n_TOF Report

Alberto Mengoni
on behalf of the n_TOF Collaboration

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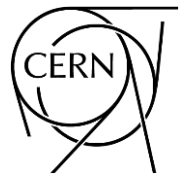
3 November 2020, 65th CERN INTC meeting
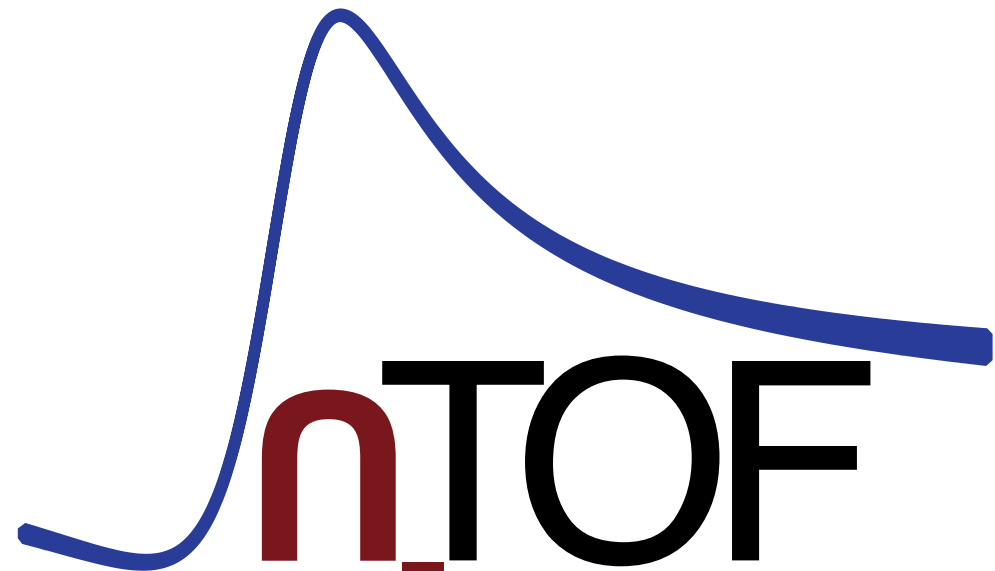
Neutron Capture on the *s*-Process Branching Point ¹⁷¹Tm via Time-of-Flight and Activation

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

(n_TOF Collaboration)
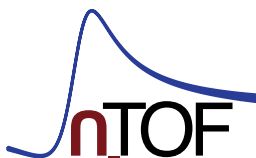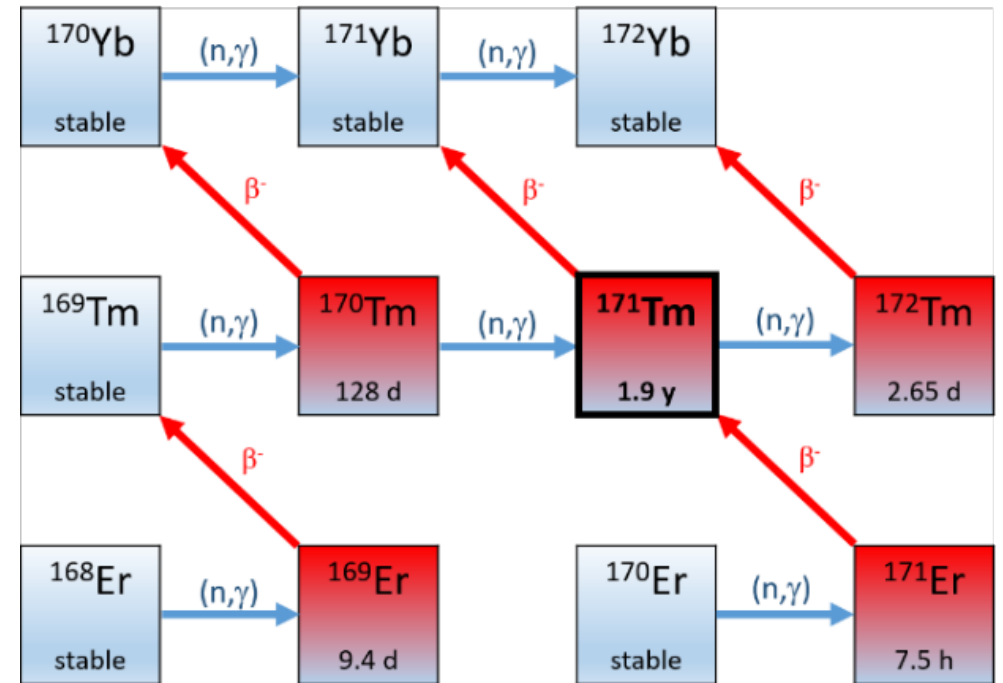
¹⁷¹Tm(n,γ)

sample mass: 3.5 mg
t₁/₂   1.9 yr
activity   150 GBq

sample produced at ILL, Grenoble, France
separated at PSI, Villigen, Switzerland
measured at n_TOF and SARAF-LiLiT facility, SNRC, Israel
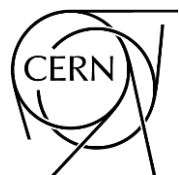
Nuclear Astrophysics at n_TOF

