A double ceramic windows coupler was designed based on the IHEP version to solve the problem of the vacuum leaking. The double windows hardly have influence in RF transmission compared with the single window coupler. With the new design, the FE electron will be stopped by the new design donut stopper. Fig. 2 shows the structure of the double ceramic windows coupler and the FE electron simulation. The new couplers were condition to 14 kW cw power in travelling wave mode and more than 8 kW cw power in standing-wave mode on the RF condition plant. Five double ceramic window couplers delivered power to HWR010 of the China ADS Inject II online successfully. The maximum transmission power is 10 kW during 10 MeV beam commission in December 2016.

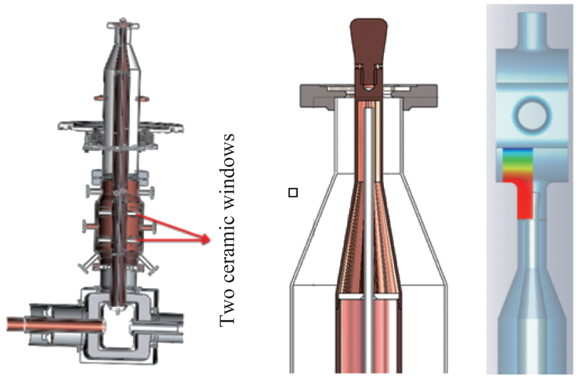

Fig. 2 (color online) View of new HWR010 coupler and FE electron simulation.

6 - 12 Design of a Double Spoke Cavity for CADS

Jiang Tiancai, Zhang Shenghu, Li Yongming, Yue Weiming, Xiong Pingran, Li Chunlong, Liu Lubei, Zhang Shengxue, Wang Ruoxu, Song Yukun, Guo Hao, Huang Yulu, You Zhiming and He Yuan

Spoke cavities have been developed and have apparent advantages for high current proton accelerator based on superconductivity at low and medium energy region. As the research and the technical reserve, Institute of Modern Physics(IMP) has started the R&D program of a double spoke cavity (operating frequency 325 MHz, β_0=0.52), within the framework of China Accelerator Driven System(C-ADS) project. The RF design and mechanical structure design have been finished, and two prototype cavities were manufactured in Harbin.

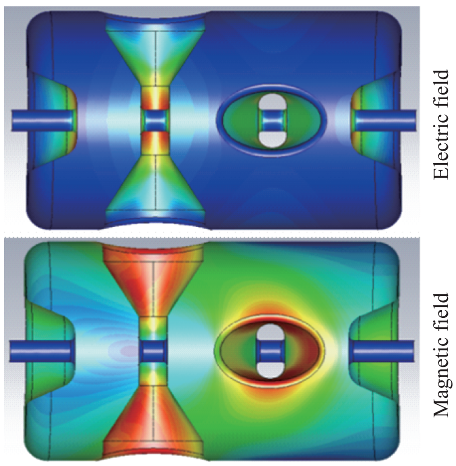

Fig. 1 (color online) The electromagnetic field distribution.

The main goal in the RF design of superconducting cavity is to get a higher accelerating gradient and a lower heat load, which are determined by a lower peak surface fields (E_p/E_{acc} and B_p/E_{acc}) and a higher $G{\cdot}R/Q_0$ (G is the geometrical factor, R is the shunt impedance and Q_0 is the quality factor). Table 1 summarizes all RF parameters of the cavity design; the effective length is defined as $L_{eff}=3\beta_0\lambda/2$. Fig. 1 shows the electric and magnetic fields distribution in the double spoke RF volume.

Mechanical structures have been studied to control the impacts of the various mechanical deformations. They are required to stiffen the cavity to withstand the vacuum load, and to reduce the frequency shifts caused by mechanical resonance. All the components, shown in Fig. 2(a) are formed by deep drawing and machining, and connected by electron-beam welding (EBW).

The IMP DSR052 after fabrication and welding is shown in Fig. 2(b). Leak test and RF test at room temperature have been done. The two cavities are proposed to be tested at low temperature in July of 2017.

