Submitted by the experts from IEC

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Approval process of LED replacement light sources

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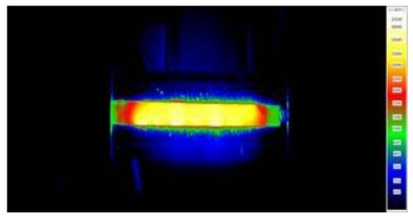
Content

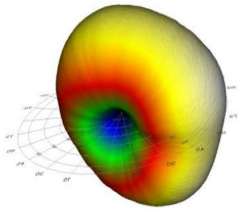
- UN approval process
- National approval process
- Summary and request for guidance

UN R37 approval
full photometric equivalence according to guideline (GRE-83-15)

Example 1: Signalling light source C5W (low power)



Near field: filament-like

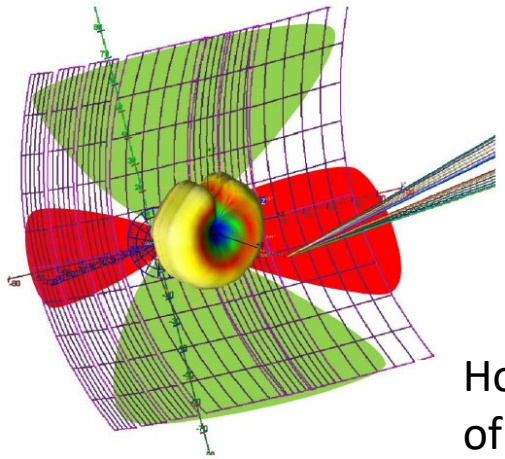


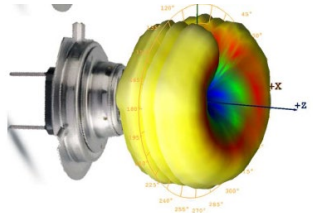
Far field: filament-like

- PRO‘s
  - complete set of light source specifications based on “full equivalence” to incandescent technology
    - Possible for 5W types with today LED technology
    - Possible for 10W and 20W types in near / mid future
  - Leads to same photometric performance in the application
  - No need for testing in the luminaire (no need for positive list)
- CON‘s
  - none

UN R37 approval
full photometric equivalence according to guideline (GRE-83-15)

Example 2: Road illumination light source H7 (high flux)

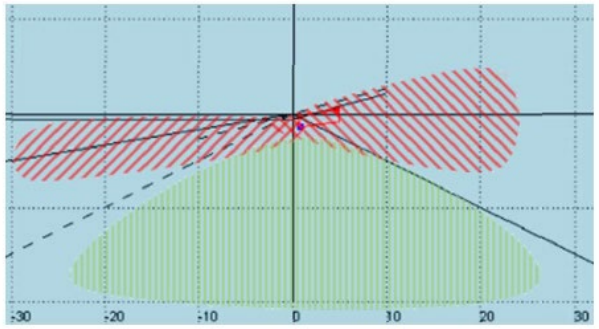




Far field: filament-like

Homogeneous illumination
of whole reflector (green and red segments)

from
reflector segment
to
light on the road

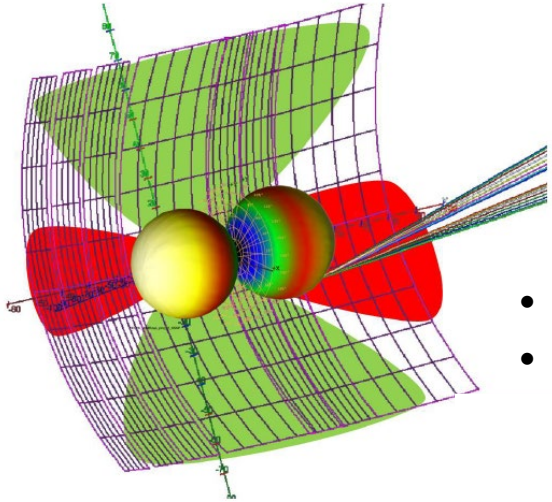


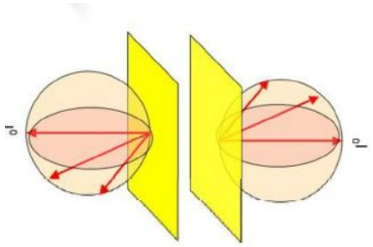
- PRO‘s
  - complete set of light source specifications based on “full equivalence” to incandescent technology
    - But not technically feasible today for high flux categories
  - It would …
    - lead to same beam performance
    - mean no headlamp testing, no positive list needed
- CON‘s
  - Full equivalence (= emulation of filament) would not improve the beam performance, i.e. advantages of LED technology not utilised

full-equivalence solutions not feasible for high flux categories with todays LED technology

