

Introduction of WGG2 neutrino scattering physics

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WG2: “ ν scattering physics”

- Importance of ν interaction cross section systematics in accelerator oscillation measurements recognized for a long time
- Understanding of neutrino interaction ever more important in the era of *precision measurement*

Example: T2K ν_e appearance systematics

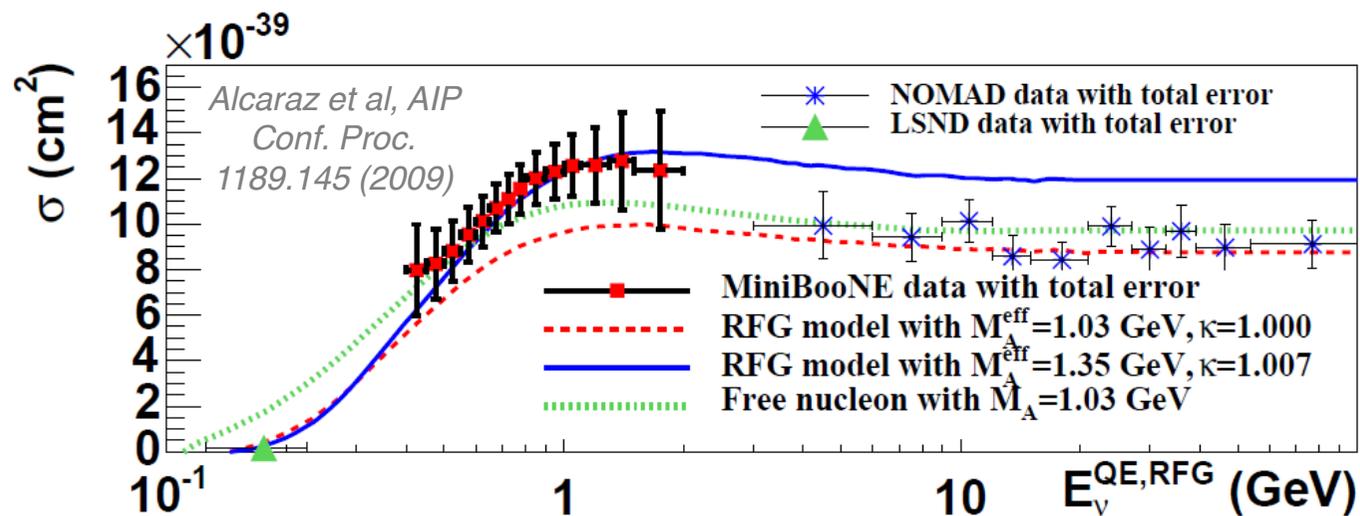
Systematic uncertainties

Error source	$\sin^2 2\theta_{13}=0.0$	$\sin^2 2\theta_{13}=0.1$
Beam flux + ν int.	4.9 %	3.0 %
w/ND constraint		
ν int. (from other exp.)	6.7 %	7.5 %
Far detector (+FSI+SI+PN)	7.3 %	3.5 %
Total	11.1 %	8.8 %
[Total (2012)	(13.0 %)	(9.9 %)]

