



PRIDE

Prototipo di Rivelatore di vertice nel DEcadimento del Ps

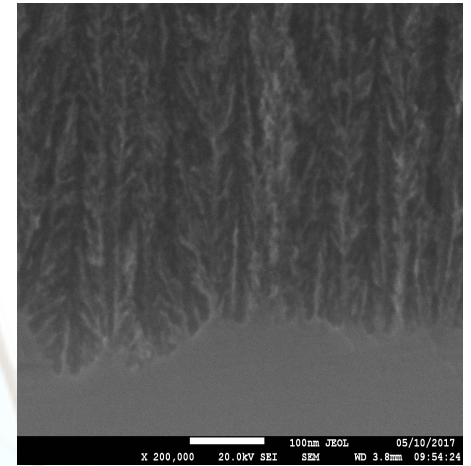
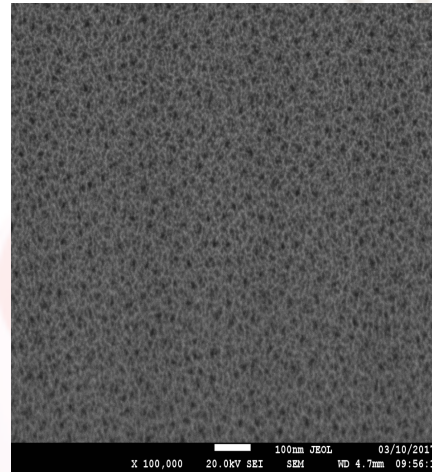
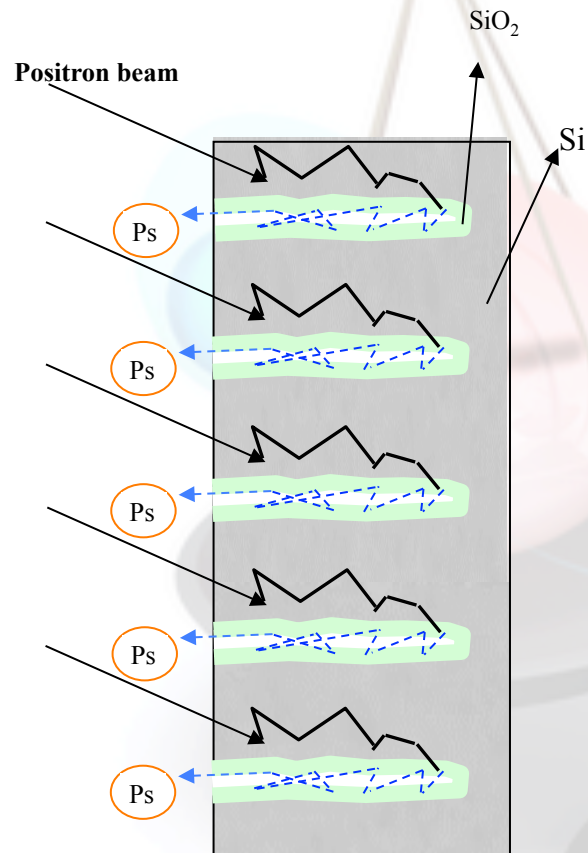
Local PI: Luca Stevanato (PD)

National PI: Sebastiano Mariazzi (TN)

