



12th MEDICIS Collaboration Board Operations for clinical production

Laura Lambert

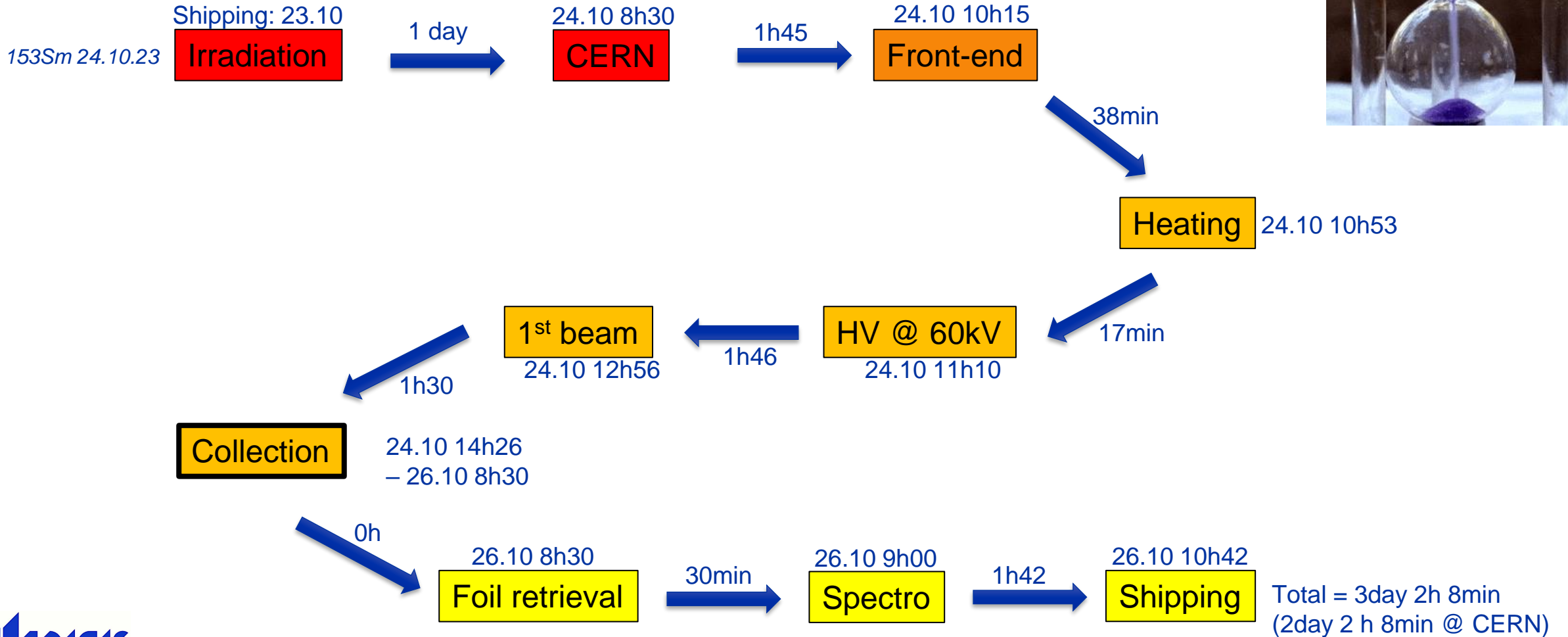
July 2nd, 2024

Operations for clinical production

- Key Performance Indicators
- Ac-225, Ra-225, Ra-224 developments
- Sm-153 overview
- Operational diagnostics update

Key performance indicators (KPI's)

Time Management



Key performance indicators (KPI's)

Logging & Tracing

OPERATION REPORTS

ELOG

3016717 v.1 ● In Work 🔒 Restricted access
2024 MEDICIS Operation Reports by CHARLOTTE DUCHEMIN ✉

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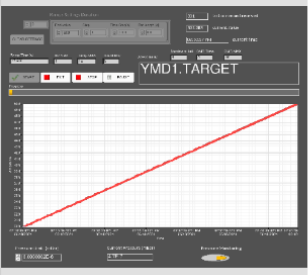
Create subdocument | Attach document | Detach | Export to Excel | Requ

#...	Id	Title
10	3071716 v.1	★ Stable-beam-tests-April-2024
20	3086623 v.1	★ Ra-224-225-#1 collection - operation report
30	3086626 v.1	★ Sc-47 #1 2024 operation report
40	3086627 v.1	★ Tb-155 #1 2024 collection - operation report
50	3093192 v.1	★ Ra-225 #2 2024-06-03 collection - operation report
60	3104806 v.1	★ Tb-155 #2 Collection Report 11-06 to 18-06-2024

18.Jun.24 ISO_MEDICIS





18-06-2024 14:09:33

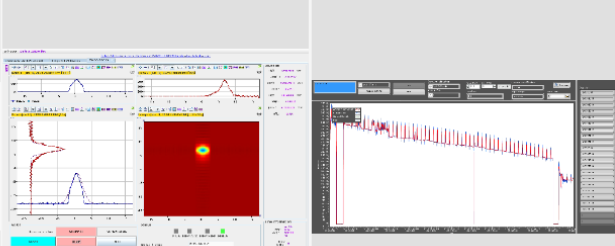
Heating target more:
Target to 500 A in 1 A steps every 10 s
Vacuum monitoring set to 6e-6 mbar.



18-06-2024 14:07:18

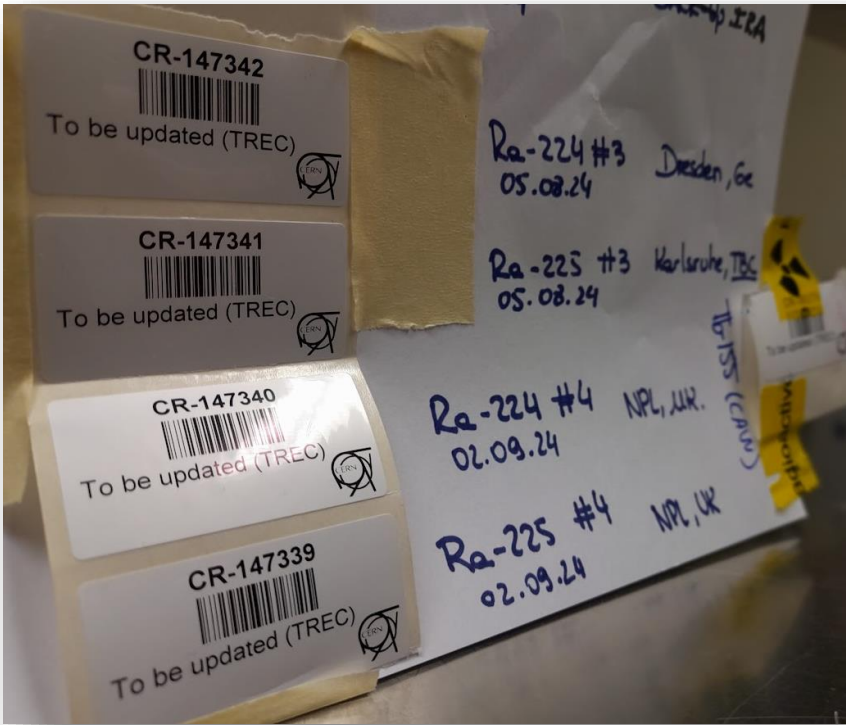
Reference for separated beam now 134 pA
Laser effect seems less prominent now.

