STARDAMP

Standardization of damping technologies for the reduction of railway noise

DB AG

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TTZ 112

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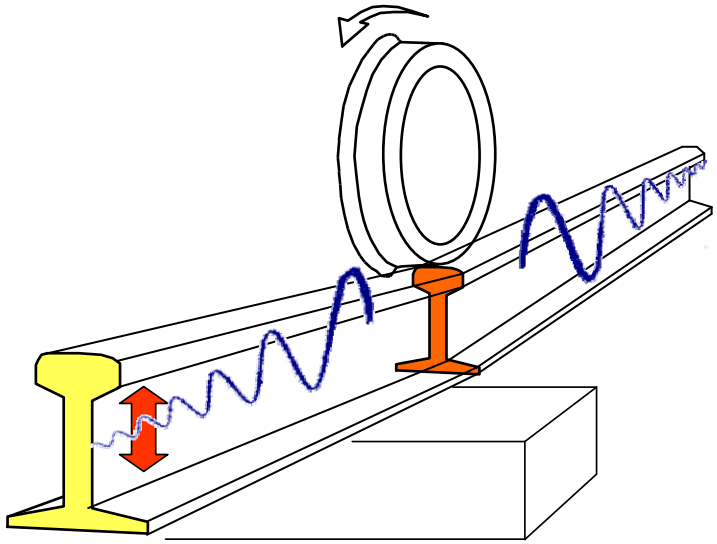
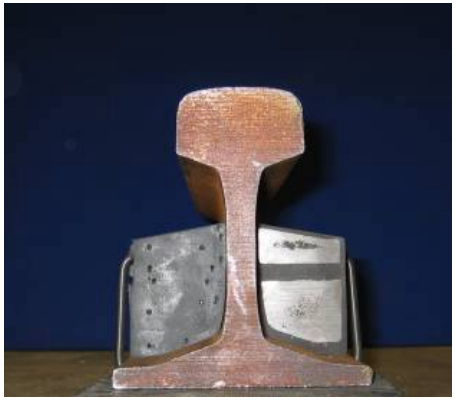
Examples for rail and wheel dampers

Special damping devices attached to
rail and / or wheel can considerably
reduce the noise radiation of rail and wheel





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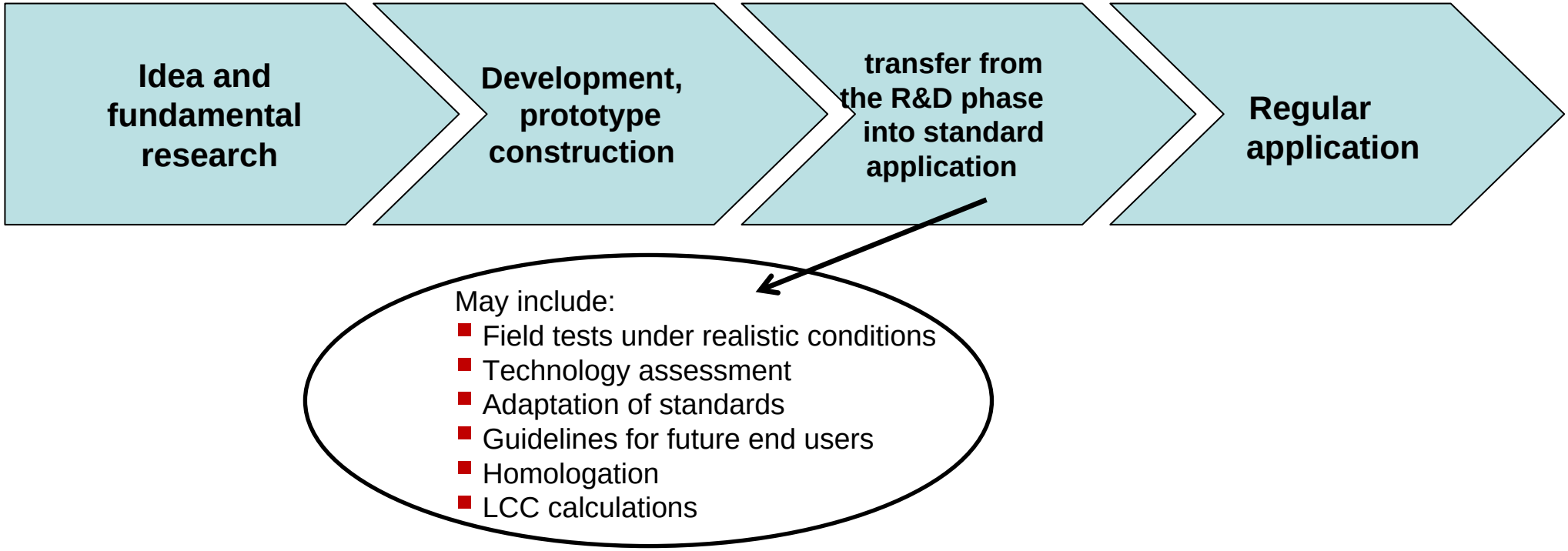
Motivation:

- Different technologies for damping elements both for rail and wheels have been developed in the past (national projects in France and Germany, EU projects in FP 5 and FP 6) and have proven to be an efficient way to considerably reduce rolling noise
- Damping technologies are promising candidates for action plans within phase II of the European Noise Directive (END)
- The step from the R&D phase to regular application is generally the most crucial step within the process of technological progress



Current situation:

- No generally agreed physical quantities and measurement protocols for the assessment of the performance of a damper
- Products are rarely comparable and an objective measure for their mitigation effect is not available
- Tests are usually carried out as field tests with real trains on real tracks, making the tests extremely costly and time consuming:
  - lead times of 3 – 12 months
  - need for temporary approval to use prototypes in real trains/on real tracks
  - results only reflect the special situation of the field test (e.g. freight wagons on ballast track)
  - No clear procedure how to transfer the results of a field test to other situations (e.g. other track type, different rolling stock, different speed etc.)
- The “Track Wheel Interaction Noise Software” TWINS is a powerful tool for the simulation of the noise radiation from railways and for assessing the influence of components on noise radiation. The use of TWINS requires long experience and a strong scientific background of the user. This is usually not available in the target group for the STARDAMP results.

Scenario I:

- Planning office A has to work out a concept for noise protection measures for a new railway line. A measure to reduce noise by 3 dB in a dwelling at a distance of 30m from the track is required.
- Manufacturer B has developed a new rail damper reducing noise radiation from the rail by 7 dB

➔ Is the product of manufacturer B the solution to the problem of planning office A?

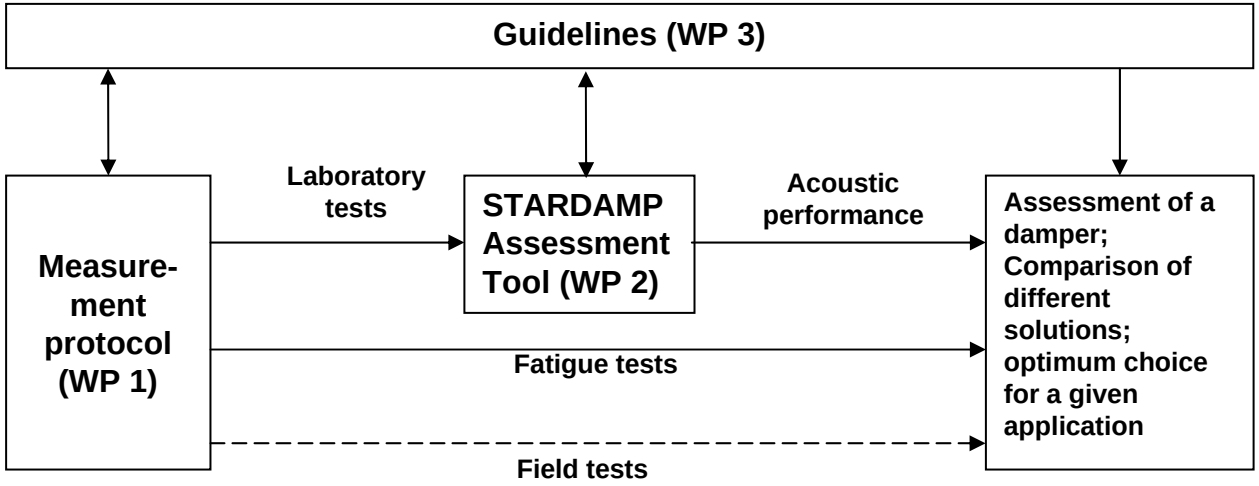
Scenario II:

- Rolling stock operator C has to compensate a 1 dB increase of noise emission caused by the implementation of a more powerful cooling unit into a high-speed train. The train is equipped with wheel dampers.
- Manufacturer D has developed an improved wheel damper. Laboratory tests have proven a considerably enhanced damping of the wheel.

