The DAΦNE Beam Test Facility & AGILE Calibration

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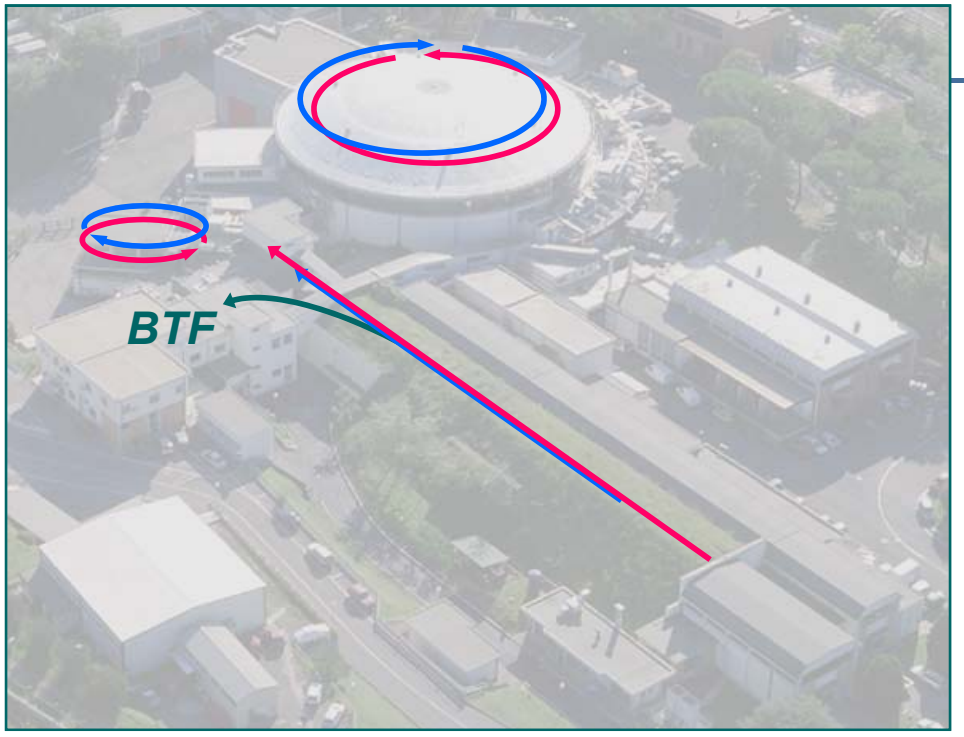
P. Valente – INFN Roma

The DAΦNE BTF



- *The **BTF** is a e^-/e^+ **test-beam facility** in the Frascati DAΦNE collider complex*

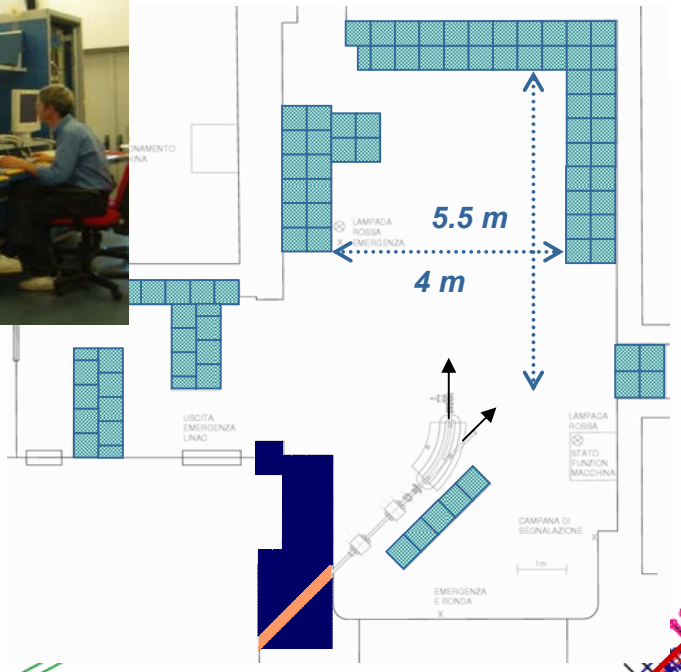
*It makes use of the **high current** Linac:*

- *1 – 4000 mA e^+/e^-,*
- *1 - 10 ns pulses, at least 10^7 particles:*

Need to attenuate the primary beam:

- ***Single particle** regime is ideal for detector testing purposes*
- *Allows to tune the beam intensity*
- *Allows to tune the beam energy*

BTF layout



BTF Hall

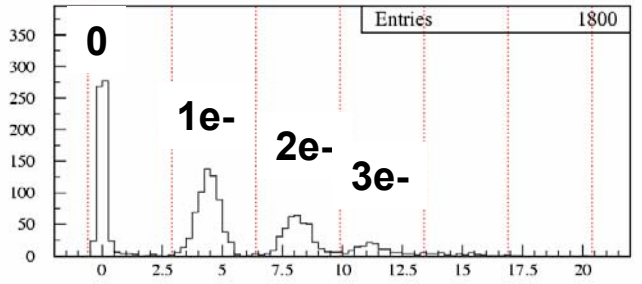
odoscope

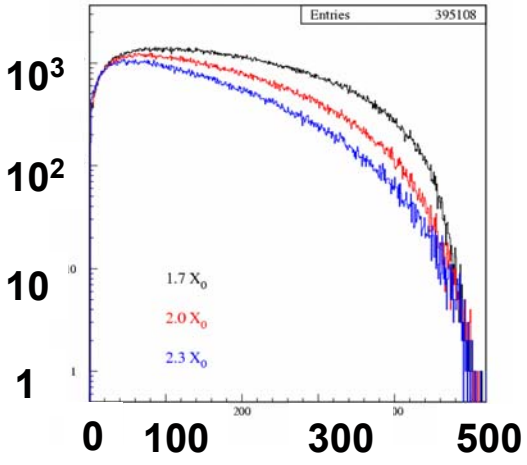
LINAC tunnel

accumulator

main ring

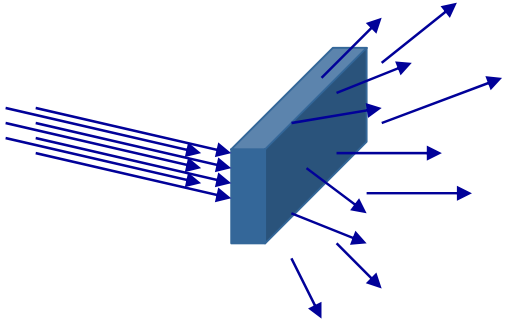
LINAC beam attenuation

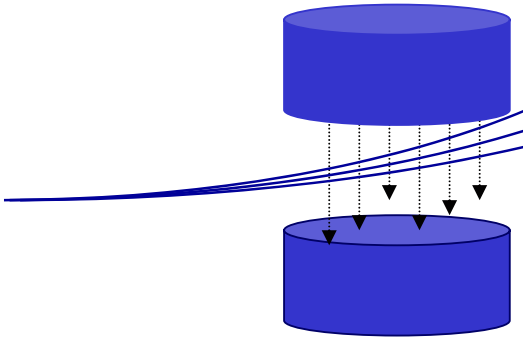




detector

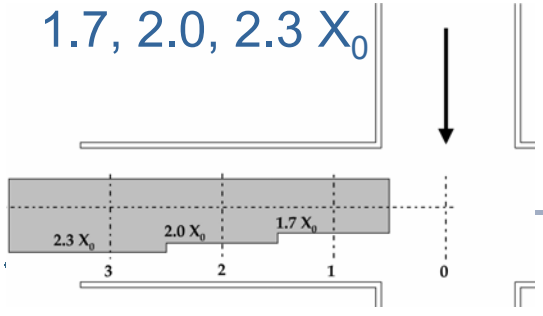
LINAC Beam 1-500 mA



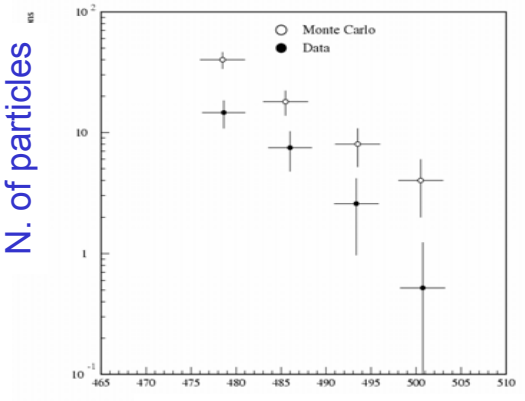


W slits

tunable Cu target:
1.7, 2.0, 2.3 X_0



45^0 magnet



BTF beam characteristic

- *Beam (e^- or e^+) intensity can be adjusted by means of the **energy dispersion** and **collimators**, down to **single particle** per pulses*

