

Update on the UK deliverables for Advanced LIGO

LSC, October 2007

Justin Greenhalgh and suspensions team

G070661-00-K



Topics

- Focus of this talk
 - Mostly on metalwork and electronics (Rutherford Appleton Lab (RAL) and B'Ham))
 - See separate talks for ribbons, ears and non-metal masses (Glasgow)
- Review of UK deliverables
- Current status
 - Noise prototype at LASTI (at MIT Boston)
 - Official Journal of the EU (OJEU) tender process started
 - Folding mirror and beamsplitter suspensions (FM/BS) design
- Future plans
 - Final sign-off on quad suspension design
 - Review of FM/BS design
 - Plans & Timescales for procurement
- Current issues



The UK deliverables for advanced LIGO

- Suspensions (passive isolation) for the main beam optics including beamsplitters and folding mirrors down to, but not including, the optics themselves.
- End test mass (ETM) and Inner test mass (ITM) structures with double-chain quadruple suspensions
 - Two “noise prototype” suspensions convertible ETM or ITM
- Beamsplitter (BS) suspensions with single-chain triple suspensions
- Combined ITM/Folding Mirror (ITM/FM) structures with suspensions
- Including actuators (OSEMs) and associated low-noise analogue drive/readout
- Electrostatic drive analogue electronics
- Four test mass blanks



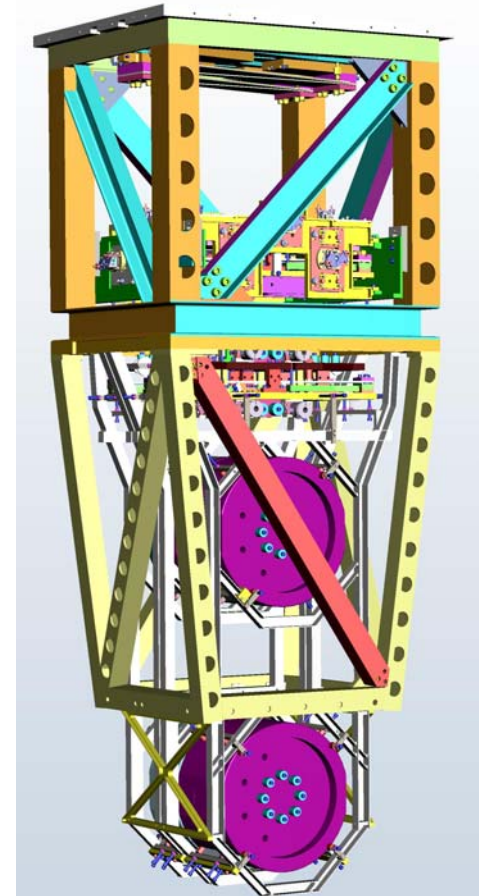
US/UK collaboration on SUS

- Close co-operation on schedules; slippages in suspension and ISI have matched pretty well.
- Excellent UK/US collaborative spirit to get around differences, technical snags etc
- Both sides working well towards completion of tests
- We have already had chance to start training US folks on the UK stuff (at LASTI, RAL, and Glasgow) - this is very good news.
- Thanks to entire team, US and UK, for efforts so far!

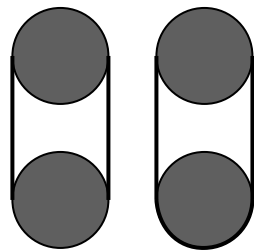


What are the UK noise prototypes?

- Two suspensions being built; ETM/ITM type quad suspensions
 - One dirty
 - All metal
 - Stays at RAL
 - Parts fit check and “test bed” for use if issues arise during LASTI tests
 - Useful for assembly training
 - One clean
 - Delivered/assembled at LASTI
 - Will include full glass suspension
 - Configurable for
 - all metal or
 - ETM (with End reaction mass and electrostatic drive) or
 - ITM (with compensator plate)



Noise prototype configurations

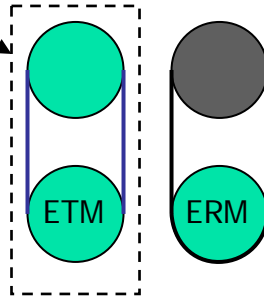


T R

All metal

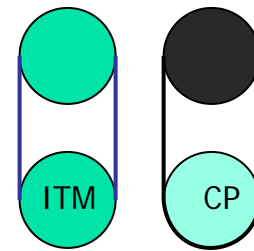


Monolithic
final stage



T R

ETM



T R

ITM + CP

Overall status of UK deliverables at LASTI

- Noise prototype structure:
 - Complete except for “sleeve”
- Metal masses
 - Complete
- OSEMs
 - Complete but not all fitted (screws went astray)
- Pigtails
 - Mostly complete
- Electronics
 - In manufacture or testing. Interim solution implemented by Jay.
- Glassware
 - Test mass and UIM at LASTI with ears bonded. 2nd UIM in transit.
 - Reaction mass at LASTI
 - Ribbon tooling working at Glasgow; ~duplicate set awaits shipping.



