# SonRoad: new Swiss road traffic noise model

**A calculation regulation was developed for application as the new Swiss road traffic noise model. The calculation is split into two parts. The source model describes the emitted sound power of a single vehicle as a function of different situation parameters; the propagation model calculates the attenuation of the sound between source and receiver.**

Kurt Heutschi,
Jan Hofmann

In Switzerland, more than half a million people suffer from excessive road traffic noise. Although great efforts have been made in the past, the terms for the installation of noise abatement measures had to be extended to 2015 for highways and 2018 for major routes. On behalf of BUWAL, the Acoustics section of Empa developed a new calculation model SonRoad for future traffic noise immission calculations.

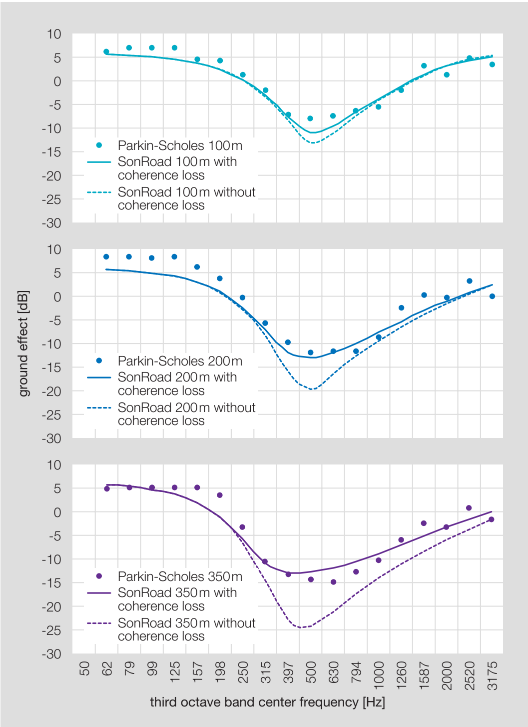


*Fig. 1:* Comparison of the SonRoad propagation model with measurements reported by Parkin and Scholes. The diagrams show interference effects with and without coherence loss for distances 100, 200 and 350 m.

The new model permits to calculate the exposure to road traffic noise at small and medium distances, while ignoring the influence of weather. In the source model, the sound power of motor and tire noise components are calculated separately for cars and lorries as a function of speed, longitudinal road inclination, surface characteristics and traffic density. The propagation model calculates geometrical spreading, air absorption, reflections at vertical surfaces, possible shielding effects and the constructive and destructive interference between direct and ground reflected sound waves. The calculation of the interference pattern is based on the solution of the wave equation for a point source over flat homogeneous ground. This solution is extended to non-homogeneous and non-flat terrain by applying a Fresnel zone approach. The significance of a reflection is determined by evaluating the ratio of the area within the Fresnel zone relative to the area of the Fresnel zone itself. As a consequence of turbulence in the air, a loss of coherence between different sound propagation paths is taken into account for larger distances. The summation is no longer strictly phase sensitive. The results of the propagation model compare well with measurements documented in the literature (Fig. 1).

**Fig. 2:** *Road traffic noise situation showing barriers and reflective elements that can be handled by the new calculation model.*

SonRoad is meant to replace the model StL-86, which is still in use today. SonRoad leads typically to lower immission levels in case of soft ground (e.g. grass). For hard surfaces (e.g. asphalt) and in situations with shielding by barriers the new model predicts higher levels than StL-86.

For distances larger than 200 m our group develops currently another calculation model based on ray tracing algorithms to take into account weather effects such as temperature gradients and wind, which leads to sound propagation paths that are no longer straight but curved.

**Support:** BUWAL

**Links:** www.empa.ch/akustik

***Contact:*** *kurt.heutschi@empa.ch*
***References:***
*K. Heutschi, Acta Acustica united with Acustica, 90, 548–554 (2004)*