Number	*$1 \div 10^{10}$ particles/pulse (**10^3 s^{-1} allowed up to now**)*
Energy	*25÷750 MeV*
Repetition rate	*50 Hz [1 pulse to spectrometer]*
Pulse Duration	*1 or 10 ns*
p resolution	*1%*
Spot size	*$\sigma_{x,y} \approx 2$ mm (single particle)*

Multi-purpose facility:

- **H.E. detector calibration and setup**
- **Low energy calorimetry & resolution**
- **Low energy electromagnetic interaction studies**
- **High multiplicity efficiency**
- **Detectors aging and efficiency**
- **Beam diagnostics**

BTF Facility in numbers…

BTF experiments 2004/2005: AIRFLY, LCCal, AGILE-MINI-TRACKER, LNF-LHCb, CaPiRe, RAP, SIDDHARTA, FLAG, CRYSTAL, MEG, NANO, APACHE-LHCb, MCAL, LAZIO, BTeV, BTFLAB, BENCE, PASSRA, FISA, AIACE, ARGO, P326, GRAAL, AGILE payload.

BTF staff 1+1

LNF users 2001-2003

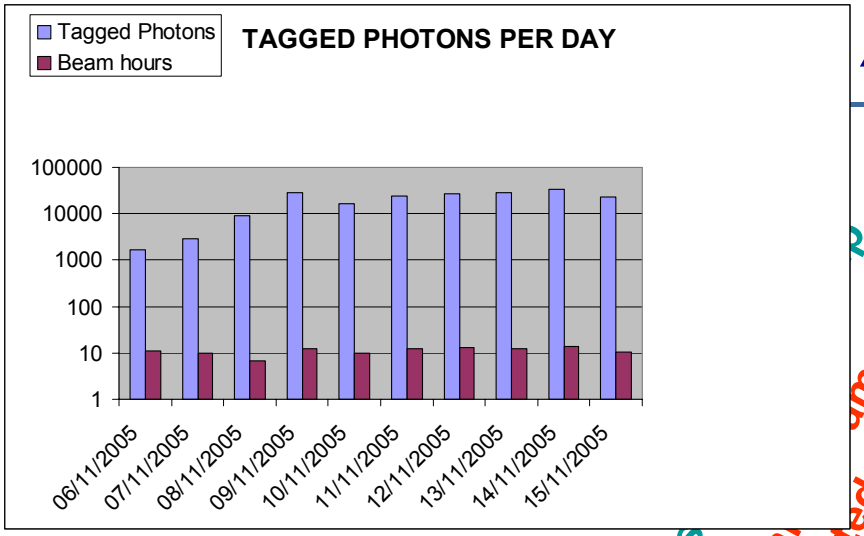
	Year	ITALIAN	Foreign
TOT/BTF	2001	145/0	41/0
TOT/BTF	2002	177/7	56/2
TOT/BTF	2003	275/50	93/40

BTF users 2004-2005

Allocated days/ available	Groups/users	Foreign/TARI	Papers (since 03)
582/570	24/139	83/71	> 44

Installation of the Photon Tagged Source since Sep 2005
neutron production is under study
Next upgrade: high intensity beam (10^3-10^{10} particle)
Installation of a pulsed dipole to improve the duty cycle from 40% to 80% (May 2006)

