

**EUROPEAN COMMISSION
DG RTD**

SEVENTH FRAMEWORK PROGRAMME
THEME 7
TRANSPORT - SST
SST.2011.RTD-1 GA No. 285095



eVADER

Electric Vehicle Alert for Detection and Emergency Response

List of vehicles under study

Deliverable Title	List of vehicles under study	
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Objectives

This document presents the list of vehicles under study and mandatory characteristics including their noise level. The vehicles that have been already measured are:

- Peugeot 106 (Electric)
- Peugeot 3008 (Diesel)
- Citroën C5 (Diesel)
- Nissan Altima (Hybrid)
- Renault Fluence (Electric, Diesel, Gasoline)
- Renault Kangoo (Electric)
- Renault Scenic (Gasoline)
- Nissan LEAF (Electric)

The vehicles that we could measured too are Peugeot ion and 207 diesel 99g de CO₂.

We compared noise levels in dB (A) for electric and ICE vehicles approaching at low speeds or in reverse gear.

Noise level differences between electric and ICE vehicles

In September 2011, Renault measured Fluence vehicles in order to evaluate noise level differences between an electric and ICE vehicles. Renault was doing the tests on car on ISO proving grounds (Aubevoye near Rouen).

The figures 1, 2 and 3 presents the noise levels in dB (A) for the three Fluence vehicles: diesel (blue), gasoline (green) and electric (red) at 10 km/h, 20 km/h and 30 km/h respectively. The microphones are at 2 m, at 1.6m height.

We compared the dB (A) noise levels as a function of the vehicle speed. There are differences (10 dB (A)) between electric and ICE vehicles, at 10 km/h. The differences are less important at high speeds.

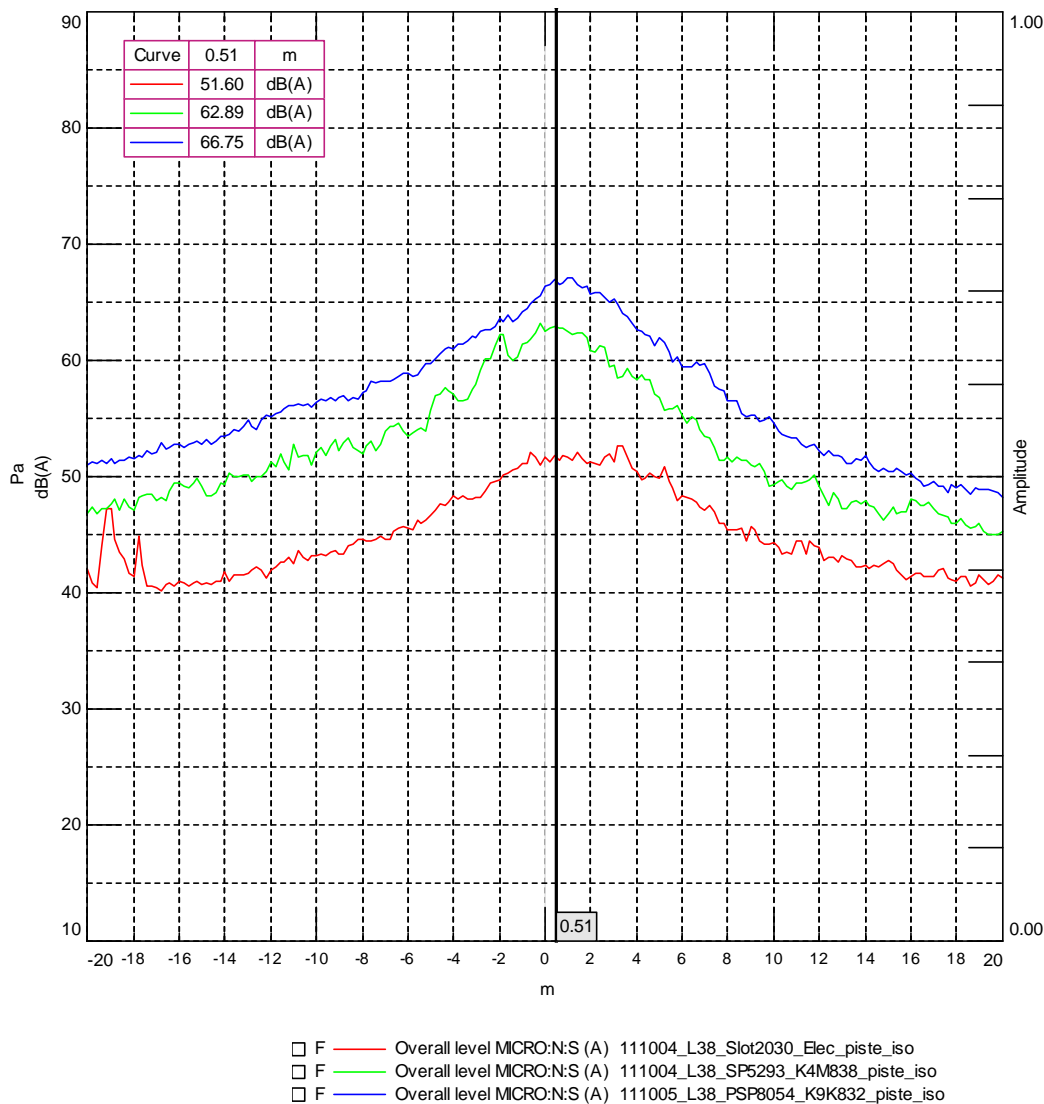
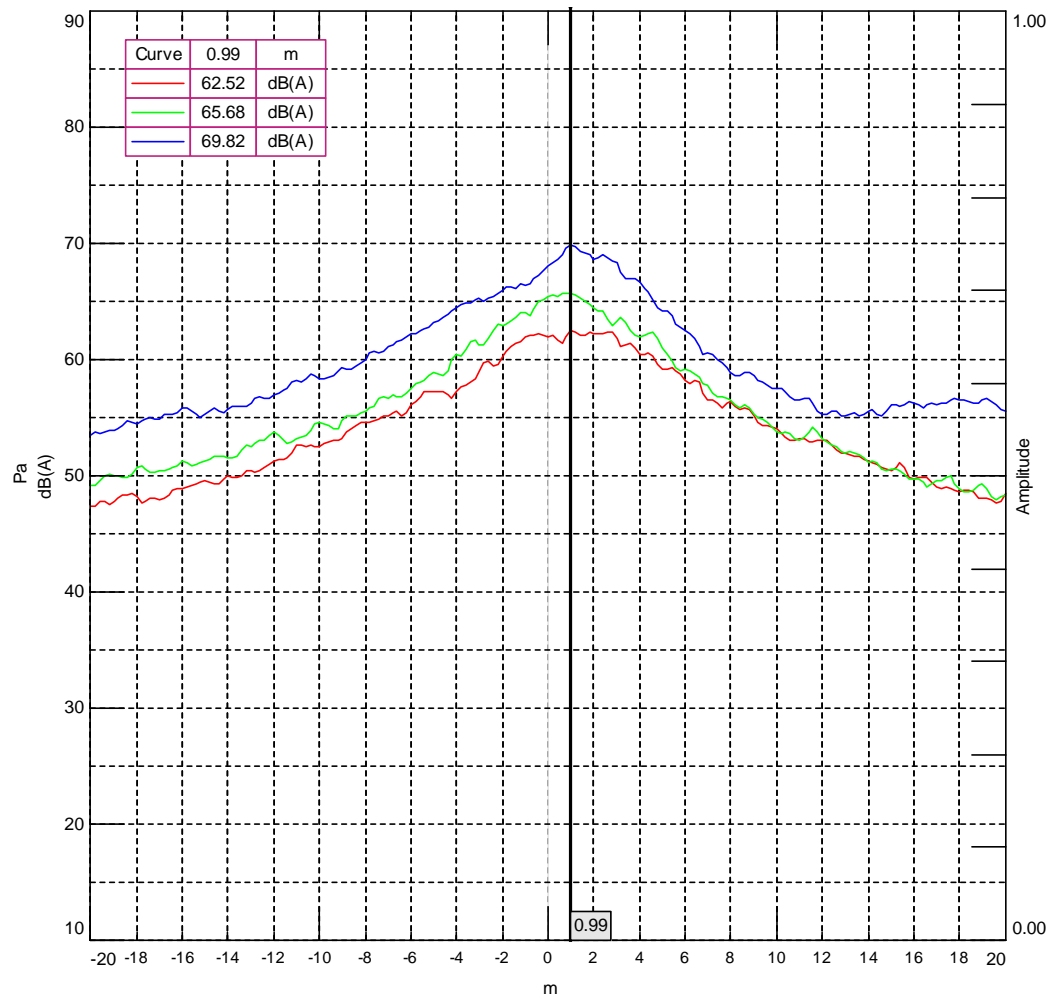


