

Informal document No. GRE-52-19
(52nd GRE, 30 March - 2 April 2004,
agenda item 26.)

GTB Task Force

LED Forward Lighting

Scope of the Task Force:

“Propose Modification of Regulation(s) in order to
introduce LEDs for forward lighting”

Objective of this Presentation:

Provide information on LED characteristics and proposed
modification of regulations and seek early feedback

Design Possibilities



GTB TF-LED

Overview

- Topics addressed in this presentation
 - LED principle of operation
 - LED evolution
 - LED specific performance parameters
 - LED benefits
 - Proposed amendments to ECE R48
 - Proposed amendments to headlighting Regs.

Principles of Light Generation

➤ Incandescent
ECE R37



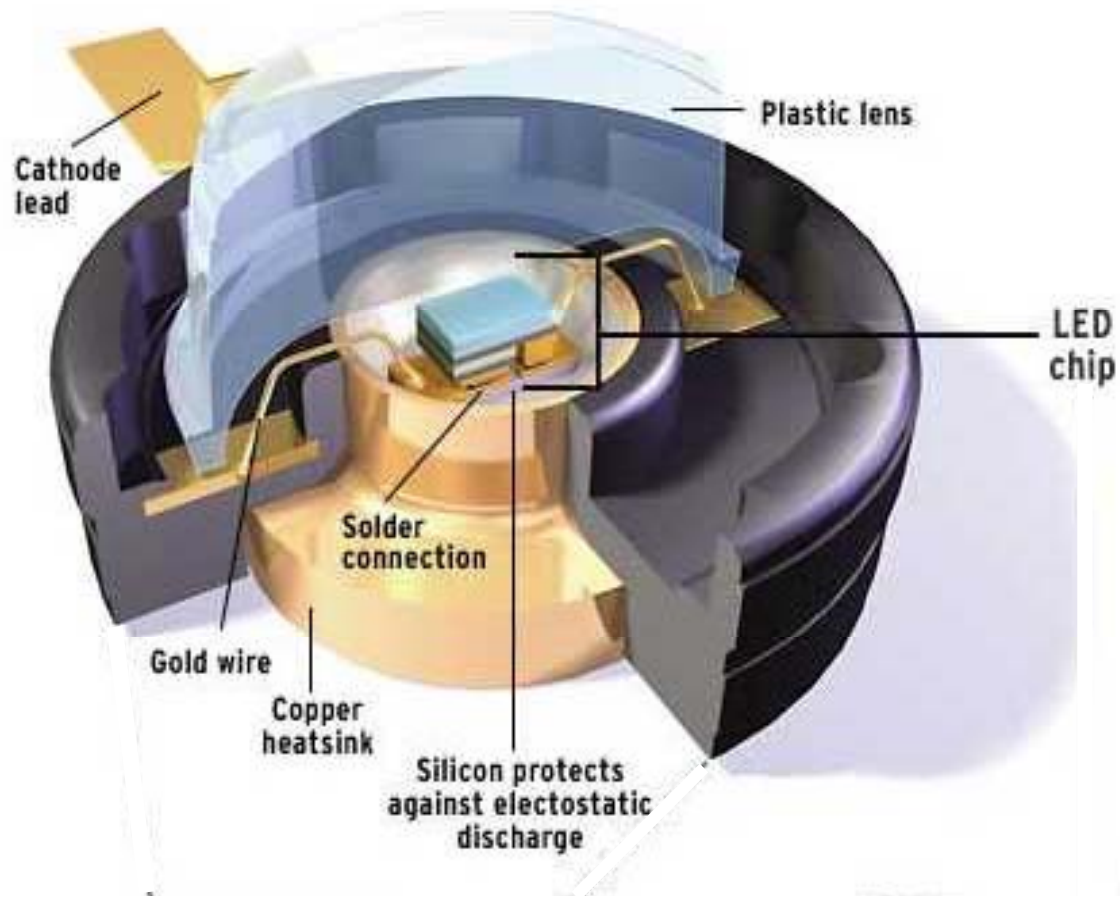
➤ Gas discharge
ECE R99



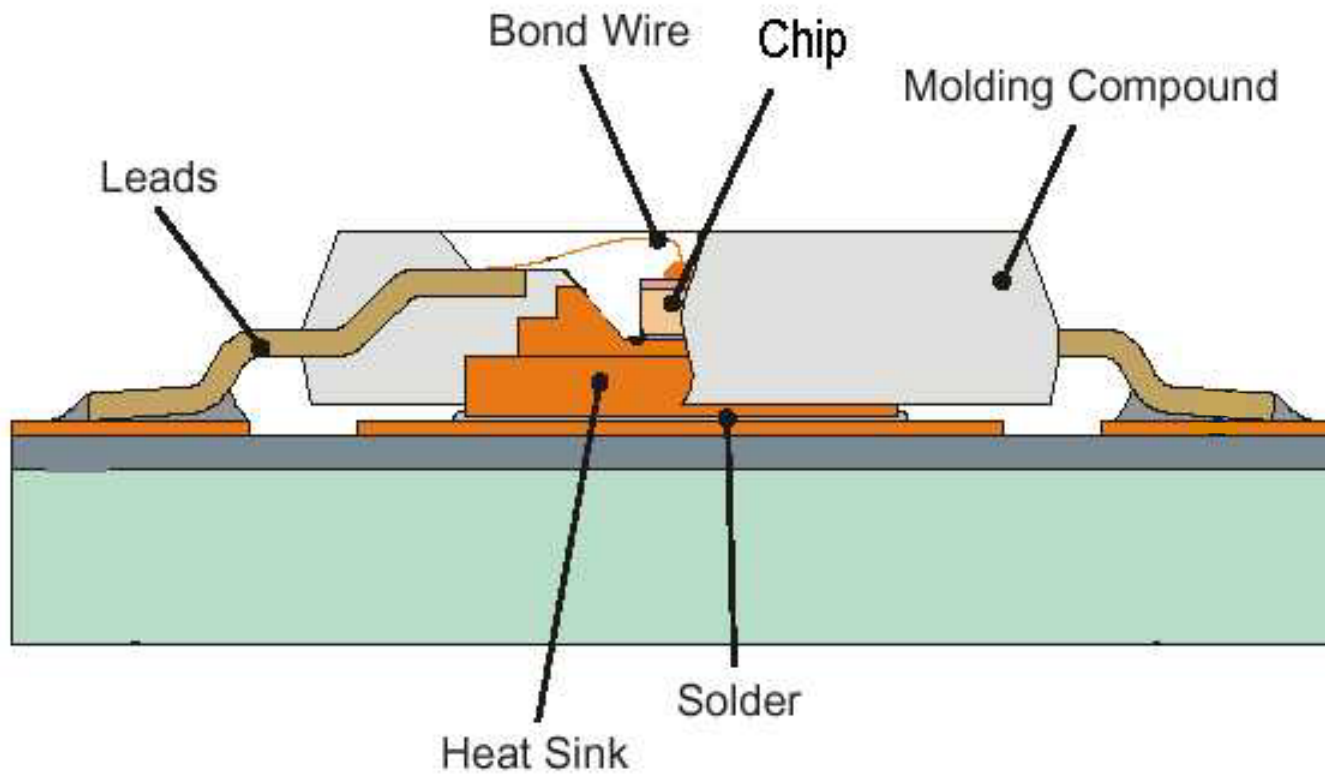
➤ LED



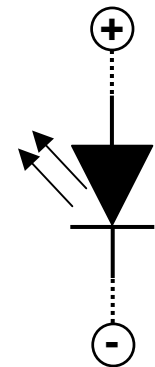
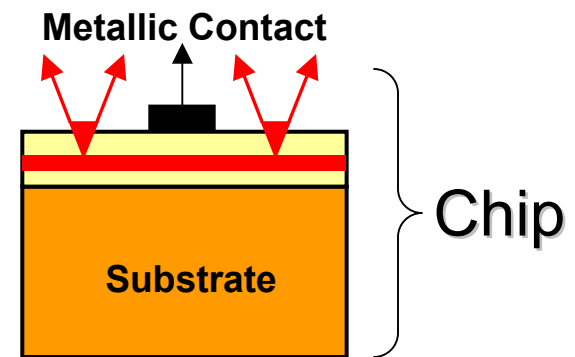
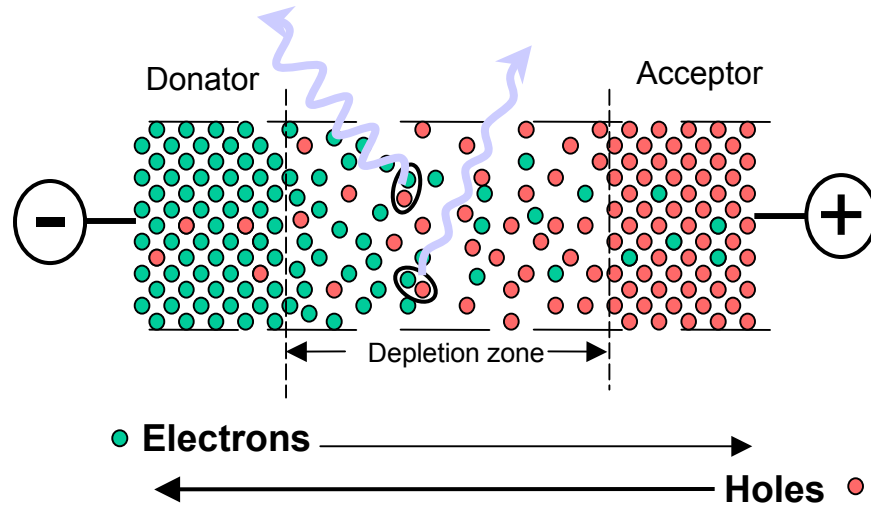
Principle LED Design



