

Vibro-acoustic performance of newly designed tram track structures

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Abstract. Rail vehicles in interaction with a railway structure induce vibrations that are propagating to surrounding structures and cause noise disturbance in the surrounding areas. Since tram tracks in urban areas often share the running surface with road vehicles one of top priorities is to achieve low maintenance and long lasting structure. Research conducted in scope of this paper gives an overview of newly designed tram track structures designated for use on Zagreb tram network and their performance in terms of noise and vibration mitigation. Research has been conducted on a 150 m long test section consisted of three tram track types: standard tram track structure commonly used on tram lines in Zagreb, optimized tram structure for better noise and vibration mitigation and a slab track with double sleepers embedded in a concrete slab, which presents an entirely new approach of tram track construction in Zagreb. Track has been instrumented with acceleration sensors, strain gauges and revision shafts for inspection. Relative deformations give an insight into track structure dynamic load distribution through the exploitation period. Further the paper describes vibro-acoustic measurements conducted at the test site. To evaluate the track performance from the vibro-acoustical standpoint, detailed analysis of track decay rate has been analysed. Opposed to measurement technique using impact hammer for track decay rate measurements, newly developed measuring technique using vehicle pass by vibrations as a source of excitation has been proposed and analysed. Paper gives overview of the method, it's benefits compared to standard method of track decay rate measurements and method evaluation based on noise measurements of the vehicle pass by.