Yannis, physicien et inventeur

S. Loucatos

CEA Saclay, 5 octobre 23

Thèse "Contribution à l' étude d'un spectromètre pour l' expérience R608 auprès des ISR"

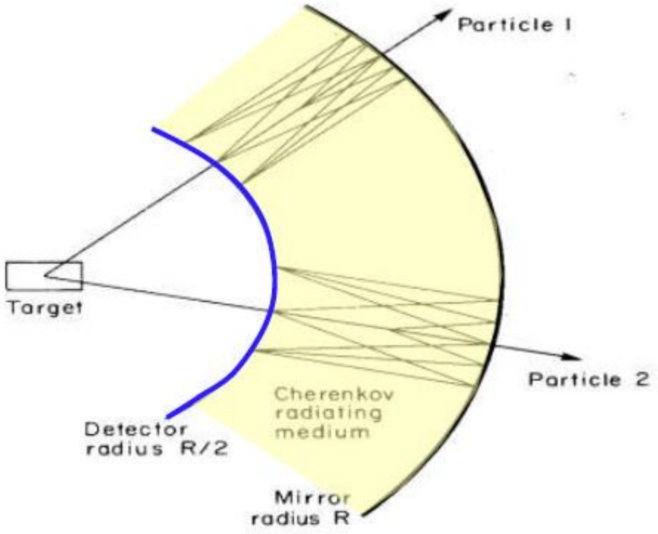
Highlights of major achievements

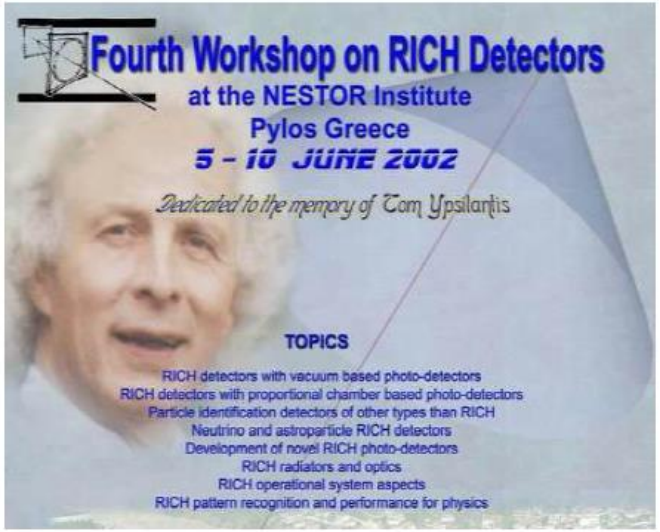
All detector's concepts have been motivated and guided by physics

- **Novel Gamma ray Telescope for astronomy**
  I. Giomataris, G. Charpak, CERN-EP-88-94
  Developed at CERN
- **Optical Trigger for Beauty**
  G. Charpak, I. Giomataris, L.Lederman, NIMA306(1991)439
  Developed by Saclay, Lausanne, CERN
- **Hadron Blind Detector**
  I. Giomataris,G. Charpak, NIM A310(1991)589
  Developed by MIT, CERN, Lausanne , ITEP
- **Micromegas detector**
  I. Giomataris, Ph. Rebourgeard, J.P. Robert, G. Charpak, NIMA376(1996)29
  Developed at Saclay
- **Spherical Proportional Detector**
  I. Giomataris et al., JINST 3:P09007,2008
  Developed at Saclay

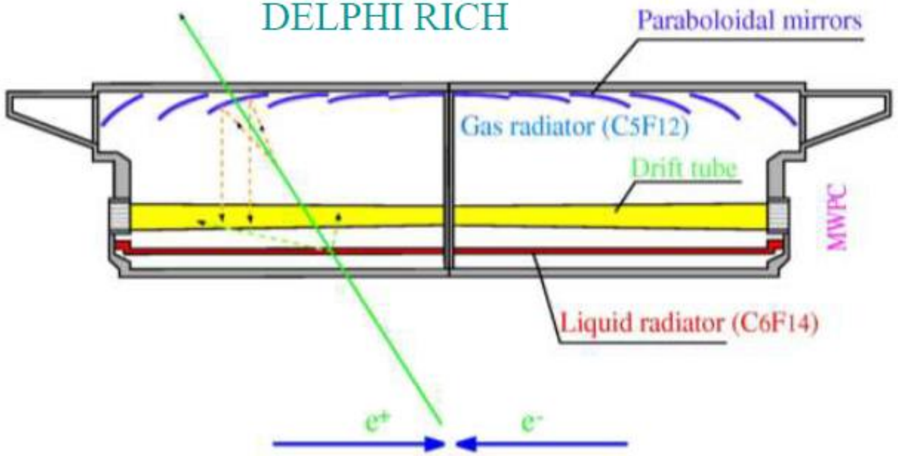
Invention du RICH
années ’70, J Séguinot et T Ypsilantis

The Ring Imaging Cherenkov Counter (RICH)
J. Seguinot and T. Ypsilantis, Nucl. Instr. and Meth.142 (1977) 377





DELPHI RICH



CLEO fast RICH

Yannis a coécrit des articles NIM en 86 et 88 sur le proto RICH de DELPHI.

Les points importants, antérieurs, étaient l'introduction du gaz TMAE et le choix de détection par longue dérive. Sur la TMAE une mesure de sa pression de vapeur par YG et proposition d'un gaz (DELPHI note 86)..

R. ARNOLD, P. BAILLON, J. D BERST, H.J. BESCH, M. BOSTEELS, E. CHRISTOPHEL Y. GIOMATARIS, J.L. GUYONNET, G. PASSARDI, J. SEGUINOT, J. TOQUEVILLE, D. TOET and T. YPSILANTIS, 'Photosensitive gas detectors for the ring-imaging Cherenkov (RICH) technique and the delphi barrel rich prototype', Nuclear Instruments and Methods in Physics Research A252 (1986) 188-207

R. Arnold et al., Nuclear Instruments and Methods in Physics Research A270 (1988) 255-288

R. Arnold et al., Nuclear Instruments and Methods in Physics Research A270 (1988) 289-318

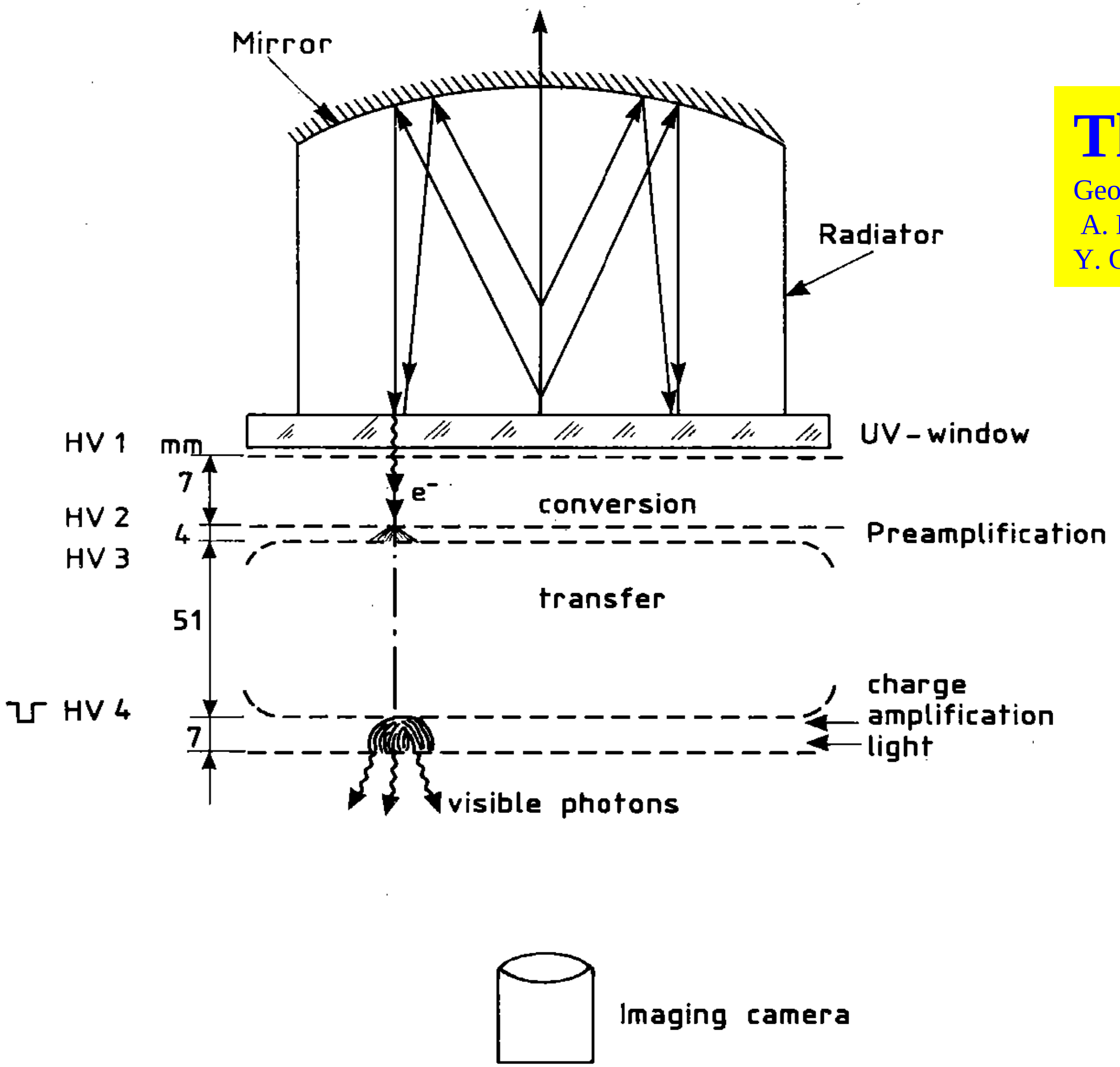
R. Arnold et al., Nucl.Instrum.Meth.A 273 (1988) 466

