ASEP Test Results

CVT & Hybrid Vehicles

GRB informal meeting #8
19-21 September 2007
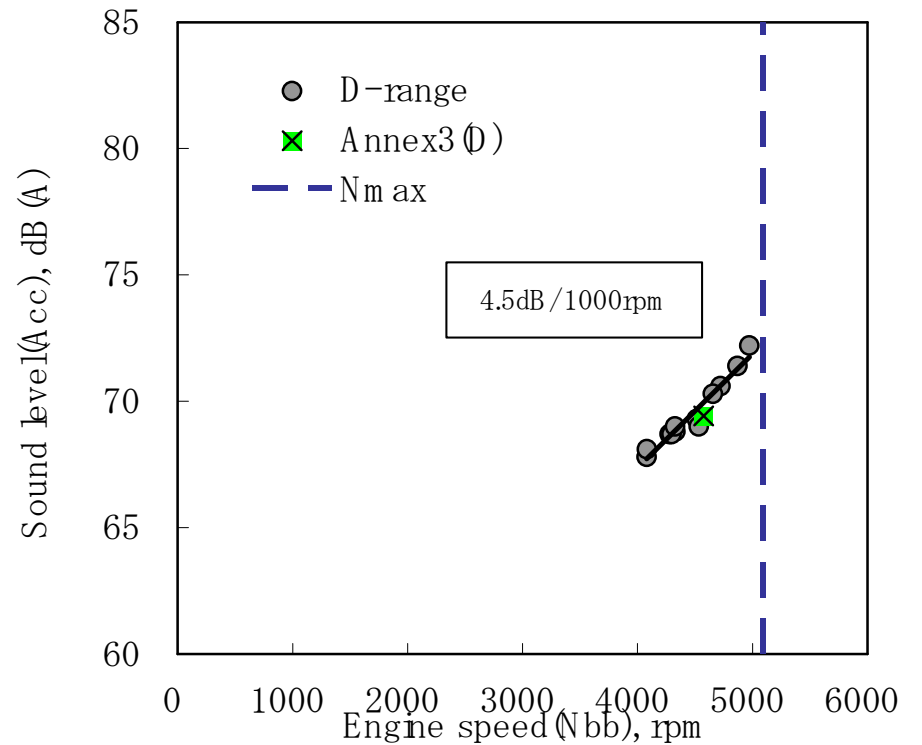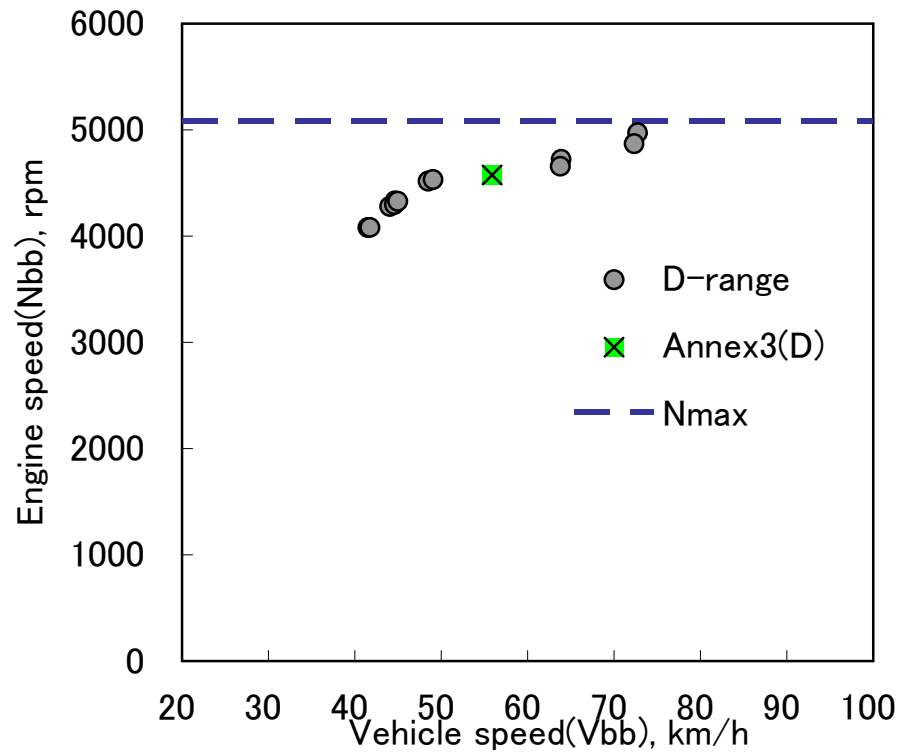JASIC
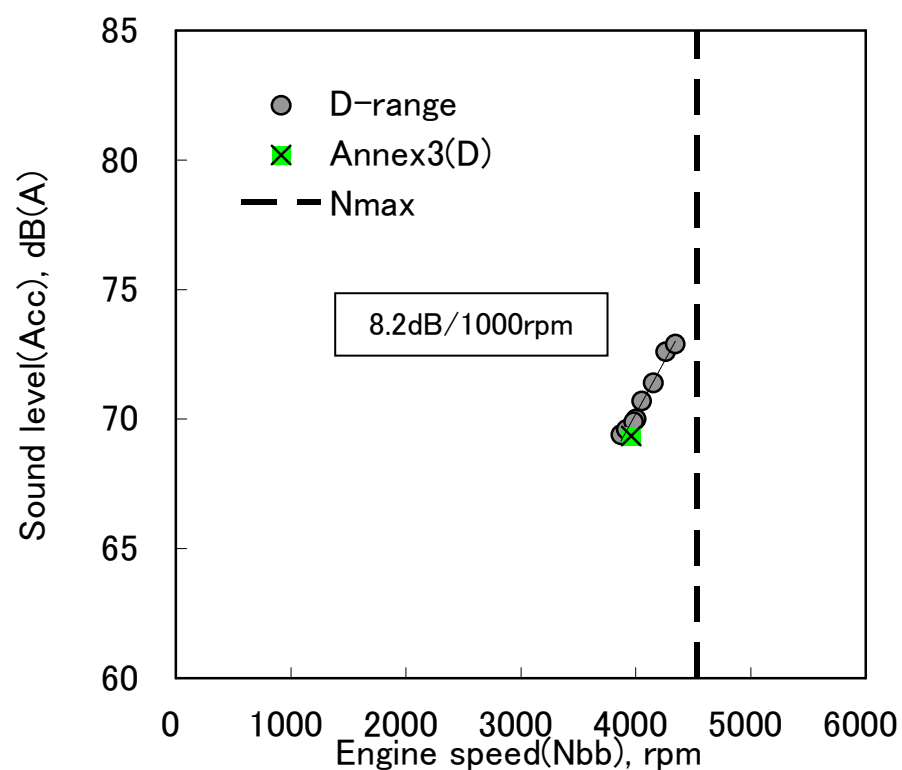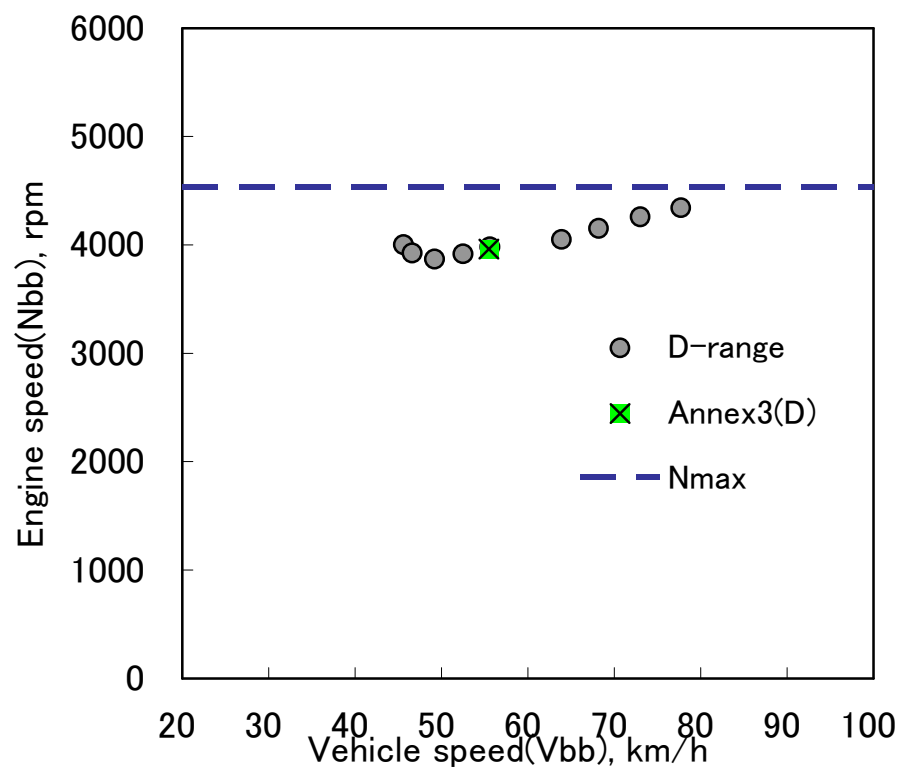
CVT

