

## Appendix 1.2 – Collaborative Research Student Agreement



### Collaborative Research Student Agreement

This agreement should be read in conjunction with the Memorandum of Agreement (Partnership Agreement) between The Queen's University Belfast (QUEEN'S) and Tezpur University (TEZPUR), signed on 3 September 2019.

#### 1. The Partners

- (i) Name of School: *QUEEN'S UNIVERSITY BELFAST*
- (ii) Name of School: *TEZPUR UNIVERSITY*

#### 2. The Student

- (iii) Name of student: *Jyotirup Sarma*
- (iv) Student's nationality: *Indian*
- (v) Outline of student's qualifications: *BSc Physics (1<sup>st</sup> class, Cotton University, India), MSc Physics (1<sup>st</sup> class, Tezpur University)*

#### 3. The Research

Research Title: **Ion acceleration and related phenomena in laser-plasma interaction**

The interaction of high power laser with matter in the plasma state has opened up a new and promising field of research in physics. The study of this field not only enhances the understanding of how radiation couples energy into matter, but can also provide novel information of relevance to astrophysical events, e.g. in areas such as particle acceleration, creation of particle-antiparticle, magnetic field generation. Through laser-irradiation of suitable targets, it is possible to achieve high accelerating gradients potentially leading to reduced accelerator size and cost as compared to conventional accelerators. In the last few decades, laser technology has made tremendous progress.

A current aim of research on ion acceleration is to attain significantly high (>100 MeV) mono-energetic ions with good conversion efficiency by varying various plasma and laser parameters. In this project we intend to investigate ion acceleration in overdense and near critical plasma using both linearly and circularly polarized light and explore the effects of plasma parameters, target size, structure and shape, density etc. and optimise these parameters to obtain monoenergetic ion beam by using Particle In Cell (PIC) simulations. Targeted three dimensional PIC simulations will be highly beneficial to explore the complex physics underlying these intense laser-plasma interaction. Multi-species gaseous/cryogenic targets may also be used to increase the conversion efficiency of laser to ions.

All related Intellectual Property Rights and/or Copyright arising from the Research shall be assigned as per standard protocol at QUEEN'S for postgraduate research.

**4. The Supervisors**

The following Supervisors shall be assigned to the Student:

*Marco Borghesi, of SCHOOL of Mathematics and Physics– QUEEN'S (Principal Supervisor)*

*Nilakshi Das, of Department of Physics – TEZPUR (Co Supervisor)*

*Satyabrata Kar, of SCHOOL of Mathematics and Physics – QUEEN'S (Third Supervisor)*

Both Supervisors commit themselves to duly exercise their duties as PhD Co-supervisors with the Student. Any required changes to these personnel shall be managed in accordance with established protocols at QUEEN'S. Supervisor's Rights and Responsibilities as outlined in Appendix 1.4 and QUEEN'S Study Regulations for Research Degree Programme:

<http://www.qub.ac.uk/directorates/AcademicStudentAffairs/AcademicAffairs/GeneralRegulations/StudyRegulations/StudyRegulationsforResearchDegreeProgrammes/>.

**5. Registration**

The Student shall be registered at QUEEN'S for the duration of the research period, commencing *16 September 2019*, in accordance with normal requirements and, as such, shall be entitled to the privileges and subject to the duties of students of the University. The Student will be registered to the School within which the Principal Supervisor is based.

The Student must register at the start of their research programme and at the beginning of every subsequent academic year at QUEEN'S. Registration in the second and subsequent years is subject to satisfactory progress reports.

The Student shall comply with the University's training requirements, the training requirements of their funding body and with any compulsory or recommended training requirements put in place by the School in which they are registered at QUEEN'S.

In registering to the University, the Student will be subject to, and must abide by, all the rules and regulations of QUEEN'S and the immigration rules for the United Kingdom.

**6. Residency Requirements**

It is expected that the Student shall spend the following periods of time at each institution:

*September 2019 - September 2022: Queen's University Belfast*

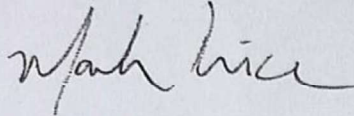
Any subsequent change(s) to the above dates shall be mutually agreed and approved in accordance with normal protocols in place at each institution, as required. At a minimum, students are expected to be in attendance at QUEEN'S annually to take part in formal annual reviews of progress and to undertake the oral examination after the thesis has been submitted.

The Student will be responsible for housing, travel, medical insurance (if applicable), and any related subsistence costs incurred during these periods and in relation to the duration of the PhD programme more generally.

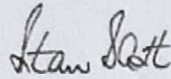
12. **Approval and Signature**

Signed for and on behalf of:

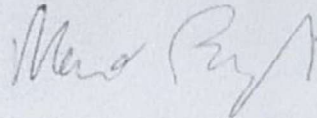
THE QUEEN'S UNIVERSITY OF BELFAST



Professor Mark Price  
Faculty Pro-Vice-Chancellor  
Date: 03/09/2019

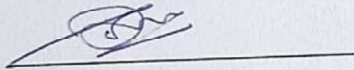


Professor Stan Scott  
University Co-ordinator  
Date: 03/09/2019

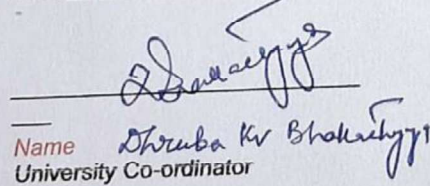


Professor Marco Borghesi  
Principal Supervisor  
Date: 3/09/2019

TEZPUR UNIVERSITY



Name  
Pro-Vice-Chancellor  
Date: 9/9/2019



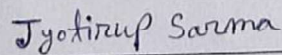
Name Shreba K Bhatnagar  
University Co-ordinator  
Date: 9/9/19



Name Prof. Nilakshi Das.  
Co-Supervisor

Date: 09-09-2019

Read and acknowledged by the Student:



Name JYOTIRUP SARMA  
Date: 09-09-2019