ACM supports NHTSA's proposal to establish more modern headlight regulations but has some additional comments for consideration regarding the specifics of NHTSA's Notice of Proposed Rulemaking (NPRM). The comments that follow were developed as part of the American Center for Mobility IAB Standards Committee's testing efforts. The content does not represent the opinion of any one company on the committee.

The amount of variability in the proposed rule implies many test runs may be needed, and will lead to these ADB systems being developed against different criteria from one company to another, and then being tested and certified at a different facility could yield another set of criteria with the intent of meeting the language as written. It is desirable that the system would recognize all vehicles on the road, but without a representative stimulus being defined by the standard, it could lead to a significant increase in development work by having to test against a wide range of vehicles in each vehicle class. The allowable radius for either the small or medium curve has a range of 60ft (i.e., 320-380), and the allowable radius for the large curve has a range of 200ft (i.e., 1100-1300), which creates variability for any given test scenario. To ensure proper operation, a company would likely have to test at least two radii per curve, leading to increased testing, and making it harder to perform the test at existing facilities. By leaving the specifications more open to interpretation, it adds a significant amount of development and on-track testing to a procedure.

The analysis and comments from IIHS show that when comparing the required field of visibility in each of the three curves for each of the passenger vehicles, light trucks, and heavy trucks there is overlap between these tests. That is, where one stimulus vehicle class could be in the ADB's field of view for the smallest radius test overlaps where the same stimulus vehicle could be for the medium radius test as well. Parts of these areas from each vehicle class also overlap with parts from other stimulus vehicle classes (I.E. A smaller vehicle class at a closer distance overlaps with a larger vehicle class at a farther distance). The variability in the curves' radii, lane width, and median width lead to a wide range of possible locations overall, but with the amount of overlap being so significant, it shows that many portions of the test runs are redundant. Therefore, many of the situations presented in the procedure may not provide additional benefit.

There is also the additional challenge of trying to fit the current test procedure on existing proving grounds facilities. ACM conducted a brief check of a dozen proving grounds between Michigan and Arizona from satellite imagery. We found that while almost all facilities can fit a circle of the smaller radius on their current facility, many would struggle to fit even half a circle of the medium radius (with only one proving ground able to fit the full circle). Only one facility could fit half of a circle at the largest radius, while most others would fit a quarter circle at that size. This creates problems as to how these systems would be tested. For Same Direction Passing test at the larger radius, the vehicles have to travel a third of the way around a circle, meaning most facilities would have to run this in at least two splits. It is more challenging for the Same Direction Same Lane test due to the similar speeds. The vehicles must travel about 60% of the way around the medium radius circle at speed, and then almost 95% of the way around the largest radius circle. That could require running the largest circle in 4-5 splits for most proving grounds.

A potential solution is to follow a similar procedure as the one laid out by SAE J3069, but with an expanded range of fixture locations. It would be more efficient, more cost effective, and we could adjust stimulus fixtures to fit all vehicle classes rather than having numerous stimulus vehicles from any class in the past 5 years. Similarly, it would also be more efficient to have fixture positions for simulating different scenarios rather than having the different radii of curves. Thus, ACM believes it may prove more feasible and efficient for NHTSA's NPRM to allow for only static stimulus vehicle fixtures as long as the same visibility area as that in NHTSA's proposed rule is covered.

As previously stated, IIHS provided data showing overlap throughout the proposed scenarios, which can be seen in Figure 1:

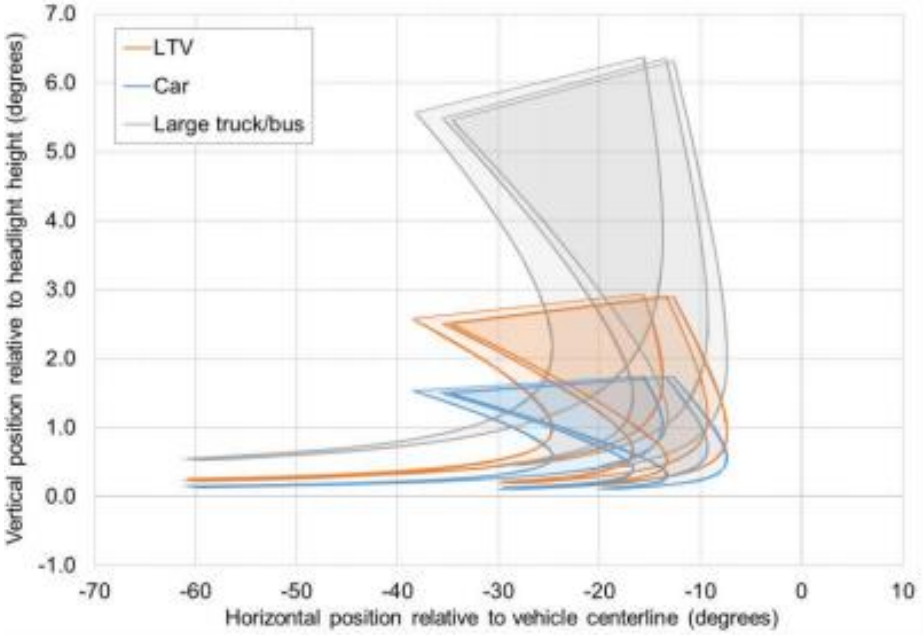

Figure 1: Angular positions of stimulus vehicles relative to the ADB vehicle. This figure shows oncoming stimulus vehicles on a left curve and contains vehicles from every class except motorcycles. It also contains all three different proposed radii of curve. From "IIHS response to NHTSA's NPRM to allow Adaptive Driving Beam (ADB) headlights" Dec 2018

While it shows that most of the total tested area for the proposed scenarios overlaps with at least one other scenario, it also provides ACM with possible angular limits for the positions of the stimulus vehicle relative to the ADB vehicle. Thus, ACM proposes performing modified test scenarios to those specified in SAE J3069 to determine static stimulus positions and orientations that provide data similar to that seen in figure above. This would entail performing straight line scenarios with various stimulus fixture locations. This can be visualized in the in Figure 2 below.

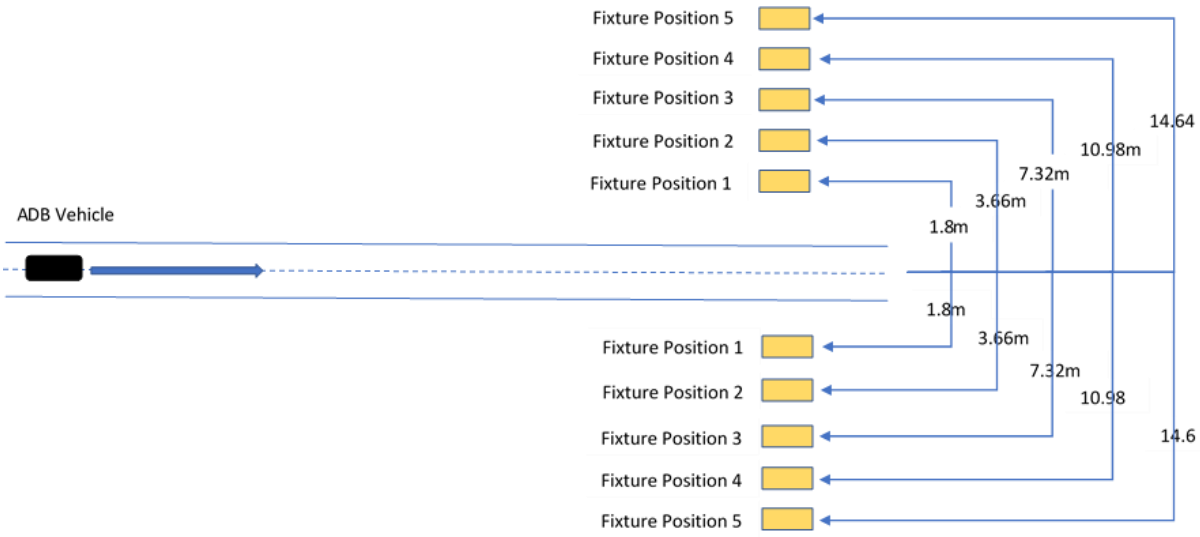

Figure 2: A modified version of SAE J3069 test scenarios, showing a fixture at ½, 1, 2, 3, and 4 lanes lateral offset s to cover a similar field of view as NHTSA's proposed rule.

Based on the charts below, running straight line tests at various lateral offsets can test a much larger field of view than the curved tests currently proposed by NHTSA. Each line represents a straight path parallel to the VUT from 170 meters to 5 meters away, at the listed lateral offset, with each lane being 3.66 meters. The passenger vehicle target eye height was 0.5 meters above the VUT headlights, and the truck target eye height was 1.6 meters above the VUT headlights.

