IFIC (CSIC-UV), València

TAUOLA 2011: two and three pseudoscalar modes in RChT

O. Shekhovtsova

together with

T. Przedzinski, P. Roig and Z. Was

arXiv: 1203.3955 [hep-ph]

TAUOLA (Monte Carlo generator for tau decay modes)

Main references (manuals):

1. R. Decker, S.Jadach, M.Jezabek, J.H.Kuhn, Z. Was, Comput. Phys. Commun. 76 (1993) 361, ibid. 70 (1992) 69, ibid. 64 (1990) 275 ***CPC*** ***(reference) version***
2. P. Golonka, B. Kersevan ,T. Pierzchala, E. Richter-Was, Z. Was, M. Worek, Comput. Phys. Commun. 174 (2006) 818, hep-ph/0312240
3. J.H.Kuhn, Z. Was, Acta Phys. Polon. 39 (2008) 47 (5-pions), , hep-ph/0602162
4. A. E. Bondar, S. I. Eidelman, A. I. Milstein, T. Pierzchala, N. I. Root, Z. Was and M. Worek (4 pions), Comput. Phys. Commun. 146 (2002) 139

Also (based on data 1997-1998):

1. Alain Weinstein : http://www.cithep.caltech.edu/~ajw/korb_doc.html#files *(cleo version)*
2. B. Bloch, private communications *(aleph version)* **MOST USED NOWADAYS**

Different intermediate states (because of different detector sensitivity), *e.g.*, $K\pi\pi$ *only* K^* *cleo* , K^* , ρ *aleph*

Hadronic modes: $\pi\nu_\tau$, $K\nu_\tau$, $2\pi\ \nu_\tau$, $2K\nu_\tau$, $K\pi\nu_\tau$, $3\pi\nu_\tau$, $KK\pi\nu_\tau$, $K\pi\pi\nu_\tau$, $2\pi\eta\nu_\tau$, $4\pi\nu_\tau$, $5\ \pi\nu_\tau$