Pictures from LASTI

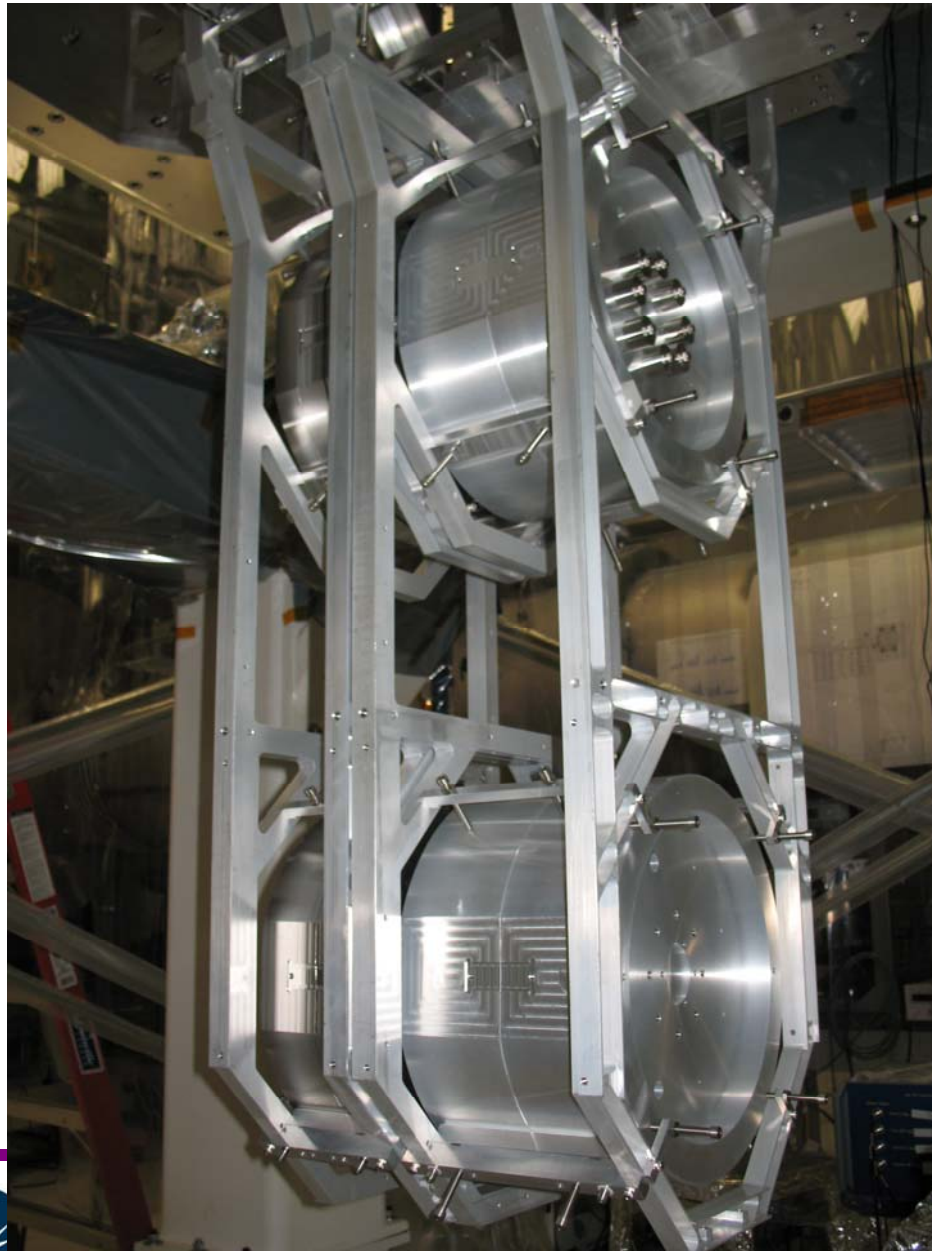
- Recent pictures from Brett



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Quad SUS
fixed to
ISI in
clean state



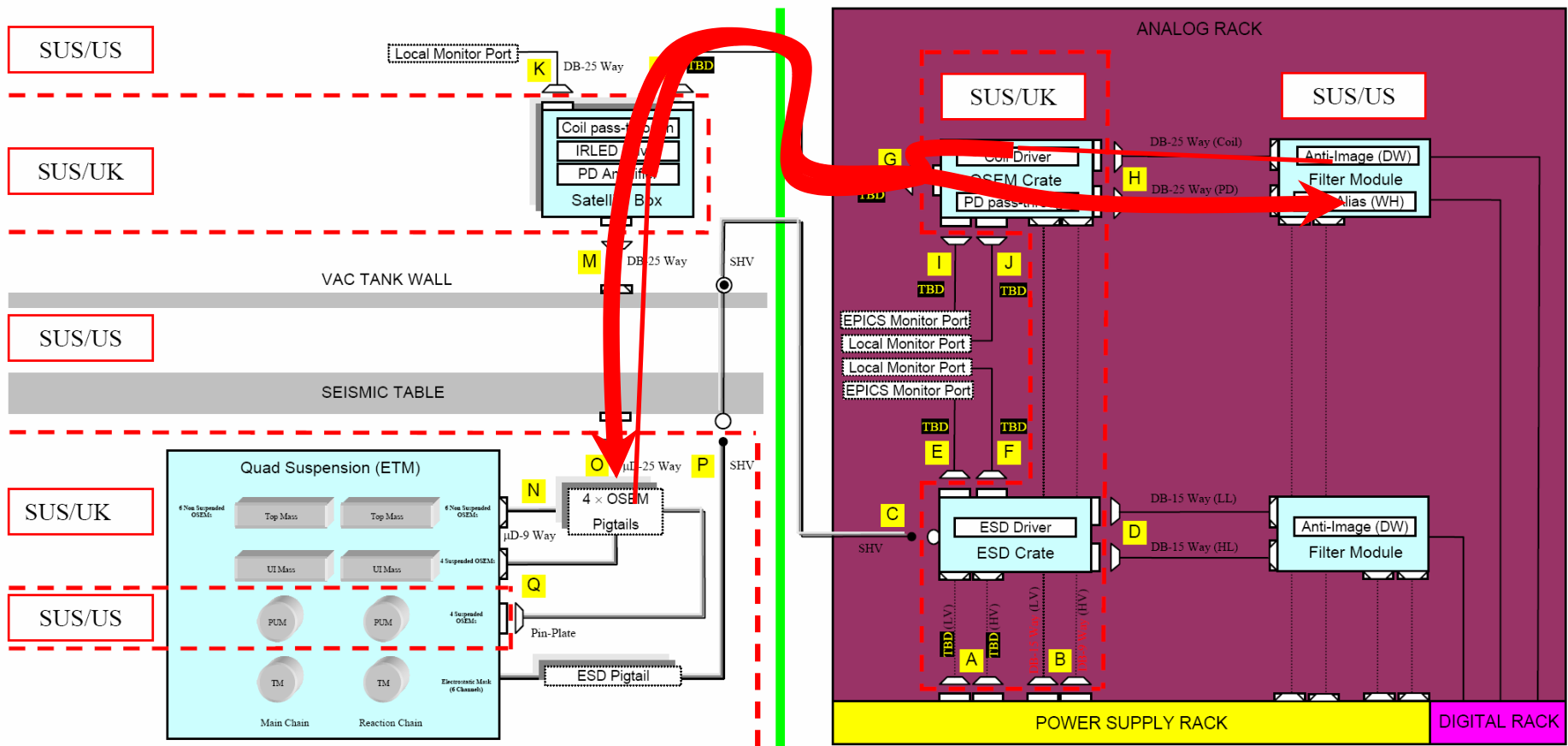


The sleeve

- See extra slides at end for background...
- The first sleeve (class B) is now at LASTI but would need minor rework to fit.
- The second sleeve is expected any day in the UK, then needs to go to Bob, then to LASTI.

