

# X-ray crystal spectrometer

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## 1. Objective

- [1] Ion temperature,  $T_i(0)$
- [2] Toroidal rotation,  $V_t(0)$

## 2. Apparatuses

### 2.1. Crystal holder

- Four curved crystals are installed on the crystal holder (see Fig. 1).

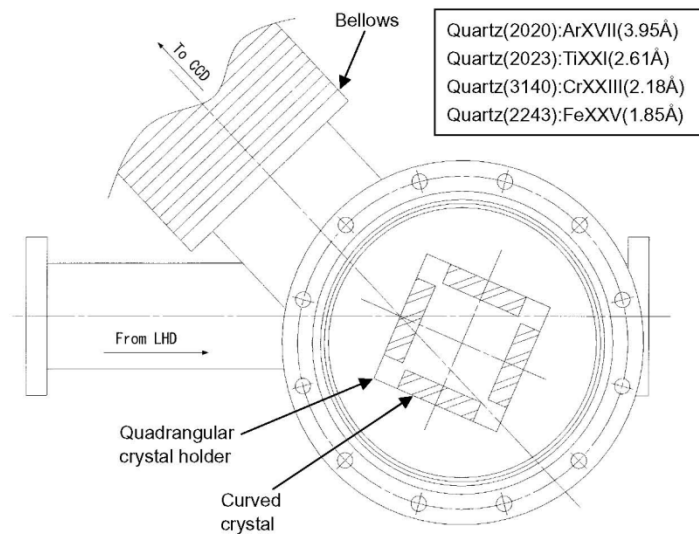
Quartz (2020): He-like ArXVII (3.95Å)

Quartz (2023): He-like TiXXI (2.61Å)

Quartz (3140): He-like CrXXIII (2.18Å)

Quartz (2243): He-like FeXXV (1.85Å)

-  $T_i(0)$  is generally measured from ArXVII with Ar gas puffing



*Fig. 1. Viewing chords of toroidal array*

### 2.2. Port assembly

- Crystal spectrometer is installed on #3-O (Fig. 2)

- Observation area: equator plane ( $-10\text{cm} \leq \Delta Z \leq +10\text{cm}$ ,  $\Delta R$  depends on  $T_e$  profile)

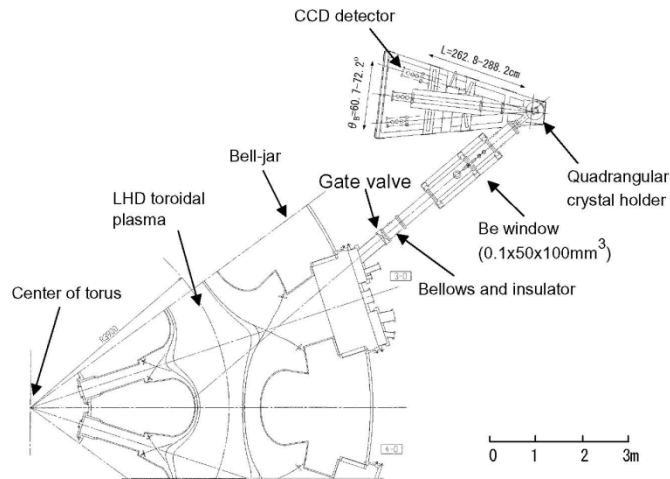


Fig. 2. Viewing chords at #5-O port

### 2.3. Specifications

- Time resolution:  $\Delta t=5\text{ms}$

### 3. Operation of crystal spectrometer

- Before experiment: opening gate valve, turning on power supply and setting detector parameters
- After experiment: closing gate valve and turning off power supply
- Ar puffing is necessary at beginning of discharges

### 4. Available data by “Retrieve”

Kaiseki-data server

-ti\_crystal

### 5. Remarks

- Example of Ti(0) measurement (see Fig. 3)

