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Mount stabilization for Shintake monitor

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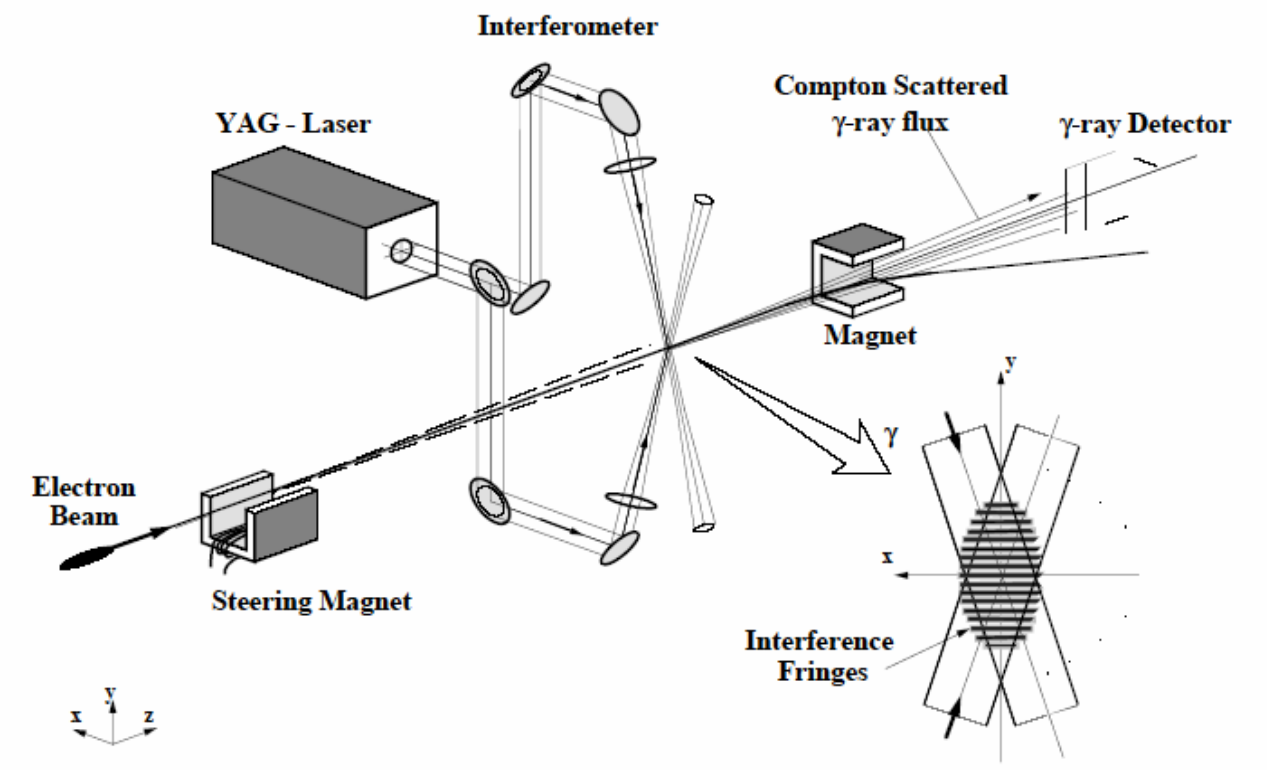
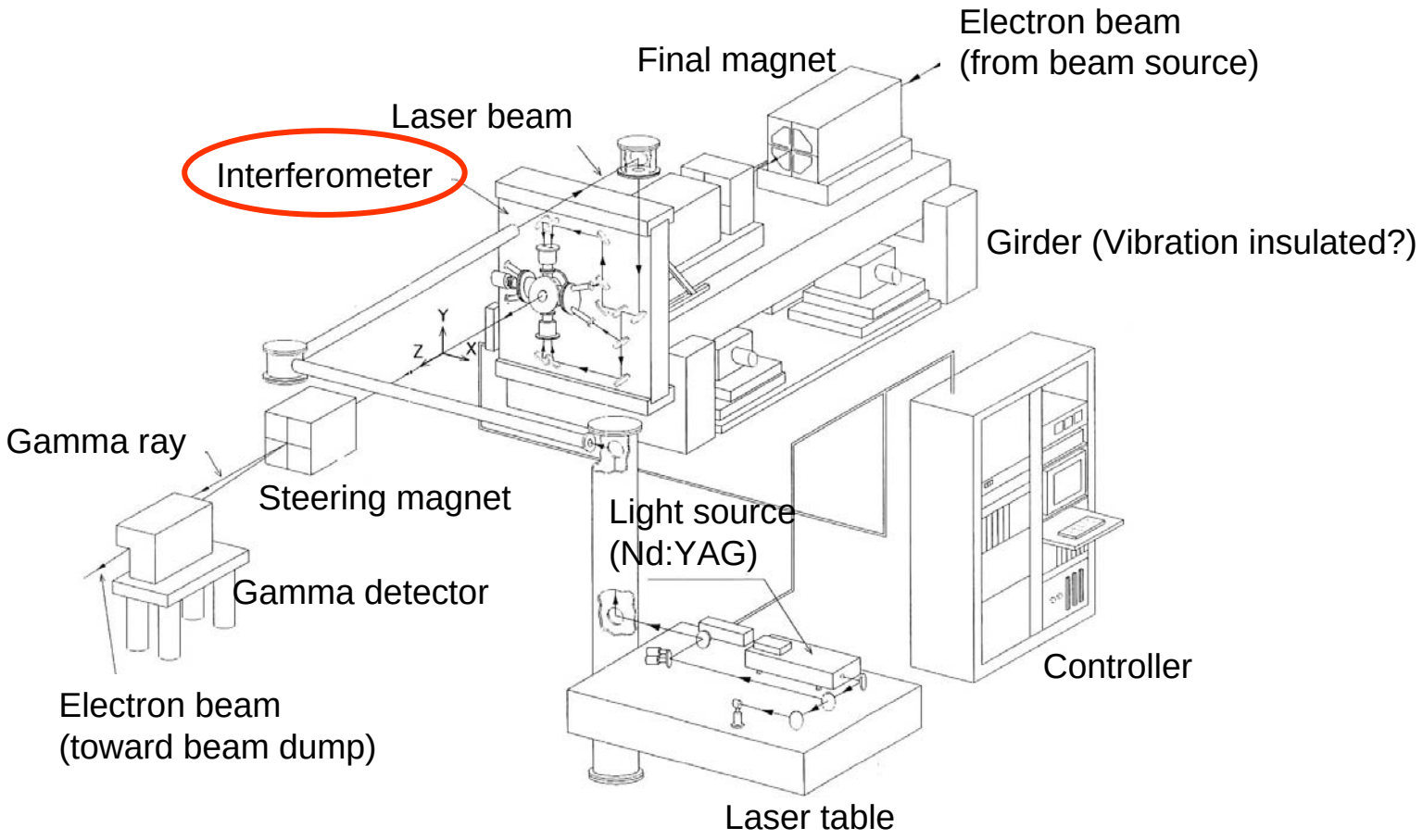
- Mount stabilization for interferometer
  - Stand alone stability for basis of total system stabilization
- Relative position stability between interference fringes and electron beam
  - Systematic stability for precise beam size measurement

