LATIN AMERICAN & CARIBBEAN NEW CAR ASSESSMENT PROGRAMME (Latin NCAP)

ASSESSMENT PROTOCOL – SAFETY ASSIST

Version 1.1.1
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AKNOWLEDGEMENT

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1 INTRODUCTION

The Latin NCAP programme is designed to provide a fair, meaningful and objective assessment of the safety performance of cars and provide a mechanism to inform consumers. This protocol is based upon that used by the European New Car Assessment Programme for the Safety Assist box.

Latin NCAP is introducing relevant changes to this new protocol such as the introduction of the overall rating scheme. Individual documents are released for the four areas of assessment:

- Assessment Protocol – Adult Occupant Protection;
- Assessment Protocol – Child Occupant Protection;
- Assessment Protocol – Pedestrian Occupant 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 Safety Assist, in particular for the Seat Belt Reminder (SBR) front and rear, Speed Assist Systems (SA), Electronic Stability Control Systems (ESC), Blind Spot Detection (BSD), Lane Support Systems (LSS) and Autonomous Emergency Braking Systems Inter-urban.

DISCLAIMER: Latin NCAP has taken all reasonable care to ensure that the information published in this protocol is accurate and reflects the technical decisions taken by the organisation. In the unlikely event that this protocol contains a typographical error or any other inaccuracy, Latin NCAP reserves the right to make corrections and determine the assessment and subsequent result of the affected requirement(s).

2 METHOD OF ASSESSMENT

Unlike the assessment of protection offered in the event of a crash, the assessment of Safety Assist functions does not require destructive testing of the vehicle. Assessment of the Safety Assist functions will be based both on fitment requirement (BSD, AEB, LKA, LDW, RED) and performance requirements (SBR, ESC, SAS, BSD, LDW, LKA, RED, AEB) verified by Latin NCAP according to the criteria detailed in this document. Assessment will only be carried out on vehicles randomly selected by Latin NCAP. In-house data or simulations will not be accepted. The intention is to promote standard fitment across the sales volume sold in the Latin American and Caribbean countries in combination with good functionality for these systems, where this is possible.

It is important to note that Latin NCAP only considers assessment of safety assist systems that meet the fitment requirements for the most basic safety equipment (as defined in the CSSTR Protocol). Passive safety technology as well as ESC, SBR and SAS will only be considered when they are fitted as standard in all versions of the model. For the performance assessment of seat belt reminder and speed assistance systems, the car is subjected to a number of trial sequences designed to highlight the effectiveness of the systems. The car performance is scored using the observations made by the inspector during driving. In addition to the basic Latin NCAP assessment, additional information may be recorded that may be communicated to consumers and added to the Latin NCAP assessment in the future.

3 SEAT BELT REMINDER SYSTEMS

3.1 Introduction

It is well known that the correct use of seat belts is the most effective way of providing protection for vehicle occupants in a crash. Currently, usage rates are very low across the Latin American and Caribbean (LAC) Countries and research has shown that many of the non-wearers would use their seat belt with some encouragement.

Although, simple seat belt reminder systems have been available for some time, the technology behind the more sophisticated systems continues to evolve. Latin NCAP, following Euro NCAP assessment protocol, has set some minimum requirements but wishes to encourage the development of increasingly improved systems. Special focus should be made in misuse of seat belts in order to “cheat” the SBR system. For example, it is well known that many users in LAC countries (and other regions of the world) will sit over a buckled seat belt to prevent the chime to turn on. Systems that detect the length of the belt outside of the coil could address this issue and will be highlighted by Latin NCAP when its functionality is tested and verified.

Latin NCAP will assess Seat Belt Reminder Systems according to Euro NCAP Safety Assist Protocol Version 8.0.2. In addition, the visual signal of the Seat belt reminder should be located in a place where the driver without moving its head and only moving its eyes not more than 15 degrees vertically and 15 degrees horizontally. Manufacturer must indicate which positions are fitted with SBR systems as standard prior to the test. Rear seats will only be assessed for “buckled” and “unbuckled” condition.

3.2 Scoring and Visualization

For Seat Belt Reminder systems which fully comply with the Euro NCAP requirements as well as the visual requirements described in 3.1, the following points will be awarded to the overall occupant score for that vehicle:

3.2.1 **Driver seat**

Where driver seating position meets the assessment criteria, **3 points** will be awarded.

3.2.2 **Passenger seat**

Where passenger seating position meets the assessment criteria AND 3 points have been awarded for the driver position, **3 additional points** will be awarded.

3.2.3 **Rear seats**

Where 6 points have been awarded for all front seating positions AND ALL rear seating positions meet the assessment criteria, an additional **4 points** will be awarded.

If the third or more row of seats is optional, on any variant, the assessment will be based on a vehicle fitted with the optional seats. In future, up to two additional points may become available to reward very sophisticated systems with enhanced capability. Such capability is not yet defined. The result of the Seat Belt Reminder assessment is not visualised.

