VOLKSWAGEN

GROUP OF AMERICA

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April 8, 2022 Date

Re: Response to Docket No. NHTSA–2022-0013; Fed. Reg. Vol. 87, No. 35, February 22, 2022

Dear Deputy Administrator Dr. Cliff,

The Volkswagen Group of America ("VWGoA") appreciates the opportunity to comment on the final rule published by the National Highway Traffic Safety Administration ("NHTSA") revising Federal Motor Vehicle Safety Standards ("FMVSS") 108; Lamps, Reflective Devices, and Associated Equipment. VWGoA participated in and supports the petition for reconsideration submitted by the Alliance for Automotive Innovation ("Auto Innovators") and the comments submitted by the SAE Regulatory Cooperation Task Force ("RCTF"). The content of this submission is intended to reinforce the petition for reconsideration submitted by the Auto Innovators and the SAE RCTF comments, as well as present additional topics for the Agency's review.

VWGoA is encouraged by the Agency's decision to update FMVSS 108 to allow ADB technology since, as the Agency is aware, the deployment of ADB technology has the potential to increase road safety by significantly increasing visibility for drivers while also mitigating glare seen by surrounding road users. However, in line with the Auto Innovators and the SAE RCTF submissions, VWGoA respectfully submits these comments on the portions of the ADB final rule that are either not practicable, not reasonable, or are not in the best interest of the public.

While the final rule implemented some improvements over the Notice of Proposed Rulemaking ("NPRM") from 2018, the end result is still a regulation and a test procedure that are unnecessarily complex and out of step with existing industry standards and regulations in other markets. Due to the complexity and stringency of the rule, we believe that introduction of ADB systems into the U.S. market will take years as companies, especially those that have been manufacturing safe, reliable systems for other markets for nearly a decade, have to work to adapt the hardware and software of their systems for the unique requirements of FMVSS 108. Advancements in lighting and camera technology have allowed for the development of a broader range of ADB technologies with varied price-points, all of which provide increased safety benefits over traditional lighting systems. This development has created a range of options in the

spectrum of ADB technology with some offering lower resolution systems with 20 or less segments that can be individually switched to accomplish an ADB function. On the other end of the performance spectrum, there are high-definition systems that offer significantly higher resolution with some digital matrix systems offering over 1 million pixels of individually activated segments of light – similar to what is found in a movie projector. All of these systems, regardless of their position on the performance spectrum, offer an improvement of nighttime visibility while limiting glare to other road users compared to conventional headlights with just lower and upper beams. This rule, as is, will only permit ADB systems into the market that reside on the high performance side of the spectrum even though the lower and upper beams of the lamps are otherwise compliant to the requirements of FMVSS 108. This will ultimately limit the opportunity for cost-effective ADB systems to enter the market which will severely hinder the widespread adoption of the technology and limit the overall safety benefits that ADB can provide.

Therefore, we encourage NHTSA to consider the points provided herein as additional opportunities for refinement as the Agency reviews the petition for reconsideration submitted by Auto Innovators. VWGoA's points for consideration are as follows:

- The large radius curve test scenarios are not practicable or necessary to evaluate ADB system performance.
- Test results from Agency testing did not meet all of the requirements of the final rule.
- Safety benefits of ADB technology are restricted by the performance requirements in the final rule.
- Analysis of ADB systems deployed by the VW Group in existing markets do not warrant the stringency of the final rule for U.S. systems.

These concerns are described in further detail in Appendix A of this submission. VWGoA is encouraged that NHTSA has moved the rulemaking process forward to include ADB technology into FMVSS 108, but remains concerned that portions of the final rule limit the ability of the technology to have a significant impact on the safety of U.S. roadways. Should the Agency wish to discuss with VWGoA in more detail, we stand ready to provide more insight into our comments.