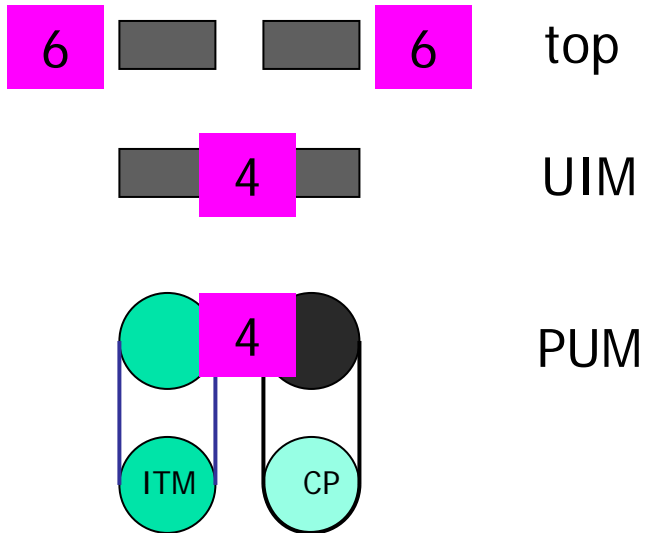


What is the UK electronics?



4 channels per unit

20 channels



Sat box * 5

Top driver unit * 3

UIM unit

PUM unit

UIM = Upper intermediate mass

PUM = Penultimate mass

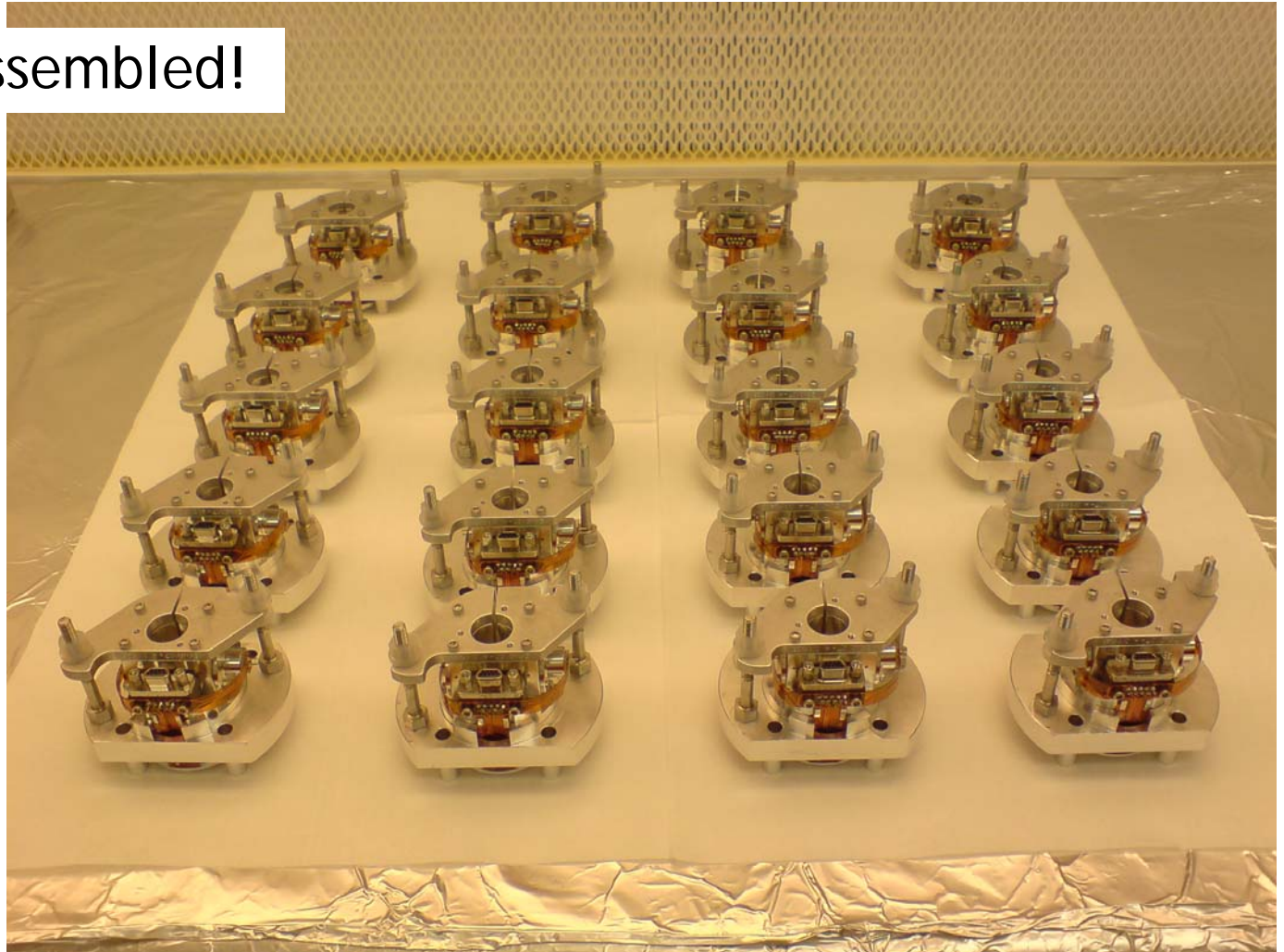
OSEMs

- OSEMs in pieces...



OSEMs

- OSEMs assembled!



Electronics progress

UIM unit

Cards and housings
for satellite boxes



- On track to deliver last week in Nov.

The pigtails

- Most *critical* Top mass pigtails delivered & installed at LASTI.
- UIM pigtails fabricated awaiting shipment to LASTI.
- PUM pigtails fabricated but awaiting pin-plates from US.

