# In-bunker monitors for ESTIA

**Francesco Piscitelli**
on behalf of the ESS detector group

Thanks to **Artur Glavic** and **Sven Oliver Schütz** (ESTIA team)

IKON15 Lund

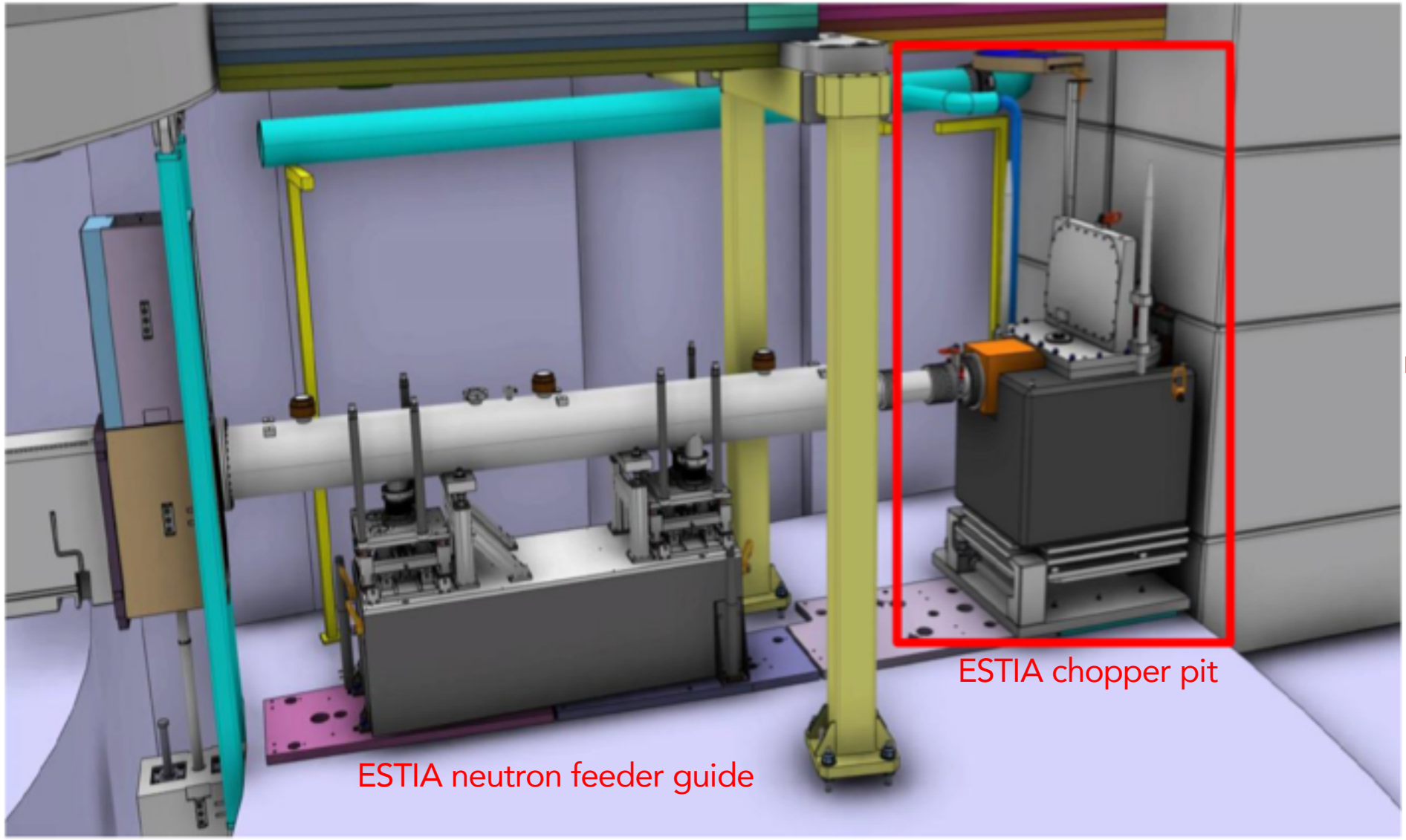
2018/09/11

part of the Sub-TG3 review
(in-bunker system)

