

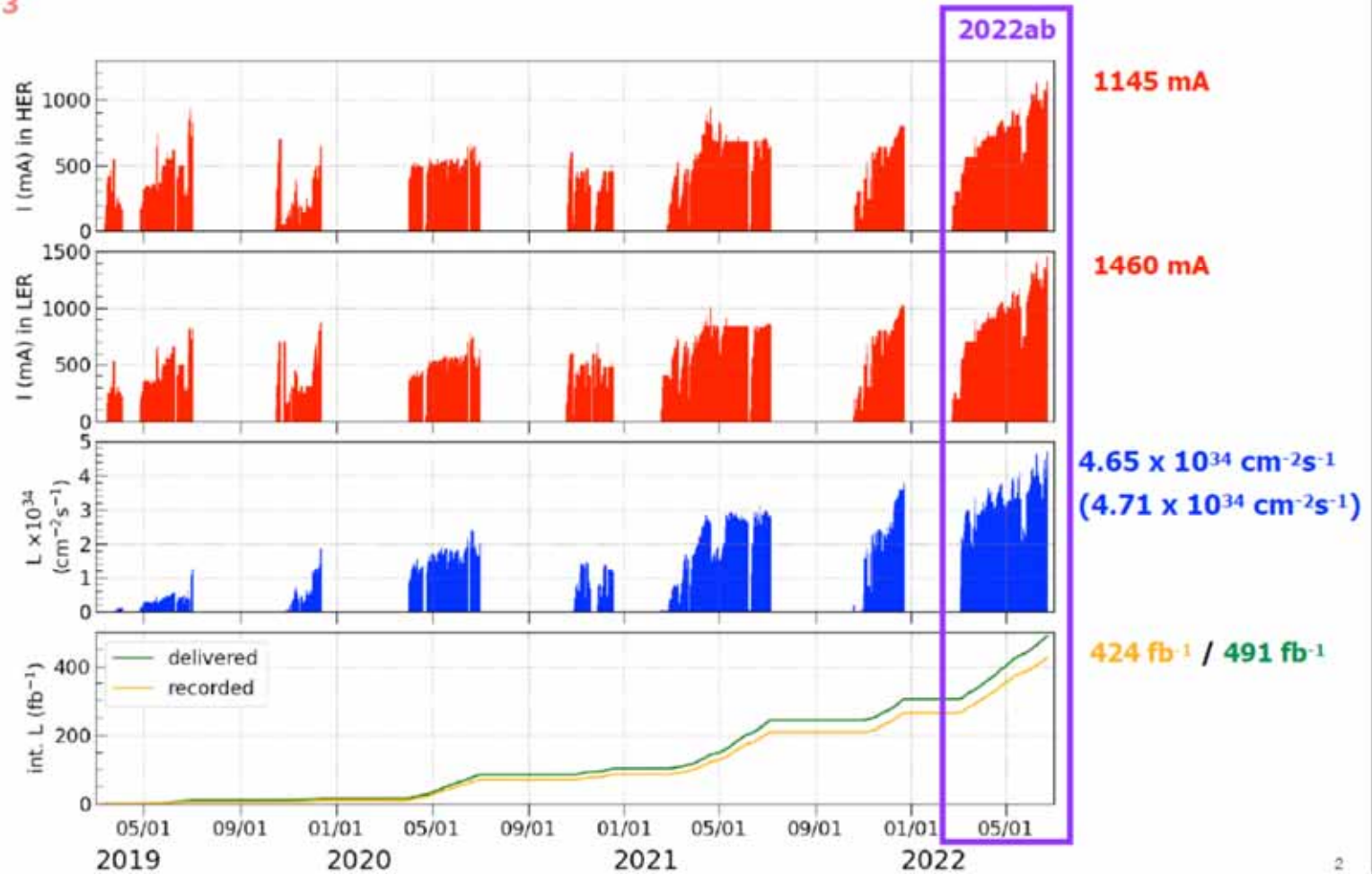
SuperKEKB Status

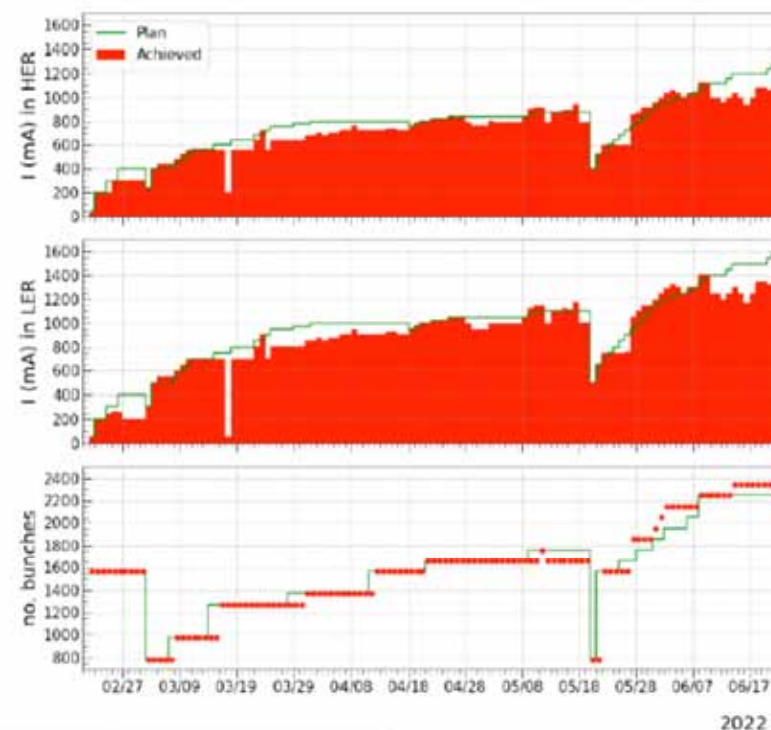
