

## PhD studentship (Full-time)

Institution	Xi'an Jiaotong-Liverpool University, China
School	School of Mathematics and Physics
Supervisors	Principal supervisor: Dr. Tiago Carlos Adorno de Freitas (XJTLU) Co-supervisor: Professor Mattheus (Thijs) Kouwenhoven (XJTLU) Co-supervisor: Dr. Juri Smirnov (UoL)
Application Deadline	Open until the position is filled
Funding Availability	Funded PhD project (world-wide students)
Project Title	Study of zero-order processes in Quantum Electrodynamics with unstable vacuum via asymptotic methods.
Contact	Please email <a href="mailto:Tiago.Adorno@xjtlu.edu.cn">Tiago.Adorno@xjtlu.edu.cn</a> (XJTLU principal supervisor's email address) with a subject line of the PhD project title.  The principal supervisor's profile is linked here: <a href="https://www.xjtlu.edu.cn/en/study/departments/school-of-mathematics-and-physics/physics/department-staff/academic-staff/staff/tiago-adorno">https://www.xjtlu.edu.cn/en/study/departments/school-of-mathematics-and-physics/physics/department-staff/academic-staff/staff/tiago-adorno</a>

### **Requirements:**

The candidate should have a first class or upper second class honours degree, or a master's degree (or equivalent qualification), in Physics

Evidence of good spoken and written English is essential. The candidate should have an IELTS score of **6.5 or above**, if the first language is not English. This position is open to all qualified candidates irrespective of nationality.

### **Degree:**

The student will be awarded a PhD degree from the University of Liverpool (UK) upon successful completion of the program.

### **Funding:**

The PhD studentship is available for three years subject to satisfactory progress by the student. The award covers tuition fees for three years (currently equivalent to RMB 99,000 per annum). It also provides up to RMB 16,500 to allow participation at international conferences during the period of the award. The scholarship holder is expected to carry out the major part of his or her research at XJTLU in Suzhou, China. However, he or she is eligible for a research study visit to the University of Liverpool up to six months, if this is required by the project.

### **Project Description:**

This research project addresses problems in Quantum Electrodynamics with external

electromagnetic fields strong enough to stimulate electron-positron pair production from the vacuum. We propose calculating pair production characteristics by external fields whose analytical form does not admit to solving relativistic wave equations exactly but permits analytical consideration via asymptotic methods. More precisely, the plan includes employing uniform asymptotic methods to solve differential equations that describe wave functions of elementary particles approximately. Using corresponding asymptotic solutions, we shall compute physical quantities characterizing vacuum instability using a generalization of Furry's representation, which, to date, is the most rigorous nonperturbative approach to this purpose. The objective is to construct a consistent formulation for studying fundamental physical problems in field theories with strong fields, free of limitations inherent to conventional asymptotic methods.

For more information about doctoral scholarship and PhD programme at Xi'an Jiaotong-Liverpool University (XJTLU), please visit

<https://www.xjtlu.edu.cn/en/admissions/global/entry-requirements/>

<https://www.xjtlu.edu.cn/en/admissions/global/fees-and-scholarship>

#### **How to Apply:**

Interested applicants are advised to email [Tiago.Adorno@xjtlu.edu.cn](mailto:Tiago.Adorno@xjtlu.edu.cn) (XJTLU principal supervisor's email address) the following documents for initial review and assessment (please put the project title in the subject line).

- CV
- Two formal reference letters
- Personal statement outlining your interest in the position
- Certificates of English language qualifications (IELTS or equivalent)
- Full academic transcripts in both Chinese and English (for international students, only the English version is required)
- Verified certificates of education qualifications in both Chinese and English (for international students, only the English version is required)
- PDF copy of Master Degree dissertation (or an equivalent writing sample) and examiners reports available