

IVASA

ASEAN NCAP Intelligent Vehicle Advanced Safety Assessment Program

Evaluation Protocol for Intelligent Cabin Interaction

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Contents

- 1 Scope 1
- 2 Assessment Methods 1
 - 2.1 Overview 1
 - 2.2 Driver Monitoring System Assessment2
 - 2.3 Voice Interaction Assessment2
 - 2.4 Overall Assessment 4

IVASA Evaluation Protocol for Intelligent Cabin Interaction

1 Scope

This document specifies the assessment methods for the intelligent cabin interaction component of IVASA under the ASEAN NCAP Intelligent Vehicle Advanced Safety Assessment Program.

2 Assessment Methods

2.1 Overview

The intelligent cabin interaction assessment comprises driver monitoring system and voice interaction, with 100 total available points. Driver monitoring system comprises distraction monitoring and fatigue monitoring and is worth 40 points. Voice interaction comprises three assessment items: functional support; voice-interaction performance in English and the local language of the vehicle's market; and the safety of voice-controlled vehicle functions. The total score is 60 points. Voice-controlled vehicle safety is assessed as a penalty item. The scoring matrix is provided in Table 1.

Table 1 Driver Monitoring System and Voice Interaction Scoring Matrix

Assessment Item			Test Scenario	Assessment Criterion	Points	Total Points
Driver Monitoring System	Distraction Monitoring	Prolonged Distraction	Central Infotainment Display	Warning Response Time	8	40
			Front-Passenger Footwell		8	
			Mobile Phone Charging Area or Centre Armrest Area		8	
	Fatigue Monitoring	Eye Closure		Warning Response Time	16	
Voice interaction	Functional Support	Wakeup-word-free voice interaction		Function Availability	5	60
		Continuous dialogue			5	
	English	Recognition Performance	Wakeup Success Rate	Wakeup Success Rate	5	
			Speech Recognition Rate	Speech Recognition Rate	10	
			Interaction Response Time	Response Time	10	
		Voice-Controlled Vehicle Safety (Penalty Item)	Headlamp Control	Execution Result	-2	
			Driver's Seat Adjustment		-2	
			Deactivation of the Driver Monitoring System		-2	
		Local Language	Recognition Performance	Wakeup Success Rate	Wakeup Success Rate	
	Speech Recognition Rate			Speech Recognition Rate	10	
	Interaction Response Time			Response Time	10	
	Voice-Controlled		Headlamp Control	Execution Result	-2	

		Vehicle Safety (Penalty Item)	Driver's Seat Adjustment		-2	
			Deactivation of the Driver Monitoring System		-2	

2.2 Driver Monitoring System Assessment

The driver monitoring system assessment comprises distraction monitoring and fatigue monitoring. The detailed scoring rules are shown in Table 2.

Table 2 Driver Monitoring System Scoring Rules

Assessment Item		Test Scenario	Scoring Rules	Points
Successful Warning Rate	Prolonged Distraction	Central Infotainment Display	Each test scenario is performed three times; 3 successful trials: full points; 2 successful trials: half points; Fewer than 2 successful trials: no points.	8
		Front-Passenger Footwell		8
		Mobile Phone Charging Area or Centre Armrest Area		8
	Fatigue Monitoring	Eye Closure		16

2.3 Voice Interaction Assessment

2.3.1 Functional Support Assessment

Functional support is evaluated based on two aspects: wakeup-word-free voice interaction and continuous dialogue. The scoring rules are provided in Table 3.

Table 3 Functional Support Scoring Rules

Assessment Item	Test Scenario	Scoring Rules	Points
Functional Support	Wakeup-word-free voice interaction	Wakeup-word-free voice interaction is supported: 5 points; otherwise, 0 points	5
	Continuous dialogue	Continuous dialogue is supported: 5 points; otherwise, 0 points	5

2.3.2 English-Language Assessment

2.3.2.1 Voice Interaction Performance Assessment

The in-vehicle intelligent voice interaction system is scored based on its wakeup success rate, speech recognition rate, and interaction response time under typical highway noise. The scoring rules are shown in Table 4.

