

# LIGHTING AND SIGNALLING FOR AD CARS INVESTIGATION & VOLVO PROPOSALS

DVN ROCHESTER  
16TH OF JANUARY 2019



# VOLVO CARS STRATEGY



VISION 2020

## Aiming for zero

Vision 2020 is about reducing the number of people that die or are seriously injured in road traffic accidents to zero. Protecting and caring for people is at the heart of Volvo Cars' philosophy and this is our commitment to saving lives.

# LIGHTING STRATEGY



- “Best in class” lighting
  - IIHS Good
  - Automatic levelling system on all cars sold worldwide
  - Adaptive horizontal cut off line on all cars worldwide
  - ADB available on all cars in Europe and China
- “Best in class” Signalling
  - Rear position light by day and night
  - Very visible Daytime running light
  - Good homogeneity of position light

With a strong brand identity



# VISION OF THE FUTURE ?



- Cars will be
  - Autonomous
  - Electric
  - Connected

## Electric vehicle



*Hybrid*



*100% electric*



## Autonomous driving



## Connected Car

# & LIGHTING ?

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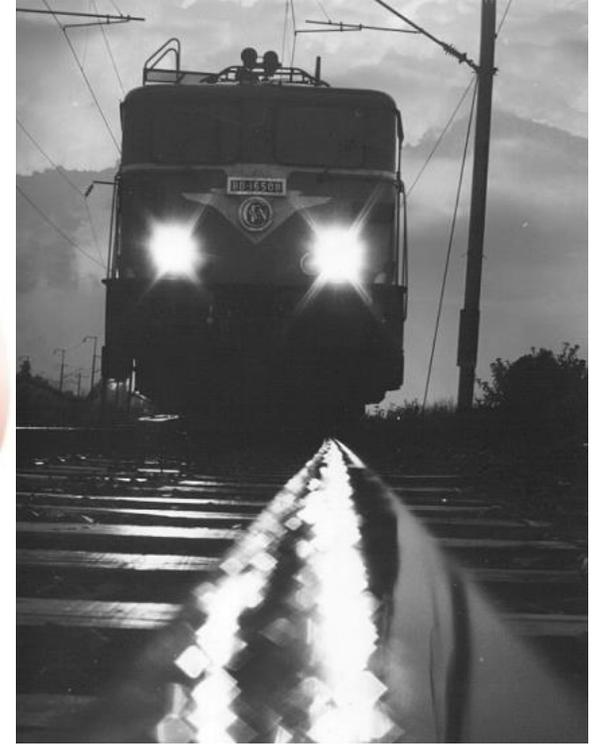
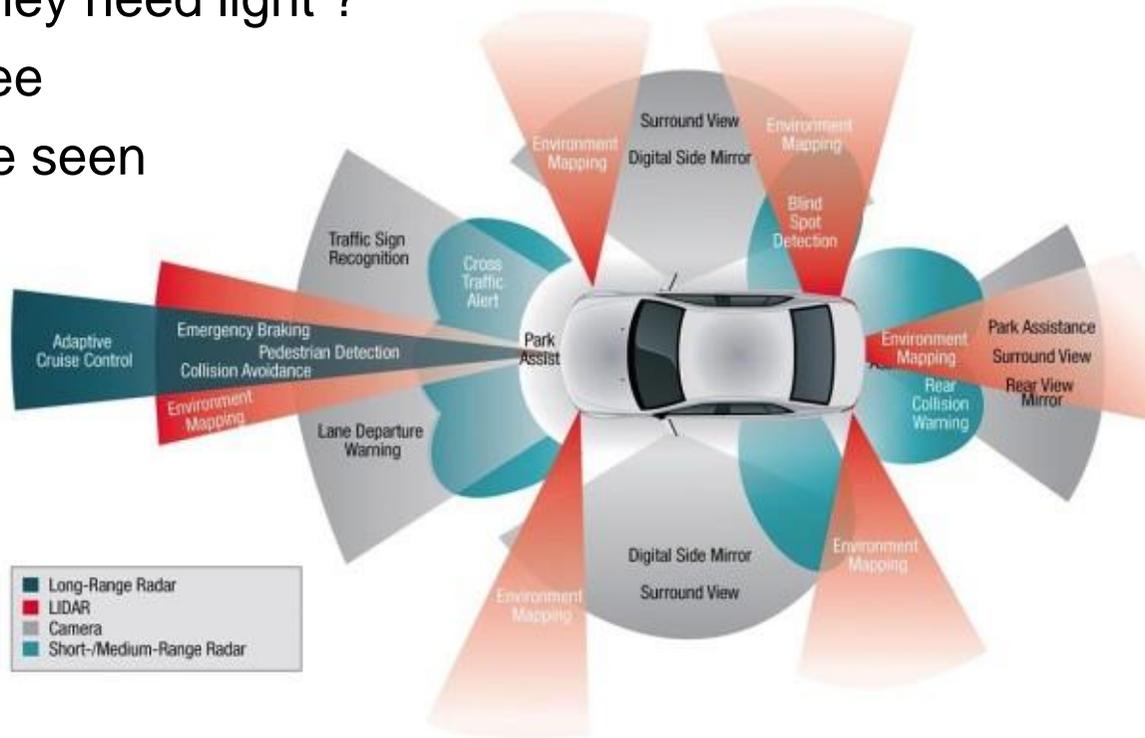


