# $K\_{L}$ reactions on neutron target

1. $K\_{L}n\rightarrow K\_{s}n$ – very hard. No charged particles from primary vertex. Limited resolution on vertex determination. Bad time-of-flight resolution for $K\_{L}$ momentum determination. Final state neutron needs to be measured (efficiency issues, neutron energy determination issues in absence of good “start time”).
2. $K\_{L}n\rightarrow Σ^{0\*}$. Pretty straightforward in case of charged decay branches $Σ^{0\*}\rightarrow Σ^{-}π^{+}$ or $Σ^{0\*}\rightarrow K^{-}p$, but very hard in case of neutral branches $Σ^{0\*}\rightarrow Λπ^{0}$, $Σ^{0\*}\rightarrow n\overbar{K^{0}}$ (no primary vertex reconstruction, large $Λ$ flight path). Fairly simple in case of $Σ^{0\*}\rightarrow Ξ^{-}K^{+}$ decays
3. $K\_{L}n\rightarrow Λ^{\*}$ same as $Σ^{0\*}$ - simple charged decay branches, tedious neutral. An interesting decay branch $Λ^{\*}\rightarrow Λη$ would have bad resolution in both $√s$ and angles (no primary vertex, bad $K\_{l}$ToF…), do not know if kinematical fitting of $η\rightarrow γγ$ decay vertex can sufficiently improve the situation.
	1. This reaction cannot be done on proton target. (Should not we expect $Λ^{\*}-Σ^{\*}$ isospin mixing and various isospin violating interference effects?)
4. $K\_{L}n\rightarrow K^{0}Ξ^{0(\*)}$ Very hard in case of $Ξ^{0}$ ground state due to absence of primary vertex. A lot better with $Ξ^{0\*}$ excited states since $Ξ^{0\*}$ charged decay particles can be utilized for the primary vertex determination without loss of accuracy in $√s$.
5. $K\_{L}n\rightarrow K^{+}Ξ^{-(\*)}$ Great reaction. Fixed primary vertex, charged particles from secondary vertex. Probably the best reaction to demonstrate our discovery potential on neutron target and double-strangeness production on neutron target.