National approvals (Germany, France, Austria …)

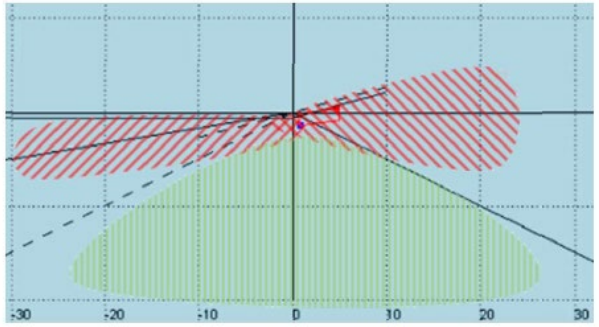
Deviating from full photometric equivalence





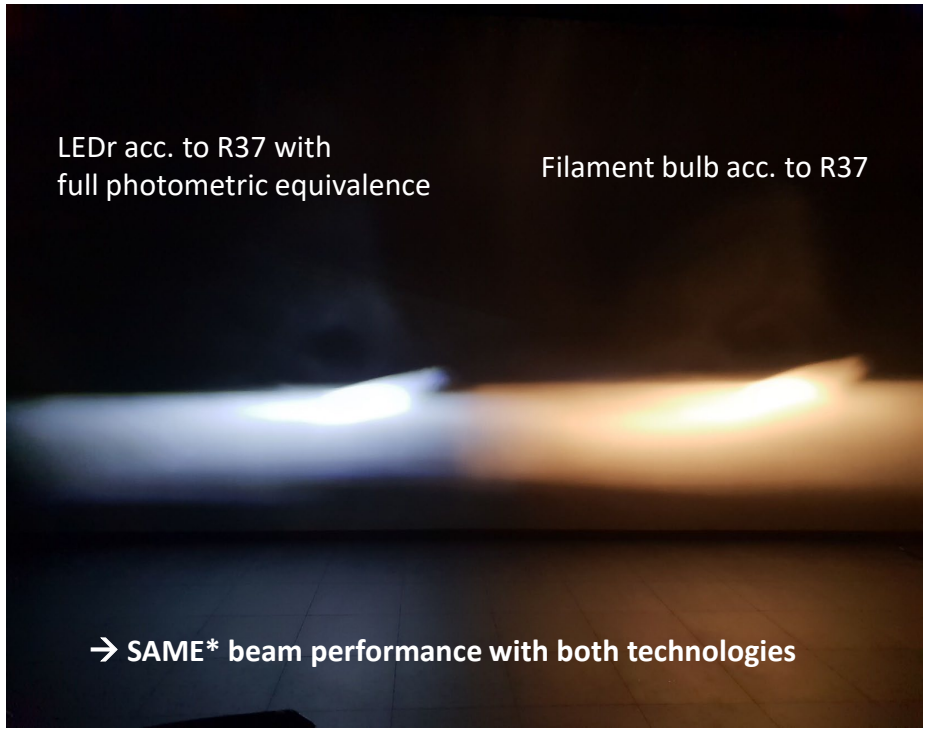
- Less light in green segments
- More light in red segments