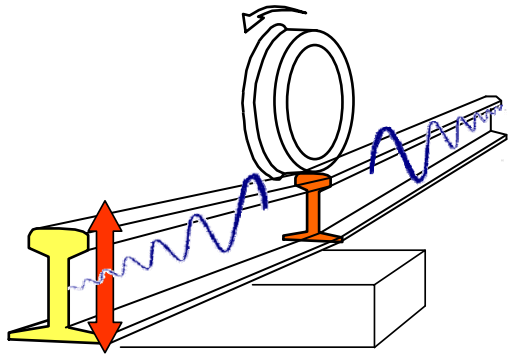
➔ Can the implementation of the improved wheel damper guarantee that the noise emission is still below TSI limits ?

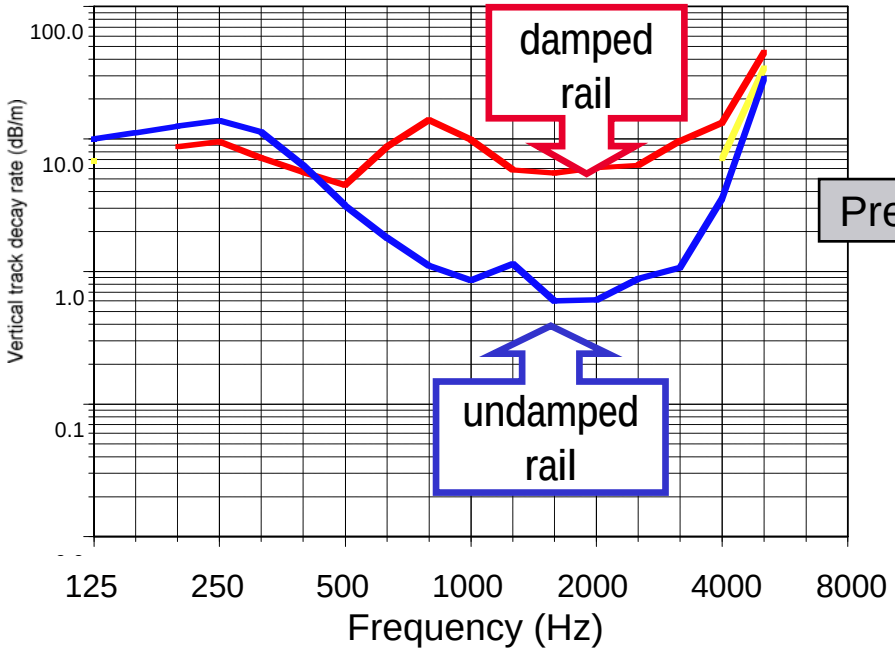
Objectives of STARDAMP:

- To define and validate methodologies for the assessment of damping technologies for wheel and rail in terms of their noise performance based on laboratory testing procedures and models (modified TWINS or simpler models) that can replace fields tests with a similar or better accuracy
- To assess the combination of damping technologies (e.g. rail + wheel)
- To define precise guidelines (for field and laboratory tests and use of models), commonly agreed by railway operators and manufacturers, and - as far as possible- easy to handle.
- To define the technical, operational and safety requirements to dampers
- To give recommendations for the homologation process

