



Management of Electromagnetic Compatibility (EMC) Guidance



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	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	1 of 21

TITLE:	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE			
REF:	LRG 3.0		STATUS:	FINAL
ISSUE:	02	REVISION:	02	DATE: 30/10/2023
DEPT:	LRSSB Safety Assurance		REVIEW DUE:	30/10/2028
DOCUMENT OWNER:			DISTRIBUTION:	
LRSSB			ALL UK TRAMWAYS	
DESCRIPTION:				
THIS DOCUMENT PROVIDES GUIDANCE ON PROCESS FOR THE MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC)				
EXPLANATORY NOTE:				
LRSSB is not a regulatory body and compliance with this guidance document is not mandatory. This document reflects good practice and is advisory only. Users are recommended to evaluate this guidance against their own arrangements in a structured and systematic way, noting that parts of this guidance may not be appropriate to their operations. It is recommended that this process of evaluation and any subsequent decision to adopt (or not adopt) elements of this guidance should be documented. Compliance with any or all of the contents herein, is entirely at an organisation's own discretion.				
SOURCE / RELATED DOCUMENTS:				
LRG 1.0 Tramway Principles and Guidance (TPG) (LRSSB) LRG 15.0: Stray Current Management (LRSSB) BS EN 50121: Railway applications. Electromagnetic compatibility See also other related documents and Standards listed in Section 10				
RELATED TRAINING COURSES:			RELATED LEGISLATION:	
N/A			Control of Electromagnetic Fields at Work Regulations 2016 Health and Safety at Work Act etc. 1974 Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS) (as amended) The Electromagnetic Compatibility Regulations 2016 (SI 1091)	
CHANGE NOTES:				
Date of Issue	Issue No.	Revision No.	Reviewer	Details of Revision
16/11/2020	02	01	David Keay	Amendments to text / format
30/10/2023	02	02	LRSSB	Amendments to text / format
UNCONTROLLED WHEN PRINTED				

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	2 of 21

LRSSB

DOCUMENT CODE: LRG 3.0

MANAGEMENT OF ELECTROMAGNETIC (EMC) COMPATIBILITY GUIDANCE

CONTENTS

1. Introduction
2. Scope
3. The EMC Management Process
4. Scheme Permission
5. Testing Regime and Process
6. EMC Strategy
7. EMC Management Plan
8. Hazard Analysis
9. Testing
10. Technical Documentation
11. Acceptance by the RSA

Figures

Figure 6.1 EMC Strategy


Figure 11.1 Interaction with the RSA for EMC Compliance

Tables

Table A Terms

Table B Abbreviations

Table 10.1 Technical Documentation

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	3 of 21

Revisions from Previous Issue

New LRG document template and other formatting.

Changes to Page 1: removal of the named preparer, reviewer and authorising person and insertion of an explanatory note in relation to the status of this guidance document.

Figures and Tables listed in the Contents Page and removal of Figure 8.1.

Changes made to Table A and Table B including additions from existing text.

Changes to the Introduction to be consistent with other LRG documentation.

Additional references made to Control of Electromagnetic Fields at Work Regulations 2016 and ER G5/5: Harmonic voltage distortion and the connection of harmonic sources and / or resonant plant to transmission systems and distribution networks in the United Kingdom. Reference to ORR Guidance on the application of Commission Regulation (EU) 402/2013 removed.


References to wider stakeholders not just Network Rail.

References to CE mark amended to include the UKCA mark to be in line post Brexit.

Changes to Section 9 in line with amendments to Standards.

Text added to aid clarification where required / appropriate.

Numerous presentational, minor factual and typographical changes.

