BABAR, stato e richieste 2015

Alberto Lusiani

INFN Pisa, 2 luglio 2014

Stato

- April 2008 end of data-taking
  - → 2009–2010 intense data analysis
    - → 2011–2012 steady data analysis
      - → 2013→ long term archival data analysis
- **ultimi 12 mesi**: diversi contributi e responsabilità locali all'esperimento e all'analisi
- **2015 e anni successivi**: coinvolgimento in diminuzione progressiva nelle attività in corso

Responsabilità 2014

- J.Walsh
  - convener gruppo di analisi su “radiative penguins” ($b \to s\gamma$, etc.)
  - membro speakers’ bureau (finisce nel 2014)
- A.L.
  - convener gruppo di analisi su fisica tau e ricerche di nuova fisica leggera
  - convener HFAG-Tau
  - membro italiano exec board

Attività ultimi 12 mesi

- L.A.Perez, J.Walsh, misura $\mathcal{B}(B \to X_s\gamma)$ con tag di B completamente ricostruiti
  - non limitata statisticamente, importante per Belle II
- **B.Oberhof**, M.Giorgi, A.L., misura $B(\tau \to \ell\nu\bar{\nu}\gamma)$ per misurare $(g-2)_\tau$
  - **tesi PHD** estate 2014
- **A.De Maria**, M.Giorgi, A.L., misura $B(\tau \to \pi\nu\gamma)$
  - **tesi magistrale** estate 2014
- gruppo "radiative penguins" (J.Walsh)
  - Inclusive $B \to X_s\ell^+\ell^-$: **B.R. and CP asymmetry**, **PRL 112, 211802 (2014)** (arXiv:1312.5364)
  - Inclusive (sum-of-exclusive) $B \to X_s\gamma$: **CP asymmetry**, **arXiv:1406.0534 [hep-ex]**, submitted to PRD
  - Angular analysis of $B \to K^*\ell^+\ell^-$
- gruppo fisica tau e ricerche di nuova fisica leggera (A.L.)
  - **search for light Higgs** $A^0 \to gg, s\bar{s}$, PRD 88, 031701(R) (2013), (arXiv:1307.5306 [hep-ex])
  - **search for light Higgs** $A^0 \to c\bar{c}$
  - invariant mass spectrum of $\tau \to hhh\nu$, already presented, to be published in 2014
  - Tau EDM form factor measurement (tesi PHD a Roma)

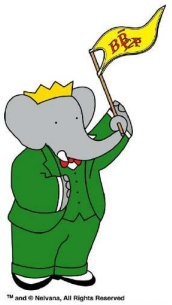
Presentazioni a conferenze

- J.Walsh, "$b \to s\gamma$ inclusive decays", FPCP, Maggio 2014
- A.Lusiani, "Babar searches for dark Higgs. . . ", Moriond Cosmology, Marzo 2014
- A.Lusiani, "Risultati recenti della collaborazione *BABAR*", 99° congresso SIF, Settembre 2013
- A.Lusiani, "Recent tau results from *BABAR*", PhiPsi, Settembre 2013
- B.Oberhof, "Recent tau physics results from *BABAR*", HEP-MAD13, Settembre 2013

Inclusive (sum-of-exclusive) $B \to X_s\gamma$: CP asymmetry

$B \to X_s\gamma$: Direct A_{CP}

$$A_{CP} = \frac{\Gamma(\bar{B} \to X_s\gamma) - \Gamma(B \to X_{\bar{s}}\gamma)}{\Gamma(\bar{B} \to X_s\gamma) + \Gamma(B \to X_{\bar{s}}\gamma)}$$



- Expected small in the SM due to left-handed nature of interaction: (-0.6, +2.8)% [Benzke et al, PRL 106, 141801 (2011)]
- New observable: isospin difference of A_{CP}

$$\Delta A_{CP} = A_{CP}(B^{\pm}) - A_{CP}(B^0/\bar{B}^0)$$

  - access directly Wilson coefficients:

$$\Delta A_{CP} = 4\pi^2 \alpha_s \frac{\bar{\Lambda}_{78}}{m_b} \mathrm{Im}\left(\frac{C_8}{C_7}\right) \qquad 17\ \mathrm{MeV} < \Lambda_{78} < 190\ \mathrm{MeV}$$

