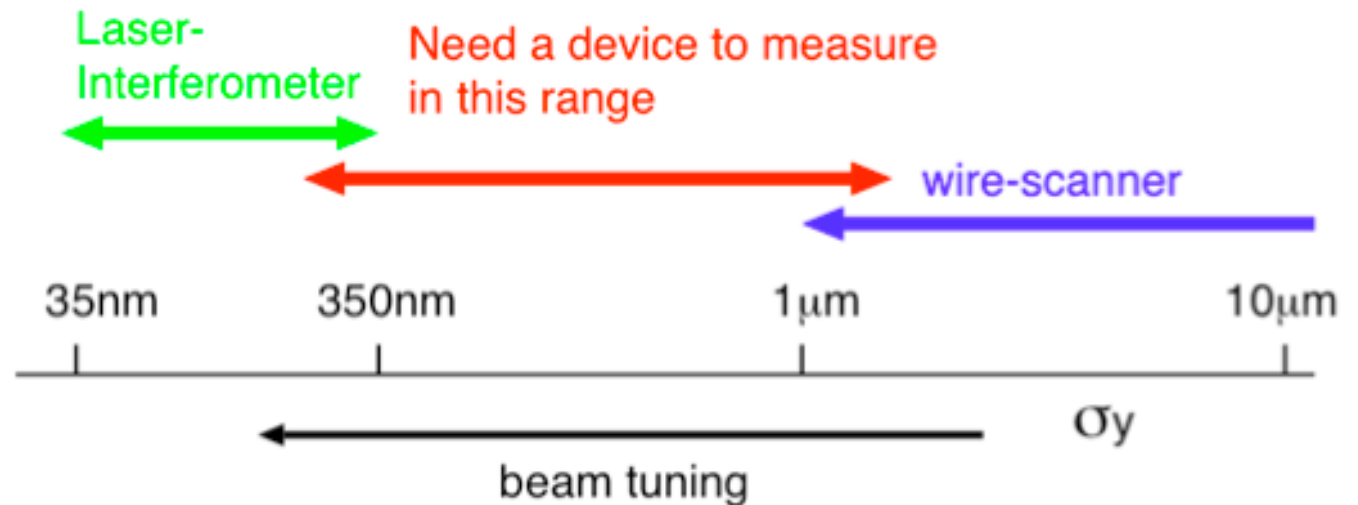


Status and plan of pattern target beam size monitor

Y.Honda
2007/Dec./19
ATF2 project meeting

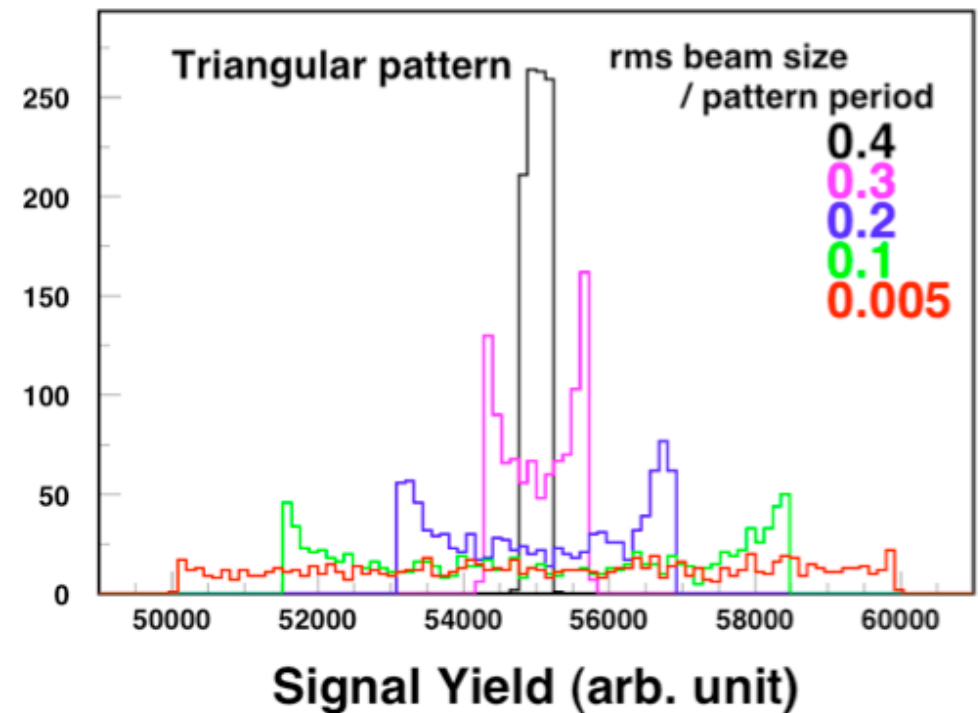
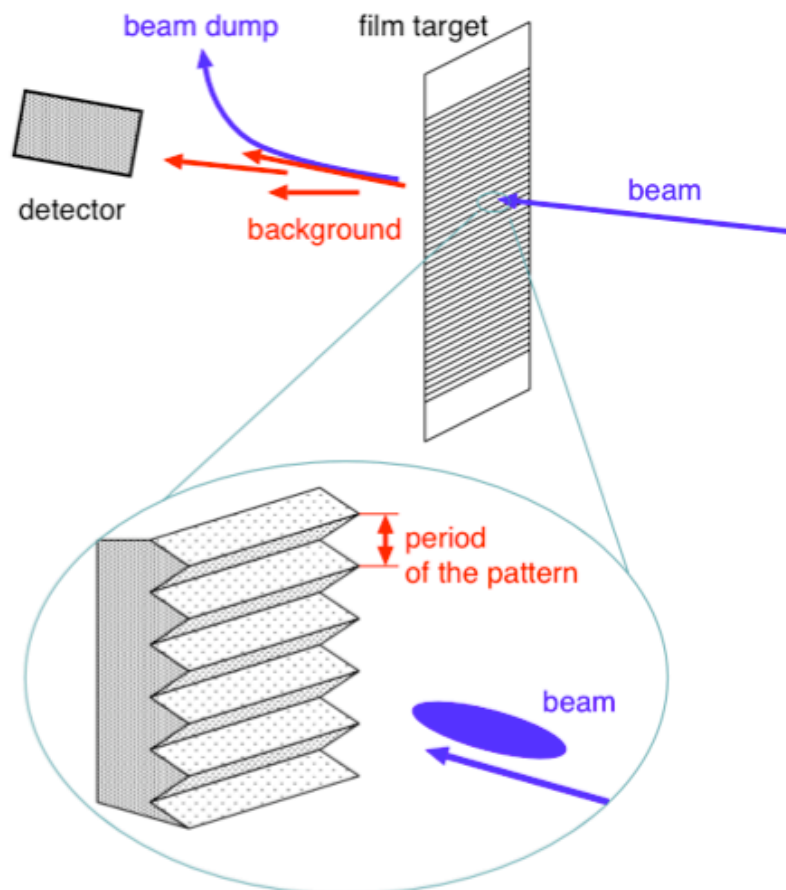
Motivation

- Cover the range gap of laser-interferometer and wire-scanner.
 - Although Shintake-monitor group is trying to increase the measurable range, it should be good to have another device.
- Absolute measurement may be difficult, but relative measurement should be useful for beam tuning.
- Easy to setup. Expert of the device itself is not necessary for operation.



