RF cavity coating material studies

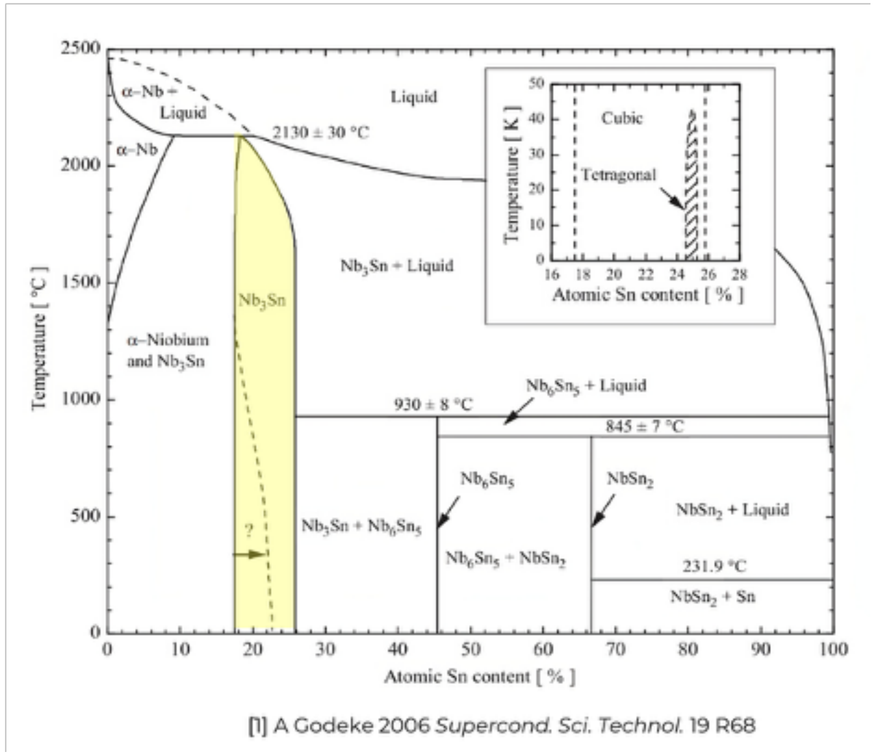
Superconducting materials for accelerating cavities alternative to Nb bulk

- FCC-ee RF cavity will be subject to high electric fields, high frequency, high energy dissipation from photon radiation in order to cope with 50 MW synchroton radiation, high luminosity and high number of circulating bunches.
- Different materials for the RF coating are under study in order to try to get high efficiency, high gradient, high frequency cavities
- The aim of the project is to provide studies on the surface of different cavities using several NbSn compounds

INFN LNL: Cristian Pira, Dorothea Fonnesu
INFN RM3: L. Tortora, V. Graziani, A. Passeri

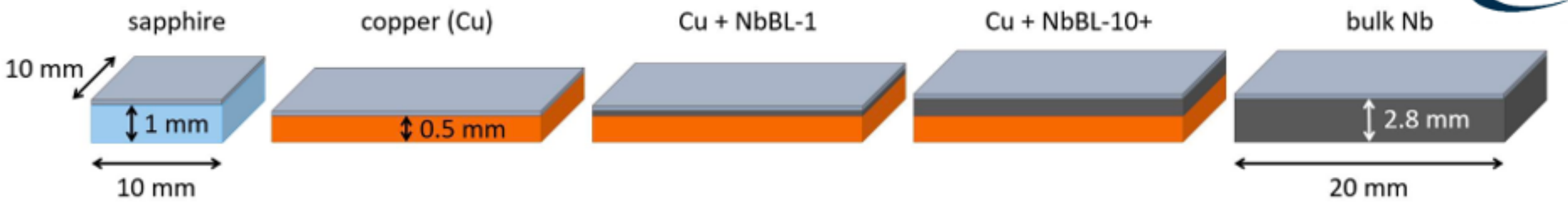
Developing and studying superconducting materials alternative to bulk Nb with low radiofrequency (rf) and microwave (mw) surface impedance at extreme conditions: high rf fields and high dc fields

