**DSSAD GUIDANCE DOCUMENT**

**1. Introduction:**

*DSSAD refers to a capability of a vehicle to monitor the performance of its Automated Driving System (ADS). This document provides recommendations to enable evaluations of ADS performance.*

*This document has been prepared to support WP.29 deliberations under the 1958, 1997, and 1998 Agreements.*

**2. Terms and Definitions:**

This section defines terms used in this document. Use of these terms and their definitions is recommended in the development of legal requirements related to ADS and ADS vehicles.

*Source: WP.29 GRVA Guidelines and recommendations for Automated Driving System safety requirements, assessments, and test methods to inform regulatory development.*

2.1 ***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.[[1]](#footnote-1)

2.2 ***(ADS) Function*** means an ADS hardware and software capability designed to perform a specific portion of the DDT.

2.3 (formerly 3.19) ***ADS feature*** means an ADS designed specifically for use within an Operational Design Domain (ODD).

2.4 ***ADS vehicle*** means a vehicle equipped with an ADS.

2.5 ***Driver*** means a human user who performs in real time part or all of the DDT and/or DDT fallback for a particular vehicle.

2.6 ***Dynamic Driving Task (DDT)*** means the real-time operational and tactical functions required to operate the vehicle.

2.6.1. 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 paragraph 2.1.). These functions can be grouped into three interdependent categories: sensing and perception, planning and decision, and control.

2.6.1.1. Sensing and perception include:

* Monitoring the driving environment via object and event detection, recognition, and classification.
* Perceiving other vehicles and road users, the roadway and its fixtures, objects in the vehicle’s driving environment and relevant environmental conditions.
* Sensing the ODD boundaries, if any, of the ADS feature.
* Positional awareness.

2.6.1.2 Planning and decision include:

* Predicting actions of other road users.
* Response preparation.
* Maneuver planning.

2.6.1.3 Control includes: ·

* Object and event response execution
* Lateral vehicle motion control
* Longitudinal vehicle motion control.
* Enhancing conspicuity via lighting and signaling.

2.7 ***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.

2.8 ***Fallback user*** means a user designated to perform the DDT pursuant to an ADS fallback response.

2.9 ***Minimal Risk Condition (MRC)*** means a stable and stopped state of the vehicle that reduces the risk of a crash.

2.10 ***Operational Design Domain (ODD)*** means the operating conditions under which an ADS feature is specifically designed to function.

2.11 ***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.

2.12 ***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.

2.13 ***(ADS) User*** means a human user of an ADS vehicle.

2.14 ***Failure*** means the termination of an intended behaviour of an element (system, component, software) or an item (system or combination of systems that implement a function of a vehicle)

2.15 ***(DSSAD) Triggering Event*** means a time stamped data element which triggers the recording and storing of time series data elements

2.16 ***Detected objects*** shall mean objects detected by the perception system of the vehicle and classified by the ADS as relevant for the purpose of performing a dynamic driving task. Objects with a negative relative velocity shall be deemed relevant.

2.17 ***Time-to-Collision (TTC) trigger*** means longitudinal and lateral calculation of the Time-to-Collision (TTC), which is the relative Euclidean distance divided by the relative Euclidean velocity between the vehicle and the detected object, calculated based on the fused sensor data.

2.18 ***Operational Design Domain (ODD) warning*** means a condition defined by the manufacturer where all some or one of the measured ODD parameters of the vehicle coincide with the ODD related limits defined in the specifications of the ADS.

2.XX **Electronic Communication Interface** means a standardised interface that can be connected to using tools and/or systems to access DSSAD data.

3. **Data Storage and Security**

3.1 The data storage system should be sufficient to record and store the DSSAD time stamped data elements and time series data elements listed in Paragraph 6.

3.2 The DSSAD shall be protected against both unauthorized access and manipulation.

3.3 In the case of the data intended to be stored off-board the vehicle cannot be transmitted, it should remain stored on the vehicle.

