EUROTeV-Report-2005-022-1

Work Plans of the EUROTeV Technical Work Packages for 2005-2007

Edited by
G Blair[1], K Büßer[2], J Clarke[3], E Elsen[2], S Guiducci[4], G Guignard[5], D Angal-Kalinin[3], D Schulte[5], N Walker[2], F Willeke[2] and Y Karyotakis[6]

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Abstract

This report summarises the status of the work in the seven scientific Work Packages of EUROTeV as presented during the ILC-European Regional Meeting at Royal Holloway in June 2005. The purpose of the meeting was to monitor the progress and to contrast the developments inside EUROTeV with the worldwide developments of the GDE. The presentations of the entire meeting are available from http://www.pp.rhul.ac.uk/workshop/.

[1] Royal Holloway, University of London, UK
[2] DESY, Hamburg, D
[3] CCLRC Daresbury Laboratory, UK
[4] INFN-LNF, Frascati, I
[5] CERN, Geneva, CH
[6] CNRS/IN2P3, LAPP Annecy, F

1 Introduction

The ILC-European Regional meeting was held at Royal Holloway, University of London, June 20-23, 2005. More than 130 experts gathered to discuss the progress and further directions of the ILC research within the framework of the emerging Global Design Effort (GDE). The milestones and goals laid down in this report by the respective task leaders thus do not correspond to the official project milestones of the EUROTeV Design Study of Annex I of the Contract. The work package coordinators have compiled the work package reports.

2 Work Package 2: Beam Delivery System

2.1 Introduction

EUROTeV Work package 2 (BDS) consists of five tasks

- BDSLD; Beam delivery System Lattice Design
- CRABRF ; Crab Cavity RF System Design
- FFBK; Fast Beam Based Feedback
- SWMD; Spoiler Wake Field and Mechanical Design
- SCFD; Super Conducting Final Doublet technology R & D

An overview of the tasks including the contact people and main objectives is presented in Table 1. Detailed milestones, deliverables and Gantt charts are presented in the following sections.

Task	Contact Persons	Task Reporter	Objectives (measurable + verifiable)	Deliverables
BDSLD	D. Angal-Kalinin (CCLRC) O. Napoly (CEA) F. Zimmermann(CERN)	D. Angal-Kalinin	Complete lattice design for ILC BDS with two IRs Extraction scheme for ILC for main IR. Collimation efficiency estimations Exploration of potential non-linear collimation system	Report on complete BDS lattice design with two IRs for ILC Lattice decks for BDS for 2 IRs Lattice decks for extraction lines for two IRs
CRABRF	A. Dexter (ULAN) M. Dykes (CCLRC)	A. Dexter	Design of high power crab cavities RF system model for phase stability performance. Klystron design and performance studies Design of high power prototype	Prototypes of two crab cavities Low Power source available Evaluation/Development of phase control system Phase testing of crab cavities Final report on SC crab cavity system
FFBK	P. Burrows (QMUL) A. Kalinin (CCLRC)	P. Burrows	Design & fabrication of BPMs and kickers for nm-level Experimental set up in the beamline for stabilisation of long bunch train Design and development of intra-train beam-beam deflection system	Prototypes of BPMs and kickers for nanometer level feedback and their tests. Experimental verification of feedback . Prototype amplifier and BPM and their tests
SWMD	N.K.Watson(Birmingham/CCLRC) W.Mueller (TUD) I.Zagorodnov (DESY) A.Sopczak (Lancaster) R.Barlow (Manchester) F.Zimmermann (CERN)	N. Watson	design / optimisation of mechanical spoiler systems 2/3D modelling of single- and multi-bunch wakefields benchmarking of wakefield calculations against experiments studies of spoiler damage scenarios material tests with high powered beams	Engineering design for ILC mechanical spoiler, including prototype evaluation of wakefield and beam damage performance
SCFD	O. Napoly (CEA)	O. Napoly	SC final doublet test station Solenoid installation Experiment of high-field s/c quadrupole in	Demonstration of feasibility for LC final doublet

			a 2T external solenoid	

Table 1: Overview of the BDS work packages

2.2 Details of the sub-tasks

In the following sections, the individual sub-tasks of WP2 are detailed, with milestones, Gantt charts and Deliverables.

2.2.1 BDSLD – Beam Delivery System Lattice Design

Task Manager: D. Angal-Kalinin (CCLRC)

2.2.1.1 Milestones

- Goal 1. Train new RAs in the field.
  - **1.1** Jan 05 : Advertise RA positions at CERN and CEA
  - **1.2** Sep 05: Recruit RA at CERN
  - **1.3** June 05: Recruit RA at CEA
- Goal 2. Design of extraction lines.
  - **2.1** June 05: 2 mrad extraction line design including diagnostics.
  - **2.2** Aug 05 : Decide between long and short final doublet
  - **2.3** June 06: Comparative studies of performance of 2 mrad and 20 mrad extraction line designs.
- Goal 3. Collimation optics studies
  - **3.1** May 05: Estimates of collimation depths for 20 mrad and 2 mrad.
  - **3.2** Jun 05: Collimation optics studies for 20 mrad BDS deck, modify the optics/spoiler openings for better efficiencies in collaboration with WP6.
  - **3.3** Sep 05: Collimation optics design for 2 mrad deck, modify the optics/spoiler openings for better collimation efficiencies in collaboration with WP6.
- Goal 4: Exploration of Nonlinear collimation system
  (Goals 4.1-4.4 : CERN for CLIC, goal 4.5: CEA for ILC)
  - **4.1** June 05 : Develop temporary optics for nonlinear energy collimation, determine its performance and shortcomings.
  - **4.2** Dec 05 : Attempt to shorten the temporary design and to improve its performance.
  - **4.3** March 06 : Simulate the application of the nonlinear system to LHC and draw conclusions on possible weaknesses of the nonlinear collimation from the pertinent cleaning efficiency.
  - **4.4** June 06: Get a feedback from WP6 about the comparison of collimation efficiency of nonlinear system with linear collimation system to improve upon the lattice.
  - **4.5** Dec 07: Build a collimation optics including octupoles that realizes the tail folding at the final doublet location.
- Goal 5: Final focus optimisation
  - **5.1** July 05: Optimise the final focus lattice for 2 mrad final doublet.
  - **5.2** Sep 05: Compare performances of 2 mrad vs 20 mrad final focus
  - **5.3** April 06: Produce designs for different L* for 20 mrad and 2 mrad.
- Goal 6: Optimise the lattice for fast extraction and machine protection.
  - **6.1** Jul 05: Study the US cold machine fast extraction scheme
  - **6.2** Oct 05: Suggest alternate scheme for fast extraction

  - **6.3** April 06: Understand the impact on the layout configuration
- Goal 7: Optimise the lattice for beam diagnostics (with WP5)
  - **7.1** Aug 05: work out the optics details of the diagnostics section using laser wire.
  - **7.2** Sep 06: Decide locations of beam diagnostics devices in the BDS.
  - **7.3** Oct 06: Input results to ILC base-line design.
  - **7.4** Jun 07: Present an optimised diagnostics section for ILC

2.2.1.2 Gantt Chart

WP2: BDSLD												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Train new RAs	1.1		1.2									
Extraction line design	==	2.1		2.2		2.3						
Collimation optics design	==	3.1	3.2	3.3	==	3.4						
Exploration of non linear collimation		==	4.1	4.2	4.3	==	4.4	==	==	==	==	4.5
Final focus optimisation		==	5.1	5.2	5.3							
Fast Extraction			6.1	6.2	6.3							
Optics for beam diagnostics			7.1	==	==	==	==	7.3	==	7.4		
Complete BDS optics design												

2.2.1.3 Deliverables

The deliverables in Jan 2008 are the following.

1. Design configuration for two interaction regions for the ILC.
2. Complete BDS design for two interaction regions for the ILC
3. BDS lattice decks for two interaction regions.
4. Extraction line designs and lattice decks.
5. Optimised diagnostics optics.
6. Report on non-linear collimation studies for CLIC.
7. Report on octupole tail folding for the ILC.

2.2.2 CRABRF – Crab cavity RF system design

Task Manager: A. Dexter (ULAN)

2.2.2.1 Milestones

- Goal 1. Recruit new RAs
  - **1.1** June 05 : Advertise RA positions at ULAN
  - **1.2** July 05 : Recruit LC-ABD RA at CCLRC
  - **1.3** Sep 05 : Recruit new RA at ULAN
- Goal 2. Train new RAs in the field.
  - **2.1** Apr 06: Study of crab cavity effects on beam dynamics.
  - **2.2** Jul 06: Working with international community establish crab cavity requirements for likely crossing angles and possible locations.
  - **2.3** Jul 06: Study of effect of HOMs on beam dynamics.
  - **2.4** Oct 06: Development of RF system model (phase stability performance).

    - **2.5** Jan 07: Possible recommendation on development of a superconducting crab cavity.
- Goal 3. Cavity and RF Design and Development
    - **3.1** Apr 06: Electromagnetic design of a three cell 1.3GHz dipole superconducting cavity including couplers and system for damping higher order modes (HOMs).
    - **3.2** Jul 06: Numerical multipacting study for a three cell 1.3GHz dipole cavity.
    - **3.3** Oct 06: Development of LOM damping of system.
    - **3.4** Jan 07: Manufacture and testing of normal conducting prototype cavity.
    - **3.5** Jan 08: Full design recommendations with respect to electromagnetic design, electronic design and thermal design.
- Goal 4. Phase Stability Experiments
    - **4.1** Apr 06: Measurements of Klystron/IOT performance available.
    - **4.2** Apr 06: Phase control measurements/experiments on ERLP defined.
    - **4.3** Jul 06: Phase control measurements/experiments on ERLP set up.
    - **4.4** Jul 06: Klystron/IOT performance simulation established.
    - **4.5** Jan 07: Establish validity of phase control model.
    - **4.6** Apr 07: Evaluation/development of phase control system.
    - **4.7** Oct 07: Phase performance tests complete.
    - **4.8** Oct 07: Proposal for high power tests of crab cavity system.
    - **4.9** Jan 08: Final report on Klystron/IOT performance complete.

2.2.2.2 Gantt chart

WP2: CRABRF												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Recruit new RAs		1.1	1.2	1.3								
Crab cavity effects	==	==	==	==	**2.1**							
Crab cavity parameters	==	==	==	==	==	**2.2**						
Effects of HOMs				==	==	**2.3**						
RF system model					==	==	**2.4**					
Three cell em design			==	==	**3.1**							
Multipacting study				==	==	**3.2**						
LOM damping system design				==	==	==	**3.3**					
NC cavity manufacture and testing						==	==	==	**3.4**			
Full design recommendations								==	==	==	==	**3.5**
Tube performance tests				==	**4.1**							
ERLP phase control / measurements				==	**4.2**	==	**4.3**	==	==	**4.6**	**4.7**	
Estb. tube performance simulations					==	==	**4.4**					
Phase control studies							==	**4.5**				
Tube performance simulations/report								==	==	==	==	**4.9**

2.2.2.3 Deliverables in January 2008

1. Report on crab cavity effects on beam dynamics
2. Report on crab cavity requirements for both the interaction regions
3. Proposed crab cavity design including couplers and system for damping HOMs

4. Evaluation/Development of phase control system
5. Klystron/IOT design and performance studies (looking at inherent phase jitter)
6. Proposal for high power testing
7. Detailed report on crab cavity system for the ILC
8. Report on klystron/IOT performance

2.2.3 FFBK – Fast Feedback

Task Manager: P. Burrows (QMUL)

2.2.3.1 Milestones

- Goal 1. Design and fabrication of prototype feedback system components
    - **1.1** April 05: FONT3 analog prototype intra-train feedback components ready
    - **1.2** May 05 : Beam tests at ATF
    - **1.3** Dec 05 : Beam tests in closed-loop feedback mode
- Goal 2. Experimental setup for stabilization of long bunch train for ILC
    - **2.1** March 06: Design of prototype digital feedback circuit
    - **2.2** June 06: Design of modified BPM signal processor
    - **2.3** Oct 06: Design of power amplifier
    - **2.4** Dec 06: Beam tests in closed loop feedback mode with ILC like short bunch train at ATF
- Goal 3: Design of system for intra-train and beam –beam deflection scans at ILC
    - **3.1** April 07 : Design of improved version of FONT4 digital system hardware
    - **3.2** Aug 07: Develop algorithms for optimized feedback and deflection-scan
    - **3.3** Oct 07:Fabrication of improved digital hardware
    - **3.4** Dec 07: bench tests (beam tests with ILC like long bunch-trains if possible)

2.2.3.2 Gantt Chart

WP2: FFBK												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
FONT3 analog prototype intra-train feedback components	==	**1.1**										
Beam tests at ATF		**1.2**										
Beam tests in closed-loop feedback mode				**1.3**								
Design of digital FB prototype					**2.1**							
Design of BPM signal processor						**2.2**						
Design of power amplifier							**2.3**					
Beam tests w. short ILC bunchtrain								**2.4**				
Design of improved version of FONT4 digital system hardware									**3.1**			
Fabrication of improved digital hardware											**3.3**	
Bench tests(beam tests)												**3.4**

2.2.3.3 Deliverables

The deliverables in Jan 2008 are the following.

1. Prototypes of feedback system components
2. Report on beam tests for FONT3
3. Prototypes of digital feedback system components
4. Report on Beam tests with digital feedback
5. Improved prototypes of ILC beam feedback/scanning components
6. Report on bench tests (and beam tests if available)

2.2.4 SWMD – Spoiler Wakefield and Mechanical Design

Task Manager: N.K. Watson (Birmingham / CCLRC)

2.2.4.1 Milestones

- Goal 1. Recruit new RAs
  - **1.1** June 05 : Advertise RA positions (CCLRC, UMAN,CERN)
  - **1.2** Oct 05 : Recruit RAs
- Goal 2. Collimator requirements
  - **2.1** Jul 05: Analysis of machine failure modes
  - **2.2** Oct 05: Estimates of collimator damage (steady state and transient)
  - **2.3** Jan 06: Report on requirements specification for LC spoilers (power density, vacuum, jitter amplification, halo removal)

- Goal 3. Bench test measurements
  - **3.1** Apr 05: Investigate design of short collimators, proposals for tests (e.g. single or multiple steps, linear, non-linear tapers)
  - **3.2** Aug 05: Bench tests in frequency domain (at Daresbury)
  - **3.3** Oct 05: Report on use of bench test results for spoiler design

- Goal 4. Wakefield simulations
  - **4.1** Jun 05: Survey existing work/familiarisation with current tools
  - **4.2** Jul 05: Baseline 3D wakefield sim. of ESA beam test proposal spoilers (MAFIA)
  - **4.3** Nov 05: Predictions for geometric, resistive collimator wakefields, and corresponding jitter enhancements at IP for baseline ILC collimation configuration
  - **4.4** Jan 06: Predictions for ESA test spoilers, alternative models
  - **4.5** May 06: Predictions for stage 2 ESA tests
  - **4.6** Jul 06: Feedback on 1st version of ECHO-3D to developers
  - **4.7** Jan 07: Predictions for stage 2 ESA tests with updated models
  - **4.8** Jun 07: Feedback on 2nd version of ECHO-3D to developers
  - **4.9** Dec 07: Final report, summary of simulation results

- Goal 5. BDS input
  - **5.1** Jun 05: Analytic wakefield predictions in Merlin
  - **5.2** Nov 05: Parametrisation of wakefield predictions from existing tools (MAFIA, etc.)
  - **5.3** Dec 06: Parametrisation of wakefield effects using ECHO-3D

- Goal 6. Spoiler wakefield beam tests
    - **6.1** Apr 05: Detailed proposal for tests using collimator wakefield test beam at SLAC End Station A
    - **6.2** Aug 05: Design drawings for spoiler prototypes
    - **6.3** Oct 05**:** Spoiler jaws fabricated (CCLRC)
    - **6.4** Nov 05: ESA beam test (1 week)
    - **6.5** Mar 06: Present results on comparison of data/models
    - **6.6** May 06: Proposal for further beam tests at SLAC
    - **6.7** Dec 06: Complete stage 2 of ESA tests
    - **6.8** Mar 07: Present results from stage 2 of ESA tests
    - **6.9** Dec 07: Final report on wakefield beam tests

- Goal 7. Develop 3D wakefield modelling package
    - **7.1** Jun 05: New RAs review existing calculations/codes (ECHO-2D, etc.)
    - **7.2** Jul 05: Areas of largest theoretical uncertainty where data most beneficial identified
    - **7.3** Nov 05: Requirements analysis/benchmark definitions for package
    - **7.4** Dec 05: Interim report on software design
    - **7.5** Mar 06: First public version ECHO-3D available to collaboration for user testing, comparison with ESA test beam data/benchmarks
    - **7.6** May 06: Input to stage 2 ESA beam test proposal from spoiler optimisation using ECHO-3D
    - **7.7** Mar 07: Second public version of ECHO-3D to collaboration for
    - **7.8** Dec 07: Final report on ECHO-3D: new code suitable for ILC regime (long structures, short bunches), with predictions verified by experimental data

- Goal 8. Damage studies
    - **8.1** Aug 05: Familiarised with simulation tools (Fluka, ANSYS, …)
    - **8.2** Oct 05: Report on survey of materials
    - **8.3** Nov 05: Decide facility for beam damage studies (small spot size, high charge density)
    - **8.4** Jan 06: Simulation of thermal transfer and structural processes within material (probably titanium, possibly also graphite)
    - **8.5** May 06: Simulation of influence of new spoiler design on absorbers (using e.g. FLUKA and GEANT4).
    - **8.6** Apr 06: Damage predictions for baseline spoiler design
    - **8.7** May 06: Proposal for beam test damage studies using small samples, comparison with modelling
    - **8.8** Feb 07: Present analysis of damage tests, comparison with simulations
    - **8.9** Dec 07: Final report on damage studies

