

3. CALICE

- 3.1 The Chair informed the panel of the background regarding the CALICE proposal. The panel had examined the proposal at its last meeting but were unable to make a decision on the proposal as it stood and requested further information from the proponents. The extra information was regarding work packages 2-4, the panel had been happy with WP1 (the seedcorn request) and WP5. This information is detailed in the attached document.

The extract from the minutes of the previous meeting at which the PPRP discussed the CALICE proposal are given in appendix 1.

- 3.2 Greg Heath, acting as contact with the proponents, gave the panel a summary of the extra information that the proponents had submitted.
- 3.3 The panel discussed the extra information that the proponents had provided on WP2, specifically the breakdown of staff costs and who was responsible for what work. Members discussed the fact that the WP tasks were spread out over each participating institute with fractions of staff effort being spent on each sub work package. The panel also discussed the issue of using ring fenced Rolling Grant staff from the ATLAS project. It was agreed that the effort was small and hence the panel were satisfied that there would be no impact to ATLAS.
- 3.4 The panel were satisfied with the answers to the remaining questions on WP 2, that it was hard to predict what a future DAQ solution might be. It was agreed that this would be a common problem. The panel felt that workpackages 2.1 – 2.3 were needed to work towards the TDR but that WPs 2.4 and 2.5 were generic R&D. The panel discussed the requirement for all of the sub work packages in WP2 and questioned whether they were all necessary for the TDR date of 2009. Members agreed that WP 2.5 could be seen as a generic and stand alone package.
- 3.5 The panel agreed that there was currently no world leader in the DAQ work and that the proponents had the potential to take the lead in this area. It was agreed that if the proponents did indeed achieve all they stated in WP2 then they would be the world leaders in this area.
- 3.6 On the cost side of the WP, the panel felt that WP 2.5 could be removed, representing a cost saving of £125k and felt that the £29k of travel money was reasonable as the proponents had to establish international leadership in this area.
- 3.7 The panel discussed WP3 and the proponent's answers to questions in this area. Previously the panel had not been convinced about the validity of the MAPS application but felt re-assured with the answers given by the proponents.
- 3.8 The proponents had stated that they could achieve a signal to noise ratio of 20 in their replies. Although the panel felt that this had not yet been demonstrated they felt that it was important to demonstrate this in a test beam and that this work should be started immediately.
- 3.9 The panel discussed the suggestion of putting in a review point after 1 or 2 years of the project. They felt that after 1 year, not enough information would be known and at 2 years there maybe a danger of losing RAs if they were not funded for the full period of the project.
- 3.10 The panel felt that MAPS were a viable solution and in order to make the technology work for this application the proponents should be strongly linked with the MAPS R&D work that was going on. The panel felt that the critical issue was knowing what the efficiency of the sensors were at the S/N of 20.
- 3.11 The panel agreed that if successful, this work would be exciting and could have benefits to the Linear Collider. Specifically, if the technology was successful, the

calorimeter could be made smaller and this had serious implications in reducing the cost of the LC detector.

- 3.12 On WP4 the panel agreed that the work was necessary but remained unconvinced that it was urgent. The proponents were bidding for money to ramp up production of the SiW detectors and to support some of the mechanical issues surrounding the calorimeter design. It was agreed that the proponents should engage with industry as much as possible on this work. The panel rated this WP as a lower priority than the others as it felt the work to be useful but not essential but noted that the requested resource was low and the effort on a small scale.
- 3.13 The panel made the following financial recommendations (note that the figures given in the table below are new money only and do not include current staff on rolling grants) –

Work Package	Cost new money (£K)	Alpha grade	Recommendation
Work package 1 – Completion of test beam work	274	5	274
Work package 2 – Data Acquisition	348	5	223
Work package 3 – Monolithic active pixel sensors	739	5	739
Work package 4 – Mechanical and thermal studies	50	3	50
Work package 5 – Simulation and physics	311	5	311
			Total = £1.597M

- 3.14 The panel had specific comments on the following areas of the proposal –

Management

The PI is competent and the group have a good track record, there is a suitable management structure. CALICE is the only significant collaboration in this area and the UK has a significant role in the collaboration.

The panel recommends that any Oversight Committee should closely look at a sensible way of splitting effort over the institutions as the proponents were proposing 5 separate new RAs (1 per institute) who would split their time over WPS.

Science

If successful the project could make significant impact to the LC.

Momentum

The project has a lot of support from the wider community and has gained a significant momentum due to the size of its collaboration.

Risk

The panel felt that there was risk that the MAPS application would not work but felt that the work was essential to prove this one way or the other.

Appendix 1

Extract from February meeting minutes CALICE

5.0 CALICE (CALorimeter for the LInear Collider with Electrons) discussion
Background info and discussion – CALICE

The background to the CALICE request was discussed. CALICE is an international project with UK collaborators spanning several institutes which focuses on developing calorimetry for a future ILC detector. The current focus for CALICE is the construction and testing of prototypes of highly granular calorimeters, using suitable technologies suitable for the ILC, in test beams during 2005 – 2006.

The CALICE UK groups were approved by the PPRP in 2002 for an initial programme within the international CALICE collaboration. This was to provide readout electronics and DAQ software for a CALICE electromagnetic calorimeter, and also to contribute to the software and analysis efforts. For the past 2 years, this work has been funded by PPARC through the PPRP's seed corn fund. They were originally awarded 2 years of funding with the final year contingent on progress and a more directed R&D programme to be submitted after the 3 year seed corn period.

