# THz Measurement Challenges and Solutions

## (Based on Electronics)

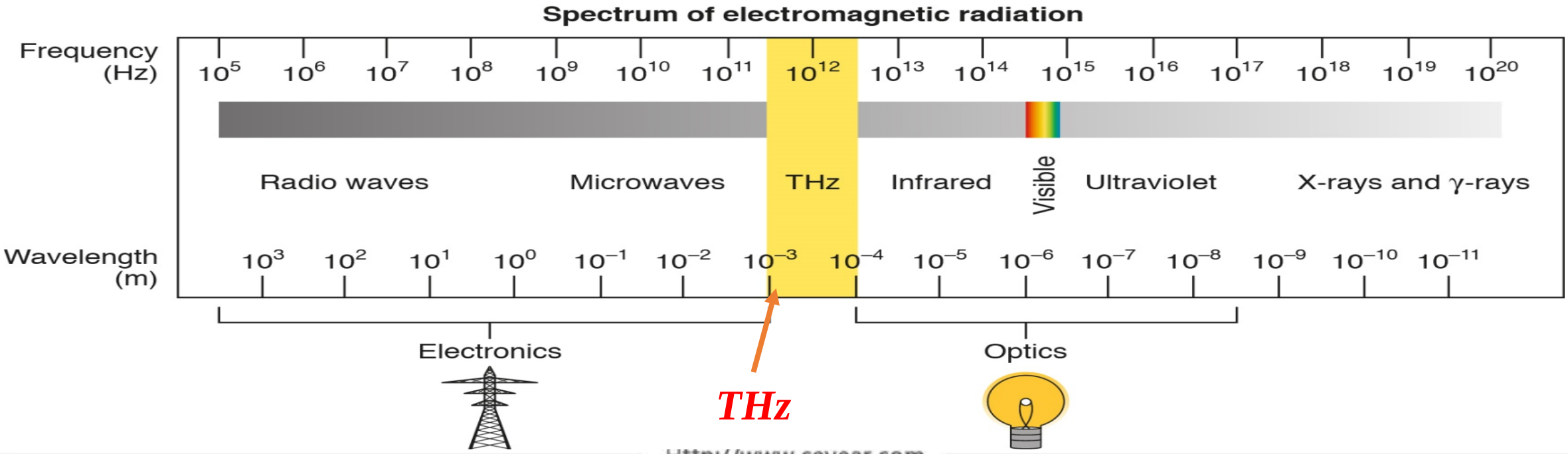
Ceyear Technologies Co., Ltd

Contents

# 1. What is THz (Tera Hertz)?

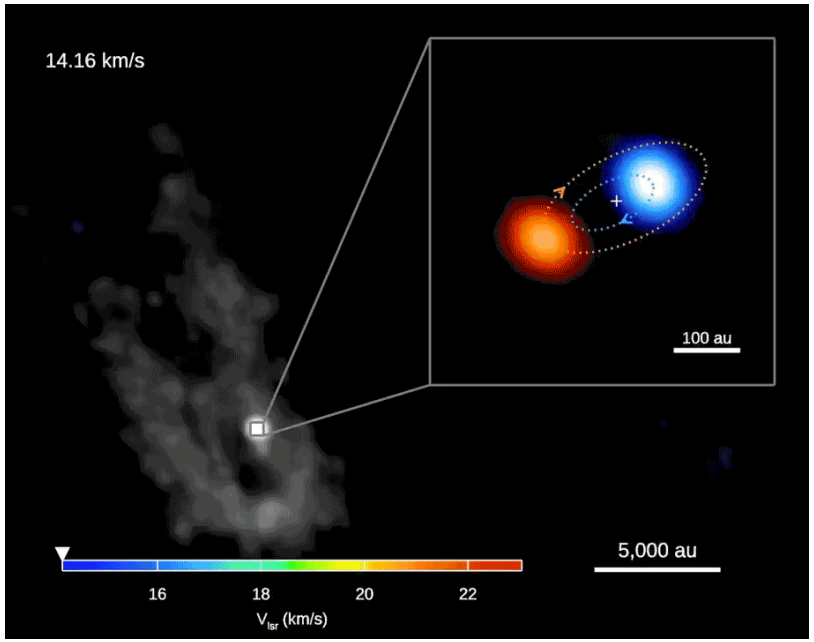
## One of the top ten leading technologies that can change the future!

- 100GHz~10THz frequency band, 0.03mm~3mm wavelength
- Large bandwidth, Limited penetration capability for conducting materials

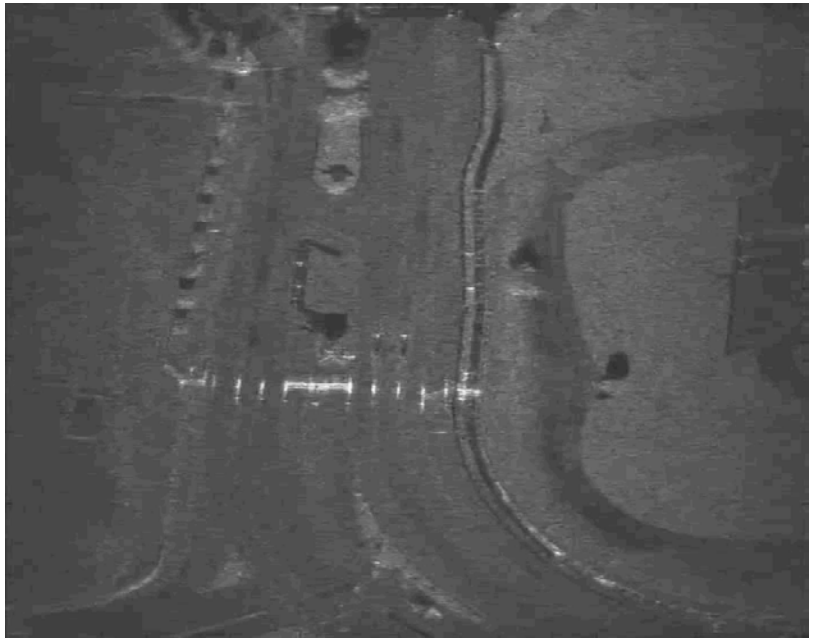


# 2. Why We Need THz?

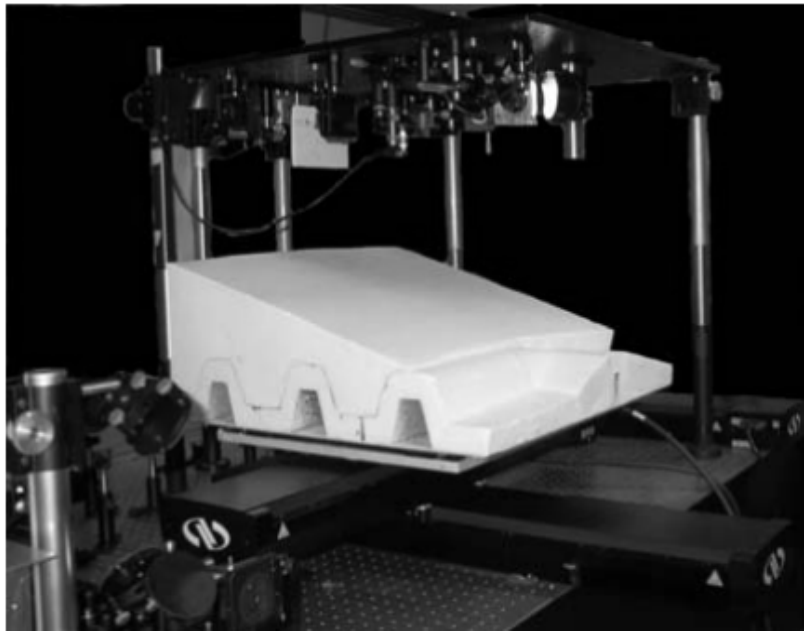
(Animation Demo)




Aerospace Exploring and Imaging



High-definition Radar

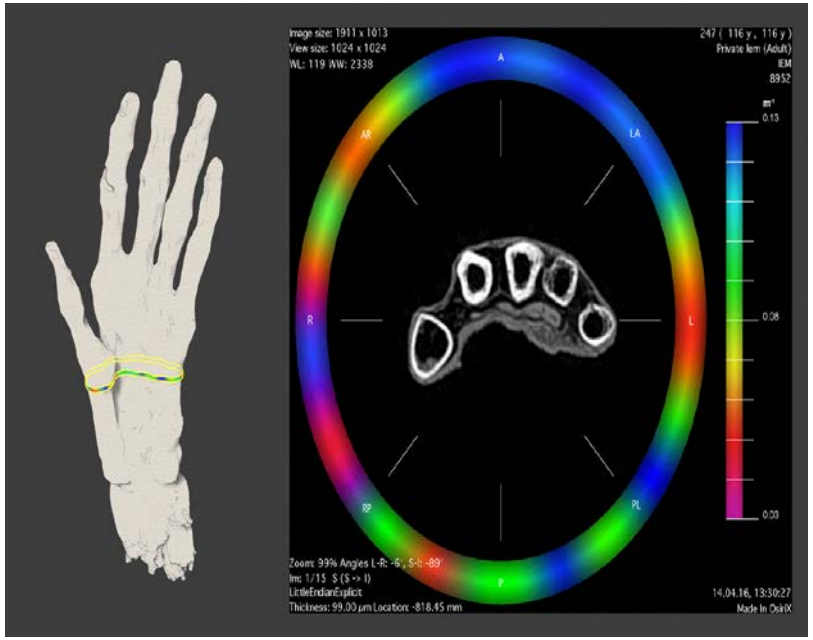


Non-destructive Material Test

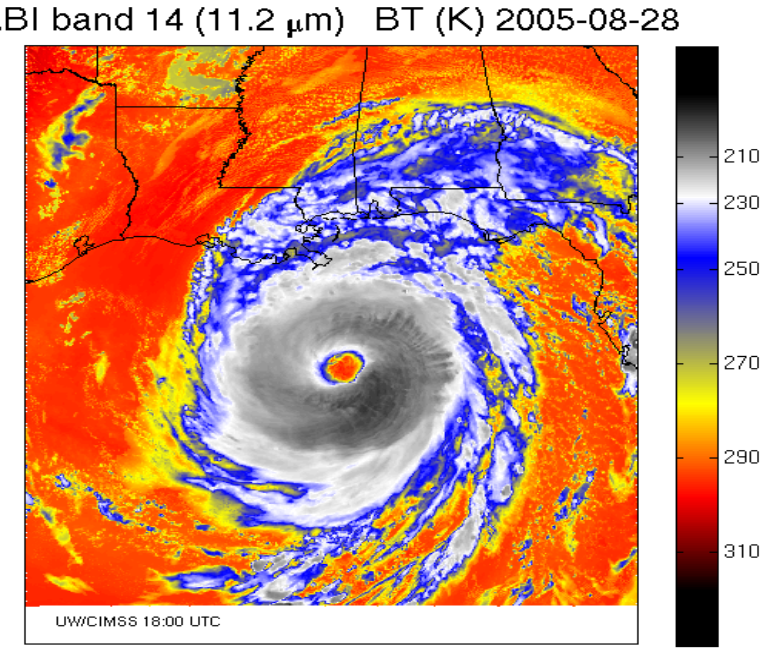
# 2. Why We Need THz?

