

# **Operations Tandem ALPI PIAVE of LNL accelerators**

**WAO 2012  
August 6, 2012**

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**Tandem-ALPI-PIAVE complex  
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I.N.F.N. - Laboratori Nazionali di Legnaro**

# Outline

- Introduction to LNL
- What is Operations responsible for at Tandem ALPI PIAVE
- Example of Shift + maintenance ( 1 week)
- Accelerator operator a lifetime career or a stepping-stone into your organization?
- How long does an operator have to stay in Operations to get your money's worth?
- How do you work on team building, motivation, career ownership, and challenge the operators?
- Summary

# LNL INFN - Identity Card

**MULTI TASK  
MULTI DISCIPLINARY  
But mainly  
Nuclear Physics Based  
User Oriented  
Laboratories**

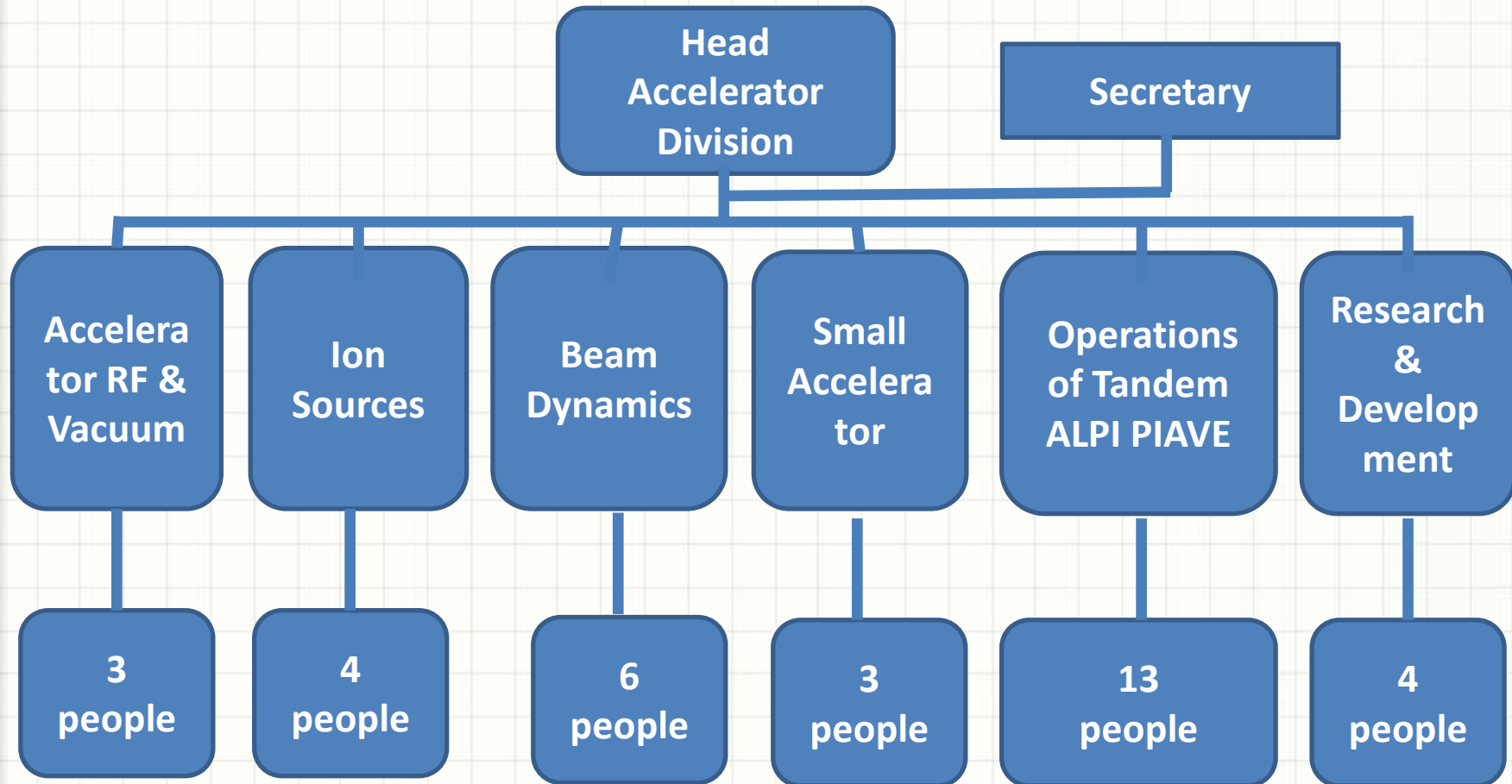
## **CORE RESEARCH ACTIVITIES**

- **Nuclear Structure and Dynamics**
- **Applications and Interdisciplinary use of ion beams and nuclear techniques and methods**



**Staff  
118 people**

# Accelerator Division



**We are 41 people + 7 PhD, in Total we are 48 People**

# The Operations Group of Tandem ALPI PIAVE

Plus me, we are:

a

- 1 Physicist

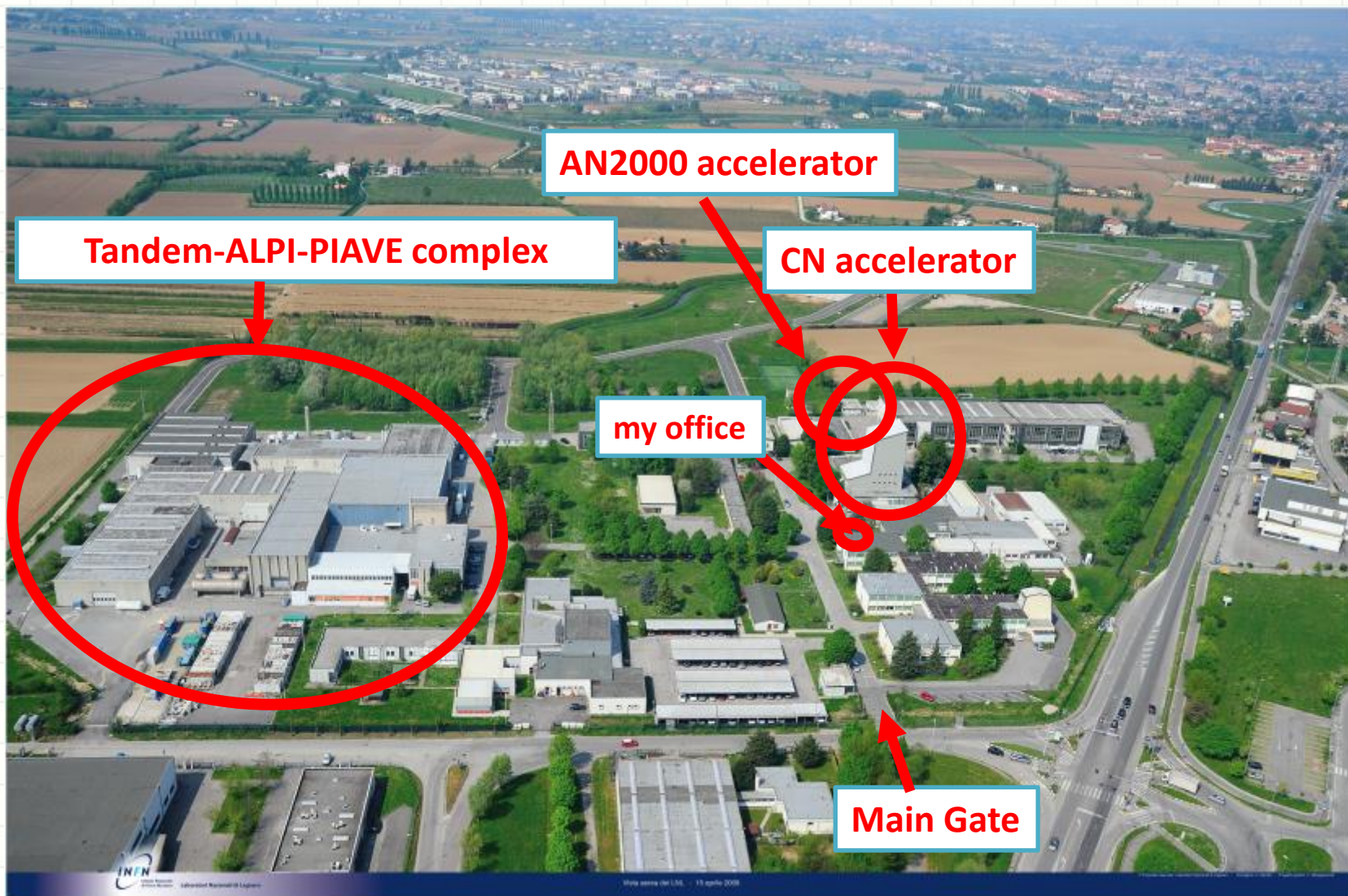
b

- 1 Senior Electrotechnical Engineer

c

- 11 Operators

# Laboratori Nazionali di Legnaro



# XTU-Tandem accelerator



# ALPI (Superconducting Linear Accelerator)

57 Nb /Cu,  
