Status of KLOE-2

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on behalf of the KLOE-2 collaboration

LNF Scientific Committee meeting
Frascati, May 6th 2021

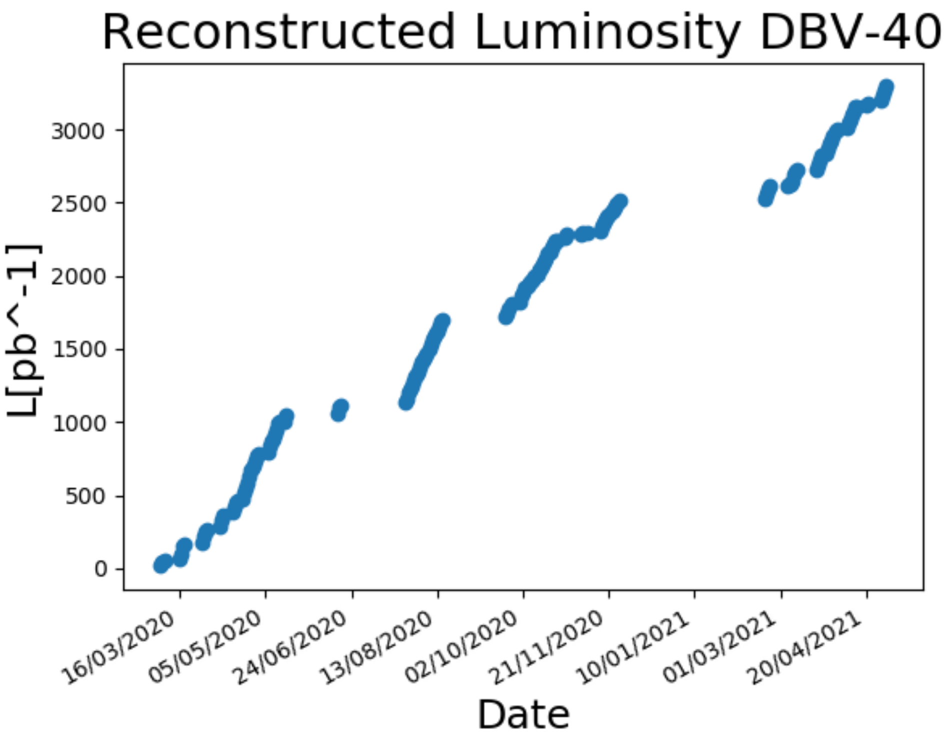
Publications/Ongoing Analysis

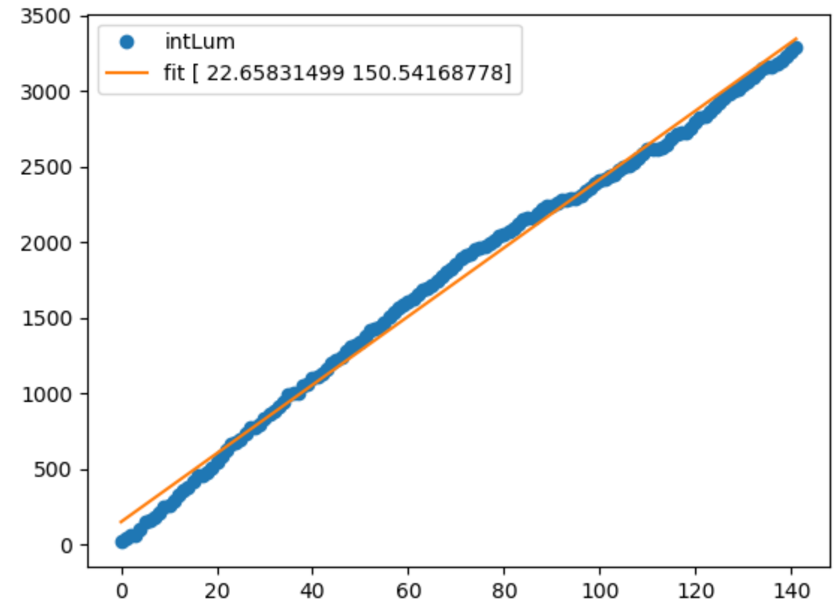
Last Publications	
Measurement of the branching fraction for the decay $K_S \to \pi\mu\nu$ with the KLOE detector	Physics Letters B 804 (2020)
Upper limit on the $\eta \to \pi^+\pi^-$ branching fraction with the KLOE experiment	JHEP 10 (2020) 047

Ongoing analyses	
T/CPT tests with $\phi \to K_S K_L \to 3\pi^0\ \pi e\nu,\ \pi\pi\ \pi e\nu$	KLOE data
$K_S \to \pi^+\pi^-\pi^0$	KLOE data
$K_S \to \pi e\nu$	KLOE data
Search for decoherence and CPTV in $K_S K_L \to \pi^+\pi^-\ \pi^+\pi^-$	**KLOE data**
$K_S \to 3\pi^0$ (CP viol.)	**KLOE-2 data**
$\gamma\gamma \to \pi^0$	**KLOE-2 data**
$e^+e^- \to \omega\ \gamma_{ISR}$	**KLOE data – PhD Thesis**
$\eta \to \pi^0\gamma\gamma$ - χPT golden mode	KLOE / KLOE-2 data
B-boson search in $\phi \to \eta\pi^0\gamma,\ \eta\to\gamma\gamma$	**KLOE/KLOE-2 data**
$e^+e^- \to (\gamma)\eta\pi^+\pi^-/\mu^+\mu^-$	KLOE data

Status of data reconstruction

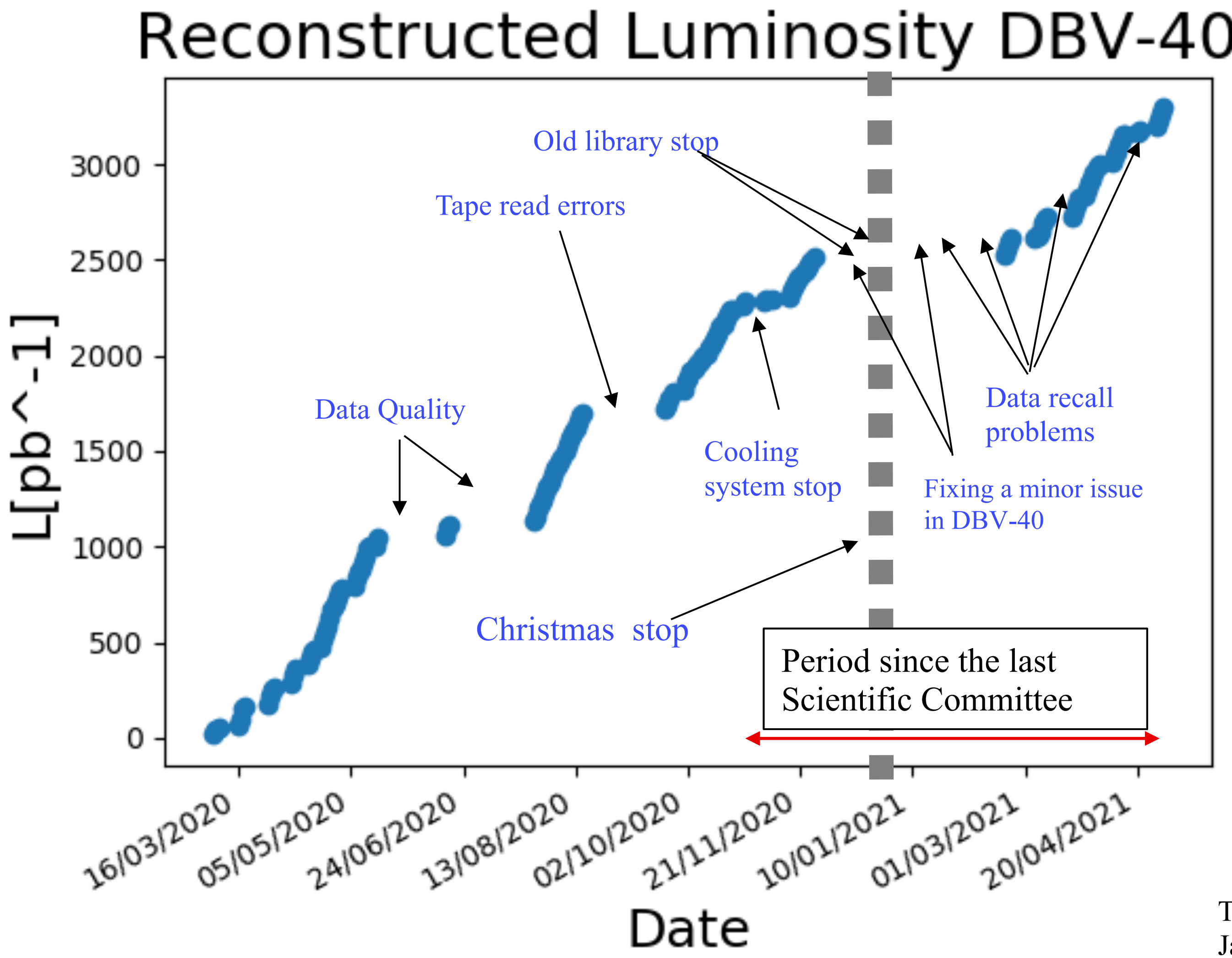
Second round (final) of data reconstruction





- **L_{int} = 3.3 fb^{-1}** reconstructed with the DBV-40
- Average (peak) reconstruction rate ~23(30) pb^{-1}/day (without considering dead time)
- ROOT output production already tested, integration in the DB2 ongoing

Status of Data Reconstruction



Recent issues:

Several hardware failures spread around KLOE Computing Center (CED) since last August/September caused several delays and difficulties to recover normal operations:

- new tape library: read/write errors
- server motherboard broken
- new disk array: cache memory burnt
- power unit broken
- old library: failure of both robotic arms

Difficult to immediately recognize these failures as clues of a common cause:

UPS malfunction not filtering voltage spikes

The UPS unit is being replaced with a new one.

We thank the LNF staff for all the support received

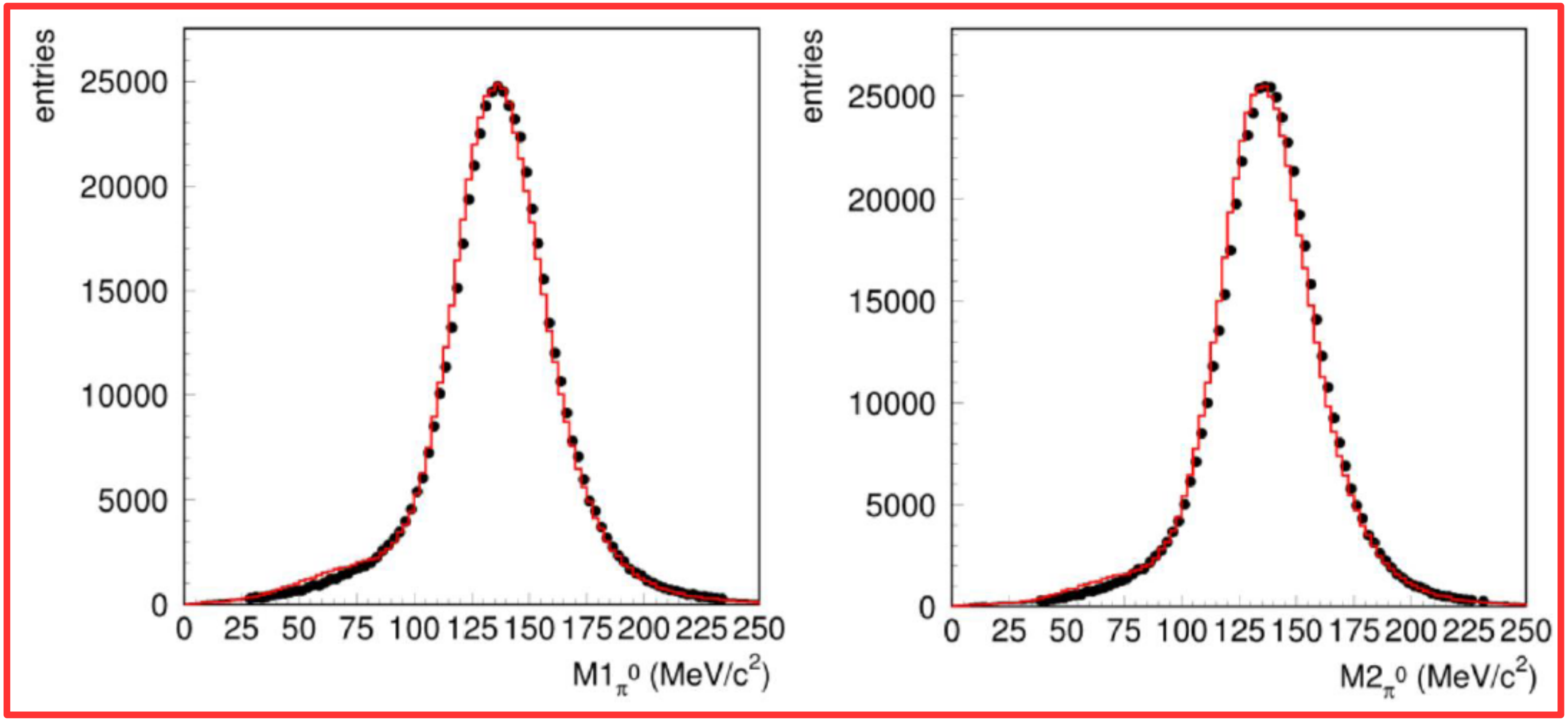
The remaining stops in December and first half of January are mainly due to fixing a minor issue in DBV-40 affecting the filtering of the downscaled minimum bias sample.
No impact on already reconstructed data.