AGILE operation 2-21/11



2/11 agile delivery and ins

3-6 payload positioning a

4-11 first gamma detected in AGILE

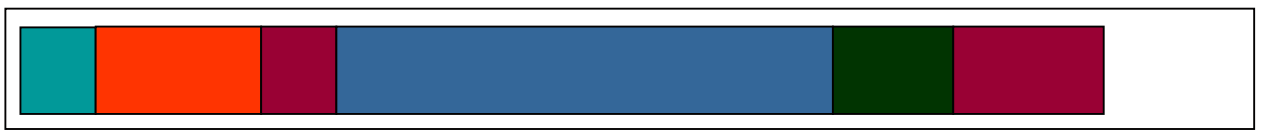
m tune up

7/11 photon production test at 650 MeV

8/-15 photon calibration @ 463 MeV

16-17 e+/e- background study at 93MeV

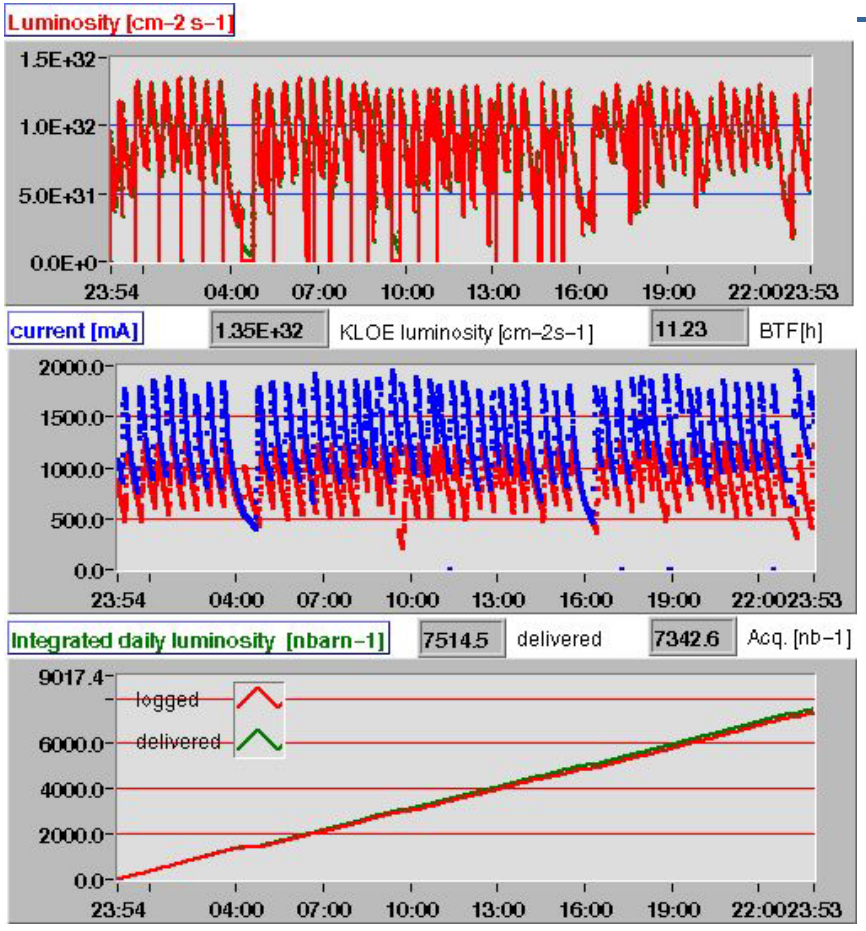
18-20 photon production test at 650 MeV



→ 2 Nov

→ de-installation

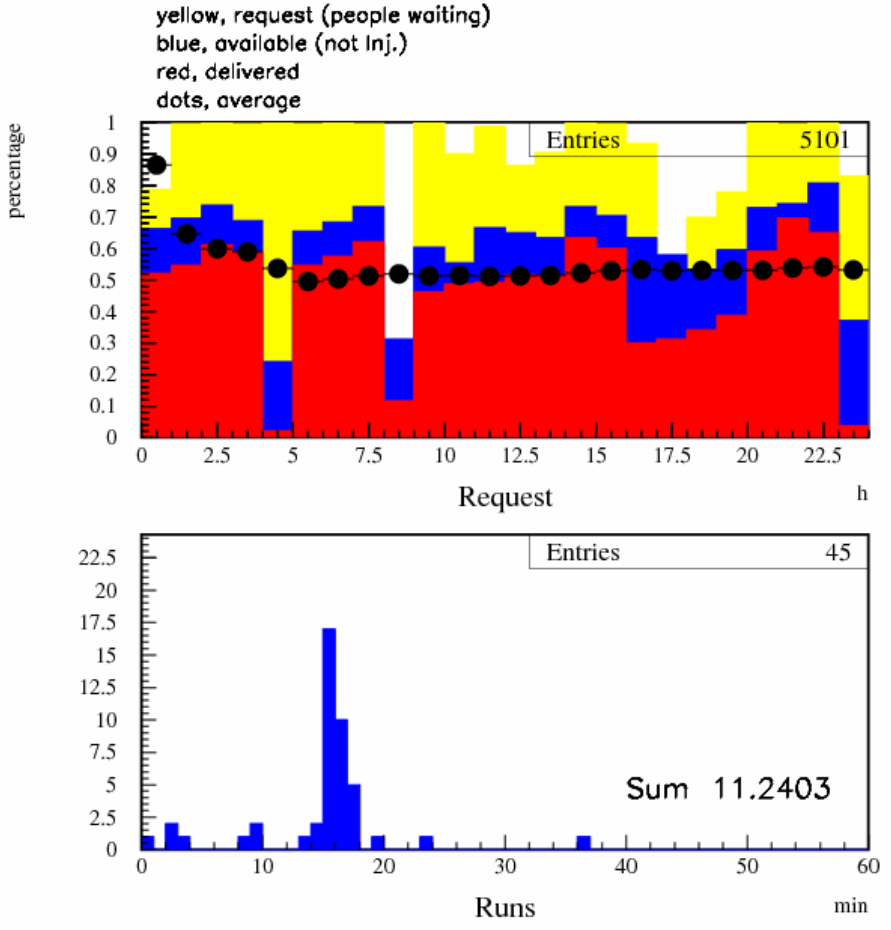
Operation with AGILE



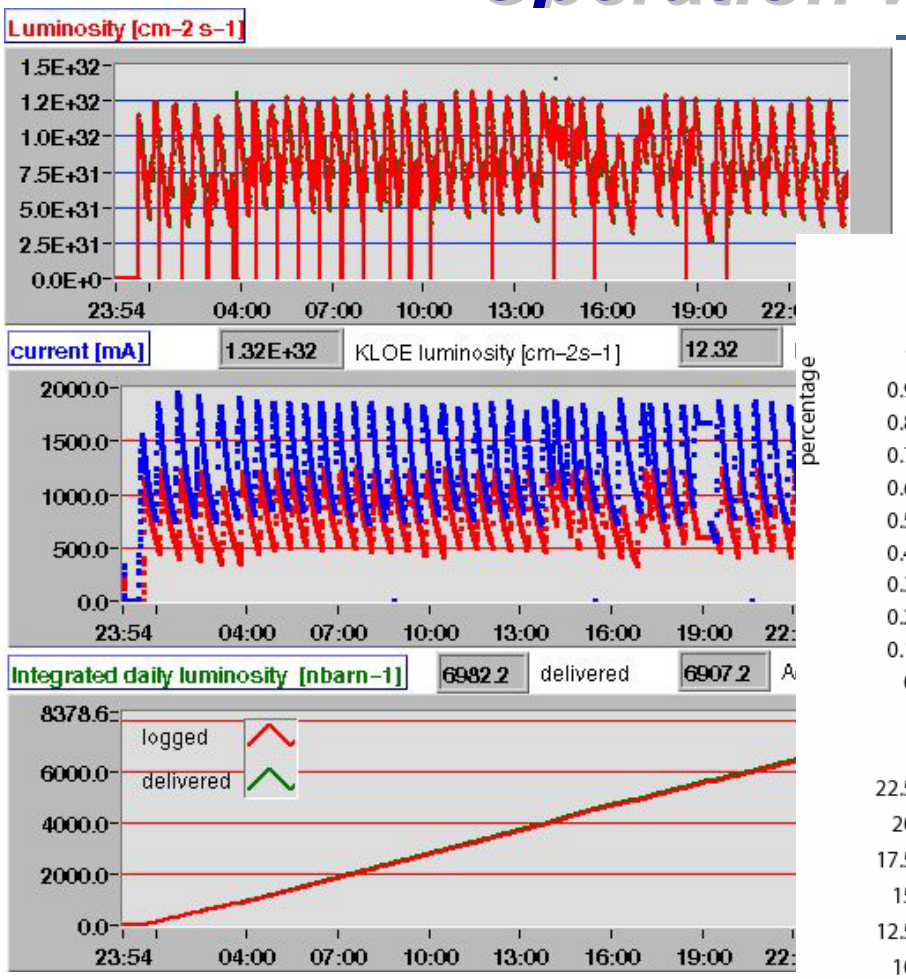
16 min average runs

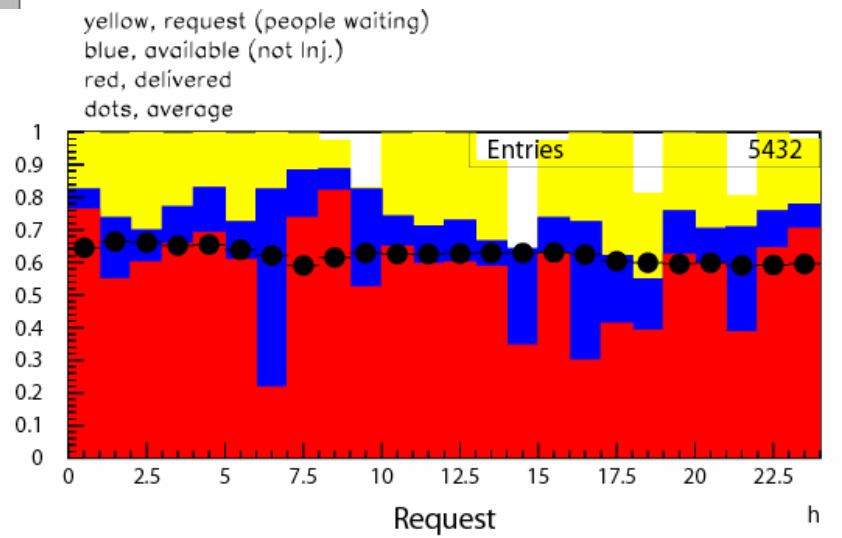
20% luminosity decrease

