

B2TIP

Guglielmo De Nardo

Università di Napoli Federico II e INFN

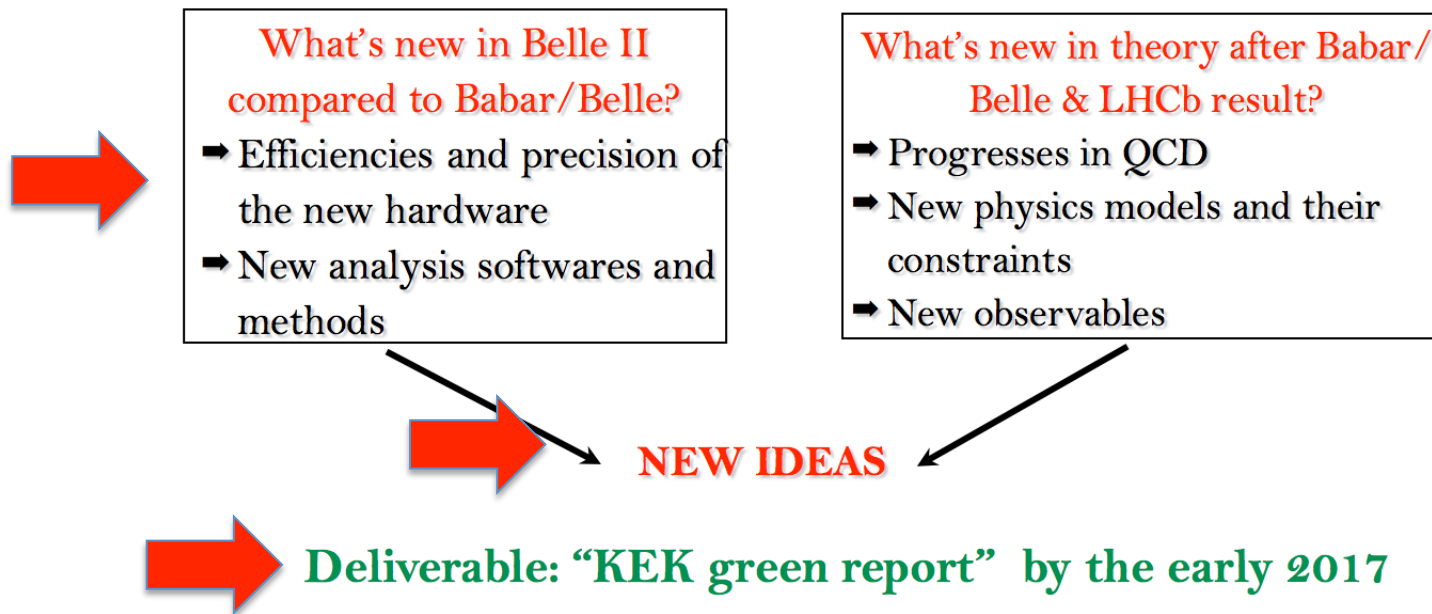
*Emi Kou intro talk
@Cracovia workshop
27 Aprile 2015*

Why B2TiP

See details on the slide at the kickoff meeting:

<http://kds.kek.jp/getFile.py/access?contribId=14&sessionId=0&resId=0&materialId=slides&confId=15226>

KEK where Belle II is hosted is the natural **gathering point** where flavour physics experts meet to discuss and develop topics of flavour physics for Belle II.



