Railway Noise Monitoring in Switzerland

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Aims of the Monitoring

The monitoring is a part of the swiss noise abatement programme for railways. Based on the emission plan 2015, a prediction for the noise emission in the year 2015, noise barriers and insulated windows are planned until 2015. The emission plan takes into account the running retrofitting of rolling stock. The aim of the monitoring is to survey the real evolution of noise emission in the long term until 2015.

Concept of the Measurements

There are measuring stations at six typical sites all over the country. The installation of the acoustic measuring devices is according to ISO 3095.2. Using the axle counters, speed, train length and train type can also be recorded.

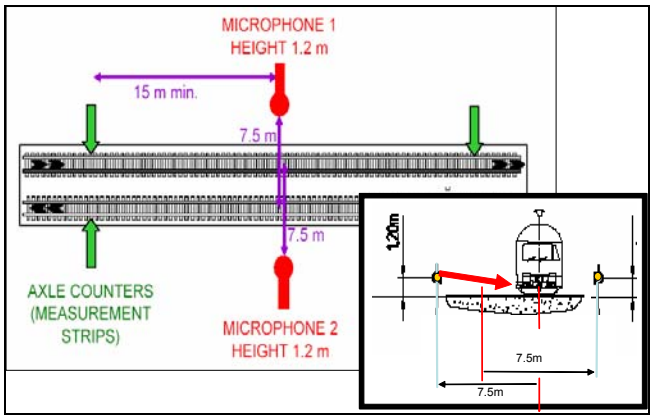

Figure 1: The measuring site

For every train pass-by a set of about 10 parameters is stored. Figure 2 shows an overview of the measured parameters and their relation. The transit exposure level (TEL) is influenced by the acoustical properties of track and vehicle. The emission rating level Lr,e is the sum of the Leq and the correction factor K1 defined in the swiss ordinance of noise. K1 depends on the number of trains. With high traffic it has the value -5 and corresponds to the noise bonus.

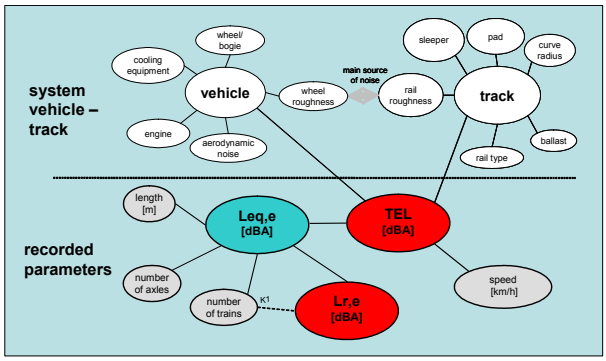

Figure 2: Recorded parameters and the system vehicle-track

Results of the First Year 2003

During the first year about half a million train pass-bys were recorded. First results were published last year [1]. More in depth evaluation is now available.

TEL 80

The normalisation of the TEL-value to a speed of 80 km/h allows the comparison of trains with different speed passing at different sites. The measured values in daily traffic of whole trains on smooth tracks (figure 3) is also interesting concerning the current discussion on emission values for new vehicles.

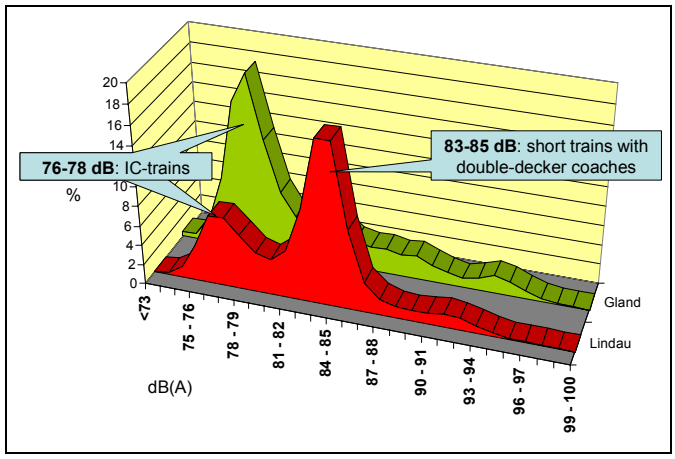

Figure 3: Distribution of TEL 80 (Transit Exposure Level normalized to 80 km/h) for passenger trains on a smooth track at two sites.

The distribution of TEL80 for freight trains shows a significant difference for the twelve tracks (Figure 4). The difference of the median value is about 5 dB. The calculated value from the swiss model SEMIBEL for freight trains with cast iron block brakes is also presented. The difference is mainly due to different rail roughness (Figure 5).

