

Curriculum Vitae of Saikat Biswas

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1 Personal data

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Present Position : Associate Professor

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Nationality : Indian

Date of Birth : 13/09/1980

Sex : Male

Marital status : Married

2 Academic Record

Examination	Year of passing	Subject	Board / Univ.	Class/ Division
Secondary Examination	1996	Bengali, English, Math, Phy. Sc., Life Sc., History, Geography, Phy. Edu., Work Edu., Biology	West Bengal Board of Secondary Education (Jagacha High School, Howrah, West Bengal, India)	First
Higher Secondary (+2)	1998	Physics, Chemistry, Biology, Mathematics.	West Bengal Council of Higher Secondary Education (Santragachi Kedarnath Institution, Howrah, West Bengal, India)	First
B. Sc.	2001	Physics (Honours) Chemistry & Mathematics (pass)	University of Calcutta. (Shibpur Dinabandhu Institution (College), Howrah, West Bengal, India)	Second
M. Sc.	2004	Physics	University of Calcutta, Kolkata, India	First
Ph.D.	2011	Physics (Experimental)	University of Calcutta. (Variable Energy Cyclotron Centre, Kolkata, India)	

Title of the Ph.D. thesis: Development of high resolution gas filled detector for high energy physics experiments.

Supervisor: Dr. Subhasis Chattopadhyay (Variable Energy Cyclotron Centre)

Ph.D. thesis Submitted on: 20.08.2010

Ph.D. degree obtained on: 04.03.2011

3 Post Doctoral experience

Position	Year	Work	Institute
Visiting Fellow	November, 2010 - November 2012	Development of GEM detector	Detector Laboratory GSI Helmholtzzentrum für Schwerionenforschung GmbH, Planckstrasse 1, D-64291, Darmstadt, Germany
DST-SERB Ramanujan Fellow	November, 2012 - June, 2013	Development of detectors	Variable Energy Cyclotron Centre, Kolkata, India
DST-SERB Ramanujan Fellow and Scientific Officer-D	June 20, 2013 to November 27, 2015	Permanent Scientific staff for Detector development for EHEP	National Institute of Science Education and Research (NISER), Bhubaneswar
Assistant Professor	November 30, 2015 to February 23 2020	Permanent Faculty in Physics	Centre for Astroparticle Physics & Space Science (CAPSS), Bose Institute, Kolkata
Associate Professor	February 24, 2020 onwards	Permanent Faculty in Physics	Centre for Astroparticle Physics & Space Science (CAPSS), Bose Institute, Kolkata

4 Short term visit to other countries

1. One month visit to Institute of High Energy Physics (IHEP), Beijing, China in June 2007.

To work on bakelite RPC.

2. La Biodala, Isola d'Elba, Italy, May 24-30, 2009.

To present a poster in the conference Frontier Detectors for Frontier Physics (11th Pisa meeting on advanced detectors)

3. GSI, Darmstadt, Germany, February 09-12, 2010.

To present a talk in the X. Workshop on Resistive Plate Chambers and related Detectors- 2010.

4. CERN, Geneva, Switzerland, 16-18 March 2011.

To attend the 4th MC-PAD Training Event, Micro-pattern gas and Photo-detectors.

5. CERN, Geneva, Switzerland, 20 days visit in October 2011.

To participate in the test beam at CERN SPS for GEM detector test for CBM-MUCH detector.

6. La Biodala, Isola d'Elba, Italy, May 20-26, 2012.

To present three posters in the conference Frontier Detectors for Frontier Physics (12th Pisa meeting on advanced detectors)

7. CERN, Geneva, Switzerland, June 13-15, 2012.

To present a talk in the RD51 mini week.

8. CERN, Geneva, Switzerland, 20 days visit in October 2012.

To participate in the test beam at CERN SPS for GEM detector test for CBM-MUCH detector.

9. CERN, Geneva, Switzerland, August 25-September 3, 2013

To attend ALICE mini week and for ALICE related discussion.

10. GSI, Darmstadt, Germany, September 4-13, 2013.

For Discussion and research work on detector.

11. CERN, Geneva, Switzerland, November 18 - December 18, 2014.

To participate in the test beam at CERN PS and CERN SPS for ALICE TPC GEM detector test and to attend RD51 mini week.

12. GSI, Darmstadt, Germany, February 20 - March 4, 2015.

For Discussion and research work on GEM detector for ALICE experiment at CERN and CBM experiment in FAIR.

13. La Biodala, Isola d'Elba, Italy, May 24 - 30, 2015.

To present four posters in the conference Frontier Detectors for Frontier Physics (13th Pisa meeting on advanced detectors)

14. CERN, Geneva, Switzerland, July 11 - August 31, 2015.

To take ALICE DCS shift, to participate in the July Monthly ALICE meeting week 13-17 July, 2015.

15. GSI, Darmstadt, Germany, April 3-19, 2016.

For research work on GEM detector for ALICE TPC upgrade, to present the work in the GSI TPCU meeting, to attend CBM collaboration meeting.

16. CERN, Geneva, Switzerland, April 20-29, 2016

To take ALICE DCS shift. Presented the GEM detector related work on TPCU production meeting.

17. GSI, Darmstadt, Germany, September 12-23, 2016.

Worked on the testing of the first quad-GEM prototype build in India with high rate X-ray generator. He operated the GEM chamber at very low gain. Also participated in the pre-production of large GEM detector for ALICE-TPC upgrade.

18. CERN, Geneva, Switzerland, November 24- December 6, 2016

To take DCS data taking shift during heavy ion run of ALICE experiment. Participated also in the testing of OROC chamber of ALICE TPC with heavy ion at Point 2 (ALICE site).

19. Budker Institute of Nuclear Physics, and Novosibirsk State University, Novosibirsk, Russia 27 February - 3 March, 2017.

To present an oral and two posters in the conference INSTR17: International Conference "Instrumentation for Colliding Beam Physics"

20. CERN, Geneva, Switzerland, May 5 - May 18, 2017

To take DCS data taking shift of ALICE experiment.

21. GSI, Darmstadt, Germany, March 18-23, 2018

To attend and present work in the 31st CBM collaboration meeting.

22. La Biodala, Isola d'Elba, Italy, May 25 - June 4, 2018.

To present six posters in the conference Frontier Detectors for Frontier Physics (14th Pisa meeting on advanced detectors)

23. CERN, Geneva, Switzerland, November 11 - December 6, 2018

To take DCS data taking shift during heavy ion run of ALICE experiment. Attended and presented a talk in the RD-51 mini week.

24. CERN, Geneva, Switzerland, April 2 - April 6, 2023

To attend meetings for ALICE related work.

25. FAIR-GSI, Darmstadt, Germany, December 15-20, 2023

To attend FAIR Council meeting and other FAIR related discussions.

26. CERN, Geneva, Switzerland, May 9 - 26, 2024

To take DCS data taking shift of ALICE experiment and discussion on ALICE upgrade.

27. FAIR-GSI, Darmstadt, Germany, July 8-11, 2024

To attend FAIR Council meeting as invitee and other FAIR related discussions.

5 Scholarships and Awards

1. National Scholarship in Higher Secondary Examination from West Bengal in 1998.

2. DAE research fellowship to pursue Ph.D in Physics.

3. DST International travel grant to attend the 11th Pisa Meeting on Advanced Detectors, held from 24/05/2009 to 30/05/2009 at La Biodola, Isola d'Elba, Italy.

4. Support from the Organizing committee to attend the 11th Pisa Meeting on Advanced Detectors, held from 24/05/2009 to 30/05/2009 at La Biodola, Isola d'Elba, Italy.

5. Support from the Organizing committee to attend the X. Workshop on Resistive Plate Chambers and related Detectors- 2010, GSI, Germany.

6. EU grants to participate the 4th MC-PAD Training Event, Micro-pattern gas and Photo-detectors, CERN, Geneva, Switzerland, 16-18 March 2011.

7. Support from the Organizing committee to attend the 12th Pisa Meeting on Advanced Detectors, held from 20/05/2012 to 26/05/2012 at La Biodola, Isola d'Elba, Italy.

8. DST-SERB Ramanujan Fellowship, November, 2012 to November, 2017.
9. Support from the Organizing committee to attend the 13th Pisa Meeting on Advanced Detectors, held from 24/05/2015 to 30/05/2015 at La Biodola, Isola d'Elba, Italy.
10. Certificate of Reviewing from NUCLEAR INST. AND METHODS IN PHYSICS RESEARCH, A: April 2017.
11. Certificate of Outstanding Contribution in Reviewing from NUCLEAR INST. AND METHODS IN PHYSICS RESEARCH, A: June 2017
12. I chaired a session in Workshop on Dynamics of QCD matter, NISER, 15-17 August, 2019.
13. Selected as a jury of the Young scientist's conference (YSC) at India International Science Festival 2019, 5-8 November 2019, Kolkata.
14. I was appointed as one of the judges for selecting the three best posters in the DAE-HEP symposium organized by NISER, Jatni during 14 – 18 December 2020.
15. I was selected as member of the Advisory committee in the Workshop on Advanced Radiation Detector and Instrumentation in Nuclear and Particle Physics (RAPID2021) 25-29 October 2021
16. I chaired a session in the Workshop on Advanced Radiation Detector and Instrumentation in Nuclear and Particle Physics (RAPID2021) 25-29 October 2021.
17. Proud Indian - Georges Charpak Distinguished Scientist Award, 2022 from IMRF, Institute of Higher Education & Research, India, 26 January 2022.
18. Selected as a member of the organizing committee of the 5th ALICE-STAR India school on Quark-Gluon plasma at IoP, Bhubaneswar, November 2022.
19. Selected as the organizing committee member of CBM theme meeting at NISER during 3-4 February 2023.

Recognition/ Award of students

1. Ms. Shreya Roy, Bose Institute (during the period was my student) received

the best talk prize in HUGS 19, Jefferson Laboratory, USA. Title: Overview of detectors for the Muon Chamber of CBM experiments at FAIR.

2. My student Mr. Sayak Chatterjee received the Best Poster Award in Workshop on Dynamics of QCD matter, NISER, 15-17 August, 2019. Title: Characterisation of GEM detector for CBM Muon Chamber.

3. My Student Mr. Sayak Chatterjee was selected for the Highlight talk on “Physics performance studies with MuCh setup” in the 37th CBM Collaboration Meeting (online), March 1-5, 2021. Sayak is the only selected student from India.

4. My Students Mr. Sayak Chatterjee and Mr. Arindam Sen were selected as a participant in 2021 CERN-Fermilab Hadron Collider Physics Summer School (23.08.2021 - 04.09.2021)

5. On 26.01.2022 Mr. Sayak Chatterjee (Student of Dr. Saikat Biswas) received the Ernest Rutherford Best Researcher Award 2022 from IMRF, Institute of Higher Education and Research, India.

6. Mr. Sayak Chatterjee received the financial support from the organizer to attend the Quark Matter, QM2022 in Poland, April 2022.

7. Mr. Arindam Sen (Student of Dr. Saikat Biswas) received the financial support from the organizer to attend the Quark Matter, QM2022 in Poland, April 2022.

8. Mr. Sayak Chatterjee is selected to receive the CBM Juniors travel grant to participate in the QM2022, Poland, April 2022.

9. Mr. Sayak Chatterjee received the Young Researcher Grant from INFN, Pisa to attend 15th Pisa meeting on Advanced Detector 2022 in Italy, May 2022.

10. Mr. Arindam Sen received the Young Researcher Grant from INFN, Pisa to attend 15th Pisa meeting on Advanced Detector 2022 in Italy, May 2022.

11. Mr. Sayak Chatterjee acted as a judge to adjudicate the Senior School Science Exhibition, 2022 at La Martiniere for Boys, Kolkata, July 2022.

12. My PhD student Sayak Chatterjee received the award for best oral presentation in the Students’ Symposium “Recent Trends in Natural Sciences, 2022” at Bose Institute, Kolkata, November 28-29, 2022.

13. My PhD student Arindam Sen is attended the EURIZON detector school

at Wuppertal, Germany (17-28 Jul 2023). (Fully sponsored by the Organizers of EURIZON detector school, Wuppertal, Germany.)