9 working groups

See details on the B2TiP website

<https://belle2.cc.kek.jp/~twiki/bin/view/Public/B2TiP>

WG1	G. De Nardo, A. Zupanic, M. Tanaka, F. Tackmann, A. Kronfeld
WG2	A. Ishikawa, J. Yamaoka, U. Haisch, T. Feldmann
WG3	T. Higuchi, L. Li Gioi, J. Zupan, S. Mishima
WG4	J. Libby, Y. Grossman, M. Blanke
WG5	P. Goldenzweig, M. Beneke, C.-W. Chiang, S. Sharpe
WG6	G. Casarosa, A. Schwartz, A. Kagan, A. Petrov
WG7	Ch.Hanhart, R.Mizuk, R.Mussa, C.Shen, Y.Kiyo, A.Polosa, S.Prelovsek
WG8	K. Hayasaka, T. Feber, E. Passemar, J. Hisano
WGNP	R.Itoh, F.Bernlochner, Y.Sato, U.Nierste, L.Silvestrini, J.Kamenik, V.Lubicz

I: Leptonic/Semi-leptonic II: Radiative/Electroweak III: $\phi_1(\text{beta})/\phi_2(\text{alpha})$ IV: $\phi_3(\text{gamma})$
V: Charmless/hadronic B decays VI: Charm VII: Quarkonium(like) VIII: Tau & low multiplicity NP: New Physics

Workshop schedule

To receive information, subscribe to the mailing list b2tip@... send an e-mail to Ph.Urquijo



Comments on the schedule

- ✓ While Belle II start up will delay, we will follow our original schedule, i.e. completing the report by the early 2017.
- ✓ Between completion of report and before Belle II start-up, new LHC results may impact Belle II physics case. For this, we will plan a “second edition/revised version” of the report. Format/procedure is under discussion.

Scope of the program and report

Benchmark measurements can be considered at various luminosity milestones: all to maximise the physics output at each stage.

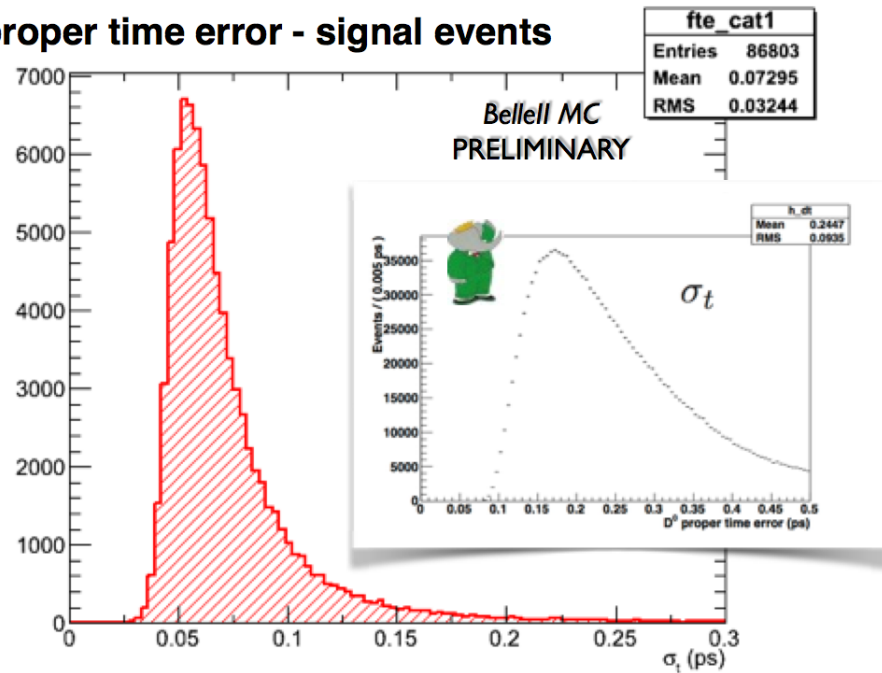
- **First ab^{-1}** . This would potentially be a mixture of samples at different centre of mass energies. Unique samples at $Y(3S)$ and energy scans would complement the main $Y(4S)$ program. ***Not all groups will be able to utilise $O(1 ab^{-1})$***
- **5 -10 ab^{-1}** . This intermediate sample size is 1 order of magnitude greater than Belle. Various anomalies in Belle, Babar (&LHCb) data could be addressed with such a sample. We will have the capacity to simulate up to $O(5 ab^{-1})$ prior to data taking for sensitivity studies.
- **50 ab^{-1}** . The reach of the full sample is the reason for Belle II. It is crucial we explore expectations for the full sample, although it will be difficult to fully simulate the 50 ab^{-1} for feasibility studies. Therefore they will be reliant on extrapolations

