

A warm welcome

HXRSS 2025

1st Hard X-ray Self-seeded FEL workshop

15–17 October 2025, PAL-XFEL, Pohang, South Korea



Introduction to the workshop

Gianluca Geloni
European XFEL

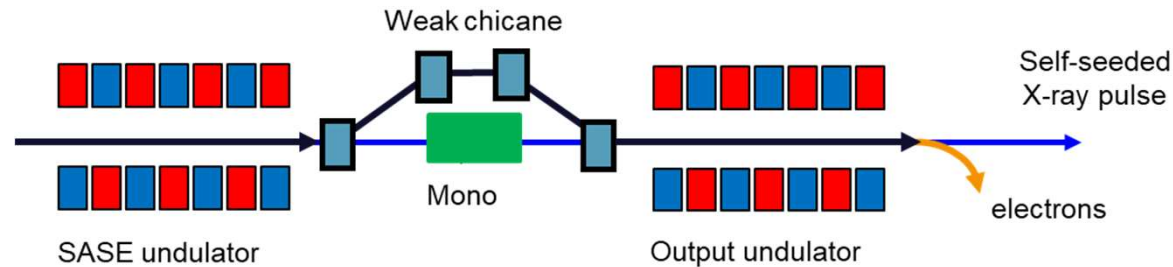
Chang-Ki Min, local committee
PAL-XFEL

With Special thanks to Heung-Sik Kang

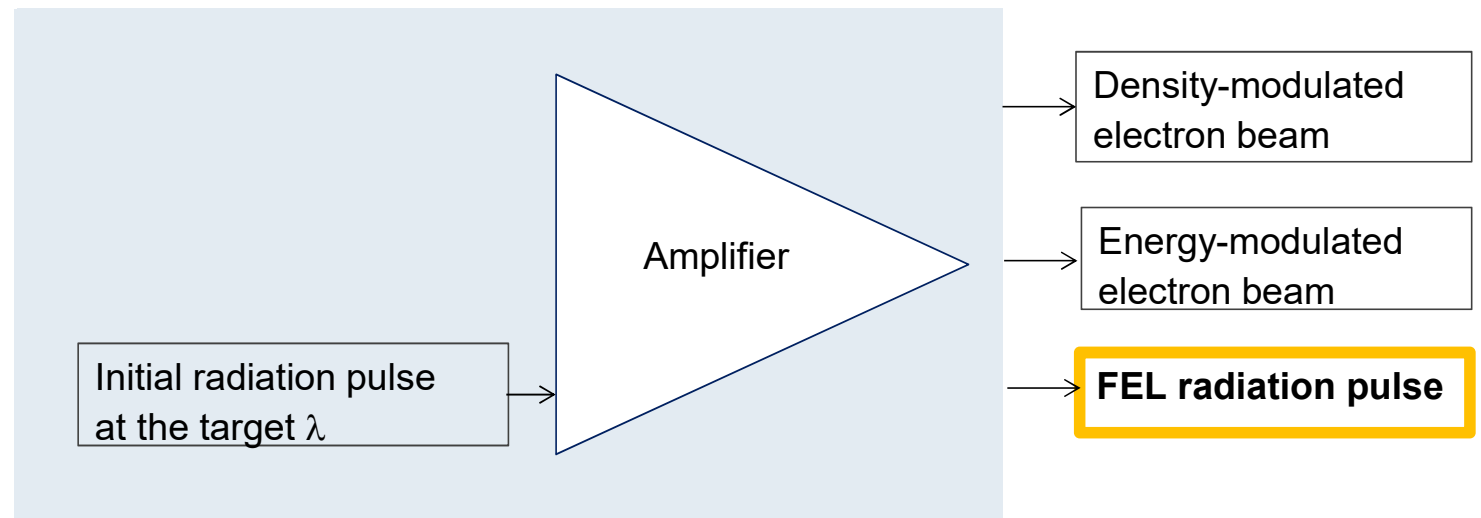
Why a workshop on self-seeding?

- HXRSS: the only scheme providing Users with high-brightness (an order of magnitude higher than SASE) and narrow-bandwidth (down to a fraction of eV) hard X-rays
- Four facilities, LCLS-I, SACLA, PAL-XFEL, and European XFEL, use a self-seeded scheme for narrow-band scientific applications.
- At upcoming CW XFEL facilities, like SHINE and LCLS-II, self-seeding is considered for advancing the scientific case.
- ...with a relatively simple addition to existing SASE setups

