

LUMIERE

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Present Status and Work Required

Background

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- 6 LOIs presented for “day 1” experiments using LUMIERE in Jan 2011 SAC meeting –

- LoI_SP2_Ph2 5: “Nuclear structure and electron shake-off in strontium, yttrium and zirconium” P. Campbell *et al.*
- LoI_SP2_Ph2 6: “Charge radius change and nuclear moment measurement in the $N=50$ and $N=104$ region using the LUMIERE setup at the DESIR facility” F. Le Blanc *et al.*
- LoI_SP2_Ph2 11: “Collinear laser spectroscopy of neutron deficient isotopes of Ag and Sn across the $N=50$ shell closure” M. L. Bissell *et al.*
- LoI_SP2_Ph2 12: “Beta-delayed spectroscopy of laser-polarised beams” D. T. Yordanov *et al.*
- LoI_SP2_Ph2 14: “Study of intruder configurations in the neutron-rich Co isotopes” T. E. Cocolios *et al.*
- LoI_SP2_Ph2 16: “Charge structure of manganese and iron isotopes as proton separation energy approaches zero” P. Campbell *et al.*

All positively received by the SAC

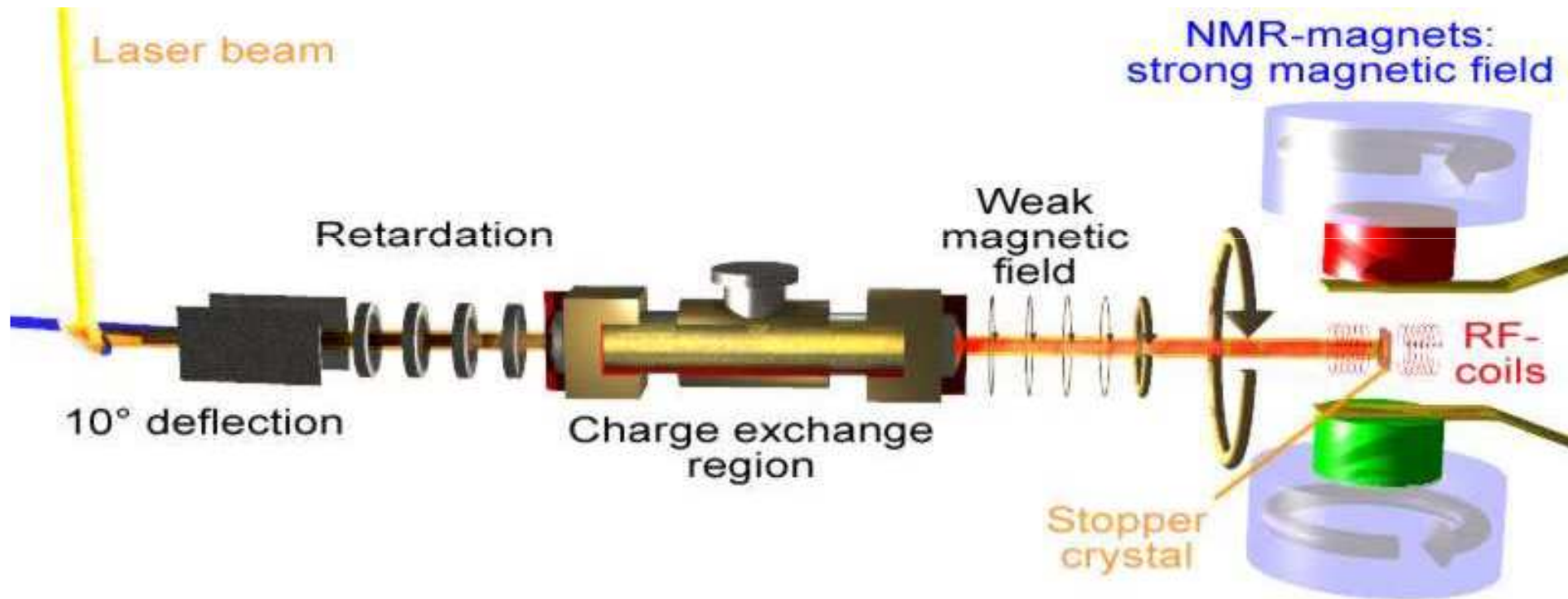
We will be quite exhausted by day 2!

LUMIERE must provide a versatile platform for ALL collinear laser techniques.

