

The Fermilab Strategy

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46th Annual Fermilab Users Meeting

June 12, 2013

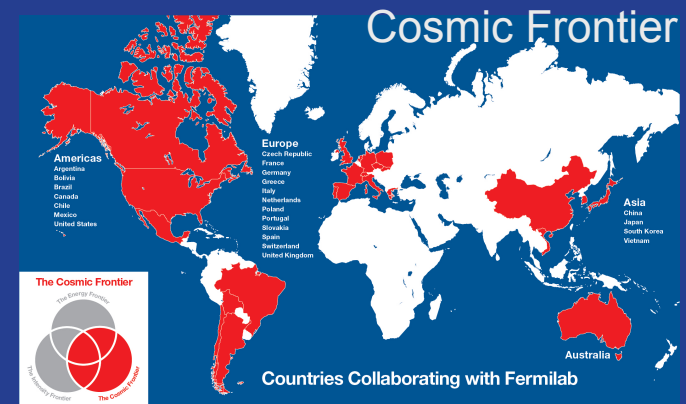


Fermilab's Vision and Mission

- Fermilab: America's particle physics laboratory
- Vision: inspire the world and enable its scientists to solve the mysteries of matter, energy, space and time for the benefit of all.
- Mission: drive discovery in particle physics by:
 - building and operating world-leading accelerator and detector facilities
 - performing pioneering research with global partners
 - transforming technologies for science and industry.

Support 4,300 users (year 2012: 2,200 onsite users + 2,100 computer users)

- 2,200 onsite users are from



- Intensity Frontier users and CMS users growing

Wilson Hall Space Task Force

Illinois Accelerator Research Center (IARC)
New Initiative!

Pressing space needs for
Fermilab staff and users



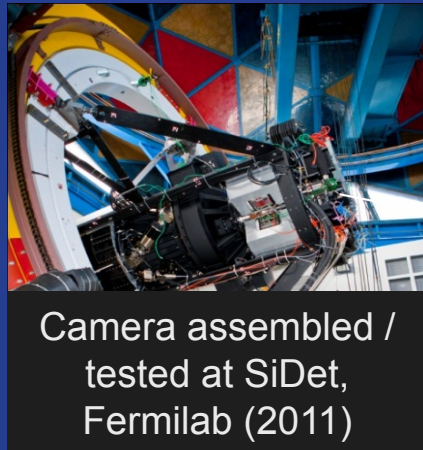
Energy Frontier: LHC – CMS and Machine

- Fermilab is the lead lab and intellectual home of the U.S. CMS collaboration.
- Remote Operations Center
- Tier-1 Computing Center
- LPC serves as a resource / physics analysis hub for the U.S. CMS community: >350 users, >100 residents, ~700 computing
- Manage the U.S. upgrade projects
 - CMS detector upgrade
 - Machine upgrade

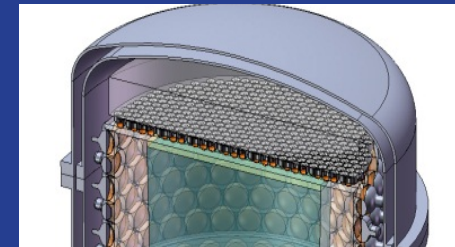
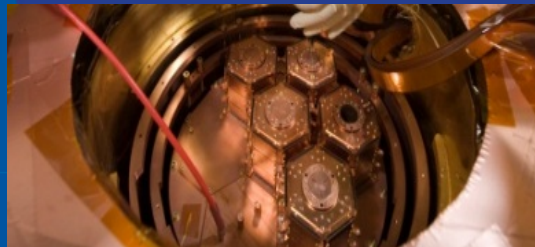