**4. Data Format:**

4.1 Each data element listed in Paragraph 6 should be available in a standardized and readable format.

4.2 Time stamp data format

4.2.1. Time stamp data should be recorded in a clearly identifiable way with following data:

4.2.1.1. The time stamped data element, as listed in paragraph 6.2.1.

4.2.1.2. The additional information noted in 6.2 for each time stamped data element as appropriate.

4.2.1.3. Date (Resolution: yyyy/mm/dd);

4.2.1.4. Timestamp

4.2.1.4.1 Resolution: hh/mm/ss timezone e.g. 12:59:59 UTC;

4.2.1.4.2 Accuracy: +/- 1.0 s.

4.2.1.5. Location:(GNSS) longitude + latitude + altitude; shall be recorded in decimal degrees and to at least [5] decimal places, but shall be unrounded.]

4.2.2. A single timestamp may be allowed for multiple elements recorded simultaneously within the time resolution of the specific data elements. If more than one element is recorded with the same timestamp, the information from the individual elements shall indicate the chronological order.]

[4.3 (Japan Proposal) Time series data format

4.3.1. Time series data should be recorded over a specified period at certain sampling rate with an appropriate resolution.

4.3.2. The sampling rate and resolution should be selected considering ADS design and feasible data size. (Remarks: further study is needed.).]

OR

4.3 (UK Proposal) Data elements

4.3.1. The data elements as listed in paragraph 6.3. shall be recorded when a time stamp data element occurs that is identified as a triggering event in paragraph 6.3.

OR

4.3 (Canada Proposal) Data elements

4.3.2 The data elements as listed in paragraph 6.3 shall be recorded when a triggering event occurs as defined in paragraph 6.3.

**5. Data Accessibility**

5.1 All of the stored data defined in Section 6 of this guidance document should be readily accessible to entities as defined under national law.

5.2 The manufacturer should ensure the data is promptly available in a format that is standardized and readable as outlined in item 4.1.

OR

5.2 The manufacturer should ensure the data is promptly available in a format that is standardized and readable as outlined in item 4.1. Information on how to interpret the data must be freely available, and interpretation shall not require any proprietary tools or systems.

5.3 The DSSAD data (whether stored on or off-board the vehicle) should be available and retrievable through an electronic communication interface. [[2]](#footnote-2)

OR

5.3 The DSSAD data (whether stored on or off-board the vehicle) should be available and retrievable through an electronic communication interface that complies with a publicly available interface standard. It is recommended to use a standard that has been published by an international Standards Development Organisation.

5.4 The manufacturer should ensure there is a method to access the data and provide an information package about its usage to authorized entities. The method of accessing data via this interface shall be documented by the manufacturer and provided upon the request of the regulatory authority including any tools or software which are required for access.

OR

5.4 The manufacturer should ensure there is a method to access the data via the electronic communication interface, and provide an information package about its usage to authorized entities. The method of accessing data via this interface shall be documented by the manufacturer and provided upon the request of the regulatory authority including any tools or software which are required for access. The regulatory authority shall not require any proprietary tools or systems to access the data.

5.5 The stored data should be retrievable even when the main onboard vehicle power supply is not available.

5.6 The stored data elements should be retrievable even after an impact of a severity level set by relevant regulations.

5.6.1. Alternatively, only for heavy-duty vehicles, the stored data should be deemed retrievable if the DSSAD withstand mechanical shocks in the component test at a severity level specified in relevant regulations (e.g. Annex 9C of the 03 series of amendment to UN R100), and be mounted cab/passenger compartment or in a position of sufficient structural integrity to protect against physical damage that would prevent the retrieval of data at least in front and side impacts of a severity corresponding to the mechanical shock aforementioned.

**6. Data Elements:**

6.1 The DSSAD should record and store the data elements listed below.

6.2 Data elements of time-stamp data

6.2.1. The following table details the data elements of time-stamp data to be recorded, along with any additional information and recording condition.