Sincerely,

Lobsiger John VWPKI DA8774ECCCD0B288

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Appendix A

The large radius curve test scenarios are not practicable or necessary to evaluate ADB system performance

The test track large radius of curvature (335- 400m) specified in the final rule is not practicable on a vast majority of the vehicle proving grounds worldwide. The distance required for accelerating to the test speed, the large curve and the distance required for safe deceleration after the curve requires an amount of space that is not widely available. This puts a significant financial and time burden on manufacturers to conduct development testing as well as self-certification testing. NHTSA did not evaluate the ability for other manufacturers or companies to conduct testing at their facilities and assumed that the test scenario would be easily achieved for the majority of companies. However, of 30 proving grounds surveyed worldwide using online mapping to view estimated space required for acceleration, the test portion and deceleration, only 5 facilities were identified as being capable of conducting the final rule testing – 3 of which are privately owned by vehicle manufacturers. For manufacturers without appropriate test tracks, significant investment would be required in order to build out additional test track surfaces to accommodate the large radius test scenario.

In the preamble, the Agency comments that the Insurance Institute for Highway Safety ("IIHS") only tested up to a medium radius curve, excluding large radius curves in its research testing. The Agency notes, "Because the curve in this scenario is essentially between a 250 m left curve and a straight road, it is reasonable to extrapolate that the lower beams tested by IIHS would also have complied on left curves with radii greater than 250 m."[1] The large radius curve testing with an ADB system would be covered in a similar extrapolation and is not necessary with the inclusion of the medium curve testing in the final rule. Since the large radius curve is redundant and is not practicable for many manufacturers to conduct the test in-house, VWGoA urges the Agency to remove the large radius test scenario as a clarification to the final rule.

Test results from Agency testing did not meet all of the requirements of the final rule

The vehicle that the Agency conducted testing with featured an ADB system that met ECE ADB requirements, yet did not comply with all of the final rule requirements. The test requirements include eight scenarios each conducted with Toyota Camry lamps, Ford F150 lamps and Harley-Davidson lamps as stimuli. The Agency provides data and discussion on each of the eight test scenarios that were conducted (note: it is unclear what the results were for scenario 3 and 6 with the truck stimulus). 50% of the 8 tests with the car lamps failed, 16% of the apparent tests with the truck lamps failed and 87.5% of the tests with the motorcycle failed.

The Agency comments on the test failures with the car and truck stimulus lamps, assuming modifications to the system would permit the system to pass the testing in

[1] Federal Register Vol 87, No. 35 February 22,2022 page 9955

failed scenarios 4, 5 and 6.[2] For scenario 8[3], the Agency acknowledged the difficultly with short and medium curves yet retained the medium curve in the final rule with no discussion on the failure in the testing. The SAE RCTF submission discusses the medium right curve in detail showing some of the laboratory requirements are in contradiction with some of the track testing scenario requirements. These contradictions need to be resolved by the Agency, as suggested by the SAE RCTF, before any ADB system could pass all of the regulatory performance requirements.

The ADB system only passed one of the eight test scenarios with the motorcycle lamps – an 87.5% failure rate. Of the 25 distance segmentations in the tests run, 52% failed in the NHTSA testing.[4] The Agency states, "Our testing showed consistently poor performance when the ADB system was tested against the motorcycle fixture and lamps we are finalizing"[5] but offered no further comment on the extent of the failures and retained the overly stringent testing in the final rule. Based on the information described above regarding performance to the test procedure, VWGoA finds certain specifications in the final rule to be unreasonable because:

i. There is no basis cited for the Agency's assumption of what modifications could be made or if the modifications would be minor to comply with the test requirements. The Agency also did not indicate what they consider to be a minor modification;
ii. A modification to meet one failed scenario may be detrimental to another scenario;
iii. The Agency has not given any indication that *any* ADB system could pass all test requirements in the final rule;
iv. No modifications to the subject ADB system were tested in order to determine if they would be effective and to what extent modifications would need to be made to comply with the requirements.

Based on the numerous failures observed by NHTSA in their own testing together with the lack of data provided by the Agency regarding the modifications, we believe that numerous challenges will be faced in attempting to develop a system that can conform to the performance requirements of the final rule.