MC status

Simulation	DBV Version	MC Version	LSF	Luminosity (pb^{-1})
$\varphi \to all$	38	201	1.00	3703
$K_S \to 3\pi^0$	38	201	1.*10⁶	2032
$e^+e^- \to e^+e^-$	38	201	0.01	353
$e^+e^- \to \gamma\gamma$	38	201	1.00	23
$\varphi \to all$	39	210	1.00	110
$e^+e^- \to e^+e^-$	39	210	0.01	85
$\varphi \to K_S K_L$	39	210	1.00	28
$e^+e^- \to e^+e^-$	39	210	1.00	25
$K_S \to \pi^+\pi^-\pi^0$	26	174	1.*10⁴	1702

- Massive MC production available with DBV-38
- Reconstruction rate ~15 pb-1/day (performed in parallel, but by allocating most of the computing power to the data reconstruction)
- Sample produced with DBV-39 to study the final refinements to insert in the DBV-40 → large scale production with MC DBV-40 will start soon
- Simultaneous MC production of signal for specific ongoing KLOE analysis

MC simulation for KLOE-2 data used in analysis ($K_S \to 3\pi^0$)



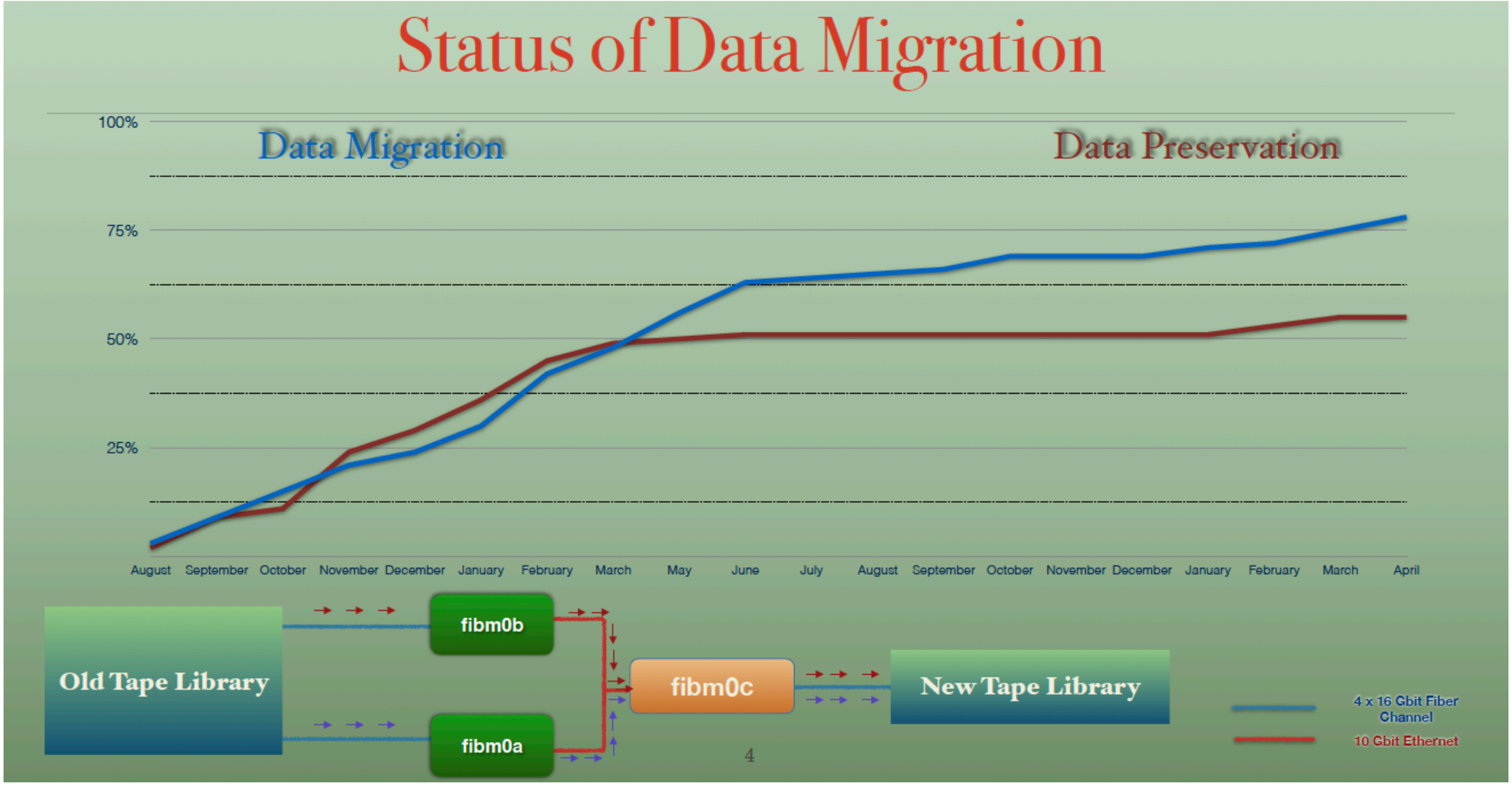
NICE AGREEMENT BETWEEN DATA AND MC

Data consolidation and recovery strategy plan

Data Migration

Data Preservation

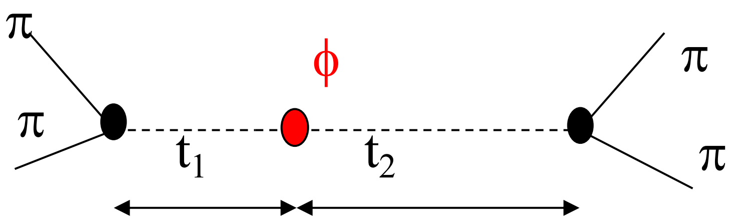
Data consolidation and recovery strategy plan



The data migration will be the last architectural change, then KLOE CED will reach the project design and the best efficiency condition ever for our computing

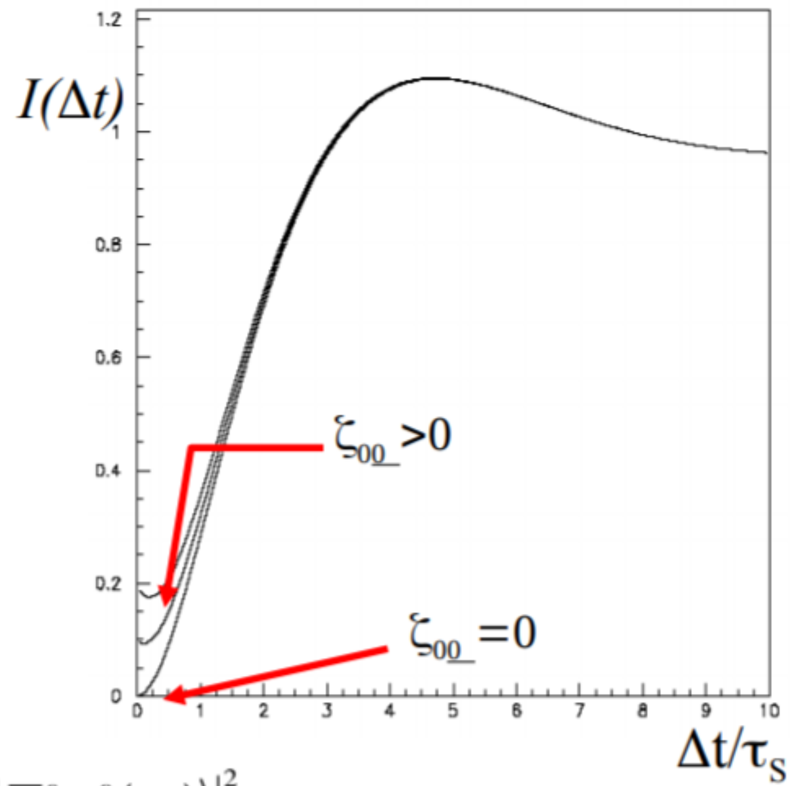
Search for decoherence and CPTV in $\phi \to K_S K_L \to \pi^+\pi^-\pi^+\pi^-$

$$|i\rangle = \frac{1}{\sqrt{2}}\left[|K^0\rangle|\overline{K}^0\rangle - |\overline{K}^0\rangle|K^0\rangle\right]$$



$\Delta t = |t_1 - t_2|$

Most precise test of quantum coherence in an entangled system.



$$I(\pi^+\pi^-,\pi^+\pi^-;\Delta t) = \frac{N}{2}\Big[\left|\langle\pi^+\pi^-,\pi^+\pi^-|K^0\overline{K}^0(\Delta t)\rangle\right|^2 + \left|\langle\pi^+\pi^-,\pi^+\pi^-|\overline{K}^0K^0(\Delta t)\rangle\right|^2$$
$$-(1-\zeta_{0\bar{0}})\cdot 2\Re\left(\langle\pi^+\pi^-,\pi^+\pi^-|K^0\overline{K}^0(\Delta t)\rangle\langle\pi^+\pi^-,\pi^+\pi^-|\overline{K}^0K^0(\Delta t)\rangle^*\right)\Big]$$

ζ_{00} decoherence parameter in the $K^0\overline{K}^0$ basis (QM predicts: $\zeta_{00} = 0$)
[or ζ_{SL} in the $K_S K_L$ basis].

Search for decoherence and CPTV in $\phi \to K_S K_L \to \pi^+\pi^-\pi^+\pi^-$

Decoherence effects might arise in a quantum gravity picture necessarily entailing CPT violation [Ellis et. al, NP B241 (1984) 381; Ellis, Mavromatos et al. PRD53 (1996)3846]:

- In this case the relevant parameter in the modified time evolution of neutral kaons is the γ parameter (at most $\gamma = O(m_K^2 / M_{planck}) \approx 2x10^{-20}$ GeV).
- the initial entangled state is modified adding a tiny symmetric part $\rightarrow$ ω effect (at most $\omega = O(m_K^2 / M_{planck}/\Delta\Gamma) \sim 1x10^{-3}$)

$$|i\rangle \propto \frac{1}{\sqrt{2}} [|K^0\rangle|\bar{K}^0\rangle - |\bar{K}^0\rangle|K^0\rangle] + \omega [|K^0\rangle|\bar{K}^0\rangle + |\bar{K}^0\rangle|K^0\rangle]$$ → [in the $K^0\bar{K}^0$ basis]

[in the $K_S K_L$ basis] ← $$|i\rangle \propto [\, |K_S\rangle|K_L\rangle - |K_L\rangle|K_S\rangle] + \omega[\, |K_S\rangle|K_S\rangle - |K_L\rangle|K_L\rangle\,]$$

Previous KLOE measurement $L = 380\ pb^{-1}$ →
KLOE PLB 642 (2006) 315

$\zeta_{SL} = (1.8 \pm 4.0 \pm 0.7) \cdot 10^{-2}$

$\zeta_{00} = (1.0 \pm 2.1 \pm 0.4) \cdot 10^{-6}$

$\gamma = (1.3^{+2.8}_{-1.4} \pm 0.4) \cdot 10^{-21}\ GeV$

$\Re(\omega) = (1.1^{+8.7}_{-5.3} \pm 0.9) \cdot 10^{-4}$

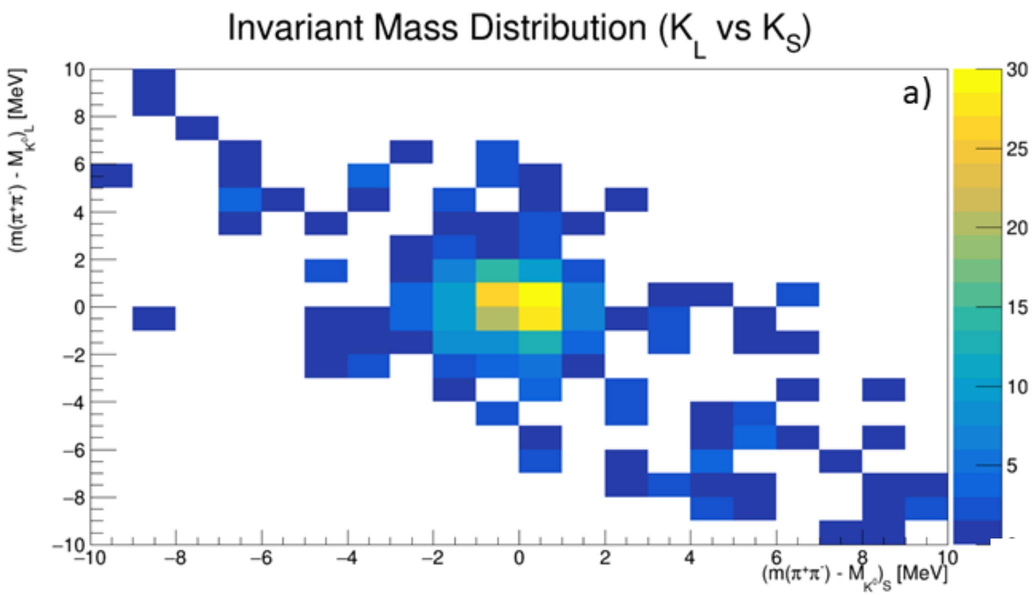
$\Im(\omega) = (3.4^{+4.8}_{-5.0} \pm 0.6) \cdot 10^{-4}$