6 Projects

1. Investigation of the Applicability of Micro-pattern Gas Detectors in the High Rate FAIR-Experiment CBM. Ramanujan Fellowship, November, 2012 to November, 2017. (PI).

2. Beam Energy Scan Program with Relativistic Heavy Ion Collisions and Development of a Gas based Detector facility at NISER. 2014. (Co-PI).

3. Intramural project: Investigation of the Applicability of Resistive Plate Chamber in the Compressed Baryonic Matter Experiment at FAIR. Rs 20 lakh for 2019-20.

4. PI of CBM-MUCH project at Bose Institute 2021-2022.

5. Intramural project: Development of Gas Electron Multiplier detector for the future high-rate Compressed Baryonic Matter Experiment at FAIR. 2024-2027.

7 Project Students

1. Viwek Mertiya (University of Rajasthan), M.Tech in Engineering Physics Project thesis. 2012-13

Title: Development of resistive plate chamber for physics research.
(Project is done at VECC).

2. Rashmita Das (F.M. University Balasore , Odisha), One month project on development of multigap RPC at VECC. 2013

(Project is done at VECC).

3. Himangshu Neog, SPS, NISER, 6 months. 2013-14

Title: Development of Resistive Plate Chamber (RPC).
(Project is done at NISER).

4. Akhilesh P Nandan, IISER TVM, 1 month. 2014

Title: Detection of particles and gamma photons using plastic scintillators.

(Project is done at NISER).

5. Sharmili Rudra, Dept. of Applied Physics, University of Calcutta, 3 months. 2014

Title: Development of detectors for high energy physics experiments.
(Project is done at NISER).

6. Amit Nanda, SPS, NISER, 6 months. 2014-15

Title: Study of characteristics of GEM Detector.
(Project is done at NISER).

7. Sumanya Sekhar Sahoo, SPS, NISER, 1 month, (Open ended experiment). 2015

Title: Building and testing of a single wire gas chamber.
(Project is done at NISER).

8. Abhishek Nag, IISER Kolkata, 1 month. 2015

Title: Measurement of relative gain uniformity of a single mask triple GEM detector.
(Project is done at NISER).

9. Akhil Bharadwaj, IISER Mohali, 2 month. 2015

Title: Characterization of a single wire gas chamber with Argon and CO₂ in 80/20 ratio.
(Project is done at NISER).

10. Khitish Biswal, SPS, NISER, summer project, 2015

Title: Efficiency measurement of a triple GEM detector using cosmic ray.
(Project is done at NISER).

11. Ruchika Gupta, Kurukhetra University, Kurukhetra, summer project, 2015

Title: Long-term stability test of a triple GEM detector with Argon and CO₂ in 80/20 ratio.
(Project is done at NISER).

12. Aritra Mondal, University of Calcutta, Kolkata, 2016

Title: Long-term stability test of GEM detector for ALICE experiment.
(Project is done at Bose Institute).
(Now at RRCAT, Indore)

13. Debdeep Ghosal, Indian School of Mines, Dhanbad, 2016

Title: Development of gas detector.

(Project is done at Bose Institute).
(Now at Department of Physics, University of Basel)

14. Shreya Roy, Bose Institute, Kolkata, 2016
Title: Development of straw tube detector.
(Project is done at Bose Institute).

15. Pratik Ghosal, Bose Institute, Kolkata, 2016
Title: Radiation detection.
(Project is done at Bose Institute).

16. Dr. Subikash Choudhury
Visiting Fellow at Bose Institute, 2016-17.
(Now Post Doc. Fellow at Fudan University, Shanghai)

17. Nilanjana Nandi, Raja Peary Mohan College, Uttarpa, Hooghly, West Bengal. Summer Project at Bose Institute 2017.
Title: Characteristic studies on straw tube and scintillator detectors.
(Now pursuing M.Sc. in University of Calcutta)

18. Sayak Chatterjee, Bose Institute, Kolkata, 2017
Title: Radiation detection and measurement.
(Project is done at Bose Institute).

19. Prateek Chawla, Bose Institute, Kolkata, 2017
Title: Radiation detection and computer interfacing.
(Project is done at Bose Institute).
(Now at IMSc, Chennai)

20. Shibnath Shaw, Vidyasagar University, Rangamati, Medinipur, West Bengal. 2017.
Title: Detection of cosmic ray.
(Project is going on at Bose Institute for his 4th semester M.Sc).

21. Shreya Roy, Bose Institute, Kolkata, 2017
Title: Characterisation of scintillator and gaseous detectors, and Measurement of angular variation of cosmic ray flux with scintillator detector
(Project is done at Bose Institute for her 4th semester Int. M.Sc-PhD).

22. Sayak Chatterjee, Bose Institute, Kolkata, 2018
Title: Study of characteristics of triple GEM Detector for CBM experiment
(Project is done at Bose Institute for her 4th semester Int. M.Sc-PhD).

23. Sayan Chakraborty, Bose Institute, Kolkata, 2018
Title: Development of Resistive Plate Chamber (RPC) for CBM Muon Chamber (Project is done at Bose Institute for her 4th semester Int. M.Sc-PhD).
(Now at NPCIL, Gujrat)
24. Souradeep Pal, St. Xavier's College (Autonomous), Kolkata. Summer Project at Bose Institute 2018.
Title: Study of the characteristics of the triple Gas Electron Multiplier (GEM) in detection of 5.9 keV X-rays of Fe⁵⁵ source.
25. Shubham Jaiswal, Bose Institute, Kolkata, 2019.
Title: Review on Gaseous Detectors and Feasibility study of straw tube detector for CBM - Muon Chamber.
(Project is done at Bose Institute for her 4th semester Int. M.Sc-PhD).
26. Abhisek Roy, Central University of Jharkhand, Ranchi. Summer Project at Bose Institute 2019.
Title: Simulation of RPC using Garfield ++.
27. Debonita Saha, St. Xavier's College (Autonomous), Kolkata. Summer Project at Bose Institute 2019.
Title: Study of the pulse height distribution of cosmic ray muons by plastic scintillation detectors.
28. Krishna Nivedita G, IISER TVM, Summer Internship at Bose Institute 2019.
Title: Study of Charging up effect of GEM detectors.
29. Aayushi Paul, University of Calcutta, Kolkata, Summer Internship at Bose Institute 2019.
Title: Study of timing properties of straw tube and scintillator detectors and application in imaging.
30. Rituparna Banerjee, IIT-ISM Dhanbad, Summer Internship at Bose Institute 2019.
Title: Progress of RPC For High Rate Operation and Issues.
31. Shivshant Chauhan, Bose Institute, Kolkata, 2021.
Title: Study of cosmic ray muons using plastic scintillation detector.
(Project is done at Bose Institute for her 4th semester Int. M.Sc-PhD).
32. Pranjal Barik, Department of Physics, Savitribai Phule Pune University, Pune, Summer Internship at Bose Institute 2022.

Title: Basic Characterization of Resistive Plate Chamber for High Energy Physics experiment.

33. Rajat Paul, Department of Physics, Savitribai Phule Pune University, Pune, Summer Internship at Bose Institute 2022.

Title: Characterisation of triple GEM chamber.

34. Shreesh Sahai, Amity Institute of Nuclear Science and Technology, Amity University Uttar Pradesh, Short Term Internship at Bose Institute 2022.

Title: Investigation of the instability in performance of a triple GEM Chamber.

35. Ayan Dandapat, IIT Ropar, Short Term Internship at Bose Institute 2022.

Title: Characterization of RPC detector for high energy physics experiment.

36. Mayukh Chatterjee, St. Xavier's College, Kolkata, Summer Internship at Bose Institute 2023.

Title: Investigation of the instability in performance of a triple GEM Chamber.

37. Aheesh Chandrakant Hegde, NISER, Jatni, Short Term Internship at Bose Institute 2023.

Title: Performance study of a triple GEM Chamber.

38. Sayan Dhani, IIT Bombay, Mumbai, Short Term Internship at Bose Institute 2023.

Title: Characteristic Study of GEM Detector for High Energy Physics Experiment.

39. Monika Aggarwal, Department of Physics and Astrophysics, Central University of Haryana, M.Sc. Dissertation at Bose Institute, January 2024-May 2024. Title: Performance Study of Bakelite RPC For High-Energy Physics Experiment. (The work is highlighted in the prestigious CBM Courier in July 2024 | Issue 2 edition.)

8 PhD Students

1. Sayak Chatterjee (Institute Fellow, Thesis defended on 14 August 2023 and Presently a Post-Doctoral Fellow at University of Massachusetts, Amherst, USA) Thesis title: Performance studies of Gas Electron Multiplier detector for the Muon Chamber of high rate CBM experiment at FAIR.

2. Arindam Sen (DST Inspire Fellow, Thesis defended on 29 December 2023

and Presently a Post-Doctoral Fellow at Jefferson Laboratory-Ohio University, USA).

Thesis title: Development Of Resistive Plate Chamber For The CBM Experiment At FAIR And Other Application Of Radiation Detector.

3. Subir Mandal (2nd year, UGC JRF)

9 Teaching

2015-16: Int. M.Sc.-PhD SEM II - Computer Interfacing

2016-17: Int. M.Sc.-PhD SEM I - Electrodynamics I

2016-17: Int. M.Sc.-PhD SEM II - Communication Experiments

2017-18: Int. M.Sc.-PhD SEM III - Nuclear Physics Practical

2017-18: Int. M.Sc.-PhD SEM I - Electrodynamics I

2017-18: Int. M.Sc.-PhD SEM II - Communication Experiments

2018-19: Int. M.Sc.-PhD SEM III - Nuclear Physics Practical

2018-19: PhD Course work - Selected topics on Nuclear Physics

2019-20: Int. M.Sc.-PhD SEM I - Electrodynamics I

2020-21: Int. M.Sc.-PhD SEM II - Communication Experiments

2020-21: PhD Course work - Selected topics on Nuclear Physics

2021-22: PhD Course work - Selected topics on Nuclear Physics

2023-24: PhD Course work - Selected topics on Nuclear Physics

10 Research Experience

I completed my M.Sc. from the University of Calcutta, Kolkata in 2004 in Physics with Nuclear Structure and Nuclear Reaction as special paper.

I joined VECC, Kolkata as a Junior Research Fellow (JRF) in September 2005 and completed my Ph.D work in Experimental High Energy Physics under the supervision of Dr. Subhasis Chattopadhyay.

At VECC I worked from September, 2005 to August, 2010 on the development of bakelite based Resistive Plate Chamber (RPC) to be used as the prime active detector for the detection of muons (produced through the interaction of neutrinos) in a 50 kTon magnetised Iron Calorimeter (ICAL) in the India-based Neutrino Observatory (INO). This proposed experiment will study the neutrino oscillations in detail using atmospheric neutrinos. INO will need a large number of RPCs each of $2\text{m} \times 2\text{m}$ dimension. The main aim of our work is to develop RPCs from the bakelite paper laminates produced and commercially available in local market in India and to operate those modules in the streamer mode. This will reduce the cost of the detector immensely.

Over the last several years, I have developed a facility from scratch where RPCs of varying sizes (starting from $30\text{cm} \times 30\text{cm}$ to $1\text{m} \times 1\text{m}$) have been fabricated

and tested with cosmic rays. A thin silicone coating has been applied to the inner surfaces of the detectors to make the surface smoother. With the application of viscous silicone fluid the efficiency of the RPCs have been found to be $>90\%$ with a counting rate ~ 0.1 Hz/cm² for more than 140 days in streamer mode using argon, Tetrafluoroethane (R-134a) and isobutane in 34:59:7 mixing ratio with cosmic rays. The time resolution (FWHM) obtained is ~ 2 nsec which is better than the required value in INO. The streamer-mode of operation of these RPCs makes the electronics simpler.

In this R&D work I was deeply engaged from the procurement of bakelite sheets from the local market and evolved through several modifications in the fabrication and surface finish.

