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Investigating $N \to N\pi$ axial matrix elements

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Excited state contamination is one of the most challenging sources of systematics to tackle in the determination of nucleon matrix elements and form factors.
The signal-to-noise problem prevents one from considering large source-sink time separations.
Instead, state-of-the-art analyses consider multi-state fits.
Excited state contributions to the correlation functions are particularly significant in the axial channel.
In this work, we confront the problem directly.
Since the major source of contamination is understood to be related to pion production, we consider 3-point correlators with a N operator at the source and a $N\pi$ interpolating operator at the sink, which allows studies of $N \to N\pi$ matrix elements.
After discussing the challenges that arise when using a 2-particle interpolating operator, like the projection onto the proper irreducible representation and on the isospin components, we present results of $N \to N\pi$ processes, mediated by an axial current, on an $m_\pi \approx 420 MeV$ ensemble.

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