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	4 of 21

TERMS AND ABBREVIATIONS

Table A – Terms

Term	Definition
Asset Family	EMC relevant equipment provided for a Light Rail (tramway) scheme.
Common Safety Method for Risk Evaluation and Assessment	Harmonised framework for safety risk management mandated for mainline railways through Legislation. ORR guidance is available on application.
Conducted Electromagnetic Stimulus	Electromagnetism caused by the physical contact of conductors.
Electro-Motive Force	The electrical potential produced by either an electrochemical cell or by changing the magnetic field.
EM Field	A magnetic field produced by moving electrically charged objects.
Fixed Installation	The Light Railway (tramway) infrastructure.
Hazard	Something (for example, a condition, object or activity) with intrinsic properties to cause harm.
HAZID	Qualitative structured process to identify hazards.
Independent Competent Person	Person appointed to oversee the safety assurance (or safety verification) process.
Infrastructure Manager	Person who is responsible for developing and maintaining that infrastructure or manages and uses that infrastructure or station, or permits it to be used, for the operation of a vehicle.
Radiated Electromagnetic Stimulus	Electromagnetism caused by induction.
Relevant Safety Authority	The body that needs to be consulted for a letter of no objection (LoNO).
Scheme Sponsor	Promotor of a scheme.
Scheme Sponsors EMC Manager	Manager appointed by the Scheme Sponsor.
Statutory Undertakers	Certain bodies that have been given statutory powers in relation to roles that are of a public character, such as Utility Companies.
Stray Current	A flow of electricity from the Light Rail system (tramway) which does not return via the rail but leaks into local Earth and buried conductors.
Transport and Works Act Order (TWA) (or Transport and Works (Scotland) (TAWS) Act Order)	Statutory process for attaining Powers to build operate and maintain a Light Rail system (tramway).
UKTram	Body representing the Light Rail sector and Light Rail systems (tramways).



	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE	LRSSB - LRG - 3.0	
		Issue	2
		Revision	2
		Date	30/10/2023
		Page	5 of 21


Table B – Abbreviations

Abbreviation	Definition
AC	Alternating Current
BS EN	British (BS) adoption of a European (EN) Standard
CE	Conformité Européenne (European Conformity)
CfS	Case for Safety
COTS	Commercial Off The Shelf
DC	Direct Current
EM (Field)	Electromagnetic Field
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ER	Engineering Reference
EU	European Union
FI	Fixed Installation
HAZID	Hazard Identification
ICNIRP	The International Commission on Non-Ionizing Radiation Protection
ICP	Independent Competent Person
IEC	International Electrotechnical Commission
ISRP	NR's Infrastructure System Review Panel
LRSSB	Light Rail Safety and Standards Board
MUP	Mass Utility Provider
NR	Network Rail
O&M	Operation and Maintenance
ORR	Office of Rail and Road
RFI	Radio Frequency Interference
ROGS	Railways and Other Guided Systems 2006 (as amended)
RSA	Relevant Safety Authority
SFAIRP	So Far As Is Reasonably Practicable
SI	Statutory Instrument
SSS	Scheme Sponsors Specification
SU	Statutory Undertaker(s)
TAWS	Transport and Works (Scotland)
TD	Technical Documentation
TPG	Tramway Principles and Guidance
TWA	Transport and Works Act
UK	United Kingdom
UKCA	UK Conformity Assessment

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	6 of 21

1. Introduction


- 1.1. This guidance supports the high level principles set out in LRG 1.0 Tramway Principles and Guidance (TPG) published by the Light Rail Safety and Standards Board (LRSSB).
- 1.2. This document provides high level guidance for the management of Electromagnetic Compatibility (EMC) for those delegated this responsibility in relation to UK Light Rail systems (tramways) based on 'line-of-sight' operations only. As with all guidance, this document is not prescriptive and is intended to give advice not to set a mandatory standard for the Light Rail sector, and it is based upon goal setting principles as good practice.
- 1.3. Much of this guidance is based on the experience gained from existing UK Light Rail systems and from published documents. It does not prescribe particular arrangements adopted by any existing UK Light Rail system and is intended to give guidance and advice to those involved in the management of Electromagnetic Compatibility.
- 1.4. This guidance is not intended to be applied retrospectively to existing Light Rail systems. However, owners and operators should consider and assess any implementation of this guidance and / or any subsequent revision, to ensure continual improvement in reducing risks related to EMC Management, so far as is reasonably practicable.

