

# High Power Circulators & Dummy Loads

## CIRCULATORS

### WAVEGUIDE CIRCULATORS



324MHz Circulator

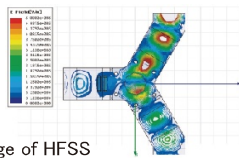
972MHz Circulator

1300MHz Circulator

#### Features

1. Adopted original multi-layer structure
2. High power durability
3. Low insertion loss
4. Compact size
5. Adopted Y junction

Available custom design in accordance with frequency and power conditions.



Simulation image of HFSS

### COAXIAL CIRCULATORS



Available insulating oil filled models and SF6-gas filled models to withstand high voltage.

Frequency	Input Power	Isolation	Ins. Loss	VSWR	Waveguide	Main User
324±1MHz	3MWpeak, 700 μs, 50Hz	>25dB	<0.15dB	<1.15	WR-2300	J-PARC
432±1.5MHz	2MWpeak, 650 μs, 50Hz	>20dB	<0.3dB	<1.15	WR-1800	
508±1.5MHz	150kW CW	>25dB	<0.2dB	<1.15	WR-1500	KEK
508±0.5MHz	250kW CW	>20dB	<0.4dB	<1.4	WR-1500	KEK
600±3MHz	35kW CW	>25dB	<0.3dB	<1.2	WR-1500	JAEA
972±2MHz	3MWpeak, 800 μs, 50Hz	>25dB	<0.2dB	<1.15	WR-975	J-PARC
1300±5MHz	500kWpeak, 1.5 μs, 5Hz	>20dB	<0.3dB	<1.2	WR-650	KEK
1300±5MHz	150kW CW	>20dB	<0.3dB	<1.2	WR-650	KEK
2856±5MHz	7MWpeak, 7kWAve.	>23dB	<0.3dB	<1.15	WR-284	

Frequency	Input Power	Isolation	Ins. Loss	VSWR	Coaxial Tube	Main User
90±0.5MHz	10kW CW	>20dB	<0.5dB	<1.2	3-1/8"	
118±0.5MHz	10kW CW	>20dB	<0.4dB	<1.4	3-1/8"	KEK
118±0.5MHz	30kW CW	>20dB	<0.3dB	<1.2	4-7/8"	KEK
171±1MHz	30kW CW	>20dB	<0.3dB	<1.2	4-7/8"	
200±0.5MHz	200kW CW *500ms	>15dB	<0.8dB	<1.4	4-7/8"	
202.5±1MHz	50kWpeak, 500 μs, 50Hz	>20dB	<0.25dB	<1.2	4-7/8"	
476±4MHz	80kWpeak, 1kWAve	>20dB	<0.2dB	<1.2	3-1/8"	RIKEN
499.8±2MHz	50kWpeak, 2ms, 10Hz	>20dB	<0.4dB	<1.2	3-1/8"	
600±3MHz	35kW CW	>20dB	<0.35dB	<1.2	3-1/8"	JAEA

## DUMMY LOADS



1250MHz Water Load



324MHz Dummy Load

### WAVEGUIDE WATER LOADS

- Water is used as RF absorber and also used as cooling water.
  - Materials having high durability and corrosion resistance are used.
- Water passage: Stainless steel, Windows: Ceramic

Frequency	Maximum Input Power	VSWR	Waveguide	Water Flow Rate	Main User
508±5MHz	1.2MW CW	<1.2	WR-1500	700L/min	KEK
972±2MHz	3MW, 700 μs, 50Hz, 120kWAve	<1.05	WR-975	100L/min	J-PARC
1250±5MHz	1MW CW	<1.2	WR-650	600L/min	KEK

### COAXIAL DUMMY LOADS

- RF absorbers originally employed withstand high voltage pulse.
- Recommended usage for high peak input power, and not high average power.

Frequency	Maximum Input Power	VSWR	Coaxial	Water Flow Rate	Main User
201±1MHz	2.5MWpeak, 500 μs, 50Hz, 62.5kW Ave.	<1.1	8-3/16"	80L/min	KEK
324±3MHz	3MWpeak, 650 μs, 50kW Ave.	<1.15	9-1/2"	60L/min	J-PARC

## COAXIAL & WAVEGUIDE CIRCUITS



This picture is offered by Accelerator Group of J-PARC.

324MHz 3MW Waveguide Circuit  
Waveguide: WR-2300  
(292.1mm × 584.2mm)

Installed 17sets at J-PARC

- Custom design is acceptable.
- Various kind of components are acceptable.  
Coaxial-Waveguide Convertors, Dividers, Directional Couplers, Phase Shifters, RF Filters, Coaxial Switches, Waveguide Switches, Attenuators



324MHz 3dB Hybrid



324MHz Phase Shifter



Dummy Load with Converter

