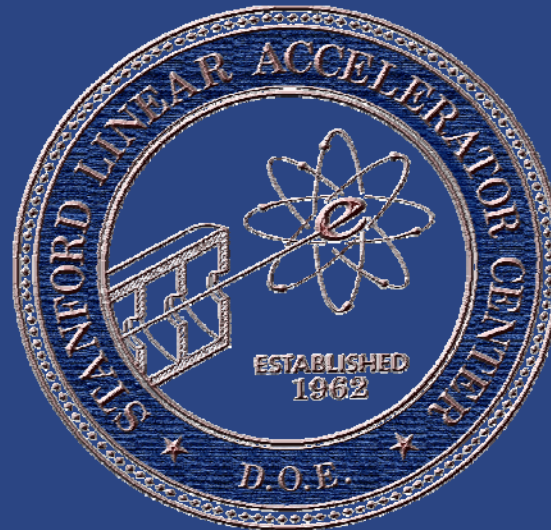


SLAC and ILC



Jonathan Dorfan, Director

LCFOA, SLAC

May 1, 2006

SLAC



Particle & Particle Astrophysics

SLAC Mission

- **Photon Science Discoveries**
 - To make discoveries in photon science at the frontiers of the ultrasmall and ultrafast in a wide spectrum of physical and life sciences
- **Particle and Astroparticle Physics Discoveries**
 - To make discoveries in particle and astroparticle physics to redefine humanity's understanding of what the universe is made of and the forces control it
- **Operate Safely; Train the Best**
 - To operate a safe laboratory that employs and trains the best and brightest, helping to ensure the future economic strength and security of the nation
 - **Particle and Astroparticle Physics future program at SLAC is very well aligned with the goals set down by the new EPP2010 Report: Our highest priority is realizing the ILC,**

SLAC



Particle & Particle Astrophysics

LCFOA Meeting
5/1/06

Photon Science Program

The use of ultra high-intensity x-ray beams for studies in physics, biology, chemistry, medicine, and environmental sciences

The recently upgraded SPEAR conventional synchrotron light source and the turn-on of Linac Coherent Light Source in 2009 provide a suite of instruments ideally suited for breakthrough science in the realm of the ultra-small and the ultra-fast

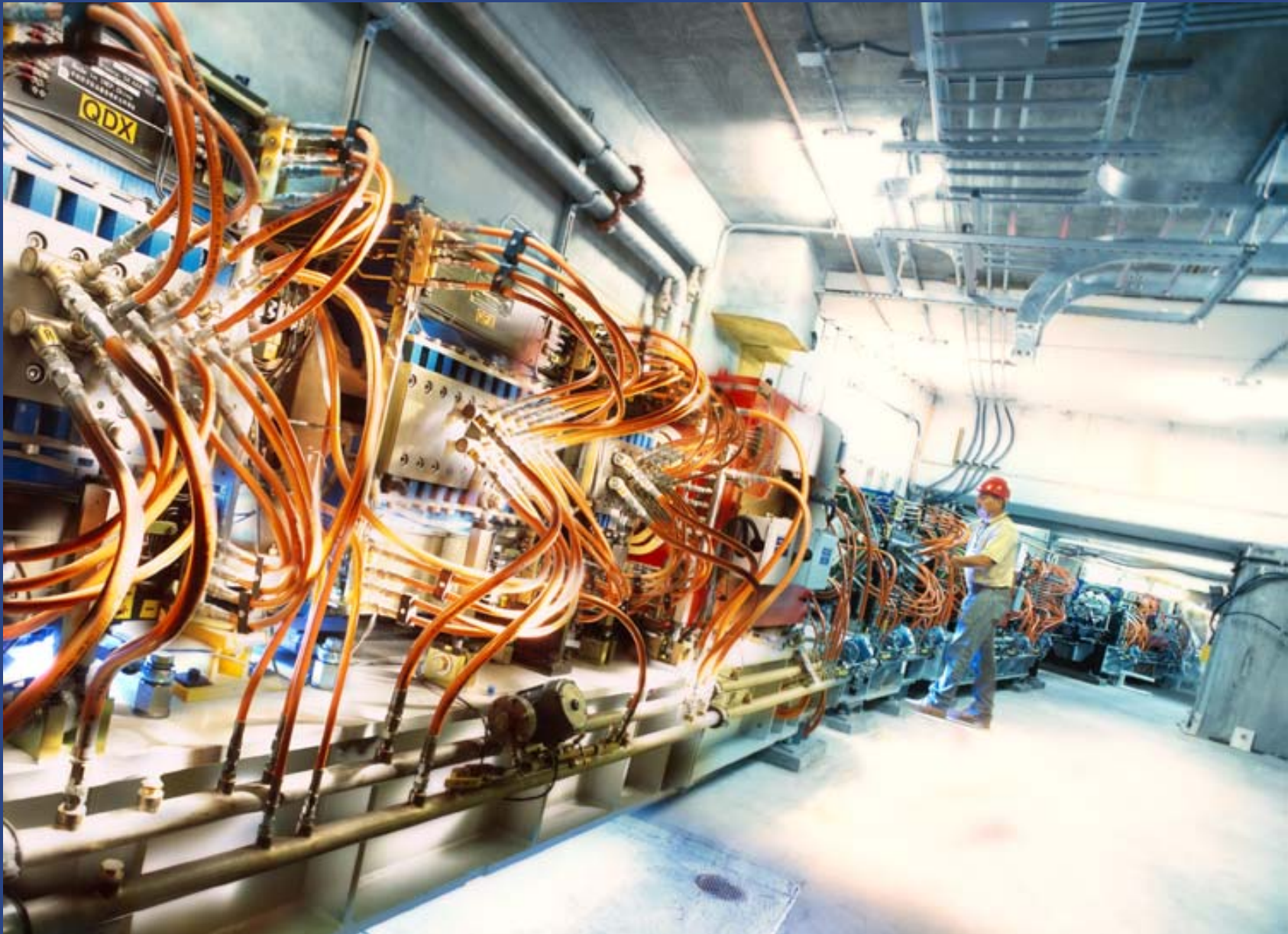
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Particle & Particle Astrophysics

