

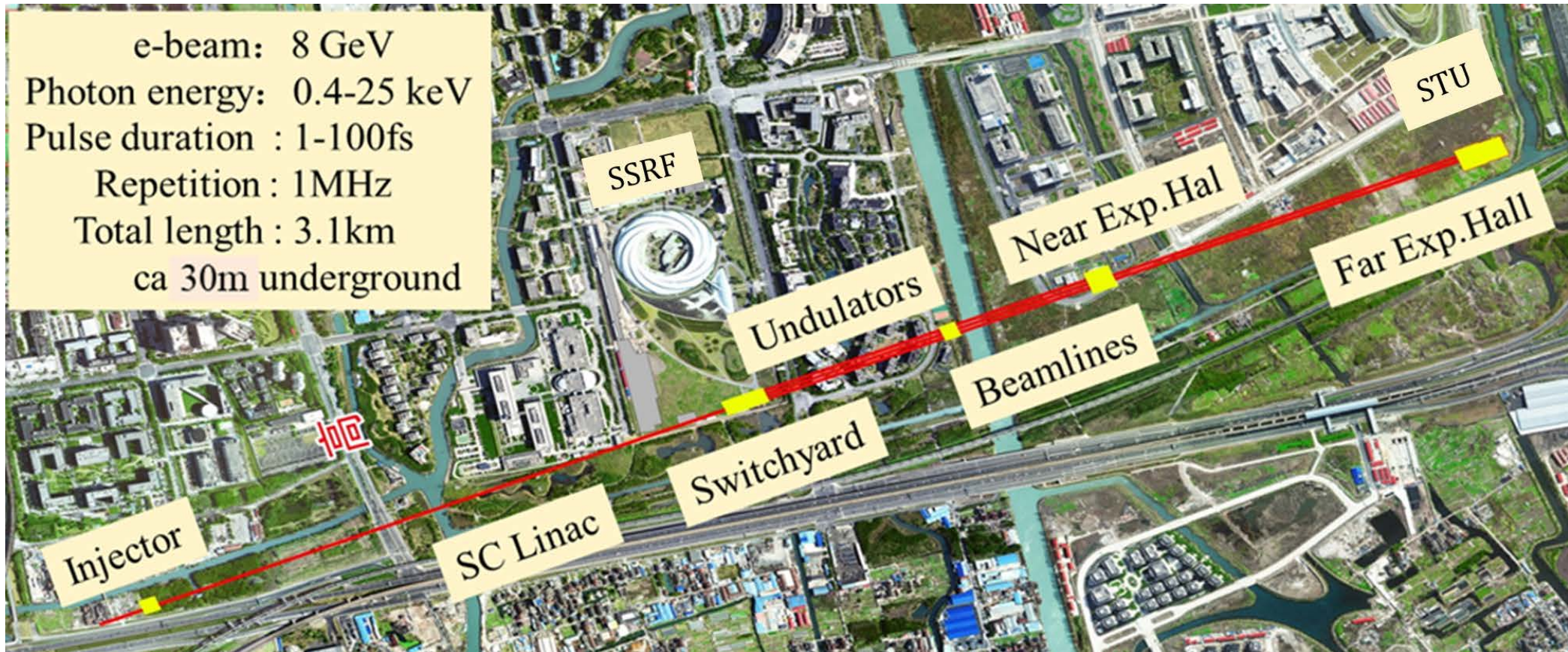
Detector Activities at SHINE

Zhi LIU

On behalf of SHINE

SHINE Facility

- SHINE: **S**hanghai **H**igh repetitio**N** rate xfel and **E**xtrême light facility
- 2018 – 2025





Detectors at SHINE

Stations	Name	FEL-line	Detector
CDE	C oherent D iffraction Imaging E ndstation (with IEB and IEM)	Soft/Hard	CCD/CMOS、HPAD
AMO	A tomic, M olecular and O ptical Science Endstation	Soft	
CDS	C oherent D iffraction Endstation for S ingle Molecules and Particles	Tender	HPAD
SES	S pectrometer for E lectronic S tructure	Soft	
SSS	S oft X-ray S cattering and S pectroscopy Endstation	Soft	CCD/CMOS
SEL	S tation of E xtrême L ight	Tender	
SFX	S erial F emtosecond (X -ray) Crystallography Endstation	Hard	HPAD
HXS	H ard X -ray S pectroscopy Endstation	Hard	SDD, TES
HSS	H ard X-ray S cattering and S pectroscopy Endstation	Tender	TES
HED	H igh E nergy D ensity Science Endstation	Hard	

