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### **P1.21: In vivo verification by means of charged fragments detection in carbon ion therapy treatments at CNAO**

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In particle therapy the application of safety margins in treatment planning to account for possible morphological variations limits particle therapy intrinsic potential requiring the implementation of safety factors. The development of an in vivo verification system, still missing in clinical routine, is hence considered a crucial step forward in improving the clinical outcome, allowing to experimentally check the planned and delivered dose consistency and to re-schedule the treatment whenever needed. The Dose Profiler (DP) is a device designed and built to operate as an online verification system of  $^{12}\text{C}$  ion treatments, exploiting the secondary charged fragments escaping from the patient body. The DP capability of spotting morphological variations occurring during the treatment delivery has been investigated for pathologies of the neck-head district in the context of a clinical trial (ClinicalTrials.gov Identifier: NCT03662373) carried out at CNAO (Centro Nazionale di Adroterapia Oncologica, Pavia, Italy) from the INSIDE collaboration. The performance of a 3D imaging procedure capable of showing where the morphological change is located, will be presented and the results will be discussed in the context of CIRT online monitoring and planning.

**Primary authors:** FRANCIOSINI, Gaia (Dipartimento di scienze di base e applicate per l'ingegneria, Sapienza, University of Rome); Prof. BARONI, Guido (CNAO (Centro Nazionale di Adroterapia Oncologica), Pavia, Italy); BATTISTONI, Giuseppe (Università degli Studi e INFN Milano (IT)); BISOGNI, Maria Giuseppina; CERELLO, Piergiorgio (INFN); CIOCCA, Mario (CNAO (Centro Nazionale di Adroterapia Oncologica), Pavia, Italy); DE GREGORIO, Angelica (INFN - National Institute for Nuclear Physics); DE SIMONI, Micol (Ludwig-Maximilians-Universität, Geschwister-Scholl-Platz, 1, Munich, D-80539, Bavaria, Germany); Dr DONETTI, Marco (Fondazione CNAO); DONG, Yunsheng (INFN Section of Milan, Milan, Italy.); FERRERO, Veronica; FIORINA, Elisa (INFN - National Institute for Nuclear Physics); KRAAN, Aafke (INFN, Pisa); LUONGO, Carmela (INFN - National Institute for Nuclear Physics); MAGI, Marco (Dipartimento di Scienze di Base e Applicate per l'Ingegneria, Sapienza Università di Roma, Italy); MARAFINI, Michela; MATTEI, ILARIA (INFN - National Institute for Nuclear Physics); MAZZONI, Enrico; MIRABELLI, Riccardo; MIRANDOLA, Alfredo (CNAO (Centro Nazionale di Adroterapia Oncologica), Pavia, Italy.); MORROCCHI, Matteo (University of Pisa / InfN Pisa); MURARO, Silvia (INFN); PATERA, Vincenzo (University of Rome Sapienza); PENNAZIO, Francesco (INFN - National Institute for Nuclear Physics); SCHI-AVI, Angelo (Università di Roma "La Sapienza"); SCIUBBA, Adalberto (INFN e Laboratori Nazionali di Frascati (IT)); SPORTELLI, Giancarlo (University of Pisa); TAMOPELLINI, Sara (CNAO (Centro Nazionale di Adroterapia Oncologica), Pavia, Italy.); TOPPI, Marco (INFN Section of Rome I, Rome, Italy.); TRAINI, Giacomo; TRIGILIO, Antonio; VISCHIONI, Barbare (CNAO (Centro Nazionale di Adroterapia Oncologica), Pavia, Italy); VITOLO, Viviana (CNAO (Centro Nazionale di Adroterapia Oncologica), Pavia, Italy); SARTI, Alessio (INFN Section of Milan, Milan, Italy.)

**Presenter:** FRANCIOSINI, Gaia (Dipartimento di scienze di base e applicate per l'ingegneria, Sapienza, University of Rome)

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