Design and Development of Soft X-ray Tomography(SXRT) diagnostics system.

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EPIC
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Outline:

- A broad overview of the Soft X-ray radiation in ADITYA Tokamak.
- Development of SXRT diagnostics system.

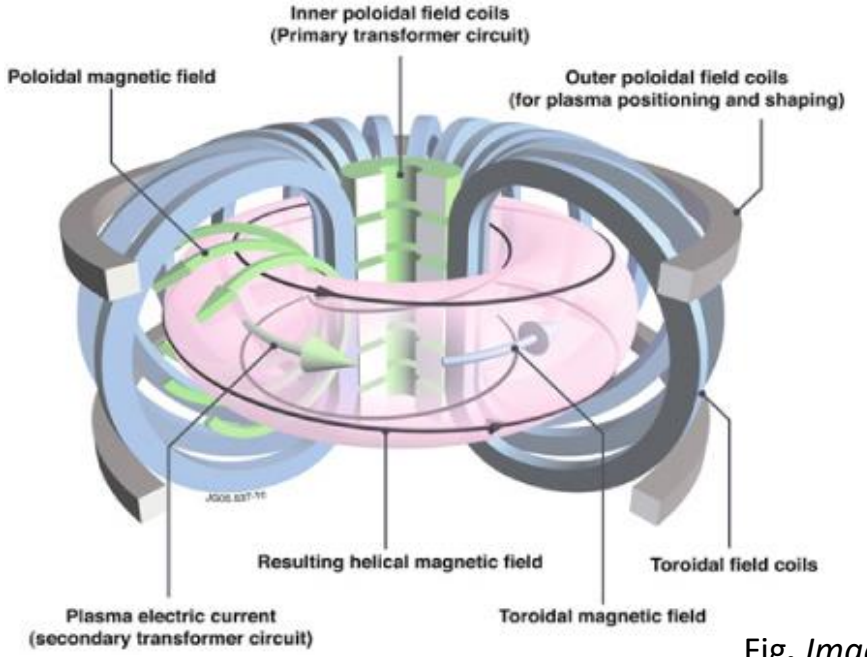


Fig. *Image of a toroidal tokamak reactor [5]*

Soft X-ray radiation (100 eV – 100 keV)

- Soft X-ray radiation emitted during plasma discharges in ADITYA-U Tokamak.
- Information on Magneto hydro dynamic activities like disruptions, mode structure, magnetic island, plasma shape, position and chord average electron temp. is obtained.
- Measurement is done with SXR photodiode array.
- Intensity depends on electron temperature, plasma density as well as impurity in plasma.

