

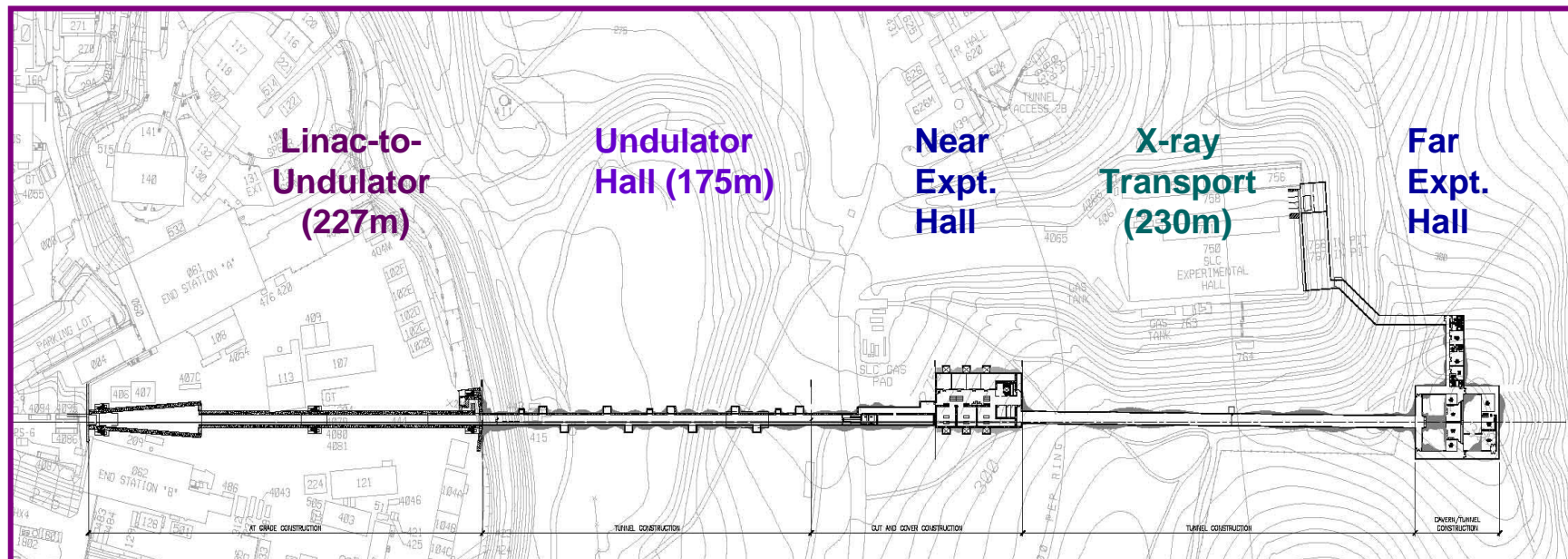


LUSI Overview

March 18, 2008

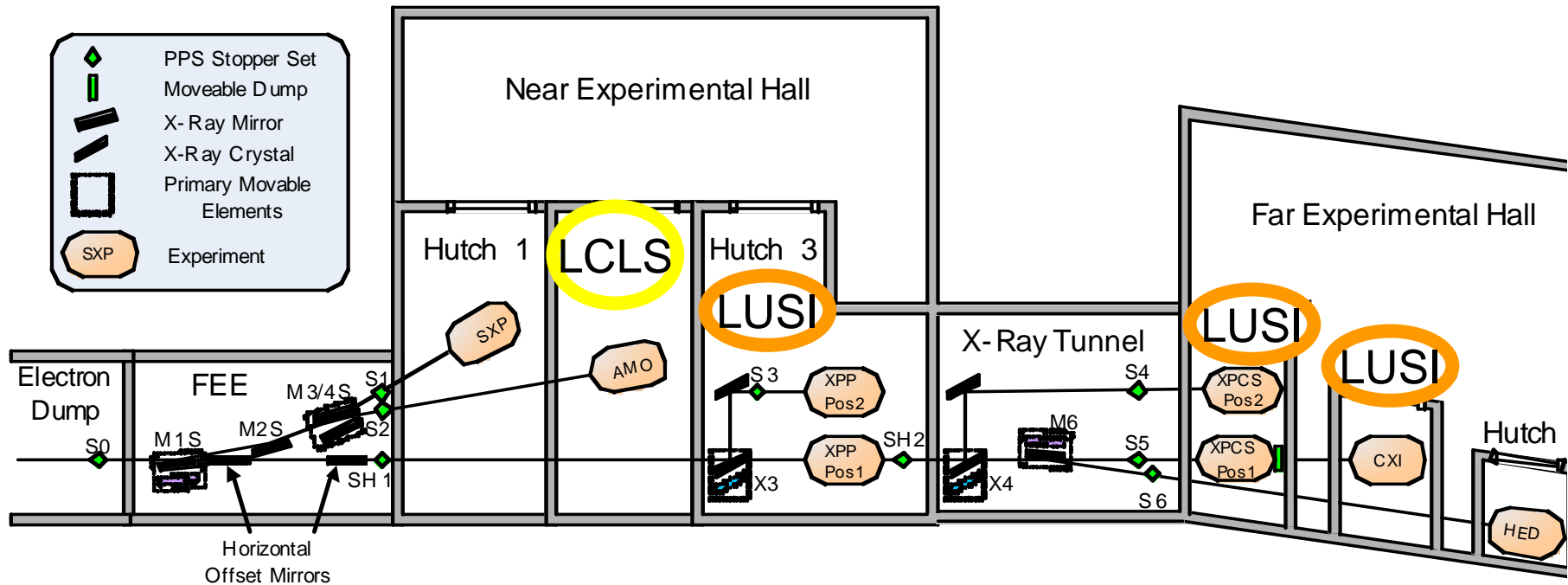


