ASEAN NCAP
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TEST PROTOCOL – AUTO HIGH BEAM/ ADAPTIVE DRIVING BEAM

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Preface

During the test preparation, vehicle manufacturers are encouraged to liaise with the laboratory and to check that they are satisfied with the way cars are set up for testing. Where a manufacturer feels that a particular item should be altered, they should ask the laboratory staff to make any necessary changes. Manufacturers are forbidden from making changes to any parameter that will influence the test, vehicle setting, test track environment etc.

It is the responsibility of the test laboratory to ensure that any requested changes satisfy the requirements of ASEAN NCAP. Where a disagreement exists between the laboratory and manufacturer, the ASEAN NCAP secretariat should be informed immediately to pass final judgement. Where the laboratory staff suspect that a manufacturer has interfered with any of the setup, the manufacturer's representatives should be warned that they are not allowed to do so themselves. They should also be informed that if another incident occurs, they will be asked to leave the test site.

Where there is a recurrence of the problem, the manufacturer’s representatives will be told to leave the test site and the Secretariat should be immediately informed. Any such incident may be reported by the Secretariat to the manufacturer and the persons concerned may not be allowed to attend further ASEAN NCAP tests.

DISCLAIMER: ASEAN 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, ASEAN NCAP reserves the right to make corrections and determine the assessment and subsequent result of the affected requirement(s).

In addition to the settings specified in this protocol, the following information will be required from the manufacturer of the car being tested in order to facilitate the vehicle preparation. A vehicle handbook should be provided to the test laboratory prior to preparation.

TEST PROTOCOL –
AUTO HIGH BEAM AND ADAPTIVE DRIVING BEAM

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NEW CAR ASSESSMENT PROGRAM FOR SOUTHEAST ASIAN COUNTRIES (ASEAN NCAP)

TEST PROTOCOL – AUTO HIGH BEAM AND ADAPTIVE DRIVING BEAM

1 INTRODUCTION

Each year, passenger vehicles are produced with new innovative mechanical and electronic features installed to enhance drivability and safety. Auto High Beam (AHB) technology is an example of such feature. AHB technology is part of ADAS (automatic driver assistance system) which detects oncoming and preceding vehicles and automatically switches between high and low beams during night driving, making it easier for the driver to recognize hazards such as motorcyclist.

Moreover, widespread popularity of the motorcycle presents a totally different problem compared to the car. It is found that in certain areas, the condition of motorcycles on the road is not up to the mark whereby some of the equipment is not in working order. For example, the headlight or the taillight might not work. Such an issue pertaining to conspicuousness of motorcyclists will definitely result in a dangerous situation, which could eventually lead to road crashes. This stems from the difficulty faced by car drivers to notice the presence of nearby motorcyclists. Regardless, with the AHB function

in a new car, this problem may reach a solution and in turn may result in a reduction of motorcyclist fatality in the ASEAN region.

This protocol describes a test procedure for measuring and rating the on-road illumination provided by passenger vehicle headlight system. The procedure is based on illumination measurements on road sections with a horizontal distance of 80 to 150 m. Visibility illumination distances are assessed for low and high beams, with additional credit given for systems that automatically switch between high and low beam.

2 DEFINITIONS

In this document, references are made to the following terms, namely:

'High-performance headlamp' which refers to devices with a long-range light beam for forward visibility by automatically change the headlamp beam illumination range depending on the condition of traffic in front.

'Main driving beam (high beam)' is the illuminating light beam of the front headlamp, for the purpose of checking for obstacles in the traffic path at night.

'Auto High-Beams (AHB)' is referring to the headlamp function which has the capability to automatically switch the high beam and the low beam.

'Adaptive Driving Beams (ADB)' is referring to the headlamp function which has the capability to automatically modify portions of the projected light to reduce glare to traffic participants on an ongoing, dynamic basis.

'Operation Speed' which refers to the driving velocity range at which the headlamp switches to low beam, or the partial beam blocking function operates (works) for each device.

'Vehicle Under Test (VUT)' is the vehicle tested according to this protocol with the safety assist system on board.

'Urban Road' comprises roads with and without illumination.

'Country Road' comprises sections having two or more lanes.

3 TEST VEHICLE PREPARATION

The AHB Assessment shall be undertaken using a vehicle in the "as-received" condition. Prior to the testing, ASEAN NCAP shall ensure that:

Tires are inflated to the manufacturer's recommended cold inflation pressure. If more than one recommendation is provided, the tires are inflated to the lightly loaded condition.

