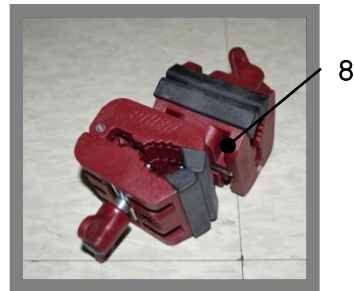


HY -TS -001 is an antenna set for evaluating electromagnetic wave immunity of automobile electric parts manufactured according to manufacturer specific standard (HKMC).



1. broadband low loss balun 1:1
2. WBD3656
3. 146MHz radiation element
4. 155MHz radiation element
5. 165MHz radiation element
6. 174MHz radiation element
7. 222MHz radiation element
8. mount clamp



■ Description

It is composed of IMDA Set and Wideband Dipole Antenna as an antenna set for evaluating electromagnetic wave immunity of automobile electric parts.

HY - TS - 001 is manufactured according to manufacturer 's specific standard. (HKMC standard)

The IMDA set is an ISO 11452-9 compatible foldable dipole antenna and consists of five antennas and baluns for evaluating the electromagnetic immunity of automotive electronic components.

It is stored in a built-in case with shock-absorbing foam material to prevent breakage.

■ Construction of HY-TS-001

No.	Product Code		Q'ty	Unit	Remark
1	Low Frequency Dipole Antenna	IBA 520	1	ea	Balun (20~520MHz)
		IMDA 146	1	ea	146MHz
		IMDA 155	1	ea	155MHz
		IMDA 165	1	ea	165MHz
		IMDA 174	1	ea	174MHz
2	Broadband Dipole Antenna	IMDA 222	1	ea	222MHz
		WBD3656	1	ea	360MHz~3GHz & 5.0~6.0GHz
3	Set Case	Hard Case	1	ea	

■ Electrical/Physical Characteristics

Category	Item	Specification	Unit	Conditions
Electrical	Frequency	0.146 ~ 6.0	GHz typ.	@Set
	Impedance	50	Ω	
	Max. Input Power	30	W	
Physical	Connector	N Female		
	Storage Case Size	660X505X210	mm	
	Weight	10	Kg	@Storage Case 포함

■ Antenna for each frequency band

Handheld Wireless Device	Real Frequency(MHz)	Test Antenna
OBT(2m)	144 to 176 / 222	IMDA 146, 155, 165, 174, 222
OBT(2m)	444	WBD3656
OBT(70cm)	420 to 450	WBD3656
TETRA/TETRAPOL (digital radio)	350 to 360 / 380 to 390 410 to 420 / 450 to 460 806 to 825 / 870 to 876	WBD3656
CDMA 800	815 to 849	WBD3656
GSM 850 / GSM 900	824 to 849 / 876 to 915	WBD3656
GSM 1800/1900	1710 to 1785 / 1850 to 1910	WBD3656
CDMA 1900	1850 to 1910	WBD3656
UMTS (WCDMA &TD/CDMA)	824 to 849 / 880 to 915 1850 to 1980 / 1885 to 2025 1920 to 1980	WBD3656
Bluetooth, WLAN(data), WIFI	2400 to 2500	WBD3656
LTE (OFDMA & SC-FDMA)	699 to 915 / 1427 to 1463 1625 to 1661 / 1710 to 1785 1850 to 2025 / 2300 to 2400 2496 to 2690	WBD3656
IEEE 802.11a(5G WIFI) IEEE 802.11p(WAVE)	5725 to 5850 5850 to 5925	WBD3656

■ Antenna VSWR

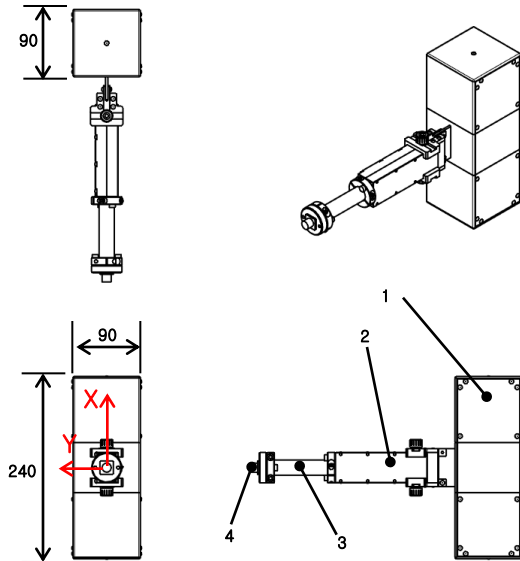
The IMDA Set recommends that when the antenna approaches the environmental surface, the VSWR curve of good impedance matching is very narrow and very sensitive, so do not place metal objects, coaxial cables, etc. around it.

The VSWR characteristics of the IMDA Set vary greatly when the cable is located in the vicinity.

The size of the IMDA Set is a fraction of the $\frac{1}{2}$ wavelength, and the internal physical length contains $\frac{1}{2}$ wavelength.

Since VSWR is important in measurement, it is recommended to fix the antenna to the position of use and to measure and use VSWR.

The IMDA series is an ISO 11452-9 compliant Folded Dipole Antennas and consists of five antennas and baluns for evaluating the electromagnetic immunity of automotive electronic components.



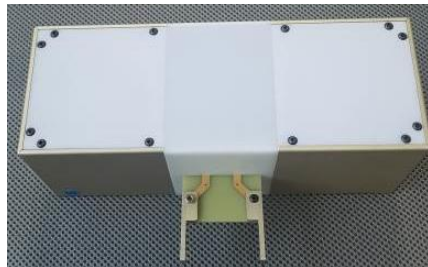
1. Radiation element (IMDA)
2. Broadband low loss balun 1:1(IBA520)
3. Ø20 mm tube for handling or fixture
4. N-female connector



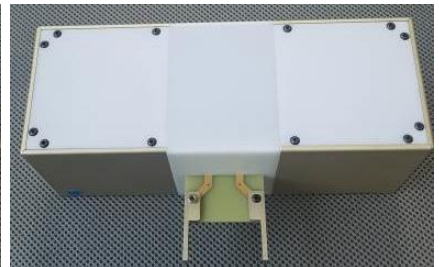
IMDA + IBA520



IBA520 (Balun)



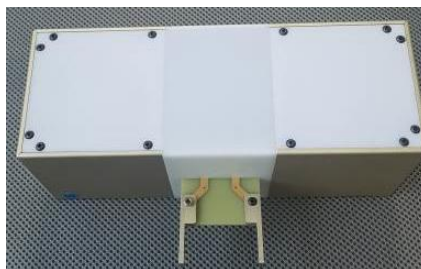
IMDA155 (155MHz)



IMDA174 (174MHz)



IMDA146 (146MHz)



IMDA165 (165MHz)



IMDA222 (222MHz)

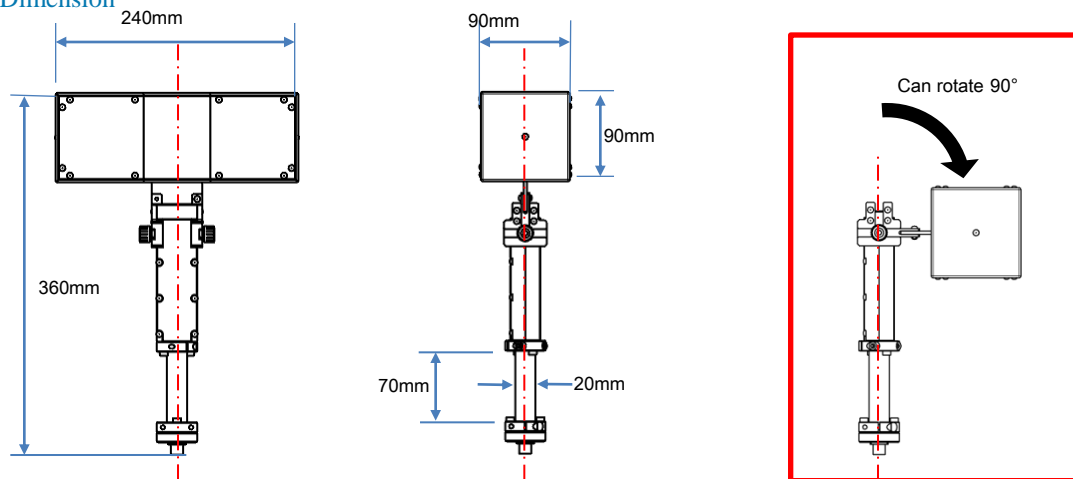
Description

It can be used in the frequency range from 146 MHz to 222 MHz by using the flat portion of a single antenna for the evaluation of electromagnetic immunity of near-field automotive electrical components. Antenna Radiator is powered by 1: 1 Balun.

