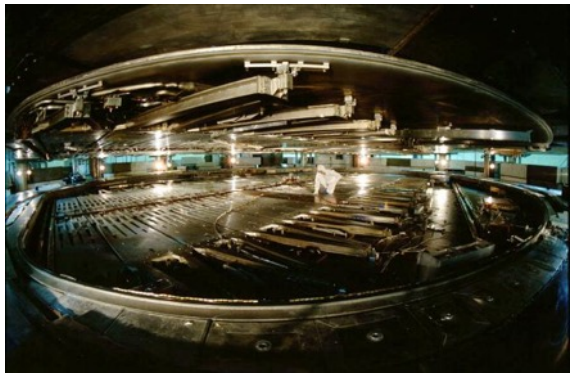
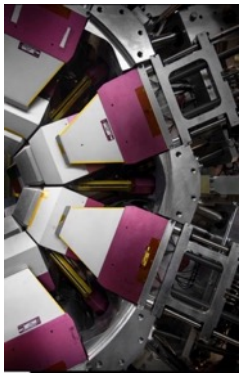
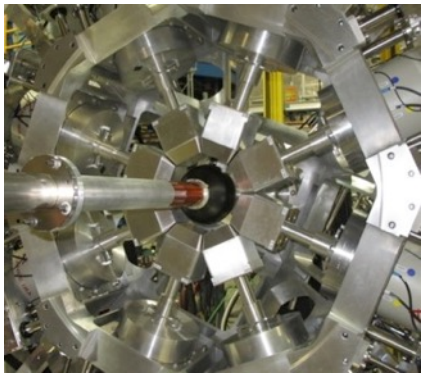
Opportunities for Future Experiments at ISAC-II, TRIUMF

