

CASE STUDY

SoNoScout Rides the Trams Poland

Europe

SoNoScout NVH Binaural Recording and
Analysis System

Light rail vehicles such as trams are becoming increasingly popular for public transport as city traffic concepts evolve all around the world. The design and manufacture of trams take into consideration:

- Functionality, economy and safety
- Environmental impact
- Comfort
- Maintenance and service – including Life Cycle Cost

Fig. 1 Testing the Pesa Type 120 N articulated low-floor tram in the streets of Warsaw, Poland. A field version of PULSE Type 3560-B used for multichannel NVH measurement (left) was used along with SonoScout Type 3653-A featuring binaural recording headset and a PDA (right)



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Sound Quality and Vehicle Condition

Research to evaluate sound signals inside trams has been undertaken using Brüel & Kjær binaural microphones, Time Data Recorder and PULSE data acquisition and analysis system. The tests were performed on a number of trams manufactured between 1908 and 2008, on normal town routes. Based on acoustical, spatial recordings, the initial quality of the design and the current technical conditions were evaluated. Normally for such recordings, a Head and Torso Simulator (HATS) and recording instrumentation would be used, which usually requires the vehicle removed from service. However, this is not always possible and is inconvenient. Good spatial recording, however, provides so much information about the vehicle that it is considered valua-

ble not only for Sound Quality (SQ) analysis, but also for troubleshooting, maintenance and service work.

Sound Quality Recording the Easy Way



Now, complicated setup, the drawback of taking vehicles out of service and the considerable cost of traditional Sound Quality (SQ) recording and analysis systems are no longer a problem. The new SoNoScout NVH Binaural Recording and Analysis System can be taken for a tram ride in your pocket. It features the functionality of a HATS and comprises an extremely easy to use, handy recorder. SoNoScout offers high-quality, calibrated, binaural recordings along with GPS data indicating the vehicle position and speed. Data acquisition can be performed by anybody on a vehicle in regular service.

Operating the touch screen of the pocket PC, the operator only needs to establish the GPS signal, choose a name for the file and press start.

During recording, the operator wears standard mini headphones with built-in microphones positioned close to his ears. This results in a binaural recording, saved as a wave file along with the GPS position and speed. By seeming to be a normal traveller, the operator avoids unwanted attention from passengers or the driver. The data gathered can be used for analysis and post-processing. The software running in the pocket PC enables you to:

- Play back the sound
- Show the sound levels vs. time, as well as FFT and CPB spectra
- Plot the contour in 3D
- Filter the signals and play them filtered
- Track the RPM
- Plot the route and vehicle speed

The sound signal can be played back and analysed along with the GPS data and features a live cursor moving over the time and spectral plot. The same kind of analysis can be performed in the handy recording device and the PC software provided. Furthermore, the data can be analysed using more advanced tools such as the PULSE data acquisition and analysis system.



The design, operation and maintenance of streetcars are of interest to manufacturers, operators and consultants. We asked one of each to evaluate SoNoScout:

The Manufacturer: Pojazdy Szynowe Pesa Bydgoszcz SA – a Polish company manufacturing rail vehicles, including fully low floor articulated streetcars.



The Consultant: The Institute of Fundamental Technological Research, Polish Academy of Sciences, known as IPPT PAN with its Department of Intelligent Technologies – a recognised scientific and research centre offering high-quality NVH and SQ testing and troubleshooting for the automotive, streetcar and railway, machine diagnostics and aerospace industries.

The Operator: Tramwaje Warszawskie sp. z o.o. – a company operating trams in Warsaw and paying considerable attention to environmental issues and travel comfort.



Test Results

The extensive tests led to the same opinion – SoNoScout is a very versatile, cost-effective and useful tool. High-quality, exchangeable data, ease of use, immediate result presentation and the ability to perform measurements during normal operation, even by a non-skilled person, were especially appreciated.

All three evaluated SoNoScout as especially suitable for the following:

- Transferring “hot” data to the consultant or designer
- Easy data collection for archiving and periodical trend analysis
- Product marketing and benchmarking, including real life examples
- Communicating quality problems or specification requirements to sub-suppliers
- “Before and after” comparisons for vehicles under maintenance/overhaul
- Studying vehicle dynamics, including normal load
- Developing, selecting and adjusting broadcast systems, warning signals and aids for blind people, etc.

So, who knows, the next time you take a tram ride you might be riding alongside SoNoScout!



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