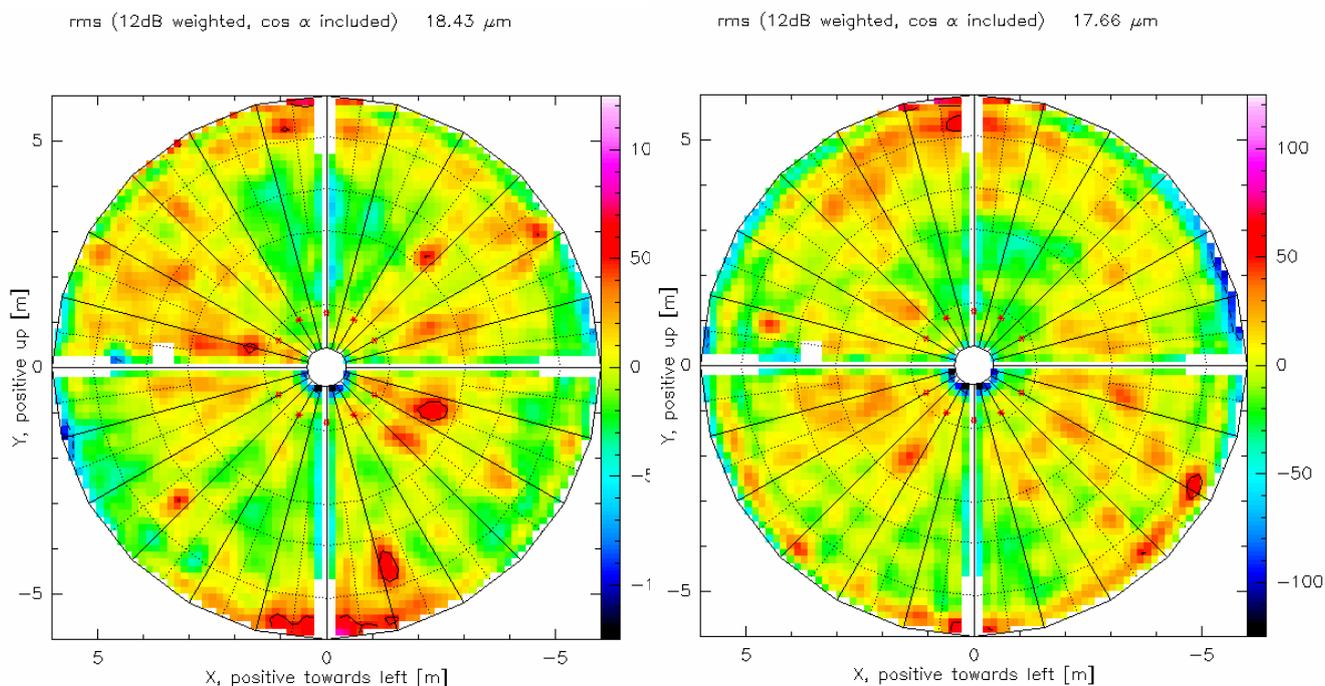


## SCIENCE IPT

### Commission and Science Verification

There was a period of bad weather at the end of April which ran through into the beginning of May. This caused further power outages at the high site with knock-on effects on the equipment, particularly the front-ends, but also the antenna drives and the LO. It was not until 8<sup>th</sup> May that we were back into routine operation. A number of new problems then showed up, including erratic pointing on DV01, which appears to be due to an instability in the tilt-meters used by the metrology system, and a break in the optical fibre carrying the LO reference inside the cable turner on PM03. The low temperature in the receiver cabin on PM03 continued to cause the calibration unit to be non-functional. There were a number of other problems such as stuck stow-pins and shutters on the Vertex antennas and dirt on the velocity encoder track on PM03. The overall availability, including weather and equipment problems, continued to be poor – during the first half of the month when we had three antennas at the high site, there were only 6 nights when we had all three operational, and in the second half, where we should have had four antennas, there were only 3 nights with all four of them operational (and this neglects the pointing problems on DV01 and the lack of calibration on PM03). On the positive side, we continued to receive strong support from AIV and from the NA and NAOJ antenna teams present on site in repairing these faults, and the teams responsible for moving the antennas performed several moves successfully, despite difficult weather conditions. Other positive points are that we are able to tune consistently to the vast majority of the allowed frequencies in all bands and that the stability of software version 7.0 was generally good.

Most of the available time was taken up with technical tests of the antennas and other systems. Using planets as test sources we have been able to improve the holographic surface measurements on the antennas at the OSF to give impressively high resolution. Here are maps of DV01, on left, and DV05, on right (the structure of the BUS is also shown):



Under these conditions (temp  $\sim -5\text{C}$ , elevation  $\sim 65$  deg), the surface errors are well within the 25 micron specification, which is encouraging. It is seen that there are some systematic features present on both dishes, which are probably thermal and/or gravitational in origin, but also that there is a pattern of more or less random errors with a scale of about one

meter. Such large errors on this scale were not expected. They appear similar to those seen on DV02 (using the conventional “tower” holography technique) when it was brought down to the OSF, which are already under investigation.

More data was taken and analysed on other aspects of antenna performance, including small-scale surface errors, pointing and tracking and focus stability. While no show-stoppers have appeared in these areas, there are still many anomalies which remain to be resolved. The situation is similar with other parts of the instrumentation, such as the LO system and the front-ends: the basic performance appears to be good, but we see numerous spurious features that are apparently associated with things like loading by the monitoring circuits, leakage of reference signals and inconsistencies in timing. It will take a sustained effort to track all these down and make the necessary corrections.

We continue to work topics closer to scientific operations, such as amplitude and phase calibration and the ability of the Observing Tool to produce complete scheduling blocks, but progress continues to be very slow, mainly because of the low availability of operational antennas. A more detailed report on the status of commissioning overall will be provided for the Board telecon on June 24<sup>th</sup>.

We participated in the annual software review CDR 8, at which the most contentious issues were those related to the archive. In addition to performance problems and difficulties such as losing scheduling blocks, we are finding it extremely difficult to recover the data that we need for commissioning purposes. It is clear that more flexibility is needed in being able to read information from the database and it was agreed that direct access would be provided to a small number of commissioning scientists and we hope this will ease the problems.

It was reported last month that a new and more optimistic schedule for the delivery of antennas to the high site had been drawn up. Naturally we continue to monitor this closely. There has already been a significant slippage in this, mostly with the antenna deliveries, but the delay is not yet at an unrecoverable level.

### Outreach

We were strongly involved in the ‘Preparing for ALMA’ session at the AAS meeting held in Miami and the ALMA Band 5 workshop that took place in Rome. This being the start of the conference season, our colleagues in the regions have been kept busy giving presentations on ALMA at numerous symposia and workshops on a wide range of topics.

### Staffing

I am pleased to say that Gianni Marconi will be joining the Commissioning team on June 15<sup>th</sup>. He is transferring from Paranal where he was responsible for the instrumentation team on the VLT and will bring a wealth of experience on both instrumentation and organization. Anita Richards from the UK Regional Centre joined us for a month’s stay and will return later in the year.