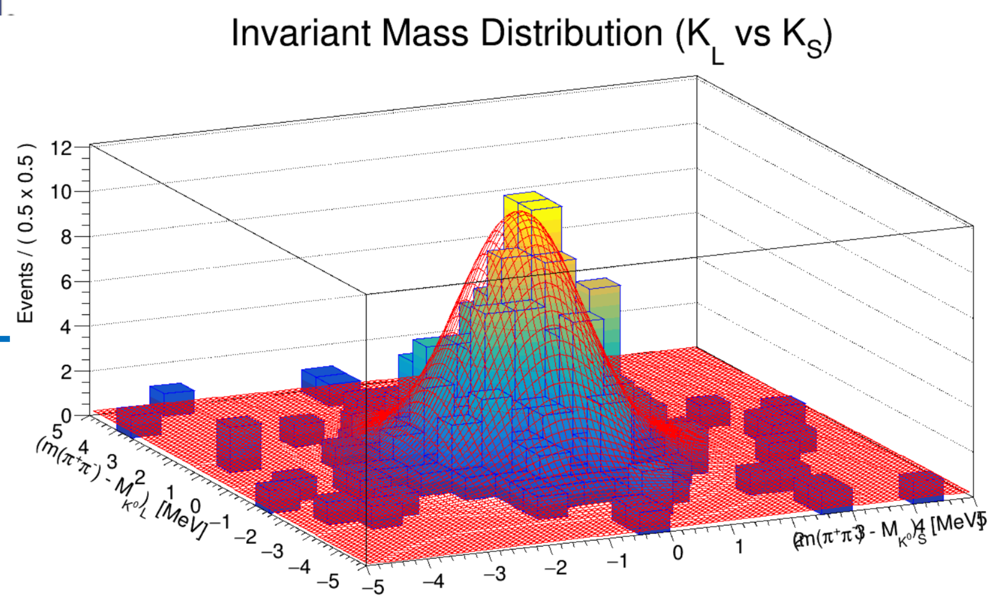
Search for decoherence and CPTV in $\phi \to K_S K_L \to \pi^+\pi^-\pi^+\pi^-$

KLOE data: $L = 1.7\ fb^{-1}$

Improvements wrt past analysis:

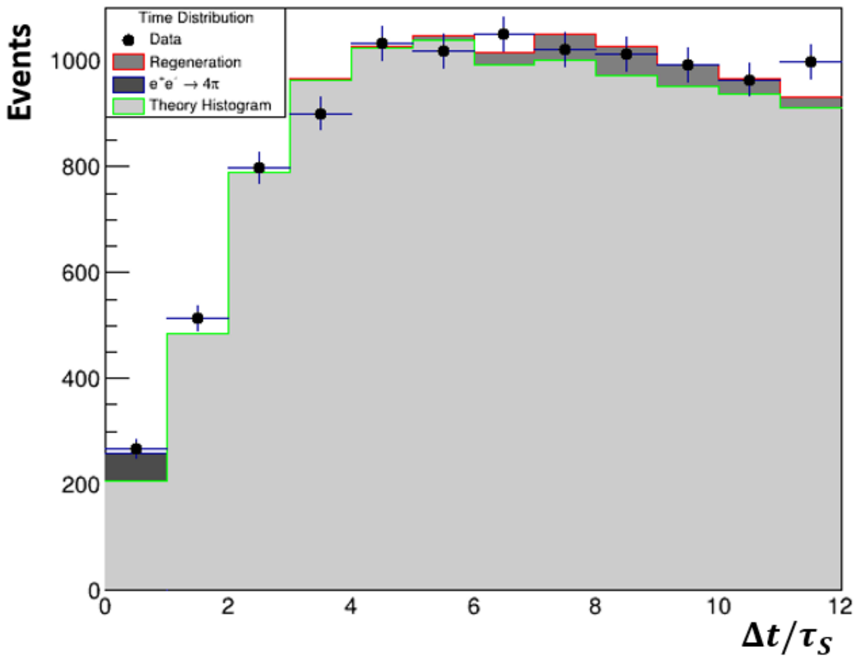
- $\cos(\theta_{\pi^+\pi^-}) > -0.975$ cut to improve Δt resolution
- improved $e^+e^- \to \pi^+\pi^-\pi^+\pi^-$ background evaluation from 2D fit





$$N_{bkg} = 53 \pm 10_{stat} \pm 4_{sys}$$

Fit with ζ_{SL} model



Results on decoherence parameters

Preliminary: under final scrutiny of the Collaboration

$\zeta_{SL} = (-0.76 \pm 1.71_{stat} \pm 0.81_{syst}) \cdot 10^{-2}$

$\zeta_{00} = (-0.52 \pm 0.88_{stat} \pm 0.42_{syst}) \cdot 10^{-6}$

$\gamma = (-0.35 \pm 1.00_{stat} \pm 0.47_{syst}) \cdot 10^{-21}\mathrm{GeV}$

$Re\omega = (-1.3^{+2.4}_{-1.8}{}_{stat} \pm 0.8_{syst}) \cdot 10^{-4}$

$Im\omega = (-2.6^{+2.9}_{-2.7}{}_{stat} \pm 1.0_{syst}) \cdot 10^{-4}$

$|\omega| = (2.9 \pm 3.2_{stat} \pm 1.2_{sys}) \cdot 10^{-4}$

Upper limits

$\zeta_{SL} < 0.024$ (90% CL)

$\zeta_{00} < 1.1 \cdot 10^{-6}$ (90% CL)

$\gamma < 1.5 \cdot 10^{-21}$ (90% CL)

$|\omega| < 8.3 \cdot 10^{-4}$ (90% C.L.)

$BR(\phi \to K_S K_S) < 1.4 \cdot 10^{-7}$ (90% C.L)

Fit including Δt resolution and efficiency effects + regeneration;

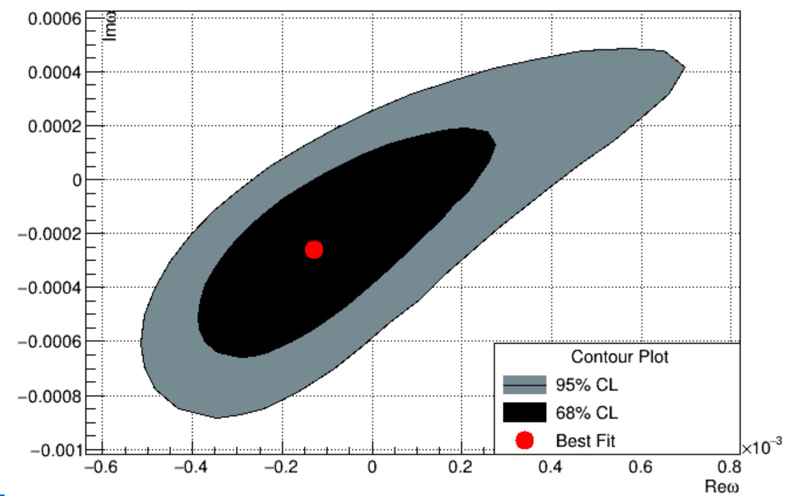
Statistical uncertainty reduced by half

Central values consistent with zero

Systematic table, preliminary

-	$\delta\zeta_{SL} \cdot 10^2$	$\delta\zeta_{00} \cdot 10^7$	$\delta\gamma \cdot 10^{21}GeV$	$\delta Re\omega \cdot 10^4$	$\delta Im\omega \cdot 10^4$	$\delta\lvert\omega\rvert \cdot 10^4$
Cut stability	±0.70	±3.6	±0.41	±0.66	±0.64	±0.81
4π Background	±0.32	±1.7	±0.18	±0.30	±0.19	±0.30
Regeneration	±0.18	±1.0	±0.10	±0.18	±0.75	±0.76
Resolution	±0.17	±0.9	±0.10	±0.15	±0.08	±0.14
Phys. Const.	±0.04	±0.2	±0.02	±0.02	±0.07	±0.08
Total	±0.81	±4.2	±0.47	±0.76	±1.01	±1.16

ω model contour plot



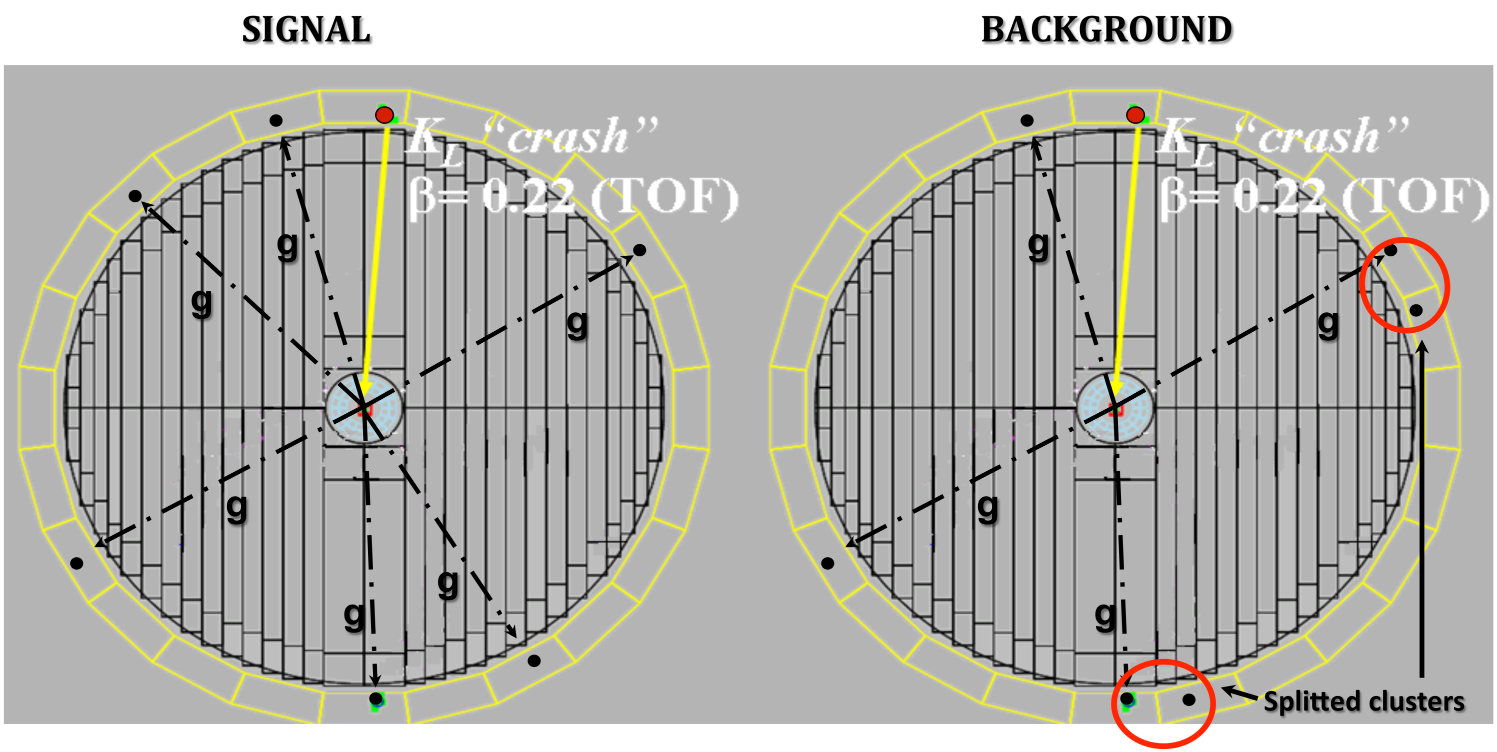
Search for the CP violating $K_S \to \pi^0\pi^0\pi^0$ decay

$3\pi^0$ is a pure CP=-1 state; observation of $K_S \to 3\pi^0$ is an unambiguous sign of CP violation in mixing and/or in decay.

