Summary Talk

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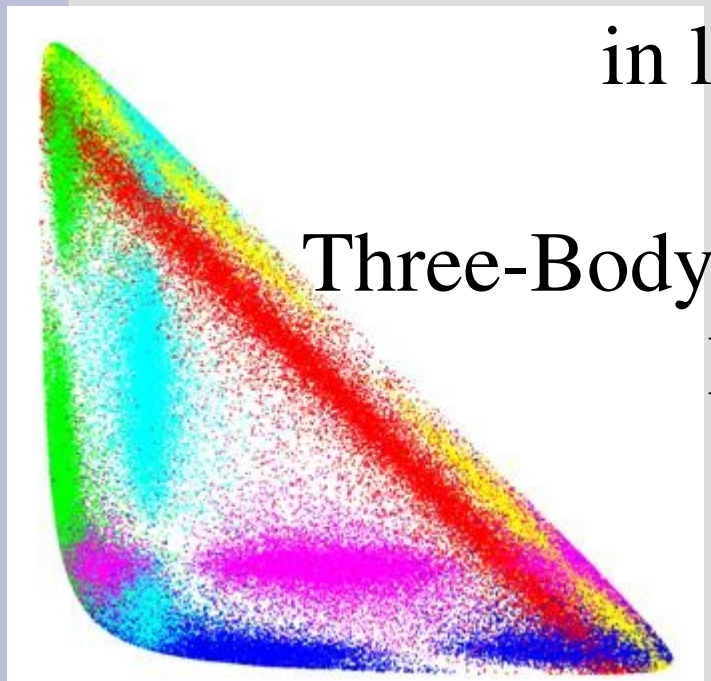
in lieu of Andreas Hoecker



Three-Body Charmless B Decays Workshop
Paris, February 2006

Disclaimer

- Probably, this is not much of a summary ...
- Many interesting talks
  - I cannot claim to have understood everything
  - but I have learned at least something
- I will present some interesting aspects of the w/s
- Apologies if I missed something important, or if my selection does not match yours

A Comment on “Old Physics”

- I will be happy if the physics we are studying continues to be so interesting in 20-30 years time

Focus of the workshop

- We focus on three body charmless B decays, and mostly three body hadronic charmless B decays

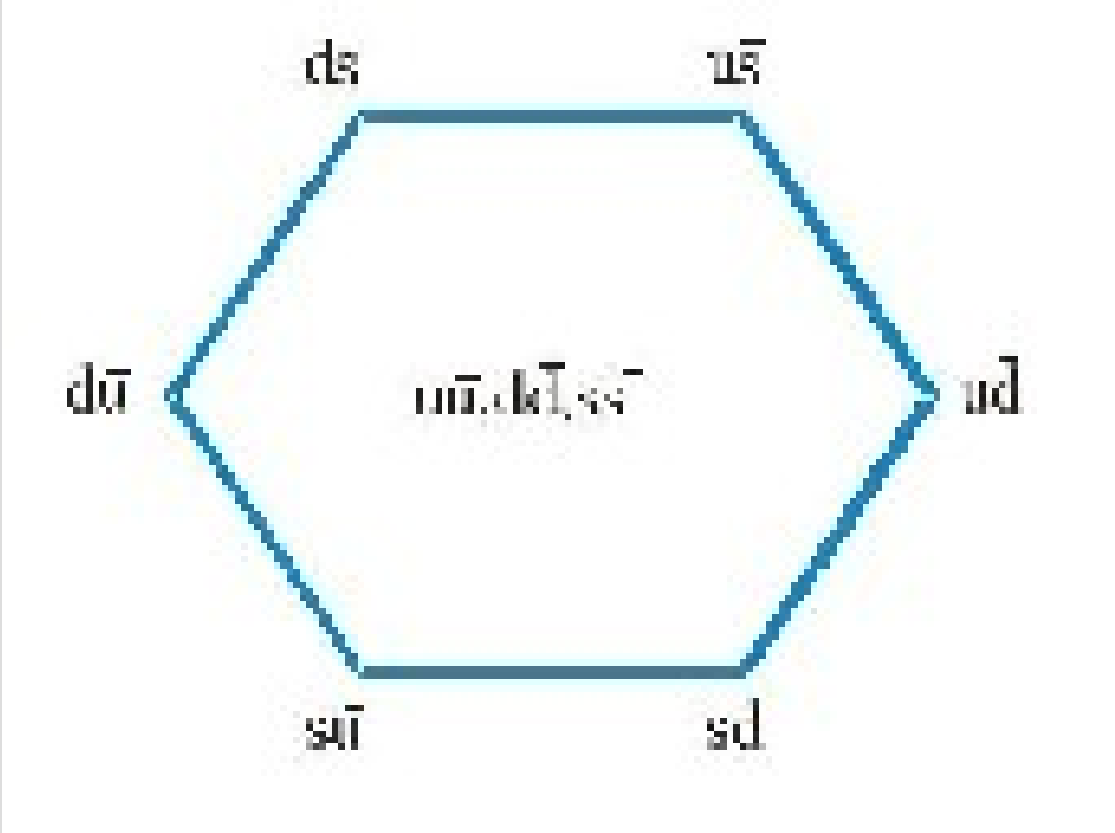
- Also touching on
  - semileptonic decays
  - radiative decays
  - charm and charmonium decays
  - scattering processes
  - etc, ...

