

TFGP-05-10

Regulatory gaps between UN-ECE and PTI as a cause of glare

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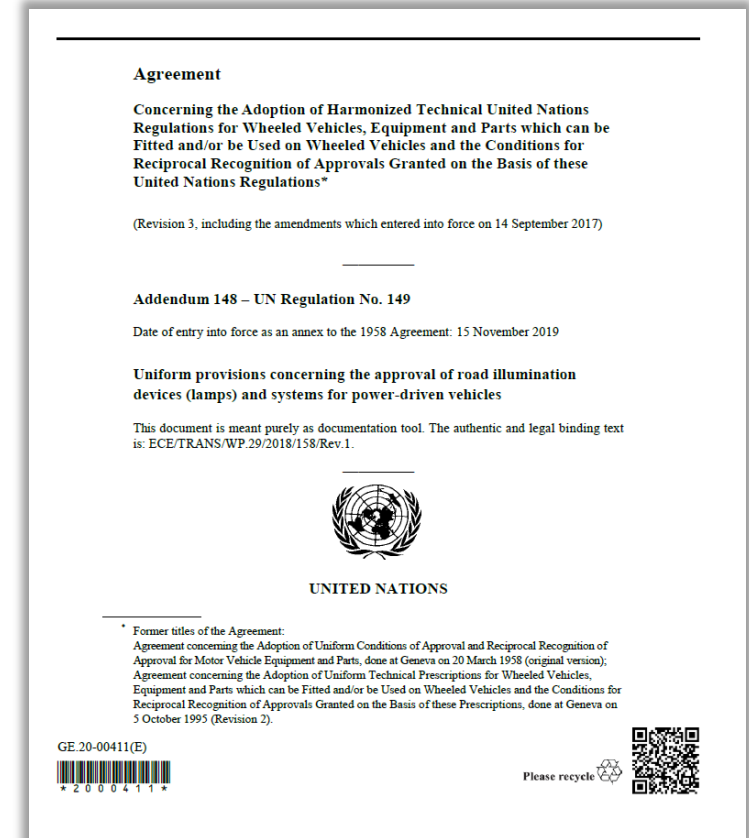
Brussels, 09.12.2025

Content of presentation

What is important?

- Procedure to approve a headlamp during homologation
 - What is measured, what not?
 - What is the link to PTI?
- How we measure during PTI?
- How could we improve type approval?

All quotations are from this version:
E/ECE/TRANS/505/Rev.3/Add.148



Intension of type approval of headlamps

What does the R149 want in terms of glare?

- Compliant photometric value
 - Sufficiently dark area above cut-off
 - Sufficiently bright area under cut-off
- A typical shape of cut-off that allows adjustment

R149 – Annex 5: 1.1.

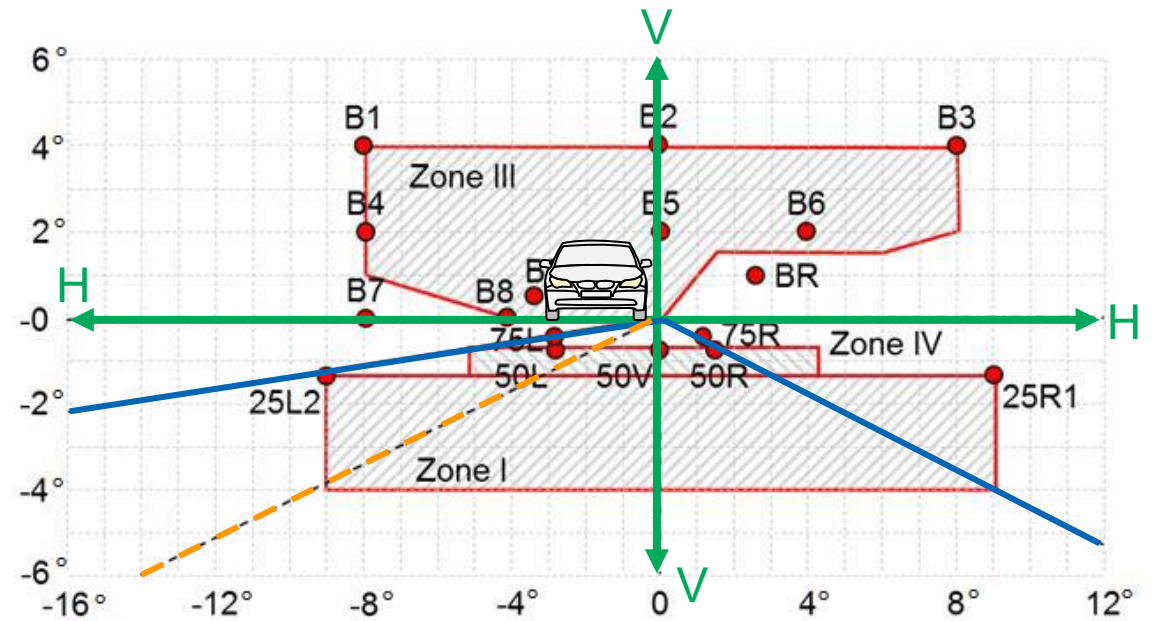
“The "cut-off" shall provide:

