Status Ξ^0_c analysis meeting, Nov. 28, CKim

- **Crosschecks**
  - Data/MC samples used for crosscheck
    a. Data: LHC18p, pass2, 5 runs [294200, 294201, 294205, 294208, and 294210]

       * For offline selection, always used HMV0 trigger + [0, 0.1] multiplicity percentile

    b. MC: LHC20ja (Xic0 enriched),

       10 runs [294525, 294526, 294527, 294529, 294530, 294531, 294553, 294556, 294558, and 294562]
  - List of items for comparison
    a. By Sample type: data or MC

    b. By framework (old vs. new)

       b-1. Online level: right after basic filtering, will be denoted as “raw”

       b-2. Offline level, 1st : after applying all essential cuts for e-Xi paring, will be denoted as “pair”

       b-3. Offline level, 2nd : after assign cut levels (e.g., previous “stand” or “tight”) (* NOT finished yet)

    c. By ALICE software version: vAN_20210701_ROOT6-1 vs. vAN_20220701_ROOT6-1

    d. By Dataset production level: pass2 (so far used for xCheck) vs. pass1 (2021 November train)
  - Preparing full sample by using Grid: ongoing

Comparison Summary of updates, for online selection (raw)

- **At online selection (AliAnalysisTask…)**
  - Confirmed surviving entries are the same if I match the conditions

    * The xCheck was done by matching all the conditions to the "old" framework

    a. By using a sample file and By printing out evtID/variables on the CLI

    b. By event (after all event selection cuts),

    By cascade filter (*FilterCascade()*), and

    By electron filter (*FilterTrack() and FilterElectron()*)
  - Updates (difference compared to the old one)

    a. Event selection:

    a-1. Data: none

    a-2. MC: require > 0 Xic0 in the event, at truth level (* even Xic0 enriched MC not always has one)

    b. Cascade filter (for both data and MC):

    b-1. Disabled Xi/V0 decay length cut

    b-2. Loose mass tolerance cuts for Xi (0.01 → 0.03) and Lambda0 (0.008 → 0.03)

    b-3. After cascade filter, require at least one Cascade (nCasc > 0)

    b. Electron filter (for both data and MC):

    c-1. Apply e+e- minimum mass > 0.05 on the fly (previously applied offline)

    c-2. After electron filter, require at least one electron track (nElectron > 0)

Comparison

Summary of updates, for online selection (raw)

Old

Event selection

- Apply cuts (multiple *return* statements)

If (IsMC) {…}

Cascade loop

- Apply cuts (*FilterCascade()*)

Track loop

- Apply cuts (*FilterTrack()*)
- Save event info (to tree)

Make e-Xi pairs

- Save cascade info
- Apply cuts (*FilterElectron()*)
- Fill tree:

a. data

b. MC (after additional cuts)

New

Event selection

- Apply cuts (multiple *return* statements)
- If (!IsMC) { … save event info (to tree) }

else { … Require nXic0>0, save event info }

Cascade loop

- Apply cuts (*FilterCascade()*)

a. Disabled decay length cuts

b. Loosen mass cuts for Xic0/Lambda0

- Require nCasc > 0
- Save info

Track loop (for electron)

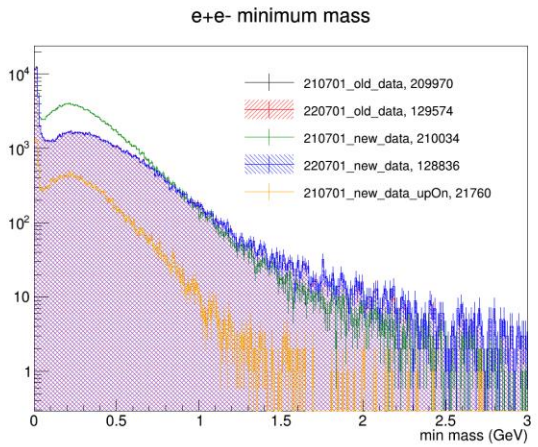
- Apply cuts (*FilterTrack(),*

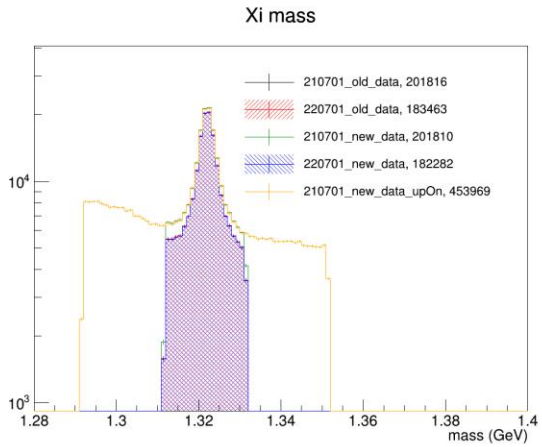
FilterTrackElectron(), e+e- minM > 0.05)

