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Intense and pure samples of 129m,131m,133mXe for a novel medical imaging technique, gamma-MRI

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Gamma-MRI is a future imaging modality that should allow the simultaneous exploitation of the sensitivity of gamma-ray detection (SPECT) and the spatial resolution and flexibility of MRI. The approach uses, like in SPECT, gamma-emitting nuclei, which are highly polarized and thus exhibit anisotropic gamma-ray emission, whereas their spins are rotated by rf pulses, like in MRI. The signal in gamma-MRI is the change in the ratio of gamma rays emitted longitudinally and transversally to the spin (and magnetic field) direction. The first nuclei used in the project are $11/2^-$ spin isomers ^{129m}Xe (T1/2=8.9 days), ^{131m}Xe (T1/2=11.8 days) and ^{133m}Xe (T1/2= 2.2days).
An efficient production and purification of the ^{129m,131m,133m}Xe is one of the first milestones in the gamma-MRI project. This contribution will present two main methods of production tested so far. The main part will concern production by neutron irradiation of enriched stable ^{128}Xe and ^{130}Xe in the RHF reactor at Intitute Laue-Langevin (ILL; Grenoble, France) and at the MARIA reactor in the National Centre for Nuclear Research (NCBJ; Świerk, Poland). Production at ISOLDE will be also covered, with emphasis on recent upgrades to the experimental setup. Both methods provide high values of xenon isotopes activities that can be extracted efficiently and used in polarization experiments.
The presentation will give a brief introduction to the gamma-MRI technique and will mention 129m,131m,133mXe activity and purity required later for the project. It will then concentrate on production at ILL and MARIA reactors, and will compare it briefly to production at ISOLDE.

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