Test Vehicles

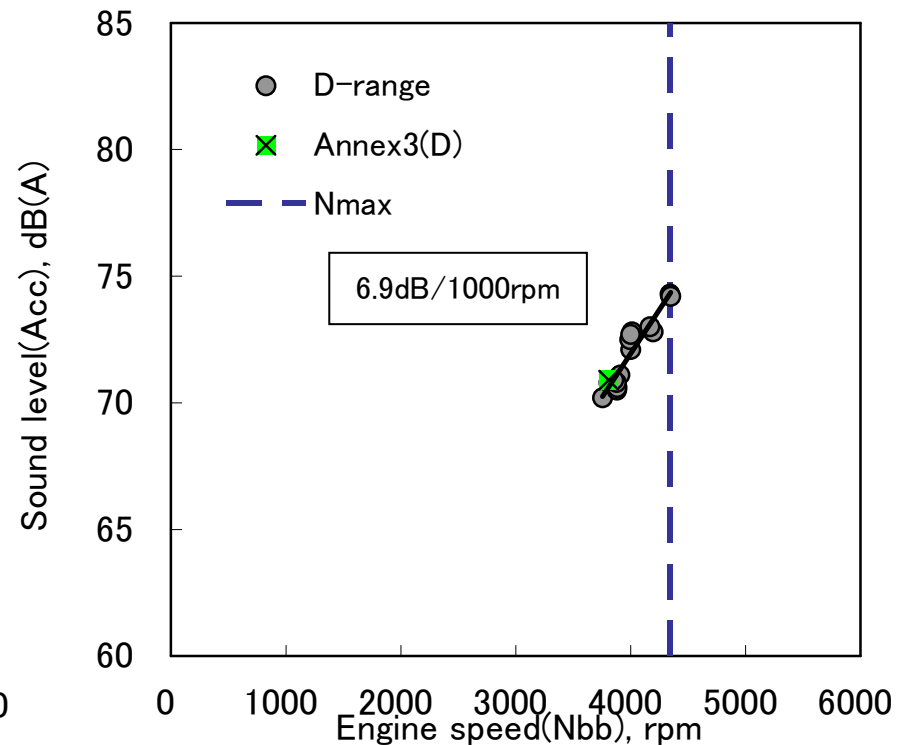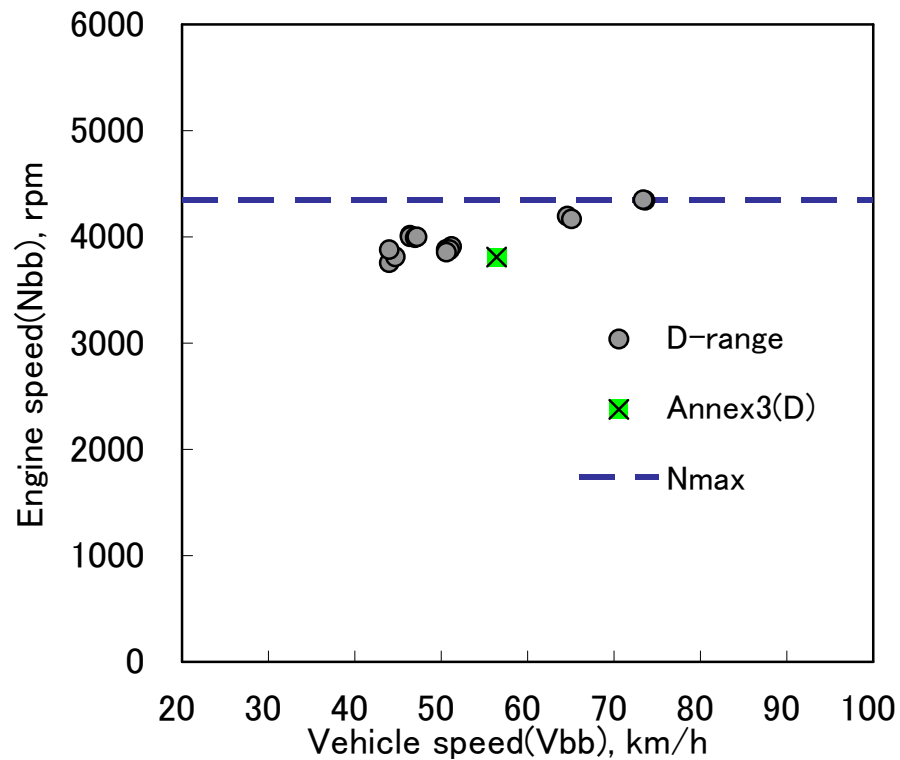| Vehicle	Category	Engine type	PMR kW/t	Maximum power kW / rpm	Transmission
Vehicle A	M1	Gasolin (Turbo)	53	47 / 6000	CVT
Vehicle B	M1	Gasolin	63	72 / 5600	CVT
Vehicle C	M1	Gasolin	69	118 / 5500	CVT

Test results for CVT vehicles (Vehicle A)

Test results for CVT vehicles (Vehicle B)

Test results for CVT vehicles (Vehicle C)

Comments for CVT vehicles

(1) Annex3 test already covers almost the maximum engine speed in Annex10.

(2) In case of CVT vehicle, range of change for engine speed is small, even if different vehicle speeds are used.
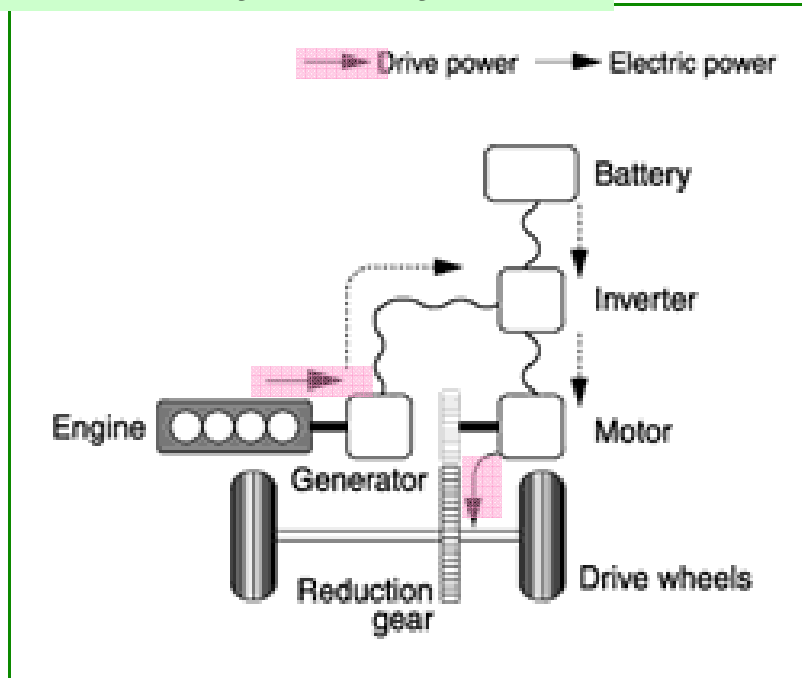
(3) Therefore, CVT vehicles can be excepted for ASEP.

Hybrid Vehicles

Test Vehicle

Vehicle	Category	Power-train type	PMR kW/t	Maximum power kW / rpm	Transmission
Vehicle D	M1	Engine (gasoline)	111	218 / 6400	CVT
		Motor	–	147 kW	

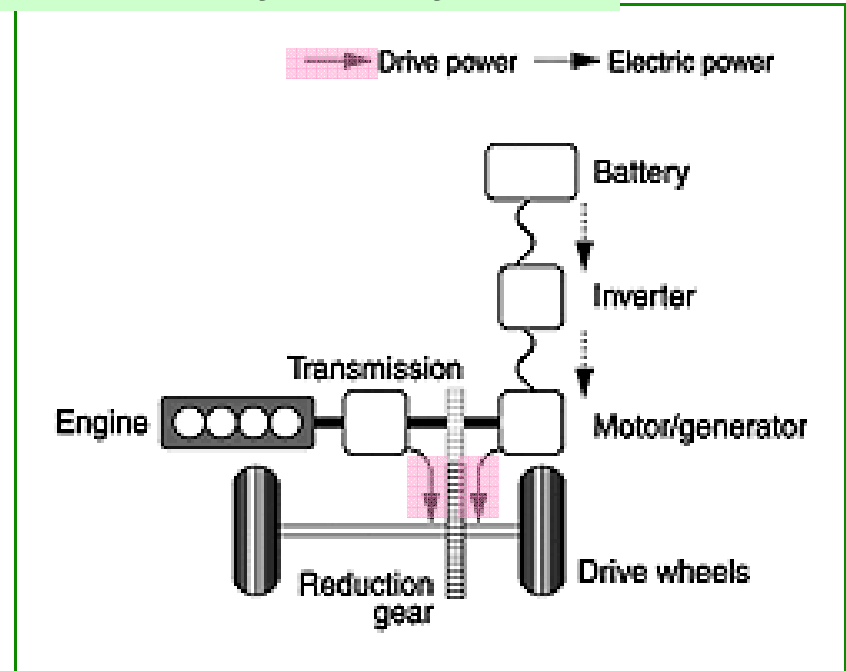# Hybrid Systems (1)

