Plan Overview

A Data Management Plan created using DMPonline

Title: Telecom-Band Colloidal Semiconductors for Integrated Photonic Light Sources

Creator: Huanqing Ye

Principal Investigator: Huanqing Ye

Affiliation: University of Manchester

Funder: Engineering and Physical Sciences Research Council (EPSRC)

Template: University of Manchester Generic Template

Project abstract:

To sustain and extend the UK’s leadership in semiconductors and photonics, there is an urgent need to broaden the routes to integrable telecom-band light sources for photonic integrated circuits (PICs). While epitaxy-grown compound semiconductors and bonding assemblies have demonstrated the value of the global PIC market, projected to USD 50-100 billion by 2030, they are tied to specific platforms and require repeated, high-cost infrastructure investment whenever new material stacks or PIC technologies emerge. These constraints limit cost-effectiveness, flexibility, and manufacturing agility at a time when silicon nitride (SiN), lithium niobate on insulator (LNOI), and emerging flexible photonic platforms are becoming strategically important.

This Manchester-, early-career-academics-led collaborative project, uniting Cardiff, Southampton and UCL, offers a complementary approach by developing tunable telecom-band colloidal semiconductor gain media that can be deposited directly onto diverse PIC platforms using scalable thin-film and printing processes. The proposed colloidal quantum dot (CQD)-PIC approach targets integration regimes where purely epitaxial routes are technically or economically challenging, thereby expanding the overall capability of the UK photonic semiconductor ecosystem. The project supports a shared vision of a resilient, platform-diverse infrastructure, compatible with multiple material systems, for light-source-integrated PICs underpinning future ultra-fast communication, AI hardware, precision sensing, and quantum technologies critical to the UK’s future economic growth.

The project is structured into five interacting work packages with clearly defined responsibilities.

WP1 (Manchester) focuses on material and device characterisation, understanding the insights into the fundamental properties of new CQDs and integrated devices. It will demonstrate on-chip optical gain and lasing on SiN and LNOI PICs and study the mechanisms governing operational stability under both optical and electrical excitation. WP1 will exploit EPSRC-funded facilities at the Photon Science Institute and characterisation capabilities at the Henry Royce Institute to benchmark research against the highest national standards, as well as collaborating St Andrews and HRI, to inform pathways towards scalable integration processes.

WP2 (Cardiff) leads material synthesis and thin-film deposition. It will develop various new CQDs and nanoplatelets, including lead-free options, stable ink formulations, and multilayer heterostructures compatible with the target PIC platforms. WP2 provides a reliable supply of well-characterised materials and processing routes for use and in engagement with partners

in material industry (Quantum Science, Nanoglow, Solar Ethos).

WP3 (Southampton) develops custom SiN and LNOI PICs, specifically for the integration of our CQD gain media, maximising mode overlap while maintaining low loss and adequate cavity quality factors, leveraging capabilities at Southampton’s Optoelectronic Research Centre and the Cornerstone platform. The outcomes will provide a foundation for PICs with integrated CQD-based, multi-wavelength light sources for the wider UK community.

WP4 (UCL) designs new diodes and optimal multi-physics modelling using CQD dot size and distribution, calibrated against WP1 measurements and linked to WP3 PIC designs. This will identify mechanisms that limit performance and reliability, and guide optimisation of device development, with relevance to industrial design-tool partners.

WP5 maximises impact by sharing outcomes with EPSRC-funded networks, such as the Royce Hub’s collaborative environment and the CDT in Compound Semiconductor Manufacturing, our partners in communication, semiconductors and photonics (BT, IQE, ICS, CCRAFT). We will work with Manchester Innovation Factory, Compound Semiconductor Catapult, and Resolute Photonics to translate advances into innovation pathways, IP creations, skills development, and visibility. We also leverage outcomes to engage diverse public audiences and policymakers to meet broader societal needs.

ID: 198135

Start date: 01-07-2026

End date: 30-06-2029

Last modified: 20-02-2026

Telecom-Band Colloidal Semiconductors for Integrated Photonic Light Sources

Manchester Data Management Outline

1. Will this project be reviewed by any of the following bodies (please select all that apply)?

- Funder

2. Is The University of Manchester collaborating with other institutions on this project?

- Yes - Part of a collaboration and owning or handling data

3. What data will you use in this project (please select all that apply)?

- Acquire new data

4. Where will the data be stored and backed-up during the project lifetime?

- University of Manchester Research Data Storage Service (Isilon)

5. If you will be using Research Data Storage, how much storage will you require?

- 1 - 8 TB

6. Are you going to be receiving data from, or sharing data with an external third party?

- No

7. How long do you intend to keep your data for after the end of your project (in years)?

- 11 - 20 years

Guidance for questions 8 to 13

Highly restricted information defined in the Information security classification, ownership and secure information handling SOP is information that requires enhanced security as unauthorised disclosure could cause significant harm to individuals or to the University and its ambitions in respect of its purpose, vision and values. This could be: information that is subject to export controls; valuable intellectual property; security sensitive material or research in key industrial fields at particular risk of being targeted by foreign states. See more examples of highly restricted information .

