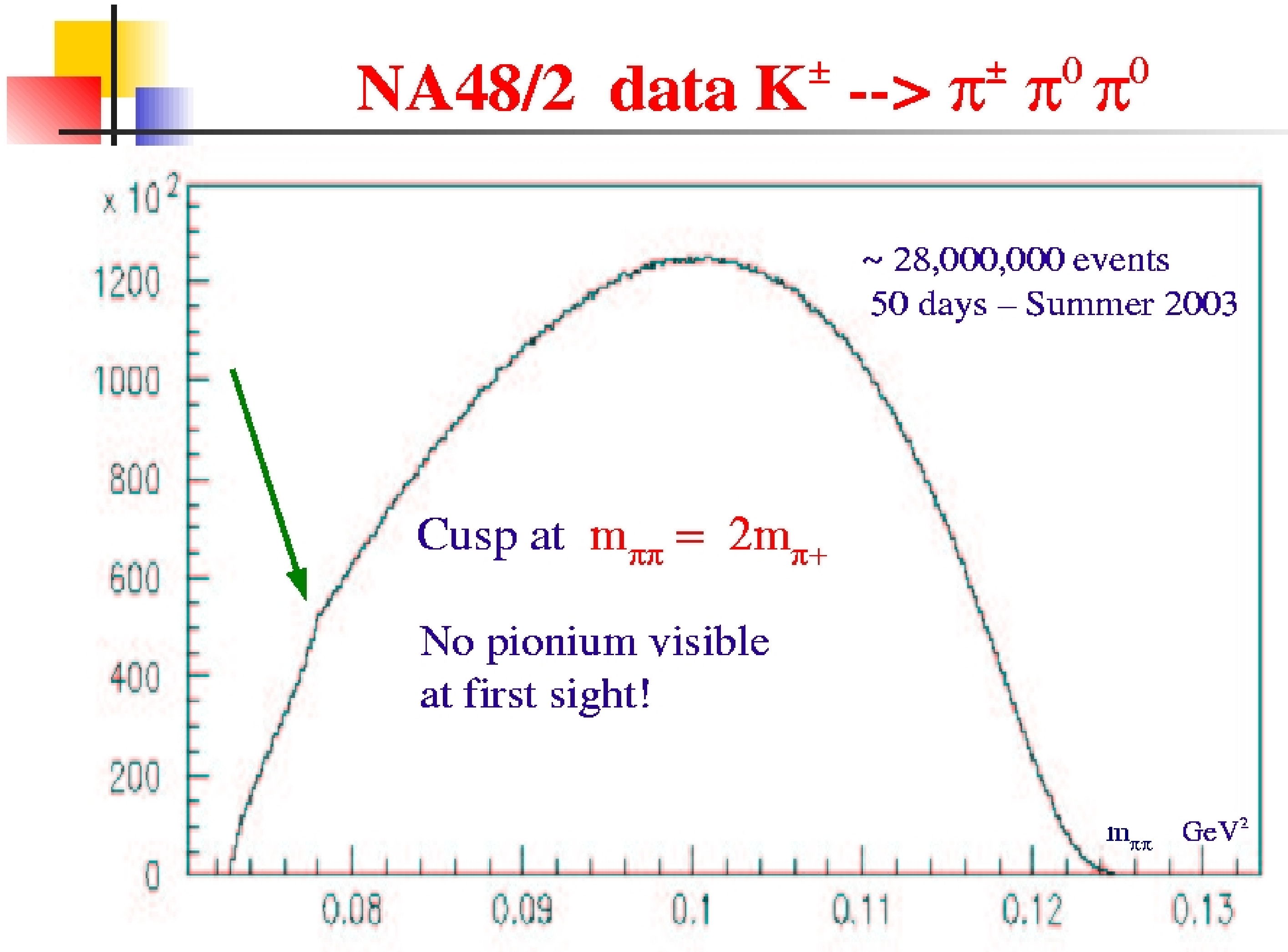
Scientifc & personal recollections about Nicola Cabibbo

My scientific collaboration with Nicola started in 2004, when he spent a sabatical year at CERN, joining the NA48 collaboration.

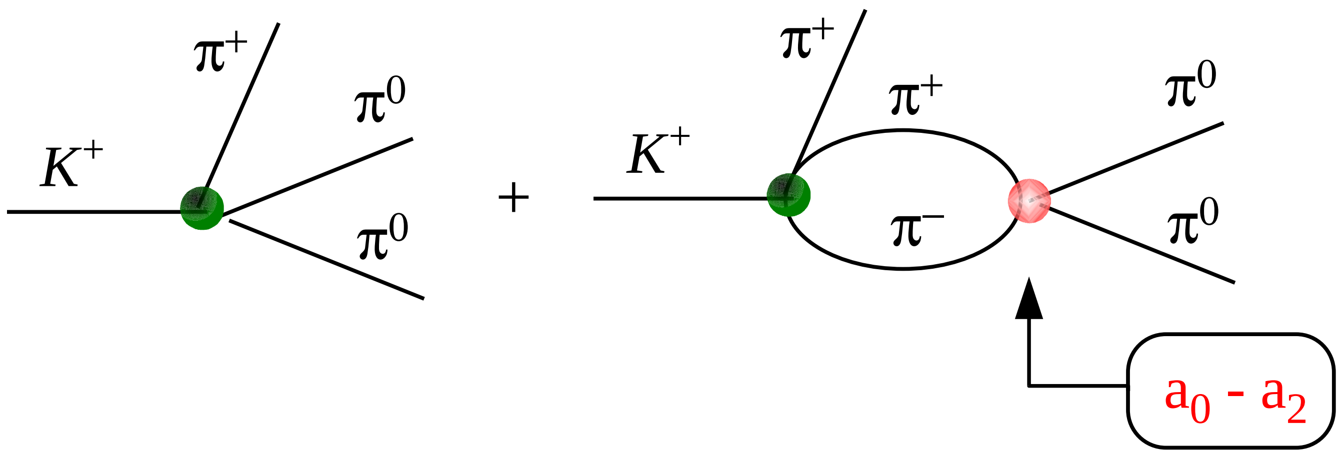
In that period, the high resolution of the NA48/2 experiment has allowed to observe, for the first time, the subtle phenomenon of the cusp effect in K decays:



I. Mannelli,
CERN March '05

As soon as he saw these data, Nicola understood the origin of this discontinuity in term of a re-scattering effect, and that this effect could be used to determine $\pi\pi$–phase shifts at threshold with high precision $\Rightarrow$ key test of the QCD vacuum

Cabibbo, PRL '04



or $\pi^+\pi^- \to \pi^0\pi^0$ at threshold

What Nicola liked most of this effect is that it is a *simple* explanation and, potentially, a very clean way to access $\pi\pi$ phase shifts (much simpler than K_{l4} or the pionium decay, where "tedious" radiative corrections are very important)

However, it was also clear that a bit more effort was needed to reach a precise description of this effect beyond the effective one-loop level of his first work.

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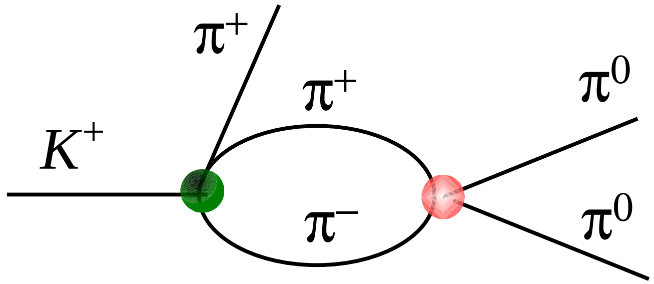

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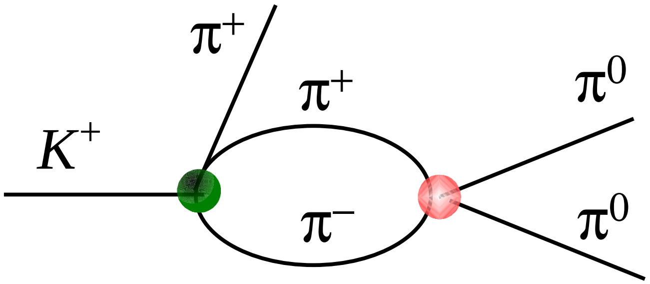


It was also quite boring... and we couldn't compete with the "Bern-Bonn army" on this ground... But we found a clever way to solve/circumvent the problem:

- systematic expansion in powers of the a_I of the amplitudes (beyond one-loop) in order to determine only the coefficient of the singularity

$\Rightarrow$ Ad-hoc effective-theory construction which maximize the available experimental info on $K \to 3\pi$ and use only:

Cabibbo & Isidori, JHEP '05

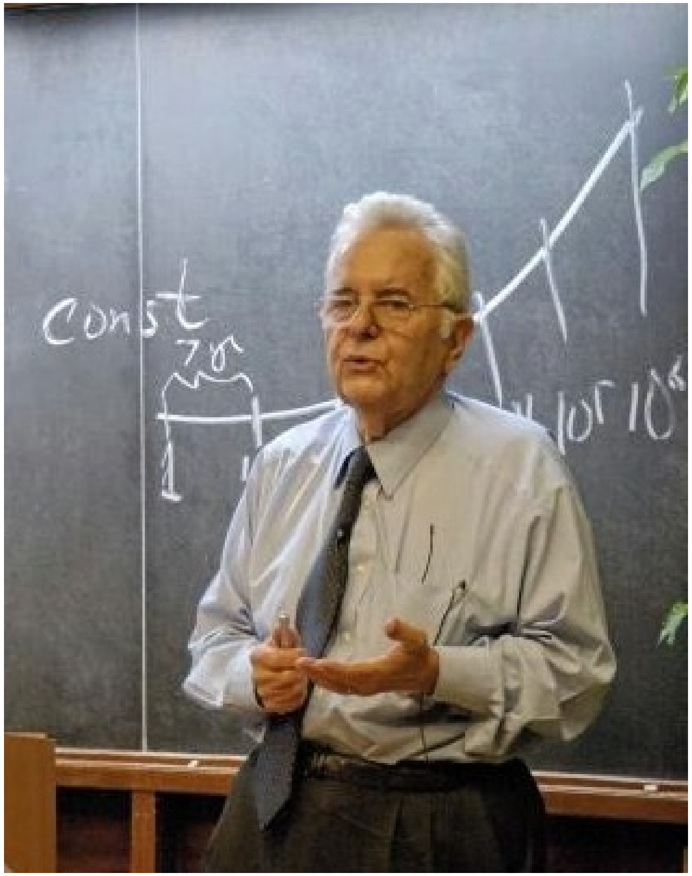
- Unitarity & analyticity
- Smallness of the a_I
- Smallness of $v_{\pi\pi} = (s-s_0)^{1/2}$

$$T(s) = A(s) + B(s)\,(s-s_0)^{1/2}$$

A(s) & B(s) regular around s_0

The full data analysis of NA48/2, published in 2009, has demonstarted the validity of our approach (*determination of* $\pi\pi$ *phase shifts, in perfect agreement with CHPT predictions, within 2-3% error*)

What I will never forget of this collaboration is the love of Nicola for solving problems, for explaining real data in physics and, most important, his "*research toward simplicity*" in the description of physical phenomena.



Grazie Nicola !