Margarita performance @ GSI2

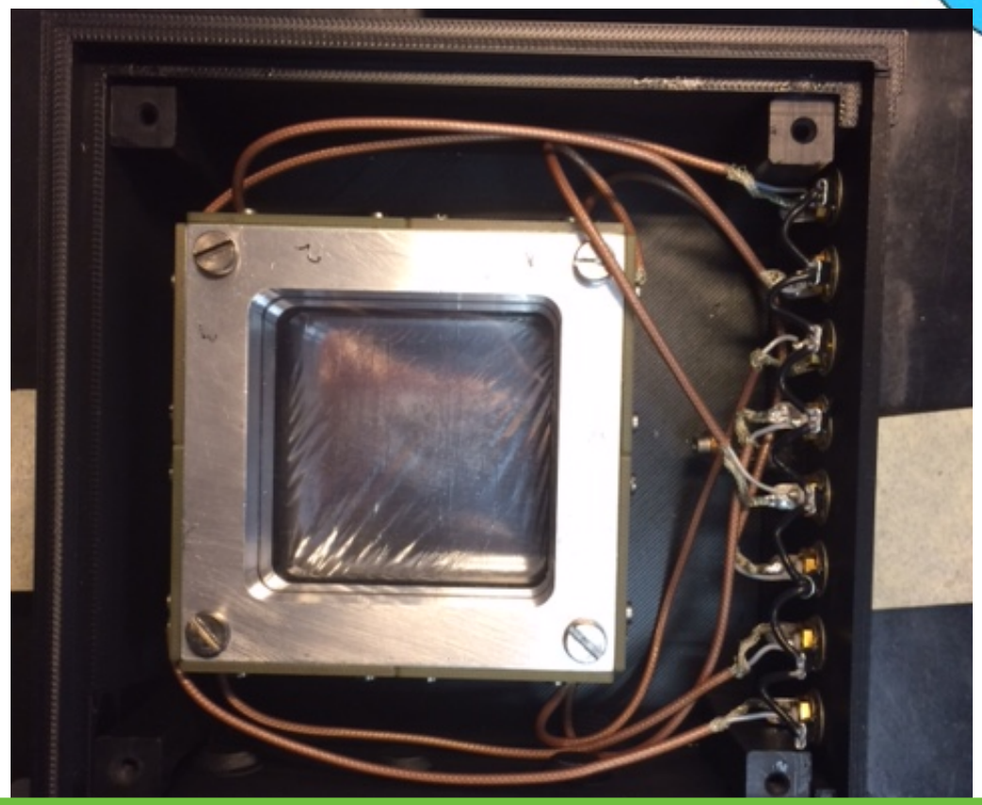
Giacomo Traini

giacomo.traini@roma1.infn.it

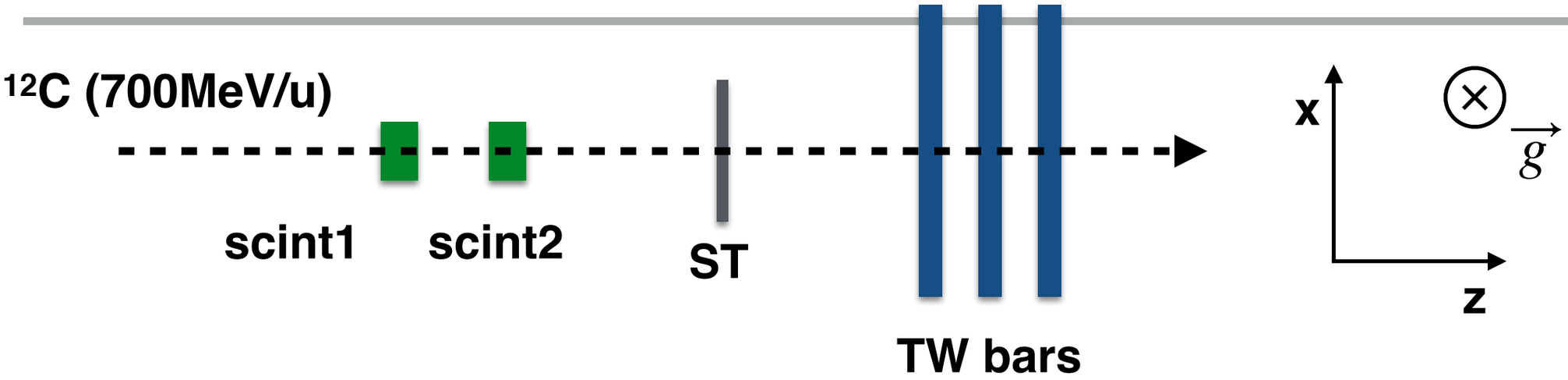
FOOT monthly meeting
1st April 2020

Update of the hardware

- **Scintillator layer replacement.** We realised that the scintillator was cracked in the center… a new study of the response was needed
- **The ground of the single channels have been shorten (detector side)** to reduce the impact of noise picked-up within GSI environment.

