

THA-380M60G / THA-380M70G

# TEM Horn Antenna

## EMC Testing in the 5G/IoT Era!

The TEM horn antenna is an antenna for conducting a close proximity radiation immunity evaluation test (near electromagnetic field immunity test) of electromagnetic waves radiated from various wireless transmitters such as mobile phones and Wi-Fi equipment.

In the future, the close proximity radiation immunity evaluation test using the TEM horn antenna is expected to expand to various product standards such as medical equipment (IEC 60601-1-2) and multimedia equipment (CISPR 35).

NoiseKen's TEM horn antenna has a wide band, low VSWR, and wide electric field uniformity, offering an ideal solution for an efficient close proximity radiation immunity test.

*\* This product is based on research results of the National Institute of Information and Communications Technology (NICT), Japan and joint-research with Noise Laboratory Co., Ltd.*



THA-380M60G

THA-380M70G

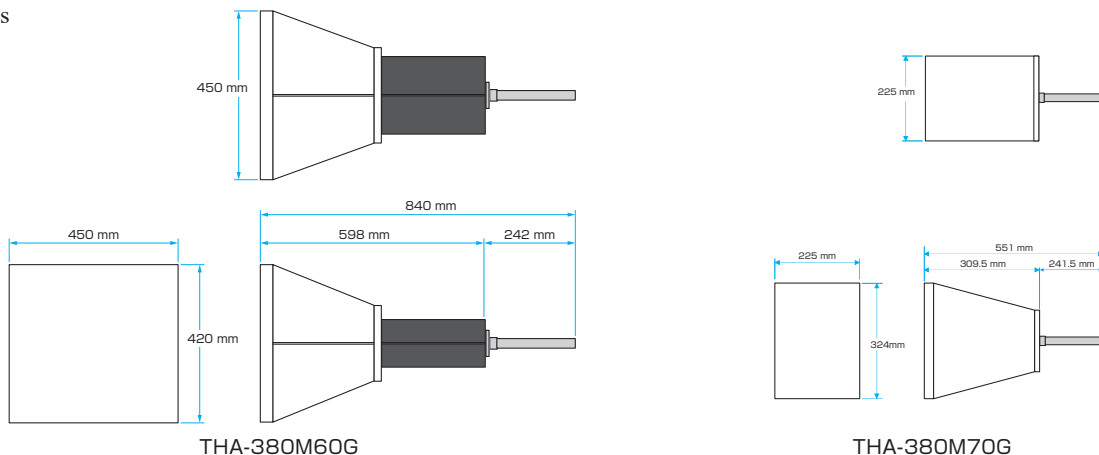
*\* prototype image*

- TEM horn antenna compliant with IEC 61000-4-39 Ed.1 standard.
- Allows testing to the entire frequency range of 380 MHz - 6 GHz with one antenna.
- Also supports 6 GHz band Wi-Fi "Wi-Fi 6E" (5.925 - 7.125 GHz).
- Low VSWR and high GAIN enable efficient electromagnetic wave radiation.
- Wide field uniformity reduces the number of times of movement of the antenna when radiating the EUT.
- Can be used for IEC 61000-4-3 preliminary testing in combination with a low-cost/low-output power amplifier by utilizing the proximity characteristics of the antenna.

### Specifications

	THA-380M60G	THA-380M70G
Parameter	Specifications	
Compliant standard	IEC 61000-4-39	
Frequency range	380 MHz - 6 GHz (8 GHz) * over 6 GHz not guaranteed	380 MHz - 7.125 GHz
VSWR	below 3 (refer to Figure "VSWR")	below 3 (refer to Figure "VSWR") * over 6 GHz not guaranteed
Input power	380 MHz - 750 MHz : 180 W MAX 750 MHz - 1.7 GHz : 100 W MAX 1.7 GHz - 6 GHz : 65 W MAX	380 MHz - 7.125 GHz : 100 W MAX
Electric field uniform area	refer to figure "Electric field distribution characteristics"	
Required power	refer to figure "Power required for generating 300 V/m (typ) (at 0.1 m)"	
Impedance (typ)	50 Ω	
Connector	N (J)	
Dimensions	W450 mm × H420 mm × D598 mm <i>*excluding protrusions, excluding φ 22 antenna support pole</i> <i>*refer to the below figure "Dimensions" for the details</i>	W225 mm × H324 mm × D309.5 mm <i>*excluding protrusions, excluding φ 22 antenna support pole</i> <i>*refer to the below figure "Dimensions" for the details</i>
Weight	approx.3.2 kg	approx.1.6 kg

