

## SOME STRONG DECAYS OF MESONS AND THE HARMONIC OSCILLATOR PARAMETER FOR THE ORDINARY QUARK-ANTI QUARK SYSTEM

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### ABSTRACT

The harmonic oscillator quark model for mesons is used to estimate the widths of the decays  $A_2(1310) \rightarrow \rho \pi$

$$A_2(1310) \rightarrow \eta \pi, \psi(3095) \rightarrow \rho \pi \text{ and } D^* \rightarrow D \pi$$

with the harmonic oscillator parameter for ordinary quark antiquark system  $\alpha^2 \simeq 0.055 \text{ GeV}^2$  and the pion coupling constant with the p- and  $\eta$ -type quark (antiquark)  $f_q^2 \simeq 0.371$ , we get reasonable widths for these decays.

The main result is that a much smaller (than the one used in the description of baryon decays)  $\alpha^2$  value is needed to describe these processes. In particular the width of the decay  $\psi \rightarrow \rho \pi$  is increased by two orders of magnitude if a bigger  $\alpha^2$ -value (e.g.  $\alpha^2 \simeq 0.1 \text{ GeV}^2$ ) is used. This conclusion is also consistent with this model results obtained for the radiative widths of "old" L=0 mesons and  $\psi \rightarrow \gamma \pi^0$  and for the low-lying positive parity L=1 "old" mesons.

### INTRODUCTION

The quark model of elementary particles has proved very successful in classifying the internal quantum number of hadrons and also very useful in describing the hadron dynamics with simple additional dynamical assumptions [1]. Assuming an appropriate interaction between quark (antiquark) and a field quantum, this model also gives quite reasonable decay widths of the hadrons [2]. In a previous paper [3] we performed calculations based on the harmonic oscillator quark model for the radiative widths of the low-lying positive parity L=1 old mesons†. Except for the decay  $A_2 \rightarrow \gamma \pi$ , experimental decay widths of these transitions are not available to date and our model result for this decay (i.e.  $A_2 \rightarrow \gamma \pi$ ) is in good agreement