Informations par Daniel Treille, DELPHI, CERN

A high-energy gamma ray telescope

I. Giomataris, G. Charpak, CERN-EP-88-94

Gamma converter
and shower Cher

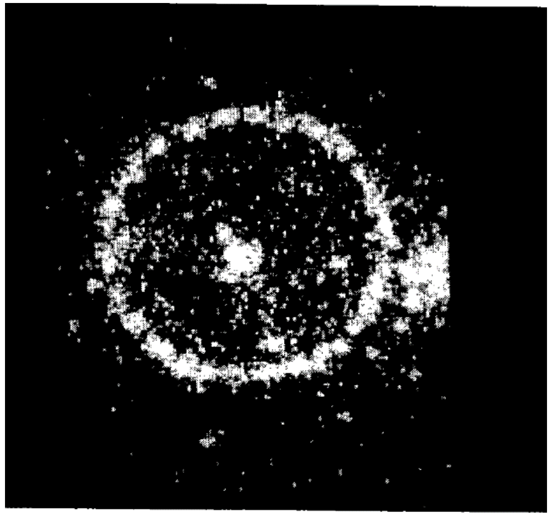


The imaging chamber

Georges Charpak, W. Dominik, J.P. Fabre, J. Gaudaen, V. Peskov, F. Sauli, M. Suzuki ,
A. Breskin, R. Chechik, D. Sauvage, IEEE Trans.Nucl.Sci.35:483-486,1988.
Y. Giomataris, A. Gougas, W. Dominik, Georges Charpak, F. SaulI, N. Zaganidis, NIMA279(1989)322

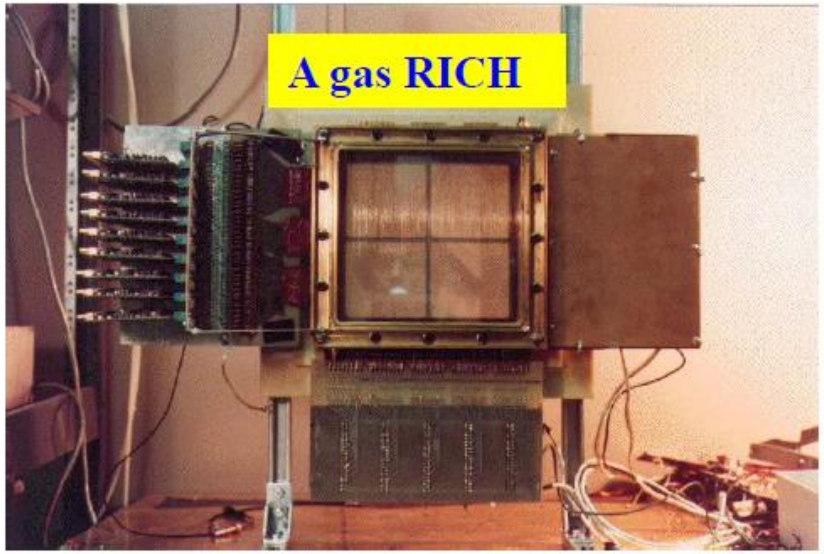
A single electron shower at 5 GeV

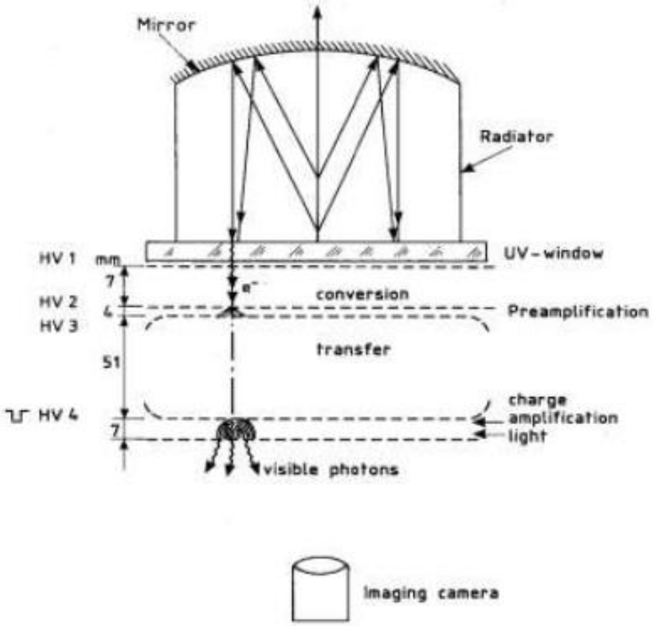
G. Charpak, Y. Giomataris,, A. Gougas,NIM.A343:300,1994.

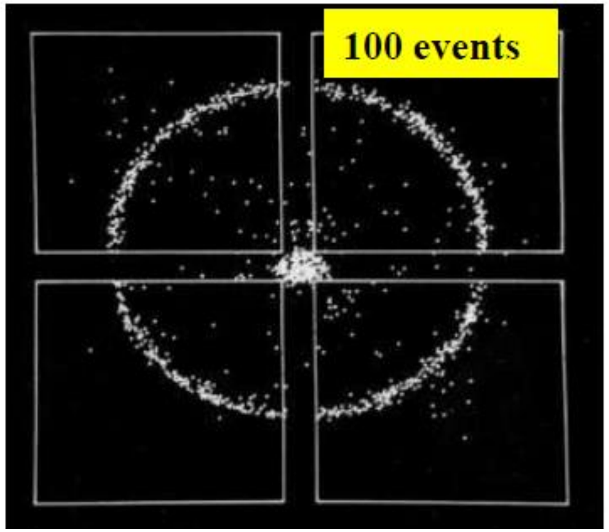


The imaging chamber

Georges Charpak, W. Dominik, J.P. Fabre, J. Gaudaen, V. Peskov, F. Sauli, M. Suzuki ,
A. Breskin, R. Chechik, D. Sauvage, IEEE Trans.Nucl.Sci.35:483-486,1988.
Y. Giomataris, A. Gougas, W. Dominik, Georges Charpak, F. SaulI, N. Zaganidis, NIMA279(1989)322

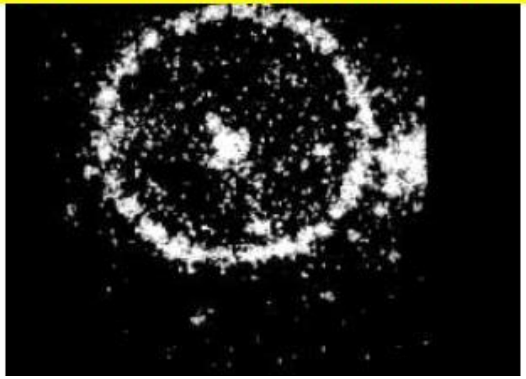


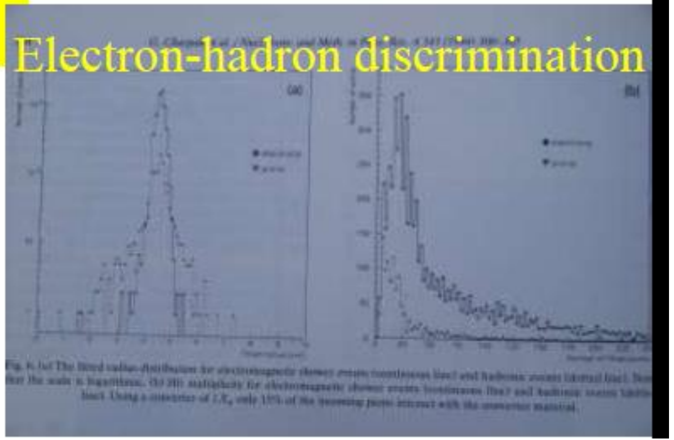




A single electron shower

G. Charpak, Y. Giomataris,, A. Gougas,NIM.A343:300,1994.





Nuclear Instruments and Methods in Physics Research A306 (1991) 439–445
North-Holland

A trigger for beauty

G. Charpak [a], Y. Giomataris [b] and L. Lederman [c]

[a] CERN, Geneva, Switzerland
[b] World Lab, Lausanne, Switzerland
[c] Fermilab, Batavia, IL, and University of Chicago, Chicago, IL, USA

Received 21 February 1991

ELSEVIER

Nuclear Instruments and Methods in Physics Research A 367 (1995) 372–376

NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH Section A

The development of the optical discriminator

M. Atac[f,g], G. Charpak[a], R. Chipaux[c], A. Delbart[c], J. Derre[c], Y. Giomataris[c,*], T. Hill[e], C. Joseph[b], D.M. Kaplan[d], C. Kochowski[c], N. Leros[b], S. Loucatos[c], J.-P. Perroud[b], Ph. Rebourgeard[c], E.I. Rosenberg[e]

[a] CERN-AT-ET, Geneva, Switzerland
[b] Lausanne University, Switzerland
[c] CEA, DSM, DAPNIA, CE Saclay, France
[d] Northern Illinois University, USA
[e] Iowa State University, USA
[f] University of California at Los Angeles, USA
[g] Fermilab, Batavia, IL, USA

