

# Basic Aspects of EMI in System Environment

By

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# Introduction

- A variety of possible **EM1 sources** (or noise sources) existing in the electromagnetic environment.
- These sources can potentially degrade the performance of an electronic system operating in their vicinity
- On the basis of their origin, they can be classified into two broad categories: as **natural noise** and as **man-made noise**

# NATURAL NOISE

- Principal natural phenomena that can cause disturbances for an electronic device are:-

Terrestrial	Extraterrestrial
Atmospherics (noise from lightning around the world)	Cosmic/galactic radio noise
Nearby and Medium distant lightning	Solar noise (whistles, solar disturbed and quiet radio noise )
Electrostatic Discharge (ESD)	

- Atmospheric noise is caused by electric discharge in the atmosphere; strong sources of **atmospheric noise** are **lightning** and **electrostatic discharge (ESD)**
- **ESD** is a natural phenomenon in which accumulated static charges are discharged and in turn cause EMI.
- The Milky Way galaxy and the sun are the primary sources of **extraterrestrial** or cosmic radio noise.
- These sources can be of two types: spatially extensive and spatially discrete.
  - Spatially extensive sources emit broadband noise while emissions from the discrete sources may be either narrowband or broadband

# MAN-MADE NOISE

EMI sources due to the power network and its equipment	EMI sources due to industrial and commercial equipment	EMI sources due to machines and tools	EMI sources due to communication systems	EMI sources due to consumer devices
<ul style="list-style-type: none"> <li>•Switching operations</li> <li>• Power faults</li> <li>•Rectifiers</li> <li>•Electric motors</li> <li>•Contractors</li> <li>•Static and rotary connectors</li> </ul>	<ul style="list-style-type: none"> <li>•Arc furnaces</li> <li>• Fluorescent lamps</li> <li>•Induction furnaces</li> <li>•Neon displaces</li> <li>•Air conditioning</li> <li>•Medical equipment</li> </ul>	<ul style="list-style-type: none"> <li>•Workshop machines</li> <li>•Rotary saws</li> <li>•Rolling mills</li> <li>•Compressors</li> <li>• Cotton mills</li> <li>•Ultrasonic cleaners</li> <li>•Welders</li> </ul>	<ul style="list-style-type: none"> <li>•Radio broadcast stations</li> <li>•Citizens-band</li> <li>•TV stations</li> <li>•Mobile telephones</li> <li>•Radar</li> <li>•Remote control door-opening transmitters</li> </ul>	<ul style="list-style-type: none"> <li>•Microwave ovens</li> <li>•Vacuum cleaners</li> <li>•Refrigerator</li> <li>•Hair dryers</li> <li>•Thermostats</li> <li>•Shavers</li> <li>•Mixers</li> <li>•Light dimmers</li> <li>•Washing machines</li> <li>•Personal computers</li> </ul>

# CW AND TRANSIENT SOURCES

- Classification of EMI sources on the basis of the time domain behavior of their emissions into continuous wave (CW) and transient sources.

Sources of Continuous EMI (Sources with Fixed Frequencies)	Sources of Transient EMI/ Sources with a Large Frequency Spectrum
Broadcast stations	Lightning
Highpower radar	Nuclear EMP
Electric motor noise	Powerline faults (sparking)
Fixed and mobile communications	Switches and relays
Computers, visual display units, pointers	Electric welding equipment
High-repetition ignition noise	Low-repetition ignition noise
AC/multiphase power rectifiers	Electric train power pickup arcing
Solar and cosmic radio noise	Human electromotor discharge