Why Do We Need Three Body Decays?

- We have not succeeded to answer all questions about CKM and heavy quark theory with two body decays
- Three body decays allow additional observables
- Some progress already experimentally, and also (very recently) theoretically
- Also can address some open questions in hadronic physics

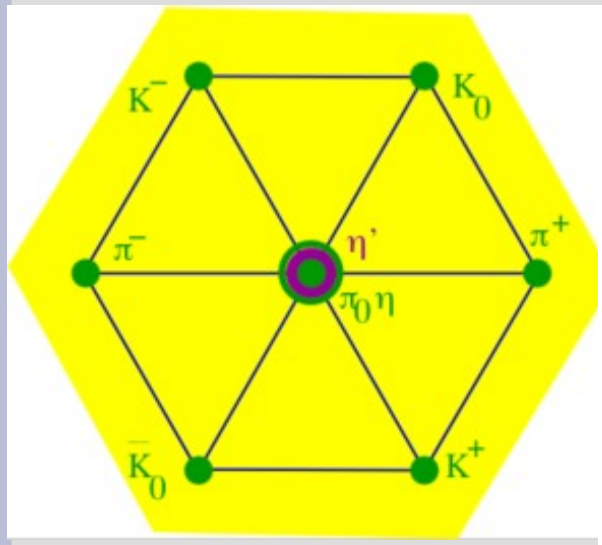
The Quark Model

Meson nonet - flavour SU(3)

