The new Fast TapeStation at Isolde

Isolde Workshop Tim Giles December 2010

Why a new FTS?

⇨ **Electronics & hardware of old tapestation unmaintainable**

⇨ **New tapestation designed and built at IReS, Strasbourg**

⇨ **Faster tape transport : 200 ms vs 1000 ms**

232 isotopes in the range 250 - 1000 ms

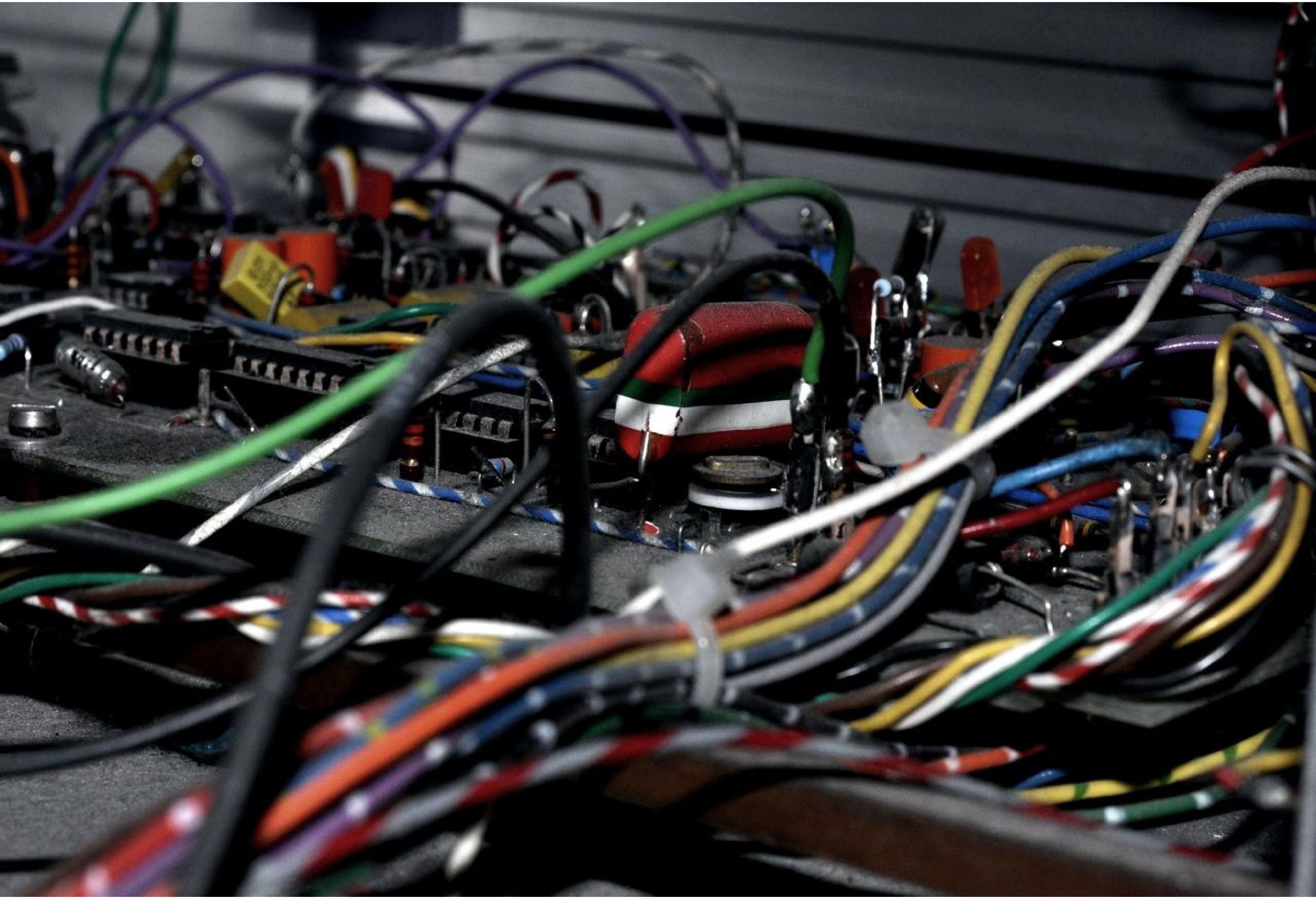
186 isotopes in the range 50 - 250 ms

⇨ **New feature : in-beam measurement**

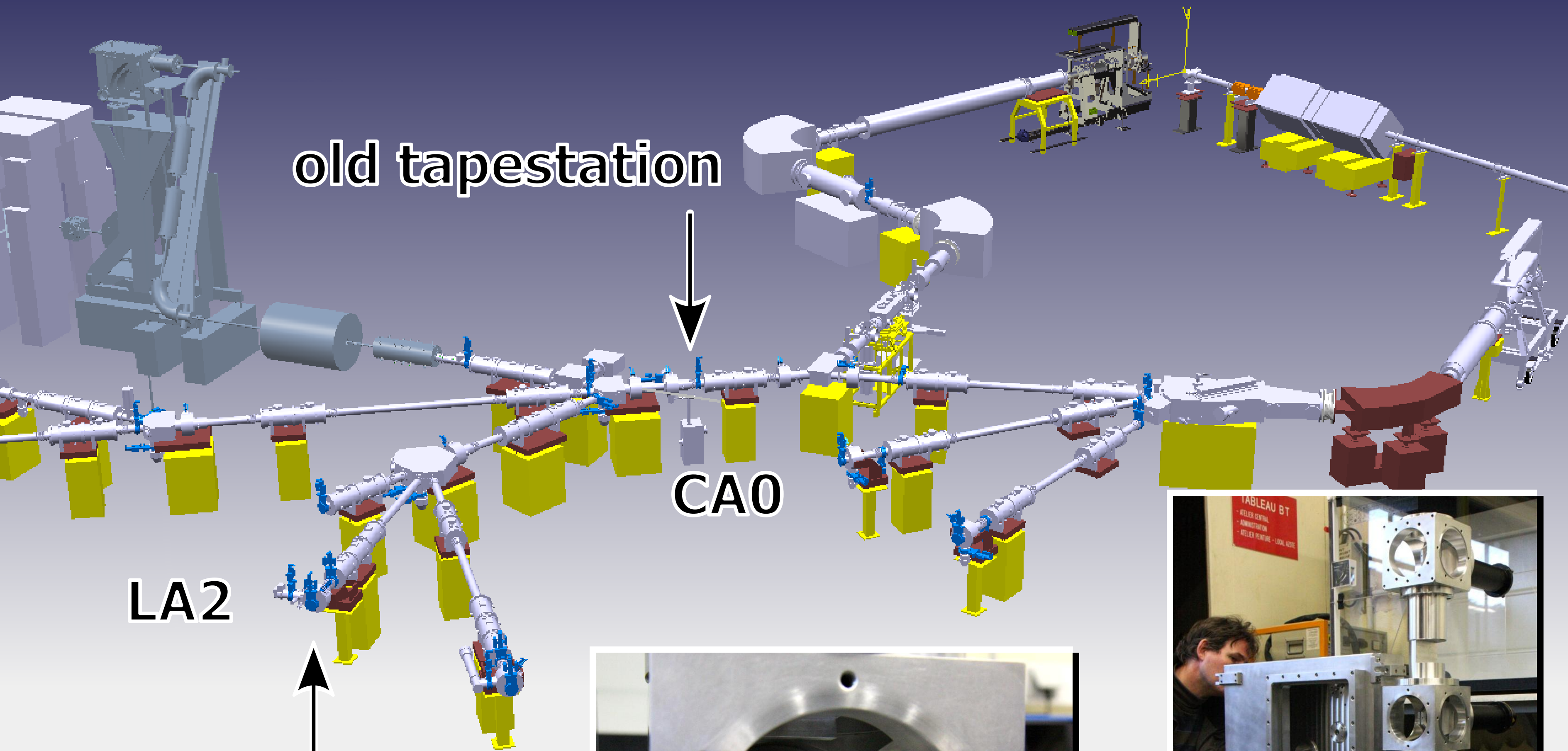
104 isotopes in the range 10 - 50 ms

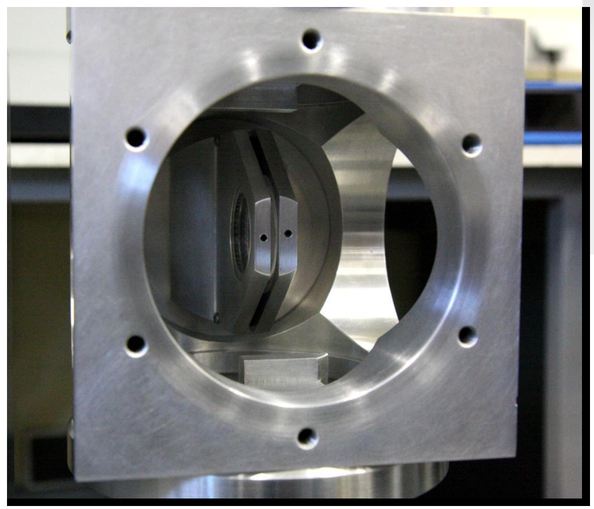
(only works for isotopes without long-lived daughters)

Why a new FTS?

