EUROPEAN NEW CAR ASSESSMENT PROGRAMME (Euro NCAP)

ASSESSMENT PROTOCOL – VULNERABLE ROAD USER PROTECTION

Version 11.0
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ASSESSMENT PROTOCOL – PEDESTRIAN PROTECTION

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INTRODUCTION

Important changes have been made to the Euro NCAP ratings resulting in the introduction of the overall rating scheme. Individual documents are released for the four main areas of assessment:

- Assessment Protocol – Adult Occupant Protection.
- Assessment Protocol – Child Occupant Protection.
- Assessment Protocol – Vulnerable Road User Protection.
- Assessment Protocol – Safety Assist.

In addition to these four assessment protocols, a separate document is provided describing the method and criteria by which the overall safety rating is calculated on the basis of the car performance in each of the above areas of assessment.

The following protocol deals with the assessments made in the area of vulnerable road user protection (VRU), in particular in the impact zones for the headform, upper legform, aPLI and AEB/LSS VRU.

METHOD OF ASSESSMENT

The assessment of VRU protection is combination of impact tests and AEB/LSS tests.

For the impact tests, consisting of headform, upper legform, aPLI impacts, a grid will be marked on the outer surface of the vehicle for all of the impact zones. Euro NCAP will test a number of grid points and manufacturers may nominate an additional number of tests to be performed, which will also be included in the assessment.

The vehicle manufacturer is required to provide the Euro NCAP Secretariat with data detailing the protection offered by the vehicle at all grid locations. The data shall be provided to the Euro NCAP Secretariat before any test preparation begins. The predicted level of protection offered by the vehicle is verified by Euro NCAP by means of testing of a sample of randomly selected grid-points, the overall prediction is then corrected accordingly.

For AEB/LSS testing, the vehicle manufacturer is also required to provide the Euro NCAP with data detailing the expected performance of the AEB/LSS VRU system for all test scenarios. The expected performance will be used to as a reference to identify discrepancies between the expected results and the test results.

Points Calculation

For the legform impact areas, a sliding scale system of points scoring has been used to calculate points based on each measured criterion. This involves two limits for each parameter, a more demanding limit (higher performance), below which a maximum score is obtained and a less demanding limit (lower performance), beyond which no points are scored. Where a value falls between the two limits, the score is calculated by linear interpolation. No capping is applied to any of the measurements.

For the headform impact area, the protection predicted by the vehicle manufacturer will be compared to the outcome of the randomly selected test locations. The results at those test locations will be used to generate a correction factor, which will then be applied to the predicted score. Only data that results in a correction factor of between 0.850 and 1.150 are accepted. Where this is not the case, the cause will be investigated and the Secretariat will subsequently decide how to proceed. Where the data are accepted, the headform score will be based on the predicted data score with correction applied.

For most AEB scenarios, a stepped sliding scale using colour bands based on the speed reduction is applied. Other AEB and LSS scenarios are are assessed as pass/fail only.

PART I

PEDESTRIAN & CYCLIST IMPACT ASSESSMENT

1 PEDESTRIAN & CYCLIST IMPACT ASSESSMENT

1.1 Criteria and Limit Values

The assessment criteria used for the pedestrian and cyclist impact tests are summarised below along with the upper and lower performance limits for each parameter. Where multiple criteria exist for an individual test, the lowest scoring parameter is used to determine the performance of that test, unless indicated otherwise.

1.1.1 Headform

The manufacturer must provide predicted data for all grid points. This data shall be expressed as a colour according to the corresponding colour boundaries for the predicted HIC_{15} performance below. Alternatively, HIC_{15} values may be provided.

Green	$HIC_{15} < 650$
Yellow	$650 \leq HIC_{15} < 1000$
Orange	$1000 \leq HIC_{15} < 1350$
Brown	$1350 \leq HIC_{15} < 1700$
Red	$1700 \leq HIC_{15}$

The manufacturer is allowed to colour a limited number of grid points blue where the performance is unpredictable. These grid points will always be tested. The procedure is detailed in the Pedestrian Protection Test protocol.

