



**TRIUMF**

**CANADA'S NATIONAL LABORATORY FOR PARTICLE AND NUCLEAR PHYSICS**

*Owned and operated as a joint venture by a consortium of Canadian universities via a contribution through the National Research Council Canada*

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# Future developments for TITAN-EC

T. Brunner



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**LABORATOIRE NATIONAL CANADIEN POUR LA RECHERCHE EN PHYSIQUE NUCLÉAIRE ET EN PHYSIQUE DES PARTICULES**

*Propriété d'un consortium d'universités canadiennes, géré en co-entreprise à partir d'une contribution administrée par le Conseil national de recherches Canada*

- Detection system
  - Test of Si(Li) detectors
  - DAQ and electronics
  - Spare preamp and PIPS detector
- Infrastructure
  - Be windows
  - Si(Li) mounting structure
  - LN2 filling
- Isobar separation (MR-TOF-MS and CPET)
- Systematic studies and Measurement cycle
- Data analysis

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- What DAQ to use

	DSPEC (Ortec)	tig10	SIS 3302
FWHM @ 14keV	0.89keV	n.a.	Not done yet
FWHM @ 122keV	0.98keV	1.46keV	1.40keV
FWHM @ 136keV	0.98keV	1.49keV	1.64 keV
FWHM @ 1173keV	1.70keV	2.04keV	2.04keV
FWHM @ 1332keV	1.80keV	2.15 keV	2.14keV
Trigger level Ge detector	800 eV LeGe	40 keV Ge	3.5 keV Ge
Time stamp	No	Yes	Yes
Transistor reset	yes	No?	No???

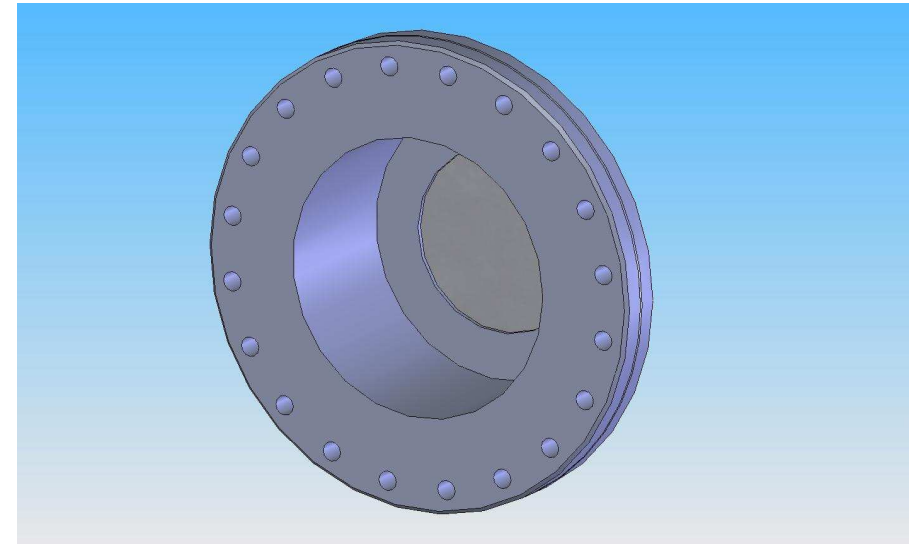
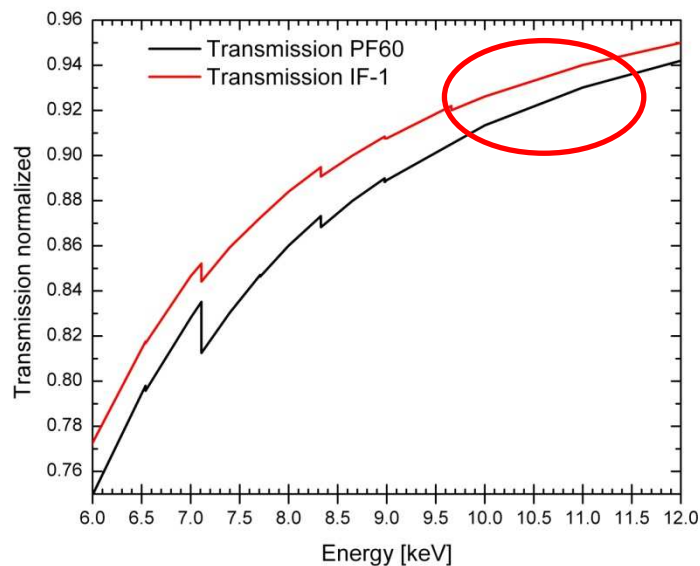
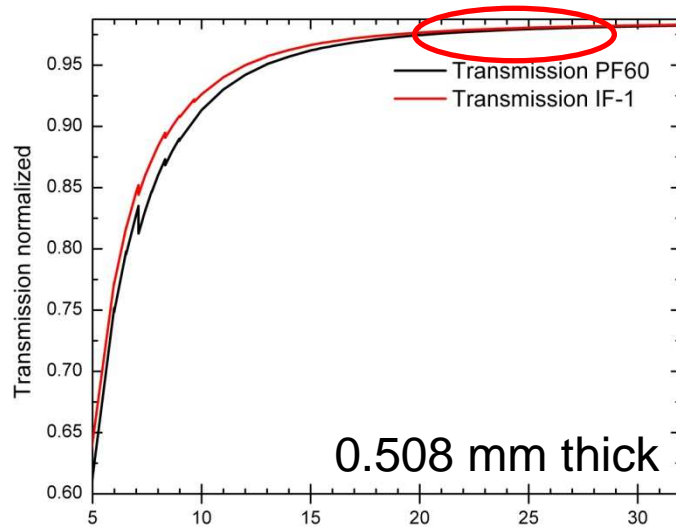
### Digital DAQ:

