Status and plan of pattern target beam size monitor

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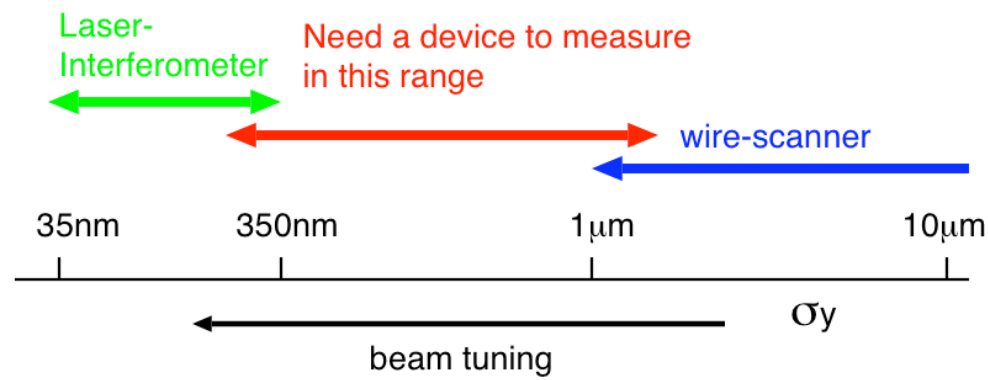
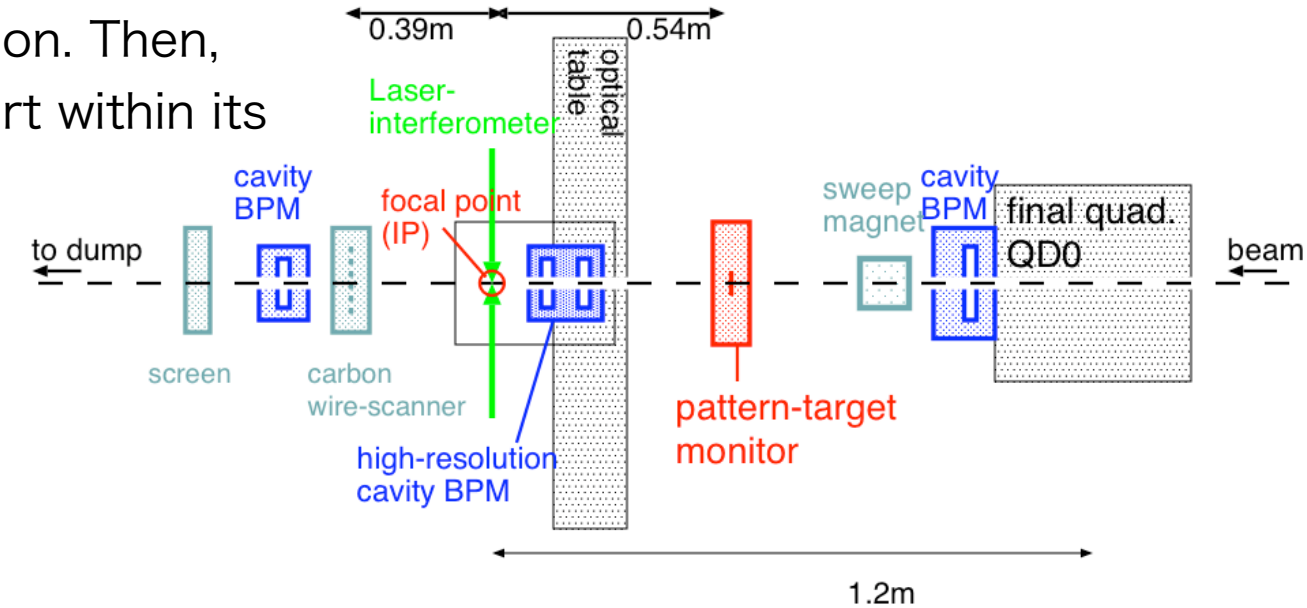
- Again, this has been discussed many times. Not going to repeat the detail introduction.
- The actual development work has not started, except for small tests that can be done easily with no budget and no man power.

