Road Vehicle noise

Regulations and standardization

Impacts and Stakes

Presented by Louis-Ferdinand PARDO

Working groups

- For automotive standardization :
  - ISO / TC43 / SC1 / WG42
  - AFNOR S30M

- For Automotive Regulation :
  - United nations : UNECE / WP 29 : World Forum for Harmonization of vehicle regulations - GRB : Working Party of Noise (Geneva)
  - European commission, parliament and of the council (Brussels)

Standardization and Regulations of vehicles

Sound emissions of M and N categories of vehicles :

(Four wheeled and more)

– Standard ISO 362-1

- United nations regulation ECE51

- European Regulations COM 856/2011

Sound emissions of L categories of vehicles :

(motorcycles, three-wheeled vehicles and Mopeds)

– Standard ISO 362-2

- United nations regulation ECE41, 9 and 63

- European Regulations xxx

Standardization and Regulations of tyres

Sound emissions of tyres of vehicles :

– United nations regulation ECE117

- Safety Regulation (GSR) EC/661/2009
- Tyre labelling regulated in EC/1222/2011

→ **Rolling noise, rolling resistance and wet grip**

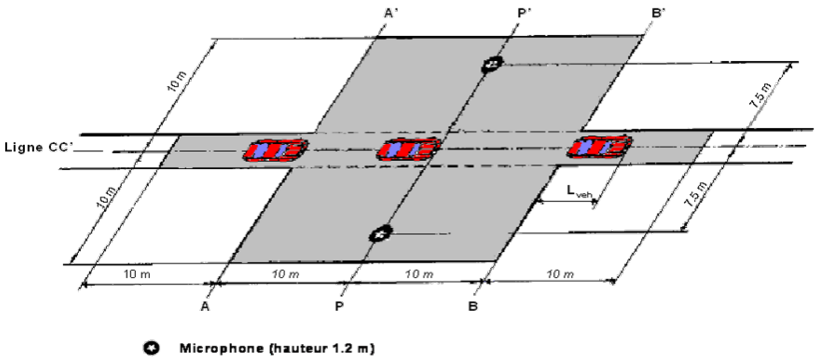
M and N vehicles – A new test method

A new measurement procedure which :

- reflects realistic urban driving conditions
- represents the major noise sources of a vehicle measured
- is more accurate

Testing conditions :

- ISO 10 844 test track
- Microphones at 7,5 m, 1,2 m height
- Pass by noise - LmaxA



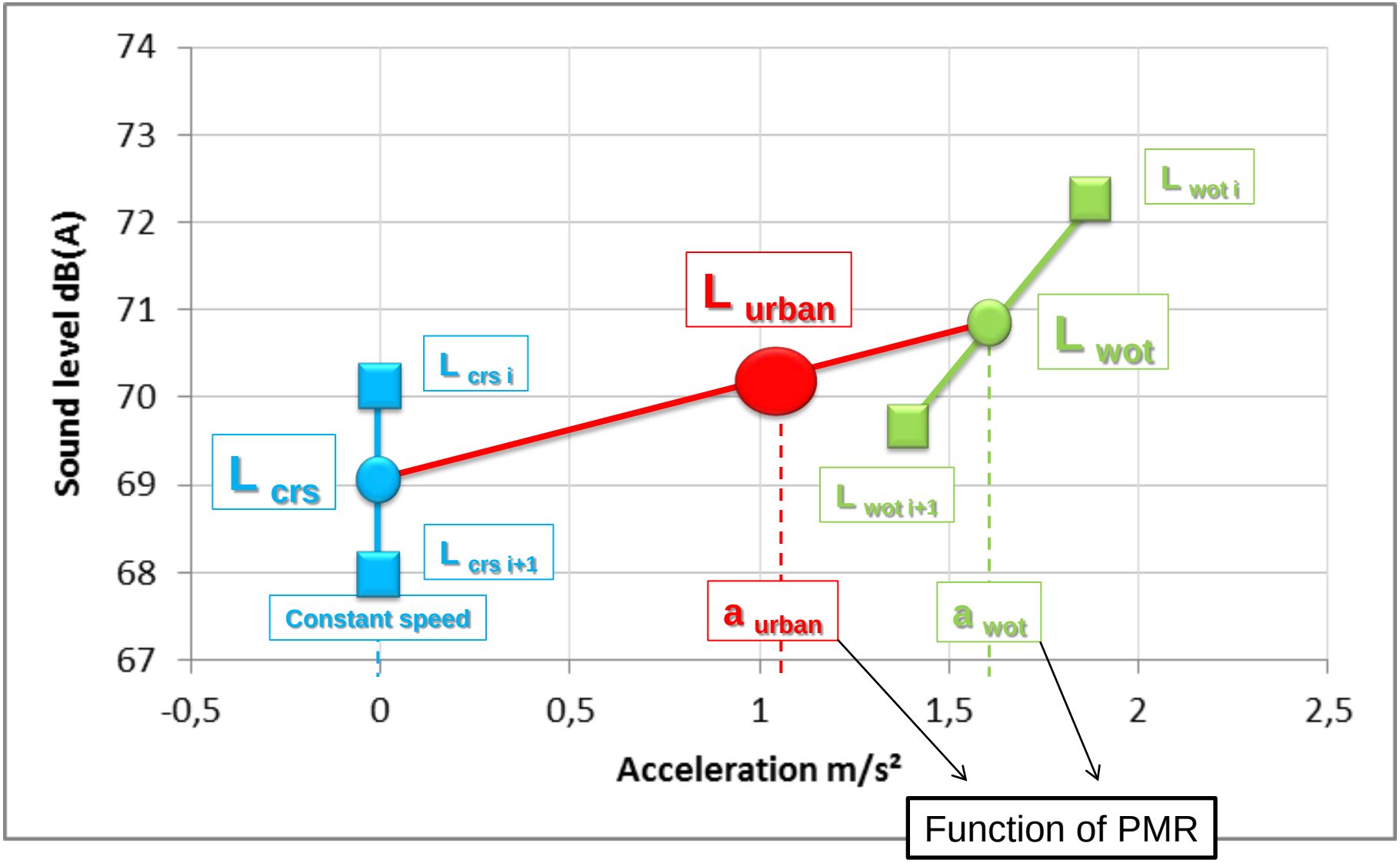
For light vehicles :

