

PITCH VARIATION

POLAND PROPOSAL



DEAPEE
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31/01/17

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GROUPE RENAULT

INPUT DATA

Calculations is taking into account :

- Empty weight of the vehicles with fuel
- Load repartition
- Maximum weight enable on front and rear axle
- Vehicle spring
- Tires deformation

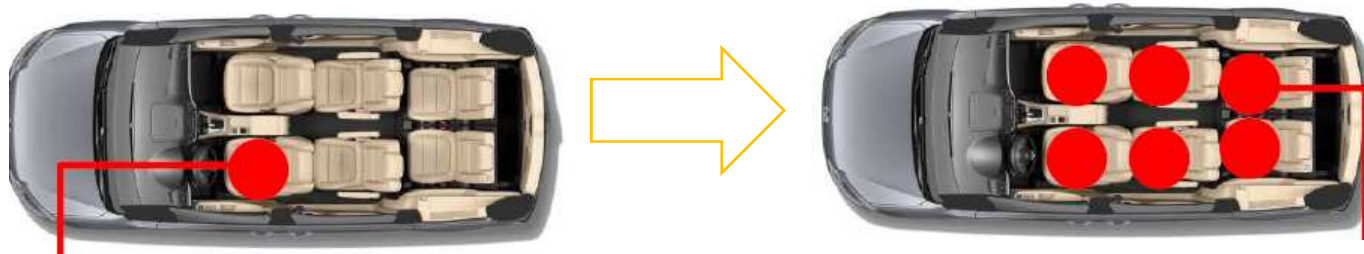
2 ways of Load :

- From passengers to trunk
- Only trunk



Step 1 calculations

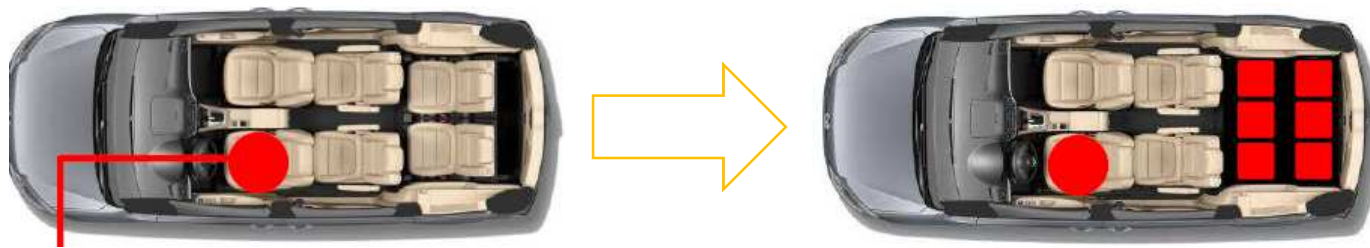
Load from passengers to trunk :



Loading by 25kg from the FRONT to the REAR of the vehicle

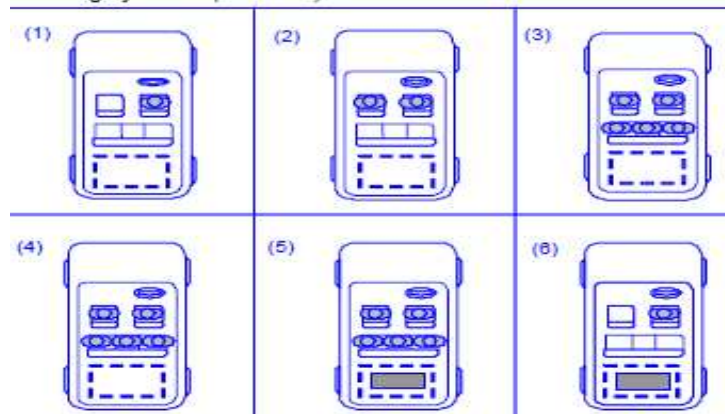
Step 2 calculations

Load in trunk



- Loading by 25kg from the REAR to the FRONT of the vehicle

Following the UTAC Service based on the state of load in R48-Annex 5:



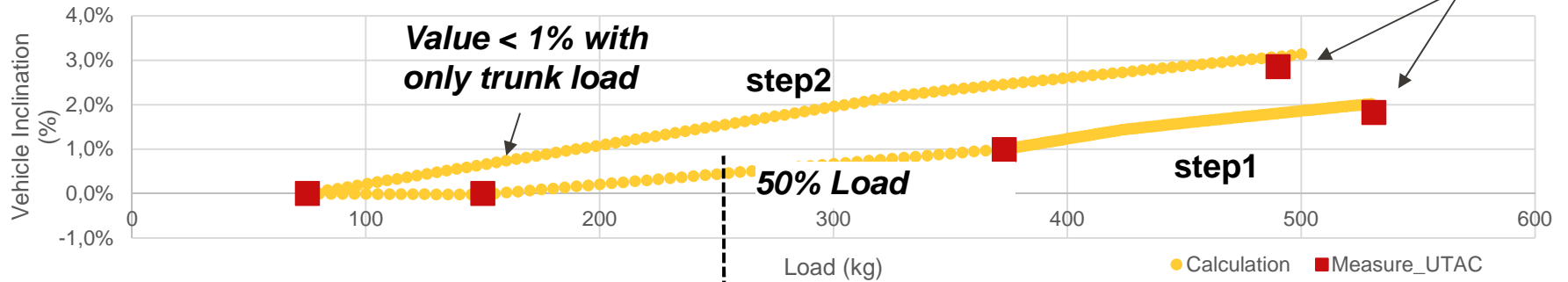
For each state of load, we measure the load and the pitch angle regarding the 1st state of load

Results for « Clio IV » 5 seats



Véhicule	Calculations of variation	Measures of variation (UTAC)
I_0	0%	0% (-1% réel)
I_{min}	-0,02%	0%
I_{max}	3,13%	2,85%
ΔI	3,16%	2,85%

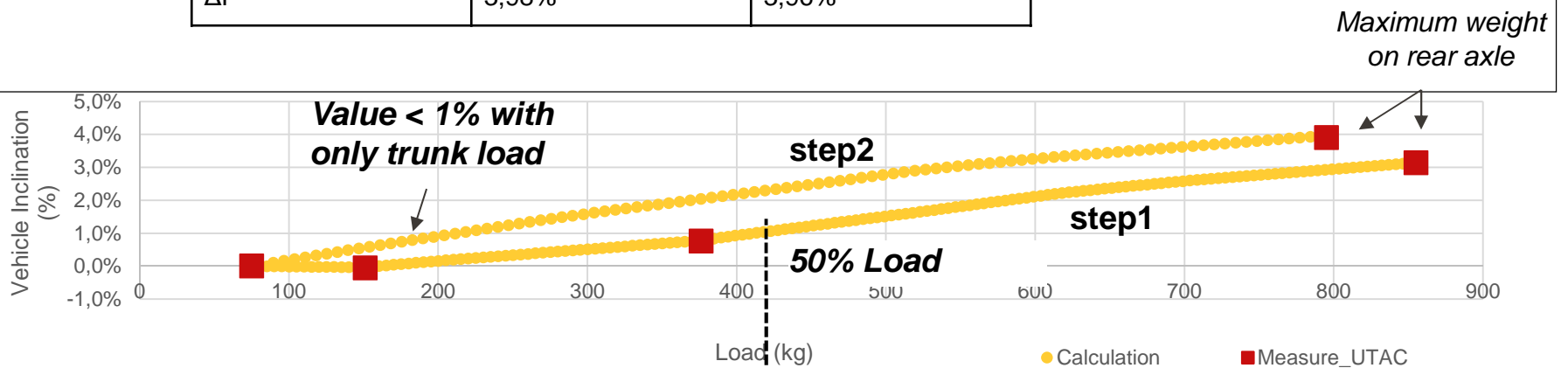
Maximum weight on rear axle



Results for « Grand Scénic » 5 seats



Véhicule	Calculations of variation	Measures of variation (UTAC)
I_0	0%	0% (-1% réel)
I_{min}	-0,04%	-0,06%
I_{max}	3,95%	3,9%
ΔI	3,98%	3,96%



VALUE OF LOAD 100%

Do you see this type of load every day by night ?