Table 1 The main RF parameters.

RF Properties	Value
Frequency/MHz	325
Optimal β	0.52
$E_{\rm pk}/E_{\rm acc}$	3.83
$B_{\rm pk}/E_{\rm acc}$/(mt/MV/m)	7.64
G/Ω	114
$R/Q/\Omega$	499
$G\times R/Q/[\Omega^2]$	56 886
Voltage(β0)[MV]@9MV/m	6.48
Pdiss(Rs=70 nΩ)/W	51.7
Length of cavity/mm	785
Diameter of cavity/mm	506

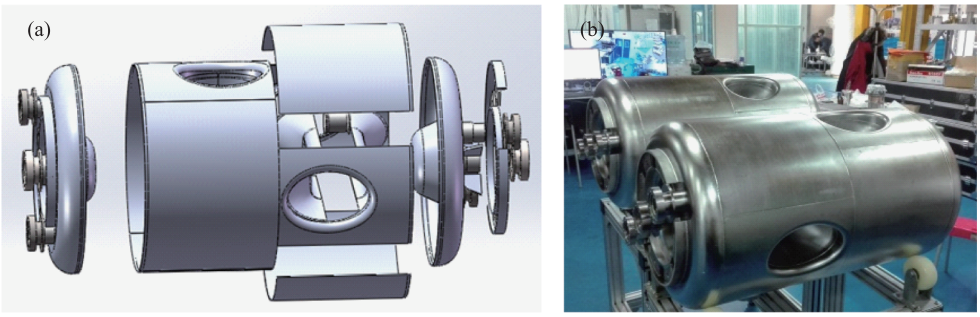

Fig. 2 (a)components of DSR052 (b)two prototype cavities.

6 - 13 25 MeV High Energy Beam Transport Line for CADS Demo Facility

Jia Huan, Qin Yuanshuai, Yuan Chenzhang, Wu Junxia, Zhang Yong, Wang Zhijun, Hu Qiang, Yao Qinggao and He Yuan

The CADS demo facility is aimed to build a prototype linac for the low energy part of the continuous wave (CW) superconducting proton linac and demonstrate technology in this section[1]. In the CADS roadmap, the realization of 25 MeV 10 mA beam is a key point. Thus, based on the 10 MeV CADS Injector II at IMP, IMP and IHEP will both contribute a cryomodule to reach 25 MeV at the site of IMP[2]. To dump the beam from the linac, we build a new high energy beam transport line with bending angle of 90°, to avoid back-scattering gamma and neutron beams to damage the linac. Fig. 1 shows the layout of the 25 MeV demo facility.

The HEBT need to meet three requirements:

1. Capability to transport 25 MeV, 10 mA CW beam to the high power beam dump.
2. Capability to transport 25 MeV, <1 kW beam to the low power beam dump during commissioning.
3. Capability to measure the beam current, emittance, energy spread and bunch length to validate the beam properties for the future CIADS linac.

The HEBT is composed by two parts. First, two quadrupoles focus the beam and transport beam through dipole, either to the low energy dump when dipole strength is zero, or to the high energy dump when beam is bending to 90°. Second, the two doublet quadrupoles transport beam to the high-power dump, while in between the doublets there is a diagnostics chamber. The length of the two parts is 2.991 m and 8.545 m. The layout of the HEBT is shown in Fig. 2.

Beam is simulated with Tracewin code. Fig. 3 shows the r.m.s. beam envelope to low energy dump. Fig. 4 shows the beam spot at low energy dump. Fig. 5 shows the r.m.s. beam envelope to high energy dump. Fig. 6 shows the beam spot at high energy dump.

The dipole parameters are listed in Table 1. The bending radius of dipole is 0.6 m and bending angle is 90°. The entrance and exit angle of dipole is 15° to provide edge focusing. The maximum quadrupole gradient is 14 T/m, below the linear upper limit of 15 T/m for quadrupoles. The design parameters of HEBT quadrupoles are