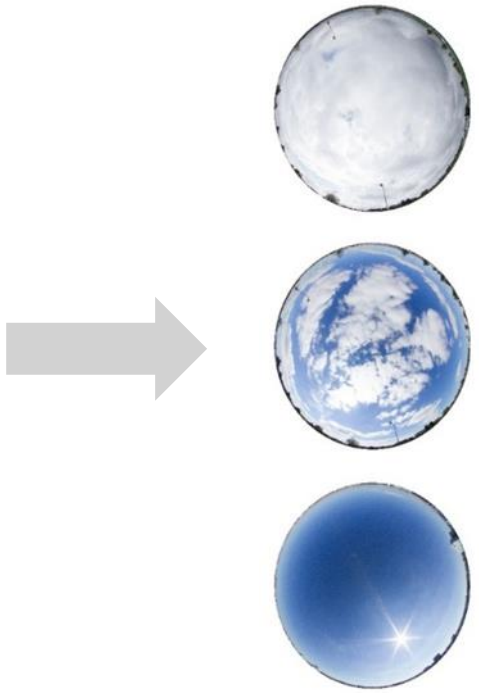
The colour(s) of the sky - Bridging the theory and practice: Implementation, Benefits and Application Areas

Aicha Diakite, Technische Universität Berlin

DAYLIGHT

Photos: Aicha Diakite

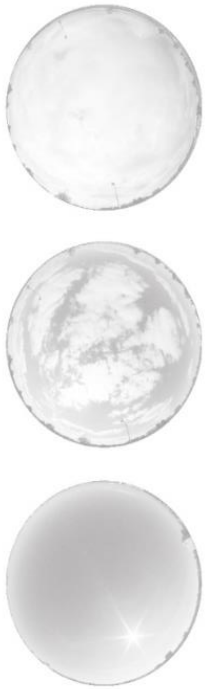
DAYLIGHT



Photos: Aicha Diakite

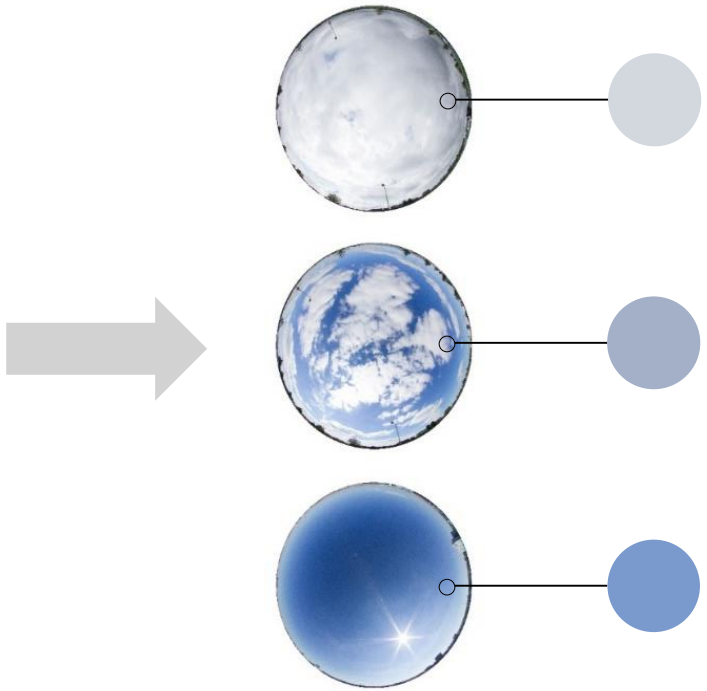
DAYLIGHT

Temporal Changes



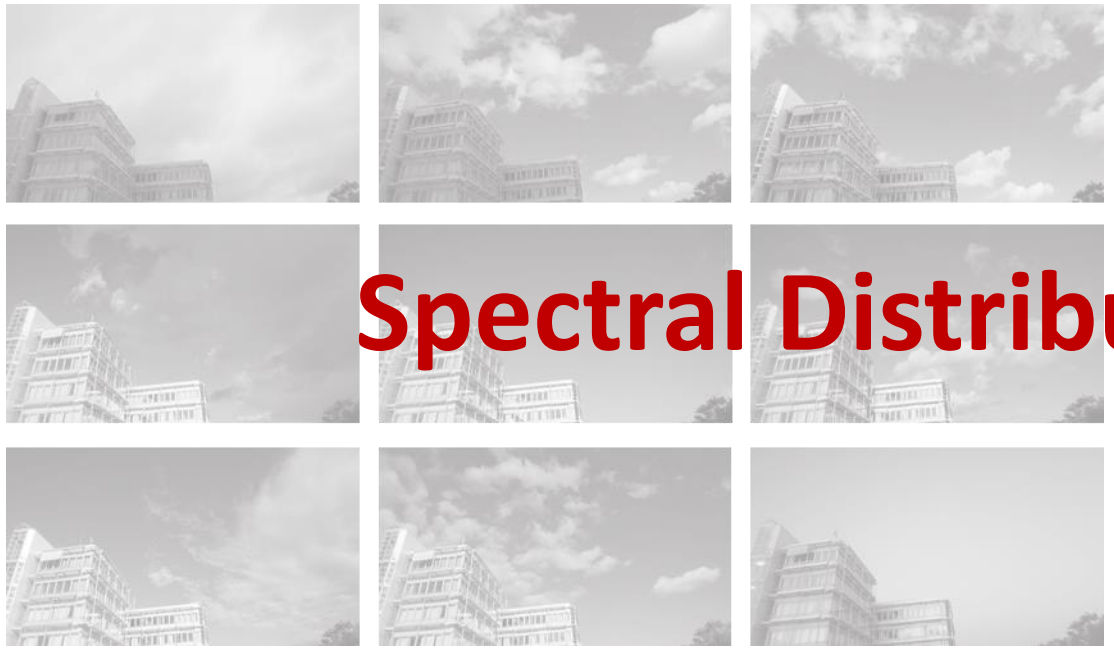
Photos: Aicha Diakite

DAYLIGHT

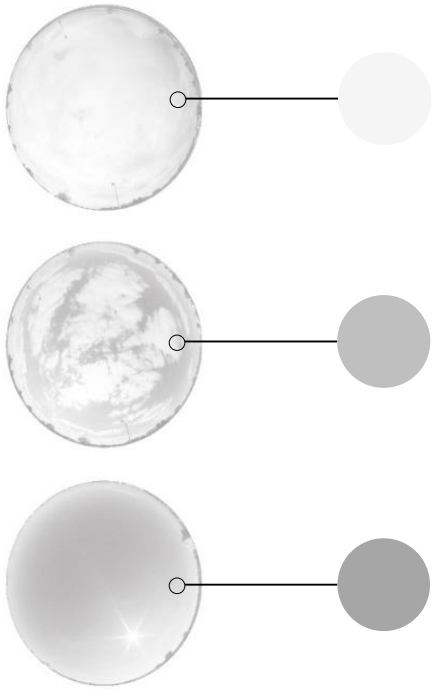


Photos: Aicha Diakite

DAYLIGHT

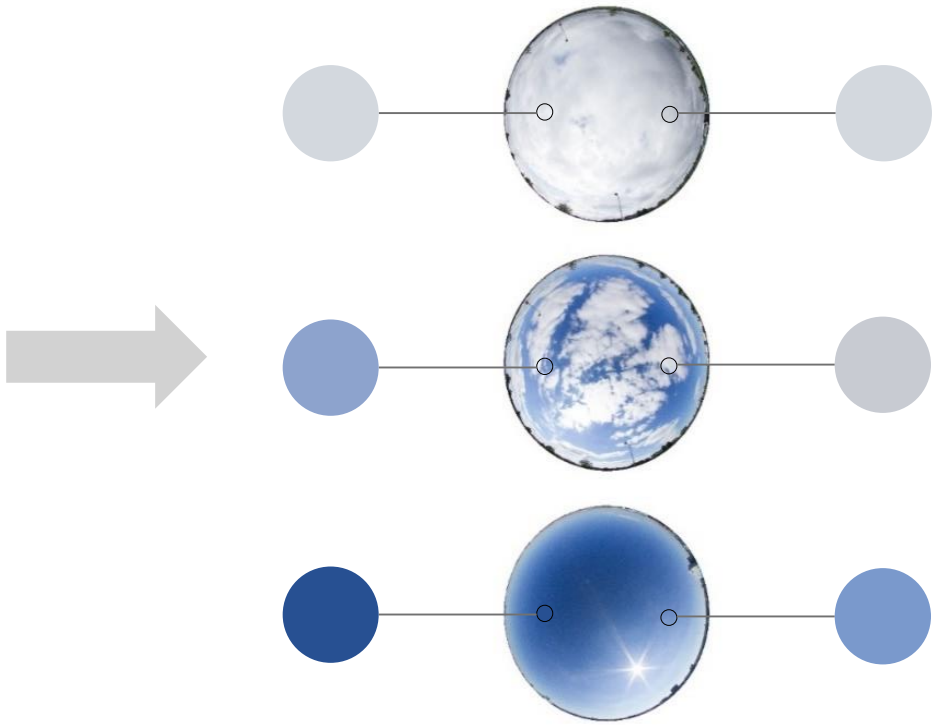


Spectral Distribution



Photos: Aicha Diakite

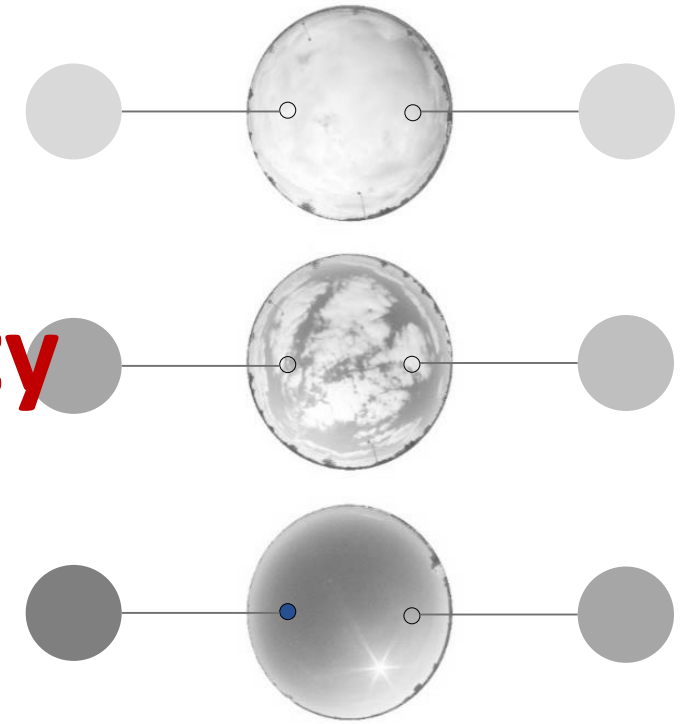