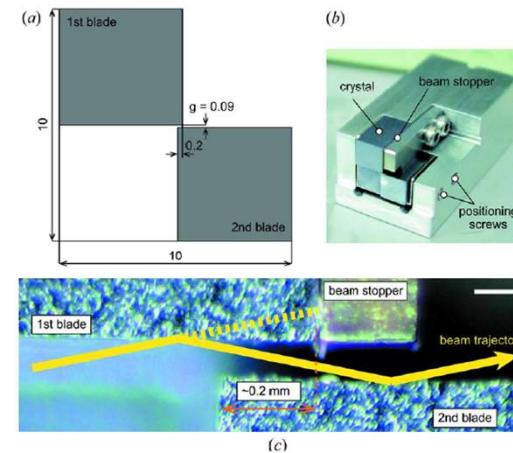
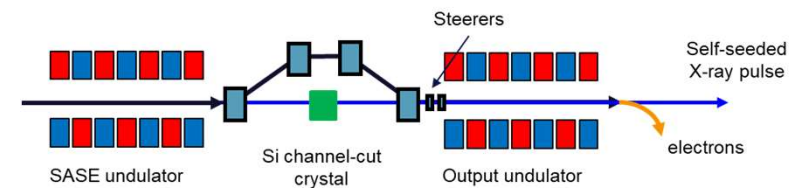
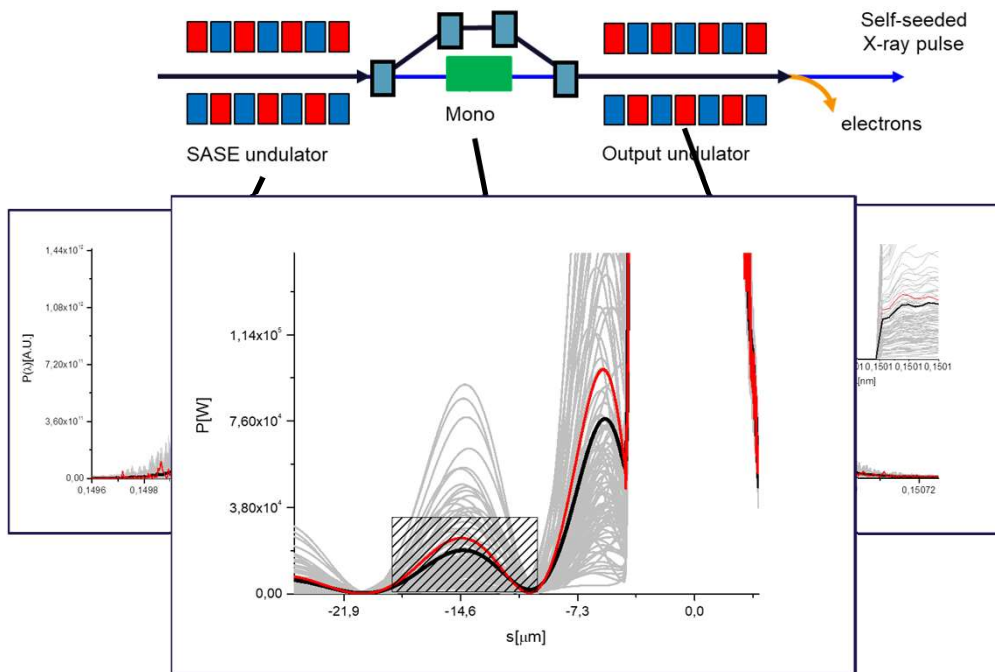
Reminder of the principle (1)



- Conceptually, a particular mode of operation of an FEL amplifier
- In SASE → start up from shot noise
- In HXRSS → start up from an initial, narrow BW radiation pulse



Reminder of the principle (2): single-crystal monochromator



Synchrotron
Radiation News,
38:2, 17-22, DOI:
10.1080/08940886.2
025.2472609

Single-crystal monochromator
LCLS (I and II), PAL-XFEL, European XFEL, SHINE

Channel-cut monochromator
SACLA, SHINE

Technique is mature enough for a summary

Topics to be discussed:

- experiments (cool things we can do with it)
- current performance (or expected performance from facilities that will install it)
- developments/schemes (transmission/reflection, single/double chicane, harmonics, phase locking)

Workshop goals:

1. Review the state of the art of HXRSS around the world
2. Discuss possible novel developments of the method and of the science case around it
3. Consider possible international collaborations to facilitate these developments

Chairs and Discussions

Space for discussions is allocated after each session.
Only a few “burning questions” after each talk

...and we have a special format for Session Chairing and Discussions:

- Each Session is chaired by the first speaker

- After each session, we will have a Panel Discussion with all Speakers, moderated by Chairs

Workshop program (I)

	15 October Wednesday
7:30	7:30 Bus pickup at Hotel Lahan
7:35	
7:40	
7:45	
7:50	
7:55	
8:00	
8:05	8:00 ~ 9:00 Breakfast(sandwich) at multipurpose room & Registration in front of PAL-XFEL auditorium
8:10	
8:15	
8:20	
8:25	
8:30	
8:35	
8:40	9:00 ~ 9:20, 20' Workshop introduction and goals - general introduction to HXRSS Heung-Sik Kang and Gianluca Geloni
8:45	
8:50	
8:55	
9:00	
9:05	
9:10	
9:15	9:20 ~ 9:45, 25' Coherence Control and Limitation with HB SASE Philipp Dijkstal
9:20	
9:25	
9:30	
9:35	
9:40	
9:45	
9:50	9:45 ~ 10:10, 25' Extrapolation of EEHG towards higher photon energies Enrico Allaria
9:55	
10:00	
10:05	
10:10	
10:15	
10:20	
10:25	10:10 ~ 10:35, 25' Overview of cavity based XFEL activities Nanshun Huang
10:30	
10:35	
10:40	
10:45	
10:50	
10:55	
11:00	10:35 ~ 11:00, 25' The cavity-based XFEL demonstrator at the European XFEL Patrick Rauer
11:05	
11:10	
11:15	
	11:00 ~ 11:20 Coffee break

Introduction and Perspectives

Alternative and novel techniques.

Chair: Philipp Dijkstal

11:20	Session B: Current performance	11:20 ~ 11:45, 25'	
11:25		Self-seeding FEL for experiments requiring energy scans at PAL-XFEL Haeryong Yang	
11:30			
11:35			
11:40			
11:45		11:45 ~ 12:10, 25'	
11:50			High repetition rate HXRSS system at the European XFEL Shan Liu
11:55			
12:00			
12:05			
12:10		remote 12:10 ~ 12:35, 25'	
12:15			Recent activities of hard X-ray self-seeding at LCLS Alberto Lutman
12:20			
12:25			
12:30			
12:35		12:35 ~ 13:00, 25'	
12:40	Daily optimization of reflection self-seeding Toru Hara		
12:45			
12:50			
12:55			
13:00	13:00 ~ 13:30, 30'		
13:05		Discussion	
13:10			
13:15			
13:20			
13:25			
13:30			
13:35			
13:40			
13:45			
13:50			
13:55			
14:00			
14:05			
14:10			
14:15			
14:20	14:30 ~ 14:55, 25'		
14:25		Self-seeding option and status at SHINE Tao Liu	
14:30			
14:35			
14:40			
14:45			
14:50			
14:55			
15:00			
15:05			
15:10			
15:15	14:55 ~ 15:15, 20'		
15:20		Bandwidth and signal to noise ratio control for hard X-ray self-seeding Tianyun Long	
15:25			
15:30			
15:35			
15:40	15:15 ~ 15:35, 20'		
15:45		Pulselength Control in Self-Seeding Philipp Dijkstal	
15:50			
15:55			
16:00			
16:05	15:35 ~ 16:00, 25'		
16:10		Development and applications of combined self-seeding and crystal optics Ichiro Inoue	
16:15			
16:20			
16:25			

Review: what can we offer to Users today with self-seeding?

