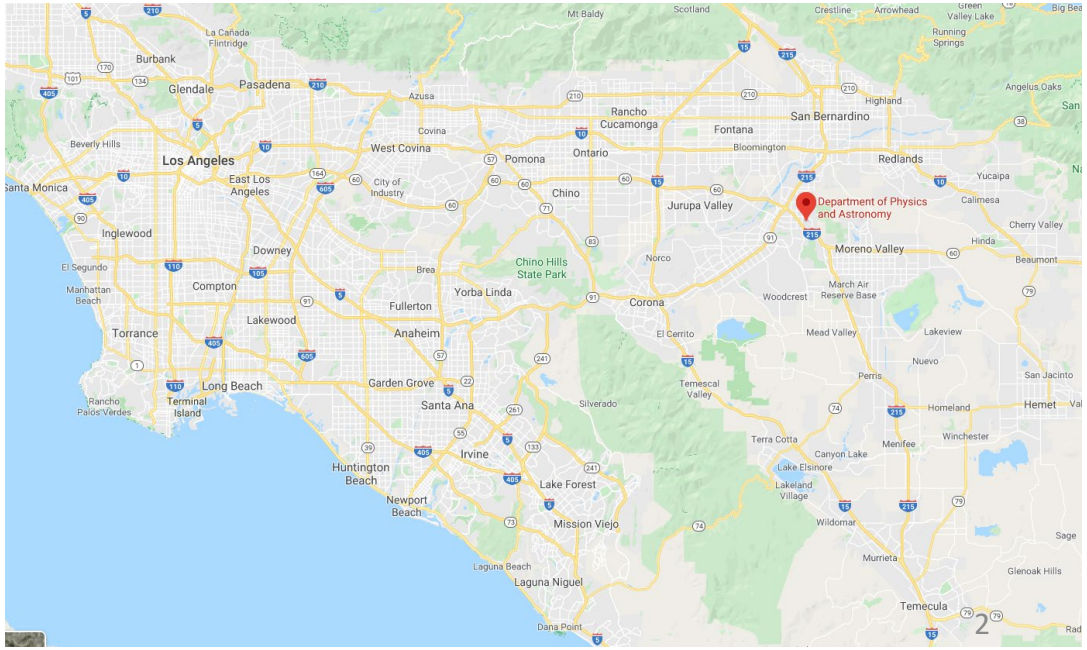
UNIVERSITY OF CALIFORNIA UCRIVERSIDE

application to CLAS12

Miguel Arratia

UNIVERSITY OF CALIFORNIA
UC RIVERSIDE

- Public university, part of UC.
- Department of Physics and Astronomy has 45 faculty, 3 nucl-exp.
- No previous JLab connection.
- My appointment (Jan 2020) is JLab-Bridged.



Arratia Group at UCR

Miguel Arratia

Currently hiring postdoc and graduate students

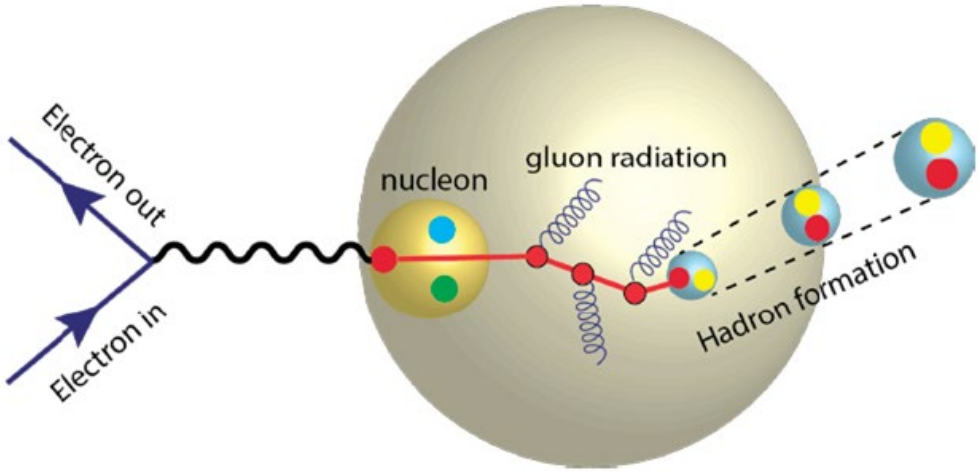
My Background:

