

Nr 7

$$- p + K^- \rightarrow \Sigma^+ + \pi^- + \pi^+ + \pi^- + \pi^0 :$$

$$[u\bar{u}d] + [s] \rightarrow [u\bar{u}s] + [d\bar{u}] + [u\bar{d}] + [d\bar{u}] + \left[\frac{1}{\sqrt{2}}(u\bar{u} + d\bar{d})\right]$$

$$I: \frac{1}{2} + (-\frac{1}{2}) \rightarrow 1 + (-1) + (+1) + (-1) + 0$$

$$Spin: \frac{1}{2} + 0 \rightarrow \frac{1}{2} + 0 + 0 + 0 + 0$$

$$Strangeness: 0 + (-1) \rightarrow (-1) + 0 + 0 + 0 + 0$$

starke WW dominiert

$$- \bar{\Sigma}^0 \rightarrow \bar{\Lambda}^0 + \gamma : [\bar{u}\bar{d}s] \rightarrow [\bar{u}\bar{d}s] + \gamma$$

$$I: 1 \rightarrow 0 + 0$$

$$Spin: \frac{1}{2} \rightarrow \frac{1}{2} + 0$$

\(\Rightarrow\) elektr. magn. WW

$$Strangeness: 0 \rightarrow 0 + 0$$

$$- n + p \rightarrow \Lambda^0 + K^0 + p : [u\bar{d}d] + [u\bar{u}d] \rightarrow [u\bar{d}s] + [d\bar{s}] + [u\bar{u}d]$$

$$I: (-\frac{1}{2}) + \frac{1}{2} \rightarrow 0 + (-\frac{1}{2}) + \frac{1}{2}$$

$$Spin: \frac{1}{2} + \frac{1}{2} \rightarrow \frac{1}{2} + 0 + \frac{1}{2}$$

starke WW

$$Strangeness: 0 + 0 \rightarrow (-1) + 1 + 0$$

$$- J/\psi \rightarrow \mu^+ + \mu^- : [c\bar{c}] \rightarrow [u\bar{d}] + [d\bar{u}]$$

$$I: 0 \rightarrow 1 + (-1)$$

$$Spin: 0 \rightarrow 0 + 0$$

\(\Rightarrow\) elektromagn. WW

$$Strangeness: 0 \rightarrow 0 + 0$$

$$- K^- \rightarrow \pi^+ + \pi^- : [\bar{u}s] \rightarrow [d\bar{u}] + \left[\frac{1}{\sqrt{2}}(u\bar{u} + d\bar{d})\right]$$

$$I: (-\frac{1}{2}) \rightarrow (-1) + 0$$

$$Spin: 0 \rightarrow 0 + 0$$

$$Strangeness: (-1) \rightarrow 0 + 0 \rightarrow \text{schwache WW.}$$

$$- \tau^- \rightarrow \pi^- + \nu_\tau : [\bar{u}d] + \nu_\tau$$

$$I: 0 \rightarrow -1 + 0$$

$$Spin: \frac{1}{2} \rightarrow 0 + \frac{1}{2}$$

\(\Rightarrow\) schwache WW (Neutrino)

$$Strangeness: 0 \rightarrow 0 + 0$$

$$- \pi^0 \rightarrow \gamma + e^- + e^+ : \left[\frac{1}{\sqrt{2}}(u\bar{u} - d\bar{d})\right] \rightarrow \gamma + e^- + e^+$$

$$I: 0 \rightarrow 0 + 0 + 0$$

$$Spin: 0 \rightarrow 0 + \frac{1}{2} + \frac{1}{2}$$

\(\Rightarrow\) elektromagn. WW

$$Strangeness: 0 \rightarrow 0 + 0 + 0$$

$$- \bar{\Delta}^0 \rightarrow \bar{n} + \pi^0 : [\bar{u}\bar{d}d] \rightarrow [\bar{u}\bar{d}d] + \left[\frac{1}{\sqrt{2}}(u\bar{u} - d\bar{d})\right]$$

$$I: \frac{3}{2} \rightarrow \frac{1}{2} + 0$$

$$Spin: \frac{3}{2} \rightarrow \frac{1}{2} + 0$$

starke WW

$$Strangeness: 0 \rightarrow 0 + 0$$

Nr 2

Matrix für Zustandsübergang durch W-Bosonen-WW:

$$V = \begin{pmatrix} |V_{ud}| & |V_{us}| & |V_{ub}| \\ |V_{cd}| & |V_{cs}| & |V_{cb}| \\ |V_{td}| & |V_{ts}| & |V_{tb}| \end{pmatrix} = \begin{pmatrix} 1 - \frac{\lambda^2}{2} & \lambda & \lambda^3 A (s - in) \\ -\lambda & 1 - \frac{\lambda^2}{2} & \lambda^2 A \\ \lambda^3 A (1 - s - in) & -\lambda^2 A & 1 \end{pmatrix}$$

$$\Rightarrow |V_{us}| = \lambda = 0,22$$

$$\Rightarrow |V_{cb}| = \lambda^2 A = |V_{us}|^2 A = 0,04 \Rightarrow A = \frac{0,04}{0,22^2} = 0,83$$

$$\Rightarrow \left| \frac{V_{ub}}{V_{cb}} \right| = \frac{|V_{ub}|}{|V_{cb}|} = \left| \frac{\lambda^3 A (s + in)}{\lambda^2 A} \right| = |\lambda (s + in)| = 0,1$$

$$\Rightarrow \left(\frac{|V_{ub}|}{|V_{cb}|} \right)^2 = \lambda^2 |s + in|^2 = \frac{0,1^2}{0,22^2}$$

$$\Rightarrow |(s + in)(s - in)| = |s^2 + n^2| = \left(\frac{0,1}{0,22} \right)^2 = 0,21$$

Nr 3

a) $f_1 \rightarrow 2\pi^+ + 2\pi^-$
Parität: $-1 \quad -1 \quad \Rightarrow f_1$ hat Parität $+1$
C-Parität: $[2\pi^-] + [2\pi^+] \Rightarrow f_1$ hat CP $+1$
 $\Rightarrow G \quad G^{PCP} = 1^{++}$

b) reiner Zerfall in $\gamma\gamma$: Nein, da Spin & Masse
möglich: $\pi^+ \rightarrow \mu^+ + \bar{\nu}_\mu$ ~~$\pi^+ \rightarrow \mu^+ + \nu_\mu$~~ $\rightarrow e^+ + \bar{\nu}_e$, $e^+ + e^- \rightarrow \gamma$
 $\pi^+ \rightarrow \mu^+ + \bar{\nu}_\mu \rightarrow e^+ + \bar{\nu}_e$
Aber sehr unwahrsch. da elekt. d. Helizität. unterschied

~~$\pi^+ \rightarrow \mu^+ + \nu_\mu$~~

Zerfall in π^0 statt π^+ bzw π^- unwahrsch
da Ladung u. Isospin untersch $\Rightarrow$ schw. WW & Energie
 π^0 zerfällt dafür mit fast 100% in $\gamma\gamma$!