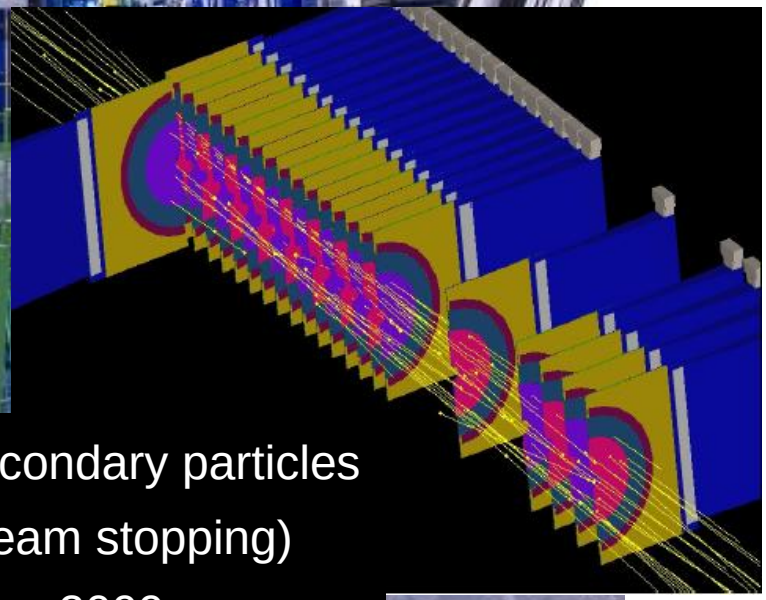
Attivita 2009 e richieste 2010 di LHCb – Milano Bicocca

Milano, 6 luglio 2009

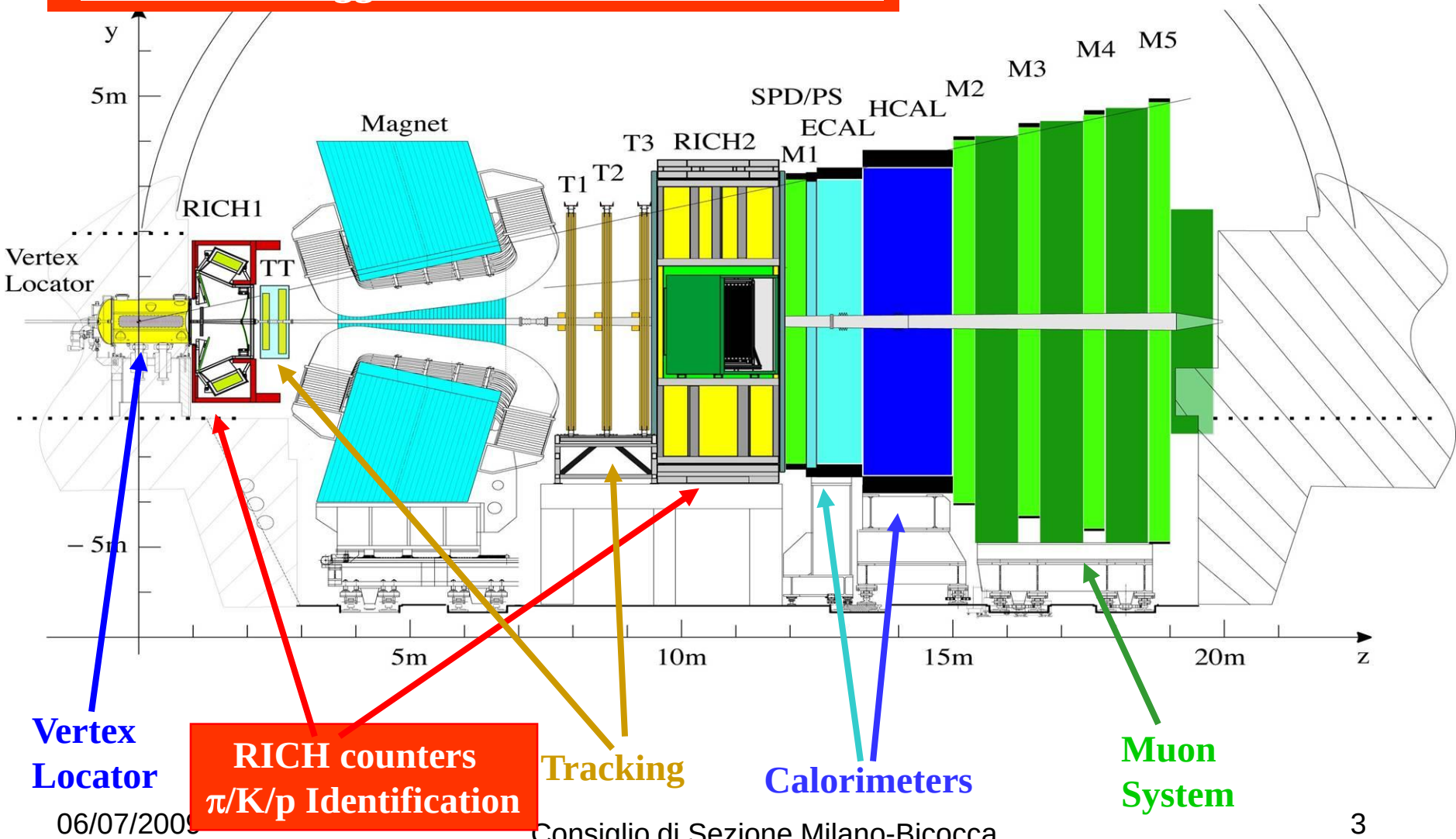
The LHCb spectrometer



TED data (secondary particles from LHC beam stopping) 6-7 June 2009.

