HIGH-GRADIENT ACTIVITIES AT CORNELL: REENTRANT CAVITIES

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Abstract

An accelerating gradient of 46 MV/m was achieved (CW) in a superconducting niobium cavity with an unloaded quality factor (Q_0) over 10^{10} at a temperature of 1.9 K. This represents a world record gradient in a niobium RF resonator. At a reduced temperature of 1.5-1.6 K, an enhanced Q_0 was measured, ranging from $7x10^{10}$ at 5 MV/m to $2x10^{10}$ at 45 MV/m. The 1.3 GHz single-cell cavity has a reduced ratio of H_{pk}/E_{acc}, ensured by a reentrant geometry. The maximum peak surface electric and magnetic field exceeded 100 MV/m and 1750 Oe respectively. A soft multipacting barrier (predicted by calculations) was observed near 25 MV/m gradient and was easily processed through. Field emission in the cavity was negligibly small, and the highest field was limited by thermal breakdown. The cavity was built, processed, and tested with LEPP facilities at Cornell University. The second generation reentrant cavity design has a 60 mm beam tube diameter. It has potential to reach 50 MV/m accelerating gradient due to a further reduced H_{pk}/E_{acc}. New 60 mm beam tube reentrant cavities are being fabricated and will be tested in the near future.

NO SUBMISSION RECIEVED