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8

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REMINDER – GTB TESTS IN 2010

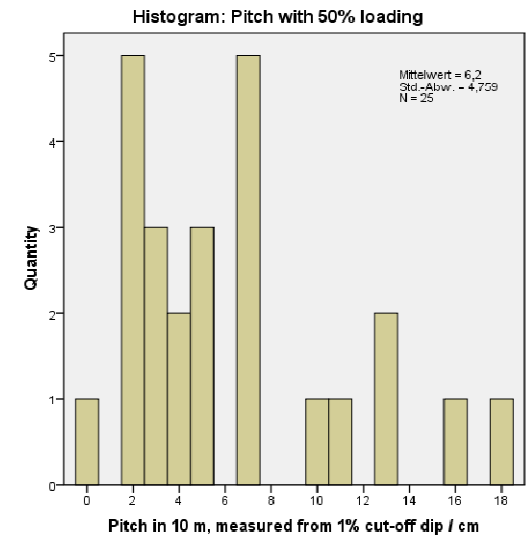
With 50% Load

18 cars tested

10 cars without glaring (< 1% pitch variation)

The 3 Renault cars tested were < 1% :

- *Twingo RS: +0,4% pitch variation*
- *Megane : +0,65% pitch variation*
- *Scénic : +0,65% pitch variation*



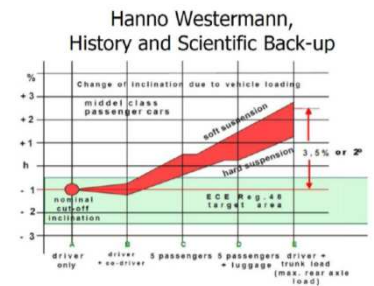
CONCLUSION

Imax – Imin in Renault :

- 3% for 'small' car (B-Segment)
- 4% for C-segment cars
- Pitch variation is more important than measurements presented by Poland (~2%)
- According to Poland proposal, automatic levelling should be mandatory for all vehicles

Measurement results

Vehicle	Headlamp height (cm)	IF (Driver seat)
1	0.74	1.6
2	0.70	0.9
3	0.68	2.3
4	0.64	1.2
5	0.62	1.4
6	0.60	1
7	0.63	1.1
8	0.60	1.7
9	0.67	1.7
10	0.67	3.3
11	0.60	2.1
12	0.74	1
13	0.69	2.3
14	0.70	1.3
15	0.66	1.7
16	0.60	2.4
17	0.70	1.6
18	0.72	2.1
19	0.72	1
20	0.70	1.6
21	0.76	2.2



CONCLUSIONS

- Renault considers this criteria not relevant
- Other factors are responsible for glare :
 - *People from France who drive in England without respecting « tourist mode » regulation*
 - *DRL/PL by night (light above the cut off)*
 - *Dirty lens (study already done to show dirty lens can glare (light deviation)*
 - *High luminance due to low beam size*
 - *Gradient value of the cut-off (smooth or sharp). Renault requirement is smooth*
 - *...*
- Renault considers manual levelling enough to avoid glare especially because the driver can adapt the beam by himself (not possible if automatic system) → potential safety issue
 - *Especially with automatic system cars can glare (Bi-Xenon 35W example with a lot of cars in the streets).*
- Automatic levelling remain expensive (20 – 50€)
- Automatic levelling system consumes between 1W-5W power consumption (equivalent to 0,1g CO₂/km)

