

# VDC ABS

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(Anti-lock Braking System, ABS)

(Vehicle Dynamic Control, VDC)

(Understeering)

(Oversteering)

VDC

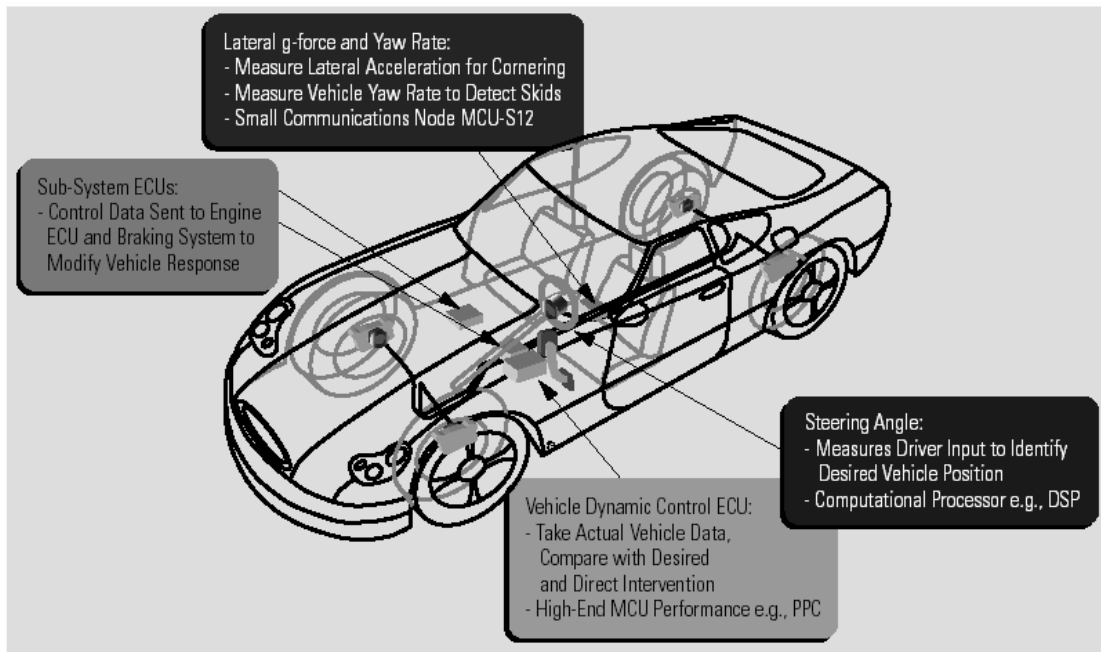
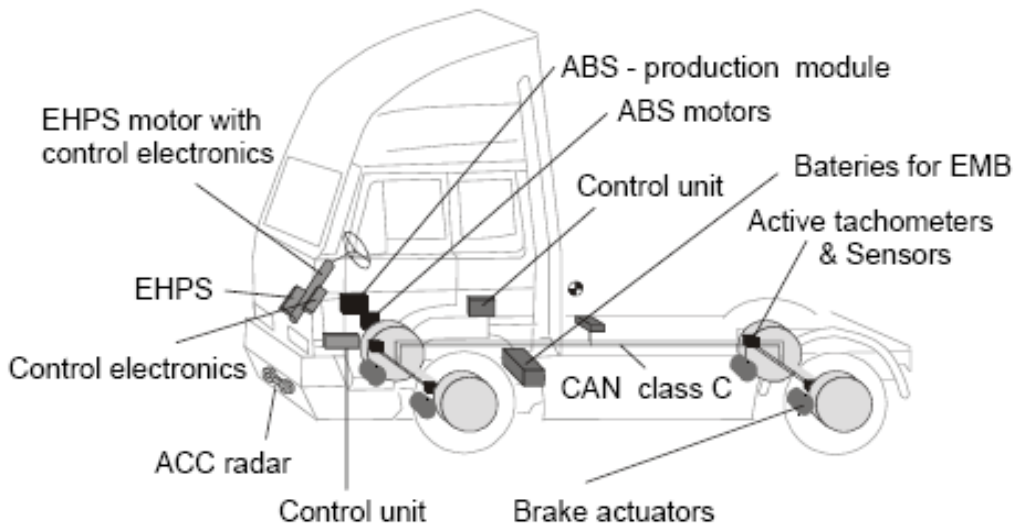
ABS