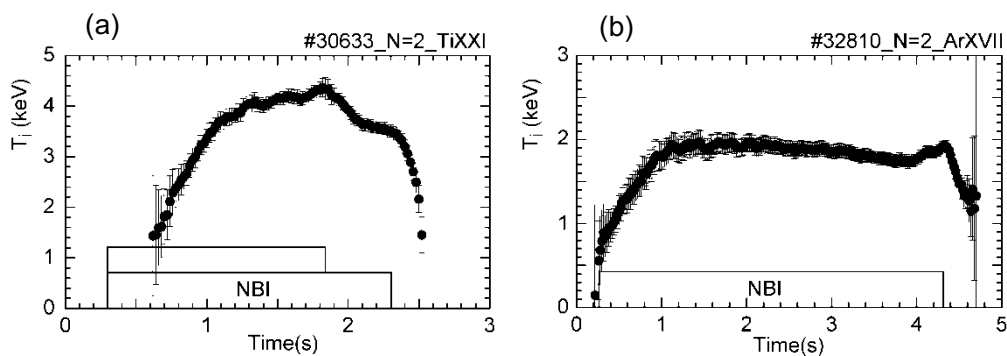


Fig. 3.  $T_i(0)$  during NBI discharges for (a) TiXXI and (b) ArXVII

- Example of Doppler profiles of ArXVII during high-Ti discharges (see Fig. 4)

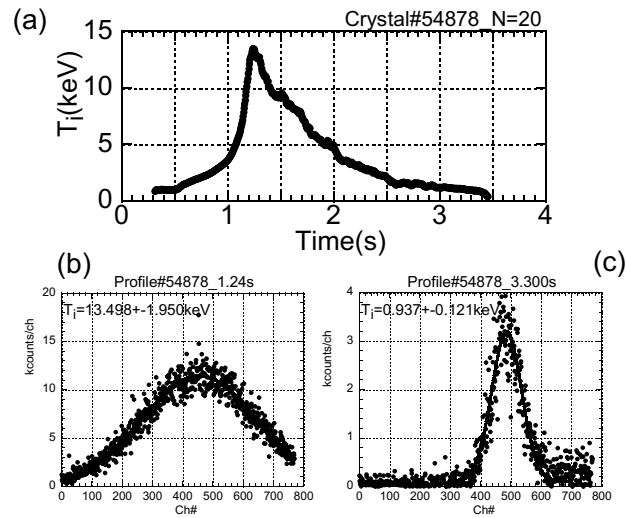


Fig. 4. Doppler-broadened ArXVII profiles; (a)  $T_i(t)$  and ArXVII line profiles at (a)  $t=1.24s$  and (c)  $t=3.3s$ .

- Example of He- and Li-like Ar spectrum (see Fig. 5)

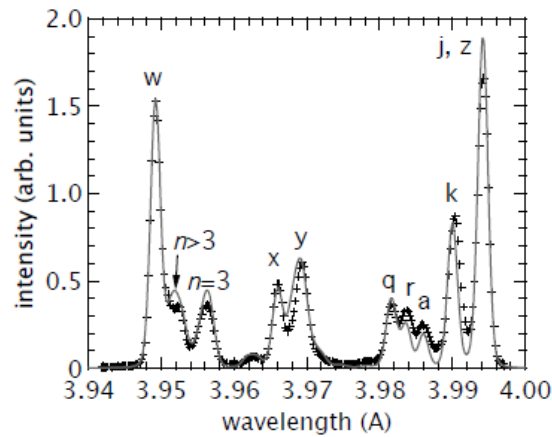


Fig.5. Typical example of He- and Li-like Ar spectrum.

## References

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- S.Morita and M.Goto RSI **74** (2003) 2375.
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- I.Sakurai, Y.Tawara et al., RSI **77** (2006) 10F328.
- I.Sakurai, Y.Tawara et al., PFR **2** (2007) S1068.
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- and others