- Goal 8. Optimal spoiler design
    - **9.1** Jun 07: Present review of wakefield beam tests, 3D wakefield simulations, damage studies and ECHO-3D status
    - **9.2** Dec 07: Optimal spoiler design to achieve requirements (geometry, material)

2.2.4.2 Gantt Chart

WP2: SMWD												
Financial Year	Jan 2005				Jan 2006				Jan 2007			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Recruitment		1.1	1.2									
Collimator requirements												
Analyse failure modes of machine		==	2.1									
Estimate collimator damage			==	2.2								
Spoiler requirement specification				==	2.3							
Bench test measurements												
Investigate various geometries	==	3.1										
Bench test measurements		==	3.2									
Final report on bench tests			==	3.3								
Wakefield simulations												
Survey/tool familiarization	==	4.1										
Baseline wakefield sim., ESA proposal spoilers		==	4.2									
Calc. geom/resist.wakes and jitter enhancement			==	4.3								
Alternative 3D sim., ESA proposal spoilers				==	4.4							
3D wakefield sim., stage 2 ESA proposal					==	4.5						
Feedback on 1st version of ECHO-3D					==	==	4.6					
Updated predictions for stage 2 ESA tests								==	4.7			
Feedback on 2nd version of ECHO-3D									==	4.8		
Final report, simulation summary										==	==	4.9
BDS input												
Analytic wakefields in Merlin	==	5.1										
Wakefield parametrisation, MAFIA			==	5.2								
Wakefield parametrisation, ECHO-3D						==	==	5.3				
Spoiler wakefield beam tests												
Proposal for SLAC tests	==	6.1										
Design drawings for spoiler prototypes			6.2									
Fabrication of spoiler prototypes			==	6.3								
First ESA beam tests				6.4								
Data analysis, model comparisons				==	6.5							
Proposal for second stage ESA tests					==	6.6						
Stage 2 of ESA tests						==	==	6.7				
Data analysis, model comparisons									6.8			
Final report on beam test studies										==	==	6.9
Develop 3D wakefield package												
Review existing calc./code (ECHO-2D, etc.)	==	7.1										
Identify areas data required			7.2									
Define package requirements/benchmarks		==	==	7.3								
Interim report on software design				7.4								
Code development		==	==	==	==	==	==	==	==	==	==	
Testing/validation 1st public version ECHO-3D					7.5							
Spoiler optimization					==	7.6	==	==	==			
Testing/validation 2nd public version ECHO-3D									7.7			
Final report on ECHO-3D											==	7.8
Damage studies												
Familiarisation with tools (Fluka, etc.)		==	8.1									

Survey of materials			==	8.2								
Identify beam facility for damage studies				8.3								
Thermal transfer simulations			==	==	8.4							
Effect of new spoiler design on absorbers					==	8.5						
Baseline damage predictions					==	8.6						
Proposal for material damage studies						8.7						
Damage study beam tests							==	==	8.8			
Final report on damage studies										==	==	8.9
Optimal Spoiler design												
Review of all work									==	9.1	==	
Design of optimal spoiler (geometry, material)											==	9.2

2.2.4.3 Deliverables

The deliverables in Jan. 2008 are the following:

1. Specification of requirements for LC spoilers
2. Report on applicability of bench tests for ILC collimator design
3. 3D simulation of wakefields for various candidate spoiler prototypes
4. Parametrised wakefield characteristics of spoilers for full simulation of the BDS
5. Report on wakefield beam tests
6. ECHO-3D: new code suitable for LC regime (long structures, short bunches), with predictions verified by experimental data
7. Report on spoiler damage estimates and comparison with test beam data
8. Optimal spoiler design to achieve requirements (geometry, material, but not engineering)

2.2.5 SCFD – Superconducting Quadrupole Doublet

Task Manager: O. Napoly (CEA/Saclay)

2.2.5.1 Milestones

- Goal 1. Drawings of the adaptation of the adaptation of the 2T MNR solenoid to quadrupole horizontal test cryostat
    - **1.1** Sep 05 : Drawings ready
- Goal 2. 1.8K Test station adaptation
    - **2.1** Jan 06: Cryogenic line manufacturing
    - **2.2** Jan 06: Electrical connection manufacturing
    - **2.3** Jan 06: Instrumentation manufacturing
    - **2.4** July 06: Mechanical assembly
- Goal 3. 2T Solenoid installation (RMN530)
    - **3.1** Jan 06:Cryogenic line manufacturing
    - **3.2** Jan 06: Electrical connection manufacturing
    - **3.3** Jan 06: Instrumentation manufacturing
    - **3.4** July 06 : Mechanical assembly
- Goal 4. Quadrupole magnet assembly
    - **4.1** Aug 06: Assembly of full quadrupole by ACCEL
- Goal 5. Cold Tests
    - **5.1** Aug 06: Assembly of full quadrupole magnet in the test station

- **5.2** Oct 06: (quadrupole+solenoid) Cold tests
- **5.3** Dec 06: Test analysis and report

2.2.5.2 Gantt Chart

WP2: SCFD								
Financial Year	Jan 05				Jan 06			
Quarter	1	2	3	4	1	2	3	4
Drawings ready			1.1					
1.8K test station adaptation				==	==	==		
Cryogenic line manufacturing				==	2.1			
Electrical connection manufacturing				==	2.2			
Instrumentation manufacturing				==	2.3			
Mechanical assembly					==	==		
2T Solenoid installation				==	==	==		
Cryogenic line manufacturing				==	3.1			
Electrical connection manufacturing				==	3.2			
Instrumentation manufacturing				==	3.3			
Mechanical assembly					==	==		
Quadrupole assembly					==	4.1		
Cold Tests							==	==
Assembly of the quadrupole magnet in the test station							5.1	
Cold tests								5.2
Test analysis and report								5.3

2.2.5.3 Deliverables

1. Dec. 06: Report on test analysis and results

3 Work Package 3: Damping Rings

3.1 Introduction

WP3 is dedicated to study the critical items of the Damping Rings (DR) of linear colliders.

A description of the status and plans of the R&D activity in progress at the global level on the DR for the International Linear Collider (ILC) is given in [1].

EUROTeV Work package 3 (DR) consists of four tasks

- ECLOUD; Studies of Electron Cloud and other Instabilities.
- LETS; Low Emittance Tuning Simulations.
- RFSEP; Application of RF Separators to DR.
- WGLRDYN; Wiggler Field Modelling and Impact on Dynamic Aperture.

An overview of the tasks including the contact people and main objectives is presented in Table 2. Detailed milestones, deliverables and Gannt charts where adequate are presented in the following sections. A detailed description of the activities of the tasks has been presented at the 1st scientific EUROTEV Workshop [2, 3, 4, 5, 6, 7].

Task	Contact Persons	Task Reporter	Objectives (measurable + verifiable)	Deliverables
o ECLOUD	F. Zimmermann (CERN) R. Wanzenberg (DESY) C. Vaccarezza (LNF) R. Cimino (LNF) O. Malyshev(CCLRC) R. Reid (CCLRC)	F. Zimmermann	Quantitative understanding of e-cloud effect Evaluation of e-cloud effect for ILC DR Study of its mitigation techniques	Documented and experimentally benchmarked code for e-cloud simulations Report on impact of e-cloud and fast ion instabilities on DR performance, including recommendations for controlling the effects.
LETS	J. Jones (CCLRC) … (DESY)	J. Jones	Development and evaluation of beam based tuning algorithms for obtaining the required ultra-low emittance	Report on comparative studies of beam based alignement
RFSEP	D. Alesini (LNF) F. Marcellini (LNF)	F. Marcellini	Investigate the applicability of RF separator technologirs for injection and extraction with strong compression of bunch distance. Beam tests in CTF3	Report on possible use of RF separators for bunch train compression in DR. Report on tests in CTF3.
WGLRDYN	M. E. Biagini(LNF) S. Guiducci (LNF)	M. E. Biagini	Produce a correct and experimentally benchmarked model for the fields of wiggler magnet systems suitable for use in dynamic aperture optimisation simulations.	Report on impact of wiggler dynamics on DR dynamic aperture.

Table 2: Overview of the DR work package.

3.2 Details of the sub-tasks

In the following sections, the individual sub-tasks of WP3 are detailed, with milestones, Gannt charts and Deliverables.

3.2.1 ECLOUD - Studies of Electron CLOUD and other Instabilities.

Task Manager: F. Zimmermann (CERN)

3.2.1.1 Milestones

- Goal 1. Train one new RA and one new scientific associate (SA) in electron-cloud simulations
  - **1.1** Spring: Advertise positions at DESY & CERN
  - **1.2** July 05: Recruit new RA and SA.
  - **1.3** September 05: First set of simulations from newly hired staff.
- Goal 2. Benchmarking of the existing code for electron cloud build-up by comparison with other simulation results and experiments.
  - **2.1** May 05: Compare electron-cloud build-up simulations for SPS strip detector (flux for different numbers of batches and different inter-train gaps) with experimental results
  - **2.2** August 05: Compare predictions from electron-cloud build-up simulations for SPS COLDEX experiment (flux and heat load) with experimental results.
  - **2.3** June 06: Perform electron-cloud build up simulations for the DAFNE wiggler and perform qualitative comparison with measurements (pressure rise, beam instability, possibly designated electron detectors).
  - **2.4** June 06: Study efficiency of various proposed countermeasures in simulations.

  - **2.5** August 06: Study importance of electron build up in damping-ring quadrupoles.
- Goal 3. Benchmarking of the existing code to simulate the e-cloud instability by comparison with experiments, in particular in the SPS and DAFNE.
  - **3.1** December 05: Compare instability observations at the SPS and the instability suppression by higher chromaticity with simulation results.
  - **3.2** February 06: Compare experimental lifetimes at the SPS with HEADTAIL simulations of emittance growth below the fast instability threshold.
  - **3.3** October 06: Compare measured instability growth rates in DAFNE with single-bunch growth rates simulated by the HEADTAIL code and with multi-bunch growth rates estimated from the ECLOUD build-up simulations.
- Goal 4. Improvement of the simulation codes
  - **4.1** August 05: Implement realistic wiggler models for DAFNE representing the nonlinear wiggler fields before and after pole modifications [8, 9].
  - **4.2** August 05: Implement realistic wiggler models for the ILC damping ring and, possibly, for CLIC.
  - **4.3** August 05: Implement the possibility of extracting multi-bunch and coupled-bunch head-tail wake fields from the ECLOUD code.
  - **4.4** December 05: Improve the modeling of electron loss for vacuum chambers in a magnetic field, so that artificial drifts are avoided.
  - **4.5** February 06: Implement an antechamber geometry, and, if foreseen by the ILC design, also synchrotron radiation photon stops and/or clearing electrodes, in the ECLOUD code.
  - **4.6** May 06**:** Update ECLOUD model parameters based on the results of code benchmarking.
  - **4.7** September 06: Develop 1st version of a new electron-cloud build-up simulation program (or extend an existing one) for correct 3-D modeling including 3-D space charge, 3-D geometry and possible 3-D time-varying external fields. Consider eventual extension towards a self-consistent electron-cloud build-up & instability model.
- Goal 5. Application of the codes to predict the effect in the damping ring designs
  - **5.1** October 05: Simulate electron-cloud build up with the ECLOUD code for a 3-km, 6-km and 17-km damping ring.
  - **5.2** October 05: Compare with results of at least one other code from POSINST (SLAC/LBNL) , PEI (KEK) and possibly CLOUDLAND (BNL/SLAC), if they become available.
  - **5.3** October 05: Simulate instability thresholds with HEADTAIL for a 3-km, 6-km and 17-km damping ring and compare them with predicted electron densities.
  - **5.4** June 06: Estimate the importance of incoherent emittance growth due to electron cloud for the different damping-ring designs.
  - **5.5** December 06: Repeat electron cloud build-up and instability simulations using the chamber material properties and the vacuum chamber layout determined or developed in the two other parts of this work package.
- Goal 6. Experimental determination of Surface parameters entering in the simulation codes.
  - **6.1** June 05: Define photon reflectivity for the real Al-chamber DAΦNE constructing material and its relevance on the simulations based on more realistic input parameters [10].

- **6.2** March 06: Define secondary electron yield and electron reflectivity for the real Al- chamber DAFNE constructing material, and its relevance on the simulations based on more realistic input parameters.
- **6.3** June 06: Study the dependence on electron and photon doses of the experimentally determined values of SEY and its relevance on the simulations based on more realistic input parameters.
- **6.4** December 06: Comparison with other possible materials.

* Goal 7. Vacuum design of damping rings taking into consideration effects as photon, electron and ion induced gas desorption.
  - **7.1** June 05: Calculate pressure profiles for the Tesla damping ring design in the presence of synchrotron radiation.
  - **7.2** December 05: Recalculate pressure profiles for the Tesla damping ring design in the presence of synchrotron radiation with distributed pumping by NEG coating or other means.
  - **7.3** December 05: Report on collated results of survey of secondary emission yields, psd, esd and isd yields, and develop work programme required to fill gaps in data.
  - **7.4** December 06: Report on pressure requirements (gas number densities) in the damping ring due to effects of electron cloud and other pressure related instabilities, and projected means of mitigating any deleterious effects.
  - **7.5** December 06: Results of work programme required to fill gaps in data.

3.2.1.2 Gannt Chart

Task2 ECLOUD								
Financial Year	Jan 05				Jan 06			
Quarter	1	2	3	4	1	2	3	4
New RAs		**1.1**	**1.2** **1.3**					
Benchmarking of build-up simulations		**2.1**	**2.2**	**2.3**		**2.4**	**2.5**	
Benchmarking of instability simulations				**3.1**	**3.2** **3.3**			
Improvement of simulation codes		**4.1**	**4.2** **4.3** **4.4**		**4.5**	**4.6**	**4.7**	
Predict effect in the damping rings				**5.1** **5.2** **5.3**		**5.4**		**5.5**
Experimental determination of surface parameters		**6.1**			**6.2**	**6.3**		**6.4**
Vacuum design of damping rings		**7.1**		**7.2** **7.3**				**7.4** **7.5**

3.2.1.3 Deliverables

The deliverables are the following.

1. Benchmarked and extended simulation code(s) for the electron-cloud build up., with a report in mid-2006
2. Benchmarked and extended simulation code for electron-cloud induced instabilities and emittance growth, with a report in mid-2006
3. Improved understanding of electron-cloud effects in SPS and DAFNE, which can serve as input to the ILC design optimization
4. An assessment of the relative severity of electron-cloud effects for damping rings of different circumference, possibly featuring one or several electron-cloud countermeasures, thereby contributing to the overall ILC damping-ring design optimization.
5. A conceptual design of the damping-ring vacuum system, including mitigation techniques, and an estimate of the expected vacuum pressure and composition
6. An assessment of the relative merits of different vacuum chamber materials and coatings and a recommendation of the materials to be used in the ILC.
7. Identification of further R&D required.
8. Overall summary report by the end of 2007.

3.2.1.4 International Context

Code benchmarking is done in collaboration with colleagues from the ILC regional design groups in Asia and America, notably KEK and SLAC.

Specifically, WP3 Electron-Cloud Task interfaces with the international ILC-WG3, and in particular provides input to the ILC damping ring assessment task “specify SEY limits to prevent electron cloud”, with results expected in November 2005, compatible with the projected milestones 5.1 and 5.2.

3.2.2 LETS- Low Emittance Tuning

Task Manager: J. Jones (CCRL)

3.2.2.1 Milestones

- Goal 1. Train one new RA in the field.
  - **1.1** Jan 05: Advertise RA positions at DESY.
  - **1.2** Jul 05: Recruit new RA. *All dates are dependant on the recruitment of the DESY RA, and are therefore subject to modification with this proviso.*
- Goal 2. Analytic estimates and Simulation of Tolerances.
  - **2.1** Jul 05: Review of existing codes.
  - **2.2** Aug 05: Analytic models of existing techniques
  - **2.3** Oct 05: Analytic estimates of sensitivities
  - **2.4** Oct 05: Set-up lattice models in chosen code(s).
  - **2.5** Nov 05: Perform simulations of tolerances.
- Goal 3: Comparative Study of tuning algorithms.
  - **4.1** Jul 05: Review of existing techniques.
  - **4.2** Nov 05: Model-independent comparison of techniques.
  - **4.3** Jan 06: Comparative estimates between the DR designs
- Goal 4: Develop Specific Design of Tuning Algorithms.
  - **5.1** Apr 06: Application of tuning algorithm to specified DR design
  - **5.2** Jun 06: Analysis of the effectiveness of tuning algorithm in realistic cases.
  - **5.3** Aug 06: Finalise the tolerances taking into account the tuning algorithm design.

- Goal 5: Machine trials of tuning algorithms.
  - **5.1** Dec 06: Review of existing experimental studies
  - **5.2** Mar 07: Recommendations on possible machine trials.
  - **5.3** Dec 07: Results from Machine trials (i.e. PETRA) – dependent on availability etc.
- Goal 6: Define Requirements for Beam Diagnostics.
  - **6.1** Nov 05: Define relevant diagnostics.
  - **6.2** Apr 06: Analyse effective positioning of relevant diagnostics.
  - **6.3** Sep 06: Specification of relevant diagnostics

3.2.2.2 Gannt Chart

WP3: LETS								
Financial Year	Jan 05				Jan 06			
Quarter	1	2	3	4	1	2	3	4
Advertise posts	**1.1**							
Recruit RAs	==	**1.2**						
Analytic models			**2.1**					
Analytic estimates			==	**2.3**				
Review of existing codes		**2.2**						
Lattice models		==	**2.4**					
Simulations of tolerences		==	==	**2.5**				
Review techniques		**3.1**						
Model-independent comparison		==	==	**3.2**				
Comparative estimates		==	==	==	**3.3**			
Application of tuning algorithm						**4.1**		
Analysis of tuning algorithm						==	**4.2**	
Finalise tolerances						==	==	**4.3**
Review of experimental studies						**5.1**		
Recommendations on machine trials						==	**5.2**	
Machine trials						==	==	**5.3**
Define diagnostics				**6.1**				
Positioning of diagnostics				==	==	**6.2**		
Specification of diagnostics				==	==	==	==	**6.3**

3.2.2.3 Deliverables

The deliverables in Jan 2008 are the following.