1.1.2 Upper Legform

Higher performance limit

Sum of forces	5.0kN

Lower performance limit

Sum of forces	6.0kN

1.1.3 aPLI

Higher performance limit

Femur Bending Moment	390Nm
Tibia Bending Moment	275Nm
MCL Elongation	27mm

Lower performance limit

Femur Bending Moment	440Nm
Tibia Bending Moment	320Nm
MCL Elongation	32mm

1.2 Modifiers

There are no modifiers applied.

1.3 Scoring & Visualisation

1.3.1 Scoring

A maximum of 18 points are available for the headform test zone (cyclist, adult and child/small adult). The total score for all grid points is calculated as a percentage of the maximum achievable score, which is then multiplied by 18 points. The pelvis and femur will both be awarded a maximum of 4.5 points and the knee/tibia will be awarded a maximum of 9 points. A total of 36 points are available in the passive VRU protection assessment.

1.3.1.1 **Headform**

Each of the grid points can be awarded up to one point, resulting in a maximum total amount of points equal to the number of grid points. For each predicted colour the following points are awarded to the grid point:

$HIC_{15} < 650$	*1.00 point*
$650 \leq HIC_{15} < 1000$	*0.75 points*
$1000 \leq HIC_{15} < 1350$	*0.50 points*
$1350 \leq HIC_{15} < 1700$	*0.25 points*
$1700 \leq HIC_{15}$	*0.00 points*

1.3.2 Headform Correction factor

The data provided by the manufacturer is scaled using a correction factor, which is calculated based on any differences between predicted data and the verification tests performed. The verification points are randomly selected and distributed in line with the predicted colour distribution.

The actual tested total score of the verification test points is divided by the predicted total score of these verification test points. This is called the correction factor, which can be lower or higher than 1.

$$Correction\ Factor = \frac{Actual\ tested\ score}{Predicted\ score}$$

The correction factor is multiplied by the predicted score of all the grid points (excluding defaulted and blue points). The final score for the vehicle can never exceed 100% regardless of the correction factor.

1.3.2.1 **HIC tolerance**

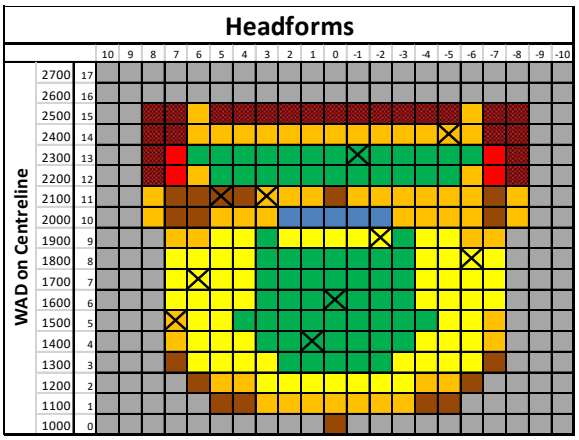
As test results can be variable between labs and in-house tests and/or simulations, a 10% tolerance to the HIC value of the verification test is applied. The tolerance is applied in both directions, meaning that when a tested point scores better than predicted, but within tolerance, the predicted result is applied. The tolerance only applies to verify whether the predicted colour of the tested verification point is correct. When, including tolerance, the colour is not in line with the prediction, the true colour of the test point will be determined by comparing the actual measured HIC value with the colour band in section 1.3.1.1 without applying a tolerance to the HIC value.

Prediction	***HIC_{15} range***	***Accepted HIC_{15} range***
Green	$HIC_{15} < 650$	$HIC_{15} < 722.22$
Yellow	$650 \leq HIC_{15} < 1000$	$590.91 \leq HIC_{15} < 1111.11$
Orange	$1000 \leq HIC_{15} < 1350$	$909.09 \leq HIC_{15} < 1500.00$
Brown	$1350 \leq HIC_{15} < 1700$	$1227.27 \leq HIC_{15} < 1888.89$
Red	$1700 \leq HIC_{15}$	$1545.45 \leq HIC_{15}$

1.3.2.2 **Example:**

Headform testing:

Manufacturer X has provided the following prediction to Euro NCAP with a total score of 144 points (excluding blue) out of the possible 232 points:



The prediction consists of the following:

68 Green	*x 1.00 =*	*68.00*
58 Yellow	*x 0.75 =*	*43.50*
56 Orange	*x 0.50 =*	*28.00*
18 Brown	*x 0.25 =*	*4.50*
4 Red	*x 0.00 =*	*0.00*
23 Default Red	*x 0.00 =*	*0.00*
5 Blue		
232 grid points		***144.00 points***

10 verification points were chosen for testing:

VERIFICATION								
Testpoint	Prediction	Value	Points		Testpoint	Prediction	Value	Points
11,+3		1558.20	0.250					
8,-6		705.40	0.750					
7,+6		921.70	0.750					
13,-1		800.50	0.750					
6,0		350.10	1.000					
5,+7		1010.50	0.500					
4,+1		550.80	1.000					
14,-5		958.20	0.500					
9,-2		805.70	0.750					
11,+5		1432.30	0.250					
Total	7.000		6.500		**Total**	0.000		0.000

Correction factor	0.929

$$Correction\ Factor = \frac{Actual\ tested\ score}{Predicted\ score} = \frac{6.50}{7.00} = 0.929$$

3 Blue zones were tested containing 5 blue points:

BLUE POINTS								
Zone	GRID-point	Value	Points		Zone	GRID-point	Value	Points
1	10,2	998.5	0.75		5			
	10,1		0.75					
2	10,0	1650.2	0.25		6			
	10,-1		0.25					
3	10,-2	1399.6	0.25		7			
4					8			
Total blue points							2.250	

The final score will be:

204 Predicted	*144.00 x 0.929 = 133.776*
23 Default Red	*0.000*
5 Blue	*2.250*
232 grid points	***136.026 points***

The score in terms of percentage of the maximum achievable score is 136.026/232 = 58.632%
The final headform score out of a maximum of 18 points is 58.632% x 18 = **10.554 points**

1.3.2.3 **Upper Legform - Pelvis**

Each of the grid points can be awarded up to one point resulting in a maximum total of points equal to the number of grid points. A linear sliding scale is applied between the relevant limits of each parameter. The upper legform performance for each grid point is based upon the worst performing parameter.

The total score for the upper legform area will be calculated out of 4.5 points by scaling the sum of grid points score by the relevant number of grid points.

Example:
For a vehicle that has 9 grid points and tests are performed to points U0, U-2 & U-4 with the following results:

Test result U0	**Score**	**Total**
Femur sum of forces = 5.26kN	0.740	**0.740**

Test result U-2	**Score**	**Total**
Femur sum of forces = 6.80kN	0.000	**0.000**

Test result U-4	**Score**	**Total**
Femur sum of forces = 4.89kN	1.000	**1.000**

Grid points that have not been tested will be awarded the worst result from one of the adjacent points. Given that U-1 and U-3 have not been tested, both will be awarded the result from the adjacent point U-2. Symmetry will also be applied to all grid points on the opposite side of the vehicle (U+1 to U+4).

U+4	U+3	U+2	U+1	U0	U-1	U-2	U-3	U-4
1.000	0.0	0.0	0.0	0.740	0.0	0.0	0.0	1.000

The score for each individual grid point is then summed, this produces a score in terms of the maximum achievable percentage of 2.740/9 = 30.444%
The final upper legform score is 30.444% x 4.5 = **1.370 points**

1.3.2.4 **aPLI**

Each of the grid points can be awarded up to one point resulting in a maximum total of points equal to the number of grid points. A linear sliding scale is applied between the relevant limits of the three parameters. The femur performance for each grid point is based upon the worst performing femur bending moment. The knee and tibia performance is based upon the lowest of the two individual assessment parameters (MCL and maximum tibia bending moment).

The total score for the femur will be calculated out of 4.5 and for the knee/tibia it will be out of 9 points. The sum of grid points scores will then be scaled down by the relevant number of grid points for each of those two regions.

