MeLi Dos

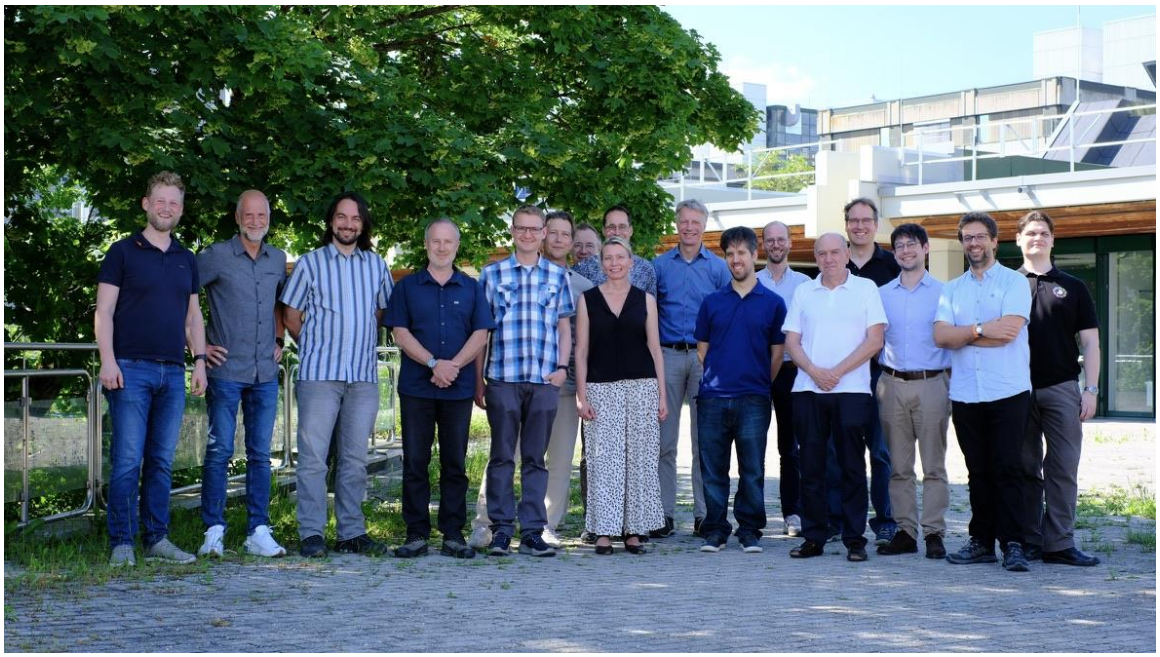
Metrology for wearable light loggers and optical radiation dosimeters



Newsletter 6

January 2026 – June 2026

This period has been the final period of the project, during which all our results had to be compiled in a readily available and more importantly, understandable format! All our deliverables have been accepted and published! We wish to express our sincere thanks to all our collaborators and stakeholders who either engaged in or followed our work. In the following, you can find a breakdown of our final 6 months of MeLiDos:



The MeLiDos team meeting in May 2026 in Technical University of Munich, Garching

Important: As the project has ended, the website has been shifted to a simpler format with a new url: https://melidosproject.github.io/.github/

Update on device characterisation

MeLiDos Work Package 1 participants completed an intercomparison study on the characterization of wearable light loggers to validate the simplified methods proposed in the Good Practice Guide. The study included devices from four manufacturers and involved several consortium laboratories. Methods for assessing angular dependence, spectral dependence, and linearity were compared.

In addition, a separate intercomparison was carried out among six partners for solar UV dosimeters, covering three different device types. From this comparison, four main findings can be seen:

- Monochromator-based methods and especially the associated quality metrics (f1') are not appropriate for the characterization of wearable light loggers
- Angular response characterization need to clearly set angular steps and measurement configuration in order to get reproducible quality indices.
- The detection limit metric is a better way to assess wearable light logger performance at low light levels as compared to other metrics like digital resolution.
- Solar UV dosimeters showed that internal processing needs to be well documented to ensure reproducible, comparable results in wearable devices.

The characterization methods developed and evaluated within WP1 have also been compiled into a scientific manuscript, which has been published as a preprint-type document on Zenodo.

The work has identified several common challenges in characterizing wearable light measurement devices, including limited access to real-time data, long measurement intervals that complicate calibration, wireless communication constraints, differences between laboratory and field measurements, and the use of proprietary device algorithms that can limit transparency and comparability.

