Quark/Gluon Initial Results

Please be careful drawing conclusions;
very preliminary studies

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Philipe (Sherpa), David (Yoda), Jesse (moral support)

What is a Quark Jet?

From discussions last night

Ill-Defined

A quark parton

A Born-level quark parton

The initiating quark parton in a final state shower

An eikonal line with baryon number 1/3
and carrying triplet color charge

A quark operator that appears in a hard matrix element
in the context of a factorization theorem.

A parton-level jet object that has been tagged as a quark
using a soft-safe flavored jet algorithm (automatically
collinear safe if you sum constituent flavors).

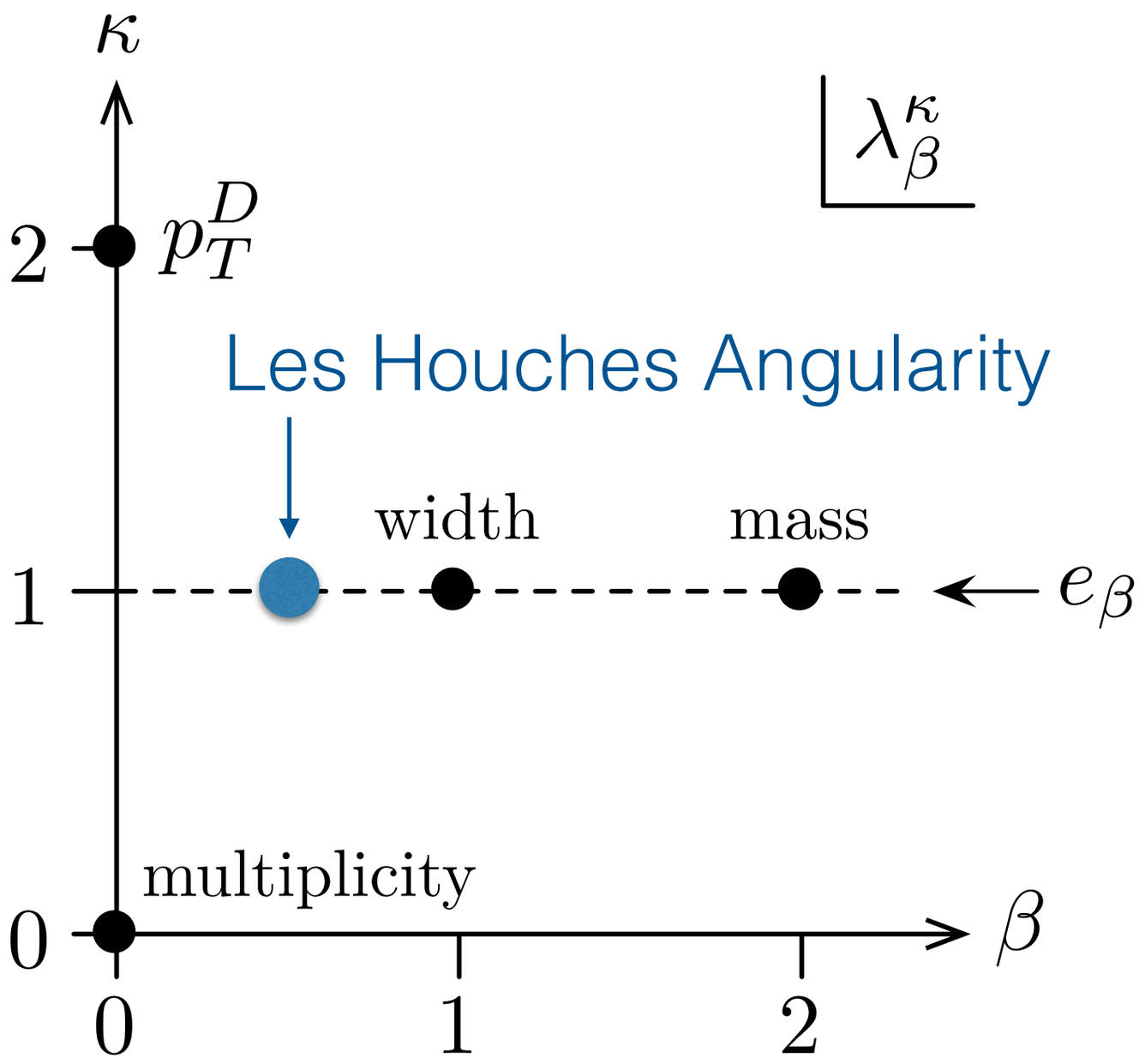
A phase space region (as defined by an unambiguous
hadronic fiducial cross section measurement) that yields
an enriched sample of quarks (as interpreted by some
suitable, though fundamentally ambiguous, criterion).