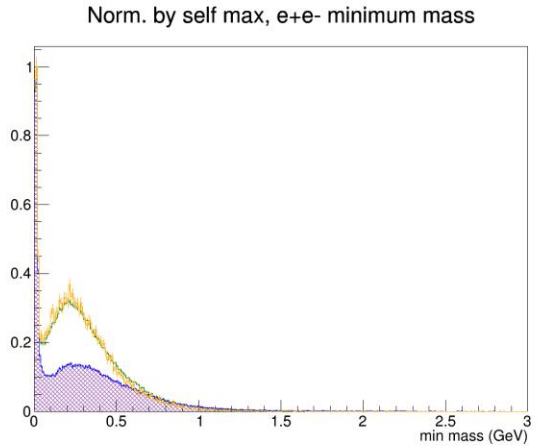
- Save info
- Require nElectron > 0

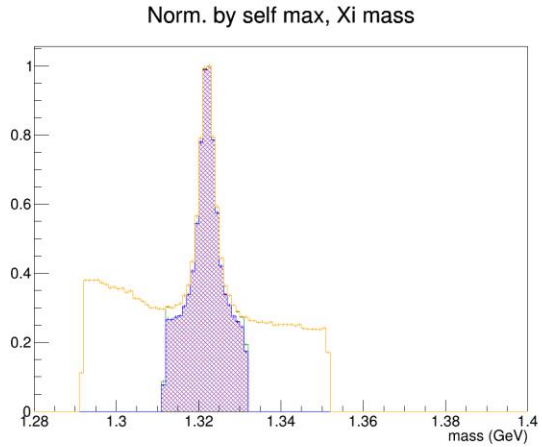
- Fill tree

Comparison By framework and library version, raw, data



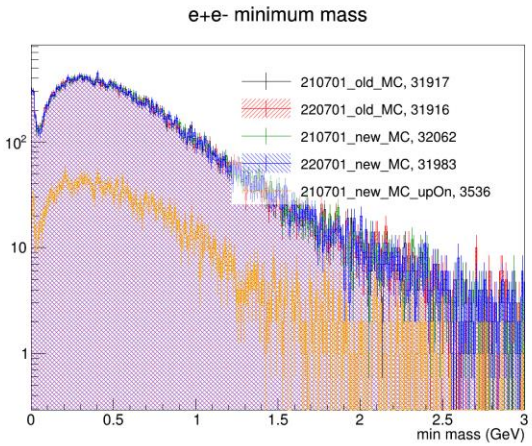


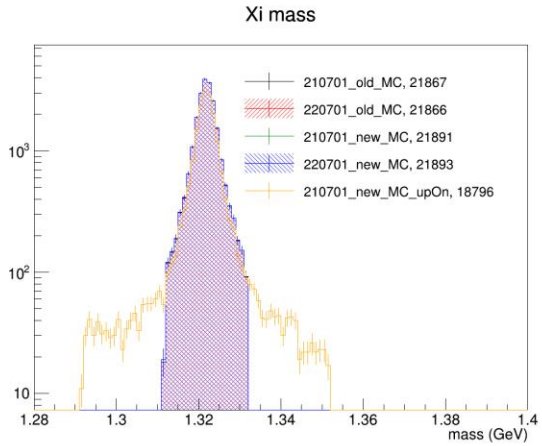


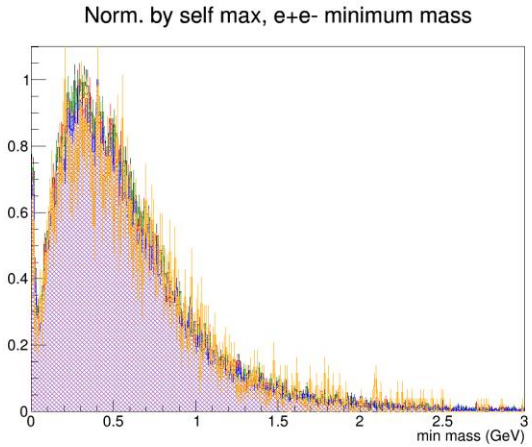


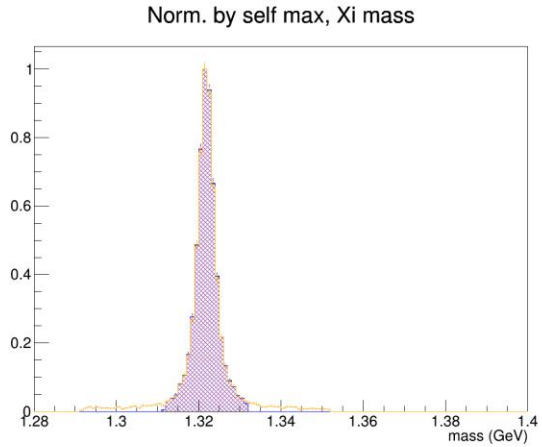
- Online level comparison: e+e- minimum mass for electrons, Xi mass for cascade (* backup)
  a. No notable difference btw old/new framework, for same version of library
  b. Effect of updates: less entries for e (by return statement after Casc loop), more for Xi (loosen mass tolerance)

Comparison By framework and library version, raw, MC









– Same trend to the data, except for upOn (yellow, updates applied)

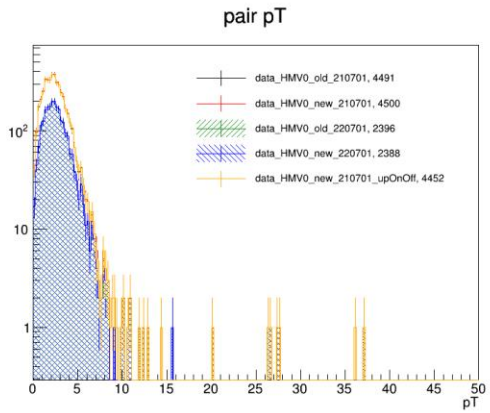
This must be the effect of “require at least one Xic0 at truth level”

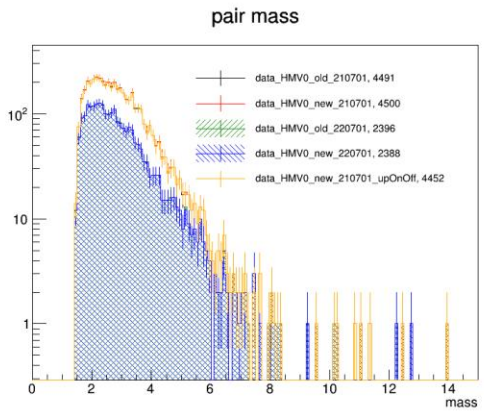
Comparison Summary of updates, for offline selection (pair)

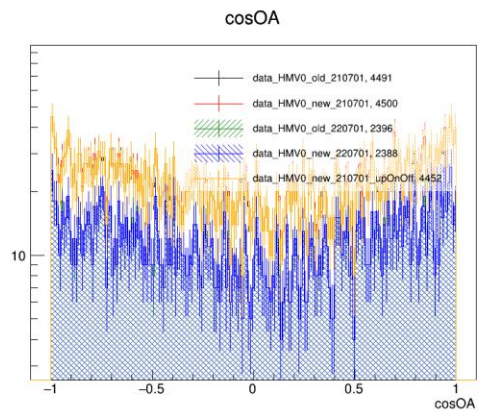
- **At offline selection**
  - Direct apples to apples comparison is impossible due to structure difference
  - Following cuts are applied for e-Xi pairs
    a. For events: RunNo, Trigger, Multiplicity, and INEL>0
    b. For cascades:
       b-1. Minimum decay length for Xi/V0 (new)
       b-2. Mass tolerance for Xi (old/new) / Lambda0 (new)
    c. For electrons, both old/new framework applies e+e- min mass > 0.05 (old/new)
    d. For pairs, invariant mass > 1.3

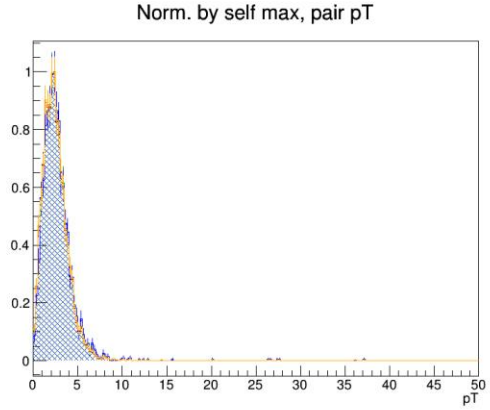
    * NOTE that this cut application is BEFORE assigning level of tightness (e.g., “stand”)

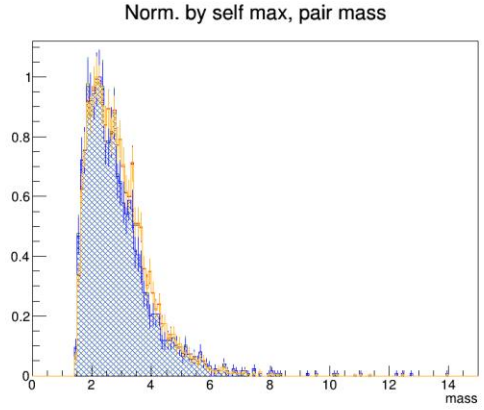
Comparison By framework and library version, pair, data