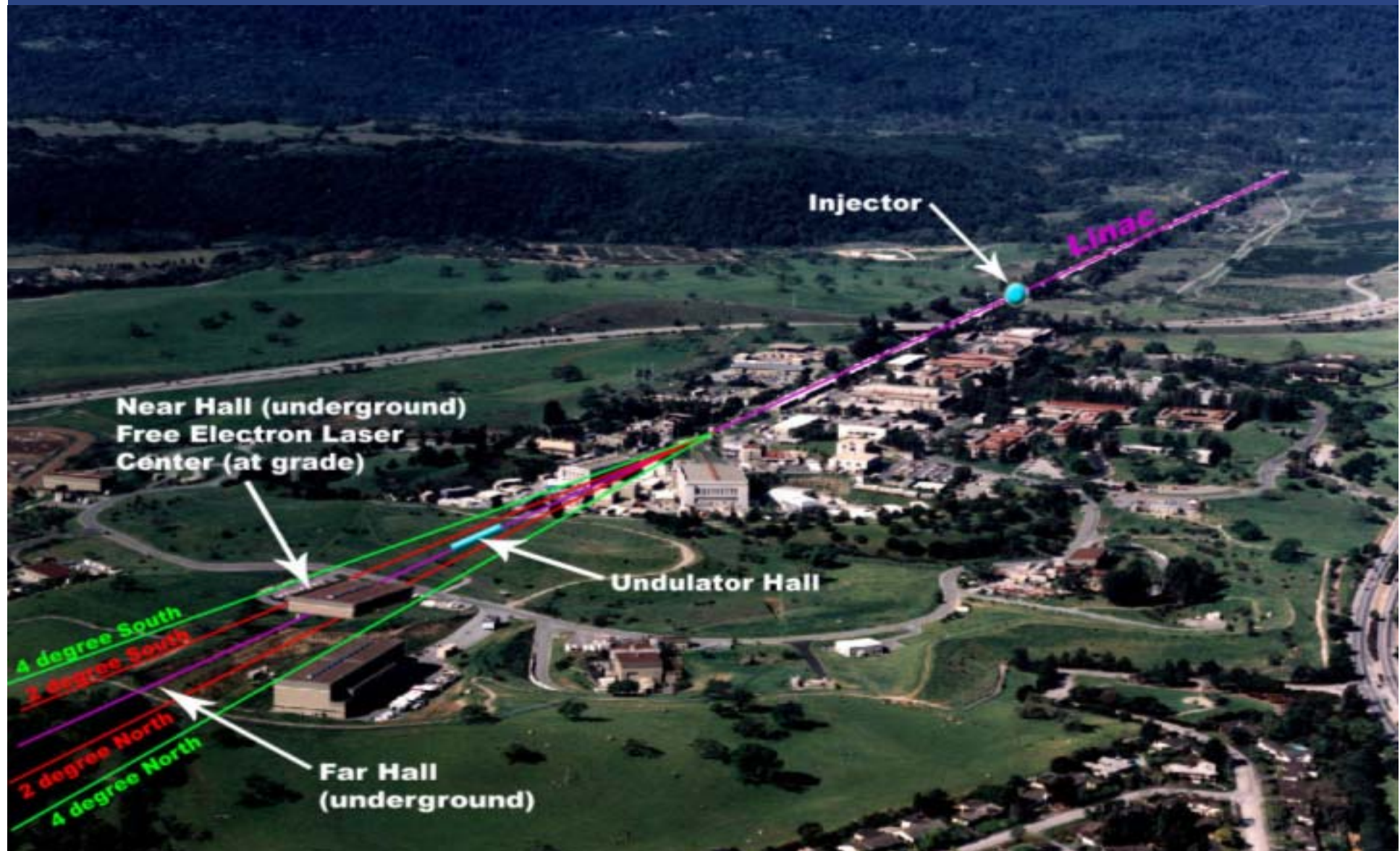
LCFOA Meeting
5/1/06

SPEAR3 – A brand New 3rd Generation Machine



Linac Coherent Light Source

Turn-on in 2009: LCLS will be the World's First X-ray Laser



Exploring the Energy Frontier Is Critical

- **The choices we have made for SLAC's future program are based solely on the physics imperatives. Thus our highest priority for the future is the energy frontier**

The physics of the Energy Frontier

- ↪ **We and our user community have been unwavering in our belief that the next major HEP facility must be the ILC. We recognize the risks associated with that choice, but feel that without such a physics tool, one cannot expect to unravel the multitude of leading questions that confront us**
- ↪ **We have made application to join the Atlas experiment. The plan is that SLAC will be a Tier II site and an intellectual hub for the West-coast Atlas community**
- ↪ **We are participating in US LHC machine upgrade program, LARP**

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SLAC: The Core of the ILC

- **With its vast experience with linear colliders (SLC, NLC, ILC), its extensive infrastructure and its highly skilled staff, SLAC plays a critical role in all aspects of the International Linear Collider effort**