Example:
For a vehicle that has 11 bumper test zone grid points and tests are performed to points L1, L+3 & L+5 with the following results:

Femur

Test result L+1		**Score**	**Total**
Max Femur Bending Moment = 400Nm		0.800	**0.800**
Test result L+3		**Score**	**Total**
Max Femur Bending Moment = 438Nm		0.040	**0.040**
Test result L+5		**Score**	**Total**
Max Femur Bending Moment = 385Nm		1.000	**1.000**

Knee & Tibia

Test result L+1		**Score**	**Total**
Tibia Bending Moment	= 257Nm	1.000	1.000
MCL Elongation	= 20mm	1.000	
Test result L+3		**Score**	**Total**
Tibia Bending Moment	= 300Nm	0.444	0.444
MCL Elongation	= 29mm	0.600	
Test result L+5		**Score**	**Total**
Tibia Bending Moment	= 225Nm	1.000	
MCL Elongation	= 36mm	0.000	0.000

Grid points that have not been tested will be awarded the worst result from one of the adjacent points. Given that L0, L+2 & L+4 have not been tested, L0 will be awarded the score from L+1, L+2 will be awarded the score from L+3 and L+4 will be awarded the score from L+5. Symmetry will also be applied to the other side of the vehicle.

Femur

L+5	L+4	L+3	L+2	L+1	L0	L-1	L-2	L-3	L-4	L-5
1.000	0.040	0.040	0.040	0.800	0.800	0.800	0.040	0.040	0.040	1.000

The score for each individual grid point is then summed, this produces a score in terms of the maximum achievable percentage of 4.640/11 = 42.182%
The final Femur score is 42.182% x 4.5 = **1.898 points**

Knee/tibia

L+5	L+4	L+3	L+2	L+1	L0	L-1	L-2	L-3	L-4	L-5
0.000	0.000	0.444	0.444	1.000	1.000	1.000	0.444	0.444	0.000	0.000

The score for each individual grid point is then summed, this produces a score in terms of the maximum achievable percentage of 4.776/11 = 43.418%
The final knee/tibia score is 43.418% x 9 = **3.908 points**

1.3.3 Visualisation of results

1.3.3.1 **Headform results**

The protection provided by each grid location is illustrated by a coloured area, on an outline of the front of the car. Where no grid is used in the assessment and the fallback scenario is adopted, the same 5 colour boundaries and HIC650 – HIC 1700 values will be applied. The headform performance boundaries are detailed below.

Green	$HIC_{15} < 650$
Yellow	$650 \leq HIC_{15} < 1000$
Orange	$1000 \leq HIC_{15} < 1350$
Brown	$1350 \leq HIC_{15} < 1700$
Red	$1700 \leq HIC_{15}$

1.3.3.2 **aPLI & upper legform results**

The protection provided by each grid location is illustrated by a coloured point on an outline of the front of the car. The colour used is based on the points awarded for that test site (rounded to three decimal places), as follows:

Green	*grid point score = 1.000*
Yellow	*0.750 <= grid point score < 1.000*
Orange	*0.500 <= grid point score < 0.750*
Brown	*0.001 <= grid point score < 0.500*
Red	*0.000 <= grid point score*

PART II

VULNERABLE ROAD USER (VRU) AEB & LSS ASSESSMENT

1 ASSESSMENT OF AEB & LSS VULNERABLE ROAD USER SYSTEMS

1.1 Introduction

AEB & LSS Vulnerable Road User (VRU) systems are systems that are designed to brake or steer autonomously for vulnerable road user's like: pedestrians, cyclists and/or powered two wheelers. For the assessment of AEB & LSS VRU systems, three areas of assessment are considered; AEB Pedestrian, AEB Bicyclist and AEB & LSS Powered Two Wheelers, which are assessed in different scenarios.

1.2 Definitions

Throughout this protocol the following terms are used:

Autonomous Emergency Braking (AEB) – braking that is applied automatically by the vehicle in response to the detection of a likely collision to reduce the vehicle speed and potentially avoid the collision.

Forward Collision Warning (FCW) – an audiovisual warning that is provided automatically by the vehicle in response to the detection of a likely collision to alert the driver.