### Dimensions

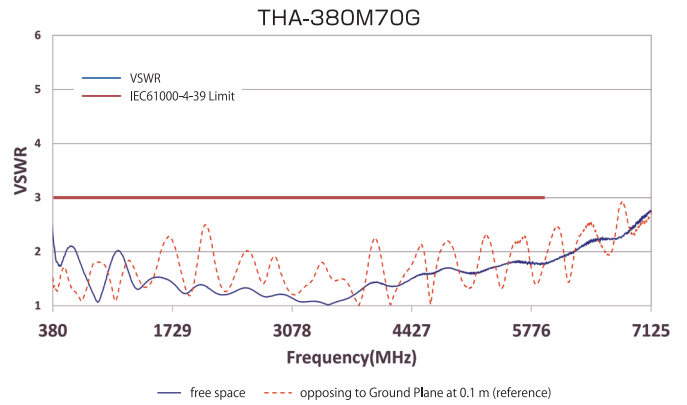
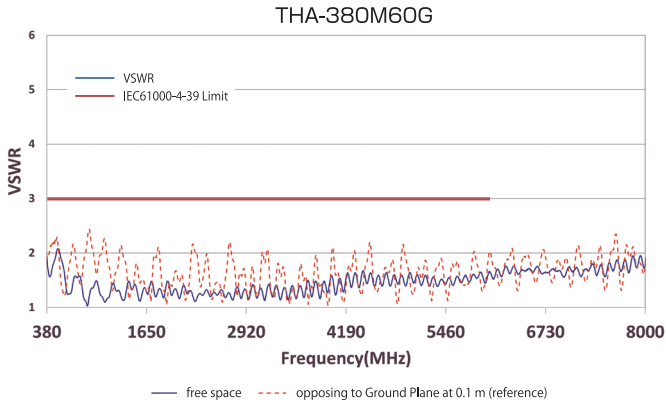


THA-380M60G

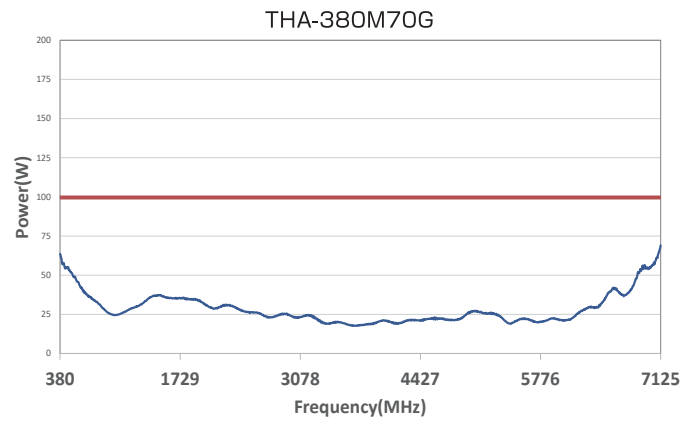
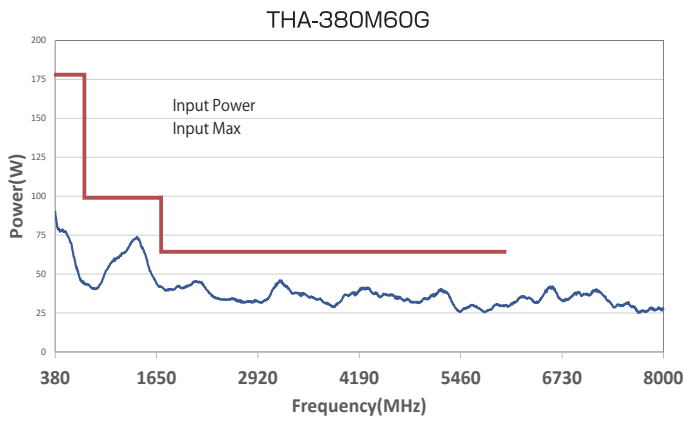
THA-380M70G