- Timing information / poor energy resolution

See [tig10 performance report](#)

### Analog DAQ (Spec. amp and CAMAC)

- Timing signal not straightforward vs. good energy resolution



Two qualities available:

PF-60: 99.0% Be @ 3k\$

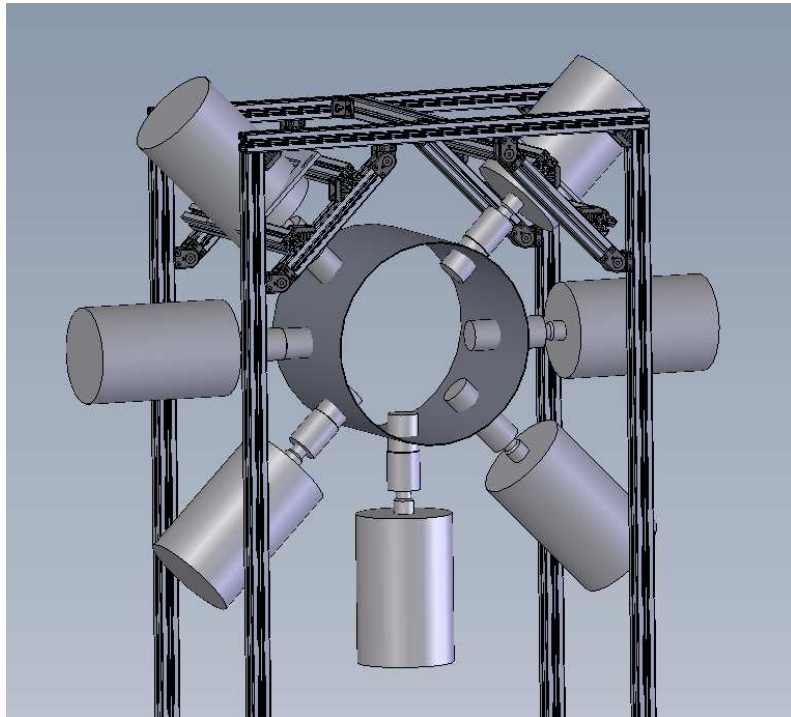
IF-1: 99.8% Be @ 6k\$

**Does it matter?**

Not for most of the cases

It does matter for Ge/As (As Ka @ 10.5keV)

