

# PROMOTING GOOD LIGHTING

The CIE's 30th Quadrennial Meeting took place in Ljubljana in Slovenia in September. The CIE's Nigel Parry was there for *Lighting Journal*

By Nigel Parry

The CIE's Quadrennial Meeting in Ljubljana was followed by the annual meeting of the Divisions and their associated technical committees.

Around 431 delegates from 41 countries and territories arrived to listen to the papers and mix with fellow-minded lighters.

As usual at CIE conferences, keynote speakers are invited in each day to open the sessions. It was worth noting that two of the three were from the UK. The first keynote speaker was Dr Peter Boyce and then, via Zoom, Kit Cuttle from New Zealand.

Boyce and Cuttle presented their view of the role and limitations of current lighting standards. Their considered opinion is that, although these prevent bad lighting, they do little to promote good lighting.

They prefer a reverse design method, as opposed to the lumen method. Unlike the lumen method, the reverse lighting design approach specifies the end state of the installation and then determines how this can be achieved. An overview of this method, also known as the 'LiDOs Procedure', written by Kit Cuttle, can be found in *Lighting Research & Technology*, 54(7), 628-629 (2022).

The LiDOs Procedure differs from the lumen method in that, at the outset, the practitioner identifies the lighting needs

and the opportunities presented by the application to form a list of lighting design objectives (in other words LiDOs) to be achieved. Spatial brightness is the only required objective and is specified by a mean room surface exitance value.

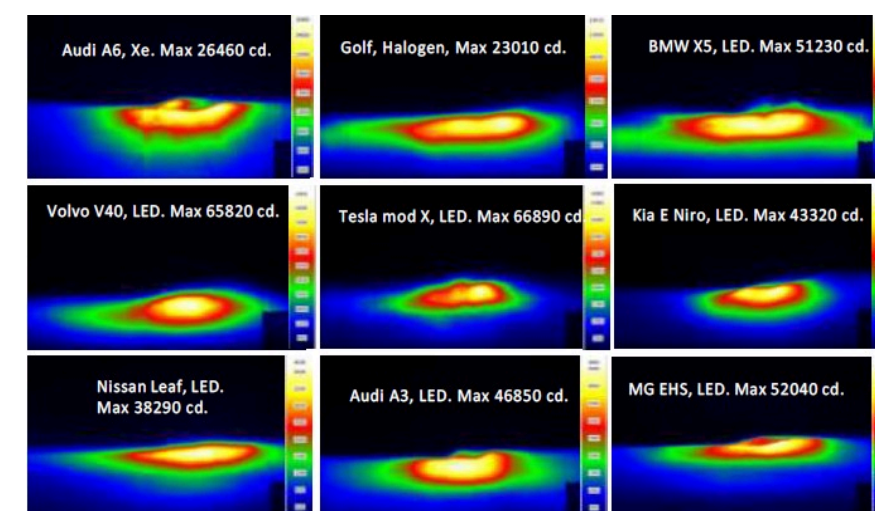
Other objectives may involve illumination diversity to achieve a distribution of visual emphases. These specified values are related to the photometric properties of the space to determine an optimal direct luminous flux distribution to achieve those lighting design objectives that relate to ambient illuminance or illuminance distribution.

The selection of luminaires and the planning of the layout and controls are then directed to providing the required direct luminous flux distribution. This is as well as achieving any of the practitioner's other chosen objectives with lighting colour and glare control specified by conventional lighting metrics.

However, this method requires reliable data for the reflectances of the major surfaces for calculating the mean room surface exitance (MRSE). It should be noted that MRSE can only be calculated, not measured.

There are a series of spreadsheets for the LiDOs procedure. The next major challenge for this approach is to include daylighting.

## Lighting research



A slide from Maria Nilsson's presentation, which considered a different approach to looking at the performance of modern LED headlamps

### DIVISION 4 ACTIVITY

Following the keynote address, the sessions split and had three rooms with different focus for the papers.

