Cavity type laser interferometer beam size monitor (Urakawa monitor)

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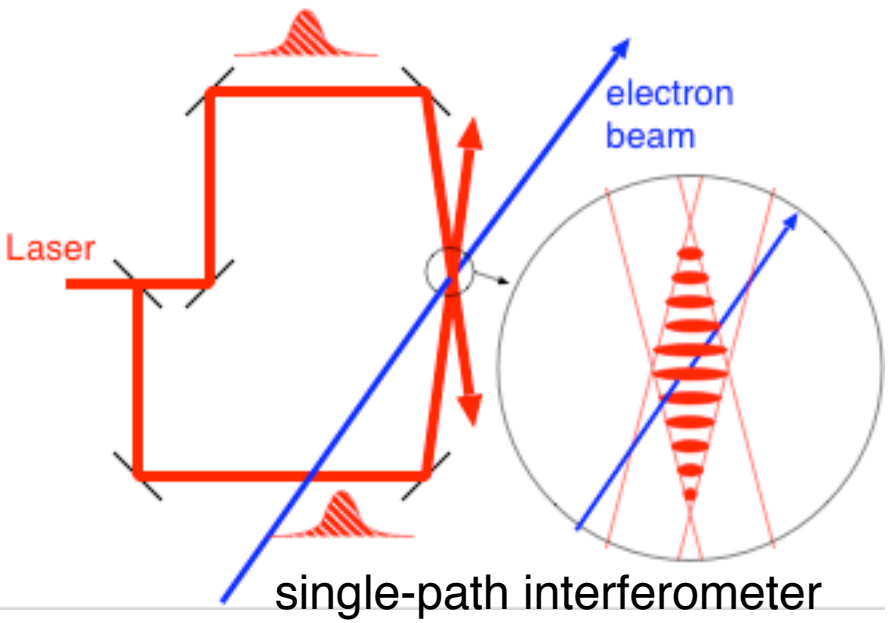
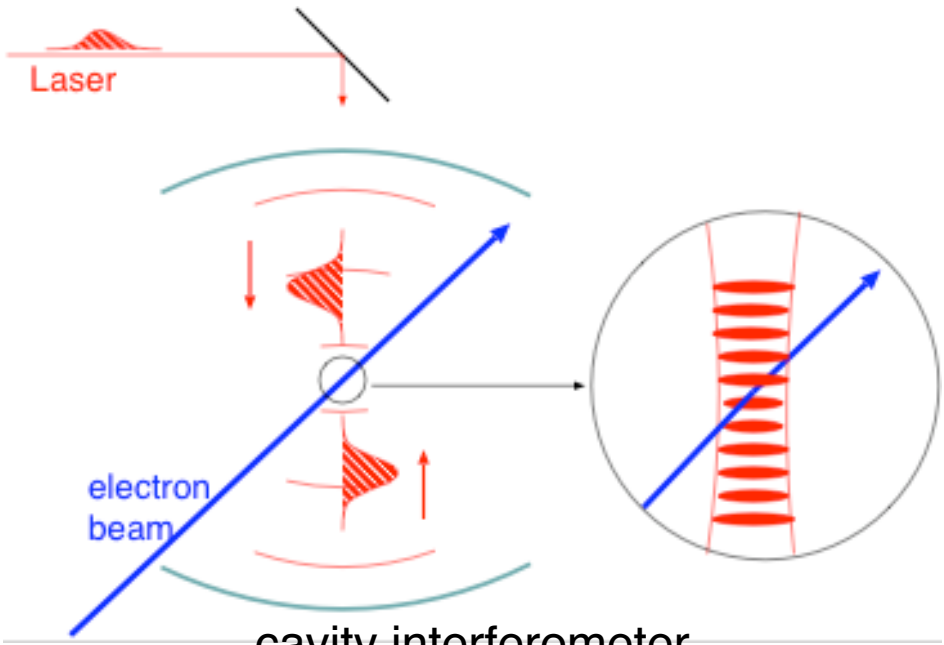
Cavity interferometer

- Principle of the beam size measurement is same as Suehara monitor
  - two laser beam of the opposite direction produces a standing wave
  - cavity case, two pulses have to be stored in the cavity
- Advantage
  - overlap of the two beams is perfect (the cavity's transverse mode)
  - time overlap can be precisely measured using cavity transmission light
- Disadvantage
  - laser power
    - >10W laser source and high finesse (10000) cavity is needed
  - stability of the cavity (and laser)
    - quiet environment and fast control



