Valeo Lighting Systems

April 8, 2022

Administrator
National Traffic Highway Safety Administration
1200 New Jersey Avenue SE.
Washington, DC 20590

Subject: Petition for Reconsideration to Docket No. NHTSA–2022–0013; RIN 2127-AL83; Fed. Reg. Vol. 87, No. 35, February 22, 2022

Dear Sir:

Valeo is a leading global automotive component supplier. Among the components supplied are exterior lighting systems. As such, Valeo has extensive experience developing and supplying ADB systems that are compliant to UNECE requirements. We strongly support the adoption of ADB lighting systems by the United States and we appreciate the issuance of the final rule to amend FMVSS-108 to allow for such systems as we feel these will greatly improve overall traffic safety.

While we fully support the adoption of ADB in the US, and appreciate the effort NHTSA put into crafting the final rule, in reviewing the issued final rule we feel some modifications are needed. As such, Valeo values the opportunity to petition for reconsideration of Docket No. NHTSA-2022-0013.

We believe the following three points are either unreasonable, not practicable or not in the public interest:

- 1 degree transition zone between the areas of reduced and unreduced intensity and the need to meet upper beam minimums in the area of unreduced intensity
- published glare limits for the ADB road/dynamic test
- lamp level laboratory testing

Each of these three points will be addressed individually below.

1 Degree Transition Zone/Upper Beam Minimum Requirements

The design and implementation of the upper beam of most current ADB systems consists of a series of overlapping arrays of light as shown in Figure 1.

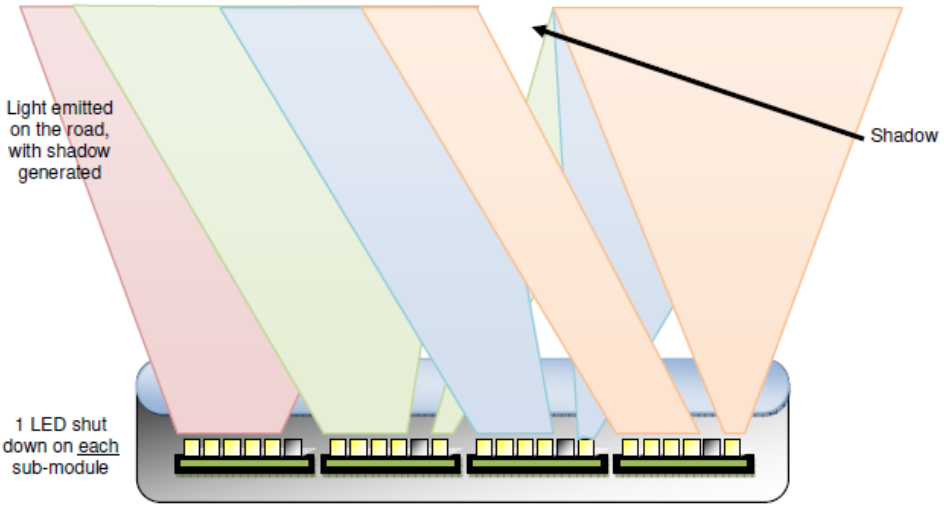


Figure 1

In order to generate an area of reduced intensity individual LEDs from each array of several LEDs are turned off. This results in an ADB beam pattern such as that shown in Figure 2. The pattern generated and the number of LEDs that are turned off or on is dependent on the location of any target vehicle(s) or object(s) inside of what would be the normal upper beam pattern.

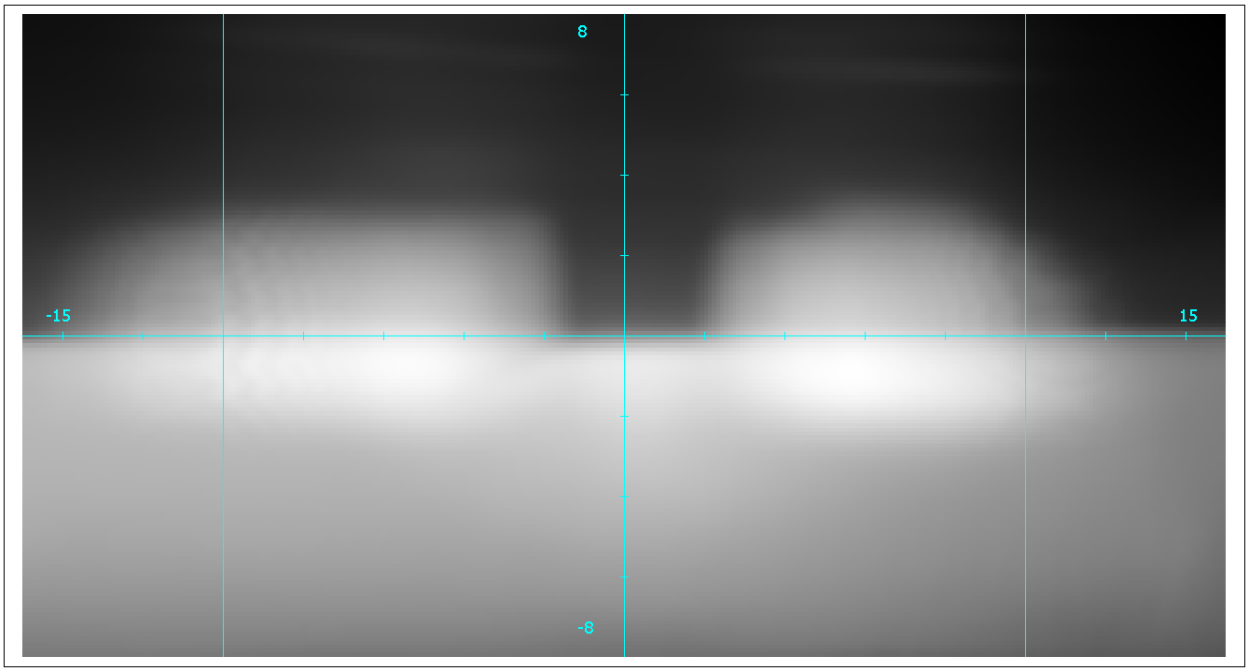


Figure 2

As can be seen in Figure 2 the transition from the area of reduced intensity to the area of unreduced intensity is not instantaneous. To fully transition from the edge of the area of reduced intensity to an area of full intensity in the upper beam portion of the ADB

beam takes at least 4° as shown in Figure 3. This is a light intensity scan of the H-H line from the same lamp shown in Figure 2.

