CATAC Meeting Minutes

March 27, 2018. 4pm EDT

Attendees: Balogh, Simard, Welch, Hutchings, Thanjavur, Cote, Davidge, Bundy, McConnachie, Crampton, Lafreniere, Richer, Welch, Rowe, Hesser, Labrie, Venn, Spekkens, Parker, Hudson, Abraham, Gallagher, Metchev, Sivanandam, Dupuis

Michael presented some summary slides describing the three WFOS designs that will be discussed at the upcoming SAC meeting April 9-10. They are available at http://casca.ca/wp-content/uploads/2018/03/WFOS-March-27-2018-Public-Webex.pdf

The meeting was then open for discussion. (There were some audio problems - particularly Bundy and McConnachie - so I apologize for any resulting errors in transcription.)

- McConnachie: what are the science drivers of each design?
    - Balogh: this is meant to be a workhorse instrument. Difficult to identify discriminating science cases that will be relevant in 2030. CATAC did attempt to map the Detailed Science Case onto capabilities, and concluded that they did not strongly discriminate
    - Bundy: The Team did identify IGM tomography, nearby galaxies/dwarfs, z=1 galaxies and transients as key science drivers in the OptoMechanical Design Review (OMDR).
- McConnachie: agree that fibre technology has greatly improved, and that sky subtraction at the 0.5% will be possible. However this really does rely on having local sky subtraction, essentially making a pseudoslit from the fibres.
- Hudson: SAC ten years ago wanted something low risk and cheap. Fiber system considered, but put off to a second generation. What is the second generation now? The other element to their thinking was that TMT has a wider field than other large telescopes; we should take advantage of that.
    - Balogh: White papers for the next instrument are being submitted now. Plan is not to have generations, but a rolling instrument program with one new instrument every three years.
    - Bundy: all the designs are difficult. Monolithic designs require pieces of glass that have never been made.
- Venn: even assuming the FRD issues can be taken care of, peak throughput of fibers is still lower than other designs. That's not likely to change. Good throughput is the key part of having a larger telescope. Xchange design looks good for my science. For galaxy archaeology blue throughput is critical.
    - Kevin: throughput disadvantage is wavelength dependent. At 310nm, designs are comparable, because the gratings arealso compromised.

All designs are much better than MOBIE. Referred to figure in the CoDP Summary document (see http://quixote.uwaterloo.ca/~mbalogh/CATAC/WFOS_CoDP1_Summary_v2_2.pdf). Reproduced here:

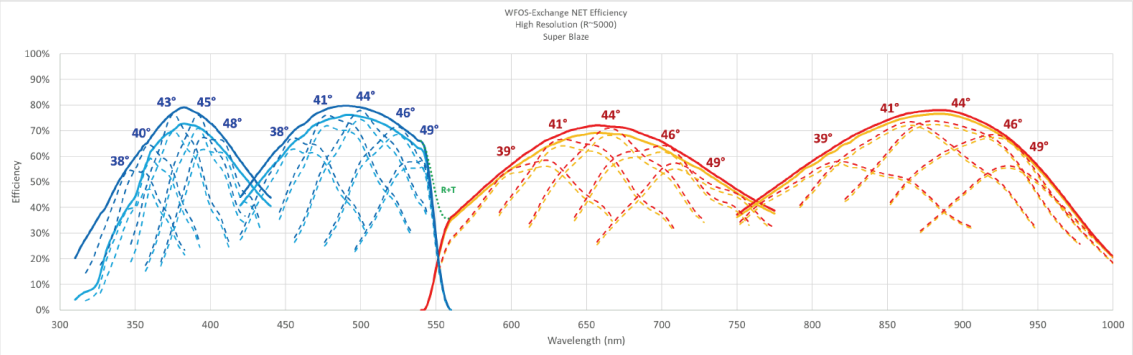

Figure 4: XChange-WFOS wavelength channels at $R \sim 5000$. Multiple exposures with different wavelength set-ups can be used to cover the desired wavelength range. Upper curves assume forthcoming technological advances in VPH gratings and make throughput assumptions that are more optimistic than those used to make Figure 8.