- UC Berkeley, postdoc. ALICE (heavy ions)
- University of Cambridge, PhD. ATLAS (HEP and heavy ions)
- U. Santa Maria, MSc, BSc. ATLAS (heavy ions), CLAS

Physics interest with CLAS

- SIDIS off nuclear targets to study:

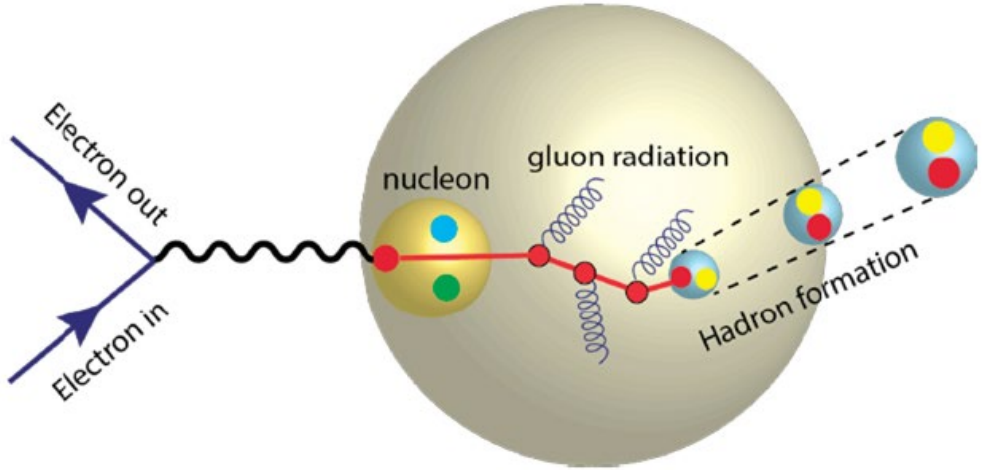
  - quark-matter interactions,
  - hadronization in matter,
  - nuclear PDF/TMDs.



Quark propagation and hadron formation program with CLAS12 (E12-06117) ;

Key measurements:

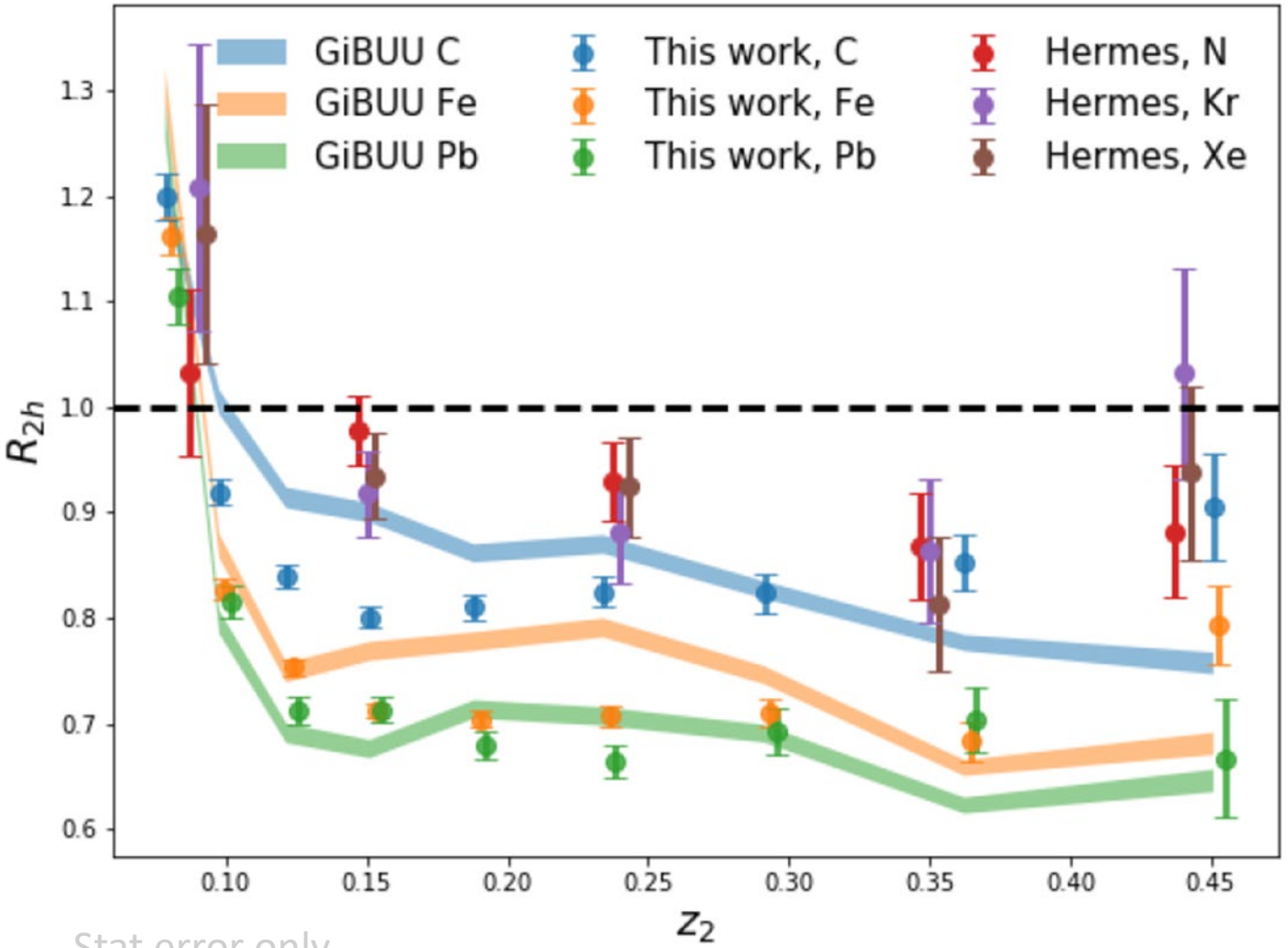
- Hadron attenuation
- Transverse momentum broadening
- **Hadron-hadron correlations**
- **Photon-hadron correlations**
- **Flavour-tagged DIS**



With various nuclear targets, for several hadron types.

Goal: Characteristic times scales involved in hadron formation,
tests models of production mechanisms,
explore the 3D quark-structure of nuclei.

Di-hadron correlations, CLAS EG2 data.