TEM horn antenna

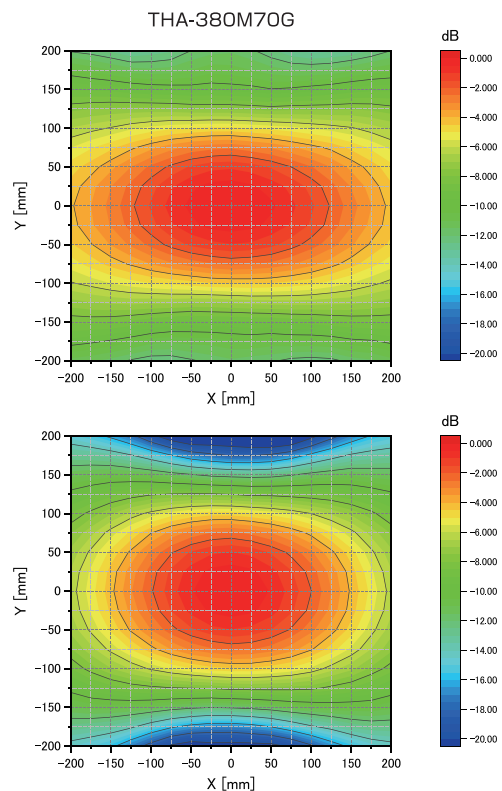
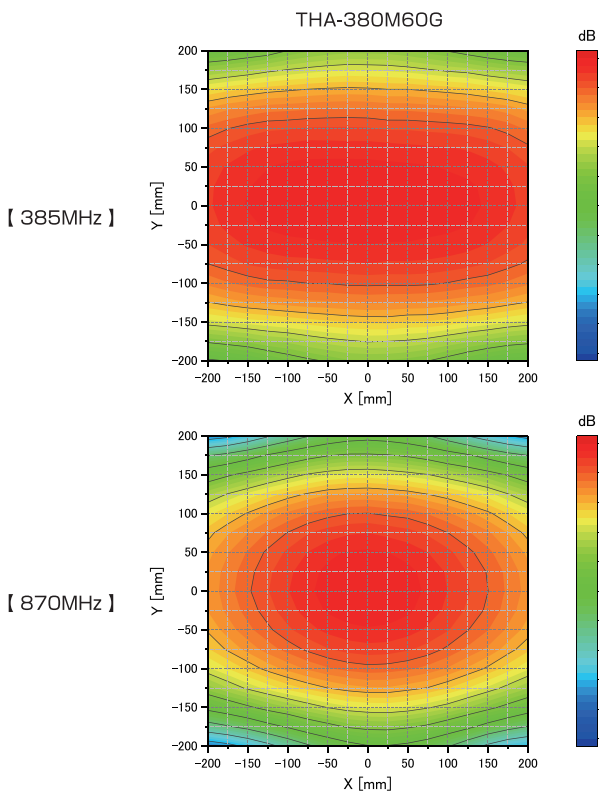
■ VSWR



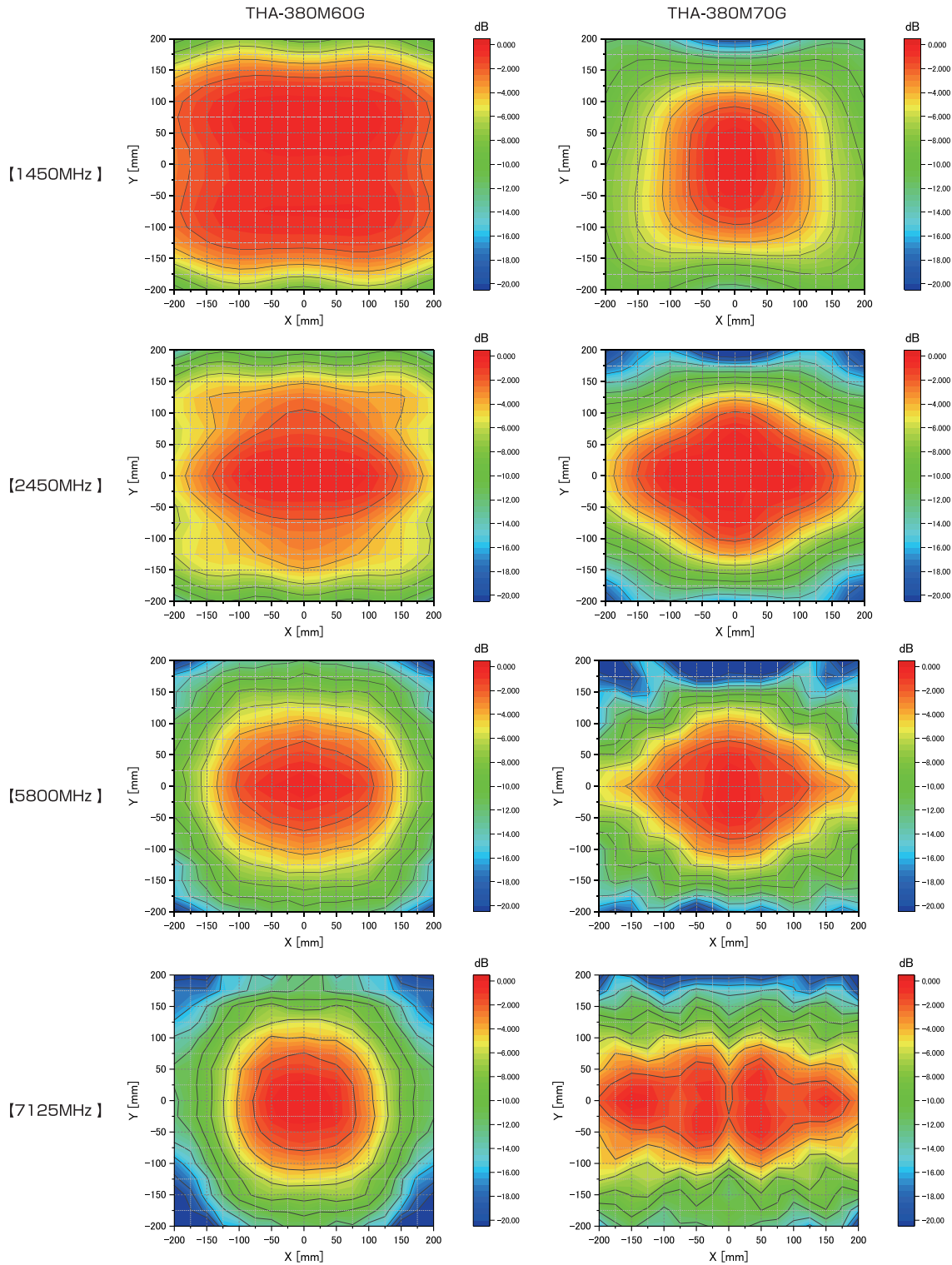
■ Power required for generating 300 V/m (typ) (at 0.1 m)