- In SM, Wilson coefficients are real: $\Delta A_{CP} = 0$
- Since C_7 is constrained by BF measurements, gives first information on C_8

J.Walsh, FPCP 2014

Inclusive (sum-of-exclusive) $B \to X_s\gamma$: CP asymmetry

$B \to X_s\gamma$: A_{CP} results

- Raw asymmetry corrected:

$$A_{\rm DET} = (-1.4 \pm 0.7)\%$$

  - due to different x-section for K^+, K^- in detector material
  - possible asymmetry in peaking background: (0.0±0.9)%

- Result for all B mesons:

$$A_{CP} = (1.7 \pm 1.9 \pm 1.0)\%$$

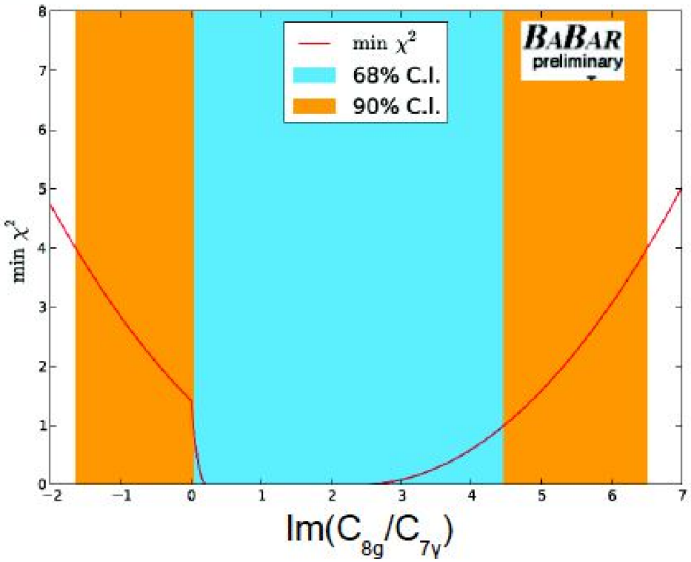
- Simultaneous fit to charged and neutral B samples:

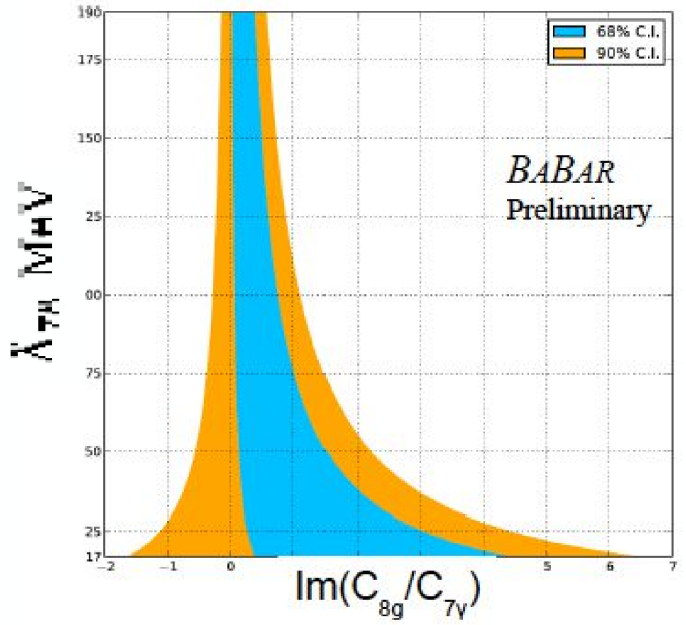
$$\Delta A_{CP} = +(5.0 \pm 3.9_{\rm stat} \pm 1.5_{\rm syst})\%$$