VDC ABS

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(Anti-lock

(Airbag)

Traction Control System (TCS) Braking System , ABS)

(Vehicle Dynamic Control,VDC)

BMW ,Cadillac ,Cheverolet ,Lexus

VDC ABS

[ ]

**(Anti-lock Brake System) ABS**

**ABS**

Robert

ABS

[ ]

VDC ABS

Bosch GmbH

[ ]

(Slip)

ABS

( )  
(Stopping distance)

( )

(Stability)

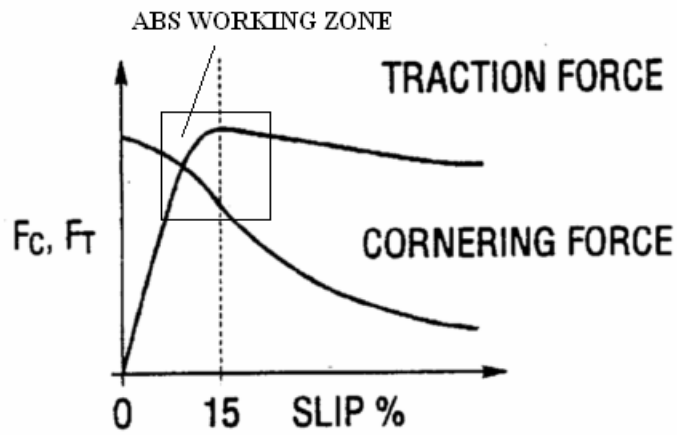
ABS

(Steerability)

(Slip)

( )

ABS



ABS

(Speed sensors)

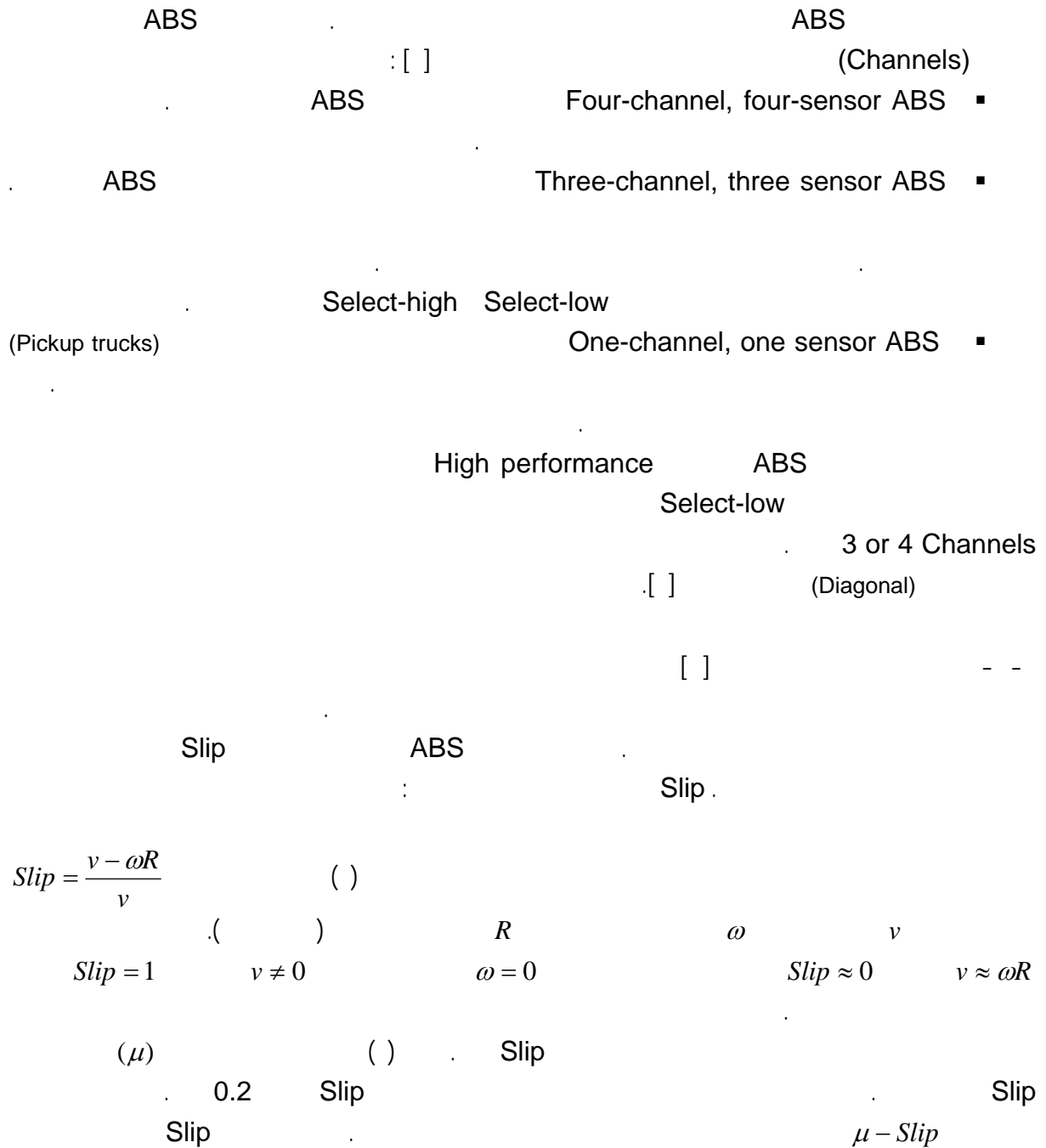
(Modulator)