DAYLIGHT



Photos: Aicha Diakite

DAYLIGHT

Spatial Variability



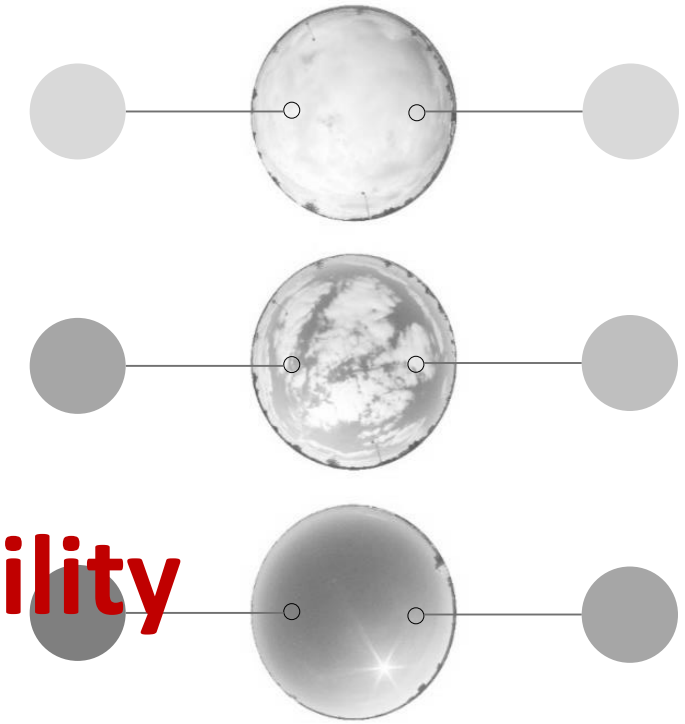
Photos: Aicha Diakite

DAYLIGHT

Temporal Changes

Spectral Distribution

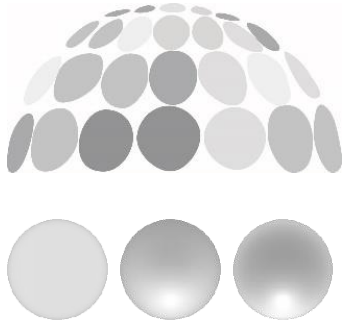
Spatial Variability



Photos: Aicha Diakite

SKY MODELS

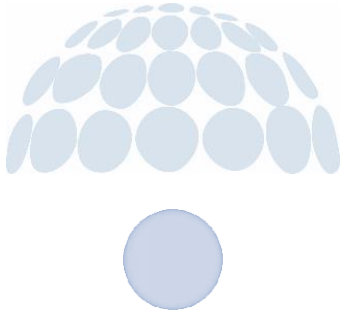
Luminance Distribution



CIE Standard General Sky
ISO 15469:2004(E)/CIE S 011/E:2003

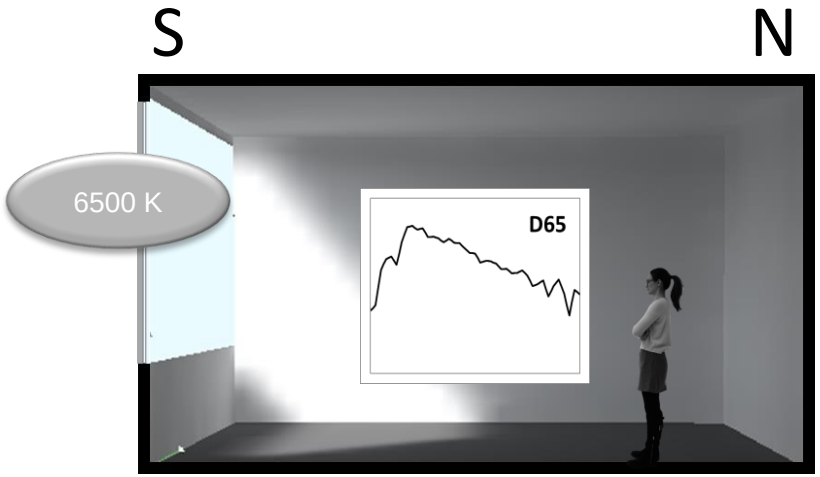
All-Weather Model
Perez et al. 1993

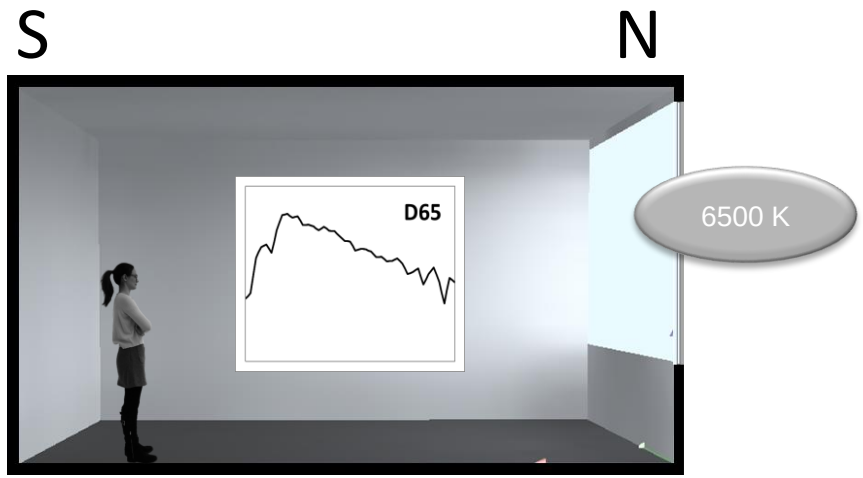
Spectral / CCT Distribution



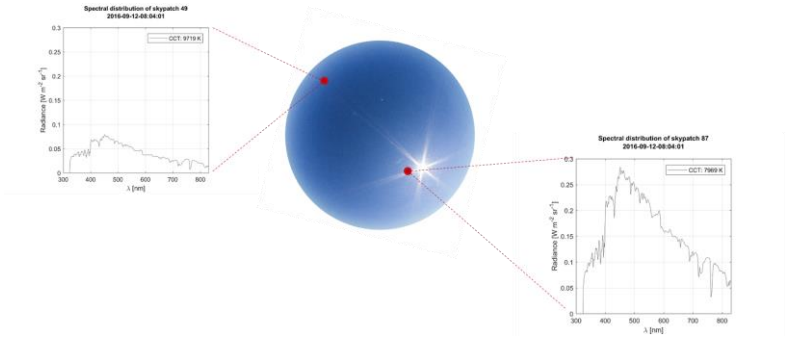
D65
CIE S 014-2/E:2006 ISO 11664-2:2007(E)