Sample Holder	Collimator	Separated Beam	Total Beam
BX60	BX40	FC30	FC70
			
61 fA	-116 fA	134 pA	175 pA



Key performance indicators (KPI's)

Logging & Tracing



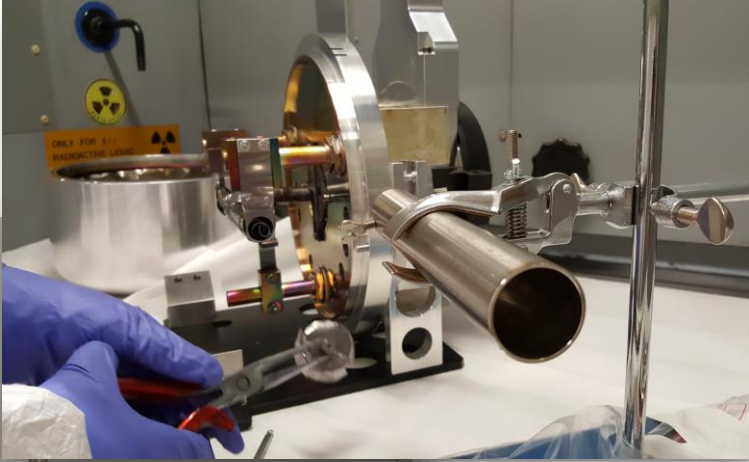
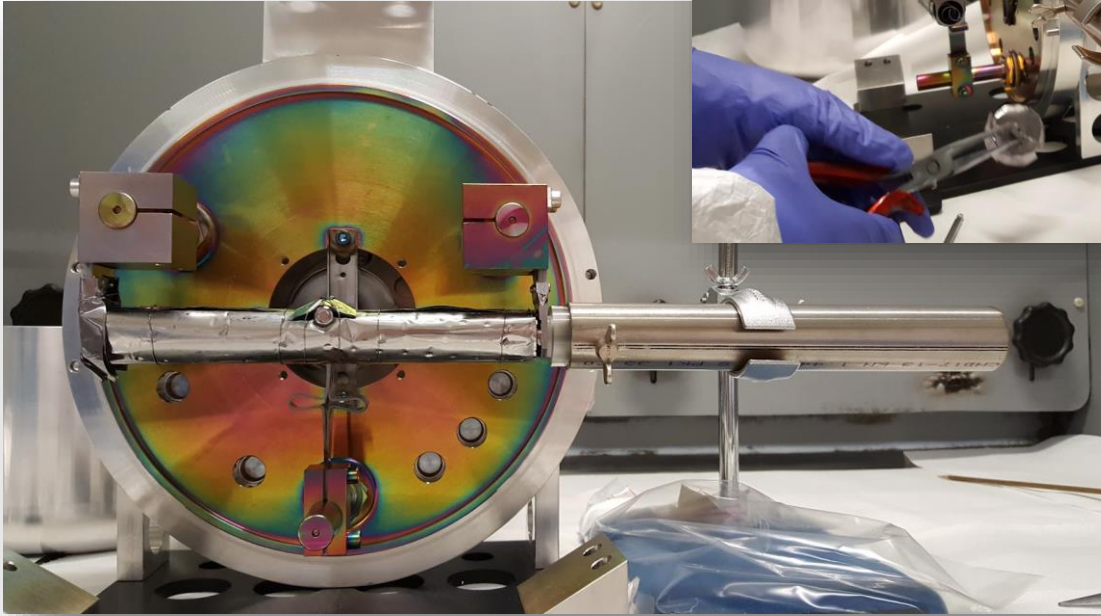
Impact	211954	MC-665
Date	11/05/23	
		Dosi collective
Contact container H ¹⁰	25A	
H ¹⁰ 10 cm collimateurs avec feuilles	160	
H ^{10,07} a 10 cm collimateurs avec feuilles	7300	
Feuille	195021	TREC
H ¹⁰ a 10 cm de la feuille	170 μSv/h	CR-147339 ⁸⁰
H ^{10,07} a 10 cm de la feuille	70 mSv/h	

ADR Sat α 80 000 c/s

Key performance indicators (KPI's)

High efficiency working with external sources

↳ Handling up to 50 GBq Sm-153



KPI's related to ALARA/dosimetry for external source:

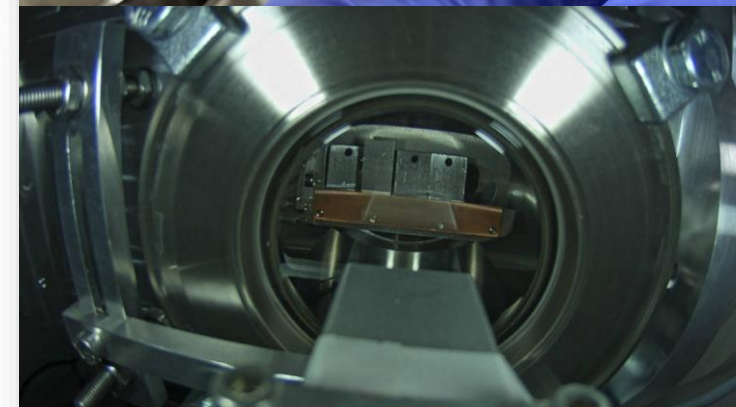
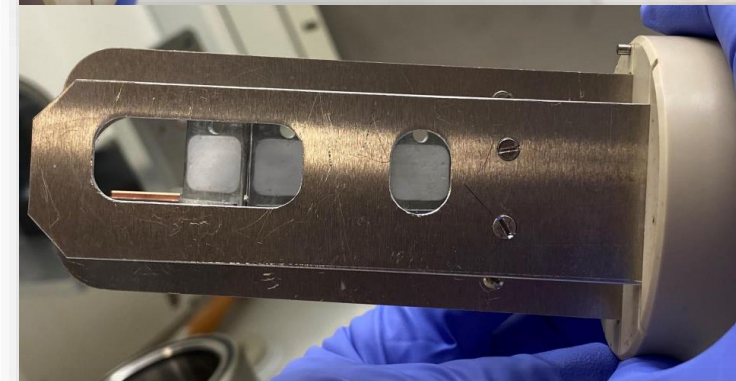
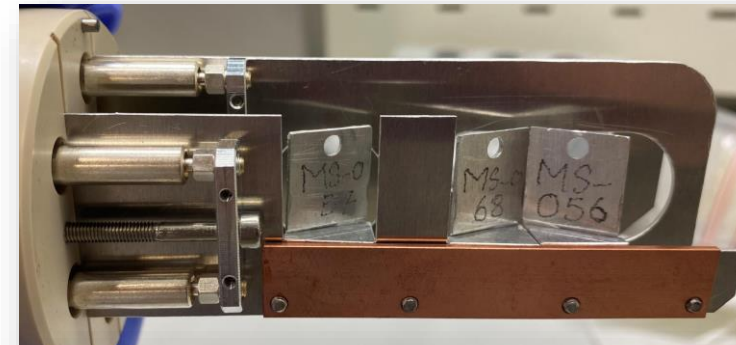
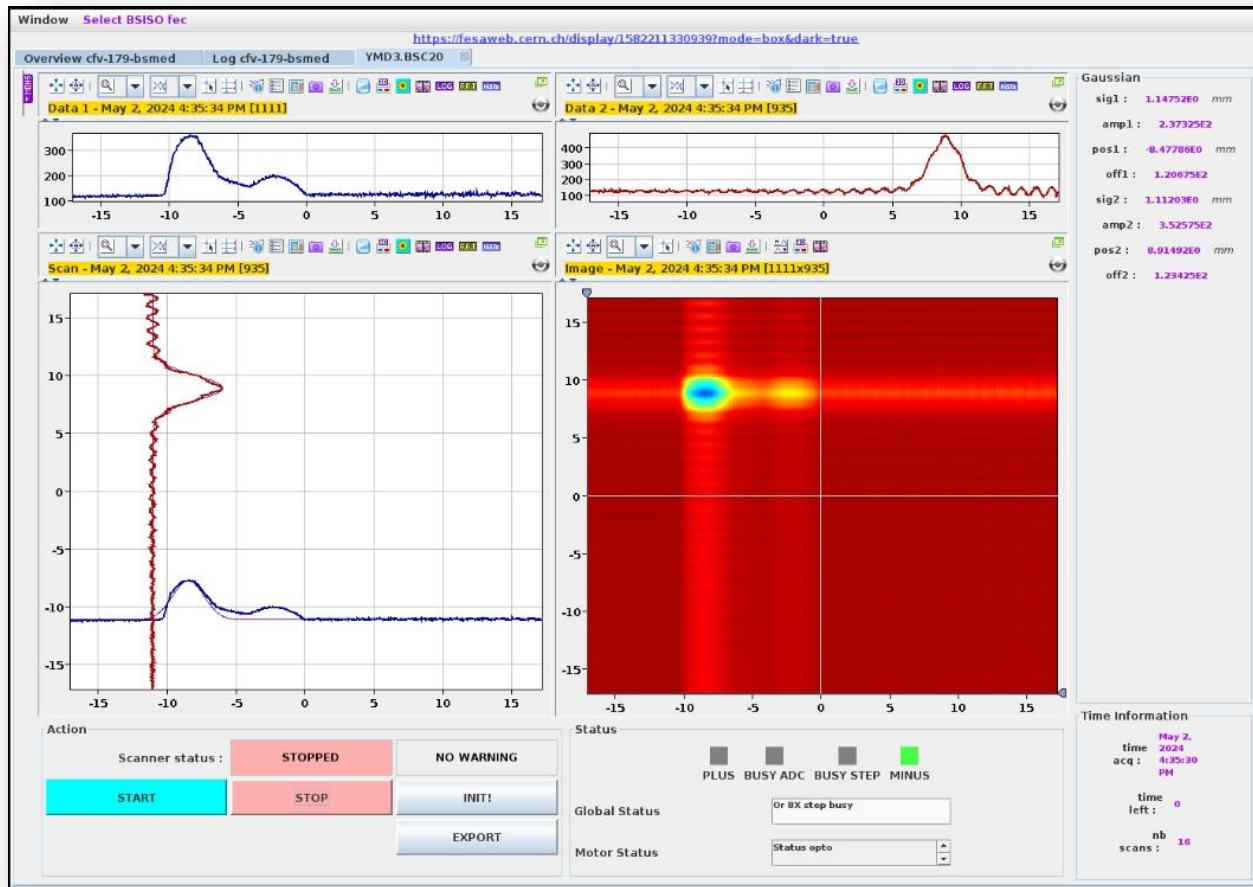
Isotope	# of collections	Collective dose [person.μSv]	Max. individual dose [μSv]
Sm-153	16	28	22
		4	4
Ac-225	3	2	1
		1	1