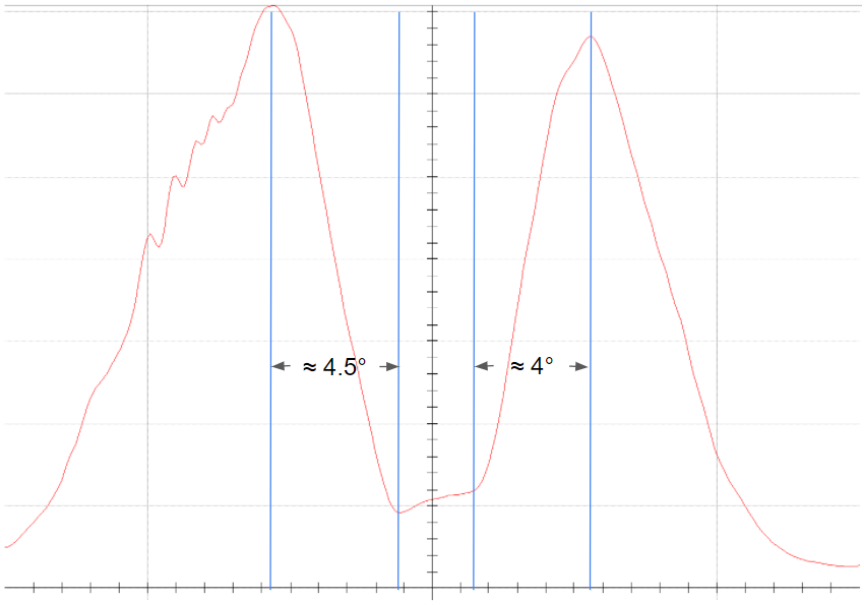


Figure 3

As a result of the above the current requirement of 1° maximum transition zones will result in much larger areas of reduced intensity in order to meet the minimum requirements of the upper beam beam test points in the areas of unreduced intensity. The transition zones would need to be placed so that the closest upper beam test point with minimum values is included inside of the transition zone if these test points do not fall inside the area of reduced intensity.

This is illustrated in the below diagrams comparing the implementation of ADB on a UNECE compliant vehicle and on an FMVSS-108 compliant vehicle.

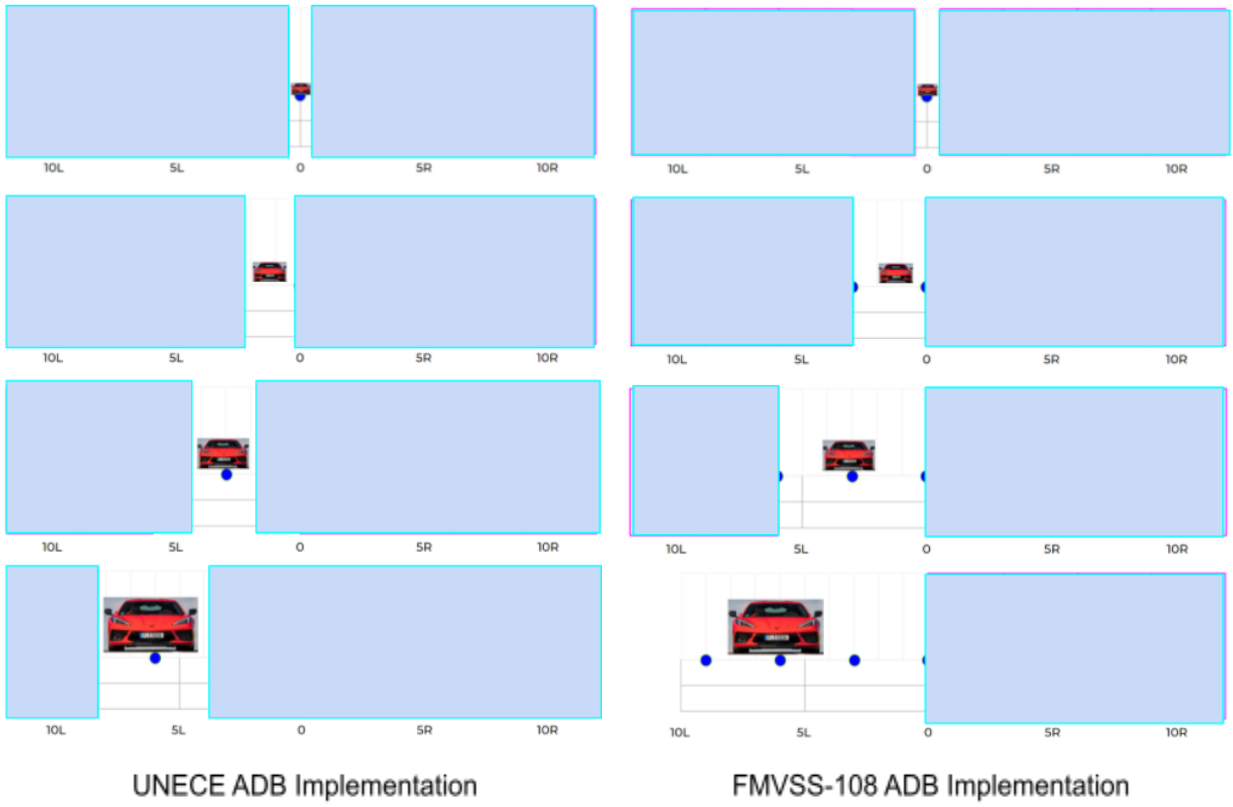


Figure 4

As is illustrated the UNECE implementation results in narrower areas of reduced intensity that closely follow the width of the oncoming vehicle. This results in the full benefit of the ADB system being utilized since as much light as possible is available in the resulting beam pattern without generating any glare toward the oncoming vehicle.