Series Hybrid System

Parallel hybrid system

Since **a series hybrid** uses its engine to generate **electricity for the motor to drive the wheels. The engine operation is independent of driver's control.**
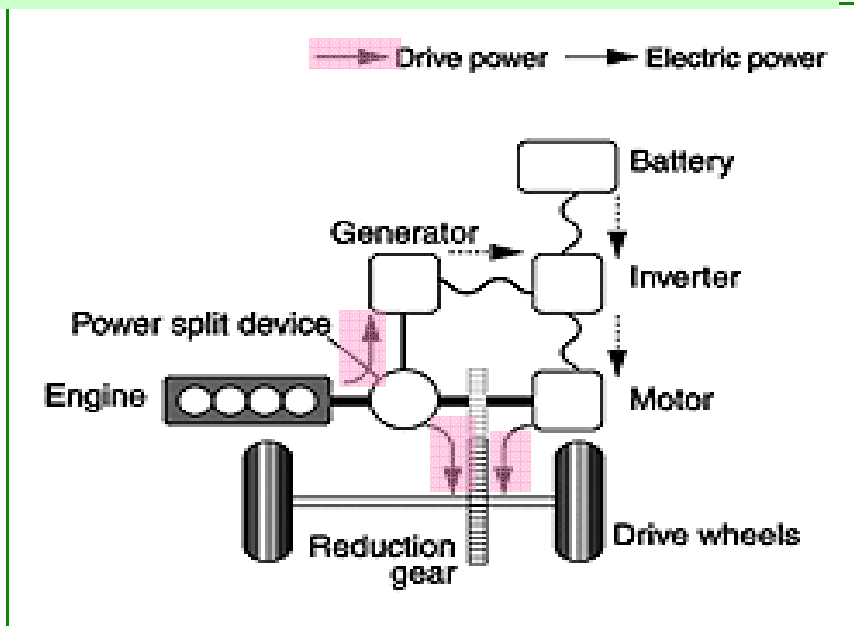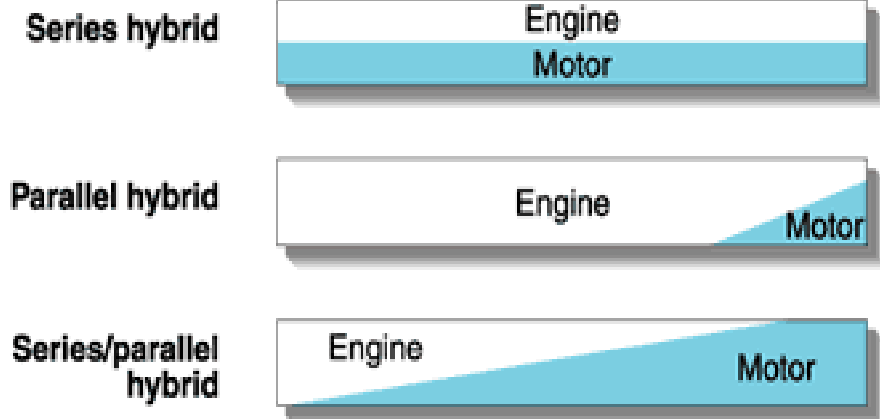
A parallel hybrid uses the **engine as the main power source**, with the motor used only to provide assistance during acceleration.
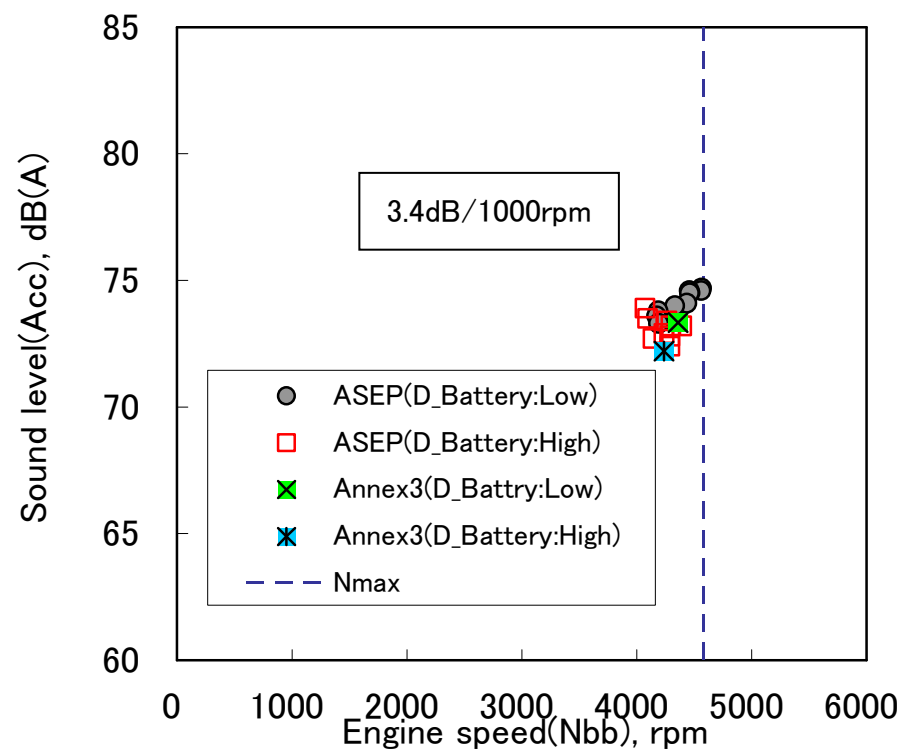
Hybrid Systems (2)

Drive power → Electric power →
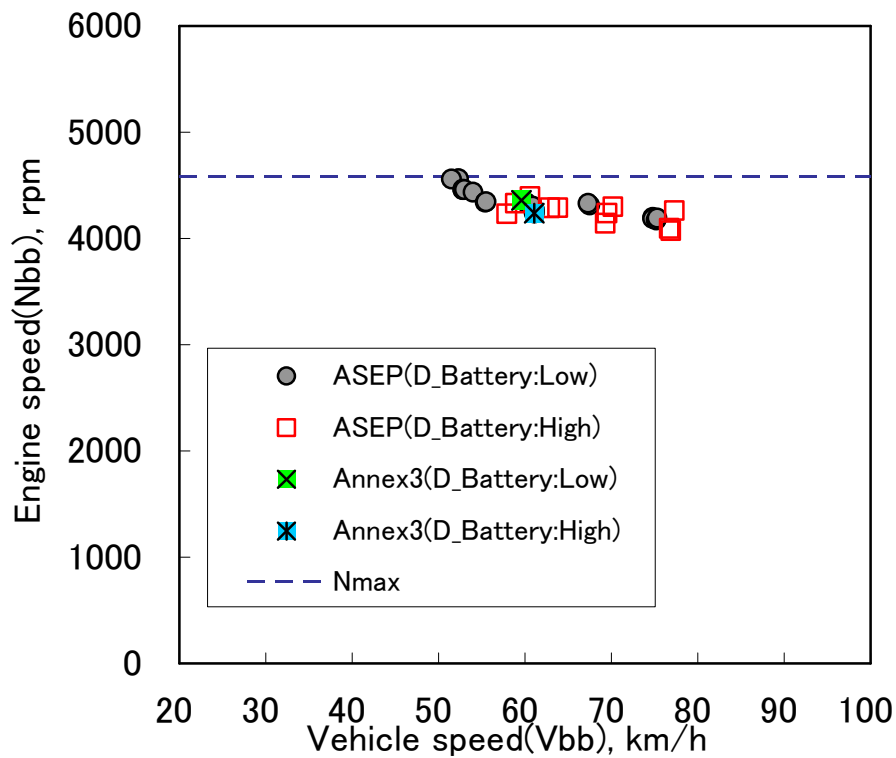
Battery
Generator
Inverter
Power split device
Engine
Motor
Reduction gear
Drive wheels

Vehicle D

In **a series/parallel hybrid,** a power split device divides the power from the engine, so the ratio of power going directly to the wheels and to the generator is continuously variable.

Ratio of engine and motor operation in hybrid system

Series hybrid — Engine / Motor

Parallel hybrid — Engine / Motor

Series/parallel hybrid — Engine / Motor

Test results for a Hybrid vehicle

Comments for Hybrid vehicles

(1) Difference between sound level in different degrees of battery charge is small.