(a) For right hand traffic beams:

- (i) A straight "horizontal part" towards the left;
- (ii) A raised "elbow - shoulder" part towards the right.

In each case the "elbow-shoulder" part shall have a **sharp edge.**”

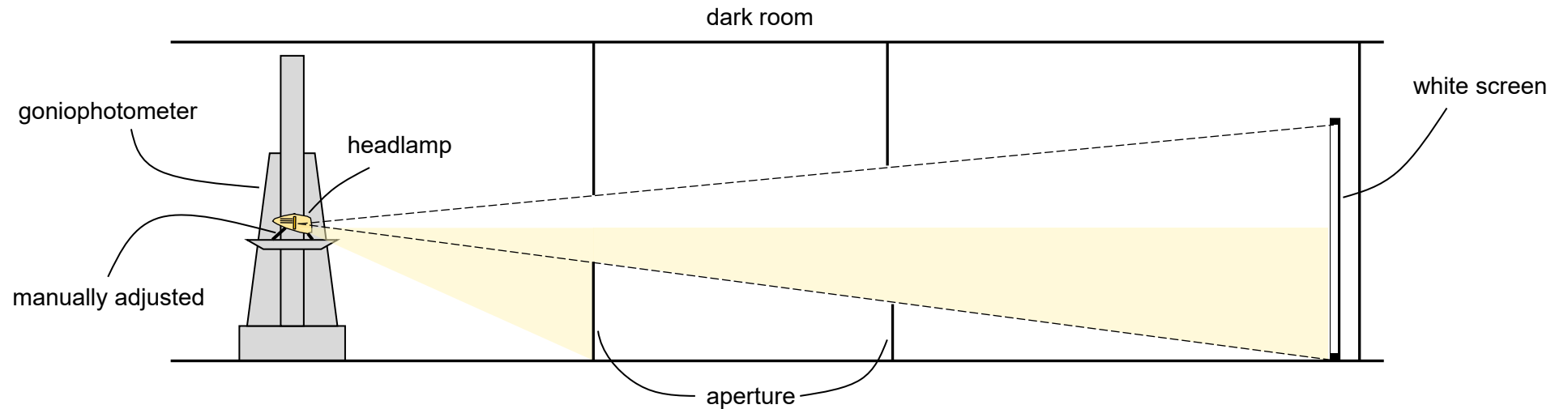
Figure A4-V, UN-ECE-R149



UN-ECE-R149

How is light distribution measured?