■ Electric field distribution characteristics



TEM horn antenna



Antenna distance: 0.1 m

2 dB / Line: The second contour line from the inside is the electric field uniform area.

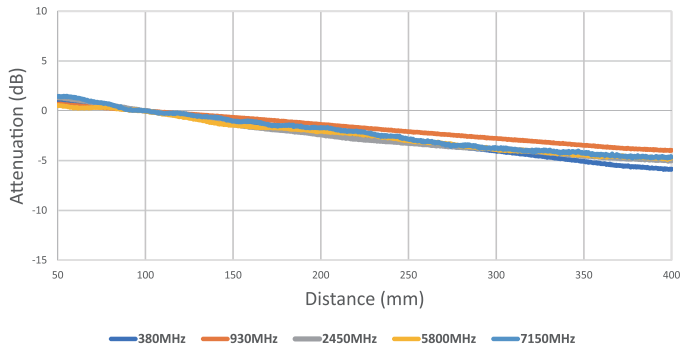
**The electric field distribution is vertically and horizontally symmetrical**

TEM horn antenna

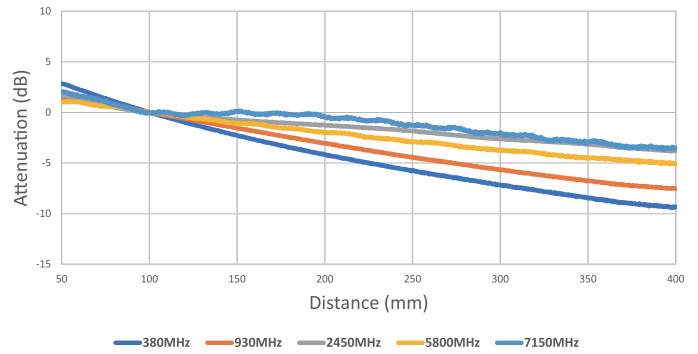
**Close proximity distance characteristics**

Distance attenuation characteristics \* Distance attenuation characteristics on axes with 100 mm from the antenna as the reference point

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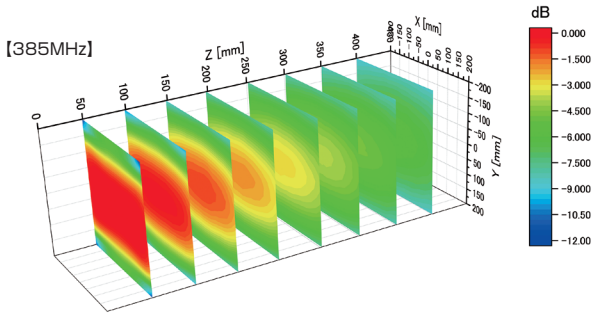


