

# Facilities summary from IDTB07

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(based on Jae's summary talk at IDTB07, updated with  
ILC detector R&D roadmap document draft)

# IDTB07

- ILC Detector Test Beam Workshop
  - 17-19 January 2007 at Fermilab
  - Very successful with about 120 participants

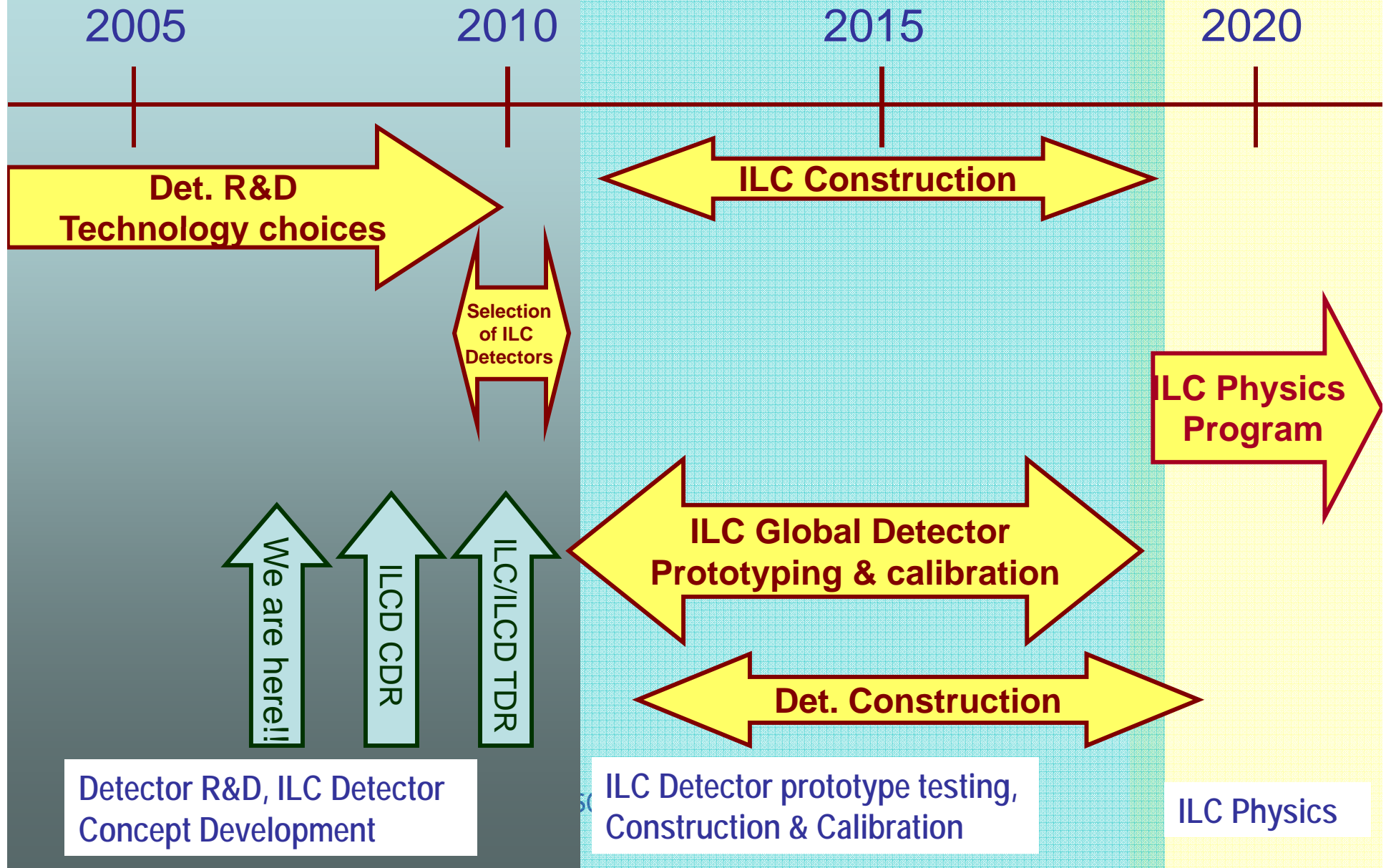
# Charges of IDTB07

- ✓ Review and assess the current status, capabilities and plans of facilities
- ✓ Review and assess the current and planned detector test beam activities
- ✓ Identify requirements for test beams to meet adequately the detector R&D needs
- ✓ Plan and discuss for the future beam test activities
  - ✓ What have we learned from LHC beam tests?
  - ✓ What can we learn from existing ILC test beam activities?
  - ✓ What should the future beam test activities focus?
- Put together a team to write the ILC detector R&D test beam roadmap document which includes all sub-detector systems and the anticipated demands to facilities
  - This document should be completed by summer 2007

# Today's session (90 min.)

- Overview on test beam facilities (KK, << 20min.)
- News from SLAC ESA (Carsten Hast, 10min.)
- FNAL test beams with ILC time structure (Eric Ramberg, 10min.)
- High filed, large bore magnet for common tracking, vtx and cal testing (Laci Andricek, 20min.)
- The test beam roadmap report (5min. Each)
  - Facilities (David MacFarlane → in KK's talk)
  - VTX (Chris Damarell → in Laci's talk)
  - TRK (Marcel Demarteau)
  - CAL (Felix Sefkow)
  - MUO (Jerry Blazey ?)