The RD30 Collaboration

Abstract

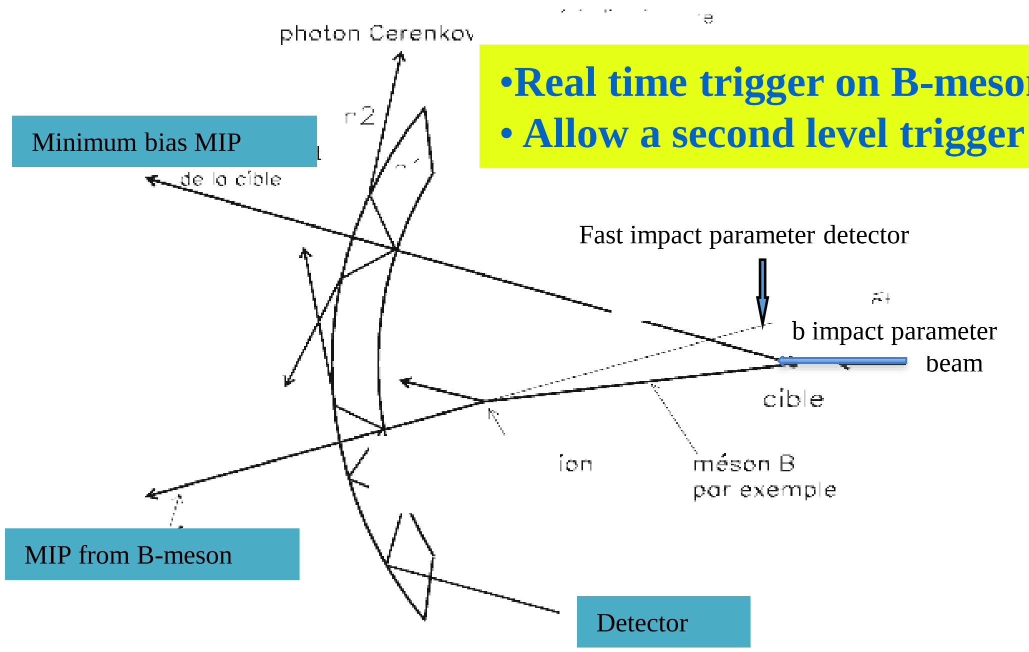
New results from the tests of the impact parameter discriminator by the RD30 Collaboration are presented. The device, based on the detection of Cherenkov light produced in a thin crystal, is able to cope with extremely high rates in the GHz range and sign tracks with non-zero impact parameter at a first trigger level. We report experimental results obtained with a sapphire shell surrounded by a liquid cladding compensating chromatic dispersion. An excellent signal to background ratio has been obtained and the sensitivity at low impact parameters reaches the requirements for efficient B-meson selection. The use of such a device for hyperon selection will also be discussed.

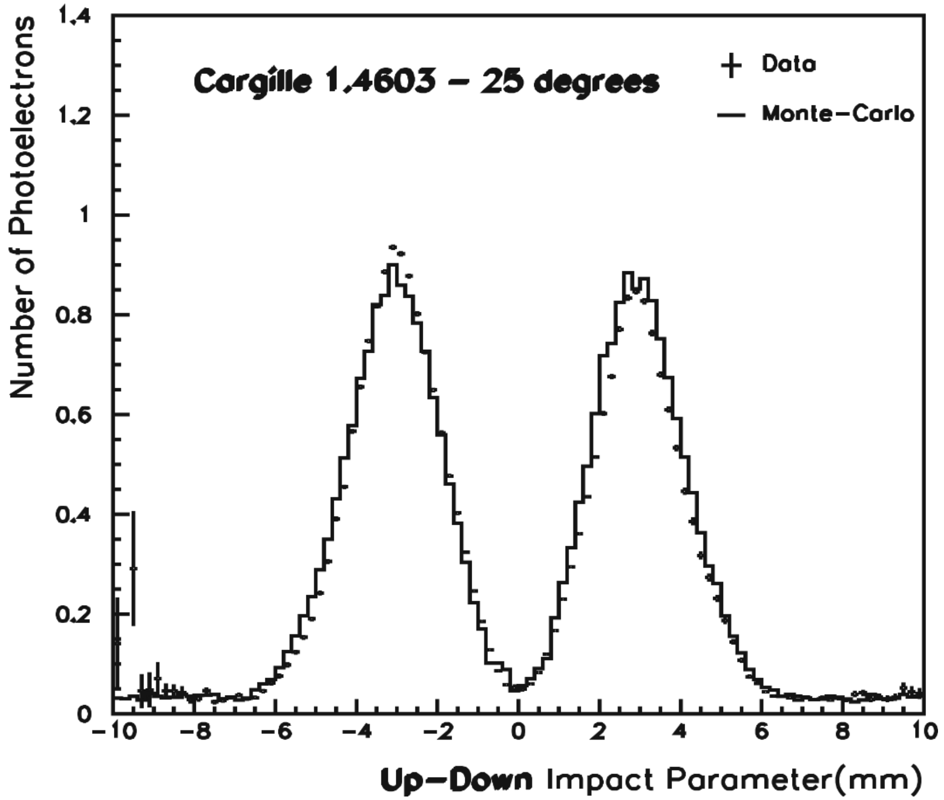
The trigger for Beauty *G. Charpak, I. Giomataris, L.Lederman, NIMA306(1991)439*

Developed by Lausanne Uni, Saclay,CERN

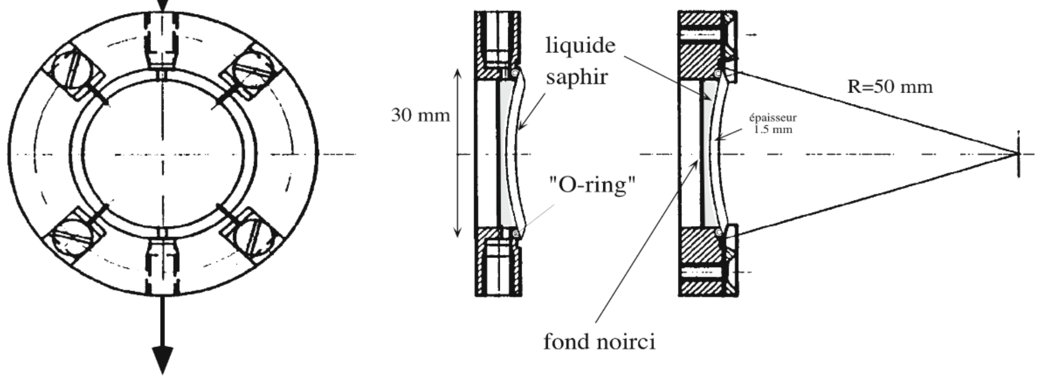
G. Charpak et al., NIMA332(1993)91-99
M. Atac et al., NIMA367(1995)372-376

•Real time trigger on B-mesons
• Allow a second level trigger





Sapphire crystal + liquid



Designed for a fixed target experiment GAJET
Not approved

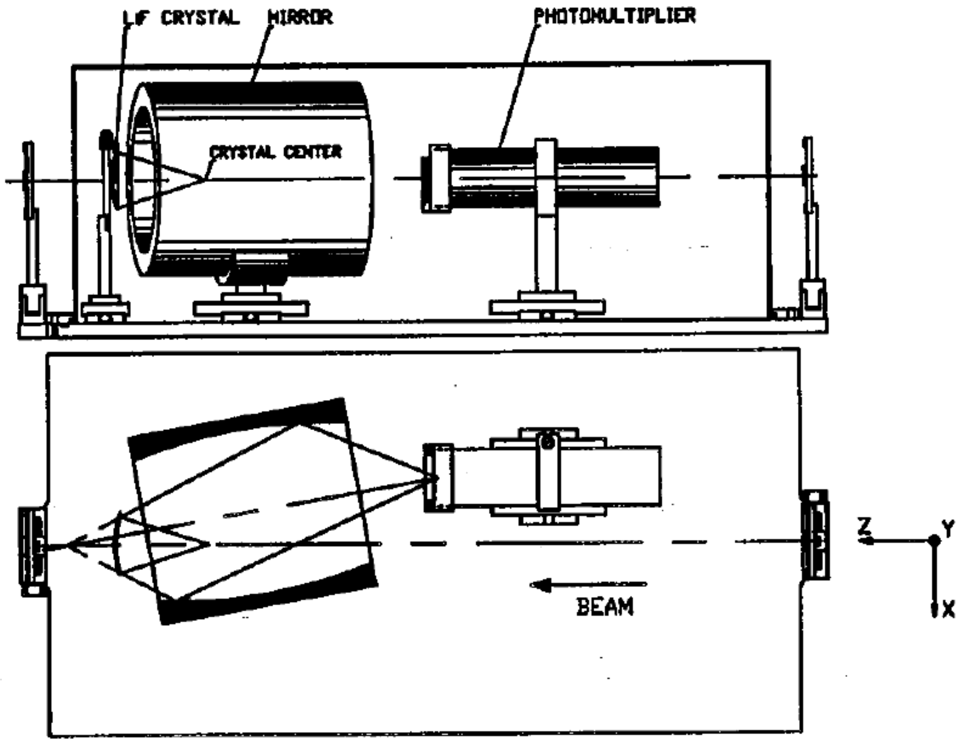


Figure 5: The experimental set-up: the LiF crystal, the ellipsoidal mirror, and the photomultiplier inside the vessel and the two fibre crosses outside.

