



## TECHNICAL INFORMATION NOTE MANAGING EMC IN THE RAILWAY INDUSTRY

### Background

Electromagnetic Compatibility (EMC) is the ability of electronic apparatus to operate in its intended environment without suffering unacceptable degradation or causing unintentional degradation to other apparatus.

The requirements for the control of EMC are embodied in the European EMC Directive, 89/336/EEC, which became mandatory on 1<sup>st</sup> January 1996. The Directive applies to all electrical and electronic apparatus, including that operating in the railway environment.

Although EMC is not specifically safety related, it is an important aspect in railway systems providing for **safe** and **reliable** operation and as such EMC forms part of the Safety Case

### Regulations and standards

In relation to the EMC Directive, the EN50121 series of standards are available specifically for the railway environment. This series is subdivided into the following parts:

- EN50121-1 General
- EN50121-2 Emission of the whole railway system to the outside world
- EN50121-3-1 Rolling stock – Train and complete vehicle
- EN50121-3-2 Rolling stock – Apparatus
- EN50121-4 Emission and immunity of signalling and telecommunications apparatus

- EN50121-5 Emission and immunity of fixed power supply installations and apparatus

In addition to EN50121, there may be other requirements that manufacturers need to consider which may be defined in Railway Group Standards, for example.

In 2002, Network Rail and the Railway Standards and Safety Board (RSSB) published a new group standard. GE/RT 8015 – Electromagnetic Compatibility between railway infrastructure and trains mandates requirements for the management of EMC between the railway infrastructure and trains to enable safe operation to be assured.

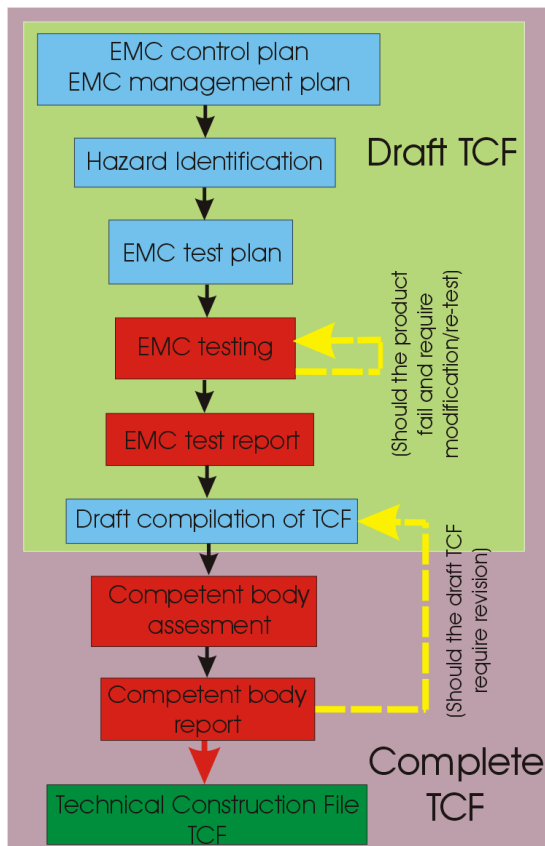
Similarly, in 2000 London Underground Limited (LUL) published document M1027 A2, a manual of EMC best practice (M 1027 A2), which defines and clarifies the key EMC requirements for all types of new, modified and “off the shelf” systems. It also defines the requirements for the EMC Control Plan, Test Plan and Test Reports as shown in the EMC management strategy in Figure 1.

### EMC Management

One of the key success factors in EMC management is ensuring that EMC is considered from the outset of the project and that all parties involved are fully aware of their obligations.

This is best achieved through the use of an EMC Management Plan, sometimes referred to as an EMC Control Plan.

Indeed, EN50121-1 implies the need for an EMC management plan as part of the overall EMC strategy, an example of which is shown in Figure 1.



**Figure 1: EMC management strategy for a TCF compilation**

A successful EMC management strategy has a number of easily identifiable stages against which progress on achieving the overall aim of demonstrating compliance with the EMC Directive can be assessed.

The EMC management plan *includes* the:

- Apparatus description
- Management rationale
- Test regime and its justification
- EMC documentation to be completed

The Hazard Identification document *includes* the:

- Identification of the electromagnetic Hazards (EMC HAZID);
- The EMC risk assessment.

The EMC test plan *includes* the:

- Definition of the EMC testing to be carried out;
- Justification for any deviation from the EMC standards
- Immunity performance criteria
- Configuration of the equipment and modes of operation

The EMC test report *includes* a:

- Description of the equipment tested
- Description of the EMC testing performed and the test results
- Description of any modifications that were made during the test to ensure EMC compliance

### Technical Construction File (TCF) and Competent Body

One of the routes to demonstrating compliance with the EMC Directive is through the use of a TCF. There are a number of instances where it may be appropriate to do this, including where the EMC standard being used has not been published in the Official Journal of the European Community (OJEC). To date, none of the standards in the EN50121 series have been so published.