Motivation

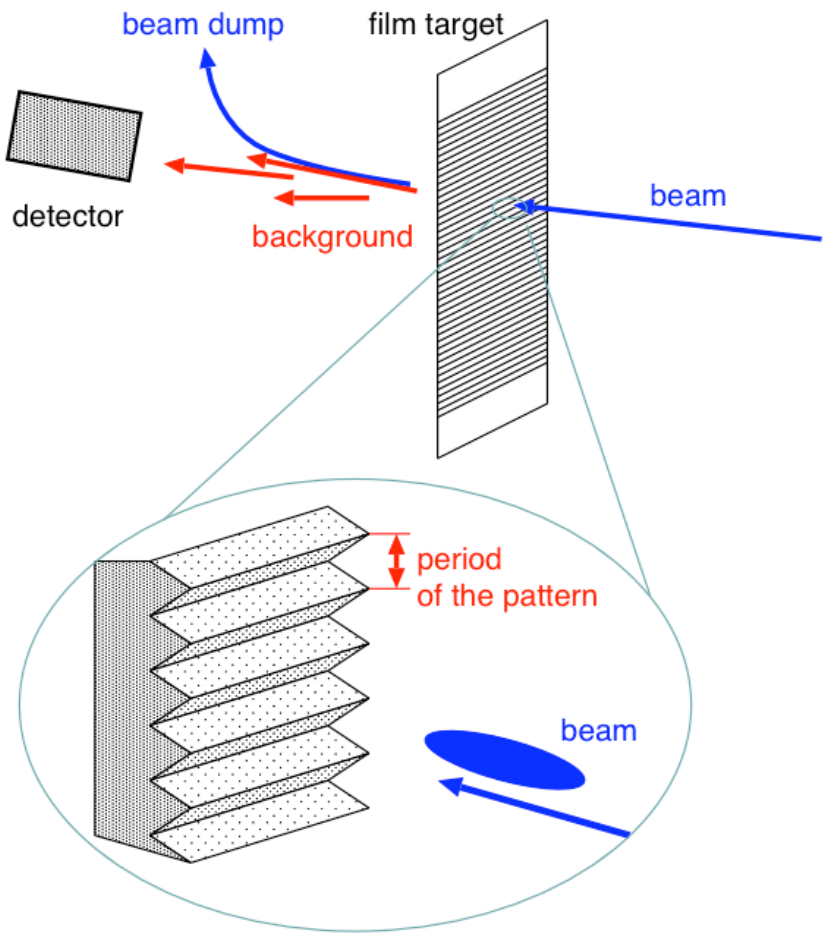
- Cover the range gap of laser-interferometer and wire-scanner, 300nm~1um region.
- Relative monitor to refer during beam tuning.
- no delicate tuning of the device for setting up.
- The location is assigned at ~0.5m upstream of the IP. Start beam tuning with IP shifted setting, then move back the IP at the designed position. Then, laser-interferometer can start within its measurable range.