Emergency Steering Support (ESS) – a system that supports the driver steering input in response to the detection of a likely collision to alter the vehicle path and potentially avoid a collision.

Vehicle width – the widest point of the vehicle ignoring the rear-view mirrors, side marker lamps, tyre pressure indicators, direction indicator lamps, position lamps, flexible mud-guards and the deflected part of the tyre side-walls immediately above the point of contact with the ground.

Car-to-Pedestrian – a collision between a vehicle and an adult or child pedestrian in its path, when no braking and/or steering action is applied.

Car-to-Bicyclist – a collision between a vehicle and an adult bicyclist in its path, when no braking and/or steering is applied.

Car-to-Bicyclist Dooring Adult (CBDA) – a collision between the vehicle's door and a bicyclist traveling alongside the parked vehicle.

Car-to-Motorcyclist – a collision between a vehicle and a motorcyclist in its path, when no braking and/or steering is applied.

Vehicle under test (VUT) – means the vehicle tested according to this protocol with a pre-crash collision mitigation or avoidance system on board.

Euro NCAP Pedestrian Target (EPTa) – means the adult pedestrian target used in this protocol as specified in the ISO 19206-2:2018

Euro NCAP Child Target (EPTc) – means the child pedestrian target used in this protocol as specified in the ISO 19206-2:2018

Euro NCAP Bicyclist Target (EBT) – means the bicyclist and bike target used in this protocol as specified in the ISO 19206-4:2020

Euro NCAP Motorcyclist Target (EMT) – means the Motorcyclist target used in this protocol as specified in the deliverable D2.1 of the MUSE project (Fritz and Wimmer 2019) which at time of publication is to be replaced with ISO 19206-5.

Time To Collision (TTC) – means the remaining time before the VUT strikes the EPT, assuming that the VUT and EPT would continue to travel with the speed it is travelling.

T_{AEB} – means the time where the AEB system activates. Activation time is determined by identifying the last data point where the filtered acceleration signal is below -1 m/s^2, and then going back to the point in time where the acceleration first crossed -0.3 m/s^2

T_{FCW} – means the time where the audible warning of the FCW starts. The starting point is determined by audible recognition.

Vimpact – means the speed at which the profiled line around the front end of the VUT coincides with the virtual box around the EPTa, EPTc, EBT and EMT.

