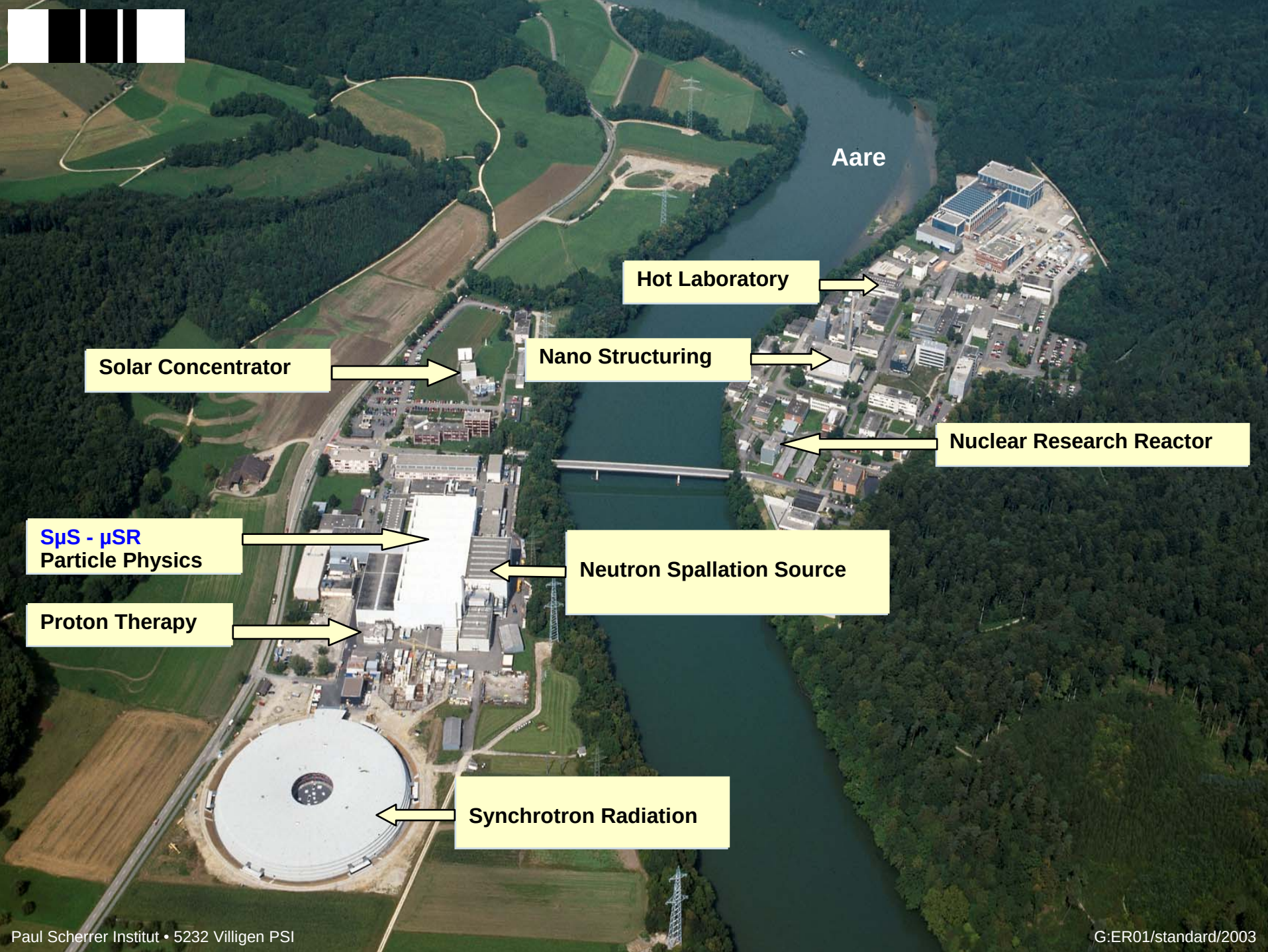

Aare
Hot Laboratory
Solar Concentrator
Nano Structuring
Nuclear Research Reactor
SμS - μSR
Particle Physics
Neutron Spallation Source
Proton Therapy
Synchrotron Radiation