The LHCb spectrometer

Special features:
a dedicated trigger and Particle Identification



Il gruppo LHCb-MilanoBicocca partecipa a

HARDWARE rivelatore RICH (radiatore, elettronica)

SOFTWARE/ANALISI

- diversi canali di decadimento di B, produzione di Higgs leggero, ricostruzione di jets,
- software di rivelatore

HARDWARE : il rivelatore RICH

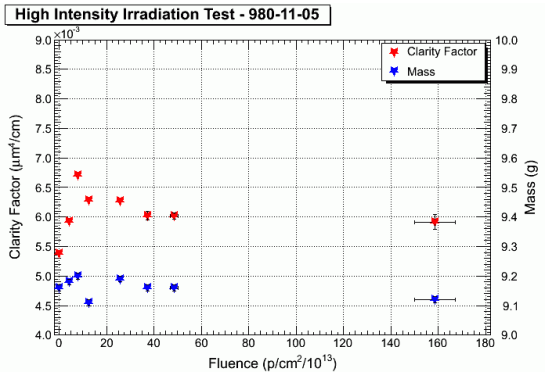
(dal 1 gennaio 2009, Project Leader **C. Matteuzzi**)

- Commissioning di RICH-1 e RICH-2
  (*E.Fanchini,D.Perego,G.Pessina*)

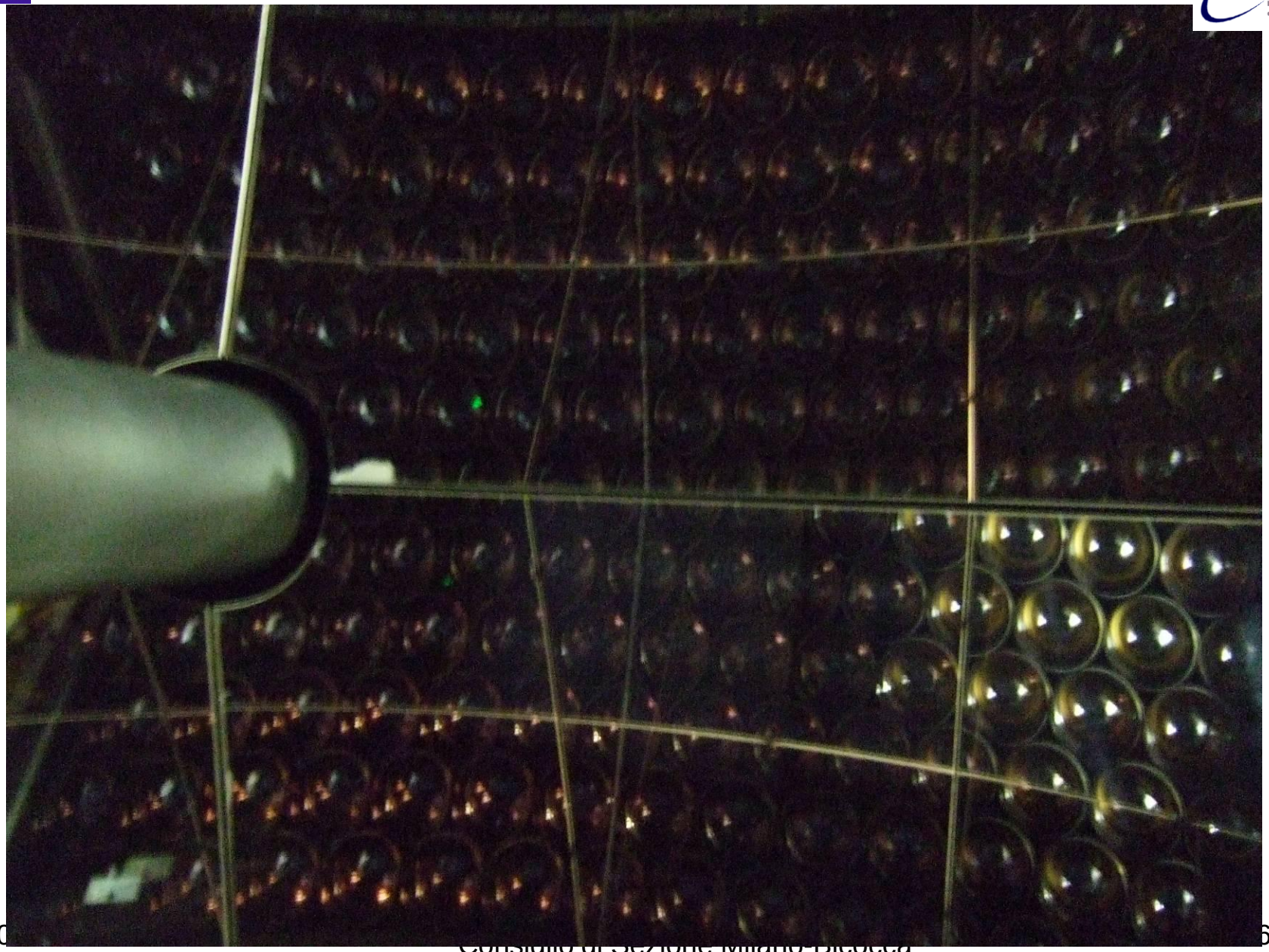
- Attivita' per l' upgrade del RICH

  Nella prospettiva di acquisire dati a 40 MHz, i fotorivelatori HPD devono essere sostituiti (hanno l'elettronica incorporata).
  Abbiamo cominciato a studiare quale tipo di PD puo' essere la scelta migliore.

- Prosecuzione test di resistenza alle radiazioni dell'aerogel
  (totale di 160×10^{13} p/cm^2 (*D.Perego,C.Matteuzzi*)



The HPDs in RICH1



HPD status

- Out of the 550 HPD tubes, **10%** have experienced vacuum problems. 21 have been repaired by Photonis and replaced in the detector.