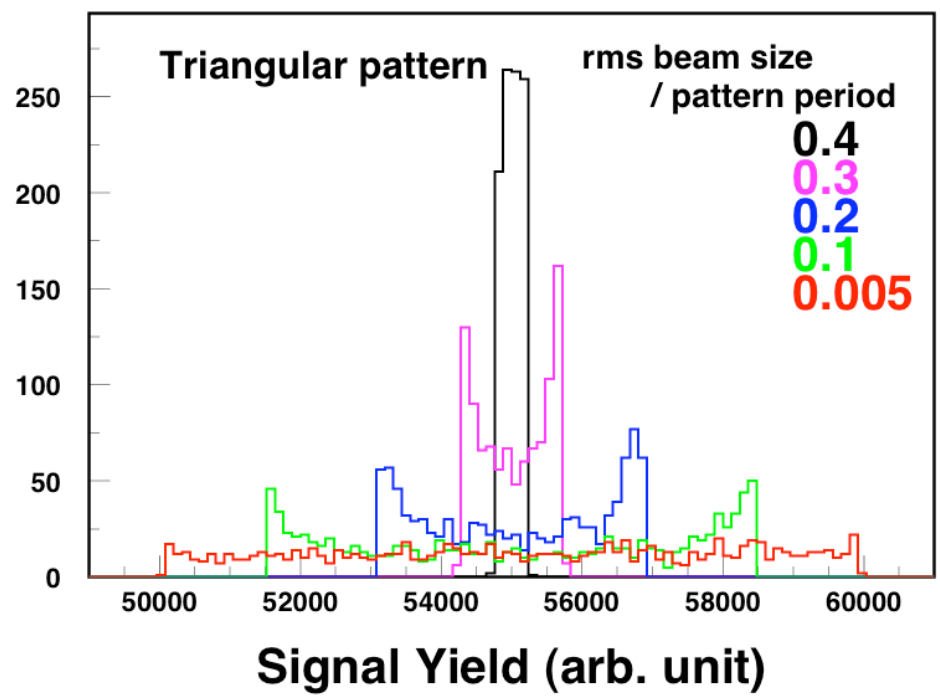




Principle

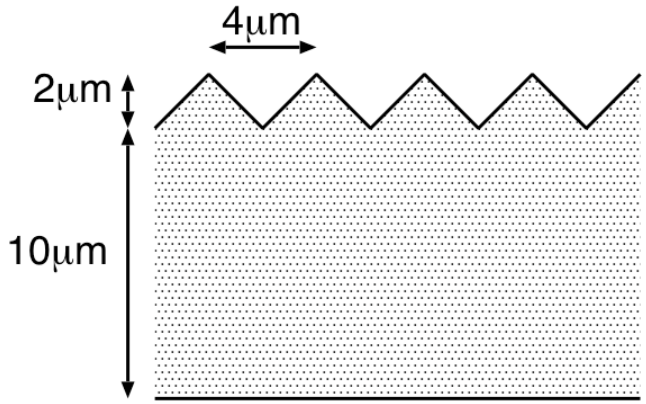
- Hit the beam on a thin film-like target with a fine pattern. Measure fluctuation of background radiation while randomly scanning the target. Smaller beam size compared with the pattern pitch results in a bigger signal fluctuation.
- Thanks to the statistical approach, precise control of target scanning or beam position stability are not required.

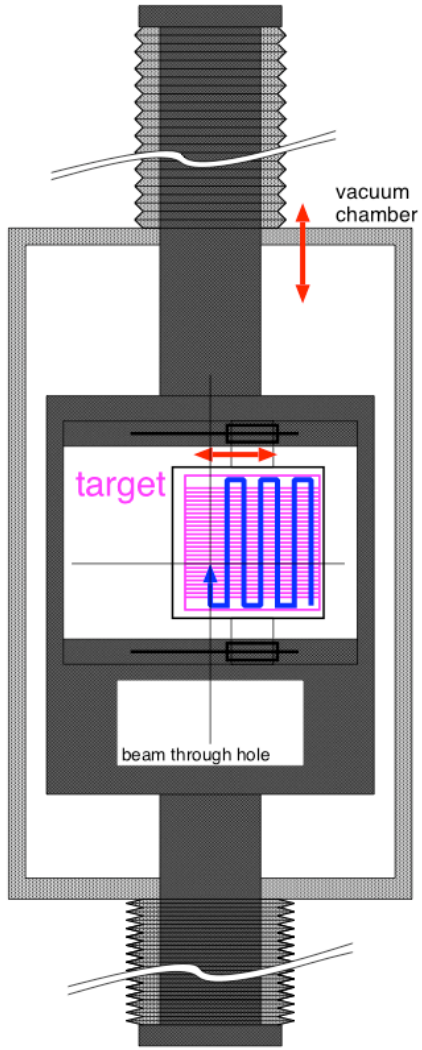




Development items

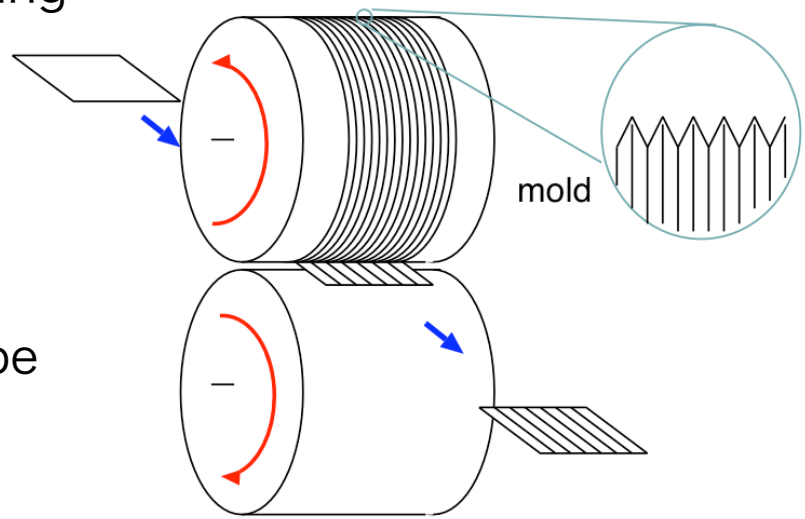
- The target must be locally damaged even by single shot. It has to be scanned continuously in order to use a new area for every shot. Need to have a long effective length enough for at least one week of operation. May be scan on a zig-zag line.
- One example of the dimensions optimized for our case is shown here.
- We need to fabricate this with an inexpensive way (it will be consumed in one week). The absolute dimensions are not so important as long as we use this for a relative reference. Uniformity and reproducibility will be important.