Looking at mainly the Division 4 (road lighting) activities, the first session was on road safety and was chaired by Ron Gibbons from the USA.

Three of the four papers were from Sheffield University. The aspects of pedestrians and cyclist safety were outlined with a clear question mark about whether cyclists should actually be in a larger grouping, to include scooters, electric mobility carriages and the like.

The next session was on road lighting measurements, chaired by Dionyz Gasparovsky (Div 4 Director). Here a number of interesting papers looked at the use of R tables and wet road conditions.

An interesting paper by Laure Lebouc, from France, looked at studies to define new observation geometries for road lighting design. Design calculations at present are based upon a 'standard' driver eye height of 1.5m above carriageway.

Yet there are other road users, cyclists and pedestrians for example, drivers of SUVs, lorries and so on, whose eye height is greater or less than 1.5m. So the angle of calculation at the target area varies – how does this affect the lighting performance from their perspective?

As view angle increases, average luminance and uniformities decrease but consider that visibility is not really affected.

Then what about R tables? Do the tables really represent current road surfaces? Road optical properties are really unknown. Designers may use generalised R values when undertaking luminance design and the tables as they stand are thought not to represent current road surfaces.

The problem as I see it is that the surface is continuously changing/evolving, a driver (say on the M25) may have four or more different road surfaces in their field of view, as repair works, new roads and so on are undertaken. So, what should be done? Is luminance still the right approach?

Maria Nilsson from Sweden had a different approach of looking at the performance of modern LED headlamps and how much they varied. And yet they are apparently all within specification?

The Division 1 workshop, 'Can cone fundamentals be used in everyday photometry?' led by Tong Bergen began with presentations from Lorne Whitehead, Yoshi Ohno and Peter Blattner.

This workshop is linked to the CIE Research Forum RF-05 and TC1-98 (A road-map toward basing CIE colorimetry on cone fundamentals). This aims to create a colour space similar to CIELAB but based on the responses of L, M and S cones.

In this system, the existing  $V(\lambda)$  function would be replaced by a new function  $V_p(\lambda)$ . This work would lead to updates of CIE 170-1:2006 and CIE 170-2:2015 (Fundamental chromaticity diagram with physiological axes).

For the second day, the plenary lecture by Simon Hodson, titled 'Shedding light on FAIR data and open science', emphasised the importance of all types of data from fundamental constants to specifications.

In this context 'FAIR' = findable, accessible, interoperable, reusable. This presentation illustrated the link between the CIE and the International Science Council (ISC), of which CODATA (the Committee on Data for Science & Technology) is an important part.

Celine Villa, from France, has been looking at the use and performance of luminous road markings and gave a



Ljubljana in Slovenia, destination for the CIE's 30th Quadrennial Meeting

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## Lighting research

→ four-month update on her research work.

Trial samples have been placed on the research building, together with typical white lining materials and these are assessed every five minutes. These systems do not seem to work well in wet conditions and also the team's assessment period so far does not extend into winter where day light 'charging' hours are less, and operational periods are longer.

### LED AND INSECTS

Egidio De Benedetto, from Italy, reported on considerations of the use of grazing lighting to light motorways, something being trialled around Naples.

The paper essentially only looked at this application with regard to fog conditions. Trials have only been undertaken under laboratory conditions looking to create fog and assess the performance.

Leonard De Causmaecker, from Belgium, discussed the impact of public LED lighting on insects' movement. This was an interesting study, based as it is upon upward-facing light boxes around three different landscapes, with a camera that recorded the insects every five minutes and software that counted their numbers.

The work so far seems to contradict what we consider, in that 2700K attacked more insects than 6500K. It was questioned if this might be different if typical street lighting was considered where the light is downwards.

Annika Jagerbrand, from Sweden considered what metrics should we use when considering and reporting light and light pollution? And the need for common reference considerations, the need to consider atmospheric/astronomical pollution, ecological impacts and impacts on human health.