Principle LED Design

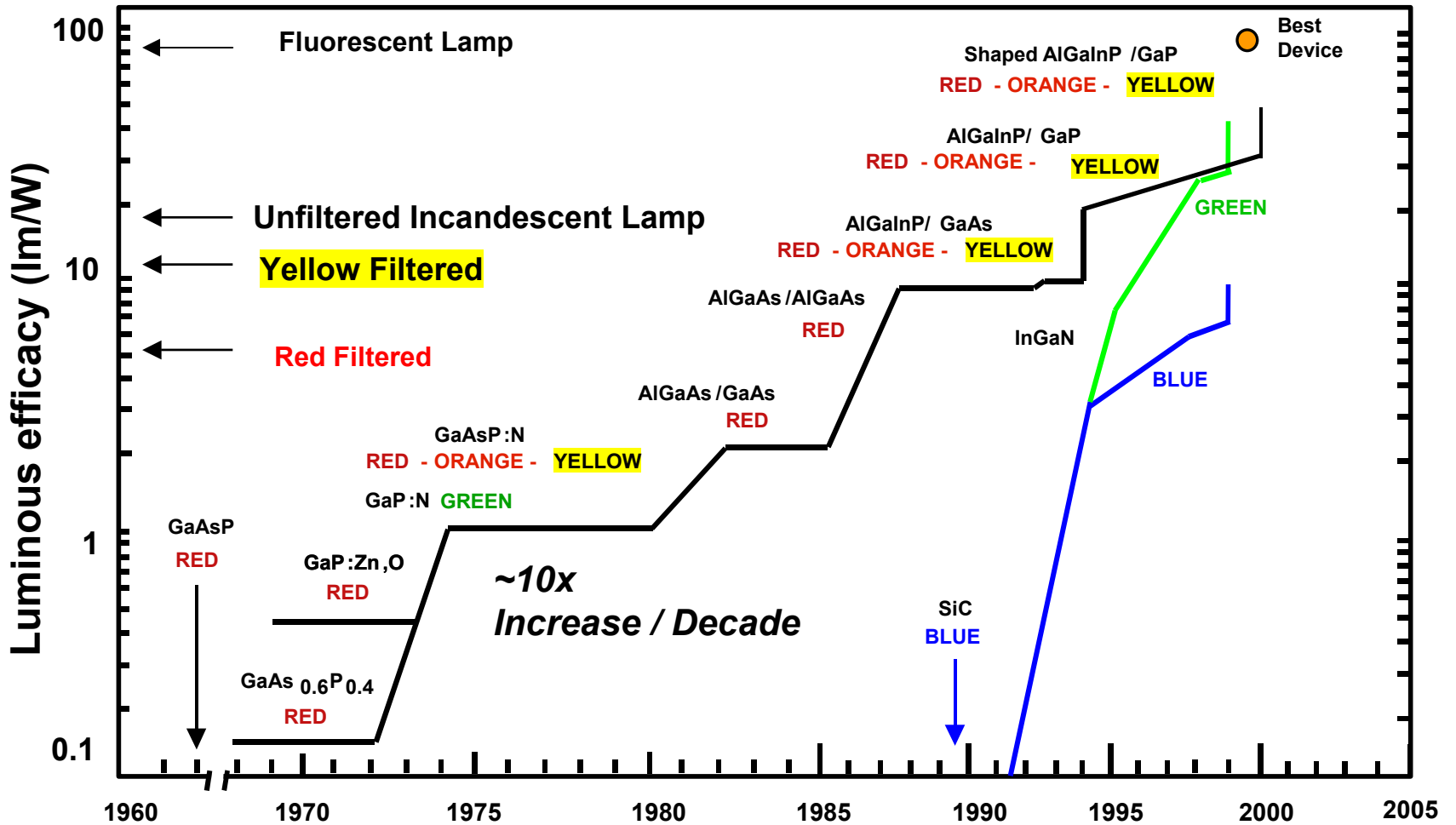


How does an LED emit light?



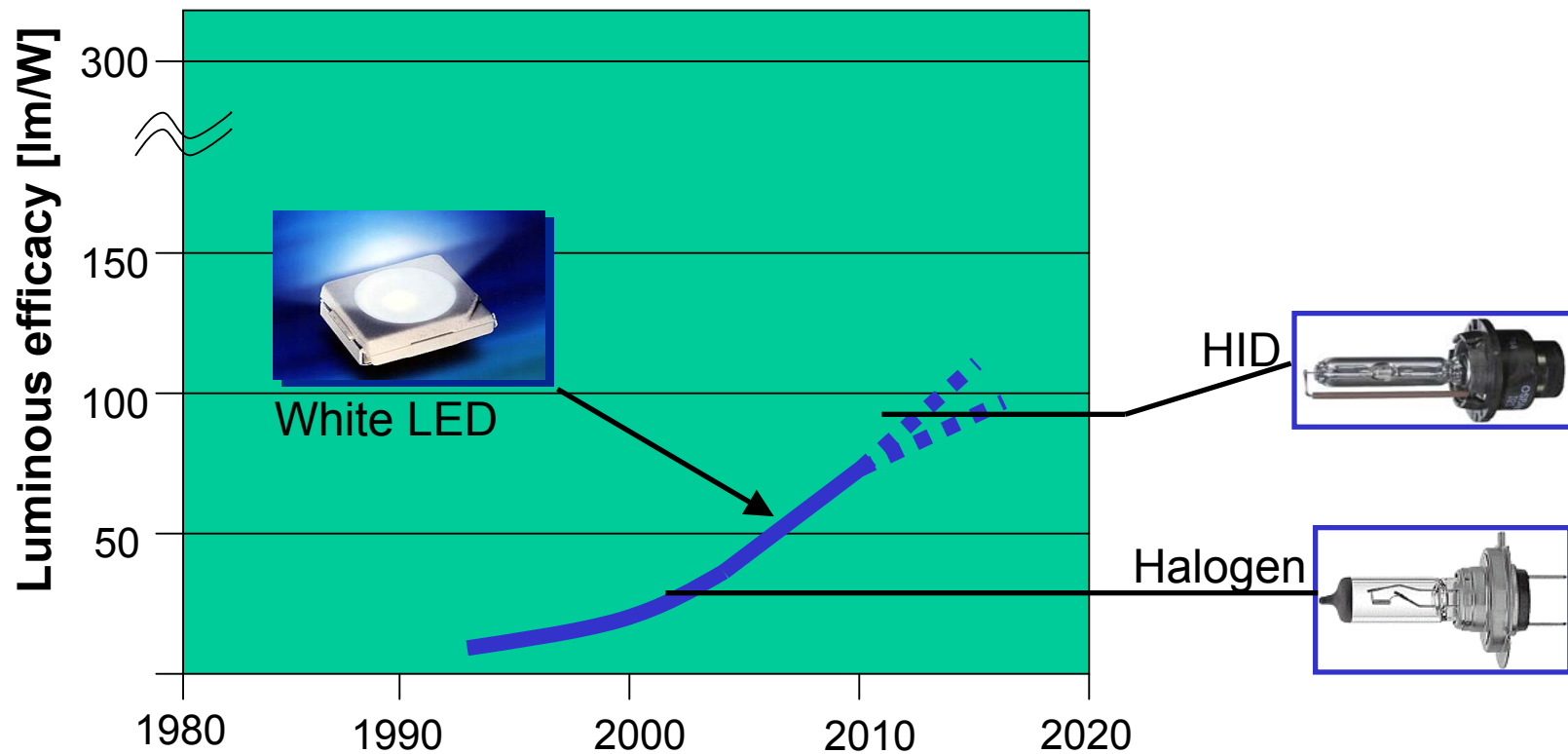
- Electrons recombine with “holes”
- Some of these recombinations emit light.