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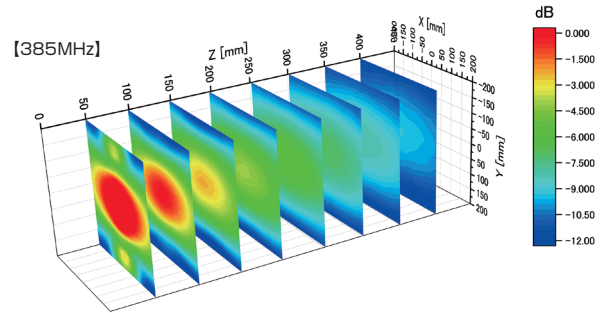


Electric field distribution distance characteristics \* Reference point: maximum of 100mm

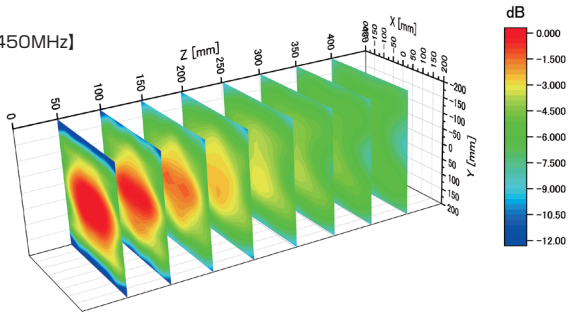
THA-380M60G



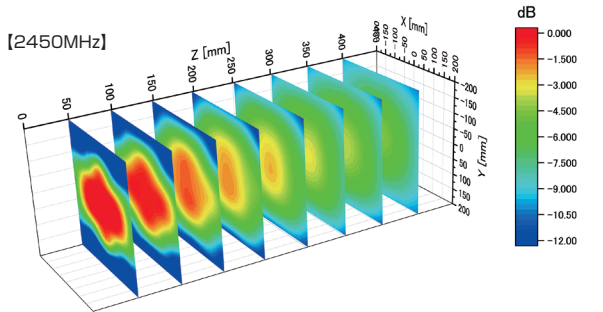
THA-380M70G



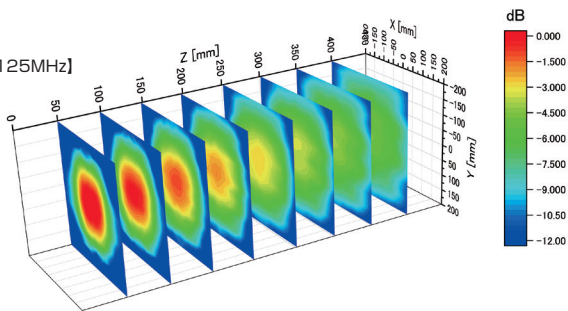
[2450MHz]



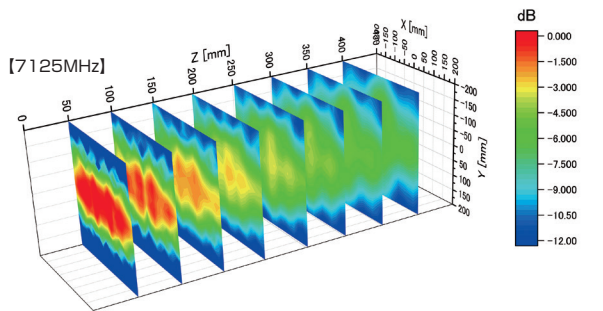
[2450MHz]



[7125MHz]



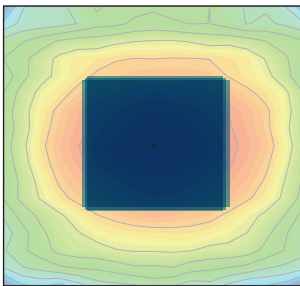
[7125MHz]



TEM horn antenna

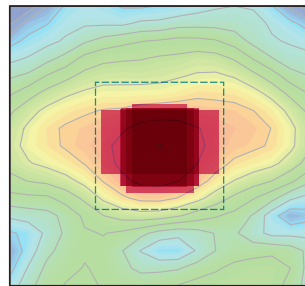
**Securing Uniform Field Area**

In the actual test, a quadrangle inscribed in the uniform electric field area is created to control the irradiation position. Therefore, a symmetrical electric field distribution characteristic that can create a large square with the maximum point in the center is required.



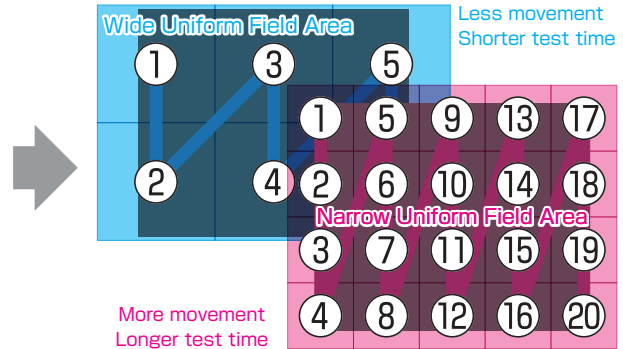
**[Symmetrical Uniform Field Area]**

Since the uniform electric field area is symmetrical vertically and horizontally, a wide uniform electric field area can be obtained with reference to the central axis of the antenna.



