



April 8, 2022

Dr. Steven Cliff
Deputy Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

RE: Petition for Reconsideration: Final Rule; Federal Motor Vehicle Safety Standards; Lamps, Reflective Devices, and Associated Equipment, Adaptive Driving Beam Headlamps [Docket Number: NHTSA-2022-0013]

Dear Deputy Administrator Cliff:

On February 22, 2022, the National Highway Traffic Safety Administration (NHTSA) (“the Agency”) issued a final rule to amend FMVSS No. 108 to allow the use of adaptive driving beam (ADB) headlighting in the United States. The Alliance for Automotive Innovation (“Auto Innovators”)¹ has long supported the introduction of this innovative safety technology and applauds the Agency for this step forward. Our predecessor organizations submitted comments to the Notice of Proposed Rulemaking (NPRM)² docket, including supplemental comments based upon vehicle level testing of proposed dynamic requirements of the NPRM.³

Auto Innovators respectfully submits the following petition for reconsideration to address several critical provisions of the final rule. The final rule contains several requirements that are either not practicable or not reasonable. As to the former, the Agency has not sufficiently substantiated that the final rule is practicable; even the ADB tests conducted by the Agency did not meet all of the requirements set forth in the final rule. If not adjusted, parts of this rule stand as an obstacle to the deployment of this important safety technology in the US market. Limiting deployment runs counter to the public’s best interest – particularly with respect to affordability, equity and ensuring the technology is more widely accessible to consumers.

Based on the analysis of the SAE International’s Lighting Systems Group through their Regulatory Cooperation Task Force (RCTF), we share two specific technical issues of concern: 1) Size of the Transition Zone, and 2) Incompatibility of FMVSS No. 108 Lower Beam Photometry and ADB Glare Requirements. This group has worldwide contributors representing vehicle manufacturers, vehicle lighting manufacturers, component manufacturers and testing laboratories. The SAE RCTF is separately submitting substantive comments to the ADB final rule docket. Auto Innovators concurs with the conclusions and recommendations of the SAE RCTF with regard to the two identified issues and will provide attribution where we refer to their comments. Auto Innovators petitions the Agency to amend

¹ Auto Innovators is the singular, authoritative, and respected voice of the automotive industry, representing motor vehicle manufacturers responsible for nearly 98 percent of cars and light trucks sold in the U.S., original equipment suppliers, technology companies, and others within the automotive ecosystem.

² 83 FR 51766, Oct 12, 2018, Docket NHTSA-2018-0090

³ NHTSA-2018-0090-0000

the final rule requirements impacted by these two issues consistent with the recommendations provided by the SAE RCTF.

In addition, there are a significant number of outstanding questions and areas where additional clarification or corrections to the final rule are needed, with or without a reconsideration of the published final rule. These are compiled in a list attached as an appendix to this main petition for reconsideration. In the meantime, we urge the Agency to work quickly to resolve these items to avoid any further delay or unnecessary barriers to innovative safety technologies that are already commonplace in other parts of the world.

SAE Technical Recommendations

Size of the Transition Zone

S9.4.1.6.4.5 of the ADB final rule states, “A transition zone not to exceed 1.0 degree in either the horizontal or vertical ... between an area of reduced intensity and an area of unreduced intensity”. This prescribed transition zone would exclude a vast majority of existing ADB systems and is unreasonably disharmonized with established global requirements. It also limits the deployment of the safety-enhancing technology due to cost and development complexity for future systems, which is not in the public’s best interest.

The SAE RCTF has identified the size of the transition zone as a requirement that would prevent many existing, globally-deployed ADB systems from being deployed in the US. High resolution pixelated ADB systems would likely comply with the 1-degree transition zone of the ADB final rule. However, these systems are quite costly and their deployment in other markets is limited to a few premium vehicle models. Consistent with the SAE analysis, it is important to note that the majority of current ADB systems incorporate a technique that forms a beam that consists of several staggered overlapping segments of light. These systems may not be able to meet the requirements for unreduced intensity beyond a 1-degree transition zone when extinguishing segments to create a dimmed zone just around an oncoming or preceding vehicle (not an enlarged zone).