Write ECO and hand project  
to TRIUMF design office



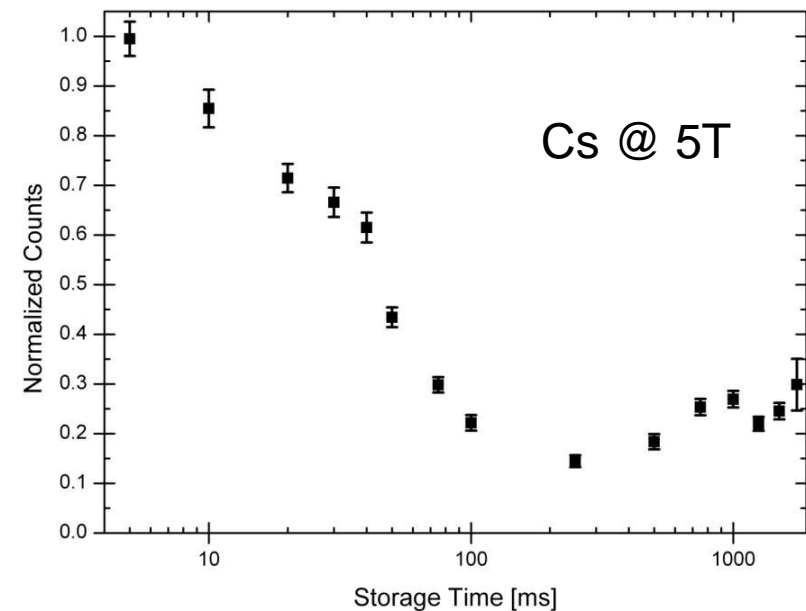
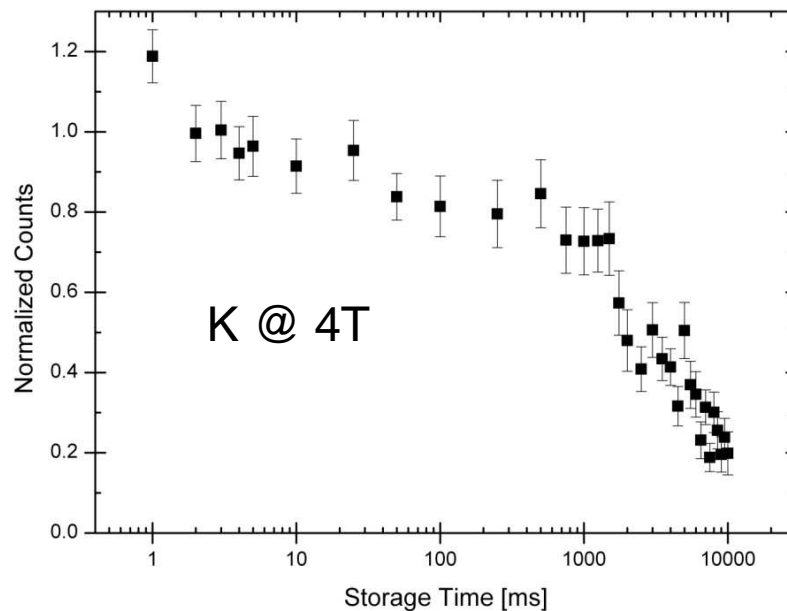
- Install detectors radial around trap
- Cut open EBIT support frame

