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March 6, 2020

Mr. James Owens, Esq.
Acting Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue S.E.
West Building Ground Floor, Room W12-140
Washington, DC 20590-0001

RE: Docket No. NHTSA-2019-0102: Advanced Driver Assistance Systems Draft Research Test Procedures

Dear Acting Administrator Owens:

NHTSA draft test procedures, Federal Motor Vehicle Safety Standards (FMVSS), and the New Car Assessment Program (NCAP) are safety beacons and highly regarded in automotive safety. On behalf of Hyundai Motor Group ("Hyundai"), Hyundai-Kia America Technical Center, Inc. appreciates the opportunity to comment on the National Highway Traffic Safety Administration's (NHTSA) November 21, 2019, Request for Comments on Advanced Driver Assistance Systems Draft Research Test Procedures. Our comments are provided in the enclosure.

Hyundai supports NHTSA's efforts to research crash scenarios and develop test procedures to advance real-world automobile safety. In consideration of the topic areas and questions posed by NHTSA in their notice, Hyundai's comments address repeatability, leveling the playing field, and innovation flexibility, while keeping safety as the top priority. Moreover, collaborating on a "roadmap" for future advance driver assistance systems (ADAS) research plans would ensure the industry safety community is working with NHTSA and would promote judicious stakeholder engagement.

In addition to the comments herein, Hyundai supports those submitted to this docket by the Alliance for Automotive Innovation. Hyundai appreciates the consideration of our feedback and looks forward to working with NHTSA as the agency charts a path forward for ADAS.

For questions related to these comments, please contact Edward Thai (1-734-337-2500).

Sincerely,

Deborah Bakker, Director
Regulation & Certification Department

Enclosure

Comments of
Hyundai Motor Group
on the
Advanced Driver Assistance Systems Request for Comments

Docket ID Number: NHTSA-2019-0102
November 21, 2019

I. Introduction

The NHTSA Request for Comments notice seeks feedback on ten draft research confirmation test procedures: Active Park Assist System, Blind Spot Detection System, Intersection Safety Assist System, Blind Spot Intervention System, Opposing Traffic Safety Assist System, Pedestrian Automatic Emergency Brake System, Rear Automatic Braking Feature, Traffic Jam Assist System, Heavy-Vehicle Forward Collision Warning, and Heavy-Vehicle Automatic Emergency Braking Systems. Hyundai has prepared comments to address the eight ADAS for light vehicles with a gross vehicle weight rating of up to 10,000 lbs. (4,536 kg).

II. Stakeholder Workshops

Hyundai urges NHTSA to hold one or more workshop(s) regarding the test procedures identified in the notice. Hyundai believes workshops such as the event on July 13-14, 2016 at the Vehicle Research and Testing Center (VRTC) to scan the 3D surrogate vehicle with the industry's sensor-equipped research vehicles can be mutually beneficial. The goal of the event was to provide timely and data-based feedback to the test target developers on the creation of a target that represents a real-world vehicle, regardless of the vehicle sensor(s) used. The event was a valuable forum to quickly integrate potential design improvements for the test targets. Each industry participant was provided an opportunity to test prototype vehicles' sensors and this data allowed the target developer to compare the surrogate to a real vehicle. This approach could be extended to other areas of safety, such as new test procedures, to provide industry time to review and gain hands-on experience with the new equipment, setup, and test execution while also providing NHTSA with performance data. Hyundai encourages more workshops of this nature to improve safety, transparency, development speed, and collaboration.

III. Driver Neutral Terms to Allow Innovation

Over decades of research, safety stakeholders have developed a library of standard test procedures to encompass lessons learned from crashes in the field. When developing these test procedures, most did not imagine a future where the human would not be the driver. As such, current FMVSS refer to humans as the driver and unintentionally raised regulatory barriers to highly automated vehicle (HAV) commercial deployments.

As the industry continues to develop level 4+ HAVs, HAVs may need to pass the same test procedures required for vehicles operated by human drivers, even though automated driving

systems and humans may not drive in the same manner, to demonstrate their competencies in real-world driving scenarios.

Over the last several years, NHTSA and safety stakeholders have been developing technical translations to modernize human-centric Federal Motor Vehicle Safety Standards (FMVSS) to create a regulatory path for HAV deployment. Hyundai encourages applying the lessons from the FMVSS technical translations project to the ADAS draft research tests to minimize future revision of the tests for possible HAV testing. Please see the following recommendations for more "innovation-friendly" test procedures:

1: Use driver-neutral language so a HAV can also meet the NHTSA test requirements and, to the extent possible, align with the language planned for the upcoming "Removing Regulatory Barriers for Automated Driving Systems" NPRM from the "February 2020 Significant Rulemaking Report"[1].

