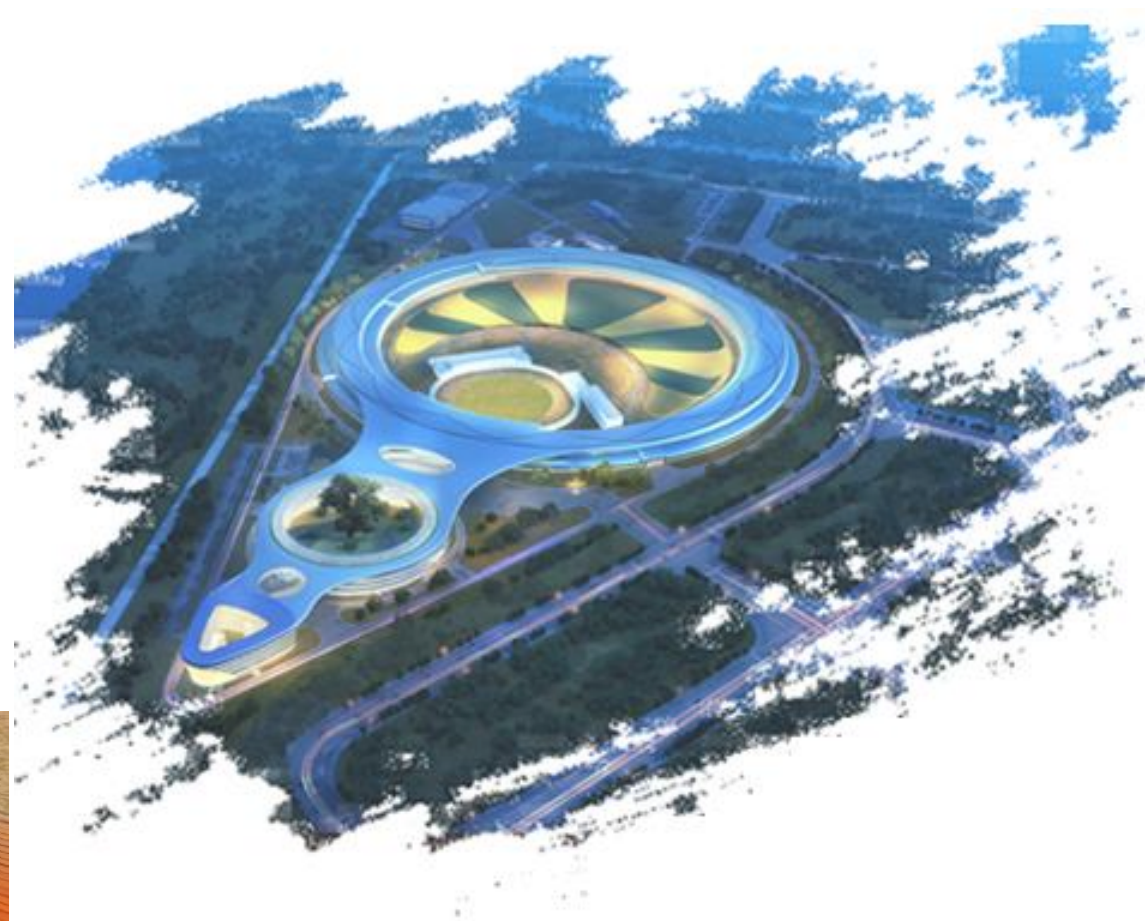


Commissioning and current status of High Energy Photon Source

Yuhui DONG

On behalf of the HEPS team

May, 2026



IPAC
2026

17th International
Particle Accelerator Conference

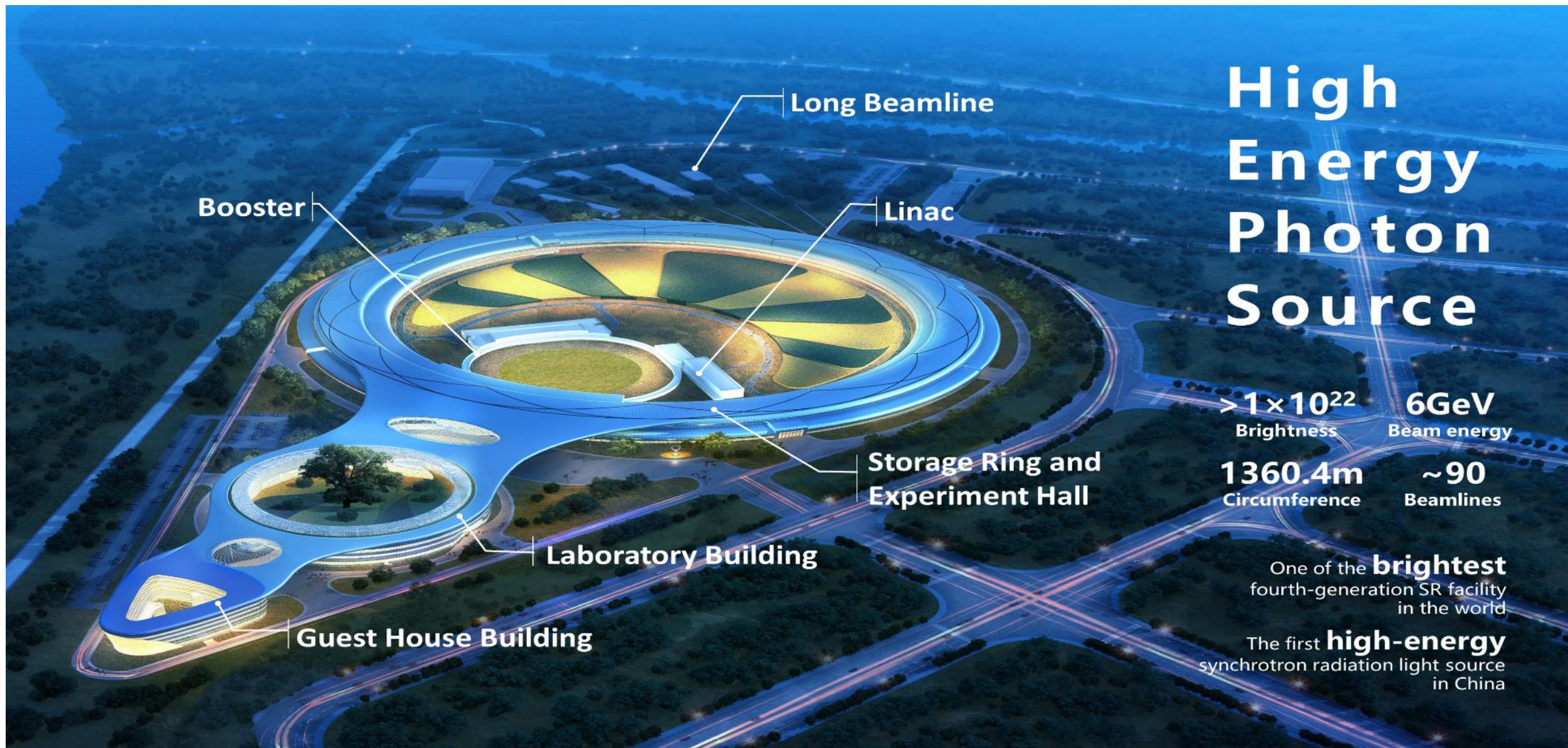
May 17 - 22
Deauville | Normandy | France

- **HEPS Introduction**
- **Commissioning**
- **Operation**
- **Summary**



HEPS Introduction

Overview of HEPS



HEPS: 1st High-energy SR source in China

Beijing Synchrotron Radiation Facility (1st-gen)



Hefei Light Source (2nd-gen)



Shanghai Synchrotron Radiation Facility (3rd-gen)



- In operation: 5 light sources (3 SRs + 2 Linacs)
- Under constr.: 4 light sources (3 SRs + 1 Linac)
- Planning, R&D: 4 light sources (3 SRs + 1 Linac)




High Energy Photon Source



Hefei Advanced Light Facility



Southern Adv. Photon Source

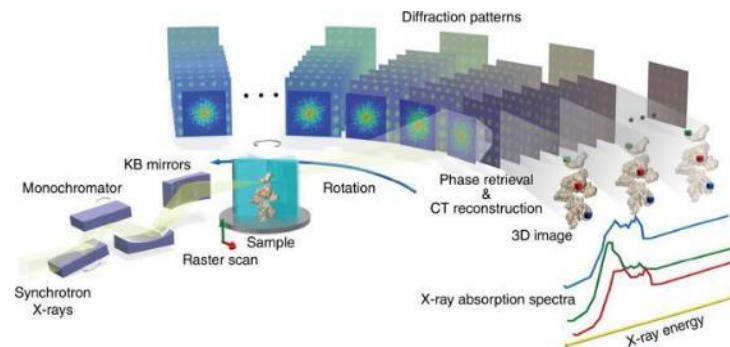
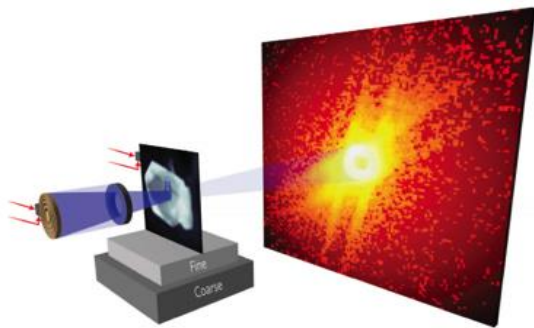



Powerful light sources

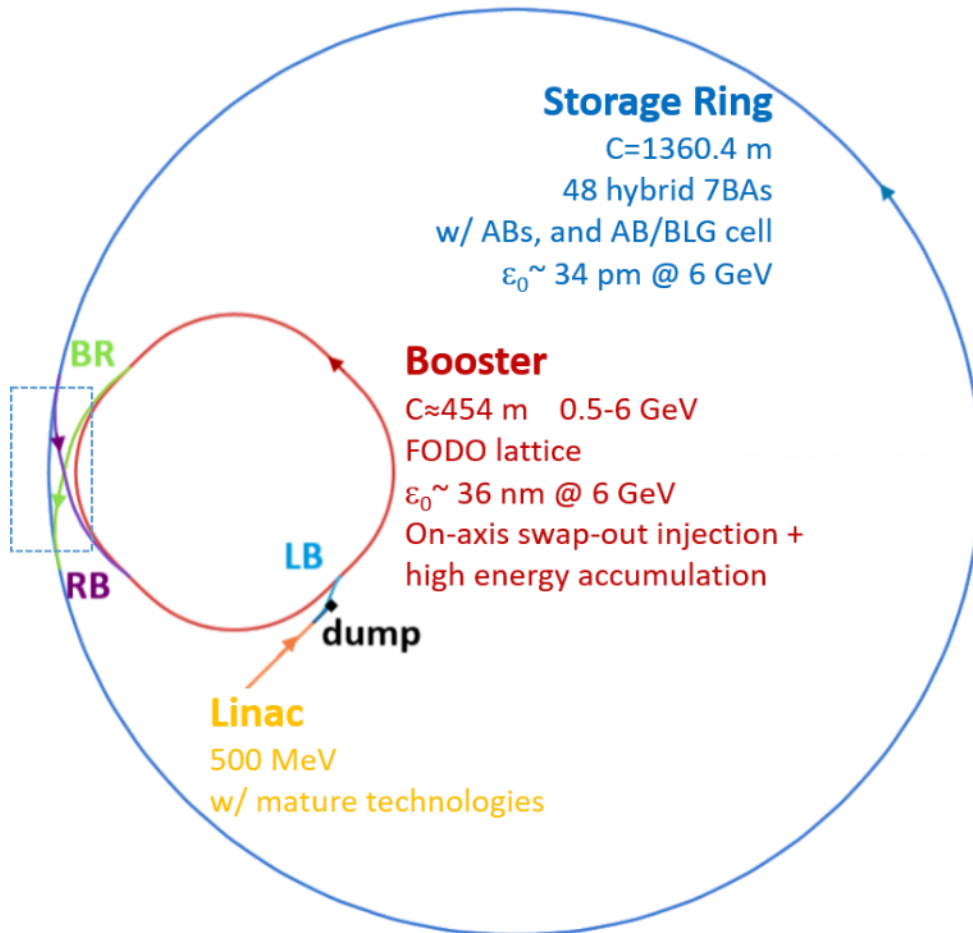
required with widely tunable frequency range from Infrared to X-rays !

HEPS will provide **high-energy, high-brilliance, high-coherence** synchrotron **light with energies up to 300 keV and more**, with the capability for **nm spatial resolution, ps time resolution, and meV energy resolution**.

While providing conventional technical support for the general users, HEPS will operate as a platform to analyze the structures, as well as the evolution of structures of engineering materials in the whole process, by in-situ, multi-dimensional and real-time observation.



Main parameters: Accelerator



- **Accelerator complex**
 - Linac (500 MeV)
 - Booster (500 MeV to 6 GeV, 1 Hz)
 - Storage ring (6 GeV, top-up)

Parameter	Value	Unit
Beam energy	6	GeV
Circumference	1360.4	m
Lattice type	Hybrid 7BA	
Hori. Natural emittance	<60	pm·rad
Brightness	$>1 \times 10^{22}$	*
Beam current	200	mA
Injection mode	Top-up	-

*: phs/s/mm²/mrad²/0.1%BW

[1] Y. Jiao *et al.*, *J. Synchrotron Rad.* 25, 1611–1618 (2018).

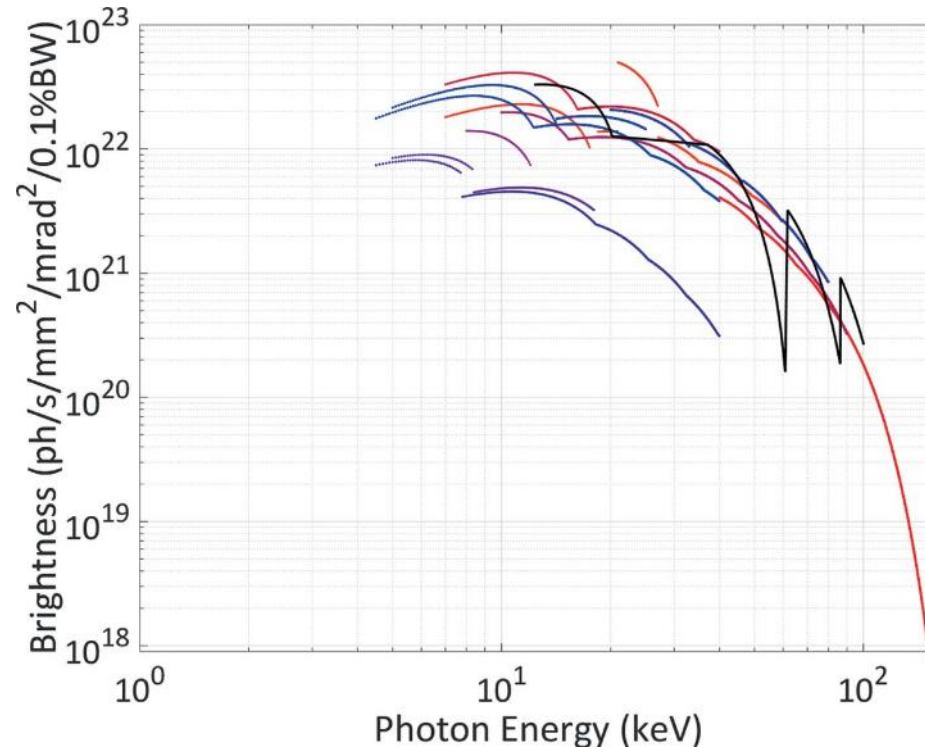
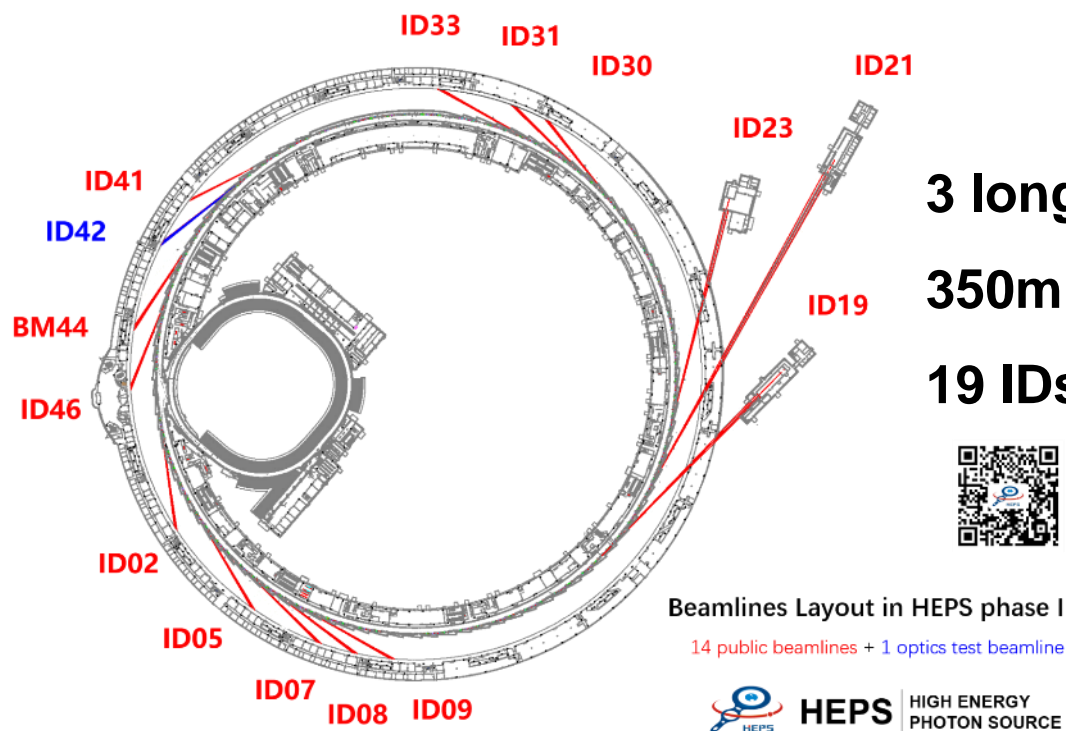
[2] Y. Jiao, *RDTM* 4, 399 (2020).

[3] H. Xu *et al.*, *RDTM* 7, 279–287 (2023).



Main parameters: Beamlines

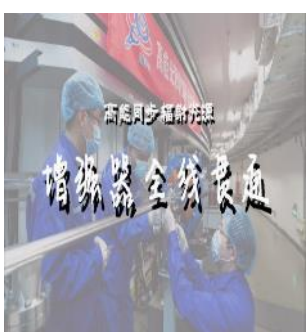
- Brightness of 5×10^{22} phs/s/mm²/mrad²/0.1%BW at the photon energy of 21 keV, can provide X-ray with energy up to 300 keV
- **14 user beamlines + 1 test BL** in Phase 1, HEPS can accommodate up to 90 BLs



Multi-Milestones Achieved from mid-2019



May 12, 2022
The Linac Vacuum-sealing in the tunnel completed



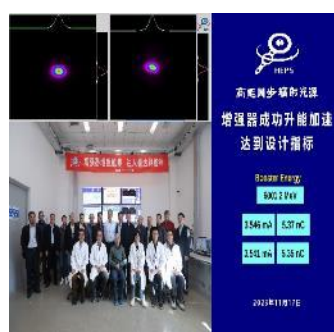
Jan. 13, 2023
The Booster Vacuum-sealing in the tunnel completed



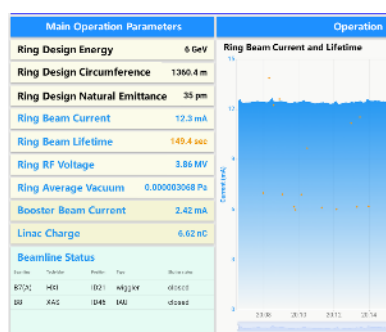
Feb. 1, 2023
The first girder was installed in the storage ring tunnel



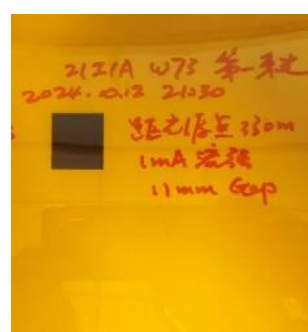
Mar. 14, 2023
The first electron beam



Nov. 17, 2023
Electron Beam Ramped Up to 6 GeV



Aug. 18, 2024
Electron beams with currents higher than 10mA were successfully stored.



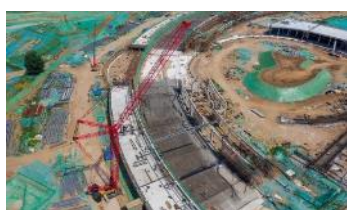
Oct. 12, 2024
the SR X-ray emitted from the R21 wiggler was successfully transmitted to the end station.