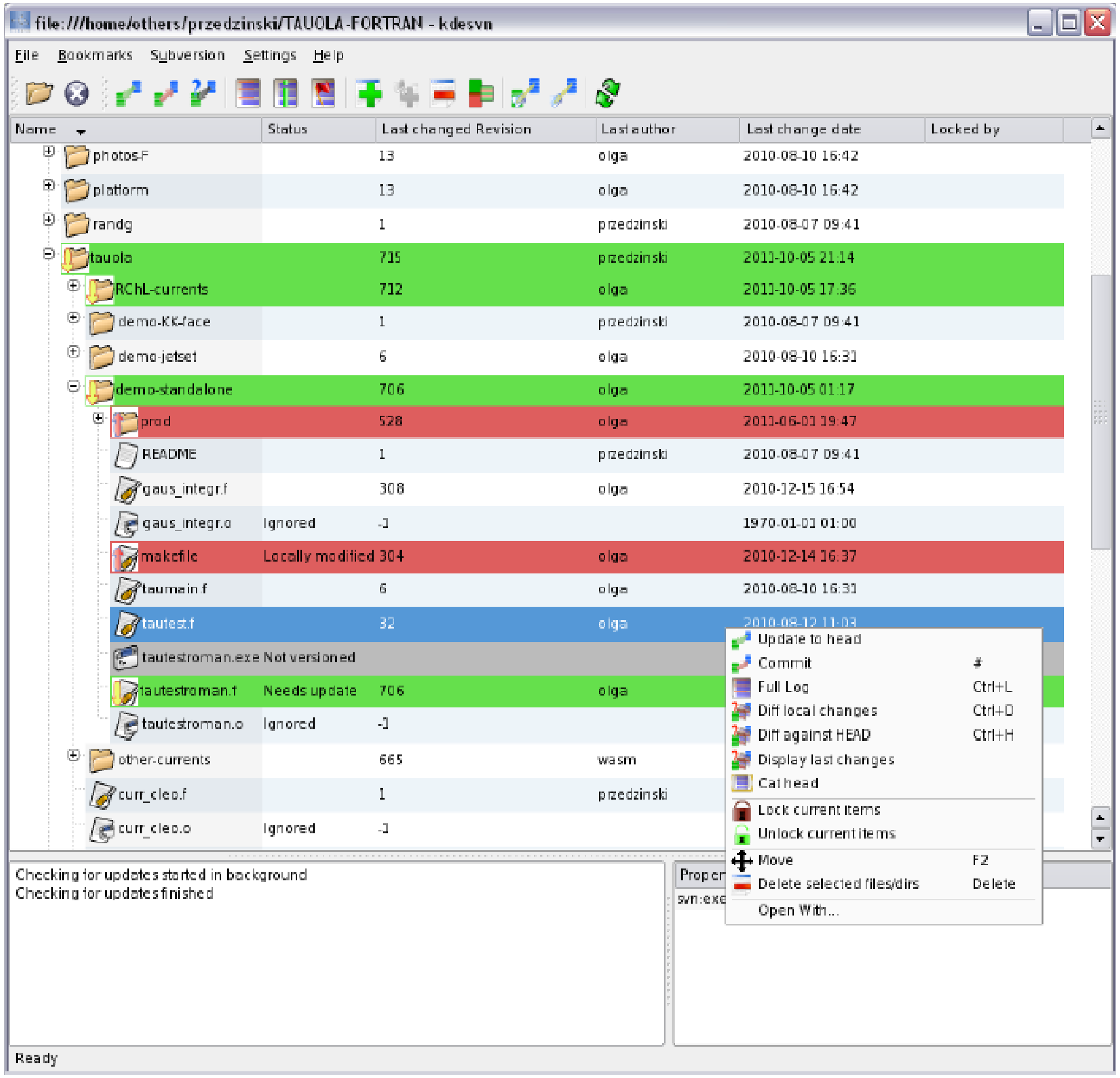
CPC version

2 pseudoscalar modes written analogous to 2π τ → normalization not fixed (too small statics 1992), no scalar FF

3 pseudoscalar modes (CPC version)→ reproduces LO ChPT limit

Code management

- SVN revision control system
  - displaying recent changes
  - branching different approaches
  - tagging milestones and stable revisions
  - when bug is found – "blame" to check who and when
  - GUI: kdesvn



file:///home/others/przedzinski/TAUOLA-FORTRAN - kdesvn

Name	Status	Last changed Revision	Last author	Last change date	Locked by
photos-F		13	olga	2010-08-10 16:42	
platform		13	olga	2010-08-10 16:42	
randg		1	przedzinski	2010-08-07 09:41	
tauola		715	przedzinski	2011-10-05 21:14	
RChL-currents		712	olga	2011-10-05 17:36	
demo-KK-face		1	przedzinski	2010-08-07 09:41	
demo-jetset		6	olga	2010-08-10 16:31	
demo-standalone		706	olga	2011-10-05 01:17	
prod		528	olga	2011-06-01 19:47	
README		1	przedzinski	2010-08-07 09:41	
gaus_integr.f		308	olga	2010-12-15 16:54	
gaus_integr.o	Ignored	-1		1970-01-01 01:00	
makefile	Locally modified	304	olga	2010-12-14 16:37	
taumain.f		6	olga	2010-08-10 16:31	
tautest.f		32	olga	2010-08-12 11:03	
tautestroman.exe	Not versioned				
tautestroman.f	Needs update	706	olga		
tautestroman.o	Ignored	-1			
other-currents		665	wasm		
curr_cleo.f		1	przedzinski		
curr_cleo.o	Ignored	-1			