- Connectivity → More customization, More software
- Electrical car → More autonomy, Less electrical consumption
- Autonomous car → To be defined

# LIGHTING AND AD CARS



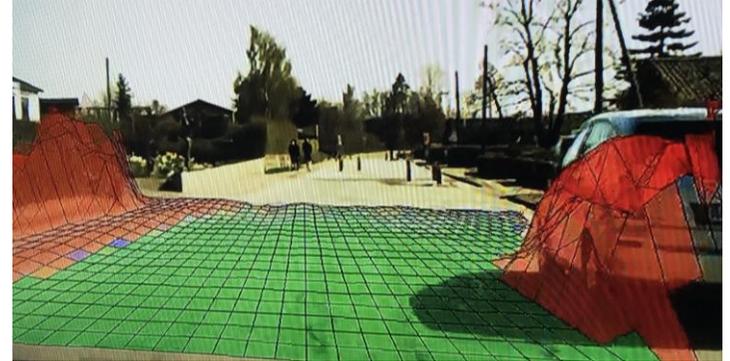
- Do they need light ?
- To see
- To be seen



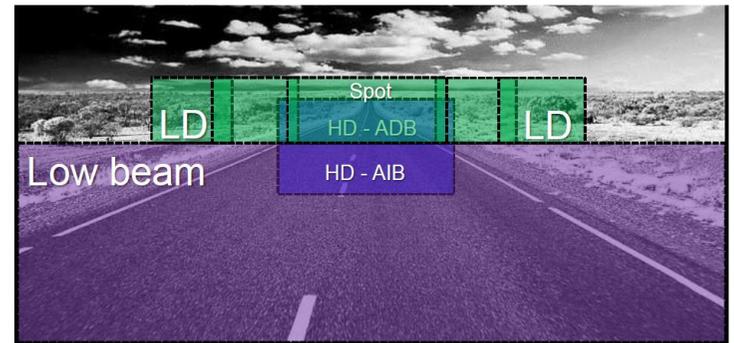
# TO SEE



- Are sensors able to detect all the things ?
- Are sensors able to detect other things than object ?
- Camera need to see
- What will be the field of view of camera ?
  - 52° today
- Do we have to increase the lighting field of view ?
  - 90 ° today for Low Beam,
  - 40 ° for High beam
- Do we have to put light above the cut of line even in city area ?
  - High Beam or ADB



*Picture of Veoneer Stereo camera*



*Beam picture of ZKW headlamp*

# TO SEE



- With the UBER accident, lighting community has seen that we can improve lighting :
  - Range
  - Aiming
  - Field of view.



