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Role of intracellular trafficking of AMPAR during LTP

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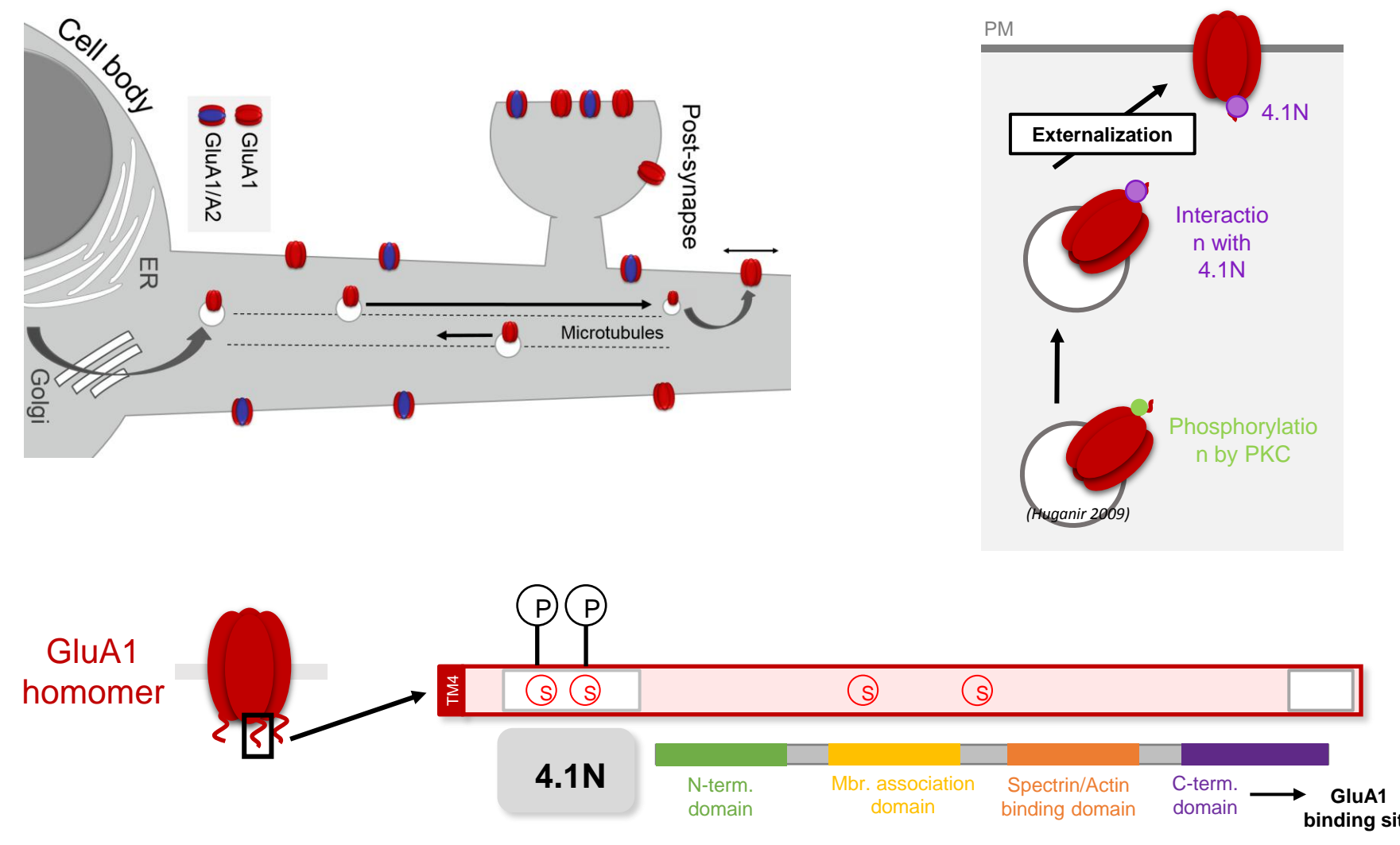
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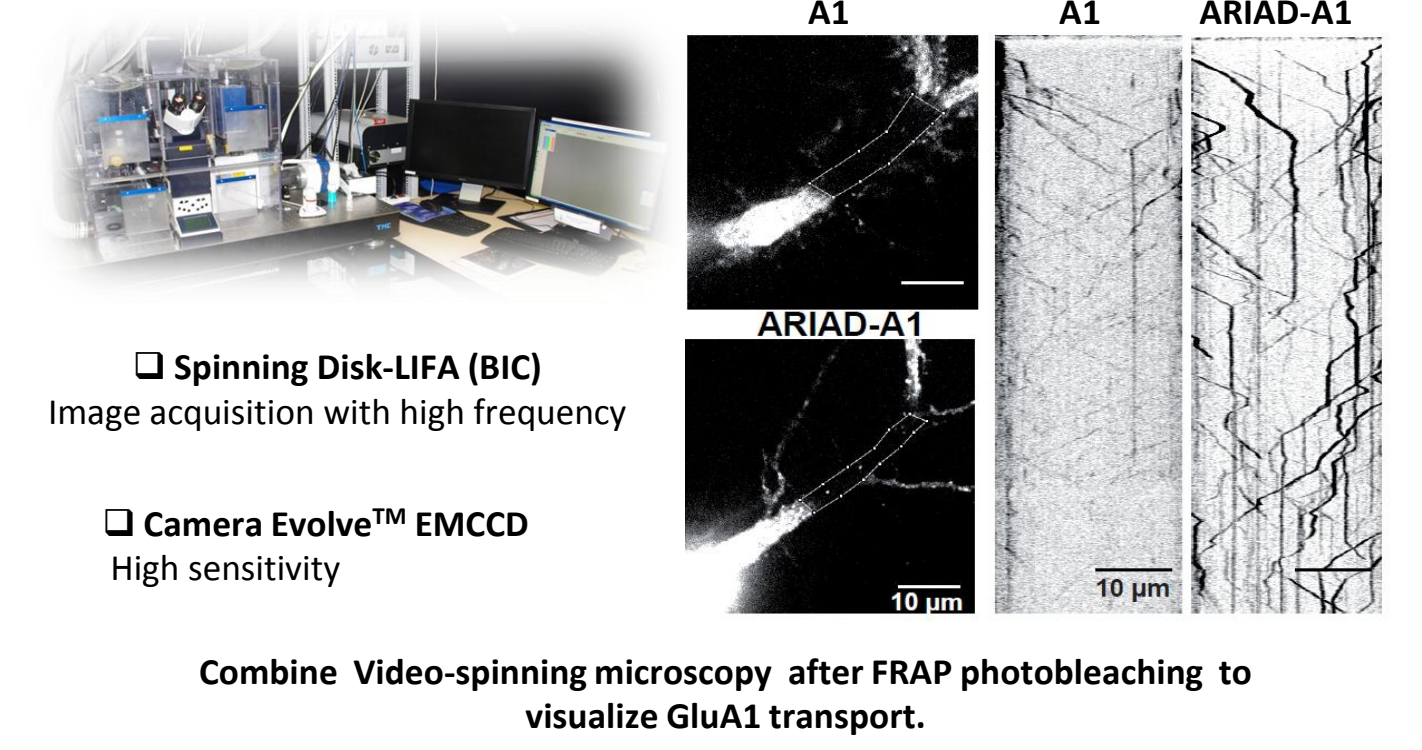
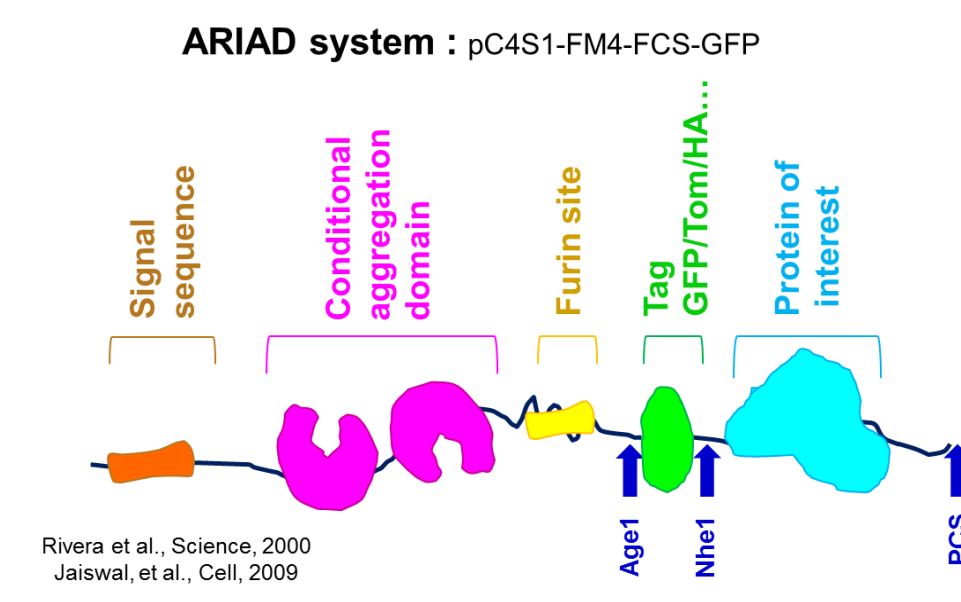
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Introduction

