Fw: comments on Tianlai Dish Array paper from Richard Shaw

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on behalf of
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Fri 7/10/2020 10:26 AM
To: tianlaianalysis <tianlaianalysis@listserv.fnal.gov>

Folks - some very useful comments from Richard are below. We can discuss when we talk about the paper on Tuesday....Peter

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From: Richard Shaw <richard@phas.ubc.ca>
Sent: Thursday, July 9, 2020 5:45 PM
To: PETER T TIMBIE <pttimbie@wisc.edu>
Subject: Re: heads up! paper may be coming at you...

Okay. Done. I've skimmed most of it, but read Section 8 in detail.

Generally, I think the paper's very nice. It gives a good level overview of the different parts of the system and the various challenges that have been, or will need to be overcome.

I'm very interested why the EM sims seem do quote badly in Fig 7 (especially for the lower panel - H plane). It would be good to comment on that as the prediction seems entirely out of phase with reality!

I was surprised that the fibres might be different lengths by hundreds of metres. Even with their long nominal length, that seems like an extremely large difference if they were intended to be the same.

Okay, on section 8. It's really interesting to see analysis of actual data, and in particular it's good to see what you're doing broken out into stages. I think that'll be useful for a lot of readers. Having spent a lot of time talking about calibration and flagging of the data, I was kind of expecting that to be the data being used in the analysis, but I can imagine why you might not want to.

In section 8.4 when you generate the average sidereal night, do you median across days of already averaged 1min x 1 MHz; or do you median over all samples in all days within equivalent 1min x 1 MHz pixels? Also, you seem to end up using averaged sidereal data at both 244 kHz and 1 MHz in later sections, although you only seem to say you use one of them in 8.4

Kudos to whoever decided to describe the stripes as like "ribbon candy or a flag fluttering in a breeze".

For section 8.5 on "polar dephasing", isn't this just setting the phase reference of the

array to the NCP? For an array of pointed dishes, I guess I'm surprised that the phase centre was anywhere else. You might want to describe it as something along those lines to make it more obvious to folks like myself that you're not doing anything unexpected.

For section 8.6 I was wondering while I read it about whether you can simply just null out CasA from your full set of visibilities? I guess as you don't have any super long baselines that might not be entirely straightforward. Looking at another of my notes, it seems like you do discuss that possibility in section 8.8.

Alright, now for section 8.9. I think you should keep a version of that section in the paper, as it just leaves a very big "?" if you don't have it. However, I found the current version overly confusing, which is a shame as I *think* what you're doing is a fairly straightforward and sensible thing to be doing. I have two suggestions, which I think would help:

First, and this one just requires some rewriting, I would suggest the sections gets laid out like:
- You are trying to estimate is there any evidence of excess power in Fig 35, i.e. you want to remove the thermal contribution and see what's left
- Be clear that what's in there is a sum of power from sky signal, cross talk, thermal noise, gain variations etc.
- Say that you can estimate the thermal contribution from the radiometer equation and thus you can subtract it out of the quantities in Fig 35. That's essentially what I understand \bar{w_{a,b,n}} t be.
I think most of the actual analysis is the same, but I think the procedure is a lot more familiar if described like that.

Second, I think it would be much nicer if you use a covariance estimate in 8.9 so you can produce versions of Fig 35 without any noise bias. Given the way you describe generating the data, it sounds like you have ample options to produce a jackknife (e.g. alternate high resolution samples within your 1min pixels). Then you could very easily produce < d_odd d_even^*> and < |(d_even - d_odd)|^2 > which very directly give you the quantities you are trying to estimate: the excess variance, and the noise of the variance.

Anyway, hope those comments are useful. Let me know if they're a bit cryptic. Nice work overall on the paper, I look forward to the final version coming out!

Best wishes,
Richard