



Test Beams Summary

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30-Mar-2010

LCWS10 in Beijing



The Test Beam Session

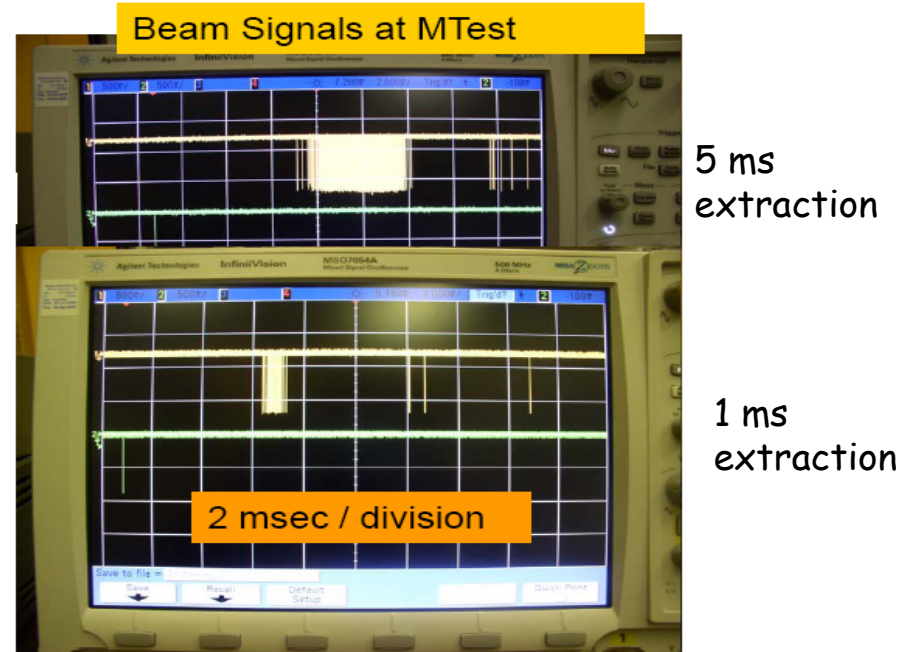
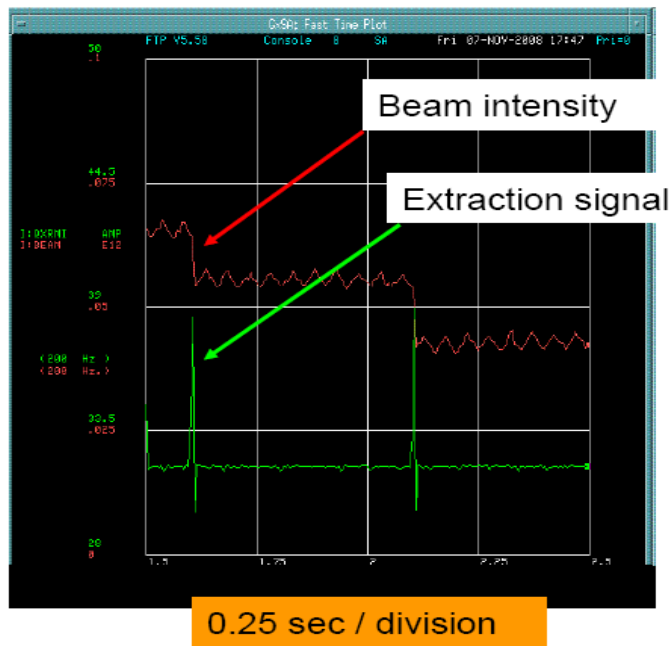
A compact session with five talks in a very compact "VIP" room.

- Fermilab Test Beam Facility (M. Demarteau)
- ESTB SLAC Test Beam Project (J. Jaros)
- Asian Test Beam Facilities (S. Uozumi)
- AIDA Framework (M. Vos)
- Report on LCTW09 at Orsay (R. Pöschl, phone)

Some highlights will be shown in this talk.
See original slides for details.