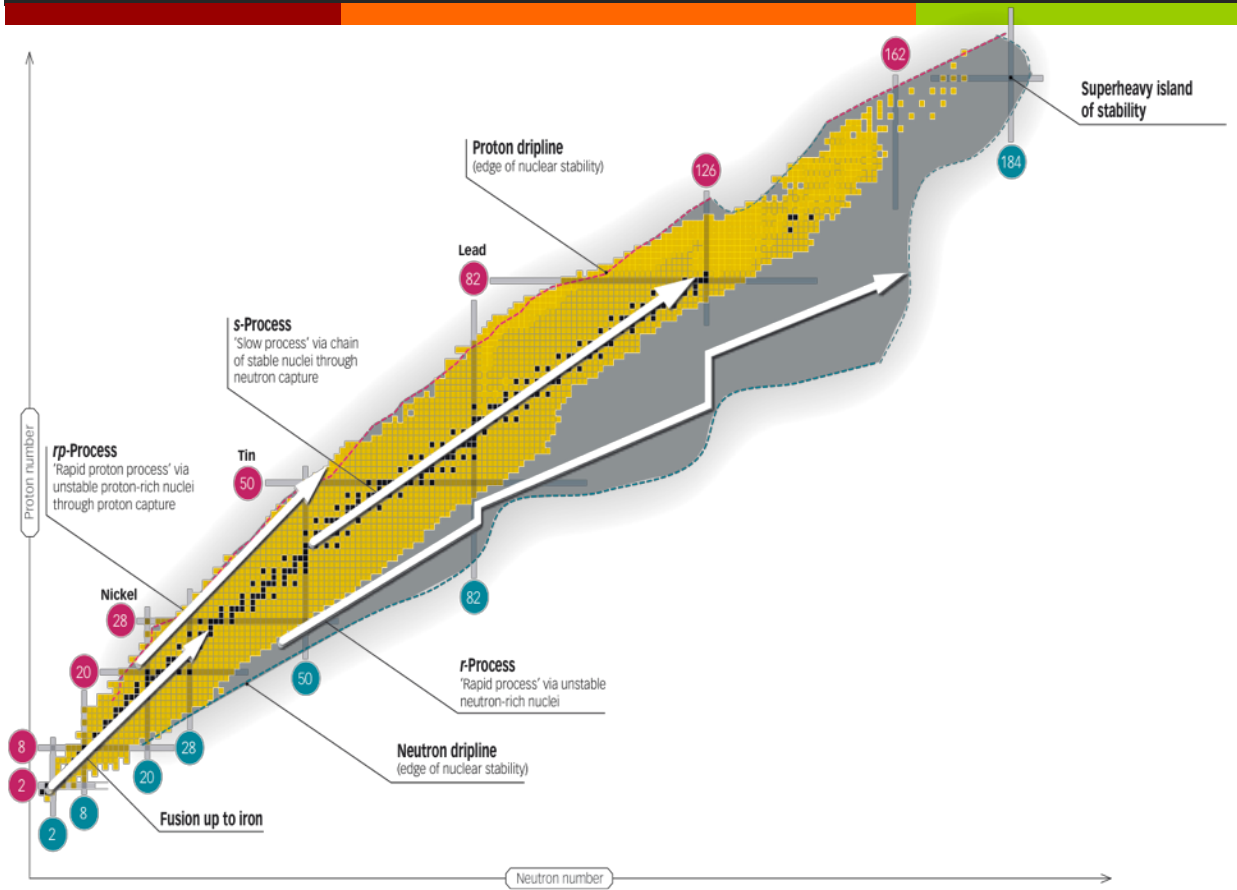
Beau Greaves, Dennis Mücher
WNPPC 2019

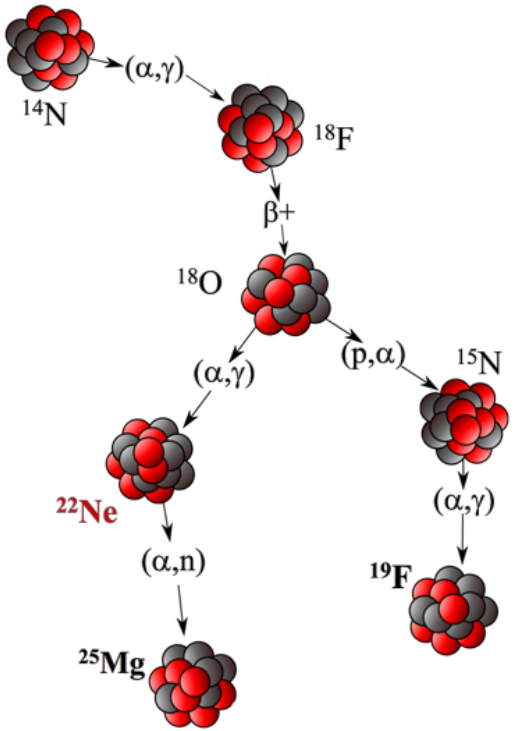
UNIVERSITY of GUELPH



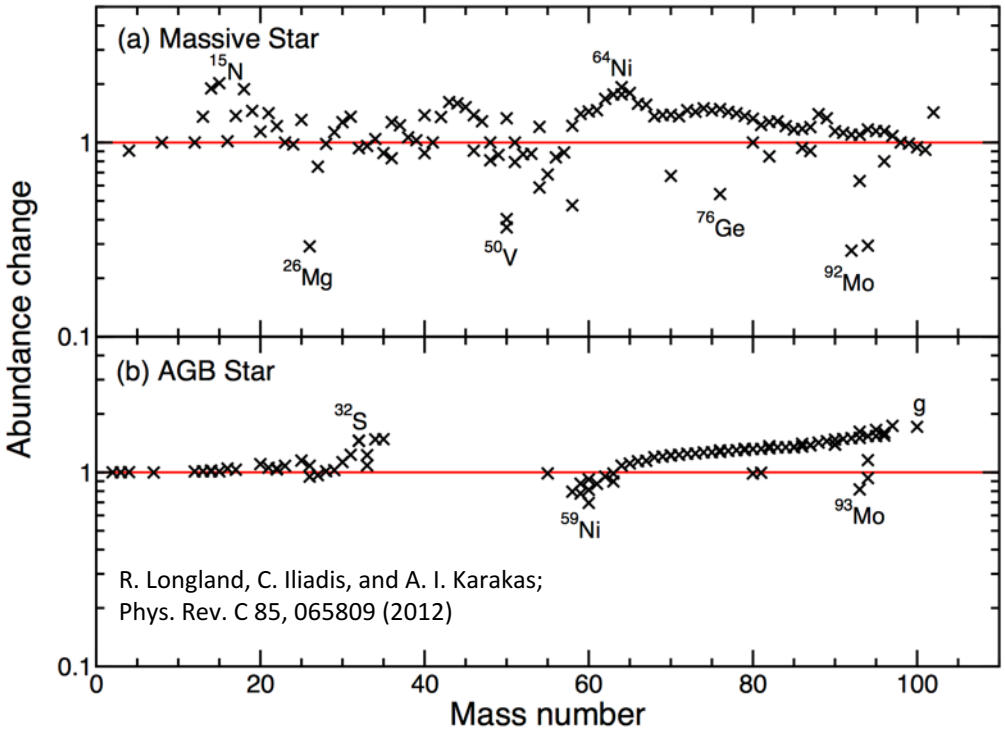



Understanding Stellar Nucleosynthesis





Reaction rates for the s-process neutron source ^{22}Ne+α



^{22}Ne produced in AGB stars from $^{18}O(\alpha,\gamma)$

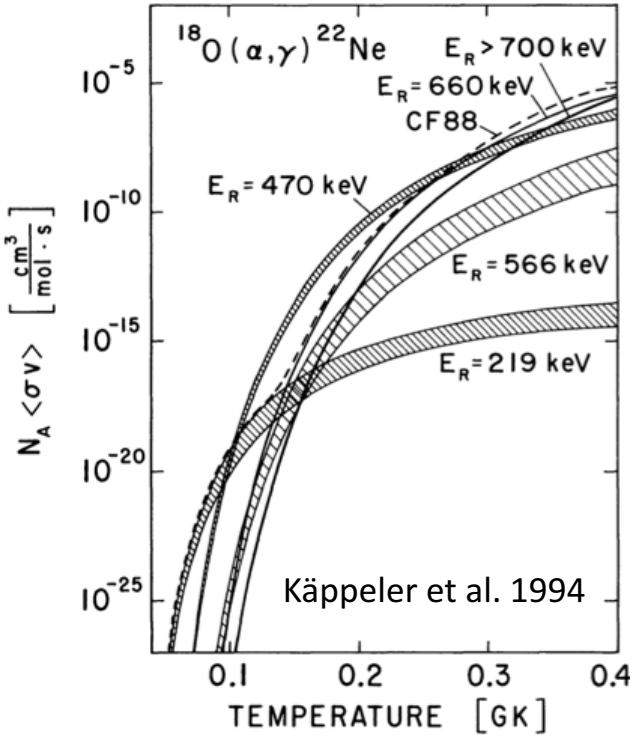
Following ^{22}Ne(α,n)^{25}Mg is main neutron source for heavy element s-process

Recent rate adjustments show drastic impact on abundances

- ^{22}Ne(α,γ)^{26}Mg
- ^{22}Ne(α,n)^{25}Mg

Example: spectroscopy of ^{22}Ne resonances at ISAC-II

E_r (MeV)	E_x (MeV)	J^{π} [a]	$\omega\gamma_{(\alpha,\gamma)}$ (μeV)[b]	$\omega\gamma_{(\alpha,n)}$ (μeV)[b]
		$^{18}O + \alpha$		
0.058.....	9.72	3^-	4.1×10^{-40}	
		(2^+)	1.5×10^{-39}	
0.218.....	9.85	2^+	7.1×10^{-12}	
		(1^-)	5.8×10^{-11}	
0.470.....	10.05	0^+	0.55	
		(1^-)	0.23	
0.566.....	10.13	4^+	7.9×10^{-3}	
		(2^+)	1.95	
		(3^-)	0.15	
0.662.....	10.21	1^-	230 ± 25[c]	