Nb-Sn possible compounds



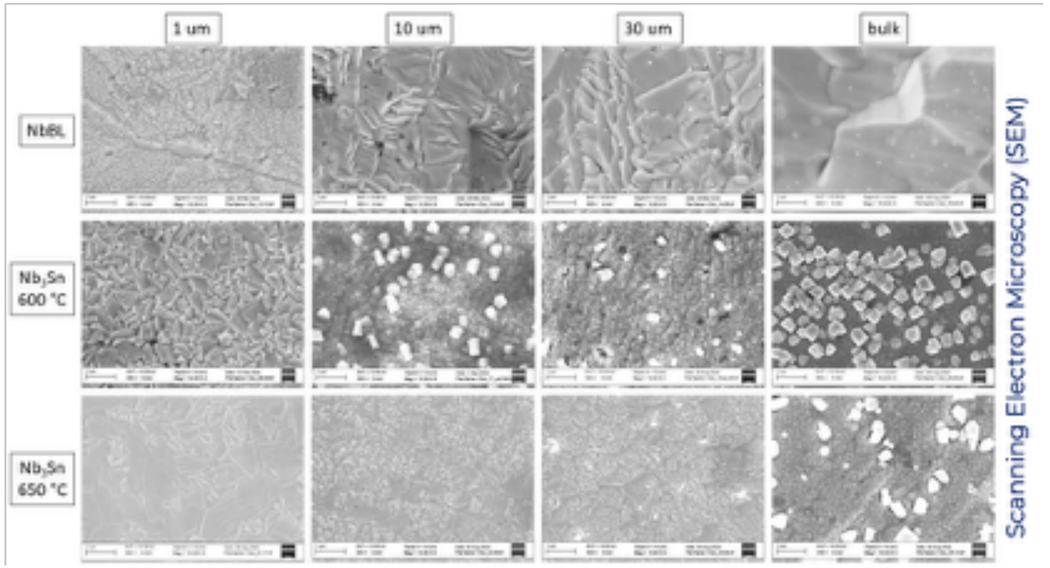
[1] A Godeke 2006 *Supercond. Sci. Technol.* 19 R68

Nb_3Sn/Cu by Magnetron Sputtering



Substrates: sapphire · copper without and with a niobium buffer layer (NbBL) · bulk Nb

The presence of a Nb buffer layer induces the formation of different surface morphologies



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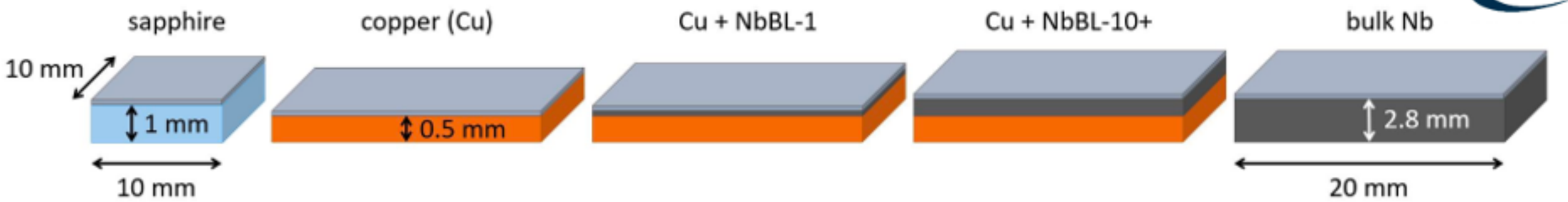
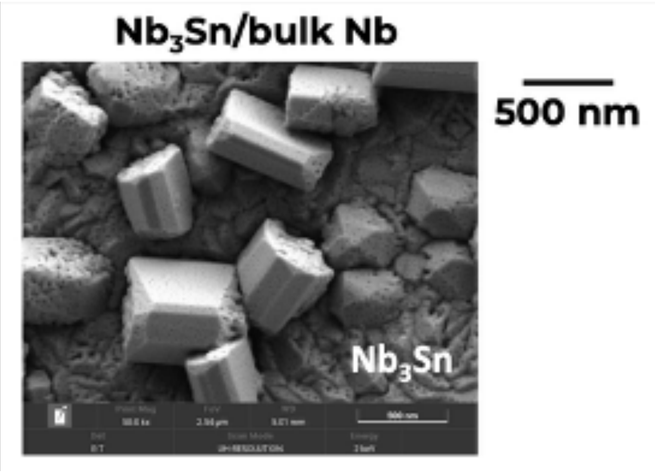


