Plan for 2014-201x
LCTPC Collaboration

Taking into account the two documents of WPmeeting 176.
The man power estimates are given in units of PhD. students, corresponding to the work a PhD. student could do in 3 years. For postdocs or senior scientists the PhD. unit with time scale of 3 years is likely to be shorter, if the background knowledge is already available. A number of the tasks indicated as PhD. students should be covered by postdocs or senior scientists to ensure continuity. In one case (4.) it is already clear, that a postdoc is needed.

1.) Gate (in total 2.5 PhD. students)
- Measure ion drift velocity in our gas/E-field. (0.5 PhD. + setup)
- Design and test a grid system with high enough transparency for electrons:
  * GEM gate – test ion absorption/electron transparency (0.5 PhD. + setup)
  * wire gate – test ion absorption/electron transparency (0.5 PhD. + setup)
- Simulation of various ideas (mono-voltage vs. bi-voltage etc.) (0.5 PhD.)
- Generate an ion disc with UV light and test influence (0.5 PhD.)

2.) Module design (in total 3-4 PhD. students)
- Including simulations and studies to reduce local field distortions.

3.) Simulation (in total 4 PhD. students)
(a1) Implementation of the response of the resistive anode in our simulation, and, test of one module with a resistive anode in the ILC events with beam backgrounds conditions. (0.5 PhD.)
(a2) Test of our current dE/dX code for the LP events, and provide it to the physics simulation. (0.5 PhD.)
(a3) Study of the pad size/length in the two hit separation, the occupancy, and the spatial resolutions (in the comparison to the current condition used in the physics analysis) (0.5 PhD.)
(b1) Studies of the dependencies of TPC and ILD tracker performances on TPC size and configurations in cooperation with the optimization group.
(b2) Pinpoint performance requirements based on various physics analysis for the technology choice, i.e. looking at different physics channels and charting distributions and requirements (single point, double track resolution, momentum and dE/dx resolution, reliability in performance), which allow the CB later to define the technology choice. Also, suggestions for the test procedure need to be studied. (1.0 PhD.)
(b3) Physics simulation to study the benefit of a TPC (vs. Si detectors): dE/dx, continuous tracking, non-pointng tracks. Find appropriate channels and show what a TPC can do better.
→ mostly done by ILD optimization group, but need input and some work from LCTPC
(c1) Study of benefit of pad/pixel readout: This may be partially included in the (b2). For the pixel readout optimized reconstruction algorithms are needed. (0.5 PhD.)
(c2) Simulation of physics events to understand requirements on two track/hits separation: This may be studied partially in (a3) for the pad readout. (0.5 PhD.)

4.) Electronics (2.5 PhD. students and one postdoc)
- Detailed simulation of physics events studying the effect of various electronics parameters on physics performance; including number of ADC bits (tracking and dE/dx!), rise time, sampling

frequency, power consumption (0.5 PhD. students)
- Start group of experts on chip design (maybe 1-2 chip designers, 1-2 PCB designers, 1-2 physicists to collect some ideas/designs and make general design proposals)
- Development of a S-ALTRO-based readout system (1.0 postdoc)
- Development of a Timepix3 readout system for large scale. (0.5 PhD. + hardware + x Timepix3 wafer)
- Address the problem of power pulsing. (0.5 PhD.)
- LV power supply and distribution on modules. (0.5 PhD.)
- HV distribution (generation locally on module?) (0.5 PhD.)

5.) Software (in total 5 PhD. students)
- Further development of Marlin TPC and better understanding of the data already taken. (3.0 PhD.)
- Develop correction procedure for local field distortions → give 'final' result for single point resolution in PCMAG and 3.5 T. (0.5 PhD.)
- Develop simulation and reconstruction tools for 2 hit/2track reconstruction. (0.5 PhD.)
- Develop methods for dE/dx measurements. (0.5 PhD.)

6.) High Field Magnet (in total 2 PhD. students)
- Test performance of current module design in 3.5 T field – in particular the design to reduce the local field distortions. (1.0 PhD.)
- Test gating device in 3.5 T (0.5 PhD.)
- Test power pulsing in 3.5 T (0.5 PhD.)

7.) External tracking device for T24/1 (in total 1 PhD. students)
- Building and operating it. The main goal is to study the track distortions and its corrections.

8.) Mechanical aspects (in total 3 physicists and/or engineers)
- More simulation studies of endcap and field cage are necessary (influence of larger modules on mechanical rigidity of endcap) (1.0 engineer)
- Build test samples for the field cage to test HV stability (70-100 kV) and mechanical rigidity. Feed information in simulation study. (1.0 engineer + material)
- Design cathode and HV connection to cathode (0.5 engineer)
- Mounting of TPC – more detailed calculations are necessary. (0.5 engineer)

9.) External tracking device for T24/1 (in total 1 PhD. students)
- Building and operating it.

10.) Temperature (in total 1 physicists and/or engineers)
- Cooling of electronics and pad plane.
- Study how much T-variation we can accept.
- Study the benefit and technical realization of a thermal jacket.

The total sum is ca. 22 PhD. units (about half of which will actually be PhD. candidates), 1 postdoc and 4 physicists/engineers.