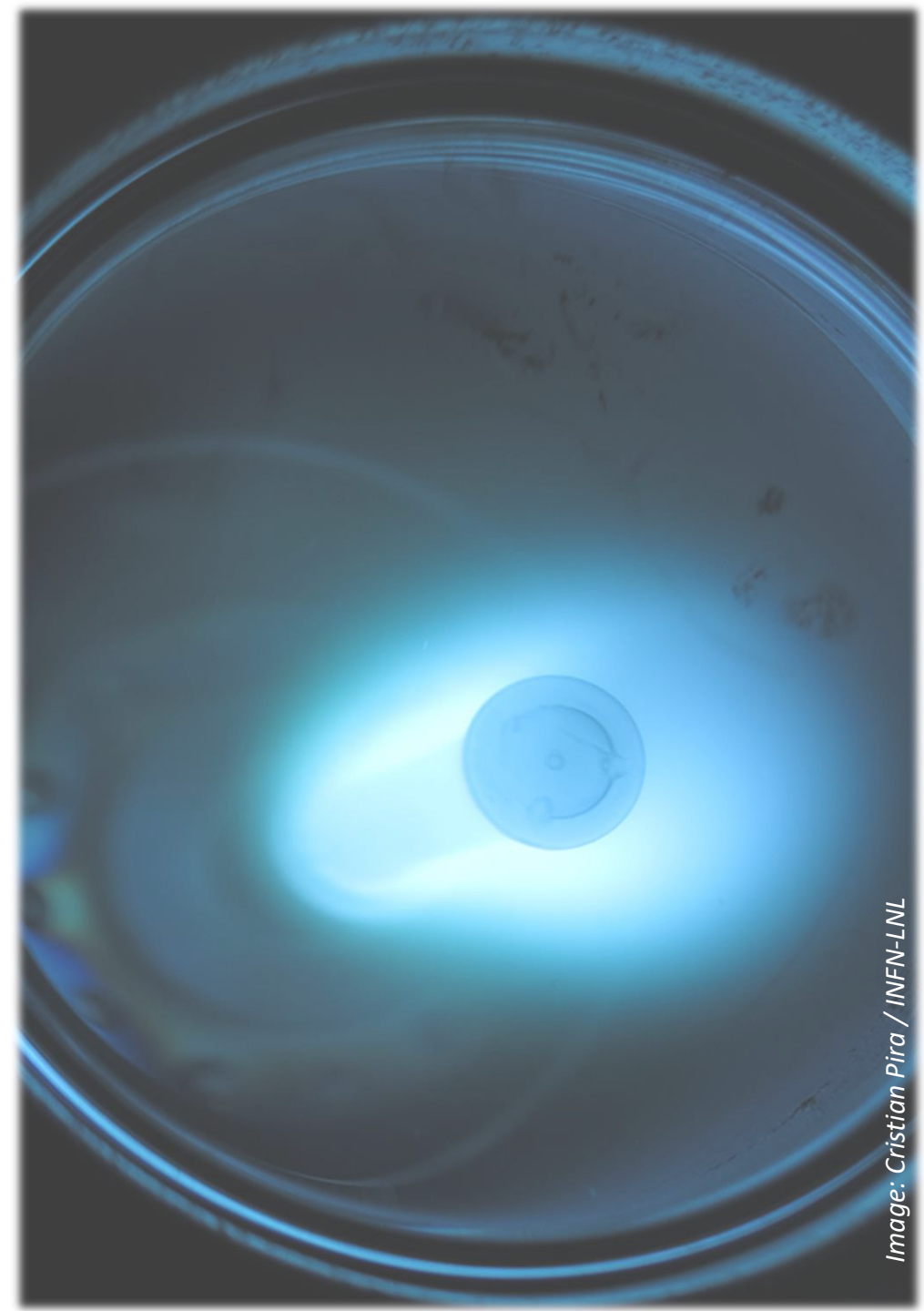


Advanced surface coating techniques for superconducting radiofrequency cavities

Vanessa Garcia
ESR 10

Supervisor: Cristian Pira

FCC Week / Amsterdam, 9-13 April 2018



Outline

Motivation

Objective

Work Plan

Status

Challenges and risks

Motivation

Objectives

Work Plan

Status

Challenges
and
risks

Theoretical limit!