Cosmic Frontier

- Dark Energy: Progression SDSS → DES → DESI → LSST



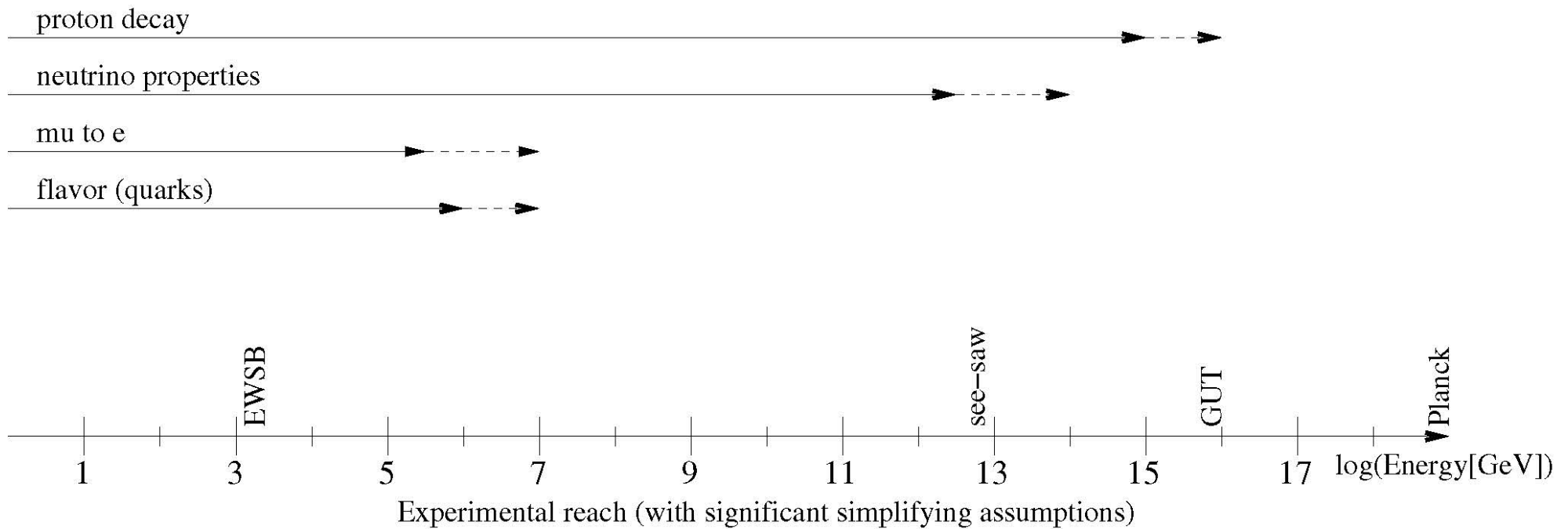
- Dark Matter: CDMS, COUPP, DarkSide → Generation 2 expt.



- Pierre Auger and Holometer experiments

Why the Intensity Frontier?