**(Animation Demo)**

IoT/ 5G/ 6G/ Satellite Communication

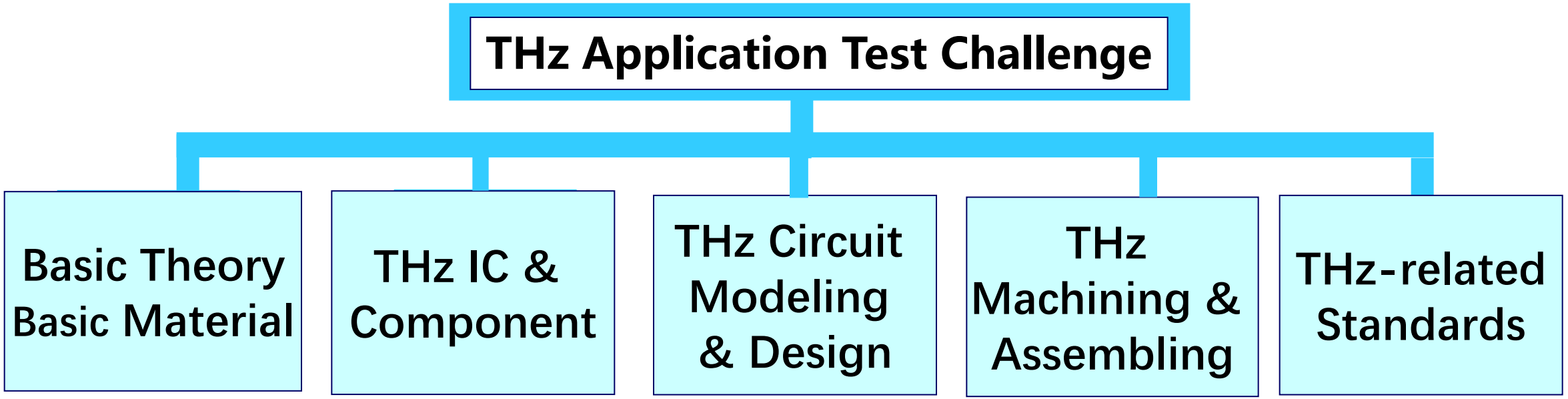


Biomedical Science




Meteorological Remote Sensing

# 3. What Scientist Needs in THz Development?



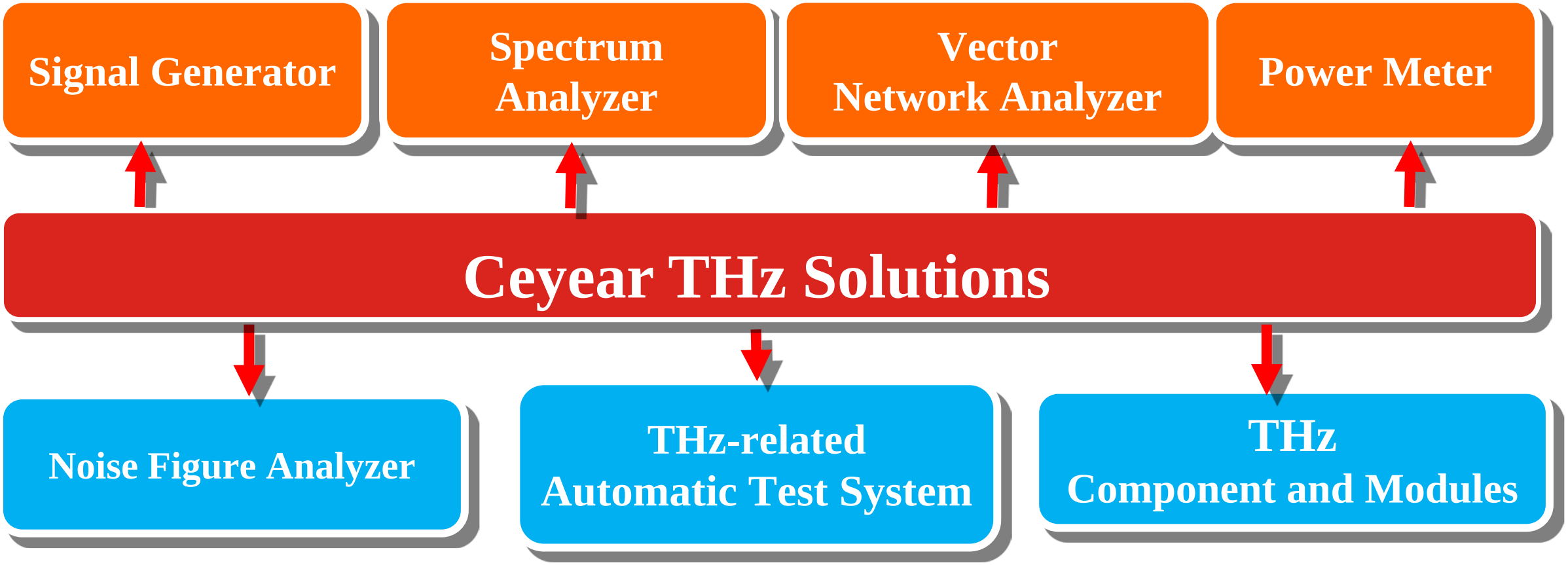

THz Signal Generation： Wideband, High Power, High Stability

THz Signal Analysis： Wideband, High Sensitivity, High Dynamic Range

Contents

# 1. Ceyear Full THz Test Ability Based on Electronics

From 40GHz to 750GHz (1.1THz coming)



# 1. Ceyear MMW Instruments

## Product

- Signal Generator
- Noise Figure Analyzer
- Spectrum Analyzer
- Power Meter
- Vector Network Analyzer

## Overall Level

- Max. frequency extension to 750GHz
- Provide 67 GHz coaxial connectors
- Max 2 GHz signal modulation bandwidth
- Max 550MHz signal receiving analysis bandwidth

# 2. Ceyear THz Extender Modules

## THz Modules

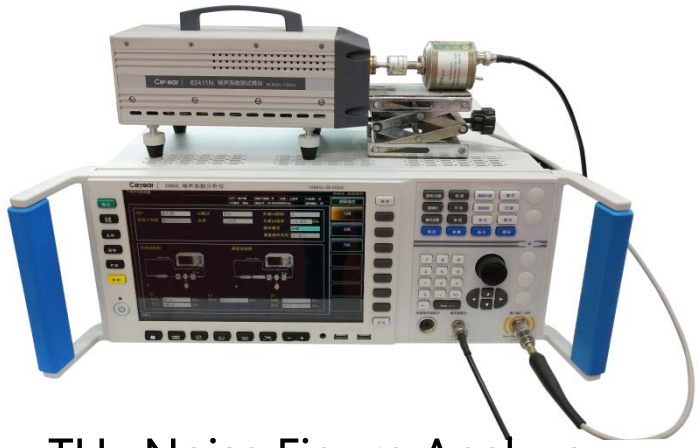
- For Signal Generator
- For Spectrum Analyzer
- For Vector Network Analyzer
- For Noise Figure Analyzer
- For Power Measurement (THz Sensor)

## Overall Capability

- Waveguide 750 GHz, 1.1 THz
- Automatic Level Control (ALC) technology under 110GHz to generate wide dynamic range output power

# 3. Ceyear THz Test Instruments

THz Signal Generator



THz Noise Figure Analyzer

THz Spectrum Analyzer-I

THz Spectrum Analyzer-II

THz
Power Meter


THz VNA (Type I)

THz VNA (Type II)

# 3. 1 THz Signal Generator


**1465 series Signal Generator**
**+ 82401/82406 series Source Modules**

**Ceyear 1465 Series Signal** Generator

- 100kHz ~ 67GHz Frequency Coverage
- Advanced Spectrum Purity
- Ultra-High Power Accuracy & Stability
- Analog/Vector Modulation
- Up to 150dB Dynamic Range

**Ceyear 82401/82406 Series Millimeter-Wave Source Module**

- 50GHz ~ 750 GHz banded Covered
- Amplitude Stabilization (ALC) Capability

# 3. 1 THz Signal Generator

**Ceyear 1465 series Signal Generator Specifications**

| Specifications<br>Model Number | Analog<br>1465A/B/CD/F/H/L | Vector<br>1465A/B/C/D/F/H/L-V |
|---|---|---|
| Frequency Range | 100 kHz to 3/6/10/20/40/50/67 GHz | |
| Frequency Switching | < 20 ms | |
| Sweep Mode | Step, List, Analog, Power | |
| Dynamic Range | Up to 150dB | |
| SSB Phase Noise | -120 dBc/Hz (at 10 GHz, 10 kHz offset) | |
| Analog Modulation | Phase, Amplitude, Frequency, Pulse, Narrow Pulse | |
| Vector Modulation | NA | Formats: PSK, QAM, FSK, ASK, MSK<br>Internal Modulation BW: 200MHz<br>External Modulation BW: 2GHz<br>EVM: < 1% |
| Auxiliary Ports | USB, LAN, GPIB, Monitor, etc. | |

# 3. 1 THz Signal Generator

## -- Extender Modules

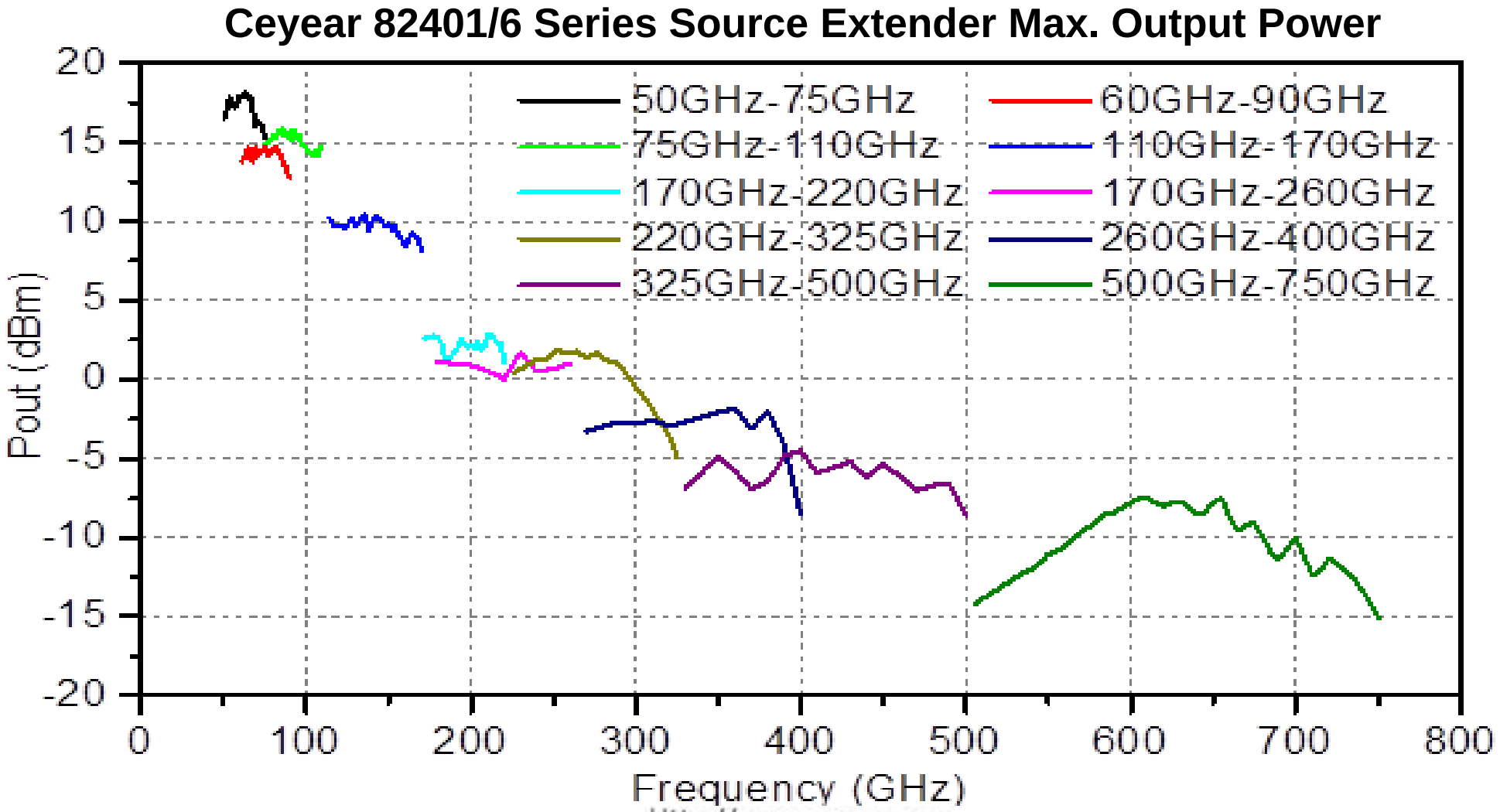
- Banded 50GHz to 750GHz
- Maximum Input Frequency： 24GHz
- Built-in Automatic Level Control circuits to generate adjustable output power under 170GHz
- Advanced Spectrum Purity
- Ultra-High Power Accuracy & Stability

| | | | | | | |
|---|---|---|---|---|---|---|
| 82401N<br>60GHz～90GHz | 82401QA<br>90GHz～140GHz | | 82401SA<br>170GHz～260GHz | 82401TA<br>260GHz～400GHz | | |
| 82406<br>50GHz～75GHz | 82406A<br>75GHz～110GHz | 82406B<br>110GHz~170GHz | 82406C<br>170GHz～220GHz | 82406D<br>220GHz～325GHz | 82406E<br>325GHz~500GHz | 82401U<br>500GHz~750GHz |

* Ceyear 1465 series Signal Generator can automatically identify the frequency band. For other Signal generator, you need setup the multiplier coefficients..

# 3. 1 THz Signal Generator

-- Modules Specs



# 3. 1 THz Signal Generator

-- Modules Specs

**Ceyear 82401/6 Series Source Extender Specifications**

| Specifications | 82406 | 82401N | 82406A | 82401QA | 82406B | 82406C |
|---|---|---|---|---|---|---|
| Frequency Range (GHz) | 50 ~ 75 | 60 ~ 90 | 75 ~ 110 | 90 ~ 140 | 110 ~ 170 | 170 ~ 220 |
| Output Power (dBm) | ≥+15 | ≥+11 | ≥+10 | ≥+6 | ≥+5 | ≥0 |
| Amplitude Stabilization Option | Yes 0~10dBm | Yes 0~10dBm | Yes 0~10dBm | Yes -5~+5dBm | Yes -5~+5dBm | No |
| Input Frequency Range (GHz) | 12.5 ~ 18.75 | 10 ~ 15 | 12.5 ~ 18.33 | 15 ~ 23.33 | 9.17 ~ 14.17 | 14.17 ~ 18.33 |
| Dimensions (W x H x D) | 120 x 85 x 240 | | | | | |
| RF Input Interface | 3.5mm (f) | | | | | |
| Output Interface | WR15 | WR12 | WR10 | WR8.0 | WR6.5 | WR5.1 |

