1. Signal and Telecommunication Installations

1.2 The tracks over which the Locomotive propulsion system shall work may be equipped with AF (Audio Frequency)/ DC track circuits and AC track circuits at 83.33 Hz and at higher frequencies. Similarly, other devices like axle counters, block instruments, point machines, etc., may also be used. On the communication network, control circuits and teleprinter circuits, VHF/UHF and microwave circuits are used.

1.3 The harmonic currents injected in the overhead supply system (as also the track return current) can introduce voltage harmonics on power supply and can interfere with signal and telecom circuits. The design of the power electronics and control electronics provided on the propulsion system shall be such as not to cause levels of interference exceeding the levels specified below at any point on the operating routes identified in Clause 2.2 of these Specifications and Standards or on adjacent lines under all modes of operation (including multiple operations) and including failure modes:

SN	Interference Current	Overall Limit
1.0	Psophometric current AC traction	10.0 A
2.0	DC component in AC mode	4.7 A
3.0	Second Harmonic component (100 Hz) and 83.33 Hz component in AC traction	8.5 A
4	1400 Hz up to 5000 Hz	400 mA
5(i)	>5000 Hz up to 32000 Hz	270 mA
5(ii)	39500 Hz up to 43500 Hz	270 mA

(Note: The measurement of the interference current shall be done in track return current circuit of the Locomotive.)

1.4 The Company shall undertake FFT (Fast Fourier Transformation) analysis of the total current from 1000Hz to 5000Hz and 5kHz to 50kHz separately to find out the frequencies which produce the highest currents within each bandwidth. In the frequency bands >32000Hz to <39500Hz and >43500Hz to 50000Hz the frequencies at which the current values exceed 270mA shall be identified. This test shall be included within the tests listed in Clause 5.6 of Particular Specifications of Testing and Commissioning and the results shall be provided in a Type Test report.

1.5 EN 50238 is currently under revision and shall include interference current limits for track circuits and axle counters. Where these overall interference current limits are more onerous than those stated in Clause 2.7.2 of these Specifications and Standards these limits shall be applied subject to provisions made in Clause 1.2.3 of these Specifications and Standards.

2. EMC

2.1 The Locomotives shall comply with the EN 50121/IEC62236 series of Railway Electromagnetic Compatibility standards and EN 50238.

2.2 The Company shall prepare, implement and maintain an EMC Management Plan in accordance with the standards referenced in Clause 2.8.1 of these Specifications and Standards. Where the Company requires additional information regarding the operational environment of the Locomotives this shall be listed as part of the Design Package and the Government shall, if available, provide this information within a reasonable time period.