I have also worked to build a INO-ICAL prototype (~ 25 ton iron) at VECC. The prototype is built with 13 layers of 50 mm thick low carbon iron (Tata A-grade) plates and 12 RPCs (both bakelite and glass) of $1\text{m} \times 1\text{m}$ in area sandwiched between them. Each layer is assembled by joining a 'T' and a 'C' shaped iron plate. The prototype detector will be magnetised to 1.5 Tesla, which will enable momentum measurement of 1-10 GeV atmospheric muons. To magnetise the iron four sets of copper coils of 5 turns each, which were made from electrolytic copper conductor tubing having a central bore for flowing low conductivity water, are used. The prototype will provide an active volume of about 1m^3 . A few $1\text{m} \times 1\text{m}$ RPC detectors are now installed inside a prototype magnet for testing.

I have also worked on building and characterizing of Multi-Gap RPC (MRPC) from the bakelite and glass in VECC India. MRPC will be used in medical imaging for its good time resolution.

I joined GSI detector laboratory, Germany on November 11, 2010 as a visiting scientist after submission of my Ph.D thesis to the University of Calcutta, Kolkata. In GSI detector laboratory a facility has been developed for the fabrication and study of the characteristics for the GEM for the future Compressed Baryonic Matter (CBM) experiment at Facility of Anti-Proton and Ion Research (FAIR) in Darmstadt, Germany. Several triple double mask GEM detectors have been studied systematically. The variation of gain, resolution of the detector with that of the applied high voltage has been measured with Fe⁵⁵ X-ray source for different gas mixtures and with different gas flow rates etc. The fraction of large signal (probable spark) relative to average signal is also measured.

I have actively participated in two test beams at CERN-SPS in October 2011 and October 2012 for testing GEM detectors for CBM. Both double mask and single mask triple GEM detectors have been tested at high rate at CERN SPS/H4. In these tests the hadronic shower detection by GEM, the spark probability due to ~ 150 GeV Pion beam has been measured.

I am also actively involved in ageing studies of the influence of construction materials on the performance of gaseous detectors using multi wire proportional chambers (MWPC).

I joined VECC once again as DST-SERB Ramanujan Fellow on 12th November

2012. The research proposal "Investigation of the Applicability of Micro-pattern Gas Detectors in the High Rate FAIR-Experiment CBM" proposed here addresses the feasibility study and applicability of Gas Electron Multipliers (GEMs) in a harsh environment. The study is very essential from the point of view of the design and construction of the muon chambers (MUCH) for the CBM experiment at FAIR. For the MUCH system large-area GEMs have been chosen as the active detector, at least for the first few stations downstream of the first hadron absorber. They will be exposed to a very harsh radiation environment. The CBM experiment will have a run time of at least 10 years. The study of long-term stability and ageing properties of GEMs is therefore very important.

In VECC, data analysis of ageing studies performed at GSI is done for GEM. The ageing study and the long term test of one triple GEM detector with 3 mm drift gap, 2 mm transfer gap and 2 mm induction gap has been performed systematically. The accumulated charge on the detector is calculated from the rate of the X-ray and the average gain of the detector. No sign of ageing is observed after accumulation of more than 0.04 mC/mm². The results are included in the TDR (in progress) of CBM-MuCh.

Development of Multigap Resistive Plate Chamber (MRPC) is performed for STAR experiment at VECC. An efficiency $\sim 85\%$ is achieved at an electric field of 100 kV/cm with a noise rate of <1 Hz/cm². Five large modules are already sent to BNL, USA for installation.

Performance of a 6-gap glass MRPC has been studied by 511 keV annihilation gamma rays from a Na²² source for medical imaging. The area of the MRPC is 16 cm \times 10 cm with 6 gap each of 200 μ m. The thickness of each glass is 600 μ m. The MRPC is tested in the avalanche mode with a gas mixture of R-134a and Isobutane in 95/5 ratio by using a finger plastic scintillator of dimension 5 cm \times 1.2 cm. The Na²² source is placed between the plastic scintillator and the MRPC. The coincidence is taken between the signals from the scintillator and the MRPC with and without the Na²² source. The coincidence count rate increases with the applied high voltage and the effect of the source is also clear. To locate the position of the source, measuring the time difference is the main goal of using MRPC in medical imaging. It has been observed that varying the source position the time difference of signals from the trigger (Scintillator) and the MRPC is changing. This is the biggest achievement of our MRPC development for medical imaging.

The coincidence count of the signals from the MRPC and the scintillator and the singles count of the scintillator are measured with and without the Na²² source. The ratio of the coincidence count and the singles scintillator counts, calculated from the data only for the 511 keV gamma ray, is defined as the efficiency. An efficiency $\sim 0.9\%$ is obtained at around 15 kV.

Resistive Plate Chambers (RPC) of area 2 m \times 2 m will be used in the proposed India-based Neutrino Observatory (INO) to determine precisely the oscillation parameters using atmospheric neutrinos in a 50 kton Iron Calorimeter (ICAL). During the last few years R&D on the RPC with bakelite paper laminates commercially

available in India is going on at SINP/VECC. Since the bakelite sheets of size $2\text{ m} \times 2\text{ m}$ are unavailable in Indian market, therefore it becomes necessary to make a $2\text{ m} \times 2\text{ m}$ bakelite sheet by joining four $1\text{ m} \times 1\text{ m}$ bakelite plates. Hence a prototype single-gap bakelite RPC of size $20\text{ cm} \times 20\text{ cm}$ has been fabricated with electrode plates made by gluing eight $10\text{ cm} \times 10\text{ cm}$ bakelite plates together to examine the feasibility of the option of planar electrodes made of glued plates. The I-V characteristic studied in the initial testing is found to be satisfactory. Two distinct slopes in the I-V plot have been obtained. Thus this RPC is expected to work adequately and further testing is therefore needed to examine its performance such as efficiency, area coverage or dead area determination, etc.

At NISER I joined as a Scientific Officer on June 20, 2013. At NISER I have established a detector laboratory where building and testing of gaseous detectors such as GEM, RPC and plastic scintillator detectors have been started satisfactorily. This work is for ALICE TPC upgrade. Long-term stability test of a $10\text{ cm} \times 10\text{ cm}$ single mask triple GEM is going on using Sr^{90} beta source. The GEM detector is built in this laboratory with drift gap, two transfer gap and induction gap as 3, 2, 2, 2 mm respectively. No ageing is observed after accumulation of more than 0.02 mC/cm^2 .

A Data logger to monitor and record the ambient parameters such as temperature, relative humidity and pressure has been developed. With this Data logger continuous recording of t, p, RH and time stamp can be done with a programmable sampling interval. This data is necessary to correct the gain of a gas filled detector.

Cosmic ray muon pulse height spectrum has been obtained for two scintillators and fitted with Landau distribution. The most probable energy deposition in 1 cm thick plastic material has been found to be $\sim 1.4\text{ MeV}$. The average velocity of the cosmic ray muons has been found to be $(2.53 \pm 0.25) \times 10^8\text{ m/s}$. In old literature the quoted value is $(2.978 \pm 0.007) \times 10^8\text{ m/s}$. To improve the results two ways may be proposed; the first is to increase the statistics i.e. registering more coincidence events and the second is to measure the time difference using time to digital converter (TDC). Both the processes are in our future plan. One RPC module is fabricated using bakelite electrode from the local market. The uniformity of surface resistivity is measured.

I joined Bose Institute, Kolkata as a faculty in Physics department and CAPSS on November 30, 2015. Here also I started building a gas detector laboratory for Experimental High Energy Physics. I am mainly involved in TPC upgrade for ALICE experiment at CERN and CBM-Muon Chamber.

In view of the currently ongoing exploration of ALICE-TPC upgrade options with regard to future operation at 50 kHz interaction rate in Pb-Pb collisions, we are very much interested in operating the TPC in an un-gated mode. After the last visit of CERN and GSI and after discussing with me it has been brought to attention of ALICE-TPC Project Leader that I have substantial expertise on the relevant technologies to find a possible solution to this end. Therefore, the ALICE-TPC project would expressly welcome India, investigating technical solutions for the

ALICE-TPC upgrade. Such efforts may imply the studies of triple and quadruple GEM prototypes in laboratory and detailed simulation studies (by other Indian collaborators) to further optimise the operational point of this detector. ALICE-TPC Project Leader has given our experience, a major role of Indian groups in the testing and commissioning of the new TPC readout chambers.

At Bose Institute I am involved in the long-term stability test of the triple GEM detector. We have recently built one 4-GEM detector using single mask GEM foils in collaboration with IOP, Bhubaneswar. We are regularly presenting the test results in the online TPC upgrade meeting at CERN.

11 List of Research Publications

11.1 Journal

1. Performances of linseed oil-free bakelite RPC prototypes with cosmic ray muons.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, M.K. Sharan, Y.P. Viyogi.

Nuclear Instruments and Methods in Physics Research A 602 (2009) 749-753.
[arXiv:0907.2976]

2. Control system for a four-component gas mixing unit.

S. Bose, S. Biswas, S. Saha, M.K. Sharan, S. Bhattacharya.

Nuclear Instruments and Methods in Physics Research A 602 (2009) 839-841.

3. INO prototype detector and data acquisition system.

Anita Behere, M.S. Bhatia, V.B. Chandratre, V.M. Datar, P.K. Mukhopadhyay, Satyajit Jena, Y.P. Viyogi, Sudeb Bhattacharya, Satyajit Saha, Sarika Bhide, S.D. Kalmani, N.K. Mondal, P. Nagraj, B.K. Nagesh, Shobha K. Rao, L.V. Reddy, M. Saraf, B. Satyanarayana, R.R. Shinde, S.S. Upadhyay, P. Verma, Saikat Biswas, Subhasish Chattopadhyay, P.R. Sarma.

Nuclear Instruments and Methods in Physics Research A 602 (2009) 784-787.

4. Development of linseed oil-free Bakelite Resistive Plate Chambers.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, Y.P. Viyogi.

Nuclear Instruments and Methods in Physics Research A 604 (2009) 310-313.
[arXiv:0907.2978]

5. Study of timing properties of single gap high-resistive bakelite RPC.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, Y.P. Viyogi.

Nuclear Instruments and Methods in Physics Research A 617 (2010) 138-140.
[arXiv:0907.2982]

6. Performances of silicone coated high resistive bakelite RPC.

S. Biswas, Purba Bhattacharya, S. Bhattacharya, S. Bose, S. Chattopadhyay, N. Majumdar, S. Mukhopadhyay, S. Saha, Y.P. Viyogi.

Nuclear Instruments and Methods in Physics Research A 661 (2012) S94-S97.
[arXiv:1206.5627]

7. Study of the influence of construction materials on the ageing properties of high rate gas detectors.

Allhussain Abuhoza, **S. Biswas**, U. Frankenfeld, J. Hehner, C. J. Schmidt, H.R. Schmidt.

Physics Procedia 37 (2012) 442-447.

8. Surface resistivity measurements and related performance studies of the Bakelite RPC detectors.

Meghna K. K., A. Banerjee, **S. Biswas**, S. Bhattacharya, S. Bose, S. Chattopadhyay, G. Das, C. Marick, S. Saha, Y.P. Viyogi.

Proceedings of Science , PoS(RPC2012)031.

9. Study on Surface Asperities in Bakelite-RPC.

N. Majumdar, S. Mukhopadhyay, P. Bhattacharya, **S. Biswas**, S. Bhattacharya, S. Saha, S. Chattopadhyay.

Proceedings of Science , PoS(RPC2012)026.

10. Study of the characteristics of GEM detectors for the future FAIR experiment CBM.

S. Biswas, A. Abuhoza, U. Frankenfeld, J. Hehner, C. J. Schmidt, H.R. Schmidt, M. Träger, S. Colafranceschi, A. Marinov, and A. Sharma.

Nuclear Instruments and Methods in Physics Research A 718 (2013) 403-405.
[arXiv:1408.0075]

11. Setup optimization toward accurate ageing studies of gas filled detectors.

A. Abuhoza, H.R. Schmidt, **S. Biswas**, U. Frankenfeld, J. Hehner, C. J. Schmidt.

Nuclear Instruments and Methods in Physics Research A 718 (2013) 400-402.

