Report: BQIT23 -Bristol Quantum Information Technology Workshop 2023

Quantum Engineering Technology (QET)Labs, University of Bristol, UK

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10th annual conference BQIT-23 organised by Quantum Engineering Technology Labs (QETlabs) Universityof Bristol, Uk.

1 Introduction

BQIT-23 was 10th annual quantum information technology conference organised by QETLabs University of Bristol, Uk. Researchers participated and presented their research work in the field of quantum technology. There were around 250 young researchers as participants and around 40 experts speakers from academia and industry. Most of the speakers and participants were involved in the advanced research in quantum photonics. The conference also covered topics like

- Quantum integrated photonic chips.
- Quantum foundation.
- Quantum dots.
- Satellite quantum communication (Photonics).
- Interferometry.
- Dark matter and gravity waves.
- Quantum computing.

Lab tour was also arranged where we got opportunity to see quantum integrated photonic processor, photonic quantum refregirators, control and readout devices.

2 Speakers

Over all workshop covered the broad scope of quantum physics but many speakers were related to Photonics field. Huge research and development is carried-out in the field of quantum photonics due to its applications in the field of electronnic and communication. Some of the talks also highlighted the possibility of computation obeying the laws of quantum physics.

2.1 Few focused presentations

Gavin Morley (University of Warwick, Uk) presented his talk on the topic *Nitrogen-vacancy centres in diamond for sensitive magnetometry and (eventually) a test of quantum gravity.*
Giulia Rubino (University of Bristol) presented on *A new operational approach to measure work in coherent quantum systems.*
Sarah Malik (UCL) presented *Quantum computing for particle physics.* She spoted light on the importance of quantum computing. Quantum computing looks poised to be one of the most transformative technologies of the 21st century, with the potential to play a disruptive role in both science and society. The current intermediate-scale quantum devices provide excellent test beds for performing proof of principle studies on using quantum computers to tackle the most challenging problems in particle physics.
Cristian Bonato (Heriot-Watt University) discussed *Silicon Carbide spin-based quantum devices for quantum networking* Single optically-active spin defects and impurities have been used in many of the leading implementations of quantum networking. Most world-leading experiments, such as the first loophole-free Bell test and the first demonstration of teleportation in a three-node network have been implemented using the NV centre in diamond. Diamond has, however, several drawbacks in terms of cost, commercial availability and lack of established fabrication recipes.
Thalia D (University of Southampton) topic *Advanced Silicon Nitride Integration for CMOS Photonic Circuits* Silicon photonics has accelerated the deployment of complementary metal-oxide semiconductor (CMOS) compatible photonic integrated circuits (PICs) based on the silicon-on-insulator (SOI) platform.
Stasja Stanisic (Senior quantum Engineer at Phase-craft) topic *Towards Practical Quantum Advantage* Phasecraft is the quantum algorithms company based in Bristol and London UK. Phasecraft partners with Google, IBM, and Rigetti.
Stasja discussed that the noisy intermediate-scale quantum era has picked up speed in recent years, with a varied range of companies now offering regular access to devices of diverse qubit numbers, gate errors, and hardware connectivity. The promise of practical quantum advantage is becoming more achievable. Phasecraft performed experiment on the GoogleSycamore devices to solve for the ground state of the FermiHubbard model using the **variational quantum eigensolver**. Phasecraft is the team of more than 30 scientists, mathematicians, engineers and researchers.
Edmund Harbord (University of Bristol) topic *"More light, more light!" How can we design high brightness, high yield manufacturable sources of single and entangled photons*

using quantum dots? Quantum dots (QDs) – nanoscale inclusions of one semiconductor embedded in another are ideal sources of single and entangled photons, with internal quantum efficiencies of 100%.