

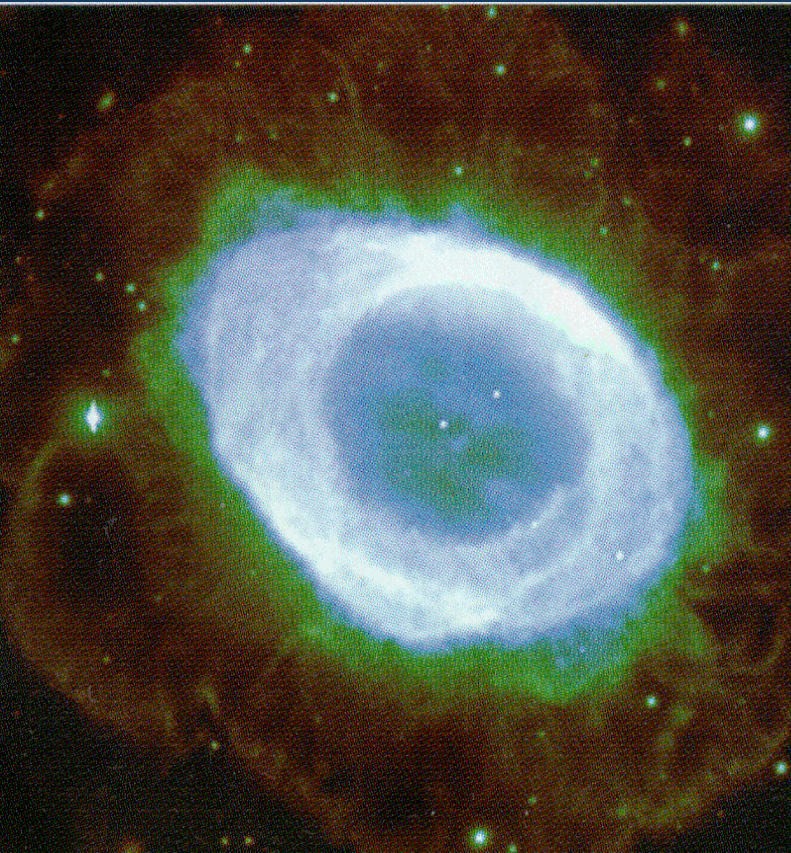
78th INTC meeting
February 2025

*Paolo Maria
MILAZZO*



n_TOF Physics Report


A brief recap from the 2024 campaign – Nuclear Astrophysics



reaction	motivation	Proposal
$^{28,29,30}\text{Si}(n,\gamma)$	isotopic abundances in pre-solar grains nucleosynthesis in massive stars	P-653
$^{209}\text{Bi}(n,\gamma)$	termination point of the s-process nucleosynthesis	P-675
$^{146}\text{Nd}(n,\gamma)$	s-process nucleosynthesis in AGB stars	P-671
$^{88}\text{Zr}(n,\gamma)$ ☢	extremely large neutron absorption cross section radioactive sample with $t_{1/2} = 83.4$ d	P-693
$^{92,97,98}\text{Mo}(n,\gamma)$	multiple nucleosynthesis processes for different stable isotopes	P-569-ADD-1
$^{63,65}\text{Cu}(n,\gamma)$	s-process nucleosynthesis about the iron peak	P-689
$^{40}\text{K}(n, p), (n, \alpha)$	s-process nucleosynthesis in massive stars	P-645