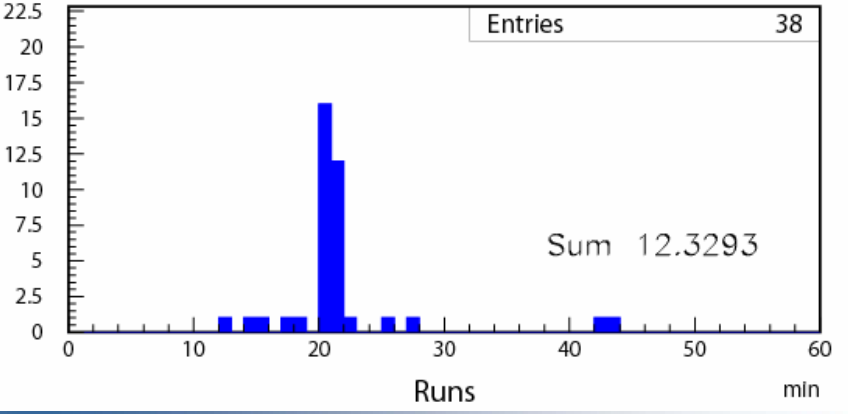
55% efficiency 46% delivery



Operation with AGILE optimization







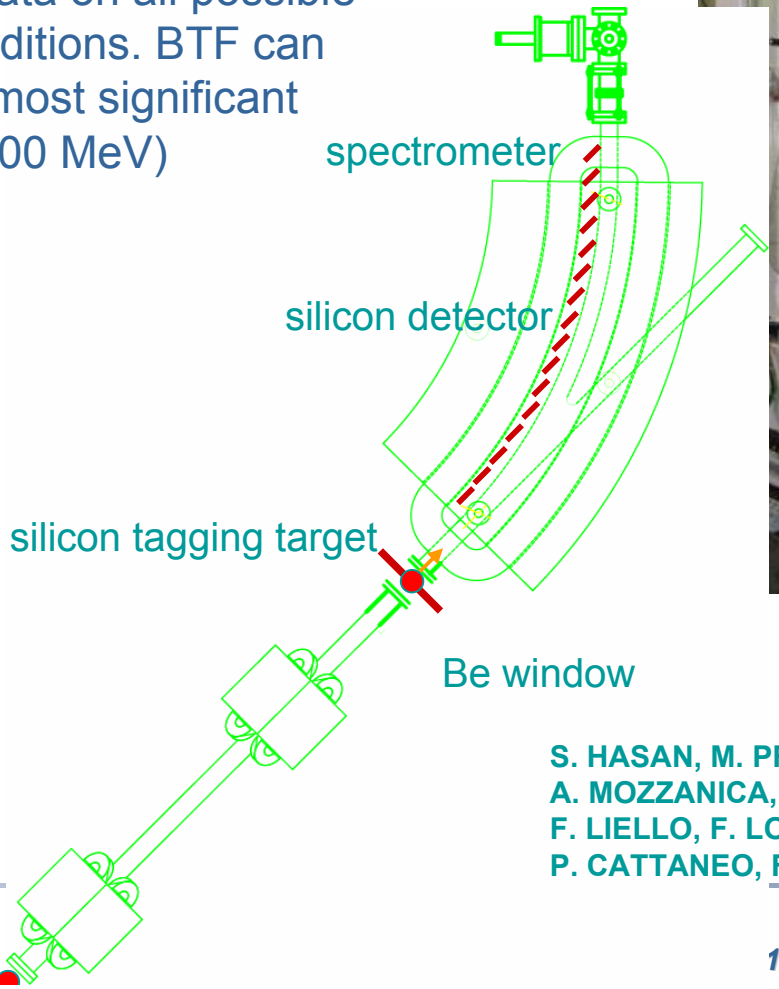
> 20 min average runs

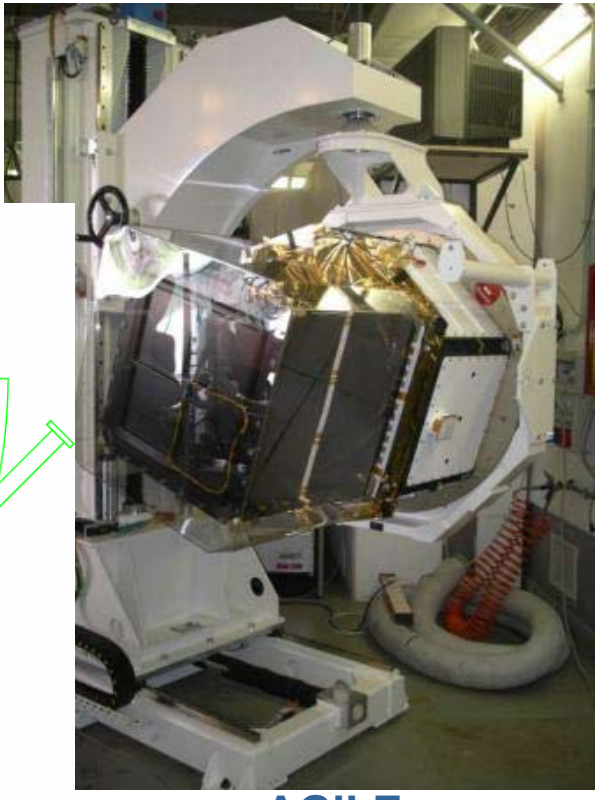
~ 30% luminosity decrease

~ 70% efficiency ~60% delivery

BTF photon tagged source
AGILE GRID photon calibration

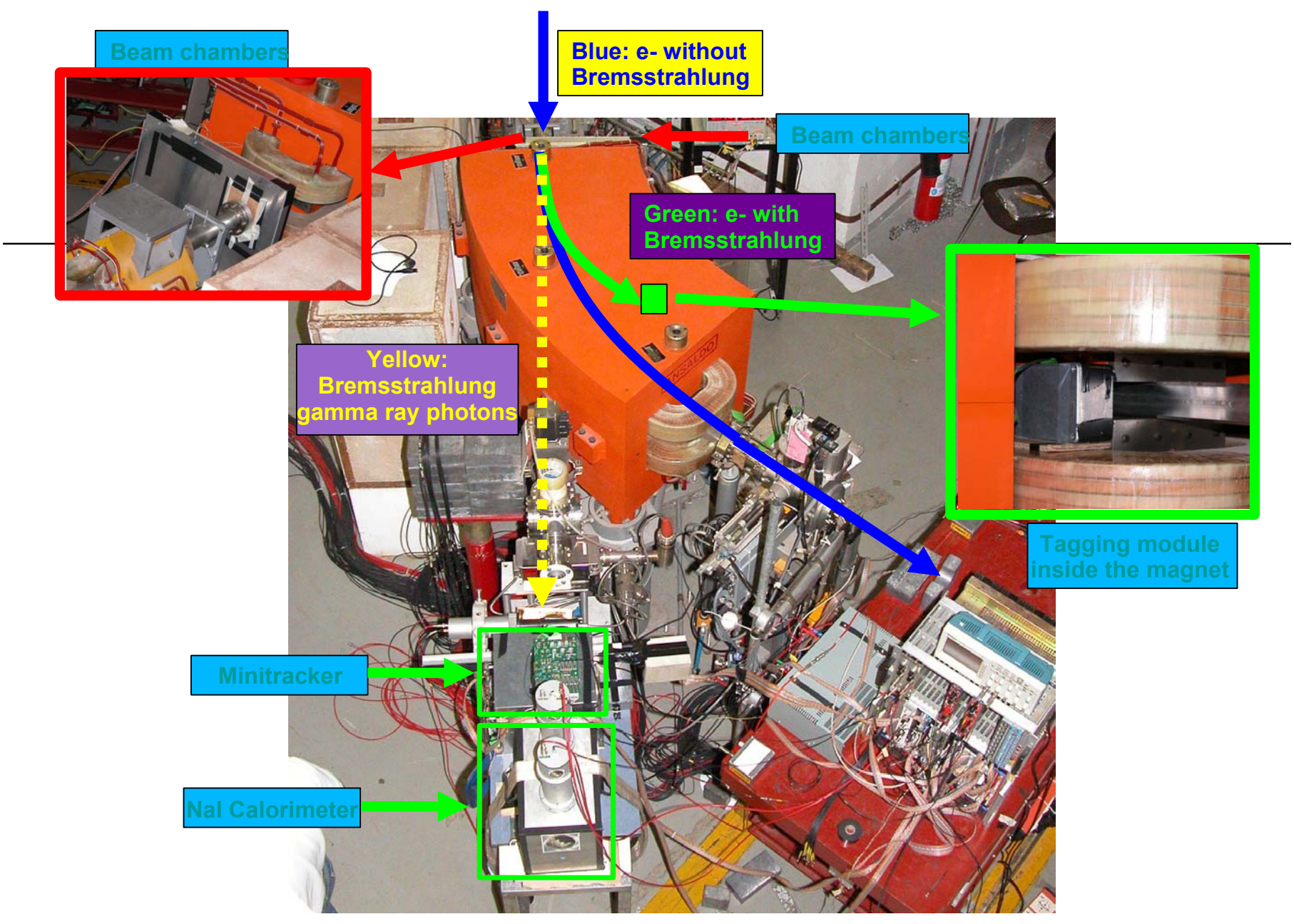
The AGILE Gamma Ray Imaging Detector calibration at BTF is aimed at obtaining detailed data on all possible geometries and conditions. BTF can provide data in the most significant energy region (20-700 MeV)