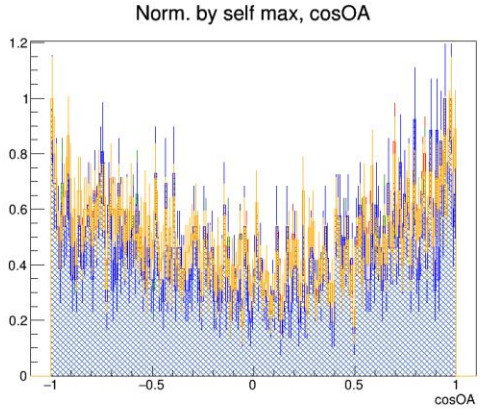






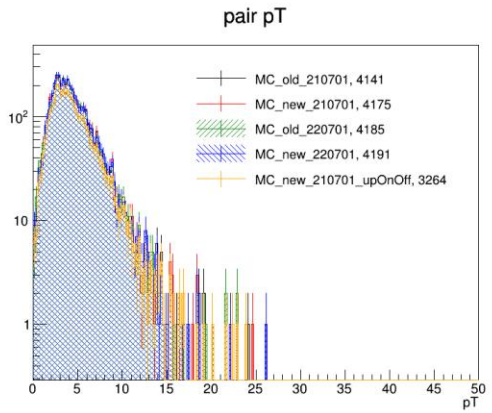


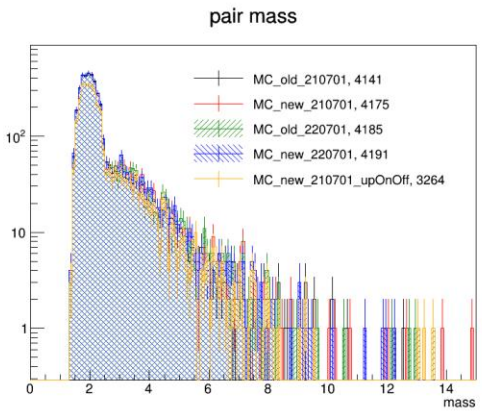


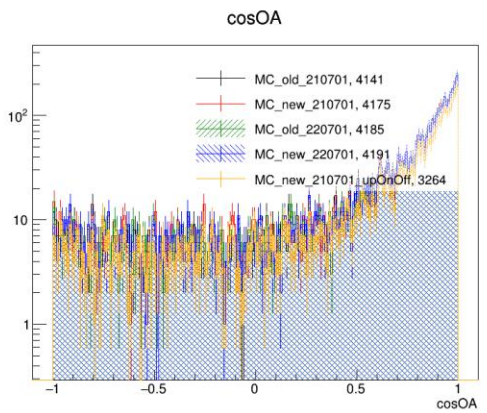


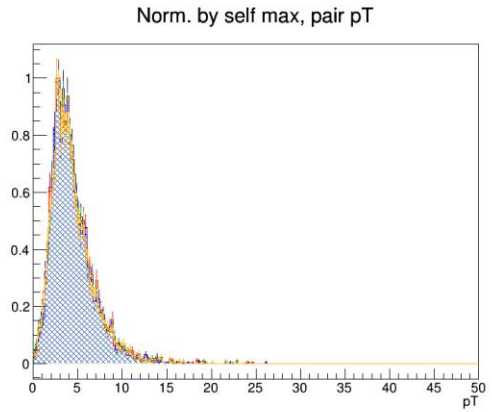
- Offline level comparison: e-Xi pairs' pT (left), mass (middle), and cosOA (right)
  a. No notable difference btw old/new framework, for same version of library
  b. Effect of updates: almost negligible (wonder if conventional decay length cut has any rejection power?)

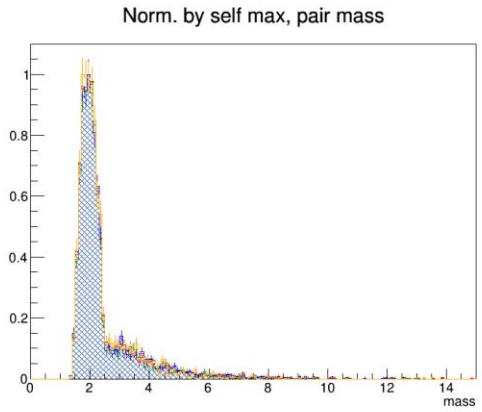
Comparison By framework and library version, pair, MC

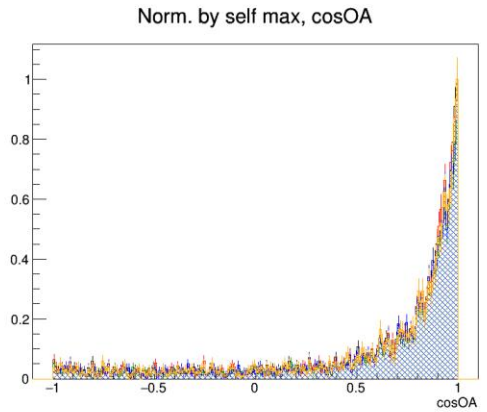












- Offline level comparison: e-Xi pairs' pT (left), mass (middle), and cosOA (right)
  a. No notable difference btw old/new framework either, like data
  b. Less entries around mass ~ 2 GeV must be the one has been successed from online selection

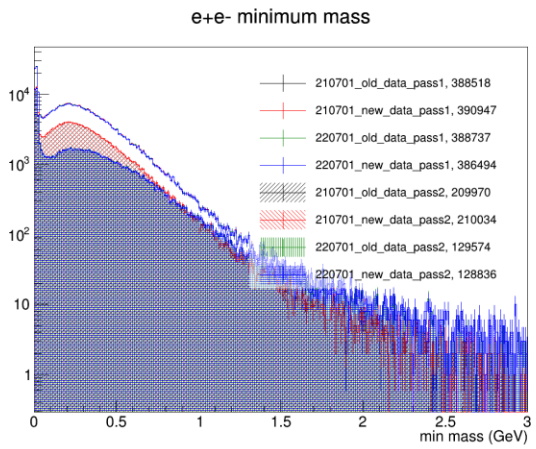
Comparison Summary for production level of data

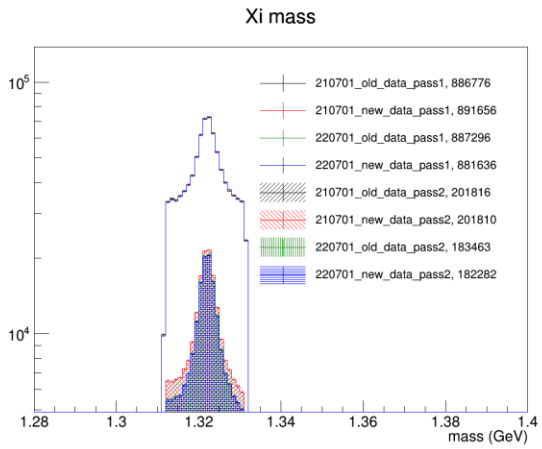
- **Multiple “pass” exist for a dataset**
  - A pass number is assigned for a complete dataset
    a. Starts from 1, then increases if new production
    b. Basically, higher pass number means something was corrected or improved –
    for Run 2 pp13 TeV, according to the DPG’s pass2 explanation (link),

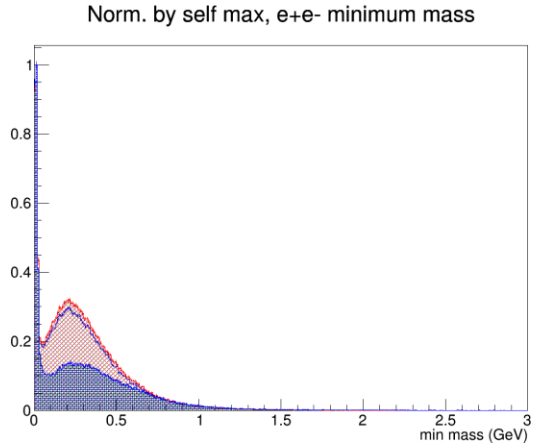
> - Aliroot version: AliRoot v5-09-56
> - Main improvements with respect to pass1:
> Same Aliroot version for all periods (more uniform reconstruction performance across years)
> Usage of TRD in the track refit
> Improved alignment of some SPD sectors
> Improved TPC reconstruction and updated error parameterization (resulting in narrower chi2 distributions)
> Finer binning for TPC distortion maps
> Improved TPC material alignment
> Correct treatment of the difference between the ALTRO clock and the LHC clock
> - Note: for LHC16k and LHC16l this is pass3

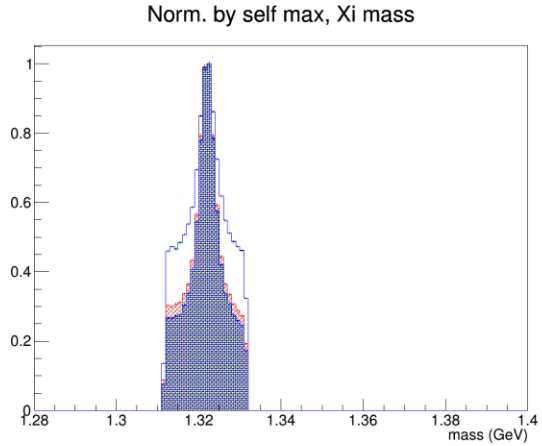
    c. Not sure if DPG page is up-to-date: Grid dataset search sometimes shows pass2 dataset NOT on the page
  - Lego train output at Nov. 2021 looks pass1