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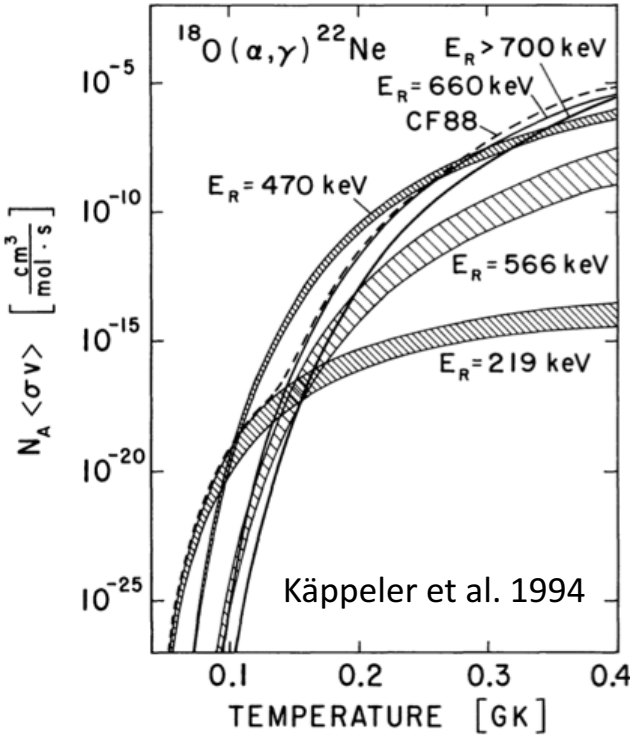
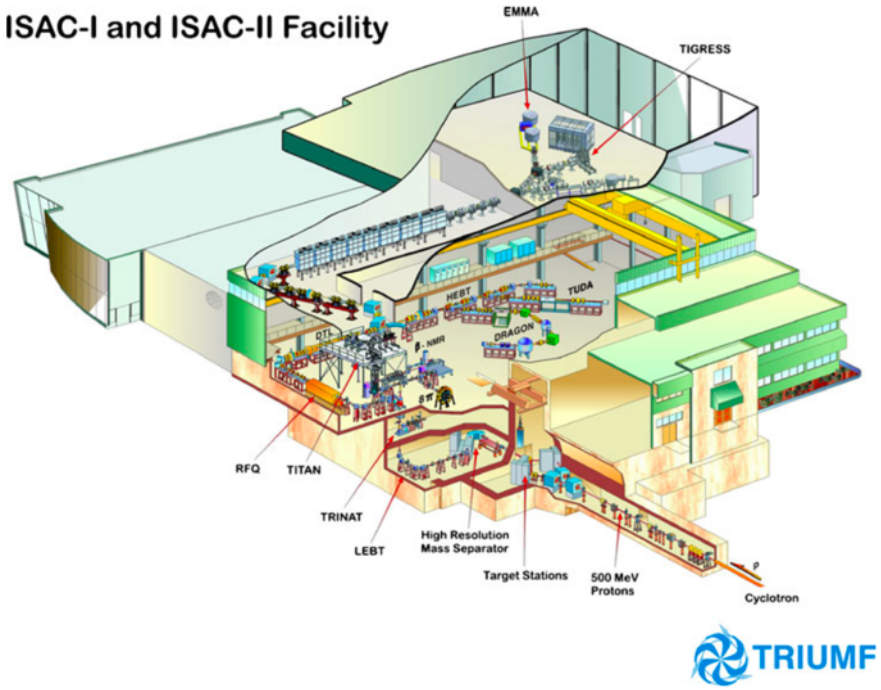
indirect: TUDA, TACTIC, **TIGRESS**, IRIS, EMMA