Design Evolution

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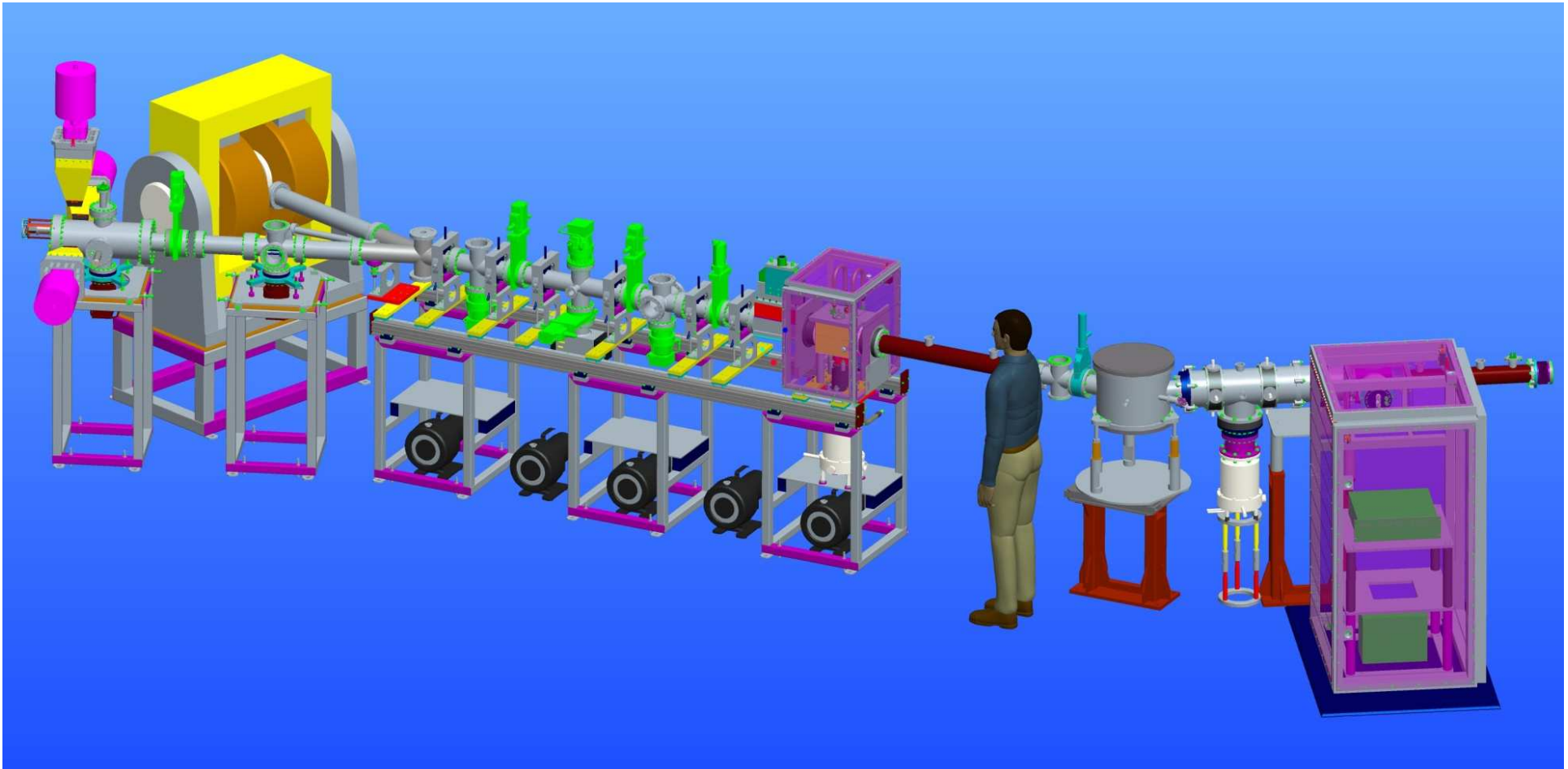
- Initially a “COLLAPS” style β -NMR / optical detection line was envisaged.