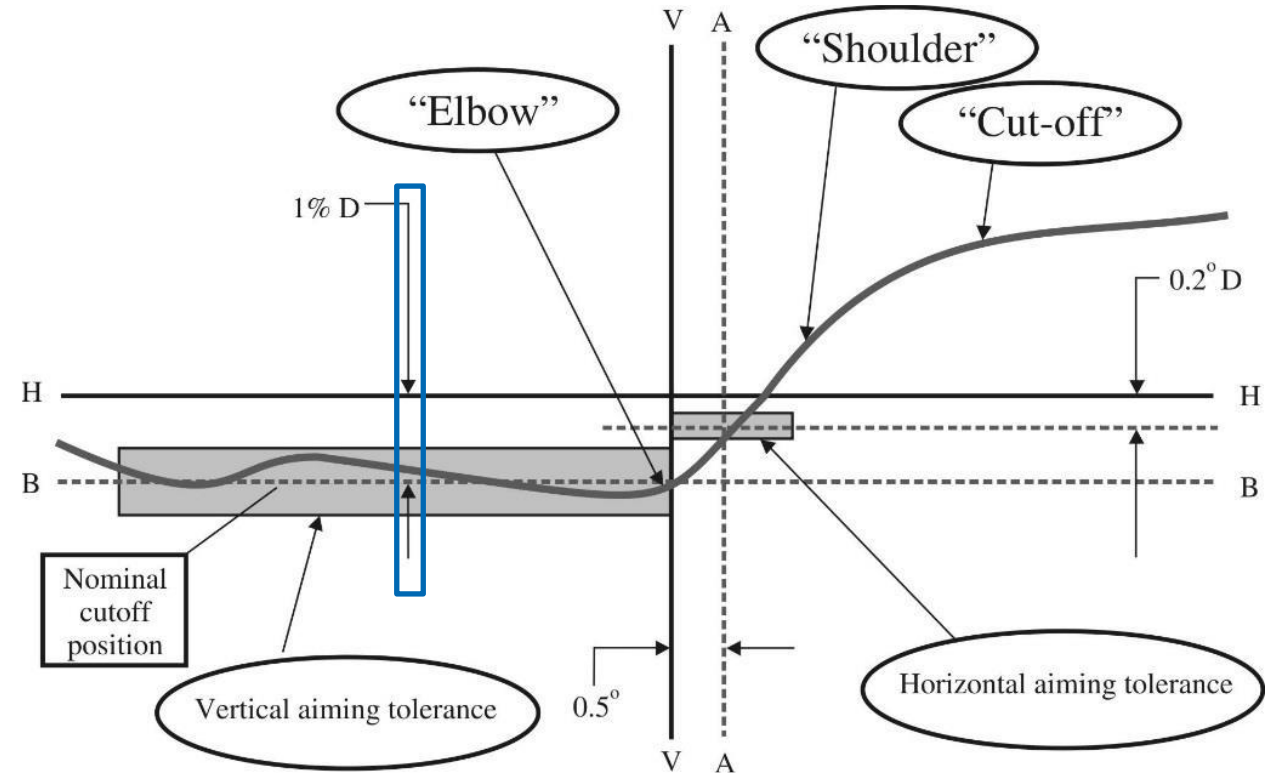
- Measured in ideal conditions in a dark room
- An **expert mounts** the headlamp individually on a goniophotometer and starts with the “**visual aiming**”



Aiming procedure in R149

Vertical adjustment by method $0.2^\circ D$

- Scan vertical line 2.5° left of VV and estimate cut-off
- Cut-off shall be at line BB (value of aiming)