INFN-PD

UNITN-TIFPA

Positron (e^+)/slow Positronium (Ps) converters



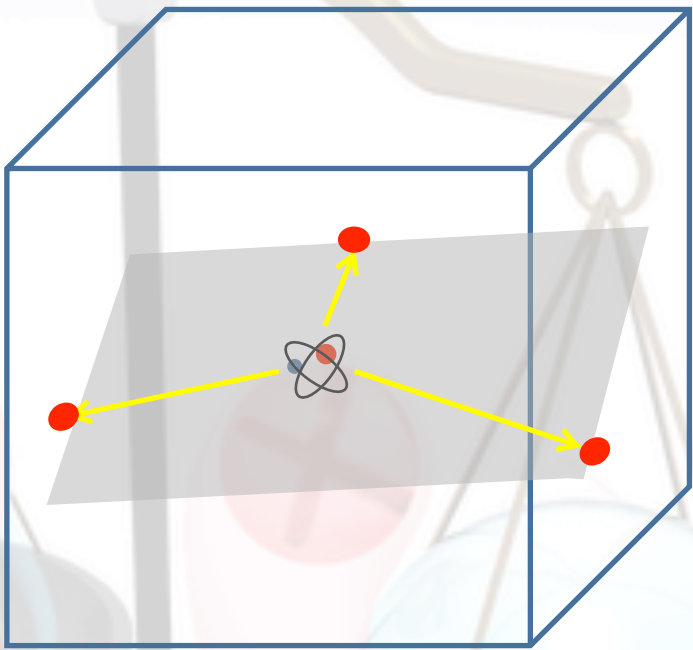
Slow Ps for: Ps spectroscopy, antihydrogen production via charge exchange reaction (AEgIS), gravity tests on a matter/antimatter system, test of Ps BEC...

Goal: development of a detector for the characterization of Ps emission (amount, velocity, angular distribution...) from different converters both in reflection and in transmission

Positronium annihilation

Ps self annihilation (3 γ)

$E_\gamma \sim (1022/3)\text{keV}$

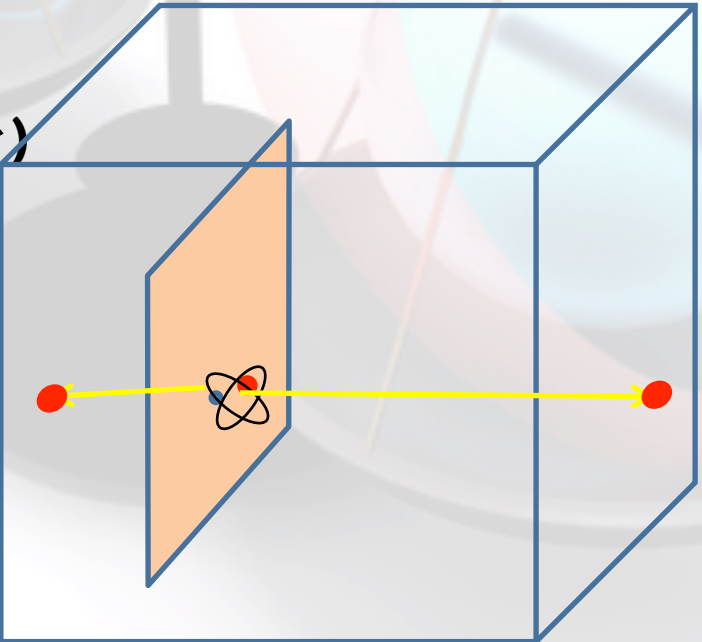


Determination of γ impact position (resolution $< 3 \text{ mm}^2$)

- 3 γ / 2 γ ratio (Ps self annihilation fraction)

Ps pick-off annihilation (2 γ)

$E_\gamma = (1022/2)\text{keV}$

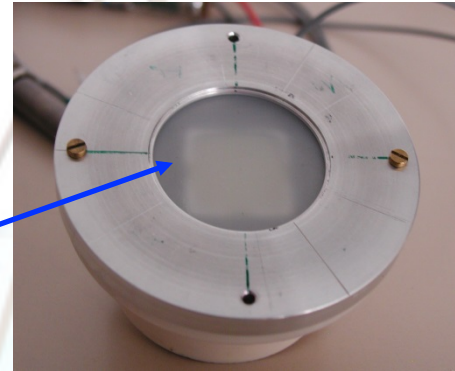


- plane/point of Ps annihilation
- Ps angular emission distribution
- Ps velocity distribution

