

# Data Management Plan for the Lzp FLPP Project Ultra-High-Speed Mid-Infrared Photonics for Next-Gen Free-Space Communications (MIR-FAST, lzp-2023/1-0503)

Version 2

## Description

This DMP serves as a comprehensive guide for managing the data generated during the MIR-FAST project. This project focuses on pioneering advancements in FSO communication technologies, specifically in the long-wave Infrared (LWIR) spectrum. The DMP outlines how we will handle, store, share, and preserve the data collected, ensuring it supports the project's objectives and is accessible for future research and development. The MIR-FAST project will generate and collect a variety of data crucial for advancing mid-infrared photonics technology. Specifically, the datasets will include Bit error Rate (BER) values, Spectrum Analysis Data, Eye Diagram Time Traces, etc. The data will also be stored in various formats, e.g., CSV.

Data will be collected using sophisticated signal processing tools and optical measurement equipment. All data will be initially stored in raw format to ensure no initial data loss and then processed for analysis. In line with our commitment to advancing knowledge in the field of optical communications, the processed data will be made available to the research community. A dedicated data manager will oversee the implementation of this DMP, assisted by the project team. Responsibilities for data collection, processing, analysis, and sharing will be clearly defined within the project team to ensure adherence to the plan.

### Funder

Latvijas Zinātnes padome

### Grant

Ultra-High-Speed Mid-Infrared Photonics for Next-Gen Free-Space Communications (MIR-FAST)

### Researchers

Armands Ostrovskis, Xiaodan Pang (orcid:0000-0003-4906-1704)

### Organizations

Riga Technical University

# 1. Main Info

Title of DMP: [Data Management Plan for the LZP FLPP Project Ultra-High-Speed Mid-Infrared Photonics for Next-Gen Free-Space Communications \(MIR-FAST, Izp-2023/1-0503\)](#)

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Researchers:

[Armands Ostrovskis](#)

[Xiaodan Pang \(orcid:0000-0003-4906-1704\)](#)

Organizations:

[Riga Technical University](#)

Contact: [Xiaodan Pang](#)

## 2. Funding

Funding organizations: [Latvijas Zinātnes padome](#)

Grants: [Ultra-High-Speed Mid-Infrared Photonics for Next-Gen Free-Space Communications \(MIR-FAST\)](#)

Project:

## 3. License

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Access Rights: [Public](#)

Publication Date: [2025-12-01](#)

## 4. Templates

### Descriptions

[Advancing LWIR FSO communication through high-speed multilevel signals and directly modulated quantum cascade lasers](#)

This study investigates the potential of long-wave infrared (LWIR) free-space optical (FSO) transmission using multilevel signals to achieve high spectral efficiency. The FSO transmission system includes a directly modulated-quantum cascade laser (DM-QCL) operating at 9.1 $\mu$ m and a mercury cadmium telluride (MCT) detector. The laser operated at the temperature settings of 15°C and 20°C. The experiment was conducted over a distance of 1 m and in a lab as a controlled environment. We conduct small-signal characterization of the system, including the DM-QCL chip and MCT detector, evaluating the end-to-end response of both components and all associated electrical elements. For large-signal characterization, we employ a range of modulation formats, including non-return-to-zero on-off keying (NRZ-OOK), 4-level pulse amplitude modulation (PAM4), and 6-level PAM (PAM6), with the objective of optimizing both the bit rate and spectral efficiency of the FSO transmission by applying pre- and postprocessing equalization. At 15°C, the studied LWIR FSO system achieves net bitrates of 15 Gbps with an NRZ-OOK signal and 16.9 Gbps with PAM4, both below the 6.25% overhead hard decision-forward error correction (6.25%-OH HD-FEC) limit, and 10 Gbps NRZ-OOK below the 2.7%

overhead Reed-Solomon RS(528,514) pre-FEC (KR-FEC limit). At 20°C, we obtained net bitrates of 14.1 Gbps with NRZ-OOK, 16.9 Gbps with PAM4, and 16.4 Gbps with PAM6. Furthermore, we evaluate the BER performance as a function of the decision feedback equalization (DFE) tap number to explore the role of equalization in enhancing signal fidelity and reducing errors in FSO transmission. Our findings accentuate the competitive potential of DM-QCL and MCT detector-based FSO transceivers with digital equalization for the next generation of FSO communication systems.

Template: [LCS FARP](#)

Type: [Dataset](#)

## 1.1 Data Summary

### 1.1.1 What is the purpose of the data collection/generation?

Evaluation of system performance defined by the project.

### 1.1.2 Type of data generated/collected

Experimental data

### 1.1.3 Format of data generated/collected

- pdf
- csv
- others

MAT

### 1.1.4 Expected size of the data – give expected size and choose unit of measurement

5

MB

### 1.1.5 Are you re-using this data set?

No

### 1.1.6 If No, please describe, if you have considered re-using any of existing data?

No

1.1.8 To whom the data might be useful ("data utility")? Other relevant remarks)

Researchers

## 2.1 Metadata and documentation

2.1.1 Will data be attributed with standard identification mechanism (e.g. persistent and unique identifiers such as Digital Object Identifiers – DOI)?

Yes

doi

2.1.2 Do you plan to provide metadata for your data?

No

2.1.4 Will search keywords be provided that optimize possibilities for re-use?

No

2.1.5 Will you follow any naming conventions for keywords?

No

2.1.6 Will you provide clear version numbers?

No

## 2.2 Making data openly accessible

2.2.2 Will you apply embargo period to access for your data?

No

2.2.3 Will data, associated metadata, documentation and code be made accessible with means of a repository?

No

2.2.5 Will documentation about the software needed to access the data included?

No

2.2.6 Is it possible to include the relevant software (e.g. in open source code)?

No

## 2.3 Making data interoperable

2.3.1 Are the formats open to software applications and to recombination with different data sets?

Yes

2.3.2 Will you use data standard vocabulary/taxonomy to make your data interoperable?

No

## 3.3 Ethical aspects

3.3.1 Are there any ethical or legal issues that could have an impact on data collection and sharing?

No

3.3.2 Have you got/will you get permission from ethics committee to collect and process data (if applicable)?

No

3.3.3 Is informed consent for data sharing and long term preservation included in questionnaires dealing with personal data, if applicable?

No

3.3.4 Will data collected/generated include personal data/ sensitive information?

No

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