Ligeti



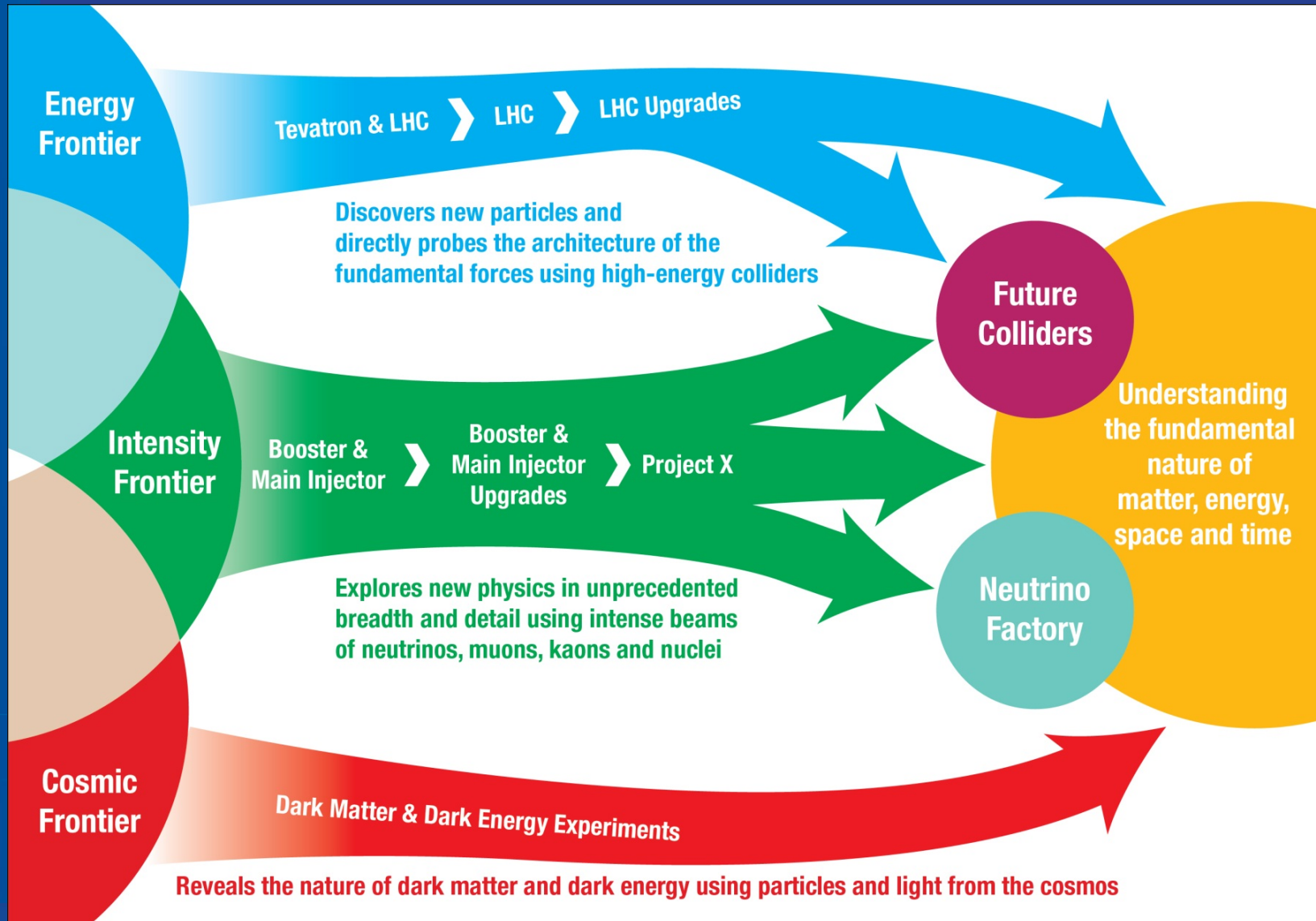
Intensity Frontier

- XOC
 - Remote Operations Center for Intensity Frontier experiments
 - ~75% designed; construction end ~ summer 2014