3.3 Future Developments

It is expected that the protocol will continue to develop, in the light of experience with these new systems. Consideration will also be given to converting some of the current recommendations to requirements.

4 ASSESSMENT OF SPEED ASSIST SYSTEMS

4.1 Introduction

Excessive speed is a key factor in the causation and severity of many road accidents. Speed restrictions are intended to promote safe operation of the road network by keeping traffic speeds below the maximum that is appropriate for a given traffic environment, thereby protecting vehicle occupants and other road users, both motorised and non-motorised. These maximum speeds are intended to control energy levels in typical crashes and to allow sufficient time for drivers to react to traffic situations. Properly selected speed limits should facilitate efficient traffic flow, reduce violations and promote safe driving conditions. Greater adherence to speed limits would avert many accidents and mitigate the effects of those that occur.

Voluntary speed limitation devices are a means to assist drivers to adhere to speed limits. Latin NCAP hopes to encourage manufacturers to promote such speed-limitation devices, to fit them as standard equipment. This, it is hoped and will lead to greater demand by consumers and an increased introduction of speed limitation systems.

The margins for alarm activation set out in this document are based on prevailing speedometer accuracy, which is specified by regulation and typically overstates the vehicle speed by several km/h.

This version of the protocol contains technical requirements for only Manual Speed Assist (MSA) systems where the driver needs to set the limited speed. Intelligent Speed Assist (ISA) systems where the car ‘knows’ the current legal speed limit to be used in the warning or speed limitation function will also be assessed by Latin NCAP in the current protocol but will be awarded with the same maximum score than MSA. The reason for this is due to the fact that road signs are not harmonized in the LAC countries, and in many cases absent. Additionally, GPS and telecommunications technologies in the region are not as advanced and accurate as in other regions of the world and there is no official database of clear speed limits that could eventually feed ISA systems fitted in cars. However, these systems are proved to be significantly beneficial and reliable and Latin NCAP encourages its strong implementation in the region.

4.2 Definitions

Throughout this protocol the following terms are used:

- **Vindicated** – The speed the car travels as displayed to the driver by the speedometer as in ECE R39.
- **Vlimit** – Maximum allowed legal speed for the vehicle at the location, time and in the circumstance the vehicle is driving.

- **Vadj** – Adjustable speed Vadj means the voluntarily set speed for the MSA/ISA, which is based on Vindicated and includes the offset set by the driver.
- **MSA** – Manual Speed Assistance. MSA means a system which allows the driver to set a vehicle speed Vadj.
- **SLIF** - Speed Limit Information Function. SLIF means a function with which the vehicle knows and communicates the speed limit.
- **SLF** – Speed Limitation Function. SLF means a system which allowes the driver to set a vehicle speed Vadj, to which the driver wishes the speed of his car to be limited and above which he wishes to be warned.
- **ISA** – Intelligent Speed Assistance. ISA is a MSA combined with SLIF, where the Vadj is set by the SLIF with or without driver confirmation.
- **iACC** – Intelligent Adaptative Cruise Control. iACC is an ACC (Adaptative Cruise Control) with SLIF, where the speed is set by the SLIF with or without driver confirmation.
- **Vstab** – Stabilised speed Vstab means the mean actual vehicle speed when operating. Vstab is calculated as the average actual vehicle speed over a time interval of 20 seconds beginning 10 seconds after first reaching Vadj – 10 km/h.

4.3 Requirements for SLIF and Speed Control Functions

The Speed Assist Systems are developed in such a way that they allow different types of Speed Assist Systems to be assessed in two areas; SLIF and Speed Control functions which may be combined.

<u>Speed Limit Information Function</u>

- Basic SLIF meeting the General Requirements
- Advanced Functions
- System Accuracy
- Warning Function

<u>Speed Control functions</u>

- Speed Limitation function (standalone function or combined with SLIF without coupling)
- Intelligent Speed Assistance (SLIF and Speed Limitation function coupled)
- Intelligent ACC (SLIF and ACC coupled)

4.4 Speed Control Function

4.4.1 **Activation / de-activation of the function**

- The speed control function must be capable of being activated/de-activated as well as have access to speed setting at any time with a simple operation. Multiple stage operations will be accepted only until December 2021, after that date the model that scored SAS points must be updated to simple operation.

- At the start of a new journey, the system should be de-activated by default.

4.4.2 **Setting of Vadj**

Manually setting the speed

- It shall be possible to set Vadj, by a control device operated directly by the driver, by steps not greater than 10km/h (5mph) between 30km/h (20mph) and 130km/h (80mph).
- It shall be possible to set Vadj independently of the vehicle speed.
- If Vadj is set to a speed lower than the current vehicle speed, the system shall limit the vehicle speed to the new Vadj within 30s or shall initiate a warning (Section 4.6.4) no later than 30s after Vadj has been set and repeat the warning every 30s if the speed it still greater than Vadj.
- The Vadj value shall be permanently indicated to the driver and visible from the driver's seat. This does not preclude temporary interruption of the indication for safety reasons or driver's demand.