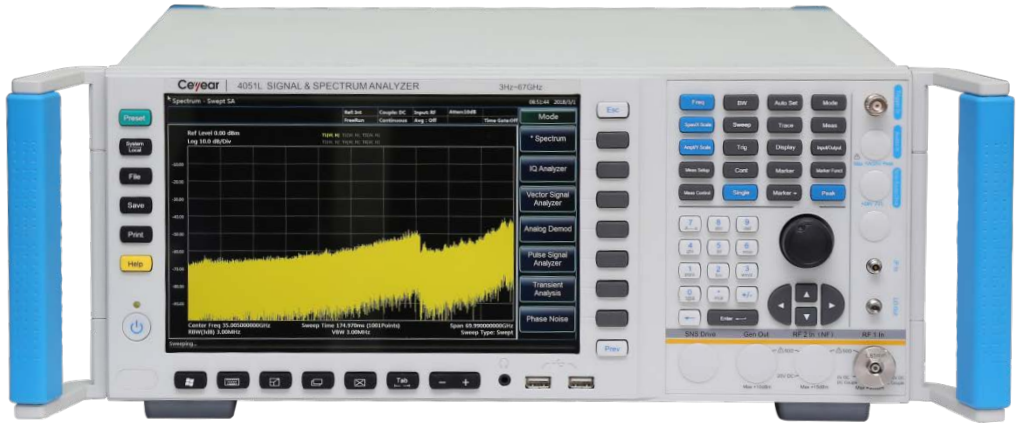
# 3. 1 THz Signal Generator

-- Modules Specs

## Ceyear 82401/6 Series Source Extender Specifications

| Specifications | 82401SA | 82406D | 82401TA | 82406E | 82401U |
|---|---|---|---|---|---|
| Frequency Range (GHz) | 170 ~ 260 | 220 ~ 325 | 260 ~ 400 | 325 ~ 500 | 500 ~ 750 |
| Output Power (dBm) | ≥-3 | ≥-7 | ≥-10 | ≥-16 | ≥-17 |
| Amplitude Stabilization Option | No | No | No | No | No |
| Input Frequency Range (GHz) | 14.17 ~ 21.67 | 12.2 ~ 18.06 | 14.44 ~ 22.22 | 9.02 ~ 13.89 | 9.25 ~ 13.89 |
| Dimensions (W x H x D) | 120 x 85 x 240 | | | | |
| RF Input Interface | 3.5mm (f) | | | | |
| Output Interface | WR4.3 | WR3.4 | WR2.8 | WR2.2 | WR1.5 |

# 3. 2 THz Signal Analyzer





**4051 series Spectrum/Signal Analyzer + 82407 series Extender Modules**

**Ceyear 4051 Series Spectrum Analyzer**

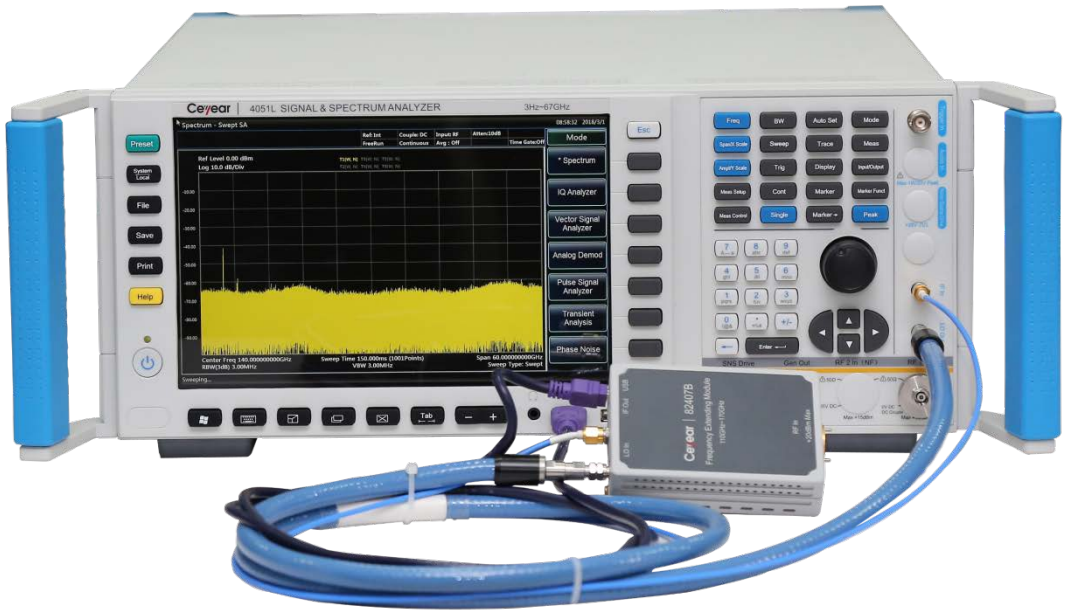
- 3Hz ~ 85GHz Frequency Coverage
- Up to 1.6 GHz Analysis Bandwidth
- 200MHz Real-Time Analysis Bandwidth
- Advanced Receiver Performance
- Comprehensive Spectrum Analysis and Measurement Application Functions

**Ceyear 82407 Series Frequency Extender Module**

- 50GHz ~ 1100 GHz Seamless Covered
- Extremely Low Noise Level

# 3. 2 THz Signal Analyzer

-- Two Dimensions




4051 Series Spectrum Analyzer
+ 82407/NB/A/B/C/D
(50 GHz ~ 325 GHz)

4051 Series Spectrum Analyzer
+ 82407NC/QA/SA/TA/R/U
(170 GHz ~ 750 GHz)

# 3. 2 THz Signal Analyzer

**Ceyear THz Spectrum Analyzer System**

- Banded 50GHz to 750GHz Frequency Coverage
- Automatic pseudo spectral recognition
- Automatic read back Frequency Convert Loss
- Automatic Amplitude Compensation
- USB interface

| | | | | | | |
|---|---|---|---|---|---|---|
| 82407NB/NC<br>60GHz ~ 90GHz | 82407QA<br>90GHz ~ 140GHz | | 82407SA<br>170GHz ~ 260GHz | 82407TA<br>260GHz ~ 400GHz | | |
| 82407<br>50GHz ~ 75GHz | 82407A<br>75GHz ~ 110GHz | 82407B<br>110GHz~170GHz | 82407C<br>170GHz ~ 220GHz | 82407D<br>220GHz ~ 325GHz | 82407R<br>325GHz~500GHz | 82407U<br>500GHz~750GHz |

* Only support Ceyear 4051 series signal/spectrum analyzer.

# 3. 2 THz Signal Analyzer

**Ceyear 4051 series Spectrum/Signal Analyzer Specifications**

| Specifications | 4051 A/B/C/D/E/F/G/H/L/N |
|---|---|
| Frequency Range (GHz) | 3 Hz to 4/9/13.2/18/26.5/40/45/50/67/85 |
| Frequency Span (Hz) | 0, 10 to Max. Frequency |
| Resolution Bandwidth (MHz) | 1 Hz to 3 (1, 2, 3, 5 steps) 4, 5, 6, 8, 10, 20 |
| Sweep Time | ≥10Hz: 1ms~6000s; 0Hz: 1μs~6000s |
| Trigger Modes | Free, Peak, Sample, Average |
| DANL (dBm) | ≤-154 (@26.5 GHz, Preamp On) |
| Phase Noise (dBc/Hz) | -125 (@1GHz, 10kHz offset) |
| Frequency Response (dB) | ±3 (Preamp Off)/±3.5dB (Preamp On) |
| TOI (dBm) | +9 (@67GHz, -10dBm input, 50kHz interval) |

# 3. 2 THz Signal Analyzer

-- Modules Specs

## Ceyear 82407 Series Frequency Extender Specifications

| Specifications | 82407 | 82407NB | 82407A | 82407B | 82407C | 82407D |
|---|---|---|---|---|---|---|
| Frequency Range (GHz) | 50 ~ 75 | 60 ~ 90 | 75 ~ 110 | 110 ~ 170 | 170 ~ 220 | 220 ~ 325 |
| Harmonics | 5 | 6 | 7 | 9 | 7 | 9 |
| Conversion Loss (max, dB) | 24 | 24 | 28 | 36 | 40 | 48 |
| Noise Level (dBm/Hz) | -132 | -132 | -130 | -120 | -115 | -110 |
| LO Power Range (dBm) | 8 ~ 12 | 8 ~ 12 | 8 ~ 12 | 8 ~ 12 | 8 ~ 12 | 8 ~ 12 |
| RF Max Input Level (dBm) | 20 | 20 | 20 | 20 | 20 | 20 |
| Dimensions (W x H x D) | ≤110×70×25.2 | | | | | |

# 3. 2 THz Signal Analyzer

-- Modules Specs

**Ceyear 82407 Series Frequency Extender Specifications**

| Specifications | 82407NC | 82407QA | 82407SA | 82407TA | 82407R | 82407U |
|---|---|---|---|---|---|---|
| Frequency Range (GHz) | 60~90 | 90 ~ 140 | 170 ~ 260 | 260 ~ 400 | 325 ~ 500 | 500 ~ 750 |
| Harmonics | 6 | 6 | 12 | 18 | 24 | 48 |
| Conversion Loss (max, dB) | 12 | 16 | 16 | 18 | 30 | 25 |
| Noise Level (dBm/Hz) | -150 | -150 | -140 | -150 | -140 | -140 |
| LO Power Range (dBm) | 8 ~ 12 | 8 ~ 12 | 8 ~ 12 | 8 ~ 12 | 8 ~ 12 | 8 ~ 12 |
| RF Max Input Level (dBm) | 15 | 15 | 15 | 15 | 15 | 15 |
| Dimensions (W x H x D) | ≤120×85×240 | | | | | |

# 3.3 THz Vector Network Analyzer

Type I

Type II

**3672 series Vector Network Analyzer + 364X Frequency Extender Modules**

**Ceyear 3672 Series Vector Network Analyzer**

- 10MHz ~ 67GHz Frequency Coverage
- Mechanical & Electronic Calibration
- Mixer/Converter Test
- One-Click Filter Test
- Pulse S-Parameter Test
- Time Domain Measurement

**Ceyear 364X Series Millimeter-Wave VNA Extender:**

- 40GHz ~ 750GHz Seamless Covered
- Large Dynamic Range
- High out power with ALC

# 3.3 THz Vector Network Analyzer

## Type I Configuration

- For user without VNA, we suggest **4 ports VNA** plus **3643 series modules** to achieve whole THz VNA system.
- 3672E VNA can work independently as S-parameter analyser from **10MHz to 67GHz**.

**Type I THz VNA Configurations**

| | Module and Name | Unit | Remarks |
|---|---|---|---|
| 1 | 3672B/C/D/E Vector Network Analyzer | 1 | 4 ports VNA, at least with option S80, 400, 480 or S06 |
| 2 | 364X series Frequency Extender Module | 2 for each band | Option 001 can generator adjustable output power with VNA option S06 |
| 3 | Ceyear series waveguide calibration kits | NC | Correspond to selected Modules |
| 4 | Cables and adaptors | NC | |

# 3.3 THz Vector Network Analyzer

## Type II Configuration

- For user with 2 port VNA, we suggest **2 ports VNA plus** plus 3640A Frequency Extension Controller plus **3643 series modules** to achieve whole THz VNA system.
- 3672E VNA can work independently as 2 or 4 S-parameter analyser from **10MHz to 67GHz**.

**Type II THz VNA Configurations**

| | Module and Name | Unit | Remarks |
|---|---|---|---|
| 1 | 3672B/C/D/E Vector Network Analyzer | 1 | 2 ports VNA, at least with option S80. |
| 2 | 3640A Frequency Extension Controller | 1 | Compatible with Ceyear 3672 VNA and PNA-X VNA |
| 3 | 364X series Frequency Extender Module | 2 for each band | Option 364X-001 can generator adjustable output power with VNA option S06 |
| 4 | Ceyera series waveguide calibration kits | NC | Correspond to selected Modules |
| 5 | Cable， adaptors | NC | |

# 3.3 THz Vector Network Analyzer

## Ceyear 3672 series VNA:

- Wide Freq. Range: 10 MHz~67 GHz
- Outstanding Dynamic Range, Test Speed
- Highly Integrated & Configurable
- Multiple Functions, Extendable features
- High Repeatability, Reliability & Stability
- Complete Component Test Solutions


Ceyear 3672 VNA Front/ Rear Panel

# 3.3 THz Vector Network Analyzer

**Ceyear 3672 Series VNA Specification**

| Specifications | 3672 A/B/C/D/E |
|---|---|
| Frequency Range | 10 MHz to 13.5/26.5/43.5/50/67 GHz |
| Frequency Resolution (Hz) | 1 |
| Number of Ports | 2, 4, 16， 20 |
| Max. Dynamic Range (dB) | 127 |
| Max. Output Level (dBm) | 13.5GHz: +1　26.5GHz: +5　40GHz: +3　67GHz: +5 |
| Power Linearity (dB) | ±2 (3672A/B/C/D) / ±3 (3672E, -20 to -7dBm) / ±3 (3672E, -25 to -20dBm) |
| Pulse Width | 33ns to 60s |
| Trace Noise | 26.5GHz: ≤0.004 / 67GHz: ≤0.02dB |
| IF Bandwidth | 1Hz to 5MHz |
| Display Formats | Log, Linear, SWR, Phase, Group Delay, Smith Chart, etc. |
| Auxiliary Ports | USB, GPIB, VGA, LAN, etc. |