June 29, 2019
Groundbreaking ceremony



July 1, 2020
The first steel beam was installed



Apr. 13, 2021
Utility installation in NO.2 Hall commenced



June 27, 2021
Roof-sealing work for the main ring building completed



June 28, 2021
HEPS Installs First Piece of Accelerator Equipment in Linac Tunnel.



Nov. 3, 2023
Civil Construction for ancillary buildings completed





Linac (high bunch charge 7 nC)

a total length of about **49 m**, **500MeV**

an s-band normal conducting electron linear accelerator
high bunch charge and large bunch charge range
an electron gun, a bunching system, and S-band
accelerating structure system.

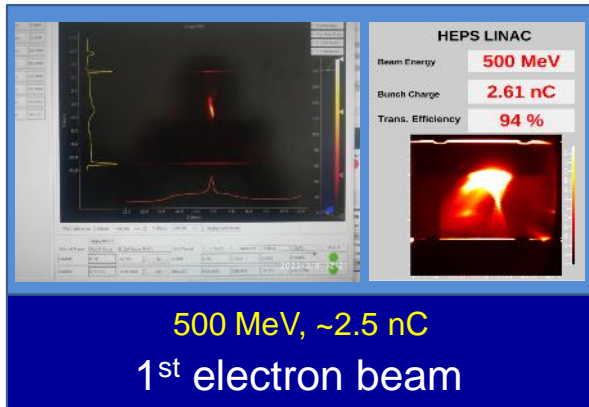


Booster (high bunch charge 5 nC)

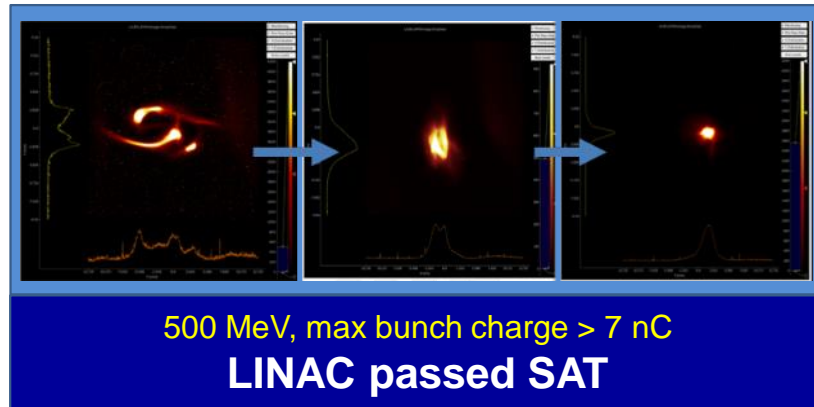
454 meters in circumference **500MeV -> 6GeV**

a four-fold symmetrical FODO structure, with each
super-period consisting of 14 standard FODO cells, two
matching sections, and an 8.8-meter-long dispersion-free
straight section.

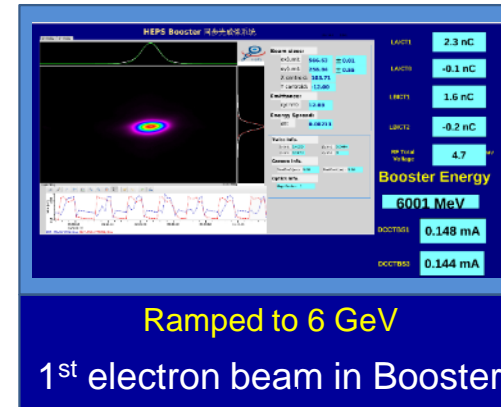
Injector commissioning completed



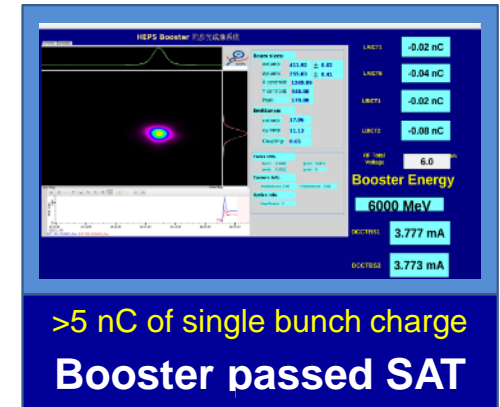
500 MeV, ~2.5 nC
1st electron beam



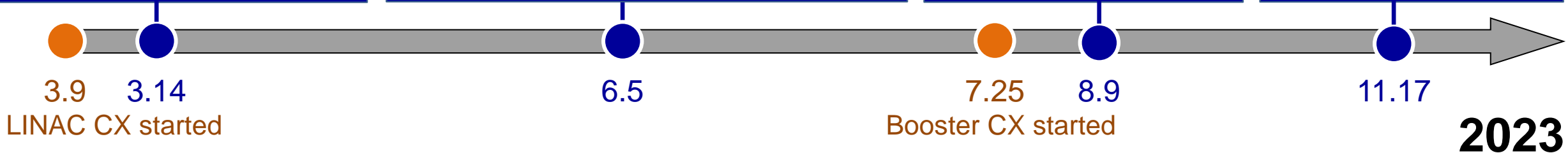
500 MeV, max bunch charge > 7 nC
LINAC passed SAT



Ramped to 6 GeV
1st electron beam in Booster



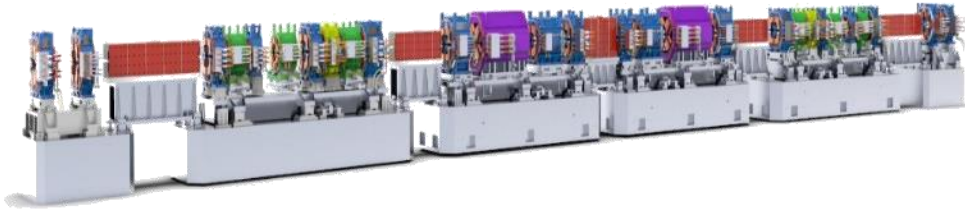
>5 nC of single bunch charge
Booster passed SAT



On-site testing of LINAC in May, 2023, the macro-pulse charge reached 7.29 nC, and beam energy stability was 0.014%.

The electron beam achieved more than 5 nC of bunch charge at 6 GeV via the booster on Nov. 17, 2023.





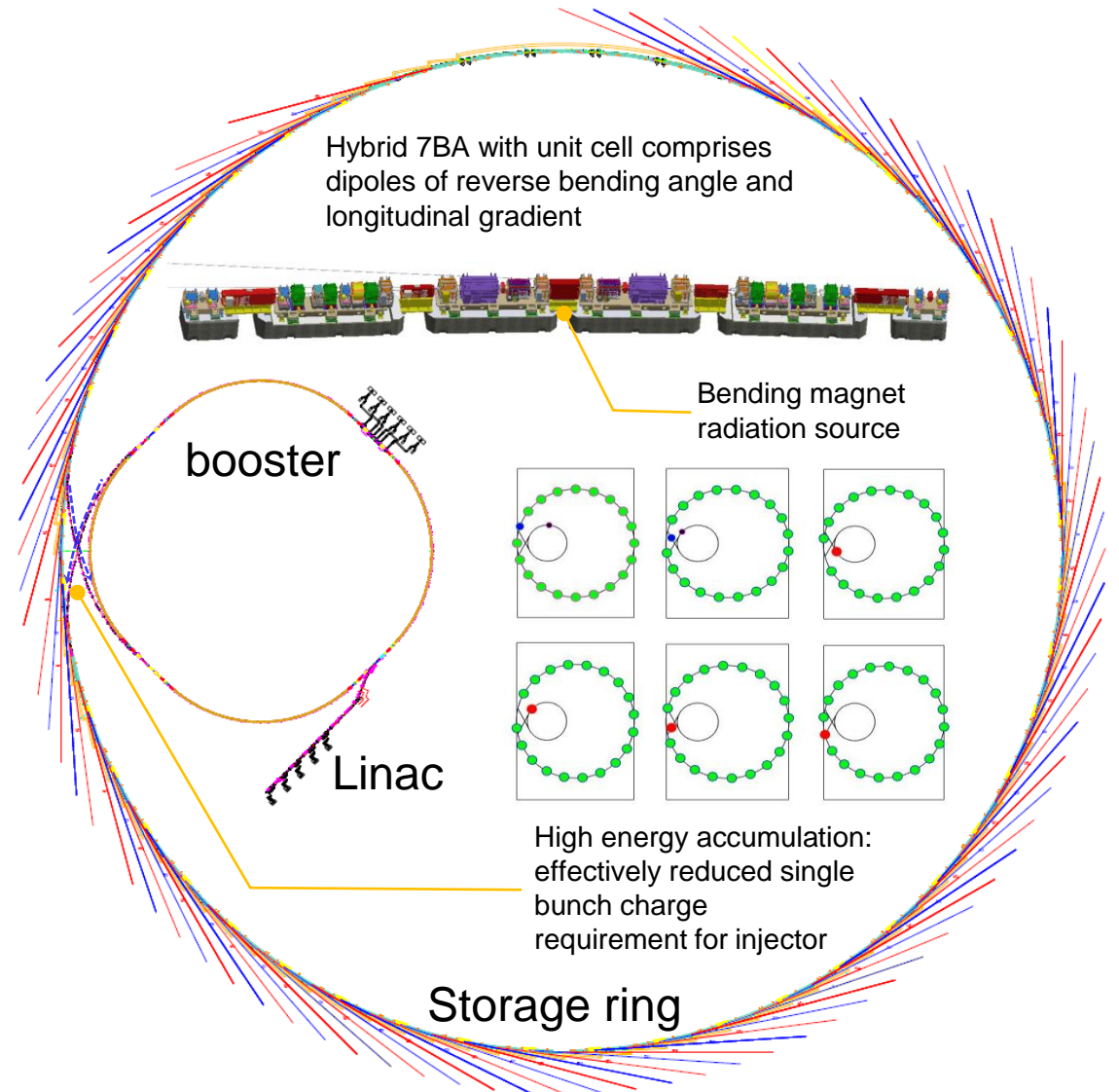
1700+ Magnets **19** IDs

~1300 vacuum chambers

500+ BPMs **288** Girders

a circumference of **1360.4 meters**

48 seven-bend achromats, meticulously designed to achieve a horizontal natural emittance of **~35 pm·rad** at a beam energy of **6 GeV**.



Process Experiment for Storage Ring Installation



April 2022

Aim to verify the feasibility of the magnet, vacuum chamber, BPM, etc. installation procedure

- The operation space and interfaces have been checked, and pre-alignment scheme, transport scheme and other critical problems have been thoroughly tested



July 2022

The pre-alignment began.
30 μ m for pre-aligned girders



Feb. 2023

The installation began
50 μ m for alignment in tunnel

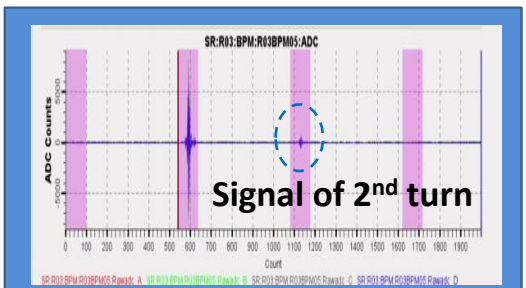


July 1, 2024

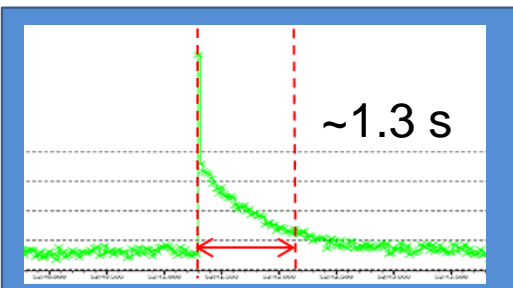
Vacuum sealing completed.



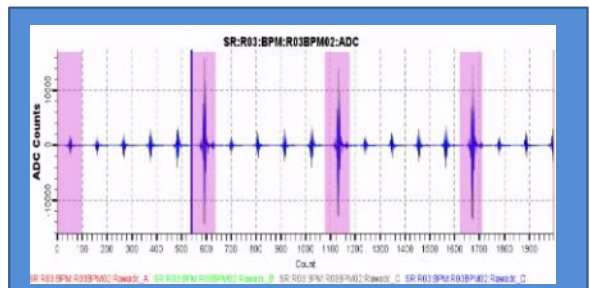
Storage ring commissioning milestones



First turn



One bunch stored

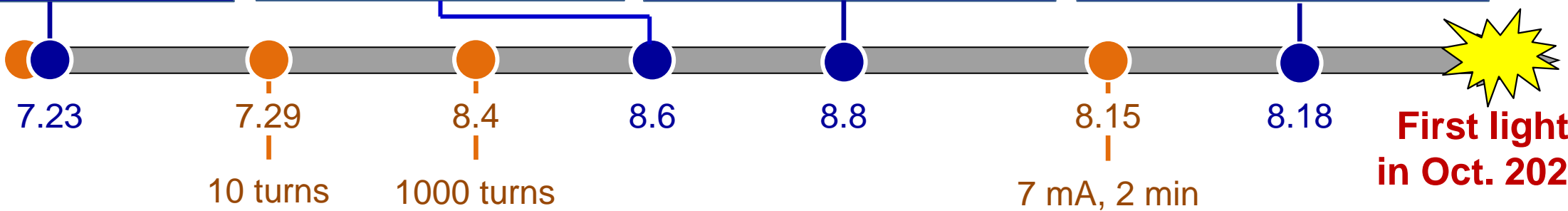


Current: ~0.4 mA, Life time: ~1 min
Multi-bunch stored



Current: ~12 mA, Life time: ~2 min
12 mA stored

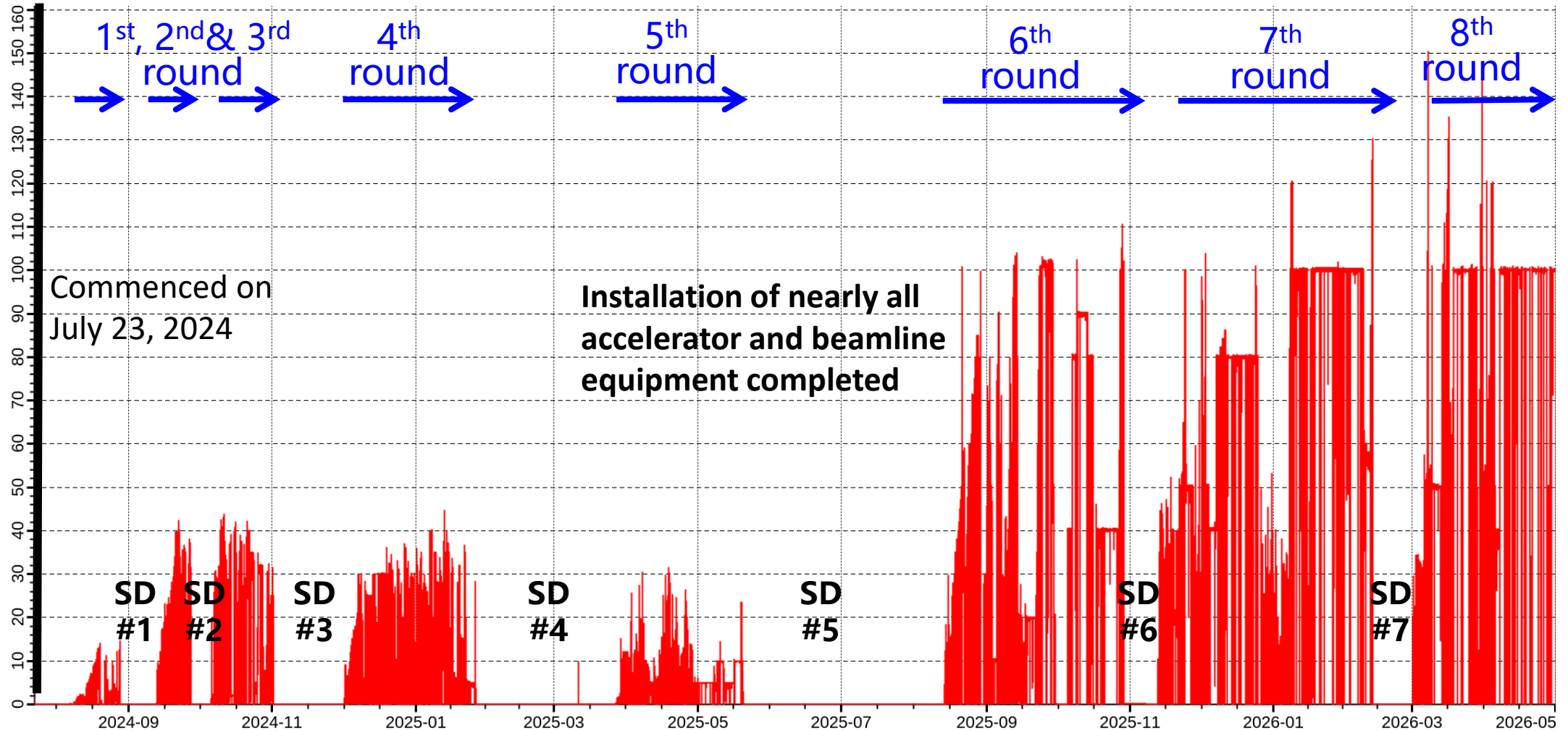
Comm. Started



Commissioning

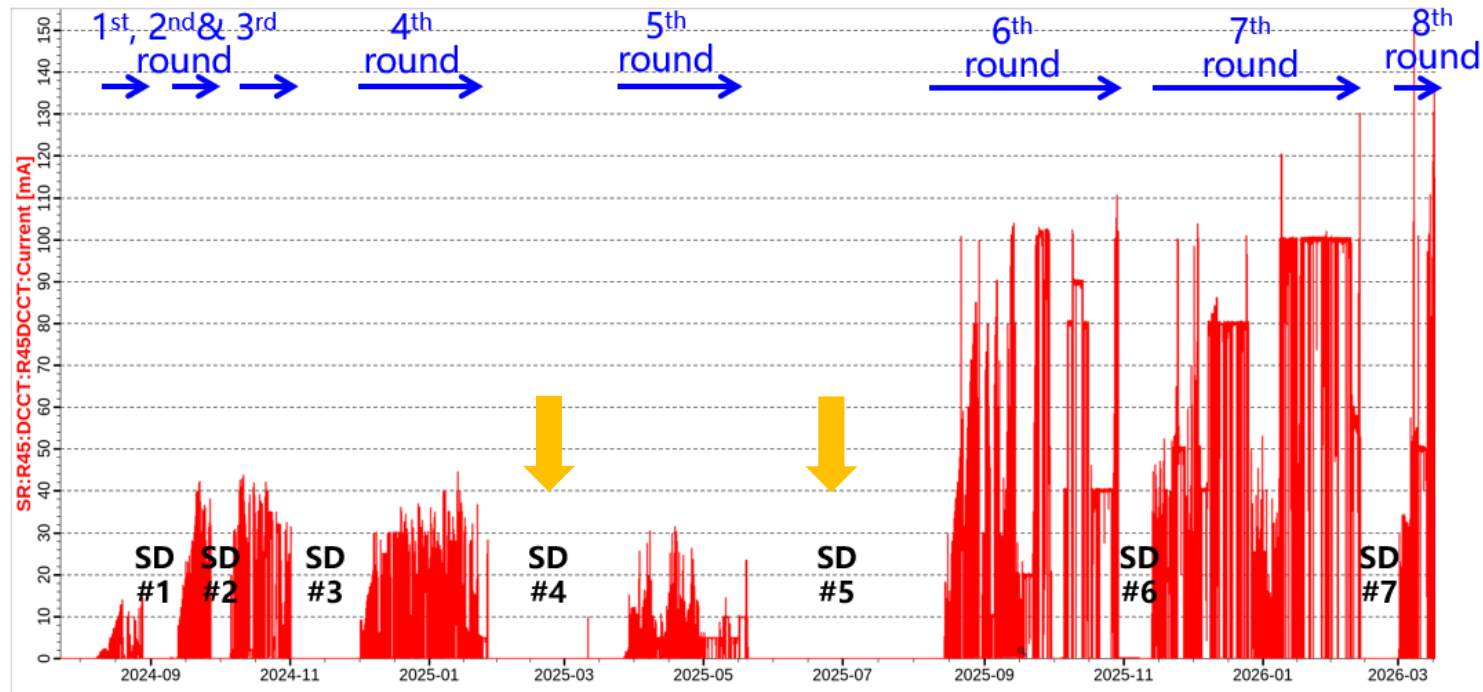
HEPS storage ring commissioning

1.5 years from beginning, 8 rounds, Beam current 150 mA, Emittance < 60 pm.rad



Equipment installation and conditioning

- Not all hardware systems were fully ready on Day One of the ring commissioning.
- Adopted a pattern of commissioning periods interspersed with shutdowns for equipment installation and conditioning.
- **Two major shutdowns** took place in 2025 (totally about 130 days):



SD#4 (Feb 5- Mar 22):

- 1, install most IDs;
- 2, fine global alignment;
- 3, install beam dump kicker;

SD#5 (May 20- Aug 9):

- 1, install 166MHz & 500MHz SCCs;
- 2, install 4th collimator;
- 3, fine alignment of booster;
- 4, install remaining IDs

SD#6:

- 1, install 6th booster Cavity;
- 2, Power Supply, Injection & Extraction, Vacuum, ID, Cryogenic System Maintenance

SD#7:

- 1, Chinese New Year holiday

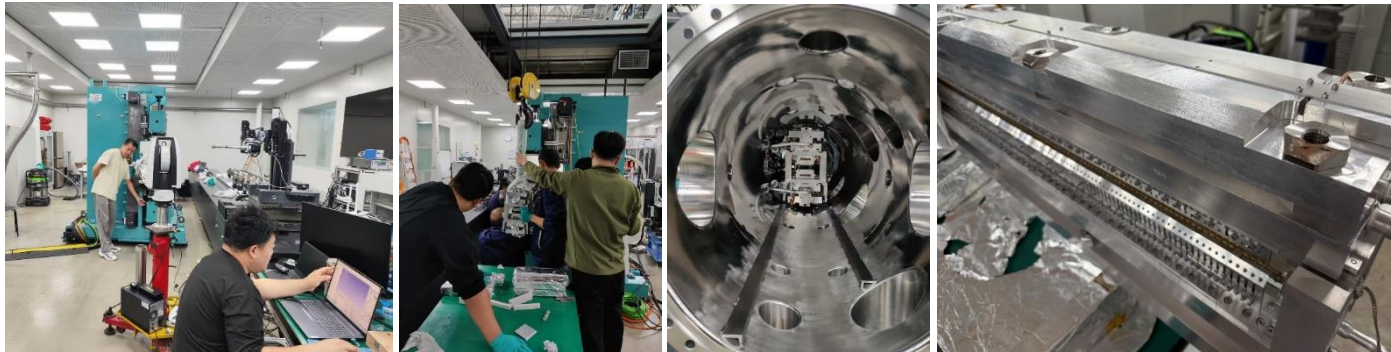
Insertion devices

- During the **first long shutdown** in 2025 (SD#4), within a 40-day period, we completed the in-tunnel installation and conditioning of **11 insertion devices** (including 1 IAU, 4 IVUs, 5 CPMUs, and 1 AK).
 - This included ID alignment, vacuum connection, vacuum baking, water and liquid-nitrogen line connection, post-baking alignment recheck, testing of feed-forward coils and long coils, and commissioning of the motion control system.