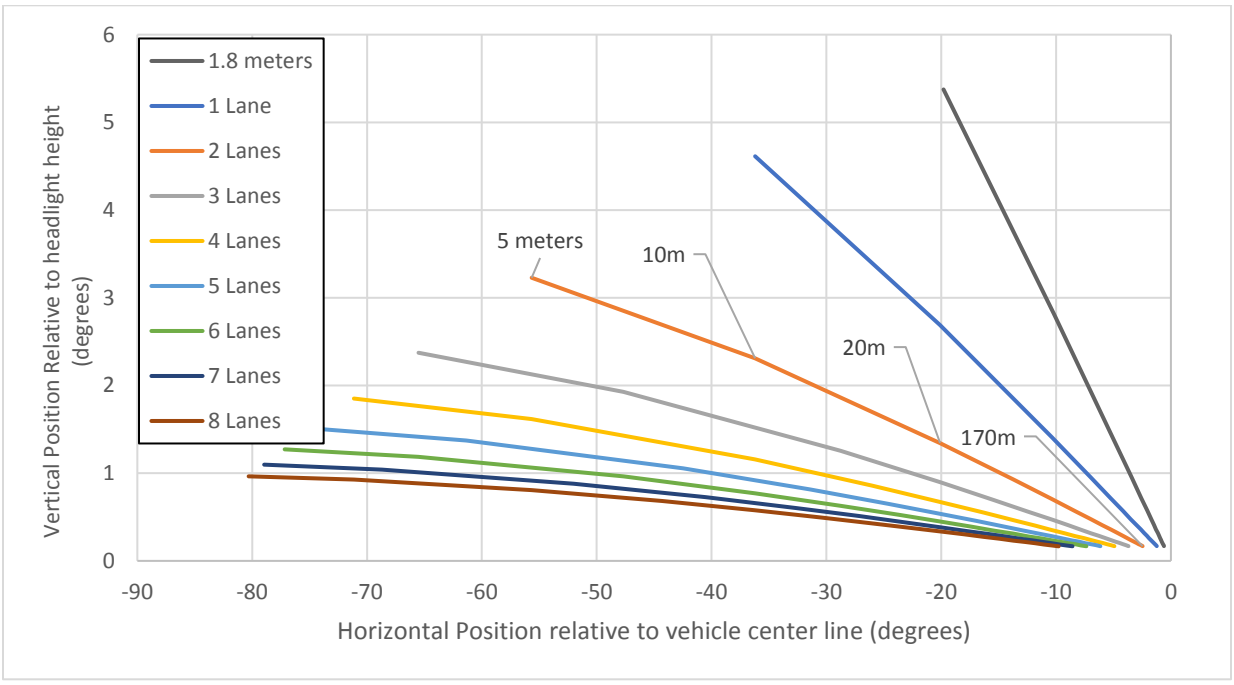

Figure 3: Angular Position of Passenger Vehicle Target Eye relative to VUT at Various Lateral Lane Offsets from 5m to 170m Longitudinally

