Aerogel counters in SpdRoot

Artem Ivanov
JINR, Dubna
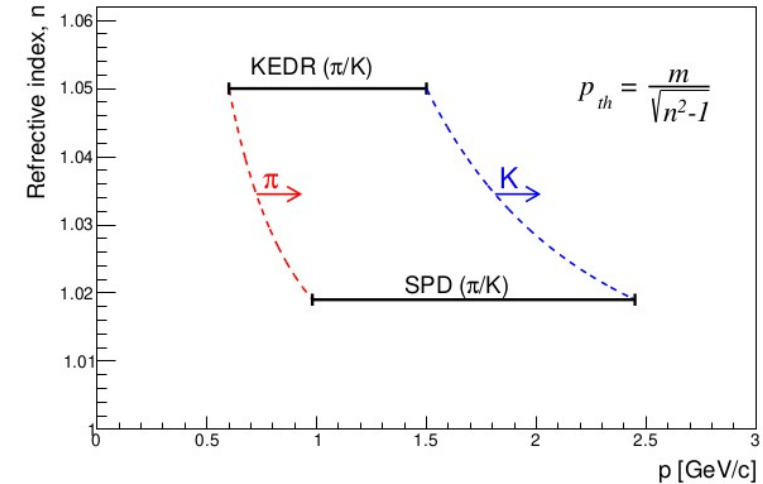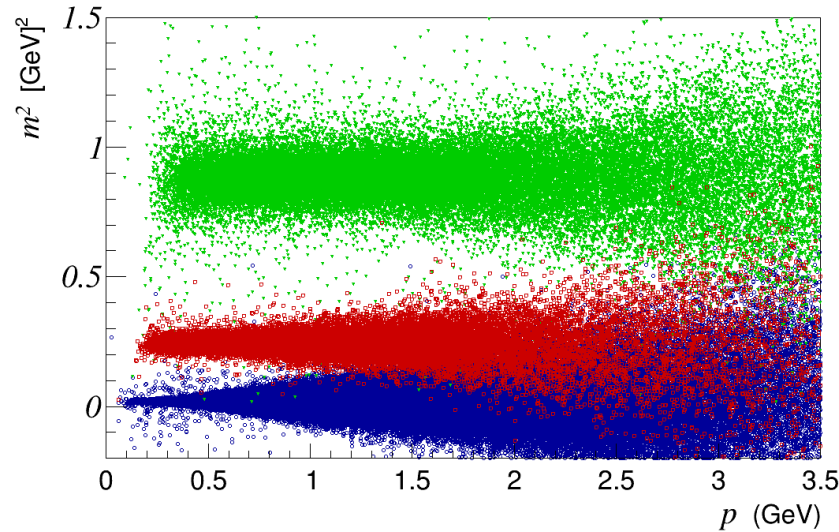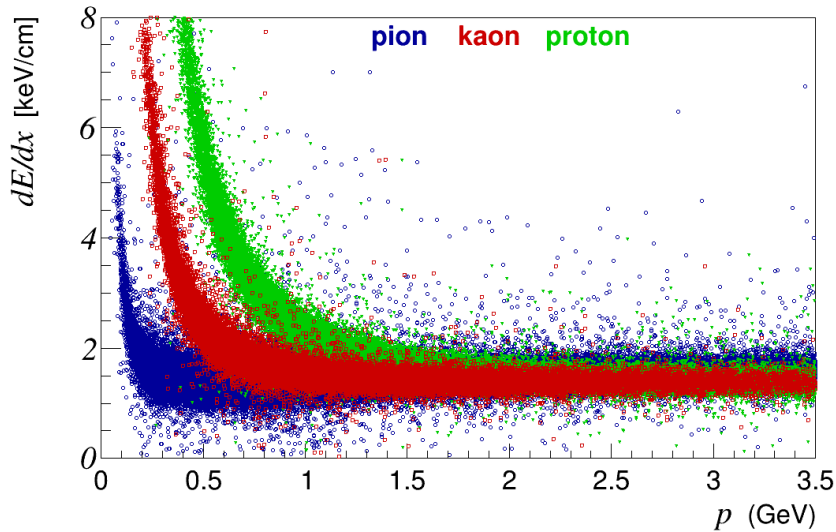
SPD Physics Weekly Meeting
5.04.2022