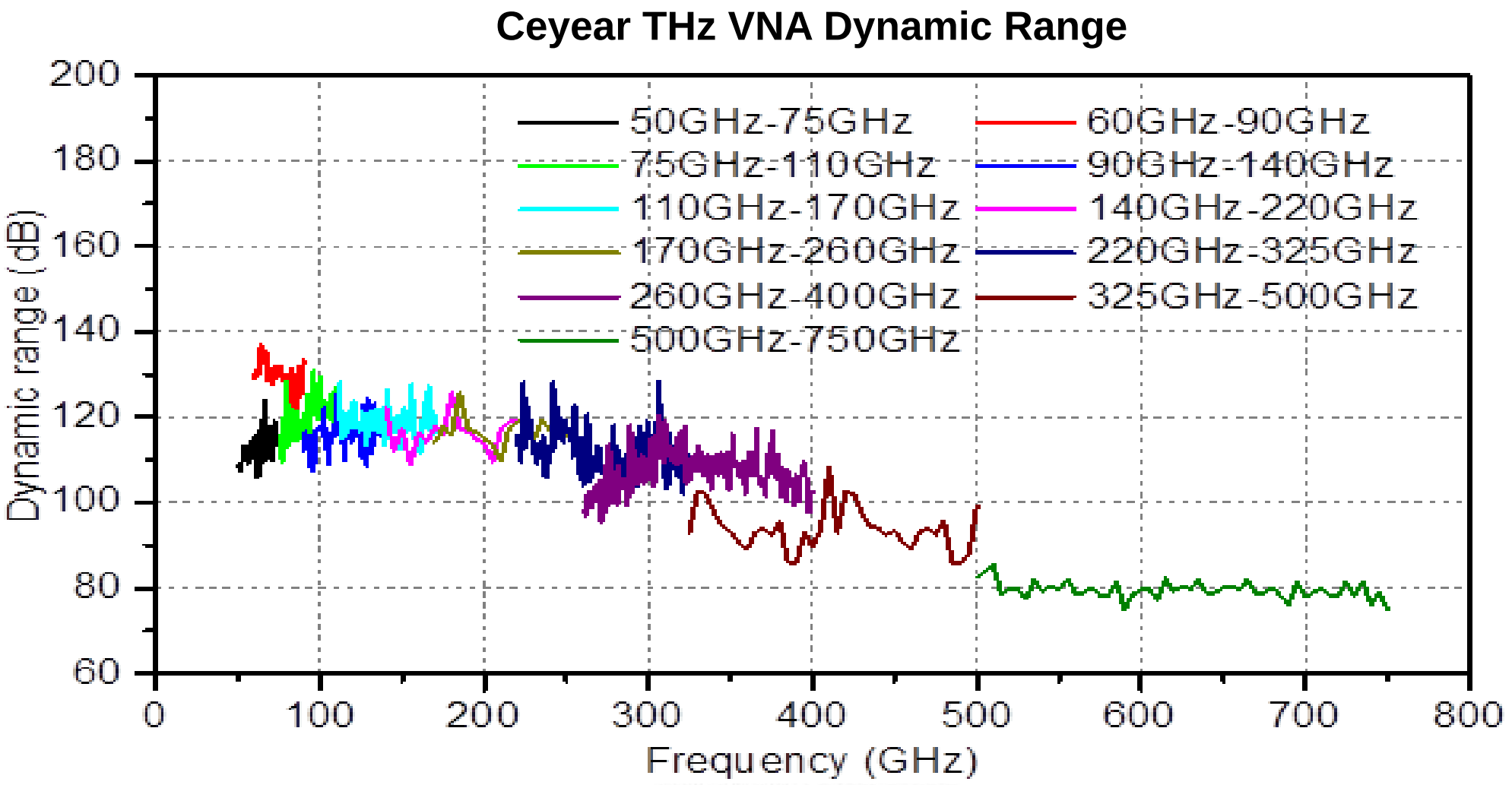
# 3.3 THz Vector Network Analyzer


- **40GHz to 750GHz** seamless covered
- High competitiveness with Keysight, R&S VNA
- Patent of **Stable Amplitude Technology** under 170GHz, to generate adjustable output power.

| | | | | | | |
|---|---|---|---|---|---|---|
| 3643NA<br>50GHz ~ 75GHz | 3643P<br>75GHz ~ 110GHz | 3643Q<br>110GHz ~ 170GHz | 3643R<br>170GHz ~ 260GHz | 3643TA<br>260GHz ~ 400GHz | | |
| 3643K<br>40GHz ~ 60GHz | 3643N<br>60GHz ~ 90GHz | 3643QA<br>90GHz ~ 140GHz | 3643SA<br>140GHz ~ 220GHz | 3649A<br>220GHz ~ 325GHz | 3649B<br>325GHz ~ 500GHz | 3643U<br>500GHz ~ 750GHz |

* Can support VNA form Ceyear and other suppliers.

# 3.3 THz Vector Network Analyzer



# 3.3 THz Vector Network Analyzer

**Ceyear 364X series Frequency Extender Modules Specifications**

| Specifications | 3643K | 3643NA | 3643N | 3643P | 3643QA | 3643Q | 3649 |
|---|---|---|---|---|---|---|---|
| Frequency *Range (GHz)* | 40~60 | 50~75 | 60~90 | 75~110 | 90~140 | 110 ~ 170 | 170 ~ 220 |
| *Output Power (dBm)* | ≥+6 | ≥+5 | ≥+5 | ≥+5 | ≥+3 | ≥-1 | ≥-10 |
| *System Dynamic Range (dB)* | ≥ 100 | ≥ 100 | ≥ 100 | ≥ 100 | ≥ 100 | ≥100 | ≥100 |
| *Effective Directivity (dB)* | ≤-35 | ≤-35 | ≤-35 | ≤-35 | ≤-34 | ≤-34 | ≤-30 |
| *Effective Load Match (dB)* | ≤-35 | ≤-35 | ≤-35 | ≤-35 | ≤-34 | ≤-34 | ≤-30 |
| *Reflection Tracking (dB)* | ≤±0.12 | ≤±0.12 | ≤±0.12 | ≤±0.12 | ≤±0.15 | ≤0.15 | ≤0.2 |
| *Transmission Tracking (dB)* | ≤±0.12 | ≤±0.12 | ≤±0.12 | ≤±0.12 | ≤±0.15 | ≤0.15 | ≤0.2 |
| *Output Interface* | WR19 | WR15 | WR12 | WR10 | WR8.0 | WR6.5 | WR5.1 |

# 3.3 THz Vector Network Analyzer

**Ceyear 364X series Frequency Extender Modules Specifications**

| Specifications | 3643SA | 3643R | 3649A | 3643TA | 3649B | 3643U |
|---|---|---|---|---|---|---|
| Frequency Range (GHz) | 140 ~ 220 | 170 ~ 260 | 220 ~ 325 | 260 ~ 400 | 325 ~ 500 | 500 ~ 750 |
| Output Power (dBm) | ≥-3 | ≥-5 | ≥-10 | ≥-20 | ≥-23 | ≥-30 |
| System Dynamic Range (dB) | ≥100 | ≥100 | ≥100 | ≥90 | ≥80 | ≥70 |
| Effective Directivity (dB) | ≤-30 | ≤-25 | ≤-25 | ≤-20 | ≤-20 | ≤-20 |
| Effective Load Match (dB) | ≤-30 | ≤-25 | ≤-25 | ≤-20 | ≤-20 | ≤-20 |
| Reflection Tracking (dB) | ≤0.2 | ≤0.2 | ≤0.2 | ≤0.3 | ≤0.3 | ≤0.8 |
| Transmission Tracking (dB) | ≤0.2 | ≤0.2 | ≤0.2 | ≤0.3 | ≤0.3 | ≤0.8 |
| Output Interface | WR5.1 | WR4.3 | WR3.4 | WR2.8 | WR2.2 | WR1.5 |

# 3.4 THz Noise Figure Analyzer

82411 H/K
(5mm)

82411 L/N/P
(3mm)

**Ceyear 3986 Series Noise Figure Analyzer**

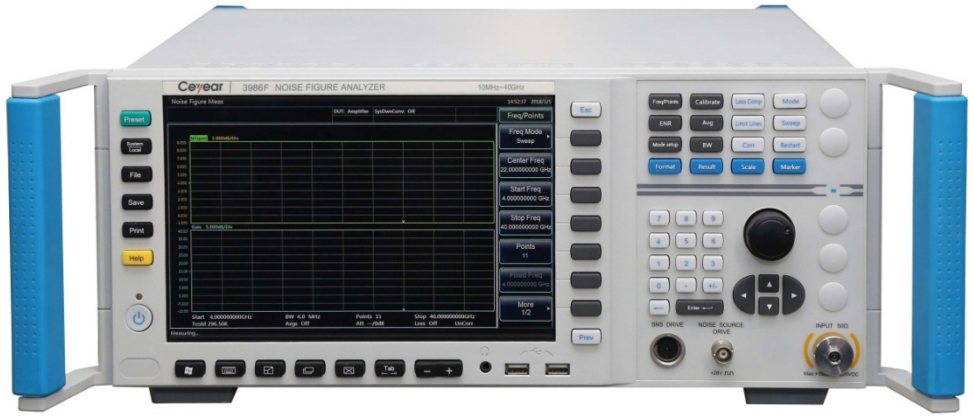
- 10MHz ~ 50GHz Frequency Coverage
- Amplifier/Upconverter/Downconverter Measurement Mode
- Standard/Smart Noise Source
- Loss Compensation, Uncertainty Calculator, Limitation Functions

**Ceyear 82411 Series Noise Figure Extender Module**

- 50GHz ~ 110 GHz Seamless Covered
- Low SWR
- High Sensitivity and Performance

**To test THz amplifier and Up/down Converter's Noise Figure and Gain.**

# 3.4 THz Noise Figure Analyzer



3986 series Noise Figure Analyzer

16603 series Standard Noise Source

16604 series Smart Noise Source

**3986 series Noise Figure Analyzer specifications**

| Specifications | 3986 A/D/E/F/H |
|---|---|
| Frequency Range | 10 MHz to 4/18/26.5/40/**50 GHz** |
| Max. Meas. BW (MHz) | 4MHz |
| NF Meas. Range (dB) | 0 to 30 |
| NF Meas. Uncertainty (dB) | ⩽ ±0.1 |
| Gain Meas. Range (dB) | -20 to +40 |
| Gain Meas. Uncertainty (dB) | ⩽ ±0.17 |
| Instrument Noise Figure (dB) | < 8.0 (@26.5GHz) |
| Auxiliary Ports | USB, GPIB, VGA, LAN, etc. |

# 3.4 THz Noise Figure Analyzer

**Ceyear 82411series Frequency Extender Modules Specifications**

| Specifications | 82411H | 82411K | 82411L | 82411N | 82411P |
|---|---|---|---|---|---|
| Frequency Range (GHz) | 50~63.5 | 61.5~75 | 75~88.5 | 86.5~100 | 96.5~110 |
| Input SWR | < 1.7:1 | < 1.7:1 | < 1.8:1 | < 1.8:1 | < 1.8:1 |
| Inherent NF (dB) | < 16 | < 16 | < 10 | < 10 | < 10 |
| IF Output Range (GHz) | 4.5~18 | 4.5~18 | 4.5~18 | 4.5~18 | 4.5~18 |
| Channel Conversion Gain (dB) | > 5 | > 5 | > 5 | > 5 | > 5 |
| Image Rejection (dB) | > 30 | > 30 | > 30 | > 30 | > 30 |

* Only support Ceyear 3986 seriesNoise Figure Analyzer.

# 3.4 MMW Noise Figure Analyzer

**Ceyear Noise Figure Analysis System**

## System Features:

- With lower instrument noise figure itself;
- Industry leading sensitivity and accuracy;
- Automatic calculation of measurement uncertainty;
- Three measurement mode with better flexibility.

## Ceyear Noise Figure Analysis System Configuration

| | Module and Name | Brand | Unit | Remarks |
|---|---|---|---|---|
| 1 | 3986 D/E/F/H Noise Figure Analyzer | Ceyear | 1 | Main unit with frequency more than 18GHz |
| 2 | 16603/16604 series Noise Source | Ceyear | 1 set | standard BNC interface or Smart interface |
| 3 | 82411 series Extender Modules | Ceyear | 1 set | Banded Modules to extend up to 110GHz. WR15/WR10 |
| | NC5115 or NC5110 Noise Source | Noise.com | 1 | 50GHz to 75GHz , WR15; 75GHz to 110GHz, WR10 |

# 3.5 THz Power Meter


**Ceyear 2438 Series Power Meter**

- 9kHz ~ 750GHz CW/ Peak power measurement
- Support 15 Parameters Measurement of Pulse Modulated Signal
- CW/Peak/CCDF Measurement Modes
- Internal Power Self Calibration Technology

**Ceyear 7171X/871XX Series Power Sensor**

- 50GHz ~ 750 GHz Seamless Covered
- Large Power Measurement Range

**2438 series Power Meter**
**+ 7171X/871XX Series THz Power Sensor**

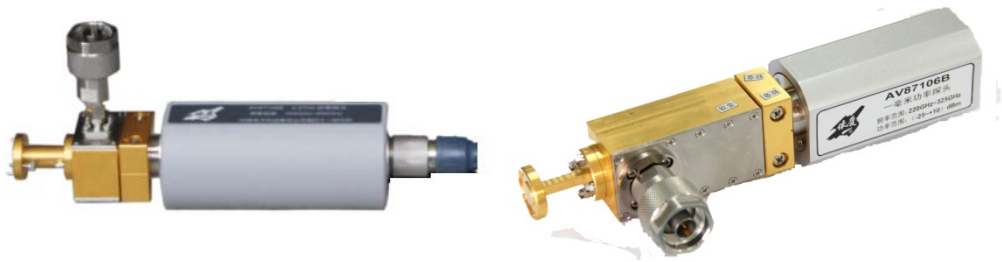
# 3.5 THz Power Meter

**Ceyear 2438 series Power Meter (Main Unit) Specifications**

| Specifications | 2438 CA | 2438 CB | 2438 PA | 2438 PB |
|---|---|---|---|---|
| Frequency Range | 9 kHz to 750 GHz | | | |
| Channel Number | 1 | 2 | 1 | 2 |
| Pulse Level Range (dBm) | NA | | -40 to +20 | |
| CW Level Range (dBm) | -70 to +50 | | -70 to +50 | |
| Resolution | Log: 0.001 dB Linear: 4 bits | | | |
| Rise Time (ns) | NA | | ≤ 13 | |
| Video Bandwidth (MHz) | NA | | ≥ 30 | |
| Min. Pulse Width (ns) | NA | | 50 | |
| Max. Pulse Repetition Frequency (MHz) | NA | | 10 | |
| Time Base Range | NA | | 2ns/div ~ 3600s/div | |

# 3.5 THz Power Meter

### 7171X/871XX series THz Power Sensor



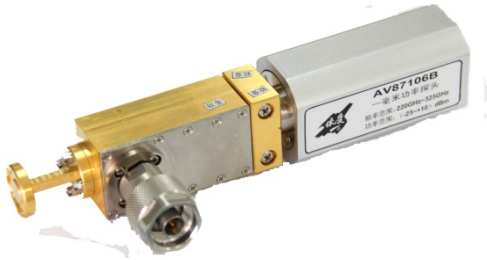
### Ceyear THz Power Measurement System

- Banded 50GHz to 750GHz Frequency Coverage
- Diode-base Sensing Technology with faster response
- Automatic Calibration Process
- GPIB/USB/LAN remote control interface

| | | | | | | |
|---|---|---|---|---|---|---|
| 87115N<br>60GHz ~ 90GHz | 87115QA<br>90GHz ~ 140GHz | | 87115SA<br>170GHz ~ 260GHz | 87115TA<br>260GHz ~ 400GHz | | |
| 71716<br>50GHz ~ 75GHz | 71717<br>75GHz ~ 110GHz | 71718<br>110GHz~170GHz | 87106A<br>170GHz ~ 220GHz | 87106B<br>220GHz ~ 325GHz | 87108B<br>325GHz~500GHz | 87115U<br>500GHz~750GHz |

* Only support Ceyear 2438 series Power Meter.