Due to the limitation of the 1° transition zone and having to meet the upper beam photometric requirements throughout the entire area of unreduced intensity the area of reduced intensity is much larger for FMVSS-108 ADB implementation. This results in minimizing the added safety benefit of ADB.

There are multiple places in the preamble of the final rule where the desire not to exceed any upper beam maximums in the areas of unreduced intensity and not exceeding any lower beam maximums in the area of reduced intensity are stated as a key objectives. We support and agree with these objectives. However by limiting the transition zone to a maximum of 1° and including the requirement of meeting all upper beam photometric test points in the area of unreduced intensity these become key design and implementation requirements and will results in the full added safety benefits of ADB not being realized in the United States

In Valeo's opinion the 1° transition zone and the requirement to meet upper beam minimum test points requirements inside the areas of reduced intensity meets all three

criteria for a petition of reconsideration to be granted. Our recommendation would be to change the transition zone maximum width to 4° and/or remove the requirement to meet the upper beam minimums in the area of unreduced intensity while keeping the requirement that no upper beam maximums can be exceeded in this same area. Without these changes approximately 88% of our ADB systems currently on the road in other regulatory markets would not meet the FMVSS-108 requirements and would require significant, and in our opinion unnecessary, design changes to make them compliant.

Road Test Glare Limits

As stated previously Valeo is appreciative of the work the NHTSA has done to craft the ADB final rule and to refine the road test scenarios that are required to demonstrate compliance of the ADB systems. However we feel that even with these modifications most systems as currently configured today would not meet the published glare requirements. As is shown in the NHTSA's own testing as summarized in the document "Adaptive Driving Beam Headlighting Systems Rulemaking Support Testing" which was docketed with the final rule, 2 of the 3 vehicles tested did not meet all of the glare requirements when testing only the standard lower beams of these vehicles.

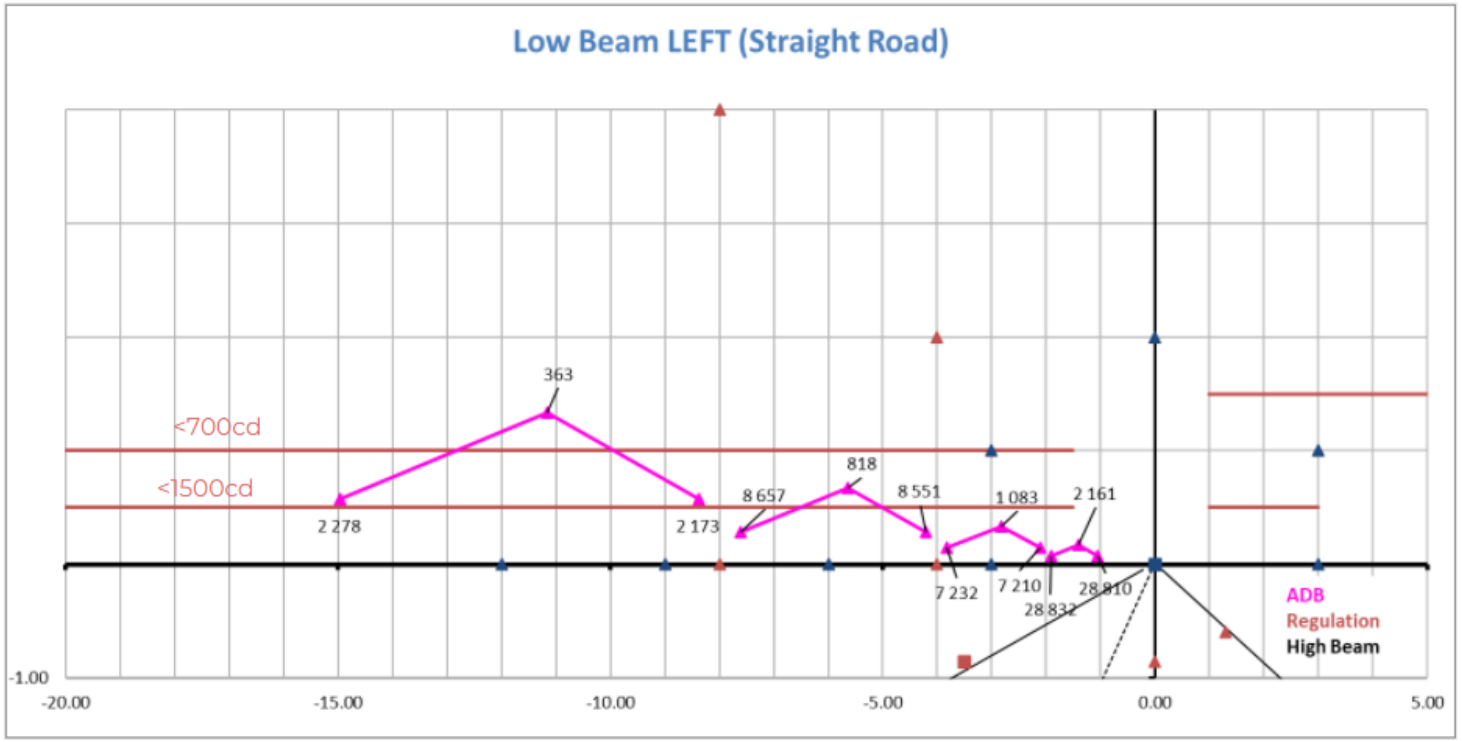
As the issues with the glare requirements for the right hard curve scenarios are well documented and discussed in the preamble to the final rule as well as the SAE Lighting System Group's posted comments to the final rule, we have decided to concentrate our efforts on issues we foresee with the same direction driving scenarios.
Valeo believes that the ADB glare requirements will be difficult to meet even in the same direction driving scenarios contained in the final rule depending on the mounting height of the headlamps. Headlamps that are fully compliant with the current lower beam photometric requirements and mounted within the mounting location requirements will not pass the glare requirements if mounted higher on the vehicle.