Comparison By dataset production level, raw, data









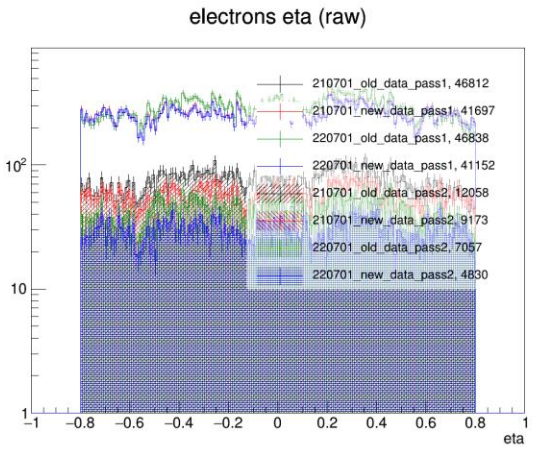
– Notable difference for pass1 vs. pass2 (* backup)

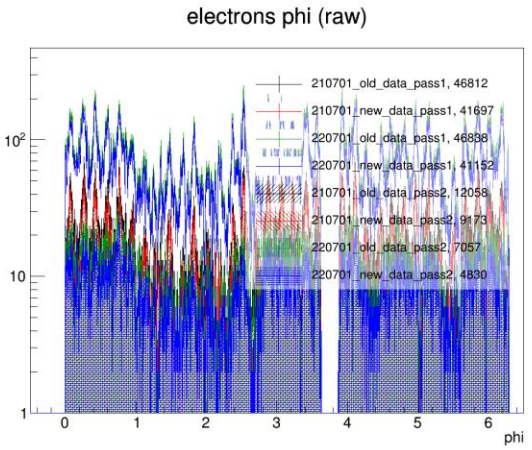
a. pass1 has noticeably more entries in both electrons and Xi (Cascade)

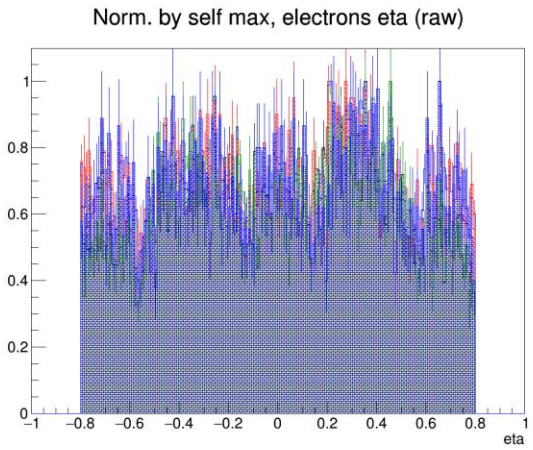
b. Judging from Xi mass's shape, it seems that pass1 has much more backgrounds

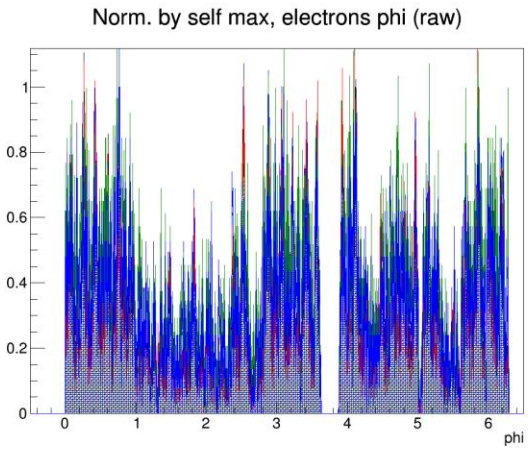
Comparison

By dataset production level, raw, data, electrons' eta/phi







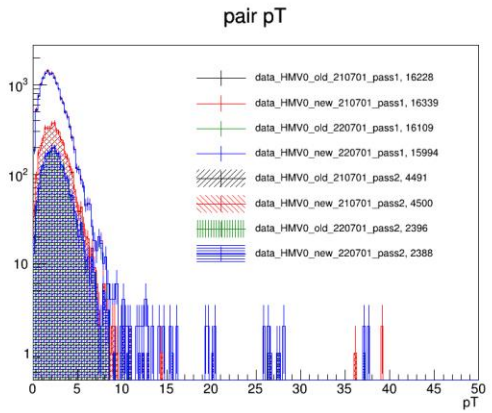


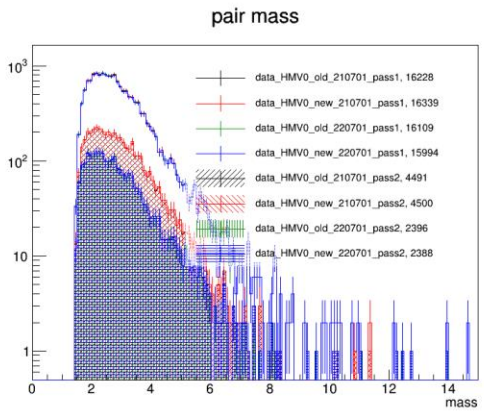
– Notable difference for pass1 vs. pass2 (* backup)

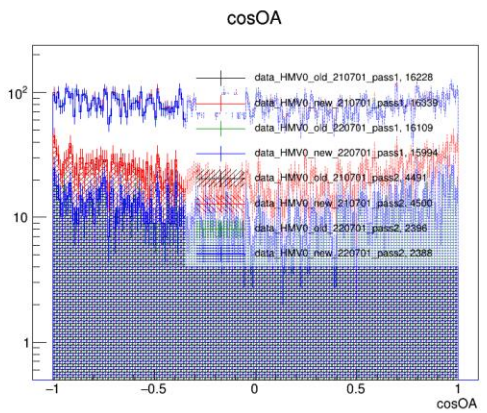
a. pass1 still has noticeably more entries, but in general

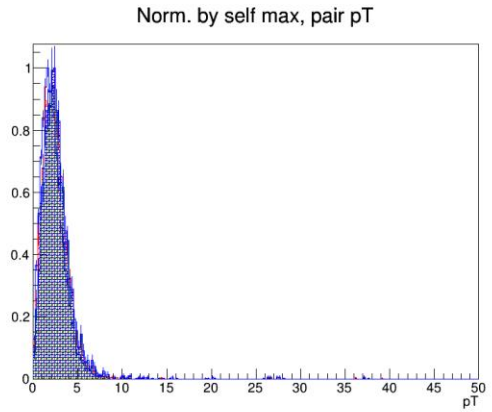
b. No specific eta/phi dependence (i.e., detector effect)

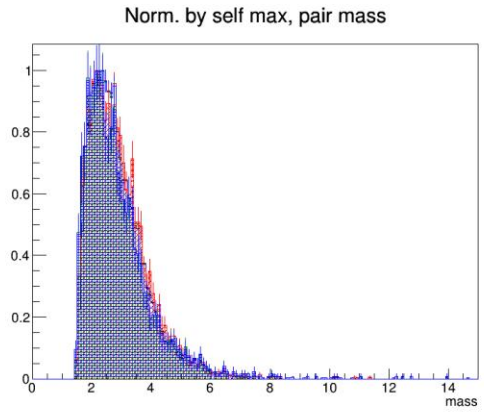
Comparison By dataset production level, pair, data