# 3.5 THz Power Meter



**Ceyear 7171X/871XX THz power sensor Specifications**

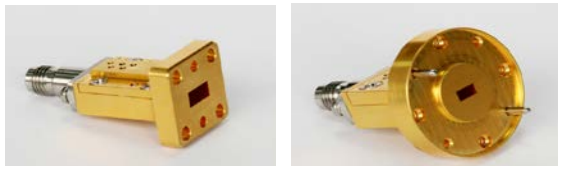
| Specifications | 71716 | 87115N | 71717 | 87115QA | 71718 | 87106A |
|---|---|---|---|---|---|---|
| Frequency (GHz) | 50 ~ 75 | 60 ~ 90 | 75 ~ 110 | 90 ~ 140 | 110 ~ 170 | 170 ~ 220 |
| Power Meas. Range (dBm) | -40 ~ +20 | -60 ~ +20 | -40 ~ +20 | -40 ~ +20 | -35 ~ +20 | -35 ~ +20 |
| Port SWR | ≤1.35 | ≤1.30 | ≤1.35 | ≤1.45 | ≤1.45 | ≤1.5 |
| Port Type | WR14.8 | WR12.2 | WR10 | WR8 | WR6.5 | WR5.1 |
| Dimensions (W x H x D, mm) | ≤44×77×220 | | | | | |

# 3.5 THz Power Meter

**Ceyear 7171X/871XX THz power sensor Specifications**

| Specifications | 87115SA | 87106B | 87115TA | 87108B | 87115U |
|---|---|---|---|---|---|
| Frequency (GHz) | 170 ~ 260 | 220 ~ 325 | 260 ~ 400 | 325 ~ 500 | 500 ~ 750 |
| Power Meas. Range (dBm) | -35 ~ +20 | -35 ~ +20 | -35 ~ +20 | -35 ~ +20 | -50 ~ +20 |
| Port SWR | ≤1.5 | ≤1.5 | ≤1.5 | ≤1.8 | ≤1.8 |
| Port Type | WR4.3 | WR3.4 | WR2.8 | WR2.2 | WR1.5 |
| Dimensions (W x H x D, mm) | ≤44×77×220 | | | | |

# 3.6 THz Passive Component/Modules



1mm Coaxial/Waveguide Calibration Kits

Horn Antenna

Waveguide Filter

Waveguide-coaxial Adaptor

Waveguide Switch

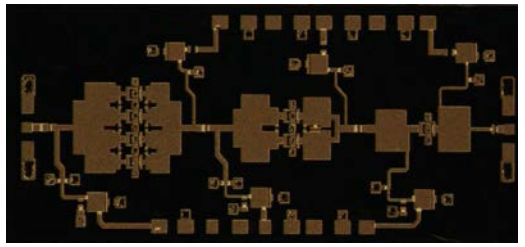
Detector

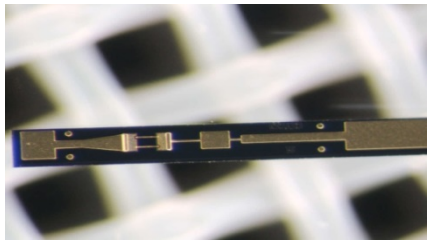
THz Front-End Related Components

# 3.6 THz Active Component/Modules

THz Harmonic Mixer

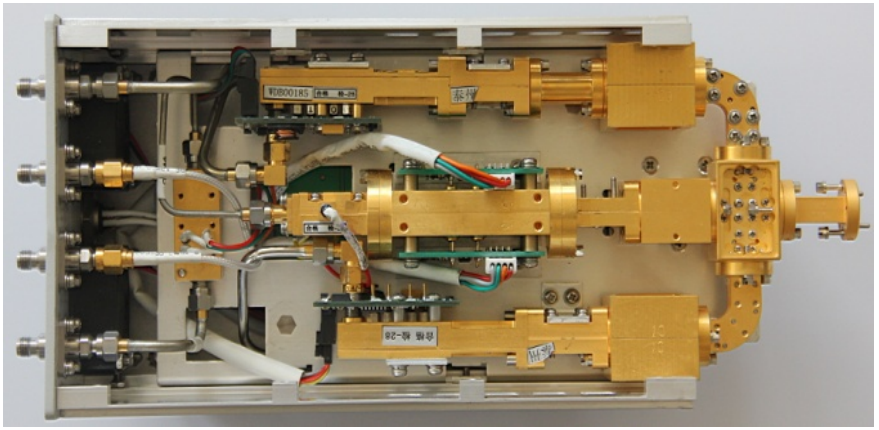
MMW Multiplier





IC for Mixer and Multiplier

THz Front-End Imaging Module for Security Checker



Customized Multi-functional Module

MMW Amplifier

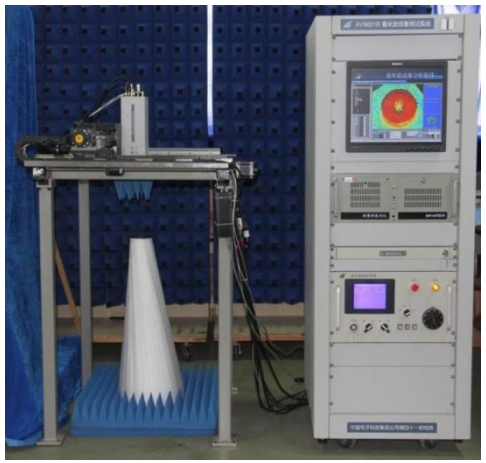
THz Front-End Related Components for Security Checker

# 4. Ceyear THz Test System

## 4.1 Material Test System

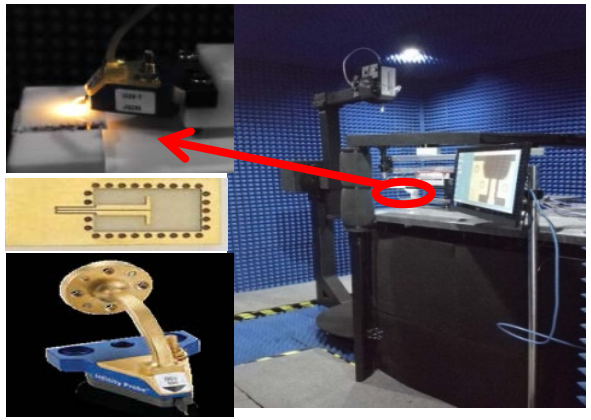
- Permittivity (ε), Loss, Permeability (μ), Reflectance, Transmission Coefficient
- Frequency Range: 50 GHz – 750 GHz
- Accuracy: ±5%

## 4.2 Antenna RCS Test System



- 50 GHz to 750 GHz
- Quasi-monostatic, Bi-static
- Polarization :HH, VV, HV, VH

**On-wafer Test**



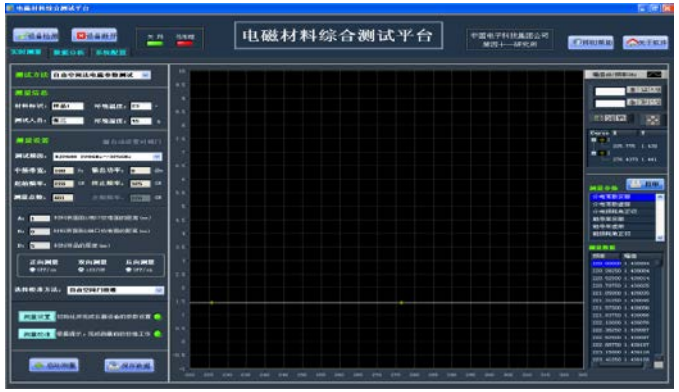
## 4.3 Antenna Test System

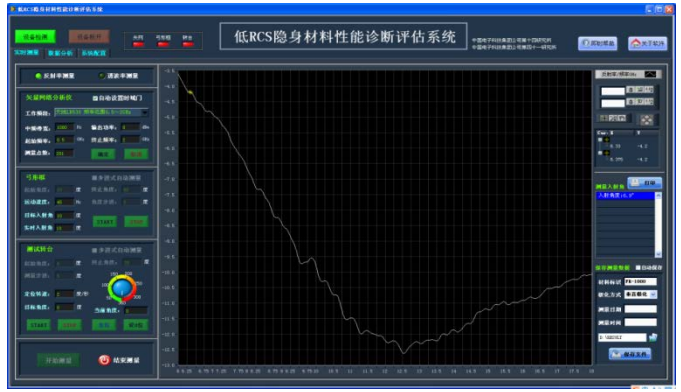
- 1 GHz to 750 GHz
- Dynamic Range: > 100dB
- Comprehensive Test Solutions

