Beam Halo studies

Andrea Parenti (DESY)

Tracker alignment meeting

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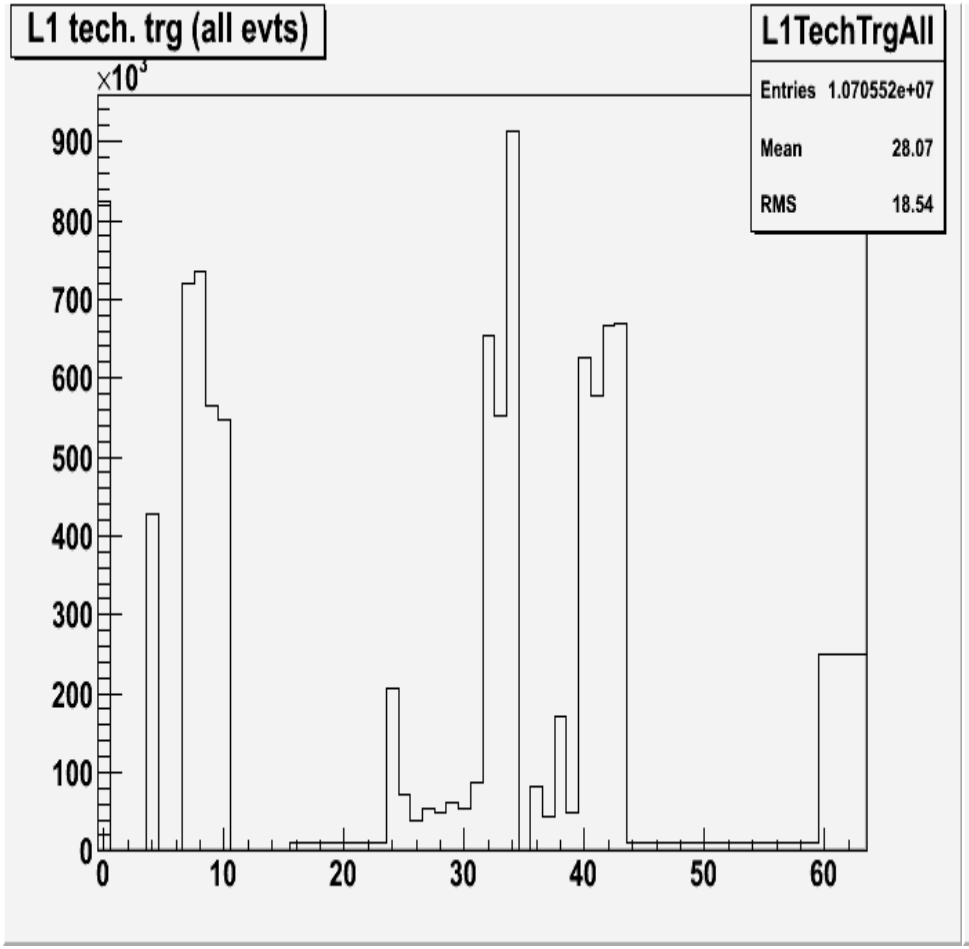
Datasets and selection

- Dataset: /Cosmics/Run2010A-TkAlBeamHalo-v4/ALCARECO
  - all runs with ≥ 1000 events
- Track selection
  - nHitMin = 8
  - minHitsinENDCAPplus = minHitsinENDCAPminus = 1
  - pMin = 2.5
  - nLostHitMax = 2
  - maxHitDiffEndcaps = 3
  - chi2nMax = 20.

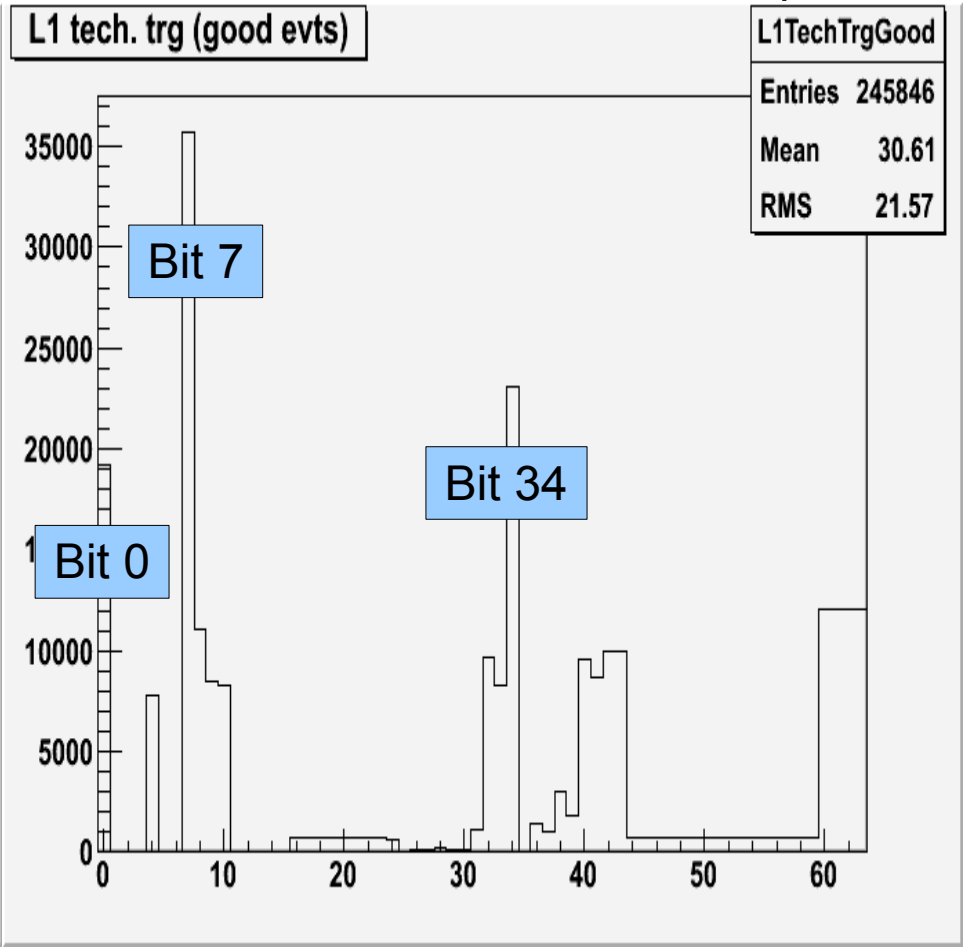
Who is triggering the events

L1 Tech Trig bit distribution

- All events:



- "Good" events (ie having at least one selected track):



Who is triggering the events?