In addition to removing the large radius curve track test scenarios, VWGoA urges the Agency to update the glare limit requirements of the regulation with a more reasonable set of performance requirements. The testing to the final rule conducted by the Agency resulted in glare exceedances in the medium curve track scenarios, where the required

[2] Scenario 4: large left radius oncoming scenario. The measured glare exceeds the limits in the 60-120 m range as well as the 30-60 m range by more than 0.1s. Scenario 5: oncoming medium right curve scenario. Exceedances in the 30-50m range Scenario 6: oncoming large right curve scenario: system tested was within the glare limits in this scenario except at distances greater than 60 m Federal Register Vol 87, No. 35 February 22,2022

[3] Scenario 8: preceding medium left curve scenario. Exceedances at distances greater then 60m Federal Register Vol 87, No. 35 February 22,2022

[4] See NHTSA Table C.1. ADB performance with final rule motorcycle fixture: most failures were where the ADB system was late to react to the motorcycle fixture. Federal Register Vol 87, No. 35 February 22,2022

[5] Federal Register Vol 87, No. 35 February 22,2022 page 10009

detection angle of the forward facing camera is beyond the capabilities of our existing ADB system cameras. For these systems, increasing the angle of detection to a wider angle to provide reaction to keep the lux values under the strict limits with the stringent time exceedance causes the sensitivity inboard from the edges of the view to be compromised, i.e. tuning existing systems to conform to the performance requirements at the far horizontal edges of the camera's detection zone will detract from the system's performance and stability in the head-on area of the vehicle. Compromising the sensitivity will limit the ADB system from utilizing increased use of unreduced intensity light and limit safety benefits of enhanced visibility in all road scenarios. With such strict glare tolerances in all scenarios, consistently controlling glare to the far extreme horizontal edges of the angular visibility of the camera would be optimized by increasing the glare exceedance limit to a more reasonable value. A study on visual and audible detection shows the mean reaction time to detect visual stimuli is approximately 180–200 ms.[6] With an average detection time of 0.18-0.2 seconds, the time for a driver to physically react to the stimuli would be closer to a full second. Additionally as stated in the final rule preamble, AAA commented to the NPRM that the final rule should not permit glare exceedances lasting longer than 1 second because its research showed that glare from an oncoming vehicle lasting approximately 1 second was rated as distracting. While ADB reaction time should be faster than a human manually switching between lower beam and upper beam, limiting the system to 0.1 seconds is unreasonable. VWGoA encourages NHTSA to increase the limit to 0.7s as well as implement the 125% exceedance limit described in SAE J3069. The combinations of these specifications will allow systems to have more consistent and reliable detection performance in all areas of the detection zone.

Safety benefits of ADB technology are restricted by the performance requirements in the final rule

The glare limit requirements are overly stringent as is evidenced by testing conducted by the Agency itself. The Agency conducted testing according to the final rule ADB requirements on three vehicles operating with FMVSS 108 compliant lower beams activated. Only one of the three vehicles, the 2019 Ford Fusion which is no longer in production, achieved passing performance with lower beams to the ADB glare requirements in all of the test track scenarios. The fact that the ADB requirements cannot be met with the remaining two test vehicle's static lower beams indicates that the ADB requirements are overly stringent and do not appropriately balance glare against the increased nighttime visibility benefits of ADB.

The restrictions placed on the visibility benefits of ADB technology with overly strict glare requirements by the final rule are also not in the best interest of the public. Visibility is more of a safety concern than glare. There is virtually no compelling evidence that precisely correlates complaints of glare from road users to an increase in crashes or other safety concerns. However, there is evidence that increased visibility increases safety. This has been shown in studies such as the study conducted by the TüV

[6] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4456887/

Rheinland Germany which analyzed accident data from DESTATIS about the influence of lighting on nighttime traffic. The study was initiated by the European Light Sight Safety Initiative in CLEPA, the European Association of Automotive Suppliers. This study was referenced in the comments submitted by VWGoA to the Agency regarding the ADB NPRM. The study shows that improved lighting significantly contributes to a reduction in nighttime accidents, and thus, to the continuous reduction of fatal accidents on many road types. The study estimated that with 100% Xenon, which provides better visibility than halogen, installation rate a potential of 8,000 fatalities per year would be avoided in Europe.[7] We believe that similar significant impacts can be accomplished by the widespread adoption of ADB technology in the U.S.