1. Benchmarked simulation codes for the analysis of tuning algorithms in the Damping Rings.
2. Design of specific tuning algorithms for the chosen damping ring design.
3. Production of tolerence tables for the chosen damping ring, listing probable tolerences under realistic conditions.
4. Machine trials of chosen tuning algorithms in comparable real machines, and comparisons with theory.
5. Requirements and recommendations for diagnostics to achieve the chosen tuning scheme.

3.2.3 RFSEP – RF Separators

Task Manager: D. Alesini, F.Marcellini (LNF)

3.2.3.1 Milestones

- Goal 1. Feasibility study for testing RF deflectors on ATF.
    - **1.1** November 05: investigate the possibility of using multifrequency drivers for each ATF klystron to feed the RF deflectors.
    - **1.2** December 05: cost estimate for both the kicker realization and the purchasing of the whole system components (mainly waveguides).
- Goal 2. Study of a strip line kicker for ILC damping ring.
    - **2.1** December 05: evaluation of the kicker performances (efficiency, field uniformity) for different strip line geometries.
    - **2.2** February 06: determination of pulser requirements in terms of needed output voltage.
- Goal 3. Design and tests of a strip line kicker for beam injection in DAFNE storage rings.
    - **3.1** November 05: design of the kicker design and of the high voltage/vacuum tight feedthrough.
    - **3.2** January 06: definition of pulser specifications and pulser purchasing.
    - **3.3** June 06: high power and reliability tests on pulser and feedthrough.
    - **3.4** December 06: kicker realization.
    - **3.5** June 07: measurements and tests of the whole system.

3.2.4 WGLRDYN – WiGgLeR Field Modelling and Impact on DYNamic Aperture

Task Manager: M. E. Biagini (LNF)

3.2.4.1 Milestones

- Goal 1. Train one new Post-Doc in wiggler modeling and dynamic aperture simulations
    - **1.1** January 05: Advertise positions at LNF
    - **1.2** September 05: Recruit new Post-Doc
- Goal 2. Realistic wiggler modeling.
    - **2.1** February 05: Build tools for simulations: Workshop at LNF for wiggler optimization for emittance tuning. Presentations and papers at http://www.lnf.infn.it/conference/wiggle2005/prog.html
    - **2.2** November 05: Compare wiggler model with beam measurements at DAFNE (tune shift with amplitude, beam decoherence)
    - **2.3** December 05: Implement realistic wiggler model, including nonlinearities, in dynamic aperture codes
- Goal 3. Benchmarking of the existing codes for dynamic aperture simulations.
    - **3.1** January 06: Implement dynamic aperture simulation codes
    - **3.2** June 06: Compare dynamic aperture simulations with measurements at DAFNE (tune shift with amplitude, beam decoherence) with different codes
- Goal 4. Application of simulation codes to predict damping ring dynamic aperture
    - **4.1** January 07: Evaluation of damping ring dynamic aperture with realistic wiggler model.
    - **4.2** June 07: Optimization of wiggler parameters and lattice optics for dynamic aperture improvement.

3.2.4.2 Deliverables

The deliverables are the following.

1. Workshop on wiggler optimization for emittance control.
2. Benchmark of beam measurements with DAFNE wiggler and benchmark of codes for DAFNE dynamic aperture, with report in mid-2006
3. Report on impact of wiggler dynamics on DR dynamic aperture by the end of 2007.

3.2.4.3 International Context

Code benchmarking is done in collaboration with colleagues from the ILC regional design groups in Asia and America, notably KEK and SLAC/LBNL.
Specifically, WP3 WGRLDYN Task interfaces with the international ILC-WG3, and in particular with the ILC DR assessment task "Determine dynamic aperture".

3.3 References

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[3] F. Marcellini, "RF Separators and Fast Kickers", 1st Scientific EUROTeV Workshop.
[4] R. Cimino, "SEY measurements and e-cloud studies at DAFNE", 1st Scientific EUROTeV Workshop.
[5] F. Zimmermann, "e-cloud Code Benchmarking and Simulations", 1st Scientific EUROTeV Workshop.
[6] O.B. Malyshev, "Vacuum problems in DR", 1st Scientific EUROTeV Workshop.
[7] J.K. Jones, "Low Emittance Tuning", 1st Scientific EUROTeV Workshop.
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[9] F. Zimmermann, D. Schulte, C. Vaccarezza, M. Zobov, R. Wanzenberg, "Electron Cloud in Wigglers", WIGGLE 2005 Workshop, LNF-INFN, 21-22 February 2005, EUROTeV-Report-2005-xxx-1
[10] C. Vaccarezza, R. Cimino, A. Giglia, N. Mahne, S. Nannarone, "Experimental Determination of e-Cloud Simulation Input Parameters for DAFNE", PAC05, Knoxville (US), May 2005; EUROTeV-Report-2005-013-1

4 Work Package 4: Polarised Positron Source

4.1 Introduction

EUROTeV Work package 4 (PPS) consists of five tasks

- HURD, Helical undulator R & D
- PTCD, Photon conversion target and collimator design
- PPMODL, Source performance modelling
- SPINF, Spin rotation & flip system design

- LEPOL, Low-energy polarimeter R & D

An overview of the tasks including the contact people and main objectives is presented in Table 3. Detailed milestones and deliverables are presented in the following sections.

Task	Task Leader	Objectives	Deliverables
HURD	J Clarke	evaluation of superconducting and permanent magnet technologies • design and testing of 1-4m prototype of chosen technology • undulator vacuum system R&D	At least one test module for each technology • larger scale prototype of selected technology • report of prototype results and report of final engineering design
PTCD	I Bailey	conceptual design of conversion target and photon collimator including Monte Carlo simulations • specification of baseline parameters • full engineering design of collimator	Report of conversion target and photon collimator conceptual designs
PPMODL	N Walker	development of sophisticated computer model including photon production, target conversion and spin tracking • optimisation of design • errors and tolerance studies • estimates of particle loss rates and radiation damage • studies of spin transport from DR to IP • investigation of spin tuning at the IP	Software for spin tracking accurately through ILC • report detailing spin tracking results including error and tolerance studies
SPINF	S Riemann	conceptual design of tuneable post-DR spin rotation and flipper system • modelling of errors and systematic errors • tolerance studies • mitigation of systematics between spin states	Report detailing conceptual design of tuneable post-DR spin rotation and flipper system
LEPOL	S Riemann	conceptual design of low-energy polarimeter for use at the source • Monte Carlo studies of performance • prototype construction and testing with beam	Report detailing conceptual design of low-energy polarimeter for use at the source • prototype polarimeter

Table 3: Overview of the PPS work package

4.2 Details of the sub-tasks

In the following sections, the individual sub-tasks of WP4 are detailed with milestones and deliverables.

4.2.1 HURD

Task Manager: J Clarke (CCLRC)

4.2.1.1 Milestones

- Goal 1. Superconducting Undulator Module
  - **1.1** Feb 05 : Assemble trial module
  - **1.2** May 05: Complete magnet tests
  - **1.3** July 05: Assemble second module
  - **1.4** Sept 05: Complete magnet tests
- Goal 2. Permanent Magnet Undulator Module
  - **2.1** March 05: Manufacture module mechanics
  - **2.2** May 05 : Assemble trial module
  - **2.3** July 05: Complete magnet tests
- Goal 3. Confirm optimum technology
  - **3.1** Sept 05: Selection of preferred magnet technology
- Goal 4: Prototype undulator
  - **4.1** Oct 05 : Design prototype

    - **4.2** June 06 : Assemble prototype
    - **4.3** Sept 06 : Magnet measurements complete
- Goal 5: Vacuum Assessment
    - **5.1** Mar 05: Consider vacuum related issues for undulator
    - **5.2** Sept 05: Initial estimate of vacuum requirements of undulator
    - **5.3** April 06: Confirm vacuum requirements
    - **5.4** Sept 06: Complete vacuum vessel design

4.2.1.2 Deliverables

1. At least one trial module for each magnet technology
2. Larger scale (1 to 4m long) prototype undulator
3. Report of trial module results
4. Report of prototype design and test results
5. Report of vacuum assessment

4.2.2 PTCD – Photon conversion target and collimator design

Task Manager: I Bailey (ULIV)

4.2.2.1 Milestones

- Goal 1. Recruit new RAs
    - **1.1** Feb 05 : Recruit LC-ABD RA at ULIV
    - **1.2** May 05 : Advertise RA position at ULIV
    - **1.3** Sep 05 : Recruit new RA at ULIV
- Goal 2. Conversion Target Design
    - **2.1** Dec 05: Functional specification for the target developed
    - **2.2** Jul 06: Numerical analysis of thermal and stress loads complete
    - **2.3** Jul 06: Radiation damage studies complete
    - **2.4** Dec 06: Target conceptual design complete
    - **2.5** Dec 07: Final engineering design complete
- Goal 3. Photon Collimator
    - **3.1** Dec 05: Assessment of previous DESY design complete
    - **3.2** June 06: Numerical analysis of thermal loads complete
    - **3.3** June 06: Radiation studies complete
    - **3.4** Dec 06: Collimator conceptual design complete
    - **3.5** Dec 07: Final engineering design complete

4.2.2.2 Deliverables

1. Report on conversion target analysis
2. Engineering design of conversion target
3. Report on collimator analysis
4. Engineering design of collimator

4.2.3 PPMODL – Source Performance Modelling

Task Manager: N Walker (DESY)

4.2.3.1 Milestones

- Goal 1. Software development for spin tracking
    - **1.1** May 05: Assess suitable codes that could be enhanced to include depolarisation effects
    - **1.2** Dec 05: Initial assessment of ILC depolarisation effects
    - **1.3** Dec 06: Initial error and tolerance studies complete
- Goal 2. Radiation Damage and Particle Loss
    - **2.1** Dec 05: Tracking of particles through target to generate radiation and particle loss estimates reported
    - **2.2** July 06: Iteration of loss estimates with target optimisation.

4.2.3.2 Deliverables

1. Software developed for correct spin tracking through DR and to IP
2. Report on spin depolarisation at IP including error & tolerance studies
3. Report on radiation and losses at target

4.2.4 SPINF – Spin rotation and flip system design

Task Manager: S Riemann (DESY)

4.2.4.1 Milestones

- Goal 1. Recruit new RA
    - **1.1** July 05 : Advertise RA position (DESY)
    - **1.2** Oct 05 : Recruit RA
- Goal 2. Spin rotator & flip system
    - **2.1** Jul 06: Conceptual design outlined
    - **2.2** Jul 07: Modelling of errors and systematics complete
    - **2.3** Dec 07: design complete

4.2.4.2 Deliverables

1. Report on spin rotator & flip system design including errors and systematics

4.2.5 LEPOL – Low energy polarimeter R & D

Task Manager: S Riemann (DESY)

4.2.5.1 Milestones

- Goal 1. Design of polarimeter
    - **1.1** Dec 05 : Review polarimeter options and select technique
    - **1.2** July 06: Simulation of polarimeter using G4
    - **1.3** Dec 06: Polarimeter prototype designed
    - **1.4** July 07: Prototype constructed
    - **1.5** Dec 07: Prototype tested with beam

4.2.5.2 Deliverables

1. Report of polarimeter simulations
2. Prototype polarimeter
3. Report of polarimeter performance with beam

5 Work Package 5: Diagnostics

5.1 Introduction

EUROTeV Work package 5 (DIAG) consists of eight tasks

- CFBPM; a precision BPM based on a confocal resonator cavity.
- LBPM; a laser-wire system suitable for the ILC.
- CAVBPM; a precision cavity BPM.
- ESPEC; energy spectrometry based on precision BPMs.
- HEPOL; a high energy polarimeter based on a high-finesse optical cavity.
- TPMON; a high precision time and phase monitoring system.
- WBCM; a wide band current monitor.
- FLUM; fast luminosity monitoring based on low angle calorimeters.

An overview of the tasks including the contact people and main objectives is presented in Table 4. Detailed milestones, deliverables and Gannt charts are presented in the following sections.

Task	Contact Persons	Task Reporter	Objectives (measurable + verifiable)	Deliverables
CFBPM	V. Ziemann (Uppsala)	W. Ziemann	Design resonator. Perform Bench tests Beam tests in CTF3	Technical drawings. Prototype BPM. Report on bench tests. Report of beam results.
LBPM	G. Blair (RHUL) B. Foster (Oxford) S. Boogert (UCL) S. Schreiber (DESY)	G.Blair	Install and commission new laser. Perform laser-wire studies at PETRA+ATF. Make recommendations for ILC laser-wire system.	New RAs working in the field. Working laser-wire system. Report on results at PETRA+ ATF. Report on design implications for ILC laser-wire. Detailed simulations.
CAVBPM	L. Soby (CERN)	L. Soby	Design and specify components. Perform bench tests. Beam tests in CTF3.	Prototype BPM. Report on bench tests. Report on beam tests.
ESPEC	D. Miller (UCL) D. Ward (Cambridge)	D.Miller	Design BPM. Design concept of BPM spectrometer Build prototype spectrometer. Perform beam tests. Study spectral shape measurements. Identify future hardware R&D.	Prototype BPM. Report on conceptual design. Spectrometer prototype. Report on beam tests. Report on spectral shape with recommendations for further hardware R&D.
HEPOL	F. Zomer (Orsay)	F. Zomer	Design & build confocal Fabry-Perot cavity Design & build concentric Fabry-Perot cavity Perform bench tests. Design laser system of ILC polarimeter.	First prototype cavity Report on bench tests Second prototype cavity Report on final bench tests with Recommendations for ILC laser polarimeter.
TPMON	J. Sladen (CERN)	J. Sladen	Survey technologies. Design and build prototype. Perform bench tests.	Report on technology survey. Working prototype. Report on bench tests.
WBCM	L. Soby (CERN)	L. Soby	Study bandwidth limitations of existing system. Design improved system. Beam tests in CTF3.	Report on BW limits. Improved prototype system. Report on beam tests.
FLUM	W. Lohman (DESY Z.)	W. Lohman	Set up MC framework. Analyse pairs and beam-strahlung for fast luminosity monitoring Develop design of electronics front end system and concept for feedback.	Monte-carlo program. Report on MC results for pairs and beamstrahlung. Report on front end electronics and feedback.

Table 4: Overview of the DIAG work package.

5.2 Details of the sub-tasks

In the following sections, the individual sub-tasks of WP5 are detailed, with milestones, Gannt charts and Deliverables.

5.2.1 CFBPM - Confocal Resonator Beam Position Monitor.

Task Manager: V. Ziemann (Uppsala)

The very short bunches in the CLIC drive and high energy beam will excite high frequency electro-magnetic fields in the vacuum structure. These fields extend in frequency below the cutoff of the vacuum pipe and perturb measurements at other places of the accelerator. We will therefore investigate a monitor that ignores the fields generated upstream, but detects the direct fields generated in the monitor itself. This device is based on a confocal resonator geometry. We will investigate the properties and the suitability of such a monitor for bunch frequency measurements as is relevant in the CLIC drive beam and for beam position measurements.

5.2.1.1 Milestones

- Goal 1: Recruitment
  - 1.1 Apr05: PostDoc recruited (Arnaud Ferrari)
  - 1.2 Jun05: Undergraduate student (6month) for simulations with Microwave Studio
- Goal 2: Simulation Calculations
  - Milestones FEMLAB
    - 2.1 Oct05: Resonator Parameters
    - 2.2 Oct05: S-parameters
  - Milestones Microwave Studio
    - 2.3 Jun05: Purchasing and learning
    - 2.4 Oct05: Resonator Parameters
    - 2.5 Oct05: S-parameters
    - 2.6 Dec05/Jun06: Deliverable: Status reports
    - 2.7 Apr06: Start simulations with GDFIDL
- Goal 3: Position sensitivity
  - 3.1 Sep05: Start simulations
- Goal 4: Tolerances
  - 4.1 Aug05: Analytic estimates
  - 4.2 Oct05: Simulations
  - 4.3 Jan06: Prototype testing
- Goal 5: Simple Aluminum Prototypes
  - 5.1 May05: Drawings
  - 5.2 Jun05: Construction
  - 5.3 Sep05: Start bench-testing
- Goal 6: Full Prototype with integrated vacuum pipe
  - 6.1 Jan06: Drawings
  - 6.2 Mar06: Construction
  - 6.3 Jun06: Start bench-testing
  - 6.4 Jun07: Testing with beam
- Goal 7: Microwave Test-stand
  - 7.1 Jun05: Specification
  - 7.2 Aug05: Assembly
  - 7.3 Sep05: Start testing devices

5.2.1.2 Gannt Chart

WP5: CFBPM												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Recruitment												
PostDoc	**1.1**											
Undergraduate student		**1.2**										
Simulation calculations												
Femlab: Resonator parameters		**2.1**	==	==	==	==						
Femlab: Resonator parameters		**2.1**	==	==	==	==						
uStudio: Purchasing and learning		**2.3**	==									
uStudio: Resonator parameters			**2.4**	==	==							
uStudio: S-parameters			**2.4**	==	==							
Status Reports on Simulations				**2.6**		**2.6**						
GDFIDL simulations						**2.7**	==	==				
Position sensitive device				**3.1**	==	==	==	==				

Tolerances										
Analytic estimates		**4.1**	==	==						
Simulations			**4.2**	==	==	==	==			
Prototype testing				**4.3**	==	==	==			
Simple Aluminum prototype										
Drawings	**5.1**									
Construction	**5.2**									
Bench testing		**5.3**	==	==	==					
Full prototype										
Drawings				**6.1**	==					
Construction					**6.2**	==				
Bench testing						6.3	==	==		
Tests with beam								**6.4**	==	==
Microwave test stand										
Specification	**7.1**									
Assembly		**7.2**								
Testing devices			**7.3**	==	==	==	==	==		

5.2.1.3 Deliverables

1. Jun05: Drawings of the simple prototype
2. Aug05: Manufacture of the simple prototype
3. Oct05: Report on test stand
4. Dec05: Status Report on Simulations
5. Mar06: Report on bench measurements of the simple prototype
6. Apr06: Drawings of the full prototype
7. Jun06: Manufacture of the full prototype
8. Dec06: Report on bench measurements of the full prototype
9. Sep07: Report on tests with beam
10. Oct07: Final report

5.2.2 LBPM- Laser-Based Beam Profile Monitor

Task Manager: G.A. Blair (RHUL)

5.2.2.1 Milestones

- Goal 1. Train two new RAs in the field.
  - **1.1** Jan 05: Advertise RA positions at Oxford and RHUL.
  - **1.2** May 05: Recruit new RAs.
- Goal 2. Set up and commission laser upgrades for PETRA laser-wire.
  - **2.1** May 05: Produce specifications for new laser + tender.
  - **2.2** Jul 05: Purchase new laser
  - **2.3** Oct 05: Laser commissioned at PETRA
- Goal 3. Design and commission second scanning dimension of the PETRA laser-wire.
  - **3.1** Jan 05: vertical dimension frame built at Oxford.
  - **3.2** Jun 05: 2d-scanner optics tested on a bread-board with low-power laser at RHUL.