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	7 of 21

2. Scope

- 2.1. The demonstration of EMC is a self-certification process. In accordance with UK Legislation, in order to achieve the necessary agreements and sign off by the relevant authority(ies) is not a clear and easily understood process. As a result, this can cause Scheme Sponsors (Promoters) to incur significant unnecessary costs.
- 2.2. A level of proof is required for some stakeholders adjacent to the tramway, for example Statutory Undertakers (SU) Network Rail (NR), universities, hospitals, airports etc.
- 2.3. New Light Rail systems should be designed and constructed to relevant and appropriate Standards employing good practice in the sector. Therefore, they should not present Electromagnetic Interference (EMI) to adjacent new or legacy infrastructure, and in turn should have suitable levels of immunity from external EMC from other parties.
- 2.4. All rail infrastructure managers including NR have a duty of care under Railways and Other Guided Systems Regulations 2006 (ROGS) (as amended) to protect their own infrastructure by seeking appropriate assurance from third parties that the safety of the infrastructure manager or third parties system is not impaired. This can be achieved either by Safety Verification or the Common Safety Method for Risk Evaluation and Assessment. Regulation 22 of ROGS 2006¹ requires all parties to cooperate to achieve this.
- 2.5. The intention of this document is to suggest a clear and staged approach to provide and then demonstrate compliance with the Regulations, and to enable the Relevant Safety Authority (RSA) to provide a letter of 'Note and Support'.
- 2.6. This document does not supply all of the information needed to achieve self-certification, but suggests a method of delivering the process to demonstrate that adjacent electrical / electronic infrastructure will not be impacted by unwanted interference. This includes setting out a model for effective cooperation and communication between the Scheme Sponsor and affected parties.
- 2.7. The EMC processes in this document are applicable for:
 - New schemes (including new infrastructure and vehicles);
 - New infrastructure for an existing Light Rail system; and
 - Introduction of a new fleet of vehicles on an existing Light Rail system.
- 2.8. For all Standards referenced to within this document, the current versions should be used unless otherwise clearly justified and documented.

¹ <https://www.legislation.gov.uk/uksi/2006/599/contents/made>


	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	8 of 21

3. The EMC Management Process

- 3.1. For Light Rail systems, the process of the management of EMC was historically through the creation of an EMC Management Plan, having undertaken all its requirements and measurements. Scheme Sponsors would then present this assurance to relevant affected parties who would then issue a 'Letter of No Objection' or letter 'Noting and Supporting' the assurance.
- 3.2. However, the management of EMC is now set out in UK Law by The Electromagnetic Compatibility Regulations 2016 (SI 1091)² ('the Regulations'). These Regulations implement EU Directive 2014/30/EU³ that came into force on 20 April 2016 and the UK withdrawal from the EU has not affected the content or locus of the UK Regulations.

² <http://www.legislation.gov.uk/ukSI/2016/1091/contents>

³ Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	9 of 21

4. Scheme Permission

- 4.1. For any new UK Light Rail scheme, the Scheme Sponsor will in most instances have applied for a TWA or TAWS Order which provides statutory powers to build, operate and maintain a proposed route or scheme. This process requires consultation with affected parties including those with sensitive safety critical electrical equipment and may include, for example, NR, airport authorities, port authorities, Mass Utility Providers (MUP), hospitals etc.
- 4.2. However, whether an application has been made for a TWA or TAWS Order or not, it is the Scheme Sponsor's responsibility to ensure contact has been made with any adjacent third party who they consider may be affected. They should advise third parties that a Light Rail system will be in the vicinity of their infrastructure operating an electrical / electronic system and radio frequency equipment on DC traction electrics, and give them the opportunity to engage in the assurance process.