This effect is particularly evident when the shadow protecting the oncoming or preceding vehicle is in the center of the ADB beam pattern. In such a case, a 1-degree transition zone would not allow the beam to meet the upper beam photometry at the H-V, H-3L, and H-3R test points. However, these systems do provide much greater than lower beam illumination in these critical visibility areas. Many of these systems would require a transition zone of approximately 4-degrees to reach full upper beam intensity. Other systems may require a transition zone larger than 4-degrees.

The SAE RCTF response includes significant technical documentation of this issue including examples illustrating the concern and measured data showing the transition zone dimensions of a number of ADB systems currently in use in other markets. The transition zones shown in the examples provided by the SAE RCTF vary from 1.9-degrees to 7.8-degrees. We encourage the Agency to consider the implications of these examples on road safety as well as affordability for the driving public.

The SAE RCTF identifies one likely solution for these ADB systems to comply with the ADB final rule requirements: enlarge the width of the area of reduced intensity to include one or more of the H-V, H-3L, and H-3R test points. We agree with the SAE RCTF assessment that this modification would diminish the area of unreduced intensity in the critical visibility areas around an oncoming or preceding vehicle without providing any glare reduction for those drivers, thus negating some of the benefits of an ADB system. If the transition zone did not have a specific dimension this situation could be avoided. The Agency, however, noted their reluctance to permit an undefined transition zone size in the ADB final rule preamble.

Based upon the analysis of the SAE RCTF, a revision in the ADB requirements to allow a 4-degree transition zone would facilitate more rapid deployment of a number of more affordable ADB systems that could provide the full benefits of ADB. Auto Innovators agrees with the SAE RCTF analysis and supports the revision of S4.9.1.6.4.5 to allow a transition zone not to exceed 4-degrees.

Incompatibility of FMVSS No. 108 Lower Beam Photometry and ADB Glare Requirements

The Agency made revisions in the ADB final rule to lessen impact of the glare restrictions in right hand curves by reducing the distance at which those glare requirements are to be measured. Unfortunately, even at the shorter distances required by the ADB final rule, there exists a conflict between existing lower beam photometric requirements and the ADB final rule glare limits. As a result, the ADB final rule is not practicable because the glare limits in the track testing are in contradiction to the laboratory photometric requirements. It is also unreasonable that 1) the ADB final rule sets forth requirements that current compliant lower beams cannot meet and 2) the ADB testing the Agency has conducted has not shown a single ADB system that can comply with the requirements.

The SAE RCTF has identified a critical area where this conflict exists along the lower beam photometric test pattern line at 0.5U, 1R to 3R. Anywhere along this line, FMVSS No. 108 requires a minimum intensity of 500 cd and allows a maximum intensity of 2700 cd. As noted in the SAE response, at some point during a right-hand curve vehicle test, the glare detection photometers will be illuminated by light which is directed towards this scan line from the test vehicle's lower beam headlamps. In this instance the ADB glare illuminance limit may fall below the lower beam headlamp photometric intensity maximum resulting in conflicting regulatory requirements. The glare detection photometers could also detect light from parking lamps during the test which would increase the difficulty of designing and producing the headlamps needed to meet the narrow window the disparate requirements impose. The SAE RCTF response includes several diagrams illustrating this situation.

Several possible solutions to this conflict were noted by the SAE RCTF, including increasing headlamp mounting height, permanently aiming the headlamps down, or equipping ADB headlamps with a leveling system that actively aims the headlamps down during ADB operation. However, the SAE RCTF also point out the serious disadvantages of any of these solutions.

A practical solution that the SAE RCTF does recommend is the lower beam comparative method, as is incorporated in SAE J3069™ S6.5.1.2. With this method, the glare measured by the test fixture photometer from an ADB equipped vehicle cannot exceed the intensity levels of that ADB vehicle's

lower beam headlamp by more than 25%. Auto Innovators supports the SAE rationale as to why this “up to 25% increase” is necessary. Incorporating this test method into FMVSS-108 will ensure the ADB:

- provides similar performance to the lower beam in the region of the opposing/preceding vehicle
- does not necessitate downward aim and resultant performance degradation of the lower beam
- accommodates any stray light contributions from parking lamps, reflections from the roadway or the test vehicle itself, and other sources not intended to be an influence on the results; and
- allows for the possibility of test-to-test detail variations, such as track centering, fuel usage, etc.