(2) When the engine operates, hybrid vehicles can be dealt with an internal combustion engine and a CVT vehicle. (Hybrid vehicles have CVT)

Comparison of Proposed Methods
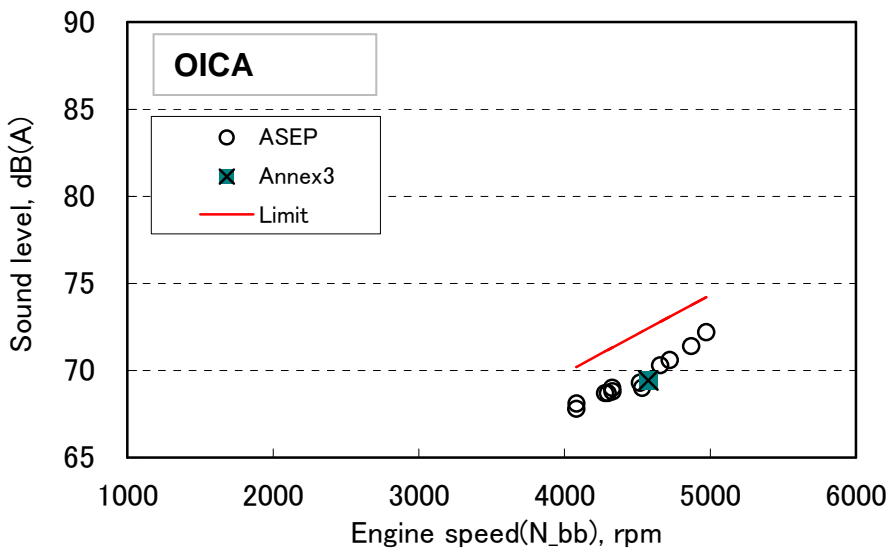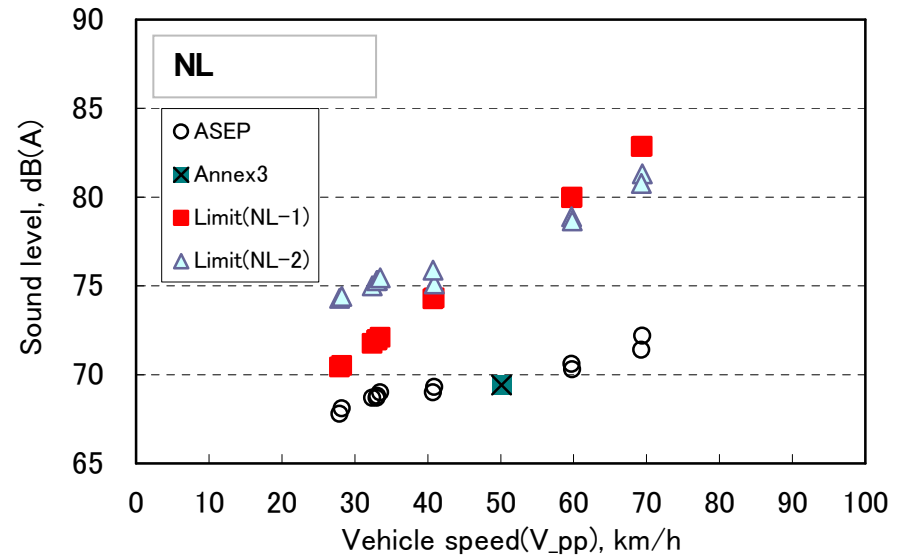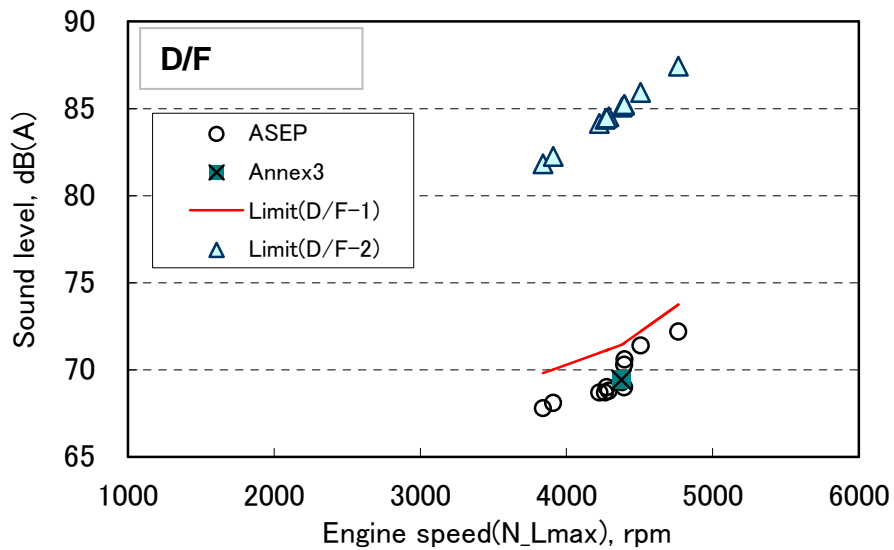
The proposed methods

(1) Germany/France

  · D/F-1: Anchor point => measured value

  · D/F-2: Anchor point => Annex3 limits

(2) The Netherlands

  · NL-1 : fixed acceleration rate of a_wot in Annex3

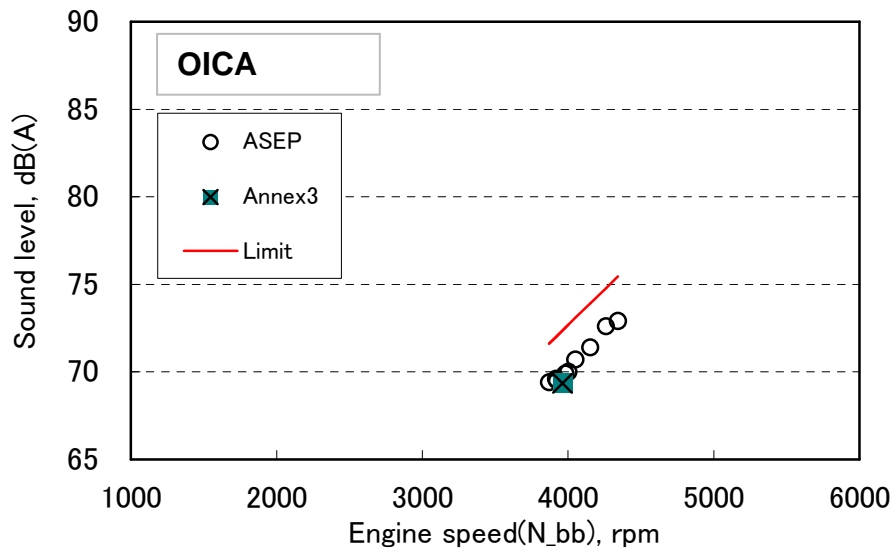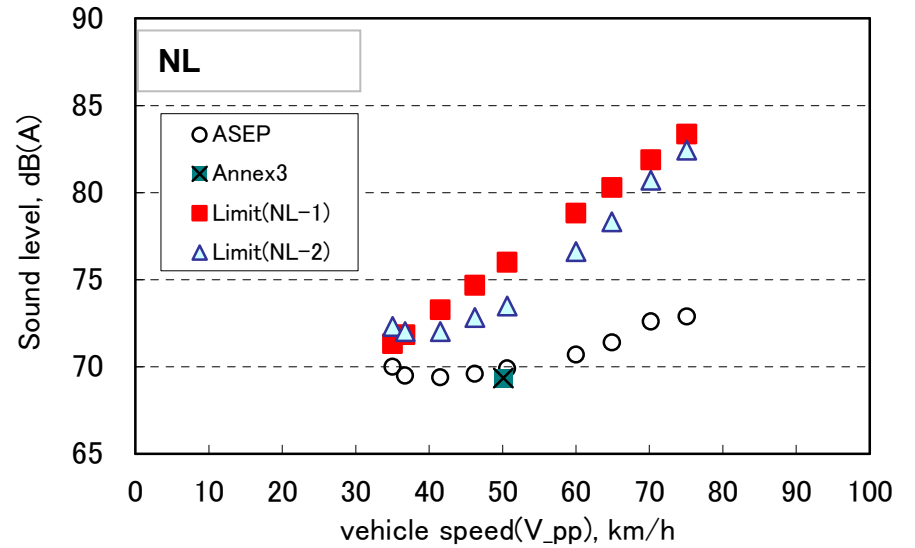 · NL-2: measured acceleration rate at each point
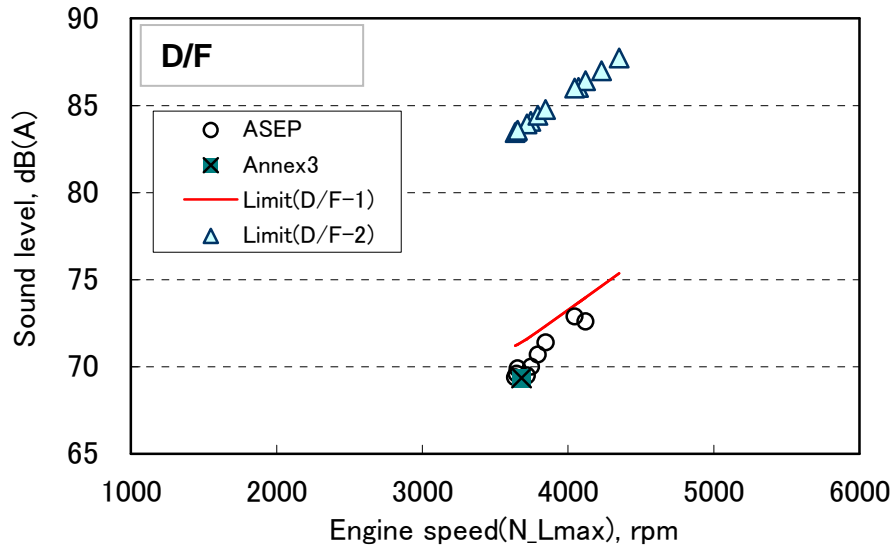
(3) OICA