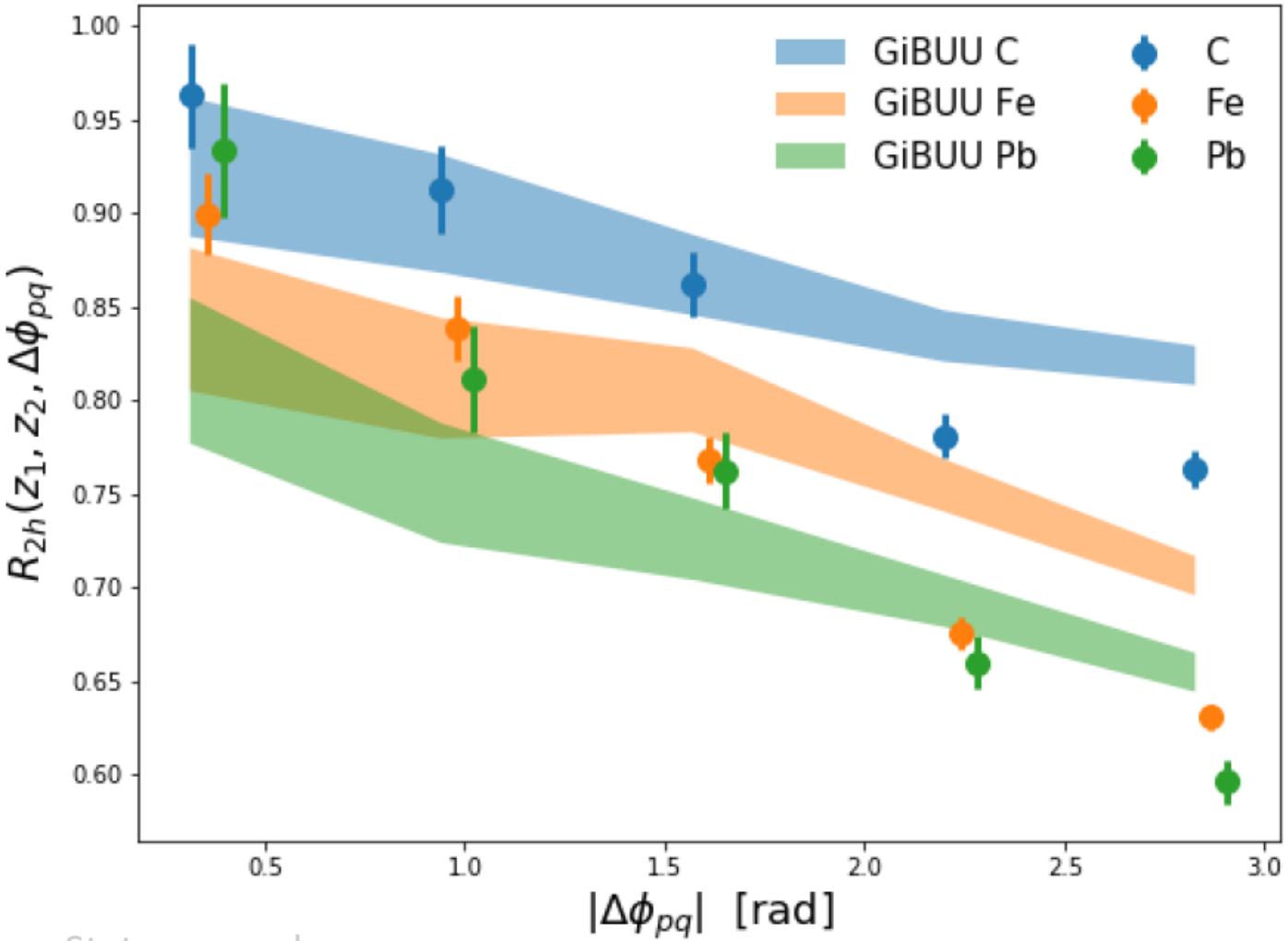


Stat error only,
No corrections yet

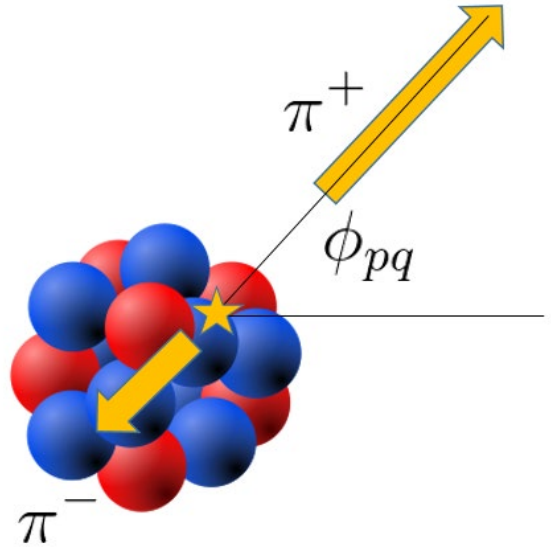
$$R_{2h}(z_2) = \frac{N_h^A(z_2|z_1 > 0.5)/N_h^A(z_1 > 0.5)}{N_h^D(z_2|z_1 > 0.5)/N_h^D(z_1 > 0.5)}$$

