PhD Oral Defense

Date: **09 October 2020 (Friday)** **Time:** **4:00pm**

Thesis Title

Artificial Anisotropic Materials for Antenna Designs and Measurements

Mr DING Chen (Supervisor: Prof. LUK Kwai Man)

Abstract

This thesis presents a series of novel circularly polarized (CP) antennas and new gain measurement techniques using artificial anisotropic materials. The artificial anisotropic material, initially used in the waveguide, has a wide bandwidth, low reflection and high flexibility in manipulating the polarization of electromagnetic (EM) waves. With the newest fabrication technology such as 3D printing, the artificial anisotropic material shows great potential in building the polarizers for CP antennas and the antenna probes of the measurement systems.

First, minimization of the polarizer using the conventional artificial anisotropic material is studied. An analytical solution for the optimal dielectric ratio is provided for obtaining minimal thickness of the polarizer. The thickness of the planar dielectric polarizer is further reduced using high-dielectric-constant materials and a special three-layered structure.

Second, a wideband omnidirectional CP antenna using a conformal artificial anisotropic material is proposed for millimeter-wave applications. The methodology for designing the polarizer is the first of its kind to generate wideband CP wave omnidirectionally.

Third, the major axis of the elliptically polarized (EP) wave generated by an LP radiating source and artificial anisotropic material is analyzed. Based on the analysis, a novel rotation-free phaseless far-field gain measurement method for antennas with any polarizing characteristics is proposed, where no probe rotation or phase information is required in the process of the measurement.