  - **3.3** Sep 05: 2d-scanner optics bread-board installed at PETRA.
  - **3.4** Apr 06: Present preliminary results on 2d scans.
  - **3.5** Mar 07: Present preliminary machine-studies based on scans.
  - **3.6** Dec 07: Present final machine studies based on 2-d scans.
- Goal 4: Investigate mode-locked (M-L) laser design with ILC time structure.
  - **4.1** Jun 05: M-L laser-lab set up at Oxford.
  - **4.2** Jul 05: Specify first hardware layout of laser.
  - **4.3** Jan 06: First stage of laser installed.
  - **4.4** Dec 06: First stage commissioned and second stage specified.
  - **4.5** Jan 07: Present results of first-stage laser.
  - **4.6** Nov 07: Second-stage laser commissioned.
  - **4.7** Dec 07: Present results and proposed upgrades resulting from laser tests.
- Goal 5: Develop laser-wire vacuum vessel plus micron-scale optics for test at the ATF extraction line.
  - **5.1** Feb 05: Specify vacuum vessel requirements.
  - **5.2** May 05: Present detailed vacuum vessel plus optics design at KEK.
  - **5.3** Sep 05: Install optical transport and vacuum vessel at KEK.
  - **5.4** Dec 05: First tests of optical system at KEK complete.
  - **5.5** Mar 06: Present results of first-stage ATF laser-wire + identify next stage involving fast-scanning system.
  - **5.6** Aug 06: Prototype fast-scanning system ready for tests.
  - **5.7** Mar 07: Present preliminary results on fast scanning system and proposed upgrades.
  - **5.8** Sep 07: Present final results on KEK data taking.
  - **5.9** Oct 07 Present final results on fast scanning tests.
- Goal 6: Develop simulations of the laser-wire in the ILC beam diagnostics section to specify TDR design.
  - **6.1** Jun 05: Present preliminary results on ILC emittance measurement at EUROTeV June 05 meeting.
  - **6.2** Aug 05: Specify preliminary ILC laser-wire requirements at Snowmass meeting 2005.
  - **6.3** May 06: Present results of ILC laser-wire system simulations based on PETRA and ATF experience.
  - **6.4** Oct 06 input results to ILC base-line design.
  - **6.5** Jun 07 Present an optimised diagnostics section for ILC

5.2.2.2 Gannt Chart

WP5: LBPM

Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Advertise posts	**1.1**											
Recruit RAs	==	**1.3**										
PETRA laser-wire specs + tender + buy	==	**2.1**	**2.2**									
Commission PETRA laser			==	**2.3**								
Build vertical frame	**3.1**											
Build+ Test 2d optics	==	==	**3.2**									
Install 2d system at PETRA			==	**3.3**								
Scans with 2d system				==	==	**3.4**	==	==	**4.5**			
Machine studies with PETRA system							==	==	**3.5**	==	**3.6**	
Set up M-L laser lab	==	**4.1**										

Install and commission M-L laser	==	==	**4.2**	==	**4.3**	==	==	**4.4**	**4.5**			
Second-stage of M-L system							==	==	**4.6**	**4.7**	==	**4.8**
Design and build vacuum vessel	**5.1**	**5.2**										
Install vessel at ATF + light transport		==	**5.3**	**5.4**								
Develop fast scanning system			==	==	==	**5.6**	==	==	**5.7**	==	==	**5.9**
Data taking + analysis at ATF				==	**5.5**	==	==	==	==	==	**5.8**	
Simulations of laser-wire in ILC	==	**6.1**	**6.2**	==	**6.3**	==	==	**6.4**	==	**6.5**		

5.2.2.3 Deliverables

The deliverables in Jan 2008 are the following.

1. A European-based centre of excellence in high-performance lasers and associated optics for application to accelerators with a team of physicists and engineers experienced in the fields of lasers for accelerators.
2. An upgrade of the existing PETRA laser-wire with a new laser and a system to scan in two dimensions.
3. Results of laboratory studies towards constructing a high-quality mode-locked laser-system with the ILC bunch structure, for laser-based beam diagnostics.
4. Laser-wire vacuum vessel design and tests.
5. Beam tests and machine studies at PETRA and ATF.
6. Detailed simulations of laser-wires at the ILC beam delivery system.
7. Identification of further R&D required towards building the ILC diagnostics section.

5.2.2.4 International Context

The laser-wire project involves several international groups; in Europe: BESSY, CERN, DESY, Oxford Uni., RHUL, UCL. In Asia: KEK and Kyoto Uni.; Hiroshima Uni. have also recently indicated an interest in joining. In the USA, SLAC has provided much support and technical advice; this involvement is expected to increase over the coming year, with special emphasis on the ATF/ATF2 programme. The PETRA and ATF/ATF2 projects are complimentary; the former will address reliability, accuracy, and long-term performance issues while the latter will aim at the smallest spot-sizes in a realistic ILC-type environment. In addition there is international interest in Japan, the UK and SLAC to extend these studies to include the “Shintake” monitor, aiding Tokyo Uni. who are currently upgrading the FFTB system for use at ATF2. The UK will be building a mode-locked laser system to investigate the requirements for the laser and also the light-transport issues relating to all the laser-based beam diagnostics systems at the ILC; international collaboration is also expected to grow here.

5.2.3 CAVBPM – Precision Cavity BPM

Task Manager: L. Soby (CERN)

The requested tasks of the WBCM and the small aperture PBPM require competences of beam instrumentation experts, of which are only a few available around the world. The corresponding persons at CERN in the BDI group are all presently assigned to high priority tasks, such that a launching of the EuroteV tasks would not be possible in the required time frame. The solution of giving to one of these experts the coordination task and to have the technical work done by CERN external resources is the best possible scenario. CERN will make all the effort in order to find suitable external resources, but in case of non-availability the EuroTeV commitment will have to be delayed.

The proposed work plans below are based on hiring a scientific associate who will NOT be paid by European funds, and a fellow who will be paid by the EU contribution.

5.2.3.1 Milestones

- Goal 1. Work plan and recruitment.
    - **1.1** Jun 05: Advertise fellow post.
    - **1.2** Jun 05: Present work plan.
    - **1.3** Sep 05: Hire fellow.
- Goal 2. Design and simulations.
    - **2.1** Sep 05: Design PBPM.
    - **2.2** Jan 06: Simulate PBPM.
    - **2.3** Jun 06: Present design at EUROTEV meeting.
- Goal 3. Build and test proto type on test bench.
    - **3.1** Jun 06: Make fabrication drawings.
    - **3.2** Sep06: Manufacture of 1 PBPM.
    - **3.3** Jan 07: Test on test bench.
    - **3.4** Jun 07: Present results at EUROTEV meeting.
- Goal 4: Manufacture 3 PBPM's with modified design.
    - **4.1** Jun 07: Manufacture 3 PBPM's.
    - **4.2** Sep 07: Test PBPM's on test bench.
- Goal 6: Beam tests.
    - **5.1** Sep 07: Test the 3 PBPM's in CTF3.
    - **5.2** Oct 07: Write final report.
    - **5.3** Nov 07: Present results to EUROTEV.

5.2.3.2 Gannt Chart

WP5: CAVBPM

Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Advertise fellow post			**1.1**									
Present work plan SA			**1.2**									
Hire fellow				**1.3**								
Design PBPM				**2.1**								
Simulate PBPM						**2.2**						
Present design at EUROTEV meeting							**2.3**					
Make fabrication drawings.							**3.1**					
Manufacture of 1 PBPM								**3.2**				
Test on test bench									**3.3**			
Present results at EUROTEV meeting.											**3.4**	
Manufacture 3 PBPM's											**4.1**	
Test PBPM's on test bench.												**4.2**
Test the 3 PBPM's in CTF3												**5.1**
Write final report												**5.2**
Present results to EUROTEV												**5.3**

5.2.3.3 Deliverables

The deliverables in Jan 2008 are the following.

1. Build proto type PBPM's
2. Report on bench tests.
3. Report on beam tests in CTF3.

5.2.4 ESPEC – Precision Energy Spectrometry

Task Manager: D. J. Miller (UCL)

Determination of the beam spectrum in collisions at the ILC will be more difficult than at LEP. There are no depolarising resonances for absolute calibration, the momentum spread in a linac is larger than in a circular machine, and colliding particles undergo beamstrahlung in the intense fields of the opposing bunch. The main goal of this task is to establish the credibility and robustness of a spectrometry chicane in the beam delivery system of the ILC, with sufficient precision on the absolute energy for its contribution to the precision on the top quark mass at threshold to be negligible compared with systematic errors due to QCD theory (~50 MeV). The chicane will use cavity beam position monitors (bpms) with well calibrated bending magnets. Test beam work on possible bpms has already begun. Optimised bpms will be developed and tested in a prototype chicane. Parallel work is being done on combining detector-based data with spectrometry to determine the luminosity weighted spectrum in physics processes. There will also be a study of techniques to determine the spectral shape of the linac beams, either from downstream spectrometry or, possible, by using the Laser-wire technology being developed in the LBPM task (2.2 above)

5.2.4.1 Milestones

- Goal 1. Recruitment.
    - **1.1** June04: Postdoc. in place at UCL (S.T.Boogert, shared 50/50 with Laserwire, LBPM, 2.2 above)
    - **1.2** Oct04. New Cambridge postdoc (M.Slater)
    - **1.3** Jan05: New UCL postdoc (A.Liapine, Ph.D in bpm design)
    - **1.4** June05. UCL summer student (F.Gournaris) to SLAC for ESA preparations.
    - **1.5** October05. Gournaris becomes UCL Ph.D student on physics, detector and spectrometry aspects of the project.

- Goal 2. Purchase of equipment and tools.
    - **2.1** April05. GDFIDL software licence installed at UCL on 25-processor farm for bpm design.
    - **2.2** July05. Purchase of digitisers for initial End Station A tests.
    - **2.3** October05. Complete purchases for initial ESA tests.
    - **2.4** Mid 2006. Purchase extra instrumentation for ESA chicane prototype tests. Renew GDFIDL licence.
- Goal 3. Bpm analysis, design and construction
    - **3.1** May05. Analysis of performance of existing Nanobpms
    - **3.2** June05. Proposed new bpm design for ATF2.
    - **3.3** Summer05. Proposed new design for ESA chicane.
    - **3.4** Autumn05. Machining of first prototypes.
    - **3.5** Winter05. Testing of first prototypes.
    - **3.6** Spring06. Design bpms for chicane tests at ESA.
    - **3.7** Summer06. Construction of bpms for chicane tests.
    - **3.8** Winter06-Spring 07. Redesign after testing.
    - **3.9** End07. Propose bpms for ILC chicane.
- Goal 4. Readout electronics for bpms.
    - **4.1** Autumn05. Participate in construction of readout for ESA tests
    - **4.2** Summer06. Development of readout for chicane tests.
    - **4.3** End07. Propose readout for ILC chicane.
- Goal 5. Analysis of testbeam running.
    - **5.1** August05. Report on 04/05 ATF tests at Snowmass.
    - **5.2** Autumn05. Develop analysis software for initial ESA test.
    - **5.3** Spring06. Report results of initial ESA test.
    - **5.4** Summer06. Develop analysis software for chicane test.
    - **5.5** Throughout06. Possible continued ATF running (if ESA commitments allow).
    - **5.6** Winter/Spring06/07. Report results of chicane tests.
    - **5.7** Spring/Summer07. Continued chicane tests, if approved.
- Goal 6. Design of spectrometers.
    - **6.1** Autumn05. Specify scope of ILC chicane for GDE's basic machine specification.
    - **6.2** Spring06. Finalise optics and design of chicane for ESA test.
    - **6.3** Autumn06. Review ILC chicane design for GDE's Conceptual Design Report.
    - **6.4** End07. Produce updated chicane design for ILC, incorporating ESA experience.

- Goal 7. Spectral shape measurement.
    - **7.1** Autumn06. Monitor progress on downstream spectrometer prototype tests.
    - **7.2** Spring07. Compare possible techniques for spectral shape measurement
    - **7.3** End07. Propose best technology for shape measurement.
- Goal 8. Recommendations for further R&D
    - **8.1** Summer07. Review accuracy and robustness of available spectrometry techniques (and combined detector/spectrometer measurements of the luminosity spectrum).
    - **8.2** End07. Propose further R&D programme to address weaknesses.

5.2.4.2 Gannt Chart

WP5: ESPEC												
Financial Year	**Jan 05**				**Jan 06**				**Jan 07**			
Quarter	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Recruitment												
UCL 50% postdoc	**1.1**											
Cambridge postdoc	**1.2**											
UCL postdoc	**1.3**											
Summer student			**1.4**									
Ph.D student				**1.5**								
Equipment and Tools												
GDFIDL license		**2.1**										
Digitisers			**2.2**									
ESA test gear			==	**2.3**								
Chicane test gear; GDFIDL renewal					==	**2.4**						
Bpm analysis, design, construction												
Nanobpm analysis		**3.1**										
Design for ATF2		**3.2**										
ESA prototype design			**3.3**									
ESA prototypes construct/test			**3.4**	**3.5**								
Chicane design					==	**3.6**						
Chicane construct							**3.7**					
Redesign							==	==	==	**3.8**		
Propose for ILC									==	==	==	**3.9**
Readout												
Construct for ESA		==	**4.1**									
Develop for chicane			==	==	==	==	**4.2**					
Propose for ILC							==	==	==	==	==	**4.3**

continued over ……….

5.2.4.3 Deliverables

1. June05. ATF2 bpm design.
2. August05. Report Nanobpm test results.
3. Winter05. First spectrometry bpm prototype.
4. Spring06. Report first ESA test results.
5. Summer06. bpms for ESA chicane tests.
6. End06. CDR design of spectrometer chicane and bpms.
7. Spring07. Report first chicane test results.
8. Upgraded bpms for continued (?) tests.

9. Autumn07. Report on continued(?) test results.
10. End07. Propose ILC spectrometry system design. Include absolute energy and spectral shape measurement, relation to detector based measurement, list of R&D still needed.

5.2.4.4 International Context

Cambridge and UCL have joined the existing Nanobpm collaboration (with SLAC, Livermore, LBNL and KEK) which is testing cavity bpms at the ATF facility at KEK. (This has led to close collaboration with SLAC, KEK and Korea on the design of new bpms for the ATF2 project.) We were also founding proposers (one of us is co-spokesperson) of the collaboration (with Notre Dame, SLAC, LBNL) which will build a prototype spectrometry chicane in the End Sation A (ESA) facility at SLAC. We have an informal collaboration (applying for INTAS support) with groups at DESY-Zeuthen, Yerevan and Dubna who are developing techniques for the measurement of the fields in spectrometry magnets. Other collaborators from U.Mass and U.Oregon will test a prototype downstream spectrometer at End Station A which could be capable of measuring the spectral shape of the beams.