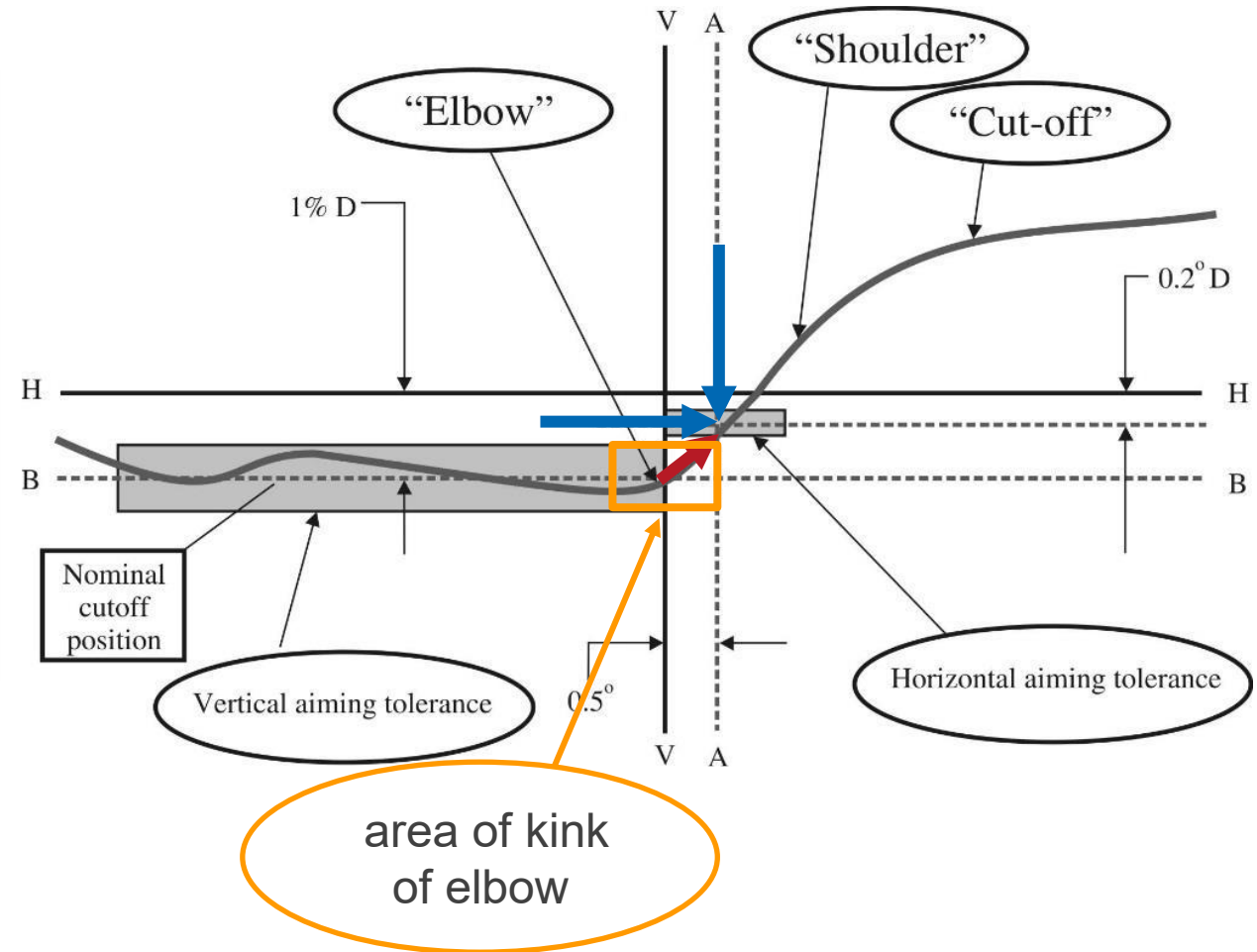


Aiming procedure in R149

Horizontal adjustment by method $0.2^\circ D$

- Scan horizontal line $0.2^\circ D$
- Above the line $0.2^\circ D$ its "shoulder" shall not exceed the line AA to the left
- The line $0.2^\circ D$ or below its "shoulder" should cross the line AA
- The kink of the "elbow" is basically located within ± 0.5 degrees to the left or right of the V-V line

R149 – Annex 5: 1.2.2.a-c



Aiming procedure in R149

Conclusion: horizontal adjustment

- No definition of what the elbow is or how it is determined, only a range
- Range of the elbow corresponds to an adjustment horizontal tolerance of +/- 0.87%

R149 – Annex 5: 1.2.3.

Where a headlamp or AFS so aimed does not meet the requirements set out in paragraphs this Regulation 5.2. to 5.4. of this Regulation respectively, its alignment may be changed, provided that the axis of the beam is not displaced:

Horizontally from line A by more than:

- (a) 0.5° to the left or 0.75° to the right, [...]
- (b) [...]

Vertically not more than 0.25° up or down from line B.

