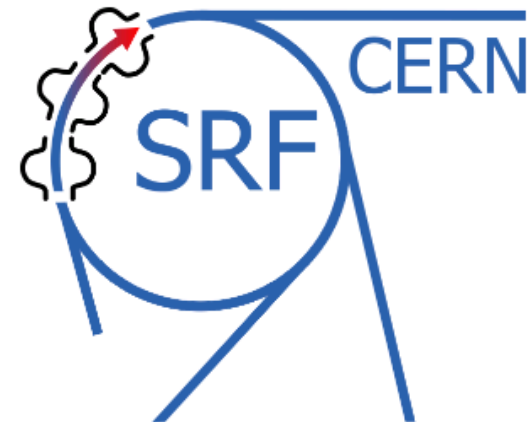


# WG3: flux sensitivity Introduction

A. Miyazaki

TTC/ARIES topical workshop @ CERN



# Impact of trapped flux

$$R_{fl} \sim S \times \eta \times H_{ext}$$

WG2

Flux

expulsion

WG1

Magnetic

shield

Flux sensitivity **may not matter** if the ambient field is well shielded and well expelled

# In reality 1: N-doped cavities

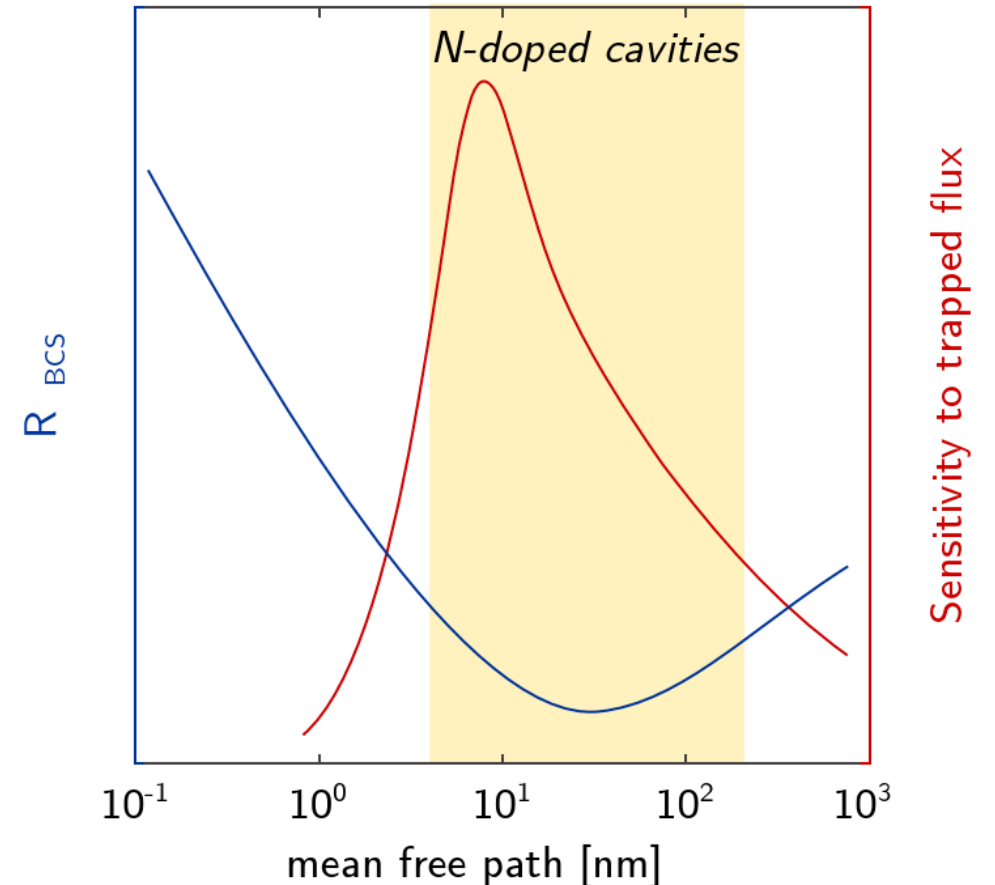
## N-doping

- $R_{BCS}$  drastically decreases
- Impact of  $R_{fl}$  becomes more
- Better  $\eta$  or  $S$  required

Also,  $S$  becomes worse when mean free path is shorten by N-doping

- Understanding of  $S$  is crucial

Plot from Julia-Marie Köszegi, PhD thesis based on M. Martinello et al., Appl. Phys. Lett. 109, 062601 (2016) and J. T. Maniscalco et al., J. Appl. Phys. 121, 043910 (2017)