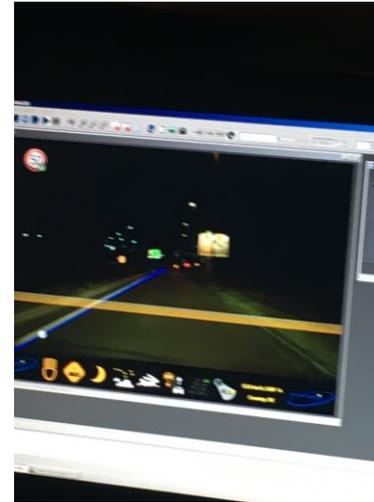
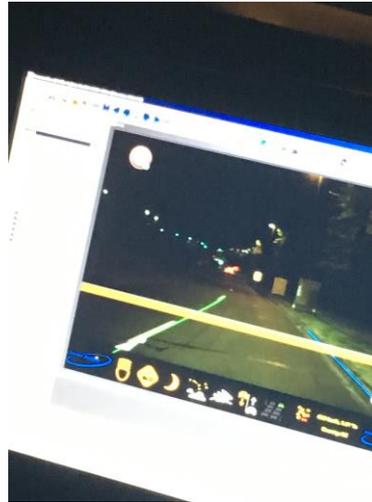
# TO SEE



- If we want to have a safe “lane center assist” system we have to improve detection



*Theory*



*Reality*

# TO BE SEEN

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# TO BE SEEN



- A lot of discussions & a special session dedicated just after the coffee break
- Do we need to be seen as a “special car” ?
- Do we need to communicate with road users ?



