



Proposals for test method improvement

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1.2.1. "Loop" means the section of the circuit having the same starting and ending point. If the same loop is run clockwise and counterclockwise it shall be considered as 2 loops.

1.2.2. "Circuit" identifies the roads which will be used for the abrasion test. The circuit may consist of one or several loops, which can be run in any order.

1.2.3. "Shift" means the period of time required to run the circuit (including break time, rotation time between vehicle in convoy or drive in vehicle).

1.6.13. Circuit, acceleration, and speed requirements

The circuit shall be a closed loop. Vehicles shall return to the departure point without being transported on a car carrier.

1.6.13.1. Circuit minimum length

Circuit shall be made of one or several closed loops. Vehicles shall return to the departure point. The minimum length shall be 300 km of different roads. Vehicle shall not be transported on a car carrier, except in case of vehicle/tyre failure.

Proposal to reduce circuit minimum length from 300 km to 250 km.

1. Efficiency and Time Management

Feasible distance per day:

2 circuits a day, ca. $2 \times 250 \text{ km} = 500 \text{ km}$

Integer # of circuits for total test with 16 test days = $16 \times 500 \text{ km} = 8000 \text{ km}$ (total abrasion test length)

2. Adaption to electrical vehicle fleet:

250 km per circuit is better aligned with current EV range and consistent recharging schedule.

3. Optimized testing cycles: Easier managing and scheduling of test shifts

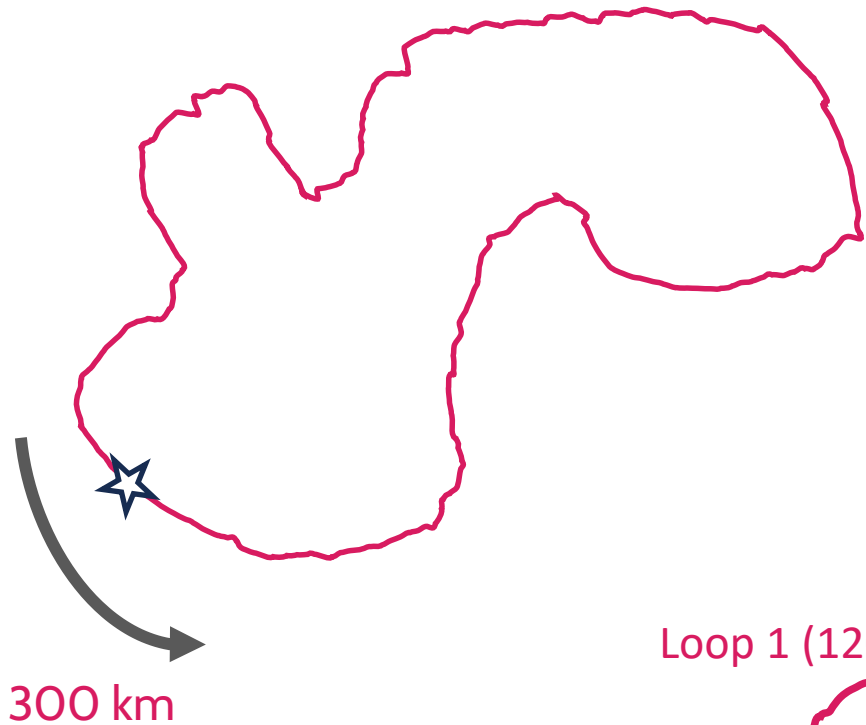
4. Consistent results (each shift has the same length)

Example Circuits

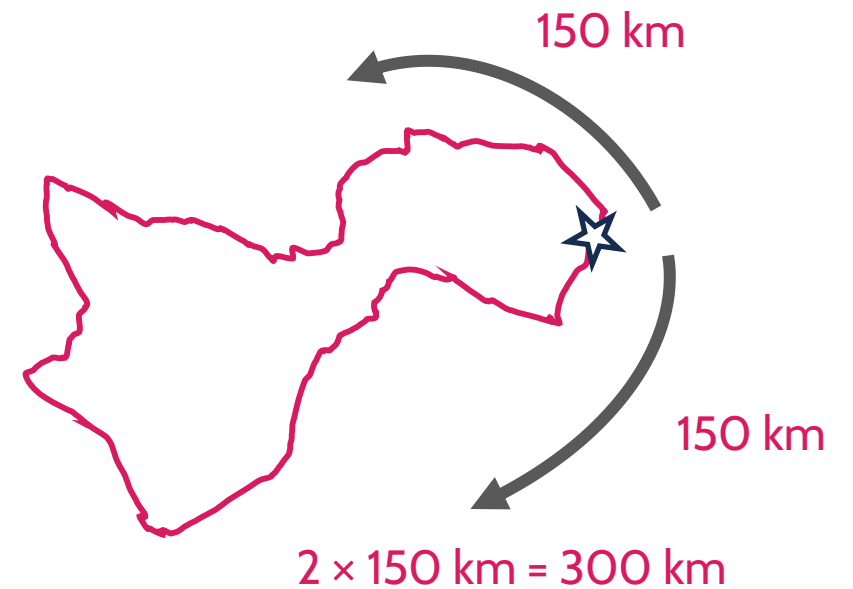
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Single Loop Circuits