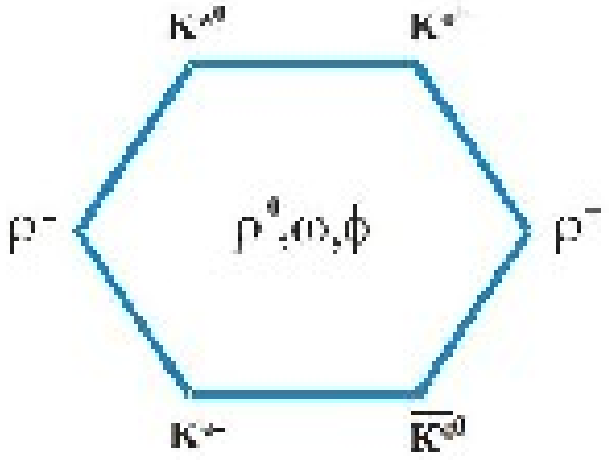


“Natural” quantum numbers

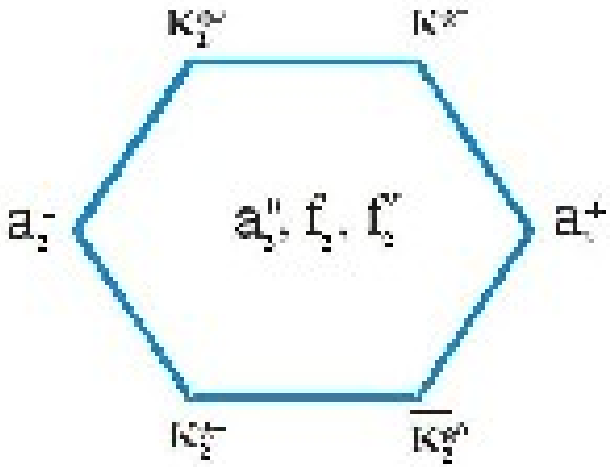
Pseudoscalars



Vectors



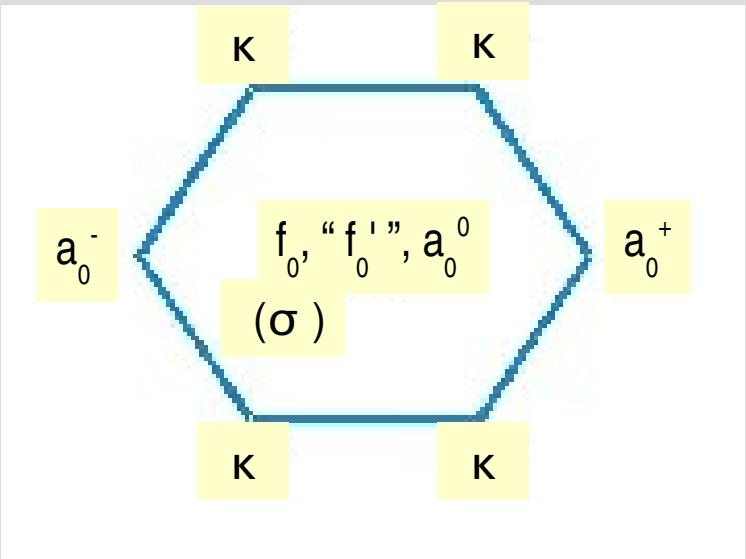
Tensors



J^P	0^-	1^-	2^-
masses/MeV	135-958	770-1020	1270-1525
widths/MeV	-	4-150	70-180

The Scalar Sector

$J^P = 0^+$ is also possible in QCD



widths >~ O(100 MeV)

- Easy (?) to identify a_0 isovector as $a_0(980)$
- If $f_0(980)$ has large ss component, tempting to identify it as " f_0 ' "
  - there should (?) be a lower lying (?) isoscalar f_0 ($=\sigma$)
- Lowest "well-identified" kaonic scalar is $K_0^*(1430)$
  - mass too high to fit into this scheme?

Problems in the scalar sector

- Other states are also possible in QCD
  - gluonia
  - four quark states (diquark – antidiquark)
  - hybrids
  - other exotic possibilities
- What, and where, if they exist, are the σ and κ?
- How can we interpret extremely broad structures?
- (Axial-vector sector OK?)

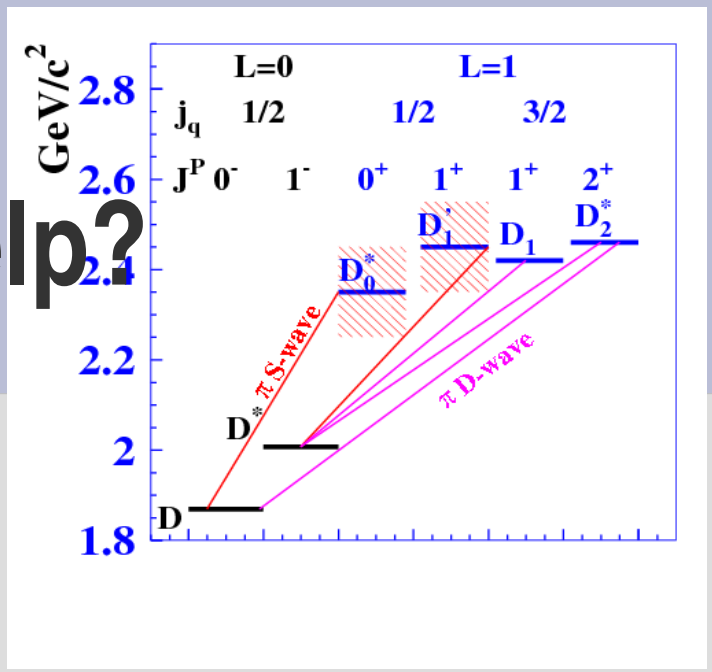
What is a resonance ?