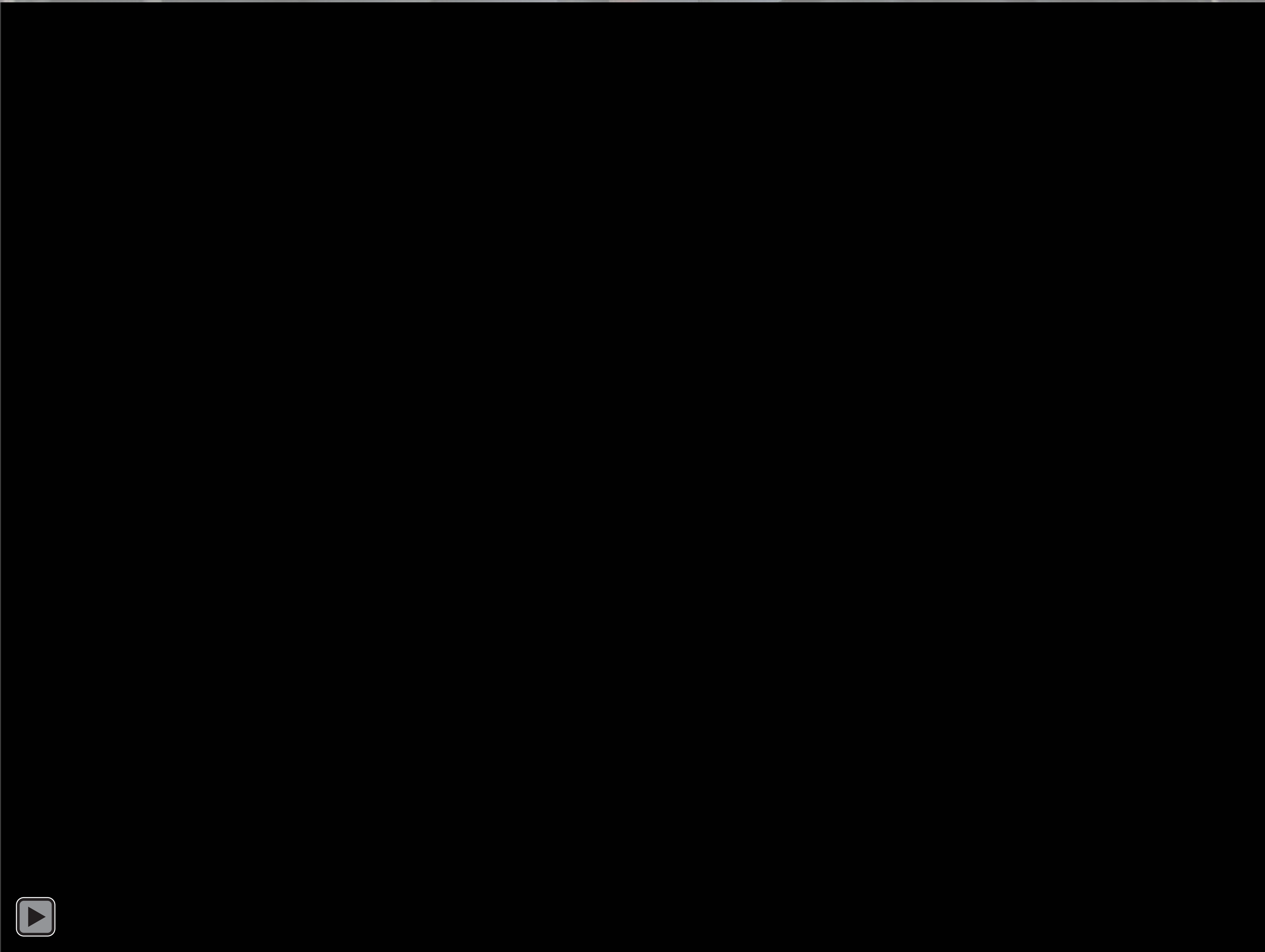


Commissioning

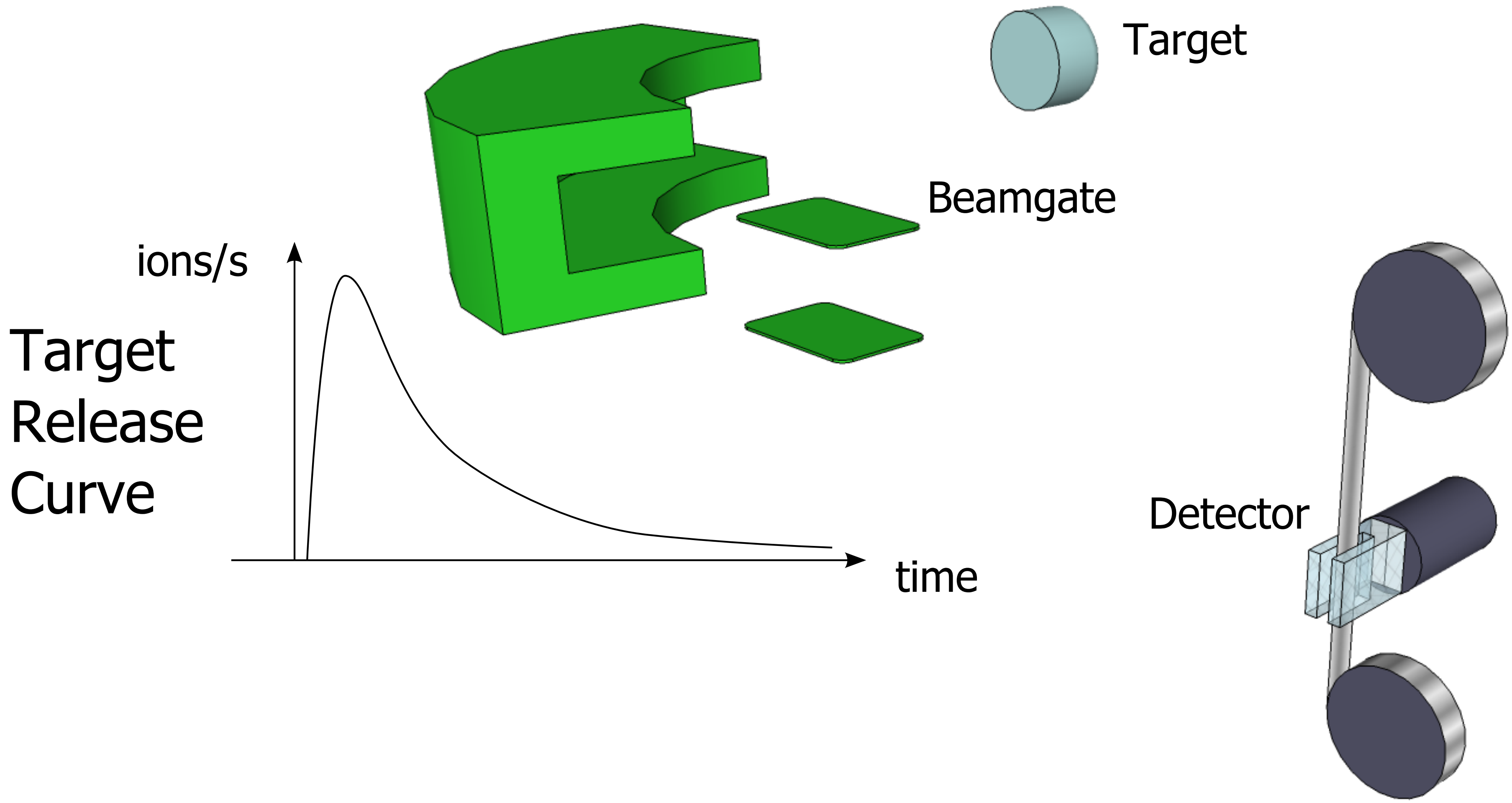




