Consolidated working draft text for the ADS GTR and UN Regulation

The following table provides current draft provisions in the first column, proposals for revision and comments for consideration in the middle column, and the right column for noting discussion and/or outcomes of the session.

Current Text		Proposals and comments	Session discussion and outcomes
1.	Purpose		
		Versions differ. GTR: This Global Technical Regulation (GTR) provides worldwide harmonised procedures to set and verify compliance with minimum requirements for the safety of Automated Driving Systems (ADS) and vehicles equipped with ADS. UNR: This Regulation establishes uniform provisions concerning the approval of motor vehicles with regard to Automated Driving Systems (ADS).	
2.	Scope		
		Versions differ. GTR: This GTR applies to the ADS of vehicles of categories 1 and 2. UNR: This Regulation applies to the ADS of vehicles of categories M and N.	
3.	Definitions		
3.1.	*"Abstraction"* means a process of selecting relevant aspects of a source		

	or referent system to be represented in a model or simulation.[1]		
3.2.	*"Automated Driving System (ADS)"* means the vehicle hardware and software that are collectively capable of performing the entire Dynamic Driving Task (DDT) on a sustained basis.[2]		
3.3.	*"ADS feature"* means an application of an ADS designed specifically for use within an Operational Design Domain (ODD).		
3.4	*"(ADS) function"* means an ADS hardware and software capability designed to perform a specific portion of the DDT.		
3.5.	*"ADS vehicle"* means a vehicle equipped with an ADS.		
3.6.	*"Behavioural competency"* means an expected and verifiable capability of an ADS feature to operate a vehicle within the ODD of the feature.		
3.7.	*"Closed-loop testing*" means testing in an environment in which actions of the ADS hardware, software, or other element(s) in the loop influence the actions of other objects in the simulation.[3]		

[1] Any modelling abstraction carries with it the assumption that it should not significantly affect the intended uses of the simulation tool.

[2] This definition is based on SAE J3016 and ISO/PAS 22736 (Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles). These standards define levels of driving automation based on the functionality of the driving automation system feature as determined by an allocation of roles in DDT and DDT fallback performance between that feature and the (human) user (if any). The term "Automated Driving System" is used specifically to describe a Level 3, 4, or 5 driving automation system.

[3] For example, evaluating ADS interactions with other objects that respond to the actions of the ADS within a traffic model.

3.8.	*"Open-loop testing*" means testing in an environment in which the actions of the ADS hardware, software, or other element(s) in the loop do not affect the actions of other objects in the simulation.[4]		
3.9.	*"Stochastic*" means a process involving or containing a random variable or variables pertaining to chance or probability.		
3.10.	*"Driver"* means a human user who performs in real time part or all of the DDT and/or DDT fallback for a particular vehicle.		
3.11.	*"Dynamic Driving Task (DDT)"* means the real-time operational and tactical functions required to operate the vehicle.		
3.11.1.	When the ADS is in operation, the DDT is always performed in its entirety by the ADS which means the whole of the tactical and operational functions necessary to operate the vehicle (i.e., the ADS performs "the entire DDT" as stated in the definition of an "Automated Driving System" under para. 3.2.). These functions can be grouped into three interdependent categories: sensing and perception, planning and decision, and control.		
3.11.2.	Sensing and perception include:		

[4] For example, evaluating ADS interaction with a recorded traffic situation.

	(a) Monitoring the driving environment via object and event detection, recognition, and classification.		
	(b) Perceiving other vehicles and road users, the roadway and its fixtures, objects in the vehicle's driving environment and relevant environmental conditions.		
	(c) Sensing the ODD boundaries, if any, of the ADS feature.		
	(d) Positional awareness.		
3.11.3.	Planning and decision include:		
	(a) Predicting actions of other road users.		
	(b) Response preparation.		
	(c) Manoeuvre planning.		
3.11.4.	Control includes:		
	(a) Object and event response execution.		
	(b) Lateral vehicle motion control.		
	(c) Longitudinal vehicle motion control.		
	(d) Enhancing conspicuity via lighting and signalling.		
3.11.5.	The DDT excludes strategic functions.		
3.12.	*"Strategic function"* means a capability to issue commands,		

	instructions, or guidance for execution by an ADS.[5]		
3.13.	*"Tactical function"* means a capability to perceive the vehicle environment and control real-time planning, decision, and execution of manoeuvres, including conspicuity of the vehicle and its motion.[6]		
3.14.	*"Operational function"* means a capability to control the real-time motion of the vehicle.[7]		
3.15.	*"Edge Case*" means a low-frequency occurrence that might arise within the ODD of an ADS and warrants specific design attention due to the potential severity of outcomes that might result from encountering such a situation or condition across a full-scale deployed fleet of such ADS vehicles.[8]		
3.16.	*"ADS fallback response"* means a system-initiated deactivation of the ADS or an ADS-controlled procedure to place the vehicle in a minimal risk condition.		
3.17.	*"Fallback user"* means a user designated to perform the DDT pursuant to an ADS fallback response.		