4.5 Warning Function

All MSA (Manually Setting Speed) and ISA systems need to meet the warning requirements of section 4.5.1 to indicate the driver that Vadj is exceeded. In addition, a supplementary warning is required, e.g. audible, haptic and head-up display meeting the requirements in section 4.5.2. A head-up display warning meeting the requirements of both 4.5.1 and 4.5.2 will be accepted. Vehicles with Speed Limiter function activated do not need a warning function when active braking is applied to limit the vehicle speed.

It shall still be possible to exceed Vadj by applying a positive action, e.g. kickdown. After exceeding Vadj by applying a positive action, the speed limitation function shall be reactivated when Vindicated drops to a speed less than Vadj

4.5.1 **Visual warning Requirements**

4.5.1.1 The visual signal must be in the direct field of view of the driver, without the need for the head to be moved and only moving its eyes not more than 15 degrees vertically and 15 degrees horizontally from the normal driving position, i.e. instrument cluster, rear view mirror and centre console.

4.5.1.2 The driver is informed when Vindicated of the vehicle is exceeding Vadj by more than 5 km/h.

4.5.1.3 The driver continues to be informed for the duration of the time that Vadj is exceeded by more than 5 km/h.

4.5.1.4 The warning signal does not preclude temporary interruption of the indication for safety reasons.

4.5.2 **Supplementary warning requirements**

4.5.2.1 The warning shall be clear to the driver.

4.5.2.2 No supplementary warning needs to be given when Vadj is exceeded as a result of a positive action.

4.5.2.3 The warning commences when the Vindicated of the vehicle is exceeding Vadj by more than 5km/h.

4.5.2.4 The total duration of the warning must be at least 10 seconds and must start with a positive signal for at least 2 seconds. Gaps of less than 1 second, which allow for signals which flash and audio signals that "beep", are ignored. If the signal is not continuous for the first 10 seconds, it needs to be repeated every 30 seconds or less, resulting in a minimum total duration of at least 10 seconds.

4.5.2.5 The warning sequence does not need to be reinitiated for each exceedance of Vadj until Vindicated has reduced to more than 5km/h below Vadj.

4.5.3 **Automatic setting the speed**

Will be assessed according to Euro NCAP's Safety Assist assessment protocol Version 8.0.2 from November 2017, Chapter 4.

4.6 Speed Control

4.6.1 The vehicle speed shall be limited or controlled to Vadj.

4.6.2 It shall still be possible to exceed Vadj by applying a positive action – e.g. kickdown (SLF/ISA) or depressing the accelerator (iACC).

4.6.2.1 After exceeding Vadj by applying a positive action, the speed control function shall be reactivated when the vehicle speed drops to a speed less than or equal to Vadj.

4.6.2.2 The speed control function shall permit a normal use of the accelerator control for gear selection.

4.6.3 The speed control function shall ensure that when stable speed control has been achieved, Vstab shall be within -10/+0 km/h of Vadj (see Euro NCAP test protocol[1])

4.6.4 When the speed control function is not able to limit to and/or maintain Vadj and Vadj is exceeded by more than 5 km/h an audiovisual warning is issued, with a total duration of at least 10 seconds. No warning needs to be given when Vadj is exceeded as a result of a positive action.

Gaps of less than 1 second, which allow for signals that flash are ignored, but the signal may not start with a gap. If the signal does not remain for the first 10 seconds, it needs to be repeated every 30 seconds or less, resulting in a minimum total duration of at least 10 seconds.

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1 Euro NCAP "SPEED ASSIST SYSTEMS" Test Protocol, Version 2.0, November 2017

For systems where active braking is applied to maintain and/or limit the speed, this warning requirement does not apply.

Note: The warning signal does not preclude temporary interruption of the indication for safety reasons.

4.7 Scoring

4.7.1 When all the previous requirements are met with the exception of 4.6 then **1 (one) point** will be awarded for SAS.

4.7.2 When also 4.6 is met then extra **2 points** will be awarded to SAS. 4.5.1 is a precondition to 4.5.2.

5 ASSESSMENT OF AEB INTER-URBAN SYSTEM

5.1 Introduction

AEB Inter-Urban systems are AEB systems that are designed to work at speeds typical for driving outside of the city environment, for example on urban roads or highways. For the assessment of AEB Inter-Urban systems, three areas of assessment are considered: the Autonomous Emergency Braking function, Forward Collision Warning function and the Human Machine Interface (HMI). The AEB function is assessed in two different types of scenarios, while the FCW function is scored separately and assessed in three different types of scenarios. The FCW function is only considered when the system provides dynamic brake support.