If you are using 'Very Sensitive' information as defined by the Information Security Classification, Ownerships and Secure Information Handling SOP, please consult the Information Governance Office for guidance.

Personal information, also known as personal data, relates to identifiable living individuals. Personal data is classed as special category personal data if it includes any of the following types of information about an identifiable living individual: racial or ethnic origin; political opinions; religious or similar philosophical beliefs; trade union membership; genetic data; biometric data; health data; sexual life; sexual orientation.

Please note that in line with data protection law (the UK General Data Protection Regulation and Data Protection Act 2018), personal information should only be stored in an identifiable form for as long as is necessary for the project; it should be pseudonymised (partially de-identified) and/or anonymised (completely de—identified) as soon as practically possible. You must obtain the appropriate ethical approval in order to use identifiable personal data.

8. What type of information will you be processing (please select all that apply)?

- No confidential or personal data

9. How do you plan to store, protect and ensure confidentiality of any highly restricted data or personal data (please select all that apply)?

- Not applicable

10. If you are storing personal information (including contact details) will you need to keep it beyond the end of the project?

- Not applicable

11. Will the participants' information (personal and/or sensitive) be shared with or

accessed by anyone outside of the University of Manchester?

- Yes - Informal sharing without contractual arrangements

12. If you will be sharing personal information outside of the University of Manchester will the individual or organisation you are sharing with be outside the EEA?

- Not applicable

13. Are you planning to use the personal information for future purposes such as research?

- No

14. Will this project use innovative technologies to collect or process data?

- No

15. Who will act as the data custodian for this study, and so be responsible for the information involved?

Huanqing Ye

16. Please provide the date on which this plan was last reviewed (dd/mm/yyyy).

2023-04-10

Project details

What is the purpose of your research project?

Study fundamental science of photonic materials for quantum applications.

What policies and guidelines on data management, data sharing, and data security are relevant to your research project?

The Royal Society supports science as an open enterprise and is committed to ensuring that data

outputs from research supported by the Society are made publicly available in a managed and responsible manner, with as few restrictions as possible. Data outputs should be deposited in an appropriate, recognised, publicly available repository, so that others can verify and build upon the data, which is of public interest. To fully realise the benefits of publicly available data they should be made intelligently open by fulfilling the requirements of being discoverable, accessible, intelligible, assessable and reusable.

The Royal Society does not dictate a set format for data management and sharing plans. Where they are required, applicants should structure their plan in a manner most appropriate to the proposed research. The information submitted in plans should focus specifically on how the data outputs will be managed and shared, detailing the repositories where data will be deposited.

Responsibilities and Resources

Who will be responsible for data management?

Huanqing Ye

What resources will you require to deliver your plan?

access University's Research Data Storage

Data Collection

What data will you collect or create?

1. Txt format data: They contain numbers and texts related to experimental data. The total volumes will be a maximumly of 10 Gbs.
2. Tiff graph data: They are extracted from microscopy tools as experimental data. The total volumes will be a maximumly of 10 Gbs.
3. Experimental samples, software coding and mechanical designing models.
4. They will be new data and can be shared via publications, conference presentations and requests from Huanqing Ye, who will assess to share under the University's data policy.

How will the data be collected or created?

Data will be collected and created using University's authorised computers, software, operating platforms and equipment. They can only be accessed by authorised users. The data will be stored in a folder hierarchy with all the data files named by dates, sample versions, experimental conditions, measurement iterations, etc.

Data will be stored in the University's Research Data Storage

Documentation and Metadata

What documentation and metadata will accompany the data?

Experimental methods and analysing processes will accompany those data by using documents including Orginal Labs' Obj. format file, words, powerpoints, python's codes (.py format), etc.
They will also be stored in a folder hierarchy with all the data files named by dates, sample versions, experimental conditions, measurement iterations, etc.
They will be stored, accompanying original data, in the University's Research Data Storage

Ethics and Legal Compliance

How will you manage any ethical issues?

There are no ethical issues in this project

How will you manage copyright and Intellectual Property Rights (IPR) issues?

Publishing data will obey the copyright and IPR policies of publishing journals.

Storage and backup

How will the data be stored and backed up?

The data will be backed up regularly, like once-a-day and will be backed up to Research Data Storage.

How will you manage access and security?

1. All the data will be collected, processed, stored and backed up on University's authorised computers and equipment, which are located in the Photon Science Institute.
2. Sharing with collaborators will be through University's authorised sharing methods like Figshare.

Selection and Preservation

Which data should be retained, shared, and/or preserved?

There are particular data that need be preserved and archived.

What is the long-term preservation plan for the dataset?

No relevant

Data Sharing

How will you share the data?

Data will be shared using a secure data service, i.e. Figshare.
Sharing can only be through Huanqing Ye.
Any others, including the project's collaborators, will request data from Huanqing Ye for re-using.

Are any restrictions on data sharing required?

Question not answered.