PAUL SCHERRER INSTITUT

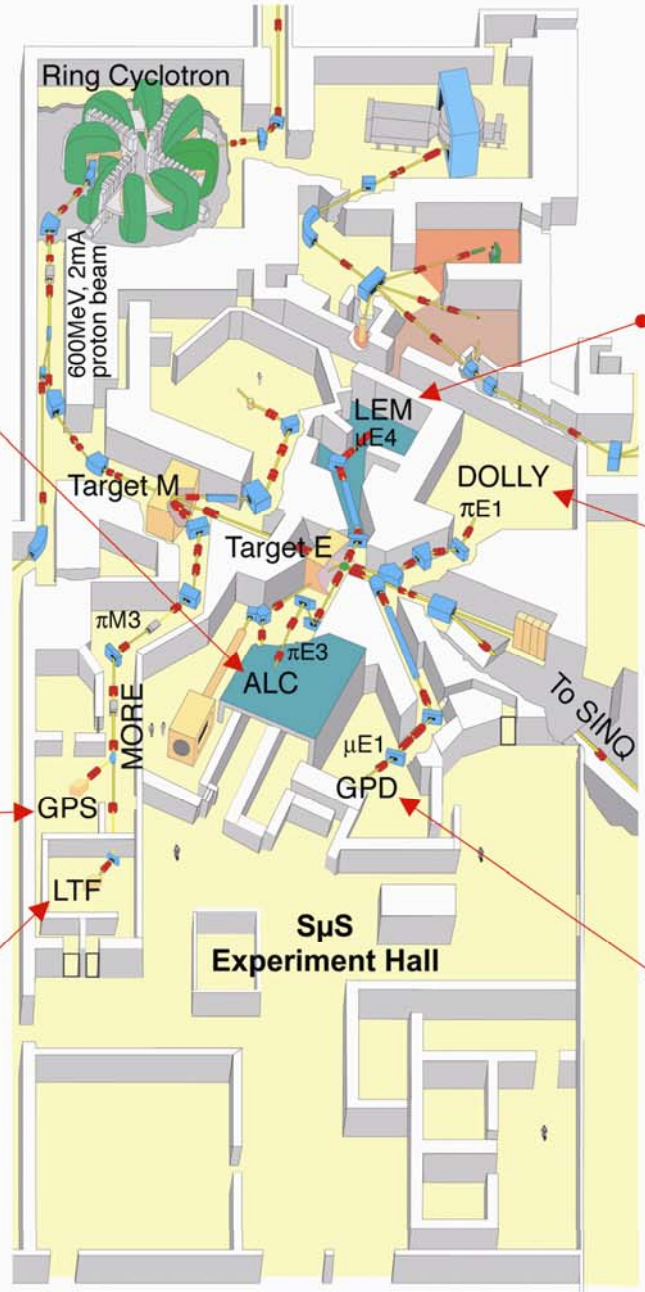
PSI

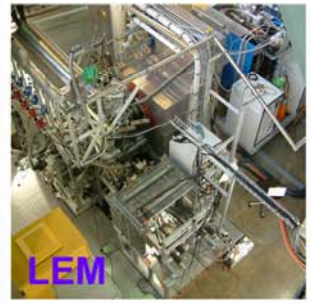
Swiss Muon Source • SμS

PSI μSR Facility

- *Soft Matter*
- *Chemistry*

4 MeV μ⁺
4.2-600 K / 0-5 T





Unique:
Tunable Energy
0-30 keV μ⁺
2-325 K / 0-0.3 T

- *Thin Films*
- *Multilayers*
- *Interfaces*

Depth resolved Cond. Mat. (nm scale)

Bulk Condensed Matter

- *Magnetism*
- *Supercond.*
- *Mat. Sci.*

4 MeV μ⁺
1.6-900 K / 0-0.6 T

Unique: Muons on Request

4 MeV μ⁺
0.02-4.2 K / 0-3 T

- *Magnetism*
- *Supercond.*
- *Mat. Sci.*

Bulk Condensed Matter

15-60 MeV μ⁺ or μ⁻
0.23-500 K / 0-0.65 T
2.6 GPa

- *Magnetism*
- *Supercond.*
- *Mat. Sci.*
- *Chemistry*

μSR

Laboratory for μSR Spectroscopy

Muon Instruments

- GPS with new electronics (VME)
- GPD with enhanced high pressure capability
- ALC with new detectors (APDs) and sample environment
- LTF replacement
- Dolly
- LEM with further upgrades (*e.g.* longitudinal polarization)

- 2009 proposal for: 10 T High Field, High Time Resolution Instrument (possible location: πE3 extended), 50mK-300K

Goal: additional dedicated beam lines for μSR instruments

High Energy Muon Instrument – GPD

μE1 Superconducting Decay Channel Beamline, 10–60 MeV μ^+ or μ^-

- New magnet
  B_{ext}: 0–0.65 T
- New cryostat
  Oxford Instruments Variox
  with Heliox ^{3}He Insert
  T: 230 mK – 300 K
- Larger sample chamber for pressure cell dia. up to 40 mm
- New detectors
- New collimation system