- Another degree of freedom that makes determination elbow range impossible

Aiming procedure in R149

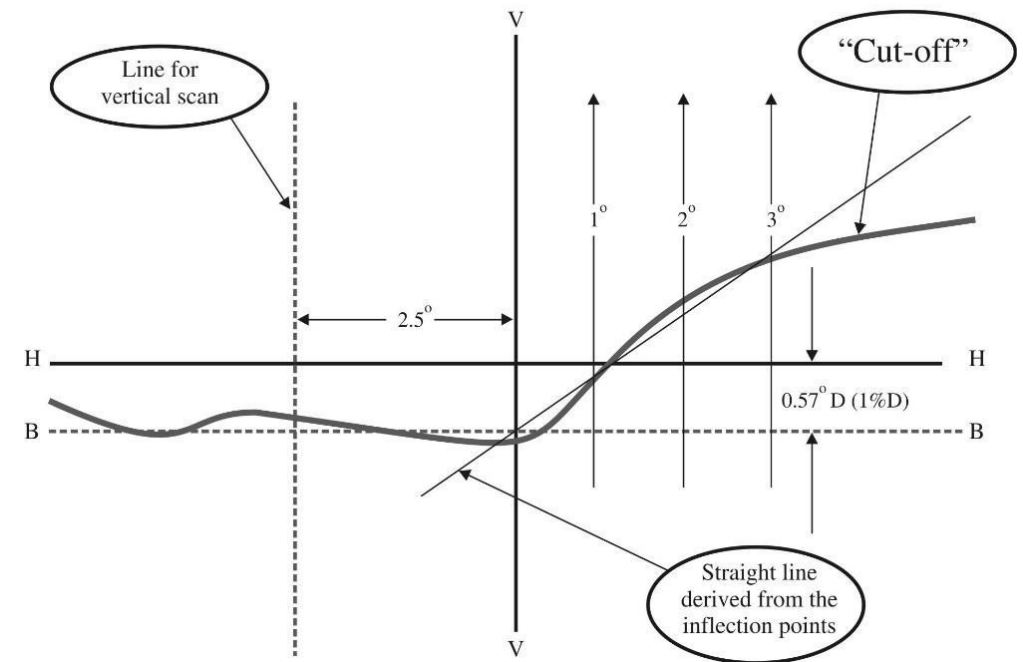
If adjustment cannot be performed repeatedly...

- Instrumental method of paragraph 2 (of Annex 5) shall be applied
 - Measurement of the quality of the cut-off
 - Sharpness of cut-off
 - Linearity of cut-off
 - Determination of adjustment ($0,2^\circ D$ or 3-lines)

... If adjustment can be performed...

- none of the above-mentioned formal checks are carried out → the headlamp passes

Based on the manual setup as in $0.2^\circ D$



Link to PTI

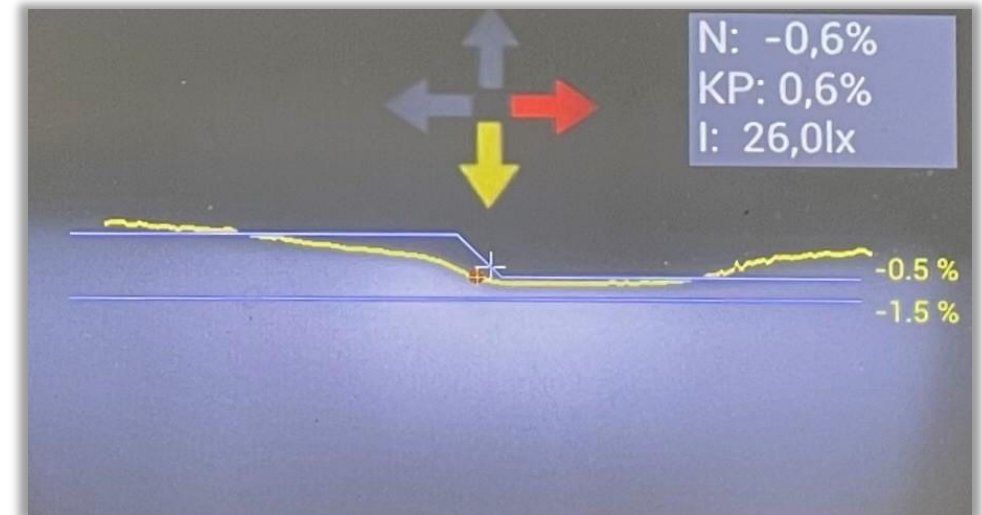
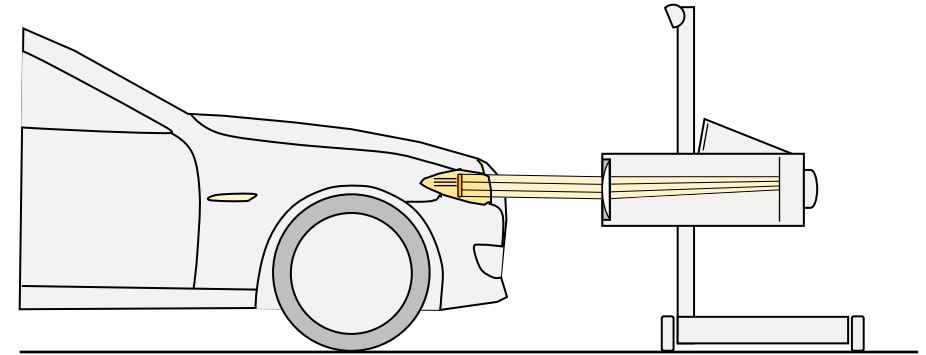
Measurements of headlamps in PTI

