

APPROVAL TEST PROCEDURES with amendments proposed by France.

The document is based on : “ACSF-05-03 (D+J) Proposal based on ACSF-04-20-meeting Version3final”

The changes are in red characters and the comments in blue characters.

The blue, yellow and blue highlighted sentences come from the original text.

Preliminary question: Are the ACSF systems always able to be activated when the assessment tests are carried out on a **private** circuit (e.g. cases where the vehicles use positioning system in addition to the reading of lane markings) ?

3.1. Functionality Tests

3.1.1. Functionality Test 1 (FU1): Test for lane keeping

3.1.1.1 Drive the vehicle with activated ACSF **at least [5/10 min]** on a track **with various including curvatures (left and right)** with road markings at each side of the lane. **at various test speeds up to $v_{smax} - 10$ km/h and down to v_{smin} . The curvatures of the track shall be such that at v_{smax} lateral accelerations in the range from $0,5$ m/s² up to 90 % of ay_{smax} are achieved.** During the driving phase, at least the 5 following [conditions/situations] have to be achieved:

- Three test speeds at v_{smin} , v_{sint} , ($v_{smax} - 10$ km/h) with a lateral acceleration in the range from $0,5$ ay_{max} and $0,9$ ay_{max}
- Two test speeds between v_{smin} and v_{smax} such as the lateral acceleration is equal to $0,5$ ay_{max} and then to $0,9$ ay_{max}

Repeat each test case.

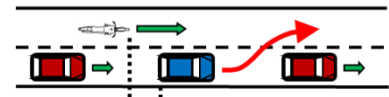
3.1.1.2 ~~Various curvature test data~~ Missing test data.

~~If the test track which was used for paragraph 3.1.1.1. has no various curvature,~~ Technical Service shall require to manufacturer to deliver data about fulfilling test ~~of the various curvature.~~ if some situations were not assessed in application of § 3.1.1.1

3.1.1.3 The requirements of the test are fulfilled if the vehicle does not cross any lane marking.

Comments/Justification:

- Duration [5/10min] is not a relevant parameter.
- To insert left and right curves in the test traveled at defined speeds in order to cover all representative configurations.
- To define precise speeds for easier test conditions.
- To allow to choose values of the curvatures radius compatible with the existing tracks.
- To allow to perform the test either continuous or sequential manner.



3.1.2. Functionality Test 2 (FU2): Test for the abort of lane change

3.1.2.1 Drive the vehicle with activated ACSF on a straight track with at least two lanes with road markings at each side of the lane at a test speed of 70 km/h or ($V_{\text{max}} - 20$ km/h) whatever is lower. Two other vehicles of category M1 or target vehicles shall drive centered in the lane ahead and behind the test vehicle (VUT) with the same speed. The time gap to the vehicle ahead shall be selected by the ~~test-vehicle~~ VUT itself. The time gap to the vehicle behind shall be 1.9 s \pm 0.1 s. The desired speed of the ~~test-vehicle~~ VUT shall then be set such, e.g. 20 km/h higher, that a lane change would be induced to pass the vehicle ahead, however for testing purposes, the execution of the lane change shall be suppressed. The willingness to carry out a lane change ("yes" or "no") shall be recorded. Then a motorcycle of category L3 shall approach from behind on a lane next to the vehicle with a speed of the ~~vehicle-test~~ VUT speed plus 50 km/h. The time to collision (TTC) (calculated as distance divided by relative speed) between the vehicle and the motorcycle shall be recorded. The motorcycle shall drive with a lateral distance to the lane marking between the motorcycle and the vehicle of 1 m \pm 0.25 m.

3.1.2.2 The requirements of the test are fulfilled if:

- the willingness to carry out a lane change changes from "yes" to "no" before the TTC between the vehicle and the motorcycle falls below [6 s] and
- the willingness to carry out a lane change remains "no" until the motorcycle has passed the vehicle completely.

3.1.2.3 In case the willingness to carry out a lane change is "no" at any time of the test described in 3.1.2.1 the test shall be repeated without vehicle behind the ~~test-vehicle~~ VUT and the requirements for passing the test given in paragraph 3.1.2.2 shall apply.

3.1.2.4 In case the willingness to carry out a lane change is "no" at any time of the test described in 3.1.2.3 the test shall be repeated without vehicle behind the ~~test-vehicle~~ VUT and with a motorcycle speed which is successively reduced by 10 km/h until the willingness to carry out a lane change is "yes" before the functional part of the test. The requirements for passing the test given in paragraph 3.1.2.2 shall apply.

3.1.2.5 If the track is not long enough, the procedure may be split into several scenarii representing each situation described above.

Comments/Justification:

- 6 s are into brackets because this value leads to a long unrealistic distance for performing the test. With our hypothesis the test needs about 850 to 900 meters long track.

