MILLIMETER WAVE MEASUREMENT SYSTEM
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Ethertronics presents the Ethertronics® ETH-MMW-1000 Millimeter Measurement System.
A cost effective, compact and adaptable solution for testing antennas/devices at mmWave frequencies.

Self-Contained Movable System
Compact and portable, the Ethertronics® ETH-MMW-1000 frees up space in laboratories and production environments. The system integrates its Gigahertz Control Unit, Measurement PC and welcomes a Vector Network Analyzer, a Spectrum Analyzer or a Radiocom Tester. Easily installed into a new or existing construction, the moveable chassis can be relocated within a test facility.

Accurate and Cost Effective Far-Field Measurement System
The Ethertronics® ETH-MMW-1000 includes a distributed axis positioning system, consisting of:
• an azimuth mast rotator for rotating the DUT about the Phi axis,
• a Theta ring positioner for elevating the measurement Horns around the DUT.
Each measurement frequency band uses a dedicated RF path (High Performance RF cables, rectangular waveguides and Horns...). The fully anechoic enclosure provides a shielded environment over a very wide frequency range (from 18 GHz to 110 GHz) and insures stable gain and phase measurement results.

Main Features
Technology
• Far-field / Spherical w/oversampling
Measurement Capabilities (Passive and Active)
• Gain
• Directivity
• Efficiency
• Beamwidth
• Cross polar discrimination
• Sidelobe levels
• 3D radiation pattern
• Radiation pattern in any polarization
• TRP, TIS, EIRP and EIS

Frequency range:
• 18 GHz to 110 GHz

Max. Size of DUT:
• 45 cm

Max. Mass of DUT:
• 10 kg on the mast

Typical dynamic range:
• 50 dB
**Testing Existing and Upcoming Technologies**

The Ethertronics® ETH-MMW-1000 is a flexible turn-key solution, suitable for all testing needs for mmWave system development and validation.

Hence, different combinations are possible, to cover one or several usual Millimeter wave bandwidths (18-26.5 GHz, 26.5-40 GHz, 33 to 50 GHz, 50 to 67 GHz...).

The System is supplied with the complete Ethertronics Software Suite:

- Ethertronics Antenna Measurement (Measurement Control, Data Acquisition)
- Ethertronics Antenna Viewer (Post-processing and tabular/graphical data output).

### System Configuration

<table>
<thead>
<tr>
<th>Software</th>
<th>Ethertronics Antenna Measurement (Measurement Control, Data Acquisition)</th>
<th>Ethertronics Antenna Viewer (Post-processing and tabular/graphical data output)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment</td>
<td>Autonomous Millimeter Measurement System, including:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Complete frame equipped with mechanical positioners and sliding doors, rubberized absorbers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• RF path assembled (RF Cables, Waveguides, Measurement Horns, Amplification stage, Switches...)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Integrated Gigahertz Control Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Integrated Computer (Windows 10)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• (Optional) Vector Network Analyzer</td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Reference Horns</td>
<td>(Optional) Mast adaptation part</td>
</tr>
<tr>
<td>Services</td>
<td>Installation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Training</td>
<td></td>
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<tr>
<td></td>
<td>Warranty</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(Optional) Post warranty service plans</td>
<td></td>
</tr>
</tbody>
</table>

**Screenshots of the Ethertronics Software**

**Aside:** Ethertronics Antenna Measurement *(Measurement Control, Data Acquisition)*

**Below:** Ethertronics Antenna Viewer *(Post-processing)*
Standard System Components

- **Sliding door**: Allows easy access to the center of the system, in order to position the DUT.

- **Rectangular Horn Antenna**: Dedicated to 1 polar/1 frequency bandwidth.

- **Half sphere support interface (Ø 300 mm)**: Includes dedicated notch to position the DUT (tablet/phone type) in vertical/horizontal position.

- **PVC Mast**: The height is easy to adjust in order to center the DUT in the middle of the rotating ring.

- **Vector Network Analyzer**: Placed in the bottom part of the frame, alongside the Integrated GigaHertz Control Unit and the PC Measurement.

- **Steerable Lifting Wheels**: Allow for optimal stability during measurements that still allows quick relocation within the Test Facility.
Electrical System Specifications

- Electrical (VAC): 110-240 VAC
- Voltage (Hz): 50/60 Hz
- Amps (A): 10 A (220V) / 16 A (110V)
- Plug type: Type E/F (CEE 7/7) or NEMA 5-15
- Shield material: Aluminum plate
- External connections: HDMI(F) + C14 (IEC 60320) + USB

Mechanical System Specifications

- Positioners (Theta and Phi): 0-180° or/and 0-360° Rotation
  0.01° Position resolution
- Frame: Aluminium Profile
- Mast + interface: PVC, Polystyren / Rohacell®51, equipped with Slip Ring
  Custom mast & interface also available
- Total overall mass: Around 430 kg (without VNA)
- Shield material: Aluminum
- External dimensions: See Aside

DUT Specifications

- DUT max. mass*: 10 kg
- Maximum DUT size: 45 cm

*Centered Load

*All dimensions are in millimeter and provided in this document for informational purposes only

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Frequency Range
Different combinations are possible, to cover one or several usual Millimeter Wave bandwidths.

- 18 to 26.5 GHz
- 26.5 to 40 GHz
- 33 to 50 GHz
- 40 to 60 GHz
- 50 to 67 GHz
- 50 to 75 GHz

Custom Probe Configuration
In order to optimize the measurement time, the number of measurement probes dedicated to a bandwidth can be optimized. A minimum of 2 measurement probes is required to cover H and V polarizations but up to 12 probes on the ring positioner can be used.

Measurement Time (with 2 measurement probes)

<table>
<thead>
<tr>
<th>Frequencies</th>
<th>Sampling</th>
<th>Time (min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>22.5°</td>
<td>~ 4.5</td>
</tr>
<tr>
<td>10</td>
<td>10°</td>
<td>~ 16.5</td>
</tr>
<tr>
<td>100</td>
<td>22.5°</td>
<td>~ 5.5</td>
</tr>
<tr>
<td>100</td>
<td>10°</td>
<td>~ 19</td>
</tr>
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</table>

Typical Dynamic Range

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Typical Dynamic Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 – 40 GHz</td>
<td>55 dB</td>
</tr>
<tr>
<td>40 – 67 GHz</td>
<td>50 dB</td>
</tr>
</tbody>
</table>

Typical cross polar level that can be measured

<table>
<thead>
<tr>
<th>Range</th>
<th>Typical Cross Polar Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; -30 dB</td>
</tr>
</tbody>
</table>

Peak Gain Accuracy

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 - 35 GHz</td>
<td>± 0.9 dB</td>
</tr>
<tr>
<td>35 - 50 GHz</td>
<td>± 0.9 dB</td>
</tr>
<tr>
<td>50 - 67 GHz</td>
<td>± 0.9 dB</td>
</tr>
</tbody>
</table>

Peak Gain repeatability

<table>
<thead>
<tr>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>± 0.3 dB</td>
</tr>
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</table>