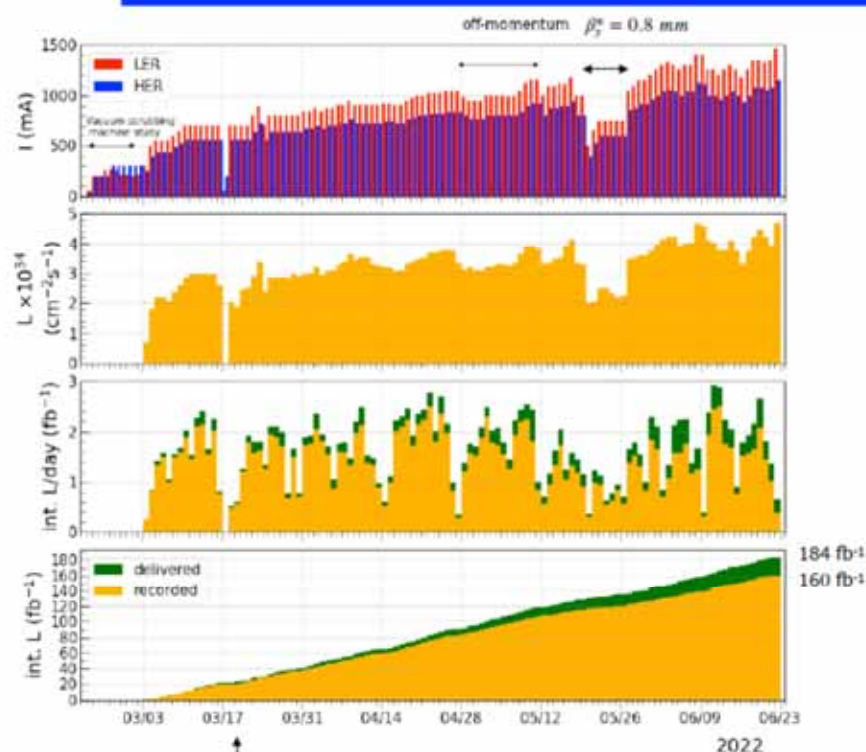
Mika Masuzawa, Hiroyasu Ego, Makoto Tobiyama