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Checking for updates started in background
Checking for updates finished
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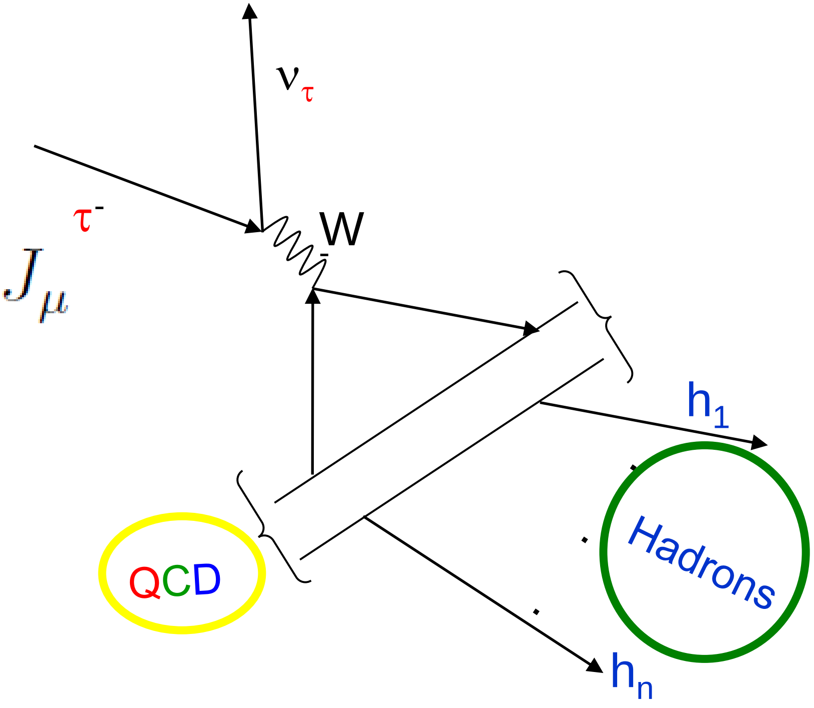
Ready

Hadronic decay mode of τ

$$\tau(P) \to X\nu_\tau(N)$$

$$\mathcal{M} = \frac{G_F}{\sqrt{2}}\bar{u}(N)\gamma^\mu(1-\gamma_5)u(P)J_\mu$$



$$J_\mu = \langle \text{Hadrons}|(V-A)_\mu\, e^{iS_{QCD}}|0\rangle = \Sigma_i(\text{Lorentz Structure})^i\, F_i(Q^2,s_j)$$

3 pseudoscalars: 3 Lorentz independent structure

2 pseudoscalars: 2 Lorenz independent structure (vector; scalar)

$F_i(Q^2,s_j)$ → RχT

Resonance Chiral Theory
(Chiral Theory with the explicit inclusion of *resonances*)

G.Ecker et al., Nucl. Phys B321(1989)311

1. **The resonance fields** ($V_{\mu\nu}$, $A_{\mu\nu}$ *antisymmetric tensor field*) is added by explicit way , based on ChPT
2. Reproduces NLO prediction of ChPT (at least)
3. Theoretical results for $2\pi\tau$, $2K\tau$, $K\pi\tau$, $3\pi\tau$, $KK\pi\tau$ → **self consistent results for TAUOLA**
4. Finite numbers of parameters (one octet: f_π, F_V, G_V, F_A)
5. Correct high energy behaviour of form factors: $F_V G_V = f_\pi^2$, $F_V^2 - F_A^2 = f_\pi^2$, $F_V^2 M_V^2 = F_A^2 M_A^2$

Talk Pablo Roig

$2\pi\tau$, $2K\tau$, $K\pi\tau$, $3\pi\tau$, $KK\pi\tau$ **88% of tau hadronic width**

Currents in RChT in TAUOLA2011

Two pseudoscalar modes:

$\tau^- \to \pi^- \pi^0 \nu_\tau$; $\tau^- \to (K\pi)^- \nu_\tau$; $\tau^- \to K^- K^0 \nu_\tau$

All modes are in separate subroutines, no problem with normalization

Hadronic current

$$J^\mu = N\left[(p_1 - p_2)^\mu F^V(s) + (p_1 + p_2)^\mu F^S(s)\right] \qquad s = (p_1 + p_2)^2$$

$$N^{\pi^-\pi^0} = 1,\ N^{K^-K^0} = \frac{1}{\sqrt{2}},\ N^{\pi^-\bar{K}^0} = \frac{1}{\sqrt{2}},\ N^{\pi^0 K^-} = \frac{1}{2}$$

F^V vector, 1st octet:

$$F^V_{PQ}(s) = F^{VMD}(s)\ \exp\left[\sum_{P,Q} N^{PQ}_{loop} \frac{-s}{96\pi^2 F^2} ReA_{PQ}(s)\right]$$

$$N^{\pi^-\pi^0}_{loop} = 1,\ N^{K^-K^0}_{loop} = \frac{1}{2},\ N^{K\pi}_{loop} = N^{K\eta}_{loop} = \frac{3}{4}$$

