

A large, abstract graphic on the left side of the slide, composed of several overlapping blue shapes. It includes a large semi-circle, a smaller circle, and several curved, ribbon-like shapes, all in various shades of blue, creating a dynamic, modern look.

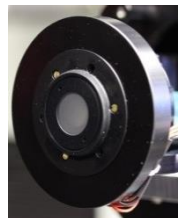
G12.09.06
Highlights from TC-PR

Stefan Kück

EMPIR PhotoLED

Future photometry based on solid-state lighting products

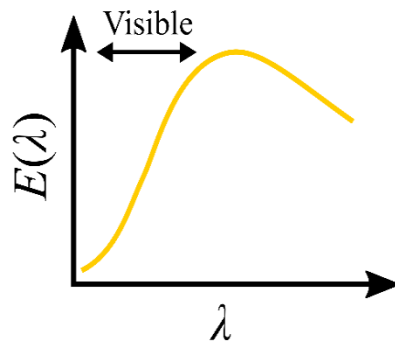
- Develop new photometry based on white LED sources
 - LED illuminants and LED reference spectra for calibration use
 - LED standard lamps for luminous intensity and luminous flux
 - Philips, OSRAM and OSRAM OS involved in the development
 - Cooperate with CIE -> New CIE Technical Reports and Standards
- New measurement methods
 - Measure illuminance of LED sources without optical $V(\lambda)$ -filters using Predictable Quantum Efficient Detectors (PQED)
 - Replace large goniophotometer facilities by a fisheye camera in angular distribution measurements of LED products.



EMPIR PhotoLED – Objectives

Future photometry based on solid-state lighting products

Calibration spectrum



CIE Standard Illuminant A lamp

Luminous intensity [cd]



Typical standard lamp

Luminous flux [lm]



Typical standard

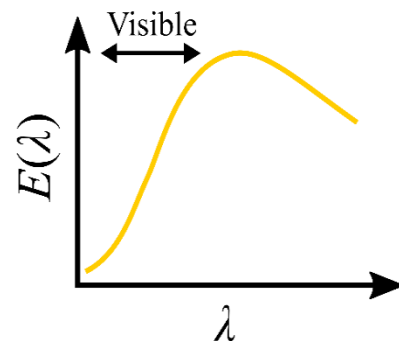
EMPIR PhotoLED – Objectives

Future photometry based on solid-state lighting products

Calibration spectrum

Luminous intensity [cd]

Luminous flux [lm]