 - ↪ **No other laboratory contributes more to the ILC effort**
 - ↪ **SLAC remains an unswerving supporter of the global design approach (GDE)**
 - ↪ **SLAC maintains its position that it will be a major partner in ILC independent of its location -- it's the physics that we want to ensure**
- **SLAC staff are broadly involved in all elements of the GDE including the RDR process**

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RDR Matrix

- Matrix of Area Systems and Technical Systems to develop cost estimate

(SLAC members in red)

	e- source	e+ source	Damping Rings	RTML	Main Linac	BDS
		Kiriki	Gao	ES Kim	Hayano	Yamamoto
			Guiducci		Lilje	Angal-Kalinin
	Brachmann	Sheppard	Wolski	Tenenbaum	Adolphsen	Seryi
	Logachev				Solyak	
Technical Systems						
Vacuum systems	Suetsugu	Michelato	Noonan			
Magnet systems	Sugahara		Thomkins			
Cryomodule	Ohuchi	Pagani	Carter			
Cavity Package	Saito	Proch	Mammosser			
RF Power	Fukuda		Larsen			
Instrumentation	Urakawa	Burrows	Ross			
Dumps and Collimators	Ban					
Accelerator Physics	Kubo	Schulte				
Global Systems						
Commissioning, Operations & Reliability	Teranuma	Elsen	Himel			
Control System	Michizono	Simrock	Carwardine			
Cryogenics	Hosoyama	Tavian	Peterson			
CF&S	Enomoto	Baldy	Kuchler			
Installation	Shidara	Bialwons	Asiri			



