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WP2 : Beam Delivery System

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ASTeC, STFC, Daresbury Laboratory

4th EUROTev Annual Meeting, DESY

30th January 2009

WP2 : Beam Delivery System

- ❑ Beam delivery System Lattice Design (BDSL)
(CEA, CERN, Manchester, JAI, LAL, STFC)
Task leader : Deepa Angal-Kalinin
- ❑ Crab Cavity RF System Design (CRABRF)
(Lancaster, Manchester, STFC)
Task leader : Amos Dexter
- ❑ Fast Beam Based Feedback (FFBK)
(Oxford, STFC)
Task leader : Phil Burrows
- ❑ Spoiler Wake Field and Mechanical Design (SWMD)
(Birmingham, Lancaster, Manchester, CERN, TEMF, STFC)
Task leader : Nigel Watson
- ❑ Super Conducting Final Doublet technology R & D (SCFD)
(CEA)
Task leader : Olivier Napoly

Beam Delivery System Lattice Design

(CEA, CERN, Manchester, JAI, LAL, STFC)

ILC

- 2mrad minimal extraction line and final focus design with designed extraction magnet parameters.
- Collimation performance optimisation for the RDR lattice.
- Performance and tuning of 14 mrad IR region.

CLIC

- Optimised BDS design for 500 GeV CM and 3 TeV CM with shorter final focus systems.
- Review of collimation design for new CLIC parameters.
- Performance simulations on the Beam diagnostics section.
- Tuning studies based on minimisation algorithms instead of knobs.

ATF/ATF2

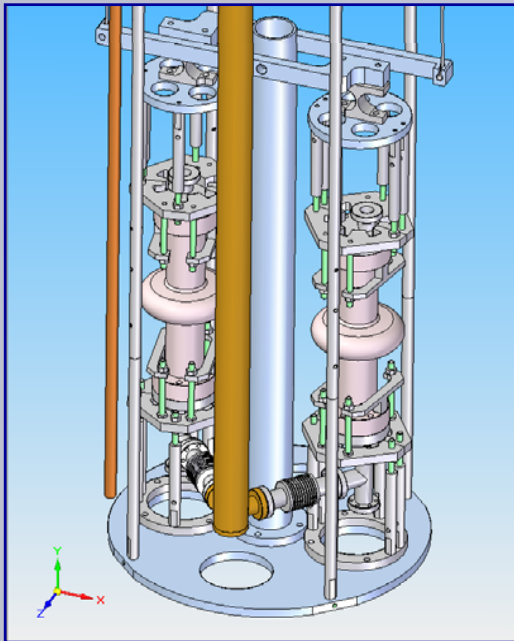
- Emittance growth investigation, emittance measurements.
- Development of tuning procedures.
- Pushed beta optics (ILC pushed and CLIC regime).

Task Summary : EUROTeV-Report-2008-078

Crab RF

(Lancaster, STFC, Manchester)

- Testing of a LLRF system which could synchronise the phases of two cavities to the required tolerance for ILC crab cavities.
- A vertical cryostat facility has been established at STFC Daresbury.
- These tests have now been completed and the required synchronisation has been achieved.



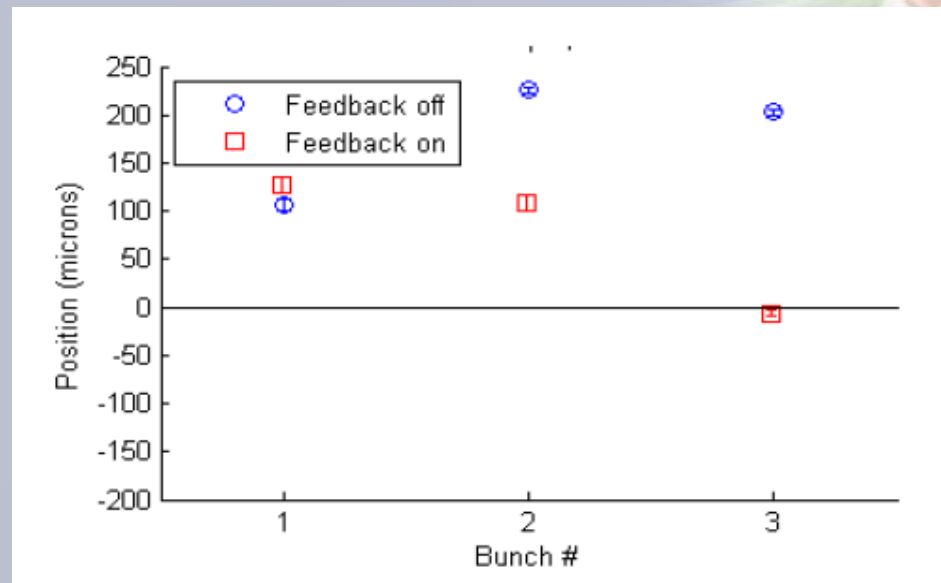
2 x 3.9 GHz SRF crab cavities in vertical cryostat to verify LLRF control and synchronisation.