- Discussion

# LC Detector Time Line



# Current status, capabilities and plans of facilities

# Testbeam Availability

Laboratory	Energy Range (GeV)	Particles	Availability and plans
CERN PS	1 - 15	e, h, $\mu$	LHC absolute priority after 11/07
CERN SPS	10 - 400	e, h, $\mu$	LHC absolute priority after 11/07
DESY	1 - 6	e	> 3 months per year
FNAL MTBF	1 - 120	e, $\pi$ , h, $\mu$	Continuous at 5% duty factor, except for summer shutdown
Frascati	0.25 - 0.75	e	6 months per year
IHEP Beijing	1.1 - 1.5 (primary) 0.4 - 1.2 (secondary)	e e, $\pi$ , p	Continuous in March 2008 and later
IHEP Protvino	1 - 45	e, h, p, $\mu$	Two one-month periods per year
J-PARC	Up to 3GeV	????	Available in 2009 earliest
KEK Fuji	0.5 - 3.4 GeV	e	Available fall 2007, for 8 months/year as long as KEKB operates
LBNL	1.5; < 0.06; < 0.03	e; p; n	Continuous
SLAC	28.5 (primary) 1.0 - 20 (secondary)	e e, $\pi$ , p	Shutdown in 2008 - 2009, with uncertain plans beyond

From Roadmap draft

# Testbeam Parameters

Laboratory	Beam energy	# Beamlines	$\Delta p/p$	Rep. Rate (Hz)	Beam instruments
CERN PS	1 - 15 GeV	4			Cherenkov, TOF, MWPC
CERN SPS	10 - 400 GeV	4			Cherenkov, TOF, MWPC
DESY	$e^-$ / 6 GeV	3	1% ?	12.5	Pixels (T24 is being dedicated to EUDET)
Fermilab	1 - 120 GeV	1	1% > 10 GeV		Cherenkov, TOF, MWPC, Si Strips, Pixels
Frascati	25-750 MeV	1			
IHEP Beijing	$e^-$ / 1.5 GeV	3	<1% 1%	25 1.5	Cherenkov, TOF, MWPC
IHEP Protvino	1-45 GeV	4			Cherenkov, TOF, MWPC
J-PARC					
KEK Fuji	8 GeV	1	0.4%	100.0	
LBNL	$e^-$ / 1.5 GeV	1		1.0	Pixel telescope
SLAC	28.5 GeV	1	0.2%	10.0	

