#### KLOE-2 Status – Sblocchi SJ – Preventivi 2019

E. De Lucia LNF- INFN on behalf the KLOE-2 Collaboration

## KLOE-2 Integrated Luminosity

KLOE-2 Run started in November 2014 and ended on March 30th 2018:
 6.8 (5.5) fb-1 delivered (acquired)

Daily record:13.7 (11.1) pb<sup>-1</sup> del. (acq) Peak Luminosity: 2.28x10<sup>32</sup> cm<sup>-2</sup> s<sup>-1</sup>



S fb<sup>-1</sup> Goal reached thanks to the combined effort of KLOE-2 & DAΦNE teams
 teams

#### KLOE-2 Achievements 2018 (I)

Dark Photon: update limit on  $U \rightarrow \mu^+\mu^- \&$ combine  $\mu+\mu-\gamma$  and  $\pi+\pi-\gamma$  final states *Milestone 2018* 

PLB 784 (2018)

- ♦ Updated limit on U  $\rightarrow$  µ+µ– with full KLOE statistics – L = 1.93 fb-1
- Combination of  $\mu+\mu-\gamma$  and  $\pi+\pi-\gamma$ final states [ $\pi+\pi-\gamma$ : PLB757(2016)356]
- $\epsilon < (6 1.94) \times 10^{-7}$  above 650 MeV



Combination of  $\sigma_{had}$  meas. and  $a_{\mu}$  determination at  $0.10 < s < 0.95 \text{ GeV}^2$ 

JHEP 1803(2018)173

 $K_{\rm S} \rightarrow \pi e v$  charge asymmetry (1.7 fb<sup>-1</sup> KLOE) Milestone 2018

JHEP 09 (2018) 21

# KLOE-2 Achievements 2018 (II)

Direct test of T and CPT in neutral kaon transitions with KLOE data

Preliminary Result @ ICHEP 2018



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## KLOE-2 Achievements 2018 (III)

#### Leptophobic Dark Matter search with KLOE-2

#### Preliminary Result @ ICHEP 2018



## KLOE-2 Data ongoing Analysis

- ◎ Analysis with KLOE-2 data:
  - $K_{\rm S} \rightarrow 3\pi0$
  - $\odot$   $\eta \rightarrow \pi + \pi -$
  - $K_S \rightarrow \pi ev$
  - $K_{\rm S} \rightarrow \pi + \pi K_{\rm L} \rightarrow \pi + \pi -$
  - $\eta \rightarrow \pi 0 \gamma \gamma$
  - B-boson search in  $\phi \rightarrow \eta \pi 0 \gamma$
- ΗΕΤ πΟ search: factor 2
   efficiency improvement with the new discriminators &
   Multivariate Analysis with data
   sample acquired in this new
   configuration

# Exploiting presently ongoing data reconstruction & MC production



### DBV-38 reconstruction

First stable reconstruction (DBV-38)

- New background filter
   ⇒ rejects 25-30 % of the events
- Version 3.0 of the DC-IT integrated tracking
- New stream for Single Photon Trigger events implemented
- Tests for a new stream for γγ physics events with HET
- Additional datarec and MC for HET & single photon trigger SPHOT streams and possible different reconstruction versions and contingency for other streams

Request 2019 – Tape 0.5 PB Erika De Lucia – Pre-CSN1 Meeting September 13th 2018





### DBV-38 reconstruction rate

- 1.5 fb<sup>-1</sup> reconstructed with DBV-38 since March 21st, 2018
  - ⇒  $\sim$  30 % of the whole KLOE-2 data set ⇒ 2016 data set finished and starting 2017

- New background filter + reconstruction optimization
   ⇒ gain a factor of 2 in reconstruction rate:
   ~ 20 pb-1 / day
- At this rate the first round of all KLOE-2 data reconstruction will be completed in ~ 6 months
- 0.8 fb<sup>-1</sup> MC production on same period

## Computing

- Migration of old servers managing old TSM library on new Power8 machine (May) reduction of 12 keuro out of 85 keuro Maintenance cost from 2018
- New Storewize 5030 Gen II Disk Array installed substituting old DS4800 DS5100 (online - users & group areas – VM boot - KLOE software) 200 TB additional reduction of 21 keuro Maintenance cost starting 2019
  - DataDirect 9900 (buffer area) 800 TB unfortunately 3 blocking failures starting 2018 (6 days in total) impact on offline activities only. Aged.
    - Referees willing to consider possible substitution, further reduce Maintenance

Storewize upgraded to replace DataDirect

	Maintenance				
	Server IBM	Storage & Network	Total Maintenance		
2015	22	20	42		
2016	22	52	74		
2017	22	48	70		
2018	17	56	73		
2019	0	35	35		
2020	0	35	35		