CIE 231:2014 and CIE TN001:2020 aid this, through this we can address unverified 'findings' on the effect of artificial light.

Tomas Novak, from the Czech Republic, advised on metrics regarding modelling radiation into the upper hemisphere when considering illuminated billboards. Essen-



The UK delegation (or most of them) in Slovenia. Below, left: Nigel Parry on the badminton court with Kaida Xiao. Below right: the TCA4-62 meeting in full swing

tially, this is the development of a digital integrating sphere with the board at its centre. In one case, it would take 46 streetlighting luminaires/columns to create the impact of one billboard.

A wide range of poster papers were also put on display. For those not aware of such sessions, some 40 'AO' size posters were put up summarising research being undertaken. The lead researcher was present to discuss and answer questions. It was quite fascinating looking at the diversity of lighting topics being considered.

### 'LIGHTING FOR PREPAREDNESS'

On the final day we had another session, which had an unusual title of 'Lighting for preparedness'.

This was hosted by Jennifer Veitch and Steve Fotios of the UK. This open session wanted to look at how could the lighting profession and CIE assist with the provision of light in emergency situations?

So, what is lighting preparedness? Essentially, it is considering the provision of lighting for use following natural disasters, pandemics, energy crises and perhaps innovation amongst other considerations.

This is not just a lighting but a power supply consideration. Rescuers need to act quickly and there are 'golden' periods where lives can be saved, so rescuers need to work 24/7 – and artificial lighting is a key

aid to help them in their searches.

In Ukraine, for example, people are reporting they feel safer at night now some lighting has been returned. In the interim, is there any form of lighting that could provide some comfort? The charity Shelter Box (<http://shelterbox.org>) has developed one such solution.

So, can suitable equipment be made ready for such incidents and distributed in the time required? A lively debate ensued with a proposal to start a Technical Committee to consider lighting resilience.

One of the final sessions looked at the design and implementation of road lighting. Once again, a debate with a high number of D4 members ensued and agreed that reports such as CIE 115 required updating.

Where do the values assigned to the different lighting classes come from? It is not possible to track back to any decisions made in British Standards, CEN Standards or the CIE's own research.

There are many uncertainties in providing a lighting installation. We have material tolerances' software – is it really up to the task? It is noted that certain software for calculating P classes when considering curved areas puts grid points at the rear of the footway, which are not calculation points; this can adversely affect the results, installation accuracy (or not) and then



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## Lighting research



measurement results. Equally, LED luminaires are still assessed as a uniform light source whereas the source is clearly non-uniform so why does this approach carry on? How can all of these be considered and brought together?

The ILP has undertaken some good

work, such as TR28, looking at undertaking performance measurement on site and considering the uncertainties. This is also supported with some guidance notes, such as 2016's GN3 *Measurement of performance of LEDs*.

The final session was on outdoor integra-

tive lighting and chaired by Annika Jaegerbrand. This session touched on a variety of subjects, including considering if female pedestrians express a lower degree of reassurance than male pedestrians and how road lighting could help?

How, too, might we evaluate any possible effect on driver circadian systems under street lighting to the impact of road lighting on melatonin?

To complete the conference, the local organisers arranged a mini-badminton competition. Suffice to say, we didn't win but Kaida Xiao and I thoroughly enjoyed it!

### DIVISION 4 TECHNICAL MEETINGS

The three-day conference was followed by Technical Committees and the Annual Divisional 4 meeting. The following committees met in Ljubljana:

#### 1. TC4-62 Adaptive road lighting. Chair: Paolo Di Leece.

The meeting was packed, with around 40 members in attendance. The report is well developed but the meeting focus was on the term for adaptive lighting.

A few remaining chapters are nearing completion and a working draft for editing will be available early 2024.

