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## Experimental measurements on impedance and beam instability in BEPCII

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The BEPCII has already realized the collision luminosity target of  $1.0 \times 10^{33} \text{cm}^{-2} \text{s}^{-1}$  in April 2016. However, in the past six years of practical operation, the collision luminosity usually remains between  $6.0 \times 10^{32} \text{cm}^{-2} \text{s}^{-1}$  and  $8.5 \times 10^{32} \text{cm}^{-2} \text{s}^{-1}$ . In the operation with high beam current, the BEPCII displayed serious beam instabilities, which greatly limits the increase of collision luminosity. A series of machine studies and analyses were conducted. According to the bunch lengthening experiments, the longitudinal effective impedance is  $0.162 \Omega$  for electron storage ring and  $0.195 \Omega$  for positron storage ring. According to the tune shift measurements, the transverse effective impedances are  $0.02840 \Omega/m$  horizontally and  $0.05253 \Omega/m$  vertically for electron storage ring, and  $0.04223 \Omega/m$  horizontally and  $0.06714 \Omega/m$  vertically for positron storage ring. The oscillation mode distribution was obtained from experiments, showing that the transverse beam coupling instability has become an important factor for limiting the increase of beam current and luminosity. Finally, some possible origins of transverse narrow-band impedance, such as the resistive wall and vertical masks, were checked. The calculated results match with the experiment results quite well. The results in this study give important references for establishing feedback systems and increasing the collision luminosity in the future research.

### Funding Agency

### Footnotes

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Yes

**Primary author:** SU, Jinliu (Institute of High Energy Physics)**Co-authors:** LIU, Yudong (Institute of High Energy Physics); DI, Yin (Chinese Academy of Sciences); LIU, Zhi (Institute of High Energy Physics); ZHU, Dechong (Institute of High Energy Physics); MA, Huizhou (Chinese Academy of Sciences); LEI, Ge (Institute of High Energy Physics); YUE, Junhui (Institute of High Energy Physics); GENG, Huiping (Institute of High Energy Physics); ZHANG, Wan (Chinese Academy of Sciences); QUE, cunyang (Wuhan University)**Presenter:** SU, Jinliu (Institute of High Energy Physics)**Session Classification:** Monday Poster Session

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