TRIALS & TESTING

EUREMCO – RECONCILING TRACKS & TRAINS

AFTER THREE YEARS+ OF WORK ON ELECTROMAGNETIC COMPATIBILITY, THE EUREMCO[1] PROJECT CULMINATED IN DECEMBER 2014. NOW IT REMAINS TO BE SEEN HOW THE CERTIFICATION PROCESS FOR ROLLING STOCK WILL BENEFIT FROM THE OUTCOMES.

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Long and costly is the only way to describe the current authorisation process for bringing rail vehicles into service, according to Technical Specifications for Interoperability (TSI) and national safety rules. The TSIs provide common regulations for bringing trains on track, when common understanding and standardised rules exist. But this is not the case with electromagnetic compatibility between rolling stock and installed track circuits, which represents one of the major cost drivers in the authorisation process. Indeed each country has developed its own requirements and assessment process – in many cases on an empirical basis, and/or not even documented!

The driving aim of EUREMCO has been to specify the conditions for cross-accepted certification throughout Europe; and this by means of sound scientific methodologies that identify the 'transfer functions' applicable to results obtained on different test tracks in different countries, for the same power supply system.

PACKAGING THE WORK

▪ **Work Package (WP) 2: Evaluation of interference currents – handling of transients**

Currently, there are no standards or procedures addressing the effects of transients on track circuits. The problem is recognised by several system operators as occurrences arise on their networks. Most operators use a variety of ways to deal with this issue, but this is often done only on a case-by-case basis. Solutions are seldom documented, and thus the expertise resides with individuals rather than with organisations. The question is always: 'How should we handle those transients that affect data acquisition during certification tests?'

In addition to the operators' experience, vehicle and track signalling system suppliers also have extensive amounts of data on transients. Over the years, this data has accumulated with regards to work, product introduction, and warranty service phases. The sharing of operator and manufacturer data with the European community of experts formed a key part of this WP.

A survey of current industry knowledge was undertaken and completed, and a report reflecting the existing knowledge written. Work was also carried out on the characteristics of transients (sources), with the completion of a modelling exercise to give the transfer function from train to track circuit receiver, and the effects of transients. Finally, lab tests of track circuits and tests of trains and track circuits were performed.

▪ **WP3: Qualification of EMC cross accepted test tracks (15kV AC)**

To validate the current version of the Technical Standard (TS 50238-2) for 15kV/16.7Hz power supply systems, rail operators DB AG, SBB, and ÖBB carried out a measurement campaign in 2010, in Germany,

Switzerland, and Austria, respectively. The measurements were taken using a locomotive with different capacitive input impedances (addition capacitors) for the simulation of roof cables with different lengths. The captured data was assessed by focusing on the comparability of the measurement results for a train, running without any changes of traction unit and traction software, on the networks of the three countries.

▪ WP4: Qualification of EMC cross accepted test tracks (25kV AC)

The objective of this WP was to define and propose Europe-wide cross-accepted test tracks for the 25kV/50Hz power supply system. These would enable conducted emission tests to be performed just once for several countries and infrastructures. The results obtained then could be used for certification in all countries, using 25kV AC electrification systems.

A better understanding of the influence of test tracks and infrastructure will also lead to a harmonised test philosophy. The measurements and simulations will help the sector to fully understand the influence of vehicles with roof cables, and thus simplify their future design and certification.

▪ WP5: Qualification of EMC cross accepted test tracks – Direct Current

The goal here was to study the influence of test tracks on the conducted emissions generated by vehicles on DC power supply systems, and to define, and later propose, Europe-wide cross-accepted test tracks for these particular systems.

The idea behind the notion of cross-accepted test lines is to have test tracks that are recognised by the different countries in Europe. This will ensure that the measurements of harmonic currents performed in one country are accepted by another with the same power supply system, without having to repeat them. Hence during EUREMCO, test campaigns were organised in several countries, in order to measure the interference currents generated by the same vehicle, on different test lines, with the same DC power supply system.

▪ WP6: Test specification for rolling stock for non-electrified lines

As more routes open up to freight traffic across Europe, considerable efforts are still required to ascertain compatibility between goods trains comprising various combinations of locomotives and wagons. Indeed, the various ways of linking them up impacts both the current seen in the rails, and the train detection system.

The integrity of the train detection system should be maintained under normal and degraded conditions of the rolling stock passing over it. This inevitably leads to lengthy compatibility proceedings. As a consequence, every single European Union (EU) country has established rules and methods for handling influencing currents for track circuits on non-electrified lines.

With respect to these rules and methods, EUREMCO will provide a general recommendation for rolling stock preventing any type of track circuits from interfering currents. This recommendation should be applicable in each country of the EU in order to integrate the national certification processes. The aim of this WP has been to enable, for the first time, harmonisation of rolling stock in the EU in terms of current interfering with track circuits on non-electrified lines.

Finally, measurements were performed to prove EMC between rolling stock and track circuits, in order to check the consistency of this recommendation. For this reason, the final task of this WP involved validation tests on dedicated test tracks.

SAFETY & SAVINGS

Closing the corresponding open points in the TSI, i.e. the electromagnetic interference limits in all power supply systems in Europe, should lead to a time and cost reduction of the certification process of rail vehicles against EMC issues; corresponding to an estimated saving of €60 million over the next 15 years.

Once a common understanding and limit criteria are reached at the European level, it will be possible to use the results obtained in one country to authorise the operation of a vehicle in another. Introducing the so-called 'transfer function' between different networks within the same power supply system (of which there are three: 25kV AC, 15kV AC, and 3kV DC) will reduce the cost and time of certification, since the need for additional tests, which are often expensive, could be eliminated.

During the wrap-up conference for the project, Philippe Citroën, director-general, UNIFE, encouraged its partners to try and incorporate EUREMCO's results in future initiatives, such as Shift2Rail[2]. He also expressed his optimism that the findings will be used by the European Railway Authority (ERA), and European standardisation organisations CEN and CENELEC, to ensure that less time and money is spent on the issue of electromagnetic compatibility in the coming years ■

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EUREMCO – funding & partners

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Technical leader: SNCF
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References
[1]www.euremco.eu
[2]www.shift2rail.org