5.2.5 HEPOL – High Energy Polarimetry

Task Manager: F. Zomer (LAL)

5.2.5.1 Milestones

See diagram below

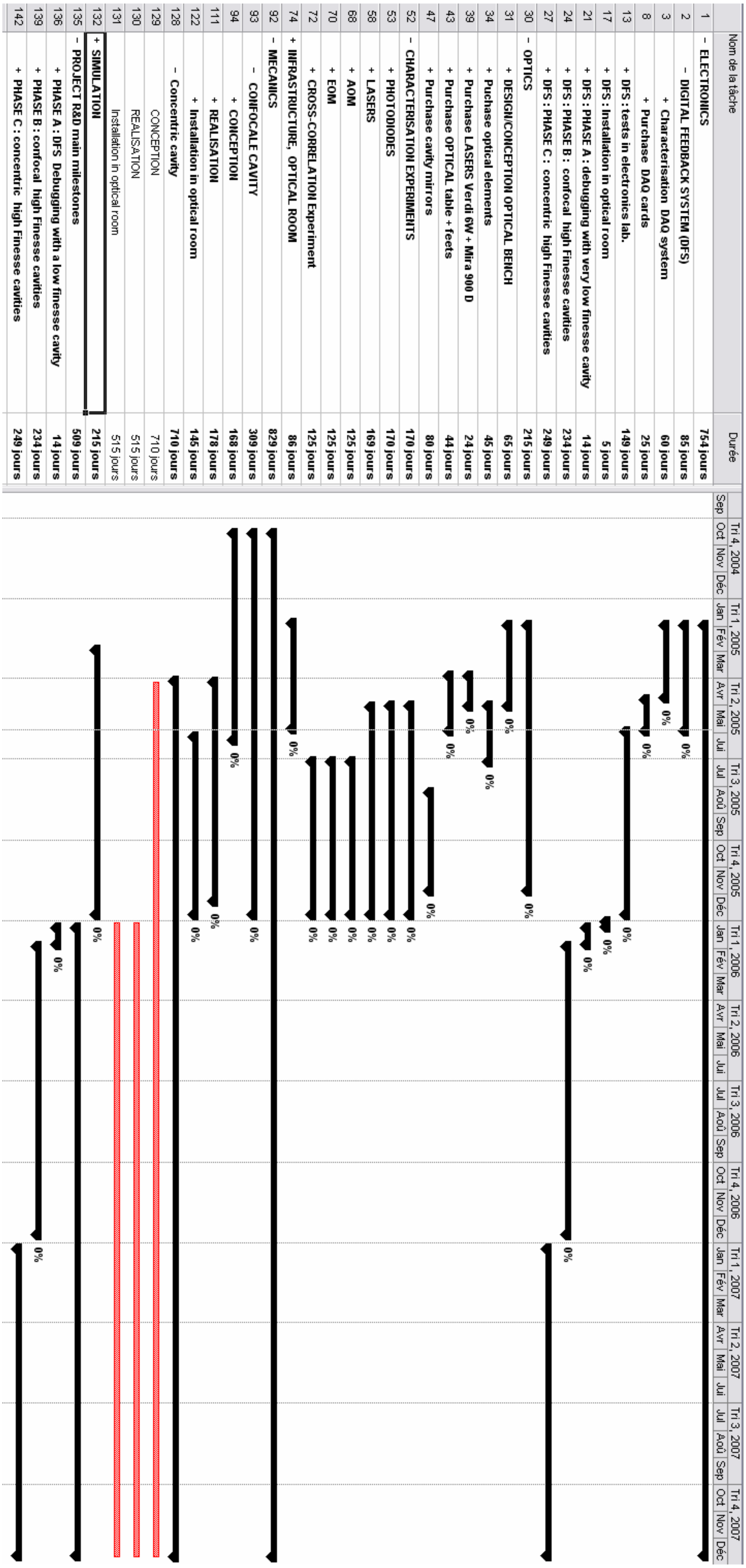
5.2.5.2 Gannt Chart

See Diagram below

5.2.5.3 Deliverables

The deliverables in Jan 2008 are the following.

1. A European-based centre of expertise in high-finesse Fabry-Perot cavities filled with a passive mode-locked laser beam and associated optics for application to accelerators with a team of physicists and engineers experienced in the fields of unstable lasers resonators.
2. Results on the operations of very high-finesses stable Fabry-Perot cavities (F=30000 and F>300000) filled with a pulsed Ti:sa laser beam in the 1ps and 100fs time width regimes.
3. Results on the operations of very high-finesses unstable (concentric) Fabry-Perot cavities (F=30000 and F>300000) filled with a pulsed Ti:sa laser beam in the 1ps and 100fs time width regimes.
4. Reports and conclusion on the use of a Fabry-Perot cavity in pulsed regime to measure the polarisation at the ILC. Identification of further R&D required towards building an ILC laser cavity for the polarimeter.



Nom de la tâche
Durée
Tri 4, 2004
Tri 1, 2005
Tri 2, 2005
Tri 3, 2005
Tri 4, 2005
Tri 1, 2006
Tri 2, 2006
Tri 3, 2006
Tri 4, 2006
Tri 1, 2007
Tri 2, 2007
Tri 3, 2007
Tri 4, 2007
Sep Oct Nov Déc Jan Fév Mar Avr Mai Jui Jul Aoû Sep Oct Nov Déc Jan Fév Mar Avr Mai Jui Jul Aoû Sep Oct Nov Déc Jan Fév Mar Avr Mai Jui Jul Aoû Sep Oct Nov Déc
1 - ELECTRONICS 754 jours
2 - DIGITAL FEEDBACK SYSTEM (DFS) 85 jours
3 + Characterisation DAQ system 60 jours
8 + Purchase DAQ cards 25 jours
13 + DFS : tests in electronics lab. 149 jours
17 + DFS : Installation in optical room 5 jours
21 + DFS : PHASE A : debugging with very low finesse cavity 14 jours
24 + DFS : PHASE B : confocal high Finesse cavities 234 jours
27 + DFS : PHASE C : concentric high Finesse cavities 249 jours
30 - OPTICS 215 jours
31 + DESIGN/CONCEPTION OPTICAL BENCH 65 jours
34 + Puchase optical elements 45 jours
39 + Purchase LASERS Verdi 6W + Mira 900 D 24 jours
43 + Purchase OPTICAL table + feets 44 jours
47 + Purchase cavity mirrors 80 jours
52 - CHARACTERISATION EXPERIMENTS 170 jours
53 + PHOTODIODES 170 jours
58 + LASERS 169 jours
68 + AOM 125 jours
70 + EOM 125 jours
72 + CROSS-CORRELATION Experiment 125 jours
74 + INFRASTRUCTURE, OPTICAL ROOM 86 jours
92 - MECANICS 829 jours
93 - CONFOCALE CAVITY 309 jours
94 + CONCEPTION 168 jours
111 + REALISATION 178 jours
122 + Installation in optical room 145 jours
128 - Concentric cavity 710 jours
129 CONCEPTION 710 jours
130 REALISATION 515 jours
131 Installation in optical room 515 jours
132 + SIMULATION 215 jours
135 - PROJECT R&D main milestones 509 jours
136 + PHASE A : DFS Debugging with a low finesse cavity 14 jours
139 + PHASE B : confocal high Finesse cavities 234 jours
142 + PHASE C : concentric high Finesse cavities 249 jours
0%

5.2.6 TPMON – Timing and Phase Monitoring

Task Manager: J. Sladen (CERN)

5.2.6.1 Milestones

- Goal 1. Train new fellow.
  - **1.1** May 05: Recruit new fellow.
- Goal 2. Study optimum IF phase detection system.
  - **2.1** Dec 05: Present results on study of IF phase detection methods.
- Goal 3. Design and commission 30GHz phase measurement system.
  - **3.1** Feb 06: Present overall design.
  - **3.2** Jul 06: Present lab results.
  - **3.3** Dec 06: Present results of first tests with beam.
  - **3.4** Jan 07: Present plans for upgrade.
  - **3.5** Jul 07: Present lab tests of upgrade.
  - **3.6** Dec 07: Present results of final tests with beam.

5.2.6.2 Gannt Chart

WP5: TPMON												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Recruit fellow		**1.1**										
Evaluation of phase detection methods		==	==	**2.1**								
Development of overall system	==	==	==	==	**3.1**	==	**3.2**		**3.4**	==	**3.5**	
Tests with beam in CTF3							==	**3.3**			==	**3.6**

5.2.6.3 Deliverables

Reports covering design, lab results and beam tests.

5.2.7 WBCM – Wide Band Current Monitor

Task Manager: L. Soby (CERN)

5.2.7.1 Milestones

- Goal 1. Work plan and recruitment.
  - **1.1** Jun 05: Present work plan.
  - **1.2** Jan 06: Hire scientific associate.
- Goal 2. Design and simulations.
  - **2.1** Jan 06: Simulate existing design.
  - **2.2** Mar 06: Simulate new design.

    - **2.3** Jun 06: Present design at EUROTEV meeting.
- Goal 3. Build and test proto type on test bench.
    - **3.1** Jun 06: Make fabrication drawings.
    - **3.2** Sep06: Manufacture of 1 WBCM.
    - **3.3** Jan 07: Test on test bench.
    - **3.4** Jun 07: Present results at EUROTEV meeting.
- Goal 4: Beam tests.
    - **4.1** Sep 07: Test of WBCM in CTF3.
    - **4.2** Oct 07: Write final report.
    - **4.3** Nov 07: Present results to EUROTEV

5.2.7.2 Gannt Chart

WP5: WBCM												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Present work plan			**1.1**									
Hire scientific associate					**1.2**							
Simulate existing design					**2.1**							
Simulate new design						**2.2**						
Present design at EUROTEV meeting							**2.3**					
Make fabrication drawings.							**3.1**					
Manufacture of 1 WBCM								**3.2**				
Test on test bench									**3.3**			
Present results at EUROTEV meeting.											**3.4**	
Test of WBCM CTF3												**4.1**
Write final report												**4.2**
Present results to EUROTEV												**4.3**

5.2.7.3 Deliverables

The deliverables in Jan 2008 are the following.

1. Report on BW limits of existing design.
2. Build improved proto type type.
3. Report on beam tests in CTF3

5.2.8 FLUM – Fast Luminosity Monitoring

Task manager: W. Lohmann (DESY-Zeuthen)

5.2.8.1 Milestones

- Goal 1. Estimation of the potential to derive beam parameters from the energy depositions by beamstrahlung remnants on the BeamCal front face.
    - **1.1** June 05: Simulations for zero and 2 mrad beam crossing angle.
    - **1.2** August 05: Simulations for 20 mrad beam crossing angle.
    - **1.3** December 05: Simulations including realistic beam transport.
- Goal 2. Extension of the simulation to a fast, full BeamCal simulation.
    - **2.1** August 05: Optimisation of the segmentation of BeamCal for single electron detection.

  - **2.2** February 06: Development of a fast electromagnetic shower simulation for the optimised segmentation.
  - **2.3** June 06: Estimation of the impact of the shower simulation on the beam parameter estimation.
- Goal 3. Development of hardware solutions for sensor readout, DAQ and an interface to the beam feedback system.
  - **3.1** September 06: Design of fast detector readout electronics.
  - **3.2** June 07: Test measurements with sensors and prototypes of readout electronics.
  - **3.3** August 07: Design of an electronics system for the BeamCal with dedicated data processing hardware and interface to the beam feedback system

5.2.8.2 Deliverables

1. August 2005: Presentation of results about the beam diagnostics capabilities for small (zero, 2mrad) and large crossing angles.
2. January 2006: Presentation of the results for realistic beam simulation.
3. February 2006: Report of the results on the capability of beam diagnostics with the BeamCal.
4. July 2006: Presentation of the impact of the shower simulation in BeamCal on the beam parameter measurement.
5. October 2006: Final report on the potential of BeamCal for the determination of beam parameters.
6. October 2006: Presentation of the design of the readout electronics.
7. July 2007: Presentation of test results of the readout electronics.
8. December 2007: Report on the design of a fast feedback infrastructure.

6 Work Package 6: Integrated Luminosity Performance Studies

6.1 Introduction

The EUROTeV Work package 6 (ILPS) consists of seven tasks

- BCDS: design a bunch compressor compatible with multi-TeV centre-of-mass energies.
- PCDL: develop conceptual design of multi-TeV post collision line to ensure upgradability of linear collider.
- BBSIM: verify and improve beam-beam simulation code.
- HTGEN: develop model of halo and tails in linear colliders.
- COLSIM: understand the impact of background on the collimation system design.
- FMSIM: identify key failure modes and evaluate their impact on the machine design
- LAST: develop an alignment and feedback strategy in order to optimise the luminosity performance of the linear collider

An overview of the tasks including the contact people and main objectives is presented in Table 5. Detailed milestones, deliverables and Gantt charts are presented in the following sections.

Name	**Contact Persons**	**Task Reporter**	**Objectives**	**Deliverables**
BCDS	M. Pedrozzi / PSI	M. Pedrozzi	Design a bunch compressor compatible with multi-TeV centre-of-mass energies Design a path length tuning chicane	Bunch compressor lattice suited for Multi-TeV Tuning chicane lattice Evaluation report of compressor performance
PCDL	V.Ziemann / Uppsala Ph. Bambade / Orsay	V. Ziemann	Develop conceptual design of multi-TeV post collision line to ensure upgradability of linear collider Understand and possibly improve the potential for instrumentation with suitable performance in the post collision line at different energies	Conceptual multi-TeV post collision line design Report evaluating the instrumentation performance in the post collision lines at different energies, for the machine with cms energy up to 1TeV and the multi-TeV case
BBSIM	Ph. Bambade / Orsay D. Schulte / CERN	Ph. Bambade	Verify and improve beam-beam simulation code	Report on benchmarking of GUINEA-PIG New GUINEA-PIG version with spin transport
HTGEN	H. Burkhardt / CERN	H. Burkhardt	Develop model of halo and tails in linear colliders Identify the potential to verify the model	Estimation of halo population due to different mechanisms Routines to include halo models in collimation simulations Report on potential benchmarks to verify predictions

Name	Contact Persons	Task Reporter	Objectives	Deliverables
COLSIM	N. Walker / DESY R. Barlow / UMA G. Blair / RHUL D. Schulte / CERN A. Faus-Golfe / Valencia	G. Blair	Simulation of post-linac beam halo collimation, estimation of collimator efficiency, optimisation of collimation system, simulations of muon and neutron production in collimator sections, estimates of impact of physics detector performance, studies of muon and neutron production, impact of luminosity tuning on halo collimation efficiency.	Simulation code. Collimation system design. Reports of simulation results.
FMSIM	N. Walker / DESY D. Schulte / CERN	N. Walker	Identify key failure modes and evaluate their impact on the machine design	Report on most critical failure modes and their impact on machine performance Code package to simulate most ciritical failures
LAST	Ph. Burrows / QMUL N. Walker / DESY D. Schulte / CERN	Ph. Burrows	Develop an alignment and feedback strategy in order to optimise the luminosity performance of the linear collider Develop tools to evaluate the luminosity performance of the linear collider due to the effects in the low emittance transport system	Code package to simulate beam transport from damping ring to IP Report describing the alignment and feedback strategy

Table 5: Overview of the ILPS work package.

6.2 Details of the sub-tasks

In the following sections, the individual sub-tasks of WP6 are detailed, with milestones, Gantt charts and deliverables.

6.2.1 BCDS - Bunch Compressor Design

Task Manager: M. Pedrozzi (PSI)

6.2.1.1 Milestones

- Goal 1. Recruit a post-doc accelerator scientist.
    - January 05: Advertise post doc. positions at PSI (completed).
    - April 05: Creation of a Web site for the BCDS Task (completed - http://eurotev.web.psi.ch)
    - March 05: Post doc Recruited (Frank Schulte, DESY) (completed)

- July 05: Post doc starting his work at PSI.

- Goal 2. Beam specifications for Multi TeV compressor and path length tuning chicane.
  - June 05: Produce first set of beam specifications and performance goals for the compressor to be discussed within ILPS.
  - July 05: Produce specifications for path length chicane (compression + phase and energy correction)
  - August 05: Definitive specification and performance goal for simulation work

- Goal 3. Chicane, first order conceptual designs.
  - December 05: Design with linear chirp and Gaussian electron distributions. .Optimization with 1D CSR effects
  - December 05: Benchmark CSR computation with different 1D model.
  - January 06: Chicane after turn around loop design with linear chirp and Gaussian electron distributions. Optimization with 1D CSR effects.
  - January 06: Chicane Benchmark CSR computation with different 1D mode

- Goal 4: Chicane second order conceptual designs.
  - June 06: Compression chicane optimization with 2D and 3D CSR models.
  - June 06: Path length/compression chicane optimization with 2D and 3D CSR models

6.2.1.2 Following activities

- Compression chicane, third order conceptual design
  - Compression chicane optimization using phase space distributions from start to end simulations (exchange between tasks).
  - Path length/compression chicane optimization using phase space distributions from start to end simulations.

- Chicane fourth order conceptual designs
  - Compression chicane lattice design and performance study with respect to dynamic and static imperfections (energy jitter, alignment errors).
  - Turn around lattice design.

6.2.1.3 Task integration

The task activities should be integrated and considered as an extension of the present effort made for the ILC bunch compressor design, mainly coordinated by SLAC (http://www-project.slac.stanford.edu/ilc/acceldev/LET/BC/). The multi-TeV beam parameters specifications upstream and downstream of the chicanes are presently driven by the CLIC requirements. The transport studies from the damping ring to the IP (task LAST) should give a realistic phase space for the ultimate chicane optimisation. The chicane simulation results and in particular the sensitivity to dynamic and static imperfections requires as well a close interaction with the LAST activities.

6.2.1.4 Deliverables

The deliverables in Jan 2008 are the following.

1. A conceptual design of a compression chicane suitable for multi-TeV linear colliders with an evaluation of the CSR effects and the compressor performances.
2. A conceptual design of a path length tuning chicane including the CSR effects and the turn around loop lattice.