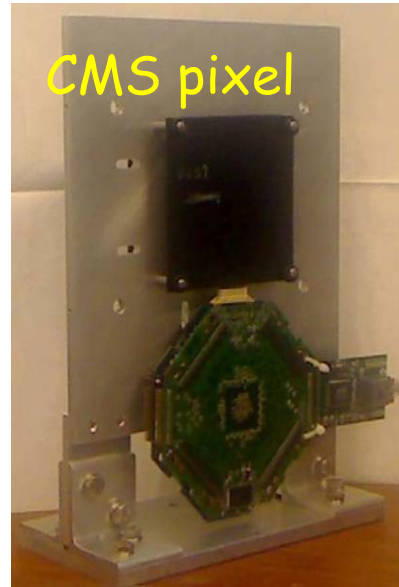
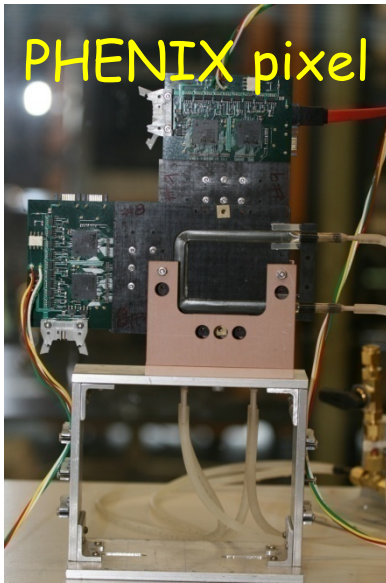
ILC-like 'Train' Structure

- The ILC is a 5 Hz machine: 1 ms train with a 199 ms inter-train quiet period
- The Accelerator Division has installed pulsed quadrupole extraction hardware that can deliver beam within 1 to 5 ms short spills, or 'pings' (=train)

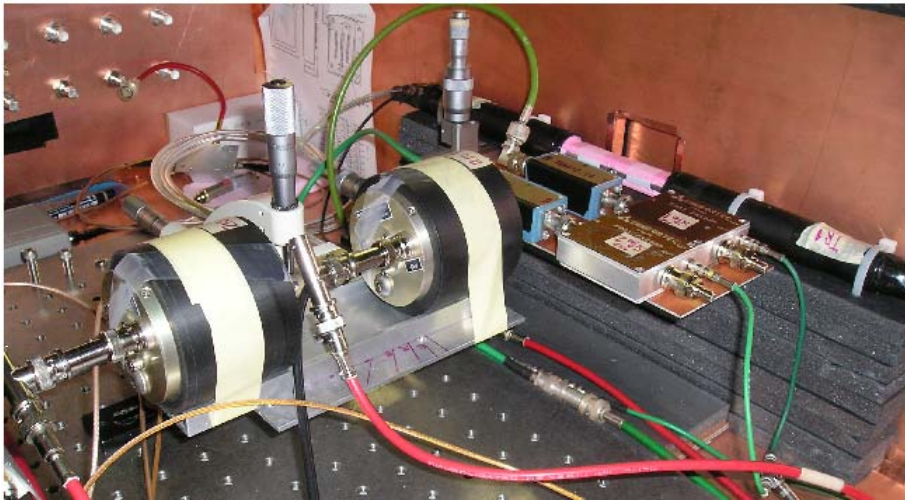


- Several of these pings can be delivered within the assigned 1 second spill time
- Two or more groups of protons (3-7 bunches each) can be coalesced with 400 ns spacing

