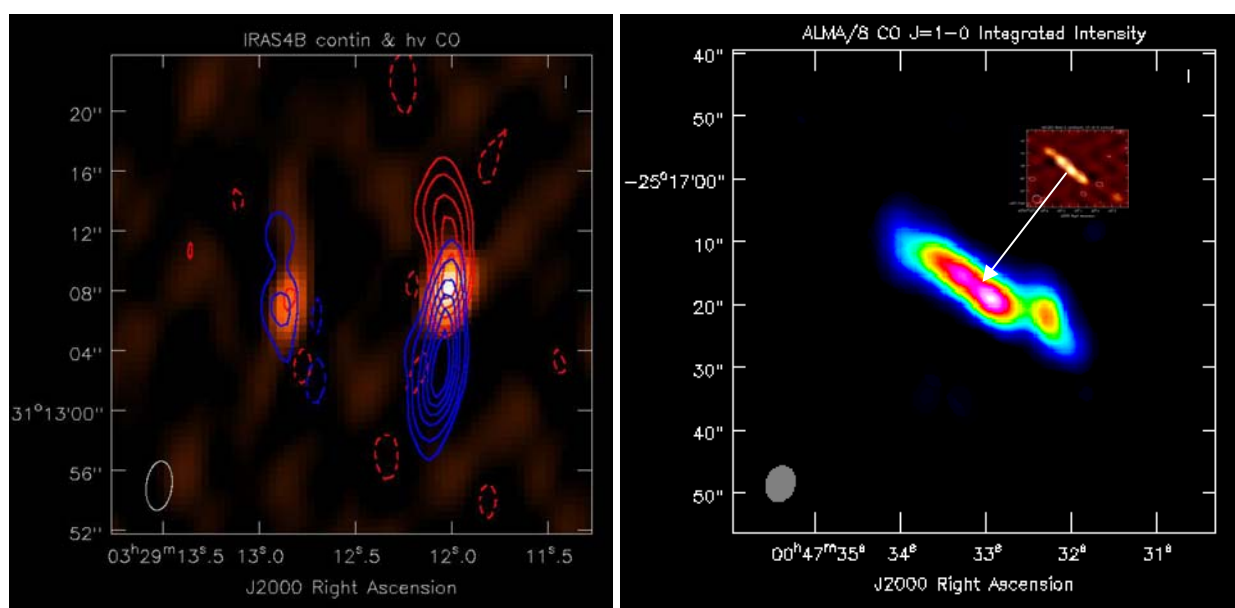


## SCIENCE IPT

### Commission and Science Verification

This was an exciting month from a CSV perspective. The Project reached the target of having eight antennas in operation at the high site by the 28<sup>th</sup> Sept and this enabled us to make the first test images using this configuration a few days later. Earlier in the month we had been able to show the first test image made in Band 9 – a milestone that we had not been expecting to reach for some months. The plots below show (left) the continuum and the outflows from the double protostar IRAS4B in NGC1333, observed at 345 GHz with 7 antennas on 16<sup>th</sup> Sept, and (right) the J = 1-0 carbon monoxide emission from our favourite galaxy, NGC253, observed with 8 antennas on 1<sup>st</sup> Oct. The 690GHz test image of this object is shown on the same angular scale as an insert in right-hand picture.



The availability of antennas showed a definite improvement, with the average percentage of those at the high site that were fully operational rising from 26% in August to 49% in September, the percentage partially operational falling from 48% to 28% and the percentage unserviceable falling from 22% to 19%. There was also some evidence that the general rate of faults is starting to decline, although the two problems that were occurring most frequently – the CANBus communication problem with the Antenna Control Computers and the encoder errors associated with timing errors – remained unresolved despite intensive efforts by Vertex and ALMA specialists. There were two unscheduled power outages, apparently associated with the power distribution system rather than the generators, but as a result of quick action by the staff at the site the disruption resulting was relatively minor.

The main software issues were residual problems with the new DataCapture component and the continuing difficulties with the correlator and archive-related sub-systems. We have continued intensive discussions on these topics with Computing IPT and amongst other things it has been agreed to hold bi-weekly meetings to monitor progress and problems on the archive area. Despite these issues the stability of the software was generally good enough to enable us to push forward with testing of a range of different types of observations. This was done using the Observing Tool to generate the Scheduling Blocks (and indeed this is how the data used to create the recent images were taken).

We also made progress on many technical topics in various areas of the system including antennas, e.g. tracking performance as a function of wind speed and fast switching behaviour, and calibration, where the problems with reading back the temperatures of the

calibration devices were corrected so that we could make a start on understanding the non-linear effects we are seeing in the power measurements. In the back-end area, the long-standing “sinusoidal phase error” has been traced to a harmonic being generated in the second local oscillator. This only occurs for certain frequency settings and it is clear that a simple software modification should suffice to make sure that these are avoided in future. Many other such problems remain to be resolved – for example we are seeing a roughly 7Hz oscillation on the line-length controllers for the photonic reference signals on two antennas. We have clear evidence that this is due to vibration caused by the HVAC systems on the antennas but we cannot find how that is getting transferred to the photonic signals. As we start to use more parts of the correlator we are also seeing more examples where, for example, groups of sub-bands are giving clearly spurious results. We are now getting a better feel of how the process of finding and fixing such problems goes: the answer seems to be that they do eventually get resolved, but in many cases this is taking much longer than we feel it should take. We are looking for ways to improve our interactions with the engineering teams, both in Chile and in the partner countries in ways that will speed-up the process of understanding and curing technical problems.

Science IPT members from all three of the Executives are now heavily engaged in the pre-acceptance testing of the antennas. For the NA members the major activity is the continued testing of the pointing and motion characteristics of Vertex antennas and also the production optical pointing telescopes. In that case of EA there was a lot of work on both the surface and the pointing of PM03 as well as initial testing of the first 7-meter antenna. Science IPT members from EU were heavily involved in preparing for the first tests of the AEM antennas.

### Outreach

ALMA was presented at the annual meeting of the Astronomical Society of Japan, held in Kanazawa and there was an ALMA-Subaru workshop in Mitaka. Science IPT members attended the 5<sup>th</sup> Zermatt ISM symposium.

### Staffing

We welcomed Liz Humphreys, who takes over from Andy Biggs as the EU ARC liaison scientist. Andy has made a huge amount of progress in testing the Observing Tool and Scheduling Blocks. Melanie Krips completed her three-month secondment from IRAM and Anita Richards made a second visit from the Manchester ARC node. Both contributed strongly to the testing and data-processing efforts.