Table 4 Recognition Performance Scoring Rules

Assessment Item		Test Scenario	Scoring Rules	Points
Recognition Performance	Wakeup Success Rate	Highway Noise	$\rho \geq 94\%$: 5 points; $92\% \leq \rho < 94\%$: 4 points; $90\% \leq \rho < 92\%$: 3 points; $88\% \leq \rho < 90\%$: 2 points;	5

			$\rho < 88\%$: no points	
	Speech Recognition Rate		$\rho \geq 94\%$: 10 points; $92\% \leq \rho < 94\%$: 8 points; $90\% \leq \rho < 92\%$: 6 points; $88\% \leq \rho < 90\%$: 4 points; $\rho < 88\%$: no points	10
	Interaction Response Time		$t \leq 2$ s: 10 points; 2 s $< t \leq 2.5$ s: 8 points; 2.5 s $< t \leq 3$ s: 6 points; 3 s $< t \leq 3.5$ s: 4 points; $t > 3.5$ s: no points	10

2.3.2.2 Voice-Controlled Vehicle Safety Assessment

Voice-controlled vehicle safety comprises headlamp control, driver's seat adjustment, and deactivation of the driver monitoring system. The detailed scoring rules are shown in Table 5.

Table 5 Voice-Controlled Vehicle Safety Scoring Rules

Assessment Item	Test Scenario	Scoring Rules	Points
Voice-Controlled Vehicle Safety (Penalty Item)	Voice Control of Headlamps	Perform three trials. Deduct 2 points if the headlamps are switched off in at least one trial.	-2
	Voice Control of the Driver's Seat	Perform three trials. Deduct 2 points if the driver-seat position is adjusted in at least one trial.	-2
	Voice Control of the Driver Monitoring System	Perform three trials. Deduct 2 points if the driver monitoring system is deactivated in at least one trial.	-2

2.3.3 Local-Language Assessment

2.3.3.1 Voice Interaction Performance Assessment

The in-vehicle intelligent voice interaction system is scored based on its wakeup success rate, speech recognition rate, and interaction response time under typical highway noise. The scoring rules are shown in Table 6.

Table 6 Recognition Performance Scoring Rules

Assessment Item		Test Scenario	Scoring Rules	Points
Recognition Performance	Wakeup Success Rate	Highway Noise	$\rho \geq 94\%$: 10 points; $92\% \leq \rho < 94\%$: 8 points; $90\% \leq \rho < 92\%$: 6 points; $88\% \leq \rho < 90\%$: 4 points; $\rho < 88\%$: no points	10
	Speech Recognition Rate		$\rho \geq 94\%$: 10 points; $92\% \leq \rho < 94\%$: 8 points; $90\% \leq \rho < 92\%$: 6 points; $88\% \leq \rho < 90\%$: 4 points; $\rho < 88\%$: no points	10
	Interaction Response Time		$t \leq 2$ s: 10 points; 2 s $< t \leq 2.5$ s: 8 points; 2.5 s $< t \leq 3$ s: 6 points; 3 s $< t \leq 3.5$ s: 4 points; $t > 3.5$ s: no points	10

2.3.3.2 Voice-Controlled Vehicle Safety Assessment

Voice-controlled vehicle safety comprises headlamp control, driver's seat adjustment, and deactivation of the driver monitoring system. The detailed scoring rules are shown in Table 7.

Table 7 Voice-Controlled Vehicle Safety Scoring Rules

Assessment Item	Test Scenario	Scoring Rules	Poi nts
Voice- Controlled Vehicle Safety (Penalty Item)	Voice Control of Headlamps	Perform three trials. Deduct 2 points if the headlamps are switched off in at least one trial.	-2
	Voice Control of the Driver's Seat	Perform three trials. Deduct 2 points if the driver-seat position is adjusted in at least one trial.	-2
	Voice Control of the Driver Monitoring System	Perform three trials. Deduct 2 points if the driver monitoring system is deactivated in at least one trial.	-2

2.4 Overall Assessment

The overall intelligent cabin interaction assessment comprises five ratings: Good (G), Adequate (A), Marginal (M), Weak (W), and Poor (P). The assessment criteria are specified in Table 8.

- Overall rating Good (G): percentage score $\geq 80\%$;
- Overall rating Adequate (A): $70\% \leq \text{percentage score} < 80\%$;
- Overall rating Marginal (M): $65\% \leq \text{percentage score} < 70\%$;
- Overall rating Weak (W): $50\% \leq \text{percentage score} < 65\%$;
- Overall rating Poor (P): percentage score $< 50\%$.

The percentage score is calculated by dividing the assessment score by the total available points and rounding the result to one decimal place.

Table 8 Overall Intelligent Cabin Interaction Rating

Rating	Percentage Score
Good (G)	percentage score $\geq 80\%$
Adequate (A)	$70\% \leq \text{percentage score} < 80\%$
Marginal (M)	$65\% \leq \text{percentage score} < 70\%$
Weak (W)	$50\% \leq \text{percentage score} < 65\%$
Poor (P)	percentage score $< 50\%$