ILC @ SLAC

- **Large and broad effort: 60 FTEs made up of about 80 people**
- **Four areas of major focus**
 - ↖ **Rf power sources (modulators, klystrons, rf distribution)**
 - ↖ **Particle sources (Polarized electron source and Positron source)**
 - ↖ **Beam delivery system and Machine-Detector Interface**
 - ↖ **Operational issues (highly available hardware, beam instrumentation, beam tuning techniques, and Machine Protection System)**
- **RF source work builds on core SLAC strength**
- **Particle sources and Beam Delivery System utilize experience from the SLC and R&D for the X-band linear collider**
 - ↖ **SLAC has led these efforts for the linear collider over the last decade**
- **Operational issues builds on knowledge from the SLC**
 - ↖ **Very experienced group from both SLC and the X-band R&D program**
- **Also significant amount of work ongoing on the civil eng. issues**

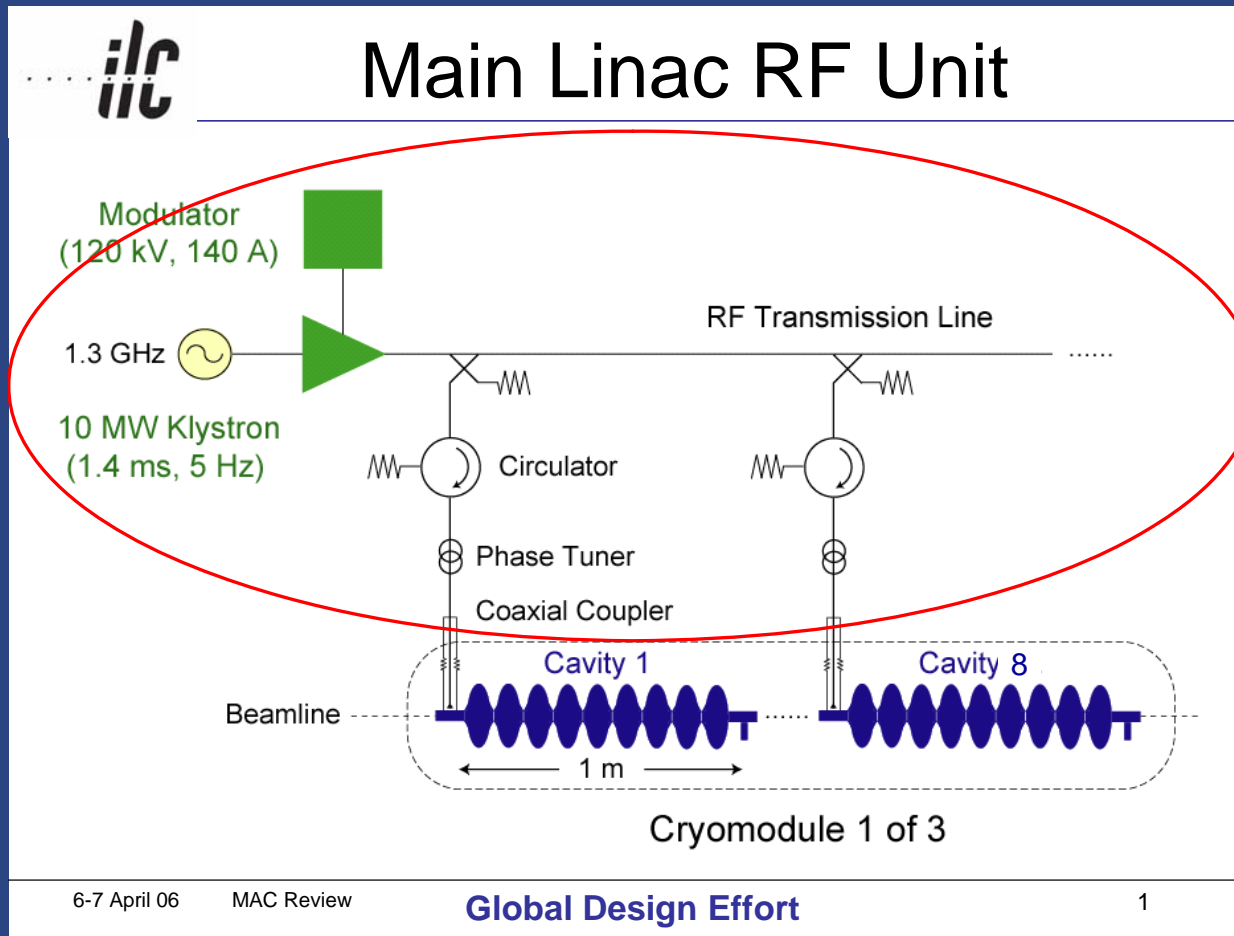
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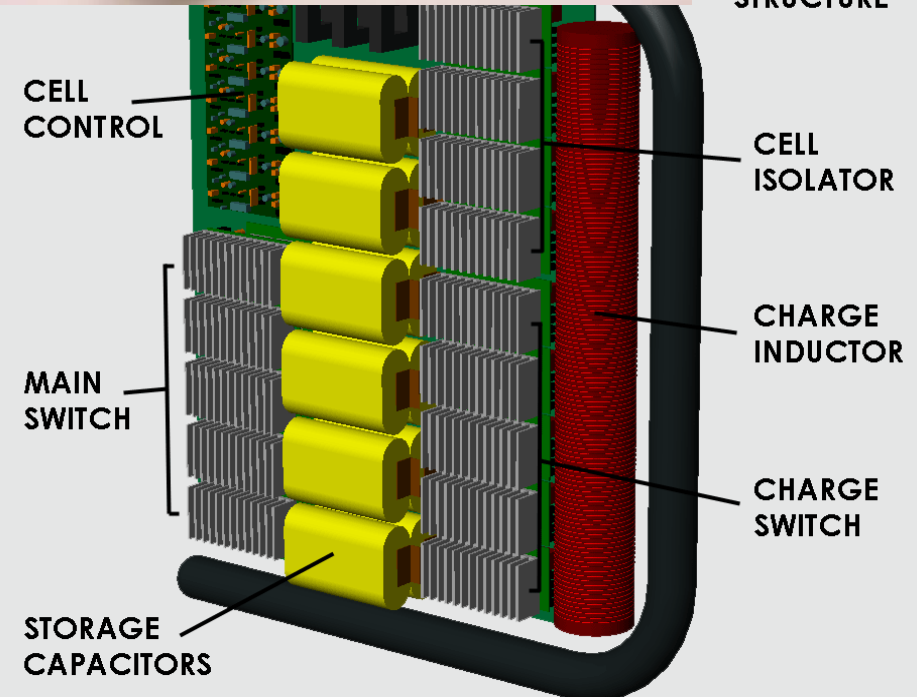
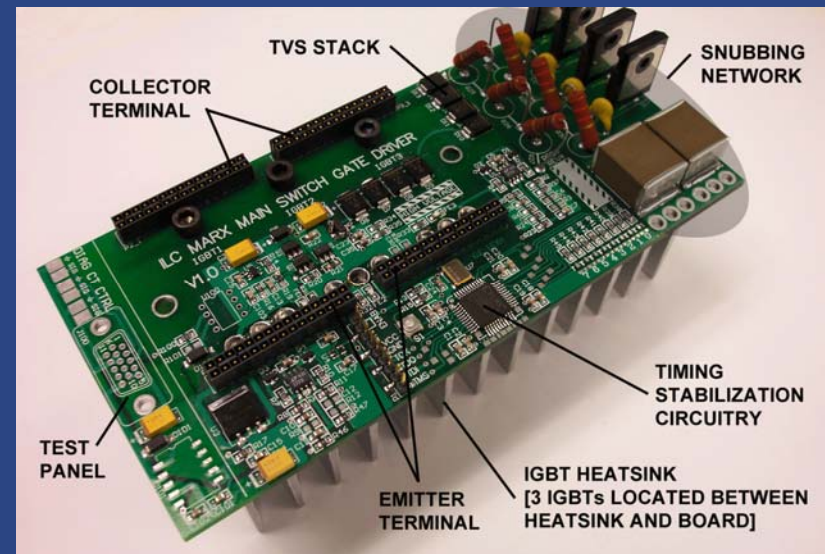
One Example: The Main Linac RF System