160 MHz  
Medium  $\beta$   
Ea 5MV/m

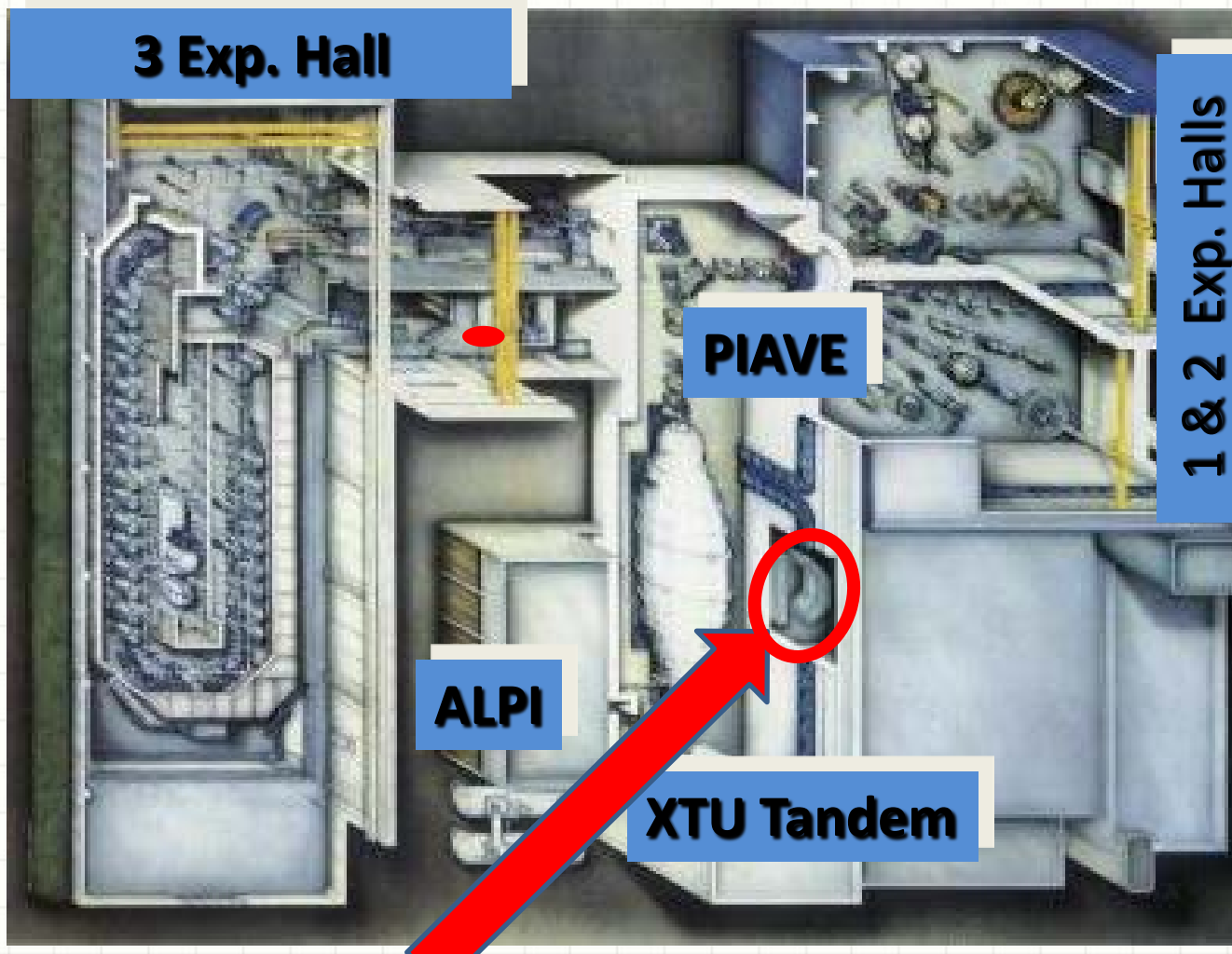
77 Super Conducting Quarter  
Wave Resonators (Nb, Nb/cu)  
In 20 Cryostats  $V_{eq} \sim 48$  MV