M. Atac et al. / Nucl. Instr. and Meth. in Phys. Res. A 367 (1995) 372–376

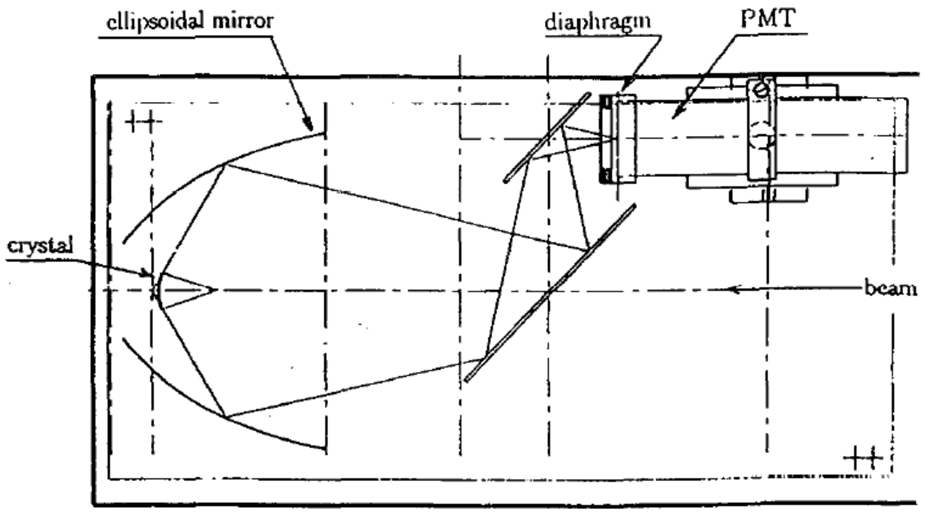
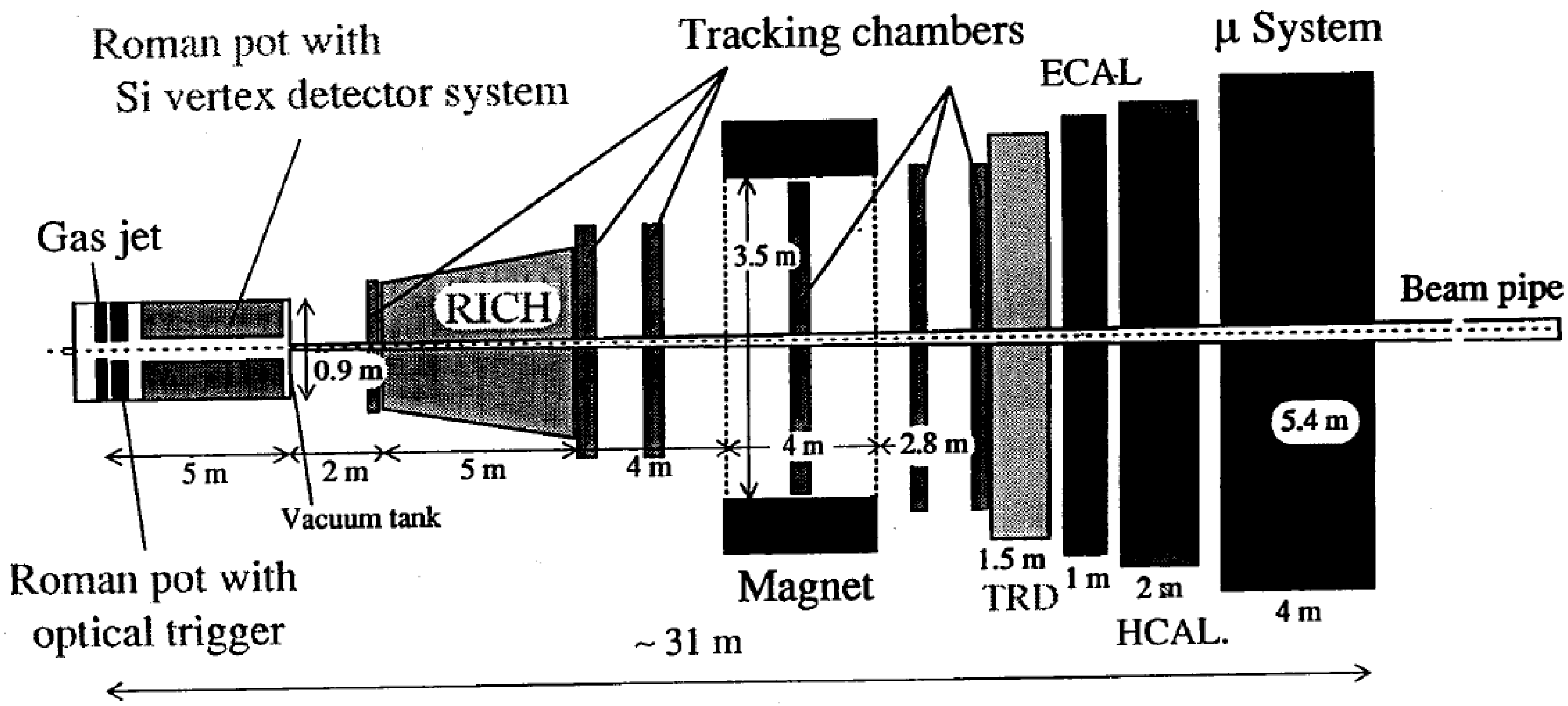


Fig. 4. The set-up used for the sapphire + liquid beam test.

GAJET Detector



Mais pour la physique du B, l'option collisionneur a été choisi, LHCb)

Fermilab experiment E789:

Fixed target study of low multiplicity decays of Charm and Beauty ($\sqrt{s} = 39$ GeV)

Use existing E605 spectrometer to:

- Measure B cross section via $B \to \Psi + X$
- Observe (or set limits on) rare decays:

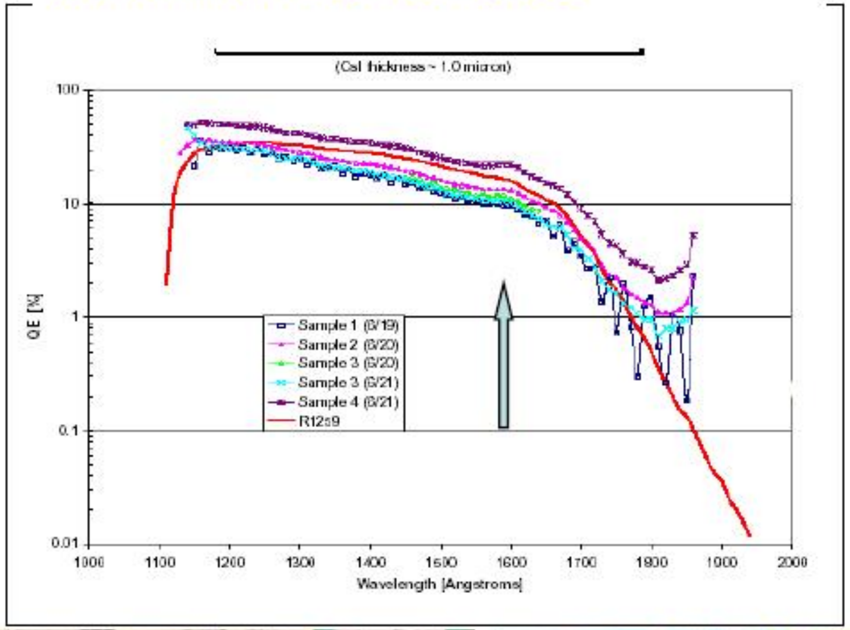
$$B_{d,s} \to \pi^+\pi^-, K\pi, K^+K^-, \bar{p}p$$

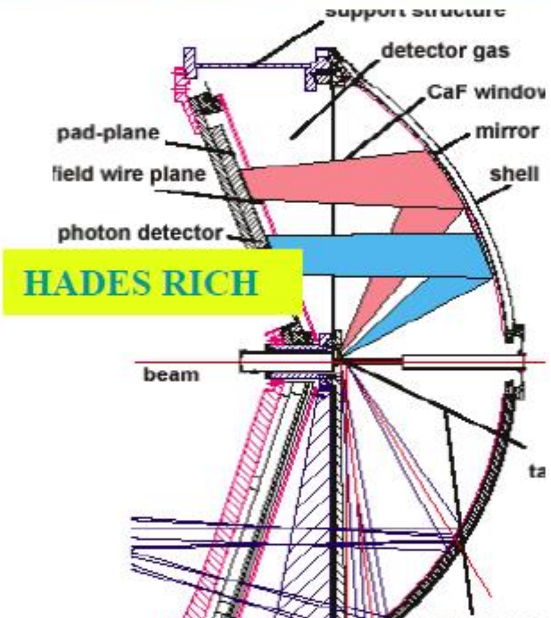
$$\Lambda_b \to p\pi^-, \bar{\Lambda}_b \to \bar{p}\pi^+$$

Solid photocathodes: CsI + gaseous detector

J. Seguinot, Georges Charpak, Y. Giomataris, V. Peskov, J. Tischhauser, T. Ypsilantis, NIM.A297:133-147,1990

A. Breskin, Nucl.Instrum.Meth.A371:116-136,1996.
F. Piuz et al.,Nucl.Instrum.Meth.A433:178-189,1999
D. Anderson, S. Kwan, V. Peskov, B. Hoeneisen, Nucl.Instrum.Meth.A323:626-634,1992





Principe photo CsI

Saclay, le 28/1/93

S. LOUCATOS

Un test sur faisceau au CERN des chambres à photocathodes CsI

(Après discussions avec P. Besson, R. Aleksan, Y. Giomataris, Ph. Bourgeois, F. Piuz)

Buts:

- Vérifier mesures E.Q. des PhC Saclay
- Fonctionn/t des chambres à la lumière Č
- Nouvelles configurations de radiateurs, détecteurs?