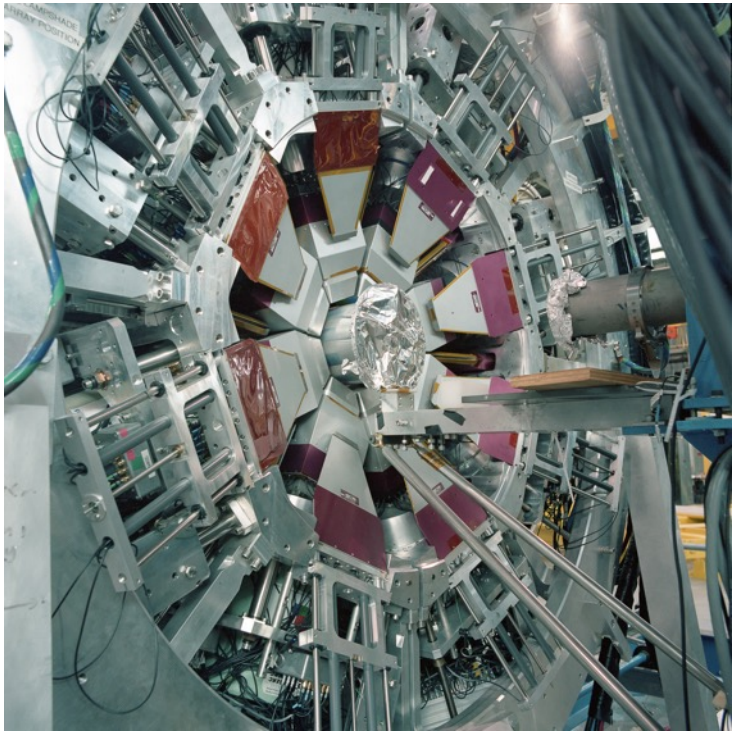
direct: DRAGON



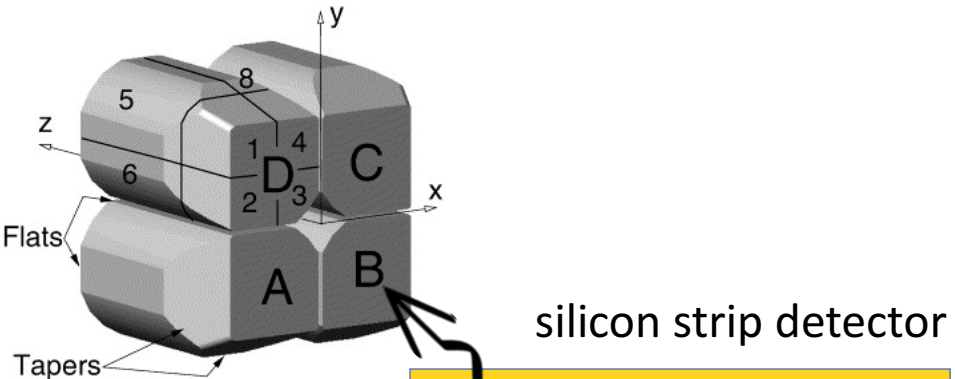
ISAC-II at TRIUMF

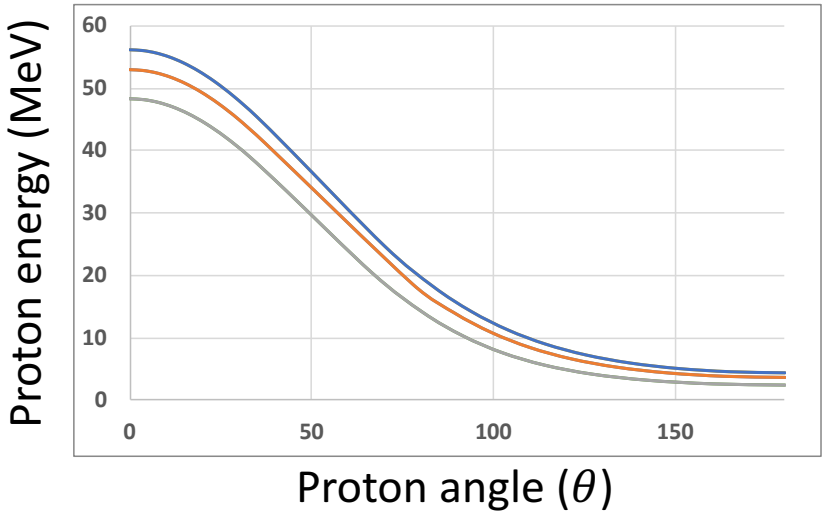


TIGRESS



Experiments in Inverse Kinematics





silicon strip detector

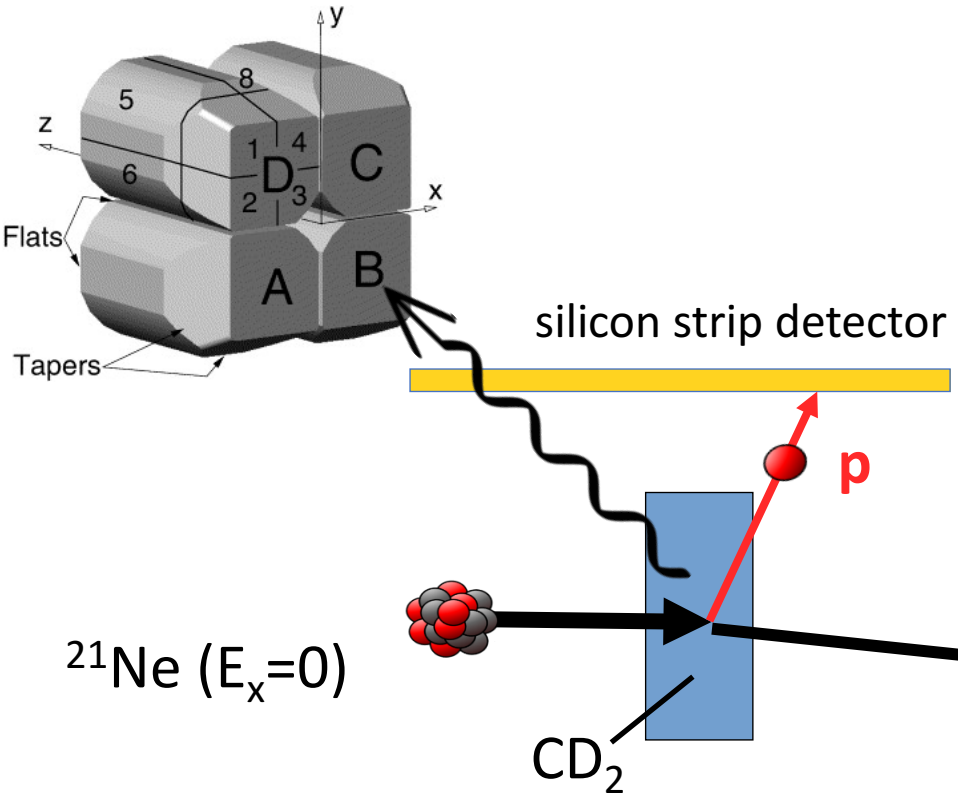
p

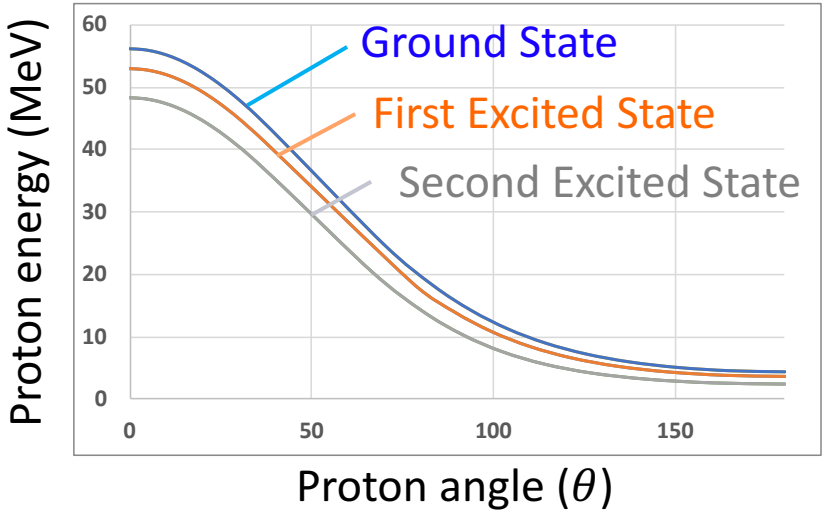
^{21}Ne (E_x=0)

^{22}Ne (E_x=?)

