RTR CONFERENCE
#RTR2024 Conference

LE N-T

LEON-T
Low particle Emissions and lOw Noise Tyres

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LE N-T

Overall project presentation

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Motivation and objectives

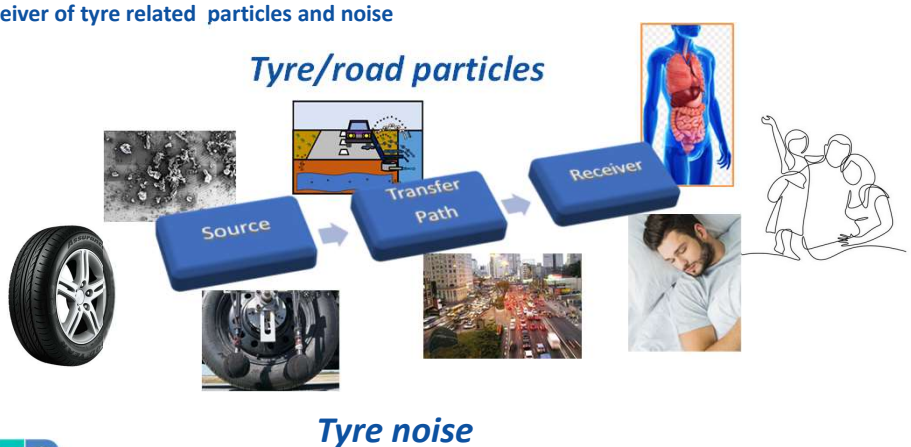
LEON-T will significantly increase the knowledge and evidence about particle and noise emissions from tyres and their associated effect on public health, in order to propose mitigating measures through regulation, labelling and tyre design:

- Contribute to effective and widely accepted measures by investigating both particle and noise emissions from tyres
- Correlate particle abrasion and particle emissions in lab and road tests
- Propose practical standardised methods for tyre abrasion rate and airborne particulate emissions
- Investigate and model the dispersion and environmental fate of tyre wear particles
- Investigation of the cardiovascular effects of exposure to tyre generated noise
- Design and construction of a low noise, low rolling resistance tyre
- Recommendation of policy measures to limit the contribution of tyre-road interaction to microplastics in the environment, to airborne particles exposure and to traffic noise.

Collaborative project with AUDI, FORD, JRC, VTI, TNO, RIVM, UGOT, INSA, BAX, ETU and LLG

Transversality of LEON-T

LEON-T investigates the relationship between the source, the transmission/fate and the effect on the receiver of tyre related particles and noise

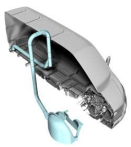


Results presentation

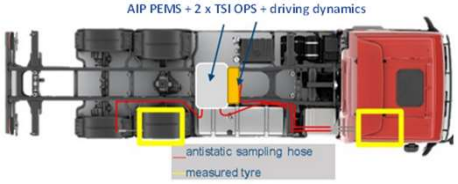
Tyre wear and emissions

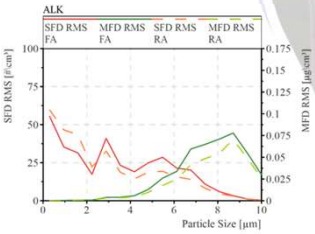
- ***Development of LDV/HDV measurement concept***
  - *Enclosed wheel housing, CVS sampling approach*
  - *On-line measurement of PN/PM emissions.*

LDV



- ***Characterisation/optimization of sampling efficiency on-going based on tracer gas measurements***
- ***Investigation relationship between particle size and PN v.s. driving severity for a Class C swap body (MAN TGX, Long dist. Tyre 315/70 R22.5)***





- ***The measured PNC´s do not correlate as expected with the severity of the cycles regarding accelerations. Influencing factors: background concentration, traffic congestion, construction sites, agricultural activities.***

5

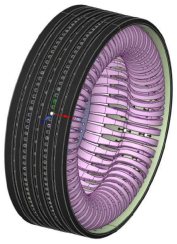
Tyre wear and emissions

- Softer tyres generate higher yield of PM_{10} both from tyres and road
- Winter tyres tested yields higher amounts of TWP compared to summer and 4-season tyres
- The contribution of tyre rubber wear to the PM_{10} produced is between 1-5%

- Asphalt surface has an influence on emission rate and particle size distribution of TWP. Bimodal size distribution with peaks at 5-25 µm & 50-200 µm
- Proposal to estimate the friction work applied in an abrasion tests to derive the abrasion coefficient in mg/Joule

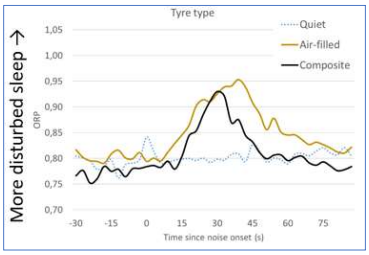
Airless tyre: Design and construction

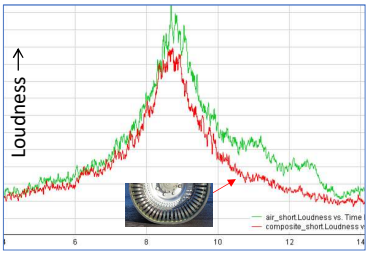
- *Design and construction of two versions of an airless tyre (steering and trailer axles) for a HGV. Size: 285/70R19.5*
- *Application for future electric design when noise and rolling resistance will be critical.*
- *Currently operational test on a Volvo FL Electric truck. Next tests: Rolling resistance & Noise*



Tyre noise effects

- *Increased sleep disturbance for individual noise events than continuous traffic flow of same level*
- *More cardiovascular arousals for air-filled tyres at higher noise levels*
- *Lower sleep disturbance for composite tyres and lower noise levels*





- *Sound pressure and tonality contribute to annoyance (relaxing situation)*

8

Policy recommendations: Tyre emission factors

- *Study of current literature (300 tyre measurements). Expected improvements: 30% based on EU microplastic strategy*

	Abrasion rate (AR)	PM10 / PM2.5 / PN *
C1	110 mg/km or 68 mg/km/t	2.5% AR / 40% PM10 / 1×10^{10} #/km
C2	×2.5 (lack of data)	As AR
C3	×8-11 (lack of data)	As AR
Winter vs. Summer	+10% (high scatter of differences)	As AR
Ice tyres vs. winter	+10% (lack of data)	As AR
Electrified vs ICE	+20-30% (impact of 200-300 kg)	As AR

* High uncertainty due to background and resuspension

9

Mid to long term expected impacts of the project

Impact: Possible Mitigation measures

- **Reducing tyre particles generation ***
  - Technology measures: Improved tyres *, reduced vehicle weight (Conflict with fleet structure), speed/acceleration limiters
  - Management: Traffic flow and volume control, maintenance of roads and vehicles, public transport, taxation.
- **Collecting particles (Vehicle and road) ****
  - Tyre dust collectors
  - Asphalt with surfaces that trap particles**
- **Reducing exposure and treatment particles**
  - Planting vegetation / Street cleaning / Treating road runoff

* ***As proposed by the EC for Euro7 Regulation***
** ***Confirmation of the influence of road surface on tyre particle dissemination***

11

Other impacts:

- Need of particle emission factors from LEON-T
  - nPETS and ULTHRAS Projects
- Discuss with DG-GROW possible particle emission scenarios and run sensitivity analysis for abrasion rate and PM/PN
- CBA for various particle emission scenarios
- Example of the effect of a design of an airless tyre (C3) on tyre noise
- Confirmation of a new tyre noise aspect causing impact on health

THANK YOU
Any questions?

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