

psiA-Consult



Umweltforschung und Engineering GmbH

Lastenstraße 38, A-1230 Wien, Tel. +43/1/865 67 55, Fax DW-16
e-Mail: office@psia.at Internet: www.psia.at

Field trial of Calmmoon Rail Trial site at Gau Algesheim/Germany

Investigation report

carried out on behalf of
SEKISUI CHEMICAL CO., LTD



Florian Biebl
Martin Jaksch

Vienna, June 2012
DN 2011-464-016 - Page 1 of 32

CONTENTS

1 TASK DEFINITION AND MEASURING SEQUENCE.....	2
2 INVESTIGATED SYSTEM STATES.....	3
2.1 Initial state.....	3
2.2 Calmmoon Rail elements.....	4
3 MEASURING CONCEPT.....	4
3.1 Measurement setup.....	4
3.2 Track decay rate (TDR).....	6
3.3 Acoustic rail roughness.....	8
4 MEASUREMENT RESULTS.....	8
4.1 Track decay rate.....	8
4.2 Acoustic rail roughness.....	10
4.3 A-weighted pass-by level $L_{p,A,pb(v)}$	11
4.3.1 A-weighted pass-by level, freight trains.....	12
4.3.2 A-weighted pass-by level, passenger trains with different braking systems, cast iron/composite brake blocks.....	13
4.3.3 A-weighted pass-by level, category 80-33.....	15
4.3.4 A-weighted pass-by level, category DB460.....	17
4.4 Average A-weighted pass-by level spectra $L_{pb(f,v)}$	19
4.4.1 Average A-weighted pass-by level spectrum, freight trains.....	19
4.4.2 Average A-weighted pass-by level spectrum, passenger trains with different braking systems, cast iron/composite brake blocks.....	21
4.4.3 Average A-weighted pass-by level spectrum, category 80-33.....	23
4.4.4 Average A-weighted pass-by level spectrum, category DB460.....	25
4.5 A-weighted sound exposure level LAE.....	27
5 ASSESSMENT.....	30
REFERENCES & DOCUMENTS.....	32

1 TASK DEFINITION AND MEASURING SEQUENCE

Sekisui Chemical GmbH fitted Calmmoon rail web dampers to the double track section of line 3510 near Gau Algesheim between Bingen and Mainz main railway stations. The present investigation report provides information about the acoustic effectiveness (reduction in noise level) of the Calmmoon Rail elements that were investigated.

The investigation took place in two phases (reference measurement without noise reduction measures and measurement with the rail web dampers fitted). An initial reference measurement was carried out from 20.09.2011 until 24.09.2011 on a measurement section at kilometre marker 6.9. Since the relevant measuring track was ballasted and tamped during this reference measurement and crucial track parameters altered as a result, the data collected

could not be utilised for a meaningful, acoustic assessment. This is why a second reference measurement was carried out on another four measuring days (27.09.-30.09.2011) after tamping had been completed.

After fitting the Calmmoon Rail elements for the trial, a second series of measurements (analogous to the reference measurement) was performed on the same measurement section.

In all measuring series (reference measurement and subsequent measurement with Calmmoon Rail elements fitted) the pass-by noise levels were recorded on the mobile, automatic 8-channel measuring system acramos®. The measuring system automatically records and analyses noise for each passing train.

The acoustic roughness of the rail as well as the TDR were measured. This made it possible to determine the particular effect of track superstructure on the pass-by noise level and to make the results comparable.

2 INVESTIGATED SYSTEM STATES

2.1 Initial state

The measuring section of double track investigated is located on a straight stretch at kilometre marker 6.9 near Gau Algesheim in Germany (an agricultural area) and has no relevant buildings (free propagation of sound). At the level of the measuring section, the measuring track lies slightly above the level of the adjacent track. From an acoustic standpoint the measuring section is chosen optimally, with neither buildings nor any topography (e.g. vegetated slopes) hindering the free propagation of sound.

