Diagnostics Workpackage

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EUROTeV Final Meeting,
DESY, Hamburg
30th January 2009

- Tasks
- Summary

Overview

- CFBPM; a precision BPM based on a nearly confocal resonator cavity.
- LBPM; a laser-wire system suitable for the ILC.
- PBPM; 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.

CFPBM – A. Ferrari (Uppsala)

A precision BPM based on a nearly confocal resonator cavity

EUROTeV-Report-2008-059

1. Numerical simulations of confocal resonator.
2. Modification of design to a nearly-confocal type.
3. Calculation of shunt impedance for the resonator cavity on a pipe and of the power spectrum showed that a reduction of the available signal by 2-3 orders of magnitude occurs, which is the most severe limitation for the use of the NCR pick-up
4. Publications:
    1. IEEE Transactions on Microwave Theory and Techniques, Volume 55, Issue 10 (2007).
    2. 7 Eurotev reports
    3. Many talks and presentations.

LPBM – G. Blair (JAI/RHUL)

A laser-wire system suitable for the ILC

EUROTeV-Report-2008-093

1. PETRAII hardware system completed previous year, together with measurements + NIM publication.
2. Dismantlement of PETRAII system, upgrade in London, reshipped to DESY.
3. Installed in PETRAIII; additional hardware costs for upgrade.
4. Completed construction of ATF2 LW with commercial lens.
5. Upgraded ATF2 LW with custom f/2 optic. NIM Publication nearly complete. (Micron scale precision has been verified)
6. Completed study of laser-wires in the linear collider, including emittance measurement.
7. Publications:
    1. Nuclear Instruments and Methods in Physics Research A 592 (2008) 162–170
    2. Phys. Rev. ST Accel. Beams 10, 112801 (2007)
    3. 1 Thesis
    4. 1Thesis (M. Price, L. Deacon)

PBPM - L. Soby (CERN)

A precision cavity BPM

EUROTeV-Report-2008-071

1. Precision BPM has been designed, manufactured and tested.
2. New BPM requirements are a resolution of 100 nm in a 6mm aperture
3. A dedicated test bench has been designed and constructed to fully characterize and optimize the PBPM
4. beam tests have been carried out in the CERN CLIC Test Facility 3 (CTF3).
5. Publications:
    1. 5 Eurotev reports
    2. Many talks and presentations.

ESPEC – M. Wing (UCL)

Energy spectrometry based on precision BPMs.

EUROTeV-Report-2008-093

1. Cavity BPM system tests for the ILC energy spectrometer + NIM publication.
2. High resolution cavity BPM Tests and ESA; Nim publciation.
3. ESA test completed and new hardware shipped to KEK.
4. Completed construction of ATF2 electronics and shipped to KEK.
5. Planned inclusion of nBPMs in laser-wire system for bunch jitter subtraction. (Will continue under EuCARD)
6. Publications:
    1. NIM A592 (2008) 201-217
    2. NIM A578 (2007) 1-22
    3. 1 Thesis (F. Gournaris, UCL)

HEPOL - F. Zomer (LAL)

A high energy polarimeter based on a high-finesse optical cavity.

EUROTeV-Report-2008-096

1. high-finesse stable two-mirror cavity in pulsed regime, laser-beam waist reduction
2. Designed and built a non-planar four-mirror cavity
3. Polarimetry studies.
4. The task evolved within the programme into the “pulsed laser injected cavity” (PLIC). Publications:
    1. **Appl. Opt. 46 (2007) 6159-6866.**
    2. One other submitted.
    3. 2 Eurotev notes
    4. Physics preprint (2005) **physics/0509016.**
    5. Many talks and presentations at Eurotev metings.

TPMON – J. Sladen (CERN)

A high precision time and phase monitoring system.

EUROTeV-Report-2008-095

1. Designed an analogue system that would yield high resolution phase information at baseband.
2. Tests with beam were done in CTF3.
3. Delivered a prototype that provides a timing measurement with a resolution below 10 femtoseconds.
4. Publications:
    1. 5 Eurotev notes
    2. Many talks and presentations at Eurotev metings.

WBCM - L. Soby (CERN)

A wide band current monitor

EUROTeV-Report-2008-070

1. A prototype of a WBCM has been built in November 2008.
2. The first measurement has shown an agreement with the expected average signal level and required bandwidth of 20GHz.
3. The suppression of the gap resonances, which should appear at about 13GHz on the test bench, has also been demonstrated
4. Full reviews completed of the types of candidate devices
5. A relaxing of the constraints due to reduction in CLIC frequency.
6. The WBDM is ready for further tests in 2009.
7. Publications:
    1. 3 Eurotev notes
    2. Many talks and presentations at Eurotev metings.

FLUM – W. Lohmann (DESY)

A fast luminosity monitoring based on low angle calorimeters

EUROTeV-Report-2008-019

1. ILC BeamCal and GamCal used to give parameters for beam properties.
2. Number of channels needed from BeamCal.
3. Benefit of using Beamstrahlung photons from GamCal evaluated.
4. Determined achievable precision and estimate of correlations.
5. Suggested treatment of correlations.
6. Publications:
    1. 3 Eurotev notes
    2. Many talks and presentations at Eurotev metings.

Summary

- All tasks have completed final reports
- All deliverables have been met, or careful analysis provided of why they could not be met.
- Excellent scientific results.
- Excellent training of young researchers.
- Ongoing programme of work, building on Eurotev success.
- Thankyou to all the task reporters and colleagues.