New test beam facilities at MTest

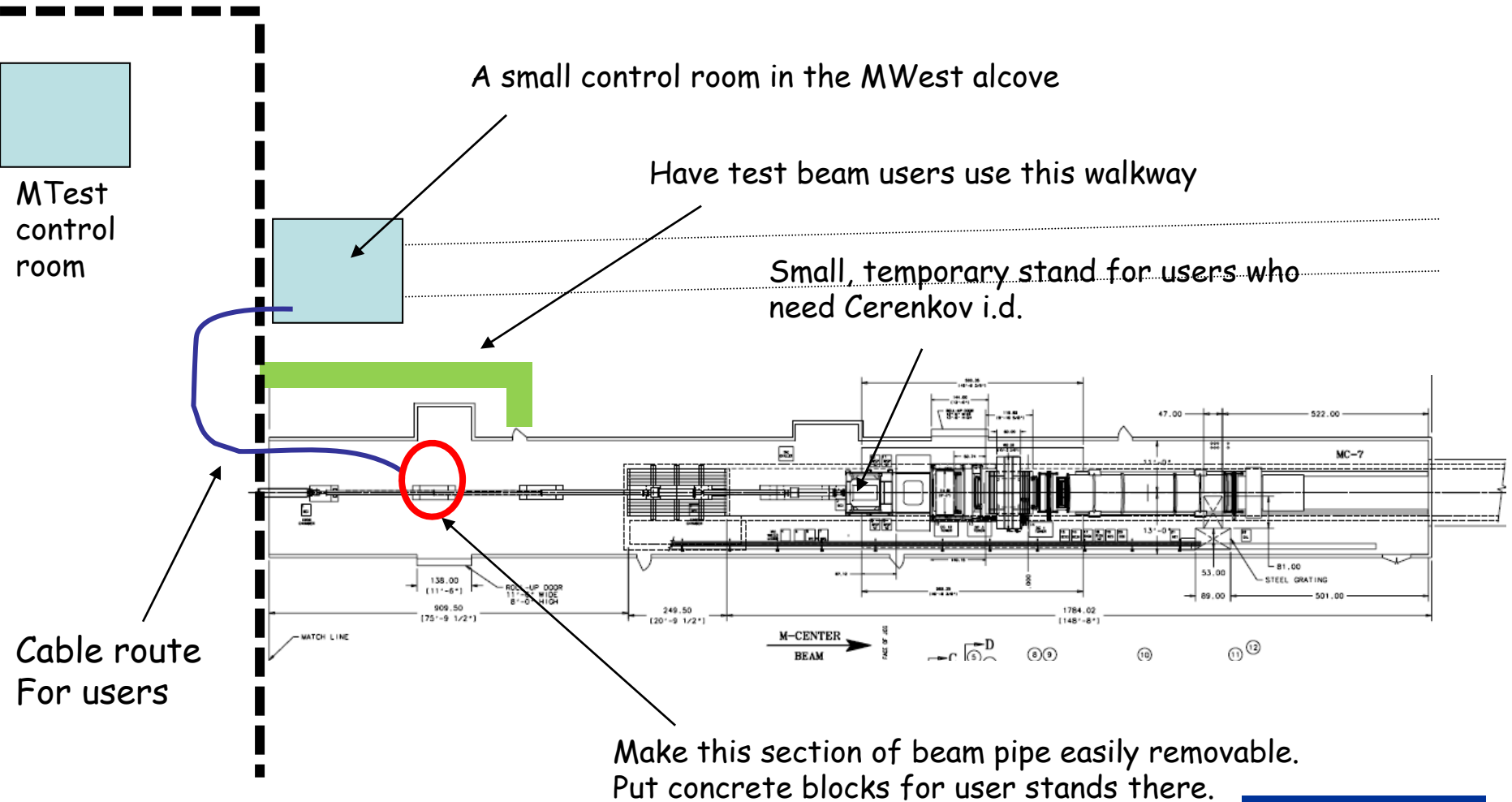


- Two stations of PHENIX pixel tracker
 - Pixel size is $50 \times 400 \mu\text{m}^2$
 - Active area per $6 \times 6 \text{ cm}^2$
- Four stations of CMS pixel tracker
 - Pixel size $100 \times 150 \mu\text{m}^2$
 - Overlap area $2 \times 2 \text{ cm}^2$
 - "CAPTAN" DAQ system
- Fast timing detector
 - Quartz bar + PHOTEK MCP
 - Time resolution 6ps



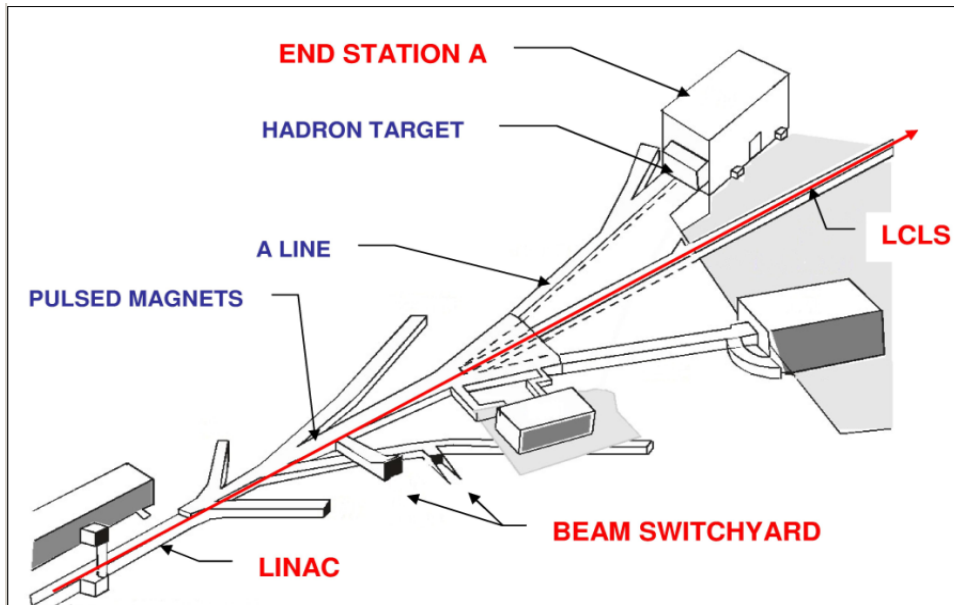
Proposal for a Small Test Beam Area in MCenter

The proposal has been approved. To be available after 2010 Summer shutdown ?