Substrates: sapphire · copper without and with a niobium buffer layer (NbBL) · bulk Nb

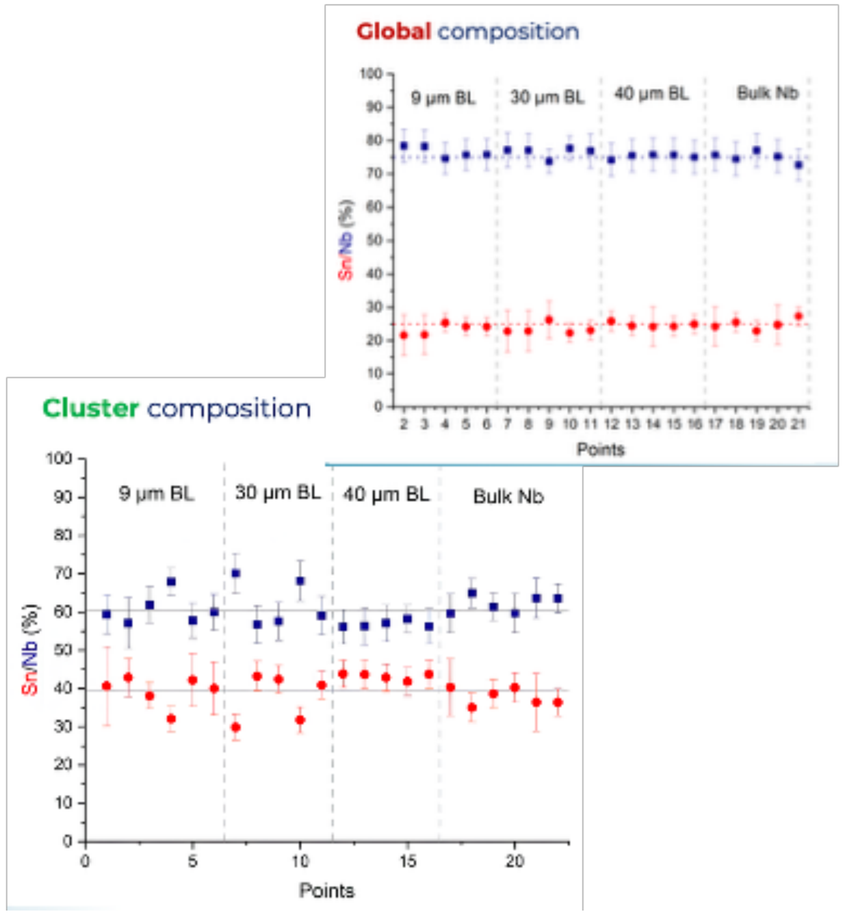
When Nb_3Sn is grown on bulk Nb or Al_2O_3 the structure of the film is characterized by the presence of cluster of material with different stoichometry



Superconducting materials for accelerating cavities alternative to Nb bulk

INFN RM3 collaboration:

- Investigation of cluster composition and localization through ToF- SIMS technique
- local quantitative composition analysis
- investigation for spurious phases
- homogeneity of SC phase across film/island interface
- size change/effect due to the heating of the substrates (possible)
- verify/falsify nucleation dependence from deposition times



SIMS: Secondary Ion Mass Spectrometry

RD-FCC cavity coating studies, financial requests

Financial requests			
		request	sub iudice
RF cavity surface tests	Travels to LNL	3 k€	
	ToF-SiM - Cs, Bi ion sources replacement (consumable)	10 k€	
	Transport of samples to LNL	1 k€	1 k€

