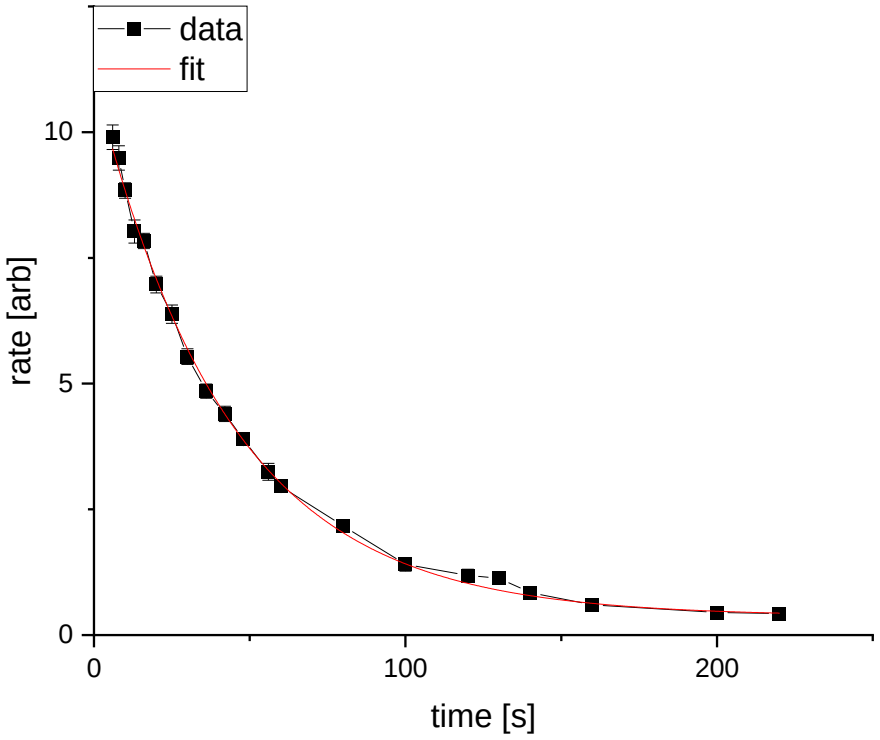
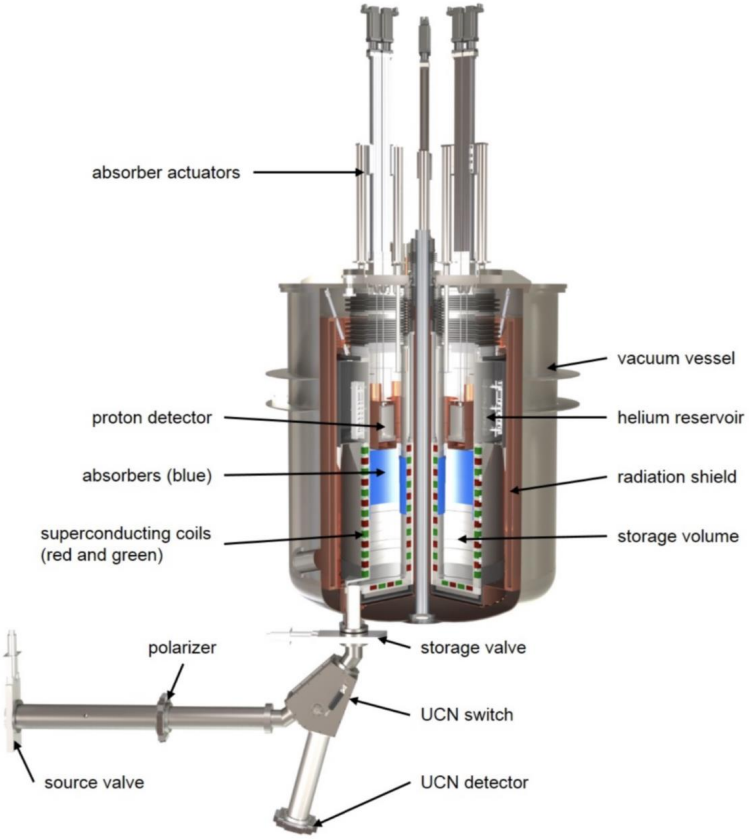
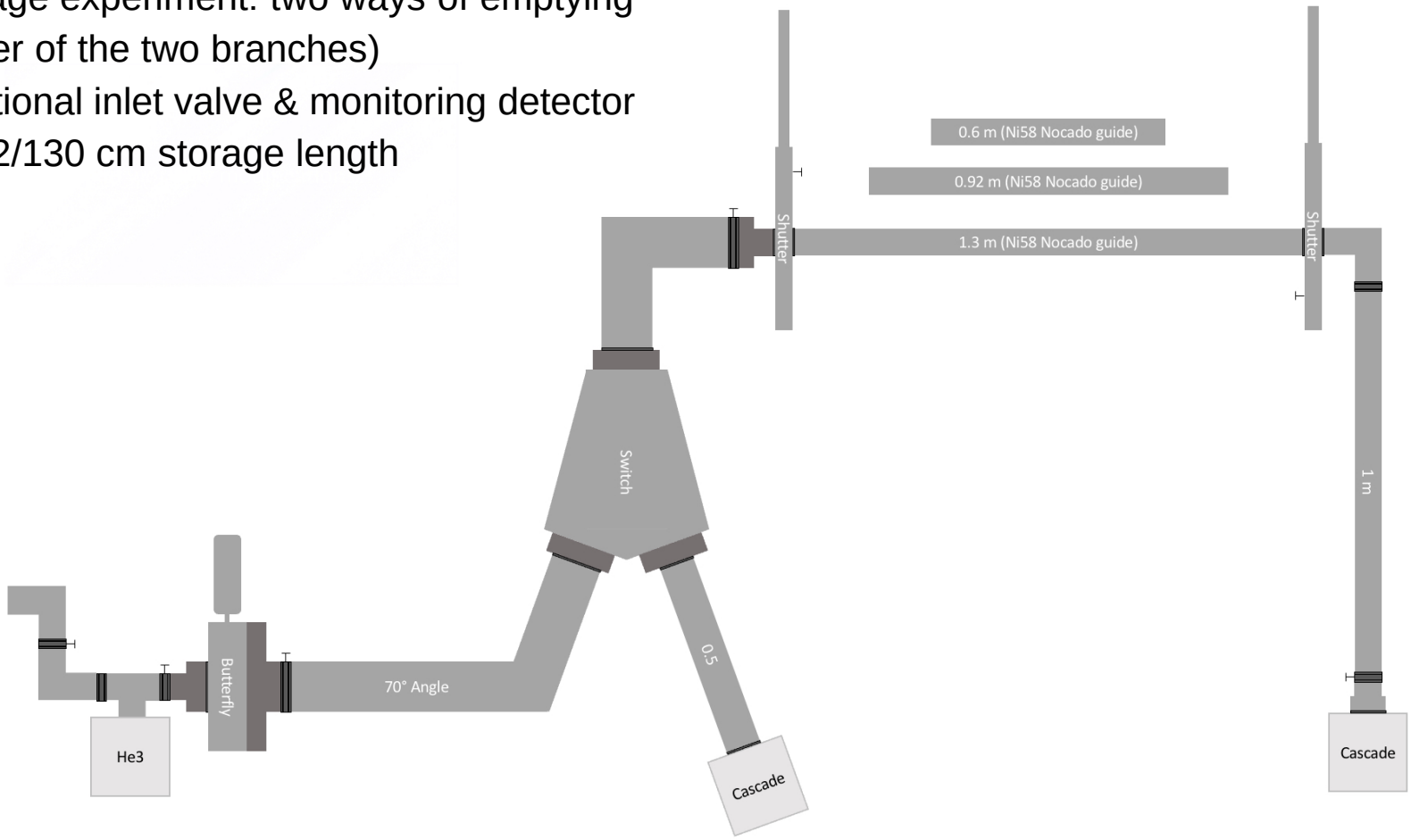
Results of ILL measurements and setup for first PENeLOPE neutron measurements