2pion and 2 Kaon modes

$m_{\pi^\pm} \neq m_{\pi^0}$ $m_{K^\pm} \neq m_{K^0}$

$F^V(0) = 1$ $SU(2)$ limit

$$\begin{aligned} F^V_{\pi\pi}(s) = & \frac{M_\rho^2 + s\left(\gamma e^{i\phi_1} + \delta e^{i\phi_2}\right)}{M_\rho^2 - s - iM_\rho\Gamma_\rho(s)} \exp\left\{\frac{-s}{96\pi^2F^2}\left[ReA_{\pi^-\pi^0}(s) + \frac{1}{2}ReA_{K^-K^0}(s)\right]\right\} \\ & - \frac{s\gamma e^{i\phi_1}}{M_{\rho'}^2 - s - iM_{\rho'}\Gamma_{\rho'}(s)} \exp\left\{\frac{-s\Gamma_{\rho'}}{\pi M_{\rho'}^3 \sigma_\pi^3(M_{\rho'}^2)}\left[ReA_\pi(s)\right]\right\} \\ & - \frac{s\delta e^{i\phi_2}}{M_{\rho''}^2 - s - iM_{\rho''}\Gamma_{\rho''}(s)} \exp\left\{\frac{-s\Gamma_{\rho''}}{\pi M_{\rho''}^3 \sigma_\pi^3(M_{\rho''}^2)}\left[ReA_\pi(s)\right]\right\}, \end{aligned}$$

SU(3) limit: δ , γ are the same for 2 pions and 2 kaons
No SU(2) up to 30% difference

See talk P. Roig for details of calculation

K pion mode

Two parametrizations:

$$F^V_{K\pi}(s) = \left(\frac{M^2_{K^*} + s\gamma_{K\pi}}{M^2_{K^*} - s - iM_{K^*}\Gamma_{K^*}(s)} - \frac{s\gamma_{K\pi}}{M^2_{K^{*\prime}} - s - iM_{K^{*\prime}}\Gamma_{K^{*\prime}}(s)}\right)$$
$$\exp\left\{\frac{-s}{128\pi^2F^2}\left[ReA_{K\pi}(s) + ReA_{K\eta}(s)\right]\right\}.$$

M.Jamin, A. Pich, J. Portoles, Phys. Lett B 664(2008) 78
(*)

$$\widetilde{F}^{K\pi}_+(s) \equiv F^{K\pi}_+(s)/F^{K\pi}_+(0)$$
$$\widetilde{F}^{K\pi}_+(s) = \frac{m^2_{K^*} - \kappa_{K^*}\widetilde{H}_{K\pi}(0) + \gamma s}{D(m_{K^*}, \gamma_{K^*})} - \frac{\gamma s}{D(m_{K^{*\prime}}, \gamma_{K^{*\prime}})}$$
$$D(m_n, \gamma_n) \equiv m^2_n - s - \kappa_n \mathrm{Re}\widetilde{H}_{K\pi}(s) - i\, m_n\gamma_n(s)$$

D.R. Boito, R.Escribano, M. Jamin, Eur. Phys. J C59(2009)821
simplified version (**)

Difference claimed by authors ~4%, different treatment of FSI, fit to Belle

Parameters to fix F^V for two pseudoscalar modes

FFKPIVEC = 0 (**) ; 1 (*)

FFKKVEC = 0 (only rho) ; 1 (with rho´)

FFVEC = 0 (no FSI) ; 1 (FSI)

TAUOLA 2011: $F^s = 0$!!!!!!

