

ALS Operator Training

Rick Bloemhard

Operations Supervisor

Advanced Light Source

Lawrence Berkeley National Lab

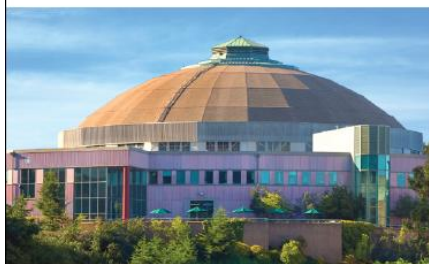
Overview

- What is the Advanced Light Source
- How is Operations organized
- What Operators do
- How are Operators trained
- How do we track Operator training

What is the ALS

Advanced Light Source

A U.S. Department of Energy,
Office of Science, User Facility at
Lawrence Berkeley National Laboratory



Under the Advanced Light Source (ALS) dome, **brilliant beams of light** travel down beamlines that radiate from a central ring like fins on a pinwheel.

Low-energy **soft x-ray light is the ALS specialty**, filling an important niche and complementing other Department of Energy light source facilities.

Soft x-rays **reveal the atomic and electronic structure** of matter—the first step toward designing new materials with which to develop new technologies.

The ALS's optimized capabilities and knowledgeable experts **attract researchers (users) who lack the advanced scientific tools** available at a national laboratory.

National user facilities, such as the ALS, are a **critical and unique part of the nation's scientific infrastructure** underpinning the innovations that spur economic growth and benefit society.

ALS in Profile

40 beamlines

- Soft x-rays
- Ultraviolet light
- Infrared light

Around-the-clock operation

- 200 staff members

2000 users each year

- Academia, national labs, industry
- Industrial users include semiconductor and pharmaceutical companies
- 600 publications per year

One of an array of LBNL facilities

- National Energy Research Scientific Computing Center
- National Center for Electron Microscopy
- Molecular Foundry
- Joint Genome Institute

Materials by Design

- Longer-lasting lithium-ion batteries for electric vehicles and mobile electronics
- Nanoscale magnetic imaging for compact data storage
- Plastic solar cells that are flexible and easy to produce

Chemistry of Energy

- Harnessing "artificial photosynthesis" for clean, renewable energy
- Fine-tuning combustion for cleaner-burning fuels
- More effective chemical reactions for fuel cells, pollution control, or fuel refinement

Environment & Health

- Using microbes to clean up toxins in the environment
- Cheaper biofuels from abundant, renewable plants
- Solving protein structures for rational drug design



What is the ALS

Materials by Design



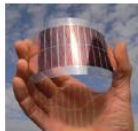
Lithium-ion batteries can power a wide variety of mobile devices, from

cell phones to electric cars. X-ray studies at the ALS can reveal what electrode materials perform best, providing a rational basis for the design of longer-lasting batteries.



Magnetic imaging at the ALS reveals how magnetic materials

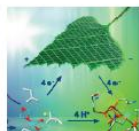
behave at the nanoscale. With such information, researchers can discover new ways to encode and manipulate data for faster, smaller, and more reliable digital applications.



Plastic solar cells are light, flexible, and inexpensive.

At the ALS, it is possible to determine the amount of molecular mixing in the active materials, a key to improving the cells' efficiency at converting sunlight into electricity.

Chemistry of Energy



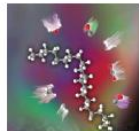
Artificial photosynthesis could be a promising way to convert

sunlight into clean, renewable fuel. X-ray experiments at the ALS can help researchers to understand and re-create the chemical processes that occur naturally in all plants.



Understanding combustion at a detailed level can help control

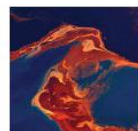
pollution and improve efficiency. ALS flame chemistry studies have yielded surprising insights that have caused researchers to rethink their models for combustion processes.



More effective chemical reactions are the ultimate goal of

ALS studies of how catalysts perform under realistic reaction conditions, such as feeding hydrogen fuel cells, sweeping toxins from emissions, or driving fuel-refinement techniques.

Environment & Health



Bioremediation is a neat solution to a difficult problem: toxins, such

as oil, are broken down into less-harmful form by microbes. At the ALS, we can study this process by correlating the form and location of the toxin with that of the microbe.



Cheaper biofuels from plant matter may be possible if we can

learn how to break down the cellulose in plant cell walls more efficiently. Promising new solvents and their effects can be studied using various ALS capabilities.



Rational drug design requires knowledge of the molecular structures of

the proteins in our bodies so that we can understand how drug molecules interact with them. At the ALS, researchers have the tools they need to study protein form and function.