Write ECO and hand project to TRIUMF design office



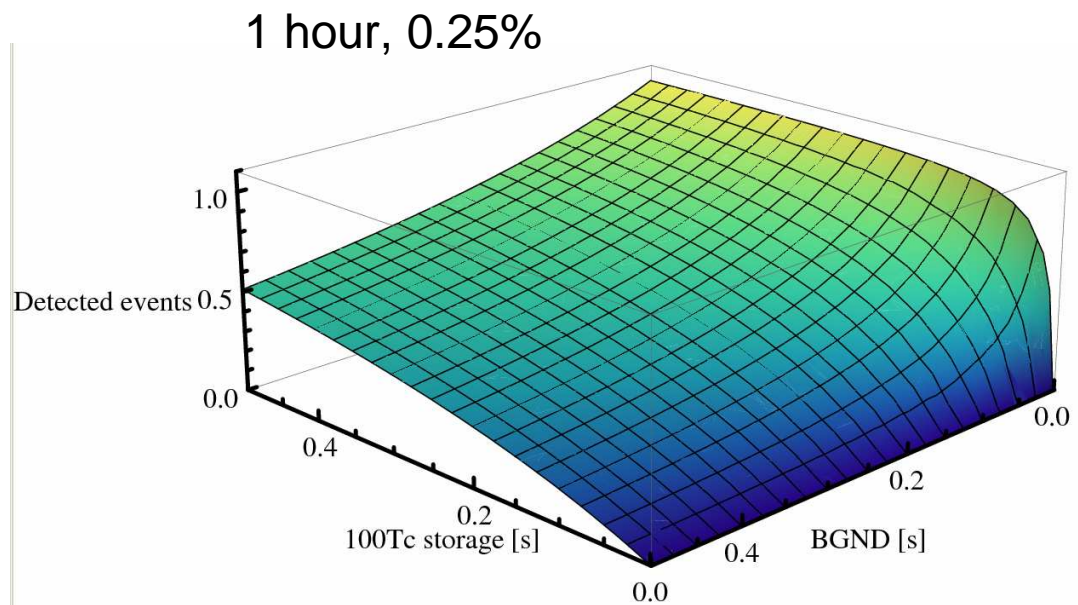
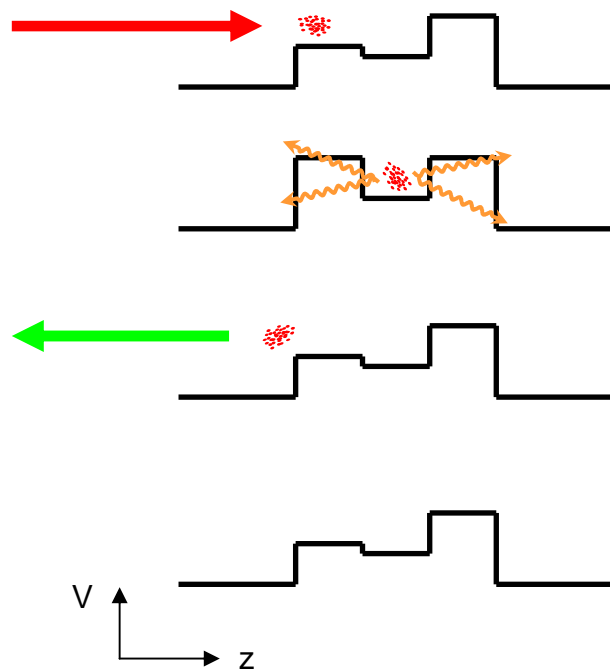
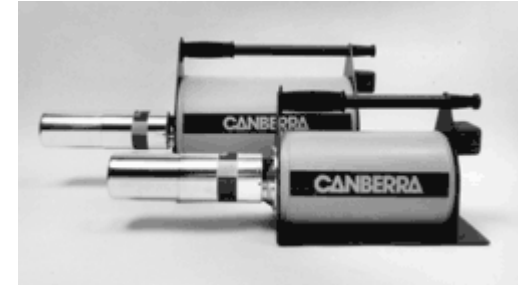
- **Trap studies**

- How long can one store ions
- Is a lower magnetic field better for ion storage?
- Can one measure the ion cloud size?