- Constraints on C_8:

$$0.07 \leq {\rm Im}\frac{C_8}{C_7} \leq 4.48, \quad 68\%\ {\rm CL}$$

$$-1.64 \leq {\rm Im}\frac{C_8}{C_7} \leq 6.52, \quad 90\%\ {\rm CL}$$





J.Walsh, FPCP 2014

Inclusive $B \to X_s \ell^+ \ell^-$: B.R. and CP asymmetry

$B \to X_s l^+ l^-$: Results [arXiv:1312.5364, accepted by PRL]

J.Walsh, FPCP 2014

- Most precise SM calculations done for two q^2 regions, our q^2_0 and q^2_5

SM theory — this measurement (10^{-6})

$1 < q^2 < 6\ \mathrm{GeV}^2$

$\mathcal{B}(B \to X_s \mu^+ \mu^-) = (1.59 \pm 0.11) \times 10^{-6}$

$\mathcal{B}(B \to X_s e^+ e^-) = (1.64 \pm 0.11) \times 10^{-6}$

[Huber, Hurth, Lunghi, NP B 802, 40 (2008)]

$X_s \mu^+ \mu^- \quad 0.66^{+0.82+0.30}_{-0.76-0.24} \pm 0.07$

$X_s e^+ e^- \quad 1.93^{+0.47+0.21}_{-0.45-0.16} \pm 0.18$

$X_s \ell^+ \ell^- \quad 1.60^{+0.41+0.17}_{-0.39-0.13} \pm 0.18$

$q^2 > 14.2\ \mathrm{GeV}^2$

$\mathcal{B}(B \to X_s \mu^+ \mu^-)_{\mathrm{high}} = (0.25^{+0.07}_{-0.06}) \times 10^{-6}$

$X_s \mu^+ \mu^- \quad 0.60^{+0.31+0.05}_{-0.29-0.04} \pm 0.00$

$X_s e^+ e^- \quad 0.56^{+0.19+0.03}_{-0.18-0.03} \pm 0.00$

$X_s \ell^+ \ell^- \quad 0.57^{+0.16+0.03}_{-0.15-0.02} \pm 0.00$

- We have also measured A_{CP}, using the self-tagging modes.

$$A_{CP} \equiv \frac{\Gamma_{\bar{B}} - \Gamma_B}{\Gamma_{\bar{B}} + \Gamma_B} = 0.04 \pm 0.11 \pm 0.01$$

consistent with SM expectation

Stato della collaborazione (fine aprile 2014)