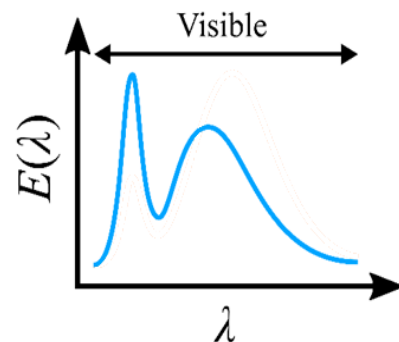
CIE Standard Illuminant A lamp



Typical standard lamp



Typical standard



LED Reference spectrum



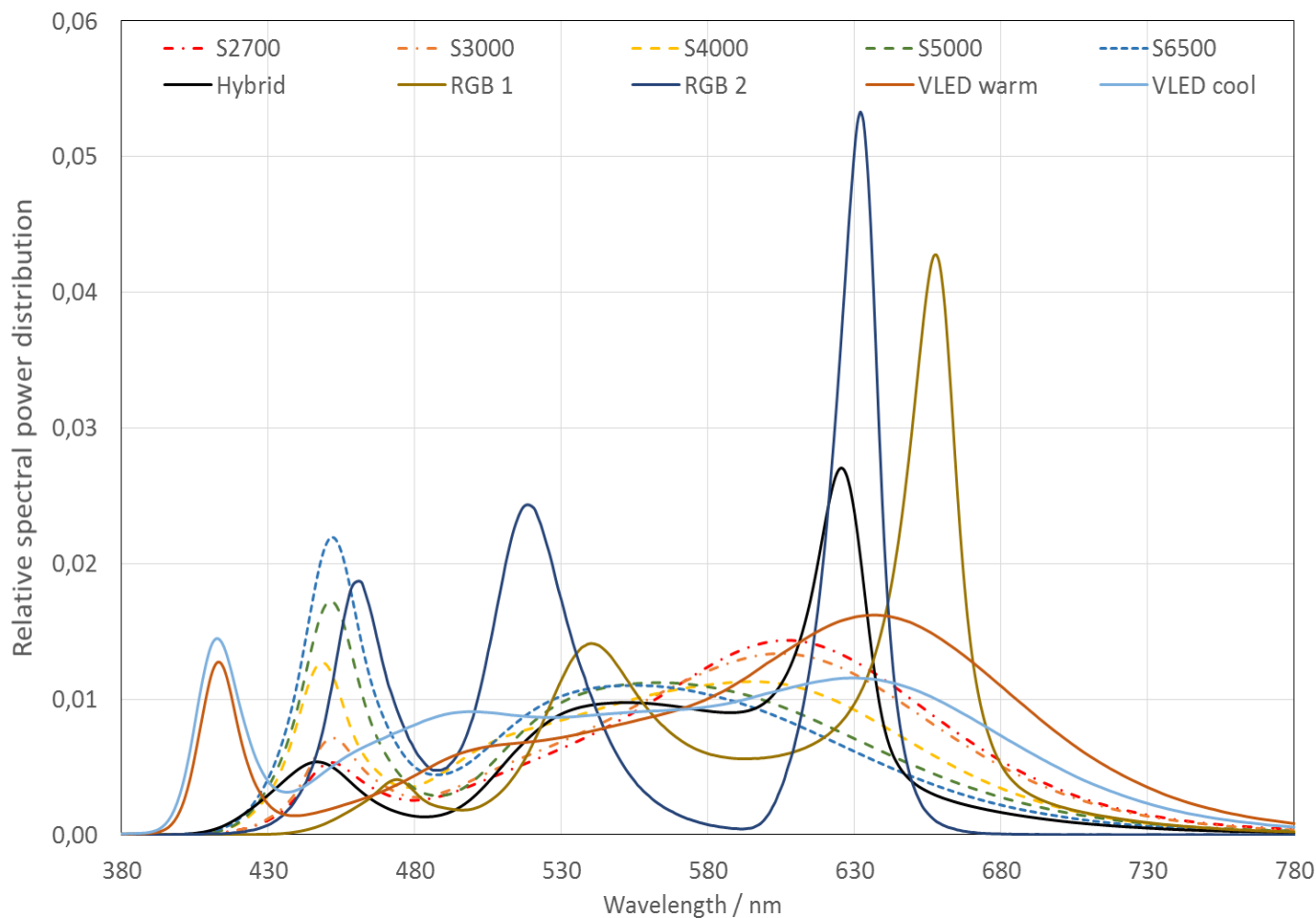
New LED technologies