ASEP Test Results (Vehicle A: D-range)
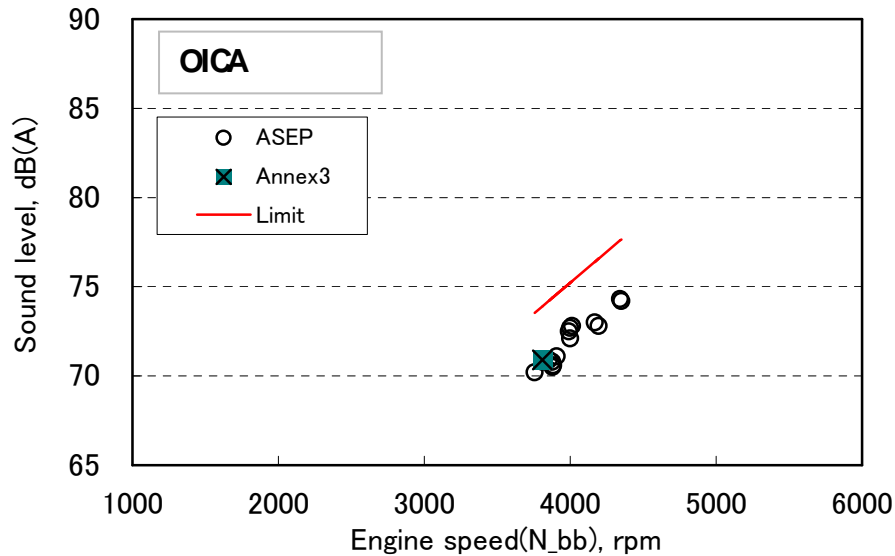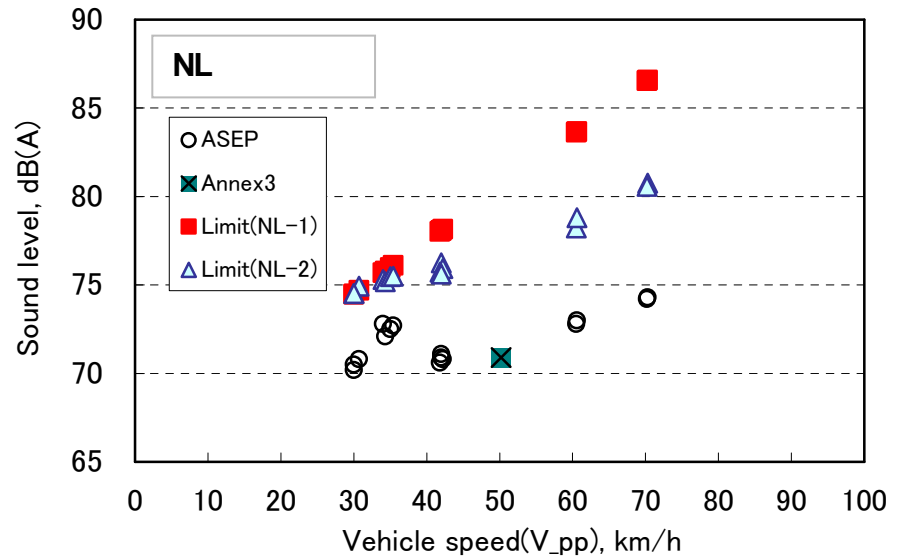

Assumption;

Sound limit in Annex3 = 72dB(A)
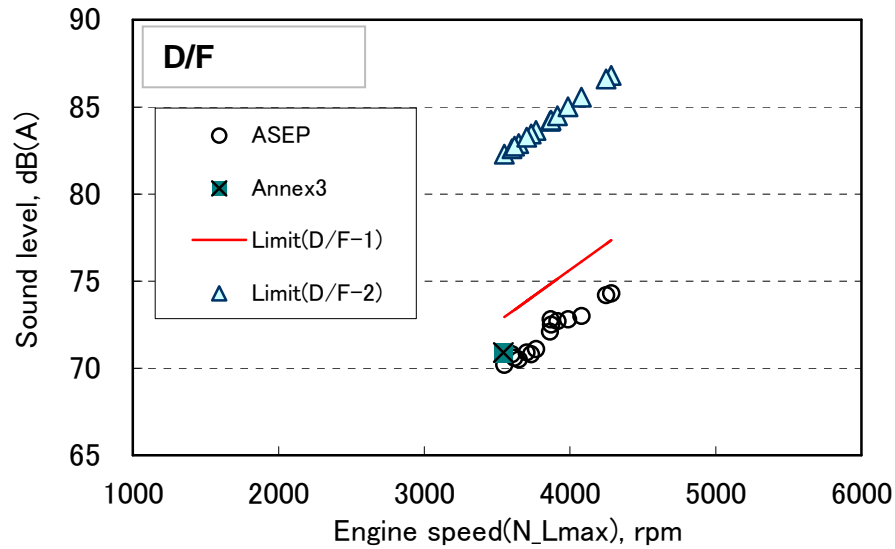
| R51/02: | 69.4dB(A) |
| New Annex3; | 66.9dB(A) |

ASEP Test Results (Vehicle B: D-range)

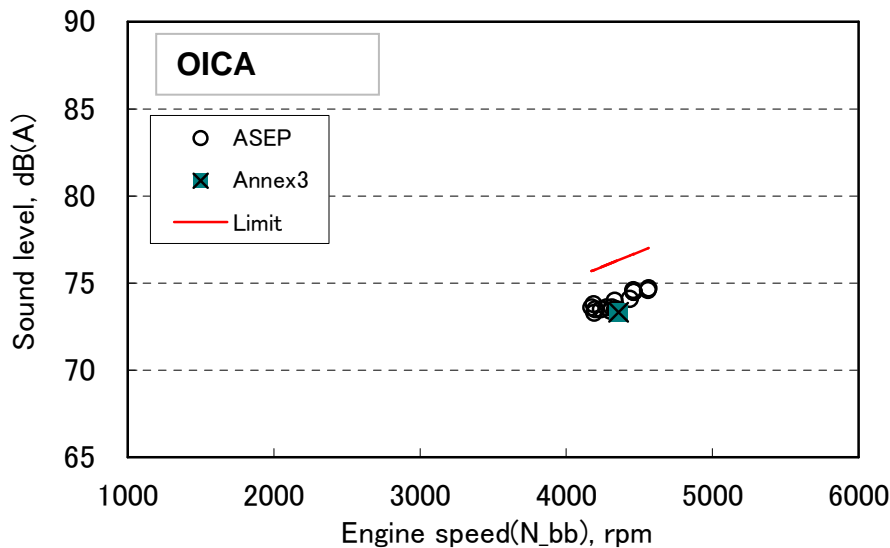R51/02:   69.5dB(A)

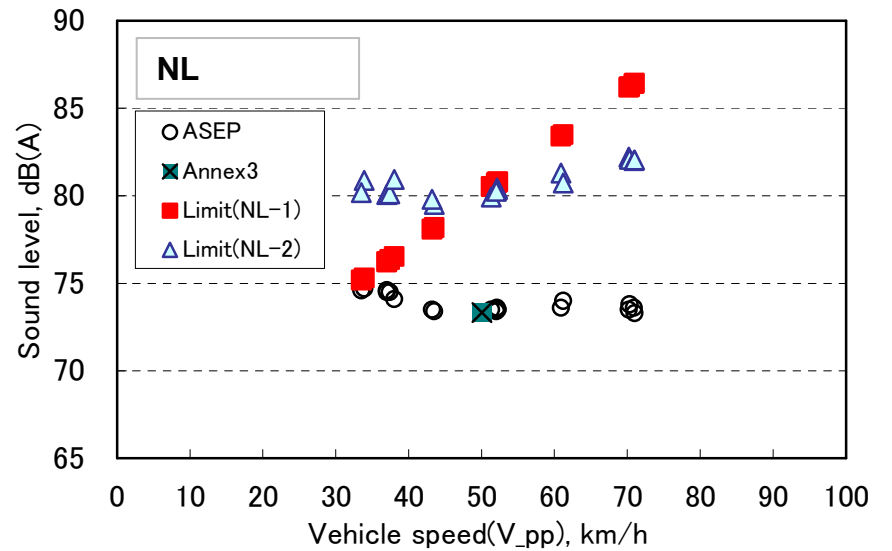New Annex3;   67.4dB(A)

