

Do LED-advertising signs affect driver attention ?

Paper authored by

Lene Herrstedt

Poul Greibe

Puk Kristine Andersson

Belinda la Cour Lund

www.trafitec.dk

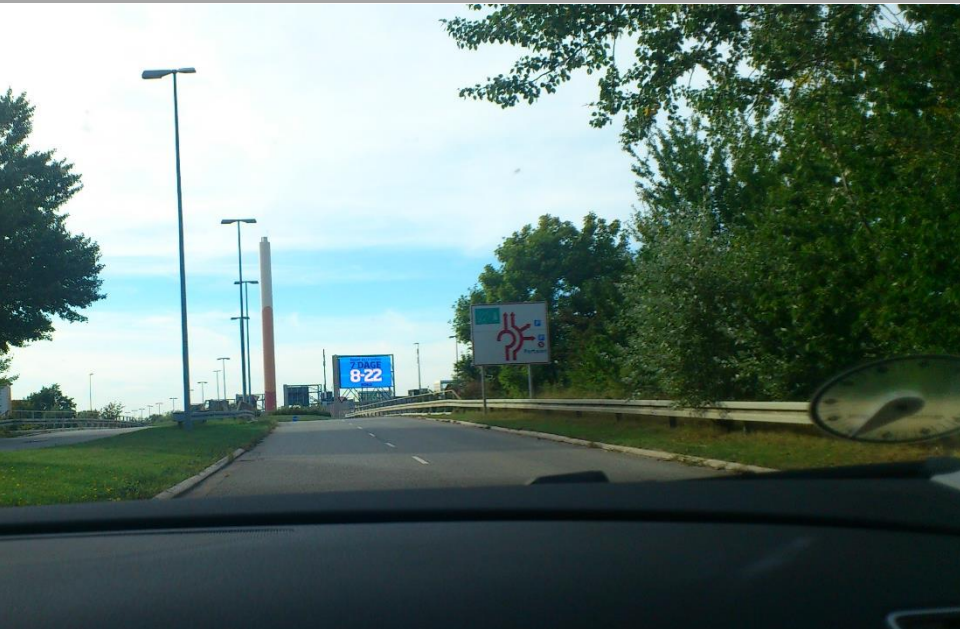
The number of LED advertising signs is rapidly increasing



Do LED advertising signs along roads affect the visual behaviour of drivers?



Do LED advertising signs along roads affect the visual behaviour of drivers?



- 1) To what extent do LED advertising signs along roads divert drivers' visual attention?
- 2) Is drivers' attention to LED signs diverted and maintained to such an extent that it affects road safety?
- 3) Compared to other types of distractors, to what extent is the attention diverted by LED signs?
- 4) Differences during daylight and darkness?