Essentially a manufacturer must demonstrate that the apparatus in question is designed to meet the EMC requirements of the operating environment. This will be accomplished by showing that appropriate measures have been taken in the design, which are verified by test data and/or a theoretical assessment. For larger projects, supporting evidence will include EMC management, control and test plans.

The TCF must include a report or certificate from an EMC Competent Body asserting that the information contained in the TCF is consistent with conformity to the Directive.

An EMC Competent Body is an independent third party, which satisfies

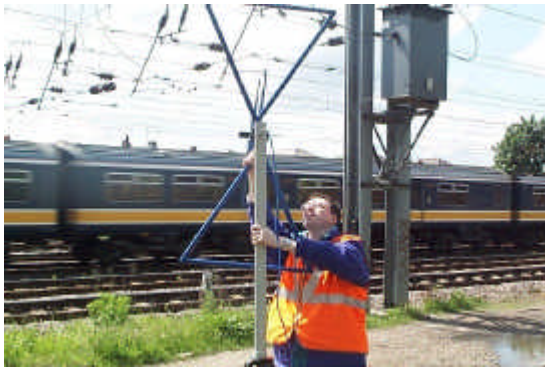
certain requirements including technical competence, professionalism of personnel and possession of civil liability insurance. In the UK Competent Bodies, such as York EMC Services Ltd, are appointed by the DTI and assessed by UKAS.

As with the standards route to conformity, the manufacturer is ultimately responsible for the Declaration of Conformity to the Directive.

### How can we help you?

York EMC Services is a well-established market leader for the provision of EMC services to the railway industry. We offer a range of consultancy, testing and training services. Specifically we can provide:

- Overall EMC project management
- UKAS accredited laboratory testing
- On-site EMC testing and electromagnetic site surveys



- Computational Modelling
- Investigations and problem solving for interference including:
  - Signalling and telecommunications equipment
  - Rolling Stock
  - Power supply and infrastructure
- Assistance with developing EMC management strategies
- Railway specific EMC training
- TCF training



- Assistance with developing TCFs
- TCF Competent Body assessment

We have a solid track record in providing EMC Services for major railway projects around the world, including:

- EMC testing and consultancy services for the West Coast Route Modernisation Project
- A comprehensive review of the EMC of the West Rail signalling system for KCRC, Hong Kong.
- EMC site measurement and consultancy services for the Victoria Line Upgrade Project
- Acting as Competent Body for TCF assessment of wheel slip protection equipment used on the Central Line, London Underground
- EMC testing of public address systems for use on the railway
- EMC testing of various rail and road rail vehicles
- Analysis of conductive interference measurements in respect of Audio Frequency Track Circuits on a main line from a major UK light rail system
- Expert witness EMC consultancy for video system for use on a major train operators' fleet
- EMC testing and consultancy services for the London Underground Jubilee Line Extension Project
- EMC testing and consultancy services for Nottingham Express Transit (NET1)

For more information on EMC in railways, please visit our website at [www.yorkemc.co.uk/railway/](http://www.yorkemc.co.uk/railway/)

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Please return the fax reply slip below or contact:

York EMC Services Ltd, Market Square, University of York, Heslington,  
York YO10 5DD

Tel. +44 (0)1904 434440 Fax. +44 (0)1904 434434  
e-mail. [enquiry@yorkemc.co.uk](mailto:enquiry@yorkemc.co.uk)

**Fax. to: +44 (0)1904 434434**

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I am interested in the following (please tick):

<b>EMC Testing</b>	<ul style="list-style-type: none"> <li>- Pre-Compliance Testing</li> <li>- Compliance Testing</li> <li>- On Site Testing &amp; Site Surveys</li> <li>- Approvals: UKAS, CAA, VCCI, FCC</li> </ul>	<input type="checkbox"/>
<b>EMC Consultancy</b>	<ul style="list-style-type: none"> <li>- Technical Construction File Preparation &amp; Competent Body Assessment</li> <li>- EMC Management Strategy, Legislation &amp; Documentation</li> <li>- Solutions for EMC Problems, e.g.                             <ul style="list-style-type: none"> <li>• Interference to line-side Equipment</li> <li>• Induced voltage on line-side cables</li> <li>• Specific EMC measurements</li> </ul> </li> <li>- Large Systems Management Plan</li> <li>- Computational Electromagnetic Modelling</li> </ul>	<input type="checkbox"/>
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