- a bump or a dip
- a would-be bound-state
- a Breit-Wigner
- a relativistic Breit-Wigner
- a pole

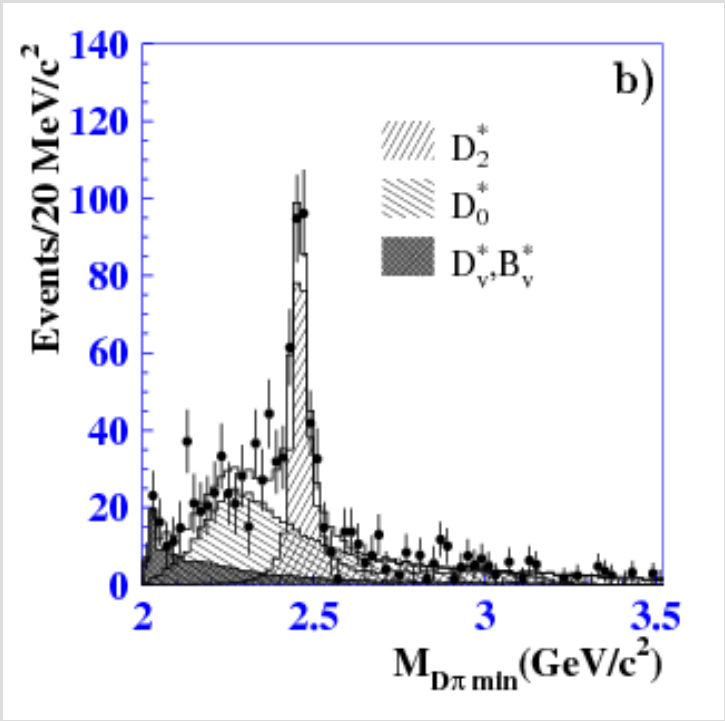
How can we treat them?

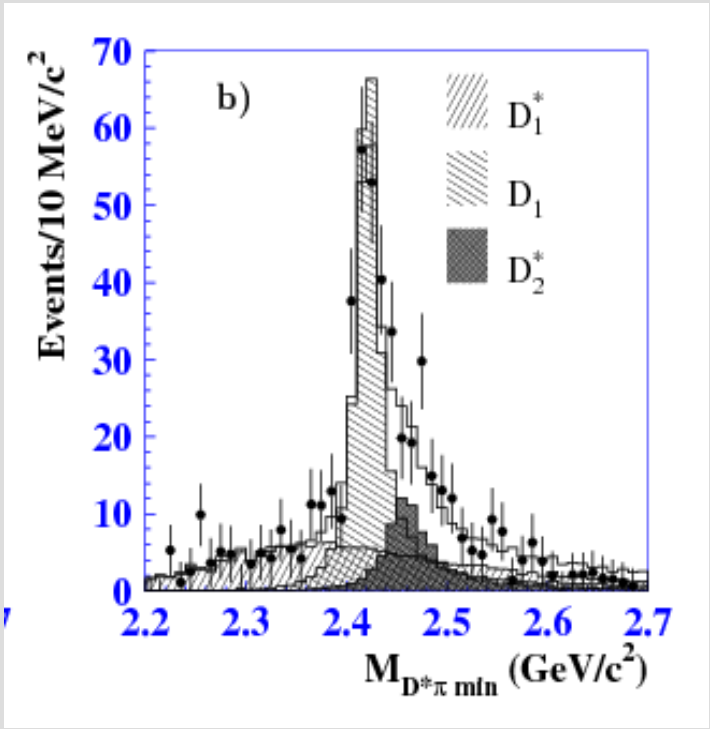
- Isobar model
  - problems with unitarity for overlapping resonances
- Coupled channel (Flatte)
- K-matrix
- GDA
- ...