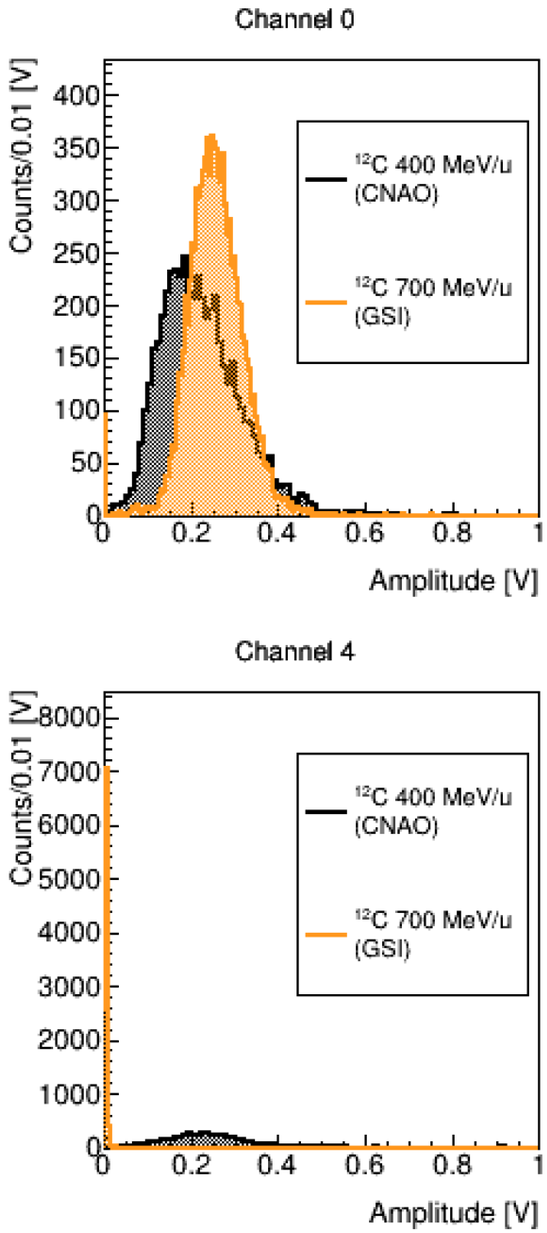


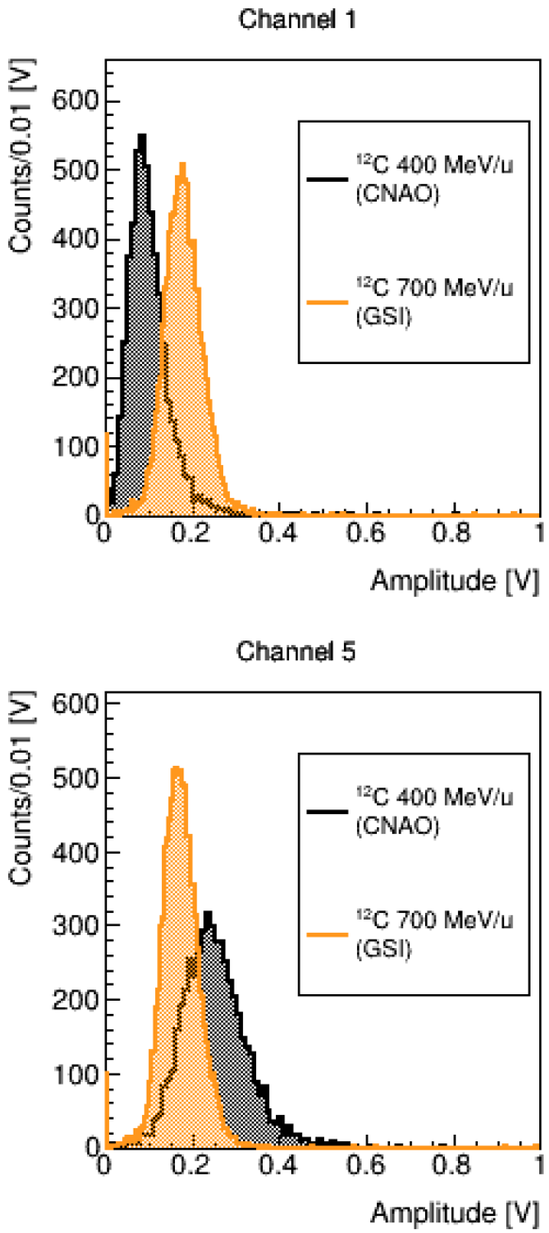
Setup

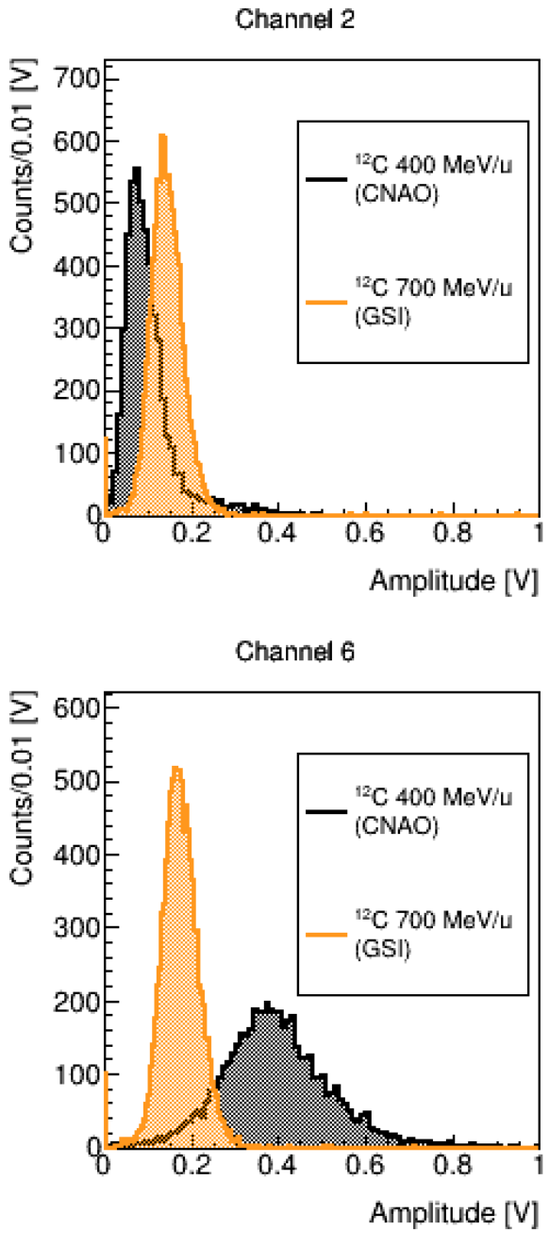