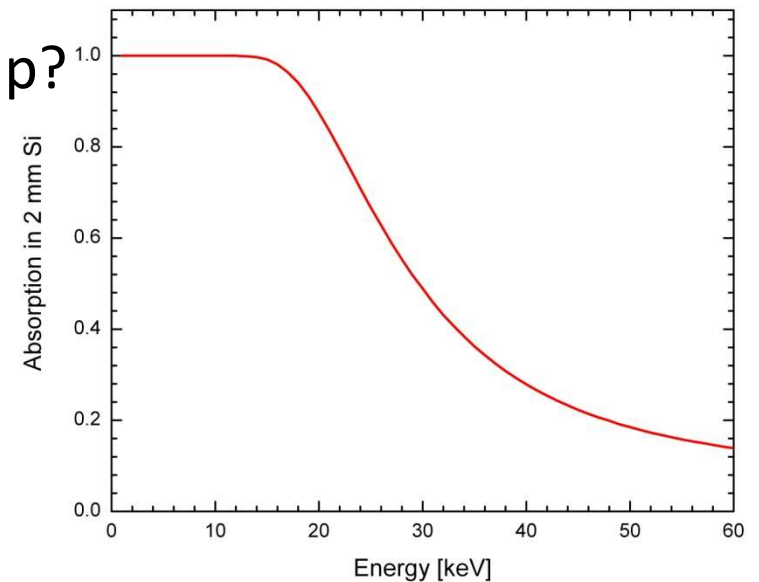
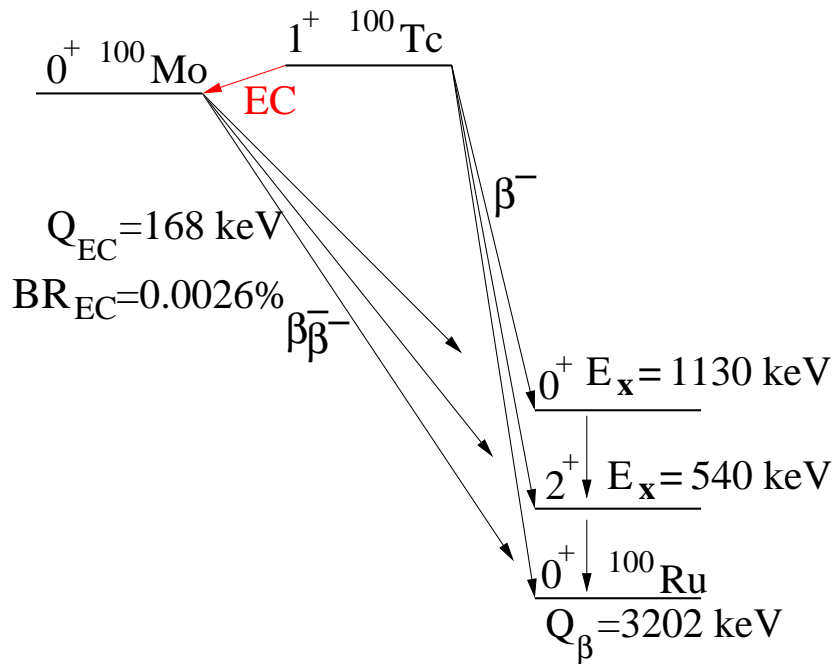
- **Measurement cycle**

- What is the optimal timing cycle
- How to best calibrate the detectors?



