



Istituto Nazionale di Fisica Nucleare

# DIODE

*Diamond Integrated for hadrontherapy*

*National: Dr Claudio Verona (Roma II)*

*Local: Dr G. Petringa*

**Durata proposta: 3 years**

**Area di ricerca: Rivelatori, elettronica**

**Responsabile nazionale: Claudio Verona**

**Unità partecipanti: INFN – Sez. Roma2, -INFN - Sez. Milano, Laboratori Nazionali del Sud (LNS)-INFN, Laboratori Nazionali di Legnaro (LNL)-INFN, INFN - sez. Roma3.**

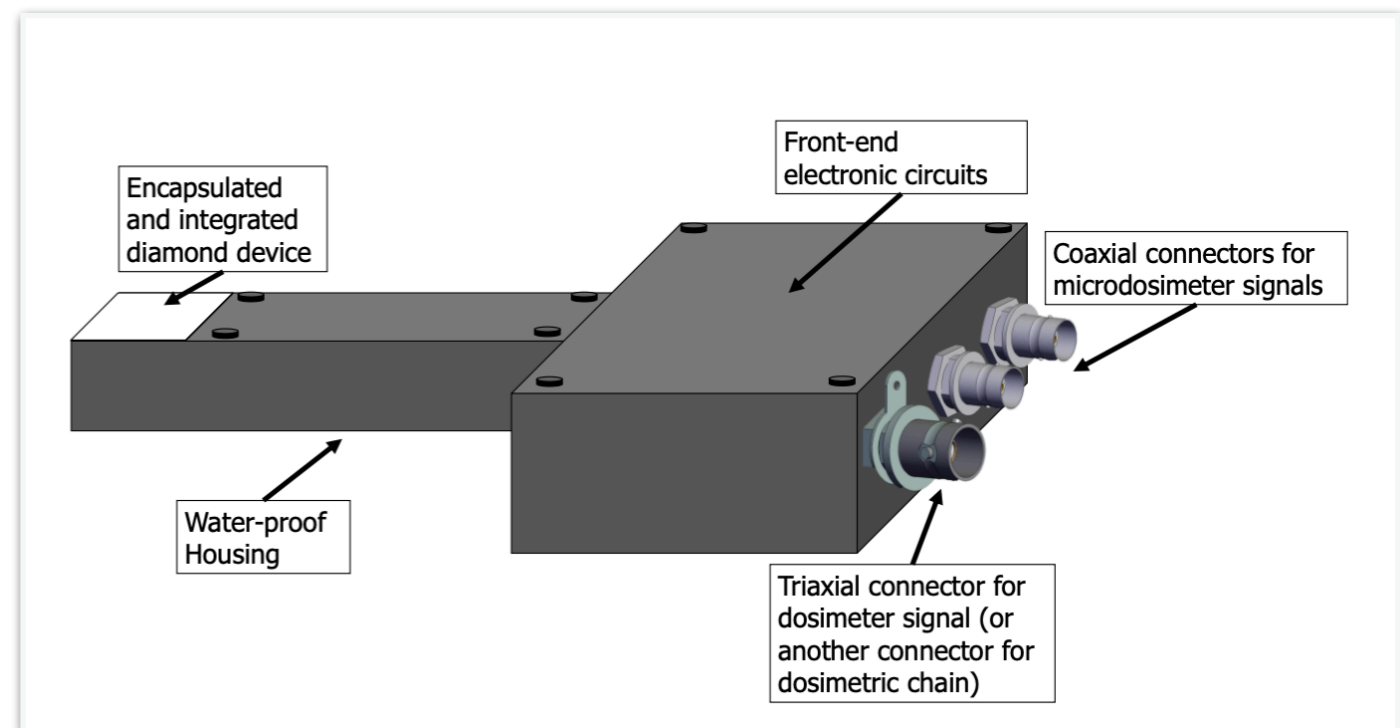
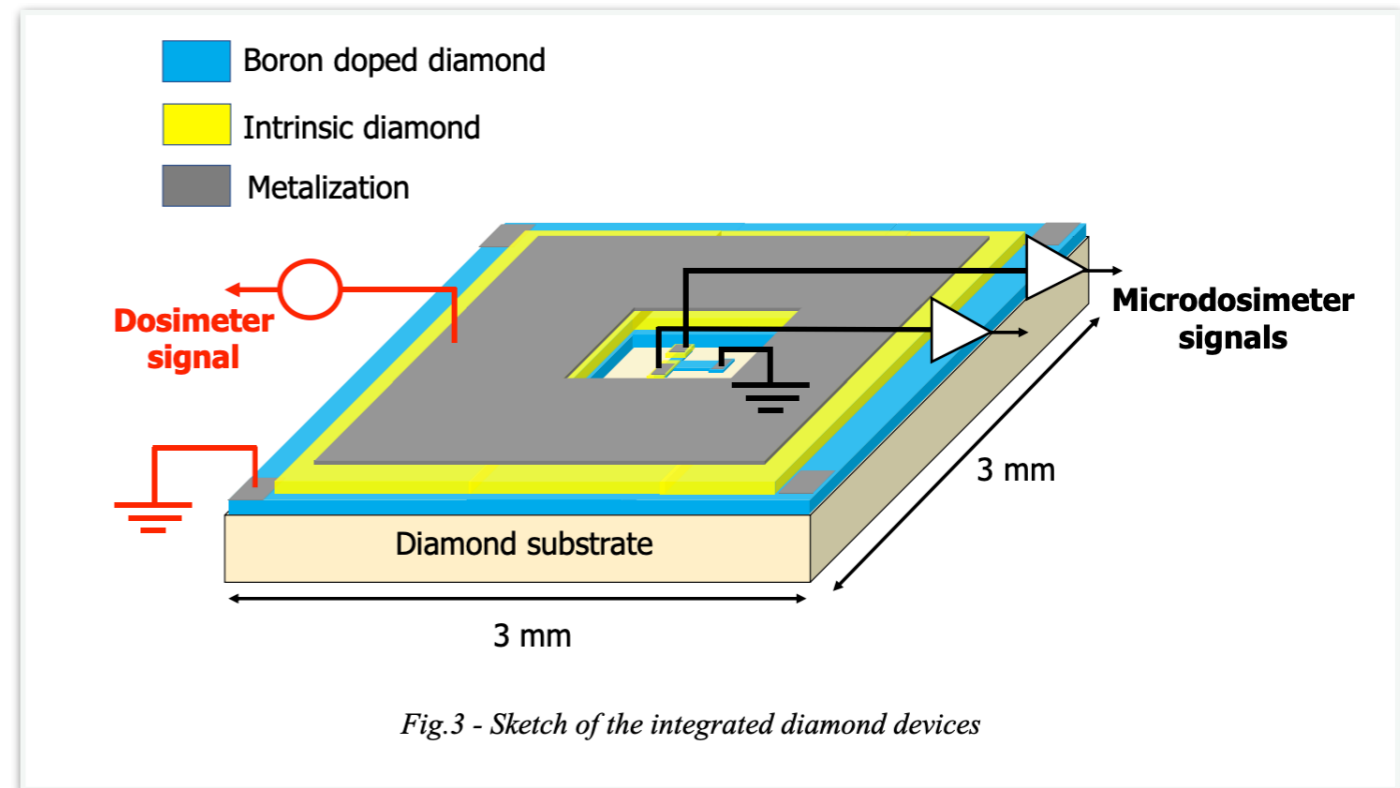
# DIODE aims