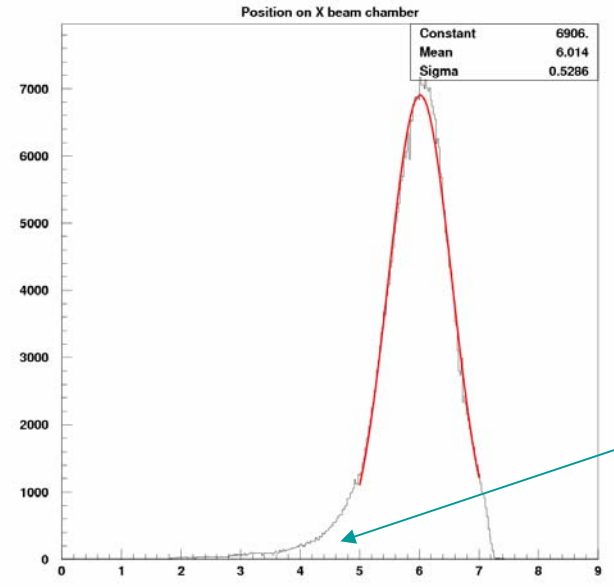


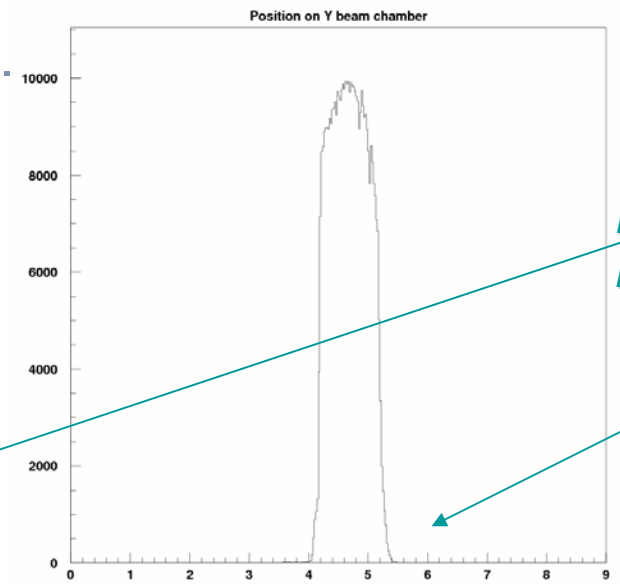


AGILE GRID

S. HASAN, M. PREST, L. FOGGETTA, C. PONTONI, A. MOZZANICA, G. BARBIELLINI, M. BASSET, F. LIELLO, F. LONGO, E. VALLAZZA, F. BOFFELLI, P. CATTANEO, F. MAURI and AGILE Collaboration

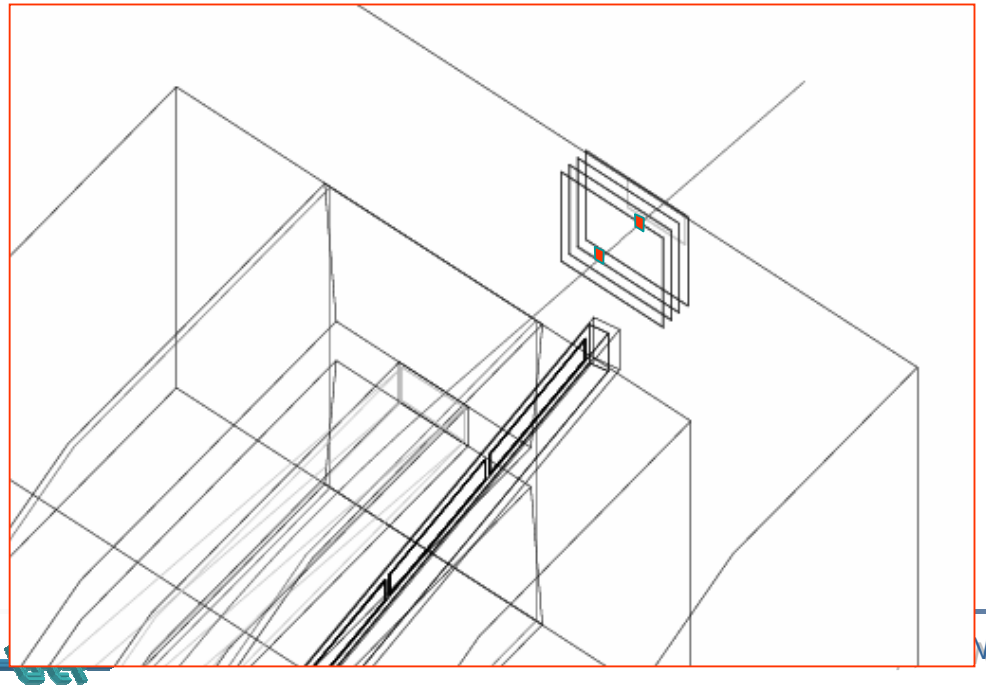

Beam chambers
Blue: e- without Bremsstrahlung
Beam chambers
Green: e- with Bremsstrahlung
Yellow: Bremsstrahlung gamma ray photons
Tagging module inside the magnet
Minitracker
Nal Calorimeter



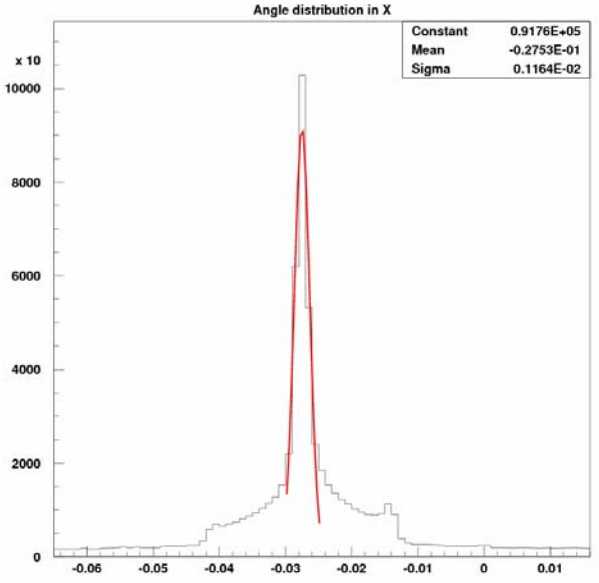


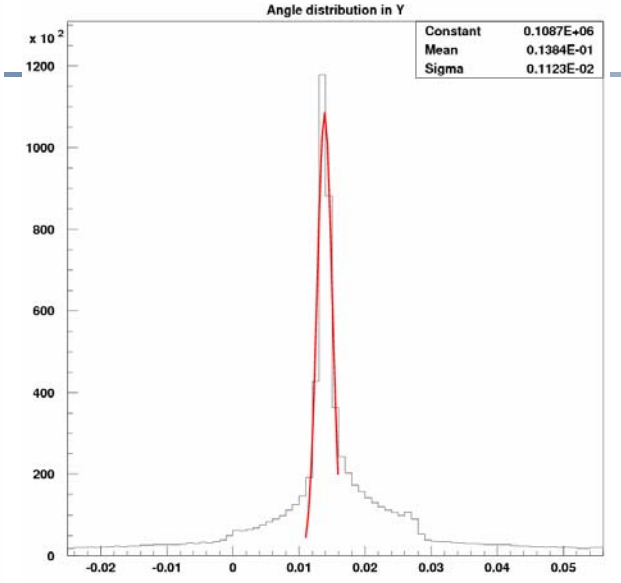
Dispersion introduced by bending magnets in x