- **Partial throttle** noise level with Urban acceleration target at 50 kph

Heavy vehicles :

- **Full throttle** at 35 km/h on BB' line.
- Engine speed target (70 to 74% or 85 to 89% of maximum rated engine speed)
- Commercial vehicles **loaded**

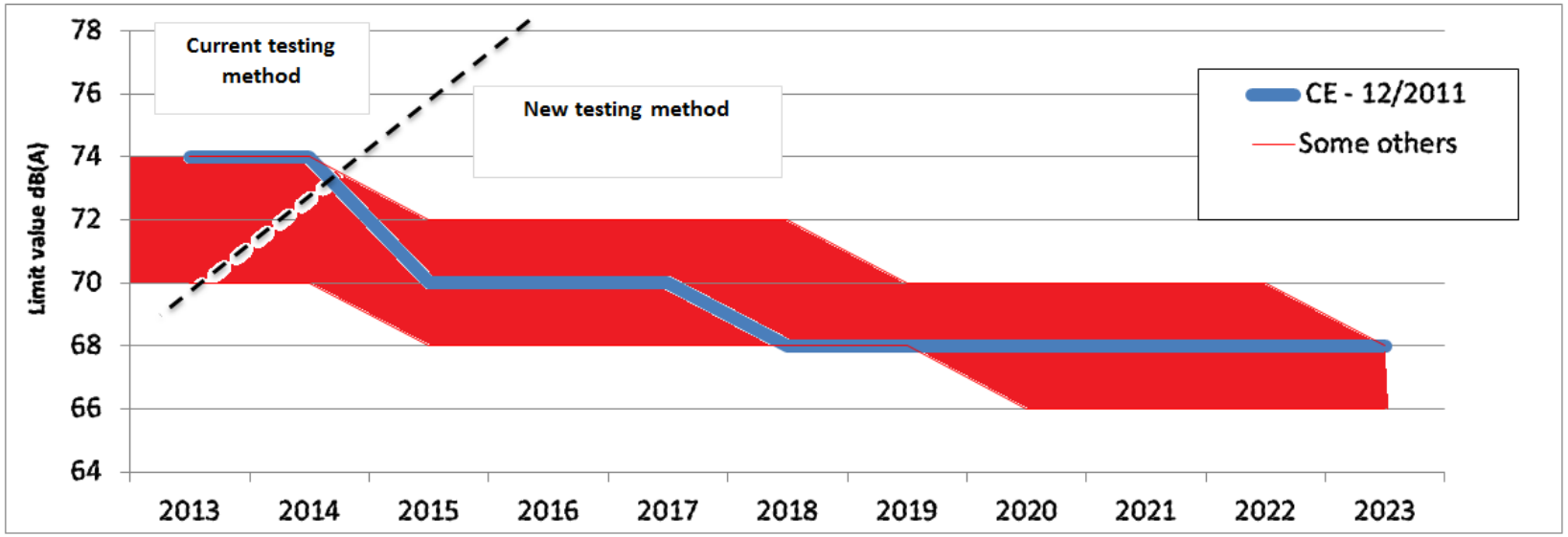
M1 and N1 vehicles – New test method



M and N vehicles – Limits reductions

- Limits reduction stages for environmental benefits
- Under discussions in Brussels to prepare an enforced proposal with councils and parliament agreement
- Large range of proposal : sub-categories, limits values and stages, …