It consists of one balun and five Radiation Elements. You can unlock the knob and replace the Radiation Element.

The Radiation Element can be mounted orthogonally to the Balun.

Dimension



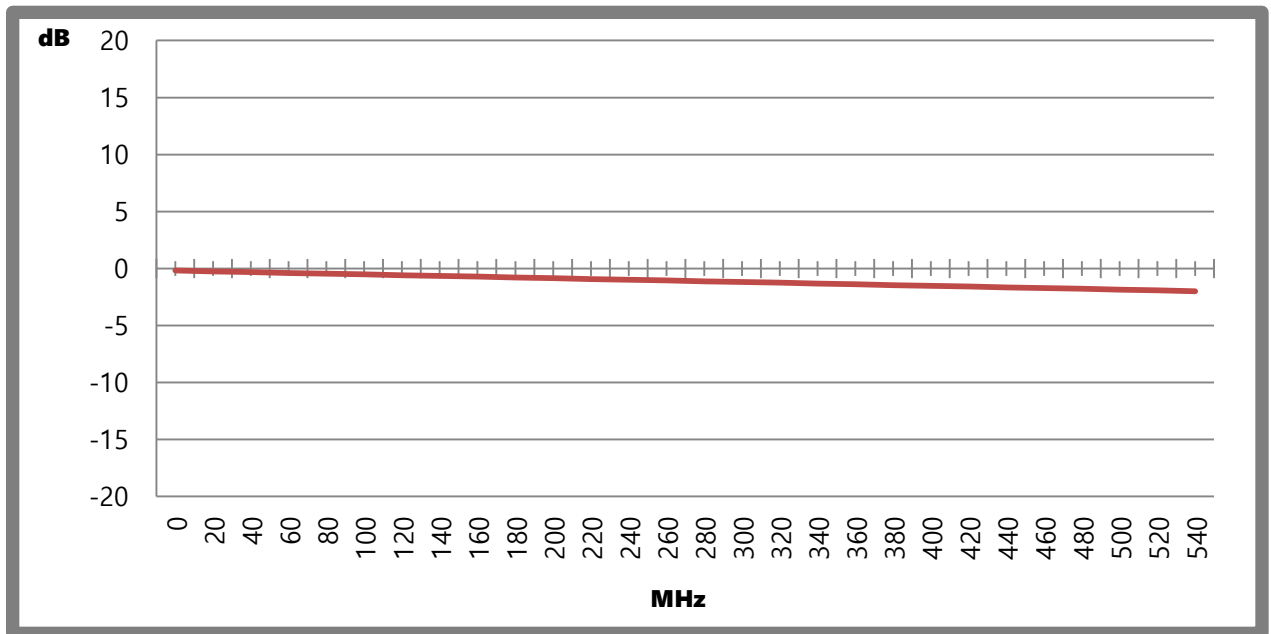
Electrical/Physical Characteristics

Category	Item	Specification	Unit	Conditions		
Folded Dipole With Balun	Electrical	Frequency	146 ~ 222	MHz typ.	@Total 5 Antenna (146,156,165,174,222MHz)	
		Bandwidth	≅5	%		
		Gain	146MHz	-1.85	dBi typ.	@ Antenna Factor (15.36dB/m)
			155MHz	-1.15		@ Antenna Factor (15.18dB/m)
			165MHz	-0.85		@ Antenna Factor (15.42dB/m)
			174MHz	-1.17		@ Antenna Factor (16.21dB/m)
			222MHz	-0.42		@ Antenna Factor (17.56dB/m)
		Impedance	50	Ω		
		Input Power	30	W	@Max.	
		Polarization	Linear			
VSWR		≤ 2.0		@ center		
		≤ 3.0		@ 5% BW of center		
Physical	Dimension	240 X 90 X 360	mm			
	Tube for Handle	20	mm	@Diameter		
	Weight	900	g	@IMDA Set Total 12kg		
	Port	N Female	type			

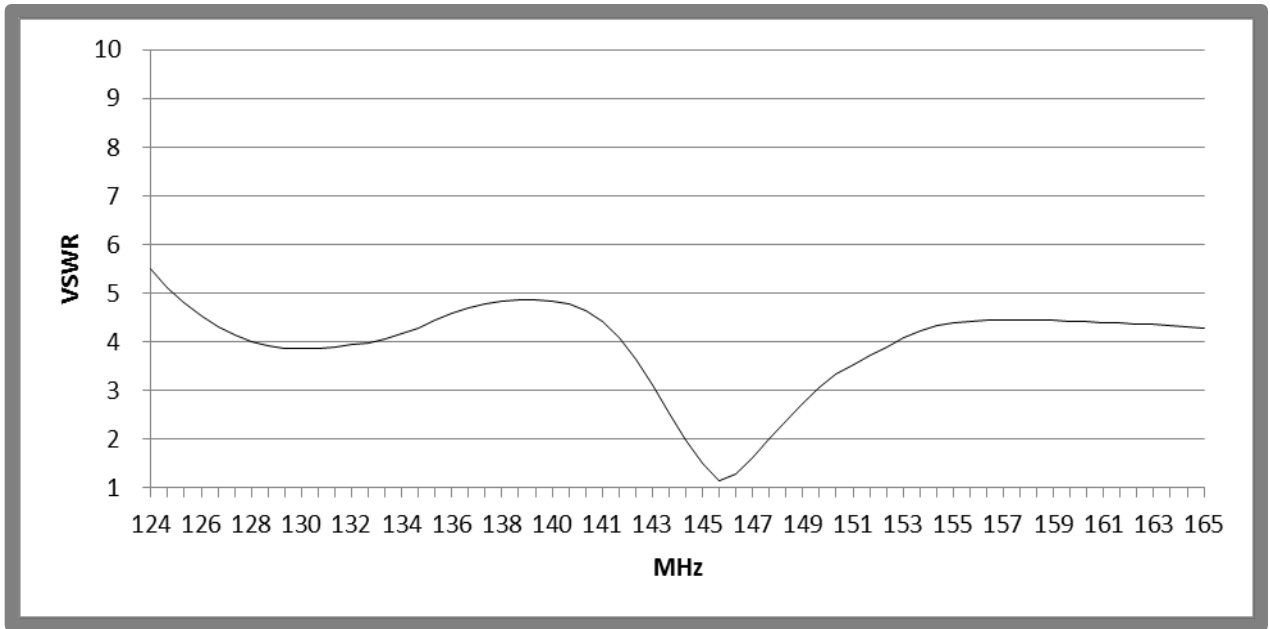
■ Electrical/Physical Characteristics (IBA520)

Category	Item	Specification	Unit	Conditions	
Balun	Electrical	Frequency	20 ~ 520	MHz typ.	
		Insertion Loss	< 2.0	dB	@20 ~ 520MHz Max.
		Impedance	50	Ω	
Balun	Physical	Dimension	250X50X43	mm	@Except Nobe
		Tube for Handle	20	mm	@Diameter
		Weight	520	g	
		Port	N Female	type	

