



March 6, 2020

James Owens, Acting Administrator
National Highway Traffic Safety Administration
US Department of Transportation
1200 New Jersey Avenue, S.E., West Building
Washington, DC 20590-0001

Subject: Advanced Driver Assistance Systems Draft Research Test Procedures Request of comments (RFC), Docket No. NHTSA-2019-0102, November 21, 2019, 84 FR 64405

Dear Acting Administrator Owens,

Hyundai MOBIS, a Tier 1 automotive supplier, affiliated with Hyundai Motor Group, appreciates the opportunity to provide input on the National Highway Traffic Safety Administration's (NHTSA's) Notice of Request for Comments for Advanced Driver Assistance Systems (ADAS) Draft Research Test Procedures. In North America, Hyundai MOBIS Technical Center develops autonomous and advanced driver assistance systems technology. Hyundai MOBIS is currently developing Active Parking Assist (APA), Pedestrian Automatic Emergency Braking (PAEB), Traffic Jam Assist (TJA), Intersection Safety Assist (ISA) and other ADAS for improving safety.

Our attached comments, which were developed in an effort to provide NHTSA with technical information and data pertinent to this RFC, were prepared with the support of our ADAS system engineering team and APS control engineering team which have extensive experience and expertise with ADAS. Hyundai MOBIS has extensive experience and knowledge of current research and best practices for ADAS.

Hyundai MOBIS appreciates NHTSA's consideration of our comments. For related questions, please contact Joseph Dadoush, via email jdadoush@mobis-usa.com, or phone 248-819-2986.

Respectfully submitted,

A handwritten signature in black ink that reads "Hoil Jeong".

Hoil Jeong

President
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Hyundai MOBIS Comments on
NHTSA's Nov. 21, 2019 Request for Comment Regarding
Advanced Driver Assistance Systems Draft Research Test Procedures
Docket No. NHTSA-2019-0102

Hyundai MOBIS' comments address the following test procedures:

- **Pedestrian Automatic Emergency Braking (PAEB)**
- **Active Parking Assist (APA)**
- **Traffic Jam Assist (TJA)**
- **Intersection Safety Assist (ISA)**

Pedestrian Automatic Emergency Braking (PAEB)

Question 2: *Do any of the draft research test procedures contain elements that may potentially confound the system operation and/or test results (e.g., regarding test conduct)? If so, please indicate what those elements are and how they might be addressed and/or mitigated?*

Hyundai MOBIS RESPONSE:

It is difficult to determine whether road markers are a potentially confounding element of system operation and/or test results. Radar is sensitive to material and size (such as the composition or dimensions of road markers), it is possible that such factors can affect performance and test results. Thus, we urge NHTSA to consider addressing the road line criteria (such as dimensions, color, material composition) that would satisfy standardized test conditions. We encourage NHTSA to specify using painted road lines that meet conditions specified in upcoming new standards for evaluating PAEB, rather than using a road marker as this will allow for clear performance test results.

Additionally, we note that in Euro NCAP Test Protocol – AEB VRU systems Version 3.0.2, Section 6.3.2, there is a specific condition that “Test areas where the vehicle under test (VUT) needs to pass under overhead signs, bridges, gantries or other significant structures are not permitted.” Furthermore, in Sections 6.1.2, 6.1.3, for the entire test, 3m of free surroundings is to be ensured on both sides of the test path of the VUT. We encourage NHTSA to consider including similar specifications in its PAEB test procedures.

Question 4: *Are the ranges of test speeds, speed combinations, and/or speed increments specified within each draft research test procedure reasonable? If not, please provide any data or evidence to support and claim of unreasonableness from a research perspective.*



Hyundai MOBIS RESPONSE:

Where avoiding a collision is the 'Pass' of test, the test speed 40 kph or 25 mph, is an exceedingly high measurement. Considering actual sensor performance, we recommend 'Collision mitigation' corresponds to decreasing the likelihood of a fatality, not necessarily preventing a collision from occurring. We recommend 'Collision avoidance' corresponds with fully preventing a collision. Preventing collisions is impractical. We propose NHTSA specify 'Collision Mitigation'. Furthermore, the 40 kph test speed is considered a severe condition to be satisfied as collision avoidance for S1d Crossing scenarios with obstacles which are parked vehicles. Accordingly, in the 40 kph test case, the speed reduction we suggest is 20 kph.

Question 5: *To reduce test burden for the assessment of some technologies for research purposes, the number of repeated trials per test condition is proposed to be less than or equal to seven based on our experience from past test procedure design work. Is this adequate, or should another number of repeated trials be performed for all technology/condition combinations to support an assessment of whether differences in the test results, for a given condition, are statistically significant?*

Hyundai MOBIS RESPONSE:

We believe seven trials per test condition are adequate. We note that in NCAP testing used by other countries, the system score reflects the level of performance. We recommend NHTSA consider an alternate evaluation procedure which may provide a score reflecting performance, allowing for assessed improvement which pass/fail does not provide. Furthermore, based on NHTSA's evaluation procedure of pass or fail, we encourage NHTSA to use five out of seven valid test trails as the performance requirement for evaluating test conditions. Five out of seven valid test trials allows for assessment of where a failed test has occurred, in order to improve performance.

Active Parking Assist (APA)

Question 1: *Can the test procedures be expected to assess adequately for the purposes of research, within practical limitations, the performance of the underlying ADAS technologies? If not, please provide specific reasons why, and suggestions for how they may be improved.*

Hyundai MOBIS RESPONSE:

The test procedure does not take into account a graded road (hill). We believe this is needed to assess safety during testing. We encourage NHTSA to consider adding a graded road test to the validation plan to increase robustness. We note APA may not be supported for use on highly sloped roads and we recommend NHTSA further study APA for this condition.



Question 4: *Are the ranges of test speeds, speed combinations, and/or speed increments specified within each draft research test procedure reasonable? If not, please provide any data or evidence to support any claim of unreasonableness from a research perspective.*

Hyundai MOBIS RESPONSE:

NHTSA's indicated parking times are 45 seconds for systems that automatically perform the parking maneuver using only automated input and 60 seconds for systems that perform the parking maneuver using automated steering, in conjunction with manual inputs (S5.4.3 stage 3 – automatic parking execution). In the draft APA test procedure, parking time for the system to complete the parking maneuver would be affected by the stop position and the controlled speed for parking after the completion of the space detection. This parking time is dependent on the manufacturer's design strategy and the driver's parking skills. For full APA, vehicle brake/accelerator systems, such as ESC, will vary from a manufacturer. For APA which provides steering only, driving behavior/performance (such as a braking pattern) makes the parking time different amongst individuals. We believe that the specified intervals by NHTSA are constraining for adequate parking time. We have not determined a specific desired parking time interval; we recommend NHTSA reconsider the effect of the aforementioned factors for the appropriate parking time.

Traffic Jam Assist (TJA)

Question 5: *To reduce test burden for the assessment of some technologies for research purposes, the number of repeated trials per test condition is proposed to be less than or equal to seven based on our experience from past test procedure design work. Is this adequate, or should another number of repeated trials be performed for all technology/condition combinations to support an assessment of whether differences in the test results, for a given condition, are statistically significant?*

Hyundai MOBIS RESPONSE:

A statistically relevant amount of tests should be run to satisfy repeatability and robustness. We believe seven trials per test condition are adequate. We recommend testing consistent with results similar to the CIB and DBS tests, which requires that five out of seven be satisfied for compliance.

Intersection Safety Assist

Question 3: *Are the draft research test procedures clearly written, understandable, and executable? If not, please provide specific areas for which clarification is necessary, and suggestions for how they may be improved.*



Hyundai MOBIS RESPONSE:

The Pass/Fail criteria of the test scenario are not clear. In test scenario 5.3.5, for ISA Scenario 1: POV Straight Across Path, “Near-Miss” Scenario shown in figure 3, we have the following questions:

- Is the SV to stop on the dotted line or continue across the dotted line?
- What is the pass/fail criteria based on where the SV stops?