Addendum to “Performance limiting effects in X-band accelerators”

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The purpose of this addendum is to clarify some of the information presented in the original paper.

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As briefly mentioned in Sec. I of the original paper [1], separating the effects of pulsed power and gradient on the breakdown rate of rf cavities in the high pulse heating regime had been established earlier using a protocol involving the variation of amplitude of fixed width rf pulses in single cell cavities of various geometries [2–6]. In addition, the technique of preheating the structure with SLED pulses described in Sec. II has been used by us [7] and others [8] in the past. What is new in this paper is a demonstration that sharply distinguishes pulse heating and gradient as two possible causes of breakdown in this regime. Our method, which independently varies pulsed heating and gradient, provides a particularly clean separation of these two mechanisms.

The idea of using a separate mode launcher [see Fig. 1(b)] and a single cell standing wave structure [see Fig. 1(a)] were developed for a program to study basic physics of rf breakdown. References to this program and the design of the cavity and mode launcher can be found in [2–5,9–12].

The particular structure used for the test in Sec. II was electrically designed at SLAC by Dolgashev, mechanically designed and manufactured at KEK by Higashi, and tuned at SLAC by Dolgashev and Lewandowski and then supplied for the experiment. The tuned field profile shown in Fig. 2 was proposed at the start of the program to separate effects of high-gradient cell and end-cells [9].

The structure shown on Fig. 1(a) has the same electrical design as the structure tested but was mechanically designed at SLAC. But since the electrical design is the same, it illustrates the relevant features.

Note that the traveling wave structure discussed in Sec. III was of a CLIC design called TD18 and was built as part of a SLAC/CERN/KEK collaboration [13–15].

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