At this stage the HMI operation is verified in a general way as scientific evidence regarding quality of warning is lacking. The current emphasis in the assessment of AEB Inter-Urban lies on the AEB function. It is expected that the requirements will be updated in the future when more real-life evidence is available. Overlap scenarios will not be considered for AEB Inter-Urban Systems.

5.2 Definitions

Throughout this protocol the following terms are used:

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 Vehicle Target (EVT) – means the vehicle target used in this protocol as specified in Annex A of the AEB test protocol[2].

Global Vehicle Target (GVT) – means the vehicle target used in this protocol as defined in TB025 - Global Vehicle Target specification for Euro NCAP v1.0

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 the detection of a likely collision to alert the driver.

Dynamic Brake Support (DBS) – a system that further amplifies the driver braking demand in response to the detection of a likely collision to achieve a greater deceleration than would otherwise be achieved for the braking demand in normal driving conditions.

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2 Euro NCAP "*TEST PROTOCOL – AEB systems*", Version 1.0, July 2013. GVT may also be used for assessment.

Car-to-Car Rear Stationary (CCRs) – a collision in which a vehicle travels forwards towards another stationary vehicle and the frontal structure of the vehicle strikes the rear structure of the other.

Car-to-Car Rear Moving (CCRm) – a collision in which a vehicle travels forwards towards another vehicle that is travelling at constant speed and the frontal structure of the vehicle strikes the rear structure of the other.

Car-to-Car Rear Braking (CCRb) – a collision in which a vehicle travels forwards towards another vehicle that is travelling at constant speed and then decelerates, and the frontal structure of the vehicle strikes the rear structure of the other.

Vrel_test – means the relative speed between the VUT and the EVT by subtracting the velocity of the EVT from that of the VUT at the start of test

Vimpact – means the speed at which the VUT hits the EVT

Vrel_impact – means the relative speed at which the VUT hits the EVT by subtracting the velocity of the EVT from Vimpact at the time of collision

5.3 Criteria and Scoring

5.3.1 To be eligible for scoring points in AEB Inter-Urban, the AEB and/or FCW system must operate up to speeds of at least 80 km/h at least.

5.3.2 Human Machine Interface (HMI)

5.3.2.1 To be eligible for scoring points for HMI, the AEB and/or FCW function needs to be default ON at the start of every journey and the warning of the FCW system (if applicable) needs to be loud and clear.

5.3.2.2 When these prerequisites are met, HMI points can be achieved for the following:

- **Deactivating AEB and/or FCW system not possible with a single push on a button 2points**
- **Supplementary warning for the FCW system 1 point**

  In addition to the required audiovisual warning, a more sophisticated warning like head-up display, belt jerk, brake jerk or any other haptic feedback is awarded.

  NOTE: The supplementary warning point is not applicable to AEB only systems

- **Reversible pre-tensioning of the belt in the pre-crash phase 1 point**

  When the system detects a critical situation that can possibly lead to a crash, the belt can already be pre-tensioned to prepare for the oncoming impact.

5.3.2.1 The HMI score is calculated by dividing the points achieved by 4.

5.3.3 Autonomous Emergency Braking (AEB) / Forward Collision Warning (FCW)

5.3.3.1 For both AEB and FCW system tests, the assessment criteria used is the relative impact speed Vrel_impact. The available points per test speed are awarded based on the relative speed reduction achieved at every test speed. Where there is no full avoidance a linear interpolation is applied to calculate the score for every single test speed. For CCRb scenarios, the relative test speed is assumed equal to the initial test speed.

$$Score_{\ test\ speed} = ((Vrel\_test - Vrel\_impact)/Vrel\_test) \times points_{test\ speed}$$

The maximum points available for the different test speeds for CCR_s, CCR_m and CCR_b are detailed in the table below

Test speed	**CCR_s**		**CCR_m**		**CCR_b**	
	AEB	**FCW**	**AEB**	**FCW**	**AEB**	**FCW**
30 km/h	-	2.000	1.000	-	-	-
35 km/h	-	2.000	1.000	-	-	-
40 km/h	-	2.000	1.000	-	-	-
45 km/h	-	2.000	1.000	-	-	-
50 km/h	-	3.000	1.000	1.000	4x 1.000	4x 1.000
55 km/h	-	2.000	1.000	1.000	-	-
60 km/h	-	1.000	1.000	1.000	-	-
65 km/h	-	1.000	2.000	2.000	-	-
70 km/h	-	1.000	2.000	2.000	-	-
75 km/h	-	1.000	-	2.000	-	-
80 km/h	-	1.000	-	2.000	-	-
Total	**-**	**18.000**	**11.000**	**11.000**	**4.000**	**4.000**

5.3.3.2 The scoring is based on normalized scores of the AEB and FCW functions. For combined systems, AEB only and FCW only respectively, the score calculation is detailed in separate sections below.

- **<u>AEB + FCW (combined)</u>**

  For each scenario (CCRs, CCRm and CCRb) normalised scores are calculated for AEB and FCW separately where available. The total AEB and FCW scores are calculated by averaging the scenario scores. This results in two separate percentages for AEB and FCW.