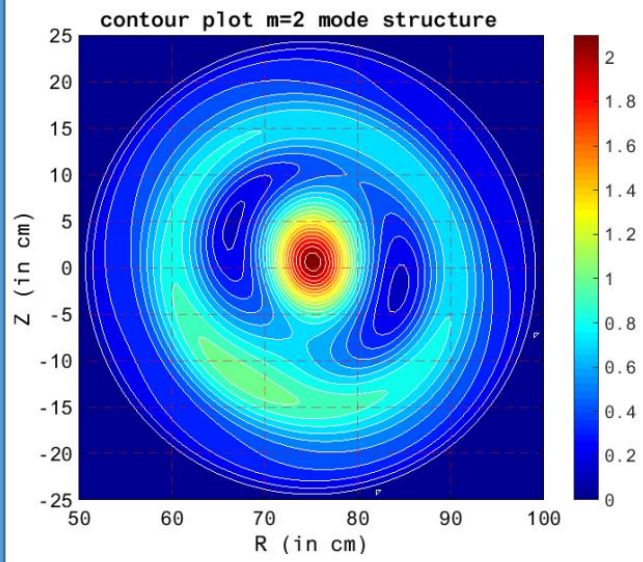
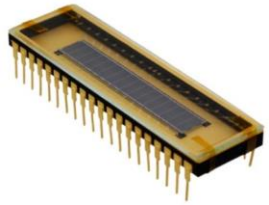
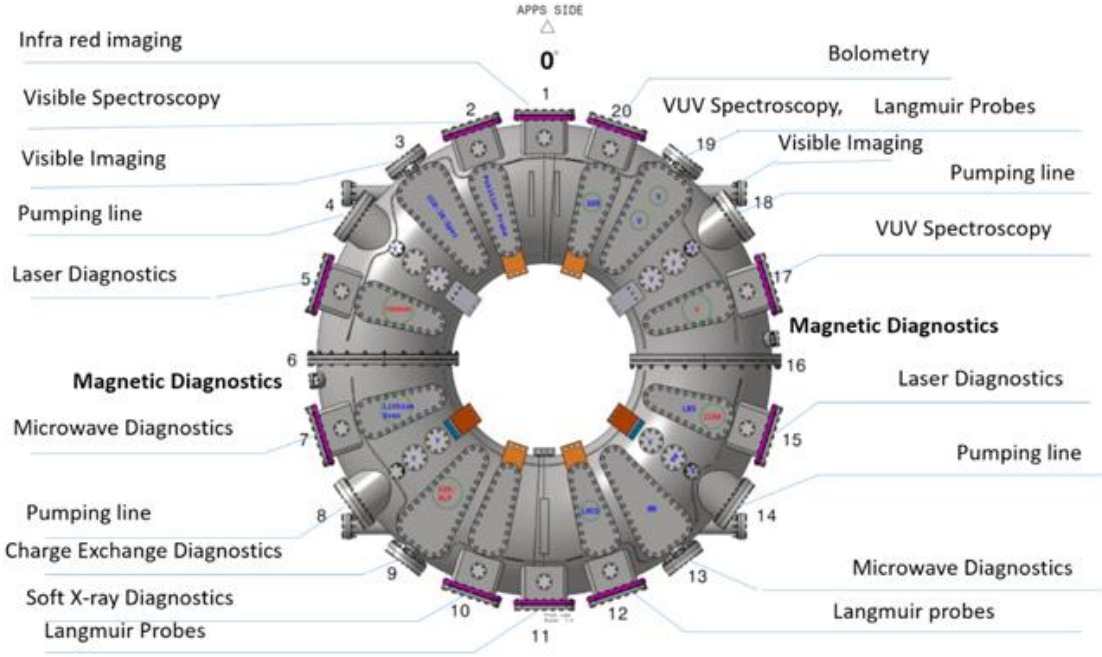


Fig: Emissivity in circular plasma.