Can B Factory Help?



- YES!
  - Example from charmed B decays
  - Belle, PRD 69 (2004) 112002





Watson's Theorem

- Allows us to relate spectra from various different processes
  - various hadronic B decays
  - various hadronic D decays
  - radiative B decays
  - semileptonic B and D decays
  - charmonia decays (ISR or 2γ processes)
  - low energy scattering

MOSTLY AVAILABLE AT B FACTORIES

- Limits to validity
  - elastic regime
  - other bodies in final state factorize (good for γ or lν)

Relevance of LASS Results to B-Factory Analyses (?)

YES!

Bill Dunwoodie (SLAC)

For the LASS Collaboration: SLAC – Nagoya – Cincinnati – INS Tokyo
(Cal. Tech – Johns Hopkins – Carleton)

LASS BaBar refugees:

David Leith, Blair Ratcliff, Dave Aston, Jaroslav Va'vra, WMD (SLAC),
Brian Meadows (Cincinnati)

Workshop on 3-Body Charmless B Decays

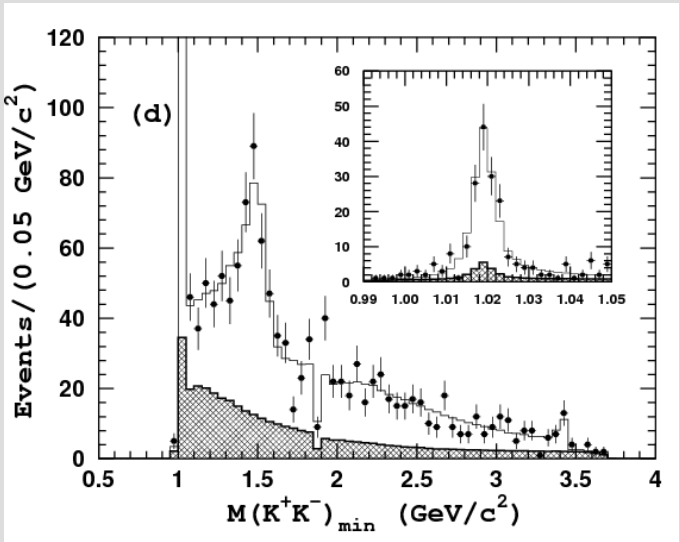
LPHNE, Paris Feb. 1-3, 2006

B decay phase space

- B mesons heavy compared to light mesons
  - Dalitz plots are large
  - invariant masses go up to ~ 5 GeV
    - “well understood” region up to ~ 2 GeV?