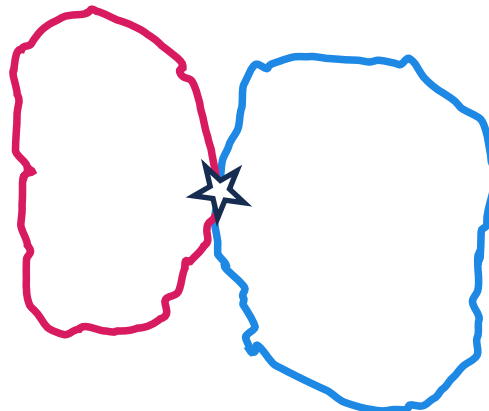
Single Loop = Circuit



Single Loop, clock+counterclockwise = Circuit



Loop 1 (120 km) + Loop 2 (180 km) = Circuit



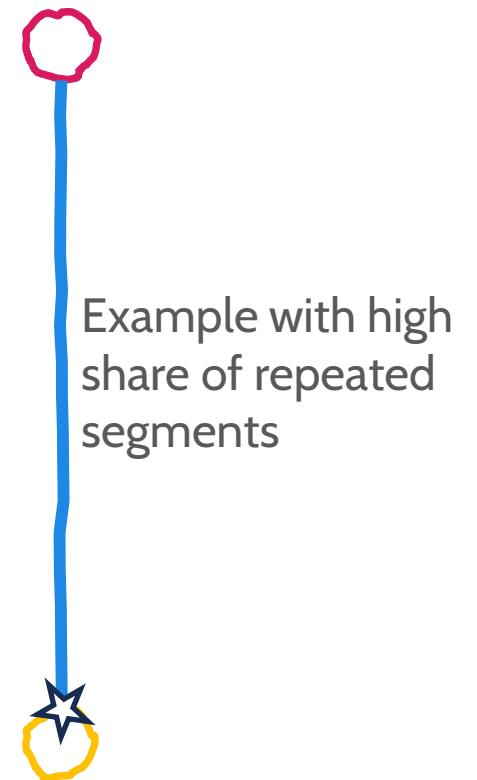
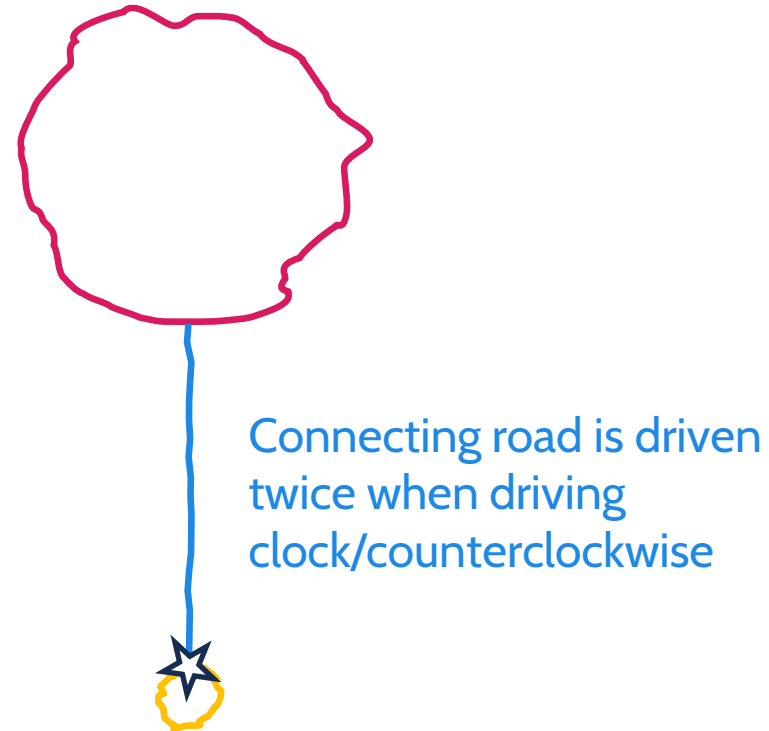
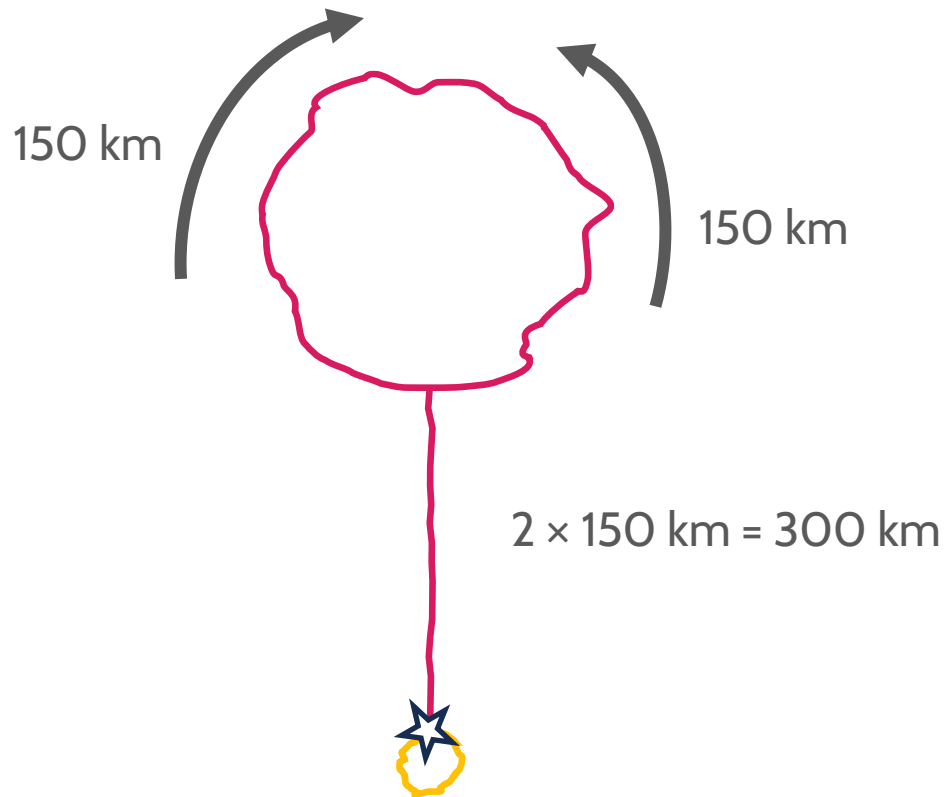
★ Start/End Point

Example Circuits

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Multiple Loop Circuits

Two loops , Loop 1 = Circle, Loop 2 = Circle and connecting road



★ Start/End Point

Circuit length, New definition

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Alignment of shift length and total abrasion testing length

- Remove unnecessary definitions (Loop, etc.).
- Proposal to introduce measure for avoiding repetition of road segments
- Keep existing cycles compliant (DEKRA, IFV, LINK, UTAC,...)



Circuit definition

Circuit Definition and Requirements for Abrasion Test

Circuit: A circuit is a predefined set of continuously connected roads for the abrasion test. The circuit must have a unique starting point, which also serves as the endpoint. The same route driven completely or partially in the opposite direction can be considered part of the same circuit.

All sections of the circuit must be continuously connected and drivable without using a car carrier or ferries. The circuit may include sections of road that cross each other, such as those resembling a figure-eight pattern. The circuit must have a minimum length of **250 km**, consisting of different roads. "Different roads" refers to distinct segments of the route that do not repeat in the same direction for more than **20 %** of the total circuit length. Vehicles must return to the departure point without being transported on a car carrier, except in cases of vehicle or tyre failure.

@ TF-TA:

Do we need a specific definition of the surfaces allowed (paved with asphalt, cement, or equivalent) and not allowed (permanent or temporary gravel in construction zone, dirt roads, cobblestone) for more than 1 (?) km per circuit?