} Loading source
} Foil retrieval



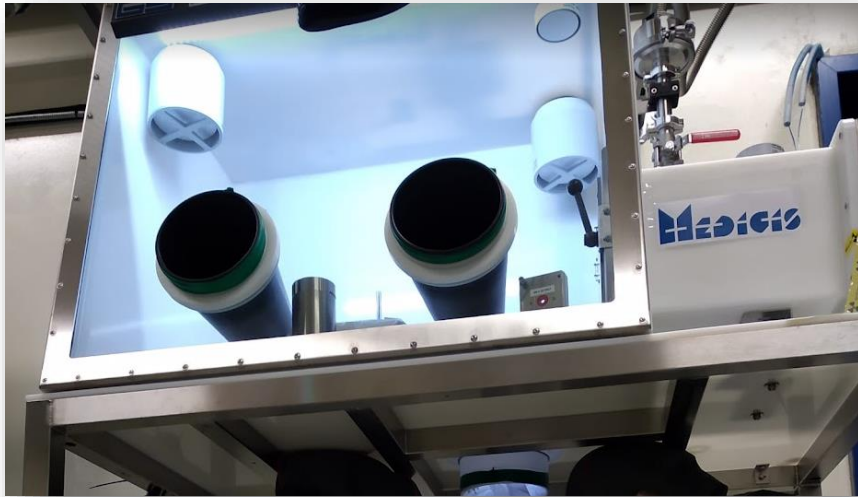
Ac-225, Ra-225, Ra-224 developments

Customised implantation holder

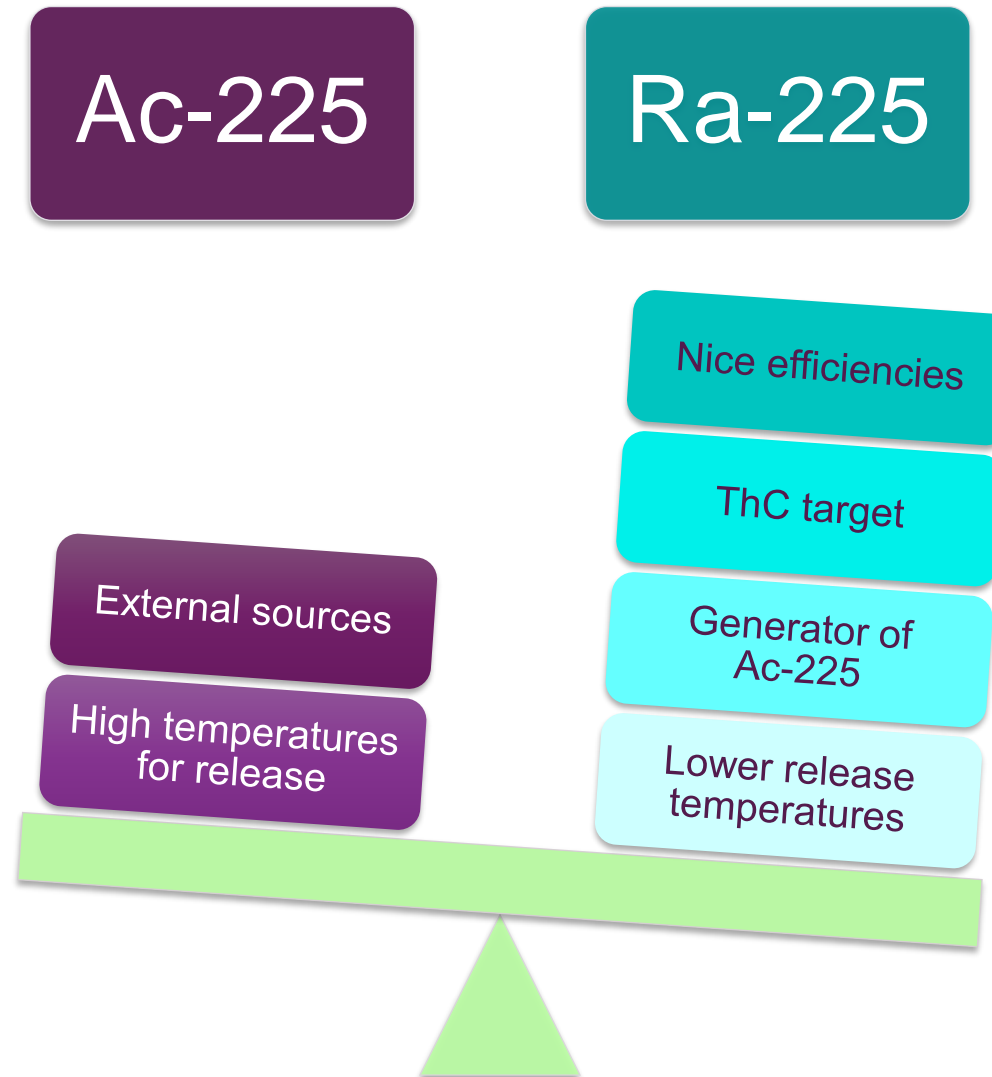


Ac-225, Ra-225, Ra-224 developments

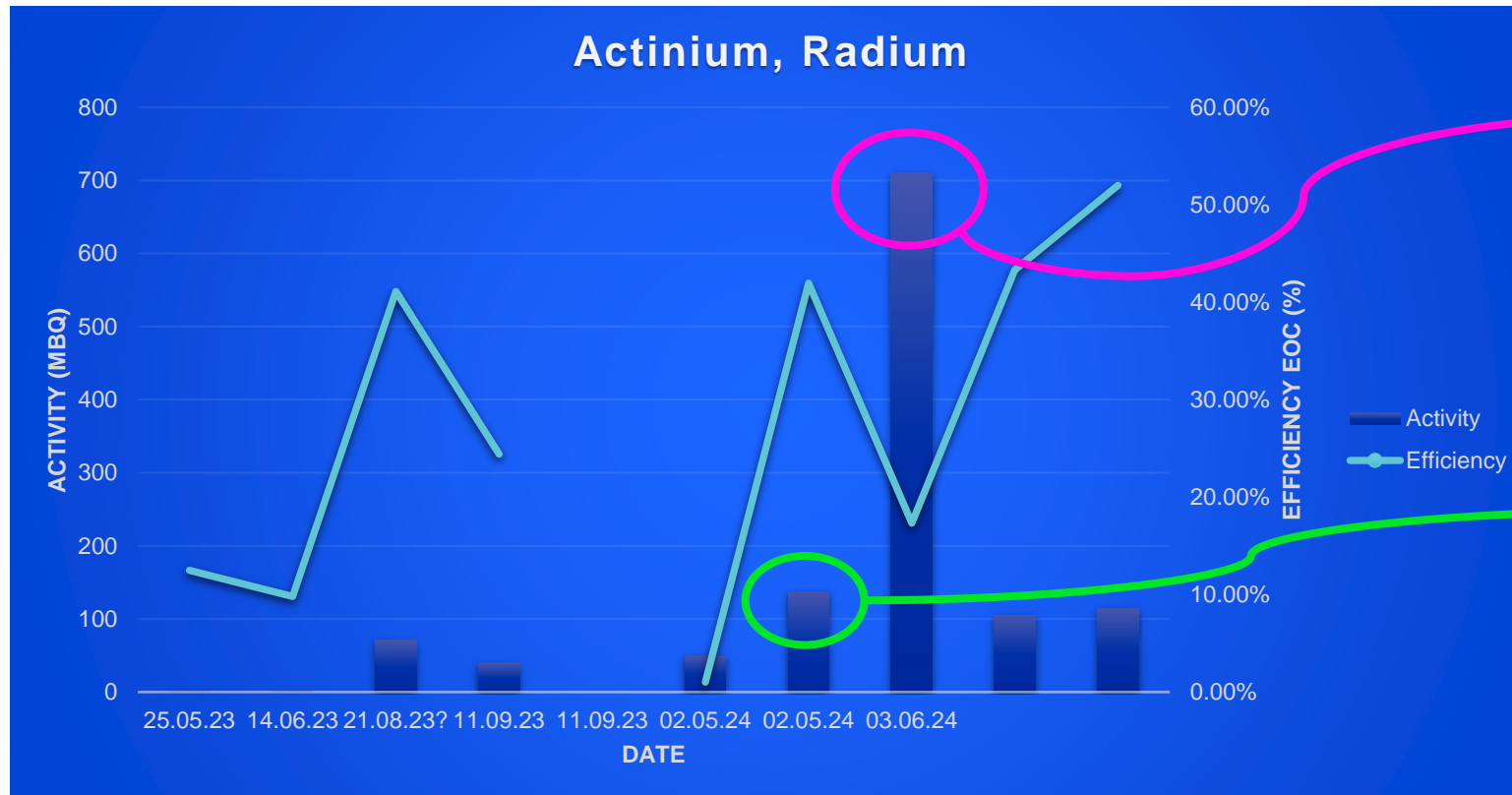
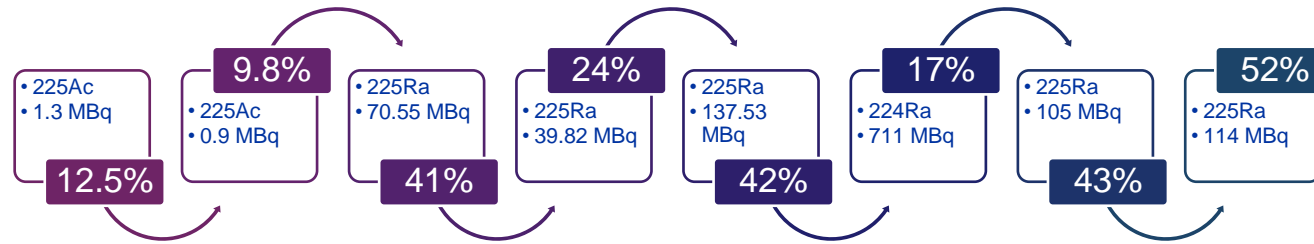