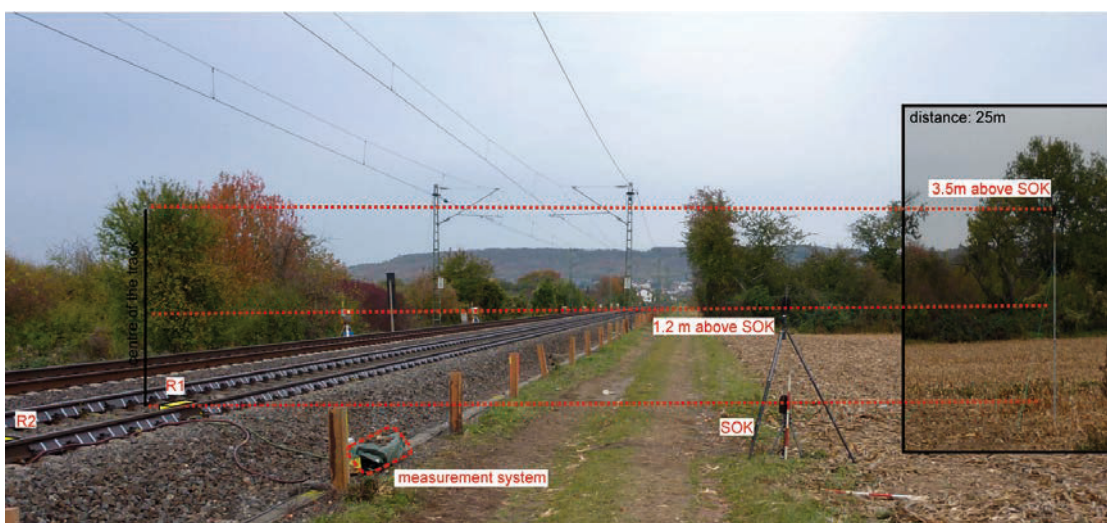


Fig. 2-1 Overview of the measuring site

2.2 Calmmoon Rail elements

The Calmmoon Rail product made by SEKISUI serves to shield the sound radiated by rails when they vibrate due to railway wheels passing over them. This is done in a way that reduces the overall sound level without impeding the overall railway engineering functionality of the rails, such as reliability and maintenance. Calmmoon Rail is designed as a sandwich form of construction. A thin sheet of metal forms the base. An absorbent material that through oscillation converts vibrations into thermal energy is affixed to this base. The effect of this conversion is that Calmmoon Rail reduces sound. Fig. 2-2 shows an element of Calmmoon Rail (dark grey) fitted to a rail.



Fig. 2-2 Calmmoon Rail example usage (left-hand image source: SEKISUI product sheet)

3 MEASURING CONCEPT

3.1 Measurement setup

Fig. 3-1 and Fig. 3-2 show the measurement setup schematically. Microphones M1 and M2 are each placed at a distance of 7.5m from the centre of the measuring track and at a height of 1.2m (M1) and at the top of rail height (M2) respectively. Microphone M3 is located at a distance of 25m and 3.5m above top of rail.

Two inductive wheel sensors are mounted on the measurement track (Mainz direction of travel). Wheel sensor R1 lies within the measurement section and allows precise correlation of the relevant axle to the measured sound level. Wheel sensor R2 lies six sleeper compartments before the measurement section and acts as a trigger for the automatic measuring system. That is, it starts a measurement even before the vehicle has reached the measurement section.

REFERENCES & DOCUMENTS

- [1] TSI-CR-NOISE: Decision of the Commission of 23. 12. 2005 concerning the Technical Specification for Interoperability (TSI) for subsystem "Vehicles – Noise" of trans-European conventional rail systems. (Com 2006/66/EU)
- [2] EN ISO 3095:2005 "Railway Applications - Acoustics - Measurement of noise emitted by railbound vehicles", edited 2005-11-01
- [3] STAIRRS: Strategies and Tools to Assess and Implement noise Reducing measures for Railway Systems. 5th FP Growth project (www.stairrs.org).
- [4] HARMONOISE Technical Report D10_WP1.2_HAR12TR-020118-SNCF10.pdf August 2002 ; http://www.imagine-project.org/bestanden/D10_WP1.2_HAR12TR-020118-SNCF10.pdf

SEKISUI

SEKISUI CHEMICAL GmbH
Königsallee 106
D-40215 Düsseldorf
Tel.: +49-(0)211-36977-0
Fax: +49-(0)211-36977-31
www.sekisui-rail.com