Custom LED lamps

EMPIR PhotoLED – Achievements

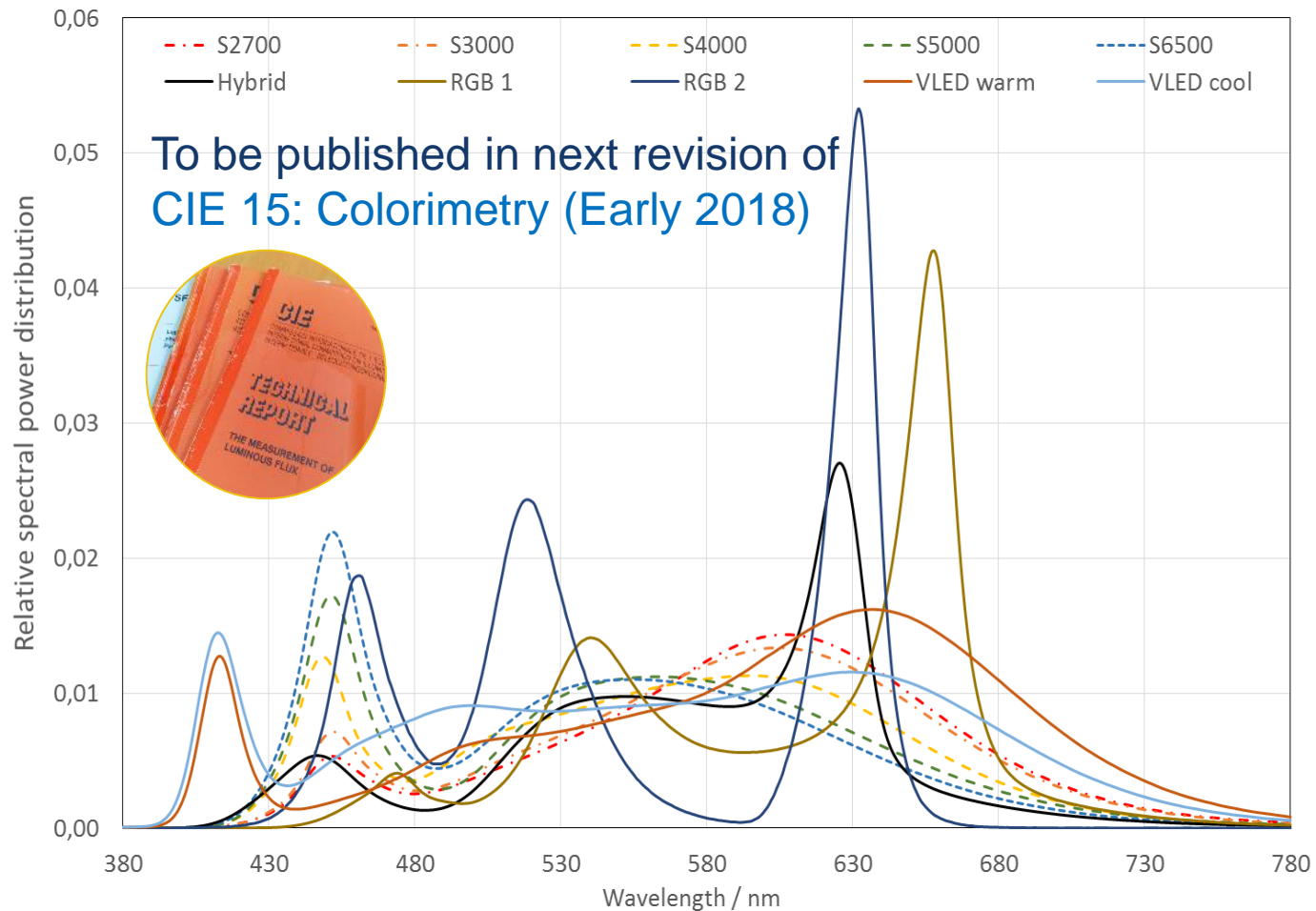
10 new LED illuminants for colorimetry



New LED Illuminants analysed in project PhotoLED from 1500 LED product spectra.

