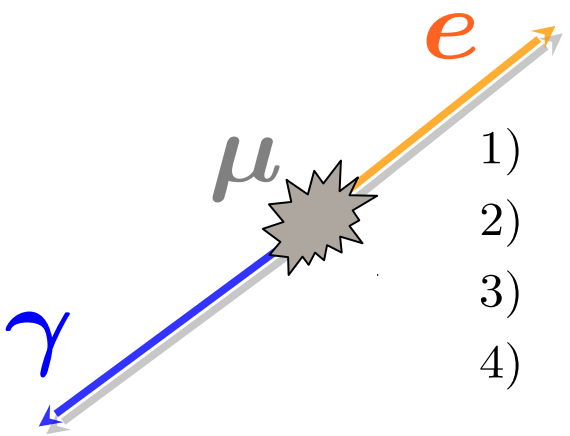
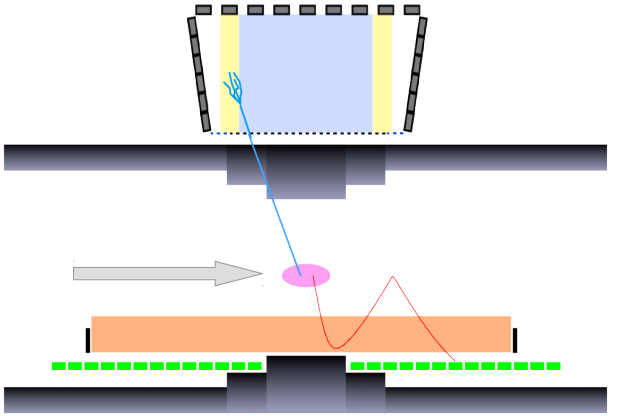
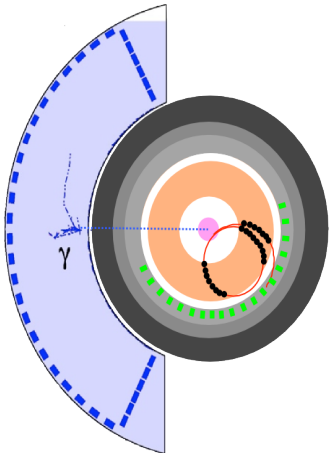
A new cylindrical drift chamber for the MEG II experiment

The MEG II experiment will search for the **μ → eγ** decay at the Paul Scherrer Institut (PSI) in Switzerland with a sensitivity on the branching ratio of **~5 × 10^{-14}** at 90% CL. In MEG II the most intense DC muon beam of the world (**7×10^{7} $μ^{+}$/s**) will be stopped in a thin target. The four-momentum of photons exiting the target is measured by means of a **liquid Xenon detector**; positrons are tracked by a magnetic spectrometer composed of a **drift chamber** and two pixelated **timing counters** and immersed in a **non uniform magnetic field**.



1) $E_\gamma = 52.83\,\mathrm{MeV}$
2) $E_e = 52.83\,\mathrm{MeV}$
3) $\delta\vartheta_{e\gamma} = 180^\circ$
4) $\delta t_{e\gamma} = 0$



