LIST OF RESEARCH TOPICS

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1. Simple Model of Wideband Antennas for EMC Measurements

E-field measurements together with H-field measurements are the basis of every experimental study in the domain of EMC. These tests require accurate standard antennas, having well-known Gain and Antenna Factor AF. These characteristics could be determined by measurement and calibration or by theoretical methods (calculable standard). For the reason of their simple and calculable radiating characteristics, the linear dipole antennas are often used for EMC tests. Half wavelength dipole has well-known calculable radiation characteristics and can be used as calculable standard for EMC measurements with low uncertainty level. Nevertheless, this antenna is not wideband and for different frequencies its length should be adjusted to resonant. This fact can reduce the application range of the dipole and rise the calibration time.

The wideband antennas especially for the most common EMC frequency range i.e. 100MHz to 2GHz will be studied together with their matching systems (Balun). The project commences by studying the EM behavior of planar log-periodic, spiral and bi-conical antennas together with the current distribution modeling. The simplified models will be proposed and the antenna will be calculated and optimized for the EMC measurements.

Level: Ph.D or two M.Eng
Supervisor: Assoc. Prof. Dr. Alireza Kazemipour
Co-supervisor: Prof. Dr. Mohd Zarar Mohd Jenu
Grant: No

2. Accurate measurements of ambient EM field

Measurements of ambient EM strength are normally undertaken to ascertain the exposure level for comparison with recommendations by WHO or ICNIRP. The accuracy of the measurements is dependent on various factors such as vicinity to conductors, antenna type, cable effects, personnel intervention and environment. This research is to quantify the uncertainty of the measurements due to the aforementioned factors. The main stress will be on the calibration and realization of EM-field (CW and pulsed/modulated RF signals) sensors. A fully calculable RF-power sensor is in perspective including the reception antenna and its integrated detector element. The application will be about the in-situ base-station radiation measurements and the ecological effects of EM-fields.

Level: Ph.D or two M.Eng
Supervisor: Assoc. Prof. Dr. Alireza Kazemipour
Co-supervisor: Prof. Dr. Mohd Zarar Mohd Jenu
Grant: No
3. Screening effectiveness of coaxial cables

The screening effectiveness test is normally conducted for audio video equipment as required in CISPR 20. In this research the analytical model of various coaxial cables will be developed and common mode current in the inner and outer conductors will be predicted. The results will be compared with experimental data.

Level: M.Eng
Supervisor: Prof. Dr. Mohd Zarar Mohd Jenu
Grant: No

4. Electromagnetic Anechoic Chamber Modeling and Measurements

Radiated emission and immunity testing are normally conducted in an anechoic chamber which characteristics must be in accordance stipulated by international standards such as ANSI 63.4 or IEC61000-4-3. This requires measurement of parameters such as Site Attenuation, VSWR and Field Uniformity. The aim of this research is to model analytically the existing 3 meter semi anechoic chamber at the EMC center UTHM using ray tracing approach. The results from this research could be applied for future development of a reliable and economical chamber.

Level: Ph.D
Supervisor: Prof. Dr. Mohd Zarar Mohd Jenu
Co-supervisor: Assoc. Prof. Dr. Alireza Kazemipour
Grant: No

5. Interaction of RF radiation with the human body electrical system

The biological effects of excessive electromagnetic energy exposure have been a major concern since after World War 2. Over the last 50 years not less than 2000 peer reviewed publications on rf bioeffects could be traced. The study types can be categorized under epidemiological, human, animal and in vitro. ICNIRP provides guidelines on reference level related to potential heating of the body. This research is to look into different aspects of the potential impact of the rf exposure on the body electrical system. The nervous system is composed of two parts: the central nervous system, which is the control centre comprising the brain and the spinal cord, and the peripheral nervous system, which consists of nerves connecting other parts of the body to the control centre. Via a combination of electrical and chemical processes, the nervous system is used to control the functioning of the entire human body. Displacement of charges due to external forces by the rf radiation might impede the smooth functioning of the nervous system. A reliable electrical model of the human body will be suggested and circuit modeling with and without incoming g rf radiation will be modeled and analyzed.

Level: M.Eng
Supervisor: Prof. Dr. Mohd Zarar Mohd Jenu
Co-supervisors: Dr. Azizi Miskon, Assoc. Prof. Dr. Alireza Kazemipour
Grant: FRGS 1/2010
6. Development of a reverberation chamber for high intensity immunity test

A reverberation or mode stirred chamber (MSC) is capable of generating up to 100 V/m with input power of 1 watt. This is useful for radiated immunity test of components related to automotive and defense industries. This research is related to measurements of field distribution in an existing MSC and the development of software and hardware necessary for the functionality of the facility.

Level: Ph.D
Supervisor: Prof. Dr. Mohd Zarar Mohd Jenu
Grant: No

7. SAR measurements due to modulated and impulsive RF radiation

Most studies on Specific Absorption Rate (SAR) in human body are limited to CW RF exposure. It is interesting to study the significance of modulated and impulsive radiation effects on the SAR especially in human head. Our initial study shows that emission from a mobile phone is highest if a cable is attached such as during charging or when operating in hands-free mode. Modeling and measurements will be conducted.

Level: Ph.D
Supervisor: Prof. Dr. Mohd Zarar Mohd Jenu
Co-supervisors: Dr Rozlan Alias, Assoc. Prof. Dr. Alireza Kazemipour
Grant: No

8. Dipole equivalence of multiple trace bending on a microstrip

This research is to provide simplified approach to the problem of emission due to multiple trace bents on a microstrip. This is an extension to a previous work on single bent emission. The traces can be modeled as dipole antennas with various orientations and excitations.

Level: M.Eng
Supervisor: Prof. Dr. Mohd Zarar Mohd Jenu
Co-supervisor: Prof. Dr. Christos Christopoulos
Grant: No

9. Magnetic shielding effectiveness of an enclosure

The magnetic shielding effectiveness of a metallic enclosure can be modeled as an equivalent electrical circuit and the results will be compared with experimental data. The capability of the enclosure to contain and route the flux for various enclosure materials, openings and sizes will be conducted and compared with experimental data.

Level: Ph.D
Supervisor: Prof. Dr. Mohd Zarar Mohd Jenu
Grant: No