

# Deepak Samuel

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## Research Positions

- June 2012 **Postdoctoral fellow in the group of Prof. Benoit Macq**, *Universite Catholique de Louvain (Belgium) & Harvard Medical School, (Boston)*.
- Project: In-vivo range verification in proton therapy (Private-public partnership between Universite Catholique de Louvain and IBA, Belgium)
  - Implementation of diode-based range verification for prostate cancers.
  - Software design for clinical use of diode-based range verification.
- Sep 2011 **Project Scientist, India-based Neutrino Observatory**, *Tata Institute of Fundamental Research, Mumbai, India*.
- Design of a generic data analysis framework for India-based Neutrino Observatory (INO)
  - Study of cosmic muon tomography using the INO-ICAL prototype detector.
- June 2008 **Postdoctoral fellow in the group of Prof. Naba Mondal**, *Tata Institute of Fundamental Research, Mumbai, India*.
- Design of a VME-based data acquisition system for the INO-ICAL prototype detector.
  - Design of data analysis frameworks for the prototype detector.
  - Monte-Carlo simulations of the prototype detectors using Geant4.
  - Study of signal properties in Resistive Plate Chambers.
  - Study of timing calibration methods for the prototype detector.

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## Education

- Feb 2008 **Ph.D Physics**, *University of Bonn, Bonn, Magna-Cum-Laude, guided by Dr. Dieter Eversheim*.
- Thesis: Test of feasibility of a novel high precision test of time reversal invariance.
  - Development of a real-time DAQ for the Time Reversal Invariance at COSY experiment at the cooler synchrotron.
  - Development of Wiener-Khinchin filter for suppression of 1/f noise in the beam current monitor.
- Aug 2002 **M.Phil Physics**, *Madras Christian College, Chennai, First Class, guided by Dr. P. Chandran*.
- Thesis: Ab-initio molecular orbital calculation on group III elements and their halides.
- May 2001 **M.Sc Physics**, *Madras Christian College, Chennai, First Class*.
- Specialization: Digital electronics and microprocessors.
- May 1999 **B.Sc Physics**, *Madras Christian College, Chennai, First Class*.

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## Languages

- English **Fluent**  
Tamil **Fluent**  
German **Working Knowledge**  
Hindi **Basic**  
French **Basic**

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## Technical Skills

Hardware	Data Acquisition Systems (VME, CAMAC), FPGA, Digitizers and other digital devices.
Software	MS Visual Studio, Qt, ROOT, Geant4, ITK, VTK, C, C++, VC++, MFC, Real-Time C, Multi-threading, Parallel Computing (PROOF), CUDA, OpenCV.
Database	SQLITE
OS	Proficient in Linux and Windows Operating Systems.
Detectors	Fabrication and Characterization of Resistive Plate Chambers.
Others	Developer of the open source data analysis framework iRoot.

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## Experience

Physics	Working experience in polarization physics, neutrino physics, particle physics instrumentation, trigger systems, data acquisition system, particle accelerators (synchrotron, cyclotron), data analysis and statistical methods, simulations of particle interactions, radiation detection principles.
C/C++	6+ years of hands-on experience.
Threading	6+ years of hands-on experience in writing Multi-threaded codes.
GUI Design	Experienced in developing GUI-based physics tools (VC++: 3 years, Qt: 3 years).
DAQ	Experienced in design of VME/CAMAC DAQ for particle physics experiments.
Simulations	Working experience in detector simulations using Geant4.
CUDA	Basic level user and certificate holder from Acceleware.
Teaching	Lectures on C++ and ROOT for Physicists for INO graduate students.