Three pseudoscalar modes:

$\tau^- \to (3\pi)^- \nu_\tau$; $\tau^- \to K^-\pi^-K^+ \nu_\tau$; $\tau^- \to K^0\pi^{-0} \nu_\tau$, $\tau^- \to K^-\pi^0K^0 \nu_\tau$

Hadronic current

Decay mode (p_1, p_2, p_3)	c_1	c_2	c_3	c_4	c_5
$\pi^-\pi^-\pi^+$	1	- 1	0	1	0
$\pi^0\pi^0\pi^-$	1	- 1	0	1	0
$K^-\pi^-K^+$	1	- 1	0	0	1
$K^0\pi^-\bar{K}^0$	1	- 1	0	0	1
$K^-\pi^0K^0$	0	1	- 1	0	- 1

$$J^\mu = N\left\{ T_\nu^\mu\left[c_1(p_2-p_3)^\nu F_1 + c_2(p_3-p_1)^\nu F_2 + c_3(p_1-p_2)^\nu F_3\right] \right.$$

$$\left. + c_4 q^\nu F_4 - \frac{i}{4\pi^2F^2} c_5 \varepsilon^{\mu\nu\rho\sigma} p_{1\nu} p_{2\rho} p_{3\sigma} F_5 \right\}$$

$N = \cos\theta_{\mathrm{Cabibbo}}/F$ 2n kaons

$N = \sin\theta_{\mathrm{Cabibbo}}/F$ 2n+1 kaons

$$T_\mu^\nu = g^{\mu\nu} - \frac{q^\mu q^\nu}{q^2}, \quad q^\mu = p_1^\mu + p_2^\mu + p_3^\mu$$

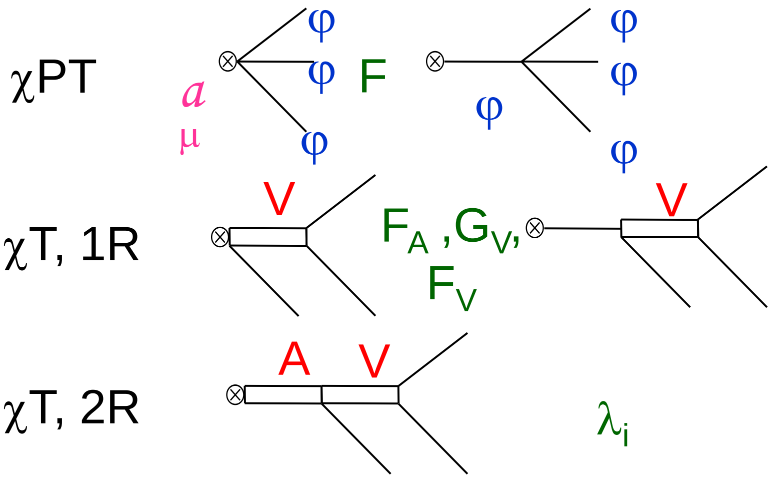
FF: F_1, F_2, F_3 axial-vector, F_5 vector, F_4 pseudoscalar

$$F_i = F_i^\chi + F_i^R + F_i^{RR} \ ,$$

$$F_4 \sim m_\pi^2 / q^2$$

1 octet: F, F_V , G_V , λ_i (5)

1 + 7 constants



$\tau^- \to (3\pi)^- \nu_\tau$ **simplified version of ρ' inclusion**

$$\frac{1}{M_\rho^2 - q^2 - iM_\rho\Gamma_\rho(q^2)} \longrightarrow \frac{1}{1+\beta_{\rho'}}\left[\frac{1}{M_\rho^2 - q^2 - iM_\rho\Gamma_\rho(q^2)} + \frac{\beta_{\rho'}}{M_{\rho'}^2 - q^2 - iM_{\rho'}\Gamma_{\rho'}(q^2)}\right]$$

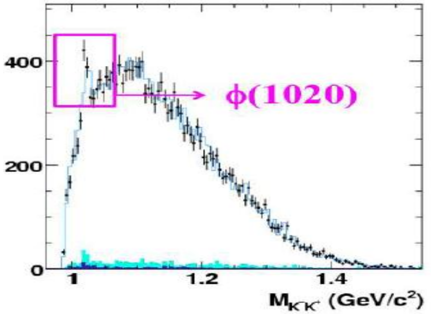
$\tau^- \to K^-\pi^-K^+ \nu_\tau$; $\tau^- \to K^0\pi^{-0} \nu_\tau$, $\tau^- \to K^-\pi^0K^0 \nu_\tau$ **no ρ', no K*´**