6.2.2 PCDL - Post-Collision Diagnostics Lattice

Task Manager: V. Ziemann (Uppsala)

6.2.2.1 Milestones

- Goal 1: Recruitment
    - **1.1** March 05: ILC PostDoc recruited (Olivier Dadoun)
    - **1.2** April 05: Multi-TeV PostDoc recruited (Arnaud Ferrari)

- Goal 2: Software
    - **2.1** April 05: made available MAD, DIMAD, GUINEA-PIG
    - **2.2** April 05: BDSIM operational
    - **2.3** June 05: Comparison of BDSIM and DIMAD
    - **2.4** June 05: 3D modeller for beamline
    - **2.5** August 05: 3D-Fieldmap and direct force equation integrator
    - **2.6** August 05: Losses calculation program

- Goal 3: ILC studies
    - **3.1** March 05: Beamstrahlung photon cone studies and comparison for *e* and *e-/e-*
    - **3.2** June 05: Study of the post collision line of the 2mrad crossing angle scheme
    - **3.3** December 05: Losses in the post collision line
    - **3.4** December 05: Comparison of e and e-e- collision
    - **3.5** December 05: Neutron simulation and tracking upgrade in BDSIM
    - **3.6** December 05: Beam parameter optimization for e-e- collision and compatibility of optics e and e-e-. Application to the 2 and 20 mrad extraction lines.
    - **3.7** December 06: Background simulation studies (photons, electrons, neutrons) created by the beam losses along the extraction line. Studies of the behavior of those particles: probability to hit the detector, post-IP spectrometer or polarimeter. Comparison of the 2mrad and 20mrad.
    - **3.8** December 06: Datagrid computing application using BDSIM and software adaptation.
    - **3.9** December 06: Final report for sub-TeV

- Goal 4: Multi-TeV/CLIC studies
    - **4.1** September 05: Extrapolating the sub-TeV design to higher luminosities and identification of the problem areas.
    - **4.2** December 05: Extrapolating the sub-TeV design to higher energies and identification of the problem areas.
    - **4.3** December 05: Report on short-comings of extrapolated sub-TeV design
    - **4.4** March 06: Adapted design for multi-TeV
    - **4.5** June 06: Report on a post-collision design for multi-TeV
    - **4.6** June 06: Coherent pair diagnostic for luminosity measurements and its implementation

- **4.7** September 06: Beamstrahlung diagnostics and implementation
- **4.8** September 06: Feasibility of polarization diagnostics in the post-collision line
- **4.9** December 06: Report on integration of diagnostics features in the multi-TeV design
- **4.10** September 07: Optimization of the multi-TeV design
- **4.11** December 07: Final report for multi-TeV

6.2.2.2 Gantt Chart

WP6: ILPS/PCDL												
	2005				2006				2007			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Recruitment:												
PostDoc (sub-TeV)	1.1											
Post-Doc (multi-TeV)		1.2										
Software:												
MAD, DIMAD, GUINEA-PIG	2.1											
BDSIM operational		2.2										
Comparison BDSIM and DIMAD		2.3										
3D modeller for beamline		2.4										
3D-Fieldmap and direct integrator			2.5									
Losses calculation program			2.6									
Sub-TeV/ILC studies:												
Beamstrahlung and comparison e+/e- vs. e-/e-	3.1											
2 mrad post collision line		3.2										
Losses in the post collision line		3.3	>>>	>>>								
Comparison e+/e- and e-/e- collisions		3.4	>>>	>>>								
Neutron background simulations		3.5	>>>	>>>								
Optimization and compatibility		3.6	>>>	>>>								
Background studies for 2 and 20 mrad schemes					3.7	>>>	>>>	>>>				
Datagrid application						3.8	>>>	>>>				
Final report								3.9				

Multi-TeV/CLIC studies:												
Extrapolating luminosities of sub-TeV design		4.1	>>>									
Extrapolating energy of sub-TeV design			4.2	>>>								
Report on problem areas				4.3								
Adapted multi-TeV design				4.4	>>>	>>>						
Report on multi-TeV design						4.5						
Coherent pair diagnostics					4.6	>>>	>>>					
Beamstrahlung diagnostics						4.7	>>>	>>>				
Polarization diagnostics						4.8	>>>	>>>				
Report on diagnostic integration								4.9				
Optimization									4.1	>>>	>>>	
Final report												4.1 1

6.2.2.3 Deliverables

1. Understanding of the requirements
2. Design of post-collision beam lines for sub- and multi-TeV operation
3. Integrate diagnostics in the beam line and investigate feasibility
4. Develop ideas for new diagnostics
5. Reports

6.2.3 BBSIM - Beam-Beam Simulation Code Development

Task Manager: Ph. Bambade (Orsay)

6.2.3.1 Milestones

- Goal 1: Recruitment
  - **1.1** February 05: ILC PostDoc recruited (Cécile Rimbault)

- Goal 2: Benchmark secondary pair generation
  - **2.1** March 05: Study relevant bibliography
  - **2.2** April 05: Study and compare production in GUINEA-PIG, CAIN and BDK generators and characterise relevant theoretical uncertainties
  - **2.3** May 05: Study dependence of production on proposed ILC beam parameters and impact on rates as function of relevant detector design parameters
  - **2.4** June 05: Report on obtained results

- Goal 3: WEB-based GUINEA-PIG documentation and program version management
  - **3.1** March 05: First study of GUINEA-PIG program structure and technical functionalities
  - **3.2** June 05: Initial WEB-based repository for multi-user code version management
  - **3.3** December 05: Initial WEB-based documentation of program features and of supported input/output conditions

- **3.4** June 06: Detailed WEB-based program documentation

- Goal 4: Implement beam-beam space-charge induced deflection for Bhabha processes in GUINEA-PIG
    - **4.1** September 05: First approximate evaluation of impact on luminosity determination from Bhabha scattering
    - **4.2** September 05: Technical study of Bhabha process with BHWIDE generator
    - **4.3** October 05: Study beam-beam deflection of produced Bhabha events in GUINEA-PIG and define suitable software interface
    - **4.4** November 05: Precise evaluation of impact on luminosity determination
    - **4.5** December 05: Report on obtained results

- Goal 5: Extend phase-space for hadronic minijet generation in GUINEA-PIG
    - **5.1** January 06: Initial study of hadronic minijet production in GUINEA-PIG and bibliography relevant to photon-photon processes at low invariant mass
    - **5.2** February 06: Technical study of PYTHIA generator for photon-photon processes at low invariant mass and contact with PYTHIA main author
    - **5.3** April 06: Interface in GUINEA-PIG relevant parameterisation for total hadronic cross-section down to the pion-pair production threshold, including a basic treatment of resonance decay kinematics using PYTHIA
    - **5.4** May 06: Technical study of hadronic minijet production in GUINEA-PIG with the new interface and evaluation of impact
    - **5.5** June 06: Report on obtained results

- Goal 6: Define default input conditions for GUINEA-PIG and document uncertainties
    - **6.1** September 06: Survey of conditions and contexts for GUINEA-PIG usage
    - **6.2** November 06: Define recommended input conditions as reference for set of defined applications, including illustrative output relevant to each
    - **6.3** December 06: Adaptive computation of GUINEA-PIG grid parameters based on beam parameters and application
    - **6.4** February 07: Evaluate algorithm-related uncertainties in GUINEA-PIG
    - **6.5** March 07: Report on obtained results

- Goal 7: Implement depolarising effects in GUINEA-PIG
    - **7.1** July 06: Study bibliography relevant to beam-beam induced depolarization
    - **7.2** September 06: Introduce tracking of spin vector in GUINEA-PIG
    - **7.3** October 06: Introduce beam-beam deflection induced spin diffusion in GUINEA-PIG
    - **7.4** November 06: Introduce radiation-induced spin-flip spin diffusion in GUINEA-PIG
    - **7.5** February 07: Technical study of beam-beam depolarizing effects in GUINEA-PIG and comparison with CAIN simulation
    - **7.6** March 07: Report on obtained results

6.2.3.2 Gantt Chart

WP6: ILPS/PCDL												
	2005				2006				2007			

	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Recruitment:												
PostDoc (Cécile Rimbault)	1.1											
Benchmark secondary pair generation:												
Study relevant bibliography	2.1											
Study and compare production in GUINEA-PIG, CAIN and BDK generators and characterise relevant theoretical uncertainties	>>	2.2										
Study dependence of production on proposed ILC beam parameters and impact on rates as function of relevant detector design parameters	>>	2.3										
Report on obtained results	>>	2.4										
WEB-based GUINEA-PIG documentation and program version management:												
First study of GUINEA-PIG program structure and technical functionalities	3.1											
Initial WEB-based repository for multi-user code version management	>>	3.2										
Initial WEB-based documentation of program features and of supported input/output conditions		>>	>>	3.3								
Detailed WEB-based program documentation				>>	>>>	3.4						
Implement beam-beam space-charge induced deflection for Bhabha processes in GUINEA-PIG:												
First approximate evaluation of impact on luminosity determination from Bhabha scattering			4.1									
Technical study of Bhabha process with BHWIDE generator			4.2									
Study beam-beam deflection of produced Bhabha events in GUINEA-PIG and define suitable software interface			>>	4.3								
Precise evaluation of impact on luminosity determination			>>	4.4								
Report on obtained results				4.5								

Extend phase-space for hadronic minijet generation in GUINEA-PIG:												
Initial study of hadronic minijet production in GUINEA-PIG and bibliography relevant to photon-photon processes at low invariant mass					5.1							
Technical study of PYTHIA generator for photon-photon processes at low invariant mass and contact with PYTHIA main author					5.2							
Interface in GUINEA-PIG relevant parameterisation for total hadronic cross-section down to the pion-pair production threshold, including a basic treatment of resonance decay kinematics using PYTHIA					>>	5.3						
Technical study of hadronic minijet production in GUINEA-PIG with the new interface and evaluation of impact					>>	5.4						
Report on obtained results						5.5						
Define default input conditions for GUINEA-PIG and document uncertainties:												
Survey of conditions and contexts for GUINEA-PIG usage							6.1					
Define recommended input conditions as reference for set of defined applications, including illustrative output relevant to each							>>	6.2				
Adaptive computation of GUINEA-PIG grid parameters based on beam parameters and application							>>	6.3				
Evaluate algorithm-related uncertainties in GUINEA-PIG								>>	6.4			
Report on obtained results									6.5			
Implement depolarising effects in GUINEA-PIG:												
Study bibliography relevant to beam-beam induced depolarization							7.1					
Introduce tracking of spin vector in GUINEA-PIG							7.2					
Introduce beam-beam deflection induced spin diffusion in GUINEA-PIG							>>	7.3				
Introduce radiation-induced spin-flip spin diffusion in GUINEA-PIG							>>	7.3				
Technical study of beam-beam depolarizing effects in GUINEA-PIG and comparison with CAIN simulation								>>	7.4			

Report on obtained results									7.4			

6.2.3.3 Deliverables

1. Comparison of GUINEA-PIG and CAIN simulations and benchmarking using other specialized generators with a view to estimate uncertainties
2. WEB-based GUINEA-PIG documentation and program version management
3. Improved version of GUINEA-PIG including treatments of beam-beam deflections for Bhabha processes, extended phase-space coverage for hadronic minijets and depolarizing effects
4. Reports

6.2.4 HTGEN - Halo and Tail Generator

Task Manager: H. Burkhardt (CERN)
The objective is to develop and collect information and code on halo and tail generation relevant for linear colliders. This work will be done by a small group based at CERN (H.B. + 1 Fellow) in close collaboration with the related international activities, and in particular the related tasks on beam delivery and collimation (BDSIM, COLSIM) within the WP6 on Integrated Luminosity Performance Studies.

6.2.4.1 Milestones

- Goal 1. Recruitment
  - May 05: Fellow selected
  - Sep 05: Planned start date for Fellow.

- Goal 2. Establish a comprehensive list of Halo candidate processes.
  - January 2005. First preliminary list of halo processes. Done: http://hbu.home.cern.ch/hbu/HTGEN.html
  - December 2005. First detailed list of halo candidate processes with literature and code references.
  - Summer 2006. Second version with literature and code references and any direct links to new code.

- Goal 3. Development of analytical models of halo where appropriate
  - December 2005. Establish a list of halo processes for which analytical models can be appropriate.
  - Summer 2006. Preliminary description of analytical halo models.

- Goal 4. Development of computer models for halo tail generation.
  - Dec 2005. Direct synchrotron spectrum generator and its implementation in Geant4.
  - Summer 2006. Detailed list of new codes needed and first preliminary codes.
- Goal 5. Simulation studies of halo/tail generation
  - Dec 2005. Preliminary list of topics to be studied by simulation.
  - Autumn 2006. More detailed list and first results

- Goal 6. Explore possibilities for benchmarking

- Dec 2005. List few possible experiments on halo.
- Summer 2006. Strategy for benchmarking.

6.2.4.2 Deliverables

The deliverables in Jan 2008 are the following.

1. Comprehensive description of halo/tail processes
2. Computer codes and were appropriate analytical models for selected
3. halo/tail processes
4. Strategy and possible results of benchmarking of halo/tail processes.

6.2.5 COLSIM - Collimation Simulation

Task Manager: G. Blair (RHUL)

The collimation simulation task works in close collaboration with the BDSLD task in workpackage 2.

6.2.5.1 Milestones

- Goal 1: Recruitment
  - **1.1** Jun05: Closing date for Manchester Post Doc. Applications.
  - **1.2** Jun05: DESY PostDoc recruited (Ramilia Amerikas).
- Goal 2: Sofware development
  - **2.1** Jun05: Beta release of BDSIM including prototype MAD interface.
  - **2.2** Implementation of thick non-linear elements (e.g Sextupoles) in BDSIM.
- Goal 3: Halo tracking and Simulation
  - **3.1** Aug05: First results of ILC halo collimation using BDSIM.
  - **3.2** Jun05: Presentation of wake-field effects, calculated using Merlin.
  - **3.3** Aug05: Presentation of Halo tracking using Merlin.
  - **3.4** Apr06: Report on BDSIM results.
  - **3.5** Apr06: Report on Merlin results.
  - **3.6** Jun06: Efficiency studies for non-linear collimation system

- Goal 4: Collimator survival simulations
  - The task will participate into studies of the collimator survival in workpackage 2 by providing data on expected losses

- Goal 5: Neutrons
  - **5.1** Jun05: Present strategies for implementing neutron tracking code.
  - **5.2** Aug05: First results on neutron simulation
  - **5.3** Jan06: Preliminary report on neutron production in beam dumps.

- Goal 6: Muons
  - **6.1** Aug05: Preliminary update of muon production calculations for ILC
  - **6.2** Apr06: Report on ILC BDS performance with regard to muons.

- Goal 7: IR region layout
  - **7.1** Aug05: First simulations of 2 mrad crossing angle IR region in BDSIM.

- **7.2** Apr06: Comparative study of 2mrad and 20 mrad IR regions.

6.2.5.2 Gantt Chart

WP6: COLSIM												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Recruitment												
PostDoc		==	1.1									
Halo tracking and Simulation			==	==	==	==						
BDSIM	==	2.1	2.2	==	==	2.3	==	==	==	==	==	==
Merlin	==	2.4	2.5	==	==	2.6	==	==	==	==	==	==
Neutrons												
Dump-related neutron production	==	5.1	5.2	==	==	5.3	==	==				
Muons												
ILC muon tracking		==	6.1	==	==	6.2	==	==	==	==	==	==
IR Layout												
BDSIM simulations	==	==	7.1	==	==	7.2	==	==	==	==	==	==

6.2.5.3 Deliverables

1. Apr06: BDSIM code alpha-release v1.
2. Jun05: Preliminary Report on Merlin wakefield simulations.
3. Apr06: Report on muon and neutron simulations.
4. Apr06: Report on comparative study of 2 mrad and 20 mrad IRs.
5. Apr06: Report on ANSYS collimator survival calculations.
6. Apr06: Full report on Merlin wakefield simulations.

6.2.6 FMSIM - Failure Mode & Effect Simulation

Task Manager: N. Walker (DESY)

6.2.6.1 Milestones

- Goal 1: Identify primary LET failure modes
  - June 2005: draft list of critical failure modes
  - August 2005: agree internationally on prioritised failure mode catalogue at ILC Snowmass Workshop.
  - August 2005: Specification of phase 1 (single-bunch) and phase 2 (multi-bunch) failure modes for implementation plan.

- Goal 2: Identify software requirements
    - June 2005: review of existing software tools (for possible use for FM simulations)
    - July 2005: First implementation plan for phased software development.

- Goal 3: Phase 1 software model development
    - October 2005: Full ILC LET lattice available (*external requirement*)
    - December 2005: first release of FM simulation tools (including detailed RF model) complete and documented

- Goal 4: Phase 1 FM simulations
    - March 2006: first results of phase 1 RF-related single-bunch failure modes, plans for second iteration
    - June 2006: final results of phase-1 RF related single-bunch failures (presented to June EUROTeV workshop)
    - June 2006: Implementation plan for further 12 months activity (phase 1+2).
    - Report on RF-related machine protection strategy.

6.2.6.2 Gantt Chart

6.2.6.3 Deliverables

1. Prioritised list (report) of critical failure modes (August 2005)
2. FM Simulation code for the ILC LET system, including RF system (December 2005)
3. Interim report on single-bunch RF-related failure modes (February 2006)
4. Final report and recommendations for fast RF related failure modes (June 2006)
5. Implementation plan for phase 1+2 studies June 2006 - June 2007 (June 2006)

6.2.7 LAST - Luminosity and Alignment Studies

Task Manager: P.N. Burrows (QMUL)

The objectives are to develop an alignment and feedback strategy in order to optimise the luminosity performance of the linear collider. For this purpose software tools will need to be developed to evaluate the luminosity performance in the low emittance transport systems. For these purposes a task www site will be set up [1]. This work involves international collaboration with groups at SLAC, Fermilab, Cornell, KEK and elsewhere. In particular, bunch compressor simulations will be carried out at SLAC so we concentrate on linac and BDS transport simulations. Also a close link needs to be maintained with the instrrumentation experts in workpackage 5 and the alignment and stabilisation experts in workpackage 7 which both will provide important input.
Some preliminary results have been presented at the Particle Accelerator Conference [2], and will be updated at the Beam Delivery/Interaction Region (BDIR) Workshop in June 2005.

6.2.7.1 Milestones

- Goal 1. Recruitment:
    - May 2005: Fellow recruited at CERN (Andrea Latina)

- Goal 2. Set up www page environment for task.

  - July 2005: www site available.

- Goal 3. Develop a code package to simulate beam transport from the exit of the Damping Ring through to the Interaction Point and the extraction line, including component misalignments, ground motion and vibration sources.
  - June 2005: Benchmarking of the beam core tracking in different codes, namely SAD, MAD and PLACET.
  - December 2005: First version code release and documentation.
  - June 2006: Implementation of the most relevant beam-based alignment, feedback and tuning strategies. Second code release.
  - December 2006: Code-to-code comparisons for the most relevant strategic steps. This will be performed in an international framwork.

- Goal 4. Develop a beam-based main linac alignment strategy
  - May 2005: Study of the performance of dispersion free steering in the CLIC main linac.
  - December 2005: Perform the simulations for the ILC to benchmark against studies performed in the US and Japan.