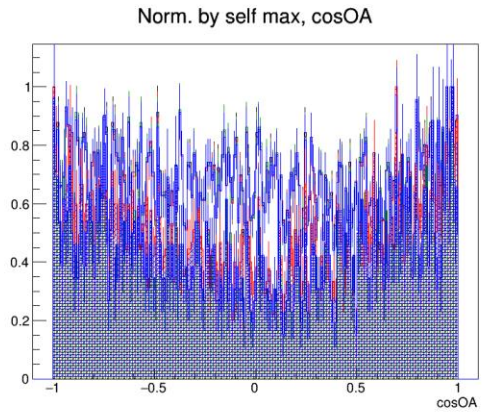










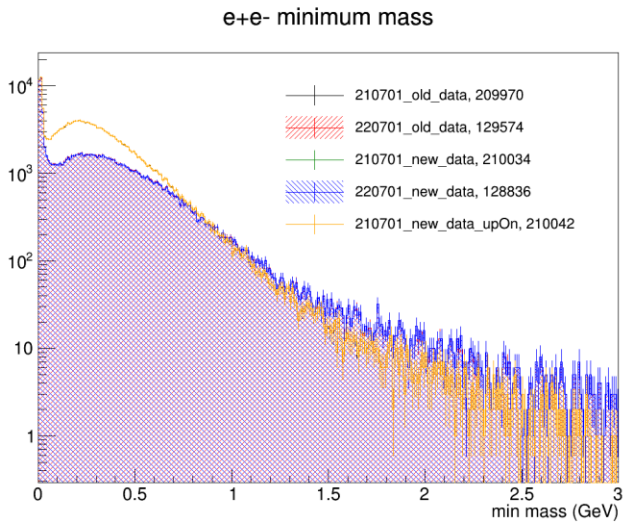


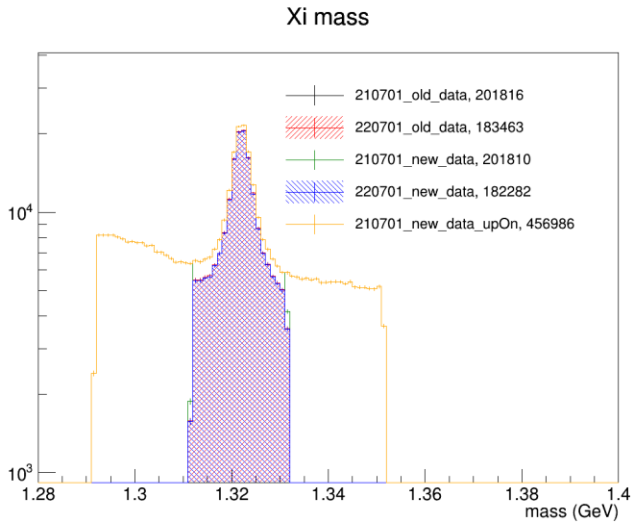
- Notable difference for pass1 vs. pass2 (* backup)
  a. Similar trend (more entries) to online level
  a. No library version dependence for pass1

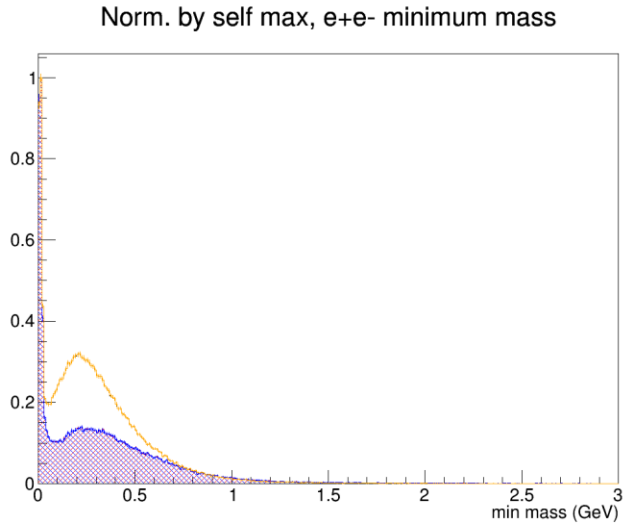
Summary

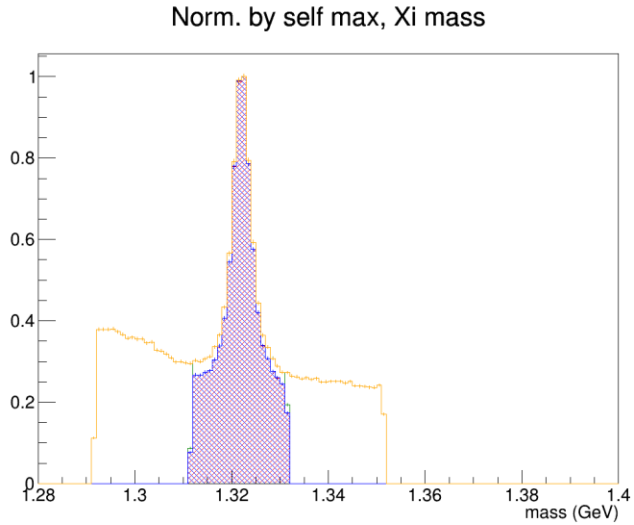
- **Crosscheck results for works done so far**
  - By framework
    a. No difference if I match conditions between them, either online (raw) or offline (pair) level
    b. Some difference arises if I apply updates, but within control
       * Expected some effect for new decay length cut, but no
    c. Still need to compare old/new with e-Xi pairs, after assigning tightness levels
  - By ALICE software version
    a. vAN_20210701-ROOT6-1 vs. vAN_20220701-ROOT6-1
    b. Consistently, 2022 version has less entries for both electrons and Cascades (Xi)
       b-1. Less BG or Less signal?
       b-2. No effect on MC (because I'm using new MC sample, i.e., LHC20ja?)
  - By data production level (pass)
    a. Pass1 has many more entries, but I'm skeptic about their quality, especially judging from Xi mass distribution
    b. No library version dependence for pass1