For example, Blind Spot Detection test in Section *5.3.1.2 1.A* can be driver-neutral and modernized while maintaining the safety intent as follows:

Current text: "The SV driver shall *manually* apply force to the brake *pedal*, bring the vehicle to a stop, and place the *transmission* in park."

Proposed text: "The SV brakes shall be applied, bringing the vehicle to a stop, and the vehicle shall be placed in park, if applicable."

This proposal addresses two potential issues: (1) Removes references to a human driver by deleting "manually" and "pedal" while maintaining the braking intent and (2) adds technology-neutral language for parking to be more innovation-friendly while conveying the intent to place the vehicle into a parked state.

2: Where driver-neutral language is not possible, add a parallel optional path to allow a HAV to execute the test procedure.

This proposal would keep the current test procedure text unchanged for human-driven vehicles and create a compliance path for HAVs.

IV. Vehicle Mileage

Vehicles may be subject to harsh environmental conditions during normal operation including degradation from sunlight, heat, cold, road vibration, road debris, etc. As such, vehicles may vary in

[1] https://www.transportation.gov/regulations/february-2020-significant-rulemaking-report-1

performance if, for example, comparing a vehicle with less than 5000 miles to a vehicle with 50,000 miles. For research purposes and to ensure repeatability, Hyundai recommends the use of vehicles with mileage between 200-5000 miles. Minimizing the vehicle mileage can reduce the risk of unintended damage from "everyday" driving. For the performance comparison purposes, evaluating vehicles with 200-5000 miles will minimize test variation.

V. **Road Surface Friction**

Road friction greatly contributes to a vehicle's braking performance and can vary considerably across labs or on the same premises (e.g. indoor versus outdoor testing). To help ensure test repeatability and integrity of data collection, Hyundai suggests NHTSA include a friction coefficient parameter such as in 4.1 Road Test Surface of "Opposing Traffic Safety Assist System Confirmation Test"[2] that states:

> *The road test surface must produce a peak friction coefficient (PFC) of at least 0.9 when measured using an American Society for Testing and Materials (ASTM) E1136 standard reference test tire, in accordance with ASTM Method E 1337-90, at a speed of 64.4 km/h (40 mph), without water delivery [1]. The test track PFC shall be documented.*

Figure 1 shows that varying the coefficient of friction from 0.9-0.7 can affect the stopping distance.

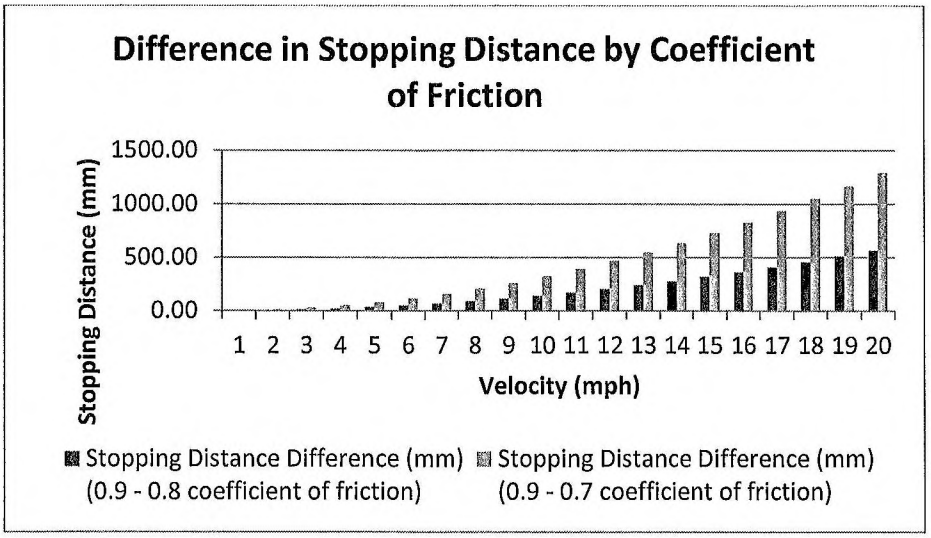

Figure 1. Applying $d = v2 / 2\mu g$, where d = stopping distance, v = velocity, μ = coefficient of friction, & g = gravity to find differences in stopping distance with varying coefficients of friction

[2] National Highway Traffic Safety Administration (2019, September). Opposing traffic safety assist system confirmation test (working draft). Washington, DC: National Highway Traffic Safety Administration.