2

Development of methods to realize **different monolithic devices**, i.e. diamond dosimeter and few diamond microdosimeters, **on the same diamond substrate**, combining chemical vapour deposition and photolithography techniques.

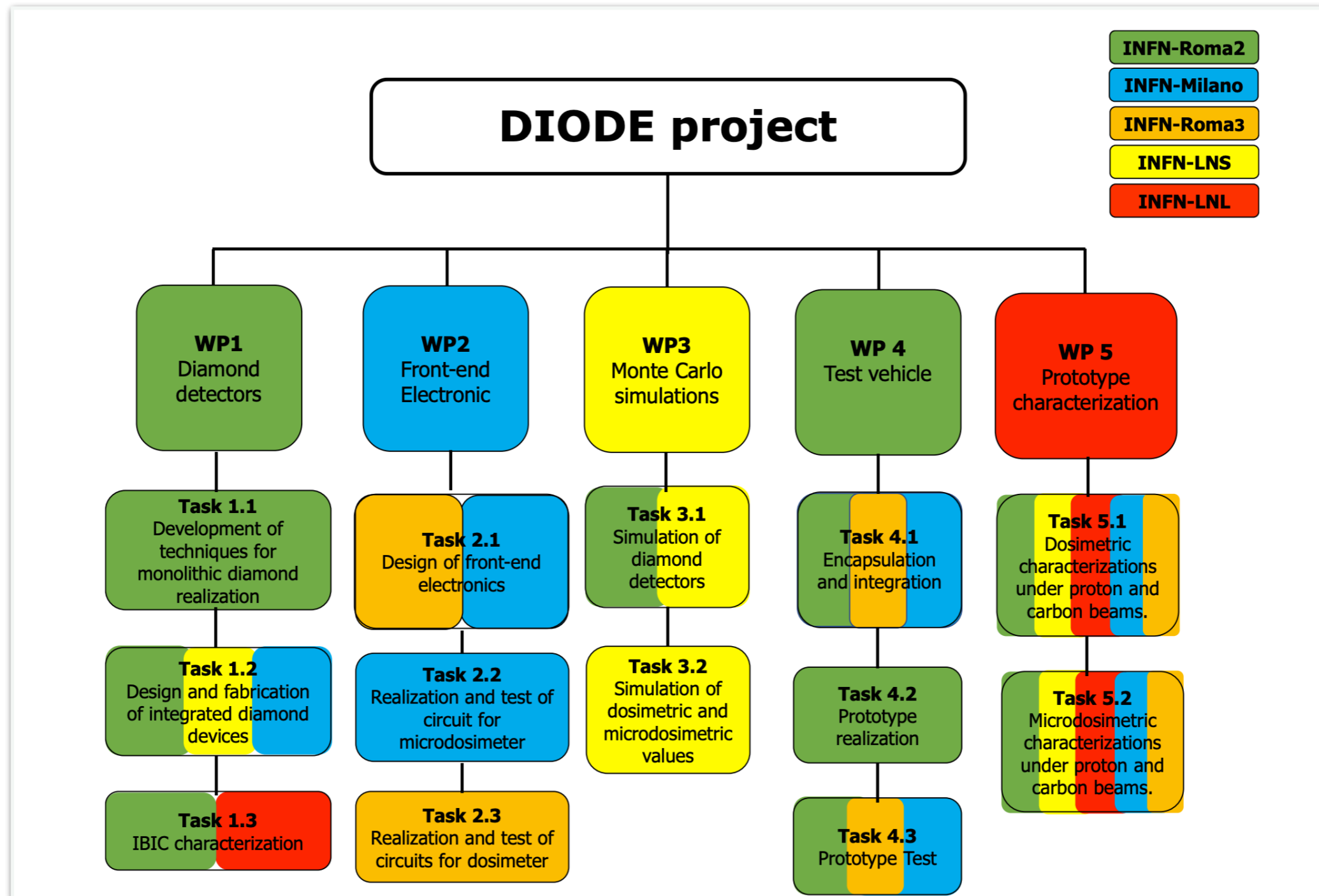
Development of a novel, practical and compact detector and its **integrated electronic chain**, system based on synthetic single crystal diamond able to **perform simultaneously hadron therapy dosimetry and microdosimetry**

Development of dedicated **Monte Carlo simulations** to study the **microdosimetric response** under different conditions and to evaluate the effects of the secondaries.



