

Technical support for small and medium enterprises using optical, millimeter-wave and microwave measurement instrument

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Abstract We support small and medium enterprises for communication, medical, analysis, sensing and various fields in Kyoto. We introduce optical, millimeter-wave and microwave measurement instrument in our Center.

Keywords Near-Field measurement, Millimeter-wave, O/E E/O measurement, Shielding effect, Absorption.

1. Introduction

We are providing measurement services for some optical devices, traceable measurements for electromagnetic compatibility testing, basic antenna parameter measurement at frequency range from 30MHz to 110 GHz for Japanese small and medium enterprises, engineers, and scientists. We also support them through collaborative development and Kyoto optical technology study committee.

This paper presents our technical support services.

2. Technical support for Japanese small and medium enterprises

We are providing measurement services and technical support using measurement instruments as follows.

- Planer near-field antenna measurement for millimeter-wave antennas.
- Far-field antenna measurement for microwave antennas.
- Measurement for electromagnetic shielding effect and electromagnetic absorption performance, dielectric constant and permeability measurement using Free-Space Method.
- Measurement for electromagnetic shielding performance using Dual-Focus Flat Cavity (DFFC) and KEC method.
- Measurement for some properties of electric to optical conversion (E/O) device, and electrical to optical conversion (O/E) devices using Optical Component Analyzer.

2.1 Planer near-field antenna measurement

Planer near field antenna measurement system can estimate far field antenna radiation pattern using near field to far field transformation theory. Our system consists of planer antenna scanning system and a vector network analyzer.

Measurement specification

- Vector network analyzer ME7838A.(Anritsu)
Frequency bandwidth: 70kHz to 110GHz.
- Planer antenna scanning system
Scanning area: 800 mm x 800 mm
Frequency range:
Waveguide: 60 GHz to 110 GHz (E-band, W-band)
Coaxial cable: 18 GHz to 60 GHz (coaxial waveguide transducer adapted to WR42, WR28, WR19)
Repeatability for positioning: < 0.05 mm

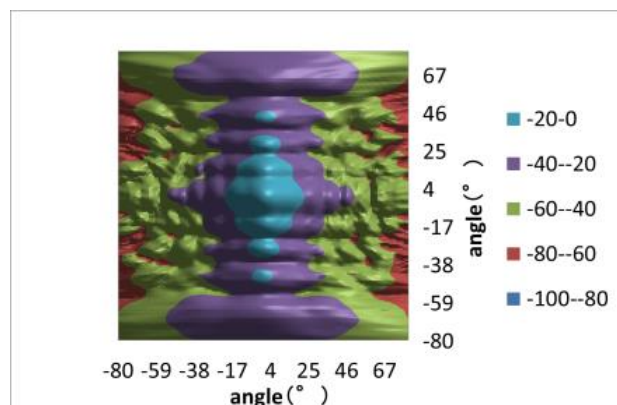


Fig. 1 Measurement result of 3-dimensional directivity pattern for standard gain horn antenna (79GHz).

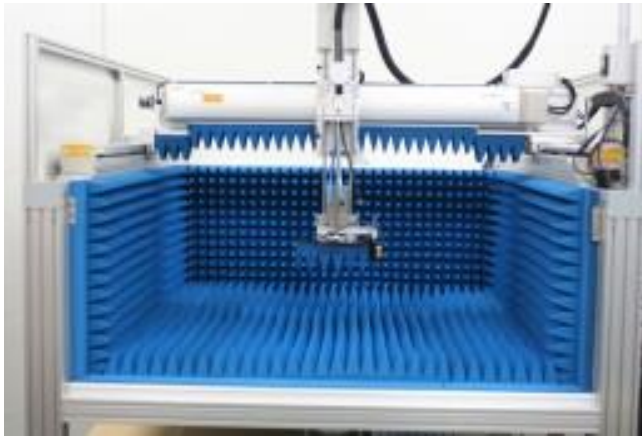


Fig. 2 Planer near field antenna measurement instrument

2.2 N4375D Lightwave component analyzer

Lightwave component analyzer (LCA) can measure the frequency response of O/E conversion devices (detector diodes), E/O conversion devices (modulators and directly modulated lasers), and some 2-port and 4port microwave devices. LCA also can measure antenna radiation pattern and antenna properties.

Measurement specification

- Frequency bandwidth for far-field antenna measurement: 10MHz-26.5GHz.
- This instrument is available to measure E/O and O/E modulation, and have 4 electric-port.
- Transmitter wavelength: 1550 nm, 1310 nm



Fig. 3 N4375D Optical component analyzer of Keysight technology Inc.



Fig. 4 Azimuth table for antenna measurement

2.3 Measurement for electromagnetic shielding effect, absorption and material constant

Electromagnetic shielding effect, absorption and material constant can be measure using free space measurement system that consists of horn antenna, dielectric lens and vector network analyzer in the frequency range of 18 GHz to 110 GHz.

Measurement specification

- Free-space method
- Frequency bandwidth:18-110GHz
- Electromagnetic shielding effect, absorption performance, dielectric constant and permeability



Fig. 5 Set up of free-space method



Fig. 6 Dual-Focus Flat Cavity(DFFC) for electromagnetic shielding effect measurement in the frequency range from 1 GHz to 15 GHz



Fig. 8 E4991A RF Impedance analyzer for dielectric constant and permeability measurement in the frequency range from 1 MHz to 3 GHz. (It copied from Keysight Web page)

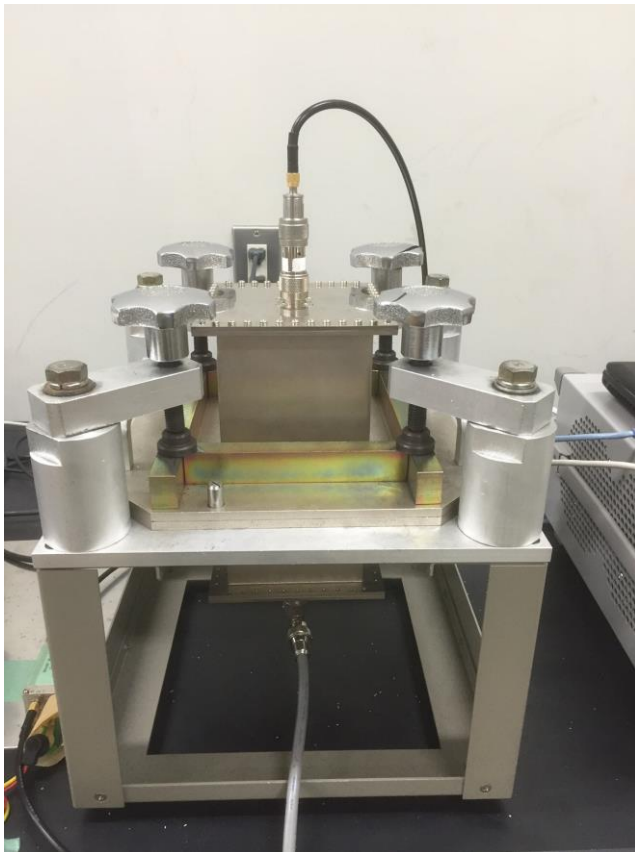


Fig. 7 KEC method jig for electromagnetic shielding effect measurement in the frequency range from 100 kHz to 1 GHz