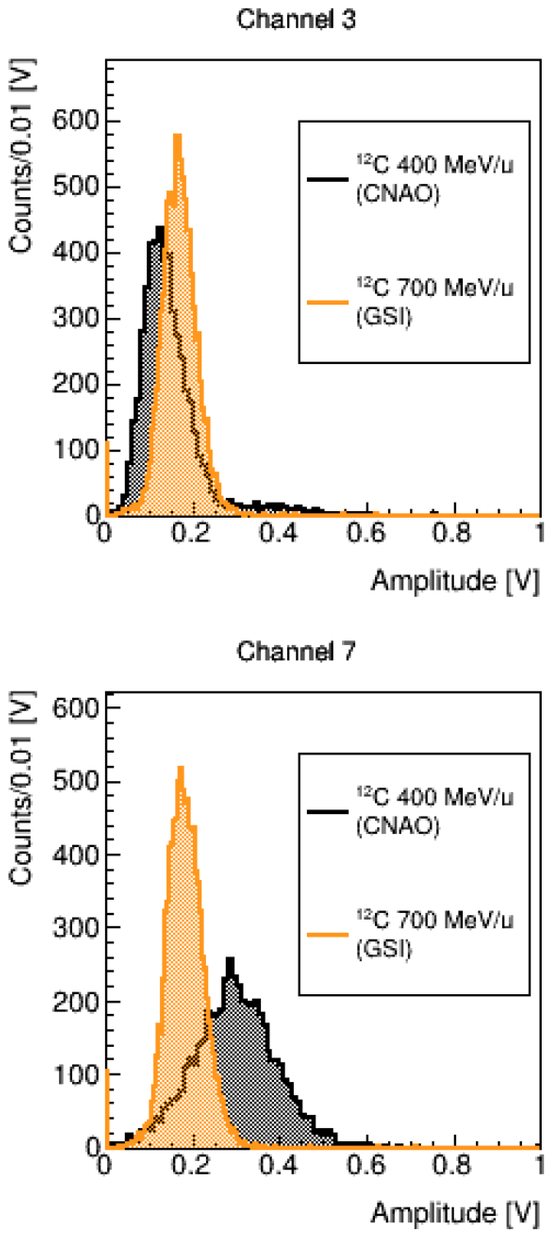
- Unfortunately the TW bars have not been acquired (probably due to an error in the board configuration)