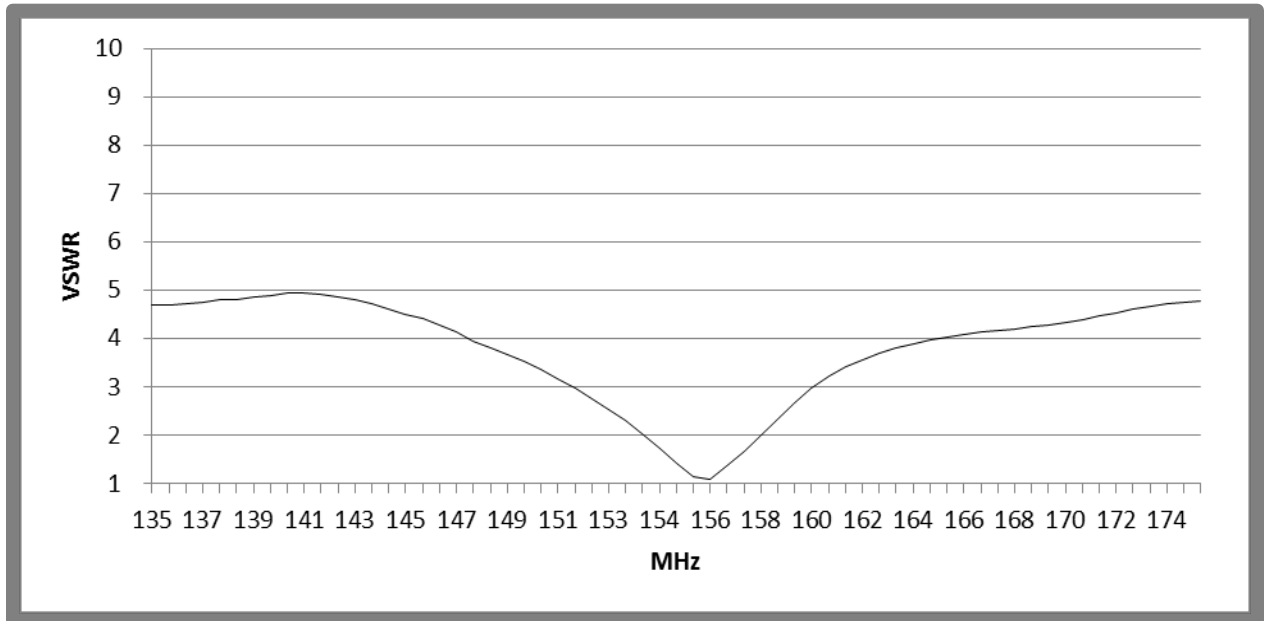
■ Insertion Loss (IBA-520)



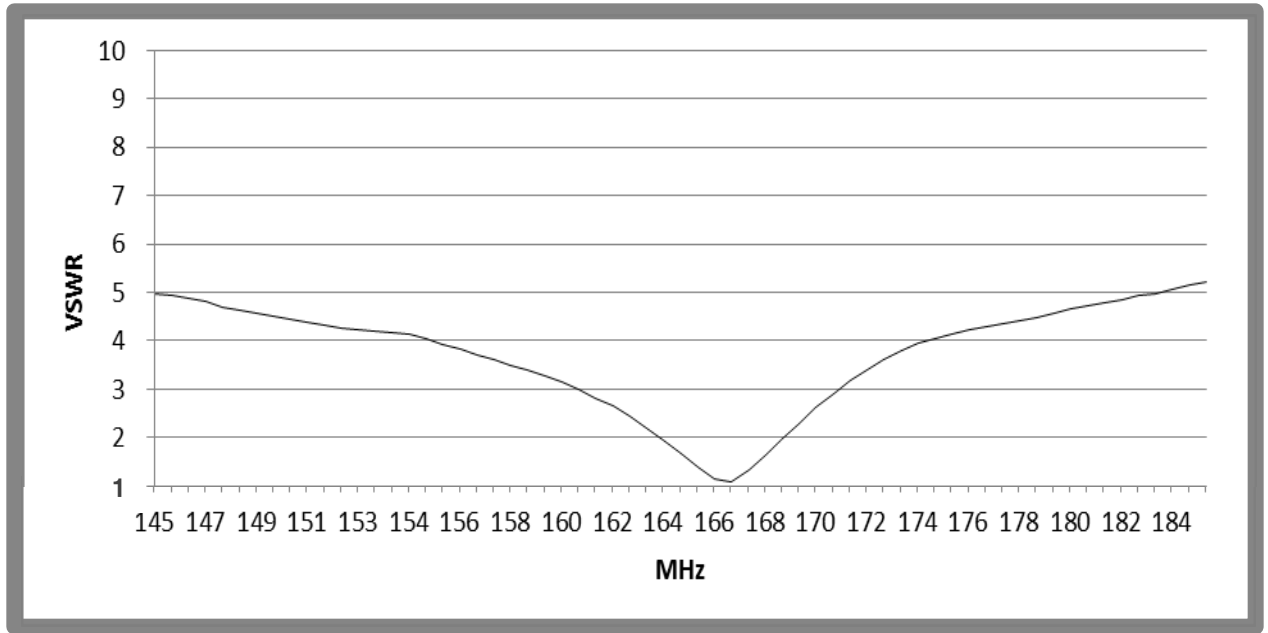
■ Typical Passive Performance Curves (IMDA146 VSWR)



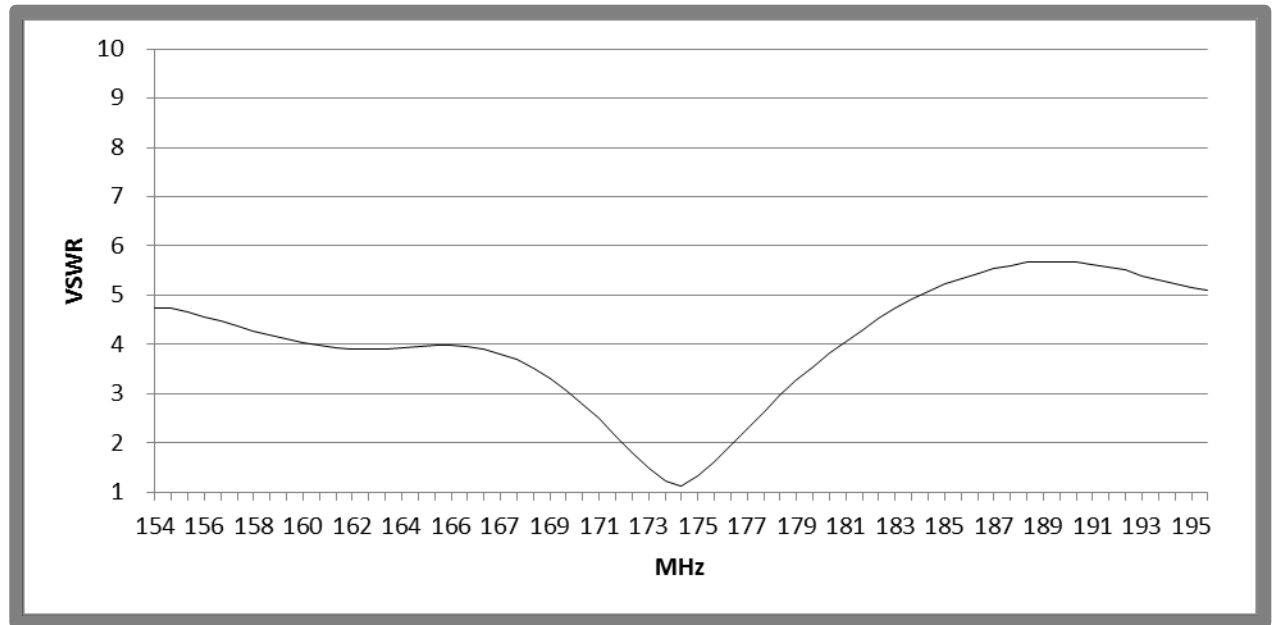
■ Typical Passive Performance Curves (IMDA155 VSWR)



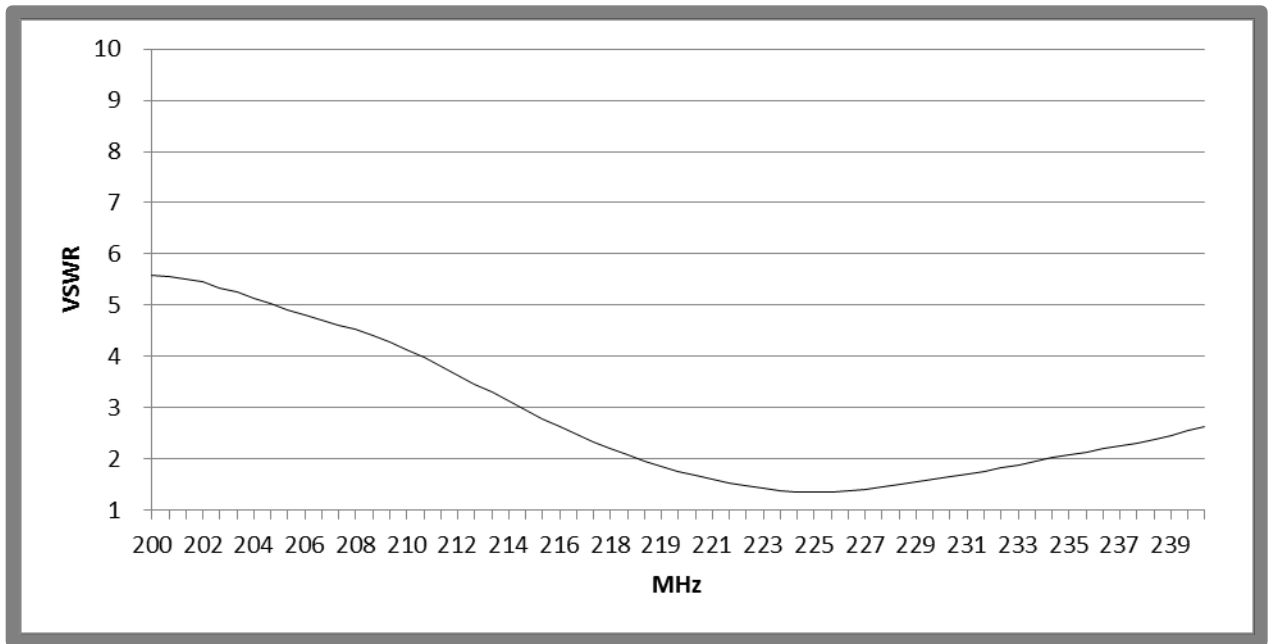
■ Typical Passive Performance Curves (IMDA165 VSWR)