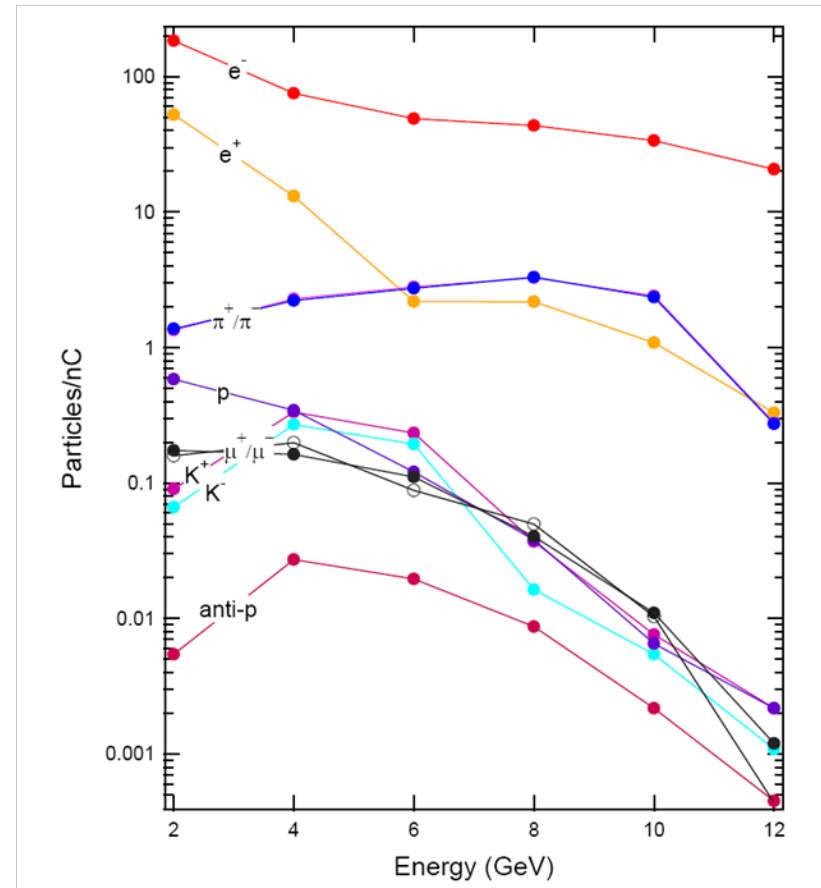


ESA Test Beams Can Provide Electrons/Hadrons up to 13.6 GeV, from single particles to full beam intensity

- **Kick 13.6 GeV LCLS beam to ESA**
5 Hz, 2×10^9 e⁻/ pulse primary beam
- **Clean secondary electrons/positrons**
 $p < 13.6$ GeV, 0.1/pulse to 2×10^9 e⁻/pulse
- **Secondary hadrons**
 $\sim 1 \pi$ / pulse < 12 GeV/c