**[Distorted Uniform Field Area]**

If the uniform electric field area is distorted, it is difficult to secure a wide uniform field area with reference to the central axis of the antenna (the uniform field area becomes narrow).

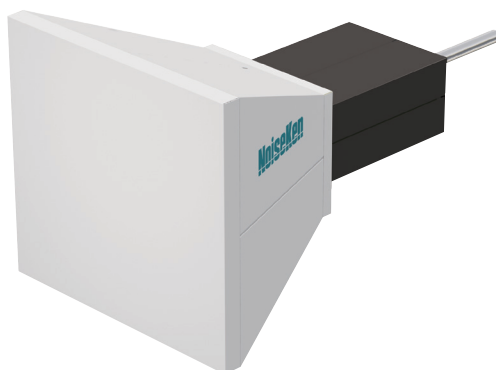


Difference in the number of antenna movements

## The wide and symmetrical electric field distribution characteristics contribute to shorter test time!

**THA-380M60G and THA-380M70G Comparison Table**

	THA-380M60G	THA-380M70G
Dimensions, Weight	Good	Excellent
Frequency range	Excellent	Excellent
	8 GHz max (*guaranteed up to 6 GHz)	7.125 GHz max
VSWR	Excellent	Excellent
	Good VSWR even when facing metallic surfaces	
Required Power (for generating 300 V/m (typ) (at 0.1 m))	Good	Excellent
Electric field distribution	Excellent	Good
Distance attenuation characteristics	Excellent	Good
	Attenuation after the reference point is low, being effective even for products with depth.	Relatively large difference in attenuation characteristics depending on the frequency.
Electric field distribution distance characteristics	Excellent	Good
Use in far-field test methods	Excellent	N/A Specifically designed as an antenna for close proximity radiation immunity testing