Chair: Haeryong Yang

Developments: what may we be offering to Users tomorrow?

Chair: Tao Liu

16:30	16:30 ~ 18:00, 90' Self-seeding Demo. At accelerator operation room & At beamline hutch & Coffee
16:35	
16:40	
16:45	
16:50	
16:55	
17:00	
17:05	
17:10	
17:15	
17:20	Banquet
17:25	
17:30	
17:35	
17:40	
17:45	
17:50	
17:55	
18:00	
18:05	
18:10	Move to hotel Lahan
18:15	
18:20	
18:25	
18:30	
18:35	
18:40	
18:45	
18:50	
18:55	
19:00	
19:05	
19:10	
19:15	
19:20	
19:25	
19:30	
19:35	
19:40	
19:45	
19:50	
19:55	
20:00	
20:05	
20:10	
20:15	
20:20	
20:25	
20:30	

Workshop program (II)

	16 October Thursday
7:30	
7:35	
7:40	
7:45	
7:50	7:30
7:55	Bus pickup at Hotel Lahan
8:00	
8:05	
8:10	
8:15	
8:20	
8:25	
8:30	
8:35	8:00 ~ 9:00
8:40	Breakfast(sandwich) at multipurpose room
8:45	
8:50	
8:55	
9:00	9:00 ~ 9:20, 20'
9:05	Generation of tunable phase-locked hard X-ray pulses
9:10	Philipp Dijkstal
9:15	9:20 ~ 09:40, 20'
9:20	Comparison same bunch and fresh bunch self seeding at PAL
9:25	Myung Hoon Cho
9:30	
9:35	09:40 ~ 10:00, 20'
9:40	Self-seeding at higher harmonics
9:45	Lu Cao
9:50	
9:55	
10:00	remote 10:00 ~ 10:20, 20'
10:05	Self-seeding systems for CW FELs
10:10	David Reis
10:15	
10:20	remote 10:20 ~ 10:40, 20'
10:25	Advanced studies at the LCLS
10:30	Alex Halavanau
10:35	
10:40	10:40 ~ 11:10, 30'
10:45	Discussion
10:50	
10:55	
11:00	
11:05	
11:10	11:10 ~ 11:30
11:15	Coffee break
11:20	
11:25	

Developments:
what may we be
offering to Users
tomorrow?

Chair: Philipp
Dijkstal

11:30	remote	11:30 ~ 11:55, 25'
11:35		IXS challenges
11:40		Mark Dean
11:45		
11:50		
11:55		11:55 ~ 12:20, 25'
12:00		Dynamics of compressed gas/liquid (CO2, water, alcohol)
12:05		Matthias Ihme
12:10		
12:15		
12:20		12:20 ~ 12:45, 25'
12:25		Water dynamics
12:30		Robin Tyburski
12:35		
12:40		
12:45		12:45 ~ 13:15, 30'
12:50		Discussion
12:55		
13:00		
13:05		
13:10		
13:15		
13:20		
13:25		
13:30		
13:35		
13:40		13:15 ~ 14:15
13:45		Lunch at multipurpose room
13:50		
13:55		
14:00		
14:05		
14:10		
14:15		14:15 ~ 14:40, 25'
14:20		Time-resolved Bragg Coherent X-ray Diffraction
14:25		Imaging of Ferroelectric Transition
14:30		Hyunjung Kim
14:35		
14:40		14:40 ~ 15:05, 25'
14:45		3D time-resolved single-shot imaging
14:50		Changyong Song
14:55		
15:00		
15:05		15:05 ~ 15:35, 30'
15:10		Discussion
15:15		
15:20		
15:25		
15:30		

Experiments:
What Users did,
and what would
they like to have?

Chair: Robin
Tyburski

Experiments:
What Users did,
and what would
they like to
have?

Chair: Hyunjung
Kim

15:35	
15:40	
15:45	
15:50	
15:55	
16:00	
16:05	
16:10	15:35 ~ 17:05, 90'
16:15	PAL-XFEL tour
16:20	&
16:25	Coffee
16:30	
16:35	
16:40	
16:45	
16:50	
16:55	
17:00	
17:05	
17:10	
17:15	
17:20	Move to restaurant
17:25	
17:30	
17:35	
17:40	
17:45	
17:50	
17:55	
18:00	
18:05	
18:10	
18:15	
18:20	
18:25	Social dinner near hotel Lahan
18:30	
18:35	
18:40	
18:45	
18:50	
18:55	
19:00	
19:05	
19:10	

Workshop program (III)

	17 October Friday
7:30	
7:35	
7:40	
7:45	
7:50	7:30
7:55	Bus pickup at Hotel Lahan
8:00	
8:05	
8:10	
8:15	
8:20	
8:25	
8:30	
8:35	8:00 ~ 9:00
8:40	Breakfast(sandwich) at multipurpose room
8:45	
8:50	
8:55	
9:00	9:00 ~ 9:25, 25'
9:05	Single-shot structure determination under high
9:10	magnetic field over 100 T
9:15	Akihiro Ikeda
9:20	
9:25	remote 9:25 ~ 9:50, 25'
9:30	Atomic-scale imaging of strong-field optically
9:35	induced electron motion in imperfect crystals
9:40	David Reis
9:45	
9:50	remote 9:50 ~ 10:15, 25'
9:55	Scandium-45 Nuclear-Clock Isomer driven by hard
10:00	X-ray self-seeding
10:05	Yuri Shvydko
10:10	
10:15	
10:20	
10:25	10:15 ~ 10:45, 30'
10:30	Discussion
10:35	
10:40	
10:45	
10:50	10:45 ~ 11:05
10:55	Coffee break
11:00	

Experiments:
What Users did, and
what would they like
to have?