KEK Accelerator Laboratory

Recent operation

SuperKEKB Phase 3





Integrated luminosity	Recorded	Date	Delivered	Date
Shift (pb ⁻¹)	958.1	April 24, swing, 2022	1035.9	April 22, swing, 2022
1 days (fb ⁻¹)	2.503	April 22, 2022	2.912	June 11, 2022
7 days (fb ⁻¹)	15.001	April 18 - April 24, 2022	16.599	April 18 - April 24, 2022



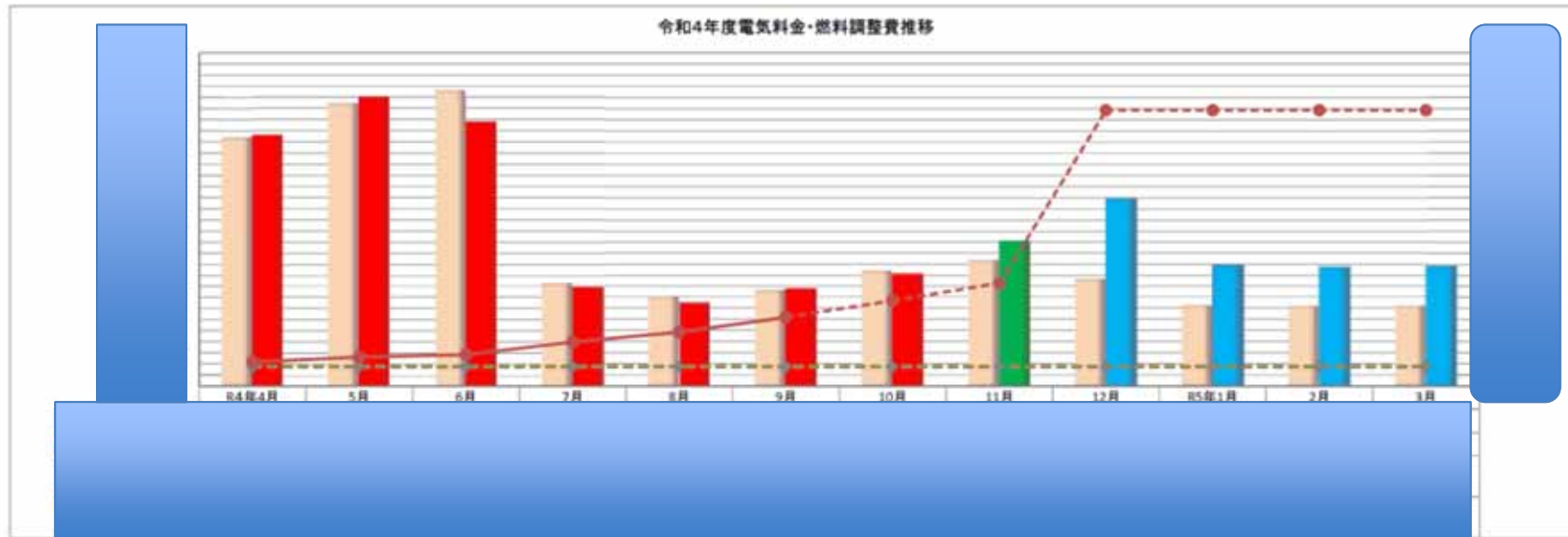
Especially on 2022b runs



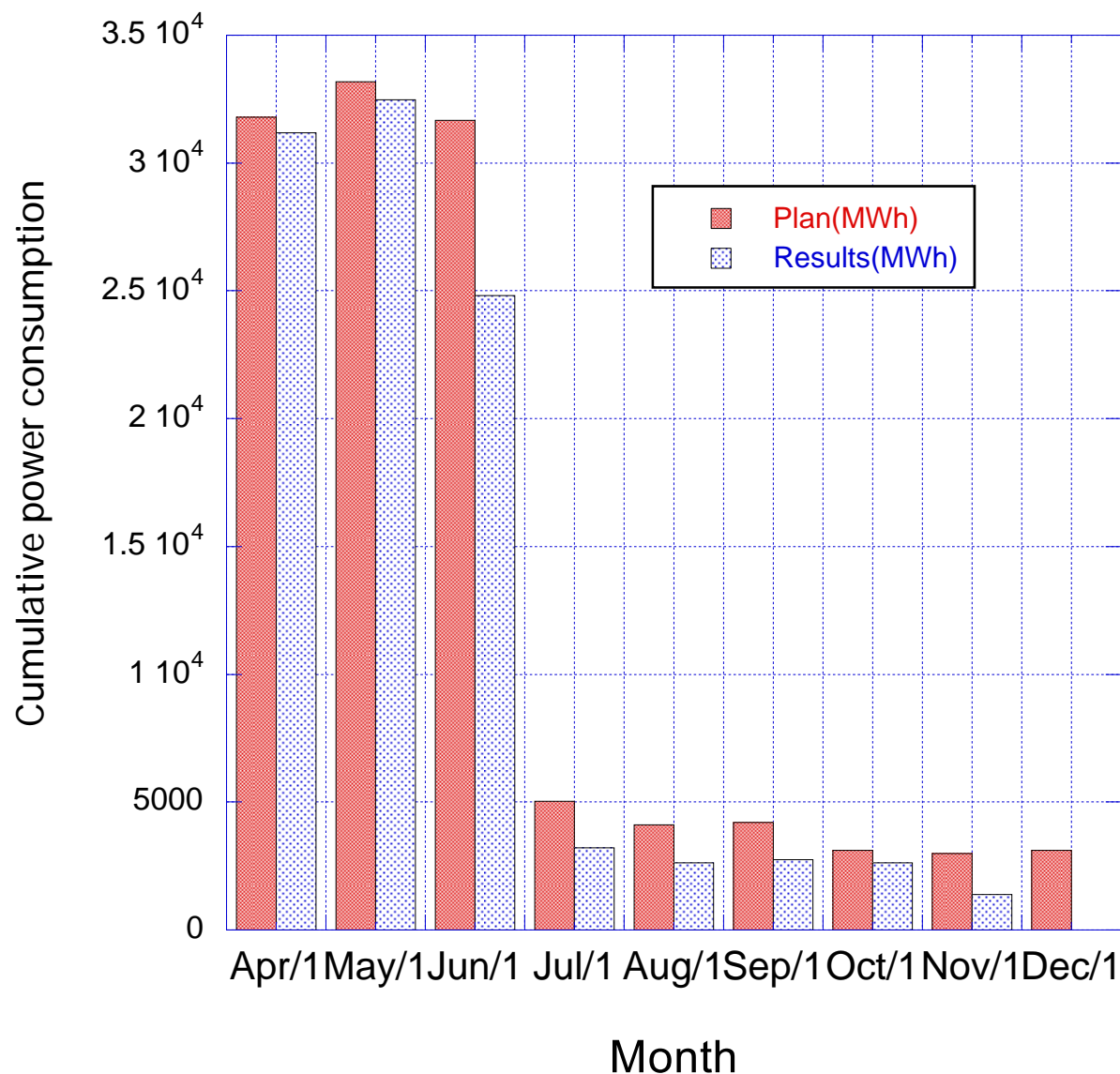
- Strongly required to get higher “peak” luminosity for the 10-years evaluation process of MEXT.
 - Decided to skip various machine studies to understand machine.
 - Could not repair damaged collimator heads.
 - Needed to skip the regular maintenance.
- Due to crazily increasing electricity costs, we had no choice but to discontinue operation and enter LS1.
 - The rising of electricity costs is continuing we are doing our best to reduce the standby power after stopping the operation of 2022b.
 - (Almost) stop the water pumps.
 - Stop the air conditioning of the power supply buildings and the arc section of the tunnel.
 - Tuning off the lights of the tunnel in the night.
 - 25Hz operation of Linac.