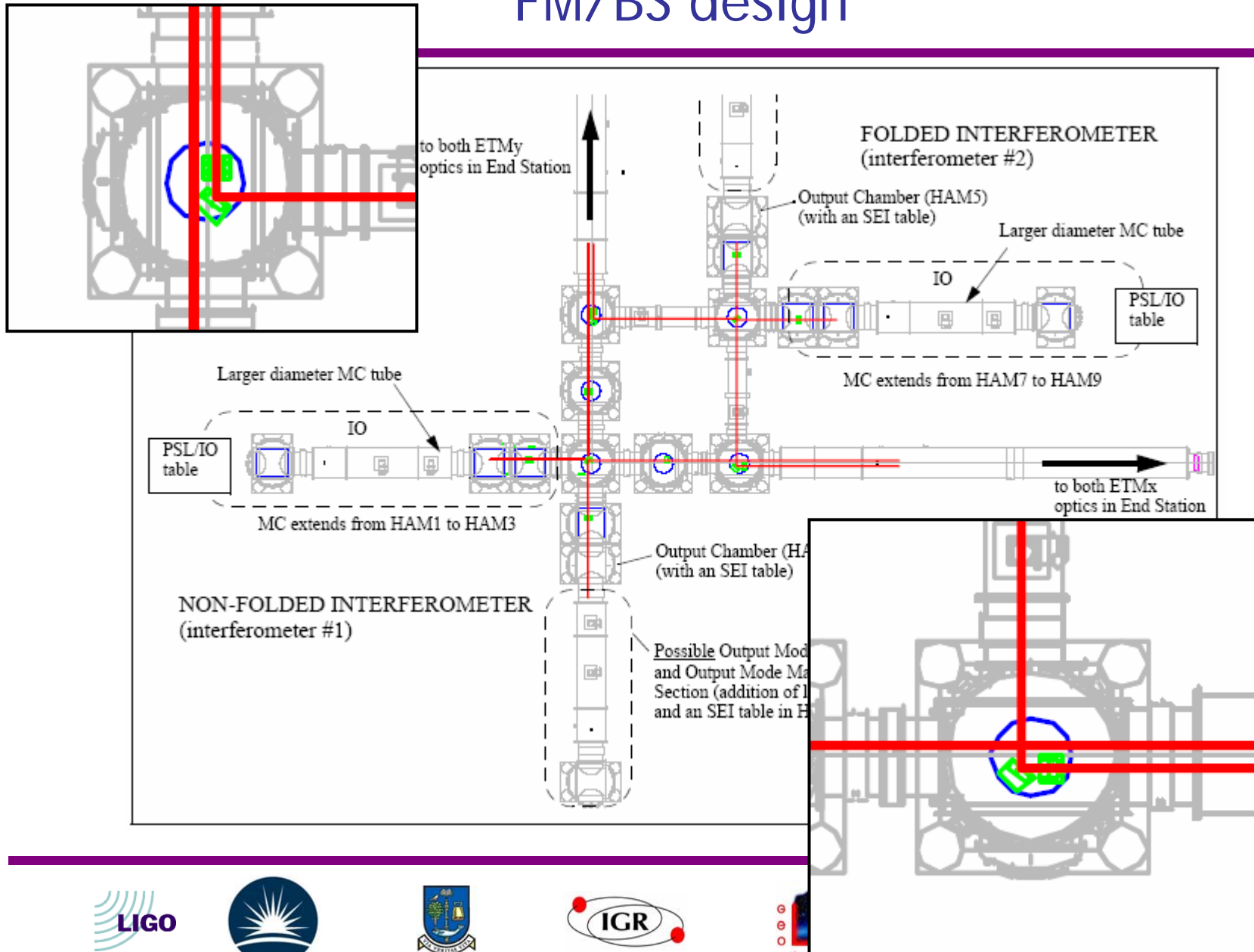


OJEU process (RAL stuff)

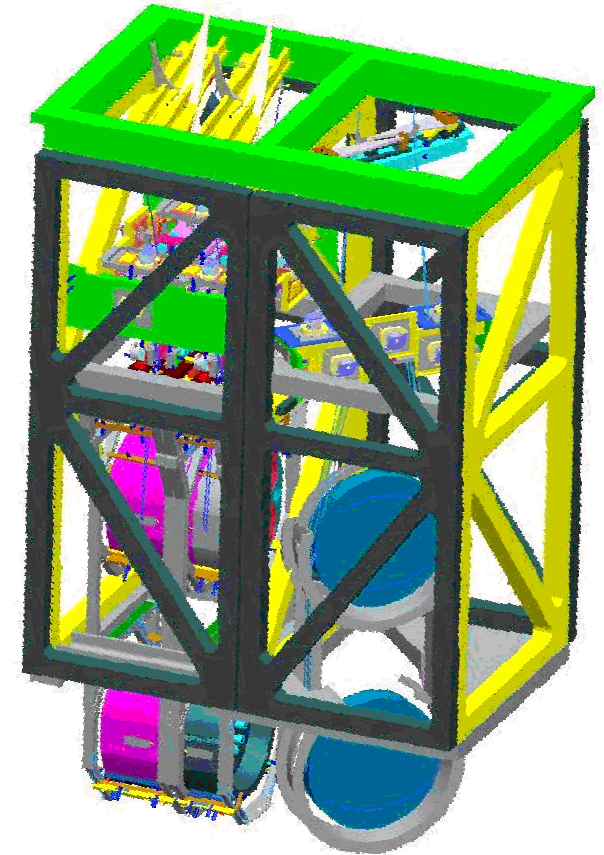
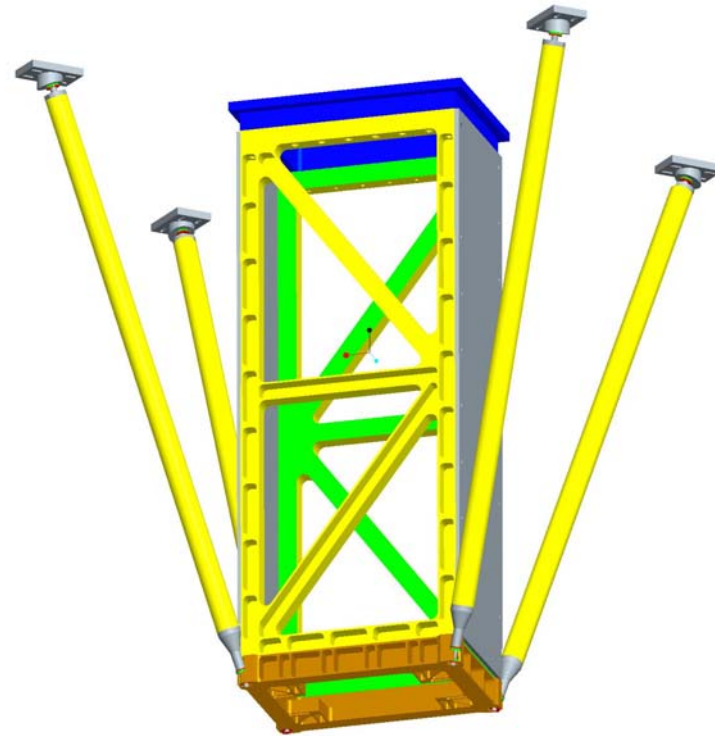
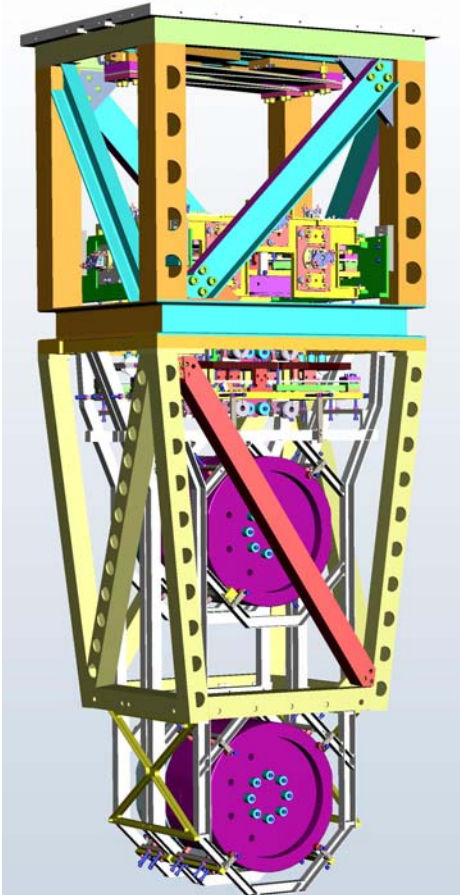
- What the steps are
 - 1. Market survey. Publish outline of the work, invite responses
 - 2. Assess responses, choose shortlist of companies
 - 3. Final RFQ
 - 4. Assess responses, choose best value
 - 4a. Wait (“standstill”)
 - 5. Final detailed negotiations
 - 6. Sign contract
- Where we are now
 - Four processes in hand: blades, large machining, small machining, weldments
 - Each with two phases (ETM/ITM; FM/BS)
 - Responses to market survey due 12 Oct - 12 Nov
 - Responses to final RFQ due 19 Dec - 23 Jan
 - Contracts could be signed 19 Jan - 23 Feb