Design Evolution

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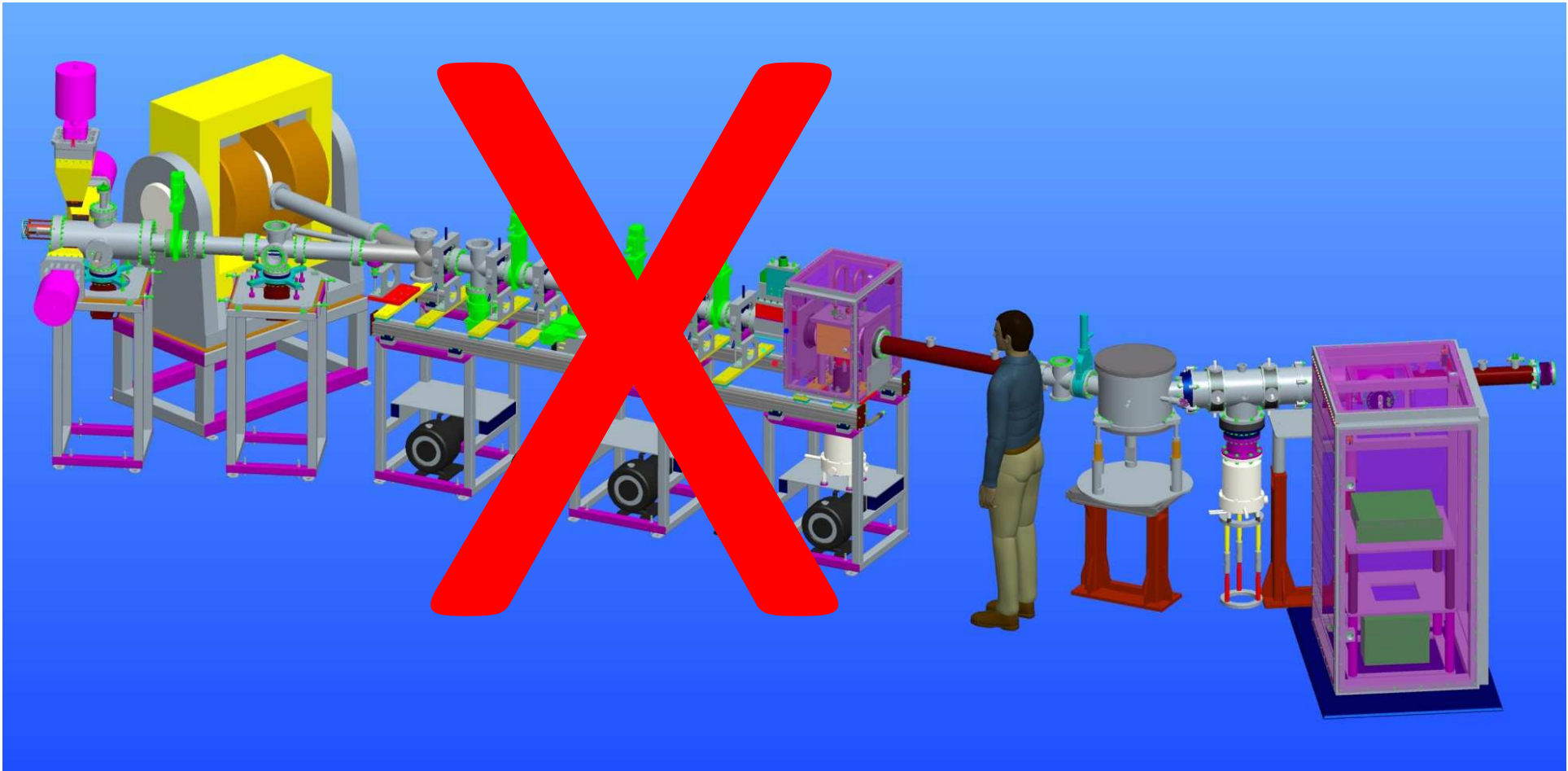
- With the development of the CRIS technique it was concluded that this should also be available at LUMIERE.



Design Evolution

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- Design attempts to combine the ultra high vacuum requirements of CRIS and the magnetic field requirements of β -NMR were not successful.