6GHz Bulk Nb cavity

Why Nb/Cu cavities?

Motivation

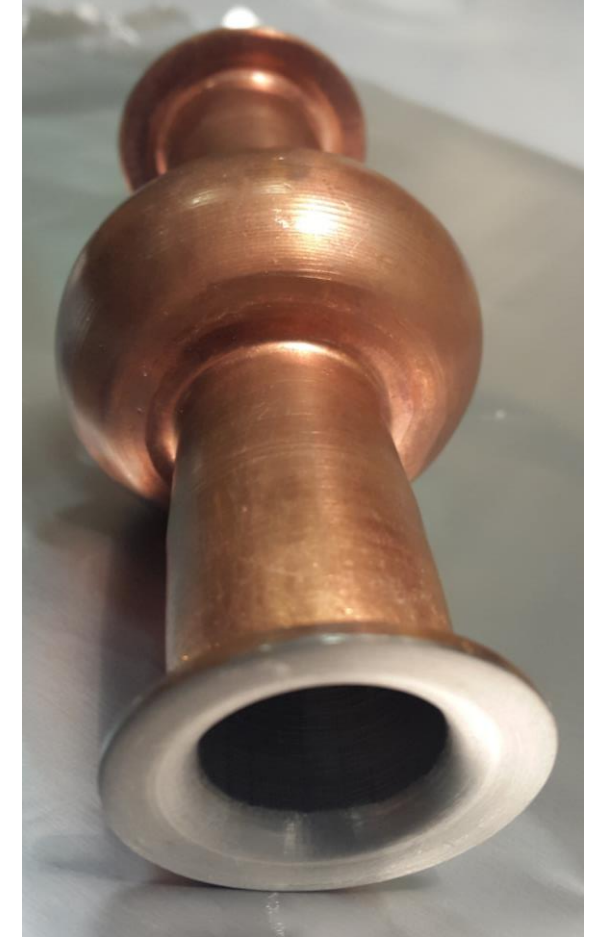
Objectives

Work Plan

Status

Challenges
and
risks

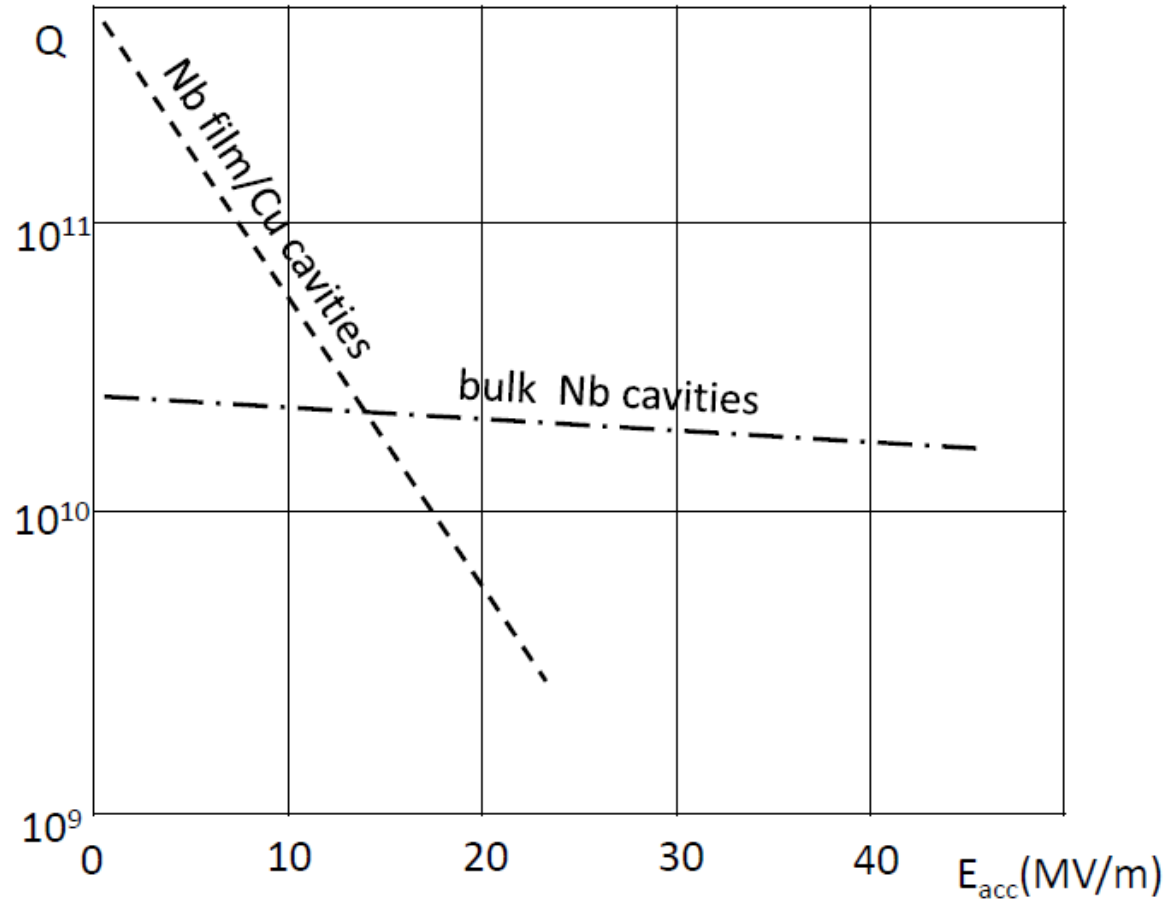
- High Q_0
- Thermal stability
- Insensibility of Earth's magnetic field
- Cost reduction



