BEPCII SRF SYSTEM OPERATION STATUS

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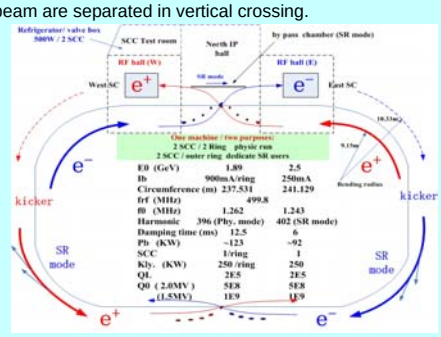
Two Superconducting cavities of 499.8MHz have been operated for BEPCII since 2006. The maximum beam power is over 120kW for both cavities. In collision mode, Helium gas pressure is only increased with beam current in one cavity. Beam tests have been taken to search the reason, such as HOM power, optimizing orbit. A brief introduction of the research is given.

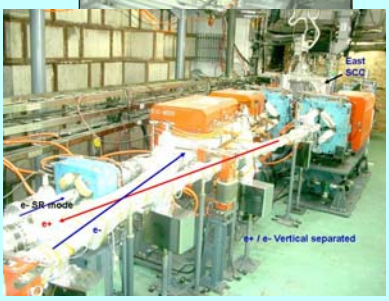
INTRODUCTION

Parameters	Collision mode BER & BPR	SR mode BSR
Beam energy (GeV)	2×(1.89~2.0)	2.5
Beam current (mA)	2×750	250
Bunch number	2×(80~88)	160
RF voltage (MV)	1.65 /Ring	1.90
Beam power (kW)	2×120	92
U_0 (KeV)	121~152 / Ring	334
f_{rf} (MHz)	499.8	499.8
Circumference (m)	237.53 /Ring	241.13
Harmonic number	396 /Ring	402
Momentum compaction factor	0.0237	0.0142
Cavity numbers	2×1 /Ring	1
Cavity detune angle	-12^0 /cav.	0^0
Coupler DC bias (kV)	+1.5	+1.5

Table 1 Typical operation parameters achieved

BEPCII is a double ring e+/ e- collider and also a SR light source. Typical parameters achieved of SRF system is list in table 1. Two Superconducting Cavities, East and West cavity are installed at the outer Rings of electron Ring (BER) and positron ring (BPR), and respectively symmetric beside the beam crossing point. In SR mode, e- beam run outer Rings, In collision mode, e+ and e- beam are separated in vertical crossing.

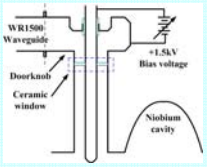




SRF operation of BEPCII

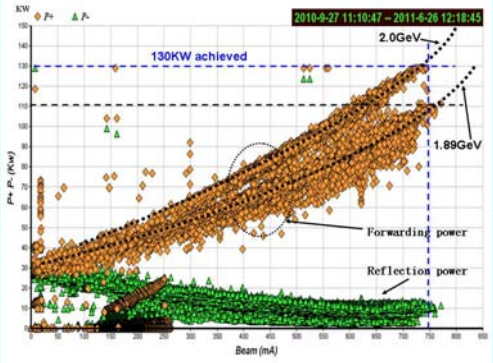
E_0 (GeV)	1.89/Ring	2.0/Ring	2.5
Run days	180	29	102
Beam curr. (mA)	2*750	2*750	250
Beam power (kW)	2*100	2*120	92
RF voltage (MV)	2*1.60	2*1.65	1.90

Operation status of SRF of BEPCII

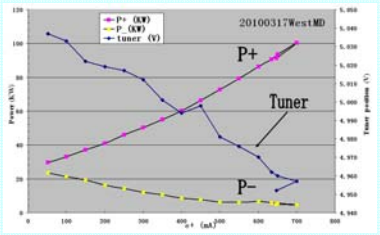


Coupler bias voltage

9 months Beam power of one cavity



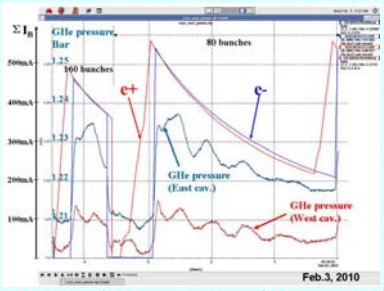
Under e+ beam of 1.89GeV@700mA, the detune frequency of beam loading is -10kc by measuring the tuner position change of West cavity at 1.5MV, that is close to the theory value of -11kc.



Beam loading detune

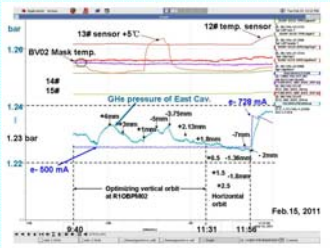
Unknown heat source of East cavity

East cav.	SR mode	Collision mode	note
e- (mA)	480/2.0GeV	750@1.89GeV	
bunches	160	80 or 160	
GHe (bar)	1.217	1.2510	pressure
RF power	~90kW	~100kW	
Vc (MV)	1.6	1.6	
GHe flow	4.5g/s	6.5g/s	

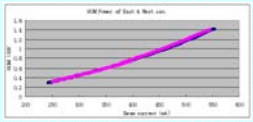


GHe pressure of East cryostat are nearly same at 80 and 160 bunches

Under e- beam, an unknown heat about 60W has been found in East cavity, that is occult only in collision mode and not in SR mode. The heat result in the Helium gas pressure of East cryostat increased, and limit e- current higher.

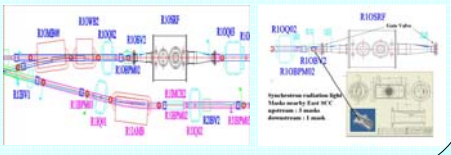


GHe pressure is optimized by beam orbit within 1.26bar that is a interlock threshold. The maximum e- current reached 825mA in test



The additional heat is not mainly depended on HOM power by testing different beam pattern of 80 and 160 bunches at 1.89GeV collision mode

It has been found that the GHe pressure is relative with the beam vertical position at R10BPM02, but not the horizontal position



CONCLUSIONS

Two RF stations of BEPCII have been safely operated for nearly five years. The design targets of 1.5MV for RF voltage and 120KW for beam power have been exceeded. The Helium gas pressure of East cavity has been reduced by the optimization of e- beam orbit. The more efforts should be done to solve the strange heat source for higher beam current and Luminosity.

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