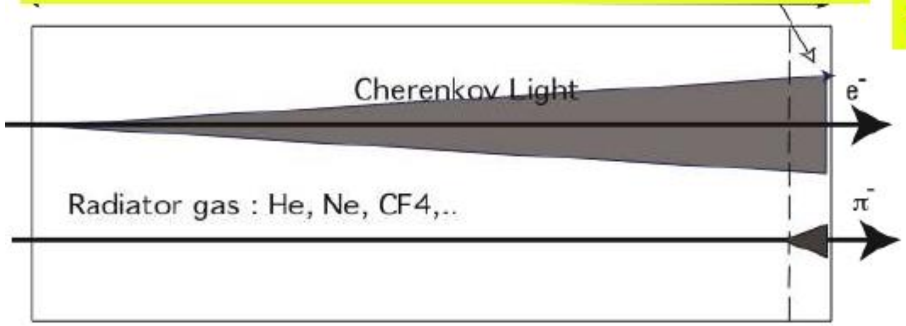
A Hadron Blind Detector (HBD)

I. Giomataris,G. Charpak, NIM A310(1991)589

No windows ⟶ Large bandwidth

CF_4 provides the largest bandwidth

Y. Giomataris, G. Charpak, V. Peskov and F. Sauli, Nucl.Instrum.Meth.A323:431,1992



1992 First succesfull test at the SPS - CERN beam

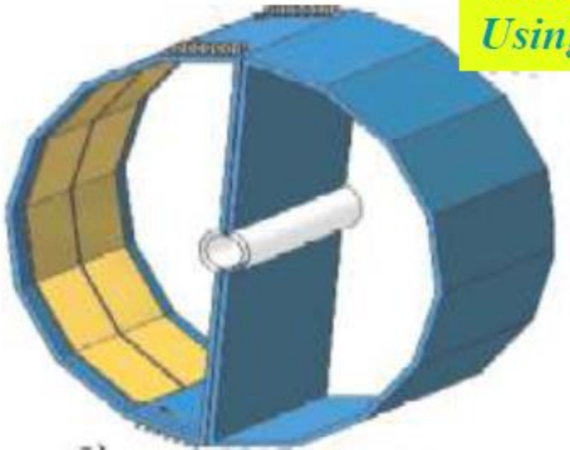
MIT, CERN, Lausanne, ITEP,

M. Chen et al., NIM A346(1994)120

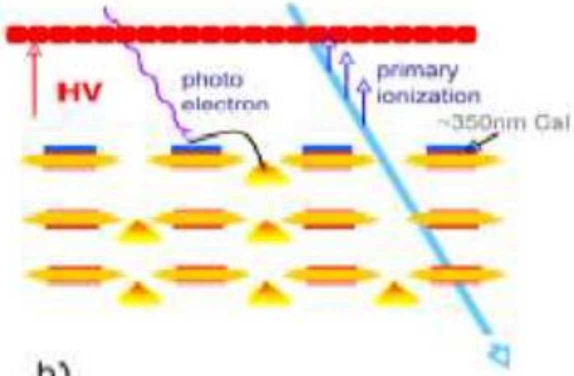
N_0 =500 measured, good electron efficiency with a hadron rejection factor of > 30

HBD concept verified by R.P. Pisani et al., Nucl.Instrum.Meth.A400:243-254,1997

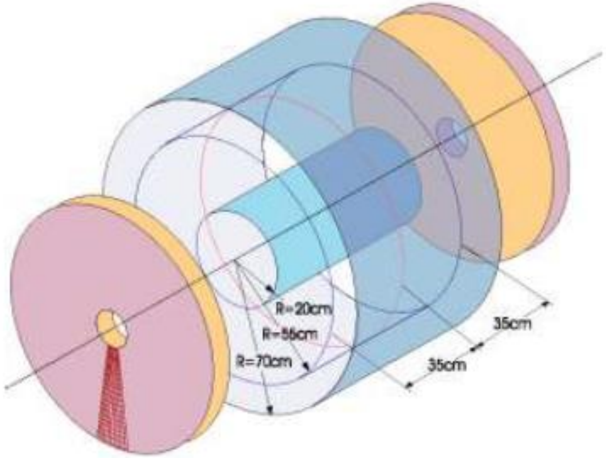
HADRON BLIND DETECTOR in PHENIX
Using multiple GEM photodetectors



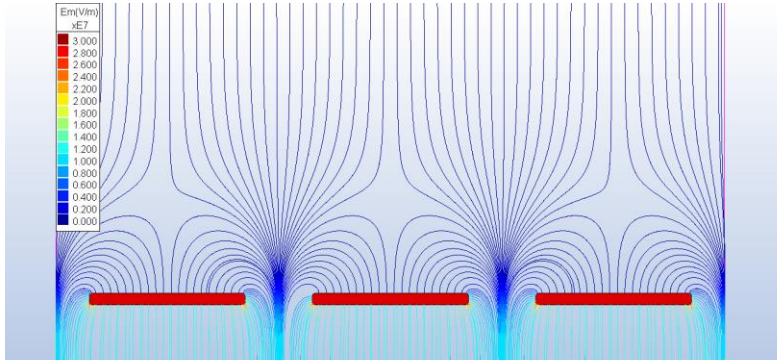
a)

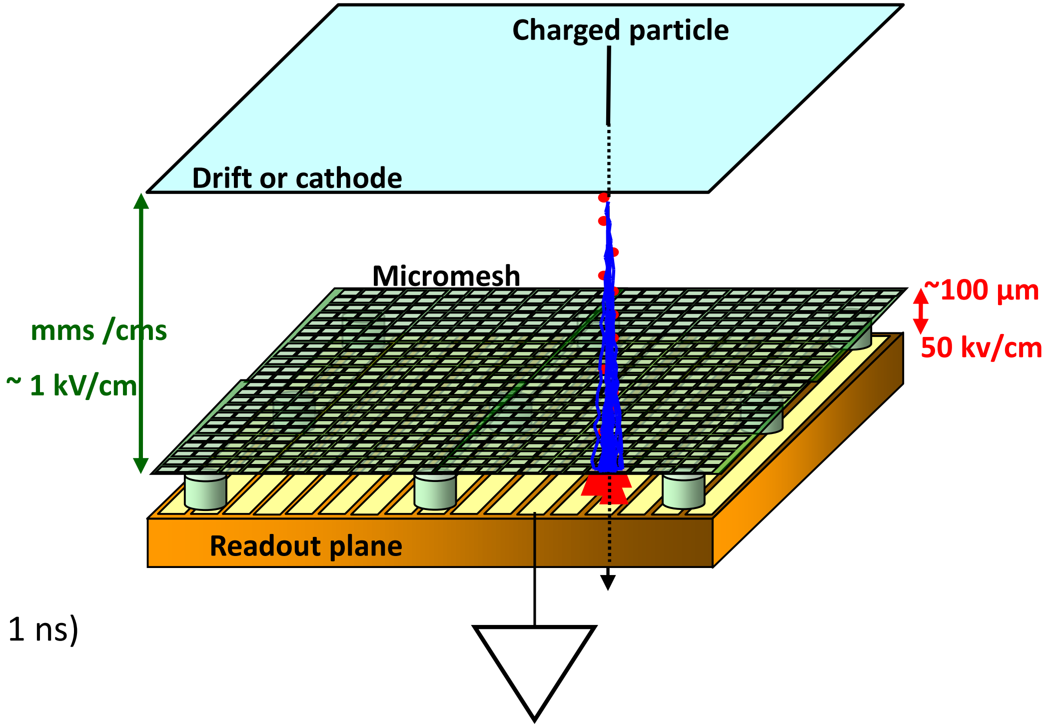


b)

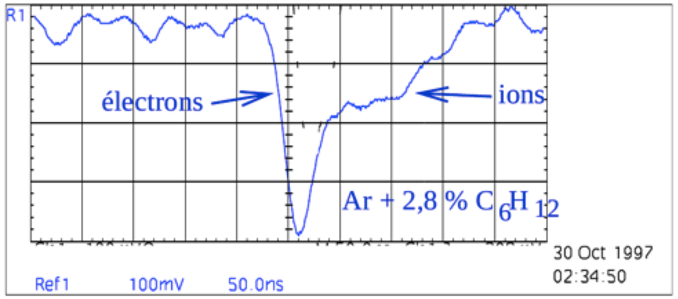


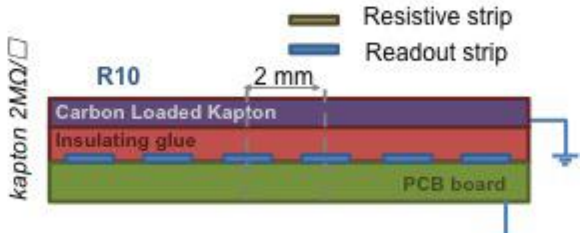
Micromegas Principle



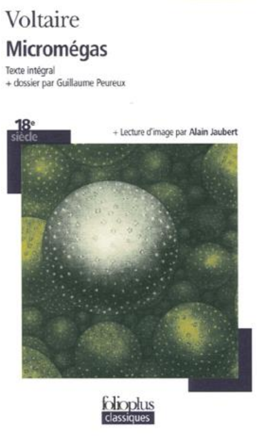


- High gain (>10^4)
- Good energy (11% @ 6 keV) and time resolution (< 1 ns)
- Good spatial resolution (< 50 µm)
- Reduced ion feedback < 1%
- Radiation hardness (10^{16} p/cm^2)
- Fast ion collection→ operation at high flux
- Cope with sparks: resistive coating