Backup By framework and library version, raw, data

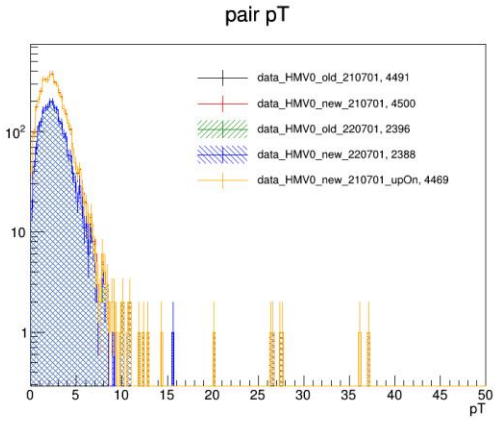


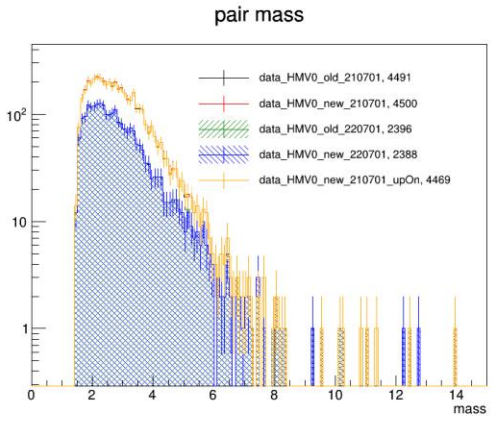


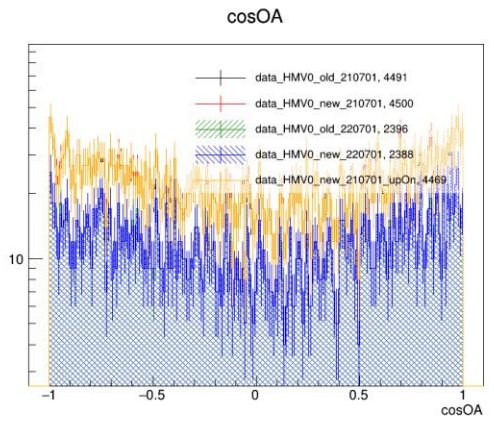


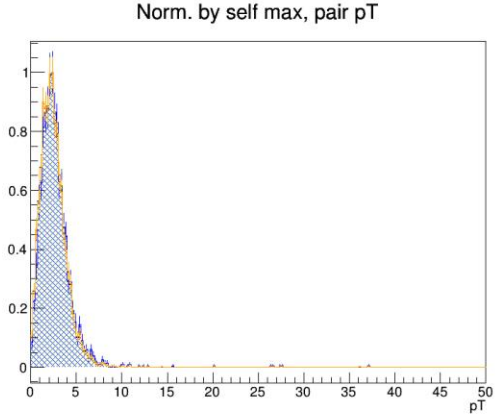


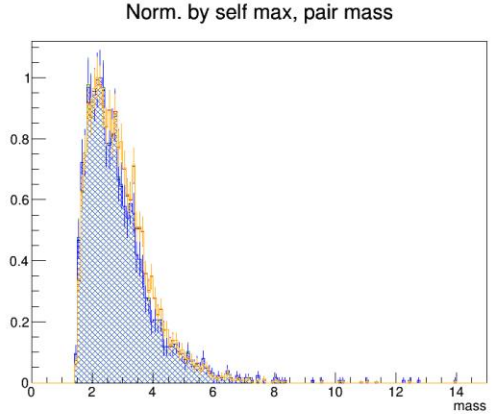
Backup By framework and library version, pair, data, online update only

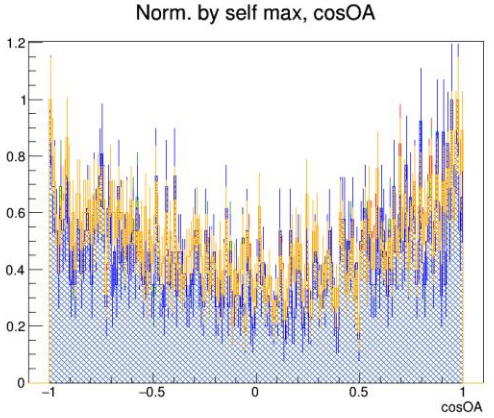




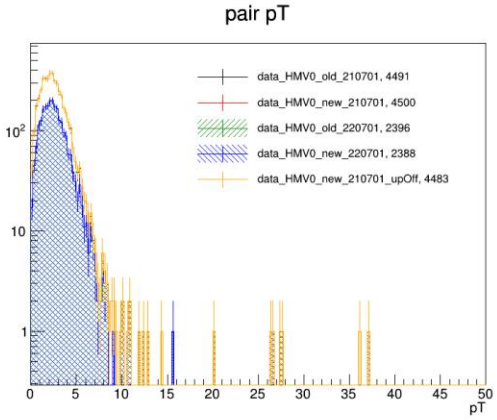


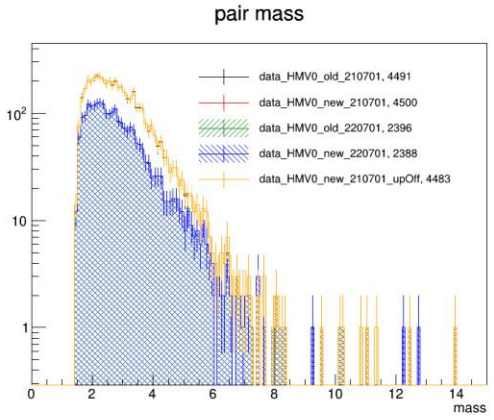


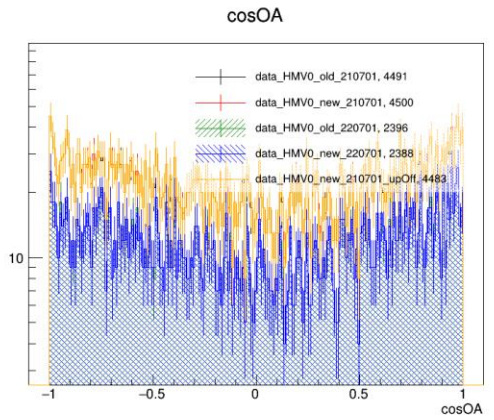


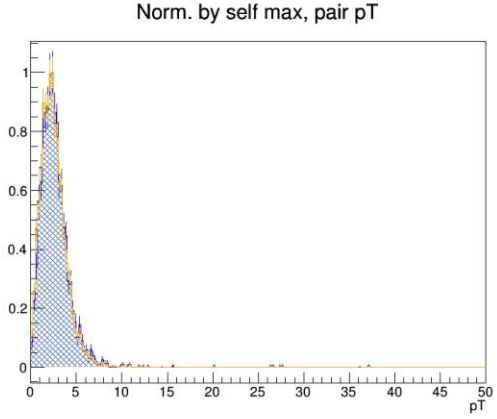


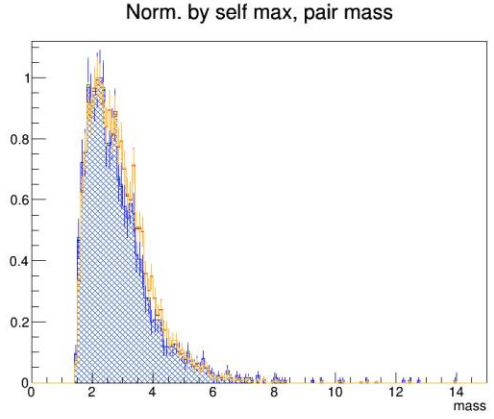
Backup By framework and library version, pair, data, offline update only