Major traffic disruptions

Major traffic disruptions

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1.11.9. Deviation from nominal circuit

The circuit is considered valid when the following provisions are met altogether:

- (a) The circuit is modified by less than 10 km for the full test or if it is modified by more than 10 km and less than 30 km, for less than 8 shifts;
- (b) The total driven distance remains in the 8000 ± 300 km;
- (c) The abrasion level of reference tyre at 20°C or 10°C as applicable is within the ranges specified in paragraph 1.6.16. of this Annex;
- (d) The acceleration limits are within the ranges specified in paragraphs 1.6.13.2. and 1.6.13.3. of this Annex.

When all provisions are met the circuit is considered valid and the distance considered for calculation has to be corrected accordingly.

Accidental deviation(s) are acceptable if representing less than 20 per cent of circuit distance or less than 100 km (whichever is lower) under the condition that the reference tyre abrasion level at 20°C or 10°C as applicable stays in authorized limits and acceleration standard deviations are respected.

In all other cases, the test is considered not valid and the circuit has to be revalidated.

Guidance on handling major disruptions (e.g., long traffic jams, full track closures) would be appreciated.

Is it possible to interrupt the test and continue another day?



Vehicle trouble handling

1.11.10 Vehicle trouble handling

Vehicle trouble handling

The following provisions apply in case of vehicle damages in the convoy:

- (a) If a vehicle used in the convoy is damaged and cannot be used anymore (e.g. major mechanical failure or accident), it shall be replaced by an identical vehicle that shall be identically loaded and tuned. The replacement vehicle, equipped with the same tyres having started the test, shall run the distance lost due to vehicle failure on the lost segment of the circuit alone without the other vehicles of the convoy;**
- (b) If a vehicle used in the convoy is broken down and can be repaired, the lost distance shall be run without other convoy vehicles on the lost segment of the test circuit;**
- (c) If the failure occurs on a candidate vehicle and not on the reference vehicle, the convoy may continue the test and the failing vehicle/tyre shall be withdrawn from the convoy. A new set of candidate tyres shall then be used for a new test, starting from scratch.**