EMC Assurance Manager


- 4.3. The Scheme Sponsor is required to nominate a person responsible for delivering assurance that EMC is achieved - an EMC Assurance Manager. This person may enlist the assistance of an EMC expert to assist with the development and delivery of the required EMC documentation, including the EMC Management Plan.

EMC Documentation

- 4.4. The EU EMC Directive requires that EMC documentation be produced for a Fixed Installation (FI). Under the UK EMC Regulations, the person who installs an FI shall hold the EMC Documentation for the lifetime of the FI. For Light Rail systems this will be the Infrastructure Manager. The Infrastructure Manager shall also ensure that the documentation can be made available to the relevant national authority on request during the lifetime of the FI.
- 4.5. A Light Rail system is classed as a 'Fixed Installation' in the Directive, which states:
- "Fixed installation" means a particular combination of several types of apparatus and, where applicable, other devices, which are assembled, installed and intended to be used permanently, at a predefined location."*
- 4.6. The Scheme Sponsor will also require a copy of the EMC documentation. This will ensure that for any modifications or additions to the FI, a valid base of EMC documentation is available to amend in line with the FI or rolling stock modifications.


Modification and Decommissioning

- 4.7. Modifications and additions to the FI both during its operational life and its decommissioning shall be appropriately documented to ensure that EMC is maintained, i.e. the EMC documentation reflects the EMC of the existing operational status of the Light Rail system.

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	10 of 21

5. Testing Regime and Process

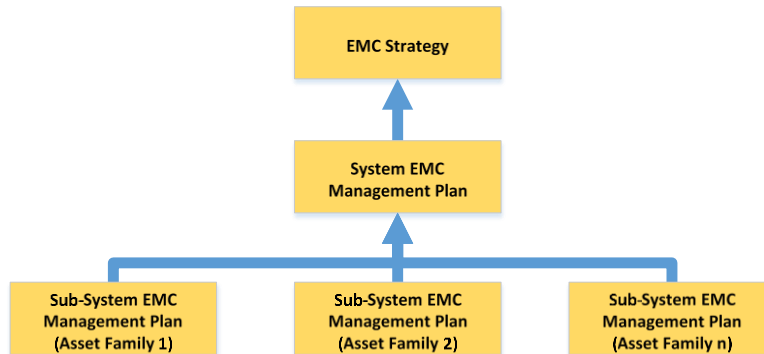
- 5.1. For any Light Rail system, both the rolling stock and the infrastructure are areas of responsibility requiring a Scheme Sponsors Specification (SSS). This shall meet all of the necessary Standards required to comply with the Regulations (see Section 9 below).
- 5.2. The SSS should require any supplier to ensure that any supplied Commercial Off the Shelf (COTS) equipment carries the CE / UKCA mark (where applicable) to demonstrate its compliance with the relevant required Standards.
- 5.3. The CE marking of the component does not necessarily ensure that the resultant FI is compliant when the separate CE / UKCA marked components have been assembled and are operated together as a system.

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	11 of 21

6. EMC Strategy


- 6.1. The Scheme Sponsor should document the SSS in an EMC Strategy as set out in Figure 6.1 below:

Figure 6.1: EMC Strategy



- 6.2. This strategy is a hierarchical document that describes how the Scheme Sponsor intends EMC assurance to be delivered throughout the lifetime of the Light Rail system. It will need to demonstrate how it will not suffer from EMI and also not cause EMI to third parties.
- 6.3. The lifetime of the Light Rail system includes:
- Design;
 - Construction;
 - Testing and commissioning;
 - Operation and maintenance; and
 - De-commissioning.
- 6.4. For new Light Rail infrastructure the following effects are regarded as EMC issues (not exclusively):
- Radio Frequency Interference (RFI), transient and surge disturbances, RF emissions;
 - Harmonics and flicker;
 - Crosstalk between parallel conductors (particularly inductive crosstalk);
 - Rail touch voltage;
 - Electromagnetic field – people safety in the presence of EM fields⁴;
 - DC stray currents (further guidance is given in LRSSB guidance document LRG 15.0 Stray Current Management Guidance);
 - Earthing and bonding – relevant to rail touch voltage, galvanic separation and DC stray current; and
 - Third party interfaces.