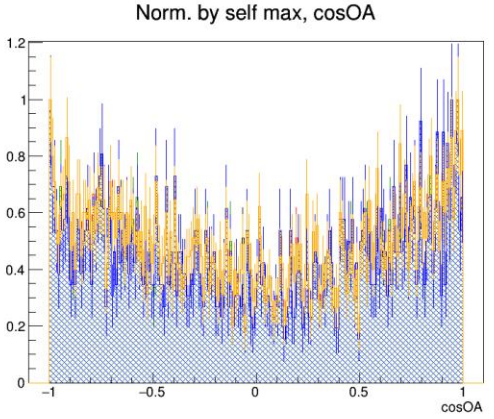




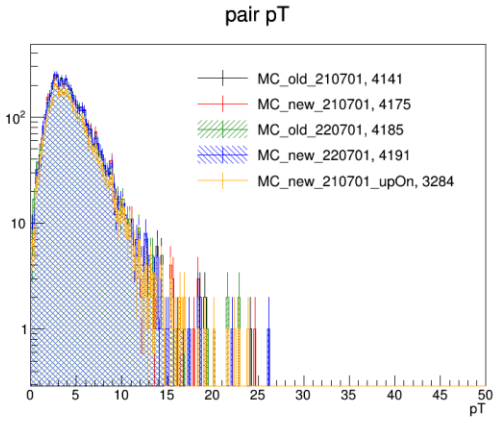


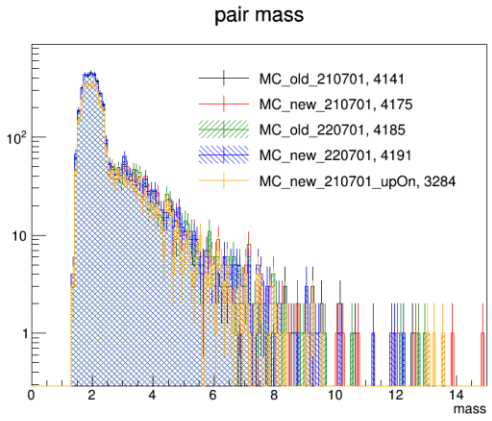


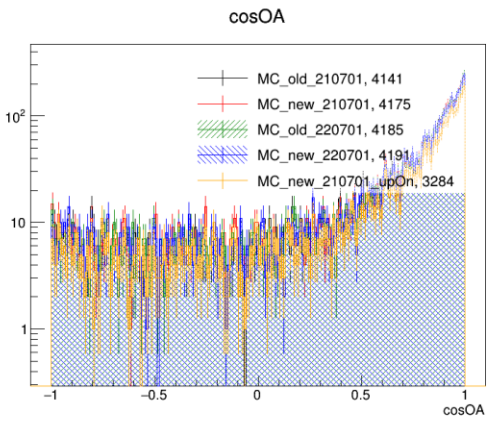


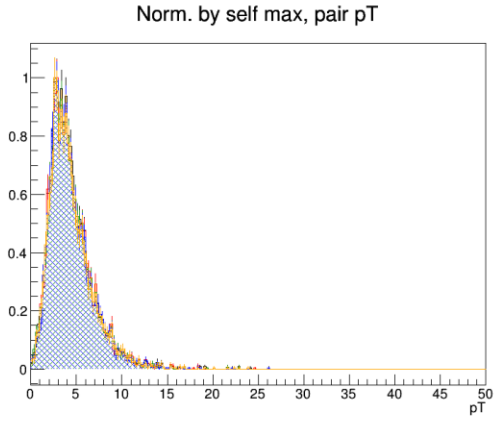


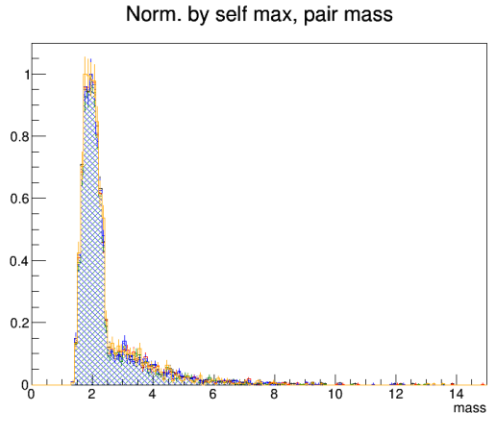
Backup By framework and library version, pair, MC, online update only

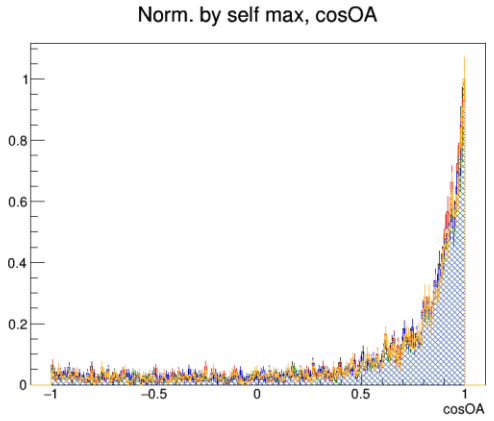




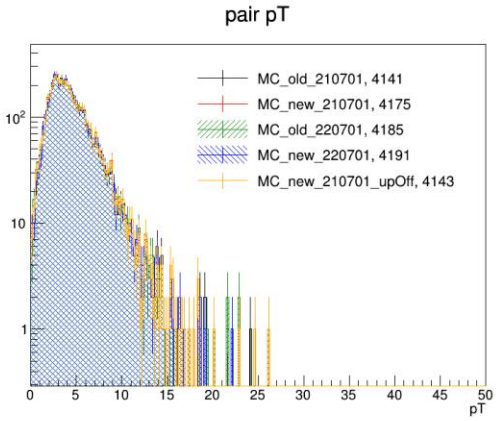


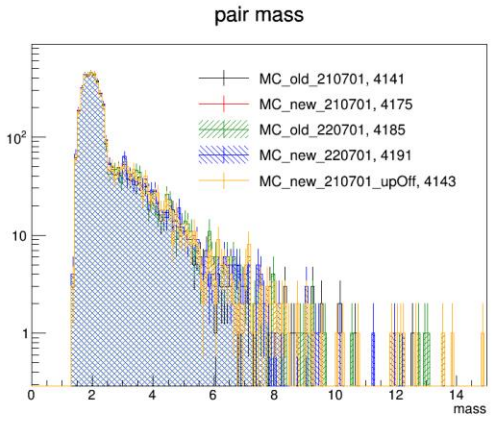


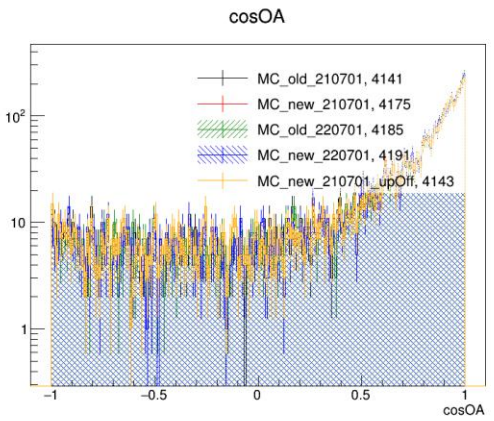


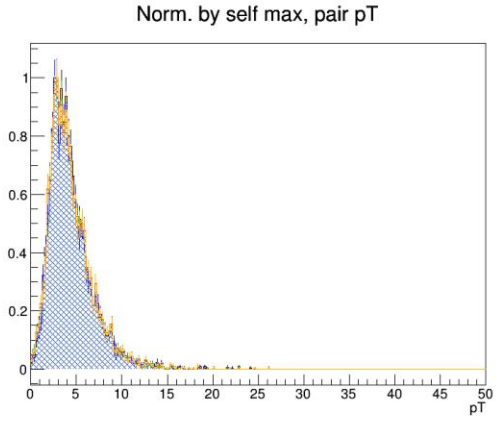


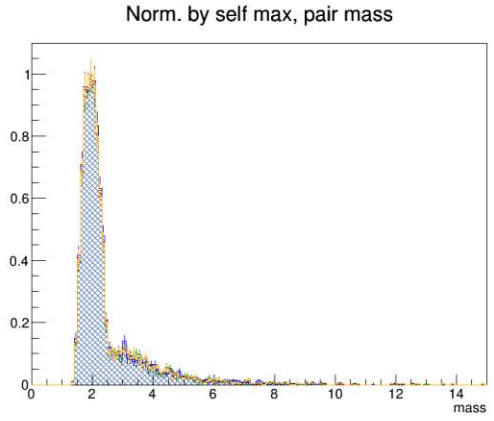
Backup By framework and library version, pair, MC, offline update only