PRACTICAL APPLICATION

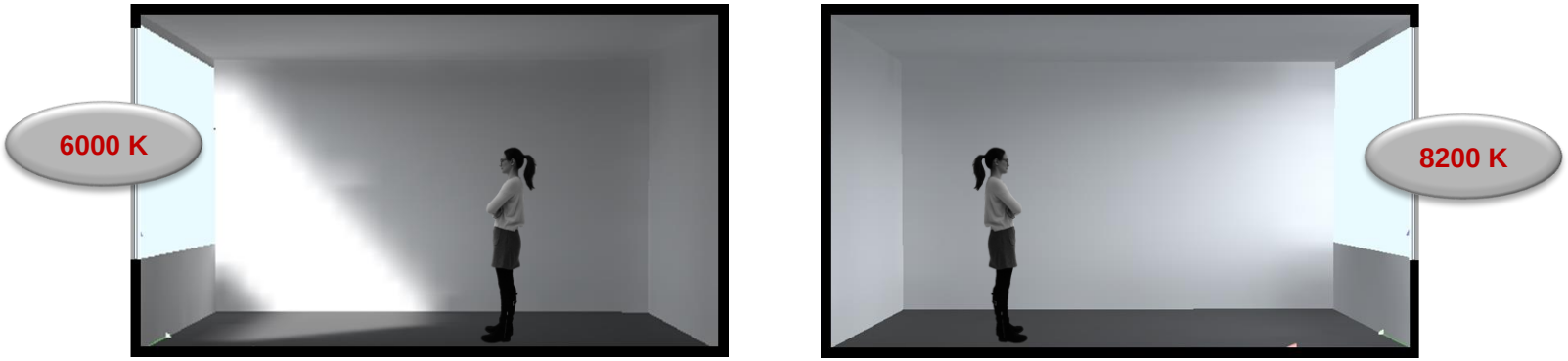




PRACTICAL APPLICATION



S N S N



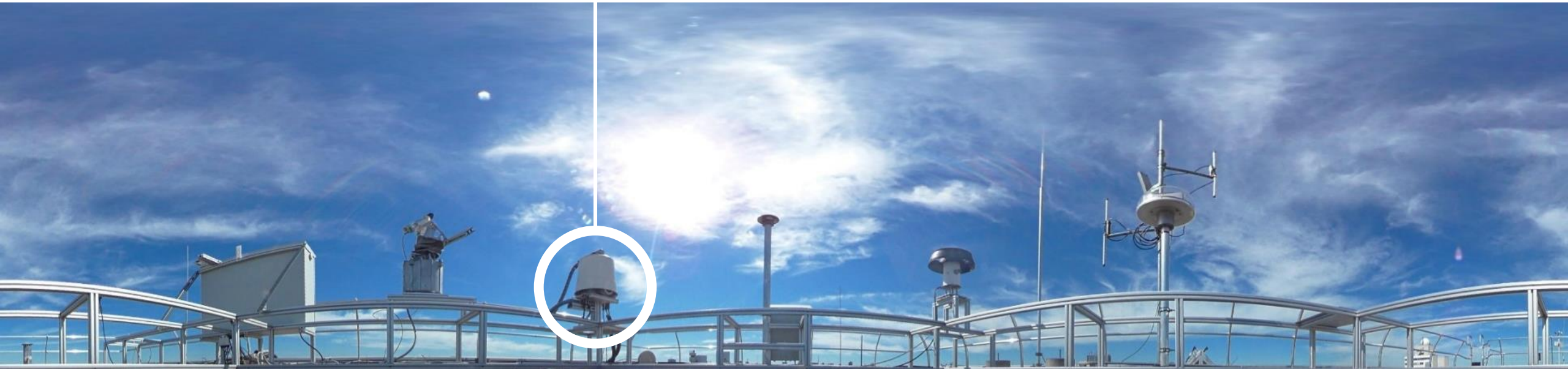
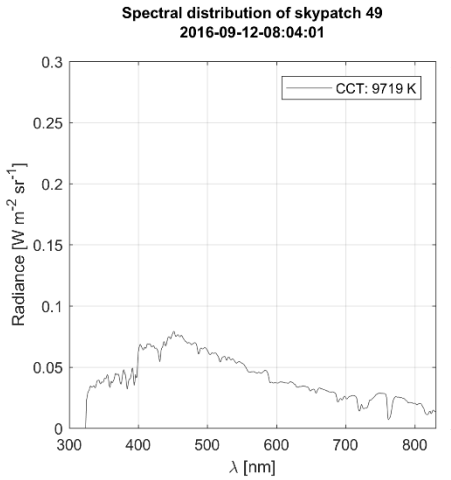
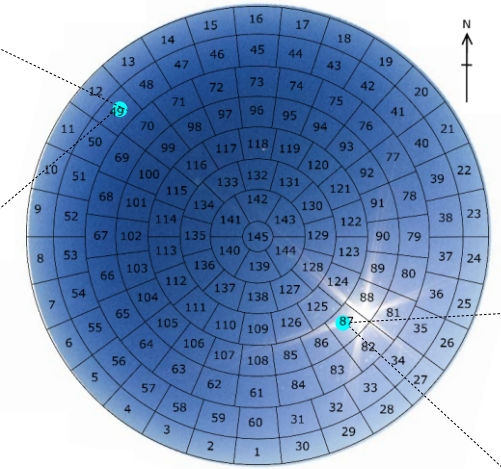


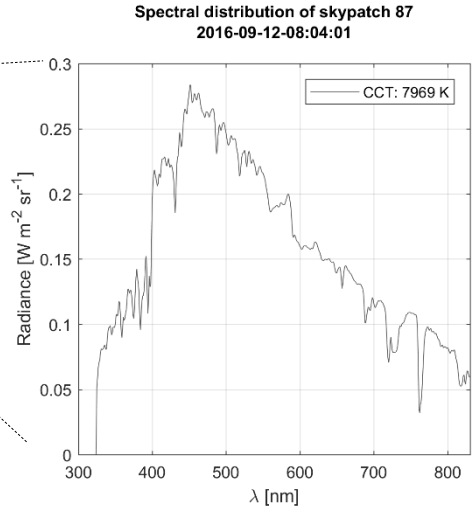
Photo: Nils Weber

SPATIALLY RESOLVED SPECTRAL DATA

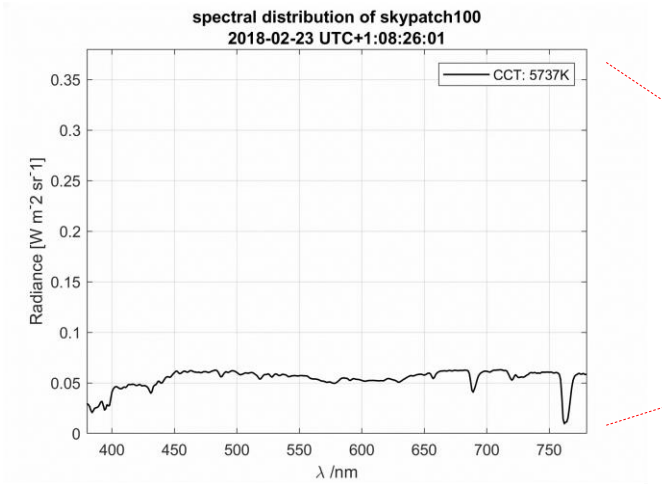
September 12 2016. 08:04 UCT = 09:00 TST, Berlin