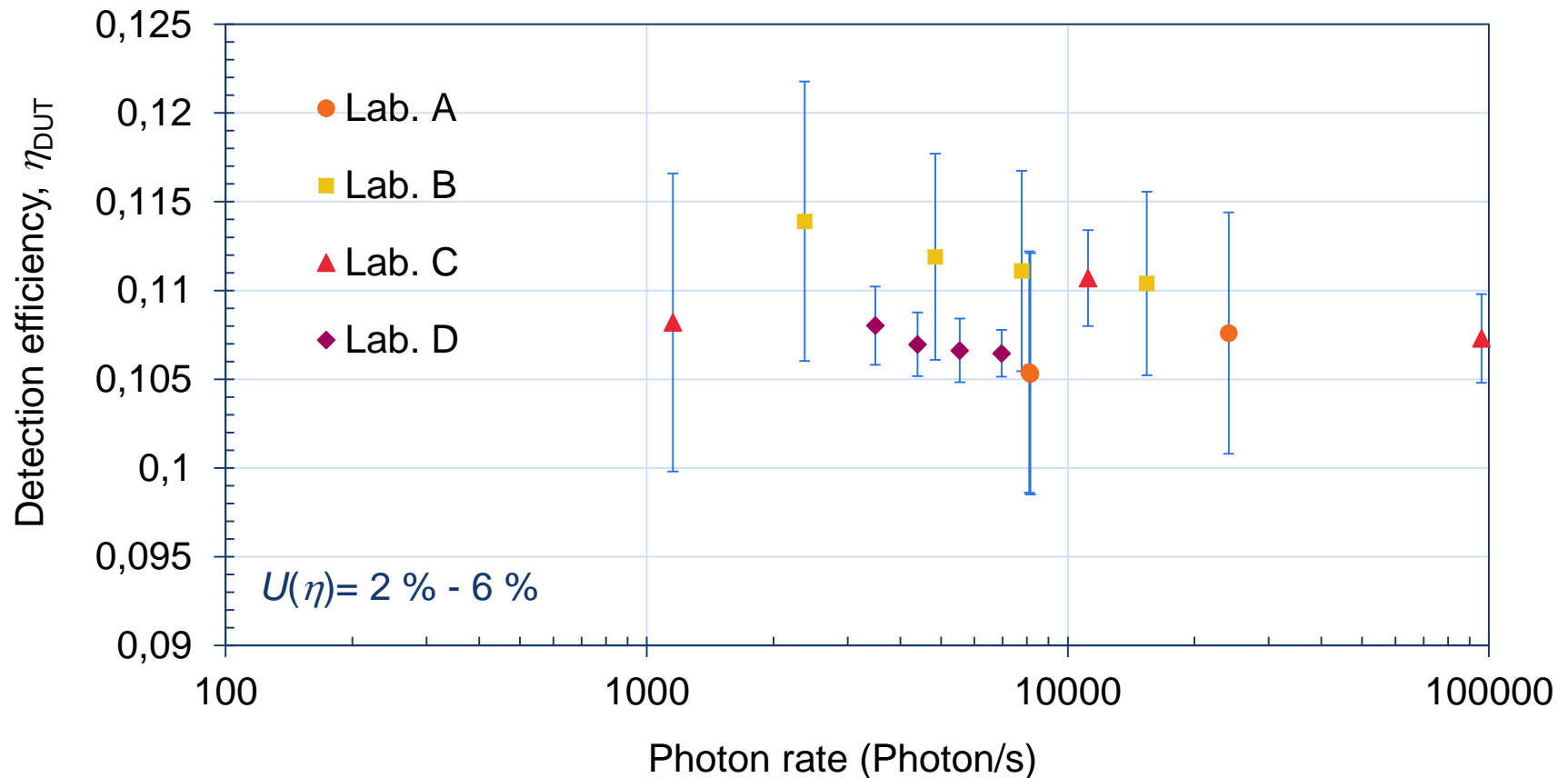
EMPIR PhotoLED –Achievements

10 new LED illuminants for colorimetry

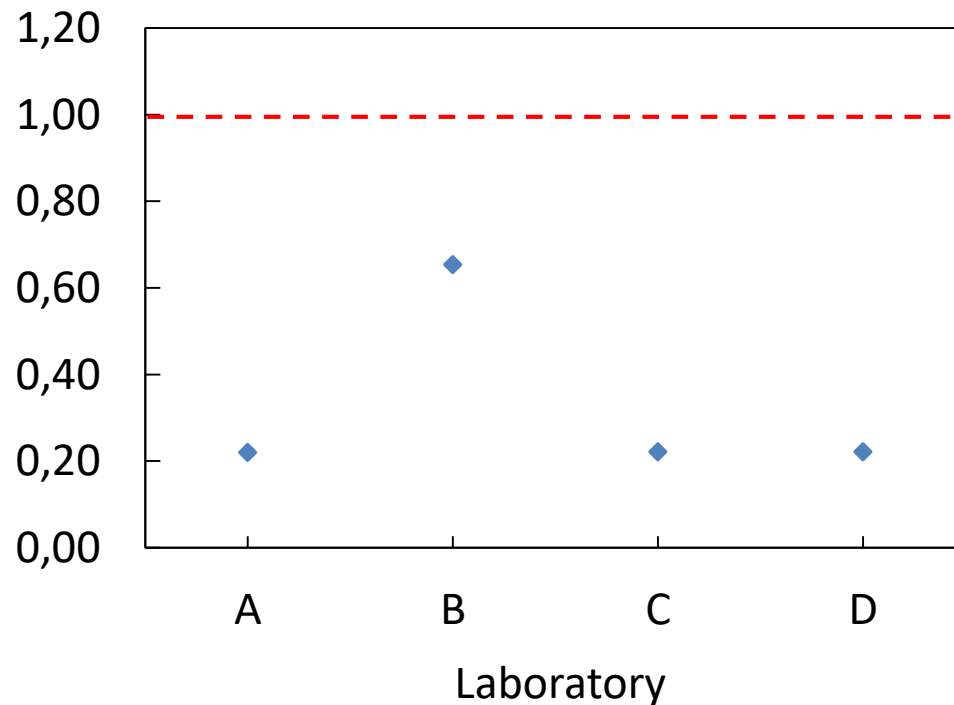
