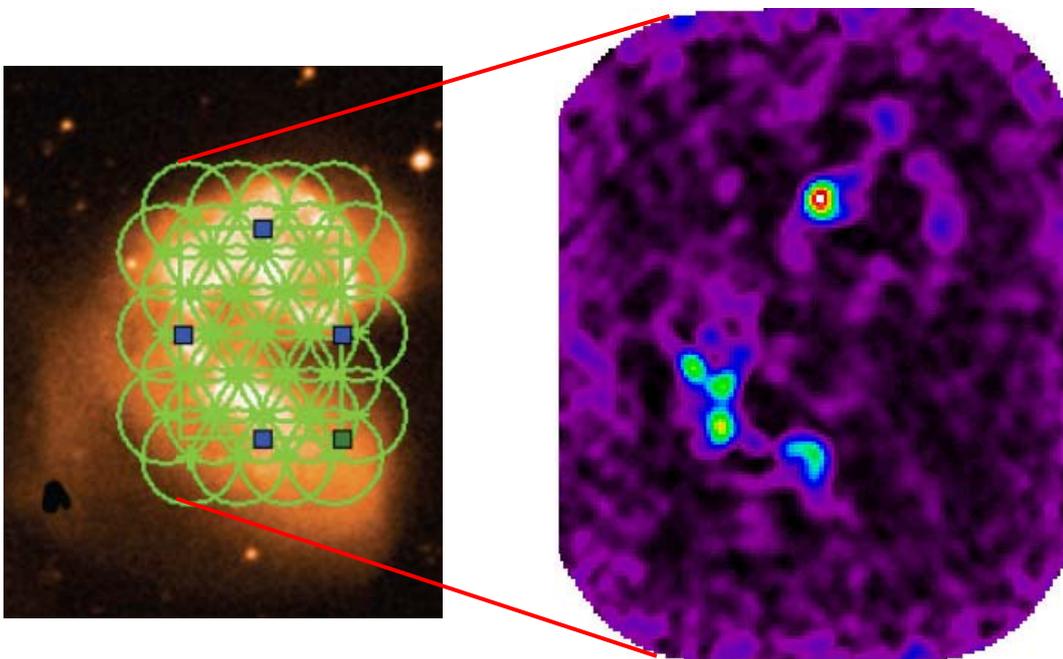


9. SCIENCE IPT

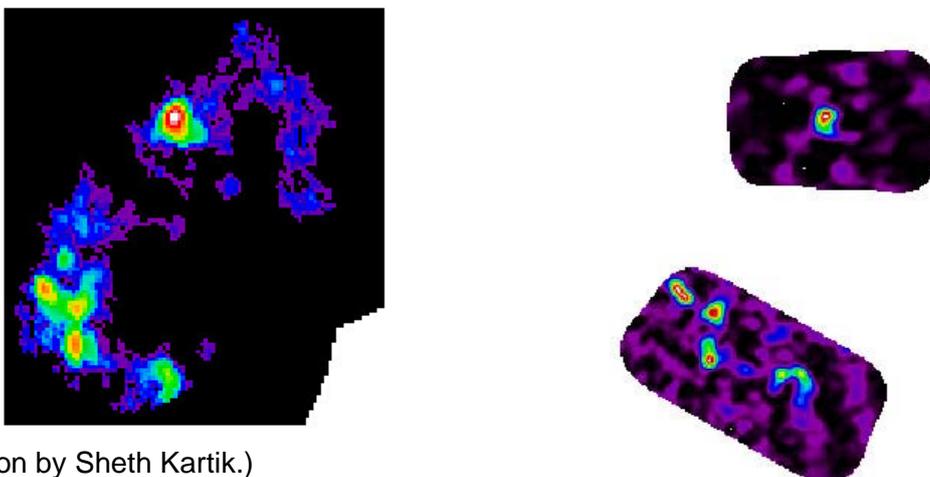
9.1 Commissioning and Science Verification

The weather finally started to improve in the second week of March and we were able to resume Commissioning activities by making real observations (as opposed to simulated ones!) Unfortunately the other problems that have been holding us up – equipment reliability and software issues – were still present. There was only a week or so between the end of the bad weather and the start of a long-planned shut-down for hardware upgrades but we had hoped to use that to obtain a first set of Science Verification data, for release at the time of the Call for Proposals. In the event we were not able to obtain data of the quality required for presentation to the community, so that initial release has now been postponed until June.