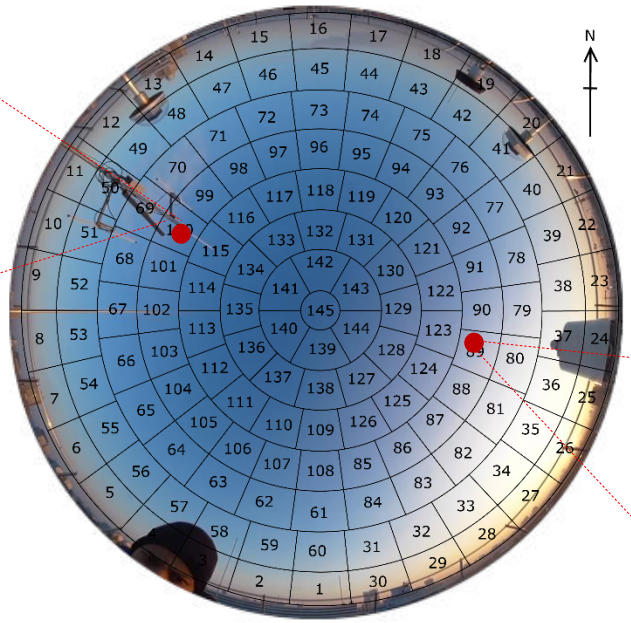


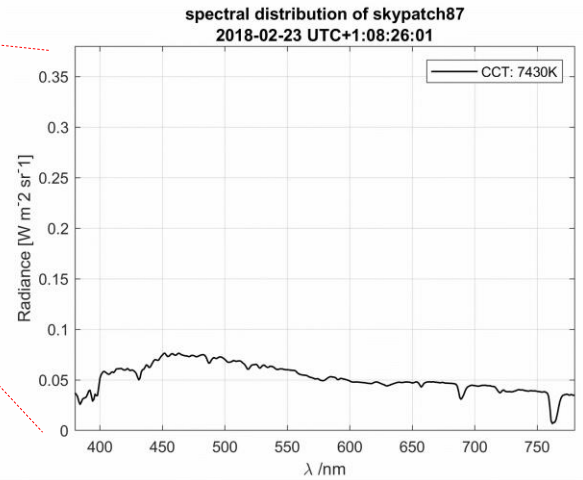




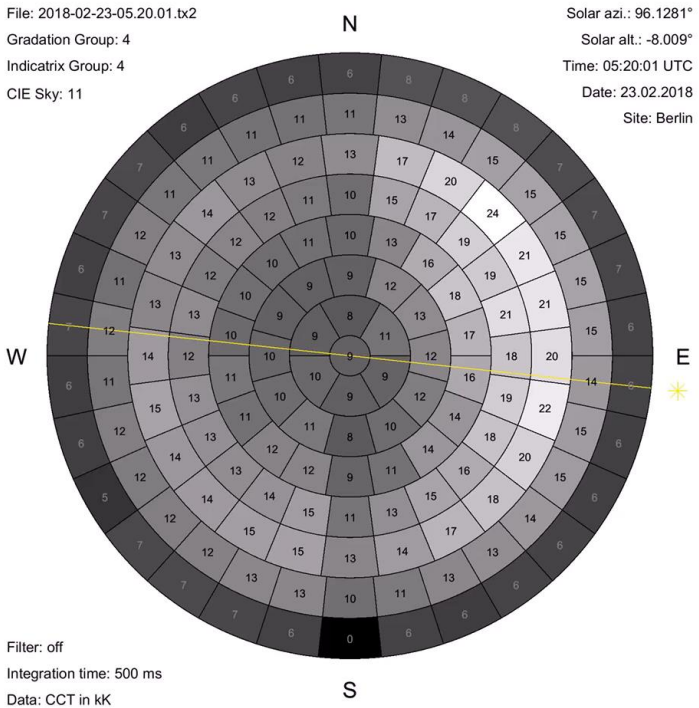
SPATIALLY RESOLVED SPECTRAL DATA







SPATIALLY RESOLVED COLORIMETRIC DATA



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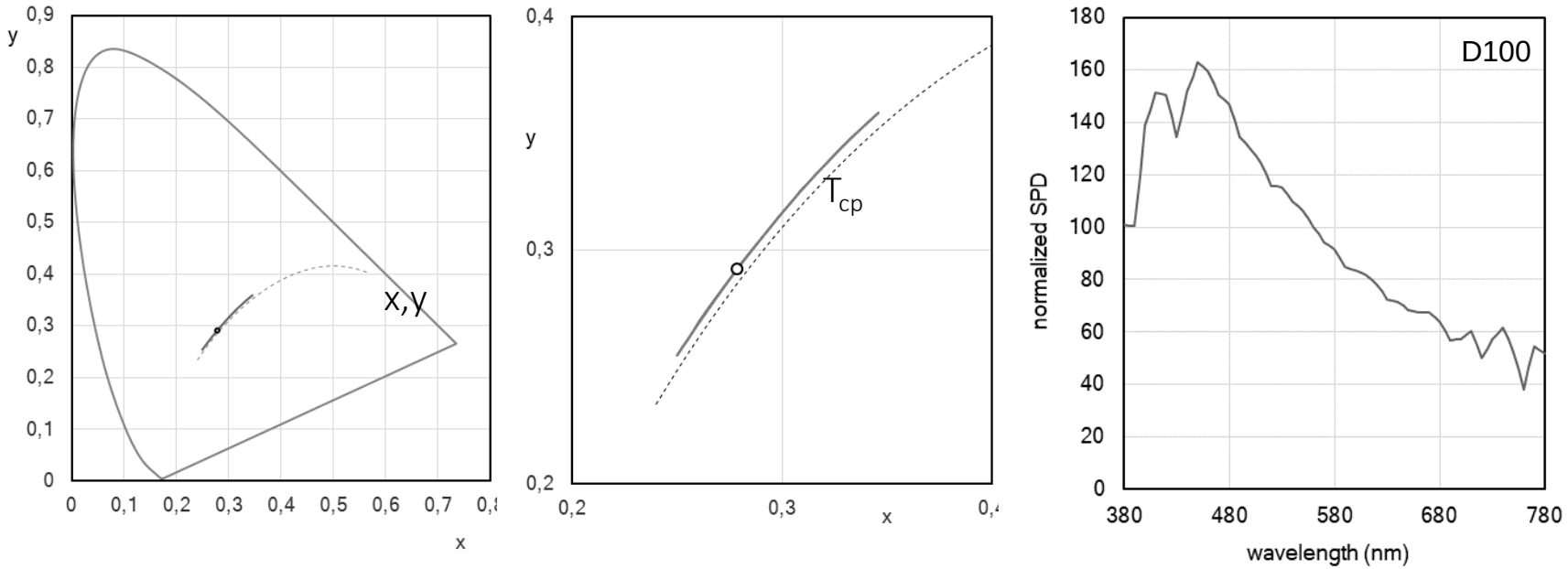
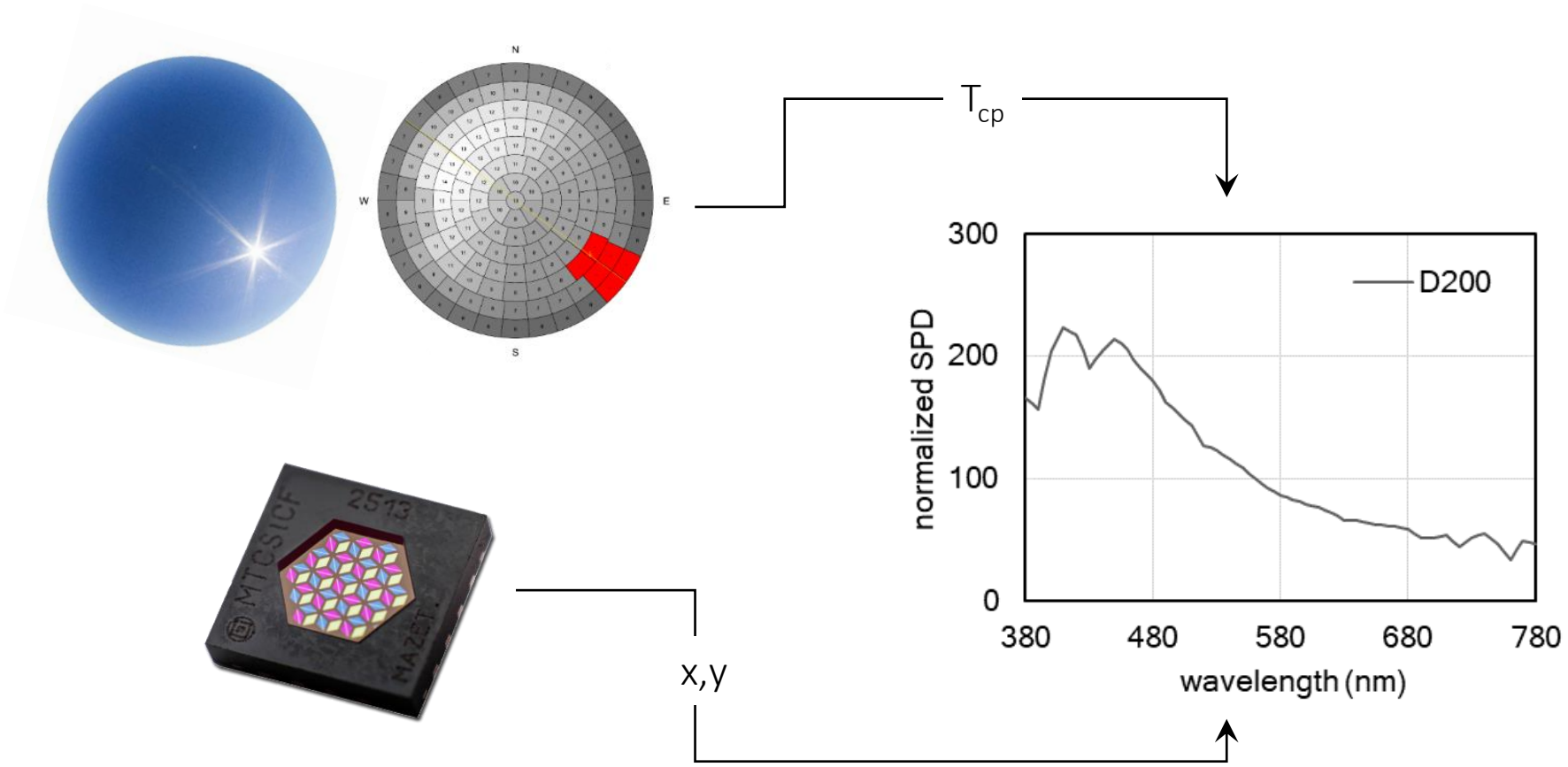
RECONSTRUCTION OF SPDs