The Hardware

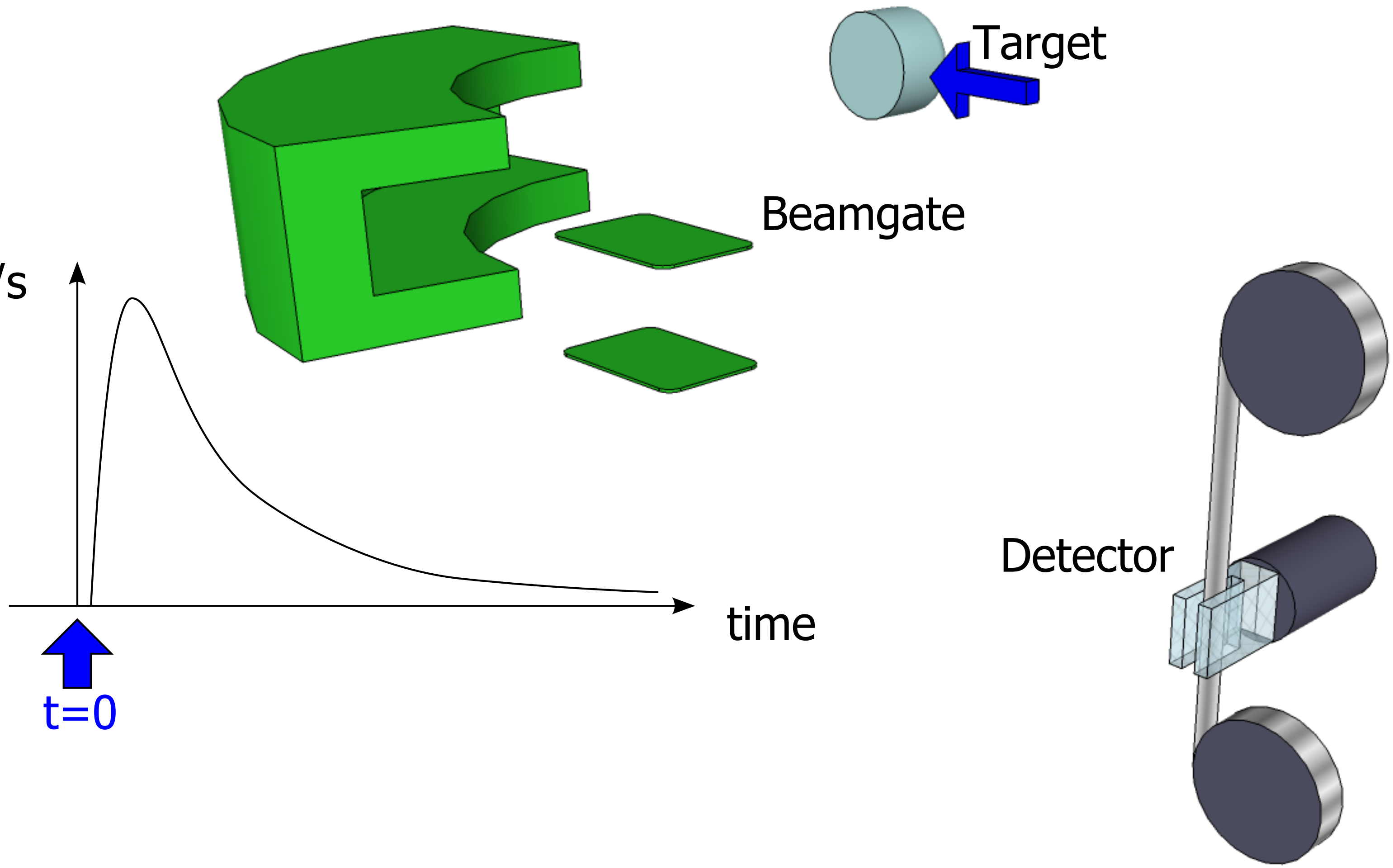


Measurement Cycle: Ready!