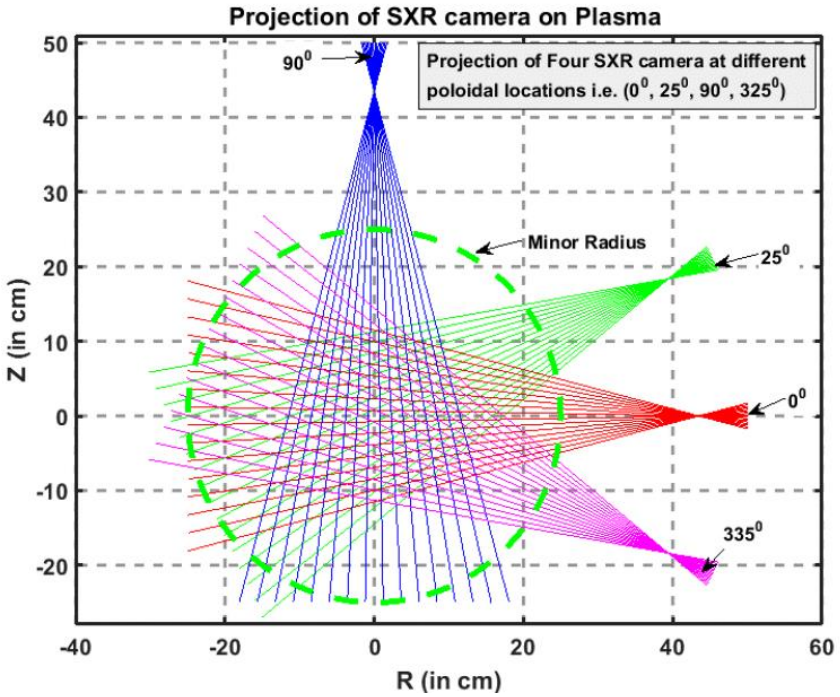




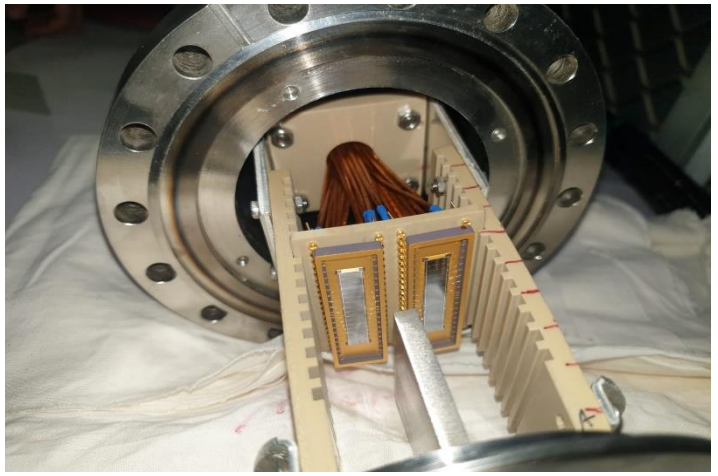
- Circular plasma with plasma current of ~150–250 kA.
- Plasma duration of ~250–300 ms
- Electron density and (3–5) × 10^{19} m^{-3}
- Temperature in the range of 500–1000 eV
- Shaped plasmas with plasma current of ~100–150 kA

Design & Development of SXRT diagnostics system.

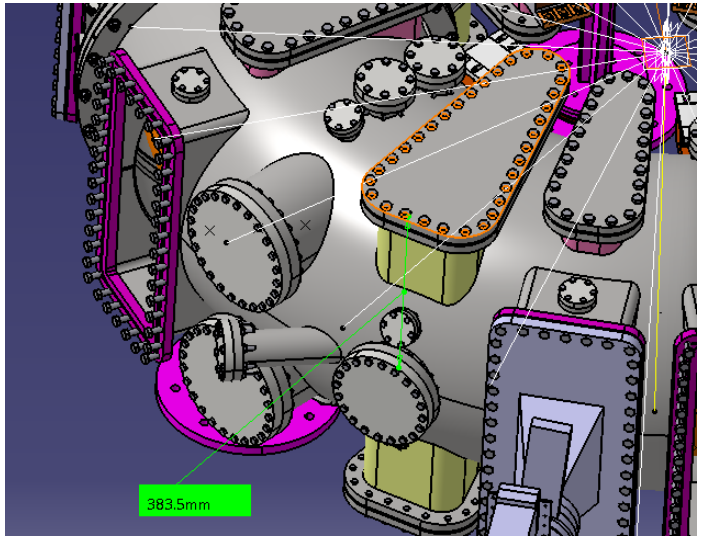
To study
- Major disruptions
- Rotation of magnetic island and the plasma position [2-3].
- Sawtooth oscillations
- Successive images generated by SXR tomography, helps to understand nature of disruptive phenomenon.



Projection with spatial resolution of 2 cm.