CSO 22947

To learn more, go to www-als.lbl.gov

ALS COMMUNICATIONS

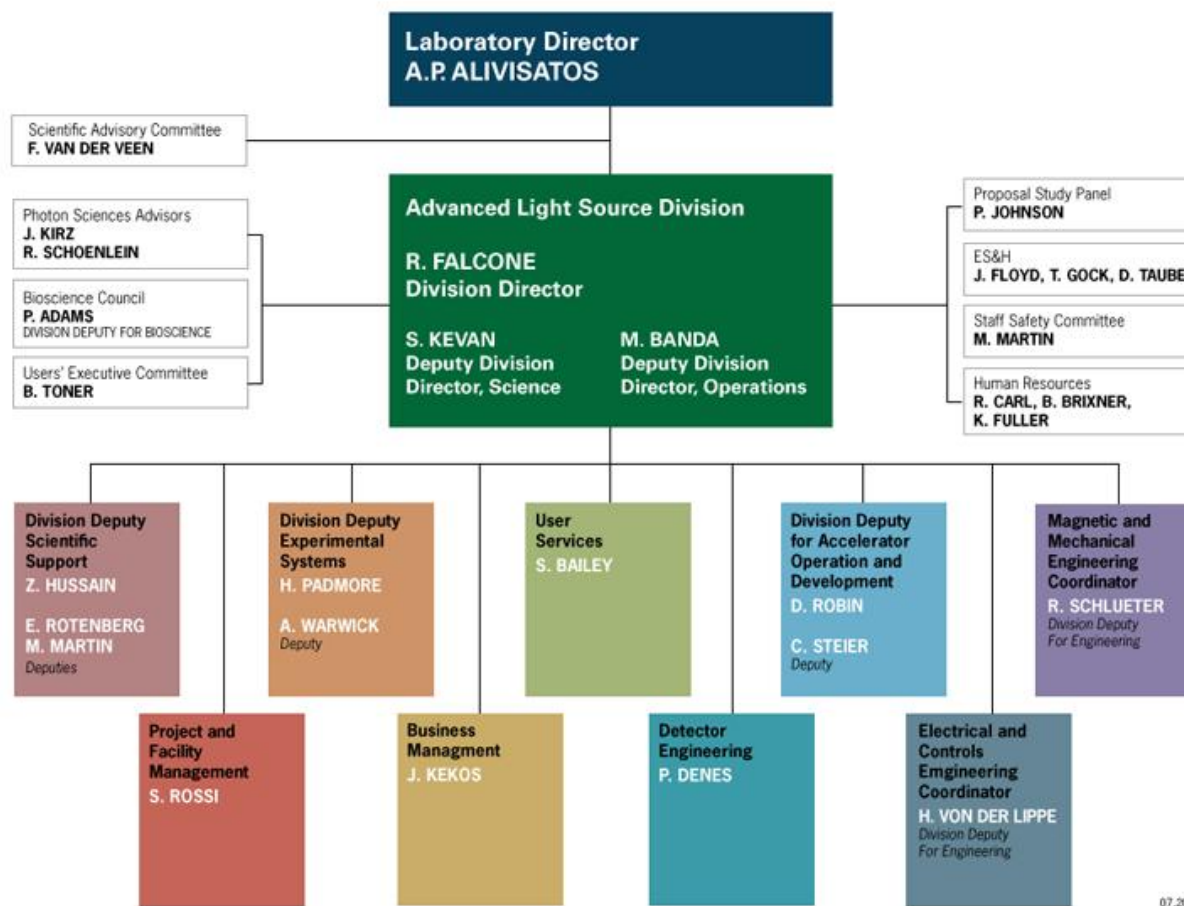
Beam Schedule

Advanced Light Source Operating Schedule July - December 2012																																	
Jul-12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
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0800-1600			AP	M	H	I										AP	M	I														M	I
1600-2400			AP	I	H	S/T										AP	I	S/T						AP								I	S/T
Aug-12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
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0800-1600						AP							M	I	AP																AP	M	I
1600-2400						AP							I	S/T	AP									AP							AP	I	S/T
Sep-12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su			
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Oct-12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W		
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Nov-12	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30			
	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F			
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	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	S	Su	M	T	W	Th	F	Sa	Su	M		
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<ul style="list-style-type: none"> User Operations U7 User Operations (7 hr shift) Special ops & scrubbing SS Safety Standown (ALS) S/T Startup & Tune M Maintenance IT Interlock Tests AP Accelerator Physics H Holiday IS/T Injection Startup MS Machine Setup B/C Beamline Commissioning X Off U ALS Users' Forum I Installation 	<table border="1"> <thead> <tr> <th colspan="3">July 2012 - Dec 2012 Cycle</th> <th>Jan-June 12</th> <th>Jul-Dec 11</th> </tr> </thead> <tbody> <tr> <td>Total