Insertion devices

- During the **first long shutdown** in 2025 (SD#4), within a 40-day period, we completed the in-tunnel installation and conditioning of **11 insertion devices** (including 1 IAU, 4 IVUs, 5 CPMUs, and 1 AK).
- During the **second long shutdown** (SD#5), we completed the installation and conditioning of the **remaining 2 insertion devices** (one additional CPMU and one Mango wiggler).
- In addition, during this shutdown, CPMU22.8 was removed from the tunnel, returned to the laboratory for modification (increasing the maximum gap by 10 mm) and re-test, then re-installed in the tunnel and re-conditioned.



Modification of the CPMU22.8

Gap	相位误差要求 (°)	相位误差	相位误差	峰值磁场	峰值磁场
		2024年5月 (°)	2025年6月 (°)	2024年5月 (T)	2025年6月 (T)
7.2	3	2.4	2.6	1.18	1.18
8		1.7	2.3	1.05	1.04
9		2.6	2.9	0.90	0.89
10		2.6	3.0	0.77	0.77
11		2.5	3.0	0.66	0.66
12		2.8	2.9	0.57	0.57
13	2.5	2.9	0.50	0.49	
14	6	2.3	2.8	0.43	0.43
15		2.1	2.7	0.37	0.37
16		1.9	2.4	0.32	0.32

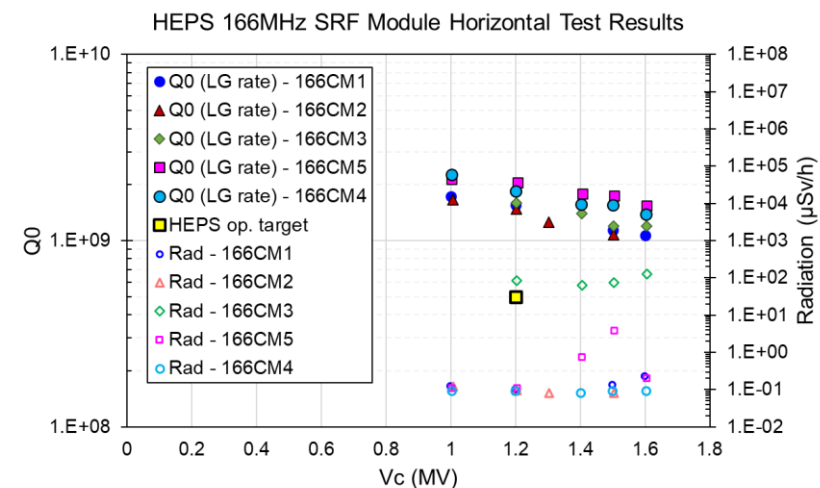
Test results after modification

166.6 MHz SRF cavities for storage ring

- All five 166.6MHz SRF cavities assembled and passed horizontal tests in Jun 2025
- Excellent performance in vertical tests nicely preserved in horizontal tests of the module
- HOM impedance measurement in line with design (heavy damping)
- Total heat load per module: 39~43W (dynamic: 5~7W)

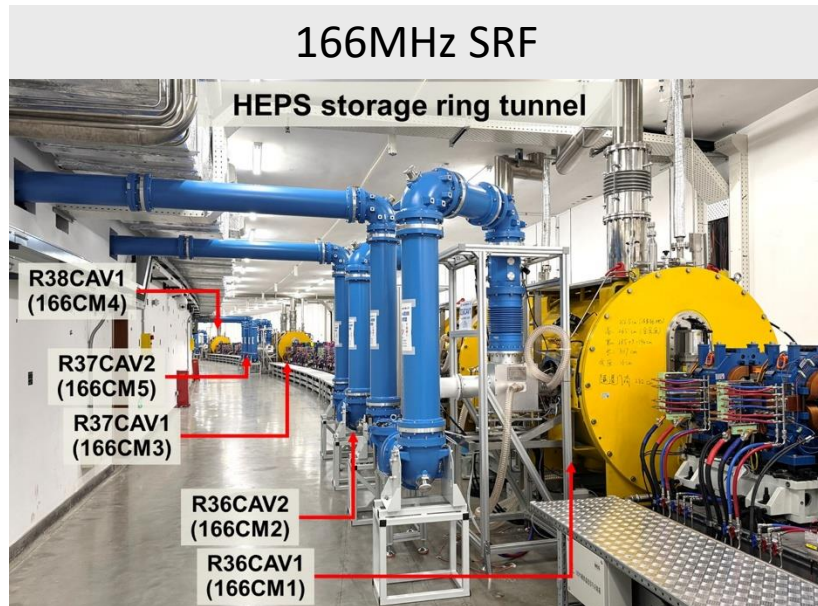


Max Vc: >1.6MV (administration limit),
Q0@1.2MV: 1.5e9~2.1e9, Rad. < 0.1mSv/h



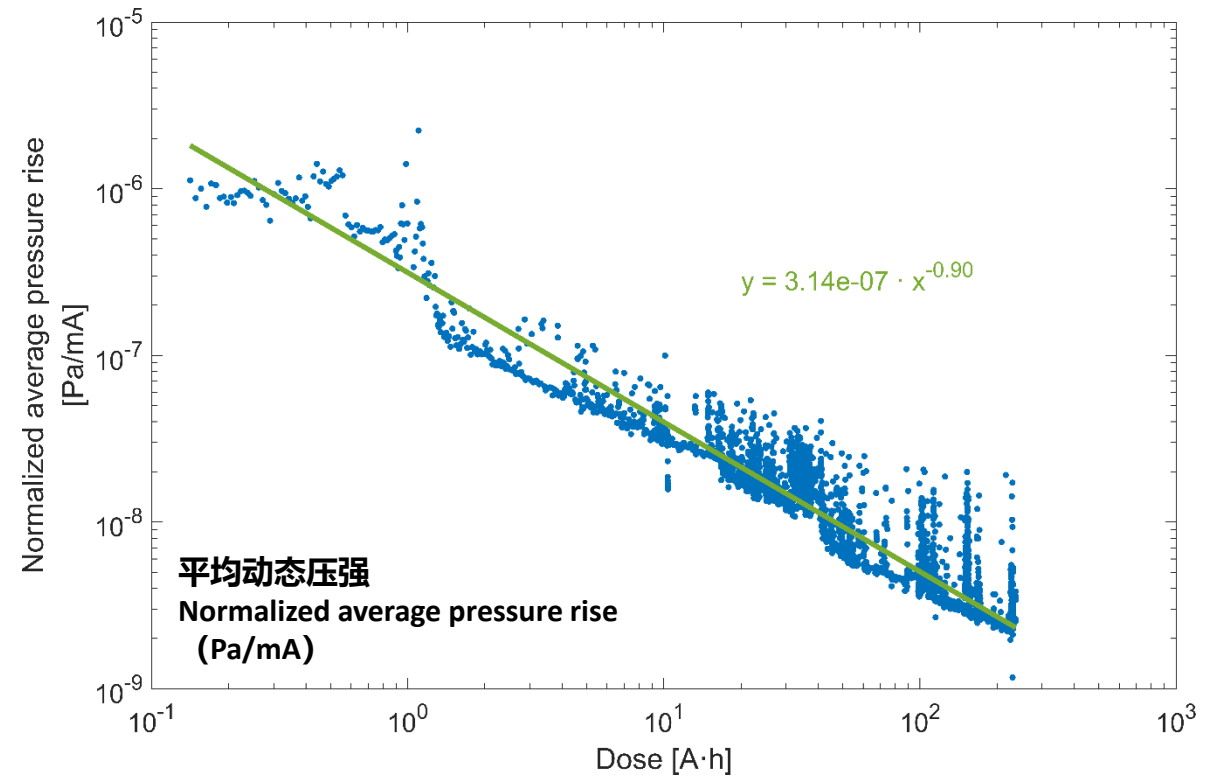
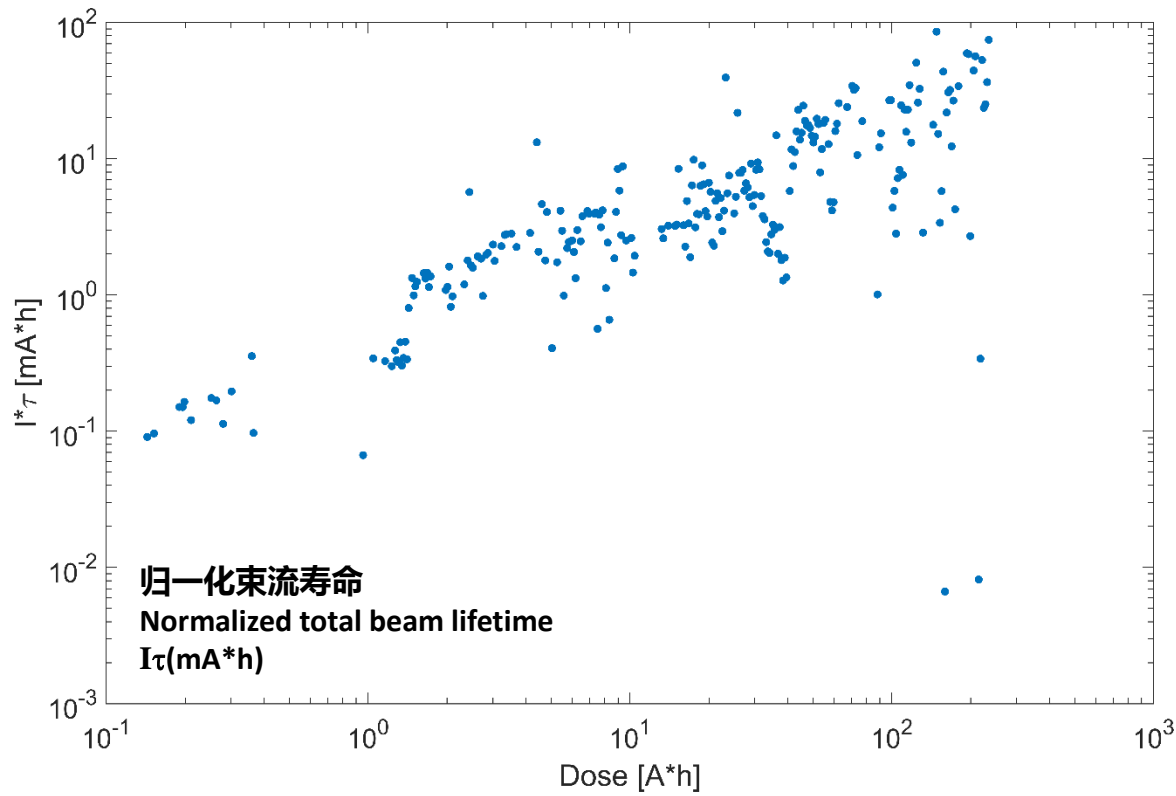
RF installation and conditioning

- During the second long shutdown (SD#5), six SRF cavities installation and conditions completed
 - an integrated schedule developed, monitored and updated on a daily basis: May 20, 2025 ~ Aug 8, 2025 (81 days)
 - Removal of 2 NC cavities, transport & installation of 6 SRF cavities (5×166MHz & 1×500MHz)
 - First cooldown of all 7 SRF cavities: Jul 22 – Aug 1, 2025 (11 days)
 - RF conditioning & performance check of all 7 cavities: Aug 2 – Aug 5, 2025 (3 days)
- Now, **BST and SR RF system in nominal setup and fully operational**



Smooth vacuum conditioning

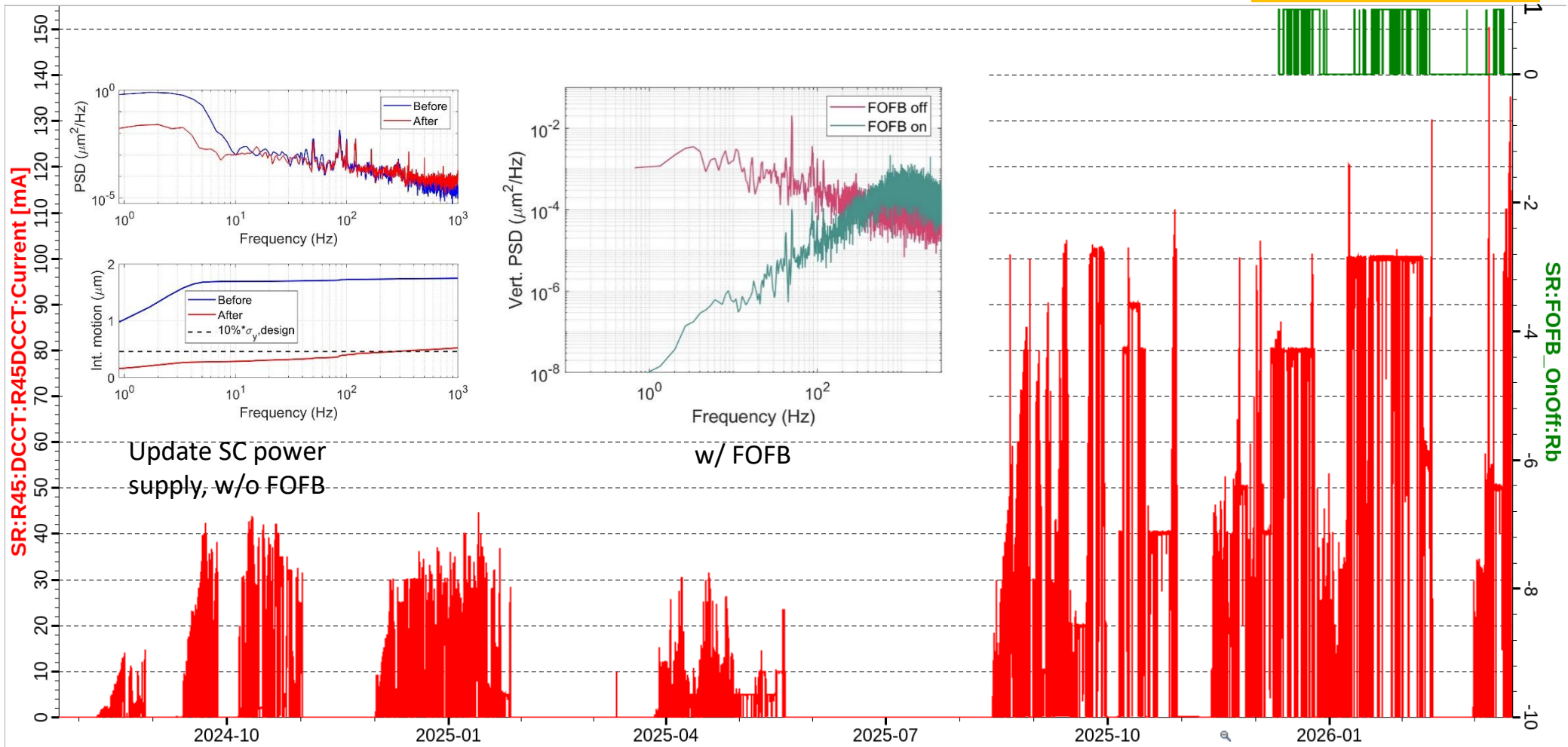
- Accumulated dose has exceeded 200 A·h.
- Accompanied by a gradual reduction in vacuum pressure.
- The normalized beam lifetime increased by 3 orders of magnitudes.



Beam motion of 0.1 μm level reached

Interference between the tuning of different beamlines largely mitigated.

1/0: FOFB on/off



Accelerator KPPs achieved by Sep 2025

- **Passed accelerator performance tests** on Sep 26-29, six key performance parameters met the acceptance criteria.
- **Passed HEPS performance acceptance review** on Oct 29, after passing beamline performance tests.

