

Workshop on Calculation of Double-beta-decay Matrix Elements (MEDEX '13)

Prague, Czech Republic

11-14 June 2013

Editors

Osvaldo Civitarese University of La Plata, La Plata, Argentina

Ivan Stekl Czech Technical University, Prague, Czech Republic

Jouni Suhonen University of Jyvaskyla, Jyvaskyla, Finland

All papers have been peer reviewed.

Sponsoring Organization Czech Technical University



Editors

Osvaldo Civitarese

Department of Physics University of La Plata Argentina

E-mail: osvaldo.civitarese@fisica.unlp.edu.ar

Ivan Stekl

Institute of Experimental and Applied Physics Czech Technical University Prague, Czech Republic

E-mail: stekl@mail.utef.cvit.cz

Jouni Suhonen

Department of Physics University of Jyvaskyla Finland

E-mail: suhonen@phys.jyu.fi

Authorization to photocopy items for internal or personal use, beyond the free copying permitted under the 1978 U.S. Copyright Law (see statement below), is granted by the AIP Publishing LLC for users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$30.00 per copy is paid directly to CCC, 222 Rosewood Drive, Danvers, MA 01923, USA: http://www. copyright.com. For those organizations that have been granted a photocopy license by CCC, a separate system of payment has been arranged. The fee code for users of the Transactional Reporting Services is: 978-0-7354-1200-2/13/\$30.00



No claim is made to original U.S. Government works.

Permission is granted to quote from the AIP Conference Proceedings with the customary acknowledgment of the source. Republication of an article or portions thereof (e.g., extensive excerpts, figures, tables, etc.) in original form or in translation, as well as other types of reuse (e.g., in course packs) require formal permission from AIP Publishing and may be subject to fees. As a courtesy, the author of the original proceedings article should be informed of any request for republication/reuse. Permission may be obtained online using RightsLink. Locate the article online at http://proceedings.aip.org, then simply click on the RightsLink icon/"Permissions/Reprints" link found in the article abstract. You may also address requests to: AIP Publishing Office of Rights and Permissions, Suite 1NO1, 2 Huntington Quadrangle, Melville, NY 11747-4502, USA; Fax: 516-576-2450; Tel.: 516-576-2268; E-mail: rights@aip.org.

ISBN 978-0-7354-1200-2'*Qtki kpcrlRtkpv+ ISSN 0094-243X Printed in the United States of America

AIP Conference Proceedings, Volume 1572 Workshop on calculation of double-beta-decay matrix elements (MEDEX '13)

Table of Contents

Preface: Workshop on Calculation of Double-Beta-Decay Matrix Elements Osvaldo Civitarese	1
Testing the single-state dominance hypothesis R. Álvarez-Rodríguez, O. Moreno, E. Moya de Guerra, P. Sarriguren, F. Šimkovic, and A. Faessler	3
Majorana phases, CP violation, sterile neutrinos and neutrinoless double-beta decay Andrej Babič and Fedor Šimkovic	7
Average and recommended half-life values for two neutrino double beta decay: Upgrade-2013 A. S. Barabash	11
Recent results on matrix elements for double beta decay using IBM-2 J. Barea, J. Kotila, and F. Iachello	16
Recent results and perspectives of ββ decay experiments with crystal scintillators at Gran Sasso R. Bernabei	20
Nuclear matrix elements for 0vβ ⁻ β ⁻ decays: Comparative analysis of the QRPA, shell model and IBM predictions Osvaldo Civitarese and Jouni Suhonen	24
R&D of crystal scintillators from enriched isotopes for high sensitivity double β decay experiments F. A. Danevich	28
Probing lepton number violation on three frontiers Frank F. Deppisch	32
Forbidden unique beta-decays and neutrino mass Rastislav Dvornický and Fedor Šimkovic	36
Experimental studies of nuclear matrix elements for neutrino-less ββ decays H. Ejiri	40

