

**The 28th International Nuclear
Physics Conference
(INPC 2022)**

Cape Town, South Africa

11 September - 16 September 2022



Research on Emerging Medical radionuclides from the X-sections (REMIX):

The Accelerator-based Production of ^{47}Sc , ^{149}Tb , ^{152}Tb , ^{155}Tb and ^{161}Tb

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The cyclotron-based production of medical radionuclides is one of the research activities carried out at INFN-LNL in the framework of the interdisciplinary project LARAMED (Laboratory of RADionuclides for MEDicine) [1]. Since the LARAMED bunkers and ancillary laboratories are currently under completion, experiments on nuclear cross section measurements are carried out in collaboration with the ARRONAX facility (Nantes, France) [2]. The REMIX project, funded by INFN in the years 2021/2023, is focused on the production of ^{47}Sc , ^{149}Tb , ^{152}Tb , ^{155}Tb and ^{161}Tb radionuclides, whose decay characteristics make them suitable for medical applications [3]. This work will outline the main results achieved withing the REMIX collaboration, that is organized in the following Work Packages (WP):

WP1. Target manufacturing (^{49}Ti , ^{50}Ti and $^{155}\text{Gd}_2\text{O}_3$) and characterization (resp. S. Cisternino) [4]; WP2. Nuclear cross section (XS) measurements with ^{49}Ti and ^{50}Ti targets for ^{47}Sc production (resp. L. Mou) [5]; WP3. Nuclear XS measurements with $^{\text{nat}}\text{Dy}$, ^{159}Tb and $^{\text{nat}}\text{Eu}$ targets for $^{\text{xx}}\text{Tb}$ production (resp. S. Manenti) [6]; WP4. Nuclear XS modeling for ^{47}Sc and ^{155}Tb production (resp. L. Canton and A. Fontana) [7]; WP5. Dosimetric calculations for ^{47}Sc - and $^{\text{xx}}\text{Tb}$ -labelled radiopharmaceuticals (resp. L. Meléndez-Alafort and L. De Nardo) [8]; WP6. ^{155}Tb Thick Target Yield (TTY) measurements (resp. P. Martini); WP7. Apparatus design and realization for irradiation tests with the LARAMED beam-line (resp. G. Sciacca) [9].

[1] J. Esposito et al, *Molecules* 24(1), 20 DOI:10.3390/molecules24010020 (2019)

[2] F. Haddad et al., *Journal of Nuclear Medicine and Molecular Imaging*, 35:1377-1387 (2008)

[3] C. Müller et al., *Br J Radiol*; 91(1091): 20180074 DOI: 10.1259/bjr.20180074 (2018)

[4] S. Cisternino et al., LNL Annual Report 2021, <https://www1.inl.infn.it/~annrep/index.htm> (2022)

[5] L. Mou et al., LNL Annual Report 2021, <https://www1.inl.infn.it/~annrep/index.htm> (2022)

[6] M. Colucci et al., LNL Annual Report 2021, <https://www1.inl.infn.it/~annrep/index.htm> (2022)

[7] F. Barbaro et al., *Phys Rev C* DOI:10.1103/PhysRevC.104.044619 (2021)

[8] L. De Nardo et al., *Physics in Medicine and Biology* DOI:10.1088/1361-6560/abc811 (2021)

[9] G. Sciacca et al., LNL Annual Report 2020, <https://www1.inl.infn.it/~annrep/index.htm> (2021)