12. Development of Multi-gap Resistive Plate Chamber (MRPC) for medical imaging.

A. Banerjee, A. Roy, **S. Biswas**, S. Chattopadhyay, G. Das, S. Pal.

Nuclear Instruments and Methods in Physics Research A 718 (2013) 138-139.
[arXiv:1408.0280]

13. Measurement of electrical properties of electrode materials for the bakelite Resistive Plate Chambers.

Meghna K. K., A. Banerjee, **S. Biswas**, S. Bhattacharya, S. Bose, S. Chattopadhyay,

G. Das, C. Marick, S. Saha, Y.P. Viyogi.
2012 JINST 7 P10003 doi:10.1088/1748-0221/7/10/P10003. [arXiv:1206.5894]

14. A numerical study on surface asperities in bakelite-RPC.

N. Majumdar, S. Mukhopadhyay, P. Bhattacharya, **S. Biswas**, S. Bhattacharya, S. Saha, S. Chattopadhyay.
2012 JINST 7 P11027 doi:10.1088/1748-0221/7/11/T11027.

15. Development of a GEM based detector for the CBM Muon Chamber (MUCH).

S. Biswas, D. J. Schmidt, A. Abuhoza, U. Frankenfeld, C. Garabatos, J. Hehner, V. Kleipa, T. Morhardt, C. J. Schmidt, H. R. Schmidt, and J. Wiechula.
2013 JINST 8 C12002 doi:10.1088/1748-0221/8/12/C12002. [arXiv:1310.0642]

16. Testing of triple-GEM chambers for CBM experiment at FAIR using self-triggered readout electronics.

A.K. Dubey, S. Chattopadhyay, J. Saini, R. Singaraju, G.S.N. Murthy, Y.P. Viyogi, A. Abuhoza, **S. Biswas**, U. Frankenfeld, J. Hehner, V. Kleipa, Th. Morhardt, C.J. Schmidt, D.J. Schmidt, A. Lymanets, H.R. Schmidt.
Nuclear Instruments and Methods in Physics Research A 755 (2014) 62-68.

17. Calibration and performance of the STAR Muon Telescope Detector using cosmic rays.

C. Yang, X.J. Huang, C.M. Du, B.C. Huang, Z. Ahammed, A. Banerjee, P. Bhattarari, **S. Biswas**, B. Bowen, J. Butterworth, M. Calderón de la Barca Sánchez, H. Carson, S. Chattopadhyay, D. Cebra, H.F. Chen, J.P. Cheng, M. Coddington, G. Eppley, C. Flores, F. Geurts, G.W. Hoffmann, A. Jentsch, A. Kesich, C. Li, Y.J. Li, W.J. Llope, S. Mioduszewski, Y. Mohamed, T. Nussbaum, A. Roy, L. Ruan, J.J. Schambach, Y.J. Sun, Y. Wang, K. Xin, Z. Xu, S. Yang, X.L. Zhu.
Nuclear Instruments and Methods in Physics Research A 762 (2014) 1-6.

18. Performance simulation of a MRPC-based PET imaging system.

A. Roy, A. Banerjee, **S. Biswas**, S. Chattopadhyay, G. Das, S. Saha.
2014 JINST 9 C10030 doi:10.1088/1748-0221/9/10/C10030.

19. Measurement of the spark probability of a GEM detector for the CBM muon chamber (MuCh).

S. Biswas, A. Abuhoza, U. Frankenfeld, C. Garabatos, J. Hehner, V. Kleipa, T. Morhardt, C. J. Schmidt, H. R. Schmidt, and J. Wiechula.
Nuclear Instruments and Methods in Physics Research A 800 (2015) 93-97.

20. A simple technique for gamma ray and cosmic ray spectroscopy using plastic scintillator.

Akhilesh P. Nandan, Sharmili Rudra, Himangshu Neog, **S. Biswas**, S. Mahapatra, B. Mohanty, P.K. Samal.

Nuclear Instruments and Methods in Physics Research A 824 (2016) 606 - 608.
[arXiv:1407.7181]

21. Building and commissioning of a setup to study ageing phenomena in gaseous detectors.

A. Abuhoza, H.R. Schmidt, **S. Biswas**, U. Frankenfeld, J. Hehner, C.J. Schmidt.

Nuclear Instruments and Methods in Physics Research A 824 (2016) 487 - 489.

22. Characterisations of GEM detector prototype.

Rajendra Nath Patra, Amit Nanda, Sharmili Rudra, P. Bhattacharya, Sumanya Sekhar Sahoo, **S. Biswas**, B. Mohanty, T.K. Nayak, P.K. Sahu, S. Sahu.

Nuclear Instruments and Methods in Physics Research A 824 (2016) 501 - 503. [arXiv:1505.07768]

23. Systematic measurements of the gain and the energy resolution of single and double mask GEM detectors .

S. Biswas, D. J. Schmidt, A. Abuhoza, U. Frankenfeld, C. Garabatos, J. Hehner, V. Kleipa, T. Morhardt, C. J. Schmidt, H. R. Schmidt, and J. Wiechula.

Nuclear Instruments and Methods in Physics Research A 824 (2016) 504 - 506. [arXiv:1505.07767]

24. Effects of variation of environmental parameters on the performance of Resistive Plate Chamber detectors.

K.K. Meghna, **S. Biswas**, A. Jash, S. Chattopadhyay, S. Saha.

Nuclear Instruments and Methods in Physics Research A 816 (2016) 1-8.

25. Long-term stability test of a triple GEM detector.

R.P. Adak, **S. Biswas**, S. Das, D. Ghosal, S.K. Ghosh, A. Mondal, D. Nag, T.K. Nayak, R.N. Patra, S. K Prasad, S. Raha, P.K. Sahu, S. Sahu and S. Swain.

2016 JINST 11 T10001 doi:10.1088/1748-0221/11/10/T10001.

[arXiv:1608.00562]

26. Measurement of basic characteristics and gain uniformity of a triple GEM detector.

Rajendra Nath Patra, Rama N. Singaraju, **Saikat Biswas**, Zubayer Ahammed, Tapan K. Nayak, Yogendra P. Viyogi.

Nuclear Instruments and Methods in Physics Research A 862 (2017) 25-30. [arXiv:1705.03849]

27. Design and fabrication of data logger to measure the ambient parameters in gas detector R&D.

S. Sahu, D. Nag, S. Rudra, S. Swain, **S. Biswas**, S. Das and P. K. Sahu.
2017 JINST 12 C05006 doi:10.1088/1748-0221/12/05/C05006.

28. Development of scintillator detector for detection of cosmic ray shower.
S. Biswas, S. Das, S.K. Ghosh, D. Nag and S. Raha.
2017 JINST 12 C06026 doi:10.1088/1748-0221/12/06/C06026.

29. A quad-GEM detector prototype operated at very low gas gain.
S. Swain, R. P. Adak, **S. Biswas**, J. Hehner, R. N. Patra, S. Rudra, P. K. Sahu, and
S. Sahu
2017 JINST 12 T07002 doi:10.1088/1748-0221/12/07/T07002.

30. ALICE TPC upgrade for High-Rate operations.
Saikat Biswas.
Proceedings of Science , PoS(ICPAQGP2015)094.

31. Gain Uniformity and Characteristics Study of a Triple GEM Detector.
Rajendra Nath Patra, R. N. Singaraju, **S. Biswas**, Z. Ahammed, T. K. Nayak, Y.
P. Viyogi.
IEEE Xplore: 19 October 2017, DOI: 10.1109/NSSMIC.2016.8069752.

**32. Particle identification studies with a full-size 4-GEM prototype for the
ALICE TPC upgrade.**
M.M. Aggarwal et al.
Nuclear Instruments and Methods in Physics Research A 903 (2018) 215-223.

**33. Characteristic study of a quadruple GEM detector and its comparison
with a triple GEM detector.**
Rajendra Nath Patra, Rama N. Singaraju, **Saikat Biswas**, Yogendra P. Viyogi,
Tapan K. Nayak.
Nuclear Instruments and Methods in Physics Research A 906 (2018) 37-42.

34. Study of performances of a straw tube detector with high rate.
S. Roy, N. Nandi, R.P. Adak, S. Biswas, S. Das, S.K. Ghosh, S.K. Prasad, S. Raha.
Nuclear Instruments and Methods in Physics Research A 936 (2019) 488-490.

35. A new type of RPC with very low resistive material.
S. Chakraborty, S. Chatterjee, S. Roy, A. Roy, S. Biswas, S. Das, S.K. Ghosh, S.K.
Prasad, S. Raha.
Nuclear Instruments and Methods in Physics Research A 936 (2019) 424-426.

**36. Study of uniformity of characteristics over the surface for triple GEM
detector.**

S. Chatterjee, S. Chakraborty, S. Roy, **S. Biswas**, S. Das, S.K. Ghosh, S.K. Prasad, S. Raha.

Nuclear Instruments and Methods in Physics Research A 936 (2019) 491-492.

37. Plastic scintillator detector array for detection of cosmic ray air shower.

S. Roy, S. Chakraborty, S. Chatterjee, **S. Biswas**, S. Das, S.K. Ghosh, A. Maulik, S. Raha.

Nuclear Instruments and Methods in Physics Research A 936 (2019) 249-251.

38. Stability study of gain and energy resolution for GEM detector.

S. Roy, S. Rudra, S. Shaw, S. Chatterjee, S. Chakraborty, R.P. Adak, **S. Biswas**, S. Das, S.K. Ghosh, S.K. Prasad, S. Raha.

Nuclear Instruments and Methods in Physics Research A 936 (2019) 485-487.

39. Characteristic study of a quadruple GEM detector in different electric field configurations.

Rajendra Nath Patra, Rama Narayan Singaraju, Somnath Dalal, **Saikat Biswas**, Yogendra P. Viyogi, Tapan K. Nayak.

Nuclear Instruments and Methods in Physics Research A 936 (2019) 433-435.

40. Long term stability study of triple GEM detector using different Argon based gas mixtures: an update.

S. Chatterjee, S. Roy, A. Sen, S. Chakraborty, **S. Biswas**, S. Das, S.K. Ghosh, S.K. Prasad, S. Raha.

Journal of Physics: Conference Series 1498 (2020) 012037 doi:10.1088/1742-6596/1498/1/012037.

41. Characterisation of an RPC prototype with moderate resistivity plates using tetrafluoroethane (C₂H₂F₄).

A. Sen, S. Chatterjee, S. Roy, **S. Biswas** and S. Das.

2020 JINST 15 C06055 doi:10.1088/1748-0221/15/06/C06055.

42. Spark probability measurement of a single mask triple GEM detector.

S. Chatterjee, U. Frankenfeld, C. Garabatos, J. Hehner, T. Morhardt, C. J. Schmidt, H. R. Schmidt, A. Lymanets, and **S. Biswas**.

Nuclear Instruments and Methods in Physics Research A 977 (2020) 164334.

43. Study of charging up effect in a triple GEM detector.

S. Chatterjee, A. Sen, S. Roy, K. Nivedita G, A. Paul, S. Das and **S. Biswas**.

2020 JINST 15 T09011 doi:10.1088/1748-0221/15/09/T09011. [ArXiv: 2007.11444]

44. A study of the secondary cosmic γ -ray flux in India during the Great American solar eclipse on 21st August 2017.

S. Roy, **S. Biswas**, S. Das, S.K. Ghosh, S. Raha.

Astrophys Space Sci (2020) 365:172.

45. The upgrade of the ALICE TPC with GEMs and continuous readout.

J. Adolfsson et al.

2021 JINST 16 P03022 doi:10.1088/1748-0221/16/03/P03022.

46. Stability study and time resolution measurement of straw tube detectors.

S Roy, S Jaiswal, S. Chatterjee, A Sen, S Das, S K Ghosh, S Raha, V M Lysan, G D Kekelidze, V V Myalkovsky and **S. Biswas.**

Pramana - J. Phys. (2021) 95:50.

47. Cosmic ray flux and lockdown due to COVID-19 in Kolkata - Any correlation?

A Sen, S Chatterjee, S Roy, R Biswas, S Das, S K Ghosh and **S Biswas.**

Pramana - J. Phys. (2021) 95:64.

48. Attenuation of electromagnetic radiation in Nuclear Track Detectors.

R. Bhattacharyya, A. Maulik, R.P. Adak, S. Roy, T.S. Bhattacharya, **S. Biswas**, S. Das, S. Dey, S.K. Ghosh, K. Palodhi, S. Raha, A. Singha and D. Syam.