Well-Defined

What people sometimes think we mean

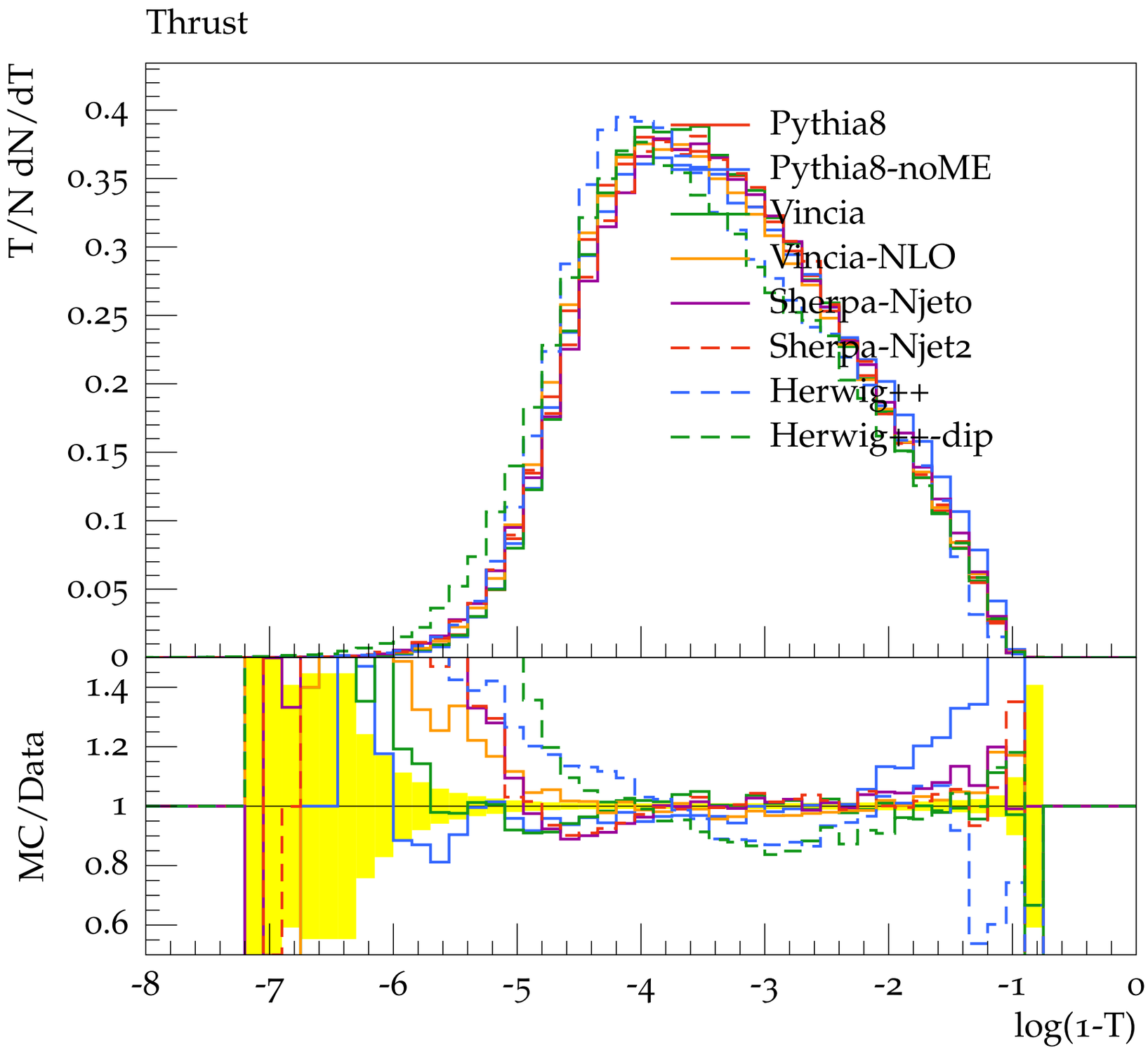
What we mean

Generalized Angularities



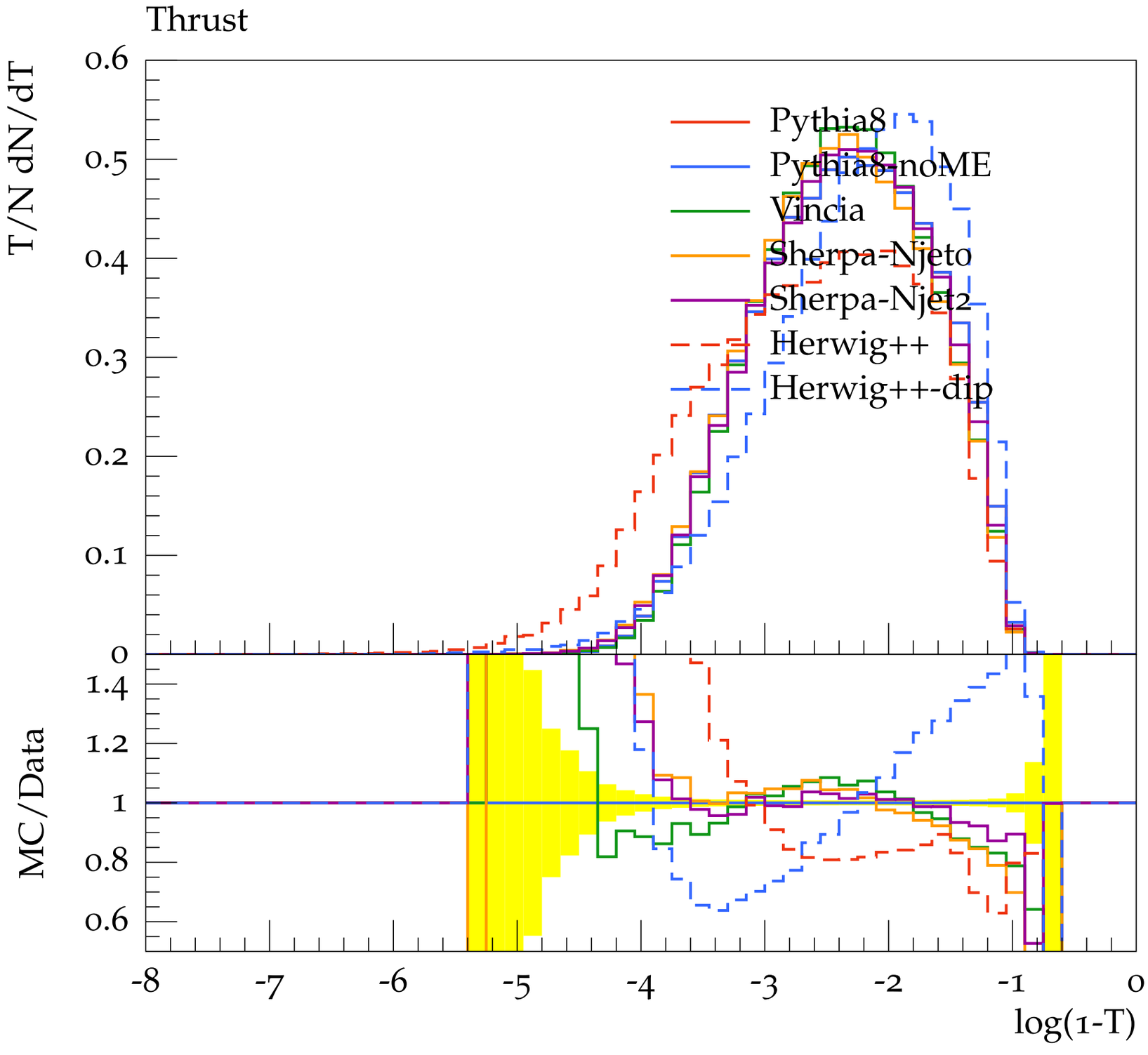
Thrust Comparison: Quark

All hadron level, Q = 200 GeV