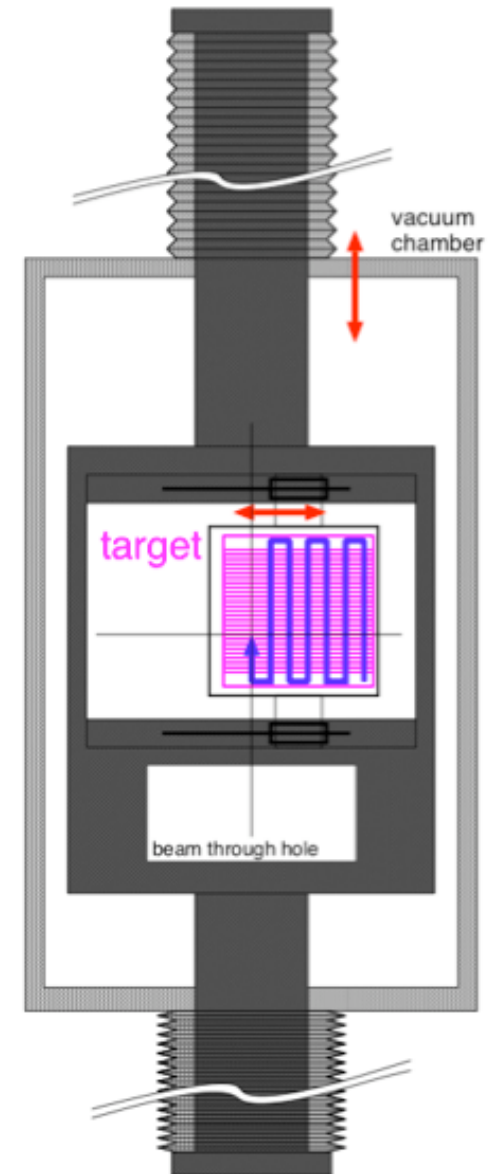
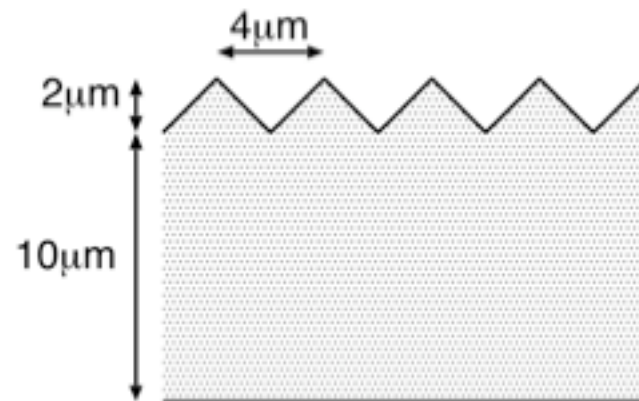
principle

- 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.



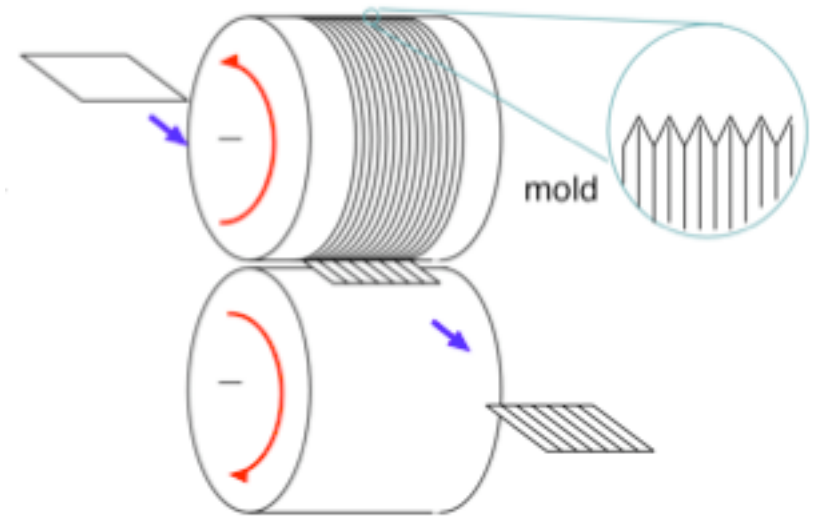
Development items

- The target must be locally damaged even by single shot. It has to be scanned continuously in order to use a new area for each shot. Need to have a long effective length that is enough for at least one week of operation.
 - for example use 2D target of 3cm x 3cm area on a zig-zag line
- One example of the dimensions of target 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. Uniformity and reproducibility will be important.
-