Parameter	Design	KPP#	Measurement	Unit
Beam energy	6	6	6.01	GeV
Beam current	200	100	100.5	mA
Natural emittance	34.8	100	56.8 ^{\$}	pm·rad
Beam stability	10%	20%	< 19.8%	fraction of rms beam size & divergence
Brightness	$>1 \times 10^{22}$	2×10^{21}	4.00×10^{21}	phs/s/mm ² /mrad ² /0.1% BW
Capability of providing X-ray photons of 300 keV			349.57	keV

Key performance parameters for national acceptance test

^{\$} Measured horizontal + vertical emittance @ 100 mA, with grating interferometry



HEPS IAC Meeting 2026



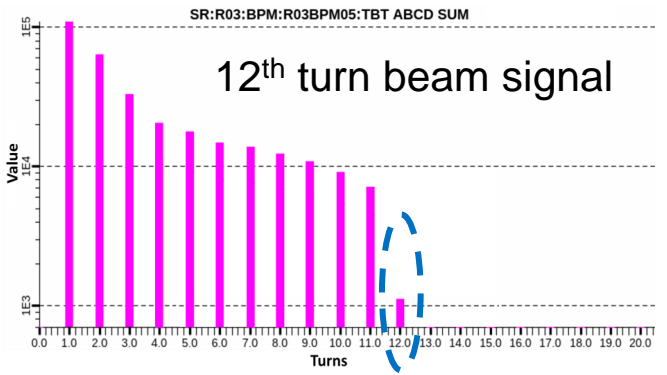
May 14, 2026



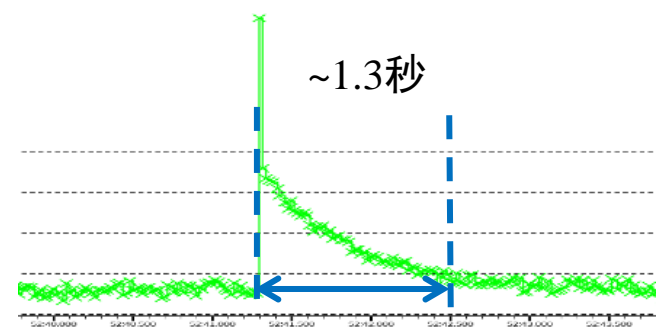
~ half a month to get first beam storage



Commissioning start



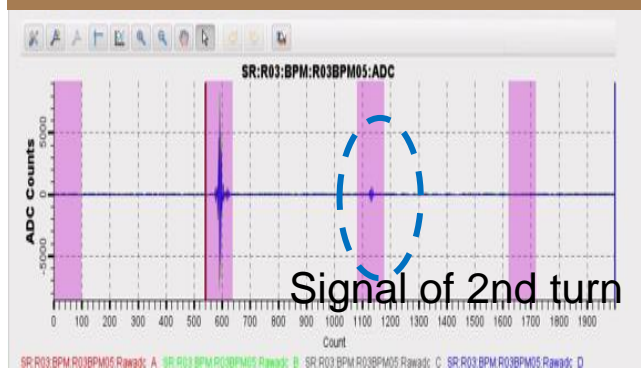
Circulation of 11 turns



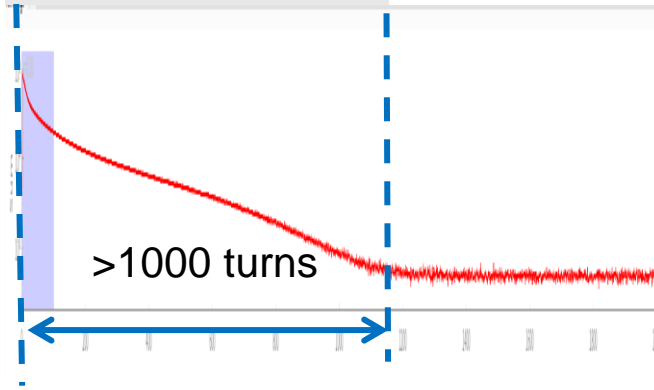
First beam storage



First turn around



Circulation of 1000 turns



Lifetime ~ 1 min

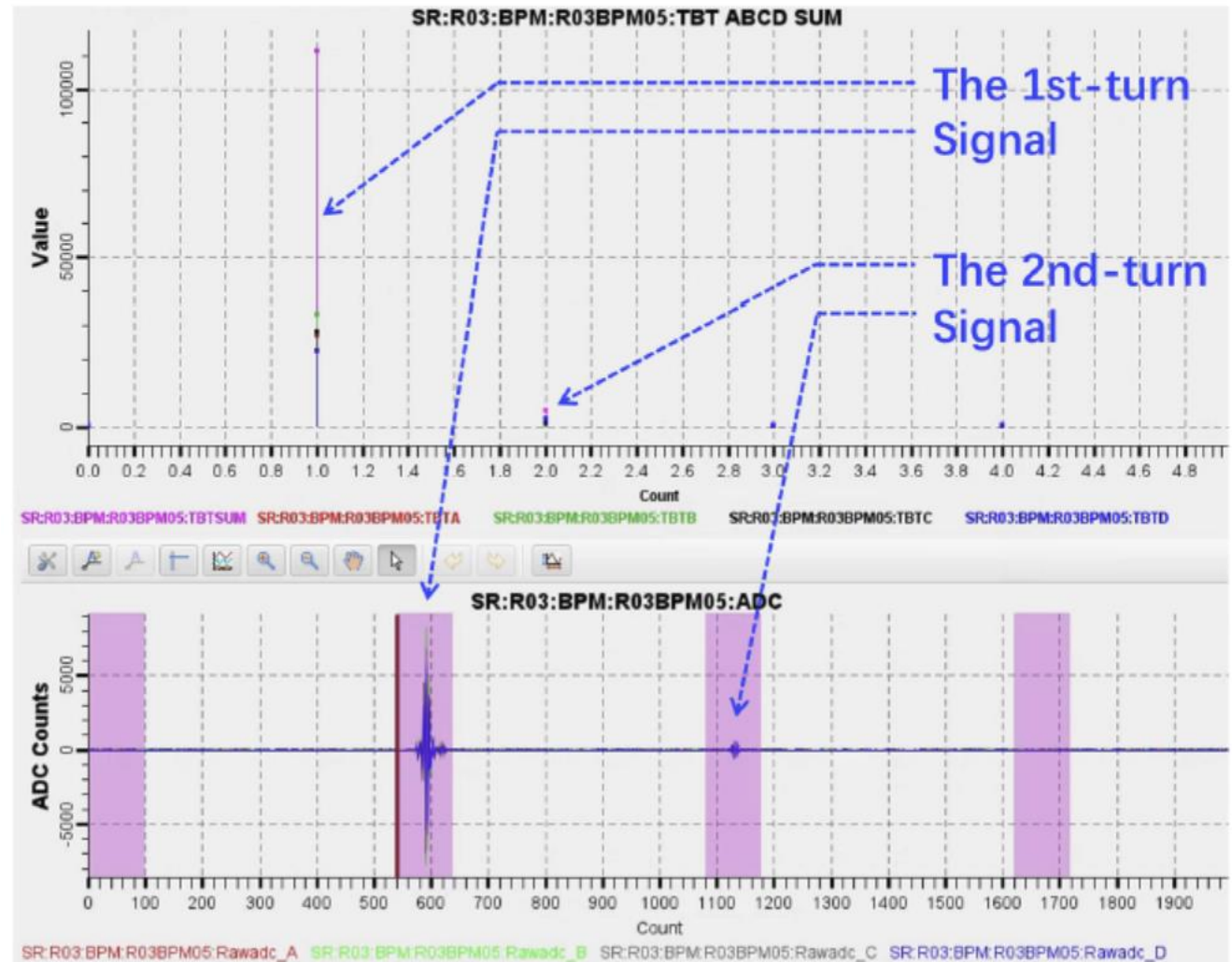
HEPS加速器运行状态

主要运行参数	运行计划	机器研究	Time
储存束流能量	6 GeV		Thu Aug 8 22:24:30 2024
储存束流长度	1360.4 m		
储存束流流强	75 uA		
储存束流寿命	57.5 sec		
储存束流自然发射度	35 pm		
储存束流辐射	2.6 MW		
储存束平均真空	0.0000012 Pa		
探测器束流强	0.75 nA		
束流总功率	6.18 nC		

Current ~ 60 uA
Life time ~ 1min



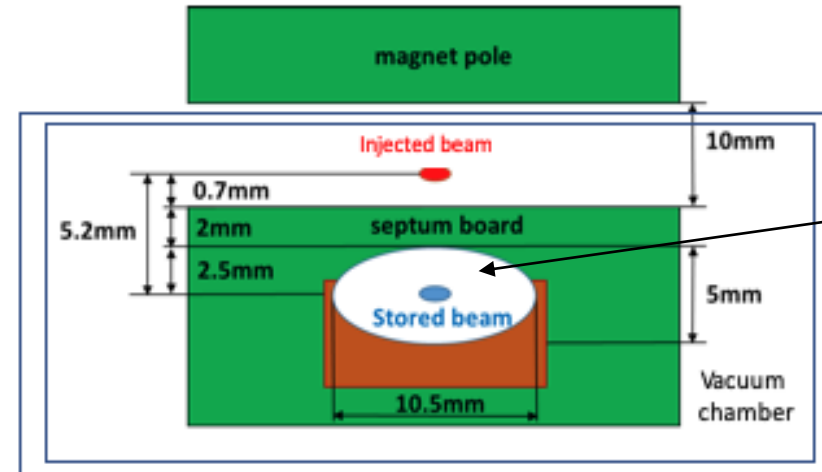
- First-turn circulation is achieved within one day
 - By using both the tools for automatically tuning (previously validated on the booster) and manual knobbing of the beam trajectories.
 - Also thanks to rigorous joint-debugging before the commissioning that verified the polarity across all magnets (more than 1000).



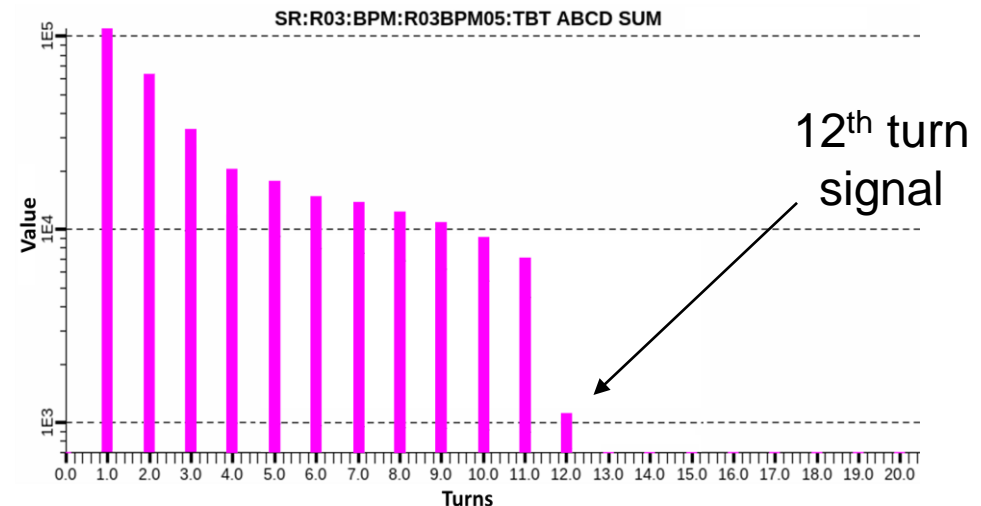
BPM sum signal



- Great challenges were faced to achieve multi-turn circulation,
 - Primarily due to the physical-aperture limitation, i.e., two 1.6-meter ± 2.5 mm vertical apertures at the injection and extraction Lambertson magnets.
- We established 11-turn circulation mainly by implementing multi-corrector strength scans and working point adjustment.

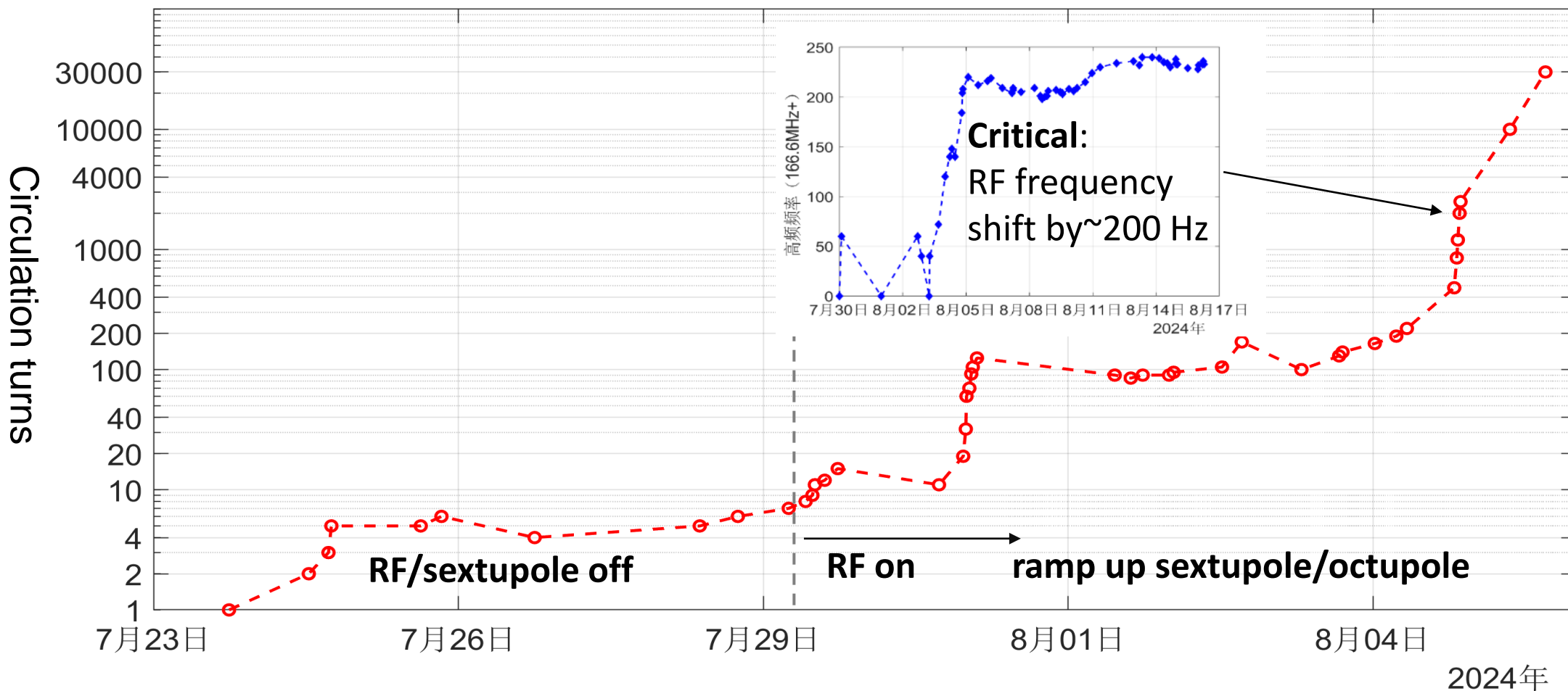


Lambertson:
 H: ± 5.25 mm
 V: ± 2.5 mm



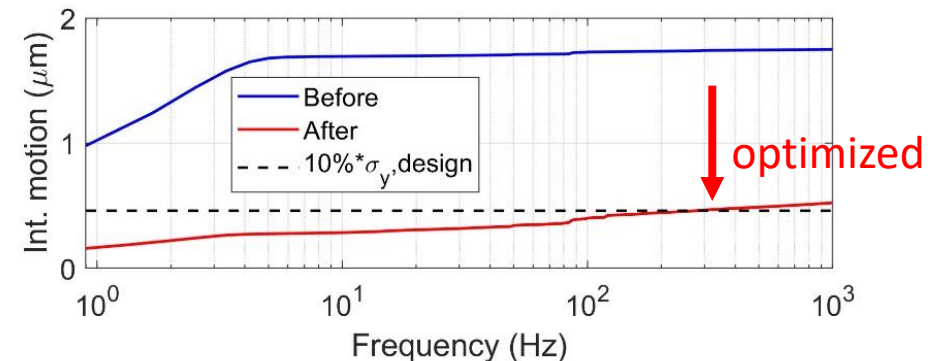
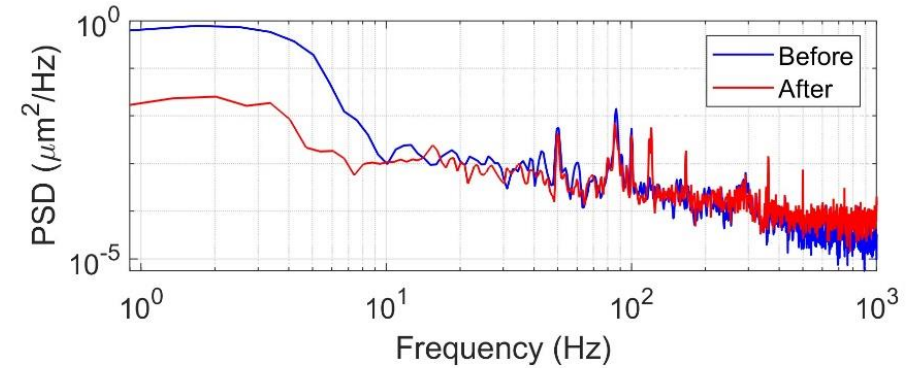
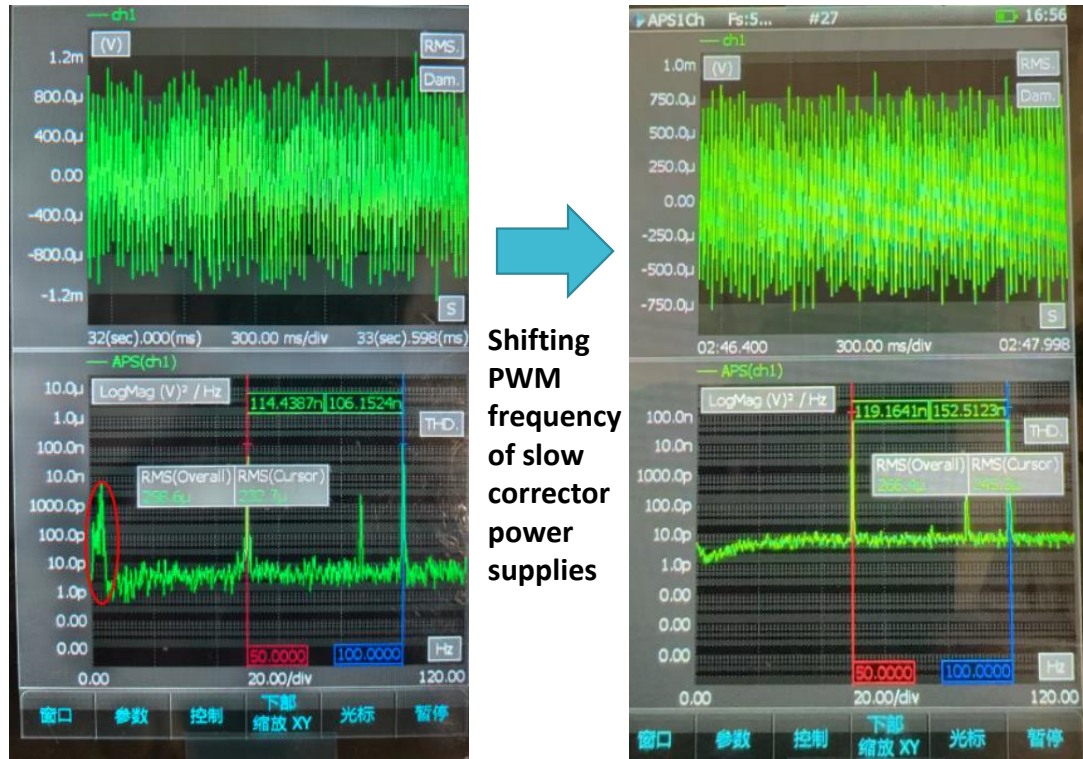
Turn on RF and sextupoles & first storage

- RF turned on, and sextupole strengths increased to 90-100% of the design values; it took about 1 week to get the first beam storage.



Beam stability

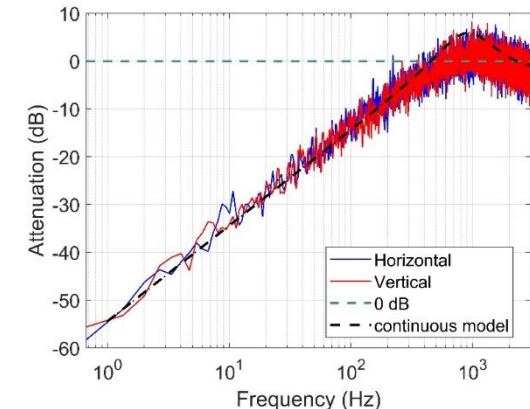
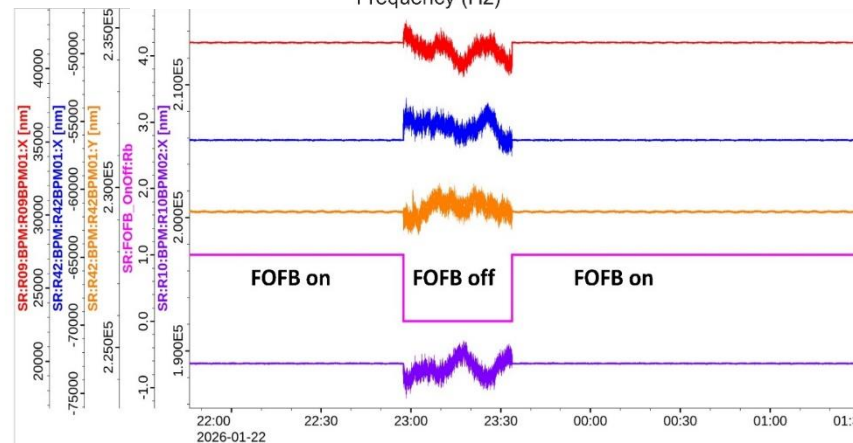
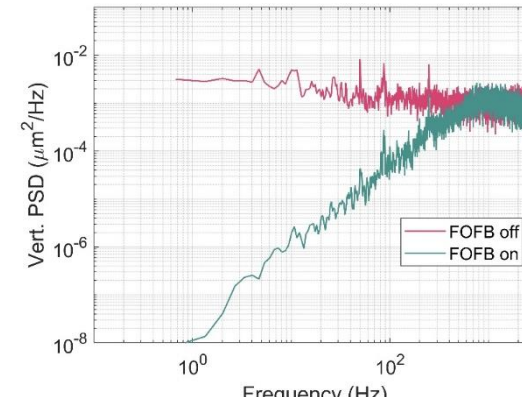
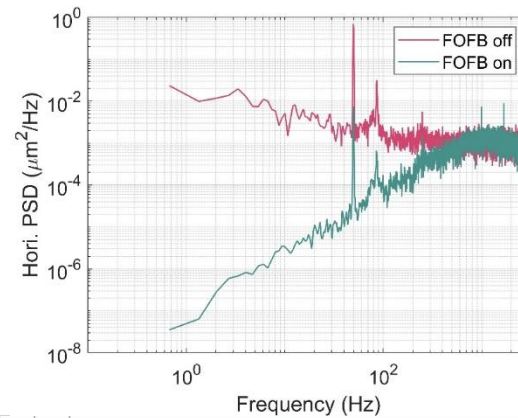
- Prior to June 2025, both accelerator and beamline commissioning were affected by **low-frequency (2-3 Hz) beam fluctuations**. A comprehensive investigation identified the power supplies for the slow correctors as the main source. After this issue was resolved, beam motion was reduced to below 20 % of the beam size.