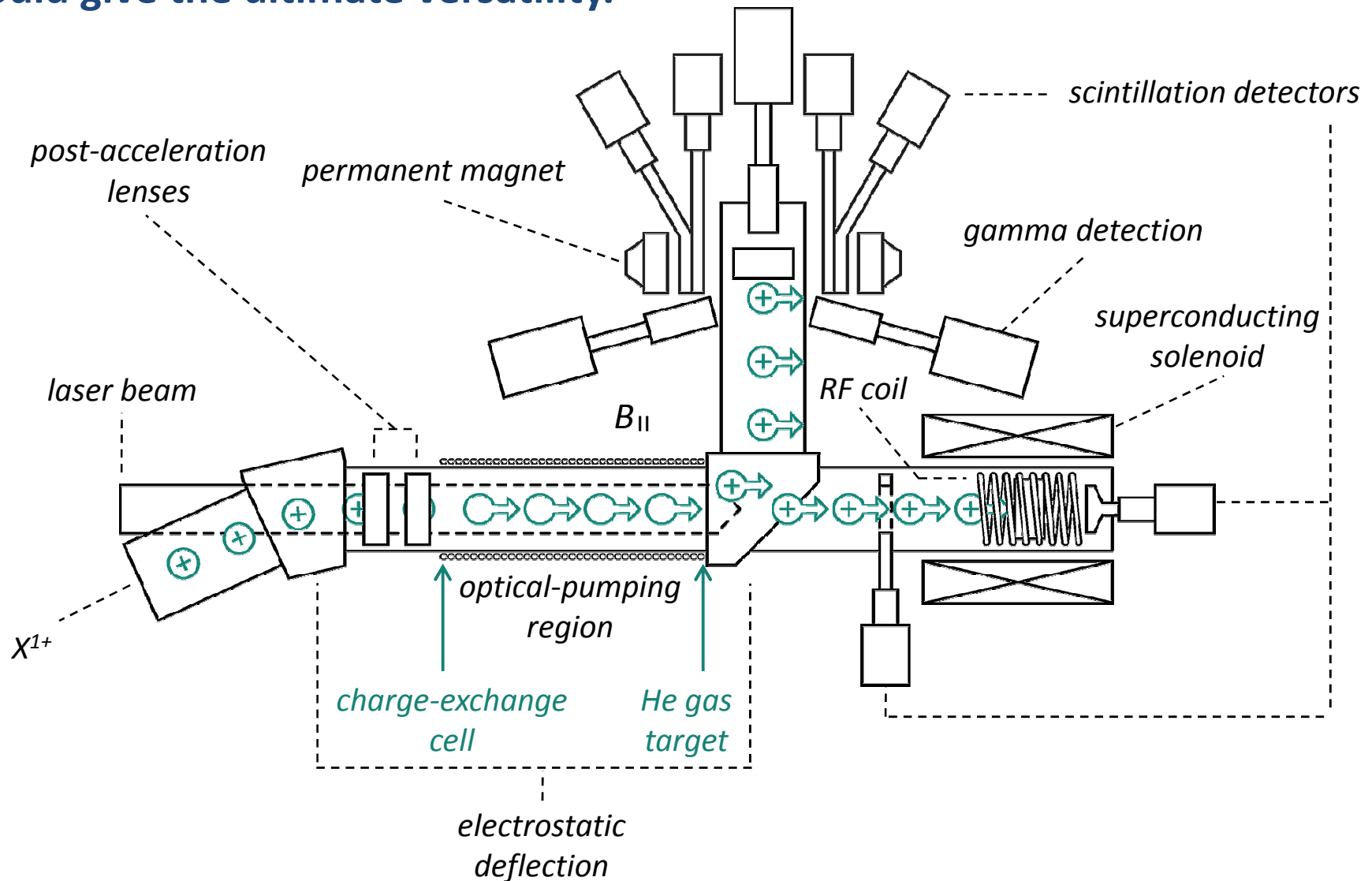


A 2 beam line solution is necessary.