- **<u>AEB only</u>**

  For systems that only offer the AEB function, the results of tests at all speeds (covering AEB and FCW) are used to calculate separate normalised AEB and FCW scores for each scenario. Where AEB and FCW test speeds are overlapping, the test result of AEB is duplicated for FCW. The total AEB and FCW scores are calculated by averaging the scenario scores. This results in two separate percentages for AEB and FCW.

- **<u>FCW only</u>**

  For systems that only offer the FCW (with brake support) function, the test results are used to calculate a normalised score for each FCW scenario. The total FCW score is calculated by averaging the scenario scores. This results in a single percentage for FCW, where the AEB score is set to 0%.

5.3.4 <u>Total AEB Inter-Urban Score</u>

The total score in points is the weighted sum of the AEB score, FCW score and HMI score as shown below.

$$AEB\ Inter\ Urban\ total\ score = (AEB\ score\ x4.5) + (FCW\ score\ x\ 3.0) + (HMI\ score\ x\ 1.5)$$

☞ **<u>Example of a combined AEB + FCW system</u>**

a) AEB function test results in CCR_m scenario.

V_{test}	V_{rel_test}	$points_{test\ speed}$	V_{impact}	V_{rel_impact}	$Score_{test\ speed}$
30 km/h	10 km/h	1.000	0 km/h	0 km/h	1.000
35 km/h	15 km/h	1.000	0 km/h	0 km/h	1.000
40 km/h	20 km/h	1.000	0 km/h	0 km/h	1.000
45 km/h	25 km/h	1.000	0 km/h	0 km/h	1.000
50 km/h	30 km/h	1.000	30 km/h	10 km/h	0.667
55 km/h	35 km/h	1.000	45 km/h	25 km/h	0.286
60 km/h	40 km/h	1.000	55 km/h	35 km/h	0.125
65 km/h	45 km/h	2.000	-	-	0.000
70 km/h	50 km/h	2.000	-	-	0.000
Total		**11.000**			**5.078**
Normalised score (AEB)					**46.2%**

AEB function test results in CCR_b scenario.

Test	$points_{test\ speed}$	V_{impact}	V_{rel_impact}	$Score_{test\ speed}$
50 km/h, 12m, 2m/s²	1.000	0 km/h	0 km/h	1.000
50 km/h, 12m, 6m/s²	1.000	20 km/h	20 km/h	0.600
50 km/h, 40m, 2m/s²	1.000	25 km/h	25 km/h	0.500
50 km/h, 40m, 6m/s²	1.000	20 km/h	20 km/h	0.600
Total	**4.000**			**2.700**
Normalised score (AEB)				**67.5%**

b) FCW function (assumed normalized scores for this example).
- Normalized score in CCRs scenario: **84.7%**
- Normalized score in CCRm scenario: **76.4%**
- Normalized score in CCRb scenario: **100.0%**

The FCW score is 87.0% (average).

c) HMI operation. Prerequisites are not met: the system can be switched OFF with a single button. HMI score is 0%.

d) AEB Inter-Urban total score. Applying the above formula renders:
4.5 x 56.9% + 3.0 x 87.0% + 1.5 x 0% = **5.1705 points** (out of 9 points)

☞ <u>**Example of AEB only system**</u>

a) AEB function (normalized AEB scores as in above example).
- Normalized score in CCR_m scenario: **46.2%**
- Normalized score in CCR_b scenario: **67.5%**

The AEB score is 56.9% (average).

b) AEB test results for FCW function assessment in CCR_s scenario.

Test speed	$points_{test\ speed}$	V_{impact}	V_{rel_impact}	$Score_{test\ speed}$
30 km/h	2.000	0 km/h	0 km/h	2.000
35 km/h	2.000	0 km/h	0 km/h	2.000
40 km/h	2.000	0 km/h	0 km/h	2.000
45 km/h	2.000	0 km/h	0 km/h	2.000
50 km/h	3.000	10 km/h	10 km/h	2.400
55 km/h	2.000	25 km/h	25 km/h	1.091
60 km/h	1.000	35 km/h	35 km/h	0.417
65 km/h	1.000	-	-	0.000
70 km/h	1.000	-	-	0.000

Test speed	$points_{test\ speed}$	V_{impact}	V_{rel_impact}	$Score_{test\ speed}$
75 km/h	1.000	-	-	0.000
80 km/h	1.000	-	-	0.000
Total	**18.000**			**11.908**
Normalised score				**66.2%**

AEB test results for FCW function assessment in CCR_m scenario.

Test speed	$points_{test\ speed}$	V_{impact}	V_{rel_impact}	$Score_{test\ speed}$
50 km/h	1.000	30 km/h	10 km/h	0.667
55 km/h	1.000	45 km/h	25 km/h	0.286
60 km/h	1.000	55 km/h	35 km/h	0.125
65 km/h	2.000	-	-	0.000
70 km/h	2.000	-	-	0.000
75 km/h	2.000	-	-	0.000
80 km/h	2.000	-	-	0.000
Total	**11.000**			**1.078**
Normalised score				**9.8%**

AEB test results for FCW function assessment in CCR_b scenario.