Particle identification in SPD

STRAW

TOF

Aerogel

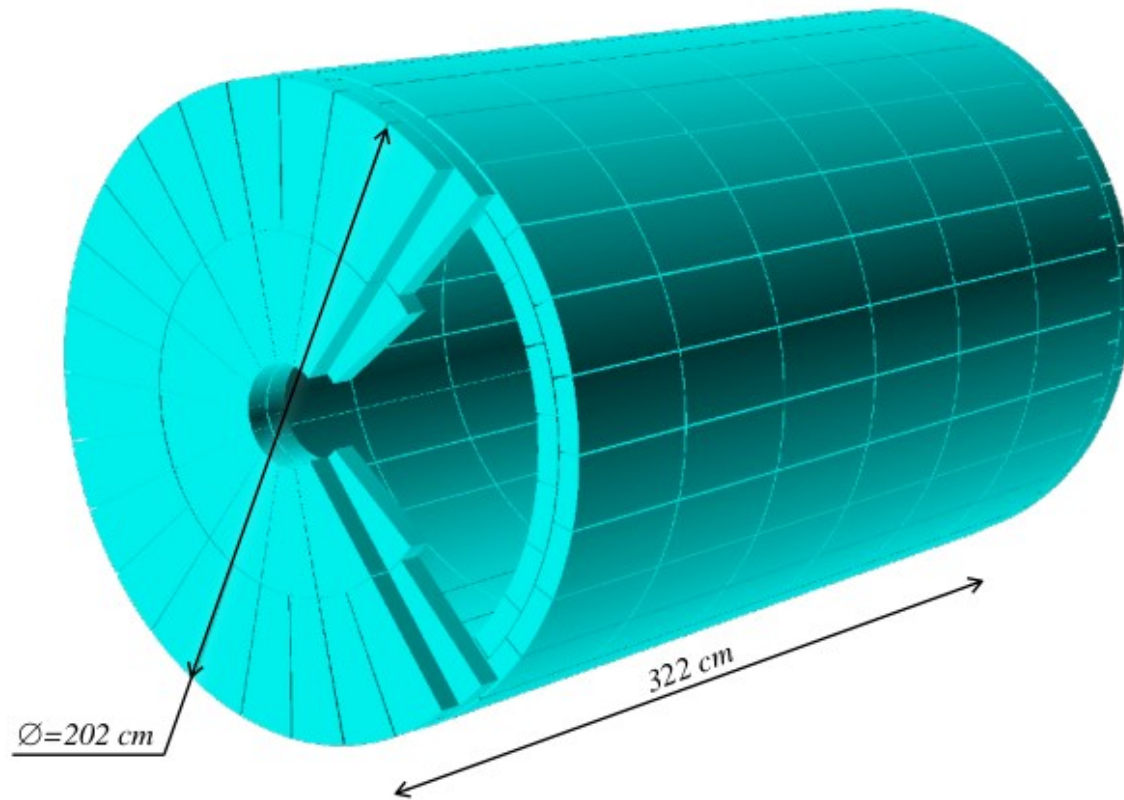_pion/kaon_ separation
- Short tracks (R<1 m) to be identified by STRAW up to 0.7 GeV
- Long tracks (R>1 m) to be identified by STRAW+TOF up to 1.5 GeV
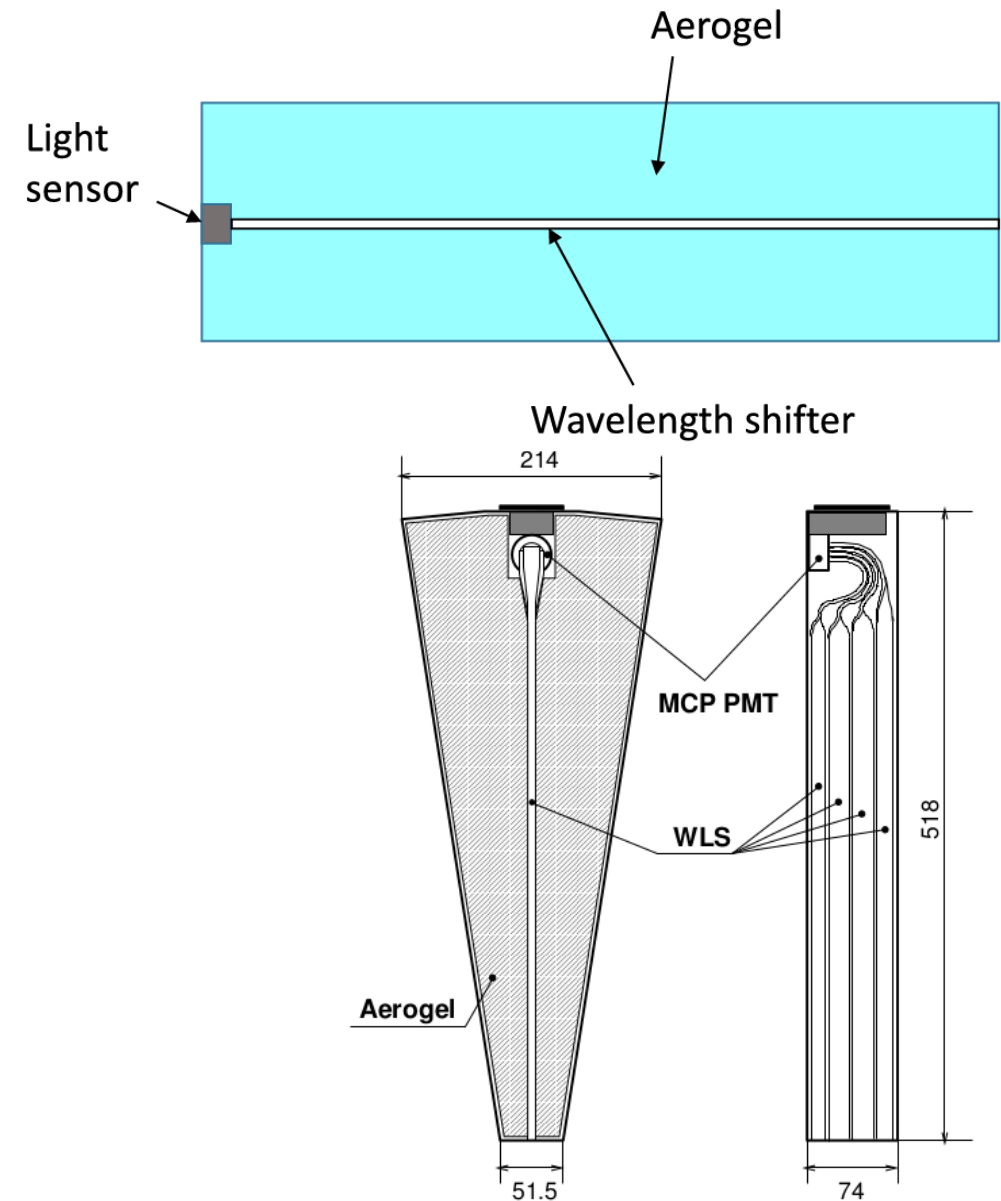- Tracks with p>1.5 GeV to be identified by aerogel
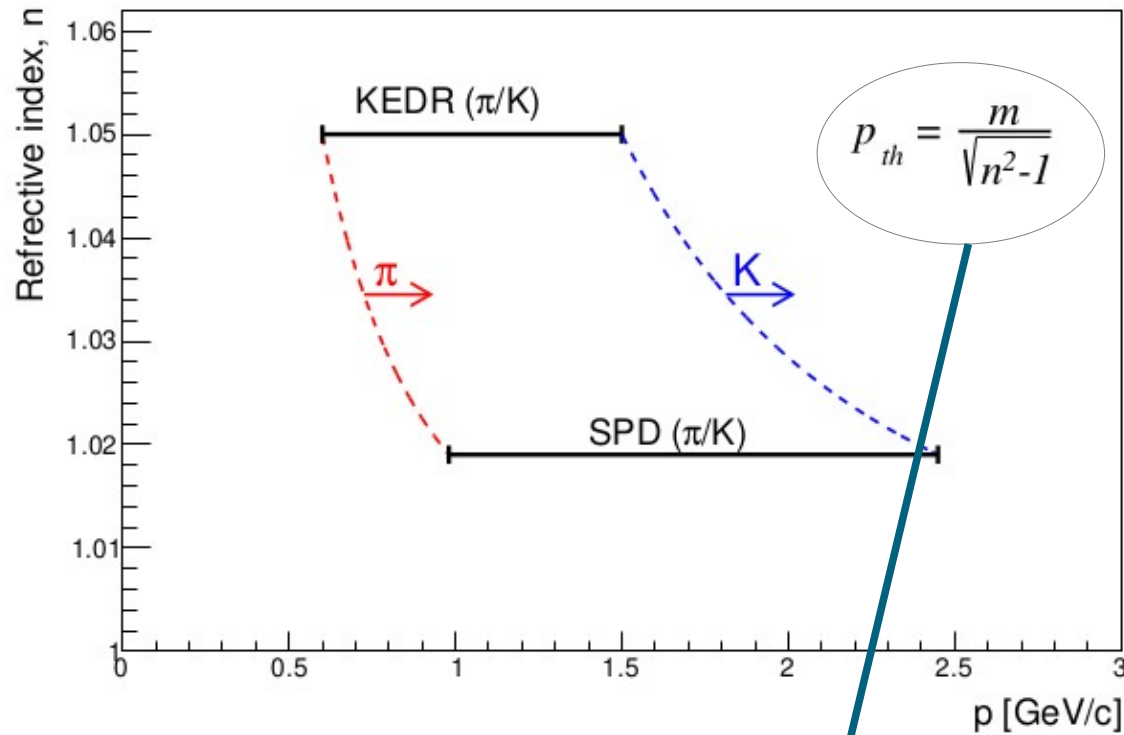
Aerogel in SPD