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## Talks and Presentations

Aug 2013	<b>Workflow for the <i>in vivo</i> Range Verification in Proton Therapy</b> , Oral Presentation at American Association of Physicists in Medicine Annual Meeting, Indianapolis, USA.
Jun 2013	<b>High Performance Proton Radiography Device Using Dose Measurements</b> , Poster Presentation at 52 <sup>nd</sup> Annual Conference of the Particle Therapy Co-Operative Group, Essen, Germany.
Jun 2013	<b>Progress towards range guided proton prostate treatment</b> , Poster Presentation at 52 <sup>nd</sup> Annual Conference of the Particle Therapy Co-Operative Group, Essen, Germany.
Mar 2012	<b>iRoot-An advanced data analysis front-end for ROOT</b> , Invited Speaker at the National Symposium on Particles, Detectors and Instrumentation, Mumbai, India.
Feb 2012	<b>RPC R&amp;D for the India-based Neutrino Observatory</b> , Oral Presentation at the Asian Forum for Accelerators & Detectors, Kolkata, India.
Aug 2011	<b>Development of Glass Resistive Plate Chambers for INO</b> , Poster Presentation at the XXV Intl. Symposium on Lepton Photon Interaction at High Energies, Mumbai, India.
Dec 2010	<b>Development of 2m x 2m size Glass RPCs for INO</b> , Oral Presentation at the 19th DAE-BRNS High Energy Physics Symposium, Jaipur, India.
Feb 2010	<b>Design and Development of Software Tools for INO</b> , Oral Presentation at the Tata Institute of Fundamental Research, ASET Colloquium, Mumbai, India.
Feb 2010	<b>VME-based DAQ system for the INO prototype detector</b> , Poster Presentation at the X International Workshop on RPCs and Related Detectors, Darmstadt, Germany.
Mar 2004	<b>Results of a Real-Time DAQ under Windows XP for the TRIC Experiment</b> , Oral Presentation at the Deutsche Physikalische Gesellschaft Spring Meet, Koeln, Germany.

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## Participated Conferences & Schools

- Aug 2013 **American Association of Physicists in Medicine Annual Meeting**, Indianapolis, USA.
- Jun 2013 **52<sup>nd</sup> Annual Conference of the Particle Therapy Co-Operative Group**, Essen, Germany.
- Jun 2012 **From Physics to Medical Imaging through Detectors**, Institut de Physique Nucleaire de Lyon, Lyon, France.
- Mar 2012 **National Symposium on Particles, Detectors and Instrumentation**, Tata Institute of Fundamental Research, Mumbai, India.
- Feb 2012 **Asian Forum for Accelerators & Detectors**, Variable Energy Cyclotron Centre, Kolkata, India.
- Aug 2011 **XXV Intl. Symposium on Lepton Photon Interaction at High Energies**, Tata Institute of Fundamental Research, Mumbai, India.
- Oct 2010 **XII Intl. Workshop on Neutrino Factories, Super beams and Beta beams**, Tata Institute of Fundamental Research, Mumbai, India.
- Dec 2010 **19th DAE-BRNS High Energy Physics Symposium**, LNM Institute of Information Technology, Jaipur, India.
- Feb 2010 **X International Workshop on RPCs and Related Detectors**, GSI Helmholtzzentrum fuer Schwerionenforschung, Darmstadt, Germany.
- Mar 2004 **Deutsche Physikalische Gesellschaft Spring Meet**, Universitaet zu Koeln, Koeln, Germany.

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## Journal articles (peer reviewed)

M. Bhuyan, S.D. Kalmani, N.K. Mondal, S. Pal, **D. Samuel**, B. Satyanarayana, and R.R. Shinde, "Preliminary results on optimisation of gas flow rate for ICAL RPCs." Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, ISSN 0168-9002, <http://dx.doi.org/10.1016/j.nima.2013.10.047>, 2013.

G. Majumder, N.K. Mondal, S. Pal, **D. Samuel** and B. Satyanarayana, "Study of the directionality of cosmic muons using the INO-ICAL prototype detector", Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, vol. 735, Supplement 21, pp. 88-93, 2014.

A. Behere, M. Bhuyan, V.B. Chandratre, S. Dasgupta, V.M. Datar, S.D. Kalmani, S.M. Lahange, N.K. Mondal, P.K. Mukhopadhyay, P. Nagaraj, B.K. Nagesh, S. Pal, Shobha K. Rao, **D. Samuel**, M.N. Saraf, B. Satyanarayana, R.S. Shastrakar, R.R. Shinde, K.M. Sudheer, S.S. Upadhyaya and P. Verma, "Electronics and data acquisition system for the ICAL prototype detector of India-based neutrino observatory", Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, vol. 701, pp. 153-163, 2013.