Figure 1: Difference between electric (red), gasoline (green) and diesel (blue) Fluence vehicles at 10 km/h.



- F — Overall level MICRO:N:S (A) 111004_L38_Slot2030_Elec_piste_iso
- F — Overall level MICRO:N:S (A) 111004_L38_SF5293_K4M838_piste_iso
- F — Overall level MICRO:N:S (A) 111005_L38_PSP8054_K9K832_piste_iso

Figure 2: Difference between electric (red), gasoline (green) and diesel (blue) Fluence vehicles at 20 km/h.

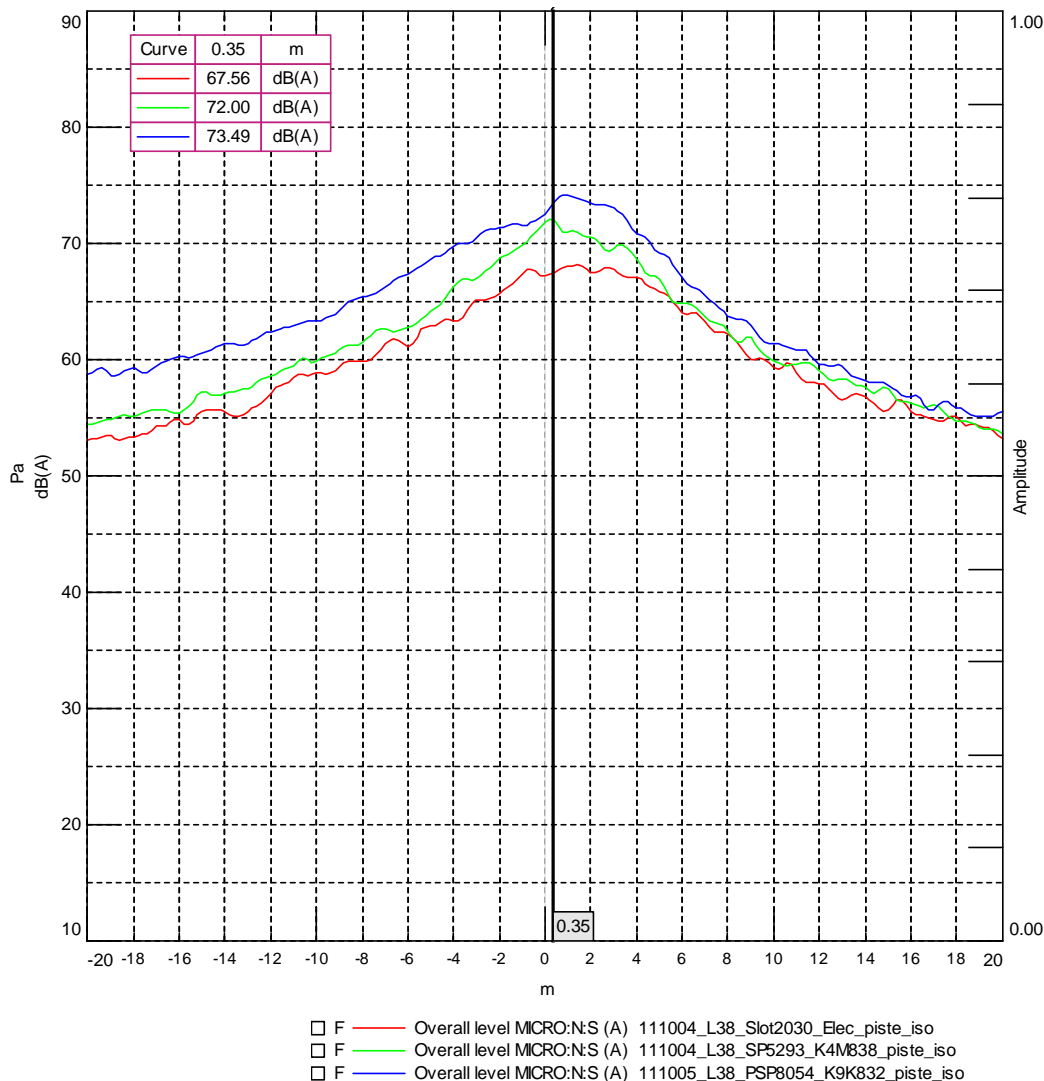
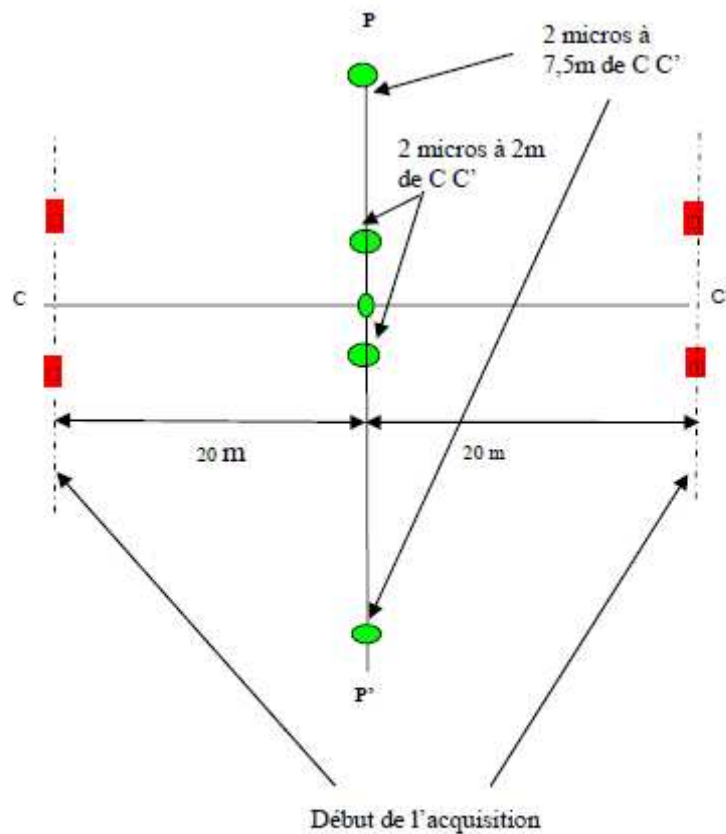


Figure 3: Difference between electric (red), gasoline (green) and diesel (blue) Fluence vehicles at 30 km/h.

In May 2010, Renault and PSA measured different vehicles in order to evaluate noise level differences between an electric Kangoo vehicle and a silent ICE vehicle. Renault and PSA were doing the tests on car on ISO proving grounds (UTAC near Paris). Hybrid (electric mode) Nissan Altima and electric 106 were be measured too.

We compared the dB (A) noise levels as a function of the vehicle speed. There are not big differences (<3 dB (A)) between electric and ICE vehicles, even at low speeds. However, in reverse gear, the differences between vehicles, at 2m or 7.5m, could be equal to 10 dB(A).

The experimental conditions are presented at figure 4: two pairs of microphones were at 2m and at 7.5m on the road and 1.2m height. The detection of the measure beginning is done via the passage of photocells from -20m to +20m.



■ : cellules photoélectriques pour le début de la mesure

Figure 4: Hardware configuration.

The two tables 1 and 2 are for the two microphones (right and left) at 2m or 7.5m. The different speeds are on the abscissa: 10 km/h, 15 km/h, 20 km/h, 30 km/h and 40 km/h. On the y-axis, there is the distance at which the sounds were recorded with a maximum around 0 meter, where are the microphones.