FEL-I : 3 keV – 15 keV, Tender line
 FEL-II : 0.4 keV – 3 keV, Soft line
 FEL-III : 10 keV – 25 keV, Hard line

CCD : Charge Coupled Device
 PAD : Pixel Array Detector
 SDD : Silicon Drift Detector



SHINE-HPAD: Requirements

- Charge integrating readout
- CW mode sampling with fast frame rate
- Single photon sensitivity
- Large dynamic range
- Large quantum efficiency
- Small pixel size
- Large detector panel
- Required 2D area detectors
 - *CDE-IEB: 4M + 1M (Soft, excluding)*
 - CDE-IEM: 1M → 4M
 - CDS: 4M + 1M
 - SFX: 16M + 4M

Parameters	Objective
Frame rate	> 10 kHz, CW
Dynamic range	0, 1 - 10^4 ph./Pixel/Pulse @ 12 keV
Pixel Size	< 100 μm \times 100 μm
Pixel Number	> 1 M Pixels
Energy Range	5 keV - 20 keV
QE	90 % @ 7 keV

SHINE-HPAD:



IHEP, CAS



IME, CAS



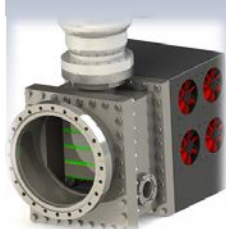
SIMIT, CAS

Center for Transformative Science
ShanghaiTech University
大科学中心

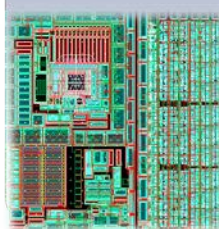


- Technology for A general purpose detector
 - fulfills requirements of CDE, CDS and SFX
- A research team including 4 institutions
 - 1st focus on Sensor, ASIC, Bump Bonding

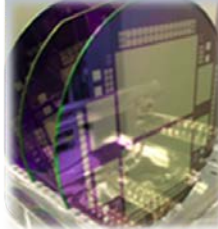
SIMIT
FEM
System



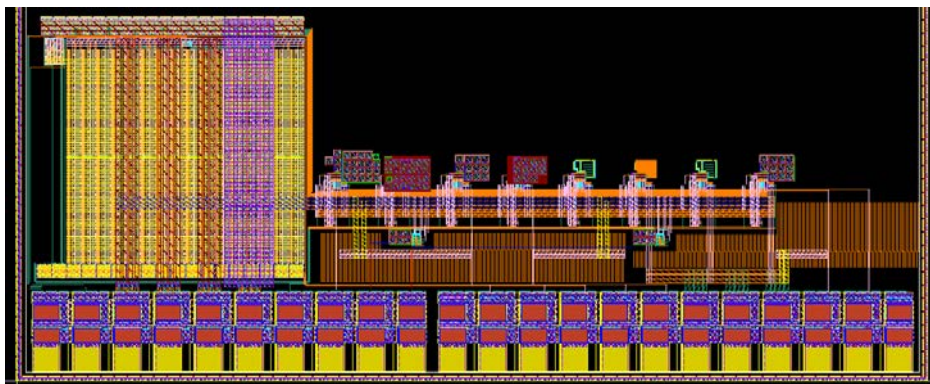
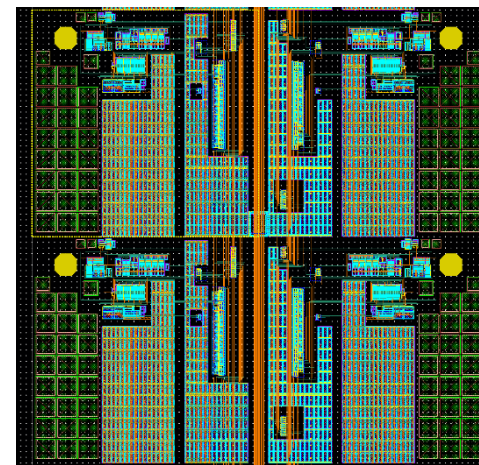
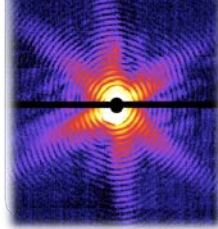
IHEP
ROC
ROB