2021 JINST 16 T06001.

49. Interplay between eclipses and soft cosmic rays.

Shreya Roy, Sayak Chatterjee, Sayan Chakraborty, **Saikat Biswas**, Supriya Das, Sanjay K. Ghosh, Sunil K. Gupta, Atul Jain, Indranil Mazumdar, Pranaba K. Nayak, and Sibaji Raha.

PoS(ICRC2021)131.

50. Research and development of scintillation detectors for the study of cosmic ray.

Saikat Biswas.

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<https://doi.org/10.51390/vajbts.v1i1.18> .

51. R&D of gas filled detectors for high energy physics experiments.

Saikat Biswas.

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<https://doi.org/10.51390/vajbts.v1i1.3> .

52. Study of charging-up effect for a single mask triple GEM detector.

S Chatterjee, A Sen, S Das, S K Ghosh and **S Biswas.**

Nuclear Instruments and Methods in Physics Research, A 1014 (2021) 165749.

53. A new technique of linseed oil coating in bakelite RPC and the first test results.

A Sen, S Chatterjee, S Das, S K Ghosh and **S Biswas**.

Nuclear Instruments and Methods in Physics Research, A 1024 (2022) 166095.

54. Characterization of a new RPC prototype using conventional gas mixture.

A Sen, S Chatterjee, S Das and **S Biswas**.

Nuclear Instruments and Methods in Physics Research, A 1045 (2023) 167572.

55. Visual investigation of possible degradation in GEM foil under test.

S Chatterjee, A Sen, S Das and **S Biswas**.

Nuclear Instruments and Methods in Physics Research, A 1045 (2023) 167573.

56. Effect of relative humidity on the long-term operation of a single mask triple GEM chamber.

S Chatterjee, A Sen, S Das and **S Biswas**.

Nuclear Instruments and Methods in Physics Research, A 1046 (2023) 167747.

57. Charging-up effect and uniformity study of a single mask triple GEM detector.

S Chatterjee, A Sen, S Das and **S Biswas**.

Nuclear Instruments and Methods in Physics Research, A 1049 (2023) 168110.

58. Development of a water-based cooling system for the Muon Chamber detector system of the CBM experiment.

Sumit Kumar Kundu, **Saikat Biswas**, Subhasis Chattopadhyay, Supriya Das, Anand Kumar Dubey, Chandrasekhar Ghosh, Ajit Kumar, Ankhi Roy, Jogender Saini, Susnata Seth, Sidharth Kumar Prasad.

Nuclear Instruments and Methods in Physics Research, A 1050 (2023) 168143.

59. Observation on the bias current variation of a single mask triple GEM chamber.

S Chatterjee, A Sen, R. Paul, S. Sahai, S Das and **S Biswas**.

2023 JINST 18 C05002.

60. Correction of the baseline fluctuations in the GEM-based ALICE TPC.

J. Alme et al.

2023 JINST 18 P11021 doi:10.1088/1748-0221/18/11/P11021.

61. Investigation of the stability in the performance of triple GEM detectors for High Energy Physics experiments.

S. Mandal, S. Chatterjee, A. Sen, S. Gope, S. Dhani, A. C. Hegde, M. Chatterjee, S. Das, **S Biswas**

11.2 National Conference Proceedings

1. Study of bakelite-based RPC detector performance with cosmic ray muons.
Saikat Biswas, S. Bhattacharya, S. Chattopadhyay, S. Saha, M.K. Sharan, Y.P. Viyogi.

Proceedings of the XVII DAE-BRNS High Energy Physics Symposium. December 2006, 335-338.

2. Development of Resistive Plate Chamber using Bakelite.

S. Biswas, S. Bhattacharya, S. Chattopadhyay, S. Saha, M.K. Sharan, Y.P. Viyogi.
Proceedings of the DAE Symposium on Nuclear Physics. Volume 52, (2007), 593-594.

3. Resistive Plate Chamber for Neutrino Oscillation Experiment.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, Y.P. Viyogi.
Proceedings of the National seminar on New Era in Nuclear and Particle Physics. (To be published) November 2008.

4. RPC with high-resistive Indian-bakelite electrodes for low-rate operation.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, Y.P. Viyogi.
Proceedings of the XVIII DAE-BRNS High Energy Physics Symposium. Volume 18, (2008), 289-291.

5. Development of silicone coated bakelite RPC.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, Y.P. Viyogi.
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6. Time resolution measurement of silicone coated bakelite Resistive Plate Chamber.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, Y.P. Viyogi.
Proceedings of the International Symposium on Nuclear Physics. Volume 54, (2009), 660-661.

7. Development of multigap RPC.

A. Banerjee, A. M. Ghosh, S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, M. R. Dutta Majumdar, S. Saha, Y.P. Viyogi.
Proceedings of the International Symposium on Nuclear Physics. Volume 54, (2009), 662-663.

8. Development of 1m × 1m bakelite Resistive Plate Chamber for INO-ICAL prototype.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, Y.P. Viyogi.
Proceedings of the National Symposium on Nuclear Instrumentation. BARC, Mumbai, (2010), 269-272.

9. Development of high resolution gas filled detector for high energy physics experiments.

Saikat Biswas.

Proceedings of the DAE Symposium on Nuclear Physics. Volume 55, (2010), 824-825.

10. Development of glass multigap RPC for PET imaging.

A. Banerjee, S. Biswas, S. Chattopadhyay, G. Das, M. R. Dutta Majumdar, S. Saha, Y.P. Viyogi.

Proceedings of the DAE Symposium on Nuclear Physics. Volume 55, (2010), 672-673.

11. New development and surface characterization of bakelite-based Resistive Plate Chamber.

Meghna K. K., S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, G. Das, C. Marick, Y.P. Viyogi, and S. Saha.

Proceedings of the DAE Symposium on Nuclear Physics. Volume 56, (2011), 1154-1155.

12. Study of the characteristics of Gas Electron Multipliers for the FAIR experiment CBM.

S. Biswas, A. Abuhoza, U. Frankenfeld, J. Hehner, C. J. Schmidt, H.R. Schmidt, M. Träger, S. Colafranceschi, A. Marinov, and A. Sharma.

Proceedings of the DAE Symposium on Nuclear Physics. Volume 56, (2011), 1068-1069.

13. Development of RPC using glued bakelite sheets.

Viwek Mertiya, Rajesh Ganai, S. Biswas, S. Chattopadhyay, G. Das, C. Marick, S. Saha, and Y. P. Viyogi.

Proceedings of the DAE Symposium on Nuclear Physics. Volume 58, (2013), 922-923.

14. Cosmic ray spectroscopy using plastic scintillator detector.

Sharmili Rudra, Akhilesh P. Nandan, Himangshu Neog, S. Biswas, S. Mahapatra, B. Mohanty, and P. K. Samal.

Proceedings of the DAE Symposium on Nuclear Physics. Volume 59, (2014), 870-871

- 15. Fabrication of Resistive Plate Chamber using Bakelite.**
Himangshu Neog, Sharmili Rudra, M. R. Bhuyan, **S. Biswas**, B. Mohanty, Rudranarayan Mohanty, P. K. Sahu, and S. Sahu.
Proceedings of the DAE Symposium on Nuclear Physics. Volume 59, (2014), 874-875
- 16. Development of Data logger for atmospheric pressure, temperature and relative humidity for gas-filled detector.**
S. Sahu, M. R. Bhuyan, **S. Biswas**, B. Mohanty, and P. K. Sahu.
Proceedings of the DAE Symposium on Nuclear Physics. Volume 59, (2014), 876-877
- 17. Detection of Gamma rays with Multigap Resistive Plate Chamber.**
A. Roy, A. Banerjee, **S. Biswas**, S. Chattopadhyay, G. Das, S. Saha.
Proceedings of the DAE Symposium on Nuclear Physics. Volume 59, (2014), 946-947.
- 18. Discharge probability measurement of the GEM detector for the CBM Muon Chamber.**
S. Biswas, A. Abuhoza, U. Frankenfeld, C. Garabatos, J. Hehner, V. Kleipa, T. Morhardt, C. J. Schmidt, H. R. Schmidt, and J. Wiechula.
Proceedings of the DAE Symposium on Nuclear Physics. Volume 60, (2015), 910-911.
- 19. Studies of characteristics of triple GEM detector for the ALICE-TPC upgrade.**
Rajendra Nath Patra, R. N. Singaraju, Z. Ahammed, **S. Biswas**, T. K. Nayak.
Proceedings of the DAE Symposium on Nuclear Physics. Volume 60, (2015), 934-935.
- 20. Development of a 4-channel TTL scaler for detector signal counting.**
S. Sahu, P. Bhattacharya, **S. Biswas**, B. Mohanty, and P. K. Sahu.
Proceedings of the DAE Symposium on Nuclear Physics. Volume 60, (2015), 958-959.
- 21. Development of triple GEM detector for a heavy ion physics experiment.**
A. Bhardwaj, K. Biswal, R. Gupta, A. Nag, A. Nanda, R. N. Patra, S. Rudra, S. S. Sahoo, P. Bhattacharya, **S. Biswas**, B. Mohanty, T. K. Nayak, P. K. Sahu, and S. Sahu.
Proceedings of the DAE Symposium on Nuclear Physics. Volume 60, (2015), 962-963.

- 22. Design and fabrication of a MHz scaler module.**
D. Nag, **S. Biswas**, and S. Das.
Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 61, (2016), 982-983.
- 23. Building of a 4-GEM prototype for ALICE-TPC upgrade.**
S. Swain, R. P. Adak, **S. Biswas**, R. N. Patra, S. Rudra, P. K. Sahu, and S. Sahu.
Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 61, (2016), 994-995.
- 24. R&D on Straw Tube detector for CBM Muon Chamber.**
R. P. Adak, **S. Biswas**, S. Chattopadhyay, S. Das, D. Ghosal, P. Ghosal, A. Mondal, D. Nag, S. Roy, and J. Saini.
Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 61, (2016), 996-997.
- 25. Stability test of the GEM detector.**
R. P. Adak, **S. Biswas**, S. Das, D. Ghosal, S. K. Ghosh, A. Mondal, D. Nag, T. K. Nayak, R. N. Patra, S. K Prasad, S. Raha, P. K. Sahu, S. Sahu, and S. Swain.
Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 61, (2016), 998-999.
- 26. Building of Gas Flow Monitor for GEM Detector.**
S. Sahu, P. K. Sahu, S. Swain, and **S. Biswas**.
Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 61, (2016), 1002-1003.
- 27. Characteristics of triple GEM detector for the ALICE TPC upgrade at CERN.**
Rajendra Nath Patra, R. N. Singaraju, **S. Biswas**, Z. Ahammed, T. K. Nayak, Y. P. Viyogi.
Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 61, (2016), 1050-1051.
- 28. Study of a Multiwire Proportional Chambers (MWPC) detector using NIM and MANAS based electronics.**
Rajendra Nath Patra, R.N. Singaraju, T. K. Ghosh, **S. Biswas**, T. K. Nayak, Y.P. Viyogi.
Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 61, (2016), 1052-1053.
- 29. Design and fabrication of a water based cooling system for the CBM Muon Chamber.**

D. Nag, A. Kumar, **S. Biswas**, S. Chattopadhyay, S. Das, A. K. Dubey, C. Ghosh, S. K. Prasad, and J. Saini.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 61, (2016), 1096-1097.