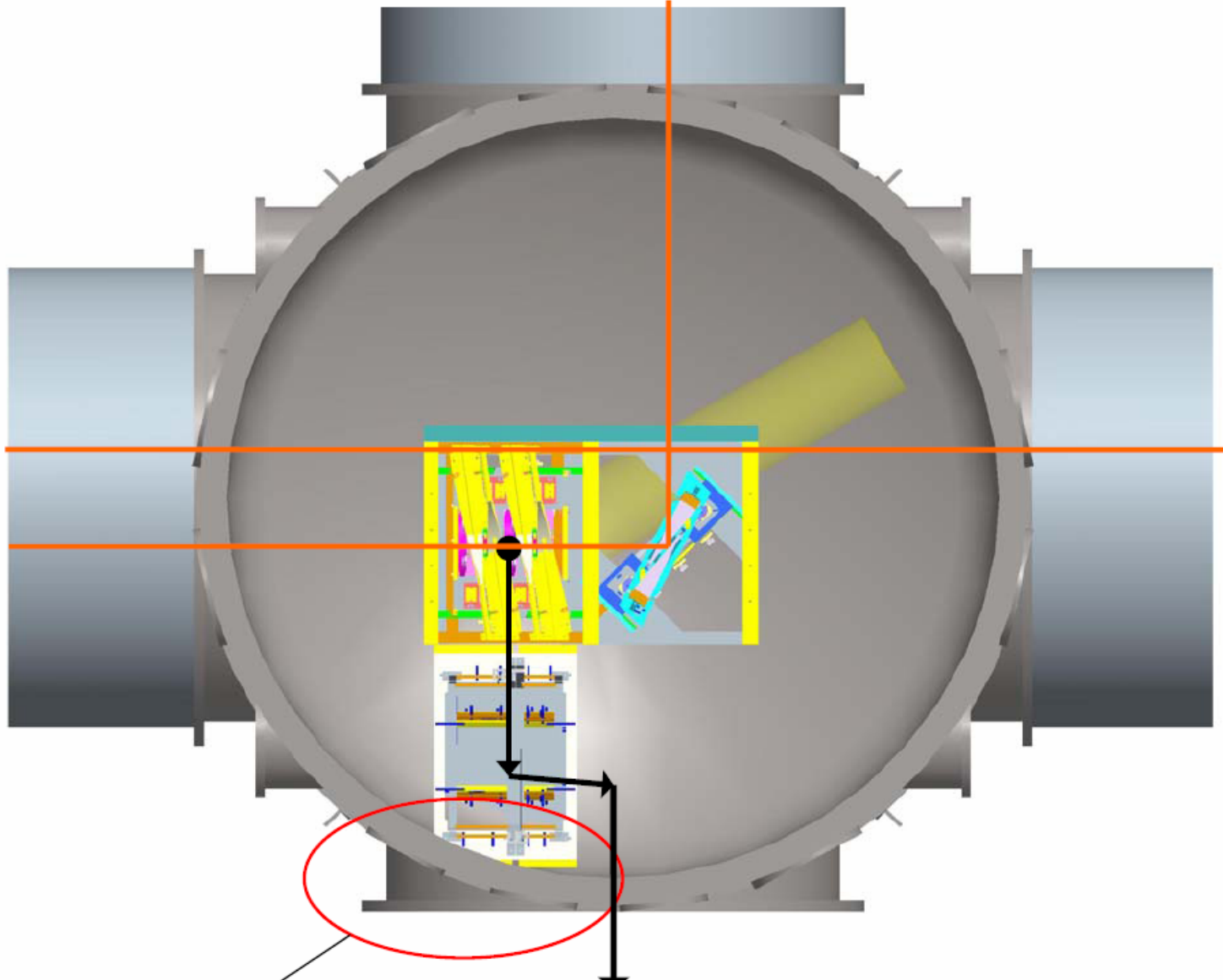


FM/BS design



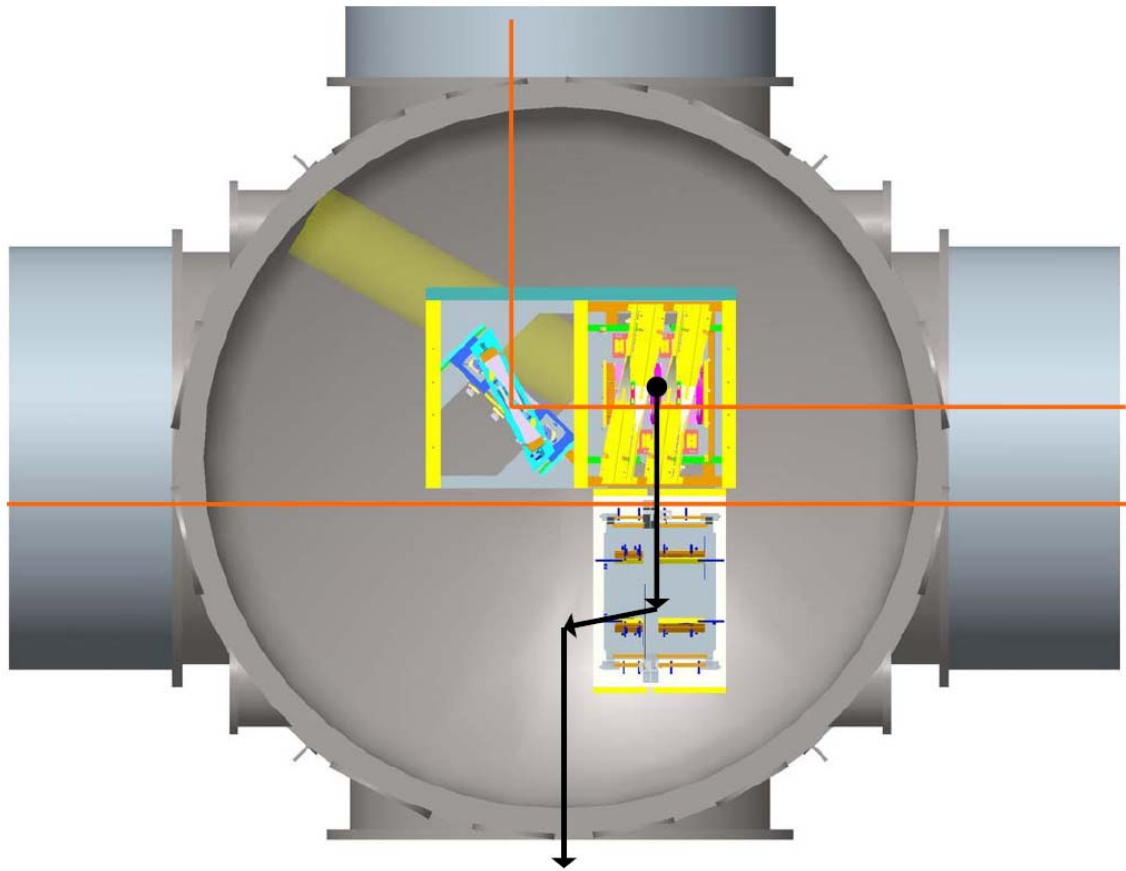
Images of ETM/ITM, BS and FM designs.





Interference with tank





Future plans

- Final sign-off on ETM/ITM design
 - Some minor changes, eg remove number of thread inserts; improve earthquake stops
- Review of FM/BS design
 - Depends on faith in structure frequency predictions; informed by SUS/ISI tests in hand right now
- Plans & Timescales for procurement
 - Electronics will flow on from N P-Type delivery
 - BHam will also make the OSEMs
 - Hope to sign OJEU contracts for ETM/ITM stuff in ~Feb 2008
 - FM/BS to follow ASAP thereafter