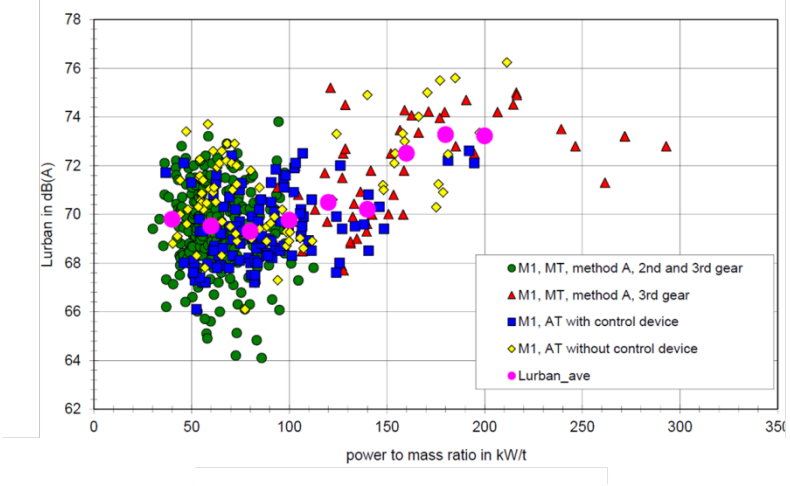
Example for passengers cars :



→ Decision in 2013

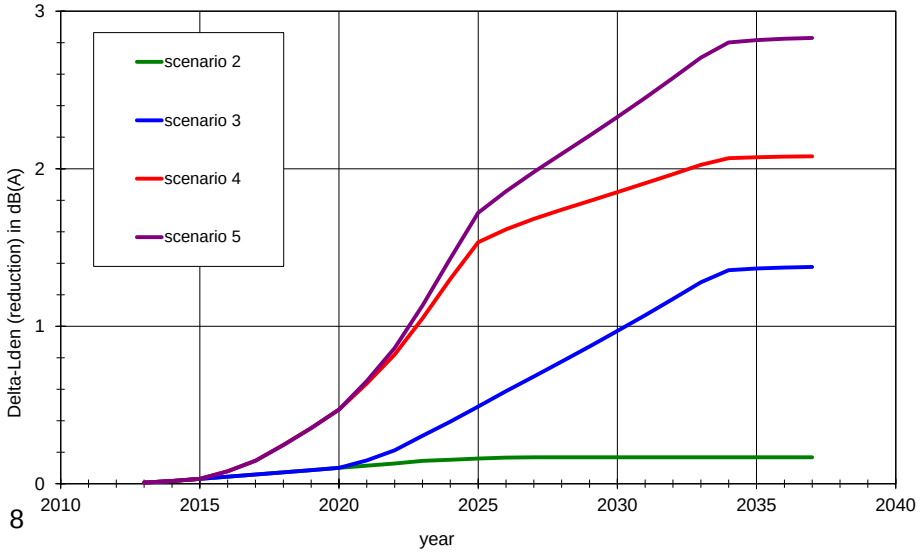
M and N vehicles – Monitoring database and impact assessment – UTAC/TUEV study

- Monitoring -1060 datasets used analysis



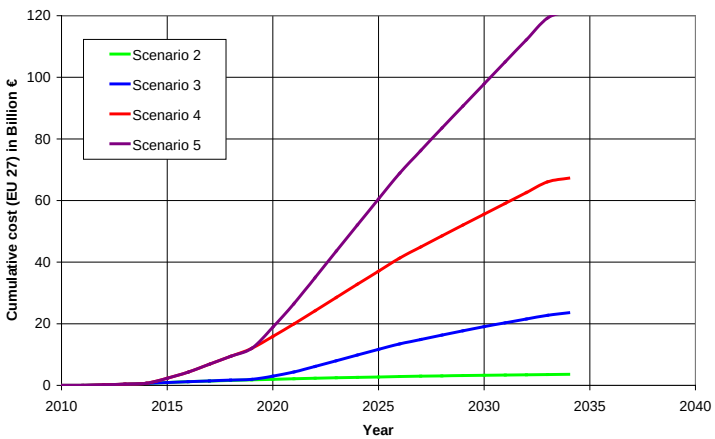
- Effect on environmental noise reduction on 20 years of application :