S. Dasgupta, N.K. Mondal, **D. Samuel**, M.N. Saraf, B. Satyanarayana and S.S. Upadhyaya, "Toward the Implementation of the Trigger Scheme for the ICAL Detector of India-based Neutrino Observatory", Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, vol. 694, pp. 126-132, 2012.

S. Dasgupta, N.K. Mondal, **D. Samuel**, M.N. Saraf, B. Satyanarayana and S.S. Upadhyaya, "Development of Trigger Scheme for the ICAL Detector of India-based Neutrino Observatory", Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment, vol. 678, pp. 105-113, 2012.

S. Pal, B.S. Acharya, G. Majumder, N.K. Mondal, **D. Samuel** and B. Satyanarayana, "Measurement of Integrated Flux of Cosmic Ray Muons at Sea Level using the INO-ICAL Prototype Detector", *Journal of Cosmology and Astroparticle Physics*, vol. 2012, pp. 033, 2012.

M. Bhuyan, V.B. Chandratre, S. Dasgupta, V.M. Datar, S.D. Kalmani, S.M. Lahamge, N.K. Mondal, P. Nagaraj, S. Pal, S.K. Rao, A. Redij, **D. Samuel**, M.N. Saraf, B. Satyanarayana, R.R. Shinde and S.S. Upadhya, "VME-based Data Acquisition System for the India-based Neutrino Observatory Prototype Detector", *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 661, Supplement 1, pp. S73-S76, 2012.

G. Majumder, S. Mohammed, N.K. Mondal, S. Pal, **D. Samuel** and B. Satyanarayana, "Velocity Measurement of Cosmic Muons using the India-based Neutrino Observatory Prototype Detector", *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 661, Supplement 1, pp. S77-S81, 2012.

M. Bhuyan, V.M. Datar, S.D. Kalmani, S.M. Lahamge, S. Mohammed, N.K. Mondal, P. Nagaraj, A. Redij, **D. Samuel**, M.N. Saraf, B. Satyanarayana, R.R. Shinde and P. Verma, "Development of 2 m x 2 m Size Glass RPCs for INO", *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 661, Supplement 1, pp. S64-S67, 2012.

M. Bhuyan, V.M. Datar, S.D. Kalmani, S.M. Lahamge, N.K. Mondal, P. Nagaraj, S. Pal, L.V. Reddy, A. Redij, **D. Samuel**, M.N. Saraf, B. Satyanarayana, R.R. Shinde and P. Verma, "Cosmic Ray Test of INO RPC Stack", *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, vol. 661, Supplement 1, pp. S68-S72, 2012.

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## Conference proceedings

S. Dasgupta, N.K. Mondal, **D. Samuel**, M.N. Saraf, B. Satyanarayana and S.S. Upadhya, "Proposed Trigger Scheme for the ICAL detector of India-based Neutrino Observatory", In proceedings of XI Workshop on Resistive Plate Chambers and Related Detectors, POS(RPC2012)068.

B. Satyanarayana, S. Dasgupta, S. Dhuldhaj, N. Mondal, P. Nagaraj, S. Rao, **D. Samuel**, M. Saraf, R. Shinde, S. Upadhya, V. Chandratre, V. Salodia, P. Saxena, M. Tewani, S. Saha and Y. Viyogi, "Electronics and data acquisition systems for the RPC based INO ICAL detector", In proceedings of XI Workshop on Resistive Plate Chambers and Related Detectors, POS(RPC2012)042.

S. Dasgupta, N.K. Mondal, **D. Samuel** and B. Satyanarayana, "Design of FPGA based TDC for the ICAL Detector of India-based Neutrino Observatory", In proceedings of 4th International Conference on Electronics Computer Technology, 2012.

D. Eversheim, F. Hinterberger, R. Jahn, **D. Samuel**, J. Dietrich, A. Lehrach, D. Prasuhn, R. Gebel, O. Felden, M. Beyer and W. Kretschmer, "The Feasibility of the TRIC Experiment at COSY", *Hyperfine Interactions*, vol. 193, pp. 335-339, 2009.

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## Journal article under preparation

S. Tang, H.M. Lu, H. Bentefour, B. Gottschalk and **D. Samuel**, "Validation of range verification in an anthropomorphic pelvic phantom".

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## References

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