20 Full Nb,  
80 MHz  
Low  $\beta$   
Ea 6MV/m





# Tandem-ALPI-PIAVE complex



Here is displayed the PIAVE-Tandem-ALPI complex, the beams being injected by the XTU Tandem into the three experimental Halls, or in to the superconductive LINAC and then distributed to three experimental halls, two of them are shown.

**Control room**

# Main device in the Tandem ALPI PIAVE

- 140 Power supply for quadrupole
- and Dipole,...
- 77 QWR s (coupler, tuning system, pick-up ecc ecc)
- 1 Plant for SF6 trasfer (2 compressor) 780 m<sup>3</sup>at 7 bar
- 40 Steerer
- 40 Power supply for steerer
- 120 Rf Amplifier
- 1 Corona Sistem
- 30 Step-Motor controller
- 50 Beam Monitor Profile
- 50 Faraday Cup
- 30 Slits sistem
- 90 Air compressor distribution
- 250 Valve
- 1 GVM sistem,
- Ecc ecc.
- 1 Voltage divider
- 2500 Resistors
- 1 Laddertron (1300 Link, ecc)
- 765 m<sup>3</sup> of SF6 at 7 Bar
- 2 Compressor and the regeneration system for the transfer of the SF6
- 24000 Spark gap
- 3 Ion pump ( in the HV terminal )
- 9 Power supply ( in the HVterminal )
- 10 Controll Variac ( in the HV terminal )
- 1 Electostatic Lens( in the HV terminal )
- 1200 Resistors support
- 1 Dillon Cell
- 4 Dew Point meter system for SF6
- 8 Cable for the CC ( in HV) for each of 8 section of the machine
- 4 pick-up wheel
- Ecc ecc.

# The Operations group is in charge of managing the tuning, beam delivery, and maintenance of Tandem ALPI PIAVE

## We are not operating:

1

- Ion Sources (negative & positive) & vacuum systems

2

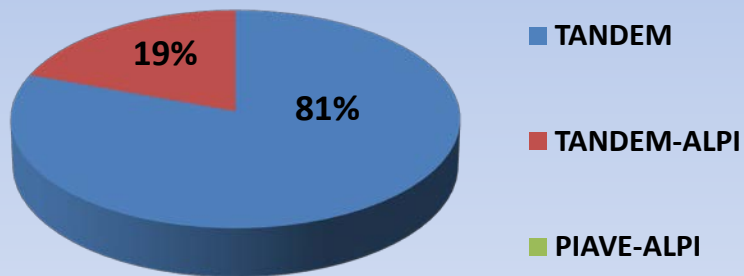
- Cryogenic Plant (He-Cold- box) & Cryostats maintenance