High Energy Muon Instrument – GPD

Current Developments

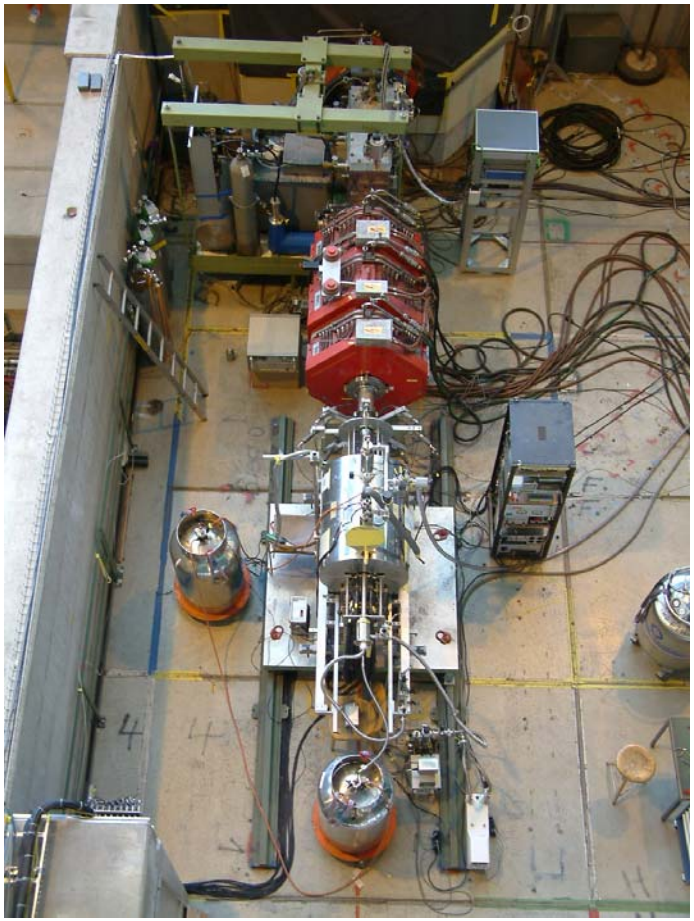
New Pressure Cell MP35N

Babes-Bolyai Univ. Cluj-Napoca (RO)

IMNF, TU Braunschweig (DE)

Tested: 2.6 GPa at 230 mK

Integral μSR Instrument: Avoided Level Crossing – ALC



πE3 Surface Muon Beamline
(non permanent)

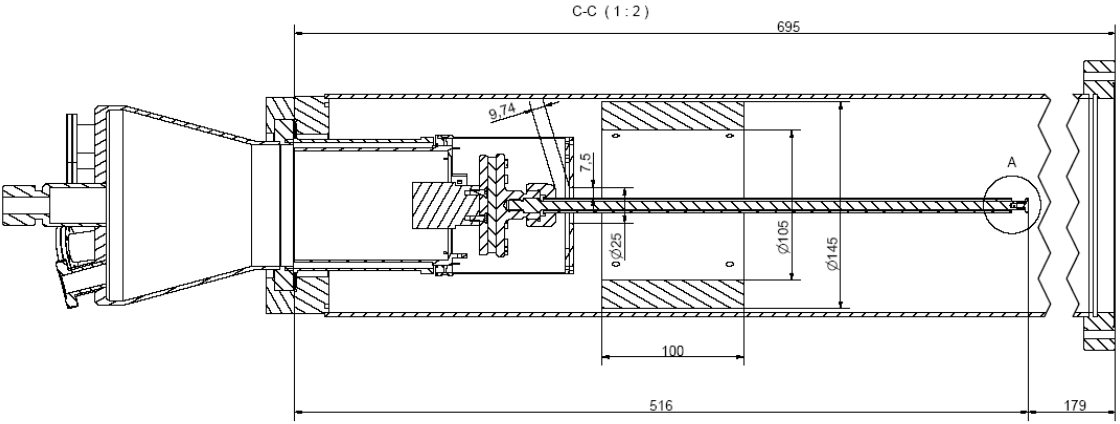
- 4 MeV μ^+, 100% polarized
- B_{ext}: 0 – 5 T longitudinal (Superconducting solenoid)
- T: 4.2 – 600 K

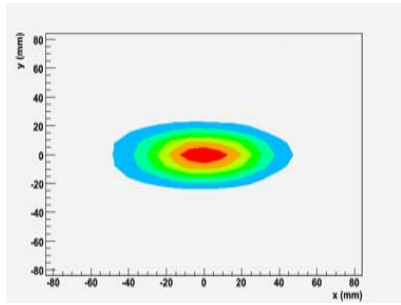
Upgrades:
- Electronics and data acquisition
- APD based detectors (2008)