The Majorana Demonstrator: A search for neutrinoless double-beta decay of germanium-76	
S. R. Elliott, N. Abgrall, E. Aguayo, F. T. Avignone III, A. S. Barabash, F. E. Bertrand, M. Boswell,	
V. Brudanin, M. Busch, A. S. Caldwell, Y-D. Chan, C. D. Christofferson, D. C. Combs,	
J. A. Detwiler, P. J. Doe, Yu. Efremenko, V. Egorov, H. Eijri, J. Esterline, J. E. Fast, P. Finnerty,	
F M Fraenkle A Galindo-Uribarri G K Giovanetti I Goett M P Green I Gruszko	
V E Cuiganna K Cugay A I Hallin D Harama A Hagai D Hanning E W Hanna	
V. E. Guiseppe, K. Gusev, A. L. nanni, K. nazana, A. negai, K. nenning, E. w. noppe,	
S. Howard, M. A. Howe, K. J. Keeter, M. F. Kidd, O. Kochetov, S. I. Konovalov, R. T. Kouzes,	
B. D. LaFerriere, J. Leon, L. E. Leviner, J. C. Loach, S. MacMullin, R. D. Martin, S. Mertens,	
L. Mizouni, M. Nomachi, J. L. Orrell, C. O'Shaughnessy, N. R. Overman, D. G. Phillips II,	
A. W. P. Poon, K. Pushkin, D. C. Radford, K. Rielage, R. G. H. Robertson, M. C. Ronquest,	
A. G. Schubert, B. Shanks, T. Shima, M. Shirchenko, K. J. Snavely, N. Snyder, A. Soin, J. Strain,	
A M Suriano V Timkin W Tornow R L Varner S Vasilvev K Vetter K Vorren B R White	
I E Wilkerson W Yu E Valushey A R Voung C H Vu and V Vumatov	15
J. F. WIRKEISON, W. Au, E. Takushev, A. K. Toung, CII. Tu, and V. Tumatov	43
Double beta decay from several perspectives	
Jonathan Engel	49
New experimental approaches to search for neutrino mass	
L. Gironi	53
"Ne production for the Beta beams project	
Rastislav Hodak, Tania M. Mendonça, and Thierry Stora	57
Shell model nuclear matrix elements for competing mechanisms contributing to double beta decay	
Mihai Horoi	61
Nuclear structure velocent to postringless double bate decay condidate 130 Te and other recent	
Nuclear structure relevant to neutrinoless double beta decay candidate and other recent	
results	<i></i>
B. P. Kay	65
Recent developments in the theory of double beta decay	
F Jachello J Barea and J Kotila	69
	0,7
Theoretical uncertainties in the nuclear matrix elements of neutrinoless double beta decay:	
The transition operator	
Javier Menéndez	73
Progress in the use of pixel detectors in double beta decay experiment TGV	
J. M. Jose and TGV Collaboration	77
Uncertainties in nuclear transition matrix elements of neutrinoless BB decay	
P K Rath	81
	01
Investigations of 2β decay measured by low background HPGe spectrometer OBELIX	
Ekaterina Rukhadze, OBELIX Collaboration. and SuperNEMO Collaboration	85
	00

Electron line shape and transmission function of the KATRIN monitor spectrometer M. Slezák	89
Crucial role of neutrinos in the electroweak symmetry breaking Adam Smetana	93
Energy-weighted sum rules connecting $\Delta Z = 2$ nuclei within the SO(8) model Dušan Štefánik, Fedor Šimkovic, and Amand Faessler	98
On the neutrinoless double β ⁺ /EC decays Jouni Suhonen	102
Consequence of total lepton number violation in strongly magnetized iron white dwarfs V. B. Belyaev, P. Ricci, F. Šimkovic, J. Adam Jr., M. Tater, and E. Truhlík	106
Results of the double beta decay experiment NEMO-3 V. I. Tretyak and NEMO-3 Collaboration	110
 Search for rare nuclear decays with HPGe detectors at the STELLA facility of the LNGS P. Belli, R. Bernabei, F. Cappella, R. Cerulli, F. A. Danevich, A. d'Angelo, S. d'Angelo, A. Di Marco, M. L. Di Vacri, A. Incicchitti, V. V. Kobychev, G. P. Kovtun, N. G. Kovtun, M. Laubenstein, S. Nisi, D. V. Poda, O. G. Polischuk, A. P. Shcherban, D. A. Solopikhin, J. Suhonen, A. V. Tolmachev, V. I. Tretyak, and R. P. Yavetskiy 	114
Neutrino-nucleus scattering of ^{95,97} Mo and ¹¹⁶ Cd E. Ydrefors, W. Almosly, and J. Suhonen	118
OMC studies for the matrix elements in ββ decay D. Zinatulina, V. Brudanin, Ch. Briançon, V. Egorov, C. Petitjean, M. Shirchenko, R. Vasiliev, and I. Yyutlandov	122
List of Participants	127
Author Index	129