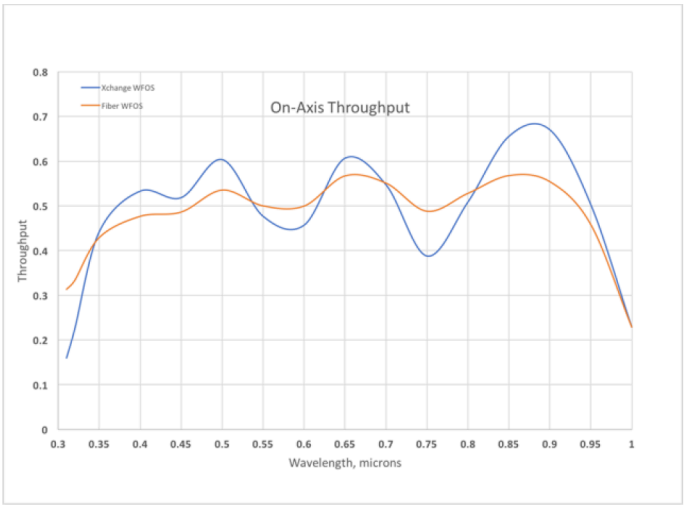

Figure 8: Throughput curve comparison for Fiber-WFOS and XChange-WFOS at $R \sim 5000$ with consistent assumptions, including a conservative 0.5% AR coating loss per surface. The assumptions here are more conservative than those used in Figure 4.

- Simard: Diagnostic spectroscopy community has often argued that making observations at different configurations is not ideal for e.g. line ratio analysis. Venn: GIRAFFE@VLT is working very well, with 200A windows. In general don't need simultaneous wavelength coverage
- Davidge: Is there a qualitative difference in the science that can be done at R=5000 compared with, say, R=10000? Venn: Great science (metallicities and abundances) can be done at R~5000 if you have exquisite S/N>200 at <0.4 microns. For other science you reall need the resolution, with a minimum 20,000. 10,000 is grey area – can sort of use it but not much better than DEIMOS at 6000.

    - Richer: most important for my science is blue sensitivity (Balmer limit). Would trade resolution for blue sensitivity
- Thanjavur:
    - It would be nice to have a simple matrix where principle science cases are mapped to each design.
    - All the designs have risks, but are there any show-stoppers? (Answer was hard to hear but I think it was essentially 'no'.)
- Abraham: Some of this comes down to the philosophy of what you want to do in 2030, and how you think about things. Fiber-WFOS looks like a survey instrument. Resolution, multiplex is fixed based on science requirements. Quantities like total information content is relevant for survey science. For a workhorse instrument, the lack of a clear science driver is not as much of a concern. Instead you want maximum flexibility because you'll want to do something different. Community needs to reflect on how they want to use this instrument. For me I'm more interested in a flexible instrument that I can use in creative ways, rather than being part of a big survey team.
- Crampton: isn't a big advantage of fiber-WFOS that it is easier to change resolution and properties than others?
    - Simard: no, you wouldneed whole new spectrometer. All you need to change resolution on Xchange is to change slit width.
- Fiber-WFOS looks a lot like OPTIMOS-EVE on EELT. How do they compare?
    - Simard: Neither ELT or GMT will have MOS at first light. For ELT the current design, MOSAIC, is combination of fiber survey spectrograph and fiber-IRMOS. Combination of two instruments, but doesn't go to K-band, or to the very blue. 120 multiplex at R=5k and 15k, over 32 square arcminutes. It is number 4or 5 in their suite. They claim they have solved the sky subtraction issues – have done experiments with e.g. GIRAFFE. Unfortunately never published in refereed journals, just SPIE papers. McConnachie agrees: they are reaching 0.6%, but need local sky subtraction.
- McConnachie: if you are really serious about 300nm then fibers are probably not the solution.
    - Bundy: look at the figure in the document (see above); throughputs are comparable at 310nm. With fibers can appropriately coat the detectors, which helps.
- R=5000 sounds a lot like 4MOST. Stellar people complain it's too low; galaxy people complain it's too high. Is the compromise right?

- Balogh: This is an important decision. SAC meets April 9-10 and we want to give them good advice that reflects what you want. Please send further thoughts or comments in the next few days to mbalogh@uwaterloo.ca.

Adjourned 5:00pm