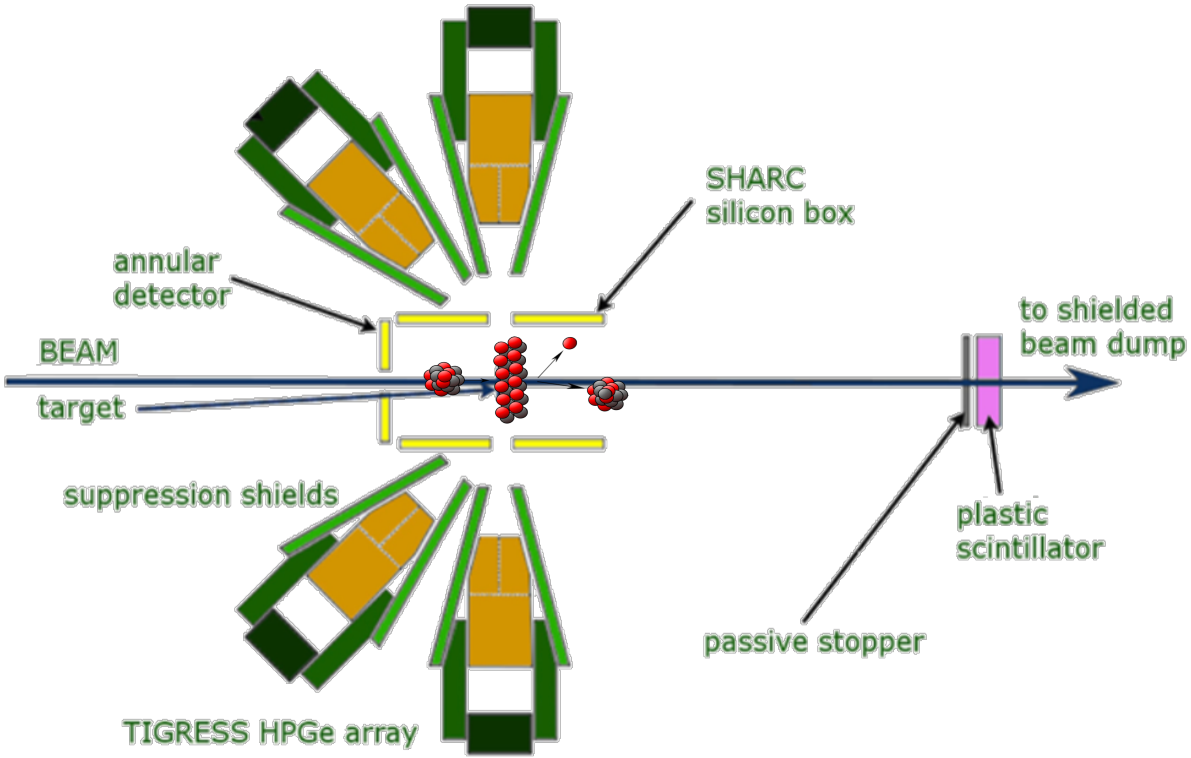
CD_2

Experiments in Inverse Kinematics

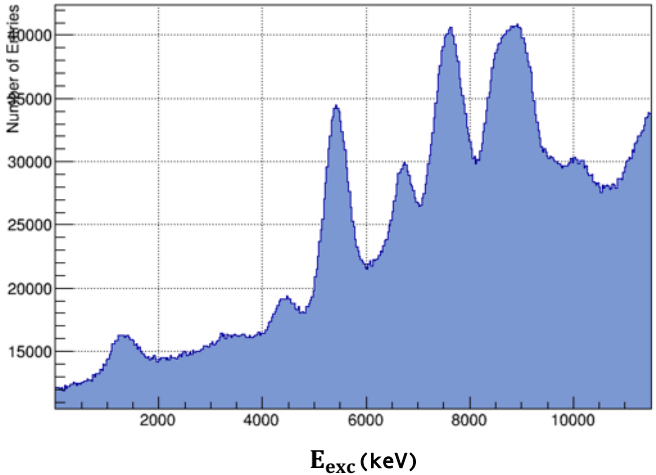




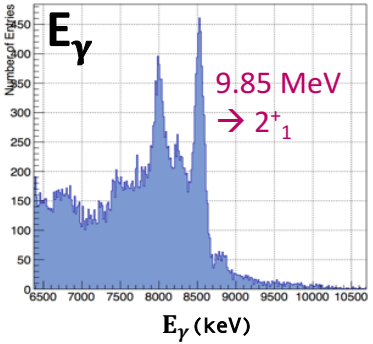
Particle-gamma spectroscopy with TIGRESS