#### Request 2019 - Maintenance 35 keuro

### Plans for KLOE-2 data (I)

- ◎ KLOE + KLOE-2 data sample: 8 fb<sup>-1</sup>  $\Rightarrow$  2.4 × 10<sup>10</sup>  $\phi$ -meson produced, the largest sample ever collected at the  $\phi(1020)$  peak
- I Last SC Findings & Recommendations: "The SC recommends that the KLOE-2 Collaboration prepares a plan for data preservation"
- CERN experts contacted through the LNF Director (Sünje Dallmeier-Tiessen and Salvatore Mele)
- The idea: "Data Preservation for KLOE would be an excellent test bed as the data set is not gigantic and the basic idea would be to have a Rootcompatible set of ntuples with reconstructed data."
- February 20th @LNF: First meeting with Sünje Dallmeier-Tiessen and KLOE-2 detector, offline, and computing experts
- First step: Change present DST Data output format to ROOT- compatible (with the assistance of experts: Axel Naumann & Federico Carminati)
- In First tests planned this summer Successfully produced first ROOTples
- Attend ROOT Users workshop, September in Sarajevo Met experts to discuss programming strategies and data output structure optimization

## Plans for KLOE-2 data (II)

#### End 2018 – Beginnning of 2019:

Complete first round of KLOE-2 data reconstruction + production of ~ 1 fb<sup>-1</sup> of all\_phys Monte Carlo

Immediately after:

Start a second round of data reconstruction, with an improved version of Datarec

Implement the ROOT output instead of the present DST format

## Short-term plans for analysis

#### October 2018:

- $\odot$  Preliminary results on the 5 prompt photon sample
  - $(\eta \rightarrow \pi^0 \gamma \gamma \text{ and B-Boson search})$  on old data *Milestone 2017 @* 40%
- End 2018:
  - $\gamma\gamma \rightarrow \pi^{0}$ : analysis of the second sample of 500 pb<sup>-1</sup>, Bhabha cross-section measurement at very low angle with HET
  - $K_s \rightarrow 3\pi^0$ : preliminary result on KLOE-2 data *Milestone 2018*
  - $\varphi \rightarrow K_S K_L \rightarrow \pi^+ \pi^- \pi^+ \pi^-$ : update with KLOE-2 data *Milestone 2018*
  - T, CPT tests with  $\phi \rightarrow K_S K_L \rightarrow 3\pi^0 \pi e_V$ ,  $\pi\pi\pi e_V$ : update of the analysis with KLOE data *Milestone 2018*

#### Beginning of 2019:

- $K_s \rightarrow \pi e_V$ : update of the analysis of KLOE-2 data
- $\circ$  η → π<sup>+</sup>π<sup>-</sup>: preliminary result on old data + first look at KLOE-2 data

## Preventivi 2019

## KLOE-2 Financial Plan 2019

	Missioni (keuro)	Consumo	Altro Consumo	Manutenzi oni	Apparato	Totale (keuro)
2019 Previsione	38 (**)	38.5	2	35 (*)	5	118.5
2018 Assegnato	68.5	55.5	27	73	42	266.0

Estimates are based on 2018 money assignments and updated FTE 15.7 (23.2)

- Missioni: (\*\*) Includes indiviso missioni as 2018 x FTE(2019)/FTE(2018)
- Consumo: includes 13 keuro (+ 1.5 SJ) for 0.5 PB of cassettes (2018 price) Additional datarec and MC for HET & single photon trigger SPHOT streams, considering also possible different reconstruction versions for these streams together with some contingency for other streams
- Altro Consumo: Maintenance for HETs measurement of DAFNE luminosity
- Manutenzioni: (\*) Major decrease wrt 2018 due to latest Storewize upgrade to replace DataDirect with very expensive maintenance & library servers replaced
- Apparato: 5 keuro as in 2018 for eventual Sostituzioni non in manutenzione

## Proposta Milestones 2019

Descrizione	Data completamento	
Implementazione del ROOT data output	30-06-2019	
Aggiornamento fisica gamma-gamma con 500 pb-1 acquisiti con i nuovi discriminatori e con nuova selezione degli eventi	31-07-2019	
Risultati preliminari decadimento eta -> pi+pi- con 1 fb-1 (dati KLOE-2)	31-07-2019	
Studi su decadimenti semileptonici del Ks con 1 fb-1 di dati di KLOE-2	31-12-2019	
Ricerca di B-boson con 1 fb-1 di dati di KLOE-2	31-10-2019	

## Conclusions

- Data taking campaign Completed
- © Several analysis on KLOE-2 data ongoing
- Towards Data Preservation: first ROOT data output produced & discussed with experts strategies and data output optimization
   On track with Milestones 2018



### SPARES

#### Data preservation

•Data output in the from of ROOT TTree:

- .FORTRAN wrap of C++ / ROOT code
- Implementation on the standard KLOE reconstruction framework
- Basic code / output already done
- •Time to reproduce all the data banks/ HBOOK structure: complexity of the code = complexity of the wrap and FORTRAN / ROOT interaction
- September 2018: Meeting with ROOT experts to discuss programming strategies and data output structure optimization

#### **Comparison of HBOOK and ROOT output**