**Near/Far Field Test System**

# 4. 1 THz Electromagnetic Material Test System

EM Material Test System

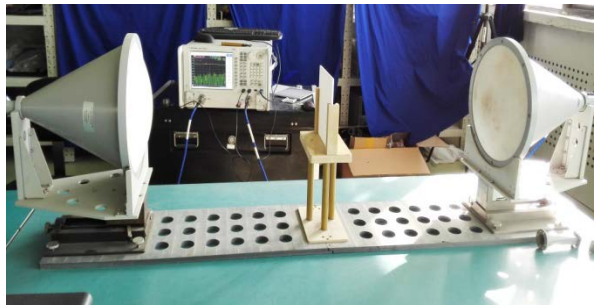


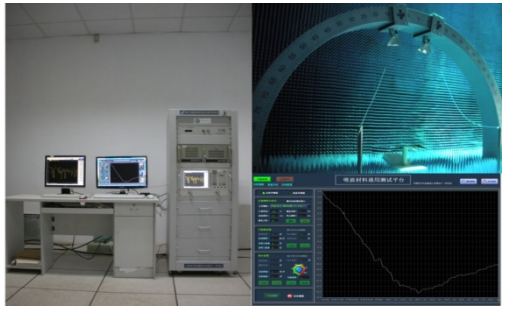




Pressing mould

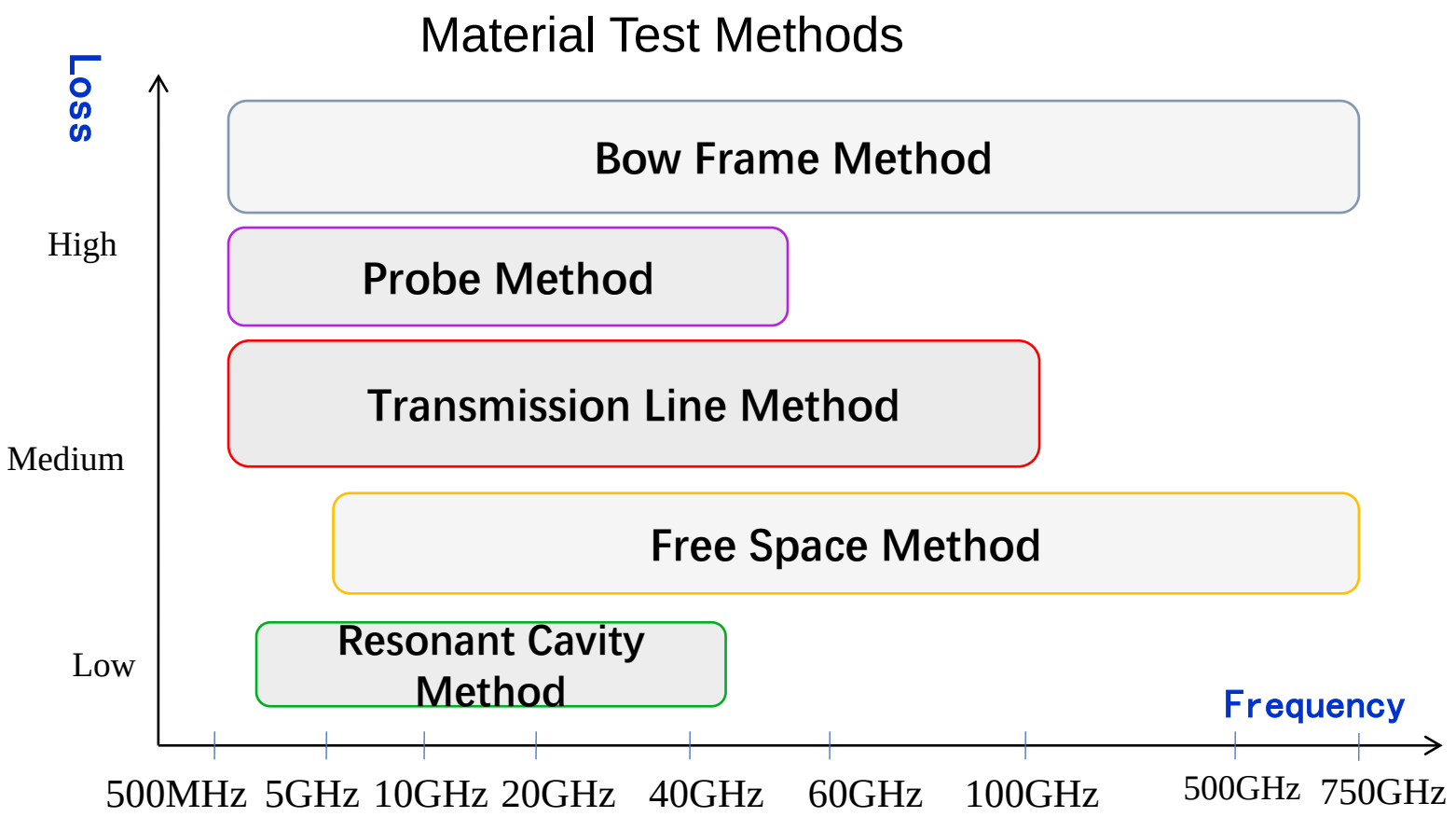
Coaxial calibration kit

Coaxial air line



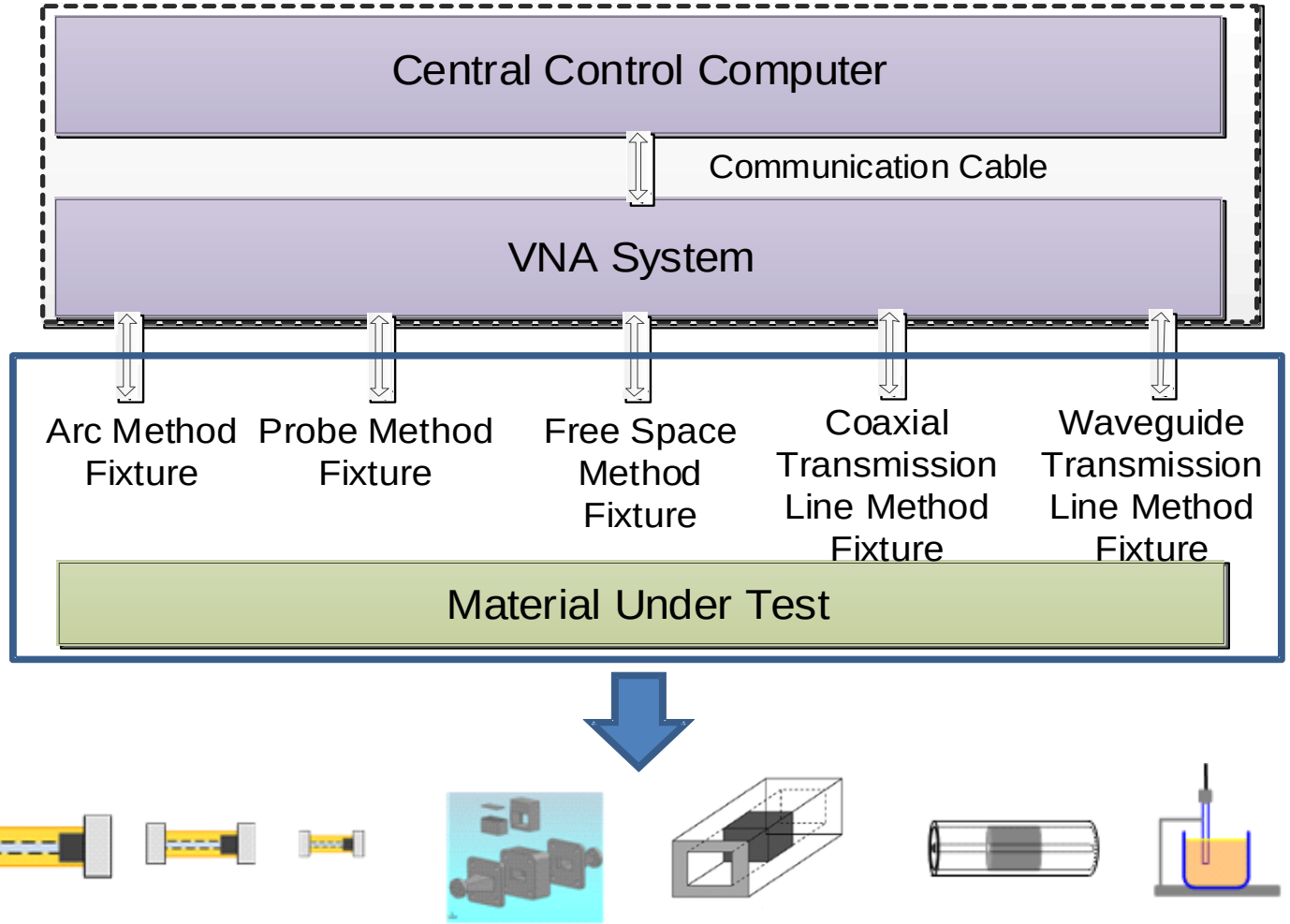


# 4. 1 THz Electromagnetic Material Test System




- **Test Items:**
  - Complex Permittivity (ε), Loss, Complex Permeability (μ), Reflectance, Transmission Coefficient
- **Test Methods:**
  - Transmission Line Method
  - Free-Space Method
  - Coaxial Probe Method
  - Bow Frame Arc Method
- **Frequency Range:**
  - 45MHz~750GHz
- **Accuracy:** ±5%

# 4. 1 THz Electromagnetic Material Test System

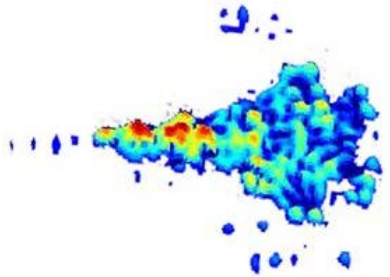


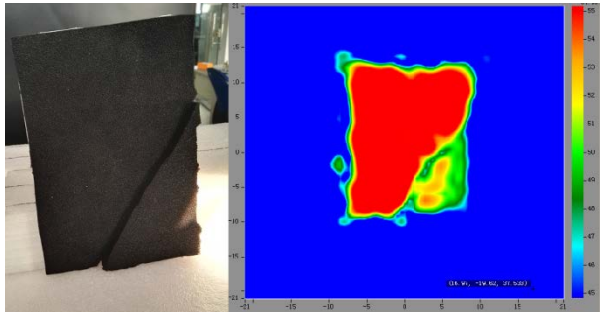

**System Configuration:**

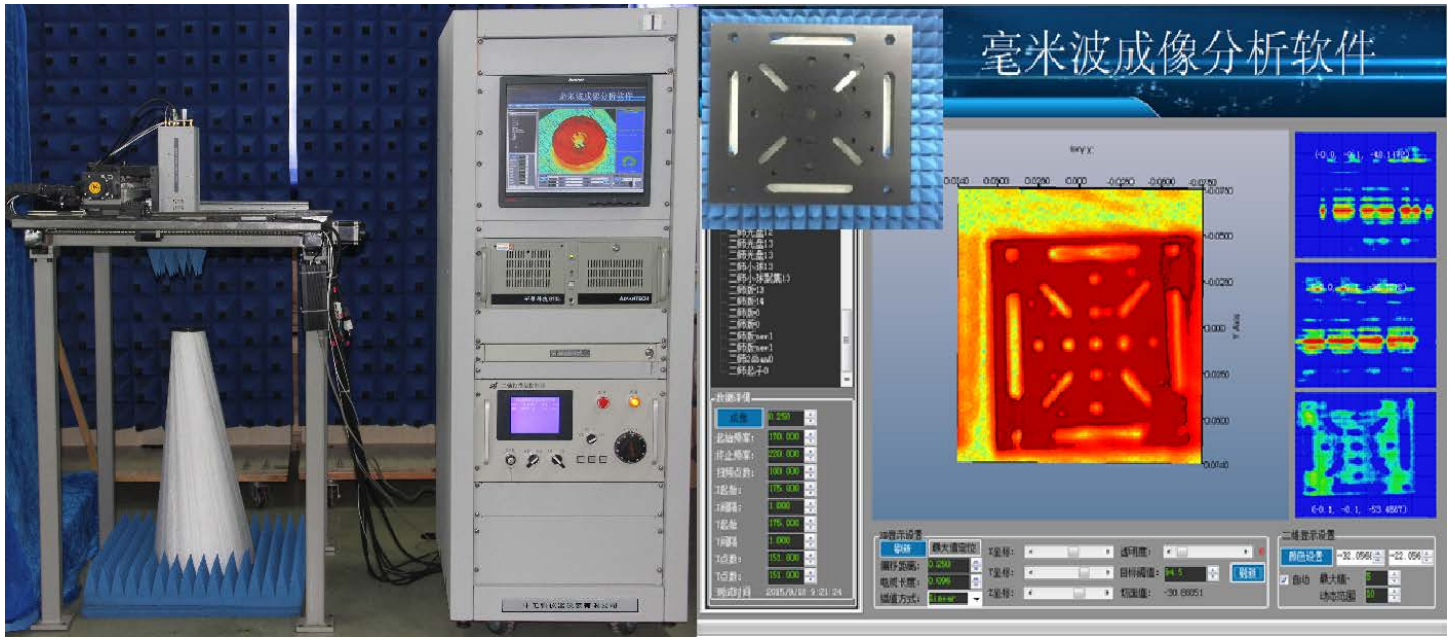
- **3672** Vector Network Analyzer
- **9809-001** Coaxial Transmission Line Method Test Suit
- **9809-002** Resonant Cavity Method Test Suit
- **9809-003** Free Space Method Test Suit
- **9809-004** Probe Method Test Suit
- **9809-005** Bow Frame Method Suit
- Control PC & Printer
- Application Software
- Connection Cable/ 1.6m Test Rack

# 4. 2 MMW/THz RCS Test System

Microwave RCS Test System

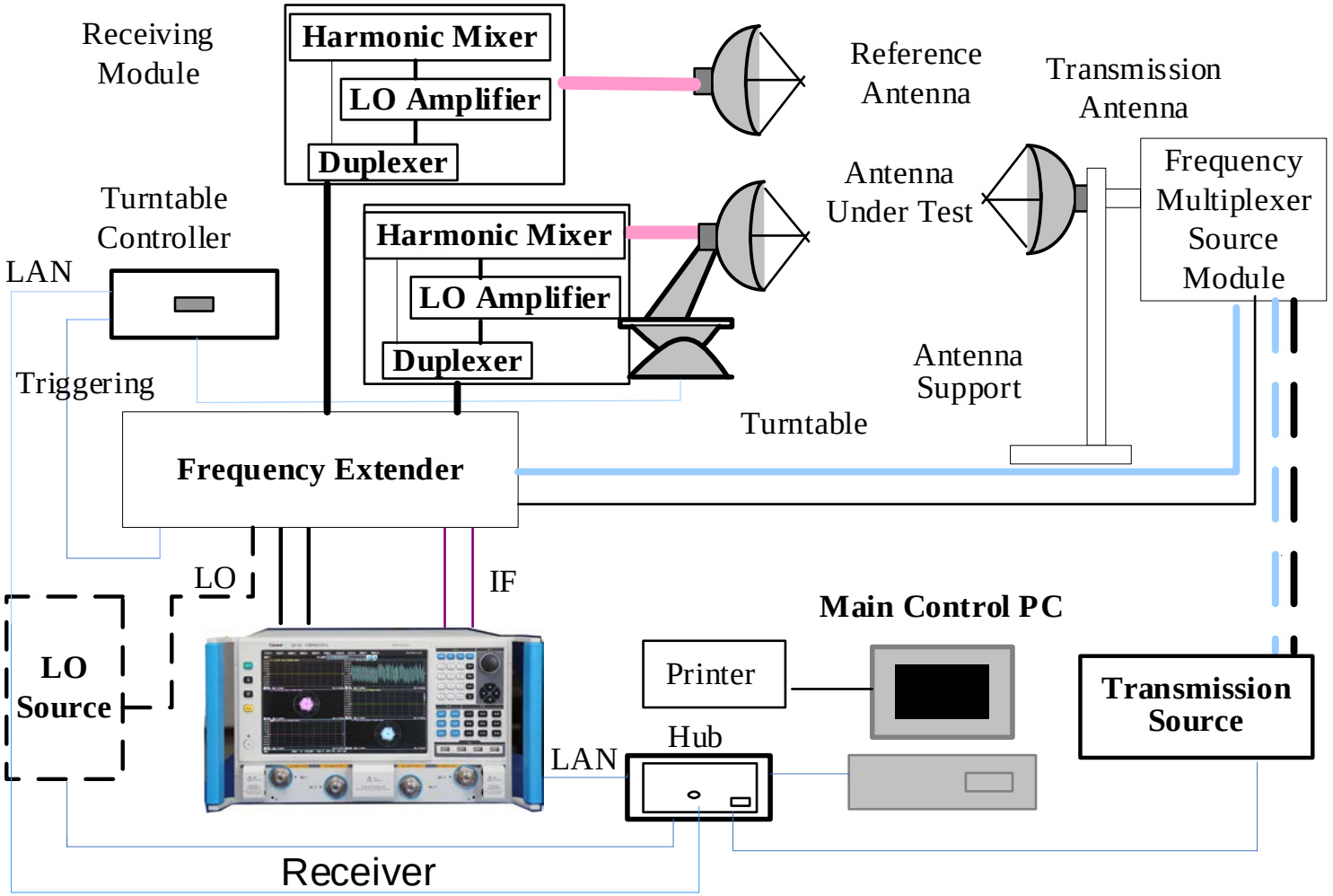







MMW RCS Imaging and analysing System

# 4. 2 MMW/THz RCS Test System

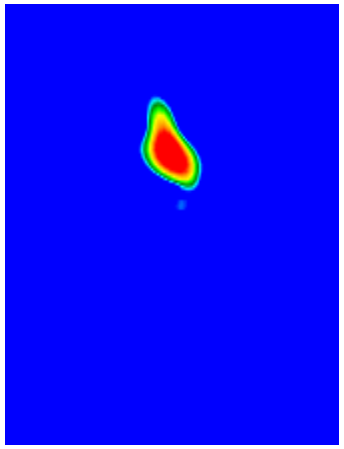



- **System Configuration**
  - **3672** Vector Network Analyzer
  - 1465 Signal Generator
  - **82718/82719** Series Antenna & RCS Receiving Module
  - Turntable & Support
  - RCS Calibration Kit
  - T/R Antenna
  - Control PC & Printer
  - Application Software
  - Connection Cable
  - 1.6m Test Rack