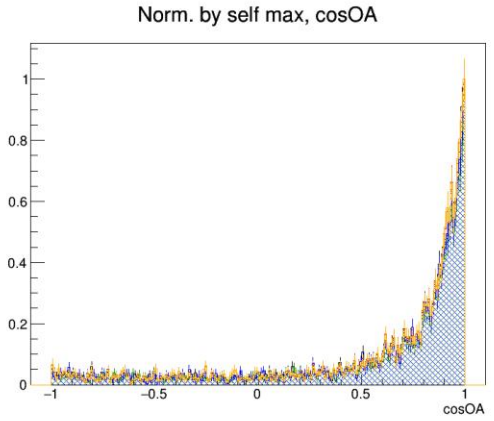




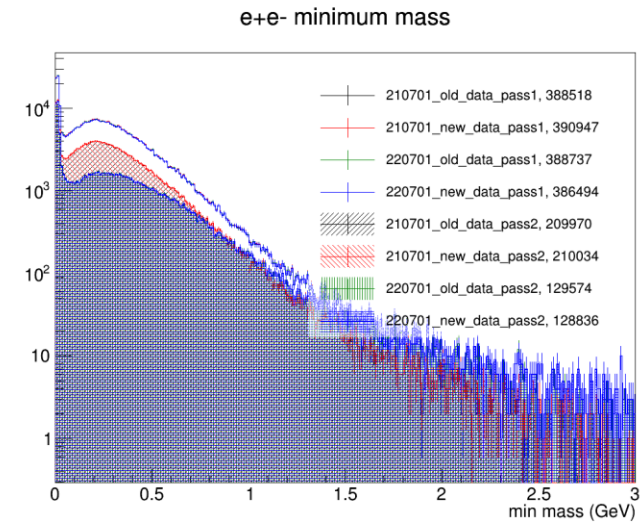


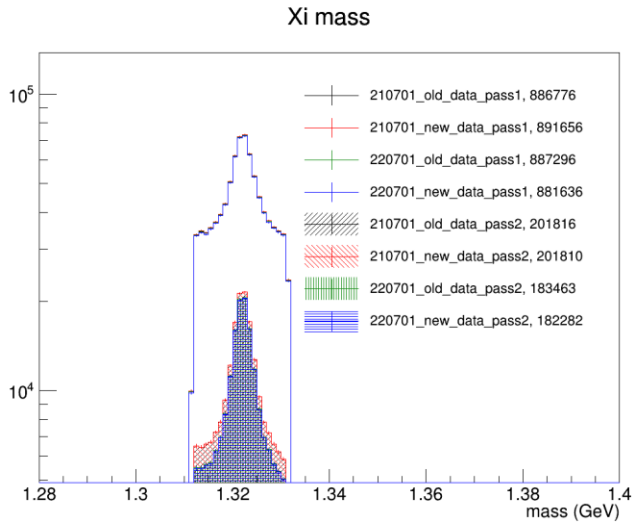


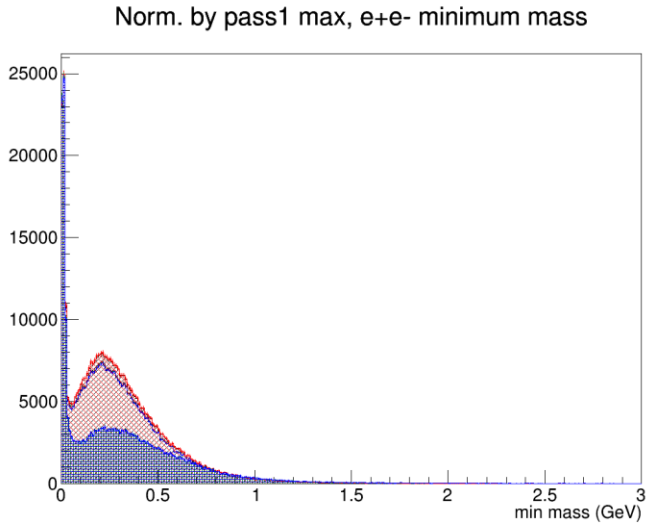


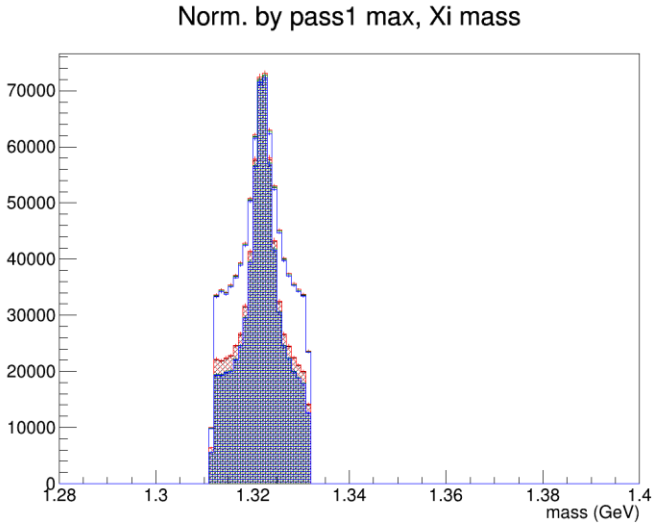


Backup By dataset production level, raw, data, normalized by pass1 max



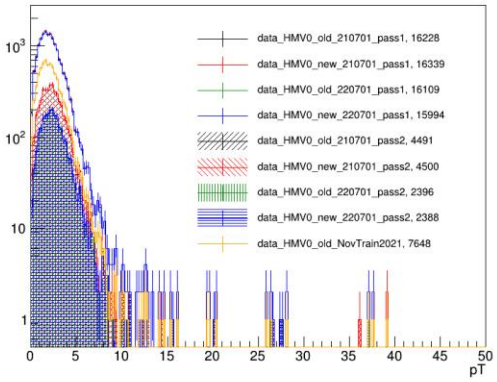




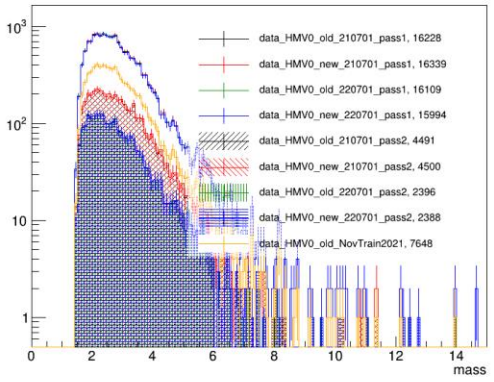


Comparison By dataset production level, pair, data, + Nov. train

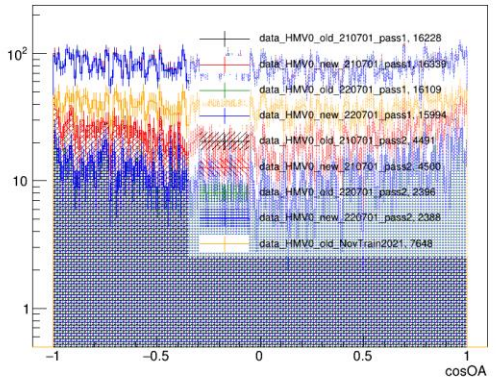
pair pT



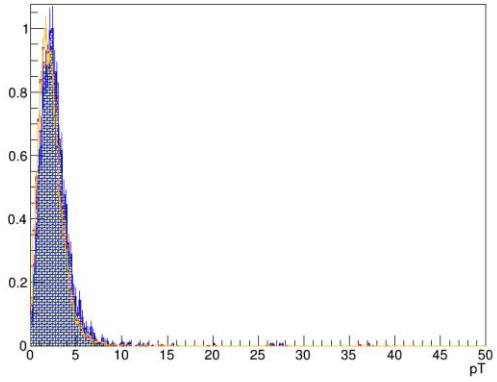
pair mass



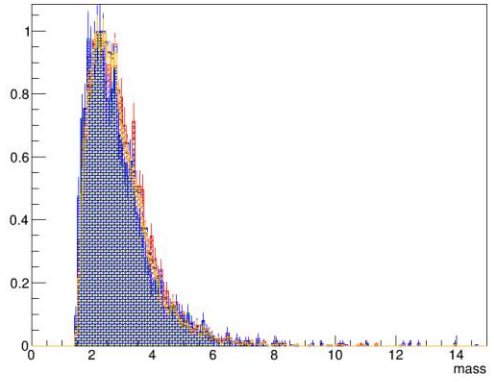
cosOA



Norm. by self max, pair pT



Norm. by self max, pair mass



Norm. by self max, cosOA