

BEAM TRANSPORT, INJECTION

13/Jun/2016 21th SuperKEKB Review N.lida for KEKB/BT Group

Contents

- Introduction
- Upgrades for SuperKEKB
 - 1. Changes of the beam energies
 - 2. New septum magnets
- Phase1 Commissioning and status
 - 1. Orbit, charge, and Injection
 - 2. Optics measurement with wire scanners
- Issues
 - 1. Water interlock
 - 2. X-Y Coupling in e+ line
- Summery



Introduction

Components of BT lines

Magnet, PS	e-		e+	
	Magnet	Power Supply	Magnet	Power Supply
Dipole	65	18	58	16
Quadrupole	53	23	53	53
Sextrupole (Phase2)	2	2	2	2
Steering	45	45	50	50
Backleg	25	25	16	16
Injection Septum	4	4	2	2
Injection Kicker	3+3	3+3	3+3	3+3

Monitor, Collimator	e-	e+	
BPM	60	60	
Screen monitor	20	20	
Wire scanner	5	6	
Collimator	4	9	
Beam shutter	2	1	

13/Jun/2016

21th SuperKEKB Review

Upgrades for SuperKEKB

- 1. Changes of the beam energies
- 2. New septum magnets

1. Change of the Beam Energy

- e-: 8 GeV to 7 GeV, and e+: 3.5 GeV to 4 GeV
 - The layout of Switching Yard 3 (SY3) has been reconstructed.

Increase of e+ energy

- Some dipoles :
 - The power supplies are upgraded.
- Dipoles in 2nd and 3rd Arc :

The gaps have been made narrower, which increase magnetic fields without upgrading their power supplies nor the water cooling of magnets.

Upgrades for SuperKEKB

Energy Compression System(ECS) at SY3





Upgrades for SuperKEKB

N. lida, 18th MAC

Chicane of ECS

SY₃

SY3 Construction changed



Magnets of ECS were removed and the new ones will be installed in this summer.



New Energy Compression System(ECS) of positron line at the end of LINAC is under construction, which is needed to change the energy of positron from 3.5 GeV to 4 GeV.

(Lang)

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T. Mori, 19th MAC

2. New Septum Magnets



MR beam duct mockup (SUS430)

					110
		HER	LER		
Magnet	Septum conductor width	ective septum width 3.5mm		Pickup coil	
	Effective septum width			0.5mm Si-steel shee	
	Gap	8mm			
	Core length	1m	790mm		

 For smaller injection error, the effective septum thickness is narrowed from 5mm to 3.5mm. (only HER in Phase1, and LER in Phase2)

- 1. Orbit, charge, and Injection
- 2. Optics measurement and matching with wire scanners



The e+ beam with huge emittance comes from the Flux Concentrator without Damping ring now. We use the collimators to guard the cavities.

Electron/Positron Orbit ON



Electron Orbit OFF measured 06/12/2016 20:35:41 ž LINAC 400 200 600 800 1000 measured 06/07/2016 07:16:14

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1. Injection

The injection efficiencies are good for the both rings.



The vertical jitter of the electron beam is large, which affects the injection efficiency.







Measured Emittances by WS



Issues

Water interlock

- 1. The dipoles are down due to the water interlock 2-3 times for a week.
 - The water of the cooling system is polluted by CuO. The Cu is dissolved from the cooling-water pipes.
- 2. The water interlocks of some dipoles whose gap is narrowed work by the leaked magnetic field (20~30Gauss) from the dipoles.
 - The iron cans are covered over the flow meter.
 - The reason is thought the interlock switches became older.
- X-Y Coupling in e+ line



Issues

Abnormal X-Y Coupling in the e+ BT





- Some hypothesis can be thought to explain the dispersion pattern.
 - 1. The quadrupole, QCD2P, is rotated -107 mrad.
 - 2. Some of the quadrupoles around the 3rd Arc are rotated ~10mrad.
 - 3. The dipoles of the 3rd Arc, BH3P, have sextupole components.
 - K2=0.1 at ∆Y=10mm.
 - The magnetic measurements of the dipoles were not so large.
 - The interference from the neighbor magnets are also suspended.
- All of them are not realistic.
- We will study more.

Summery

- The performance of BT is almost well.
- Some issues are not serious in Phase 1, but they should be improved by the beginning of Phase 2.

Thank you.



Charge at the end of BT



e- Orbit from RF-Gun

File Ref BPM Update



e+ Orbit

File Ref BPM Update



2016/06/06 15:29:35 v4.0c

Phase 1 Commissioning and Status Collimation







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Measured Emittances

