CLEPA/OICA proposal for AEBS Step 2

Test vehicles (N2)

VW Crafter (3,5t)

IVECO Daily 70C17K (7,0t)

MAN TGL 4x2 BL (7,5t)

Vehicle Data

Data	Vehicles		
	VW Crafter	**IVECO Daily 70C17K**	**MAN TGL 4x2 BL**
Gross weight	3,5 t	7,0 t	7,5 t
Test-weight laden	3.400 kg	6.420 kg	6.900 kg
Test-weight unladen	2.140 kg	3.495 kg	4.580 kg
Brake system	hydraulic	hydraulic	pneumatic

WABCO Test Facility at Jeversen (Germany)

Dynamic Area:
- outer radius 110 m
- asphalt

Lane Change and
  Brake Tests here:

Test Area & Equipment

General views

Test Program for the Determination of Last Point to steer

- Stationary target (balloon car)
- Speeds: 40, 50, 60, 70 and 80 km/h (without EVSC intervention)
  - Three times at each speed – average used
- Overlap: 100 %, lane width 3.5 m
- Measured vehicle data and observed data recorded:
  - steering angle
  - velocity and distance
- Load condition: laden and unladen (measured)

40-80 km/h

0 km/h

Monitoring by several video-cameras and measuring equipment. ➔ Video
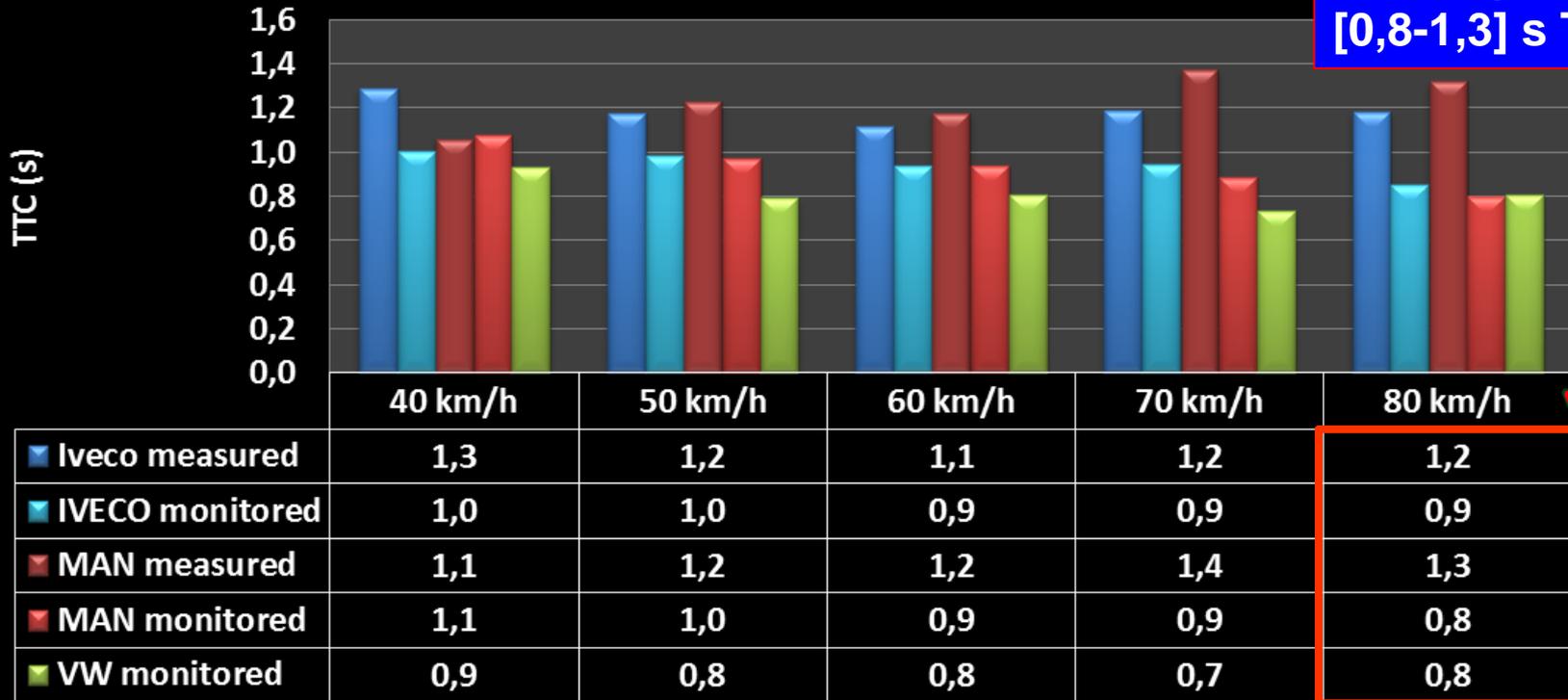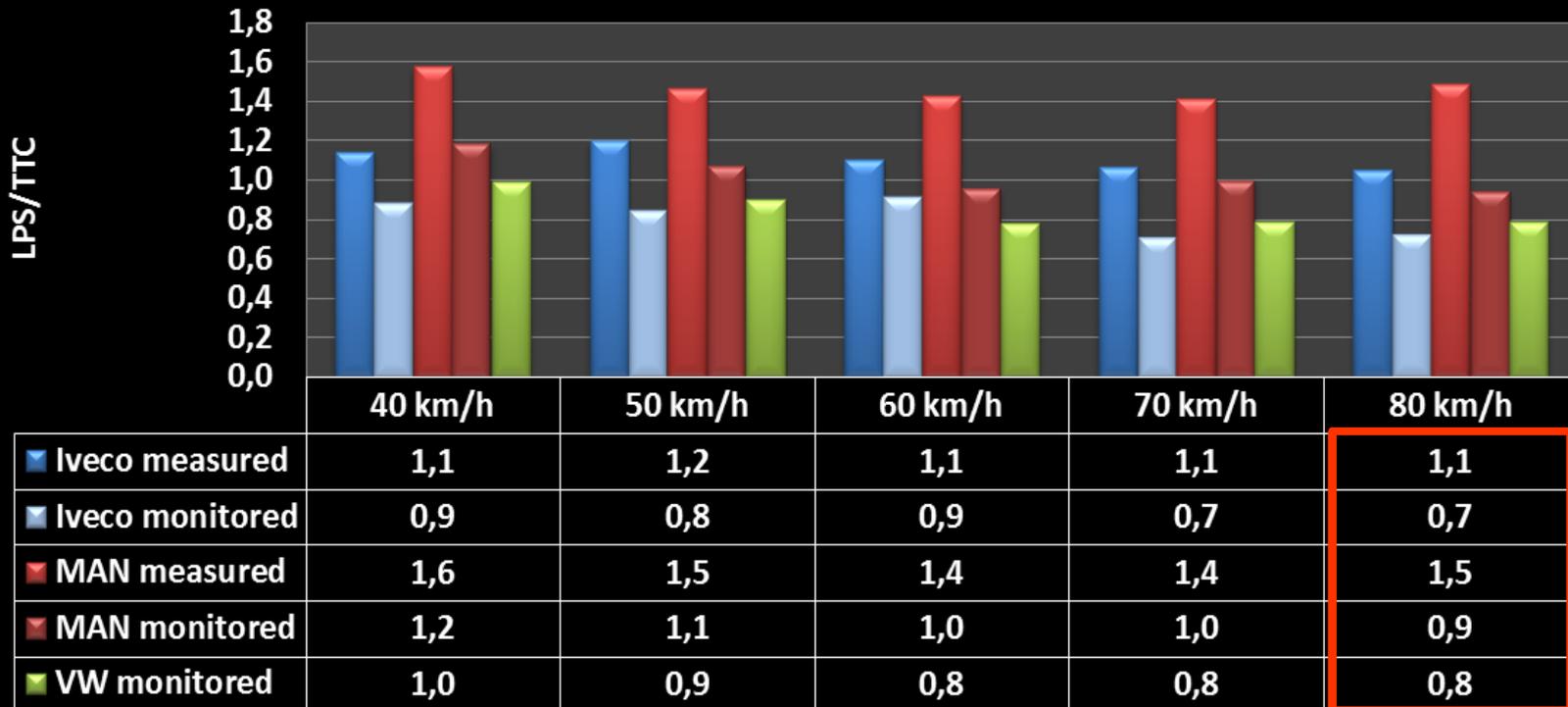
OICA
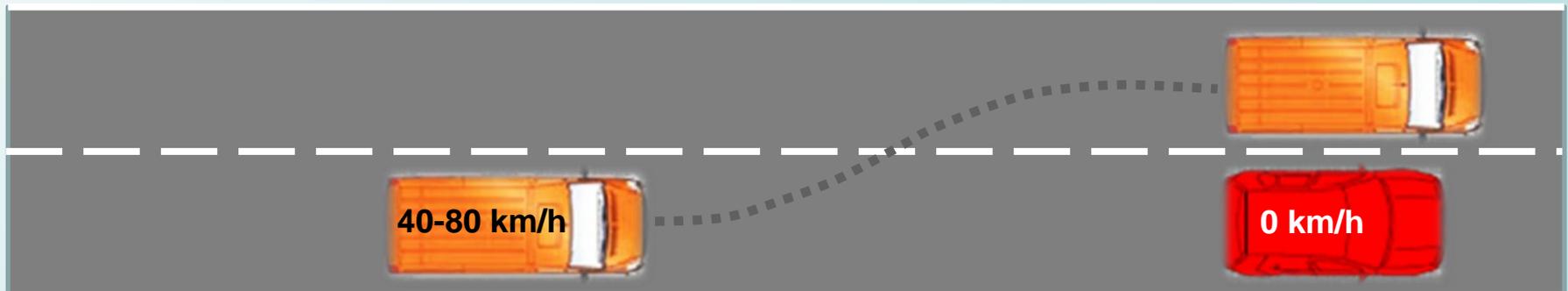
CLEPA
European Association of
Automotive Suppliers

