This project has received funding from the European Union's Horizon 2020 Research and Innovation programme under GA No 101004730.

Millisecond flash lamp treatment for SRF accelerating cavities

Cristian Pira

Coatings of SC (Nb_3Sn, NbTiN, …) on Cu planar substrate

Slawomir Prucnal and Shengqiang Zhou

Flash lamp annealing and characterisation of planar samples

Member of
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Budget

REQUEST	MOTIVATION	COST
Personnel costs	2 year person	96 500
Equipment and consumables	FLA system for 6 GHz	13 500
TOTAL		**110 000**

REQUEST	MOTIVATION	COST
Personnel costs	iFAST contract extension	20 000
Equipment and consumables	Targets, Helium, samples	20 000
TOTAL		**40 000**

REQUEST	MOTIVATION	COST
Personnel costs	iFAST contract extension	3 000
Equipment and consumables	Cavities production	7 000
TOTAL		**10 000**

Total budget 160 kEuro

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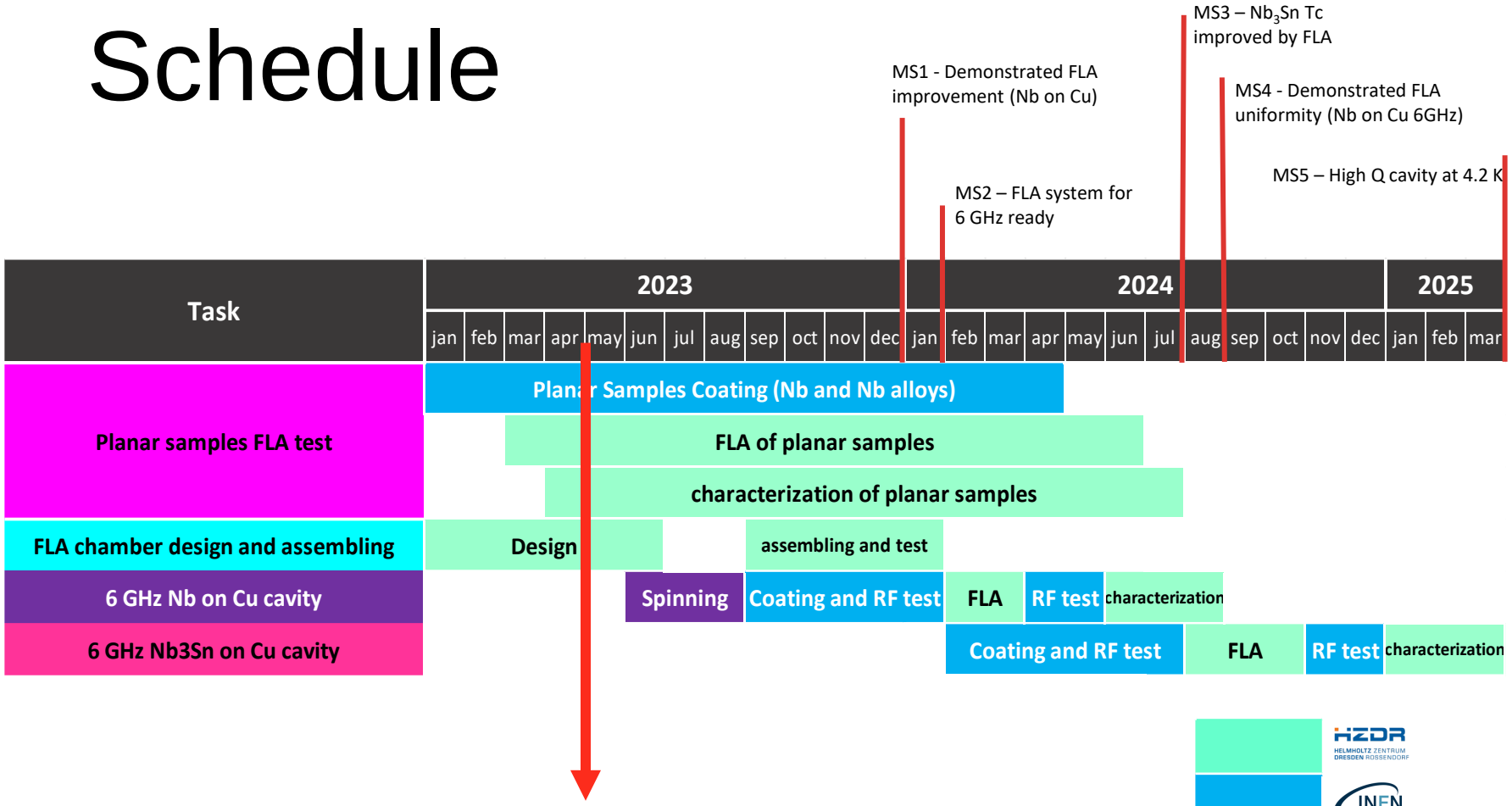
Schedule