	All events	“Good” events
All events (no Trg selection)	5836	521

L1 Tech Trg Bit	Selected	Selected & “Good”
7	354	190
34	2286	121
0	1633	98
36 || 37 || 38 || 39 (beam halo)	638	31
8	983	18
31	272	13
40 || 41 || 42 || 43 (min bias)	1383	13
7 || 34	5108	274
7 || 34 || 0	5338	329
7 || 34 || 0 || 36 || 37 || 38 || 39	5338	329
7 || 34 || 0 || 36 || 37 || 38 || 39 || 8	5340	330
7 || 34 || 0 || 36 || 37 || 38 || 39 || 8 || 31	5362	334
7 || 34 || 0 || 36 || 37 || 38 || 39 || 8 || 31 || 40 || 41 || 42 || 43	5362	334

Run 142130 only!

- 334 out of 521 “good” events (64%) are taken by L1 Tech. trigger bits 0 || 7 || 8 || 31 || 34 (36-39 and 40-43 do not add any event)
  - most of the “good” events taken by just 7 || 34 || 0

List of technical triggers

- What are the L1 technical trigger bits? See
  - https://twiki.cern.ch/twiki/bin/viewauth/CMS/GlobalTriggerMenu_L1M

Technical trigger	Bit Number
• L1Tech_BPTX_plus_AND_minus.v0	0
• L1Tech_BPTX_quiet.v0	7
• L1Tech_HCAL_HF_MM_or_PP_or_PM.v0	8
• L1Tech_BSC_minBias_OR.v0	34

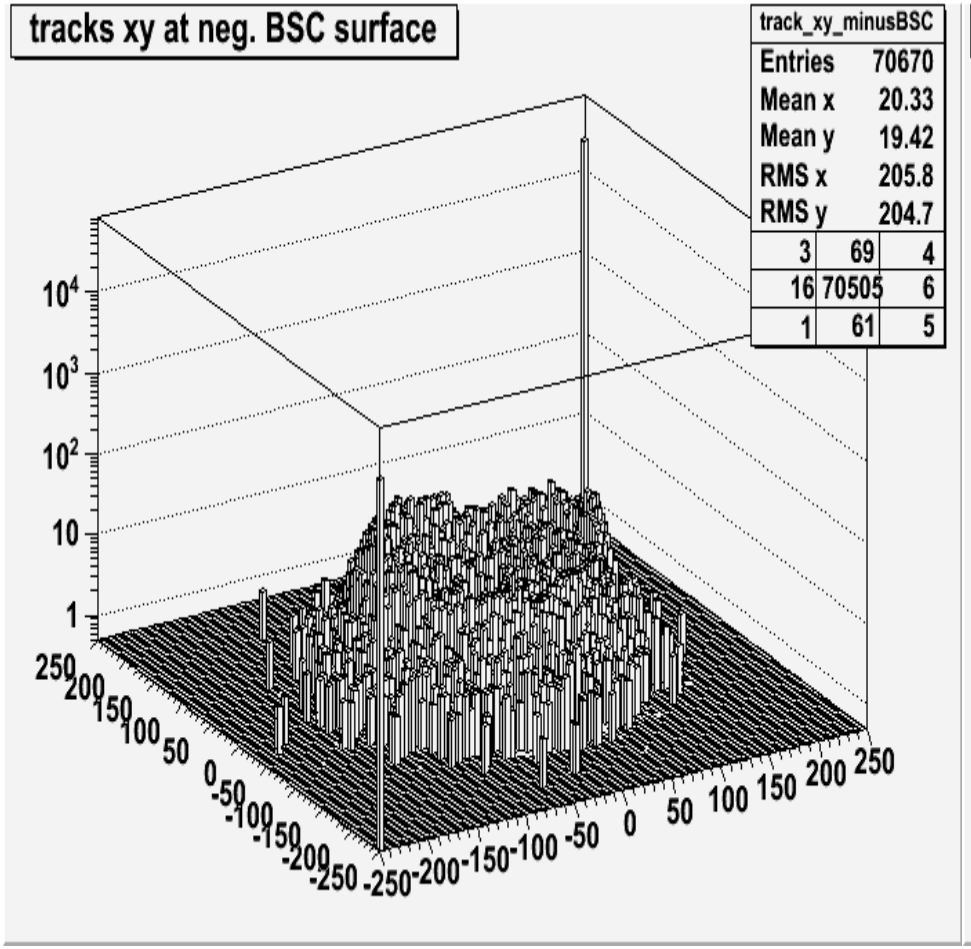
BH Track propagation to BSC surface

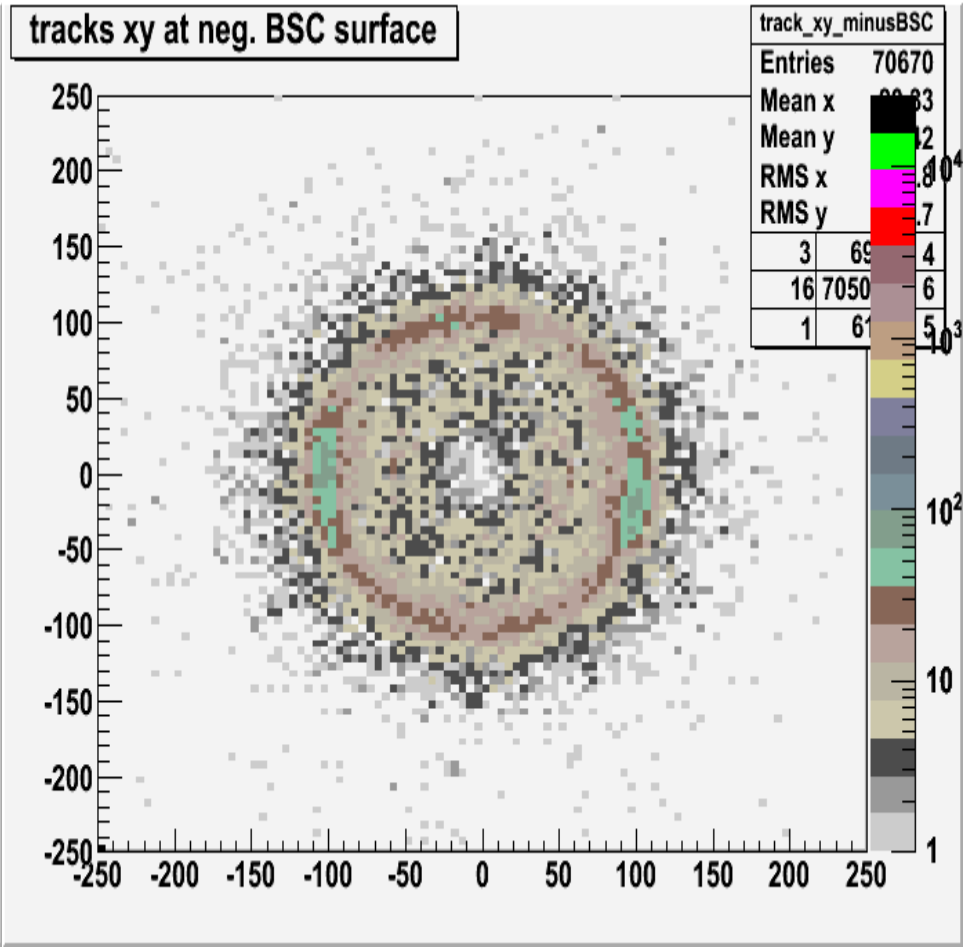
Introduction

- “Good” tracks are propagated to z=±10.86 m (by means of “RKTestPropagator”)
  - plots for z=+10.86 m are in the backup
- Trigger selection:
  1) all events
  2) events triggered by L1 Tech bits '36 OR 37 OR 38 OR 39'
  3) events triggered by L1 Tech bits 'NOT (36 OR 37 OR 38 OR 39)'
  - “good” events: 1) 69215, 2) 6977, 3) 62238
- “Special” bins:
  - (+250,+250): “invalid” propagation
  - (-250,-250): more than one track in the ALCARECOTkAlBeamHalo collection
- Many invalid propagations... needs to be understood