Standard Model prediction: $BR(K_S \to 3\pi^0) = 1.9 \cdot 10^{-9}$ PLB 723 (2013) 54

Best upper limit by KLOE with 1.7 fb^{-1}

$BR(K_S \to 3\pi^0) < 2.6 \times 10^{-8}$ @ 90% CL



$K_S \to 3\pi^0 \to 6\gamma$

$K_S \to 2\pi^0$ + accidental/splitted clusters
$K_L \to 3\pi^0$, $K_S \to \pi^+\pi^-$ („fake K_L-crash")

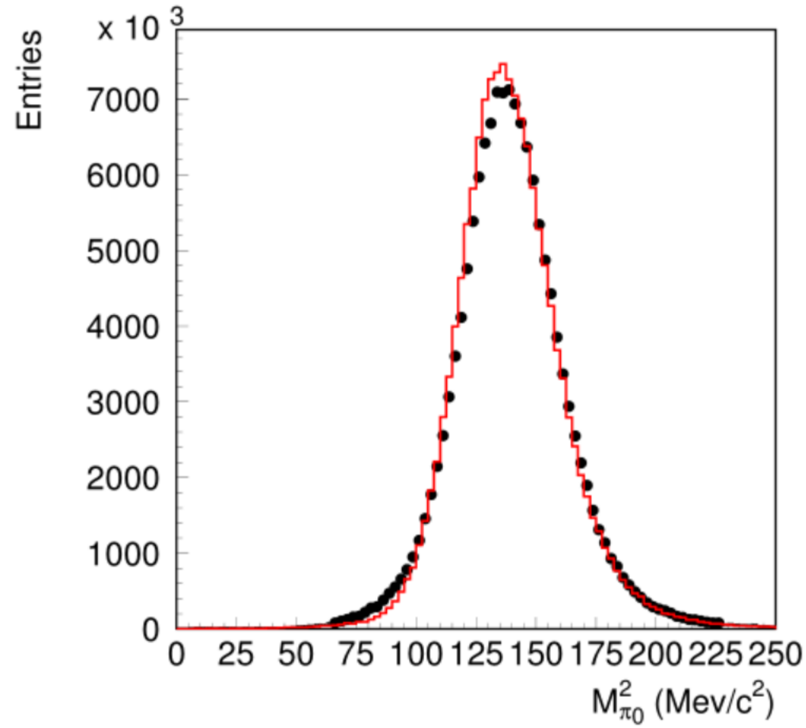
Search for the CP violating $K_S \to \pi^0\pi^0\pi^0$ decay

- **Analysed data:**
  - **In total ~4 fb^{-1}, DBV38**

- **MC simulations:**
  - $K_S \to 3\pi^0$ signal: ~1.7 fb^{-1}, DBV38, LSF = 10^6
  - **All Backgrounds: in total ~4 fb^{-1}, DBV38, LSF=1**
- Preselection with the following requirements:

  - K_L-crash: E>150 MeV, $0.2 < \beta < 0.225$
  - prompt photons: $E_{cl} > 20$ MeV; $|\cos\theta_{cl}| \leq 0.915$

    and $|\Delta T_{cl}| \leq \mathrm{Min}(3.0 \cdot \sigma_T(E_{cl}), 2\ \mathrm{ns})$
- $K_S \to 2\pi^0$ (4 prompt photons) used for normalization
- Main background source: $K_S \to 2\pi^0$ with two additional clusters (shower splitting/accidentals)
- New discriminant variables to reject machine background



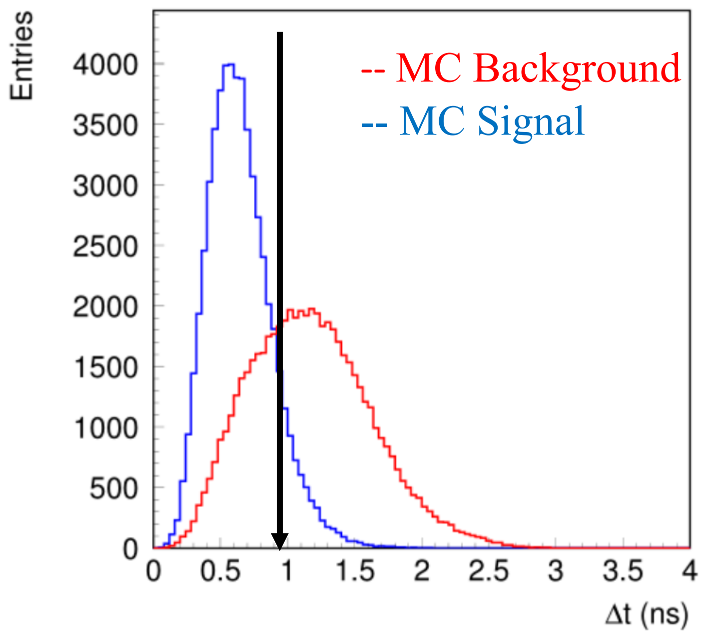
Search for the CP violating $K_S \rightarrow \pi^0\pi^0\pi^0$ decay

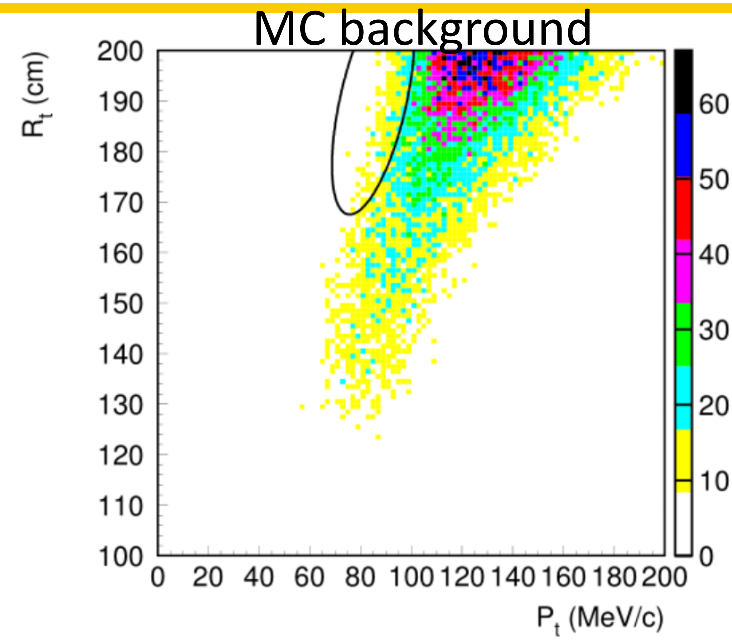
$$E_t = \sum_{i=1}^{6} E_{\gamma i}/6$$

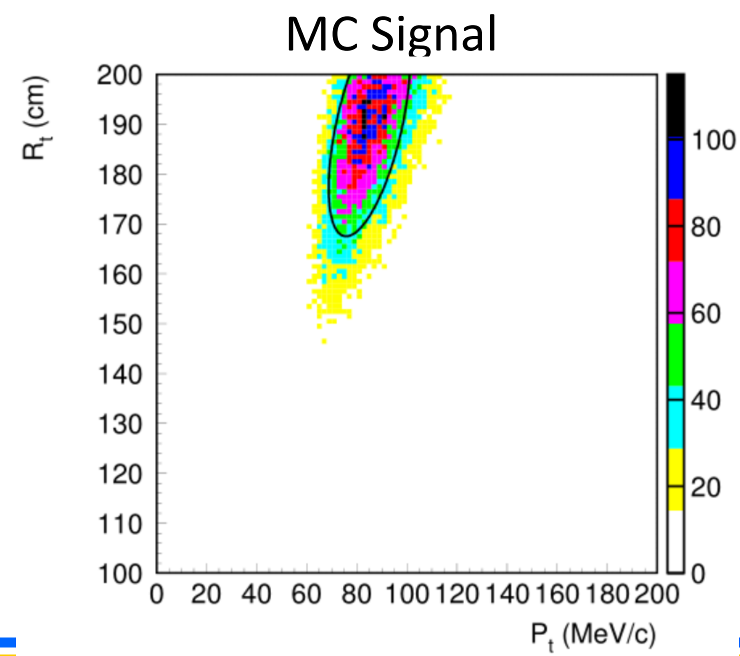
$$P_t = \sum_{i=1}^{6} \frac{E_{\gamma i}}{E_t} \sqrt{(P_{xi})^2 + (P_{yi})^2}\,;$$

$$R_t = \sum_{i=1}^{6} \frac{E_{\gamma i}}{E_t} \sqrt{(R_{xi})^2 + (R_{yi})^2}$$

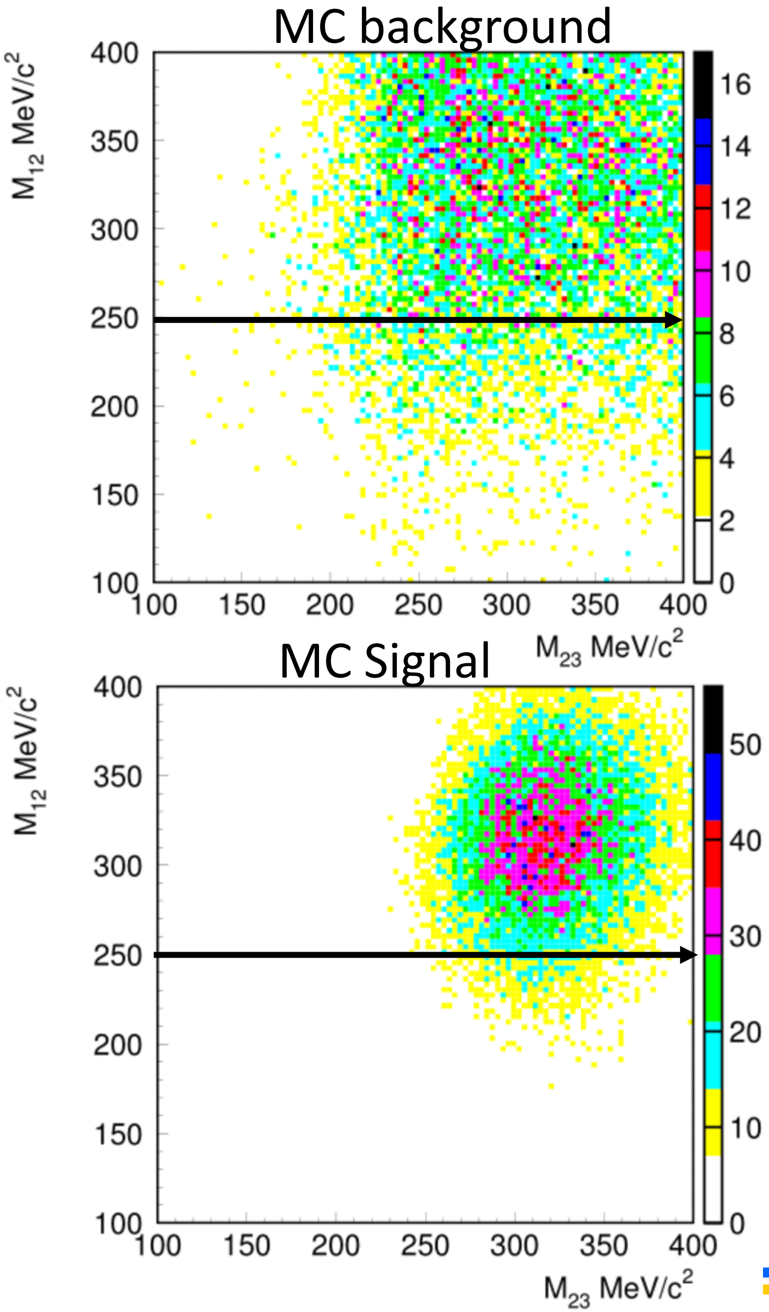
Photon coincidence time: $\Delta t = t_{cl}^{max} - t_{cl}^{min}$

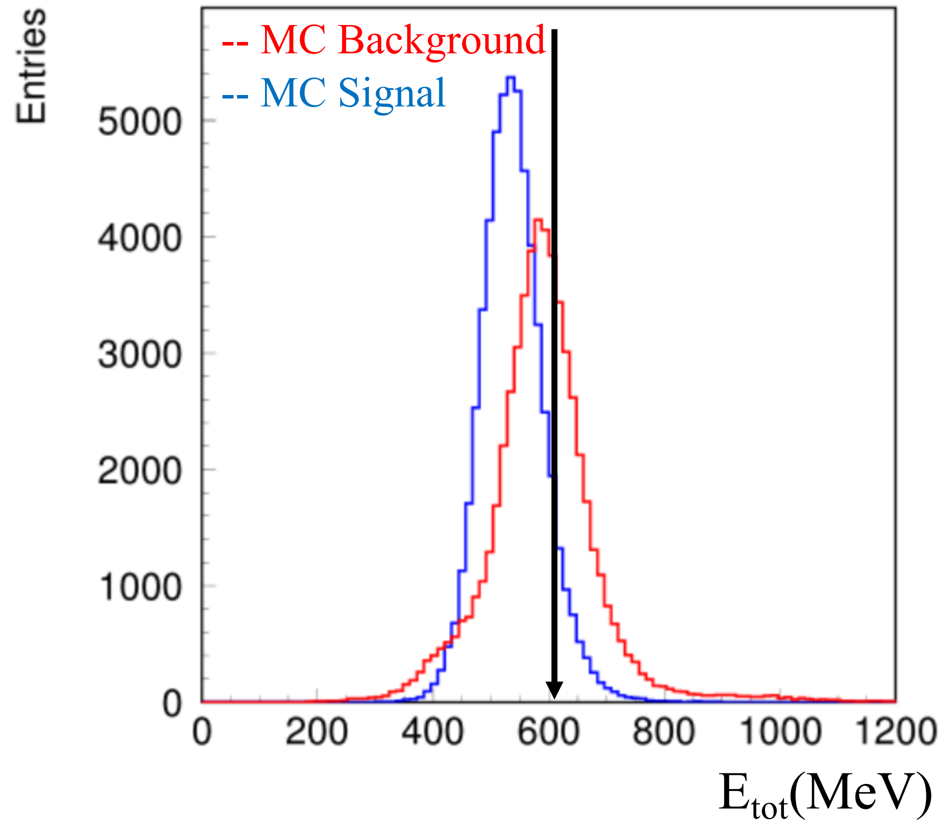






Search for the CP violating $K_S \to \pi^0\pi^0\pi^0$ decay





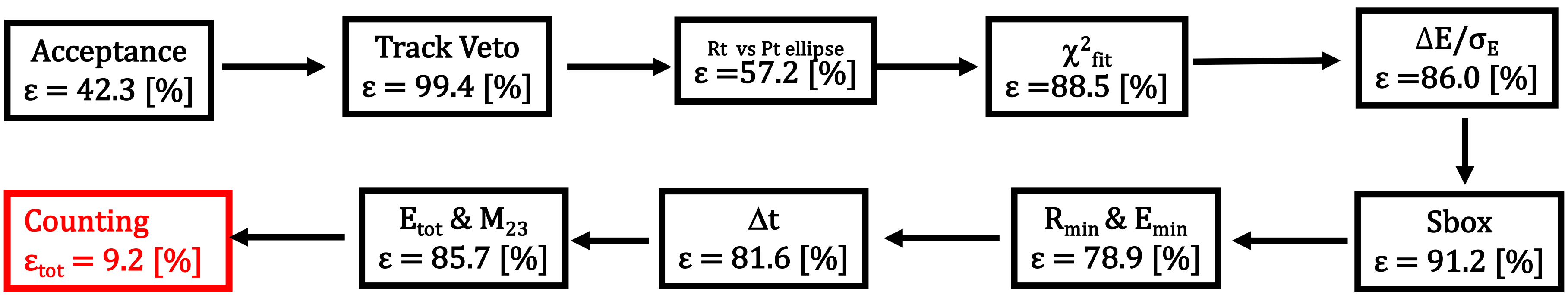
- **E_{tot}**: Total Energy of the six clusters
- $M_{12/23}$: invariant mass of the two reconstructed pions