1. First planar samples annealed and measured
2. FLA chamber designed – under construction

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Technical scope and Goal

Nb_3Sn coated Cu-cavity

Current challenges:

1. **Nb-cavity – operation temperature 2K, low thermal conductivity, expensive, high energy consumption**
2. **High Tc coating on Cu-cavity - low melting point of Cu (allowed temp. 650 °C), diffusion of Cu into Nb_3Sn and Sn migration into Cu limits the cavity performance**

Develop a novel thermal process to improve performances of SC coating suppressing (reducing) Cu substrate heating

And reduce cryogenic power costs by 60%

Solution:
Millisecond-flash-lamp-annealing (FLA)

Material	Tc	H_{sh}
Nb	9.2 K	0.2 T
Nb_3Sn	18.3 K	0.4T

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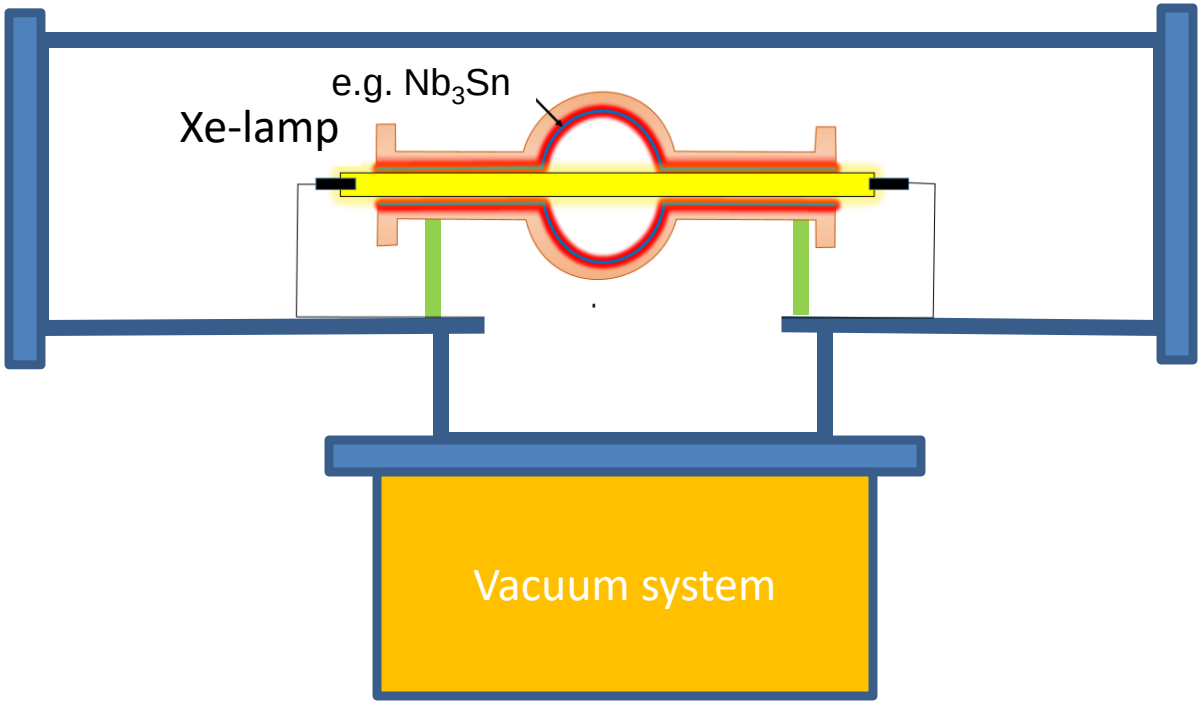
How to implement in a cavity?



Vacuum chamber for Flash lamp processing of Cu-cavity coated with Nb_3Sn

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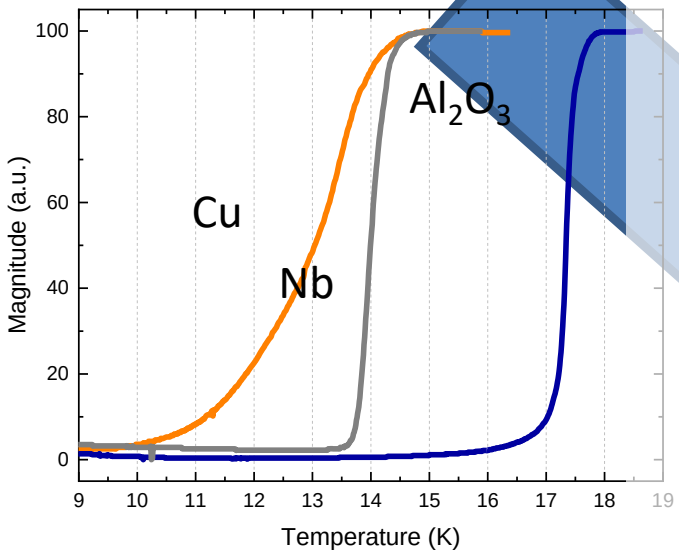
Starting point