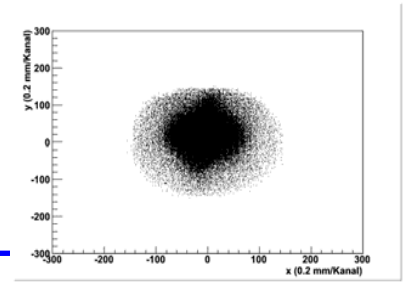
LEM: Low energy Muons

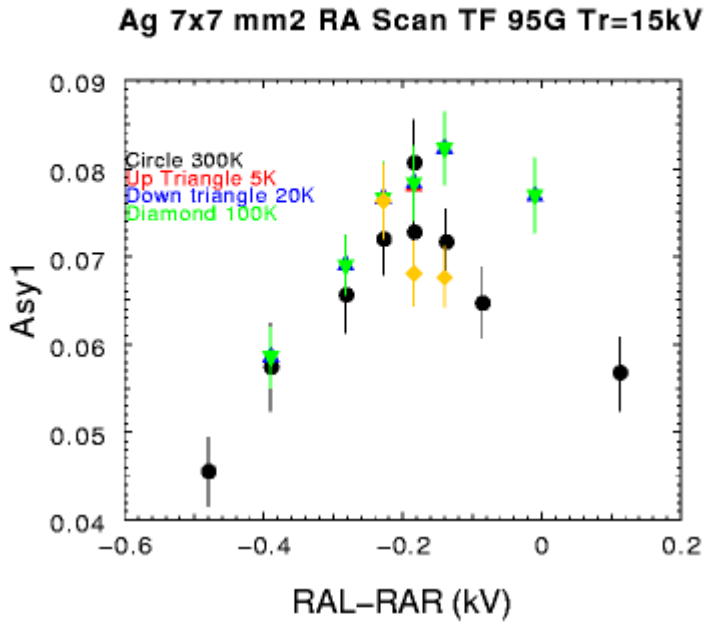
- Routine use of s-Ar moderator→1.4 intensity increase
- "Small sample" setup (with Rob Kiefl, UBC/Triumf)
- Fly past setup
- Reduce background with Ni backing
- Improved version being tested (floating sample, cool shield, positron blocker)

"untwinned" YBCO-7 Crystals (from UBC R. Liang, W. Hardy et al.)