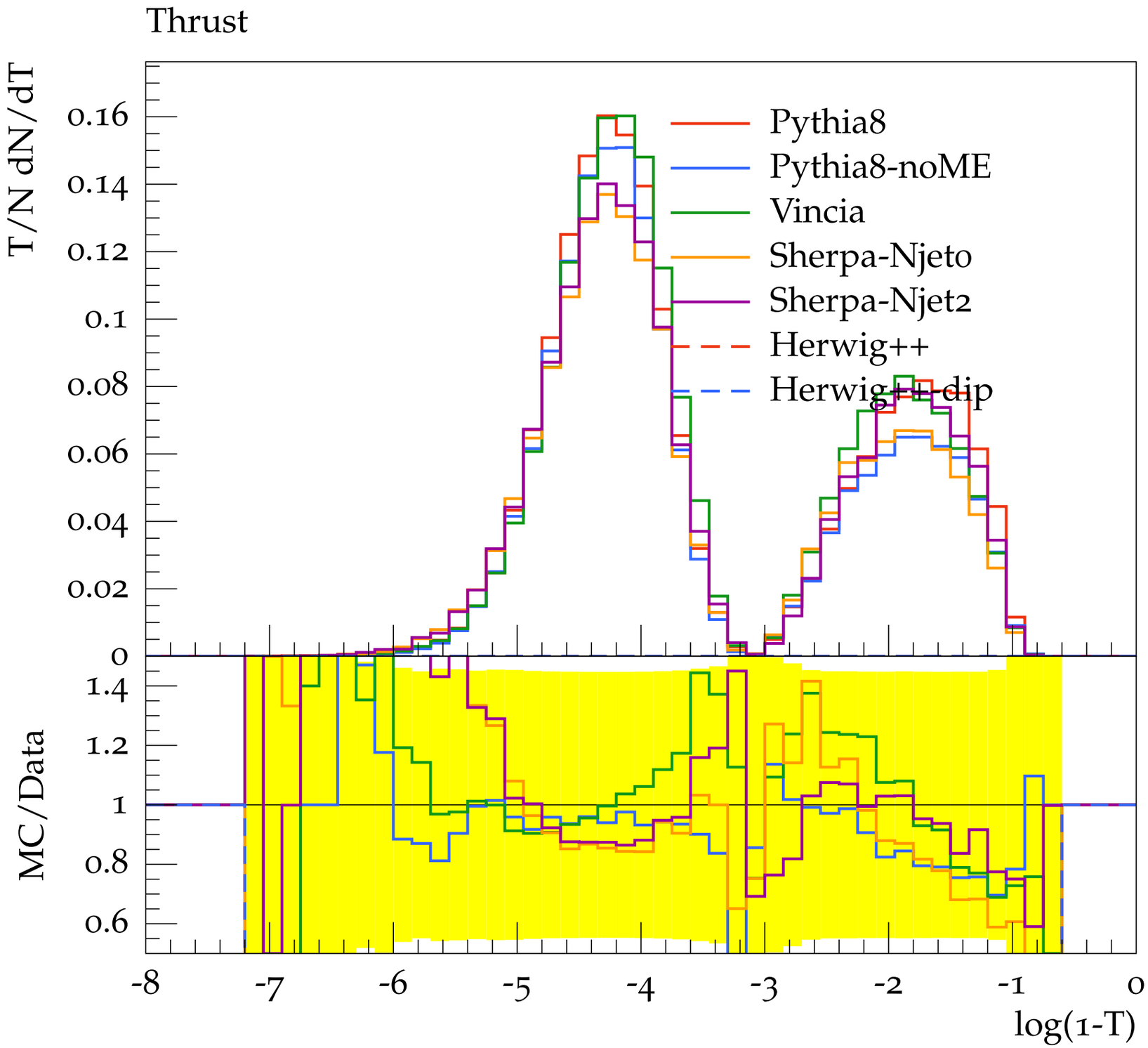
Thrust Comparison: Gluon

All hadron level, Q = 200 GeV



Thrust Comparison: Separation

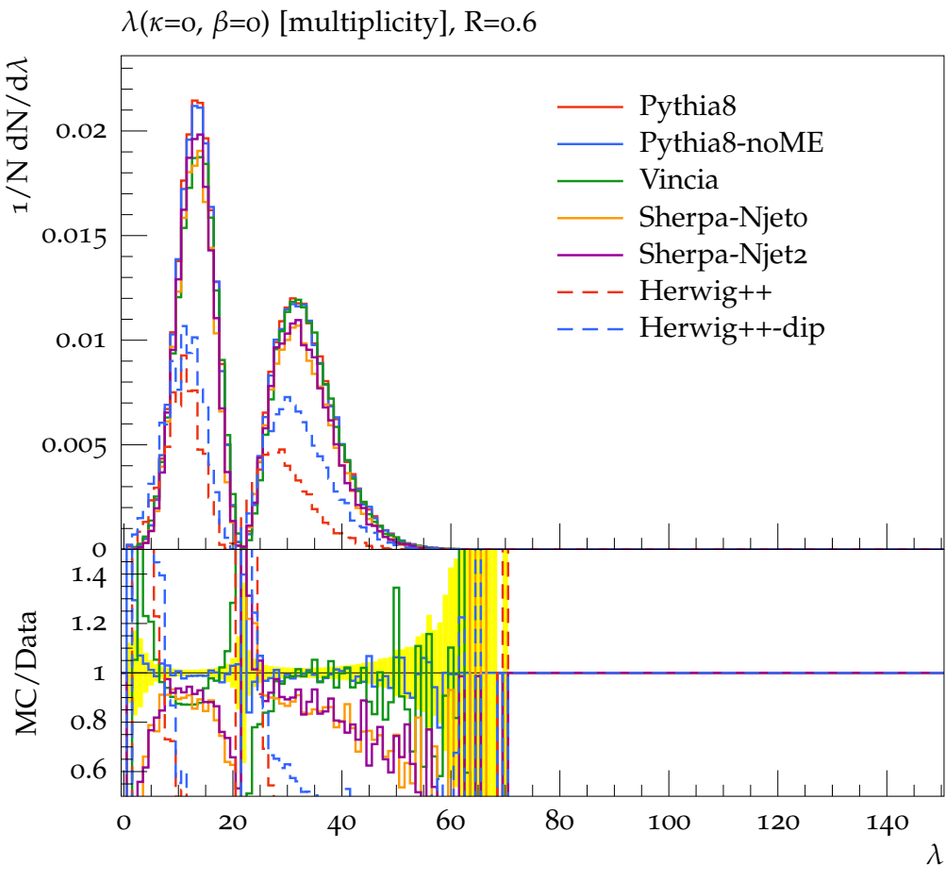
All hadron level, Q = 200 GeV