6GHz Nb/Cu cavity

Q-slope problem

- Motivation**
- Objectives
- Work Plan
- Status
- Challenges and risks



$$Q_0 = \frac{\omega_0 U}{P_d}$$

Q_0 = Quality factor
 ω_0 = Resonant frequency
 U = Stored energy
 P_d = Dissipated power

Motivation

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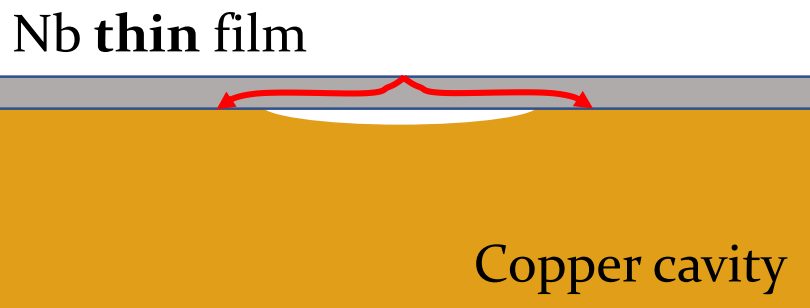
Status

Challenges
and
risks

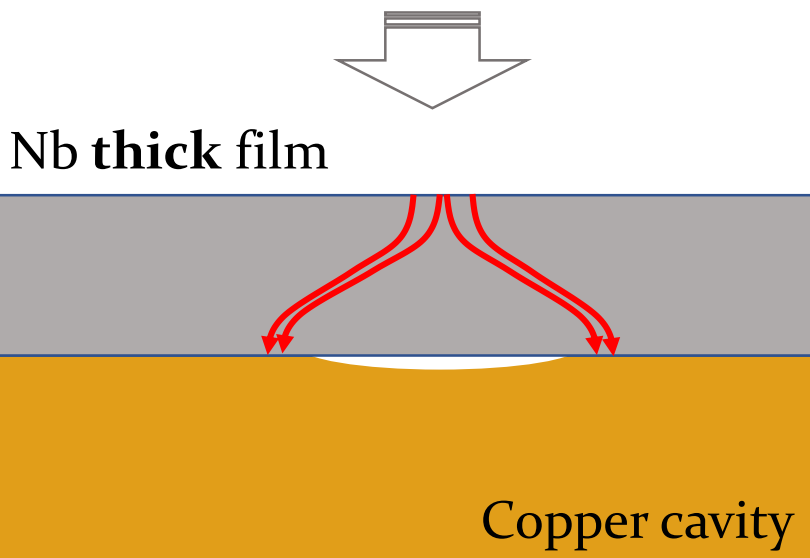
- **Develop a novel coating technique for Niobium coated Copper cavities**
- **Derive correlations of radiofrequency performances of film cavities to the parameters of the sputtering process.**