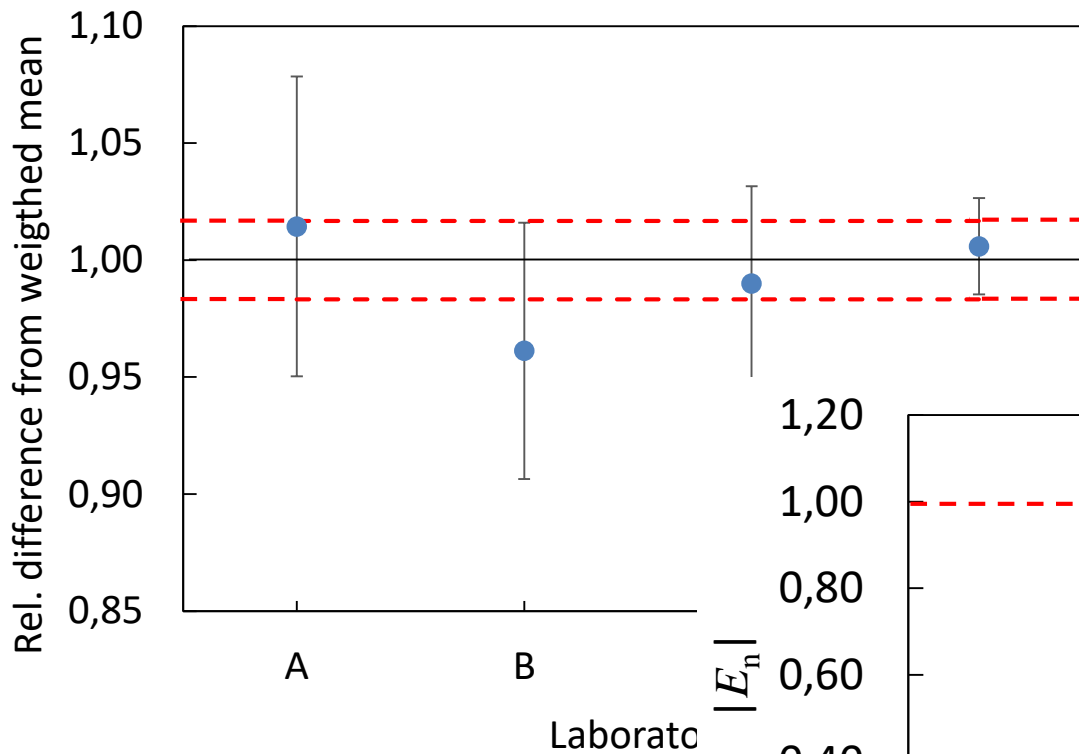


New LED Illuminants analysed in project PhotoLED from 1500 LED product spectra.