We recognize the agency previously considered SAE J3069 in its entirety, but Auto Innovators strongly urges the Agency to reevaluate at least this *particular aspect* of that industry standard in light of the unintentional conflicting limitations discussed above.

Additional Requests for Clarification / Correction

In Appendix I, attached, we have outlined additional areas for reconsideration that, in our view, require correction. We request that the Agency address these through an update to the final rule (as part of this petition) or in a supplemental notice to the final rule.

These include:

- S9.4.1.1 (*Operating instructions*)
- S14.9.3.12.3 (*Stimulus test fixtures*)
- S14.9.3.12.4.5 and S14.9.3.12.4.6 (*related to debris on sensors*)

Additionally, Appendix II contains several provisions that require additional clarification by the Agency before we can make an educated determination on whether an additional petition for reconsideration is necessary.

We also note that revised procedures will be needed to fully test for FMVSS No. 108 compliance with the addition of ADB. We urge the Agency to issue the revised procedures and ensure that they maximize harmonization with industry standards wherever possible.

Need for Public Awareness of the Unique Characteristics of ADB

Since the 1940s, most motor vehicle laws required two, and only two, headlamp beams: an upper beam and a lower beam. In 1968 this was memorialized in Federal Motor Vehicle Safety Standard No. 108 (FMVSS 108).

General experience has shown that police officers will sometimes stop and cite a driver who is using upper beam headlamps in situations with a preceding or approaching vehicle. Although an oncoming or preceding vehicle would experience dimmed lights because of an ADB system on the approach vehicle, an officer may observe the traffic situation from a different angle and incorrectly perceive that the ADB driver is using upper beams. This could potentially result in the vehicle using an ADB system being pulled over by the officer.

Explaining this technology in an education campaign can help law enforcement better understand the technology and avoid wasting resources pulling over compliant vehicles. NHTSA has engaged in numerous public education campaigns to raise awareness of the importance of vehicle safety equipment and safe driver behavior, and ADB technology could benefit from a similar approach. We encourage the Agency to initiate such a campaign to familiarize the motoring public as well as state and local law enforcement with the unique operation and safety benefits of ADB systems.

Conclusion

Auto Innovators remains generally supportive of the Agency's efforts to update the final rule to enable the deployment of advanced lighting technologies in the United States. Although we have outlined a number of areas that require reconsideration to achieve a more practicable, reasonable rule to better support the interest of the public, as well as identified areas that require further clarification, we are optimistic that these can be addressed. Such actions would also be consistent with the intent of the Bipartisan Infrastructure Law in ensuring greater harmonization.⁴ This approach will bring to the U.S. the technologies already being deployed globally to improve road user safety. To help speed this process and ensure informed policymaking decisions in support of any corrections or clarifications to the final rule, we request that NHTSA hold a public workshop to address the issues identified in the main body and appendix of this comment. We look forward to continued engagement on this important topic.

Please contact me if you have any questions on any aspect of this petition.

Sincerely,



Scott Schmidt
Vice President, Safety Policy
Alliance for Automotive Innovation

⁴ Infrastructure Investment and Jobs Act - Section. 24211. Global Harmonization.

Appendix I – Additional Petitions for Reconsideration & Corrections to the Final Rule

The following section outlines several additional provisions that we petition NHTSA to reconsider and provide corrections in an updated final rule. Auto Innovators requests that NHTSA provide corrections in a supplemental notice even if the petition for reconsideration is denied.