72 institutions in 13 countries

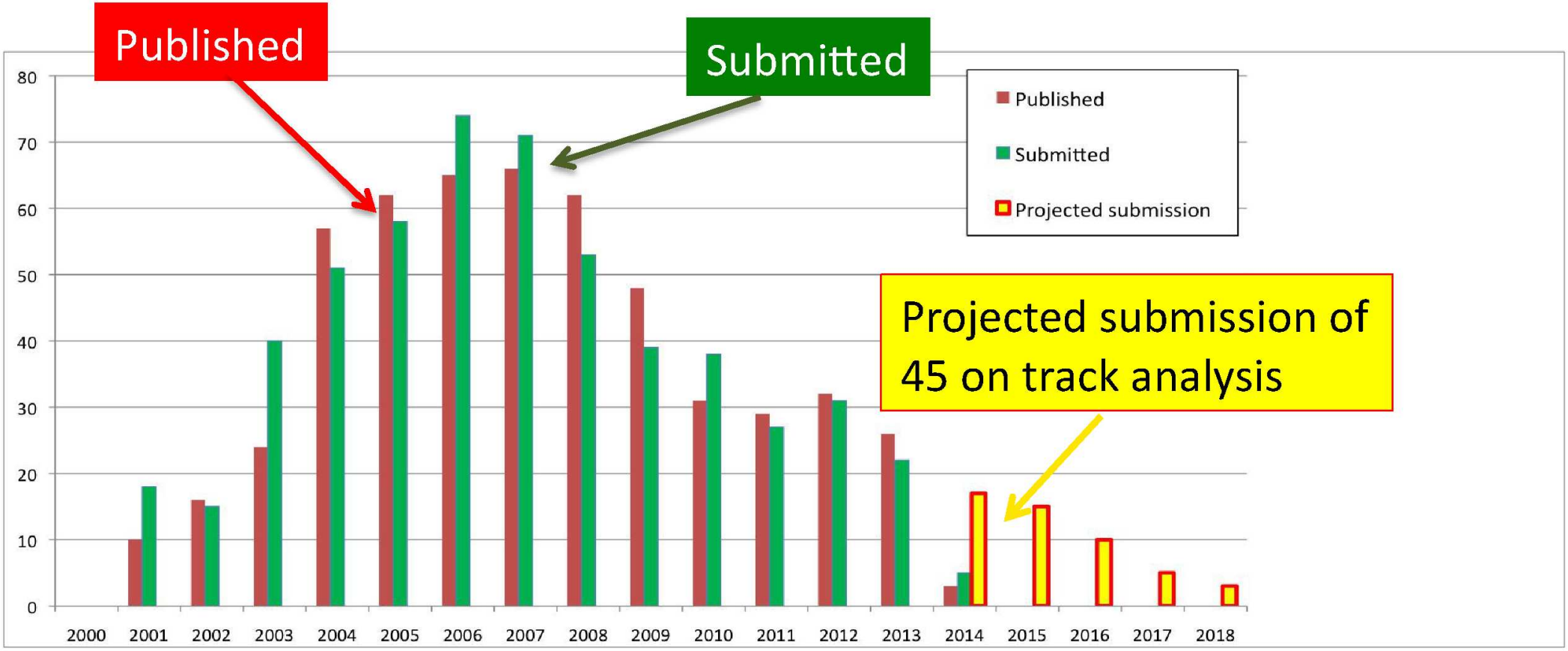
	Faculty & Staff	Postdocs	Grad Student	ALL	Student Assoc.
CANADA	8	4	8	20	4
FRANCE	21	1	3	25	3
GERMANY	10	3	7	20	4
INDIA	1			1	1
ISRAEL	1		3	4	
ITALY	50	7	5	62	5
NL	1			1	
NORWAY	2			2	
RUSSIA	9		1	10	1
SaudiArabia	1			1	
SPAIN	4			4	
UK	15	4		19	
USA	82	23	6	111	16
TOTAL	**205**	**42**	**33**	**280**	**34**
cf Dec 2013	210	44	33	287	35
cf May 2013	203	47	39	289	35
cf Jan 2013	219	51	56	325	37
cf May 2012	219	51	56	326	30