# DIODE methods

3



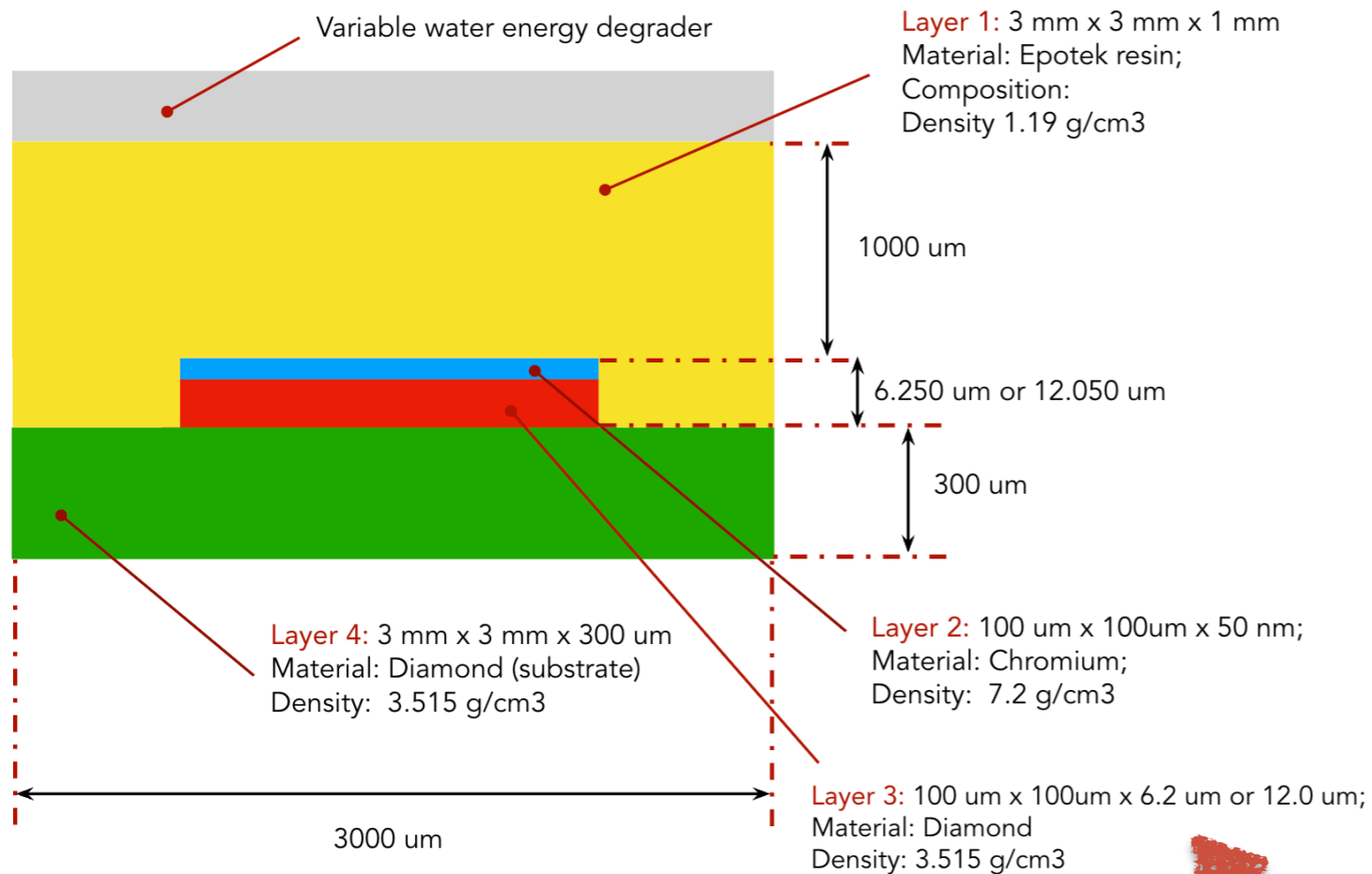
D.2 Month 12: First Monte Carlo simulations of the prototype