Beam stability

- Prior to June 2025, both accelerator and beamline commissioning were affected by **low-frequency (2-3 Hz) beam fluctuations**. A comprehensive investigation identified the power supplies for the slow correctors as the main source. After this issue was resolved, beam motion was reduced to below 20 % of the beam size.
- In Dec 2025, start **put FOFB into operation**, further reducing the beam fluctuation amplitude to below 10% of the beam size at IDs.

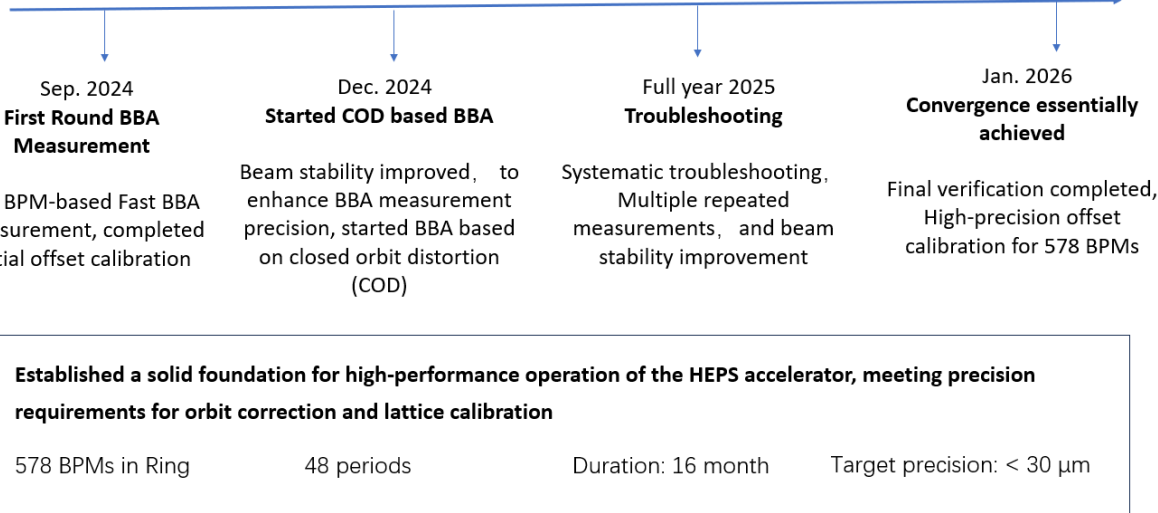
Parameter	Feedback design
Algorithm implementation	Fast + RF feedback
BPM sampling rate	22 kHz (FA)
FC sampling rate	22 kHz
Signal processors (16 stations)	FPGA (Virtex-7)
Num. BPMs /plane	192 (4 per cell)
FC /plane	192 (4 per cell)
FC PS bandwidth	10 kHz
FC latency	< 25 μ s
FOFB closed-loop bandwidth	>500 Hz



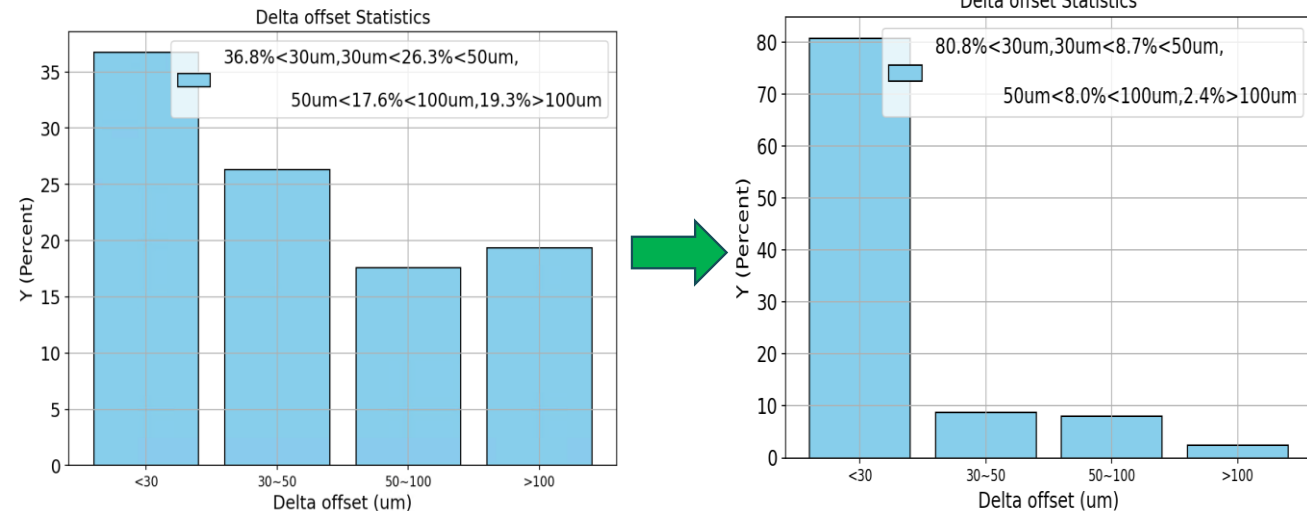
Beam-based alignment (BBA)

- Multiple rounds of beam-based alignment (BBA) carried out, meeting the precision requirement for orbit correction and lattice calibration.
- Orbit stability plays a critical role in ensuring the reproducibility of BBA measurement results. In August 2025, after the low-frequency (2–3 Hz) beam fluctuations resolved, the proportion of BPMs achieving reproducibility of better than 30 μm increased from less than 40 % to over 80 %.

HEPS BBA progress

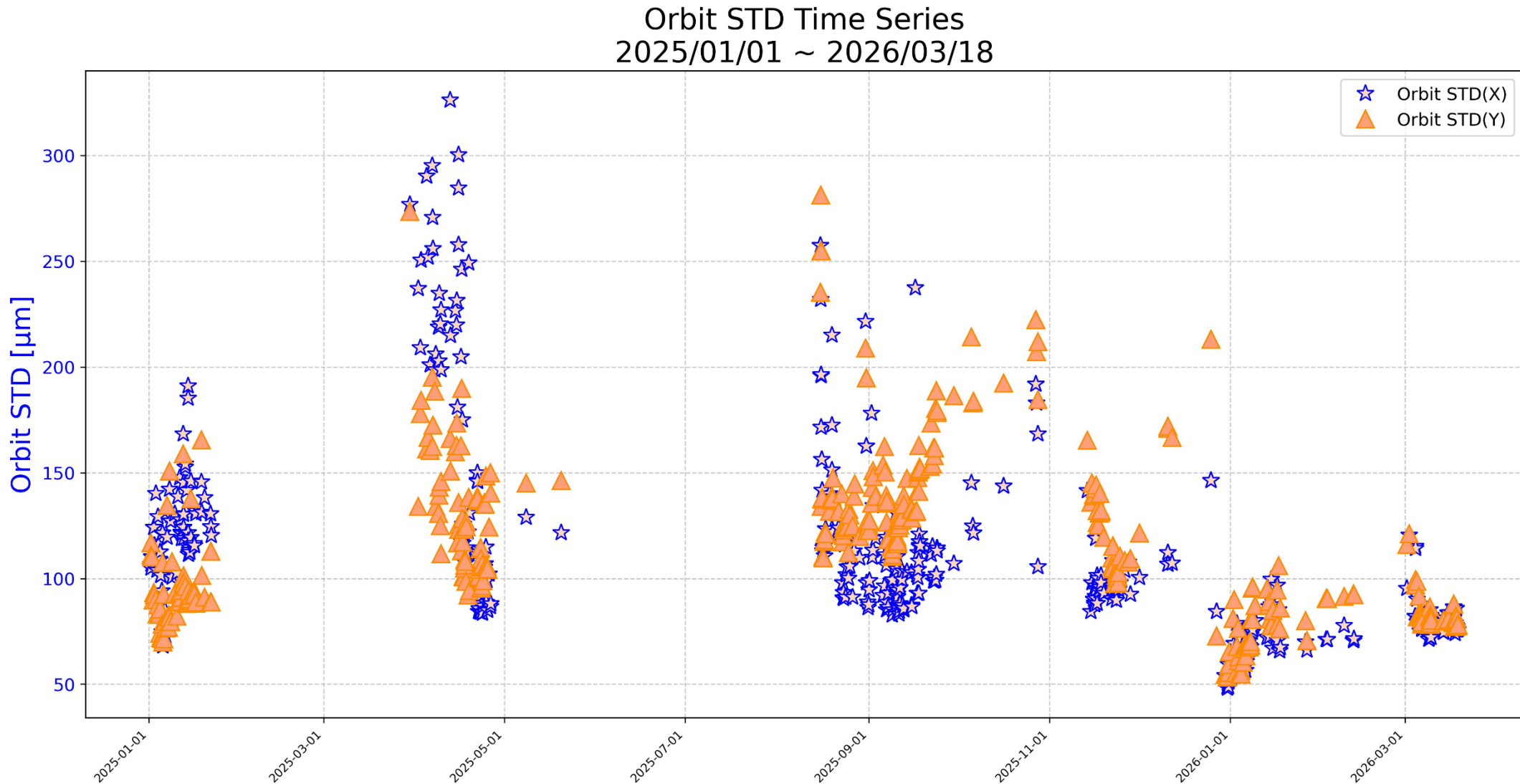


Reproducibility of BBA Results Before and After the corrector PWM optimization



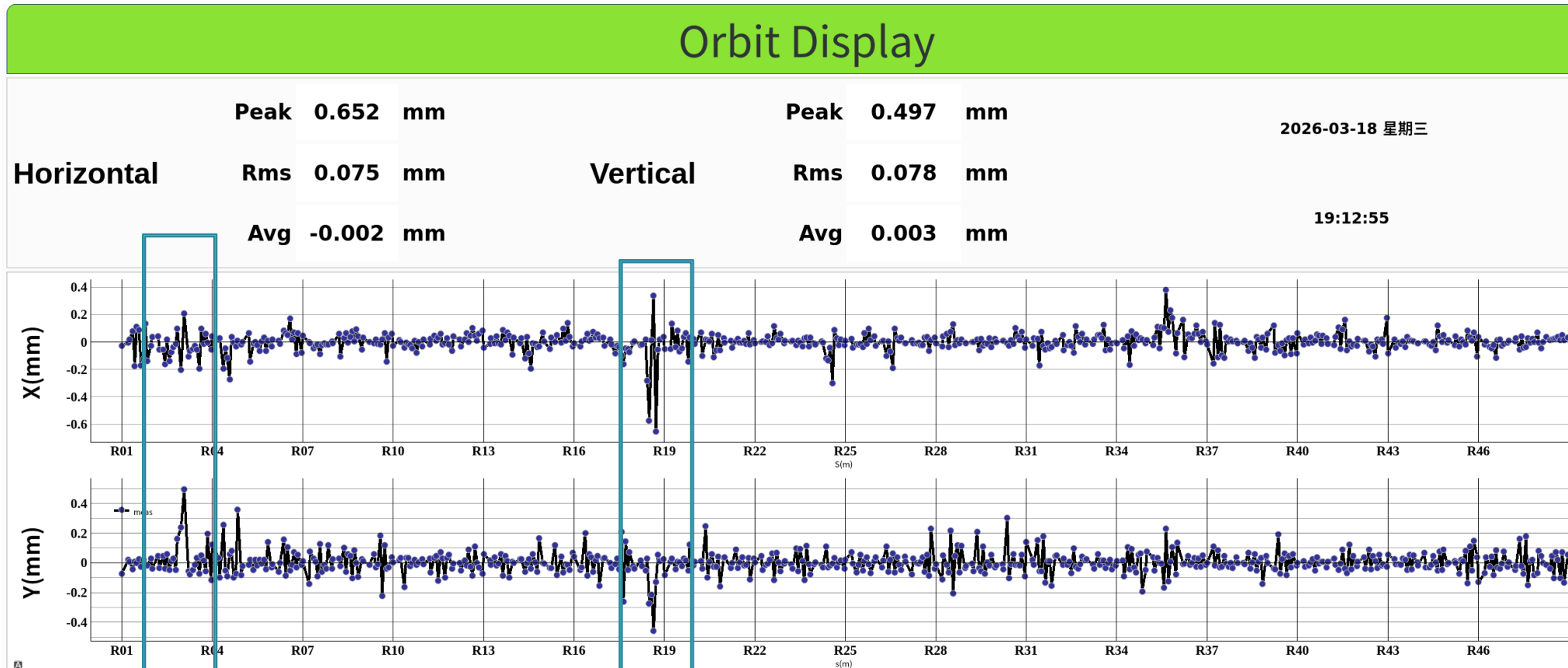
Closed orbit correction

- Orbit correction iterated with BBA, results in reduced rms closed orbit.



Closed orbit correction

- Current rms closed orbit is **70-80 μm** , all BPM readings within ± 0.4 mm except two locations where orbit bumps are intentionally applied for beam loss control and lifetime optimization.



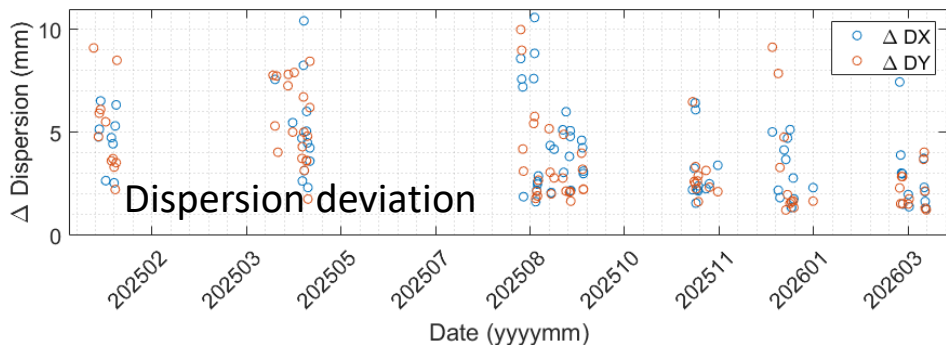
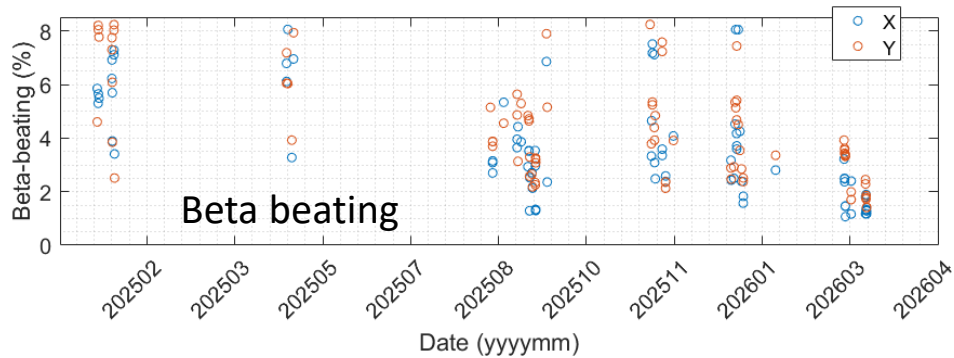
Injection region

R18 local bump

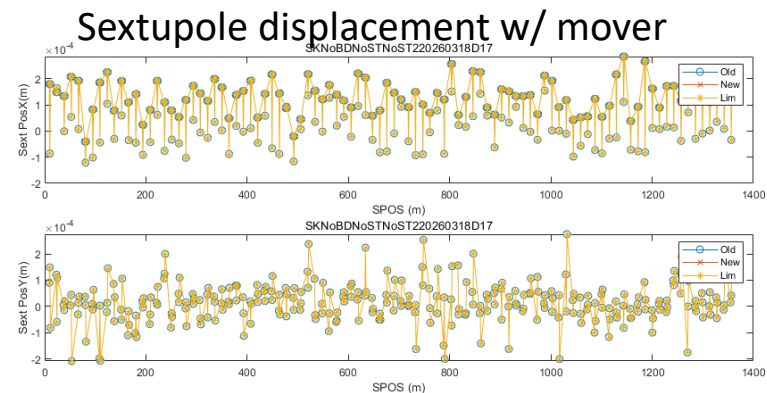


Optics correction

- From Mar 2025 to now, 5 rounds of orbit and optics correction iterations performed, based on response matrix and LOCO.
- Besides the parameter setting optimization, **updated AT lattice model** (better reflect the cross-talk effect) and **sextupole movers** were used to improve the correction results.

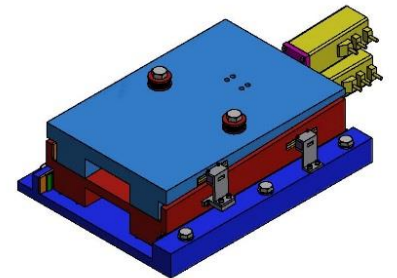


Beam parameters after correction(20260318)		
Beta beating(LOCO) (%) X&Y	1.28	1.41
Δdispersion (mm) X&Y	1.29	1.25
RM Skew/normal(%) HV/HH&VH/VV	3.19	3.74