THA-380M60G



THA-380M70G



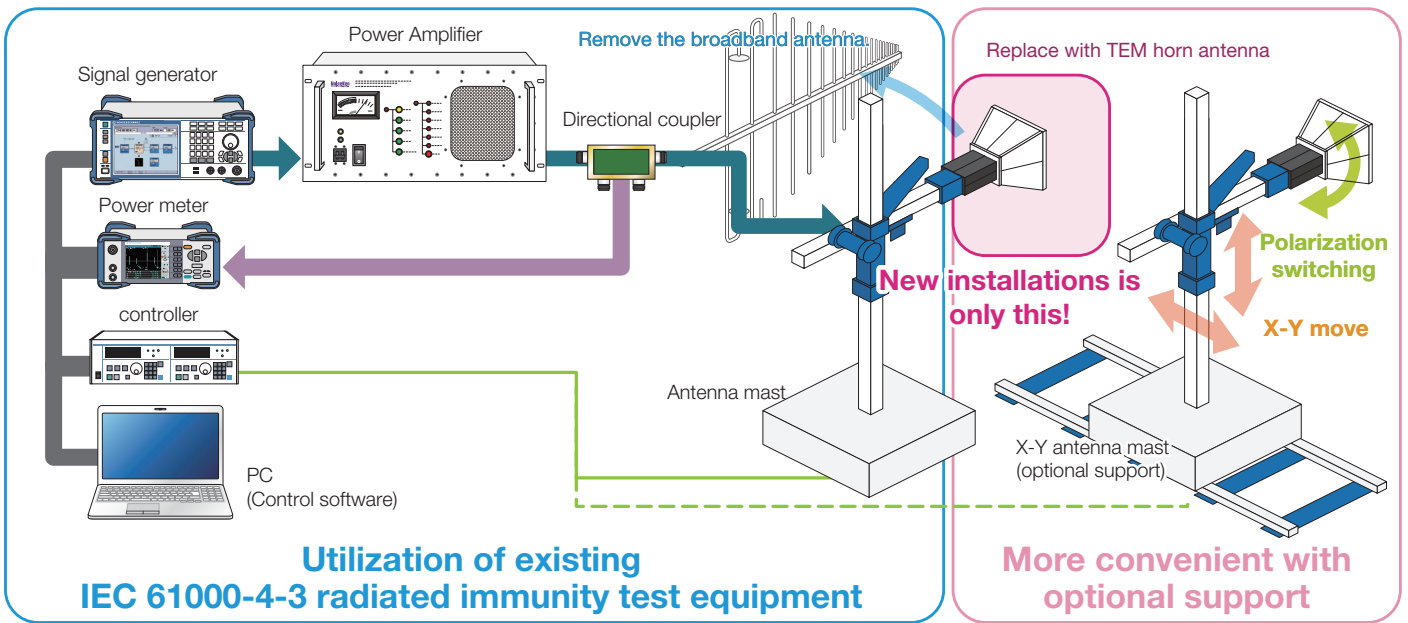
TEM horn antenna

**System configuration image**

The system consists of a signal generator serving as a signal source for noise, a power amplifier that amplifies the signal, a TEM horn antenna that emits radio waves, a power meter to check the power supplied to the TEM horn antenna and a software to control these devices.

The basic system configuration is almost the same with the IEC 61000-4-3 radiated immunity test. System setup for the proximity irradiation test can be achieved by simply switching the antennas from the broadband antenna to the TEM horn antenna.

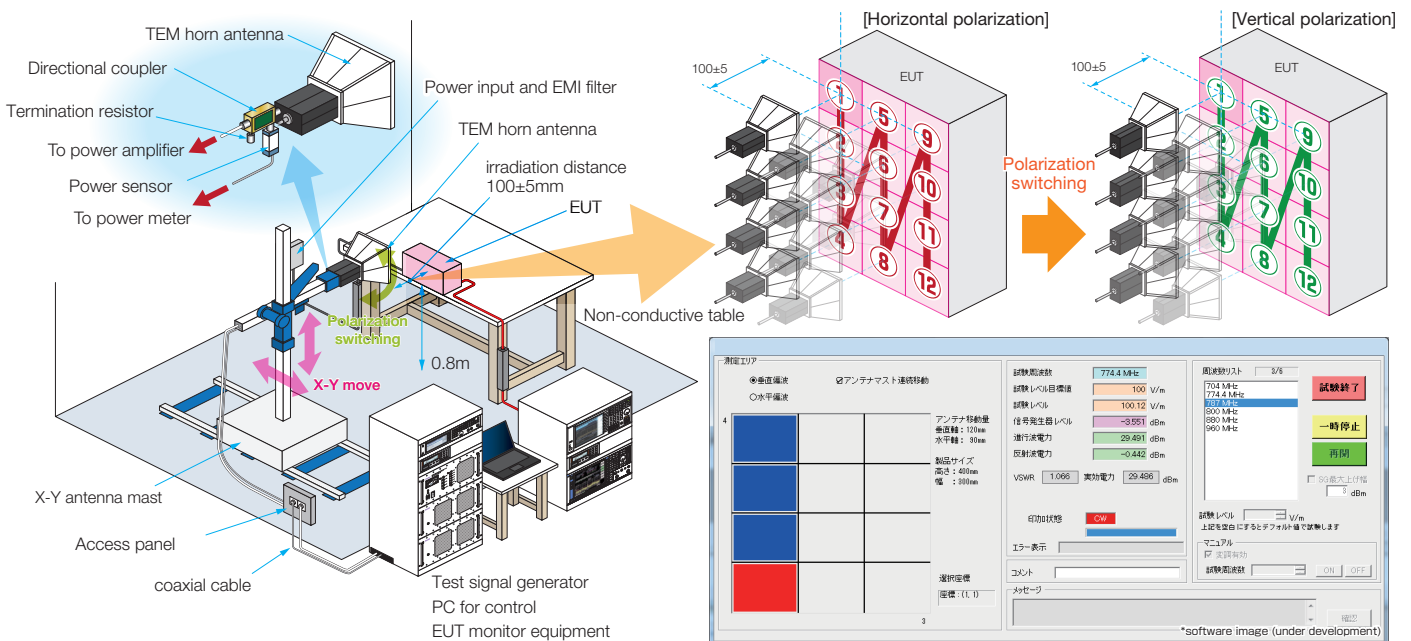
\*antenna position control (X-Y control) is available as an option



**System configuration using the dedicated software**

**Test image using dedicated software (X-Y position movement and polarization switching control)**

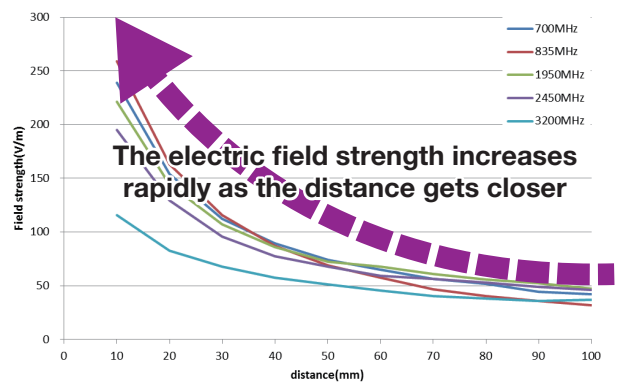
In the test, the distance between the DUT and the antenna is set to 100 mm, and all surfaces of the DUT are radiated with vertically polarized waves and horizontally polarized waves. By using the dedicated software to automate the antenna movement and radio wave radiation, you can further reduce test time and labor.