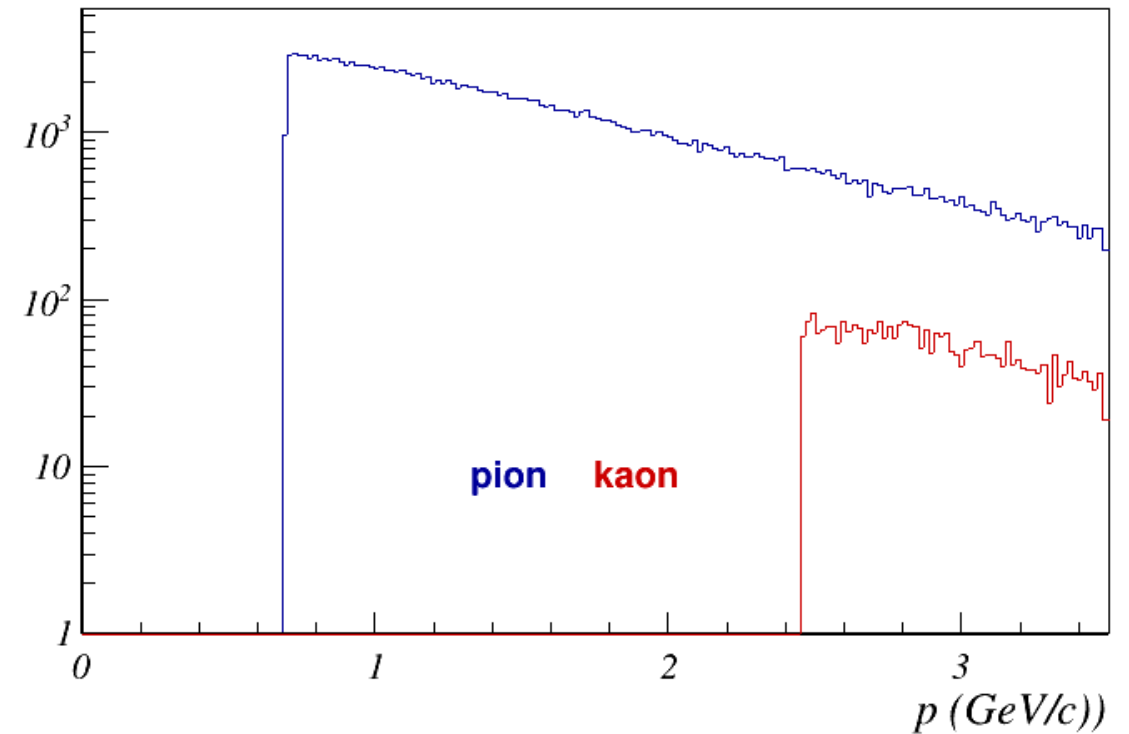Possible arrangement of counters in SPD

ASHIPH system in the KEDR experiment

Aerogel

Light sensor

Wavelength shifter

214

MCP PMT

WLS

518

Aerogel

51.5

74

322 cm

Ø=202 cm

Only End-Cap are considered

Momentum threshold

$$p_{th} = \frac{m}{\sqrt{n^2-1}}$$

n=1.02				
	electron	muon	pion	kaon	proton
P_{th} (GeV/c)	0.0025	0.52	0.69	2.45	4.66