⁴ Refer to Control of Electromagnetic Fields at Work Regulations 2016
<https://www.legislation.gov.uk/ukxi/2016/588/made/data.pdf>

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	12 of 21


6.5. Rail touch and step potentials are not strictly covered by the EMC Directive, but should be included for the safety of persons.

6.6. The EMC Strategy should include the following:

- Introduction;
- System overview;
- EMC regulatory compliance;
- EMC environments;
- EMC standards - including relevant EN Standards and third party Standards where applicable (for example, NR/SP/SIG/50004 'Methodology for the Demonstration of Electrical Compatibility with DC (AC Immune) Track Circuits'), etc.;
- Special cases (for example, NR, MUP, etc.);
- Supplier EMC deliverables:
 - EMC Management Plan;
 - EMC Hazard Analysis; and
 - EMC Certification Report.
- Scheme sponsor acceptance criteria (the following three bullet points are offered as an example):
 - Code 1: work may proceed - no changes to the submitted documentation required;
 - Code 2: work may proceed - revise and resubmit in line with the changes on the provided comment sheet; and
 - Code 3: work may not proceed - urgently revise and resubmit in line with the changes on the provided comment sheet. The issue raised may have significant cost implications to the scheme.


6.7. The final product of the EMC strategy should be the EMC Technical Documentation for a new or revised Light Rail system. This documentation demonstrates the EMC of the Light Rail system; refer to Section 10 for further details.

6.8. This Technical Documentation should be held by the Infrastructure Manager for the lifetime of the Light Rail system. The Technical Documentation should be made available to the independent Competent Person (ICP) overseeing the safety verification (or 'Common Safety Method for Risk Evaluation and Assessment') process who will report to the Scheme Sponsor's senior management / client, and may refer more serious issues to the Office of Rail and Road (ORR) if appropriate.

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	13 of 21


7. EMC Management Plan

- 7.1. All suppliers should document the SSS in an EMC Management Plan. This plan should cover all aspects of the proposed suppliers' asset family for the life of the Light Rail system including the following (not exclusively):
- Asset family overview. To include scope and brief description of EMC relevant equipment to be provided for the scheme. This should include a note of any special cabling requirements.
 - EMC management and organisation within the asset family.
 - Overview of EMC design and control methodologies. This will describe the planned EMC measures for the various subsystems and relevant Standards for equipment. The need for a hazard identification (HAZID) study will be addressed here.
 - Management of EMC interfaces. This will address the strategy for dealing with:
 - intra-system EMC - EMC between the systems within the asset family;
 - intersystem EMC - EMC between the systems within the asset family and systems within other asset families i.e. vehicle to signalling; and
 - extra-system EMC - EMC between systems within the asset family and third party systems.
 - Deliverables Schedule. A list of further EMC documentation required for the asset family will be produced. This should include:
 - An EMC Hazard Analysis;
 - EMC Certification Report; and
 - EMC Test Plans for inadequately documented equipment and subsequent Test Reports for the equipment, etc.
- 7.2. The system EMC Management Plan and those for the sub-systems should identify the delegation of responsibility for the management of interface EMC issues and emergent system EMC issues so it is clear who has the lead responsibility in resolving them.
- 7.3. If EMC certification for a system is inadequate for its intended environment, a Standards gap analysis should be performed. This will show the difference between existing EMC certification and what is required for the intended EMC environment on the scheme. Where gaps exist between the documented measurements and the required Standards, equipment should be retested, modified or even replaced so that certification is appropriate.
- 7.4. Inadequately certified equipment should be listed in the EMC Hazard Log. The hazard would then be closed when appropriate certification is in place. The results of the gap analysis may act as a basis for further EMC Test Plans, testing and Test Reports in order to bridge any gap in Standards.