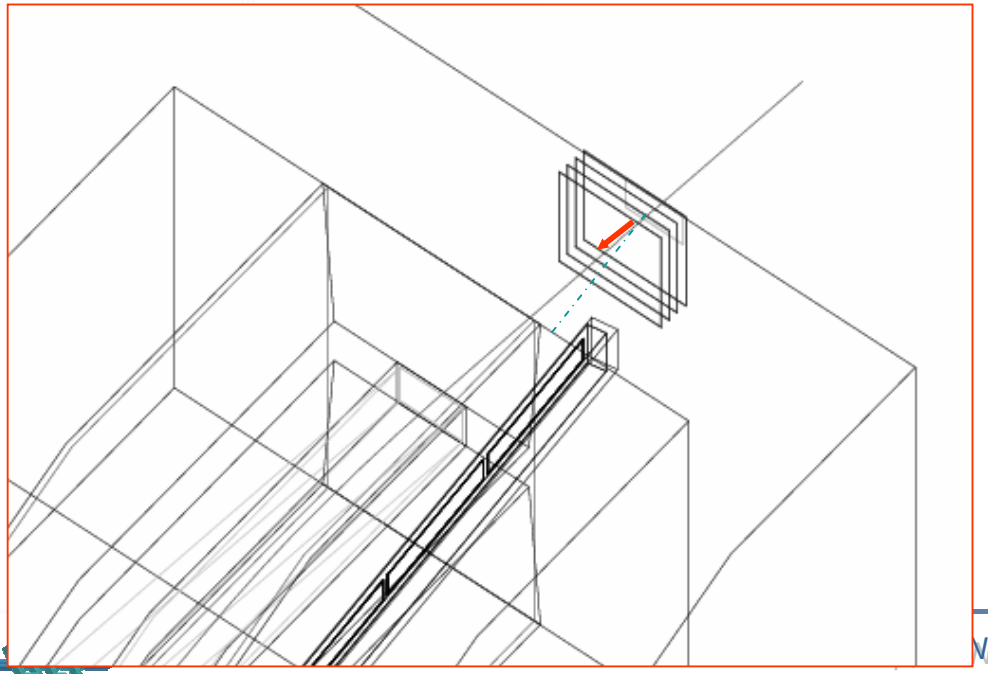
Collimator image in y



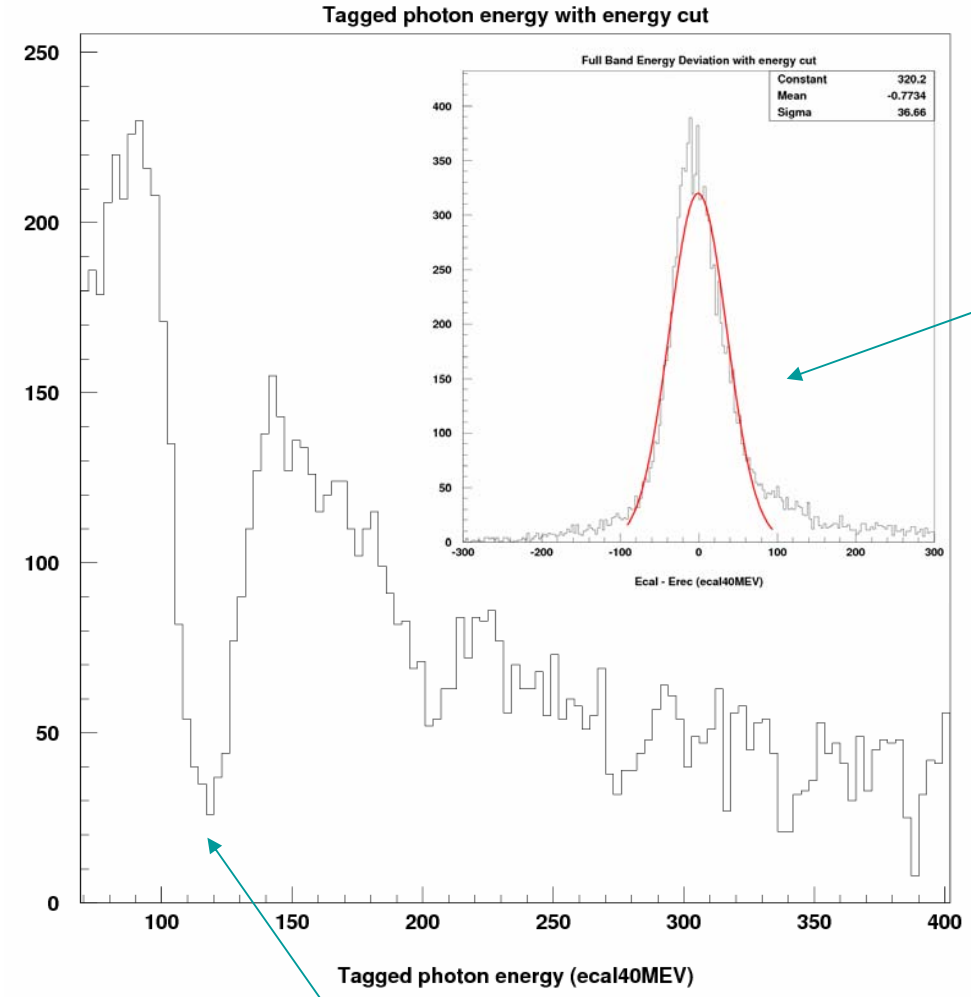
Beam size on Si m-strip chambers



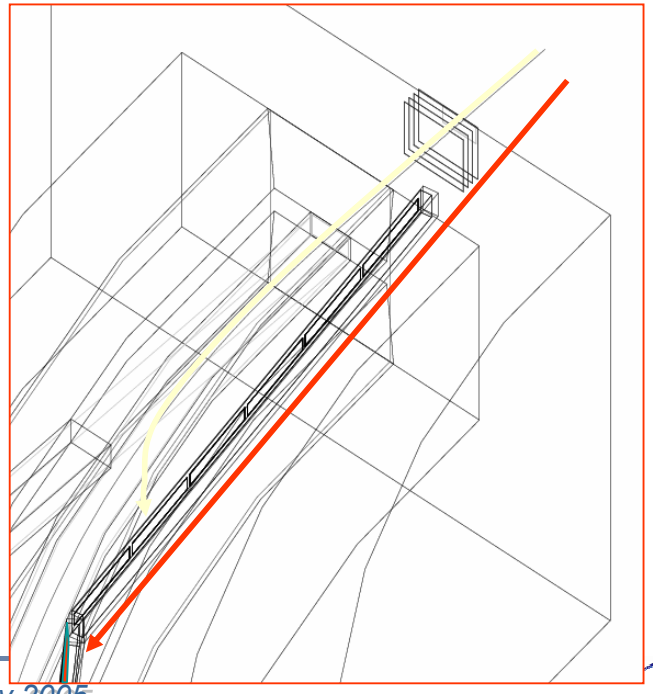




Beam divergence