Invention



Nuclear Instruments and Methods in Physics Research A 376 (1996) 29–35

ELSEVIER

NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH Section A

MICROMEGAS: a high-granularity position-sensitive gaseous detector for high particle-flux environments

Y. Giomataris[a,*], Ph. Rebourgeard[a], J.P. Robert[a], G. Charpak[b]

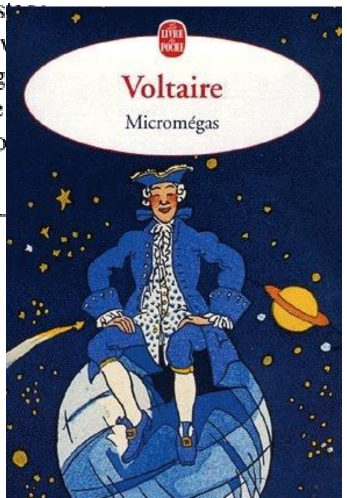
[a] *CEA/DSM/DAPNIA/SED-C.E.-Saclay, 91191 Gif/Yvette, France*
[b] *Ecole Superieure de Physique et Chimie Industrielle de la ville de Paris, ESPECI, Paris, ESPCI, Paris, France* and *CERN/AT, Geneva, Switzerland*

Received 24 January 1996

Abstract

We describe a novel structure for a gaseous detector that is under development at Saclay. It consists of a two-st... parallel-plate avalanche chamber of small amplification gap (100 μm) combined with a conversion-drift space. It follo... fast removal of positive ions produced during the avalanche development. Fast signals (≤1 ns) are obtained during collection of the electron avalanche on the anode microstrip plane. The positive ion signal has a duration of 100 ns. The evacuation of positive ions combined with the high granularity of the detector provide a high rate capability. Gas gains o... to 10^5 have been achieved.

spacers. The device operates as a two-stage parallel plate avalanche chamber and it is called MICROMEGAS (MI-CRO-MEsh-GAseous Structure).



Citation Micromégas de Voltaire dans l’article

Acknowledgements

We are grateful to many colleagues for their continuous support and help. J. Haissinski, the director of our department and P. Micolon, the director of the detector development group, unfailingly encouraged us to persist. We would like to thank J.P. Passerieux and O. Maillard for providing low noise preamplifiers. We are indebted to P. Mangeot and C. Mazur for many fruitful discussions. The authors wish to thank A. Giganon, C. Jeanney, D. Zacharian and Y. Piret for their technical assistance. We would also like to thank S. Vascotto for her competent help in reading and correcting this paper. Finally, we would like to thank Catherine Allegrini and Francois Voltaire for the acronym.

ELSEVIER Nuclear Instruments and Methods in Physics Research A 412 (1998) 47–60 Section A

First beam test results with Micromegas, a high-rate, high-resolution detector

G. Charpak[a], J. Derré[b,*], A. Giganon[b], Y. Giomataris[b], D. Jourde[b], C. Kochowski[b], S. Loucatos[b], G. Puill[b], Ph. Rebourgeard[b], J.P. Robert[b]

[a] *CERN/LHC–EET, Geneva and ESPCI, Paris, France*
[b] *CEA/DSM/DAPNIA/C.E-Saclay, 91191 Gif-sur-Yvette, France*

Received 2 February 1998

Abstract

We present particle beam test results using a high-rate, high-position and high-time-resolution gaseous detector, 'Micromegas', of $15 \times 15\,cm^2$. The rate capability was measured with 10 MeV protons from a TANDEM accelerator. No effect on gain was observed at particle rates up to $10^9\,mm^{-2}\,s^{-1}$. With an argon and DME filling the gain was stable up to to 50 mC total charge on a $3\,mm^2$ area. With minimum-ionizing particles in a CERN beam a high efficiency, close to 100%, was measured, under stable conditions. A first space-resolution measurement of $50\,\mu m \pm 20\,\mu m$ was obtained. The operation of the chamber shows that it is possible to optimize the geometrical parameters in order to improve the space resolution and bring the time resolution low enough to contain the events of each beam crossing (every 25 ns) in the European Large Hadron Collider. Further work in this direction is being actively pursued.

ELSEVIER Nuclear Instruments and Methods in Physics Research A 423 (1999) 32–48 Section A

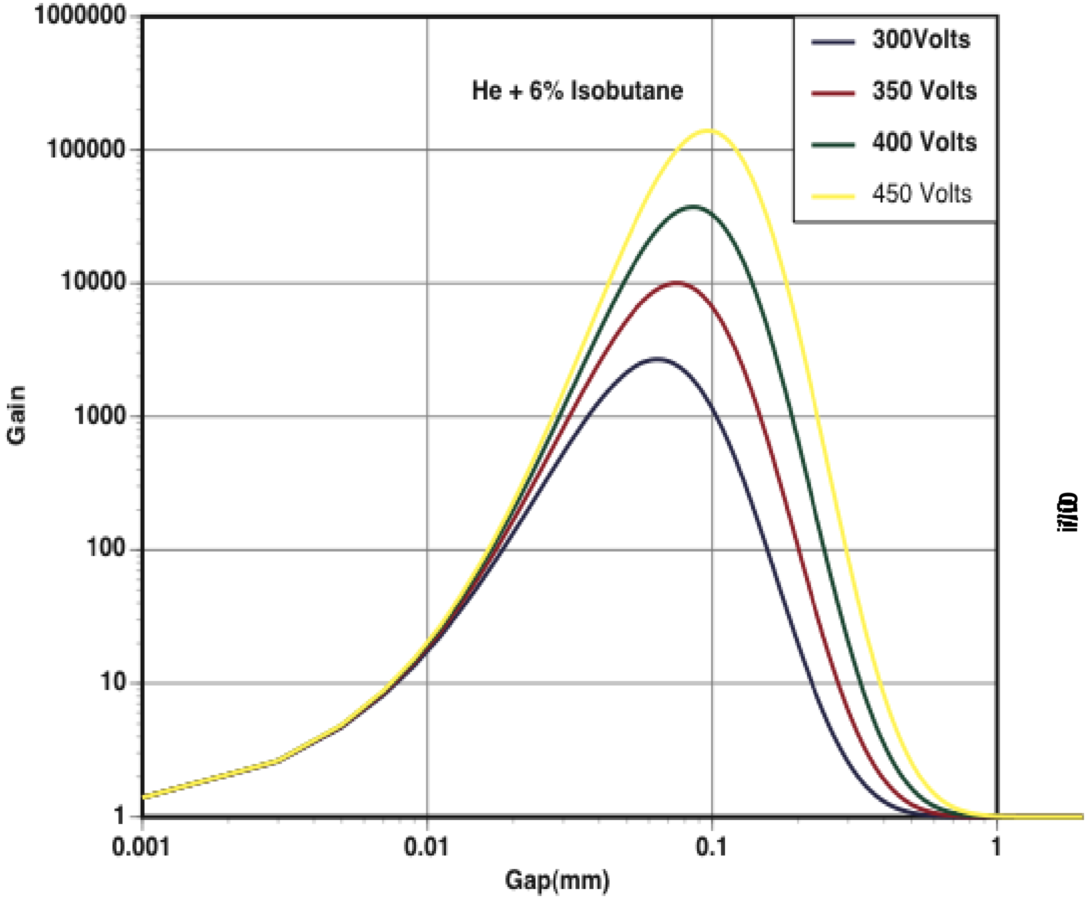
Development of a fast gaseous detector: 'Micromegas'

G. Barouch[a], A. Bay[b], S. Bouchigny[a], G. Charpak[c], J. Derré[a,*], F. Didierjean[d], J.-C. Faivre[a], Y. Giomataris[a], C. Kochowski[a], F. Kunne[a], J.-M. Le Goff[a], F. Lehar[a], Y. Lemoigne[a], S. Loucatos[a], J.-C. Lugol[a], A. Magnon[a], B. Mayer[a], J.-P. Perroud[b], S. Platchkov[a], G. Puill[a], Ph. Rebourgeard[a], Y. Terrien[a], D. Thers[a], H. Zaccone[a]

[a] *CEA/Saclay, DAPNIA, 91191 Gif-sur-Yvette Cedex, France*
[b] *Lausanne University, IPN, BSP, 1015 Dorigny, Switzerland*
[c] *CERN/LHC, Geneva, Switzerland*
[d] *EURISYS Mesures, 1 Chemin de la roseraie, Lingolsheim, 67834 Tanneries Cedex, France*

Received 17 September 1998

Virtue of the small gap
Y. Giomataris, NIM A419, p239 (1998)