Since 1 May 2013

8 People joined BaBar as Associates:
- **1 PhD Staff**
- **1 Postdoc**
- **1 Graduate Students**
- **5 Undergraduates**

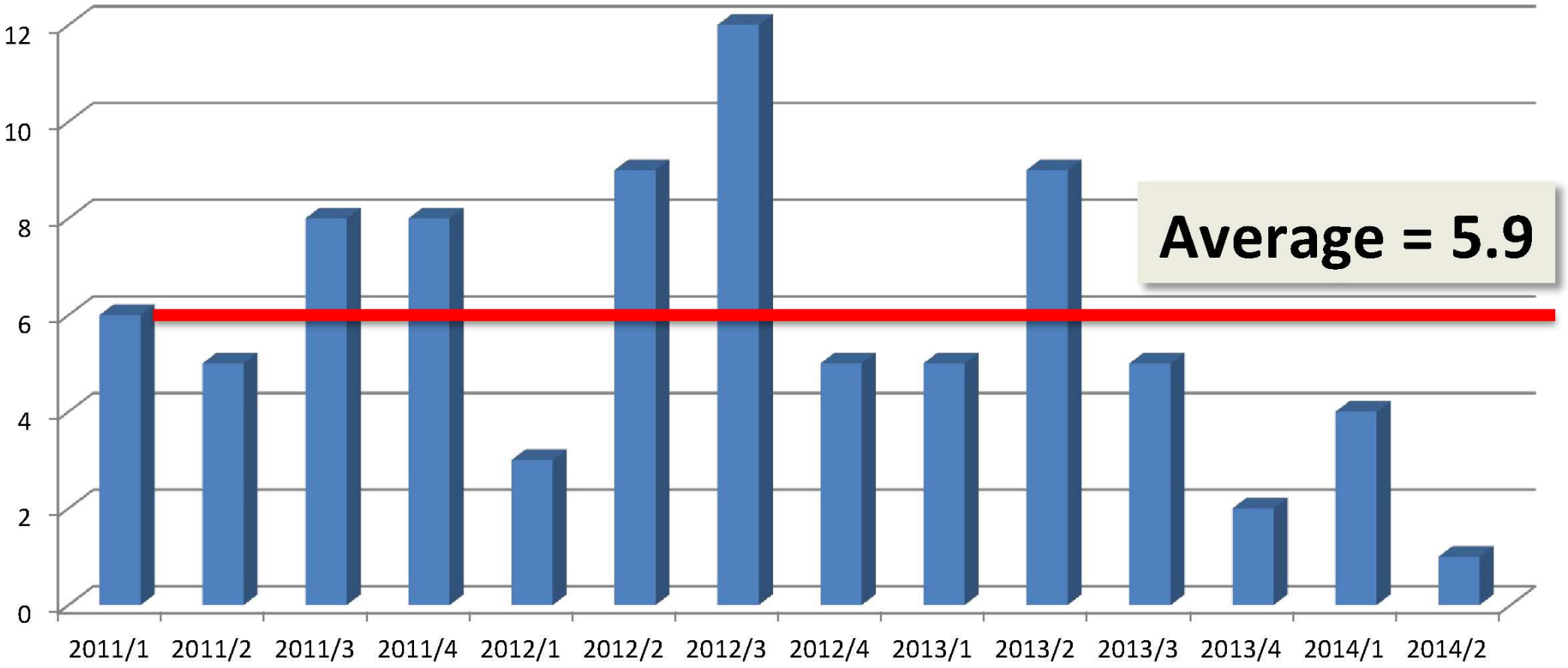
7 people joined BaBar as Members:
- **1 PhD Staff**
- **5 PostDocs**
- **1 Faculty**

Pubblicazioni (fine aprile 2014)



- warning: for 2014 only 4 oout of 12 months are reported
- ~45 analyses on track for publication
- ~25 analyses with uncertain future

Pubblicazioni per trimestre: in modesta diminuzione



Altre attività della collaborazione negli ultimi 12 mesi

- pubblicato "**The Physics of the B Factories**" (arXiv:1406.6311 [hep-ex], 928 pagine)
  - J.Walsh, section editor in "Radiative and electroweak penguin decays"
  - A.L., section editor in "Tau Physics"
- **LTDA** (Long Term Data Analysis) in operation
- *BABAR* ha promosso e collabora su **DPHEP**
  (ICFA Study Group on Data Preservation and Long Term Analysis in High Energy Physics)

Personale e percentuali *BABAR* 2014 → 2015

		2014	2015	
1	C.Angelini	50%	0%	p.o.
2	G.Casarosa	40%	0%	ass.ric.
3	M.Giorgi	50%	50%	p.o.
4	A.Lusiani	70%	30%	ric.
5	B.Oberhof	100%	0%	→ Frascati
6	L.A.Perez	50%	0%	→ IPHC - CNRS Strasbourg
7	G.Triggiani	20%	20%	p.a.
8	J.Walsh	30%	20%	primo ric.
	FTE fisici	3.6	0.7	
	FTE tecnologi dalla sezione	0.0	0.0	
	Totale FTE	**3.6**	**0.7**	

BABAR Pisa, richieste 2015

finanziamenti per riunioni di collaborazione e un livello base di attività

Richieste	k€
missioni interne 1.4 kE * 0.7 FTE	0.98
missioni estere 1.0 m.u. * 0.7 FTE * 5.40 kE	3.78
totale missioni	4.76
consumi 1.5 kE * 0.7 FTE	1.05
materiale inventariabile	0.00

nessuna specifica richiesta di servizi di sezione