# TO BE SEEN - BENCHMARK





**TO BE SEEN - VOLVO PROPOSAL**

# 360° TURQUOISE LIGHT IN AD MODE

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# 360° TAKE OFF

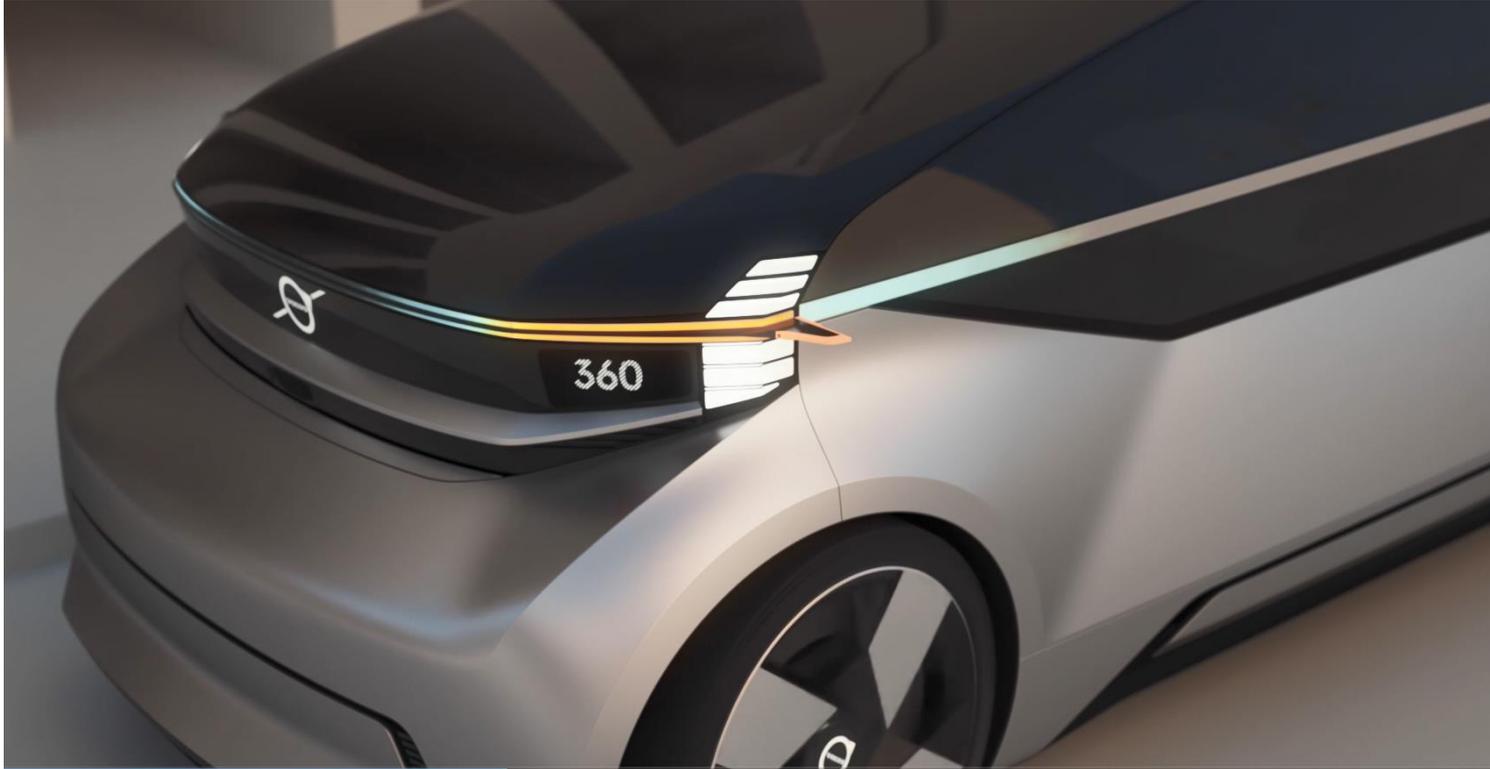


# WELCOME

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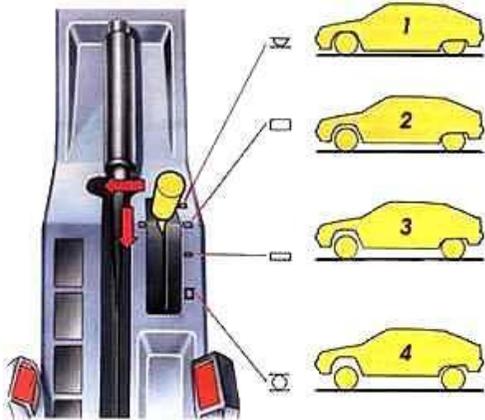
# START TO MOVE