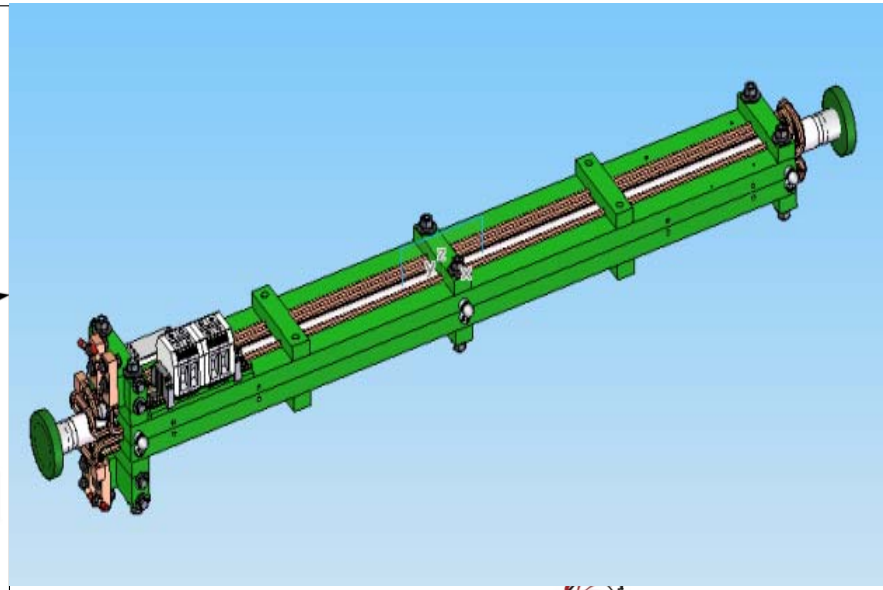
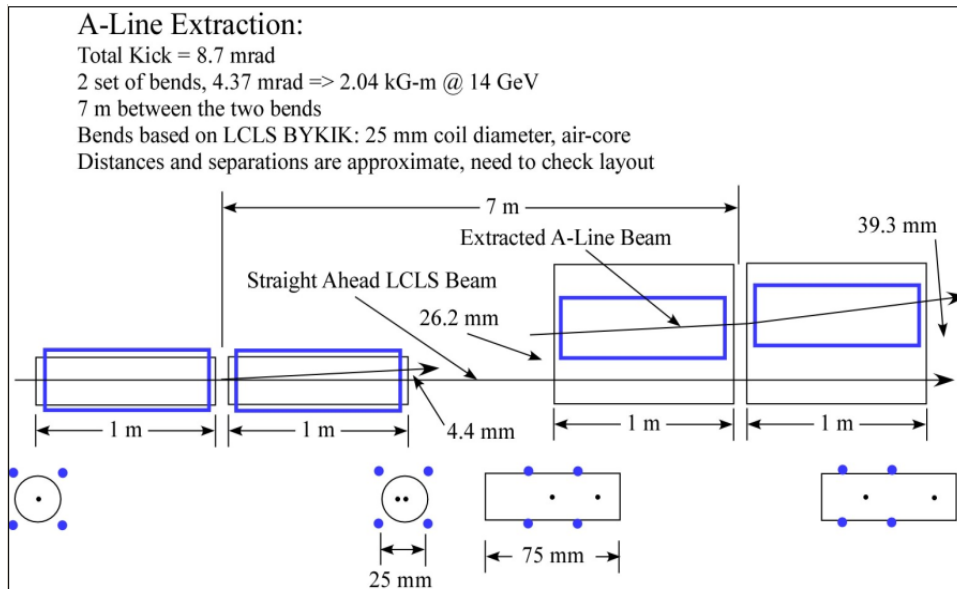
Secondary Particle Yields



ESTB Stage I

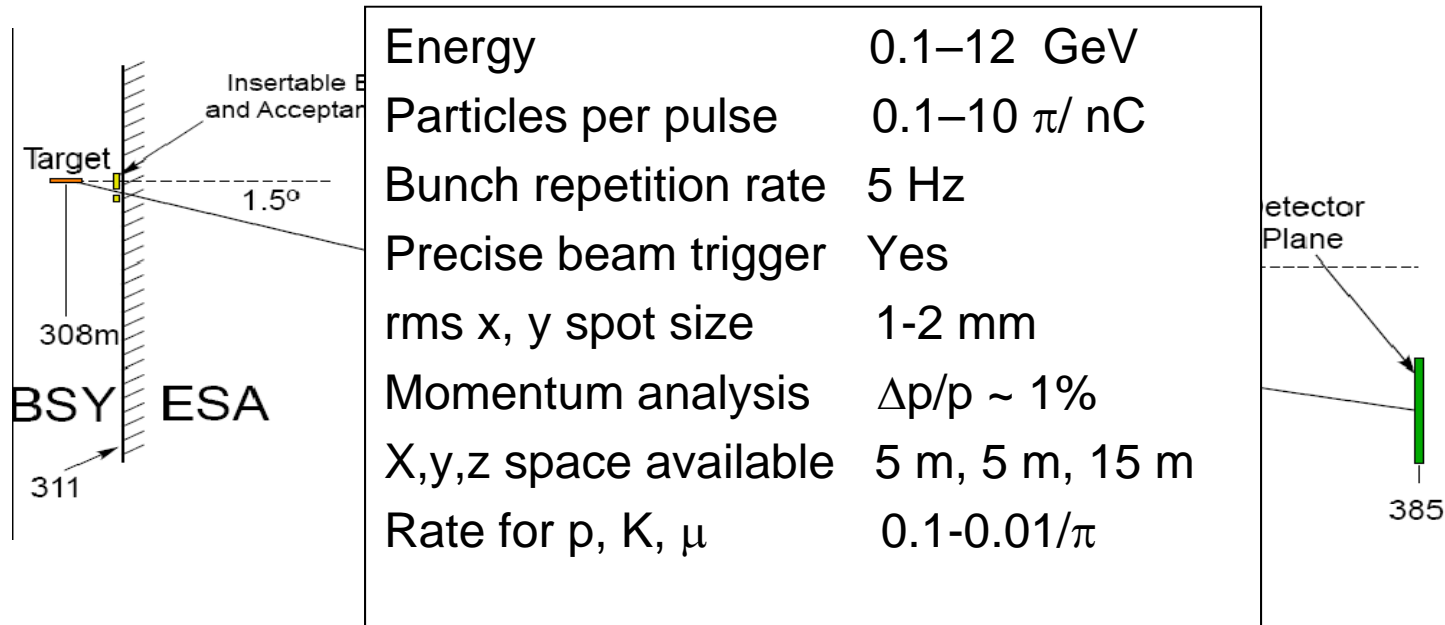
- * Construct kicker magnets and vacuum chamber for BSY
- * Update PPS System and install new beam dump for ESA
- * Update MPS and Controls as needed
- * Schedule: Construction 2010, Beams by ~Spring 2011.