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	14 of 21

8. Hazard Analysis


- 8.1. A hazard analysis process for dealing with hazards is detailed below.
- 8.2. HAZID should be undertaken by a suitably qualified panel comprising of all the interested parties. They will identify all of the EMC hazards for consideration and allocate ownership to each one. The victim and source also need to be considered as this often aids structure for EMC logs.
- 8.3. The hazards are then analysed to understand the likelihood and the severity of the identified risks. In the context of EMC hazards, a measurement for the outcome of risks may not be restricted to safety, but may also need to consider performance / reliability etc.
- 8.4. Mitigation measures are then identified for each risk. These will be re-analysed with potential further mitigation measures until risks have been reduced So Far As Is Reasonably Practicable (SFAIRP). This may require an analysis to demonstrate that further reduction of the risk would be grossly disproportionate in a benefit to cost argument.
- 8.5. The final part of the hazard management is to formally close the risk. The Hazard Log will then be monitored to ensure that acceptable risk levels do not change and are being adequately managed.
- 8.6. The Scheme Sponsor's EMC Manager owns the EMC Hazard Log and should ensure that all interface and control issues can be assured as being managed, and that all Standards and Legislation have been adhered to.

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	15 of 21

9. Testing

- 9.1. The EMC test standards described below give the prescribed levels of EM performance for electrical / electronic apparatus. In the absence of specific Light Rail group standards, the generally applicable (heavy) railway Standards on EMC are applied.
- 9.2. For equipment, these tests should be performed on representative apparatus in the laboratory to enable the CE / UKCA marking to be applied. In some cases, this marking will have already been obtained for other railway applications, and therefore it is possible to assess these cases against the new environment.
- 9.3. The harmonised Standards for EMC within Light Rail systems are the appropriate parts of BS EN 50121⁵ as summarised below:
- BS EN 50121-1:2017 - Railway applications. Electromagnetic compatibility. General;
 - BS EN 50121-2:2017 - Railway applications. Electromagnetic compatibility. Emission of the whole railway system to the outside world;
 - BS EN 50121-3-1:2017+A1:2019 - Railway applications. Electromagnetic compatibility. Rolling stock. Train and complete vehicle;
 - BS EN 50121-3-2:2016+A1:2019 - Railway applications. Electromagnetic compatibility. Rolling stock. Apparatus;
 - BS EN 50121-4:2016+A1:2019 - Railway applications. Electromagnetic compatibility. Emission and immunity of the signalling and telecommunications apparatus; and
 - BS EN 50121-5:2017+A1:2019 - Railway applications. Electromagnetic compatibility. Emission and immunity of fixed power supply installations and apparatus.
- 9.4. These standards set out limits for emissions and immunity such that compliant apparatus should operate correctly when placed in the Light Rail environment.
- 9.5. A structured plan should be drawn up that progressively builds up from tests on components, if necessary, to sub-system then whole system operational tests. Stage gates should be built into the test plan to ensure successful completion of lower grade tests before progressing to more complex system tests. This should be agreed with any affected third parties who may need to undertake monitoring on their own systems as part of the testing.
- 9.6. Other Standards and Guidelines.
- BS EN 50500:2008+A1:2015 - Measurement procedures of magnetic field levels generated by electronic and electrical apparatus in the railway environment with respect to human exposure;
 - ICNIRP - Guidelines for limiting exposure to time-varying Electric, Magnetic, Electromagnetic fields (Up to 300 GHz);
 - ICNIRP - Guidelines for limiting exposure to Static Magnetic Fields;

⁵ BS EN 50121: Railway applications. Electromagnetic compatibility

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	16 of 21

- ER G5/5⁶ - Harmonic voltage distortion and the connection of harmonic sources and/or resonant plant to transmission systems and distribution networks in the United Kingdom.

