HECTOR SCIENCE MEETING

TUESDAY 12 APRIL 2022, 3.00 – 4.00PM

Zoom – the meeting was recording for minute taking purposes only.

Attendees: Julia Bryant (Chair), Sree Oh, Matt Owers, Stefania Barsanti, Jesse van de Sande, Scott Croom, Mina Pak, Joon Hyeop Lee, Jiwon Chung, Hyunjin Jeong, Jong Chul Lee, Angel Lopez-Sanchez, Sam Vaughan, Amelia Fraser-McKelvie, Richard McDermid, Luca Cortese, Madusha Gunawardhana, Joss Bland-Hawthorn, Charlotte Welker, Mark Krumholz, Di Wang, Sarah Sweet, Matthew Colless, Andrew Battisti, Emily Wisnioski, Gabriella Quattropani, Caroline Foster

Apologies: Lisa Kewley, Marie Partridge.

Item	
1	**Action Items from the previous meeting (8 February 2022)** **WALLABY** • Julia reminded the group to contact Luca with any project ideas to connect with the appropriate WALLABY team member. **eROSITA Opportunities** • Julia encouraged everyone to speak to Matt about any potential eROSITA proposals. Joint projects can now be proposed.
2	**Update on Hector Commissioning** • The issue with the field rotator has been raised and work is being undertaken to replace the mechanism. In the upcoming run the field needs to be stable. During the last run, it gradually moved. This could be overcome by resetting every 5 – 10 minutes, however this is not ideal as currently the new cameras do not allow exposures to be paused. The new design takes out the tension mechanism which should mean that it will be held at a specific position without being pulled back. This will be in place and tested at the end of April. • The distortion correction. A composite image was taken to map the distortions (Madusha will discuss this later) and Tony has used his distortion fit which has reduced the errors considerably. The software for 2df maps the distortion of the instrument to the telescope optics and whilst Hector sits on the top end it is differently aligned and positioned so the code needs to be updated. • The red CCD was not working due to a manufacturing fault and was shipped back to the US and then could not be tested until it was on site. This will take place at the end of April looking at its performance and also if the new shutters on the cameras are light tight. There will be a number of dark images taken on site, so its performance will be known ahead of the May run. However, if issues are ongoing, there is not sufficient time to return it to the US prior to the May run. A previous fault was detected with a vacuum leaking in the camera. The reliability issue is now affecting the supplier as Astralis-MQ are now looking at alternative suppliers for new instruments. This supplier has previously been used for Taipan without any reliability issues. •
3	**Data Reduction Pipeline and Progress (Sree)** • Julia acknowledged the great work that Sree and Madusha have done with the data reduction from the last run. • Sree introduced the Data Reduction Working Group (DRWG) page below - log in with your Data Central account (and thanked Stefania for her work on this). A meeting for the DRWG will be set up after Easter: https://hector.survey.org.au/wiki/working-groups/data-reduction-wg • Sree will keep the page up to date including agendas and summaries for the data reduction meetings once they start. • The status of the data reduction pipeline is contained in one document which can be refereed to online DRWG page. There is a table of contents and for each task a description and any updates. Once the task is finalised a conclusion will be included. • It was noted that the load time for the pages on the Data Central site is quite slow. Julia confirmed that following the last observing run a list of issues was sent to Simon O'Toole to investigate especially the short log out time. The slides Sree presented are uploaded to the data central cloud: https://cloud.datacentral.org.au/s/GazKkeYgiOdbF2W **Spectral features of various flats** (refer to the slide in the link above). • Slide 1 - Plot top left - Sree checked if the spectral feature of the dome flat is comparable with the twilight flat, but as can be seen this is not the case. This has been reported to Ashley Anderson at SSO. He plans to add some lights in the green wavelengths to fit the red line more closely to the black line. Hopefully these lights can be added before the next commissioning run to have a spectrally flatter dome flat. • Slide 2- Plate to plate variation in twilight throughput.

