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Development of beam window with a large diameter, a thin wall thickness and a large proof pressure for COMET experiment through additive manufacturing

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In next-generation particle accelerators composed of the superconducting magnets, the high proof pressure is required to prepare for a severe accident of liquid helium leakage into the beamline. Furthermore, the beam window should be made of thin and low-density material to reduce loss of the beam through the beam window. It is known that the proof pressure of the sphere-shaped window is higher than that of the plate-shaped window. KEK and Metal Technology Co. LTD. have jointly developed large-diameter, thin, and high-pressure resistant beam windows made of Ti-6Al4V through an additive manufacturing. Currently, we are manufacturing a spherical beam window with a diameter of 260 mm and a thickness of 0.5 mm, which is expected to have a proof pressure of higher than 0.9 MPa according to analysis. After additive manufacturing by laser or electron beam, hot isostatic pressing (HIP) to eliminate the pores remaining in the manufacturing process, and subsequent polishing process was successfully completed. At last, the manufactured beam windows were installed in the beamline at COMET experimental facility. In this presentation, we will report on the status and a future prospect of the COMET beam windows by additive manufacturing.

Themes for the contribution

4 Target design, analysis, and validation of concepts:

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