Tentative Outline

1. Introduction & scope of the report.
2. Detector and **Reconstruction** Performance of Belle II (common input for projections) → next slide
3. Analysis **Algorithms** (common input)
4. **WG chapters** x 8 (WG 1 — 8)
 - Authors of each section — contributions from non-convenors are fine. Discuss in your group
 - Highlights of the WG.
 - Physics phases
 - a.) First physics ideas {theory, experiment} e.g. dark sector, exotic quarkonia-like.
 - b.) Golden modes: Anomalies to study in the first $5ab^{-1}$ {theory, experiment}, e.g. $B \rightarrow D^* \tau \nu$.
 - c.) Golden modes: Long term goals {theory, experiment}, e.g. $B \rightarrow K \nu \nu$.
 - Extrapolations (depending on difficulty, there are two options)
 - Extrapolation from Belle and Babar results
 - Simulation based extrapolation (either full analysis, or partial - see 2) & 3))
5. New physics and global analyses
 - Models
 - Code & Studies
6. Summary of recommendations for First physics (first year), and first $5ab^{-1}$ plans (What fraction at $Y(4S)$?)
7. Roadmap for Belle II analysis
8. Summaries

Belle II Full Simulation Analysis

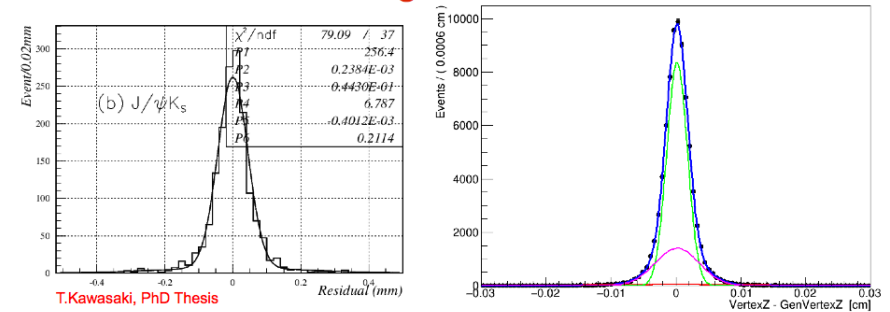
proper time error - signal events



WG6: G. Casarosa, D0 proper time resolution

WG3: L. Ligioli, Time dependent CPV in B decays

Vertexing: Breco side



Belle
 • Shift = 0.2 μm
 • Resolution = 63 μm

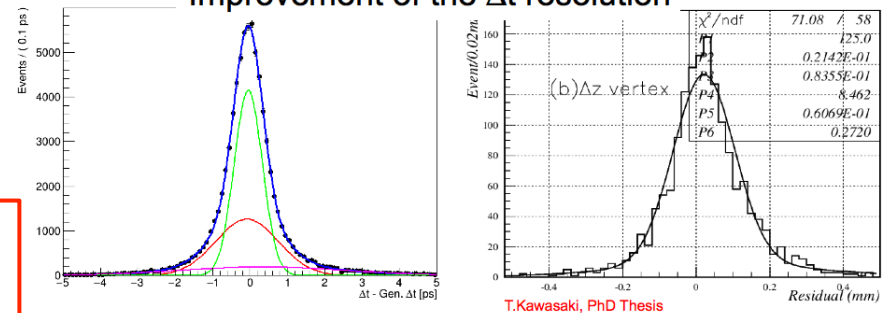
Belle II
 • Shift = 1.9 μm
 • Resolution = 23 μm

- improvement in the computation of σ_t w.r.t. B_{ABAR} (plot in the box)
 - average $\sigma_t = 0.07$ ps VS 0.25 ps for B_{ABAR}
 - RMS $\sigma_t = 0.03$ ps VS 0.09 ps for B_{ABAR}

