Project Finalisation Friday 20th of October 2017
AITC Woolley Meeting Room
Chair: Alex
Secretary: Chris

Summary:

Final project meeting with all clients and stakeholders

Actionable Items:

- Add pivotably requirement of frame to consider long term accessibility to cabling
- Consider sound cancelling capabilities of the laser (James)

Attendance:

Steve (S), Paul (P), Chris Leow (CL), Celine d'Orgeville (CD), Wenjie (W), Alex (A), James Webb (J), Mark Blundell (M), Drew McCausland (D)

Agenda:

Item	Discussion	Actions + Responsibilities
Meeting Open	11:02am	
Present Audit Slides	A: discussing work packages diagram CD: All for you D and M so ask questions when you need clarification A: Outputs of the project. Enclosure and subsystem design reports outlining all the justifications for designs. Electrical subsystem. High-level overview of the design, mechanical, electrical, environmental. D: Is there a printout of the requirements? If we want to make reference to them than it will help. P: We don't have access to a printer here D: Have they been validated yet? A: Took upper limit of a lot of the design D: Ok that's cool CD: First team had 3 laser options, Toptica, EOS, ANU. Toptica is removed when this team started. Trying to accommodate for the ANU laser and EOS at the same time. D: What was the reasoning behind eliminating Toptica CD: Politics ask Jak Gray	
Mechanical Frame	A: This is what I worked on and talked to M about it. Oscillators are being moved so there will only be around two breadboards. M try	

	and use CF cause lighter, lower CTE instead of steel. D: More difficult to analyse unless you have software CF. Simulate steel then move to CF if you need. If it's a weight perspective or vibration attenuation. Be that as it may you have a concept there. CF or Mild steel. FEA assuming it was isotropic material. A: Isotropic because the layout was quasi-isotropic, but approximation using typical CF parameters. But not access to that information. D: If you buy it off the shelf, the material properties won't be told to you. Unless you look into getting custom made tubes from a supplier overseas or in Sydney. You can always make the initial approach that it's made from steel and start. A: Dragonplate did give the layup D: Modulus of the CF? A: Modulus and tensile strength, but nothing to do with the epoxy, or thickness. Designed based off Dragonplate pre-fab components D: *sighs* mhmm A: Steel inserts where there are forces applied to prevent crushing and the EOS ball adjusters to adjust height. Prefab gusset plates using welder. Solidworks is all there. But would be good to give it to you via USB. D: Have we thought about ongoing maintenance of the telescope? If we have a framework bolted hard on this side of the yoke. How easy would it be to get into the electronics in there. J: Removable panels, solid removable panels was the tear down. How easy do you make the access instead of compromising all the time. D: Do you leave the frame in place and take the panel off. Make it pivoted to enable access to the internal electronics. People trying	

	to get components through the frame rails. If it doesn't affect mounting stiffness than it would help. CD: Dunno how long it will take. Have discussion with Craig. So add to the requirements. M: Something could go wrong. Could reposition each time it is misaligned A: Testing the strength, FEA. 1D. Loading was hard to know, but it was taken to 200kg. D: Is that right James? BB are only 8kg? 200kg? J: There was a big invar plate under the subassembly. Who knows, but it's pessimistic as a guess. M: Why invar can't we use CF? J: While there's so much R&D on the amplifier. It's unsure A: Gave them 150 p/m 50 per breadboard. J: Given everything is bolted to the stainless table it's a guess D: Potentially this could get to 4-500kg. Can the telescope tolerate it? M: Frame on other side with codo path. Optical table? D: We did an experiment where Jak stood on the edge of the yoke, when we had the laser displacement measuring kit. It was like 30microns. If we are talking 5 Jak's. J: I'd be hoping for half that. It's static. D: Interesting M: Deflection of 2.5mm. Which is quiet large. A: Thought it was small D: Quiet large. Where was it? A: Right on the edge. If you have the adjusters than you can change it will the ball adjusters. M: Surprised you have a lot of deflection D: You don't have shear plates on there, but there is a lot of	

	deflection. Can take that out with the gusset plates. What wall thickeness did you assume in the model? M+A: In inches? A: 2.something thickness in inches. J: 65 thou D: 1.5ish, pretty thin. Is that what you can buy off the shelf? M: Yeah? A: 0.085 is the smallest you could get. D: How did it respond to vibration? P: We didn't get to that. But we did measure that when it was tracking. D: I think he had it already, when Alex did it. P: I don't think he did anything on the tracking D: Did you talk to him about it? Anyway it doesn't matter? If the telescope isn't moving where is the vibration coming from? P: Chillers. J: New data is good. D: I think Alex's data accounted for that. J: Do you have the time series of that? D: Important that we have the time series data. P: Yeah I have the whole data file. D: What is the Hz in the first peak? P: 0.8Hz D: Right… that's going to excite everything. M: Unless we can stick Jak to dampen vibration D: I thought it was 10Hz. From a design point of view… what was the power output thing at 0.8Hz? P: Acc. at 0.77. 0.0077. Square that to get the power. Put it in FEA to get power. I thought it was 10^-5	

