



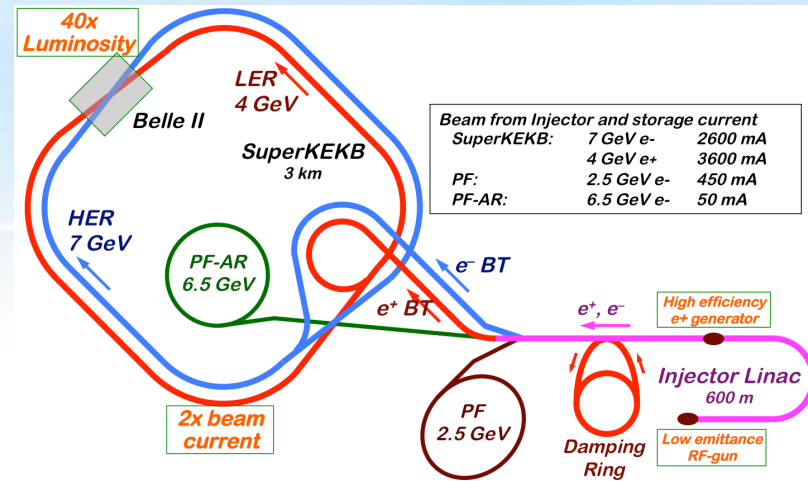
# Upgrade of KEK Electron/positron Linac Control System for the both SuperKEKB and Light Sources

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# Multi-purpose injector linac

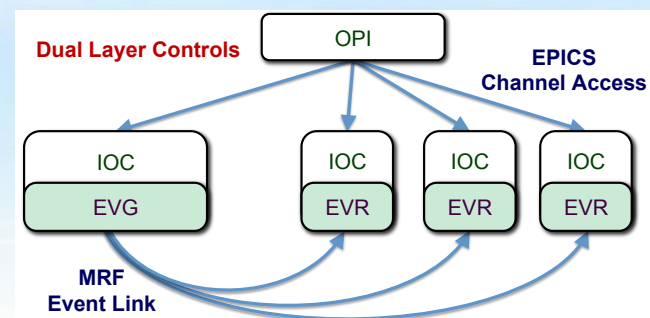
- 7-GeV electron 4-GeV positron injector linac at KEK has supported the both **particle physics** and **photon science** storage rings for more than 30 years.
- Natures of beam demanding approaches from those experiments are so different that the operation becomes tough to be planned, especially for construction and maintenance.
  - long-term integrated performance vs. short-term beam **stability**
  - continuous **improvements** vs. preventive planned maintenance
- The control system should help enabling the consistent operation.



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# Pulse-to-pulse modulation (PPM)

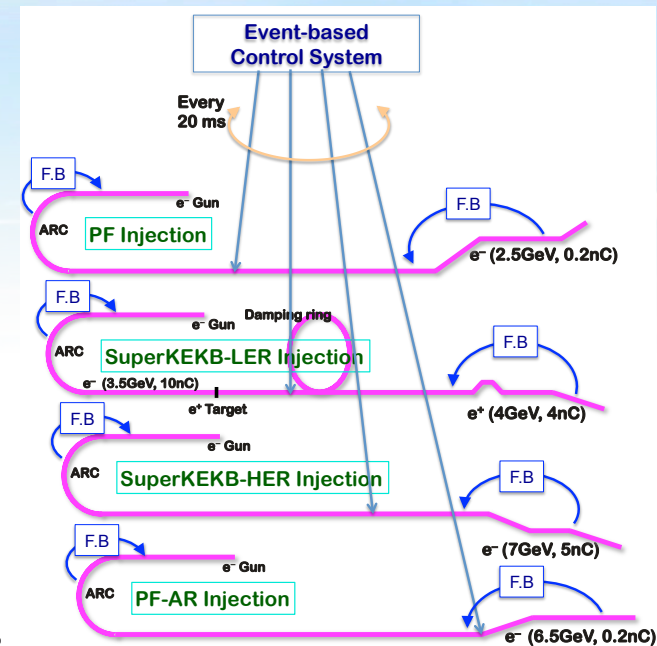
- Dual-layer controls based on MRF event controls and EPICS controls were employed in the last stage of previous KEKB project.
- Further improved for SuperKEKB with MRF/SINAP 3 x EVGs and ~100 x EVRs.
- Many PPM-capable pulsed devices were added.
  - 66 pulsed quad, bend, and corrector magnets with newly designed power supplies
  - LLRF drivers and monitors with IQ controls on FPGA and embedded EVRs
  - High-precision BPMs with wide-dynamic range, and beam wire-scanners indispensable for beam emittance management
  - Damping ring and main ring injection/extraction devices
- picosecond-level synchronization and dynamic operational configuration should be available



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# Multiple virtual accelerators

- Several beam modes are prepared
  - 2.5, 4, 6.5 & 7 GeV, 0.2 ~ 10 nC / bunch, e<sup>-</sup> & e<sup>+</sup>
- Each set of beam-mode event parameters make the single injector behave as independent virtual accelerators.
- The system is under tuning with new equipment.
- Waiting for the SuperKEKB first collision in April 2018, full operation in 2019.
- This virtual accelerator concept should satisfy the both particle physics and photon science users with the simultaneous top-up injections.



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