Nb Thick Films on 6 GHz cavities



Palmieri-Vaglio Model: thermal boundary resistance



Palmieri et al.
The way of thick films toward a flat Q-curve in sputtered cavities
18th International Conference on RF Superconductivity

Tuesday talk: Cristian Pira
Coating studies on 6 GHz seamless cavities

Motivation

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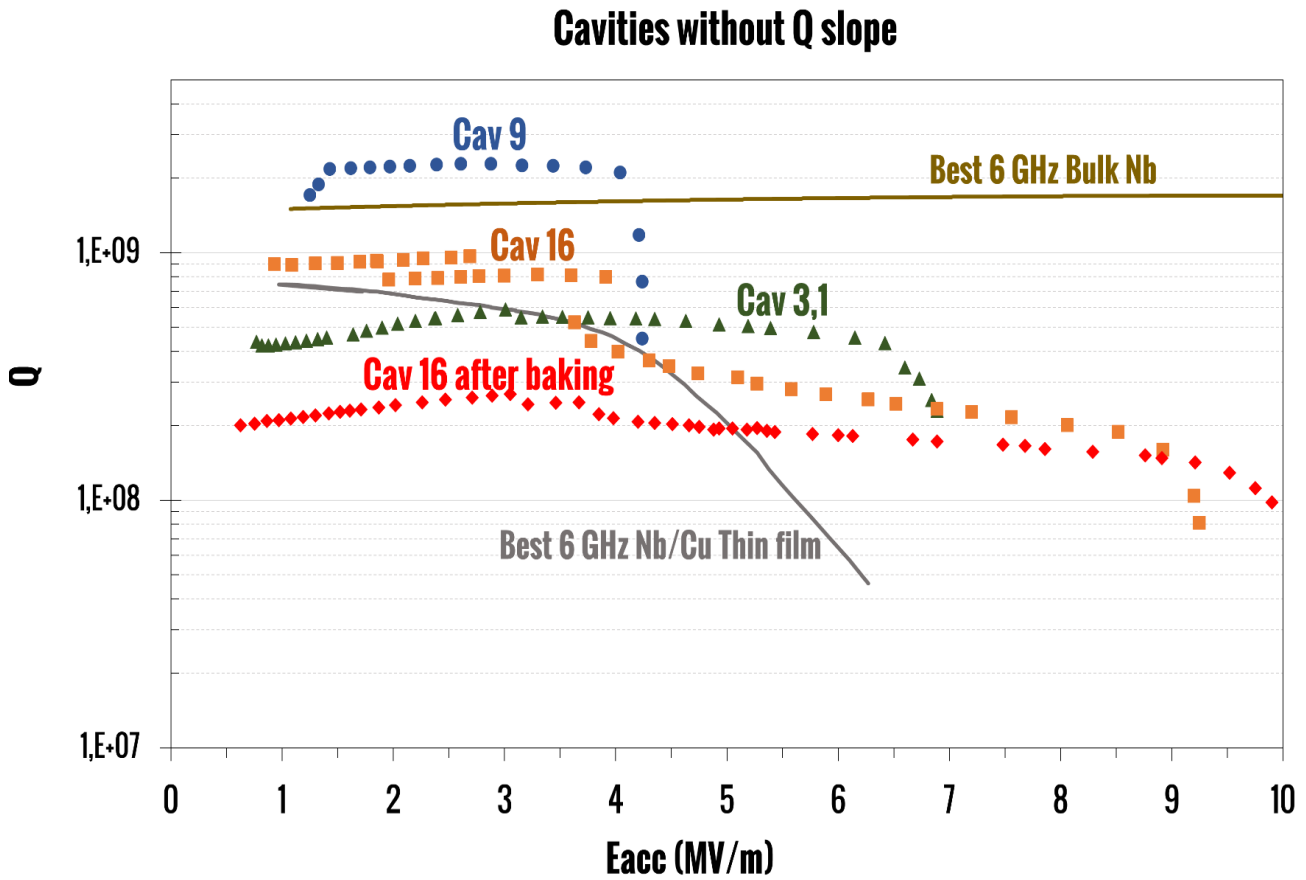
Motivation