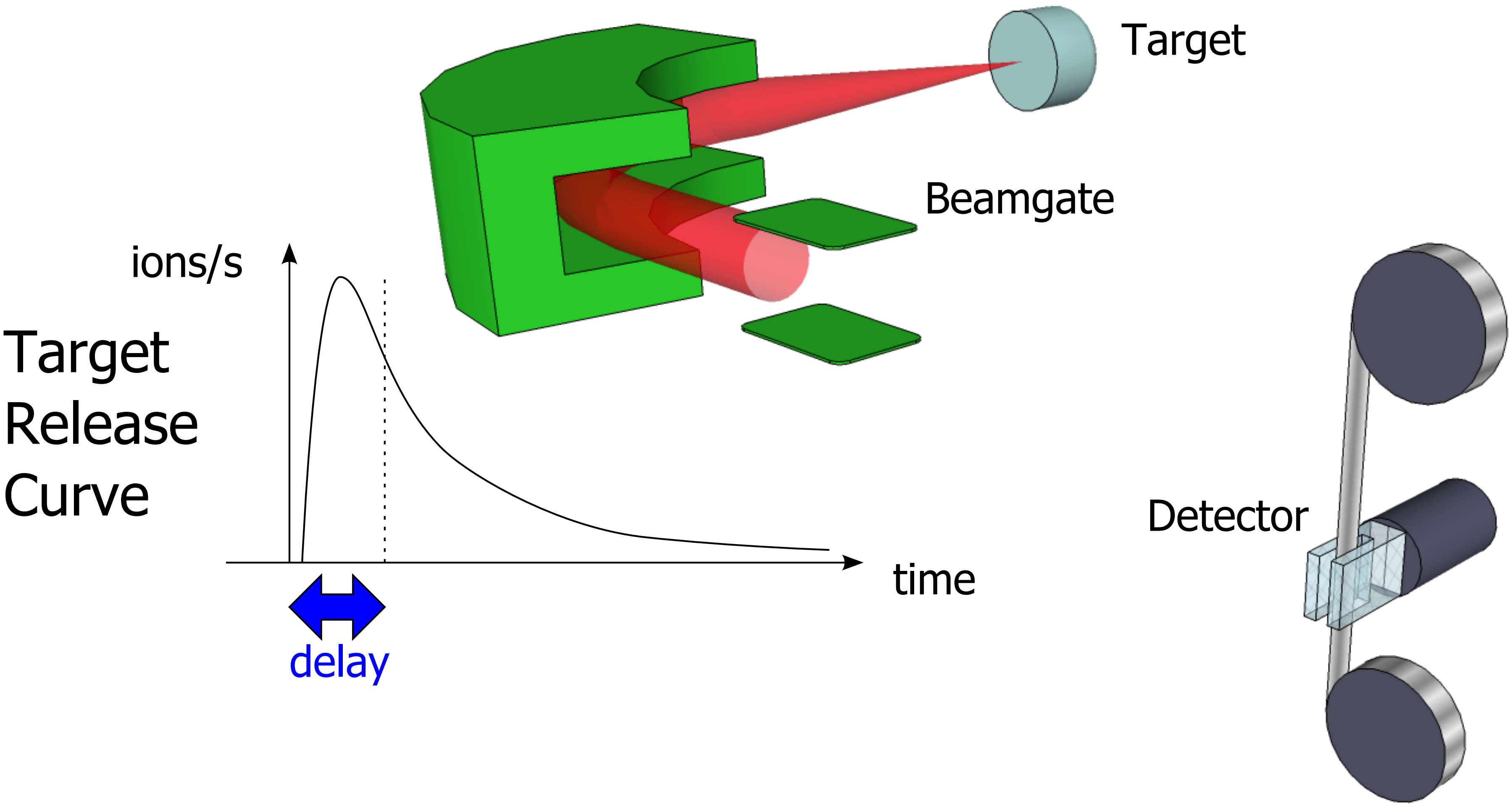


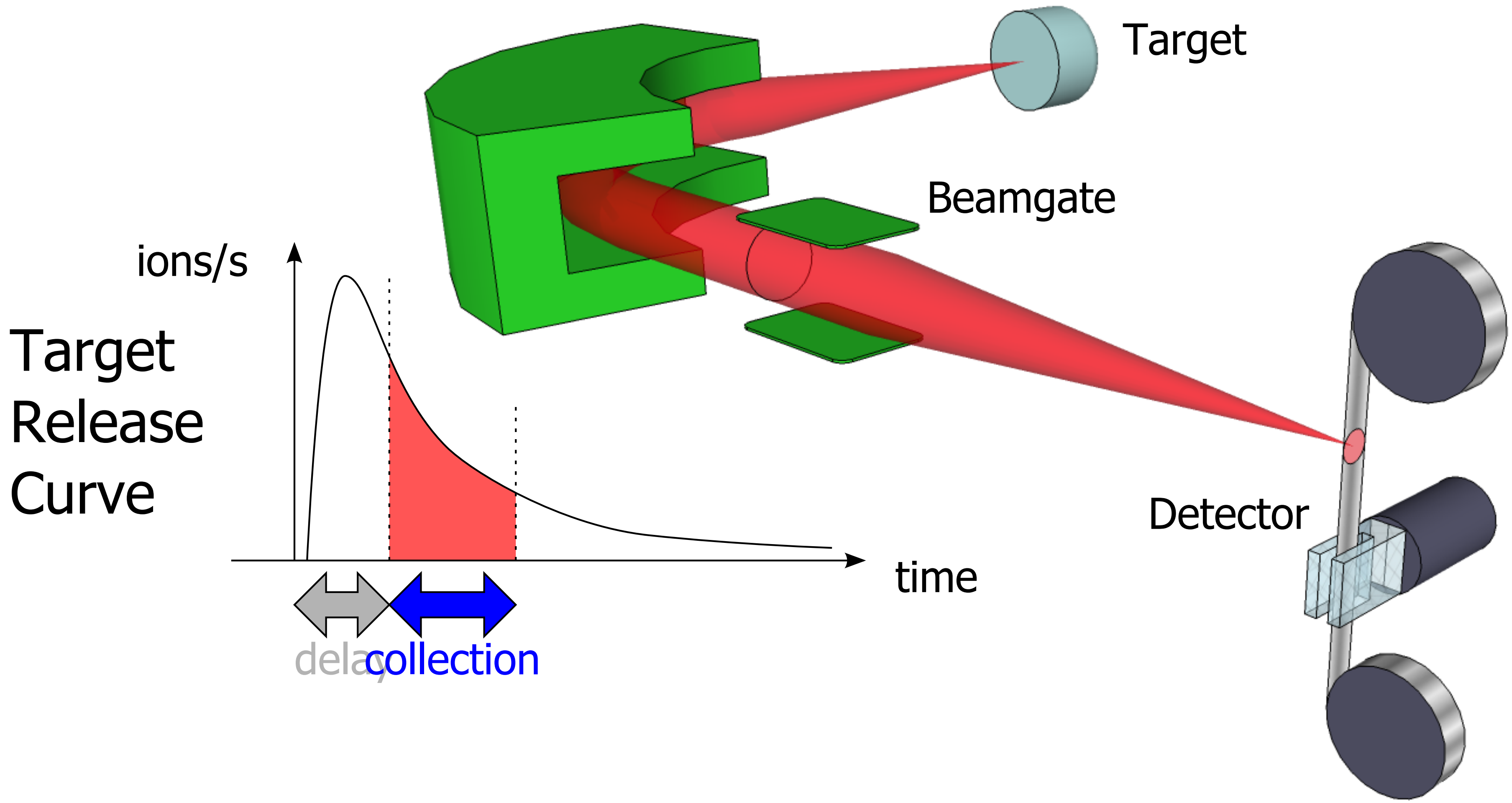
Measurement Cycle: Proton impact

Target
Release
Curve



Measurement Cycle: Delay

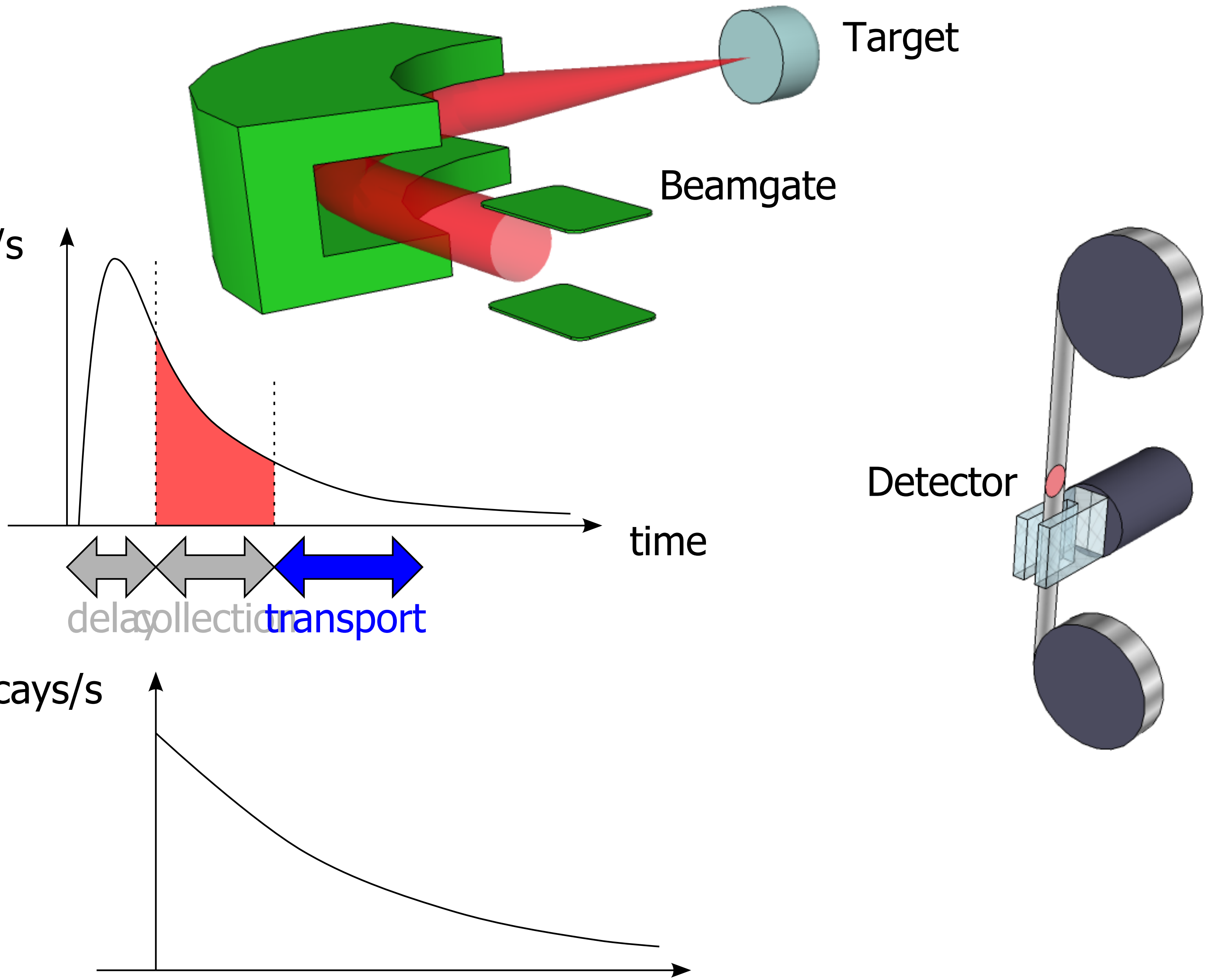



Target
Beamgate
ions/s
Target Release Curve
time
delay
collection
Detector

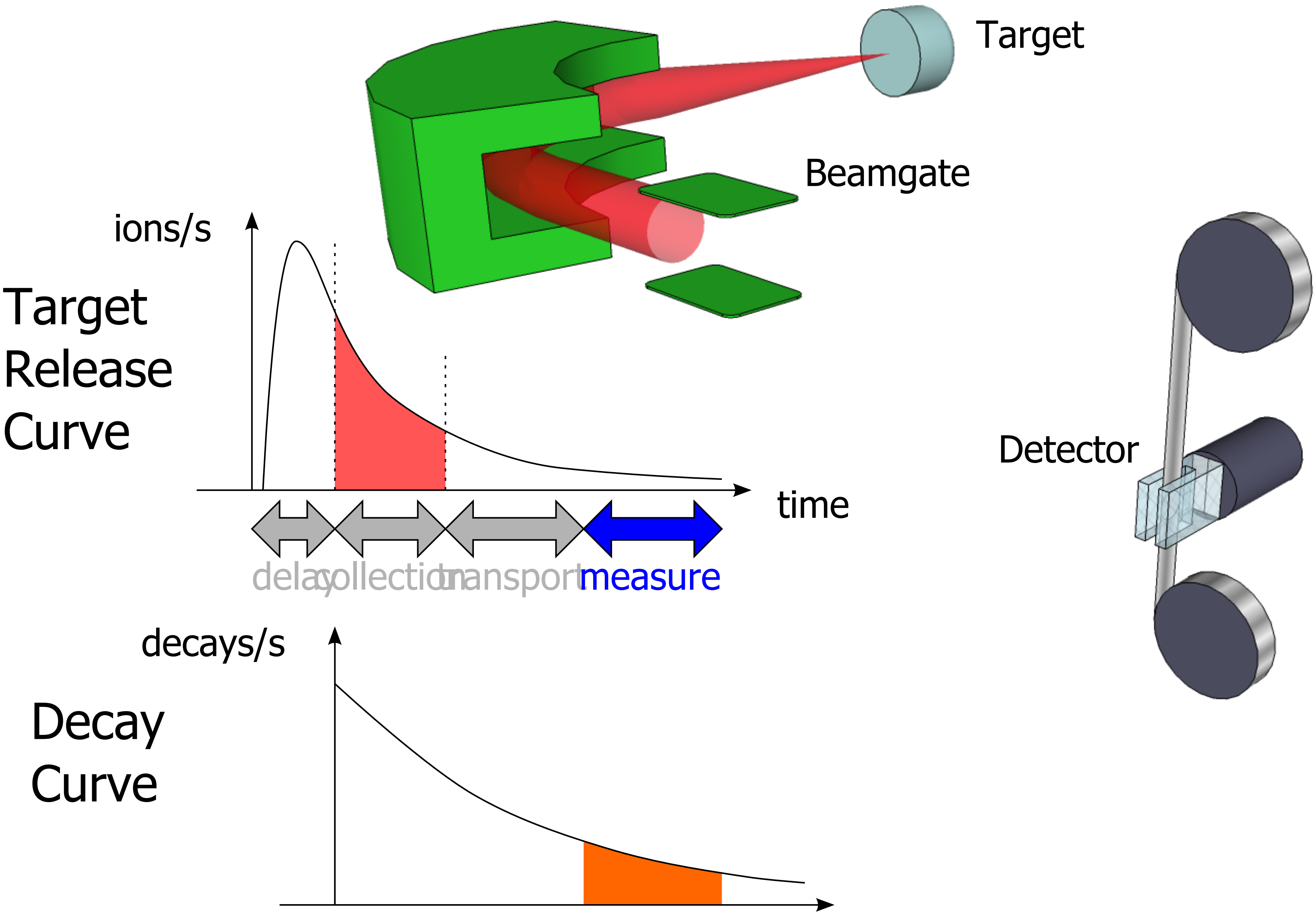
Measurement Cycle: Transport

Target
Release
Curve

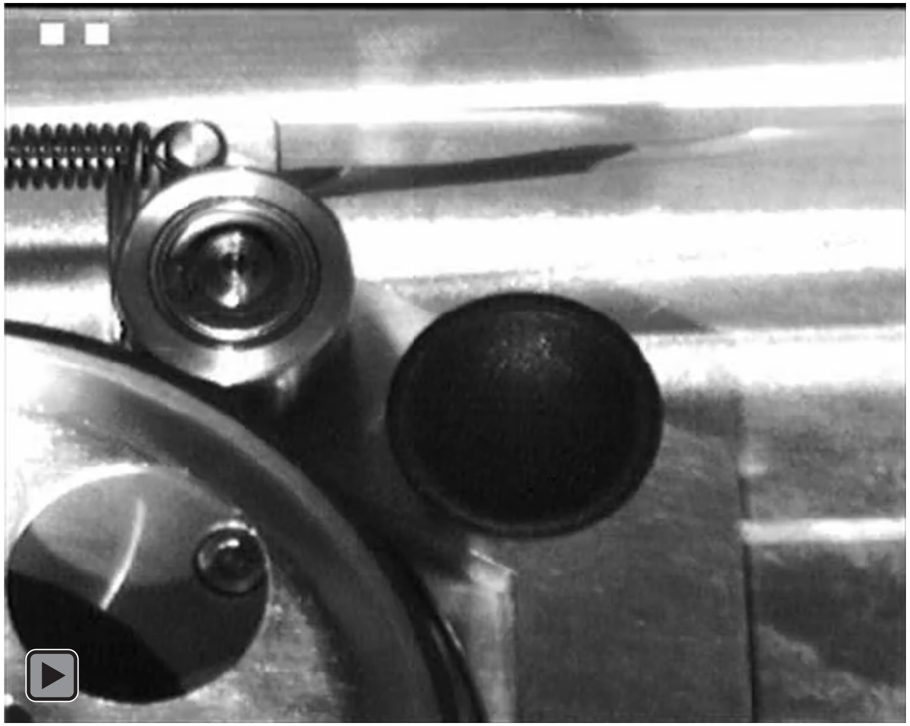
Decay
Curve



Measurement Cycle: Measure



Speed Limit