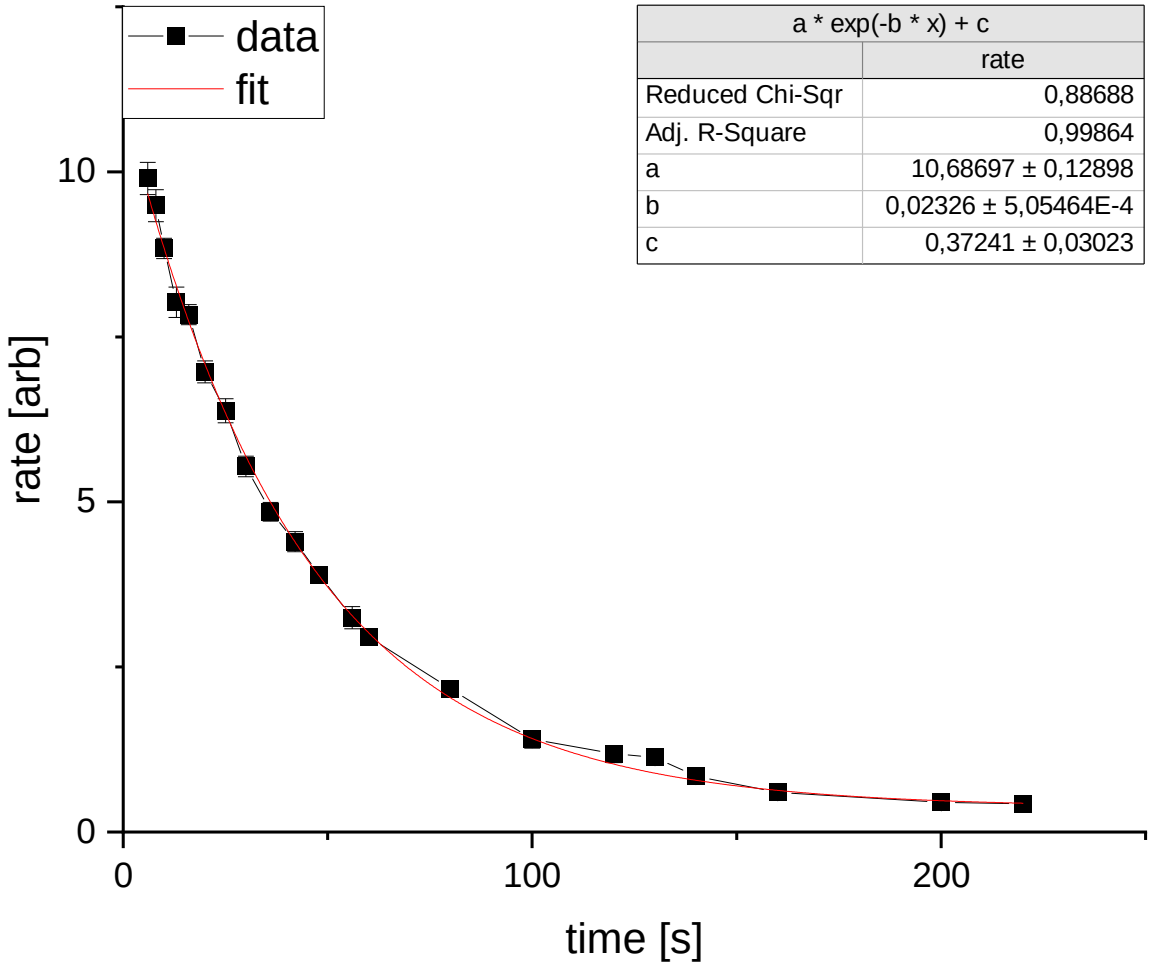


Experiments conducted at ILL Grenoble

Storage experiment: two ways of emptying (either of the two branches)
Additional inlet valve & monitoring detector
60/92/130 cm storage length