[5] Examples include setting the starting point, destination, route, and way points to be used by an ADS during a trip.

[6] Examples include deciding whether to overtake a vehicle or change lanes, signalling intended manoeuvres, deciding when to initiate the manoeuvre, choosing the proper speed, and executing the manoeuvre.

[7] Operational functions involve executing micro-changes in steering, braking, and accelerating to maintain lane position or proper vehicle separation and immediate responsive actions to avoid crashes in critical driving situations.

[8] Examples include a unique road sign or an unusual animal type in the roadway.

3.18.	*"Minimal Risk Condition (MRC)"* means a stable and stopped state of the vehicle that reduces the risk of a crash.		
3.19.	*"Model*" means a description or representation of a system, entity, phenomenon, or process.		
3.20.	*"Model calibration*" means a process of adjusting numerical or modelling parameters in a model to improve agreement with a referent.		
3.21.	*"Model parameter"* means a numerical value inferred from real-world data and used to characterise a system functionality.		
3.22.	"*Occurrence*" means a safety-relevant event involving an ADS vehicle.		
3.22.1.	"*Non-critical Occurrence*" means an operational interruption, defect, fault, or other circumstance that influenced or may have influenced ADS safety but did not result in a collision or serious incident.[9]		
3.22.2.	"Critical Occurrence" means an occurrence during which at least one of the following criteria is fulfilled:		
	(a) At least one person suffers an injury that requires medical attention or dies as a result of being in the vehicle or being involved in the event.		

[9] Examples include minor incidents, safety degradation not preventing normal operation, emergency/complex manoeuvres to prevent a collision, and more generally all occurrences relevant to the safety performance of the in-service ADS (like transfer of control, interaction with remote operator, etc.).

	(b) The ADS vehicle, other vehicles or stationary objects sustain physical damage that exceeds a certain threshold.		
	(c) any vehicle involved in the event experiences an airbag deployment.		
3.23.	"*Operational Design Domain (ODD)*" means the operating conditions under which an ADS feature is specifically designed to function.		
3.24.	"*ODD exit*" means:		
	(a) the presence of one or more ODD conditions outside the limits defined for use of the ADS feature, and/or		
	(b) the absence of one or more conditions required to fulfil the ODD conditions of the ADS feature.[10]		
3.25.	*"Other road user (ORU)"* means any entity making use of publicly accessible road infrastructure.		
3.26.	*"Priority vehicle"* means a vehicle subject to exemptions, authorizations, and/or right-of-way under traffic laws while performing a specified function.		
3.27.	*"Proving ground"* and "*Test track*" mean a facility closed to public		

[10] ODD conditions are distinct from ADS capabilities. An ADS may be designed to manage transient changes in the operating environment where such transient changes do not represent an ODD exit.

	traffic and designed to enable physical assessment of an ADS and/or ADS vehicle performance, e.g., via sensor stimulation and/or the use of dummy devices.		
3.28.	*"Real time"* means the actual time during which a process or event occurs.		
3.29.	*"Road-safety agent"* means a human being engaged in directing traffic, enforcing traffic laws, maintaining/constructing roadways, and/or responding to traffic incidents.		
3.30.	*"Safety case"* means a structured argument supported by a body of evidence that provides a compelling, comprehensible, and valid case that the ADS is or will be free from unreasonable risk for a given application in a given environment.		
3.31.	*"Safety concept"* means a description of the measures designed into the ADS so that it operates in such a way that it is free of unreasonable safety risks to the ADS vehicle user(s) and other road users in every operating condition relevant to the ODD.		
3.32.	*"Sensor Stimulation*" means a technique whereby artificially generated signals are provided to trigger the element under testing in order to produce the result required for evaluation of the element.		