3

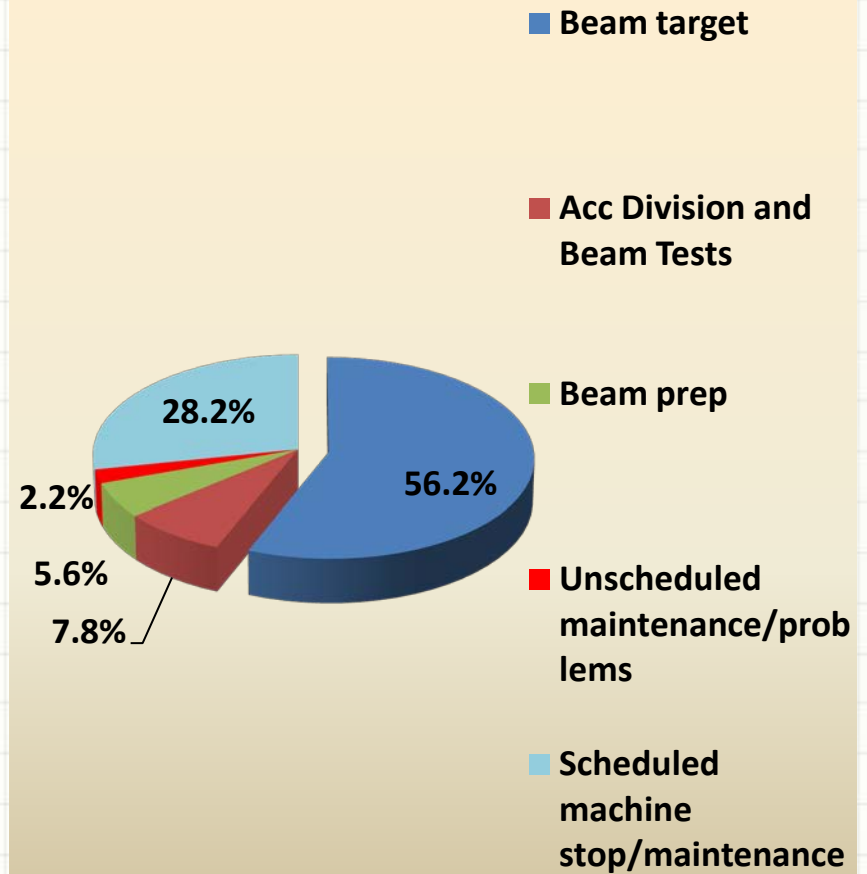
- Controls systems management & maintenance

# Year 2011

## HOURS BEAM ON TARGET



## TOTAL HOURS



# The 11 Operators are on shift for 9 months/year and are:

a

- 1 Woman

b

- 10 Men

**TOTAL**

- (10 Technicians & 1 Engineer)

# The Age of the Operators at LNL is:

From

- 34 year

to

- 52 year

Average

- 45 year

# Week Shift + maintenance example

Shift - Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
07:00 – 15:00	A B	G H	L M	E I	C F	A D	G B
15:00 – 23:00	C D	A B	G H	L M	E I	C F	A D
23:00 – 07:00	E F	C D	A B	G H	L M	E I	C F
<b>Maintenance</b>							
07:00 – 15:00	H			F			
15:00 – 23:00		L	I		D		
<b>Day Maintenance</b> 08:30 – 16:42	L	I		D	B		

Each operator work for 36h (average) each week

# Accelerator operator a lifetime career or a stepping-stone into your organization?

In  
LNL

- We have the same staffing as 25 years ago, but 3 more accelerators (1 in progress)

In  
LNL

- We have the minimum people we need

So

- Usually for the operator is life-time career



# How long does an operator stay in Operations?

a

- **Depends on the Laboratory policy (no new hires are approved)**

b

- **Depends on the work load (too much work - people want to leave)**

# How long does an operator have to stay in Operations to get your money's worth?

**a**

- No less than 5 years

**b**

- The right solution would be between 5 and 15 years

# What's your definition of a "good operator"?

**Alone in the control room  
is able to deliver beam safely,  
for himself and  
for all the people  
in all the laboratory**

# How do you work on team building, motivation, career ownership, and challenge the operators?

1

- Present operators with a role model (personal example)