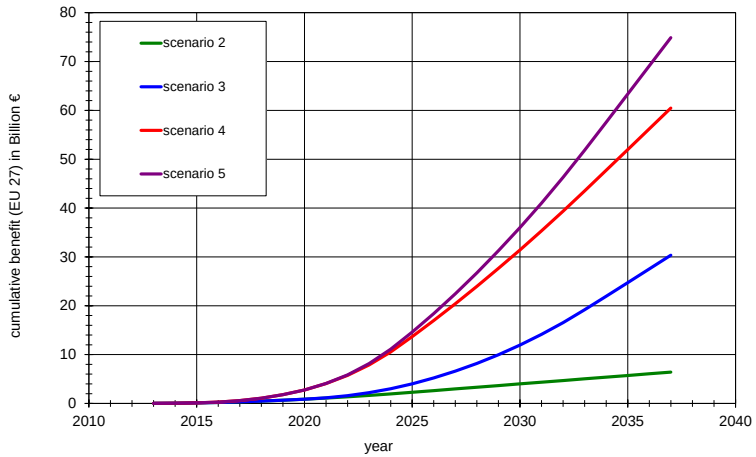
	Reduction limits	Reduction Lden
	In dB(A)	
Scenario 2	2	0,2
Scenario 3	4	1,4
Scenario 4	5	2,1
Scenario 5	6	2,8



M and N vehicles – Monitoring database and impact assessment – UTAC/TUEV study

Cumulative cost and benefit in billion € for the different scenarios and the EU 27 :



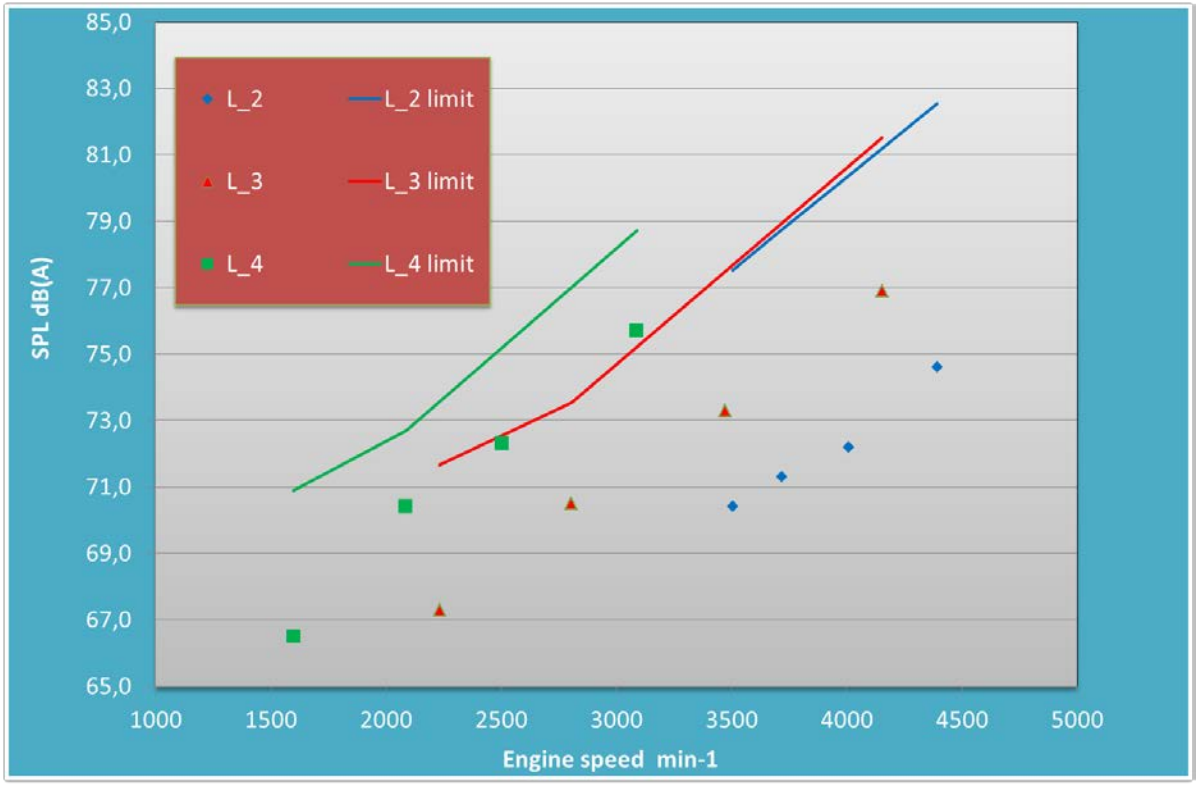


	Cost (C)	Benefit (B)	Ratio (C/B*)
	in billions €		
Scenario 2	3,4	5,0	0,7
Scenario 3	21,5	19,2	1,1
Scenario 4	62,6	43,5	1,4
Scenario 5	112,2	51,8	2,2

Monetary values for cost and benefit are similar (ratio from 0.7 to 2.2) but effort and profit is not distributed on the same groups or number of people (204,5 Mo citizens; 17,6 Mo customers)