Use LCLS Kicker Magnets in BSY



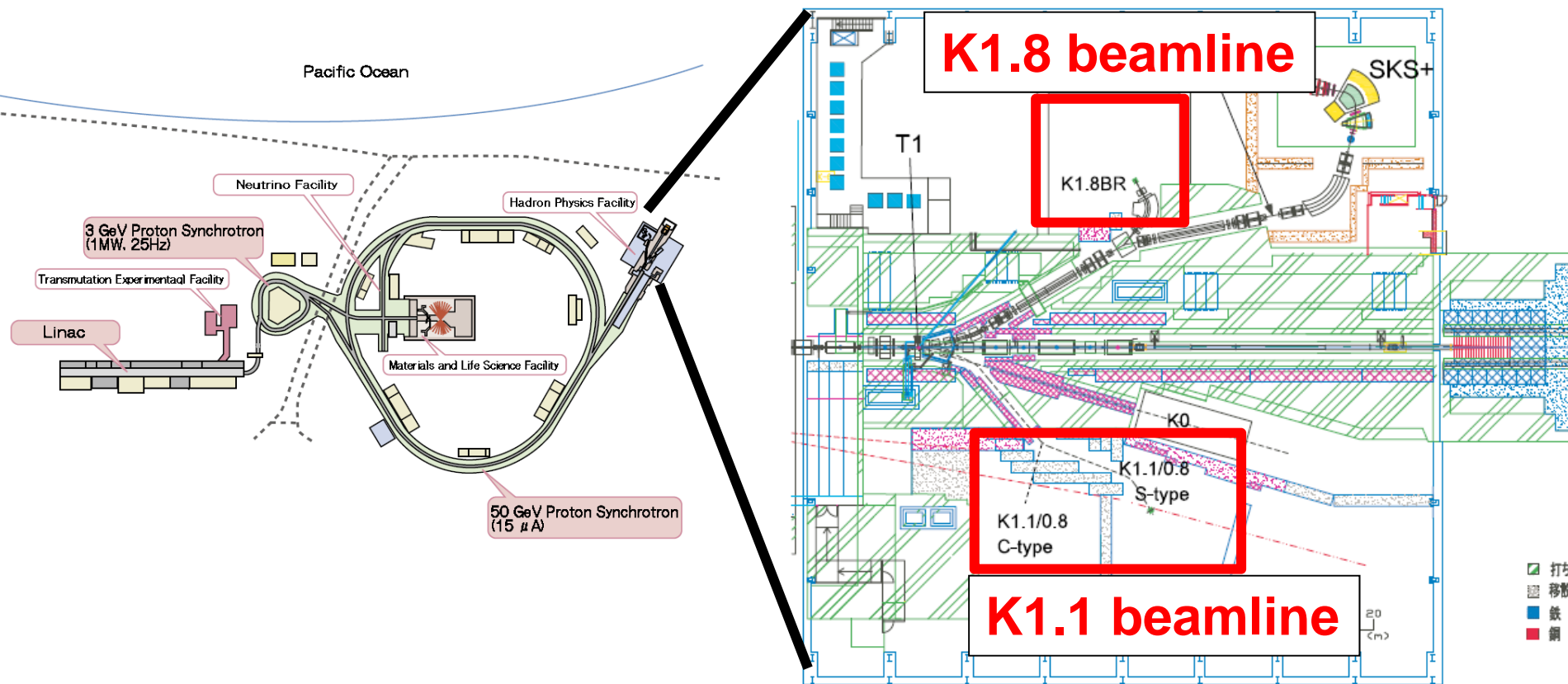
ESTB Stage II Hadron Production

Add Be target, beam dump, analyzing magnet, momentum slit, and quadrupole doublets to produce a secondary hadron beam in ESA. Production angle = 1.5° and Acceptance = $10 \mu\text{sr}$



J-PARC test beam facility

- Available beams : pions, protons of 0.5-1.5 GeV



Two areas being prepared :

- K1.8 ... expected to be the main test beam facility.
- K1.1 ... Tentative facility until K1.8 is ready (available Fall 2010)