Chair: Akihiro Ikeda

11:05		11:05 ~ 11:30, 25'
11:10		Application of hard X-ray self-seeding at higher
11:15		photon energies
11:20		Angel Rodriguez-Fernandez
11:25		
11:30		11:30 ~ 11:55, 25'
11:35		Nonlinear spectroscopy utilizing two-color pulses
11:40		composed of seeded and broadband beams
11:45		Thomas Linker
11:50		
11:55		11:55 ~ 12:20, 25'
12:00		Ultrafast Photocatalytic Reaction Dynamics Probed
12:05		by HERFD-XAS with Self-seeded XFEL Pulses
12:10		Tae Wu Kim
12:15		
12:20		
12:25		12:20 ~ 12:50, 30'
12:30		Discussion
12:35		
12:40		
12:45		
12:50		12:50 ~ 13:20, 30'
12:55		Overall discussion and wrap-up
13:00		
13:05		
13:10		
13:15		
13:20		13:20 ~ 14:00
13:25		Lunch box pickup, Move to Pohang KTX station
13:30		
13:35		
13:40		
13:45		
13:50		
13:55		
14:00		

Experiments:
What Users did, and
what would they like
to have?

Chair: Angel
Rodriguez-Fernandez

Moderators:
Chang-Ki Min
Gianluca Geloni

We wish you a fruitful and interesting workshop!

Workshop goals:

1. Review the state of the art of HXRSS around the world
2. Discuss possible novel developments of the method and of the science case around it
3. Consider possible international collaborations to facilitate these developments



Workshop Chair
Gianluca Geloni (EuXFEL)
Heung-Sik Kang (PAL)

Scientific Program Committee

Haixiao Deng (SARI)	Shan Liu (DESY)	Chang-Ki Min (PAL)
Simon Gerber (PSI)	Alberto Lutman (SLAC)	Sven Reiche (PSI)
Ichiro Inoue (RIKEN)	Rory Ma (PAL)	Takahiro Sato (SLAC)
Xiangjin Kong (Fudan Univ.)	Anders Madsen (EuXFEL)	Kenji Tamasaku (RIKEN)

Local Organizing Committee (PAL)

Chang-Ki Min	Abin Hwang	Eun-Hoe Kim	Hyeon Kim	Chi Hyun Shim
Taesung Ahn	Sookhyun Jin	Gyujin Kim	Rory Ma	Haeryong Yang

With special thanks to
Chang-Ki Min
And Heung-Sik Kang
For the great work
done!

**With in mind our goals, we wish a fruitful
and interesting workshop!**

Workshop goals:

1. Review the state of the art of HXRSS around the world
2. Discuss possible novel developments of the method and of the science case around it
3. Consider possible international collaborations to facilitate these developments

Collaboration for PAL-XFEL Self-seeding

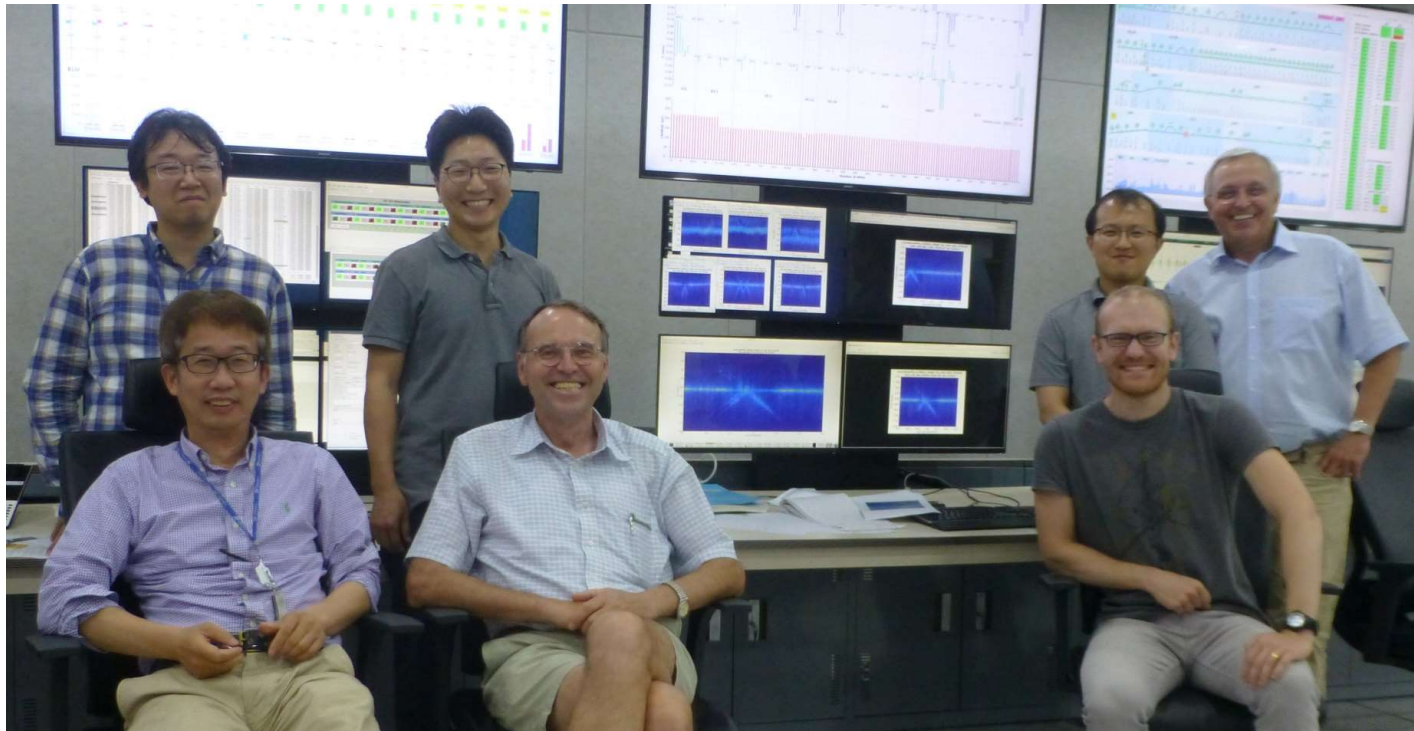
- December 10, 2013** Kwang-Je Kim's advised the collaboration with ANL on self-seeding project for the PAL XFEL project
- Jan. 2014** Task force team organized at PAL-XFEL
- Sept. 23 ~ 24, 2014** Collaboration meeting for developing a self-seeding system for PAL-XFEL
Yuri Shavydko (ANL), Deming Shu (ANL), Vladimir Blank (TISNCM), Kwang-Je Kim (ANL)
- October 31, 2014** **An Argonne Work for Others Project and Collaboration with Pohang Accelerator Laboratory**
- May 28 ~ 31, 2018** PAL-XFEL HX-self-seeding commissioning with Franz-Josef Decker (SLAC), Deming Shu (ANL), Svitozar Serkez (Euro-XFEL), and Yuri Shvydko (ANL)
- Oct. 1 ~ 7, 2018** self-seeding test with Henrik Loos
- Nov. 17 ~ 20, 2018** self-seeding test with Alberto Lutman (SLAC), Zhirong Huang (SLAC)
- July 11, 2019** self-seeding test with Gianluca Geloni (Euro-XFEL), Alexander Malyzhenkov (PSI)
- Mar. & Aug. 2024** self-seeding experiment with Philipp Dijkstal (PSI), Wenxiang Hu (PSI), Gabriel Aeppli (PSI)