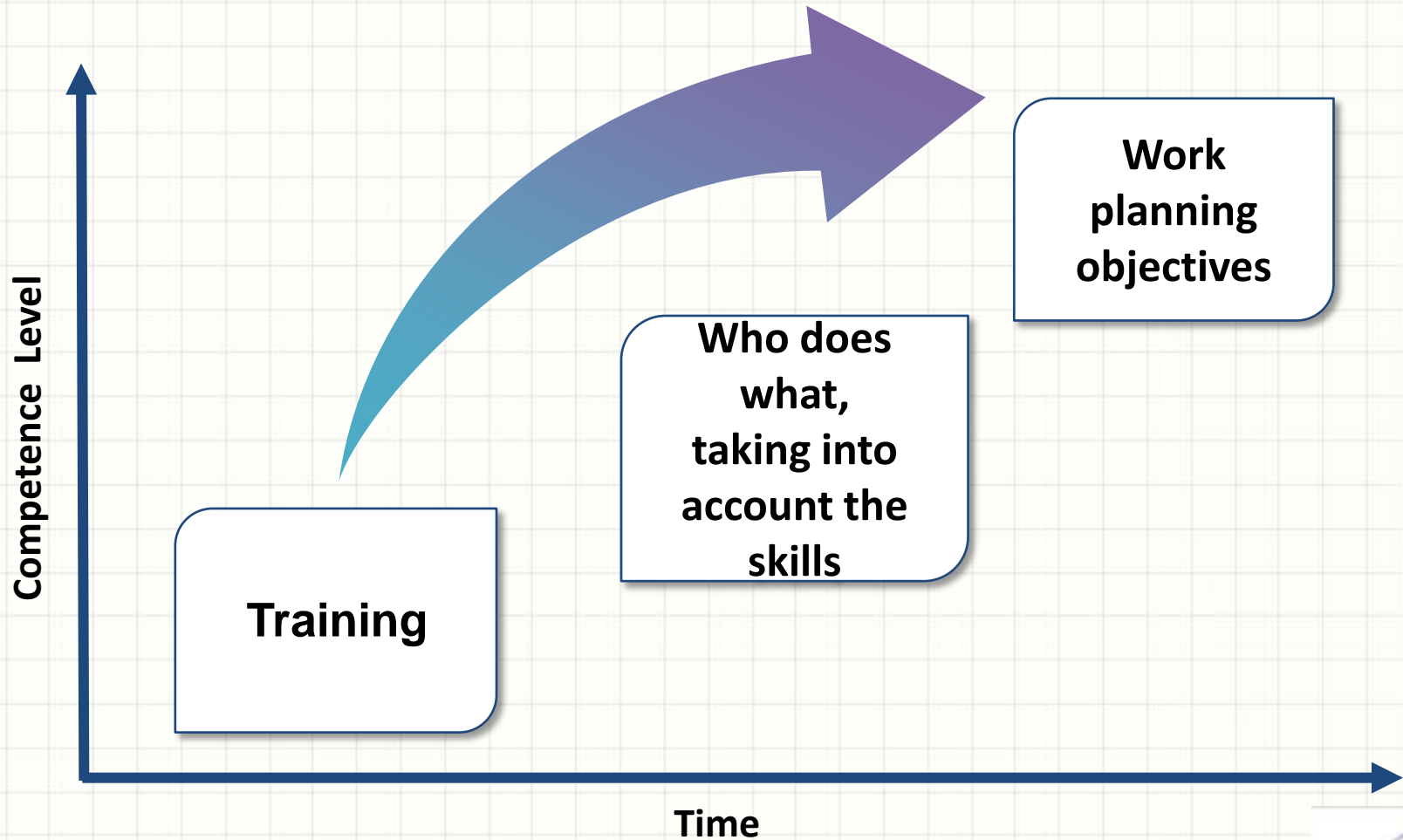
2

- Match job with skills

3

- No favours, impartial and fair to all

# How do you work on team building, motivation, career ownership, and challenge the operators?



# Who does What

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## Responsible

## Info about the contact

Vacuum

[Carletto@Inl.infn.it](mailto:Carletto@Inl.infn.it)

Power Supply

[Contran@Inl.infn.it](mailto:Contran@Inl.infn.it)

RF Amplifier

[Pacchiega@Inl.infn.it](mailto:Pacchiega@Inl.infn.it)