# 4. 2 MMW/THz RCS Test System

- One/Two/Three-Dimensional RCS Imaging
- High Speed Imaging of Local Scattering Characteristic
- High Speed Millimeter-Wave Imaging
- Near-Field to Far-Field RCS Transformation
- Frequency/Time/Angle Domain Measurement
- RCS Calibration

**(Animation Demo)**



# 4. 2 MMW/THz RCS Test System

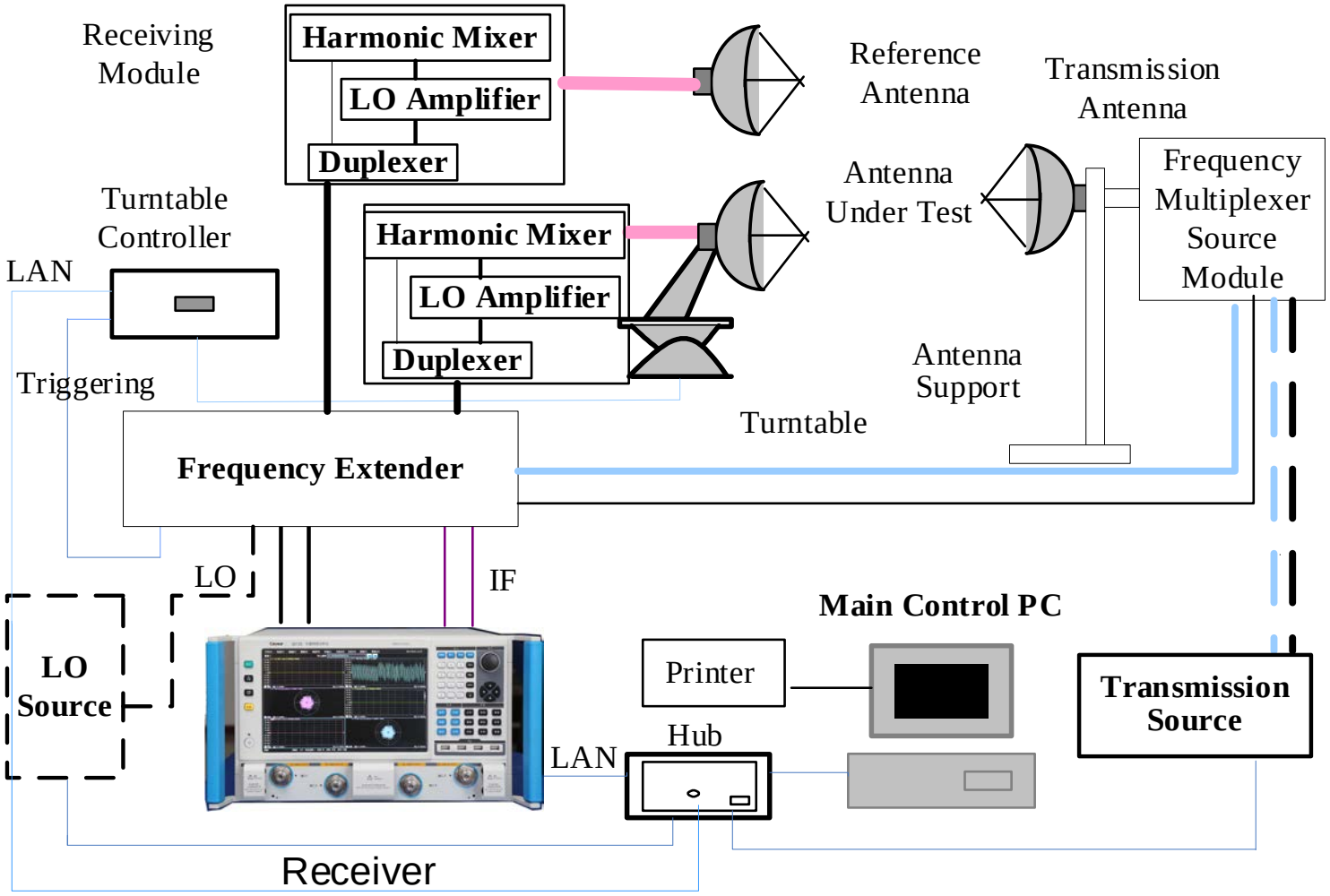
**Ceyear RCS Test System Specifications**

| Specifications | Ceyear Microwave/Millimeter Wave RCS Test System |
|---|---|
| Frequency Range (GHz) | 1 to 20/40/67/ ……/ 750GHz |
| Test Method | Monostatic / Bistatic |
| Dynamic Range (dB) | > 100 |
| Polarization | HH, VV, HV, VH |
| Radiation Power (Peak, dBm) | +10 (typ., without amplifier) |
| Receive Sensitivity (dBm) | -110 (typ., without low noise amplifier) |
| Calibration Kit | Metal Ball / Metal Plate / Metal Corner Reflector / Other Comparable Object (with calibrated RCS value) |
| Power Source | 220VAC±10%, 50Hz±5% |
| Power Consumption (W) | < 3000 |
| Dimensions (W x H x D, mm) | 600 x 1600 x 800 |

# 4. 3 MMW/THz Antenna Test System

- Full band coverage from **0.1 to 500 GHz**
- Standard, series and general purpose design, flexible system configuration
- High precision **multi-axis motion control**
- Comprehensive **near/far/compact field** measurement capability
- Support **near-to-far field transformation, error correction and compensation** functions
- Powerful **data analysis** capability
- High resolution **aperture field diagnosis**
- **Antenna array channel consistency test**

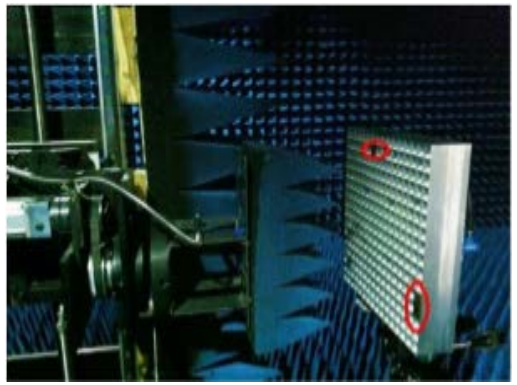
# 4. 3 MMW/THz Antenna Test System



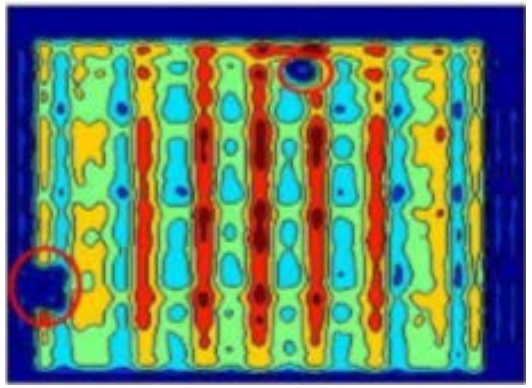

## System Configuration:

- 3672 Vector Network Analyzer
- 1465 Signal Generator
- 82719 Series Antenna & RCS Receiving Module
- 82718 Series Antenna & RCS Transmission Module
- Turntable & Support
- T/R Antenna
- Control PC & Printer
- Application Software
- Connection Cable
- 1.6m Test Rack

