

Status of XAL at SLAC/LCLS

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- XAL setup
- XAL Online Model for LCLS
- Linac Energy Manager (LEM)
- Save, Compare, Restore (SCORE)
- Model Server
- LCLS High-Level Application Environment
- Current status

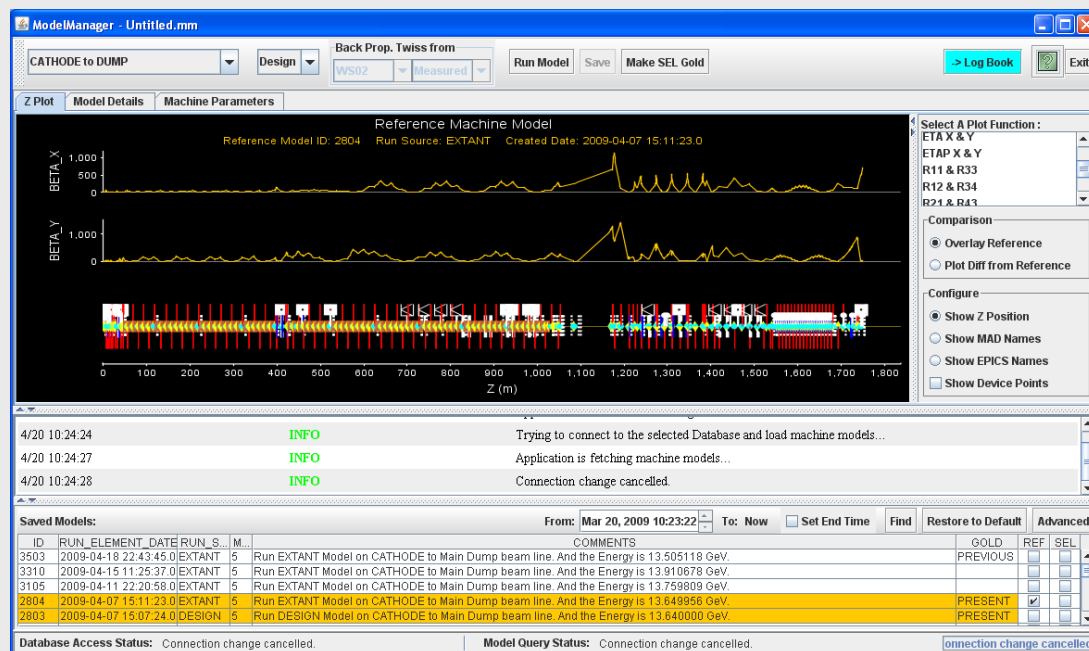
- Database for XAL inputs
- Elements/Symbols Database for lattice data
 - Master Excel spreadsheet as MAD DECK
- RF cavity/gap tables for TTF coefficients and power distribution info
- XAL source code branched from SNS 07/2007
- Source repository – SLAC CVS server
- Python script for generating XAL XDXF file

- Particle frame coordinate
- Validate XAL model (XAL vs. MAD)
 - Rewrite all transfer matrices with MAD-8 algorithm
 - R-matrix (transverse 4x4)
 - Twiss parameters, Chromaticity, phase advance...

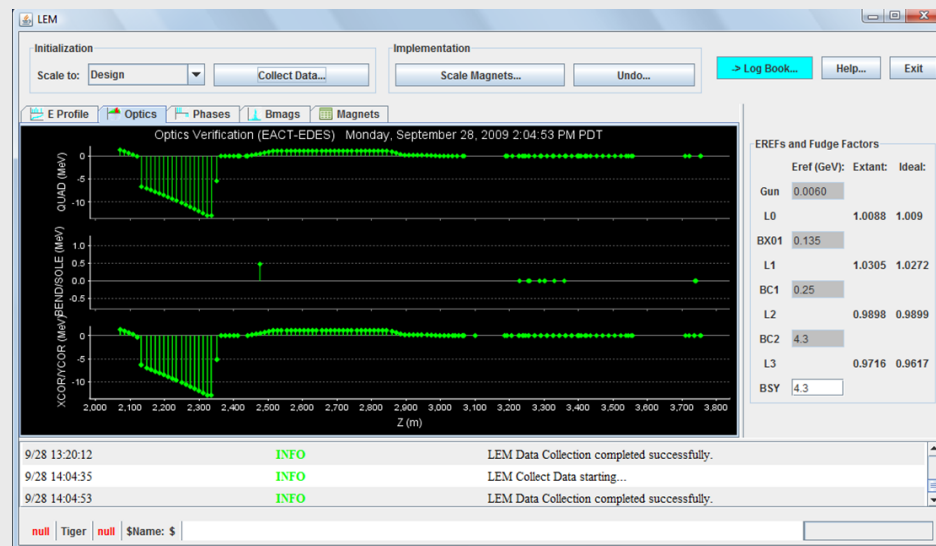


■ Online model manager

- Run model
- View available models – comparison
- Tag GOLD model



- Scale non-matching magnets based on design or reference energy/field pair
- Fixed points for energy calibrations
- LEM as API for other apps to call



Database modifications

- Oracle APEX GUI
- PV configuration tracker
- IRMIS PV validation

Restore with LEM API

The screenshot shows the SCORE application window with a table of subsystem data. The table has columns for Subsystem Name, DES Live Val, CORN Live Val, DES Live Val, ACT Live Val, ACT Save Val, DES, ACT, and CON. The data is filtered for the region 'Gun to TD11-LEM'.