Results: neutron lifetime



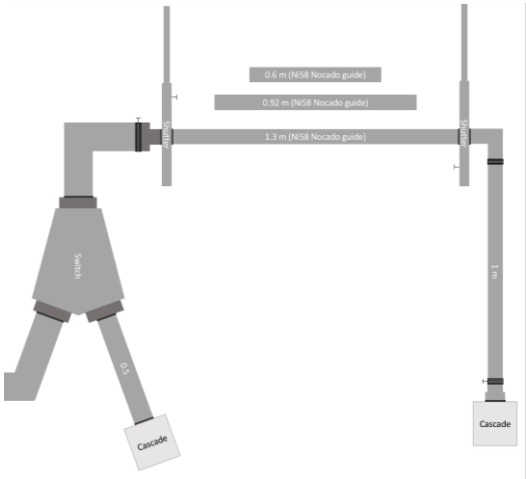
a * exp(-b * x) + c	
	rate
Reduced Chi-Sqr	0,88688
Adj. R-Square	0,99864
a	10,68697 ± 0,12898
b	0,02326 ± 5,05464E-4
c	0,37241 ± 0,03023

Results: neutron lifetime

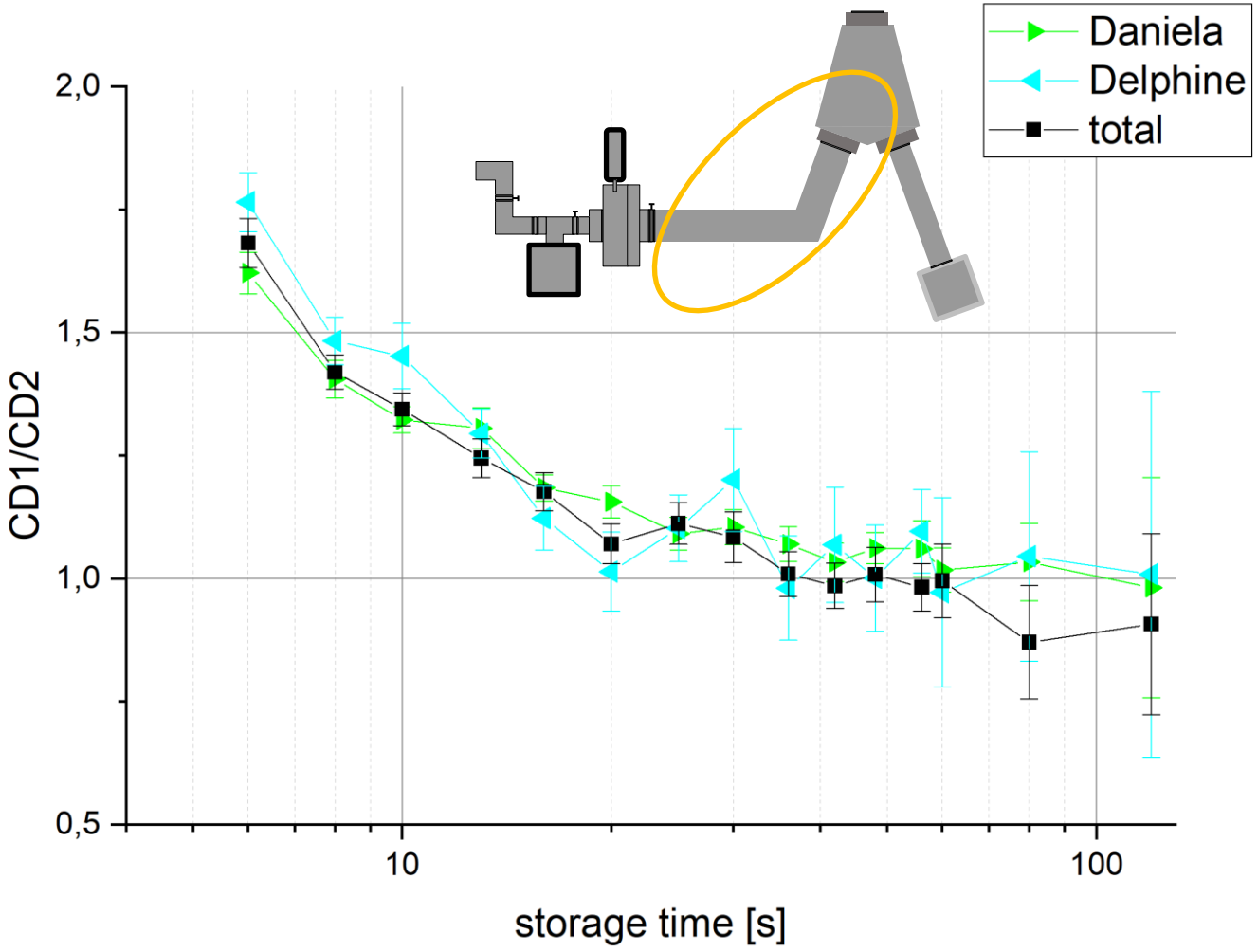
Lifetime [s]	ILL			TRIGA
Length	1.3 m	0.92 m	0.6 m	2 m
Left	57.1(5.0)	17.6(2.1)	33.1(7.1)	
Right	57.9(1.0)	43.9(9.1)	47.3(3.0)	73.9(5.9)

- Shortest lifetime for 92 cm guide
- Equal for both detectors at 130 cm, large differences for both shorter guides

