

EMP Qualification of a Modern Fighter Aircraft

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For many years, military aircraft have had to be able to continue to operate in a hostile electromagnetic (EM) environment. The electromagnetic pulse (EMP), which is generated by a nuclear detonation, has to be considered as part of this electromagnetic environment. Consequently, military systems of strategic importance and high value assets such as fighter aircraft must be hardened against the effects of EMP such that continued operational capability is sustained. Flight safety and mission critical systems have an increasing dependence on electronics for continued operation. The procedures used to demonstrate hardness against EMP for these systems have had to become more thorough and more cost effective. Recently, system qualification based only on illuminating the aircraft in typical operational conditions with the full threat field has become impractical due to the cost, restrictions of use, availability of simulator facilities and the high levels required to determine adequate safety margins.

In this paper, we will discuss the route to EMP qualification of a modern fighter aircraft such as Eurofighter Typhoon. The Eurofighter Typhoon program has chosen an EMP clearance process which consists of equipment level qualification, system verification trials and data analysis due to technical considerations and regard to cost efficiency. Either predictions from low level swept current (LLSC) data or coupled currents from simulator trials extrapolated to the specified EMP environment are used for comparison against equipment qualification data. A qualification margin is determined by these comparisons.

The second part of this paper will focus on specific issues associated with transient measurements experienced during system level EMP trials. These include simulator requirements, requirements for the employed measurement chain, the analysis and assessment of measured data and the determination of safety margins. Particular attention will be paid to the differences between classical EMC measurements and data collected during high power transient measurements such as those associated with EMP trials. Important aspects will be illustrated by lessons learned during the recent Eurofighter Typhoon system level EMP trial.