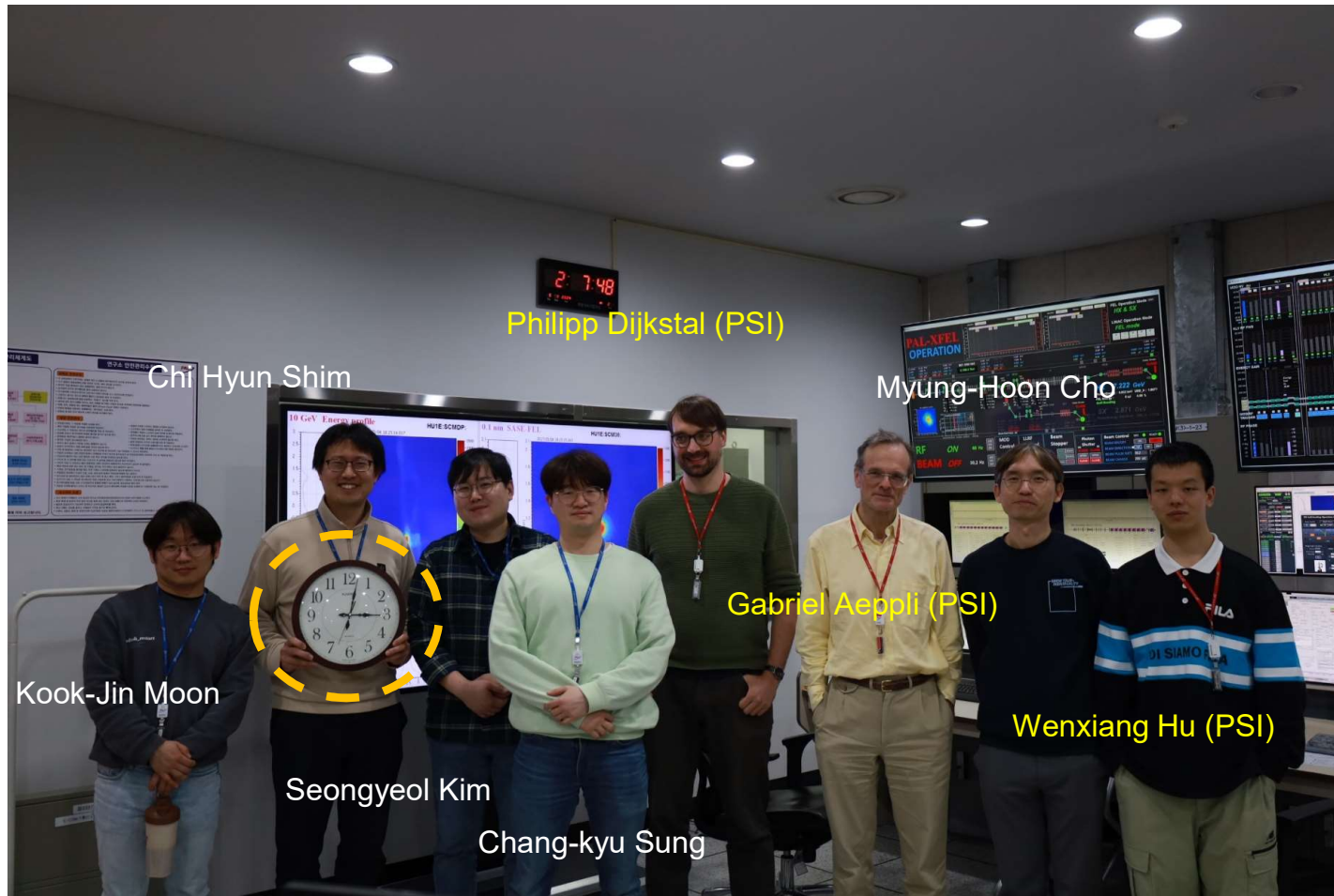
Many thanks to those who contributed to the PAL-XFEL self-seeding project !!