Momentum threshold

pion/kaon separation
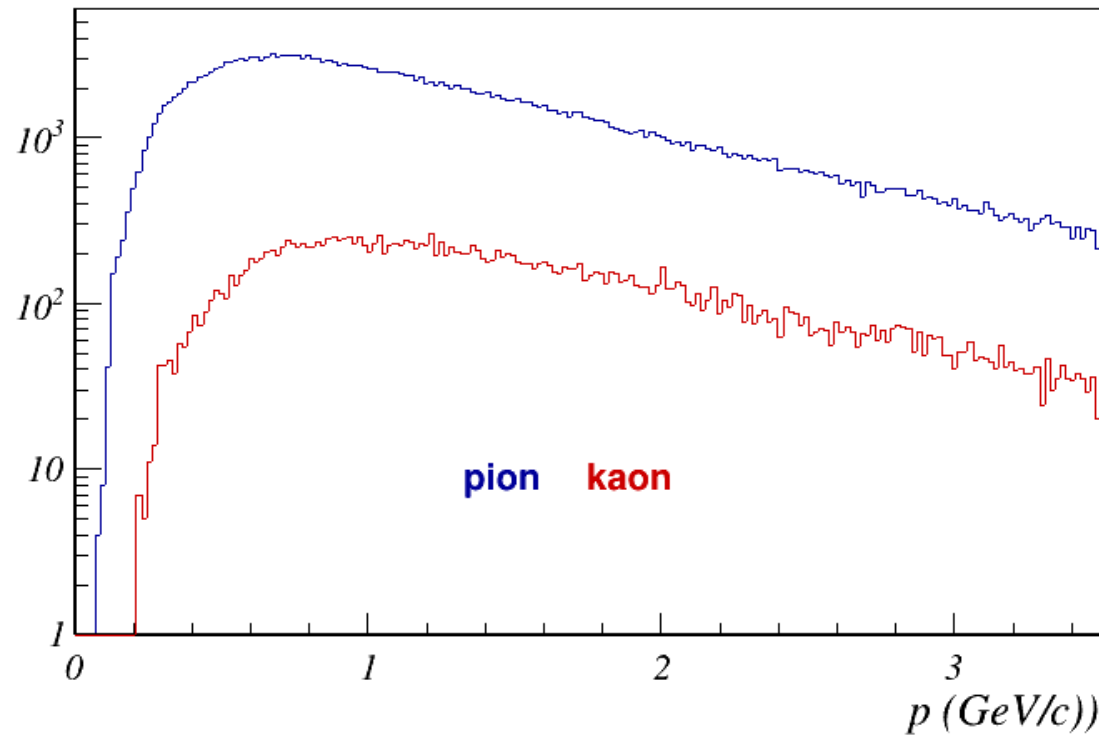
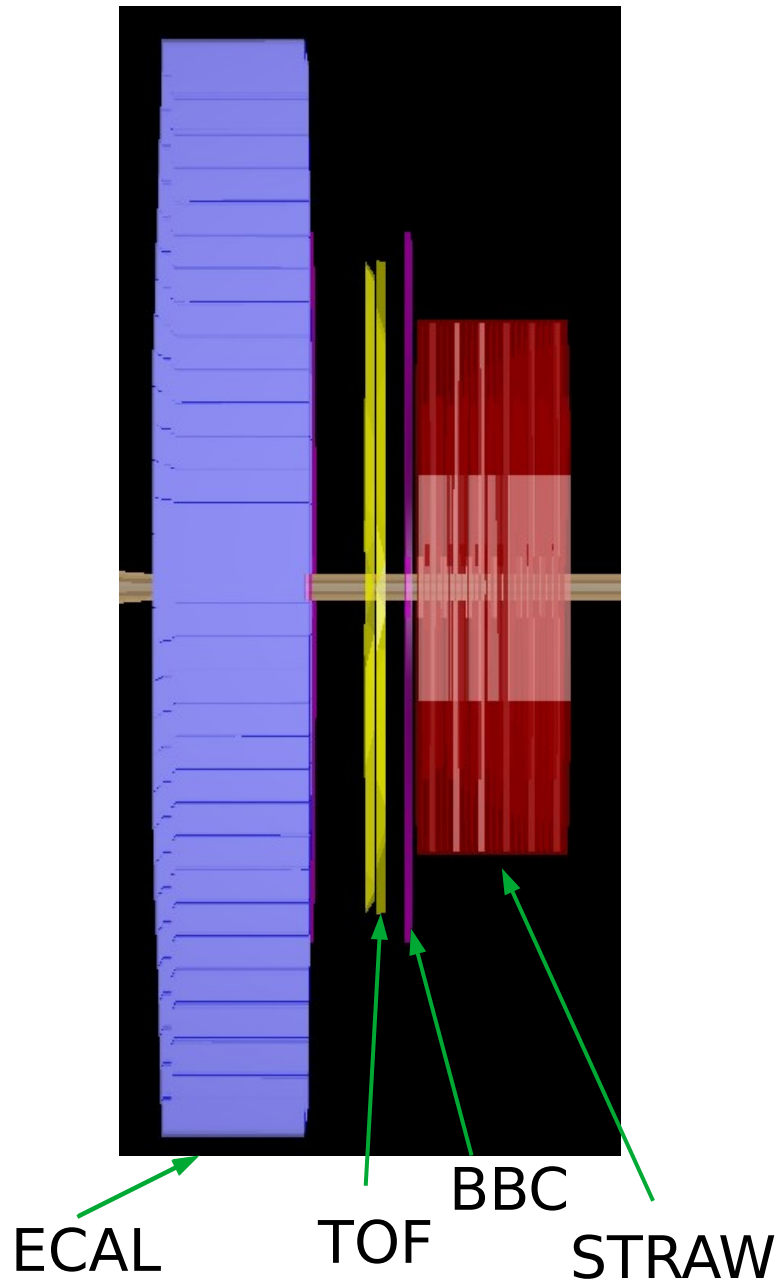| n=1.02					
	electron	muon	pion	kaon	proton
P_{th} (GeV/c)	0.0025	0.52	0.69	2.45	4.66