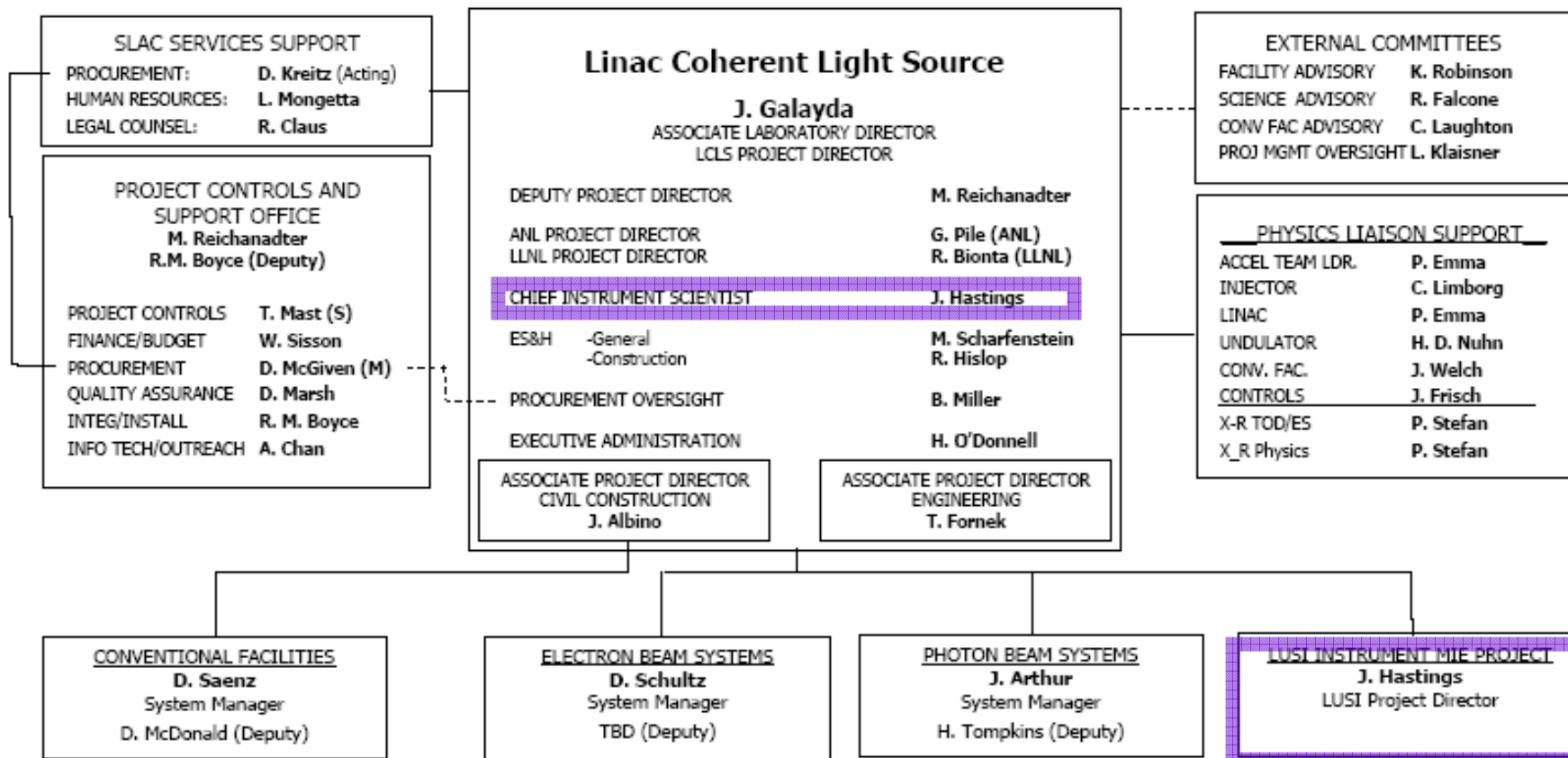
Project Director:	J. Hastings
Deputy Project Director:	T. Fornek
Chief Engineer:	N. Kurita
Finance Manager:	C. Lowe

