KOSTAS ORGINOS (W&M/JLAB) VIA WILL DETMOLD (MIT)

SPC overview of Cold QCD

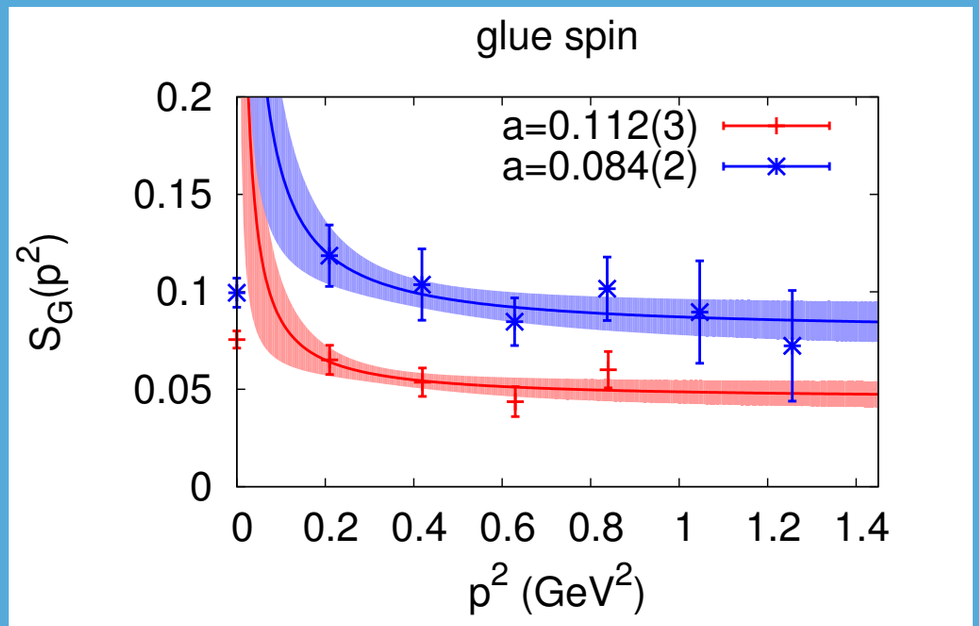
COLD NUCLEAR PHYSICS

- Cold Nuclear Physics program
  - Hadron Structure
  - Hadron Spectrum
  - Hadron Interactions
- Existing facilities: Jlab 12GeV, RHIC, ATLAS@ANL
- Future facilities:
  - Ton-scale 0νββ decay Experiment
  - FRIB @ MSU
    - Three new faculty positions in LQCD starting this year
  - EIC @ JLAB (or BNL) ?
- New DoE NP Topical Collaboration on transverse momentum dependent hadron structure
- Interrelated topics that use common methods in their calculations