- The evolution of each tube is under control
  all the tubes going bad are predictable

- Considering the new schedule of LHC, we have time (until probably september 2009) to replace the tubes which are expected to glow in RICH-2 in 2009 and 2010.
  This will assure a safe and stable operation of the RICH detectors for the next long period of running.

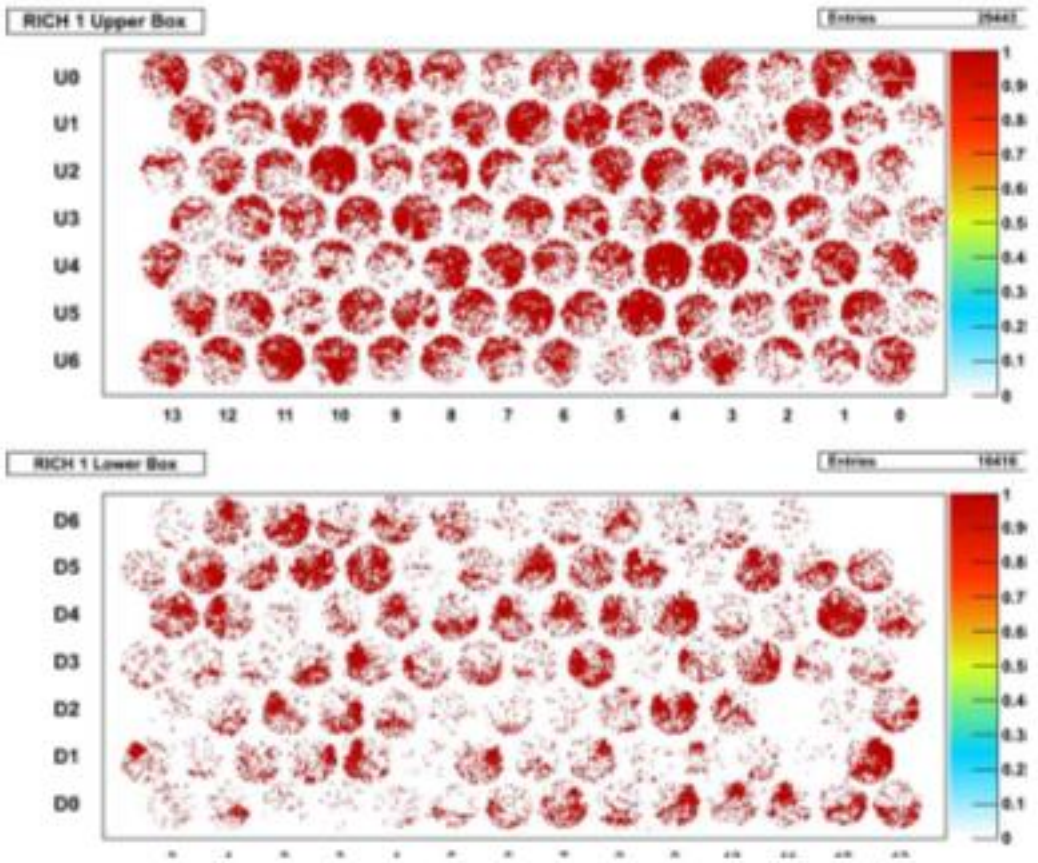
- Financial aspects:
  An agreement with DEP-Photonis has been reached and all the 100 tubes to be repaired will be shared **50% -50%** between LHCb and Photonis

All RICH systems on track

Commissioning under way
HPDs now permanently powered (-20 kV)
Measured magnetic distorsions

First ‘real data’

September
2008 LHC beam



RICH 1

- these are photons from particles crossing the HPDs
- more than 10000 hits per event
- hits mostly from Cherenkov light generated in the quartz– and HPDs windows
- photocathode surface clearly visible – electronic noise negligible

INFN Istituto Nazionale di Fisica Nucleare

Upgrade activities

Upgrade for data at 40 MHz foresees to change the HPD and all the front end electronics.

Studies already started and going on with MaPMT kind of photodetectors

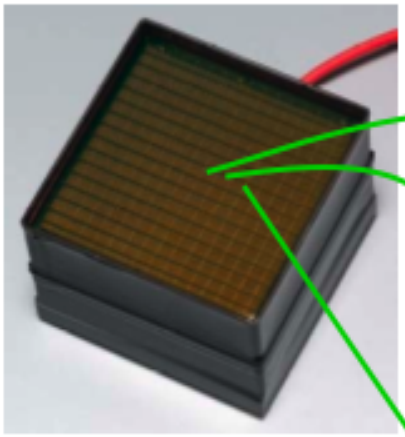
(in Milano, Genova, Edinburgh, CERN, Oxford)