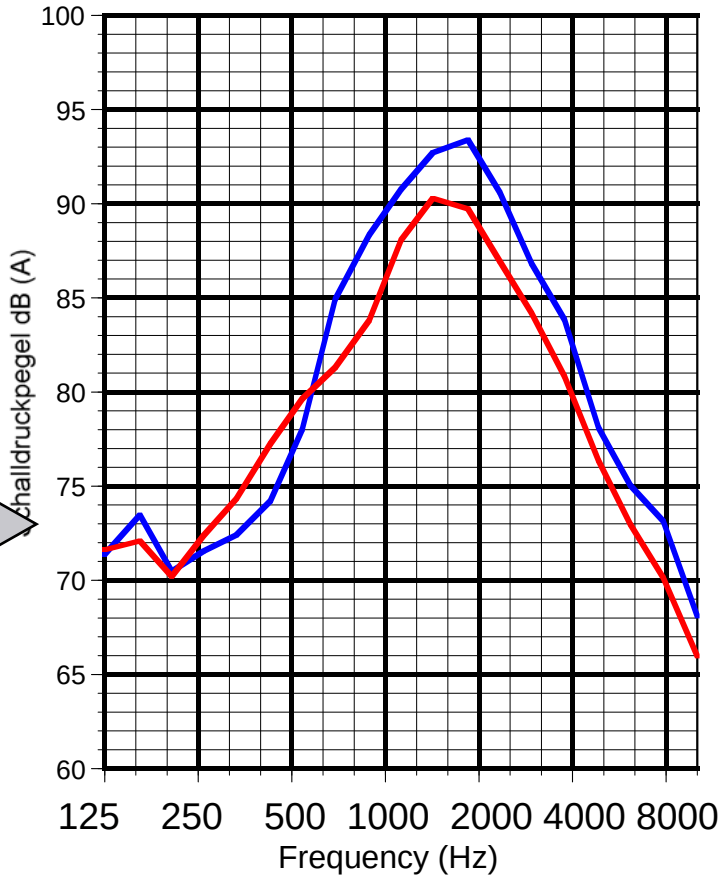


Example: Track decay rate

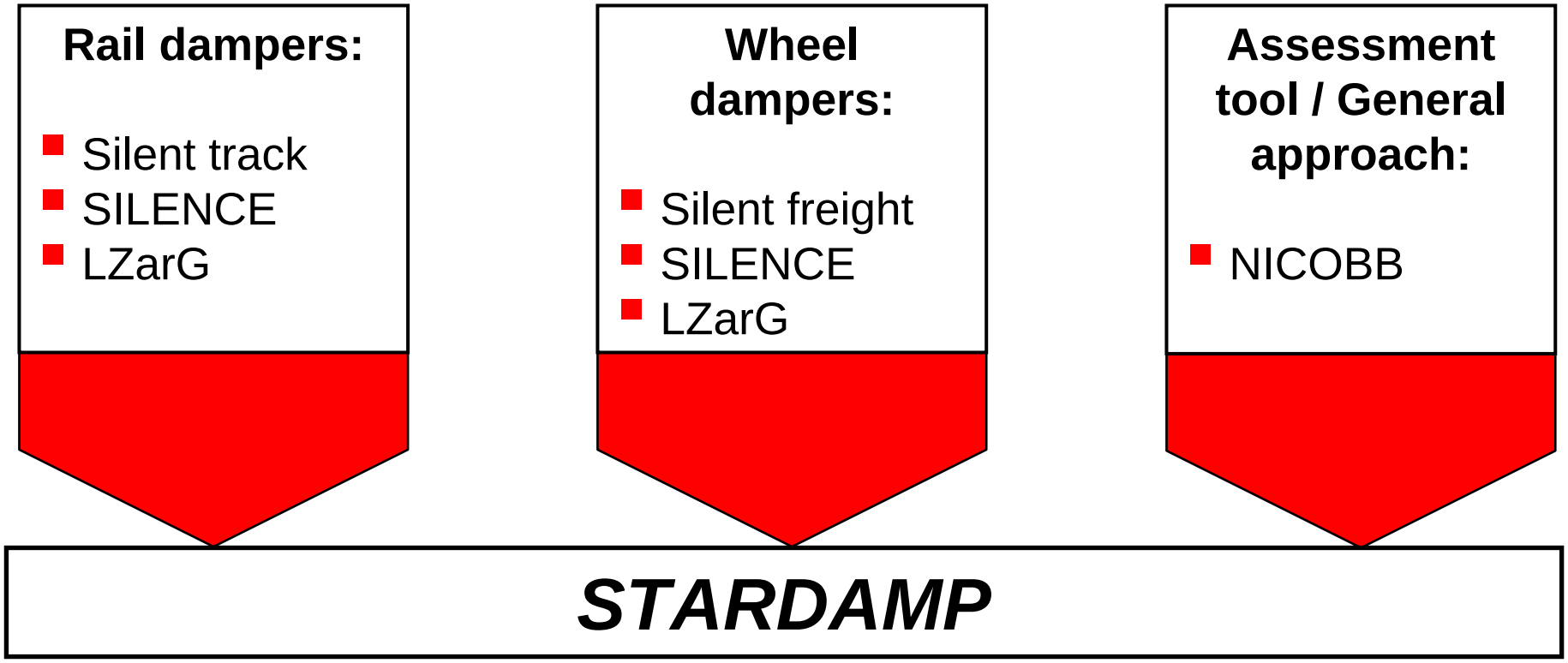




Prediction of noise



Relation to previous and on-going projects:



Data for the validation of the STARDAMP methodology will also be provided by national projects (eg. KP II in D)

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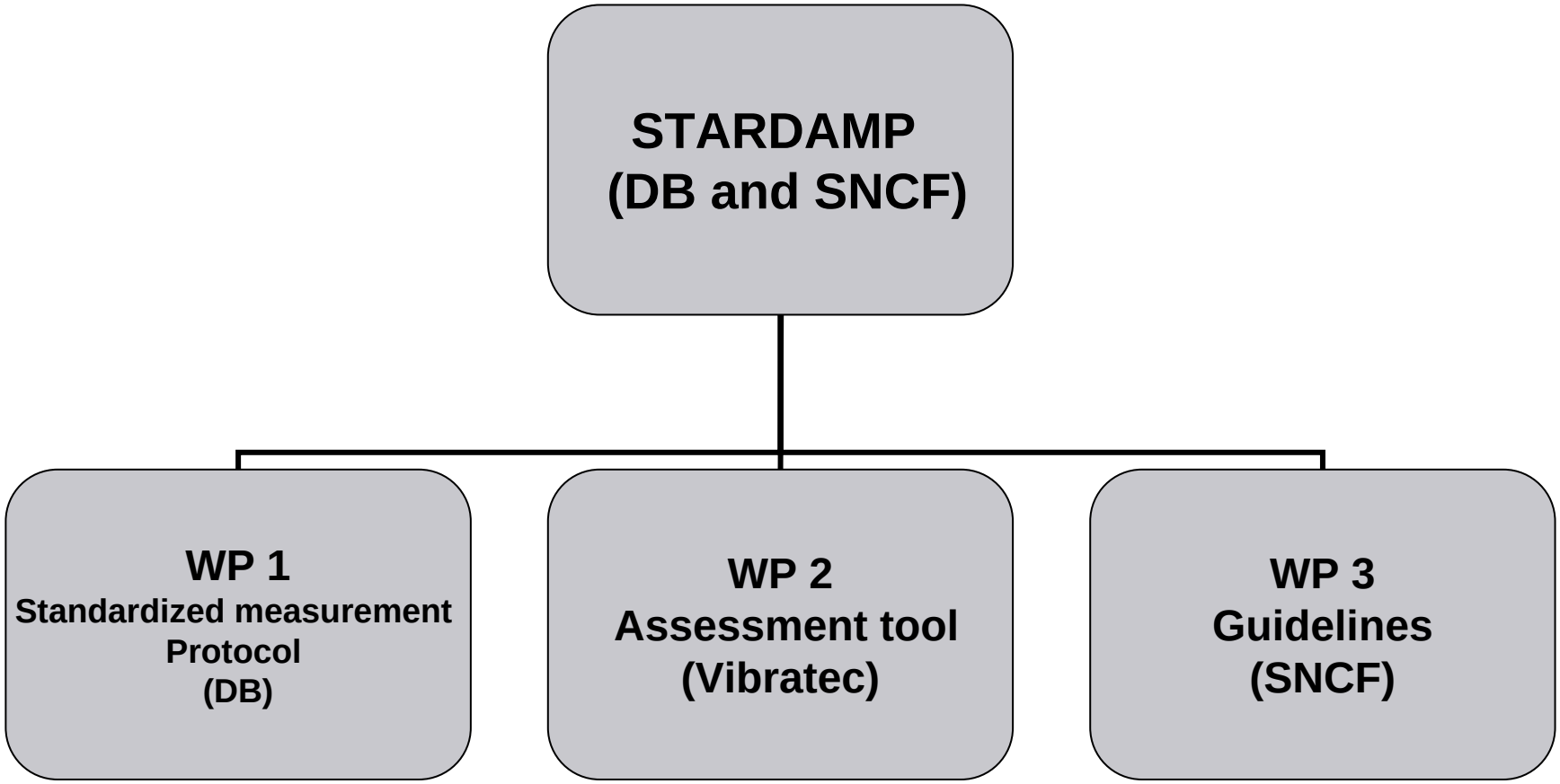
Consortium:

End users	Suppliers of dampers	Research Institutes
DB SNCF Alstom	Schrey & Veit Valdunes GHH-Radsatz Corus	Vibratec TU Berlin ISVR (sub-contractor)

Project structure and responsibilities



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Work package 1: Standardized measurement protocol

- Specification of requirements by the potential end users taking into account the availability of test facilities, required accuracy, expertise required from end users etc.
- Specification of generally accepted procedures for the generation of those quantities, which are necessary for the assessment of a damper
- Specification of the different configurations (wheels, track types etc.) to be covered by the model to be developed in WP 2
- The protocol will consist out of three parts:
  - **(I) Measurement protocol fatigue tests (**e.g. life time of the fastening system; important criterion for assessing a damping technology as it strongly influences LCC and safety)
  - **(II) Measurement protocol lab tests:** This will mainly specify the input for the assessment tool. Separate measurement protocols for lab tests shall be worked out for rail and wheel dampers
  - **(III) Measurement protocol field tests**
- Definition of the “reference wheel(s)” and the “reference track(s)” against which the noise reduction potential of a damping system has to be assessed
- Round robin test for the laboratory test procedures to validate their accuracy

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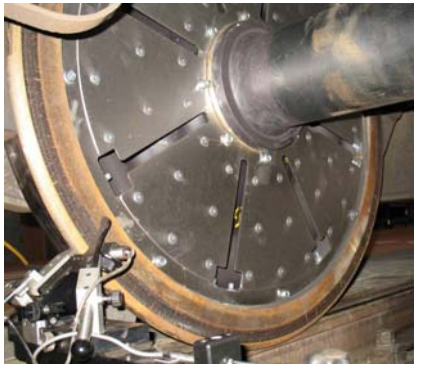
Work package 2: Assessment tool

Development of software tools (separately for rail and wheel dampers) to calculate on the basis of standard measurement data (wheel modal damping, track decay rates etc.) for a particular scenario the noise reduction obtained by a damping system. The STARDAMP approach is to use the TWINS model as basis and downsize it to the specified requirements:

- Definition of the requirements for the tools
- Modelling of different wheels by FE-methods as input for TWINS
- Development of simplified (TWINS based) and robust models for wheel and track noise
- Models shall take into account the possible re-radiation of dampers or their possible shielding effects
- Programming of an easy to handle simulation tool to estimate the performance of wheel and rail damping systems (“STARDAMP Assessment Tool”)
- User-friendly interface, which allows using the software without the “overhead” of learning TWINS
- Validation of the software tool with laboratory tests and field measurements (as far as possible using available measurement data)

Work package 3: Guidelines

- Guidelines shall be worked out, which describe the application of the test procedures (WP 1 and WP 2) including the application of the software tool (WP 2) for the potential users. The potential users of the guidelines will include manufacturers, railway operators, and planning offices. These guidelines shall be the basis for the assessment and homologation of rail and wheel dampers.
- The guidelines will include a catalogue of existing state-of-the-art damping techniques and their optimum use for the different categories defined in WP 1
- The guidelines will not only cover acoustic aspects but also maintenance and safety aspects, LCC etc.
- Recommendations for future optimization of damping technologies
- Recommendations for using the STARDAMP results in homologation processes



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Total budget: **1.840 k€**

Total budget French partners: **997 k€**

Total budget German partners: **843 k€**

Start date: 1st Oct 2010

Duration: **2 years**

Thank you very much

for your attention