*"Naturalistic driving study"
- test drivers drive an
instrumented car*





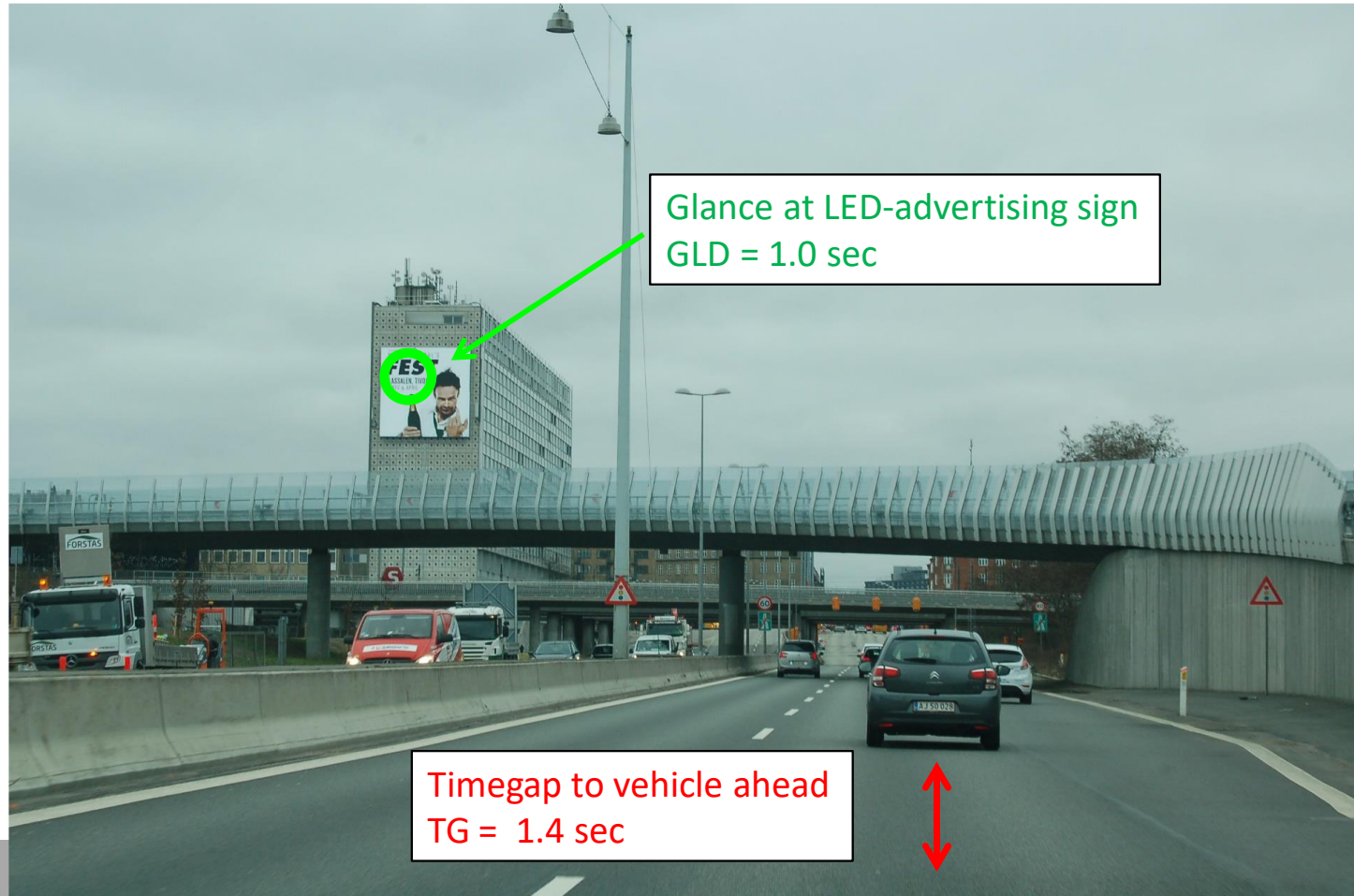
- A Smart Eye 3 - camera system
- A scene camera for video detection of traffic situation ahead
- GPS for speed registration
- Laser scanner for measurements of distances

$$\text{Safety Buffer (sec.)} = \text{TG (sec.)} - \text{GLD (sec.)}$$

TG = Time gap to vehicle ahead (sec.)

GLD = Glance duration (sec.)

”Free running” car,
when $\text{TG} > 3 \text{ sec}$



Safety Buffer

Reflects the time available to respond to a sudden conflict situation requiring immediate action to avoid an accident

Visual Distraction

Diversion of drivers' visual attention away from the road and the traffic toward a competing activity/object irrelevant for the driving task.

“When a driver is looking away from the road at driving irrelevant stimuli for a total period of at least 2 sec. within 6 second continuous period, the risk of being involved in an accident or near-crash situation almost doubles”

(Klauer et al 2006)

Test route	No. of LED Advertising signs	Daylight		Darkness		Total	
		Test route drives	LED drive pasts	Test route drives	LED drive pasts	Test route drives	LED drive pasts
Hundige	6	6	36	4	20	10	56
Aarhus	19	6	109	4	63	10	172
Total	25	12	145	8	83	20	228

- 2 test routes (ring roads/arterial roads – speed limit 60-70-80 km/h)
- 25 LED-advertising signs
- 16 drivers 25 – 58 years old
- 20 test route drives (4 drivers made 1 drive in daylight and 1 in darkness)
- 228 drive pasts: 145 in daylight and 83 darkness

Results – How often did the driver glance?

Number of LED glances per drive past	Daylight		Darkness		Total	
	No.	%	No.	%	No.	%
0	54	37%	35	42%	89	39%
≥ 1	91	63%	48	58%	139	61%
≥ 2	61	42%	32	39%	93	41%
≥ 3	39	27%	22	27%	61	27%
≥ 4	26	18%	13	16%	39	17%
≥ 5	14	10%	10	12%	24	11%

Results – For how long did the driver glance?

11% of all LED glances had a duration > 1 sec.
The longest LED glance had a duration > 7 sec.

In 15% of all drive pasts the *cumulative glance duration* ≥ 2 sec.
In 10% of all drive pasts the *cumulative glance duration* ≥ 3 sec.