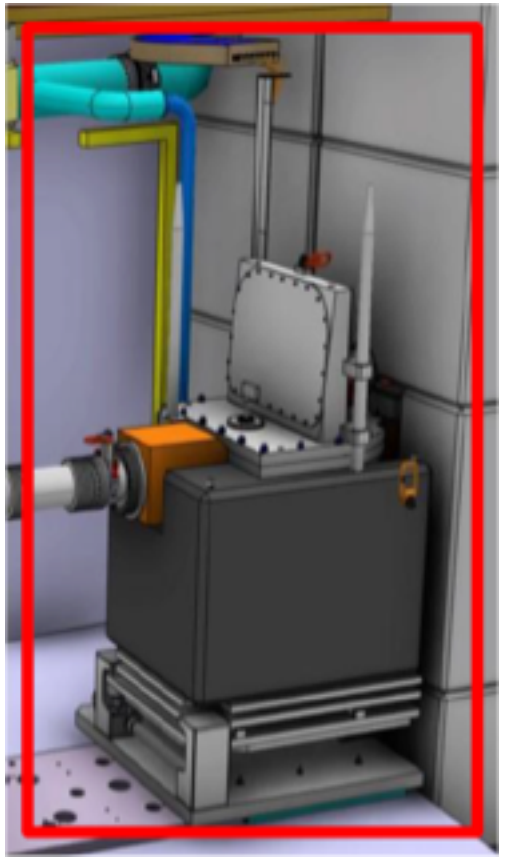
ESTIA as an example …

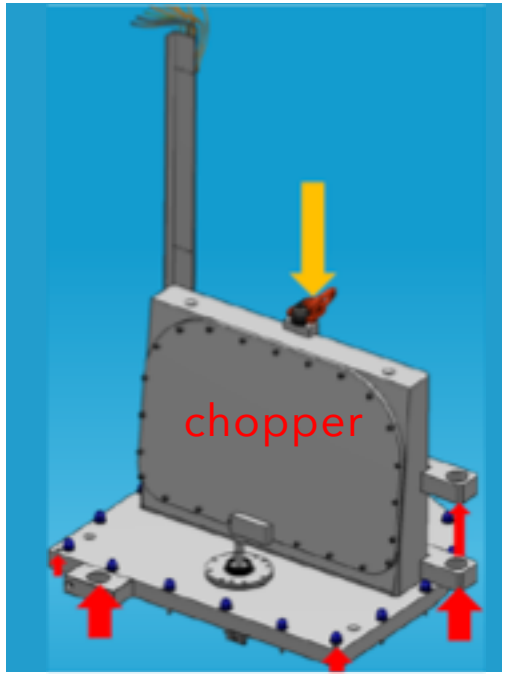
how problems are approached and how integration is performed

