# b-Tagging Data/MC Comparisons:
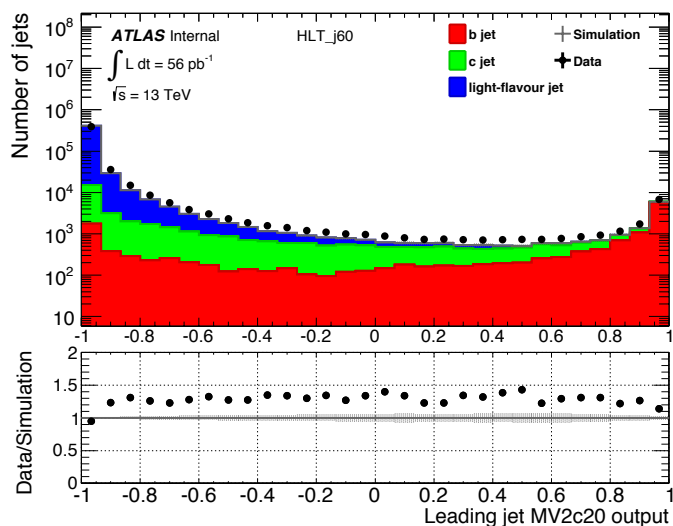## *Using ATLAS-R2-2015-03-15-00*

Laurie McClymont,

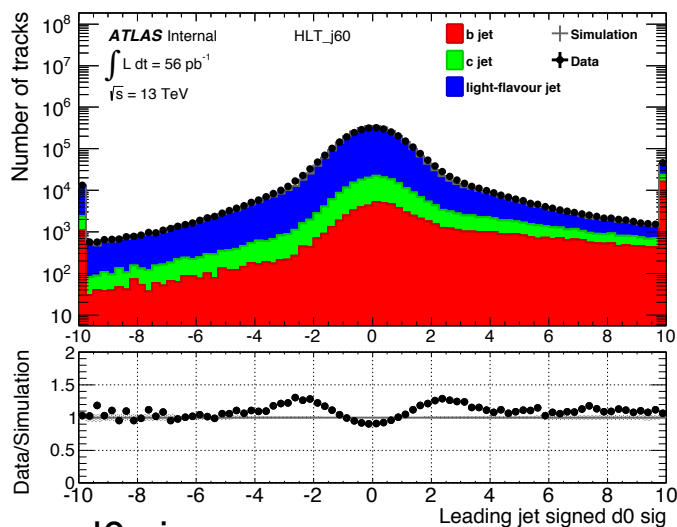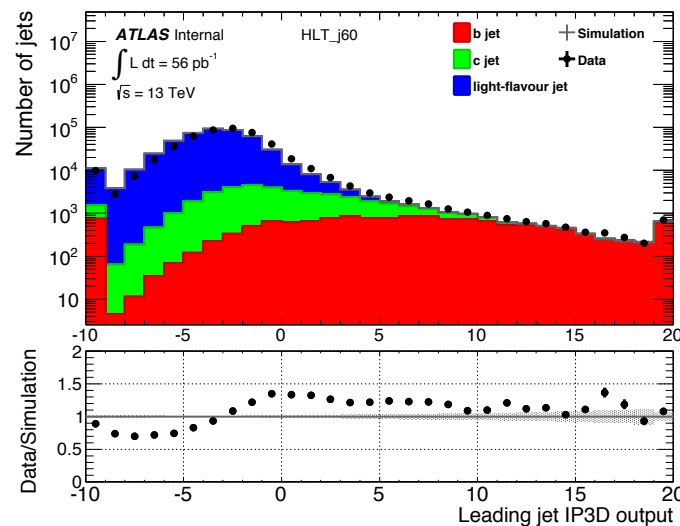Flavour Tagging Group

17/02/16

- Early Data/MC comparisons of key b-tagging variables in early Run-2 dijet events.
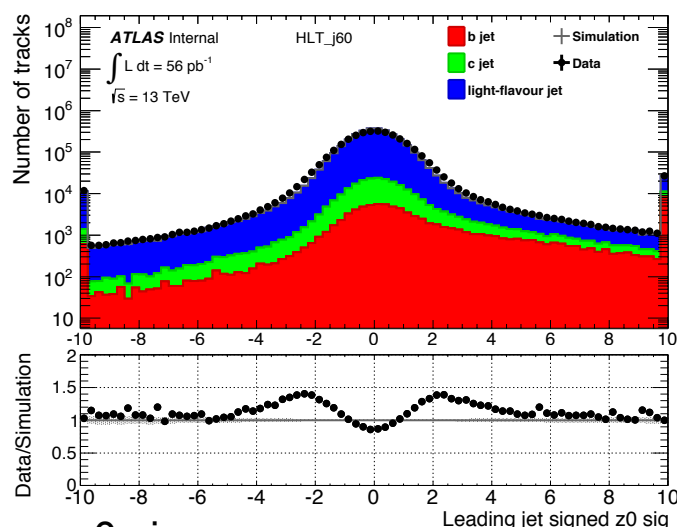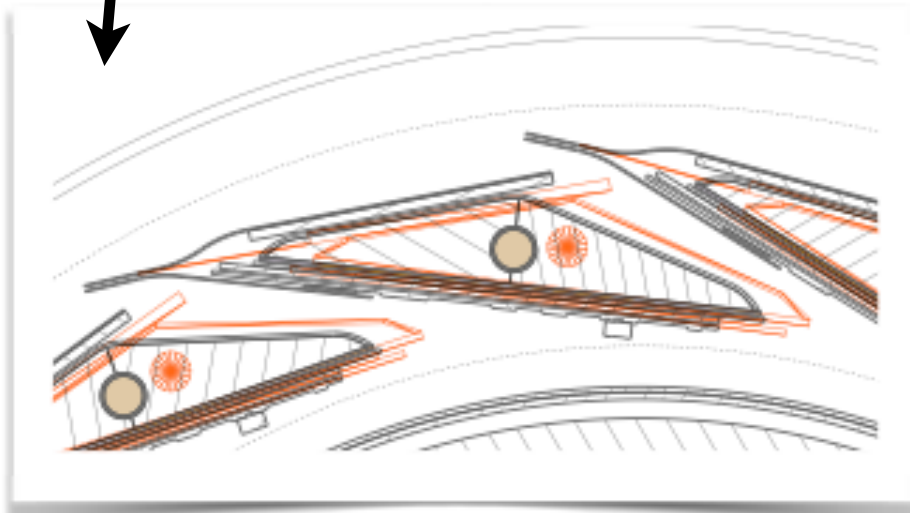- There were some discrepant results ...
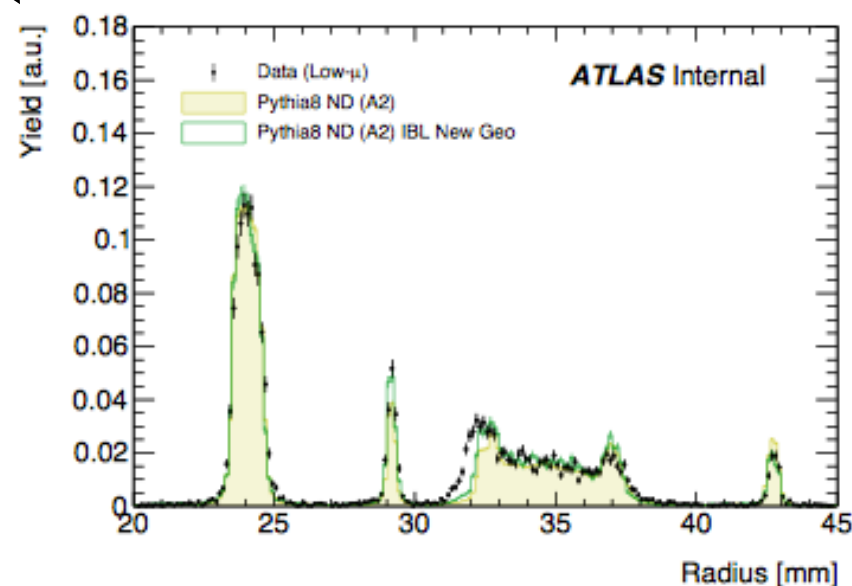
MV2c20