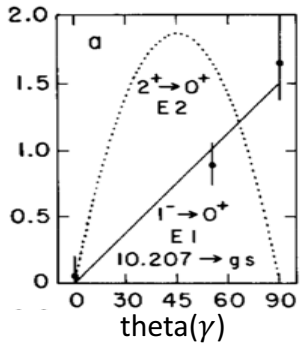


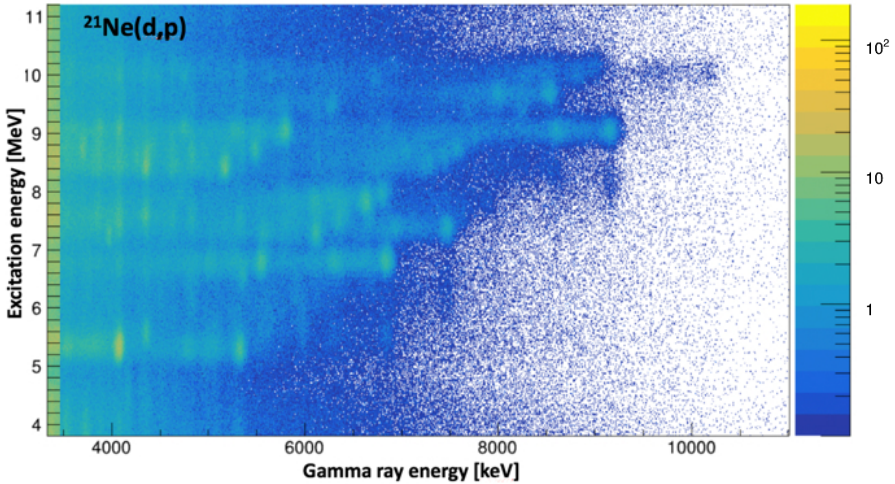
^{21}Ne(d,p), 7.9 MeV/u
August 2017

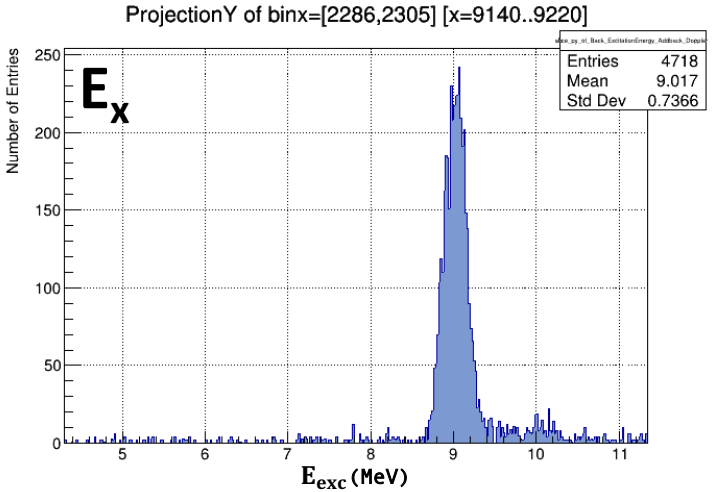


Spectroscopy of ^{22}Ne resonances at ISAC-II

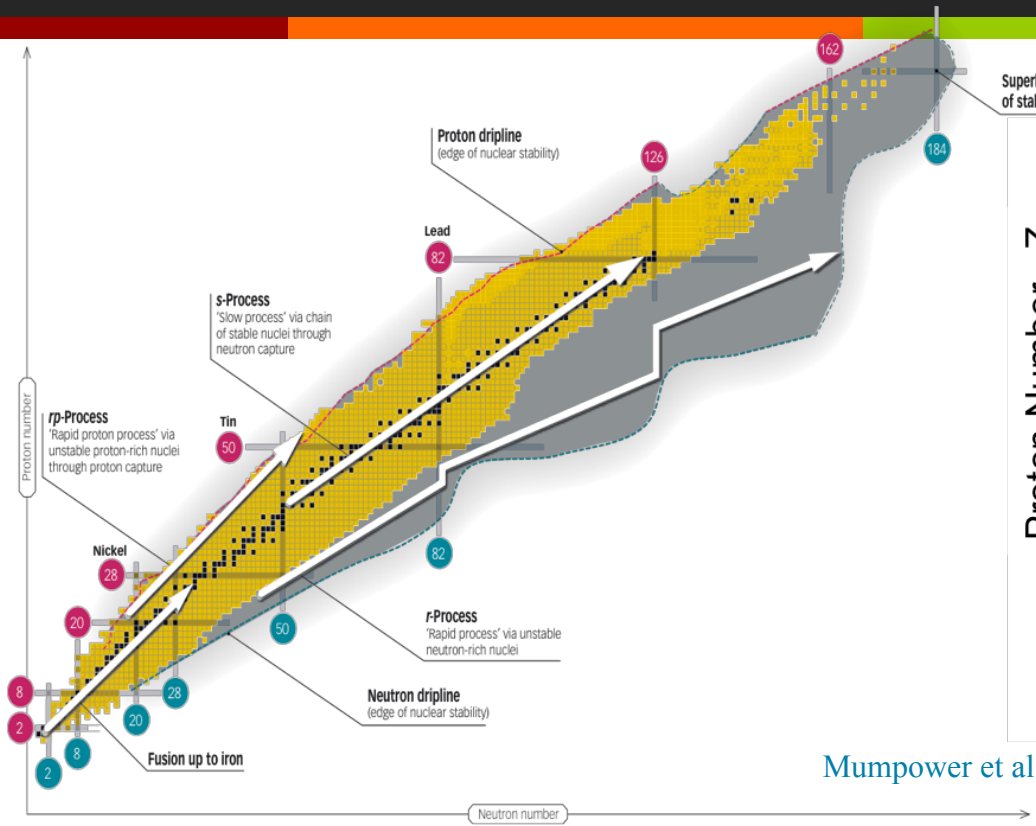


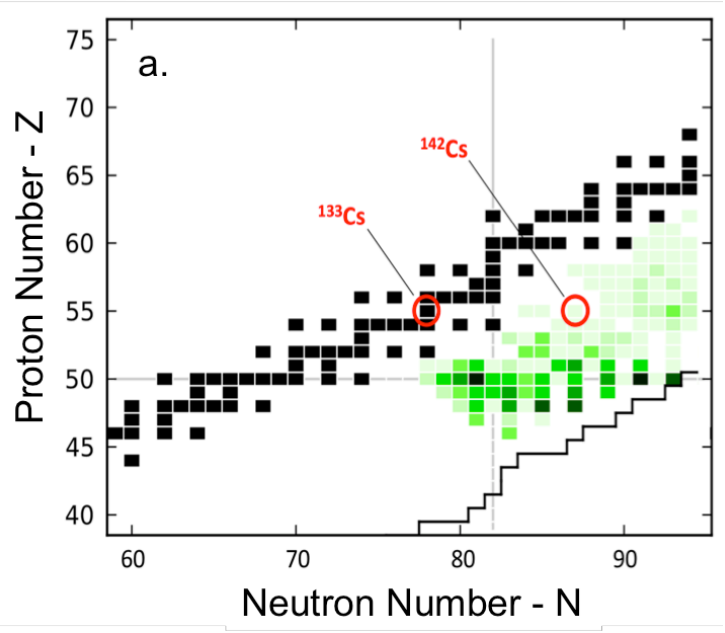






Neutron capture rates in the r-process

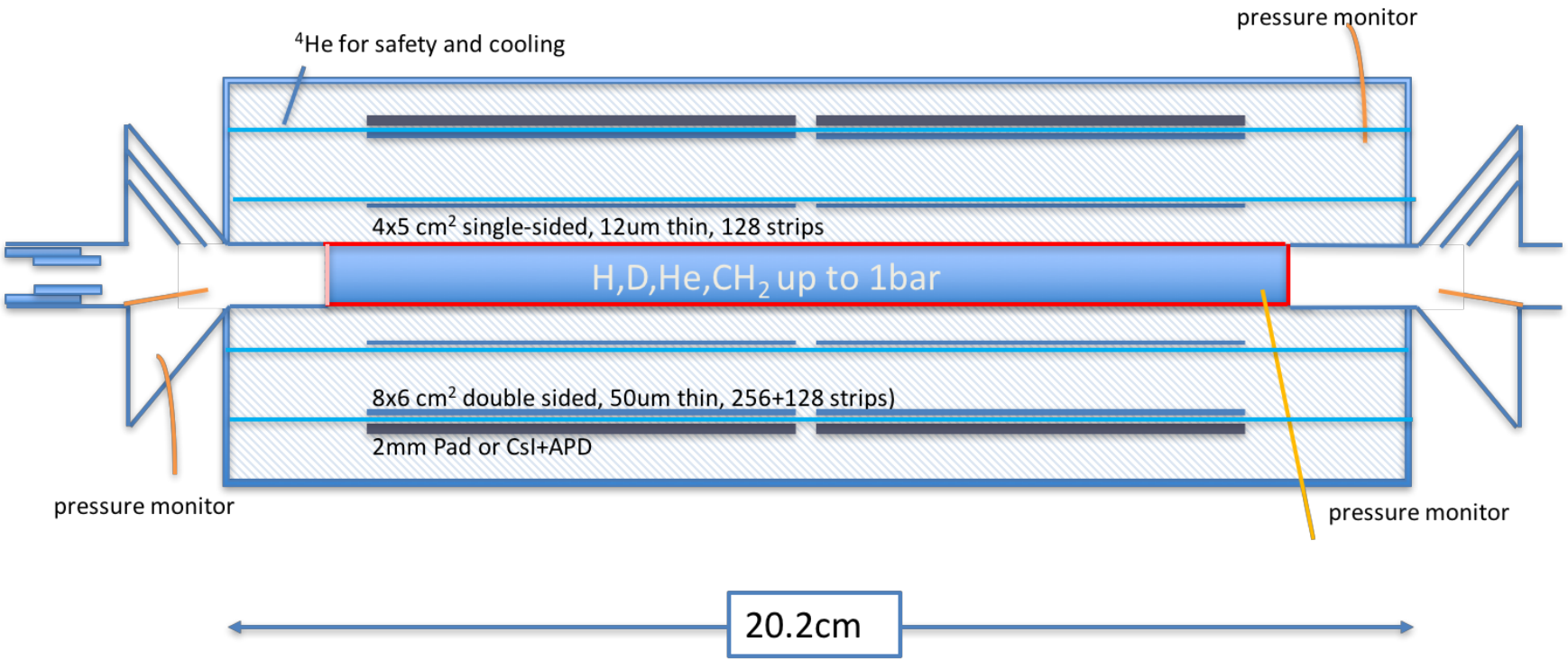