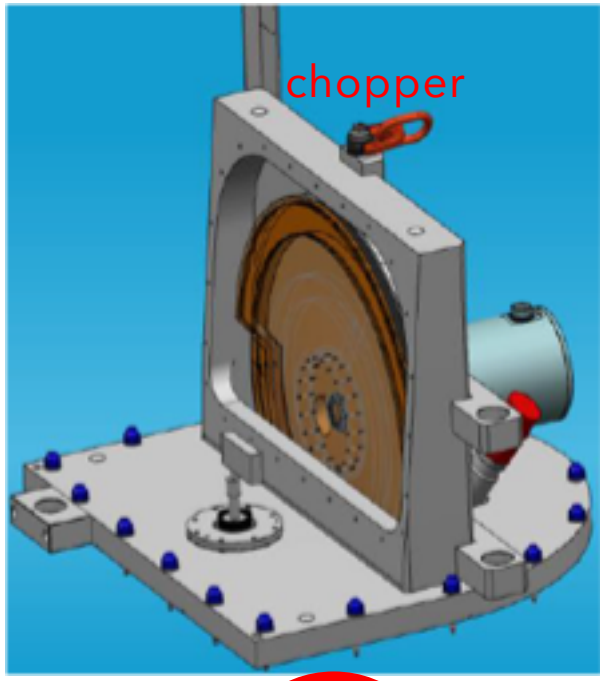
# ESTIA in-bunker system

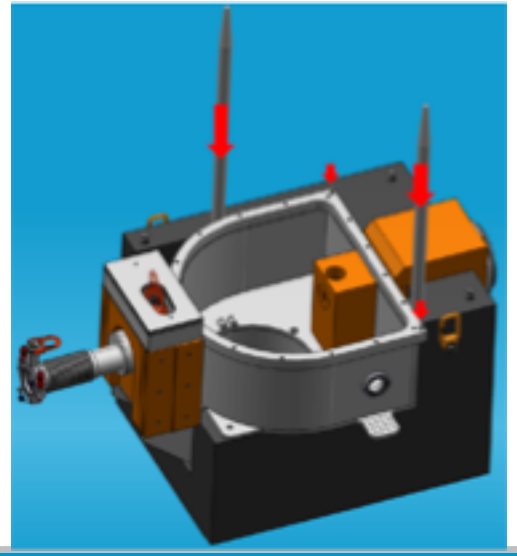


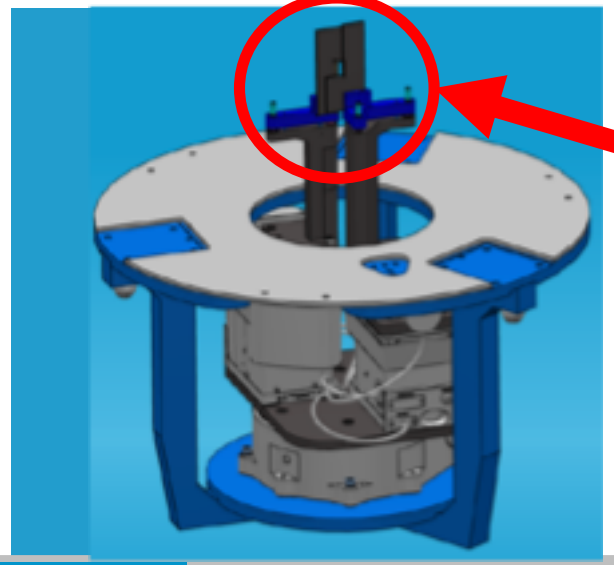
# ESTIA chopper pit

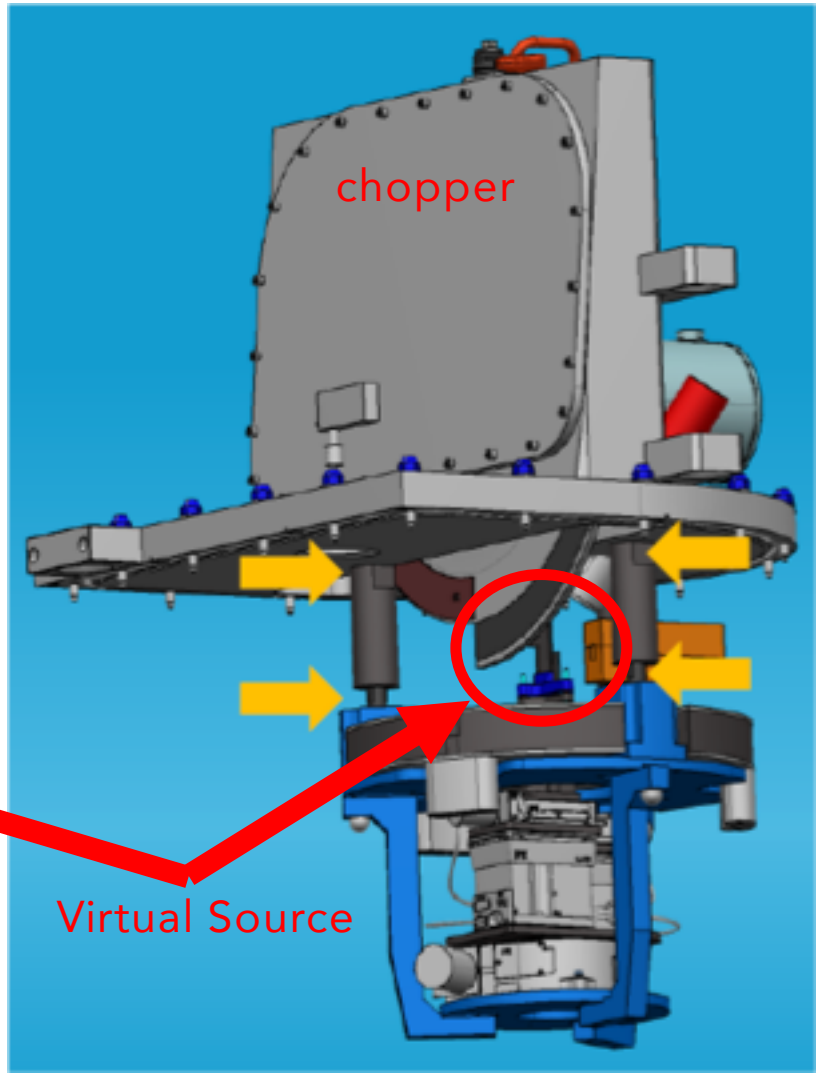