M1 and N1 vehicles – Off cycle

- A new test track to control noise level of vehicle outside type approval range
- Measurement of full throttle noise level from 20 to 80 kph :



M and N vehicles – In-door facilities

Internal context :
Reduction of time development project

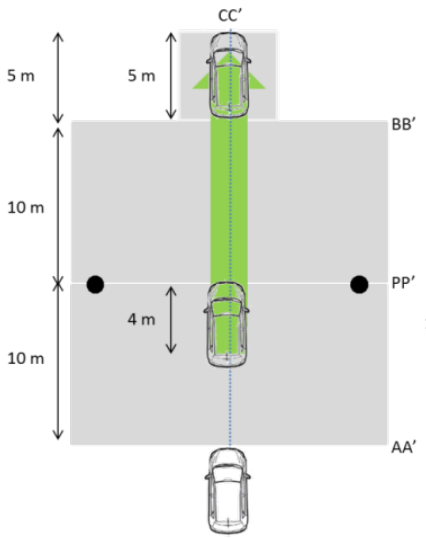
External context
New regulation with stringent limit decrease

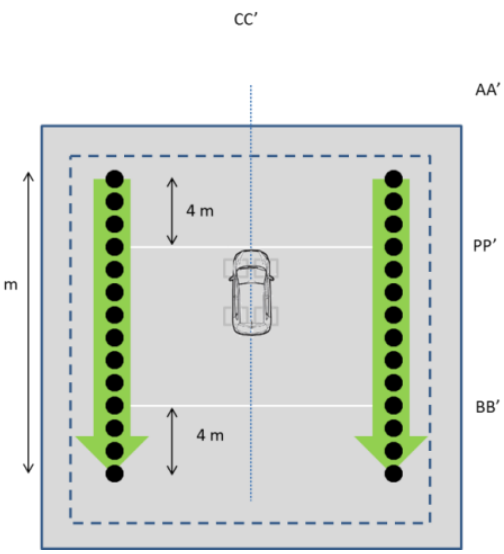
Increase of development and validation cycles

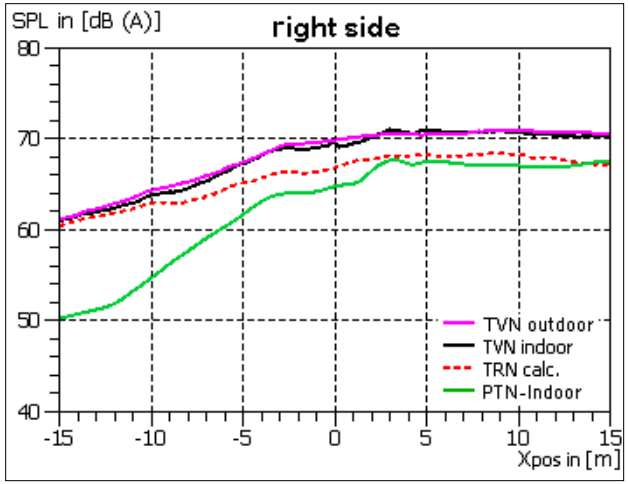
Conflit conditions needed new development method and facilities → In door

M and N vehicles – In-door facilities

- ISO 362-3 in progress *(with possibility for futures discussions for type approval in-door)*
- Good correlation between out-door and in-door testing results







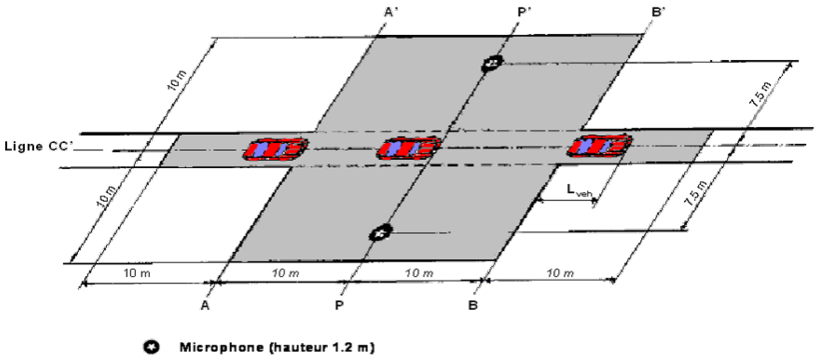
→ Project to adapt UTAC acoustic room to propose such facilities in France (UTAC)

Rolling noise – Test method

A measurement procedure for all tyres.