Abundance of AMPARs (AMPA) at synapse is essential for the establishment and maintenance of synaptic function. Their synaptic localization is dependent on a highly dynamic exocytosis, endocytosis and plasma membrane mobility events. Using our new biochemical tool combined with photonic live imaging, we controlled and followed the intracellular transport of tagged GluA1 containing receptors in cultured rat hippocampal neurons. Analyses are performed for GluA1 WT and mutants of GluA1 C-terminus domain in basal condition and during LTP. In organotypic hippocampal slices we combine imaging and electrophysiology experiments to analyze the impact of intracellular transport of AMPAR on LTP. Localization of AMPAR is regulated by their intracellular trafficking through interaction of their C-terminus domains with different intracellular partners. These interactions play a major role in the exocytosis and localization of the receptor at the plasma membrane both in basal condition of during LTP. In hippocampal slice intracellular transport of AMPAR plays a major role during LTP.

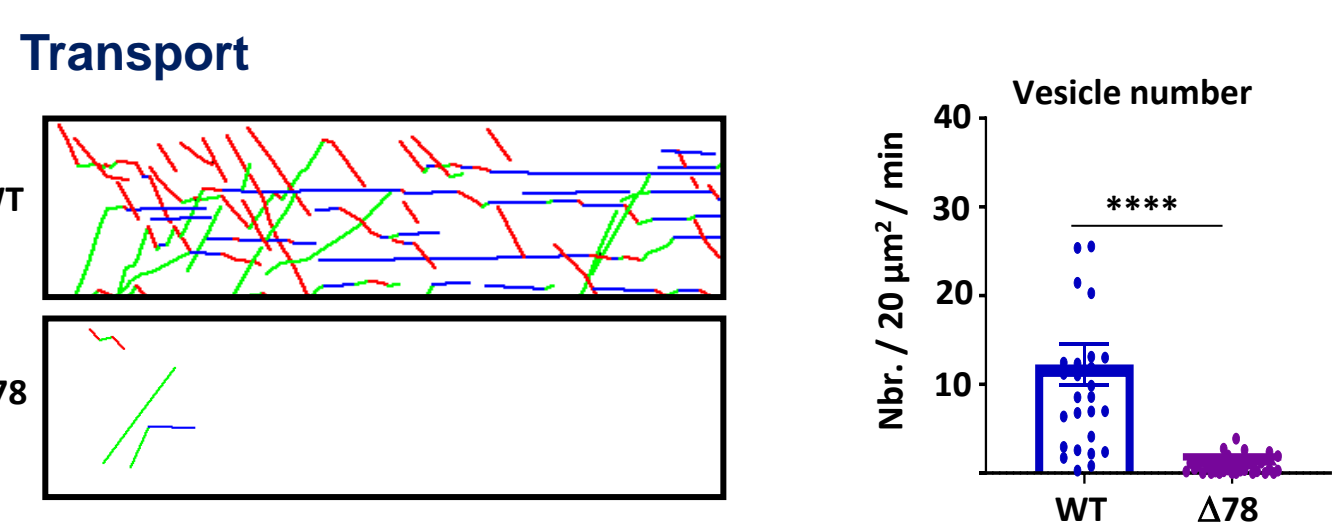
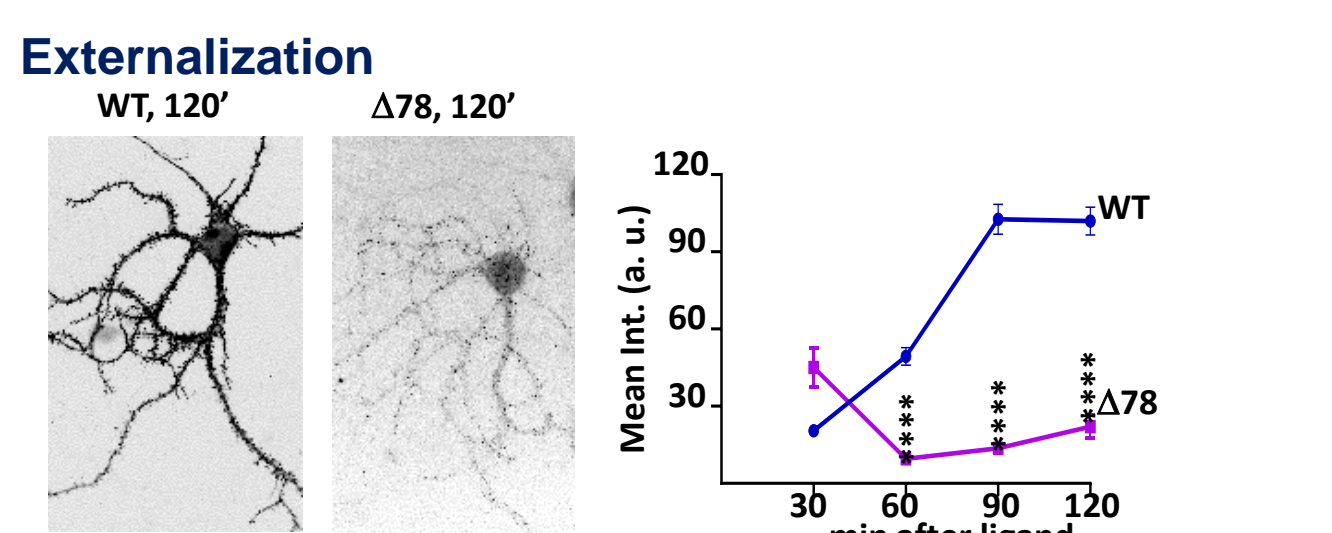
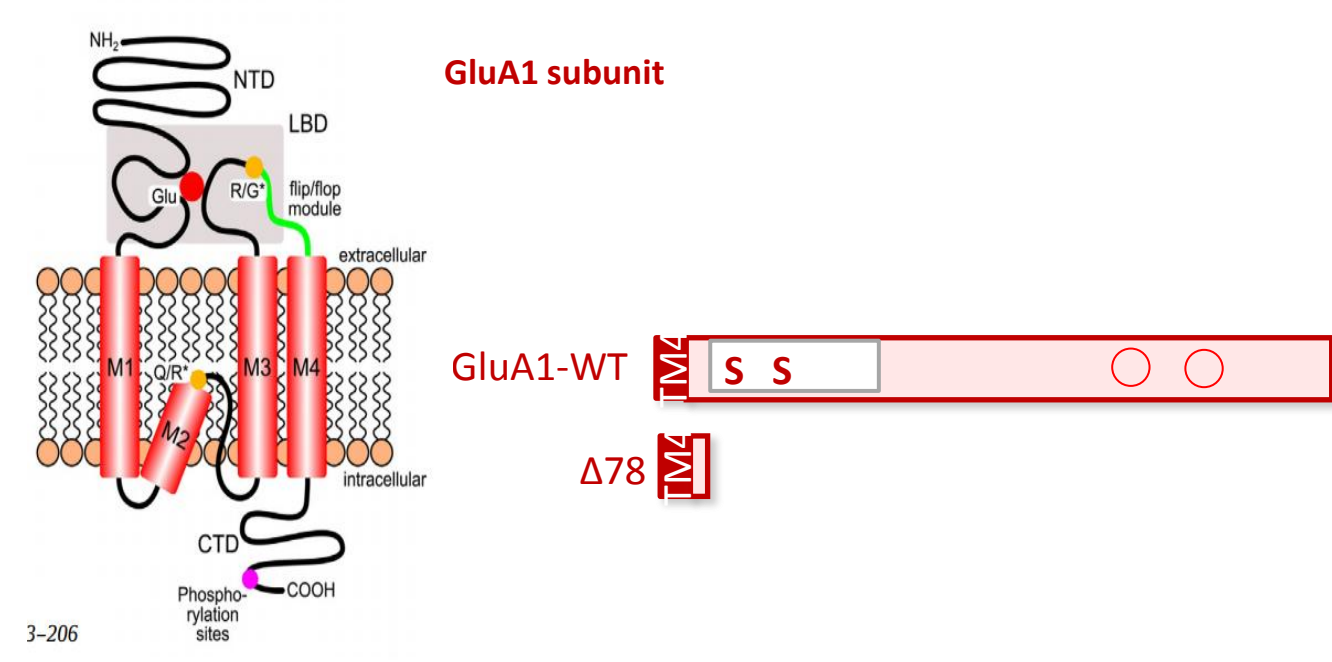