Sept. 23~24, 2014



Self-Seeding Test (May 30, 2018)



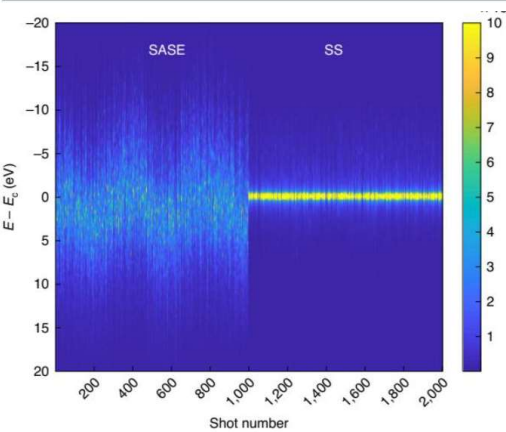
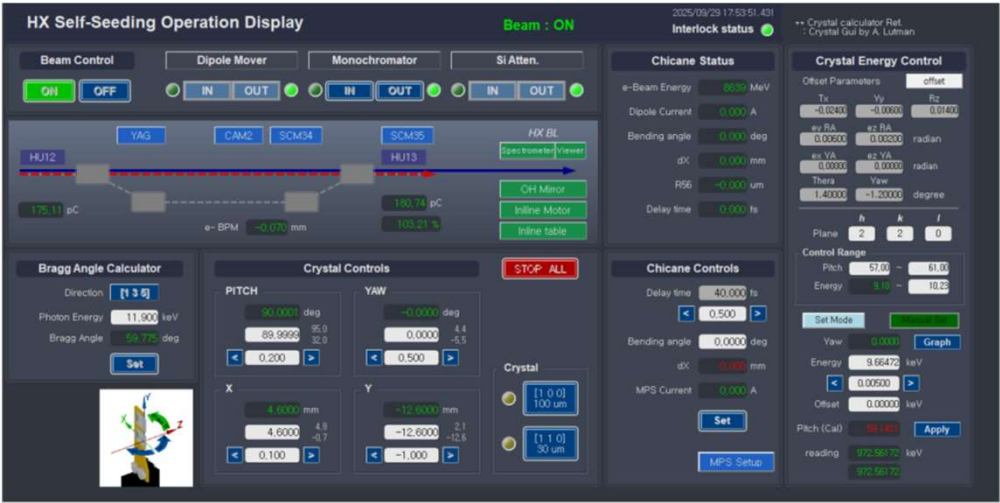


XFEL Accelerator Control Team PAL-XFEL

Self-seeding Demo.

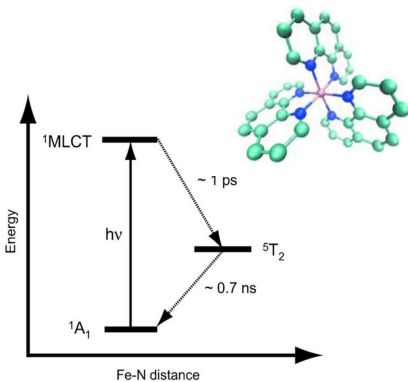
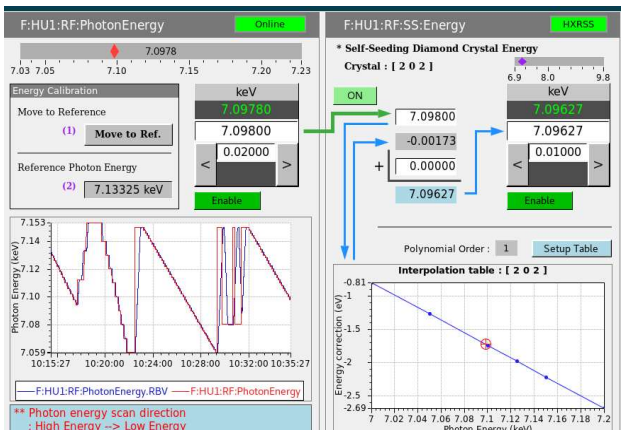
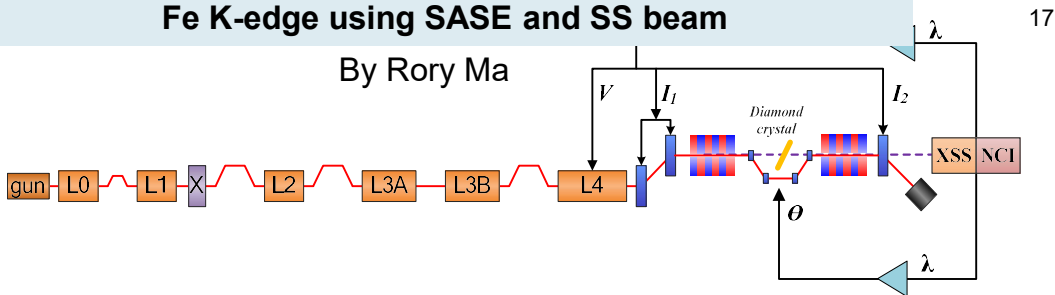
At acc. Operation room, seminar and demo for tuning