Development of Efficiency of LED

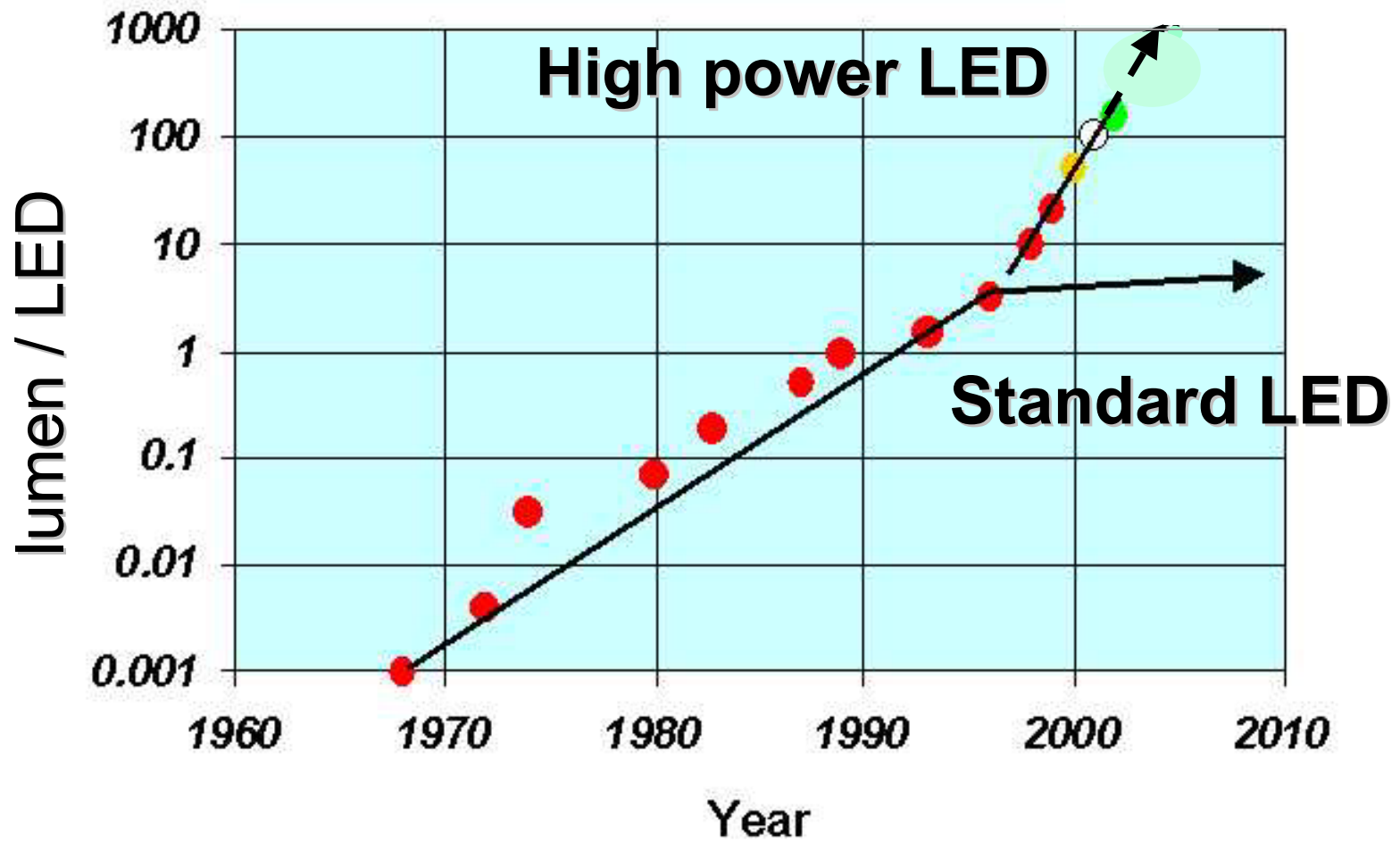


Development of Efficiency of white LED

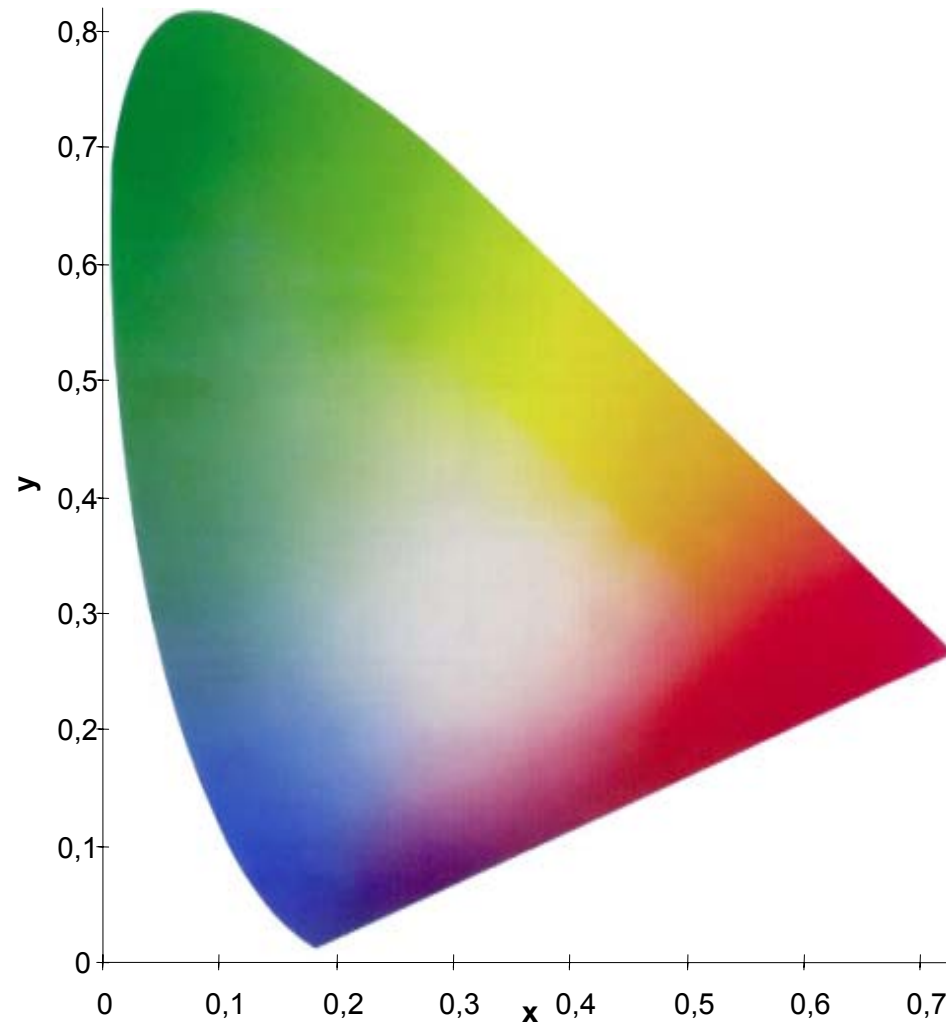
