

A proposal for the Definitions of Automated Driving under WP.29 and the General Principles for developing a UN Regulation

- The following table reflects the general principles for automated driving systems as WP.29. These principles will be treated as guidelines for developing a new regulation related to automated driving systems at WP.29.
 - The control systems that intervening in case of emergency (AEB, ESC, Deadman, etc.) are not included in these definitions of automated driving.
 - The control functions that avoid dangers caused by unpredictable traffic conditions (goods/luggage dropping, frozen road, etc.) or other drivers' illegal driving behaviors are not considered in this table.
- The regulation on automated driving needs to have new specific performance requirements and verification tests under various conditions depending on each level.
- In discussing system requirements, it is desirable to organize them by level as well as by road way type (1: limited space; 2: motorway; 3: urban road).
- The following table shows the distinguish way of level of automated driving under WP.29 at this present considering the results of discussions so far and the assumed use cases. This table should be reconsidered appropriately in accordance with each concept of automated driving system to be placed on the market in the future.

	Driver in the loop	Driver in the loop (a)	Driver in the loop (b)	Driver out of the loop (Part Time) <u>Regarding Level 3 OICA stated that the driver is part of the loop, not part-time out of the loop</u>		Driver out of the loop (Full time)
Outline of Classification	The vehicle cannot be driven without the driver's continuous operation.	The driver and the system share dynamic driving tasks (see SAE's definitions) under limited driving environments and conditions The system offers to operate in response to the driver's request, or to operate the vehicle for the driver just for a limited period (short time).	The system offers to operate the vehicle for the driver for a certain period (Long time) which the driver requests.	The system occasionally performs all dynamic driving tasks.		The system always operates all dynamic driving tasks.
Ref. SAE Level (J3016)	1	2		3	4	5
Consideration points on development of regulation	Same as current principle (manner)	Same as current principle (manner) Driver normally is forced to engage in dynamic driving tasks in order to address changes in the driving environment.	The regulation needs to consider an arrangement that ensures the driver's involvement in dynamic driving tasks even when the system is in control.	<u>Cell needs to be split to reflect Lv 3, Lv 4: Lv 3: The regulation needs to ensure that the driver is in a condition that enables him or her to resume operation of dynamic driving tasks when the driver must resume the driving task (takeover demand by the system), under other than the use cases. For Lv4: The system is able to cope with all situations in the use case (fallback included), driver not necessarily needed.</u>		Harmonization with the existing regulation on a driverless traffic system is necessary.
Examples of the necessary system performance requirements						
Override function by the driver	O (Necessary in general)	O (Necessary in general)	O (Necessary in general)	Δ (necessity depends on the system) necessary in general	Δ (necessity depends on the system)	X (Unnecessary)
Aspects of arrangement that ensures the driver's involvement in dynamic driving tasks (driver monitoring, etc.)	Δ (detection of hands-off as necessary)	Δ (detection of hands-off as necessary)	O (detection of driver's distraction for driving task Driver availability recognition system as necessary) (detection of seated/unseated, etc.) Driver availability recognition system" means a function able to assess driver's physical availability to takeover manual driving.	O (detection of seated/unseated, etc.) Driver availability recognition system. Driver availability recognition system means a function able to assess driver's physical availability to respond to a transition demand from the vehicle.	O (System that depends on the driver's conditions that can resume to driving operation)	X (Unnecessary)
Aspects of arrangement that ensures the driver's resumption of dynamic driving tasks (transition periods to the driver, etc.)	X (Unnecessary)	X (Unnecessary)	O (Periods based on the condition which the driver does not involve in sub-tasks.)	O (sufficient periods that considers the driver's performance of sub-tasks)	O (periods that depends on the driver's conditions that can resume to driving operation) – see cell above "Consideration points on development of regulation" for differences in Lv 3 and Lv 4	X (Unnecessary)
System reliability (E-safety)	Reliability considering the driver override	Reliability considering the driver override	Reliability considering the transition periods to the driver	Reliability considering the transition periods to the driver performing sub-tasks	Reliability of the system's performance of safe driving	
Comprehensive recognition of surrounding environment (sensing, etc.)	Direction of travel only	The area to be monitored depends on the system function (Lateral and/or longitudinal directions)	The area to be monitored depends on the system function (Lateral and/or longitudinal directions)	Lateral and longitudinal directions	Lateral and longitudinal directions	
Recording of system status (inc. system behavior) (DSSA-Data Storage System for ACSF, EDR, etc.)	X (Unnecessary)	X (Unnecessary)	O (the driver's operations and the system status (inc. system behavior)) <u>The system operates under driver's responsibility and thus he is monitoring continuously the operating status and the driving environment. Thus a DSSA does not seem</u>	O (the driver's operations and the system status (inc. system behavior))	O (the system status (inc. system behavior))	

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			necessary for Lv 2.		
Security (E-security)	0 (Necessary if the information communication in connected vehicles, etc. affects the vehicle control)				
Summary of the current conditions and the issues to be discussed (specific use cases)					
Roads where entry is regulated except for motor vehicles (inc. a part of urban roads)	<ul style="list-style-type: none"> ○ Already put into practice ○ To be develop standardized (guideline etc) as necessary 	<ul style="list-style-type: none"> • Automated parking by the driver's remote control (monitoring) (RCP [Remote Control Parking], to be discussed by ACSF-IWG?) 	Partially outside of the scope of discussion at WP.1 (currently possible to be discussed at WP.29)	Partially outside of the scope of discussion at WP.1 (currently possible to be discussed at WP.29)	
Roads exclusively for motor vehicles (inc. a part of urban roads)	<ul style="list-style-type: none"> • LKA (draft standards) • ACC (no specific performance requirements) • ACSF Cat.B1 (Steering Function hands-on) • IPA (Intelligent Parking Assist) 	<ul style="list-style-type: none"> • ACC+ACSF (Cat.B1, Cat.C (Basic Lane Change Assist), Cat.D [Smart LCA]) • ACSF Cat. E • ACSF Cat.B2 (Continuous Lane Guidance hands-off) <u>CAT B2/E may potentially be seen as Lv 3 systems as well regarding their technical requirements (e.g. transition demand, DSSA, minimal risk maneuver, etc.).</u> 	<ul style="list-style-type: none"> (Under discussion) • Categories A-E under ACSF (amendment of R79) • Highway chauffeur 	To be discussed with the amendment of Conventions by WP.1 taken into account	To be discussed with the amendment of Conventions by WP.1 taken into account
Urban roads		<ul style="list-style-type: none"> • To be discussed as the second phase of ACSF 	To be discussed with the amendment of Conventions by WP.1 taken into account	To be discussed with the amendment of Conventions by WP.1 taken into account	

コメントの追加 [BB1]: Further clarification of road types seems necessary (e.g. Public Roads excluding use of pedestrians/bicycles)

コメントの追加 [BB2]: Same as above