OR

6.2.1. The following table details the data elements of time-series data to be recorded during a triggering event, along with the data sample rate and resolution.

|  |  |  |
| --- | --- | --- |
| **Event** | **Additional Information** | **Recording condition** |
| Activation of the feature | ADS feature is engaged/begins the DDT due to system, driver, or user input |  |
| Deactivation of the feature | Deactivation due to system, driver, or user input | Whilst the system is active |
| ADS fallback to user, if applicable | Transition of control initiated due to events such as the following:   1. Planned event 2. Unplanned event 3. Detection that fallback user is not ready nor receptive 4. Detection that fallback user not present 5. System failure | Whilst the system is active |
| Start of ADS fallback to an MRC | MRC necessary because   1. exit of ODD 2. ADS failure 3. collision detected 4. Absence of a fallback-ready user or failure in the transition of control to the user, if applicable | Whilst the system is active |
| User input to the driving controls, if applicable | Application of brake pedal or acceleration control or steering | Whilst the system is active |
| Prevention of user takeover, if applicable | Prevention of user takeover (if applicable) due to:   * Unintentional driver input, * The current situation being unsuitable, * The current situation being unsafe, or * The driver not being suitably engaged. | Whilst the system is active |
| Start of Emergency Manoeuvre | An “emergency manoeuvre” is a manoeuvre performed by the system in case of an event in which the vehicle is at imminent collision risk and has the purpose of avoiding or mitigating a collision.  “Imminent collision risk” describes a situation or an event which leads to a collision of the vehicle with another road user or an obstacle which cannot be avoided by a braking demand with lower than 5 m/s2. | Whilst the system is active |
| End of Emergency Manoeuvre | Same as above. | Whilst the system is active |
| Event Data Recorder (EDR) trigger input |  | Whilst the system is active |
| Detected collision |  | Whilst the system is active |
| [Failure to achieve an originally-intended MRC] |  | Whilst the system is active |
| Detected severe failure | The failure could include the following:   1. ADS / Sensor 2. Other vehicle systems (mechanical, electrical, etc.)   A failure would be severe if it is one that prevents the ADS from performing the DDT.[[3]](#footnote-3) | Whilst the system is active |
| [Interaction with remote operator, if applicable][[4]](#footnote-4) |  | Whilst the system is active |
| [Communication with remote operator, if applicable][[5]](#footnote-5) |  | Whilst the system is active |
| [Proximity conflict] |  |  |

6.3 Time series data elements

6.3.1. The following table details the data elements of time-series data to be recorded during a triggering event, along with the data sample rate and resolution.

OR

6.3.1 The following data elements of time-series data shall be recorded in cases referred to in paragraph 6.3.2 with the specified data sample rate and recording interval.

OR

6.3.1. The time series data element should be recorded as referred to paragraph 6.3.2.

6.3.2. The data elements shall be recorded in compliance with paragraph 6.3.1 if the following thresholds are reached or conditions occur:

a) TTC trigger threshold of [0.2s]

1. EDR trigger input
2. [ODD warning]

6.3.3. All relevant detected objects referred to in paragraph 6.3.2. shall be recorded. However, if the number of detected objects is higher than eight (8), at least eight (8) objects most relevant for the event shall be recorded. [Objects classified as road traffic participants, such as vehicles or pedestrians, shall be considered as most relevant]