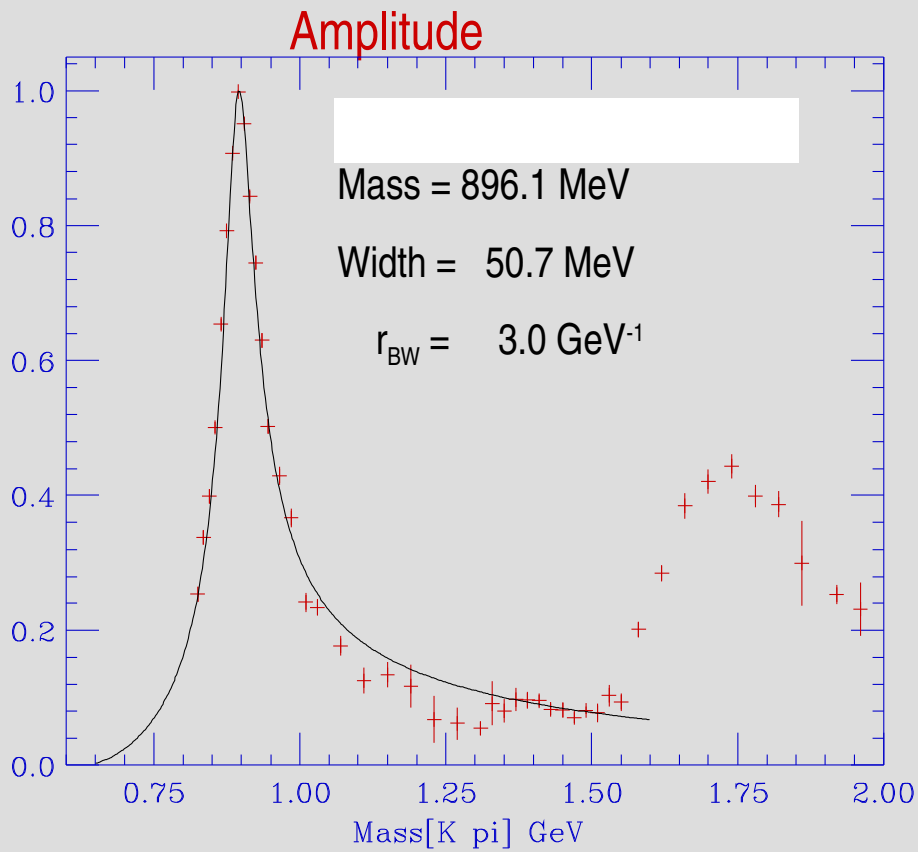
- Are there any events in the middle of the DP?
  - Yes, sometimes
  - How can we understand them?

$B^+ \rightarrow K^+K^+K^-$

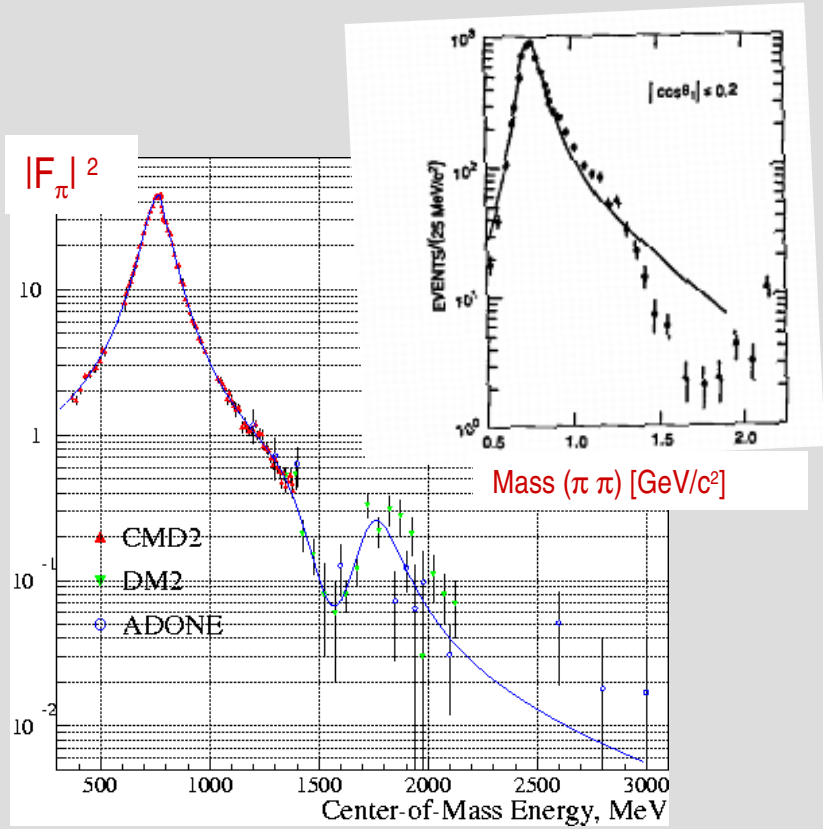


Description at “High” Invariant Masses

Kπ P-wave



ππ P-wave



How Do We Proceed?