Why are LED now interesting for head lighting?



LED Evolution

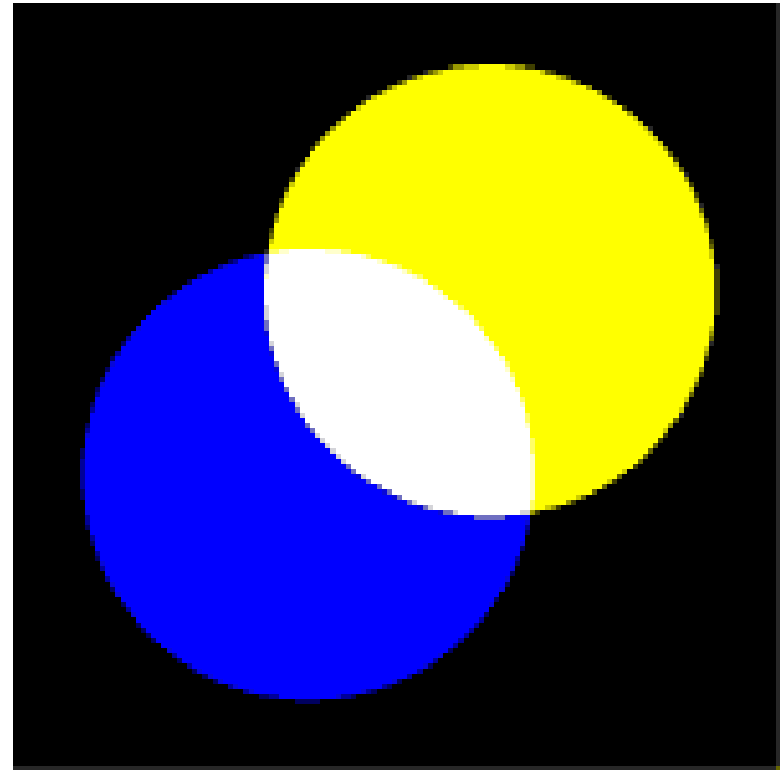
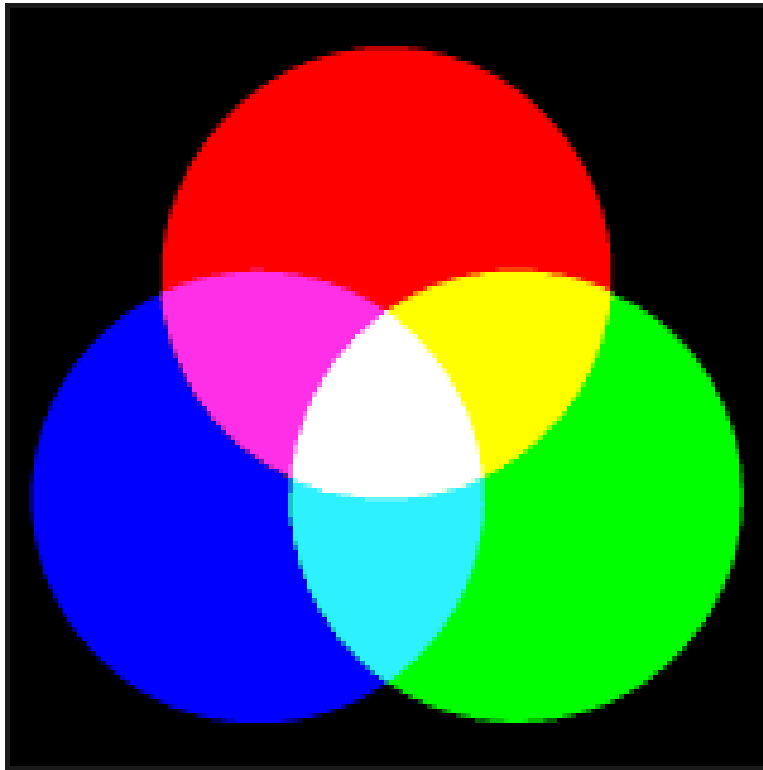