6.3.4. In case sensor data referred to in paragraph 6.3.1. are recorded, the manufacturer shall demonstrate that the sensor data, possibly together with additional information made available to the competent authority, shall provide information about the ADS performance equivalent to the information derived from the recording of the detected objects.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Data element** | **Condition for requirement** | **Resolution** | **Minimum Range** | **Recording interval/time (relative to time stamp)** | **Data sample rate (samples per second)** | **Accuracy** | **Trigger [Event(s) recorded for]** | **Restriction applicable to recording** |
| Camera footage[[6]](#footnote-6) | Mandatory if available [if not included in sensor or object classification data]  OR  [ ] Mandatory  [ ] If Fitted |  |  |  |  |  |  |  |
| Detected object distance, longitudinal |  |  |  |  |  |  |  |  |
| Detected object distance, lateral |  |  |  |  |  |  |  |  |
| Detected object relative velocity, longitudinal |  |  |  |  |  |  |  |  |
| Detected object relative velocity, lateral |  |  |  |  |  |  |  |  |
| Detected object classification | Mandatory if available |  |  | -[x] to 0 sec | [TBC] |  | ~~[Detected collision EDR trigger input]~~ |  |
| Detected lane | Mandatory if available |  |  |  |  |  |  |  |
| Sensor data[[7]](#footnote-7) | Mandatory if ‘Detected object elements’ are not available |  |  | -[x] to 0 sec | [TBC] |  | ~~[Detected collision EDR trigger input]~~ |  |
| Geolocation, vertical |  |  |  |  |  |  |  |  |
| Geolocation, horizontal |  | Latitude: +-DD.DDDDD° (5 decimal places), and Longitude: +-DDD.DDDDD° (5 decimal places) in WGS84 |  |  |  |  |  |  |
| [Vehicle heading] |  |  |  |  |  |  |  |  |
| ADS-requested gear |  |  |  |  |  |  |  |  |
| ADS-requested accel demand | Mandatory |  |  | -[x] to 0 sec | [TBC] |  | ~~[Detected collision EDR trigger input]~~ |  |
| ADS-requested service braking demand | Mandatory |  |  | -[x] to 0 sec | [TBC] |  | ~~[Detected collision EDR trigger input]~~ |  |
| ADS-requested parking brake demand | Mandatory |  |  | -[x] to 0 sec | [TBC] |  | ~~[Detected collision EDR trigger input]~~ |  |
| ADS-requested steering demand | Mandatory |  |  | -[x] to 0 sec | [TBC] |  | ~~[Detected collision EDR trigger input]~~ |  |
| [ADS-requested direction indicator demand] |  |  |  |  |  |  |  |  |
| ADS-requested hazard warning signal |  |  |  |  |  |  |  |  |
| ADS-requested exterior lighting |  |  |  |  |  |  |  |  |
| ADS-requested audible warning signal |  |  |  |  |  |  |  |  |
| Vehicle-indicated direction indicator status |  |  |  |  |  |  |  |  |
| Vehicle-indicated hazard warning signal status |  |  |  |  |  |  |  |  |
| Vehicle-indicated exterior lighting status |  |  |  |  |  |  |  |  |
| Vehicle-indicated audible warning system status |  |  |  |  |  |  |  |  |
| Vehicle acceleration, longitudinal | Mandatory |  |  | -[x] to 0 sec | [TBC] |  | ~~[Detected collision EDR trigger input]~~ |  |
| Vehicle acceleration, lateral | Mandatory |  |  | -[x] to 0 sec | [TBC] |  | ~~[Detected collision EDR trigger input]~~ |  |
| Vehicle acceleration, vertical |  |  |  |  |  |  |  |  |
| [Yaw rate] | Mandatory |  |  | -[x] to 0 sec | [TBC] |  | [Detected collision EDR trigger input] |  |
| ADS-determined vehicle speed | Mandatory |  |  | -[x] to 0 sec | [TBC] |  | ~~[Detected collision EDR trigger input]~~ |  |
| Vehicle indicated gear position |  |  |  |  |  |  |  |  |

1. 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. [↑](#footnote-ref-1)
2. Contracting parties may further define technical specifications for data accessibility under national law. [↑](#footnote-ref-2)
3. In accordance with the provisions of 5.2 IWG ADS guidance document. [↑](#footnote-ref-3)
4. These items will be offered for future consideration based on technological advancements or conclusions reached by GRVA and its subsidiary bodies. [↑](#footnote-ref-4)
5. Same as footnote above. [↑](#footnote-ref-5)
6. This requirement shall be without prejudice to national and regional legislation on privacy and protection of personal data. [↑](#footnote-ref-6)
7. e.g. camera, radar, LiDAR, used by the ADS for decision making. This shall be documented in the information package provided to the Authorised Entity. This shall include a “Visual Representation“ submitted to the Authorised Entity at the time of providing the DSSAD Data and shall comply with the requirements of 4.1 and 5.4. [↑](#footnote-ref-7)