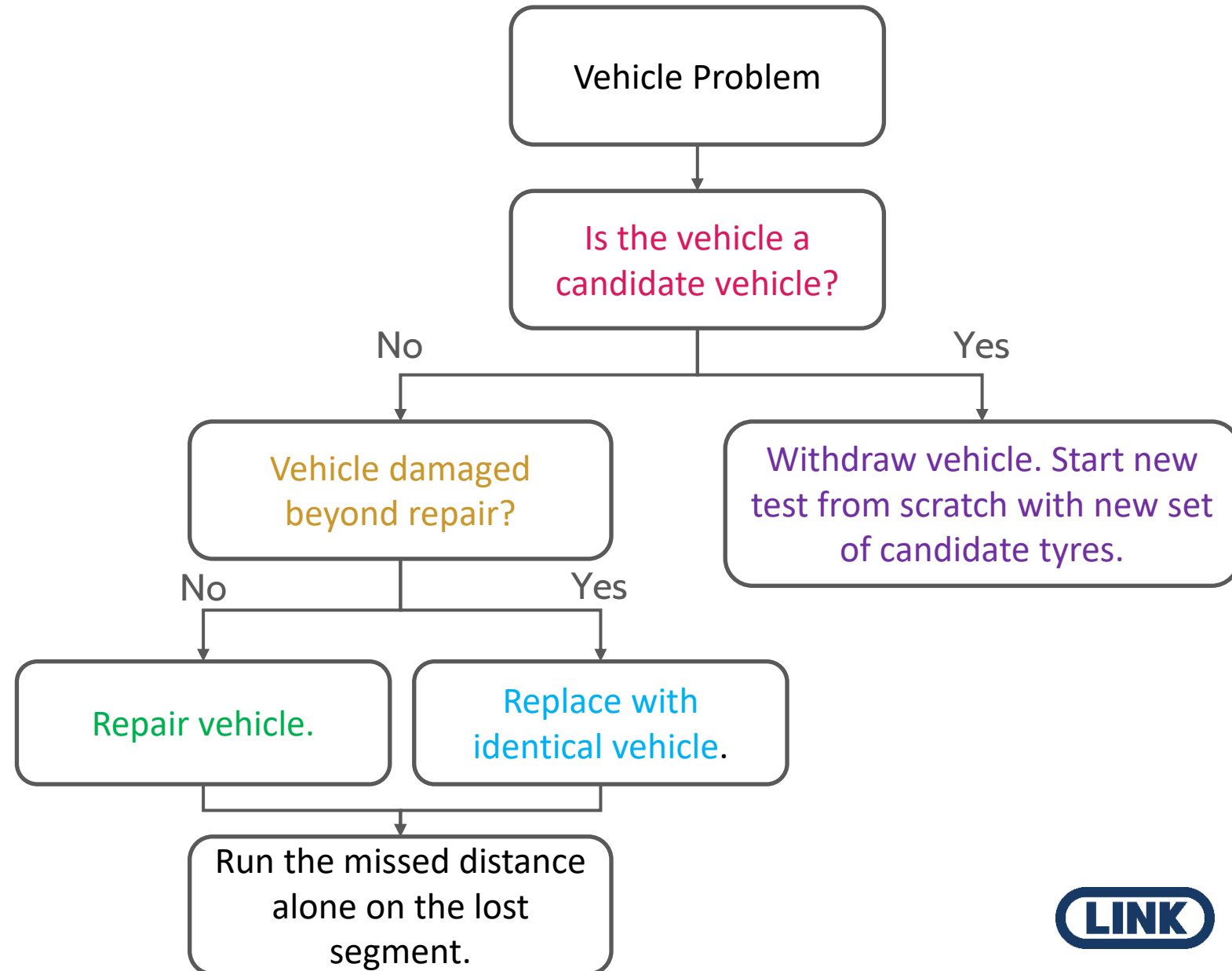
1.11.10 Vehicle trouble handling

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Vehicle trouble handling

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1.11.10 Vehicle trouble handling - Proposal

Current proposal asks to withdraw candidate vehicle independently if it is repairable or not. **Is this the intend?**

LINK proposes to remove differentiation between candidate and reference vehicle. Allow repair of vehicles if possible.
Proposal for a clearer wording in the current draft regulation:

1.11.10 Vehicle Trouble Handling

In the event of a vehicle failure during the test, the following provisions shall apply:

If the vehicle can be repaired and returned to service:

- (a) The repaired vehicle shall operate alone on the lost segment of the test circuit.
- (b) It shall complete the distance lost during the period of unavailability.
- (c) No other convoy vehicles shall accompany the repaired vehicle during this recovery run.

If the vehicle cannot be repaired or is otherwise unusable (e.g. due to major mechanical failure or accident) **or the repair is not considered a viable option (e.g., cost or time to repair):**

- (a) The vehicle shall be replaced with an **identical vehicle**, loaded and tuned in the same manner to the same specifications.
- (b) The replacement vehicle shall be equipped with the **same tyres** used at the start of the initial test.
- (c) The replacement vehicle shall operate alone on the lost segment of the test circuit to complete the distance lost.
- (d) No other convoy vehicles shall accompany the replacement vehicle during this recovery run.

Acceleration calculation / AET

Annex 3, Appendix 1: Accelerations calculation

The current postprocessing of recorded vehicle acceleration/data data follows a certain logic, laid out in Annex 3. This section is not yet detailed enough to enable third parties the implementation in their own tools. There are unclear definitions, and the provided python code is not debugged.

Python code:

```
from scipy import interpolate
import numpy as np
data_inp['distance'] = data_inp['speed']/data_inp['fsample']
data_inp['distance'] = data_inp['distance'].cumsum()

# interpolate function for acc
f_accx = interpolate.interp1d(data_inp['distance'], data_inp['accx'])
f_accy = interpolate.interp1d(data_inp['distance'], data_inp['accy'])

# generate array of distance every 1m
distance_1m = np.array(data_inp['distance'].iloc[0], data_inp['distance'].iloc[
1], 1)

# create an interpolation every 1m for the accelerations - numpy array result
# len of the array same as len of distance_1m
accx_DB = f_accx(distance_1m)
accy_DB = f_accy(distance_1m)

# compute the stdx with ceiling accx_DB and accy_DB
stdax = np.std(accx_DB)
stday = np.std(accy_DB)
```

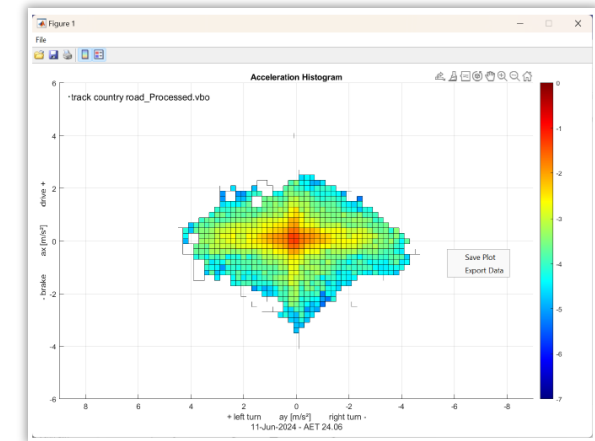
Example of incorrect numpy range definition in annex 3.

