



# **PROGRESS ON BEAM DYNAMICS STUDIES FOR THE ISRS**

# **ISOCHRONOUS RING SPECTROMETER**

**Fazel Taft<sup>1</sup>, Yanis Fontenla<sup>1</sup>, Jorge Giner Navarro<sup>1</sup>, Ismael Martel<sup>2</sup>, Javier Resta-López<sup>1,</sup> E. López<sup>3</sup>** <sup>1</sup>Instituto de Ciencia de los Materiales Universitat de València, Paterna, Spain <sup>2</sup>Universidad de Huel <sup>2</sup>Universidad de Huelva, Huelva, Spain

<sup>3</sup>Instituto de Física Corpuscular, Paterna, Spain

(Fazel.taft@uv.es)

#### Abstract

A new lattice configuration is being developed for a com-pact, isochronous ring for the ISRS project, as an innovative spectrometer at HIE-ISOLDE. The design incorporates ten combined function, Canted Cosine-Theta (CCT) superconducting magnets, enabling the ring to fit within a constrained 5x5 meter hall space. This design presents significant challenges, particularly in accommodating the injection of a high beam rigidity beam, as the CCT magnets mechanical dimensions severely limit the space available for these subsystems. Using Xsuit code simulations, the performance of beam injection and extraction, based on a high-field, superconducting septum and a fast magnetic kicker, is evaluated, along with the time-of-flight separation of various isotope ion products from selected nuclearreactions of interest.

#### MAGDEM

#### ring baseline design





component of the ISRS ring lattice is the The main alreadymentioned MAGnet DEMonstrator (MAGDEM), a Nb-Ti iron-free, CCT superconducting, helium-free, system underdevelopment at CERN [3].

Bending angle	36 deg
Max B field at centre	2.2 T
Max gradient at centre	10 T/m
Effective length	580 mm
Aperture	200 mm





Isochronous mode ( $\gamma_t = \gamma = 1.05$ ) (momentum acceptance 4.8 %)



Quasi-Isochronous mode ( $\gamma_t = 1.16$ ) (momentum acceptance 6.7 %)



# **Time of flight Detection**

#### **Betatron Tune and Resonanses**

## **Injection and Extraction**







Sushi septum	
Bending angle	45 deg
Effective length	400 mm
Magnetic field	3.8 T
Magnetic kicker	
Magnetic k	icker
Magnetic k Kick angle	icker 50 mrad
Magnetic kKick angleLength	icker 50 mrad 600 mm

#### Revolution time (10 turn)

#### 2675 ns





### References

[1] J. Resta-Lopez et al. Design of a compact superconducting recoil separator for HIE-ISOLDE. Proc. of IPAC23, Venice, Italy (2023)

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[2] I. Martel et al, Letter of Intent "Design study of a Superconducting Recoil Separator for HIEISOLDE", INTC-I-228 (2021)

[3] G. Kirby "Design and Optimization of a 4 Tesla 200 mm Aperture Helium-Free NbTi Nested CCT Quadrupole/Dipole Superconducting Magnet," (2025)

[5] D. Barna et al. The Superconducting Shield (SuShi) Septum Magnet Prototype. IEEE Trans. On Applied Superconductivity, vol. 32, no. 6 (2022)

https://www.uhu.es/isrs/project-isrs-spain/

https://www.uv.es/resta/NOVAS/Home.html

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![](_page_0_Picture_40.jpeg)

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