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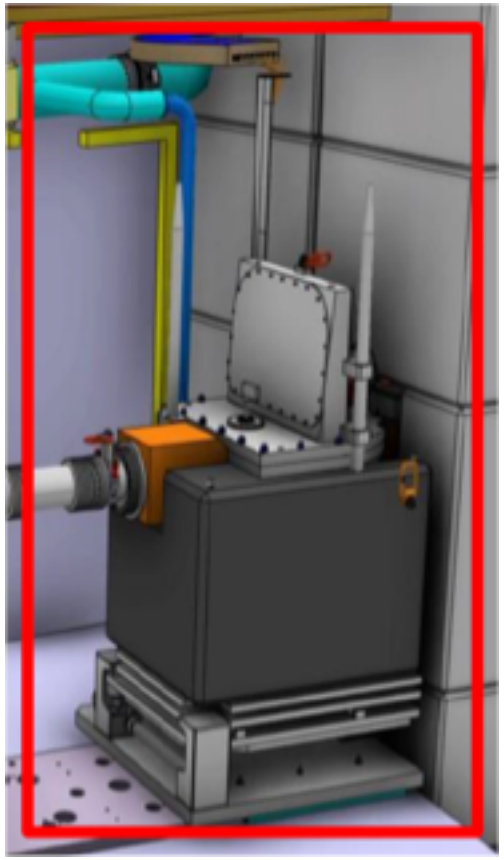
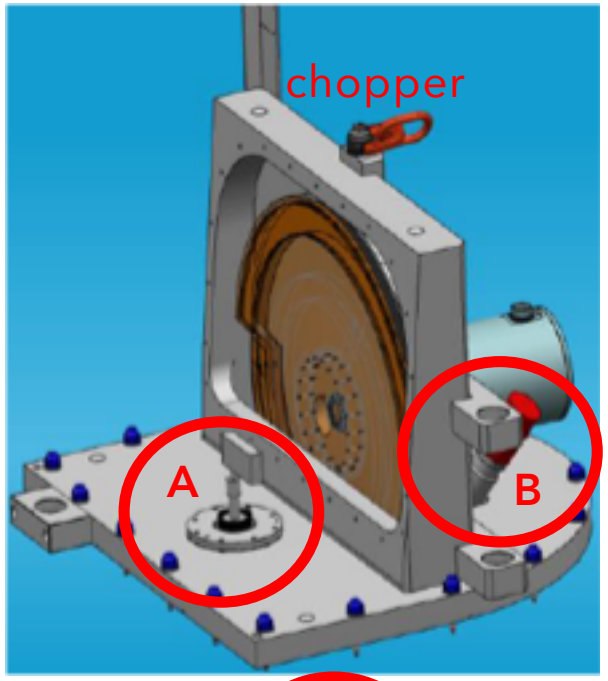
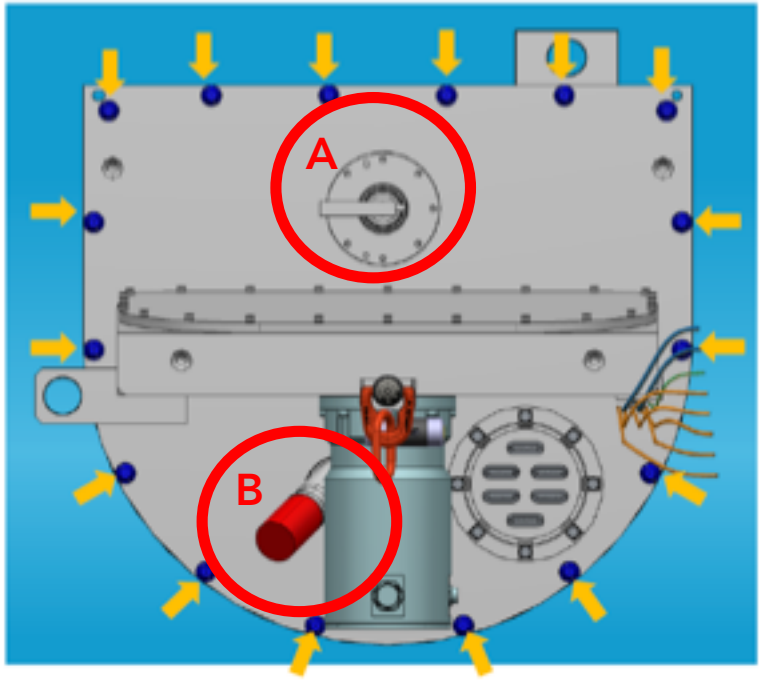
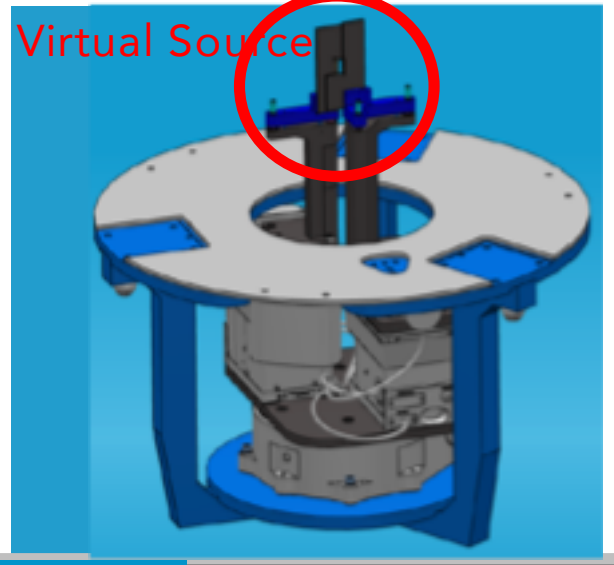