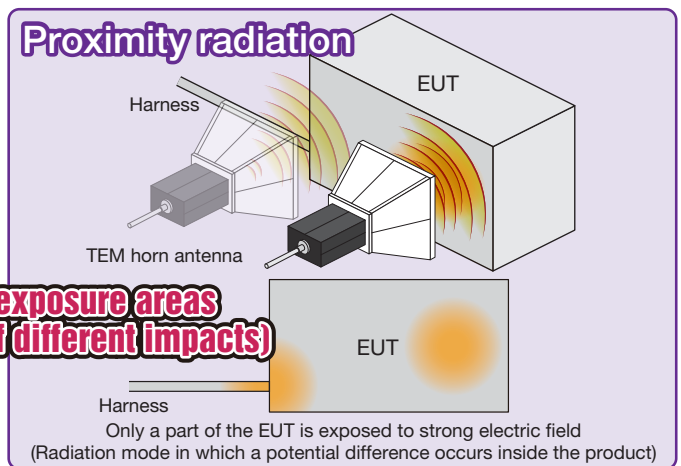
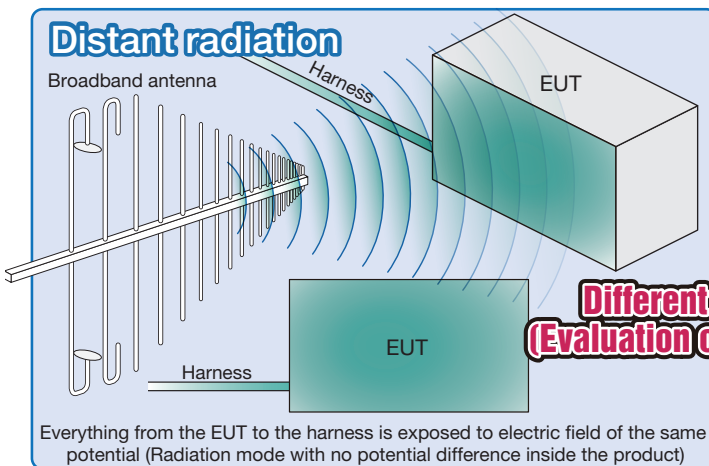
TEM horn antenna

**The need for the close proximity radiation immunity testing**

With the advent of new communication technologies and infrastructures such as IoT and 5G, in addition to smartphones and wireless LANs, which have become extremely popular in recent years, a world is emerging in which many electronic devices are connected by wireless communication. On the other hand, from the perspective of EMC, the number of cases where these wireless transmitters are in close proximity to other electronic devices is increasing, raising concerns about the risk of electromagnetic interference. Against this background, IEC 61000-4-39, an electromagnetic immunity test method for nearby transmitters, was issued. Since the electromagnetic field generated by a nearby transmitter is extremely strong and has the characteristics of the near field, it is necessary to perform it in addition to the conventional radiated immunity test that radiates from a distance. The basic standard IEC 61000-4-39 defines the antenna to be used, and it is necessary to use a TEM horn antenna in the frequency band of smartphones, mobile phones, and 5G (sub6).



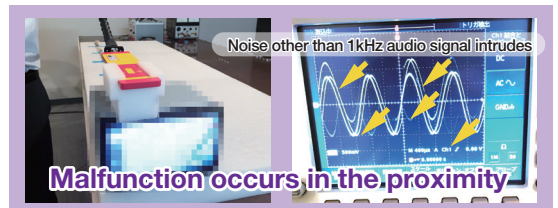
Electric field near the transmitter-Image of distance characteristics



**Different exposure areas (Evaluation of different impacts)**



Test conditions  
 Product: Automotive navigation system  
 Modulation: PWM  
 Frequency: 900 MHz  
 Evaluation: 1 kHz audio signal  
 [Note]  
 This test is the result of the test conducted in accordance with the proximity radiation immunity test standard (ISO 11452-9) for automobile equipment.  
 Both distant and close proximity radiation testing are already being conducted for vehicles and in-vehicle equipment.



**Different test conditions show different test results**

# NoiseKen

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