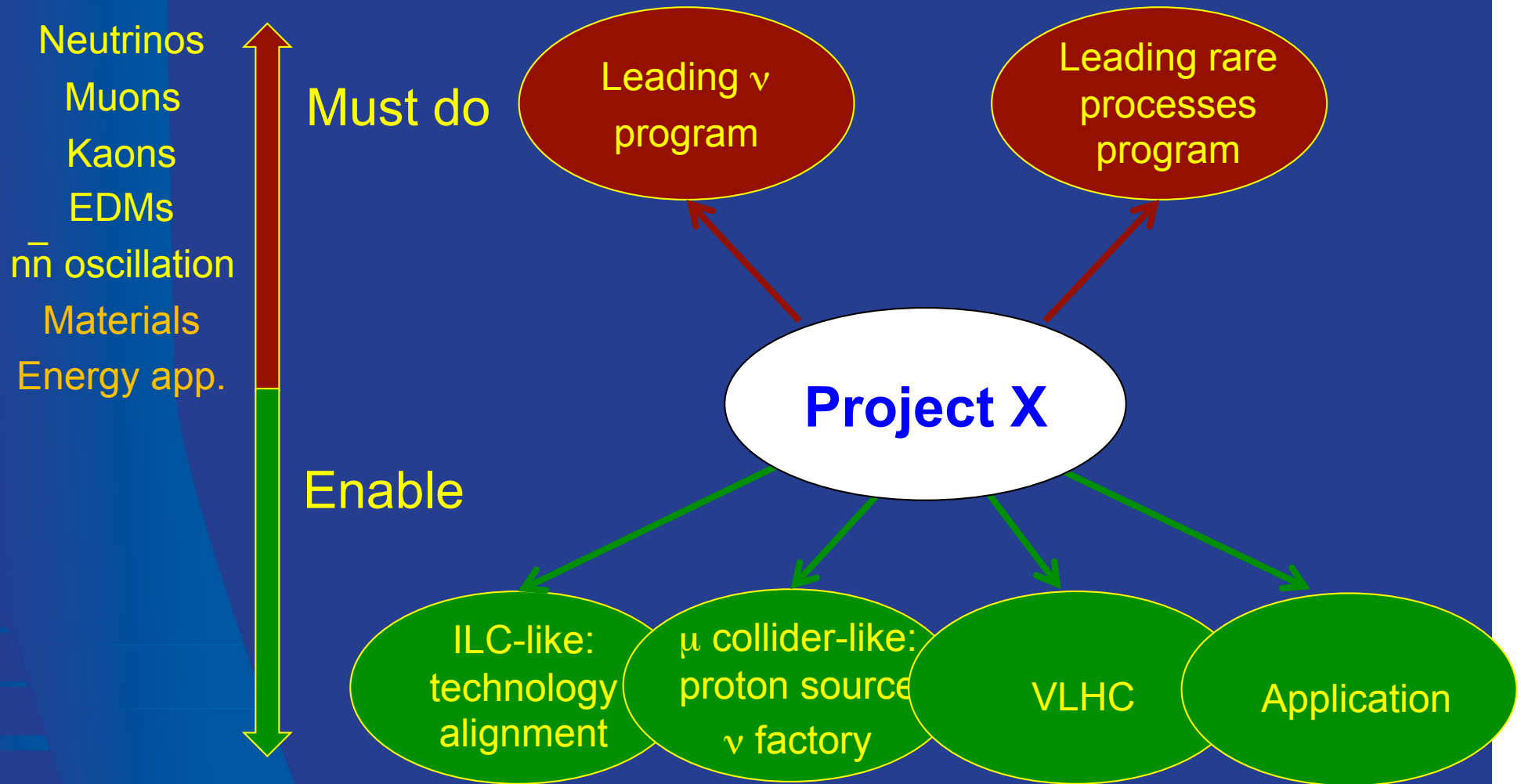


- Launched the Intensity Frontier Fellowship
 - <http://www.fnal.gov/pub/forphysicists/fellowships/>