Biomolecular & Imaging Tools

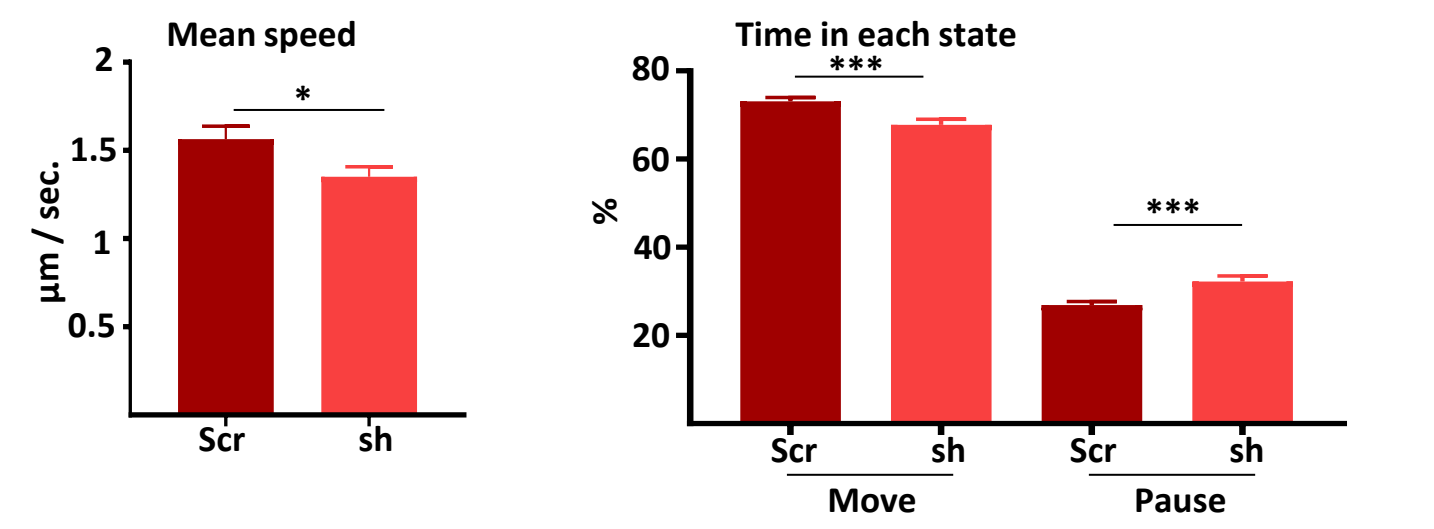
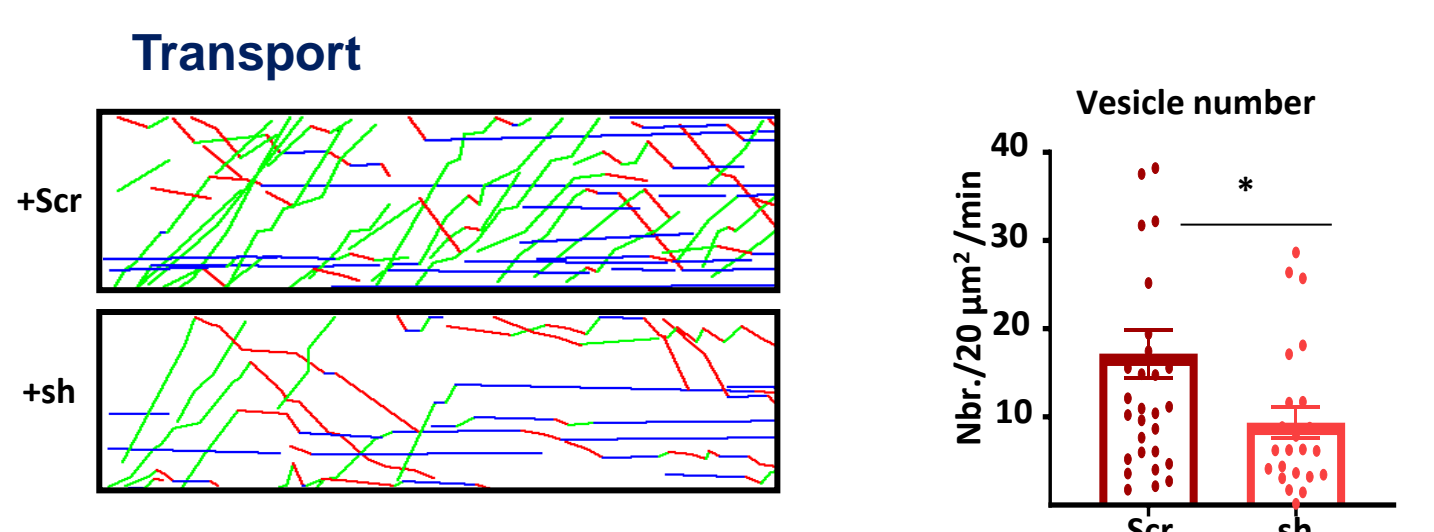
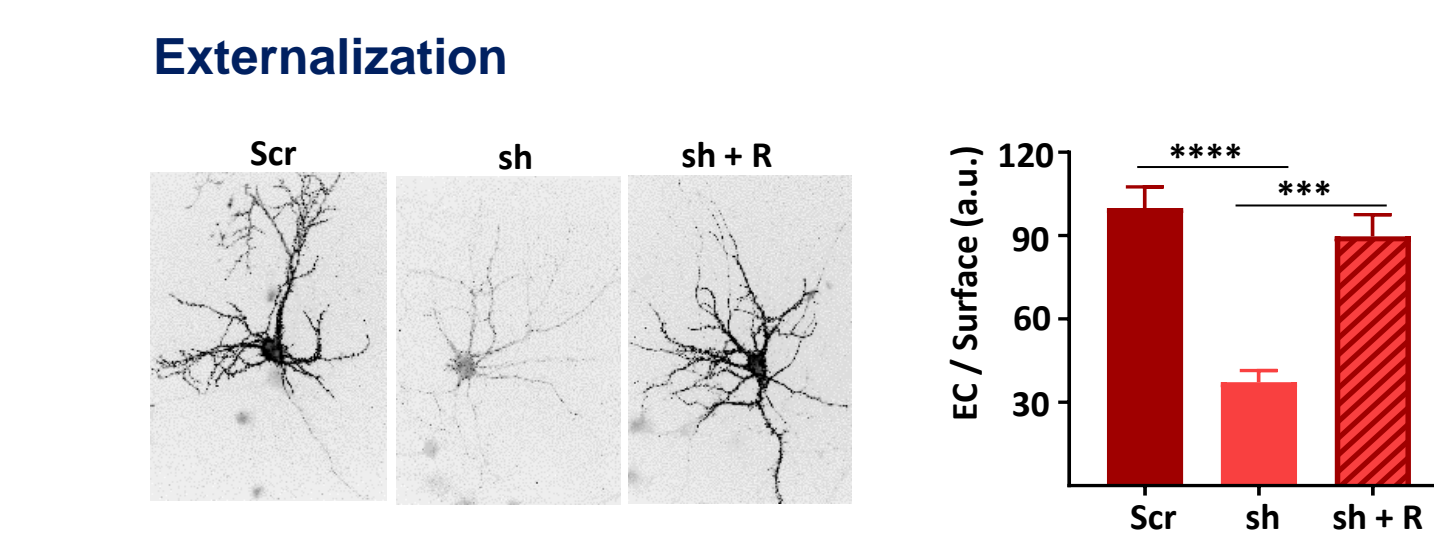
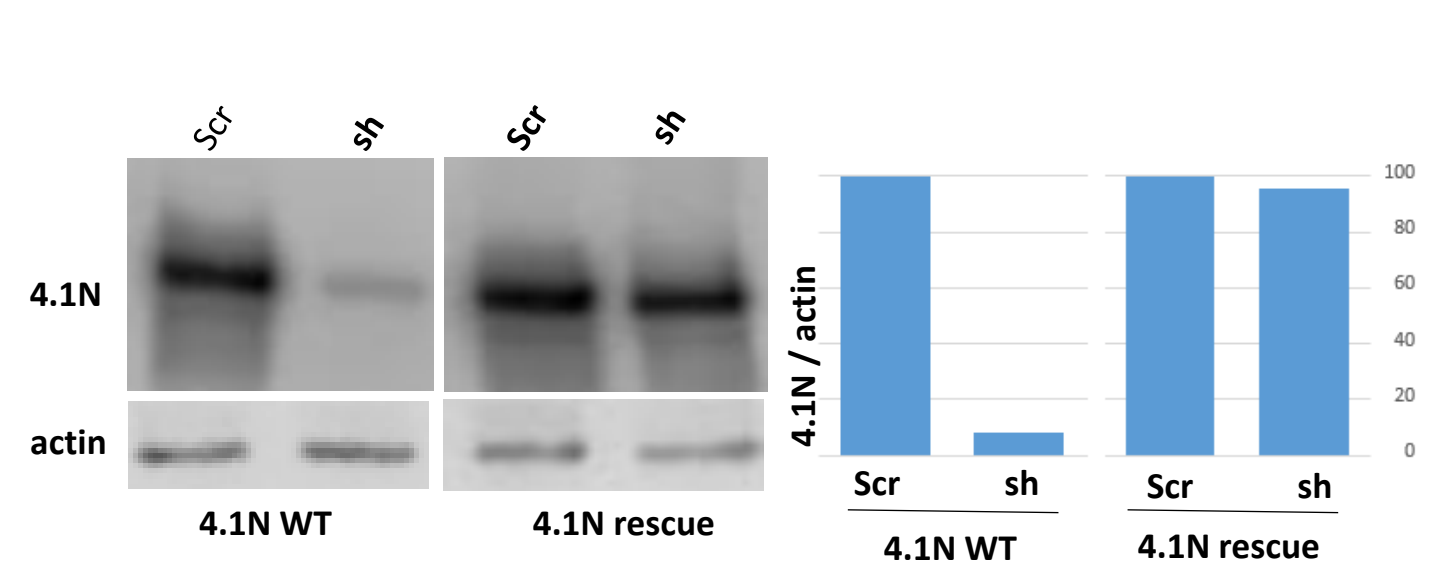


