



Phase Metrics Workshop

Monday (Afternoon Session) - **Room HL 204**

- 13:30 - 13:45 - Welcome & Logistics - **Remo**
- 13:45 - 14:15 - Outline of the meeting & Topic Organisation - **Ed - Bill**
“What are the essential tests, statistics, number, data that are required and that have a physical implementation at ALMA in order to improve current and future science data?”

Single Source Statistics:

These observations can provide us with some understanding on; which conditions at site will lead to specific phase metrics; weather cycles; conditions where we can observe; tests to examine conditions and optimal observing bands.

- 14:30 - 15:00- ALMA Long Baseline Campaign 2014/2015 - Basic Phase Characteristics & Pseudo cycling - **Satoki**
- **COFFEE BREAK**
- 15:20 - 15:50 - ALMA Long Baseline Campaign 2014 - Weather Correlations & Use of the Two-Point-Deviation - **Luke**
- 16:00 - 16:30 - Examination of the GonoGo criterion - Results from 2014/2015 - **Bill**
- 16:40 - 18:00...

Open Discussion Time: - *Suggestions for improved version of GonoGo or option to remove GonoGo and use the bandpass source, output used to calculate go-ahead statistic and the resultant parameters, Use of Two-Point-Deviation, Integration with WVR scaling (more on Tuesday), Can observations be used ‘on-the-fly’ - i.e. the bandpass. Tests that MUST be undertaken for new implementation - phase referencing GonoGo.*

Tuesday (Morning Session) - **ROOM HL 204**

WVR Discussions:

The Water Vapour Radiometers are an excellent piece of hardware that already significantly improve the `phases' of ALMA. However, are there elements in the hardware or software that can be modified, optimised or made more efficient.

- 09:00 - 09:45 - Introduction to Radiometer-based Phase Correction - Principles, Instrumentation and Application - **Richard**
- 10:00 - 10:20 - The O2 Oxygen sounder - Applicability in better atmosphere models - **George**
- **COFFEE BREAK**
- 10:30 - 10:50 - WVR application timescale, 1 sec vs. 6 sec - **Ed**
- 11:00 - 11:30 - Optimising WVR solutions (scaling) - improved phases and images—**Luke**
- 11:40 - 12:00 - Cloud Continuum removal - Effectiveness, applicability - **Bill**
- 12:10 - 12:30 -- TelCal WVR online, monitoring and phase RMS calculations - **Dominique**
- 12:40 - 13:00 - Correlation of changes with measured pressure over the array - **Satoki**

Tuesday (Afternoon Session) - **ROOM HL 204**

WVR Continued:

- 14:00 - 15:00...

Open Discussion Time - *Optimisation of data product (WVR scaling/cloud removal integrated (telcal?) or stand alone? Are the inaccuracies that required scaling, due to problems in the hardware or software. Do the scaling factors act as a 'fudge-factor' to re-correct the data. Are we missing a zenith value (Ed later), or is this really the dry air contributing to the extra correction required. What values are used for ATM and WVRGCAL from the weather stations?*

- **COFFEE BREAK**

Antenna Position Measurements:

The position of the antennas are a critical and important parameter to measure accurately, especially in the long baseline configurations. Positional errors can be a limitation in establishing the correct phase solutions. What is currently underway and can be done to ensure these are correct for all datasets.

- 15:20 - 15:40 - 'Inside' Tc Antpos - phase correction, analysis, SPW combination and plots- **Dominique**
- 15:50 - 16:20 - Long baseline antenna measurements- **Todd**
- **COFFEE BREAK**
- 16:40 - 17:10 - Are antenna position changes related to tropospheric changes? - **Ed**
- 17:20 - 17:40 - Suggested observing strategies for the next long baselines to reduce the effect of 'changes' - **Ed**
- 17:40-18:30...

Open Discussion Time - *What is the impact of incorrect positions, how does this transfer into limitations in images? Do pressure correlations get corrected out in calibration or do they cause an inherent problem. Are weather stations included, do we need more? Do position measurements need to be very often due to 'shifting' based on weather conditions.*

Wednesday (Morning Session) - **ROOM HL 106**

Phase referencing Statistics:

Although the WVRs are excellent for correcting the phase for specific conditions, all observations still require phase referencing to remove the phase variations not caused by the water vapour content of the atmosphere. The referencing schemes must be tested in a variety of conditions such that we understand when to use such scheme to get a usable data product while maximising telescope efficiency.

- 09:00 - 09:20 - Is the GonoGo criteria good for estimating the phase referencing scheme - **Bill**
- 09:30 - 10:00 - Phase referencing statistics and correlations - Fast switching experiments 2014/2015. Details of source separation, cycle time and image quality. When does and doesn't fast switching work - **Yoshi**
- 10:10 - 10:20 - What about the calibrators? Searches and contributions - **Anita**
- 10:30 - 10:40 - Multi frequency AGN survey with the KVN - **Taehyun**
- **COFFEE BREAK**
- 10:50 - 11:10 - Pushing bands 9 and 10 beyond 5 km configurations - 'normal' observing techniques - **Ed**
- 11:20 - 11:40 - Testing phase referencing in marginal conditions - does very-fast referencing really help - **Yoshi - Ed**
- 11:50 - 12:10 - Diurnal properties of the long baseline phase statistics - **Bill - Ed**
- 12:10 - 13:00...