# Non-linear behavior?

Conventional models are linearized  
at **low RF** fields

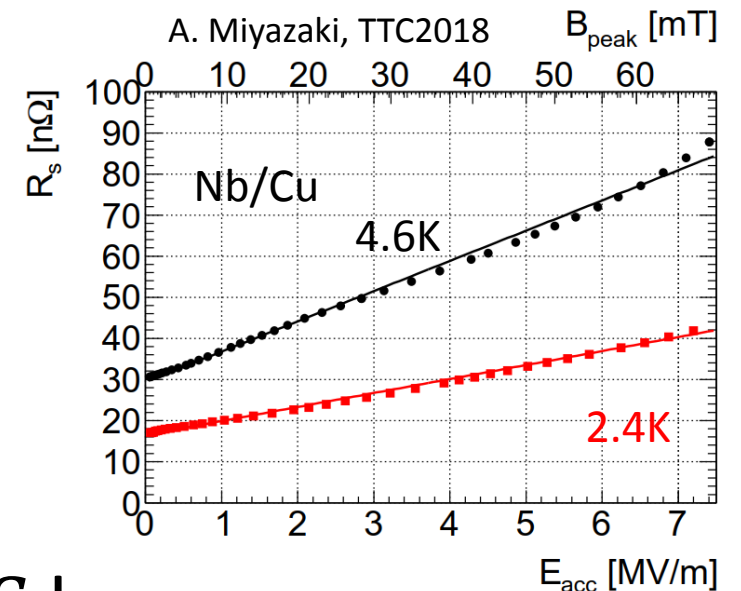
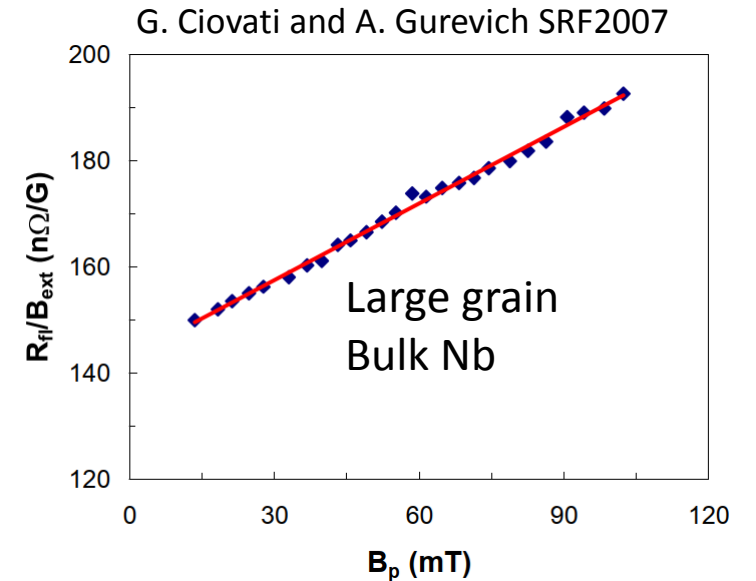
→  $R_{fl}$  does not depend on RF fields

Trap flux  $O(10\mu\text{T})$  on purpose

→  $R_{fl} \propto E_{acc}$  at **finite RF** field

→ Q-slope

Better understanding of  $S$  is necessary when  $S$  becomes  
important as the above examples (N-doped, layered)



09:00	<b>Introduction to the session</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	<i>Akira Miyazaki</i> 09:00 - 09:03
	<b>Trapped flux sensitivity studies as a function of: treatment, RF field and frequency</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	<i>Martina Martinello</i> 09:03 - 09:20
	<b>Overview of flux trapping at Cornell</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	<i>James Maniscalco</i> 09:20 - 09:37
	<b>Sensitivity to trapped flux in high-purity large-grain niobium based on cavity measurements</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	<i>Rongli Geng</i> 09:37 - 09:54
10:00	<b>Flux trapping investigation in superconducting samples via the quadrupole resonator</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	<i>Marco Arzeo</i> 09:54 - 10:11
	<b>Reports on sensitivity measurements at KEK</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	<i>Kensei Umemori</i> 10:11 - 10:18
	<b>Optimization of High Temperature N2 Doping for Minimization of Sensitivity to Trapped Flux and Maximization of Quench Fields</b>	<i>Daniel Bafia</i>

Collection of experimental data from all over the world

11:00	<b>Dissipation caused by oscillating vortices in the SRF cavities</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	<i>Alexander Gurevich</i> 11:00 - 11:25
	<b>Trapped flux sensitivity in the low amplitude radio-frequency regime</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	<i>Dr Mattia Checchin</i> 11:25 - 11:42
	<b>A simple model for the RF field dependence of the trapped flux sensitivity based on a non-linear pinning force</b>	<i>Ruggero Vaglio</i>
12:00	<b>Vortex dynamics and hysteretic flux losses due to pinning</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	<i>Danilo Liarte</i> 11:59 - 12:16
	<b>Discussion</b> 30-7-018 - Kjell Johnsen Auditorium, CERN	12:16 - 12:30

Review on existing theoretical models

Newly published extensions in a model

discussion → future prospect