

Water-cooled air bearing chopper in a vacuum

B. Knapp

¹Professional Instruments, US

bnknapp@airbearings.com

Abstract

Design considerations and test results for a water-cooled air bearing heat load chopper with integral vacuum chamber are described. This chopper has been installed in multiple synchrotron facilities worldwide operating at vacuum levels as low as 5×10^{-6} Torr. The air vacuum side is sealed from the air bearing using multiple stages of differentially pumped non-contact capillary seals. The heat load chopper protects downstream equipment and samples from damage from an intense X-ray beam. The heat absorbed by the chopper disk is carried away by coolant that is continuously pumped through the rotating disk via a non-contact fluid rotary union. The jitter measurement demonstrated 2 parts per million speed stability, or σ less than 25 ns at speeds of 4,000, 5,000, and 6,000 RPM. These jitter results represent an improvement of two orders of magnitude compared to published results for a water-cooled heat load chopper using rolling-element bearings and ferrofluidic seals.