- Judd et al. (1964) | CIE 15:2018
- Rochester (US), Enfield (UK) and Ottawa (CA)
- 622 SPDs for CCTs between 4000 K and 25000 K

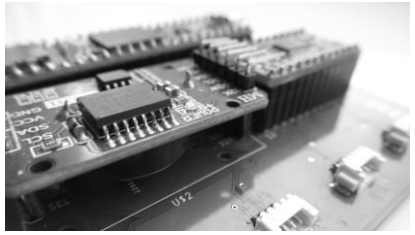


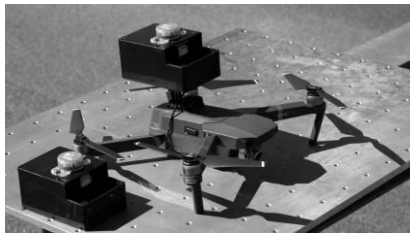
PRACTICAL APPLICATION



PRACTICAL APPLICATION

GOAL: To enhance user well-being and performance in interiors

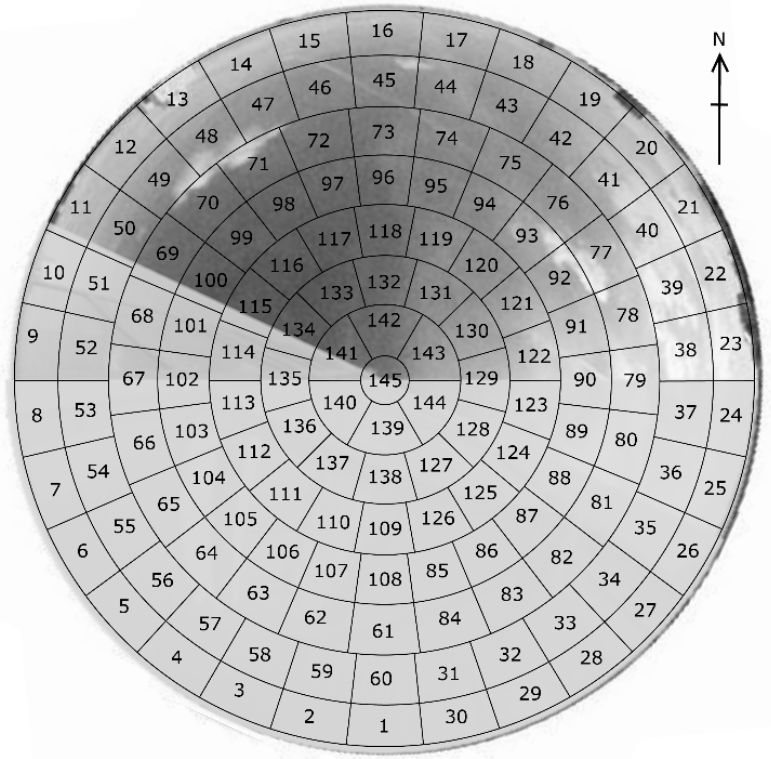


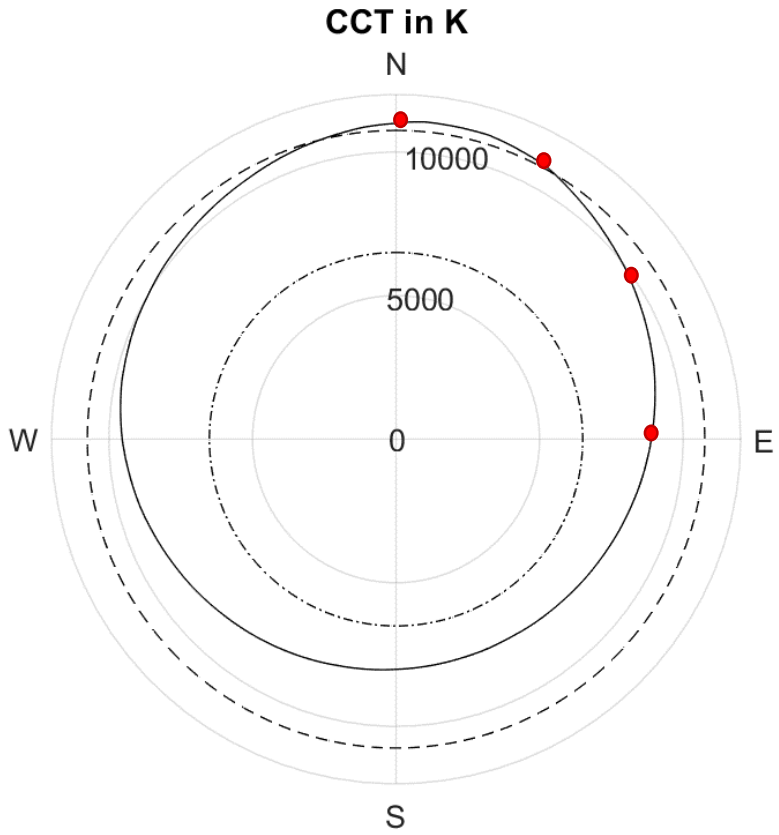


Measure – Describe – Evaluate – Use

DAYLIGHT PLANNING

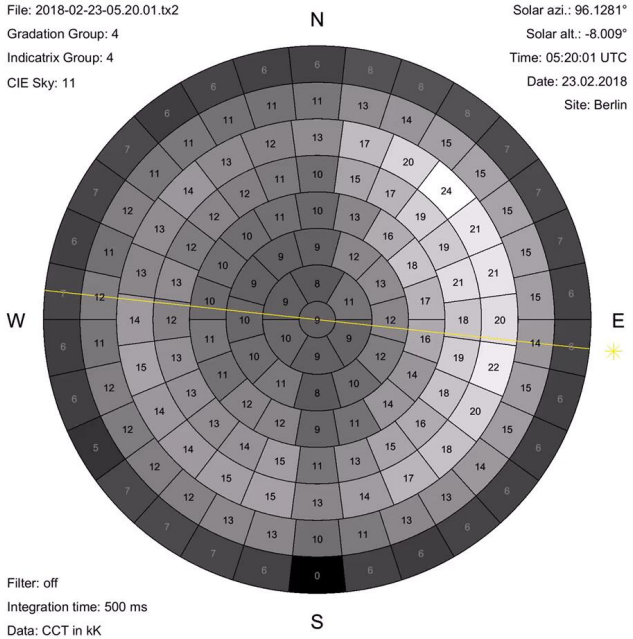
Spectral Daylight Potential Diagrams (SDPDs)

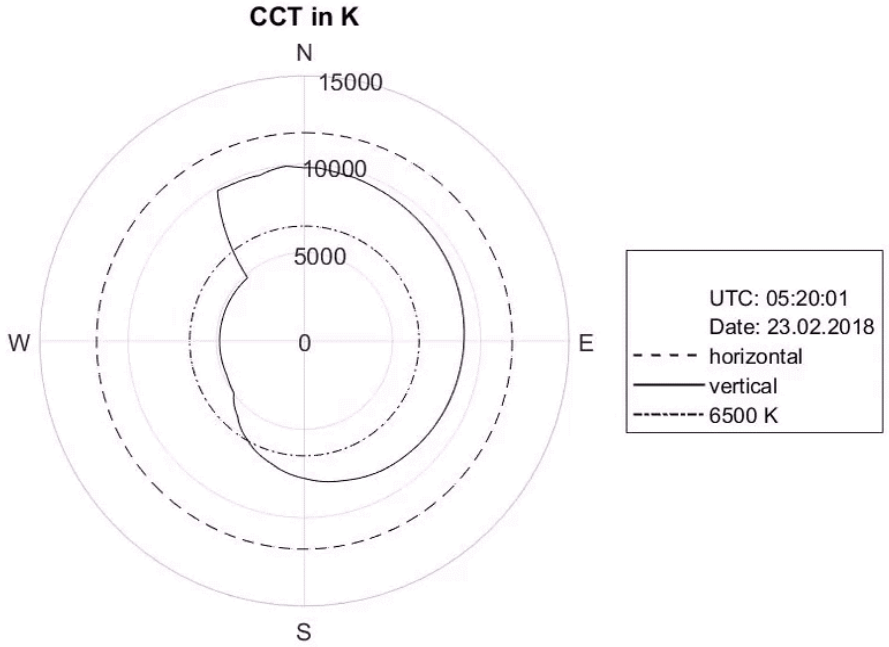




Photos: Aicha Diakite

SDPDs





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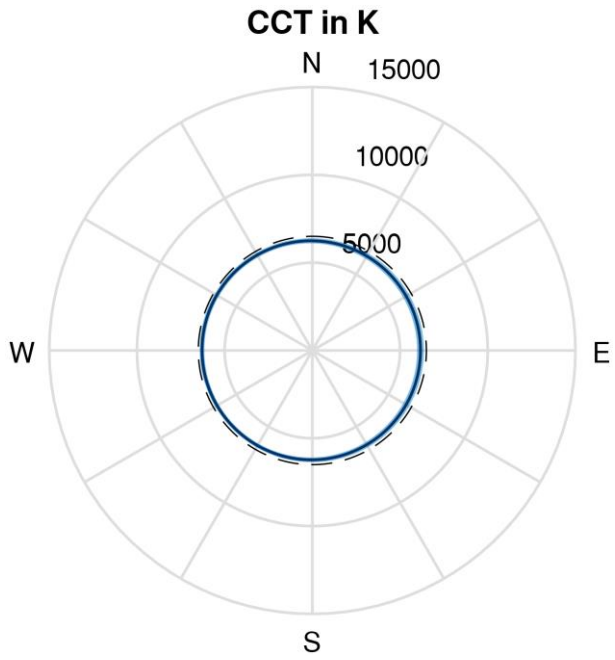
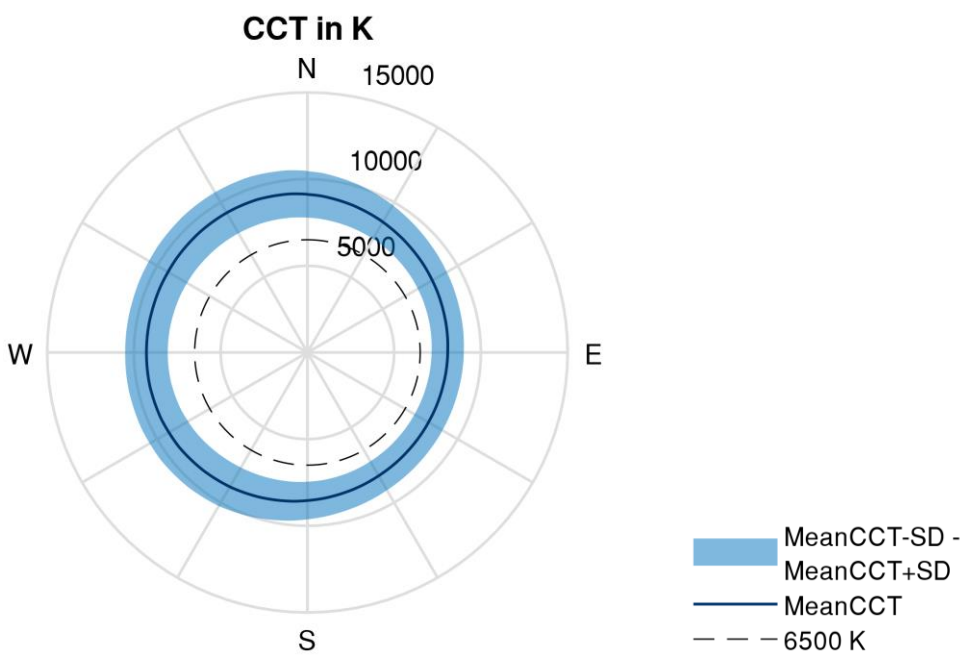
Exemplary SDPDs





CIE 3:12
Summer 2015
Orientation 1° steps
UTC 7:30 a.m. - 8:30 a.m.

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DISSEMINATION

Lighting Recommendations

IEA SHC Task 61/ EBC Annex 33 on “Integrated Solutions for Daylighting and Electric Lighting”

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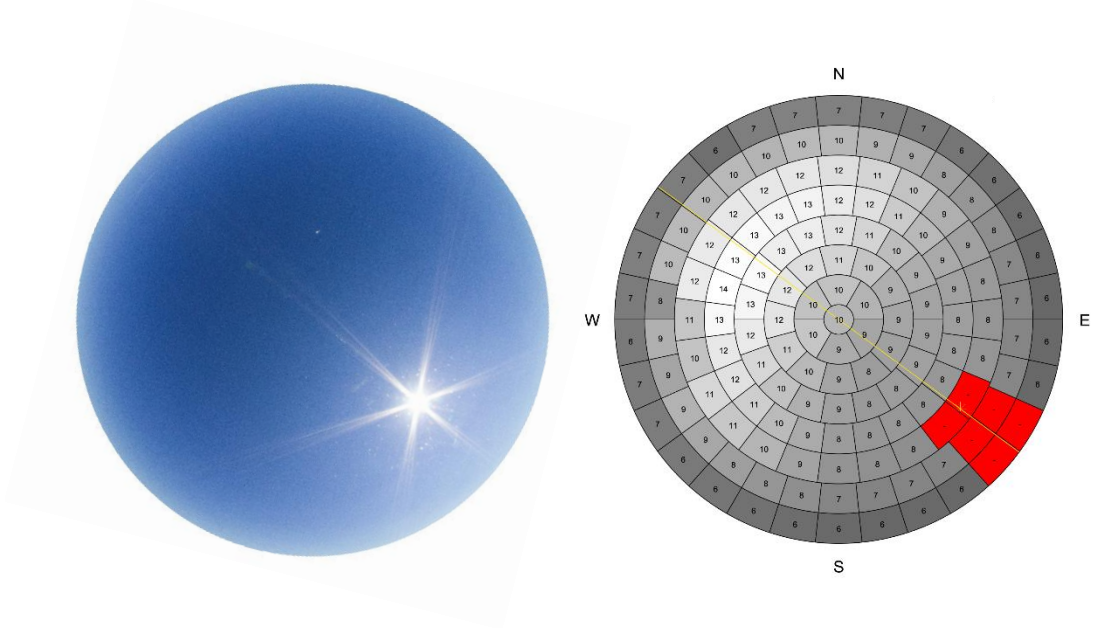
SPECTRAL SKY MODELS