IP3D



d0 sig

z0 sig

## Problems

- Geometry tag missing 23% IBL material

- Angle of overlap issue

Simone Pagan Griso, Heather Gray

https://indico.cern.ch/event/433839/contribution/6/attachments/1128840/1612854/PC_20jul.pdf

**GEO Model**
**IBL**



- New Tag Produced: ATLAS-R2-2015-03-**15**-00_VALIDATION

- We want to use this new geometry to look at data/MC comparisons.

- We looked at ATLAS-R2-2015-03-**15**-00_VALIDATION ttbar events.

- This has been compared to previously validated ATLAS-R2-2015-03-**01**-00_VALIDATION

- It looks like we can use new Geo. Full study in backup



IP3D

SV1

JF

MV2c20

d0 sig

z0 sig
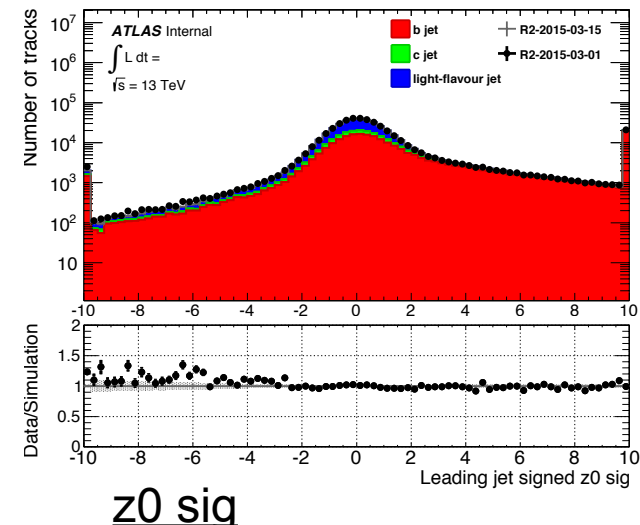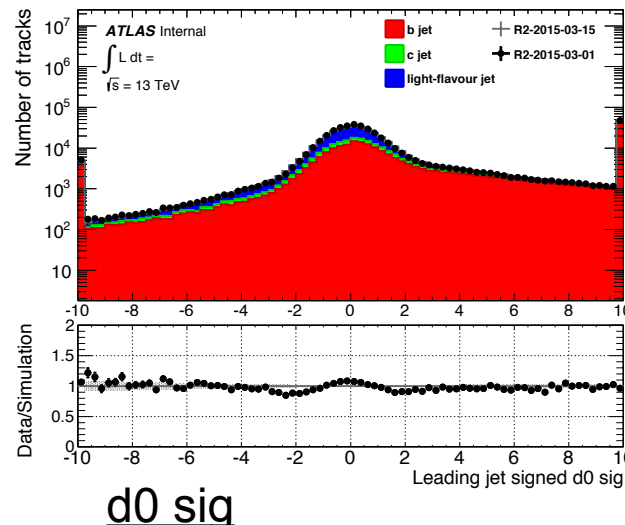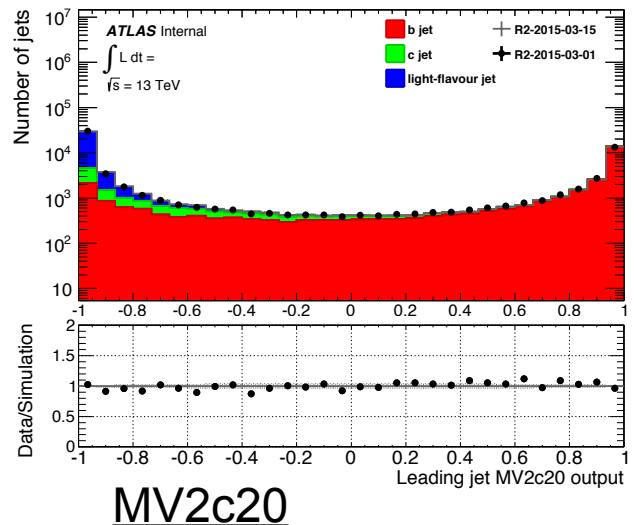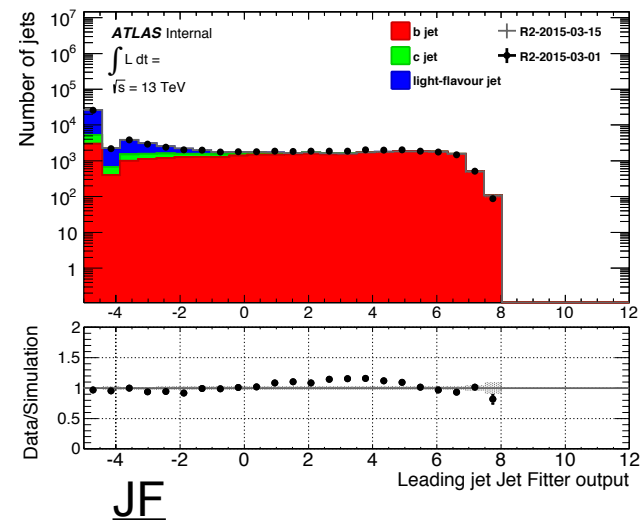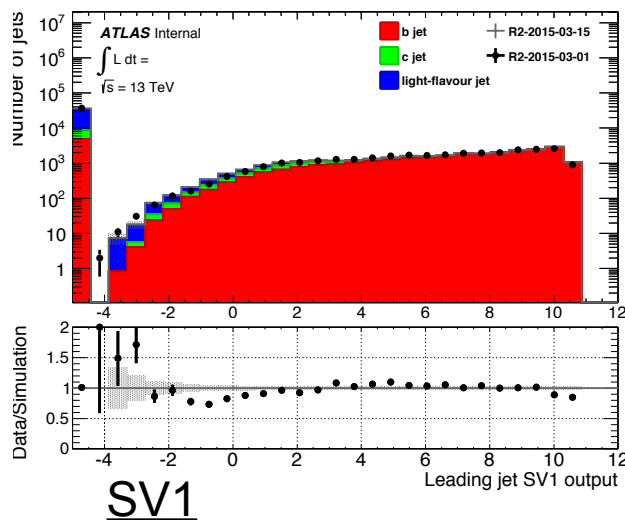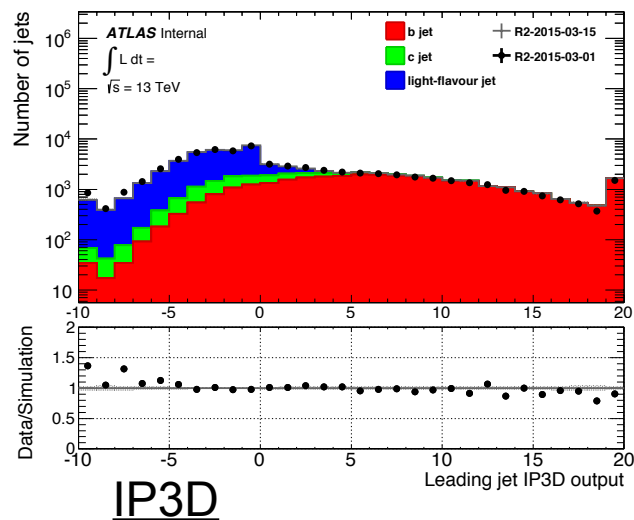
- **Updated Geo Sample**
  - Used MC ttbar events to look at a new updated geo sample.
  - Compared ATLAS-R2-2015-03-**15** to ATLAS-R2-2015-03-**01**-00
  - No large or unexplainable discrepancies (Not always been true...)