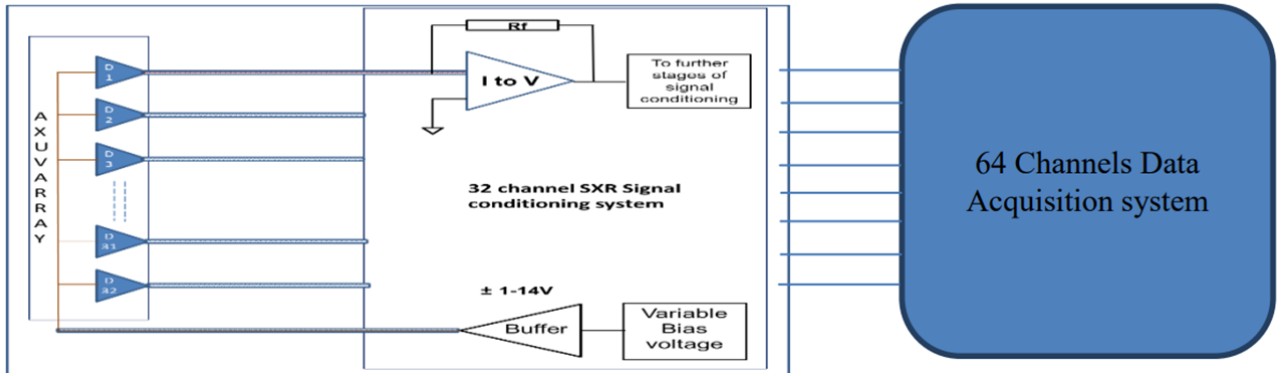


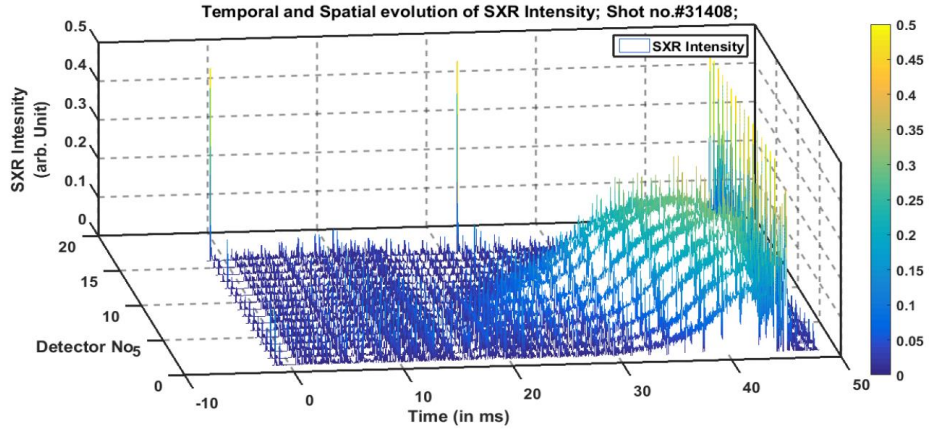
Inside view from SXR camera being mounted at 90^0



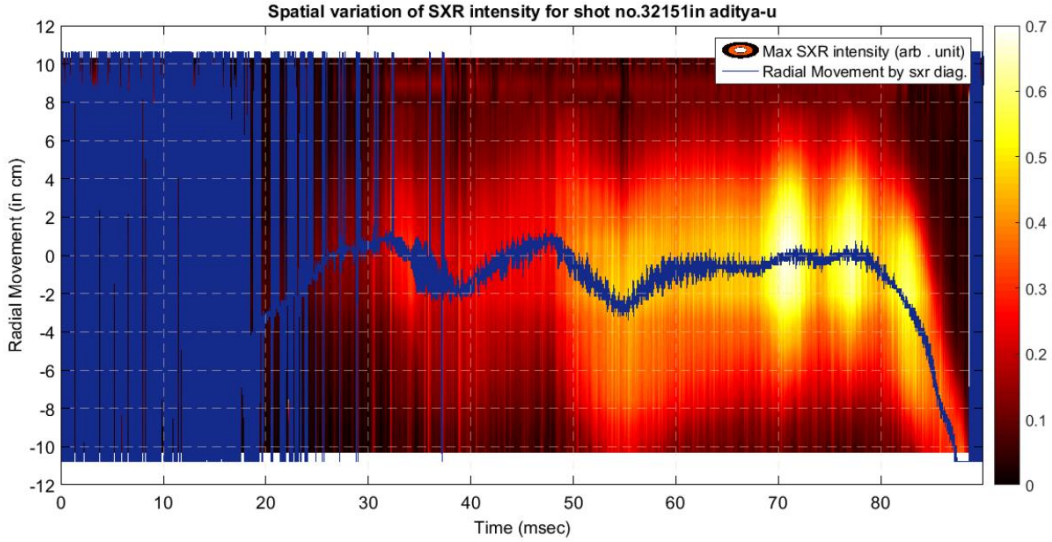
SXR camera placed around 40 cm from midplane.

Electronics and DAQ system for SXR signal conditioning.





- AXUV array is configured in photoconductive mode and biased with variable voltage provided by electronics.
- Every channel contains all signal conditioning blocks like preamp, amplifier, filter, isolator and driver.
- High gain transconductance amplifier with 100khz bandwidth at 1M gain is used in first stage
- 64 channel DAQ system, which is on single board computer and has board 4M memory, simultaneously sampled with selectable sampling rate from 1k to 100k and accessible on LAN.



THANK YOU FOR YOUR ATTENTION!

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