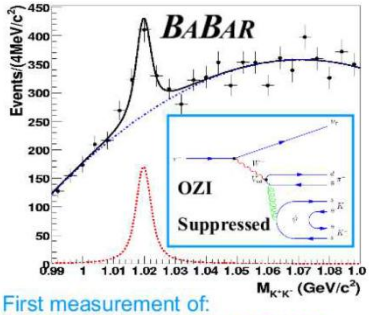
Results for Fi: D.G. Dumm et al, Phys Lett B685 (2010) 158 3 pion modes
D..G. Dumm et al, Phys Rev D81(2010) 034031 KKpi modes

Numerical values :

1. high-energy behaviour of FF (talk of Pablo !!!)
2. fit to ALEPH data (3pions)
3. ideal mixing angle $\theta_V = \tan^{-1}(1/\sqrt{2}) \Rightarrow$ no ϕ intermediate state

$$F_5^{\rm RR}(q^2, s_2, s_1) = -16\sqrt{2}\pi^2 F_V\, G_V \frac{1}{M_\rho^2 - q^2 - iM_\rho\Gamma_\rho(q^2)}\left[\frac{C^{\rm RR}(q^2, s_1, m_K^2)}{M_{K^*}^2 - s_1 - iM_{K^*}\Gamma_{K^*}(s_1)} + \right.$$
$$\left. C^{\rm RR}(q^2, s_2, m_\pi^2)\left(\sin^2\theta_V \frac{1+\sqrt{2}\cot\theta_V}{M_\omega^2 - s_2 - iM_\omega\Gamma_\omega} + \cos^2\theta_V \frac{1-\sqrt{2}\tan\theta_V}{M_\phi^2 - s_2 - iM_\phi\Gamma_\phi}\right)\right],$$

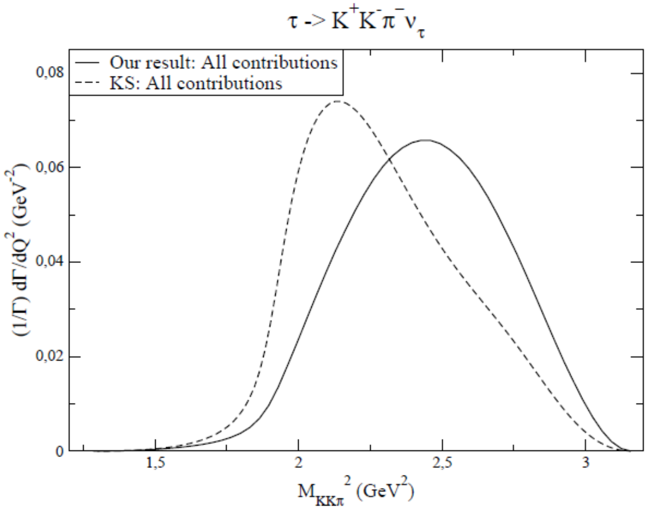


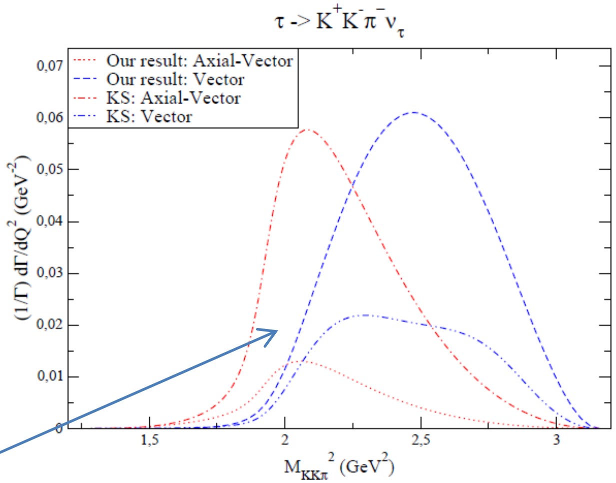


First measurement of:
$B(\tau^-\to\pi^-\phi\nu)=(3.42\pm0.55\pm0.25)\times10^{-5}$
Significance: 5.7σ

Talk of Ian Nugent,
Cracow, May 2011

Comparison between CPC and TAUOLA 2011 (arXiv:0911.2640):





Sizable vector contribution in RChT

Vector contribution (absent for 3 pion modes):