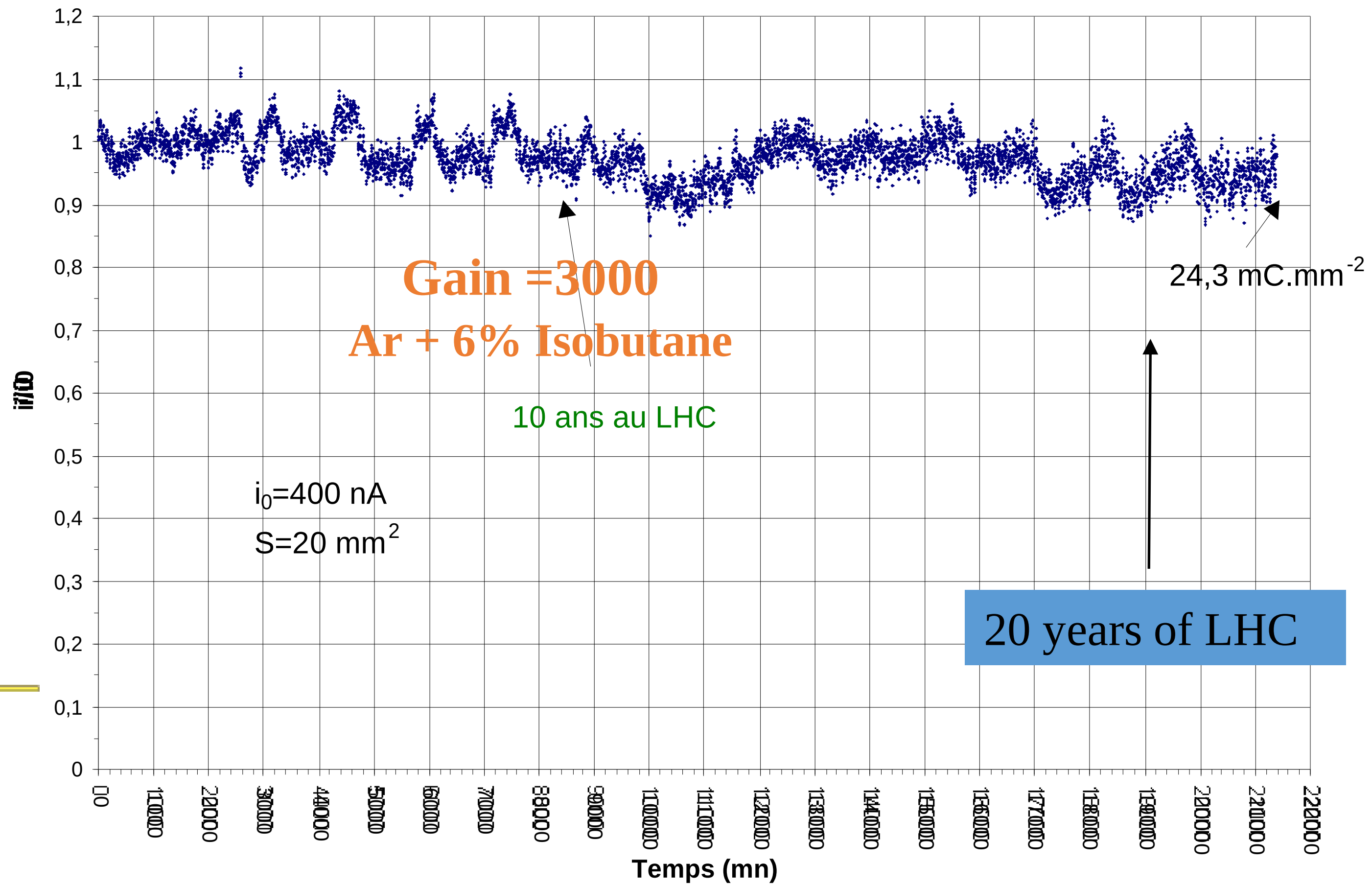


Optimum gap : 30 - 100 microns

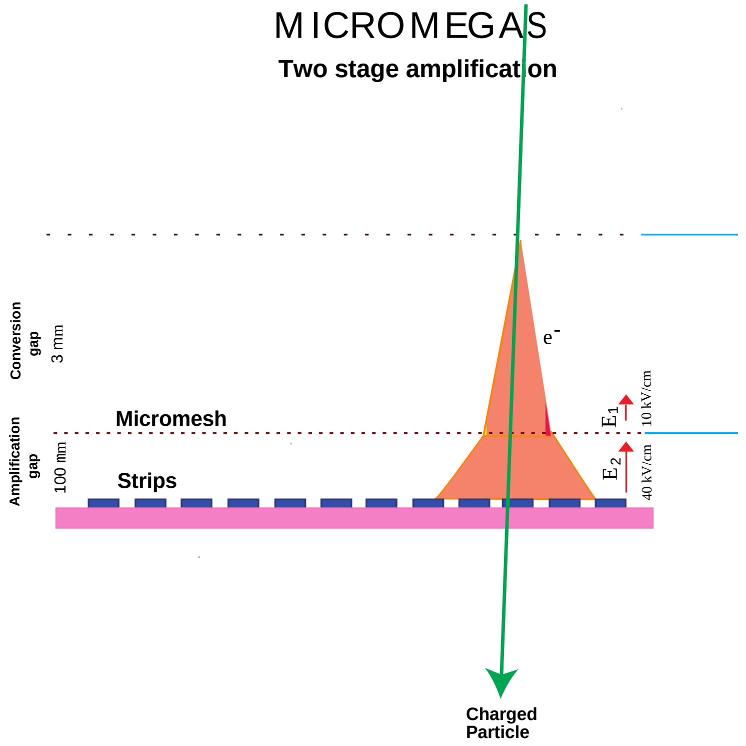
Optimal par rapport
Aux 4mm crus aux plaques parallèles