- Comparison study for detection efficiency of single-photon detectors at 1550 nm

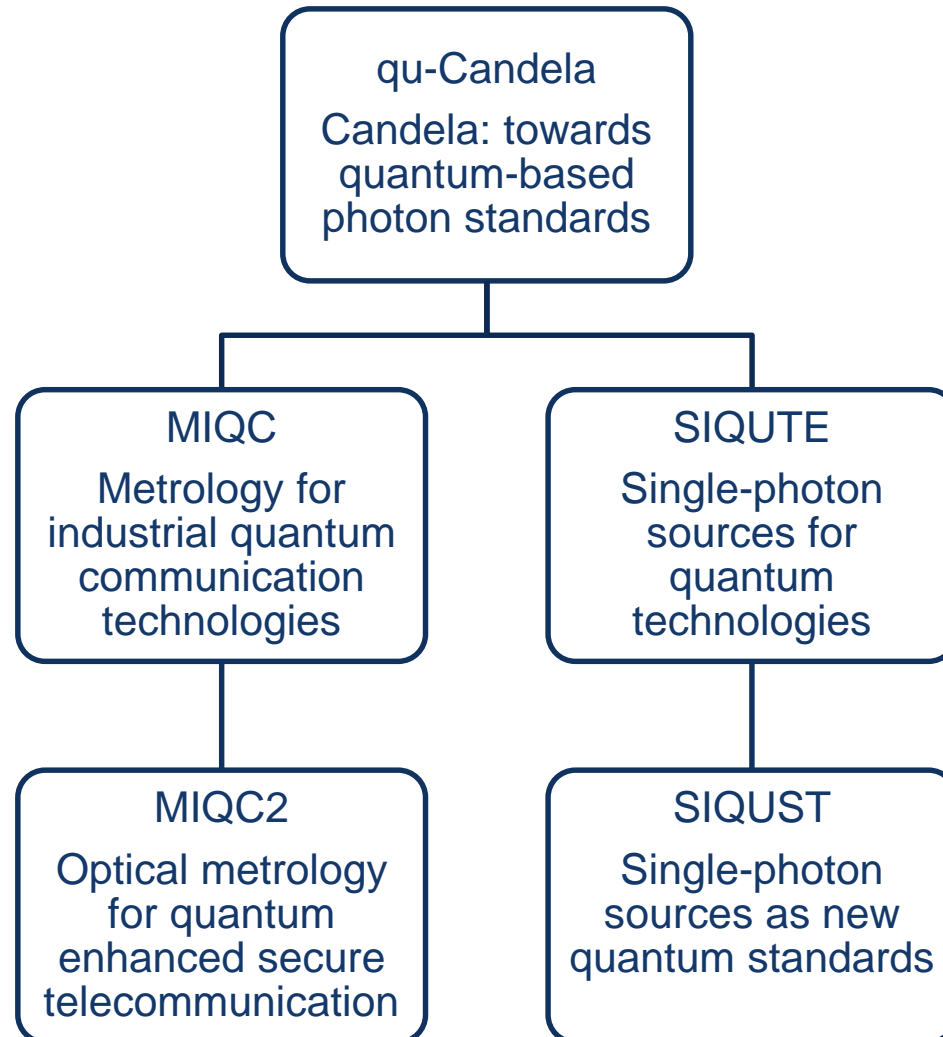


EMPIR – MIQC2

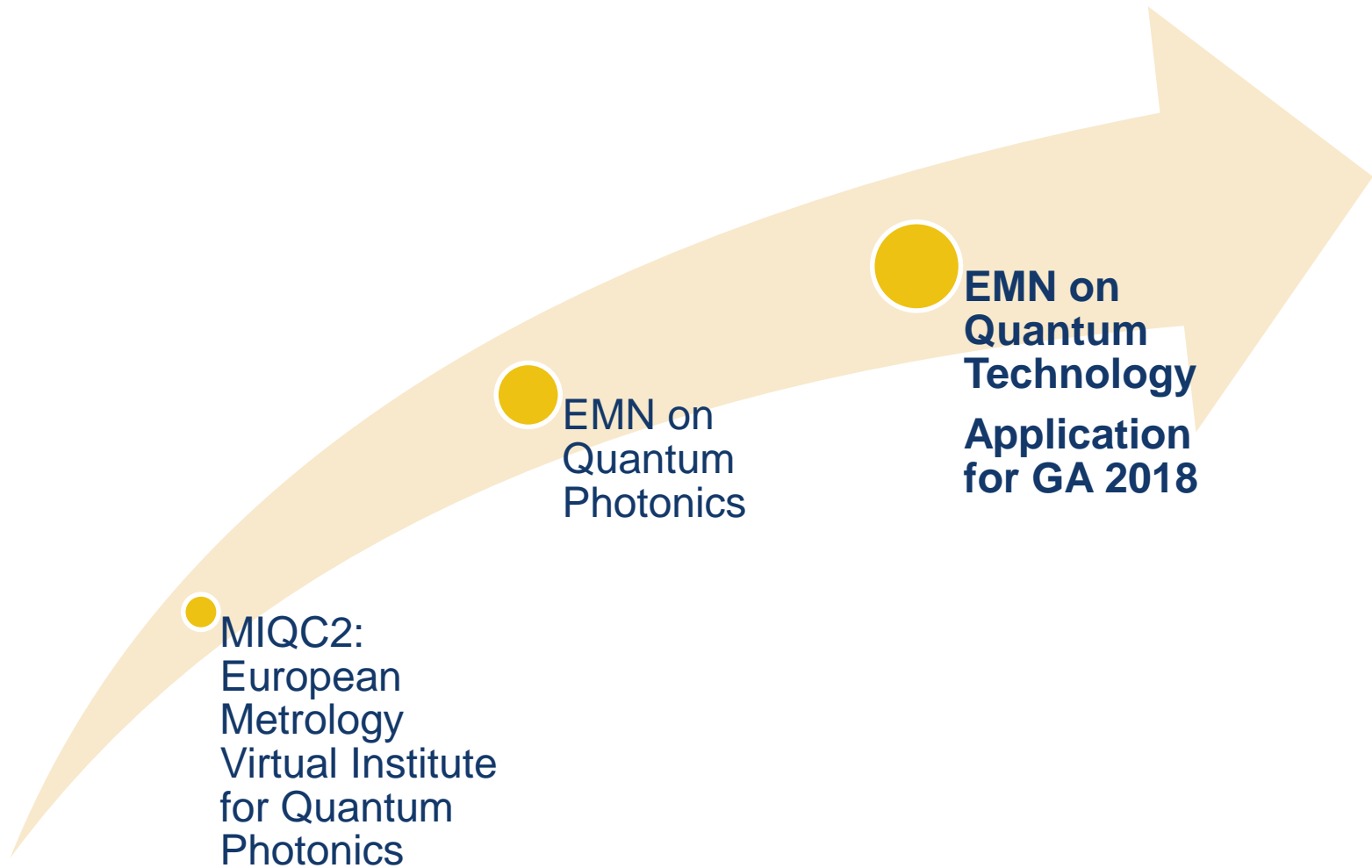


$$E_{n,i} = \frac{\eta_i - \bar{\eta}_w}{\sqrt{U(\eta_i)^2 + U(\eta_w)^2}}$$

Activities in Quantum Photonics



European Metrology Network



National metrology institutes (NMIs) expect in the immediate future large demands from industry, standardisation bodies and governments, which single NMIs will not be able to respond adequately.

The active coordination of European NMI research activities is fundamental to maintain European competitiveness in the quantum technologies field for future decades, while new big actors appear on the international scene with nearly limitless economic resources.

⇒ For this reason the creation of the European Metrology Networks on Quantum Technologies (EMN-Q) was proposed.

This network will react to upcoming challenges

- by **coordinating** actively the European NMI research activities on quantum technologies,
- by **aligning** with the objectives of the EC Quantum Technologies Flagship and with the industrial requirements,
- by **contributing** to standardization & certification of quantum technologies, and
- by **promoting** take-up of metrology in the development of these technologies, and provide linkage with other technical areas.

Strategically, the network will

- ensure the **efficient use of the funds** available at the European level for these QT research domains;
- **avoid unnecessary duplication** of activities;
- **act as the main contact point** to stakeholders connected to the domains of QT which are covered by the scope of this EMN.

