

# BEACH 2016: an overview (of sorts)

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**Abstract.** A brief history of the conference series and its contemporary context are presented.

## 1. Introduction

The first *Conference on Hyperons, Charm and Beauty Hadrons* met in Strasbourg, France, in September 1995, and was considered by attendees to have been a success. Many supported a continuing series of such conferences that would focus on hyperons and charm and beauty hadrons, distinct from existing heavy flavor meetings. A second conference was then held in Montreal, Canada, in August 1996. Subsequent editions of the conference, now known as BEACH, have been held biennially, with venues alternating between Europe and North America. George Mason University is happy to host this twelfth edition.

## 2. An “evolution” of topics

At the third edition in Genoa, Italy, in June - July 1998, the organizers already referred to BEACH’s plenary talks-only policy as a “tradition.” Topics covered included [1]

- CP violation in B decays
- Top physics
- Charmonium production and decay
- Heavy-quark effective theory
- Non-relativistic QCD
- Electroweak measurements; tests of the Standard Model
- Spectroscopy
- New detectors and related technologies

At our twelfth edition, we cover

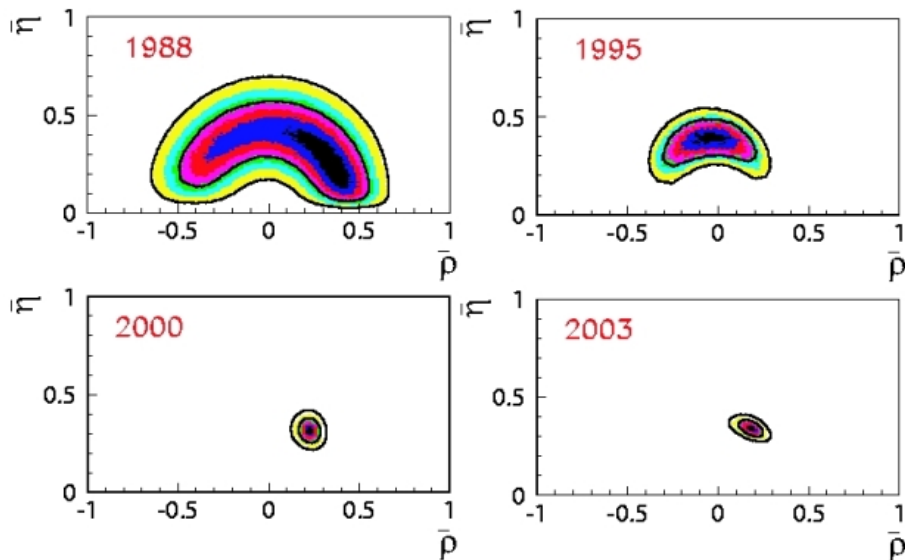
- Hadron production and decays
- Heavy quarks, quarkonium, and hyperons
- Electroweak measurements
- Neutrinos
- Symmetry violations

- Lattice and non-relativistic QCD
- Physics beyond the Standard Model
- New facilities and projects

### 3. The evolution of results

Because BEACH conference programs remain close to their origins, the conferences have documented the growth and maturation of its purview.

As an example, consider the Cabibbo-Kobayashi-Maskawa matrix unitarity triangle apex position [2] in terms of the Wolfenstein parameters,  $\bar{\eta}$  and  $\bar{\rho}$  [see Figure 1]. Thus, Nicola Cabibbo's presentation [3] of the latest fit result [see Figure 2] in his introductory overview of the sixth edition in Chicago, in July 2004, was subsequently updated [see Figure 3] by Jernej Kamenik's [4] of the eleventh edition in Birmingham, England, in July 2014.

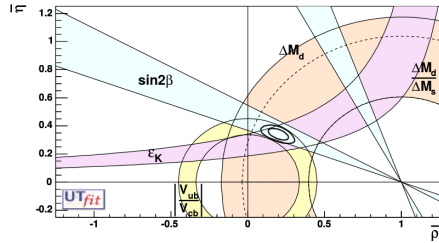


**Figure 1.** History of unitarity triangle apex, 1988 - 2003

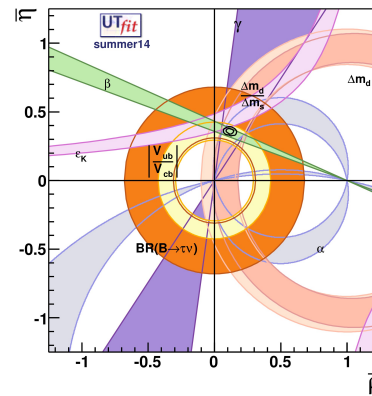
### 4. BEACH's place

In November - December 2011, the U.S. Department of Energy, Office of Science, sponsored a workshop [5] intended to make the case, at the dawn of the LHC era, for the continuing importance of a broad approach to what at that point had been called flavor physics. The workshop was called "Fundamental Physics at the Intensity Frontier." Six working groups—heavy quarks, charged leptons, neutrinos, photons, proton decay, and nucleons, nuclei, and atoms—were charged with elucidating "the full spectrum of Intensity Frontier physics" and identifying the facilities required to investigate it.

The heavy quark working group identified CP asymmetries, rare decays, and precision measurement of key distributions in the strange, charm, and bottom sector as its primary foci. The charged lepton group identified lepton flavor violation with muons and taus and  $g - 2$  as its foci. The neutrinos group identified lepton flavor violation with neutrino oscillations and double beta decay. The photons group, now dubbed the hidden sectors group, set its sights on new particles searches. The proton decay group vowed to keep looking for protons to decay, and



**Figure 2.** Unitarity triangle apex, 2004



**Figure 3.** Unitarity triangle apex, 2014

the nucleons and atoms group would search for electric dipole moments and make additional precision measurements of parity violation.

The program of this twelfth edition of the BEACH conferences, which addresses nearly every item on the Intensity Frontier’s “broad and diverse, yet connected, set of science opportunities,” shows that BEACH remains not just relevant, but central, to these endeavors.

Here, we see where we are and where we are going with respect to this science.

## References

- [1] Hyperons Conference (n.d) <https://www.ge.infn.it/hyperons98/>
- [2] *15 YEARS of  $(\rho - \eta)$  predictions* (n.d.) <http://www.utfit.org/foswiki/pub/UTfit/Old/ckm-history/ckm-history.html#15yearhisto>
- [3] *BEACH 2004 - An Introduction* (June 2004) <http://capp.iit.edu/beach04/talks/cabibbo.pdf>
- [4] *The Flavorful Road to New Physics* (July 2014) [http://indico.cern.ch/event/283978/contributions/648565/attachments/524082/722823/Kamenik\\_BEACH.2014\\_1.pdf](http://indico.cern.ch/event/283978/contributions/648565/attachments/524082/722823/Kamenik_BEACH.2014_1.pdf)
- [5] H Weertz, *et al Fundamental Physics at the Intensity Frontier* May 2012 <http://www.ipd.anl.gov/anlpubs/2012/06/73380.pdf>