Aerogel in SpdRoot

Only End-Cap
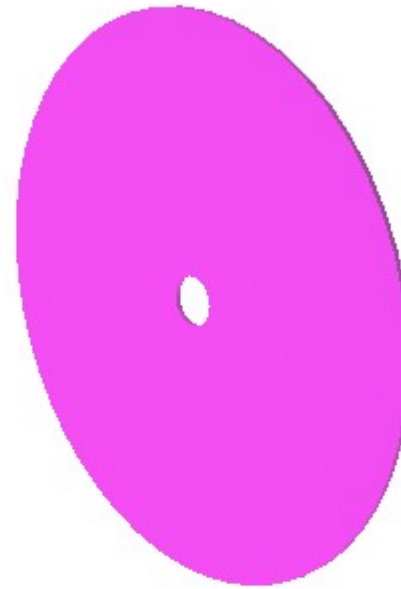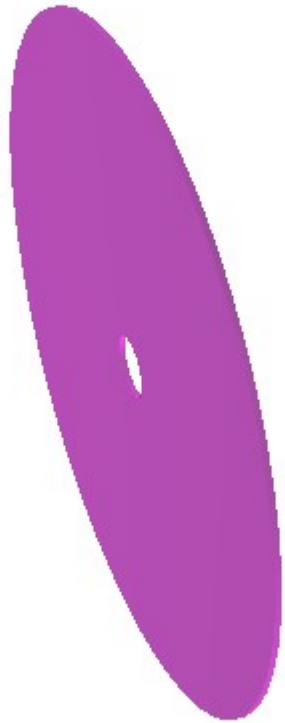
Aerogel in SpdRoot: End-Cap