Test	$points_{test\ speed}$	V_{impact}	V_{rel_impact}	$Score_{test\ speed}$
50 km/h, 12m, $2m/s^2$	1.000	0 km/h	0 km/h	1.000
50 km/h, 12m, $6m/s^2$	1.000	20 km/h	20 km/h	0.600
50 km/h, 40m, $2m/s^2$	1.000	25 km/h	25 km/h	0.500
50 km/h, 40m, $6m/s^2$	1.000	20 km/h	20 km/h	0.600
Total	**4.000**			**2.700**
Normalised score				**67.5%**

Combining the results of all scenarios, the FCW score is 47.8% (average).

c) **HMI operation.** Prerequisites are not met: the system can be switched OFF with a single button. HMI score is 0%.

AEB Inter-Urban total score. Applying the above formula renders:

4.5 x 56.9 % + 3.0 x 47.8 % + 1.5 x 0 % = **3.995 points** (out of 9 points).

6 ASSESSMENT OF ELECTRONIC STABILITY CONTROL

6.1 Introduction

Electronic Stability Control (ESC) systems have a demonstrable safety benefit: cars fitted with ESC systems are involved in fewer loss-of-control crashes than those which are not and the accidents they have are less severe. Latin NCAP has promoted standard fitment of ESC since 2010 and encourages the adoption of this technology as standard across the region. Unfortunately, there is currently no mandatory requirement for ESC in any of the LAC countries.

Latin NCAP will conduct its own tests, based on the UN R13H, UN R140, GTR8 requirements and/or Euro NCAP ESC assessment protocol. Additionally, Latin NCAP will conduct at least 3 runs of a "moose test" in two different scenarios with a professional driver from the accredited crash test facility in order to assure the real-life robustness of the electronic stability control system. The test will be performed according to the latest version "Latin NCAP Moose test Testing Protocol".

As this assessment is performed by Latin NCAP for the first time in the region, Latin NCAP will monitor the performance of the vehicles along 2020 and 2021 and reserves the right to propose further changes to the setup, scenario, criteria or rating for 2022 and 2023, if any. These may include an increase in the test speed.

6.2 Criteria and Scoring

6.2.1 Vehicles whose ESC systems meet the UN R13H, UN R 140 or GTR8 requirements, as defined in regulation, are rewarded with 15 points to be included in the Safety Assist box.

6.2.2 Vehicles not equipped with ESC systems do not meet the above requirements, will score zero points.

6.2.3 Three runs of the "moose test" according to the latest version of "**Latin NCAP Moose test Testing Protocol**" will be performed.

6.2.4 Until 31st December 2021, the results of both Moose tests scenarios will be reported as additional information for consumers indicating the maximum speed reached in both tests before any fail criteria is recorded. The consumer will be presented with a brief overall analysis of the performance of the ESC system in both scenarios, along with the maximum speed in which one of the fail conditions was met.

6.2.5 As from January 1st 2022 until 31st December 2023 ESC will be affected as follows:

- ESC points will be reduced by 5 points if the first run (lower speed[3]) of the Moose test runs is a fail.
- ESC points will be reduced by 3 points if the first run of the Moose test runs

[3] As defined in the latest version of Latin NCAP "TESTING PROTOCOL – MOOSE TEST"

is a pass the second one a fail.

- ESC points will be reduced by 1 point if the first two runs of the Moose test are a pass and the last one a fail.
- ESC points will not be affected if there is no fail in all three Moose tests runs.

7 ASSESSMENT OF LANE SUPPORT SYSTEMS

Lane support systems are becoming increasingly widespread and from 2019, these systems are included in the Safety Assist score.

Latin NCAP intends to develop tests which complement any legislative requirements, to be able to rate lane support systems in more detail in the future. In the meantime, to try to encourage manufacturers to fit these systems more broadly, Latin NCAP rewards Lane Departing Warning (LDW), Lane Keep Assist (LKA) and Road Edge Detection (RED) based on fitment rates where Euro NCAP test procedure is used to demonstrate the system functionality.

Until such time that it becomes clear that one type of system is more beneficial than the other, equal credit is given to LDW and LKA systems.

Latin NCAP will consider LDW/LKA for assessment only if it meets the fitment requirements for basic safety equipment (as defined in the Vehicle Specification, Selection, Testing and Retesting protocol).

7.1 Definitions

Lane Keeping Assist (LKA) – heading correction that is applied automatically by the vehicle in response to the detection of the vehicle that is about to drift beyond a delineated edge line of the current travel lane.

Lane Departure Warning (LDW) – a warning that is provided automatically by the vehicle in response to the vehicle that is about to drift beyond a delineated edge line of the current travel lane.