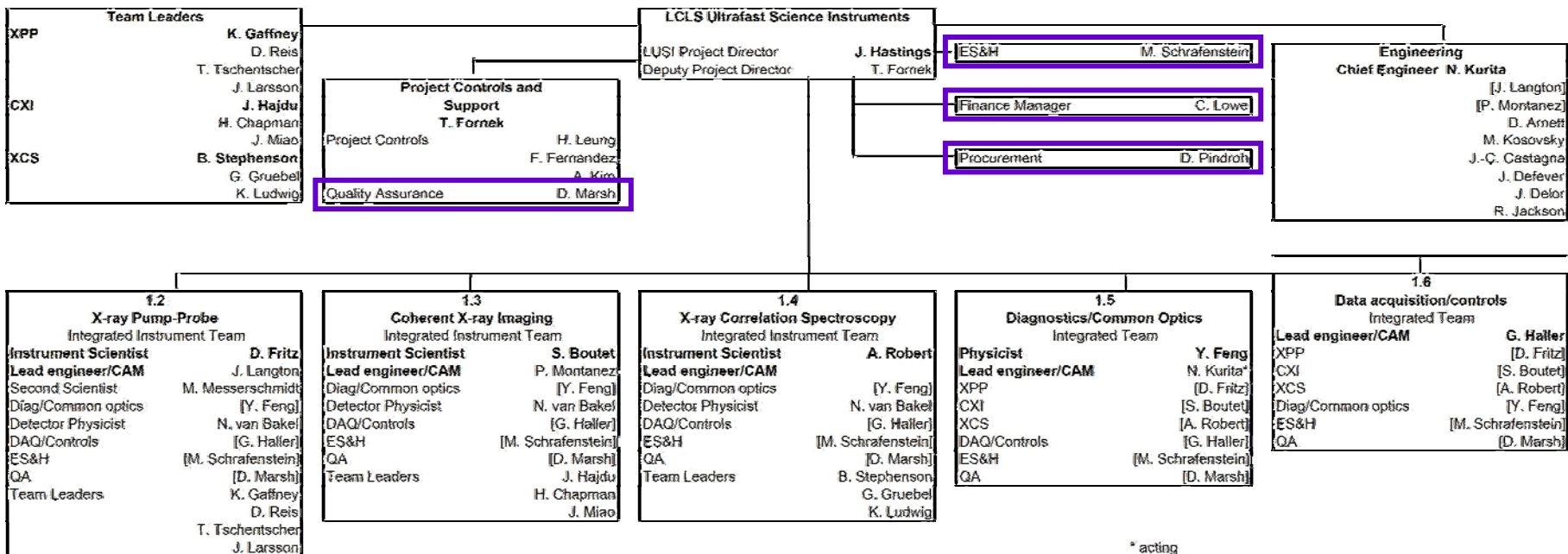


Source to Sample distance : ~ 440 m

SLAC Near & Far Hall Hutches and Beamline Layout







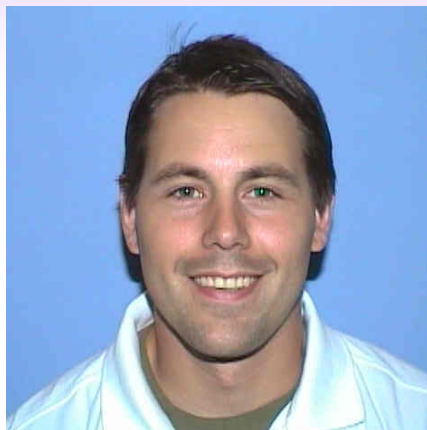
* acting

Approved Feb. 26, 2008

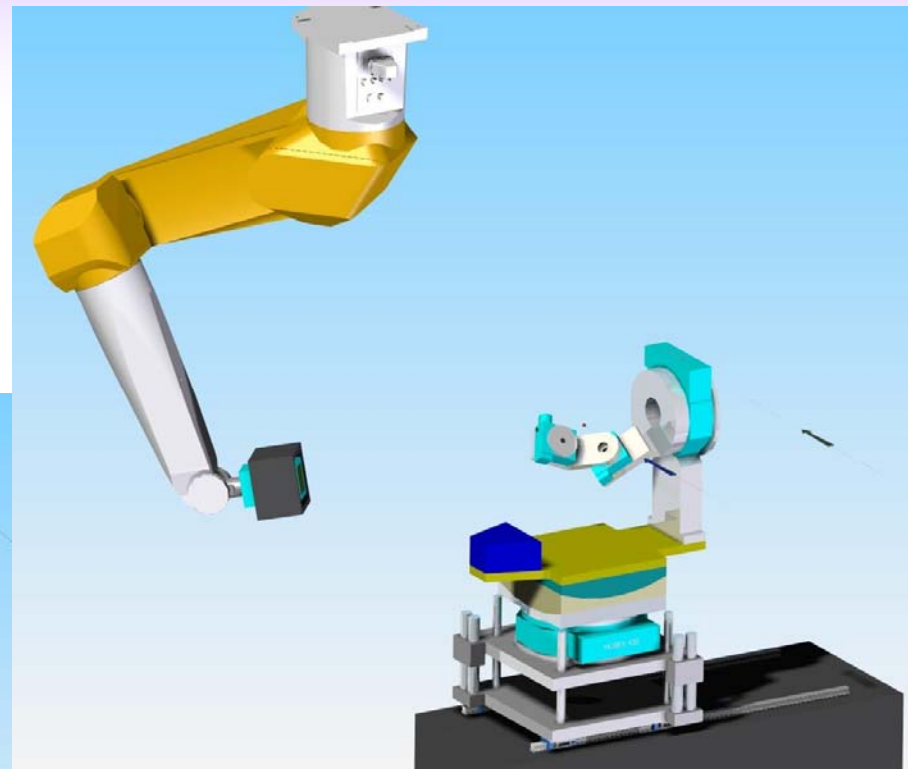
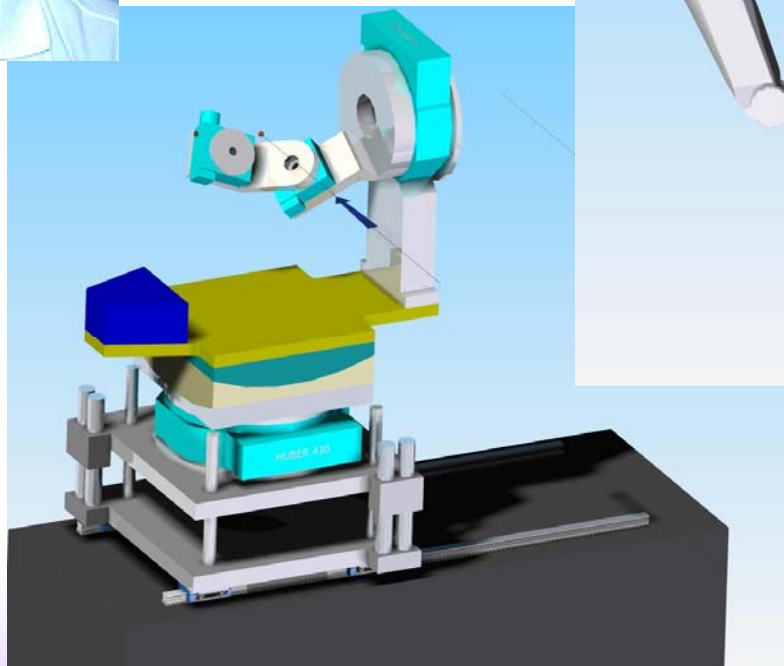
J. Hastings

