

Addendum to the LCTPC MOA: R&D Progress Report October 2007

Overview

Responsibilities, structures and plans 2007 are outlined in this document. All issues for the TPC performance within the ILC framework have been described at several reviews since 2001, most recently for the WWS R&D review in LC Note LC-DET-2007-005 at <http://flcweb01.desy.de/lcnotes/>. The names of LCTPC members is kept up to date at <https://wiki.lepp.cornell.edu/wws/bin/view/Projects/TrackLCTPCcollab>.

1 Responsibilities 2007

1.1 Collaboration Board (CB)

The groups and, in bold, the **CB members** are listed in the following.

-Americas-	
Carleton:	Madhu Dixit
Montreal:	Jean-Pierre Martin
Victoria:	Dean Karlen
Cornell:	Dan Peterson
Indiana:	Rick Van Kooten
LBNL:	Dave Nygren
Louisiana Tech:	Lee Sawyer
-Asia-----	
Tsinghua:	Yuanning Gao
For the CDC groups:	Akira Sugiyama
Hiroshima	
KEK	
Kinki	
Saga	
Kogakuin	
Tokyo U A & T	
U Tokyo	
Tsukuba	
Mindanao	
-Europe-----	
Inter U Inst for HEP(ULB-VUB):	Xavier Janssen
LAL Orsay/IPN Orsay:	Vincent Lepeltier
CEA Saclay:	Paul Colas
Aachen:	Stefan Roth
Bonn:	Klaus Desch
DESY/UHamburg:	Ties Behnke
EUDET:	Joachim Mnich
Freiburg:	Andreas Bamberger
Karlsruhe:	Thomas Müller
MPI-Munich:	Ariane Frey
Rostock:	Henning Schroeder (deputy: Alexander Kaukher)
Siegen:	Ivor Fleck
Nikhef:	Jan Timmermans
Novosibirsk:	Alexei Buzulutskov
St.Peterburg:	Anatoliy Krivchitch
Lund:	Leif Jonsson
CERN:	Michael Hauschild (deputy: Lucie Linsen)

1.1.1 New groups

This first Addendum was written at the same time as the LCTPC MOA, September 2007, thus there are no new groups to report at this time. The changes in the group structure will appear here in future Addenda.

1.1.2 Observers

Groups or persons that could not sign the MOA but want to be informed on the progress will appear here.

1.2 Regional Coordinators (RC)

The RCs, after selection of candidates by search committees in each region and were elected on by the CB members of the respective region, are

–Americas: **Dean Karlen**

–Asia: **Takeshi Matsuda**

–Europe: **Ron Settles** (who requests to continue for only one year) followed by **Jan Timmermans**.

Spokesperson selection: The RCs decided not to have a predetermined rotation of RCs as their chairperson and spokesperson for the collaboration; he/she will be chosen by the RCs once per year, and the reasoning for the choice will be explained to the collaboration. For the first year, Ron Settles was chosen to be Chairperson/Spokesperson.

1.3 Technical Board (TB)

The present workpackage structure is presented here; the **TB members** are the conveners of the workpackages and are listed in bold) in the following table. Preliminary information (to be confirmed) about the interests of the groups for the different workpackages is also shown; details of which group does what is in the process of being specified.