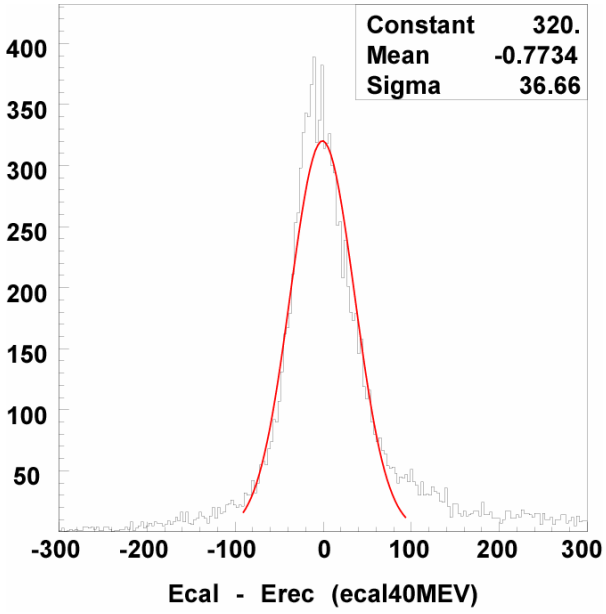


Resolution dominated by calorimeter

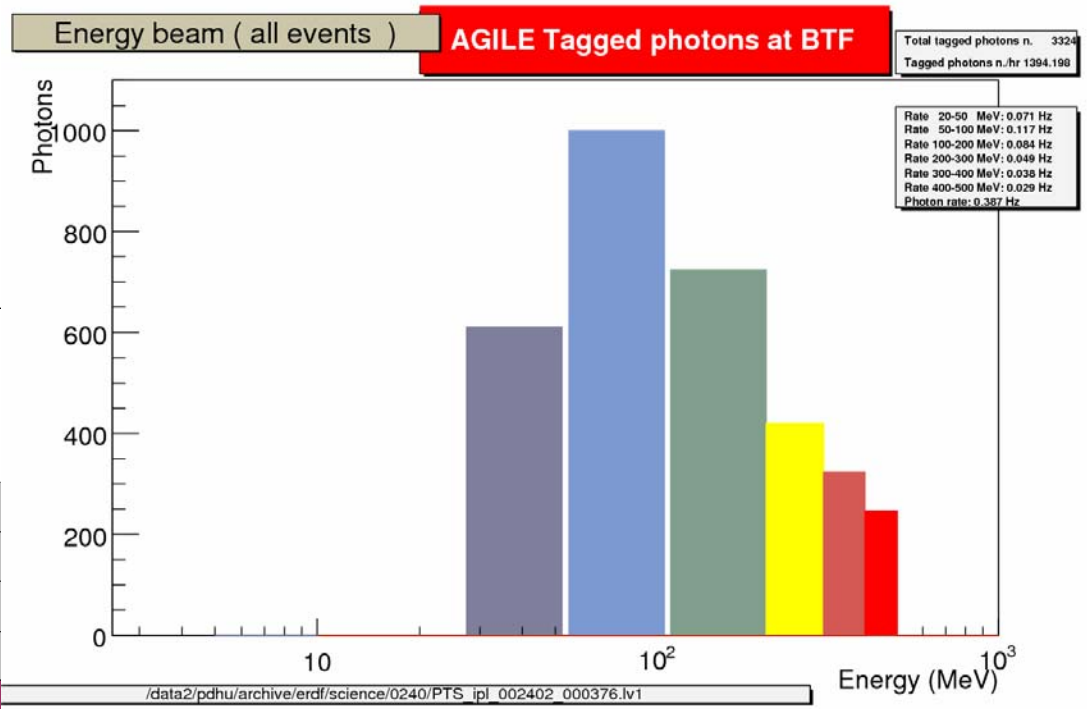


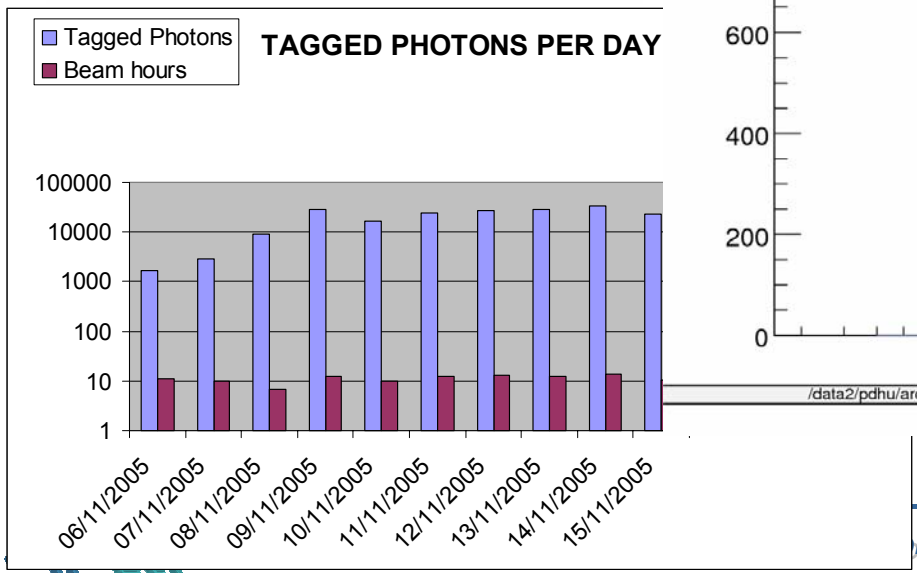
*Exclude modules 7&8 due to e⁻ **mistag***