- Dedicated glovebox for working with alphas
- Custom base to allow for high weight load
- Shielded bag-out system



Ac-225, Ra-225, Ra-224 developments



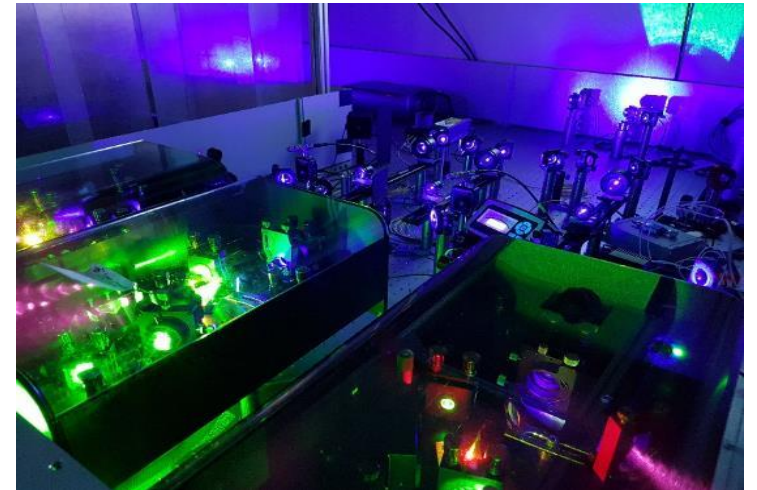
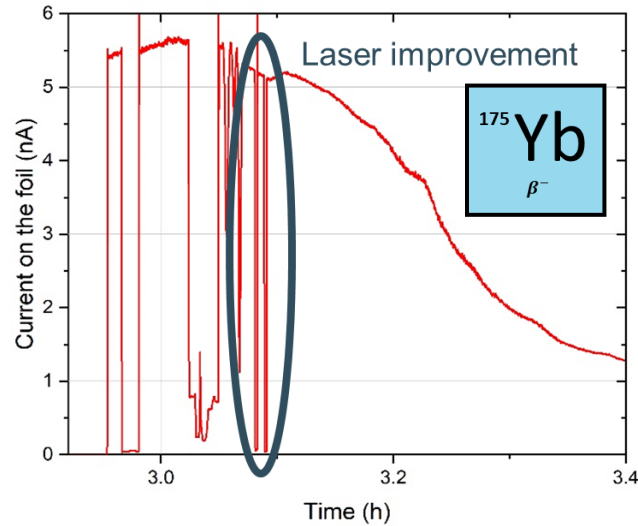
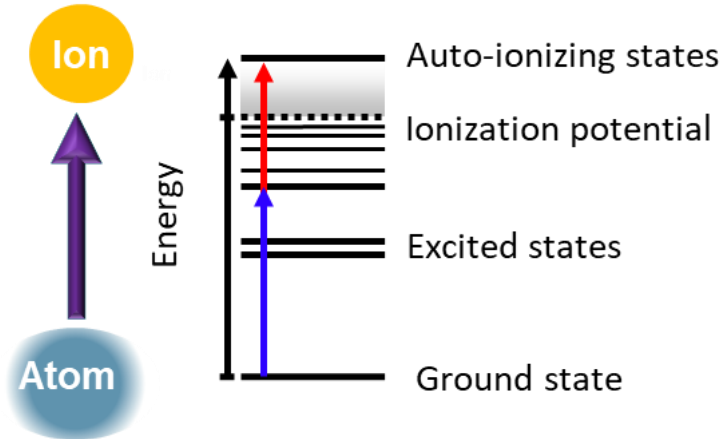
Ac-225, Ra-225, Ra-224 developments