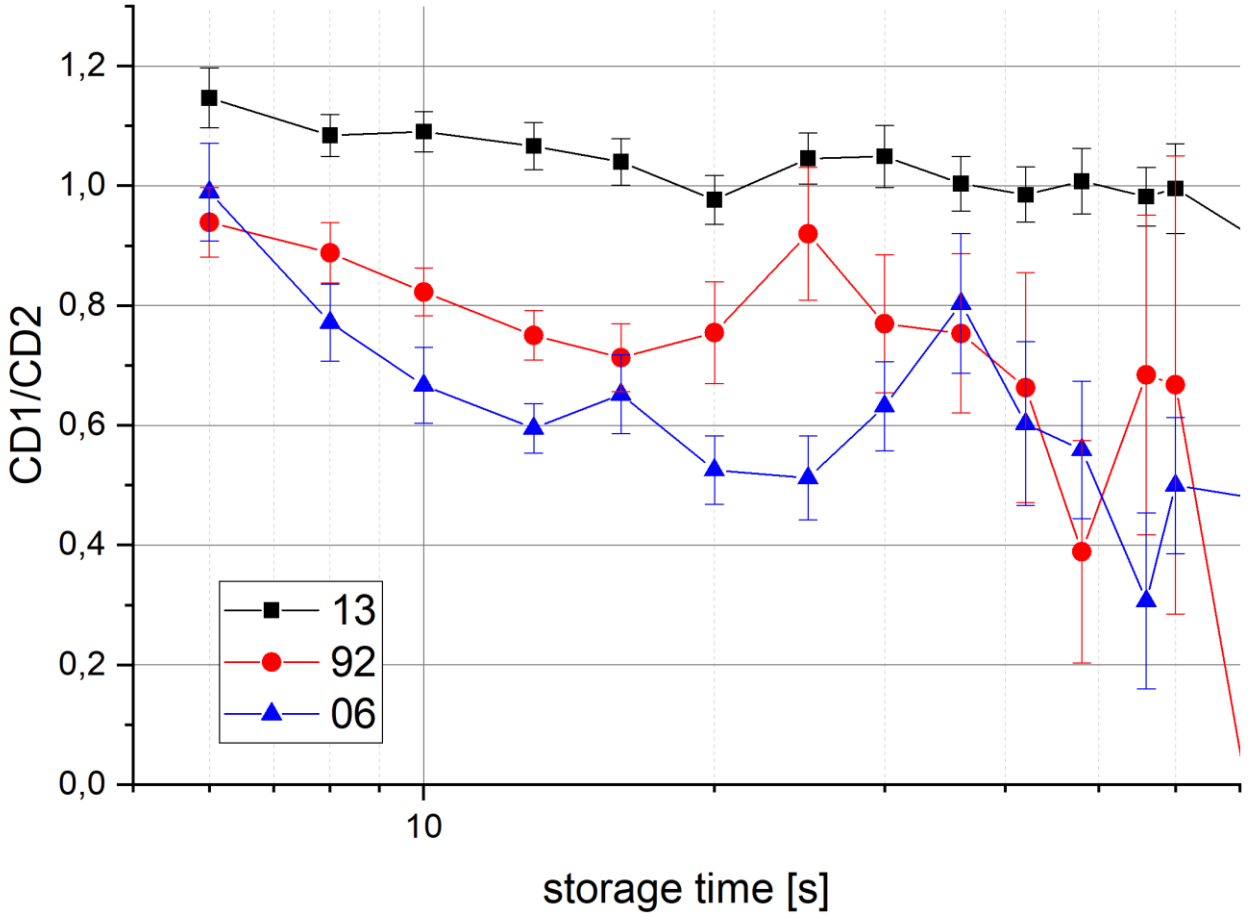
➢ Energy dependant loss after storage



Results: Side difference vs Storage time



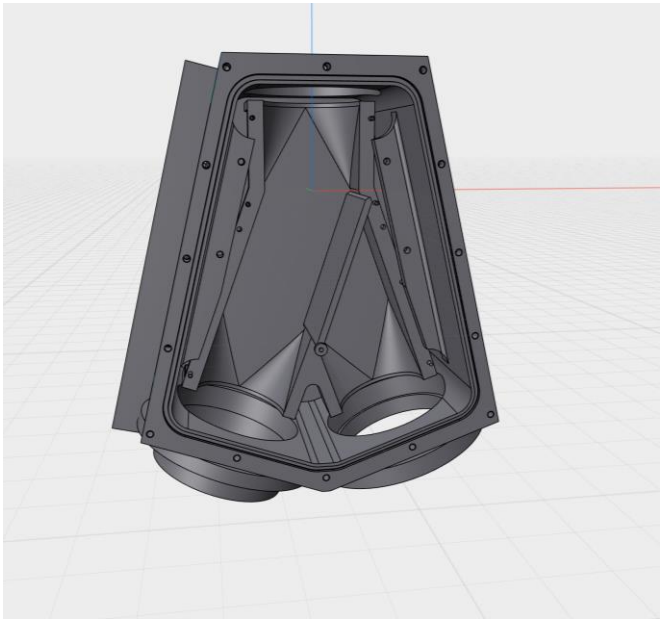
Results: Side difference vs Storage time II