Hyundai recommends adding a road friction parameter to the following tests:

- Active Park Assist System Confirmation Test
- Pedestrian Automatic Emergency Brake System Confirmation Test
- Rear Automatic Braking Feature Confirmation Test

VI. Brake Burnishing

Hyundai recommends adding the brake burnishing protocol defined in S14.1.2 and S14.1.3 of FMVSS No. 135, Light Vehicle Brake Systems (and in TP-135-01), to the following tests to achieve full brake system capability, ensure consistent performance, and increase repeatability:

- Active Park Assist System Confirmation Test
- Blind Spot Intervention System Confirmation Test
- Opposing Traffic Safety Assist System Confirmation Test
- Rear Automatic Braking Feature Confirmation Test

VII. Fuel Level Clarification

Many of the proposed test procedures state the fuel tank shall be full, but the meaning of "full" is undefined. To increase test repeatability, Hyundai suggests a parameter, such as 85%, of tank capacity be specified for all light vehicle test procedures.

VIII. Loaded Vehicle Weight

In Section 2.5 of the Rear Automatic Braking feature Confirmation test procedure, "...up to five 45 kg weights were placed on the seat pans of the available seating positions and five 23 kg weights were placed on the floorboards of the corresponding seating positions." Hyundai believes the weight requirement in the test procedure is not representative of real-world driving. Furthermore, the current New Car Assessment Program's Forward Collision Warning Test Procedure[1], Section 8.3.D, requires one driver in the subject vehicle and test equipment, if possible, on the passenger side of the vehicle. Hyundai recommends adding the weight of one Hybrid III Anthropomorphic Test Device 50th percentile male multiplied by the average occupancy by vehicle type, as shown in Figure 2.

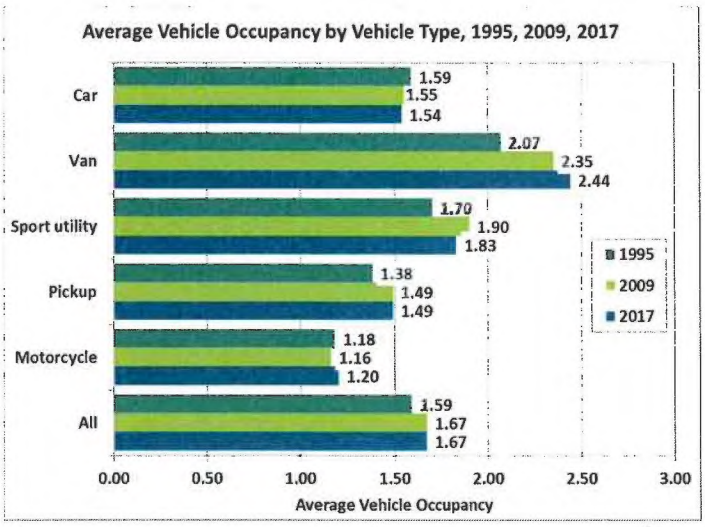

Figure 2: Average occupancy by vehicle type sampling since 1995.[3]

Average Vehicle Occupancy by Vehicle Type, 1995 National Household Travel Survey, 2009, & 2017 by Federal Highway Administration

Vehicle Type	1995	2009	2017	Suggested Occupancy Weight (lbs.)
All	1.59	1.67	1.67	1.67 * 172.3 = 288
Motorcycle	1.18	1.16	1.20	1.20 * 172.3 = 207
Pickup	1.38	1.49	1.49	1.49 * 172.3 = 257
Sport utility	1.70	1.90	1.83	1.83 * 172.3 = 315
Van	2.07	2.35	2.44	2.44 * 172.3 = 420
Car	1.59	1.55	1.54	1.54 * 172.3 = 265

Table 1: Suggested occupancy weights to load vehicle for testing.
Note: Average vehicle occupancy is mileage-weighted. Hybrid III 50th percentile male was used for average weight.

Hyundai recommends adopting field-representative weight loading by vehicle type for all light vehicle tests to represent real-world use.

[3] U.S. Department of Transportation, Federal Highway Administration, National Household Travel Survey website, accessed June 6, 2018. https://nhts.ornl.gov