Vehicle under test (VUT) – means the vehicle tested according to this protocol with a Lane Keep Assist and/or Lane Departure Warning system.

Lane Edge – means the inner side of the lane marking or the road edge

Distance To Lane Edge (DTLE) – means the remaining lateral distance (perpendicular to the Lane Edge) between the Lane Edge and most outer edge of the tyre, before the VUT crosses Lane Edge, assuming that the VUT would continue to travel with the same lateral velocity towards it.

Road Edge Detection (RED) is a system with the same objective as the LDW system, but in the absence of a marked lane. Warning systems are enough to be able to score the full points for the current protocol.

7.2 Criteria and Scoring

To be eligible for scoring points in Lane Support Systems, the vehicle must be equipped with an ESC system that complies with UNECE Regulation 13H.

For any system, the driver must be able to override the intervention by the system and the system must be activated by default every time the car is turned on (it activates the function without voluntary action of the driver).

LSS systems should be assessed on the right and left side of the vehicle.

7.2.1 **Lane Departure Warning**

7.2.1.1 For LDW system tests, the assessment criteria used is the Distance to Lane Edge (DTLE)

7.2.1.2 LDW (like LKA) will be tested in scenarios with solid and dashed lines, each one of them at four different approach lateral speeds: 0.2, 0.3, 0.4, and 0.5 m/s. Any LDW system that issues an audible and/or haptic warning before DTLE of less than 20cm for at least three of the four proposed speeds in both of the two road marking combinations proposed will be awarded with one point. Where an LKA system fulfils the requirements for one point award detailed in 7.2.2, the LDW requirements are automatically met and awarded one point.

7.2.2 **Lane Keep Assist (LKA)**

7.2.2.1 For LKA system tests, the assessment criteria used is the Distance to Lane Edge (DTLE)

7.2.2.2 LKA (like LDW) will be tested in scenarios with solid and dashed lines, each one of them at four different approach speeds: 0.2, 0.3, 0.4, and 0.5 m/s. The limit value for DTLE for LKA tests is set to 30cm or less for testing against lines, meaning that the LKS system must not permit the VUT to cross the inner edge of the lane marking by a distance greater than 30cm. The performance must comply with this DTLE requirements for at least three of the four different approach lateral speeds 0.2, 0.3, 0.4, and 0.5 m/s in both of the two road marking combinations in order to be awarded with one point.

7.2.3 **Road Edge Detection (RED)**

7.2.3.1 The limit value for DLTE for Road Edge (RED) test is set to 10cm from testing against the road edge, meaning that the RED system only allows the VUT to have a part of the front wheel outside of the road edge.

7.2.4 **Scoring for LDW, LKA and RED**

- In the case of LKA + LDW (combined), Systems offering both LKA and LDW functions, these functions are tested separately.

- In the case of LKA only, Systems that only offer the LKA function will be tested and assessed in both the LKA and LDW scenarios. When LKA scenarios are all pass, LDW point is automatically awarded.
- In the case of LDW only, systems that only offer the LDW function, the function will be tested and assessed in the LDW scenarios only.
- When the VUT passes 3 out of 4 lateral LDW test speeds (on both left and right side) on both line marking scenarios for each speed, 1 point is awarded to the SA box.
- When the VUT passes 3 out of 4 lateral LKA test speeds (on both left and right side), on both line marking scenarios for each speed, 1 point is awarded to the SA box.
- For each scenario (line and lateral speed) to be a PASS, the vehicle needs to pass for both left and right lateral departures. The worst case scenario will be used to calculate the final score.
- When the VUT passes 1 out of 4 lateral RED test speeds, 1 point is awarded to the SA box.

Example of LDW and LKA:

LKA (LANE KEEP ASSISST)	***DTLE to activation (m)***			
Lane approach speed	**Dashed line**		**Solid line**	
0.2 m/s	-0.09	OK	-0.05	OK
0.3 m/s	-0.21	OK	-0.14	OK
0.4 m/s	-0.19	OK	-0.11	OK
0.5 m/s	-0.32	NOT OK	-0.6	NOT OK

LDW (LANE DEPARTURE WARNING)	***DTLE to activation (m)***			
Lane approach speed	**Dashed line**		**Solid line**	
0.2 m/s	-0.16	OK	-0.15	OK
0.3 m/s	-0.19	OK	-0.17	OK
0.4 m/s	-0.15	OK	-0.07	OK
0.5 m/s	-0.53	NOT OK	-0.34	NOT OK

8 BLIND SPOT DETECTION

For vehicles equipped with a Blind Spot Detection (BSD) system to warn the driver of other vehicles present in the blind spot, 3 points are available in the SA box. BSD short range using, for example, short range sensors like parking sensors will be awarded maximum of **1 point**. Longer range sensors are awarded maximum **3 points** when requirements are met including the 1 point for short range (max BSD score 3 points).