	J: Numerical signal processing. Is that DC? If you stick that into the Fourier transform. P: I've got all the MATLAB code that I used. D: The face that you used the FFT. J: It was the same as Alex's but he didn't annotate it. Could be spectral leakage, or a DC component. That's alright this is why we have multiple eyes. S: There are a lot that have frequencies between 4-8Hz. D: This is Alex's data? S: Yes. D: Moving in altitude and azimuth directions. 8Hz, 6Hz, 4Hz. I thought he had it in power terms, but maybe it's just acceleration terms. S: Air quality control and temperature control. ANU laser 10-15 degrees ambient. Need insulation panels on the side of the enclosure, or else there will be a lot of heat. 75mm thick. Just in the tolerance of the frame size. Insulation and active heater will ensure that heat transfer will be 20-30W. D: Why did it need to be as thick as that. S: With it being 10 degrees. Assuming 0 degrees ambient. Using a small heater 75mm was optimal. 50mm insulation was minimum. Maximum to prevent heat loss into the dome, thicker insulation was better than thinner. D: What was the output from the electronics. J: Definitely not 60W. 200W on the laser diodes, but cooling on them. D: Seems thick when you have heaters inside. J: Most reasonable need is the ANU laser, which doesn't need 500W input. S: Temperature probe PID. Theoretically maximum loss.	

	D: Only holes that you will have in the insulation panels are the beam exit holes. M: Isn't there a window for that? CD: we haven't decided, but if we need it for the temperature control. J: We can put piece of AR coded silicon in there? No problem W: Cooling set up in there. Need chilled water. EOS 17 degrees. ANU don't know exact, but two different temperatures hence two chillers. EOS max 400W. ANU 800W between the two components as absolute max. Simplest was liquid to air chiller. Chillers on entry level of the dome which is partially insulated which won't put hot air turbulence into top level. Don't know exact requirements so refinements D: You have good idea of cooling requirements of our laser J? J: It's about 400W. Well behaved. One of the few specs well known D: ANU R&D laser is solid state and will not require much heat dissipation. CD: Electronics will, semiconductor chip and laser head not sure but will need a prototype? D: When do you expect the laser? CD: Knowledge of numbers or hardware? Work is starting now 16mths for laser to be delivered here. Ideally EOS laser will be functioning prior to that. J: Then have beam path to flip into P: Basic electrical and communications diagram. EOS CAN bus. Ethernet, might need CAN to ethernet gateways for standardisation. Dome power is enough, but need to measure existing power draw of systems in the dome to account for worse case scenario such as summer. J: Electrically interface to it is quiet simple	

	P: Should be ok for single journal power outlet D: You are expecting a quick fit electrical connectors? Quick disconnect? J: Jak standard style for stuff. Minimal number of penetrations into the dome needed then fanned out internally. P: Power requirements as per documentation discussed. General logistics. S: Aux Cabinet directly underneath enclosure. Fibre cable between oscillators and laser hear <1m. Aux cabinet EOS on table if it can be split in half. One component needed to be reasonably close. 2-3m J: There are a number of pieces. D: What needed to be split in half J: Rack modules can be split up because it's too talk D: And how is the rack mounted then? Inside the dome against one wall? M: You know the work bench the top of that J: Currently being used for storage of the previous stuff. S: Coolers on the bottom floor. Approx 6.5m cable. M: Does it have to go through the cable wrap? P: It's on the entry floor so moving the same as the top floor. S: Clean room will need the cable wrap which is about 40m. J: Theory Yue says it's ok. D: That's for our laser? S: Yup. Cable goes from entry level into tray to the basement into the conduit to the clean room. Dunno where it goes in the ceiling. P: 36m to the wall of the control room. S: No information on more space in the conduit. M: 150x150. Could lay it on the light pipe. Should be ample space.	

	P: Nothing is going on the middle floor, due to stairwell space. Otherwise entry, or top floor due to shudder. Hatch is narrower in the CAD models. S: 100-200mm short all around due to the beams near the shudder P: Going through the documents in the repo and what each document contains. J: Look forward to reading the SS reports D: So that requirements matrix CD: I will have to go. I think it was professional work and pleased with what they did. It appears that it was a good job. Is the last week? A: We don't come up unless we have good reason to. D: We have email contacts? A: Yeah it will be somewhere in Git. J: I like the way you broke it down into the subsystem of the deliverables. Monolithic requirements matrix and it was entangled. The way you have broken it down and chained it, it works CD: Will do the audit tonight. You can keep having the discussions. If you want more don't hesitate to schedule a time.	
Going through documentation	D: From requirements matrix, what requirement is called up that you think we can't meet or difficult to meet? P: Temperature control for ANU laser. Component ones? D: Chillers can be set S: 8L/min could be excessive, or fine. Don't think any of them can't be met. D: Vibration sensitivity perspective. It's a do, or die J: That's what Tim is trying to do. Lives in his own world. Lives in Cairns connected via ethernet.	

Project Finalisation Friday 20th of October 2017
AITC Woolley Meeting Room
Chair: Alex
Secretary: Chris

	D: Did you compare vibration spectrum against Alex's? Is it same? S: Very similar, order of magnitude of peaks is the same, but some of the other stuff is the same. D: Only issue is lower frequencies? Don't have much measured below 10Hz, except of the major one. Prefer working to our one than Alex's one. P: Did use lower sensitivity compared to Alex's D: 1G/microV I think is what he was using. 0.01 – 0.007. Have we thought about how we might input vibration spectrum into the table? J: If we have an actuator on the table and there is a time series than we can put that on the table. Have my music cranking in there. D: Would be preferred and helpful. Could develop noise cancelling. And do we have the time series of what Alex produced. He should have that. S: Elliot might have that? S: 10mV/G is what Alex had.	
Feedback	M: Do you need feedback from us? We will get back to you as soon as you can? J: Referencing will help. We can see where we got your ideas from due to the moving landscape. D: That's great. S: All conversations are tracked in the repository.	
Meeting Close	12:00pm	