- The noise levels are maximum at high speeds: there is 50 dB (A) for a microphone at 2 m at 10 km/h and 70 dB (A) for a microphone at 7.5m at 40 km/h.
- The results are similar for the two microphones, left and right.
- The noise level is greater at 2m than at 7.5m: the differences between the microphones pairs could be reached from 5 to 10 dB (A) as a function of the vehicle speed.
- The noise level is slightly higher for the gasoline vehicle than for the electric one (some dBs).

vitesse (km/h) / d(m)	Kangoo VE (dBA)					Scenic thermique (dBA)				
	10	15	20	30	40	10	15	20	30	40
-20	43.4	44.1	45.4	48.4	53.2	47.8	45.4	47.6	50.7	53.7
-15	47.2	45.3	46.8	50.6	56.1	47.3	45.1	49.1	52.8	55.1
-10	46.0	46.5	49.1	53	59.3	49.5	46.1	50.7	54.4	57.3
-8	46.3	47.1	50.3	55	60.8	48.6	47.2	51.8	56.5	59.0
-5	47.8	49.3	53.5	58.1	63.6	48.8	49.4	54.2	59.1	62.7
-2	50.7	52.8	56.9	62.7	67.2	50.9	53.3	58.5	62	66.3
0	52.9	55.3	59.2	65.1	69.9	52.7	56.1	60.5	66.1	68.7
2	51.9	55.4	59.3	65.8	70.8	52.8	55.9	60.5	66.1	69.7
5	49.4	53.8	58.2	64.4	70.7	51.9	55.7	59	63.9	69.3
8	44.9	49.4	53.0	59.0	65.6	51	50.7	53.9	58.7	65.0
10	44.1	47.3	50	56.3	62	48.1	47.9	51.4	55.7	61.7
15	42.9	45.5	48.2	51.2	56	48.9	45.6	47.8	50.5	56.1
20	42.4	45.5	46.6	49.1	51.8	46	45.1	46.6	48.1	51.5

Table 1: Differences between Electric Kangoo and Gasoline Scenic at 2m, left microphone.

vitesse (km/h) / d(m)	Kangoo VE (dBA)					Scenic thermique (dBA)				
	10	15	20	30	40	10	15	20	30	40
-20	42.2	44.4	44.9	47.6	53.0	41.6	45.1	46.0	50	52.5
-15	45.3	44.9	45.9	48.9	55.9	42.5	45.1	47.2	51.5	54.8
-10	43.9	45.3	46.9	51.5	57	43.2	45.6	49.3	52.8	56.9
-8	43.4	45.9	48.1	52.9	58.1	43.7	46.6	50.0	54.5	57.8
-5	44.2	46.4	49.6	54.8	59.1	44.4	47.3	51.5	55.6	59.0
-2	44.7	47.1	50.5	55.9	60.5	46.3	48.4	51.9	56.4	60.2
0	44.9	47.4	51.0	56.2	60.9	46.1	48.3	52.3	57.6	60.9
2	45.3	47.3	51.4	55.9	60.7	48.1	48.9	52.4	57.1	61.4
5	44.6	47.6	51.1	55.9	60.5	47.7	48.6	52.7	56.8	61.3
8	43.9	47.6	49.9	54.6	59.2	47.8	47.7	51.7	56.2	60.1
10	43.0	47.0	48.6	53.2	58.2	48.7	47.2	50.8	54.2	59.0
15	41.8	47.0	47.6	50.4	54.3	43.9	44.4	47.8	50.5	55.9
20	41.5	52.6	47.6	47.9	51.5	44.1	44.2	47.6	48.7	52.4

Table 2: Differences between Electric Kangoo and Gasoline Scenic at 7.5m, right microphone.

The tables 3 and 4 present the results for reverse gear (MA). There are 10 dB (A) of differences between vehicles, at 2m or 7.5m.

Km/h	dB(A) Kangoo VE	dB(A) Scenic thermique	dB(A) Altima HY	dB(A) 106	Km/h	dB(A) Kangoo VE	dB(A) Scenic thermique	dB(A) Altima HY	dB(A) 106
10	53.4	52.6	50.8	50.9	10	53.1	53.1	50.4	52.2
15	56.0	56.8	55.8	54.3	15	55.6	57.1	54.6	54.8
20	59.8	61.2	60.5	58.6	20	59.7	61.5	59.3	59.7
30	66.2	66.6	65.8	64.3	30	65.6	66.3	64.9	65.5
40	71.0	70.3	69.0	69.0	40	70.8	71.0	68.5	69.7
MA	54.1	62.2	51.1	62.9	MA	55.9	63.6	50.5	61.0

Table 3: Differences between vehicles at 2m, left and right microphone at left and right respectively.

Km/h	dB(A) Kangoo VE	dB(A) Scenic thermique	dB(A) Altima HY	dB(A) 108	Km/h	dB(A) Kangoo VE	dB(A) Scenic thermique	dB(A) Altima HY	dB(A) 108
10	45,6	47,6	45,7	42,7	10	45,7	46,0	45,7	43,6
15	47,1	48,5	46,1	44,9	15	47,8	48,8	47,6	46,2
20	49,7	51,2	50,6	49,3	20	51,5	52,5	50,7	50,3
30	55,6	56,8	56,3	55,2	30	56,4	57,3	56,4	56,4
40	60,6	61,7	59,3	58,8	40	60,8	61,2	58,8	59,6
MA	47,8	53,6	43,9	54,9	MA	47,3	57,1	44,8	55,6

Table 4: Differences between vehicles at 7.5m, left and right microphone at left and right respectively.