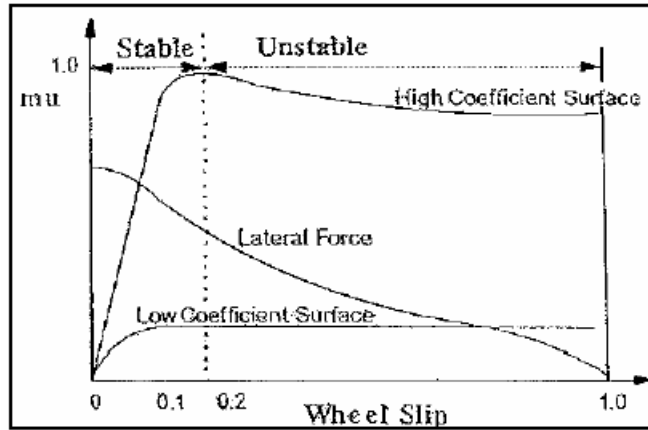
(Controller)

ABS

( )







Slip=1  
Slip ( )

. [ ], [ ], [ ] ABS  
Slip control, State machine method and Fuzzy logical control

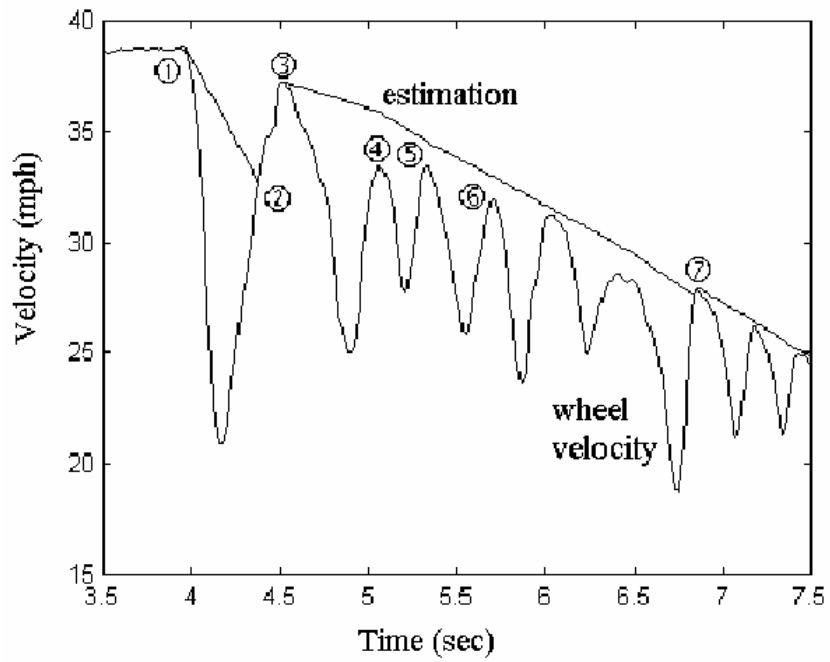
ABS ABS  
Slip ABS Slip ( )  
( $\omega$ )

