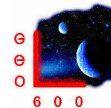


Update on SUS work in UK and especially at RAL

LSC, March 2008

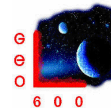
Justin Greenhalgh and suspensions team

G080090-00-K



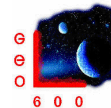
Topics

- Overall UK situation
 - Glasgow: non-metal stuff
 - Birmingham/Strathclyde: electronic stuff
 - RAL: mechanical metal stuff
- Current RAL situation (UK mechanics)
 - OJEU tenders
 - Hysteretic tilt
- For details of Glasgow and Birmingham work, see separate talks



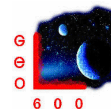
Overall UK situation

- Grant end date: October 2009!
 - All parts complete and delivered
 - All bills paid
 - Extension sought to allow installation support.
- Birmingham
 - N PType electronics delivered, bench testing nearly complete
 - N PType OSEMs all delivered
 - OSEM FRR held; gearing up for production
 - Electronics FRR in two parts, gearing up for pre-production



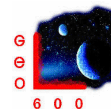
Overall UK situation - 2

- Glasgow:
 - Two test-mass blanks delivered; ears bonded
 - Noise prototype RM and PUMs at LASTI, ears/prisms bonded
 - Ribbon machine taking shape at LASTI
- RAL
 - OJEU process in progress
 - FRR started on ETM/ITM
 - Prototype BS in manufacture
 - Some snags at LASTI (hysteretic tilt)
 - Two important changes



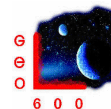
OJEU process

- Requirement on any European govt agency
- Enforced international tendering
- Can be time-consuming
- We elected to use the pre-selection route
 - Advertise outline requirements
 - Preselect companies
 - Tender only preselected companies with exact requirements (can include options)
 - Select best value
 - Place contract
- And we elected to use two “tranches” in the outline requirements
 - First tranche = ETM/ITM
 - Second tranche = BS + FM



OJEU current status

- Preselection complete
- Tenders for ETM/ITM done, responses in
- Preparing to sign contracts
 - Bids for structures expire early April - FRR held
 - Bids for machining expire June - but we want to sign contracts well before then. - FRR soon
 - Need to check machining spec for blades
- Tenders for BS/FM to follow soon...
 - FRR will follow assembly of prototype in UK

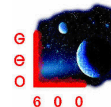


BS starts to arrive...



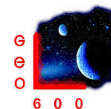
Hysteretic tilt

- Initial symptoms
 - Strange non-repeatable tilts of the order ~hundreds of microRad at test mass
- Initial diagnosis
 - Something to do with blade clamps
- Experimental programme
 - Tests on LASTI noise prototype
 - Tests on UK noise prototype
 - Tests on single mass 2-wire suspension
 - Tests on blade in a single mass
- Current understanding
 - There is an effect in the wires or wire clamps, of the right magnitude to explain observations on suspension
 - Blade clamp effect at LASTI not fully understood but thought to be connected with bolt torques and modified clamps



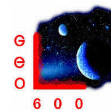
Experiments

- Managed to reproduce problem on UK noise prototype.
- Effect is: you tilt the suspension and let it slowly return. It does not come back to the same place: offset $\sim 5\%$ of applied tilt.
- Could not produce permanent set of sufficient size in blade clamps
- Did see a clear effect with a single mass and two wires
- Brazing clamps did not fix it.
- Extrapolating effect from two-wire test gives quantitatively the effect seen on the full SUS at RAL and LASTI.
- Effect can be reduced by allowing the suspension to oscillate, so the applied tilt slowly dies away (2 wire test at RAL and full SUS at LASTI and RAL)
- Effect is present at various input levels from $\sim 100\text{mRad}$ down to $\sim 2\text{ mRad}$



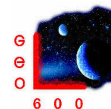
Test of hysteresis theory

- Test on two-wire suspension shows residual tilt proportional to input tilt.
- Allows us to give a value of residual torque per unit input tilt per wire/clamp interface.
- Apply a tilt on the SUS - check tilts at all masses
- Knowing those tilts, calculate residual torque at every wire/clamp interface on SUS.
- Apply those torques to the matlab model to predict residual tilt at each mass
- Results match remarkably well (10-20%)



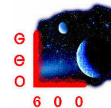
Current plans

- “Plan A”:
 - Brett is able, using our new understanding, to align the metal sus as currently configured well enough to go in the tank at LASTI
 - Test mass reasonably horizontal
 - Local control OSEMs in both chains aligned and damping
 - Global OSEMs not required but magnets are present on UIM for balance.
- “Plan B”:
 - Joe and Amanda visit LASTI for at least one week starting 31 March
 - Fit new wire clamps to increase “d” distances
 - Fit new blade clamps at the same time
 - Align sus as above



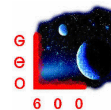
Changes - 1

- Good news:
 - It looks as though we are able to redesign the optics so that we can decouple the ITM and FM structures:
 - Saves designing a special combined structure
 - Avoids the hardest assembly challenge
 - We have agreed that the ERM will be same mass as the TCP (~30kg rather than ~40kg)
 - Saves dealing with very dense glass
 - Makes the PRMs the same on both SUS designs



Changes - 2

- Opportunity:
 - Ian Wilmut, WP3 project manager, has been poached by Atlas
 - Recovery plan: more of Justin, new design engineer Amanda Brummitt to join team.



Noise prototype configurations