- within CPC parametrization CLEO was not able to reproduce data
- CLEO parametrization: to adjust data added factors (hep-ex/0401005)

$$
\begin{aligned}
J^\mu = & \left(q_1^\mu - q_3^\mu - Q^\mu \frac{Q(q_1-q_3)}{Q^2}\right) F_1(s_1, s_2, Q^2) \\
& + \left(q_2^\mu - q_3^\mu - Q^\mu \frac{Q(q_2-q_3)}{Q^2}\right) F_2(s_1, s_2, Q^2) \\
& + i\epsilon^{\mu\alpha\beta\gamma} q_{1\alpha} q_{2\beta} q_{3\gamma} F_3(s_1, s_2, Q^2)
\end{aligned}
$$

$$
\begin{aligned}
F_1 &= -\frac{\sqrt{2}}{3f_\pi} \mathrm{BW}_{a_1}(Q^2) \frac{\mathrm{BW}_\rho(s_2) + \beta_\rho \mathrm{BW}_{\rho'}(s_2)}{1+\beta_\rho}, \\
F_2 &= -\frac{\sqrt{2}}{3f_\pi} \cdot R_F \cdot \mathrm{BW}_{a_1}(Q^2) \cdot \mathrm{BW}_{K^*}(s_1), \\
F_3 &= -\frac{1}{2\sqrt{2}\pi^2 f_\pi^3} \cdot \sqrt{R_B} \cdot \frac{\mathrm{BW}_\omega(s_2) + \alpha \mathrm{BW}_{K^*}(s_1)}{1+\alpha} \\
& \cdot \frac{\mathrm{BW}_\rho(Q^2) + \lambda \mathrm{BW}_{\rho'}(Q^2) + \delta \mathrm{BW}_{\rho''}(Q^2)}{1+\lambda+\delta},
\end{aligned}
$$

$$R_B = 3.23 \pm 0.26$$

RChT prediction should be checked by data

http://annapurna.ifj.edu.pl/~wasm/RChL/RChL.htm

Numerical benchmarks of formfactor implementation:

1. a1 width ($\Gamma_{a_1}(q^2)$) is tabulated to avoid problem with triple integration:

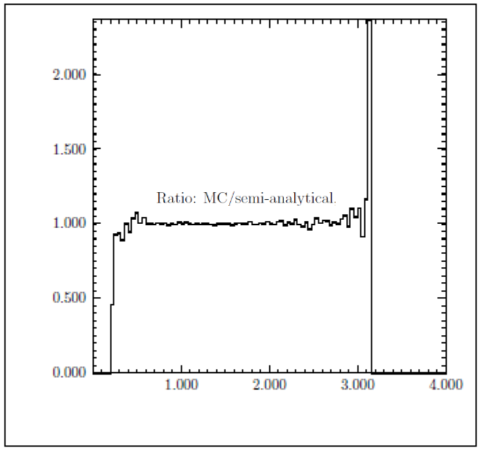
$$\begin{aligned}\Gamma_{a_1}(q^2) &= 2\Gamma^{\pi}_{a_1}(q^2)\theta\left(q^2-9m_\pi^2\right)\\ &+ 2\Gamma^{K^\pm}_{a_1}(q^2)\theta\left(q^2-(m_\pi+2m_K)^2\right)+\Gamma^{K^0}_{a_1}(q^2)\theta\left(q^2-(m_\pi+2m_K)^2\right)\end{aligned}$$

$$\begin{aligned}\Gamma^{\pi,K}_{a_1}(q^2) &= \frac{-S}{192(2\pi)^3F_A^2F^2M_{a_1}}\left(\frac{M_{a_1}^2}{q^2}-1\right)^2\\ &\int dsdt\,(V_1^\mu F_1+V_2^\mu F_2+V_3^\mu F_3)^{\pi,K}\left((V_{1\mu}F_1+V_{2\mu}F_2+V_{3\mu}F_3)^{\pi,K}\right)^*\end{aligned}$$

Cross check with linear interpolation

2. Check of every channel: $m_\pi = (m_{\pi^0}+2\cdot m_{\pi^+})/3$ $m_K = (m_{K^0}+m_{K^+})/2$ except for 2pion, 2 Kaon

Check of precision integration compared with analyt result (Gauss integration)