Specification expected for Shintake Monitor (Laser fringe beam size monitor) in ATF2

- Measure size of the beam converged to 37 nm of diameter (+/- sigma) with accuracy of 10% or better(?) using interference fringes as a reference

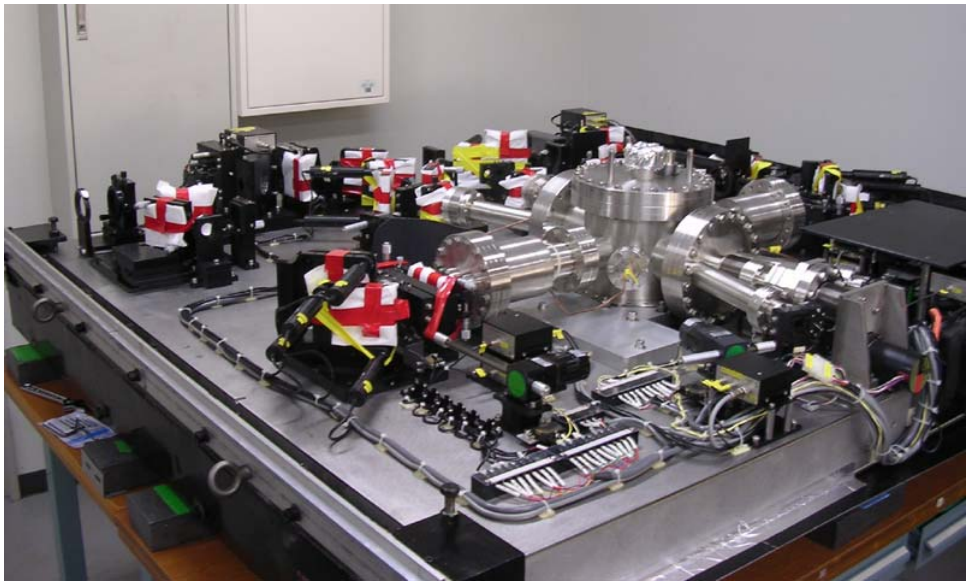


Shintake monitor system schematics in FFTB

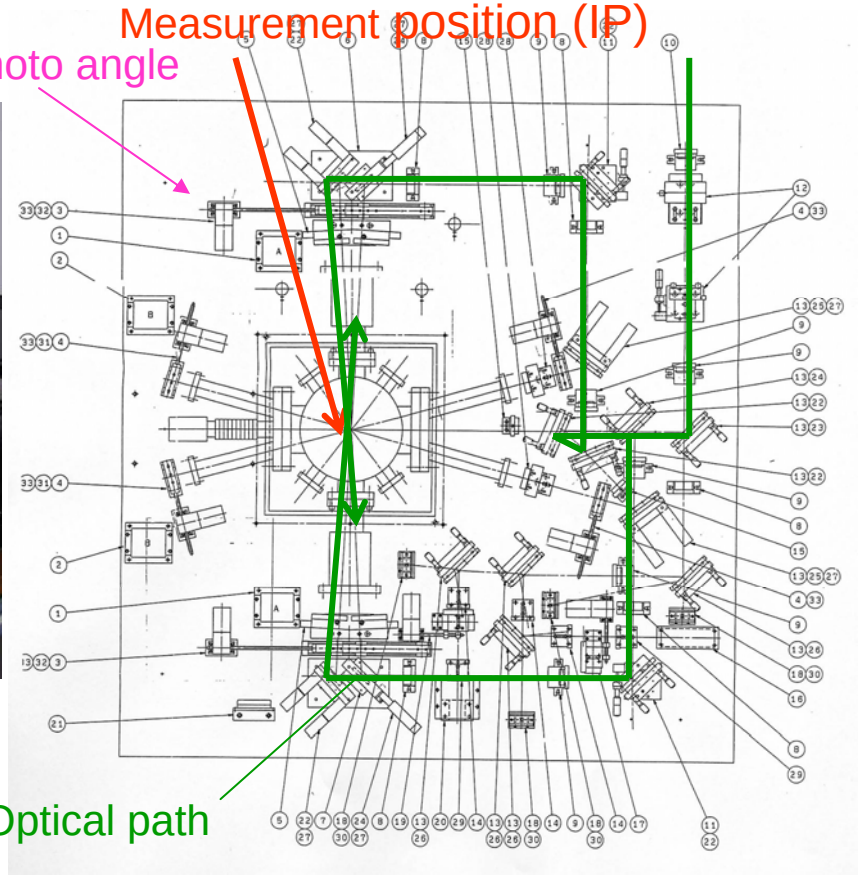


Interferometer of Shintake monitor

using table (1.6×1.5×0.1 m) to mount optics, total weight of ~740kg



Photograph of the interferometer laid for adjustment,
The optical table is supported vertical in usage.



Specifications of Shintake monitor achieved in FFTB (1993-1997)

- Measure size of the electron beam converged to 70 nm in diameter (+/- sigma) at the IP.

- Interferometer was mounted on the table (=girder) for the final magnet by steel beam rigidly (=without insulation).

  – Suggests that the configuration adopted in FFTB was enough to measure 70 nm diameter of beam->can be referred for new design.

However

- No evaluation for vibration (=short term fluctuations: 0.1sec-few min) or drift (=long term fluctuations: several10min or longer).

  -> Must to be surveyed as reference for new design

Design and estimation of stable mount for the interferometer

(Stand alone stability of the interferometer for basis of total system stability)

- Design policy
  - Based on the design for FFTB except mounting directly on floor
    - (Limited by capacity of the girder)
    - Mount on stone table with steel beam (angle)
    - Not using vibration insulators between interferometer, mount jig, and table
  - Practical design with conventional methods
  - Target of stability: micro-meter order of stability->basis of total stabilization

- Estimation points
  - Evaluate affect of floor vibration
    - difference in mount and vibration between FFTB and ATF2
  - Decide design policy for stand alone stabilization
    - Necessity of vibration insulator between the table and floor

Stability control for beam size measurement

(systematic stability for beam size measurement)

- Design policy
  - Target stability: relative position stability between interference fringes and electron beam enough to measure 37 nm diameter of beam size.
    - 10% of 37nm->3-4 nm of tolerance?

  (Not necessarily to stabilize the interference fringes nor electron beam absolutely.)

  - By using any methods including R&D if necessary.

- Reference for alignment
  - It's necessary to decide (or define) position reference for alignment (=datum) between interference fringes (=Shintake monitor) and electron beam (=final magnets).

Decide targets for stabilizing

- Decide (or estimate) targets for stabilizing.
  - Term: How long should the system be stabilized?
  - Amplitude: How precise should the system be stabilized?
  - Others.

Summary

- Interferometer is going to be mounted with stability of few micro-meters in the first design using conventional methods for basis of system stabilization.
- It seems necessary to stabilize relative position between interference fringes and electron to be few nano-meters from the expected resolution.
- It’s necessary to define position reference for systematic stabilization.
- It’s necessary to decide target in stability (term, amplitude, etc.).