Role of the interaction between 4.1N and the C-terminal domain of GluA1 in the intracellular transport of GluA1 during basal transmission and LTP

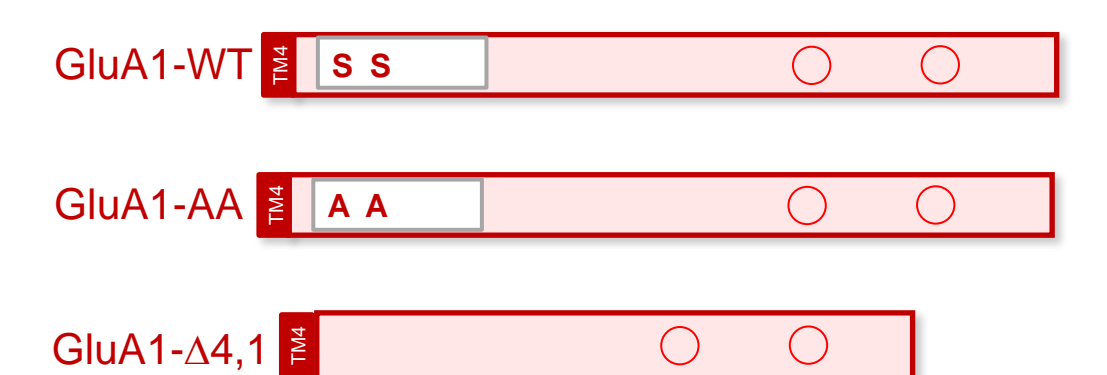
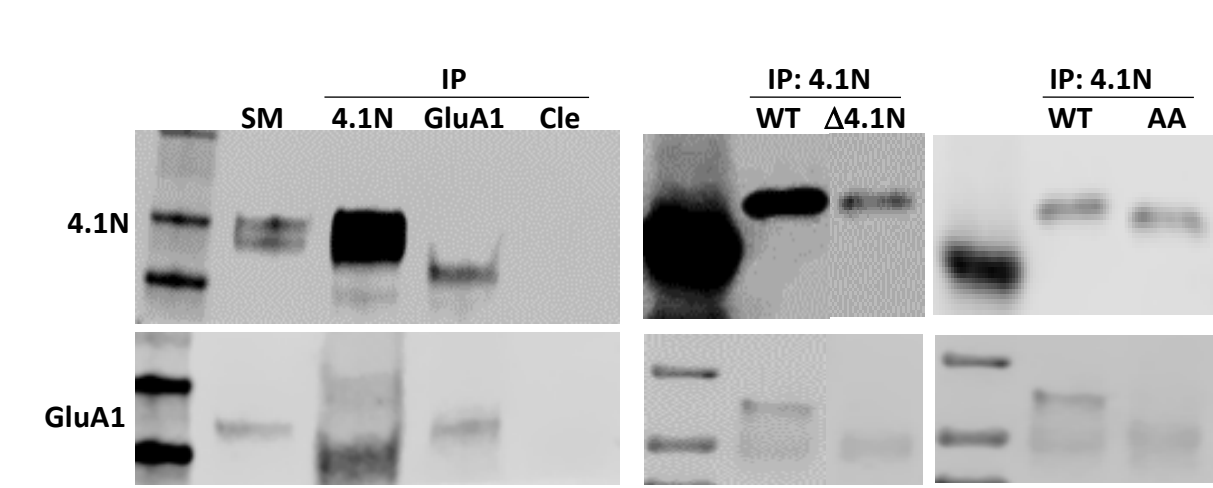
GluA1 C-term. domain and IT



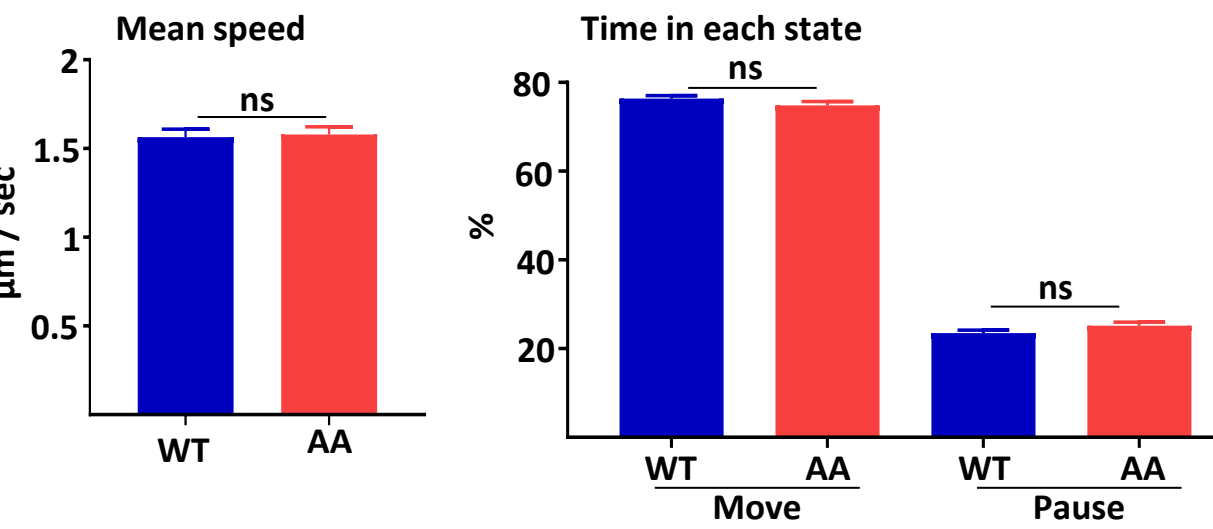
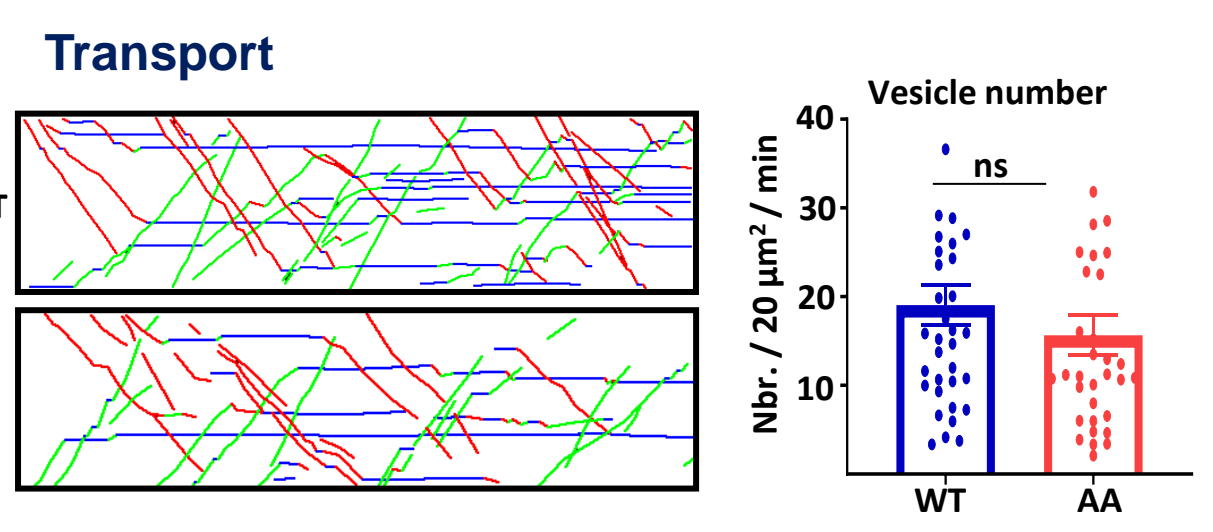
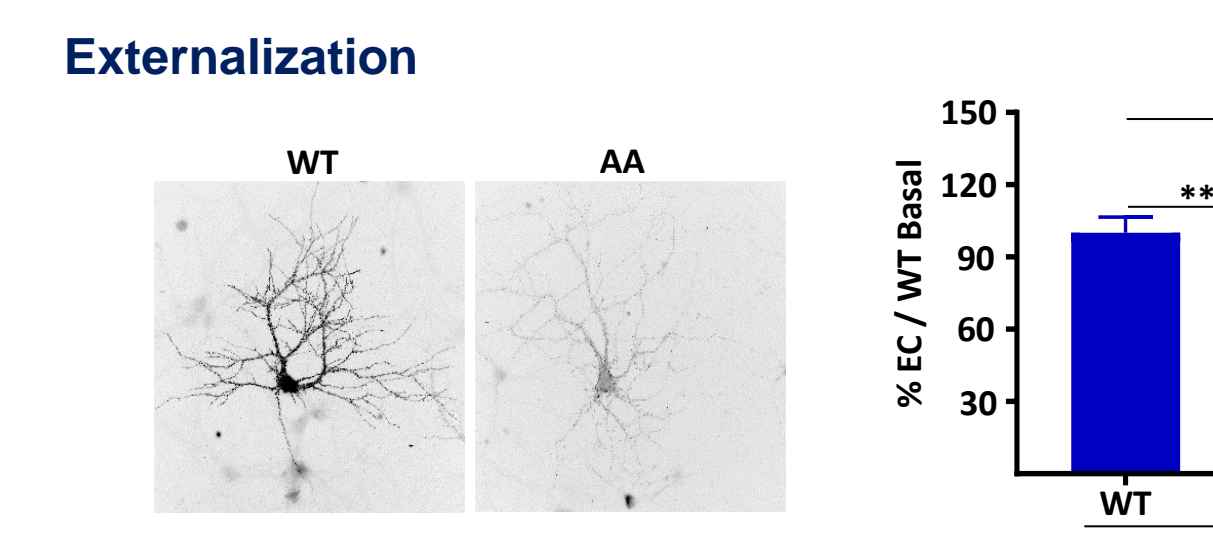
4.1N and GluA1 IT