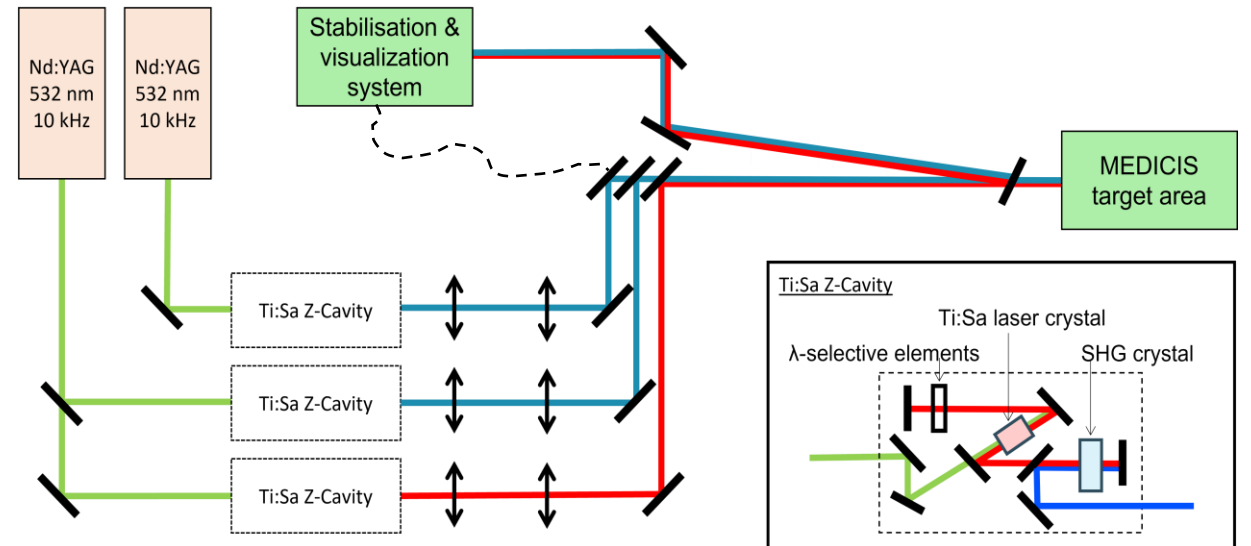
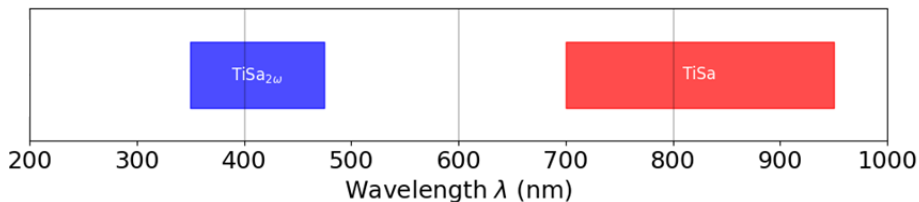
711 MBq ²²⁴Ra

138 MBq ²²⁵Ra

The MELISSA laser lab : overview



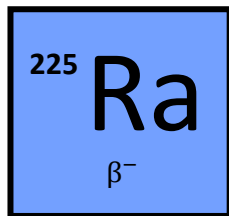
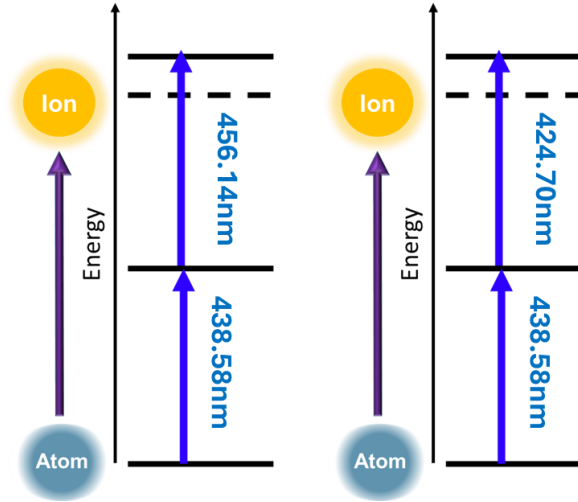
- 2 Nd:YAG pump lasers
- 3 Ti:Sa cavities
- Wavelength-selective elements (~5 GHz)
- Second-Harmonic Generation
- Telescope and transport system
- Stabilisation/visualisation system



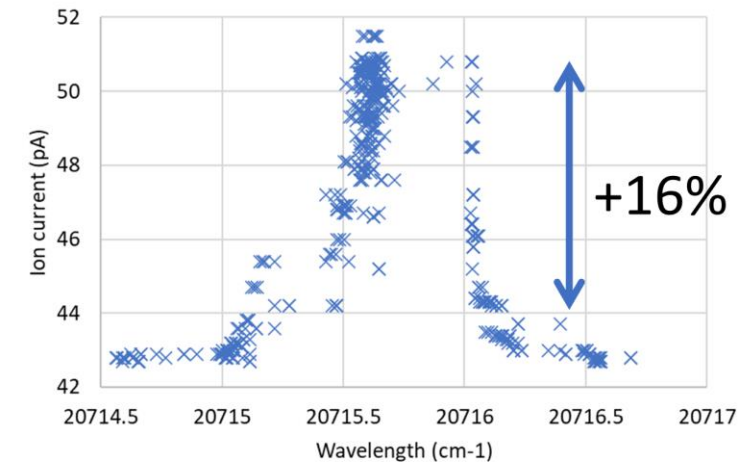
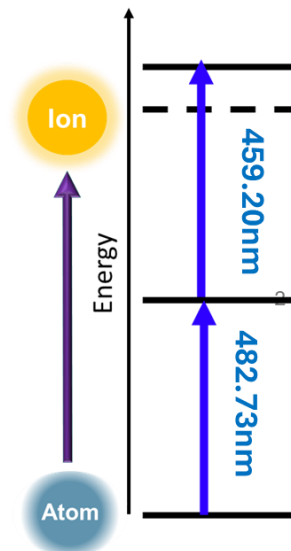
Laser ionization of Ac/Ra



- 2 laser ionization schemes running in parallel for optimal ionization



- First step outside the TiSa range
- Development of diamond-based Raman laser
- First use August 2023 in Melissa



Ac-225, Ra-225, Ra-224 developments

- [MED-024](#), KU Leuven (Belgium)

Mass separation of ^{225}Ac from ^{227}Ac and from irradiated Th target to support Targeted Alpha Therapy.

- [MED-027](#), INMOL (Pakistan)

Strengthening theranostics or radionuclide therapy in Pakistan.

- [MED-030](#), KU Leuven (Belgium)

Targeted Alpha Therapy in Belgium: qualifying the Ac-225 pipeline.

- [MED-032](#), CERN (IO)

PRISMAP – The European medical radionuclide programme: CERN-MEDICIS contribution.

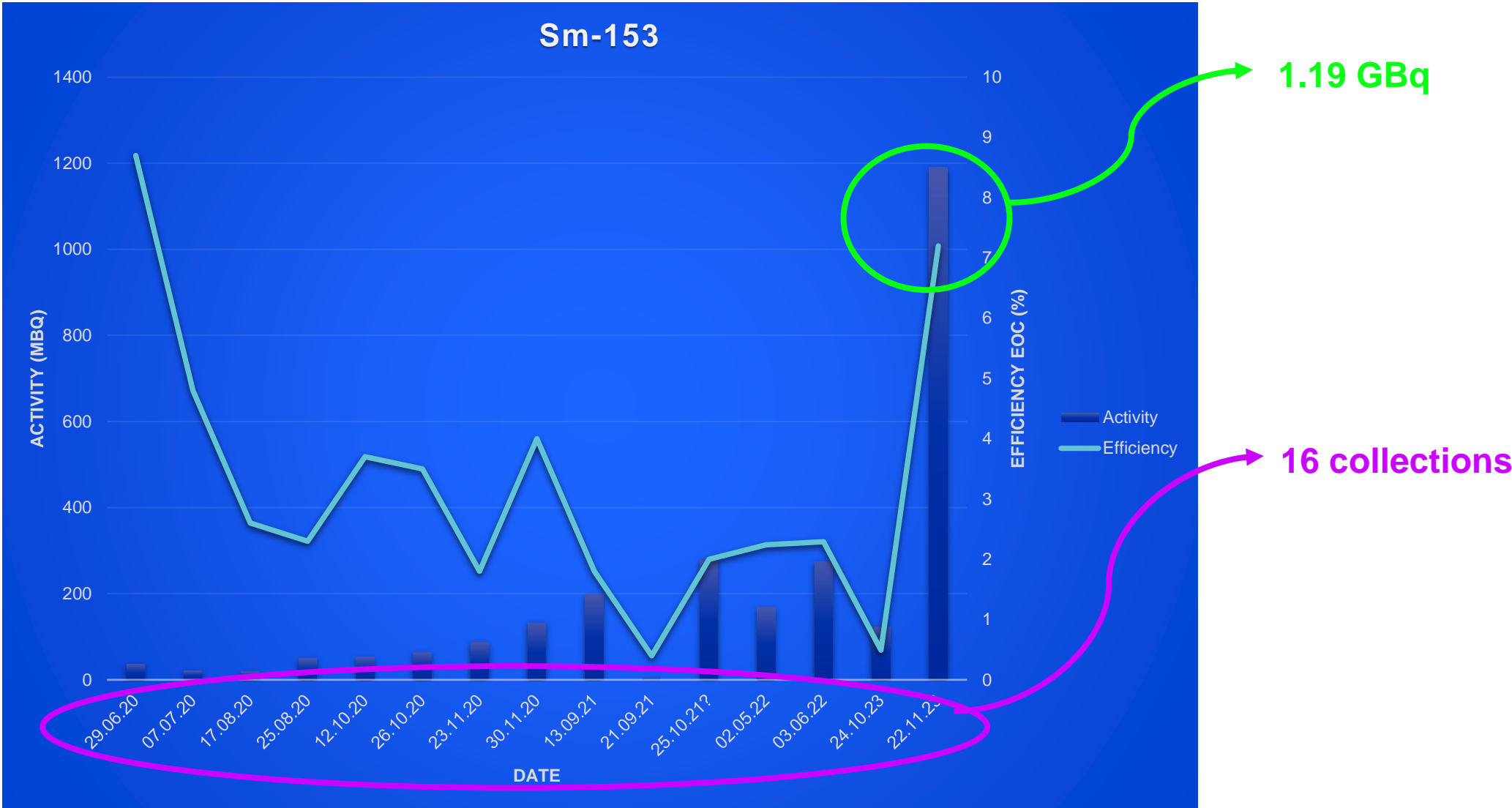
- [MED-034](#), IRA-CHUV (CH)