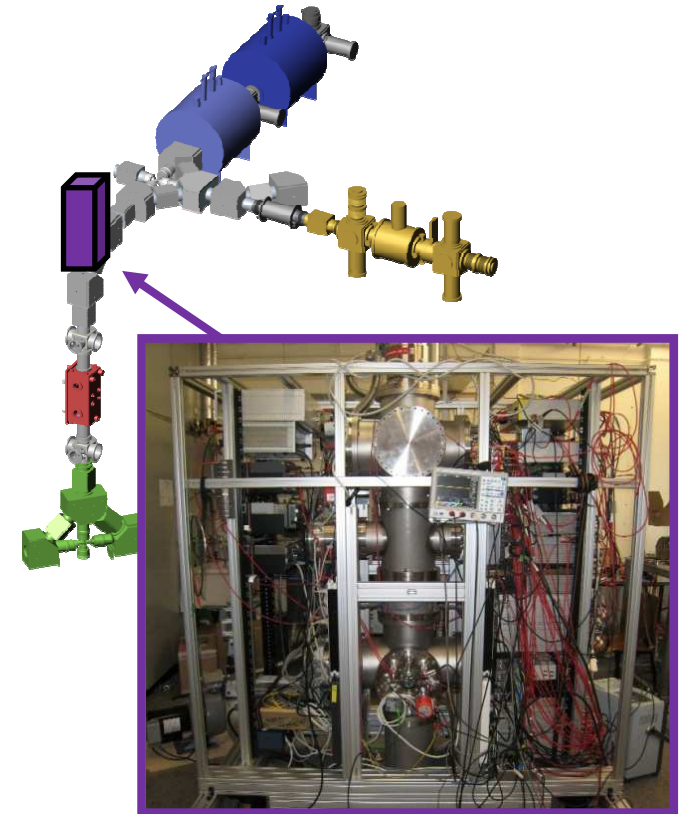


- How do you normalize the spectra
  - Can the Si(Li) detect higher energetic photons (100keV – 400keV)
- Does a beta anti-coincidence really help?