- Evaluation of large-scale research projects (report) "Exploring new laws of physics through advanced B-factory accelerators"
- Evaluation of large-scale research projects (report) "KEK Super B Factory Project"
 - Only Japanese report available
 - https://www.mext.go.jp/b_menu/shingi/gijyutu/gijyutu4/021/index.htm
 - *This project aims to discover and elucidate new laws of physics beyond the standard theory by further improving the performance of the SuperKEKB accelerator, which has the world's highest collision performance as an electron-positron collider. , It can be evaluated as a plan that has a strategic nature and can gain the consensus of domestic and overseas research communities and the support of society and the public.*
 - *In order to achieve the three scientific goals based on the excellent results that have been achieved so far, and to obtain scientific results, Japan will continue to take the lead in improving the performance of accelerators and appropriately promoting maintenance and management, including countermeasures against aging. It is expected that they will lead cutting-edge particle physics research and maintain their international competitiveness while fulfilling their important roles.*
 - *Considering the above comprehensively, it is evaluated that this plan should be actively promoted and should be started as soon as possible.*

Electricity charges



- Rapid increase of “Fuel surcharge” starting last year.
- Electric power co. (Kyushu Electric Power Co., inc.) strongly requested the change of contract to new scheme “Market-linked electricity rate” – KEK (Tsukuba campus) had no choice but to accept the proposal.
 - Resulting very high rate starting Dec.



Need to pay

- 4/5 of Linac electricity (during PF/PF-AR operation)
- 3/5 of facilities (Applied Research Lab.)



Comparison with previous years



■ FY2021 w/o operation

- 4,066 MWh (September)

■ FY2022

- 1378 MWh (November)

KEK Electric Power Information 2022-12-02 11:43:41

11時 51分 07 秒			
受電		20.7 MW	DM予測
受電電力計		20.7 MW	20.4 MW
KEKB		1.9	
筑波	MAG	0.1	中央・南
	He冷凍機	0.0	4.8
	RF	0.0	ACC
	Utility	0.7	0.2
大穂	MAG	0.1	ERL開発棟
	RF	0.0	0.1
	Utility	0.2	N-EXP. H.
			0.2
富士	MAG	0.0	ニュートリノ
	RF	0.0	0.0
	BT	0.0	STF/SAD
	Utility	0.5	0.9
			開発共用棟
日光	MAG	0.0	0.0
	He冷凍機	0.0	センター
	RF	0.0	0.9
	Utility	0.4	NML
			0.1
			超伝導
			0.1
			一般電力
			0.5
			ATF
			1.3
			AR
			6.2
			PF
			7.8
			入射器
			2.4
			光源
			3.0
			PFエネセン
			0.6
			一般
			1.2
			DR
			0.6

- If the current electricity bill continues as it is, not only will we be unable to operate any accelerators at all next fiscal year, but there is a risk that we will not be able to even maintain the equipment.
 - In order to operate the SuperKEKB accelerators as planned (~5 months), large amount of additional budget (of 10 B yen or more) might be required.
- We will need to check the accelerator components before restarting operation (conditions, water cooling, stabilities, etc).

Unwanted Long Shutdown and LS1

Half a year delay

We could start a part of LS1 work already from summer to gain more contingency for later works. We could also add several other works for machine and detector. TB will discuss what we can do.



One year delay

One year delay scenario looks less meaningful than before. EB will discuss this.





After LS1



- The prices of the items (magnets, concrete radiation shield, lead radiation shield, etc.) have skyrocketed, and the delivery times have been terribly delayed.
 - We are making every possible efforts not to delay the startup of the accelerators in October next year, including the budget carryover procedures.
- Belle II will decide the starting-up time, around next May.
 - Might be too late for the preparation of IR recovery works.
 - PXD sensors situation.



Human resources



■ ACCL 3rd (Head: M. Tobiya)

- Safety, Vacuum, RF system, NC cavity, SC Cavity, Cryogenics, Acc. Theory
- Prof.: 5, Assoc. Prof.: 8, Assist. Prof.: 4, Technical staff: 10, Re-hired: 9

■ ACCL 4th (Head: M. Masuzawa)

- Control, BT, Beam Instruments, Magnet, SC Magnet, Commissioning
- Prof.: 4 Assoc. Prof.:8 Assist. Prof.:6, Technical staff: 10, Re-hired: 11

■ ACCL 5th (Head: H. Ego)

- Prof.: 6, Assoc. Prof.: 7, Assist. Prof.:5 PD 1, Technical Staff:6, Re-hired:14



The 26th KEKB Accelerator Review



- 23rd (8/Jul/2019-10/Jul/2019)
 - In person review
- 24th (15/Jul/2020)
 - Online review
- 25th (1/Sep/2021 2/Sep/2021)
 - Online review
- International Task Force ARC review (7/Mar/2022)
 - Online
- This review (13/Dec/2022 to 14/Dec/2022)
 - In person + Hybrid review