Occurency of visual distraction and low safety buffers

- *Visual distraction* was detected for 11% of all LED drive pasts
- In 5 % of all drive pasts (11 out of 228) *visual distraction occurred* together with a *low safety buffer* of ≤ 1 sec.
- In 4 % of all drive pasts *visual distraction occurred* together with a *negative safety buffer*





Glances outside the Field relevant for driving with duration ≥ 1 sec. was defined as "critical glances"

Results:

The average duration of "critical glances " at LED advertising signs was longer compared to all other types of objects

Object	Average glance duration (sec.)
LED advertising signs	1.63
Road signs	1.12
Road and traffic	1.39
Mirrors	1.12 - 1.31
Instrument board	1.17
Other Advertising	1.56

What did the driver look at during drive pasts of LED advertising signs?

- 86% of the time the drivers look at *driving-related objects*: Road, Road users, road signs and traffic lights
- 14% of the time the drivers look at *non-driving-related objects*. LED advertisings account for about half
- *LED and other advertising signs* make up 10% of drivers visual attention while *road signs and traffic lights* account for 7 % of the glance duration

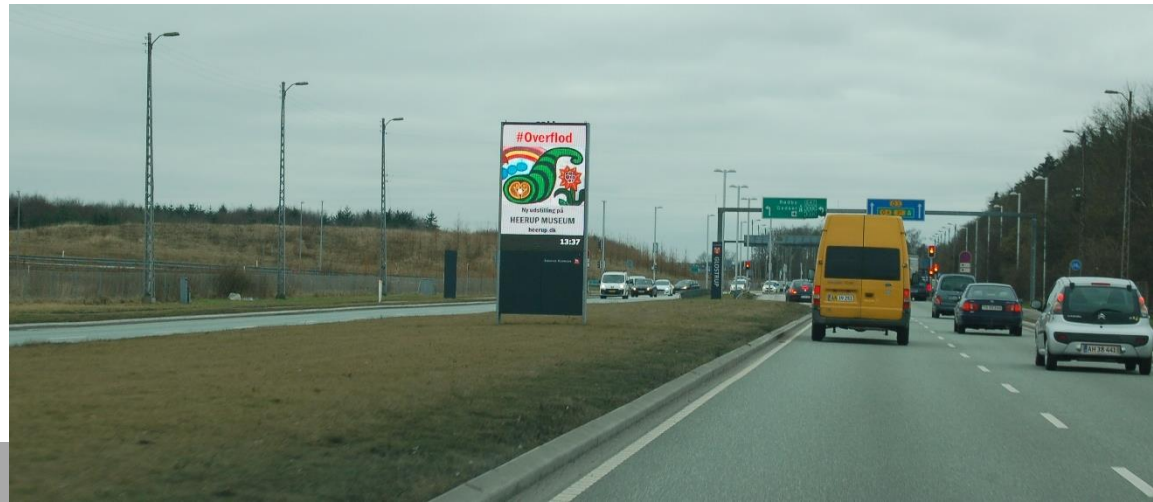


Drivers visual attention is being diverted by LED-advertising signs

- In 10% of all drive pasts the driver glances at LED for ≥ 3 sec.
- In 1 out of 10 drive pasts *visual distraction occurs*

Road safety is affected

- In 14% of all drive pasts the driver look at LED advertising even though the safety buffer is low (≤ 1 sec.)
- In 5 % of all drive pasts visual distraction occurs together with a low safety buffer (≤ 1 sec.)



No significant differences between daylight and darkness

*Neither the number of glances, glance duration or frequency of
Visual distractions*

***LED signs in surroundings of "low visual complexity" seems to
divert driver attention more compared to "high visual complexity"***

- But no significant difference was found

- ***Significant more time glancing on large LED-advertising signs***



- ***Significant more time glancing on LED signs located in the right side or in the central island***



Thank you for your attention

Lene Herrstedt

lh@trafitec.dk

Poul Greibe

pgr@trafitec.dk

Puk Kristine Andersson

puk@trafitec.dk

Belinda la Cour Lund

bl@trafitec.dk

www.trafitec.dk

	Advertising Signs	
	LED	Static
Advertising glances \geq 1 sec.	11%	18%
Cumulative glance duration \geq 2 sec.	15%	22%
Drive pasts with Visual Distraction	11% 1 out of 10	16% 1 out of 6
Drive pasts with Visual Distraction combined with low Safety Buffer \leq 1 sec.	5%	2%

Thank you for your attention

Lene Herrstedt

lh@trafitec.dk

Poul Greibe

pgr@trafitec.dk

Puk Kristine Andersson

puk@trafitec.dk

Belinda la Cour Lund

bl@trafitec.dk

www.trafitec.dk