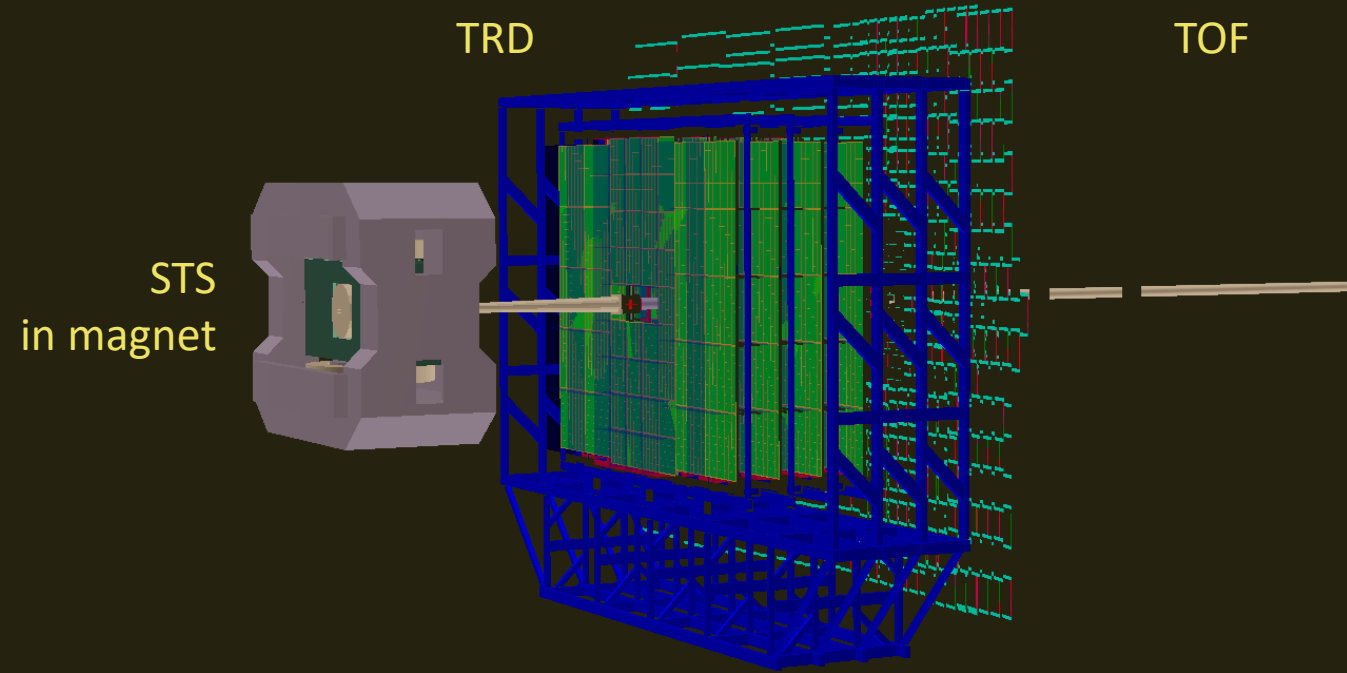


Event builder based on CBM raw data

Anna Senger

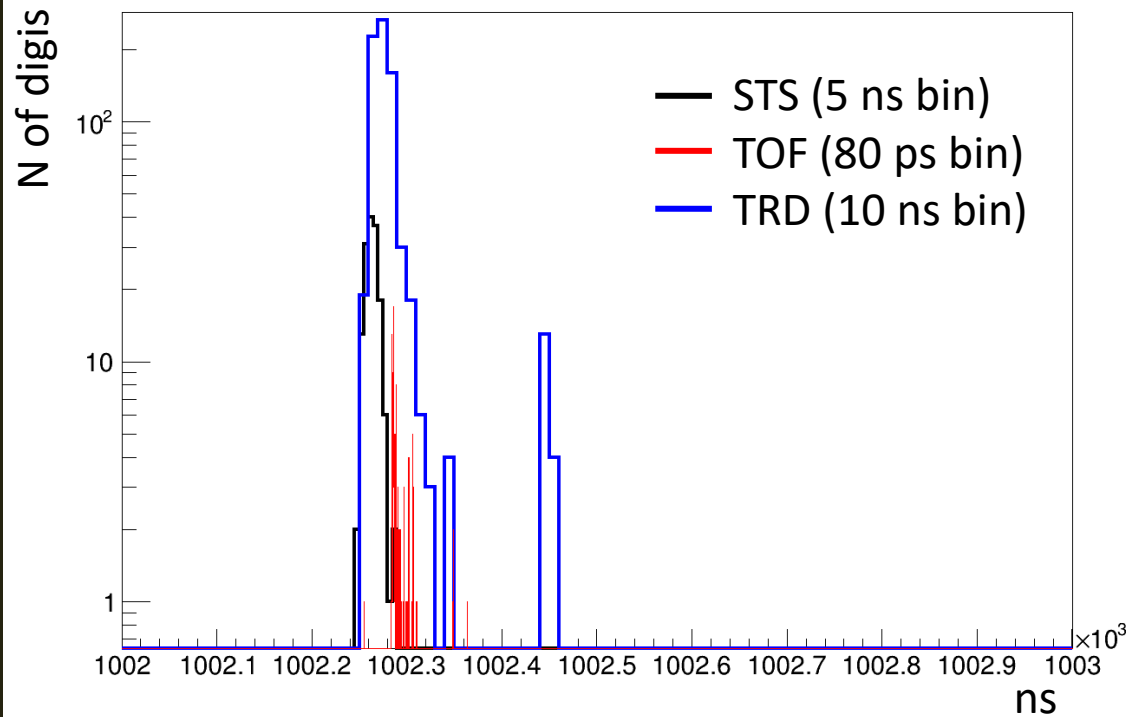
Simulation input

- **setup SIS100_hadron**
 - STS v22d
 - TRD v24c_1h
 - TOF v21a_1h
 - beam pipe v21d:v24i
 - magnetic field / magnet v22a
- **particles generated using PHQMD with small clusters**
 - `/lustre/cbm/prod/gen/phqmd52_winn/auau/pbeam12agev/mbias/small_clusters`
- **transport with GEANT4**
- **without detector noise and without beam**

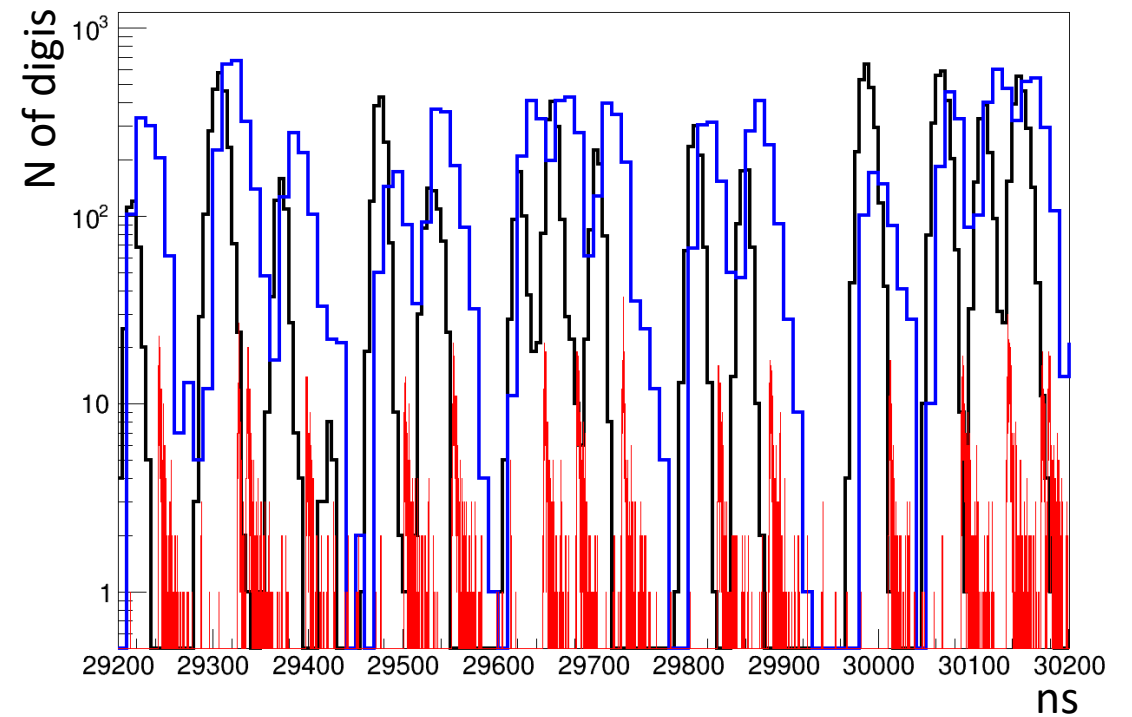


Digis in time slice: 1 μ s

10^5 interaction / s

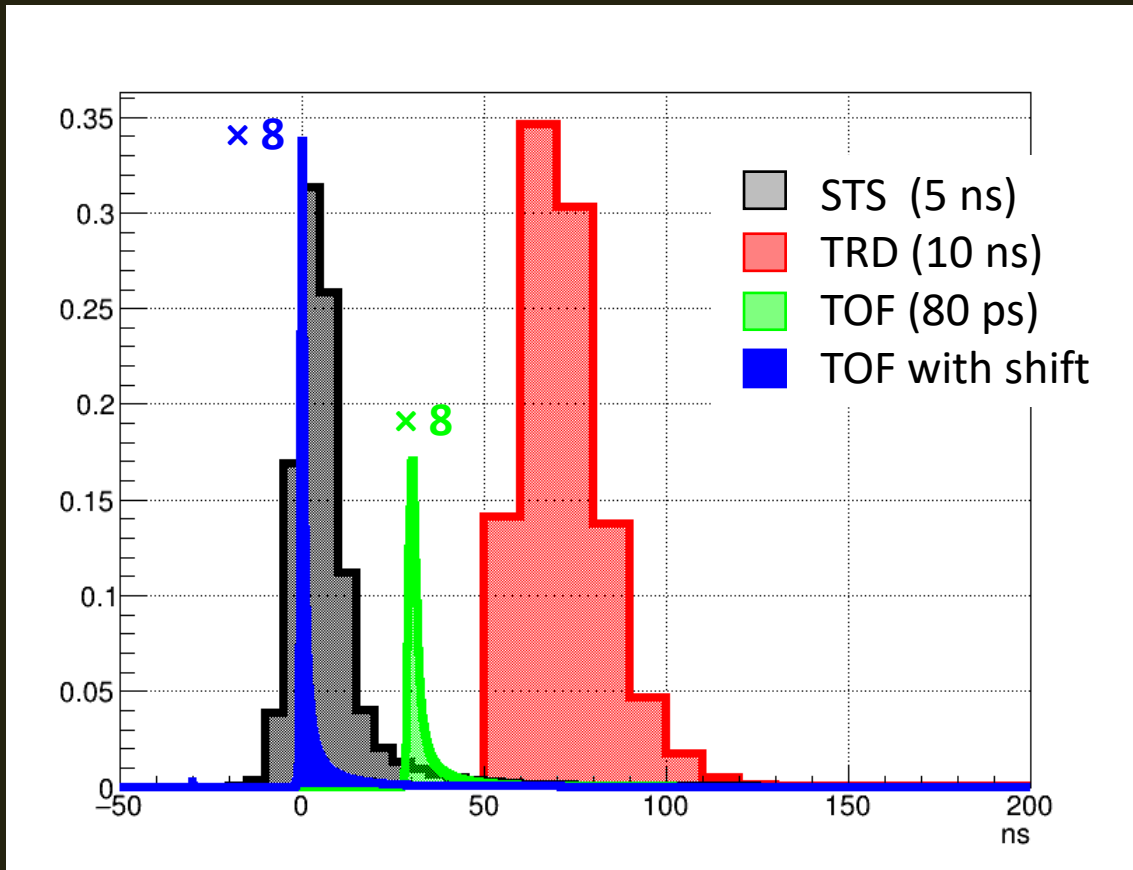


10^7 interaction / s



Event selection: reference detector

Event-by-event reconstruction



Reference detector:

STS – δ -electrons from the target and large time resolution 🙄

TRD – large time resolution 🙄

TOF – small time resolution, less background particles from target 👍

Update TOF digi time taking into account time of flight („TOF with shift“):
event trigger window $-2 \div 20$ ns

Time shift implementation

CbmTaskBuildRawEvents.h

```
Double_t ShiftDigiTime(ECbmModuleId _system, UInt_t _entry);
```

CbmTaskBuildRawEvents.cxx

```
Double_t CbmTaskBuildRawEvents::GetDigiTime(ECbmModuleId _system, UInt_t _entry){
    ....
    //case ECbmModuleId::kTof: return (fTofDigis->at(_entry)).GetTime();
    case ECbmModuleId::kTof: return (ShiftDigiTime(_system, _entry));
    ....
}
Double_t CbmTaskBuildRawEvents::ShiftDigiTime(ECbmModuleId _system, UInt_t _entry){

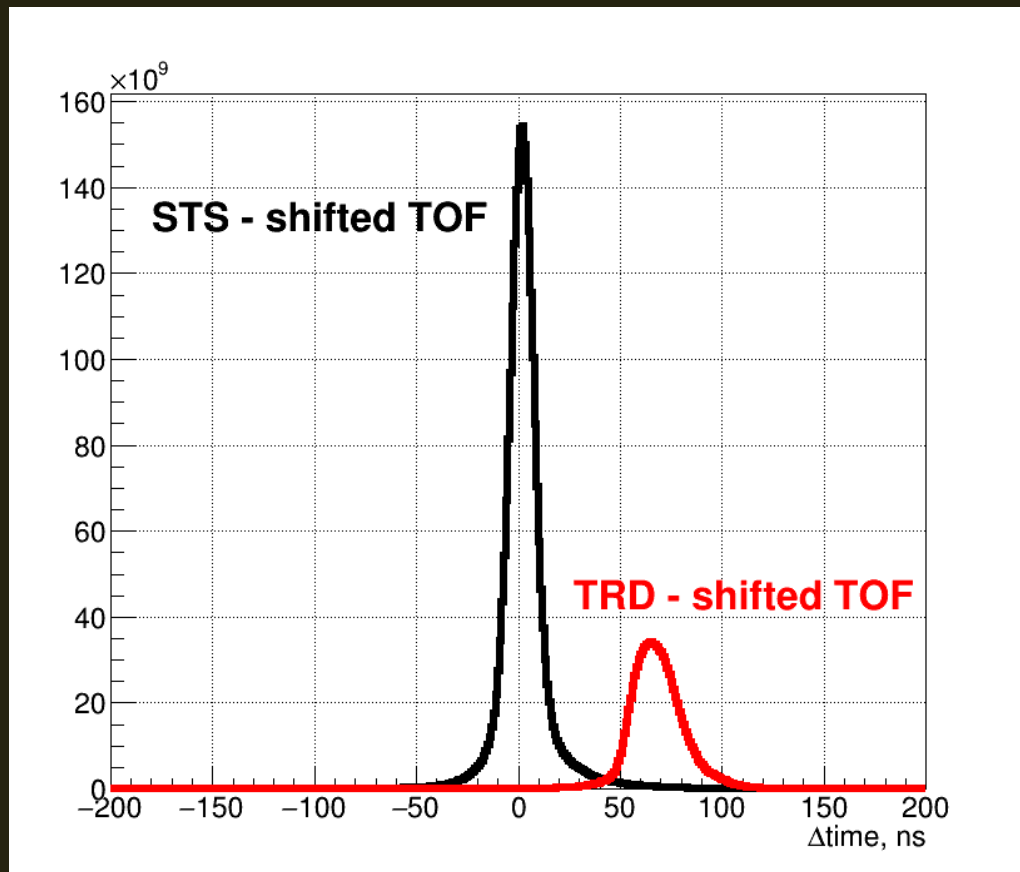
    Double_t time = fTofDigis->at(_entry).GetTime();
    Double_t sm    = fTofDigis->at(_entry).GetSm();
    Double_t rpc   = fTofDigis->at(_entry).GetRpc();
    Double_t ich   = fTofDigis->at(_entry).GetChannel();
    Double_t type  = fTofDigis->at(_entry).GetType();

    Int_t iChId = CbmTofAddress::GetUniqueAddress(sm, rpc, ich, 0, type);

    fChannellInfo = fDigiPar->GetCell(iChId);
    Double_t X    = fChannellInfo->GetX();
    Double_t Y    = fChannellInfo->GetY();
    Double_t Z    = fChannellInfo->GetZ()+44.;
    Double_t R    = TMath::Sqrt(X*X+Y*Y+Z*Z);
    return time - R/29.9792458;
}
```

Event selection: detector windows

Event-by-event reconstruction

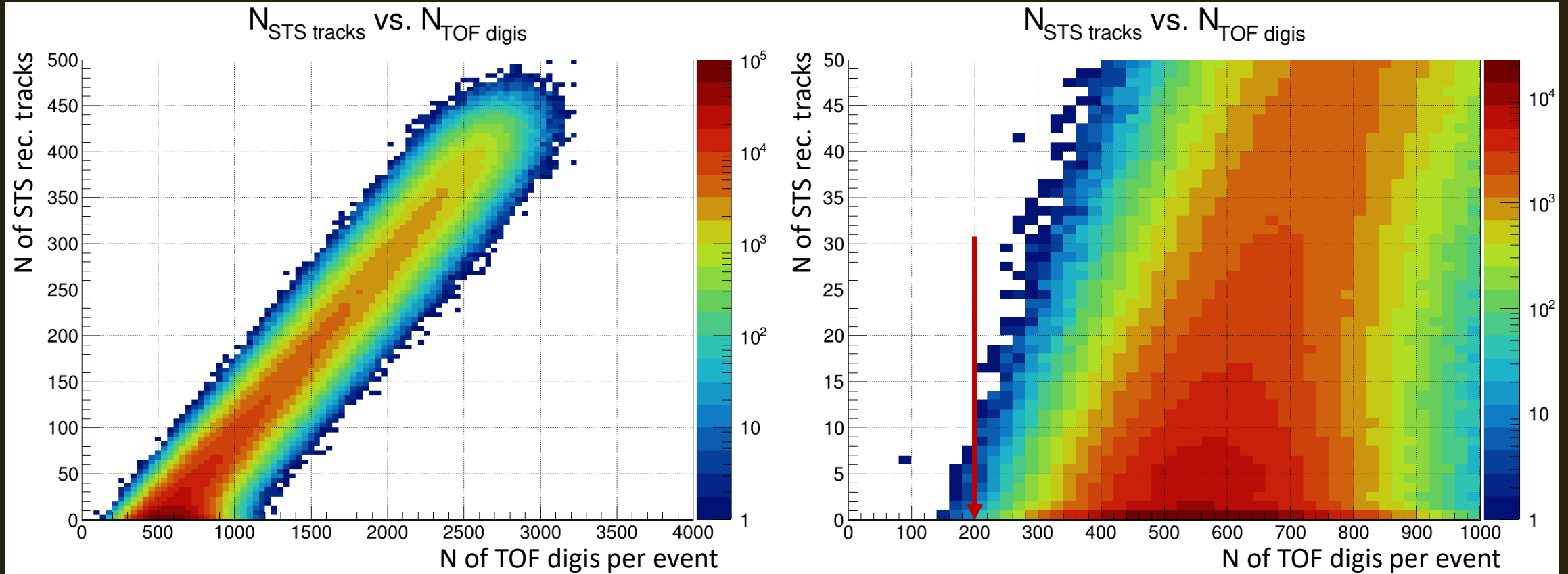


STS: $-50 \div 55$ ns

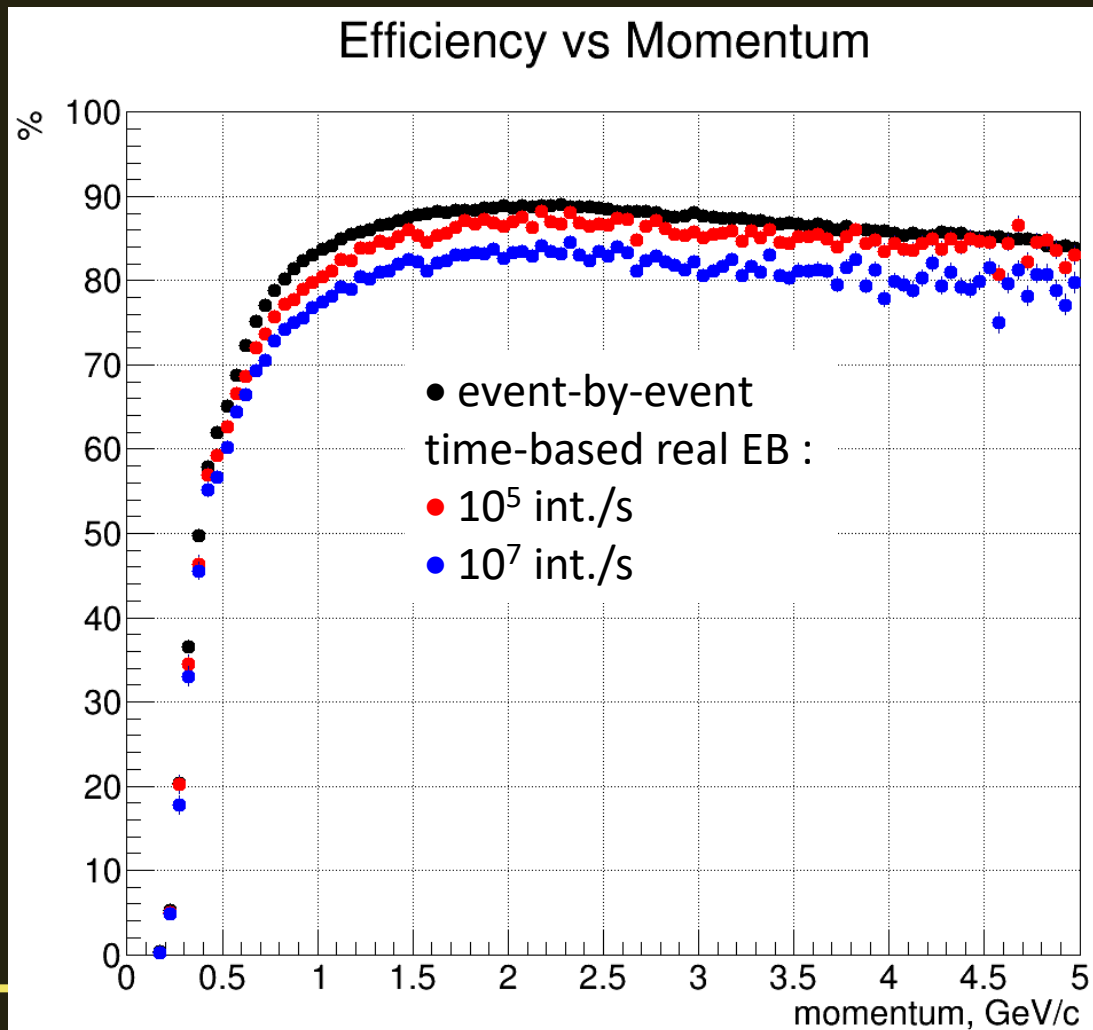
TRD: $0 \div 150$ ns

Event selection: minimum number of digis

Event-by-event reconstruction



Global reconstruction efficiency STS+TRD+TOF



%

Event builder QA: number of long tracks

STS+TRD+TOF

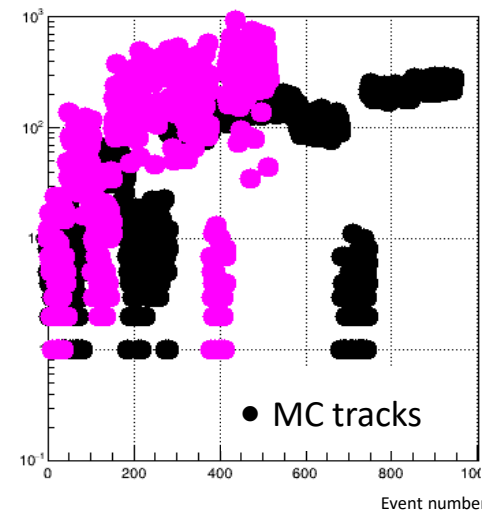
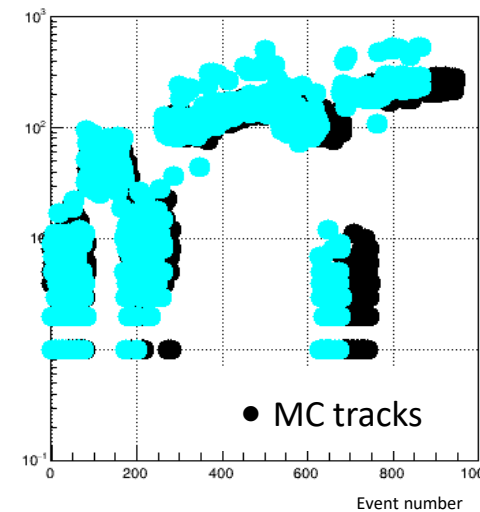
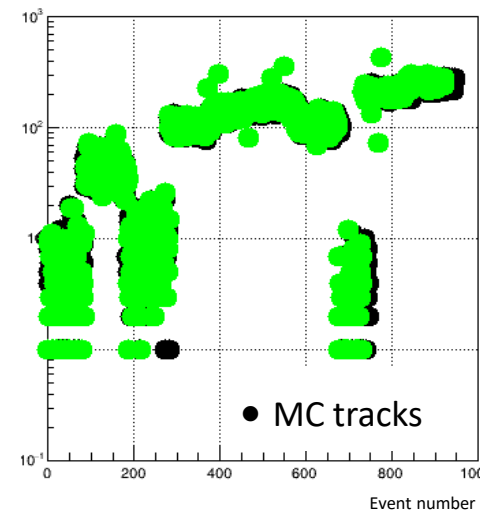
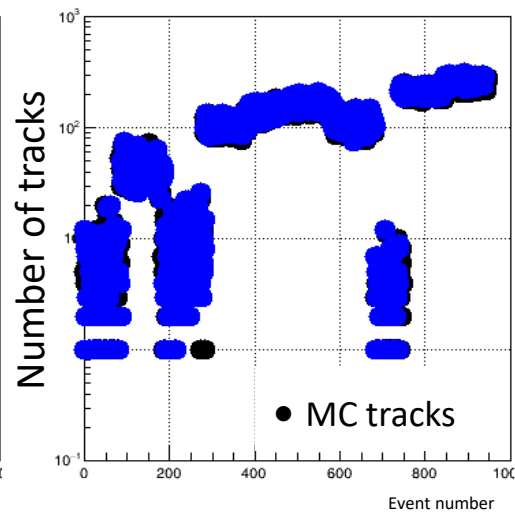
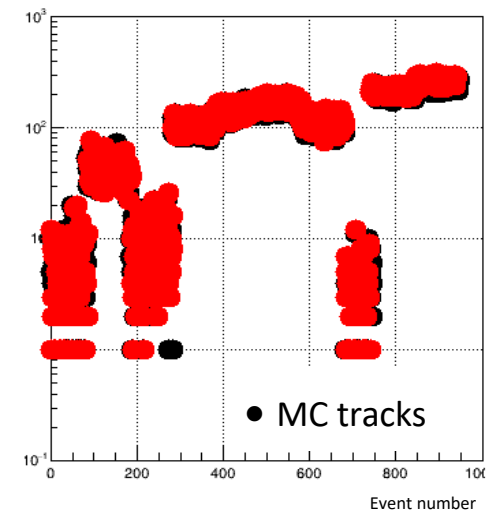
Event-by-event

10^5 , ideal EB

10^5 , real EB

10^6 , real EB

10^7 , real EB



splitting: $\sim 1\%$

splitting: 0 %
merging: 6.5 %

splitting: 1.5 %
merging: 30 %

merging: reconstructed tracks from different MC events are put to one reconstructed event
splitting: reconstructed tracks from one MC event are put to different reconstructed events

Next steps

- Use tracks or multiple primary vertices for event selection / separation. Needed: new or updated global tracking for reconstruction in time slice; multiple primary vertices reconstruction.

Event builder based on global tracks

<https://indico.gsi.de/event/19534/contributions/82196/>