3.33.	*"Simulation"* means the imitation of the operation of a real-world process or system over time.		
3.34.	*"Simulation toolchain*" means a combination of simulation tools that are used to support the validation of an ADS.		
3.35.	*"Test case specification*" means the detailed specifications of what must be done by the tester to prepare for the test.		
3.36.	*"Test method*" means a structured approach to consistently derive knowledge about the ADS by means of executing tests.[11]		
3.37.	*"Traffic scenario"* means a description of a sequence of driving situations that may occur during a given trip.[12]		
3.37.1.	*"Nominal scenario"* means a traffic scenario representing usual and/or expected objects, object behaviours and/or road conditions.		
3.37.2.	*"Critical scenario"* means a traffic scenario representing unusual and/or unexpected objects, object behaviours, and/or road conditions.		

[11] For example, virtual testing in simulated environments, physical, structured testing in controlled test-facility environments, and real-world on-road conditions.

[12] Scenarios include a driving manoeuvre or sequence of driving manoeuvres. Scenarios can also involve a wide range of elements, such as some or all portions of the DDT, different roadway layouts, different types of road users and objects exhibiting static or diverse dynamic behaviours, and diverse environmental conditions (among many other factors).

3.37.3.	*"Failure scenario"* means a traffic scenario representing a system failure that compromises the capability of the ADS to perform the entire DDT.		
3.37.4.	*"Functional scenario*" means a basic traffic scenario describing a situation and its corresponding elements at the highest level of abstraction in natural, non-technical language.[13]		
3.37.5.	*"Abstract scenario"* means a formalized, declarative description of a scenario derived from a functional scenario.[14] The specification on the abstract level enables highlighting of the relevant aspects of the scenario while focusing on efficient description of relations (cause-effect).		
3.37.6.	*"Logical scenario"* means a traffic scenario elaborated at a lower level of abstraction to include value ranges or probability distributions for each element of the corresponding functional scenario.[15]		
3.37.7.	*"Concrete scenario*" means a traffic scenario at a level of abstraction in which specific values have been selected for each element from the		

[13] For example, a description of the ego vehicle's actions, the interactions of the ego vehicle with other road users and objects, and other elements that compose the scenario such as environmental conditions.

[14] Declarative descriptions can include structured natural language, programming language or other forms of languages that meet the required criteria (formalized and declarative).

[15] For example, elaborating the lane element to cover possible lane widths.

	continuous ranges as may be defined in the corresponding logical scenario.		
3.37.8.	*"Complex scenario*" means a traffic scenario containing one or more situations that involve a large number of other road users, unlikely road infrastructure, or abnormal geographic/environmental conditions.		
3.38.	*System-initiated deactivation of the ADS* means a procedure by which the ADS initiates the transfer of performance of the DDT from the ADS to a vehicle user.		
3.39.	*User-initiated deactivation of the ADS* means a procedure by which the user initiates the transfer of performance of the DDT from the ADS to a vehicle user.		
3.40.	*"(ADS) User"* means a human user of an ADS vehicle.		
3.41.	*"Useful life (of an ADS vehicle)"* means the duration during which an ADS vehicle is in an operational state under which it may be driven on public roads regardless of the operational state of the ADS.		
3.42.	*"Validation of the simulation model*" means the process of determining the degree to which a simulation model is an accurate representation of the real world from the perspective of the intended uses of the tool.		
3.43.	*"Verification of the simulation model*" means the process of		

	determining the extent to which a simulation model or a virtual testing tool is compliant with its requirements and specifications as detailed in its conceptual models, mathematical models, or other constructs.		
3.44.	*"Virtual testing*" means the process of testing a system using one or more simulation models.		
3.45.	*"Driver-In-the-Loop*" *(DIL*) means a driving simulator with components to enable the driver to operate in and communicate with the virtual environment and used to assess the human-automation interaction design.		
3.46.	"*Hardware-In-the-Loop*" (HIL) means the hardware of a specific vehicle subsystem running the software with input and output connected to a simulation environment to replicate sensors, actuators, and/or mechanical components in a way that connects all the I/O of the Electronic Control Units (ECU) before the final system is integrated.		
3.47.	*"Model-In-the-Loop*" (MIL) means high-level-of-abstraction software frameworks running on general-purpose computing systems to enable quick algorithmic development without involving dedicated hardware.		

3.48.	*"Software-In-the-Loop*" (SIL) means a methodology where executable code such as algorithms, an entire controller strategy, or a complete software implementation is assessed within a modelling environment on general-purpose computing systems.		
3.49.	*"Vehicle -In-the-Loop*" (VIL) means a fusion of real-world and virtual environments to assess the dynamics of a physical ADS vehicle on a vehicle test bed or a test track at the same level as real-world testing.		