INTERNATIONAL UNION
OF RAILWAYS

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UIC Train Track Interaction

Acoustics

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Presentation summary

- **Scope of the TTI acoustics group**
- **White paper main results**

  Noise source generation, rolling noise and aerodynamic noise

  Acoustic comfort, subjective perception and psychoacoustic indicators
- **Pending questions**

Why the TTI Acoustics Group?

Technical Group

- Complementary to the Noise Expert Group (NEG)
- Dealing with technical issues/subjects
- Managing interaction with both Rolling Stock and Track Expert Groups (TEG)
- Ground borne vibration as a summary of work carried out in the Vibration Expert Group (VEG)

Objectives

- Producing a White Paper identifying:
  - State of the Art
  - Pending questions
- Propose and carry out Technical Projects within UIC
- Filling the gaps and not duplicating with other programs (S2R, CEN…)

Participants

Amongst others:

- ADIF
- CARS
- DB
- RFI
- Ricardo Rail
- Satis
- SBB
- SNCF
- Trafikverket
- …

- **The initiative is still open for other members to join in!**

White Paper Main Results 1/3
Noise source generation, rolling noise and aerodynamic noise:

- **Rolling noise**
  - Models (TWINS) largely used
  - Limitation for reflection on slabs/ slab track models
  - Audio capabilities developed but lack of validation
- **Wheel-rail interaction noise sources (singularities: joints, flat wheels…)**
  - Models developed individually (joints – wheel flats , comprehensive model missing
  - total model for switch missing
  - Recent progress in curve squeal modeling , engineering applications still to come
- **Implementation of well known solutions (wheel and rail absorbers) still difficult**

White Paper Main Results 2/3
Noise source generation, rolling noise and aerodynamic noise:

- **Roughness generation (rail and wheel)**
  - Models missing also for corrugation growth
  - Qualification of composites braked block wheels in progress
- **Equipment noise, Parking noise**
  - Phenomenological models based on experiments
  - Not suited to psychoacoustics
  - Acoutrain model ?
  - Brake squeal?
- **Aerodynamic noise**
  - Widely studied: specific models (panto), LBM methods…
  - Overall design of carbody important

White Paper Main Results 3/3

> **Acoustic comfort, subjective perception and psychoacoustic indicators**

- Low frequency annoyance
- Multicriteria comfort indicators
- Track contribution to interior noise

> **Groundborne vibration**

- Summary of VEG white paper
- Linked to work in both NEG and VEG

Suggested lines of work 1/2

> **Rolling noise:**
  - Rail dampers acceptance
  - Rail noise and roughness generation in relation with
    - track characteristics (components, route),
    - traffic (speed, weight, rolling stock type),
    - grinding policies and mitigation measures
  - Slab track specific questions
    - Acoustic reflection at the ground surface
    - Track decay rate relevance (concerns both prediction tools and experimental assessment)
  - Global comprehensive model S&C

> **Aerodynamic noise:**
  - Benchmark of quality of design of different trains

Suggested lines of work 2/2

> **Low frequency annoyance:**
  - Measurement procedures and multicriteria indicators

> **Other noise and vibration topics**
  - High frequency dynamic stiffness measurements in the context of GBV
  - Increase/reduction of noise in combination with new track components (USP, UBM…)
  - Build a knowledge data base to collect and provide all known data, measurements…>
  - Guideline for on the shelf solutions with **independent validation data**

Thank you for your kind attention

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