TUESDAY, 13 DECEMBER			
8:30 AM	→ 9:00 AM	Executive session	① 30m ② -
9:00 AM	→ 9:10 AM	Welcome	① 10m ② -
9:10 AM	→ 9:40 AM	SuperKEKB Status Speaker: Tobiyama	① 30m ② -
9:40 AM	→ 10:10 AM	2021c-2022b Speaker: Ohnishi	① 30m ② -
10:10 AM	→ 10:30 AM	Belle II Status Speaker: Matsuyaka	① 20m ② -
10:30 AM	→ 11:00 AM	MDI (BIG) Speaker: Nakayama	① 30m ② -
11:00 AM	→ 11:10 AM	Coffee break	① 10m
11:10 AM	→ 11:40 AM	Control Speaker: Hiroshi Kaji	① 30m ② -
11:40 AM	→ 12:10 PM	Monitor Speaker: Tobiyama	① 30m ② -
12:10 PM	→ 1:30 PM	Lunch	① 1h 20m
1:30 PM	→ 2:00 PM	Injector Speaker: Satoh	① 30m ② -
2:00 PM	→ 2:30 PM	Injection Speaker: Ito	① 30m ② -
2:30 PM	→ 3:00 PM	BT Speaker: Tanaka	① 30m ② -
3:00 PM	→ 3:10 PM	Coffee break	① 10m
3:10 PM	→ 3:40 PM	Vacuum Speaker: Shibata	① 30m ② -
3:40 PM	→ 4:10 PM	MR magnets and QCS Speaker: Aikawa	① 30m ② -
4:10 PM	→ 4:40 PM	RF Speaker: Hoshizaki	① 30m ② -
4:40 PM	→ 5:00 PM	Helium refrigerator for SRF Speaker: Hasegawa	① 20m ② -
5:00 PM	→ 7:00 PM	Executive session(2)	① 2h ② -

WEDNESDAY, 14 DECEMBER				
8:30 AM	→ 9:00 AM	Executive session	⌚ 30m	🔗
9:00 AM	→ 9:30 AM	Optics issues Speaker: Sugimoto	⌚ 30m	🔗
9:30 AM	→ 10:00 AM	Collimator issues Speaker: Ishibashi	⌚ 30m	🔗
10:00 AM	→ 10:30 AM	Impedance issues (-1 mode Bx B FB etc.) Speaker: Ohmri	⌚ 30m	🔗
10:30 AM	→ 11:00 AM	Sudden Beam Loss Speaker: Ikeda	⌚ 30m	🔗
11:00 AM	→ 11:30 AM	NLC (What NLC is.) Speaker: A. Morita	⌚ 30m	🔗
11:30 AM	→ 12:00 PM	LS1 Status Speaker: Shibata	⌚ 30m	🔗
12:00 PM	→ 1:20 PM	Lunch	⌚ 1h 20m	
1:20 PM	→ 1:40 PM	ITF activity summary Speaker: Masuzawa	⌚ 20m	🔗
1:40 PM	→ 2:10 PM	Beam-Beam, comparison of bb interaction between simulations and experiments Speaker: Zhou	⌚ 30m	🔗
2:10 PM	→ 2:40 PM	LS2	⌚ 30m	🔗
2:40 PM	→ 3:30 PM	Others	⌚ 50m	🔗
3:30 PM	→ 3:40 PM	Coffee break	⌚ 10m	
3:40 PM	→ 5:30 PM	Report writing	⌚ 1h 50m	🔗
5:30 PM	→ 5:50 PM	Closing	⌚ 20m	🔗



Summary



- Peak luminosity of $4.7 \times 10^{34} \text{cm}^{-2}\text{s}^{-1}$ has been achieved.
- Demonstrated stable operation over 1A in the LER (with smaller bunch current less than 0.7mA/bunch).
- We have successfully passed the MEXT review.
- We are doing our best to deal with the soaring electricity bills, but at the moment the outlook for operating costs is not bright.



Backup slides