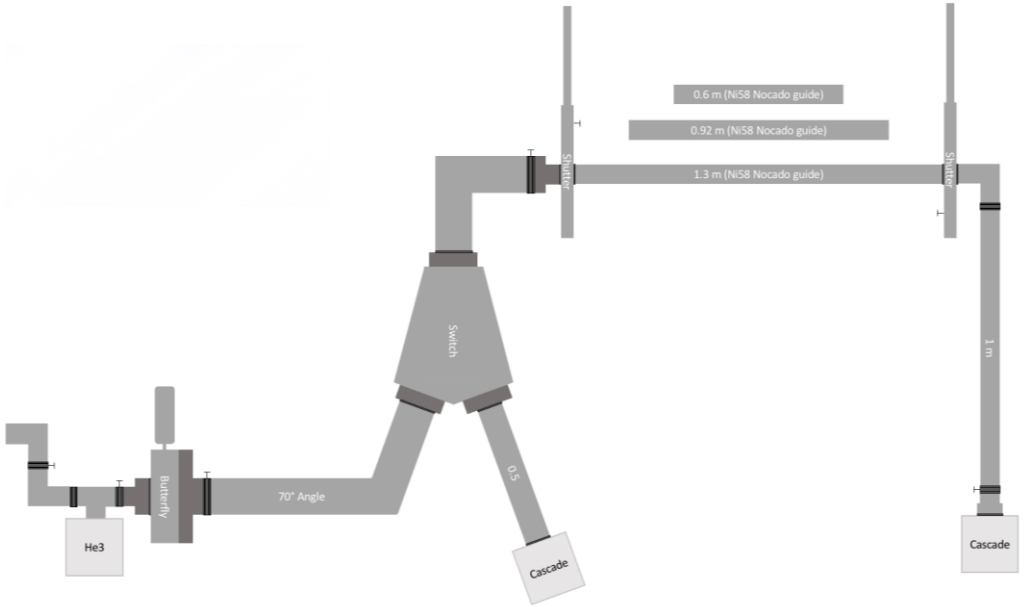


Results: Switch leakage

$$\frac{\phi_{\mathrm{CD1S0}}}{\phi_{\mathrm{CD1S1}}} = 104.07(90)\ \%$$

$$\frac{\phi_{\mathrm{CD2S0}}}{\phi_{\mathrm{CD2S1}}} = 1.39(10)\ \%$$



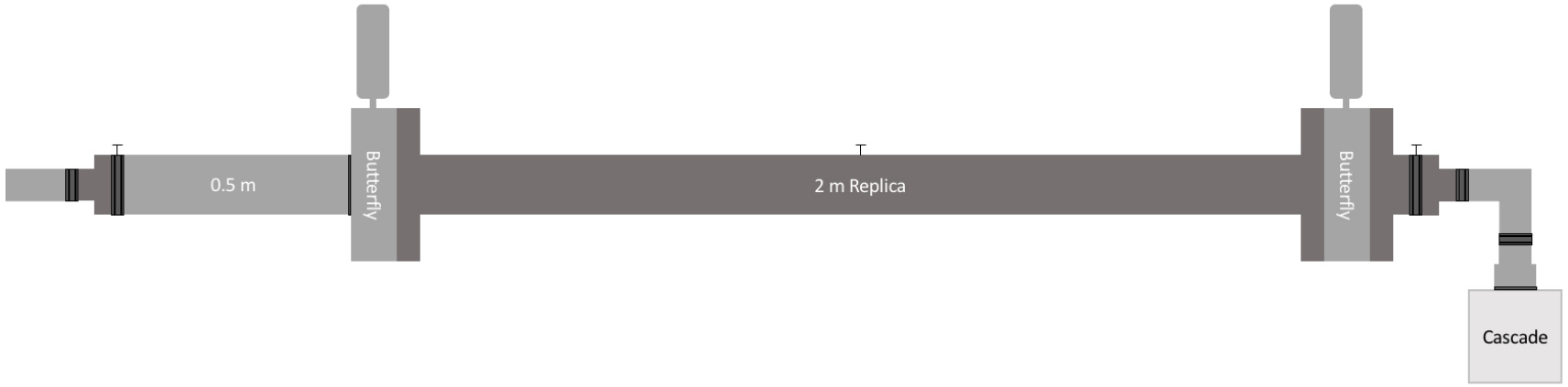


Results: Valve leakage

Leakage [%]	In setup	Standalone
Butterfly 1	1.96(11)	3.42(4)
Butterfly 2	0.92(10)	2.22(5)
combined	0.46(10)	

Combined leak significantly higher than product of individual leak rates

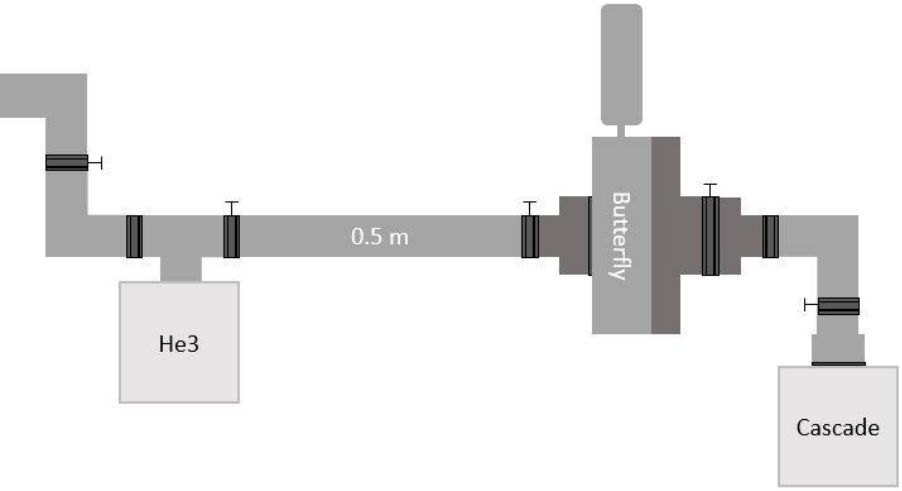
➢ Leakage is energy dependant

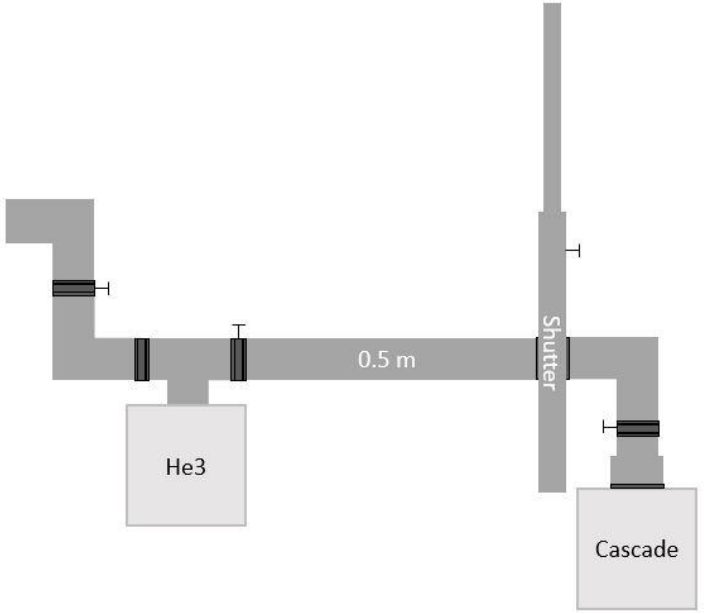


Results: Valve leakage II

	Leakage [%]
Butterfly 1	0.66(1)
Butterfly 2	3.94(2)

Leakage [%]	Shutter 1	Shutter 2
Polished	0.024(2)	0.045(3)
Dull	0.030(2)	0.048(4)