Photo production at BTF

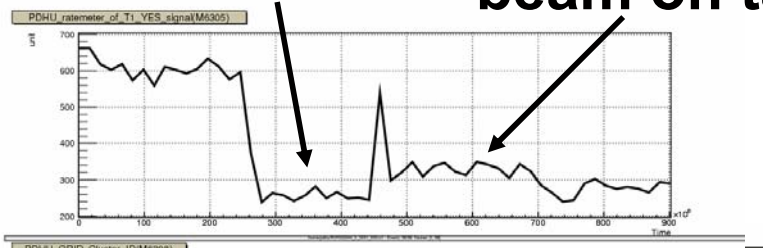


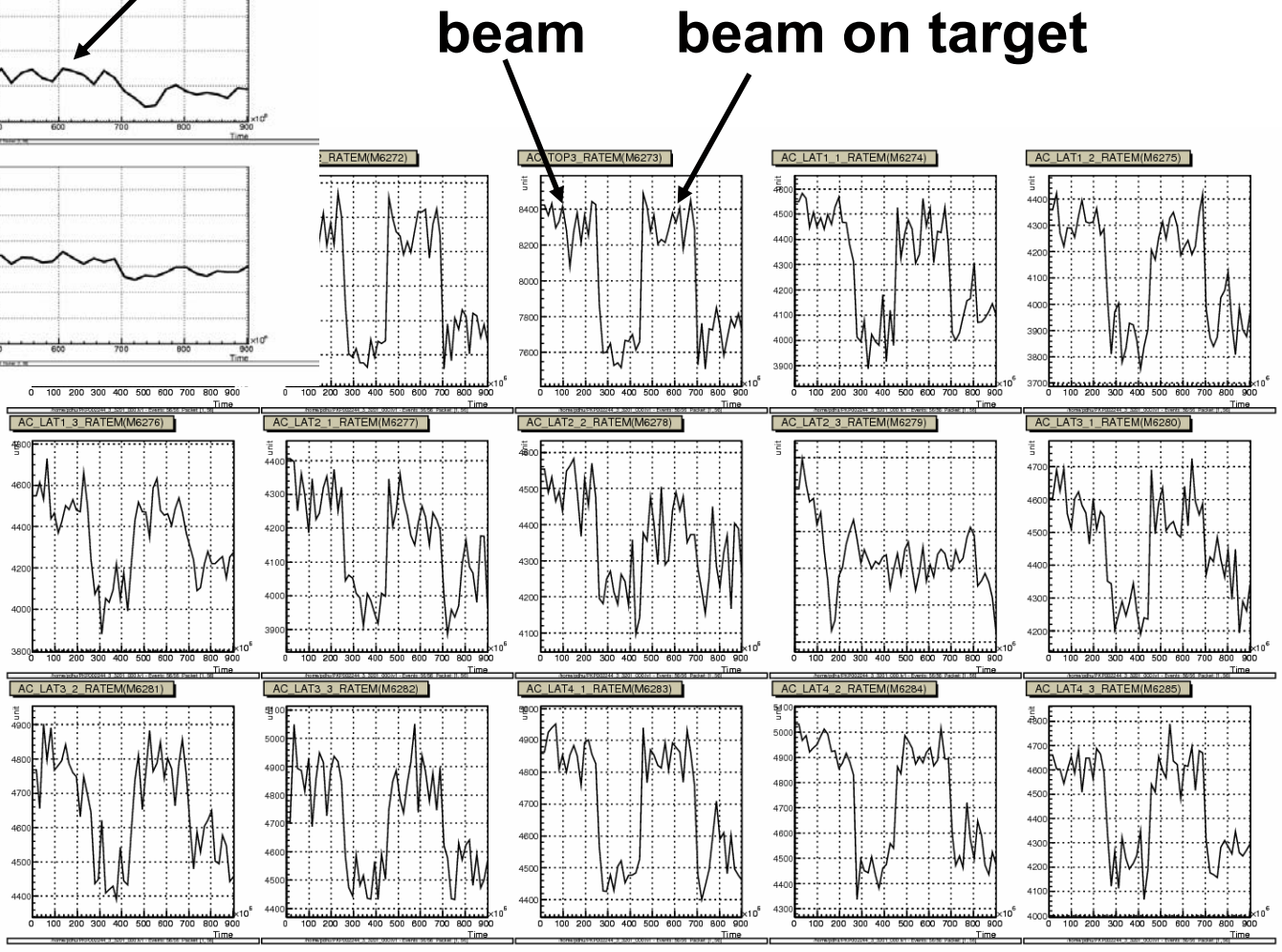
200.000 tagged photon
between 20 ~ 450 MeV
0.5Hz average rate production
(3-4 electron per spill)





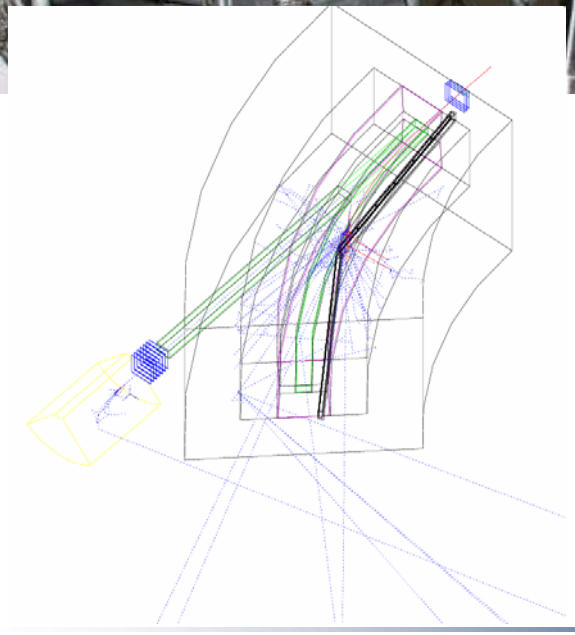
Background

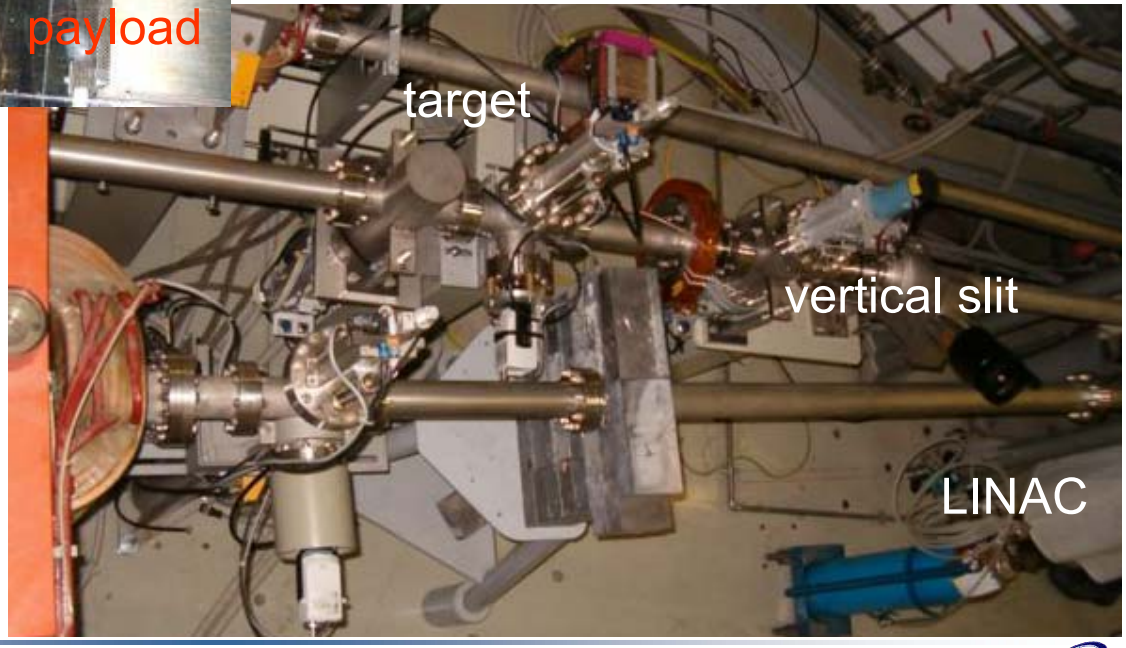

no beam
beam on target
PDHU_ratemeter_of_T1_YES_signal(M6305)
PDHU_GRID_Cluster_ID(M6308)
beam


beam
beam on target
AC_TOP3_RATEM(M6273)
AC_LAT1_1_RATEM(M6274)
AC_LAT1_2_RATEM(M6275)
AC_LAT1_3_RATEM(M6276)
AC_LAT2_1_RATEM(M6277)
AC_LAT2_2_RATEM(M6278)
AC_LAT2_3_RATEM(M6279)
AC_LAT3_1_RATEM(M6280)
AC_LAT3_2_RATEM(M6281)
AC_LAT3_3_RATEM(M6282)
AC_LAT4_1_RATEM(M6283)
AC_LAT4_2_RATEM(M6284)
AC_LAT4_3_RATEM(M6285)

Background

tagged photons ~ 0.5Hz
cosmic ~ 19 Hz
target background ~ 3 Hz
trigger rate ~ 38 Hz





Conclusion

- **AGILE team is successfully running the gamma ray calibration and the program core is completed with good preliminary results (~ 200.000 tagged gamma rays)**
- **The scientific collaboration between the BTF/DAFNE staff and the AGILE team worked very well, with simultaneous optimal operations of both KLOE and AGILE**
- **The photon tagging system at BTF is now available for scientific use by the community**

We warmly thank DAFNE operators and scientific staff, the KLOE group for the strong collaboration, the LNF management and DAFNE machine and Laboratory directors

More information…

*Access to the facility should be asked to the **BTF Users Committee**:*

P. Gianotti, G. Mazzitelli (responsible), S. Miscetti, M. Preger (chairperson), P. Valente

P. Possanza, secretariat

Technical documentation, photographs and more on the Web site:
http://www.lnf.infn.it/acceleratori/btf/

*The BTF was widely used as a TARI facility in the **EU** 5th Framework Program*

*…and will be involved in the **EU** 6th Framework Program*

Sixth Framework Programme