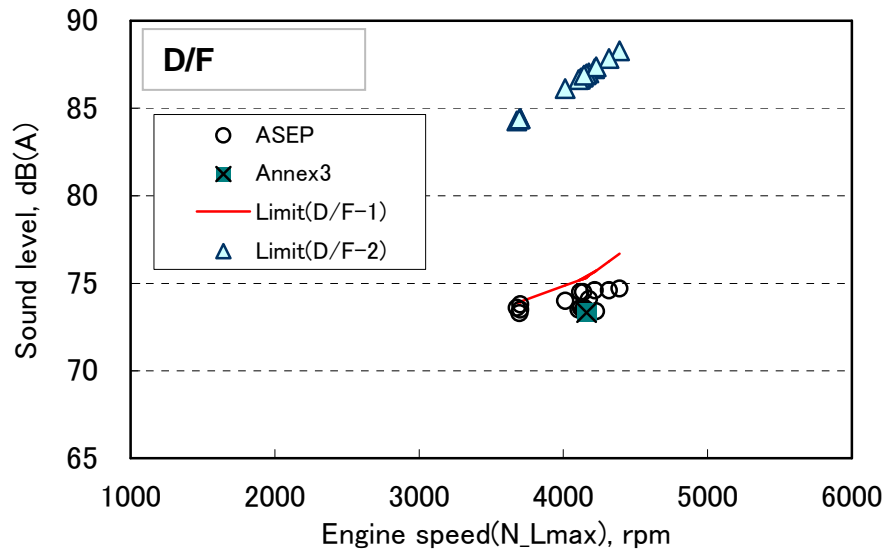# ASEP Test Results (Vehicle C: D-range)
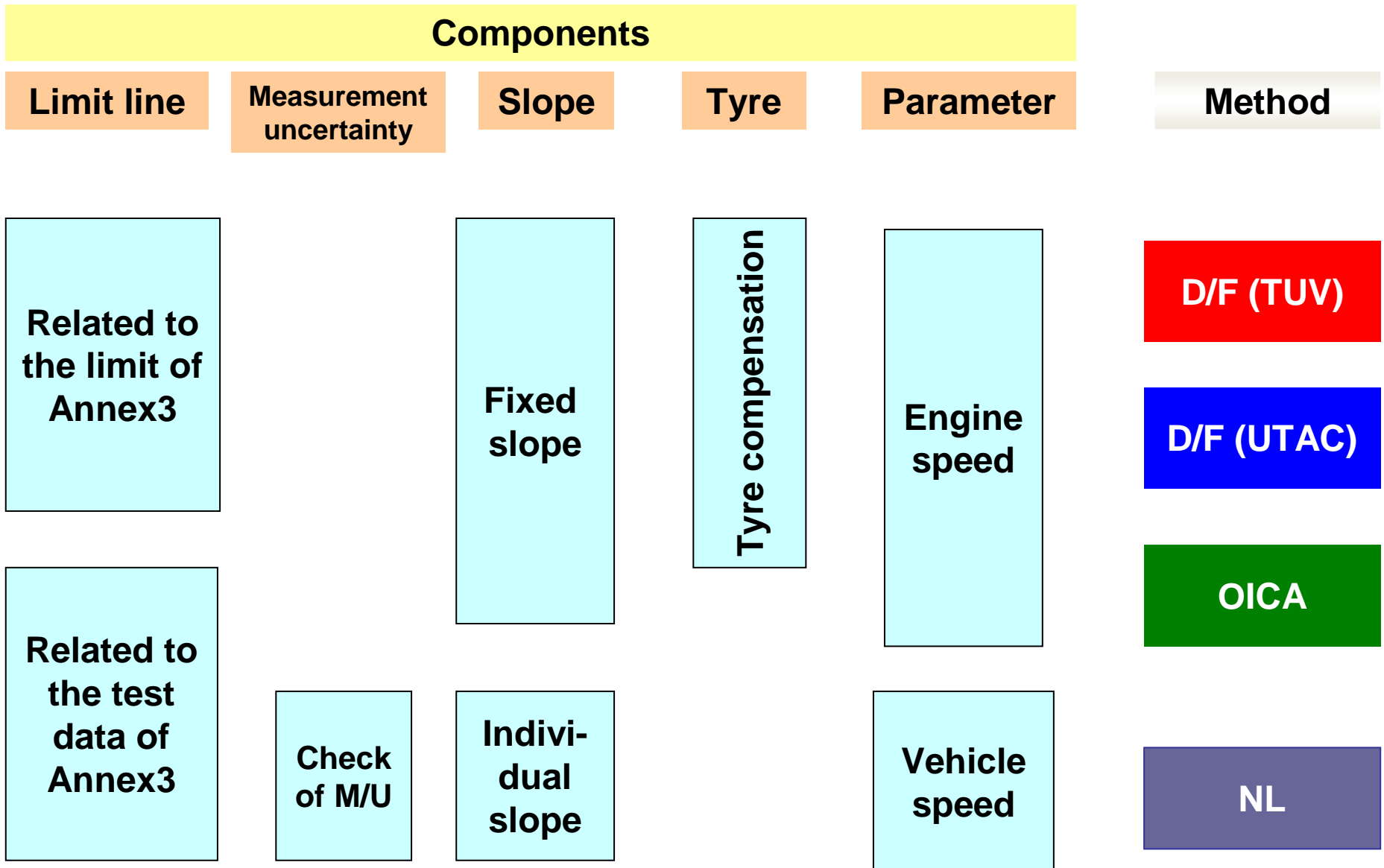

R51/02:   71.0dB(A)

New Annex3; 68.9dB(A)

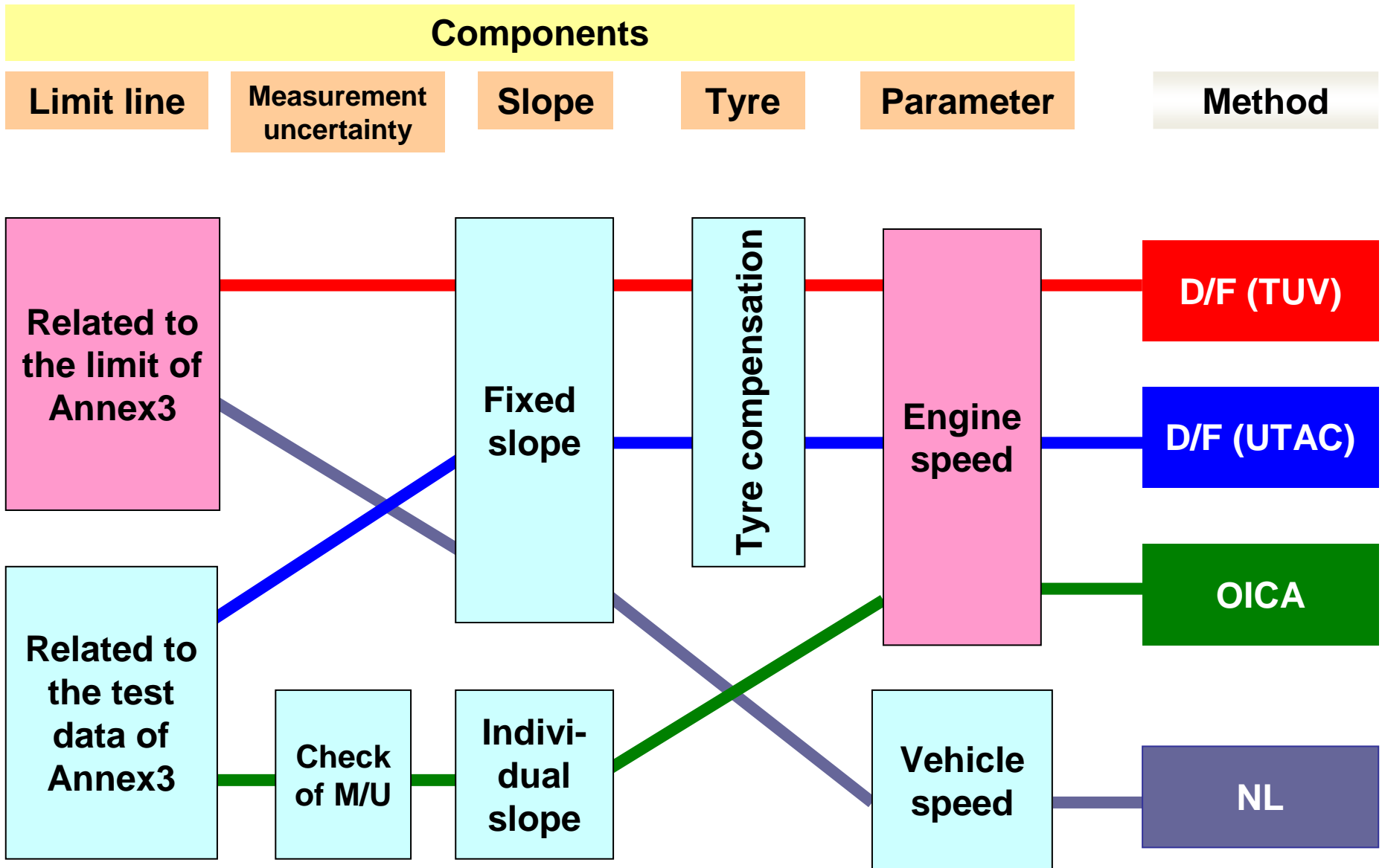# ASEP Test Results (Vehicle D Hybrid)