Following are three separate analyses completed for the same direction driving scenarios. Figure 5 shows a 750 mm headlamp mounting height, Figure 6 shows a 900 mm mounting height and Figure 7 shows a 1160 mm mounting height. All three figures show the glare requirements at 15m, 30m, 60m and 120m for the driver and passenger outside rearview mirrors and the vehicle driver's eyes photometers on the specified test fixture. Our internal analysis showed these photometers to be the more critical to monitor to ensure overall compliance to the glare requirements. These grouped requirements are shown as small triangles connected by a solid line. The glare requirements shown are the result of dividing the calculated system requirements by 2 to account for each side of the vehicle. These figures show what would be the requirements for the left side headlamp. The figures also show both the lower and upper beam photometric requirements.

Without cosine correction

HL Width	1.100
HL Height	0.750

Straight road : HL@0.75m from ground



Values in cd

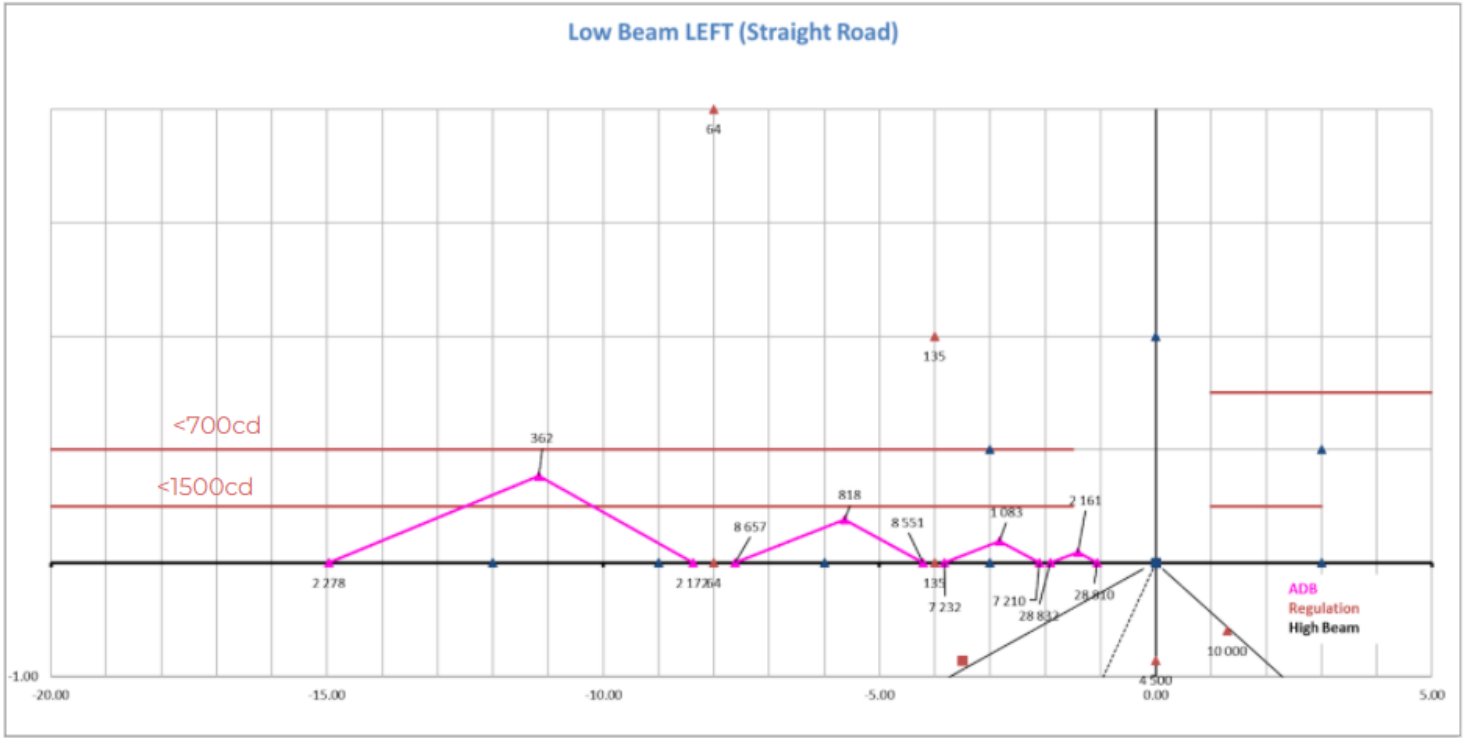
Here is for one side == 50% of the target considered