- Add a § 3.1.2.5 when the available track is not long enough.

Option: Replace 6 s by a distance (to be defined) and use the formula in the main text to calculate the distance for passing the test.

3.1.3. Functionality Test 3 (FU3): Test for lane change: No comment.

Transition Tests. General comment: We confirm that the declared value for $a_{y_{smax}}$ should be at least 1 m/s^2 (requirement already introduced in the main text) in order to perform the tests on tracks with common radius values for the turns.



3.2.1. Transition Test 1 (TR1): Transition due to exceeding lateral acceleration

3.2.1.1. Drive the vehicle with activated ACSF on a track with road markings at each side of the lane at a test speed of **80 km/h or 10 km/h below V_{smax} whatever is lower:**

- either (between 70 km/h and $V_{smax} - 10\text{km/h}$) when $V_{smax} \geq 80$ km/h
- or (between $V_{smax} - 50$ and $V_{smax} - 10$) when $V_{smax} < 80$ km/h . The track shall comprise a section in which the curvature shall be such that at test speed the lateral acceleration of the vehicle would be more than $(a_{y_{smax}} + 0.5) m/s^2$ or $3.5 m/s^2$ whatever is lower for a [length of at least 150 m/a length corresponding to [4s] at the test speed]. The test driver of the vehicle shall not take over steering control again until the minimal risk maneuver is finished.

3.2.1.2. The requirements of the test are fulfilled if

3.2.1.2.1. In case transitional demand initiated during test

- the transition demand was given at least when the lateral acceleration exceeds $a_{y_{smax}}$ by more than $0.3 m/s^2$ and
- the vehicle does not cross any lane marking for 4 s after the transition demand and
- the minimal risk manoeuvre as specified by the vehicle manufacturer was initiated at least 4 s after the transition demand and

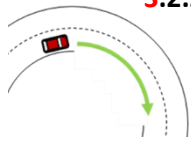
~~the hazard lights are activated at least 4 s after the transition demand.~~ at the beginning of the MRM.

3.2.1.2.2. In case no transitional demand during test

- when transition demand was not initiated during test, the vehicle reduces speed by itself so that $a_{y_{smax}}$ was not exceeded for more than 1 s and vehicle shall not cross any lane marking. (to be put in the requirement section)

Comments/Justification:

- To already take into consideration all the systems (those for which the $V_{smax} \geq 80$ km/h and those for which < 80 km/h).
- Let the choice to select the test speed versus the values of the curvature radius compatible with the existing tracks and the lateral acceleration $a_{y_{smax}}$ declared.
- 150m can represent a long distance for small radius of the curvature, so we prefer to fix a time in relationship with that defined for the transition demand.



3.2.2. Transition Test 2 (TR2): Transition due to missing lane marking

3.2.2.1. Drive the vehicle with activated ACSF on a track with road markings at each side of the lane at a test speed of **80 km/h or 10 km/h below V_{smax} whatever is lower** :

- either between 50 km/h and $V_{smax} - 10 \text{ km/h}$ when $V_{smax} \geq 80 \text{ km/h}$
- or 50 km/h when $V_{smax} < 80 \text{ km/h}$

The track shall comprise a section with [a length of at least 150 m/ /a length corresponding to X seconds at the test speed] in which **the outer side** lane marking is missing on one side and in which the curvature shall be such that at test speed the lateral acceleration of the vehicle would be less than $a_{y_{smax}}$ and more than 0.5 m/s^2 . The test driver of the vehicle shall not take over steering control again until the minimal risk manoeuvre is finished.

.....

Comments/Justification:

- To already take into consideration all the systems (those for which the $V_{smax} \geq 80 \text{ km/h}$ and those for which the $V_{smax} < 80 \text{ km/h}$).
- Let the choice to select the test speed versus the values of the curvature radius compatible with the existing tracks and the lateral acceleration.
- 150m can represent a long distance for small radius of the curvature, so we prefer to fix a time in relationship with that defined for the transition demand.

3.2.3. Transition Tests (TR3): Transition due **to no appropriate reactions from the driver unfastening the seat belt**

3.2.3.1. Drive the vehicle with activated ACSF **at least 1 min** on a track with curvatures with road markings at each side of the lane at a speed of **$v_{smax} - 10 \text{ km/h}$** :

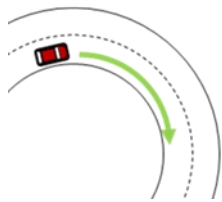
- either between 50 km/h and $V_{smax} - 10 \text{ km/h}$ when $V_{smax} \geq 80 \text{ km/h}$
- or 50 km/h when $V_{smax} < 80 \text{ km/h}$

The curvatures of the track shall be such that at v_{smax} **test speed the lateral accelerations of the vehicle in the range from $0,5 \text{ m/s}^2$ up to 90% of $a_{y_{smax}}$ are achieved would be less than $a_{y_{smax}}$ and more than 0.5 m/s^2** . Subsequently, the driver shall unfasten the seat belt / or the seat belt sensor shall be cut off at the beginning of driving in the curvature.