D-range (battery : low)

Methods and components

Components					Method
Limit line	Measurement uncertainty	Slope	Tyre	Parameter	
Related to the limit of Annex3		Fixed slope	Tyre compensation	Engine speed	D/F (TUV)
					D/F (UTAC)
					OICA
Related to the test data of Annex3	Check of M/U	Indivi-dual slope		Vehicle speed	NL

Methods and components

Comment -1

There are a lot of combinations of components for ASEP method.
Each component should be discussed in order to decide a method.

Among them, most Japanese concerns are engine speed base and limit line related to the Annex3 limits.
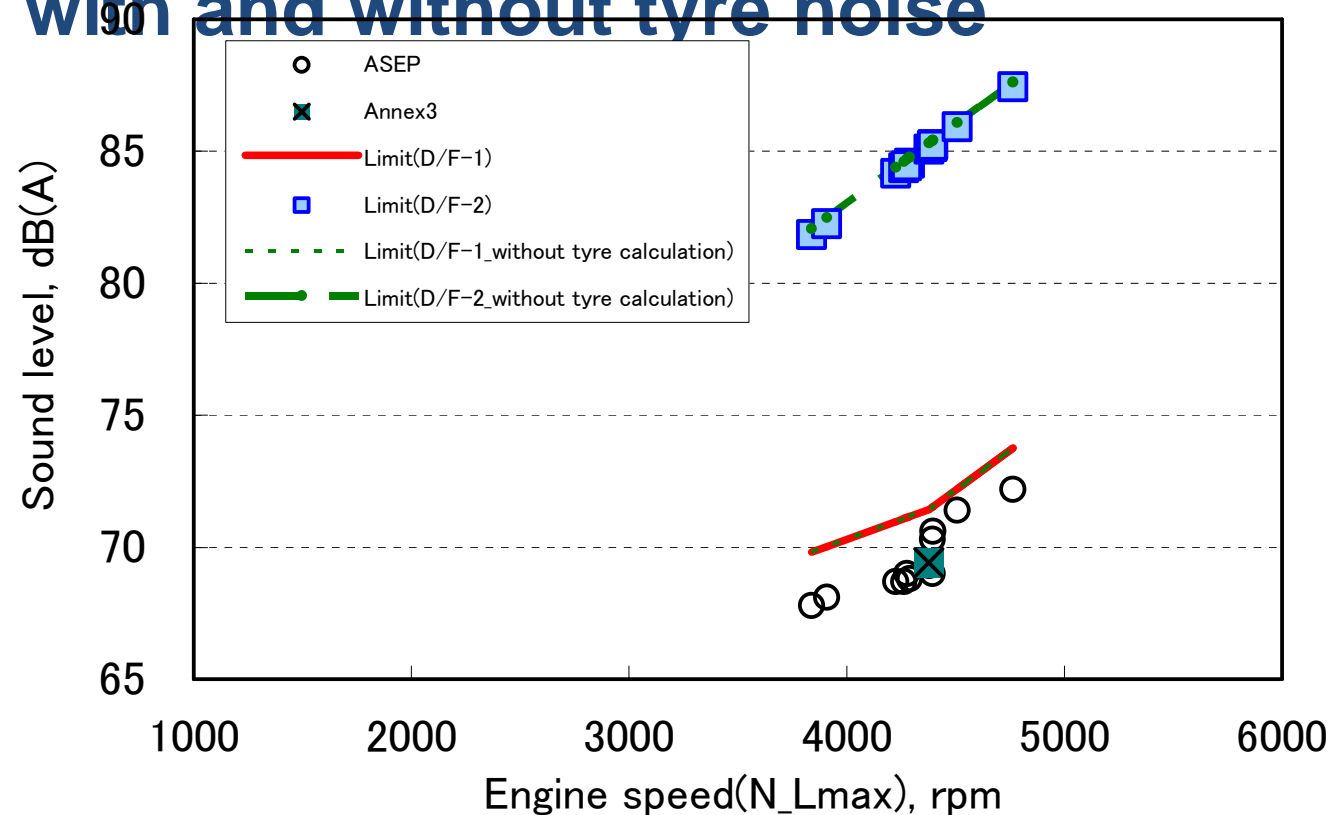
Comment -2

(1) Tyre noise calculation is not necessary for one gear test.

(2) Tyre noise calculation is not necessary at least for
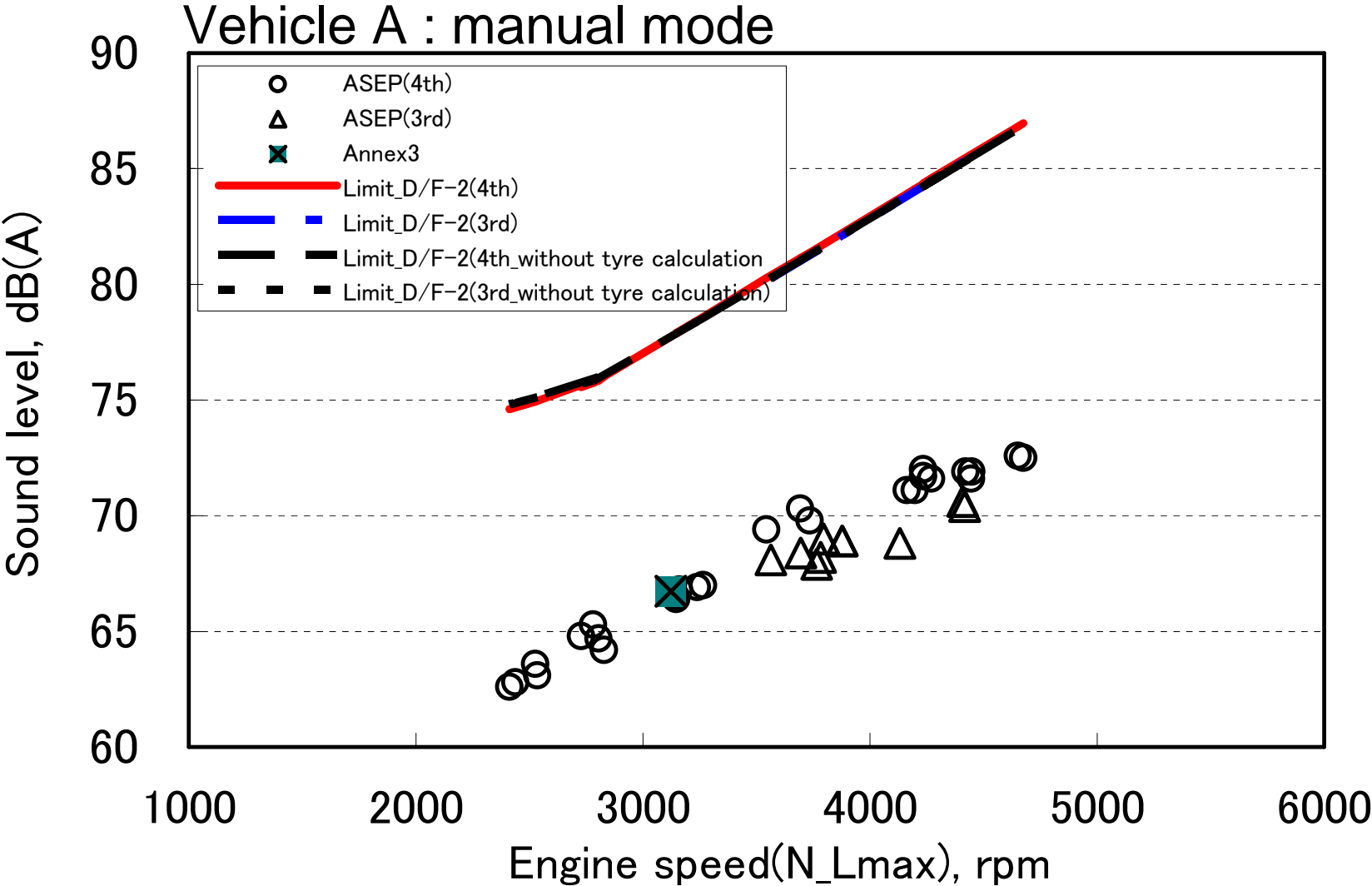
Annex3 limit base. There is no significant difference