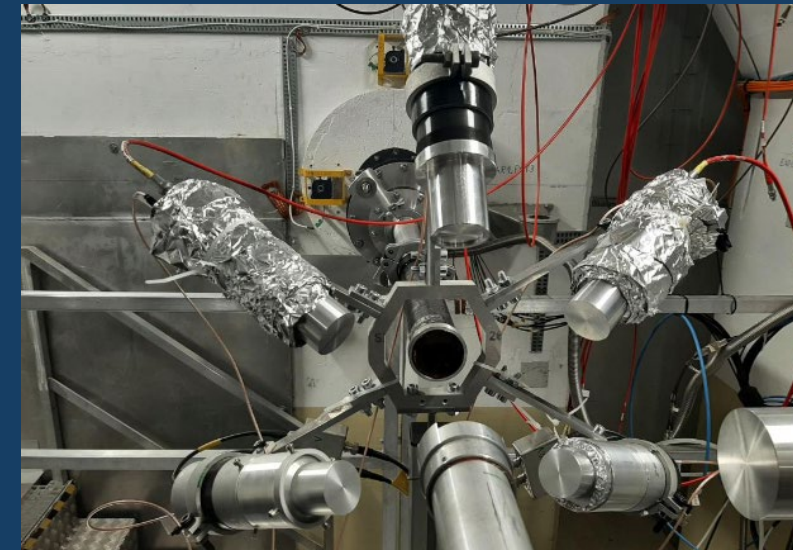
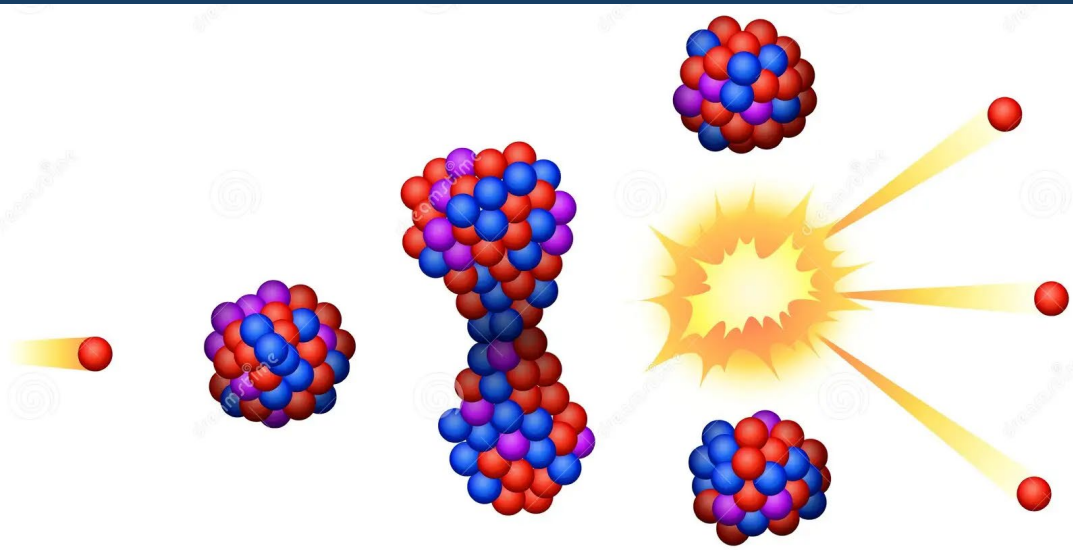
A brief recap from the 2024 campaign – Nuclear Applications



reaction	motivation	Proposal
$^{166,167}\text{Er}(n,\gamma)$	Burnable neutron absorbers for nuclear technologies	P-656
$^{209}\text{Bi}(n,\gamma)$	Radiological burden associated to ^{210}Po inventory	P-675
$^{92,97,98}\text{Mo}(n,\gamma)$	Development of nuclear fuel for advanced nuclear reactors	P-569-ADD-1
$^{238}\text{U}(n,\gamma)$ 	Key reaction for any nuclear technology applications	P-672
$^{63,65}\text{Cu}(n,\gamma)$	Advanced nuclear technologies applications	P-689
$^{12}\text{C}(n, \text{lcp})$	Proton radiation therapy	P-651

A brief recap from the 2024 campaign – And more

reaction	motivation	Proposal/Lol
$^{24}\text{Mg}(n,n'\gamma)$	HPGe + LaBr3(Ce) detector test new reaction channel investigations	I-261
$\text{Ce}(n,f)$	search for new fission modes in light systems around $Z=60$	P-665
$^{40}\text{Ar}(n,\gamma)$	Understanding neutron propagation in argon First capture measurement on a gas sample at n_TOF	I-256



EP

Newsletter of the EP department

The 2024 n_TOF run: Highlights and perspectives

Paolo Maria Milazzo (Universita e INFN Trieste), Michael Bacak (Vienna University of Technology), and Victor Alcayne (CIEMAT) 11th Dec 2024



Highlights 2024

The origin of Lead and the s-process branching points

Adria Casanovas Hoste (Universitat Politècnica Catalunya), Alberto Mengoni (ENEA-Bologna) 11th Dec 2024



Shedding Light on the Origin of ^{204}Pb , the Heaviest *s*-Process-Only Isotope in the Solar System