 - Glassware in parallel
 - Grant ends October 2009 - all major spend to be complete by then (goods made, delivered, paid for)



Current issues

- Structural frequency OK?
 - SPI wrinkle
- Get FM & BS designs approved
- Get BHam electronics to LASTI
- Concerns on welding



And finally...



Celebration meal?

Thanks to Ron and the team at Birmingham

Backup - welding aluminum

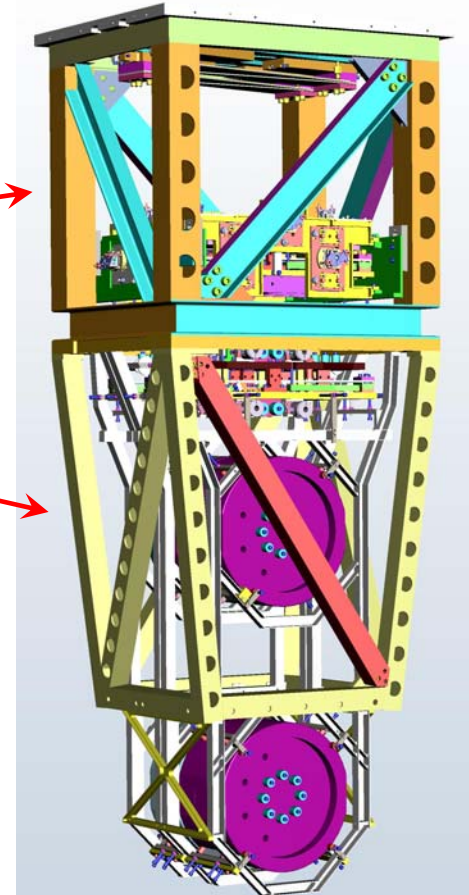


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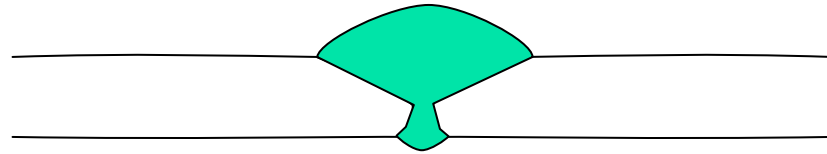
Problems with welding aluminium

- Note there are two weldments in the ETM/ITM structure
- The upper structure
- The sleeve