30. Study of cosmic ray with plastic scintillator detector.

S. Shaw, N. Nandi, S. Chatterjee, P. Chawla, S. Roy, R. P. Adak, **S. Biswas**, S. Das, S. K. Ghosh, and S. Raha.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 62, (2017), 1030-1031

31. Characterization of the Straw tube detector.

N. Nandi, S. Roy, R. P. Adak, **S. Biswas**, S. Das, S. K. Ghosh, S. K. Prasad, and S. Raha.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 62 (2017), 1032-1033

32. Variation of gain and energy resolution with temperature and pressure of straw tube detector.

S. Roy, N. Nandi, R. P. Adak, **S. Biswas**, S. Das, S. K. Ghosh, S. K. Prasad, and S. Raha.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 63 (2018), 1046-1047

33. Study of charging up effect in GEM detector.

Krishana Nivedita G, Ayushi Paul, Sayak Chatterjee, Shreya Roy, Arindam Sen, **Saikat Biswas**, Supriya Das.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 64 (2019), 976-977

34. R & D of Straw Tube detector for High Energy Physics experiments.

S. Roy, S. Jaiswal, S. Chatterjee, A. Sen, **S. Biswas**, S. Das, S. K. Ghosh, S. Raha, V. M. Lysan, G. D. Kekelidze, V. V. Myalkovsky.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 64 (2019), 990-991

35. Development and issues of bakelite RPC.

Arindam Sen, Rituparna Banerjee, Abhisek Roy, Sayak Chatterjee, Shreya Roy, **Saikat Biswas**, Supriya Das.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 64 (2019), 996-997

36. Feasibility study of water distribution for the CBM MuCh cooling system.
Sumit Kumar Kundu, Susnata Seth, **Saikat Biswas**, Sanjay Kumar Ghosh, Supriya Das, and Sidharth Kumar Prasad.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 65 (2021), 790-791

37. Effect of bias current variation on the gain of a single mask triple GEM chamber.

S. Sahai, R. Paul, P. Barik, A. Dandapat, S. Chatterjee, A. Sen, S. Das, and **S. Biswas**.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 66 (2022), 1186-1187

38. Behavioural change in performance of GEM detector.

S Mandal, A Sen, S Gope, S Das, **S. Biswas**.

Proceedings of the DAE-BRNS Symposium on Nuclear Physics. Volume 67 (2023), 1251-1252

11.3 Preprint

1. Development of bakelite based Resistive Plate Chambers.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, M.K. Sharan, Y.P. Viyogi.

[arXiv:0802.2766v1]

11.4 Internal notes

1. Study of the characteristics of GEM for the FAIR experiment CBM.

S. Biswas, A. Abuhoza, U. Frankenfeld, J. Hehner, C. J. Schmidt, H.R. Schmidt, M. Träger, S. Colafranceschi, A. Marinov, and A. Sharma.

CBM Progress Report 2011, 44. ISBN 978-3-9811298-9-2.

2. Optimization of a setup for ageing studies of gaseous detectors.

Alhussain Abuhoza, H.R. Schmidt, **S. Biswas**, U. Frankenfeld, J. Hehner, C. J. Schmidt.

CBM Progress Report 2011, 52. ISBN 978-3-9811298-9-2.

3. Ageing studies of GEM foils for the CBM-MUCH detector.

S. Biswas, D. J. Schmidt, A. Abuhoza, U. Frankenfeld, C. Garabatos, J. Hehner, V. Kleipa, T. Morhardt, C. J. Schmidt, H. R. Schmidt, and J. Wiechula.

CBM Progress Report 2012, 49. ISBN 978-3-9815227-0-9.

4. Design and fabrication of a data logger for atmospheric pressure, temperature and relative humidity for gas-filled detector development.
S. Sahu, M. R. Bhuyan, Sharmili Rudra, **S. Biswas**, B. Mohanty, P. K. Sahu.
RD51-NOTE-2015-004, [arXiv:1507.03575v1].

5. Building of a 4-channel TTL scaler for counting detector signals.
S. Sahu, R. P. Adak, S. Biswas, T. Mishra, D. Nag, R.N. Patra, **S. Rudra**, P. K. Sahu, S. Swain.
RD51-NOTE-2016-003, [arXiv:1608.00563].

6. Study of characteristics of Straw Tube detector for CBM Muon Chamber.
R. P. Adak, **S. Biswas**, S. Chattopadhyay, S. Das, D. Ghosal, S. K. Ghosh, A. Mondal, D. Nag, D. Paul, S. K. Prasad, S.Raha, S. Roy, and J. Saini.
CBM Progress Report 2016, 83. ISBN 978-3-9815227-4-7.

7. Study and design of a water based cooling system for MuCh CBM.
D. Nag, **S. Biswas**, S. Chattopadhyay, C. Ghosh, S. Das, S. K. Prasad, J. Saini and J. Kumar.
CBM Progress Report 2016, 90. ISBN 978-3-9815227-4-7.

8. Study of the rate handling capacity of a straw tube detector.
S. Roy, N. Nandi, R. P. Adak, **S. Biswas**, S. Das, S.K. Ghosh, S.K. Prasad, and S. Raha.
CBM Progress Report 2017, 74. ISBN 978-3-9815227-5-4.

9. Stability and uniformity study of triple GEM detector.
S. Chatterjee, S. Roy, S. Chakraborty, S. Rudra, S. Shaw, R. P. Adak, **S. Biswas**, S. Das, S. K. Ghosh, S. K. Prasad, and S. Raha.
CBM Progress Report 2018, 65. ISBN 978-3-9815227-6-1.

10. Development of RPC with low resistive material for CBM-MUCH.
S. Chakraborty, A. Sen, S. Chatterjee, S. Roy, A. Roy, **S. Biswas**, S. Das, S. K. Ghosh, S. K. Prasad, and S. Raha.
CBM Progress Report 2018, 67. ISBN 978-3-9815227-6-1.

11. Aging studies of Straw tube detector.
S. Roy, S. Chatterjee, S. Chakraborty, A. Sen, **S. Biswas**, S. Das, S. K. Ghosh, S. K. Prasad, S. Raha, V. D. Peshekhonov, V. M. Lysan, G. D. Kekelidze, and V. V. Myalkovsky.
CBM Progress Report 2018, 68. ISBN 978-3-9815227-6-1.

12. Charging-up effect in single mask triple GEM chamber.

Sayak Chatterjee, Arindam Sen, Supriya Das, Sanjay Kumar Ghosh, and **Saikat Biswas**.

CBM Progress Report 2021, 99. ISBN 978-3-9822127-0-8.

13. Performance studies of bakelite RPC with new technique of linseed oil coating.

A. Sen, S. Chatterjee, S. Das, S. K. Ghosh, and **S. Biswas**.

CBM Progress Report 2021, 106. ISBN 978-3-9822127-0-8.

14. Identification of Hadrons using PID framework.

Sumit Kumar Kundu, Arindam Sen, **Saikat Biswas**, Ankhi Roy, and Supriya Das.

CBM Progress Report 2021, 198. ISBN 978-3-9822127-0-8.

15. Study of uniformity for a single mask triple GEM detector.

S. Chatterjee, A. Sen, S. Das, and **S. Biswas**.

CBM Progress Report 2022, 100. ISBN 978-3-9822127-1-5.

11.5 Book Chapter

1. Chapter 81: Building of a Bakelite Resistive Plate Chamber Prototype.

Himangshu Neog, Sharmili Rudra, M. R. Bhuyan, **S. Biswas**, B. Mohanty, Rudra-narayan Mohanty, P. K. Sahu, and S. Sahu.

Proceedings of the XXI DAE-BRNS High Energy Physics Symposium, Springer Proceedings in Physics 174, DOI 10.1007/978-3-319-25619-1-81, Springer International Publishing Switzerland 2016.

2. Measurement of angular variation of cosmic ray flux with plastic scintillator.

S. Roy, R. P. Adak, R. Biswas, **S. Biswas**, S. Das, S. Das, D. Nag, D. Paul, S. Rudra.

Advanced Detectors for Nuclear, High Energy and Astroparticle Physics, Proceedings of ADNHEAP 2017, Springer Proceedings in Physics 201, 199 - 204, doi.org/10.1007/978 - 981 - 10 - 7665 - 7_20

ISBN 978-981-10-7664-0

3. Some aspects of characterization of GEM detector.

D. Nag, **S. Biswas**, S. Das, S. K. Ghosh, D. Paul, S. K Prasad, S. Raha, S. Roy.

Advanced Detectors for Nuclear, High Energy and Astroparticle Physics, Proceedings of ADNHEAP 2017, Springer Proceedings in Physics 201, 205 - 210 doi.org/10.1007/978 - 981 - 10 - 7665 - 7_21

ISBN 978-981-10-7664-0

4. A TTL Fast Pulse Counter for Detector Signals.

S. Swain, S. Sahu, P. K. Sahu and **S. Biswas**.

Advanced Detectors for Nuclear, High Energy and Astroparticle Physics, Proceedings of ADNHEAP 2017, Springer Proceedings in Physics 201, 211 - 216
doi.org/10.1007/978 - 981 - 10 - 7665 - 7_22

ISBN 978-981-10-7664-0

5. Design and Fabrication of a Controlled Water Based Cooling System for CBM Muon Chamber.

D. Nag, **S. Biswas**, S. Chattopadhyay, S. Das, A. K. Dubey, C. Ghosh, A. Kumar, S. K. Prasad and J. Saini.

Springer International Publishing AG, part of Springer Nature 2018, XXII DAE High Energy Physics Symposium, Springer Proceedings in Physics 203, 893-895,
https://doi.org/10.1007/978 - 3 - 319 - 73171 - 1_218

6. Study of a Triple GEM Detector Operated with Different Argon Based Gas.

Rajendra Nath Patra, R. N Singaraju, **S. Biswas**, Z. Ahammed, T. K. Nayak and Y. P. Viyogi.

Springer International Publishing AG, part of Springer Nature 2018, XXII DAE High Energy Physics Symposium, Springer Proceedings in Physics 203, 821-823,
https://doi.org/10.1007/978 - 3 - 319 - 73171 - 1_199

7. Time Resolution and Characteristic Studies of MWPC Detectors with Argon Based Gas Mixtures.

Rajendra Nath Patra, R. N. Singaraju, **S. Biswas**, T. K. Nayak and Y. P. Viyogi.

Springer International Publishing AG, part of Springer Nature 2018, XXII DAE High Energy Physics Symposium, Springer Proceedings in Physics 203, 509-511,
https://doi.org/10.1007/978 - 3 - 319 - 73171 - 1_119

8. Development of an Extended Air Shower Array at Darjeeling: An Update.

S. Roy, S. Chakraborty, S. Chatterjee, **S. Biswas**, S. Das, S. K. Ghosh, A. Maulik, and S. Raha.

Springer Nature Singapore Pte Ltd. 2021, XXIII DAE High Energy Physics Symposium, Springer Proceedings in Physics 261, 813-817,
https://doi.org/10.1007/978-981 - 33 - 4408 - 2_113

9. A Feasibility Study to Track Cosmic Ray Muons with Solid State Detectors Using GEANT4.

S. Roy, S. K. Prasad, **S. Biswas**, S. Das, S. K. Ghosh, and S. Raha.

Springer Nature Singapore Pte Ltd. 2021, XXIII DAE High Energy Physics Symposium, Springer Proceedings in Physics 261, 1187-1190,
https://doi.org/10.1007/978-981 - 33 - 4408 - 2_178

10. Performance Studies of Single Mask Triple GEM Detector for Future Heavy-Ion Experiments.

S. Chatterjee, A. Sen, S. Das, and S. Biswas.

Springer Nature Singapore Pte Ltd. 2024, XXV DAE- BRNS High Energy Physics (HEP) Symposium 2022, Springer Proceedings in Physics 304, pp. 563–567, 2024.

11.6 Book

1. Advanced Detectors for Nuclear, High Energy and Astroparticle Physics, Proceedings of ADNHEAP 2017.

Saikat Biswas, Supriya Das, Sanjay Kumar Ghosh (Editors).

Springer Proceedings in Physics 201, ISBN 978-981-10-7664-0.

12 Reviewer of the journals

1. Journal of Instrumentation
2. Nuclear Science and Techniques
3. Nuclear Instrumentation Methods for physics research A
4. Scientific Reports, Nature
5. Physica Scripta
6. Pramana- Journal of Physics

13 Conferences & Schools Attended

1. DAE-BRNS International Workshop on Large Scale Computing, VECC, India, February 8-10, 2006.

2. SERC School on Nuclear dynamics at low and medium energies and nuclear structure, VECC, India, March 13- April 2, 2006.