A. Casanovas-Hoste^{1,2,3,*}, C. Domingo-Pardo,² J. Lerendegui-Marco,⁴ C. Guerrero,⁴ A. Tarifeño-Saldivia,² M. Kr̄iĉka,⁵ M. Pignatari,^{6,7,8,9} F. Calviño,¹ D. Schumann,¹⁰ S. Heinitz,¹⁰ R. Dressler,¹⁰ U. Köster,¹¹ O. Aberle,³ J. Andrzejewski,¹² L. Audouin,¹³ V. Bécasres,¹⁴ M. Bacak,¹⁵ J. Balibrea-Correa,¹⁴ M. Barbagallo,¹⁶ S. Barros,¹⁷ F. Beĉvár,⁵ C. Beinrucker,¹⁸ E. Berthoumieux,¹⁹ J. Billowes,²⁰ D. Bosnar,²¹ M. Brugger,³ M. Caamaño,²² M. Calviani,³ D. Cano-Ott,¹⁴ R. Cardella,³ D. M. Castelluccio,^{23,24} F. Cerutti,³ Y.H. Chen,¹³ E. Chiaveri,³ N. Colonna,¹⁶ G. Cortés,¹ M. A. Cortés-Giraldo,⁴ L. Cosentino,²⁵ L. A. Damone,^{16,26} M. Diakaki,¹⁹ E. Dupont,¹⁹ I. Durán,²² B. Fernández-Domínguez,²² A. Ferrari,³ P. Ferreira,¹⁷ P. Finocchiaro,²⁵ V. Furman,²⁷ K. Göbel,¹⁸ A. R. García,¹⁴ A. Gawlik-Ramiega,¹² T. Glodariu,^{28,†} I. F. Gonçalves,¹⁷ E. González-Romero,¹⁴ A. Goverdovski,²⁹ E. Griesmayer,¹⁵ F. Gunsing,^{19,3} H. Harada,³⁰ T. Heffrich,¹⁸ J. Heyse,³¹ D. G. Jenkins,³² E. Jericha,¹⁵ F. Käppeler,^{33,†} Y. Kadi,³ T. Katabuchi,³⁴ P. Kavargin,¹⁵ V. Ketlerov,²⁹ V. Khryachkov,²⁹ A. Kimura,³⁰ N. Kivel,¹⁰ M. Kokkoris,³⁵ E. Leal-Cidoncha,²² C. Lederer-Woods,³⁶ H. Leeb,¹⁵ S. Lo Meo,^{23,24} S. J. Lonsdale,³⁶ R. Losito,³ D. Macina,³ J. Marganiec,¹² T. Martínez,¹⁴ C. Massimi,^{24,37} P. Mastinu,³⁸ M. Mastroianni,¹⁶ F. Matteucci,^{39,40} E. A. Maugeri,¹⁰ E. Mendoza,¹⁴ A. Mengoni,²³ P. M. Milazzo,³⁹ F. Mingrone,²⁴ M. Mirea,^{28,†} S. Montesano,³ A. Musumara,^{25,41} R. Nolte,⁴² A. Oprea,²⁸ N. Patronis,⁴³ A. Pavlik,⁴⁴ J. Perkowski,¹² I. Porras,^{3,45} J. Praena,^{4,45} J. M. Quesada,⁴ K. Rajeev,⁴⁶ T. Rauscher,^{47,48} R. Reifarth,¹⁸ A. Riego-Perez,⁴⁹ Y. Romanets,¹⁷ P. C. Rout,⁴⁶ C. Rubbia,³ J. A. Ryan,²⁰ M. Sabaté-Gilarte,^{3,4} A. Saxena,⁴⁶ P. Schillebeeckx,³¹ S. Schmidt,¹⁸ P. Sedyshev,²⁷ A. G. Smith,²⁰ A. Stamatopoulos,³⁵ G. Tagliente,¹⁶ J. L. Tain,² L. Tassan-Got,¹³ A. Tsinganis,³⁵ S. Valenta,⁵ G. Vannini,^{24,37} V. Variale,¹⁶ P. Vaz,¹⁷ A. Ventura,²⁴ V. Vlachoudis,³ R. Vlastou,³⁵ A. Wallner,⁵⁰ S. Warren,²⁰ M. Weigand,¹⁸ C. Weiss,^{3,15} C. Wolf,¹⁸ P. J. Woods,³⁶ T. Wright,²⁰ and P. Žugec^{21,3}

(n_TOF Collaboration)