Subsystem Name	DES Live Val	CORN Live Val	DES Live Val	ACT Live Val	ACT Save Val	DES	ACT	CON
SOLBK SOLN IN20 111	-0.02990	-0.02990	-0.02990	-0.02990	-0.02990	BDES	BACT	BCON
SOLBK SOLN IN20 111	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	EDES	EACT	ECON
CO01 QUAD IN20 121	0.000E+0	0.000E+0	0.000E+0	-6.210E-7	1.673E-6	BDES	BACT	BCON
CO01 QUAD IN20 121	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	EDES	EACT	ECON
SOL1 SOLN IN20 121	0.44700	0.44700	0.44700	0.44700	0.44700	BDES	BACT	BCON
SOL1 SOLN IN20 121	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	EDES	EACT	ECON
XC00 XCOR IN20 121	-4.280E-4	-4.280E-4	-4.280E-4	-4.280E-4	-4.280E-4	BDES	BACT	BCON
XC00 XCOR IN20 121	6.000E-3	6.000E-3	6.000E-3	6.000E-3	6.000E-3	EDES	EACT	ECON
SO01 QUAD IN20 122	-5.000E-3	-5.000E-3	-5.000E-3	-4.999E-3	-4.999E-3	BDES	BACT	BCON
SO01 QUAD IN20 122	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	EDES	EACT	ECON
YC00 YCOR IN20 122	-5.011E-4	-5.011E-4	-5.011E-4	-5.010E-4	-5.010E-4	BDES	BACT	BCON
YC00 YCOR IN20 122	6.000E-3	6.000E-3	6.000E-3	6.000E-3	6.000E-3	EDES	EACT	ECON
XC01 XCOR IN20 221	-2.007E-4	-1.908E-4	-2.004E-4	-2.033E-4	-2.003E-4	BDES	BACT	BCON
XC01 XCOR IN20 221	6.000E-3	6.000E-3	6.000E-3	6.000E-3	6.000E-3	EDES	EACT	ECON
YC01 YCOR IN20 222	-4.508E-4	-4.377E-4	-4.539E-4	-4.504E-4	-4.513E-4	BDES	BACT	BCON
YC01 YCOR IN20 222	6.000E-3	6.000E-3	6.000E-3	6.000E-3	6.000E-3	EDES	EACT	ECON
BXC BEND IN20 231	1.629E-4	1.629E-4	1.629E-4	1.601E-4	1.601E-4	BDES	BACT	BCON
BXC BEND IN20 231	6.000E-3	6.000E-3	6.000E-3	6.000E-3	6.000E-3	EDES	EACT	ECON
BXG Trm BTRM IN20 231	-1.04540	-1.04540	-1.04540	-1.04528	-1.04528	BDES	BACT	BCON
BXG Trm BTRM IN20 231	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	EDES	EACT	ECON
SOL2 SOLN IN20 311	0.000E+0	0.000E+0	0.000E+0	-6.155E-4	-6.151E-4	BDES	BACT	BCON
SOL2 SOLN IN20 311	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	EDES	EACT	ECON
XC02 XCOR IN20 311	-8.307E-4	-8.307E-4	-8.307E-4	-8.305E-4	-8.305E-4	BDES	BACT	BCON
XC02 XCOR IN20 311	0.0239E+0	0.0239E+0	0.0239E+0	0.0239E+0	0.0239E+0	EDES	EACT	ECON
YC02 YCOR IN20 312	1.032E-3	1.032E-3	1.032E-3	1.032E-3	1.032E-3	BDES	BACT	BCON
YC02 YCOR IN20 312	0.000E+0	0.000E+0	0.000E+0	0.000E+0	0.000E+0	EDES	EACT	ECON

Gun to TD11-LEM #98353 machine data saved at 2011-08-26 11:16:10.0

8/26 12:54:52 INFO Snapshot Number 98353 Opened in Region Gun to TD11-LEM
8/26 12:54:53 INFO Ready

physics | lcls-srv04 | 30929 | score-RO-3-4

The screenshot shows the SCORE application window with a table of snapshot data. The table has columns for Region, Mod Date, Description, Config Title, Pri, Save, Set, and User. The data is filtered for the region 'Gun to TD11-LEM'.