- **Instrument scientist**
 - *Team leader*
 - *Physics*
- **Lead Engineer**
 - *CAM*
 - *Engineering*
- **Includes all stakeholders**
 - *science team leaders*
 - *LUSI interfaces*
 - *Diag/common optics*
 - *Detectors*
 - *Controls/data management*
 - *ES&H, QA*

1.2	
X-ray Pump-Probe	
Integrated Instrument Team	
Instrument Scientist	D. Fritz
Lead engineer/CAM	J. Langton
Second Scientist	M. Messerschmidt
Diag/Common optics	[Y. Feng]
Detector Physicist	N. van Bakel
DAQ/Controls	[G. Haller]
ES&H	[M. Schrafenstein]
QA	[D. Marsh]
Team Leaders	K. Gaffney
	D. Reis
	T. Tschentscher
	J. Larsson

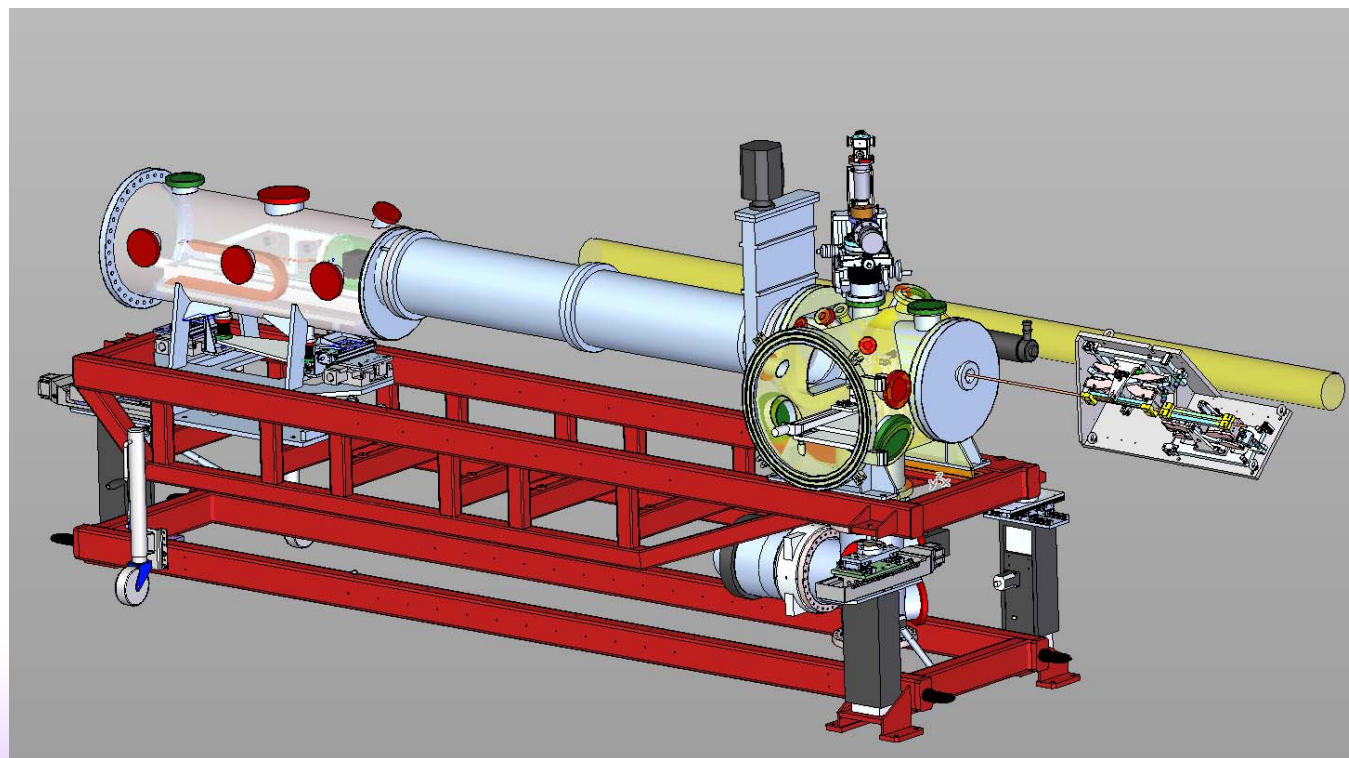


D. M. Fritz



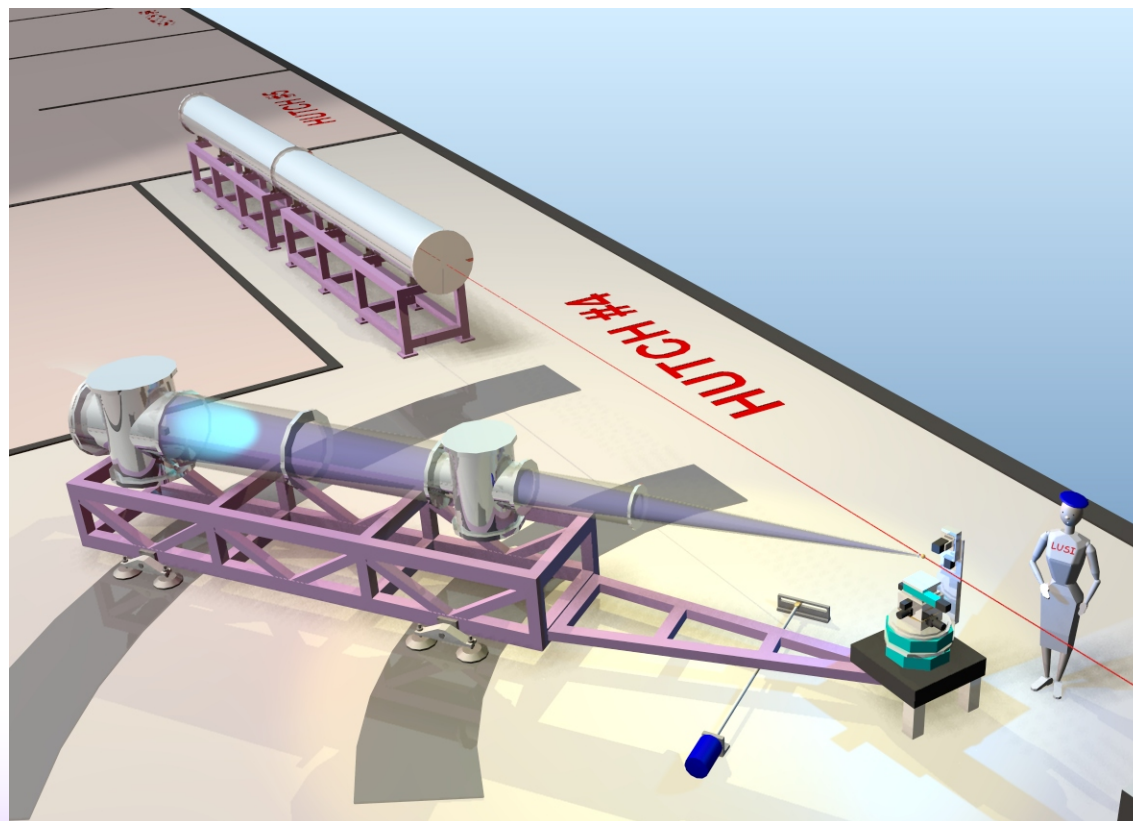


S. Boutet



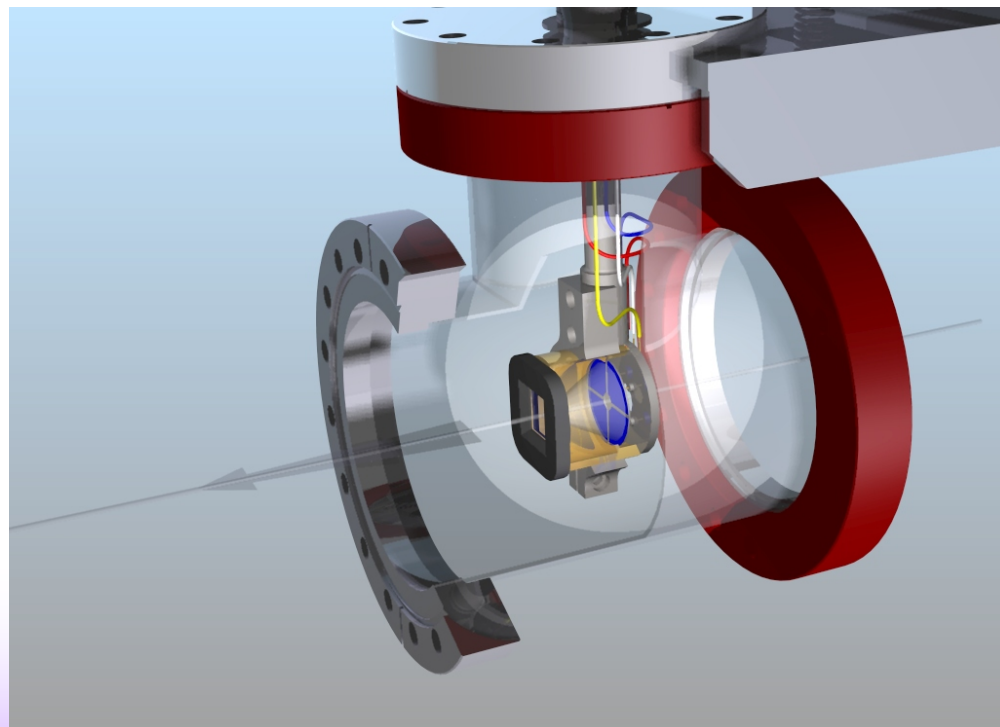
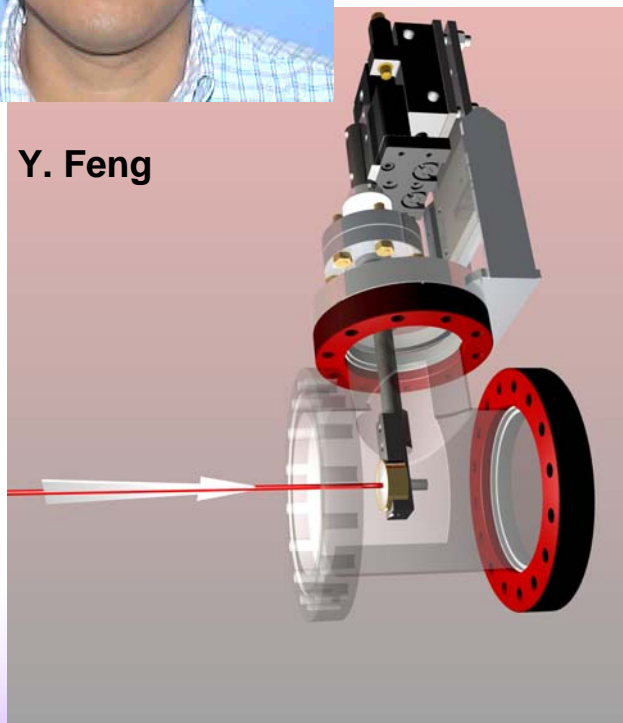