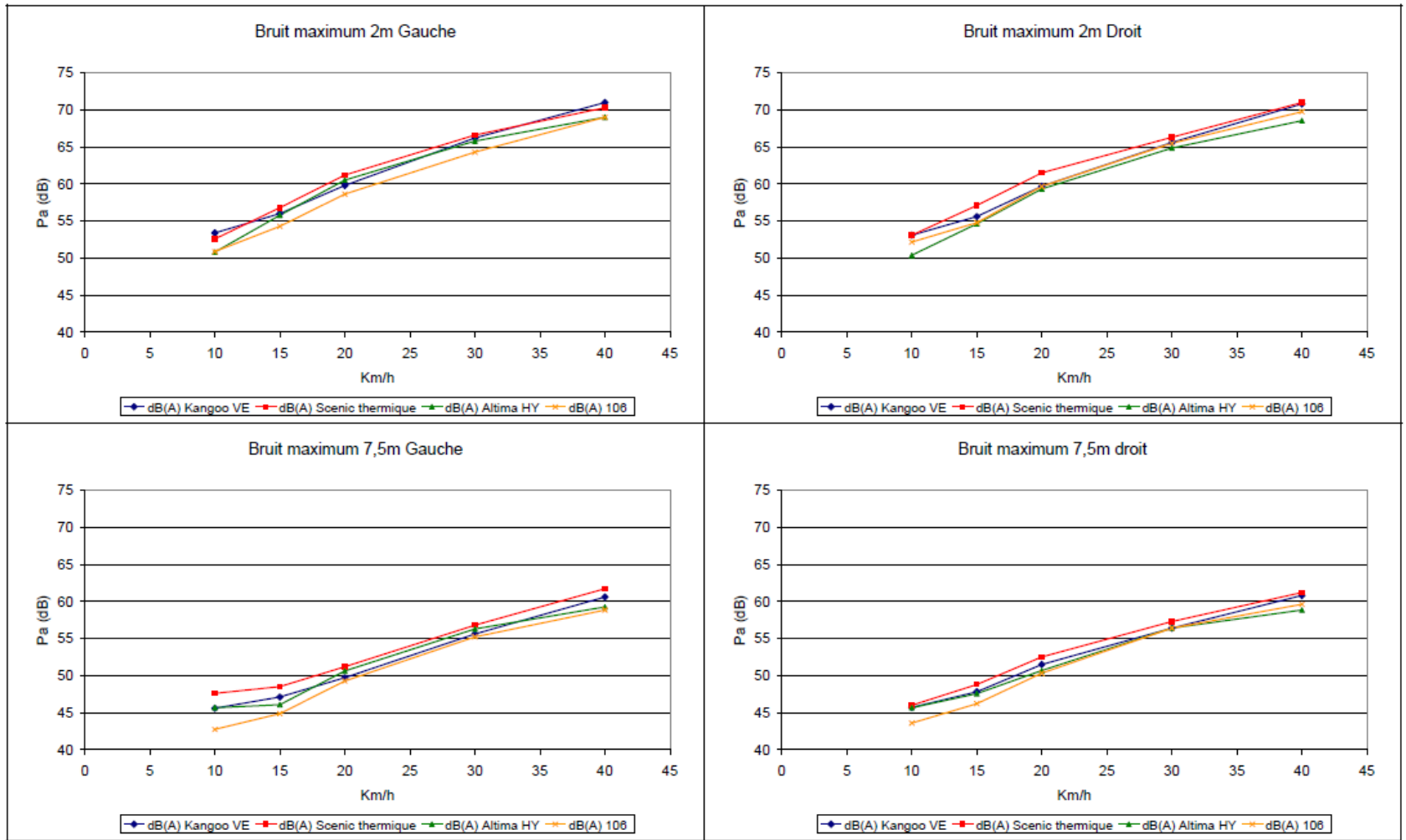
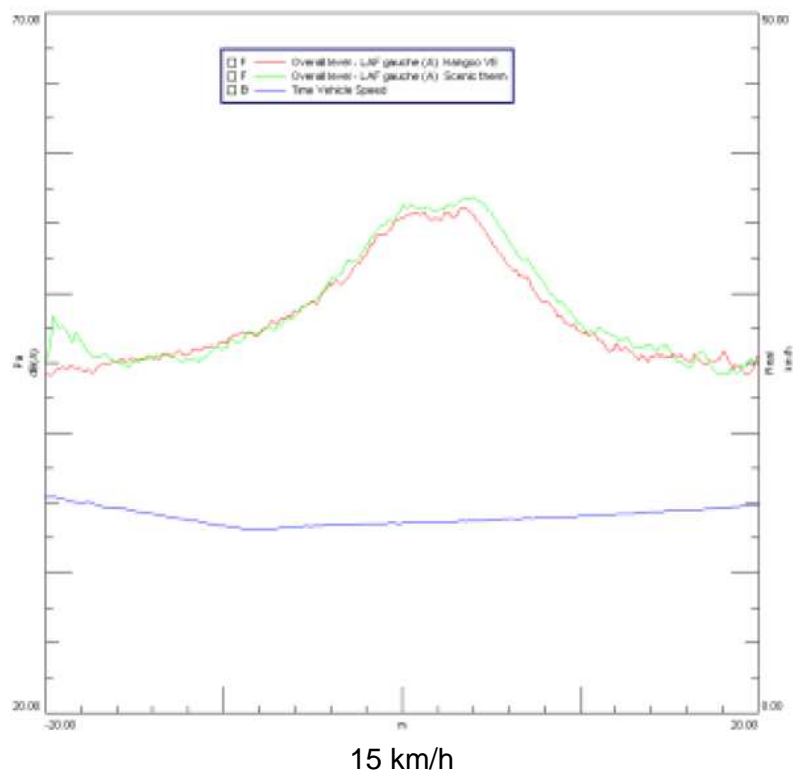