- **The analysis chain efficiencies:**

$E_{cr} > 150$ MeV

$0.20 \leq \beta_{cr} \leq 0.225$

$\chi^2_{fit} < 90$
$\Delta E/\sigma_E \geq 1.70$
$0 \leq c^2_{2p} \leq 100$
$c^2_{3p} \leq 7.0$
$R_{min} > 65$ cm
$E_{min} > 35$ MeV
$\Delta t < 0.82$ ns
$E_{tot} < 600$ MeV
$M_{23} > 250$ MeV/c^2

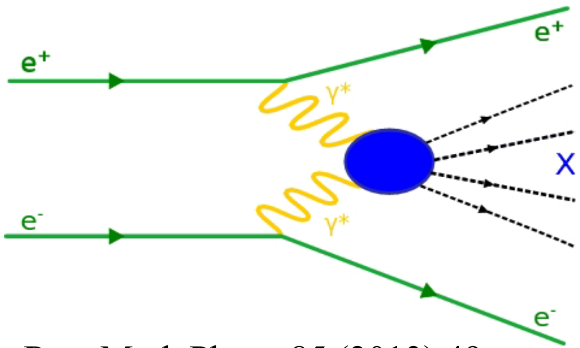


- At the end of the analysis we count **0 candidates** in the background simulations (upper limit corresponding to the last published result (PLB 723 (2013) 54).
- Cuts optimization procedure is in progress

$$e^+e^- \to e^+e^-\gamma^\star\gamma^\star \to e^+e^- X$$

$$[\mathbf{C(X) = +1}]$$

$$\mathbf{X} = \pi^0, \pi\pi, \eta$$



Rev. Mod. Phys., 85 (2013) 49

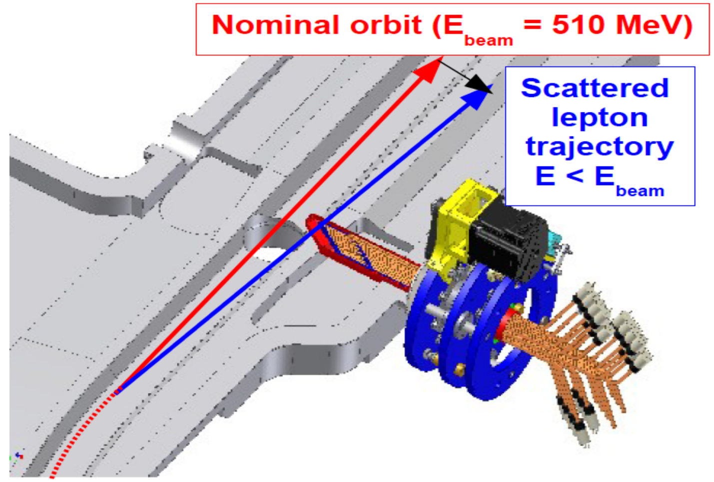
- Precision measurement of $\Gamma(\pi^0\to\gamma\gamma)$
- Transition form factor $F_{\pi\gamma\gamma^*}(q^2,0)$ at space-like q^2 ($|q^2|< 0.1$ GeV^2), impact on value and precision of $a_\mu^{LbyL;\pi 0}$

$$e^+ e^- \to e^+ e^- \gamma^* \gamma^* \to \boxed{e^+ e^-}\ \boxed{X}$$

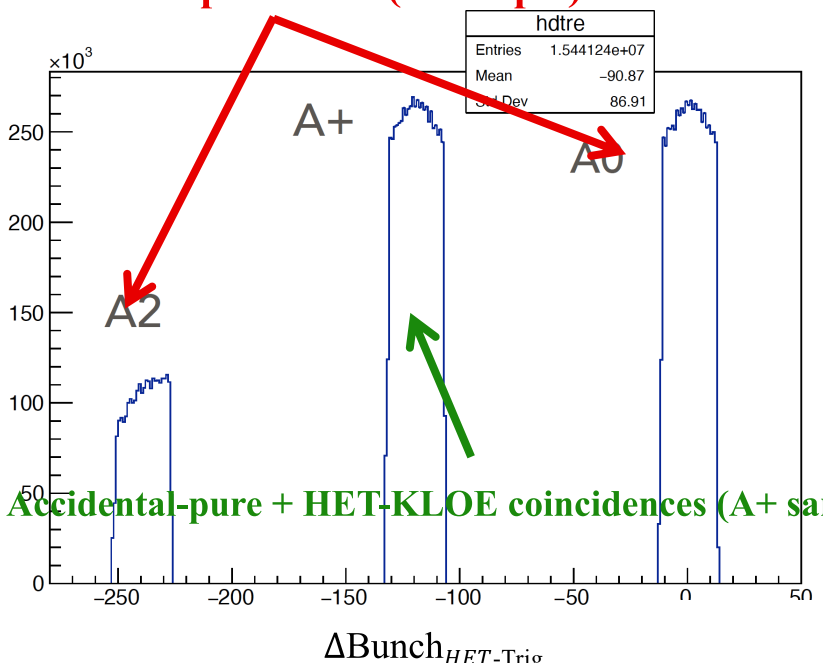
to taggers

in KLOE

Measurement concept:
Eur. Phys. J. C 72 (2012) 1917



Accidental-pure data (A sample)



Accidental-pure + HET-KLOE coincidences (A+ sample)

First bending dipoles of DAΦNE act as spectrometers for scattered leptons (420 < E < 495 MeV)

Scintillator hodoscope + PMTs, inserted in Roman pots
pitch: 5 mm, ~ 11 m from IP (σ_E~2.5 MeV σ_t~500 ps)

HET is acquired asynchronously w.r.t. the KLOE-2 DAQ (Xilinx Virtex 5 - FPGA),synchronization with the "Fiducial» signal from DAΦNE (each 325 ns)and the KLOE trigger

HET acquisition window corresponds to about 2.5 DAΦNE revolutions, data are recorded only when a KLOE trigger is asserted

The analysis is based on the HET-KLOE coincidences and the accidental-pure samples used for background modelling (shape and number)

Status of $\gamma\gamma \to \pi^0$ Search

preliminary

The reconstruction of 3 fb^{-1} of good-quality data has been completed (2015-16-17-18 data-taking periods)

Single-arm selection:
-Sample of 2 clusters associated with the same bunch crossing the KLOE barrel calorimeter
-Selected bunch crossing, and, independently selected HET signal, are in a time window of 40 ns around the KLOE trigger

Analysis Strategy:
-Simultaneous fits of A+/A samples in $M_{\gamma\gamma}$, $\Delta T_{\gamma\gamma}$- $\Delta R_{\gamma\gamma}$ /c, $\cos\theta_{\gamma\gamma}$.
-Fit to accidental–pure samples used to constrain the number of accidentals in A+
-Time coincidence window : 4 bunch crossings

-Accidental pure sample (A) used to model background pdf

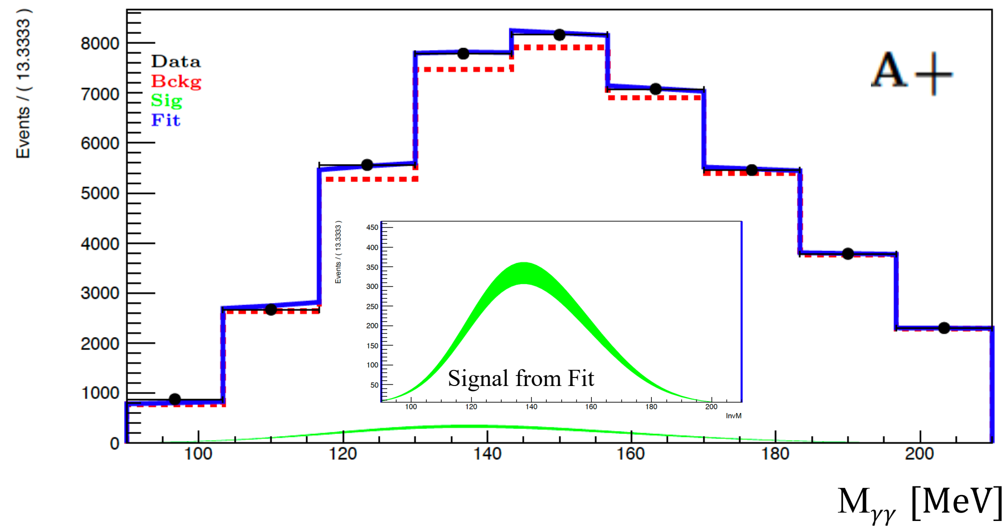
-Signal pdfs by Ekhara simulation, control samples and BDSIM transport of the leptons through the beam line. Acceptance extracted using low angle raditive Bhabha cross section measurements, in progress

-$M_{\gamma\gamma}$, $\cos\theta_{\gamma\gamma}$ with a signal-enriching cut ($\Delta T_{\gamma\gamma}$-$\Delta R_{\gamma\gamma}$/c < 0.3 ns) separately fitted. Signal fraction (0.55) fixed from signal simulation

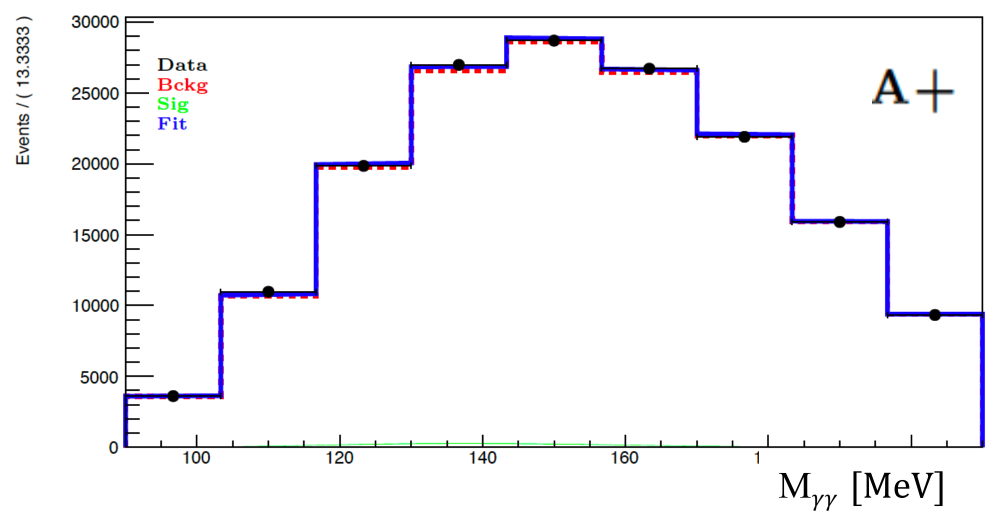
-Pz vs plastic position (xHET) correlation included in the fits for 2017-18 data, checks of simultated signal and fit results ongoing

8% precision on signal reached with ~ 1.5 fb^{-1} (2017-18 data), very preliminary, results under check

$\Delta T_{\gamma\gamma}$- $\Delta R_{\gamma\gamma}$/c < 0.3 ns



$\Delta T_{\gamma\gamma}$- $\Delta R_{\gamma\gamma}$/c > 0.3 ns

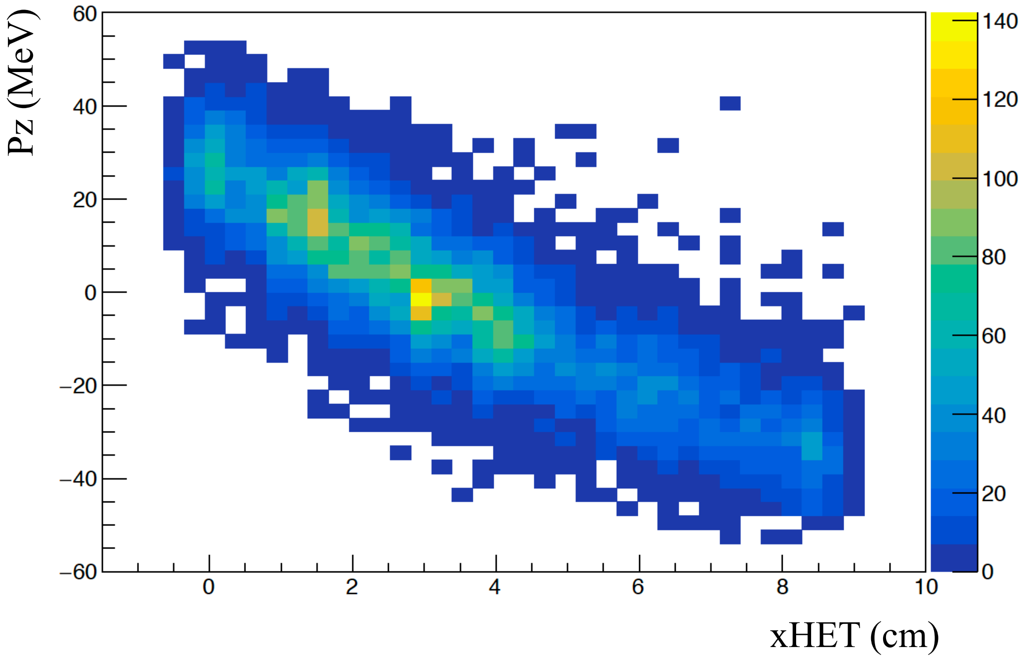


Status of $\gamma\gamma \to \pi^0$ Search: Pz, xHET correlation included

- Simulataneous fit of bidimensional Pz-xHET distribution included in the analysis for 2017-18 sample
- Acceptance per channel measured with low angle radiative Bhabha in the HET for all data-taking periods