...oltre le estrapolazioni e le ipotesi ragionevoli

Studi con Belle II Full MC presentati al B2TiP workshop

Improvement of the Δt resolution



Belle II
 • Shift = -0.004 ps
 • Resolution = 0.79 ps

Belle
 • Shift = 0.2 ps
 • Resolution = 0.92 ps

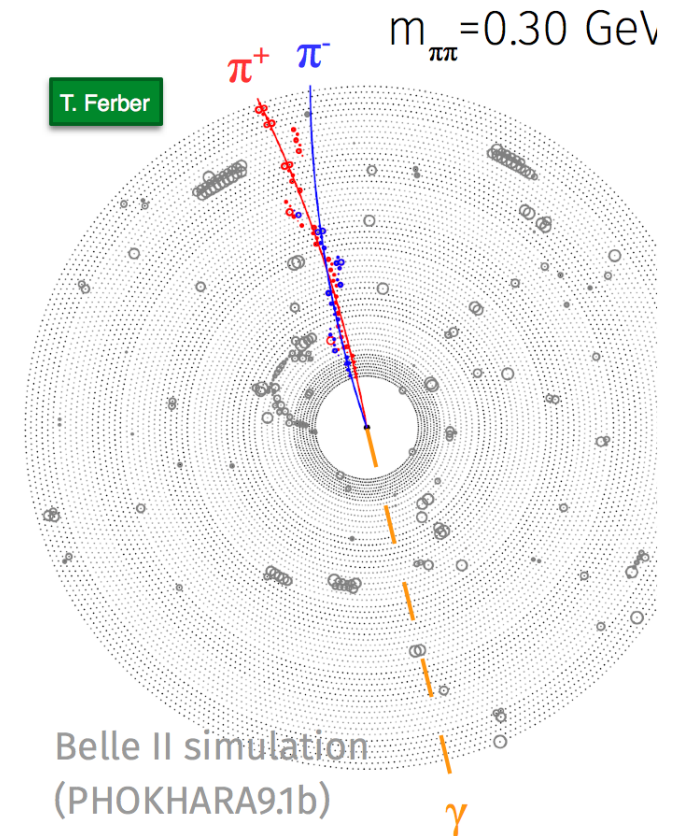
Belle II MC

a) * Most Belle II performance improvements can be determined from signal MC. Reconstruction algorithms are maturing fast. Some are already reliable, e.g. IP/vertex resolution. We aim to set benchmarks for most key input by late 2015.

b) Full reconstruction studies will use a shortcut: generator skimmed events - simulate 10x less.

b) Full simulation work on Generic MC pushes ahead: large computing effort.

1. $O(300 \text{ fb}^{-1})$ June 2015 {B, D, τ , low-multi.}
2. 1 ab^{-1} Late 2015 \rightarrow Basis for most extrapolations used in the report.
3. 5 ab^{-1} 2016.



Future workshops & meetings

- **To assist organisation & convergence** Dedicated WG video conf. meetings to be organised over the coming 2 months.
- B2TiP & KEK-FF Workshop, **KEK**, 26 – 29 October **2015 (To Be Confirmed)**
 - BGM 15–16 Oct. & B2GM 19–23 Oct.
- WG8 τ Workshop, **Nagoya**, September **2015 (To Be Confirmed)**
- B2TiP Workshop, **USA**, April-May **2016**
- B2TiP Report Meeting, **Munich**, October-November **2016**

Conclusioni

- B2TIP è un network sperimentali-teorici per definire il programma di Fisica di Belle II
- *Deliverable* esplicito un report nel 2017
 - a la BaBar Physics Book
- Sono necessarie simulazioni dettagliate
 - La comunità degli sperimentali è chiamata a farsi parte attiva nell'analisi e lo sviluppo dei tool
 - e nell' editing delle specifiche sezioni del report
 - E' possibile e conviene iniziare subito.