



**The 2013
Defence & Security
Forum**
At European Microwave Week

Frequency Matters.

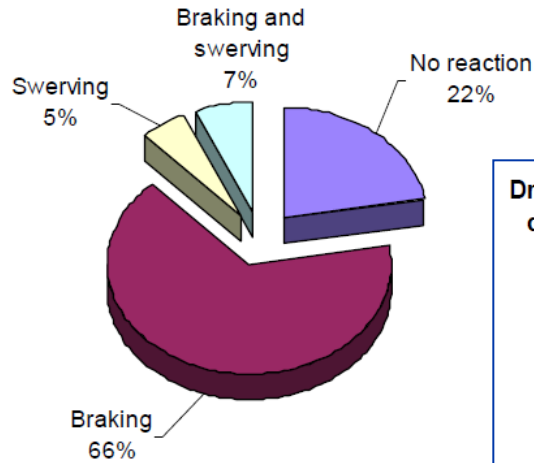
Comparative Test of Advanced Emergency Braking Systems

Christof Gauss

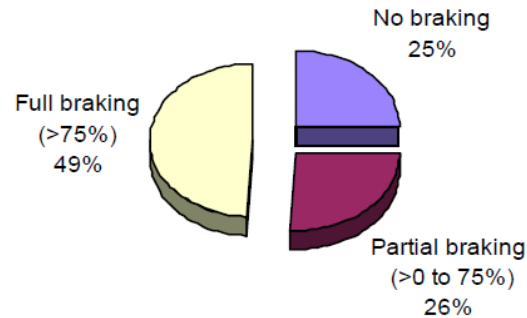
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Presenter: Holger H. Meinel, DAIMLER AG

Driver reaction in rear-end collisions documented by ADAC accident researchers



Driver (braking) reaction in rear-end collisions documented by ADAC accident researchers



To assist drivers in inadequate braking, adaptive braking assist systems are needed. Such systems automatically increase the brake pressure to avoid the collision.

Products – the cars under test



- Audi A6 3.0 TDI quattro
- BMW 750i
- Ford Focus 1.6 I EcoBoost Titanium
- Honda Civic 2.2 i-DTEC Executive
- Lexus GS 250F Sport
- Mercedes B 180
- Mercedes C 350 CDI
- Opel Insignia 2.0 BiTurbo CDTI Sport
- Volvo V40 T4 Summum
- VW Touareg V8 TDI



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Products – highlights

The VW Touareg, Audi A6 and Lexus GS were rated “good”. The almost identical systems in the VW and Audi offer an excellent alert strategy, but they fall behind the competition in terms of autonomous braking in urban traffic. The Lexus performs well overall

Installed as a standard in a Mercedes B-Class for the first time, the Mercedes collision warning system cum braking assistance is groundbreaking and will contribute to a quick adoption of the systems.

BMW – 7 series

Both the collision warning and the braking assistance work impeccably most of the time, earning the tested car a “very good” rating and the “best in test” ranking.

With marginally lesser ratings, the Mercedes C-Class and the all-new Volvo V40 rank up at the top with BMW. Compared with the last test, both manufacturers improved their systems and both models now have a high collision prevention potential

As they are today, emergency braking systems offer an enormous plus in safety
ADAC demand: emergency braking systems should be installed in every passenger car



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Products – HMI presentation (examples)

- collision and distance warning



Mercedes C 350 CDI



Honda Civic 2.2



Volvo V40

LEDs projected on the windscreen reproducing the preceding car's braking lights



BMW 750i – head-up Display

WARNING:

 distance too small



Audi A6 3.0 TDI quattro



Results



Rating scale:		ADAC verdict	Overall rating	Approach on slower vehicle	Approach on steadily decelerating vehicle	Approach on stopping vehicle	Approach on stationary vehicle	Adaptive brake assist	Alert cascade	Upgrade: following distance warning	Downgrade: fail operation	Tier 1
++	very good											
+	good											
O	satisfactory											
⊖	acceptable											
-	poor											
Manufacturer/type				15%	15%	15%	15%	20%	20%			
BMW 750i		++	1.3	1.1	1.0	1.8	1.7	0.6	2.0	-0.1		Conti
Mercedes C 350 CDI		++	1.4	1.4	1.6	1.9	1.4	0.6	1.8	-0.1	0.1	Conti
Volvo V40 T4 Summum		++	1.5	0.8	2.0	1.9	1.0	0.6	2.0	-0.1	0.2	Delphi
VW Touareg V8 TDI		+	1.7	1.5	1.4	2.4	3.3	0.6	1.5			Autocruise
Audi A6 3.0 TDI quattro		+	1.8	1.8	1.5	2.7	3.3	0.6	1.3			Bosch
Lexus GS 250F Sport		+	2.1	0.8	3.1	1.7	2.8	1.6	2.5			Denso
Opel Insignia 2.0 BiTurbo CDTI Sport		O	3.3	2.3	2.4	2.0	3.1	5.5	3.0		0.1	Delphi
Honda Civic 2.2 i-DTEC Executive		O	3.4	2.8	3.7	2.7	2.6	5.5	2.3		0.1	elesys
Mercedes B 180		O	3.5	3.3	3.3	4.3	4.4	2.2	3.8	-0.1	0.1	Autoliv
Ford Focus 1.6 I EcoBoost Titanium		⊖	3.6	2.7	2.7	2.9	4.2	5.5	3.3			Delphi

Added by
the presenter



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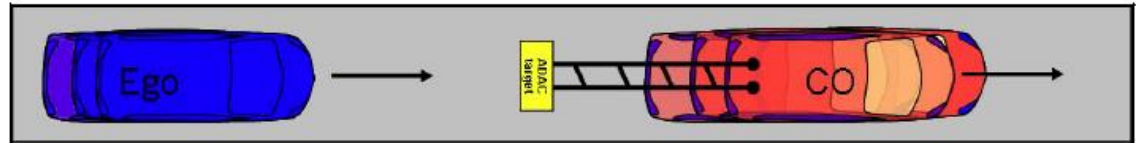
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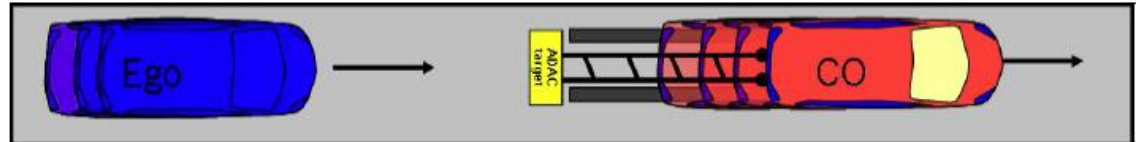
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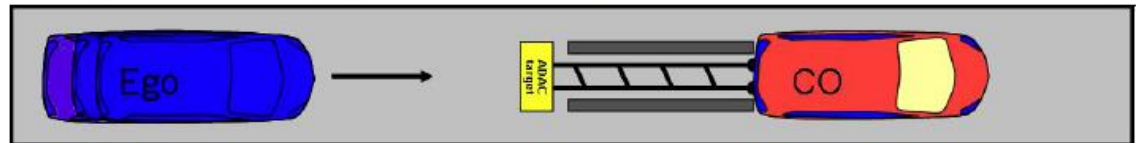
- Utility test scenario – approach on slower vehicle



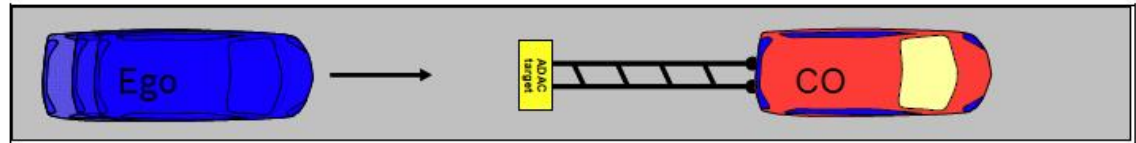
- Utility test scenario – approach on steadily decelerating vehicle



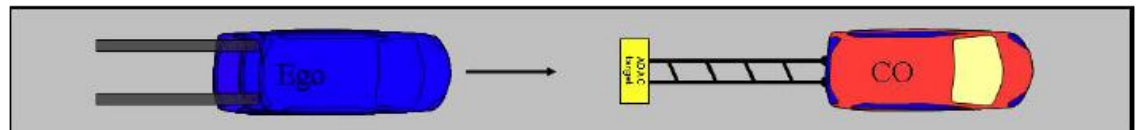
- Utility test scenario – approach on stopping vehicle