Workpackage Convener	Groups involved
Workpackage (0) TPC R&D Program	LCTPC collaboration
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Workpackage (1) Mechanics	
a) LP design, incl. endplate structure Dan Peterson	Cornell,Desy,MPI,IPNOrsay, +contribution from Eudet
b) Fieldcage, laser, gas Ties Behnke	Aachen,Desy,St.Petersburg, +contribution from Eudet
c) GEM panels for endplate Akira Sugiyama	Aachen,Carleton,Cornell,Desy/HH, Kek/CDC,Victoria
d) Micromegas panels for endplate Paul Colas	Carleton,Cornell,Kek/CDC, Saclay/Orsay
e) Pixel panels for endplate Jan Timmermans	Freiburg,Nikhef,Saclay,Kek/CDC, +contribution from Eudet
f) Charge-dispersion-foil for endplate Madhu Dixit	Carleton,Kek/CDC,Saclay/Orsay
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Workpackage (2) Electronics	
a) Standard RO/DAQ system for LP Leif Joensson	Aachen,Brussels,Cern,Desy/HH,Lund, Montreal,Rostock,Tsinghua, +contribution from Eudet
b) CMOS RO electronics Harry van der Graaf	Freiburg,Nikhef,Saclay, +contribution from Eudet
c) Electronics for LCTPC Luciano Musa	Aachen,Cern,Desy/HH,Lund,Rostock, Montreal,St.Petersburg,Tsinghua, +contribution from Eudet
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Workpackage (3) Software	
a) LP software + simul./reconstr.framework Peter Wienemann	Desy/HH,Freiburg,Carleton,Victoria, +contribution from Eudet
b) LCTPC simulation/perf./backgrounds Stefan Roth	Aachen,Carleton,Cern,Cornell,Desy/HH, Kek/CDC,St.Petersburg,Victoria
c) Full detector simulation/performance Keisuke Fujii	Desy/HH,Kek/CDC,LBNL
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Workpackage (4) Calibration	
a) Field map for the LP Lucie Linsen	Cern+contribution from Eudet
b) Alignment Takeshi Matsuda	Cern,Kek/CDC
c) Distortion correction Dean Karlen	Victoria
d) Radiation hardness of materials Anatoliy Krivchitch	St.Petersburg
e) Gas/HV/Infrastructure for the LP Klaus Dehmelt, Peter Schade	Desy, Victoria, +contribution from Eudet

2 Next R&D Steps, the LP and SPs

2.1 What has been learned

Before addressing plans, a brief overview of what has been learned in the past few years is needed. As described in the MOA, the R&D is proceeding in three phases: (1) Small Prototypes–SP, (2) Large Prototypes–LP and (3) Design.

Up to now during Phase(1),

- about 4 years of MPGD experience has been gathered,
- gas properties have been well measured,
- the best possible point resolution is understood,
- the resistive-anode charge-dispersion technique has been demonstrated,
- CMOS pixel RO technology has been demonstrated,
- the proof of principle of TDC-based electronics has been shown and
- design work has started for the LP.

2.2 Next steps

The Phase(2) LP and SP work is expected to take about four years and will be followed by Phase(3), the design of the LCTPC. A scenario for the options is presented in Table 1 which will be updated in future Addenda as the planning progresses.

Regular bi-weekly WP phone meetings started in May 2006 where details for the LP design are being worked out and next R&D steps are being developed. The LP is underway, and the groups agree that over the next three years there will be an evolution of endplates towards a true prototype for the LCTPC. These stages are symbolized by LP1, LP1.5, LP2 in the table. Supplemental testing with the SPs, which have been used extensively to date as witnessed by Section 2.1, will continue, since there are still several issues to be explored which can be performed more efficiently using small, specialized set-ups. The small-prototype work is driven to a large extent by the needs of the individual labs, whereby certain issues will be studied; example as seen in the following table.

Table 1: LCTPC R&D Scenarios for Large Prototype and Small Prototypes.

Large Prototype R&D		
Device	Lab(years)	Configuration
LP1	Desy/Eudet(2007-2009)	Fieldcage \oplus 2 endplates: GEM+pixel, Micromegas+pixel <i>Purpose: Test construction techniques using ~ 10000 Alice/Eudet channels to demonstrate measurement of 6 GeV/c beam momentum over 70cm tracklength, including development of correction procedures.</i>
LP1.5	Fermilab/Eudet(2010)	Fieldcage \oplus 2 endplates: GEM+pixel, Micromegas+pixel <i>Purpose: Continue tests using 10000 Alice/Eudet channels to demonstrate measurement of 100 GeV beam momentum over 70cm tracklength, in a jet environment and with ILC beam structure using LP1.</i>
LP2	Fermilab/Eudet(2011)	Fieldcage \oplus endplate: GEM, Micromegas, or pixel <i>Purpose: Prototype for LCTPC including gating and other options, demonstrate measurement of 100 GeV beam momentum over 70cm tracklength, and in jet environment and ILC beam structure, test prototype LCTPC electronics.</i>
Small Prototype R&D		
Device	Lab(years)	Test
SP1	KEK(2007-2008)	Gas tests, gating configurations
SP2,SP3	Fermilab(2008-2009)	Performance in jet environment
SPn	LCTPC groups(2007-2009)	Performance, gas tests, dE/dx measurements, continuation of measurements in progress by groups with small prototypes