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Increase rf performances

Increase reproducibility

Derive a correlation between RF performances and deposition parameters

Motivation

Objectives

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Challenges and risks

Cavity Fabrication

Collaboration with I-Cube (ESR-09)



Mechanical Finishing

Improve spinning process

Insert 6 GHz tumbling



Chemical Polishing



PVD process

Study effects of different sputtering parameters



RF Characterization

Collaboration with CERN (ESR-01) and HZB (ESR-08)

Motivation

Objectives

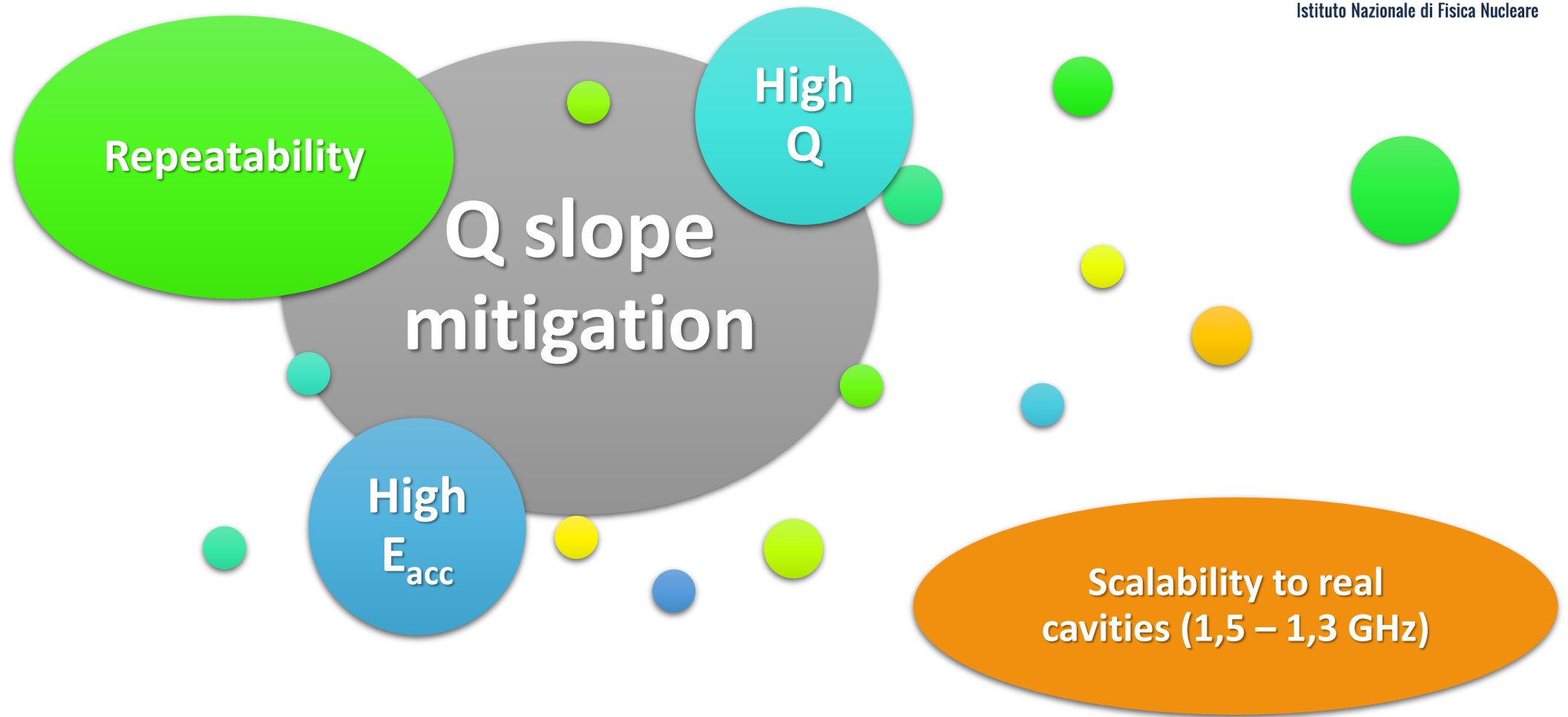
Work Plan

Status

Challenges
and
risks

- Learning phase (...)
- Familiarity with existing protocol
- Organizing database