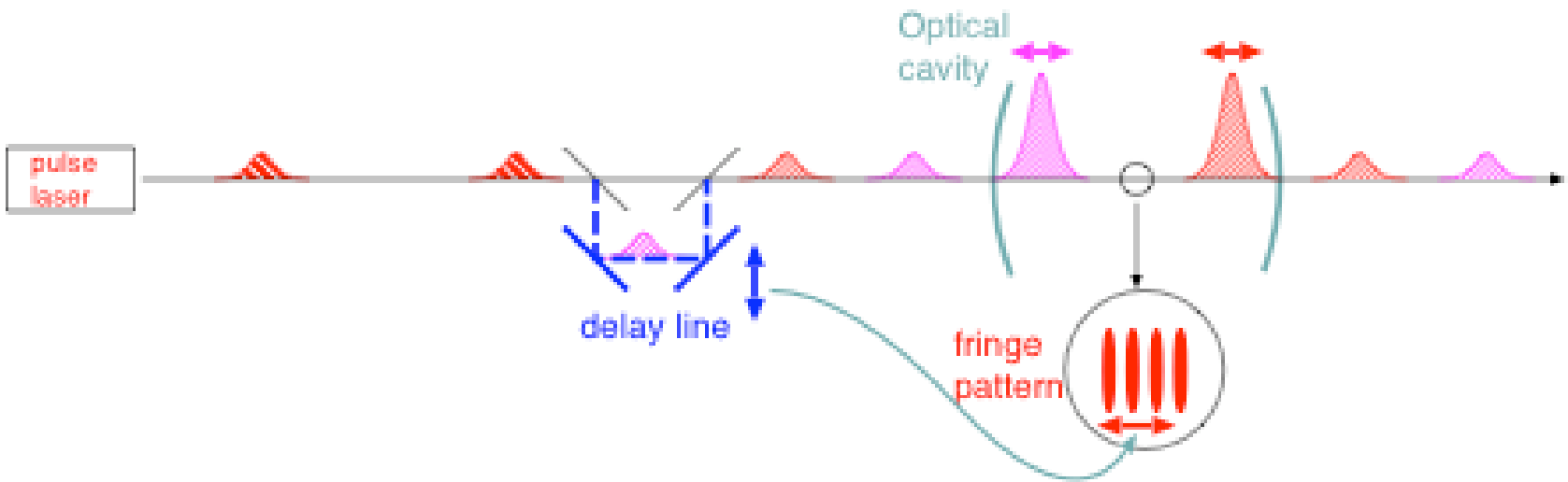
single-path interferometer
(Suehara monitor)



cavity interferometer
(Urakawa monitor)

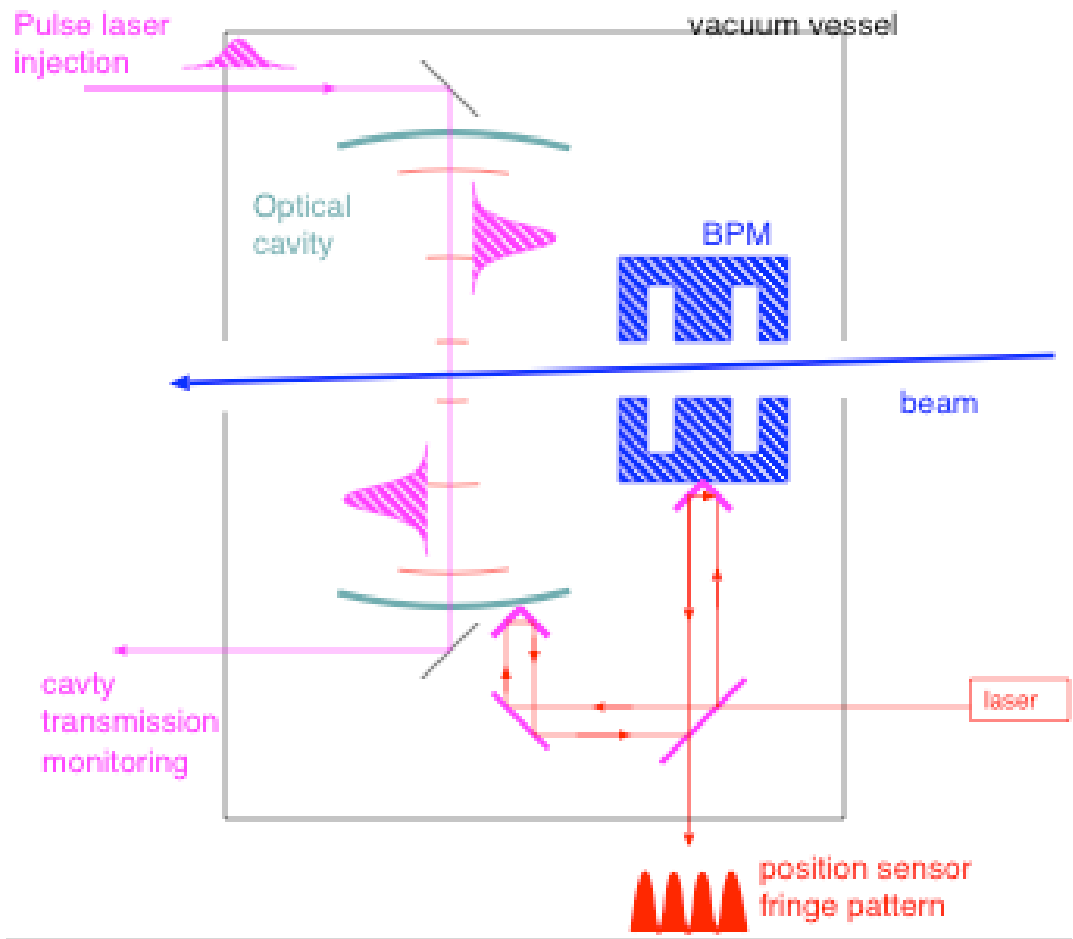
Fringe scan

- Cavity stores two pulses
  - laser's rep. rate has to be x2 of the cavity's round trip time
- Rep. rate doubling using a delay line scheme enables us to do fring scan/control
- The cavity transmission laser pulse can be used
  - monitor intensity balance of two pulses in the cavity
  - pulse spacing (fringe position) of two pulses



Fringe position and beam orbit measurement

- Position of one of the cavity mirror is a good reference of fringe position at the cavity center
- A cavity BPM will be contained in the interaction chamber
- Relative position of the cavity mirror and the BPM will be monitored by a laser interferometer



Control system

- Three control loops
  - synchronize laser source to electron beam
  - lock cavity resonance
  - fringe position control