Chiral loops and VMD in the $V \to PP\gamma$ decays

J. E. Palomar[a], S. Hirenzaki[b], E. Oset[a]

[a] *Departamento de Física Teórica e IFIC, Centro Mixto Universidad de Valencia-CSIC, 46100 Burjassot (Valencia), Spain*
[b] *Department of Physics, Nara Women's University, Nara 630-8506, Japan*

We evaluate radiative decays of ρ and ω going to two neutral mesons, $\pi^0\pi^0$ and $\pi^0\eta$ [1]. We use the sequential vector decay mechanisms in addition to chiral loops and ρ-ω mixing. The chiral loops are obtained using elements of Unitarized Chiral Perturbation Theory ($U\chi PT$) successfully applied in the study of meson-meson interactions up to 1.2 GeV. The chiral loops are found to be very important in the case of the $\rho \to \pi^0\pi^0\gamma$ decay and small in the other cases. We have also estimated the effects of the f_2, a_2 intermediate resonances concluding that they are negligible for the decays studied here. A good agreement with present measurements of $\rho \to \pi^0\pi^0\gamma$ and $\omega \to \pi^0\pi^0\gamma$ is obtained and predictions are made for the other decays where the rates obtained are rather small. The case of the ρ decay is interesting since both mechanisms lead to very different $\pi\pi$ invariant mass distributions. In particular the loop terms reflect the contribution of $\rho \to \sigma\gamma$ and hence the experimental mass distribution can offer information about the σ properties.

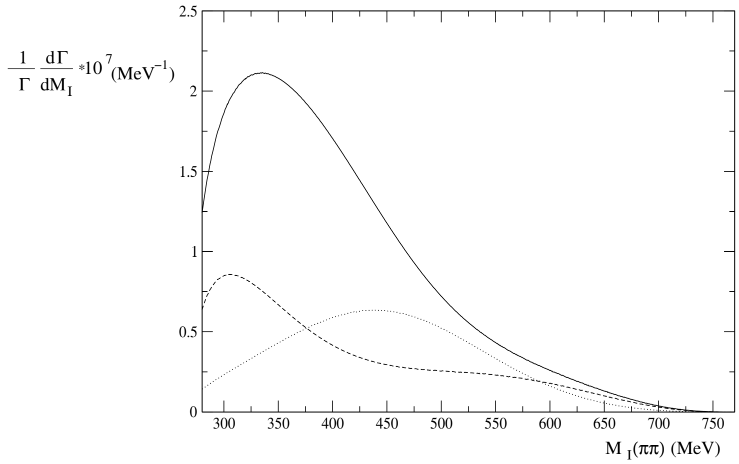

Figure 1: $dB(\rho \to \pi^0\pi^0\gamma)/dM_I$ as a function of the invariant mass of the two pions. Dashed line: sequential contribution; dotted line: loop contribution; solid line: sum of both. The sequential and loop contributions interfere constructively.

References

[1] J. E. Palomar, S. Hirenzaki and E. Oset, to appear in Nucl. Phys. **A**, arXiv:hep-ph/0111308.