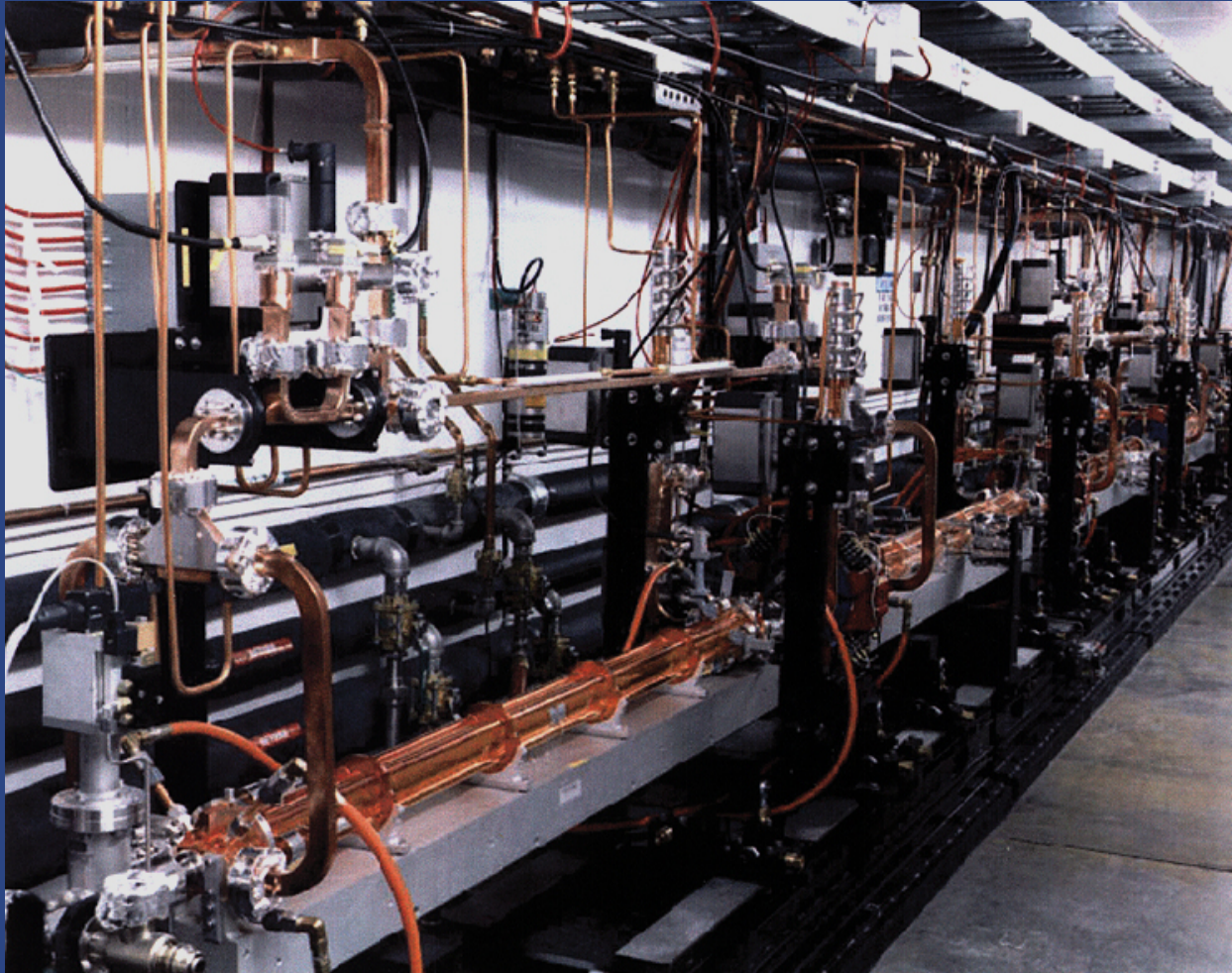
SLAC has the experience, the staff, and the infrastructure to provide a demonstration system from wall plug to the cold junction.

SLAC Marx Generator Modulator

- Stack of 12 kV units
- Pros
 - ↪ Uses emerging technology
 - ↪ Modular design for longer MTBF and shorter MTTR
 - ↪ No oil; compact unit
 - ↪ No magnetic core
 - ↪ Finer waveform control



Infrastructure: LC Test Accelerator and L-Band Hardware Tests in ESB at SLAC



Fully operational
accelerator for
testing Linear
Collider components
and concepts

Currently doing
intensive tests for
ILC and
high -gradient
acceleration as well
as laser acceleration
advanced R&D

SLAC Infrastructure: Unique Electron and Positron Beams

- E166 is an internationally based experiment that sought to demonstrate positron polarization. The experiment ran at the FFTB at SLAC. A helical undulator was used to produce the polarized positrons from a high energy electron beam

Results:

- The Undulator produced photons at the expected intensity. Undulator is well understood
- Photon polarization was demonstrated and the observed asymmetry agreed well with predictions
- Polarized Positrons were produced, converted into photons and transmission asymmetry measured
- E166 has provided successful demonstration of feasibility of polarized positron production at ILC
- ESA configured for beam tests of Machine Detector Interface