Design Evolution

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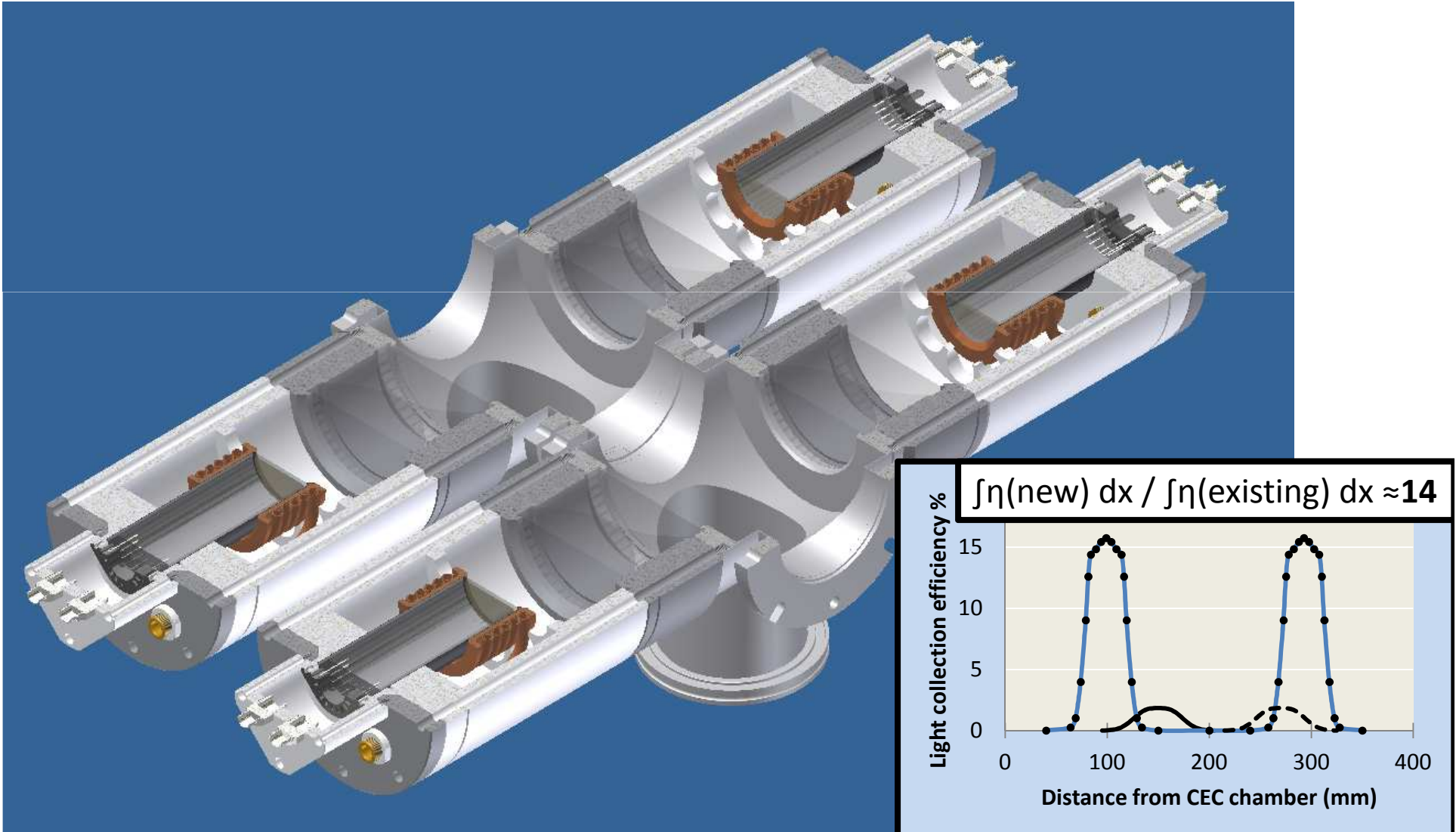
- At the same time it was concluded that a TRIUMF style polarization line would give the ultimate versatility.