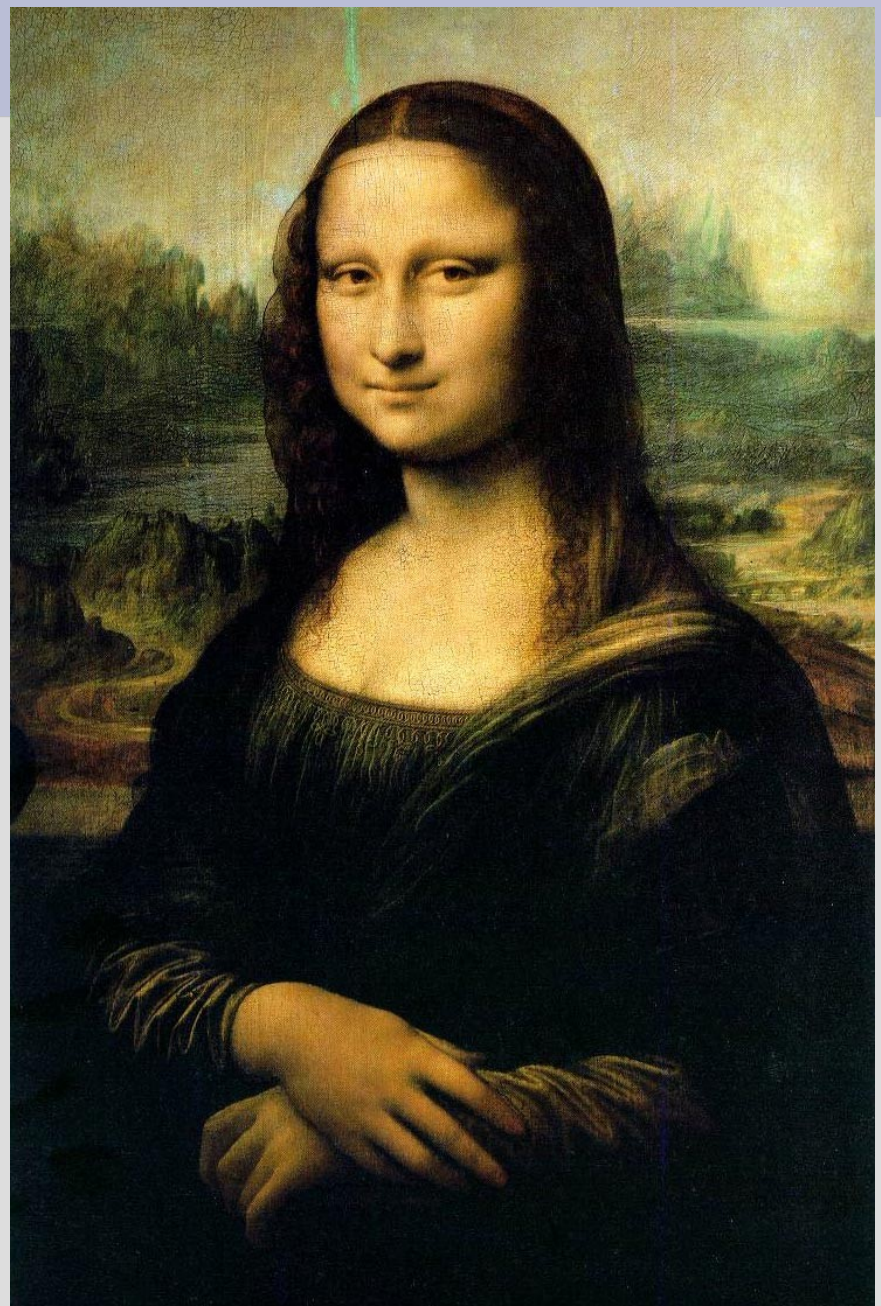
- No Dalitz plot is an island
  - results from each interplay with each other
  - resonances can decay to different final states
- Communication is essential
  - between different analysts
  - different subgroups within an experiment
  - different experiments
  - experiment and theorists
- Small workshops like this are ideal for this purpose!