# Attività svolta nel 2023

## 4 Stima della corda media

Milestone D.2 Completata al 100% => simulazione del detector

### Geometria del rivelatore



### Fascio di protoni

Energia

148.7 MeV

Spread energetico

0.15 MeV

Beam spot

circolare, 4mm FWHM

### Fascio di ioni carbonio

Energia

247.8 MeV

Spread energetico

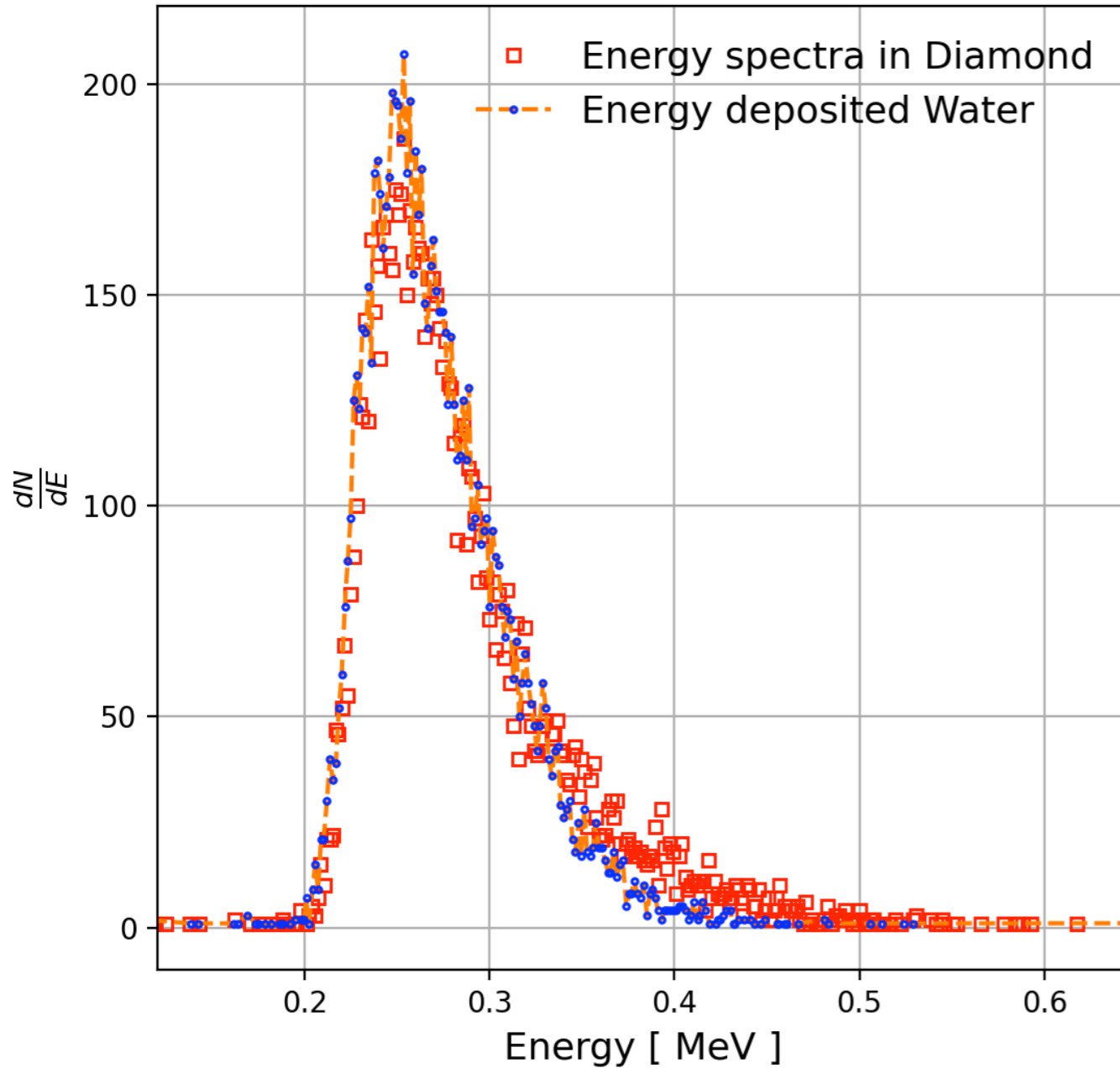
0.25 MeV

Beam spot

circolare, 4mm FWHM

# Attività svolta nel 2023

## 5 Stima della corda media



### Protoni

Depth [ mm ]

Mean chord [  $\mu\text{m}$  ]

0.0

19.6

10.0

19.6

15.25

19.6

### Ioni Carbonio

Depth [ mm ]

Mean chord [  $\mu\text{m}$  ]

0.0

19

16.0

19

28.0

19

44

19

56

19

60

19.2

103

19.2

110

19.2

113

19.45

126.4

19.55

# DIODE participants and requests

6

Request 2024		
Missioni	5 kE	Travel to Trento and CNAO for data taking

Nome	FTE
GAP Cirrone	0.1
G Petringa	0.2
R Catalano	0.3
A Kurmanova	0.4
<b>totale</b>	<b>1.0</b>