Optical )

correlation method or Spatial filtering method)

. [ ]  
Adaptive Nonlinear Filter

ABS ( )



( )  
Peak

Peak

Peak

**(Vehicle Dynamic Control) VDC**

(VDC)

$(C_\alpha)$

$\alpha$  ( )

( )



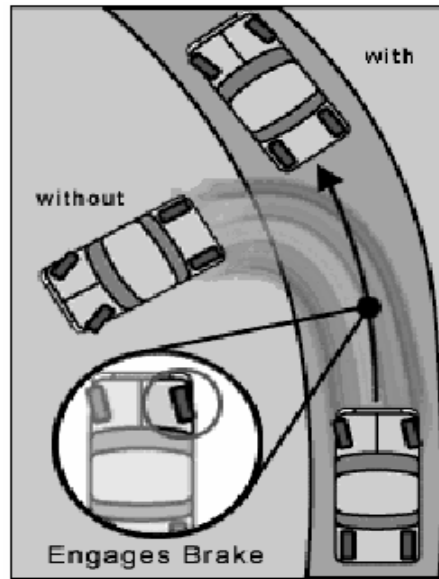


VDC

( )

Over-steer

[ ]



VDC

Over-steering

Transversal distribution of

Braking

Transversal distribution of traction force

braking force

[ ]

(Differential Braking)

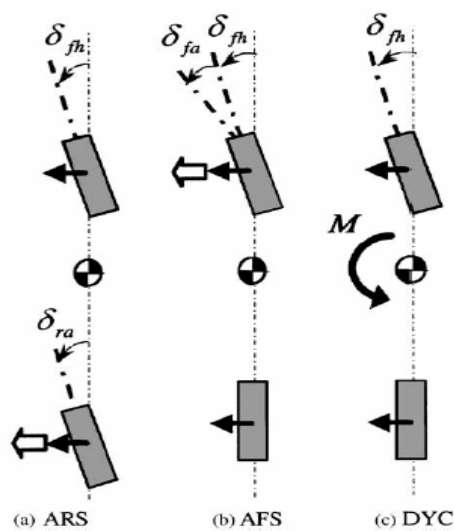
( ) [ ]

VDC

(Direct Yaw Moment, DYC)

[ ]

VDC



VDC

ARS AFS DYC  
 ( ) DYC

$$\begin{bmatrix} M & 0 \\ 0 & I_z \end{bmatrix} \begin{Bmatrix} \dot{v} \\ \dot{r} \end{Bmatrix} + \begin{bmatrix} \frac{C_{af} + C_{ar}}{u} & \frac{aC_{af} - bC_{ar}}{u} + mu \\ \frac{aC_{af} - bC_{ar}}{u} & \frac{a^2C_{af} + b^2C_{ar}}{u} \end{bmatrix} \begin{Bmatrix} v \\ r \end{Bmatrix} = \begin{bmatrix} C_{af} \\ aC_{af} \end{bmatrix} \delta + M_z \quad (1)$$

(r) Yaw rate (v) ( )

$M_z$

$$M_z = K_r \cdot r + K_v \cdot v + K_\delta \cdot \delta \quad (2)$$

(EVs)

(ICE)

DYC

VDC

( )