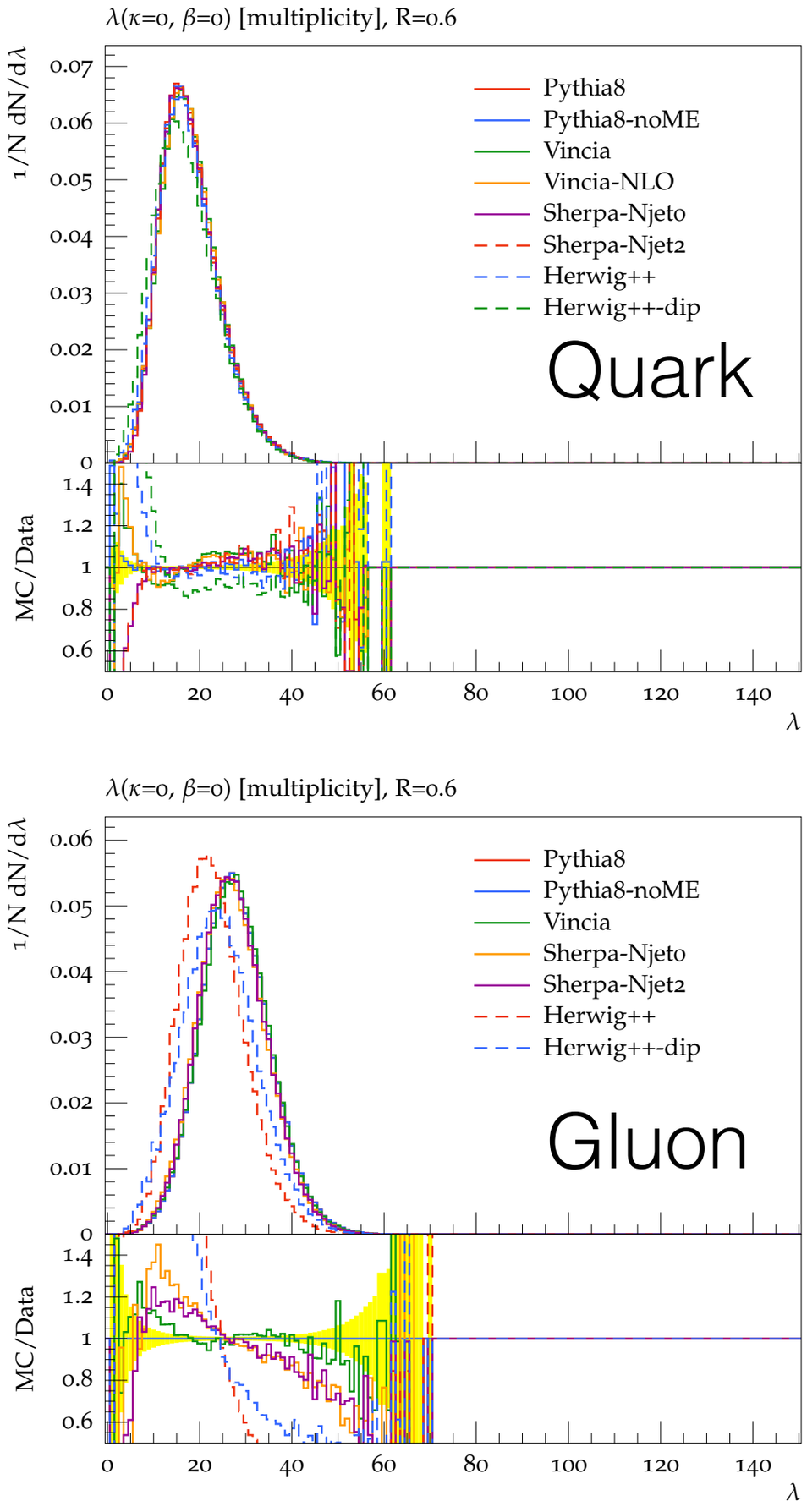


Multiplicity Comparison

All hadron level, R=0.6 Q=200 GeV

Separation

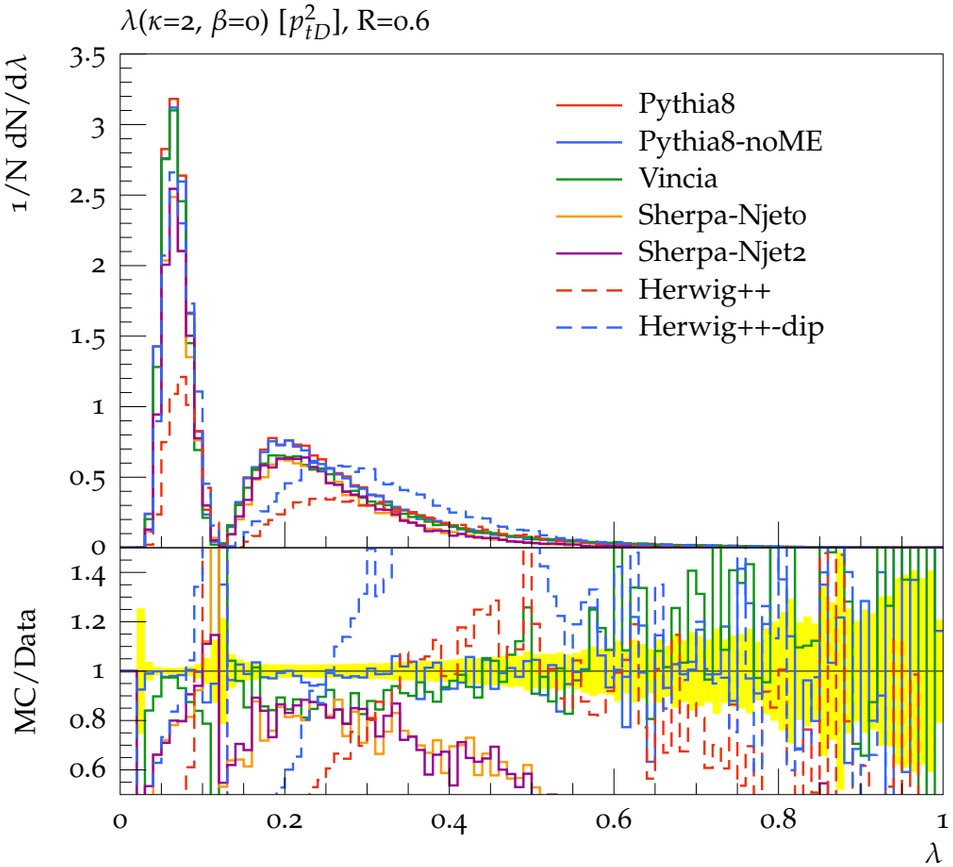


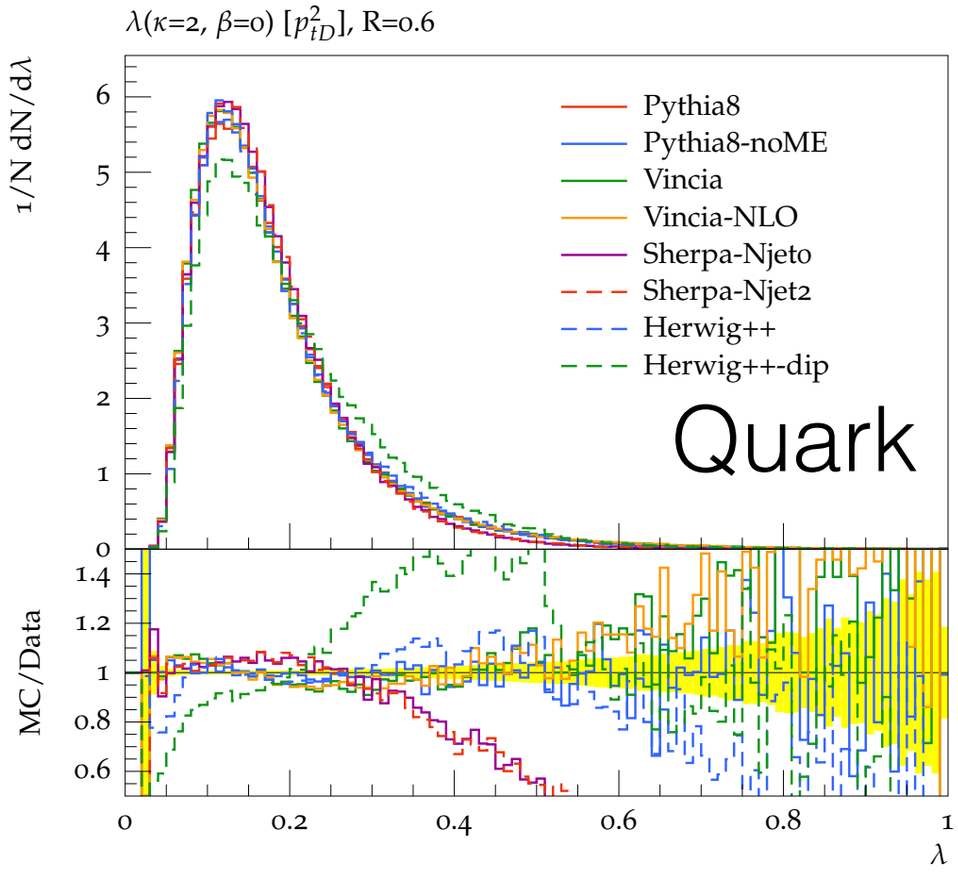


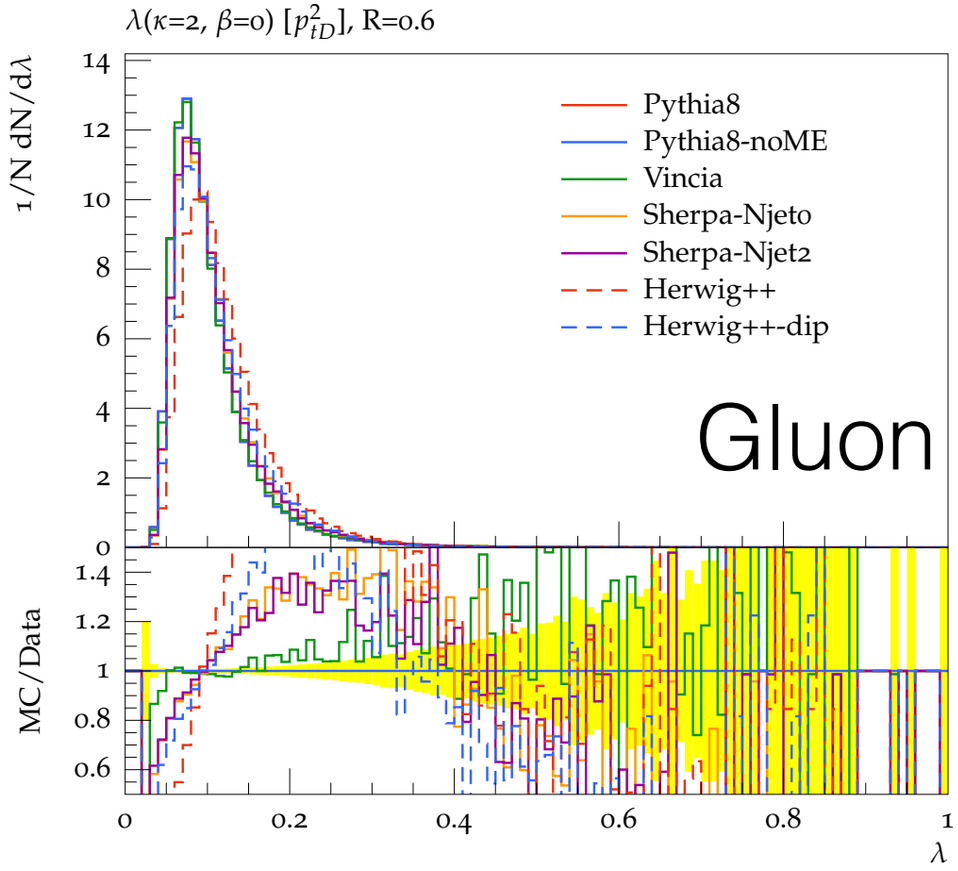
