Analysis, Modelling and Measurement of the Effect of Intentional High-Power Microwave Radiation on Electronic Circuits

Research Field
Electronic Engineering
Electromagnetic Compatibility
Computational Physics

Project Suitability
PhD/MPhil

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Intentional high-power microwave (HPM) interference poses a serious threat to electronic, communication and computer systems worldwide. HPM sources are able to reach radiated power levels in excess of hundreds on megawatts and even reaching gigawatt levels. These intensely powerful sources coupled with high-gain antennas are capable of delivering sufficient radiation to cause system upset and permanent failure from kilometre distances.

Given the reliance of our modern world on proper functioning of such systems, it is rather surprising that no standard has been fully developed that governs the susceptibility and immunity of electronic products against the HPM interference. This project seeks to contribute to further understanding of the interaction of HPM radiation with electronic devices through analysis, modelling and measurement that are key to the development of such standards. The analysis entails identifying the most susceptible coupling path from the incident electromagnetic wave to the target device. This involves modelling the electromagnetics of the target device as well as modelling the response of the circuit to the interference. These modelling and calculate results are validated against prototype measurements.

This project builds on the existing collaboration between the Curtin Institute of Radio Astronomy (CIRA) and the Defence Science Technology (DST) group in understanding the interaction of HPM with electronic devices. The student has the opportunity to perform experiments at the radio frequency instrumentation laboratory at CIRA and Curtin as well as interact with DST subject matter experts.