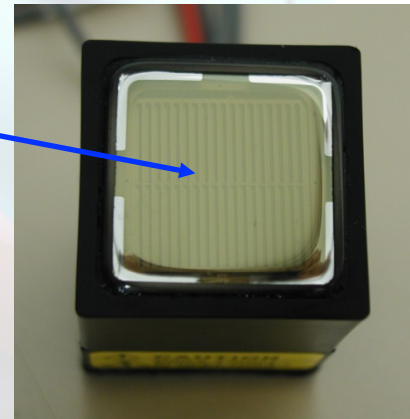
EURITRACK FP6-2003-IST-2 (Grant 511471)

YAP:Ce + multi-anode PMT

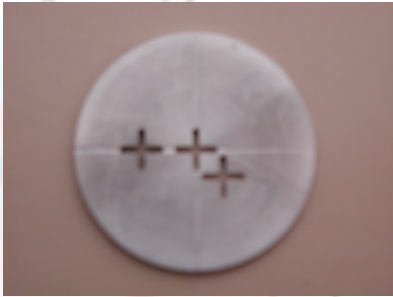
YAP:Ce detector (F = 40 mm, h = 0.5 mm)



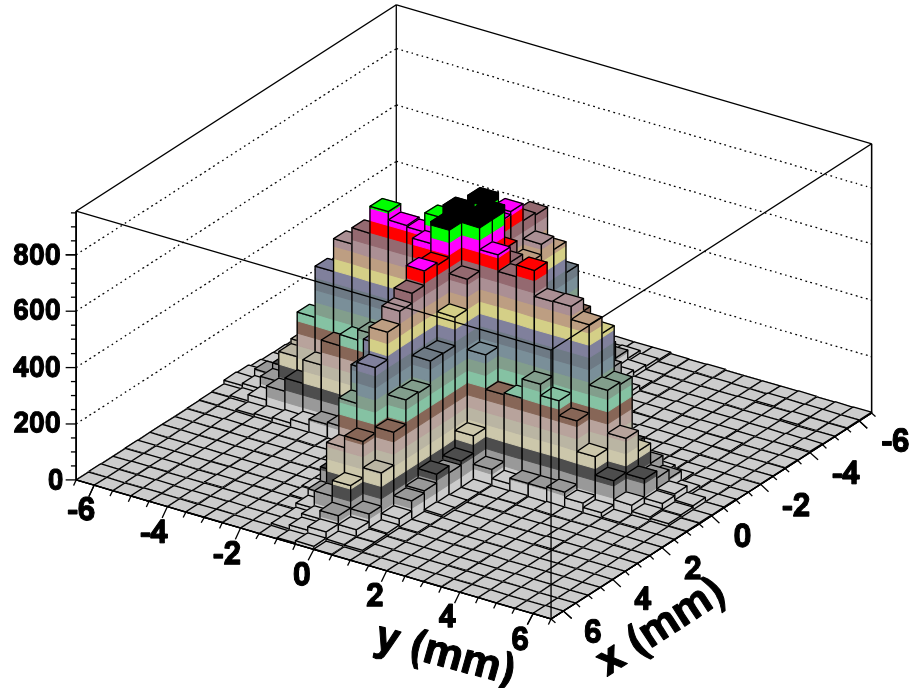
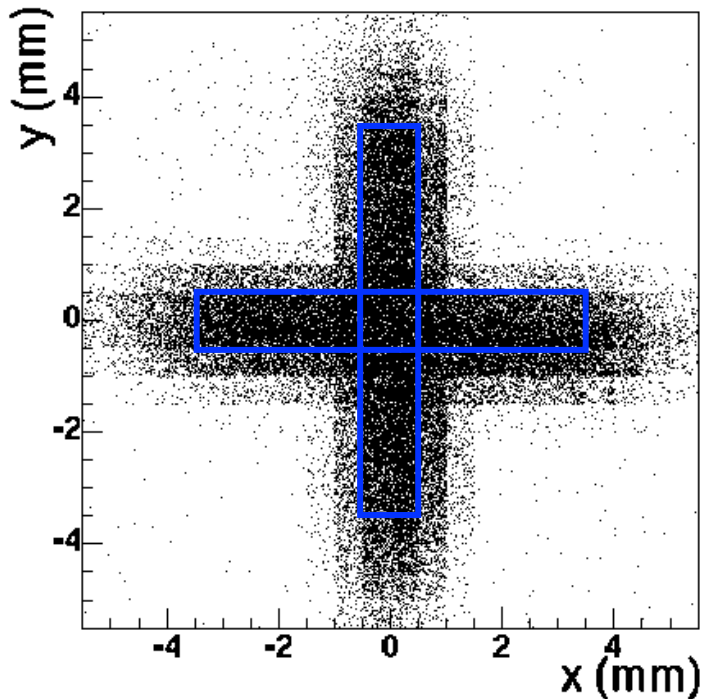
Read by a 2x2 multi-anode PMT
Hamamatsu R5900U-00-M4 (18x18 mm²)