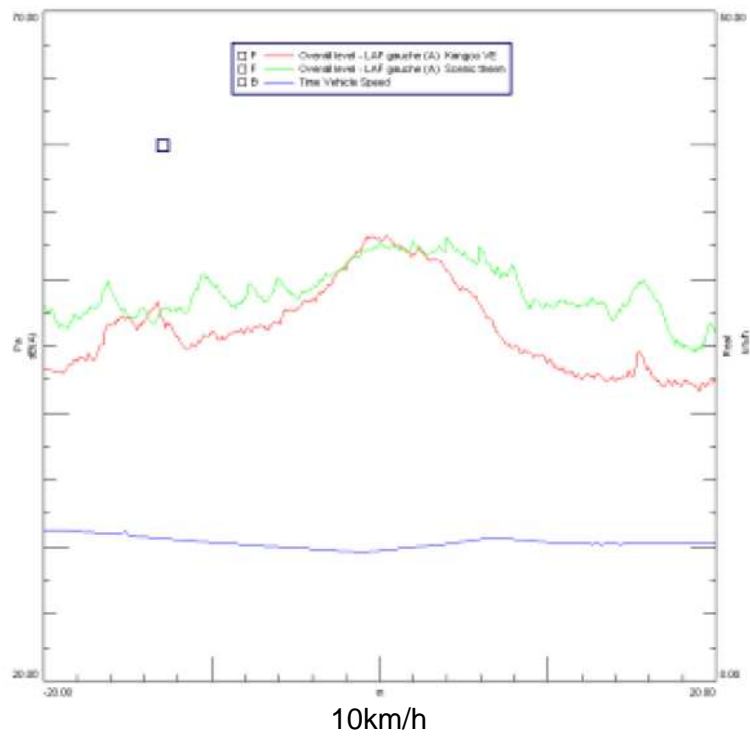
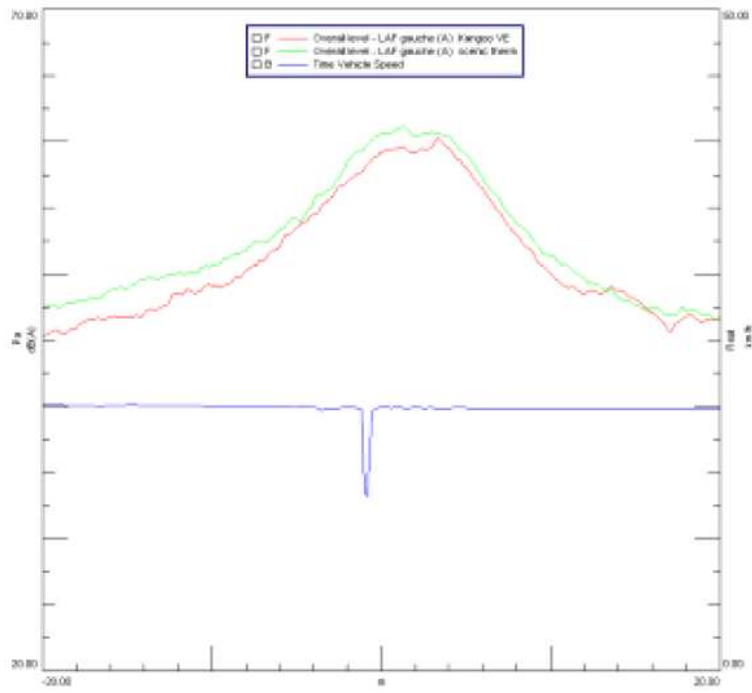