■ Typical Passive Performance Curves (IMDA174 VSWR)



■ Typical Passive Performance Curves (IMDA222 VSWR)

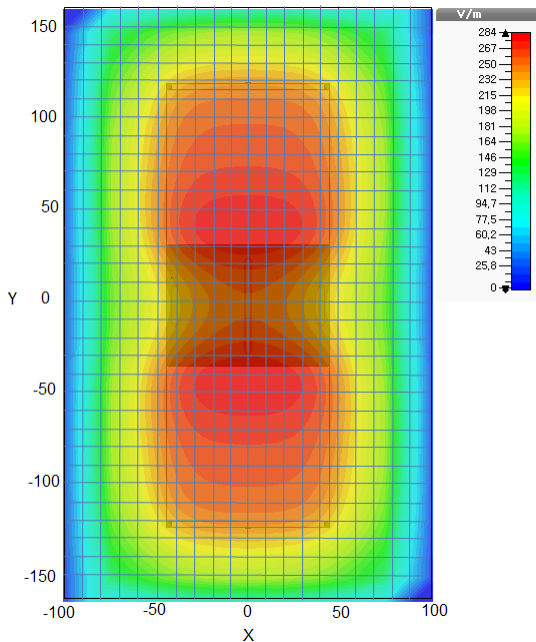


Field Uniformity

Field uniformity measurements were estimated using simulations. Consists of a plane above the area separated by a constant distance $d = 50$ mm. All diagrams come with the same color scale normalized to 0 dB.

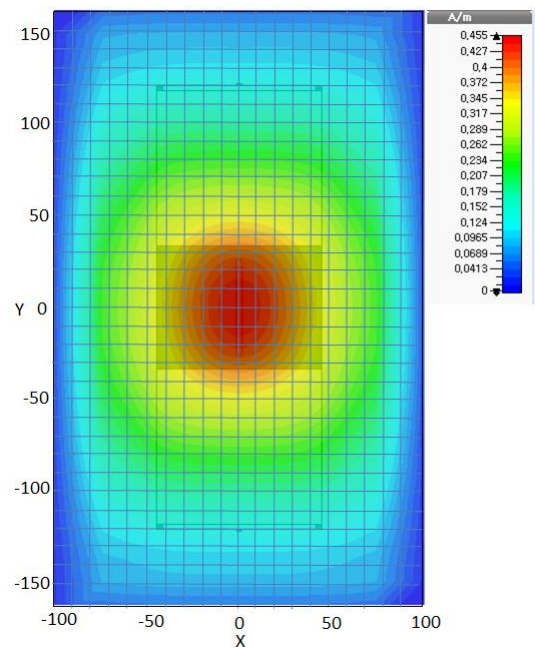
Simulated for each frequency at $d = 50$ mm. The reference plane of distance d is the WBD3656 surface facing the EUT.

Electric Field (V/M)



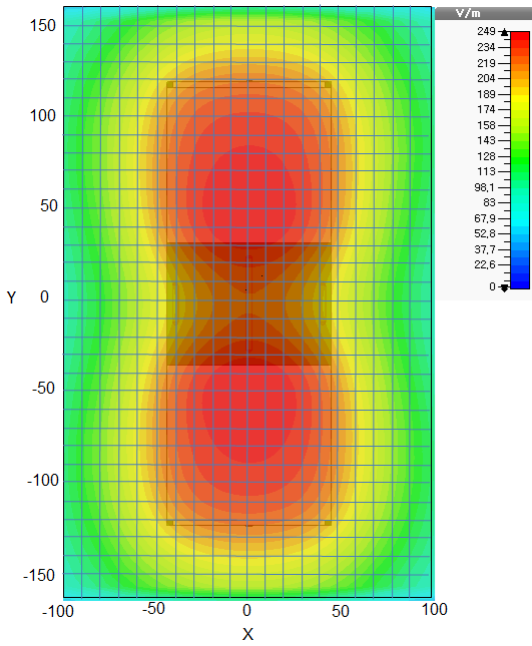
146 MHz; 1 W net input
Field strength: 284 V/m

Magnetic Field (A/M)



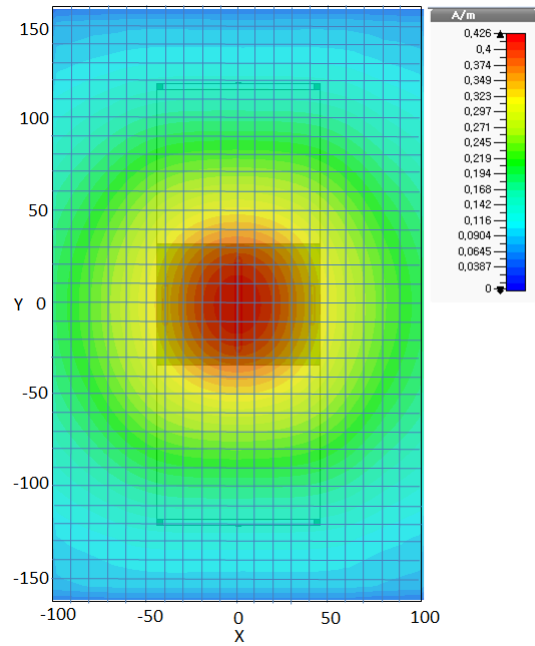
146 MHz; 1 W net input;
Field strength: 0.46 A/m

■ Electric Field (V/M)

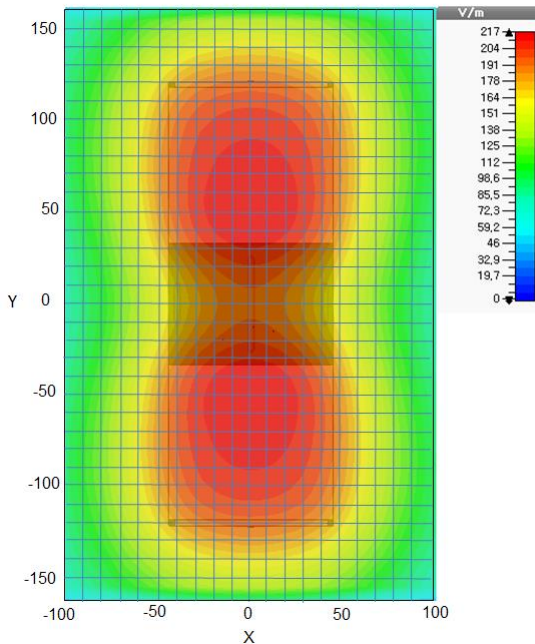


155 MHz; 1 W net input
Field strength: 265 V/m

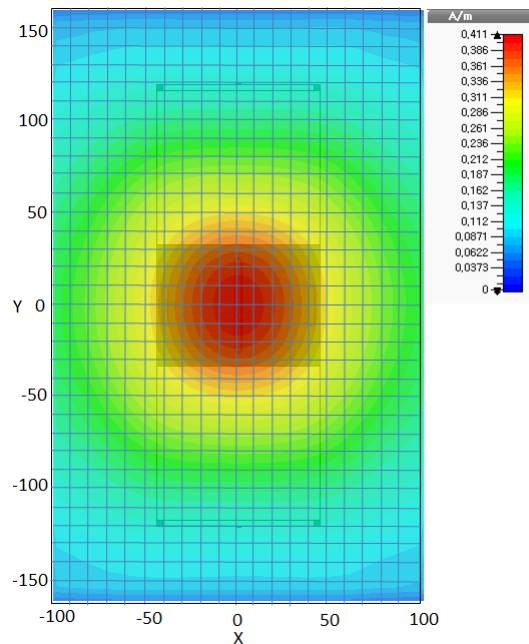
■ Magnetic Field (A/M)



