# ACCELERATOR SEMINAR

## "$Nb_3Sn$ and Superconducting Radio Frequency Cavities: Its Potential, and Lessons from Bulk, Thin Film and Wire Fabrication"


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Superconducting radiofrequency (SRF) cavities are used to generate the extreme electric field gradients that are required to accelerate charged particles. The material of choice for SRF cavities is niobium, as a result of its record lower critical magnetic field (*H*c1), which enables the cavities to operate in the Meissner state with exceptional low loss. State-of-the-Art bulk Nb cavities exhibit, at 2 K, a maximum electric field gradient (*E*acc) around 50 MV/m at a quality factor (*Q*0) around 1010, and it is believed that the potential for Nb is exhausted. After a concise introduction of relevant superconducting parameters, I will sketch how Nb3Sn can move beyond the limits of Nb cavities: 1)By providing a similar *Q*0 at an increased temperature of 4.2 K due to its lower BCS resistivity; 2)By potentially doubling the achievable *E*acc if its superheating field (*H*sh) can be reached; 3)By shielding a bulk Nb cavity from vortex penetration using a thin Nb3Sn coating. Following the outline of its theoretical potential, I will discuss the more practical issues for the manufacture of bulk and thin film Nb3Sn, by summarizing the available literature. I will include lessons that were learned from the vast experience that is available from the optimization of high current Nb3Sn wires, and summarize relevant knowledge on the formation of Nb3Sn. I will conclude with some suggestions for further research that addresses more specific issues for SRF cavity applications of Nb3Sn.


**Thursday, February 16, 2012**
**11:00 a.m.**
**CEBAF Center, Room F113**

**Coffee before seminar at 10:45 a.m.**

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For further info, please contact Alex Bogacz at x5784 or Anne-Marie Valente at x6073