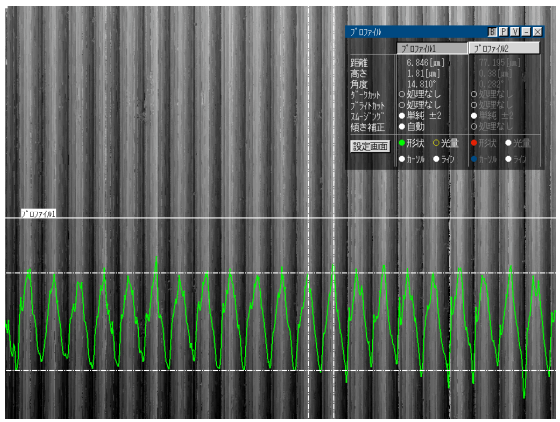




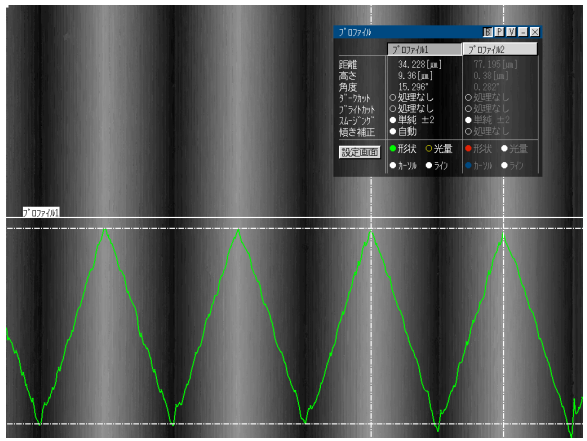
Preliminary test for target fabrication

- One candidate of fabrication method is imprinting using a roll mold.
- Test at KEK machining center with a precision turning machine. Try to check the possibility of mold fabrication.
- Triangular structure of 2um depth seemed to be OK.
- Test of imprinting will be the next item to test.





深さ2μm、S1000rpm、F1mm/min、助走路無



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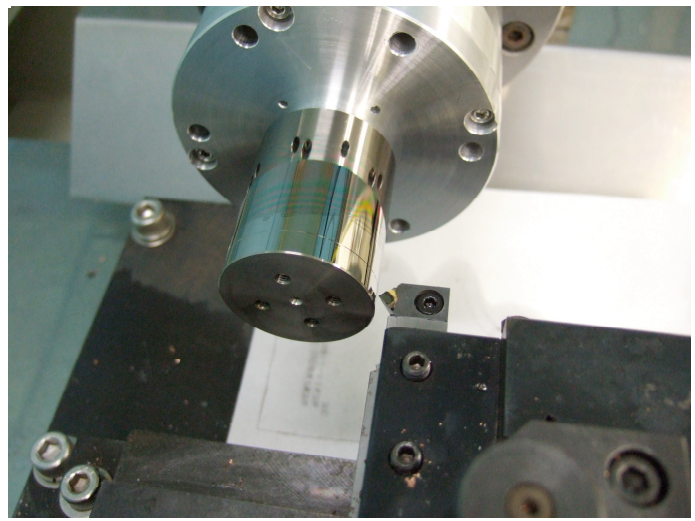

Plan for preliminary beam test

- Try to answer these questions
  - Signal strength. (It is estimated to be comparable with wire-scanners).
  - Damage area by single shot. (check with a microscope, later)
  - Effect on vacuum pressure.
- Set up
  - Re-use ODR chamber which has a scanning stage inside.
  - Installation
    - a wire-scanner to check beam size
    - an aluminium foil of 20um or 12um thickness (a dummy target)
  - Wire scanner detector
- Beam time in coming ATF operation
  - 1 hour for a week.