Final Deliverable :
EUROTeV-Report-2008-064
EUROTeV-Report-2008-073

Fast Beam Based Feedback

(Oxford, STFC)

- Development and testing of prototype hardware for the ILC intra-train beam-based feedback system.
- Basic functionality demonstrated for ILC.
- The linearity and resolution of BPM processors were tested under a variety of beam conditions in January, March and May'08. Alternate processing scheme was tested and looks very promising.
- Feedback system operation at ATF, with particular attention to quality of the feedback.

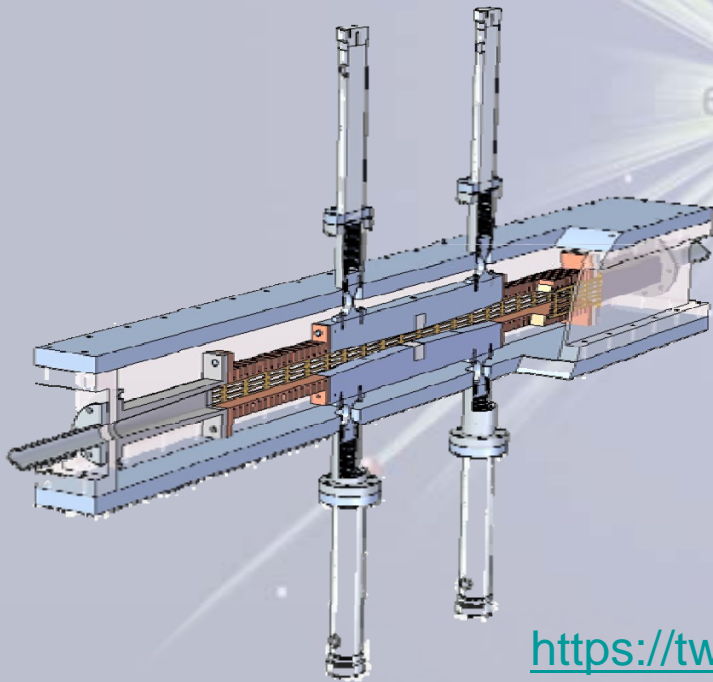


Task Summary :
EUROTeV-Report-2008-074

Spoiler Wake Fields and Mechanical Design

(Birmingham, Lancaster, Manchester, CERN, TEMF, STFC)

- Wake field tests (T480) at ESA, MAFIA/GdfidL simulations and data analysis.
- Beam damage simulations (FLUKA/Geant4, ANSYS). Beam damage test beam at ATF (phase 1) (Feb./Mar. 2008), Proposed phase 2 (using stress waves) in ATF2 extraction line.
- First draft engineering design of ILC spoiler was presented at EPAC08.



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*Final Deliverable:
EUROTeV-Report-2008-044
EPAC08 paper*

