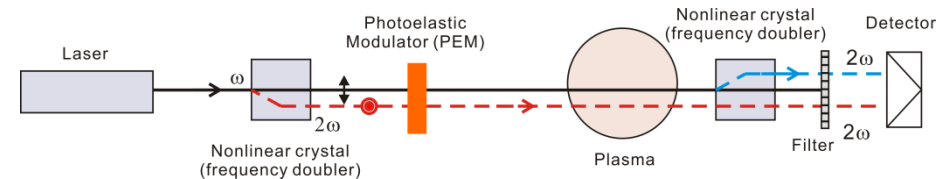


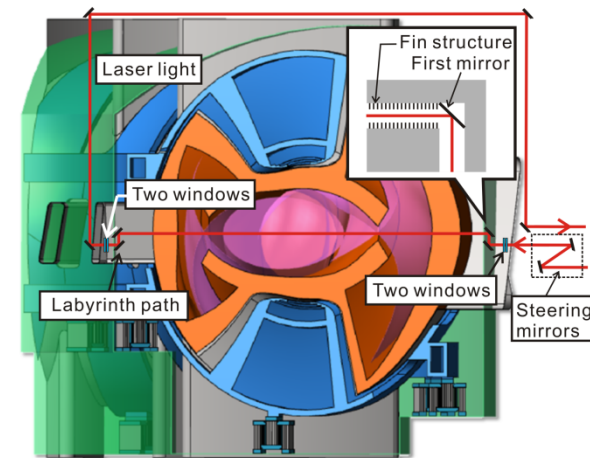
# (FIP/P8-31) Conceptual design of high resolution and reliable density measurement system on helical reactor FFHR-d1 and demonstration on LHD (T. Akiyama, NIFS)

## Density measurement system on FFHR-d1

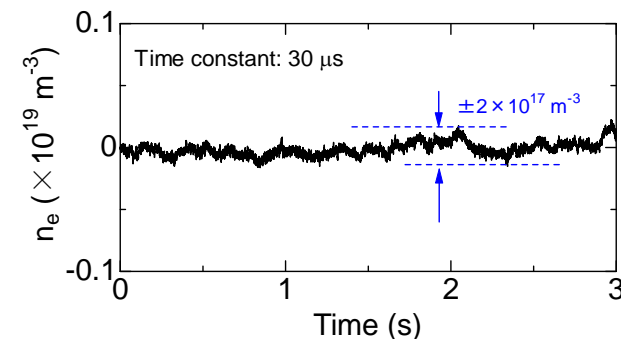
- Quantitative operation scenarios in FFHR-d1 are developing.
- The fusion output is quite sensitive to an electron density.  $\bar{n}_e$  variations of  $1 \times 10^{18} \text{ m}^{-3}$  leads to fusion output variation of 0.17 GW.
- Requirements from operation scenarios
  - ✓ Density resolution:  $10^{17} \text{ m}^{-3}$
  - ✓ Response time: less than 10 ms
  - ✓ No fringe counting failure
- Conventional interferometer cannot achieve above requirements.
- “A dispersion interferometer” combined with a polarimeter, which are free from measurement errors from mechanical vibrations and can reduce the risk of fringe counting failure, will satisfy above requirements.
- Proto-type of the dispersion interferometer was installed on the Large Helical Device (LHD). The density resolution of the order of  $10^{17} \text{ m}^{-3}$  is achieved and the risk of fringe counting failure is reduced.



Principle of a dispersion interferometer



Layout of dispersion interferometer on FFHR-d1



A density error of the dispersion interferometer on LHD