Open Discussion Time - *Can we improve on the tests currently undertaken at ALMA to improve the choice of conditions we can observe in? Are we too conservative or too optimistic -pseudo vs. real cycling tests? Optimal fast switching, cycle times and image quality - can it be categorised? Will there be 'on-the-fly' cycle time management, or single time setting? Can we create a condition vs. cycle time 'matrix' - monthly, daily? When do we reach instrument limitations or constraints of the 'nearby' calibrators - strong and far vs. weak and close?*

Wednesday (Afternoon Session) - ROOM HL 106***Astrometry:***

How accurate can we be in determining the source positions with ALMA. Moreover, if we want to use ALMA to examine proper motion or parallaxes, for example, are we limited by phase corrections and observing conditions?

- 14:00 - 14:20 - Astrometry results from the long baseline campaign - multi source observations for accurate astrometry - **Antonio**
- 14:30 - 14:50 - Is this single test sufficient, further examination, astrometry runs, multi calibrators in science data - **Ed - Antonio - Open Discussion**
- 15:00 - 15:20 - Long term astrometry: Parallax studies, proper motions, planet/stellar wobbles - tests, feasibility, offered observation modes for LB ? - **Ed**
- **COFFEE BREAK**
- **15:30 - 15:50** - Check sources for Astrometry - **Ed**
- **16:00 - 17:00...**

Open Discussion Time - *How critical is the astrometry in general observations? How do multi-sources help, can these be used in science observations, timescales for parallax studies, offered mode, phase limitations - baseline positions or calibration based?*

GROUP MEAL EVENING - Belgisch Bier Cafe Olivier - 7 pm

Hooigracht 23, 2312 KM Leiden

For menu see: <http://www.alma-allegro.nl/alma-phase-correction-workshop/>

Thursday (Morning Session) - **ROOM HL 106**

ALMA long baseline experience:

After the initial long baseline campaign ALMA was pushed beyond 5 km baselines for observations in Cycle 3. What lessons did we learn in the initial campaign?, are these observations easier than anticipated?, were Cycle 3 LB observations a success?

- 10:00 - 10:20 - Lessons Learned at LB (1) - **Crystal (LINK)**
- 10:30 - 10:50 - Lessons Learned at LB (2) - **Anita**
- 11:00 - 11:20 - The use of Check sources during the observations - What the QA2 current script does with check sources and plans for improvements - **Todd (LINK)**
- **COFFEE BREAK**
- 11:40 - 12:40...

Open Discussion Time - *Is there me knowledge sharing beyond the 'Experts', extra long baseline information? Who is the 'lead' or advisor for QA2?, what can and cannot be guaranteed - 'appropriate' projects to advise for long baselines. Should check sources or dual phase calibrators be implemented?*

- Further 'Free' or Open Discussion on previous topics before lunch

Thursday (Afternoon Session) - ROOM HL 106***Higher Frequencies:***

Pushing ALMA to higher frequencies allows us to undertake different science, targeting otherwise inaccessible molecules, but also may offer us the highest spatial resolutions possible. Higher frequencies however have much more stringent observational constraints with phase variations being proportional to the frequency itself, and due to the lack of potential calibrators

- 14:00 - 14:20 - ALMA Band-to-Band (B2B) tests attempts - **Ed**
- 14:30 - 14:50 - Band 3 to Band 7 fast switching results - **Yoshi**
- 15:00 - 15:20 - Dual frequency simulation using sub-arrays - Band 3 to 6 tests - **Luke**
- **COFFEE BREAK**
- 15:40 - 16:00 - High Frequency calibrators - summary, problems, standardisation, sky map - **Carmen - Yanett**
- 16:10 - 17:30...

Open Discussion Time - *When does band to band 'need' to be used? - Constraints with the strong transfer source. Band accuracy for different sources on the sky. Feasibility of having a dual frequency receiver, science and technical basis. Are there enough calibrators, what else can we use?*

Friday (Morning Session) - ROOM HL 106***Summary and Future:***

After an involved week of talks and discussion we now summarise all the findings. The aim to produce reports/memos/papers and moreover, how to implement the findings for future cycles or to correct the data we already have. How can we advise for the future and what is physically possible to implement. We also need to correctly share the information beyond this 'expert' group such that contact scientists can also undertake tests and make improvement on science data with PIs.

- 09:30 - 10:00 - Conference Summary - **Remo**
- 10:15 - ***Open Session*** - *Recommendations for improvements, implementation, future tests, reports/memos/papers. Group leads, work groups and future contact, organisation and communication. Overflow from previous days discussion.*

Contacts:

Remo Tilanus: rtilanus@strw.leidenuniv.nl

Office: 534 Oort Building

Luke Maud: maud@strw.leidenuniv.nl

Office: 542 Oort Building