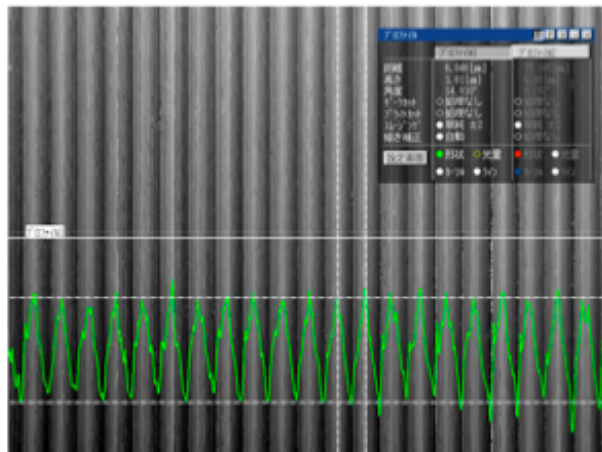
Preliminary test for target fabrication

- One candidate of fabrication method is imprinting using a roll mold.
- Possibility of fabricating the mold has been tested at KEK machining center with a precision turning machine.
- Triangular structure of 2 μ m depth seeded to be OK.
- Test of imprinting will be the next item to test.

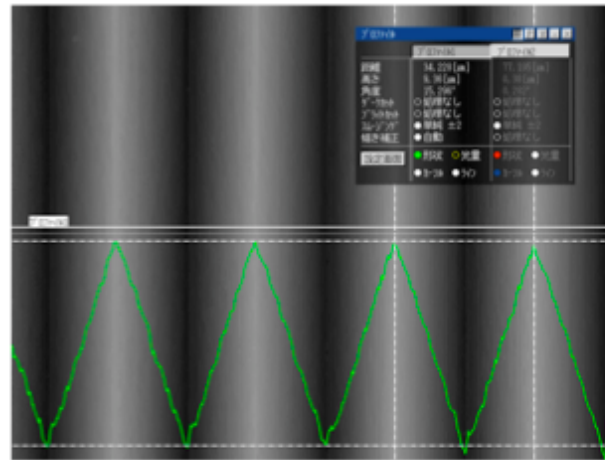


2 μ m depth

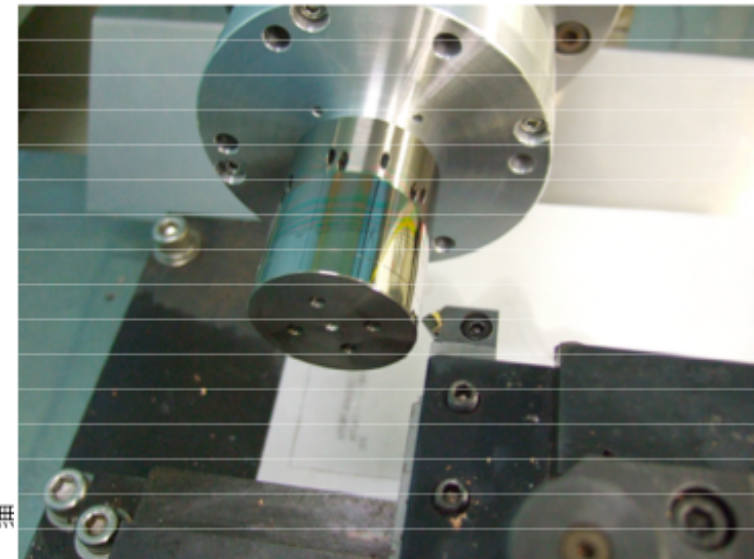
10 μ m depth



深さ2 μ m、S1000rpm、F1mm/min、助走路無

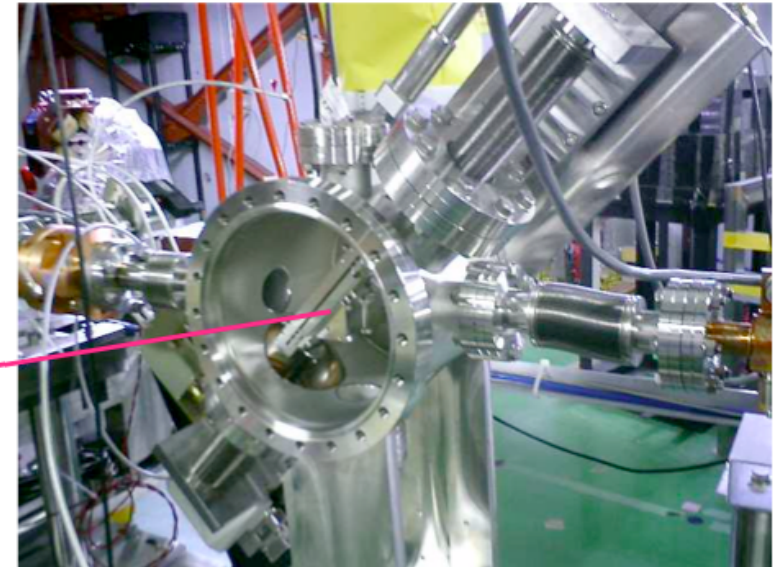
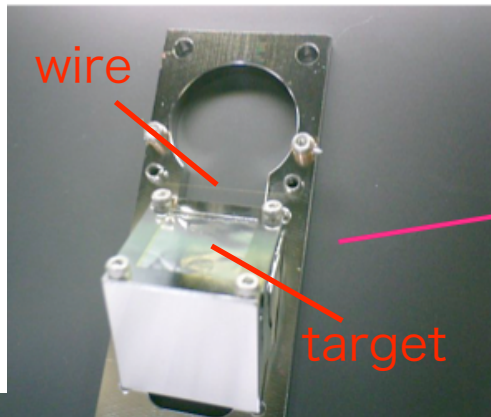
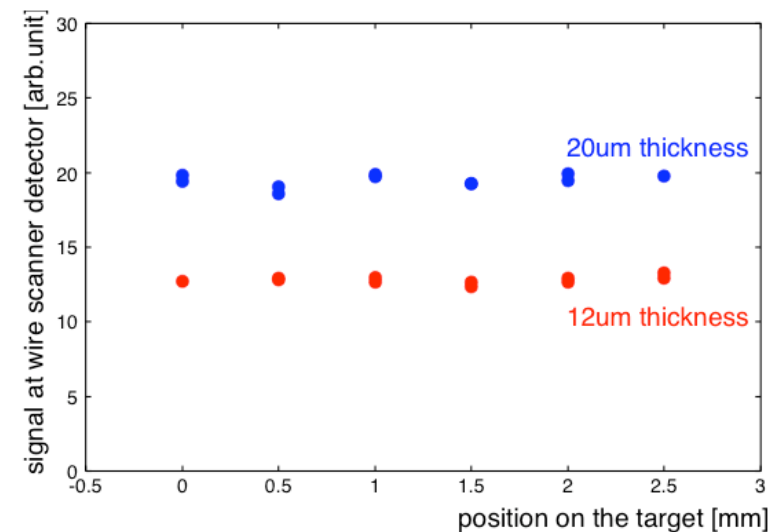


深さ10 μ m、S1000rpm、F1mm/min、助走路無



Preliminary beam test

- Set up
 - Re-use ODR chamber in the extraction line
 - 10um tungsten wire
 - flat aluminium foil of 12um and 20um thickness
 - Wire scanner detector
- Beam time
 - 10/26: 12um (y-size), 0.4×10^{10} /bunch
 - 12/7: 45um (y-size) x 120um (x-size), 0.5×10^{10} /bunch
- Result
 - Signal yield
 - Comparable or lower compared with 10um tungsten wire signal. Radiation will not be the problem.
 - Signal stability
 - stable and uniform within a few % (intensity normalized), required uniformity should be 5%.
- To be done after beam operation
 - take the target out and check damage area with a microscope.



summary and plan

- So far no fatal problem found
 - radiation seems to be manageable
 - signal stability is ok
- To be done
 - fabrication test of the target (imprinting test)
 - engineering to realize the mechanism of the device (2D scanner)
 - check damage on the target