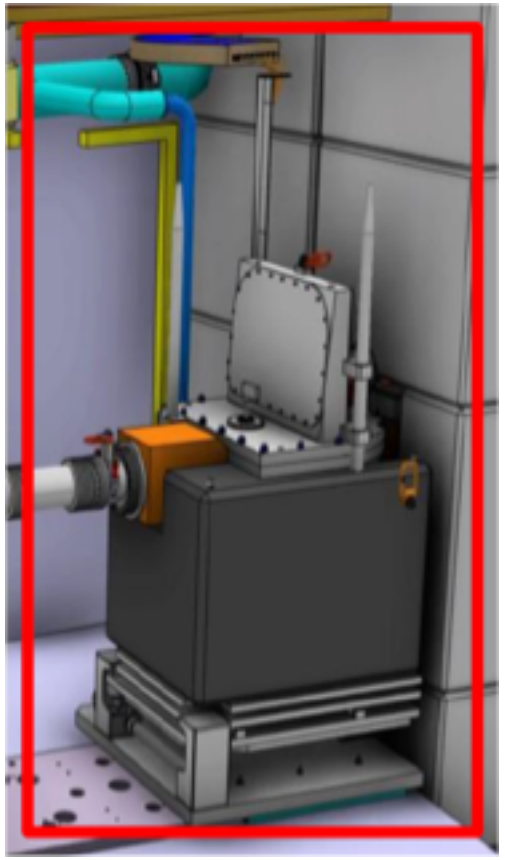
2 Monitors:
A) He3 tube
B) Scintillator



ESTIA chopper pit



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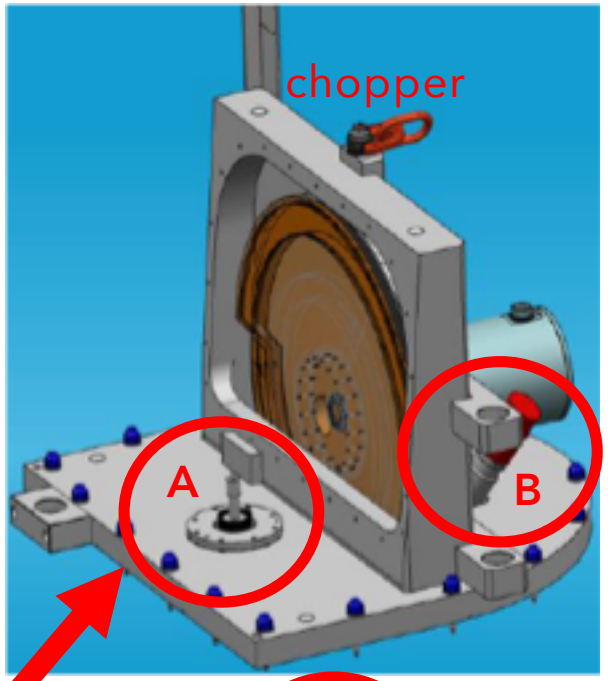
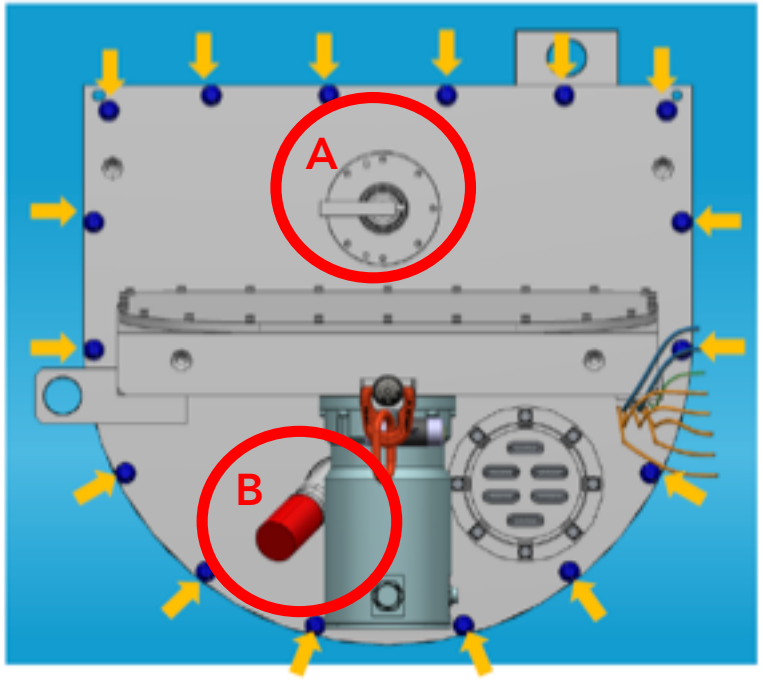
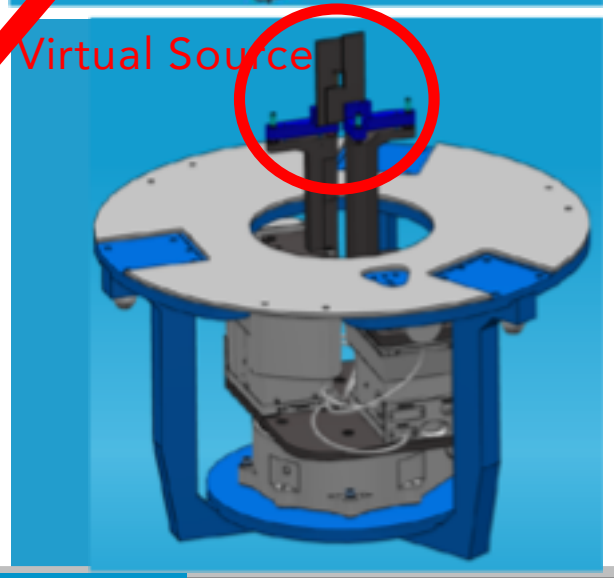
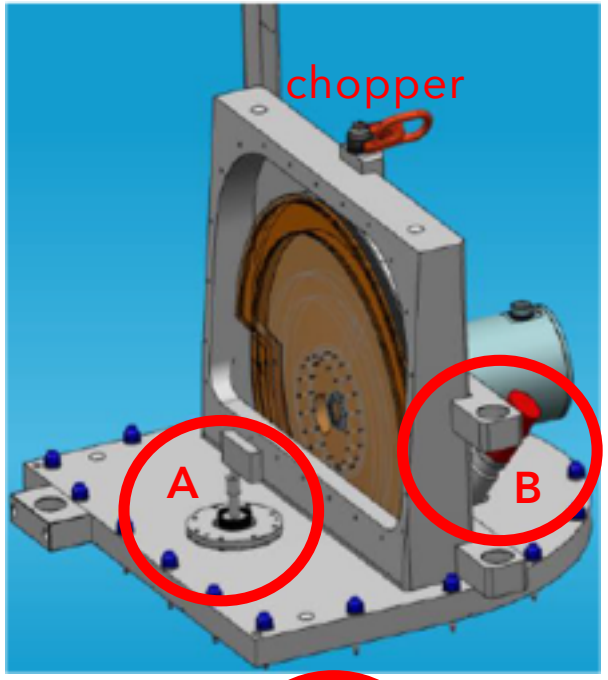
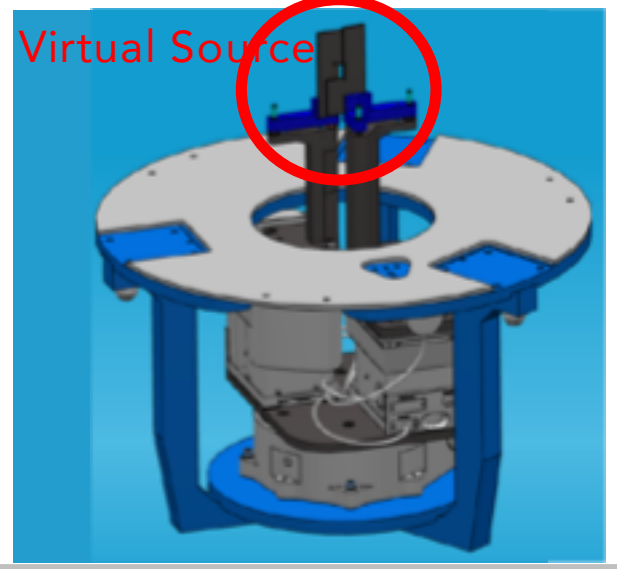



Good mechanical integration
and good for remote handling,
generally good to attach the BM to a chopper