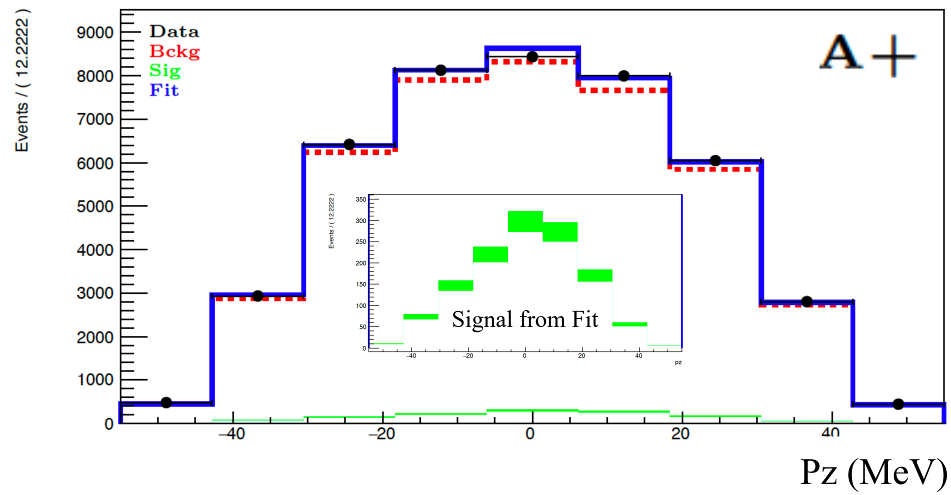
preliminary

Expected Pz-xHET signal correlation derived from acceptance studies

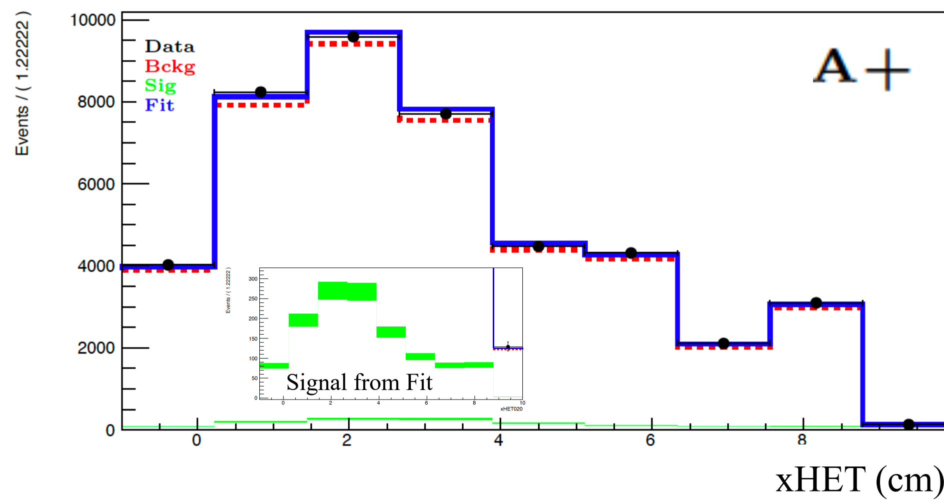


Acceptance evaluation in advanced state, test of the new Ekhara inputs ongoing

$\Delta T_{\gamma\gamma}$- $\Delta R_{\gamma\gamma}/c$ < 0.3 ns



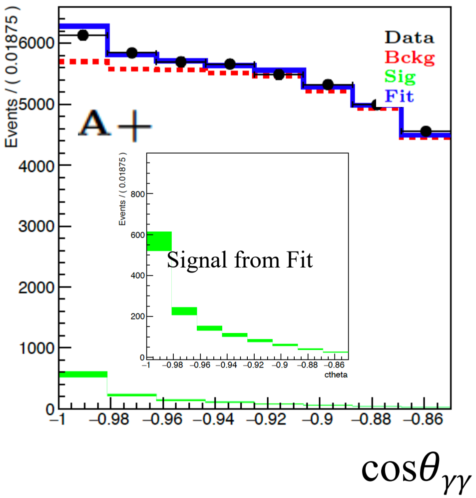
$\Delta T_{\gamma\gamma}$- $\Delta R_{\gamma\gamma}/c$ < 0.3 ns

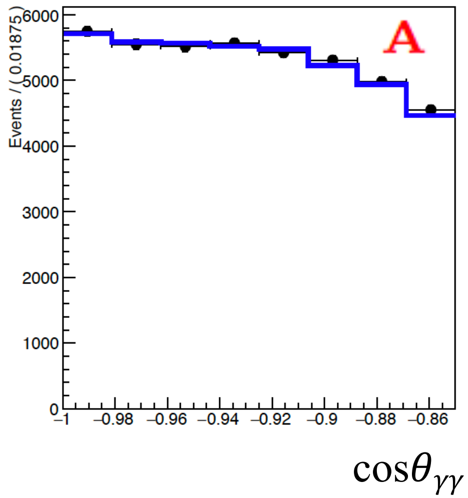


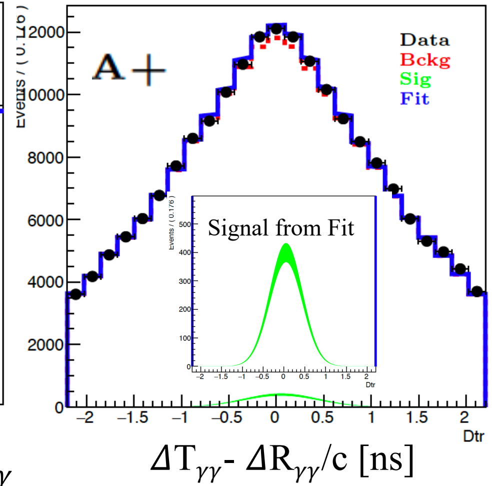
Status of $\gamma\gamma \rightarrow \pi^0$ Search

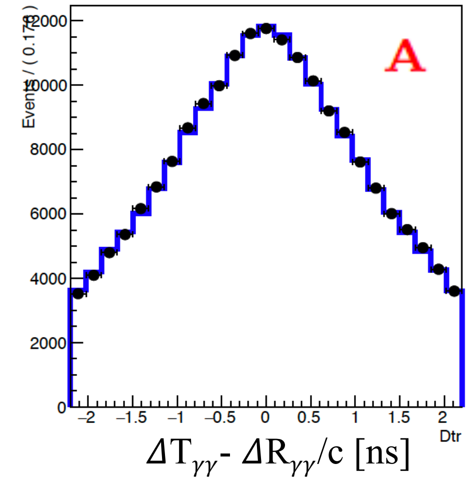
$\Delta T_{\gamma\gamma}$- $\Delta R_{\gamma\gamma}/c < 0.3$ ns

preliminary

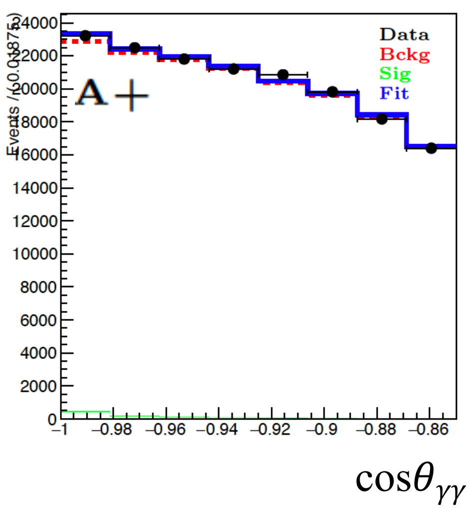


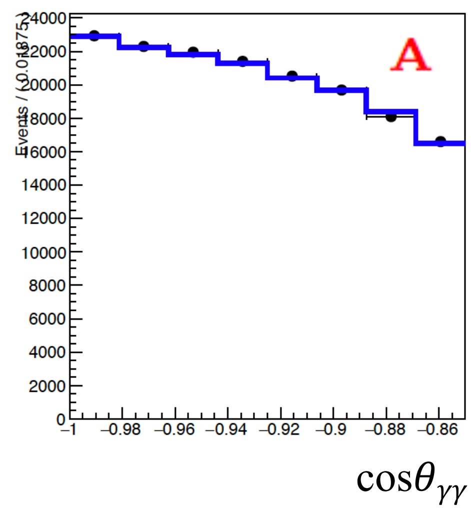


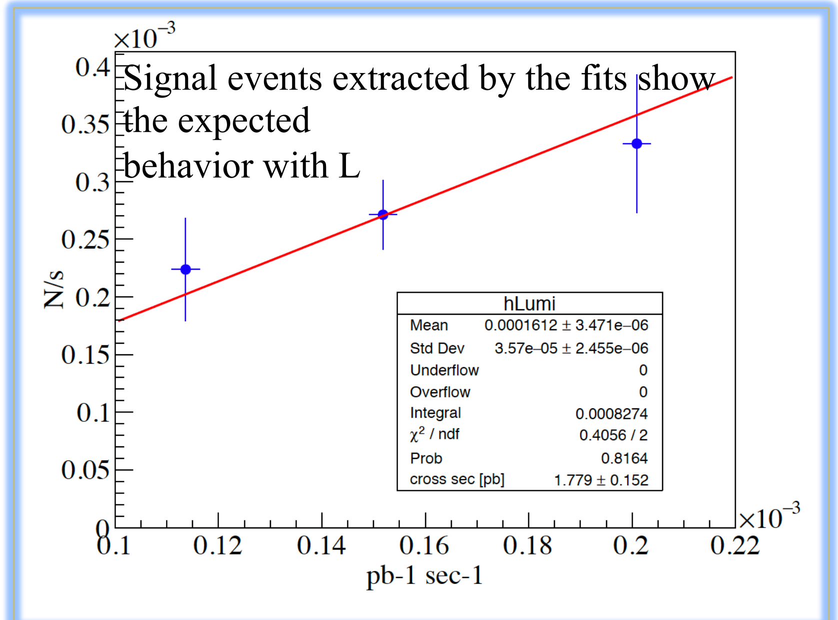




$\Delta T_{\gamma\gamma}$- $\Delta R_{\gamma\gamma}/c > 0.3$ ns

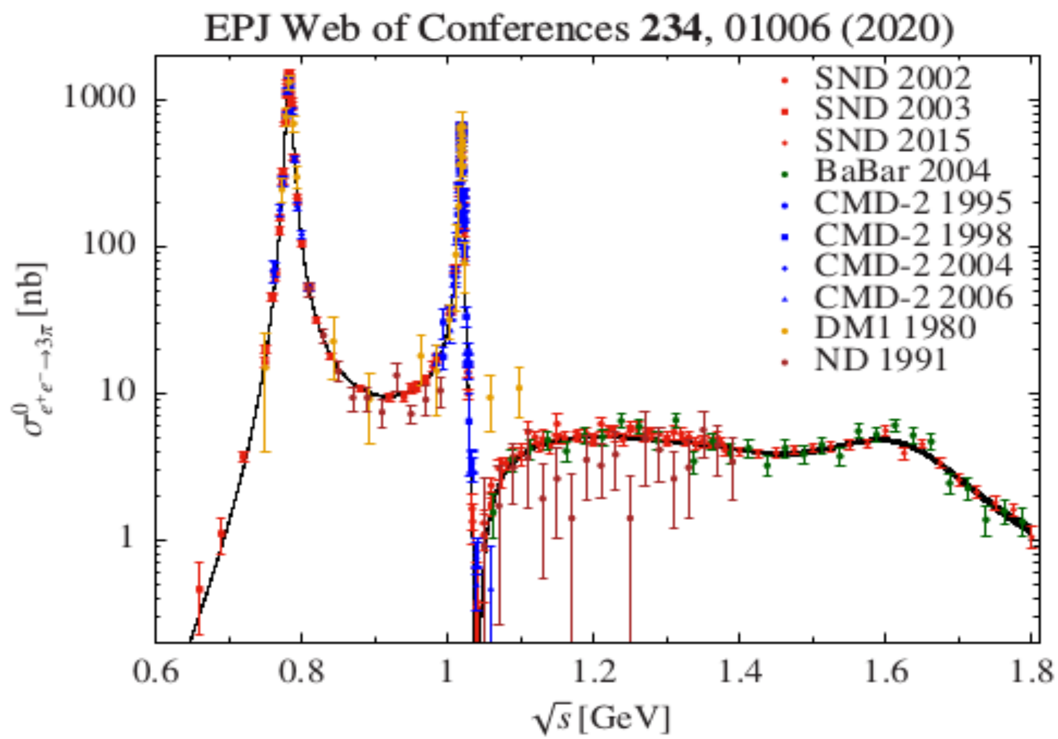


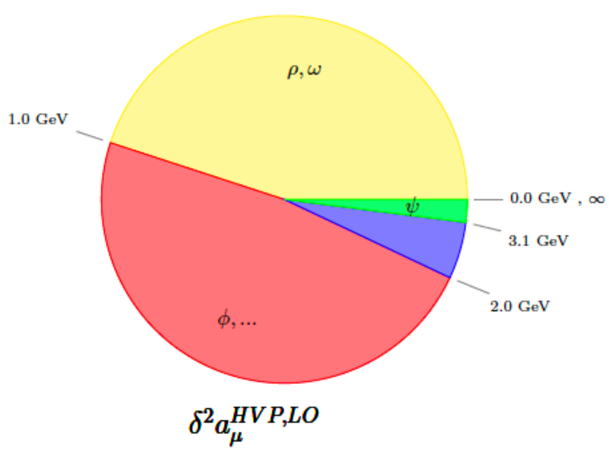




$e^+ e^- \rightarrow \pi^+\pi^-\pi^0\gamma_{ISR}$

- 3π channel encounters the second largest contribution on a_μ^{HVP} at the leading order, both in absolute values and uncertainties.
- Cross section measurement of $e^+e^- \rightarrow 3\pi$ is feasible using ISR technique with fewer energy points at KLOE
- Improve lack of ISR data samples in low energy region, complementary results to direct energy scans
- Analysis ongoing on ~1.72 fb^{-1} on-peak and ~246 pb^{-1} off-peak data samples.





Physics goals:

-to extract the peak cross section of the process $e^+e^- \rightarrow V \rightarrow 3\pi$, involving vector resonances $V = \varphi, \omega$

-to measure cross section of non-resonant process $e^+e^- \rightarrow \gamma^* \rightarrow 3\pi$.

-to measure product of branching fractions $B(\omega \rightarrow e^+e^-) \times B(\omega \rightarrow 3\pi)$

$e^+ e^- \to \pi^+\pi^-\pi^0\gamma_{ISR}$

Sample statistics: about 1.7 fb-1

Event selection:
- $K_S K_L$ stream
- at least two tracks with opposite curvature
- three neutral clusters with $|\cos\theta|<0.92$, Eclu >15 MeV, Tclu-Rclu/c < min $(2,5\sigma_t)$ ns
- Two tracks with opposite curvature extrapolated inside a cylinder with $\rho = \sqrt{x^2+y^2} < 4$ cm and $|z| < 10$ cm

Additional selections:

-Kinematic fit with seven constraints $\chi^2_{7C} < 26$ rejects Kaons

- $\theta_{\gamma\gamma} < 140^\circ$ to reject Bhabha events

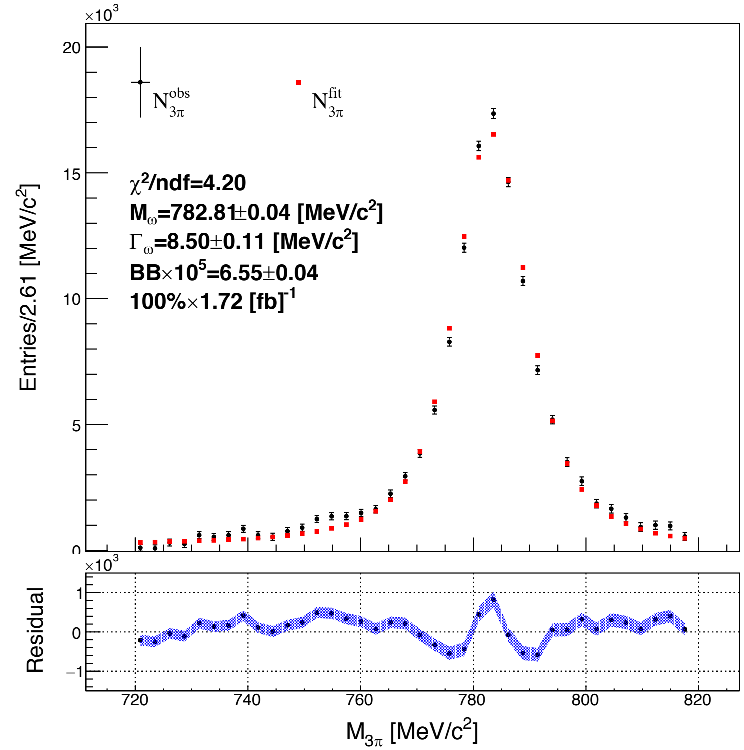
-M > 300 MeV to reject $\rho\pi$ events with M from

$$\sqrt{s} - \sqrt{M^2 + p_+^2} - \sqrt{M^2 + p_-^2} - |\bar{p}_\phi - \bar{p}_+ - \bar{p}_-| = 0$$

$\beta_\pi < f_\beta\,(M_{2\pi})$ to reject further backgrounds with:

$$f_\beta = 1.98 + \frac{1}{1 - \exp\left(\frac{M_{2\pi} - 0.8}{0.11}\right)}$$

Cross section extraction in the omega region in progress:

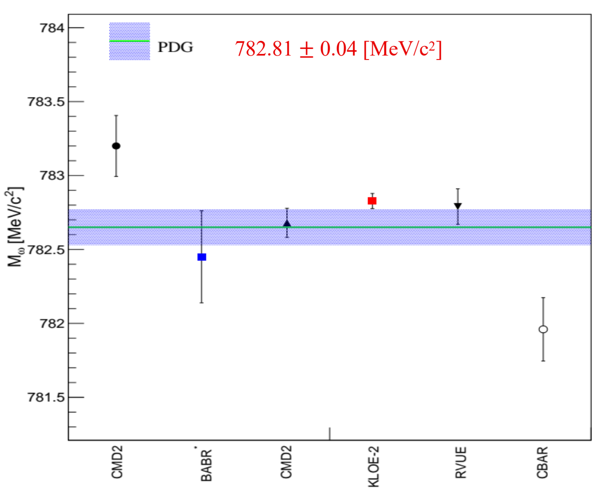


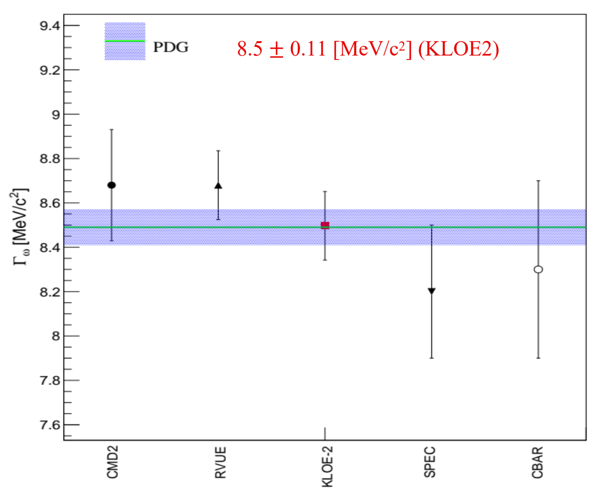
Preliminary fit obtained with a simple BW model, refinement of the model in progress

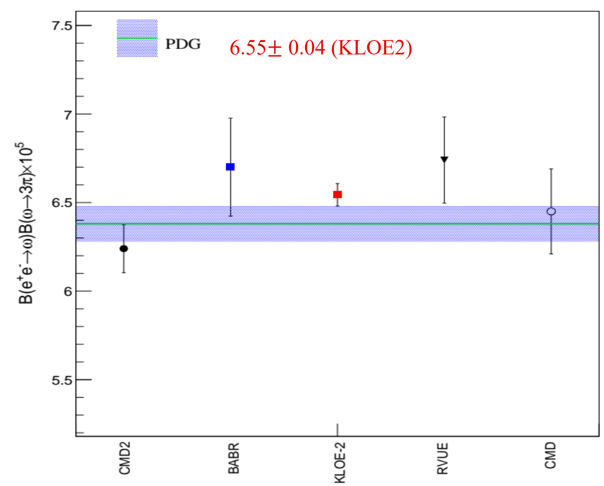
$e^+e^- \rightarrow \pi^+\pi^-\pi^0\gamma_{ISR}$

KLOE preliminary results

Luminosity $[\text{fb}]^{-1}$	M_ω $[\text{MeV}/\text{c}^2]$	Γ_ω $[\text{MeV}/\text{c}^2]$	$\mathscr{B}_{ee}\mathscr{B}_{3\pi} \times 10^5$ [-]
1.7	782.81 ± 0.04	8.50 ± 0.11	6.55 ± 0.04
PDG	782.65 ± 0.12	8.49 ± 0.08	6.38 ± 0.10





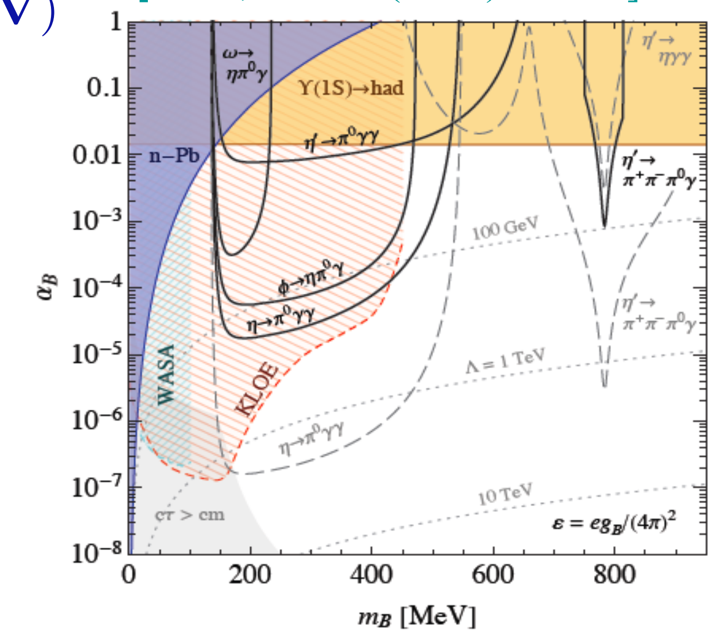


Analysis of systematic uncertianty ongoing

- Dark Force mediator coupled to baryon number (B-boson) with the same quantum numbers of the ω(782) ⇒ $I^G=0^-$

$$\mathcal{L} = \frac{1}{3} g_B \bar{q}\gamma^\mu q B_\mu \qquad \alpha_B = \frac{g_B^2}{4\pi} \lesssim 10^{-5} \times (m_B/100\text{MeV})$$

[Tulin, PRD89(2014)114008]

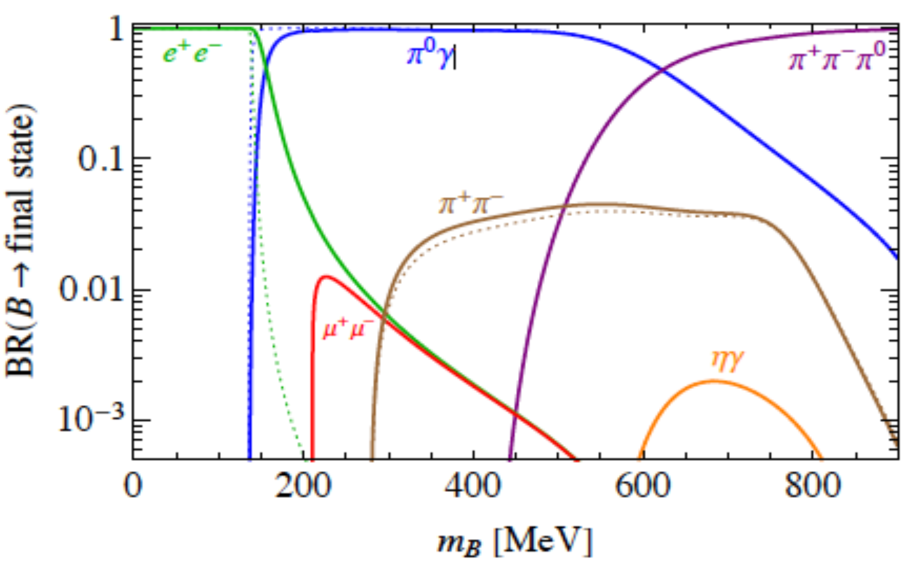


- Dominant decay channel (m_B < 600 MeV): $B \to \pi^0\gamma$
- Can be studied in:

  $\phi \to \eta B \Rightarrow \eta\pi^0\gamma \Rightarrow$ 5 prompt γ final state

  $\eta \to B\gamma \Rightarrow \pi^0\gamma\gamma$

  $e^+e^- \to \pi^0\gamma\,\gamma_{ISR}$



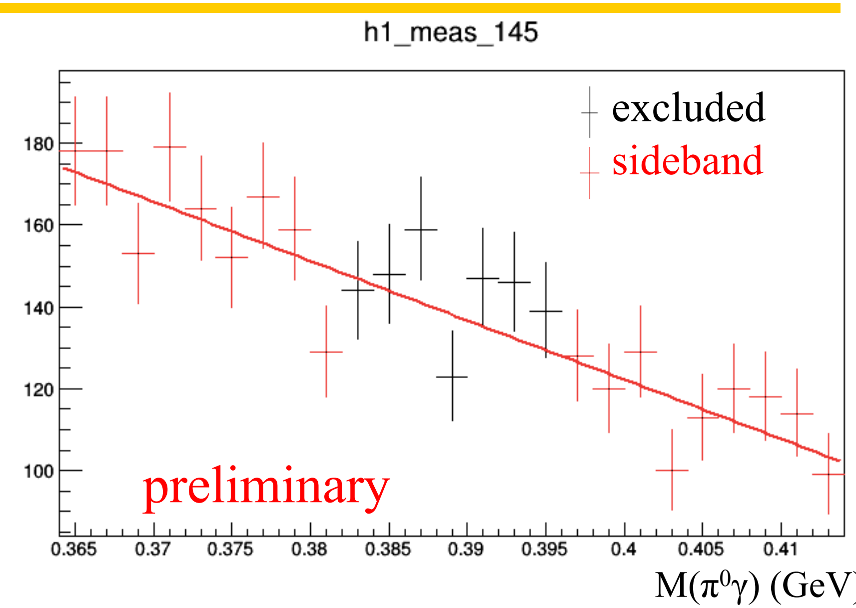
Decay → Production ↓	$B \to e^+e^-$ $m_B \sim 1 - 140$ MeV	$B \to \pi^0\gamma$ 140–620 MeV	$B \to \pi^+\pi^-\pi^0$ 620–1000 MeV	$B \to \eta\gamma$
$\pi^0 \to B\gamma$	$\pi^0 \to e^+e^-\gamma$	...	...	...
$\eta \to B\gamma$	$\eta \to e^+e^-\gamma$	$\eta \to \pi^0\gamma\gamma$	...	...
$\eta' \to B\gamma$	$\eta' \to e^+e^-\gamma$	$\eta' \to \pi^0\gamma\gamma$	$\eta' \to \pi^+\pi^-\pi^0\gamma$	$\eta' \to \eta\gamma\gamma$
$\omega \to \eta B$	$\omega \to \eta e^+e^-$	$\omega \to \eta\pi^0\gamma$	...	...
$\phi \to \eta B$	$\phi \to \eta e^+e^-$	$\phi \to \eta\pi^0\gamma$	...	