- Goal 5. Develop a main linac tuning strategy
  - May 2005: Developed a first strategy of main linac emittance and luminosity tuning bumps and applied it to CLIC.
  - June 2006: Study the performance of linac tuning in presence of dynamic imperfections.
  - June 2006: Develop strategy to mitigate the effect of RF jitter phase jitter induced by the drive beam.

- Goal 6. Design of ILC BDS beam-based feedback system(s) including component specifications and locations.
  - August 2005: Baseline design.
  - June 2006: Preliminary engineered design in preparation for ILC CDR.

- Goal 7. Develop BDS beam-based alignment strategy.
  - December 2005: First version of strategy.
  - July 2006: Improved strategy in preparation for ILC CDR.

- Goal 8: Develop BDS beam-based feedback and tuning strategy.
  - August 2005: First version of strategy.
  - June 2006: Improved strategy in preparation for ILC CDR.

- Goal 9: Incorporate BDS feedback and tuning strategy into global low-emittance transport luminosity optimization strategy.
  - December 2006: Baseline strategy as part of ILC CDR.

- Goal 10: Develop an optimisation strategy for the collision parameters.
  - June 2006: Develop an IP tuning strategy to optimise the collision parameters for ILC and CLIC machine.

6.2.7.2 Deliverables

The deliverables in January 2008 are the following:

1. Documented code package for beam transport from Damping Ring to IP.
2. Optimised engineered design for ILC BDS beam-based feedback system(s).
3. BDS beam-based alignment strategy.
4. BDS beam-based feedback and tuning strategy.
5. Global low-emittance transport feedback and tuning strategy.

6.3 References

[1] Task www site TBA
[2] PAC papers:
1567 - RPPP013: P.N. Burrows et al, Tests of the FONT3 Linear Collider Intra-Train Beam Feedback System at the ATF.
1128 - RPPP014: G. White, D. Schulte, N.J. Walker, Multi-Bunch Simulations of the ILC for Luminosity Performance Studies.
2132 - RPPP015: G. White, Reconstruction of IP Beam Parameters at the ILC from Beamstrahlung.
EUROTeV-Report-2005-004-1: D. Schulte, Different Options for Dispersion Free Steering in the CLIC Main Linac.
EUROTeV-Report-2005-006-1: P. Eliasson, D. Schulte, Luminosity Tuning Bumps in the CLIC Main Linac.

7 Work Package 7: Metrology and Stabilisation

7.1 Introduction

EUROTeV Work package 7 (METSTB) consists of three tasks

- RTRS; rapid tunnel reference system.
- MSTBT; mechanical stabilisation technology.
- PGMS; precision ground motion spectra.

An overview of the tasks including the contact people and main objectives is presented in Table 6. Detailed milestones, deliverables and Gannt charts where adequate are presented in the following sections.

Task	Contact Persons	Task Reporter	Objectives (measurable + verifiable)	Deliverables	Specific Comments
RTRS	A. Reichold (Oxford)	A. Reichold	Design RTRS Perform Bench tests Prototype test at DESY	Technical drawings. Prototype RTRS. Report on bench tests. Report of prototype tests.	
MSTBTi	Y.Karyotakis (LAPP) A.Jeremie(LAPP)	Y.Karyotakis	Survey of techniques available for nanometre-level mechanical stabilisation Studies of passive and active(feedback) systems	Prototype mechanical stabilisation system	
MSTBTo	D.Urner (Oxford)	D.Urner	Design laser-based Distance Meter Perform Bench tests Stabilize NanoBPM at KEK	Technical drawings. Prototype distance meter. Report on bench tests. Report of system performance.	
PGMS	W.Bialowons (DESY)	W.Bialowons	Set up ground motion measurements	Ground motion spectra	

Table 6: Overview of the METSTB work package.

7.2 Details of the sub-tasks

In the following sections, the individual sub-tasks of WP7 are detailed, with milestones and Deliverables.

7.2.1 MSTBT Mechanical Stabilisation Technology

Note: This sub task is splited in two parts depending on the motion measurement technique, inertial **MSTBTi** or optical **MSTBTo.**

7.2.1.1 MSTBTi

Task Manager: Y.Karyotakis (LAPP)

Note: Dr. Y.Karyotakis is METSTB workpackage coordinator. N.Geffroy was hired as RE with EUROTeV funds. Collaboration with ESIA (Engineering School in Annecy). B.Bolzon is a preparing a PhD Thesis on some of the aspects in this workpackage. The thesis will be a description of the results and the significance of this workpackage's findings.

7.2.1.1.1 Milestones for MSTBTi

- Goal 1. Mechanical simulations
  - **1.1** Apr 05: Simulation tools' commissioning
  - **1.2** Jul 05: Simulation on a simple model
  - **1.3** Oct 05: Design and simulation of a simple prototype
  - **1.4** Oct 06: Design and simulation of a quadrupole prototype
- Goal 2. Stabilisation technology survey
  - **2.1** Jul 06: Sensor evaluation
  - **2.2** Jul 06: Passive stabilisation material evaluation
  - **2.3** Jul 06: Actuator evaluation
  - **2.4** Jul 06: Feedback loop development
  - **2.5** Jul 06: Interim report
- Goal 3. Construction of a quadrupole prototype
  - **3.1** Jun 07: Prototype construction
  - **3.2** Jul 07: Prototype installation and commissioning
- Goal 4. Validation of the quadrupole prototype test bench
  - **4.1** Dec 07: Technological choice validation
  - **4.2** Dec 07: Feedback loop validation
  - **4.3** Dec 07: Final report

7.2.1.1.2 Deliverables

The deliverables in Jan 2008 are the following.

8. A broad comprehension of the vibrational behaviour of a final focus quadrupole prototype.
9. An operational feedback loop.
10. Technological assessment useful for an ILC environment.
11. An interim Report.
12. Complete final focus quadrupole stabilisation test bench.
13. Validation (or refutation) of the stabilisation methods on the test bench.
14. Identification of further R&D required towards building the ILC final focus stabilisation.
15. Final report.

7.2.1.1.3 International Context

The work on MSTBT has been performed in close collaboration with A.Seryi at SLAC, and P.Cupal at Karkov and the CLIC group at CERN.

7.2.1.1.4 References

Stabilisation studies from LAPP/ESIA, Ch.Boulais et al., CARE/ELAN Note-2004-005.

Vibration stabilization for the final focus magnet of a future linear collider, C.Adloff et al., Proceedings of REM 2005(Research and Education in Mechatronics) in Annecy, France, June 2005.

7.2.1.2 MSTBTo Mechanical Stabilisation Technology

Task Manager: D. Urner (Oxford)

Note: Dr. D. Urner was appointed by Oxford University to lead MSTBT Nov. 2004. Dr. P. Coe was hired as RA with EUROTeV funds. Goal 2 has been extended attempting now to stabilize an existing setup nano-BPM[7] at KEK laboratory, which allows testing the interferometers in an accelerator environment. The BPM achieve similar resolution and therefore provide a crosscheck of achieved MSTBT resolutions. The various presentations of results have not been included in the milestones.

7.2.1.2.1 Milestones for MSTBT

- Goal 1. Prototype of distance meter combining Michelson interferometer with nm precision and FSI[8] with micrometer precision
  - **1.1** Jun 05: Initial design for MI[9]
  - **1.2** Jul 05: Setup of initial design and test of fringe quality
  - **1.3** Aug 05: Custom readout for MI
  - **1.3** Aug 05: Test of initial design for FSI
  - **1.5** Oct 05: Phase tests for initial MI design
  - **1.6** Oct 05: Final design for MI
  - **1.7** Dec 05: Setup of final design
  - **1.8** Jan 06: Initial laboratory laser frequency stabilization.
  - **1.9** May 06: Software suit for MI readout and analysis.
  - **1.10** May 06: Phase tests of final MI design
  - **1.11** Jul 06: Interim Report
  - **1.12** Dec 06: Final laser frequency stabilization.
- Goal 2. Vertical motion stabilization of Nano-BPM setups at KEK to several tens of nanometers using a grid of distance meters.
  - **2.1** May 05: Grid simulation and design for KEK setup
  - **2.2** Oct 05: Mechanical design of vacuum system enclosing laser lines
  - **2.3** Dec 05: Stabilization algorithm for generic grid system
  - **2.4** Feb 06: Test of MI Prototype in accelerator environment at KEK
  - **2.5** Apr 06: Installation of vacuum system at KEK
  - **2.6** May 06 Software for grid analysis of pyramid design
  - **2.7** June 06: Test and compare to simulation of simple pyramid design
  - **2.8** June 06: Stabilization mockup of MSTBT setup at KEK
  - **2.9** Sep 06: Installation of MI system in vacuum system
  - **2.10** Sep 06: Full software suit for grid analysis
  - **2.11** Dec 06: Installation of frequency stabilization
  - **2.12** Dec 06: Software ties to existing mover software
  - **2.13** Mar 07: Measurements of vertical motion using full system
  - **2.14** June 06: Closing of active stabilization loop
  - **2.15** Oct 07: Final report

[7] BPM: Beam Position Monitor
[8] FSI: Frequency Scanning Interferometer
[9] MI: Michelson Inteferometer

7.2.1.2.2 Deliverables

The deliverables in Jan 2008 are the following.

1. A fully tested and operational distance meter prototype combining both MI and FSI techniques
2. A report describing the findings from the operation of the above prototype.
3. Results of studies using the above setup in a grid system to measure the relative vertical displacement of 2 nano-BPM setups at KEK laboratory.
4. Results of studies of the closed loop feedback circuit stabilization of the two nano-BPM systems relative to each other using the above grid position information as input.
5. Identification of further R&D required towards building a stabilization system for the final focus quadrupoles.

7.2.1.2.3 International Context

The work on MSTBT has been performed in close collaboration between the nano-BPM groups of KEK, the ATF group at KEK the nano-BPM group at SLAC and the StaFF[10] group at Oxford.

7.2.1.2.4 References

Motion Stabilization with Nano-Meter Precision, David Urner et al., Second Mini-Workshop on Nano Project at ATF held at MDI workshop at SLAC 11. Dec 2004, http://acfahep.kek.jp/subg/ir/nanoBPM/nano.project/second/talks/Motion_Stability_Precision.pdf

StaFF (Stabilization of the Final Focus) at KEK, David Urner et al., Third Mini-Workshop on Nano Project at ATF at KEK 30. May 2005, http://acfahep.kek.jp/subg/ir/nanoBPM/nano.project/third/talks/urner.pdf

[10] StaFF: Stabilization of the Final Focus

7.2.1.3 RTRS Rapid Tunnel Reference Surveyor

Task Manager: A. Reichold (Oxford)

Note: The original sub tasks 7.3.1 (LiCAS system) and 7.3.2. (Gelis System) present in the proposal have been subsumed into a single unified task 7.3 which now describes the complete development of the RTRS. This has been necessary because the LiCAS technology appeared more promising for the development of the first prototype RTRS. The various presentations of results from LiCAS have not been included in the milestones.

7.2.1.3.1 Milestones for the RTRS

- Goal 1. 3-car Prototype RTRS hardware research and development.
  - **1.1** May 05: EDFA[11] proven to be suitable for FSI[12].
  - **1.2** May 05: Complete refurbishment of DESY test tunnel
  - **1.3** Jun 05: Select and Purchase CCD’s for LSM[13]
  - **1.4** Jun 05: Select and Purchase collimation optics for wide area FSI
  - **1.5** Jul. 05: Select and purchase collimation optics for long distance FSI
  - **1.6** Jul 05: Custom readout electronics ready for series production.
  - **1.7** Jul 05: Full mechanical design of measurement and service car ready for production.
  - **1.8** Sep 05: Single line FSI and LSM accuracy understood in lab. experiments
  - **1.9** Sep 05: Integrate LSM and FSI into prototype measurement cars
  - **1.10** Oct 05: Construction of all mechanical components completed
  - **1.11** Nov 05: Assembly and commissioning of 3-car prototype at DESY
  - **1.12** Mar 06: Begin to operate 3-car prototype in test tunnel at DESY
  - **1.13** Jul 06: Interim Report
  - **1.14** Oct 06: Report about 3-car prototype
- Goal 2: Analysis and Calibration Software for the 3-car RTRS prototype
  - **2.1** Jan 05: Full performance simulation programs.
  - **2.2** Feb 05: Basic FSI analysis code functional.
  - **2.3** Mar 05: Basic LSM analysis code functional.
  - **2.4** Apr 05: LiCAS Software workshop at DESY
  - **2.5** May 05: Basic calibration procedure for external FSI system.
  - **2.6** Jul 05: Basic calibration procedure for LSM system.
  - **2.7** Oct 05: On-line DAQ and train control software framework.
  - **2.8** Nov 05: Off-line analysis software framework.
  - **2.9** Mar 06: Integrated calibration software.
  - **2.10** Aug 07: Integrated suite of all software parts.
- Goal 3. Design of a 5 car prototype RTRS for use in the European X-FEL.
  - **3.1** Nov 06: Conceptual mechanical design
  - **3.2** Apr 07: Final mechanical design
  - **3.3** Sep 07: Choice of commercial components (optics, CCDs, lasers, EDFAs).
  - **3.4** Oct 07: Final Design for custom electronics.
  - **3.5** Dec 07: Final Report

[11] Erbium Doped Fibre Amplifier
[12] Frequency Scanning Interferometry
[13] Laser Straightness Monitor

7.2.1.3.2 Deliverables

The deliverables in Jan 2008 are the following.

1. A fully tested and operational 3-car RTRS prototype.
2. A report describing the findings from the operation of the above prototype.
3. Results of laboratory studies towards the use of FSI and LSM technology in an RTRS.
4. The design for a 5 car RTRS suitable for use in the European X-FEL at DESY.
5. Simulations describing the expected performance of a survey of the ILC using an RTRS..
6. Identification of further R&D required towards building an RTRS for the ILC.

7.2.1.3.3 International Context

The work on the LiCAS project has been performed in close collaboration between the applied Geodesy group at DESY and the LiCAS group at Oxford.

7.2.1.3.4 References

An FSI Alignment System for the ATLAS Inner Detector and Possible Applications for NLC, Armin Reichold et. al.,
Web Proceedings of The 22nd ICFA Advanced Beam Dynamics Workshop on Ground Motion in Future Accelerators,
http://www-project.slac.stanford.edu/lc/wkshp/GM2000/webtalks/FSI_for_NLC/

An Alignment and stabilization system for future linear colliders, A.Reichold and S.Gibson, in Proc. of the APS/DPF/DPB Summer Study on the Future of Particle Physics (Snowmass 2001) ed. N.Graf, SNOWMASS-2001-T601
Prepared for APS / DPF / DPB Summer Study on the Future of Particle Physics (Snowmass 2001), Snowmass, Colorado, 30 Jun - 21 Jul 2001.

Linear Collider Alignment and Survey at the University of Oxford,
Paul Coe, Grzegorz Grzelak, Ankush Mitra, Armin Reichold, Roman Walczak
proceedings of: 26th Advanced ICFA Beam Dynamics Workshop on Nanometre-Size Colliding Beams (September 2-6, 2002, Lausanne)

The Linear Collider Alignment and Survey (LiCAS) Project
R. Bingham, E. Botcherby, P. Coe, G. Grzelak, A. Mitra, J. Prenting, A. Reichold,
Proceedings of the Seventh International Workshop on Accelerator Alignment, SPring8, Japan, 14 November 2002.

Hochgenaue Vermessung und Justierung zukünftiger Linearbeschleuniger
Markus Schlösser(1), Andreas Herty(1), Ankush Mitra(2),
Johannes Prenting(1), Armin Reichold(2)
(1)Deutsches Elektronen-Synchrotron DESY Hamburg
(2)LiCAS Group, University of Oxford, UK
Ingenieurvermessung 2004, 14th International Conference on Engineering Surveying Zürich, 15.–19. March 2004

High Precision Survey and Alignment of large Linear Accelerators
J. Prenting, M. Schlösser, A. Herty , DESY, Hamburg, Germany
J. Green, G. Grzelak, A. Mitra, A. Reichold, University of Oxford

Linac 2004, 22nd International Linear Accelerator Conference,
Luebeck, Germany, August 16-20 2004

The Rapid Tunnel Reference Surveyor (RTRS)
M. Schloesser et. al,
Proceedings of the Eighth International Workshop on Accelerator
Alignment, CERN, Switzerland/France, October 2004

Measurements of the LiCAS systems
A. Mitra et al.,
Proceedings of the Eighth International Workshop on Accelerator Alignment,
CERN, Switzerland/France, October 2004

Simulation of the performance of the LiCAS train
G. Grzelak et al.,
Proceedings of the Eighth International Workshop on Accelerator Alignment,
CERN, Switzerland/France, October 2004

7.2.2 PGMS Precision Ground Motion Spectra

7.2.2.1 Introduction

PGMS task consists of the following sub tasks

- MEASURE; vibration measurement techniques for active stabilisation tests.
- MODEL; theoretical investigation of ground vibration and cultural noise
- MODUL; investigation of the vibration of a superconducting accelerating module.
- SEISMO; investigation of seismic sensor performance in the fringe field of a detector.
- SURVEY; survey of the ground vibration at potential Linear Collider sites.

An overview of the sub tasks including the contact people and main objectives is presented in Table 7. Detailed milestones, deliverables and Gannt charts where adequate are presented in the following sections.

Task	Contact Persons	Task Reporter	Objectives (measurable and verifiable)	Deliverables	Specific Comments
MEASURE	H. Ehrlichmann (DESY)	H. Ehrlichmann	Vibration measurements of stabilisation mock ups	Report on vibration measurements	
MODEL	T. Bierer (TUHH) and J.Grabe (TUHH)	J. Grabe	Analytical and numerical investigation of cultural noise and ground vibration	Report on the theoretical investigations	
MODUL	R. Amirikas (DESY)	R. Amirikas	Measurement of resonance behaviour of a superconducting module	Report on the measurements	
SEISMO	R. Amirikas (DESY)	R. Amirikas	Investigation of a seismic sensor for final focus stabilisation	Report on the investigation and prototype sensor	
SURVEY	W. Bialowons (DESY)	W. Bialowons	Vibrations Measurements at potential Linear Collider sites	Report on vibration measurements	

Table 7: Overview of the PGMS sub-task.