Wave Lengths & Mixing of Colours



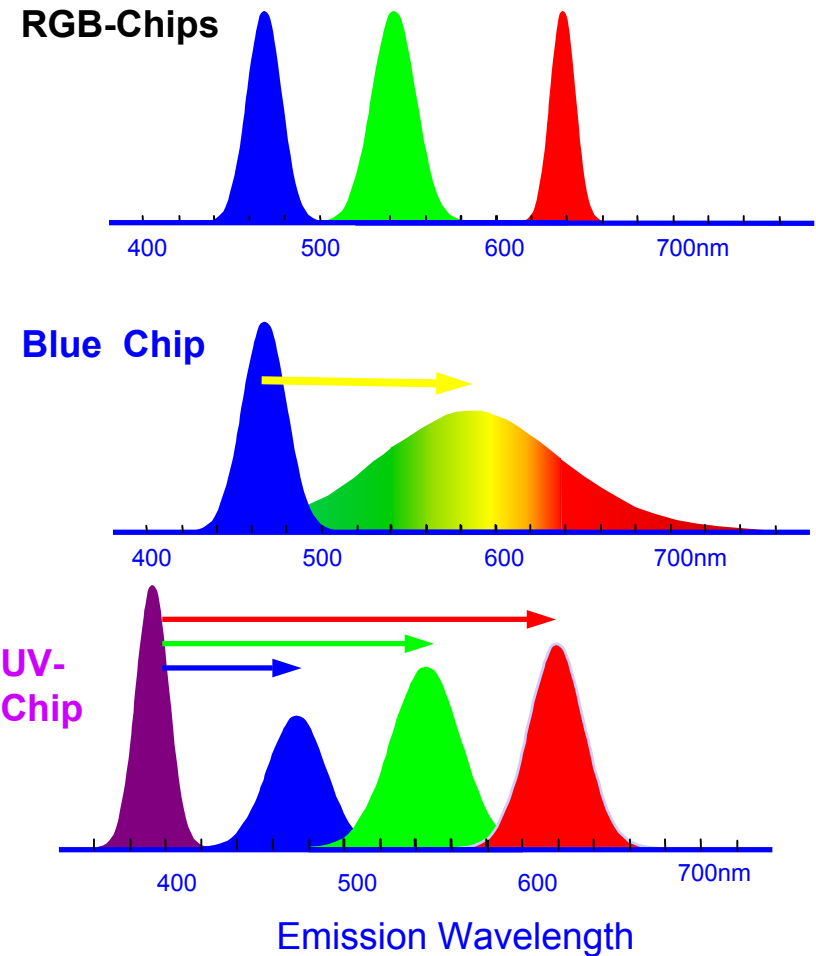
How to generate White Light

Mixing of Colours



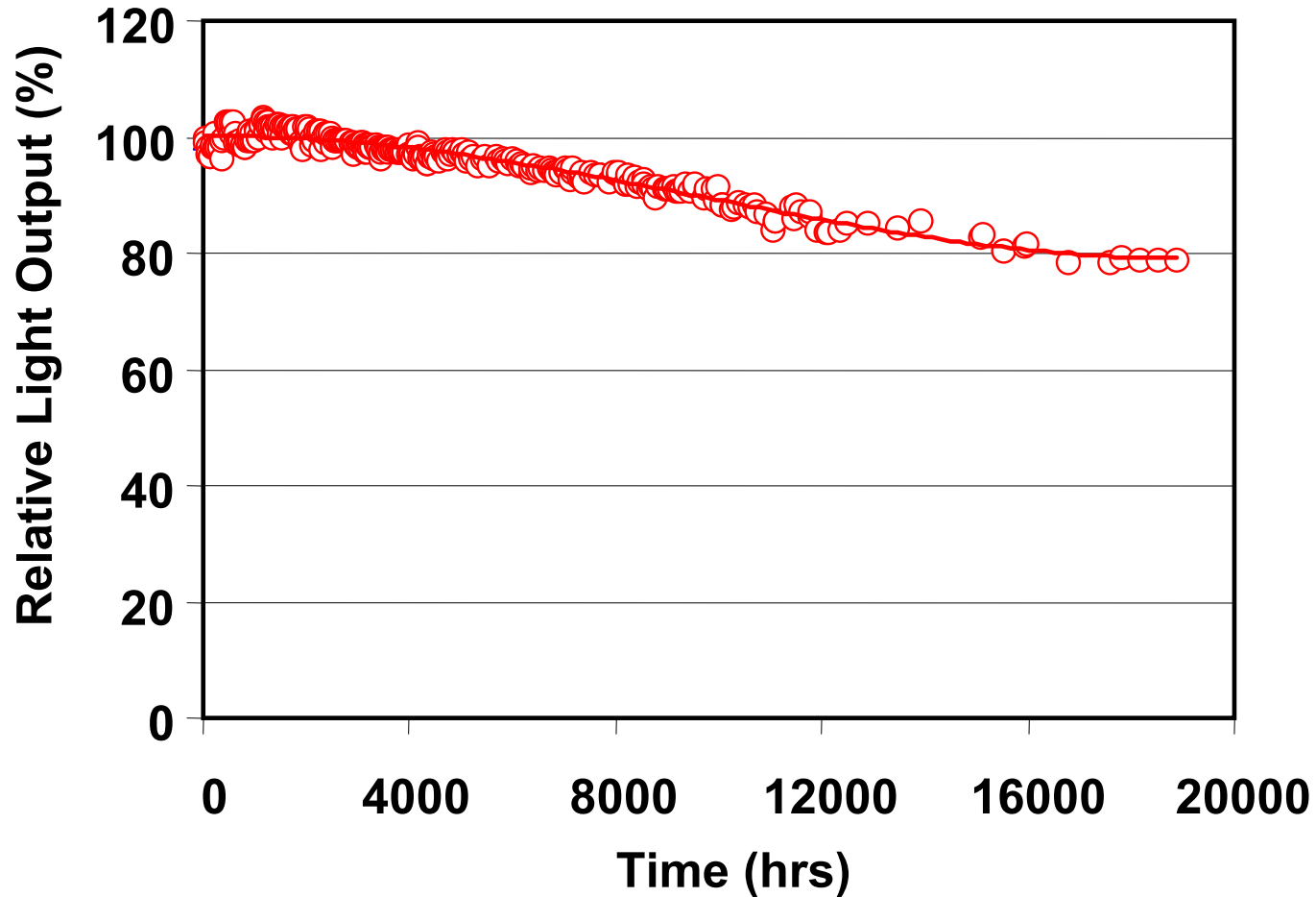
White Light Generation