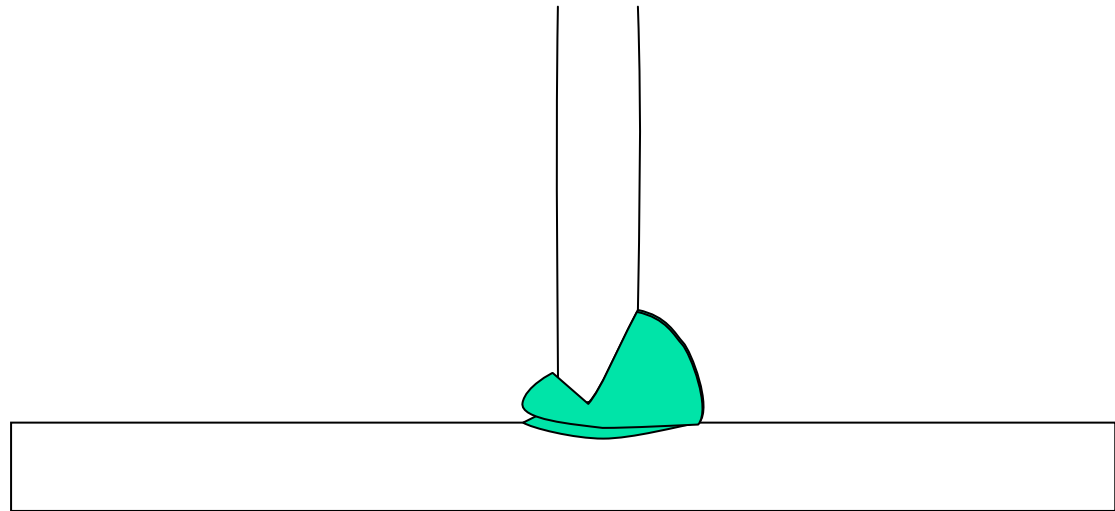


Current understanding

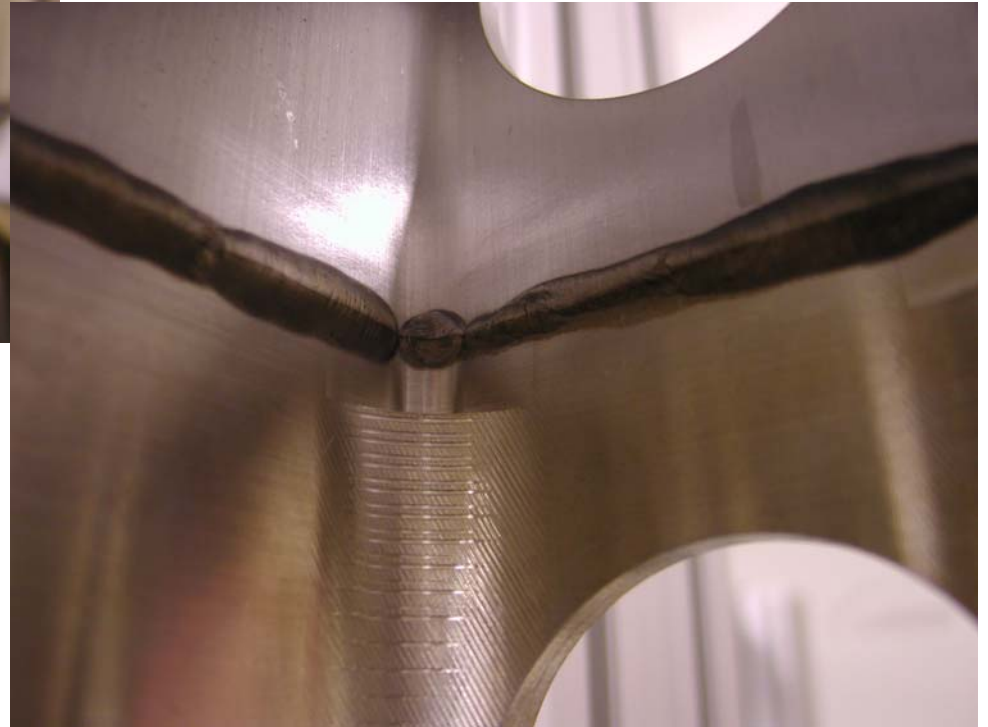
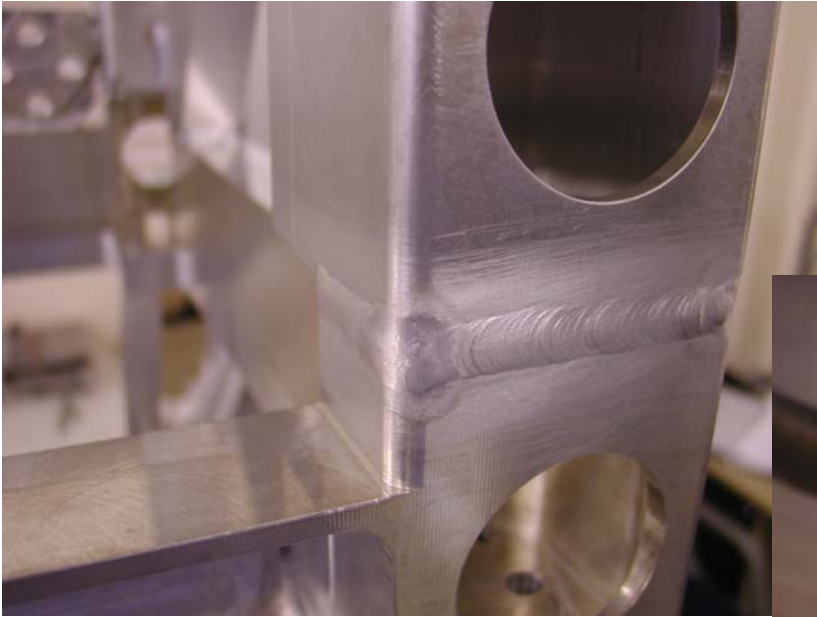
- THIS works