Regulatory Text Corrections

S9 Associated equipment requirements

S9.4.1.1 Operating instructions

The final rule states:

S9.4.1.1 Operating instructions. Each semiautomatic headlamp switching device must include operating instructions to permit a driver to operate the device correctly, including: how to turn the automatic control on and off; how to adjust the sensitivity control (for Option 1 and if provided for Option 2); and any other specific instructions applicable to the device.

For clarity, Auto Innovators recommends that the regulatory text be updated as follows:

S9.4.1.1 Operating instructions. Each semiautomatic headlamp switching device must include operating instructions to permit a driver to operate the device correctly, including: how to turn the automatic control on and off; how to adjust the sensitivity control (~~for Option 1 and if provided for Option 2~~ if provided); and any other specific instructions applicable to the device.

S14 Physical and photometry test procedures and performance requirements.

S14.9.3.12.3 Stimulus test fixtures.

The final rule states:

“S14.9.3.12.3.3 Photometers. Photometers must be capable of a minimum measurement unit of 0.01 lux. The color response of the photometer must be corrected to that of the 1931 CIE Standard Observer (2-degree) Photopic Response Curve, as shown in the CIE 1931 Chromaticity Diagram (incorporated by reference, see §571.5), with a cosine correction characteristic within 3%. The photometer lenses on the test fixture shall be clean and free from dirt and debris, and the photometers will be zero-calibrated for each test to account for ambient light. The illuminance values from the photometers shall be collected at a rate of at least 100 Hz and a maximum 25-degree angle of incidence.”

When zero calibrating for each test, Auto Innovators recommends the final rule be updated to specify that the light of test fixture lamps (together with environment light) is subtracted from the

measurement to ensure only the ADB system is being evaluated. In addition, the agency should also provide in the docket the manufacturer's headlamp aiming instructions and information sufficient to mount in design position all stimulus lamps required in the ADB final rule S14.9.3.12.3

S14.9.3.12.4.5 and S14.9.3.12.4.6

The final rule states:

"S14.9.3.12.4.5 To the extent practicable, adaptive driving beam system sensors and the windshield on the test vehicle (if an adaptive driving beam system sensor is behind the windshield) shall be clean and free of dirt and debris.

S14.9.3.12.4.6 The headlamp lenses of the test vehicle shall be clean and free from dirt and debris."

It is unclear why "to the extent practicable" is specified when referring to the cleanliness of the ADB system but not the headlamp lenses. Auto Innovators recommends that NHTSA update the final rule to address this inconsistency, as follows:

S14.9.3.12.4.6 To the extent practicable, the~~The~~ headlamp lenses of the test vehicle shall be clean and free from dirt and debris.

Appendix II – Additional Clarification Questions

This section outlines several provisions that require additional clarification by the agency before we can make determination on whether an additional petition for reconsideration is necessary. As noted in our main comment, we request that NHTSA host a public workshop in the near future to provide clarification on these questions and provide an opportunity for additional input in response.

1 Auto Innovators Questions on Final Rule Requirements

S9.4.1.6.4.5

Auto Innovators has several outstanding questions related to the requirements of Option 2 (Adaptive Driving Beam systems) that we request additional clarification on, as the agency responses may impact whether a further petition for reconsideration is needed:

1. It is not clear what the science/data is to prove a safety need for limiting the transition zone (considering areas of reduced intensity are left up to the manufacturer)? Or is this for compliance measurement purposes?

S10 Headlighting system requirements.

S10.18.8 On-vehicle aiming

In addition to the issue outlined in our petition for reconsideration on this matter, Auto Innovators has a number of related clarifying questions should the agency disagree with our proposal. The preamble states "*The horizontal VHAD need only be accurate enough to set at 0 in order to perform basic photometry testing in the lab.*"⁵

1. Does a horizontal VHAD need to be visible on vehicle?
2. Is +/- 2.5 deg of adjustment required?

There is no data or reasoning from the agency as to why the final rule requires the VHAD to have graduations. If the agency does not have sufficient supporting reasoning that graduations are necessary, the Auto Innovators recommends removing the requirement that the VHAD has graduations.