Testing conditions :

- ISO 10 844 test track
- Microphones at 7,5 m, 1,2 m height
- Coast by noise – LmaxA
- Tyre load and pressure inflation conditions



For light vehicles tyres (C1 and C2) :

- 8 passes from 70 to 90 kph
- Temperature correction
- Final result at 80 kph

Heavy vehicles tyres (C3) :

- Coast by from 60 to 80 kph
- No temperature correction
- Final result at 70 kph

Rolling noise – Limits reductions

- From 2 to 5 dB reduction :

C1		
Width (mm)	Limit dB(A)	
	< 1.11.2012	> 1.11.2012
≤ 145	72	70
]145; 165]	73	
]165; 185]	74	
]185; 215]	75	71
]215; 245]	76	
]245; 275]		72
> 275		74

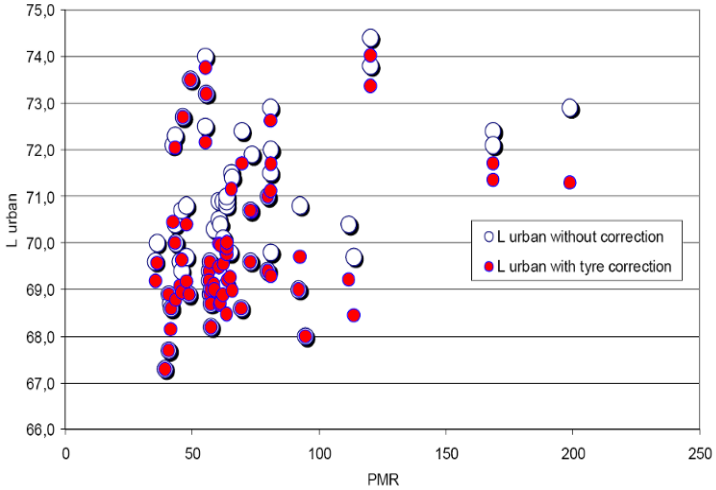
C2		
Catégory of use	Limit dB(A)	
	< 1.11.2012	> 1.11.2012
Normale	75	72
Hiver*	77	73
Spéciale	78	74

C3		
Catégory of use	Limit dB(A)	
	< 1.11.2012	> 1.11.2012
Normale	76	73
Hiver*	78	74
Spéciale	79	75