- origin of the heavy elements
  s-process nucleosynthesis in stars

THE EUROPEAN
PHYSICAL JOURNAL A

Regular Article – Experimental Physics

Measurement of the ^{235}U(n,f) cross section relative to the ^{6}Li(n,t) and ^{10}B(n,α) standards from thermal to 170 keV neutron energy range at n_TOF

S. Amaducci[1,35], L. Cosentino[1], M. Barbagallo[2], N. Colonna[2], A. Mengoni[3,4], C. Massimi[4,5], S. Lo Meo[3,4], P. Finocchiaro[1,a], O. Aberle[6], J. Andrzejewski[7], L. Audouin[8], M. Bacak[9,6,10], J. Balibrea[11], F. Bečvář[12], E. Berthoumieux[10], J. Billowes[13], D. Bosnar[14], A. Brown[15], M. Caamaño[16], F. Calviño[17], M. Calviani[6], D. Cano-Ott[11], R. Cardella[6], A. Casanovas[17], F. Cerutti[6], Y.H. Chen[8], E. Chiaveri[6,13,18], G. Cortés[17], M.A. Cortés-Giraldo[18], L.A. Damone[2,19], M. Diakaki[10], C. Domingo-Pardo[20], R. Dressler[21], E. Dupont[10], I. Durán[16], B. Fernández-Domínguez[16], A. Ferrari[6], P. Ferreira[22], V. Furman[23], K. Göbel[24], A.R. García[11], A. Gawlik[7], S. Gilardoni[6], T. Glodariu[25], I.F. Gonçalves[22], E. González-Romero[11], E. Griesmayer[9], C. Guerrero[18], F. Gunsing[10,6], H. Harada[26], S. Heinitz[21], J. Heyse[27], D.G. Jenkins[15], E. Jericha[9], F. Käppeler[28], Y. Kadi[6], A. Kalamara[29], P. Kavrigin[9], A. Kimura[26], N. Kivel[21], I. Knapova[12], M. Kokkoris[29], M. Krtička[12], D. Kurtulgil[24], E. Leal-Cidoncha[16], C. Lederer[30], H. Leeb[9], J. Lerendegui-Marco[18], S.J. Lonsdale[30], D. Macina[6], A. Manna[4,5], J. Marganiec[7,31], T. Martínez[11], A. Masi[6], P. Mastinu[32], M. Mastromarco[2], E.A. Maugeri[21], A. Mazzone[2,33], E. Mendoza[11], P.M. Milazzo[34], F. Mingrone[6], A. Musumarra[1,35], A. Negret[25], R. Nolte[31], A. Oprea[25], N. Patronis[36], A. Pavlik[37], J. Perkowski[7], I. Porras[38], J. Praena[38], J.M. Quesada[18], D. Radeck[31], T. Rauscher[39,40], R. Reifarth[24], C. Rubbia[6], J.A. Ryan[13], M. Sabaté-Gilarte[6,18], A. Saxena[41], P. Schillebeeckx[27], D. Schumann[21], P. Sedyshev[23], A.G. Smith[13], N.V. Sosnin[13], A. Stamatopoulos[29], G. Tagliente[2], J.L. Tain[20], A. Tarifeño-Saldivia[17], L. Tassan-Got[8], S. Valenta[12], G. Vannini[4,5], V. Variale[2], P. Vaz[22], A. Ventura[4], V. Vlachoudis[6], R. Vlastou[29], A. Wallner[42], S. Warren[13], C. Weiss[9], P.J. Woods[30], T. Wright[13], and P. Žugec[14,6]