calendar shifts</td> <td>=</td> <td>552</td> <td>543 shifts</td> <td>552 shifts</td> </tr> <tr> <td>Total user shifts</td> <td>=</td> <td>363</td> <td>65.8%</td> <td>56.2%</td> </tr> <tr> <td>Special operations</td> <td>=</td> <td>10</td> <td>1.8%</td> <td>2.0%</td> </tr> <tr> <td>Maint.Install.Inr. Tests/MS/IT</td> <td>=</td> <td>58</td> <td>10.5%</td> <td>24.3%</td> </tr> <tr> <td>Acc.physics and MS</td> <td>=</td> <td>61</td> <td>11.1%</td> <td>7.6%</td> </tr> <tr> <td>Startup and tune</td> <td>=</td> <td>12</td> <td>2.2%</td> <td>7.7%</td> </tr> <tr> <td>Holiday/Off</td> <td>=</td> <td>48</td> <td>8.7%</td> <td>2.8%</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="3">The following data are percentages of total user shifts</th> </tr> </thead> <tbody> <tr> <td>Total user shifts</td> <td>=</td> <td>363</td> <td>Previous cycle</td> </tr> <tr> <td>1.9 GeV multibunch shifts</td> <td>=</td> <td>332</td> <td>91.5%</td> </tr> <tr> <td>2-bunch shifts</td> <td>=</td> <td>31</td> <td>8.5%</td> </tr> <tr> <td></td> <td></td> <td></td> <td>10.5%</td> </tr> </tbody> </table>	July 2012 - Dec 2012 Cycle			Jan-June 12	Jul-Dec 11	Total calendar shifts	=	552	543 shifts	552 shifts	Total user shifts	=	363	65.8%	56.2%	Special operations	=	10	1.8%	2.0%	Maint.Install.Inr. Tests/MS/IT	=	58	10.5%	24.3%	Acc.physics and MS	=	61	11.1%	7.6%	Startup and tune	=	12	2.2%	7.7%	Holiday/Off	=	48	8.7%	2.8%	The following data are percentages of total user shifts			Total user shifts	=	363	Previous cycle	1.9 GeV multibunch shifts	=	332	91.5%	2-bunch shifts	=	31	8.5%				10.5%
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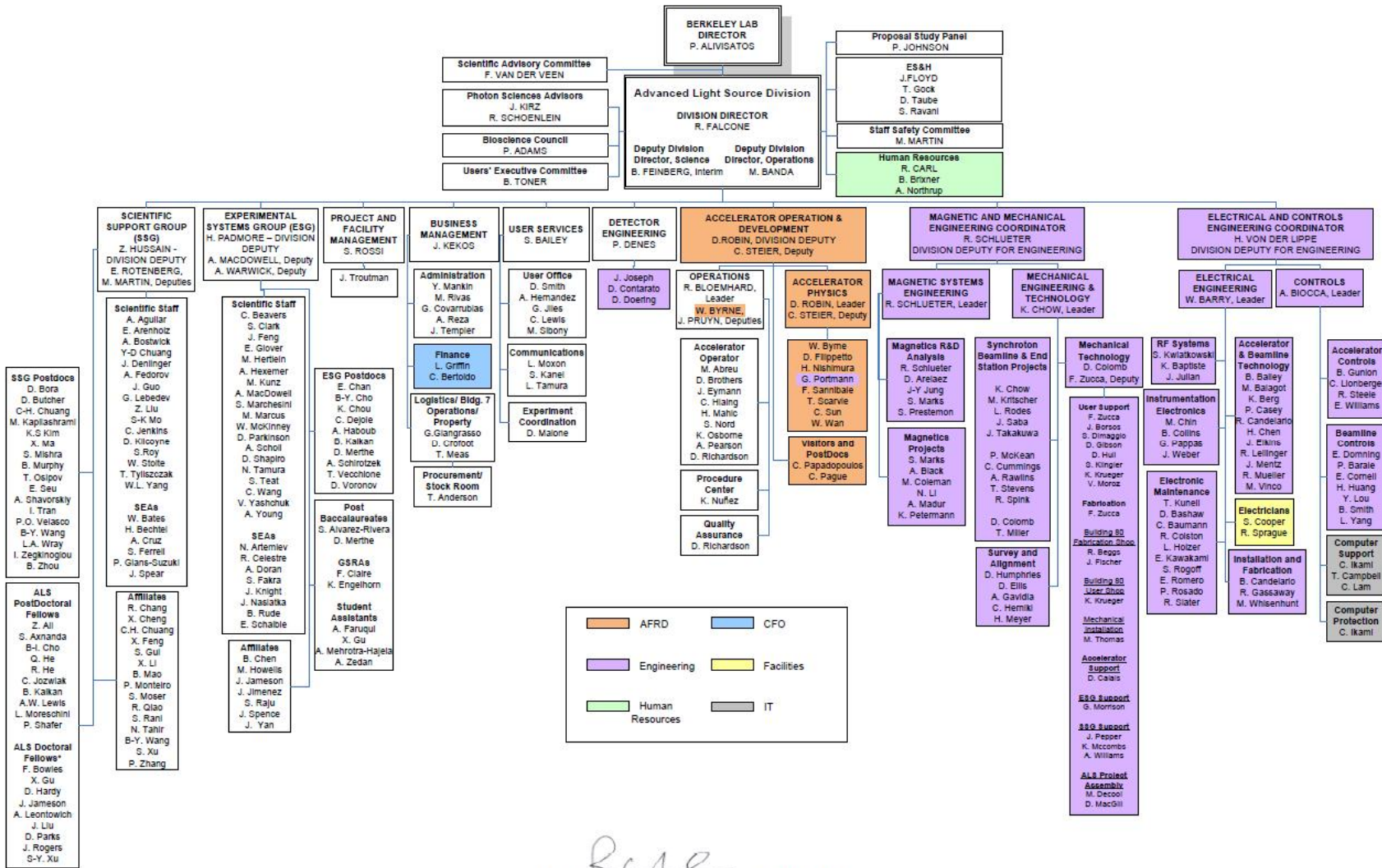
Organization