“Good” tracks propagated to -10.86 m

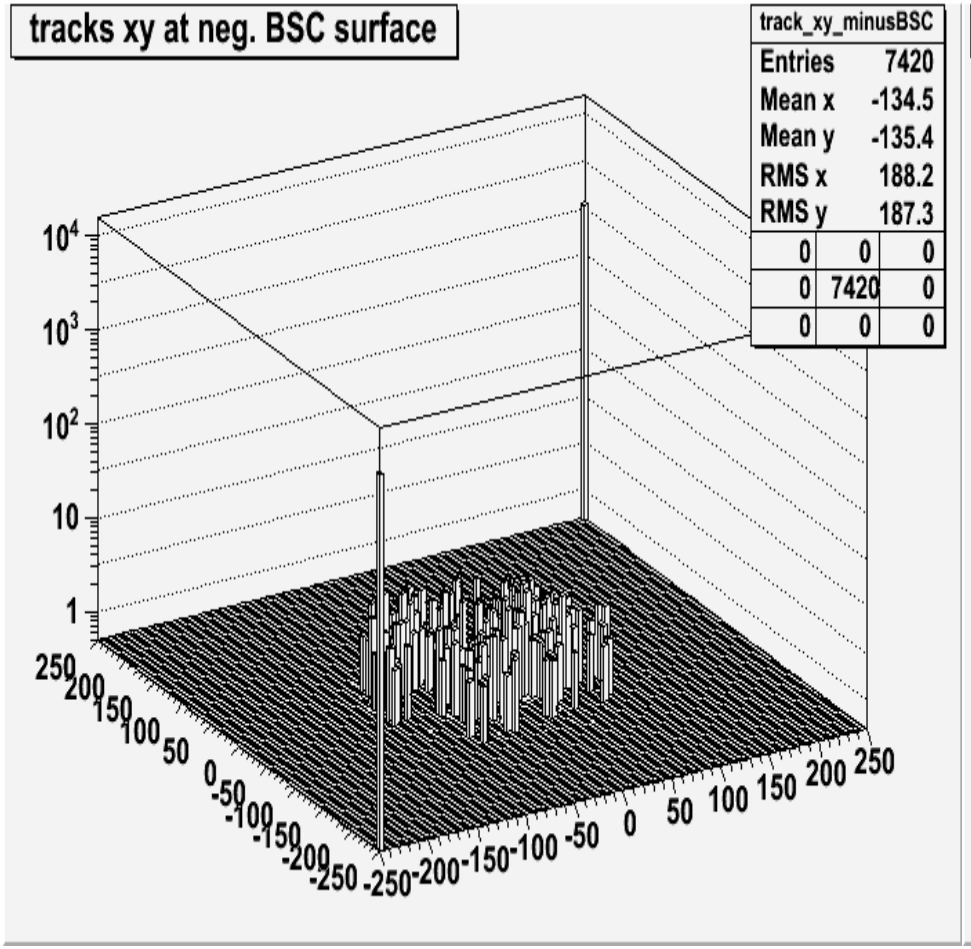
- All “good” events

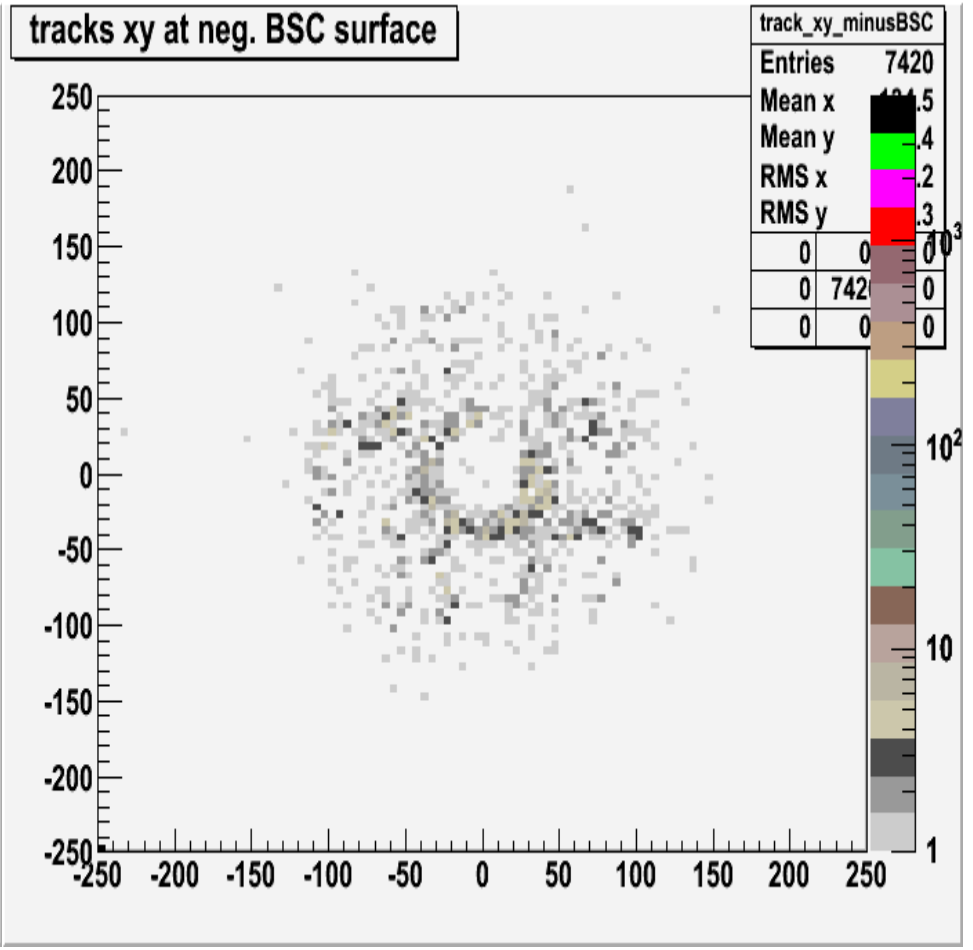




“Good” tracks propagated to -10.86 m

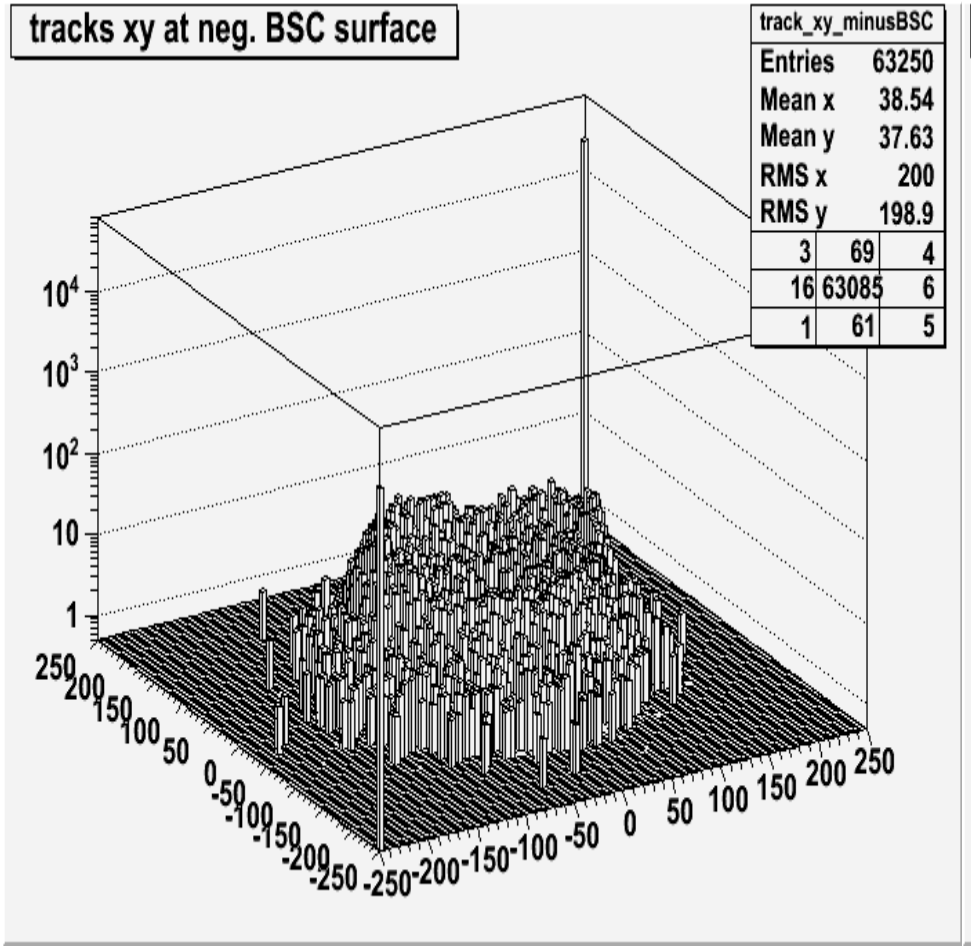