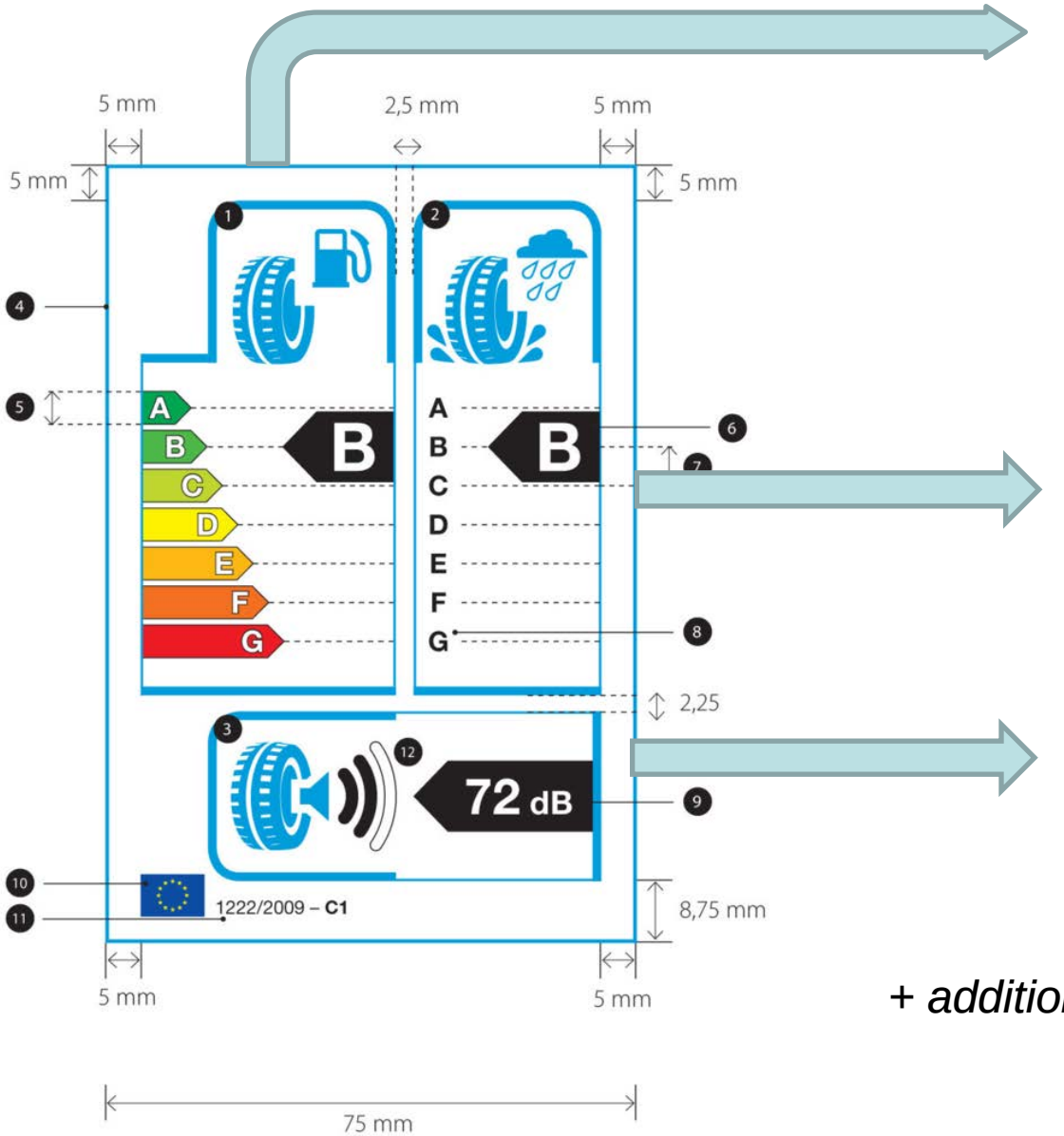
All tyres will be concerned on 2016

- Applicable on OEM and replacement tyres

- Low impact on L urban :
  From 0 to 2,4 dB (0,5 dB on average)



Rolling noise – Labelling



Class of energy in link with the rolling resistance.

Class of safety in link with the wet grip.

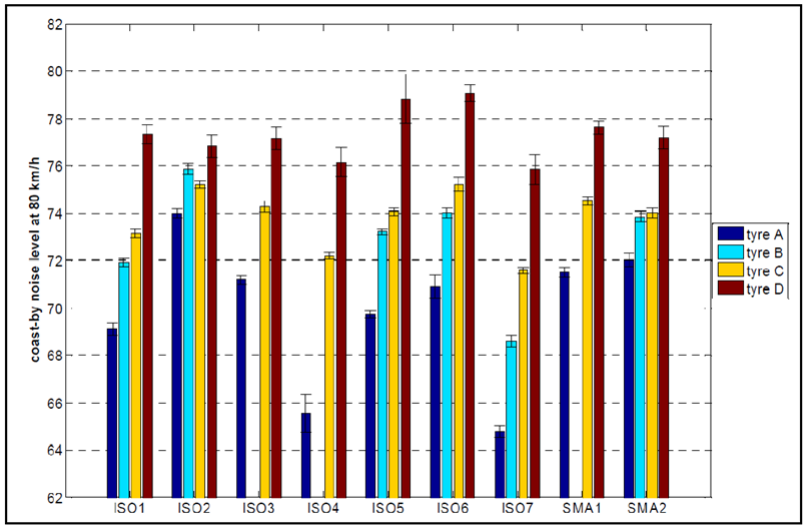
Class of noise in link with the acoustic level.

+ additionnal datas (e.g: trademark, dimensions, etc.)

New test track – ISO 10844

- A new test track for a reduction of vehicle and tyre dispersion from track to track

The four measurement tyres: A - Pirelli slick tyre; B - Pirelli P6000 summer tyre; C - Goodyear Eagle Ultra Grip winter tyre; D - Goodyear Wrangler 4x4 offroad tyre



Until 9 dB on slick tyre

- A new test track to improve testing measurement with in-situ procedures

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New test track – ISO 10844 specifications

- Dense asphaltic concrete
- Maximum chipping size from 6,3 to 10 mm
- Thickness of the wearing course ≥ 30 mm

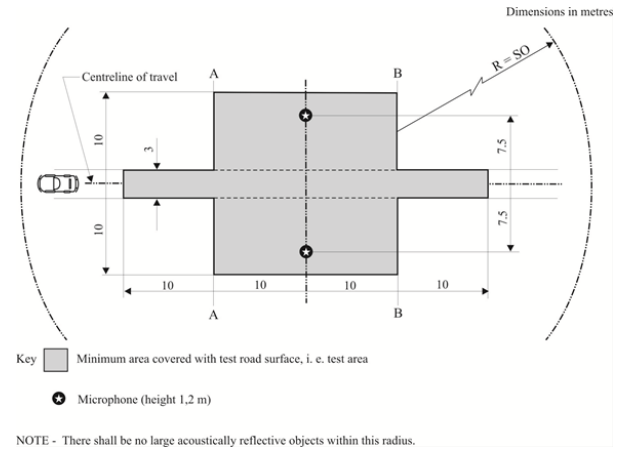
1994 standard :

- Residual void ≤ 8% or sound absorption ≤ 10%
- Macro texture depth ≥ 0,4 mm

2011 standard :