AET Tool – Terms and Conditions

Acceleration Evaluation Tool

	StdDev Acc Long	StdDev Acc Lat	Max Acc Long	Max Acc Lat	Urban-like Acc	Highway-like Acc	Max Speed	<60 km/h	60-90 km/h	>90 km/h
Limit	0.45 m/s ²	0.93 m/s ²	5 m/s ²	5 m/s ²	≥ 25%	≥ 35%	140 km/h	≥ 10%	≥ 25%	≥ 35%
Tolerance	±10%	±10%	< 0.02% distance	< 0.1% distance			< 0.5% distance			
track country road_Processed.vbo	0.507 m/s ²	1.050 m/s ²	4.11 m/s ²	4.70 m/s ²	72.2 %	0.0 %	105 km/h	40.0 %	38.0 %	22.0 %
	12.7 %	12.9 %	0.000 %	0.000 %			0.000 %			
track curvy road_Processed.vbo	0.541 m/s ²	1.515 m/s ²	3.39 m/s ²	4.82 m/s ²	0.0 %	0.0 %	91 km/h	48.0 %	52.0 %	0.0 %
	20.2 %	62.9 %	0.000 %	0.000 %			0.000 %			
track motorway_Processed.vbo	0.317 m/s ²	0.443 m/s ²	7.04 m/s ²	3.33 m/s ²	0.0 %	100.0 %	140 km/h	1.0 %	9.0 %	90.0 %
	-29.6 %	-62.4 %	0.001 %	0.000 %			5.695 %			

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AET tool is a very useful tool provided by ETRTO for checking the cycle compliance and de-facto standard. However, it is a black box supplied without any source code. In view of an ISO-17025 certification, it cannot be used by third parties.

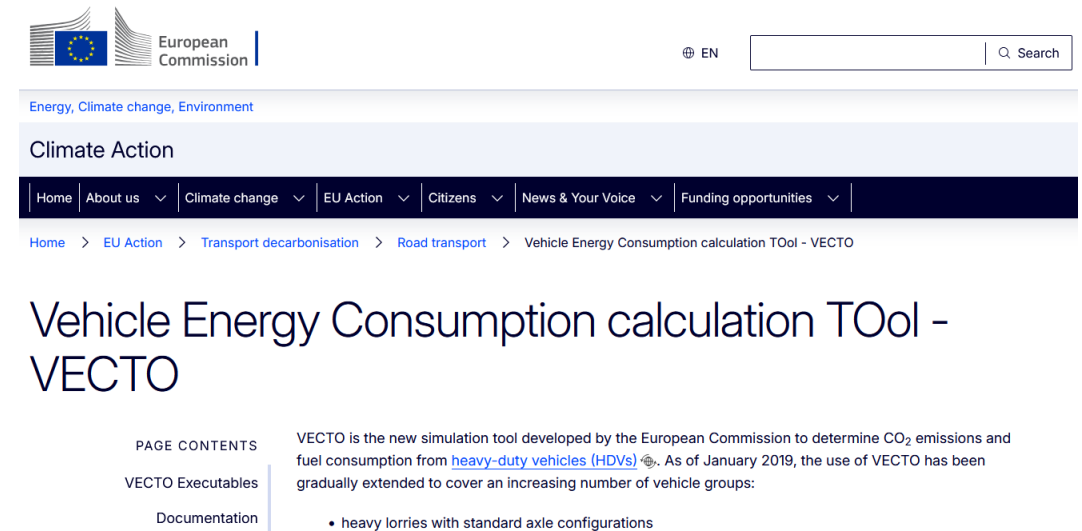
One crossing, two roads

Proposed workflow:

1. Improve algorithm description in regulation

and

- i) Make the AET an official tool provided by the European Commission (similar to the [VECTO tool](#) used for CO₂ emission calculation).
- ii) Provide an example dataset (golden dataset with expected results) as an authoritative or traceable source (to be shared by EU Com). This would allow validation of results for third party developed tools or for future AET software updates.





Thank you!