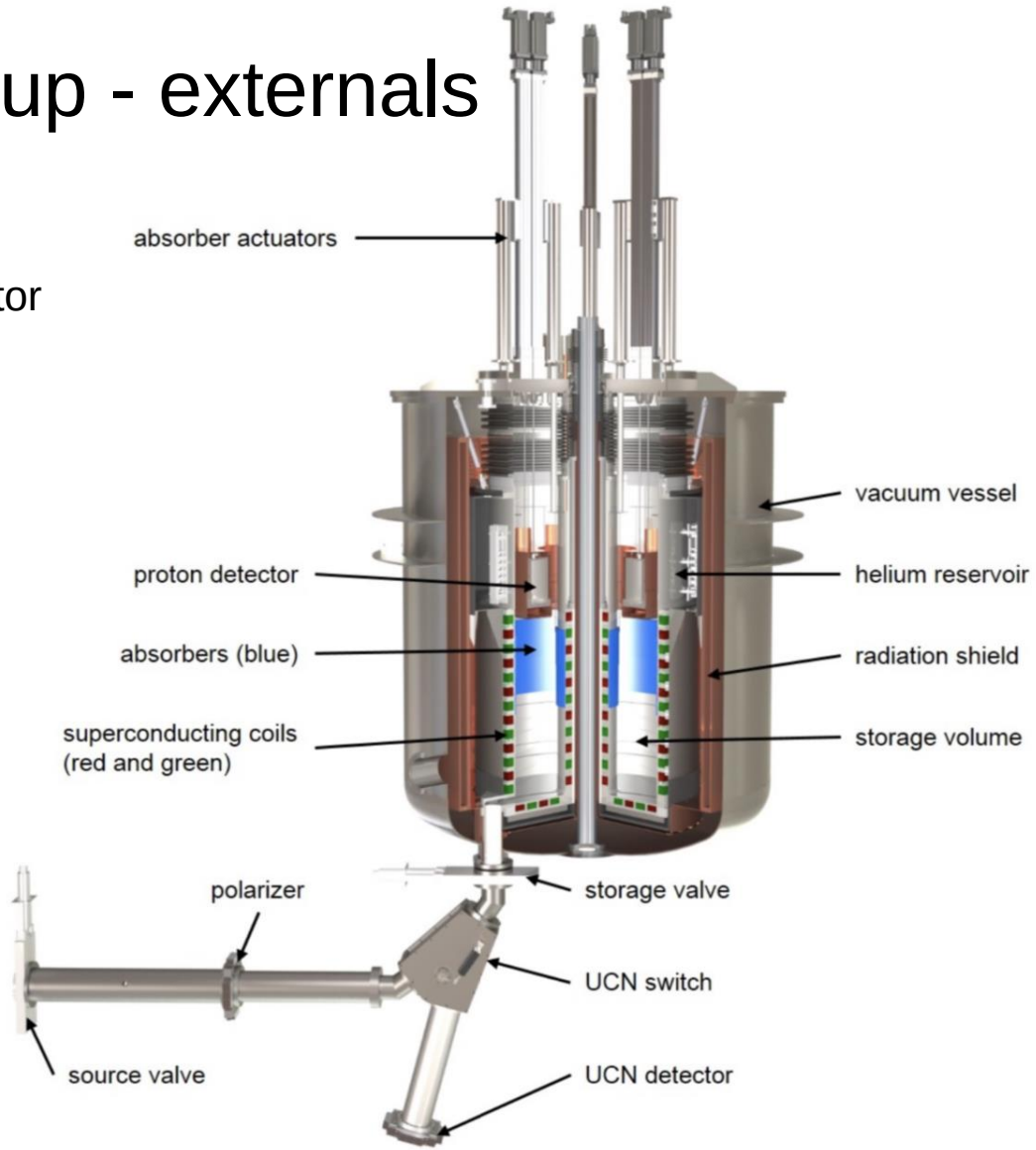


Minimal working setup - externals

Guide neutrons from a source into PENeLOPE and to an external detector

Using:

- Guides
- Valves
- Switch
- Detector
- Polarizer



Minimal working setup - internals

Keep neutrons inside PENeLOPE

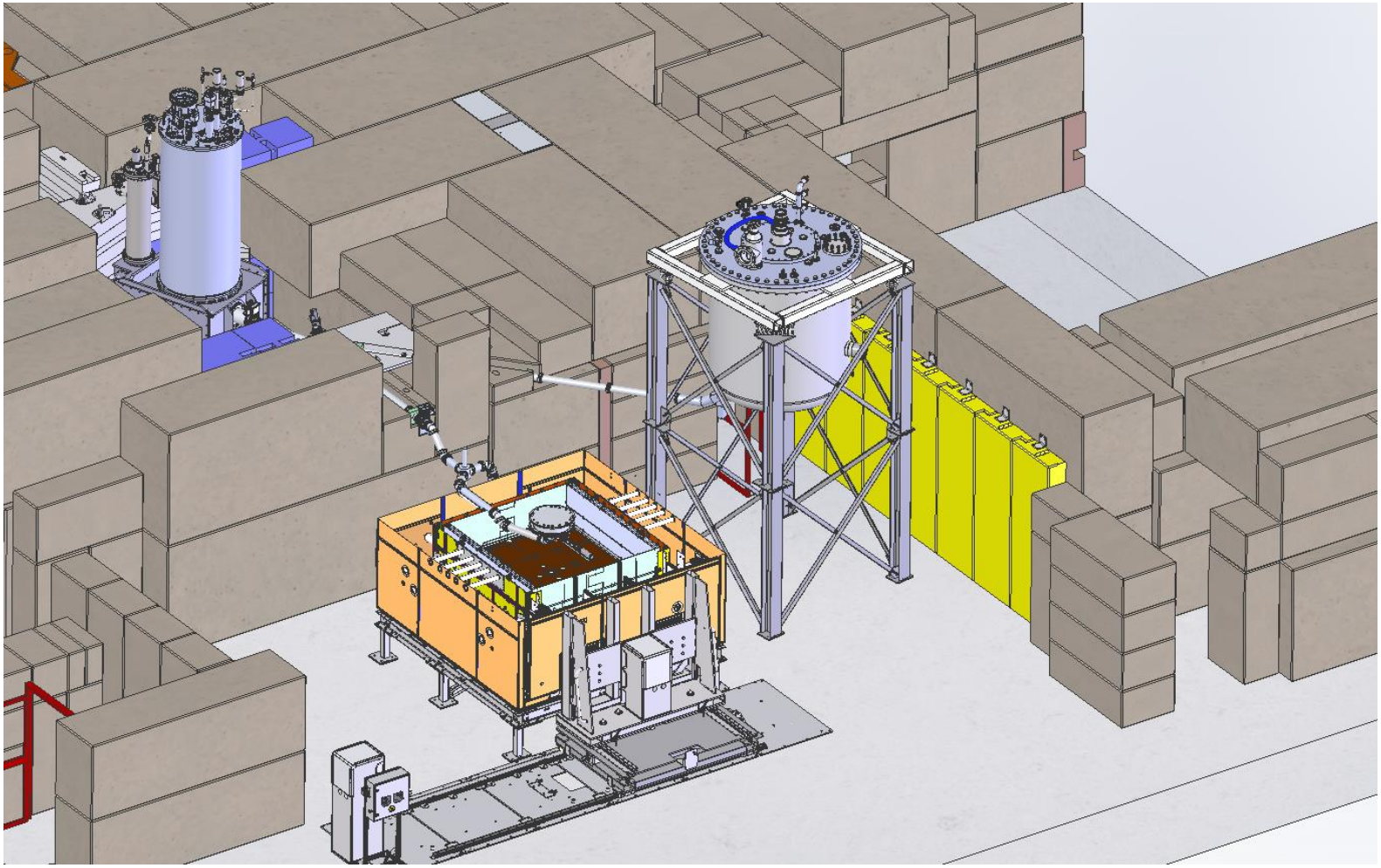
Using:

- Superconducting Magnets
- Central Coil

Get neutrons inside?

➢ Construct interface

Minimal working setup - TRIUMF



Outlook: Key takeaways

Externals:

- Valves: Shutters are reliable with low leakage
- Switch: working, but leakage + geometry challenging
- Guides: adequate transmission
- Detectors: better readout would be beneficial

Internals:

- Central coil + power: install & certify
- Enable UCN connection

We need neutrons!

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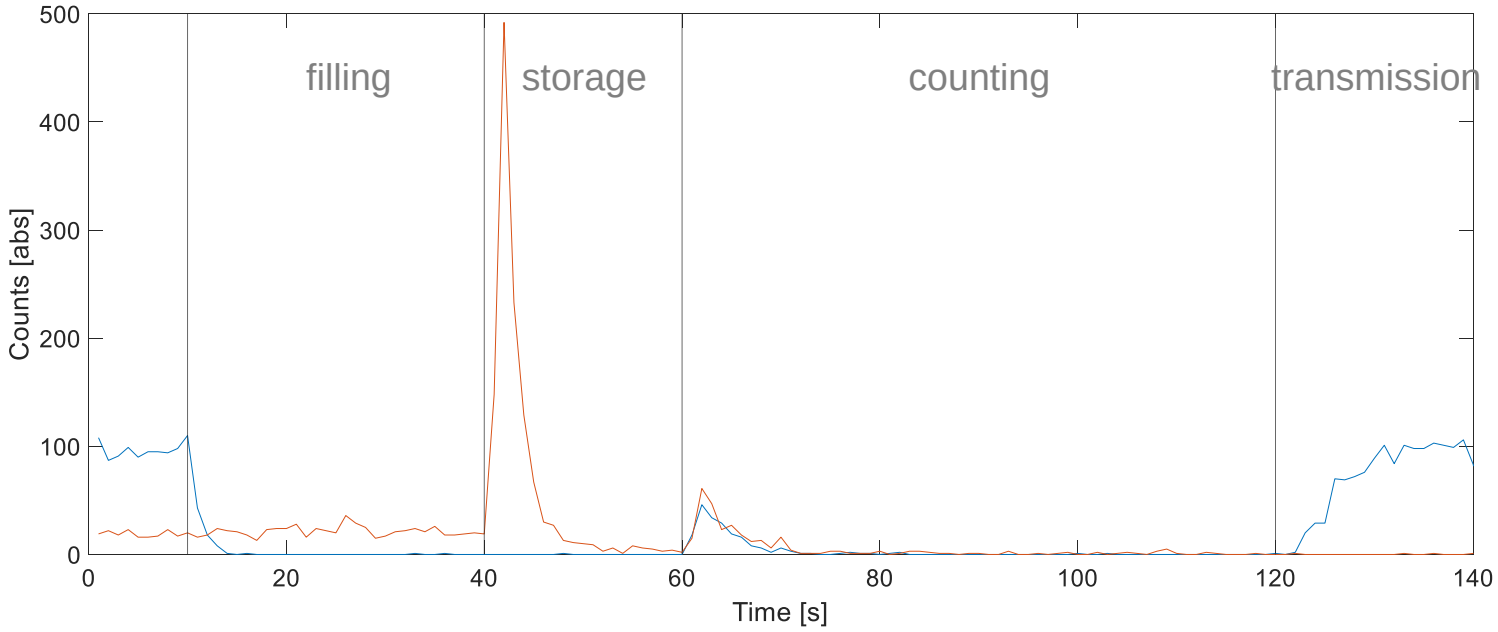
example readout