PTD Comparison

All hadron level, R=0.6 Q=200 GeV

Separation



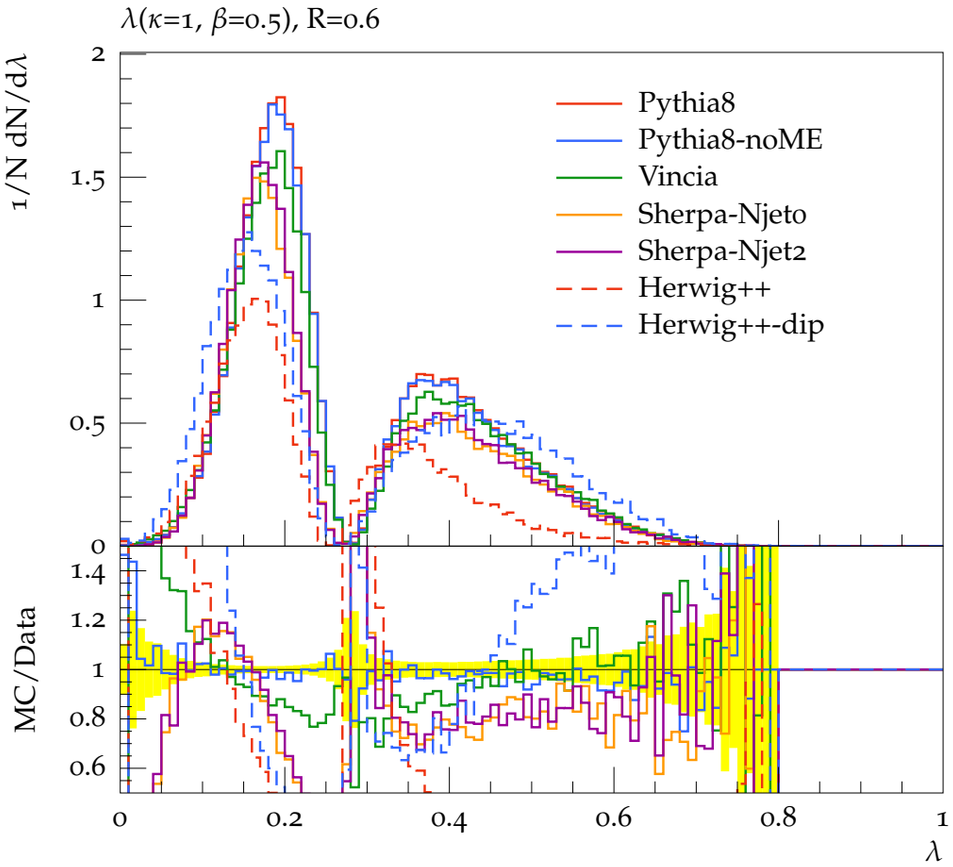


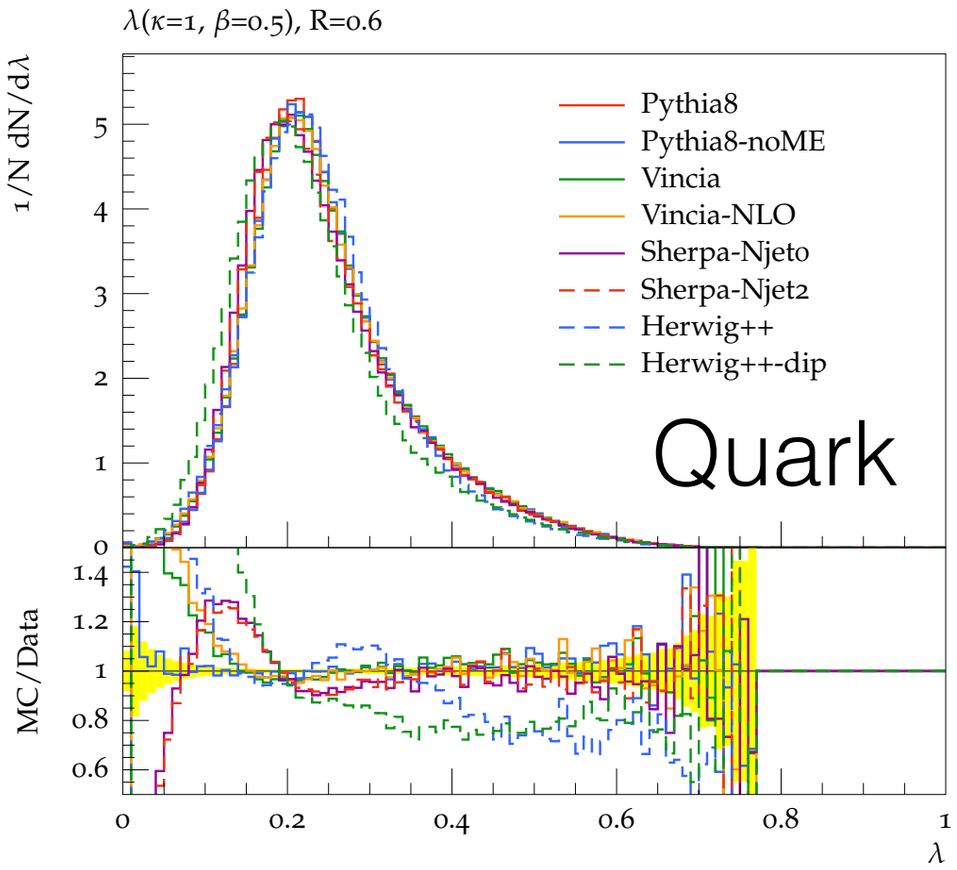


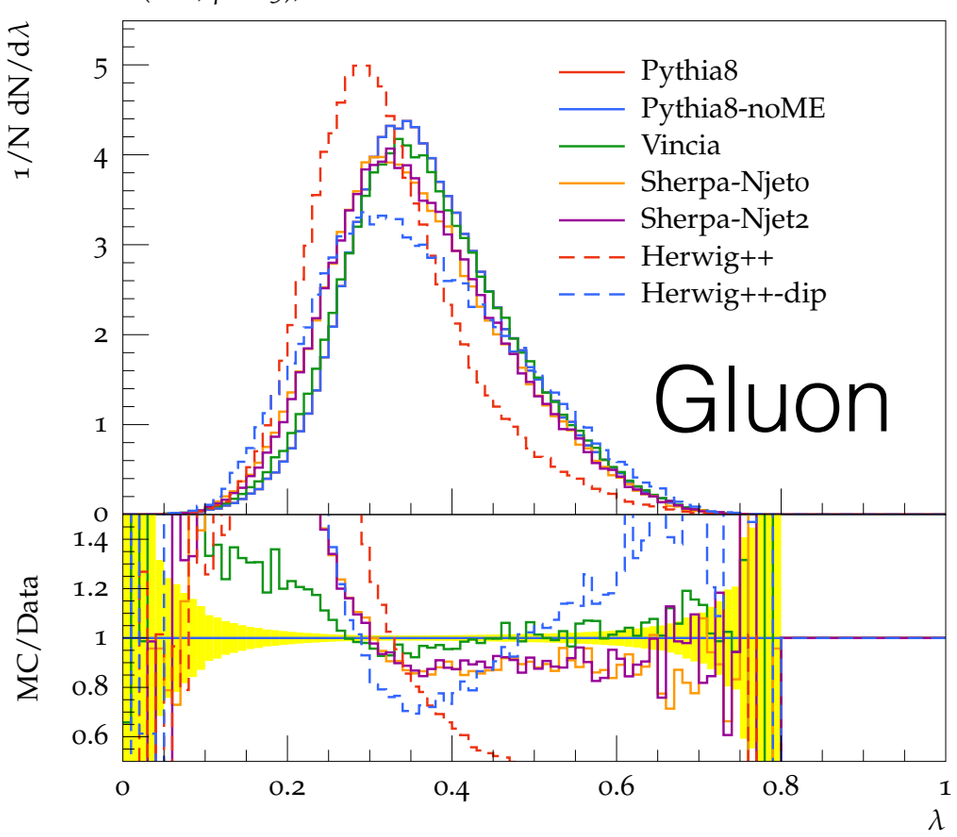
LH Angularity Comparison