Current

Without ECAL
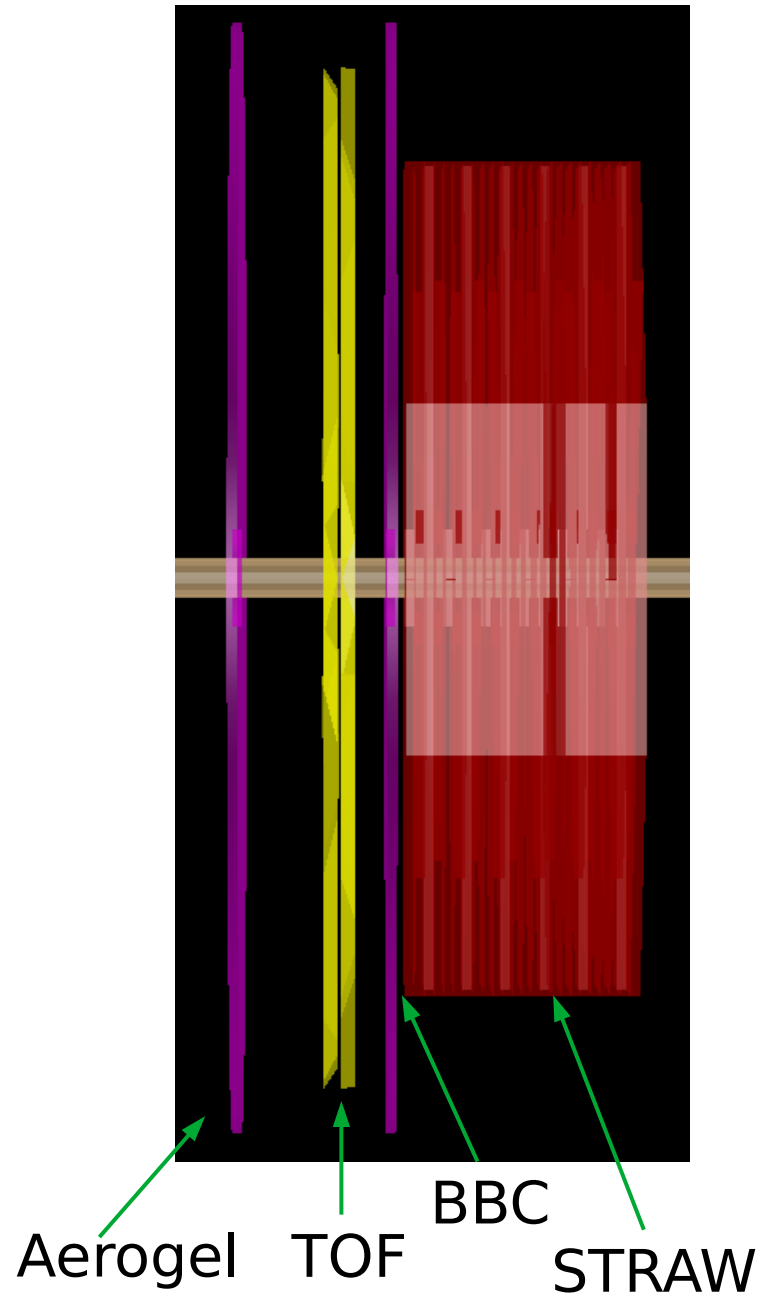
The wrong position

Aerogel has to be between
BBC and TOF

ECAL   TOF   BBC   STRAW

Aerogel   TOF   BBC   STRAW

7

Aerogel in SpdRoot: End-Cap

spdroot/common/SpdCommonGeoMapper.cxx

```
/*==================== AEROGEL (AEG) ======================*/

Int_t     SpdCommonGeoMapper::theAegDefGeoType       = 1;
TString   SpdCommonGeoMapper::theAegBaseMaterial     = "air";        = 16.
Double_t  SpdCommonGeoMapper::theAegThickness         = 2.;      // cm
Double_t  SpdCommonGeoMapper::theAegSize              = 115.;    // cm
Double_t  SpdCommonGeoMapper::theAegWidth             = 105.;    // cm
Double_t  SpdCommonGeoMapper::theAegMinDist           = 199.6;   // cm
```
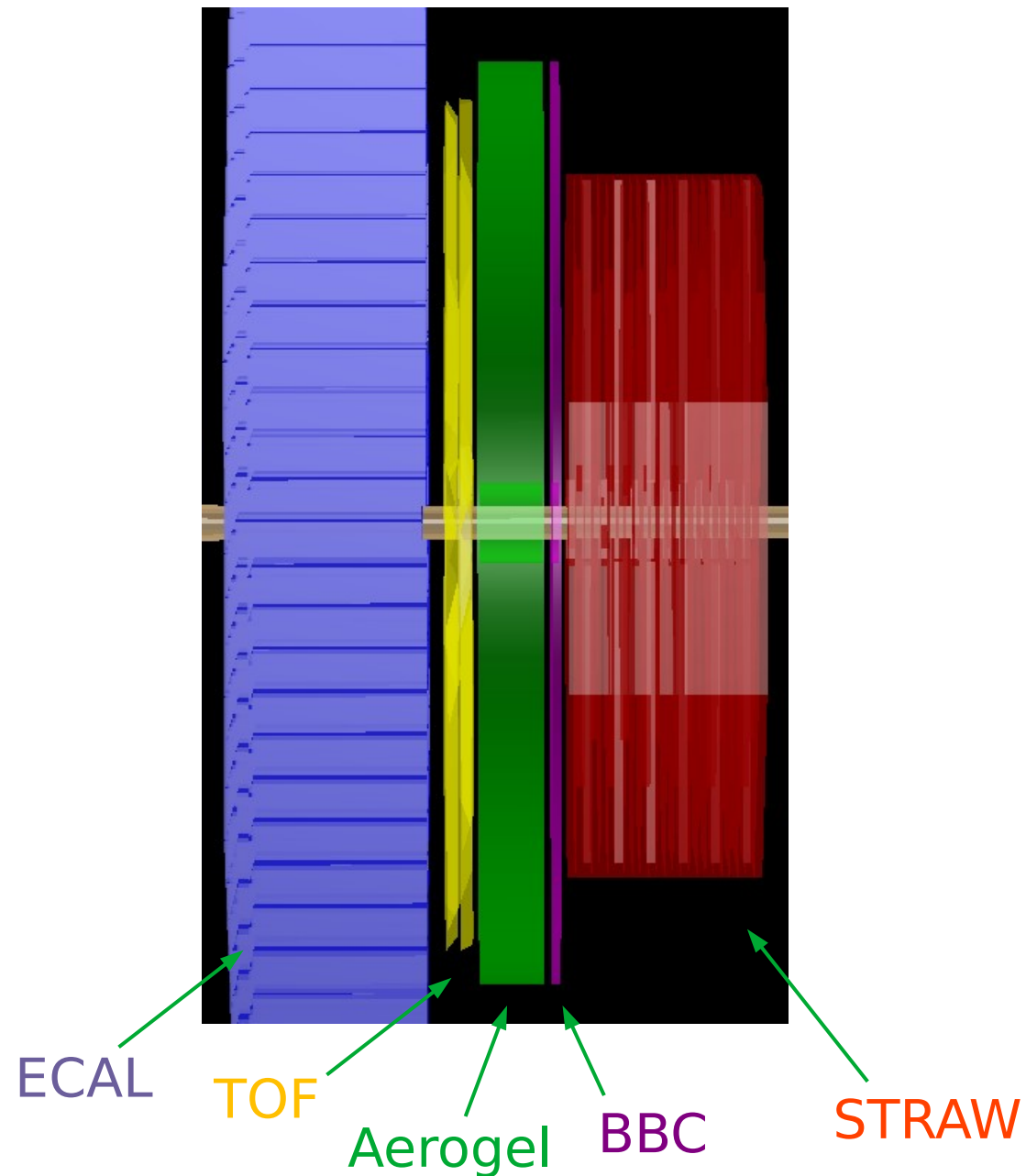
= 171.8;
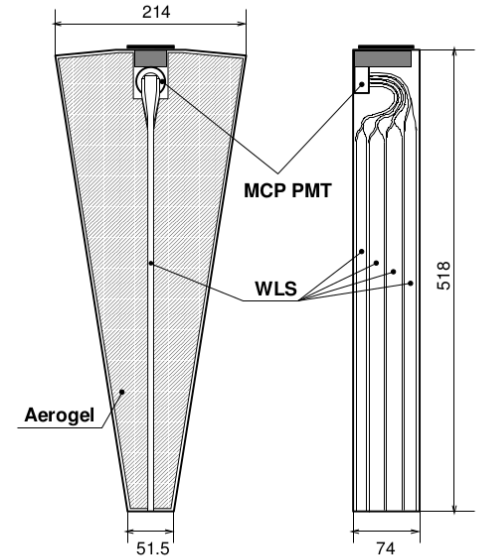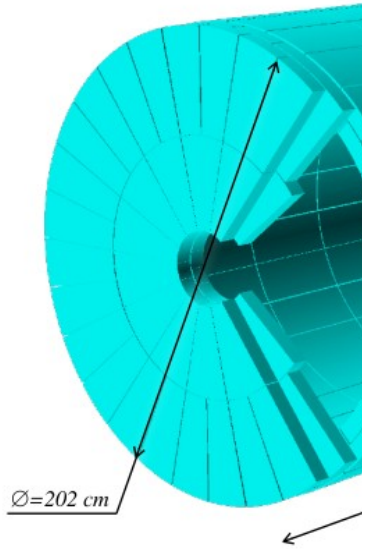
```
/*==================== TIME-OF-FLIGHT SYSTEM (ENDCAPS) ======================*/

Double_t  SpdCommonGeoMapper::theTofECMinDist        = 171.6;   // cm
```