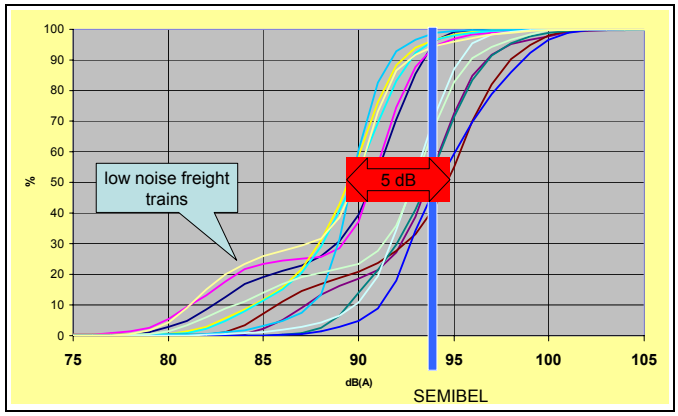

Figure 4: Sum curve of TEL80 for freight trains

TEL 80 and Rail Roughness

The data shows a significant correlation of the rail roughness ($L_{\lambda CA}$, [3]) and the TEL80 for passenger trains.

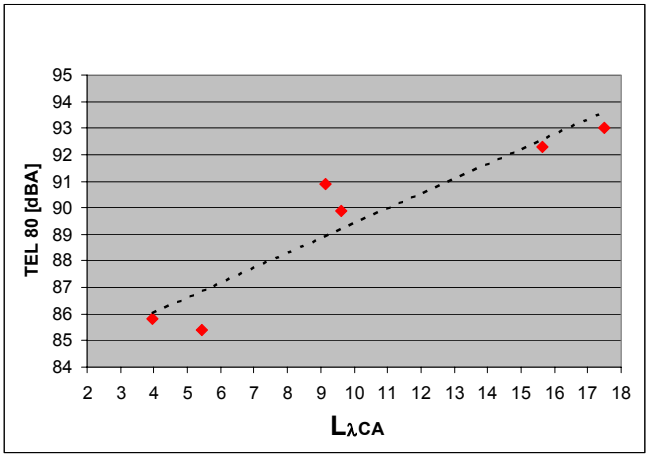

Figure 5: Correlation of TEL80 and rail roughness ($L_{\lambda CA}$ corresponding to [3])

Rating Emission Level (Lr,e)

It is the legal duty of the Federal Office of Transport to inform the public about the results of the measurements. They are published also in the internet [2]. The presentation will be enlarged during 2004.

The main interest is focussed on the value of the rating emission level Lr,e, which is fixed in the emission plan (Figure 6).

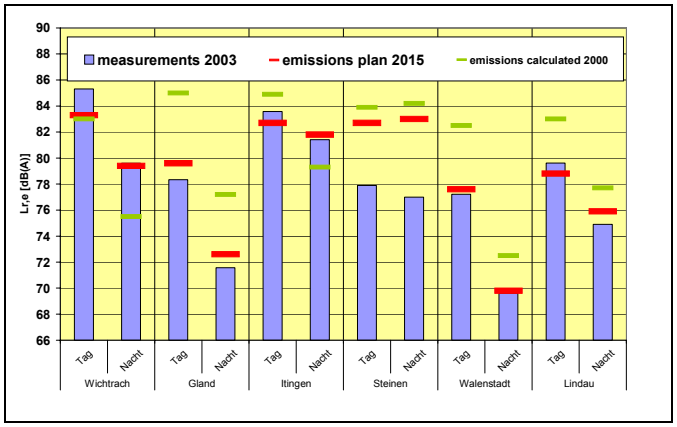

Figure 6: Rating Level of emissions (Lr,e) from measurements, emission plan 2015 and calculated for the year 2000.

The data from the first year shows the following main results:

- The high rail roughness in two sites (Wichtrach, Itingen) induces higher emissions
- in the critical night period the actual values are near the emission plan 2015 or clearly below.

Details of Single Trains

It is also planned to use the measuring sites to check the emission value for retrofitted rolling stock. For this purpose a detailled registration of the pass-by of single trains is necessary. In this way the check is possible under daily running conditions.

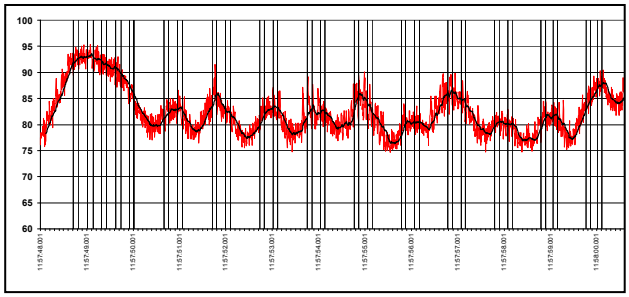

Figure 7: Time-level record of a single train with axles

References

[1] Bundesamt für Verkehr 2003: Monitoring Eisenbahnlärm, 1. Messbericht Januar - Juli 2003.

[2] Homepage of the Swiss Federal Office of Transport: www.bav.admin.ch/ls

[3] Definition of Track Influence: Roughness in Rolling Noise. Harmonoise Report, 17.7.2003