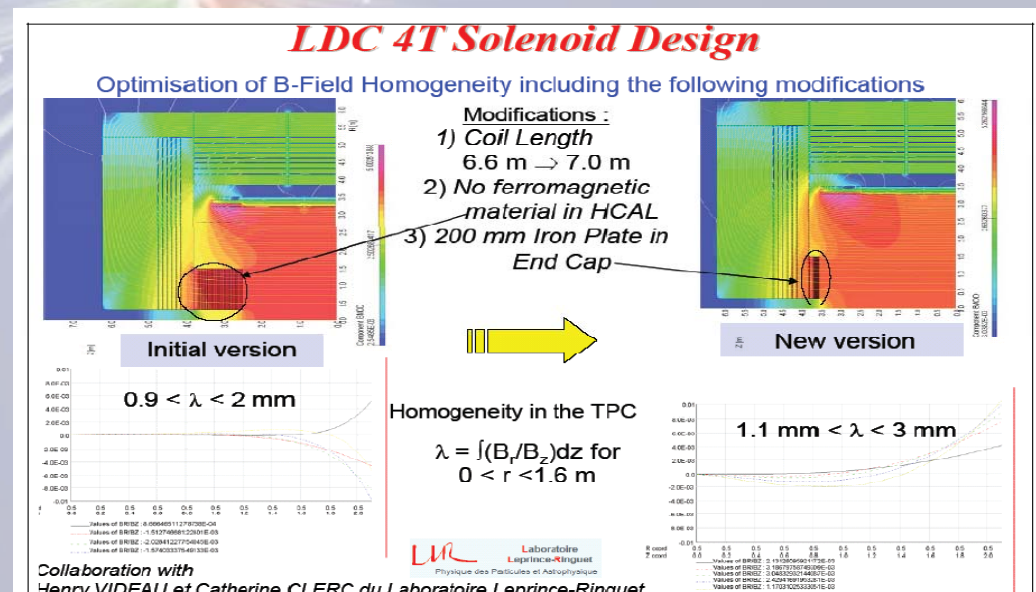
<https://twiki.cern.ch/twiki/bin/view/ILCBDSColl/WebHome>



Super conducting Final Doublet Technology (CEA)

- The construction of the 1m long superconducting quadrupole prototype with Nb₃Sn conductors is completed (not part of the EUROTeV contract).
- This task did not deliver the cold test of the Nb₃Sn superconducting quadrupole embedded in the 2-4 T solenoid field.
- The 3D magnetic and mechanical modelling efforts initiated by this task, both for the quadrupole and for the solenoid magnets, lead the way to a successful investigation of the ILC interaction region properties.

Task Summary :
EUROTeV-Report-2008-079



Milestones

Milestone Name	Planned (in months)	Achieved (in months)	Comments
Detailed scope and planning report to First Workshop	6	6	
Presentation of results and detailed implementation at second workshop	18	25	
Presentation of phase 2 results to Third workshop; plans for GDI-TDR input and further R&D (phase 3 & beyond)	30	30	
Optimised BDS lattice design with component specification available.	30	30	EUROTeV-Report-2008-078
Demonstration of high-field super conducting quadrupole in strong solenoid complete	48	Not achieved	EUROTeV-Report-2008-079
CRAB RF low-power systems test (including phase stability studies) available.	48	46	EUROTeV-Report-2008-073 Report-2008-064
Mechanical spoiler design complete	48	42	EUROTeV-Report-2008-044 EPAC'08
Demonstration of prototype intra-train feedback and scanning systems available.	48	36	EUROTeV-Report-2008-074

Deliverables

Deliverable Name	Planned (in months)	Achieved (in months)	Comments
Fully documented optimised BDS lattice, including component (magnet) specification	30	30	EUROTeV- Report-2008-078
Engineering design for ILC mechanical spoiler, including prototype evaluations of wakefield and beam-damage performance	48	42	EUROTeV- Report-2008-044 EPAC'08
Prototpye intra-train feedback stabilisation and scanning system	48	40	EUROTeV- Report-2008-074
Report on CRAB RF low-power prototype tests, including phase-stability system	48	47	EUROTeV- Report-2008-073 Report-2008-064
Report on demonstration of superconducting quadrupole in strong solenoid field	48	Not achieved.	EUROTeV- Report-2008-079

Summary

- BDS work package has delivered most of the milestones and deliverables.
- There was a change in programme for SCFD task due to resources issues and technical problems. The changed programme has lead to a successful investigation of the ILC interaction region properties.
- There are task summaries for 3 tasks (BDSLD, FFBK,SCFD). The deliverables of other two tasks (SWMD, CRABRF) have been covered in one/more EUROTev reports.
- The work package has delivered 80 EUROTev reports + 3 journal publications (+ few in preparation).
- Thanks to all the Task Leaders and the contributors.