The final rule criteria prioritizes glare over visibility so much that it limits the ability of a system to fully realize the increased visibility benefits of ADB. The IIHS headlight testing protocol also evaluates visibility and glare, but more fairly balances glare with the safety of enhanced visibility. A GOOD IIHS rating indicates to the consumer that the headlamps provide better visibility in comparison to other vehicles. A lamp designed to meet the final rule will not likely receive a favorable rating in IIHS. The SAE RCTF submission shows a data set of several GOOD rated headlamps, of which only a portion comply with the overly stringent final rule glare limits. In addition to the final rule limiting the visibility benefits of the ADB system, consumers rely on the IIHS ratings for purchasing decisions and non-favorable ratings will deter consumers from choosing ADB-equipped vehicles over non-ADB-equipped variants with a better rating. This will diminish the extent to which safety-enhancing ADB technology is deployed on U.S. roads.

Further discussion indicating that the final rule requirements focus too heavily on glare with overly stringent requirements with insufficient focus on visibility - which is an important safety factor - is shown when reviewing the IIHS evaluations of the vehicles tested by the Agency. The only vehicle tested by the Agency that passed all of the track testing requirements was the 2019 Ford Fusion with FMVSS 108 compliant halogen lower beams. These lamps achieve a POOR rating in IIHS headlamp testing with lower beam results stating, “On the straightaway, visibility was fair on the left side of the road and inadequate on the right side. On curves, visibility was inadequate in all 4 tests.”[8] The second vehicle that was tested with FMVSS 108 compliant lower beams by the Agency was a 2016 Volvo XC90, which achieves a MARGINAL rating with the standard LED headlamps and POOR ratings for the optional LED headlamps offered for MY2016 (note: the same lamps are used on the MY16 and MY17). The IIHS results state for the standard lower beam, “On the straightaway, visibility was inadequate on both sides of the road. On curves, visibility was inadequate in all 4 tests. The low beams never exceeded glare limits.”[9] The comments on the results were similar for the optional lamps – the visibility was inadequate and they never exceeded glare limits.

[7] See NPRM comments in NHTSA-2018-0090-0001

[8] htttps://www.iihs.org/ratings/vehicle/Ford/fusion-4-door-sedan/2019#headlights

[9] https://www.iihs.org/ratings/vehicle/Volvo/xc90-4-door-suv/2017#headlights

Also as mentioned in the SAE RCTF submission, there is a contradiction between the glare requirements for ADB track testing and the laboratory photometry performance requirements. If left unresolved, these contradictions will prevent ADB systems from achieving compliance to the final rule. Glare performance metrics should be aligned with the SAE J3069 125% lower beam values to harmonize with Canada and existing ADB system capabilities as requested in the SAE RCTF submission that is supported by Auto Innovators. Adopting the SAE tolerance will help alleviate the contradiction and allow manufacturers to certify ADB systems without sacrificing performance in the IIHS headlight assessment test.

Analysis of ADB systems deployed by the VW Group in existing markets do not warrant the stringency of the final rule for U.S. systems

The preamble states, "ADB systems are available in foreign markets but are not currently offered on vehicles in the United States. This final rule amends FMVSS No. 108 to permit ADB systems on vehicles in the United States and ensure that they operate safely"[10] However, there are no known safety recalls, reported concerns or customer complaints with ADB in the rest of the world which indicates an absence of safety issues with current ADB systems. ADB is offered on hundreds of models and based on a theoretical analysis; this equates to 6 million vehicles and 25 billion kilometers driven per year operating safely without any negative feedback from drivers or other road users.[11] This data speaks to the effectiveness of rest of world and existing industry requirements in providing an ADB system that increases visibility without producing excessive glare and rebuts the necessity of a new set of exceptionally rigorous requirements for the U.S. as dictated in the final rule. Specifically, the transition zone in the final rule unreasonably restricts ADB technologies to comply with a laboratory test that is in addition to track testing. VWGoA encourages NHTSA to align with the SAE RCTF request that is supported by the Auto Innovators to increase the transition zone to 4 degrees and also adopt the 125% lower beam exceedance criteria from SAE J3069 to allow for more reasonable requirements and better harmonization.

[10] Federal Register Vol 87, No. 35 February 22,2022 page 9917

[11] https://www.drivingvisionnews.com/wp-content/uploads/2019/12/S1-1_Audi_workshop0119.pdf