

# MC-INFN – PREVENTIVI 2020

Local coordinator:

Aafke Kraan, INFN Pisa

INFN Pisa 4/7/2019

#### Reminder: what is MC-INFN?

- Working group to gather various activities for development and maintenance of MC codes (mostly FLUKA e GEANT4), in national and international context
- Various INFN experiments in different groups involved
  - In Pisa: Gr III and GrV

MC-INFN@INFN Pisa is relevant for:

- Collaboration with CNAO, LNS and other hadrontherapy centers → accurate MC codes can lead to better patient treatments
- Improve understanding of fragmentation processes at the 100 MeV-1 GeV scale, still largely unexplored!

## ACTIVITIES 2019

**FLUKA:** activities in Pisa are aimed at usage and validation of FLUKA code

- **FOOT** experiment:
  - Experimental setup CNAO and GSI data takings
  - Calibration of scintillator detector
  - Data analysis (data-MC comparisons)
    - CNAO data (March 2019)
    - GSI (april 2019) data



#### **INSIDE** experiment at CNAO

- Setup complete MC simulation framework on pc, then extend setup to computing center
- Introduce artifacts in CT scans and simulate various PET images (Master thesis Andrea Berti)
  → apply to machine learning (see slide 4)



### ACTIVITIES 2019

### FLUKA

DoPET

DoPET: portable planar PET system, constructed at INFN (RDH)

Collaboration with proton therapy center, Krakow

Analysis of activity profiles in phantoms

A.Topi et al, Accepted for publication in IEEE TRPM

Analysis of in-beam PET time-profiles in proton

therapy A.C. Kraan et al, 2019 JINST 14 C02001



### **ACTIVITIES 2020**

- continue the testing and validation of the FLUKA code at INFN Pisa
- remain up to date in national and international context
- transfer knowledge during organized FLUKA schools
- **DOPET**, currently being upgraded
  - Simulations of CT images
- **INSIDE** experiment at CNAO:
  - Setup larger-scale MC simulation framework, using disk space and cores computing center
  - Apply machine learning to multiple simulated PET images (Master thesis Andrea Berti) → possibly useful as tool in decision whether or not to adapt a patient treatment



# **RICHIESTE: MISSIONI E CONSUMO**



<u>missioni</u>						
	viaggio	Vitto/allog	persone	giorni	meetings	
MC-INFN national meeting	250	200	I	2		450
FLUKA coll. meeting	300	400	I	3	I	700
FLUKA school (teach)	1500	1000	I	6	I	2500
Totale missioni						4000
<u>consumo</u>						
	costo unita'	quantita				
External disks (for first tests on	100	5				500
pc on multiple DICOM images)						
Total						4500

# PERSONE E RICHIESTE AI SERVIZI

	Posizione	MC-INFN (%)
M.G. Bisogni	PA	10
A. Kraan	Ric-INFN	30
A. Pilleri	Dott	50
V. Rosso	PA	30
TOTALE	FTE	1,2