Motivation
Objectives
Work Plan
Status
**Challenges
and
risks**



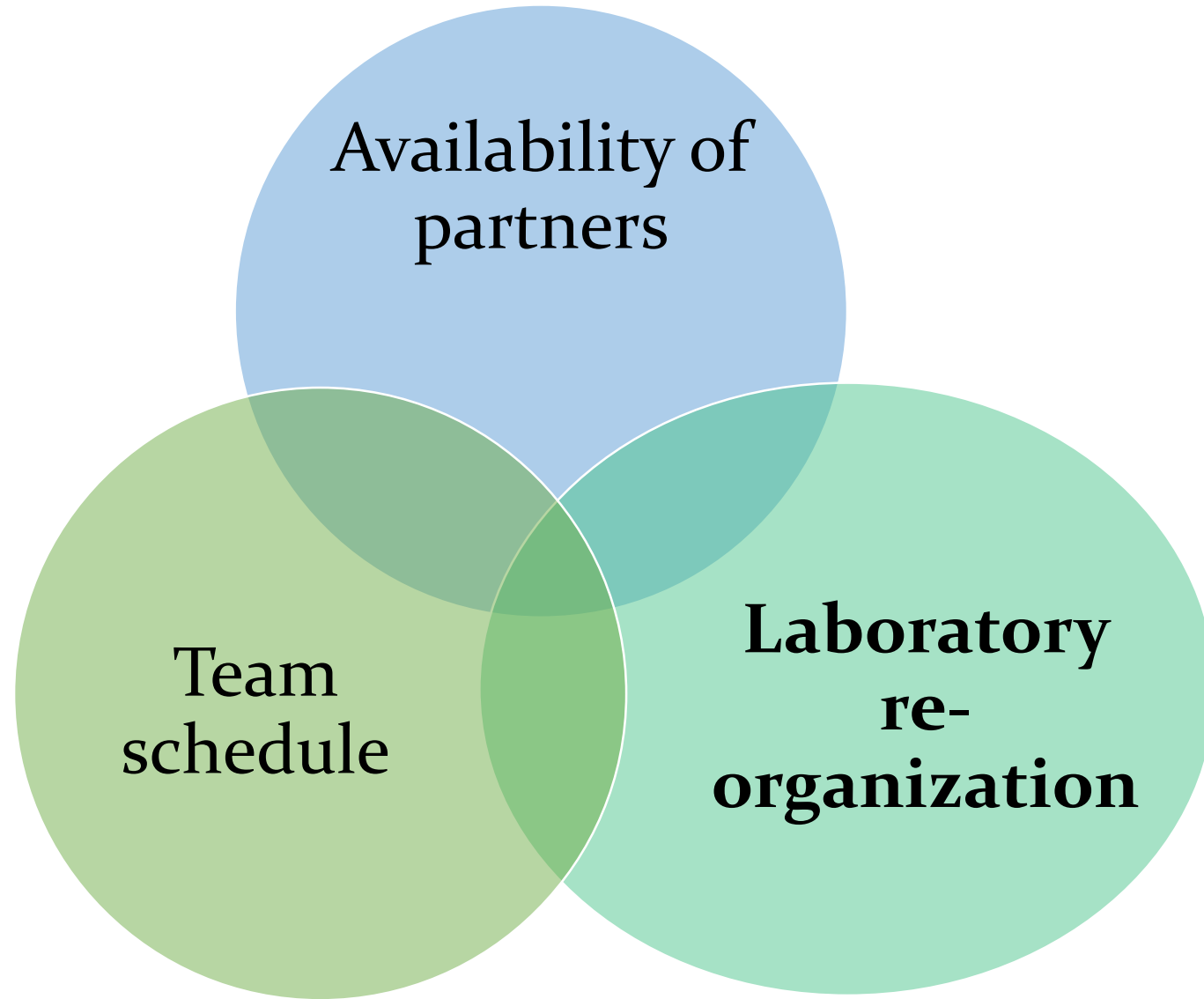
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