All hadron level, R=0.6 Q=200 GeV

Separation



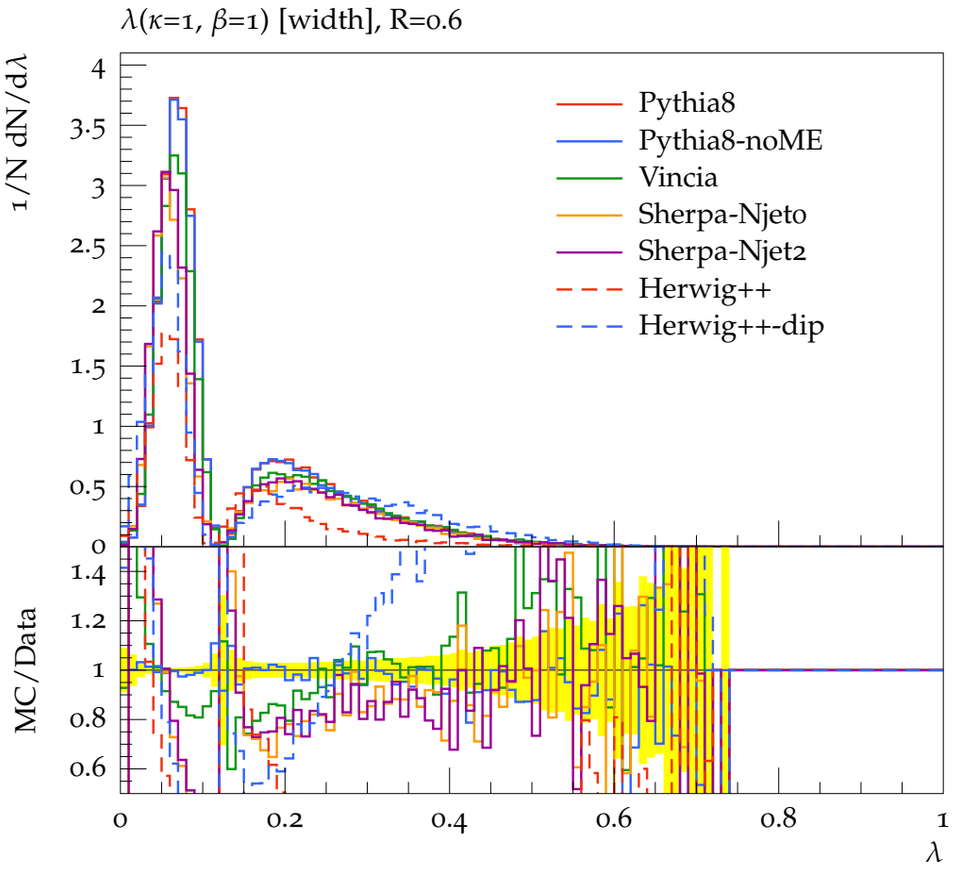


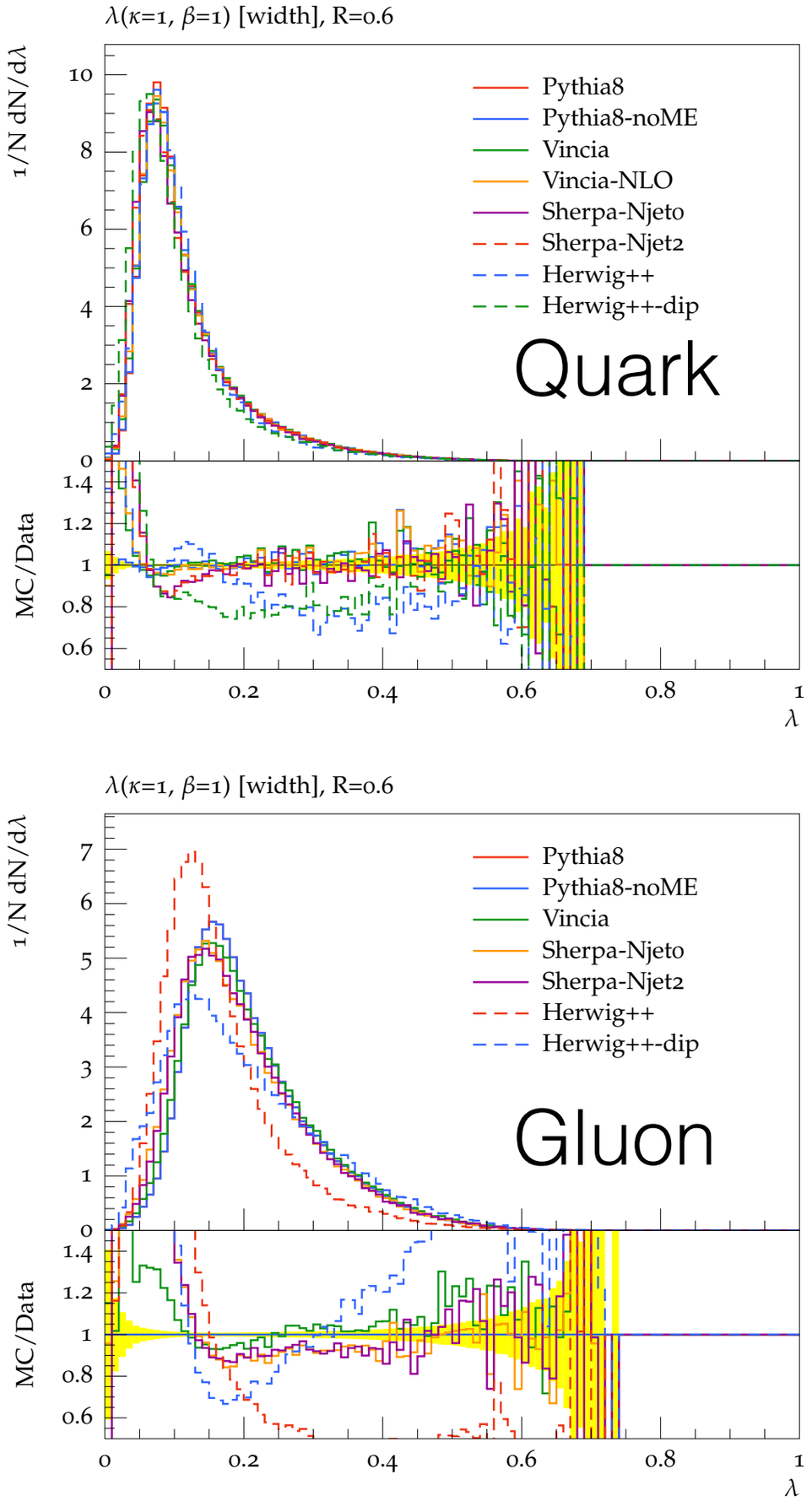


Width Comparison

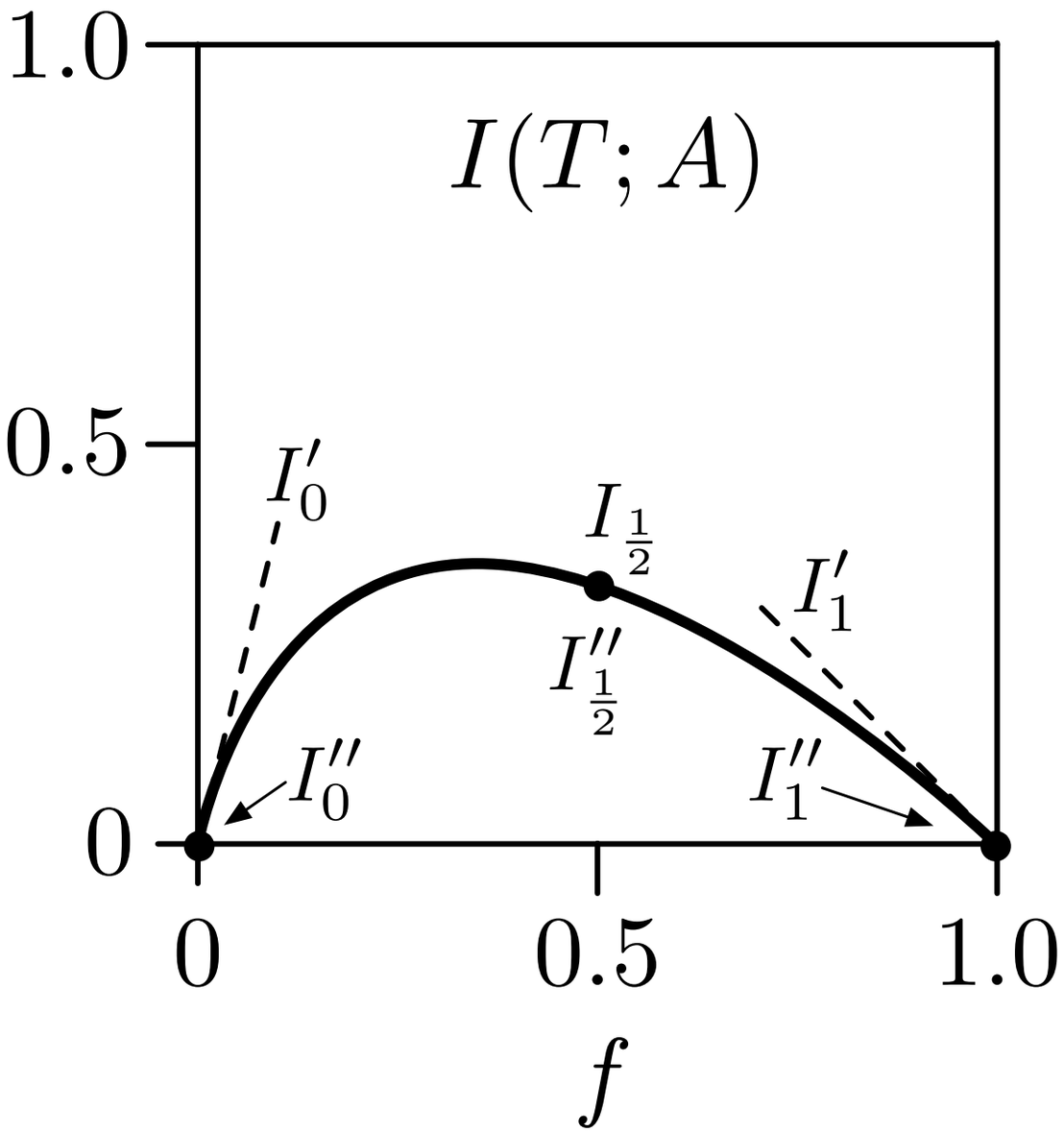
All hadron level, R=0.6 Q=200 GeV