- Utility test scenario – approach on stationary vehicle



- Utility test scenario – braking assistance



Results – as of 09/2012 - examples

The greatest surprise in this test was the BMW. In last year's test the 5-series was only rated satisfactory. With the more advanced Driving Assistant Plus, which has been deployed in the facelifted 7-series, BMW wins in the overall rating. The system has hardly any flaws. In autonomous braking manoeuvres it reduces speed considerably (often avoiding collisions altogether). The BMW also has a very effective adaptive braking assist system.



BMW 750i



Mercedes C 350 CDI

Mercedes also worked on the further development. The efforts being rewarded with good overall results for the C-Class. Mercedes has made real progress in the low-speed segment. Before stationary vehicles, the braking manoeuvres can avoid collisions altogether. Further strength of the C-Class are significant speed reductions in cases involving great speed differentials and very effective adaptive braking assist system(BAS PLUS).

The result of the B-Class is merely satisfactory but with this range, Mercedes proves impressively that it is possible to offer a functional standard collision warning system in a compact car. The system includes adaptive brake assist that supports the driver in braking when a rear-end collision with a preceding car is imminent. The B-Class was downgraded because its system does not support autonomous braking.



Mercedes B 180

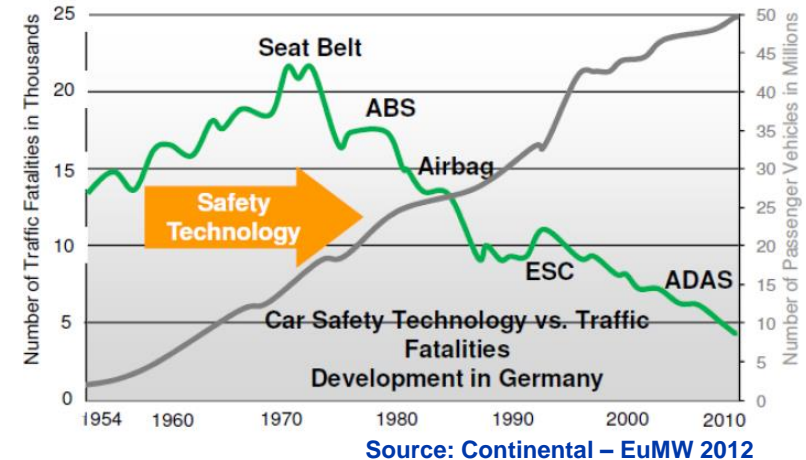
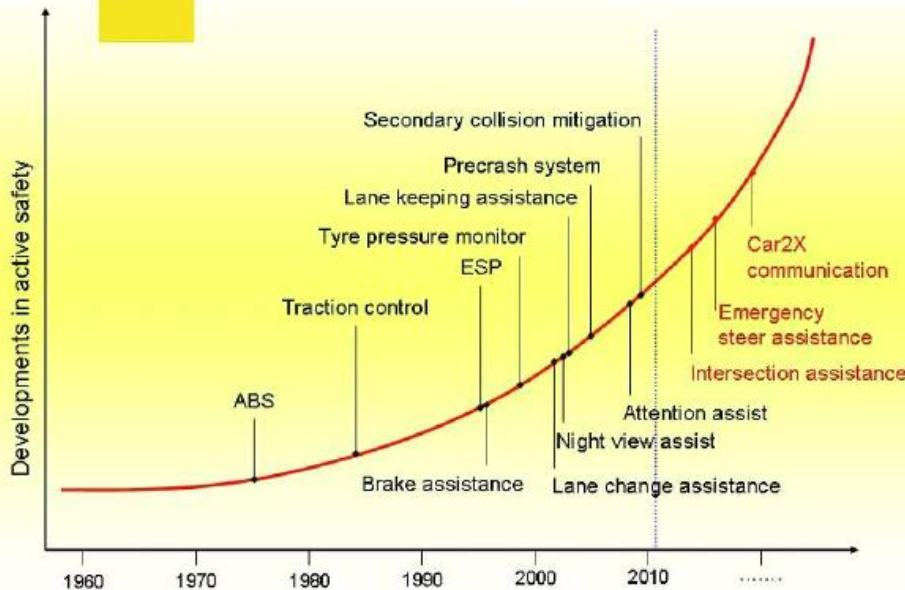


