



Metrology for wearable light loggers
and optical radiation dosimeters

Work Package 1

Characterisation methods and quality indices

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Maria Nilsson Tengelin

RISE Research Institutes of Sweden

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METROLOGY
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AIM OF WORK PACKAGE 1

To develop standard characterisation methods and a set of quality indices for wearable light loggers and UV radiation dosimeters.

- Similar to those introduced in ISO/CIE 19476:2014 Characterization of the performance of illuminance and luminance meters but also taking into account specific features and needs for these kinds of devices. (e.g., alpha-optic indices)
- Also taking into account previous work, e.g., Luke Price et al. Optical performance characterization of light-logging actigraphy dosimeters, J. Opt. Soc. Am. A 34, 545-557 (2017)
- The feasibility of the methods and quality indices will be tested and validated through a set of intercomparisons using representative devices.

Synergies with CIE JTC 20 (D6/D2): Wearable alpha-optic dosimetry and light logging methods, limitations, device calibration and data schemes

Task 1.1

Definition of the requirements for the characterisation of wearable light loggers and solar UV radiation dosimeters

State of the Art: wearable light loggers

- A few different models of wearable light loggers (both commercial and prototypes), will be reviewed and analysed regarding availability, and their underlying techniques (e.g. filter based or spectrally resolved).
 - Devices that do not measure melanopic light will be rejected.
 - At least three different models of wearable light loggers will be selected.
- Potential challenges in the characterisation of the wearable light loggers will be identified (e.g., accessibility of raw data)

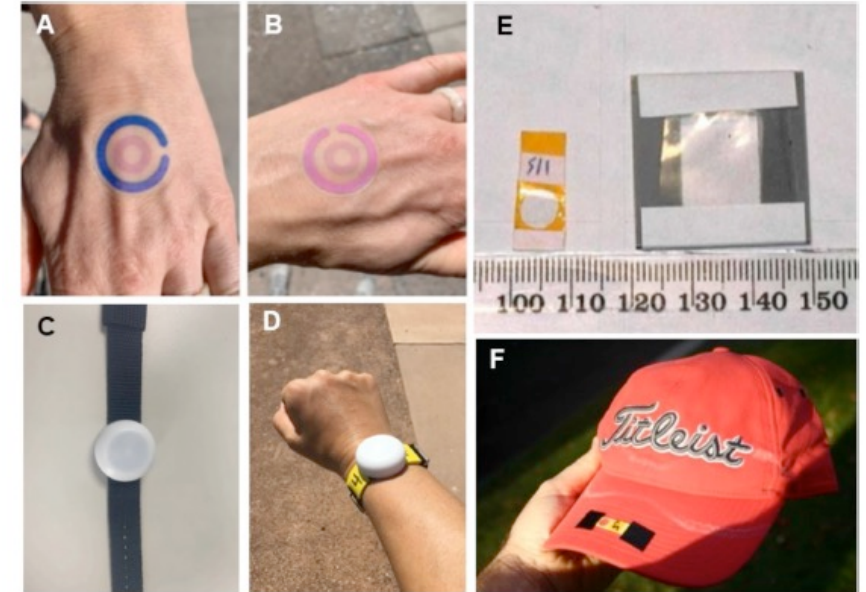


Task 1.1

Definition of the requirements for the characterisation of wearable light loggers and solar UV radiation dosimeters

State of the Art: solar UV dosimeters

- A few different models of wearable solar UV radiation dosimeters (both commercial and prototypes), will be reviewed and analysed regarding performances (e.g., range and responsivity) and availability.
 - At least three different models of wearable solar UV radiation dosimeters will be selected (only electronic, i.e., not chemical).
- Potential challenges in the characterisation of the devices will be identified.



Henning, A., J. Downs, N. & Vanos, J.K. Wearable ultraviolet radiation sensors for research and personal use. *Int J Biometeorol* 66, 627–640 (2022).
<https://doi.org/10.1007/s00484-021-02216-8>

Task 1.1

Definition of the requirements for the characterisation of wearable light loggers and solar UV radiation dosimeters

Characterisation needs, challenges and proposed methods

- Identify the most relevant parameters for which current methods of characterisation are less appropriate (e.g. current practices for spectral responsivity measurements are too long and costly for dosimeters or not feasible due to limitations in the devices).
- Propose at least 2 feasible methods and at least 2 measurement set-ups for the assessment of these parameters.
- Concerns both wearable light loggers and solar UV radiation dosimeters.