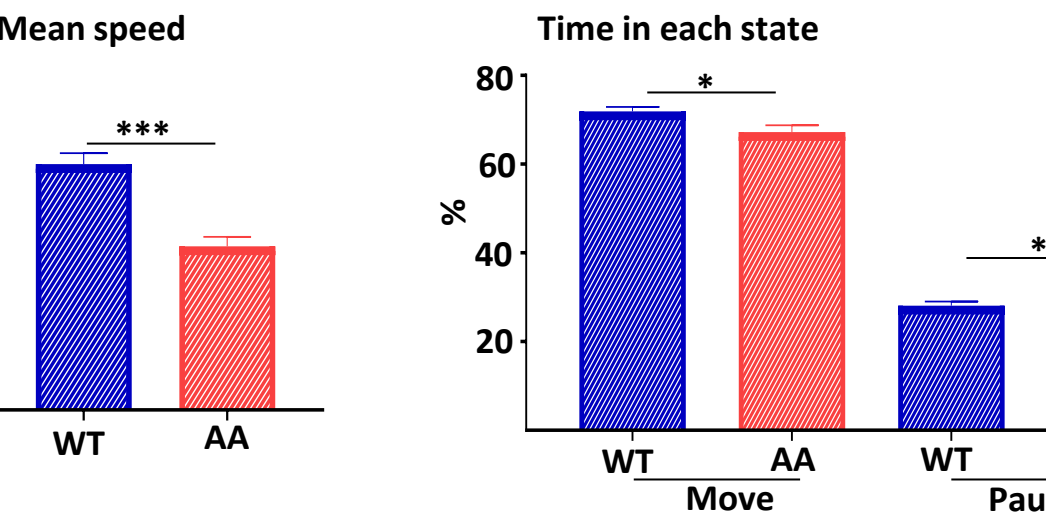
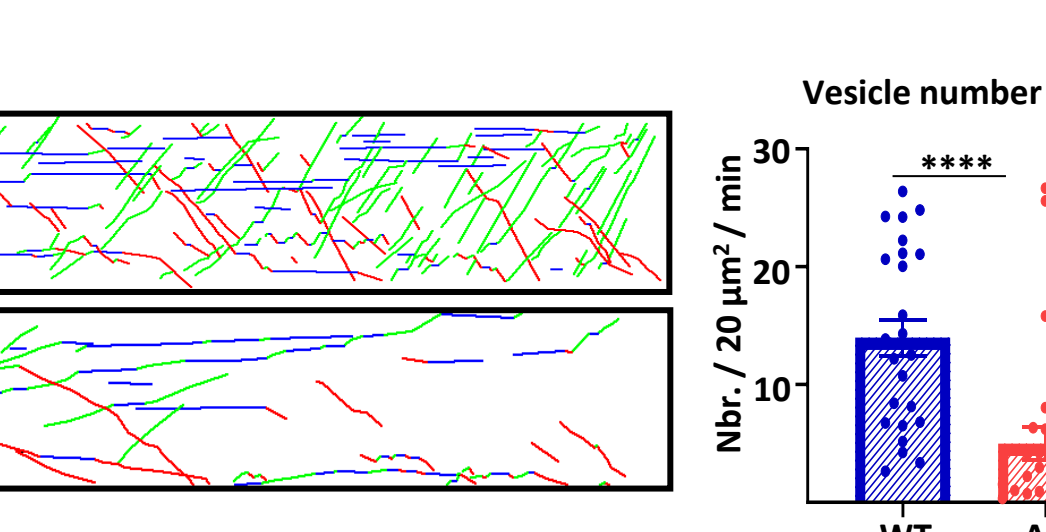
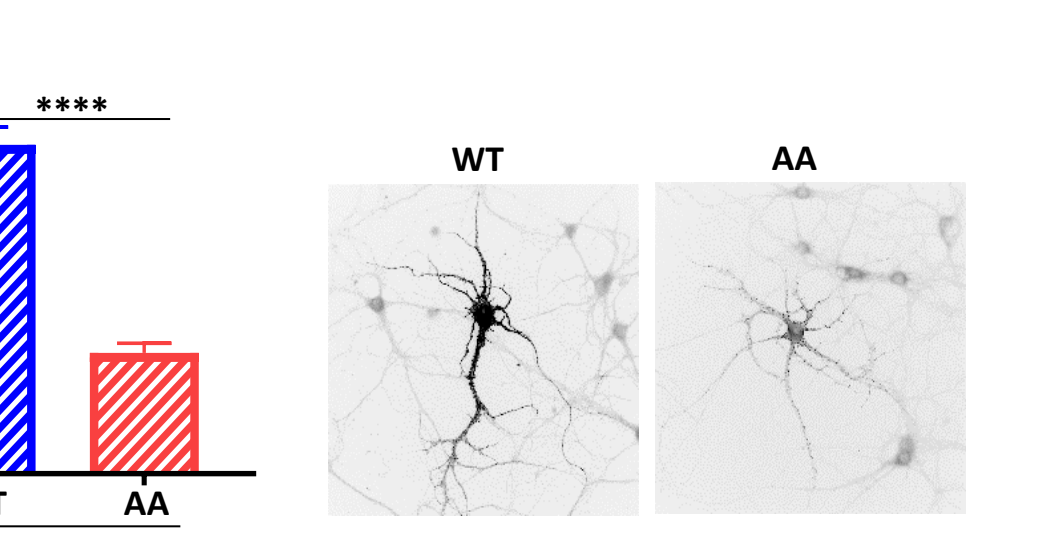
Binding GluA1 / 4.1N and GluA1 IT