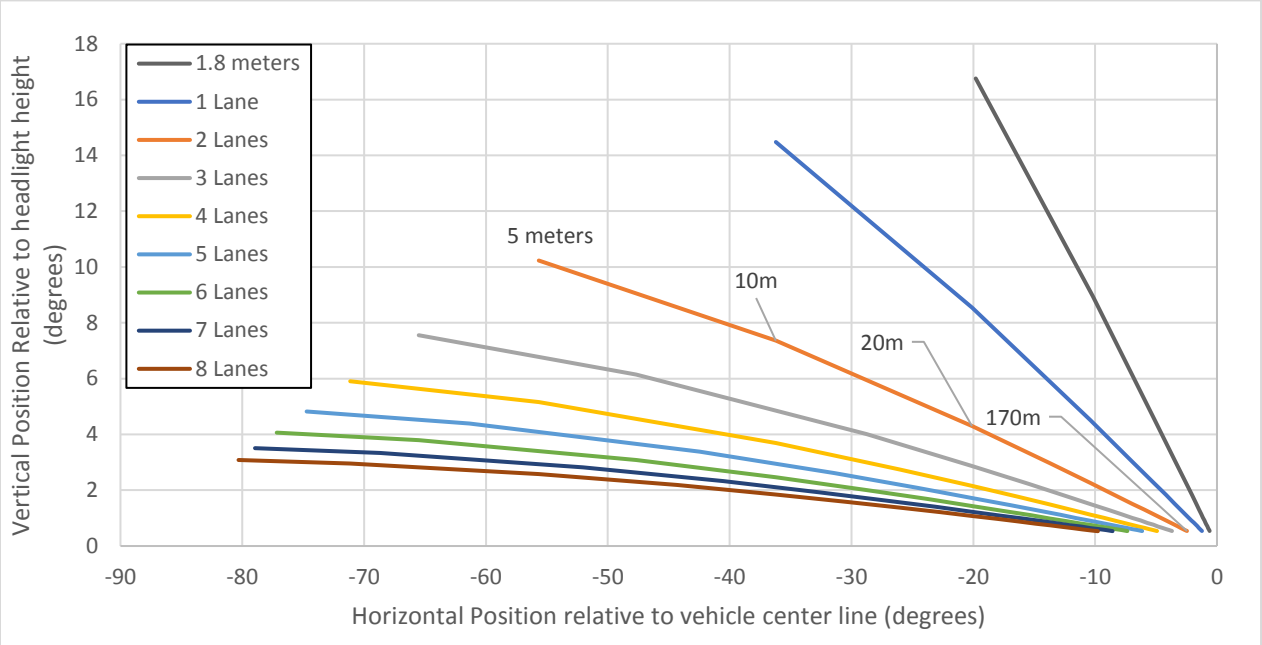

Figure 4: Angular Position of Truck Target Eye relative to VUT at Various Lateral Lane Offsets from 5m to 170m Longitudinally

Plotting the edge cases from Figures 3 and 4 yields Figure 5. The area boxed in green is roughly the area designated by IIHS in their analysis showing the ADB's viewable area being tested. This shows that a series of straight-line tests with varying lateral offsets can cover an even larger viewable area than the curved tests, and so the curved tests could possibly be replaced entirely.

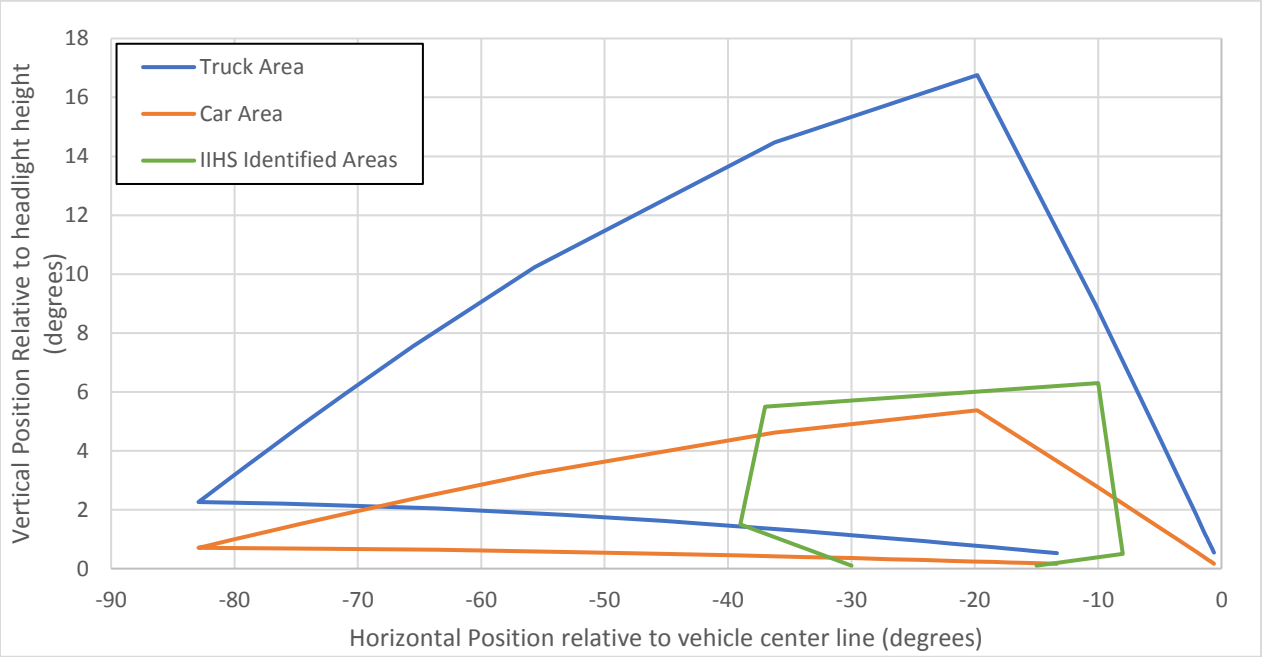

Figure 5: Comparing Total Viewable Area for Trucks and Passenger Cars in Straight Line Tests to Area from NHTSA Curved Test, as Identified by IIHS

ACM acknowledges that the proposed simplification in the test procedure represents a significant departure from the real-world situations that the proposed rule is trying to replicate and test against. ACM also acknowledges that simplifying the test in this manner may result in design work being done to program the system to comply with the test. However, the current proposed rule has variability within the scenarios, scenarios with little extra value, and scenarios that are difficult to test at current proving grounds. It is our intent to continue to encourage the development and adoption of new standards, to increase safety for road users, and provide novel alternatives to improve the repeatability and reliability of test procedures.