Test Results – Lane change *laden* - TTC

Measured: calculation from measured distance (time = distance/velocity);
Monitored: calculation from observed distance. Between first measured steering
wheel movement and first lateral movement of vehicle a time delay of
approximately 0.3 s was apparent.

The driver still can avoid a collision by steering [0,8-1,3] s before the obstacle! Annoying warning before [0,8-1,3] s TTC!

Avoidance - laden - TTC in s

	40 km/h	50 km/h	60 km/h	70 km/h	80 km/h
Iveco measured	1,3	1,2	1,1	1,2	1,2
IVECO monitored	1,0	1,0	0,9	0,9	0,9
MAN measured	1,1	1,2	1,2	1,4	1,3
MAN monitored	1,1	1,0	0,9	0,9	0,8
VW monitored	0,9	0,8	0,8	0,7	0,8

Test Results – Lane change *unladen* – TTC

- Measured: calculation from measured distance (time = distance/velocity)
- Monitored: calculation from observed distance

Avoidance - unladen - TTC in s

	40 km/h	50 km/h	60 km/h	70 km/h	80 km/h
Iveco measured	1,1	1,2	1,1	1,1	1,1
Iveco monitored	0,9	0,8	0,9	0,7	0,7
MAN measured	1,6	1,5	1,4	1,4	1,5
MAN monitored	1,2	1,1	1,0	1,0	0,9
VW monitored	1,0	0,9	0,8	0,8	0,8

Test Program for the Maximum Deceleration

- Speeds: 50, 60, 70, 80 km/h
- Maximum deceleration
- ABS active
- Load condition(measured):
    - laden
    - Unladen

Test Results – Brake Performance by driver pedal application

Maximum Measured Performance (MFDD):