BASAL



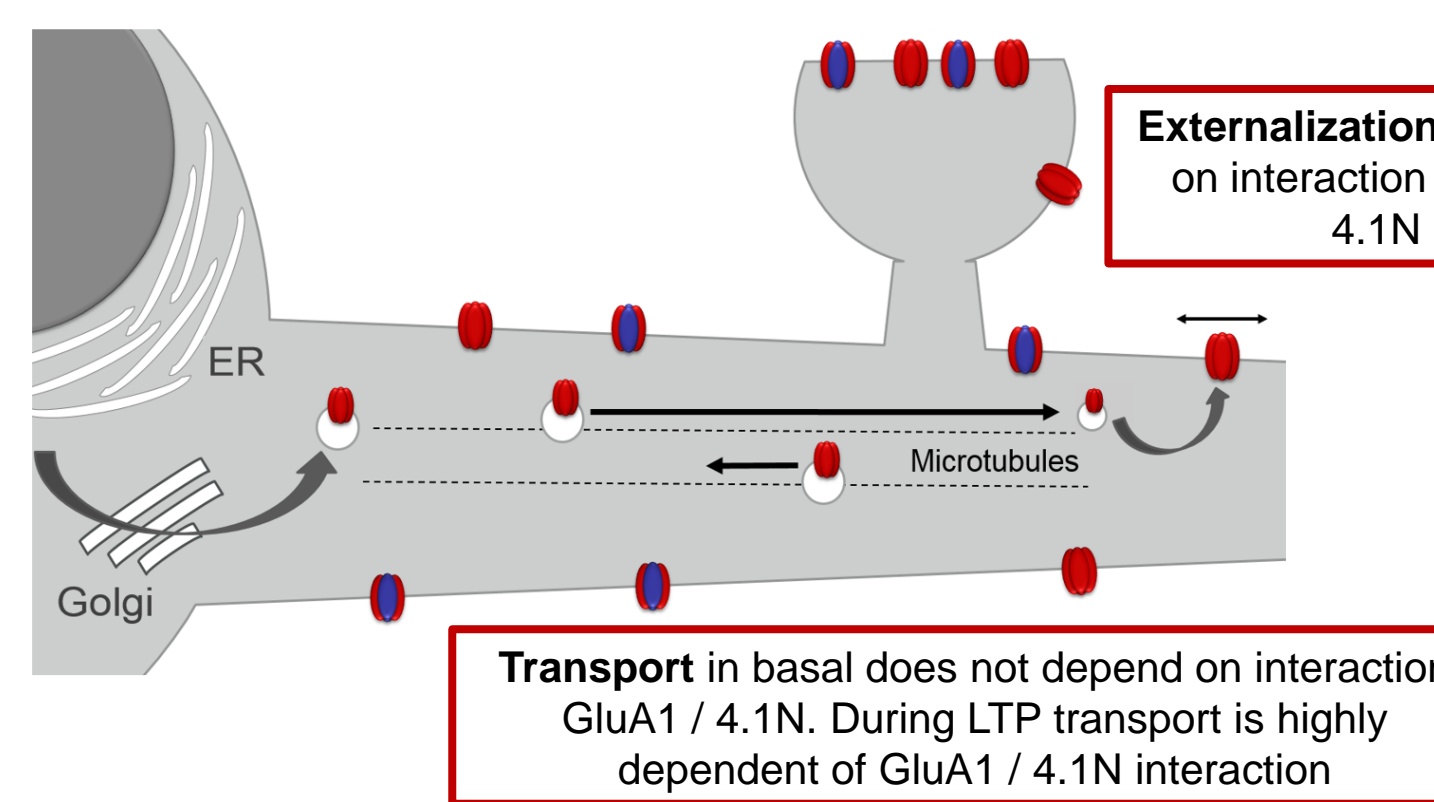
LTP



Conclusions

- 1- Intracellular transport of GluA1 is dependent on its C-term. domain.
- 2- In basal condition, interaction GluA1 / 4.1N is necessary for the export but NOT for its intracellular transport.
- 3- During LTP, interaction GluA1 / 4.1N is necessary for the export AND for intracellular transport of GluA1.

Translocation from ER to Golgi to vesicles depends on 4.1N and SAP-97 (data not shown)

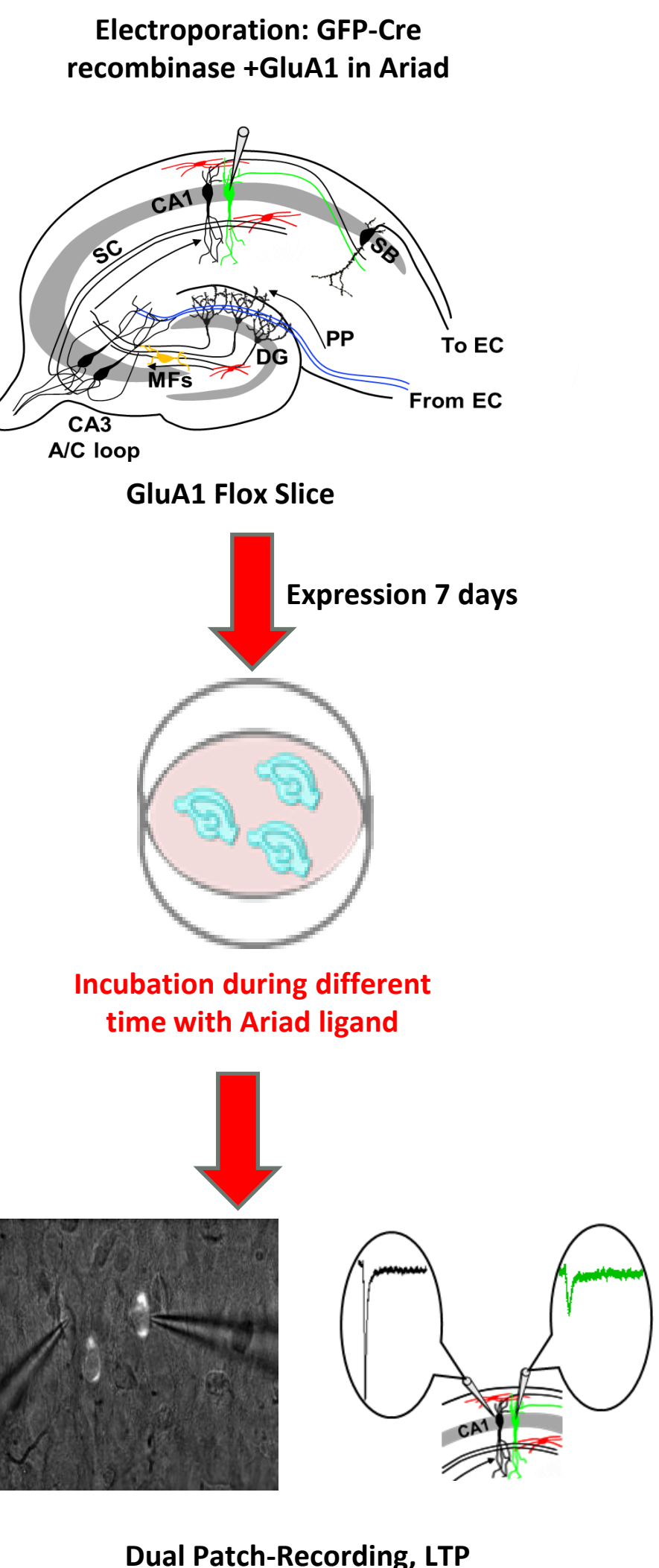


❖ Exocytosis is dependent of the interaction GluA1 / 4.1N both in basal transmission and during LTP.

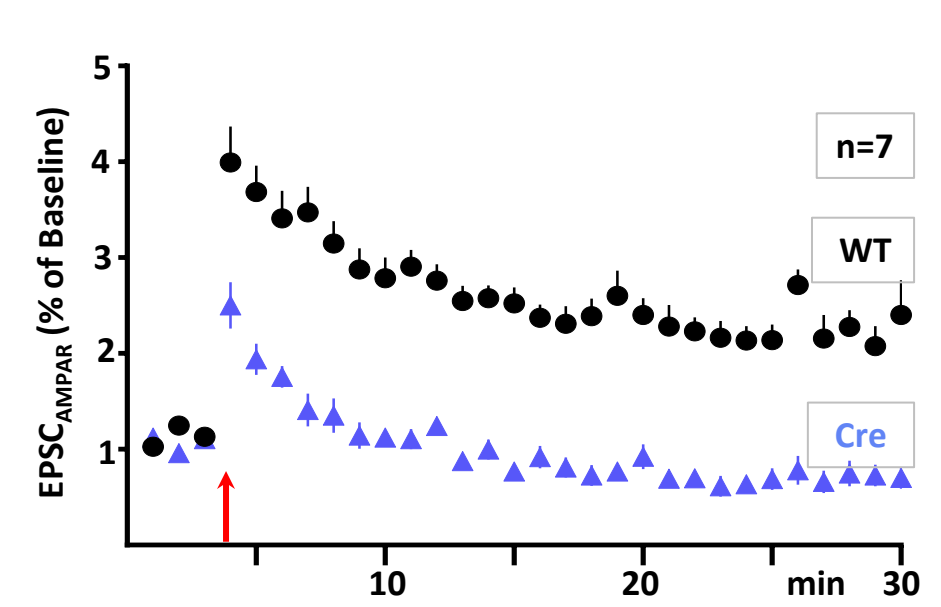
❖ Intracellular transport depends on interaction GluA1 / 4.1N only during LTP