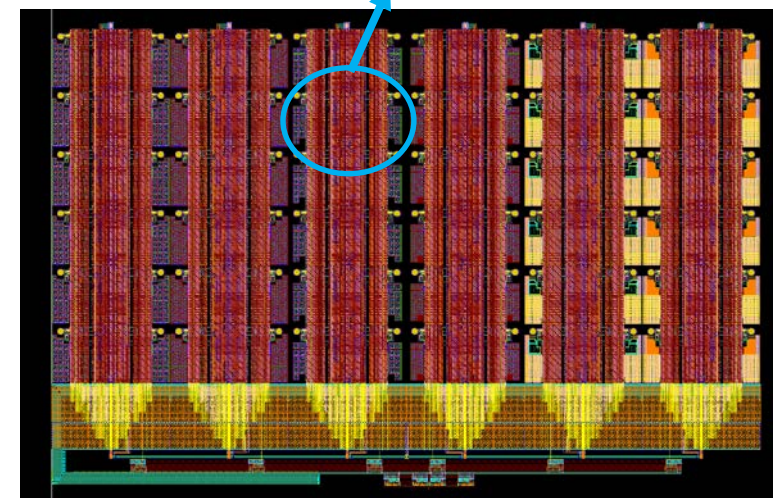
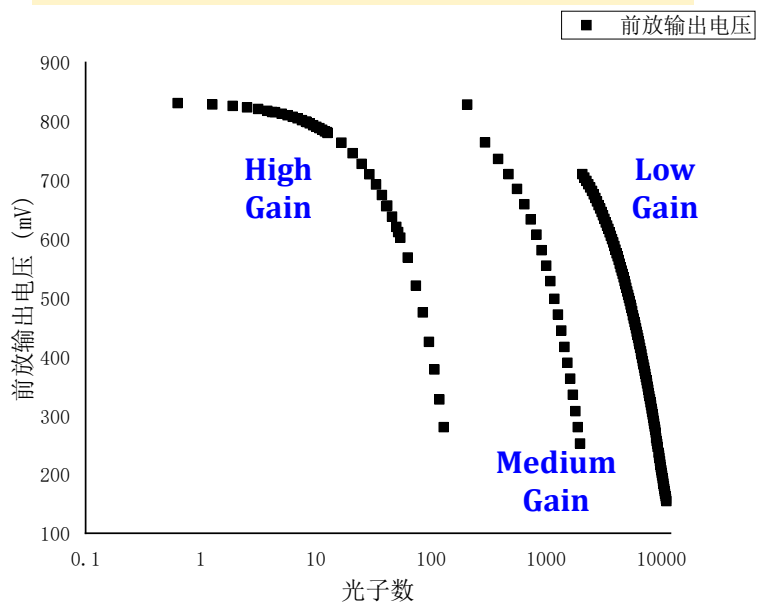
IME
Sensor