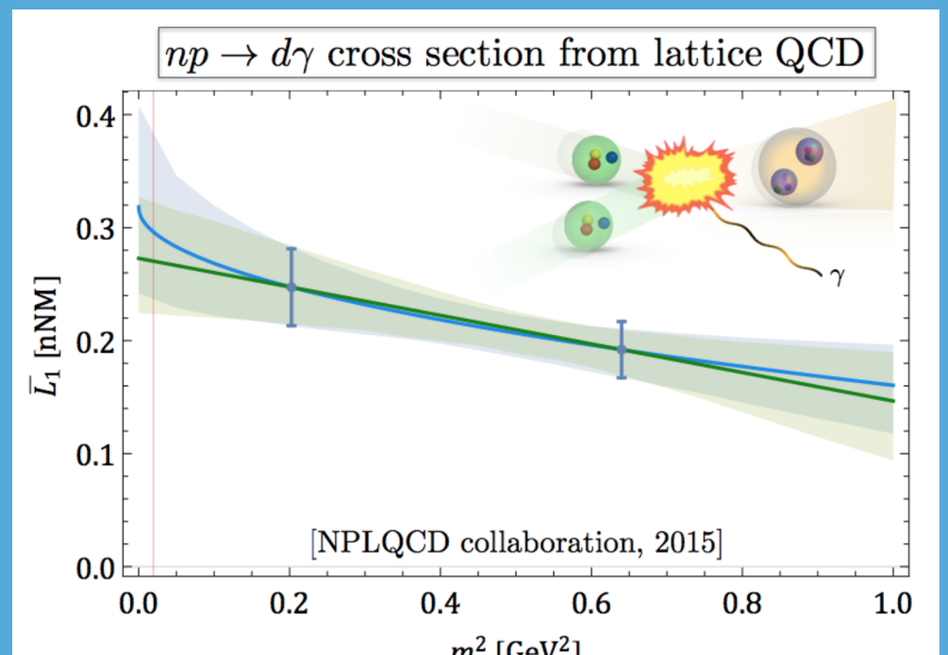
TMD Collaboration

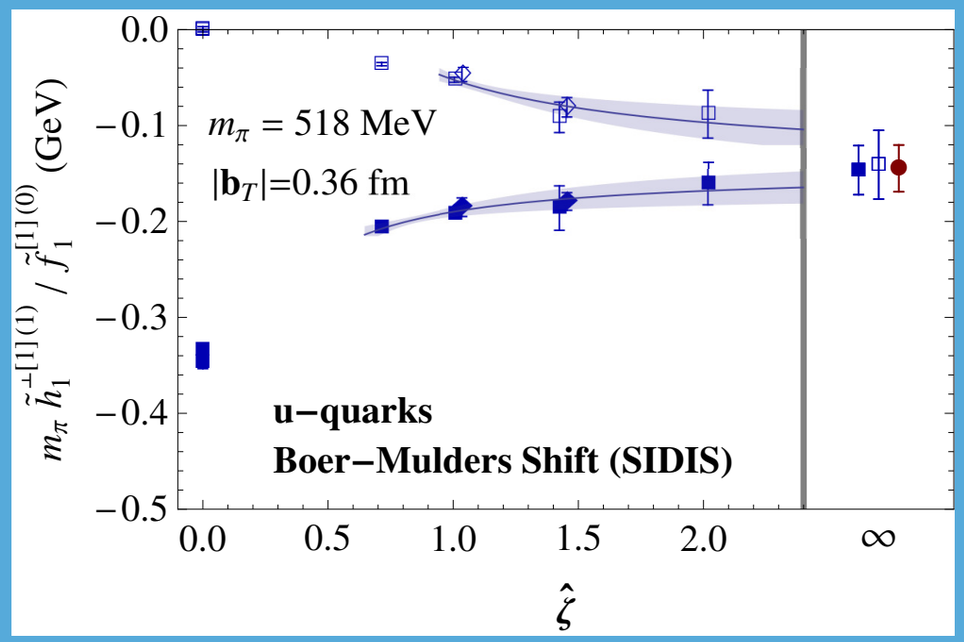
PHYSICS HIGHLIGHTS

χQCD: gluon spin

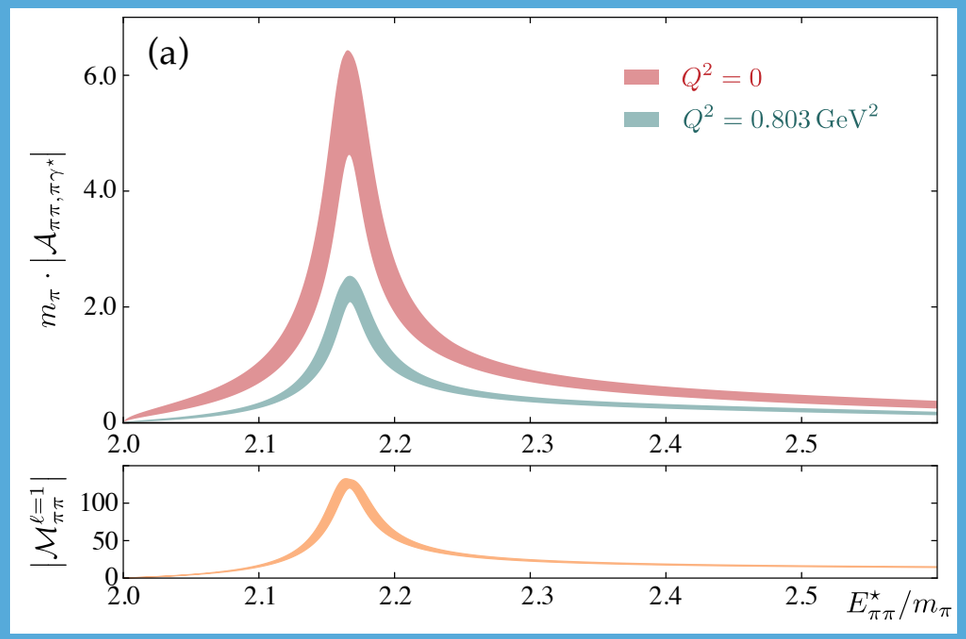


NPLQCD: np→dγ





LHPC/NME: TMDs

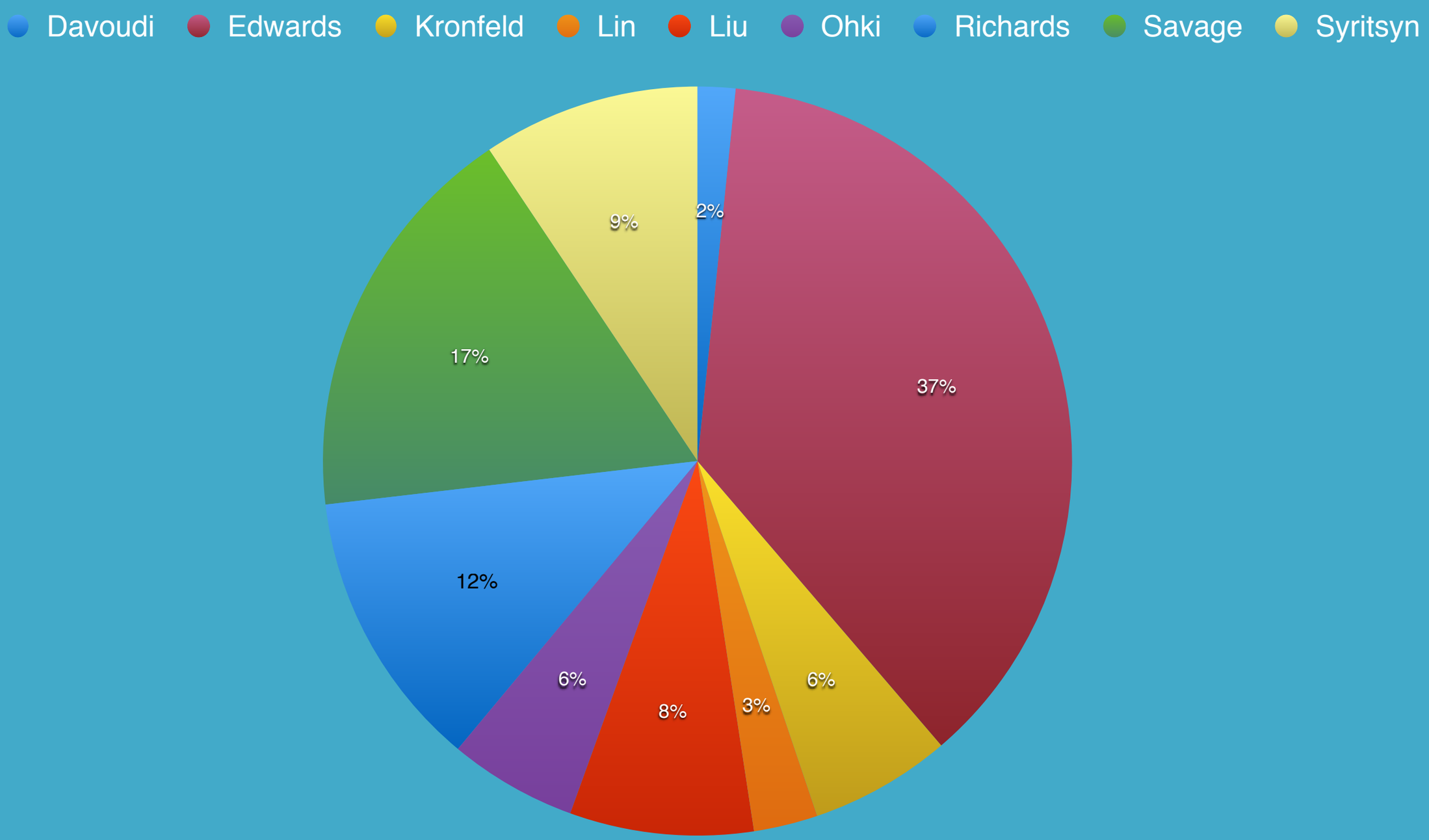


HadSpec: πγ*→ππ

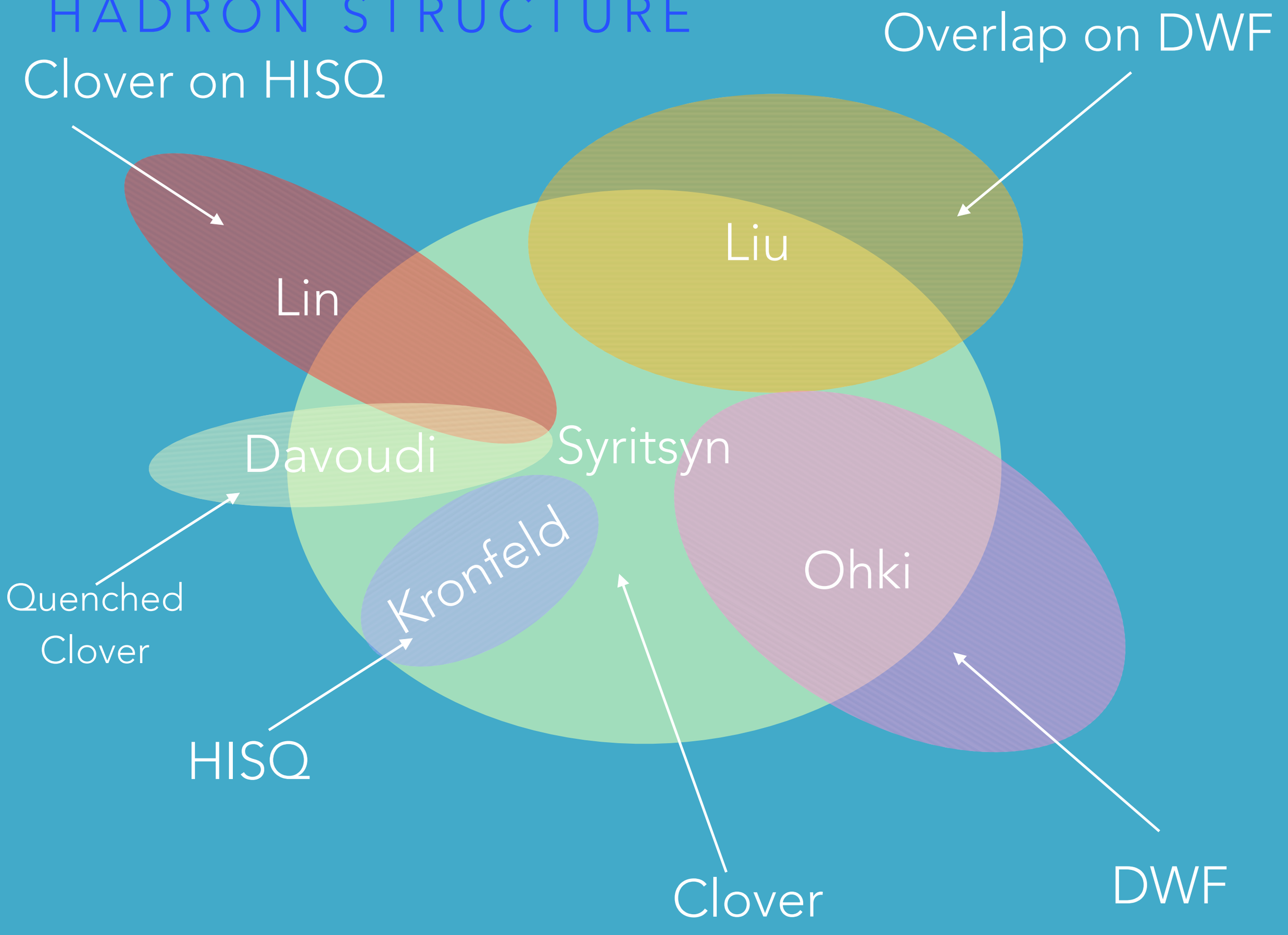
REQUESTS

PI	TOPIC	Request (x10 core hours)	MACHINE
DAVOUDI	HIGH MOMENTS OF PDFS	13.6	CLUSTER
EDWARDS	QCD SPECTRUM	310	12S, GPU, NEW JLAB CLUSTER
KRONFELD	NUCLEON AXIAL FORM FACTOR	51	CLUSTER
LIN	EXPLORATION OF QUASI-PDFS	23.1	FNAL CLUSTER
LIU	NUCLEON STRUCTURE	66.3	12S AND NEW JLAB CLUSTER
OHKI	NUCLEON STRUCTURE	46.21	FNAL CLUSTER
RICHARDS	DELTA RESONANCE	101.1	GPU AND NEW JLAB CLUSTER
SAVAGE	NUCLEAR PHYSICS	146	GPU / CLUSTER NEW JLAB CLUSTER
