Positron Injector Linac Upgrade for SuperKEKB
(4 challenges in the upgrade)

Takuya Kamitani (KEK)
SuperKEKB Injector & e+ source

1.1 GeV Damping Ring circ. 136 m

ECS

BCS

photo cathode

RF gun

thermionic gun

e+ for LER
3.5 -> 4.0 GeV
(1 -> 4 nC) x 2
2000 -> 92[H]/7[V] um

e- for HER
8.0 -> 7.0 GeV
(1 -> 5 nC) x 2
300 -> 20 um

50 Hz (e+ or e-) pulse-by-pulse mode switching

e+ target & capture section
2T pulsed coil
-> 5T Flux Concentrator (AMD)
6m S-band structures (2a=21mm)
-> 12m L-band (35mm) or L.A. S-band (30mm)
(1) Can we develop Flux Concentrator?

- **Flux concentrator**: eddy current driven 5-T pulsed solenoid
- **Spiral slit FC or Straight slit FC?**
- **No water leaks and No breakdowns in operation?**
- **FC offset and Target offset OK?** e+ yield reduced?

LINAC-2012 conference in Tel Aviv, Israel, 2012.09.10, "Positron Injector Linac Upgrade for SuperKEKB" by Takuya Kamitani
(2) Can we eliminate satellite particles?

- e+ capture in deceleration phase
  -> satellite particles
  -> radiation at DR injec.

- co-prime (5/11)
  L-band frequency capture section effectively reduce satellite particles

- L-band component R&D underway, but construction cost high

- How to survive with S-band capture section?
  - large aperture S-band
  - high field helps?
  - deflector?
(3) Can we manage e⁺/e⁻ compatible optics?

- different energy e⁺/e⁻ beams in the same Q magnet field
  -> compromised optics

- pulse Qs can be installed in region after DR
(4) Can we catch up with Schedule?

ATTENTION!!
This is my personal opinion, not a formal schedule.

FC development, DC solenoid+Q+ST magnets fabrication
Capture section accelerating structures development
Beam line rearrangement, installation, alignments

FC current 50%
Solen. current 50%
Beam rep 0.5 Hz

e+ Preliminary Commissioning

LER operation

FC+Solen. cur. 100%
Beam rep 50 Hz
no DR, LER direct inj.

non-damped e+ Commissioning

LER operation

FC+Solen cur. 100%
Beam rep 50 Hz
DR -> LER injection

damped e+ Commissioning.

DR operation

HER operation

SuperKEKB Commissioning

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