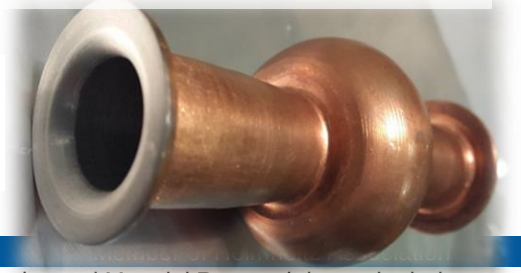


Current status of Tc for Nb_3Sn thin film on different substrate: Cu, Nb and Al_2O_3.

Deliverables

1. Nb_3Sn on Cu substrate with 18 K Tc.
2. Uniform treated the cavity using FLA
3. Nb_3Sn on Cu 6 GHz cavity operates at 4.2 K with the same performances like Nb-cavity at 2 K)

Nb_3Sn coated Cu-cavity



the end of the project

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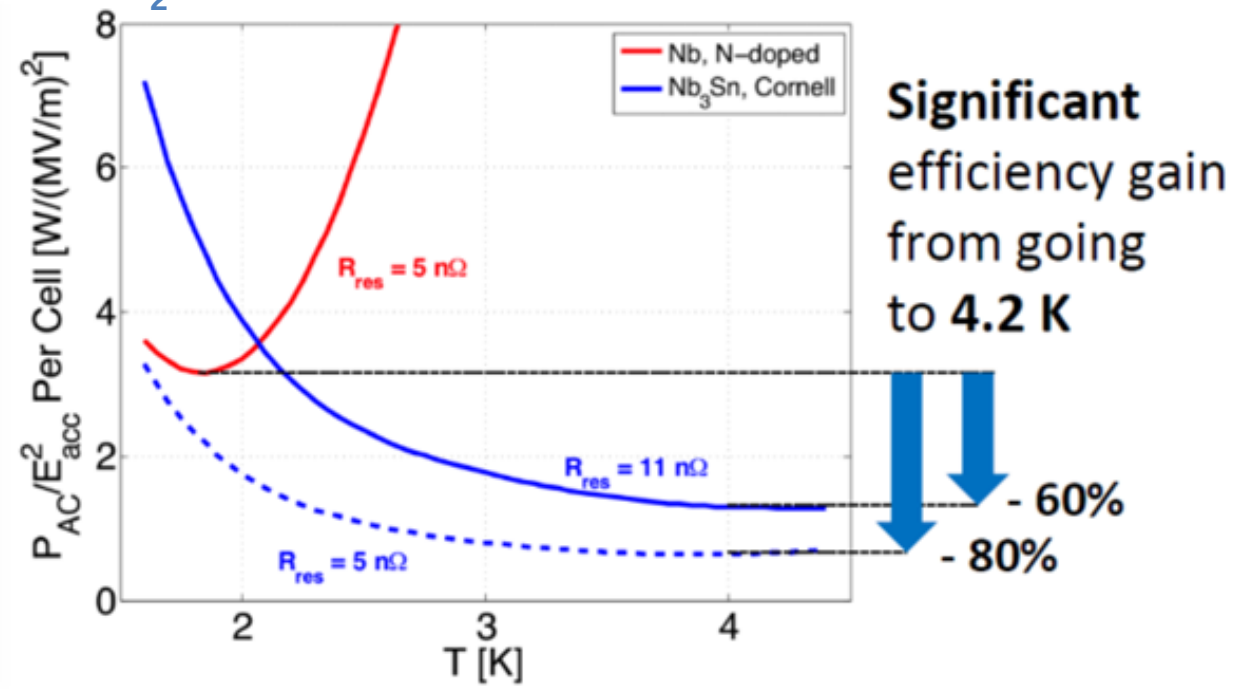
Sustainability

Our technology will significantly **reduce the environmental impact** and **energy-costs** of SRF accelerator technology:

- The goal is realize SC resonant cavities operating at higher T than bulk Nb **reducing cryogenic power costs by 60%**
- The thermal load and hence the temperature throughout the entire substrate is much lower compared to conventional annealing: **FLA is less energy-intensive**, resulting in a reduction of **CO_2 emissions**



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