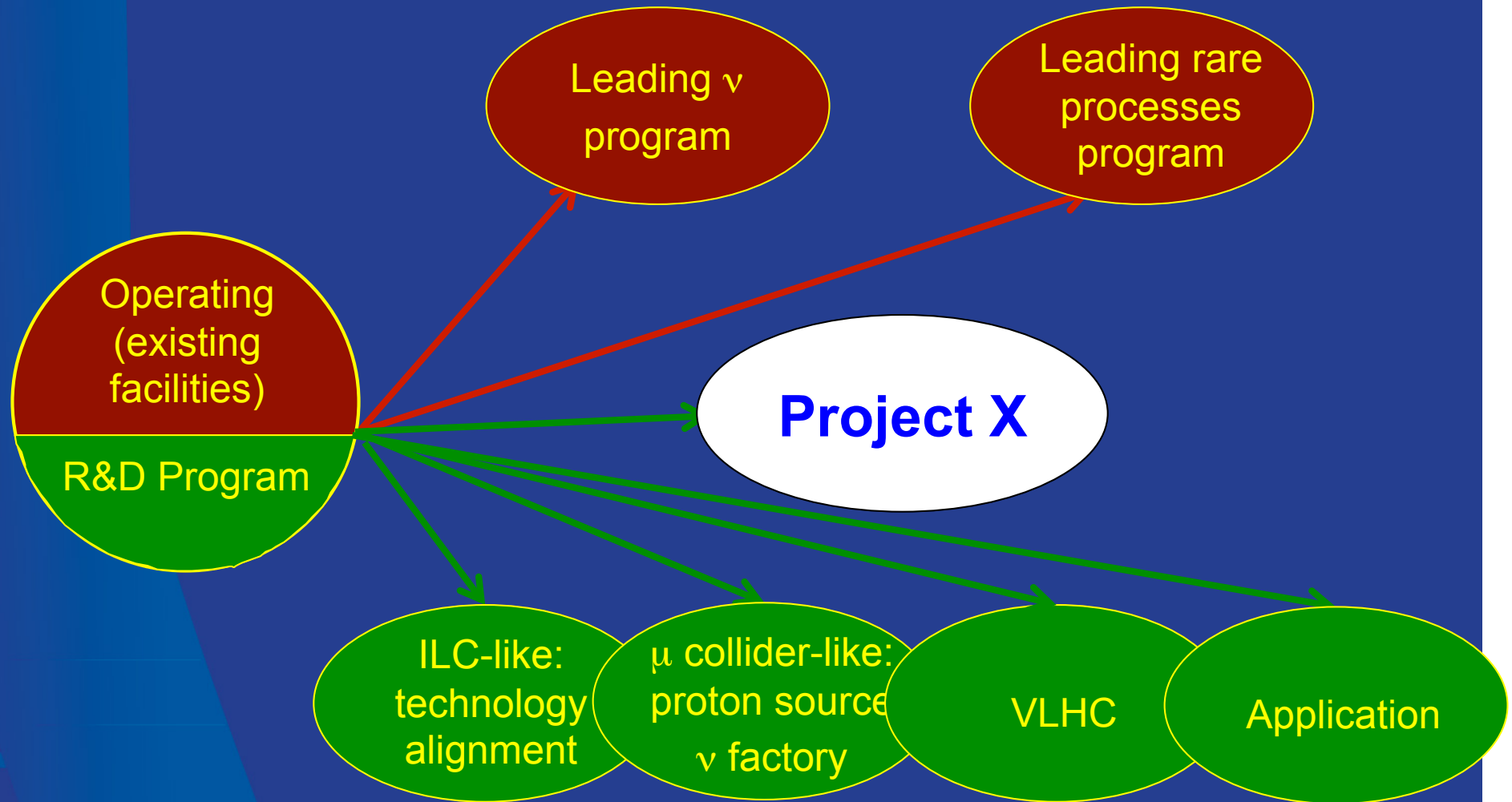
Science and Facility Roadmap



Twenty-year term vision



Getting there: program this decade



Ten-Year Goals for Fermilab



1. Be the world leader at the Intensity Frontier



2. Be a world leader at the Energy Frontier, at the Cosmic Frontier, and in theoretical particle physics



3. Plays a leadership role in developing the technology for next generation accelerator facilities and in advancing basic understanding