3. INO School at HRI, Allahabad and SINP/VECC, Kolkata, India, April-May 2006.

4. XVII DAE-BRNS High Energy Physics Symposium, IIT, Kharagpur, India, December 11-15, 2006.

5. 21st International Workshop on Weak interactions and Neutrinos, SINP, India, January 15-20, 2007.
6. DAE Symposium on Nuclear Physics at Sambalpur University, Burla, Sambalpur, India, December 11-15, 2007.
7. 20th International Conference on Ultra Relativistic Nucleus Nucleus Collisions, Quark Matter 2008, Jaipur, India, February 4 – 10, 2008.
8. IX International Workshop on Resistive Plate Chamber and related Detectors-2007, TIFR, Mumbai, India, February 13-16, 2008.
9. NENPP-08, University of Burdwan, India, November 28-29, 2008.
10. XVIII DAE-BRNS High Energy Physics Symposium, BHU Varanasi, India, December 14-18, 2008.
11. DAE Symposium on Nuclear Physics at IIT Roorkee, India, December 22-26, 2008.
12. Frontier Detectors for Frontier Physics (11th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 24-30, 2009.
13. International Symposium on Nuclear Physics. BARC, Mumbai, India, December 8-12, 2009.
14. X. Workshop on Resistive Plate Chambers and related Detectors-2010, GSI, Darmstadt, Germany, February 09-12, 2010.
15. DAE-BRNS Theme Meeting on Advanced Detectors for Imaging in Physics and Medical Diagnosis, VECC, Kolkata, India, March 4-5, 2010.
16. Workshop "The muon detection system of the Compressed Baryonic Matter Experiment at FAIR", GSI, Darmstadt, Germany, January 19-21, 2011.
17. 4th MC-PAD Training Event, Micro-pattern gas and Photo-detectors, CERN, Geneva, Switzerland, 16-18 March, 2011.
18. 19th CBM Collaboration meeting, GSI, Darmstadt, Germany, March 26-30, 2012.
19. Frontier Detectors for Frontier Physics (12th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 20-26, 2012.

20. RD51 mini week , CERN, Switzerland, June 13-15, 2012.
21. 20th CBM Collaboration meeting, VECC, Kolkata, India, September 24-28, 2012.
22. 100th Indian Science Congress, Kolkata, Calcutta University, Kolkata, India, 3-7 January 2013.
23. INO Collaboration Meeting, BARC, Mumbai, 5- 7 March 2013.
24. STAR regional meeting and discussion on phases of QCD, NISER, Bhubaneswar, India, July 8-10, 2013.
25. Second Conclave of DST-Ramanujan Fellows, December 13-14, 2013, Pune.
26. IWAD and 14th RD51 Collaboration Meeting, 27-31 October, 2014, VECC, Kolkata.
27. RD51 mini week , CERN, Switzerland, December 08-11, 2014.
28. 7th International Conference on Physics and Astrophysics of Quark Gluon Plasma (ICPAQGP 2015), 2-6 February, 2015, VECC, Kolkata, India.
29. Frontier Detectors for Frontier Physics (13th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 24-30, 2015.
30. CBM-Electronics workshop: 11-12 January 2016, BI-Darjeeling.
31. FAIR Detector Workshop: 19-20 February 2016, Puri, Odisha.
32. 27th CBM Collaboration meeting, GSI, Darmstadt, Germany, April 11-15, 2016.
33. National Conference on "Advanced Detectors for Nuclear, High Energy and Astroparticle Physics", 15-17 February 2017, Bose Institute, Kolkata, India.
34. INSTR17: International Conference "Instrumentation for Colliding Beam Physics", Budker Institute of Nuclear Physics, and Novosibirsk State University, Novosibirsk, Russia 27 February - 3 March, 2017
35. ALICE-India Collaboration meeting, 26-29 October 2017, Jammu University

36. CBM-India meeting, 15-17 February 2018, Falta.
37. 31st CBM Collaboration meeting, GSI, Darmstadt, Germany, March 19-23, 2018.
38. Frontier Detectors for Frontier Physics (14th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 27- June 02, 2018.
39. RD51 mini week , CERN, Switzerland, December 04-06, 2018.
40. FAIR week, Vigyan Samagam, Nehru Science Centre, Mumbai, 24-30 June, 2019.
41. FAIR week, Vigyan Samagam, VITM, Bengaluru, 3-7 September, 2019.
42. FAIR week, Vigyan Samagam, Science City, Kolkata, 19-23 November, 2019.
43. Vth ALICE-STAR-India school on Quark Gluon Plasma, IOP, Bhubaneswar, November 9, 2022.
44. XXV DAE-BRNS HEP Symposium, IISER Mohali, Punjab, December 14, 2022.
45. Mega Science Expo, IISF 2022 at MANIT, Bhopal during 21-24 January 2023.
46. Attended the "FAIR Industry Meet", 12-13 April 2023 at Bose Institute.
47. Represented Bose Institute in the "Government Achievements and Schemes Expo - 2023" at Pragati Maidan, New Delhi, 21-23 July 2023.
48. Represented Bose Institute in the "26th National Exhibition" at Central Park, Karunamoyee, Kolkata, 24 - 27 August 2023.
49. Represented Bose Institute in the "10th Indian National Exhibition-cum-Fair 2023" at KMDA ground, Patuli, Kolkata-700094, 6 - 10 December 2023.
50. Attended "Meeting on the physics of ALICE, CBM and STAR" (MPACS) during 29-30 January 2024 at VECC, Kolkata.

51. Represented Bose Institute in the DST's 1st National Scientific & Technical Rajbasha Seminar 2024 at ARCI, Hyderabad during 21-22 March 2024.

52. Attended 2nd DRD1 Collaboration Meeting & Topical Workshop on Electronics for Gaseous Detectors held during 17–21 Jun 2024, CERN (Online mode).

14 Talks Given

1. XVII DAE-BRNS High Energy Physics Symposium, IIT Kharagapur, India, December 11-15, 2006.

Title: Study of bakelite-based RPC detector performance with cosmic ray muons.

2. INO collaboration meeting, DU, Delhi, India, March 9-10, 2007.

Title: Development of Bakelite RPC.

3. Indo-Japan collaboration meeting, SINP, Kolkata, India, May 2007.

Title: Development of Bakelite RPC in SINP/VECC.

4. IHEP, China, June 2007.

Title: Resistive Plate Chambers for Experiments at India-based Neutrino Observatory (INO).

5. DAE Symposium on Nuclear Physics at Sambalpur University, Burla, Sambalpur, India, December 11-15, 2007.

Title: Development of Resistive Plate Chamber using Bakelite.

6. IX International Workshop on Resistive Plate Chamber and related Detectors-2007, TIFR, Mumbai, India, February 13-16, 2008.

Title: Performances of linseed oil-free bakelite RPC prototypes with cosmic ray muons.

7. INO collaboration meeting, BARC, Mumbai, India, April 13-14, 2008.

Title: Performances of silicone coated bakelite RPC.

8. NENPP-08, University of Burdwan, India, November 28-29, 2008.

Title: Resistive Plate Chamber for neutrino oscillation experiment.

9. XVIII DAE-BRNS High Energy Physics Symposium, BHU Varanasi, India, December 14-18, 2008.

Title: RPC with high-resistive Indian-bakelite electrodes for low-rate operation.

10. DAE Symposium on Nuclear Physics at IIT Roorkee, India, December 22-26, 2008.

Title: Development of silicone-coated Bakelite RPC.

11. INO collaboration meeting, PU, Chandigarh, India, November 23-24, 2009.
Title: Development of Bakelite RPC and Status of INO prototype.

12. X. Workshop on Resistive Plate Chambers and related Detectors-2010, GSI, Darmstadt, Germany, February 09-12, 2010.

Title: Performances of silicone coated high resistive bakelite RPC.

13. DAE-BRNS Theme Meeting on Advanced Detectors for Imaging in Physics and Medical Diagnosis, VECC, Kolkata, India, March 4-5, 2010.

Title: Development of Bakelite RPC for INO-ICAL prototype.

14. India-based Neutrino Observatory National Meeting 2010. IIT Kharagpur, India, May 3-5, 2010.

Title: Latest results on the development of Bakelite RPC.

15. India-based Neutrino Observatory National Meeting 2010. IIT Kharagpur, India, May 3-5, 2010.

Title: Status of INO Prototype Lab at VECC.

16. Workshop "The muon detection system of the Compressed Baryonic Matter Experiment at FAIR", GSI, Darmstadt, Germany, January 19-21, 2011.

Title: Towards Realistic MUCH/GEM Detector Tests.

17. 19th CBM Collaboration meeting, GSI, Darmstadt, Germany, March 26-30, 2012.

Title: Summary of the beam test at CERN SPS, October 2011.

18. CAPSS Seminar, Bose Institute, Kolkata, April 19, 2012.

Title: Gas filled detectors for high energy physics experiments.

19. RD51 mini week , CERN, Switzerland, June 13-15, 2012.

Title: Spark probability measurement for GEM for CBM.

20. 20th CBM Collaboration meeting, VECC, Kolkata, India, September 24-28, 2012.

Title: R&D of GEM at GSI: an update.

21. MPGD 2013 & 11th RD51 collaboration meeting, Parainfo building,

Zaragoza, Spain, 1-6 July 2013 (Through video).

Title: Development of GEM for the CBM MUCH Detector.

22. STAR regional meeting and discussion on phases of QCD, NISER, Bhubaneswar, India, July 8-10, 2013.

Title: Development of Muon Telescope Detector (MTD) at VECC.

23. IWAD and 14th RD51 Collaboration Meeting, 27-31 October, 2014, VECC, Kolkata.

Title: Proposal to join RD51 collaboration of NISER.

24. RD51 mini week , CERN, Switzerland, December 08-11, 2014.

Title: Activities on GEM detector development at NISER-IoP, India.

25. 7th International Conference on Physics and Astrophysics of Quark Gluon Plasma (ICPAQGP 2015), 2-6 February, 2015, VECC, Kolkata, India.

Title: ALICE TPC upgrade for High-Rate operations.

26. FAIR Detector Workshop: 19-20 February 2016, Puri, Odisha.

Title: GEM detector development for CBM at GSI.

27. National Science Day celebration, 29 February 2016, Maulana Azad College, Kolkata.

Title: Advanced gaseous detectors for high energy physics experiments.

28. SXC Workshop on Astroparticle Physics: 26-30 May 2016, Bose Institute, Darjeeling.

Title: (i) Detectors in experimental high energy physics.

(ii) Advanced gaseous detectors for high energy physics experiments.

29. Special Task Force meeting, September 2-4, 2016, BARC, Mumbai.

Title: ALICE TPC Upgrade with GEM detectors for high rate operations.

30. INSTR17: International Conference "Instrumentation for Colliding Beam Physics", Budker Institute of Nuclear Physics, and Novosibirsk State University, Novosibirsk, Russia 27 February - 3 March, 2017

Title: Study of some aspects of straw tube detectors for CBM-MuCh.

31. Special Task Force meeting, August 22-23, 2017, VECC, Kolkata.

Title: ALICE TPC Upgrade with GEM: Infrastructure and readiness at Bose Institute.

32. ALICE-India Collaboration meeting, 26-29 October 2017, Jammu Univer-

sity

Title: Detector development at Bose Institute.

33. CBM-India meeting, 15-17 February 2018, Falta.

Title: GEM production plan and status at Bose Institute.

34. 31st CBM Collaboration meeting, 19-23 March 2018, GSI, Germany.

Title: Detector development for CBM-MUCH at Bose Institute.

35. ALICE Collaboration meeting, 26-29 March 2018, VECC.

Title: R&D at Bose Institute : Updates.

36. RD51 mini week , CERN, Switzerland, December 04-06, 2018.

Title: Stability study of triple GEM detector with radioactive source.

37. FAIR week, Vigyan Samagam, Nehru Science Centre, Mumbai, 24-30 June, 2019.

Title: Detectors for Physics and Medical Imaging: an introduction.

38. Workshop on Dynamics of QCD matter, NISER, Bhubaneswar, 15-17 August, 2019.

Title: Detectors for Muon chamber of CBM experiment.

39. FAIR week, Vigyan Samagam, VITM, Bengaluru, 3-7 September, 2019.

Title: Detectors for Physics and Imaging: an introduction.

40. FAIR week, Vigyan Samagam, Science City, Kolkata, 19-23 November, 2019.

Title: Detectors for Physics and Imaging: an introduction.