Advanced Light Source
Lawrence Berkeley National Laboratory

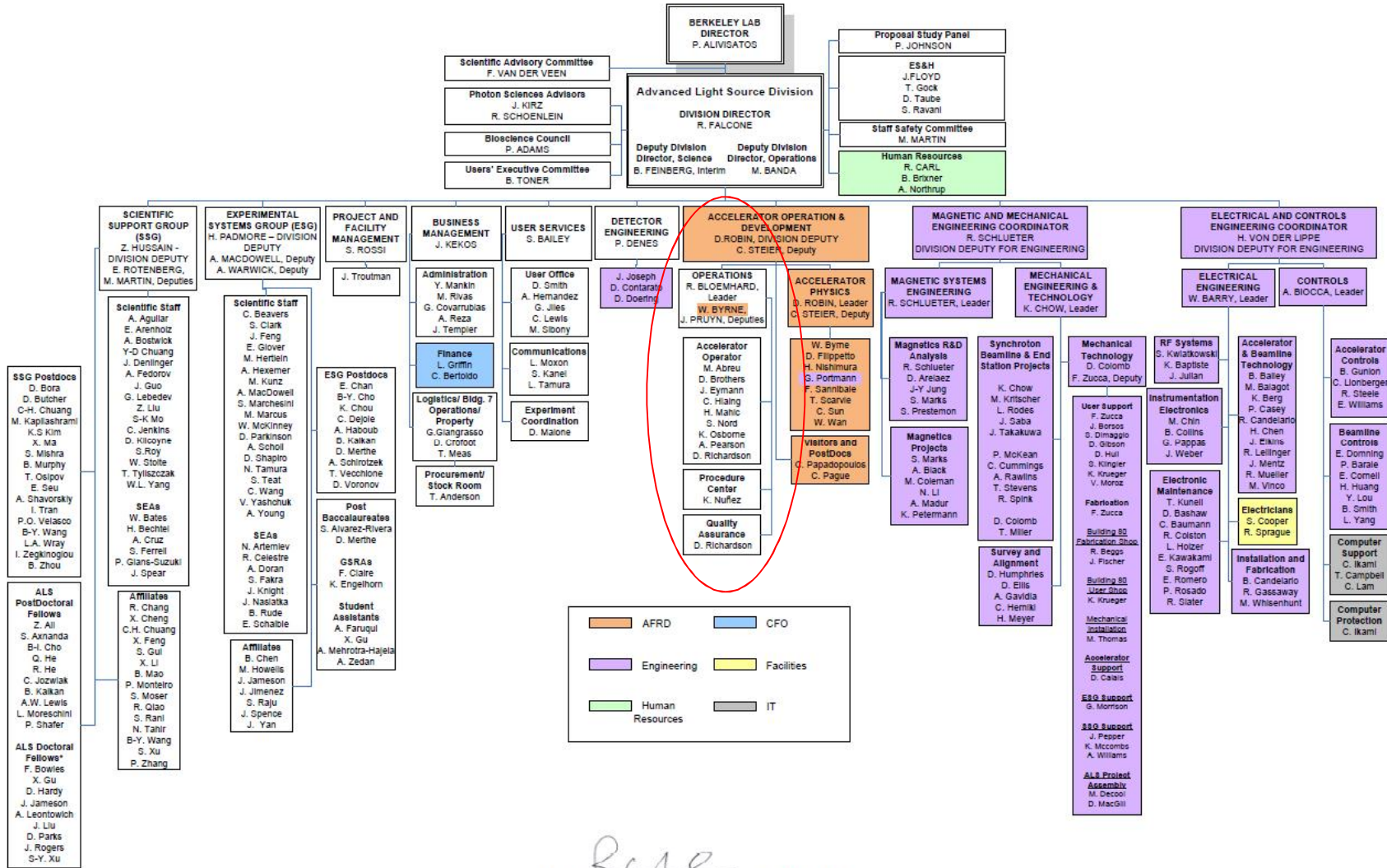


07.2012

Organization



Organization



Signature: *R. Falcone* Rev. June 2012

Organization

OPERATIONS
R. BLOEMHARD,
Leader
W. BYRNE,
J. PRUYN, Deputies

**Accelerator
Operator**
M. Abreu
D. Brothers
J. Eymann
C. Hlaing
H. Mahic
S. Nord
K. Osborne
A. Pearson
D. Richardson

**Procedure
Center**
K. Nuñez

**Quality
Assurance**
D. Richardson

What Accelerator Operators Do

- Operate the Accelerator.... and:
 - Troubleshoot small and medium sized problems
 - Coordinate diagnosis, repair major problems
 - Review and report performance data
 - Emergency Response
 - Provide First Aid
 - Search & Secure
 - Train new Operators
 - Keep training up-to-date
 - Help solve User problems
 - Write Control System Software