- "Conditional suppression factor" allows us to study correlated nuclear effects.
- Superb statistics dwarfs HERMES. (PRL 96:162301,2006)
- GiBUU (v2019): transport model with hadronic and "pre-hadron" degrees of freedom.
- Excellent prospects for CLAS12

Di-hadron azimuthal correlations with CLAS EG2

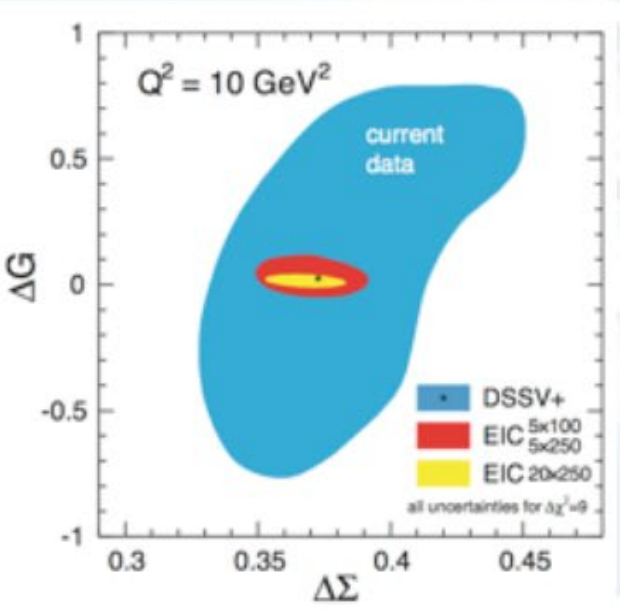


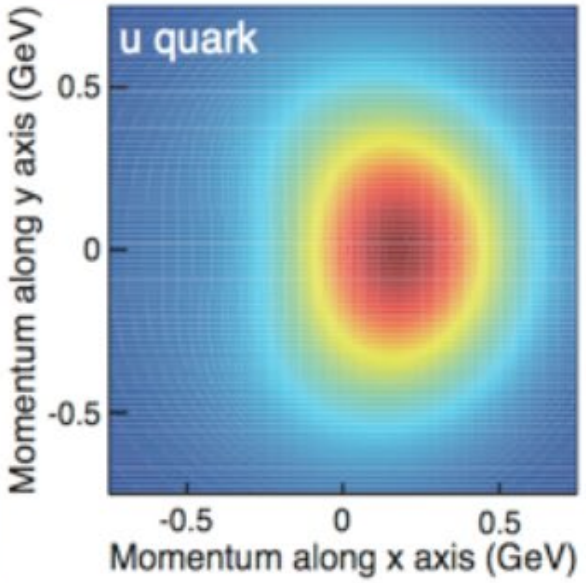
Stat error only,
No corrections yet

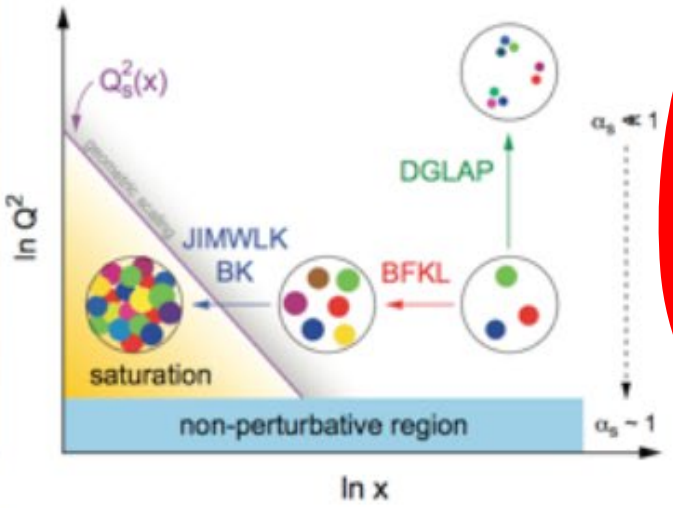


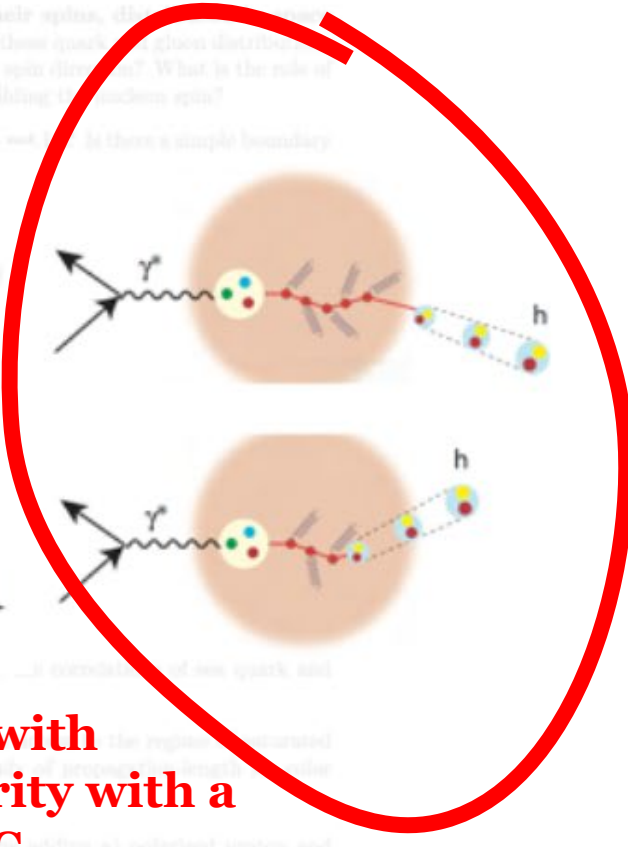
- Potential first observation of "surface bias" in DIS
- Opens up possibility for future studies with control of "path-length" in nuclear effects.
- CLAS12 will allow us to go multidimensional and extend kinematic reach

“Golden Physics Measurements”, in white paper





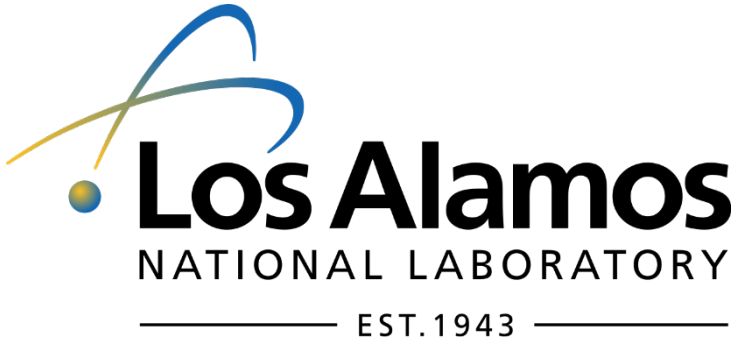




I aim for a “EIC pathfinder” program with CLAS12, focused on the complementarity with a low-energy center-of-mass IP at eRHIC.

University of California EIC consortium

Riverside, Berkeley, Los Angeles, Davis and 3 National Labs



Technical projects, calibration, software development

- Plan to work on tracking calibrations for upcoming runs, also related software.
- Currently setting up my lab (750 sq.ft lab space + 450 sq.ft class-7 cleanroom), currently focused on projects involving silicon sensors.
  Interested in possible technical contributions to CLAS12.

Summary

- The CLAS12 large acceptance and high luminosity gives us the unprecedented opportunity to study nuclear effects with rare, multi-particle events. I plan to import techniques used in high-energy nuclear physics.
- I think CLAS12 is the best platform to develop a “EIC pathfinder” program.
  We urgently need nuclear data to fully achieve this!
- I am particularly interested in contributing and expanding the program of:

  - Quark Propagation and Hadron Formation (E1206117)
  - The EMC Effect in Spin Structure Functions (E1214001)
- In addition, I look forward to collaborate with the CLAS12 3D imaging community to explore new opportunities at the EIC, with jets in particular.
- I look forward to contribute to the success of the CLAS12 program!