The fuel tank is filled to 100% capacity with the appropriate fuel and maintained to at least 75% capacity throughout the testing.

Appropriate instrumentation is installed in the vehicle.

3.1 Instrumentations

The measurement of position and distance will be adjusted to reflect the centre of the vehicle's leading edge.

3.1.1 Photometry Equipment

A lux meter will be placed at the measured location of the test track. This lux meter will record the light intensities with respect to the distances from the VUT leading edge.

4 TEST CONDITIONS

The test location shall be on a flat asphalt or concrete surface. The ambient temperature during testing shall be within the range of 5°C - 40°C. The test is recommended to be conducted at night, with road illumination (≥ 15 lux) and without illumination (<5 lux).

4.1 Test Track

4.1.1 The test is conducted on a dry (with no visible moisture on the surface), uniform, solid-paved surface with a consistent slope between level and 1%.

4.1.2 The surface must be paved and may not contain any irregularities (e.g., large dips or cracks, manhole covers or reflective studs) that may give rise to abnormal sensor

measurements within a lateral distance of 3.0 m to either side of the test path and with a longitudinal distance of 10 m ahead of the VUT when the test ends.

5 PROVISIONS OF DATA FROM MANUFACTURER

5.1 Manufacturers shall provide ASEAN NCAP inspector one of the following documentations necessary for the confirmation of device function and operation speed of the vehicle undergoing the equipment check, or documentation that is the equivalent thereof performance test required.

5.1.1 Standard certified test results of UNECE Regulation No. 48-06 (or later), section 6.1.9.3.3.2 – Uniform provisions concerning the approval of vehicles with regard to the installation of lighting and light-signalling devices' or 'automatic control of the main-beam headlamps' (as found in the UN ECE R48), that are applicable to the model of the car undergoing equipment check, or equivalent documents.

5.1.2 Standard certified test results of UNECE Regulation No. 112-01 (or later) section 6.3.3 class B and UNECE Regulation No. 149 – Uniform provisions concerning the approval of motor vehicle headlamps emitting an asymmetrical passing beam or a driving beam or both and equipped with filament lamps and/or light-emitting diode (LED) modules.

5.1.3 A technical report from a laboratory witnessed by technical services provider is acceptable. Refer to ASEAN NCAP Guideline In-House Test Report Documentation Submissions Version 1.0.

5.1.4 Instruction manual (owner's manual) associated with the model of the car undergoing the equipment check, or other documentation equivalent to this.

6 TEST PROCEDURE

6.1 High-performance headlamp function and equipment check

If, according to the Standard certified test result documentation, the authentication of the 'automatic control of the main-beam headlamps' is confirmed, in the attached Appendix 2, state 'Yes' in the 'automatic switching type' column. For devices that fall outside of this category, state 'No' in the columns for each device type.

6.2 Checks of operation speed

The VUT will be tested with the systems enabled, as refer to Annex 1.

All vehicles will be started on a level surface at the final loading condition for the test and the ignition will remain on during testing.

In the event that 'yes' was recorded for the device as stated in paragraph 6.1, record the operation speed in the column

marked ‘speed range’ in Appendix 2. Table 1 lists the operation speed requirements.

Table 1: Operation speed requirements

Test	Headlight	Activated start speed	Requirement
Operational speed	Low to High Beam	< 50 km/h	Must automatic switching/ adapting
	High to Low Beam	< 50 km/h	Detect oncoming/ preceding vehicle

Three (3) runs shall be completed to determine repeatability.

If the VUT does not meet the requirement as described in Table 1, no point shall be rewarded.

6.3 Illuminance Measurements

The VUT will be positioned in a static condition with the high beam as the main driving beam turned **ON**. A 100 m distance of lux meter will be measured from the leading edge of test vehicle to record the visibility and illuminance of its driving beam, as described in Figure 1.

In order to compromise for changes in illumination that are due to changes in vehicle pitch, lux meter is placed at each measurement location of A and B to capture illuminance readings at different vertical heights and horizontal range. Visibility illuminance values are assessed at point A and B that are 3.3 m apart.