 - Help write, review and update procedures
 - Inspect the whole ALS facility (at least once per shift)

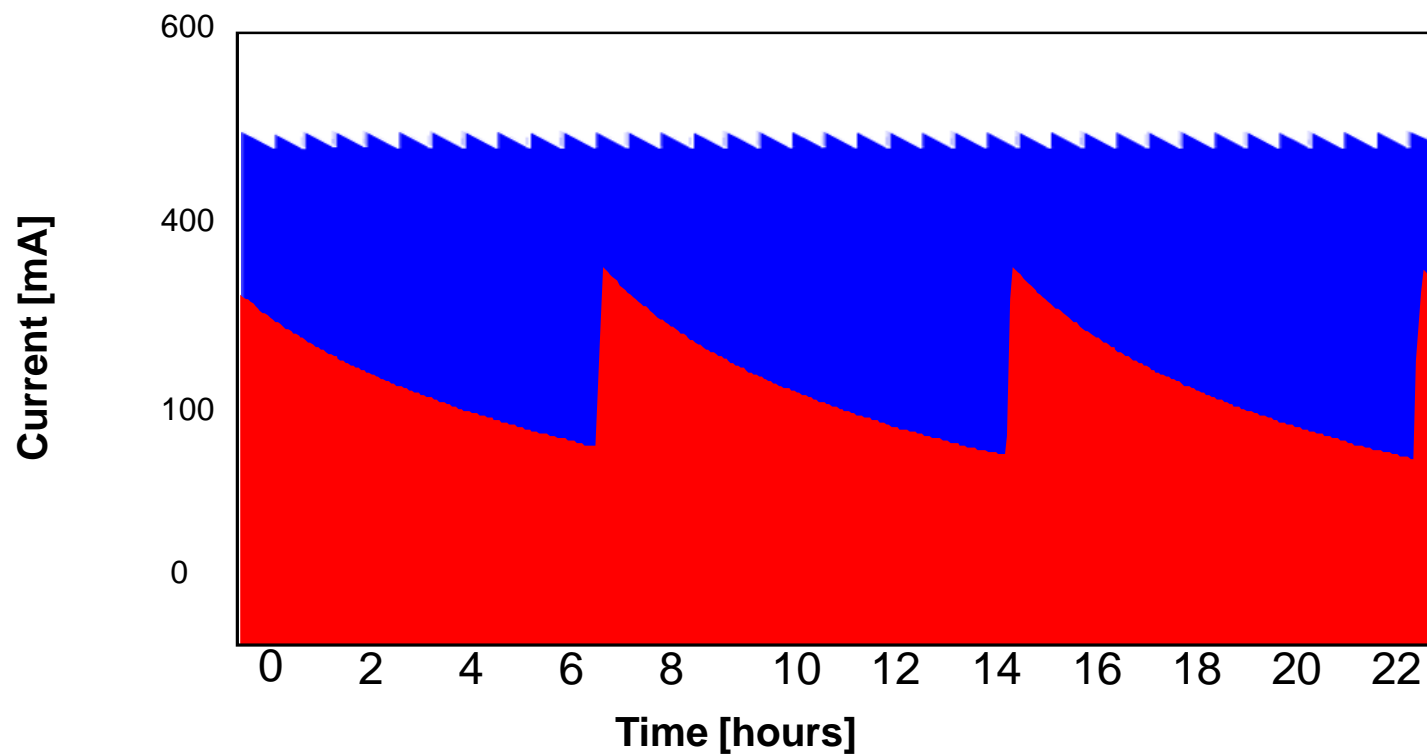
What Floor Operators Do

- Control the delivery of light to individual beamlines
- Control the removal and replacement of shielding
- Help coordinate beamline repair work
- Coordinate inspections of beamlines & endstations
- Train beamline staff on shielding control procedures

FO tasks are more Administrative than AO tasks are

- Two operators (one floor and one accelerator) wanted to expand their level of responsibility and volunteered to 'cross-train' as AFO's
- This was successful despite early concerns that taking on two different jobs meant neither one would be done well
- Later another AO cross-trained. We decided to work towards getting all Ops as AFO's.