from
reflector segment
to
light on the road

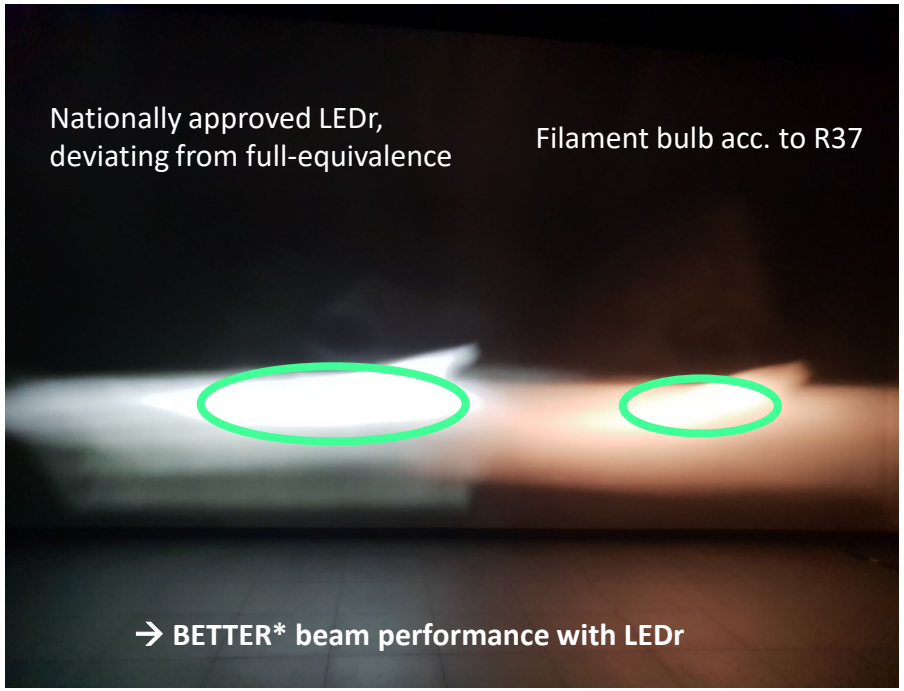


- Methodology
  - Extensive testing (in headlamps and vehicles)
  - Limited light source specifications
  - Resulting in positive list
- PRO‘s
  - Enabling legalization of safe LEDr, supporting market surveillance
  - Increased beam performance in many tested headlamps
  - Technically feasible with today LED technology
- CON‘s
  - Incompatible with some headlamps / vehicles
  - Mis-use may lead to non-compliant beams
  - High effort for industry and approval authorities to maintain the positive list
  - Country-specific approval processes, limited mutual recognition
  - Not yet possible in most countries

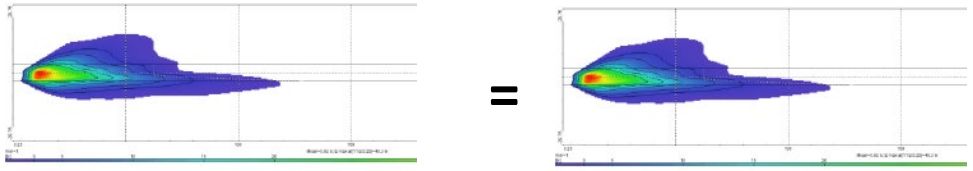
Examples – beam performance comparison



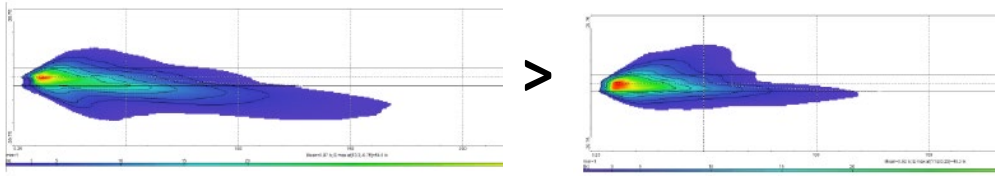
** Besides the color temperature*



**Compliant beam with more light in 50m … 70 m range*



→ SAME beam performance with both technologies



→ BETTER beam performance with LEDr

Summary and request for guidance

- *SUMMARY:*
  - *The UNECE R37 Framework for LEDr is based on "full photometric equivalence" and is enforced. It allows safe LED replacements with the SAME photometric performance as the conventional technology.*
  - *For road illumination, a further extension of the framework can offer BETTER beam performance:*
    - *Overcome the limitations and drawbacks of the conventional light source*
    - *Make full use of the advantages of LED technology*
  - *National-approved 2-sided designs have proven that compliant and better performing beams are feasible.*
    - *Data from German and French approvals are public.*
    - *The basis for the national approvals is always a verification of the photometry in the application (positive list approach)*

- *REQUEST FOR GUIDANCE:*
  - *Does GRE support the re-evaluation of the equivalence criteria beyond full-equivalence?*