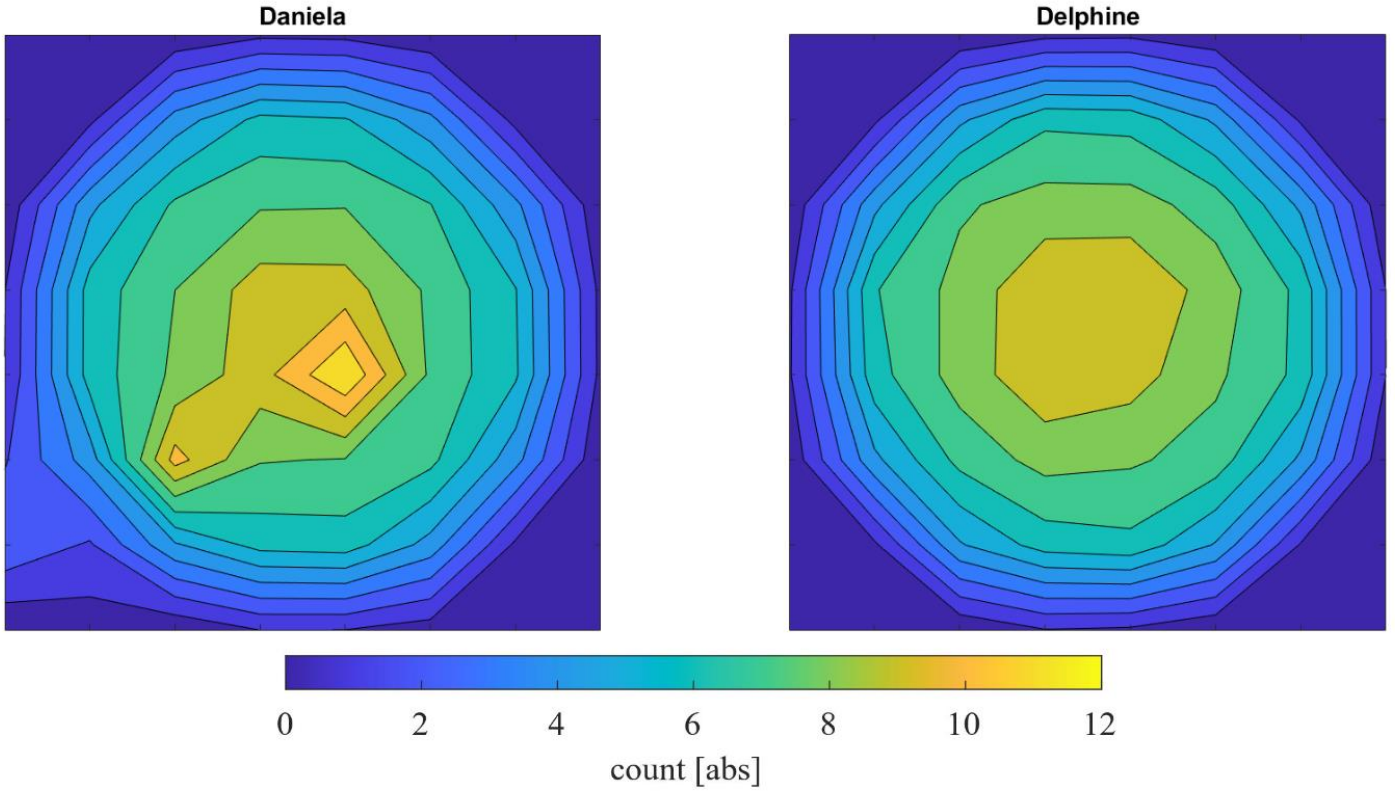
Blue: emptying to the right (ILL), comparable to TRIGA data

Orange: emptying to the left through the switch

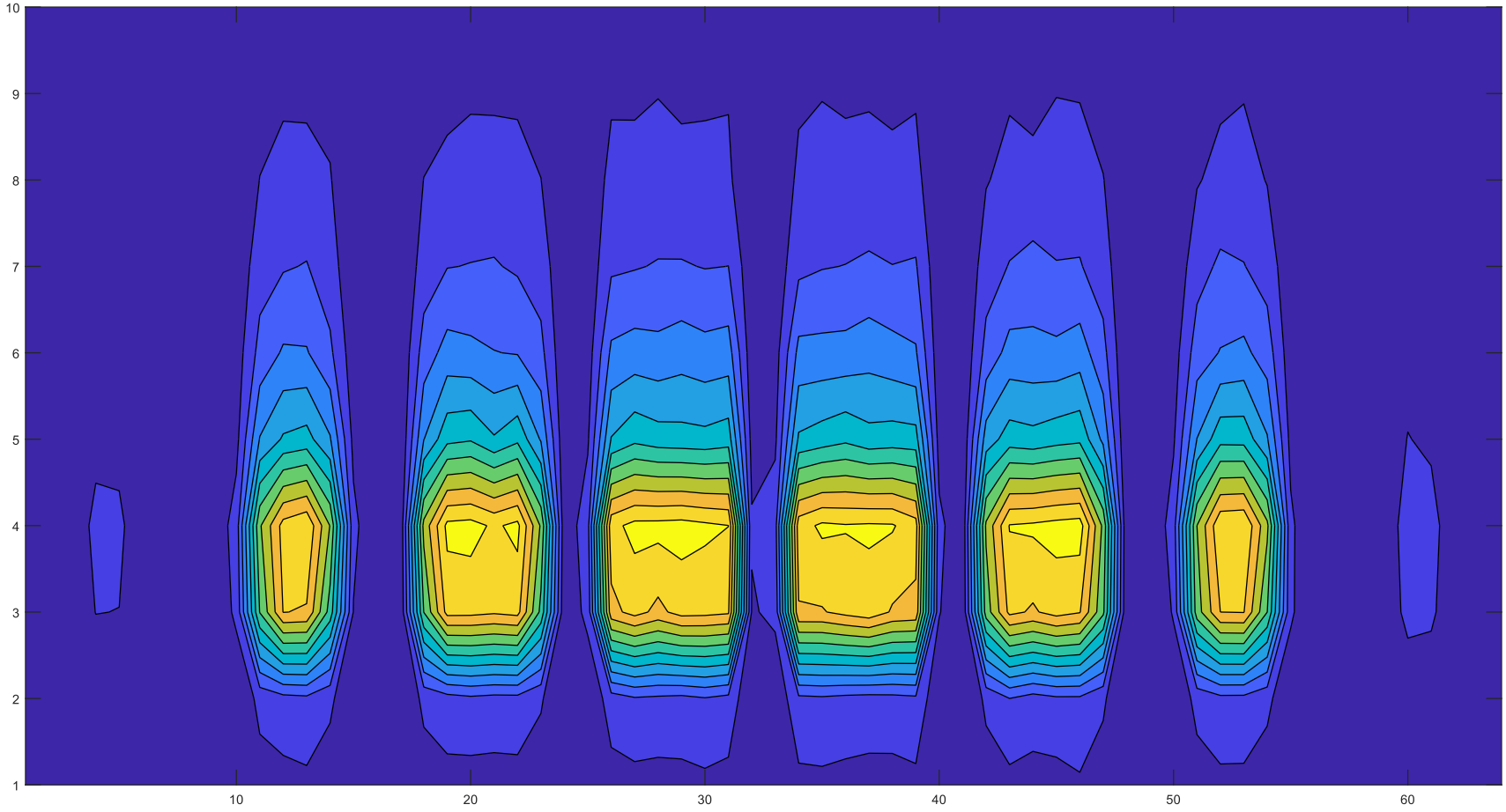


detector efficiencies at ILL

2 Cascade detectors: Daniela and Delphine (Identical model, 8 by 8 pixels)
Below: Transmission through the setup with 1.3 m storage guide



CD1 spacial development



Emptying peak for different storage times