ST signal amplitudes

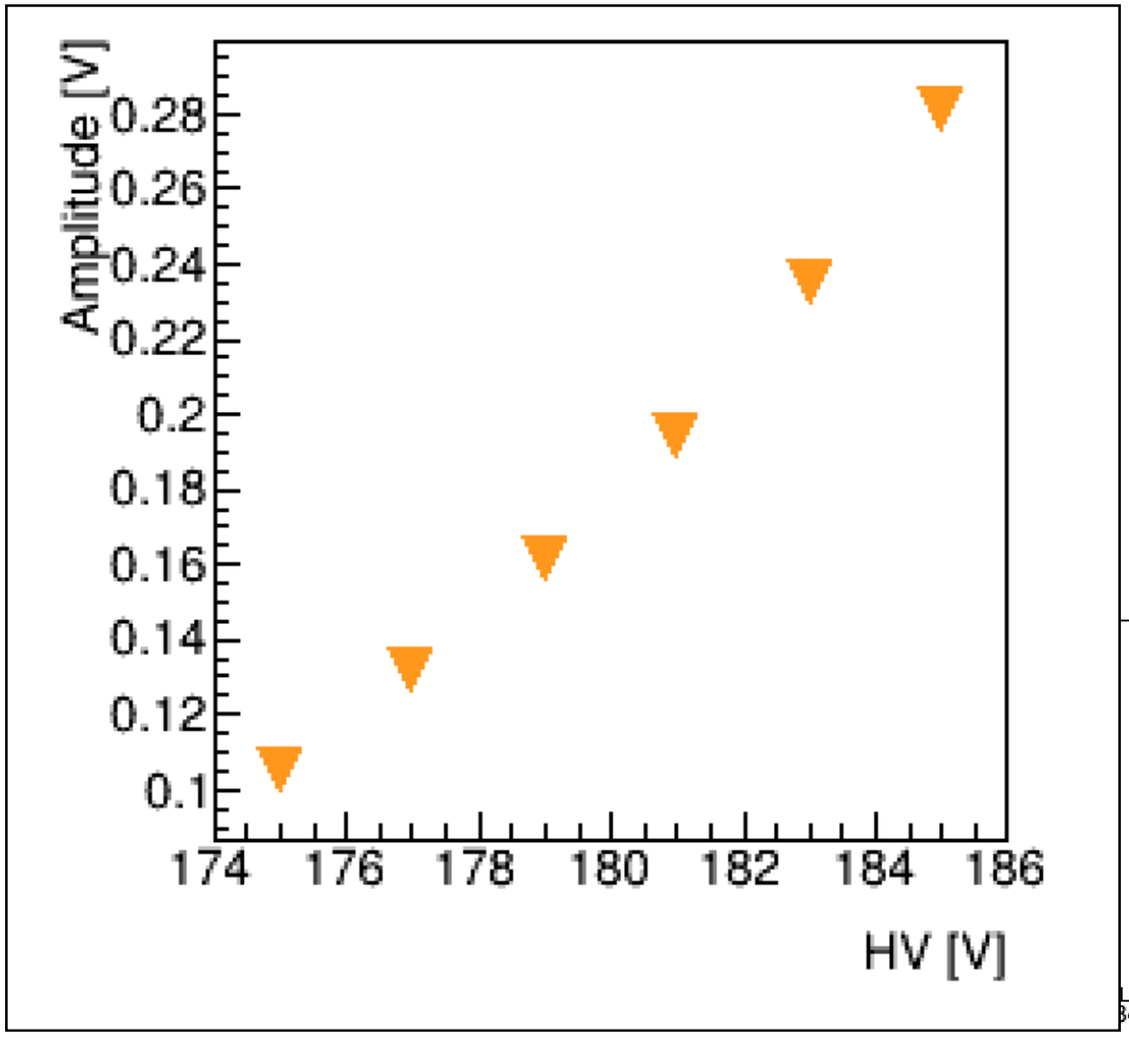




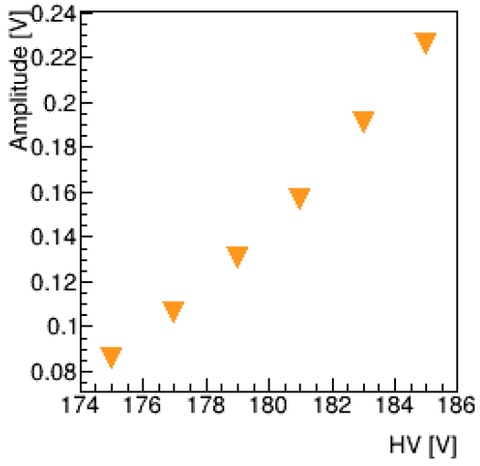


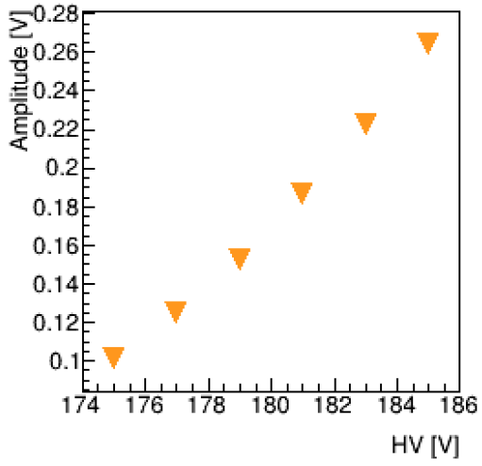


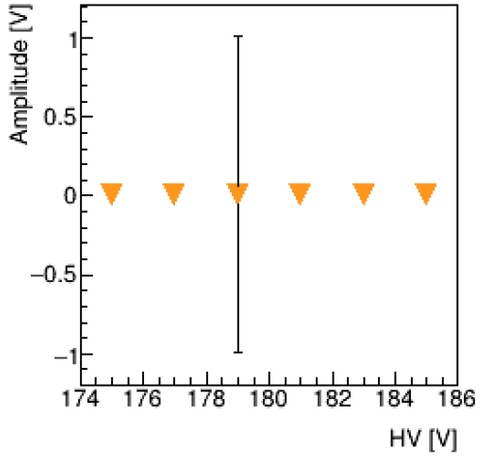
Channel gain equalization