A. Robert



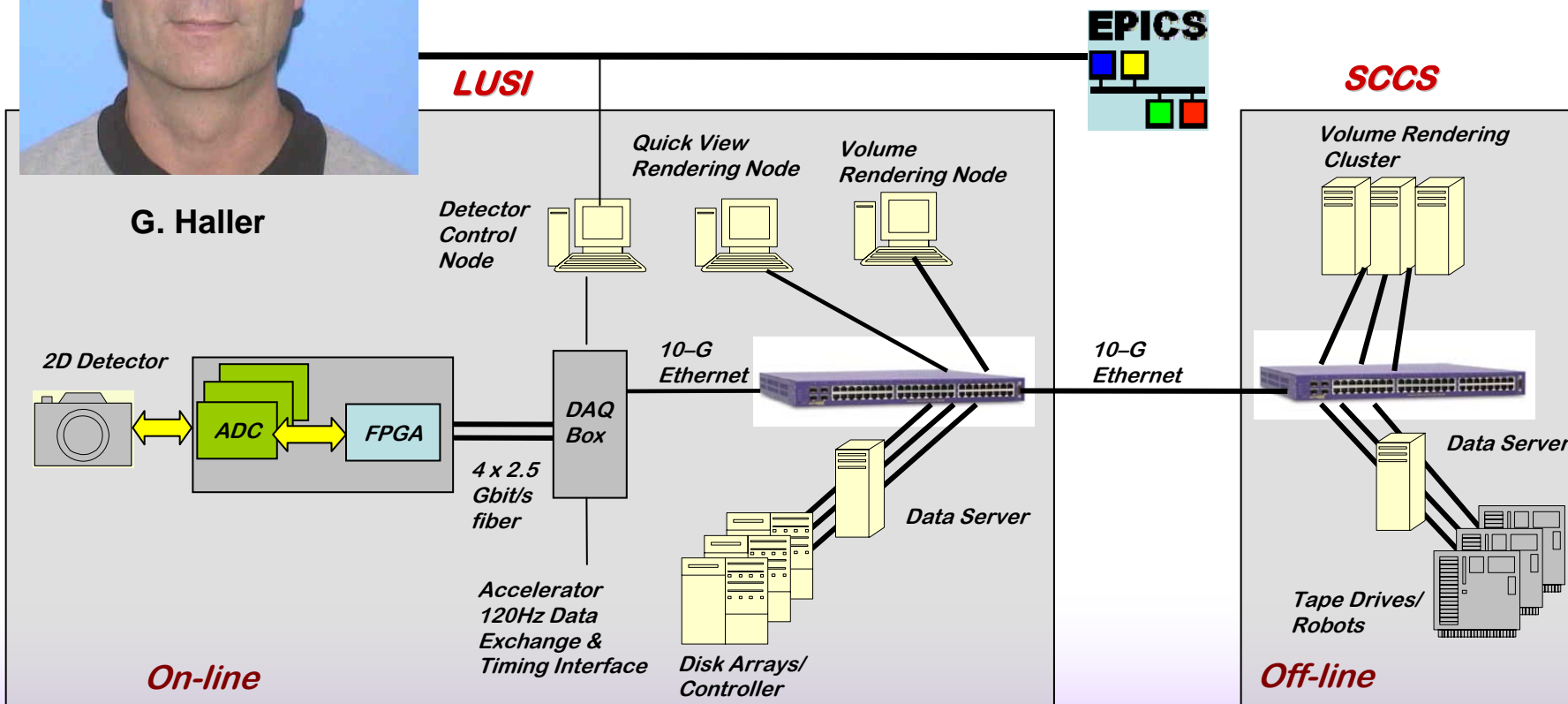


Y. Feng



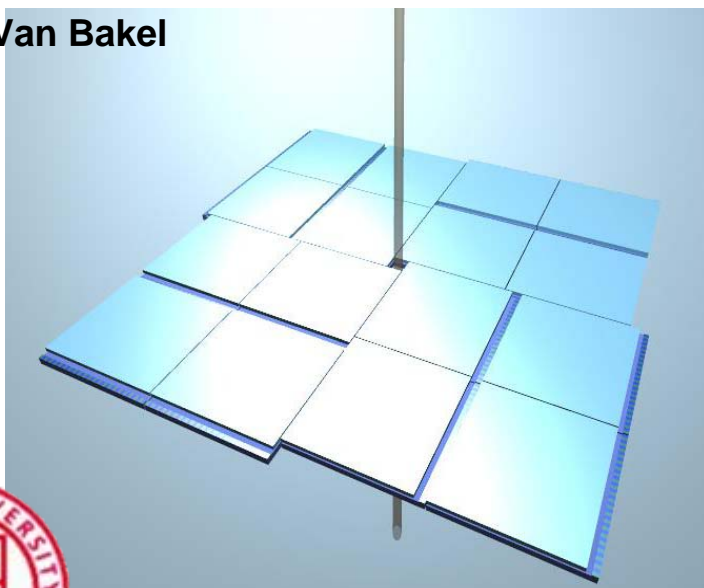


G. Haller

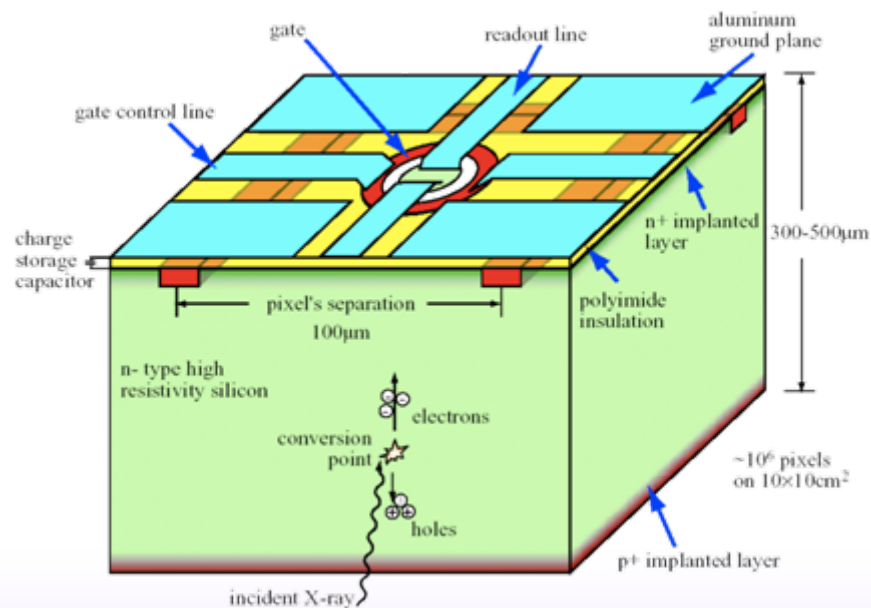




N. Van Bakel



LCLS Detector used for CXI



LUSI Detectors used for XPP, XCS

- ***X-ray pump probe instrument (XPP)***
 - *4-24 keV operation with pump laser*
 - *2-d detector with 1024x 1024pixels*
 - *Large dynamic range, moderate pixel size*
- ***Coherent x-ray imaging instrument (CXI)***
 - *4-24 keV operation with focused beam*
 - *2-d detector with 760 x 760 pixels*
 - *Moderate pixel size, central hole*
- ***X-ray photon correlation spectroscopy (XCS)***
 - *4-24 keV operation*
 - *2-d detector with 1024 x 1024pixels*
 - *Very low noise, small pixel*

- *Diagnostics to measure the pulse by pulse (120 hz) fluctuations in the electron beam and intrinsic fluctuations in the SASE process*
- *Large (1k x1k) 2-dim detectors that can be read out pulse by pulse*
- *Peak data rate from the 2-dim detectors ~ 2 Gigabit/s*
 - *Online data processing*
 - *Real time display of data*
- *Sample environments – particle injector*
- *X-ray optics – novel optics and sub microradian tolerances*

<i>Risk</i>	<i>Category</i>	<i>Mitigation</i>
<i>CR resolutions</i>	<i>Schedule</i>	<i>Plan these in the performance baseline</i>
<i>XPP robot arm does not meet specs</i>	<i>Schedule/ Technical</i>	<i>Implement 2-theta arm, point detector In house design Cartesian robot</i>
<i>CXI KB mirror vendor supplies mirrors only</i>	<i>Schedule/ Technical</i>	<i>Design manipulators in house</i>
<i>Thin Si crystals</i>	<i>Technical</i>	<i>Diamond - reduced performance (coherence preservation) ; thick crystals – lose multiplexing</i>