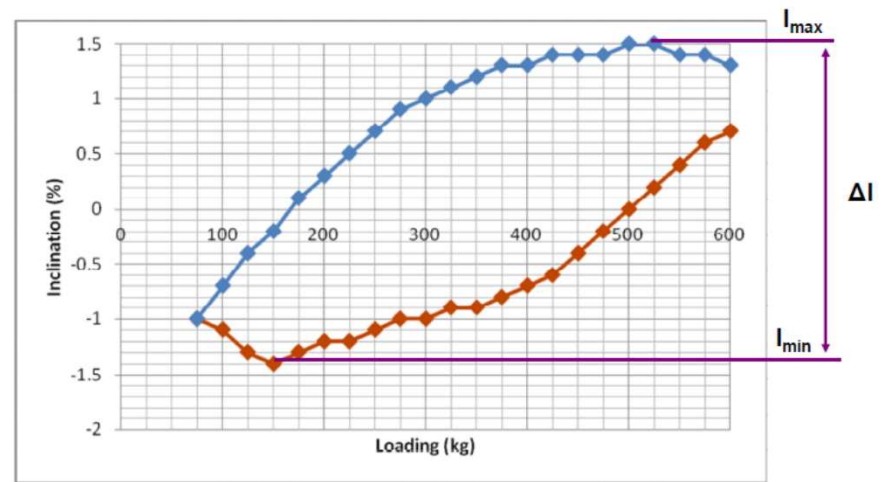


ANNEX – Poland Proposal

Measurement results

Vehicle	Headlamp height (m)	ΔI (I _{max} - I _{min})
1	0.74	1.6
2	0.70	0.9
3	0.64	2.1
4	0.84	1.2
5	0.82	1.4
6	0.88	1
7	0.83	1.1
8	0.68	1.7
9	0.87	1.7
10	0.67	3.3
11	0.80	2.1
12	0.74	2
13	0.89	2.3
14	0.79	1.3
15	0.66	1.7
16	0.69	2.4
17	0.75	1.6
18	0.73	2.1
19	0.72	2
20	0.70	1.6
21	0.76	2.2

ΔI MEASUREMENT PROCEDURE



$$\Delta I = I_{\max} - I_{\min}$$





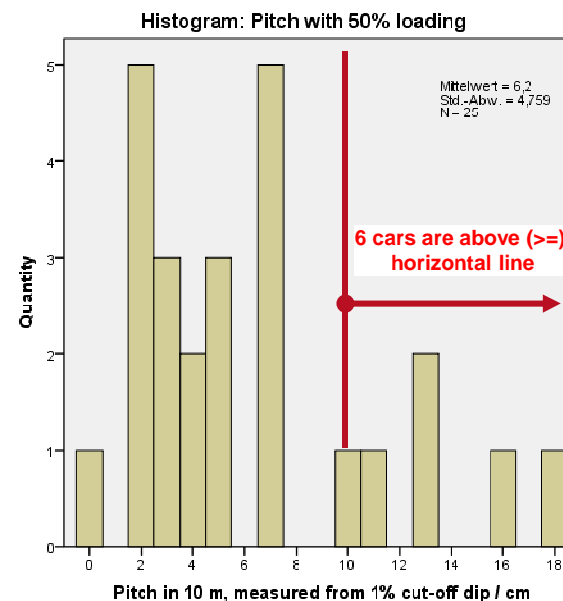
ANNEX - Pitch vs. Loading

Loading condition 50%:

- Range of pitch: 0 cm – 18 cm:
 - Reason for relatively low influence on rating mean at 50%
- 6 cars are above horizontal line
→ High Glare Potential

Loading condition 100%:

- 4 cars: Pitch from 21 cm – 23 cm
→ High Glare Potential



- Assumption: The relative small difference between the two clusters 0% and 50% is caused by the high deviation of pitch at 50% loading.
- Conclusion: Clusters had to be built based on pitch condition and independent of loading condition

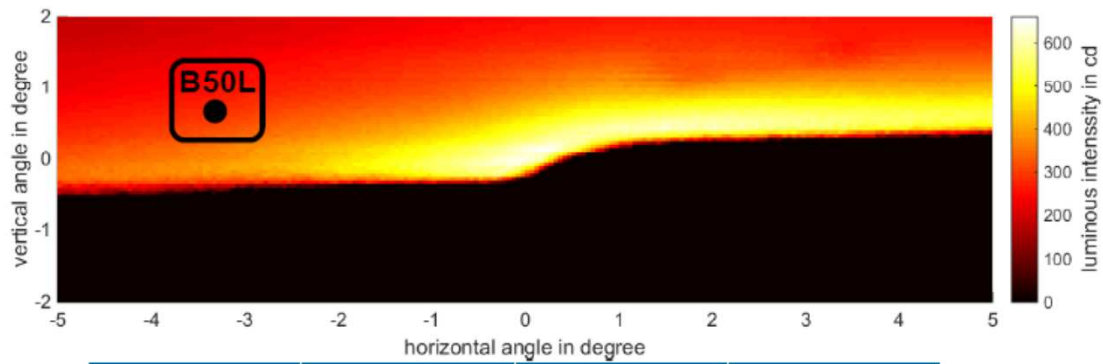
ANNEX - Dirty lens

2. Literature Review



TU Darmstadt, 2016

- Same results as Sivak
 - Less light "beneath" and more above cut off line



	Mean	σ	Difference
Clean	0,2 lx	$\pm 0,01$ lx	
dirty	0,7 lx	$\pm 0,01$ lx	+ 250 %