185.0;

8

Corrected position

ECAL   TOF   Aerogel   BBC   STRAW

Naive calculation probability
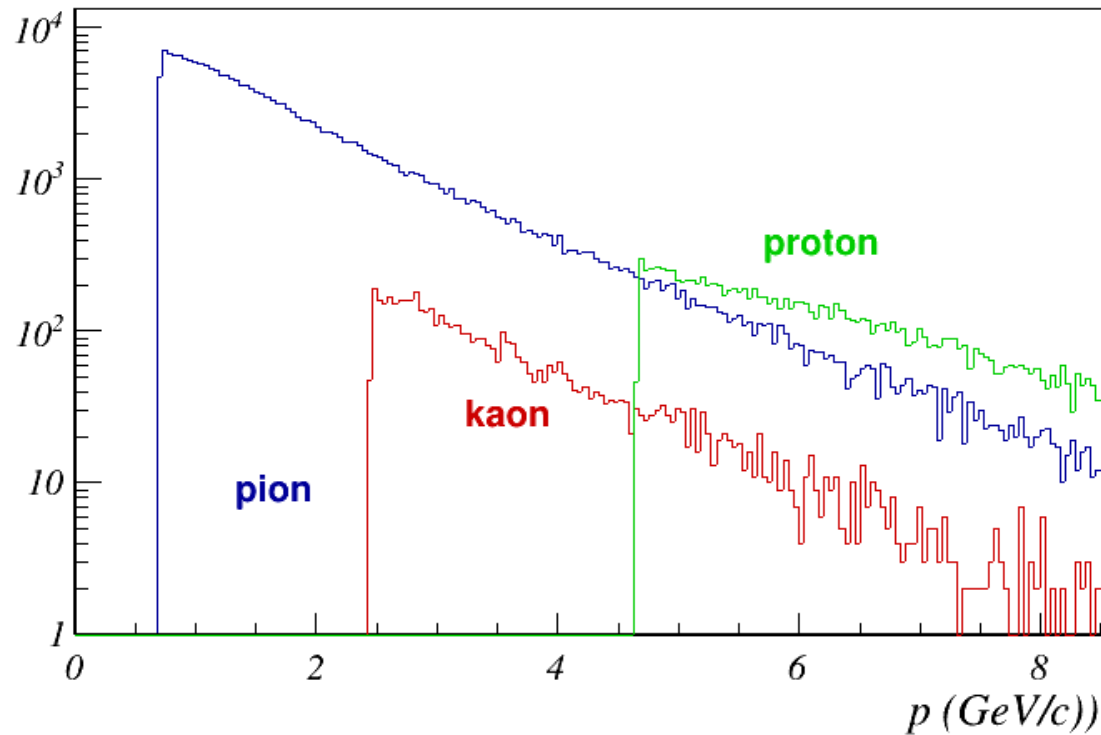
Momentum 0 – 2.45

prob['pion'] = 1;   prob['kaon'] = 0; prob['proton'] = 0;

Momentum 2.45 – 4.66

prob['pion'] = 1;   prob['kaon'] = 1; prob['proton'] = 0;

Momentum 4.66 - ...