The proposal is in two parts. The first is the completion of the test beam campaign and analysis of the data, at £274K of new money. The request was for this work to be funded from the seed corn fund.

The second is to perform further generic R&D for ILC calorimetry, working towards technical design reports in 2009. The stated intention of the project is that the UK will be well placed to design and construct a substantial part of the calorimeter for an ILC detector.

As the request was in two parts the PPRP had to assess these and make funding recommendations on each. The second part of the request would have to go to the SC for a funding decision. The panel were informed that there was no explicit pot of money set aside for this project in the SCs planning tables. There was however some funds for general Linear Collider work set aside. However a future request for the LCFI project was likely to bid for this money as well.

The proponents had received four referee's reports on their proposal and had sent replies to these comments prior to the meeting. The only area raised by referees that the proponents did not explicitly address was the MAPS development. It was hoped that this would be addressed in the presentations and subsequent Q&A. One PPRP member who was not able to make the meeting also provided comments which added to the discussions.

The panel felt that the proponents had answered all of the referee's questions adequately in their presentation.

4.2 Request

The request is for 5 work packages totalling £1720K in new money with £207K requested from seed corn funds (WP1) and the rest from the major project funding line (WPs 2-5). The request was for the funds for WP1 to be taken from the seed corn line and the funds for the remaining WPs to come from the Science Committees major project fund at ~ £1500K.

WP1 - Completion of test beam work, data taking and exploitation of data.

WP2 - Data Acquisition, Generic R&D which addresses issues associated with reading out a highly granular and compact detector.

WP3 - Monolithic active pixel sensors (MAPS), Investigation of digital readout of small pixels using MAPS technology.

WP4 - Mechanical and thermal studies, Investigation of issues connected with heat flow and thermal modelling and the assembly of large silicon pad arrays.

WP5 – Simulation and Physics, Develop tools and simulation studies in order to participate in global detector design and optimisation.

Work Package	Cost new money (£K)	Total cost to PPARC (£K)
Work package 1 – Completion of test beam work	274	298
Work package 2 – Data Acquisition	348	720
Work package 3 – Monolithic active pixel sensors	739	944
Work package 4 – Mechanical and thermal studies	50	167
Work package 5 – Simulation and physics	311	352

Total request (£K)	05/06	06/07	07/08	Total
New money totals	359	657	704	1720
Total cost to PPARC	513	903	1067	2482

4.3 Groups & collaborators: UK involvement, track record, management

The CALICE collaboration is currently undertaking an R&D programme into calorimetry for the ILC and is the biggest group undertaking this area of R&D with 167 members from 26 institutes worldwide including America, Asia and Europe.

The UK institutes involved in the bid are: Birmingham University, Cambridge University, University College London, Manchester University, Imperial College, Royal Holloway, University of London and RAL. There is an intention that the Edinburgh HEP group join CALICE in the near future and a letter of intent was received by the panel to this effect.

The UK groups joined CALICE 2 years ago with funding from the PPRP. The panel were extremely pleased with their progress and track record to date. Therefore the panel were keen to see this work completed.

The CALICE collaboration have several management committees. The overall direction of the collaboration is determined at the Steering Board where the UK has representation from the UK spokesperson. There is also a technical Board which the UK has two representatives on. The proposed UK management is based on the past two years experience of work.

4.4 Technology

On WP3 (MAPS), the panel felt that the MAPS were not technically mature enough. There are other MAPS projects in the UK and a further one in Strasbourg. The panel felt that a lot more CALICE specific modeling needed to be done on MAPS.

The PPRP had already funded seed corn work on MAPS by Renato Turchetta and work was on-going at DESY. The Panel would have liked to see the work programme presented with some explicit staging and felt that this was a weakness of the bid. The panel felt that the proponents could identify a decision point after ~12 months where work could be stopped if the MAPS technology is shown to be non-viable either for technical or managerial/political reasons. For WP3, the panel invited a revised submission to include more technical detail on the current status of MAPS work, i.e. performance of existing sensors and simulations of the calorimetry application. The panel also requested more MAPS simulations.

On WP4 (mechanical), the Panel questioned whether the work proposed was too early given the timescales for LC experiment construction. In particular the justification for work on assembly robots at this time was felt to be lacking. Members agreed that any revised submission should address the question of what was required for the 2009 Technical Design Report.

On WP2 (DAQ), similar issues arose as to whether the work was too early. In particular where specific technologies have been selected for study (PCI Express), the value of the work needs to be clarified given that it is unlikely this will be the technology of choice for the final LC DAQ. The panel felt that the proponents could link into industry to do their process industrialisation but again felt this was pre-mature. Again, the revised submission should address what was really needed for the TDR.

Of the five workpackages included in the proposal, the Panel did not require any changes to WP1 and WP5.

4.5 Timeliness & competition

The proponents claim that the WPs proposed will put them in a position to define its contribution to the ILC detector Technical Design Reports (TDR) call to be submitted in 2009. This is building towards an ILC on the timescale of the first collisions in 2015. The panel felt that there were proposed areas of work in WPS 2, 3 and 4 that were pre-mature these are detailed under section 4.4. This was based on the Linear Collider running in 2017 which would mean a build phase in 2014. Therefore the panel felt that design taking place just now may be out of date by this time.

In order to position itself to be involved in a future ILC detector the proponents have adopted an approach of studying both electromagnetic (ECAL) and hadronic (HCAL) calorimeters. They are the only collaboration taking this approach.

4.6 Conclusion

The panel requested a re-submission of the proposal to address the concerns raised in section 4.4. This will be assessed at the next PPRP meeting.