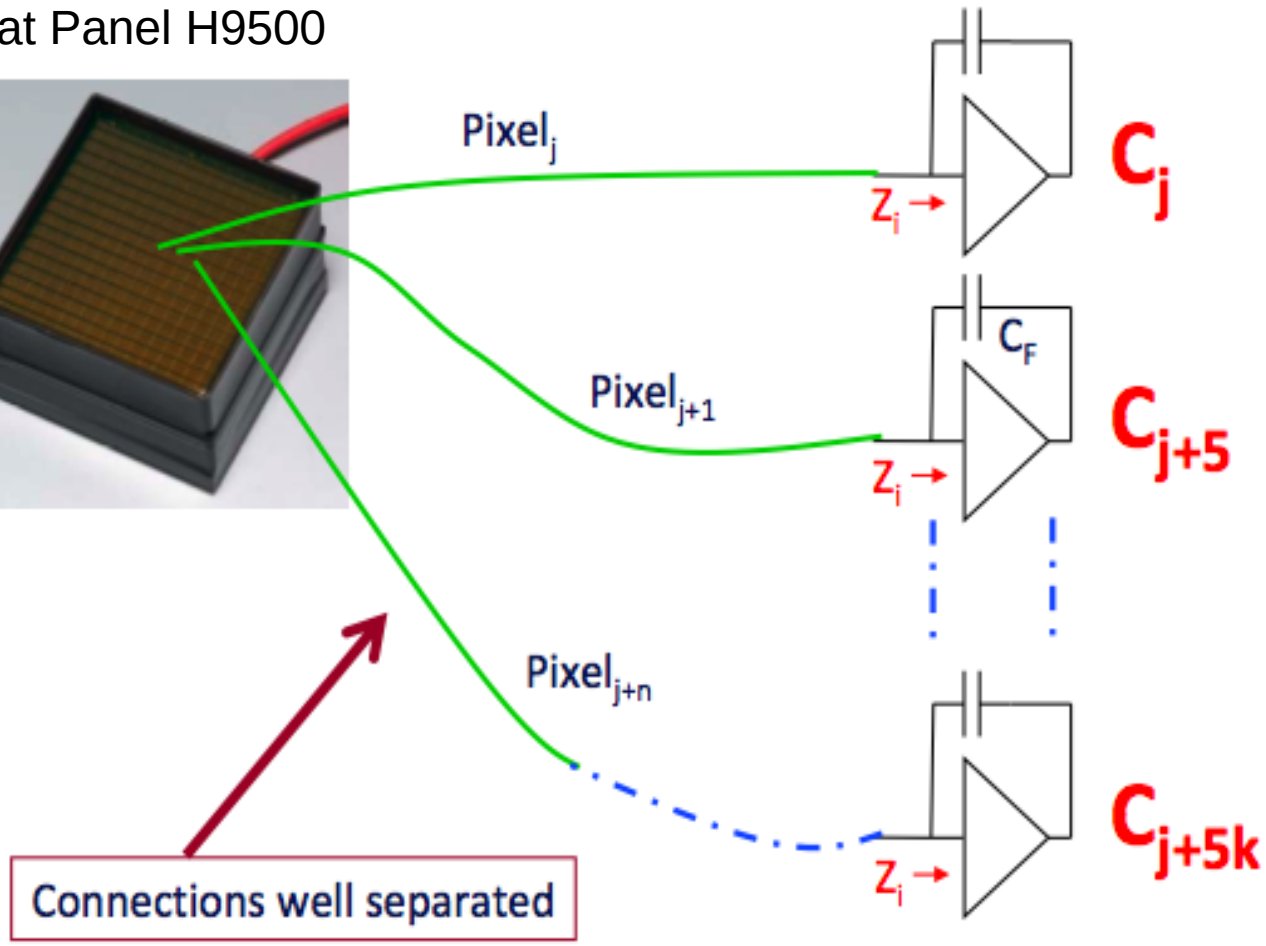
Misure di cross talk a Milano

Measurement set-up for cross-talk study (II)