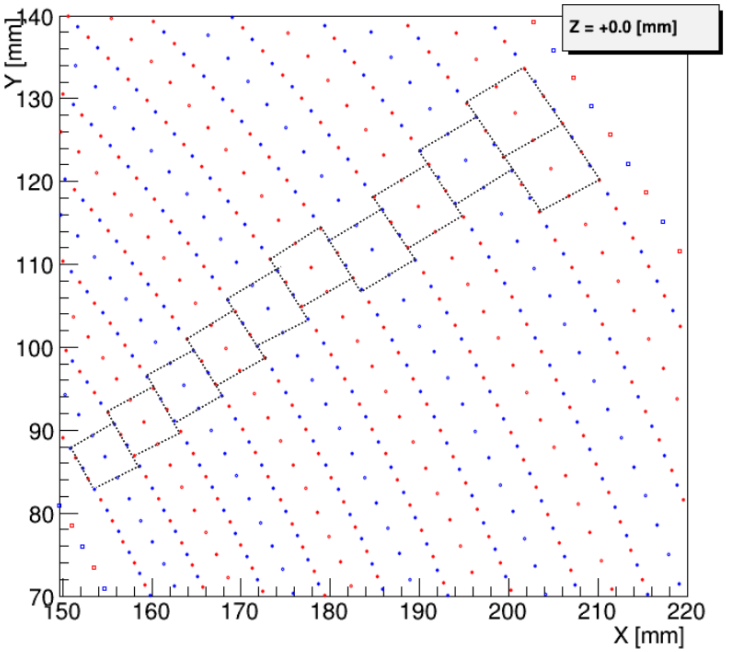


Speaker: Marco Grassi

Drift chamber geometry

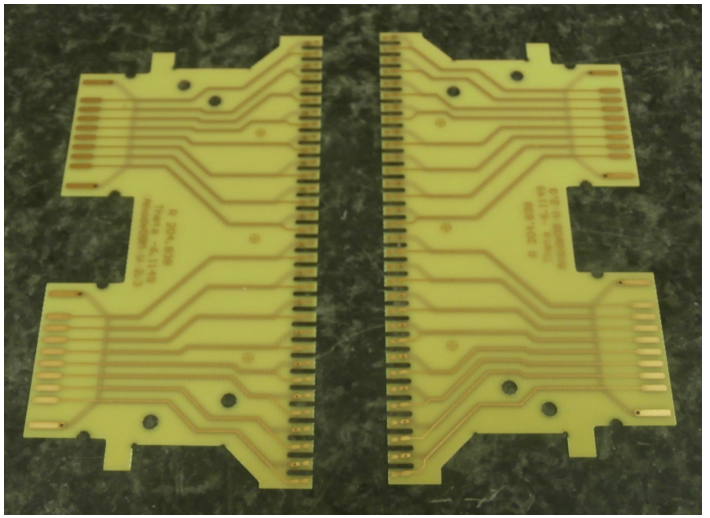
The design of the MEG II drift chamber is optimised for meeting the fundamental requirements of **high transparency** for low multiple scattering contribution (50 MeV positrons), **sustainable occupancy** (~7×10^7 μ^+/s stopped on target) and **fast electronics** for cluster timing capabilities.

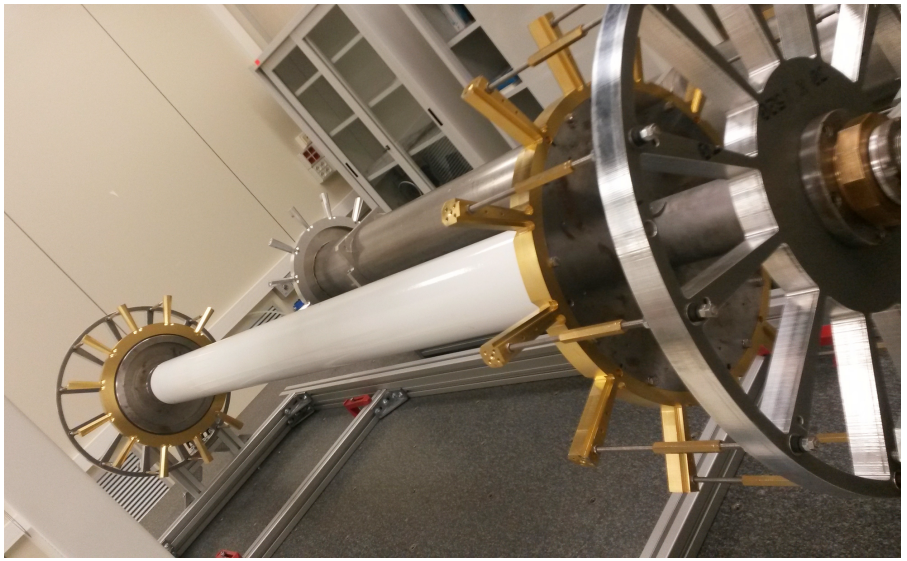
- ten layers of drift cells with anodes having alternating **stereo angles** 7°-8°.
- drift **cells** having an approximately **squared** shape **7×7 mm²**.
- an ultra-low mass gas mixture with **helium and isobutane** 85:15, yielding less than 2×10^{-3} radiation lengths per track.
- 20 μm gold-plated tungsten anodes.
- 40-50 μm silver-plated aluminum cathodes and guard wires.
- 2π coverage for a length of 193 cm.
- double readout for longitudinal coordinate estimate.