- **Moving Forward**
  - We would like to request a dijet sample produced with updated Geo
  - This will allow us to re-compare to the reprocessed data
  - Check for discrepancies between data and MC in the IP distributions.

- **MC Request...**
  - *mc15_13TeV.36102X.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZXW.merge.AOD*
  - Slices JZ1W-JZ4W, 1M per slice
  - Tag: *e3099_s2781_r7465_p2494*, for ATLAS-R2-2015-03-**15**
  - AFII should be enough

- **Our question!**
  - What do tags and release in MC do we need to make a meaningful comparison between reprocessed data and MC
  - Currently used r20.7 and tags in this JIRA ticket

# Backup Study

## Updated IBL Geo Validation:
### *Looking at ATLAS-R2-2015-03-15-00*

Laurie McClymont,

Flavour Tagging Group

Flav. Tag Algorithm Meeting
11/02/16

- <u>Updated Geo Tag:</u>   - ATLAS-R2-2015-03-**15**-00_VALIDATION

- Grey line in plots, also shown as coloured stack of flavour fractions.

- ttbar events
- pileupFinalBunch = 0

*"valid1.110401.PowhegPythia_P2012_ttbar_nonallhad.merge.e3099_s2781_r7465_p2494"*

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- <u>Validated Geo Tag:</u>    ATLAS-R2-2015-03-**01**-00_VALIDATION
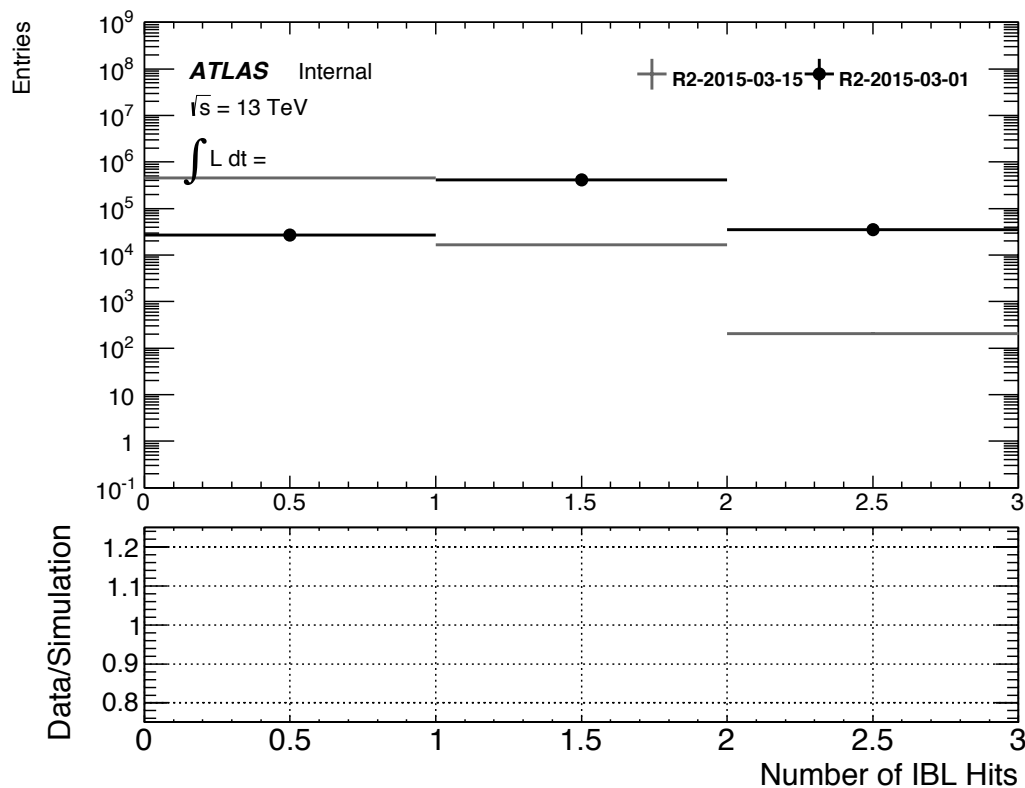
- Black markers in plots

- ttbar events
- pileupFinalBunch = 6

*"valid1.110401.PowhegPythia_P2012_ttbar_nonallhad.recon.AOD.e3099_s2578_r7058_tid06432679_00"*