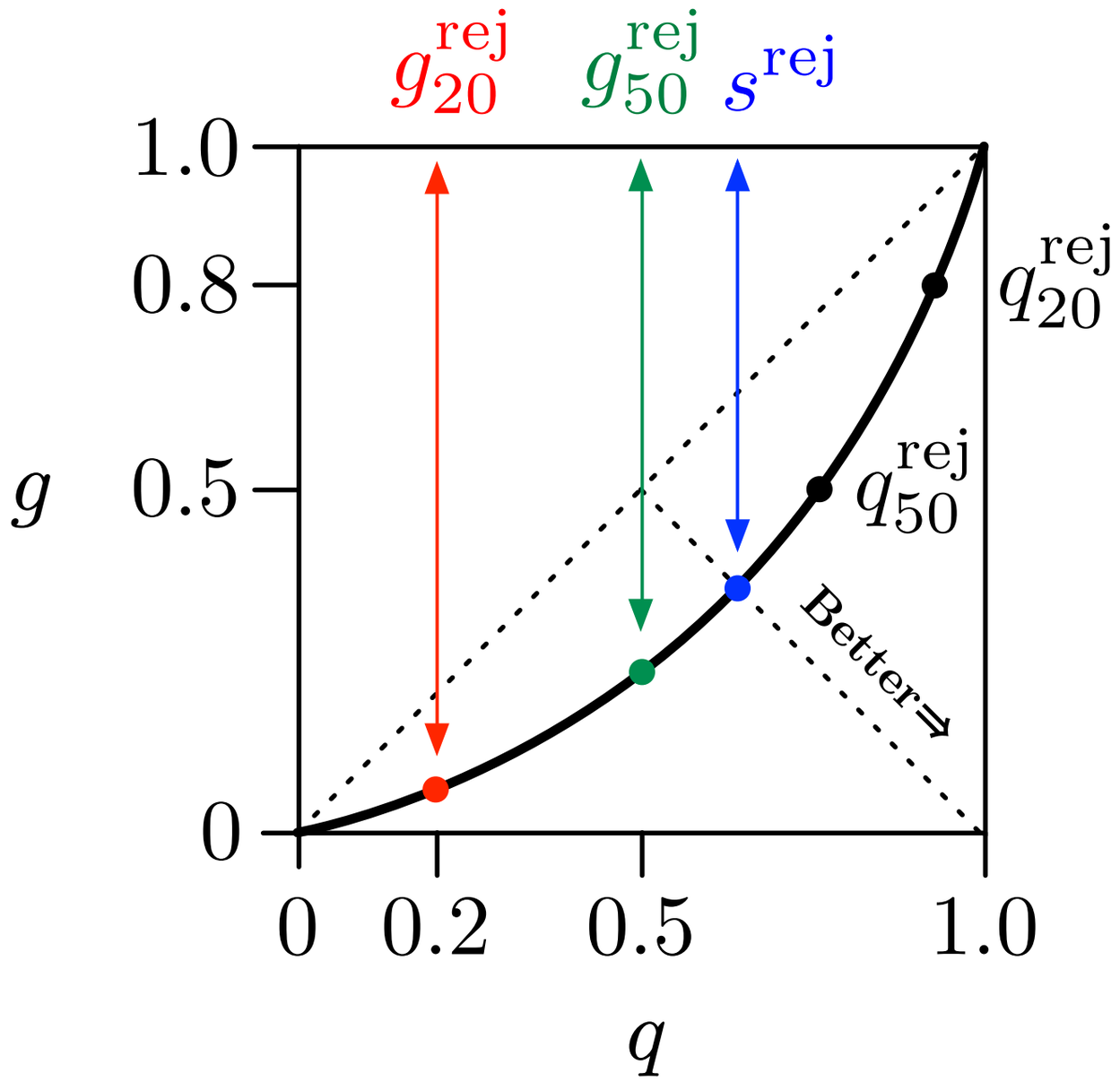
Separation





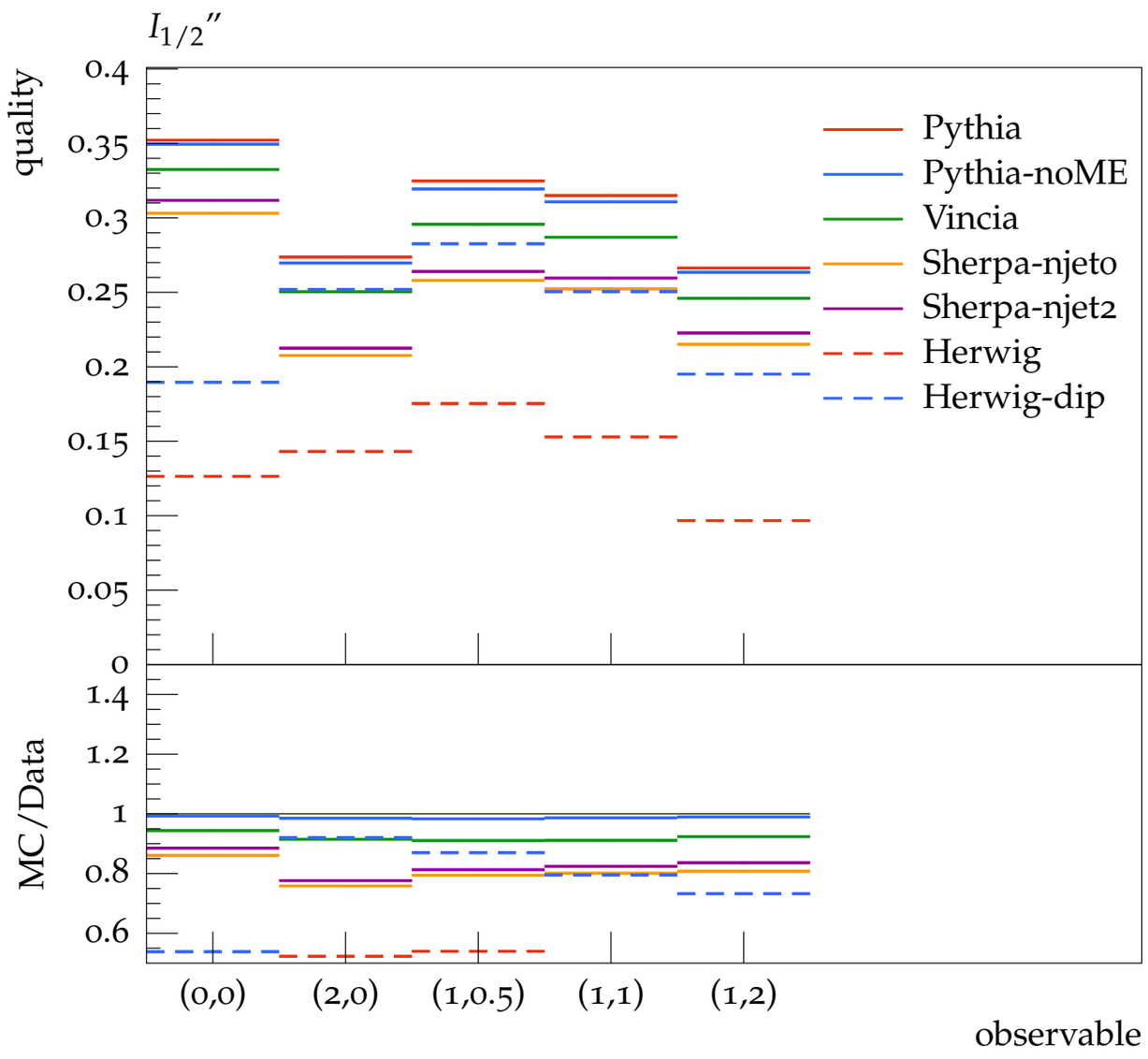
Performance Metrics



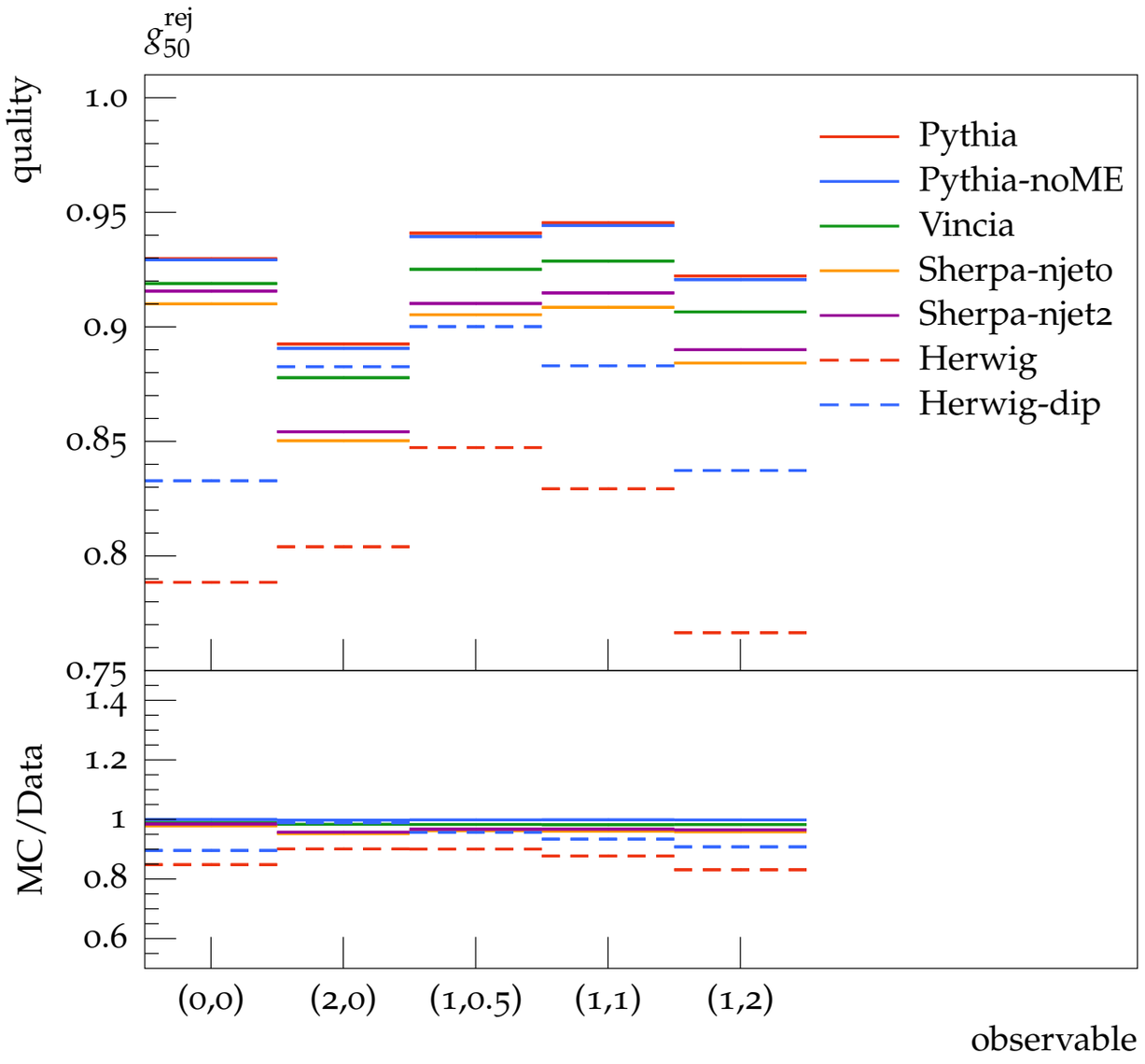


Performance Summary

Higher is better (R = 0.6, Q = 200 GeV)