- “Good” events triggered by: '36 OR 37 OR 38 OR 39'

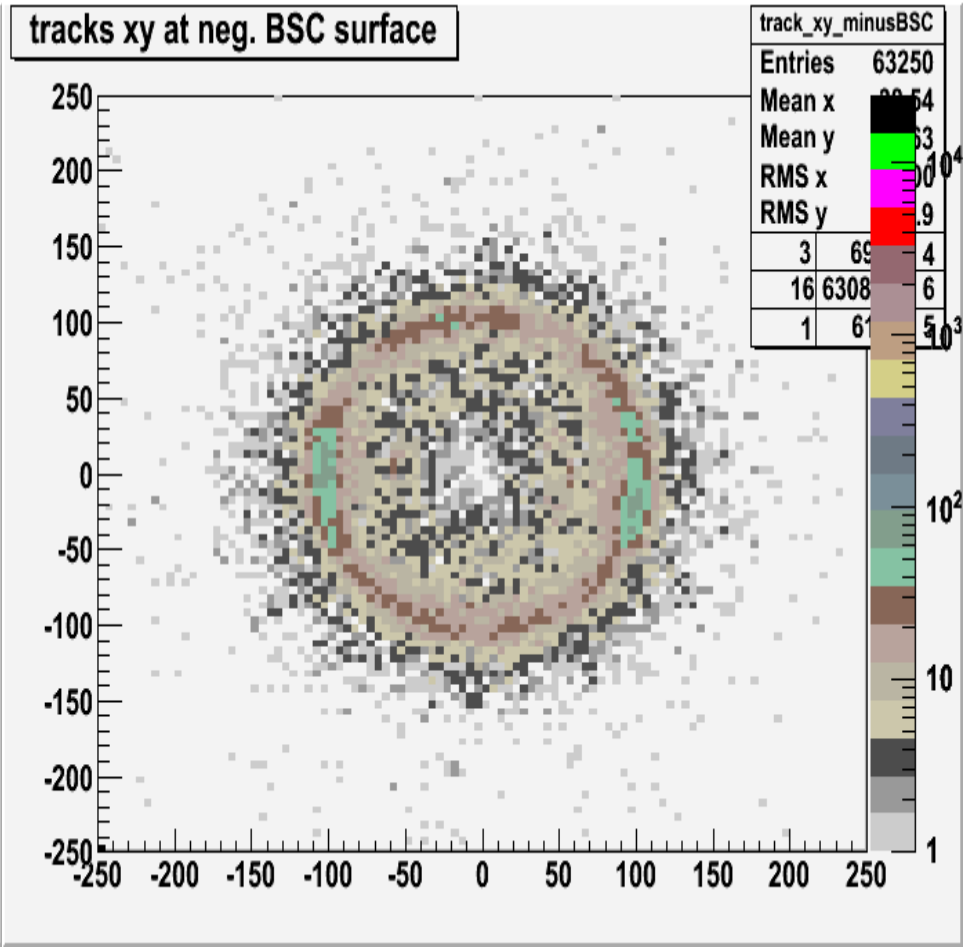




“Good” tracks propagated to -10.86 m

- “Good” events triggered by: 'NOT (36 OR 37 OR 38 OR 39)'