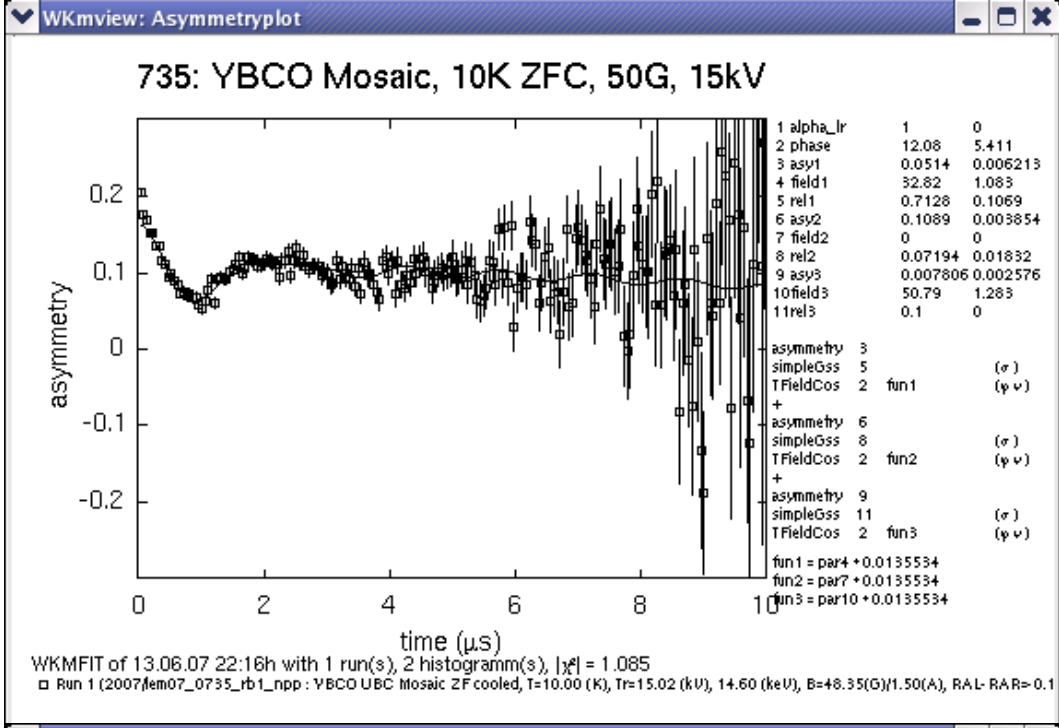
Signal Asymmetry: 0.08

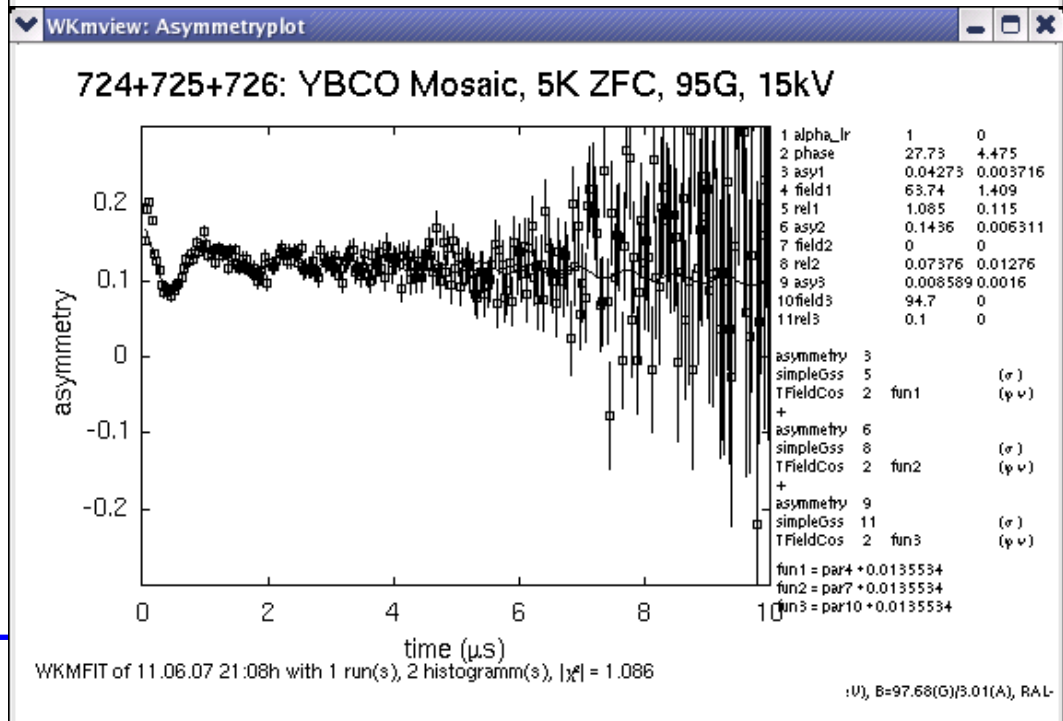
BG Asymmetry: 0.135

Event rate reduction: 0.28 * Max

Meissner state at the surface of small (~50 mm^2) single YBCO crystals

Measurement of λ_a and λ_b





Surface Muon Instruments – GPS/LTF and DOLLY

Recent Upgrades, Plans

GPS:

- Second sample environment port (since Summer 2006) for easy change between He flow cryostat and CCR or Oven
- New data aquisition electronics and GUI (since 2006)

DOLLY:

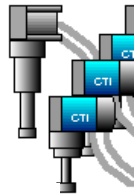
- New cryostat (OI Variox, Spring 2007, can be used with OI ^{3}He insert)

LTF:

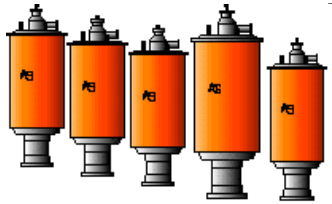
- New ^{3}He/^{4}He dilution refrigerator (*e.g.* on DOLLY)

SμS Sample Environment

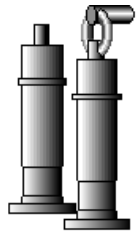
Temperature: 0.02 - 900 K



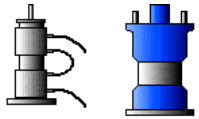
3 Closed Cycle Refrigerators



7 He-Cryostats



1 Dilution Cryostat, 1 ^{3}He Insert



4 Furnaces

Magnetic Field: 5 T longitudinal (ALC), 3 T transverse (LTF)
0.6 T longitudinal or transverse (standard)

Pressure: 2.6 GPa hydrostatic