From Roadmap draft

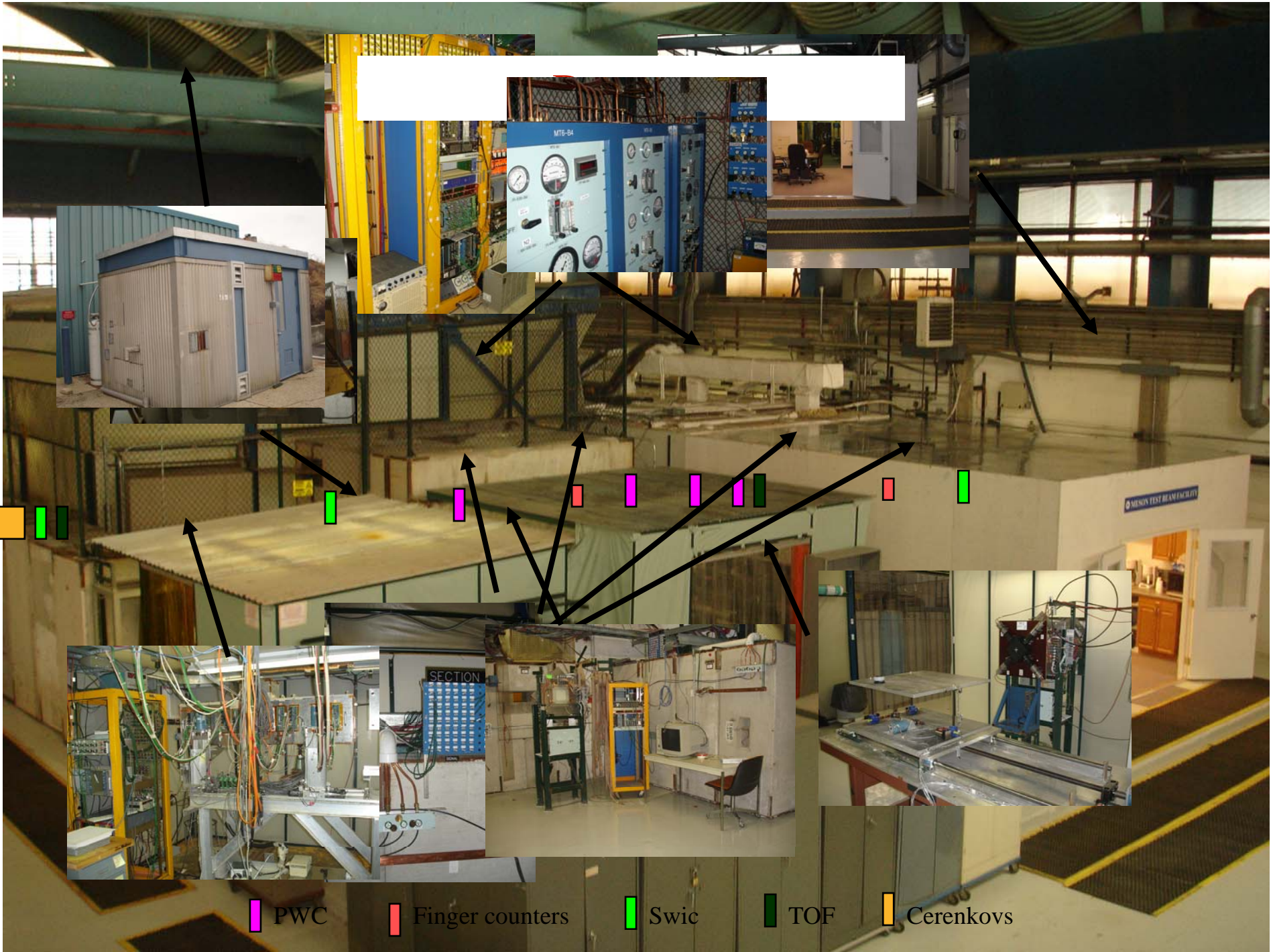


# Facilities summary

- Six low energy ( $<10\text{GeV}$ ), electron facilities available at various time periods
- One med energy ( $<28\text{GeV}$ ) electron facility available up to 2008 (SLAC ESA), but uncertain beyond 2008
- Two med to low E ( $<45\text{GeV}$ ) hadron facilities available
  - ITEP-Protvino is available 2 months/year
  - CERN PS has limited availabilities once LHC turns on till the operation stabilizes
- Two high E hadron facilities available
  - CERN SPS has limited availabilities once LHC turns on till the operation stabilizes
  - Impressive upgrades in Fermilab MTBF for ILC detector R&D needs