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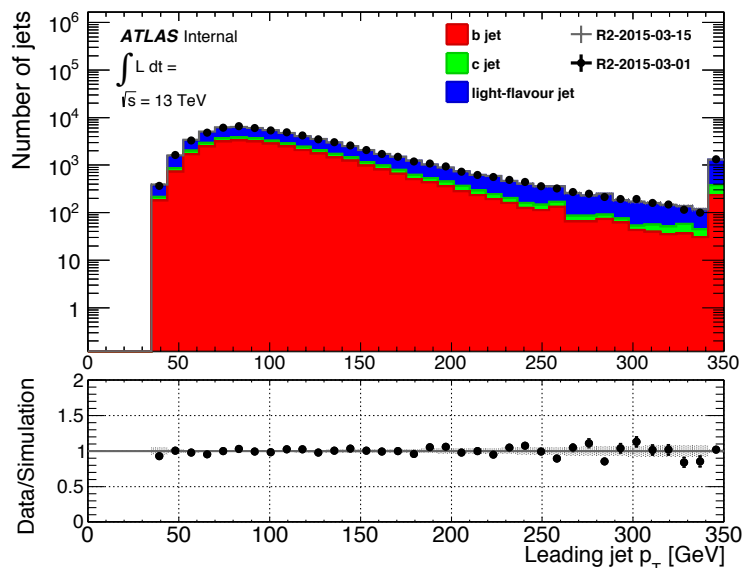- We are using NTuples created using Run2BTagOptimisationFramework

- **For a different production**
  - Problem with # IBL hits
  - Large number of 0 hit where hit is expected.
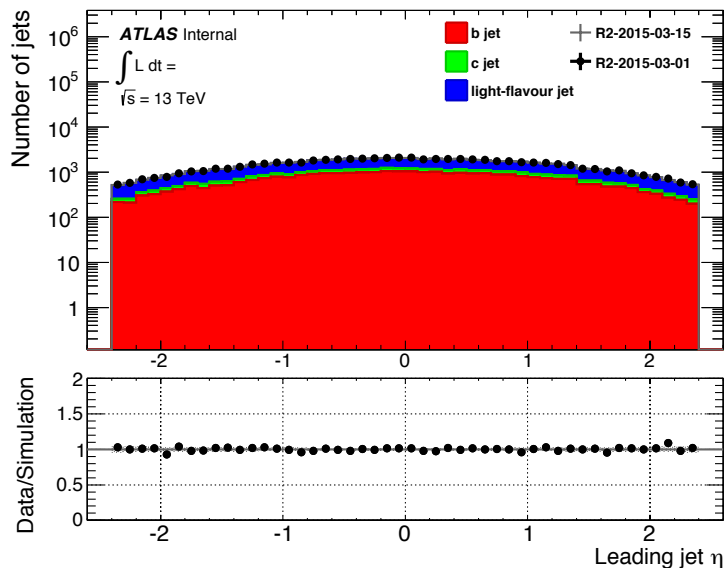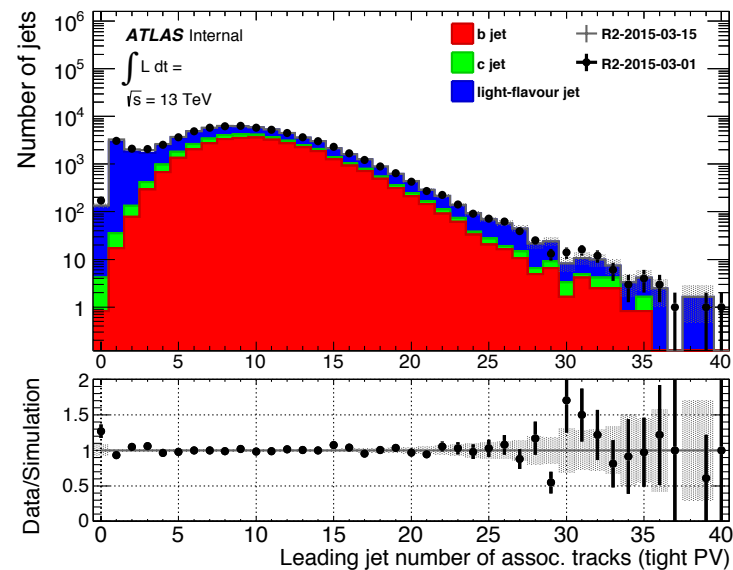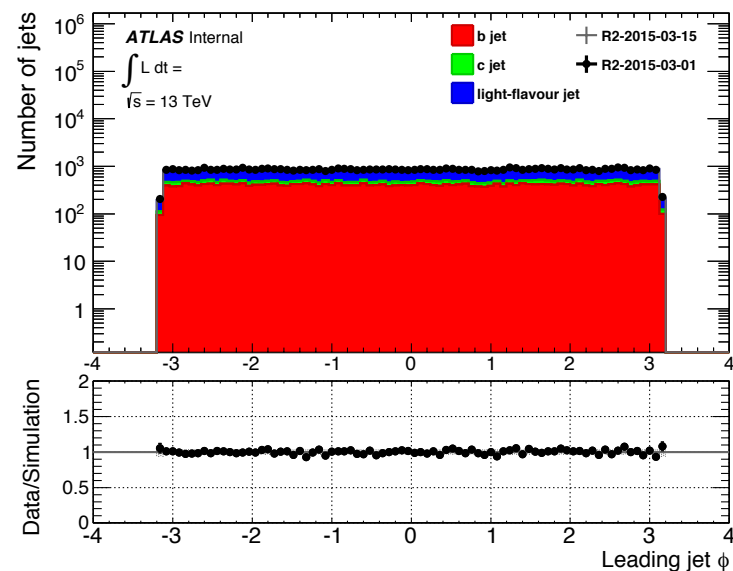
- **Don't panic! This is not the newest production**
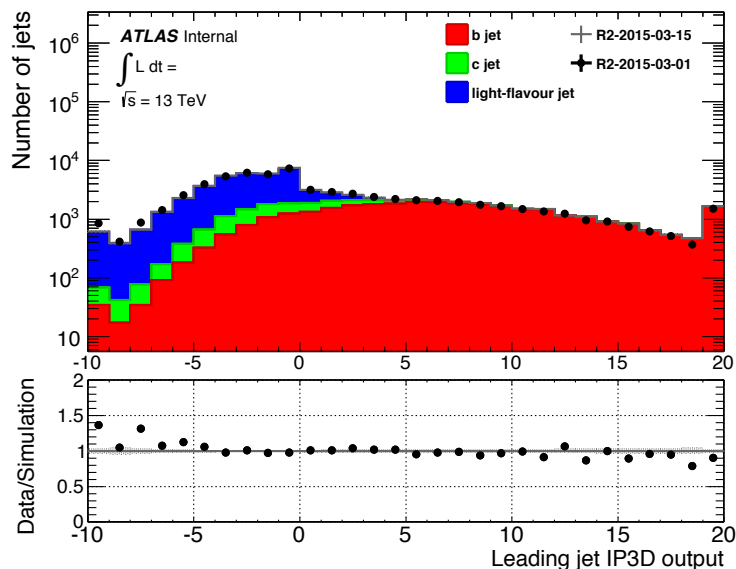
## Jet pT