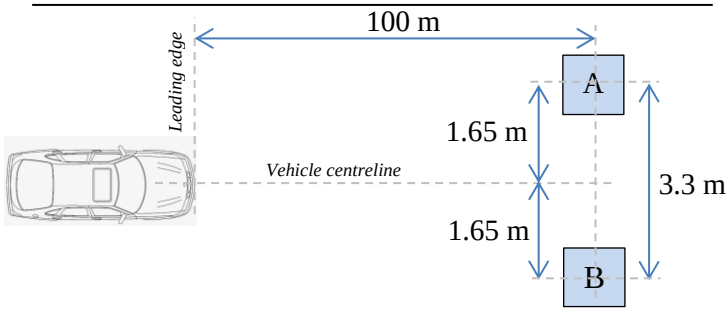


Figure 1: Horizontal layout of the illuminance measurements assessment

Lux meters are placed at each measured location on the test track at the heights of 25 cm and 110 cm from the ground, respectively. The vertical layout of the illuminance measurement is illustrated in Figure 2.

The height of lux meters used at each point in the assessment are based on the visibility height of a motorcyclist riding a motorcycle (height closest to ideal).

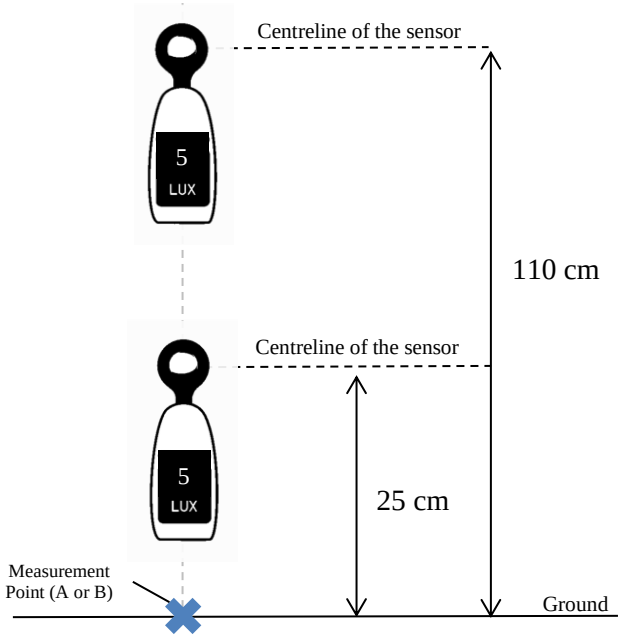


Figure 2: Vertical layout of the illuminance measurements at point A or B

ASEAN NCAP shall determine the functionality; whether the AHB system provides adequate illuminance when the test is performed according to the procedure.

For each visibility illuminance measurement point listed in Table 2, the minimum value of 5 lux must be obtained.

If the test vehicle does not meet all the requirements as described in Table 2, no point will be rewarded.

Table 2: AHB illuminance measurements requirements

Test	Position	Distance (m) [1]	Height (cm) [2]	Min requirements (lux)
Illuminance	A	100	25	5
			110	5
	B	100	25	5
			110	5

[1] *Measured from the ground*
[2] *Measured from the VUT leading edge*

6.4 Equivalent Test Procedure

At the request of the manufacturer, the above test set procedure can be replaced by the test procedure described in UNECE Regulation No. 48-06 (or later), section 6.1.9.3.3.2 and UNECE Regulation No. 112-01 (or later), section 6.3.3 class B, UNECE Regulation No. 123, section 6.3.2 or UNECE Regulation No. 149. Manufacturer shall submit certification of the abovementioned regulations or test report witnessed by technical services provider.

OR

The test may be performed by different test procedure, provided that such test procedure fulfils the requirement of paragraphs 6.1, 6.2 and 6.3 above.

However, other tests may be permitted at the discretion of ASEAN NCAP provided equivalence can be demonstrated. In such a case a report shall be attached with the methods describing the procedure used and the results obtained.

ANNEX 1

Reference
E/ECE/324/Rev.1/Add.47/Rev.9
E/ECE/TRANS/505/Rev.1/Add.47/Rev.9

Test drive

1. The test course specifications for the automatic control of auto high beams and adaptive driving beams headlamps shall comprise traffic conditions, at speed corresponding to the relevant road type, as described in Table 3.

1.1 The test drive shall be carried out in clear atmosphere and with clean headlamps.

1.2 The test track shall comprise roads with illumination (≥ 15 lux) and without illumination (<5 lux).

1.3 For the test course A and B in Table 3, the engineers/inspectors conducting the tests shall evaluate and record the acceptability of the performance of the adaptation process in relation to oncoming and preceding road users. This means that the test engineers/inspectors shall be seated in the vehicle being tested and additionally be seated in the oncoming and preceding vehicles.