Other Relevant Reference Standards

9.7. Generic EMC Test Standards

- BS EN 61000-6-1:2007 - EMC Generic Standards - Immunity for residential, commercial and light industrial environments;
- BS EN 61000-6-2:2001 - EMC Generic Standards - Immunity for industrial environments;
- BS EN 61000-6-3:2007+A1:2011 - EMC Generic Standards - Emission Standard for residential, commercial and light industrial environments;
- BS EN 61000-6-4:2007+A1:2011 - EMC generic Standards - Emission Standard for industrial environments; and
- Other Standards in the 6100 series (Electromagnetic Compatibility) may also be relevant in some cases.

9.8. Network Rail

- NR RT/E/C/50018 - Methodology for the Demonstration of Interaction with Neighbouring Railways;
- NR/L1/SIG/30040 - EMC Strategy for Network Rail;
- NR/L2/RSE/30041 - EMC Assurance Process for Network Rail;
- NR/SP/ELP/27224 - Installation of cable routes forming part of the traction distribution (3 September 2022); and
- NR/SP/TEL/50016 - Methodology for the Demonstration of Compatibility with Telecommunications Systems.

9.9. Signalling and Telecommunications

- BS EN 62949:2017 - Particular safety requirements for equipment to be connected to information and communication technology networks.


9.10. Rolling Stock

- BS EN 50238 - Railway Applications - Compatibility between rolling stock and train detection systems - General; and
- BS EN 50155:2021 - Railway applications. Rolling stock. Electronic equipment.

9.11. Mechanical and Electrical Services

- BS EN IEC 55015 - Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment (incorporating amendment BSI - 21/30436339 DC (2021));
- BS EN 61547:2023 - Equipment for general lighting purposes. EMC immunity requirements; and
- BS EN IEC 61439-1: 2021 - Low voltage switchgear and control gear assemblies – Part 1: type – tested and partially type-tested assemblies.

⁶ Refer also to the Office of Gas and Electricity Markets (Ofgem) Grid Code GC0129

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	17 of 21

9.12. Power

- BS EN 50162 - Protection against corrosion by stray current from direct current systems;
- BS EN 50163 - Railway Applications - Supply Voltages to Traction Systems;
- BS EN 50160:2022 - Voltage characteristics of electricity supplied by public electricity networks; and
- ENA Engineering Recommendation G5/5 - Harmonic voltage distortion and the connection of harmonic sources and / or resonant plant to transmission systems and distribution networks in the United Kingdom.

9.13. Earthing, Bonding and Lightning Protection


- BS 7430:2011+A1:2015 - Code of practice for protective earthing of electrical installations;
- BS EN 62305-1:2011 - Protection against Lightning. General Requirements (and other Standards in the same series);
- BS EN50122-1:2022 - Railway applications. Fixed installations. Electrical safety, earthing and the return circuit - Protective provisions against electric shock;
- BS EN50122-2:2022 - Railway Applications - Fixed Installations Part 2: Protective provisions against the effects of stray currents caused by DC, traction systems; and
- BS EN50310 - Telecommunications bonding networks for buildings and other structures.

9.14. Cabling and Electrical installations

- BS 7671 - Requirements for Electrical Installations. IET Wiring Regulations;
- BS EN 50174-1:2018+A1:2020 - Information Technology. Cabling Installation. Installation specification and quality assurance;
- BS EN 50174-2:2018 - Information Technology. Cabling Installation. Installation planning and practices inside buildings;
- BS EN 50174-3:2013+A1:2017 - Installation Technology. Cabling Installation. Installation planning and practices outside buildings ; and
- BS IEC 61000-5-2 - Electromagnetic compatibility. Installation and Mitigation guidelines. Earthing and cabling,

9.15. The levels of EMC compliance with the various Standards described herein should be documented in the Operation and Maintenance (O&M) manuals.