The activity consists in:

- preparation of films at LNL
- transport of samples between LNL and Roma Tre for surface analysis
- analysis of the samples at Roma Tre Surface lab using the TOF-Sims (Secondary Ion Mass Spectrometer) technique (using Cs and Bi ion beams)

New activity: study of cavity coating with NbSn compounds

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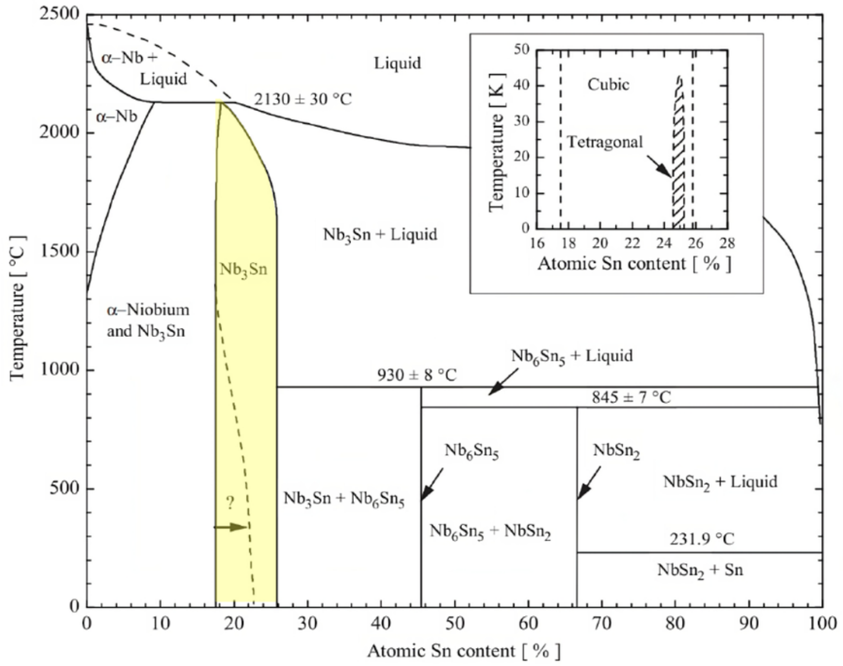
Nb-Sn possible compounds



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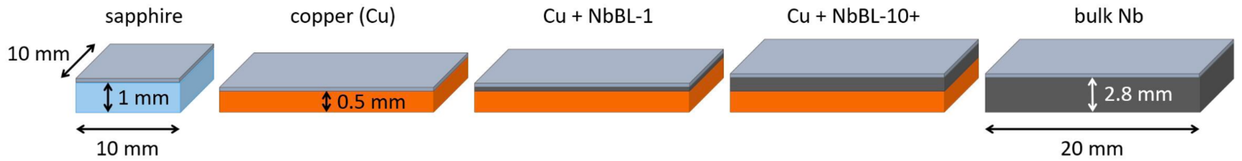

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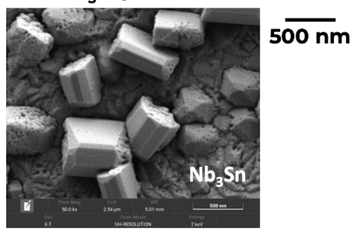
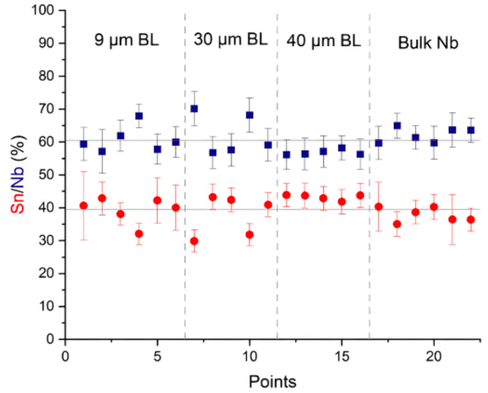
Nb_3Sn/bulk Nb



Cluster composition



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