# TURN INDICATOR

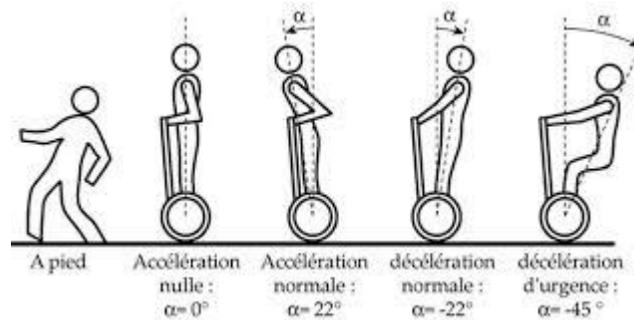


# ACCELERATION



*Citroen DS concept*

*Segway concept*

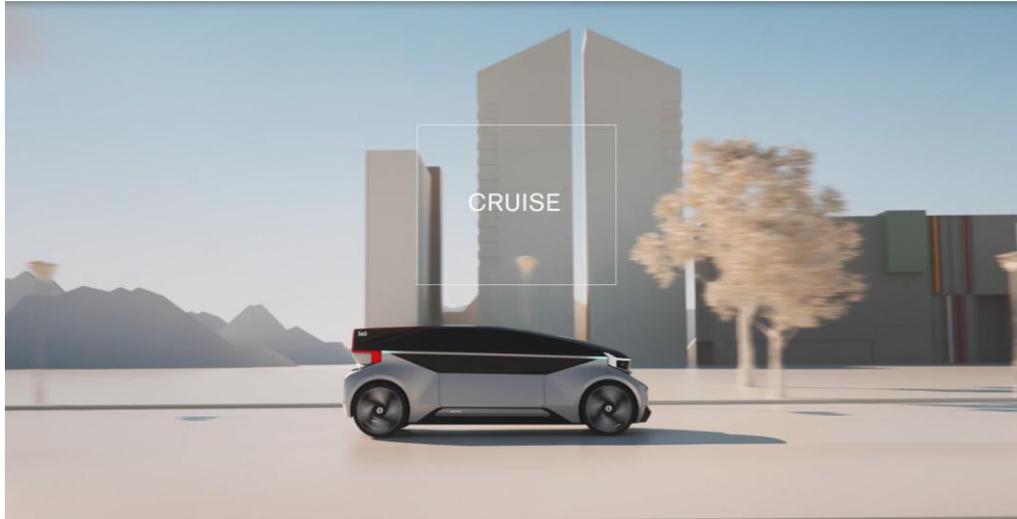