- IVECO Daily 70C17K (5,0 t)   **7,8 m/s^2**
- VW Crafter (3,5 t)   **7,7 m/s^2**
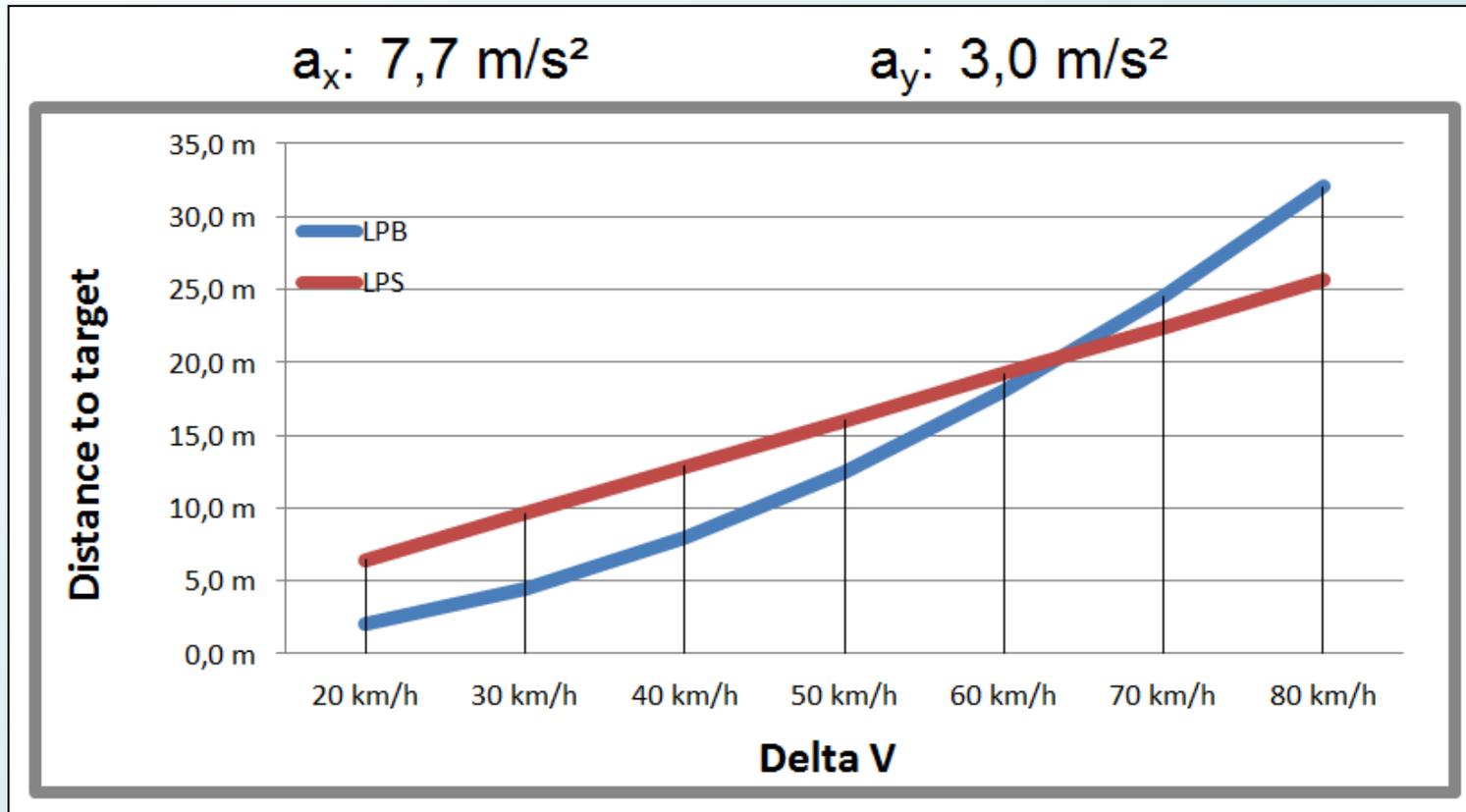- MAN TGL 4x2 BL (7,5 t)   **6,7 m/s^2**