200ms transport time:
Maximum speed constrained by inertia of tape-bobbins, and tension of pinch-roller

- Tape-overshoot on decelleration
- Pinch-roller opens during acceleration
- Tape tension to be taken into consideration

Yield Analysis

Read data-points from tapestation file

Find isotope decay chain $\;{}^{n}X \xrightarrow[\alpha]{} {}^{n-4}Y \xrightarrow[\beta]{} {}^{n-4}Z$

Calculate decay curve

Make initial guess at release-curve parameters

Calculate modelled counts for each data point

¨fit model to data¨

resists problems with long collection times

Minimise average error-per-point

¨robust¨ fit, in units of std. error

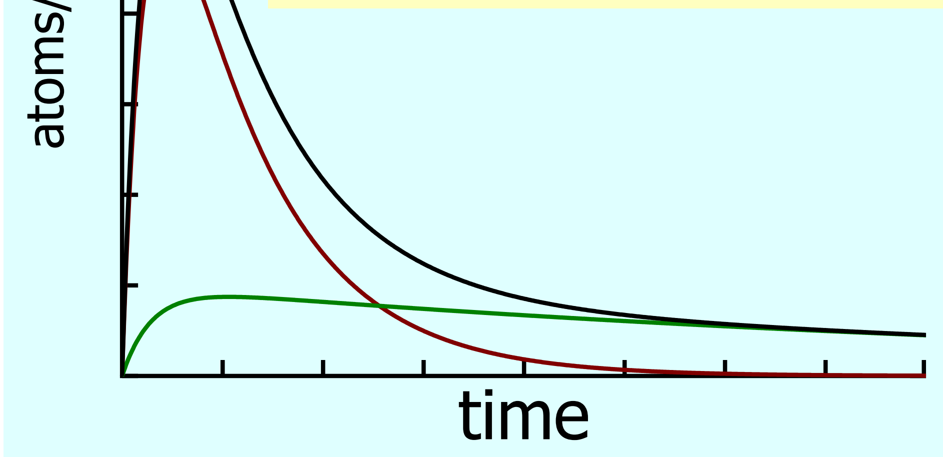
¨Simplex¨ n-dimensional optimiser

Common-sense check

eg. $t_{f2} > t_{half}$; delete outlying points

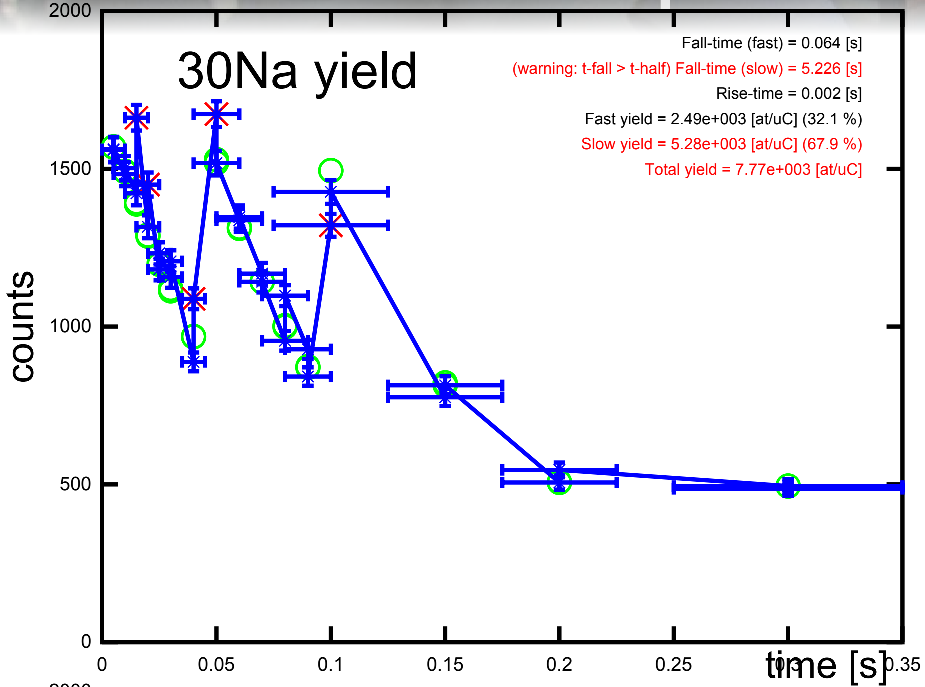
Release curve parameters:

n_0	yield [atoms / uC]
r	fast : slow yield ratio
t_r	rise-time [s]
t_{f1}	fast fall-time [s]
t_{f2}	slow fall-time [s]