Prior	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012
3.4	2.0	6	15	19	10	4.6

1) FY09 CR

In millions

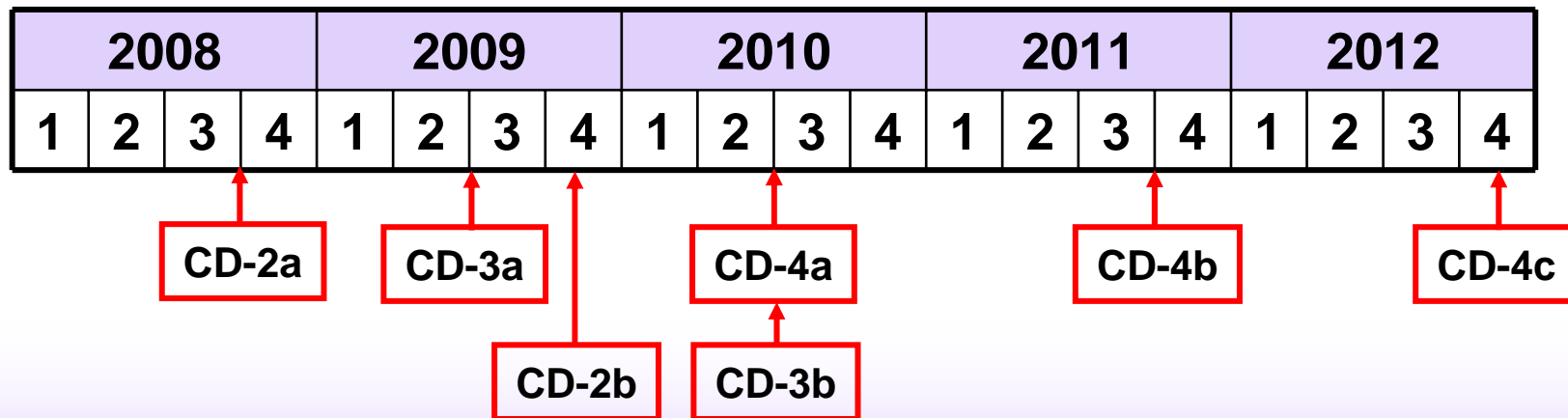
Q1	Q2	Q3	Q4
1.5	1.5	6	6

2) Instrument priorities

- 1) X-ray pump-probe including sample environments
- 2) Coherent imaging including particle injector
- 3) XCS complete to extent possible within funding

LUSI Critical Decision Dates

- CD-2a XPP
CXI
- CD-3a XPP
CXI
- CD-2b XCS
- CD-3b XCS
- CD-4a XPP Early Science
- CD-4b CXI Early Science
- CD-4c Project complete



CD-4a XPP - Hutch 3

- *Diffractometer system*
 - *Kappa goniometer*
 - *Tilt stage*
 - *Detector mover*
- *Beam optics, diagnostics*
- *LUSI 2-d detector*
- *Controls and data management*

CD-4b CXI - Hutch 5

- *1.0 micron focused beam*
- *Sample chamber*
 - *Apertures*
 - *Raster stage*
 - *Port for particle injector*
- *Precision instrument stand*
- *Detector stage*
- *LCLS 2-d detector*
- *Beam diagnostics*
- *Controls and data management*

<i>WBS</i>		<i>Costs in millions</i>
1.0	<i>Total Project</i>	41.820
1.1	<i>Management</i>	4.836
1.2	<i>XPP</i>	8.008
1.3	<i>CXI</i>	10.017
1.4	<i>XCS</i>	0.750
1.5	<i>Diag/common optics</i>	9.534
1.6	<i>Controls/data systems</i>	8.675

		<i>Costs in millions</i>
1.0	Total Project (includes 0.75 for XCS)	41.820
Management	Contingency @ 10%	0.484
1.2-1.6	Contingency @ 30%	11.096
	Total incl. contingency	53.400
	MIE Budget	55.100
	Additional available for XCS	1.700
	Total available for XCS	2.450
CD-1 XCS costs incl. contingency		7.800

- *Beam sharing offset monochromators*
- *XPP*
 - *All sample environments*
 - *Laser power amplifier and associated optics*
 - *Small angle scattering option*
- *CXI*
 - *Cryo-goniometer*
 - *Ion desorption laser*
 - *Be lens (10 micron focus)*
- *Associated diagnostics and controls*
- *Hartmann Wavefront Sensor*

		<i>Costs in millions</i>
1.0	Total Project (includes 0.75 for CXI)	37.305
Management	Contingency @ 10%	0.558
1.2-1.6	Contingency @ 30%	9.517
	Total incl. contingency	47.380
	MIE Budget	55.100
	Additional available for XCS	7.720
	Total available for XCS	8.470
CD-1 XCS costs incl. contingency		7.800

- ***First pass at Performance baseline complete***
 - *Continue to refine basis of estimates*
 - *Need to rationalize with funding profile – this may push XPP CD-4a later, also CXI CD-4b later*
 - *Deliver complete P3 schedule*
 - *We need to find additional contingency*
- ***LUSI capability for early science***
 - *XPP in hutch 3*
 - *CXI in hutch 5*
 - *Delivery dates are funding limited*
 - *Continue to refine deliverables so CD-4a,b better match LCLS CD-4*
- ***Continue engineering***