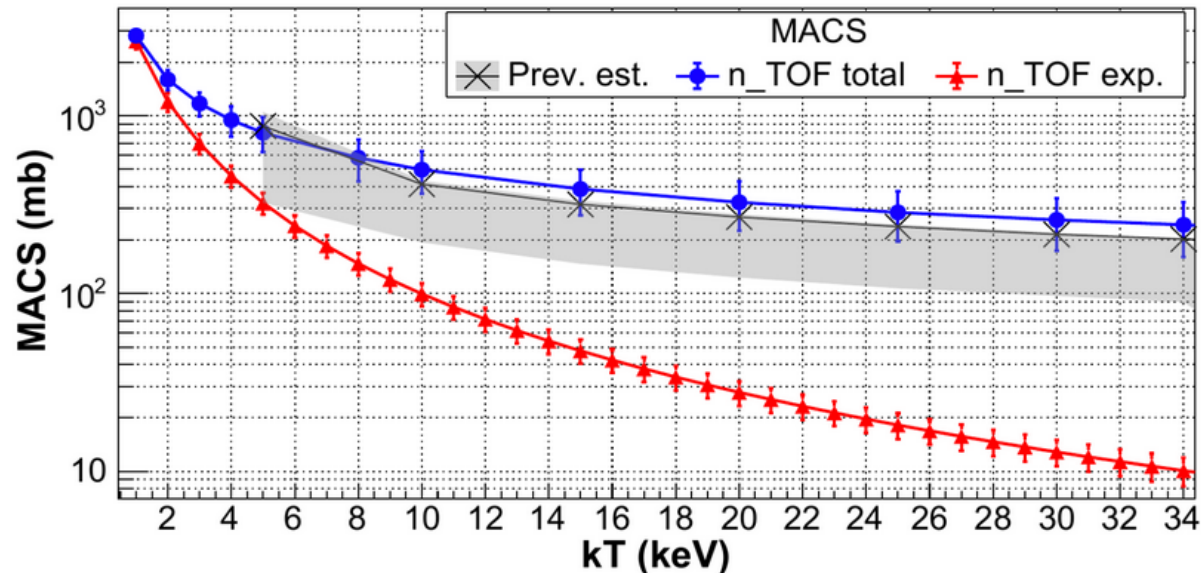


FIG. 1. Schematic view of the chart of nuclei at the termination of the *s* process. The arrows correspond to the main *s*-process path, with dashed arrows depicting paths strongly enhanced during high temperature and high neutron density events.

by using the new MACS, the uncertainty arising from the $^{204}\text{Tl}(n,\gamma)$ cross-section on the *s*-process abundance of ^{204}Pb has been reduced from $\sim 30\%$ down to $+8\%/-6\%$, and the *s*-process calculations are in agreement with the latest solar ^{204}Tl solar abundance of ^{204}Pb reported by K. Lodders (Space Sci. Rev. 217, 44 (2021))

n_TOF – Phase IV (from 2021)

Year	INTC Session	Accepted Proposal	LoI	PoT (10 ¹⁹)	Publications On Peer reviewed Journals
2020	65	6	3		
2021	66/67/68	3	3	0.8	
2022	69/70/71	9	3	2.5	6
2023	72/73/74	11	5	2.3	9
2024	75/76/77	12	5	3.2	12
2025	78	(4)		3.4	2 (+3 in the pipeline)
2026				1.8	

34 talks at the next

16TH NUCLEAR DATA FOR SCIENCE AND TECHNOLOGY CONFERENCE
 JUNE 22ND – 27TH | MADRID (SPAIN) | 2025

<https://twiki.cern.ch/twiki/bin/view/NTOFPublic/ListOfContributionND2025>

4.0·10¹⁹ already approved in EAR1

Along 23 years of activity more than 150 experimental data sets have been produced, published and disseminated

<https://twiki.cern.ch/twiki/bin/view/NTOFPublic/DataDissemination>

Full list of *n_TOF* publications: <https://twiki.cern.ch/NTOFPublic/ListOfPublications>

New proposals (focused on EAR2)

Searching for the X17 Particle using the novel $n + {}^3\text{He}$ Reaction

Speaker: Carlo GUSTAVINO (Istituto Nazionale di Fisica Nucleare, Italy)

Study of semiconductor detectors' performance at NEAR

Speakers: Michael BACAK (TU Wien, Atominstitut, Austria) and
Maria DIAKAKI (National Technical University of Athens, Greece)

Measurement of the ${}^{238}\text{Pu}(n, \gamma)$ cross-section at EAR2

Speaker: Victor ALCAYNE (Centro de Investigaciones Energeticas Medioambientales y Tecnologicas, Spain)

Search for a resonance in ${}^{25}\text{Mg}(n, \gamma)$ cross section to constrain the ${}^{22}\text{Ne}(\alpha, n){}^{25}\text{Mg}$ neutron source reaction rate

Speaker: Cristian MASSIMI (Università di Bologna and Istituto Nazionale di Fisica Nucleare)

GOOD NEWS

*The flow **Proposal** → **Experiment** → **Publications** is well consolidated*

*From 2024 we can profit of more intense proton beams (+30%);
i.e. more Physics (backlog can be digested faster)*

EAR1 is fully booked for 2025

Proposals presented today will fill the EAR2 (partially) and NEAR schedule

New proposals will be presented to next INTC meetings in view of 2026