

# **MARA-LEB**

#### An Insight into Nuclear Physics Experiments

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# JYFL Acclab





#### **About Me**

- ► Bachelor Degree in Physics at the University of Valencia (Spain)
- Master's Degree in Nuclear Physics at the University of Sevilla (Spain)
- Dual Doctoral Student at the University of Liverpool and the University of Jyväskylä (Finland)
- Outside of Physics: I play basketball, I love videogames and I am interested in many fields of knowledge.





# **A Nuclear Physics Experiment**

► Accelerate something (beam)

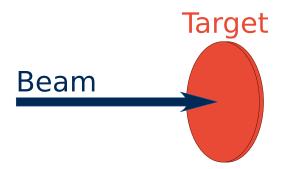






# **A Nuclear Physics Experiment**

- Accelerate something (beam)
- ► Crash it into something else (target)

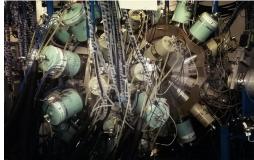




### **A Nuclear Physics Experiment**

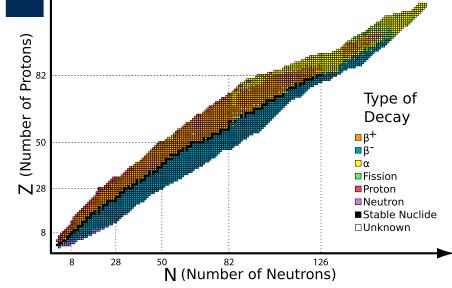
- Accelerate something (beam)
- ► Crash it into something else (target)
- ► See what happens (detectors)

The JUROGAM Ge-detector array





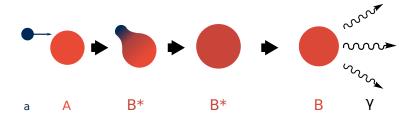
#### **▲ Nuclear Chart**





#### Reactions

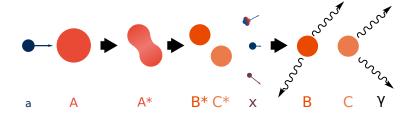
Fusion:  $a + A \longrightarrow B$ 





#### Reactions

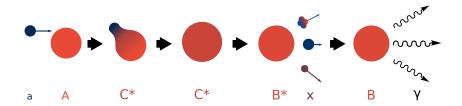
Fission:  $a + A \longrightarrow B + C (+x)$ 





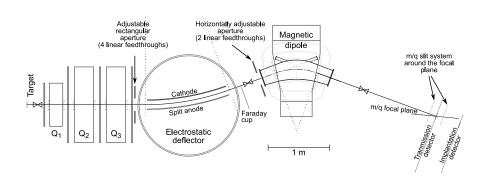
#### Reactions

Fusion-Evaporation:  $a + A \longrightarrow B + x$ 





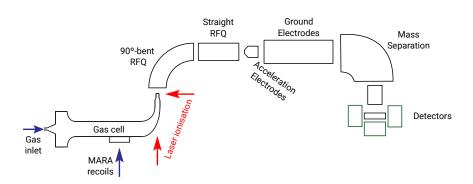
The Mass Analysing Recoil Apparatus (MARA) uses electric and magnetic fields to select specific recoils from fusion-evaporation reactions.





The MARA Low Energy Branch (MARA-LEB) will be used for exotic cases to suppress background.

It will use laser ionisation for both measurement and purification.



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Sb 103 MARA-LEB is of interest in the N=Z region, close to the proton dripline, where no more protons can Sn 102 50 be added to the nucleus. In 100 In 101 50 ms  $^{80}$ Zr,  $^{94}$ Ag and  $^{100}$ Sn and their neighbours Ag 96 are of particular interest. Ag 92 Ag 95 Ag 97 Ag 98 Aq 99 1.76 s 25.5 s

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42		Mo 81	Mo 82		/									Mo 93			
				23 ms	2.3 s	3.2 s	19.1 s	14.1 s	8.0 m	2.11 m	5.56 h	15.49 m	14.53	4.0 ky	9.15	15.84	
Nb		Nb 79	Nb 80	Nb 81	Nb 8/2	Nb 83	Nb 84	Nb 85	Nb 86	Nb 87	Nb 88	Nb 89	Nb 90	Nb 91	Nb 92	Nb 93	Nb 94
?		?	?	<44 ns	90 ms	3.9 s	9.8 s	20.5 s	88 s	3.7 m	14.50 m	2.03 h	14.60 h	680 y	34.7 My	100.	20.4 ky
40	Zr 77	Zr 78	Zr 79	Zr 88	Zr 81	Zr 82	Zr 83	Zr 84	Zr 85	Zr 86	Zr 87	Zr 88	Zr 89	Zr 90	Zr 91	Zr 92	Zr 93
40			56 ms	A.6 s	5.5 s	32 s	42 s	25.8 m	7.86 m	16.5 h	1.68 h	83.4 d	78.41 h	51.45	11.22	17.15	1.61 My
Y 75	Y 76	Y 77	Y 79	Y 79	Y 80	Y 81	Y 82	Y 83	Y 84	Y 85	Y 86	Y 87	Y 88	Y 89	Y 90	Y 91	Y 92
		63 ms	24 ms	14.8 s	30.1 s	70.4 s	8.30 s	7.08 m	39.5 m	2.68 h	14.74 h	79.8 h	106.626 d	100.	64.00 h	58.51 d	3.54 h

Pd 91

Pd 93

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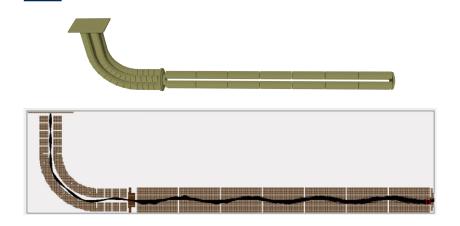


# Simulations - Ion Transport System





## **Simulations - Ion Transport System**

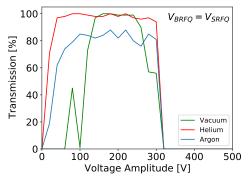


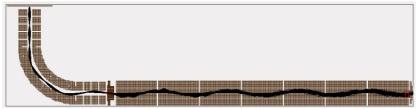
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#### **Simulations - Ion Transport System**







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