155 MHz; 1 W net input;
Field strength: 0.43 A/m

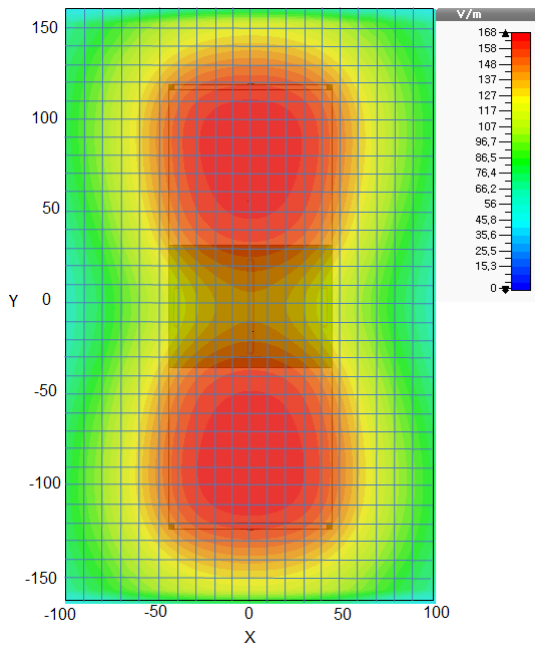


165 MHz; 1 W net input
Field strength: 249 V/m



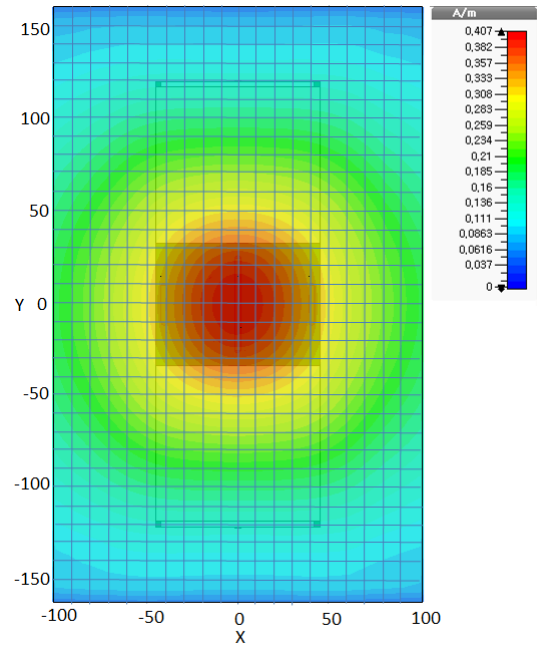
165 MHz; 1 W net input;
Field strength: 0.41 A/m

■ Electric Field (V/m)

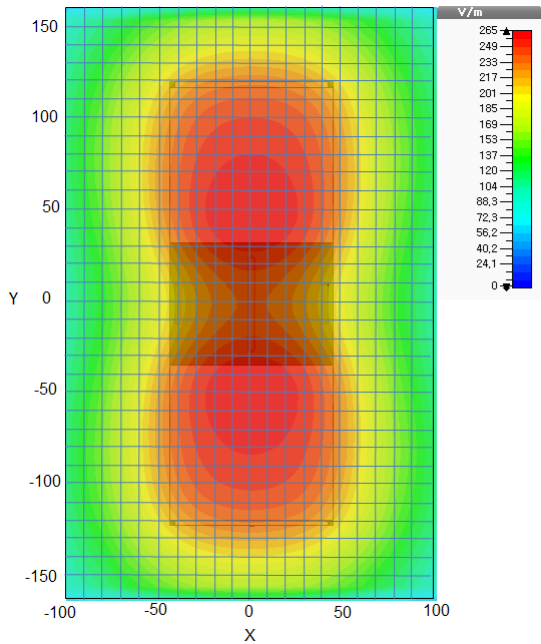


174 MHz; 1 W net input
Field strength: 217 V/m

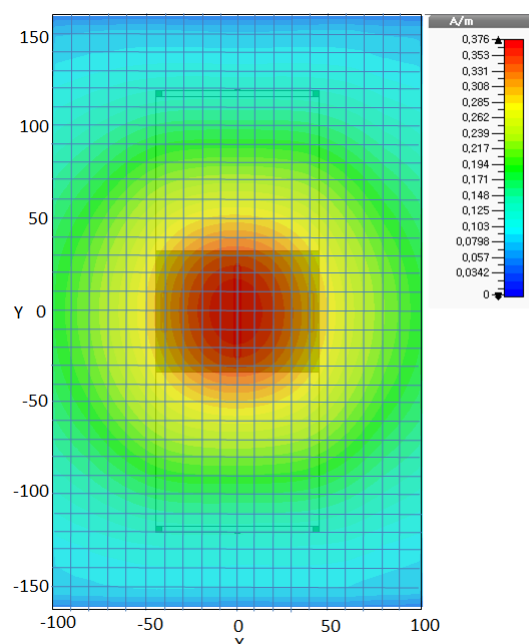
■ Magnetic Field (A/m)



174 MHz; 1 W net input;
Field strength: 0.41 A/m

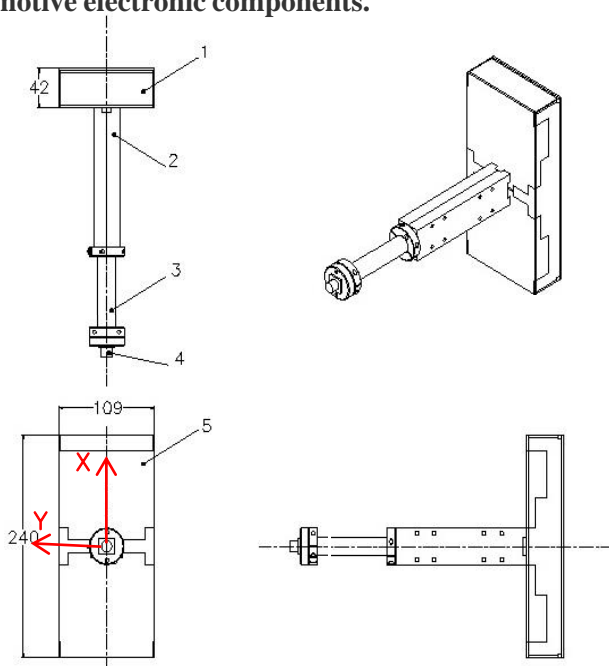


222 MHz; 1 W net input
Field strength: 168 V/m



222 MHz; 1 W net input;
Field strength: 0.38 A/m

The WBD3656 is Broadband Dipole Antenna for evaluating the electromagnetic immunity of automotive electronic components.



1. Radiation element
2. Element fixture and spacing frame(non-metallic)
3. 20 mm tube for handling or fixture
4. N-female connector

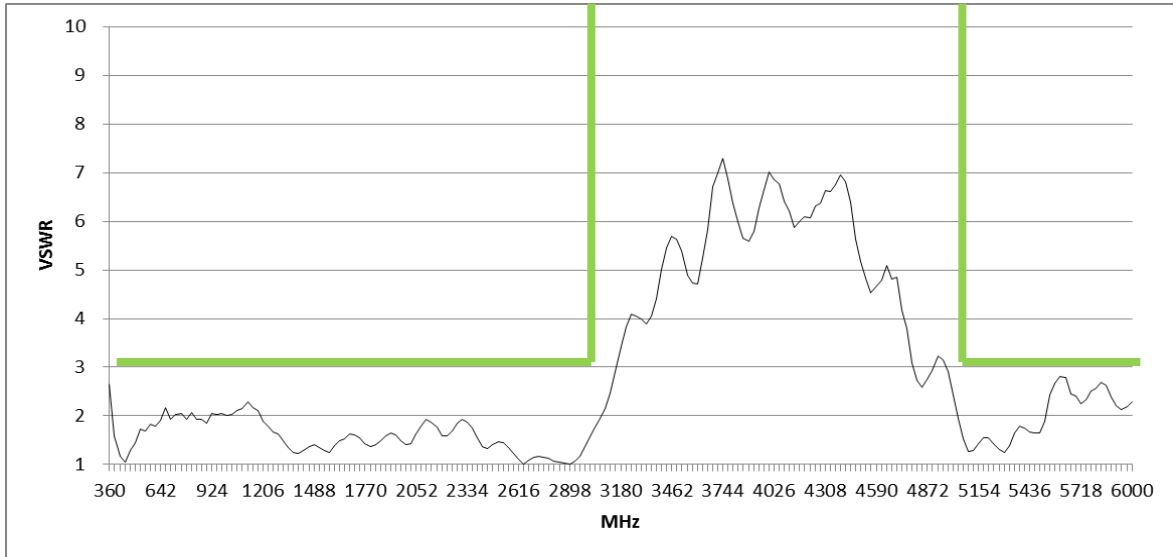
Description

It can be used in the frequency range from 360 MHz to 3000 MHz & 5000 MHz ~ 6000 MHz by using the flat portion of a single antenna for the evaluation of electromagnetic immunity of near-field automotive electrical components.