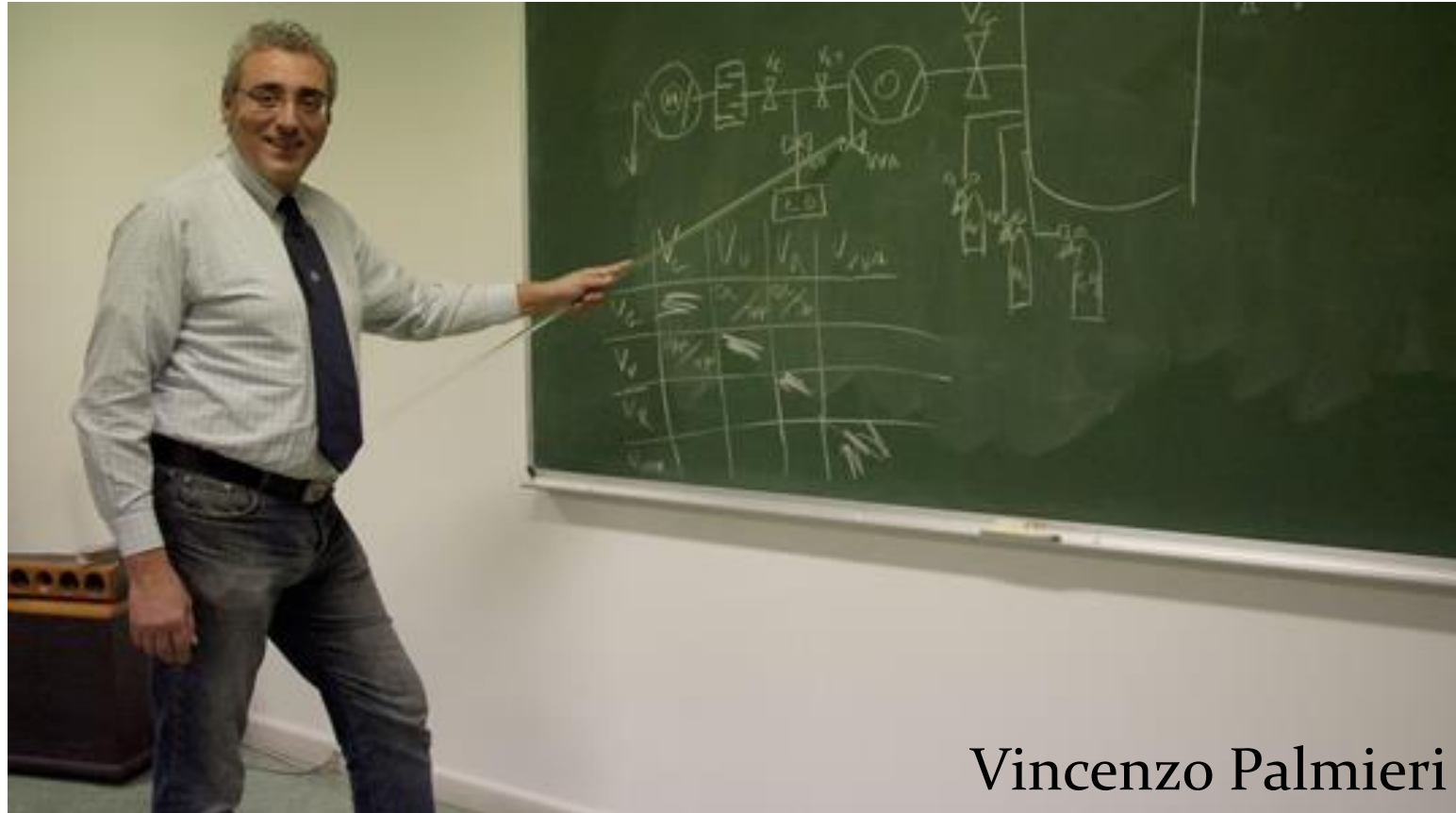
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and
risks**





Vincenzo Palmieri



Thank you!