Validation procedure will be required with a small motorcycle (125 cc) at ΔV: ($|V_1-V_2|$) > 15 km/h in a condition of $V_1 \geq 40$ km/h or $V_2 \geq 40$ km/h for the test vehicle. The expected short range BSD detection area is described in the following diagram:

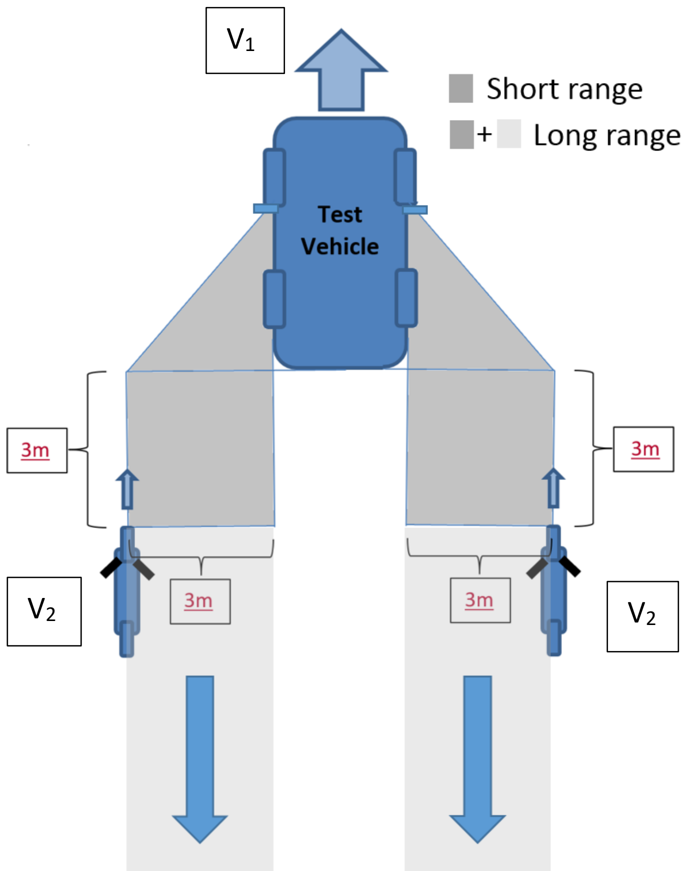

Figure 1 - BSD Short / Long Range area description

Three speeds and scenarios are proposed in configurations for taking over left and right and car taking over bike and bike taking over car.

8.1 Scoring

The BSD system will be tested in four different scenarios;

- Car takes over bike (car overtakes from RIGHT)
- Car takes over bike (car overtakes from LEFT)
- Bike takes over car (bike overtakes from RIGHT)
- Bike takes over car (bike overtakes from LEFT)

In each of these four scenarios the BSD system will be assessed at three different speeds. When at least 2 out of the 3 speeds of each scenario is a pass, **1 point** is awarded for BSD short range.

Example:

CAR TAKES OVER BIKE						
Bike speed	**Lateral Distance direction (m)**	**Take over from**	**Min V car**	**detection?**	**Detection stopped while bike out of mirror range**	**Max detect distance to back**
41 km/h	AB = 3m	RIGHT	56 km/h	YES	NO	4
50 km/h	AB = 1.5m	RIGHT	65 km/h	YES	NO	4
60 km/h	AB = 3m	RIGHT	75 km/h	NO	YES	0
41 km/h	CD = 3m	LEFT	56 km/h	YES	NO	4
50 km/h	CD = 1.5m	LEFT	65 km/h	YES	NO	4
60 km/h	CD = 3m	LEFT	75 km/h	NO	YES	0
BIKE TAKES OVER CAR						
Car speed	**Lateral Distance direction (m)**	**Take over from**	**Min V bike**	**detection?**	**Detection stopped while bike out of mirror range**	**Max detect distance to back**
41 km/h	AB = 3m	RIGHT	56 km/h	YES	NO	4
50 km/h	AB = 1.5m	RIGHT	65 km/h	YES	NO	4
60 km/h	AB = 3m	RIGHT	75 km/h	NO	YES	1
41 km/h	CD = 3m	LEFT	56 km/h	YES	NO	4
50 km/h	CD = 1.5m	LEFT	65 km/h	YES	NO	4
60 km/h	CD = 3m	LEFT	75 km/h	NO	YES	4

9 Assessment of E-Call systems

As from January 2022, cars that offer standard E-call systems (or similar) will be able to score 2 points in the SA box extra to the available scoring (SAS box remains with maximum 40 points). In the case of a crash, the system must fulfill the following conditions to score the points:

- The system cannot be disabled by the driver
- The system will make the call automatically without any action by the vehicle occupants.
- The system should automatically send to the car manufacturer´s call center and to the emergency services the GPS location of the accident.
- It is required a minimum of 28 points in AOP box to be able to score the E-Call points in the SA Box.