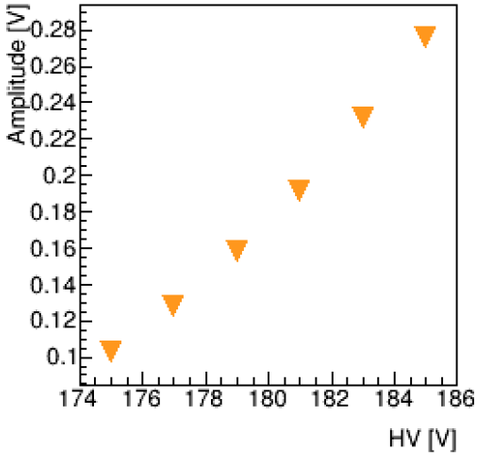


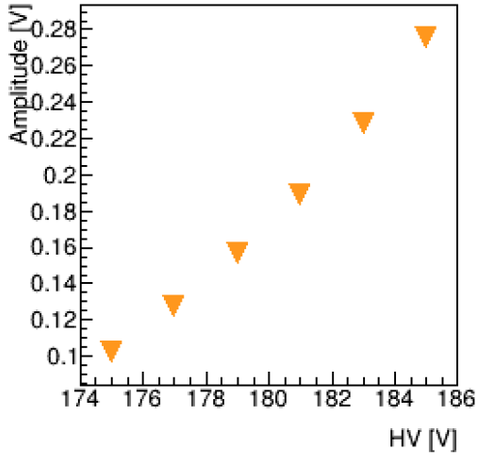
- The different response of channels can be equalised properly tuning the HV
- The gain in the BD region of the SiPMs vary of a factor ~2-3