41. INO week, Vigyan Samagam, Science City, Kolkata, 5 December, 2019.

Title: Detectors for High Energy Physics.

42. INO online lecture series for general audience, with Q&A session, April 29 2020.

Title: Detectors for High Energy Physics.

43. IV ALICE-India School on Quark-Gluon Plasma, November 8 - November 20, 2021.

Title: Building of Detectors for High Energy Physics Experiments.

44. V ALICE-STAR India school on Quark-Gluon Plasma, 01-12 November 2022, Institute of Physics (IOP) Bhubaneswar.

Title: Advanced gaseous detectors for heavy-ion experiments and ALICE 3.

45. XXV DAE-BRNS HEP SYMPOSIUM, IISER Mohali, December 12-16, 2022.

Title: Performance studies of GEM detector for future Heavy-Ion experiments.

46. First MuonID Mexico Meeting (for ALICE 3), 15-16 December 2022.

Title: RPC activities for the India-based Neutrino Observatory and Present RPC activities at Bose Institute.

47. Invited talk at Serampore College on 22 March 2023.

Title: “FAIR: Universe in the laboratory”.

48. Delivered a lecture in an outreach program at Bose Institute on 01 September 2023.

Title: “ Bose Institute’s contribution to the European Organisation for Nuclear Research (CERN)”.

49. Faculty Colloquium at Bose Institute on 22 September 2023.

Title: “FAIR: Universe in the laboratory”.

50. Invited talk at IIT Jodhpur on 06 October 2023.

Title: “FAIR: Universe in the laboratory”.

51. Invited talk in the Meeting on Physics of ALICE, CBM and STAR (MPACS), VECC, 29-30 January 2024.

Title: “Gaseous Detectors from INO to CBM via STAR and ALICE”.

52. Talk in DST’s 1st National Scientific & Technical Rajbasha Seminar 2024 at ARCI, Hyderabad during 21-22 March 2024.

Title: ”FAIR: Prayogshala me Brahmaand”.

53. Talk in 2nd DRD1 Collaboration Meeting & Topical Workshop on Electronics for Gaseous Detectors held during 17–21 Jun 2024, CERN.

Title: “Stability study of GEM detector and Performance study of a new RPC prototype”.

54. Delivered a lecture in an outreach program to a group of students and teachers of Calcutta International School on 18.06.2024.

Title: “Bose Institute’s contribution to the European Organisation for Nuclear Research (CERN)”

55. Presented the a talk in the 41st FAIR Council meeting at FAIR, Germany

on 9 July 2024 to welcome the FAIR Council to Kolkata for the “42nd FAIR Council meeting in Kolkata during 3-4 December 2024”.

56. Presented the status of Indian in-kind contribution to FAIR, Germany in the Bose Institute-FAIR Steering committee meeting in FAIR, Germany on 9 July 2024.

57. Presented talk in the 44th CBM Collaboration meeting at Prague on 17 September, 2024 (online mode).

Title: “Straw tube detector for CBM-MuCh”.

15 Poster Presentation

1. Frontier Detectors for Frontier Physics (11th Pisa meeting on advanced detectors), La Biodala, Isola d’Elba, Italy, May 24-30, 2009.

Title: Study of timing properties of single gap high-resistive bakelite RPC.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, Y.P. Viyogi.

2. International Symposium on Nuclear Physics. BARC, Mumbai, India, December 8-12, 2009.

Title: Time resolution measurement of silicone coated bakelite Resistive Plate Chamber.

S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, S. Saha, Y.P. Viyogi.

3. International Symposium on Nuclear Physics. BARC, Mumbai, India, December 8-12, 2009.

Title: Development of multigap RPC.

A. Banerjee, A. M. Ghosh, S. Biswas, S. Bhattacharya, S. Bose, S. Chattopadhyay, M. R. Dutta Majumdar, S. Saha, Y.P. Viyogi.

4. Frontier Detectors for Frontier Physics (12th Pisa meeting on advanced detectors), La Biodala, Isola d’Elba, Italy, May 20-26, 2012.

Title: Study of the characteristics of GEM detectors for the future FAIR experiment CBM.

S. Biswas, A. Abuhoza, U. Frankenfeld, J. Hehner, C. J. Schmidt, H.R. Schmidt, M. Träger, S. Colafranceschi, A. Marinov, and A. Sharma.

5. Frontier Detectors for Frontier Physics (12th Pisa meeting on advanced detectors), La Biodala, Isola d’Elba, Italy, May 20-26, 2012.

Title: Development of Multi-gap Resistive Plate Chamber (MRPC) for Medical Imaging.

A. Banerjee, A. Roy, S. Biswas, S. Chattopadhyay, G. Das, S. Pal.

6. Frontier Detectors for Frontier Physics (12th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 20-26, 2012.

Title: Setup optimization toward accurate ageing studies of gas filled detectors.

A. Abuhoza, H.R. Schmidt, S. Biswas, U. Frankenfeld, J. Hehner, C. J. Schmidt.

7. 7th International Conference on Physics and Astrophysics of Quark Gluon Plasma (ICPAQGP 2015), 2-6 February, 2015, VECC, Kolkata, India.

Title: Development of a triple GEM detector prototype.

Rajendra Nath Patra, Amit Nanda, Sharmili Rudra, S. Biswas, B. Mohanty, T. K. Nayak, P. K. Sahu, S. Sahu.

8. Frontier Detectors for Frontier Physics (13th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 24-30, 2015.

Title: A simple technique for gamma ray and cosmic ray spectroscopy using plastic scintillator.

RUDRA Sharmili, NANDAN Akhilesh P., NEOG Himangshu, BISWAS S., MAHAPATRA S., MOHANTY B., SAMAL, P.K.

9. Frontier Detectors for Frontier Physics (13th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 24-30, 2015.

Title: Characterizations of GEM detector prototype.

Rajendra Nath Patra, Amit Nanda, Sharmili Rudra, P. Bhattacharya, Sumanya Sekhar Sahoo, S. Biswas, B. Mohanty, T. K. Nayak, P. K. Sahu, S. Sahu.

10. Frontier Detectors for Frontier Physics (13th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 24-30, 2015.

Title: Systematic measurements of the gain and the energy resolution of single and double mask GEM detectors.

Saikat Biswas, D. J. Schmidt, A. Abuhoza, U. Frankenfeld, C. Garabatos, J. Hehner, V. Kleipa, T. Morhardt, C. J. Schmidt, H. R. Schmidt, J. Wiechula.

11. Frontier Detectors for Frontier Physics (13th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 24-30, 2015.

Title: Building and Commissioning of a Setup to Study Ageing Phenomena in Gaseous Detectors.

Alhussain Abuhoza, S. Biswas, U. Frankenfeld, J. Hehner, C. J. Schmidt, H.R. Schmidt.

12. INSTR17: International Conference "Instrumentation for Colliding Beam Physics", Budker Institute of Nuclear Physics, and Novosibirsk State University, Novosibirsk, Russia 27 February - 3 March, 2017

Title: Design and fabrication of a data logger for atmospheric pressure, temperature and relative humidity for gas-filled detector development.

S. Sahu, D. Nag, S. Rudra, S. Swain, S. Biswas, S. Das, P. K. Sahu.

13. INSTR17: International Conference "Instrumentation for Colliding Beam Physics", Budker Institute of Nuclear Physics, and Novosibirsk State University, Novosibirsk, Russia 27 February - 3 March, 2017.

Title: Development of scintillator detector for detection of cosmic ray shower.

S. Biswas, S. Das, S. K. Ghosh, D. Nag, S. Raha, S. Singh.

14. Frontier Detectors for Frontier Physics (14th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 27-June 02, 2018.

Title: Stability study of gain and energy resolution for GEM detector.

S. Roy, S. Rudra, S. Shaw, S. Chakraborty, S. Chatterjee, R. P. Adak, S. Biswas, S. Das, S. K. Ghosh, S. K. Prasad, S. Raha.

15. Frontier Detectors for Frontier Physics (14th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 27-June 02, 2018.

Title: Plastic scintillator detector array for detection of cosmic ray air shower.

S. Roy, S. Shaw, N. Nandi, S. Chatterjee, S. Chakraborty, P. Chawla, R. P. Adak, S. Biswas, S. Das, S. K. Ghosh, A. Maulik, S. Raha, S. Singh.

16. Frontier Detectors for Frontier Physics (14th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 27-June 02, 2018.

Title: A new type of RPC with very low resistive plates.

S. Chakraborty, S. Chatterjee, S. Roy, A. Roy, S. Biswas, S. Das, S. K. Ghosh, S. K. Prasad, S. Raha .

17. Frontier Detectors for Frontier Physics (14th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 27-June 02, 2018.

Title: Study of uniformity of characteristics over the surface for triple GEM detector.

S. Chatterjee, S. Chakraborty, S. Roy, S. Biswas, S. Das, S. K. Ghosh, S. K. Prasad, S. Raha.

18. Frontier Detectors for Frontier Physics (14th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 27-June 02, 2018.

Title: Study of performances of a straw tube detector with high rate.

S. Roy, N. Nandi, R. P. Adak, S. Biswas, S. Das, S. K. Ghosh, S. K. Prasad, S. Raha.

19. Frontier Detectors for Frontier Physics (14th Pisa meeting on advanced detectors), La Biodala, Isola d'Elba, Italy, May 27-June 02, 2018.

Title: Comparative study of triple and quadruple GEM detectors and effect of drift field on the electron transparency.

Rajendra Nath Patra, Saikat Biswas, Rama Narayana Singaraju, Yogendra Pathak Viyogi, Tapan K. Nayak

20. 29th International Conference on Ultra-relativistic Nucleus-Nucleus Collisions (QM 2022) on 8.4.2022.

Title: New method of linseed oil coating for Bakelite RPCs for Heavy-ion experiments.

21. 15th Pisa meeting on Advanced detectors-Edition 2022, May 22-28, 2022.
Title: Characterisation of a new RPC prototype using conventional gas.

22. 15th Pisa meeting on Advanced detectors-Edition 2022, May 22-28, 2022.
Title: Effect of relative humidity on the long-term operation of a single mask triple GEM chamber.

23. 15th Pisa meeting on Advanced detectors-Edition 2022, May 22-28, 2022.
Title: Visual investigation of possible degradation in GEM foils under test.

24. XXV DAE-BRNS HEP Symposium at IISER Mohali, Punjab, December 15, 2022.

Title: Bakelite RPC prototype with new method of linseed oil coating.

25. XXV DAE-BRNS HEP Symposium at IISER Mohali, Punjab on December 16, 2022.

Title: Investigation on the detector current variation for a single mask triple GEM prototype.

26. International Conference on Physics and Astrophysics of Quark Gluon Plasma (ICPAQGP-2023), 7-10 February 2023, Puri, Odisha.

Title: A new method of linseed oil coating in bakelite RPC.

16 Seminars / Symposia organized

1. FAIR Detector Workshop: 19-20 February 2016, Puri, Odisha. (Organized along with Dr. Supriya Das, CAPSS).

2. Convener of National Conference on "Advanced Detectors for Nuclear, High Energy and Astroparticle Physics", 15-17 February 2017, Bose Institute, Kolkata, India.

3. Convener of 34th CBM Collaboration meeting, UAC, Bose Institute, 29 September - 3 October, 2019. Before the collaboration meeting there were a 2-day CBM software school and 1-day CBM Junior's day.
4. Volunteer Coordinator for FAIR project, Vigyan Samagam, Mumbai, Bengaluru, Kolkata, Delhi. June, 2019- March, 2020.
5. Convener of FAIR week at Vigyan Samagam, Mumbai, Bengaluru, Kolkata.
6. Working as Institute representative for JEST 2020, JEST 2021 (for The University of Burdwan centre), JEST 2022, JEST 2023 (for Burdwan centre).
7. Bose Institute along with NISER and VECC organized CBM theme meeting at NISER during 3-4 February 2023.
8. Organised the "FAIR Industry Meet", 12-13 April 2023 at Bose Institute.
9. Organised an outreach program at UAC, Bose Institute to a group of students and teachers of Calcutta International School, 18 June 2024.