Role of neo-synthesized GluA1 in the induction and maintenance of LTP in hippocampal slices

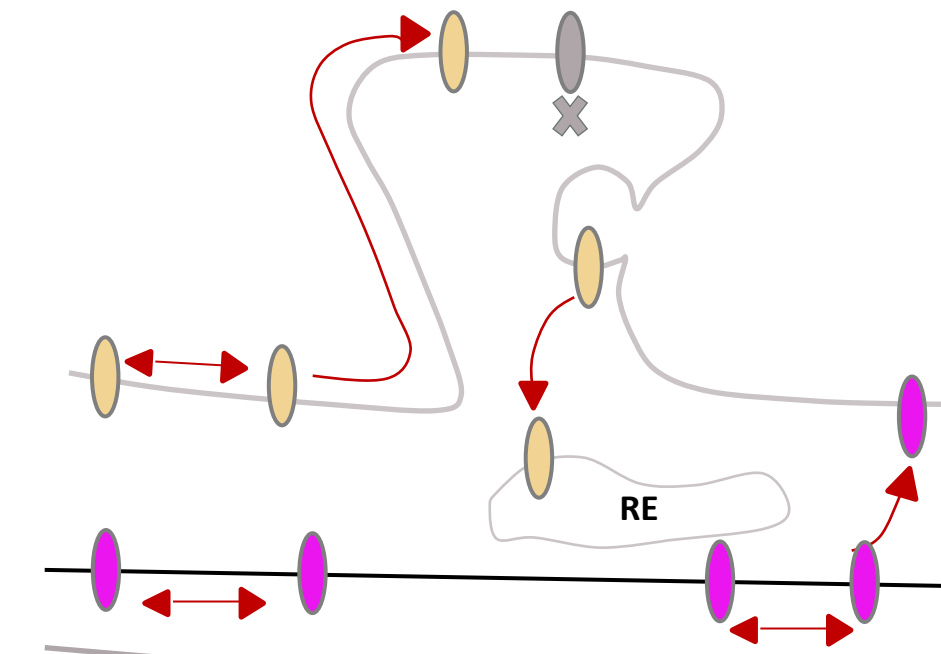
Method



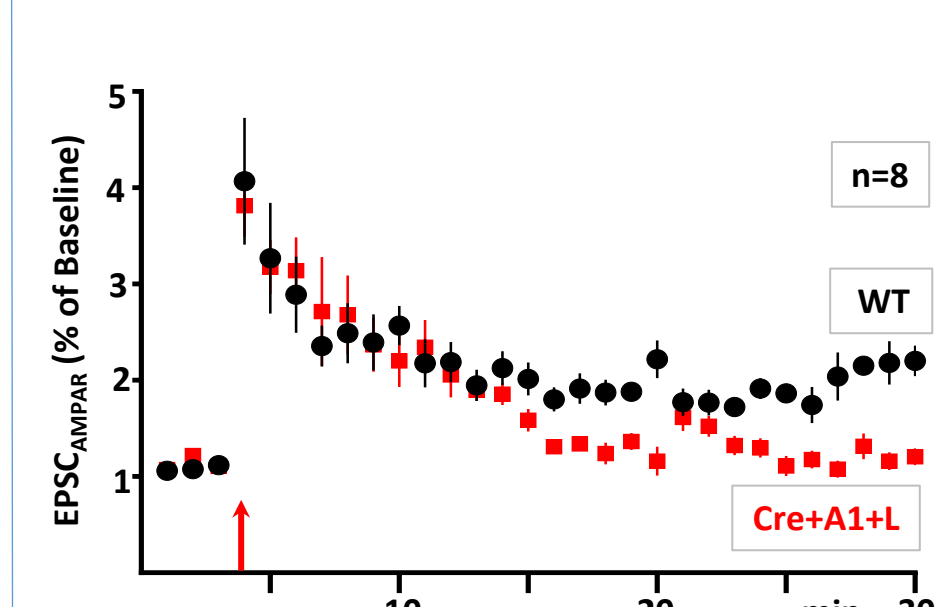
No Ligand



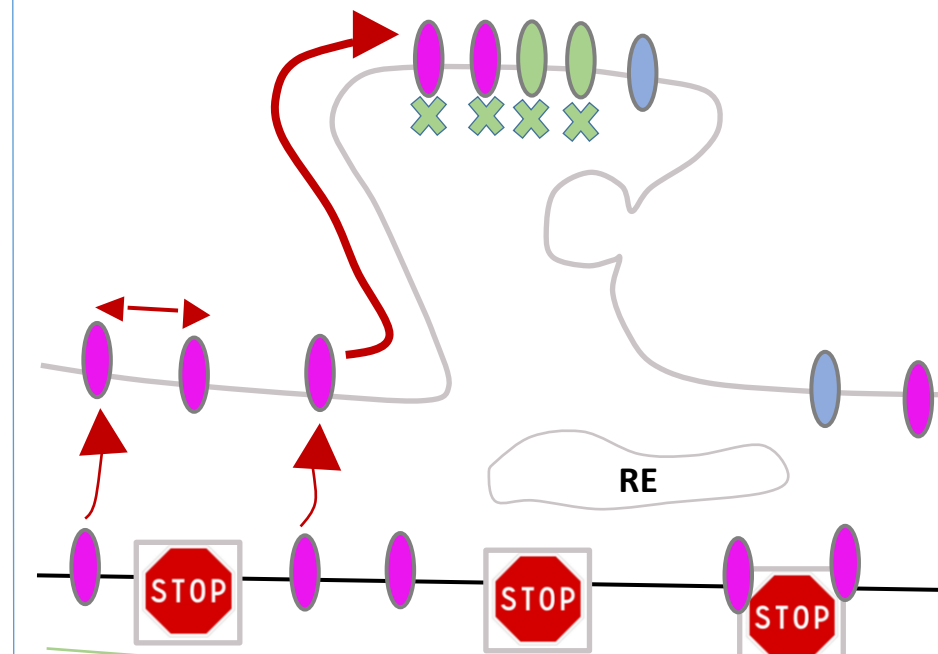
Basal



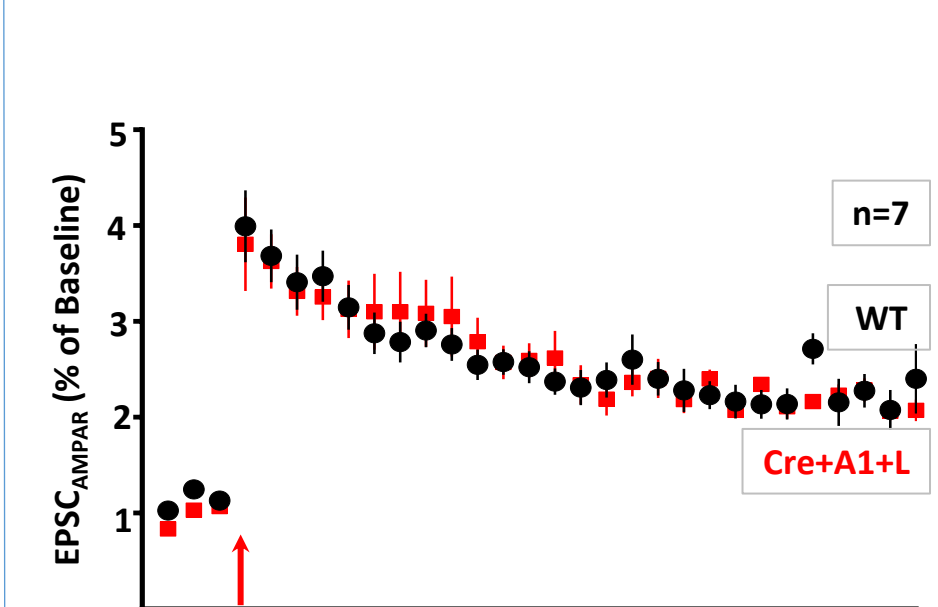
30 min Ligand



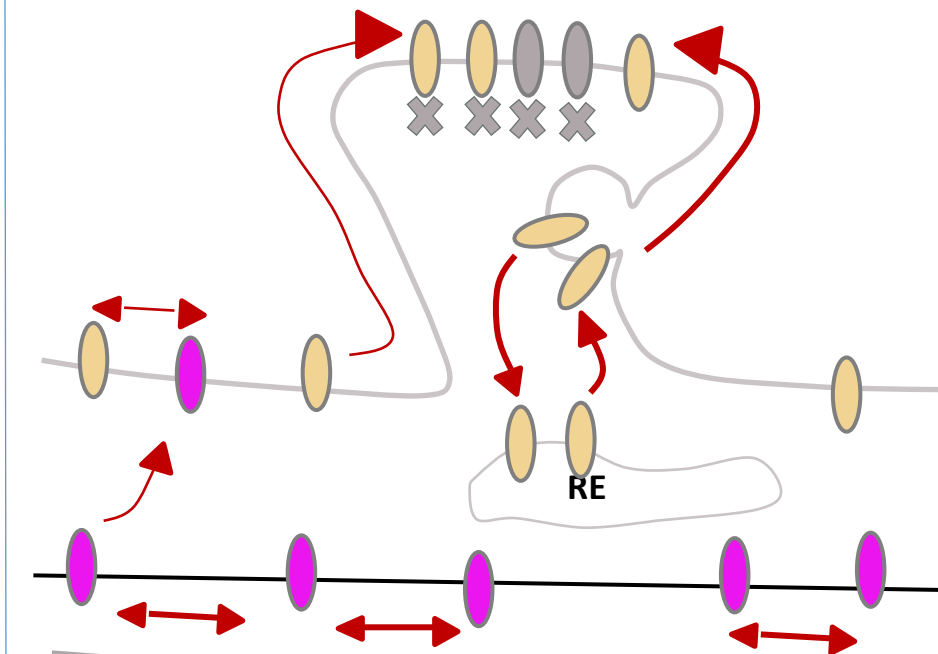