Determination of ^{227}Ac impurity in ^{225}Ac using alpha spectrometry

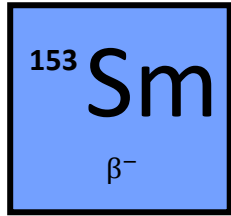
- [MED-037](#), NPL / KU Leuven (UK/BE)

AlphaMET (Metrology for Emerging Targeted Alpha Therapies)

Sm-153 overview



Laser ionization of Sm

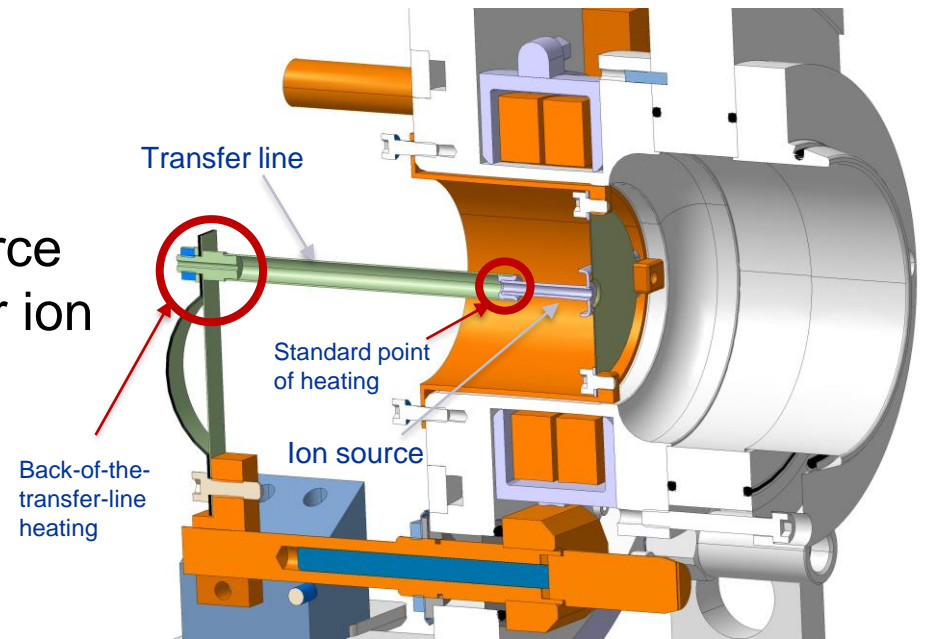
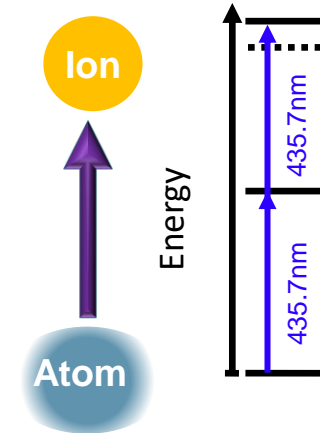
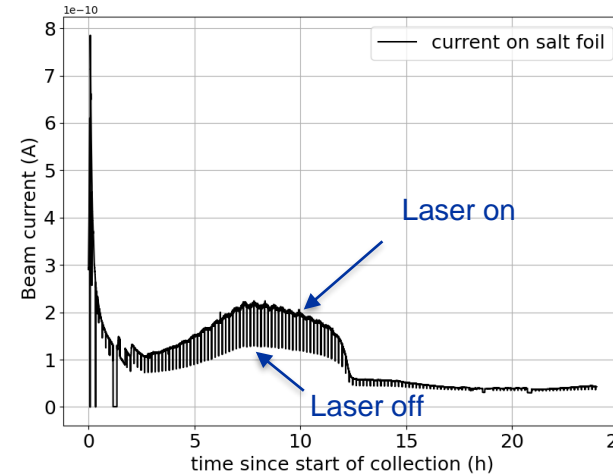


- 1-color scheme
- Up to 30% efficiency
- Can be set up on 3 lasers simultaneously for maximum efficiency

Stable Sm tests for ion source development:

- Laser ionization can be used to “probe” the ion source
- Heating the back of the transfer line results in better ion extraction
- Comparison of two ion source – transfer line configurations
- Is the heated transfer line more efficient?

¹⁵³Sm collection 2023



Sm-153 overview

- [MED-025, KU Leuven \(Belgium\) - COMPLETED](#)

Mass separation for the production of high specific activity Samarium-153 for targeted radionuclide therapy.

- [MED-032, CERN \(IO\)](#)

PRISMAP – The European medical radionuclide programme: CERN-MEDICIS contribution.

- [MED-035, CHUV / Heidelberg Univ. Hosp. \(CH/DE\)](#)

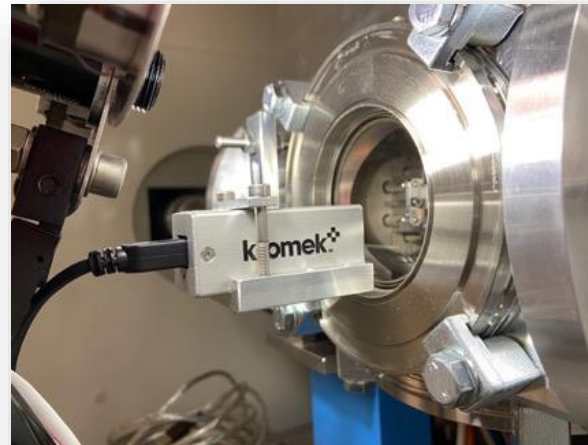
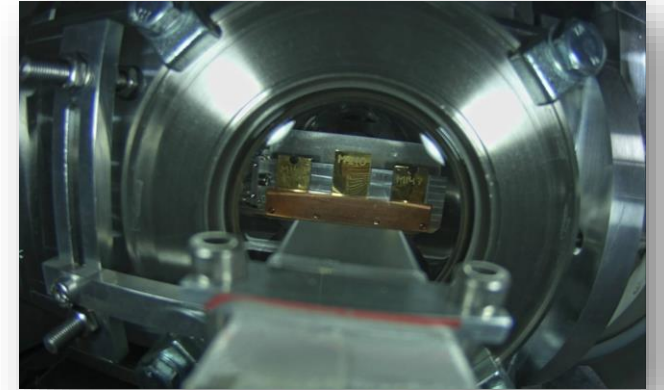
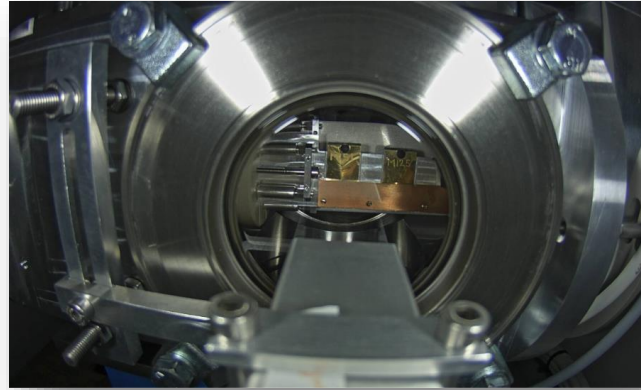
^{153}Sm -FAPI-46 Radioligand Therapy with High-Molar Activity ^{153}Sm