## Sum Track $P_T$

## Eta

## Phi

## IP3D

## SV1
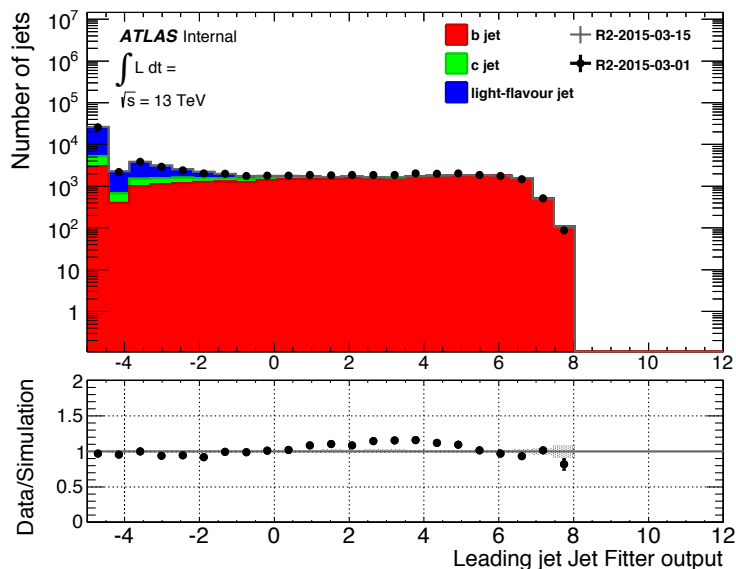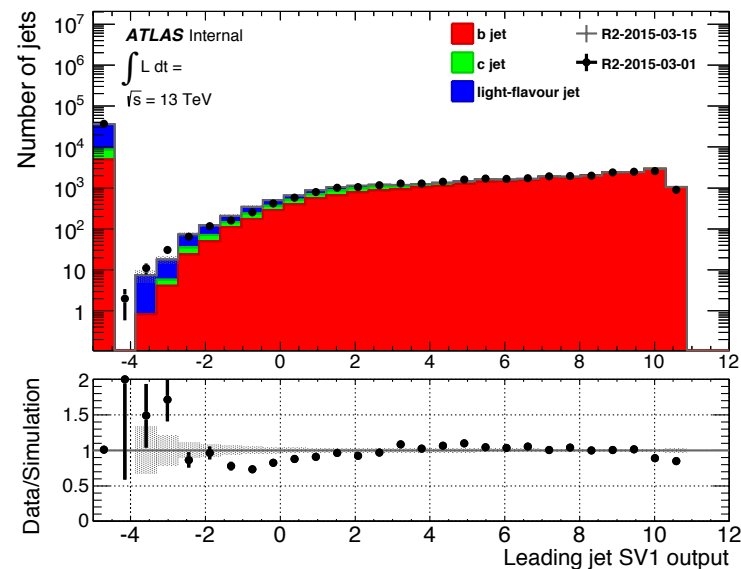
## Jet fitter
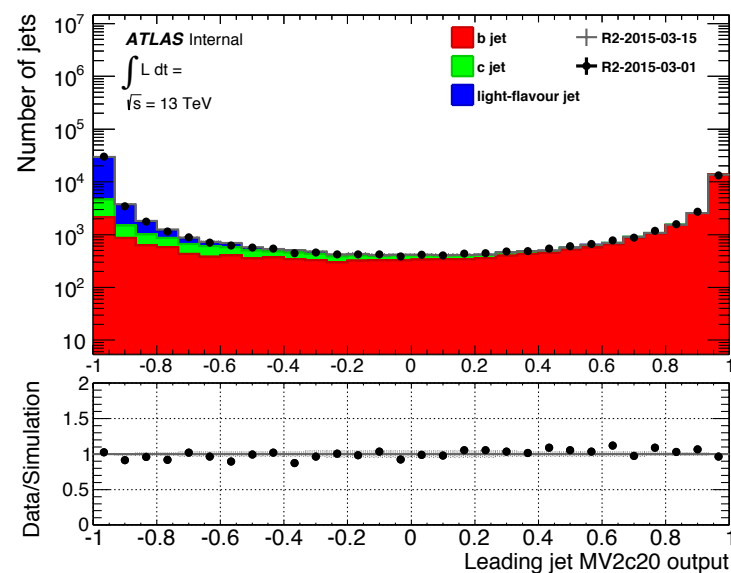
## MV2c20