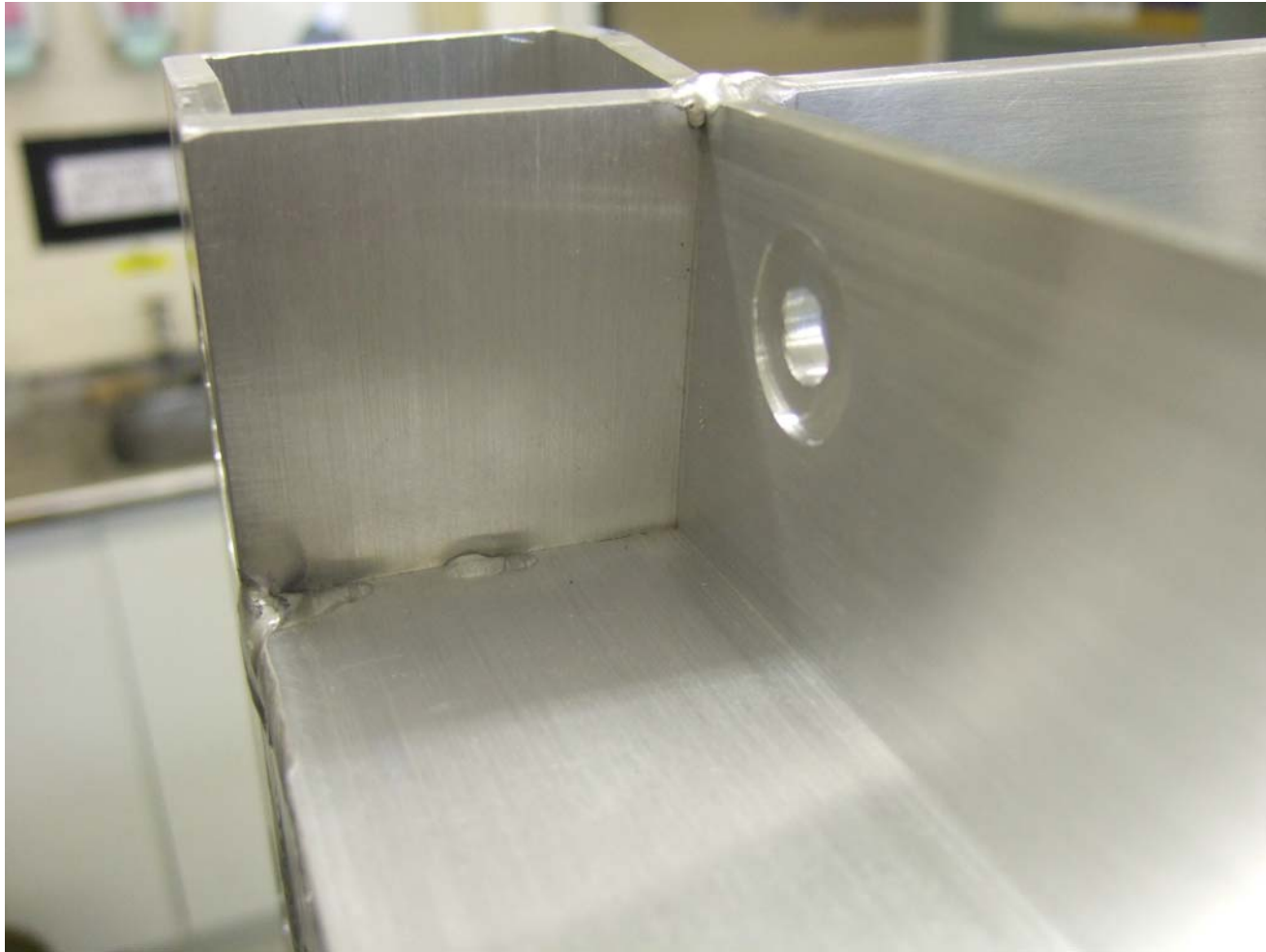
- THIS doesn't



The good...



... the bad...

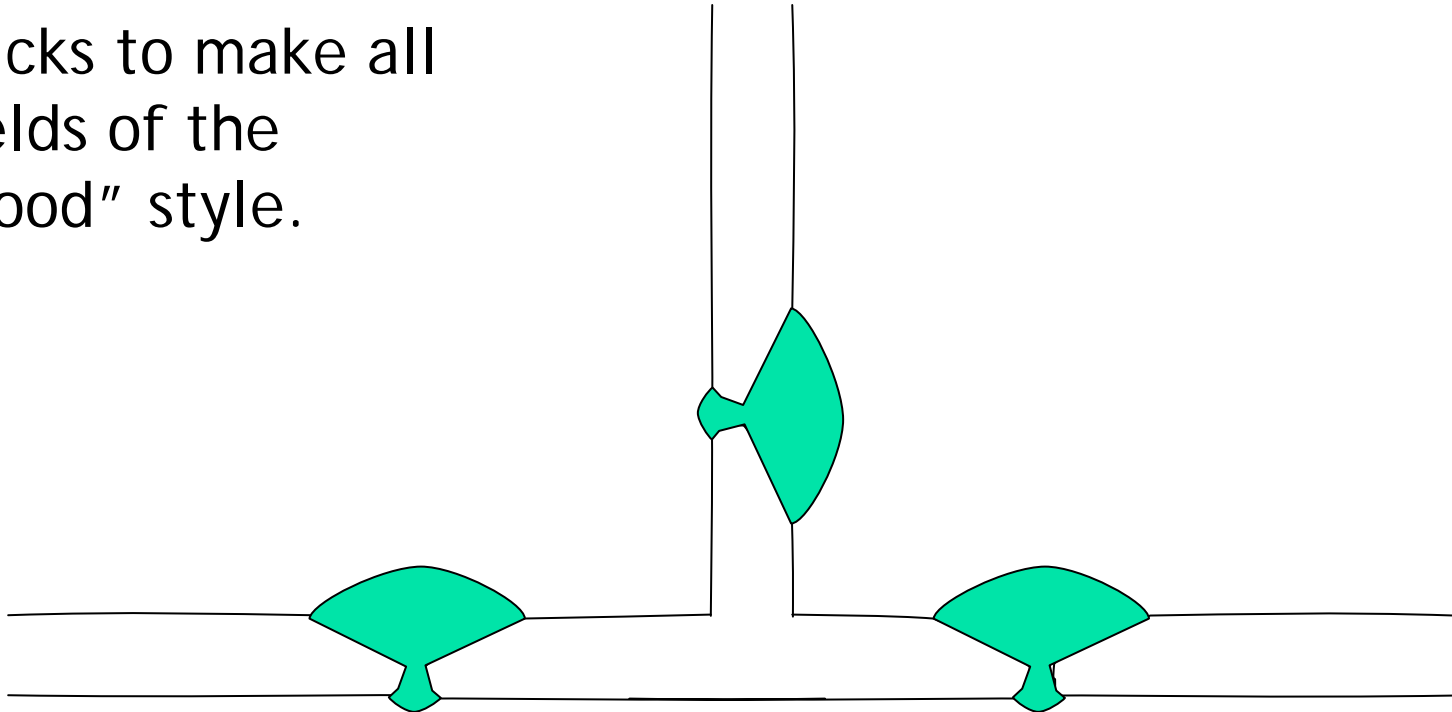


... and the ugly ...



Current understanding

- Tricks to make all welds of the “good” style.



Work on new sleeve...