- red, green and blue LEDs
- blue LED and yellow Phosphor
- UV-LED and red, green and blue phosphor



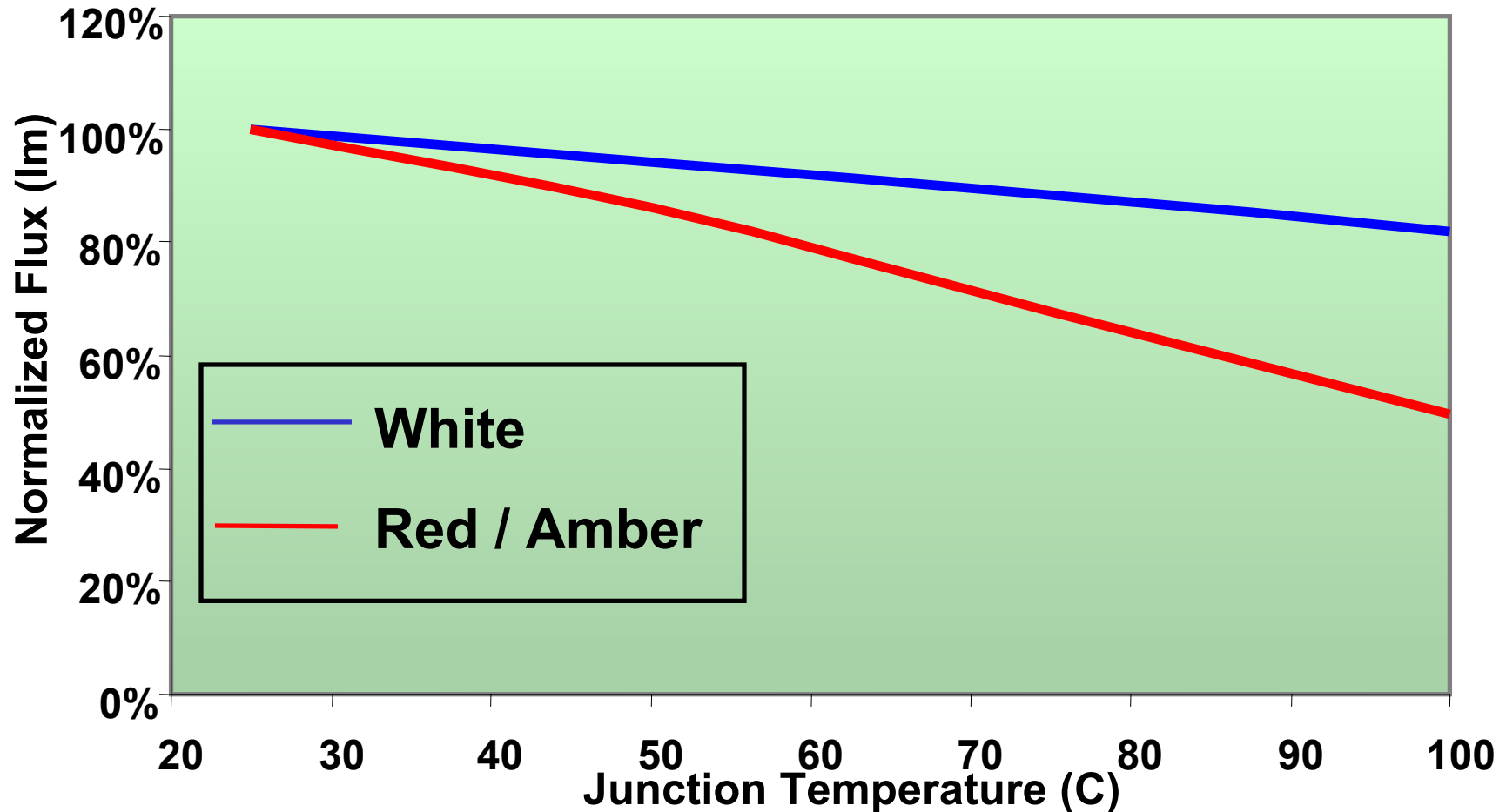
Technical Properties of White LEDs

Luminous Intensity versus Time:



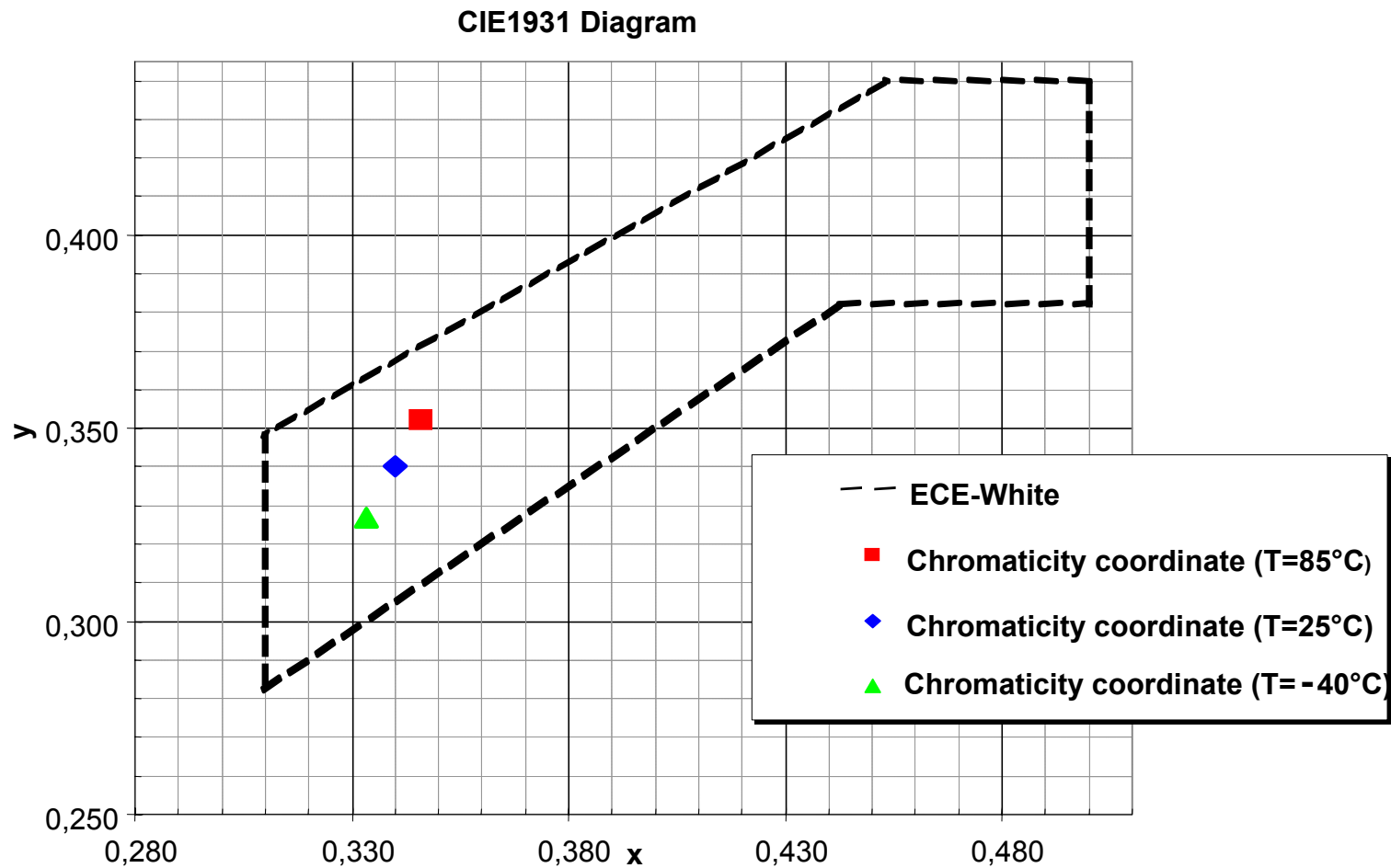
Technical Properties of LEDs

Luminous Intensity versus Temperature (typical):



Technical Properties of LEDs

Colour Drift Versus Temperature:



Benefits of LEDs

- Safety benefits
 - Long life span (vehicle life)
 - Shock and vibration resistance
 - New design possibilities
(e.g. for pedestrian protection)
- Other benefits
 - High optical system efficiency

Proposed Amendments to ECE R48

- Add „LED Modules“
 - **Existing:**
„*Light source module*“ means an optical part of a device which is specific to that device, is containing one or more non-replaceable light sources, and is only removable from its device with the use of tool(s)
 - **Proposed amendment:**
“*LED module*” means a light source module with all light sources being LEDs
- Fail safe provisions
- Provisions for levelling & cleaning

Proposed Amendments to Frontlighting Regs

- No new ECE regulation(s)
- Add „LED modules“ & LED specific requirements to Reg 112
- Review voltage specifications for measurements
- Establish new Annex “LED Module Requirements”
 - General specifications, manufacture, test conditions
 - Minimal red content and max. UV content
 - Temperature stability (luminous intensity and colour)
- Use similar annex for other relevant regulations: AFS, NFF, R113, R98 (bending light)

Automotive LED Applications

LED application in current automotive lighting:

Interior

- Dashboard illumination in different colours



Exterior

- Red:
Rear position lamps
Stop lamps
- Amber:
Direction indicators



Design Possibilities LED Headlamps



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Notes: