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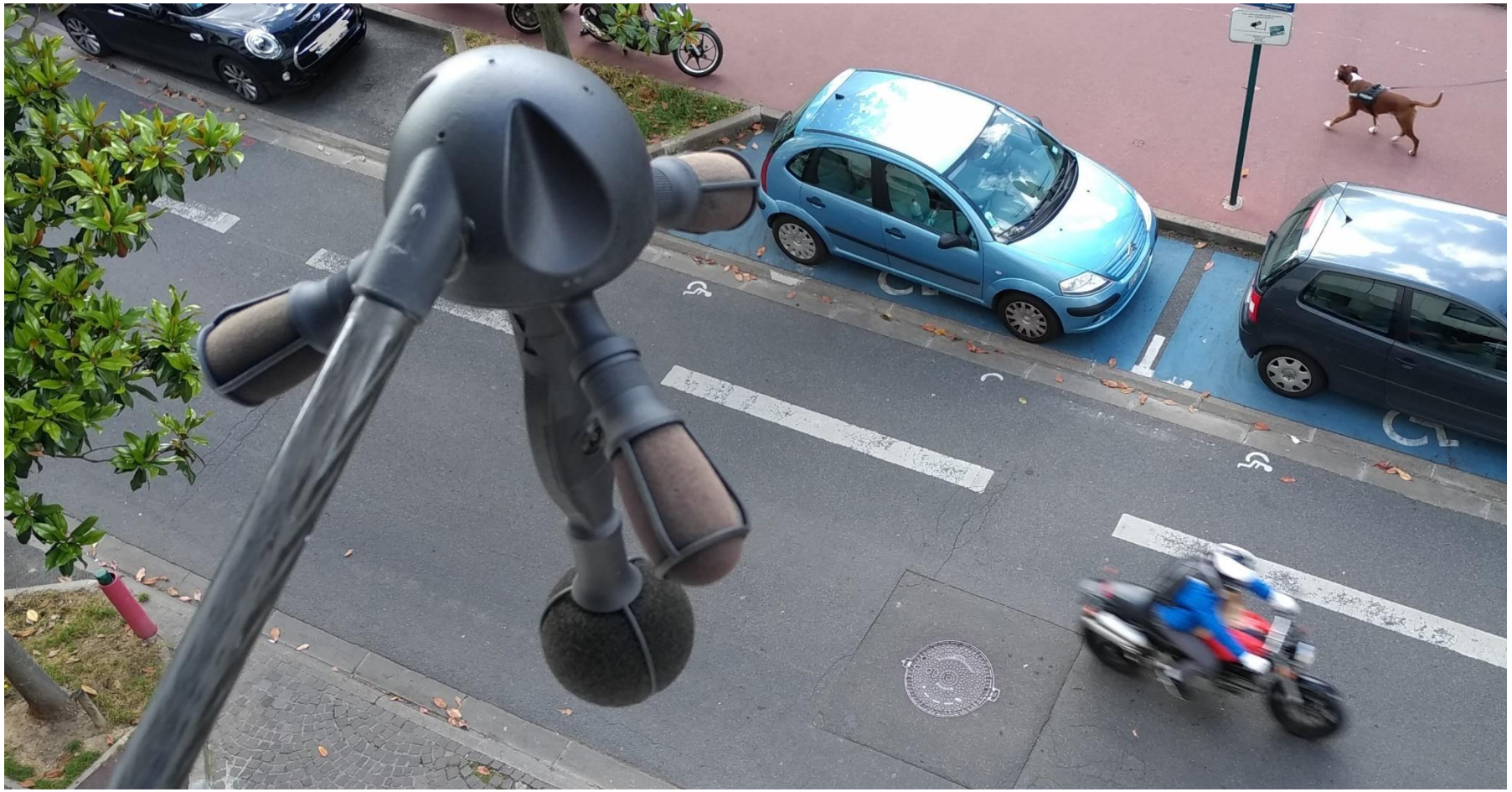
Meduse and Hydre
Tackling noise where it comes from



Thanks to technology,
the way we tackle noise has changed… and will change again !

Handheld SLM

Noise Monitoring Systems (2005)

- 24x7
- Level-based event detection

Sonopode (2010)

- DoA-based aircraft event detection
- Based on Rion NA-37 System

Meduse (2019)

- Enables to see the noise
- General purpose sensor
- Optimized cost

Hydre (2022)

- Fighting excessive noise made by drivers
- Legal Metrology

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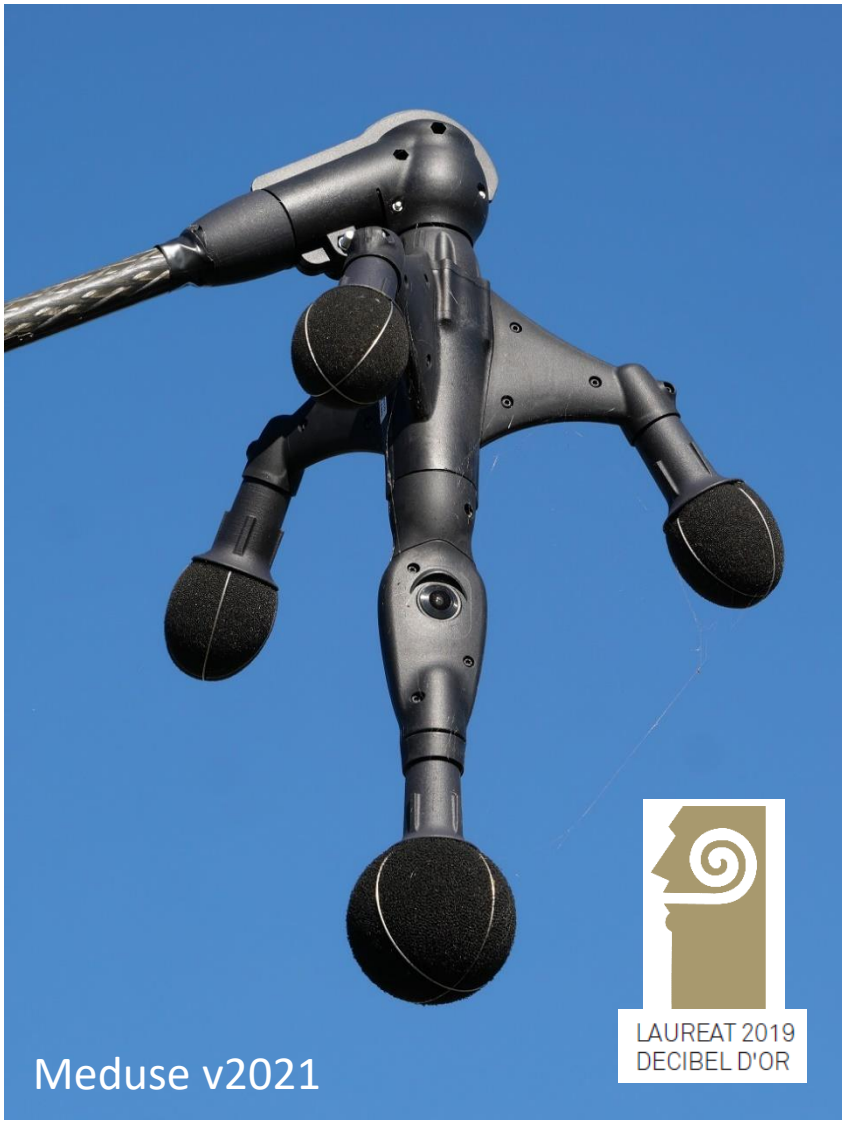
Meduse
A general purpose noise sensor that enables to see noise

- **Tetrahedric acoustic goniometer with embedded 360° imaging system (patented)**

- **Acoustic calculations**
  - LAeq, LCeq every 100ms
  - Direction of Arrival of the loudest source every 100ms
  - No audio recording (DGPR)
- **Imaging**
  - 360° 15mn timelapse (DGPR)
  - Static and dynamic blurring and masking (DGPR)

- Installation on street lights or railings (arm)
- Aircraft noise : sky oriented, on a pole
- No imaging sensor version available

- **Winner of the French “Decibel d’Or” award**



Meduse v2021

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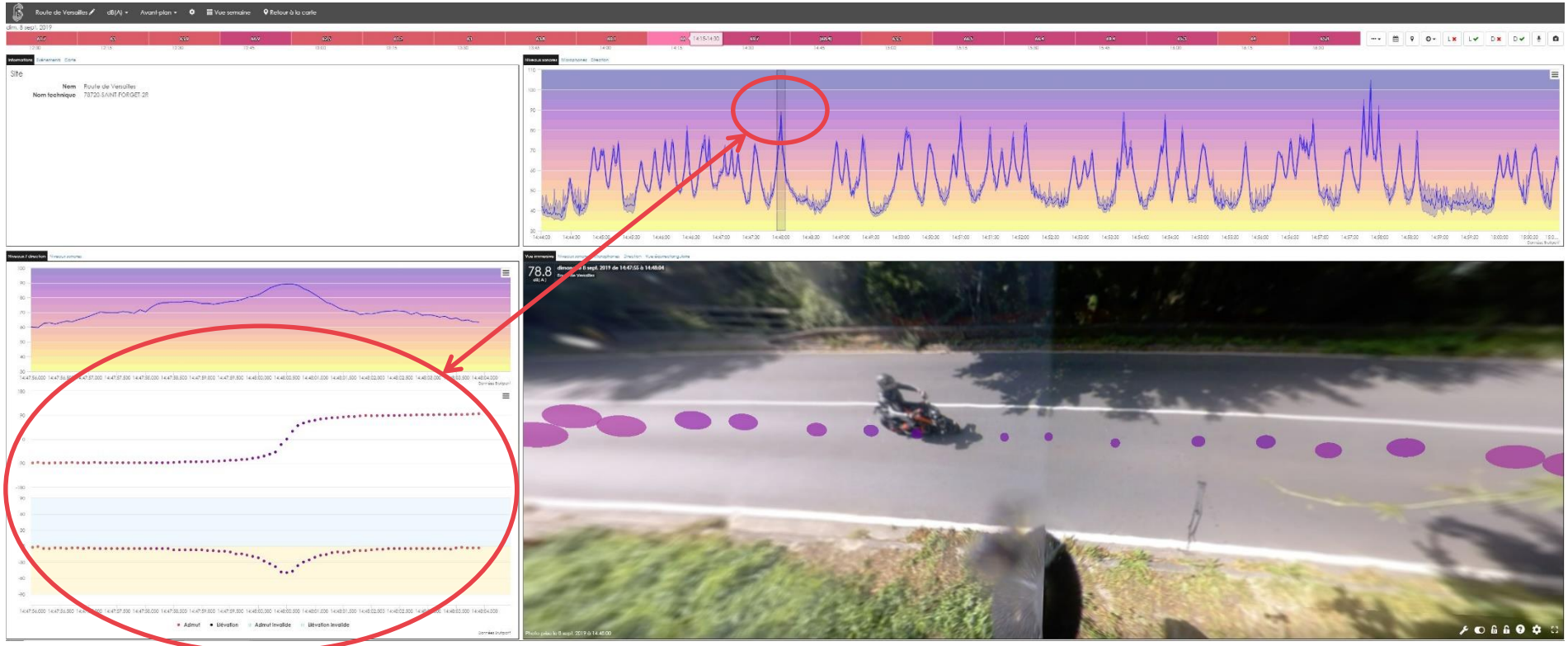
Vehicule Noise Event Detection Application

Passage of a biker



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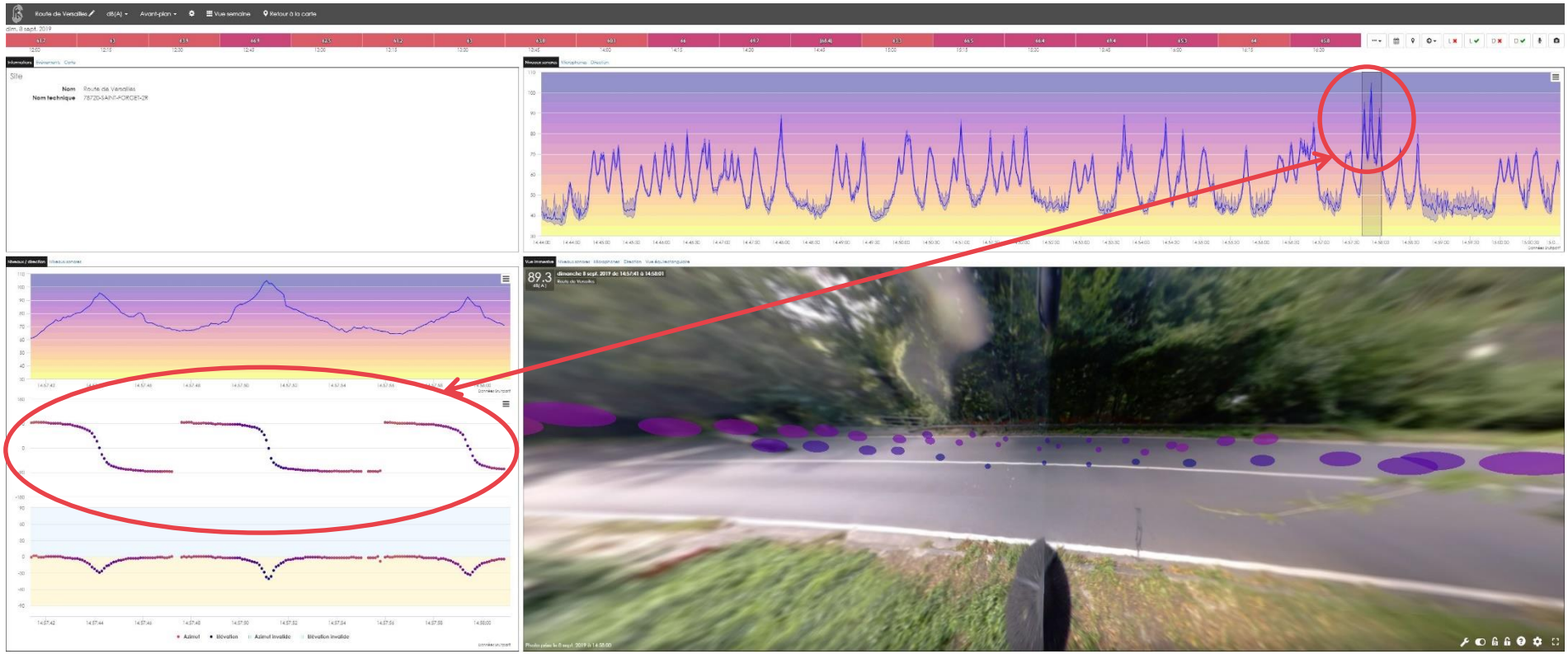
Vehicule Noise Event Detection Application

Some bikers



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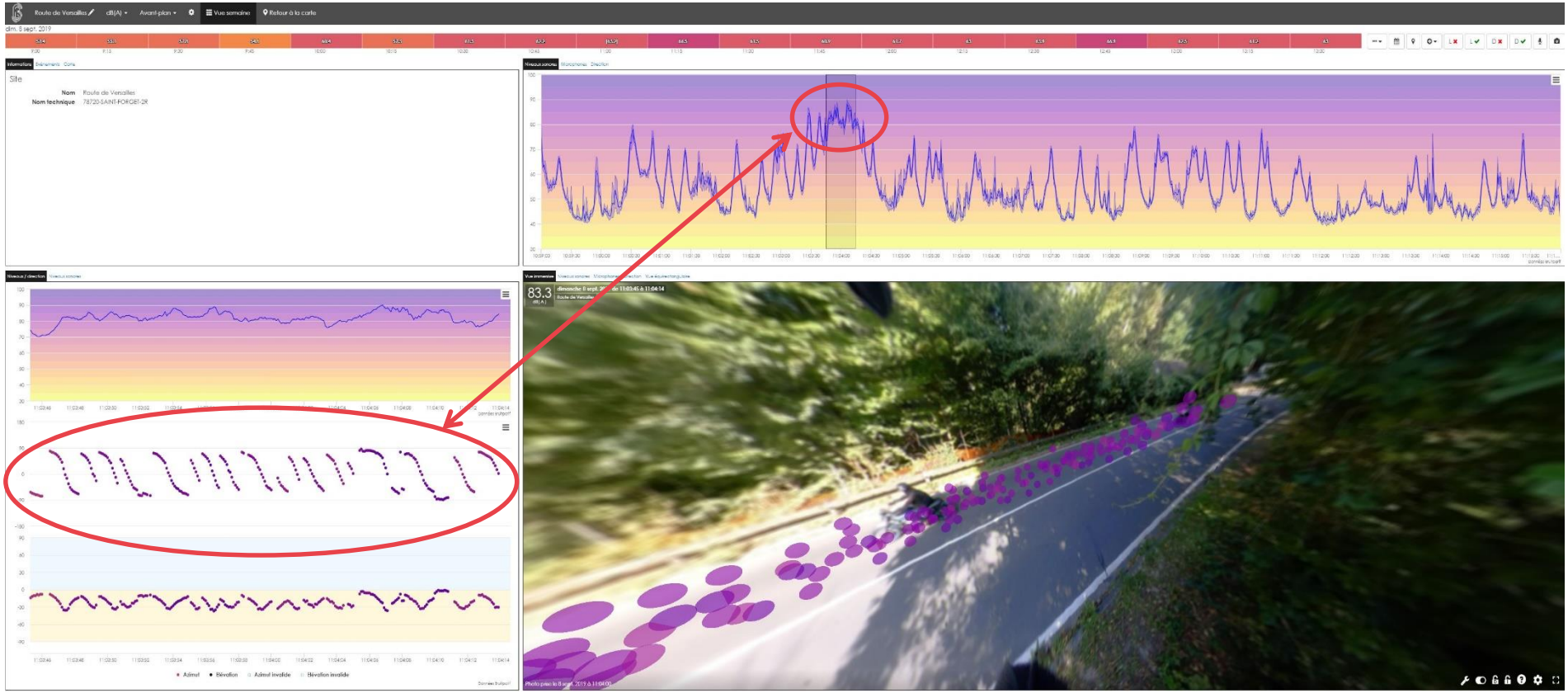
Vehicule Noise Event Detection Application

Many bikers !



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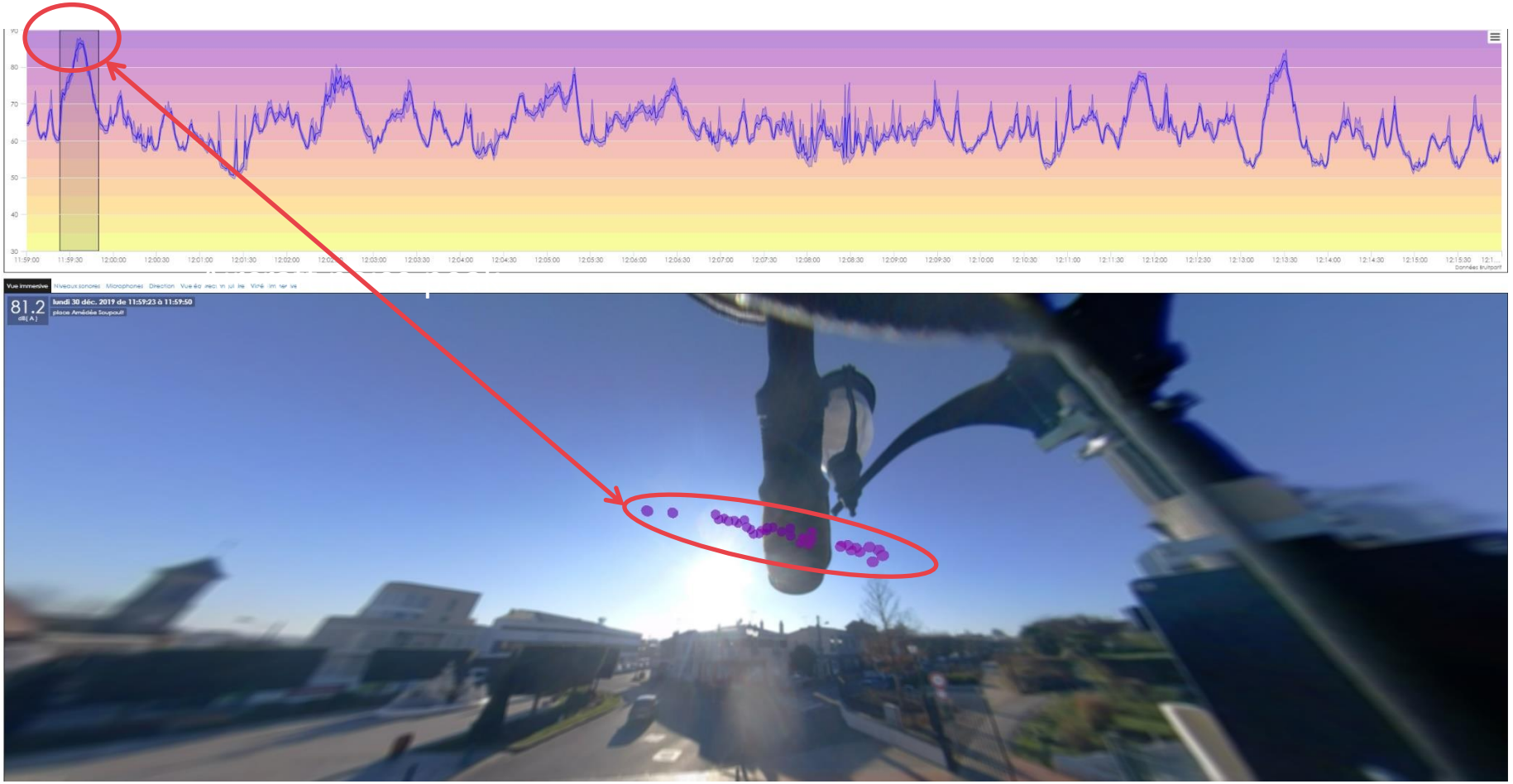
Aircraft Noise Event detection

Purely acoustic characterization of noise from the sky



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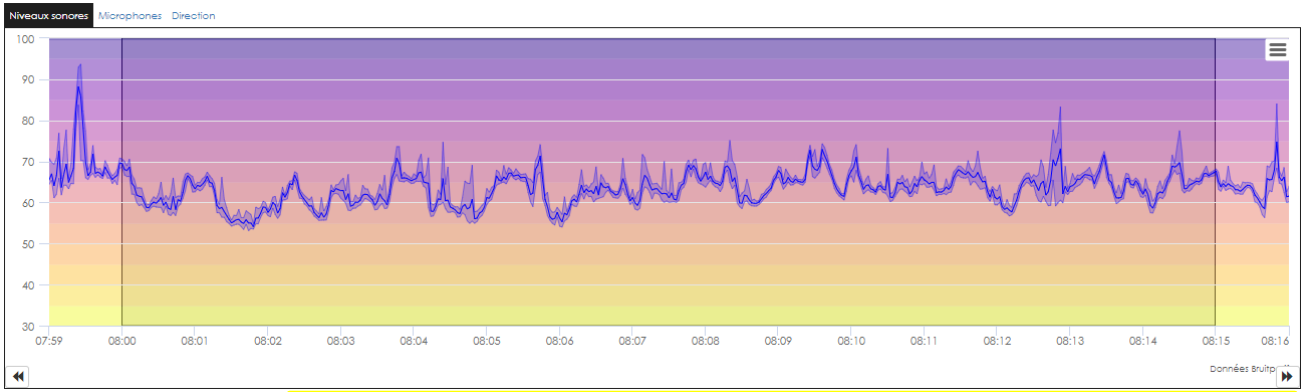
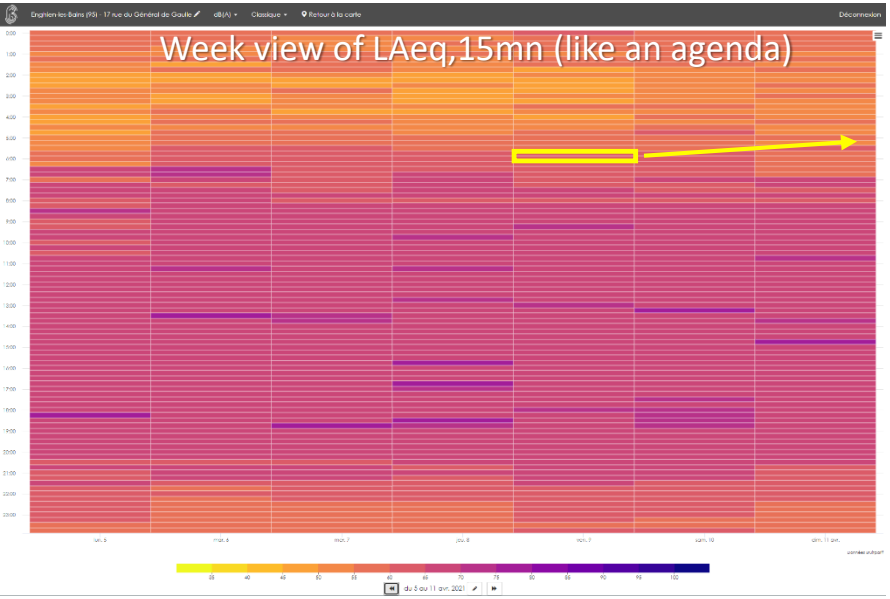
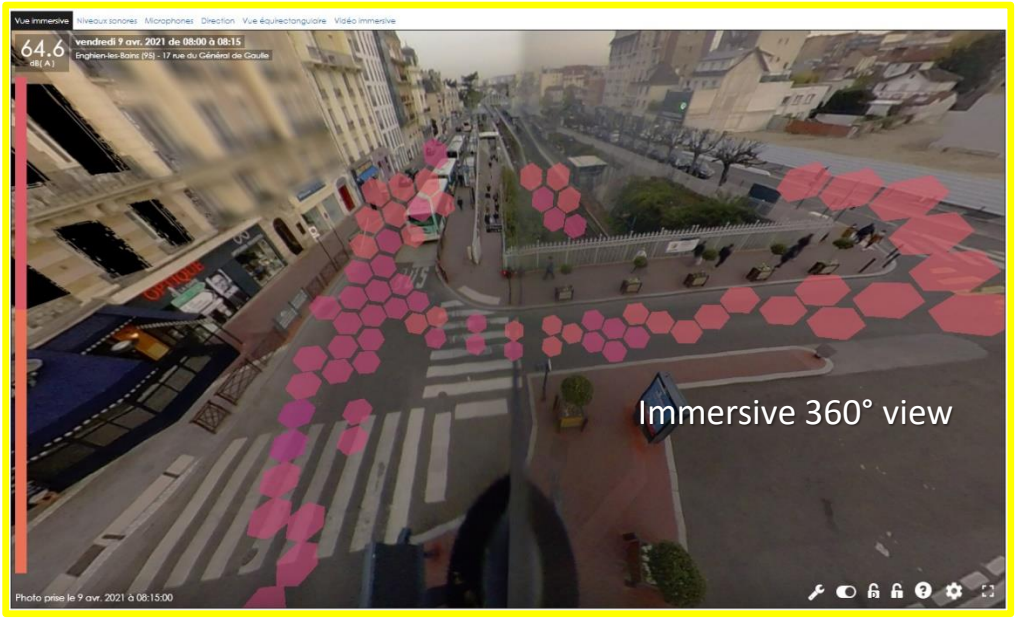
Spatialized noise assessment

Using statistics on Direction of Arrival







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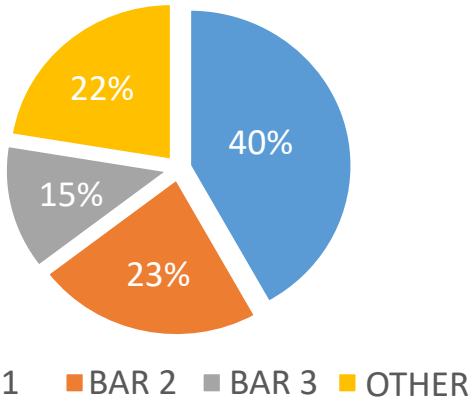
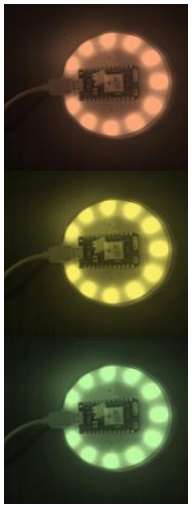
Management of public tranquility

Contribution of the different bars in noise



Provide feedback
to customer and bar holders
to encourage self regulation



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Educational Noise System (based on Meduse)

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HYDRE

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HYDRE : a multi-sensor system

Windmeter and Communications

Pumba « top » acoustic subsystem

ALPR camera 1

ALPR camera 2

Pumba « bottom » acoustic subsystem

Wide angle camera

- Secured and hardened design
- Installed and powered by public light pole

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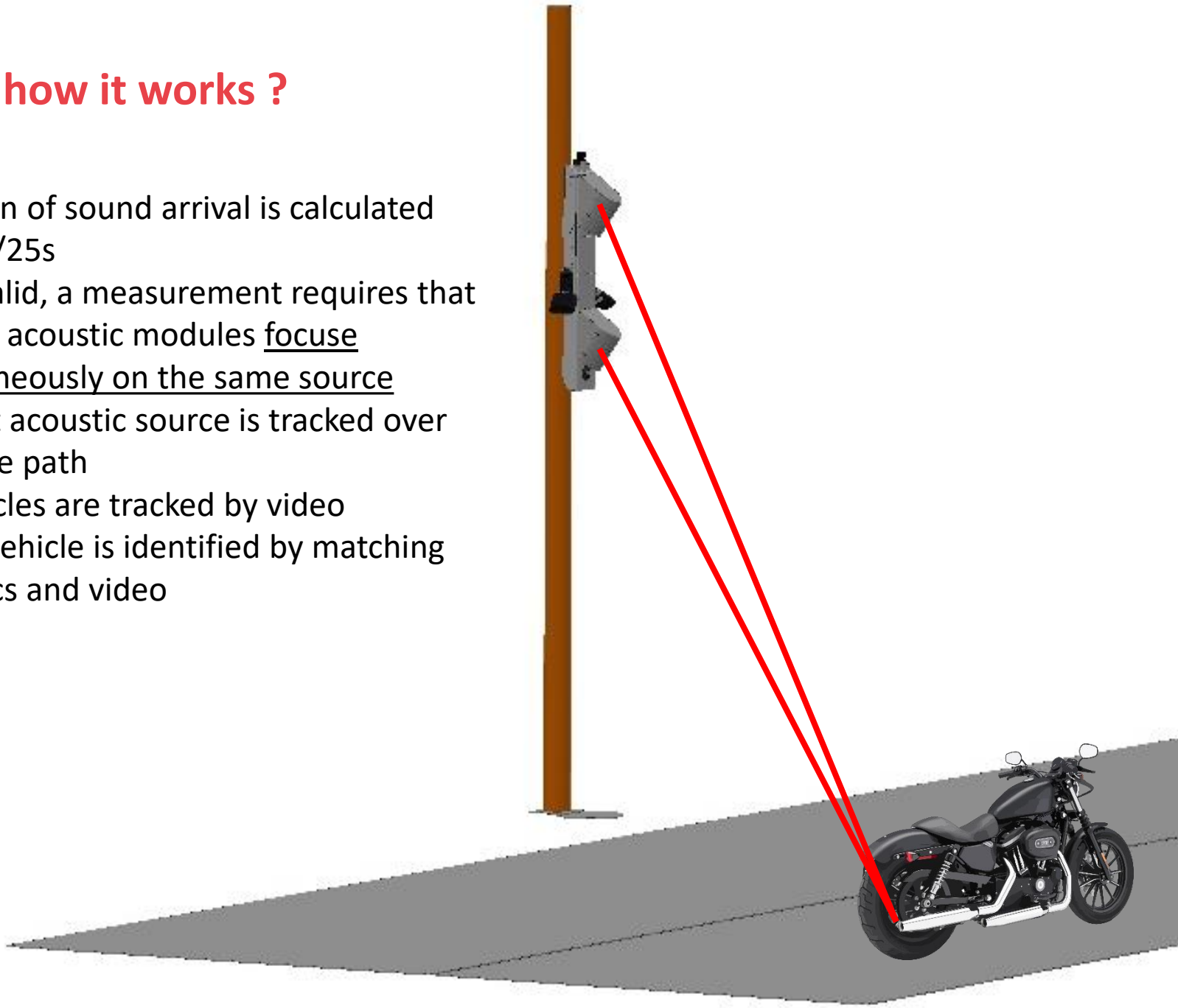
HYDRE : how it works ?

- Direction of sound arrival is calculated every 1/25s
- To be valid, a measurement requires that the two acoustic modules focuse simultaneously on the same source
- Noisiest acoustic source is tracked over its entire path
- All vehicles are tracked by video
- Target vehicle is identified by matching acoustics and video



How (and why) to measure at a reference distance ?

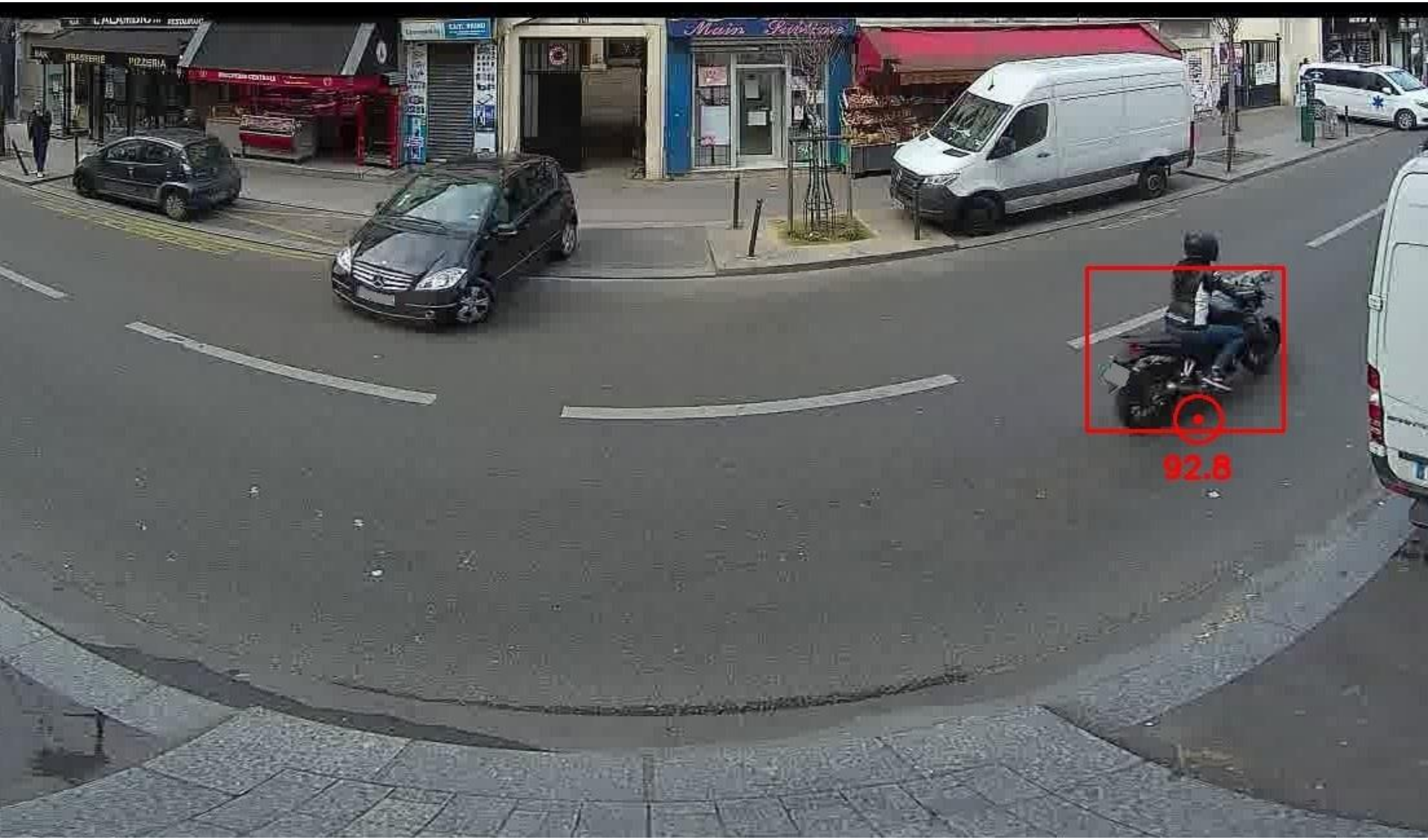
- For a moving vehicle, it is impossible to sanction a driver based on a simple measurement made with a sound level meter
  - The system would not behave in an equitable manner for the different traffic lanes
  - This could result in the driver taking risks to get as far away from the microphone as possible, even if it means driving the wrong way.

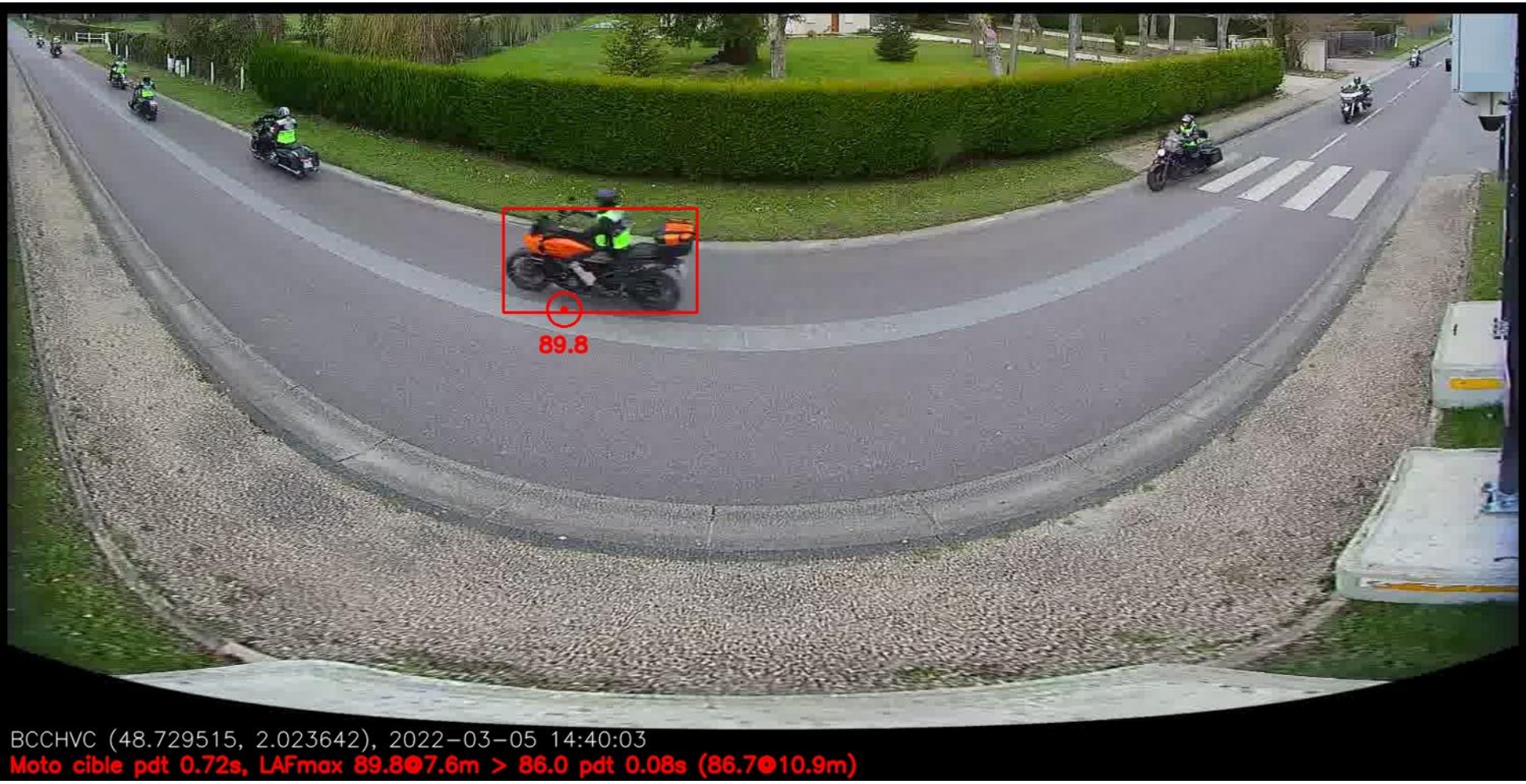
It is absolutely necessary to evaluate at any time the distance at which the noise source is located in order to be able to calculate a noise level at a standard reference distance

✓ Hydre is the only system that performs this operation in an entirely acoustic way, by crossing the directions detected by the two acoustics subsystems.

✓ This technique is the only one that can guarantee the requirements of legal metrology about distance estimation

HYDRE in concrete terms…


92.8


89.8
BCCHVC (48.729515, 2.023642), 2022-03-05 14:40:03
Moto cible pdt 0.72s, LAFmax 89.8●7.6m > 86.0 pdt 0.08s (86.7●10.9m)

BPAR20 (48.852100, 2.403002), 2022-04-12 18:33:16

Moto cible pdt 1.24s, LAFmax 87.7●7.6m > 86.0 pdt 0.08s (83.2●12.7m)

Detections LAPI

2RM

Bleu (95%)

FX7X0RX

FR

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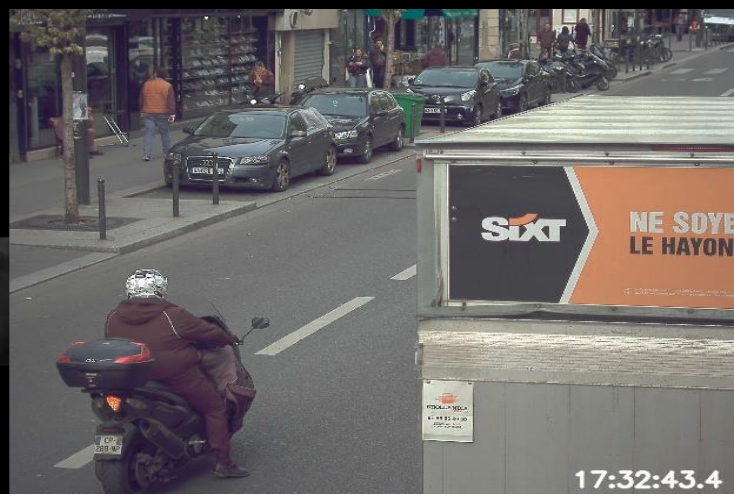
Pas d'image disponible

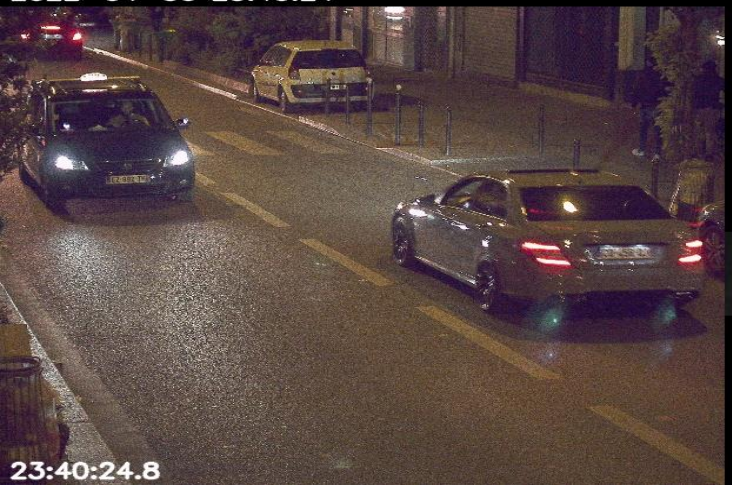
BPAR20 (48.852100, 2.403002), 2022-04-12 17:32:41

Moto cible pdt 1.28s, LAFmax 87.3●7.6m > 86.0 pdt 0.08s (84.1●10.9m)



Pas d'image disponible


88.1
BPAR20 (48.852100, 2.403002), 2022-04-10 01:51:12
Voiture cible pdt 0.28s, LAFmax 88.1●7.6m > 86.0 pdt 0.16s (83.0●13.6m)
01:51:12.3
WF G
PL
WP XXXX G
WP XXXX G
01:51:13.6

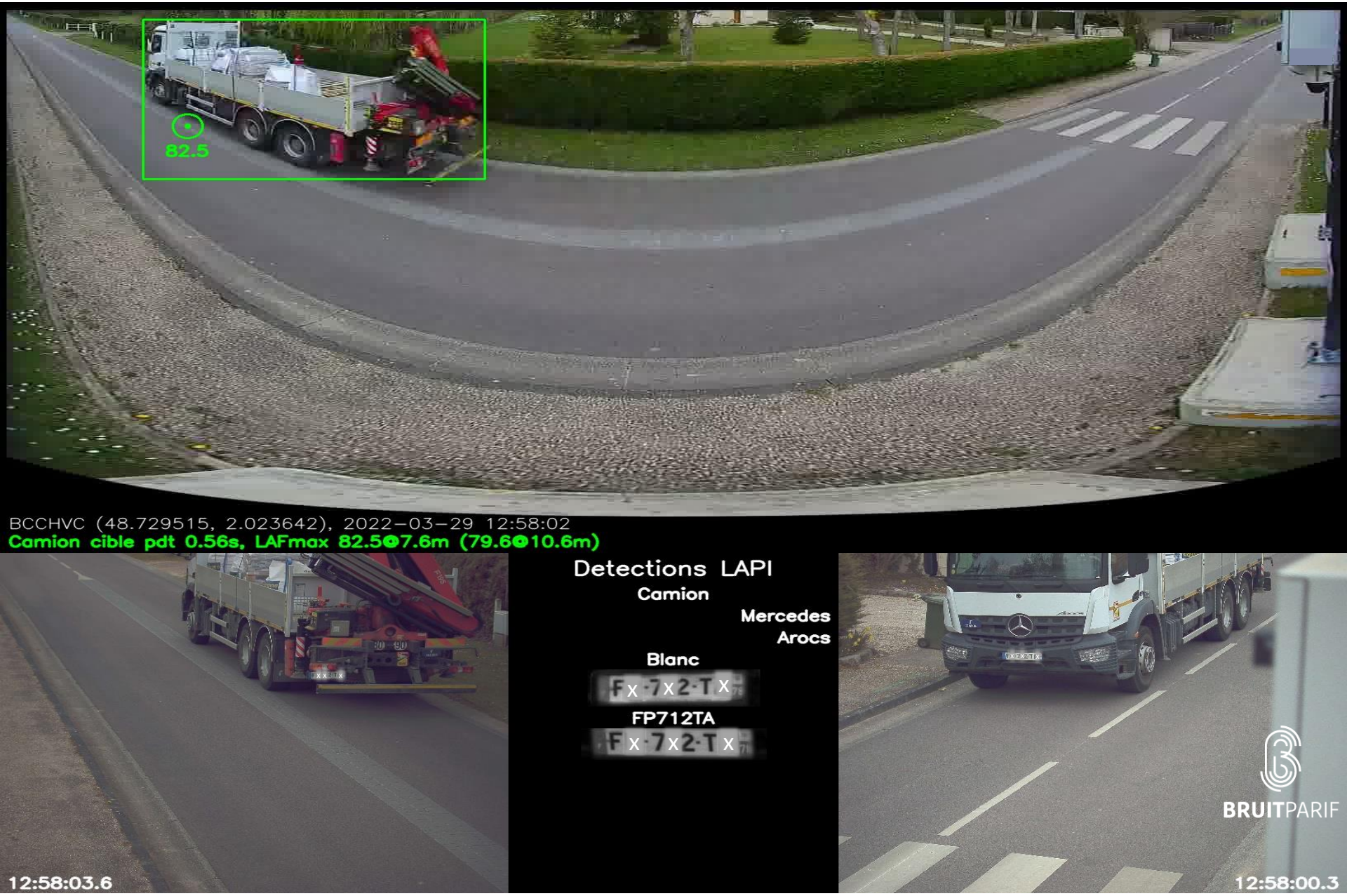


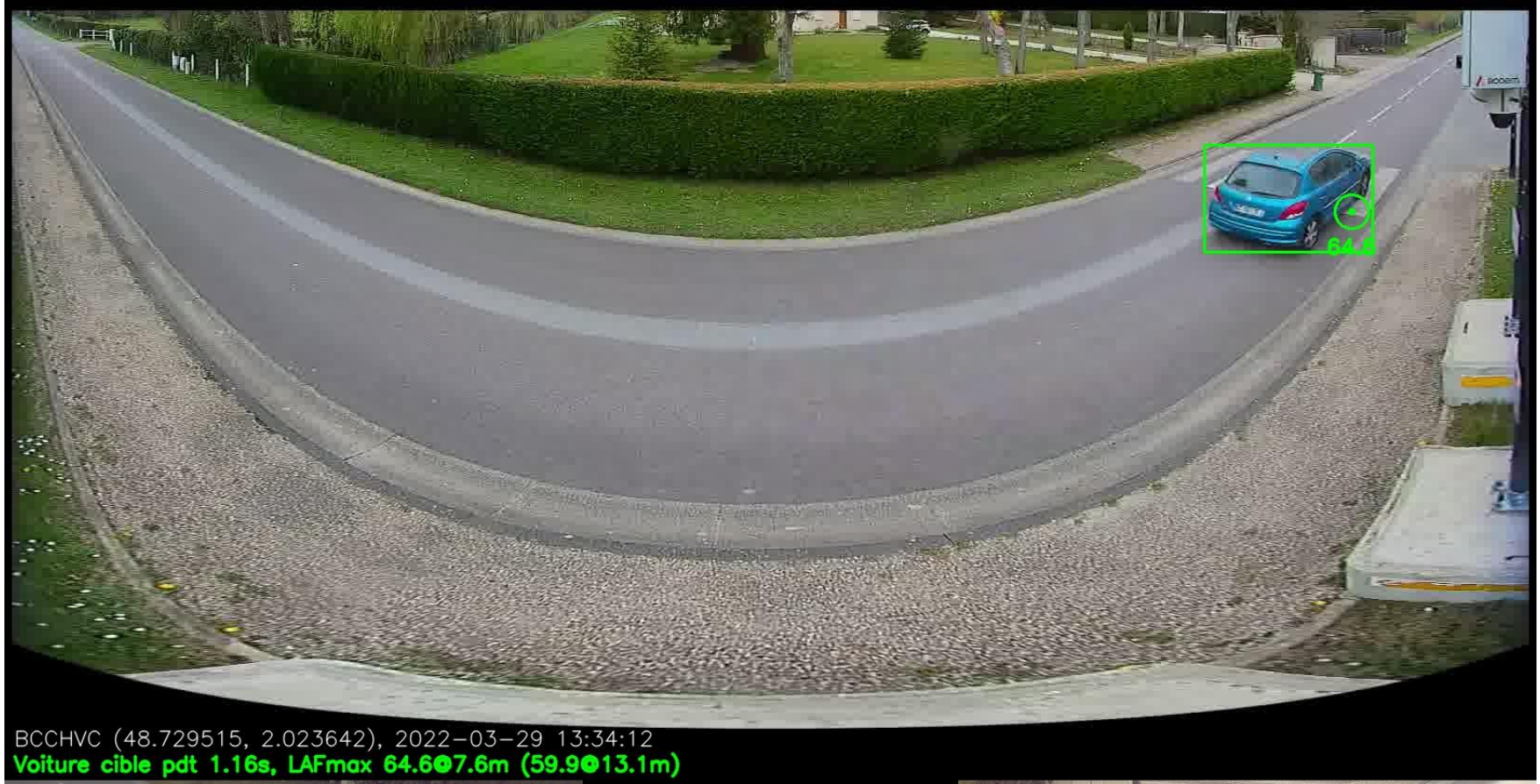
Detections LAPI

Voiture

Mercedes

FR


82.5
BCCHVC (48.729515, 2.023642), 2022-03-29 12:58:02
Camion cible pdt 0.56s, LAFmax 82.5@7.6m (79.6@10.6m)
Detections LAPI
Camion
Mercedes
Arocs
Blanc
FP712TA
12:58:03.6
12:58:00.3
BRUITPARIF



Detections LAPI

Voiture

Peugeot

207

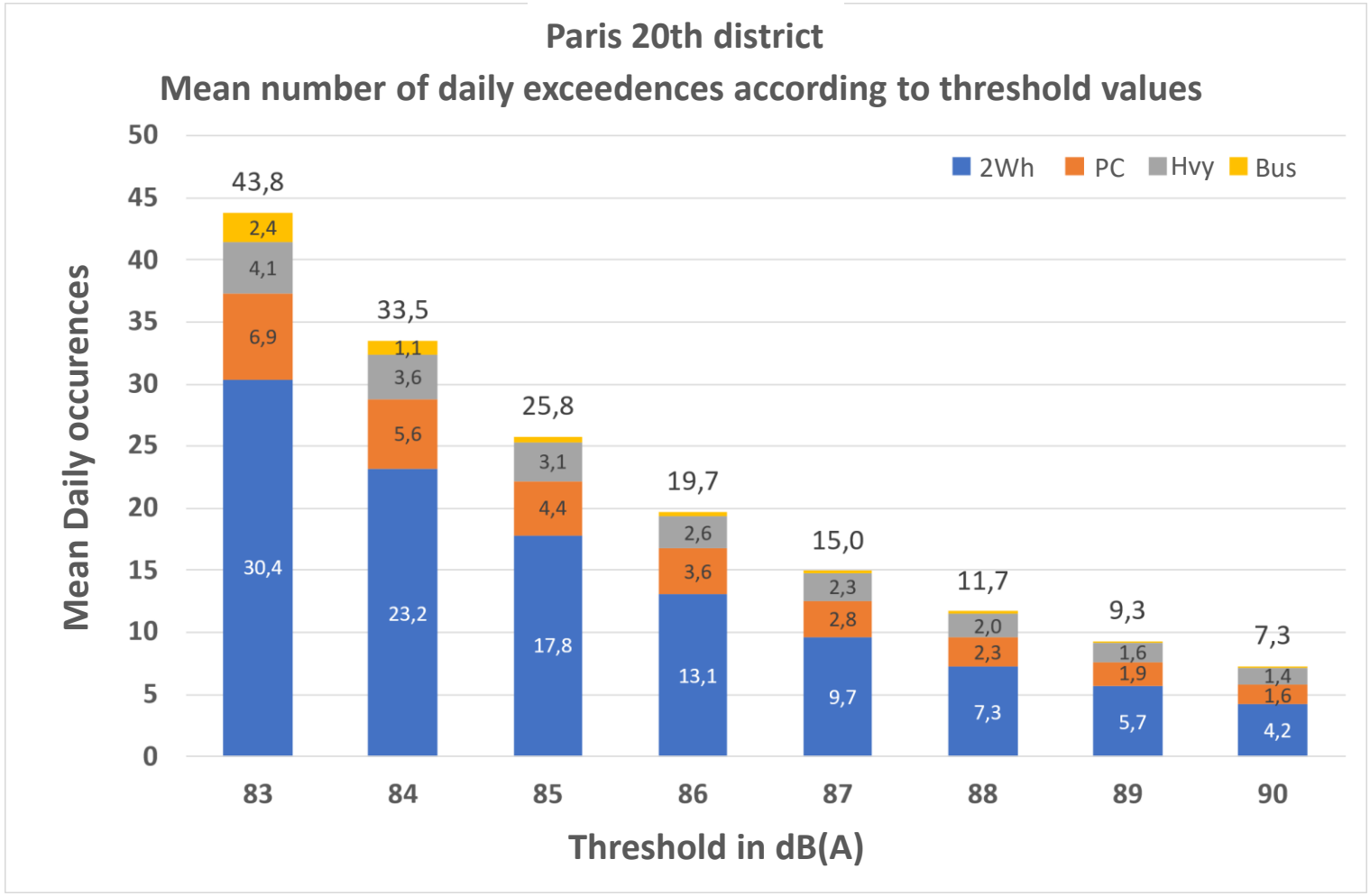
Bleu

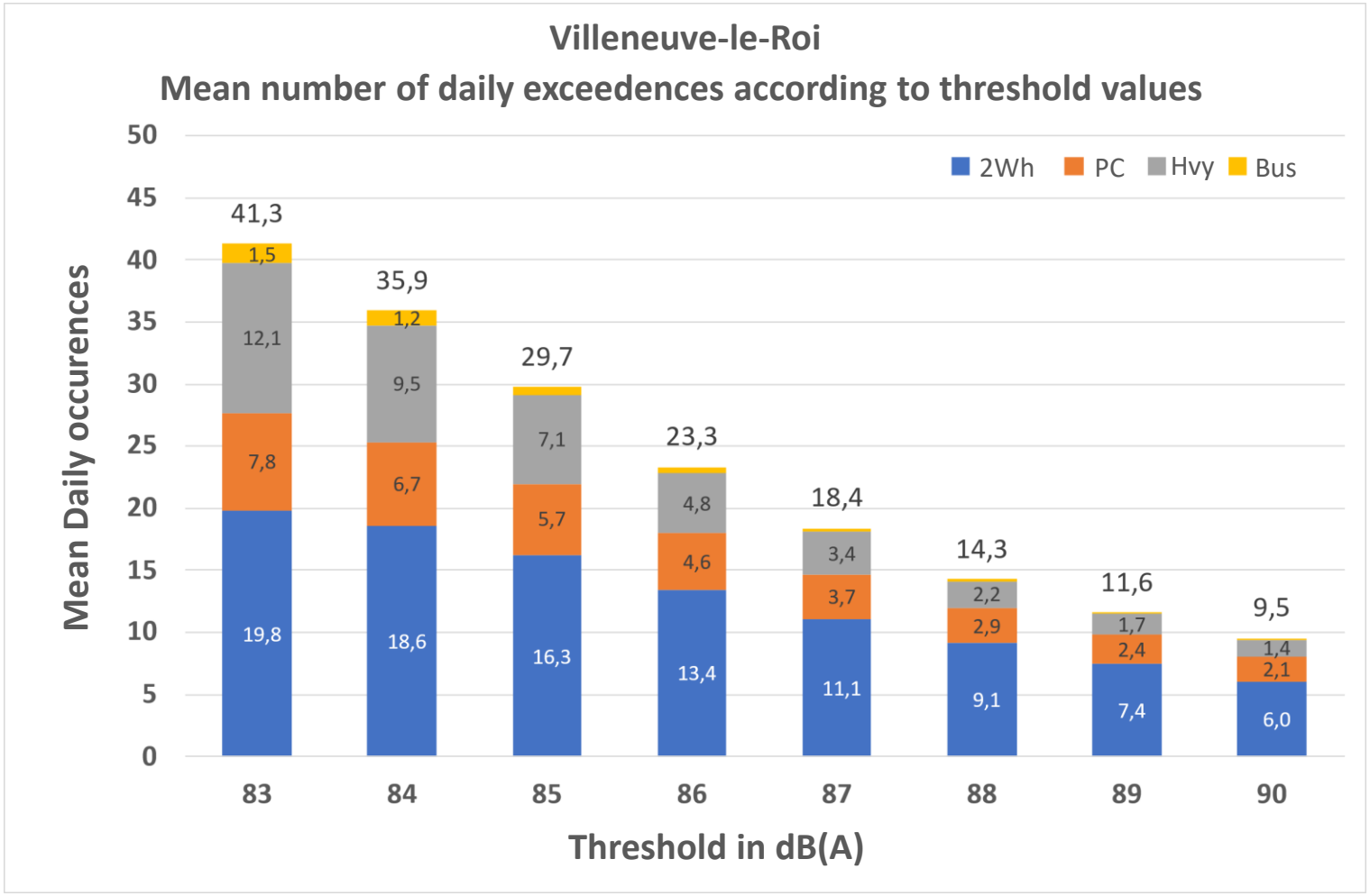
CC561GL

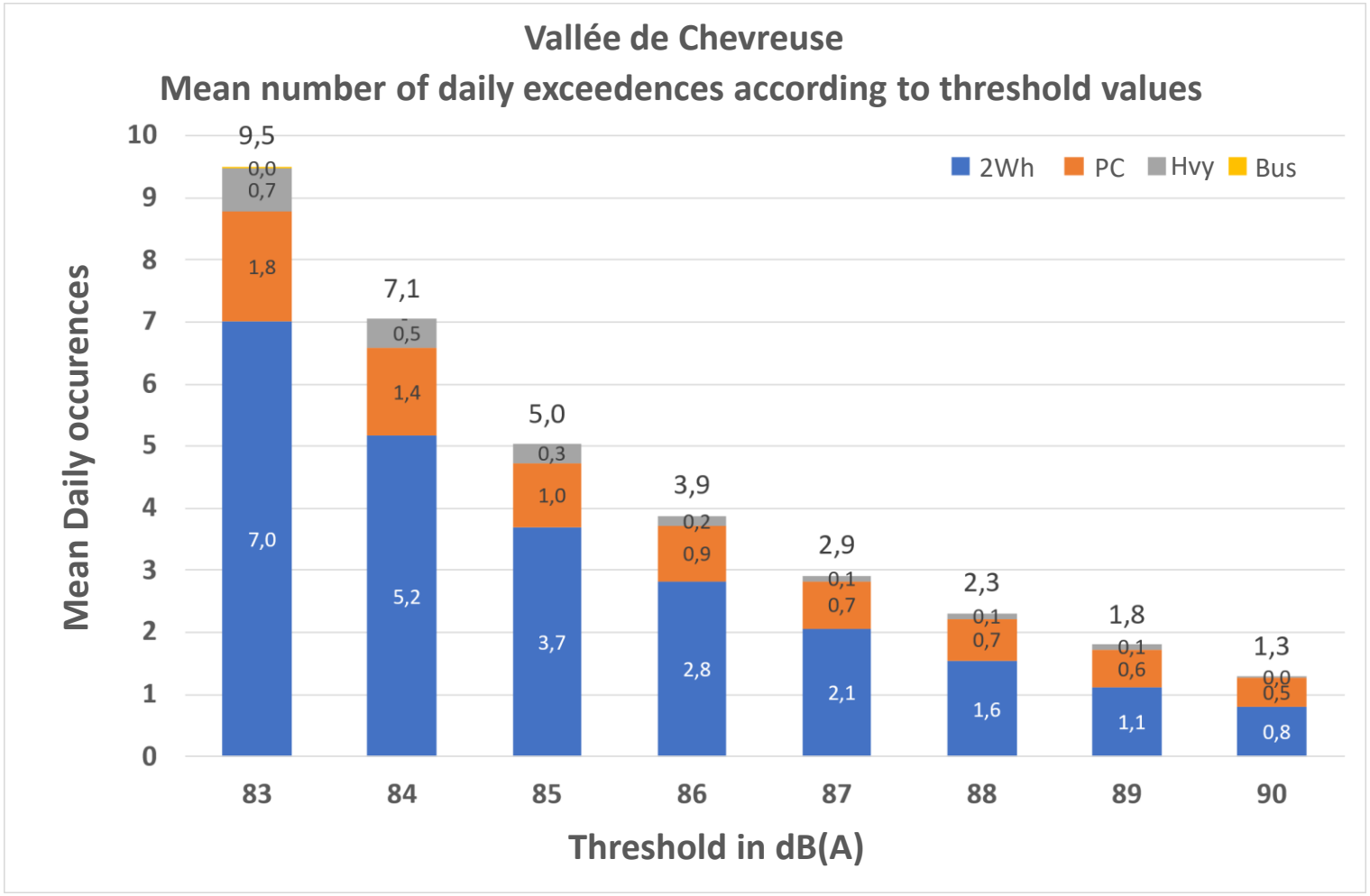
Average number of threshold exceedances per day

3 experimentation sites :

- Paris 20th (rue d’Avron)
- Villeneuve-le-Roi (RD5)
- Vallée de Chevreuse (RD86)


Paris 20th district
Mean number of daily exceedences according to threshold values
Mean Daily occurences
Threshold in dB(A)
2Wh
PC
Hvy
Bus
50
45
40
35
30
25
20
15
10
5
0
83
84
85
86
87
88
89
90
43,8
2,4
4,1
6,9
30,4
33,5
1,1
3,6
5,6
23,2
25,8
3,1
4,4
17,8
19,7
2,6
3,6
13,1
15,0
2,3
2,8
9,7
11,7
2,0
2,3
7,3
9,3
1,6
1,9
5,7
7,3
1,4
1,6
4,2


Villeneuve-le-Roi
Mean number of daily exceedences according to threshold values
2Wh
PC
Hvy
Bus
Mean Daily occurences
50
45
40
35
30
25
20
15
10
5
0
41,3
1,5
12,1
7,8
19,8
35,9
1,2
9,5
6,7
18,6
29,7
7,1
5,7
16,3
23,3
4,8
4,6
13,4
18,4
3,4
3,7
11,1
14,3
2,2
2,9
9,1
11,6
1,7
2,4
7,4
9,5
1,4
2,1
6,0
83
84
85
86
87
88
89
90
Threshold in dB(A)


Vallée de Chevreuse
Mean number of daily exceedences according to threshold values
Mean Daily occurences
Threshold in dB(A)
2Wh
PC
Hvy
Bus
83
84
85
86
87
88
89
90
9,5
7,1
5,0
3,9
2,9
2,3
1,8
1,3
7,0
1,8
0,7
0,0
5,2
1,4
0,5
3,7
1,0
0,3
2,8
0,9
0,2
2,1
0,7
0,1
1,6
0,7
0,1
1,1
0,6
0,1
0,8
0,5
0,0

Thank you for your attention !

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