By Haeryung Yang

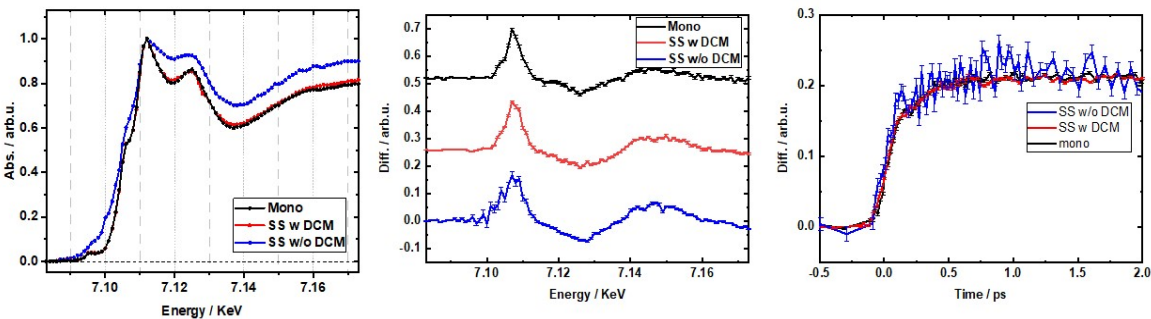


At experimental Hutch, X-ray absorption spectroscopy at Fe K-edge using SASE and SS beam

