NEUTRINO2010, XXIV International Conference on Neutrino Physics and Astrophysics, Athens, GREECE

Contribution ID: **103** Type: **not specified**

Towards a Giant Liquid Argon Observatory for Proton Decay, Neutrino Astrophysics and CP-violation in the Lepton Sector (GLACIER)

A.Badertscher, A.Curioni, S.DiLuise, U.Degunda, L.Epprecht, L.Esposito, A.Gendotti, S.Horikawa, L.Knecht, C.Lazzaro, D.Lussi, A.Marchionni, A.Meregaglia, G.Natterer, F. Petrolo, F.Resnati, A.Rubbia, C.Strabel, T.Viant
ETH Zurich, 101 Rämistrasse, CH-8092 Zurich, Switzerland

T.Hasegawa, N. Kimura, T.Kobayashi, T.Maruyama, K.Nishikawa, M.Tanaka, M. Yoshioka
KEK High Energy Accelerator Research Organization, 1-1, Oho, Tsukuba, Ibaraki, 305-0801, Japan

D.Autiero, E.Béchetoille, B.Carlus, Y.Déclais, S.Gardien, C.Girerd, J.Marteau, H.Mathez
IPNL, Université de Lyon, Université Lyon I, CNRS/IN2P3, 4 rue Enrico Fermi, 69622 Villeurbanne Cedex, France

M. Zito, E. Mazzucato, A. Delbart, O. Besida, G. Vasseur, A. Longhin
Commissariat à l' Energie Atomique / Direction des Sciences de la Matière, 25 rue Leblanc, Paris 75015, France

M.Chorowski, W.Gizicki, J. Kisiel, L.Lankof, J.W. Mietelski, J.Polinski, J. Sobczyk, M.Szarska, E. Rondio, R. Sulej, D. Stefan, J. Slizowski, T. Szeglowski, K. Urbanczyk, K.Wojtuszewska, A. Zalewska
IFJ Pan and Polish partners, H.Niewodniczański Institute of Nuclear Physics PAN, Radzikowskiego 152, 31-342 Kraków, Poland

A. Apostu, I. Brancus,F. Chipesiu, G. Cata Danil, O. Duliu, I. Lazanu, R.M. Margineanu, B. Mitrica, A. Oprina, M. Pectu, C.A. Simion, A. Saftoiu, O. Sima, S. Stoica
Horia Hulubei Natonal Institute of R&D for Physics and Nuclear Engineering, IFIN-HH, Magurele-Ilfov, Romania

A.Ereditato, I. Kreslo, M. Messina, U. Moser, B. Rossi
University of Bern, 4 Hochschulstrasse, Bern 3012, Switzerland

J.Coleman, M. Lewis, K. Mavrokoridis, C. Touramanis
Department of Physics, Oliver Lodge Laboratory, University of Liverpool, L69 7ZE Liverpool, United Kingdom

D. Wark
Rutherford Appleton Laboratory, Chilton, Didcot OX11 0QX and Imperial College, London, United Kingdom

V. Kudryavstev, S. Paling, M. Robinson, N. Spooner, D. Walker
The University of Sheffield, New Spring House 231, Glossop Road, Sheffield S102GW, United Kingdom

M. Hakala, R. Matikainen, G Nuijten, J. Roinisto, J. Salmelainen
Kalliosuunnittelu Oy Rockplan Ltd, 2 Asemamiehenkatu, Helsinki 00520, Finland

O. Hirabayashi, K. Kawakami, T. Kaneta, T. Oshimo, S. Taguchi
PENTA-OCEAN construction co., Ltd., 2-2-8 Koraku, Bunkyo-ku, Tokyo, 112-8576, Japan

G. Galvanin, M. Temussi, G. Ristaino
AGT Ingegneria Srl, Perugia, 10 A via della Pallota, Perugia 06126, Italy

S.Gajosinski, A. Grotowski, A. Markiewicz, W. Pytel, Z. Sadecki
KGHM CUPRUM Ltd Research and Development Centre, Pl. 1 Maja, 50-136 Wrocław, Poland

B. Brockway, D. Gurney, M. Haworth, J. Thompson, R. Rogers
Technodyne International Ltd, Unit16, Shakespeare Business Centre Hathaway Close, Eastleigh UK SO 50 4SR, United Kingdom

Abstract:
The feasibility of a very massive underground liquid Argon detector (Giant Liquid Argon Charge Imaging ExpeRiment) of total mass of the order of 100 kton is considered for a next generation nucleon decay, long baseline neutrino physics and neutrino astrophysics experiment.

The detector concept envisions a volume of very pure liquid argon stored in a large non-evacuable cryogenic storage tank, conceptually similar to the LNG tanks used by the petrochemical industry. The detector is operated in double phase with charge extraction and amplification in the vapor phase, readout by appropriately

segmented electrodes (LAr LEM-TPC). The method is an elegant solution for long drift paths and mm-sized readout pitch segmentation.

The LAr LEM-TPC charge imaging concept has been successfully demonstrated on small prototypes using LEM/THGEMs. The images obtained are of very high quality, owing to the charge amplification and have good measured dE/dx resolution.

Effective extrapolation to the required mass scale requires concrete R&D, for example on large area readout methods, use of alternative MPGDs (e.g. MicroMEGAS), very long drift paths, warm and cold readout electronics, liquid argon purity in non-evacuated very large volumes, etc. In this context, small setups have and are being operated, and a 250L chamber, a 1-ton chamber (ArDM-1t) and a 6m3 device are under assembly at KEK and CERN.

Additional dedicated test beam campaigns are being considered, e.g. to test and optimize the readout methods and to assess the calorimetric performance of such detectors, and to address scaling to larger fiducial masses.

Beyond these efforts, a 1000 ton detector in a short baseline neutrino beam is being contemplated, whose purpose is to acquire the necessary experience for the realization of the giant detector by building a smaller, precursor version, and using it to do important neutrino physics research.

The underground localization of a 100 kton experiment along the JPARC neutrino beam (Okinoshima island) is being investigated in collaboration with Japanese industry, and in Europe the FP7 LAGUNA design study addresses its feasibility at 7 potential sites located in Finland (Pyhäsalmi), France (Fréjus), Italy (Umbria region), Poland (Sieroszowice), Romania (Slanic), Spain (Canfranc) and United Kingdom (Boulby). The procurement of the required amount of liquid argon as well as the safety and environmental impact at the individual sites are also addressed.

Primary authors: Prof. RUBBIA, Andre (ETH Zurich); Prof. HASEGAWA, Takuya (KEK / IPNS)

Presenters: Prof. RUBBIA, Andre (ETH Zurich); Prof. HASEGAWA, Takuya (KEK / IPNS)