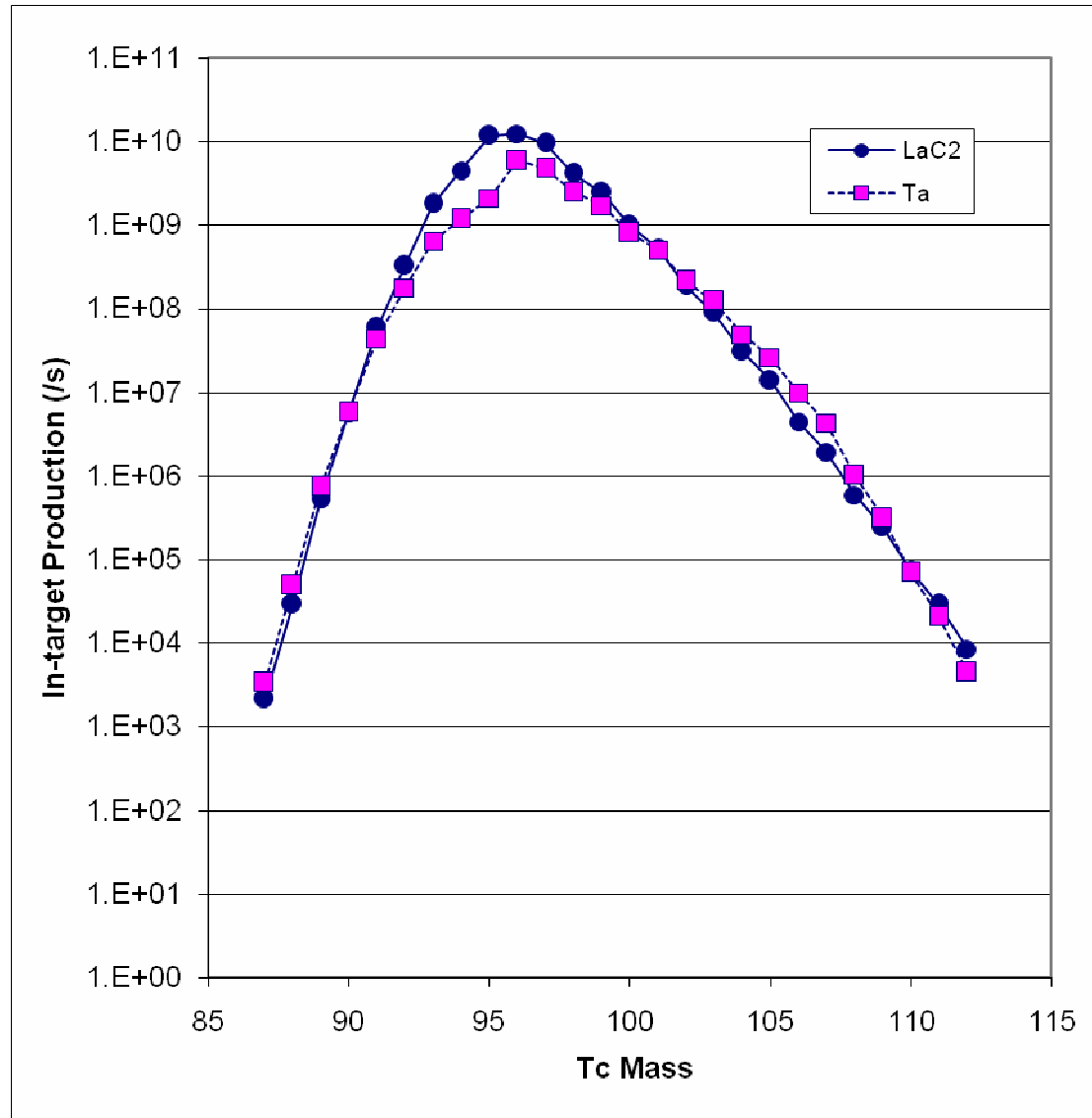
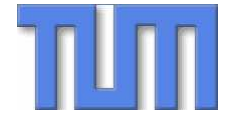
$^{100}\text{Mo}$	$^{100}\text{Tc}$ (EC)	[ $1^+ \rightarrow 0^+$ , T1/2 = 15.8 s]	$K_\alpha = 17.5 \text{ keV}$
$^{110}\text{Pd}$	$^{110}\text{Ag}$ (EC)	[ $1^+ \rightarrow 0^+$ , T1/2 = 24.6 s]	$K_\alpha = 21.2 \text{ keV}$
$^{114}\text{Cd}$	$^{114}\text{In}$ (EC)	[ $1^+ \rightarrow 0^+$ , T1/2 = 71.9 s]	$K_\alpha = 25.3 \text{ keV}$
$^{116}\text{Cd}$	$^{116}\text{In}$ (EC)	[ $1^+ \rightarrow 0^+$ , T1/2 = 14.1 s]	$K_\alpha = 25.3 \text{ keV}$
$^{82}\text{Se}$	$^{82\text{m}}\text{Br}$ (EC)	[ $2^- \rightarrow 0^+$ , T1/2 = 6.1 min]	$K_\alpha = 11.2 \text{ keV}$
$^{128}\text{Te}$	$^{128}\text{I}$ (EC)	[ $1^+ \rightarrow 0^+$ , T1/2 = 25.0 min]	$K_\alpha = 27.5 \text{ keV}$
$^{76}\text{Ge}$	$^{76}\text{As}$ (EC)	[ $2^- \rightarrow 0^+$ , T1/2 = 26.2 h]	$K_\alpha = 9.9 \text{ keV}$

- MR-TOF-MS
  - Maximum capacity
- CPET
  - Cooling techniques in a Penning trap





# TRIUMF $^{100}\text{Tc}$ production rate



LaC<sub>2</sub> target with 50  $\mu\text{A}$  p beam

Ta target with 70  $\mu\text{A}$  p beam

Thanks to  
**Marik Dombisky**

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