## d0

## d0 Err

## d0 Sig
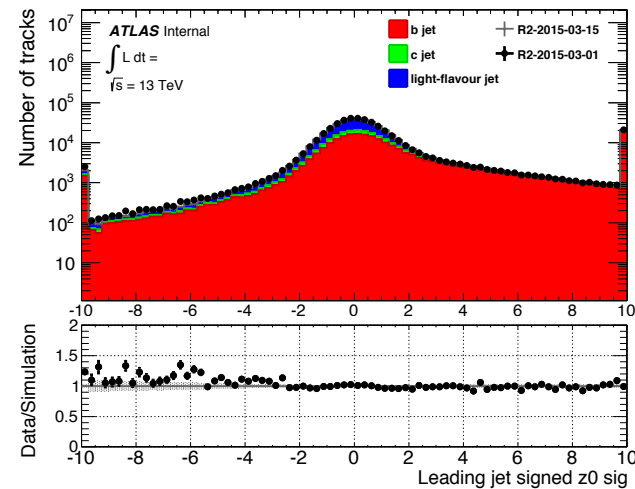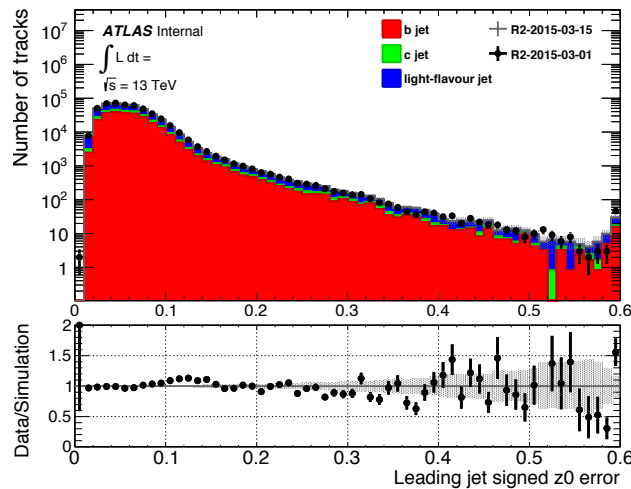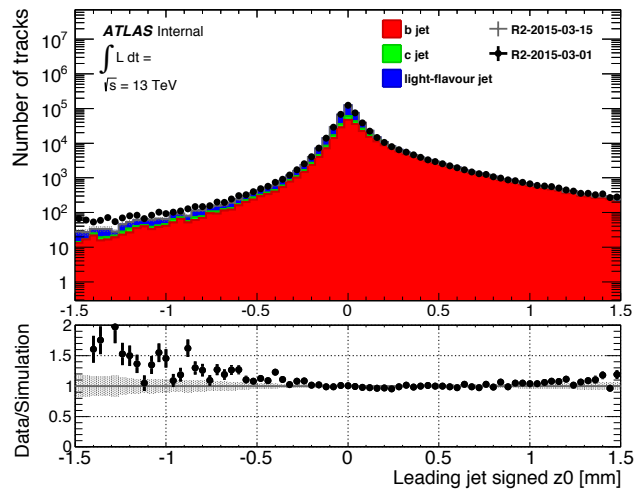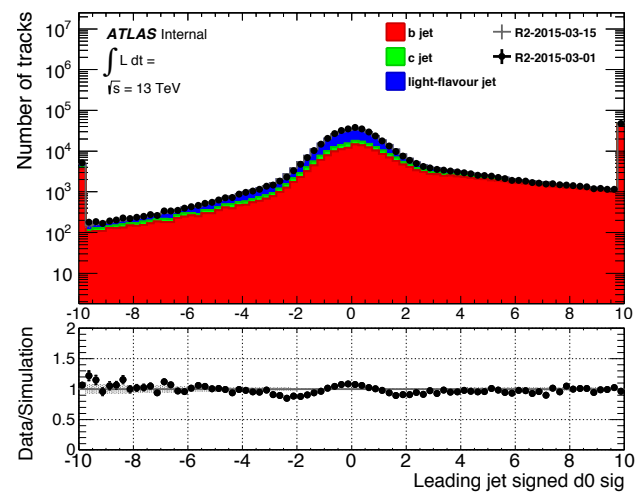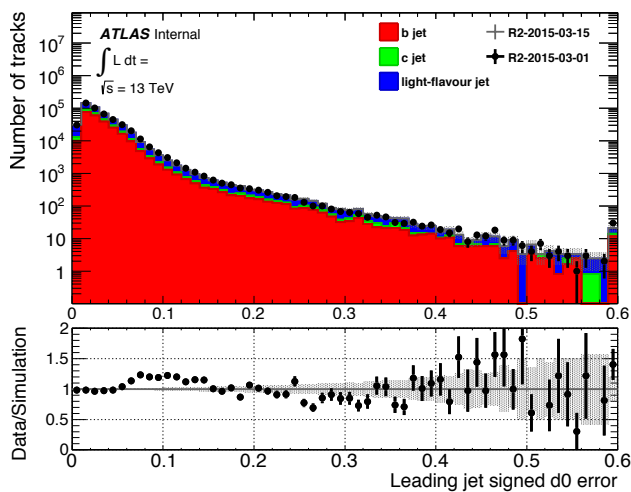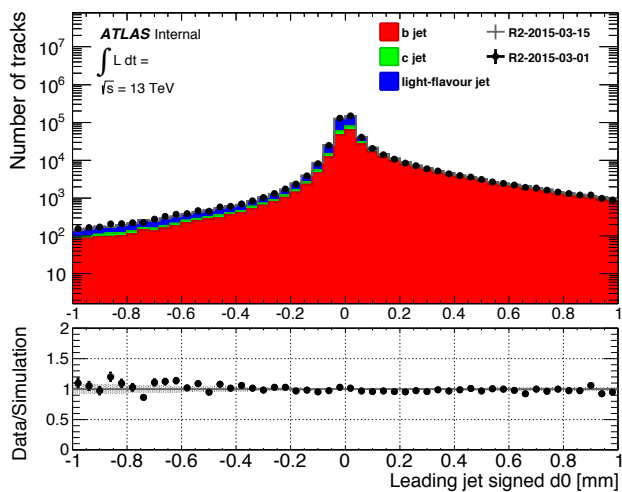