Top Off Mode Operation



Top Off Benefits

- Better beam stability
- Higher beam brightness
- Increased user beam time
- The ALS experiences less downtime
- Operators operate the accelerator less
 - Meaning they have more time for Floor Operations

Revamped Training Program

- 1½ years ago two new operators were hired
- Decided to train them as AFO's from the start
 - First month on intros, basic safety & hazards training
 - Next two months concentrated on FO training
 - Side benefit – introduces trainee to ALS science and to our 'customers'
 - Then the more technically complicated AO training

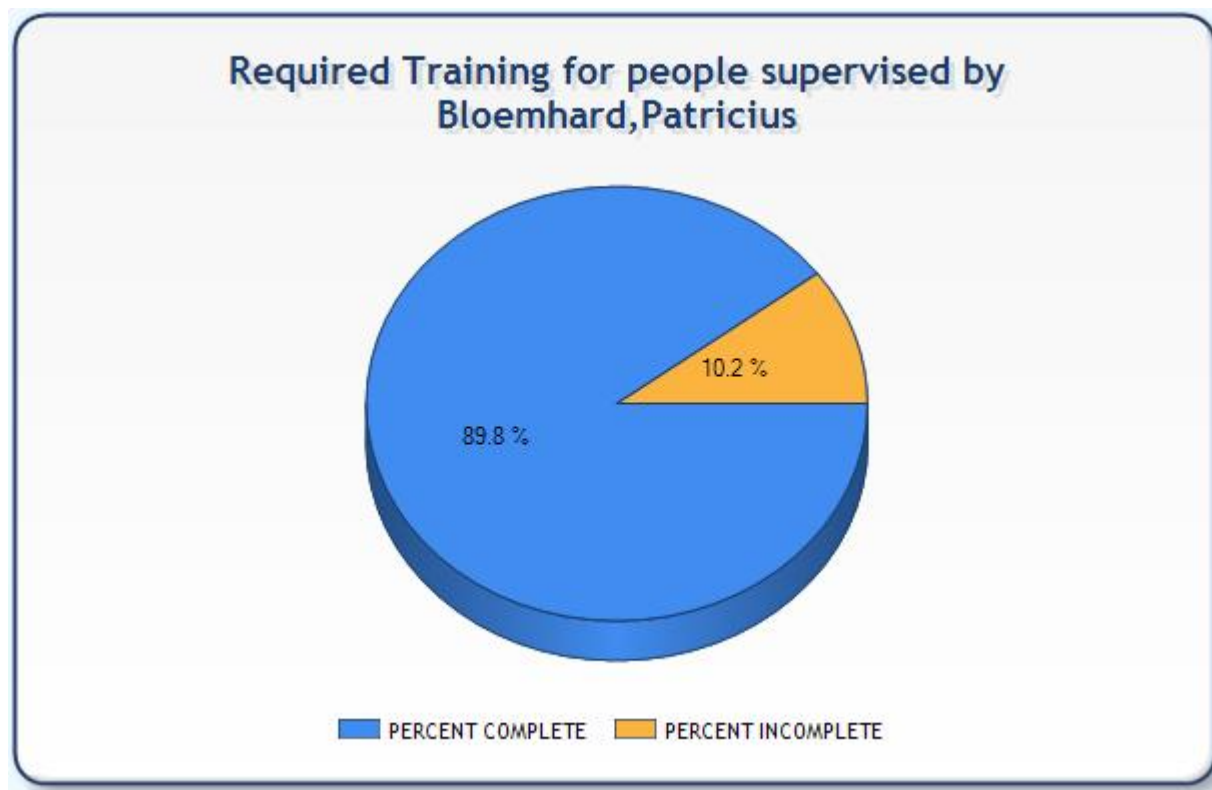
Major Changes Included

- Mentor operator assigned to trainees
- Trainees keep a detailed training diary with log entries for each training session
 - This documents training time per task & per procedure
- Incorporated definite training timeline expectations
 - Instead of taking an open-ended 1 – 2 years, this program delivered qualified FO's in 3 months & AFO's in 9 months
 - If you want this to work you need to hold both trainees and trainers accountable
- Use of some less desirable Accelerator Physics shifts to practice beam loss diagnosis and recovery
- Scheduled feedback sessions to improve program

New & Improved Training Program

- [Operator Training \(pdf\)](#)
- [Floor Operator Training \(pdf\)](#)