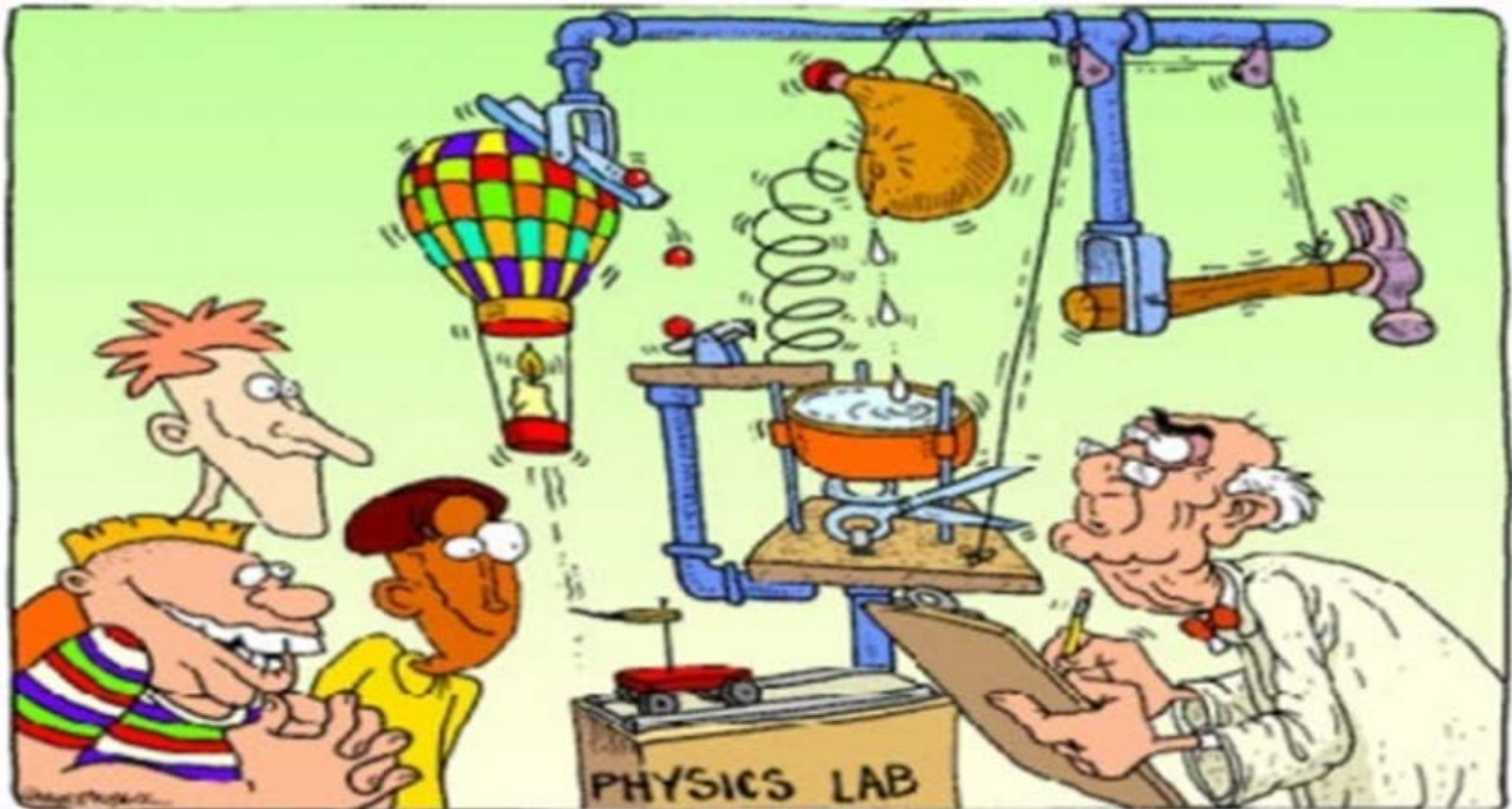
Insulating gas SF6

[Daniele@Inl.infn.it](mailto:Daniele@Inl.infn.it)

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# Summary

This presentation, it is not a lesson of Physics or Organizing, but: Just my experience



# Thank you for your attention

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