

## Internal JIVE BlackHoleCam meeting

**Date:** 4 April 2016, 11:00 in Arpad's office

**Subject:** pipeline WP, simulations WP

**Present:** Arpad Szomoru, Des Small, Mark Kettenis, Ilse van Bommel

### Results from discussion at F2F meeting

There is a summary of the afternoon discussion in Bonn, which included a range of mm-VLBI data processing experts. We discussed the order of calibration and several suggestions were made. Bottom line is that we require some flexibility in this, to enable users to define their own preferred order. Within CASA this is no problem. Ilse has written a draft summary which was sent to all participants for input.

### Design document for pipeline

To follow up on the initial discussion with NRAO and Mark's visit, we can re-iterate the design document that we started earlier. This doesn't need to be as formal as we initially thought. Mark already has a list of to-do items after his visit to NRAO, he will put this up on the wiki. Another outcome of his visit was the suggestion to have an MoU between JIVE and NRAO for the work we do on CASA.

A related issue is that the phase model for the calibration needs to be written down. This includes a definition of what is stored in which table, and how it is applied to the visibility data. It also includes the definition of a reference frequency, which is preferentially the center of the band (or channel).

### Production code in C++

An important outcome of the meeting of Mark with NRAO is that they request us to write the final production code of the fringe finder in C++. The prototype is currently in Python. Arpad suggests to start porting the existing infrastructure to C++ before Des and Ilse travel to NRAO at the end of May. Translating is expected to be fast. Some potential bottle necks are finding a good LSQ solver for the globalization step and re-running the verification with AIPS. Ilse will work on a verification test suite based on the current tests that have been done.

### Phase offset problem

Des reports that after applying the delay and rate corrections the phases are flat across the band, but they have an offset that is different for each baseline. We would expect the phases to line up around 0 degrees. Several suggestions as to the cause of this have not delivered any new insights. Mark suggests to compare the phase solutions for a number of datasets, this was done only for one dataset so far.

### Fringe finder figure of merit

One of the key concerns of data processing experts is a good definition of signal to noise on the fringe peak per baseline. The globalization step gives a figure of merit for the final solutions, and it is straight forward to implement a per-baseline signal-to-noise ratio, as is used in HOPS.

### Action items:

**4. Solver document:** this needs to be revisited when the code is ported to C++, as per NRAO's request. Des will look into the available solvers for this.

**6. Verification report:** Ilse will do this as part of the deliverable in the BHC project. This report is due by the end of April. The verification tests with simulations and real data

are now providing comparable results. There are still some issues in AIPS that we do not fully understand, this will be the topic of a separate memo.

**7. Visit to NRAO:** Mark visited NRAO to work on implementation of some of his scripts into the CASA codebase. Full CASA FRING compatibility is expected in the 4.8 release, due in March 2017. Another request was to write the production code in C++, which is mainly because the infrastructure for C++ is better than for Python. Mark has access to the svn codebase repository, and the ticketing system.

**9. Imager:** this was originally planned for our own verification, but is beyond the scope of the project for BHC. LOFAR presumably has only wide-field imagers, which are not of much use to VLBI anyway. Remove item.

**12. Multi-band delay:** this requires solving of the phase offset first

**13. EHT data:** is still not available for 2015 run, but Ilse has an antenna table that can potentially generate a simulated EHT MS for verification. This needs a bit more work.

**18. Real data:** the EA054 data has a marginally resolved source, but so does the N14C3 dataset that we are currently working on. Also this action item awaits solving of the phase offset problem.

**Actions:**

<b>ID</b>	<b>Description</b>	<b>Owner</b>	<b>Ref.</b>	<b>Due</b>
4	Write note on motivation for solver	Des	151019	See 19
6	Write report on comparison with AIPS	Ilse	151019	160501
7	Contact NRAO CASA dev with suggestions for improvement of CASA VLBI data processing	Mark	151019	Done
9	Inquire about imager studies for LOFAR	Ilse	151019	Remove
12	Test multiband delay correction	Des	151214	See 21
13	Get real EHT data	Ilse	151214	
15	Organise visit to NRAO	Mark	151214	Done
17	Compare CASA and AIPS with real data correlated with known clock offset	All	160118	Done
18	Process EVN EA054 data with CASA	Mark & Des	160115	See 21
19	Assess available solvers for C++	Des	160404	
20	Develop verification test suite	Ilse	160404	
21	Compare phase solutions between AIPS and CASA	Des/Ilse	160404	
22	Put up CASA to-do on the wiki	Mark	160404	
23	Write up phase model for CASA calibration	Mark	160404	
24	Improve delay and rate application	Mark	160404	

**Next meeting: 12 May 2016, 11AM**