	There needs to be a correction in throughput as it varies a lot from plate to plate. The figures show the throughput of the twilight flat normalised by the first day in the first plot, in the next plot the throughput has been varied by 10%. Sometimes it is not possible to take twilight flats so the dome flat has to be used to calculate throughput and therefore the dome flat needs to be comparable to the twilight flat. • Slide 3 – Comparison of through puts from the dome flat vs twilight flat (10 Dec) Plot 1 shows that they are comparable, and plot 2 shows a 3% variation, but some days it can be more problematic with the difference about 7 – 8% • Slide 4 – 2 March - Misaligned dome screen. Some misalignments between the telescope pointing and the dome screen has been detected which may account for the variation. • Slide 5 – Summary Always ensure that there is alignment between the telescope and the screen. Discussion: • Driving the telescope up further ensures that the problematic zenith angles are avoided where the alignment is an issue when using the dome flat screen. • Is the spectral shape the same spatially? Dividing through by the average spectrum, do you get a spectrally flat flat field? Sree will look at this as a next step and will discuss this further with Scott. • Scott noted that the throughput measurements directly correlate to sky subtraction accuracy and this needs to be below 1% and closer to 0.1%. With SAMI an average sky residual of about 0.5% was achieved. To do similarly or better with Hector we will need to get the throughput averages down to well below 1%. This will take some time and effort. Illuminating the screen correctly will assist. • Julia noted that currently the data taken from the same twilight zones don't appear to have any more variation from field to field than with SAMI. There is some variability inherent from the use fibres, so the calibration is important. Reducing things like scattered light will improve the calibration. Scattered light is not an issue with the new spectrographs which is driven by the optical model. There is still scattered light in AAOmega, but this can be dealt with through processes established by SAMI.
4	**Hector Optical Distortion Update (Madusha)** Madusha gave an update on the centroid fitting and the optimising the pointing run. • Slide 1 – Centroid fitting and quantifying various offsets During commissioning there are a number of checks made. The figure on the left shows the positions of the fibre bundles and the data, the crosses fit to the centre of the star. On the right is the same plot but with the offset between the centre of the star and the centre of the bundle. The green are radial offsets the red and blue are the offsets in the p and q direction. The p direction is parallel to the grey band, q is perpendicular. A positive off set is blue and negative offsets are red. • Slide 2 – Histograms summarising all of the issues regarding offsets. Radial offsets from the bundle centre and the plate centre are shown in the top 2 graphs. P and Q direction offsets are the 2 graphs on the left on the middle and bottom rows. Compass access direction in the middle. The graphs on the right are perpendicular to and parallel to the radial access. The letters in the plot indicate the probe ID and the colours indicate where the probe is located. An analysis was done to establish if there were any correlations between the offsets and where the bundles are located on the plate in order to minimise this range. • Slide 3 – Optimising the pointing model. The data fitting model requires more than 21 offsets from 1 observation. During the last commissioning run 4 iterations of the same field were taken and Stars A, B and C were used as reference stars and multiple observations were then taken which were then stacked. Iteration 1 and 2 are shown; the blue crosses are the centroid fittings for iteration 1 and the red crosses are the centroid fittings of iteration 2. The numbers show the offset between the 2 centroid fittings and the direction of the offset. • Slide 4 – 2nd example shown on the right. A number of corrections are often required - a professional correction, an x y offset correction and in some cases where the field is observed at a high air mass a radial fit is required. • Slide 5 – Optimising the pointing model. The plots received from Tony are shown here. The top plot is the combined raw offset. The 2nd plot is the residuals after fitting the optical distortion model. Discussion: • Hyper proper motion stars were taken into account. Binary stars were also taken into account and left out, with the exception of a couple which Sam checked. • There were issues with Probe C which is always right at the edge of the field. To check that bundle C was replaced with bundle A. This showed that the bundle was ok, but the star is "off" so it may not be the correct star or the star may be in the wrong position according to the catalogue. • The residual rotation, residual shift and the change with air mass are expected and not faults. Madusha selected a particular field to align everything to, so Tony's fit informs what the fundamental zero point rotation is. Until you know the rotation calibration there will be a residual rotation. Overall, the fit are all rotation and not random directions. Ideally the test would have been done with all of the fields directly overhead, but this was not possible due to the bad weather, hence images were taken at a higher air mass.

5	**New Cubing Methods (Brent)** • Sree has been sending information to Brent, however this has not yet been fully analysed. **Action Item:** • New cubing methods will be discussed at the next meeting.
6	**Observer Numbers** • Sree sent a call out for observers. • Julia encouraged everyone to think about which nights they will be observing – each team member needs to observe for approximately 12 night per year. At present more observers are required as training needs to take place. • Two observers can be trained at each run. By 2nd semester trained observers need to be available. • The Hector Exec is currently looking at contributions to the survey. • A lot of people are doing 2df nights and there are many people who have already been doing observing nights for 2df. • For those who are not able to physically observe, there are many other ways to contribute, eg data reduction or coordinating busy weeks (junior researchers). Ideally a busy week will be scheduled for September where data will be available, please consider assisting with the organisation of these weeks and also the work required prior to the busy week **Action Item:** • Team members to contact Sree regarding observing nights and training. • Team members, please contact the lead of the relevant WG to discuss contributions outside of observing.
7	**First Data and 5 Initial Science Cases** • 41.5 nights have been included in the Reserved Time proposal for the next semester. This consists of 27.5 dark and 14 grey nights. The proposal submitted a request for 35 nights with Hector and 6.5 nights with 2df to complete the cluster and H1 and H3 regions (subsets within WAVES) prior to moving to other WAVES regions. • The first 2 proposals focused on some of the SAMI clusters to observe some of the R200 region (some of the early science there is aligned to Matt's work), this will add onto the SAMI data and give early science gains. • There is also a proposal being submitted, led by Jesse, for a small number of the shared time nights. This is to achieve a total of 50 nights per semester for Hector. The proposal is similar to 2022A with a few modifications to clarify why 15,000 galaxies are required. • Early Science papers should be considered and is there additional ancillary work that is required to streamline the process of getting papers finalised. • Stefania has been working on the Wiki to allow people to register science cases. Members are encouraged to consider what science cases will align with the first 5 science cases in the original proposal. **Action Item:** • The additional ancillary work which will be required to streamline the process of getting early papers finalised will be discussed at the next meeting.
	The next Hector Science meeting is scheduled for Wed 11 May 2022, 3 - 4pm AEDT **Meetings will continue alternately on the 2nd Tue and Wed of each month at 3 - 4pm AEST (12 – 1pm AWST).**