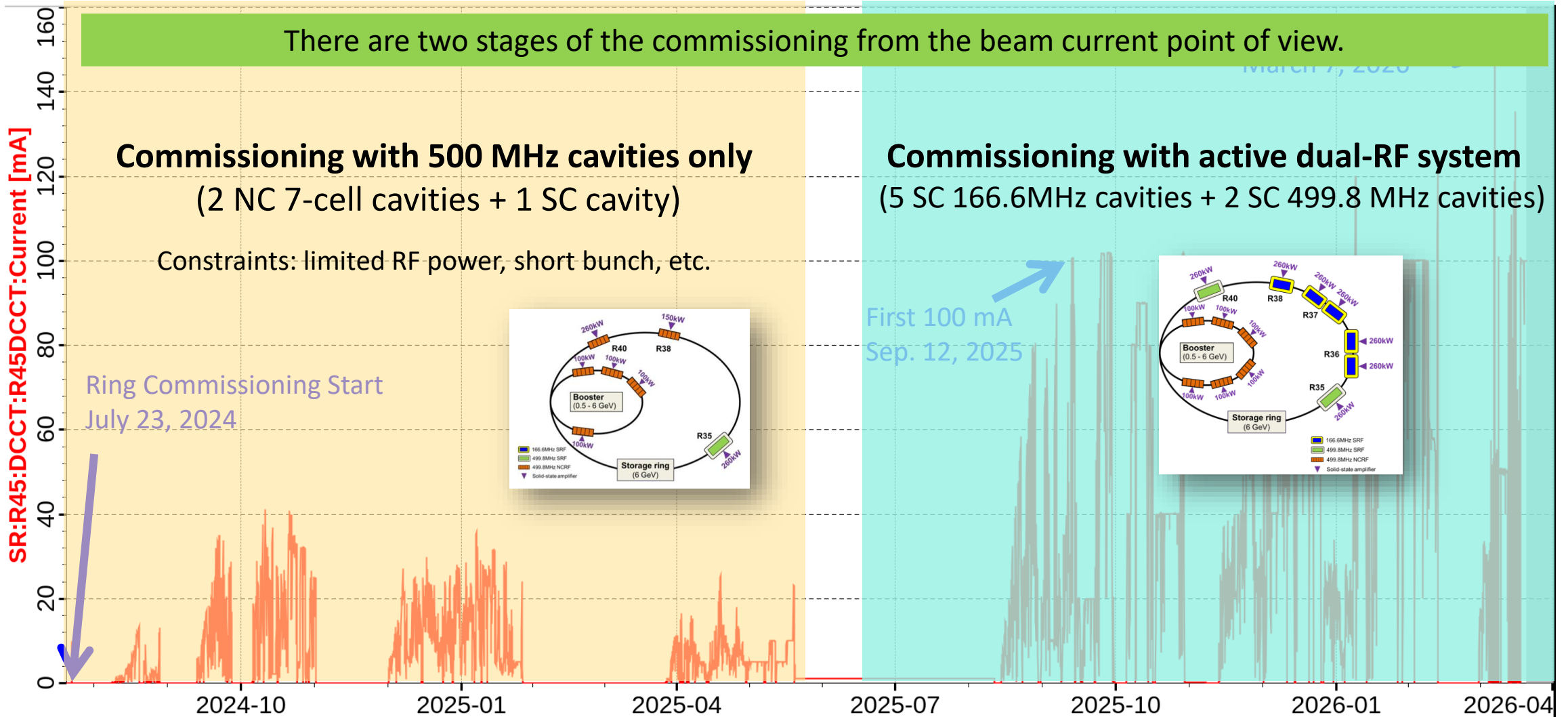


X

Y

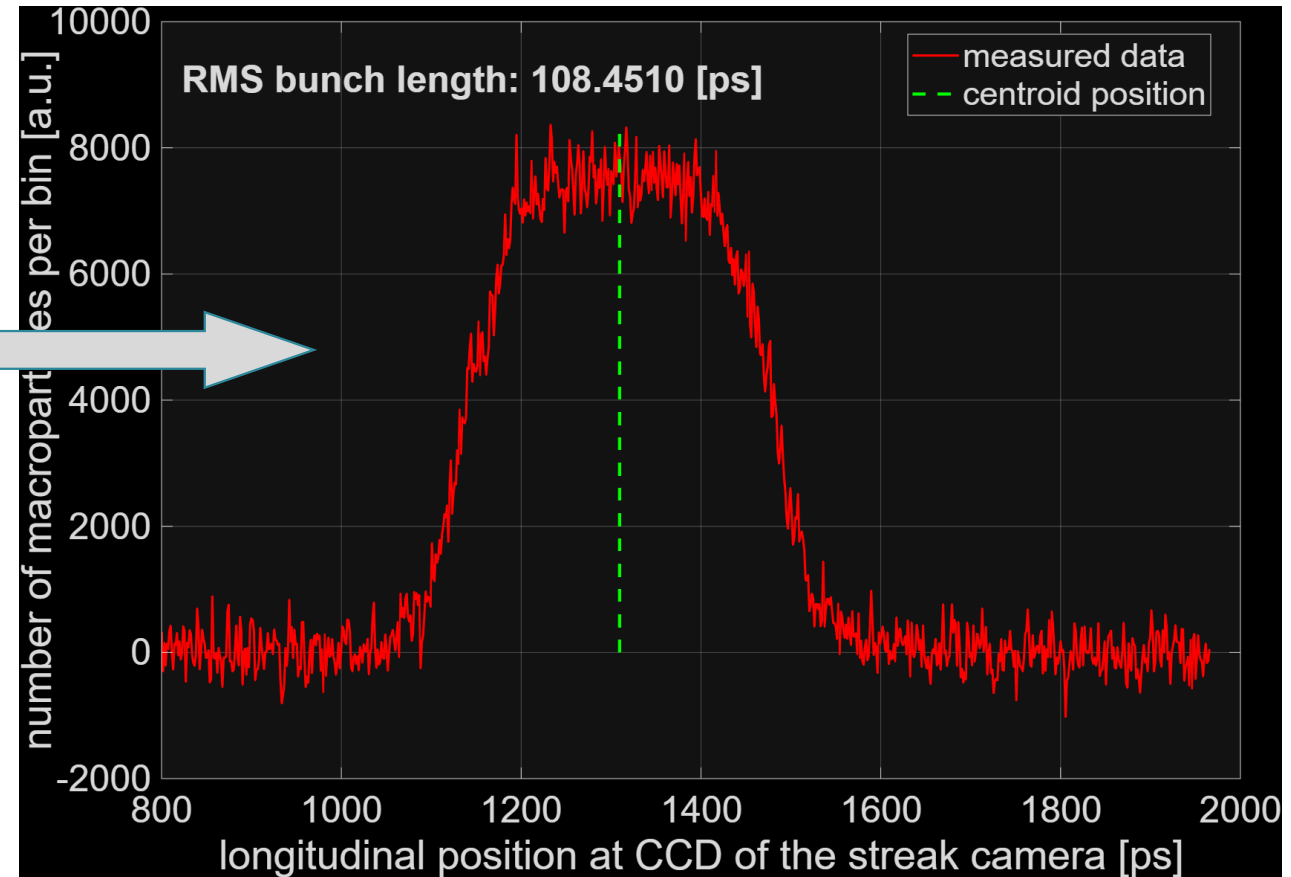
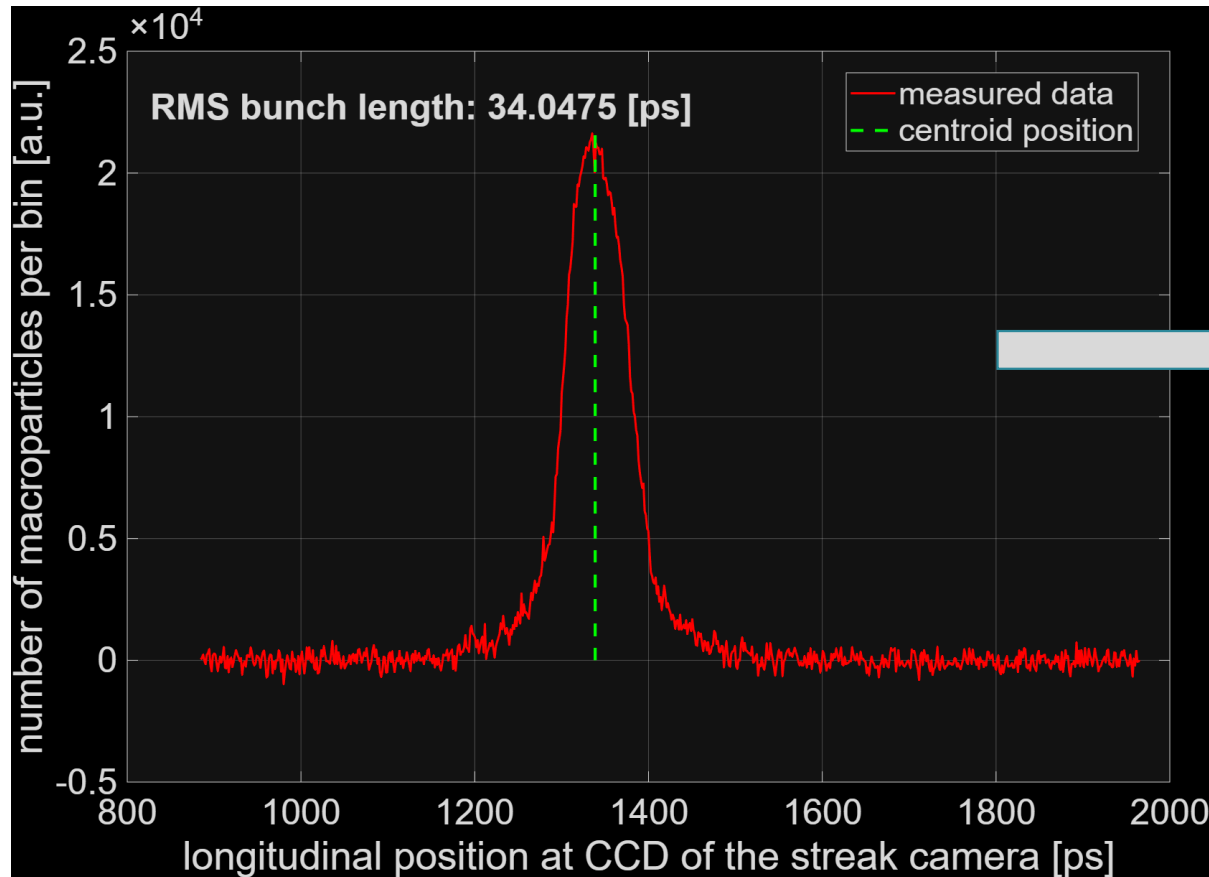


Progress of High-Current Commissioning



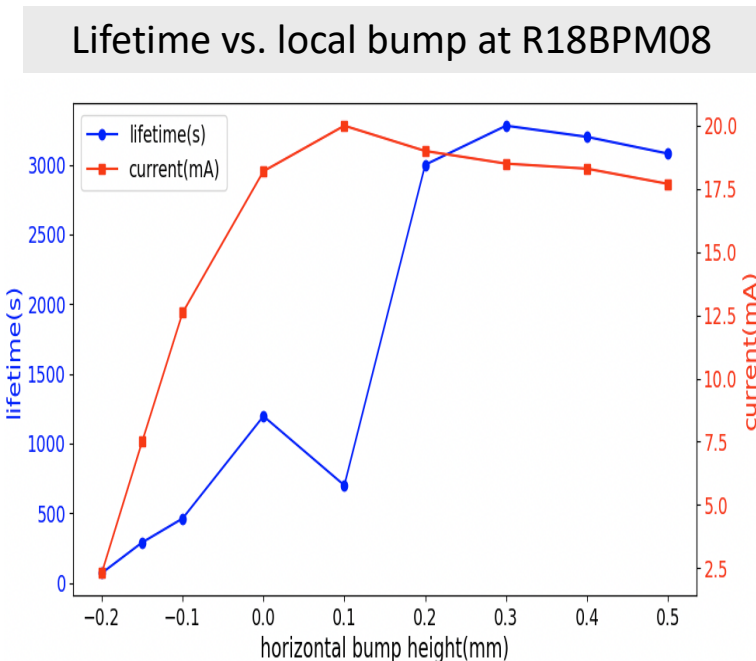
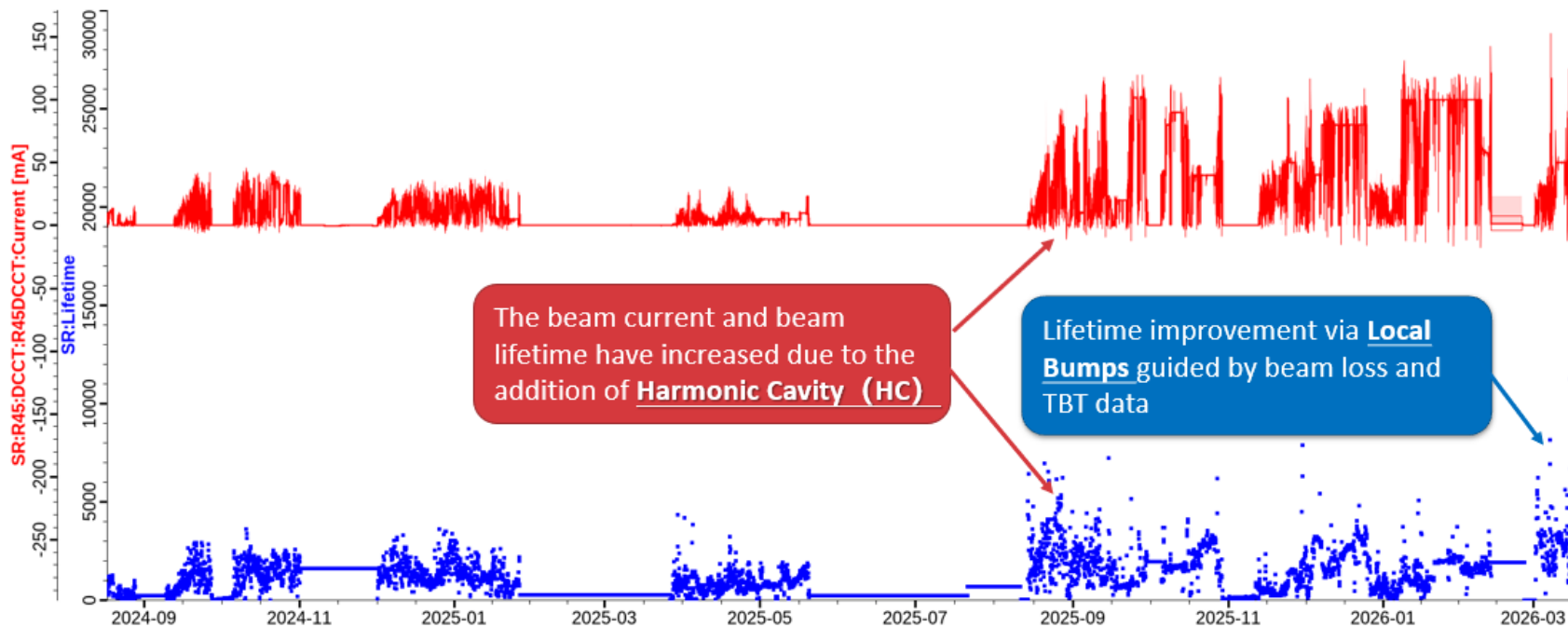
Bunch lengthening commissioning

- Manage to reach nearly ideally flat bunch distribution at arbitrary beam current.
 - Dec.29 and Dec.31, 2025, try ‘ideal lengthening’ (~ 1.2 nC / bunch)



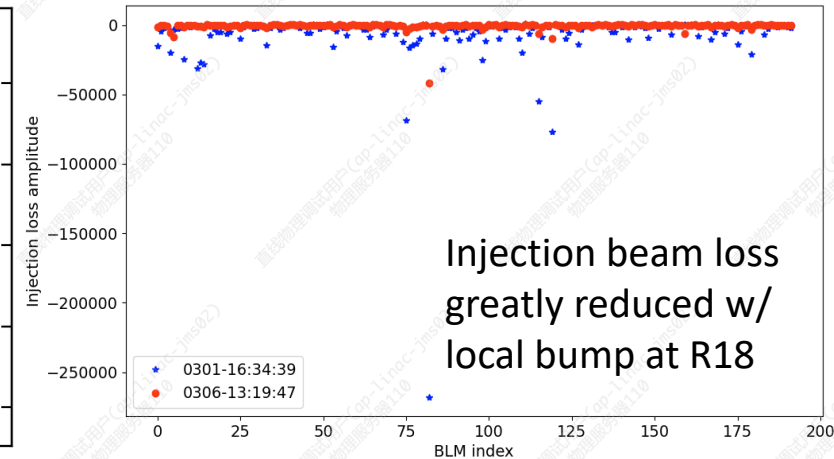
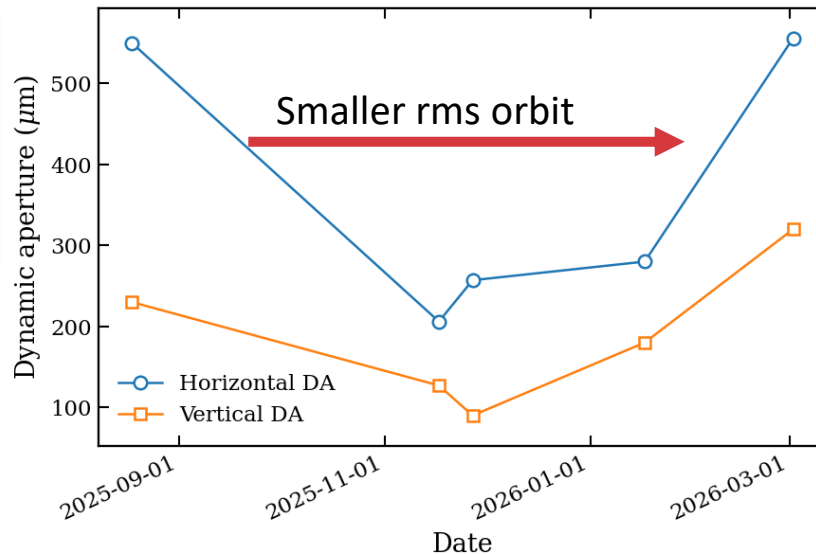
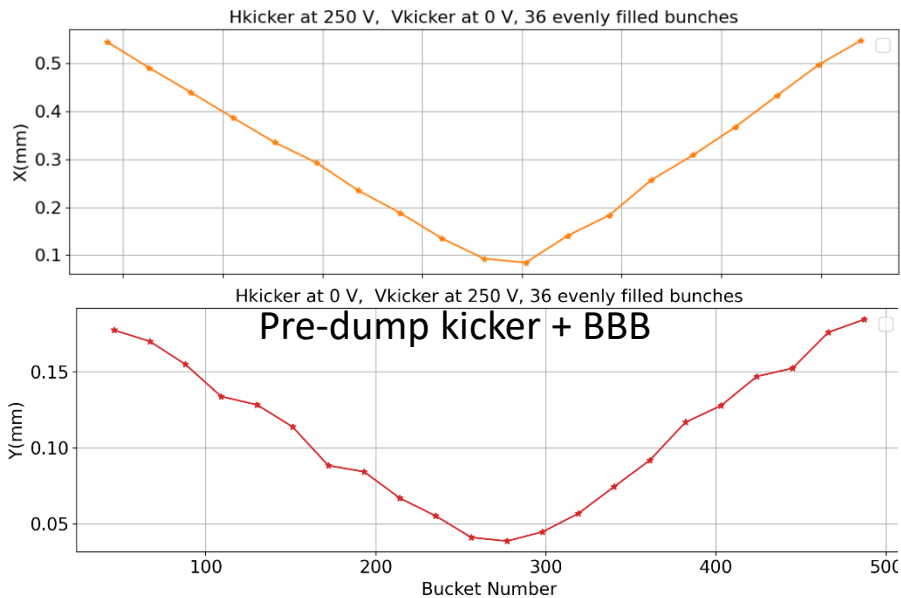
Beam lifetime & DA

- After more than 200 Ah of vacuum conditioning, currently beam lifetime is ~ 1 hr@ 100 mA, primarily limited by Touschek effects.
- Beam lifetime effectively improved w/ **harmonic cavity** and a **local bump** in R18 arc region.
- ML-based optimization of sextupole strengths are under way.



Beam lifetime & DA

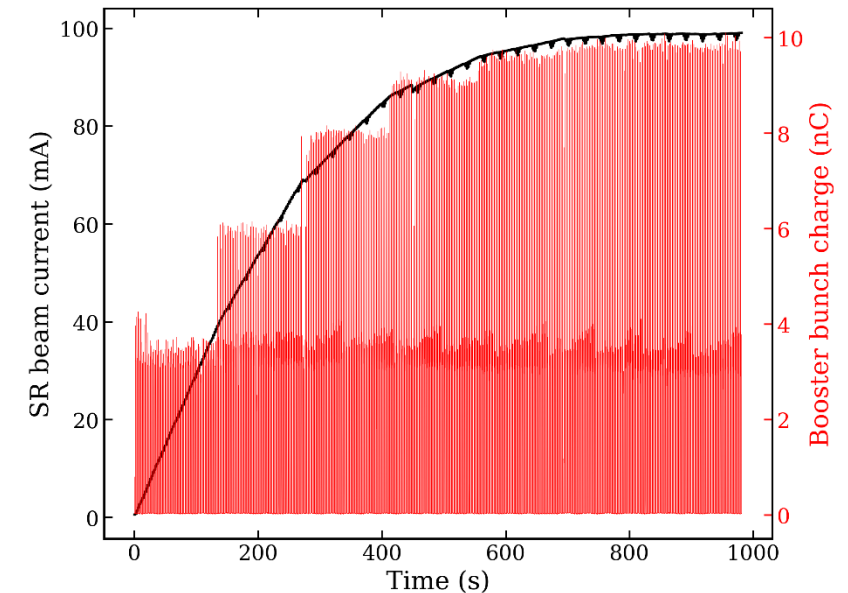
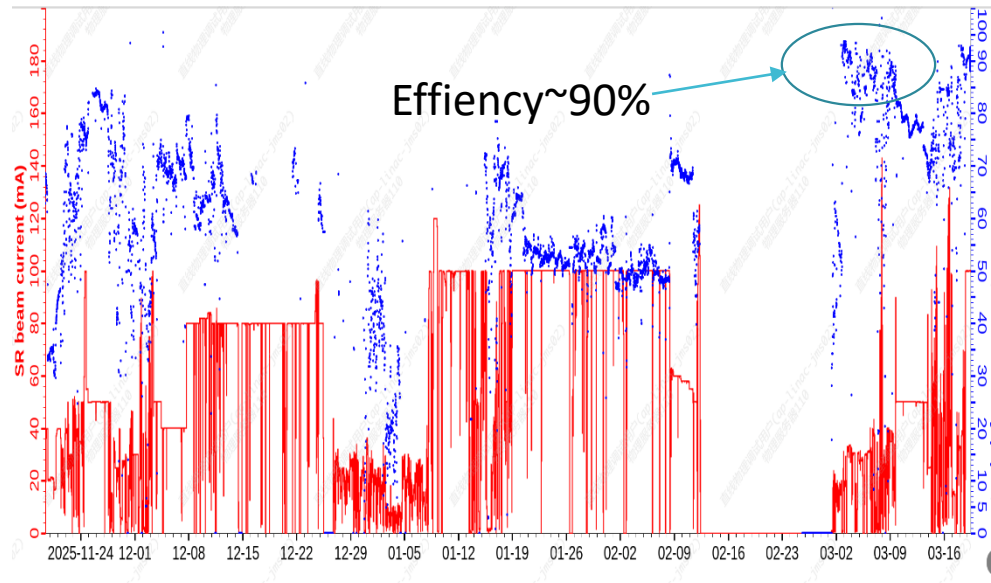
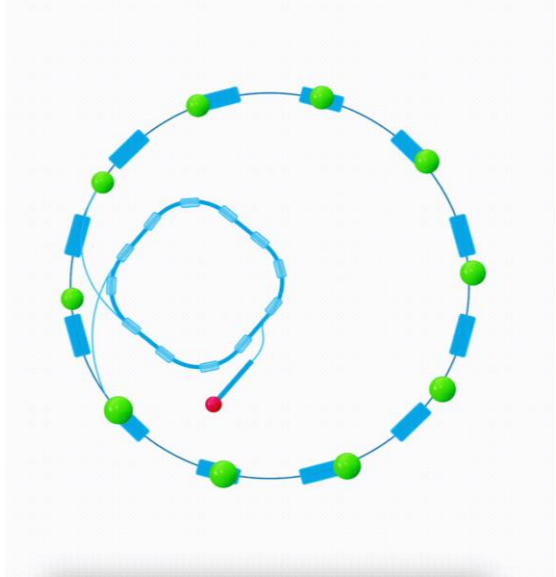
- After more than 200 Ah of vacuum conditioning, currently beam lifetime is ~ 1 hr@ 100 mA, primarily limited by Touschek effects.
- Beam lifetime effectively improved w/ **harmonic cavity** and a **local bump** in R18 arc region.
- ML-based optimization of sextupole strengths are under way.
- **DA measured** with pre-dump kickers (4.5us pulse, all bunches) or injection/extraction/pre-extraction kickers (4ns/10ns pulse, single bunch) and BBB or TBT data acquisition.
- **A long-standing issue that has troubled us, “smaller orbit, smaller DA”, solved** recently with a local bump in R18 arc region.