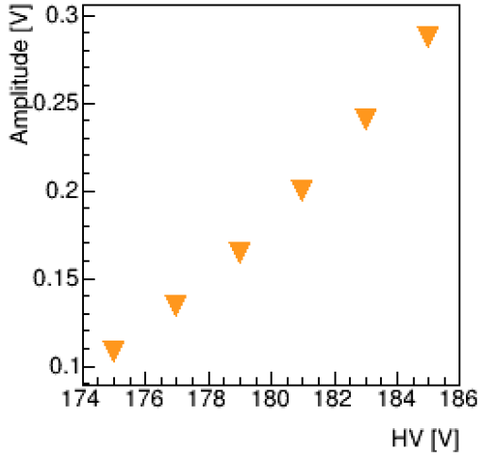






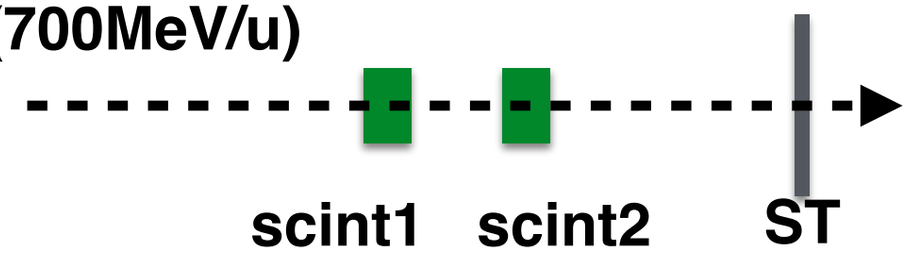


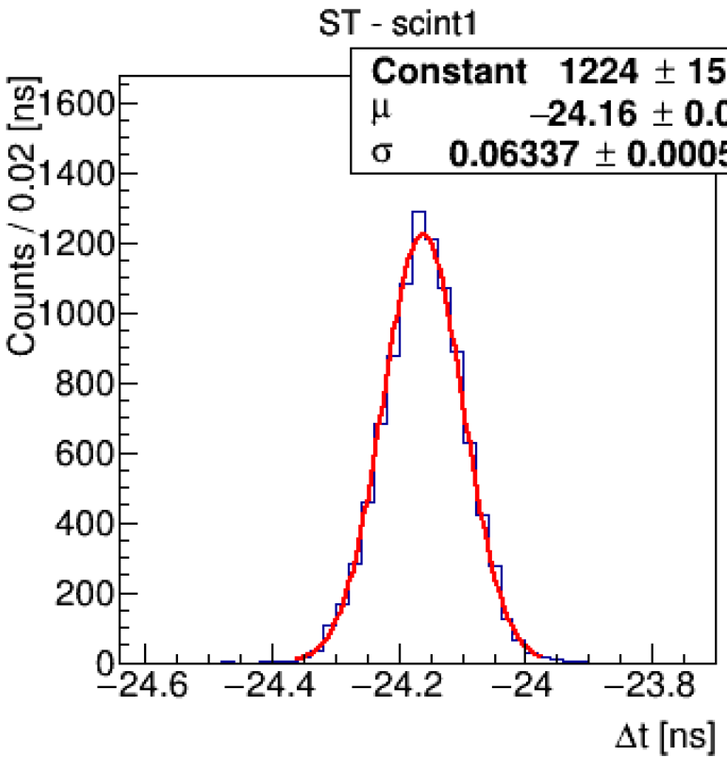


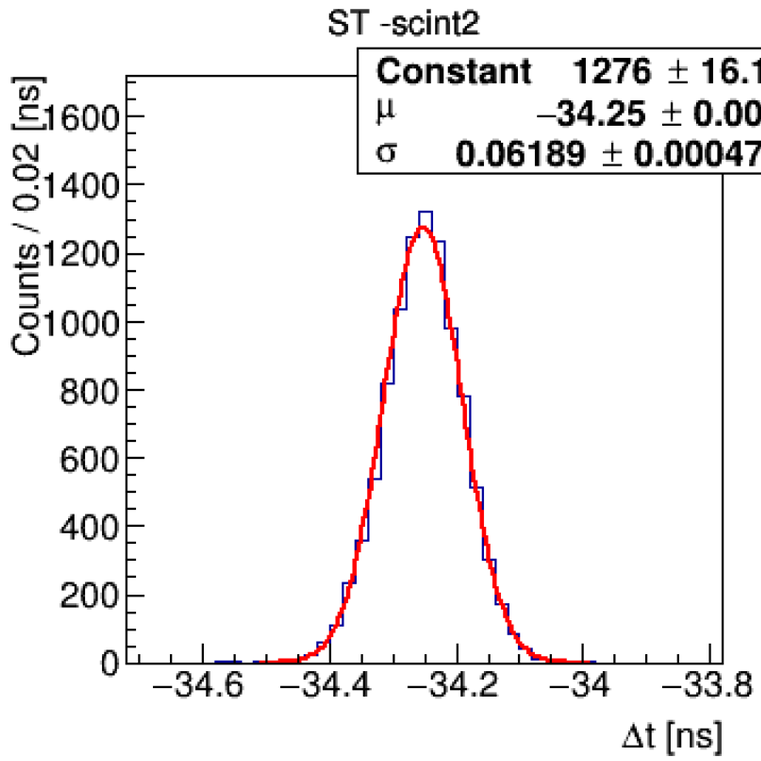


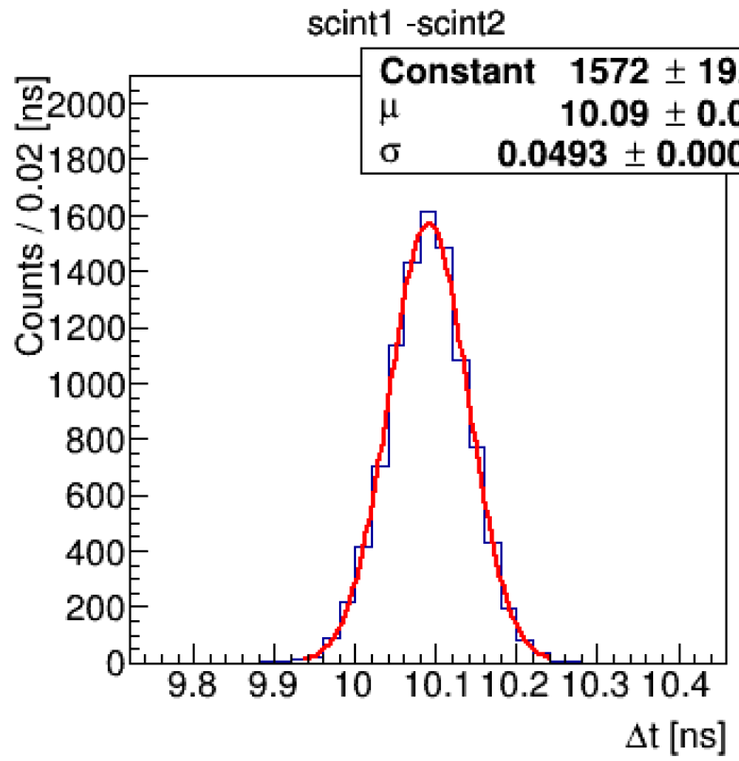
Time resolution

^{12}C (700MeV/u)