Region	Mod Date	Description	Config Title	Pri	Save	Set	User
BPM	08/26/2011 11:17:54	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Undulator CAM	08/26/2011 11:17:52	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Wire Scanner	08/26/2011 11:17:51	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Undulator Taper	08/26/2011 11:17:49	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Vacuum	08/26/2011 11:17:48	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Timing-All	08/26/2011 11:17:46	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Feedback-All	08/26/2011 11:17:04	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
FEE	08/26/2011 11:17:02	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Collimator	08/26/2011 11:16:21	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Cavity BPM Cal	08/26/2011 11:16:19	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
BSA	08/26/2011 11:16:17	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Undulator-LEM	08/26/2011 11:16:15	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
LTU-LEM	08/26/2011 11:16:14	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
TD11 to BSY-LEM	08/26/2011 11:16:12	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER
Gun to TD11-LEM	08/26/2011 11:16:10	Post AMO Setup - 6% Jitter	3.57 GeV + 0.0 MeV, 6000 A, 0.27 mj, 556 ev, 40 pC	N	N	N	EPICS_MON_USER

- XAL Online Model data saved in Oracle DB
 - Design model
 - Extant model
- Full Machine model available at all time
- Data access via AIDA (CORBA based service)
 - Support MATLAB, Java, HTML

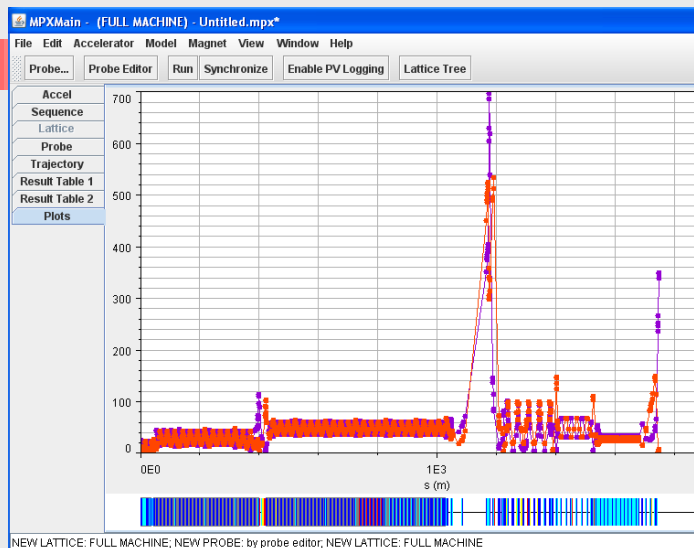
Messaging

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4/14 10:45:09      INFO      Application has finished launching!
4/14 10:47:25      INFO      Application are trying to find models in the beam line...
4/14 10:47:47      INFO      Application is running the XAL machine model...
4/14 10:48:19      INFO      The new XAL machine model's ID is "RUN" !
4/14 10:51:27      INFO      Application is running the XAL machine model...
4/14 10:53:35      INFO      The new XAL machine model's ID is "RUN" !
    
```

GUI framework/layout

Common look-an



ModelManager - Untitled.mm

CATHODE to DUMP Design Back Prop. Twiss from WS02 Measured Run Model Save Make SEL Gold Log Book Exit

Z Plot Model Details Machine Parameters

Reference Machine Model
Reference Model ID: 2804 Run Source: EXTANT Created Date: 2009-04-07 15:11:23.0

4/20 10:24:24 INFO Trying to connect to the selected Database and load machine models...
4/20 10:24:27 INFO Application is fetching machine models...
4/20 10:24:28 INFO Connection change cancelled.

ID	RUN_ELEMENT_DATE	RUN_S.	M.	COMMENTS	PREVIOUS	REF	SEL
3503	2009-04-18 22:43:45.0	EXTANT	5	Run EXTANT Model on CATHODE to Main Dump beam line. And the Energy is 13.505118 GeV.			
3310	2009-04-15 11:26:37.0	EXTANT	5	Run EXTANT Model on CATHODE to Main Dump beam line. And the Energy is 13.910678 GeV.			
3105	2009-04-11 22:20:58.0	EXTANT	5	Run EXTANT Model on CATHODE to Main Dump beam line. And the Energy is 13.759809 GeV.			
2804	2009-04-07 15:11:23.0	EXTANT	5	Run EXTANT Model on CATHODE to Main Dump beam line. And the Energy is 13.649956 GeV.	PRESENT	✓	
2803	2009-04-07 15:07:24.0	DESIGN	5	Run DESIGN Model on CATHODE to Main Dump beam line. And the Energy is 13.640000 GeV.	PRESENT		

Database Access Status: Connection change cancelled. Model Query Status: Connection change cancelled. Connection change cancelled.

- LCLS XAL is working
- XAL inline model for quick prototyping but most online model usage is not real-time
- SLAC GUI preference (not quite portable)
- No active XAL development at this moment