May 14, 2026

Injection commissioning

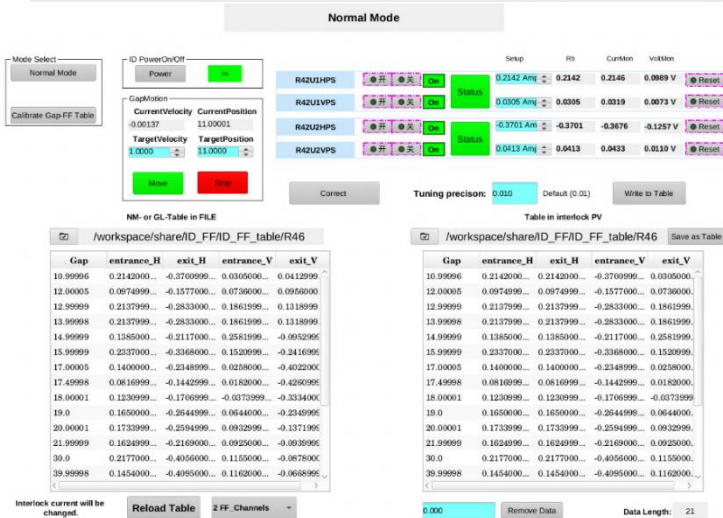
- Swap-out injection based on high-energy accumulation in booster is adopted.
- The bottleneck of the whole injection process is the **beam transmission efficiency from the booster to the storage ring**. This efficiency gradually increased to **~90%**, especially after applying a local bump in R18 arc region.
- For the timing mode (63 bunches uniformly filled), max. beam current of **~100 mA** achieved (7.3nC/bunch).



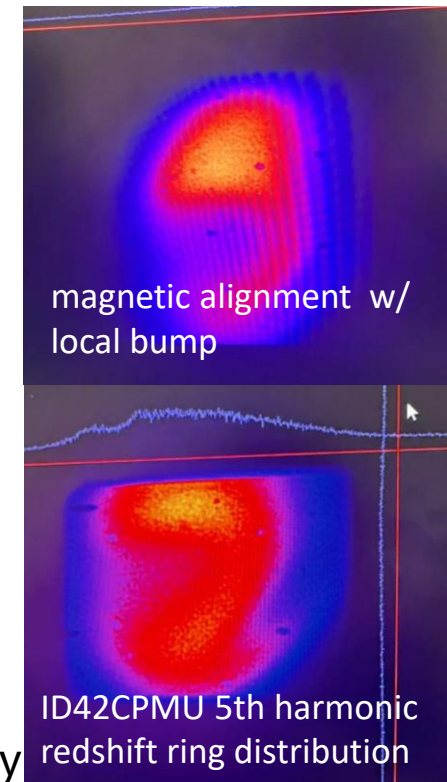
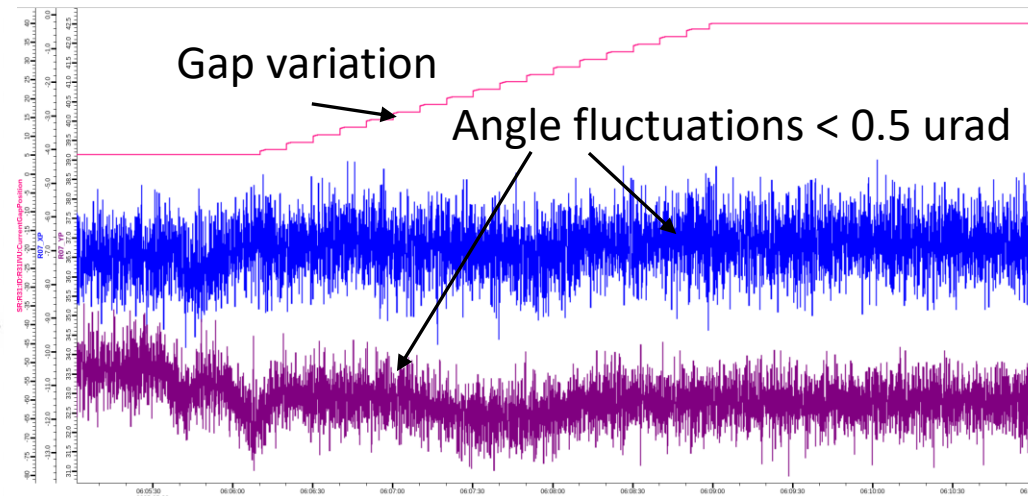
ID commissioning

- ID **orbit feed-forward** systems are operating stably, effectively compensating for changes in global closed orbit caused by ID gap variations for all IDs.
- In-vacuum ID magnetic alignment performed, w/ local bump at ID or ID girder alignment.
- A **U0 feed-forward** system is under development to control significant changes in beam synchronous phase and bunch lengthening induced by U0 (energy loss per turn) variations from insertion device gap changes.

ID orbit feed-forward system



Beam position variation control w/ FF system



Storage ring commissioning milestones

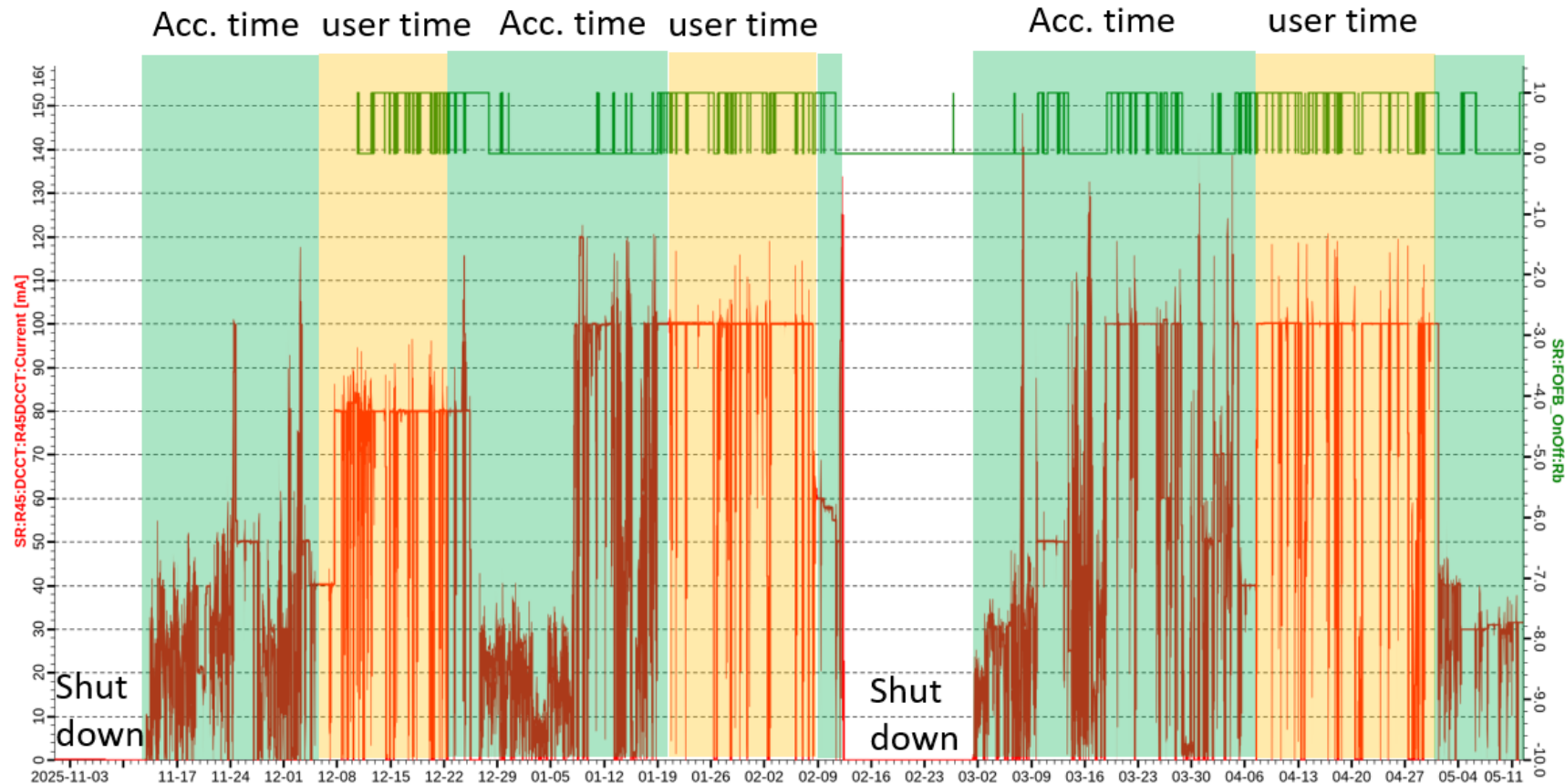
- Commissioning started from July 23, 2024, and passed the accelerator KPP test on Sep. 29, 2025.
- Total time of 14 months including shutdowns for equipment installation in between.



Operation

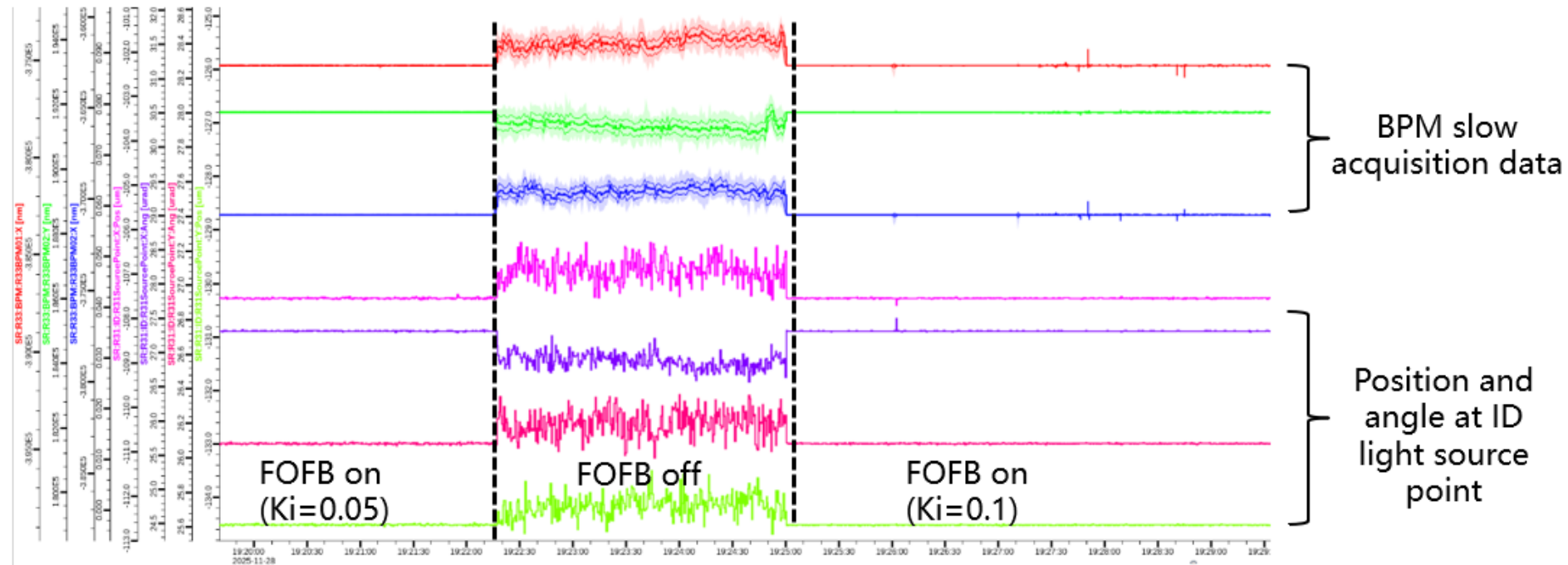
Machine operation

- Since passing the acceptance review (Oct 29, 2025), we have **delivered photon beams to beamlines for a total of about 70 days**, supporting both beamline optimization and initial user experiments (Dec 4–24, 2025, Jan 19–Feb 11, 2026, and Apr 7–May 1, 2026).



Orbit stability during user time

- Combination of FOFB and RF frequency feedback contributed significantly to suppressed beam fluctuations and long-term orbit drifts. Interference between the ID tuning activities of different beamlines was markedly reduced.

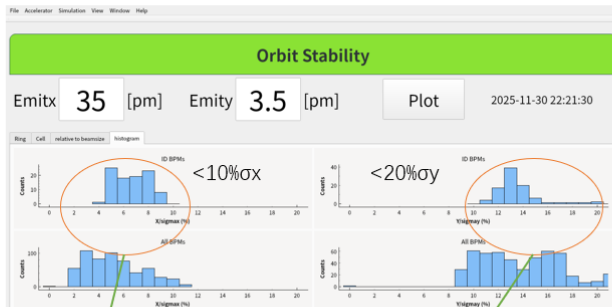


Orbit stability during user time

- Short-term orbit stability: beam position fluctuations < 10 % beam size at the ID light source point .
- Long-term orbit stability (>10h): position drift < 10 nm, and angular drift < 3 nrad at the ID light source point.

Short-term orbit stability: 0.02-500Hz@80mA, 5s FA data

FOFB off

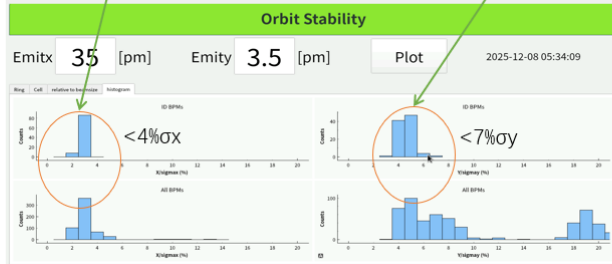


Orbit stability at ID < 20% (Nov 30, 2025)

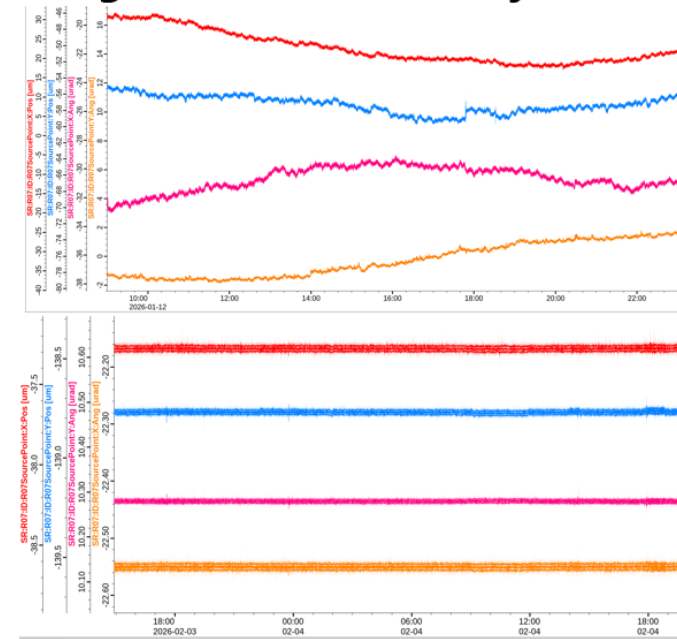
FOFB on (12-3)

Orbit stability at ID < 10% (Dec 08, 2025)

FOFB on



Long-term orbit stability: 100mA, >10 h SA data



Position jitter std: 1-10 μm
Angle jitter std: 0.5-2 μrad
(Jan 12, 2026, FOFB off)

Position jitter std < 10 nm
Angle jitter std < 3 nrad
(Feb 03, 2026)

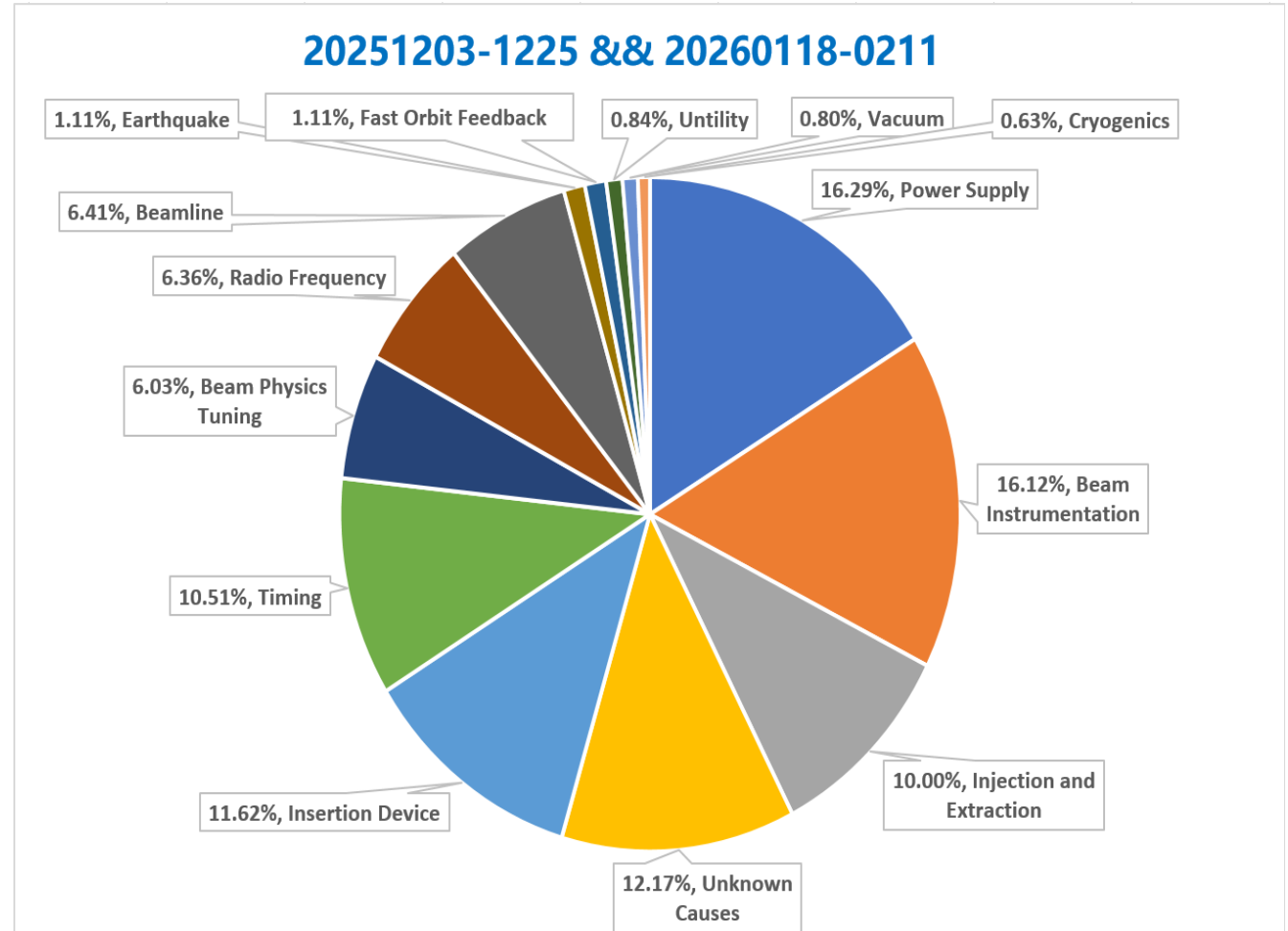
SA data has a filtering effect on high-frequency components



Statistical Analysis of Faults During Beamline time

- We defined that if the beam trip or top-up current is below 98mA, it will be recorded as a fault.