Mumpower et al., Progress in Particle and Nuclear Physics 86 (2016) 86–126

D. Muecher, A. Spyrou, I. Dillmann: 31 shifts approved with high priority at ISAC-II

TI-STAR = TIGRESS Silicon Tracker Array



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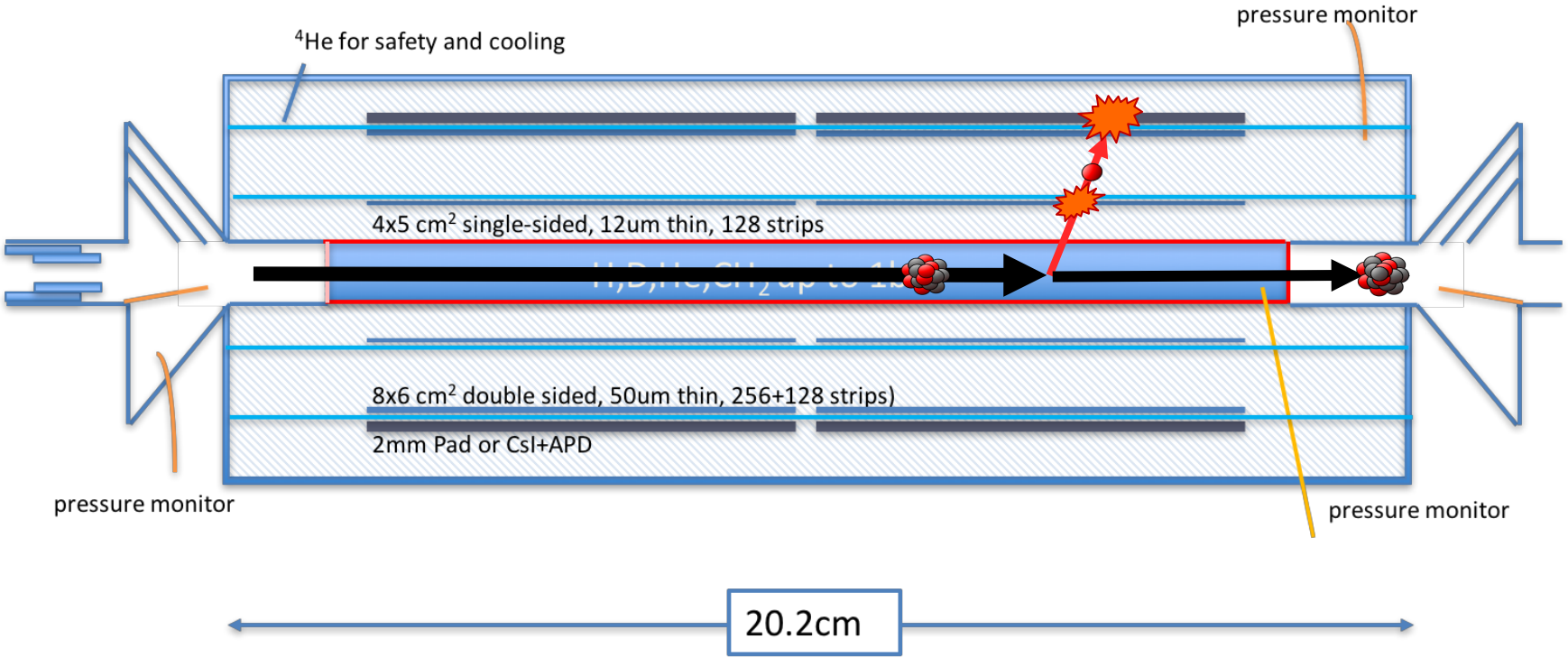
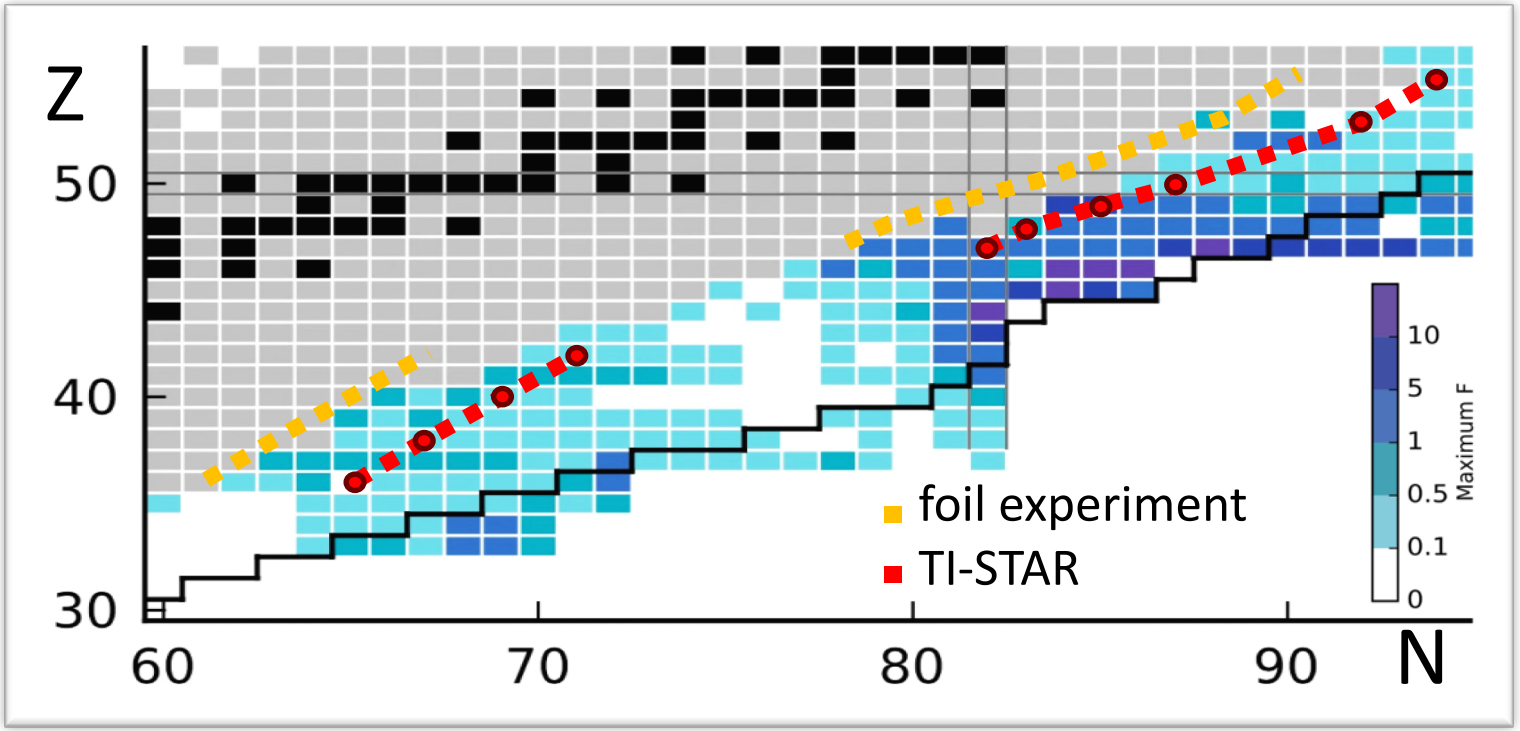


