XJTLU-XJTU-UoL Joint Doctoral Supervision Project (Full-time)

Reference No.	SFXJTU2505
XJTLU School	Academy of JITRI
PhD Programme	Electrical and Electronic Engineering
Supervisors	XJTLU supervisor: Professor Huiqing Wen XJTU supervisor: Dr Yingjie He UoL supervisor: Dr Lin Jiang
Project Title	Research on Modulation and Control of Low Switching Frequency High Power Grid Connected Inverter 低开关频率并网逆变器暂态优化控制技术研究
Application Deadline	Open until the position is filled

Requirements:

A UK first-class or upper second-class honours Bachelor's degree and a UK Master's degree with Merit (or their equivalent) are required for PhD admissions. Exceptional candidates holding only a Bachelor's degree may be considered on an individual basis.

Evidence of good spoken and written English is essential. The candidate should have an IELTS (or equivalent) score of 6.5 or above, if the first language is not English.

For more information about entry requirements and admission procedures of PhD programme at XJTLU, please visit:

Entry Requirement - Xi'an Jiaotong-Liverpool University

How to Apply - Xi'an Jiaotong-Liverpool University

Programme Structure:

Doctoral students in the joint programme are registered with both XJTLU and the UoL. Upon successful completion of the programme, the students will be awarded a PhD degree from University of Liverpool.

During their doctoral studies at XJTLU, students are expected to conduct research at XJTU as visiting students. Additionally, students have the opportunity to apply for a three to six-month research visit to UoL.

Project Description:

In recent years, with the gradual development of variable speed pumping and storage, and other new energy equipment, there has been a growing focus on the research of high-power grid-connected inverters with capacities about 20 megawatts. However, the switching frequency in such applications usually only reaches about 600Hz. This low switching frequency leads to significant nonlinearities in the modulation link and results in output currents with high

harmonic content and low frequencies. Additionally, the coupling of the control loop, LCL filter resonance peaks, and sideband harmonics generated by modulation becomes more pronounced, making the design of filter and control parameters more challenging and leading to poor output performance and potential system instability. Based on these factors, this project proposes a study on the co-optimization of three-level LCL grid-connected inverters through accurate analysis of low switching frequency PWM. This study includes the following aspects: ①Researching on SVPWM optimization of sideband harmonics in low switching frequency grid connected inverters; ② Analyzing low switching frequency grid-connected inverters based on the harmonic state-space (HSS) model to characterize PWM modulation and study the coupling between modulated harmonics, filter resonance peaks, and the control loop; ③ Researching on the stability, collaborative optimization of control and filter parameters in low switching frequency grid-connected inverters. Successful breakthroughs in these technologies will further reduce the cost and size of low switching frequency grid-connected inverters while improving their output performance. This research holds significant theoretical value and promising application prospects for advancing the industrial application of high-power grid-connected inverters.

Joint Supervisory Team:

XJTLU supervisor: Professor Huiqing Wen

XJTU supervisor: Dr Yingjie He

UoL supervisor: Dr Lin Jiang

How to Apply:

Interested applicants are advised to email Professor Huiqing Wen (Huiqing.wen@xjtlu.edu.cn or Dr Yingjie He (yjhe@mail.xjtu.edu.cn) the following documents for initial review and assessment (Please include 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