These findings will contribute to the ongoing development of practical and harmonized approaches for the characterization of wearable light and have been shared with CIE divisions and CIE JTC 20.

Field use of wearable light loggers

The Work Package 2 team has also been finalizing the work for WP2 during this period, notably with the end of the field data collection.. The project implemented the first multinational measurement campaign of personal light exposure using a harmonized protocol. Across 191 adults, nine sites, and 1,480 participant-days, harmonised wearable and experience-sampling data show that biologically relevant light exposure is highly structured by daily context, outdoor activity, daylight access, and micro-environment, often falling below recommended daytime melanopic levels. The project provides the first multi-country, near-corneal view of real-world light exposure and establishes personal light exposure as a modifiable target for circadian, sleep, and neurobehavioural health. The work will be published in the near future, with a preprint already available. A summary of the data-collection campaign and datasets is part of our deliverables.

Several tools to facilitate the use of wearable light loggers in the field, and the subsequent analysis of their data, are already available. They are summarized in our 6th deliverable.

Research for the future

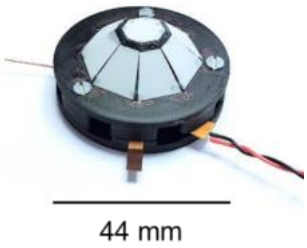
In Work Package 3, the development and characterization of the three different spatially resolved light logger prototypes has been completed. All three prototypes follow approaches which go beyond designs based on RGB cameras.



Camera-based light logger



Low-resolution multispectral camera



Multidirectional light logger

The camera-based light logger prototype consists of a 3x2 microlens array with six different spectral filters in front of a monochrome camera sensor. Like this, more spectral channels are available compared to approaches based on RGB cameras, however, the complexity of this prototype is far bigger and the development of a fully autonomous wearable prototype was beyond the scope of the project. That is why two different, technically simpler approaches were followed which led to two fully autonomous prototypes.

The low-resolution multispectral camera prototype was developed with the aim of using a flat printed circuit board with a wide-angle lens to transmit light to the nine multispectral sensors in a way that provides spatially resolved data. This approach attempts to simplify the prototype's structural planning and assembly by using commonly available components to focus light onto the multispectral sensors, which are placed in a plane perpendicular to the optical axis.

The multidirectional light logger also comprising nine multispectral sensors of the same type, but here, the sensors are oriented in different directions by means of a flexible PCB. This approach is a logical extension of currently available spatially averaging light loggers.

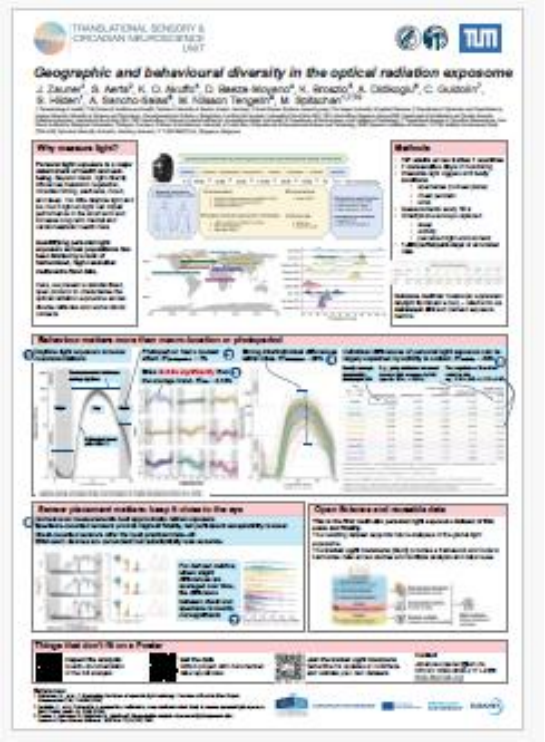
After the completion of the development and device characterisation, the multidirectional light logger was compared to a commercial wearable light logger.