9.16. Any outcomes of testing that require to have particular attention going forwards through maintenance should also be suitably documented in O&M manuals.


	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	18 of 21

10. Technical Documentation


10.1. The Technical Documentation (TD) will comprise the documentation listed below in Table 10.1.

Table 10.1: Technical Documentation

Asset Family	Document	From	To
Depot	EMC Management Plan	Supplier	Scheme Sponsor
	Hazard Analysis		
	Certification Report		
Control Room	EMC Management Plan		
	Hazard Analysis		
	Certification Report		
Electrification	EMC Management Plan		
	Hazard Analysis		
Signalling	EMC Management Plan		
	Hazard Analysis		
	Certification Report		
Substations	EMC Management Plan		
	Hazard Analysis		
	Certification Report		
Track-side Systems	EMC Management Plan		
	Hazard Analysis		
	Certification Report		
Trams	EMC Management Plan		
	Hazard Analysis		
	Certification Report		
Whole Railway	EMC Strategy	EMC Specialist	Scheme Sponsor
	Letters of Note and Support	Special Case Third Party	
	EMC Test Plan(s)	EMC Specialist	
	EMC Test Report (pre-energisation)		
	EMC Test Report(s)		
	EMC Assurance Document		
	Document Package	Scheme Sponsor	Responsible Person and ORR

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	19 of 21

- 10.2. When the documentation is complete, the Scheme Sponsor should supply the Infrastructure Manager with the documentation as well as providing a copy to the ICP for their EMC safety verification assurance.

	MANAGEMENT OF ELECTROMAGNETIC COMPATIBILITY (EMC) GUIDANCE		LRSSB - LRG - 3.0	
			Issue	2
			Revision	2
			Date	30/10/2023
			Page	20 of 21

11. Acceptance by the RSA

Schedule of Key Milestones and Tasks

11.1. Listed below are the stages towards EMC compliance and acceptance by the RSA. This is followed by Figure 11.1 that illustrates the interaction with the RSA as part of this process.

11.2. The Scheme Sponsor should agree formal timescales and deliverables with the RSA at an early stage to ensure an efficient and cost effective process.

11.3. Stage 1 - EMC Strategy

- Prepare the EMC strategy documentation detailing interaction with any relevant third parties (as detailed in Section 10 of this document);
- Submit EMC Strategy to the RSA; and
- Receive RSA response - 'Noting and Supporting'.

11.4. Stage 2 - HAZID

- Perform the HAZID analysis (as detailed in Section 8 of this document);
- Carry out multi-discipline risk assessment;
- Prepare of EMC Case for Safety (CfS) for interface with third party infrastructure and equipment;
- Submit the CfS to RSA; and
- Receive response from RSA - 'Noting and Supporting'.

11.5. Stage 3 - Immunisation Modelling

- Carry out EMC Studies:
 - Signalling;
 - Other (non-signalling) assets;
- Submit EMC Studies to RSA; and
- Receive RSA response - 'Noting and Supporting'.

11.6. Stage 4 - Immunisation Works

- Design resultant agreed mitigation works of third party assets;
- Submit designs to RSA for approval;
- RSA approval;
- Implement alterations to third party assets;
- Test and verify altered assets;
- Submit report demonstrating successful testing to RSA; and
- RSA accept altered assets.

11.7. Stage 5 - EMC Testing

- Prepare the EMC test plan (as detailed in Section 9 of this document);
- Submit EMC test plan to RSA; and
- RSA Response 'Noting and Supporting'.

11.8. Stage 6 – Case for Safety (CfS)

- Update Final CfS with Assurance of Compatibility;
- Submit Final CfS to RSA; and
- Receive RSA Letter ‘Noting and Supporting’ bringing new rolling stock and / or Infrastructure into Passenger Service.

Figure 11.1: Interaction with the RSA for EMC Compliance