Keeping Track of Training





Keeping Track of Training

Accelerator Operator 1

Procedure	Revision	Type of Procedure	Type of Change	Note	017604 Abreu,Matthew J	016151 Bloemhard,Patricius	003464 Brothers,David J	127975 Byrne,Warren E	028421 Eymann,Jillian Marie	0 H
ALS 01-01	3	Administrative				11/6/2008	10/17/2008	11/7/2008	10/17/2008	3/16/2011
ALS 01-02	5	Administrative	Major	Add verif. mitigation install		2/6/2010	11/5/2009	1/30/2010	11/5/2009	5/6/2011
ALS 01-04	6	Administrative	Major	Training reqs & afterhrs		3/30/2010	3/16/2010	4/16/2010	3/29/2010	5/6/2011
ALS 01-05	6	Administrative	Major	MT bypass form added.		3/5/2011	3/21/2011	3/15/2011	2/7/2011	5/10/2011
ALS 02-01	13	Administrative	Minor	Other Auth Persons added	Rev. 12 (11/06/2008)	Rev. 12 (10/29/2008)	Rev. 12 (11/07/2008)	Rev. 12 (11/15/2008)	Rev. 12 (04/14/2011)	Re
ALS 02-05	1	Administrative	Minor	Add JHAWA and Maximo		12/9/2010	11/15/2010	12/5/2010	12/6/2010	4/8/2011
BL 08-02	3	Technical				6/4/2009	6/26/2009	6/25/2009	6/4/2009	5/3/2011
BL 08-08	7	Technical				6/15/2009	6/26/2009	7/14/2009	6/15/2009	5/3/2011
BL 08-11	4	Technical	Minor	Ergo update to filter wheel		12/9/2010	12/1/2010	12/4/2010	12/1/2010	6/17/2011
BL 08-23	3	Technical	Minor	New storage locations & append		2/10/2010	11/19/2010	2/22/2010	5/6/2010	5/4/2011
BL 08-24	9	Technical	Minor	Add cryo admin lock	Rev. 8.10 (02/23/2011)	Rev. 8.10 (03/10/2011)	Rev. 8.10 (03/10/2011)	Rev. 8.10 (03/10/2011)	Rev. 8.10 (05/03/2011)	Re
BL 11-01	5	Administrative	Minor	Update terms, update append.		11/18/2009	11/15/2010	12/8/2009	11/25/2009	5/3/2011
CS 02-02	2	Administrative				11/6/2008	7/30/2009	11/7/2008	11/19/2008	8/21/2011
CS 02-03	7	Technical	Minor	New controls		3/16/2010	3/12/2010	4/16/2010	3/12/2010	9/17/2011
EC 02-27	3	Technical	Major	New controls software.		5/31/2011	5/31/2011	5/31/2011	5/31/2011	9/16/2011 Re
EC 02-80	0	Technical				6/25/2009	8/24/2009	7/14/2009	7/8/2009	9/1/2011
EC 02-82	2	Administrative	Minor	Temp key release for EC 02-80		3/16/2010	6/25/2010	4/6/2010	3/8/2010	6/18/2011
EE 08-01	3	Administrative				11/26/2008	8/24/2009	11/7/2008	11/15/2008	9/15/2011
HP 01-04	8	Administrative	Minor	Only RCT performs survey	Rev. 7 (06/02/2008)	6/12/2012	Rev. 7 (05/22/2008)	6/12/2012	Rev. 7 (05/10/2011)	Re
HP 01-06	5	Technical				6/25/2009	7/28/2009	6/25/2009	6/2/2009	6/4/2011
HP 02-01	10	Administrative	Major	T-4 and ALS1005 Training		3/31/2010	3/16/2010	4/7/2010	5/6/2010	5/3/2011
ID 02-08	1	Technical				12/20/2008	8/24/2009	12/20/2008	12/12/2008	9/21/2011
MT 08-02	2	Administrative	Major	New access reqs and roles	Rev. 1 (01/21/2009)		11/1/2010	11/1/2010	11/1/2010	8/30/2011
OP 02-01	3	Technical	Minor			1/13/2012	1/4/2012	1/13/2012	1/13/2012	1/4/2012
OP 02-02	6	Administrative	Minor	B15, LN Tank, SR Roof,Klystron		2/7/2012	2/7/2012	3/30/2012	3/12/2012	2/17/2012
OP 02-04	14	Administrative	Major	6.0 Corrective Actions		6/28/2010	6/28/2010	7/16/2010	6/28/2010	5/3/2011
OP 02-05	5	Technical	Minor	Minor changes seel below		10/24/2011	10/24/2011	1/13/2012	1/13/2012	1/13/2012
OP 02-06	8	Technical				3/3/2009	9/27/2009	9/29/2008	9/29/2008	9/19/2011
OP 02-07	10	Technical				1/16/2009	10/20/2009	1/16/2009	1/16/2009	8/30/2011
OP 02-08	3	Technical	Minor	New controls systems software		6/8/2011	5/27/2011	6/8/2011	5/27/2011	8/22/2011
OP 02-10	4	Technical				12/20/2008	7/8/2009	12/20/2008	12/10/2008	6/16/2011
OP 02-11	12	Technical	Minor	Save GTB and BTS parameters	Rev. 11.10 (03/04/2011)	Rev. 11.10 (03/04/2011)	Rev. 11.10 (03/04/2011)	Rev. 11.10 (03/04/2011)	Rev. 11.10 (05/16/2011)	Re
OP 02-12	8	Technical				3/14/2009	9/28/2009	12/22/2008	12/22/2008	11/1/2011
OP 02-14	5	Technical	Minor	Add new HL Controls systems.		5/21/2010	5/21/2010	6/30/2010	5/21/2010	9/20/2011
OP 02-17	3	Technical	Minor	Updated menu names.		9/3/2009	8/28/2009	8/13/2009	8/13/2009	
OP 02-21	5	Technical	Minor	add TO/Decay shutdown options		9/3/2009	8/18/2009	9/21/2009	8/11/2009	10/3/2011
OP 02-23	2	Technical	Minor	Add restore settings		6/8/2011	5/27/2011	5/27/2011	5/27/2011	9/17/2011
OP 02-28	0.2	Technical	Negligible			3/9/2012	3/9/2012	3/9/2012	3/9/2012	3/9/2012