- Measure headlamps in build-in state and separately with headlight tester
- Aiming of the elbow (kink) for testing the alignment

→ Kink is the only link between type approval and PTI

→ The correct alignment of the kink provides the correct photometric values on the street

→ We are currently measuring according to a point that is not defined!

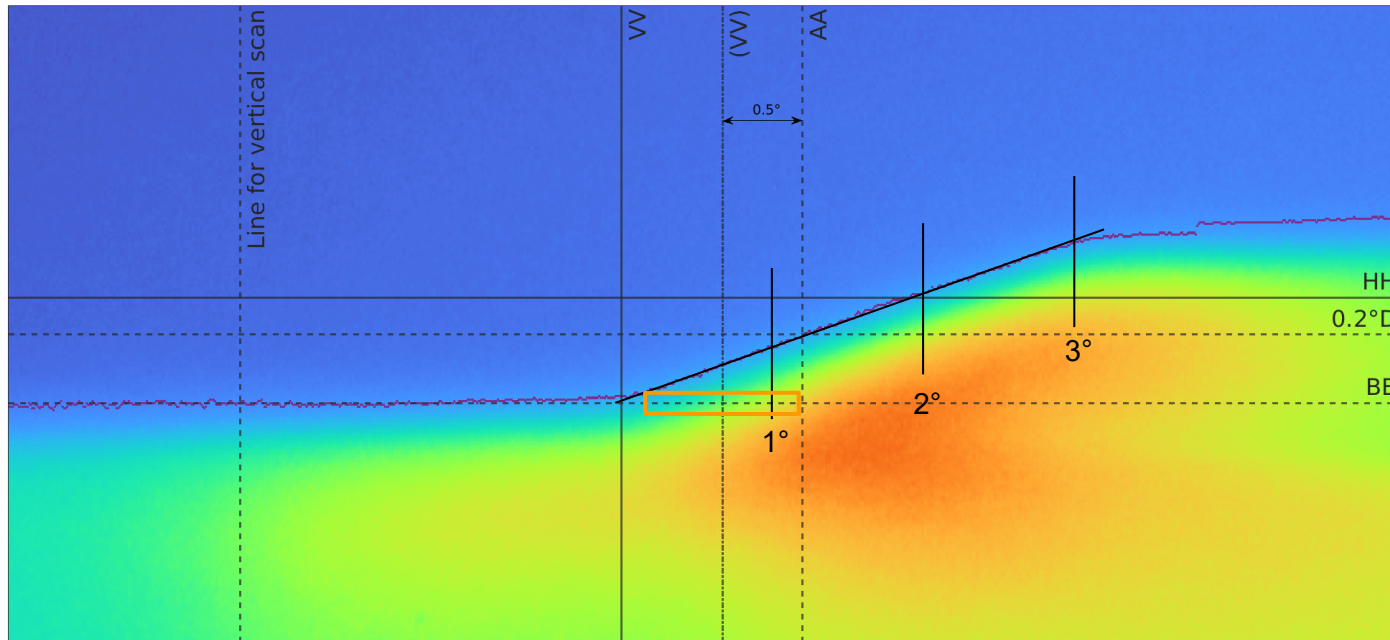


Aiming procedure in R149



Example 1: Fiat Tipo (Type 356, xenon-projection)

- Reverse calculated VV line is not in the area of the elbow as seen by a human
- But again: What is the elbow? Maybe the three lines scan method is a chance?