4. Plays a leadership role in developing the technology for next generation detectors and computing facilities

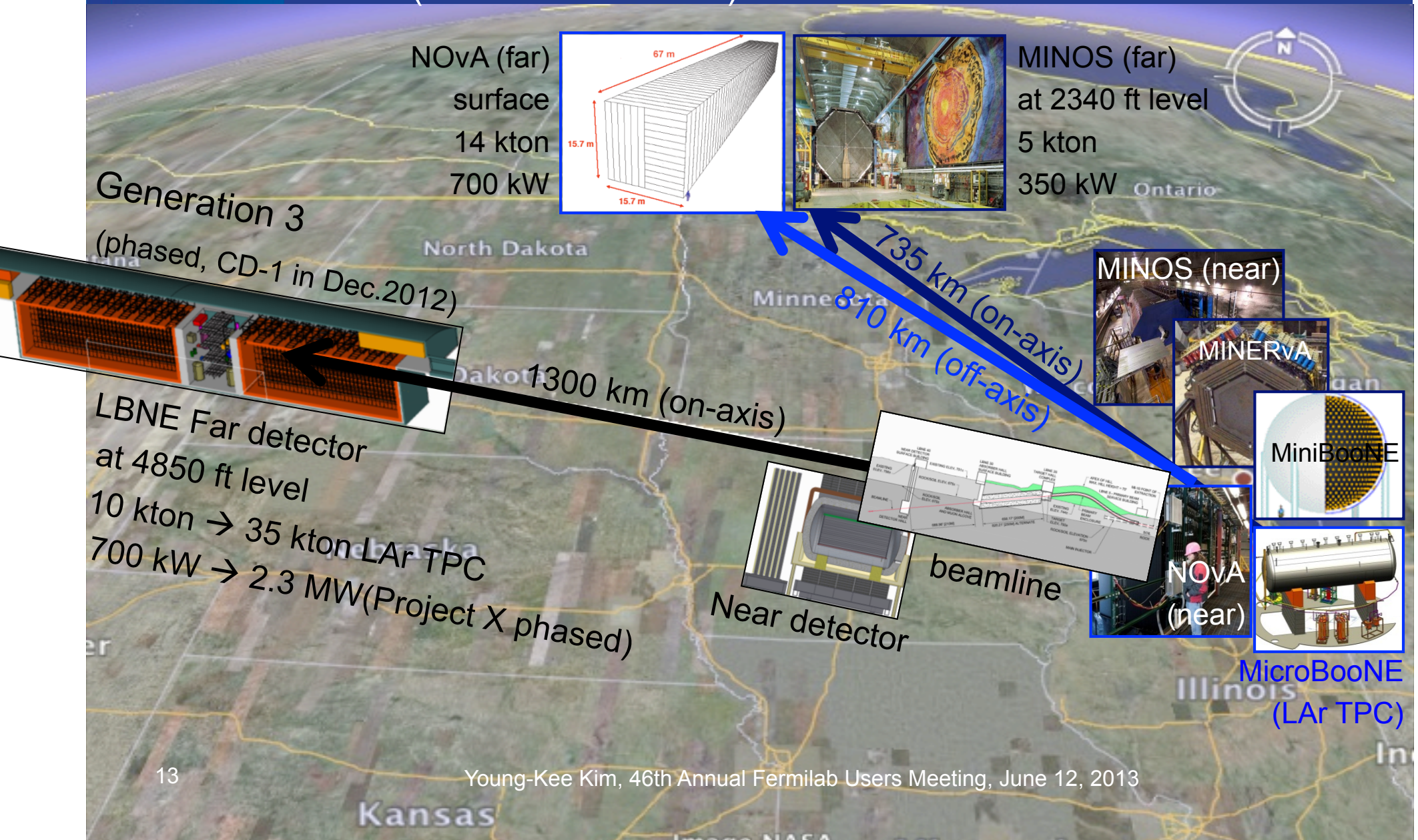


5. Plays a leadership role in applying technologies to society's problems by leveraging state and national investment in the IARC

Evolution of U.S. Accelerator-based Neutrino Experiments

Generation 2
(under construction)

Generation 1



LBNE: CD-1 (Dec. 2012) and Next Step

- DOE's CD-1 was needed to attract international collaboration (demonstrate that the U.S. is serious). The CD-1 process did not assume other potential contributions.
→ beamline + 10kt surface detector (DOE funding only)
- CD-1 approval document states “If additional domestic or international funding commitments are secured sufficiently prior to CD-2, the DOE LBNE Project baseline scope could be refined before CD-2 to include scope opportunities such as a Near Neutrino Detector complex at Fermilab or an underground location at SURF for the far detector.”
- The plan is to put the stage 1 detector underground with contributions from non-DOE.

LBNE: What U.S. offers to the world community

- Neutrino beam
 - **accelerator facilities**
 - exist now! (up to 700kW)
 - the expanding future accelerator Project X (up to 2.3 MW)
 - **beamline**
- Baseline
 - **great baseline (1,300 km)**
- Underground facility
 - **an operating underground facility that can host a large detector → expandable**

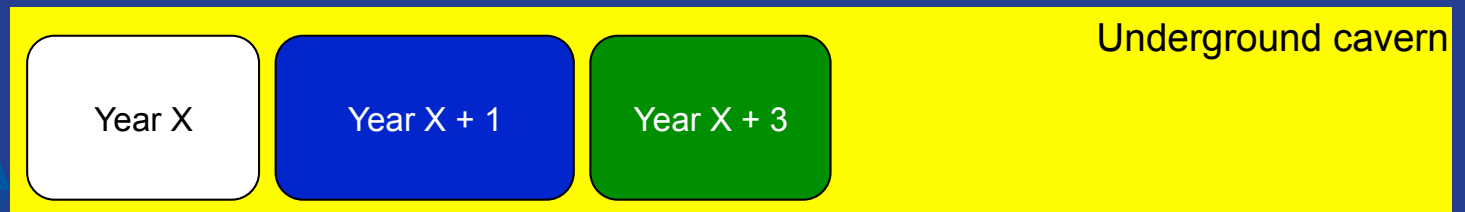
LBNE: Evolution of detectors (Phase 1)

