SHiP Straw Tracker Plans

on behalf of ship-tracker@cern.ch
Reminder: Spectrometer Straw Tracker

- Rate max ~2kHz/straw (ø1cm)
- Y resolution ~130 μm
- Track efficiency ~100%
Reminder: Spectrometer Straw Tracker
Reminder: R&D

- **Straw prototypes**
  - study sagging & its effects under controlled conditions
    - needs a 5m straw, support mechanics, a DAQ, test beam area, gas, an external tracker, optical wire-offset measuring system
  - study signal characteristics on 5m straw
  - study straws with D=15 or 20 mm ?
    - needs new coated foil, tests can start with commercial aluminized mylar

- **Straw parameters optimization and specification**
  - «straightness» requirements
  - larger diameter ? (10 => 15 => 20 mm?) cost reduction !
  - slower gas ? (rate smaller than in NA62)
  - optimize HV (affects sagging)

- **Tracker geometry optimization**
  - stereo angle
  - trade off between vertex and momentum resolution
Test beam

- Goal: measure drift time distributions with well defined tracks and with known wire-vs-straw offset.

- Set up a tracker telescope to define tracks with <~100um vertical precision on DUT (device under study)
  - Now using ITEP delay wire chambers (kindly provided by Pavel Shatalov)

- DUT = a few straws (not necessarily 5m) with controlled and optically measured wire offset
  - start with single straw of 5m
Ambitious plan

- Available:
  - 5.6m Bosch support
  - 5m straws
  - straw end pieces

- Week 43:
  - produce end support pieces
  - assemble one long straw
  - where? (lab 15 or NH?)

- Week 44:
  - take some first data at NH
  - backup: use short straw again

- Continue next year in any case
  - develop optical wire-offset measuring system this winter
WE MADE IT

Thanks to particular efforts from

- Temur Enik, Alex Semmenikov, Sergei Movchan: straw parts and assembling the long straw
- Pavel Shatalov, Iouri Guz, Anatoly Zhokhov: set up DAQ, straw readout, telescope, test and measure
Short straw setup

Moscow DWC

Dubna short straw

SPS North Hall H8 line

H8 dump

CERN

Massimiliano Ferro-Luzzi

SHiP collaboration meeting

Feb 10-2016
Long straw setup
More on the 2015 testbeam measurements

=> see Iouri Guz, next talk

- Important:
  
  we have new young blood!
  Vladimir Soloviev, master student,
  (St Petersburg State Polytechnic University)
  Supervision: Katerina Kuznetsova, Yaroslav Berdnikov
  Started working on testbeam data

WE NEED MORE!
Test beam 2016

Request submitted via Richard:

- Got two weeks in H2 zone, end of July - start of Aug, to be shared with other SHiP detectors
  - nice thing: we can enter the zone freely already start of July (NA61)
- Parasitic area at H2 dump, start moving there next week
  - will use it mostly June - Oct

Setup:

- (Single) long or short straw
- Install an optical system to monitor wire-straw offset
  - parts/components: CERN (?)
  - mechanical design / assembly => ITEP, Alexander Semmenikov
- Use 4 DWCs (instead of 3), if possible
  - Optional: if resolution of DWCs turns out to be marginal, possibility to collaborate with an external group with a Si telescope (10cm x 10cm x 8 strip planes, 180 um pitch)
2016 test beam: H2 parasitic and H2 zone

H2 zone

Move Feb 17
Further R & D

- Dubna committed to help developing larger diameter straws
  - breaking pressure expected to be around 4 bar for 20mm
  - (now 8 bar for 10mm)

- Main difficulty: need to fabricate some new PET welding tools
  - can start testing/training with aluminized PET foil
  - but validation requires the correct Cu/Au coated PET
    - CERN will investigate procurement of small roll

- Build a multi-straw prototype ?
  - to be discussed
  - purpose to be defined
Summary

- R&D program on straw geometry optimization is starting
  - done first test beam with short and 5m straw
    ▪ related tracks from ITEP chambers to straw signals
  - done first gain and attenuation measurements on short and 5m straw

- Soon:
  - setup to measure wire-straw offset independently (optically)
  - study signal characteristics, attenuation, two-sided readout
  - straws of larger diameter

- More effort to be put on:
  - Tracker geometry optimization studies with FairShip
  - Developments of detector and signal treatment in FairShip
  - Engineering R&D, design studies of 5mx10m station mechanics
  - Electronics R&D
backup
No vacuum... air ? helium at 1 bar ?

Radiation length at 1 bar and 20 C:

- air = 300 m => 40 m is 13%
- helium = 5700 m => 40 m is 0.7%

Current straw tracker design (NA62):

0.5% of a radiation length per station