IHEP Beijing Test Beam Facility

Parameter	Primary Electron Beam		Secondary Beam	
	Before	Upgrade	Before	Upgrade
N_e / Bunch	10^{10}	$10^2 - 10^{10}$	1	1 - 2
Energy (GeV/c)	1.1 - 1.5	1.1 - 1.89	0.4 - 1.2	0.3 - 1.2
Energy Spread	< 1%	< 1%	1%	0.5%
Kinds of Particle	$e^{+/-}$	$e^{+/-}$	$e^{+/-}$, $\pi^{+/-}$, P	$e^{+/-}$, $\pi^{+/-}$, P
Bunch Width(ns)	1.2	1.2, 0.02		
Bunch Rate (Hz)	25-50	25-50	1.5-2(Single); 7-8 (Mixed Multi- particles)	1 -2(Single); ~ 1 (two particles)

2008.07-2010. 12 Shut down for the upgrade and has a short-term running of E2 line;

2011.01 Commission

AIDA is an infrastructure aiming to boost European detector R&D for accelerator-based experiments

Infrastructure, for whom?

AIDA must be supported by,
and the proposal must cater to,
the whole detector R&D community

(s)LHC →

- ✓ ALICE
- ✓ ATLAS (WP9)
- ✓ CMS (WP2)
- ✓ LHCb (WP9)

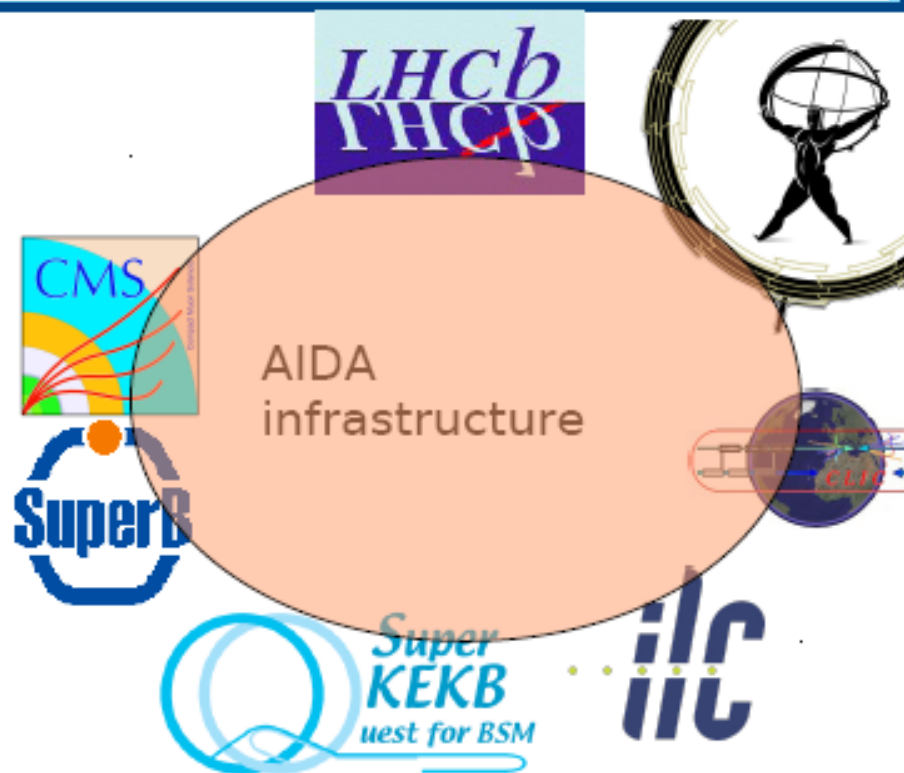
Future e^+e^- machines →

- ✓ ILC (WP9)
- ✓ CLIC (strong overlap with ILC)

Super B-factories →

- ✓ Belle-II (WP9)
- ✓ SuperB (WP8)

Accelerator-based neutrino experiments (WP8)



Caters to communities developing detectors that are to be installed within the AIDA life-time (ATLAS IBL, LHCb VELO upgrade, Belle-II PXD) and to others pursuing exciting new concepts that may yield the detector technology of the next (or next-to-next) generation of experiments)

AIDA

Max. 10 Million Euro in EU contribution

9 work packages:

- 1 MGT
- 3 COORD
- 3 TA
- 2 RTD

WP#	Type	Task	Description	Editors	Budget
1	MGT		Project management and communication	S. Stavrev (CERN) L. Serin (LAL)	450
		1.2	Communication and disseminations		
2	COORD		Development of common software tools	F. Gaede (DESY) P. Mato (CERN)	1100
		2.2	Geometry toolkit for HEP		
		2.3	Reconstruction toolkit for HEP		
3			Micro-electronics and interconnection technology	H.G. Moser (MPI) V. Re (INFN)	1100
		3.2	3D interconnections		
		3.3	Shareable IP blocks for HEP		
4	COORD		Relation with industry	S. Stapnes (Oslo) P. Sharp (RAL)	300
		4.2	User topical working groups		
5	TA		Transnational Access DESY	I. Gregor (DESY)	100
6	TA		Transnational Access CERN	H. Taureg	150
7			Transnational Access Irradiation	M. Mikuz (Ljubljana)	600
		7.2	UCL Louvain-la-Neuve		
		7.3	ForschungsZentrum Karlsruhe		
		7.4	Ljubljana University		
8	RTD		Improvement and equipment of beam lines	H. Taureg (CERN) E. Gschwendtner (CERN)	3,000
		8.2	Test beams at CERN and Frascati		
		8.3	Upgrade of proton and neutron irradiation facilities		
		8.4	Component qualification and database		
		8.5	General beam and irradiation equipment		
		8.6	Combined beam tests and DAQ		
9	RTD		Advanced infrastructure for detector R&D	H. Videau (LLR) M. Vos (IFIC)	3,000
		9.2	Gaseous Tracking		
		9.3	Precision Pixel Detectors		
		9.4	Silicon Tracking		
		9.5	Highly Granular Calorimetry		

Conclusions

AIDA aims to boost European detector R&D for accelerator-based experiments

Follow-up for EUDET, but catering to a much broader community

Test beam infrastructure is one of its main objectives (WP9 and some of WP8)

AIDA passed 1st selection with a high score. Started negotiation for final approval.

- Dates and Location: 3.11.09 – 5.11.09 at LAL Orsay
- Successor of 1st workshop of this kind at FNAL in Jan. 07
<https://conferences.fnal.gov/idtb07/>
Three year rhythm looks appropriate
- Review achievements/developments since FNAL workshop
- **Assure that necessary R&D for DBDs can be conducted**
- Sharpen the view of community to identify synergies in R&D programs (particularly) testbeam efforts
Common tools, common reservation of testbeam areas, common application for beam time
- “Remind” Testbeam operators of our needs
- **The workshop will render a document where the testbeam plans are listed and explained**

For more info on LCTW09 see:

<http://events.lal.in2p3.fr/conferences/LCTW09>

Summary Table of Projects

LCTW09

Project	2010/2	Site	2011/1	Site	2011/2	Site	2012/1	Site	2012/2	Site
Calo	xx	CERN	xx	CERN	xx	CERN	xx	CERN	xx	CERN
		FNAL		FNAL		FNAL		FNAL		FNAL
		SLAC		SLAC		SLAC		SLAC		SLAC
Needs		Magnet		Magnet		Magnet		Magnet		Magnet
	Particle Types: e, π, p , Energies: 1-120 GeV, Low Rates \approx 100 Hz									
Gas/TPC	xx		xx	CERN	xx	CERN	xx	CERN	?	CERN
		DESY		DESY		DESY		DESY		DESY
				FNAL		FNAL		FNAL		FNAL
Needs		Magnet		Magnet		Magnet		Magnet		Magnet
	Particle Types and rates: e as available at DESY. Hadron beam test not planned but possible.									
SiTrack	x	Various (see Tab.2)	x	Various	x	Various	x	Various	x	Various
Needs		Magnet/Telescope		M./T.		M./T.		M./T.		M./T.
	Particle Types: e, π, p , Energies: 1-120 GeV, High Rates \approx 10 kHz for short periods									

- Try to combine projects, needs and preferred sites
- Difficult to summarize wealth of activities in short and concise table
- Question to operators: What kind of information would you need?
- Availability of beam lines
- Shutdown of FNAL in 2012 can be harmful to progress in view of DBDs
- The same is true if CERN needs to shutdown testbeam lines due to LHC issues

- LCTW09 witnessed the wealth of highly challenging R&D activities
How can Testbeam activities accompany the R&D needed for DBDs
- Right time to make up our minds on what we want and how to organise ourselves
- Still in the phase of sharpening conclusions
 - Beam structure
 - Request for Semi-Permanent beam lines
 - Organisation among R&D groups
- **Workshop document in preparation**
 - Good progress
 - Publication planned for 30/4/2010
 - Document will benefit from further input at LCWS10
- Publication to the Detector Community (LC-Note) and Site Managers

Summary

- First of all, we deeply appreciate the laboratories for providing us new (and existing) test beam facilities for these years.
- Definitely we still need (new, upgraded) test beam facilities to continue detector R&D studies for the ILC experiments (for DBD and beyond).
- To keep the test beam activity, good communication between the users and the facility staffs is essential... we are preparing a document as a result of LCTW09.