~1.3 GBq collected
and delivered to
Heidelberg

~1.4 GBq collected
and delivered to
SCK-CEN



Operational diagnostics

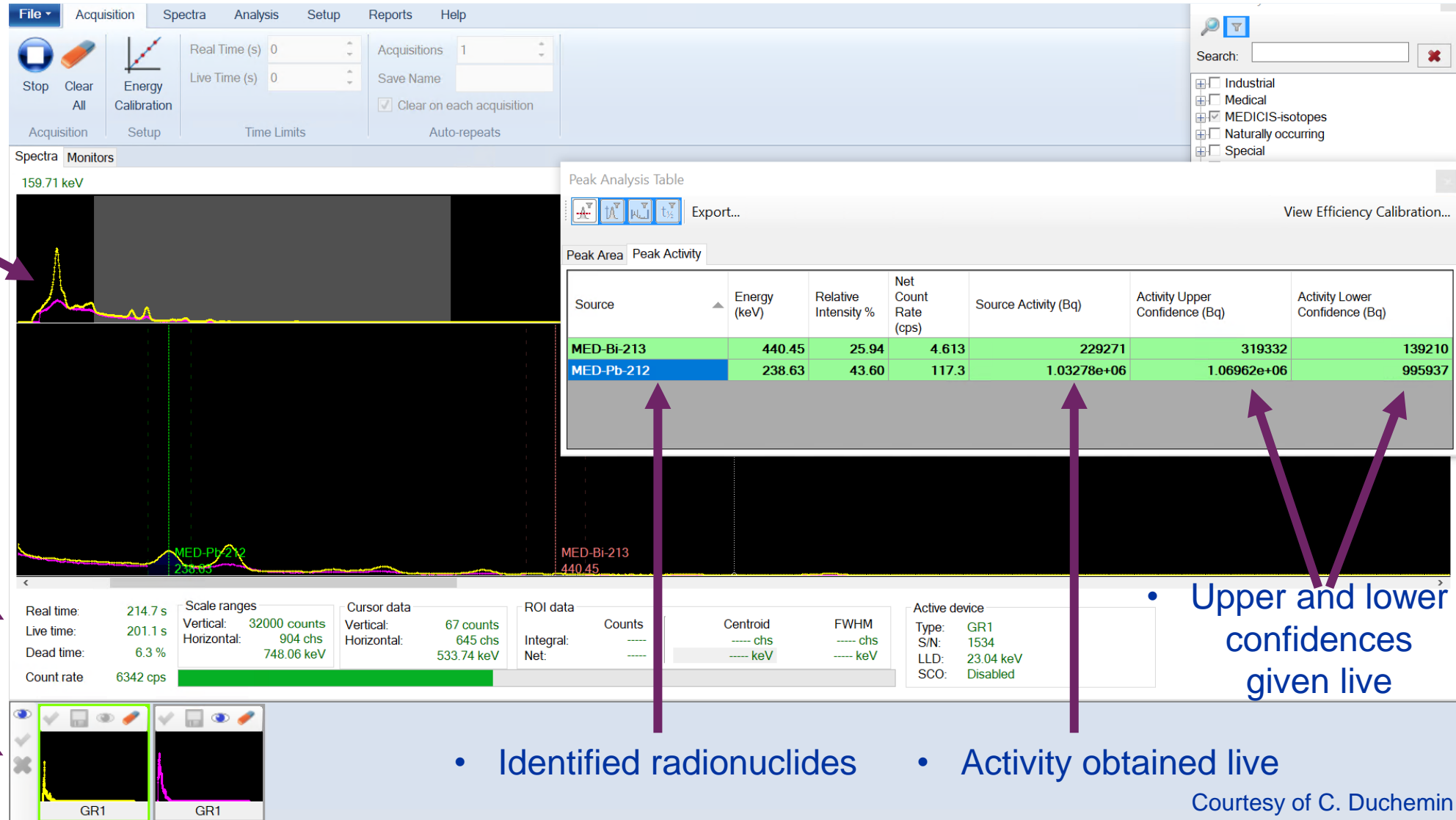


Operational diagnostics

- γ -ray spectra: can acquire as many spectra as KROMEK connected

- Real and live time in seconds
- Dead time in %
- Count rate in cps

- Detector selection



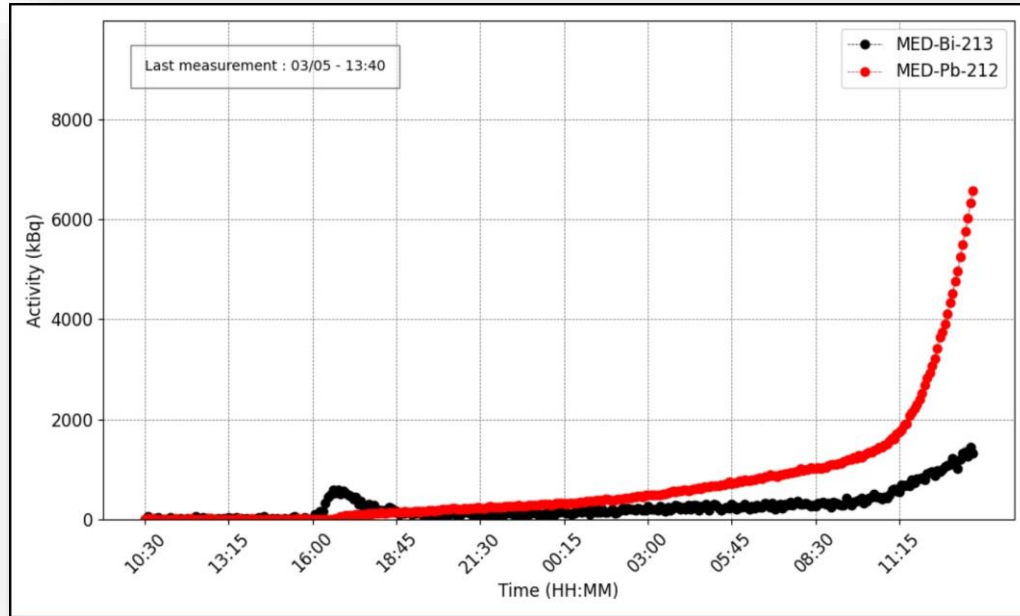
• Identified radionuclides

• Activity obtained live

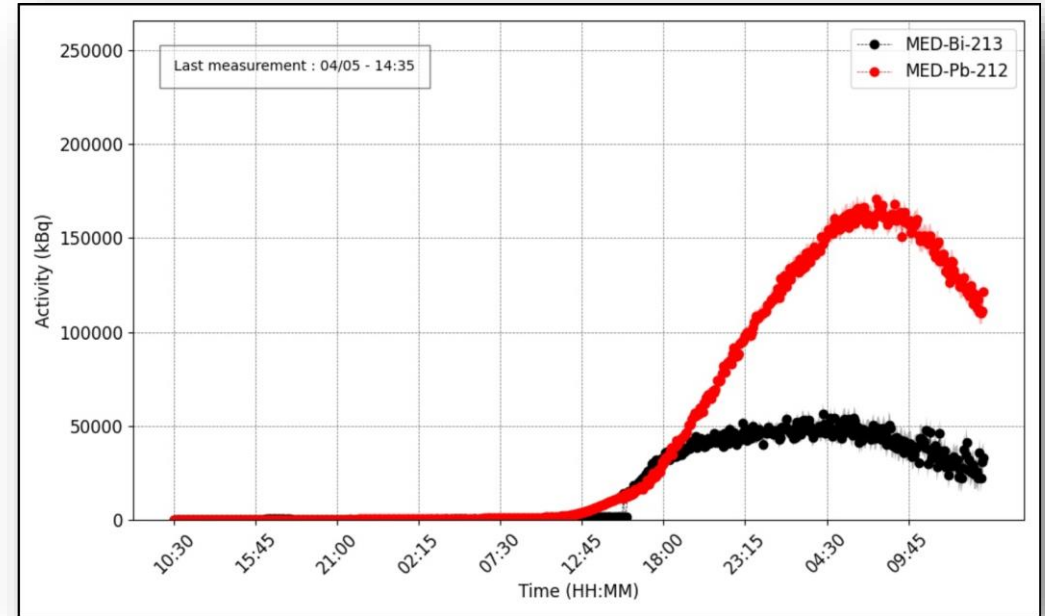
• Upper and lower confidences given live

