Proposal for amendments to UN Regulation No.13H

I.   Proposal

This proposal was prepared by the expert from CATARC and is based on the existing UN Regulation No.13H. It is aimed at adding trigger threshold requirement, and modifying the requirement of the sampling rate, the limit of BAS deceleration and the data selection criteria of "B" BAS,indicated in bold for new and strikethrough for deleted characters.

Annex 1

Paragraph 22.1.2.,amend to read:

22.1.2. For category B systems, define the brake pedal speed which shall be achieved in order to activate the Brake Assist System (e.g. pedal stroke speed (mm/s) during a given time interval)[2],**and the brake pedal speed should between 472.4-683.3mm/s : _____** ;

Annex

Paragraph 2.2.3.,amend to read:

2.2.3.   Details on analogue and digital data processing of the BAS test procedures are described in Appendix 5 to this annex. ~~A sampling rate for data acquisition of at least 500 Hz is required.~~ **A sampling rate for data acquisition of at least 100 Hz is required.**

Paragraph 4.3.,amend to read:

4.3.   Data evaluation

The presence of BAS 'B' is demonstrated if a mean deceleration (a_{BAS}) of at least ~~0.85~~ **0.90**· a_{ABS} is maintained from the time when t = t_0 + 0.8 s to the time when the vehicle speed has been reduced to 15 km/h.

Annex 9 - Appendix 4

Paragraph 1.3.,amend to read:

1.3.   **The full deceleration is defined as the average deceleration during the first cycle of the ABS system, and the** full deceleration shall be reached within the timeframe of 2.0 ± 0.5 s. The deceleration curve, recorded against time, shall be within a corridor of ± 0.5 s around the centre line of the deceleration curve corridor. The example in Figure 3 has its origin at the time t_0 crossing the a_{ABS} line 2 seconds. Once full deceleration has been achieved, the brake pedal shall be operated so that the ABS continues fully cycling. ~~The time of full activation of the ABS system is defined as the time when pedal force F_{ABS} is achieved.~~ The measurement shall be within the corridor for variation of increase in deceleration (see Figure 3).

II. Justification

1.   There should be a explicitly requirement to the range of brake pedal speed to activate "B"BAS, one obvious low brake pedal speed trigger may cause a false positive accident, one obvious high brake pedal speed trigger is too difficult to achieve for a normal driver, and then lost the safety effect of BAS. A range between 472.4 to 683.3mm/s may be used based on the document below:
     Forkenbrock, G.J., Snyder, A., Jones, R.E., "An Evaluation of Light Vehicle Brake Assist," NHTSA Technical Report, DOT HS 810 989, May 2009.
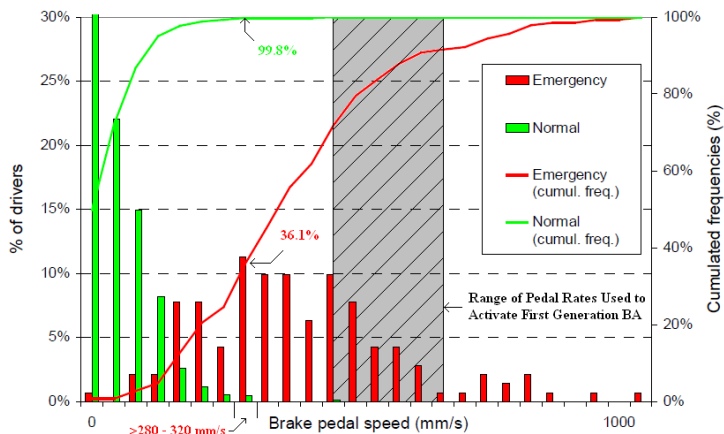
2.   A sampling rate for data acquisition of 100 Hz will fulfil the requirement of BAS test and data analysis, and based on the strict requirement of brake force control in BAS test, braking robots and GPS-IMU are commonly used in the industry, and the data output rate of these equipment is between 100 to 250Hz, so the sampling rate should be adjusted to solve the difference between the execution and the content of the standard.

3.   The deceleration requirement of activated "B"BAS should increase from 85% to at least 90%, based on the nonlinearity relationship between brake pedal force and deceleration, a brake pedal force of $0.70F_{abs}$ will achieve $0.74\text{-}0.79$ a_{ABS} in maF curve, when using a pedal speed which is very close to the activation threshold of BAS to apply a rapid brake, a pedal force of 0.70 F_{abs} will achieve $0.85\text{-}0.87a_{abs}$ without the activation of BAS, which exceeds deceleration requirement of activated BAS(0.85 a_{abs}). Based on the facts that, when the "B"BAS is

activated, the deceleration of vehicle will generally achieve 100% of a_{abs}, the deceleration requirement of activated "B"BAS should increase from 85% to at least 90%.
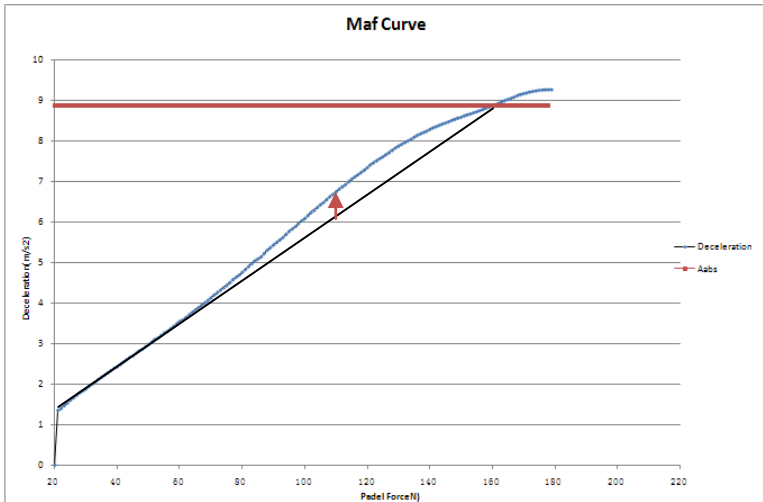
Model	$F_{ABS}(N)$ /70%Fabs	$a_{ABS}(m/s^2)$	Deceleration of 70% F_{ABS} in maF(m/s^2)	$a_{70\%maF}$/ $a_{ABS}(\%)$	$A_{70\%FABS(NO BAS)}$	$A_{70\%FABS(NO BAS)}$/$a_{ABS}(\%)$	A_{BAS} Activated	$A_{BAS\ Activated}$/ $a_{ABS}(\%)$
SUV C	134/94	8.51	5.89	69%	----	----	8.72	102%
SUV F	140/98	9.02	7.16	79%	7.84(98N)	87%	9.11	101%
A CLASS S	176/123	8.55	6.37	75%	7.30(100N)	85%	9.10	106%
SUV S	160/112	8.88	6.93	79%	----	-----	9.11	103%
SUV B	151/106	8.73	5.62	64%	----	-----	8.20	94%

4. Determine the selection criteria and measurement range of data is the prerequisite of the calculation of F_{abs}, but now a_{abs} have been used in the data selection process, there is a obvious logical problem, so a selection criteria based on the average deceleration during ABS full cycling should be used to replace the existing criteria based on a_{abs}, and then calculate the F_{abs} and a_{abs}