3.2.3.2.

Comments/Justification:

- To harmonize the conditions of test as TR2



3.2.4. Transition Test 4 (TR4): Transition due to failure

3.2.4.1. Drive the vehicle with activated ACSF on a track with road markings at each side of the lane at a test speed of ~~10 km/h below V_{smax}~~ :

- either between 50 km/h and $V_{smax} - 10\text{km/h}$ when $V_{smax} \geq 80$ km/h
- or 50 km/h when $V_{smax} < 80$ km/h

The track shall comprise a section with [a length of at least 200 m/a length corresponding to X seconds at the test speed] in which the curvature shall be such that at test speed the lateral acceleration of the vehicle would be less than $a_{y_{smax}}$ and more than 0.5 m/s^2 . A single sensor failure [e.g. lane marking detection] of the automatic steering function shall be induced that the vehicle is within the first 50 m of this section, when the transition demand initiated. ~~The driver shall override the ACSF by steering after the transitional demand and minimal risk manoeuvre initiated.~~

3.2.4.2.

Comments/Justification:

- To harmonize the conditions of test as TR2, TR3

3.2.5. Transition Test 5 (TR5): Driver take over test

3.2.5.1. Drive the vehicle with activated ACSF on a track with road markings at each side of the lane at a test speed of ~~70 km/h or ($V_{smax} - 20$ km/h) whatever is lower:~~

- either between 50 km/h and $V_{smax} - 10\text{km/h}$ when $V_{smax} \geq 80$ km/h
- or 50 km/h when $V_{smax} < 80$ km/h

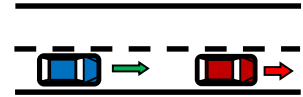
The track shall comprise a section with [a length of at least 200 m/a length corresponding to X seconds at the test speed] in which the curvature shall be such that at test speed the lateral acceleration of the vehicle would be less than $a_{y_{smax}}$ and more than 0.5 m/s^2 . A single sensor failure [e.g. lane marking detection] of the automatic steering function shall be induced that the vehicle is within ~~when the vehicle is driven in~~ the first [50 m] of this section, when the transition demand initiated ~~of the track~~. The driver shall override the ACSF by steering after the transitional demand and minimal risk manoeuvre initiated.

3.2.5.2.

Comments/Justification:

- To harmonize the conditions of test as TR2, TR3, TR4.

3.3. Emergency Tests



3.3.1 Emergency Test 1 (EM1): Protective **braking deceleration** with moving target

3.3.1.1. Drive the vehicle with activated ACSF behind a target vehicle. The vehicle and the target vehicle shall drive within the lane markings on a track with road markings at each side of the lane at a speed of **70 km/h or $(V_{smax} - 20 \text{ km/h})$** **10 km/h below V_{smax}** whatever is lower. The time gap between the **test** vehicle and the target vehicle shall be **selected by the vehicle itself but shall not be more than 2.4 s \pm 0.05 s**. Then the target vehicle shall decelerate with $6 \text{ m/s}^2 \pm 0.25 \text{ m/s}^2$ and with a mean brake jerk of $6 \text{ m/s}^3 \pm 0.25 \text{ m/s}^3$ in the first second of braking. The vehicle shall not carry out a lane change to avoid a collision. Thus any other lane adjacent to the lane the vehicle is driving in shall be blocked e. g. by other vehicles.

3.3.1.2. The requirements of the test (3.3.1.1.) are fulfilled if the vehicle does not collide with the target vehicle.

Comments/Justification:

- To take into consideration all the systems (those for which the $V_{smax} \geq 80 \text{ km/h}$ and those for which the $V_{smax} < 80 \text{ km/h}$). 70 km/h corresponds to the common value separating the both domains.

3.3.2. Emergency Test 2 (EM2): Protective **braking deceleration** with stationary target

3.3.2.1. Drive the vehicle with activated ACSF **at least 1 min** on a track with road markings at each side of the lane at a test speed 10 km/h below V_{smax} . **The speed has to be stabilized during at least 4 s before t**he vehicle **shall** approaches with a time to collision of 4s a target vehicle being at standstill and being placed in the center of the lane. The vehicle shall not carry out a lane change to avoid a collision. Thus any other lane adjacent to the lane the vehicle is driving in shall be blocked e. g. by other vehicles next to the target vehicle.

3.3.2.2. The requirements of the test are fulfilled if the vehicle does not collide with the target vehicle.

Comments/Justification:

- To limit the test speed to 120 km/h (to avoid destroying the target)
- To define the minimum time for maintaining the speed at the constant value.