T.Ishida, KEK seminar July 2013

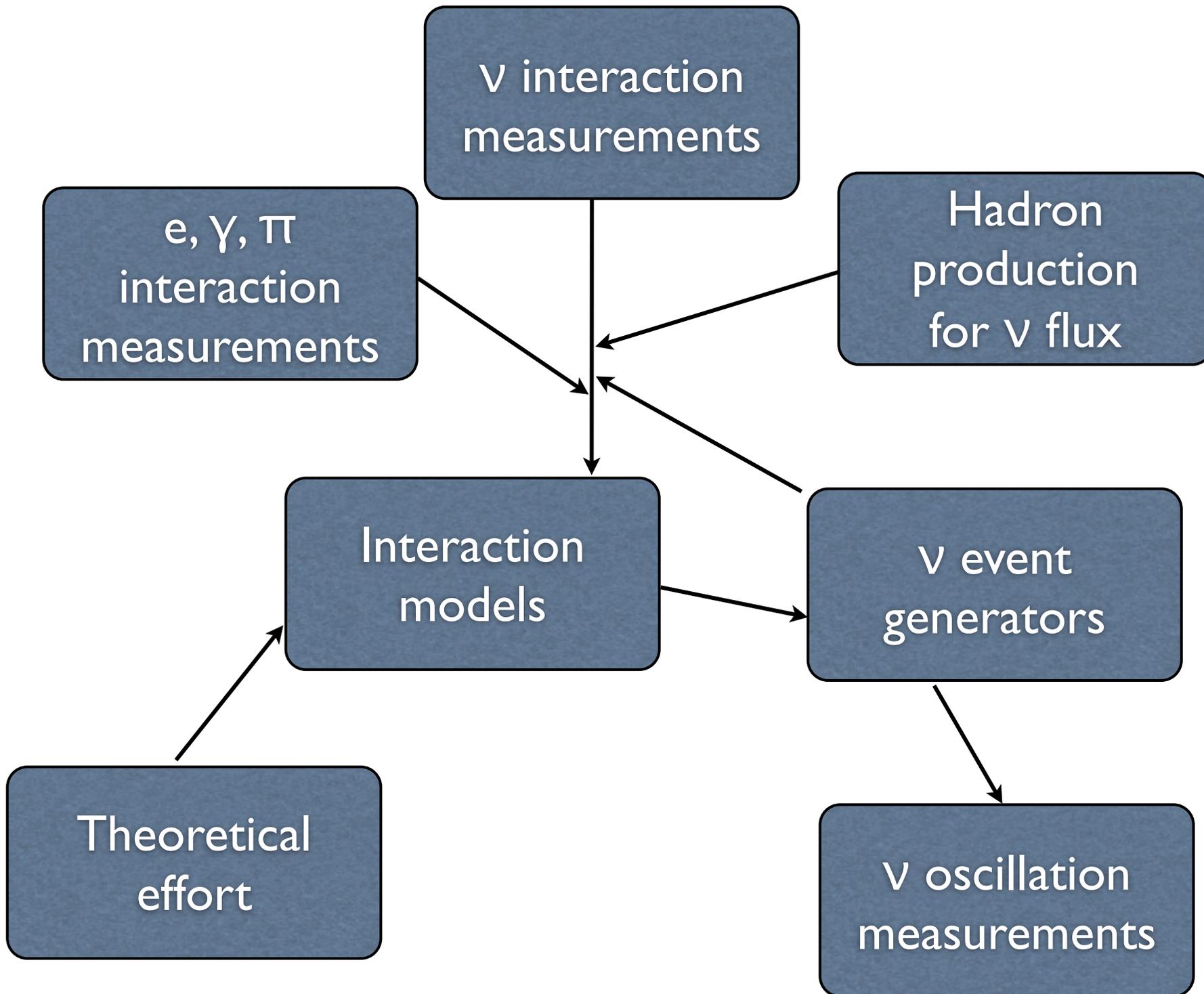
ν scattering physics

- On top of the relevance to precision oscillation measurements, ν interaction has many interesting mysteries and challenges itself
 - CCQE “puzzle”
 - Pion production mechanism
 - Unique probe of nuclear structure

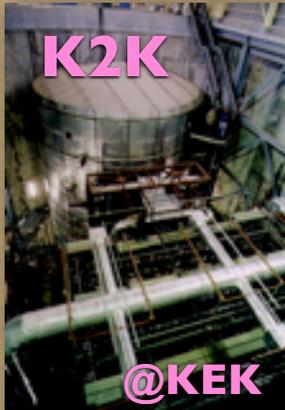


WG2: Forum for discussion

- Need close communication and interplay between
 - Experimentalists and theorists
 - Neutrino physicists and nuclear physicists
 - People having different ideas
- NuFact WG2 is (together with NuINT workshop) at heart of this field to have discussions for further progress
 - Many ideas from discussions in past NuFACT



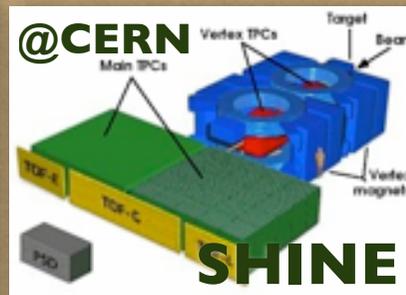
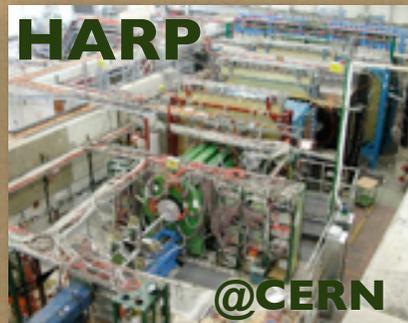
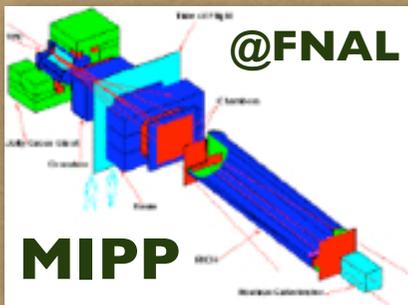
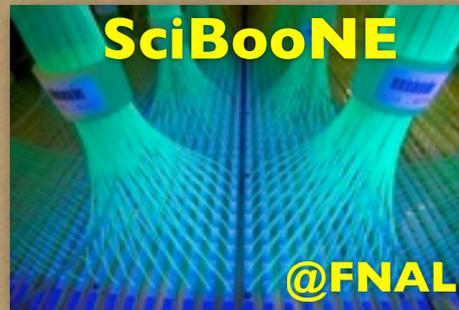
Near detectors of LBL exp'ts



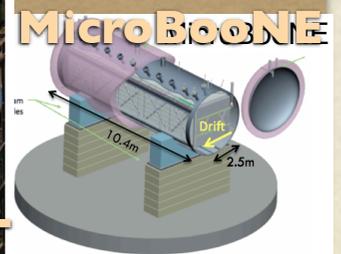
SBL exp'ts



Dedicated exp'ts



Liq. Argon TPCs



Hadron production experiments

Conclusions

@NuFACT12

- New interesting experimental cross sections **data underway**
- **Theoretical work** being done in parallel
- Input from theory (and manpower) is needed to make better event generators (collider exps. have this)
- Experiments are cautioned about the consequences of pulling known model parameters far outside of their physical range
- Barrier between new models and generators needs to be broken
 - **Idea:** common event format so theorists can provide small samples to experiments (**H. Gallagher**)
 - can expt see these events?
 - does the new theory look more like reconstructed data?

Continues to this year



2013 WGG2 agenda

- Latest results from experiments
 - MINERvA, T2K, MINOS, ArgoNEUT, MiniBooNE, NOMAD, NOvA,
- Related measurements
 - Hadron production, electron scattering, pion scattering
- Future detector & beam
 - LAr R&D, nuSTORM,
- Theoretical works
 - CCQE, pion production, photon emission, structure functions, ..

- Joint session with WGI
 - Systematic effects on oscillation measurements
 - 1:30PM today
- Plenary talks on Friday morning
 - Dave Schmitz: on experiments
 - Jan Sobczyk: on theories
 - Pilar Coloma: effects on oscillation analyses