7.2.2.2 Details of the sub-tasks

In the following sections, the individual sub-tasks of WP7 are detailed, with milestones, and Deliverables.

7.2.2.3 Measure – Seismic measurements.

Task Manager: H. Ehrlichmann

7.2.2.3.1 Milestones

- Report on each measurement,
- January 2007, stabilisation characteristic of a first stabilisation mock up for the final focus quadrupoles
- January 2006, measurement of the behaviour of a seismic sensor inside of a static magnetic field.

7.2.2.3.2 Deliverables

- Report on the measurements

7.2.2.3.3 International Context

In collaboration with CERN and LAPP

7.2.2.4 Model – Analytical and numerical investigation of ground vibration

Task Manager: J. Grabe (TUHH)

7.2.2.4.1 Milestones

- January 2007, final report
- January 2006, interim report.

7.2.2.4.2 Deliverables

- Model for the study of ground vibration

7.2.2.5 Modul – Investigation of the resonance behaviour of a superconducting module

Task Manager: R. Amirikas (DESY)

7.2.2.5.1 Milestones

- January 2006, setup of module test stand
- January 2007, results of measurements

7.2.2.5.2 Deliverables

- Report of the measurements

7.2.2.5.3 International Context

Together with the TESLA collaboration and the XFEL project.

7.2.2.6 SEISMO – Seismic sensor for final focus stabilisation

Task Manager: R. Amirikas (DESY)

7.2.2.6.1 Milestones

- January 2006, test of a state of the art sensor at HERA interaction point North (H1)
- January 2007, prototype sensor for one axis

7.2.2.6.2 Deliverables

- Report on the measurements and prototype sensor

7.2.2.6.3 International Context (if appropriate)

In collaboration with Oxford University.

7.2.2.7 SURVEY – Ground vibration investigation of potential Linear Collider sites

Task Manager: W. Bialowons (DESY)

7.2.2.7.1 Milestones

- January 2007, Final report of the ground vibration mapping

7.2.2.7.2 Deliverables

- Report on ground vibration measurements

7.2.2.7.3 International Context

In collaboration with colleagues and institutes in the United States, Asia and Europe

7.2.2.8 References

Wilhelm Bialowons and Heiko Ehrlichmann, Deutsches Elektronen-Synchrotron DESY, 22601 Hamburg, Germany, “Ground Vibration Measurements at the Proposed ALBA Site in Barcelona, TESLA Report 2005-10 and EUROTeV Report 2005-007 (in review).

Wilhelm Bialowons and Heiko Ehrlichmann, Deutsches Elektronen-Synchrotron DESY, 22601 Hamburg, Germany, “Ground Vibration Measurements at the European XFEL Site in Hamburg, XFEL Report 2005-xx and EUROTeV Report 2005-xxx (in preparation).

8 Work Package 8: Global Accelerator Network Multipurpose Virtual Laboratory

8.1 Introduction

The work on the EUROTeV work package GANMVL (WP8) has started in January 2005 and has made steady progress during the first six months in 2005. A detailed working plan was developed and discussed on a first GANMVL-workshop in Frascati, Italy on February 10, which is presented in this memorandum. Major achievements are the performance and evaluation of a worldwide user query, early prototype testing and elaboration of a specification of the planned collaboration tool. The project has thus progressed as planned according the working plan published on the 1st GAN workshop. The working plan and milestones is laid out in detail in this document.

EUROTeV Work package 8 (GANMVL) consists of four sub work packages which each contain a number of subtasks:

- ODI: Overall Design and Integration
- SC: System Components
- ME: Mechanical and Electrical Design
- DGF: Demonstration of GAN and far remote operating

An overview of the tasks including the contact people and main objectives is presented in Table 8.

Detailed milestones, deliverables and Gantt charts are presented in the following sections.

Task	Contact Person	Reporter	Objectives	Deliverables
ODI	Kasemann (DESY)	Kasemann (DESY)	**Analysis of User Needs** ODI-6 Evaluation of Human Computer Interface Issues ODI-7 Evaluation of Collaboratory Issues ODI-2 Overall Design Requirements ODI-5 Design Evaluation	Develop Working plan (workshop, Workshop contributions workshop summary report) Workout and perform User Questionnaire (webpage) Evaluate User needs (report) Design Specifications (report) Design Review (Workshop, workshop contributions, workshop Summary report) Reiterated Design (Report) Design Review (Workshop, workshop contributions, workshop Summary report)
SC	R.Pugliese (Elettra)	R.Pugliese (Elettra)	**System Components** SC-1 Audio Task SC-2 Desktop Video SC-3 Virtual Instrumentation Integration Subtask SC-4 Integration of Controls SC-6 Network Security Subtask SC-7 Applications Programming, Integration and User Interface Subtask	0-th Order Prototype (implementation manual) full functional prototype (implementation, implementation manual) Review Prototype (Workshop, workshop contributions, workshop summary report) Prototype Design Manual (report) GANMVL 2nd Phase Implementation (implementation manual, implementation design review report, GANMVL User Manual)
ME	S.Khodyachykh(DESY)	S. Khodyachykh (DESY)	**Hardware implementation**	GANMVL Electro-Mechanical Implementation, Description and user guide for the end-user devices
DFG	P. Schuett (GSI)	F. Willeke (DESY)	**Demonstration of GAN using MVL** Evaluation of human computer interface and sociological aspects	GANMVL Evaluation Report

Table 8: Overview of GANMVL work package.

8.2 Details of the sub-tasks

In the following sections, the individual sub-tasks of WP8 are detailed, with milestones, Gantt charts and deliverables.

8.2.1 ODI Specifications and Overall Design

Task Leader: M. Kasemann (DESY)
Deputy Task Leader: D. Sertore, (INFN Milano)

The overall system design task develops a design which is driven by the user needs. Basis is worldwide user questionnaire which provides input from a large group of accelerator scientists and engineers. This query has already been performed successfully and has been analysed thoroughly. A first iteration of the specifications and the overall design has been worked out during the June 16-17 2005 GANMVL workshop at DESY. The design now being reiterated in the sub-tasks and after a final design review in October of 2005, the final design report is going to be finalized and published.

The subtasks are:

- ODI-1 Analysis of User needs
- ODI-6 Evaluation of Human Computer Interface Issues
- ODI-7 Evaluation of Collaboratory Issues
- ODI-2 Overall Design Requirements
- ODI-5 Design Evaluation

All participating institutes participated in the assessment of user needs using the results of the query and by providing input from their laboratory's point of view. The university institutions Mannheim and Udine are providing the input for the tasks ODI-1, ODI-6 and ODI-7. The work is performed by M. Hodapp, University of Mannheim and R. Ranon and Augusto Senerchia from the University of Udine. Supervision is provided by Prof. L.Chittaro of Udine and Prof. Walter Bungard of Mannheim.

The overall design is provided by DESY and by INFN Milano. The main persons involved are M. Kasemann (DESY), D. Sertore (Milano), R. Pugliese (Elettra), R. Bacher (DESY), K. Rehlich (DESY) and F. Willeke (DESY).

8.2.1.1 Milestones Task ODI

- Goal 1: Recruitment
    - **1.1** Recruitment of PHD-Student University of Mannheim (M. Hodapp)

- Goal 2: Design and Perform user Query
    - **2.1** Febr.15: Questionnaire completed and approved
    - **2.2** April 30 User Query finished valuated

- Goal 3: Design Specification, first iteration

  - o **3** June 20 : User Requirements and Technical specifications iterated and made available
- Goal 4: Design Specification, final iteration
  - o **4** Oct 30: Final Design Review
- Goal 5: Developing and Updating the Design in parallel with prototype testing

8.2.1.2 Gantt Chart

WP8 : Subtask ODI												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Recruitment												
Graduate student	1.1 1.2											
User Query												
Design questionnaire	2.1			==	==	==						
Perform and evaluate questionnaire	2.2	==	==	==	==	==						
Evaluation												
Derive design Specs from User needs		3										
System Design		4	==	==								
Updating Design				5	==	==	==	==	==	==		

8.2.1.3 Deliverables

1. 15. Feb. 2005 Summary Report GANMVL Workshop Febr.10-11/05
2. 28. Feb. 2005 User Questionnaire Documents and implemented web page
3. 30. March 2005 User Query Evaluation Report
4. 15. June 2005 First Iteration Design Report
5. Oct. 30 2005 Final Design Report
6. When needed Design Report Updates

8.2.2 System Components

Task Leader: R. Pugliese
Deputy Task leader: M. Einhoff, IGD

The sub work package system components will provide and integrate all the software components of the MVL tool. The work sub package is organized in several tasks and working teams:

Working team Audio and Video systems
- Subtask SC1 - Video Task
- Subtask SC2 - Audio Task
- Subtask SC3 - Desktop Task

Working Team Leader: M. Einhoff, IGD,
Deputy working team Leader: R. Pugliese Elettra
Participating Institutions: IGD, ELettra, DESY (Zeuthen), INFN-LNF

Working Team Virtual Instruments Integration,

- Subtask SC-3
- Working Team Leader: R. Bacher, DESY
- Deputy Team Leader: P. Schuett, GSI
- Participating Institutions: DESY, GSI, DESY (Zeuthen)

Working Team Integration of Controls and Network Security Subtask

- Subtask SC-4 Integration of Controls
- Subtask SC-5 Network Security Subtask
- Working Team Leader: K. Rehlich, DESY
- Deputy Team Leader: K. Ohrenberg, GSI
- Participating Institutions: DESY, Elettra, IGD

Working Team Integration and User Interface Subtask

- Subtask SC-7
- Working Team Leader: R. Pugliese, DESY
- Deputy Team Leader: M. Einhoff, IGD
- Participating Institutions: Elettra, IGD

8.2.2.1 Milestones for System Components

- Goal 1 Implementation of Audio Tool
  - **1.1** 15.06.05 Complete Review of existing Systems
  - **1.2** 30.06.06 Audio System prototype implemented and tested
  - **1.3** 01.10.06 Integral test of system in first prototype completed
  - **1.4** 30.06.07 Provide and implement final audio system
  - **1.5** 01.10.07 Tests of final audio system completed
- Goal 2 Implementation of Video
  - **2.1** 15.06.05 Decision on 2D-3D video made
  - **2.2** 15.06.05 Complete Review of existing Systems
  - **2.3** 30.12.05 Provide, implement system for the first prototype
  - **2.4** 30.06.05 Video System prototype implemented and tested
  - **2.5** 01.10.06 Integral test of system in first prototype completed
  - **2.6** 30.06.07 Provide and implement final audio system
  - **2.7** 01.10.07 Tests of final audio system completed
- Goal 3. Implementation of Desktop Video Tool
  - **3.1** 15.06.05 Complete Review of existing Systems
  - **3.2** 30.12.05 Provide, implement system for the first prototype
  - **3.3** 30.06.06 Desktop Video System implemented and tested
- Goal 4: Integration of Virtual Instruments into MVL based on Plug-and-Play Mechanism
  - **4.1** 30.06.05 Decide on technical specifications based on analysis of user survey
  - **4.2** 31.10.05 Decide on conceptual design of virtual instrument integration
  - **4.3** 31.10.05 Decide on list of supported virtual instrument types and instrument functions
  - **4.4** 30.05.06 Implementing of virtual instrument prototypes completed

  - **4.5** 30.05.07 Implementing of supported virtual instrument completed
  - **4.6** 30.09.07 Integration of supported virtual instruments completed
  - **4.7** 01.10.07 Start of final system test

- Goal 5: Develop and Implement Mechanisms safely and transparently to Access Accelerator Controls
  - **5.1** 15.06.05 Thick versus Thin Clients Solutions Decision made
  - **5.2** 30.06.06 Prototype of Authentication and Authorization Procedures implemented and integrated
  - **5.3** 01.10.06 Controls Access tested with first Prototype
  - **5.4** 30.06.07 Final System developed and Implemented
  - **5.5** 01.10.07 Final system tested in MVLGAN Implementation
- Goal 6: Select, design and Implement a Network Security concept for secure MVL operations
  - **6.1** 15.06.05 Network security concept selected
  - **6.2** 30.06.06 Network Security Software implemented protoype
  - **5.3** 01.10.06 Test of Network security software completed
  - **6.4** 30.06.07 Final System Implemented
  - **6.5** 01.10.07 Final system tested in MVLGAN Implementation
- Goal 7: Integrate all components and develop convenient user interfaces for setting up the MVL server and for MVL remote clients
  - **7.1** 15.05.05 zero-th order prototype implemented and tested
  - **7.2** 30.06.06 Software implemented for the prototype
  - **7.3** 01.10.06 Test software completed
  - **7.4** 30.06.07 Final System Implemented
  - **7.5** 01.10.07 Final system tested in MVLGAN Implementation

8.2.2.2 Gantt Chart

WP8: SC												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Advertise posts	==											
Recruit personnel	==	==	==									
Audio System Selection	1.1	==										
Prototype implementation		1.2	==	==	==	==						
Test prototype						1.3	==					
Implement final system						1.4	==	==	==	==		
Test Final System										1.6	==	
Video Scope Decision	2.1	==										
Review exist system	2.2	==										
Implement protoype			2.3	==	==							
Integrate protoype				2.4	==	==						
Test prototpye						2.5	==					
Implement final system							2.6	==	==	==		
Test final system										2.7	==	
Desktop Video, Survey exist. System	3.1	==										
installation			3.2	==								
Integration and test				3.3	==	==						
Virtual Instruments Survey	4.1	==										
Implementation		4.2	==	==	==	==						
Test						4.3	==					
Plug and Play Implementation							4.4	==	==	==		
Test of completed system										4.5	==	
Controls Access, Concept	5.1	==										
Prototype implementation			5.2	==	==	==						
Protoype Test						5.3	==					
Final System Implementation							5.4	==	==	==		
Final System Test										5.5	==	
Network Security concept developem.	6.1	==										
Implement prototype			6.2	==	==	==						
Test protoype						6.3	==					
Implement final system							6.4	==	==	==		
Test final system										6.5	==	
Integration&UserInterface 0-th order test	7.1	==										
Implementation of Prototype			7.2	==	==	==	==					
Test of Prototype							7.3	==				
Implement final system								7.4	==	==		
Test Final System										7.5	==	

8.2.2.3 Deliverables

1. Audio System specification
2. Audio System implementation manual prototype
3. Audio System prototype test report
4. Audio System implementation manual final system

5. Audio System final system test report

6. Video System specification
7. Video System implementation manual prototype
8. Video System prototype test report
9. Video System implementation manual final system
10. Video System final system test report

11. Desktop Video System specification
12. Desktop Video System implementation manual prototype
13. Desktop Video System prototype test report
14. Desktop Video System implementation manual final system
15. Desktop Video System final system test report

16. Virtual Instrument System specification
17. Virtual Instrument System implementation manual
18. Virtual Instrument System test report
19. Virtual Instrument System plug and play implementation manual final system
20. Virtual Instrument System final system test report

21. Accelerator Access System specification
22. Accelerator Access System implementation manual prototype
23. Accelerator Access System prototype test report
24. Accelerator Access System implementation manual
25. Accelerator Access System final test report

26. Network Security System specification
27. Network Security System implementation manual prototype
28. Network Security System prototype test report
29. Network Security System implementation manual
30. Network Security System final test report

31. GANMVL Prototype software implementation manual prototype
32. GANMVL Prototype test report
33. GANMVL software implementation manual prototype
34. GANMVL test report

8.2.3 1.3 Hardware Implementation (ME)

Task Leader: S. Khodyachyhk, DESY
Deputy Task Leader: L. Catani INFN-Roma2
Participating Institutions: DESY, INFN-Roma2

This task consists of integrating the functionality of MVL in a compact and transportable hardware set up and proving special hardware for capturing and transmitting data from optical systems (like OTR).

8.2.3.1 Milestones

2. Goal 1. Develop MVL hardware
   - **1.1** 15.06.05 Conceptual design completed
   - **1.2** 15.06.05 test installation for eye-contact video conf. completed
   - **1.3** 31.12.05 market survey completed and orders placed
   - **1.4** 28.02.05 hardware components delivered
   - **1.5** 30.06.06 test set-up MVL completed
   - **1.6** 01.10.06 prototype tested
   - **1.7** 31.12.06 orders for improved design placed
   - **1.8** 30.06.07 final system completed
   - **1.9** 31.12.07 test completed

8.2.3.2 Gantt Chart

WP8: ME												
Financial Year	Jan 05				Jan 06				Jan 07			
Quarter	1	2	3	4	1	2	3	4	1	2	3	4
Recruiting			==	==								
Conceptual design	1.1	==										
test installation		**1.2**										
Market survey complete and ordering				**1.3**								
hardware components delivered			**1.4**	==	==							
test set-up MVL implementing				**1.5**	==	==						
prototype testing						**1.6**	==					
ordering for improved design							**1.7**	==				
Completing final system								1.8	==	==		
Testing final system										**1.9**	==	==

8.2.3.3 Deliverables

1. MVL Hardware implementation manual prototype
2. MVL prototype Hardware Test report
3. MVL Hardware implementation report
4. MVL Hardware Test Report
5. MVL Description and User guide for end-user devices.

8.2.4 Demonstrating GAN and Remote Operation using the MVL (DGF)

The demonstration of far remote operations is taking place at many institutions now. Within the GANMVL project it should be tested, what tools are needed to maintain, troubleshoot, repair, operate and push performance of complex accelerator equipment or even an entire accelerator by a remote institute which build and designed the equipment and maintains the ownership of this equipment.
It is planned to test the planned MVL equipment in as many institutions and situations possible or desirable. This will start late in 2007. An evaluation of the results is planned for the end of 2007 as a conclusion of the project. Presumable and hopefully the usage of MVL will continue beyond this date.

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