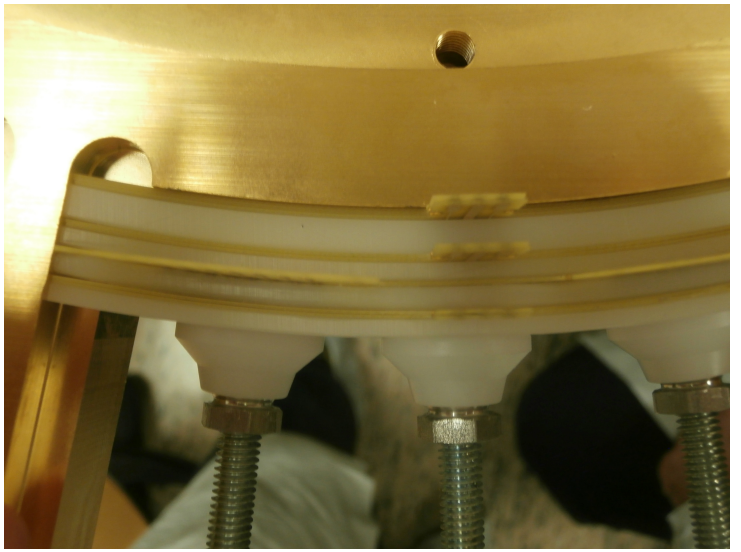


Drift chamber construction

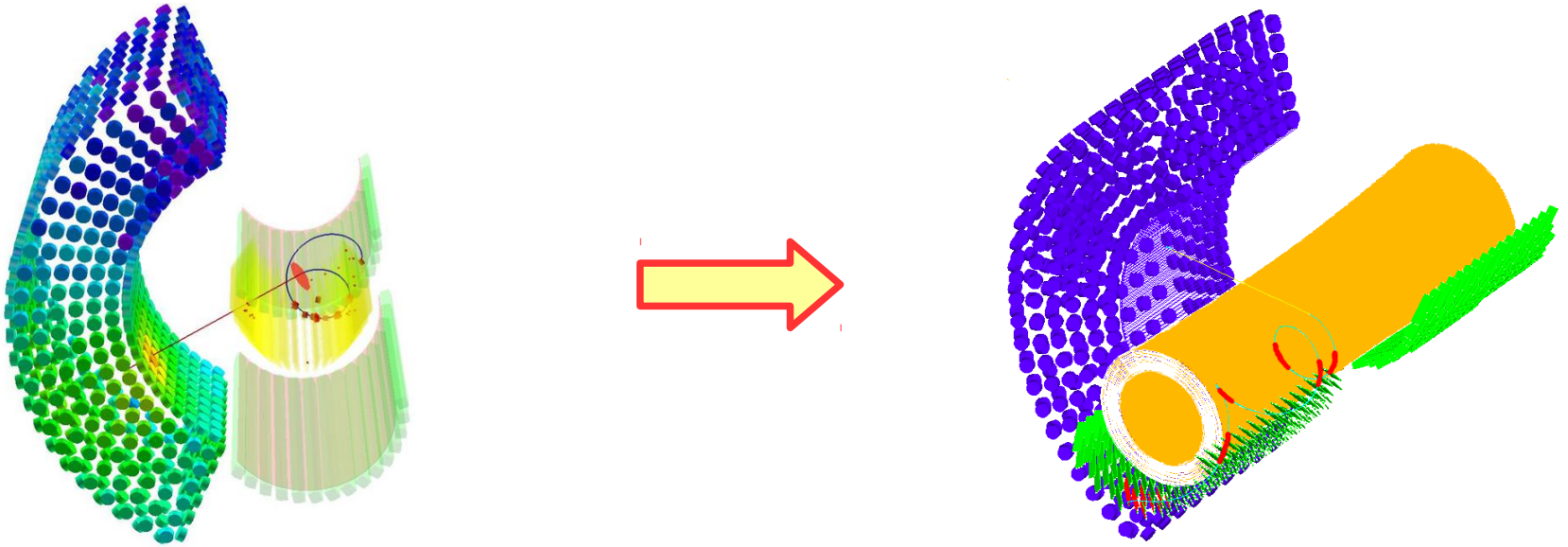
The detector geometry will be realised by the stacking of FR4 wire PCBs with PEEK spacers in each sector of the endplate. A carbon fiber support structure will guarantee the proper wire tension. In the inner side an aluminated mylar foil will tight the gas volume. All the mechanical compatibilities and the insertion in the MEG II apparatus will be checked with a mock-up chamber.







Expected performaces



Resolutions	MEG	MEG II
p_e (keV)	306	130
ϑ_e(mrad)	9.4	5.3
φ_e(mrad)	8.7	4.8
e^+ efficiency (%)	40	88