Design Evolution

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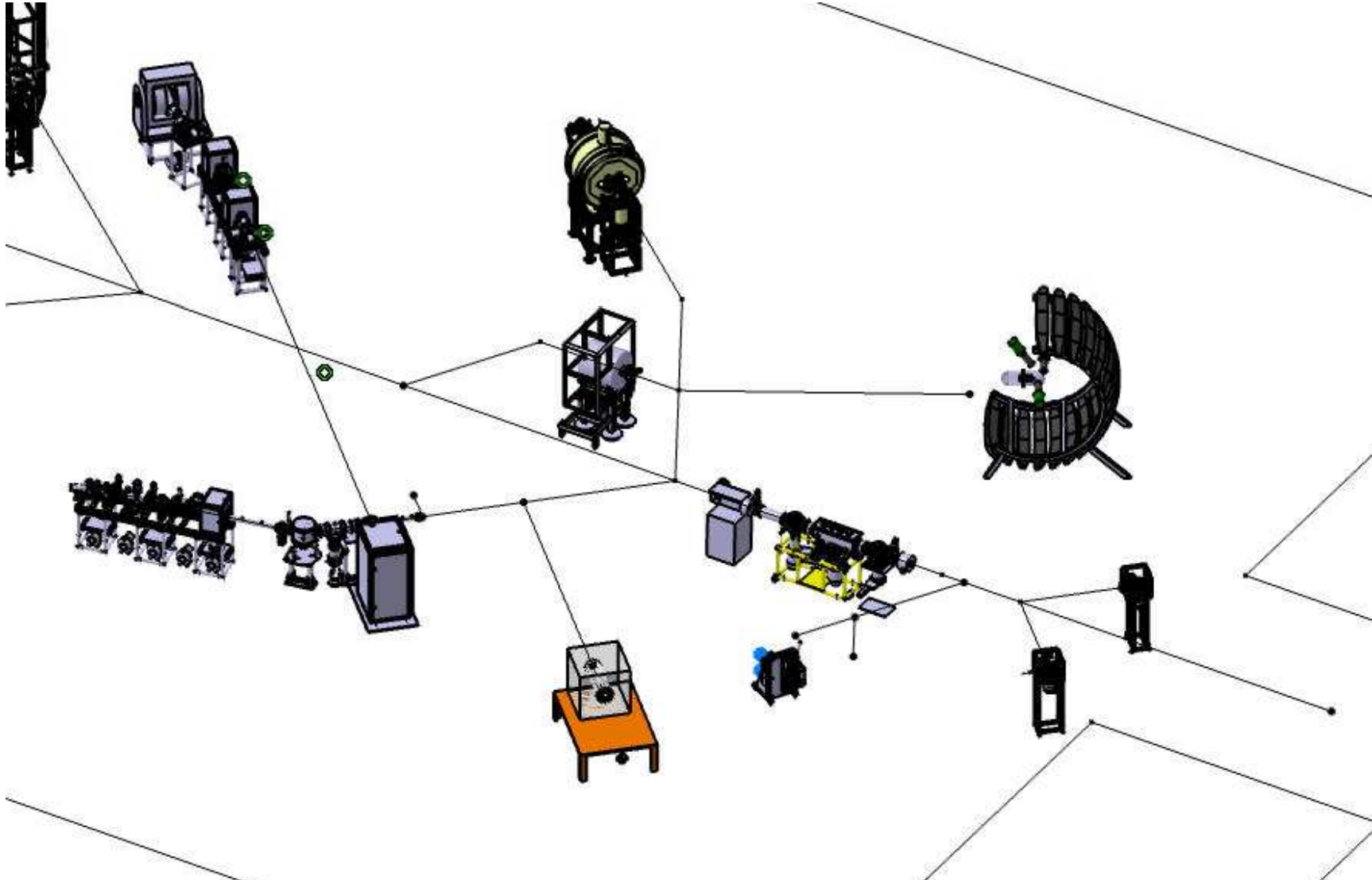
- Furthermore a new optical detection station developed by Leuven has demonstrated a $> \times 10$ improvement in detection efficiency.



And Now?

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- Preliminary designs incorporated into hall layout. Final arrangement of β -NMR line in progress.



LASER requirements?

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- Diverse techniques require a diverse LASER setup.

LASER	#	Cost (€)	Notes
CW ring dye (MATISSE DS)	1	88 000	Alternative could be available within collaboration.
CW ring TiSa (MATISSE TS)	1	88 000	
External cavity frequency doubler	2	40 000	
CW DPSS pump laser (Verdi 18W)	1 or 2	82 000	
Large frame Ar ⁺ (Optional with 2 DPSS)	0 or 1	69 000	Could be available (service costs?)
Low rep. Rate NdYAG (Litron Nano TRL)	2	40 000	
Pulsed Dye Amplifier (SIRAH / Custom)	2	90 000	
Wavemeter Bristol	1	19 000	
Wavemeter Angstrom WS/6-200	1	20 000	
Lab installations /optomechanics/optics	1	35 000	
		Order of 750 000	

Installation requirements

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- Power, water, environmental, space ... requirements have been defined.
- Technique development is continuously ongoing at all major international facilities and is actively feeding into the design of LUMIERE.
- Final design validation to be concluded once incoming beam characteristics are fully specified.
- Process of defining in-kind collaboration contributions / work packages must now begin.
- Ask research councils for €...

Community service...

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- **Beyond our core programme LUMIERE could provide**
 - Laser purified beams to decay spectroscopy or other users.
 - Laser polarized beams.

- **Significant interest was expressed in the DESIR collaboration committee meeting.**
 - Please let us know quickly what beams you are interested in.
 - Reinjection into main beam line or small mobile setups?

The Collaboration

LUMIERE

G. Neyens, M.L. Bissell



J. Billowes, P. Campbell, B. Cheal, K. T. Flanagan

MANCHESTER
1824

F. Le Blanc, I. Matea, D. Verney



T. E. Cocolios, D. T. Yordanov



J. -C. Thomas, B. Bastin

