



PHYSICS AND ASTRONOMY COLLOQUIUM

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“Non-linear physics opportunity in superconducting RF cavities”

Abstract

Superconducting Radio Frequency (SRF) is one of the core technologies of the 21st century and has several interesting applications. Especially, an application for accelerator is very unique because of requirement for a very high field. This colloquium starts from a general review of the history of superconductivity and BCS theory. Although this was one of the biggest challenges in the 20th century, its theory in equilibrium states was finally well understood. SRF physics requires to extend the theory to non-equilibrium response against a very strong (even comparable to the critical field) oscillating magnetic field. The linear response theory is introduced as a standard theory of SRF cavities for accelerator applications. Then, experimental evidences of non-linear response are introduced to motivate further studies of this subject. Non-linear surface resistance caused by trapped flux oscillation, recently emphasized by our group, requires a new model beyond conventional linearized models of 1960s. Recent studies on different CERN cavities are also discussed, and detailed data analyses excluded some of the plausible models. A newly found empirical relation is compared with interesting phenomenon in high frequency or nitrogen doped cavities. Phenomenological approaches to explain these phenomena are introduced, and a fundamental challenge and importance of non-equilibrium physics are again emphasized. If time allows, possible new cross-over between particle physics and condensed matter physics is mentioned.

Wednesday, April 4, 2018

10:00 a.m.

ECS Building - Room 104