Possible scenario

- Primarily U.S. DOE (but with some other resources)
 - Construct a beamline
 - Excavate **a cavern that can house ~35 kt LAr detector**
 - Build a ~5 kt detector



- Country #1 (e.g. India) builds a near detector
- Region #1 (e.g. Europe) builds > 5 kt detector
-



LBNE: Evolution of detectors (Phase 1)

Possible scenario

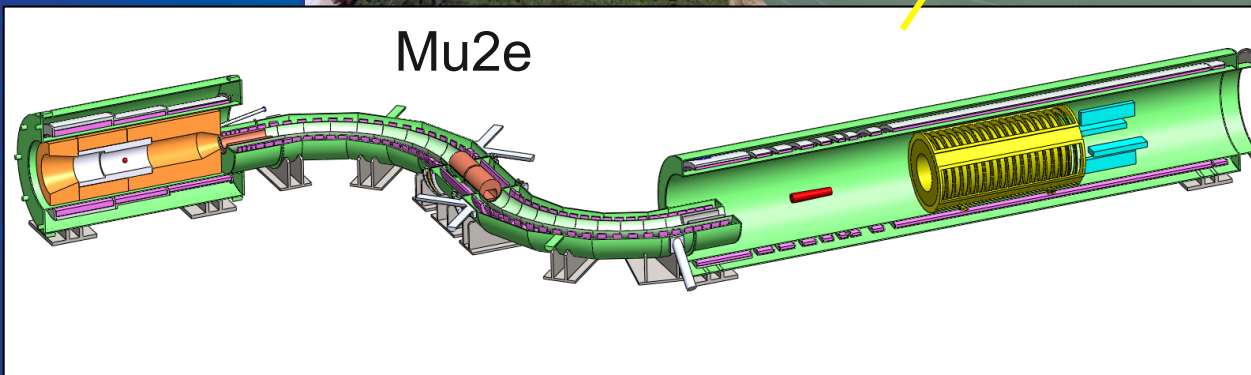
Primary funding sources	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
U.S. (construction: beamline, underground infrastructure, far detector)	CD-1			CD-2	CD-3							Physics	
Europe (construction: far detector)													Physics
India (construction: near detector)												Physics	



Europe, India

- News: efforts towards combining LBNO and LBNE for the U.S. project (together ~700 collaborators now and will grow)
- This is consistent with the 2013 European strategy. This opens the door for CERN and European institutions to partner with U.S.

The Muon Campus



Evolution of accelerator facilities

This decade

Next decade



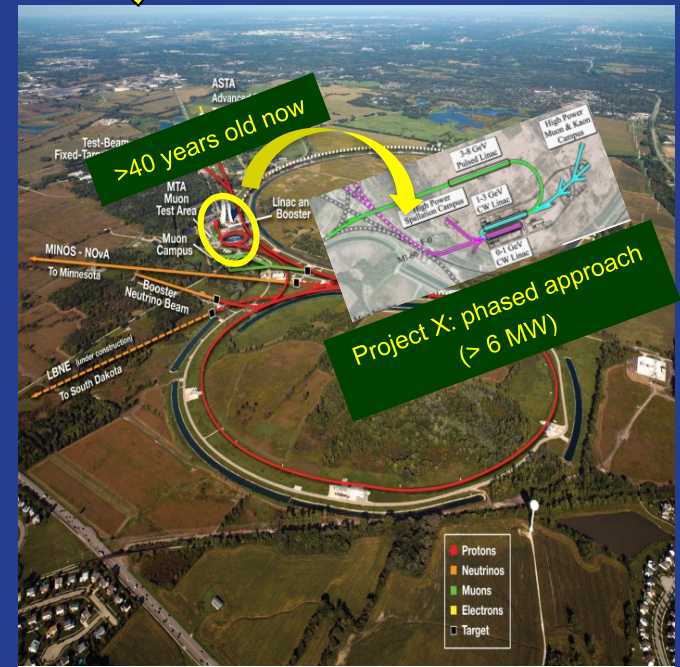
Construction:

- NOvA Accelerator Upgrade
- Proton Improvement Plan
- Muon Campus
- Illinois Accelerator Research Center
- Accelerator Facilities for Project X, ...