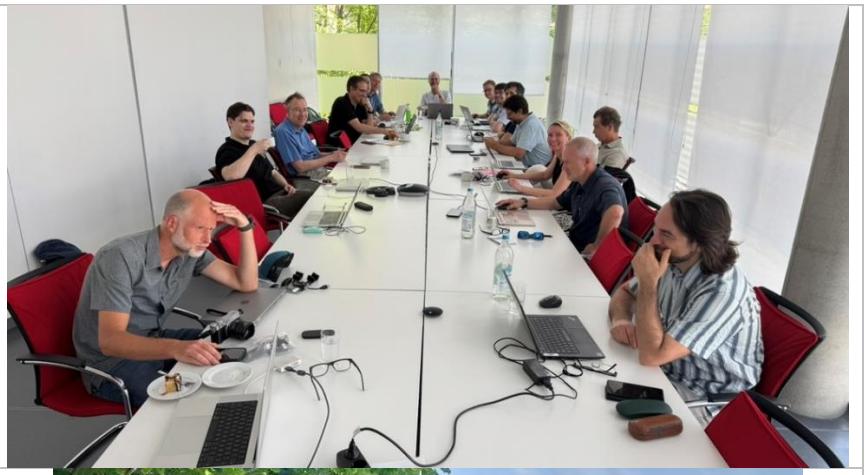
The developments, including the results of the characterisations and comparisons, are summarised in an evaluation report. The report also provides guidance on the characterisation of camera-based light loggers and presents conclusions on the benefits and drawbacks of spatially resolved light loggers.

The project's dissemination activities and events

January 2026 – June 2026

The **activities** by the members of the MeLiDos consortium keep making visible the objectives:

Project MeLiDos CEU Ángel Herrera Research Award 2025 January 2026	
Johannes Zauner. TUM Poster Global Exposome Summit 2026 April 27-29, 2026	

MeLiDos final meeting May 26-28, 2026	
FUSPCEU CONFERENCE Annual National Committee for Lighting in Bulgaria conference June 4–6, 2026	
Upcoming: LS2026, 2-4 December 2026, Athens, Greece	https://ls2026.ece.ntua.gr/
Upcoming: CIM2027, 15-78 March 2027, Lyon, France	https://www.cim-metrology.org/en/

Recent publications

- Individual, behavioural, and environmental determinants of personal light exposure in daily life: A multi-country wearable and experience-sampling study (Analysis Artifact) https://zenodo.org/communities/22nrm05_melidos/ (Zenodo)
- MeLiDos Project Data Hub This repository provides a project-level overview of the MeLiDos datasets, with a focus on the site-specific personal light exposure datasets and their citation metadata. https://melidosproject.github.io/melidosData/ (R package, documentation)

Deliverables

1. Research paper on the developed characterisation methods for wearable light loggers (optical radiation dosimeters) - https://doi.org/10.5281/zenodo.23079430
2. Guidance on characterisation methods of wearable light loggers and solar UV dosimeters - https://doi.org/10.5281/zenodo.21621071
3. Comparison report on the interlaboratory comparison of wearable light loggers and solar UV dosimeters - https://doi.org/10.5281/zenodo.21707083
4. Summary report - Multisite-light dosimetry data set - https://doi.org/10.5281/zenodo.21621179
5. Technical guide for wearable light radiation dosimetry and visual experience assessment - https://doi.org/10.5281/zenodo.22655833
6. Summary report on the developed software ecosystem for light dosimetry data analysis - https://doi.org/10.5281/zenodo.21621188
7. Evaluation report on the performance of spatially resolved devices measuring photobiological quantities including performance comparison between spatially resolved and spatially averaging devices per use case and conclusions on their benefits and drawbacks - https://doi.org/10.5281/zenodo.21625838
8. Letter from CIE Division 2 and 6 confirming that the project results have been submitted for consideration in their potential incorporation in new standards - https://doi.org/10.5281/zenodo.22940686

LightLogR training course (playlist): https://www.youtube.com/playlist?list=PLzoZGn0-37XrPf68j4b7MtiwOBoAPbvl0

Reference readings:

Several communications and papers have been shared in Congresses by the different members

Guidolin, C., Aerts, S., Agbeshie, G.K. et al. Protocol for a prospective, multicentre, cross-sectional cohort study to assess personal light exposure. BMC Public Health 24, 3285 (2024). https://doi.org/10.1186/s12889-024-20206-4

Zauner, J., Tsukimori, E., & Spitschan, M. (2025, July). LightLogR newsletter (No. 01). https://doi.org/10.5281/zenodo.16308351

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