## z0

## z0 Err

## z0 sig
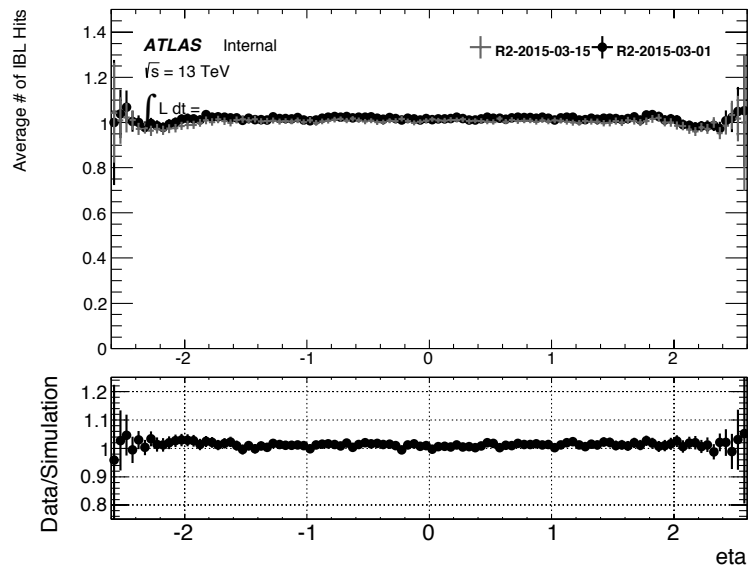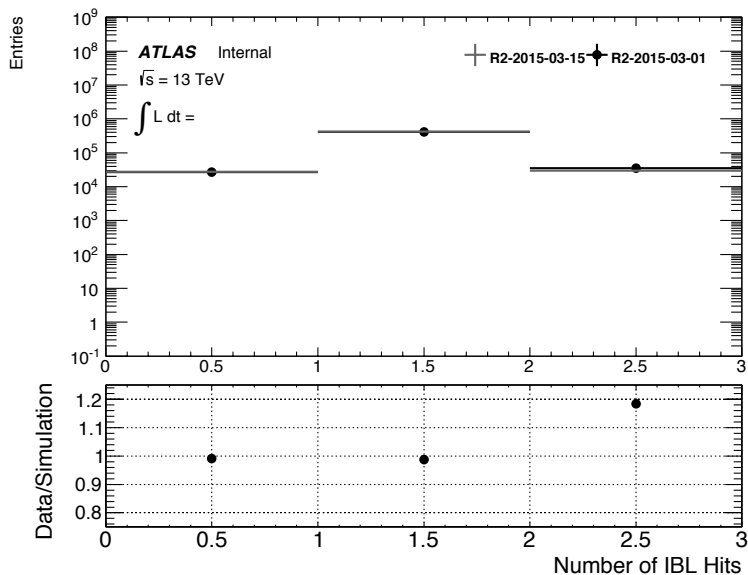
# IBL Hits

# IBL Hits vs. track pT
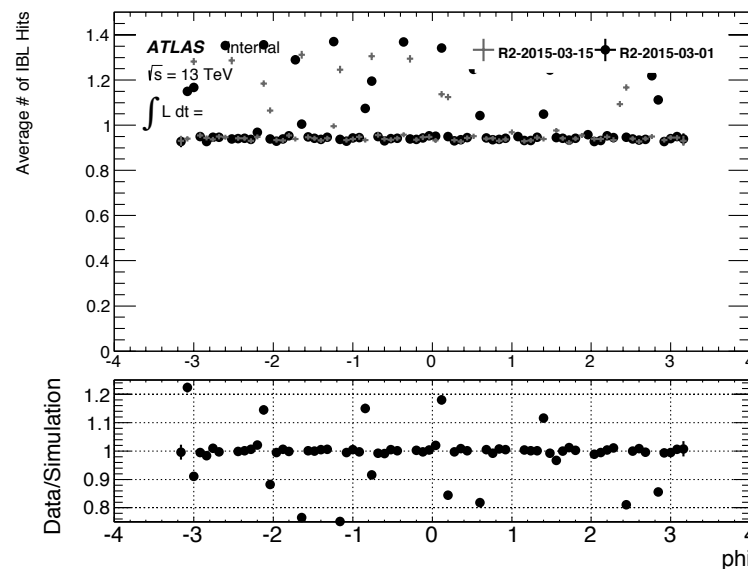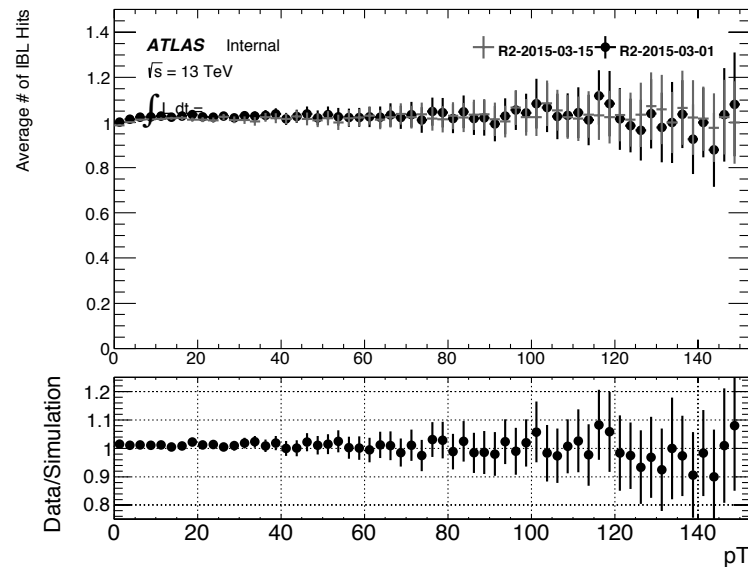
# IBL Hits vs. η

# IBL Hits vs. Φ
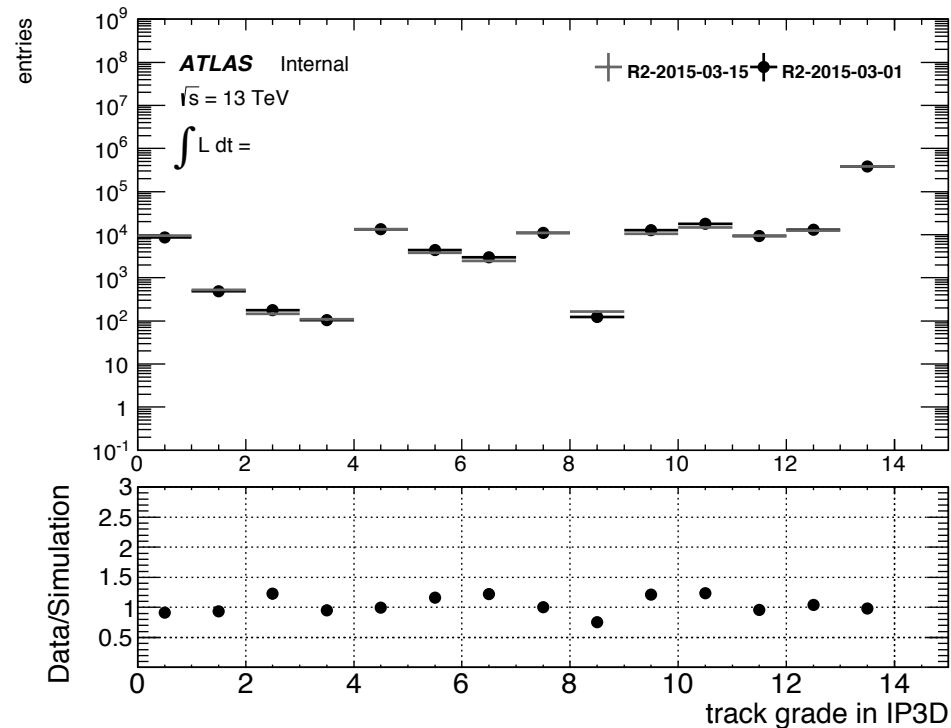
IP3D Grades:
Tracks split into 14 categories
- shown on right

**IP3D Grades legend:**

| Color | Category |
|---|---|
| | 0 - 0In0NIn_EInENIn: no hit in first 2 layer and both expected |
| | 1 - 0In0NIn_EIn: no hit in first 2 layer and expected in the first |
| | 2 - 0In0NIn_ENIn: no hit in first 2 layer and expected in the second |
| | 3 - 0In0NIn: no hit in first 2 layer and not expected |
| | 4 - 0In1NIn_EIn: no hit in first layer and expected |
| | 5 - 0In1NIn: no hit in first layer and not expected |
| | 6 - 1In0NIn_ENIn: no hit in second layer and expected |
| | 7 - 1In0NIn_ENIn: no hit in second layer and expected |
| | 8 - First2LayerShared: shared in both first and second layer |
| | 9 - PixelShared: at least 1 share in first 2 layers or shared in other layers |
| | 10 -SCTShared: >1 shared in SCT (noPixShared) |
| | 11 -First2LayerSplit: at least a split hit in one of the first 2 layer |
| | 12 -PixelSplit: split hits in other pixel layers |
| | 13 -Good: split hits in other pixel layers |

