

# **THz-TDS NDE Inspection Techniques for Defect Evaluation on the Trailing Edges in Wind Turbine Blades**

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In this study, a method was proposed for measuring a refractive index of a composite using T-rays (THz) and the characteristics of the T-ray E-field of a CFRP composite were investigated based on the angle between one-ply fiber axis and the electric field (E-field) vector according to the conductivity. Terahertz waves (T-ray) have a limited penetration in CFRP composites because of the conductivity. However Terahertz waves (T-ray) could penetrate the materials of the trailing edge in wind turbine blades due to the nonconductivity. So it was found that T-ray interacts with the electrical conductivity and electric field direction of composites. In the trailing edge of wind turbine blades, when scanning a blade in a complex shape, the effect of the shape and the composite can be minimized in the axial direction and also T-rays are affected by THz signals due to internal defects of the trailing edge. Here when the THz-TDS (Time domain spectroscopy) system was used to measure the TOF of T-ray penetration, the measured TOF values were overall in agreement with one another within  $\pm 5.2\%$ . The slight difference can be the effect of the trailing edge of the wind turbine blade made of three composite materials, as well as the internal defects such as fiber and resin deficiency and voids. It was confirmed that the degree of optimum detection technique should be on scanning the defect to the axial direction for the blades.