# ACCELERATION

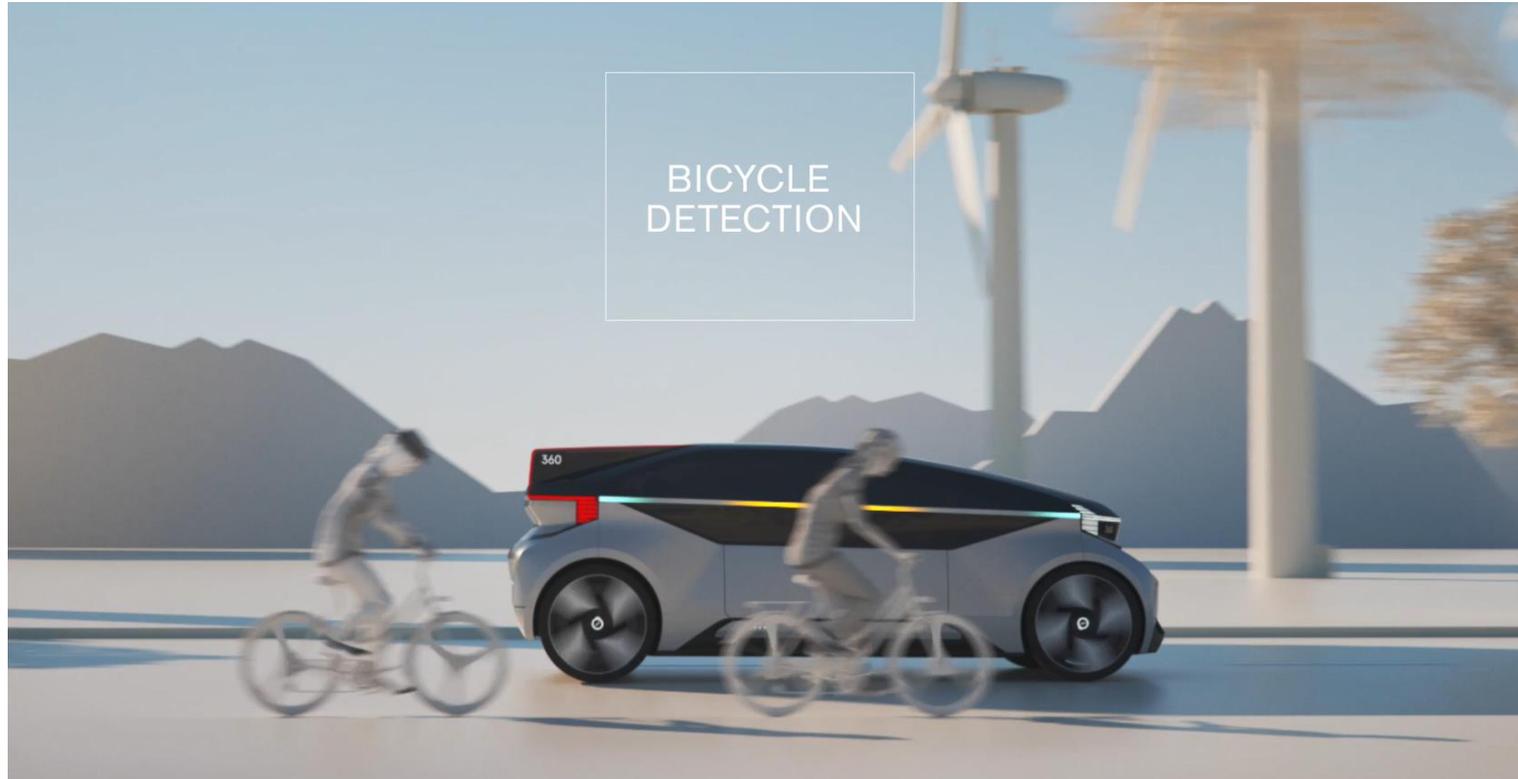
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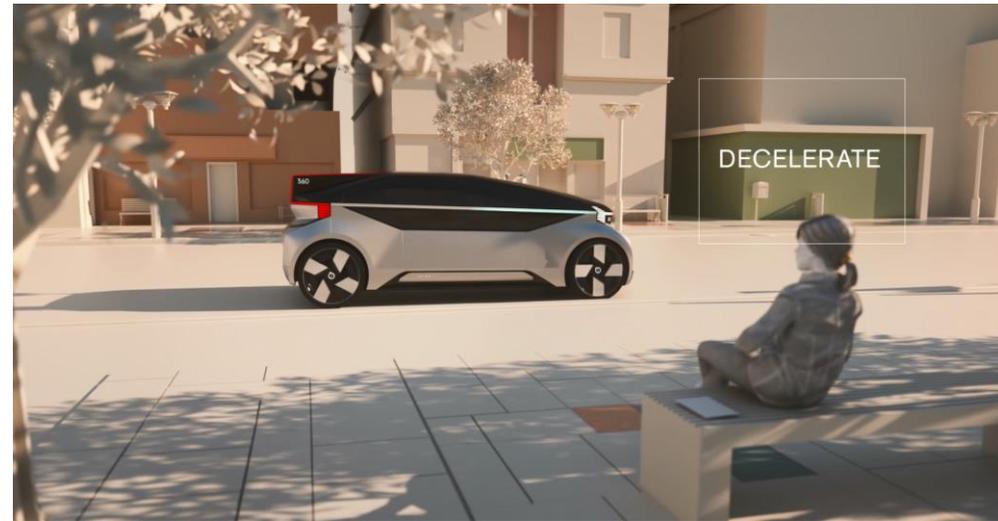
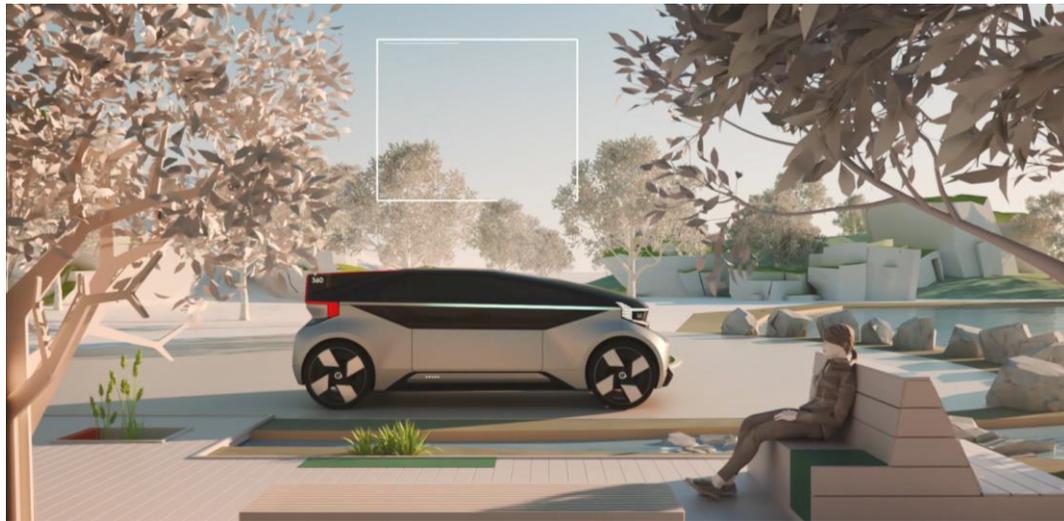
# CRUISE