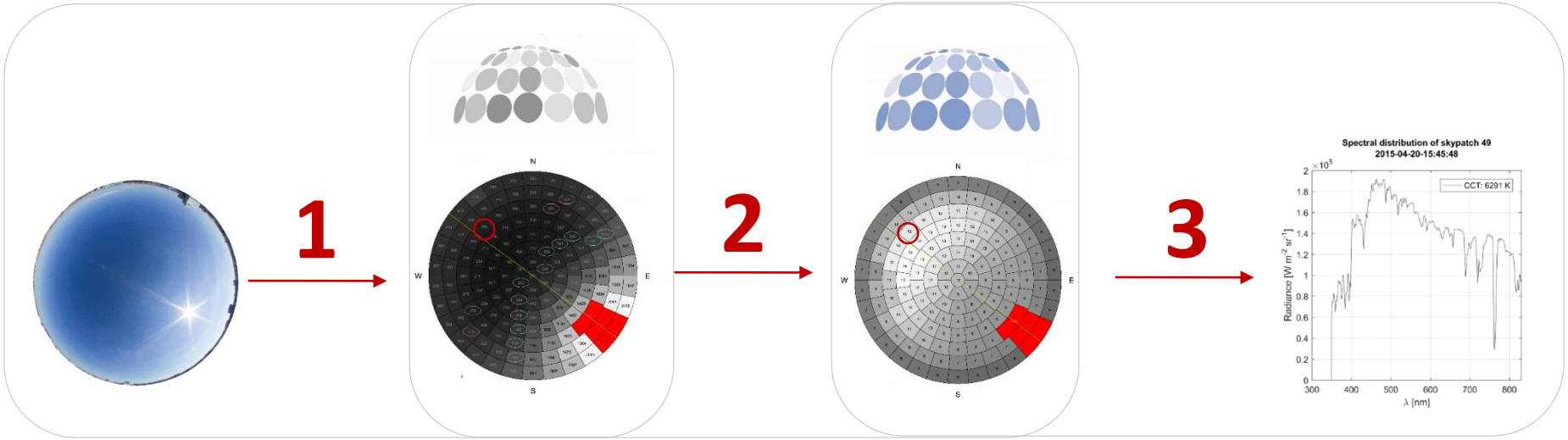
SPECTRAL SKY MODELS

CIE Standard General Sky
ISO 15469:2004(E)/CIE S 011/E:2003

All Weather Model
Perez et al. 1993

CCT = f(L, x1, x2,…)
TU Berlin

S(λ) = f(CCT)
Judd et al. 1964
CIE 015:2018



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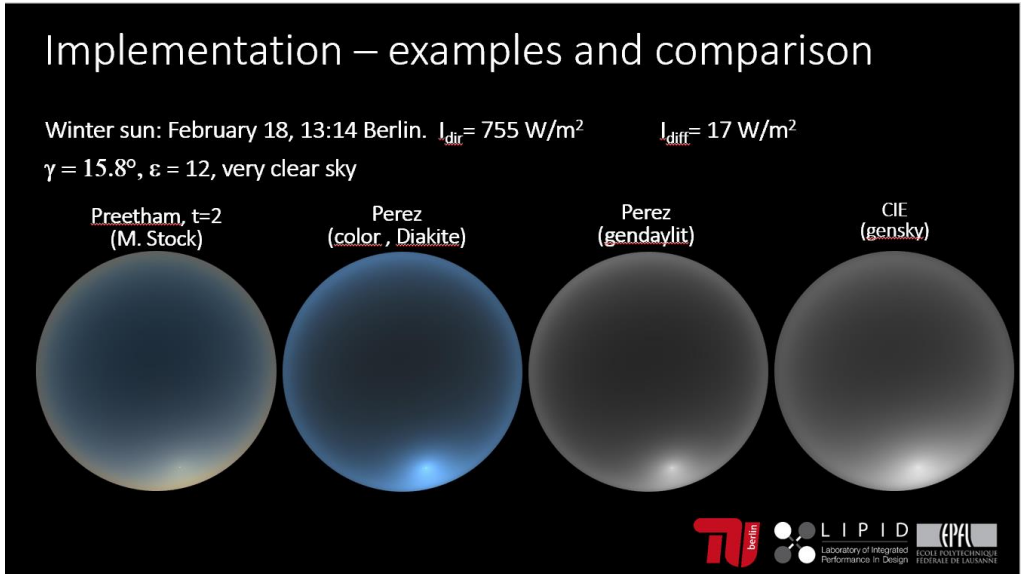
DISSEMINATION

Simulation tools

Implementation in Radiance in collaboration with Jan Wienold - LIPID EPFL



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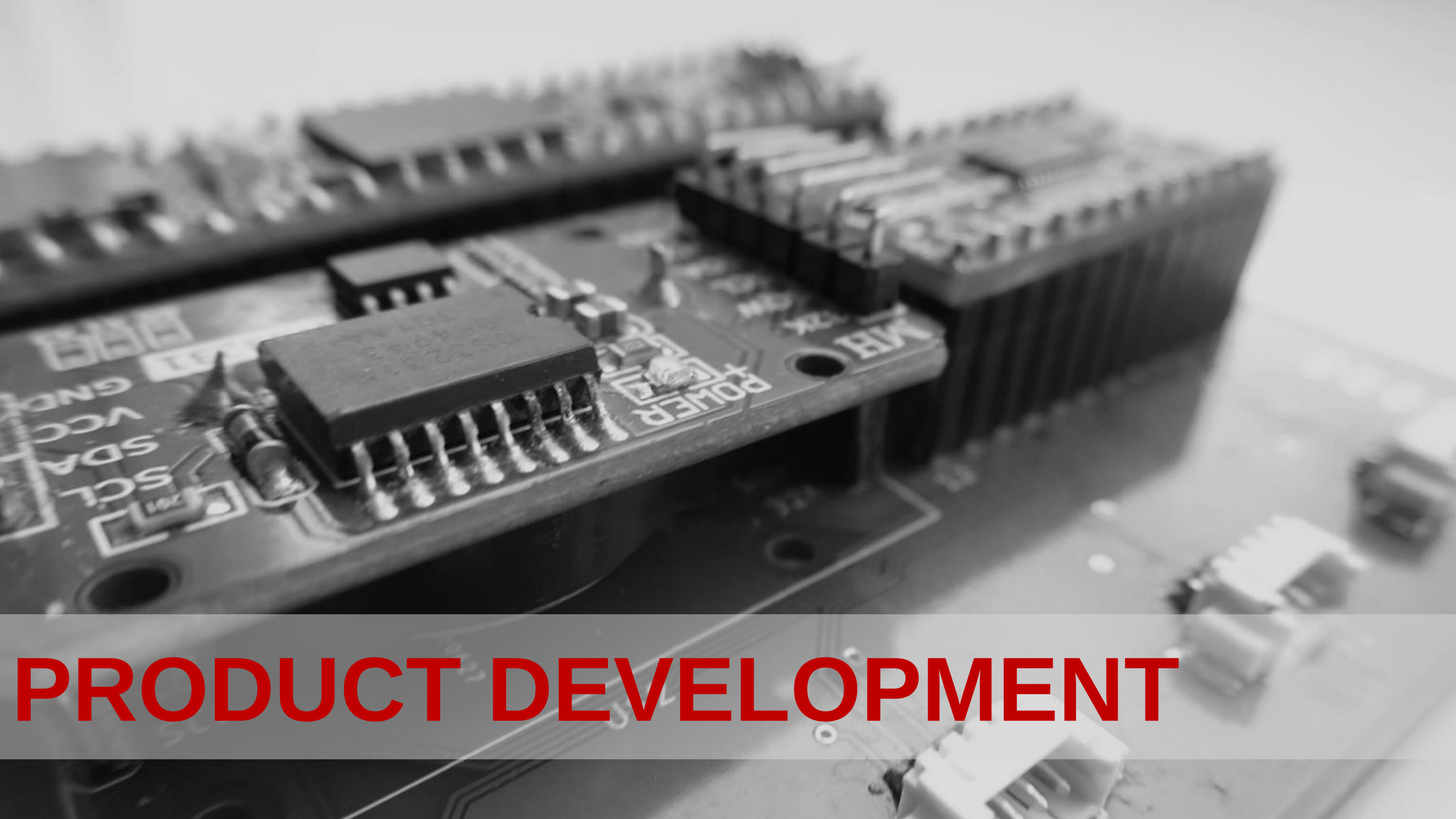
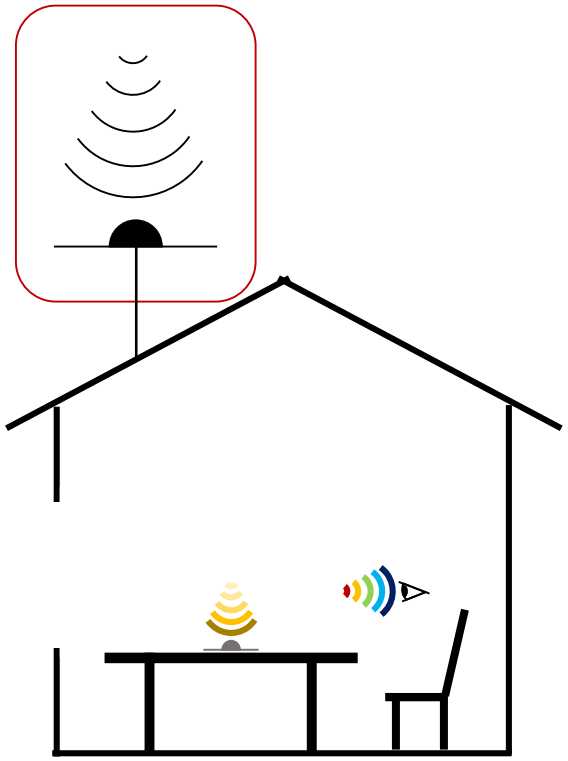


