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## High Power Radiofrequency Operation of the Radiofrequency Quadrupoles in the Spallation Neutron Source

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The Spallation Neutron Source (SNS) recently took delivery of a third Radiofrequency Quadrupole (RFQ03) that will ultimately be installed on the front-end (FE) of the SNS Linac. The first RFQ (RFQ01) operated in the SNS FE for more than a decade before being replaced with the second RFQ (RFQ02). RFQ01 was relocated to the Beam Test Facility (BTF) where it operated for five more years. The RFQ02 was initially installed in the BTF for high power testing and used with H- beam for BTF operation. It replaced RFQ01 in the SNS FE in 2017 and has been operating for beam production since then. There are some differences between the three RFQs. RFQ01 has a square cross-section with pi-mode stabilizing loops (PISLs) with the structure being fabricated using two layers of materials, GlidCop outside and OFHC inside. RFQ02 and RFQ03 has an octagonal cross-section with end-wall stabilizer rods and was fabricated using OFHC only. RFQ01 suffered some field flatness distortion incidents that resulted in degradation in beam transmission efficiency and required RF tuning. RFQ02 has performed well but had a melted RF seal in the high energy end wall, that was ultimately mitigated by a redesign of the end flange seals. The SNS decided to order RFQ03 that has a design that followed that of RFQ02 closely, but end-wall contacts were modified to prevent RF seal failure. This report presents the testing, installation, high power RF operation, and design improvements of the RFQ03.

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### Footnotes

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Yes

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