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RF Tuning for the SNS LINAC RFQ

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Tuning becomes essential at the end of manufacturing an RFQ to acquire the operating frequency and achieve the required RF field profile along the length of the structure. During commissioning, unexpected detuning events may also necessitate tuning to obtain the original design field profile. Proper separation of quadrupole and dipole modes is needed to maintain the desired field distribution in the RFQ. We use transmission-line theory to model the field distribution as a weighted summation of quadrupole and dipole modes. Applying perturbative fields, we evaluate the effect of slug tuners on the same field. Using the measured field profile along the length of the RFQ obtained from the bead-pulling technique, the new tuner depths that can deliver the desired field profile are calculated. The RFQ tuning code takes the field profile as input and provides delta change in tuner depths as output. Iterations of the above steps are needed to accurately obtain the desired field profile. This paper presents an RFQ tuning procedure with a tuning example. We discuss the advantages and pitfalls of this method.

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Footnotes

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Yes

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