S14.9.3.12.3 Stimulus Test Fixture

The March 2021 update to SAE J3069 included an update (in section 5.5.2.1) that modified the requirements to state that "*[t]he stimulus fixture can be constructed in a manner that represents the intended vehicle type to avoid false readings*". Ideal conditions would have headlamps and taillamps mounted in nominal design position relative to the roadway. Such orientation details are typically unknown to companies outside of the vehicle and lamp manufacturers. Vertical aim of the headlamps can be easily defined (*as noted in other questions*).

⁵ <https://www.federalregister.gov/d/2022-02451/p-538>

We request clarification on the following questions:

- Whether the FMVSS 108 test fixture can be designed to resemble/represent an actual vehicle OR whether a real vehicle can be used in lieu of the test fixture. Auto Innovators strongly recommends that this be permitted, as discussed in more detail below.
- How can companies who are performing vehicle tests ensure that the taillamps are properly oriented on the fixture to simulate vehicle mounting condition?
- Do the stimulus lamps chosen include horizontal adjusters and instructions for aim on fixtures?
 - If not, the headlamps should be mounted in nominal design position relative to the roadway. How can companies who are performing vehicle tests ensure that the headlamps are properly oriented on the fixture to simulate vehicle mounting condition?

Recommendation that NHTSA allow for the use of actual vehicles as a compliance option.

Auto Innovators requests that the final rule be updated to allow for an additional compliance option whereby manufacturers could opt to certify a vehicle using actual vehicles, as an alternative to the current test fixtures defined in the final rule. We believe this approach would allow systems to be evaluated under more realistic real-world conditions, and would enable certain systems (e.g. camera and radar-based systems) to detect the presence of a vehicle more accurately, and differentiate between other light sources in the environment that might impact detection. Such an approach would help enhance system performance, consumer acceptance, and overall safety benefits of ADB technology.

To ensure alignment with the final rule (and the established test fixtures), we propose the permitted alternative compliance option vehicles include the three vehicles identified in this final rule – Toyota Camry, Ford F-150, Harley Davidson.

Auto Innovators therefore requests that NHTSA update the final rule to include the use of stimulus vehicles as a compliance option.

S14.9.3.12.3.2 Taillamps

S14.9.3.12.3.2 indicates that the measurement locations specified in Figures 24 and 26 shall be measured to the center of the taillamp. However, S14.9.3.12.3.1 for stimulus headlamps clearly specifies the measurement location as “to the optical axis marking of the headlamps.” How should the center of the stimulus taillamp be determined? Or can this be a part of the OVSC pre-test information provided by the manufacturer – what point on the taillamp was used/should be used as the center for testing?

S14.9.3.12.3.1 Headlamps and S14.9.3.12.3.2 Taillamps

As noted above, S14.9.3.12.3.1 specifies which headlamps are to be used as stimulus lamps during track testing of the ADB vehicle. S14.9.3.12.3.2 specifies which taillamps are to be used as stimulus lamps during track testing of the ADB vehicle.

By prescribing production vehicle lamps instead of using generic fixture lamps as done in SAE J3069, the Final Rule does not sufficiently address the possibility of the end of service life of the prescribed lamps. Rulemaking and updates to FMVSSs generally take a considerable amount of time, at a much slower

pace than industry advances. Current FMVSSs reference many SAE standards from as early as the 1960s when there have been several revisions of most of the standards. Even the testing conducted by the Agency to confirm the Final Rule requirements was done with a motorcycle lamp that is already out of production by the time the Final Rule was published. Also, the F150 headlamp part number specified in the Final Rule is for a 2019MY vehicle, even though the Agency states that it is a 2018MY, is an example of how it will be confusing for the entire industry to remain aware of the status of lamp production and part changes over time from these specific OEMs. Additional clarification is therefore requested to specify how the stimulus lamp changes will be monitored by NHTSA.

In the immediate future automakers will develop and confirm using the stimulus lamps chosen. At some point in the future, it is expected that NHTSA will announce new lamps to be used in future certification tests. The industry should have some understanding of how this will be handled now, rather than having such discussions with NHTSA in a more urgent situation several years from now. We therefore request clarification from NHTSA on the following questions to determine whether corrections to the final rule are needed at this time:

1. How frequently does NHTSA envision updating the required stimulus lamps?
2. What does NHTSA envision that process looking like? For example: Will there be some 'grandfathering' period, somehow, where vehicles could be certified against either old or new stimulus lamps? What are the anticipated lead times would be provided?

