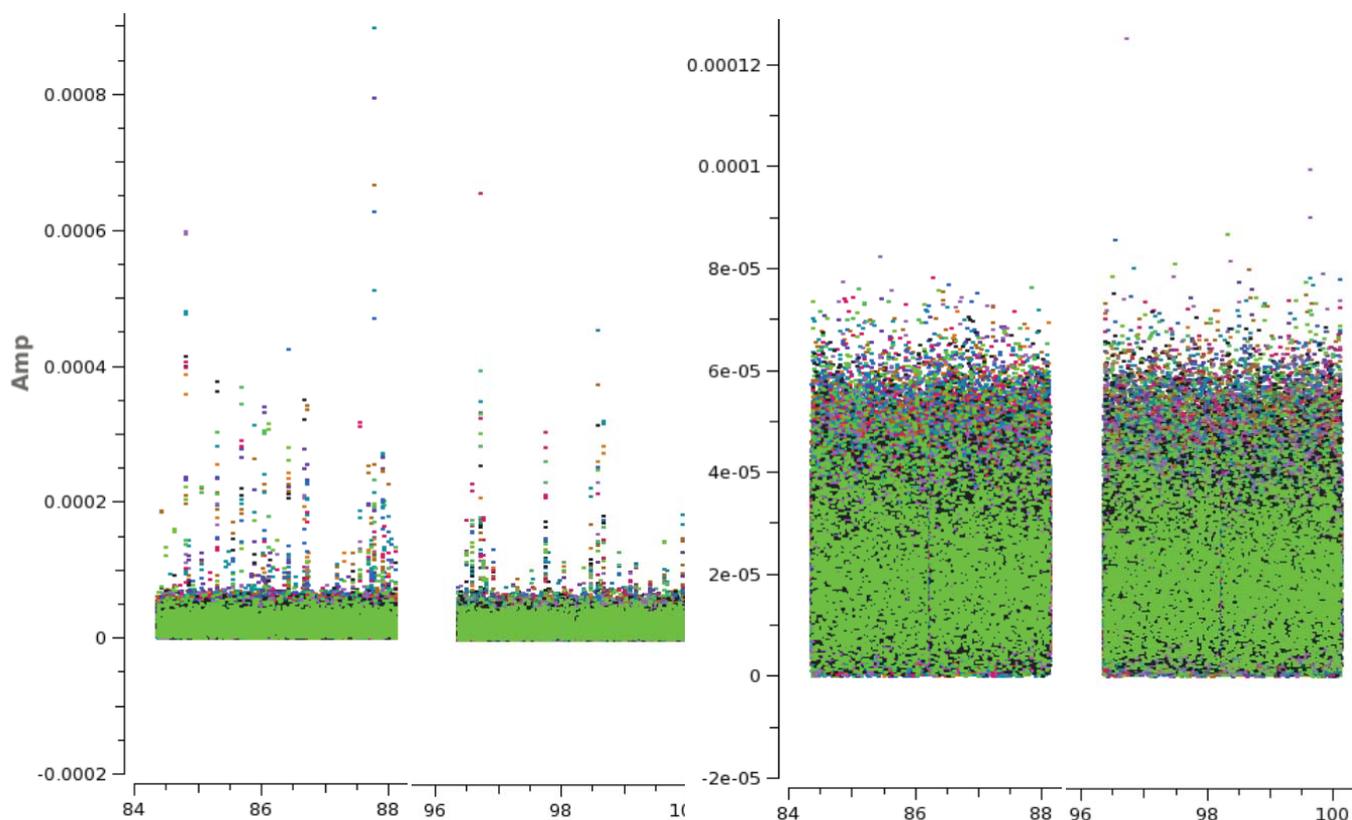


## 9. SCIENCE IPT

### 9.1 Commissioning and Science Verification

The emphasis this month has been on preparing for the start of scheduled observations and in particular on getting the antennas into the required configuration. Progress was made on this but we are well short of where we had hoped to be, with only 10 of the 16 antennas in the correct locations by the end of the month. After the initial delays in getting power connected, the main problems have been the need to remove ice and snow from the roads and foundations, together with high winds which prevented antenna movements. The month started with winds as high as 40 m/s and it continued to be windy (22% of the 15-minute time periods in the month had peaks of over 20 m/s) and cold, so the snow on the site only went slowly. (The mean temperature was -6.5 C and only 6% of the time above freezing). Apart from time lost to high winds, however, the weather has generally been good for observing. After the antennas had been moved we concentrated on getting good values for all the parameters of the array, i.e. delays and baselines, as well as pointing and focus models.