STU
DAQ
DATA

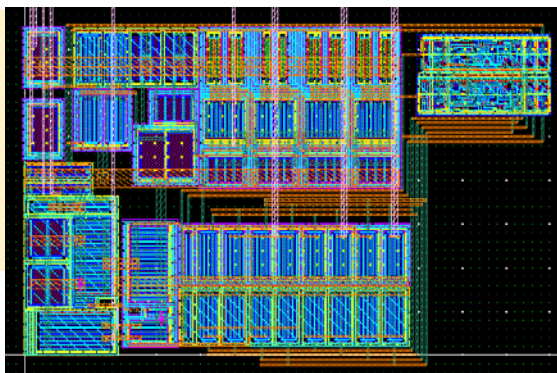


Test of Pre-CSA with dynamic gain



2nd MPW : 2020.10
200 μm \times 200 μm
6 \times 12 Pixels

1st MPW : 2019.12
(1) Pre-CSA with dynamic gain
(2) Calibration Module



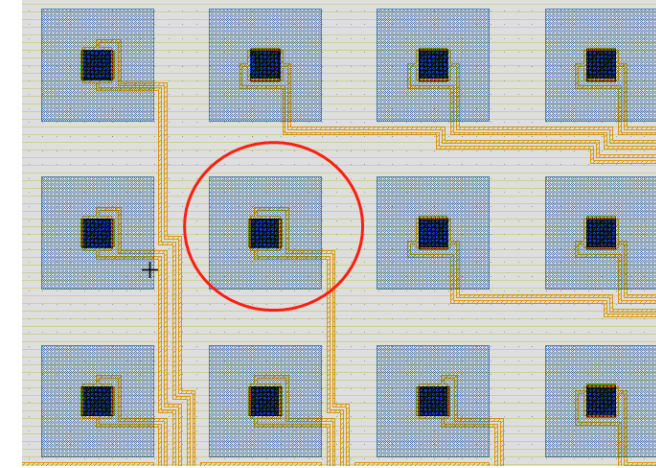
上海科技大学
ShanghaiTech University

SHINE-TES: Status

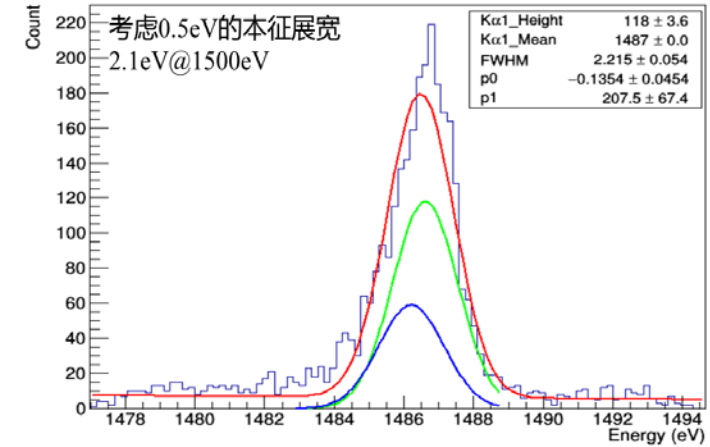
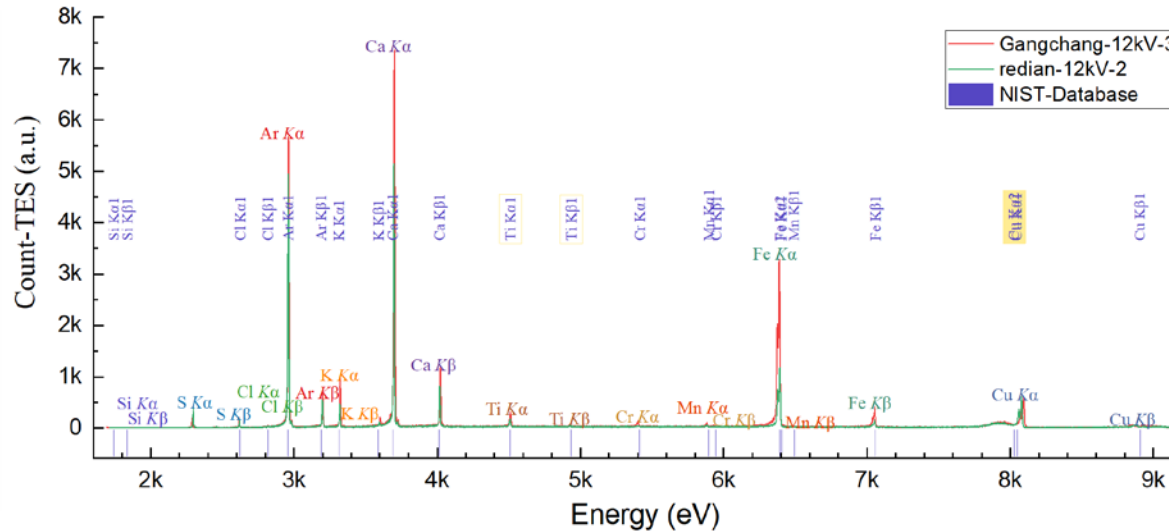
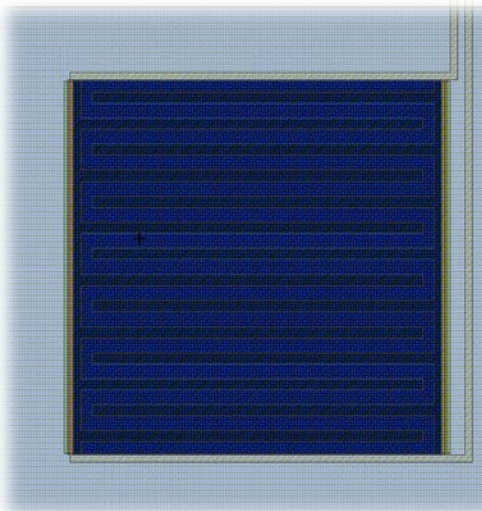
• TES: Transition Edge Sensor

TES Pixel Size	Energy Resolution	Energy Range
500 μm	7.6 eV @ 8 keV	up to 25 keV
125 μm	2.1 eV @ 1.5 keV	up to 1.5 keV

TES - 125 μm



TES - 500 μm



Thanks for your Attenuation !