Figure 5

Without cosine correction

HL Width	1.100
HL Height	0.900

Straight road : HL@0.9m from ground



Values in cd

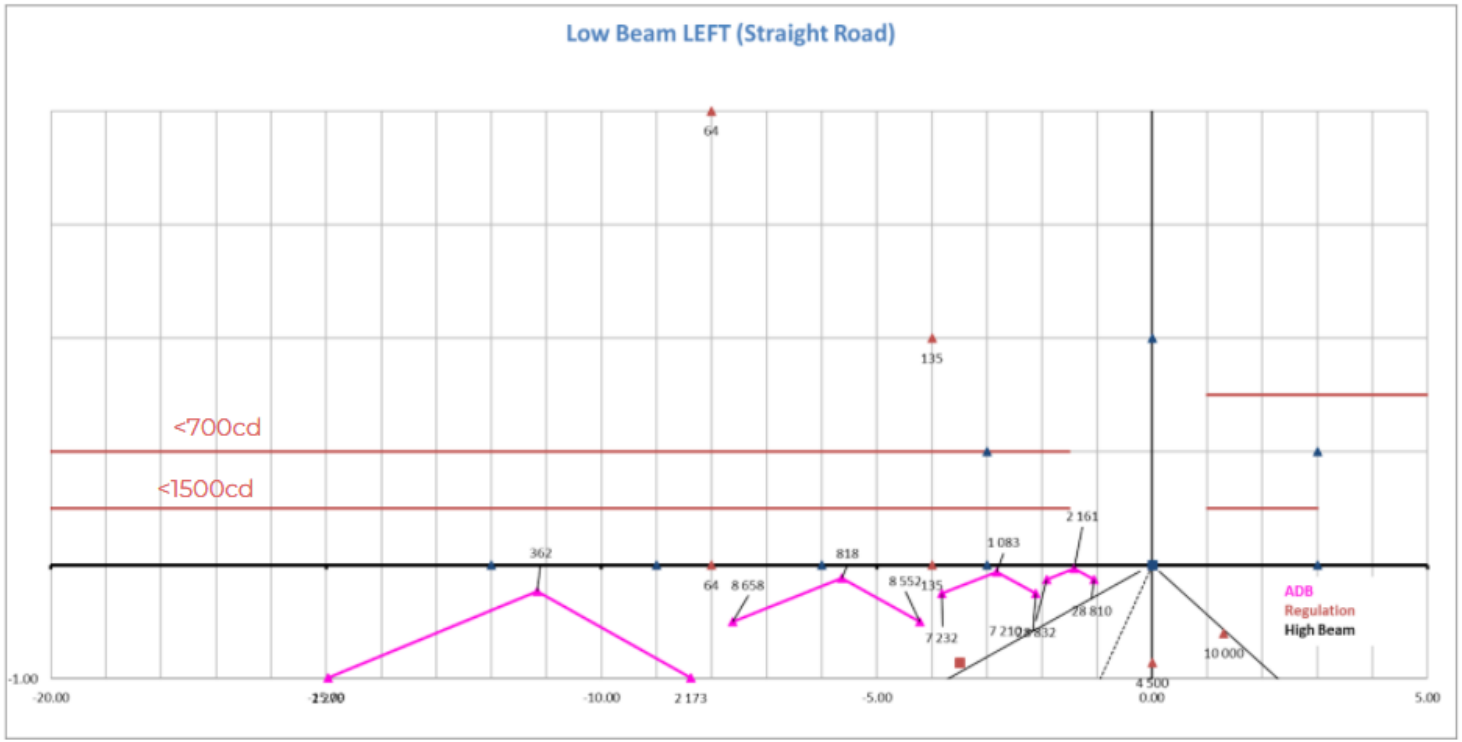
Here is for one side == 50% of the target considered

Figure 6

Without cosine correction

HL Width	1.100
HL Height	1.160

Straight road : HL@1.16m from ground



Values in cd

Here is for one side == 50% of the target considered

Figure 7

As can be seen in these figures as the mounting height of the headlamps increases the glare requirements become more difficult if not impossible to pass. The ADB glare requirements begin to conflict with the lower beam photometric requirements. Per the preamble of the final rule NHTSA acknowledges that there may be issues in complying with the glare requirements but also suggests there may be ways to deal with this including redesigning the lower beam photometric output or as per footnote 100 incorporating dynamic vertical aiming into the headlamp. We do not believe that redesigning the lower beam photometric output would solve this issue. While incorporating dynamic vertical aim may aid in meeting the ADB glare requirements, this would sacrifice the ability to have the benefit of the visibility provided by a traditional lower beam in the area of reduced intensity, as is stated in the preamble as well.

In the rationale for changing the requirements for the right hand curve scenarios it is stated that “accepting some level of glare in such situations - which is already present with current lower beams - is a reasonable tradeoff to ensure adequate visibility for the driver.” We fully agree with this rationale and believe it should be applied to all of the possible ADB driving scenarios.

Valeo believes that the issues discussed above regarding the ADB road test glare requirements meet all three criteria for a petition of reconsideration to be granted. Our recommendation would be to change these glare requirements from mandated fixed values to values that are calculated based on the headlamps being tested. This would include doing a baseline glare measurement of the vehicle’s standard lower beams using the mandated test fixtures and driving scenarios and then repeating the test scenarios with the ADB system activated. The measured glare values with the ADB system activated could not exceed the baseline measurements by more than 25%. This is essentially the same as what is currently described in SAE J3069.

Laboratory Testing

Valeo’s last point of discussion deals with the laboratory testing of the ADB headlamps. No specific test method is defined in S14.2.5 of FMVSS-108 for ADB headlamps and no test method is included in the final rule other than references to S14.2.5. Based on the above it is inferred that all possible ADB configurations (combinations of areas of reduced intensity and areas of unreduced intensity) would need to be checked in some way. The preamble of the final rule states all possible configurations would not necessarily need to be tested, but the manufacturer would need to exercise due care to ensure that all possible configurations comply with the FMVSS-108 requirements.

In order to exercise due care, the supplier would need to have data either from actual testing or simulations that shows all possible configurations meet the requirements. Given the number of ADB configurations that are possible, or that will be possible as technology advances, this could lead to hundreds of hours of tests or simulation activity.

Based on the above Valeo feels this requirement is unreasonable and not practicable. Our recommendation would be to define specific laboratory testing configurations that parallel the vehicle road test scenarios. This would be similar to what is done in the UNECE regulations. In our proposal only lower beam photometric test points in the area of reduced intensity and the upper beam H-V test point (if applicable) in the area of unreduced intensity would be checked. We believe that eleven testing set-ups could be defined for each hand of lamp that would cover most if not all of the possible road test scenarios. It could then be inferred that if the requirements are met using these eleven set-ups then all other possible ADB configurations would be compliant.

