



## WG2 introduction

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*Welcome to Rio de Janeiro  
and thank you for joining us*

Enormous progress in neutrino scattering (WG2) physics over the last decade

- Advent of modern, high intensity neutrino sources has produced many measurements
- Increased theoretical interest and a wide range of approaches applied to modern data
- Summary of theoretical developments (M. Martini) and experimental developments (S. Bolognesi) in Plenary 2

However, open questions still persist:

- Disagreement between MiniBooNE, NOMAD data in reporting overall CCQE cross section
- Difficulty modeling MiniBooNE outgoing pion distributions from resonance production
- What are the implications of these issues on oscillation experiments?

Confront these issues with **new measurements**, new theoretical calculations, and new experimental approaches:

T2K:

- New CCQE-like results [158]
- Resonant and coherent pion production [266]

MINERvA:

- Quasi-elastic results [159]
- Pion and kaon! production [160]

NOvA ND recent efforts [161]

**Question:** Are modern models able to describe the new results? What puzzles remain?

**Question:** Where is there agreement/disagreement between new experimental results at different beam energies?

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T2K:

- New CCQE-like results [158]
- Resonant and coherent pion production [266]

MINERvA:

- Quasi-elastic results [159]
- Pion and kaon! production [160]
- Deep Inelastic Scattering [172]

NOvA ND recent efforts [161]

BONuS Experiment [173]

**Questions:** Are modern models able to describe the new results? What puzzles remain? Where is there agreement/disagreement between new experimental results at different beam energies?

NEUT generator comparisons to MiniBooNE, MINERvA data [267]

Confront these issues with **new ongoing measurements**, new theoretical calculations, and new experimental approaches:

Special edition: very low energy coherent scattering of neutrinos:

- CONNIE [170]
- COHERENT [171]

Confront these issues with new measurements, **new theoretical calculations**, and new experimental approaches:

Relativistic description of meson-exchange currents and SuperScaling predictions in charged-current neutrino reactions [162]

The relativistic Green's function Model and the Optical Potential [163]

CRPA and NN correlations [164]

QRPA-based calculations for neutrino scattering and electroweak excitations of nuclei [165]

Neutrino-induced meson productions in resonance region [166]

**Questions:** Are modern models able to describe the new results? What puzzles remain? Where is there agreement/disagreement between new experimental results at different beam energies?

Confront these issues with new measurements, new theoretical calculations, and **new experimental approaches**:

Joint session with WG1+2:

- Use of T2K near detectors (ND) [178]
- Next generation T2K, Hyper-Kamiokande (HK) ND [150]
- DUNE ND [151]
- CAPTAIN, LArIAT [152]
- ANNIE [153]

Joint session with WG1+2+3:

- Impact of systematic uncertainties on DUNE [132]
- Impact of systematic uncertainties on HK [155]
- Prospects for reducing beam uncertainties through hadron production expt's [134]
- Prospects for precision cross section measurements [133]

**Questions:** How have near detectors been used so far? What are the tactics used by future near detectors (or dedicated service experiments) to address deficiencies? What are the most significant neutrino interaction systematic uncertainties which need confronting for osc experiments?

Confront these issues with new measurements, new theoretical calculations, and **new experimental approaches**:

Joint session with WG2+3:

- Novel measurement of electron neutrino cross section [144]

CAPTAIN -> CAPTAIN/MINERvA [268]

**Questions:** What are the tactics used by future near detectors (or dedicated service experiments) to address deficiencies?





Let's welcome some exciting new results!