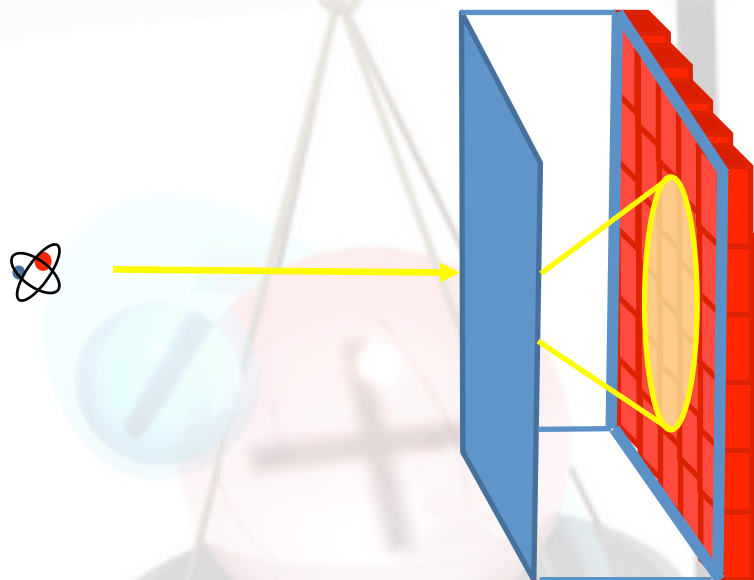
Test with a cross collimator



Collimator with two crossed $7 \times 1 \text{ mm}^2$ slits placed in front of the YAP:Ce detector