EURAMET TC-PR WORKSHOP on EMPIR Call 2018 on SI, Health, Normative, Networks

- **SI Broader Scope:**
 - 6 PRTs suggested, 6 submitted
 - ⇒ 2 SRTs, 2 pending, 2 rejected
- **Normative:**
 - 1 PRT suggested, 1 submitted
 - ⇒ 1 SRT
- **Networks:**
 - 3 PNTs suggested, 2 submitted
 - ⇒ 2 SNTs

EURAMET TC-PR WORKSHOP on Support, Collaboration and Coordination

- Presentation from the participants on needs for support, collaboration, coordination
- Each NMI to present at max. 3 issues, it is facing in their work and there it needs/searches support from EURAMET TC-PR or their members
- Each NMI to present one strategic goal for the next 5 years.
- Max. 5 min each

Planning of comparisons



CCPR comparison	K6.2010	K3.2014	K4.2017	K2.b.2016	K2.a.2016	K1.a.2017	K5.20xx	K1.b.20xx	K2.c.20xx
	Regular spectral transmission	Luminous intensity	Luminous flux	Spectral responsivity (300 - 1000 nm)	Spectral responsivity (900 - 1600 nm)	Spectral irradiance (250 - 2500 nm)	Spectral diffuse reflectance (360 - 820 nm)	Spectral irradiance UV	Spectral responsivity UV (200 - 400 nm)
EURAMET comparison	K6.2015	K3	K4	K2.b	K2.a	K1.a	K5	K1.b	K2.c
BEV (AT)									
BIM (BG)									
CMI (CZ)				1					
DFM (DK)									
DMDM (RS)									
EIM (GR)									
GUM (PL)							1		
INM (RO)									
INRIM (IT)				1					
IO-CSIC (ES)		Link / CCPR ?							
IPQ (PT)									
JV (NO)				1	1				
LNE (FR)	Pilot / Link / CCPR								
METAS (CH)		Pilot / Link / CCPR							
METROSERT (EE)									
BFKH (HU)									
NPL (UK)									
PTB (DE)	Link / CCPR	Link / CCPR	Link / CCPR			Link / CCPR			
SMD (BE)									
SMU (SK)									
RISE [SP] (SE)			Pilot						
UME (TR)		Pilot		Pilot / Link / CCPR					
VSL (NL)									
VTT (FI)									

Planning of comparisons



CCPR KCs
EURAMET KCs

CCPR comparison	K6.2010	K3.2014	K4.2017		K1.a.2017	K5.20xx	K1.b.20xx	K2.c.20xx
	Regular spectral transmission	Luminous intensity	Luminous flux		Spectral irradiance (250 - 2500 nm)	Spectral diffuse reflectance (360 - 820 nm)	Spectral irradiance UV	Spectral responsivity UV (200 - 400 nm)
EURAMET comparison	K6.2015	K3	K4		K1.a	K5	K1.b	K2.c
BEV (AT)								
BIM (BG)								
CMI (CZ)				1				
DFM (DK)								
DMDM (RS)								
EIM (GR)								
GUM (PL)						1		
INM (RO)								
INRIM (IT)				1				
IO-CSIC (ES)		Link / CCPR ?						
IPQ (PT)								
JV (NO)				1	1			
LNE (FR)	Pilot / Link / CCPR							
METAS (CH)		Pilot / Link / CCPR						
METROSERT (E)								
BFKH (HU)								
NPL (UK)								
PTB (DE)	Link / CCPR	Link / CCPR	Link / CCPR			Link / CCPR		
SMD (BE)								
SMU (SK)								
RISE [SP] (SE)			Pilot					
UME (TR)		Pilot		Pilot / Link / CCPR				
VSL (NL)								
VTT (FI)								

Members of EURAMET TC-PR / NMIS

Participation CCPR
(possible link)

(will) act as link

Participation EURAMET /
Participation EURAMET
declared

Pilot

Excused as pilot
(size or previous piloting)

Some statistics



- Meetings:
 - 31.01. – 01.02.2018: SMU, Slovak Republic
 - 30.01. – 31.01.2019: IPQ, Portugal
- 24 members (all NMIs)
- CMCs: 34 reviewed, 5 withdrawn (EURAMET.PR.13.2018)
- Comparisons: 5 proposed, 8 ongoing, 2 completed, 1 abandoned