Software Demo

Example Results: Yields



$^{30}Na \rightarrow {}^{30}Mg$ t_{half} = 48 → 335 ms

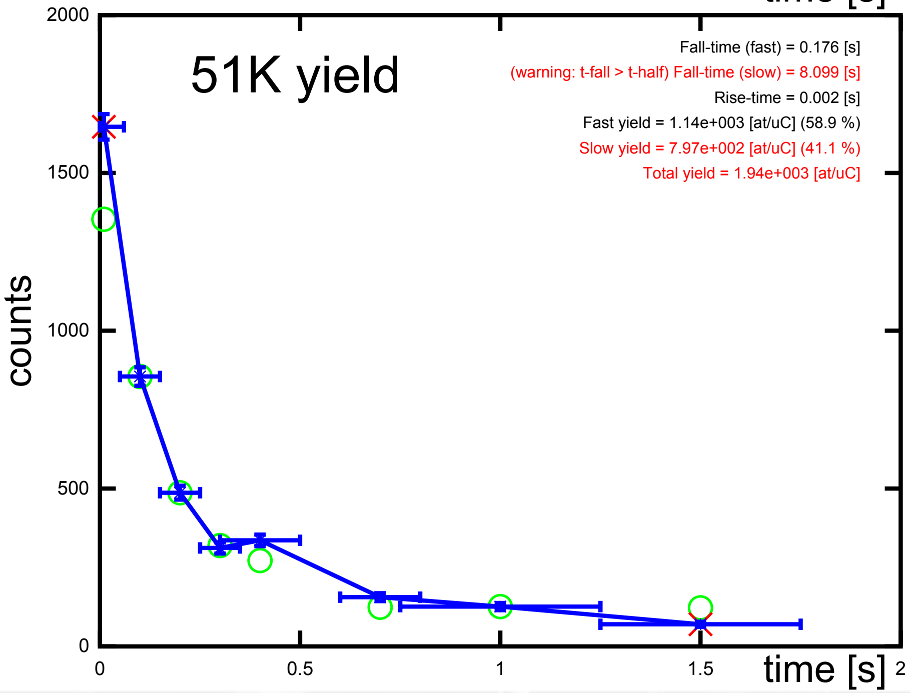
yield = 2.5e3 at/uC

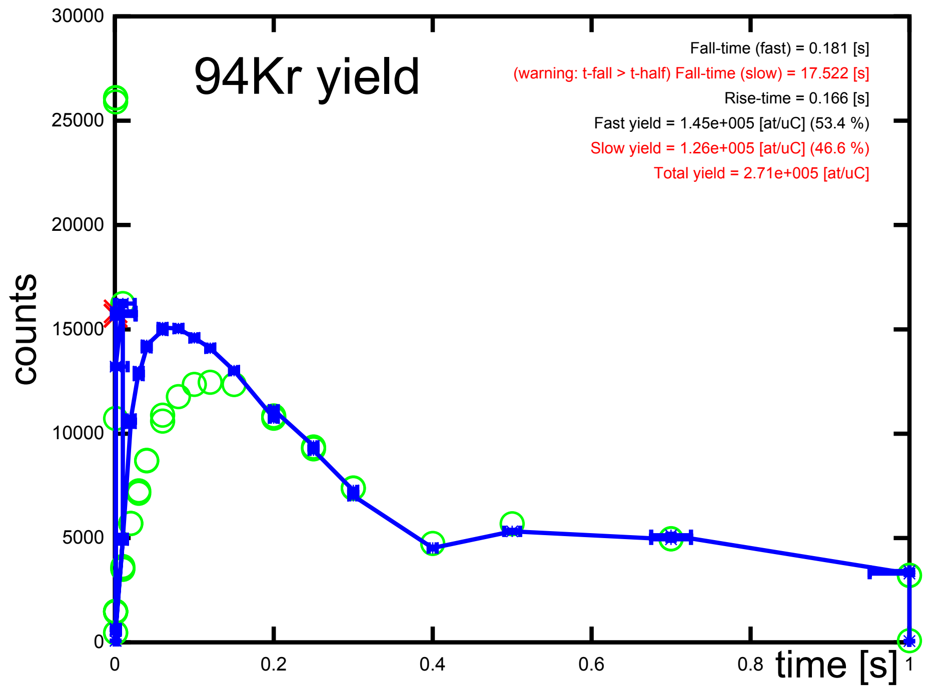
^{51}K t_{half} = 365 ms

yield = 1.1e3 at/uC

^{94}Kr t_{half} = 200 ms

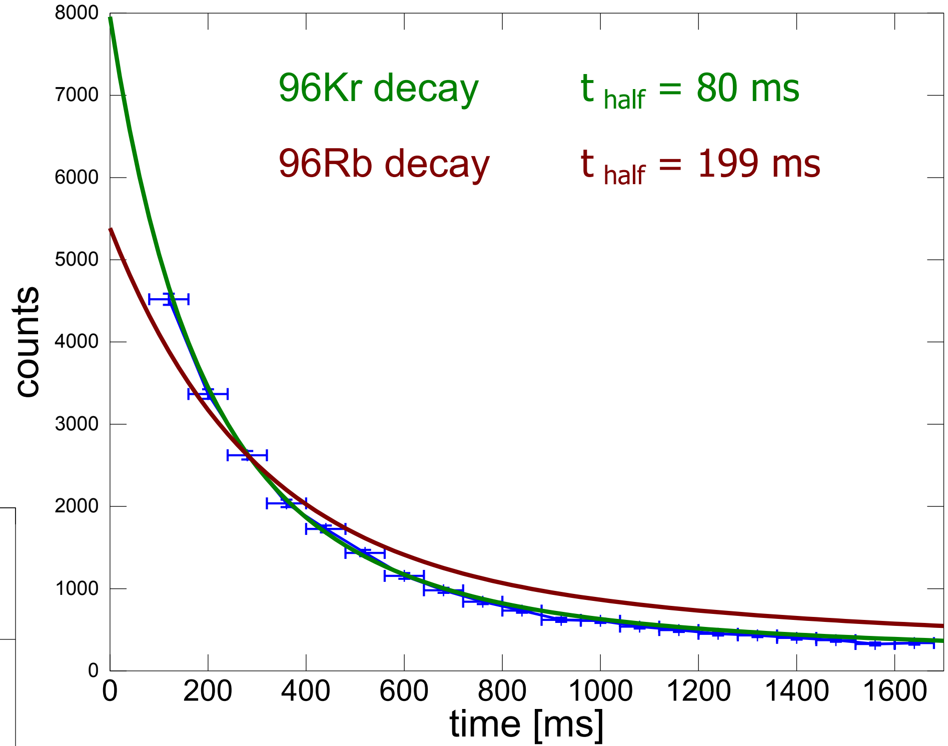
yield = 1.5e5 at/uC *

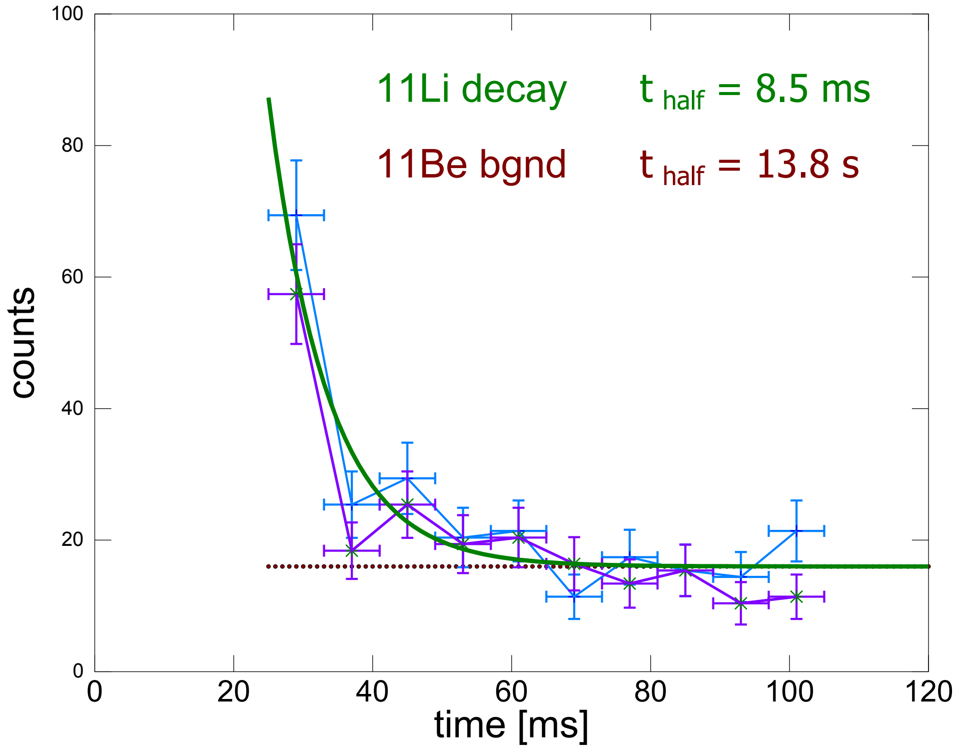




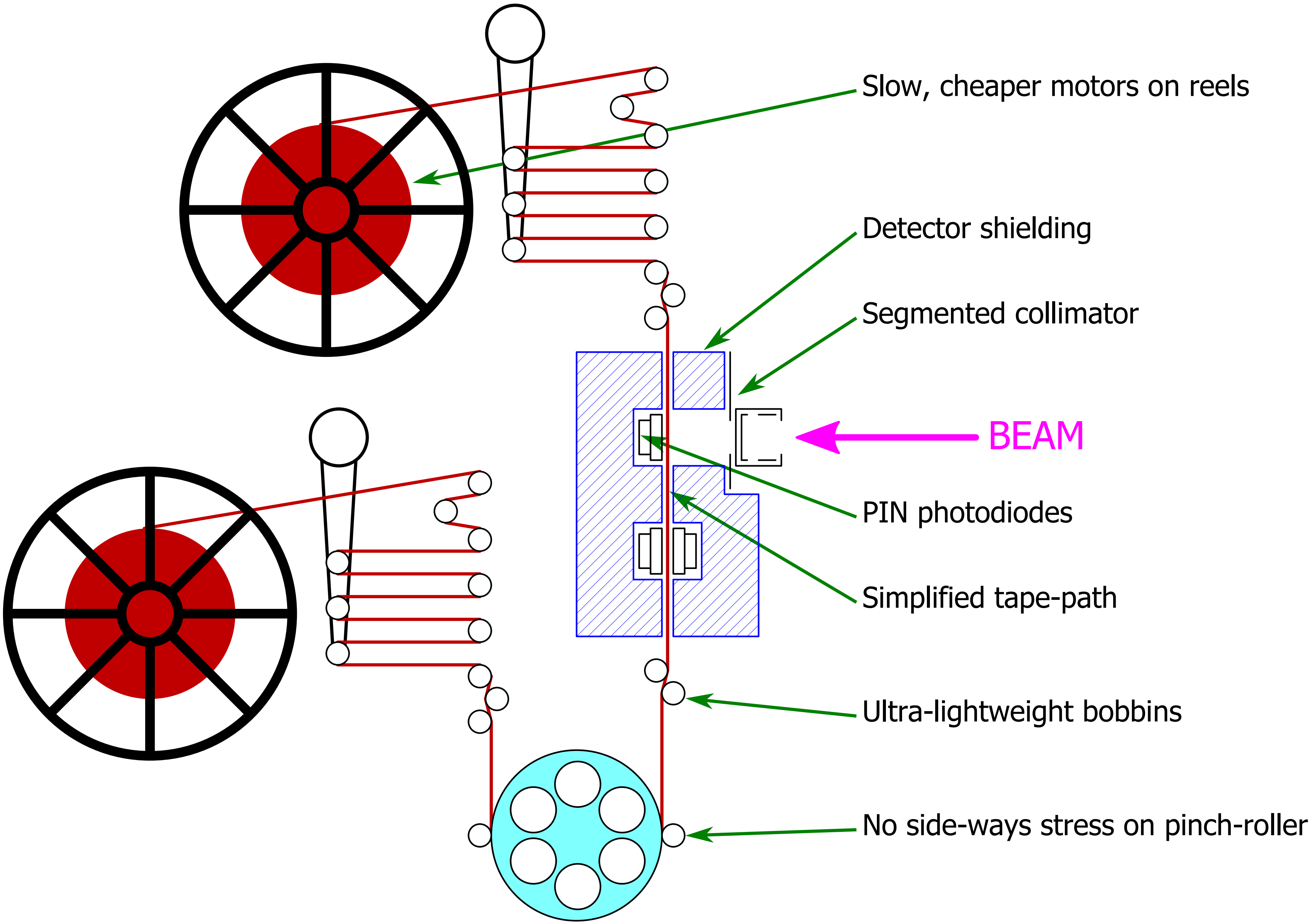
In-beam measurements

Decay-curves for isotope identification:





A Future FTS Design



Conclusion

- Reliability testing is vital
- Decay curves: Software upgrades in progress
- Faster counters: New counters planned
- Installation in CA0
- Rapid yield analysis is essential
- Acknowledgements:

The FTS mechanics and detectors were designed and built at IReS in Strasbourg by Philippe Dessange and his team

The control system was built at CERN by Gerrit Jan Focker and Stephane Bart Pedersen