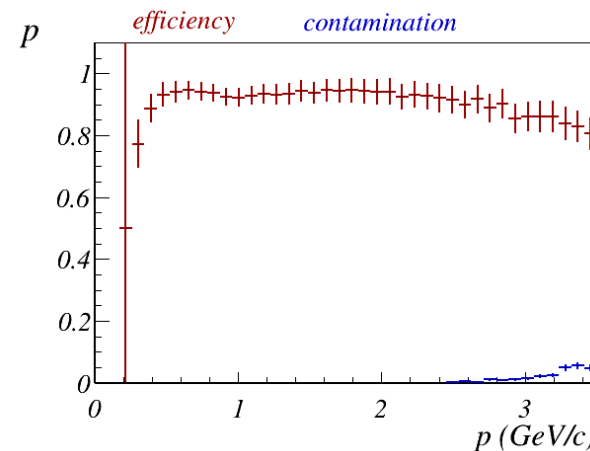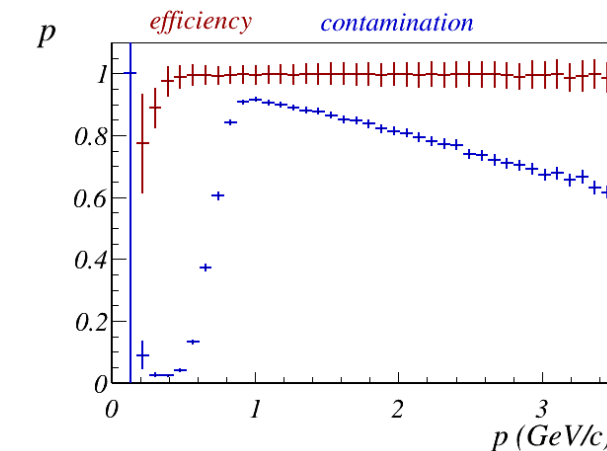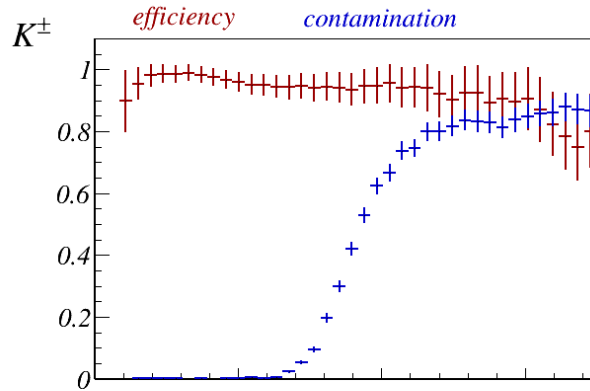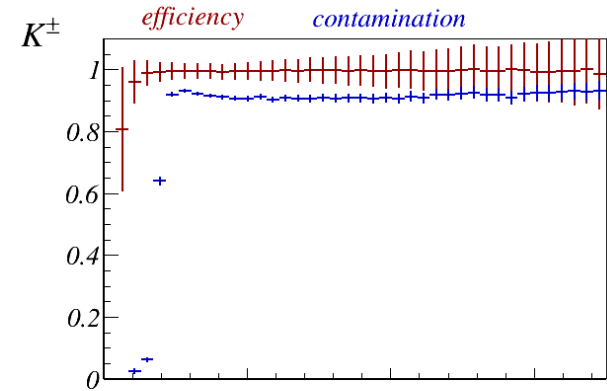*prob['pion'] = 1;   prob['kaon'] = 1; prob['proton'] = 1;*

n=1.02		
	pion	kaon	proton
P_{th} (GeV/c)	0.69	2.45	4.66

Particle identification

STRAW

TOF

Aerogel
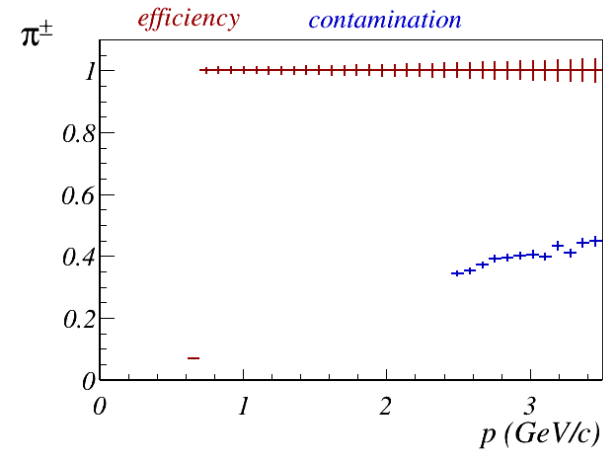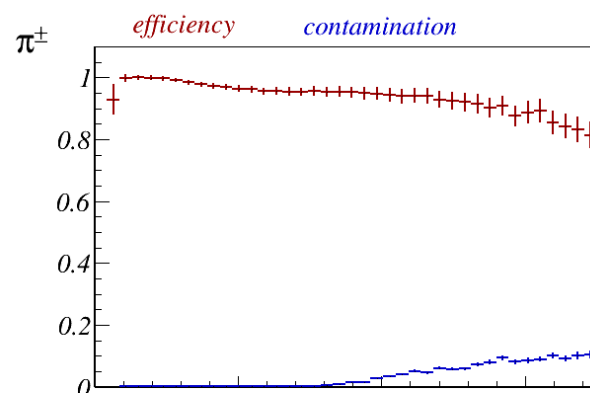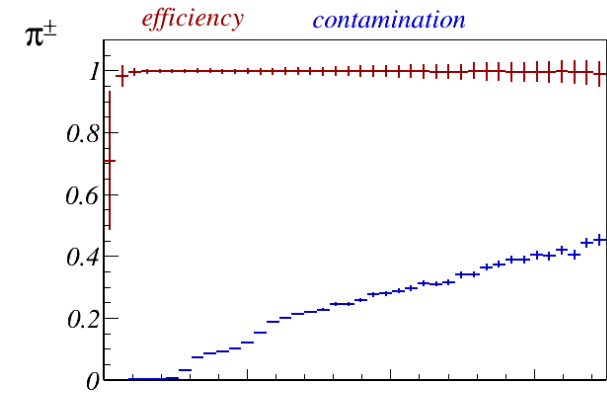
$$efficiency = \frac{N_{corr}}{N_{true}}$$

$$contamination = \frac{N_{incorr}}{(N_{incorr} + N_{corr})}$$

N_{corr} − the number of correctly identified particles of a certain type
N_{incorr} − number of misidentified particles a certain type
N_{true} − the true number of particles of a certain type.

11

Next

- Add realistic behavior Aerogel counters in SpdRoot