We were however able to demonstrate the “mosaic” observing mode is working rather well and with a reasonable level of efficiency. The target chosen was the interacting pair of galaxies NGC 4038/4039, known as the Antennae. On the left below is an optical image with the 31 pointing positions we used indicated and on the right is the CO J = 1–0 image.



Here, on the same scale as the ALMA image, is the OVRO CO J = 1–0 mosaic by Christine Wilson et al. (2000) and on the right are two smaller ALMA mosaics of the CO J = 2–1 line.



(Reduction by Sheth Kartik.)

The total observing time for the ALMA J = 1–0 map was a little over four hours, of which about 55% was actually integrating on the different pointing positions, 25% was taken up by

calibration measurements and antenna moves and 20% by software overheads. Improved versions of these maps will be part of the first release of Science Verification data.

Suggestions for further SV targets continue to trickle in – we now have over a hundred. A selection was made of eighteen objects for observation over the period between now and the start of Early Science, and that list was published along with the Call for Proposals.

On the technical side, a very positive aspect is that the upgrades to the photonic Local Oscillator system and to the 64-input Correlator went well and both these new systems were in use at the end of the month. Testing of the ACA correlator also made some progress and the efforts to improve the locking of the receivers appear to be paying dividends.

We were not, however, able to move the antennas to the new antenna stations as planned because the power system was not ready. Faults also occurred in many different sub-systems on the antennas – including a drive motor, shutters, encoders, an uninterruptible power supply, air conditioning units and a focus mechanism (hexapod). The most serious problems with the ALMA-installed equipment were the failure of a calibration device, vacuum leaks in cryostats and the shutting-down of several of water vapour radiometers with excessive motor current readings. Three antennas were brought down to the OSF at the start of the observing shut-down period to correct the most serious issues. The repair work has taken a lot longer than expected and so far only one of these has gone back up to the AOS. Other long-standing problems, such as occasional bad encoder readings thought to be associated with timing problems, remain unresolved. We also discovered that when using the high-resolution modes of the correlator, moving the sub-bands away from the centre of the baseband creates numerous “birdies” – spurious narrow spectral lines. In addition we found a new source of phase “jumps” and encountered an effect that causes individual basebands to lose coherence completely after a system restart. It is not yet clear whether these last two problems are due to hardware or to software.

Regarding software, we were back to the state where we could make observations using scheduling blocks, but there were still a number of problems with the data or the data reduction system that affect amplitude calibration and the frequency scales. We continue to suffer from difficulties in the process of getting data into the archive. During this period these problems included some low-level bugs in the “bulk data” handling system, interference caused by work being done on the archive in Santiago and a particularly frustrating case where what was apparently a very good set of Band 7 data taken under excellent observing conditions was completely lost because a memory overflow occurred as the files were being written out at the very end of the observation.

Apart from the usual CSV activities, a lot of effort went into supporting the preparations for the Call for Proposals. In addition Science IPT members from the Executives continue to be heavily involved in antenna testing at the three vendor sites. With acceptance reviews for antennas from all three vendors coming up, this has been a particularly busy time for the scientists working on these tests and reports.

9.2 ASAC

The ASAC met in Santiago on 28th February and 1st March and a report was provided for the Board. No telecons were held during March.

9.3 Staffing

Aya Higuichi and Kartik Sheth joined us for further tours as, respectively, EA and NA ARC liaisons. Denis Barkats, Kengo Tachihara and Eric Villard were all successful in their applications to become Systems Astronomers in the Department of Science Operations. These appointments will of course greatly strengthen the Operations team but we cannot afford to lose them from the Commissioning effort at this point. Their transfers will not take place immediately but will be staged over a considerable period. Meanwhile we will continue to work on strengthening the CSV team by making new fixed-term appointments and by bringing in experienced people from the community for extended visits.