Ford Focus 1.6

While the Ford Focus with its City Stop active braking system and Forward Alert was merely rated acceptable, it still contributes towards road safety. The system reliably alerts the driver to an impending collision with a preceding car but it initiates light braking only when the driver actively throttles off. There is no collision warning when approaching stationary vehicles. To its credit, City Stop reduces collision speed to 30kph, or even avoid the collision altogether. The Ford Focus does not have adaptive brake assist either.

ADAC

Milestones of Active Safety



Future: ADAC accident research data suggests that intersection accidents (e.g. right-of-way violations) are one of the most frequent personal injury accident types. In this area, the networked systems of the future will enable complete surround monitoring or car2car or car2infrastructure communication and so help reduce the number of persons injured or killed in road accidents.



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- The systems must be made **available in the compact and small vehicle** segments and must be developed continuously to become more affordable
- **False alarms must be avoided.** Accidental emergency brake activation cannot be tolerated. To ensure that the maximum number of driver types can benefit from AEBS, driver observation models and plausibility checks are required (alarm dilemma: sporty vs. inexperienced drivers ...).
- **Warnings must be effective and identifiable.** Indefinite generic acoustic signals which cannot be readily identified when they sound or inconspicuous warning lamps are of little use in the prevention of rear-end collisions.
- **Specific haptic warnings** (e.g. brake jerk and subsequent partial braking) buy the driver time to react and indicate what he/she is required to do (depress the brake pedal). A promising approach is the "active accelerator" that actively presses against the driver's foot to warn of an imminent collision. It warns the driver exactly where it is needed, i.e. the driver's foot saying "danger ahead, throttle off".
- Emergency braking systems **must activate when the engine is started** and must not allow permanent deactivation.
- Most driver assistance systems and emergency braking systems in particular are unknown territory to motorists. Often the effectiveness and protective potential of such systems cannot be verified on the road, in real-life traffic. For the systems to be widely accepted it is crucial to make motorists aware of the operation, functionality and limitations of the systems. **This is communicated most effectively in video demonstrations.** **Demonstrations are a means to inform motorists effectively.** ADAC therefore demands that driver assistance systems should always be distributed to the user with a demo video (e.g. how the system works and its limitations).



More to see in this context ...

ADAC

- **EuMW Exhibition area:**
4 radar sensor equipped vehicles are displayed



- **MICROAPPS within the exhibition area:**
Panel Session/ Panel Discussion
Automotive Radar – *market & sensors, performance, availability & measurability*
 - **Thursday, October 10, Stand 109**
 - **10:30 to 12:00 h**
- **EuRAD 13**
Automotive Radar
 - **Friday, October 11, Room Istanbul**
 - **10:40 to 12:20 h**



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Acknowledgement



This presentation has only become possible due to the support of the ADAC and its Technik Zentrum

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I especially want to thank Christof Gauss for his kind cooperation



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Comparative Test of Advanced Emergency Braking Systems

Thank you for your attention

We all knew it,
since a long,
long time . . .

“ WE HAVE NOT REACHED – OR EVEN
APPROACHED – THE LIMITS OF
ACHIEVABLE PERFORMANCE ”

From:
RADAR 2012
Les Gregory
Director - BAE SYSTEMS



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Early Afternoon Session

13:50 – 15:30 h



Back-up

Experience and Future Expectations regarding Automotive and Military Radars

- Claudio Hartzstein "*Future developments of ADAS systems*"
- Christof Gauss, ADAC "*Comparative Test of Advanced Emergency Braking Systems*" (presentation given by Holger Meinel)
- Andreas Strecker, CASSIDIAN, "*High performance X-Band E-Scan radar for security applications*"
- Tom Schipper, KIT and Alicja Ossowska, Valeo, "*Automotive radar application in difficult environments (e.g. tunnel)*"