Ideal braking performance delivered by the driver

From 65 km/h on it is a better decision to steer around an obstacle and avoid an impact, than collide with only a reduced speed.
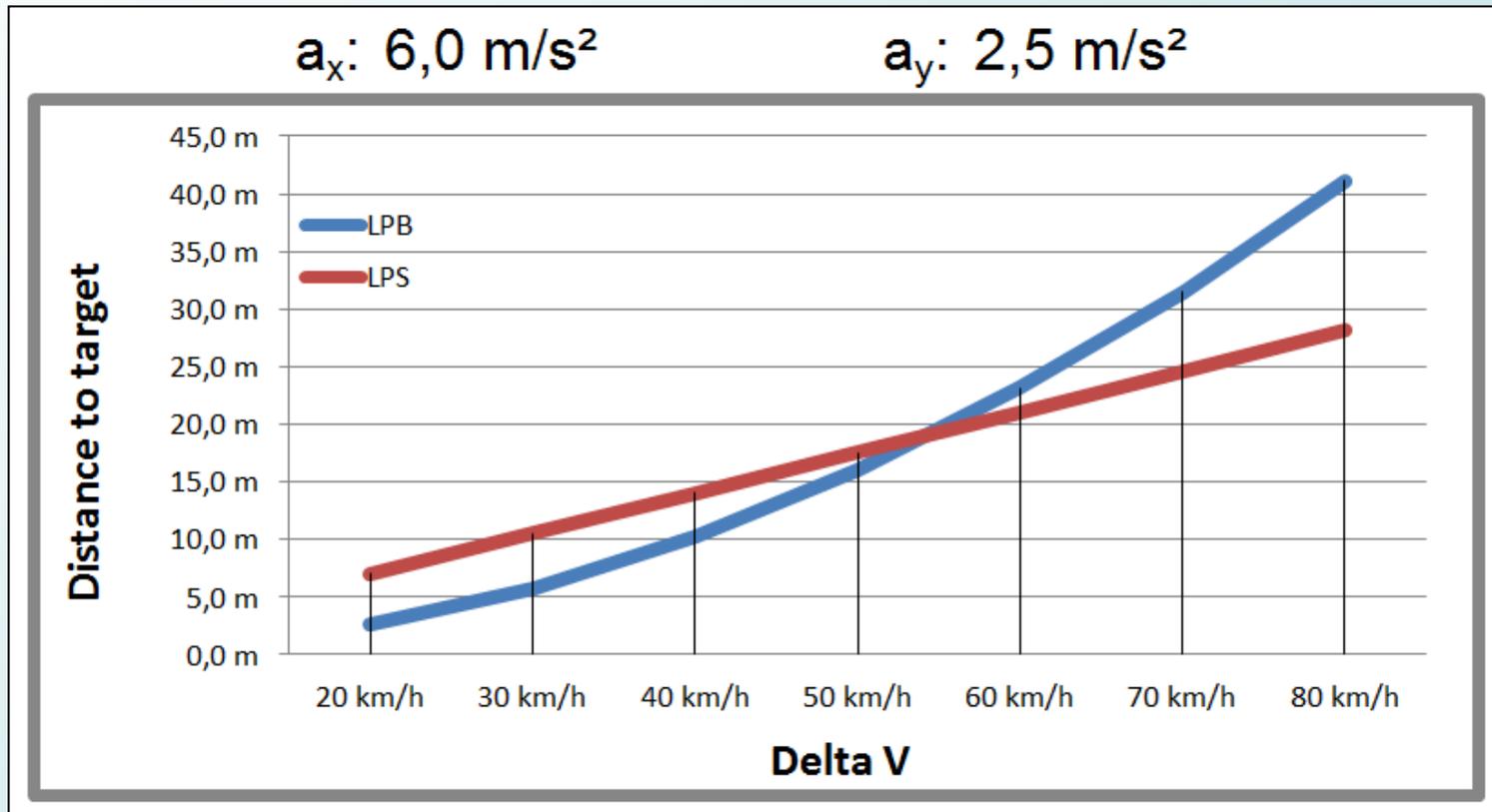
Realistic braking performance delivered by an AEBS and steering in real life conditions

At 80 km/h the LPS is 13 m later than the LPB. So if a system brakes at LPB the driver would still be able to avoid the impact by steering 0,6 s later.

a_x: 6,0 m/s² a_y: 2,5 m/s²

Conclusion

- The tested vehicles had a significantly different dynamic behavior compared to N3-vehicles.

- TTC at last-point-to-steer (LPS) is around 1 sec.

- Collision warning(s) should not start before minimum value of LPS, because drivers would be annoyed by the warning being earlier. (Not later than the start of the emergency braking phase.)

- The vehicle test speed did not significantly influence the value of TTC at LPS. Therefore there is no need to change the test speed of 80 km/h.

Test Team: Bosch, Iveco, Knorr-Bremse, MAN, Volkswagen, VDA, WABCO.

Thank you for your kind attention!

OICA/CLEPA Proposal

A	B	C	D	E	F	G	H	Row
	Stationary target			Moving target				
	Timing of warning modes		Speed reduction (ref. paragraph 6.4.4.)	Timing of warning modes		Speed reduction (ref. paragraph h 6.5.3.)	Target speed (ref. paragraph 6.5.1.)	
	At least 1 haptic or acoustic (ref. paragraph 6.4.2.1.)	At least 2 (ref. paragraph 6.4.2.2.)		At least 1 haptic or acoustic (ref. paragraph 6.5.2.1.)	At least 2 (ref. paragraph 6.5.2.2.)			
M_3[1], N_2>8t and N_3	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	Not less than 20 km/h	Not later than 1.4 s. before the start of emergency braking phase	Not later than 0.8 s. before the start of emergency braking phase	No impact	12 ± 2 km/h	1
N_2≦8 t[2, 4] and M_2[2, 4]	**Not later than the start of the emergency braking phase** [3]	Not less than 10 km/h		**Not later than the start of the emergency braking phase** [3]		**No impact**	67+/-2 km/h	2

1/ Vehicles of category M3 with hydraulic braking system are subject to the requirements of row 2
2/ Vehicles with pneumatic braking systems are subject to the requirements of row 1"
3/ **Values shall be specified by the vehicle manufacturer at the time of Type Approval (Annex 1, paragraph 15).**
4/ **Approval to the entire values specified in row 1 may apply at manufacturer's choice**