No.	Subsystem	Count	Duration
1	Power Supply	11	676
2	Beam Instrumentation	17	669
3	Injection and Extraction	4	415
4	Unknown Causes	19	505
5	Insertion Device	1	482
6	Timing	3	436
7	Beam Physics Tuning	7	250
8	Radio Frequency	15	264
9	Beamline	1	266
10	Earthquake	2	46
11	Fast Orbit Feedback	2	46
12	Utility	1	35
13	Vacuum	1	33
14	Cryogenics	1	26
18	Total	85	4149



Measures to address beam loss/trip

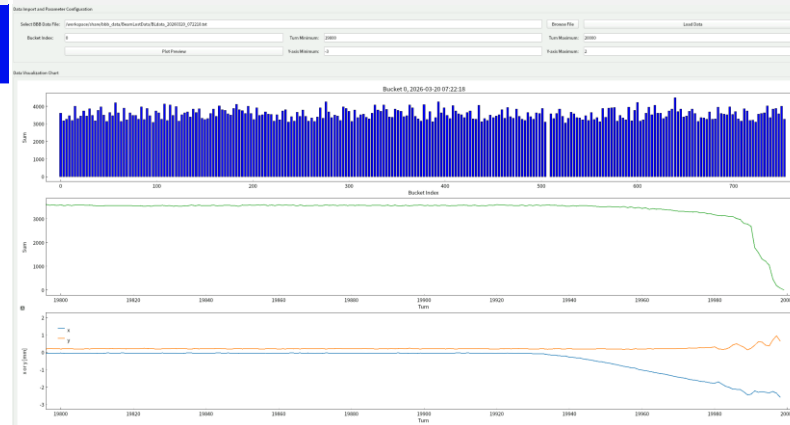
- To address beam loss/trip caused by various factors during operation, we focus on:
 - Developing diagnostic tools for rapid fault source identification (bunch-by-bunch BPM & RF signals) .
 - Enhancing hardware stability to reduce failure rates, and maintaining sufficient spare components for quick equipment replacement.

Integrated display of fault information for critical systems

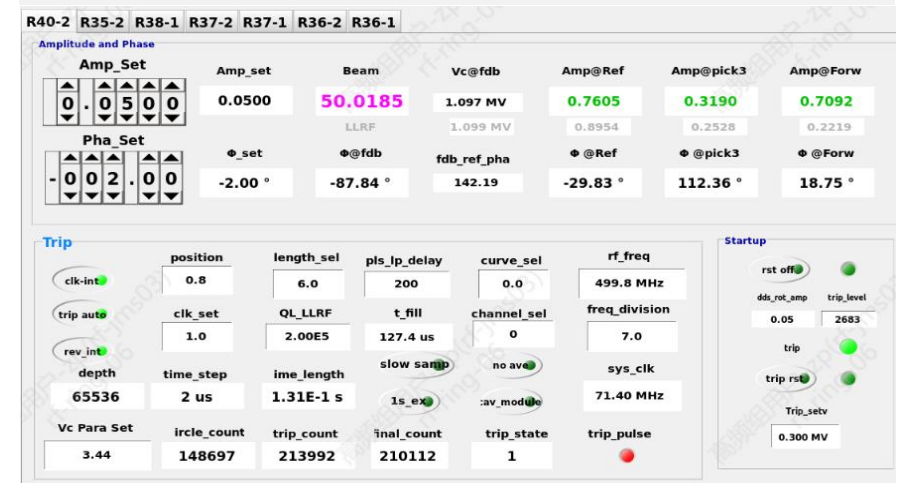
HEPS 加速器Alarm状态

	MPS	PS	RF	Vac	RunTime
SR	■	■	■	■	RFFBBK ■
RB&BR		■			FOFB ■
BST	■	■	■	■	BeamLost ■
KICK		■			SOFB ■
Linac	■	■	■	■	

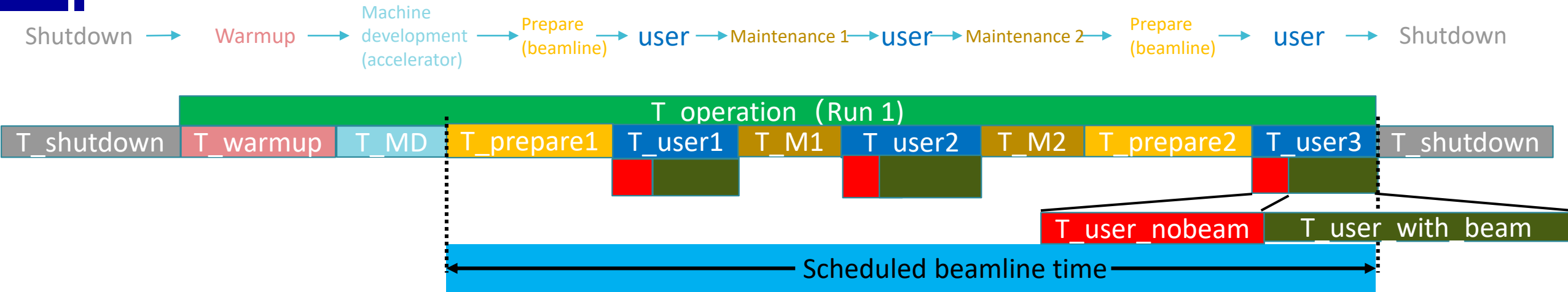
Beam loss diagnosis based on bunch-by-bunch BPM data



Beam loss diagnosis based on RF signals



2nd user time period, faults statistics & analysis



26/1/18-2/8	Statistics
T_user	465h50min
Number of downtimes	21
Total downtime	23h44min
A_user(Availability)	94.91%
MTBF*	21.05h
MTTR ^{\$}	1.18h

Availability for user :

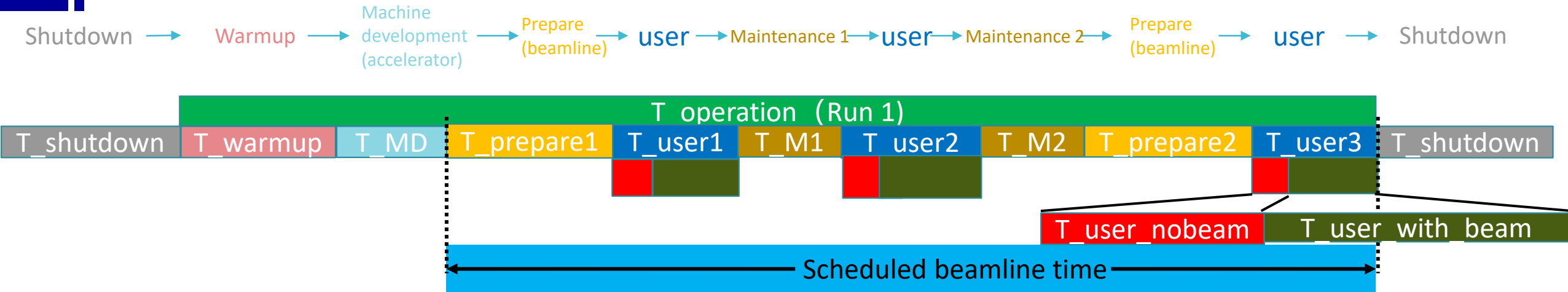
$$A_{\text{user}} = \frac{T_{\text{user_with_beam}}}{T_{\text{user}}} = 94.91\%$$

MTBF*: mean time between failure

MTTR^{\$}: mean time to repair



3rd user time period, faults statistics & analysis



26/4/7-5/1	Statistics
T_user	498h7min
Number of downtimes	26
Total downtime	19h42min
A_user(Availability)	96.05%
MTBF*	18.4h
MTTR ^{\$}	0.76h

Availability for user :

$$A_{\text{user}} = \frac{T_{\text{user_with_beam}}}{T_{\text{user}}} = 96.05\%$$

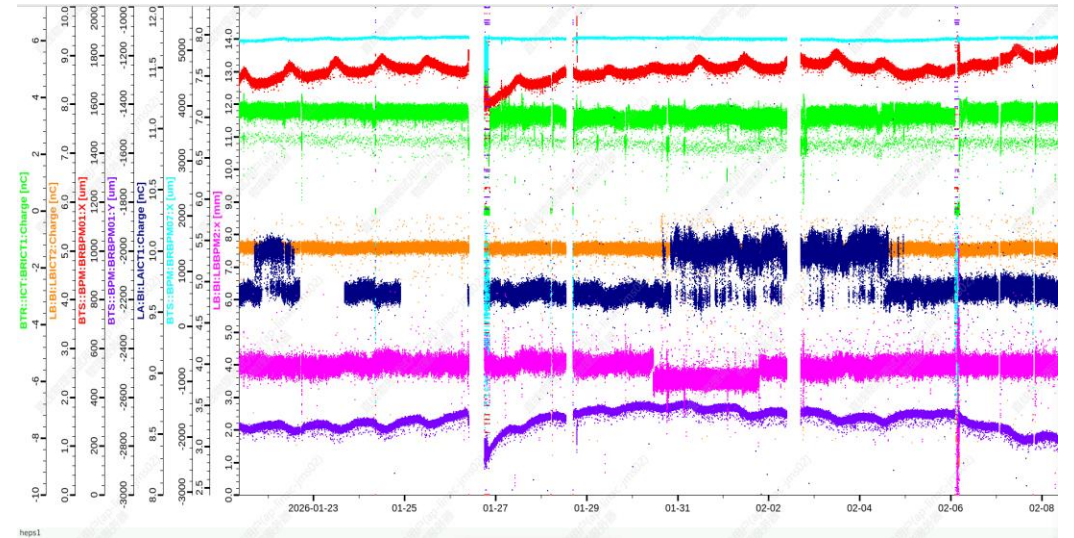
MTBF*: mean time between failure

MTTR^{\$}: mean time to repair

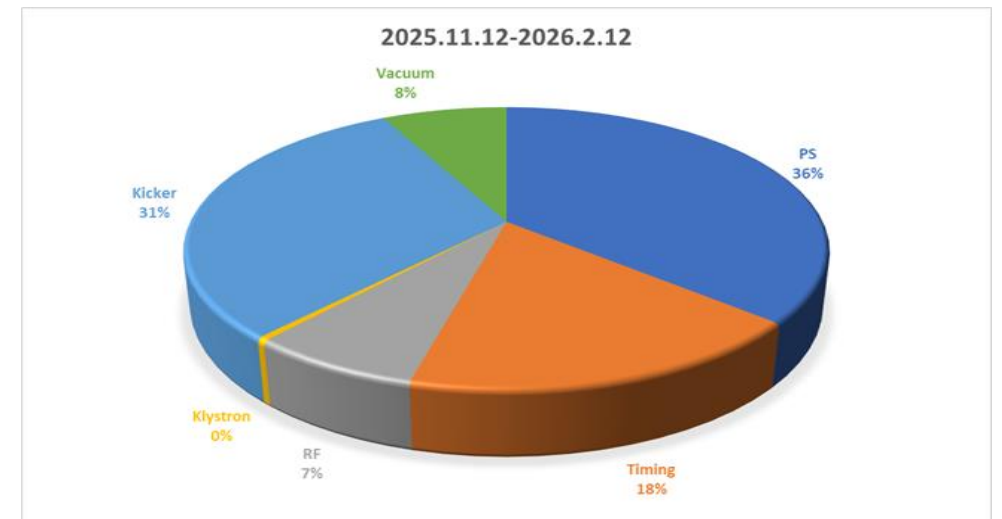


Injector status

- The injector primarily operates in a 2.5 nC bunch charge mode with a repetition period of about 2 seconds, and overall operation remains stable.
- Operation Mode
 - Charge: 2.5 nC
 - Repetition period: ~2 s
- Extracted orbit shows diurnal variation
 - Peak–peak: ~80 μm (H) / ~40 μm (V)
- Beam availability: >99%
- $MTTR^* = \frac{\text{Total downtime}}{\text{Num of failure}} < 50\text{min}$
- Top failure sources:
 - Power Supplies
 - Kicker
 - Timing



**Statistical results are derived from data points within 1.21 – 2.8, 2026



*MTTR: mean time to repair



Pilot Proposals

1st round

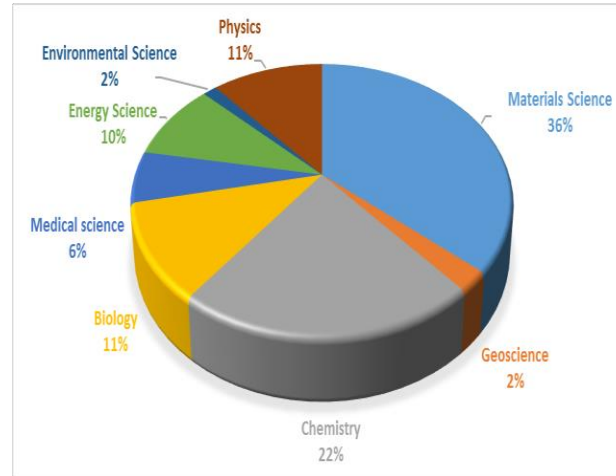
2025.12.3-2025.12.25

11 BLs, 60 proposals,
1718.5 hours, 210
users, 35 institutions

2nd round

2026.1.16-2026.2.11

12 BLs, 162 proposals,
3132 hours, 498 users, 80
institutions

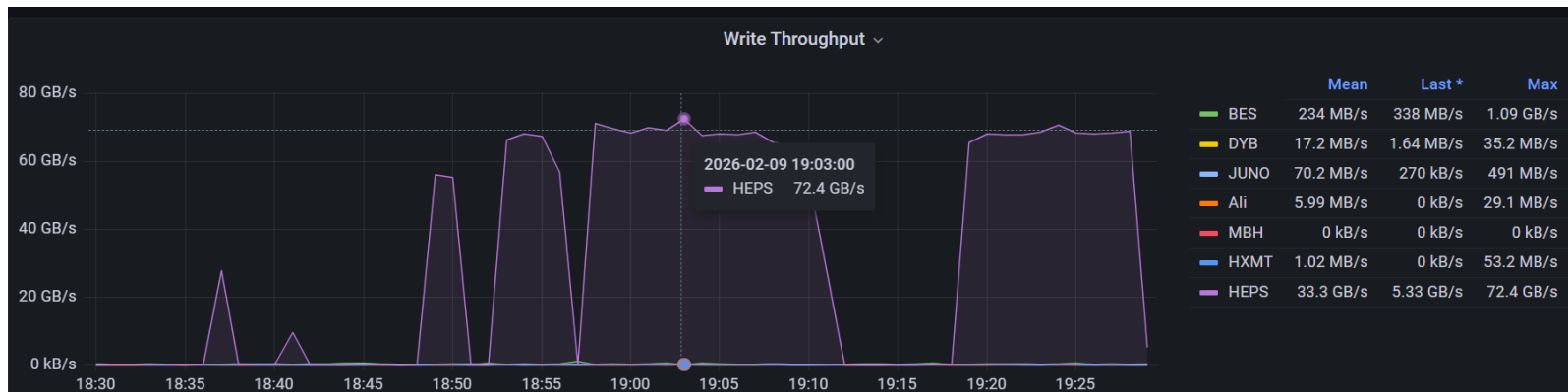


2 Rounds **13** BLs involved

222 proposals conducted

4850.5 Beamtime/hours

708 visiting users **91** institutions



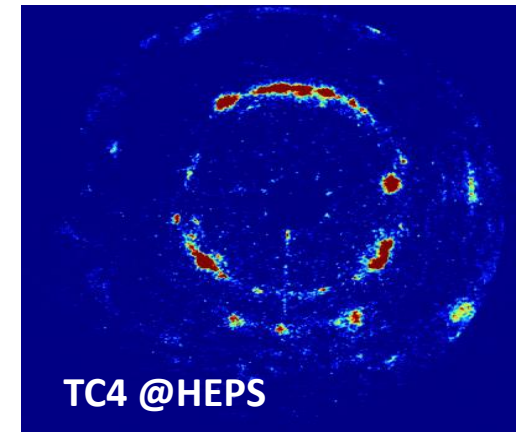
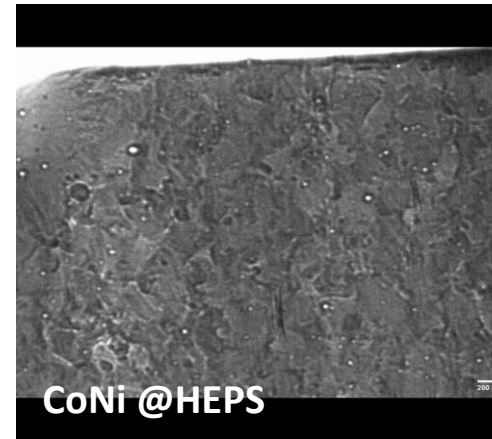
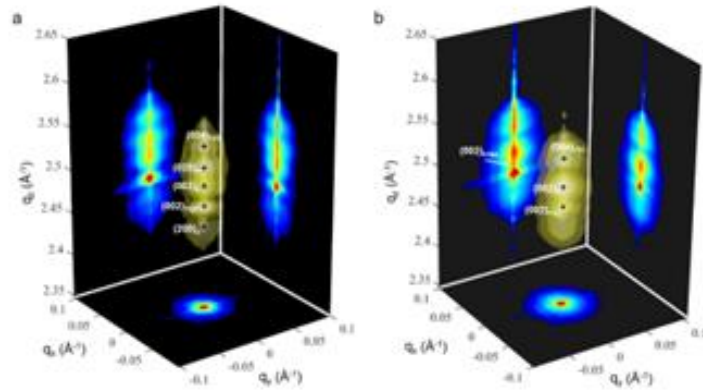
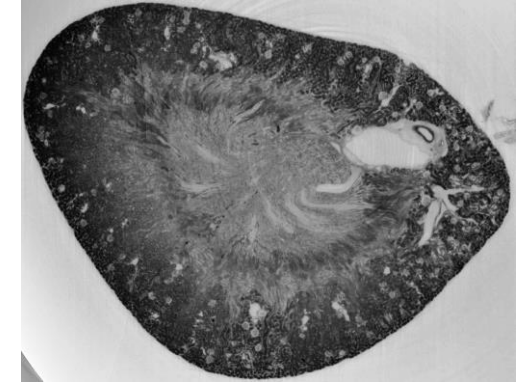
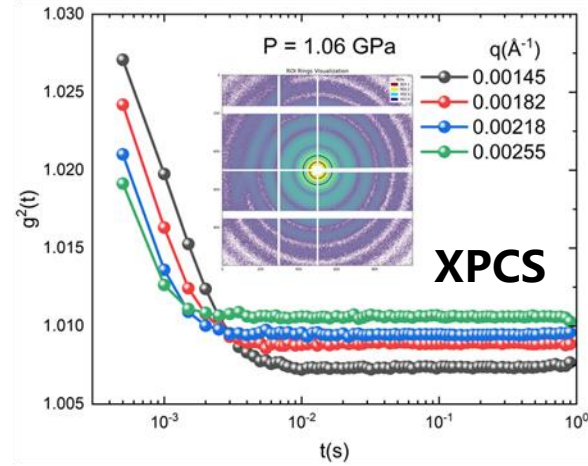
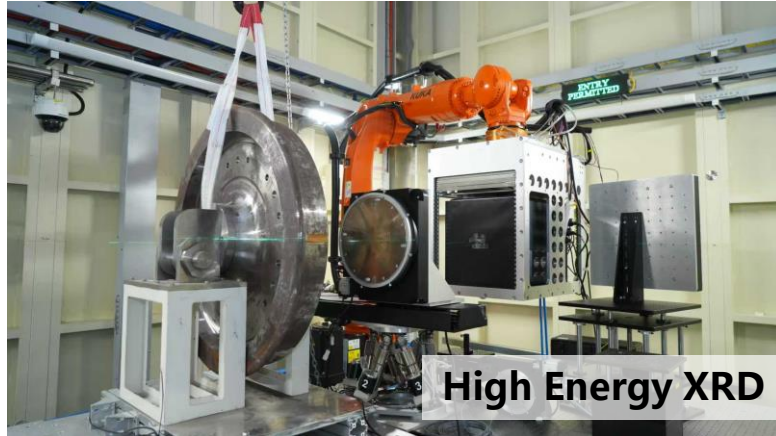
452 TB Raw & processed data

60575 datasets

Data collected from Initial
commissioning phase



Highlighted Applications



BCDI/Ptycho | X-ray Raman | Nuclear Resonance | Phase-contrast imaging | High speed

Imaging | RIXS | PDF | nano-XANES | HERFD | Nano-ARPES



HEPS | HIGH ENERGY PHOTON SOURCE

HEPS IAC Meeting 2026

May 14, 2026

Summary

- As a green-field fourth-generation synchrotron radiation light source, HEPS's construction and commissioning faced various challenges, but have been progressing basically on schedule (2019-2025).
- HEPS has successfully passed the performance acceptance review, and now pilot user experiments are underway.
- HEPS is planned to be open to users globally in mid-2026.



Thanks for your attention!





Currently max. beam current ~ 40 mA

- Right after the beam storage, we met a great vacuum bottleneck.
 - Beam experiments and tunnel inspections revealed that a silicone rubber ring was left in the extraction light pipe of the R20 vacuum chamber, which caused extraordinary outgassing when synchrotron light is hitting on it.
- Now the current limitation is from RF power and voltage
 - In May to July of 2025, full installation of harmonic cavities (499.8 MHz) and fundamental cavities (166.6 MHz) is underway, which will enable substantial current enhancement