Electrical/Physical Characteristics

Category	Item	Specification	Unit	Conditions	
Antenna	Electrical	Frequency	0.36 - 3.0 & 5.0 ~ 6.0	GHz typ.	
		Gain	1.54	dBi typ.	@400MHz
			2.99		@900MHz
			4.99		@1800MHz
			3.77		@2000MHz
			2.91		@2450MHz
			3.75		@2600MHz
			6.15		@5500MHz
	Impedance	50	Ω		
	Input Power	30	W	@Max.	
Polarization	Linear				
VSWR	≤ 3.0		@ all frequency		
Physical	Size	240 X 106 X 300	mm		
	Tube for Handle	20	mm	@Diameter	
	Weight	800	g		
	Port	N Female	type		

■ Typical Passive Performance Curves (VSWR)



■ Antenna for each frequency band

Handheld Wireless Device	Real Frequency [MHz]	Test Antenna
OBT(2m)	444	WBD3656
OBT(70cm)	420 – 450	WBD3656
TETRA/TETRAPOL (digital radio)	350 - 360 / 380 - 390 410 - 420 / 450 - 460 806 - 825 / 870 - 876	WBD3656
CDMA 800	815 - 849	WBD3656
GSM 850 / GSM 900	824 - 849 / 876 - 915	WBD3656
GSM 1800/1900	1710 - 1785 / 1850 - 1910	WBD3656
CDMA 1900	1850 - 1910	WBD3656
UMTS (WCDMA &TD/CDMA)	824 - 849 / 880 - 915 1850 - 1980 / 1885 - 2025 1920 - 1980	WBD3656
Bluetooth, WLAN(data), WIFI	2400 - 2500	WBD3656
LTE (OFDMA & SC-FDMA)	699 - 915 / 1427 - 1463 1625 - 1661 / 1710 - 1785 1850 - 2025 / 2300 - 2400 2496 - 2690	WBD3656
IEEE 802.11a(5G WIFI) IEEE 802.11p(WAVE)	5725 - 5850 5850 - 5925	WBD3656

■ Application

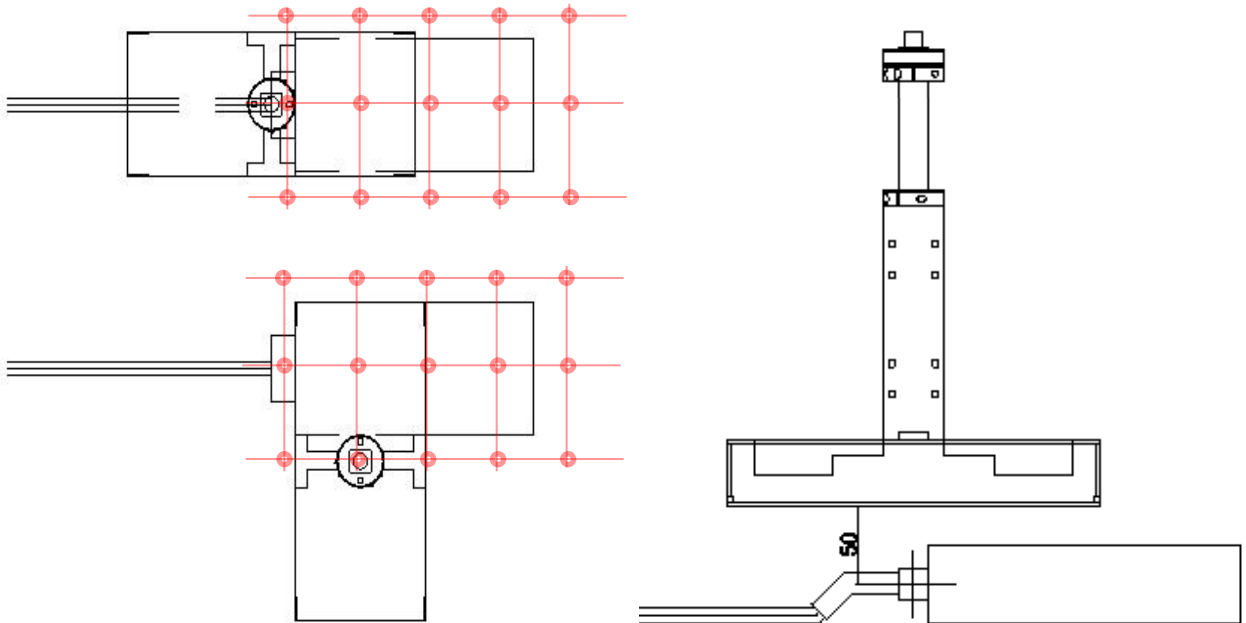
Broadband antenna allows easy measurement without replacing the antenna in a wide frequency band.

ISO 11452-9 measurement method is as follows.

The recommended spacing between the EUT surface and WBD3656 is 50 mm. These intervals minimize variations in VSWR and provide adequate field uniformity.

The EUT surface should be divided into square shaped grids, and the width of the gratings should be different depending on the desired field uniformity. We recommend measurement with two crossed polarizations for each crossing grid.

Repeat every lattice point until the entire EUT surface is covered. Recommended lattice widths from about 30 mm to 50 mm are recommended.

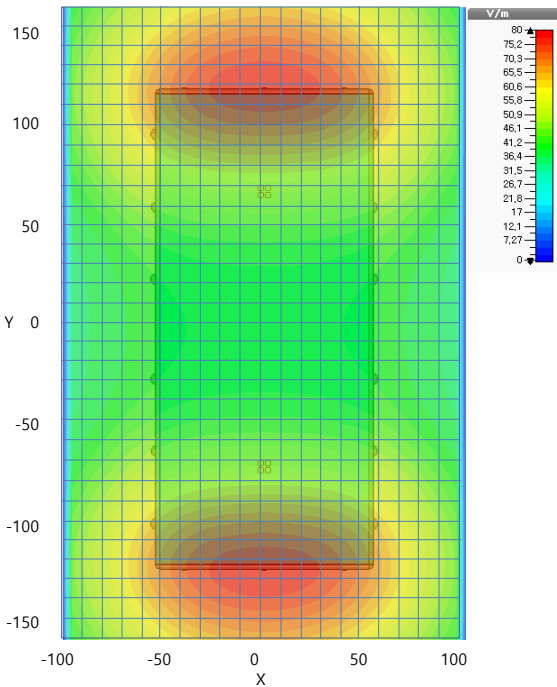


Field Uniformity

Field uniformity measurements were estimated using simulations. Consists of a plane above the area separated by a constant distance $d = 50$ mm. All diagrams come with the same color scale normalized to 0 dB.

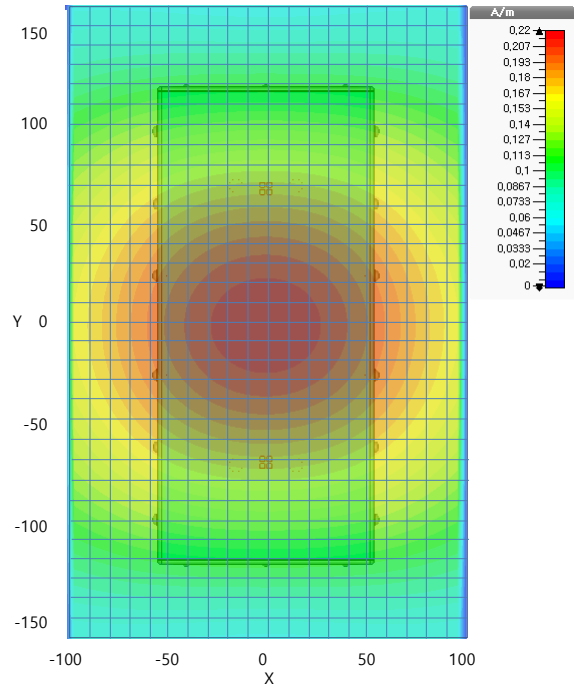
Simulated for each frequency at $d = 25$ mm. The reference plane of distance d is the WBD3656 surface facing the EUT.