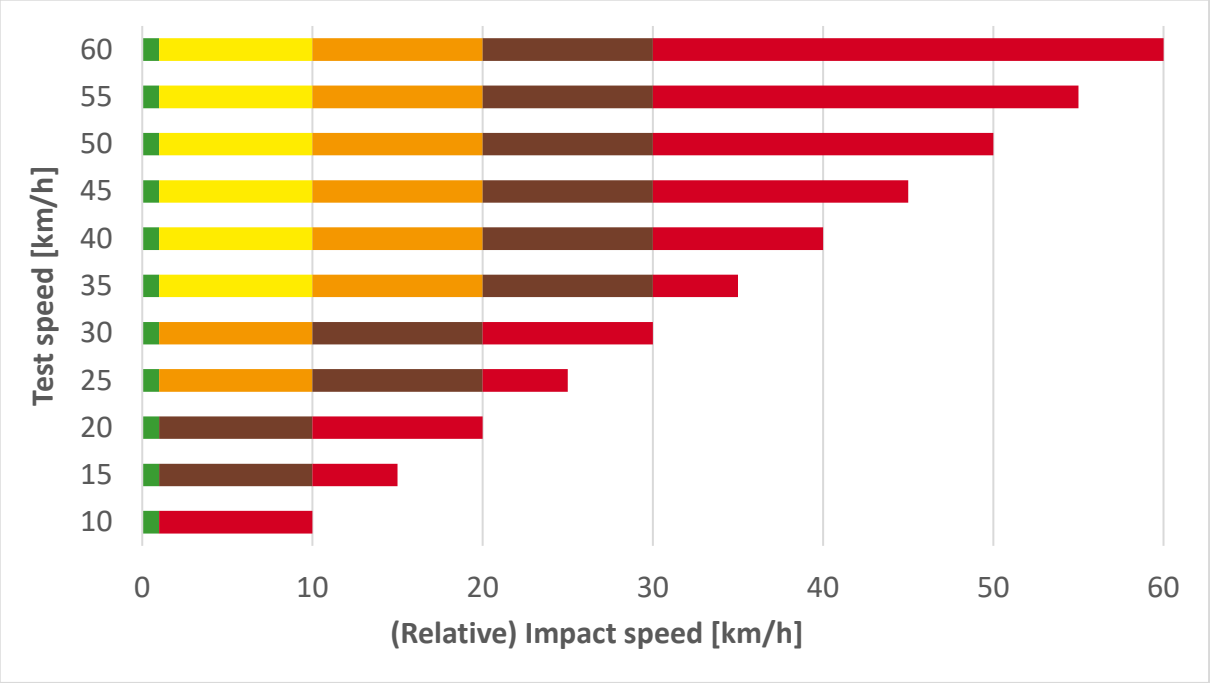
1.3 Criteria and Scoring

To be eligible for scoring points in AEB and/or LSS VRU:

- The vehicles must score 18 or more points in the subsystem tests, i.e. the sum of Headform, Upper Legform & Lower Legform scores.
- Must be default ON at the start of every journey. It may not be possible to switch off the system with a momentary single push on a button.
- For AEB Pedestrian, must operate (i.e. warn or brake) from speeds of 10 km/h in the CPNA-75 scenario in both day and night. In addition, the system must be able to detect pedestrians walking as slow as 3 km/h and reduce speed in the CPNA-75 scenario at 20 km/h, also for both day and night.
- The AEB systems may also not automatically switch off at a speed below 80 km/h.
- Additionally, for CPRA/CPRC the system may not release the brakes after an intervention, unless the threat (EPT) has left the vehicle path or in case of a positive action by the driver.
  When the VUT is fitted as standard with a rear-view camera, the brakes may be release after 1.5s or longer after the AEB intervention.

1.3.1 Assessment Criteria

For the AEB system tests (except for CPTA, CPRA/CPRC, CBTA & CBDA), the assessment criteria used is the (relative) impact speed. For CMRb scenarios, the relative test speed is assumed equal to the initial test speed.
The (relative) impact speed is then given a colour based on the relative test speed as defined in the graph below:



For other AEB and LSS tests, points are awarded on a pass/fail basis based on full avoidance for each test speed.
In CPRA-s/CPRC-s this means that there must be avoided for all three overlaps per test speed to be assessed as a pass.
For CMoncoming and CMovertaking, all tests within the scenario need to be a pass.

For the FCW system tests in the longitudinal scenarios, the assessment criteria used is the Time-To-Collision (TTC). The available points per test speed are awarded when the warning is issued at a TTC >= 1.70s.
Alternatively, when the FCW issued at a TTC < 1.70s in the CPLA-25 and CBLA-25 scenarios, the manufacturer has the option to demonstrate to Euro NCAP that their ESS system will provide the appropriate support to avoid the collision by steering to have the available points awarded.

1.3.2 AEB Pedestrian

A maximum of 9 points is available for AEB Pedestrian, 6 points for daytime performance (all scenarios) and 3 points for performance at night conditions (CPFA, CPNA, CPNC and CPLA). For each scenario a normalised score is calculated and multiplied with the available points for that specific scenario.

For each predicted colour the following scaling is applied to the colourband, which is then multiplied by the points available for the test speed:

Green	*1.000*
Yellow	*0.750*
Orange	*0.500*
Brown	*0.250*
Red	*0.000*

The following points are available for the different test speeds in each AEB Pedestrian scenario for both day and night conditions:

Test speed	Daytime												Nighttime					
	CPFA	CPNA		CPNC	CPLA		CPTA				CPRA/CPRC		CPFA	CPNA		CPNC	CPLA	
	50%	25%	75%	50%	50%	25%	Opposite direction		Same direction		Stationary	Moving	50%	25%	75%	50%	50%	25%
							Farside	Nearside	Farside	Nearside								
4 km/h											1.000	1.000						
8 km/h											1.000	1.000						
10 km/h	1.000	1.000	1.000	1.000			1.000	1.000	1.000	1.000			1.000	1.000	1.000	1.000		
15 km/h	1.000	1.000	1.000	1.000			1.000		1.000				1.000	1.000	1.000	1.000		
20 km/h	1.000	1.000	1.000	1.000	1.000		1.000		1.000				1.000	1.000	1.000	1.000	1.000	
25 km/h	1.000	1.000	1.000	1.000	1.000								1.000	1.000	1.000	1.000	1.000	
30 km/h	2.000	2.000	2.000	2.000	1.000								1.000	1.000	1.000	1.000	1.000	
35 km/h	3.000	3.000	3.000	3.000	2.000								2.000	2.000	2.000	2.000	2.000	
40 km/h	3.000	3.000	3.000	3.000	2.000								2.000	2.000	2.000	2.000	2.000	
45 km/h	3.000	3.000	3.000	3.000	3.000								3.000	3.000	3.000	3.000	3.000	
50 km/h	2.000	2.000	2.000	2.000	3.000	3.000							3.000	3.000	3.000	3.000	3.000	3.000
55 km/h	2.000	2.000	2.000	2.000	3.000	3.000							3.000	3.000	3.000	3.000	3.000	3.000
60 km/h	1.000	1.000	1.000	1.000	2.000	2.000							2.000	2.000	2.000	2.000	2.000	2.000
65 km/h						1.000												1.000
70 km/h						1.000												1.000
75 km/h						1.000												1.000
80 km/h						1.000												1.000
TOTAL	**20.000**	**40.000**		**20.000**	**30.000**		**8.000**				**4.000**		**20.000**	**40.000**		**20.000**	**30.000**	
Scenario points	**0.250**	**0.250**		**1.000**	**0.500**		**2.000**				**2.000**		**0.750**	**0.750**		**0.500**	**1.000**	
	6.000												**3.000**					

1.3.2.1 AEB Pedestrian Scoring Example

AEB Pedestrian	Daytime			Nighttime		
	Points	Percentage	Score	Points	Percentage	Score
CPFA	20.000	100.0%	0.250	16.000	80.0%	0.600
CPNA	39.120	97.8%	0.245	26.680	66.7%	0.500
CPNC	8.420	42.1%	0.421	2.500	12.5%	0.063
CPLA	25.824	80.7%	0.404	22.650	75.5%	0.755
CPTA	3.000	75.0%	1.500			
CPRA/CPRC	2.000	50.0%	1.000			
TOTAL	**3.819**			**1.918**		
	5.737					

1.3.3 AEB Bicyclist

A maximum of 9 points is available for AEB Bicyclist. For each scenario a normalised score is calculated and multiplied with the available points for that specific scenario.

For each predicted colour the following scaling is applied to the colourband, which is then multiplied by the points available for the test speed:

Green	*1.000*
Yellow	*0.750*
Orange	*0.500*
Brown	*0.250*
Red	*0.000*

The following points are available for the different test speeds in each AEB Bicyclist scenario:

Test speed	Daytime							
	CBFA	CBNA	CBNAO	CBLA		CBTA		CBDA
	50%	50%	50%	50%	25%	Opposite direction		
						Farside	Nearside	Stationary
0 km/h								1.000
10 km/h	1.000	1.000	1.000			1.000	1.000	
15 km/h	1.000	1.000	1.000			1.000		
20 km/h	1.000	1.000	1.000			1.000		
25 km/h	1.000	1.000	1.000	1.000				
30 km/h	1.000	1.000	1.000	1.000				
35 km/h	1.000	1.000	1.000	2.000				
40 km/h	1.000	1.000	1.000	2.000				
45 km/h	1.000	1.000	1.000	3.000				
50 km/h	1.000	1.000	1.000	3.000	3.000			
55 km/h	1.000	1.000	1.000	3.000	3.000			
60 km/h	1.000	1.000	1.000	1.000	1.000			
65 km/h					1.000			
70 km/h					1.000			
75 km/h					1.000			
80 km/h					1.000			
TOTAL	**11.000**	**11.000**	**11.000**	**27.000**		**4.000**		**1.000**
Scenario points	**2.000**	**1.000**	**1.000**	**2.000**		**2.000**		**1.000**
	9.000							