LTP, first phase



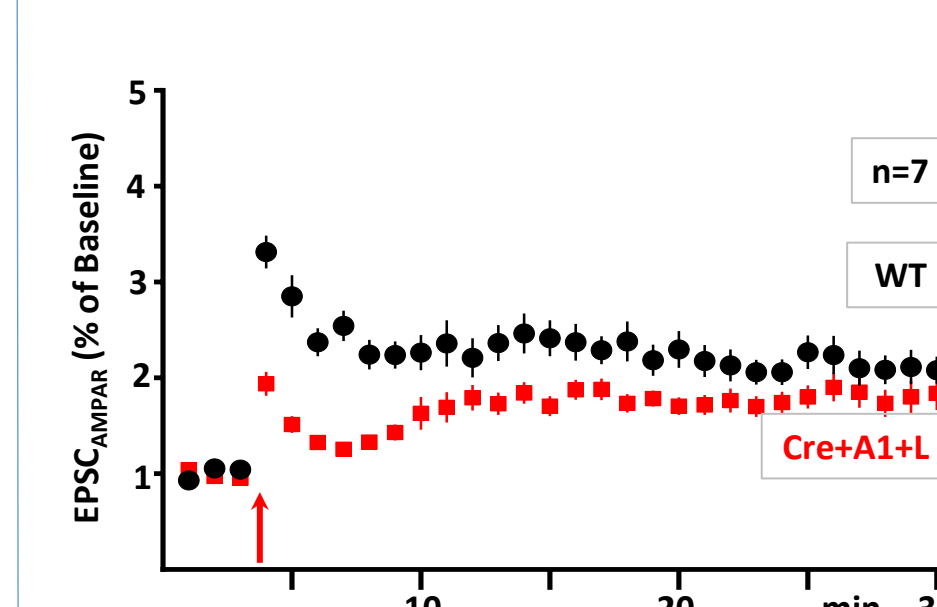
1 hour Ligand



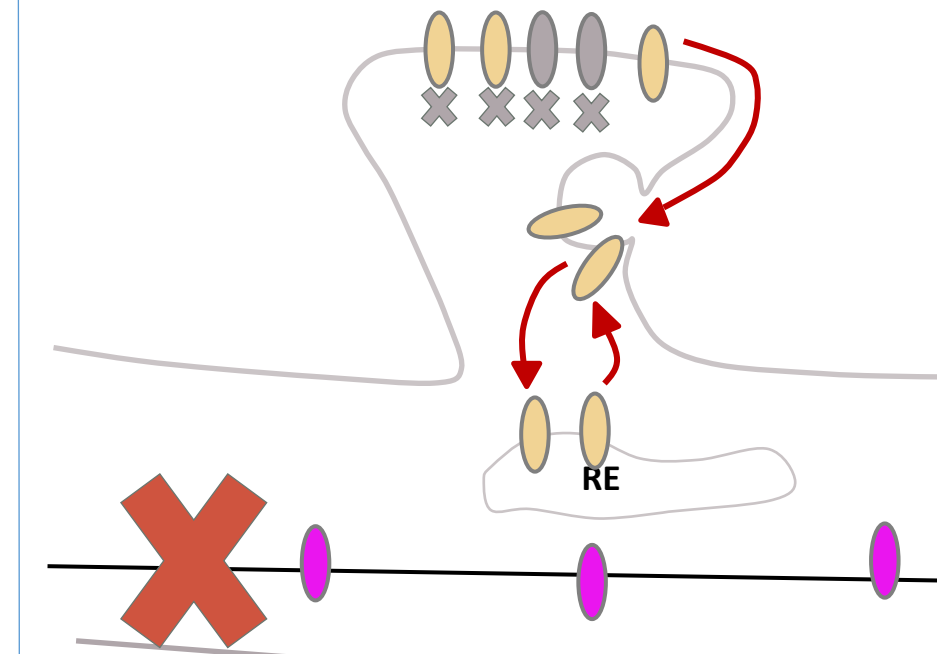
LTP, sustained phase



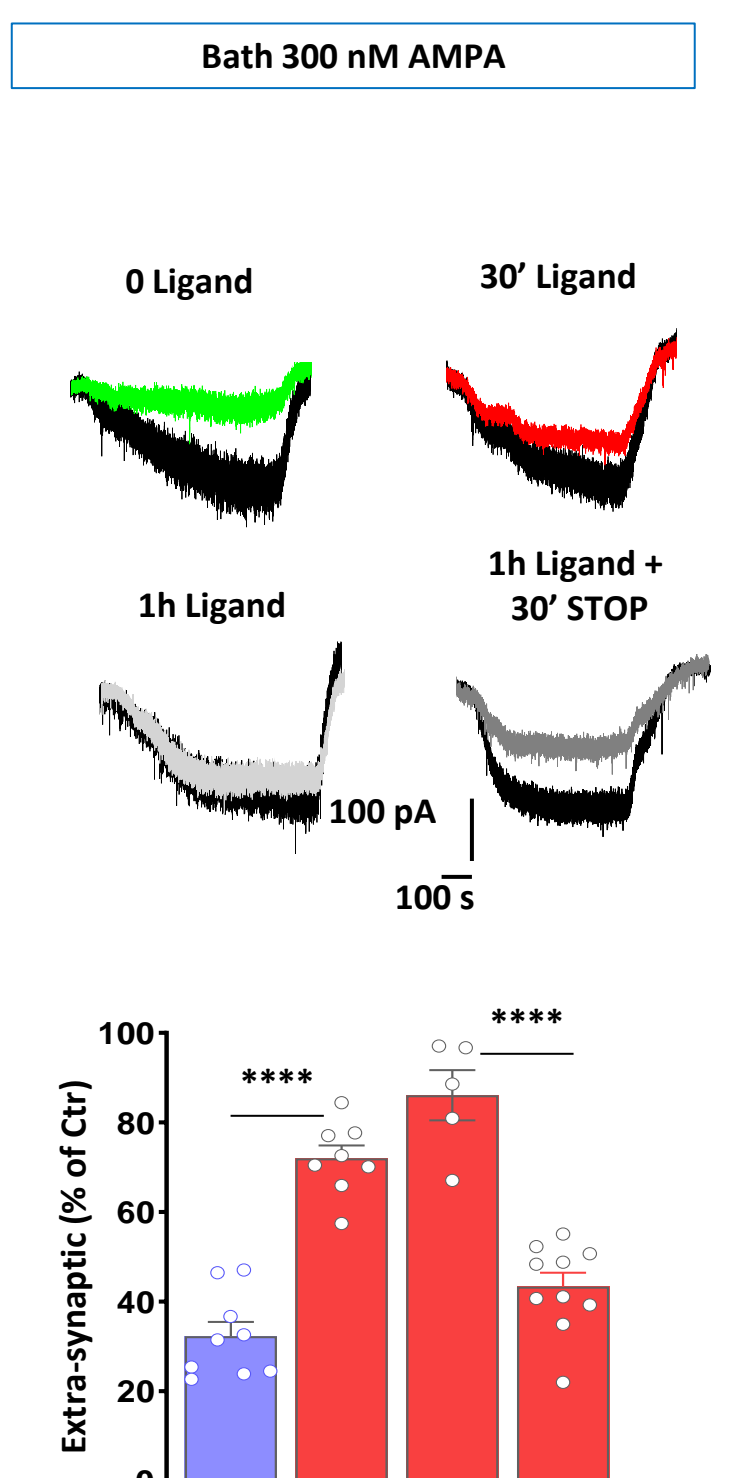
1 hour Ligand then 30 min stop



LTP without new AMPAR



Extrasynaptic receptors



«Old» mobile receptor
«Old» trap receptor
Neo-synthesized receptor
RE: recycling endosomes