# <sup>3</sup> A He based microstrip gas chamber with a novel 2D readout

Detector lab ILL, Grenoble FRANCE



#### INSTITUT LAUE LANGEVIN

- The ILL detector laboratory provides high quality neutron detectors to the ILL instruments and must guaranty their operation with high reliability.
- We must be able to repair a detector in an acceptable delay to minimise the instrument unavailability.
- We are making decisive breakthroughs in concepts, and we develop them up to concrete operational detectors.
- Our 3 patents (MSGC, Multi-Tube, Multi-Grid) are oriented towards optimal performance and reliability of the instruments.
- We help our associates by giving access to our technology



JC Buffet (mech engineer)



S. Cuccaro J. Pe (mech technician) (mec



J. Pentenero (mech technician)



J. Marchal<sub>7</sub> (physicist)











V. Buridon BrightnESS post-doc



D. Roulier SINE2020 Post-doc

- Ultra-high vacuum, gas handling systems, high purity vessels, high voltage, ٠ mechanical mounting, metrology
- High precision machining of mechanical pieces (metal, ceramics)
- Physics of detectors: based on the physical process of neutron interaction in gas, signal development, and data treatment, the SDN specifies, studies, fabricates, tests and maintains gas detectors that best sweet the ILL
- Well equipped laboratory for detector mounting and maintenance (ILL3) with high quality vacuum and gas systems, crane, outgasing chambers, clean room...
- 2 small detector labs
- 2 neutron beam lines (CT1 and CT2)
- Tooling machines (wire spark erosion, 3-axis tooling center, ...)-->many of the mechanical pieces of detectors are built in house



## Curved 1D MSGC for the D20 Powder Diffractometer (2000)

D20 powder diffractometer
1D localisation
48 MSGC plates (8 cm x 15 cm)
Angular coverage : 160° x
5,8°
Readout pitch : 2.57 mm (0,1°)
5 cm conversion gap
1.2 bar CF4 + 2.8 bars 3He

# MicroStrip Gas Chamber (MSGC)





#### MSGC (1988, A. Oed)







Challenges 2D readout on a MSGC 1 mm x 1 mm resolution High counting rate: 10 kHz/mm<sup>2</sup> 50 kHz/readout channel > 1 MHz/MSGC

## **Considered solution**

Parallel charge division along the cathode strips





#### Strip connections







#### New design on Borofloat 33 substrate, realized by IMT (Greifensee, CH)





- > 5 bar pressure vessel
- multi-pins feedthroughts  $\triangleright$





# Next step: 20 cm x 20 cm MSGC





Old design (anode readout)



New design (cathode readout)



## New 20 cm x 20 cm MSGC











NEUTRONS 13



Promising results but still a development No equivalent in terms of counting rate and resolution

MSGC are delicate to develop, but very reliable after see D20 in operation since february 2000

Critical components: multi-pins feedthrough, 3He, MSGC The supply of these components is now under control

Market: 10/year (guess)