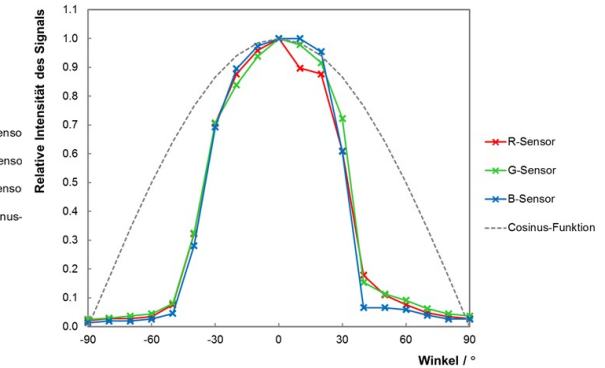
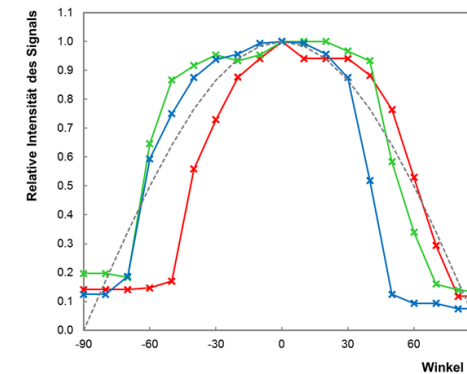
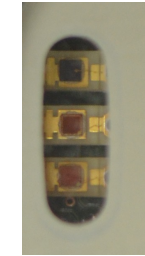
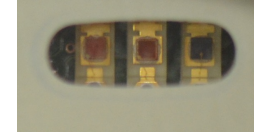
Photo by [Harry Quan](#) on [Unsplash](#)

Task 1.2

Development of characterisation methods and quality indices

Characterisation of:

- Spectral responsivity
- Directional response
- Linearity
- Limit of detection and dark reading
- Short-and long-term stability and repeatability
- Influence of environmental factors (humidity, temperature etc.)
- Influence of TLM and polarization



L. Udovicic, M. Janßen, D. Nowack, L. Price; "Personenbezogene Lichtexpositionsmessungen in Feldstudien - Eine Handlungsanleitung zur Charakterisierung und Kalibrierung von Lichtexpositionsdetektoren."
1.Auflage. Dortmund: Bundesanstalt für Arbeitsschutz und Arbeitsmedizin, 2016. Seiten: 47,
Projektnummer: F 2355, Papier, PDF-Datei, DOI: 10.21934/baua:bericht20161220

Development of metadata items for documenting device characteristics

Good Practice Guide on characterisation methods

Task 1.3

Validation of proposed characterisation methods and reliability of summary metrics for wearable light loggers and for solar UV radiation dosimeters, through intercomparison exercises

Intercomparison of wearable light loggers

- Depending on the measurement capabilities of the laboratories, not all laboratories will evaluate all properties.
- Each property will be independently evaluated by at least three laboratories.

Intercomparison of solar UV dosimeters

- Depending on the measurement capabilities of the laboratories, not all laboratories will evaluate all properties.
- Each property will be independently evaluated by at least three laboratories.

Intercomparison report

Availability of end-product dosimeters with longevity on the market?

Characterisation methods feasible for future generation dosimeters/technologies?

Have we missed something?

Input or questions after today:

- maria.nilssontengelin@ri.se

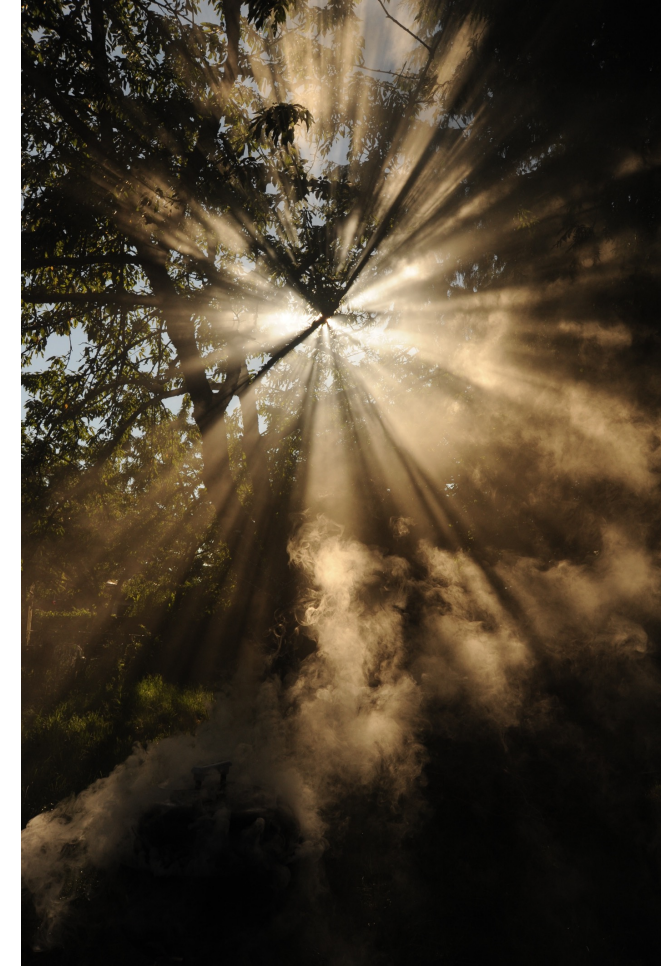


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