Neutron capture rates accessible using ARIEL beams



adapted from Prog. Part Nucl Phys 86 (2016) 86-126

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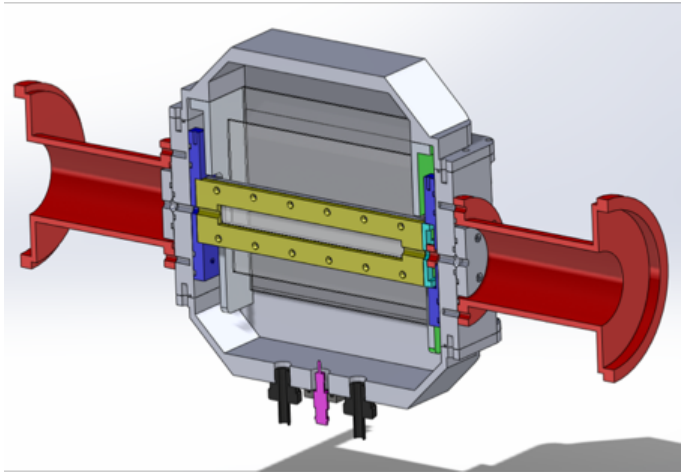
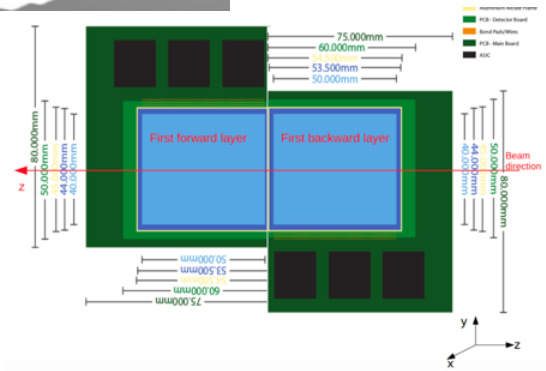
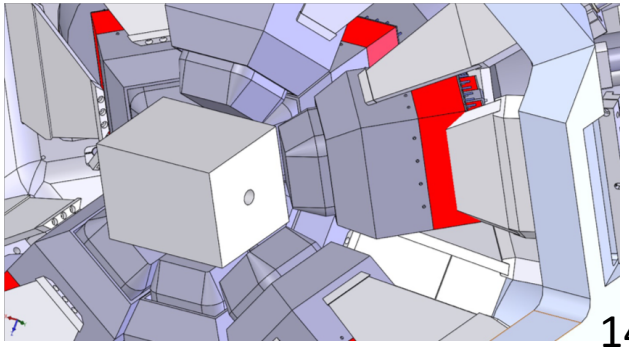


- **L. Atar, T. Rockman** (both UofG): Geant4
- **Hadi Behnamian** (Iranian lightsource facility)**:** detector development, cooling
- **Vinzenz Bildstein**, UofG: general detector and electronics layout
- **R. Gernhäuser, M. Böhmer** (both TU Munich): ASICs, PCBs
- **F. Sarazin** (Mines), **R. Hendersson** (TRIUMF): mechanical design
- **F. Retiere** (TRIUMF) + team: FPGA
- **R. Openshow, P. Lu** (TRIUMF): gas system
- **D. Muecher** (UofG, TRIUMF): PI

Budget: $769,000 funded to 75%





Acknowledgements

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- **TRIUMF** –S. Gillespie, G. Hackman, A. Babu, F. Barrett, N. Bernier, S. Bhattacharjee, R. Caballero-Folch, A. Chester, A. Murphy B. Olaizola, Y. Saito, R. Umashankar
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- **NSCL** – A. Spyrou
- **Surrey** – W. N. Catford, P. Siuryte
- **University of Toronto** – T. Drake

Thank you for listening!

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