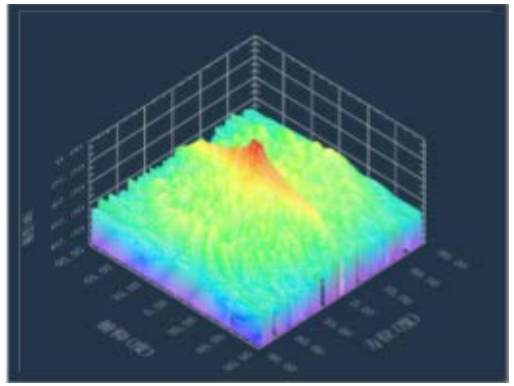
# 4. 3 MMW/THz Antenna Test System



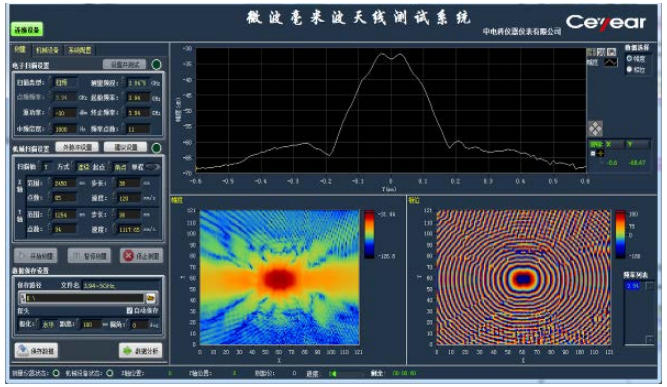
Near-Field Test



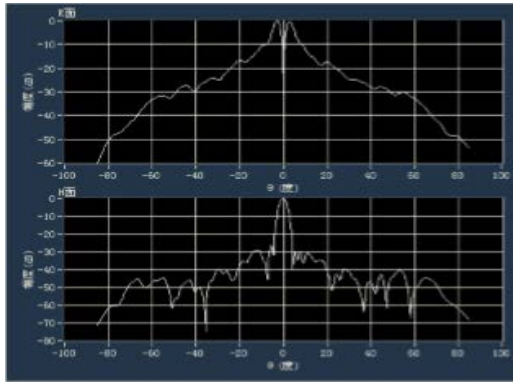
Aperture Field Diagnose



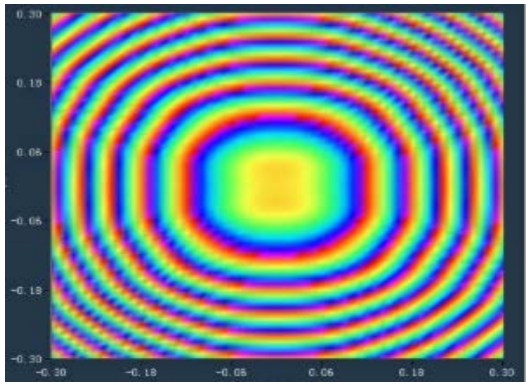
3D Antenna Pattern



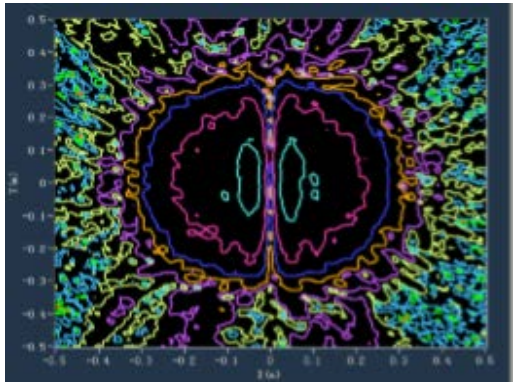

Powerful Data Analysis



E-Plane & H-Plane Pattern



Antenna Phase

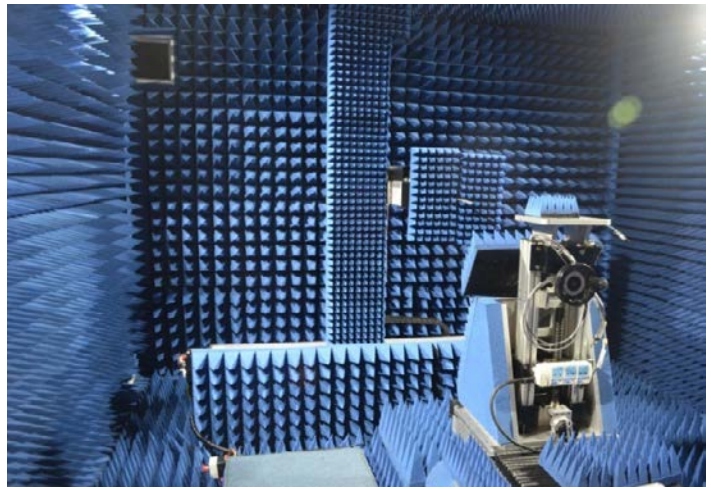


Amplitude Contour

Powerful Data Analysis

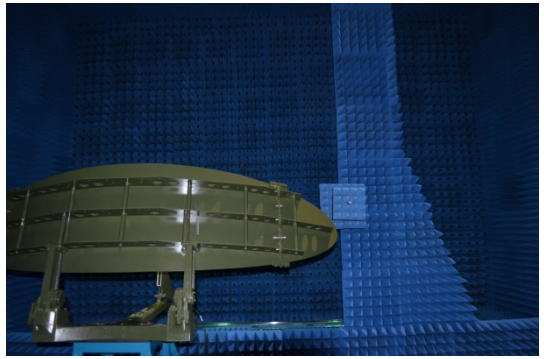
# 4. 3 MMW/THz Antenna Test System

On-Wafer Antenna Test System



Compact Field Antenna Test System


Movable outdoor Far-field Antenna Testing System



Indoor near-field Antenna Testing System

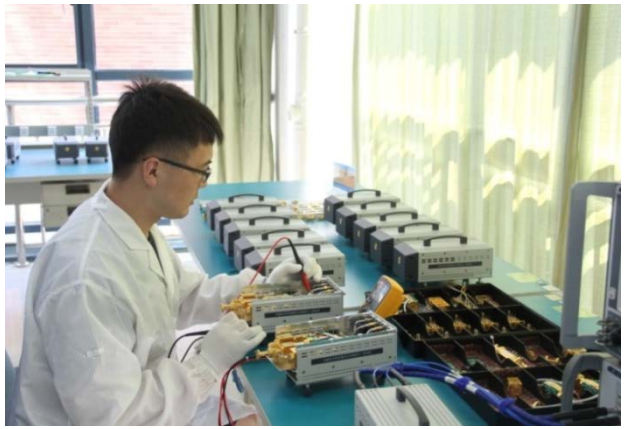
# 4. 3 MMW/THz Antenna Test System

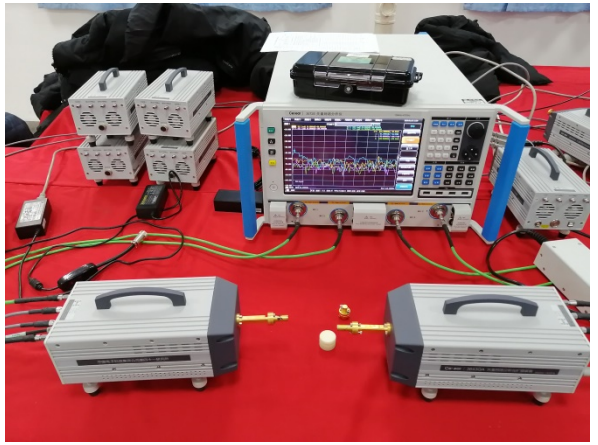
**Ceyear Antenna Test System Specifications**

| Specifications | Ceyear Microwave/Millimeter Wave Antenna Test System |
|---|---|
| Frequency Range (GHz) | 10MHz to 20/40/67/ ……/ 750GHz |
| Output Power (dBm) | ≥+10 (at 110GHz),<br>≥-7 (at 325GHz),<br>≥-20 (at 500GHz), |
| Sensitivity (dBm) | ≤ -105 (at 110GHz),<br>≤ -105 (at 325GHz),<br>≤ -80 (at 500GHz), |
| Power Source | 220VAC±10% |
| Power Consumption (W) | < 1500 |
| Dimensions (W x H x D, mm) | 600 x 1600 x 800 |

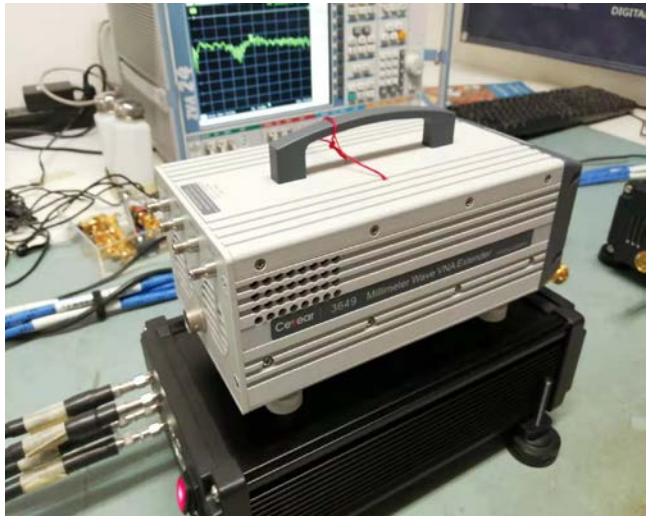
Contents

# 1. Manufacture & Exhibition

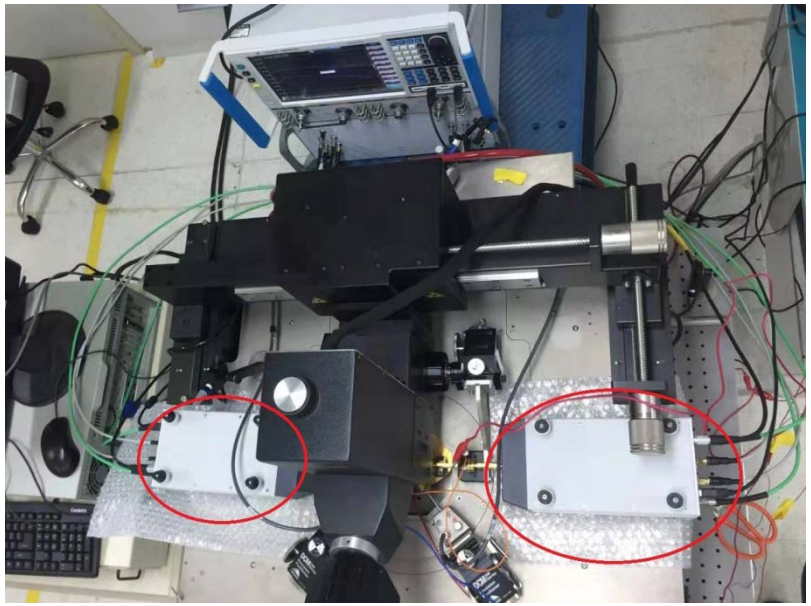


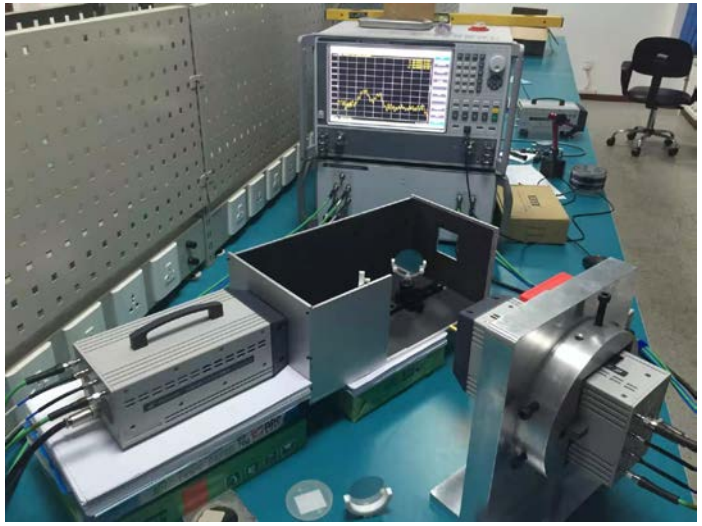


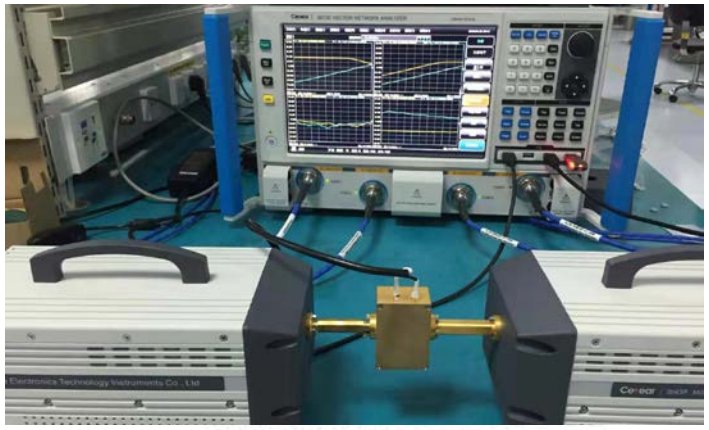


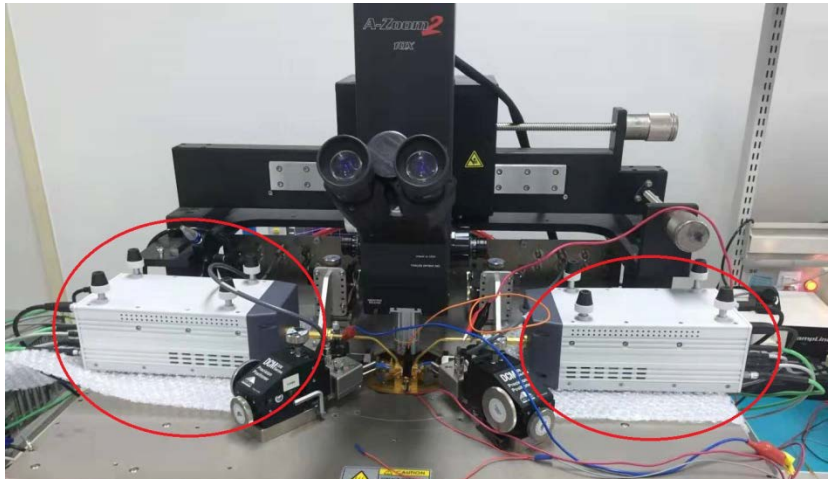


# 2. Typical Applications









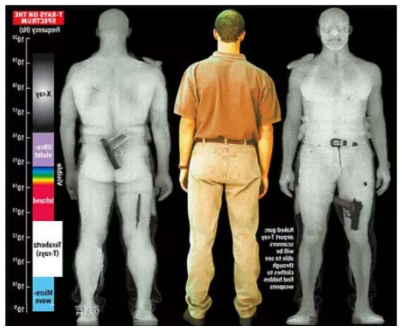
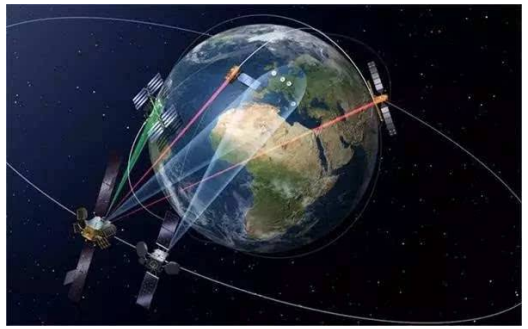
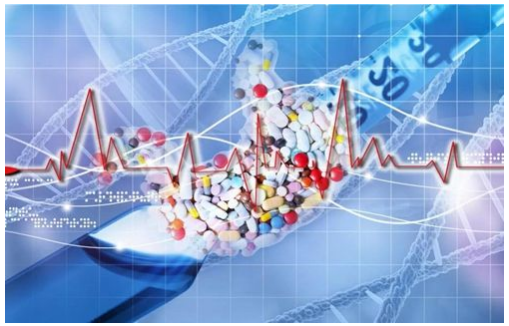
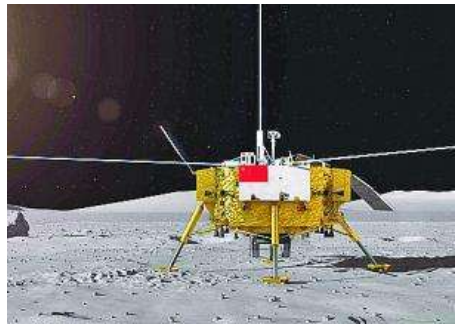
# 3. Typical Applications

## Some Typical Users

| | Typical Users | Freq. | Application Area | Website |
|---|---|---|---|---|
| 1 | Tsinghua University | 500GHz | THz safety testing and substance analysis | www.tsinghua.edu.cn |
| 2 | Beijing University of Posts and Telecommunications | 500GHz | THz near-field antenna testing | www.bupt.edu.cn |
| 3 | Shanghai Jiao Tong University | 325GHz | On-chip antenna testing | www.sjtu.edu.cn |
| 4 | Automation Institute of Chinese Academy of Sciences | 500GHz | Imaging and detection technology research | www.sia.cn |
| 5 | University of Electronic Science and Technology of China | 500GHz | Research of electronic components and electrical vacuum devices, 6G communication | www.uestc.edu.cn |
| 6 | The 54th Institute of CETC | 500GHz | For communication technology research | www.cti.ac.cn |
| 7 | Harbin Institute of Technology | 325GHz | For radar imaging technology research | www.hit.edu.cn |
| 8 | Beihang University | 220GHz | For security imaging research | www.buaa.edu.cn/ |
| 9 | Beijing Institute of Technology | 500GHz | For device, antenna, and component research | www.bit.edu.cn |
| 10 | Some Telecom Companies | 325GHz | Research on high-speed and 6G communication | |
| 11 | Southeast University | 500GHz | For device technology research | www.seu.edu.cn |

# 4. More Information about Ceyear Solution

- Ceyear has developed our own MMICs and THz ICs;
- Ceyear can perform remote demonstration. Of course, it is our honor to invite you to China to test by your experts;
- Ceyear has plenty of successful application cases in many high-tech companies, universities and research institutes;
- Ceyear has full customizing ability in components, modules and systems in MMW and THz area.

# THANKS !

Focus on Measurement

Explore the Future

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