

RF design of a C-band spherical cavity pulse compressor

Abstract: The baseline design for the CEPC linac has been established at 30 GeV, employing S-band and C-band normal-conducting accelerating structures (AS). From 1.1 GeV to 30 GeV after the damping ring, there are 235 sets C-band units with pulse compressors. A C-band high-power test bench will be established in Huairou Park at IHEP. A C-band (5712 MHz) spherical cavity pulse compressor have been developed. This compressor comprises a special 3dB coupler and a single spherical energy storage cavity. The special 3dB coupler converts the TE₁₀ mode in the rectangular waveguide into two polarization degenerated TE₁₁ modes in the cylindrical waveguide; it also acts as a circular polarizer, with a 90° phase difference between the two TE₁₁ modes. The TE₁₁₄ mode with an unloaded Q factor of 126,000 is selected for resonance in the spherical cavity, and the energy multiplication factor of the entire pulse compressor is 2 with the coupling coefficient of 5.43. Compared with traditional SLED-type pulse compressors, the spherical cavity pulse compressor achieves pulse compression using only one spherical cavity, leading to a compact overall structure.

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