Figure 5: Minimum noise level as a function of the vehicle speed.

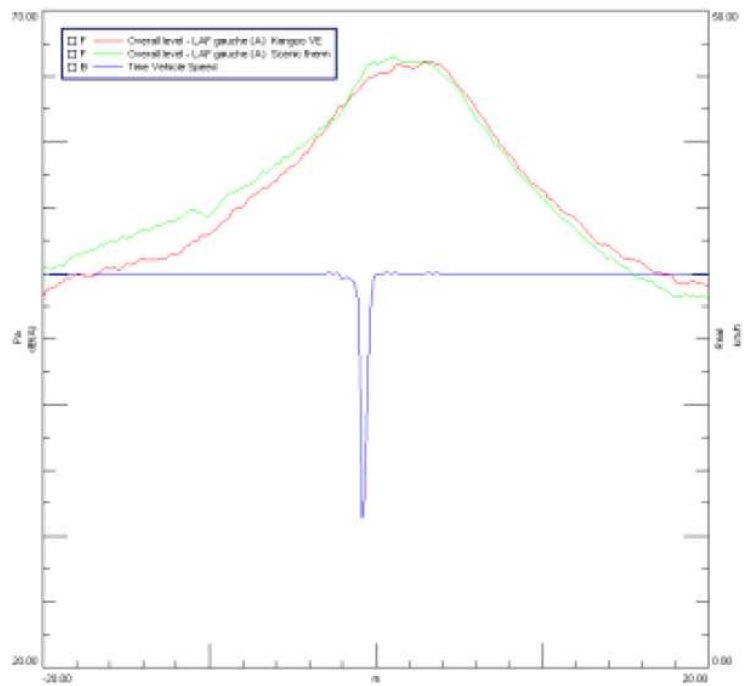
Appendix: Raw data

Left microphone at 2m:

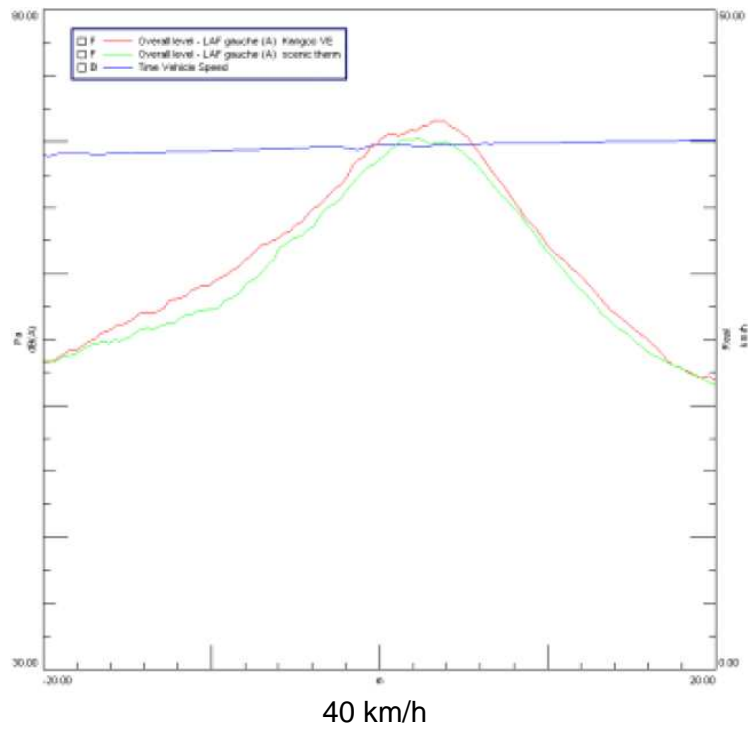




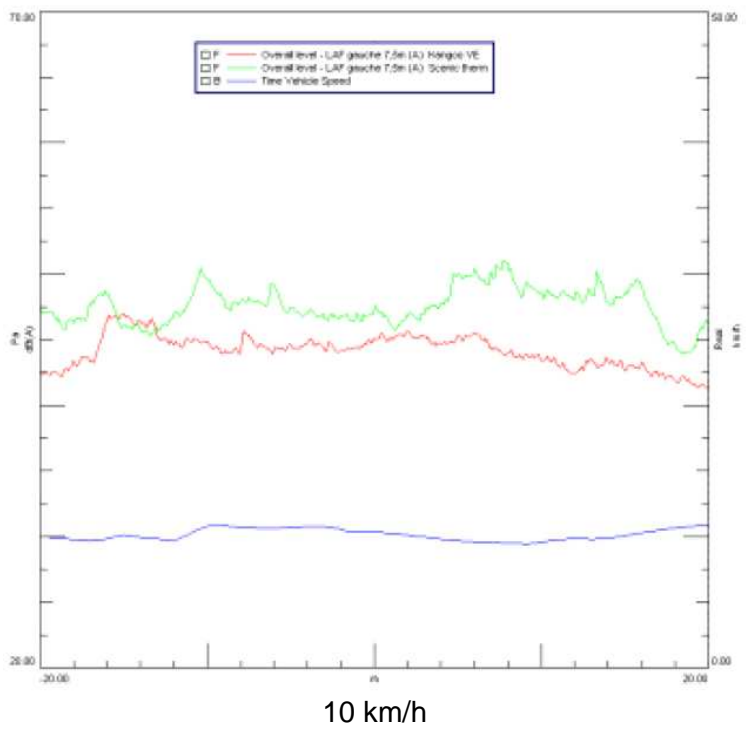
20 km/h

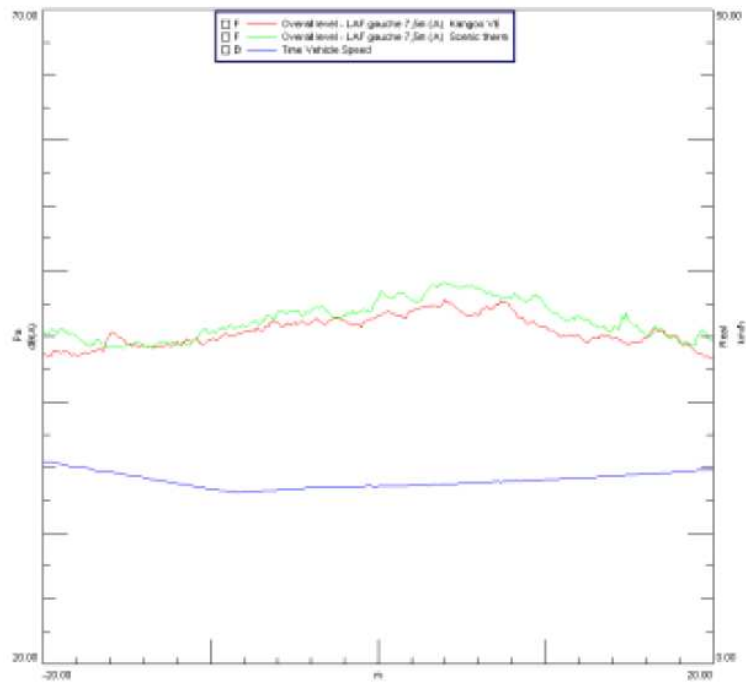


30 km/h

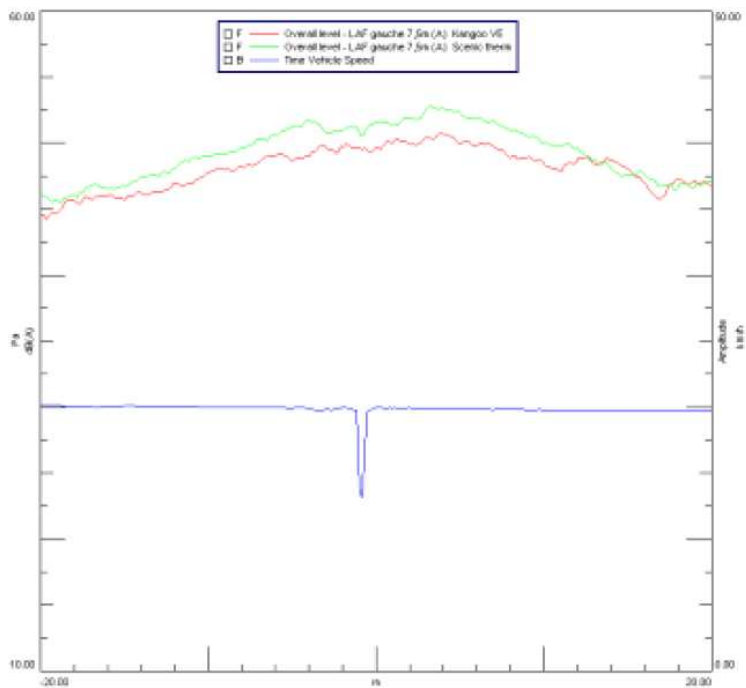