SYRITSYN	NUCLEON STRUCTURE	78.45	FNAL CLUSTER
TOTAL		835.76	

REQUESTS


Davoudi
Edwards
Kronfeld
Lin
Liu
Ohki
Richards
Savage
Syritsyn
2%
37%
6%
3%
8%
6%
12%
17%
9%

HADRON STRUCTURE



HADRON SPECTRUM - INTERACTIONS

Edwards

Richards

Anisotropic Clover

Savage

Isotropic Clover

HADRON STRUCTURE

- Last year n—> infinity proposals
- This year n-2 proposals!
- The field is very vibrant. Lots of new ideas and many new young and old people are getting into it.
  - Direct computation of PDFs on Euclidean lattices
  - Approaches to solve the problem of power divergences plaguing the computations of high moments
- Precision calculations are pursued and results are on the way.
- In some cases similar calculations are performed with different methodologies.
- This is helpful in for cross checks and better understanding of systematics.

HADRON SPECTRUM-INTERACTIONS

- Three proposals
  - (NPLQCD, Hadron Spec [meson,baryon])
- Hadron Spectrum:
  - Coupled channel phase shifts, meson resonances, radiative transitions.
  - Calculations done with anisotropic clover fermions at pion masses > 220MeV
  - More complicated processes are now studied
  - Feasibility of baryon resonance studies on **isotropic clover** lattice is starting

HADRON SPECTRUM-INTERACTIONS

- Nuclear Physics (NPLQCD)
  - Magnetic moments of light nuclei
  - Polarizabilities of light nuclei
  - np —> d γ transition
  - Begun calculations of scattering phase shifts and spectrum of light nuclei at 300 MeV
  - Explore computation of weak matrix elements of light nuclei at in the coming year at the SU(3) flavor symmetric point

GAUGE CONFIGURATIONS

- Larger component of Cold Nuclear Physics is using isotropic clover
  - NPLQCD
  - A branch of Hadron Spectrum (Baryons)
  - LHPC/NME
  - Leskovec (Rare B decays)
- HISQ is also used either as sea quark action only or both sea and valence action
  - Kronfeld
  - Lin
- No more anisotropic clover gauge generation is proposed
- DWF are used both in valence and sea sectors (with Overlap valence)
  - χQCD (Liu), with overlap valence
  - RBC (Ohki)

GAUGE CONFIGURATIONS

Isotropic clover gauge generation needs more resources!

Both DWF and HISQ have already large libraries of gauge configuration ensembles however these configurations are not preferred by the majority of Cold QCD projects