Efficiency for L1 DT primiteves

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Outline

Intro

- Look at efficiency for L1DTTrigger;
- Look only at bending primitives: ϕ superlayers (1 and 3);
- Efficiecny definition: $\epsilon = \frac{N}{D}$
  - Numerator:
    - ★ A primitive is present;
    - ★ Consider only correct BX (=0), any code;
    - ★ for legacy and new L1 primitives.
  - Denominator:
    - ★ Some DTDigi are present;
    - ★ Any number of DTDigi
    - ★ Separately for number of Layers and SuperLayers which have at least one Digi;
    - ★ For local position in chamber use centroid of wires with Digis, normalized to chamber width ($x \in [-1., 1.]$)

Details

- `CMSSW_5_3_14`
- latest code from `GIT` repository `battibass/L1IntegratedMuonTrigger.git`
- datasample
  - 100k
  - SingleMu
  - flat pT Gun, $3 < p_T < 140$ *GeV*
  - charge=+1
  - $|\eta| < 0.85$
  - $-30° < \phi < 30°$
  - No PU, No noise

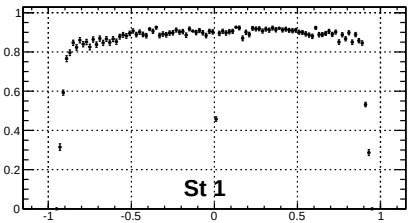
Outline

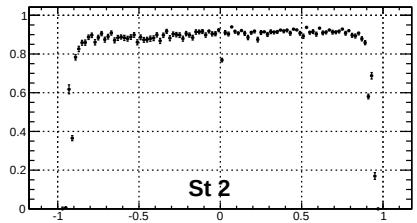
Eff vs chamber position

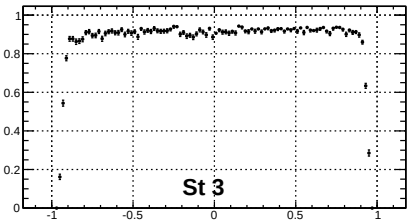
- Showing ϵ for legacy and new primitives as well as ratio New/Legacy
  - grouped per station and per wheel;
  - per chamber granularity is available, but too much stuff to show here.
- only if BX is correct (BX=0)
- Inclusive in term of quality code, and number of Layers or SuperLayers with DTDigis;
  - Exclusive efficiency later;
- Drop at border of chamber (acceptance);
- for Station 1 and 2 (all wheel) a hole at $x = 0$, maybe a bug in how the DTDigi centroid is computed: checking;
- Some % of ϵ drop from Legacy to New, but for Station 4

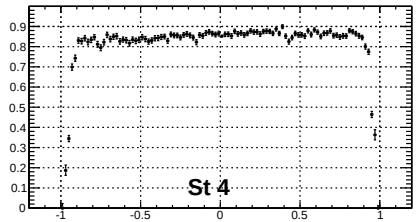
Efficiency vs Chamber position by Station

Legacy

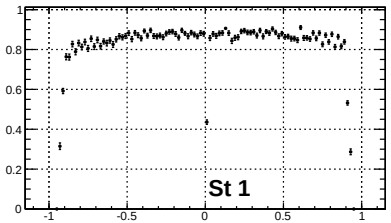


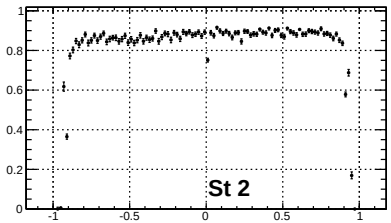


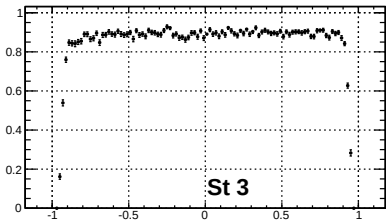


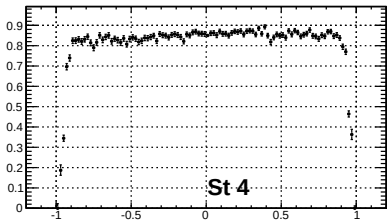


New



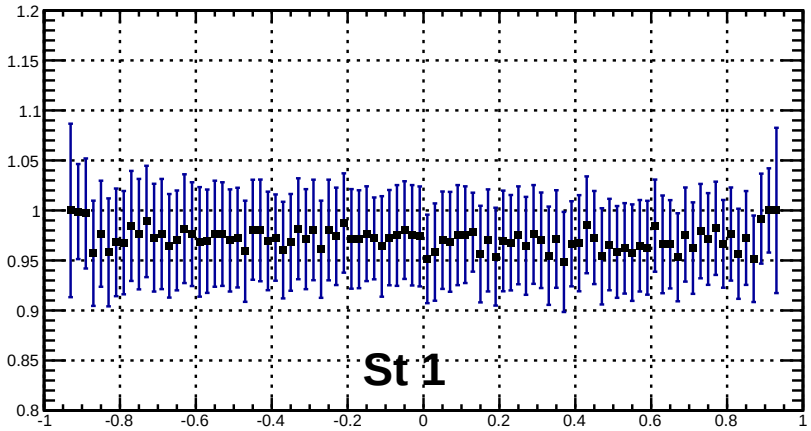


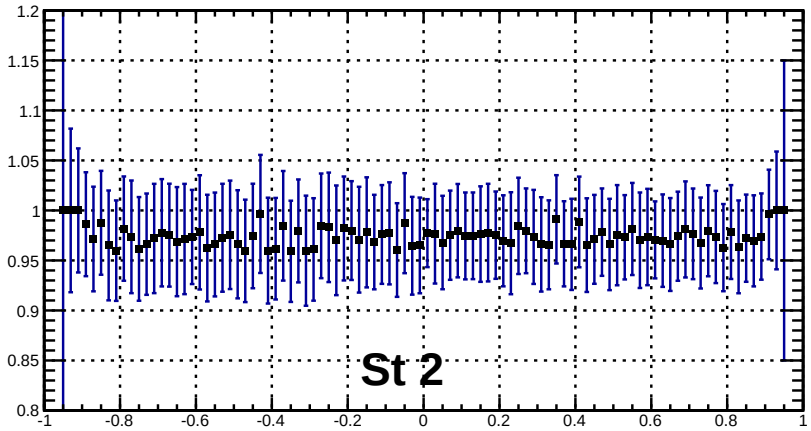


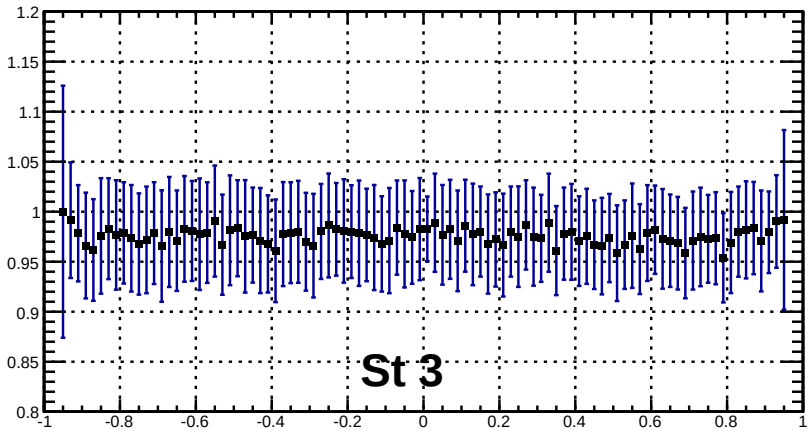


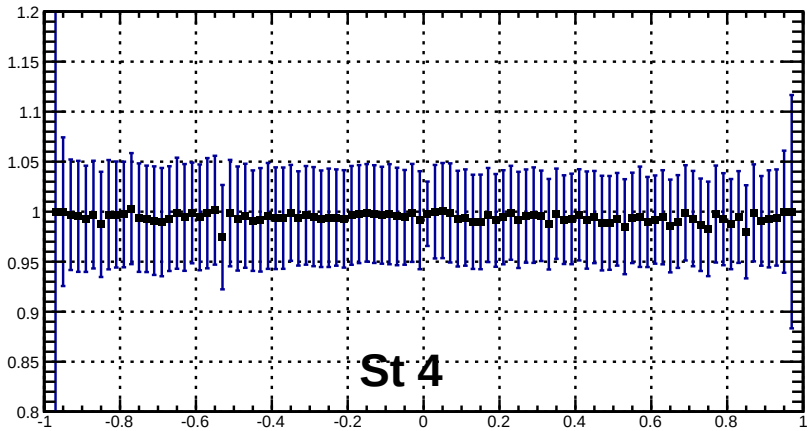
Efficiency vs Chamber position by Station

New/Legacy



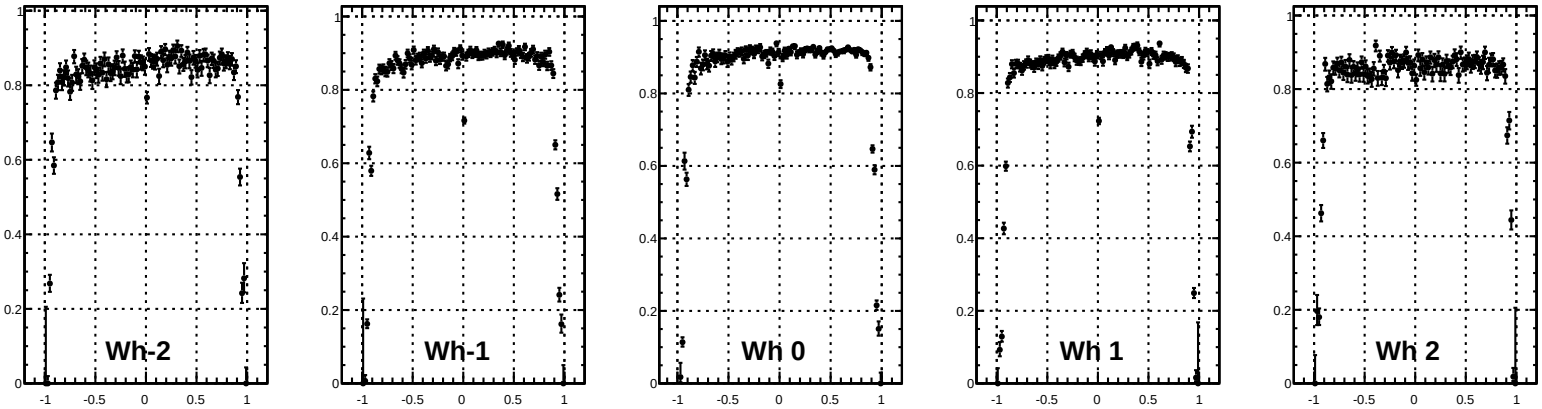




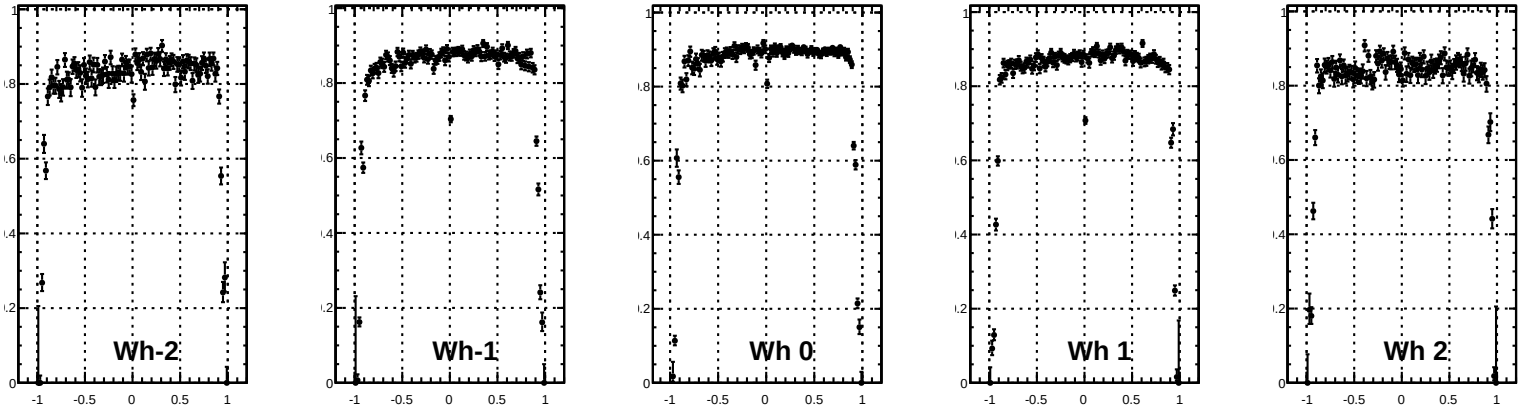


Efficiency vs Chamber position by Wheel

Legacy

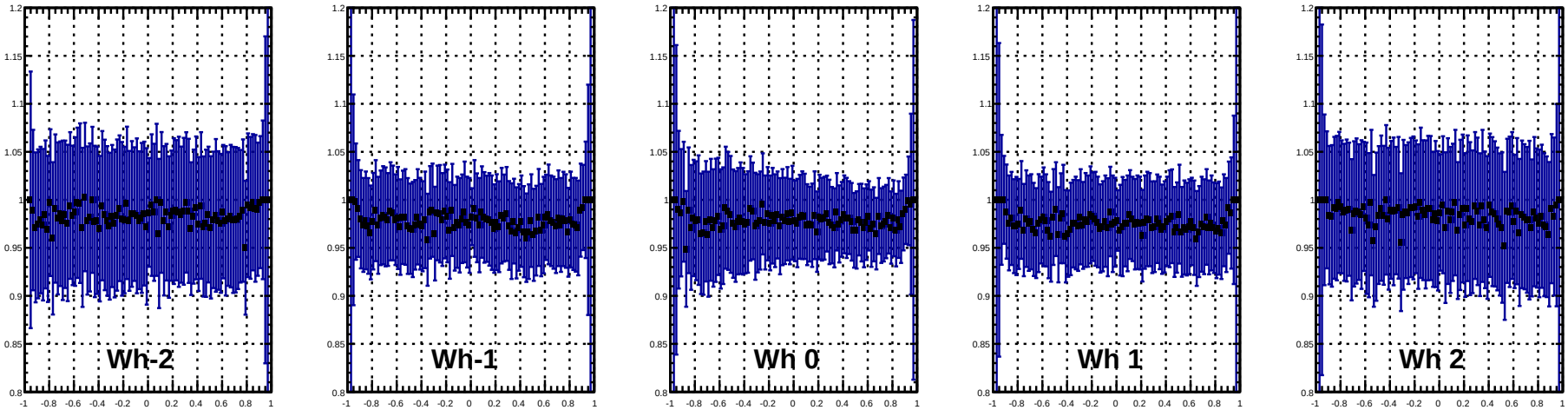


New



Efficiency vs Chamber position by Wheel

New/Legacy



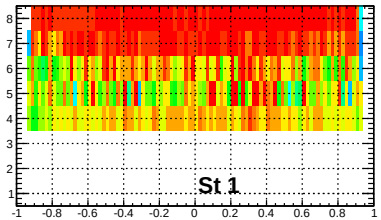
Outline

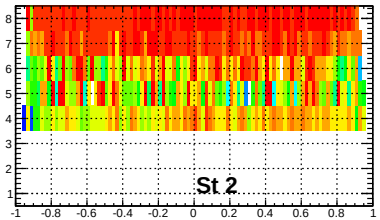
Eff vs chamber position vs n Layers

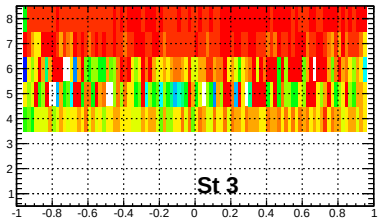
- Showing ϵ for legacy and new primitives as well as ratio New/Legacy
  - grouped per station and per wheel;
  - per chamber granularity is available, but too much stuff to show here.
- only if BX is correct (BX=0)
- Inclusive in term of quality code
- **As a function of Num of Layers with at least one DTDigi**
  - NB: considering only ϕ Layers (SL=1,3, max N layers=8)
- ϵ drops only for nLayers=8 (and some for nLayers=7)