- Grading curve
- Mean profile depth 0,5 ± 0,2 mm
- Sound absorption ≤ 8% (drive lane) and 10% (propagation area)
- Geometry (irregularity, deviation)

→ UTAC new test track is a reference for IFSTTAR CPX method and Automotive and tyre industry



Quiet vehicles - Regulation

- A sound for electrical vehicle to prevent pedestrian injury
- First recommendation based on Japanese guideline :
  - Sound shall be automatically generate until reaching 20km/h and in moving rearward;
  - Sound shall remind motor vehicles;
  - Sound shall be automatically altered in volume or tone depending on the vehicle speed;
  - Sounds shall not be similar to siren, chime, bells, horn sounds shall be avoid;
  - Sound which not remind motor vehicle shall be avoid (animals, insects, natural phenomenon, etc);
  - Sound level shall not exceed ICE vehicle level

- Include in the same way in future European regulation COM 856/2011
  → Sound required or recommanded for EV and HV not yet decided

- Work in progress for a Global Technical Regulation in Geneva (WP29/GRB)
- Work in progress in ISO for testing method

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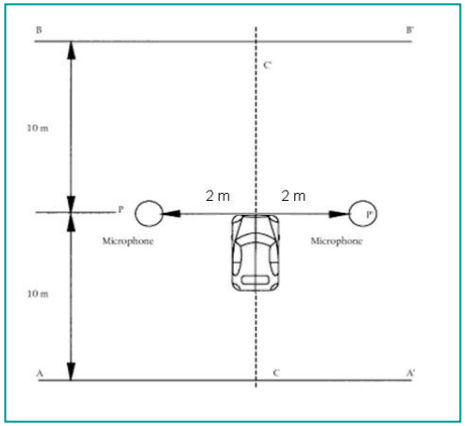
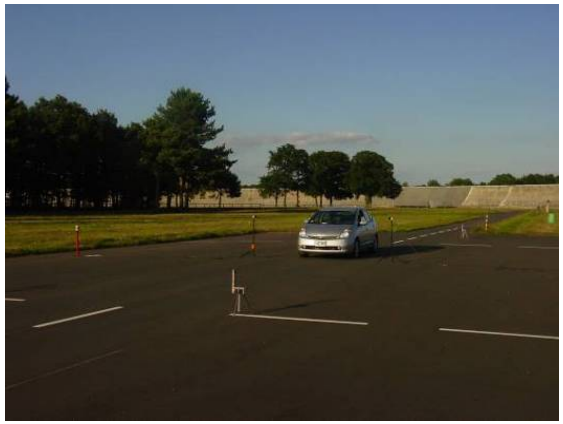
Quiet vehicles - Standard

- ISO 16254 : Measurement of minimum noise emitted by road vehicles
- 2 operating conditions : Stop (Idle) and motion (10 kph) on mode which provide lowest noise (+ pitch shifting) :

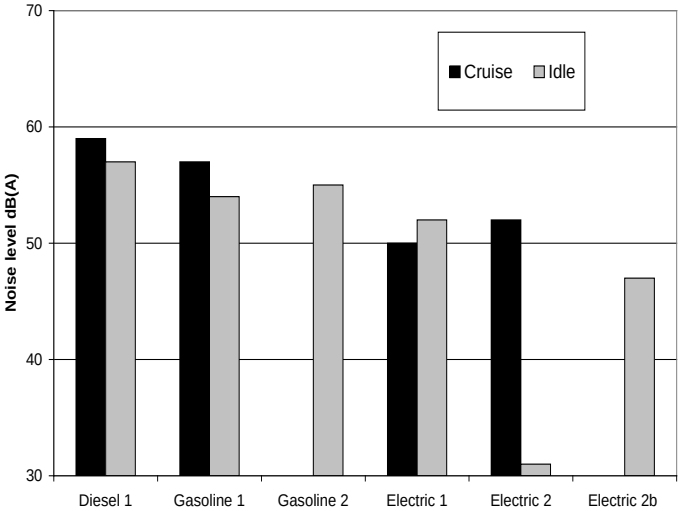




Some results :

Good differentiation between E mode and IC mode :*IC mode : Above 50 dB(A) and E mode : Below 50 dB(A)*

➢E mode noise level closed to tyre noise level and close de background noise



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M and N vehicles – Delivery noise

- A new standard NF XP S31-200 to propose a robust test method for delivery noise

- Vehicle concerned : N categories

- **Testing conditions :**
  - Vehicle in motion (evaluation by équivalence i.e. ISO 362.2007)
  - Stationnary Vehicle
  - Cooling devices (evaluation by équivalence ie. Directive 2000/14/CE)
  - Opening / closing driver and passenger door
  - Opening / closing merchandise door
  - Opening / closing Opening / closing
  - Rolling on the floor

- Metric based on LwA

Thank you for your attention

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