# PEDESTRIAN DETECTION



# DECELERATION

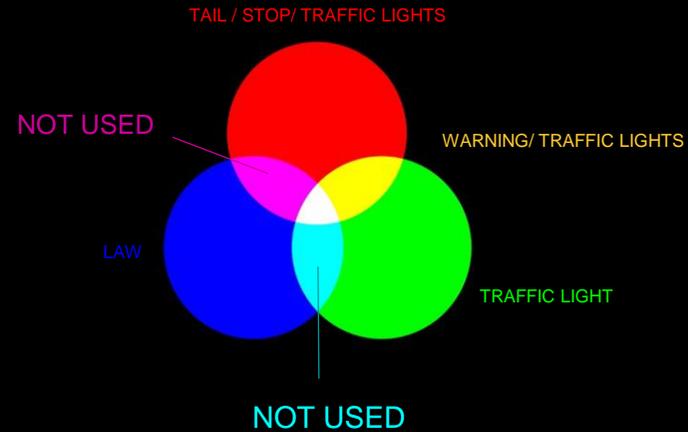


# DIRECTIONAL WARNING SOUND





# WHY TURQUOISE ?



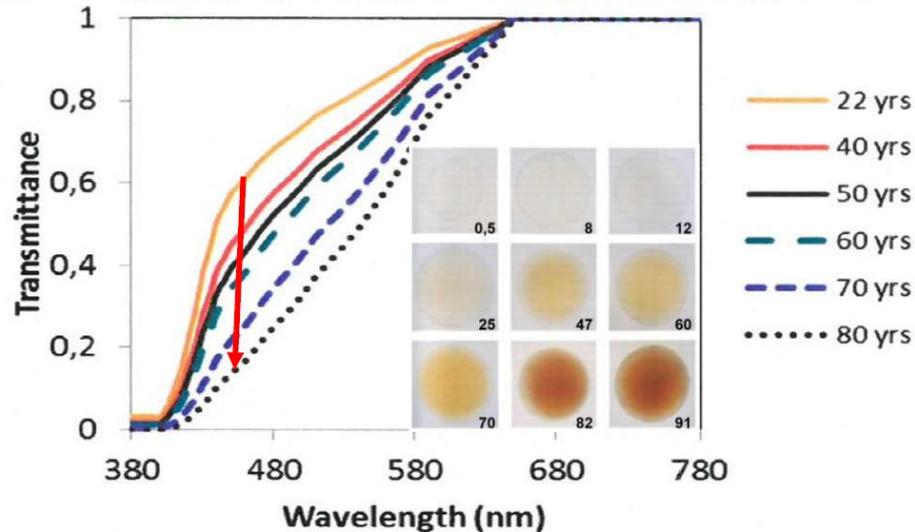
# IS TURQUOISE THE BEST COLOR ?

