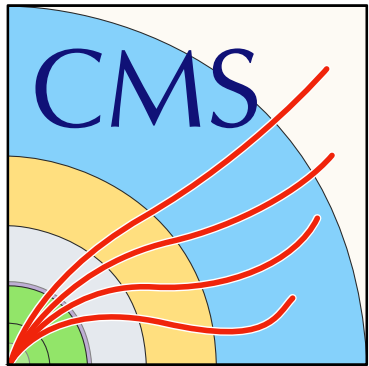


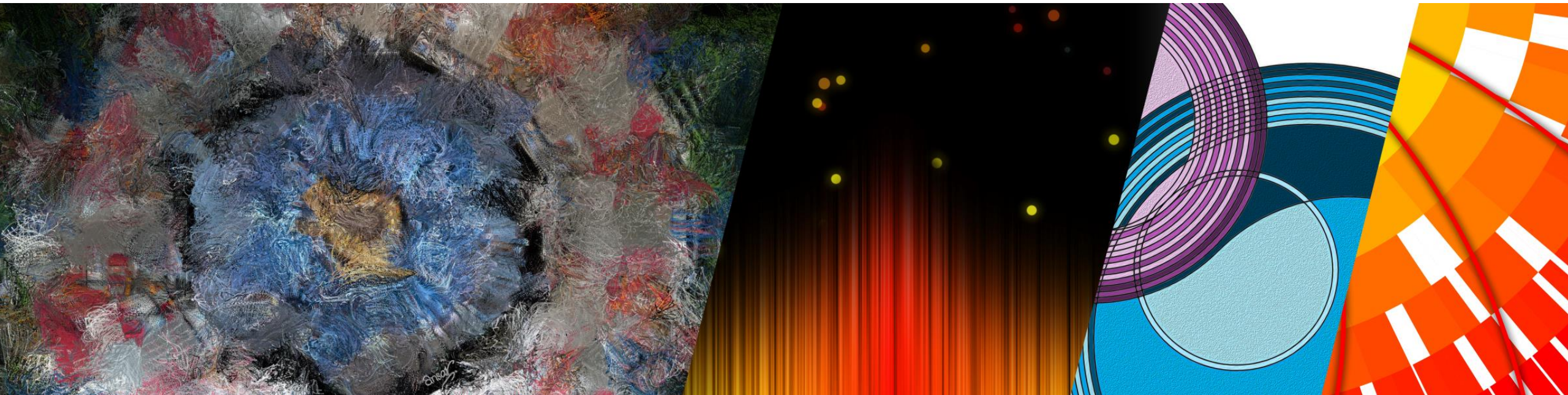


EXO-23-014: A search for displaced dimuons in early Run-3 (2022) data

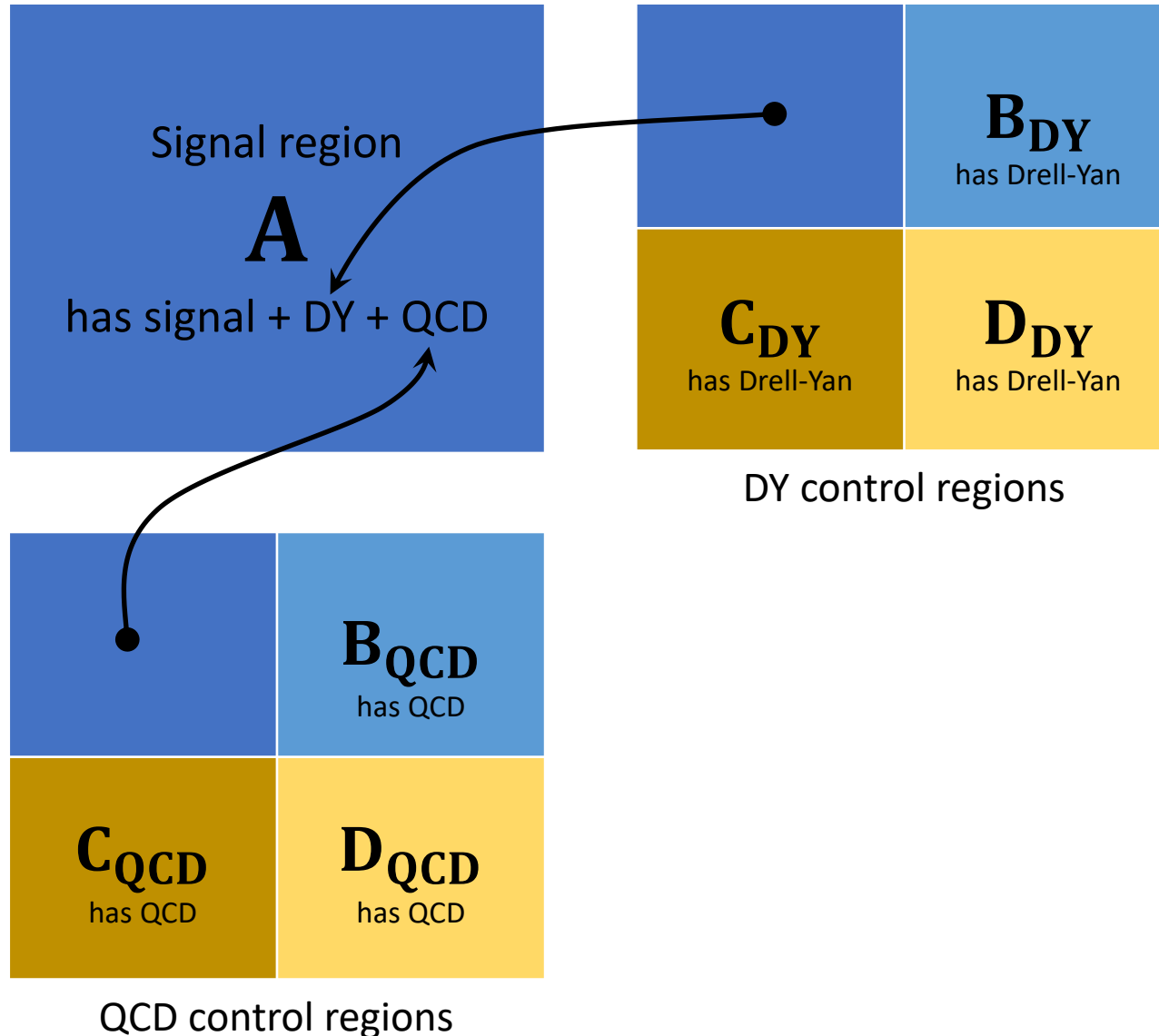


Explanation of control regions in datacards; 12 July 2023

Muhammad Ansar Iqbal, on behalf of the DDM analysis group



STA-STA dimuon category



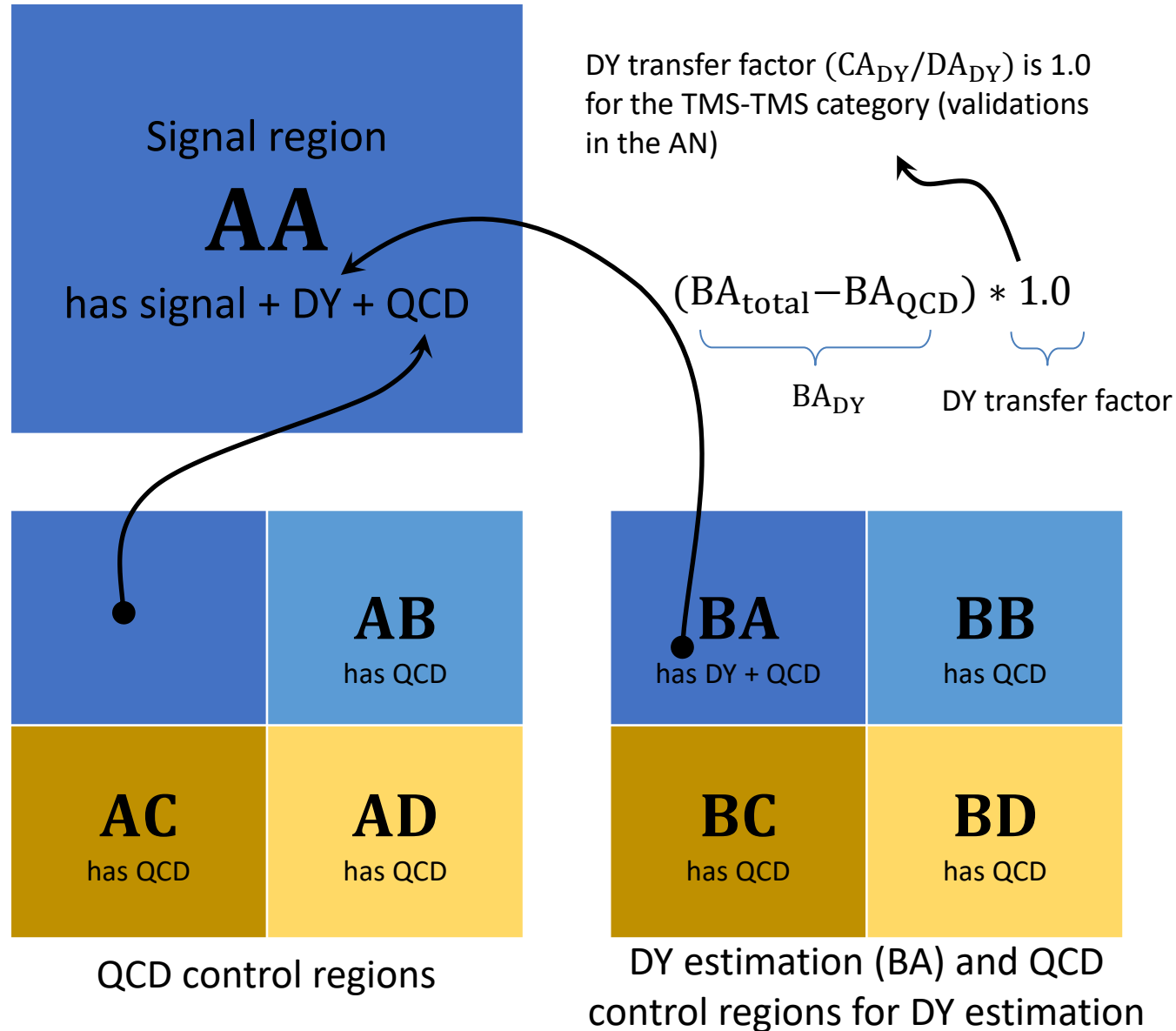
- There is no signal or Drell-Yan (DY) contribution in QCD control regions, and no signal or QCD in DY control regions. Therefore:
- **QCD estimation:** Get the QCD estimate in the signal region, A_{QCD} , by doing the ABCD:

$$A_{QCD} = B_{QCD} * \left(\frac{C_{QCD}}{D_{QCD}} \right)$$

- **DY estimation:** Get the DY estimate in the signal region, A_{DY} , by doing the ABCD:

$$A_{DY} = B_{DY} * \left(\frac{C_{DY}}{D_{DY}} \right)$$

TMS-TMS dimuon category



- **QCD estimation:** No contamination in QCD control regions; therefore:

$$AA_{QCD} = AB_{QCD} * \left(\frac{AC_{QCD}}{AD_{QCD}} \right)$$

- **DY estimation:** The Drell-Yan estimation region now contains a QCD contribution; evaluate the QCD here:

$$BA_{QCD} = BB_{QCD} * \left(\frac{BC_{QCD}}{BD_{QCD}} \right)$$

- Using the total observation in BA, which is the sum of DY and the QCD calculated in the above equation, calculate the DY in the signal region:

$$AA_{DY} = (BA_{total} - BA_{QCD}) * (1.0),$$

with 1.0 as the DY transfer factor (see AN for details and validations).