# Colour and Flavour Physics Group

## at the Valencia node

### Group Members

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### Ongoing projects

- Form factors of QCD currents
  - Hadron $\tau$ decays : $\tau^- \to (3P)^- \nu_\tau$
  - Hadronic cross section from $e^+e^-$ annihilation in the resonance region
  - Scalar form factor within the Resonance Chiral Theory
  - $\mathcal{O}(p^6)$ low energy constants and $1/N_C$ expansion

## ... still more projects

- Non-leptonic kaon decays

  - Isospin breaking in $K \to \pi\pi$ decays
    (Coll. with Wien node)

  - Electroweak penguins in $K \to \pi\pi$ decays : the dispersive approach
    (Coll. with UMASS and Toronto)

  - $\varepsilon'/\varepsilon$
    (Coll. with Berna and Trieste)

- Electromagnectic effects in semileptonic meson decays

  - Radiative corrections to $K_{\ell 3}$ and $\pi_{\ell 3}$ decays and determination of $|V_{us}|$ and $|V_{ud}|$
    (Coll. with Wien & Marseille nodes and PSI)

- Quark masses

  - Charm and Bottom quark masses within QCD sum rules

  - Strange quark mass from $e^+e^-$ and $\tau$ decay data
    (Coll. with Granada subnode)

## ... and more

- Lattice
  - Lattice determination of weak matrix elements
  - Finite size effects and chiral symmetry on the lattice
    (Coll. with Marseille node)

- B and D physics
  - Semileptonic processes : form factors
  - Non-leptonic processes
  - CP-violation

# HADRONIC AND NUCLEAR THEORY GROUP

Members

E. Oset, M.J. Vicente, J.A. Oller, J.R. Pelaez, J. E. Palomar, D. Cabrera, L. Roca, M. Doering, Li Qiang Bing, Jaivir Singh

– Dynamical generation of baryon resonances.

Using chiral Lagrangians for meson baryon interaction and techniques of unitarized chiral perturbation theory one nonet of dynamically generated resonances is obtained

$N^*(1535)$, $\Lambda(1405)$, $\Lambda(1670)$, $\Sigma(1620)$, $\Xi(1620)$

Recently a second octet has been found with the most spectacular thing the realization that the $\Lambda(1405)$ corresponds actually to two resonances.

– Chiral Lagrangians and VMD in $V \to PP\gamma$

$\rho \to \pi^0\pi^0\gamma,\ \rho \to \pi^0\eta\gamma,$

$\omega \to \pi^0\pi^0\gamma,\ \omega \to \pi^0\eta\gamma,$

$\phi \to \pi^0\pi^0\gamma,\ \phi \to \pi^0\eta\gamma,$

– $\sigma$ meson in the nuclear medium seen through the $(\gamma, \pi^0\pi^0)$ reaction in nuclei.

– Chiral dynamics of p-waves in $K^-p$ scattering.

– $\eta \rightarrow \gamma\gamma\pi^0$ reaction.

Improvements on the work of Ametller, Bijnens, Bramon, Cornet.

Sequential VMD terms considered, tuned to the VM radiative decay data of 2002
Contribution of $a_0(980)$ calculated with unitarized chiral perturbation theory
Extra loops considered
Consistency with $\gamma\gamma \rightarrow \pi^0\eta$ implemented

– Decays of $J/\Psi$ with VMD and unitarized chiral perturbation theory

$\phi\pi\pi$, $\omega\pi\pi$, $\rho\pi\eta$, $\phi K\bar{K}$ ....