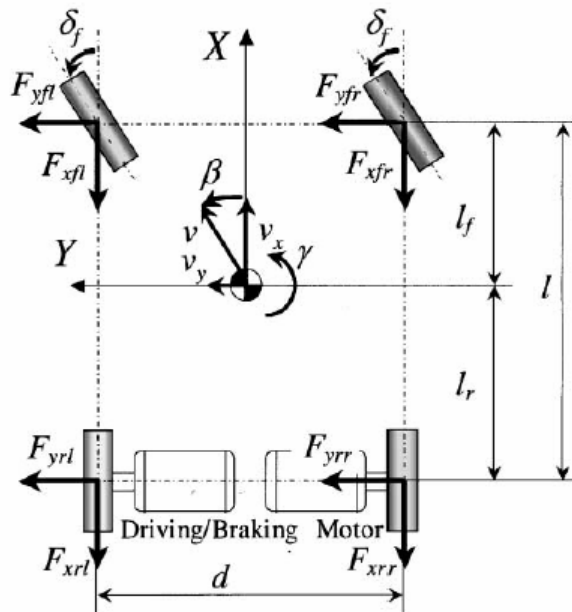
EVs

ICE

EVs

Over-steer

[ ] Os



[ ] EVs

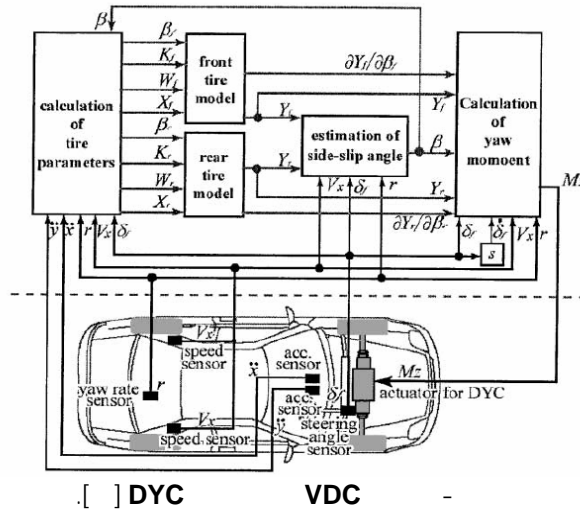
(Differential Braking)

ABS

VDC

4-channel, ABS

VDC



(Lateral Dynamic)

(Over Steering)

(Slip Angle)

(VDC)

ABS

VDC

[1]. Petri Arminen, "Microsensors in Vehicle Stability and Driving Control", 2001.  
 [2]. P. Oppenheimer, "Comparing Stopping Capability of Cars with and without Antilock Braking Systems (ABS)", SAE 880324.  
 [3]. H. Demel, F. Hemming, "ABS and ASR for Passenger Cars – Goals and Limits", SAE 890834.  
 [4]. Getting the ABS Concept, [www.autostuffworks.com](http://www.autostuffworks.com).  
 [5]. Fangjun Jiang, Zhiqiang Gao, "An Adaptive Nonlinear Filter Approach to Vehicle Velocity Estimation for ABS", Applied Control Research Lab, Cleveland State University, 1998.  
 [6]. Constantin von Altrock, "Fuzzy logic technologies in automotive engineering", Wescon 94, Idea/Microelectronics Conference Record, Sept. 27-29, 1994.  
 [7]. E. Wellstead, N. B. O. L. Pettit, "Analysis and redesign of an antilock brake system controller", IEE Proc. Control Theory Appl., Vol. 144, No. 5, p. 413-426, Sept. 1997.  
 [8]. J. Eric Bowman, E. H. Law, "A Feasibility Study of an Automotive Slip Control Braking System", SAE technical paper 930762.  
 [9]. K. Miyake, I. Yamaki, T. Fujita, "Four Wheel Anti-Lock Brake System (ABS) for Four Wheel Drive Vehicles", SAE 880322.

- [10]. E. Esmailzadeh, A. Goodarzi, G.R. Vossoughi, "Optimal yaw moment control law for improved vehicle handling", Elsevier Science Ltd, 2001.
- [11]. Masao Nagai, Motoki Shino, Feng Gao, " Study on integrated control of active front steer angle and direct yaw moment", JSAE Review 23 (2002) 309–315.
- [12]. Motoki Shino, Masao Nagai, "Yaw-moment control of electric vehicle for improving handling and stability", JSAE Review 22 (2001) 473–480.
- [13]. Masato Abea, Yoshio Kanoa, Kazuasa Suzukia, Yasuji Shibahatab, Yoshimi Furukawab, " Side-slip control to stabilize vehicle lateral motion by direct yaw moment", JSAE Review 22 (2001) 413–419.