Construction:

- Proton Improvement Plan
- Muon Campus
- Superconducting Accelerator Facilities for Project X, ...

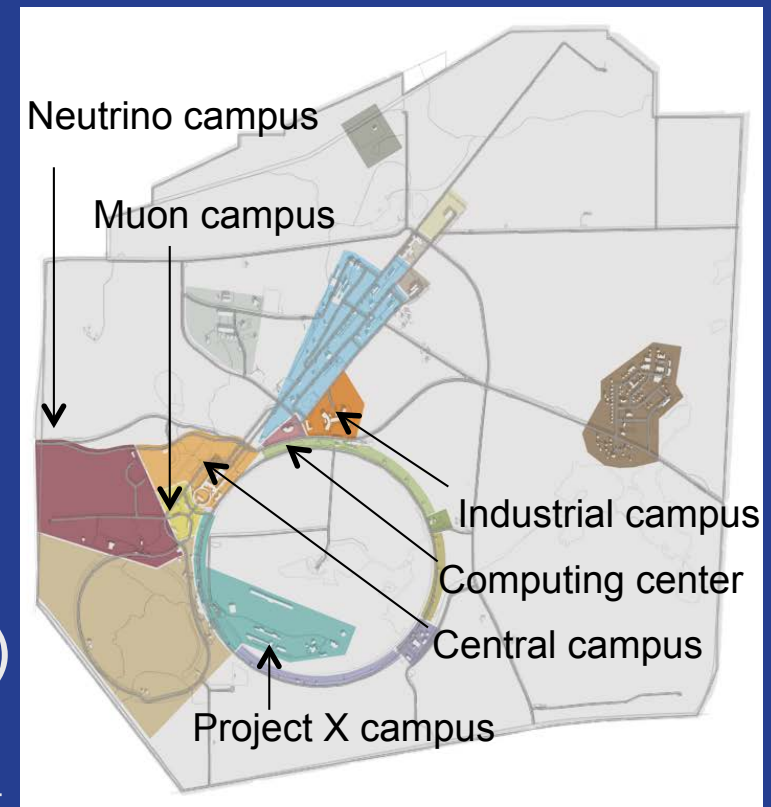


Construction:

- Project X: CW, multi-MW at 3 GeV, 8 GeV and 120 GeV.
- Neutrino program, Muon program
- Kaon program, EDMs, nn-bar oscillation
- Materials irradiation, Energy application

Campus Master Plan

- 1st master plan
 - > 40 years ago
 - Robert Wilson greatly influenced the design of the entire laboratory site.
- 2nd master plan (June 2013)
 - To ensure that the Fermilab campus evolves in a way that supports the long-term goals; intensity frontier initiatives, facilities, consolidation, centralization, modernization



Continuously produce physics

	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23
Physics: Particle Experiments				Operations (future expts with CD-0 or higher level approval)								Data analysis continues		
Intensity Frontier														V: LBNE
										μ: Mu2e				
						ν: NOvA								
						ν: MicroBooNE								
					ν: MINOS+									
			nucleon: SeaQuest											
		ν: MINERvA												
	ν: MINOS													
	ν: MiniBooNE													
Not included are the ORKA kaon experiment which received the Stage 1 approval from Fermilab, and experiments such as nuSTORM, proton EDM and neutron-antineutron oscillation experiments which are currently developing proposals with the encouragement of Fermilab Physics Advisory Committee.														
Energy Frontier										LHC (14 TeV, Lum upgrade): CMS				
						LHC (14 TeV): CMS								
	LHC (7-8 TeV): CMS													
	Tevatron: CDF/D0													
Cosmic Frontier													DE: LSST	
													DM: Gen 3	
									Dark EnergyMS DESI					
								Dark Matter: Generation 2						
				Dark Energy: DES										
	Dark Matter: Generation 1													
Physics: Theory and basic understanding of technologies														
Theory	Particle and Particle Astro Theory													
Accelerator	Accelerator Science at ASTA													
Detector	Testbeam experiments													