# Upgrade of Fermilab MTBF

- New design of the test beam
  - beam material reduced from 17.8% to 3.4%  $X_0$
  - momentum range extended below 4 GeV
  - overall rate substantially improved
  - Duty factor limited no more than 5 %
- Test beam area better equipped and supported
  - Cables, gas lines, offices,
  - New TOF counters,
  - Differential Cherenkov detectors,
  - Motion tables and video systems
  - Laser alignment system



# Requirements to test beam facilities from R&D groups

# Defining R&D Requirements

- BI&MDI groups' requirements well understood
- Vertex groups
  - defining their requirements to start in ~2010
  - Prototype detectors to be tested in a common infra structure
  - setting up a coordination group in order to plan and develop the common infra structure
- Tracking groups
  - TPC performed beam test many times → Well positioned to clearly define the requirements
  - Si-based tracker needs are being formulated but can use better coordination (Jae's comment at IDTB07)
- Calorimeters and Muons
  - Requirements defined 3 years ago
  - Need to update given the anticipated change in focuses

# Requests of R&D groups

- Large bore, high field magnet (3~6T)
  - VTX group: a 3~6T magnet with split coil feature
  - Tracking group: AMY (3T) and/or TRIUMF (2T) magnets (and then 5~6T magnet ?)

→ See Laci's talk
- ILC beam time structure (1ms beam + 199ms blank)
  - VTX, TRK and CAL electronics

→ See Erik's talk
- Mimicking hadron jets
  - VTX, TRK and CAL
- Common DAQ hardware and software
- Common online and offline software
  - Reconstruction and analysis software
- Tagged neutral hadron beam (FNAL MCenter)
  - Successful PFA means the HCAL measures neutral hadrons
  - Simulation models need some neutral hadron data
  - Hadron calorimeter calibration can use momentum tagged neutral hadrons

# Detector R&D Needs

Detectors	N_Groups	Particle Species	P (GeV)	Magnet (Tesla)	N_Weeks /yr	ILC time structure	Note
<b>BI&amp;MDI</b>	2E+8ESA+1 F+2C+3BC	e	up to 100	Not specified	64		Mostly low E elec
<b>Vertex</b>	10	e, $\pi$ , p; $\mu$	up to 100	3 - 6	40	Yes	
<b>Tracker</b>	3TPC+ 2Si	e, $\pi$ , p; $\mu$	up to 100	1.5 $\rightarrow$ 2~3 $\rightarrow$ 5~6	20	Yes	
<b>Cal*</b>	5 ECALs+3 DHCALs + 5 AHCALs	e, n, $\pi$ , K, p; $\mu$	1 $\rightarrow$ 120	Not specified	30 - 60	Yes	
<b>Muon/TC MT</b>	3	e, $\pi$ , $\mu$	1 $\rightarrow$ 120	Not specified	12		

\*Note: Most calorimeter R&D activities world-wide are organized under CALICE collaboration.

Can some of these work concurrently?

# ILC detector R&D test beam roadmap document



# Roadmap Document Structure

- Introduction
  - Physics Needs
  - Time scale considered in the document
- Facilities
  - Summarize the current capabilities and plans
- Detector R&D → Organized by detector types
  - Current activities
  - Requirements
  - Plans
- Computing, Simulation and Software
- Summary of requests to facilities

Responsible authors for each section were defined.

# On what time scale?

- First draft by LCWS 2007 at DESY
  - May 30 – June 1, 2007
- Final draft within 1 month of LCWS2007
  - Release the final draft by July 1, 2007
- Deliver the document to facility managers and ILC leadership on July 1, 2007

DONE

# Facilities part of the roadmap document

- Survey the status and plans of the beam test facilities
  - CERN (SPS and PS)
  - DESY (DESY II)
  - Fermilab (MTBF, MCenter)
  - IHEP-Beijing (BES)
  - IHEP-Protvino
  - KEK (KEK-B) and J-PARC (in future)
  - LBNL (ALS and LOASYS)
  - SLAC (ESA → SABER ?)

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