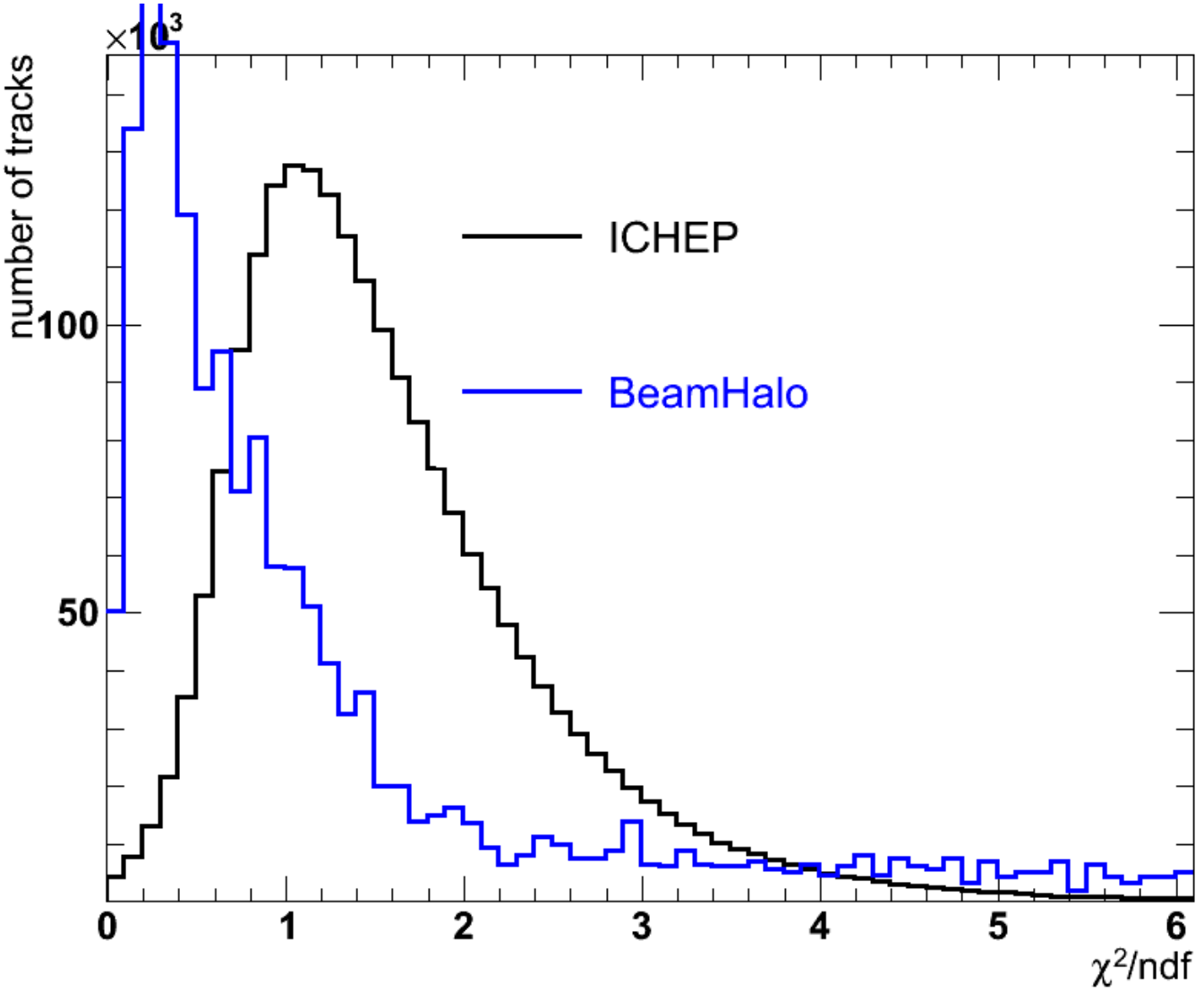


Track validation

Status

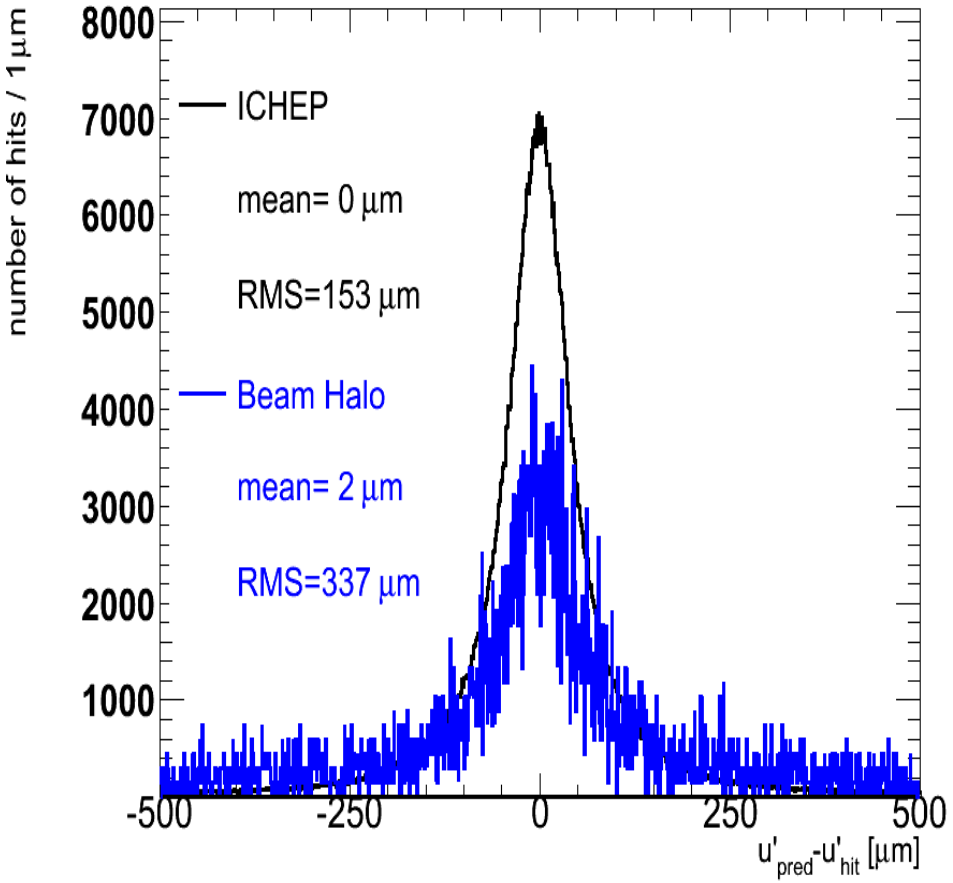
- CMSSW_3_9_0 was needed in order to apply the following cuts:
  - process.AlignmentTrackSelector.minHitsPerSubDet.inENDCAPplus = 1
  - process.AlignmentTrackSelector.minHitsPerSubDet.inENDCAPminus = 1
  - process.AlignmentTrackSelector.nLostHitMax = 2
  - process.AlignmentTrackSelector.maxHitDiffEndcaps = 3
- A CMSSW_3_9_0 area has been set-up in /afs/cern.ch/cms/CAF/CMSALCA/ALCA_TRACKERALIGN/data/commonValidation
  - configuration files for beam halo now available
- run over 500000 beam halo events: 4472 tracks selected
  - tried to run on more events: memory exhausted after ~1M, then problems in accessing files on CMSCAF...
  - BH compared to: /afs/cern.ch/cms/CAF/CMSALCA/ALCA_TRACKERALIGN/web/BEAM10Results/SystematicMisalignmentV2/ICHEP_reference/Cosmics/AlignmentValidation_ICHEPgeometry.root

Track Chi2

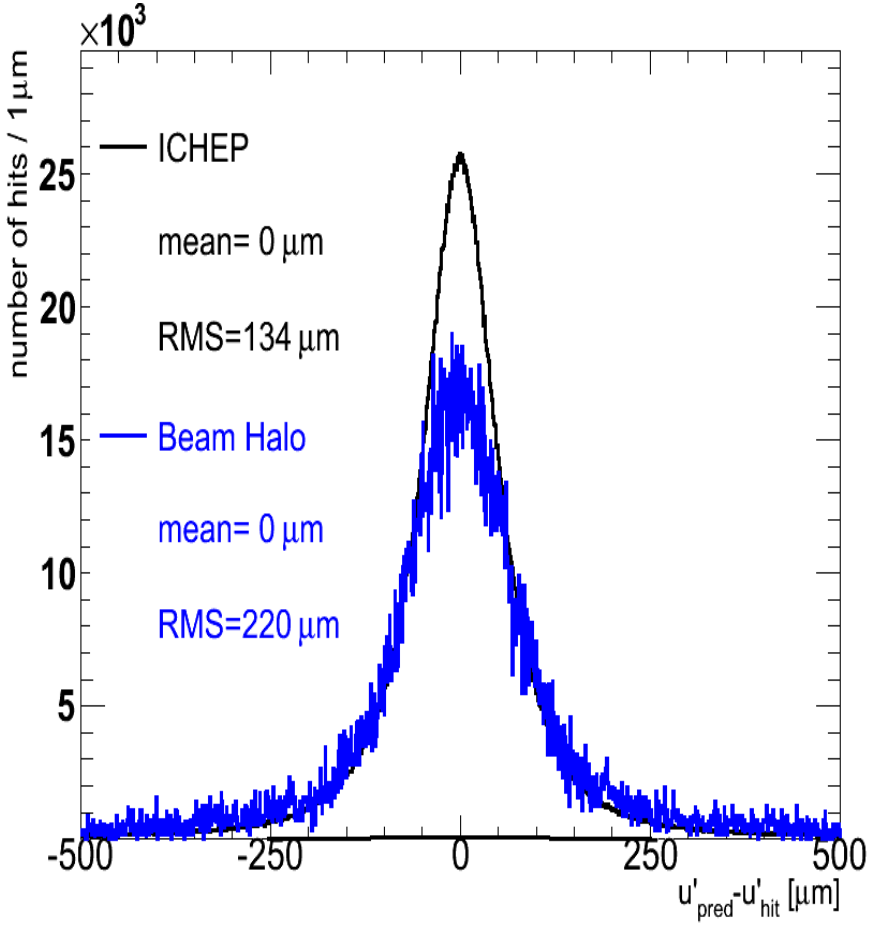


Track residuals

- Residuals in TID

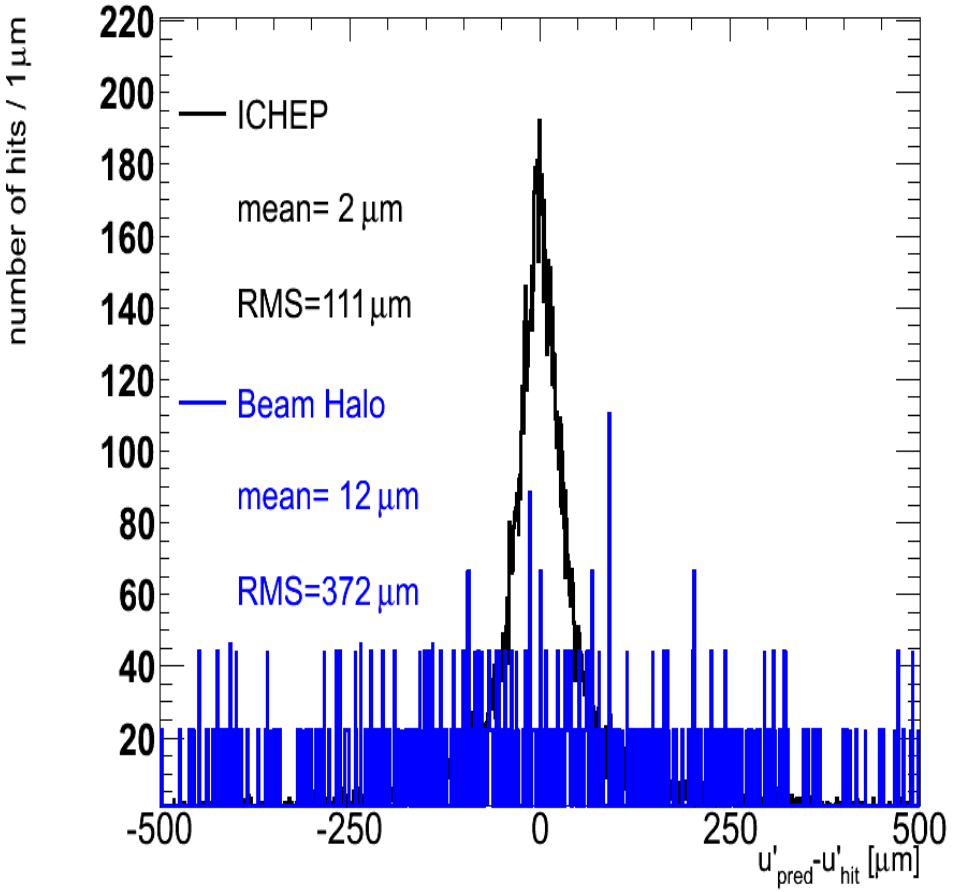


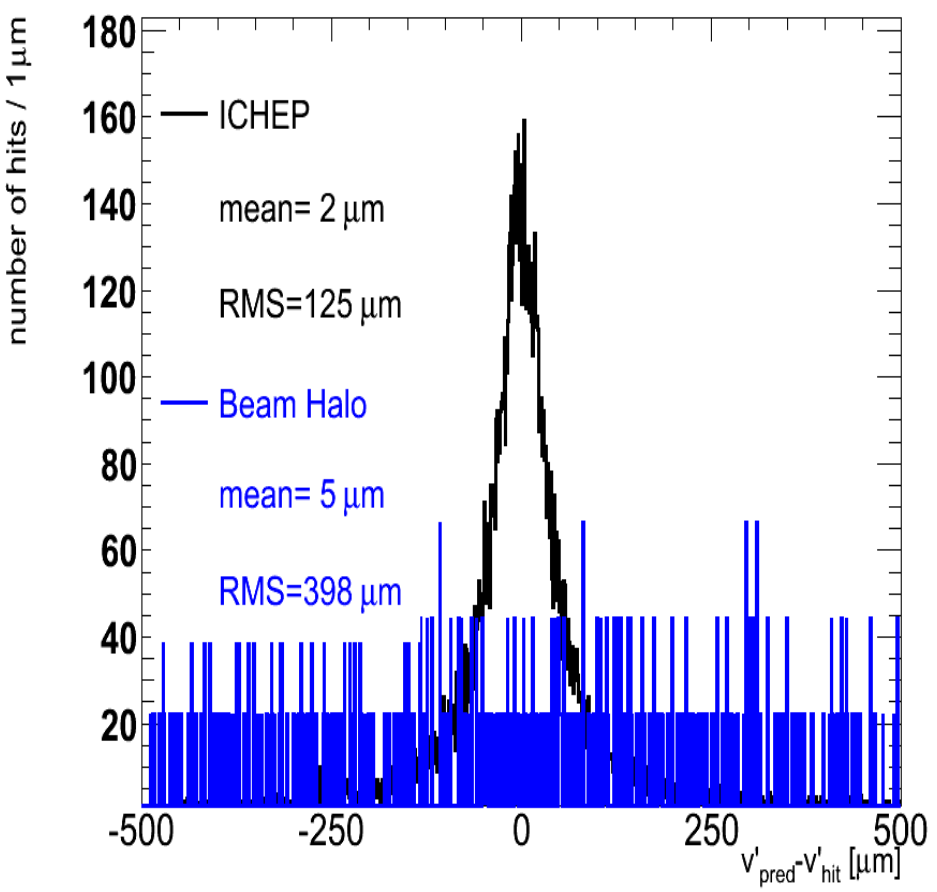
- Residuals in TEC



Track residuals

- Residuals in PXE, x