Courtesy of C. Duchemin

Operational diagnostics



Nice implantation rate



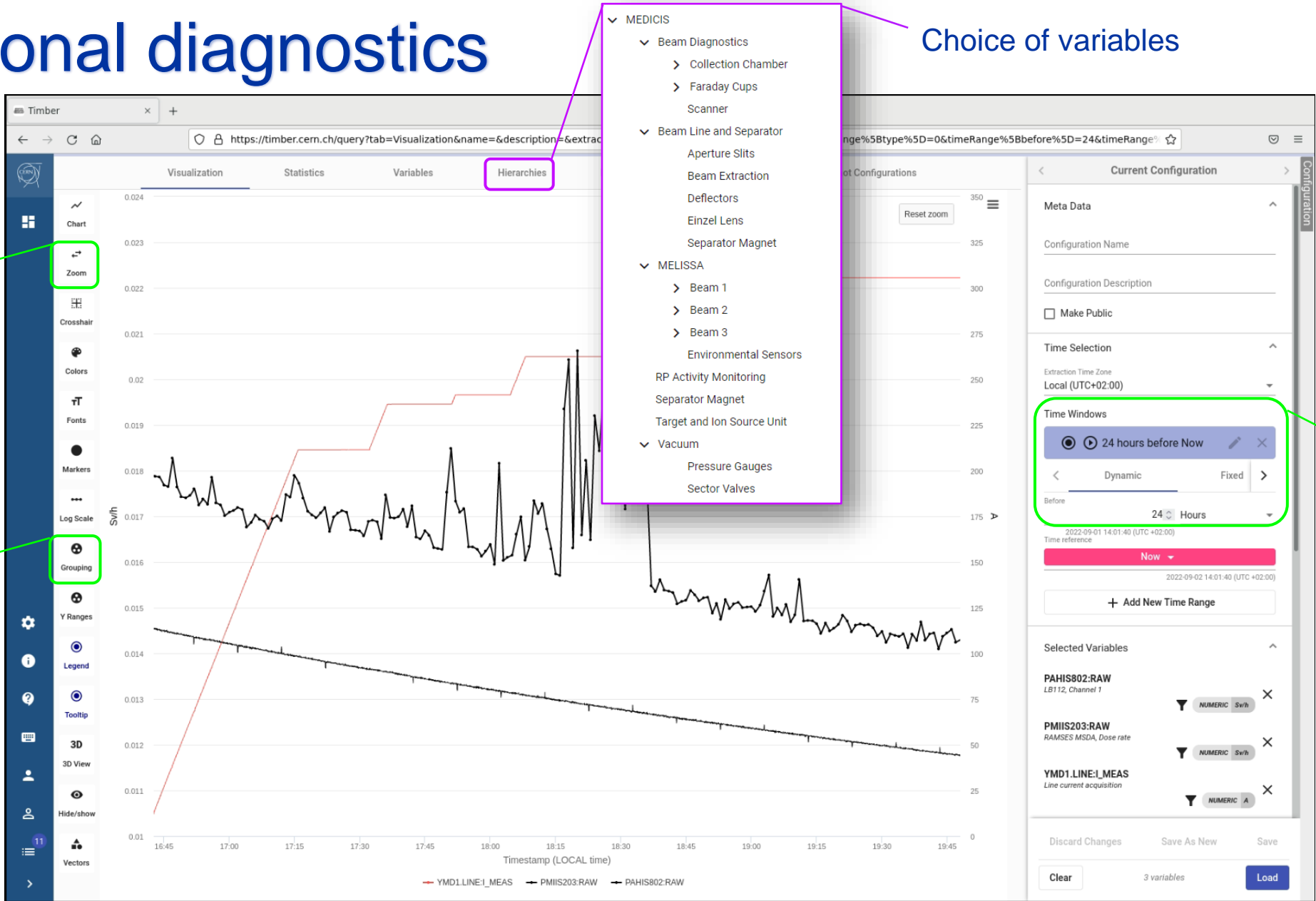
Saturation due to high dead time

Operational diagnostics

Choice of variables

Zoom on both x and y axis

Grouping options for data sets



Time selection

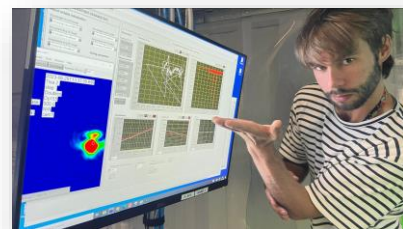




MEDICIS



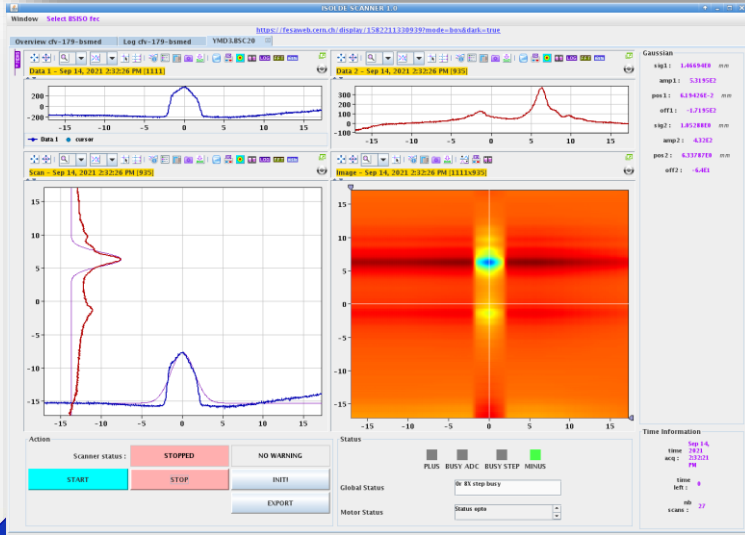
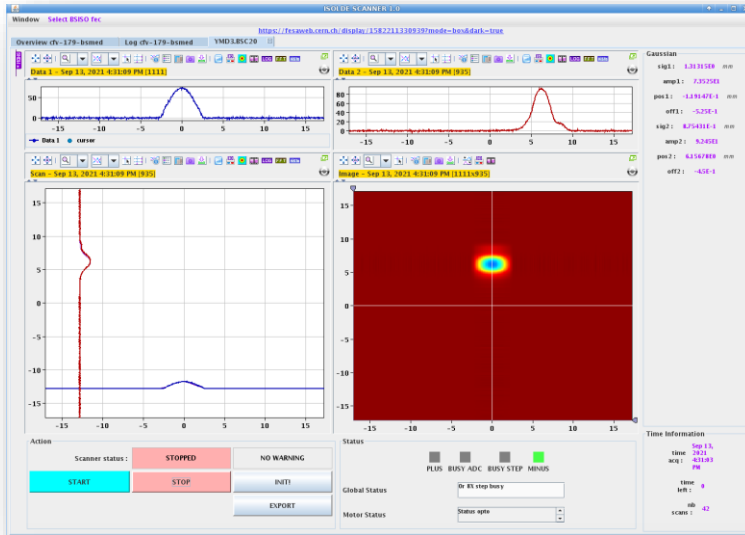
**Thank-you to the MEDICIS dream team and all of our collaborators!
Merci!**



home.cern



Sm-153 overview



From 8th collab. Board.

- 13.09
 - Large increase in collected activity seen ~ 1650C
 - When heating to ~1850C -> tailing from neighbouring mass Sm-152
 - 199 MBq EOC -> efficiency of 1.8 %
- 20.09
 - Broken line to start that was quickly fixed
 - 118 MBq on Kromek EOC
- 25.10
 - 278 MBq EOC -> efficiency of 2.0 %



Sm-153 overview

- Improvements?
- Release temperatures?

-Large tailing from Sm-152 means mass separation very beneficial!