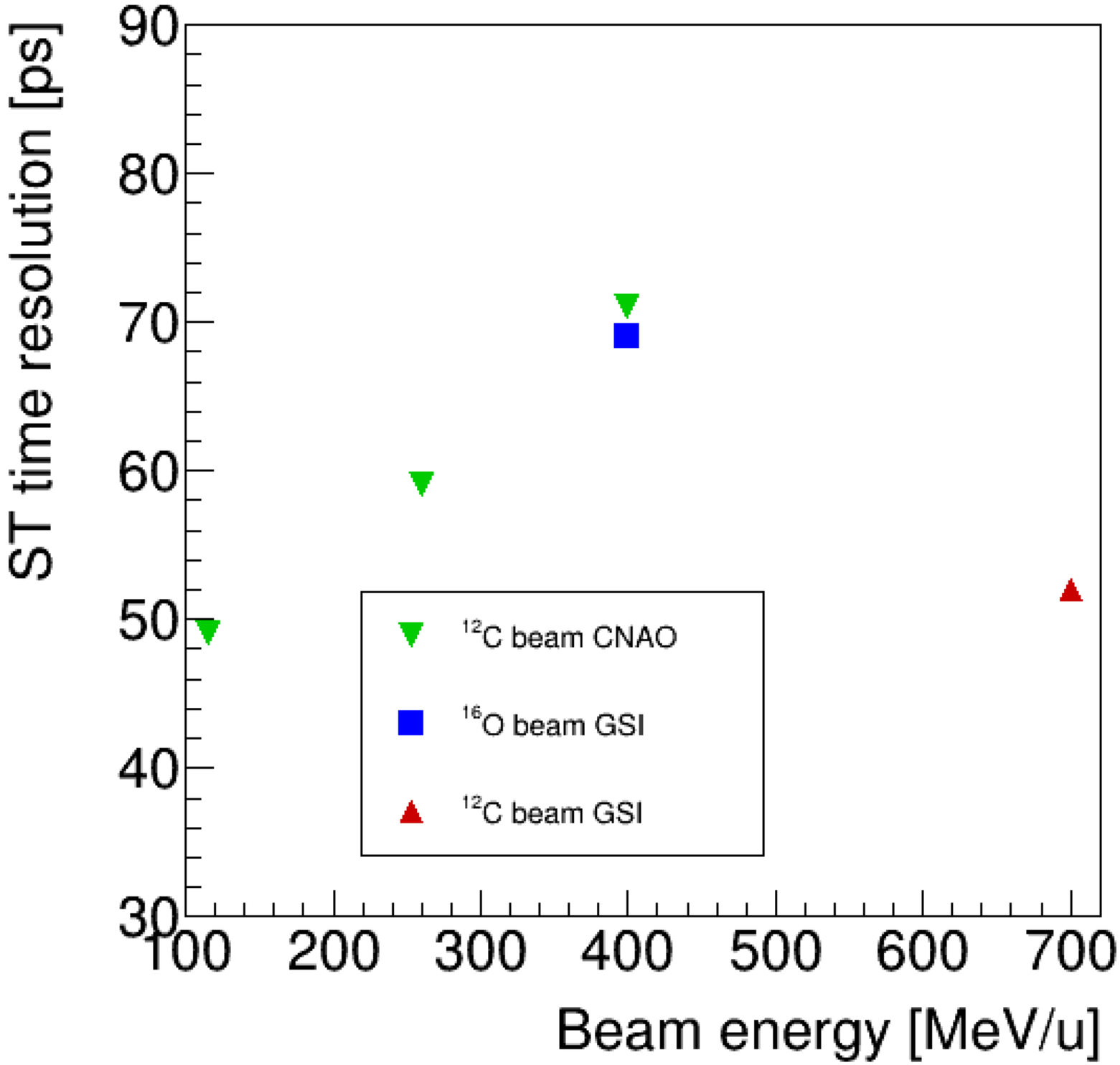
$$\sigma^2_{\mathrm{ST},1} = \sigma^2_{\mathrm{ST}} + \sigma^2_1$$