By Rory Ma



J. Synchrotron Rad. (2009). 16, 110–115

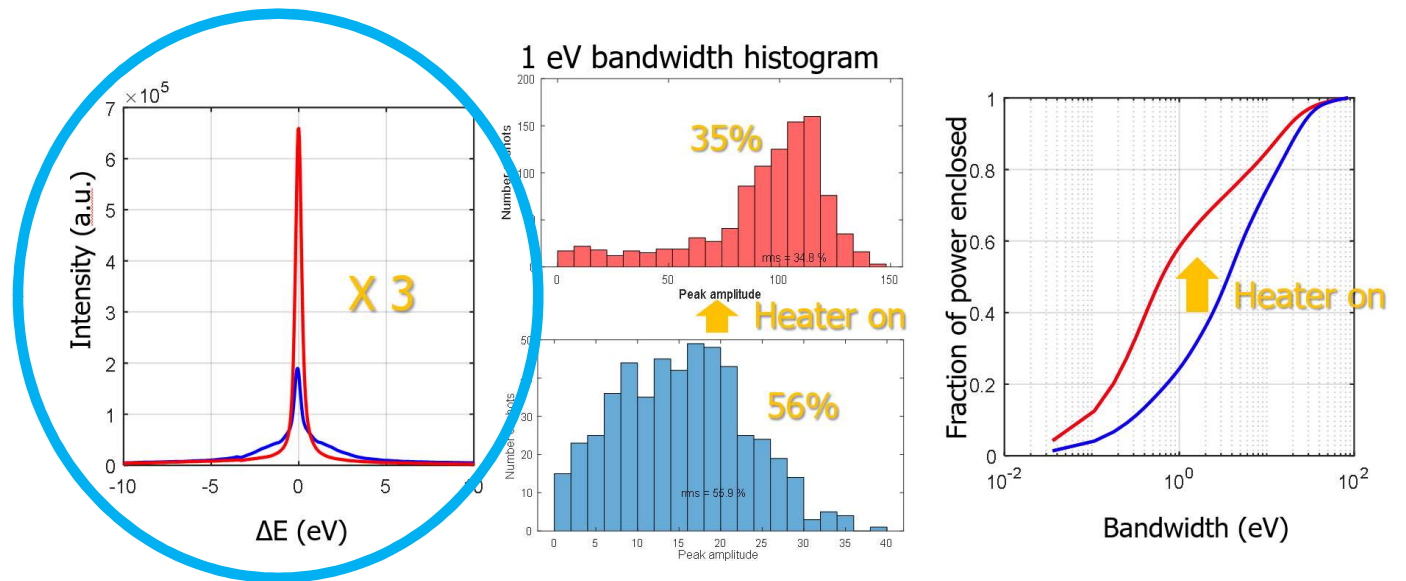


Year 2019 breakthrough, Chinese restaurant at Pohang



FEL 2019,

Improved Seeding with **laser heater**



Venue

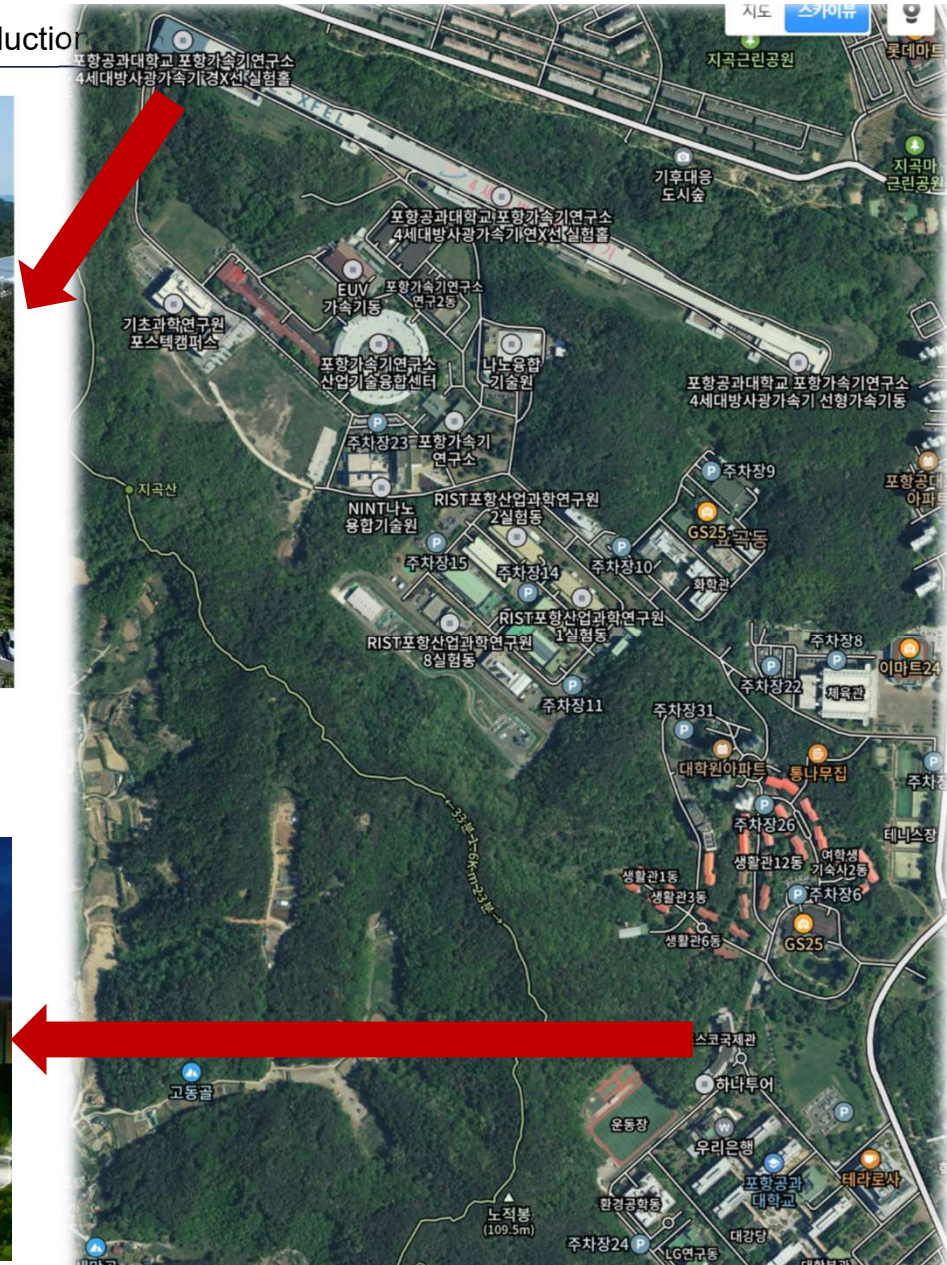
Photo time :
Tomorrow before Tour

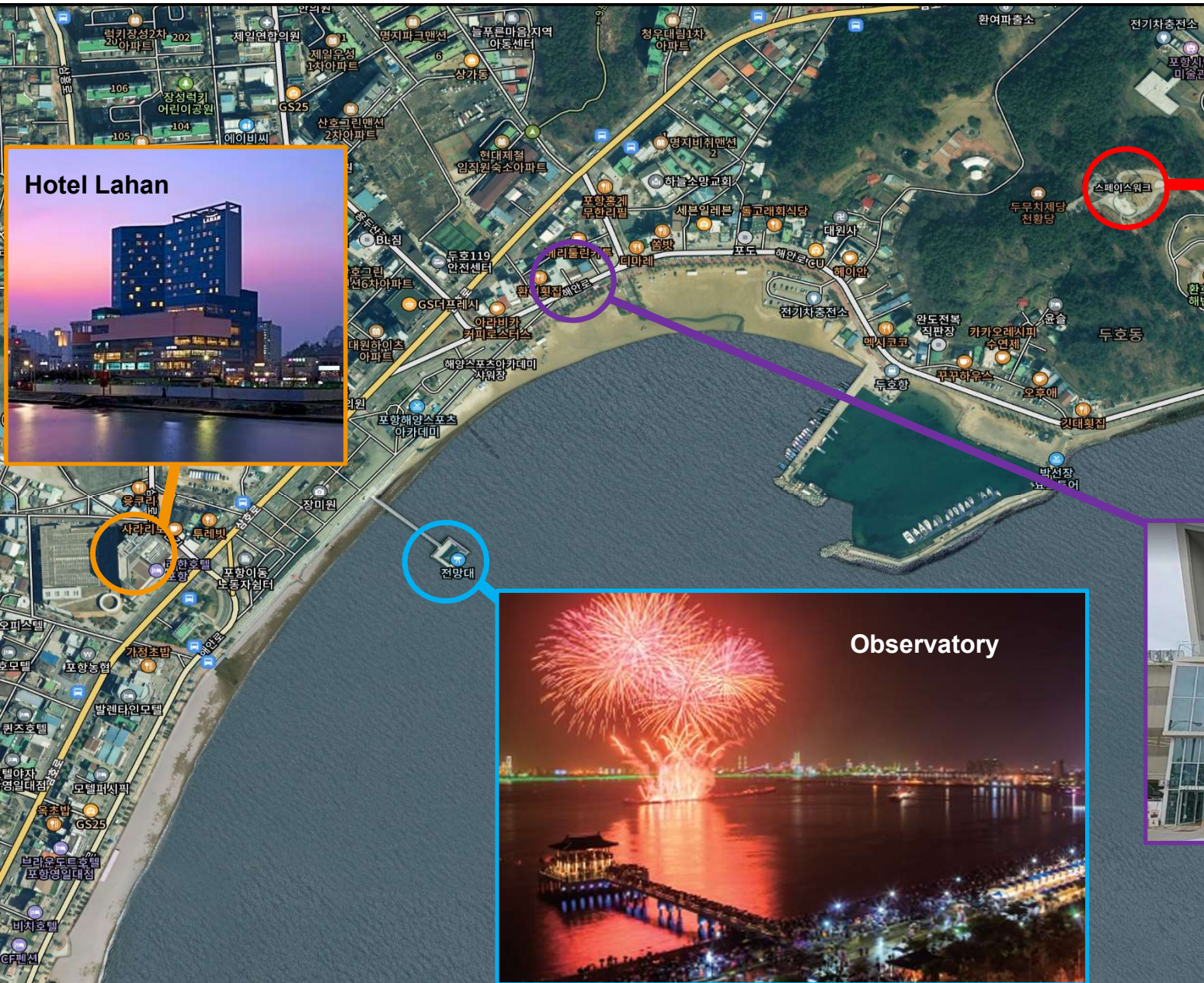


Banquet today
at POSCO International Center



Introduction





Hotel Lahan



Skywalk



Observatory



Café : Oh! Bremen



Bronx Brewery