High radiation resistance

G. Puill, et al., IEEE Trans. Nucl. Sci. NS-46 (6) (1999)1894.

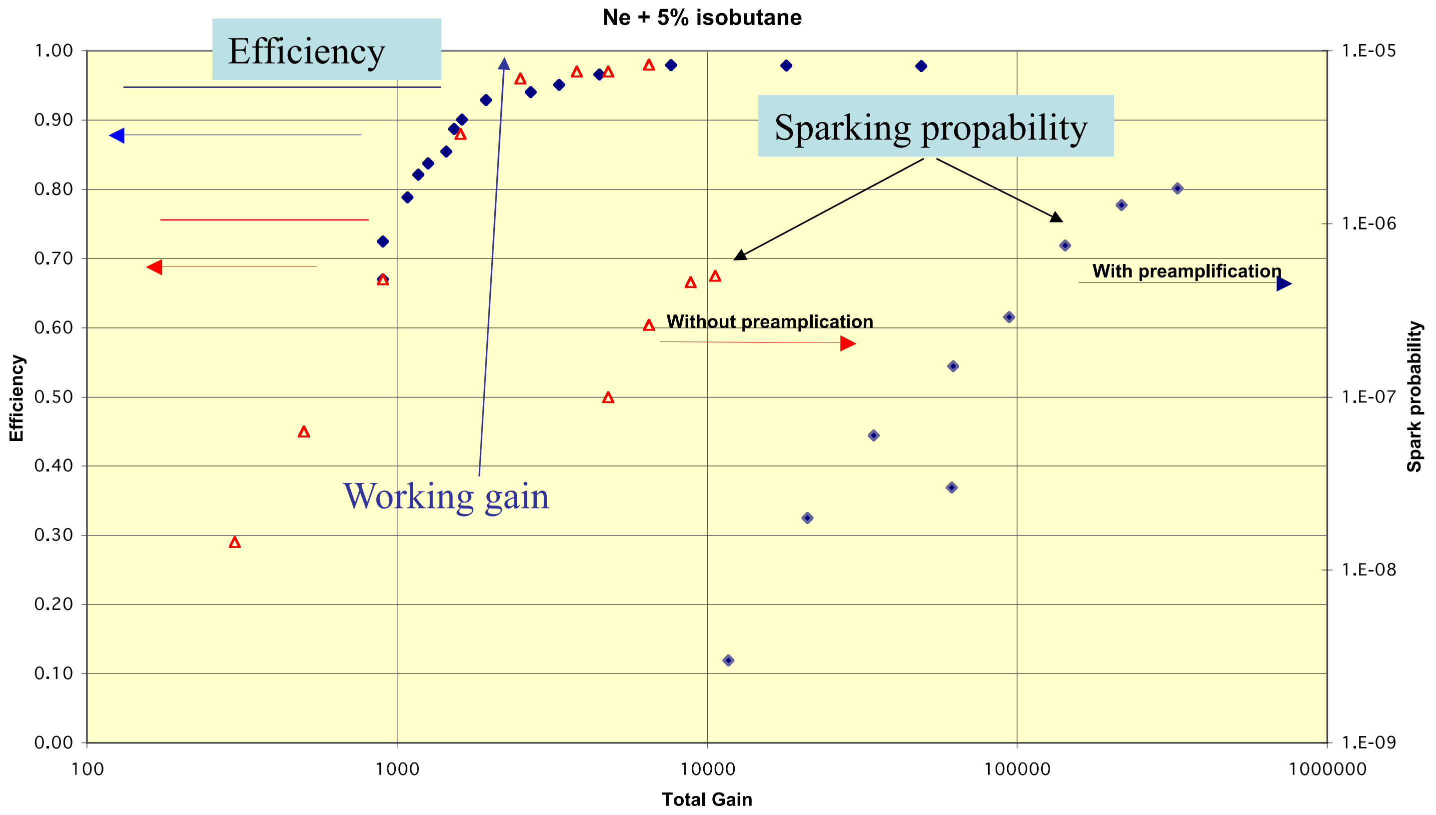


X rays



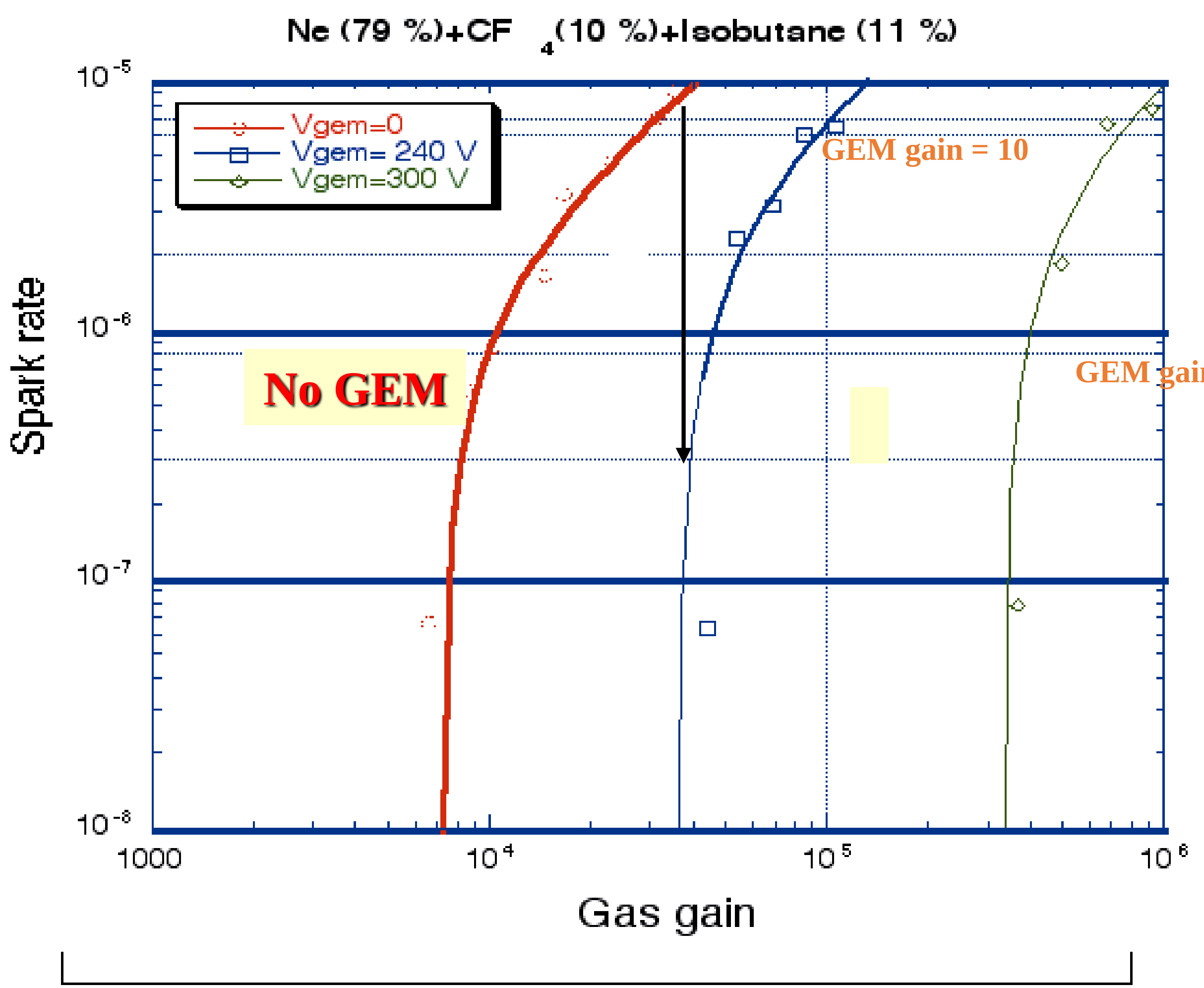
Micromegas + preamplification results In pion beam

A. Delbart et al., Nucl.Instrum.Meth.A478:205-209,2002



giomataris ioannis

Micromegas + GEM in hadron beam



COMPASS RICH

Ref: S. Kane et.al., A study of Micromegas with preamplification by a single GEM, COMO conf., published in World Scientific

HELLAZ

ELSEVIER Nuclear Instruments and Methods in Physics Research A 433 (1999) 554–559
Section A
www.elsevier.nl/locate/nima

Identification of solar neutrinos by individual electron counting in HELLAZ

P. Gorodetzky[a,*], T. Patzak[a], J. Seguinot[a], J.C. Vanel[a], T. Ypsilantis[a], J. Derre[b], I. Giomataris[b], H. Zaccone[b]

[a] *PCC-Collège de France, II Place, Marcelin Berthelot, 75005 Paris, France*
[b] *Dapnia, Saclay, France*

Abstract

In the HELLAZ project, Micromegas chambers have been used with He at one bar and room temperature. Pulses due to the avalanch electron movement, as short as 4 ns at the base, that can follow each other within 7 ns, have been obtained with fast current preamps. The gain (10^6) allows a very good single electron efficiency.

ELSEVIER Nuclear Physics B (Proc. Suppl.) 138 (2005) 56–58
www.elsevierphysics.com

Dark matter with HELLAZ

P. Gorodetzky[a], I. Giomataris[b], J. Collar[c], J. Dolbeau[a], T. Patzak[a], P. Salin[a]

[a]IN2P3/CNRS PCC-Collège de France, 11 place Marcelin Berthelot, 75005 Paris, France
[b]CEA, Saclay, DAPNIA, Gif-sur-Yvette, Cedex, France
[c]The University of Chicago, Chicago, IL, USA

Dark matter interacting in a pressurized TPC will produce an energy spectrum of recoil nuclei whose end point depends on the atomic mass and the pressure of the gas. These can be varied from He to Xe, and 10^{-2} to 20 bar. The threshold depends on the gain of the end cap detector and can reach single electron capability, that is a few eV. HELLAZ has reached that gain with 20 bar He. Parts of this presentation are taken from [1].

par Thomas Patzak,
Collège de France, APC

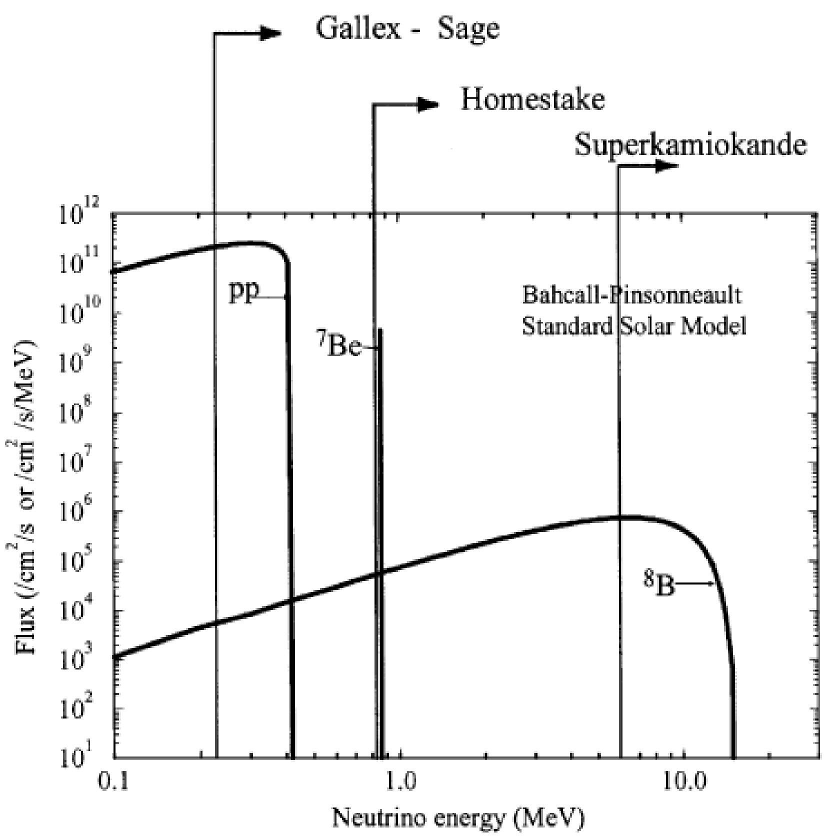


Fig. 1. Main components of the solar neutrinos according to the Standard Solar Model.

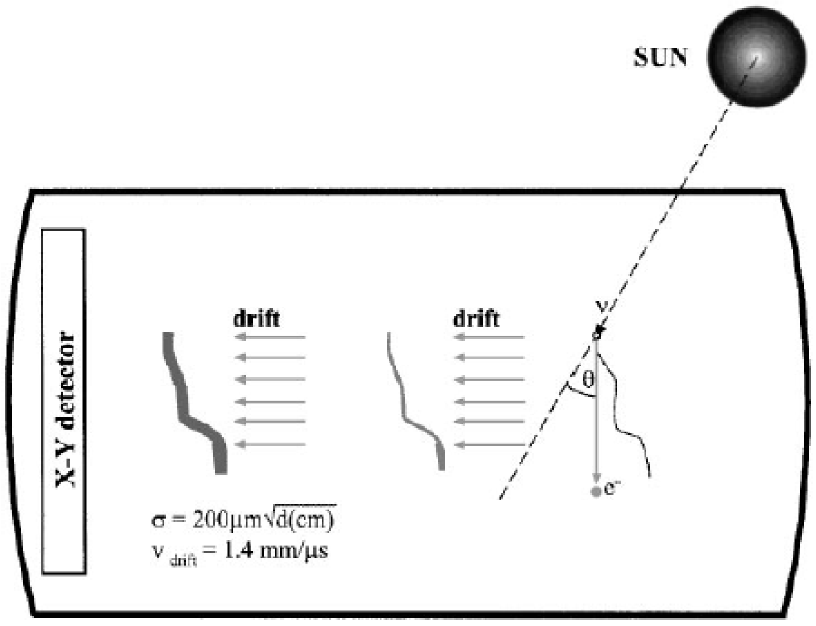


Fig. 2. Sketch of the Time Projection Chamber. Also included is the creation and evolution of an electron track.

electron energy and direction of emission. Using the kinematics, one can reconstruct the solar neu-

Par la direction du soleil et la diffusion élastique, on connait l'énergie du neutrino

‘Paris TPC Conference on rare event detection’

Since 2002

YANNIS, merci pour l’aventure commune des inventions, connaissances et réalisations menée dans l’esprit de collaboration et d’amitié