#### 2. TC4-58 Obtrusive lighting colourful and dynamic displays. Chairs: Steve Lau/Allan Howard.

Three presentations (Allan Howard, Steve Lau and Tomas Novak) were provided and explored how this area is expanding. Importantly the report is to provide guidance to the industry and planners.

This work is 80% completed and the due date for completion is December 2025.

#### 3. TC4-50 Road surface reflection. Chair: Valerie Muzet.

Valerie has taken over the TC and is formulating a new work plan. A number of presentations were given on various aspects of on-site measurements.

The committee is now looking to collect R-tables for its report. Extension is approved and draft to editor due in 2024, and the report is due to be published in 2025.

#### 4. TC4-53 Tunnels lighting evolution. Chair: Jerome Dehon.

This committee held eight meetings in the last year, so progress is good but still more work to be done.

An extension is required, with the aim to provide a working draft by the third quarter of 2024.

#### 5. JTC 13 Depreciation maintenance of lighting systems. Chair: Dionyz Gasparovsky.

This committee is developing new terms for maintenance for the luminaire and for the surfaces. It was

noted that there are still many issues relating to road surface reflectances, which will have an influence upon the design.

This committee is to work alongside CIE/ISO TS22012, and then may update the ISO. The aim is to complete this by the next mid-term meetings in 2025.

#### 6. JTC 18 Lighting education. Chair: Dionyz Gasparovsky.

This committee is looking for a new D3 chair, as Dionyz Gasparovsky is the current D4 chair. This committee reported slow progress, with meetings earlier this year. It will meet to look at areas of work to be developed.

The following Technical Committees are also active:

- TC 4-47 Application of LEDs in transport signalling and lighting (Hugh Barton). This has completed preparing for publication.
- TC 4-57 Guide for sports lighting (Alan Smith).
- TC 4-59 Guide for lighting urban elements (Diana del Negro). This has an updated workplan in that it is set to publish by 2026.
- TC 4-60 Road traffic lights – photometric properties of roundel signals (Ron Gibbons). This is due for completion summer 2026.
- TC 4-61 Artificial lighting and its impact on the natural environment (Annika Jägerbrand). This will require further resources and/or work to complete. Parallel activity is a possibility.
- JTC 01 Implementation of CIE 191:2010 Mesopic photometry in outdoor lighting (Stuart Mucklejohn). This was due to send out for ballot by the end of October 2023.

In addition, at the Annual Meeting it is worth noting that updating CIE 115 was agreed. Steve Fotios presented a proposal for a revision, combining breaking it down to elements covering: pedestrians and motorists (Year 1); cyclists and vulnerable road users (Year 2+). Then the plan will be to revise CIE 115.

### CONCLUSIONS

In summary, the conference provides huge networking opportunities to find out and discuss how the application of light and lighting is approached across the world. A high number of students are in attendance, who wish to understand the practical application of light and lighting to aid their research.

Research never seems to stop, there is always a bit more required. As Ron Gibbons (US) commented in one session, more research needs to be undertaken in the field rather than in the laboratory. But this does cost.

In the past four years, CIE has published 56 documents relating to light and lighting. This is no mean achievement, considering the last four years and the requirement for agreement on each publications content.

Why not therefore consider joining the CIE at your national level? You gain a 66.67% discount on all publications and the CIE-UK provide bursaries for attendance at CIE events such as this session, and much more.



**Nigel Parry** is CIE D4 Editor and UK treasurer. With thanks to the generous contributions from **Allan Howard** and **Stuart Mucklejohn**.

### FUTURE MEETINGS AND EVENTS

The 2024 Shanghai (CN) hybrid 'Lighting up the cities' symposium and/or workshop on architectural lighting and/or various aspects of obtrusive light will be held next September. The Technical Committees and Annual Meeting will also be held online during the year.

Vienna will then be the destination of the 2025 CIE Mid-Term Meeting, including workshops. CIE is looking for proposals for its 2026 meeting, ideally in Africa or America. And Nanjing in China will be the venue for the 2027 CIE Quadrennial Session.