→ We have two methods with different solutions.

Aiming procedure in R149



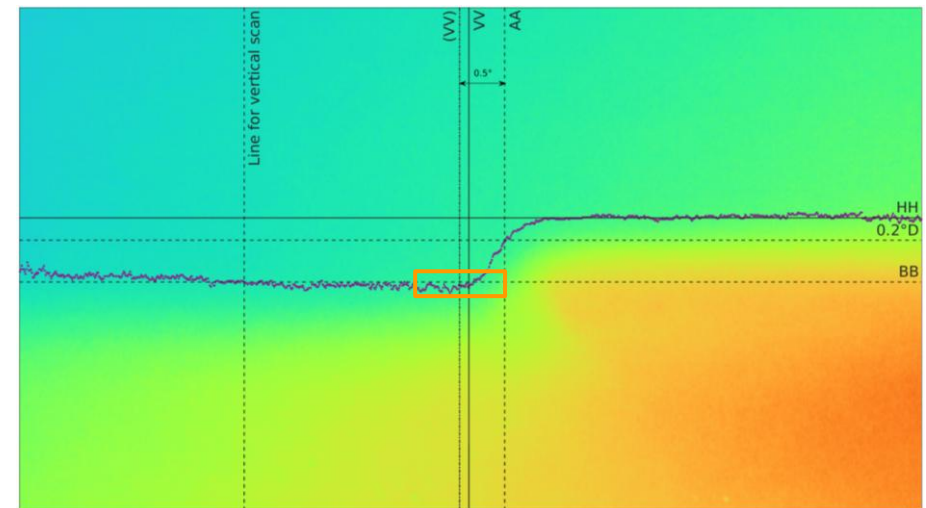
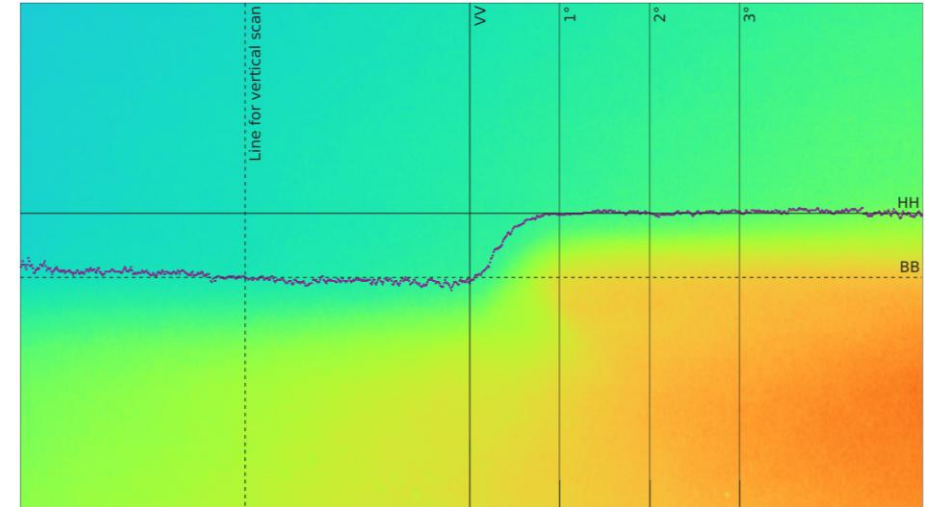
Example 2: Audi A6 (C8, led-projection)

- Three lines are in the a horizontal part behind the elbow

→ No valid result with three lines scan method

→ Try method 0.2°D

- Estimated (VV) is close to the human seen elbow, but it does not provide a definition of the elbow
- The location of the estimated (VV) depends on angle of the shoulder or on the unknown conditions of section 1.2.3.



Aiming procedure in R149

Suggestion for improving

- The methods must fulfil the requirement for reproducibility.
- The definition required to align the headlight (shape of cut-off, kink point) must be so clear that it can be determined instrumentally using a standardized method for TA and PTI.