see: Corrigendum to "Evaluation of the Neutron Data Standards"
in Nucl. Data Sheets **163**, 280 (2020)
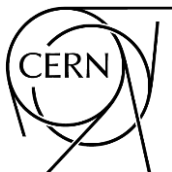
data adopted for ^{235}U(n,f) cross section standard
by IAEA Nuclear Data Standards CRP
(October 2020)
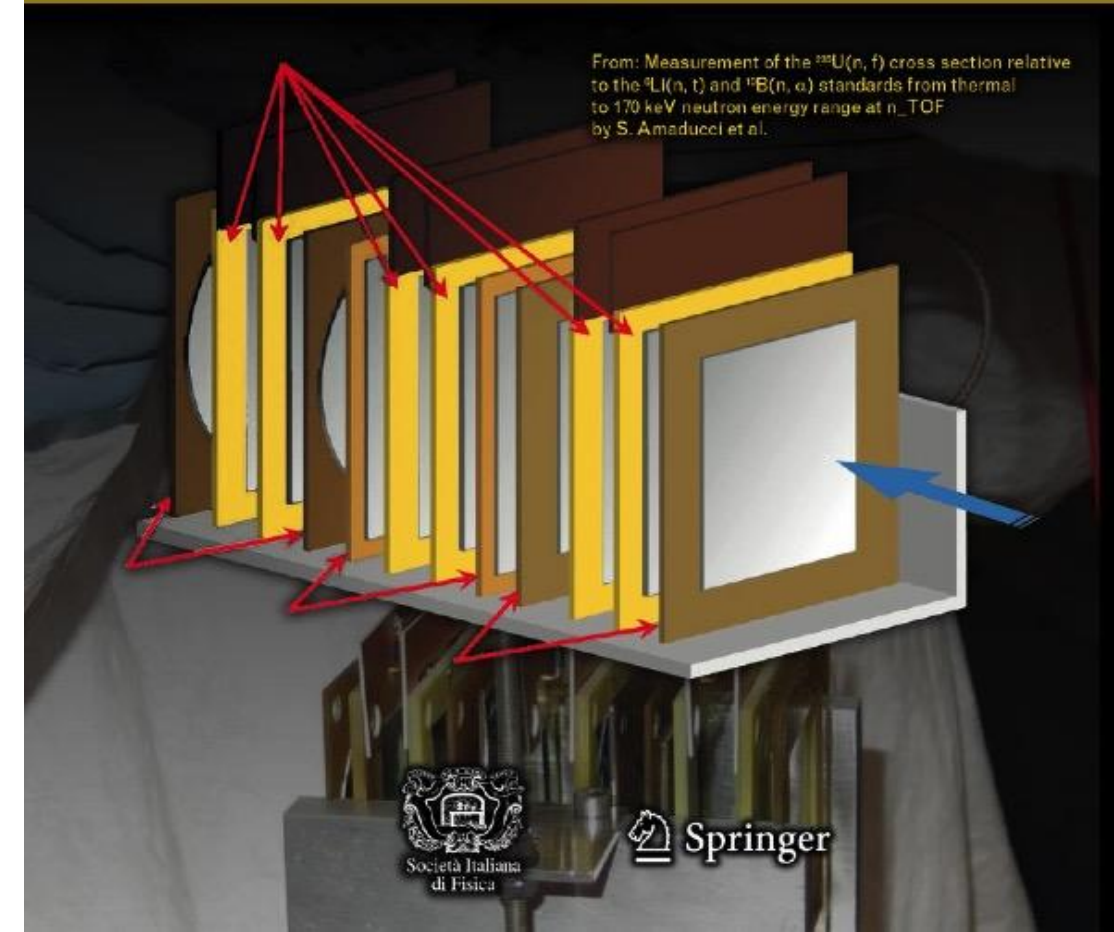
Publications & experimental data dissemination

➢ **26 papers published in 2020**
7 in peer reviewed journals + 19 in conference proceedings

➢ overall 200 papers published
115 in peer-reviewed journals, 45 in Phys. Rev. C, 30 in NIMA

➢ 75/85 in Open Access in the last 5 years

https://twiki.cern.ch/NTOFPublic/ListOfPublications

➢ 116 data sets included in the Experimental Nuclear Reaction Database (EXFOR @ IAEA), 91% of all measurements performed
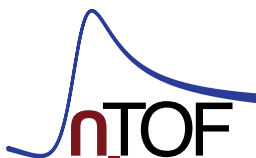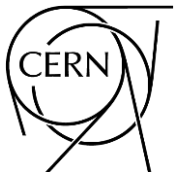
Phase-2021: new proposals

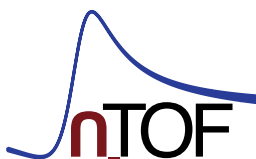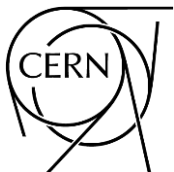| reaction	field of interest	note
^{94,95,96}Mo(n,γ)	– s-process AGB stars, SiC grains – fp, fuel alloys	stable samples (*)
^{94}Nb(n,γ)	– anomalies in pre-solar grains – strong contributor to the long-term radiotoxicity among fp	radioactive sample $t_{1/2}$ = 20 ka
^{79}Se(n,γ)	– s-process thermometer – strong contributor to the long-term radiotoxicity among fp	radioactive sample $t_{1/2}$ = 300 ka
^{239}Pu(n,γ) and α-ratio	– advanced nuclear technologies	radioactive sample $t_{1/2}$ = 24.1 ka (*)
^{243}Am(n,f)	– contributes to production of ^{239}Pu (by $\alpha + \beta^-$ decays)	radioactive sample $t_{1/2}$ = 7364 a

(*) part of a EU H2020 nuclear data project
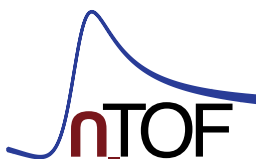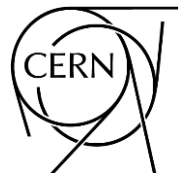
Phase-2021: new LoI(*)

reaction	field of interest	note
DDX cp emisssion x-section E > 20 MeV	– particle radiation therapy	
n + d → p + 2n	– nn scattering length	basic nuclear physics application
n_TOF NEAR Station	– nuclear astrophysics – non-metallic material irradiation – SEE – others	

Commissioning of the III generation spallation target and beam characteristics in the next talk by Javier Praena

(*) to be discussed in February 2021

The END