PRODUCT DEVELOPMENT

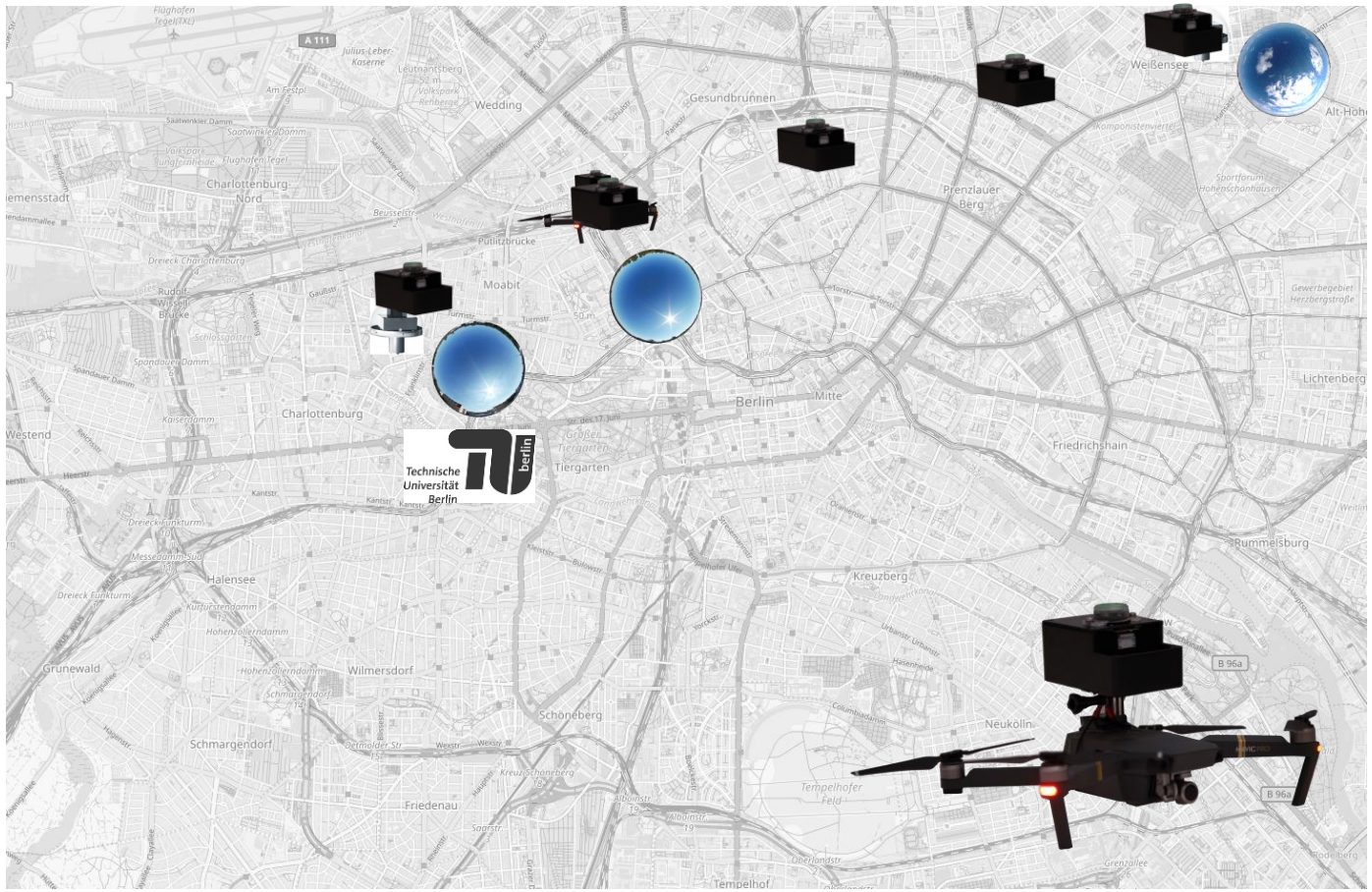
SPECTRAL SENSOR

- Spatial and spectral data (rgb sensors)
- Determination of the incident daylight for integrative lighting solutions
- For areas (for more than one building)



RESEARCH

RANGE OF THE MEASUREMENTS



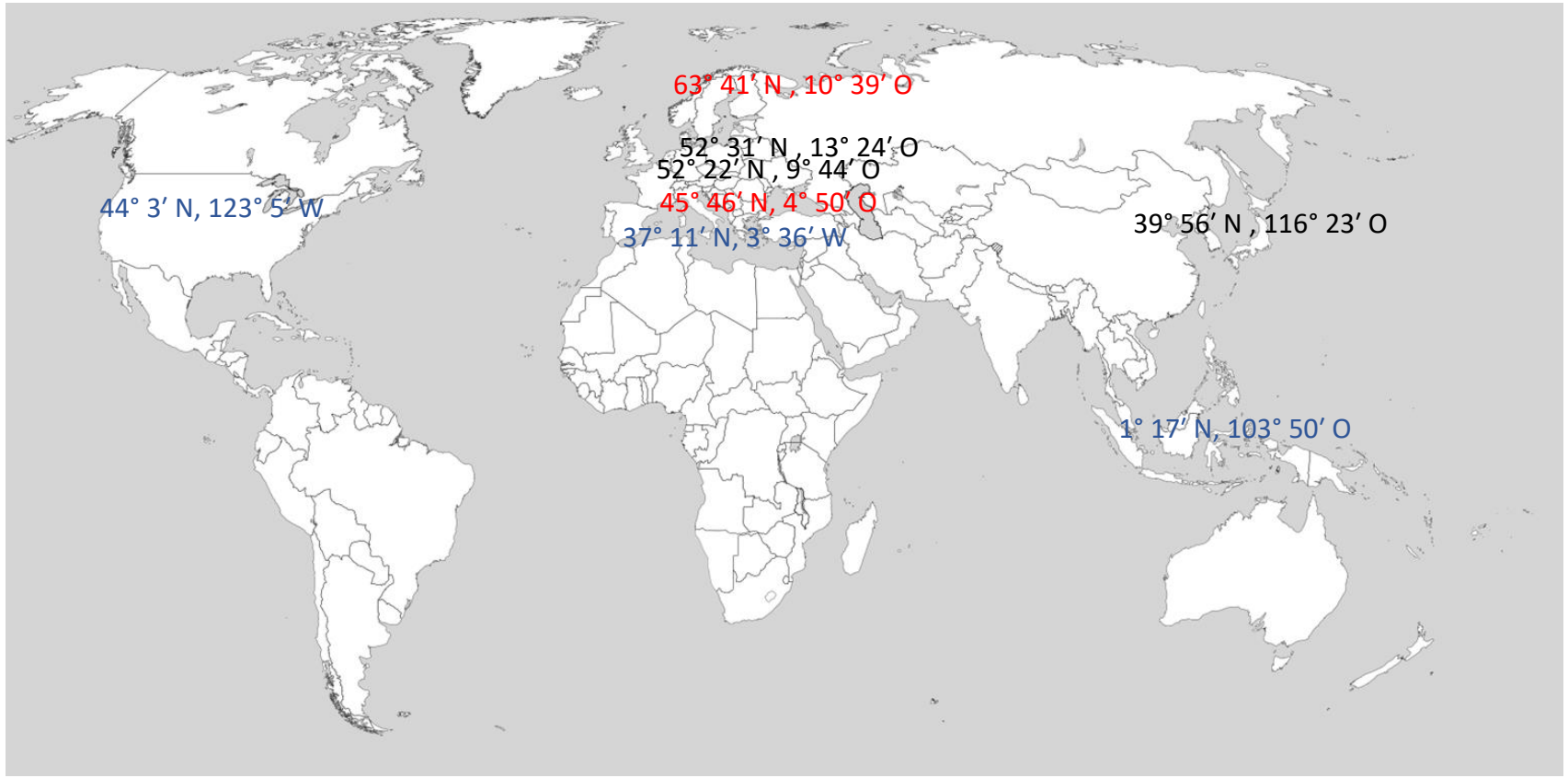
50 m

20 m

10 m

2 m

WORLD WIDE MEASUREMENT CAMPAIGN
WORLD WIDE MEASUREMENTS



Picture: Petr Dlouhý https://commons.wikimedia.org/wiki/File:A_large_blank_world_map_with_oceans_marked_in_blue.svg)

DAYLIGHTING AND INDOOR LIGHTING TEAM

Daylighting and Indoor Lighting Group Leader

Dr Martine Knoop

Sensor Development

Nils Weber

Directionality of IIL-Effects

Kai Broszio

Spectral Models & Daylight Planning

Aicha Diakite

Virtual Reality Light

Silke Müller

Spectral Data: Simulations & IIL-Effects

Frederic Rudawski

Virtual Reality User Reaction

Marina Leontopoulos

DAYLIGHTING AND INDOOR LIGHTING TEAM

Prof. Stephan Völker | Chair of the Lighting Technology
Ingbert Zimmermann | Laboratory supervisor
Jörg Oertwig | Technician

Dimitri Belostowski | Student Assistant
Lucas K. Liegener | Student Assistant
Sebastian Bremer | MA thesis
Eric Rockstädt | BA thesis

https://www.li.tu-berlin.de/menue/equipment/dms/indoor_daylight/parameter/en/

THANK YOU FOR YOUR ATTENTION!

www.aichadiakite.com

VELUX STIFTUNG

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