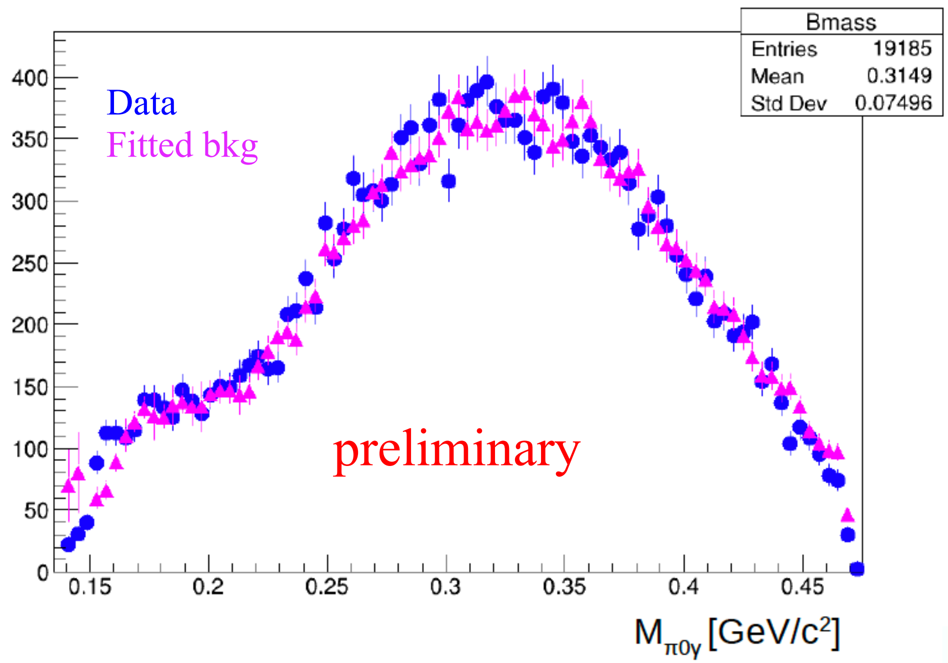
Search for the B boson

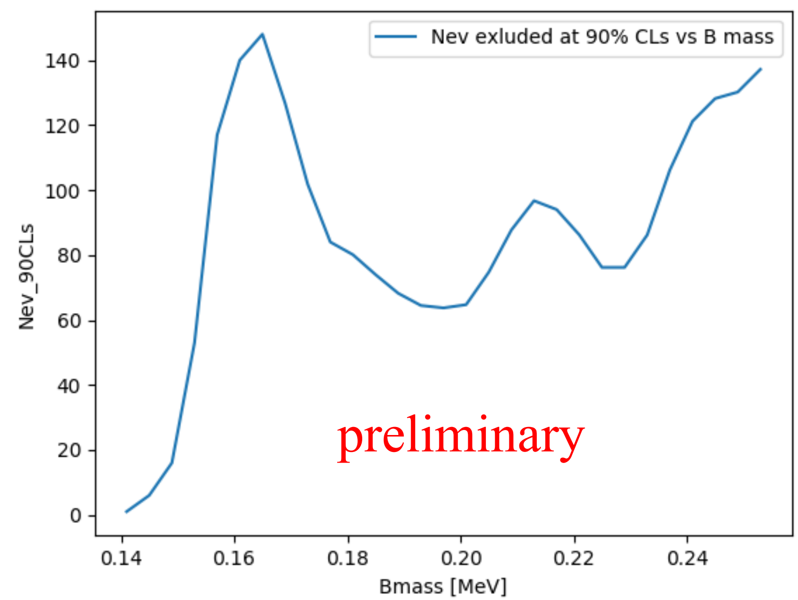
Study on ~1.7 fb^{-1} full data sample
Selection of 5 prompt γ's
Kinematic fit
Main residual background
from $\Phi \to a0\gamma \to \eta\pi^0\gamma$ and
$\Phi \to \eta\gamma \to 3\pi^0\gamma$ with lost or merged photons.

Sidebands background extraction for Upper Limit calculation
refined and detailed calculation based on CLs technique

Systematic uncertainties due to irreducible background estimation (below 2% over the invariant mass range of the B boson) included in the limit extraction procedure







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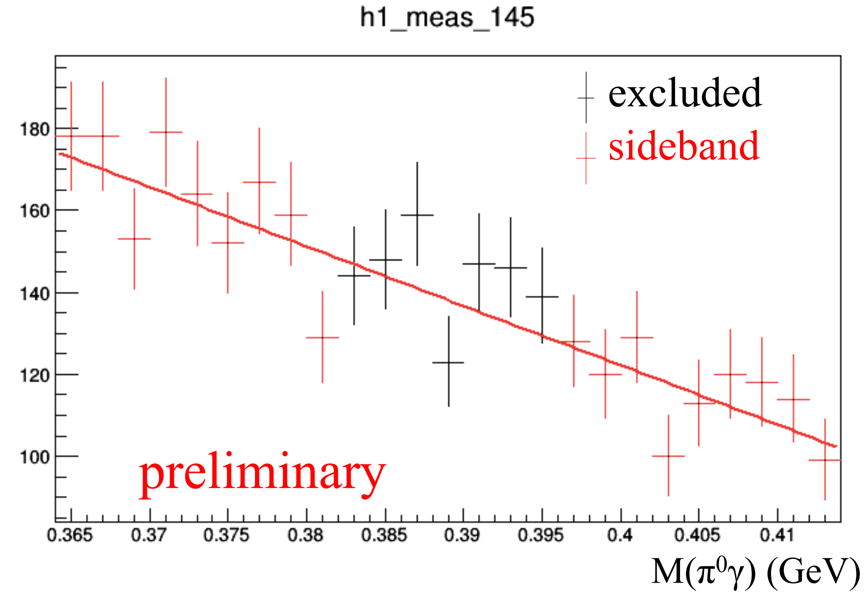

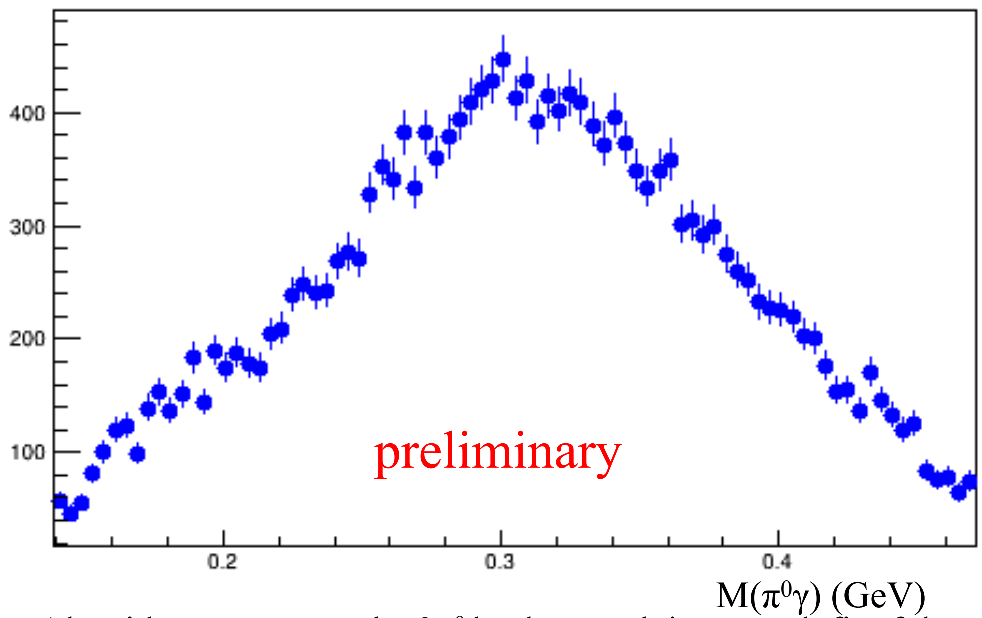

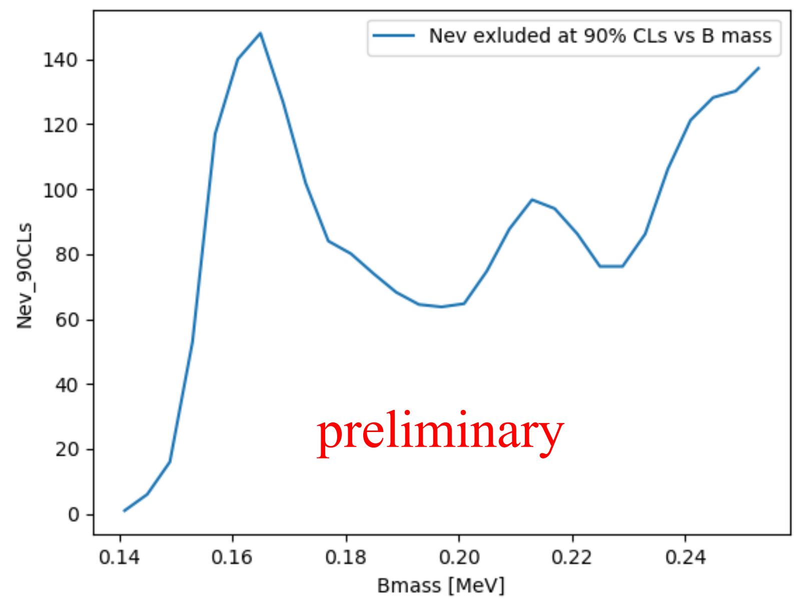

Algorithm to remove the $2\pi^0$ background improved, fit of the new InvM and new limit extraction in progress

Conclusions

Several analyses, ongoing both with KLOE and KLOE-2 data-sets, are very advanced.
Main goals for the end of the year: submit two papers ($K_S K_L \rightarrow \pi^+\pi^- \pi^+\pi^-$, T/CPT tests) and three final results ready for publication (B boson limit, $\eta \rightarrow \pi^0\gamma\gamma$, BR($K_s$e3)).

KLOE-2 data reconstruction with final DBV version in good progress,
about 3.3 fb^{-1} produced, almost two years of data taking completed

The problem of repeated hardware failures in the KLOE computing center is being solved with the installation of a new UPS unit replacing the old one.

ROOT output implemented and tested, integration on DB2 ongoing

Massive MC production available with DBV-38 used in KLOE-2 analyses, large scale production with final DBV version will start soon

Observations:

- KLOE reported significant progress to the SC. The reconstruction of the data events using the last version (DBV-40) has progressed well. By now 2.4/fb have been reconstructed and it is expected that the reprocessing of the data will finish in February if no unexpected delays occur. MC production has continued with DBV-38 but is now close to starting also for DBV-40. The migration of the file system to GPFS was done successfully and the tape storage available is sufficient to keep both data and MC in versions DBV-40 and DBV-38 concurrently.
- In terms of data analysis, two papers have been published and on many other analyses progress was made. For instance, it now looks promising that for the novel HET $\gamma\gamma\rightarrow\pi^0$ a precision of 6% is in reach. For the first time clear signals of $\phi\rightarrow\eta\pi\pi$ and $\phi\rightarrow\eta\mu\mu$ are observed, enabling a first branching ratio measurement in these modes. Another interesting new result soon to be released is a search for quantum decoherence in K_SK_L events with 4x higher statistics than before. And there are several measurements that test discrete symmetries: CP, T or CPT. In total 12 analyses are in progress, but in many cases the analyses rely on a single person who cannot work on the analysis full-time. Additional manpower, e.g. talented master/laurea students, would be very welcome to help ensure that the data will be published.