Table 3

Test course	Road / Traffic condition	Road type	
		Urban	Country
	Speed (km/h)	50 ± 10	80 ± 20
	Average percent of the full test course length	10%	70%
A	Single oncoming / preceding vehicle in a frequency so that the main driving beam will switch ON and OFF	X	X
B	Single oncoming / preceding vehicle in a frequency so that the main driving beam will react to demonstrate the adaptation process.	X	X

Automatic switching conditions dipped-beam headlamps

Automatic switching conditions dipped-beam headlamps[1]		
Ambient light outside the vehicle[2]	Dipped-beam headlamps	Response time
less than 1,000 lux	ON	no more than 2 seconds
between 1,000 lux and 7,000 lux	at manufacturer's discretion	at manufacturer's discretion
more than 7,000 lux	OFF	more than 5 seconds, but no more than 300 seconds

[1] Compliance with these conditions shall be demonstrated by the manufacturer, by simulation or other means of verification accepted by the authority responsible for the assessment.

[2] The illuminance shall be measured on a horizontal surface, with a cosine corrected sensor on the same height as the mounting position of the sensor on the vehicle. This may be demonstrated by the manufacturer by sufficient documentation or by other means accepted by the authority responsible for the assessment.

APPENDIX 1

HIGH-PERFORMANCE HEADLAMP EQUIPMENT CHECK

(To be filled out by the manufacturer)

Specifications of the car being assessed.

1. Make/Type (Model name): _____/ _____/_____

2. Declaration from Car Manufacturer

Automatic switching type

Yes (Operating speed): _____ km/h to _____ km/h / No

3. Supporting documents

Function and equipment documents: R48 certified test results / Others: _____

Operation speed documents: Instructional manual / Others: _____

APPENDIX 2

Operation Speed Assessment
RESULT
(To be filled out by ASEAN NCAP)

ʻAutomatic switching type’	Yes		No	

Requirement	Activated start Speed (km/h)			Performance acceptability (Yes/No)			
	Run 1	Run 2	Run 3	VUT	Oncoming	VUT	Preceding
URBAN ROAD							
With illumination: _____ lux (≥ 15 lux)							
Low to High Beam[1]							
High to Low Beam[2]							
Without illumination: _____lux (<5 lux)							
Low to High Beam[1]							
High to Low Beam[2]							
COUNTRY ROAD							
Low to High Beam[1]							
High to Low Beam[2]							

[1] *Must automatically switching at < 50 km/h*

[2] *Detect oncoming/preceding vehicle at < 50 km/h*

Illuminance Evaluation

Position	Distance (m) [1]	Height (cm) [2]	Measurement (lux)	Minimum requirements (lux)
A	100	25		5
		110		5
B	100	25		5
		110		5

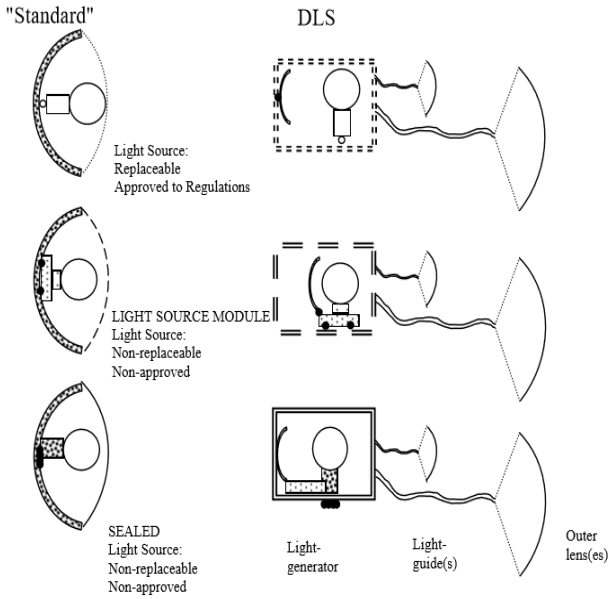
[1] *Measured from the ground*

[2] *Measured from the VUT leading edge*

APPENDIX 3

E/ECE/324
Rev.1/Add.47/Rev.5 E/ECE/TRANS/505
Regulation No. 48
page 110

EXAMPLES OF LIGHT SOURCE OPTIONS



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Editors

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