From: Harrison, RA (Richard)
Sent: 10 November 2004 17:20
Subject: SOLAR ORBITER SPECTROMETER - MEETING NOTES

Dear All,

Thanks to everyone for a productive meeting last week. A lot of useful points came out of the meeting, plus a clear direction for the next steps. The main points I would raise now are the following:

1. Could everyone who presented a Powerpoint display pass a copy to me, if they are able to do so, and I will insert it onto the Web site.

2. OPTICAL DESIGN TASK GROUP: With regard to optical design, we have been concentrating on the normal incidence option which was generated by Roger Thomas. We need to include the grazing incidence option from Luca Poletto. Although the normal incidence system, for a given size, will have a better optical performance, the thermal issues and possibly the shorter wavelength options may be appropriate for a grazing incidence approach. It was agreed that there should be a proper trade-off study. This has to be done, by Kevin Middleton (RAL), Roger Thomas (GSFC) and Luca Poletto (Padua) working as our optical design task group. Kevin will coordinate with Roger and Luca to ensure that we prepare the trade off study over the next few months.

3. THERMAL TASK GROUP: Closely associated with the optical design work, is the thermal effort, which will feed directly into the trade-off study. Bryan Shaughnessy will work closely with Kevin, Roger and Luca to progress on this.

4. WAVELENGTH TASK GROUP: Finally, the trade-off study needs some decisions on the wavelength selection and we should plan to make some decisions on this in the next few months so we can proceed with the design optimisation. Peter Young coordinated the production of a document in 2003. Much of the discussion at MSSL was repeating issues covered by that document and the dedicated meeting which generated it on January 9, 2003. My suggestion at the MSSL meeting was that anyone wishing to feed into the wavelength discussion should read that document (www.orbiter.rl.ac.uk, click on 'EUS Wavelength Workshop (Jan 9 2003 RAL) - Report' (bottom right)). Please pass comments back to Peter. He will probably contact the relevant players to bring the discussion to some conclusions.

5. SCHEDULE TO THE AO: The above activities are the logical next steps which, combined with the basic mechanical, thermal and detector work being done at this time, represent the 'feasibility phase' of study for an EUS instrument. As presented at the MSSL meeting, our plan is to have a 'post-feasibility study' consortium meeting in the Spring of 2005. After this, the detailed design phase must forge ahead, with a prep-proposal consortium meeting in the early Autumn of 2005. We should anticipate starting to draft the proposal in late 2005, when we expect the AO.

6. INSTITUTIONAL RESPONSIBILITIES: Another issue which we have to face now is the need to define the responsibilities for each institute within the consortium. We have initial thoughts from discussions last year, but I will follow this up with detailed discussions with each group. We cannot head into a detailed instrument design phase not knowing who can/should do what. I will contact people to chase this one up.

7. Finally, a number of issues came up at the MSSL meeting which were relevant to the ESA Payload Definition Document. These issues were either discussed at the meeting at ESTEC on the 1st of November, which I attended, or have been raised with them since. The comments relevant to the EUS are below:

- PDD critical and optional parameters: It has been suggested that the PDD should define

parameters as critical or optional. The critical ones would be mass, telemetry, thermal parameters, length etc… and the instrument teams must not cross defined boundaries for these. For the optional ones, such as aperture, wavelength ranges, etc… the PDD should only be used as a guide or suggestion. The instrument teams would have more freedom there. ESTEC have promised to get back on this idea.

- ESA provision of hardware: There was some confusion over the provision of radiators, doors and any front filter assembly. Are these a spacecraft item or to be provided by the instrument group. ESTEC have been asked to confirm.

- EUS front filter: The Astrium study suggested that we require a front filter/grid. The responses to that option have been fed back to ESTEC. Specifically, the following points were made: EUS studies suggest that the radiator grid entrance filter adds complexity and risk and that it is more elegant to focus on the primary mirror with a dedicated radiator, plus the reflector/heat stop throwing heat out of the front of the instrument. This is seen as the 'simple' approach. The UK EUS group has taken it on board that they (we) need to show that this approach will work before the idea of the filter/grid is removed from the ESTEC technology list. The Astrium grid filter (Al) is thick, compared to our expected needs. The complexity of the design is of concern (e.g. thermal flexing, single point failure) and the degradation to the intensity would probably be critical. The need for a filter at some point is recognised and would be in the spectrometer (i.e. away from the thermal extremes). However, an aluminium filter at the front would remove the possibility for the longest wavelength band (>912 Angstrom). Current thinking is that we could use SiC optics and no coating on the mirrors and obtain the 500A and >912A bands. The shorter band at about 170-200A needs multilayer and the thermal/particle performance is an issue.

- Detectors: The EUS discussion is leaning toward the use of 2k x 2k 8-10 micron APS detectors. The EUS group confirmed that whilst the 5 micron APS device (3k x 4k) was already in house, its MTF performance, and other technical issues were such that pushing for this rather than the larger pixel device would really increase risk for no good reason (it was only a driver because of the 0.5 arcsec pixel) and would not perform so well. Again, it is the keep it simple option. There is some discussion about common detector approaches, for the EUI, EUS, VIM and COR instruments. The most obvious way is back-thinned 2k x 2k 10 micron APS (with no additional coating or MCP) for EUI and EUS, incorporating a filter in the optical path somewhere, and VIM and COR could use the same devices front illuminated, with no additional coating or MCP. However, since back-thinned devices provide 100% filling factors, it may be better even for these to use back-thinned, back illumination. There is no definite requirement for phosphor coating or MCPs. The APS development activities, under Nick Waltham, are specifically aimed at Orbiter, and the BOLD development is also appropriate. My suggestion to ESTEC (again!) is that they talk with the appropriate groups and play a role in supporting relevant activities in the detector area. This was suggested by the Payload Working Group 2 years ago and is repeated regularly!

- Solar Environment Facility: ESTEC announced that they were planning a 23 solar constant Solar Environment Facility. This would be a valuable facility (instrument sized - not spacecraft sized) for thermal testing - as suggested by the Payload Working Group. Particle environment testing is another issue. The ESTEC group met last Friday to define the facility requirements but I have not heard anything yet. They have been asked to respond a.s.a.p. to the Payload Working Group's suggestion of a programme of test activities to be completed well before the AO.

- Image Stabilisation: Given the requirement of < 1 arcsec/10 sec or, even better, the 0.5 arcsec/10 sec, the EUS would probably NOT include an image stabilisation system.

I guess that is enough for one e-mail! However, the length of the message does stress the value of the discussion last week.

Cheers,

Richard

Professor Richard A. Harrison
Head of Space Physics Division
Rutherford Appleton Laboratory
Chilton, Didcot
Oxfordshire OX11 0QX, UK
Tel: (44) 1235 44 6884 Fax: (44) 1235 44 5848