## Decreased retinal illuminance with less blue content

Source of the lens photos: S. Lerman, 1980



Source: Lighting for Older People and People with Visual Impairment in Buildings; CIE Publ. 227:2017

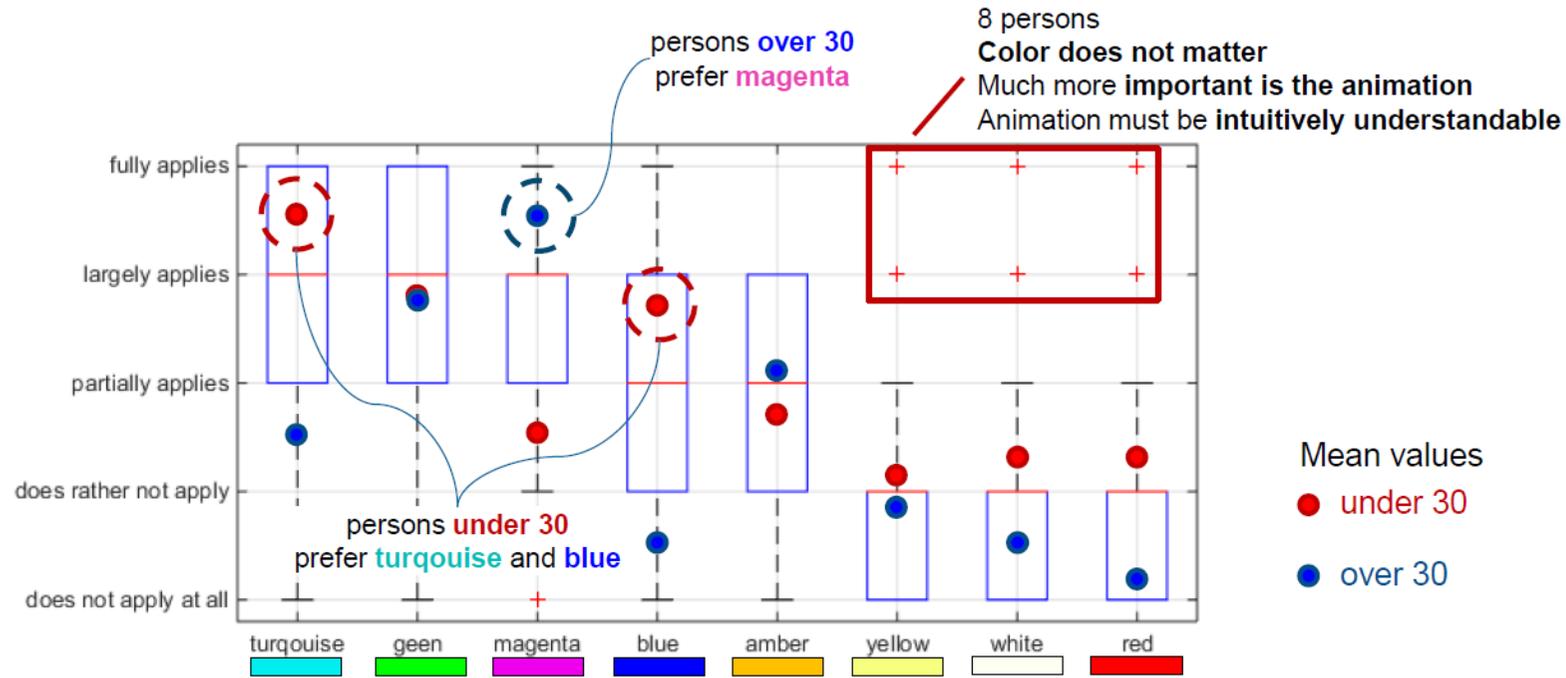


Extract from Technical study done by TU Darmstadt for CLEPA, presented in GTB la Haag the 28th of february 2018

# IS TURQUOISE THE BEST COLOR ?

## Second investigation

Results: Which of the colors do you find most suitable?



# THANK YOU