Proposed detection technique



Pixeled PMT
 Hamamatsu H-12700
 64 pixel of 5x5 mm²

Acquisition of the intensity and timing of the signal of each pixel

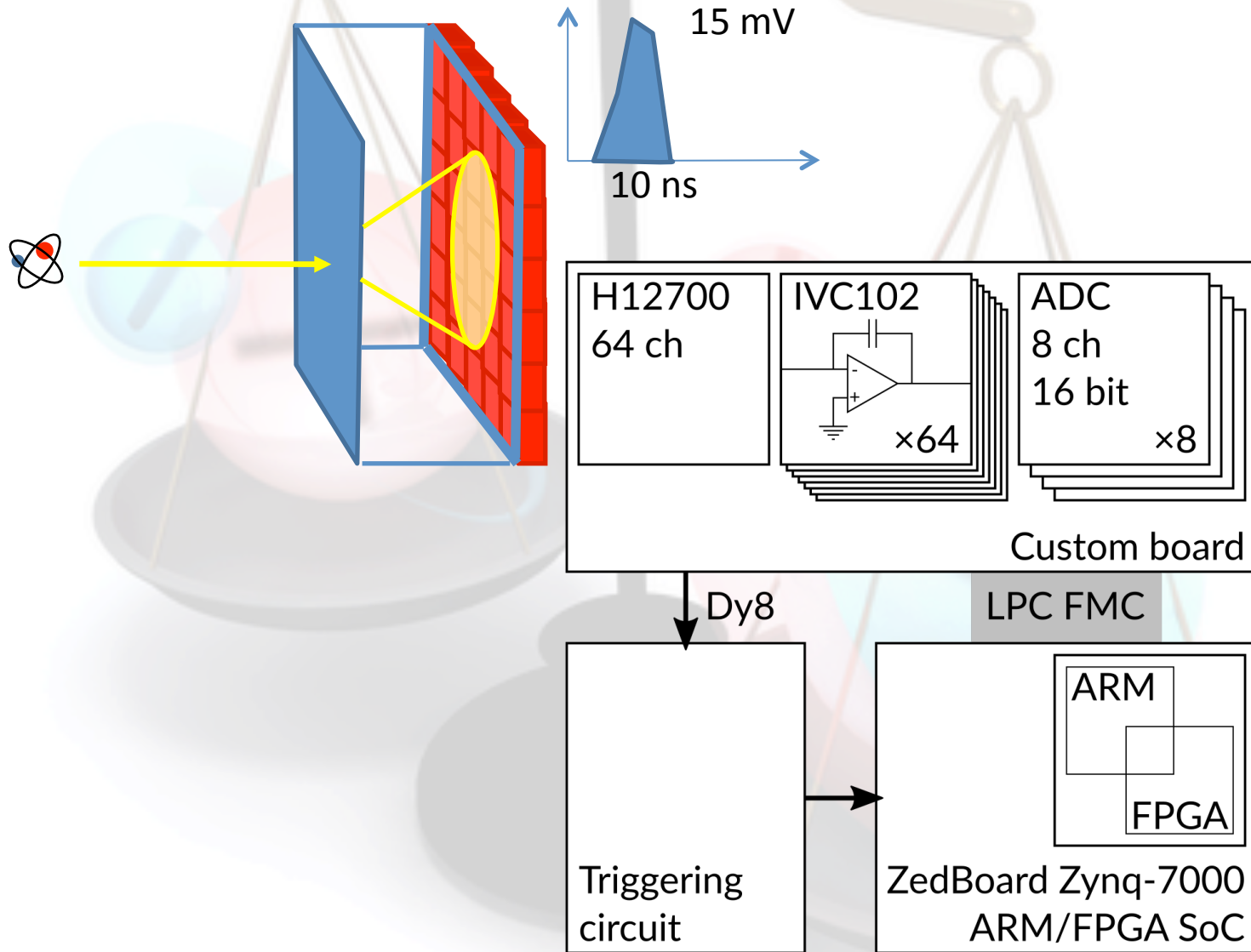
<3 mm in impact position
 error also on 45°
 impinging γ s

YAP(Ce) 50x50xThickness mm³

Scintillator	Density [g/cm ³]	Thickness [mm]	Detection efficiency [at 511 keV]	Detection efficiency [at 350 keV]
YAP	5.37	10	31.9 %	34.7 %
YAP	5.37	5	18.7 %	20.5 %
YAP	5.37	3	12.0 %	13.0 %

Expected detection in 3 mm configuration: Double 6.72 cps, Triple 0.675 cps
 Triple counts in 24h: 60.000, statistical error 0.4%

Proposed read-out



Budget: 2 years, development and test of 2 detectors with the TN positron beam

2 YAP (Ce) crystals	4 keuro
2 PMT H-8500	6 keuro
4 low noise HV channels	4 keuro
2 acquisition chains: <ul style="list-style-type: none">- 8 ADC (64 ch)- FPGA- 128 IVC102- integrated circuits and board design	0.5 keuro 0.5 keuro 2 keuro 3 keuro
vacuum chamber and detector support	4 keuro
travel expenses TN-PD	6 keuro
Total	30 keuro

Involved people and FTE

People	FTE		
S. Mariazzi	0.4	National PI	Unitn-TIFPA
R.S. Brusa	0.2		
G. Monaco	0.2		
L. Penasa	0.2		
L. Stevanato	0.4	Local PI	INFN-PD
G. Nebbia	0.4		
C. Fontana	0.2		
M. Lunardon	0.2		
S. Moretto	0.1		