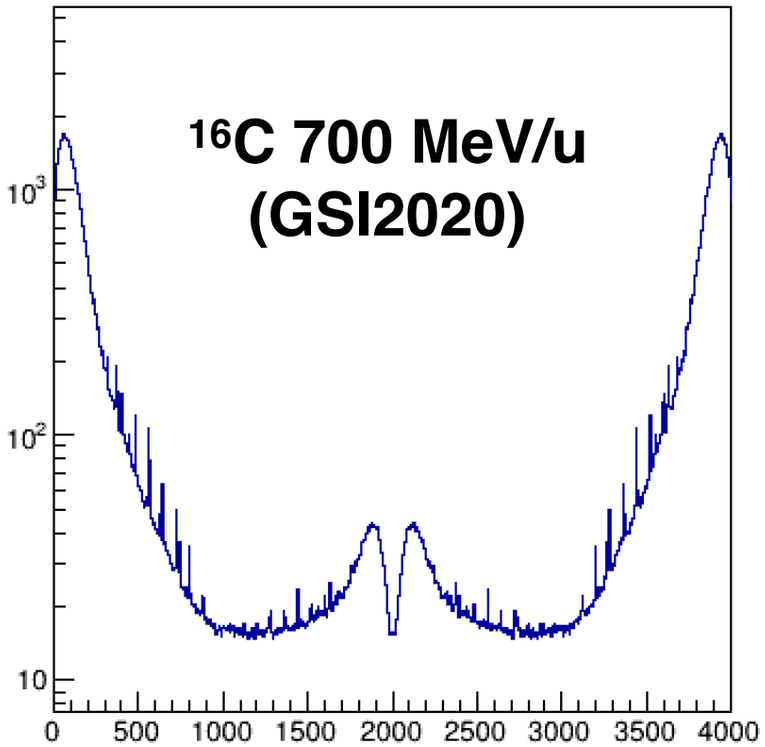
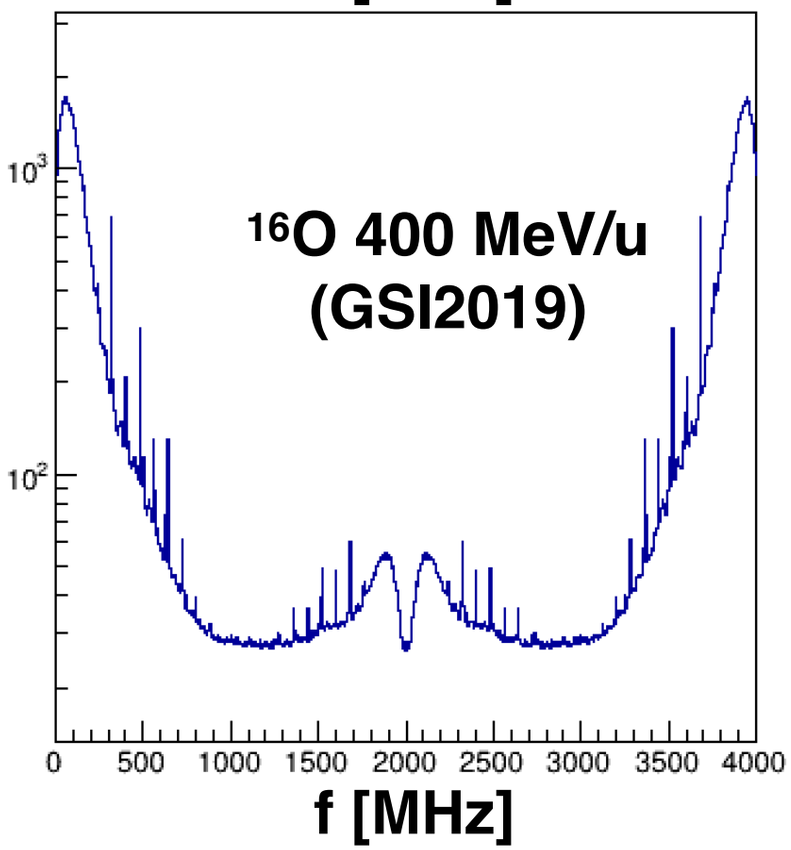
$$\sigma^2_{\mathrm{ST},2} = \sigma^2_{\mathrm{ST}} + \sigma^2_2$$

$$\sigma^2_{1,2} = \sigma^2_1 + \sigma^2_2$$

$$\sigma_{\mathrm{ST}} = \sqrt{\frac{1}{2}\left(\sigma^2_{\mathrm{ST},1} + \sigma^2_{\mathrm{ST},2} - \sigma^2_{1,2}\right)} \sim 53 \text{ ps}$$

Comparison with the past



Noise study

- The noise is **still observable**. We observed a “low frequency” component that could be observed as a baseline fluctuation, and a “high frequency" component.
- The amount of noise dependent on … whatever! (cable configuration and orientation, positioning in the room). Small setup variations dramatically affect the noise picked up by the system.
- However,acting on the WD internal filters and using **a reasonable threshold (40-50mV), at the operating HV it seems that could be take under control** (~Hz noise rate), keeping an high efficiency on the incoming ion detection.
- The impact on time resolution has to be evaluated, but the obtained results suggest that should be minimum/ negligible.
- I have just started a fourier analysis to better understand which is the right way to shield the detector in the future.