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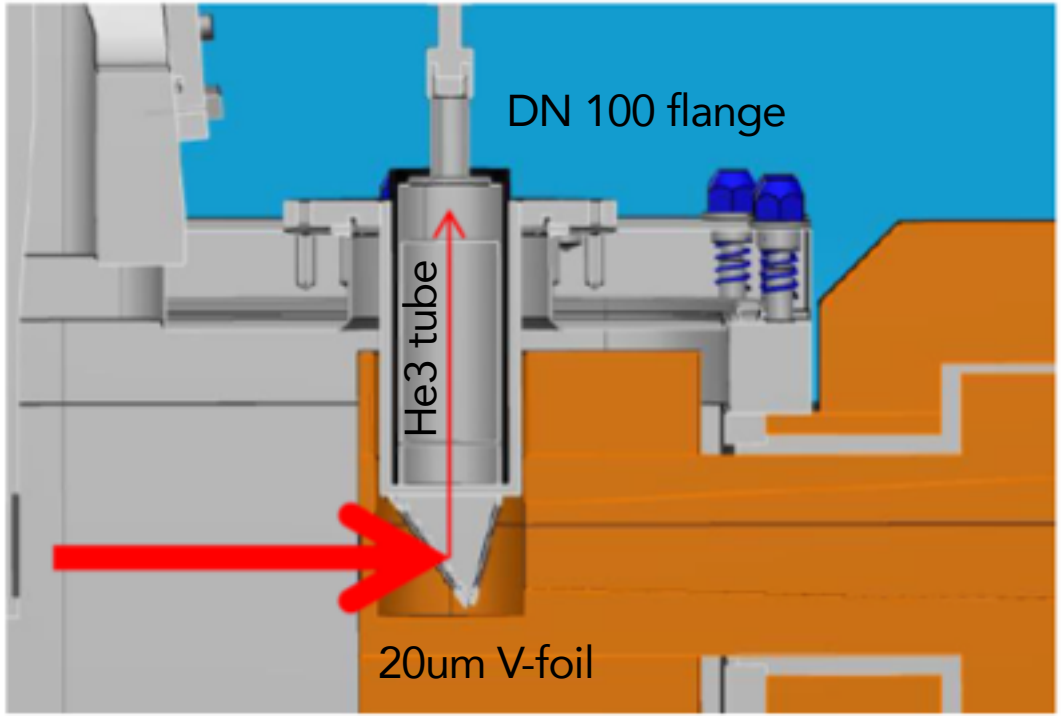
A



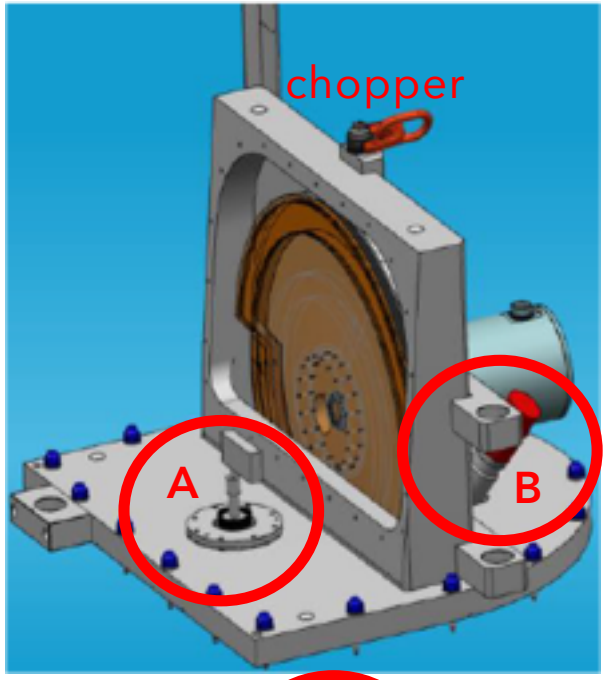

20um Vanadium scatters 0.1% of neutrons (1.8Å) in 4pi

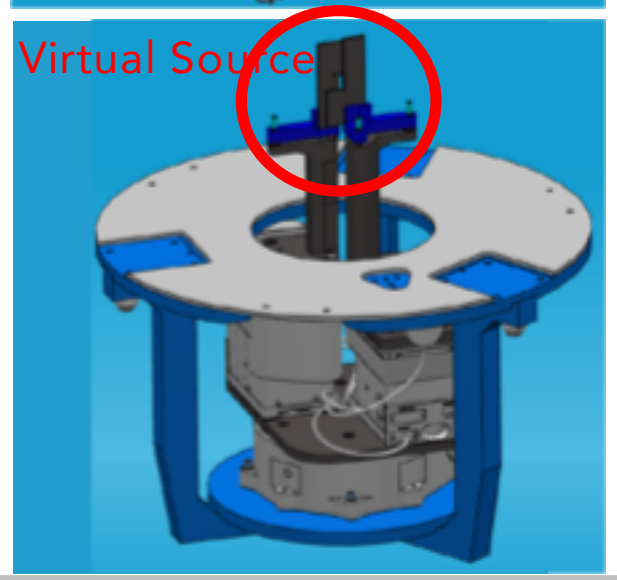
WARNINGS:

- Counting rate capability up to **50kcps** at most
  -> V foil thickness and He3 efficiency must be carefully tuned

- Challenge in the signal to background ratio **(S/B)**, assuming $10^{10}$n/s that can produce background (even with a good shielding).
  **Gamma-sensitivity $10^{-6}$ – $10^{-7}$** and **fast-neutron sensitivity** is about **$10^{-3}$**

- **Aging** of the He3 tube due to integrated radiation dose (integrated current on the anode wires)