- Residuals in PXE, y

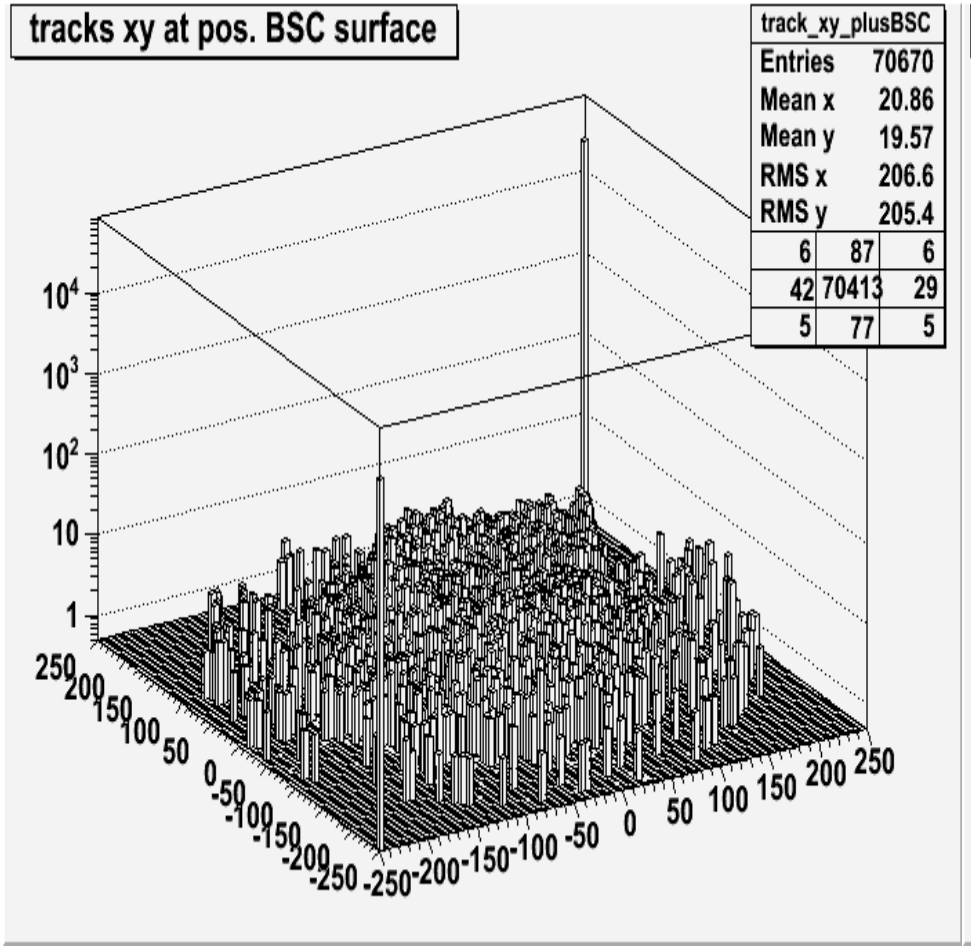


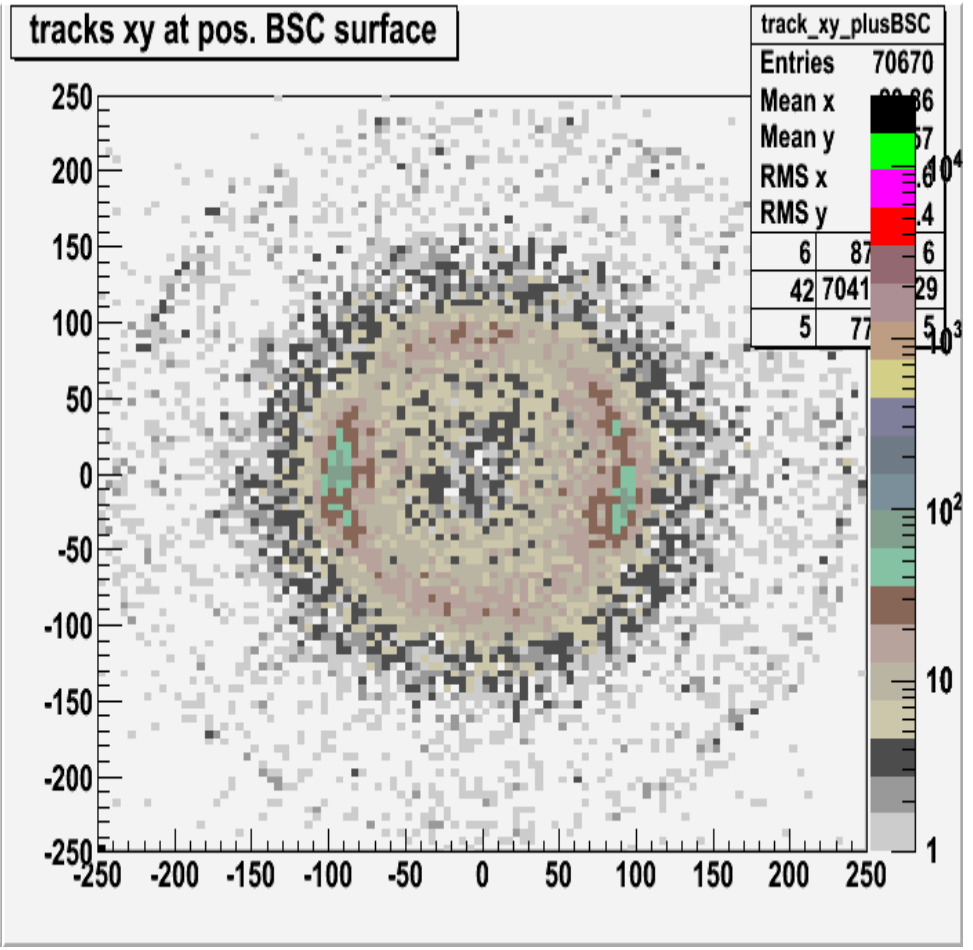


Backup Slides

“Good” tracks propagated to +10.86 m

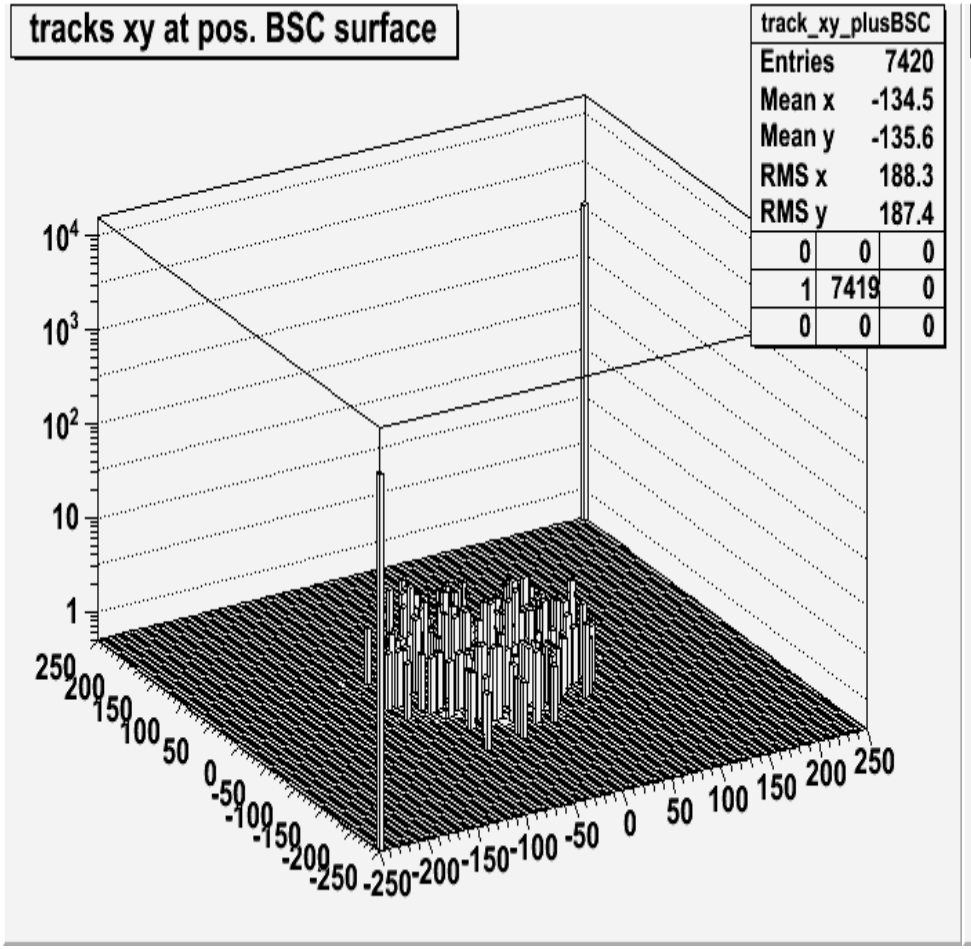
- All “good” events

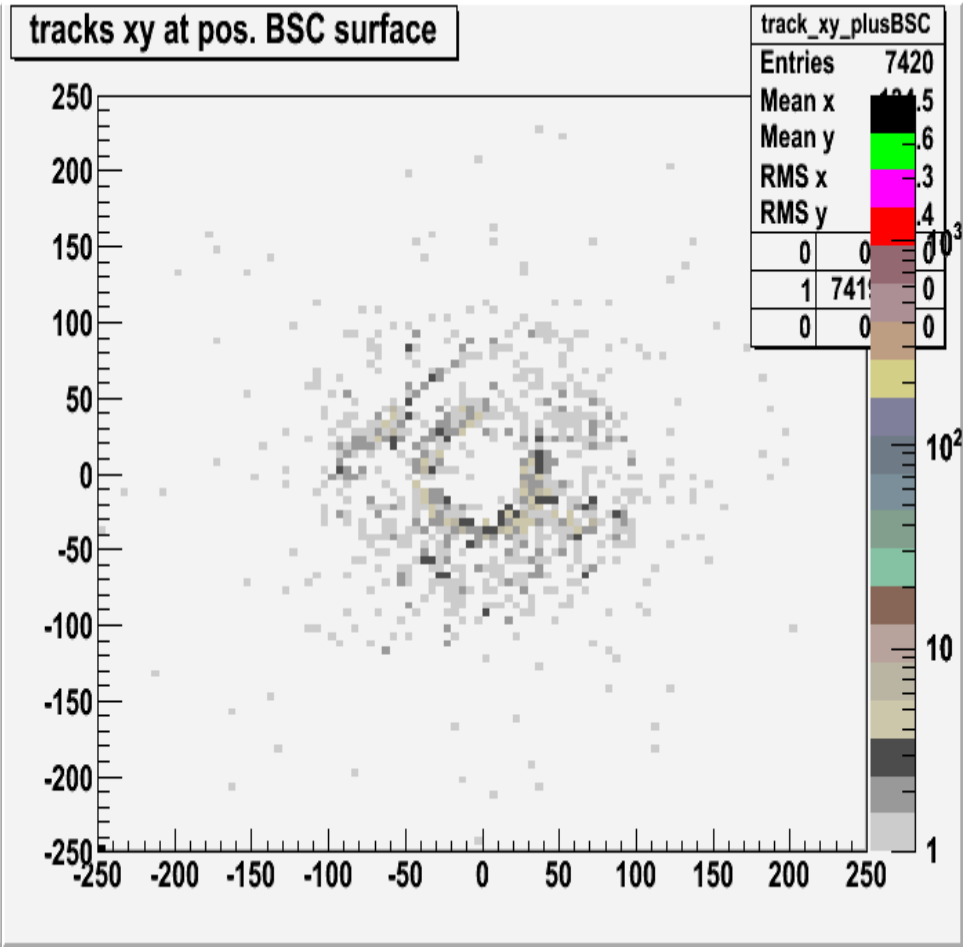




“Good” tracks propagated to +10.86 m

- “Good” events triggered by: '36 OR 37 OR 38 OR 39'





“Good” tracks propagated to +10.86 m

- “Good” events triggered by: 'NOT (36 OR 37 OR 38 OR 39)'