is no long term funding in place to cover these expenses, due to the failure of the LRP Phase 2. Band 3 construction is funded year-to-year through NRC. Other ALMA construction expenses have been funded through transitional funding provided by HIA. We are 2 years in arrears in our contributions. This is an urgent issue.

4. Canadian Contributions

Band-3 receiver construction continues to make good progress. All design reviews have been passed and the team is on schedule for the Production Readiness Review in Jan 09. Construction will then rapidly ramp up to ~1/month for ~4/years.

Our software contributions are also going well. We have 3 software initiatives: the ALMA Control Software (Arne Grimstrup), the reduction software CASA (Shannon Jaeger), and the ALMA Archive Request Handler (a few people). The archive work is nearly complete. CASA has now been released to the general public (though still in Beta 2.3 stage). The software can be downloaded through <http://www.my.nrao.edu>. Work on the ACS is ongoing and on schedule. The entire ALMA software suite has recently undergone an external review, but the report has not yet been made public.

Enhanced Contributions:

James Di Francesco and Doug Johnstone are compiling an ALMA Primer for use by those new to interferometry. Doug Johnstone is working on a general PowerPoint document for use by those giving ALMA talks to the public or within the University context.

The canceled 2008 Canadian CASA summer school will be rescheduled for this summer, likely early June at McMaster. This is intended for graduate students, though all interested future ALMA users with limited interferometry background are encouraged to attend.

The Recent Band 1 Workshop (as reported by James Di Francesco):

The goal of the Band 1 Workshop, held at HIA-Victoria on 8-10 October 2008 was to examine the scientific and technical cases for building Band 1 cartridges for ALMA. The ALMA project has begun to look into development of new capabilities after the start of full operations. Band 1 (31-45 GHz) was one of the original 10 bands that ALMA was designed to have but it was one of six Bands removed after a de-scoping measure several years ago. (Three of these bands, including some with lower scientific priority, were reinstated to the project when Japan formally joined a few years ago.)

The meeting brought together both scientists and engineers interested in the possibilities of Band 1 on ALMA. The ~30 attendees came primarily from Canada, Taiwan and Chile. The scientific topics discussed included observations of:

- CO from high-redshift galaxies
- the Sunyaev-Zeldovich Effect in galaxy clusters
- the Zeeman effect in molecular lines to trace magnetic field strengths
- masers
- supernovae, especially using ALMA as part of a VLBI experiment
- protostellar disks for indications of planetesimal growth
- anomalous low-frequency continuum emission possibly from spinning dust grains

The Workshop resulted in a better understanding of the advantages and disadvantages that the Band 1 receivers could provide. The repetition of EVLA capability was particularly noted; indeed, the two facilities will have similar sensitivities to first order but a more careful analysis of the two facilities and their sites is needed.

An informal partnership between Canada, Taiwan and Chile has begun, with several working groups formed to explore further Band 1 technology development. In addition, a science document will be produced by early next year that will provide a succinct case for consideration by the community.

5. Misc. Points

There is a new ALMA website: www.almaobservatory.org

The next ALMA science workshop will likely focus on Star Formation and AGN

(high and low redshift).

The Vertex (test) Antenna is up for grabs! With ALMA testing finished it is not clear what the future of the test antenna should be. It sounds like anyone who is willing to remove it from the site could have it, otherwise it might become part of the VLA visitor center.

D) EVLA -- Sean Dougherty

Unavailable at time of writing.

E) SKA -- Sean Dougherty

Unavailable at time of writing.

F) ASKAP – Ingrid Stairs

The international community was recently invited to submit Expressions of Interest for an initial set of Survey Science Projects for the Australian SKA Pathfinder (ASKAP). Expressions of Interest are the first stage of a three-stage process to define Survey Science Projects that are envisaged to utilize at least 75% of ASKAP's observing time during the first five years of its science operations, starting in 2012. This invitation was made public to Canadian astronomers through the CASCA exploder.

G) Education/Outreach -- Gil Holder

The RAC web page has now found a permanent home on the CASCA server, but is badly in need of updating. Gil fixed all of the stale links, but the content is very dated. An action item was suggested at the RAC telecon, whereby members of the RAC were to check out the site and make suggestions for improvement.

On the outreach front, there is some concern that radio astronomy in Canada is not at the forefront of IYA activities. The decentralized nature of the IYA efforts makes it unclear exactly what to do about this. Gil am emailing people related to IYA activities in hopes of making some inroads in this.

3) Administrative changes.

Both Ingrid Stairs and Sean Dougherty are scheduled to leave the RAC after the telecon of spring 2009. The names of potential candidates for their replacement were brought forward during discussions. Selected candidates will soon be contacted by the RAC chair.