Separation Power
$(S-B)^2/(S+B)$

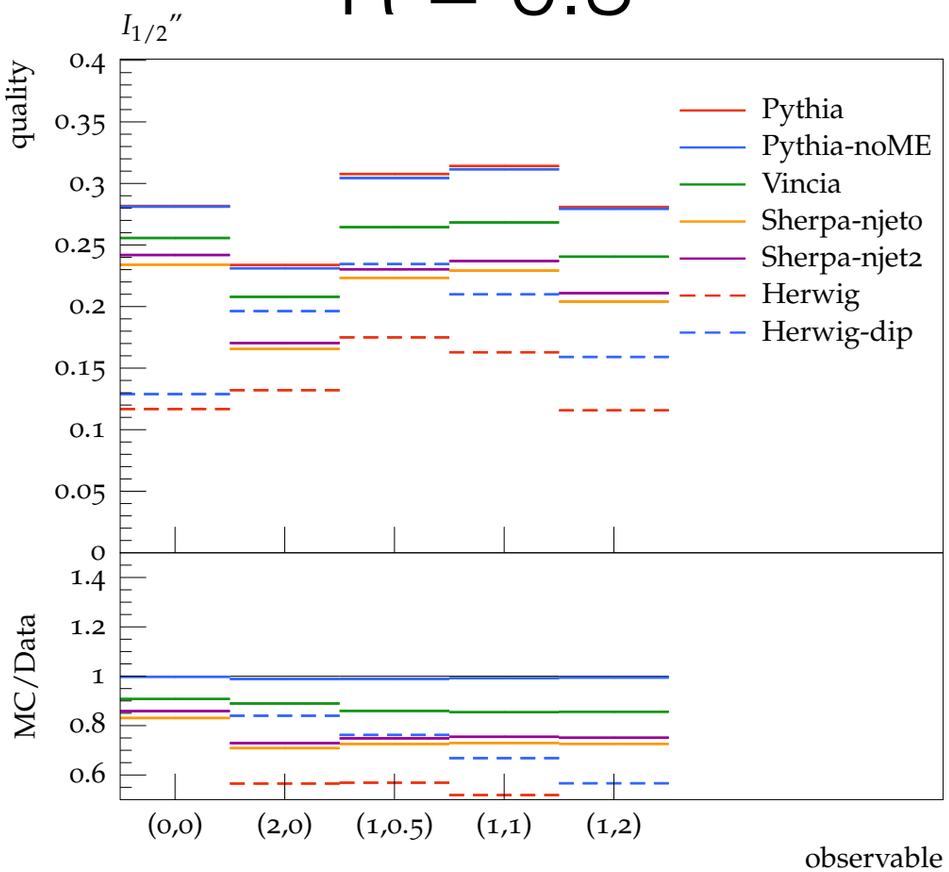


Gluon Rejection at
50% Quark Efficiency

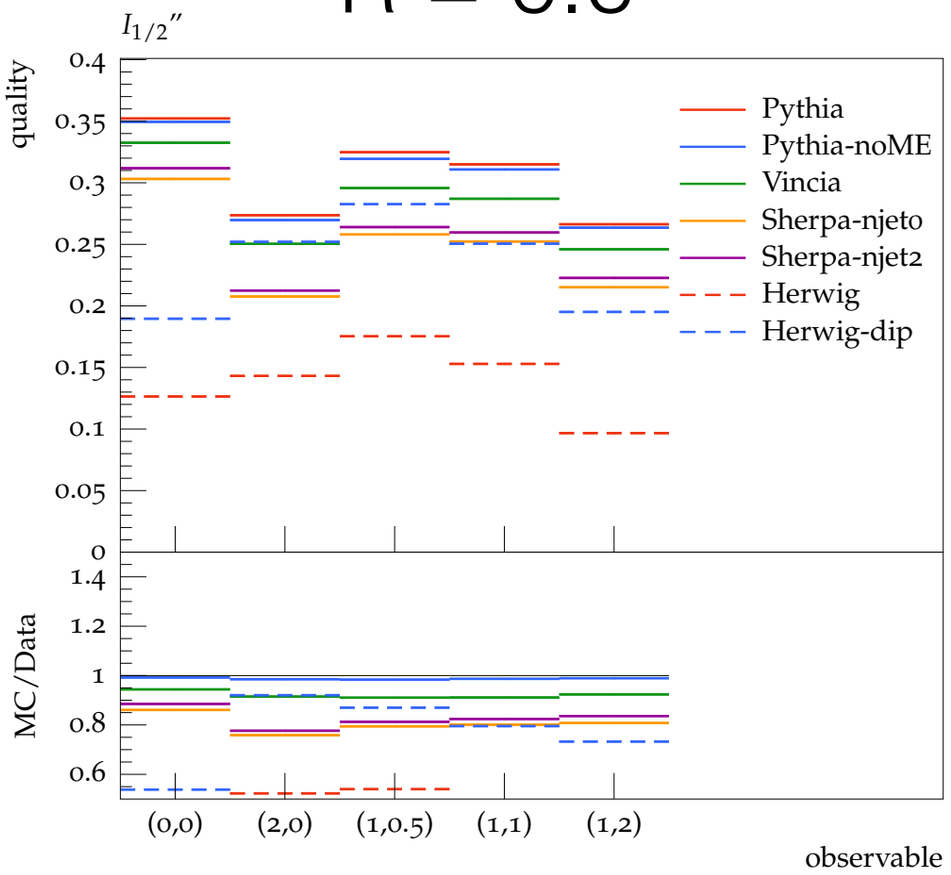
Separation Power

Higher is better

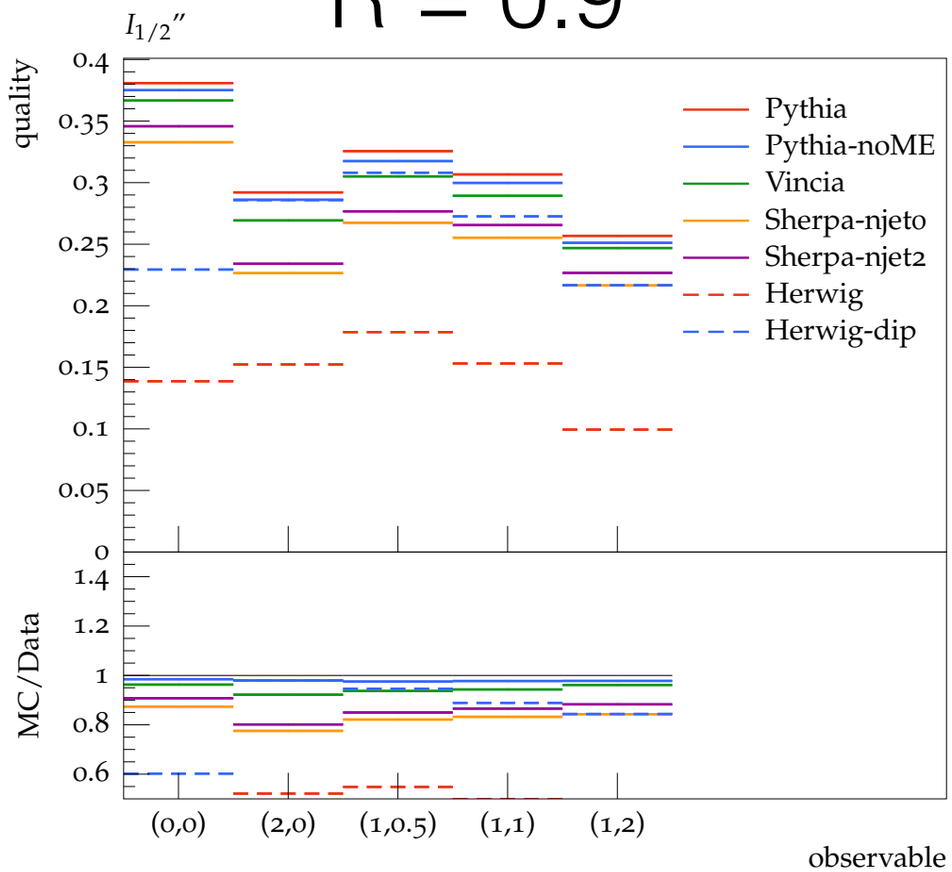
R = 0.3



R = 0.6



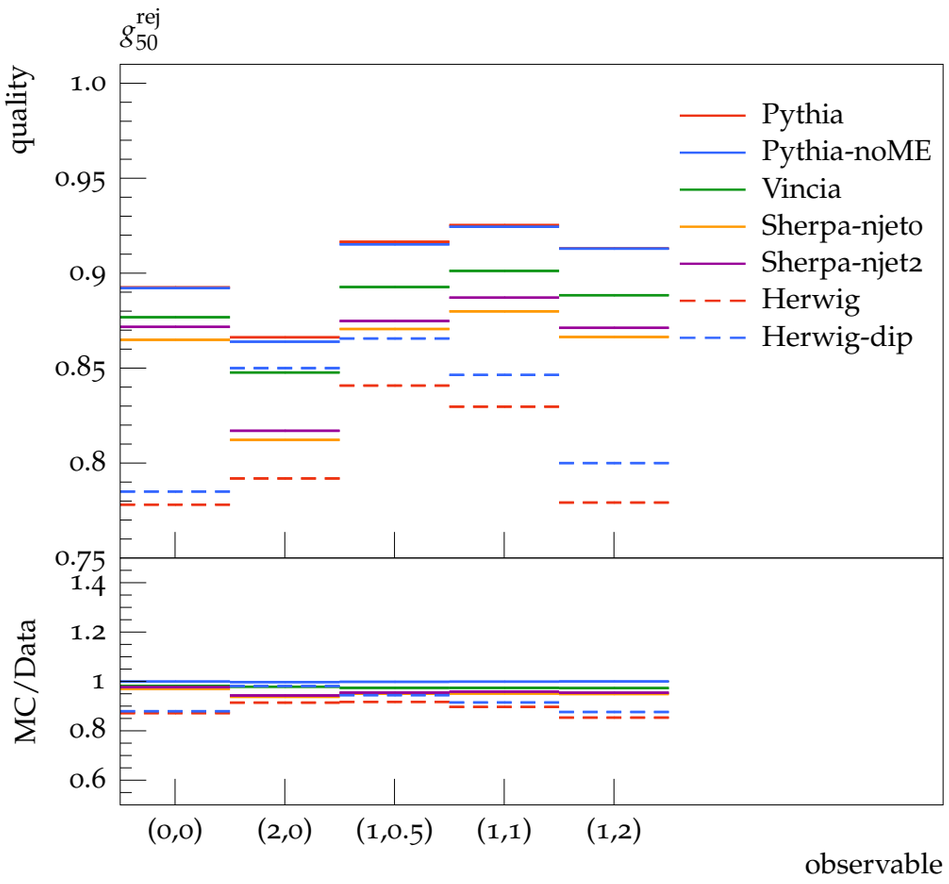
R = 0.9



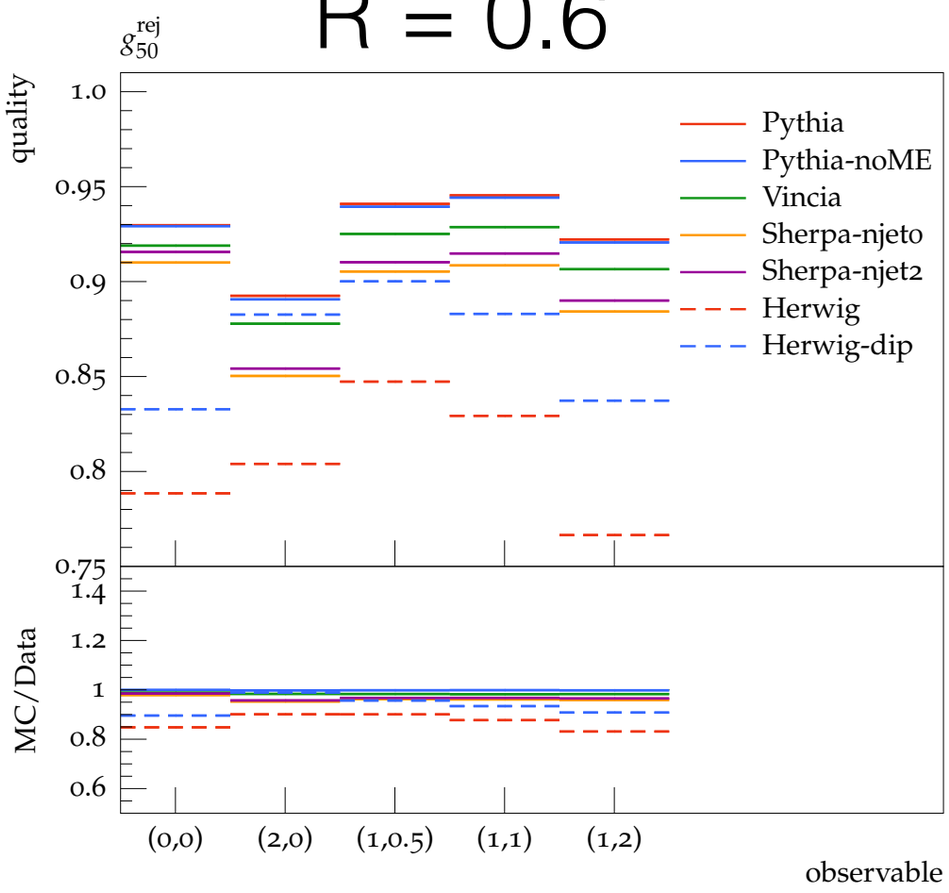
Gluon Rej. @ 50% Quark

Higher is better

R = 0.3



R = 0.6



R = 0.9