

FINE 1

D5.1- List of TDs influencing the N&V performance of the system

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EXECUTIVE SUMMARY

The Shift2Rail project FINE 1 deals among other with the reduction of noise generated by the railway system. It will provide a common definition of sources and sub-assemblies characterization of noise performance. It will develop methodologies for efficient and accurate predictions on interior noise, develop characterisations and specification methodologies for sources and train assemblies and define and support auralisation and visualisation of noise scenarios. Additionally, it will identify all N&V relevant components in the S2R TDs, set and follow up N&V targets for each TD and monitor and evaluate the activities of S2R as a whole in respect to their noise relevance. For this reason, the interface between FINE 1 and the other projects of Shift2Rail has to be established. This deliverable lists the Technical Demonstrators having an influence on noise and vibration on the railway system and nominate the responsible person for communication with the respective projects.



ABBREVIATIONS AND ACRONYMS

AWP	Annual Working Plan
FINE 1	Future Improvements on Noise and Energy
MAAP	Multi-Annual Action Plan
SPD	System Platform Demonstrator
TBA	To Be Added
TD	Technical Demonstrator

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1. INTRODUCTION

This document presents the results of Task 5.1 of FINE 1. The objective of this task is to ensure that the aspects related to noise and vibration in other Shift2Rail projects are taken into account. This is achieved by

- Identifying the Technical Demonstrators having an influence on noise and vibration
- Nominating a responsible contact from the FINE 1 project. This person will be responsible for the interface between FINE 1 and the other Shift2Rail project.
- Ensure an efficient communication between the projects and distribute the relevant information to FINE 1's other Work Packages, especially WP07 about train interior noise and WP08 about sources and subassemblies

2. TECHNICAL DEMONSTRATORS INFLUENCING ACOUSTICS

2.1 SOURCES OF INFORMATION

Different sources of information were used to establish the list of technical demonstrators with an interface to noise and vibration.

- The Multi-Annual Action Plan (MAAP)
- The released Annual Working Plans
- The released answers to the Calls contained in the Annual Working Plans
- The deliverables of these projects, as far as available

2.2 LIST OF TDs AND RESPONSIBILITIES

Table 1 presents the list of Technical Demonstrators having an influence on the noise and vibration performance of the railway system, the agreed contact partner of FINE 1 and the name of the Shift2Rail project taking care of the Technical Demonstrator.

Table 1: Identified TDs, responsible partner and corresponding S2R project

N°	Partner	Shift2Rail project
TD1.1 Traction Systems	Alstom	PINTA
TD1.2 Carbody Shell	CAF	PIVOT
TD1.4 Running Gear	Bombardier	PIVOT
TD1.5 Brake Systems	Siemens	PIVOT
TD1.6 Doors and Access Systems	Talgo	PIVOT
TD1.7 Train modularity in use	Bombardier	TBA
TD3.1 Enhanced Switch and Cross	DB	TBA
TD3.2 Next Generation Switch	DB	TBA
TD3.3 Optimized track system	DB	TBA
TD3.4 Next generation track system	DB	TBA
TD3.5 Proactive Bridge and Tunnel	DB	TBA
TD5.1 Freight electrification	Bombardier	TBA
TD5.3 Wagon design	Bombardier	TBA
TD5.4 Novel Terminal, Hubs, Marshalling Yards, Sidings	Bombardier	TBA
TD5.5 New Freight Propulsion	Bombardier	TBA

2.3 JUSTIFICATION OF THE RETAINED TDs

TD1.1 Traction Systems

Traction systems (Traction motors, gearboxes and traction converters) are major noise sources of the railway system. They are typically the dominant noise sources during the starting and braking phases of the train and can significantly contribute to the noise at constant speed. The noise of traction systems can be both perceived for interior and exterior noise. Hence, the project FINE 1 will get involved in the TD. This is valid for all SPDs, except for freight trains.

The noise performance of traction systems is dealt with in WP3.1 of Shift2Rail's project PINTA.

TD 1.2 Carbody Shell

The carbody shell constitutes the interface between the interior and the exterior of the train. As such, it is an important factor for the noise reduction in the vehicle, especially when the vehicle is in motion. Shift2Rail's project PIVOT aims at introducing composite materials in the carbody shells. The effects on the noise performance (structure-borne and airborne) should be accompanied by FINE 1 in order to assess the effects on noise.

The carbody shell will contribute to the noise performance of all SPDs except for freight trains.

The noise and vibration aspects of the carbody shell are part of Shift2Rail's project PIVOT, WP 1.5.