A joint effort with System Engineering has produced important progress on the issue of spurious features in the spectra: Walsh switching is now working correctly and this suppresses the features quite effectively. In addition it has been found that many of the features are associated with DC offsets in the digitizers and that getting these set accurately greatly reduces them. With these two items under control we should be able to provide pleasingly “clean” data for Early Science. The plots below show the cross-correlation amplitudes on blank sky versus frequency in GHz. Left is without Walsh switching showing many spurious features, right is with switching. Note the change in the amplitude scale.



There was also encouraging progress on the issue of locking – the new tuning algorithm appears to be a great improvement. More generally a lot of effort has gone into tidying up problems and processes that were not at the level of “blockers” but were nevertheless causing significant loss of quality in the data or reducing the observing efficiency.

On the software side most of our effort has been focussed on making sure that software release R8.0.3 is stable and reliable. Residual bugs and short-comings are still being found and remedied and there is currently concern over unreliability on start-up, but overall we are confident that this version will provide a satisfactory platform for carrying out the Cycle 0 observing. A lot of effort has also been going into the key observing script that implements the actions required by the Scheduling Blocks. We need to be sure that this contains all the functionality needed and performs robustly. There was again only limited progress on testing the development version of the software, R8.1.

A “focus campaign” on polarization measurements took place towards the end of August. For this we were joined by George Moellenbock from NRAO Socorro and Hiroshi Nagai from NAOJ. Additional support came from Jeff Kern and Erich Schmid from Computing IPT who were visiting the OSF and (remotely) from Ed Fomalont in Charlottesville. A large amount of data was obtained and is still being examined. It is clear that the spectral structure seen in the band 3 instrumental polarization is real and that it is also present at some level in bands 6 and 7. The mechanism that generates it is not yet understood but it appears to be quite stable over periods of months. This means that removing it by careful calibration is possible at least in principle. Some problems with the “solver” used to determine the contributions of the individual antennas were found during this work and these will need to be fixed before we can go much further. Overall we remain optimistic that it will be possible to include a polarization capability in the Cycle 1 call for proposals but obviously a good deal more work needs to be done before this can be confirmed. Work on other Cycle 1 capabilities, including in particular the ACA and single-dish observing, continued and will be moved up in priority in the coming months. Science Verification activities will also become increasingly directed towards those aspects.

An internal workshop was held on the outstanding technical problems that have been uncovered during commissioning. We still have an impressively long list of open issues, but they are being resolved at a reasonable rate, so the general picture was felt to be positive.

At the Executives there was continuing strong involvement in reduction of Science Verification data and work on ALMA Development activities has also been ramping. Science IPT members from the Executives continued to work on antenna testing at the vendor sites and on the analysis of data from those tests.

## **9.2 ASAC**

There was an ASAC telecon on August 10<sup>th</sup> when progress with assessing proposals was described along with the readiness for starting observing. The new ASAC terms of reference and the Principle of ALMA Development were also discussed.

## **9.3 Staffing**

Kouichiro Nakanishi, Samatha Blair and Violette Impellizzeri have all arrived in Chile to join the commissioning effort. Between them they have a very wide range of observational and instrumental experience and this will greatly strengthen the team for the next phases of Commissioning and Science Verification. Maria Diaz Trigo and Alfonso Trejo joined us from, respectively, the EU and EA ARC's and each did two shifts at the OSF. Arancha Castro Carrizo and Katherine Johnston both returned to Europe after completing their three-month tours with us. We are most grateful for all their contributions.

## **9.4 Outreach**

There was a session at the URSI General Assembly in Istanbul on “Millimeter and Sub-mm Science and Technology with Special Focus on ALMA”. This included presentations and posters on the major components of the ALMA system as well as some of the early scientific data.