S14.9.3.12.3.3 Photometers.

The photometer should be reading at an angle of incidence no greater than 25 degrees, but how should we limit it to 25 degrees? Will the photometer be shaded or processed by software?

S14.9.3.12.4 Test Vehicle Preparation

In S14.9.3.12.4, it is noted that "before initiating testing, if the test vehicle is equipped with a fuel tank it shall be filled to approximately 100% of capacity with the appropriate fuel and maintained to at least 75% capacity throughout the testing." We request clarification be provided to specify whether NHTSA will re-aim the headlamp before each test run depending on the fuel status to follow S14.9.3.12.4.3 tolerance when the fuel consumption exceeds 5kg.

S14.9.3.12.5.1

The final rule states:

S14.9.3.12.5.1 The test road shall have a longitudinal grade (slope) that does not exceed 2%.

To help ensure greater repeatability and reproducibility, we request that NHTSA specify test road linearity as well as longitudinal grade.

In addition, we have questions and concerns related to the 2% grade specification (i.e. 0-2% grade) as this could potentially impact test repeatability and reproducibility in certain cases. We are currently evaluating the potential impact of this requirement to determine whether we can propose a more

suitable alternative, recognizing that specifying a grade that is unreasonably low may have an impact on the number of test locations where it may be possible to evaluate ADB systems. In the interim, we would request that NHTSA specify in the final rule or corresponding test procedure, that **test roads used for testing should seek to minimize the longitudinal grade as much as possible below 2% to the extent practicable, and, consistent with the current requirement, should not exceed 2%.**

To the extent NHTSA has not already done so, we request that the Agency provide the grade slope information for any tests roads that it plans to use for compliance testing. This information would be useful as we conduct our review.

Additionally, we request clarification on the following questions:

- Is the 2% gradient a momentary value during driving or is it a gradient value throughout the course?
- Also, is this gradient the gradient in the direction of travel of the vehicle? Or is it the slope of the bank slope?

S14.9.3.12.5.5

The final rule states:

S14.9.3.12.5.5 The test road surface may be concrete or asphalt and shall not be bright white.

We request that NHTSA specify what is meant by "bright white"?

S14.9.3.12.6.2 Detection of Ambient Light Level

The final rule states:

"S14.9.3.12.6.2 Testing shall be conducted when the ambient illumination at the test road as recorded by the photometers is at or below 0.2 lux."

Additional clarification is needed on whether the orientation of the lux meter should be oriented to be perpendicular to the road surface, or angled to face the evaluation vehicle. This is important given that ambient light measurements could be different based on moon phase and position during testing. Auto Innovators recommends that it should be positioned facing the evaluation vehicle or in a similarly suitable position for test data collection.

Definitions

In the definitions section:

"Headlighting system midpoint means the intersection of a horizontal plane through the test vehicle's headlamp light sources, a vertical plane through the test vehicle's headlamp light sources and a vertical plane through the test vehicle's centerline."

Integral beam lamps can have multiple light sources. Is this meant to be the "optical center"? Most headlamps today—and likely in the near future will—use multiple light sources to create the various lower beam, upper beam and adaptive driving beam illumination patterns. The definition as written is ambiguous as to which of these multiple headlamp light sources are to be used in finding this 'midpoint'. In fact, in most cases no single vertical or horizontal plane will go through all of the headlamps' various light sources. It seems logical that the intention would be to use the "optical center" of the ADB portion of the headlamp, but could NHTSA please confirm this was the intent?

NHTSA Testing Locations and Test Tracks

Section S14.9.3.12 defines the tests for compliance with adaptive driving beam photometry requirements. As manufacturers look to develop systems that meet the requirements of the regulation, can NHTSA provide clarification on the test tracks that will be used for compliance testing?