Tesi in corso : Matteo Maino

Hamamatsu
Flat Panel H9500

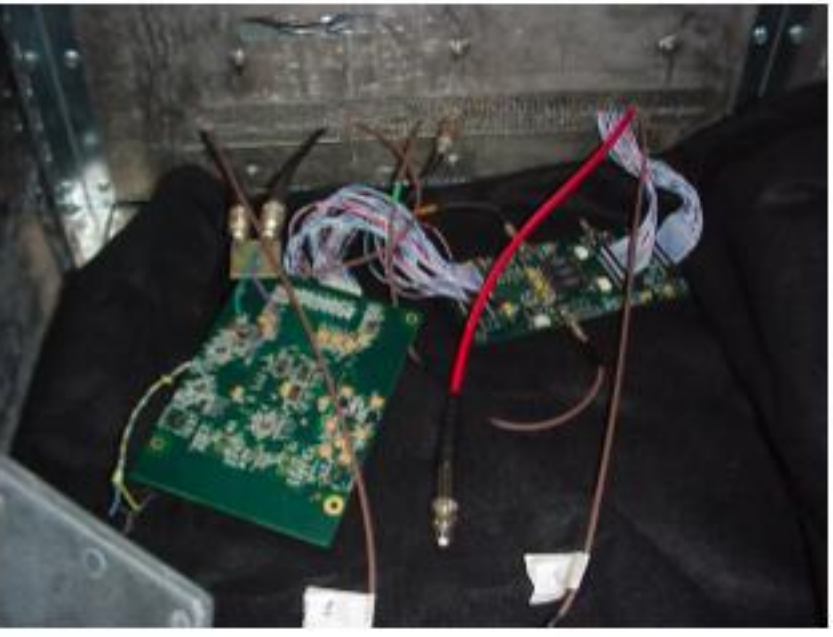


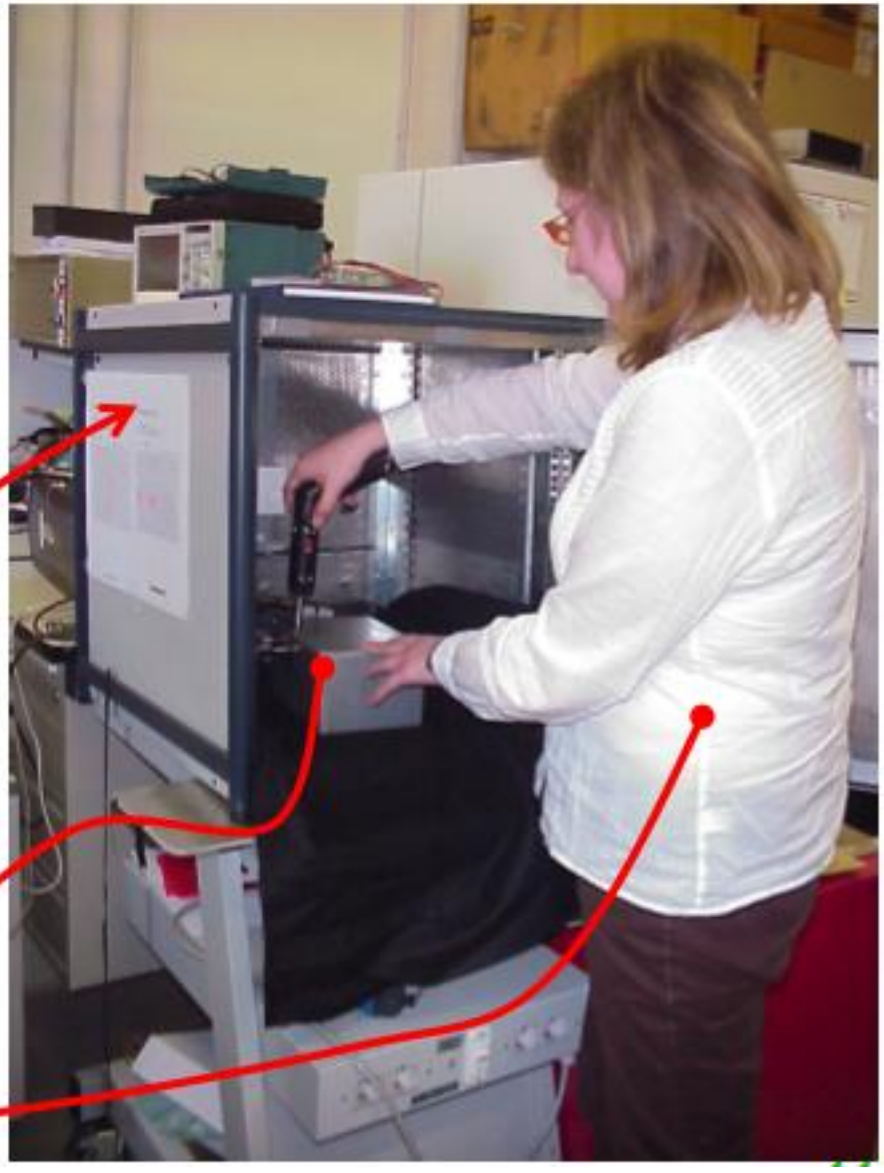


We connected one channel every 5 suppressing completely the cross-talk from the small, necessary, short flat cable.

Set-up (I)

The box with the flat panel has been housed inside a small Faraday cage.

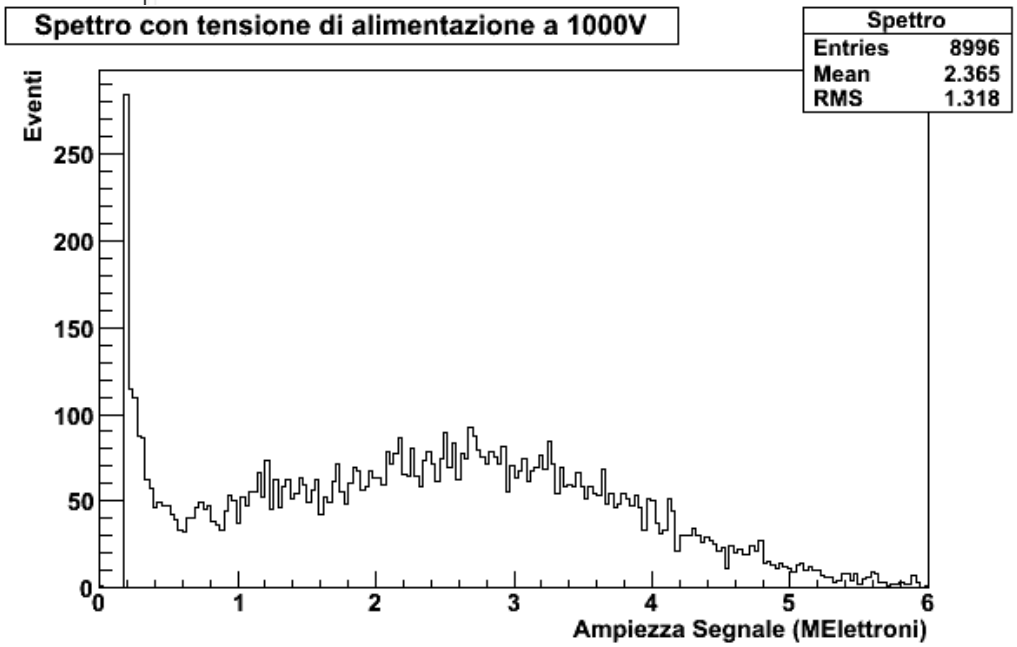




Studi prelimari della risposta di un flat panel a un singolo fotone

Singolo pixel illuminato con led blu da 470nm

Frequenza di conteggio ≈ 100Hz



ANALISI e SOFTWARE :

Preparazione analisi dei primi dati

(*M.Calvi,E.Fanchini,C.Matteuzzi,D.Perego*)

Studi di vari canali

$B_s \rightarrow J/\psi\, \Phi$, $B_d \rightarrow J/\psi\, K_s$
$B_s \rightarrow D_s\, D_s$ (tesi di R.Turra)
$B_d \rightarrow D^*\mu\nu$ (tesi di L.Tamburello)
$pp \rightarrow WH, ZH$
ricostruzione di jets
$pp \rightarrow \mu\mu + X$

Software di rivelatore : monitoraggio di *n* e *C* dell'aerogel con anelli saturi (p>20 -30 GeV) (*D.Perego*)

Attivita 2009

BORSE CERN-INFN:

- E. Fanchini
  - s/w Uso dei primi dati per studiare Drell-Yan 2-muons final states (determinazione delle pdf), studio di di-jets
  - h/w Monitoraggio dell'HV

    started: 1 luglio 2009

- D.Perego
  - s/w Uso dei primi dati per calibrazione radiatori (in particolare n e C dell'aerogel) e per ottimizzazione del pattern recognition del RICH per la PID globale
  - h/w responsabilita del commissioning del RICH in pit8 (divisa con T. Blake, IC)

    will end: 1 ottobre 2009

Composizione del gruppo LHCb - Milano

A. Baschirotto	30%	p.a.
M. Calvi	100%	p.a.
C. Matteuzzi	100%	dir ric.
G. Pessina	30%	I tecn.
D. Perego	100%	ass.
L. Trentadue	70%	p.o.
E. Fanchini	100%	dottoranda
X.X	*100%*	*ass. INFN 2009*
X.X	*100%*	*borsa università*

da sett. 2009 6(+6) mesi

Totale 7.3 f.e.

