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 Responsibilites 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 Sacly:	**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
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, +contriubution from Eudet
f) Charge-dispersion-foil for endplate **Madhu Dixit**	Carleton,Kek/CDC,Saclay/Orsay
Workpackage (2) Electronics	
a) Standard RO/DAQ sytem 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
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
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 in 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 sympolized 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⊕2 endplates: GEM+pixel, Micromegas+pixel
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.		
LP1.5	Fermilab/Eudet(2010)	Fieldcage⊕2 endplates: GEM+pixel, Micromegas+pixel
Purpose: Continue tests using 10000 Alice/Eudet channels to demonstrate measurement of 100GeV beam momentum over 70cm tracklength, in a jet environment and with ILC beam structure using LP1.		
LP2	Fermilab/Eudet(2011)	Fieldcage⊕endplate: GEM, Micromegas, or pixel
Purpose: Prototype for LCTPC including gating and other options, demonstrate measurement of 100GeV beam momentum over 70cm tracklength, and in jet evironment and ILC beam structure, test prototype LCTPC electronics.		

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