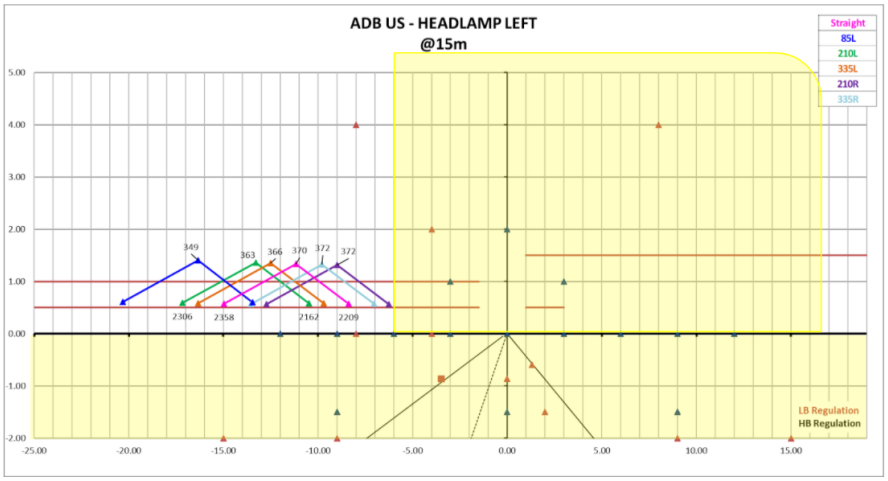


Figure 8

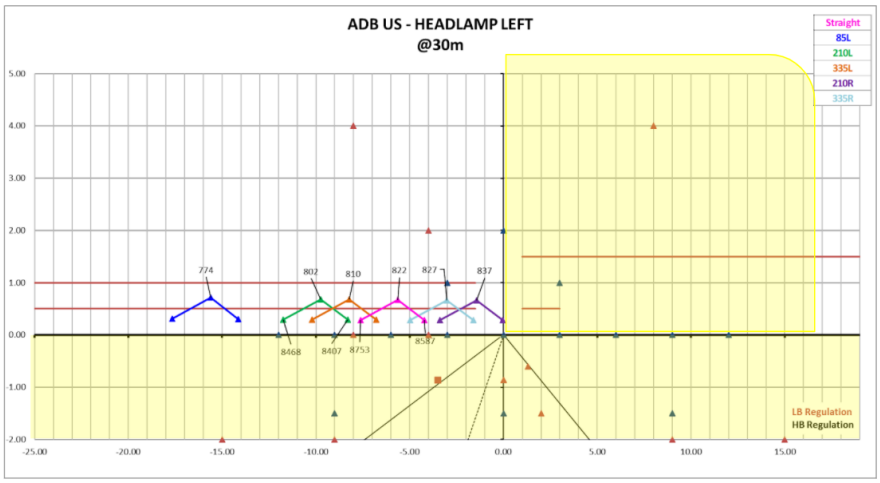


Figure 9

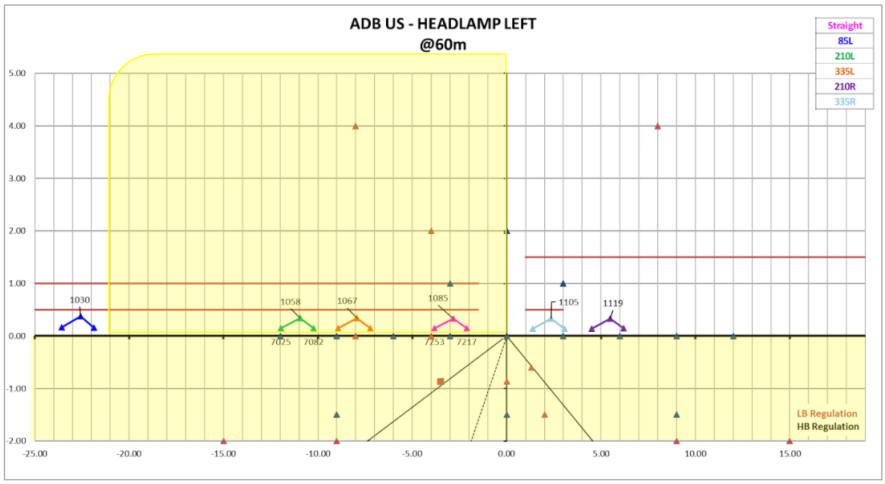


Figure 10a

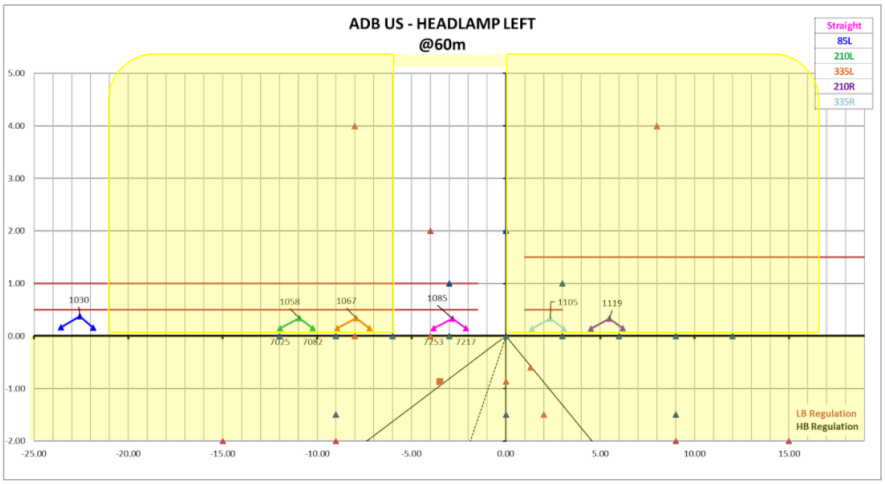


Figure 10b

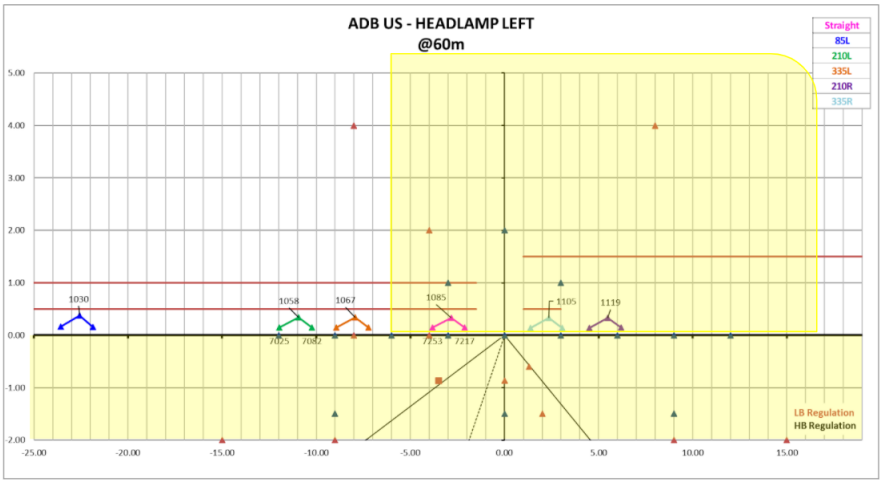


Figure 10c

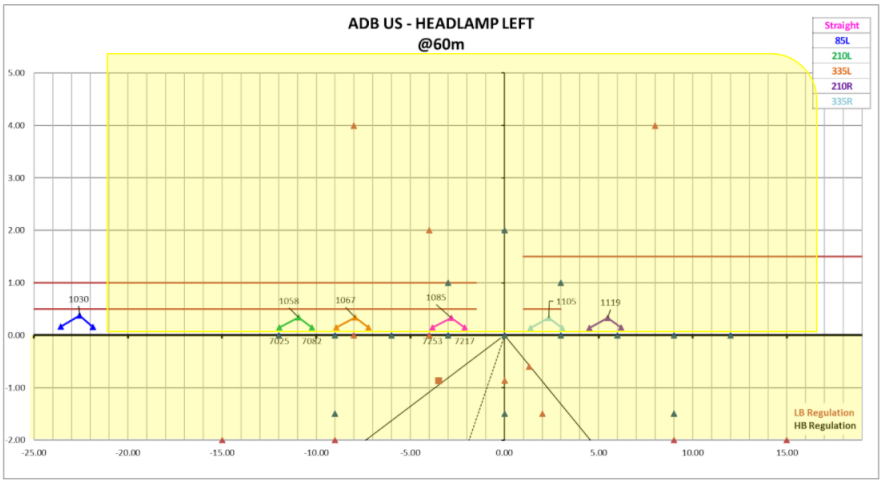


Figure 10d

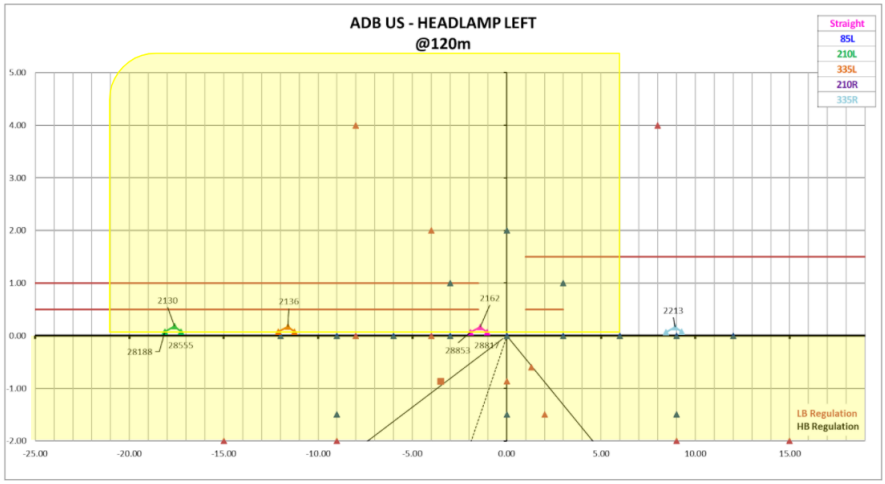


Figure 11a

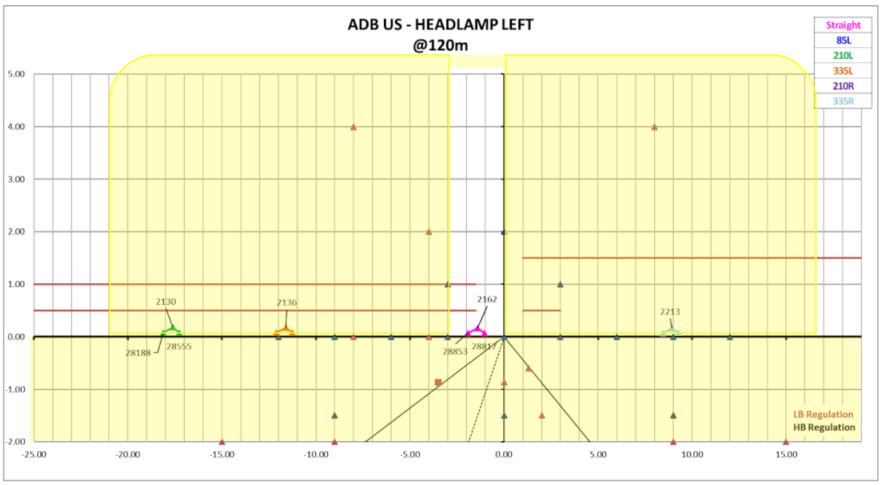


Figure 11b

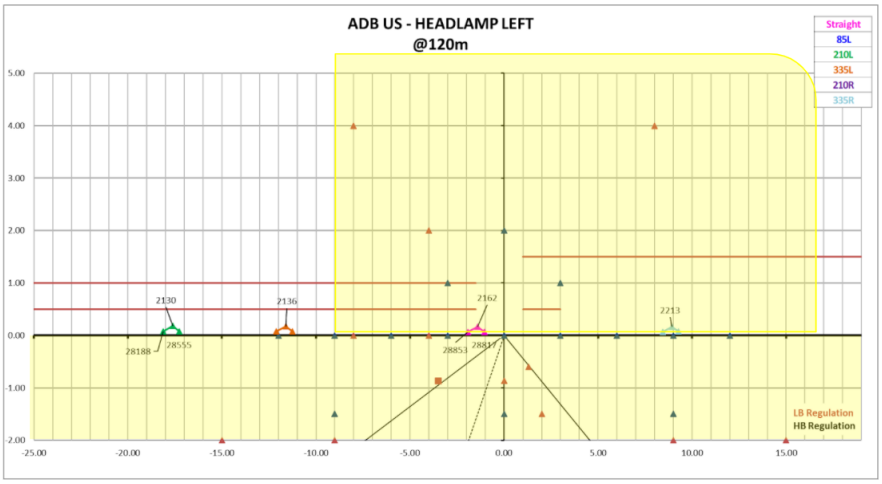


Figure 11c

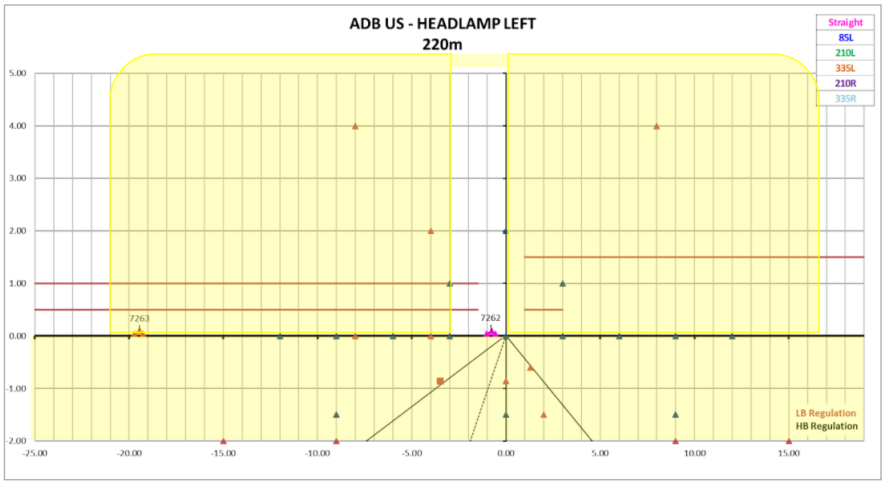


Figure 12a

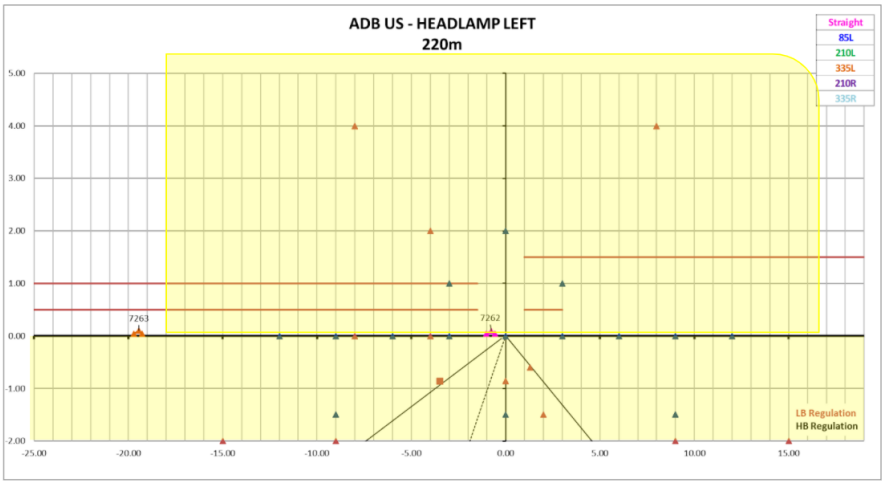


Figure 12b

Each of the figures above shows the proposed laboratory testing set-ups for the different ADB road test scenarios and different photometer distances. Figure 8 shows the proposed testing for 15m; Figure 9 shows the proposal for 30m; Figures 10 show the proposal for 60m; Figures 11 show the proposal for 120m and Figures 12 show the proposal for 220m.

A summary of the proposals for left hand lamps is below:

15m - Figure 8

lower beam test points	upper beam test points
4U-8L	H-V
1U-6L to L	
0.5U - 6L to L	

30m - Figure 9

lower beam test points	upper beam test points
4U-8L	none
2U-4L	
1U-1.5L to L	
0.5U - 1.5L to L	

60m (set-up 1) - Figure 10a

lower beam test points	upper beam test points
4U-8R	none
1.5U-1R to 3R	
1.5U-1R to R	
0.5U-1R to 3R	

60m (set-up 2) - Figure 10b

lower beam test points	upper beam test points
2U-4L	none
1U-1.5L to 6L	
0.5U-1.5L to 6L	

60m (set-up 3) - Figure 10c

same as 15m proposal

60m (set-up 4) - Figure 10d

lower beam test points	upper beam test points
1U-20L to L	H-V
0.5U-20L to L	

120m (set-up 1) - Figure 11a

lower beam test points	upper beam test points
4U-8R	H-V
1.5U-6R to R	

120m (set-up 2) - Figure 11b

lower beam test points	upper beam test points
1U-1.5L to 3L	none
0.5U-1.5L to 3L	

120m (set-up 3) - Figure 11c

lower beam test points	upper beam test points
1U-9L to L	H-V
0.5U-9L to L	

220m (set-up 1) - Figure 12a

same as 120m (set-up 2)

220m (set-up 2) - Figure 12b

lower beam test points	upper beam test points
1U-18L to L	H-V
0.5U - 18L to L	

The above recommendations are based on a first analysis of the requirements. Adjustments could be made to the left and right hand extents depending on the location of the transitions zones and how the ADB beam is constructed. The set-ups for right hand lamps would be similar but may vary slightly.

As stated in the beginning of this document, Valeo fully supports the adoption of ADB in the United States. We would like FMVSS-108 to allow for the full benefits of this safety feature and feel that the above recommendations would allow for this. ADB has been on the roads in other regulatory markets for many years and we see no reason why these same systems, with FMVSS-108 compliant lower and upper beams should not be allowed on the road as soon as possible.

Respectfully submitted on behalf of Valeo Lighting Systems

Eric Blusseau
Regulations Manager
Valeo Lighting Systems

Mark Verplank
Regulations Manager
Valeo North America