R.Mazza (20%), F.Chignoli (50%), A. DeLucia (30%)

Responsabilita del gruppo di Milano

★ *Rivelatore*

C.Matteuzzi **RICH Project Leader**
Radiatore aerogel

G. Pessina **Distribuzione e stabilizzazione dell'alta tensione dei RICH**

★ *Analisi*

M. Calvi **Co-Convenor CP measurements , responsabile data-stripping e falvour tagging , membro del PPG (Physics Planning Group)**

C. Matteuzzi **Co-Convenor of F-WG** *(convenor per Exotica)*, **membro dell'Editorial Board**

Richieste LHCb-Milano per 2010

(contando 3.6 Keuro per m.u.)

MI : 10 keuro

ME : 101 keuro

Consumi : materiale per upgrade 72 keuro
contratti manutenzione
metabolismo
M&O cat.B

Inventariabile 16 keuro

Richieste LHCb-Milano per 2010

Più in dettaglio…….

Missioni Interne *(1.5 Keuro x 6.3 f.e)* : 10 keuro

Missioni Estere (*resp. analisi 2 m.u, PL RICH 9 m.u.,*
shift+picket 3 m.u. LHCb week 4 m.u.,
base di 1.5 m.u. per f.e.) : 101 keuro

Consumi : *2 FP PMT (7), elettr. test per FP(5),*
chip monol.(6) + packag.(1)
M&O cat.B RICH (37), metabolismo(13) 69 keuro

S/W ricerca *aggiorn. licenze (2), s/w analisi Jitter x oscill.(1)* 3 keuro

Inventariabile sistema acquisizione veloce:
crate VME/QDC/interfaccia (12),
ISEG power supply(4.5) 16 keuro

spare

$B_s \rightarrow \mu^+\mu^-$

Expected Sensitivity

90% C.L. limits:

exclude significant enhancement from the SM with less than 1 fb^{-1}

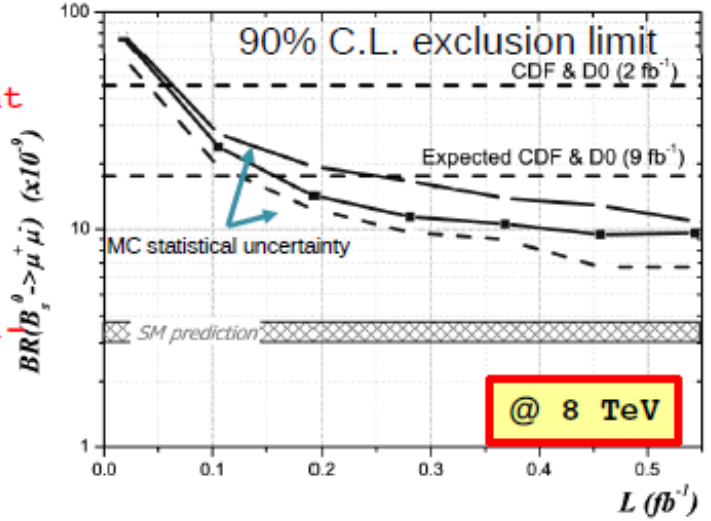
Expected Tevatron limit (~$2x10^{-8}$) is reached with < 0.1–0.2 fb^{-1}

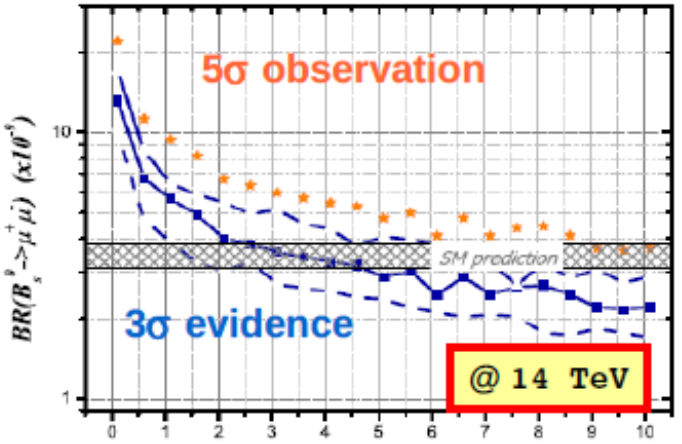
In presence of a signal, 5σ observation:

for BR ~$2x10^{-8}$ with < 0.5 fb^{-1}

for the SM BR with <= 10 fb^{-1}

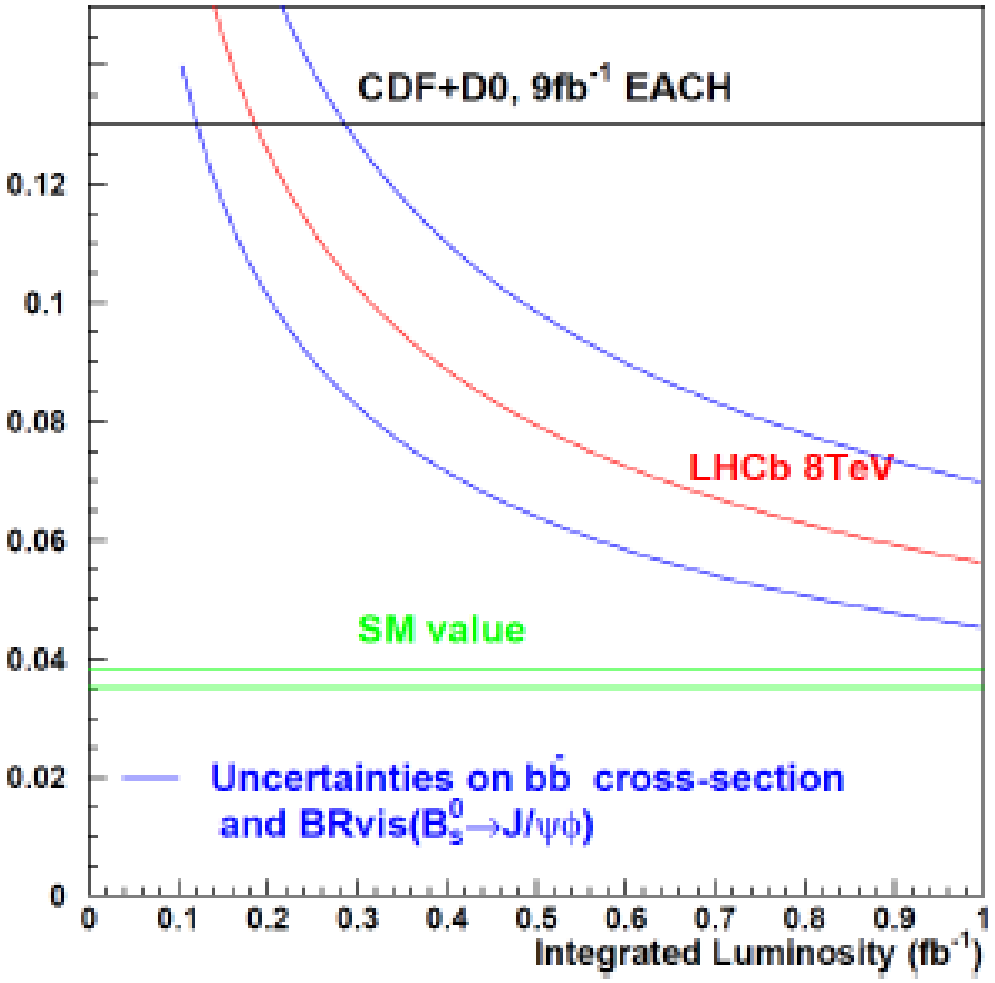
ATLAS	< $7x10^{-9}$ (10 fb^{-1})
CMS	< $14x10^{-9}$ (10 fb^{-1})
LHCb	< $3.5x10^{-9}$ (2 fb^{-1})