Left microphone at 7.5m:

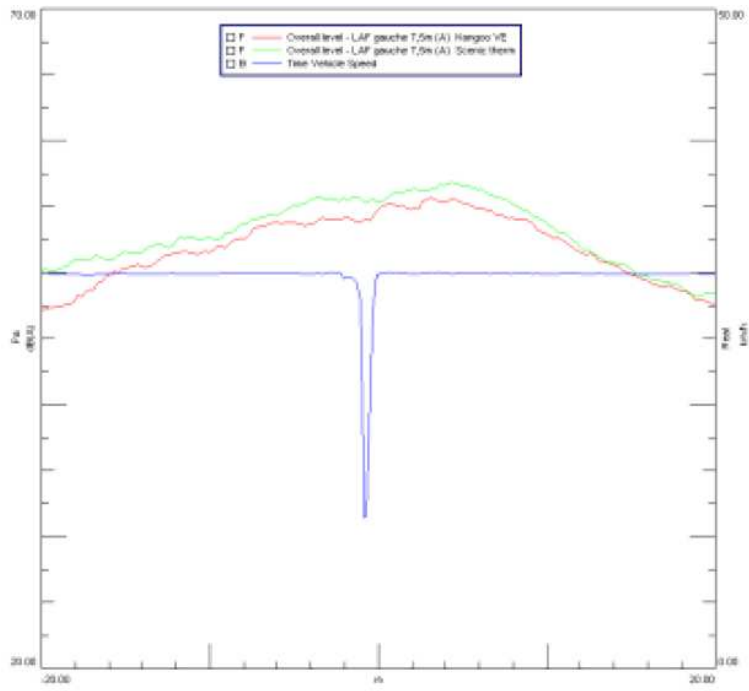




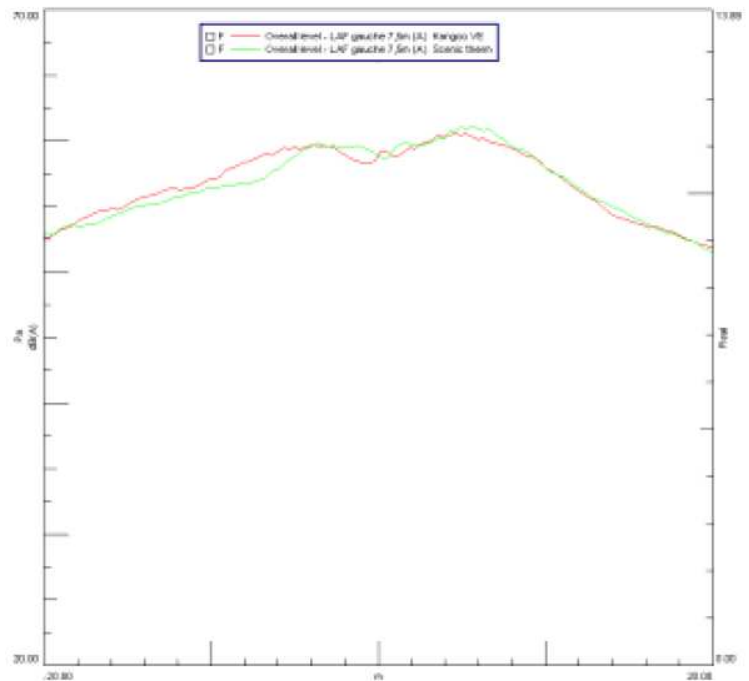
15 km/h



20 km/h



30 km/h



40 km/h