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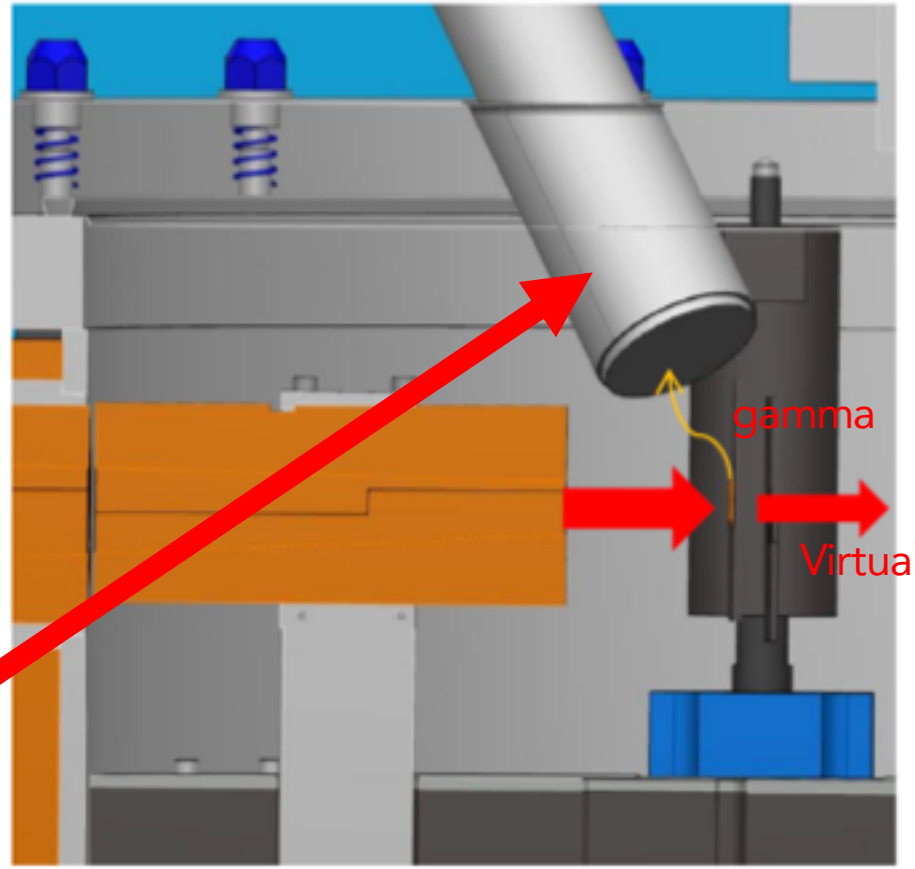
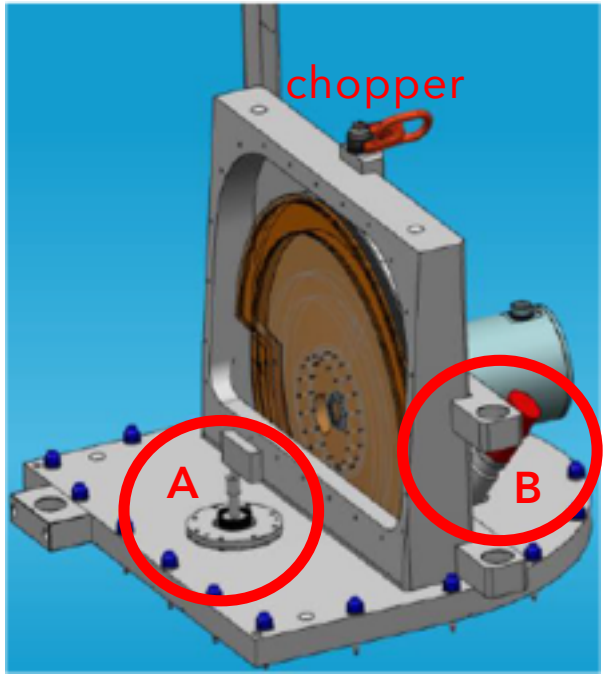
Canberra LaBr3 **B**




WARNINGS:

- Challenge in the signal to background ratio **(S/B)**, the chopper will also produce a large amount of gammas.
- **Aging** and radiation hardness.
- Electronics usually coupled for commercial devices, cannot be moved away.