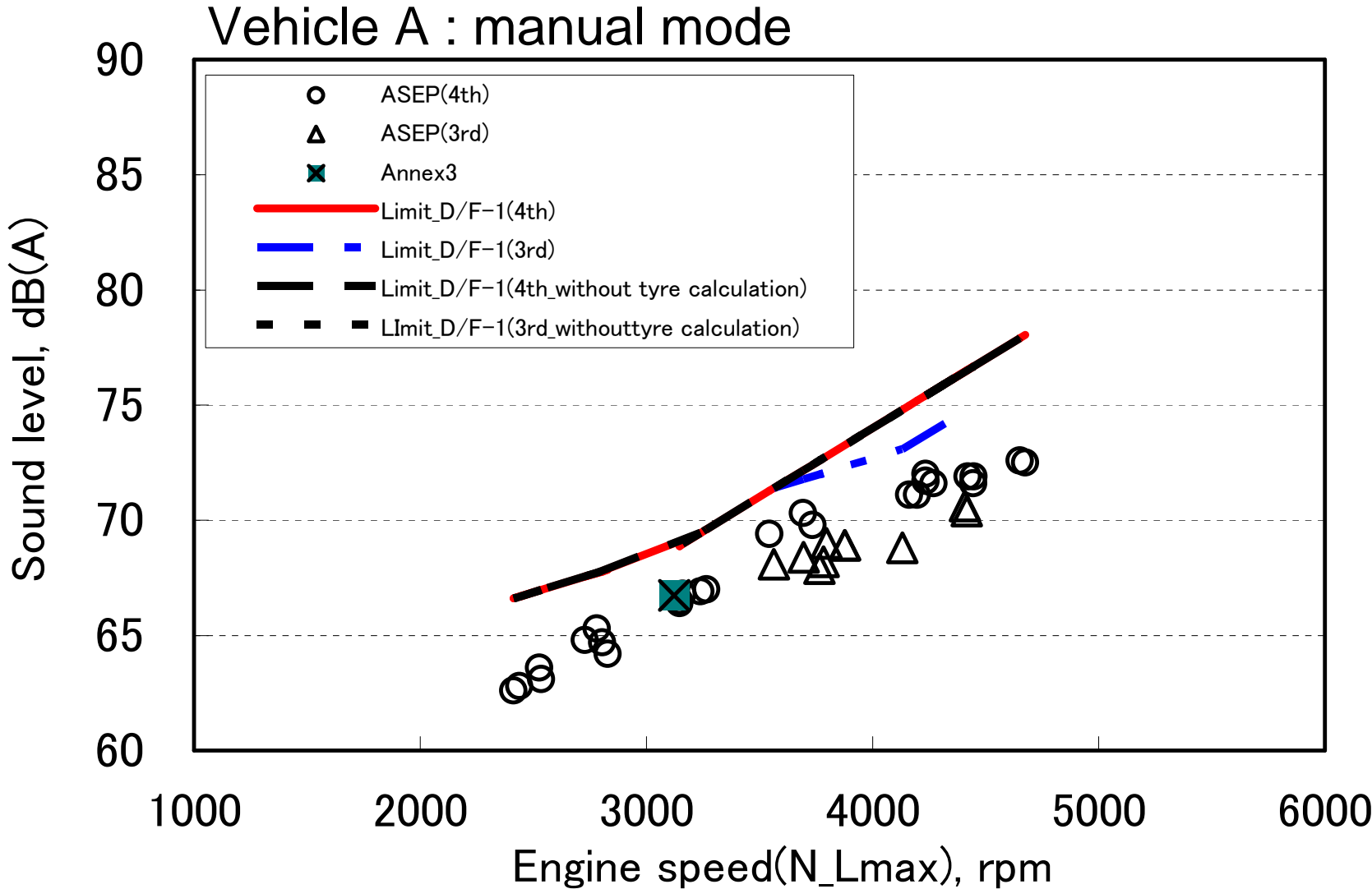between with and without tyre noise calculation.

Vehicle A : D-range

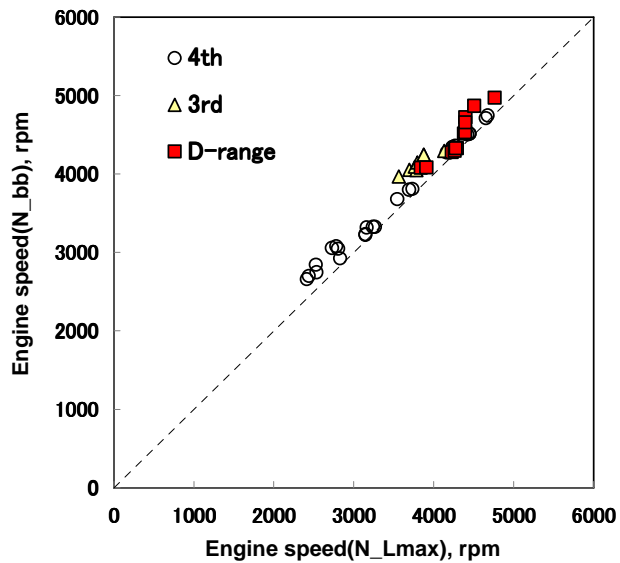# The influence of tyre noise calculation on D/F proposal

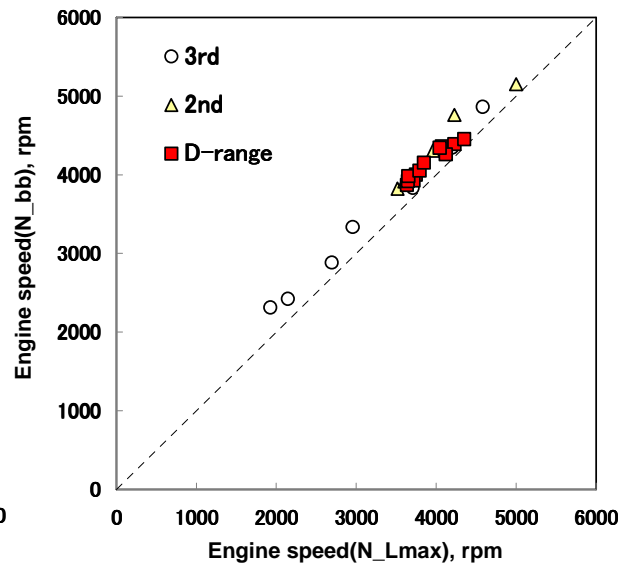The influence of tyre noise calculation on D/F proposal

Vehicle A : manual mode

Comment -3

Both N_Lmax and N_bb can be used, since the correlation between N_Lmax and N_bb is good. Using N_bb is better due to simplify test equipments.
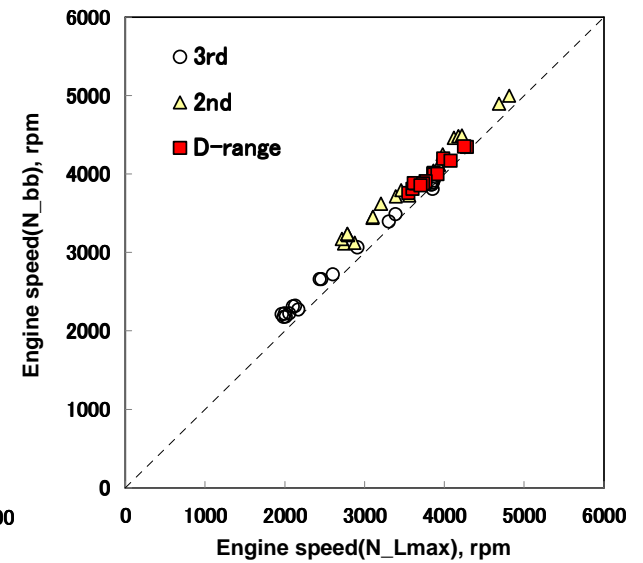

Vehicle A

Vehicle B

Vehicle C

Summary

- **CVT**

  Annex3 test already covers almost the maximum engine speed in Annex10.

- **Hybrid**

  Hybrid vehicles can be dealt with an internal combustion engine.

- **Test method**
  - **Should take the limit line according to Annex3 limit**
  - **Can skip tyre noise calculation at least on Annex3 limit base**
  - **Can use recorded engine speed at BB**