Experimental 210GHz terahertz nondestructive testing for aerospace composite materials

In this paper, we propose a terahertz nondestructive testing method to achieve the image of the aerospace composite materials. We commence in the following manner, using the continuous back wave oscillator (BWO) as the source of terahertz radiation, which has a frequency of 210 GHz. By the reflection type imaging testing system, the terahertz probe focus moves from the surface to inside of the concealed composite materials. The materials are bonded on the two-dimensional scanning translation units towards the focal of the terahertz mirror, which can move in real-time to get the data by the phase-locked amplifier. All the system is controlled by the computer. The interior structure can be tested by the images range from 0.5mm to 1mm resolution. The images are calculated by principal component analysis (PCA) and the least square method (LSM). With the proper math to calculate in Matlab, the structure, the size, position and shape defects such as cracks, inclusions, empty and bubbles in the aerospace insulation composite materials can be tested by the terahertz image system. It is a more convenient and intuitive method of imaging inner aerospace composite material.