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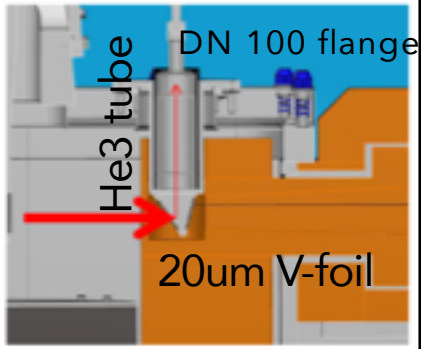
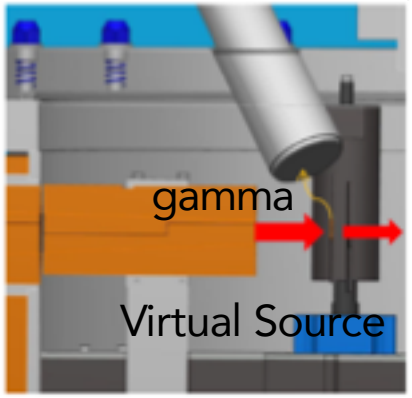
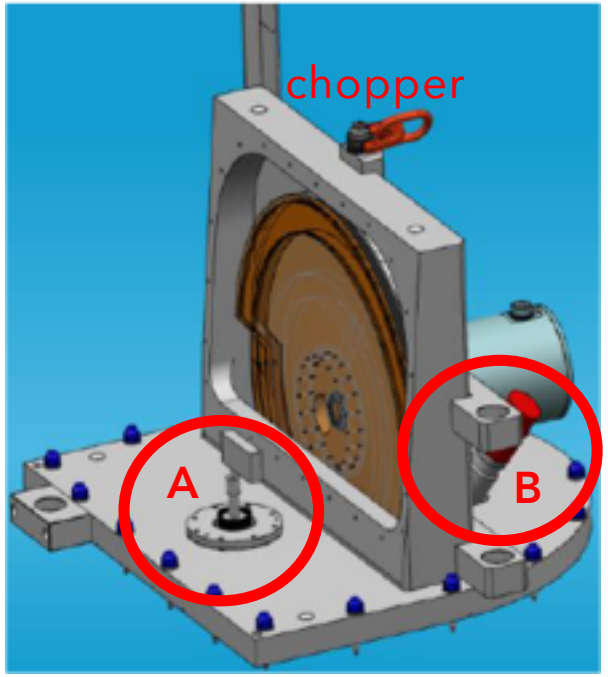



B




- Both mechanically coupled to the chopper -> Maintenance
- Space enough for different technologies and electronics and routing cables

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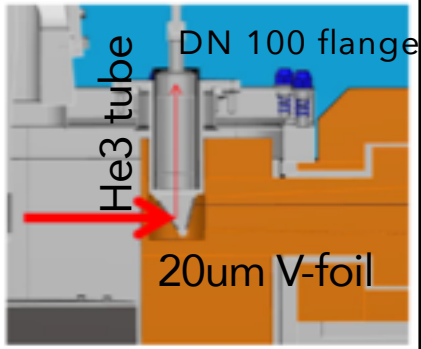


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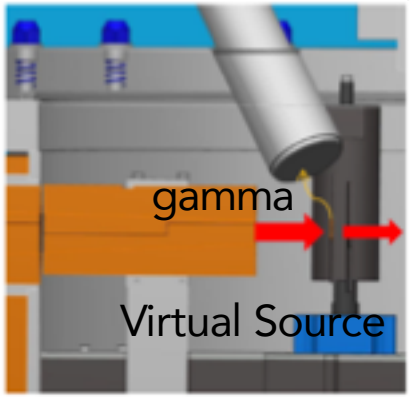


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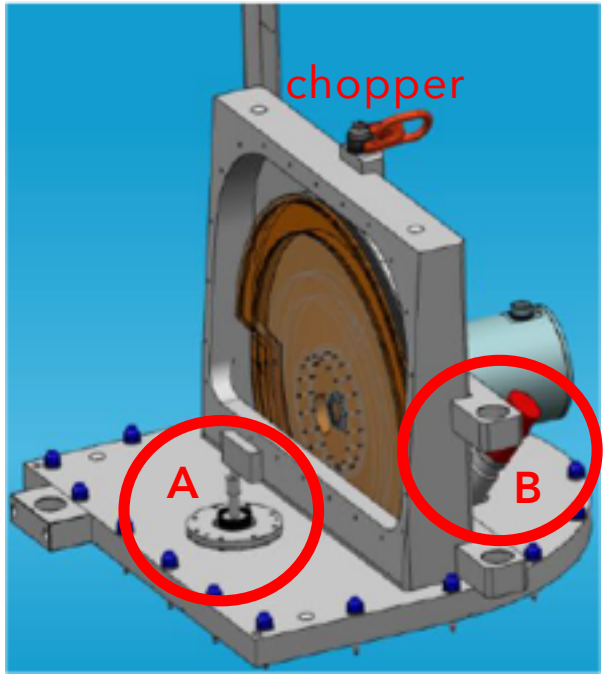
- Space enough for different technologies and electronics and routing cables

- GND of monitor must be separated to the mechanics (isolated BM) (GND floated and fixed from the HV source over a long cable)
- Amplifiers/electronics must be moved as far as possible from radiation source (He3 feasible, scintillator not)

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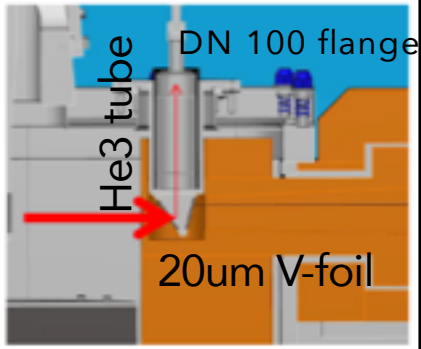


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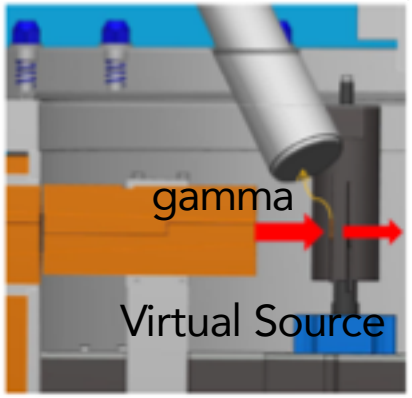


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- Aging, radiation hardness, lifetime
- Signal-to-Background (S/B) challenge
- Count rate

As per today's knowledge it is not clear if it is possible to operate these monitors in the bunker

These details need to be solved for all instruments.

Thanks to the ESTIA team for the effort put on this.

Discussion, thoughts, feedback …