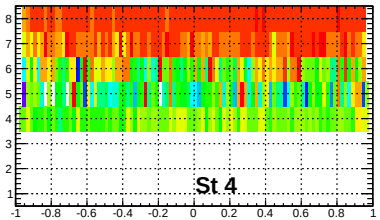
Efficiency vs Chamber position vs #Layers by Station

Legacy

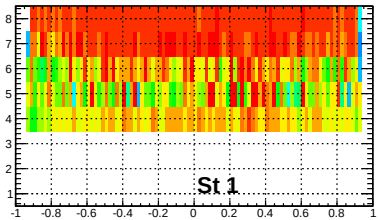


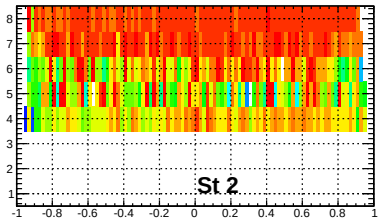


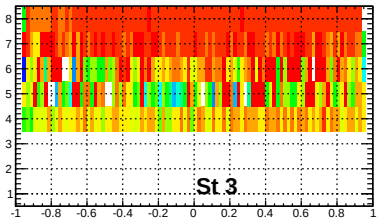


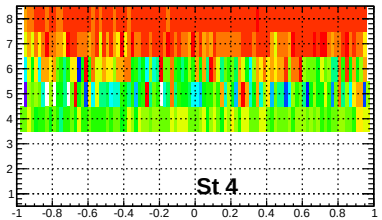


New



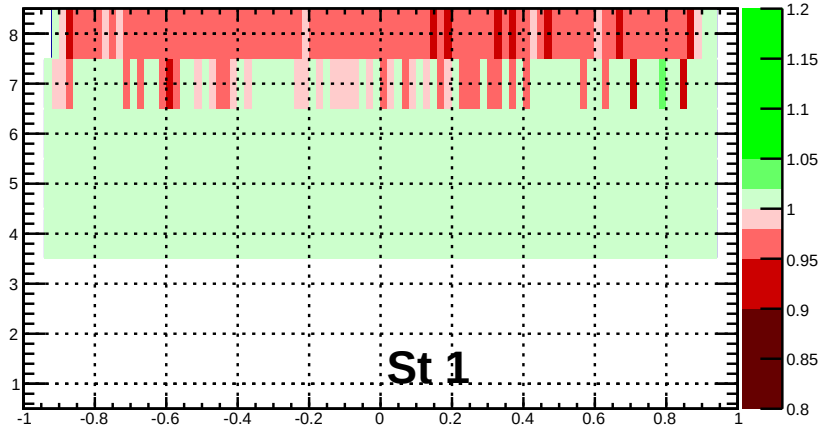


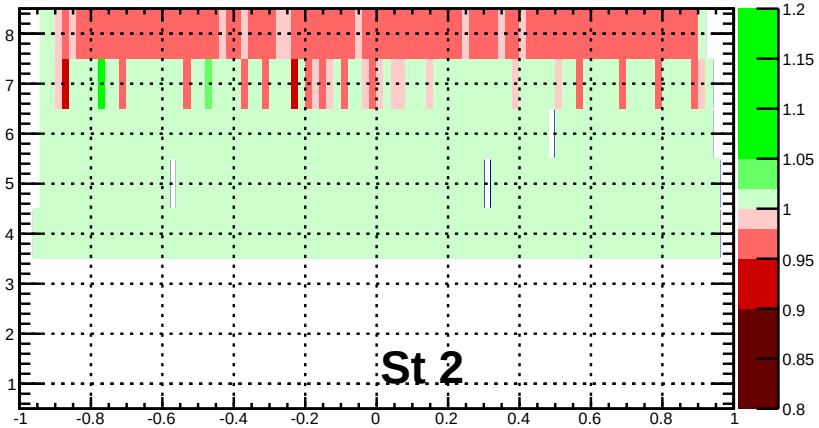


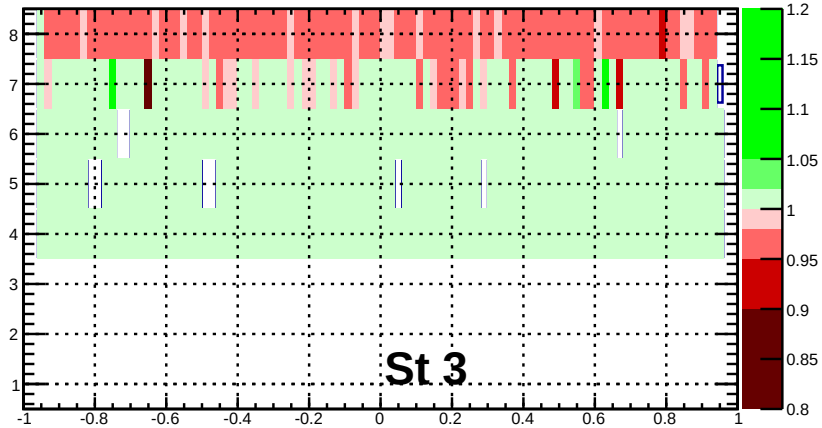


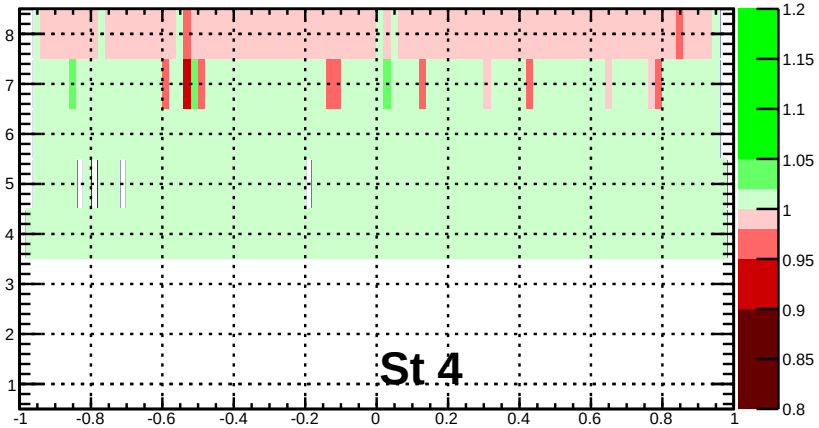
Efficiency vs Chamber position vs #Layers by Station

New/Legacy



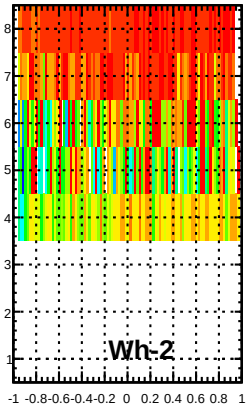


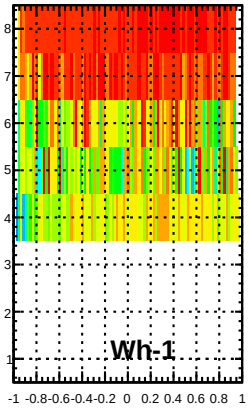


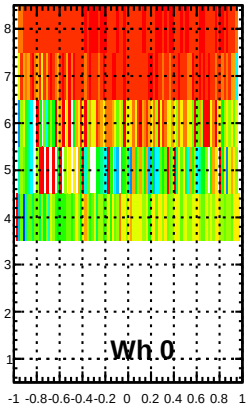


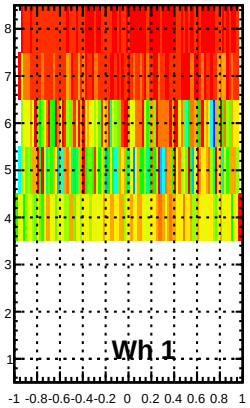
Efficiency vs Chamber position vs #Layers by Wheel

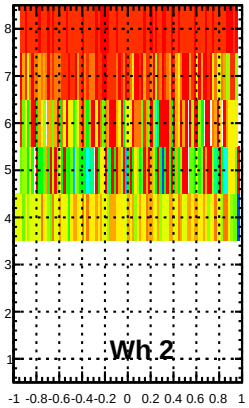
Legacy



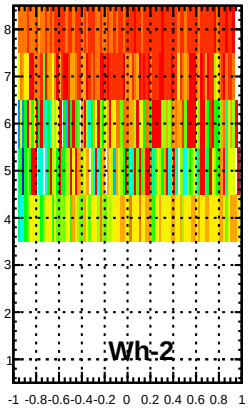


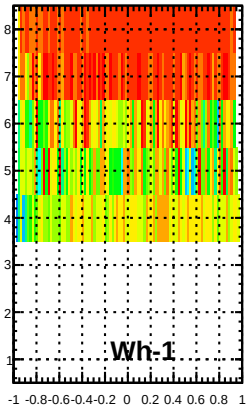


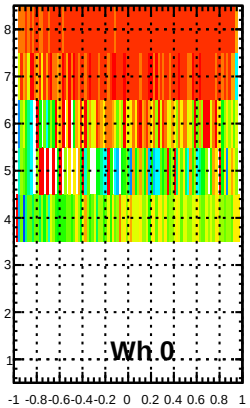


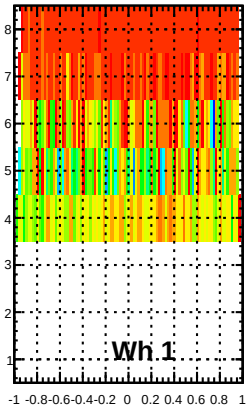


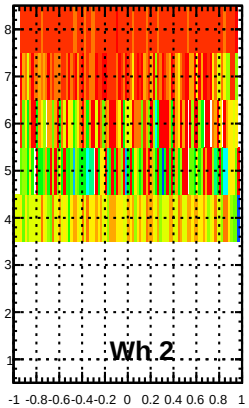
New





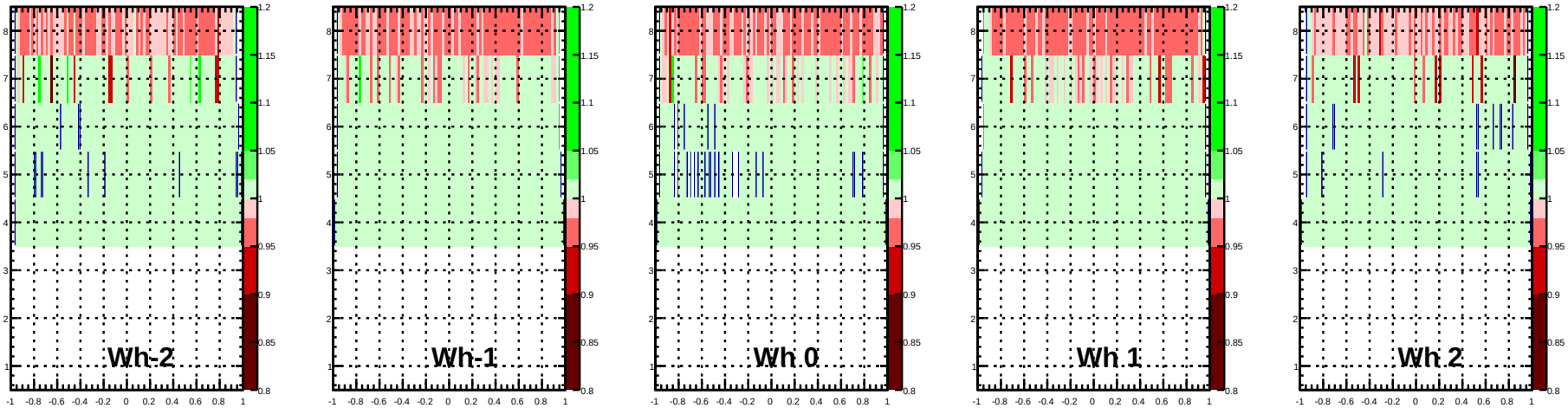






Efficiency vs Chamber position vs #Layers by Wheel

New/Legacy



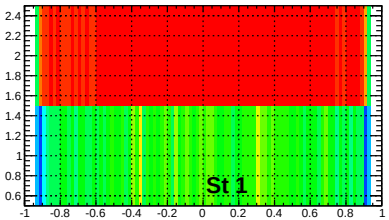
Outline

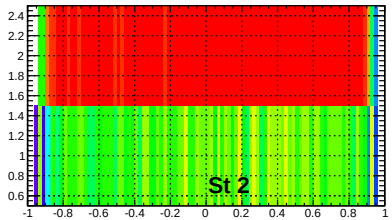
Eff vs chamber position vs n SL

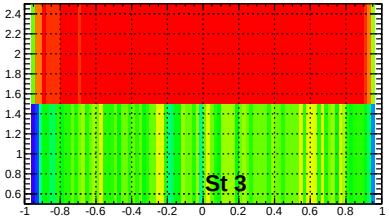
- Showing ϵ for legacy and new primitives as well as ratio New/Legacy
  - grouped per station and per wheel;
  - per chamber granularity is available, but too much stuff to show here.
- only if BX is correct (BX=0)
- Inclusive in term of quality code
- **As a function of Num of SuperLayers with at least one DTDigi**
  - NB: considering only ϕ SL (1,3)
- Show also ϵ vs pos for nSL=1 and nSL=2
- ϵ drops only for nSL=2, not at the border of the chambers, and much less for Station 4

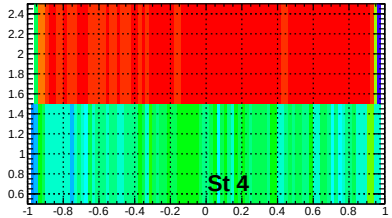
Efficiency vs Chamber position vs #SL by Station

Legacy

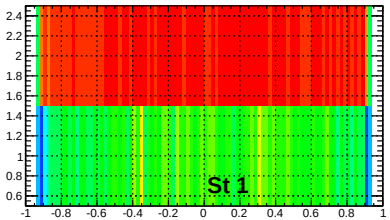


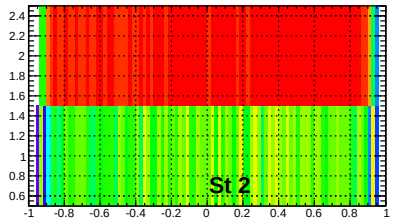


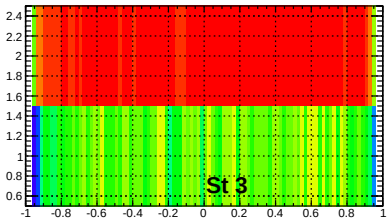


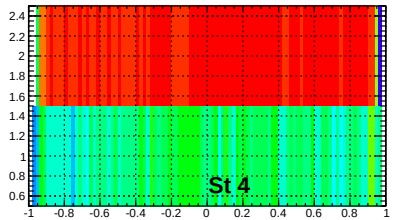


New



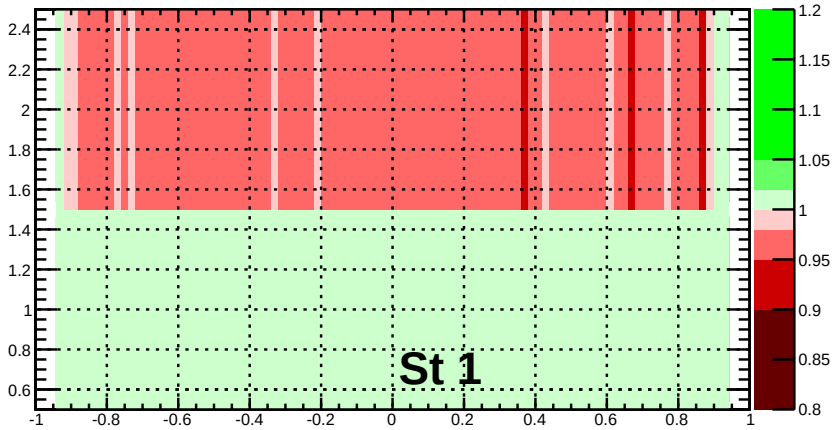


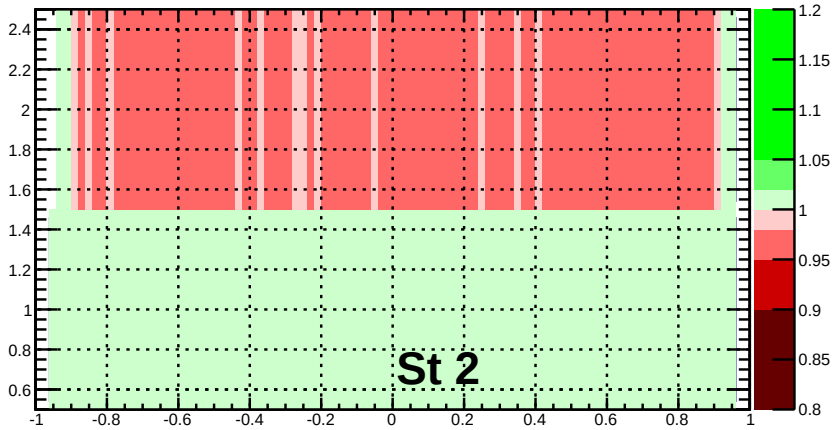


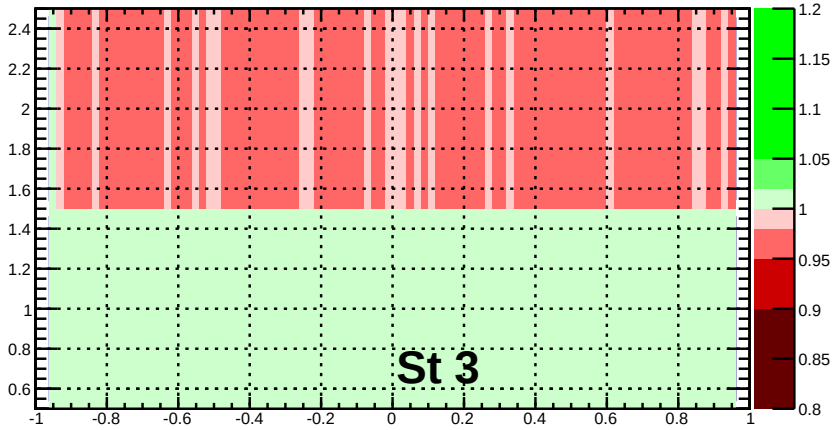


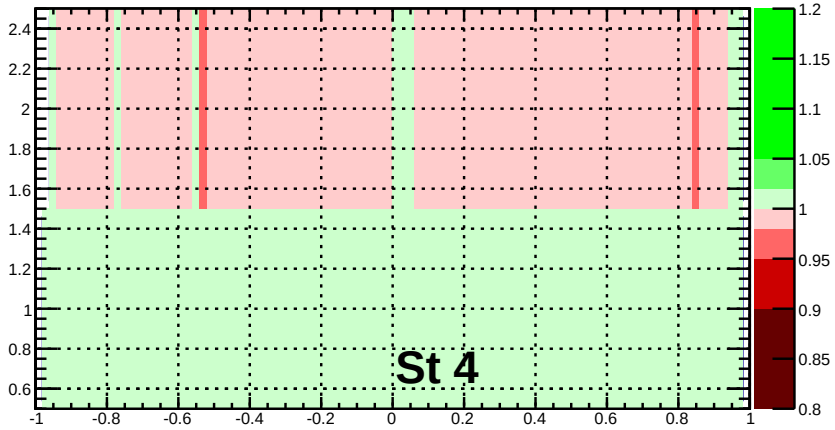
Efficiency vs Chamber position vs #SL by Station

New/Legacy



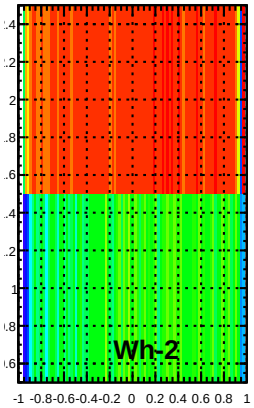


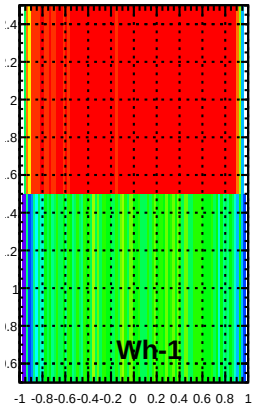


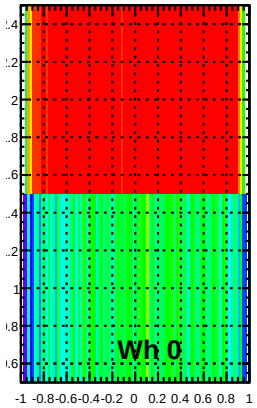


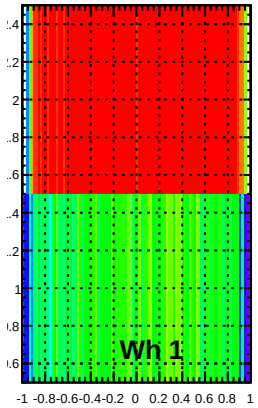
Efficiency vs Chamber position vs #SL by Wheel

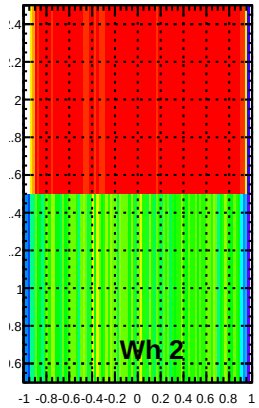
Legacy



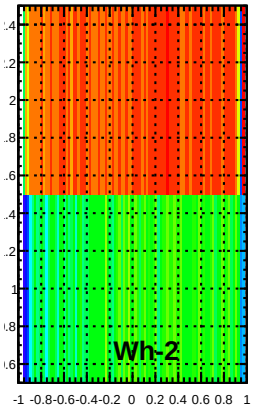


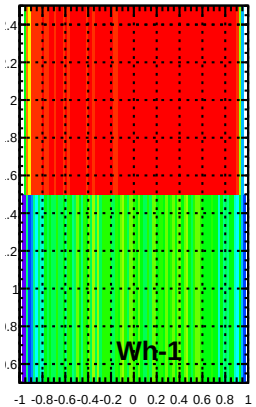


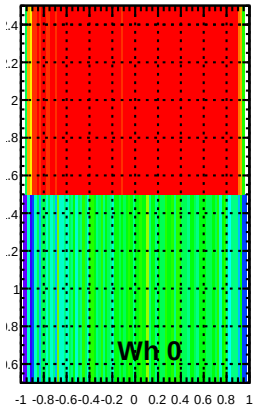


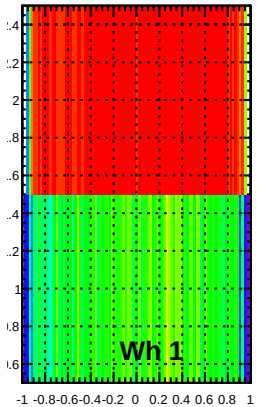


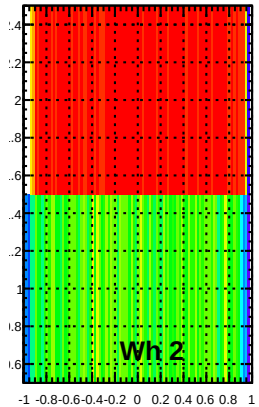
New





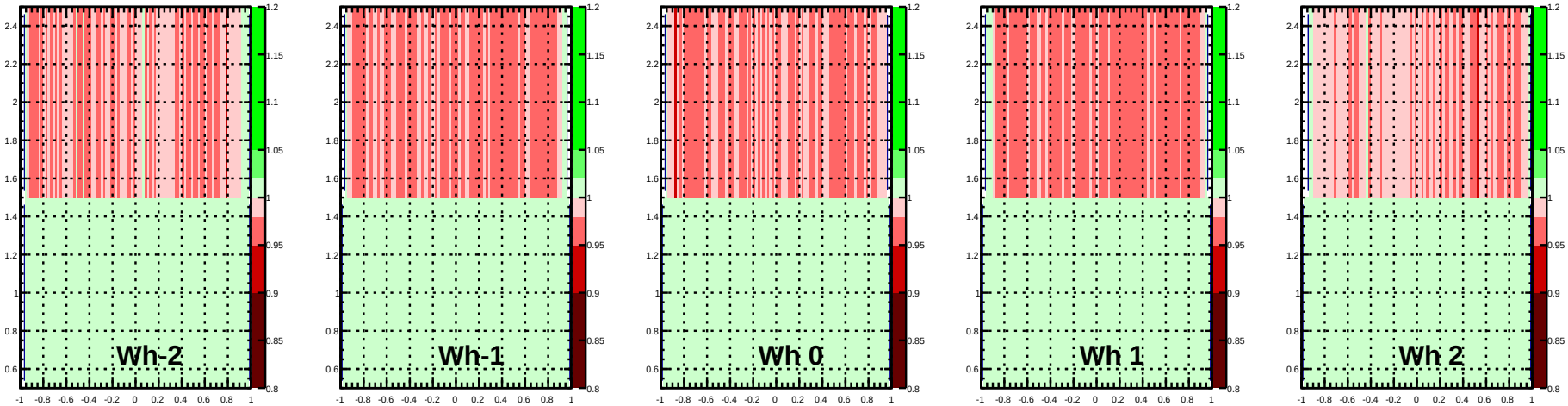






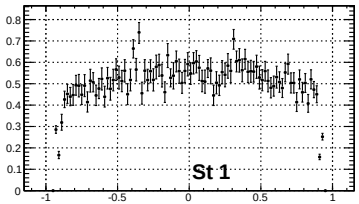
Efficiency vs Chamber position vs #SL by Wheel

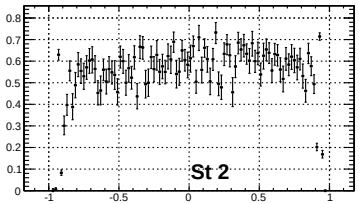
New/Legacy

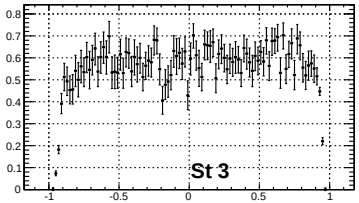


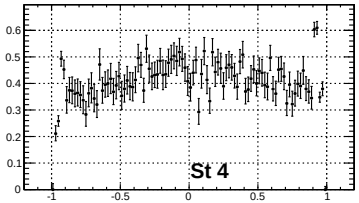
Efficiency vs Chamber position #SL==1 by Station

Legacy









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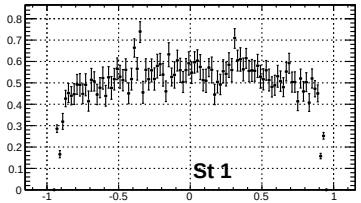
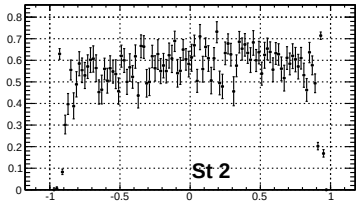
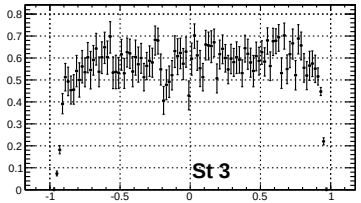
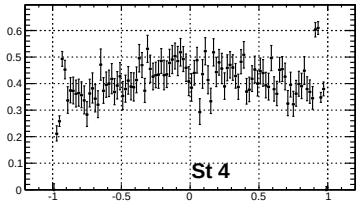


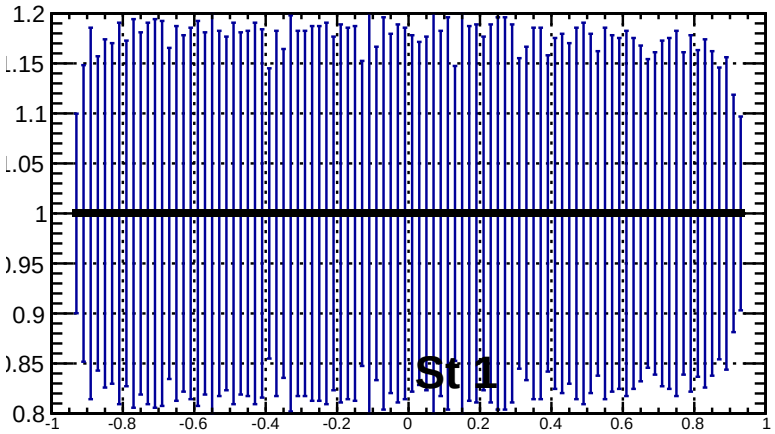


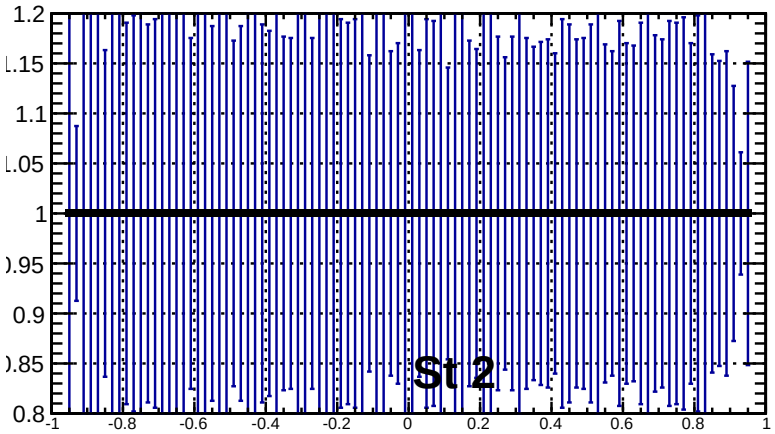


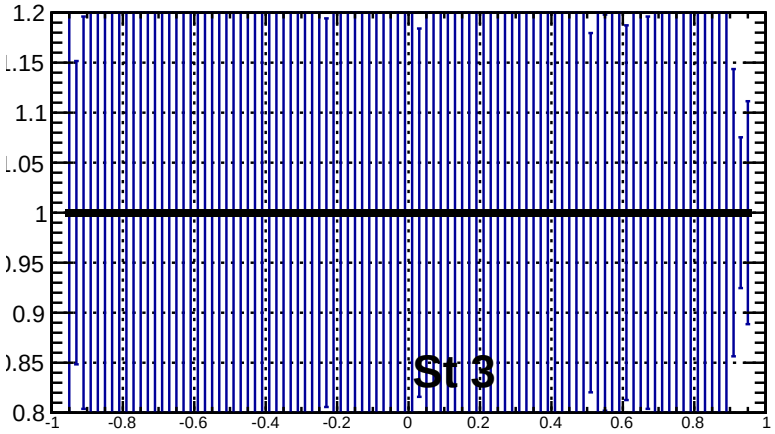


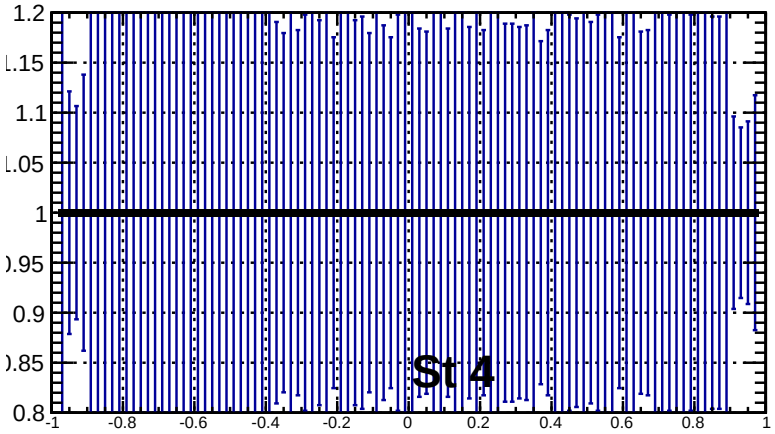
Efficiency vs Chamber position vs #SL by Station

New/Legacy



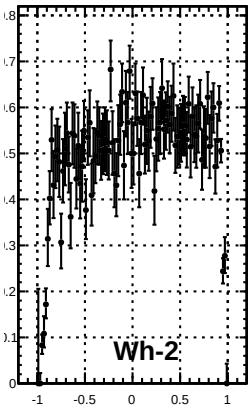


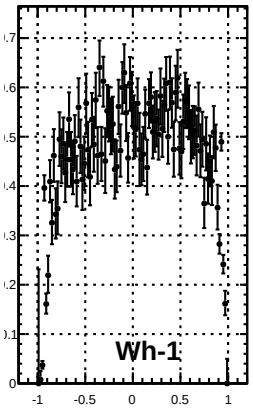


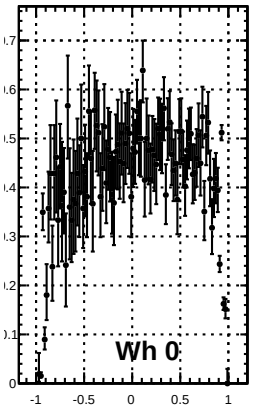


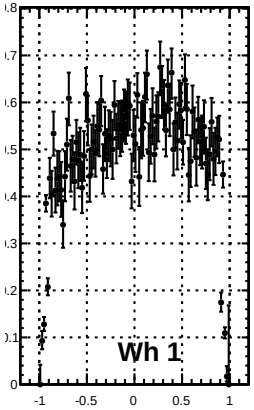
Efficiency vs Chamber position #SL==1 by Wheel

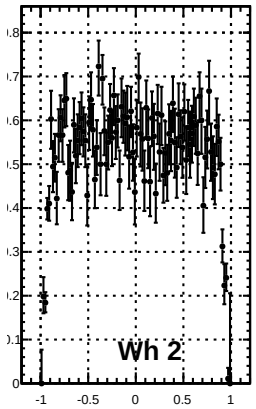
Legacy



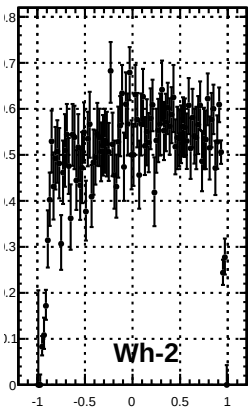


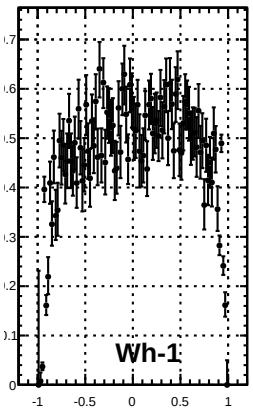


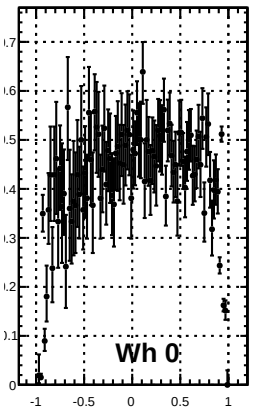


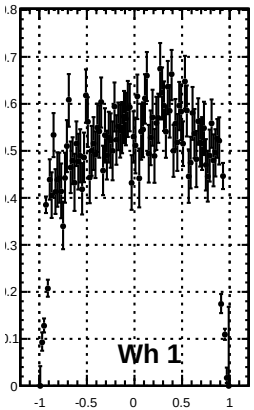


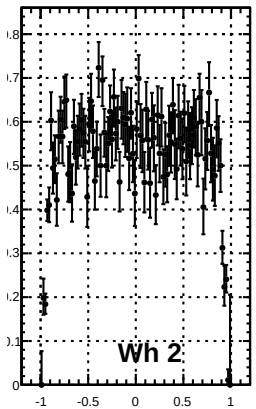
New





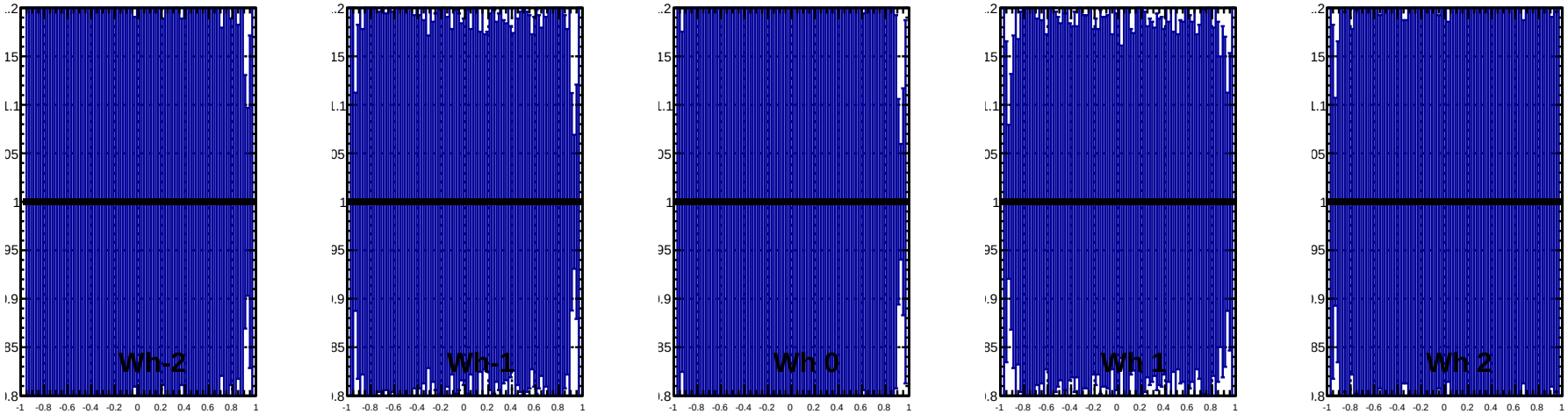






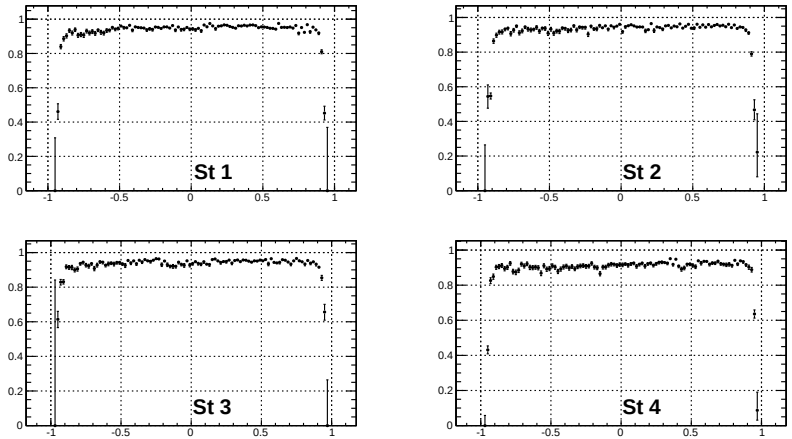
Efficiency vs Chamber position vs #SL by Wheel

New/Legacy

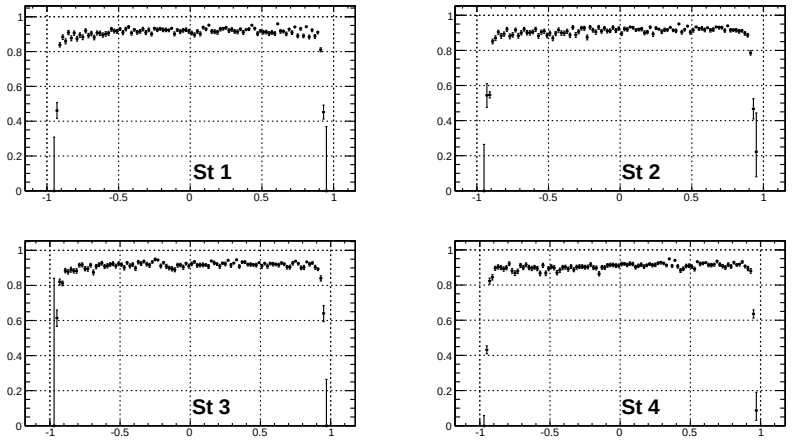


Efficiency vs Chamber position #SL==2 by Station

Legacy

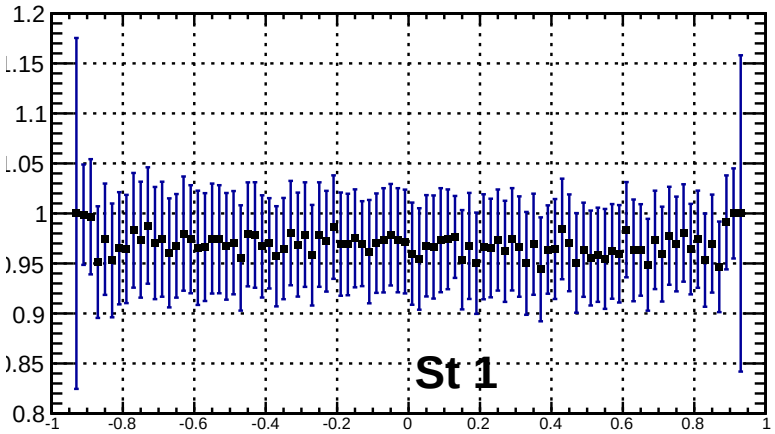


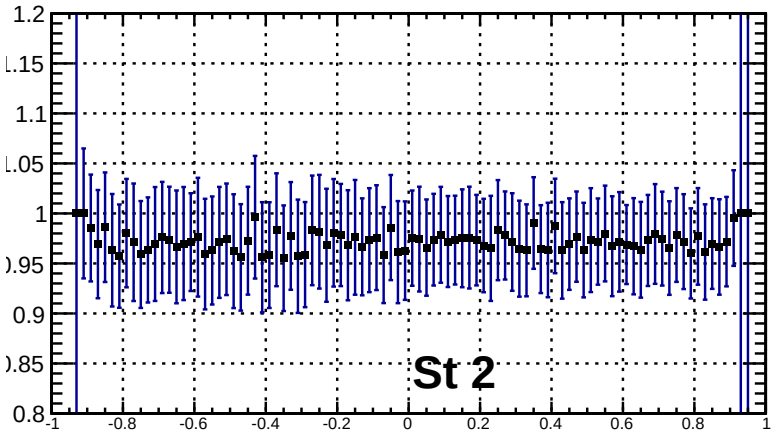
New

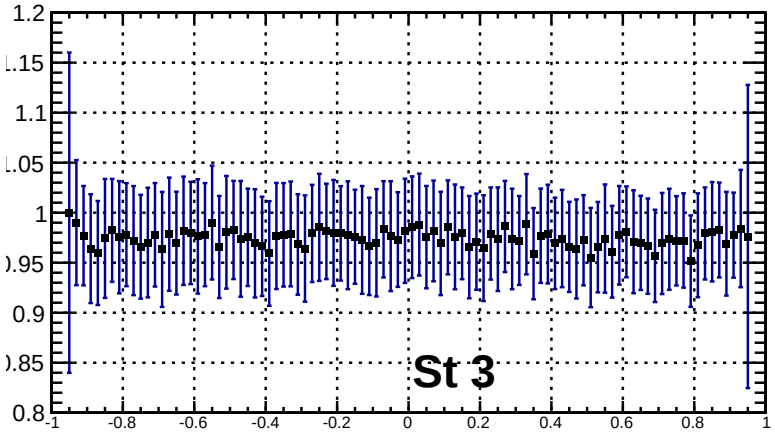


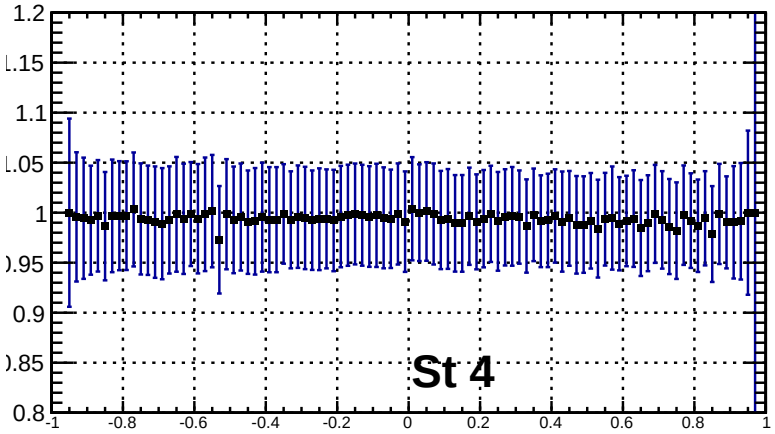
Efficiency vs Chamber position #SL==2 by Station

New/Legacy



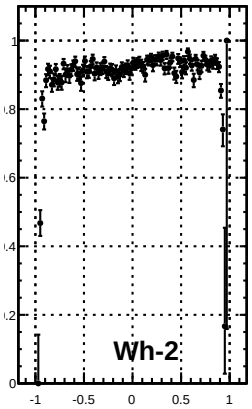


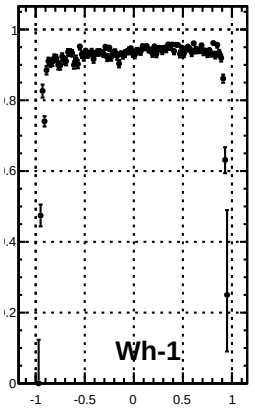


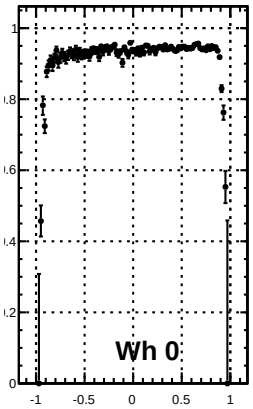


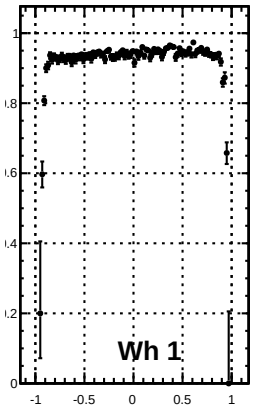
Efficiency vs Chamber position #SL==2 by Wheel

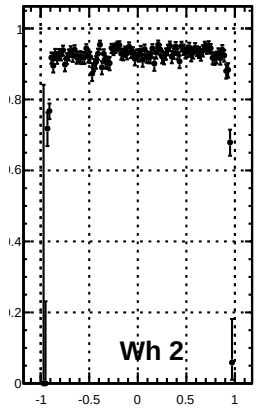
Legacy



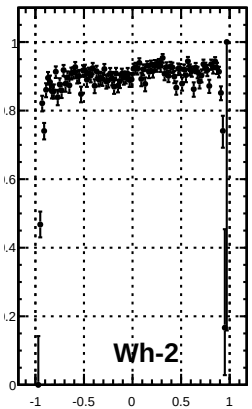


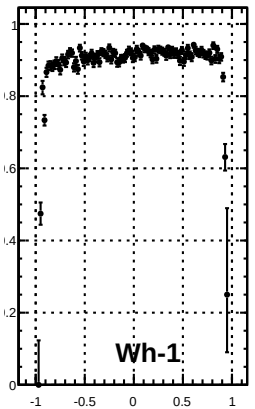


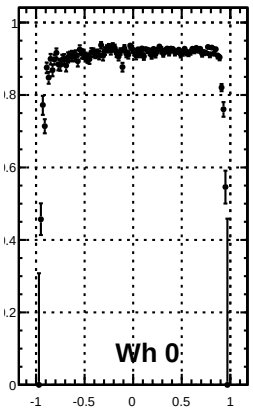


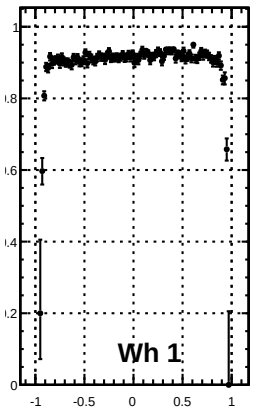


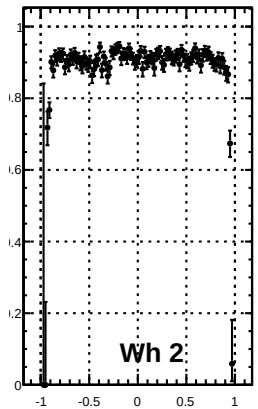
New





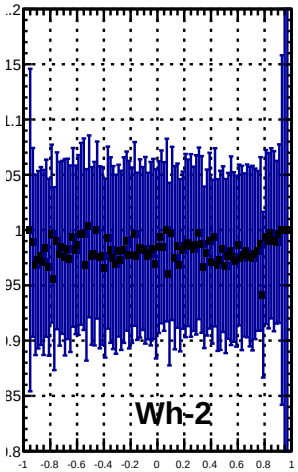


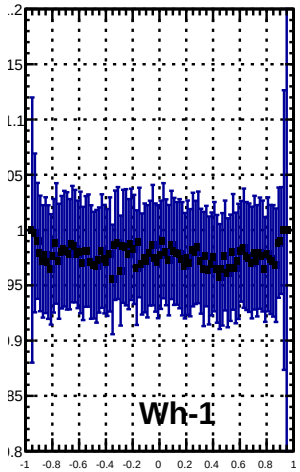


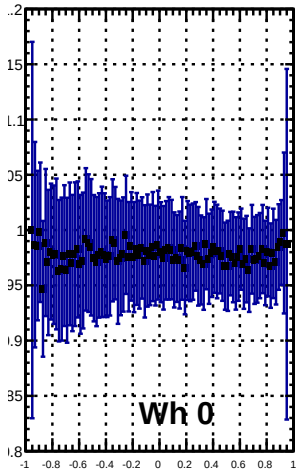


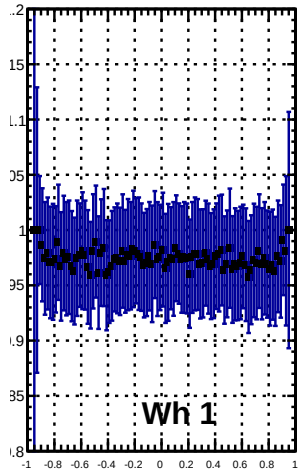
Efficiency vs Chamber position #SL==2 by Wheel

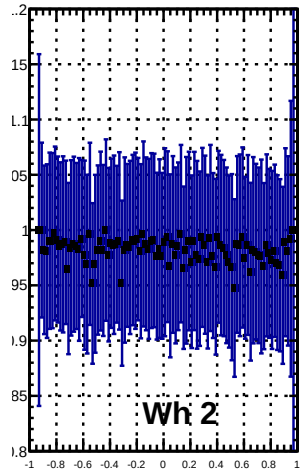
New/Legacy











Outline

Primitives vs Code

- Study the Primitive distribution as a function of chamber position
- Subdivided for different Quality Code;

Legacy

- LI, LO never used.
- at chamber edge: HI (almost no HO)
- Almost no HO for wheel0 and nSL=1

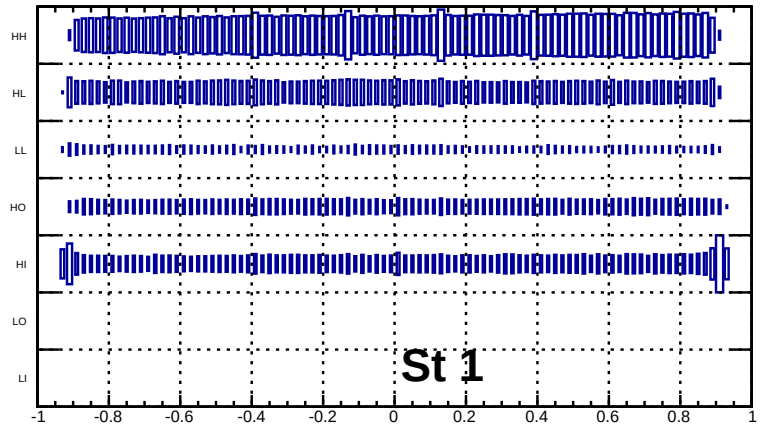
New

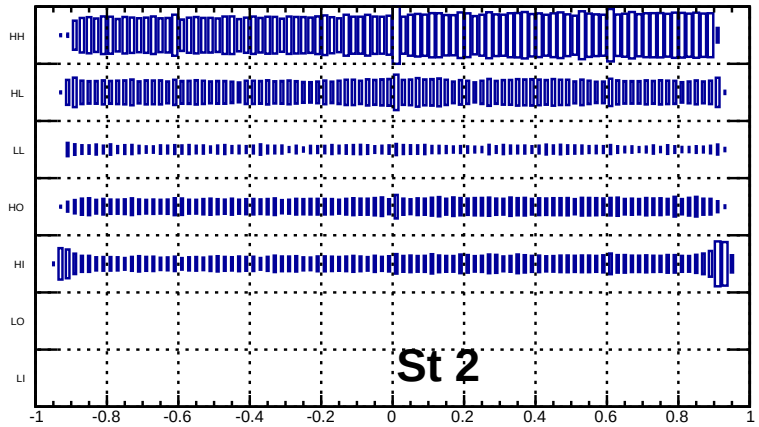
- at chamber edge: HI+RPC (almost no HO)
- HO similar to HO+RPC St3 and St4 (no outer RPC)
- Almost all HO+RPC for wheel0 and nSL=1

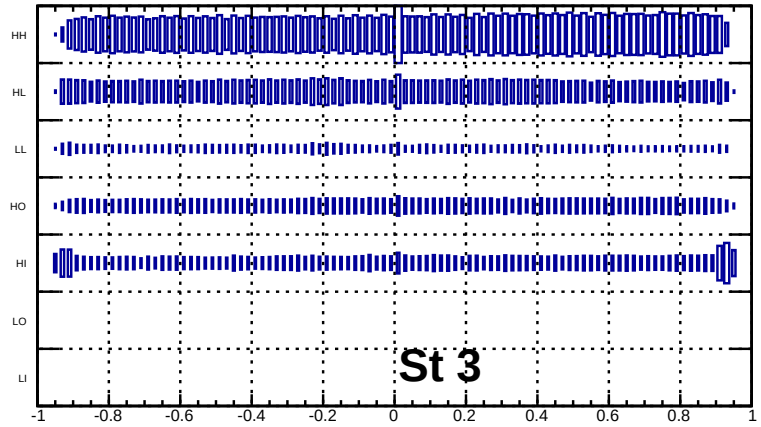
Code	Legacy	New
1	LI	HI
2	LO	HO
3	HI	HI+RPC
4	HO	HO+RPC
5	LL	(HI+HO)+ RPC@bx0
6	HL	(LL || HL)
7	HH	HH

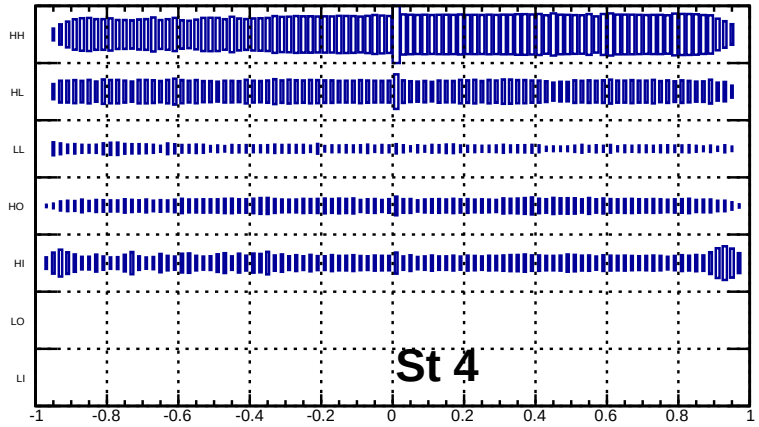
N primitives vs Chamber position vs Code by Station

Legacy



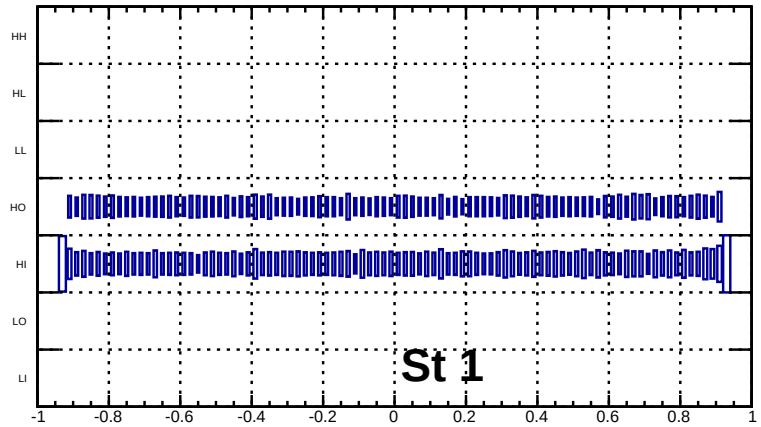


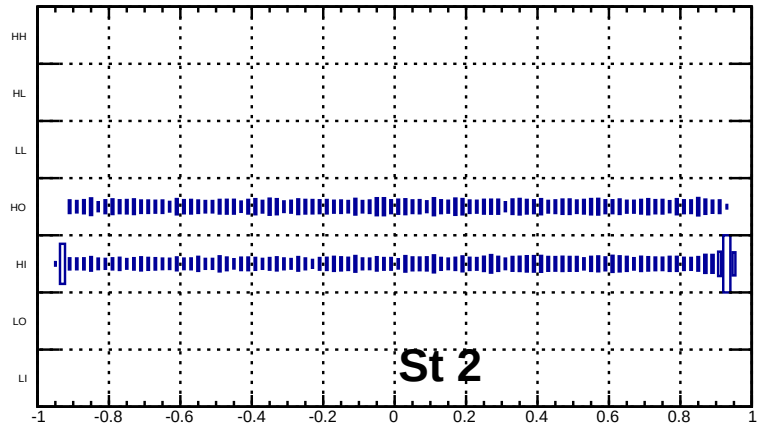


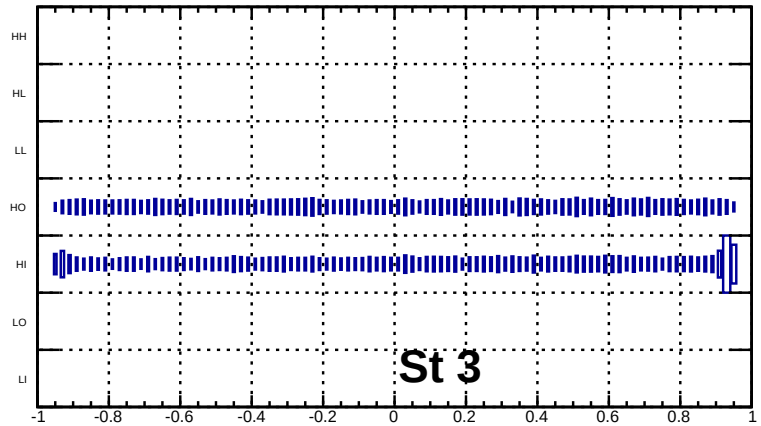


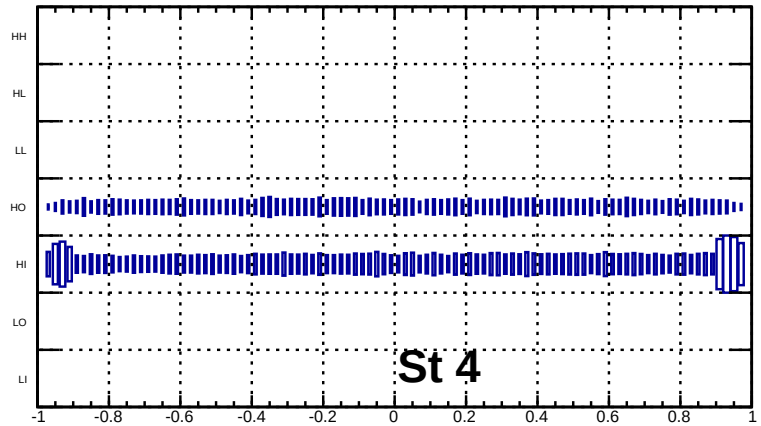
N primitives vs Chamber pos vs Code by Station vs nSL

Legacy n SL=1



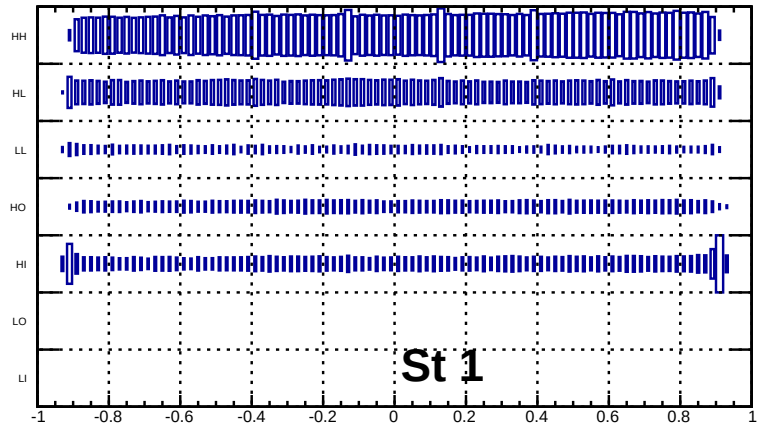


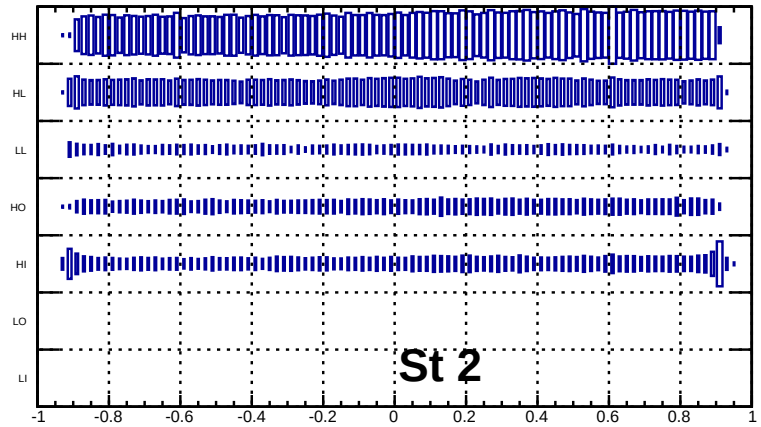


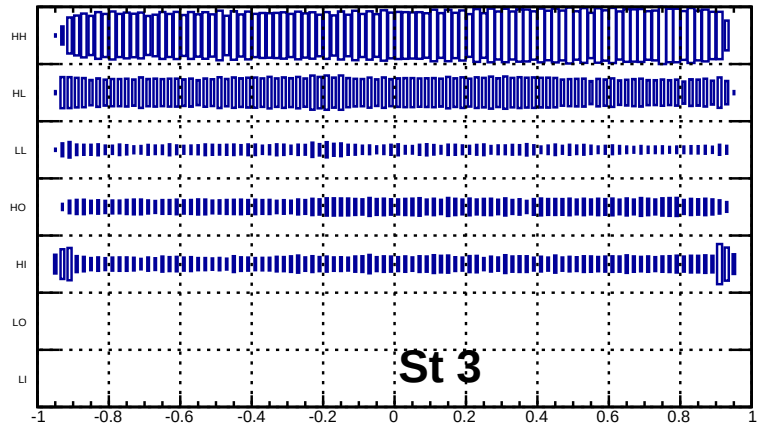


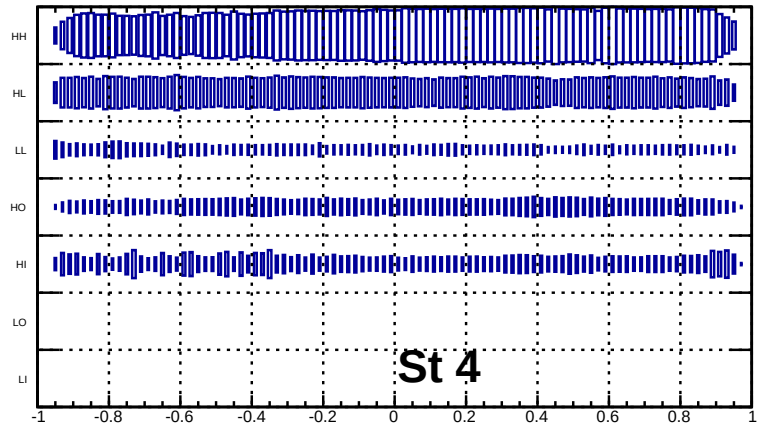
N primitives vs Chamber pos vs Code by Station vs nSL

Legacy n SL=2



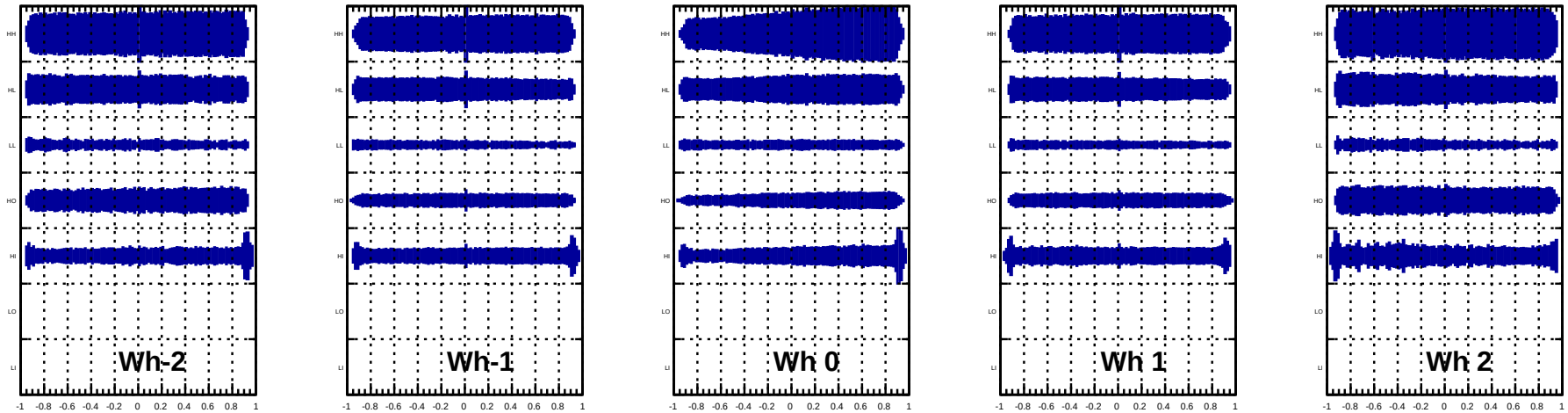






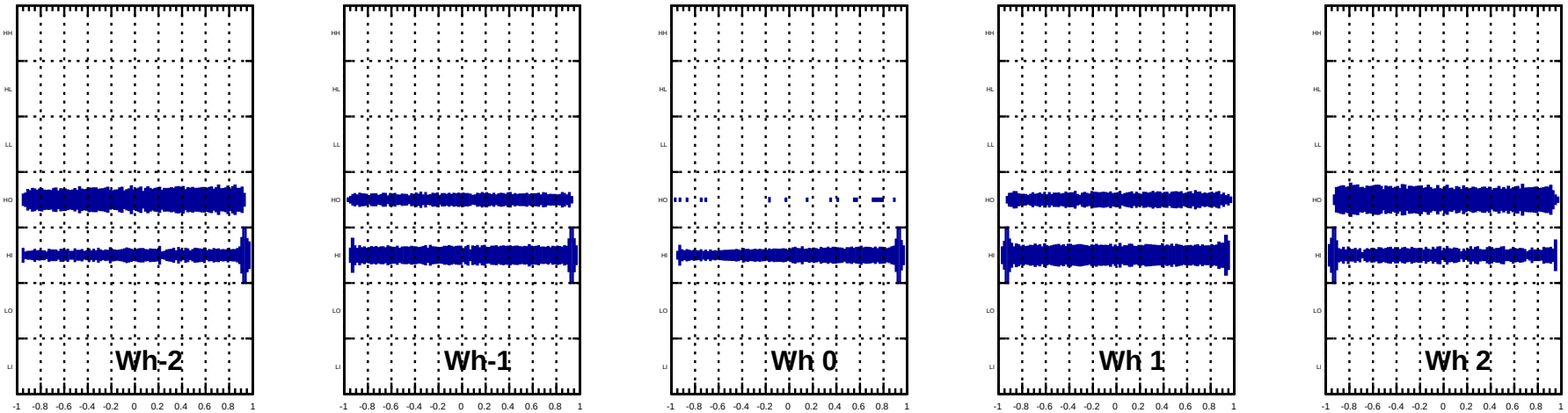
N primitives vs Chamber position vs Code by Wheel

Legacy



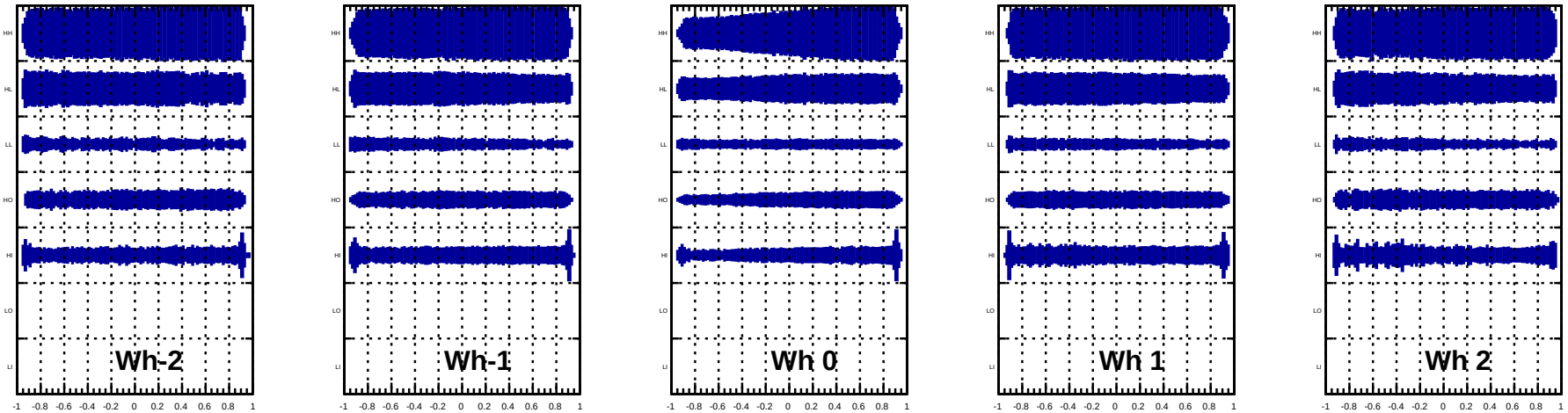
N primitives vs Chamber position vs Code by Wheel vs nSL

Legacy n SL=1



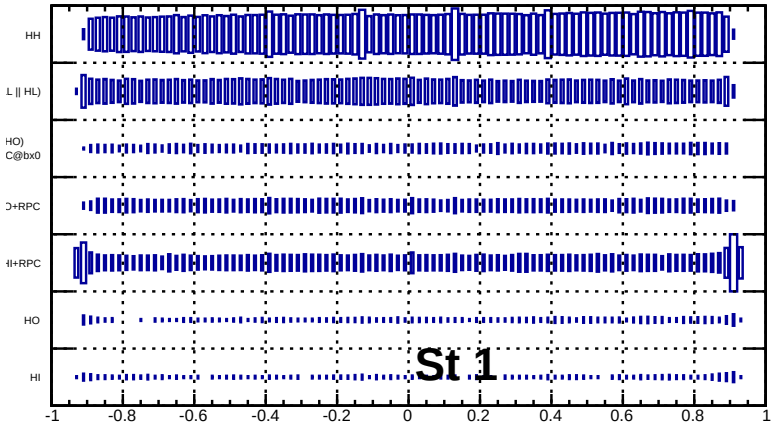
N primitives vs Chamber position vs Code by Wheel vs nSL

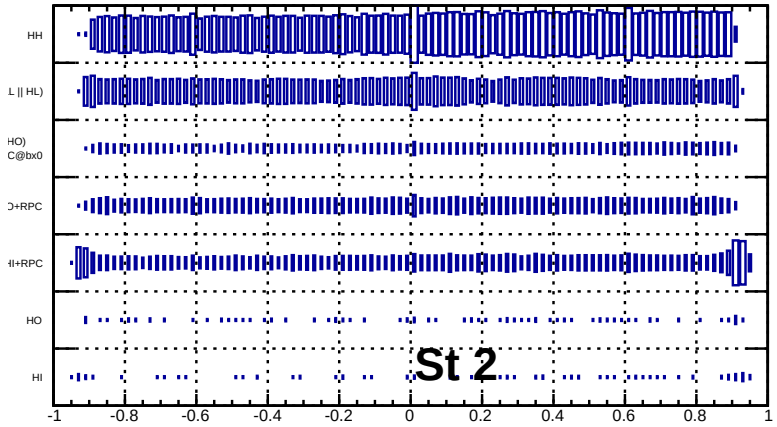
Legacy n SL=2

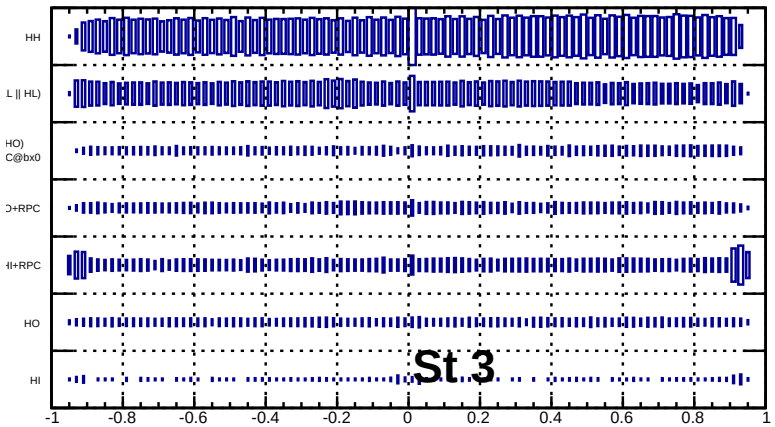


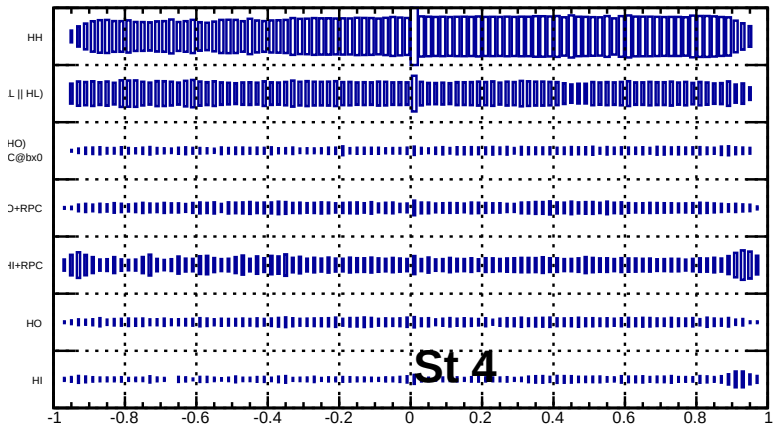
N primitives vs Chamber position vs Code by Station

New



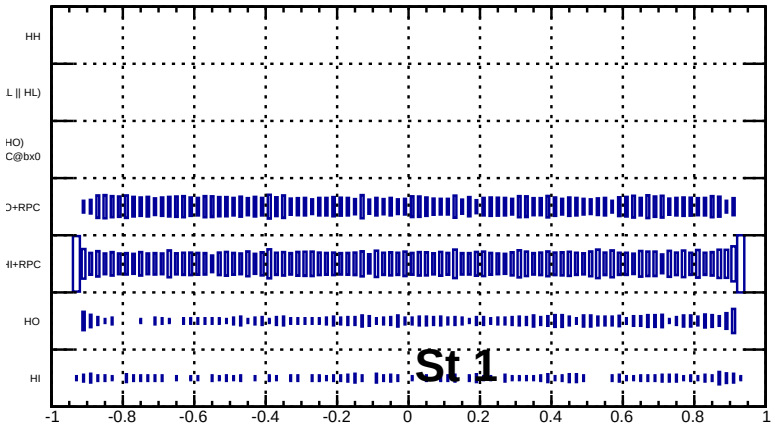


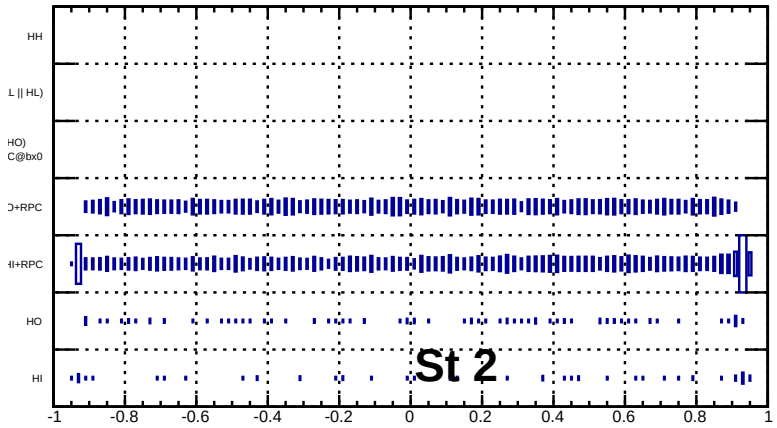


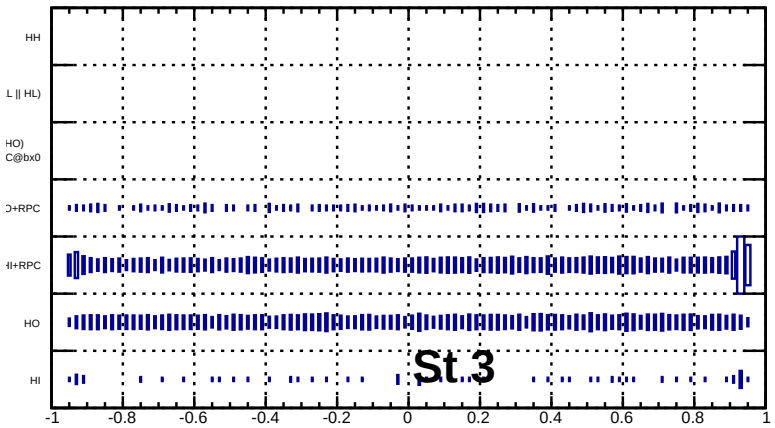


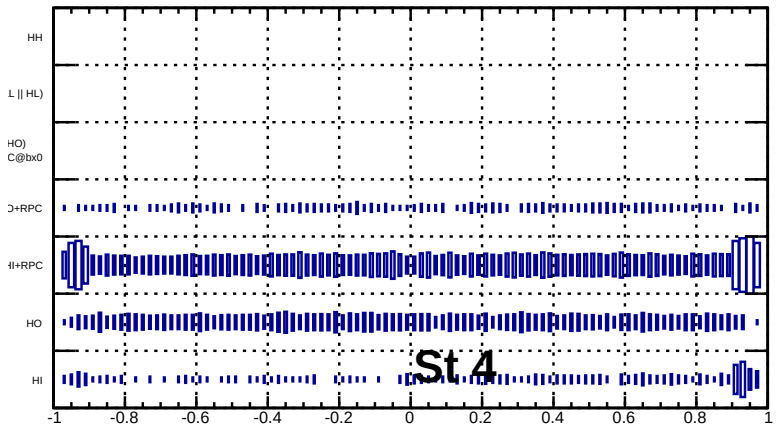
N primitives vs Chamber pos vs Code by Station vs nSL

New n SL=1



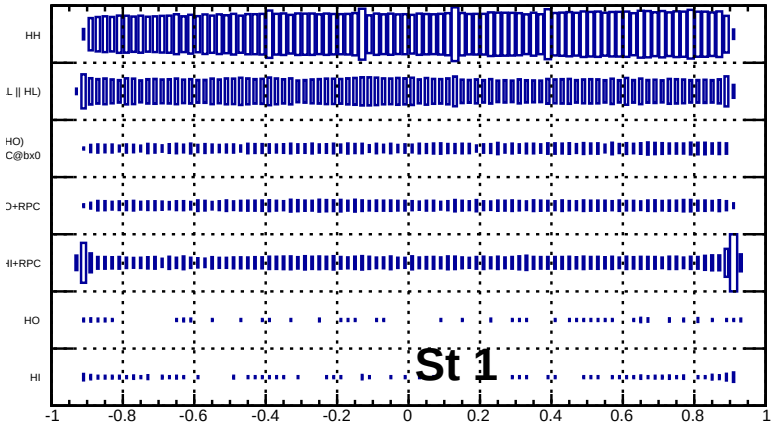


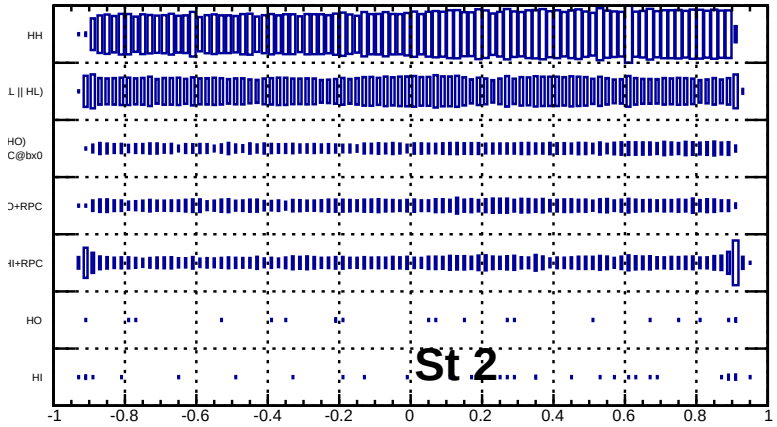


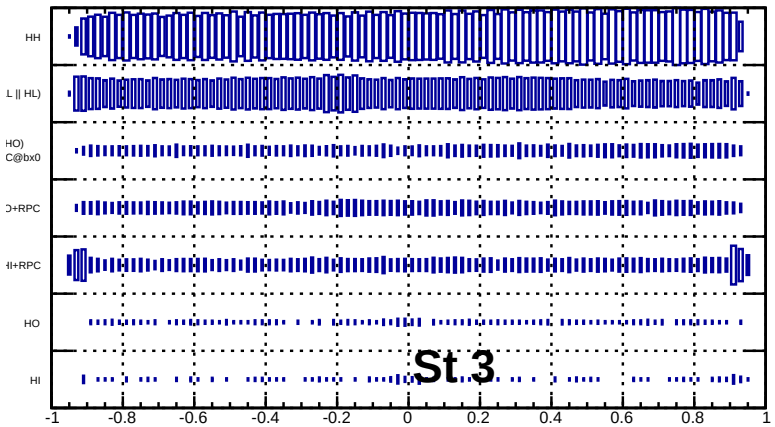


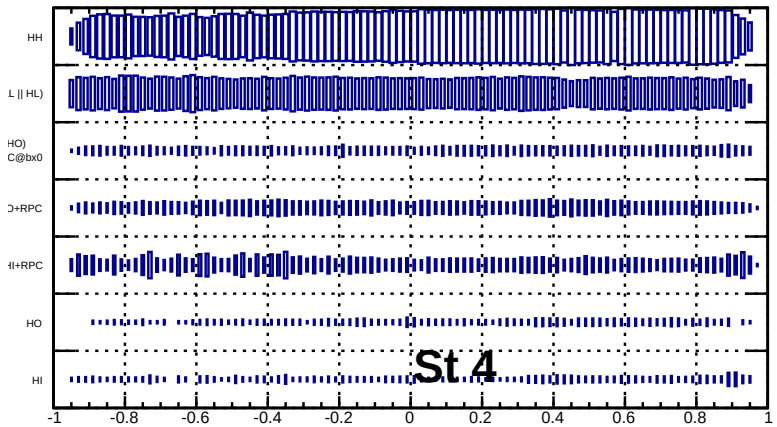
N primitives vs Chamber pos vs Code by Station vs nSL

New n SL=2



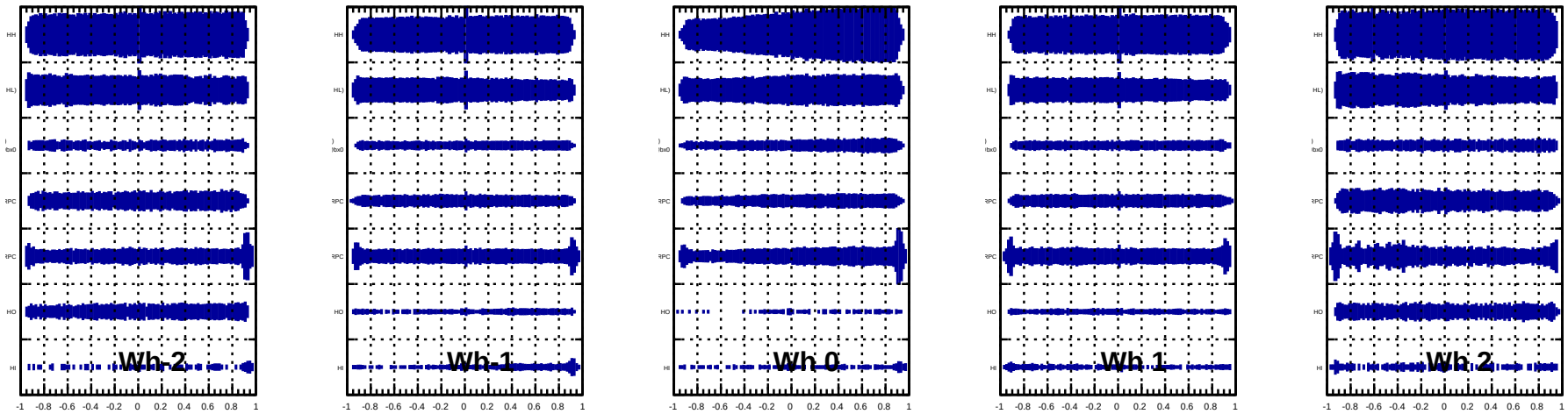






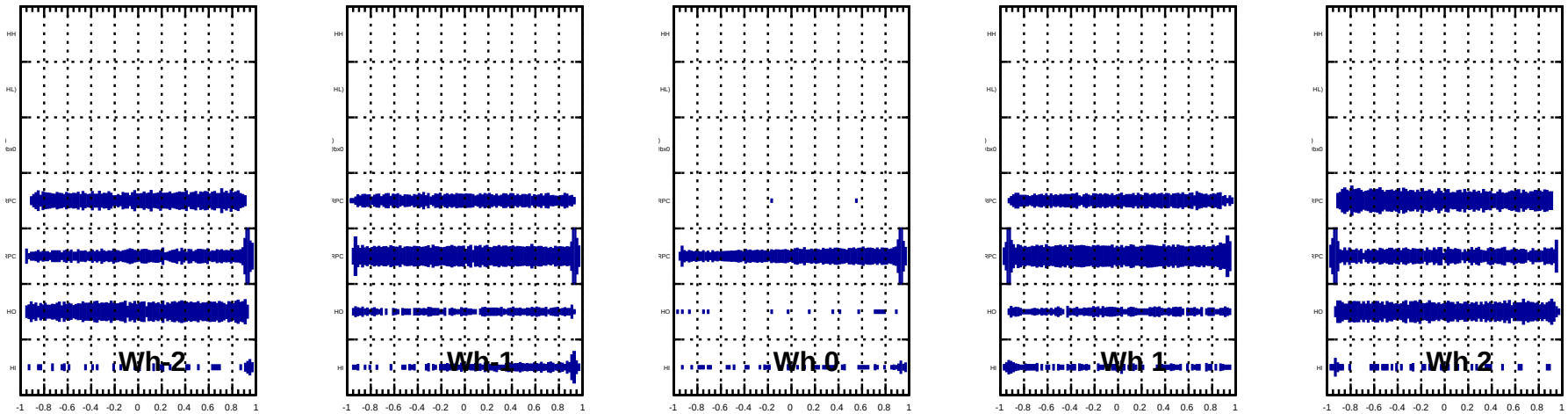
N primitives vs Chamber position vs Code by Wheel

New



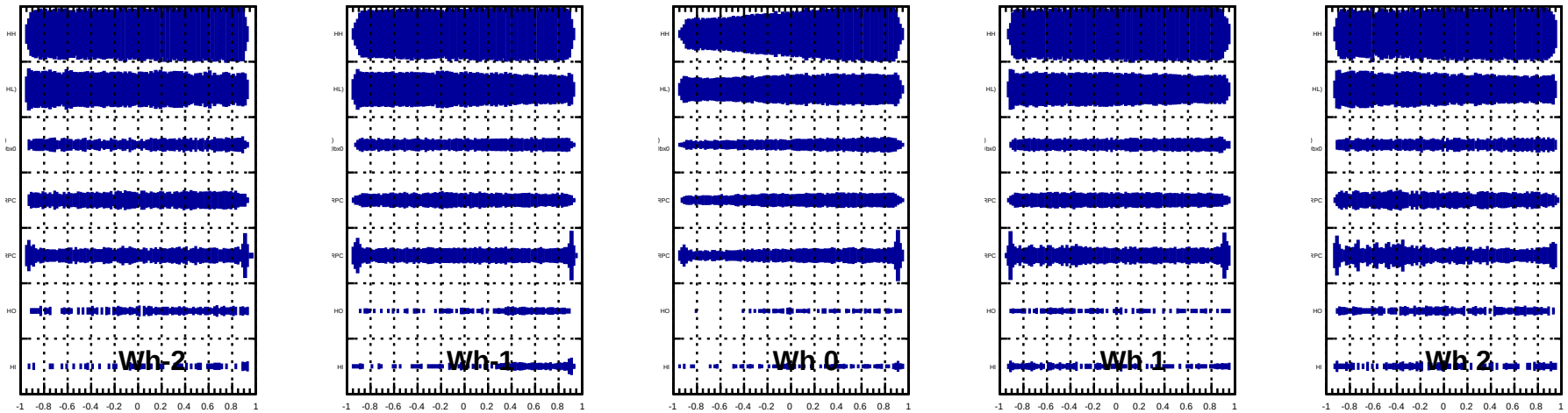
N primitives vs Chamber position vs Code by Wheel vs nSL

New n SL=1



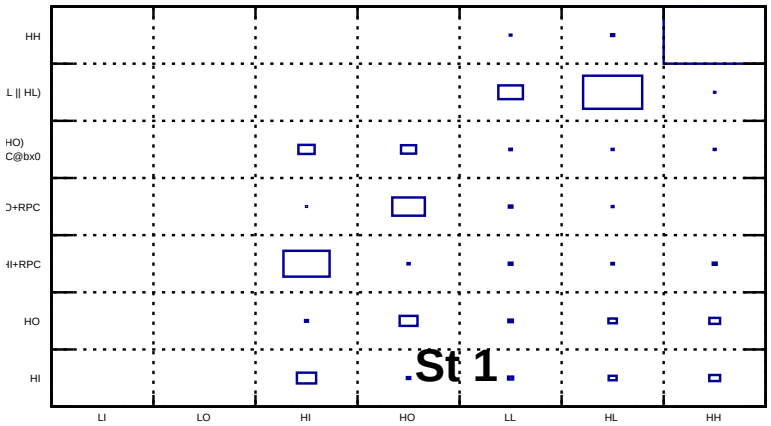
N primitives vs Chamber position vs Code by Wheel vs nSL

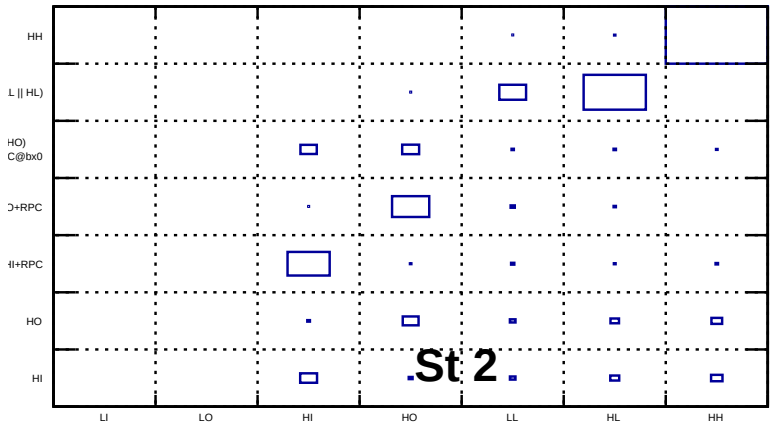
New n SL=2

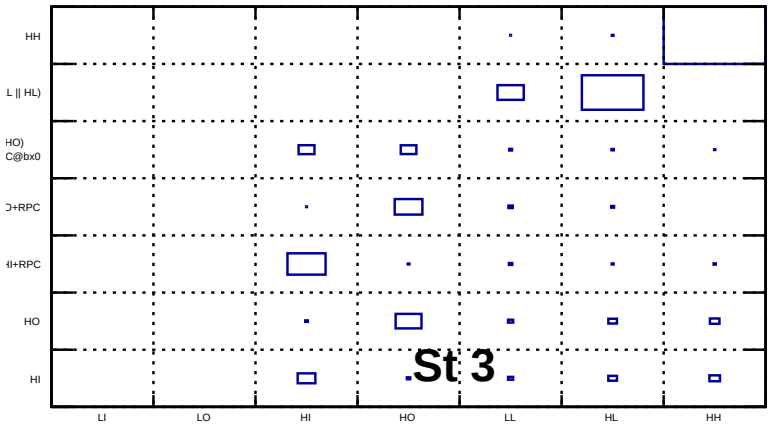


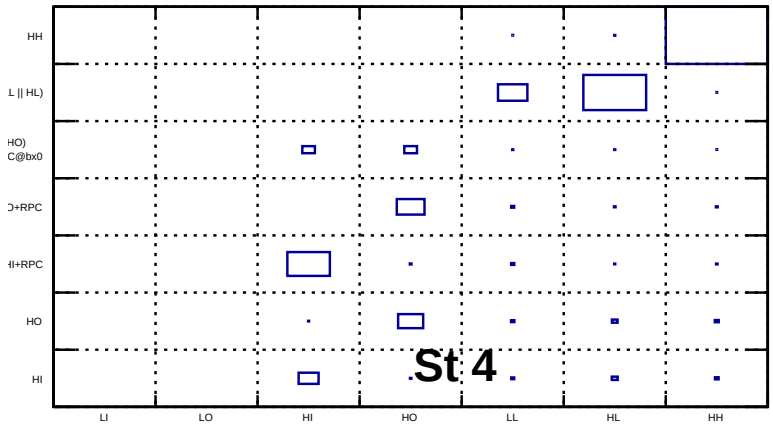
Outline

Quality code New vs Legacy by Station

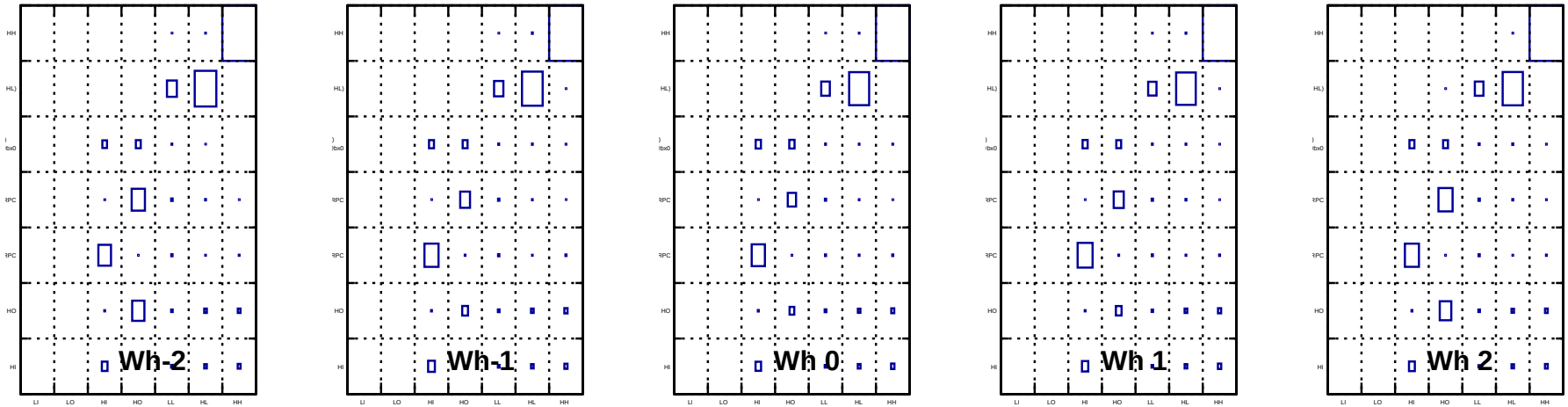








Quality code New vs Legacy by Wheel



Summary

- Overall, the New Primitives behaves as expected;
- There is a drop of efficiency at the level of few %;
- Something odd in Wheel=0 for nSL=1;
- RPC use:
  - good for HI for all station and for HO only for station 1 and 2
  - at chamber edge many new superprimitives are HI+RPC, almosto none HO+RPC