The Message

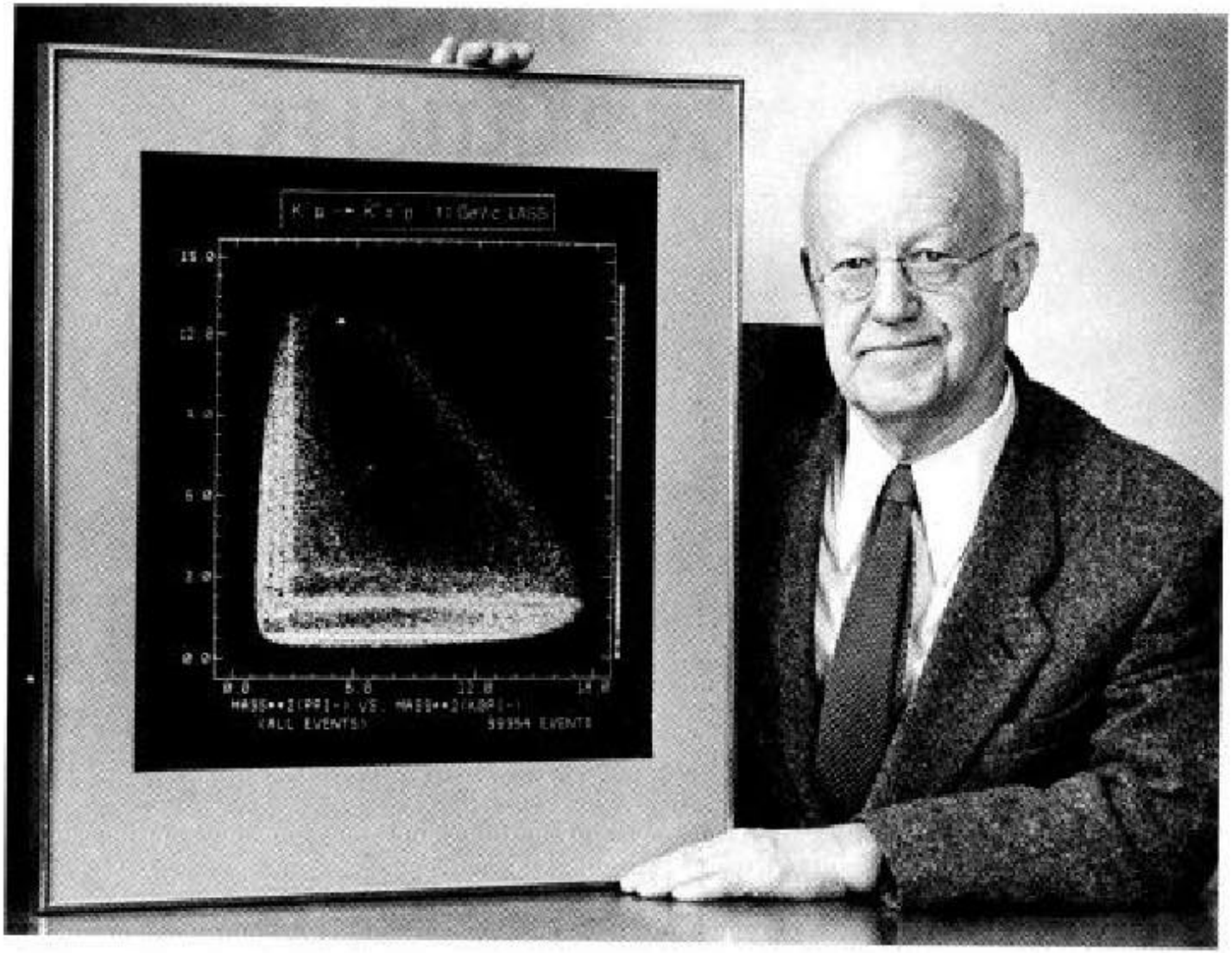
Try to look beyond a single channel ...

The Message

The bigger picture is much more beautiful!



Let's thank the organisers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