Electric Field (V/M)



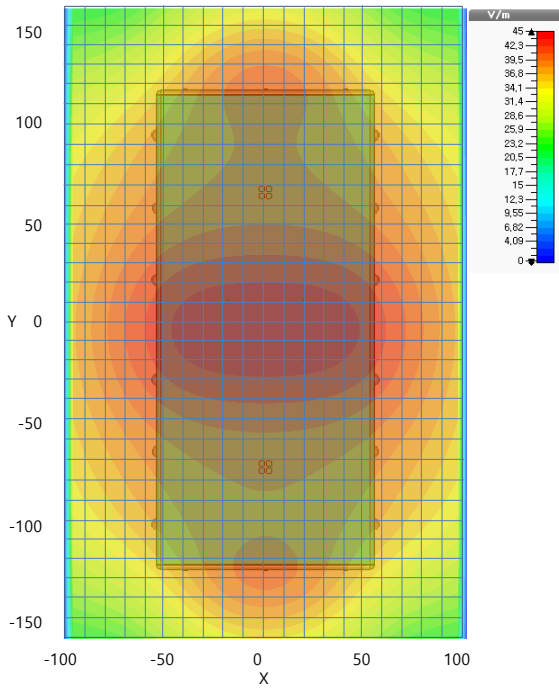
400 MHz: 1 W net input
E-field strength: 77 V/m

Magnetic Field (A/M)



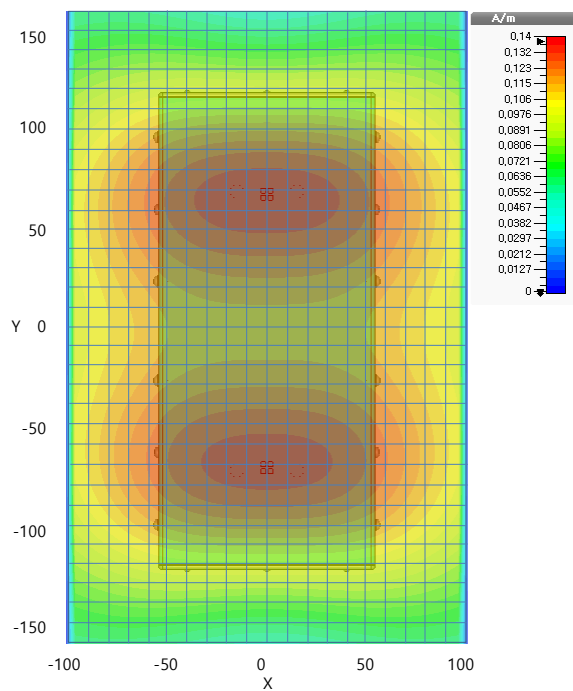
400 MHz: 1 W net input
H-field strength: 0.22 A/m

■ Electric Field (V/M)

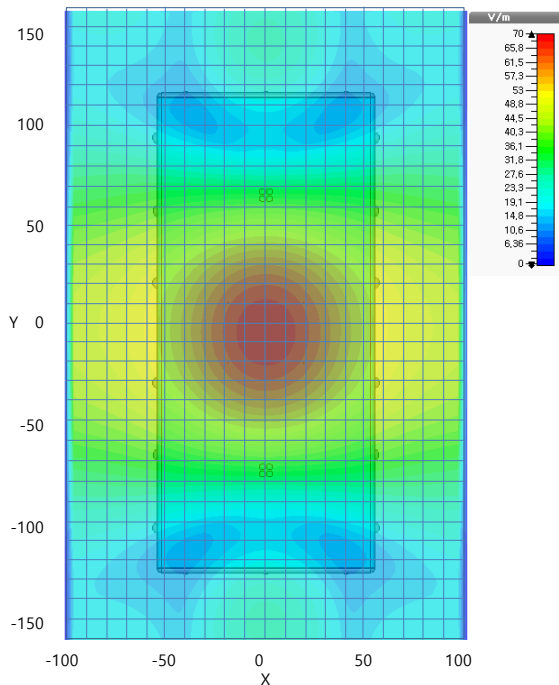


900 MHz: 1 W net input
E-field strength: 44.9 V/m

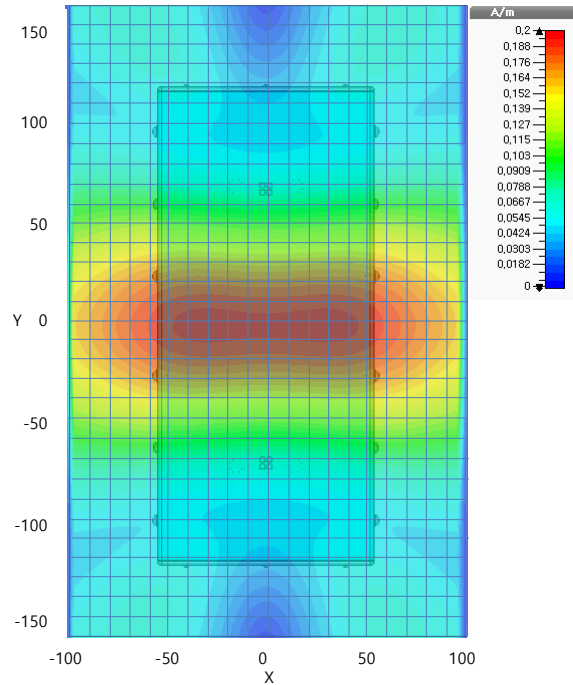
■ Magnetic Field (A/M)



900 MHz: 1 W net input
H-field strength: 0.13 A/m

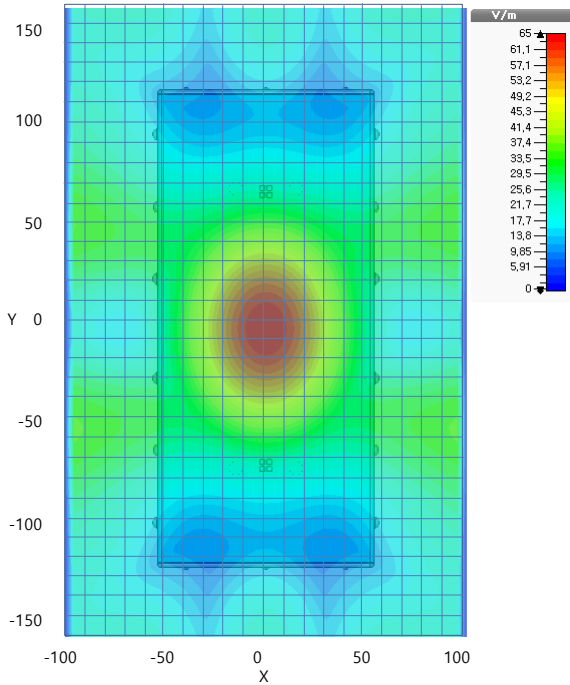


1800 MHz: 1 W net input
E-field strength: 69.9 V/m



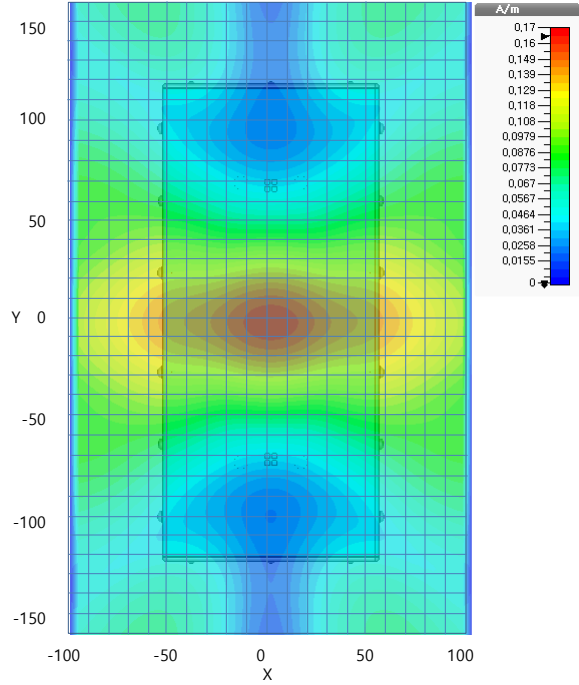
1800 MHz: 1 W net input
H-field strength: 0.2 A/m

■ Electric Field (V/M)