$B_s \rightarrow J/\psi(\mu\mu)\ \phi(KK)$

Expected sensitivity on $2\beta s$



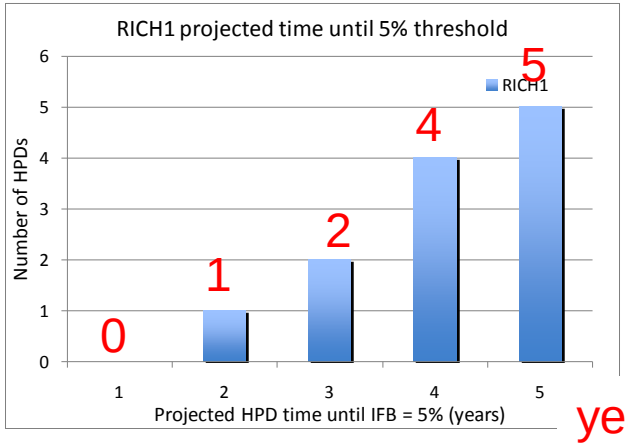
Predictions of IFB Development

- HPDs passing IFB = 5% :
  ~11 HPDs per year

A total of 55 tubes are expected to fail in the next 5 years

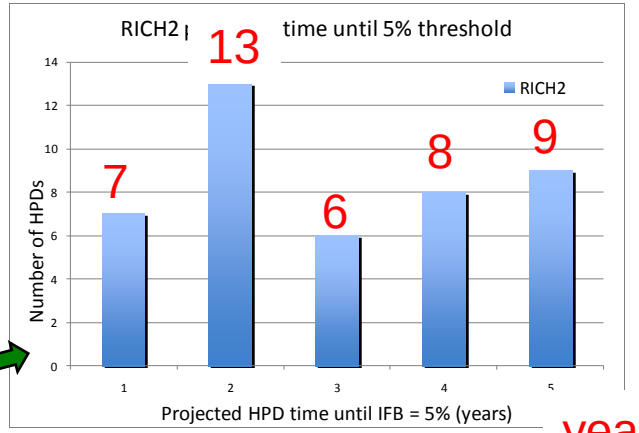
12 in RICH-1
43 in RICH-2

RICH1



years

RICH2



years

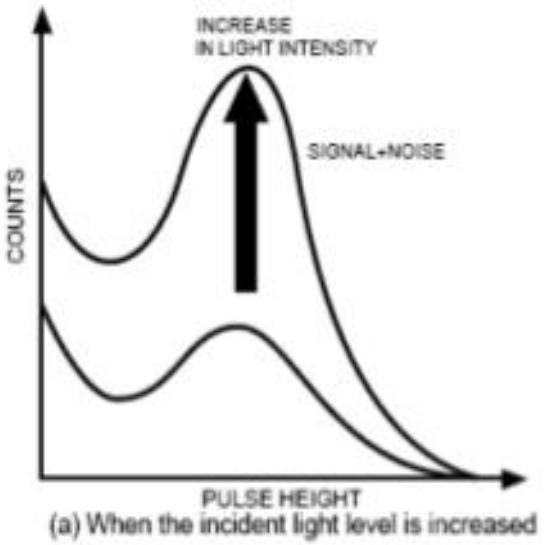
Plan to replace these 20 for september

C.Matteuzzi, CSN1 Padova, 19 maggio 2009

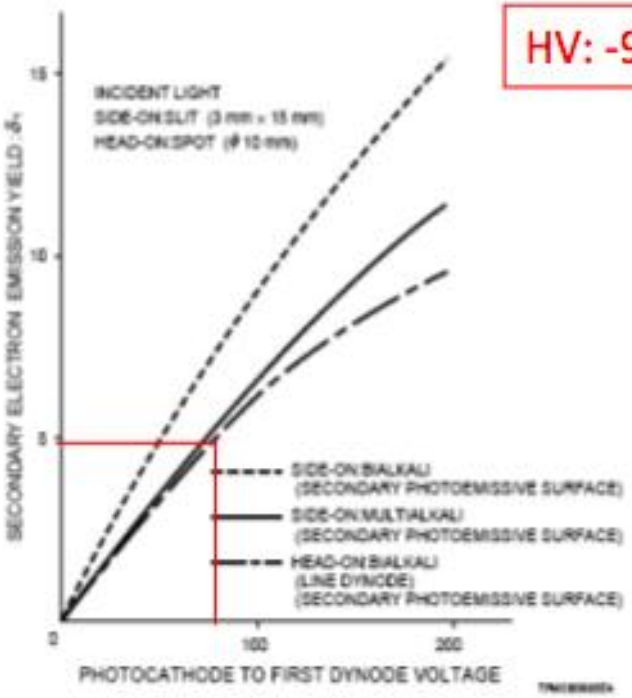
Simulation of cross-talk from single-photon signal (I)

In the simulation and measurements we have considered that:

- ✓ the noise and the single-photon signal response have both a normal distribution;
- ✓ There is a dependence of the number of electrons generated at the first dynode with the drop-out voltage applied to it.



(a) When the incident light level is increased



HPD status

The facts:

Out of the 550 HPD tubes, **10%** have experienced vacuum problems

47 HPDs in RICH-2 (20 have been replaced in the detector)

1 HPD in RICH-1 (it has been replaced in the detector)

12 HPDs in lab

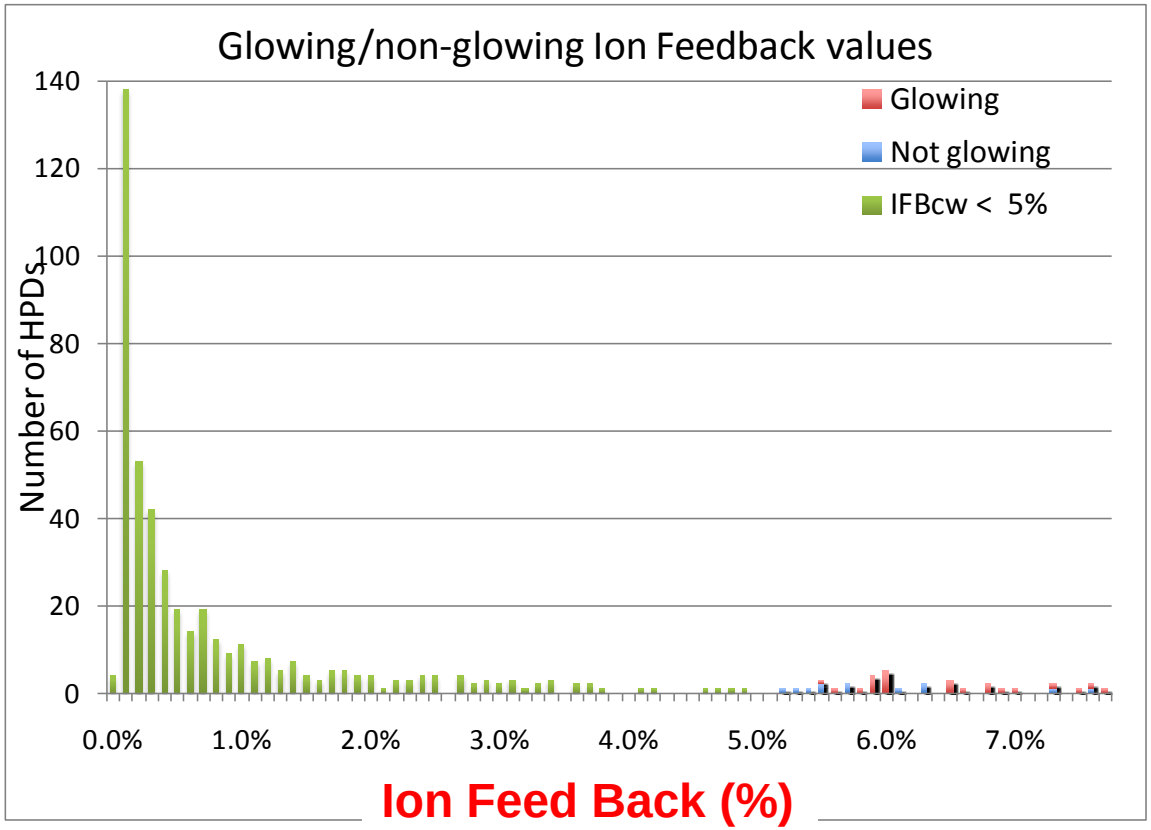
22 already repaired by Photonis, tested, accepted

IFB measurement *(cw laser method)*

- Thresholds of glowing:
  - no glowing HPD for IFB < 5%
  - lower threshold at IFB > 5%

    i.e. HPDs can turn glowing at any point between IFB=5…8%

full HPD sample (550)



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