Keeping Track of Training

 LAWRENCE BERKELEY NATIONAL LABORATORY ALS PROCEDURES TRAINING PROFILE 			
Employee:	Bloemhard,Patricius (016151)	Supervisor:	Banda,Michael J (801058)
Division:	Advanced Light Source	Job Title:	Technical Support Supermdt
Employee Status:	Active	Hire Date:	06/05/2006

■ Training Requirements that have NOT been fulfilled.
 ■ Training Requirements that have been fulfilled.

Obligation Type	Procedure	Title	Current Version	Version Credited	Date Credited	Date Expires
Required	ALS 01-01	Training Doc for Procedures	3	3	10/17/2008	
	ALS 01-02	Proc Temp Bypass of Personnel	5	5	11/05/2009	11/05/2010
	ALS 01-04	Reqd Training for Keycard Acc	6	6	03/16/2010	
	ALS 01-05	Equip. temp. Bypass Procedure	6	6	03/21/2011	
	ALS 02-01	Authorized Persons List	13	12	10/29/2008	
	ALS 02-03	Crit. Issuing ALS Work Permit	2	2	11/15/2010	
	ALS 02-05	Work Permit Process at the ALS	1	1	11/15/2010	
	ALS 08-01	Accelerator Review Committee	2	2	01/12/2012	
	ALS 08-02	Investigation of Adverse Event	1	1	09/16/2010	
	ALS 08-03	ALS Staff Safety Committee	1	0	08/23/2010	
	ALS 09-01	Electrical LOTO Training Proc.	8	8	12/05/2008	
	ALS 16-01	ALS Proc. Format & Guidelines	4	4	11/02/2009	
	BL 08-01	Putting Beamlines Online	10	10	06/24/2010	
	BL 08-02	Taking Beamlines Offline	3	3	06/26/2009	
	BL 08-04	Inspec.&Test for particomp FE	5.1	5.1	11/15/2010	
	BL 08-05	BL Hutch Access Procedure	7	7	11/15/2010	
	BL 08-08	BL Abbreviated Key-enable Proc	7	7	06/26/2009	
	BL 08-10	BL 9.3.1 Monochromator Vacuum	4	4	11/15/2010	
	BL 08-11	Beamline 3.1 Filter Change	4	4	12/01/2010	
	BL 08-16	BL Review Committee	6	6	08/30/2011	
	BL 08-19	Beamline Mini-Hutch Sample Acc	3	3	11/15/2010	
	BL 08-21	Ilumin of BL05.0 Carbn Filtr	2	2	11/22/2010	
	BL 08-23	Hazardous Gases and Gas Cabs	3	3	11/19/2010	
	BL 08-24	BL Mini-Hutch Main/Mod Access	9	8.1	03/10/2011	
	BL 08-25	Use of RSSD at ALS	3	3	02/02/2012	
	BL 08-26	Using ES w/self-sup Atm Window	1	1	11/15/2010	
	BL 08-27	Conn/Disconn ES w/ Atm Window	1	1	12/06/2010	
	BL 08-29	BL 6.0.2 (ES1) Sample Chamber	4	4	11/22/2010	
	BL 08-31	Policy & Guide for BL Rad Acc	1	0	08/11/2007	
	BL 08-32	Shielding Control End-point	4	4	11/19/2010	
	BL 08-34	Approving a BL for Top Off	3	3	06/28/2010	
	BL 08-39	Config. Control of 11.0.2.1A	1	1	02/15/2012	
	BL 11-01	ALS Beamline Logkeeping	5	5	11/15/2010	

ALS

WAO 2012 – ALS Operator Training

Questions?

Lunch Time!