## Data / Old MC
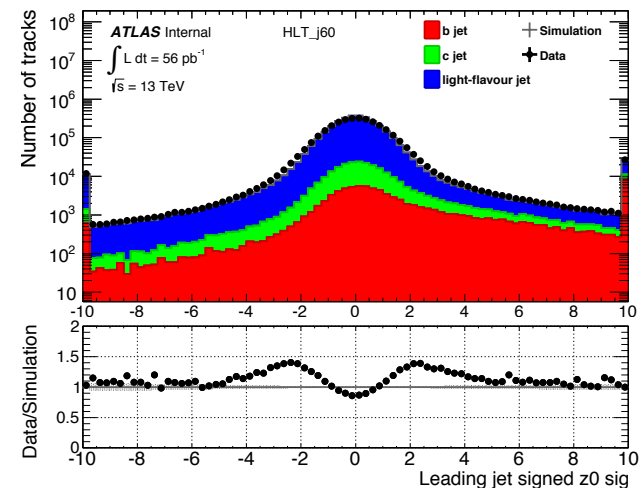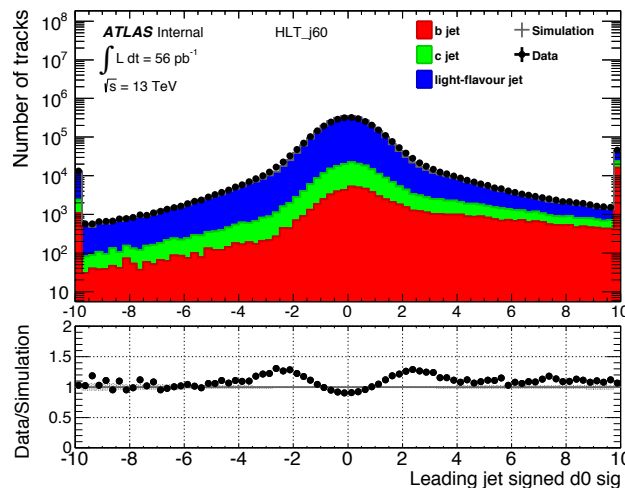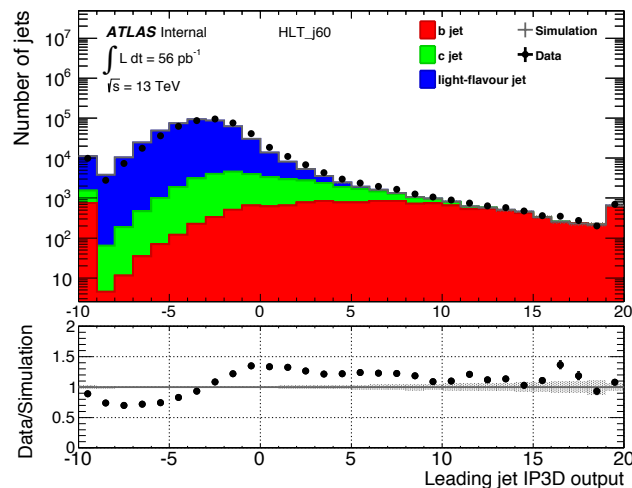


## Old MC/ New MC
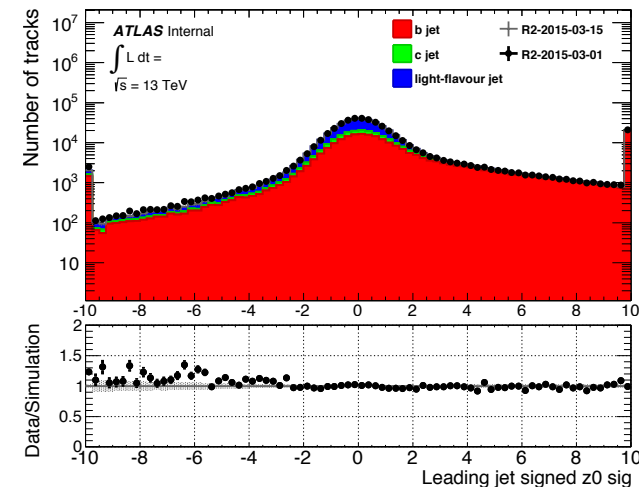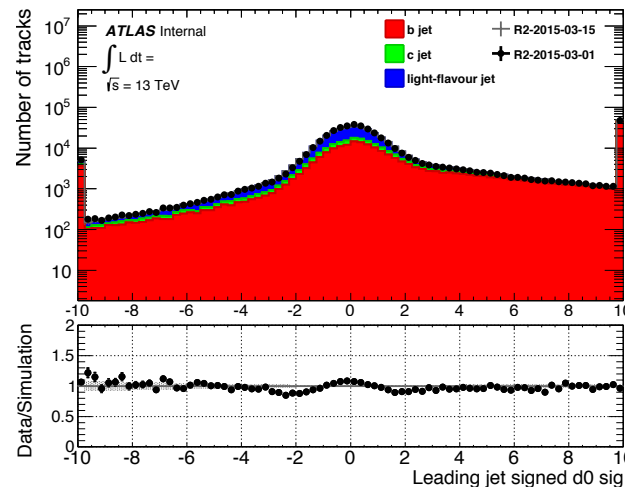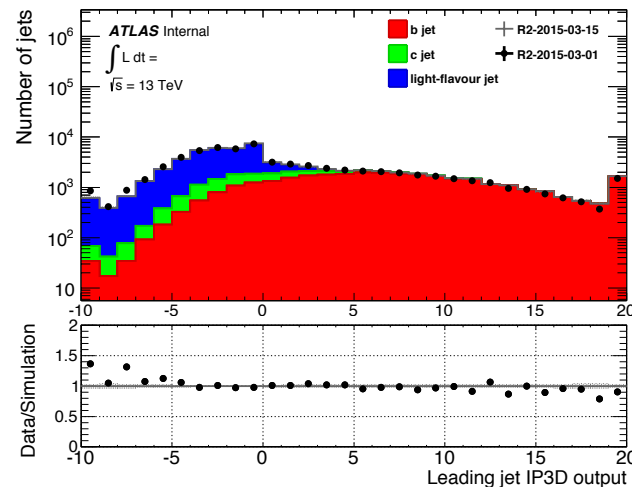


IP3D                     d0 sig                     z0 sig

- **Word of caution**: These are not like for like comparisons
- Above is light-rich dijet sample, below is b-jet rich ttbar sample

- **Updated Geo Sample**
  - Used MC ttbar events to look at  a new updated geo sample.
  - Considered a validation sample for updated geo, ATLAS-R2-2015-03-**15**
  - Compared to ttbar sample with validated geo: ATLAS-R2-2015-03-**01**-00
  - No large or unexplainable discrepancies (Not always been true...)

- **Moving Forward**
  - We would like to request a dijet sample produced with updated Geo
  - This will allow us to re-compare to the data, to see if this explains the discrepancies between data and MC in the impact parameter distributions.

- **Request...**
  - *mc15_13TeV.36102X.Pythia8EvtGen_A14NNPDF23LO_jetjet_JZXW.merge.AOD*
  - Slices JZ1W-JZ4W, 1M per slice
  - Tag: *e3099_s2781_r7465_p2494*, for ATLAS-R2-2015-03-**15**
  - AFII should be enough
  - Need to use r20.7 and tags used in the JIRA ticket
  - How to compare r20.7 MC and r20.1 data?
    - Can we still compare IP distributions?
    - Reprocessing of data...