For CBDA, the following scoring is applied:

CBDA	Requirement	Criteria	Points	Score
Information	Visual information	TTC ≥ 2.3s	0.250	0.250
Warning or Retention	Visual warning (e.g. flashing) accompanied with an audible or haptic warning	TTC ≥ 1.7s	0.250	0.500
	Door retention	1.7s ≤ TTC ≤ -0.4s	0.500	
All doors	Warning or retention system applied to all doors		0.250	0.250
TOTAL				**1.000**

1.3.3.1 AEB Bicyclist Scoring example

AEB Bicyclist	Daytime		
	Points	Percentage	Score
CBFA	6.567	59.7%	1.194
CBNA	11.000	100.0%	1.000
CBNAO	5.775	52.5%	0.525
CBLA	27.000	100.0%	2.000
CBTA	3.000	75.0%	1.500
CBDA	0.500	50.0%	0.500
TOTAL	**6.719**		

1.3.4 AEB/LSS Motorcyclist

A maximum of 9 points is available for AEB/LSS Motorcyclist. For each scenario a normalised score is calculated and multiplied with the available points for that specific scenario.

For each predicted colour the following scaling is applied to the colourband, which is then multiplied by the points available for the test speed:

Green	*1.000*
Yellow	*0.750*
Orange	*0.500*
Brown	*0.250*
Red	*0.000*

The following points are available for the different test speeds in each AEB/LSS Motorcyclist scenario:

Test speed	AEB						FCW			LSS		
	CMRs	CMRb		CMFtap			CMRs	CMRb		Cmoncoming	Cmovertaking	
	50%	25% & 12m	25% & 40m	30 km/h	45 km/h	60 km/h	50%	25% & 12m	25% & 40m	72 km/h	60 km/h	80 km/h
10 km/h	1.000			1.000	1.000	1.000						
15 km/h	1.000			1.000	1.000	1.000						
20 km/h	1.000			1.000	1.000	1.000						
25 km/h	1.000											
30 km/h	1.000						1.000					
35 km/h	1.000						1.000					
40 km/h	1.000						1.000					
45 km/h	1.000						1.000					
50 km/h	1.000	1.000	1.000				1.000	1.000	1.000		1.000	
55 km/h	1.000						1.000					
60 km/h	1.000						1.000					
72 km/h										2.000		1.000
TOTAL	**11.000**	**2.000**		**9.000**			**7.000**	**2.000**		**2.000**	**2.000**	
Scenario points	**1.000**	**1.000**		**3.000**			**0.500**	**0.500**		**2.000**	**1.000**	
	9.000											

1.3.4.1 AEB/LSS Motorcyclist Scoring example

AEB Motorcyclist	Daytime		
	Points	Percentage	Score
CMRs AEB	8.000	72.7%	0.727
CMRb AEB	1.000	50.0%	0.500
CMFtap			
CMRs FCW	5.000	71.4%	0.357
CMRb FCW	2.000	100.0%	0.500
CMoncoming	2.000	100.0%	2.000
CMovertaking	0.000	0.0%	0.000
TOTAL		**4.084**	

1.4 Visualisation

The AEB/LSS VRU scores are presented separately using a coloured top view of the different scenarios; crossing and longitudinal (where applicable). The colours used are based on the scenario scores respectively, rounded to three decimal places.

Colour	**Verdict**	**Applied to Total Score**	**Applied to Scenario**
Green	*'Good'*	*6.751 - 9.000 points*	*75.0% - 100.0%*
Yellow	*'Adequate'*	*4.501 - 6.750 points*	*50.0% - 75.0%*
Orange	*'Marginal'*	*2.251 - 4.500 points*	*25.0% - 50.0%*
Brown	*'Weak'*	*0.001 - 2.250 points*	*00.0% - 25.0%*
Red	*'Poor'*	*0.000 points*	*00.0%*