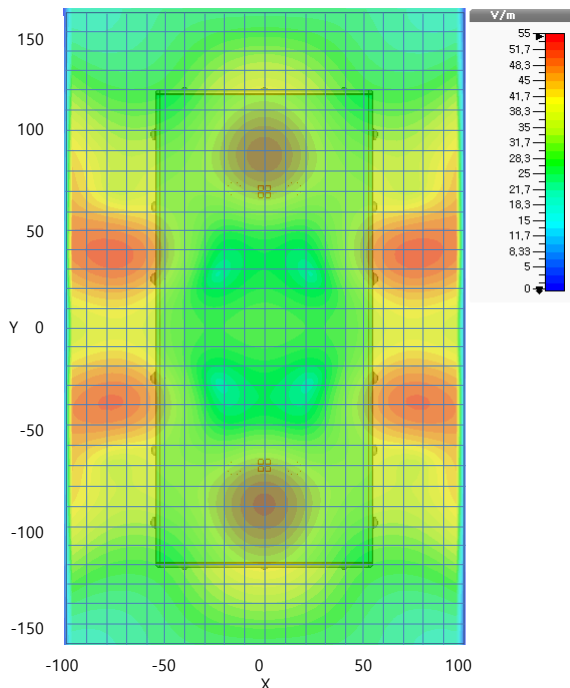


2000 MHz: 1 W net input
E-field strength: 65.3 V/m

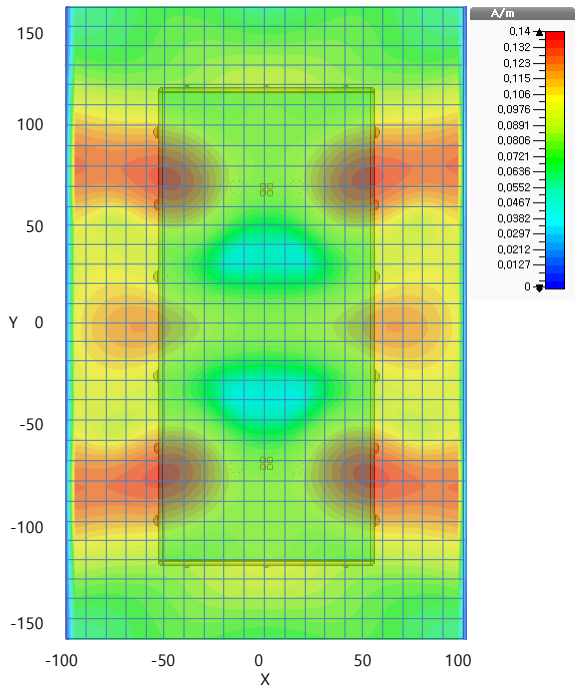
■ Magnetic Field (A/M)



2000 MHz: 1 W net input
H-field strength: 0.16 A/m

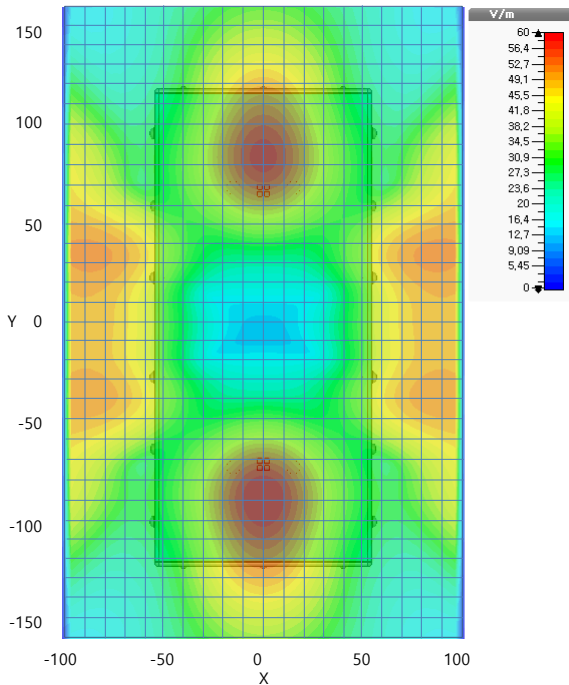


2450 MHz: 1 W net input
E-field strength: 51V/m



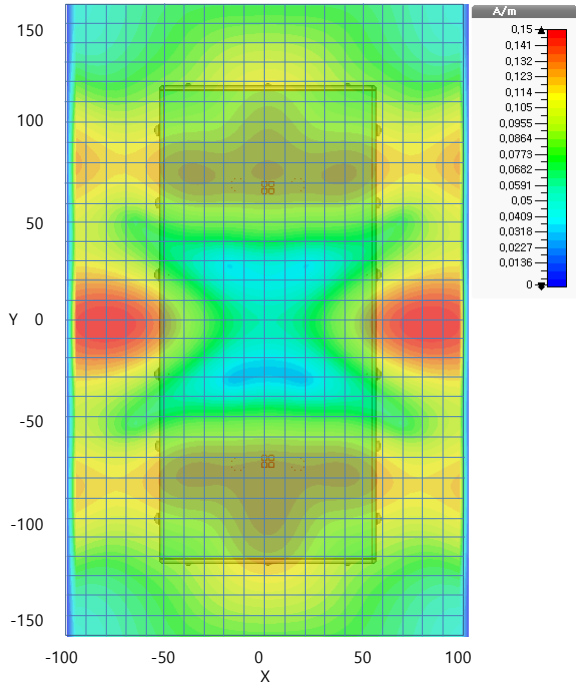
2450 MHz: 1 W net input
H-field strength: 0.13 A/m

Electric Field (V/M)

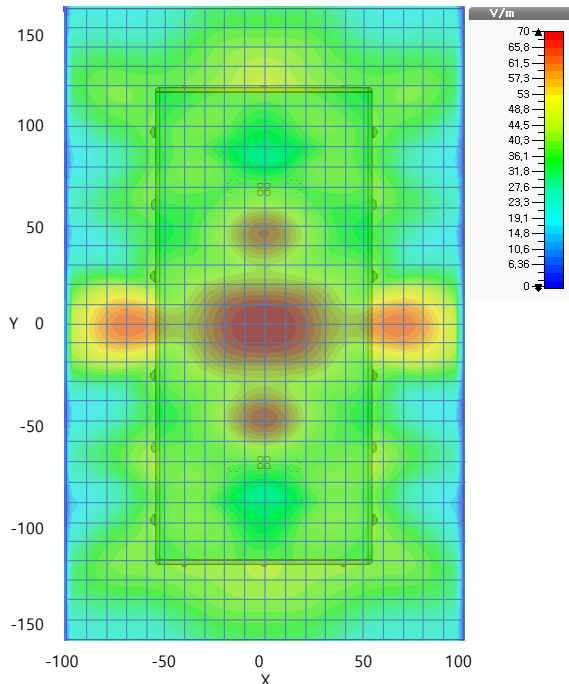


2600 MHz: 1 W net input
E-field strength: 60.5 V/m

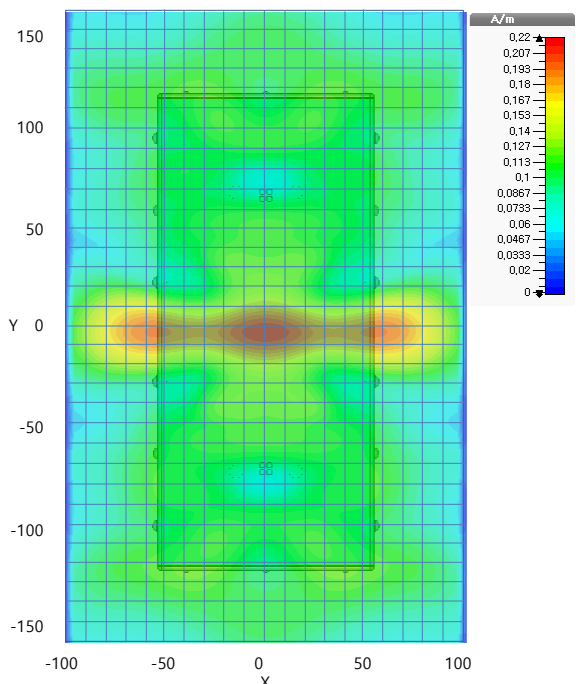
Magnetic Field (A/M)



2600 MHz: 1 W net input
H-field strength: 0.15 A/m



5500 MHz: 1 W net input
E-field strength: 70.7 V/m



5500 MHz: 1 W net input
H-field strength: 0.21 A/m