TD1.4 Running gear

The running gear is typically the dominant source of trains at speeds up to 200-250 km/h. It contributes both to interior and exterior noise. The transmission into the train inside is done via airborne noise (rolling noise at the interface of the wheels and the rail) and structure-borne noise (carbody to running gear connection points such as dampers, air springs and anti-roll bar). Furthermore, it is one of the key components for the generation of ground vibration, which will be a topic of a CCA 5 future call.

As such, the project FINE 1 will work with PIVOT project on the TD. The work on acoustics and vibration is in PIVOT's WP4.4.

TD1.5 Brake systems

Brake systems can contribute to the noise performance of the rail vehicles through multiple mechanism. At first, the air supply units (compressors) can be problematic for exterior noise close to railway depots, as they can operate at night to ensure that the train can be quickly ready for passenger service. Secondly, the brake squealing noise remains one of the most significant disturbances of environmental pollution next to tracks. This is particularly true for urban vehicles stopping frequently and/or being embedded in cities, such as tramways. FINE 1 will liaise with PIVOT for an efficient cooperation between CCA5 and this TD.

TD1.6 Doors and access system

Similar to the carbody shell, doors and access systems are contributing to the reduction transmitted from the outside to the inside. The doors are of particular importance for metro trains, frequently operated in tunnels. The aspects on sound reduction of the train noise are treated in WP6 of the PIVOT project.

TD1.7 Train modularity in use

The TD "Train modularity in use" will focus among other on the increase of the passenger comfort and satisfaction. The acoustics impact of new materials will be studied. Hence, the FINE 1 project will liaise to investigate the impact on interior noise of STDs.

TD3.1 Enhanced Switch and Cross

Switches and crosses contributes to interior noise and exterior noise of trains in motion. They can be a factor of disturbance for habitations and buildings located in vicinity of tracks and depots.

TD3.2 Next Generation Switch

One of the aim of the next generation switch is to reduce the noise and vibration pollution of switches. In the development of this TD, validation test in controlled environment are planned,

which will also address acoustics and vibration performance. FINE 1 will therefore establish an interface with this TD and monitor it during the course of the project.

TD3.3 Optimized track system

Rolling noise is generated at the interface between rolling stock (running gear) and the track. The track contributes significantly to the overall noise of all trains in motion, and can be dominating over a large speed range. Furthermore, part of the overall excitation level is determined by the track roughness. Hence, the FINE 1 project will work together with the TD “Optimized track system”. The parallel working Swiss project “Go-Leise” from SBB should be monitored or kept in sight.

TD3.4 Next generation track system

Similarly to the TD “Optimized track system”, the “Next generation track system” will address the issue of noise and vibration pollution (exterior noise) and discomfort (interior noise) of rolling stock. FINE 1 will ensure that the noise aspects of this TDs are integrated into the global model as defined in the CCA WA5.

TD3.5 Proactive Bridge and Tunnel

Bridges and Tunnel contribute both to the noise and vibration performance of the railway systems. Tunnels are of particular relevance for the massive transit systems of large conurbations. In tunnels, the noise generated by trains in motion will be reflected by the walls and transmitted in the passenger’s compartment, thus increasing the noise levels for driver and passengers.

Bridges are typically low-damped steel structure. When a train rolls on a bridge the structure will be excited and loud disturbing noise radiated in the immediate surroundings, causing excessive noise pollution.

FINE 1 will collaborate in the noise topics of this TD.

TD5.1 Freight electrification

An electrification of the freight in Europe shall be monitored to ensure that the noise disturbance is not worsened by the integration of traction motors and electrical converters. This is of particular importance since the freight typically runs at night to allow day operation of the passenger trains.

TD5.3 Wagon design

The wagon design itself is important for noise pollution. Since one of the objectives is to align the noise emission of wagons on the one of passenger trains, special care shall be taken in the design of the wagons (wheels, brake system, roughness generation mechanism...)

TD5.4 Novel Terminal, Hubs, Marshalling Yards, Sidings

The FINE 1 project will interact with the “hybridization of legacy shunting fleet” activities of this TD. FINE 1 will accompany the testing of the retrofitted shunting rolling stock.

TD5.5 New Freight Propulsion

The freight and its propulsion concept are one of the greatest source of complaints when it comes to noise emission of the rail system. Since the increase of share of the freight is one of the objective of Shift2Rail, care shall be taken not to hinder the development of rail freight because of the associated increase of noise pollution. Hence, FINE 1 will work on this TD dealing with the specification of future propulsion concept of freight trains.

3. PROCESS

Members of the nominated partners will be responsible to take contact with the IP and TD leader and to ensure efficient communication with regards to the noise aspects. The list will be also used for the task 5.3 about state of the art of noise performance of these TDs.