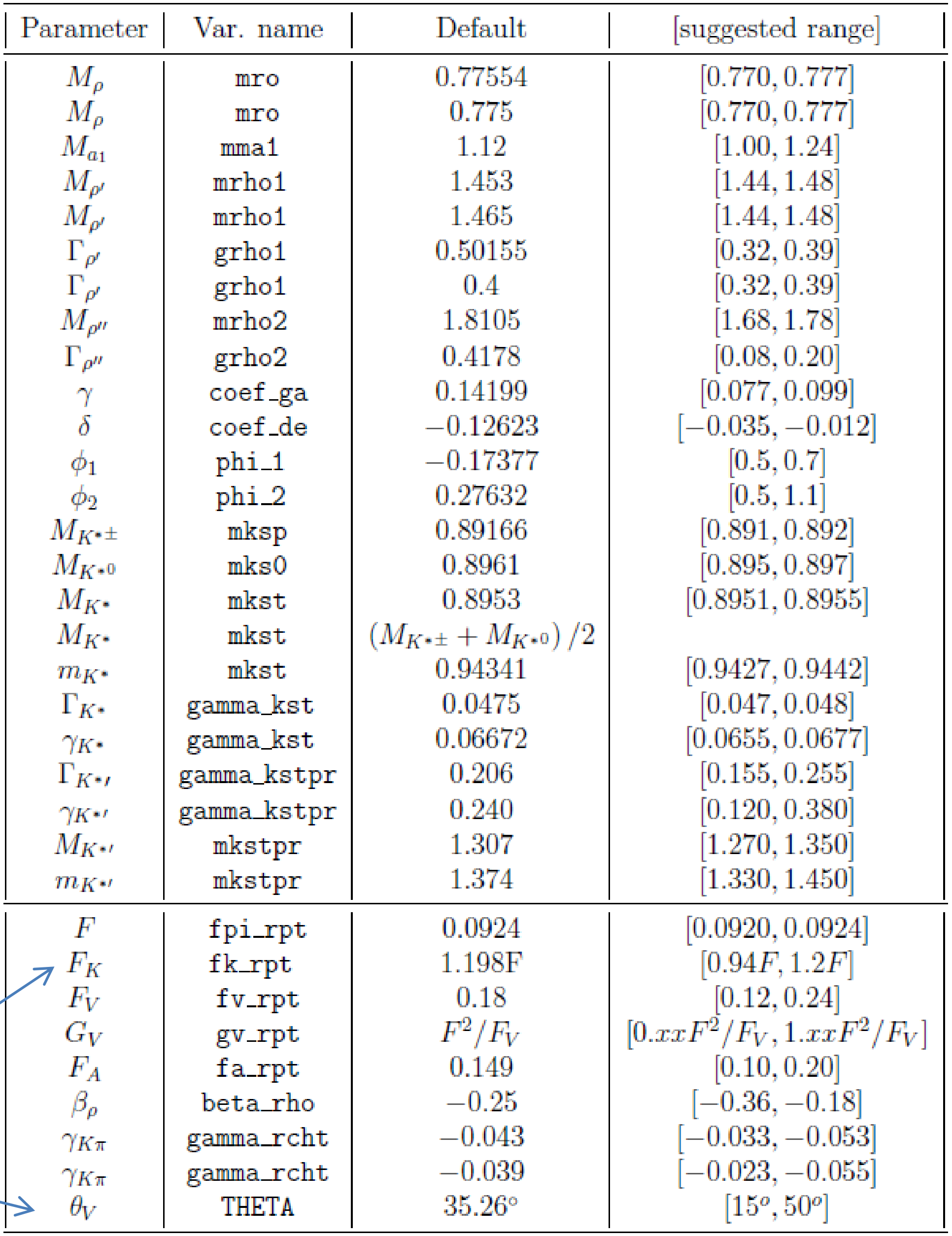
- F= 1 (2pseudoscal), F_1 = F, F_{others} = 0 to check phase space
- F_{all} = physical, max difference 0.03% (for integrated width)

← $\tau \to \pi^-\pi^-\pi^+\nu_\tau$

3. Comparison of analytical result with linearly interpolated spectrum

Parameters to fit

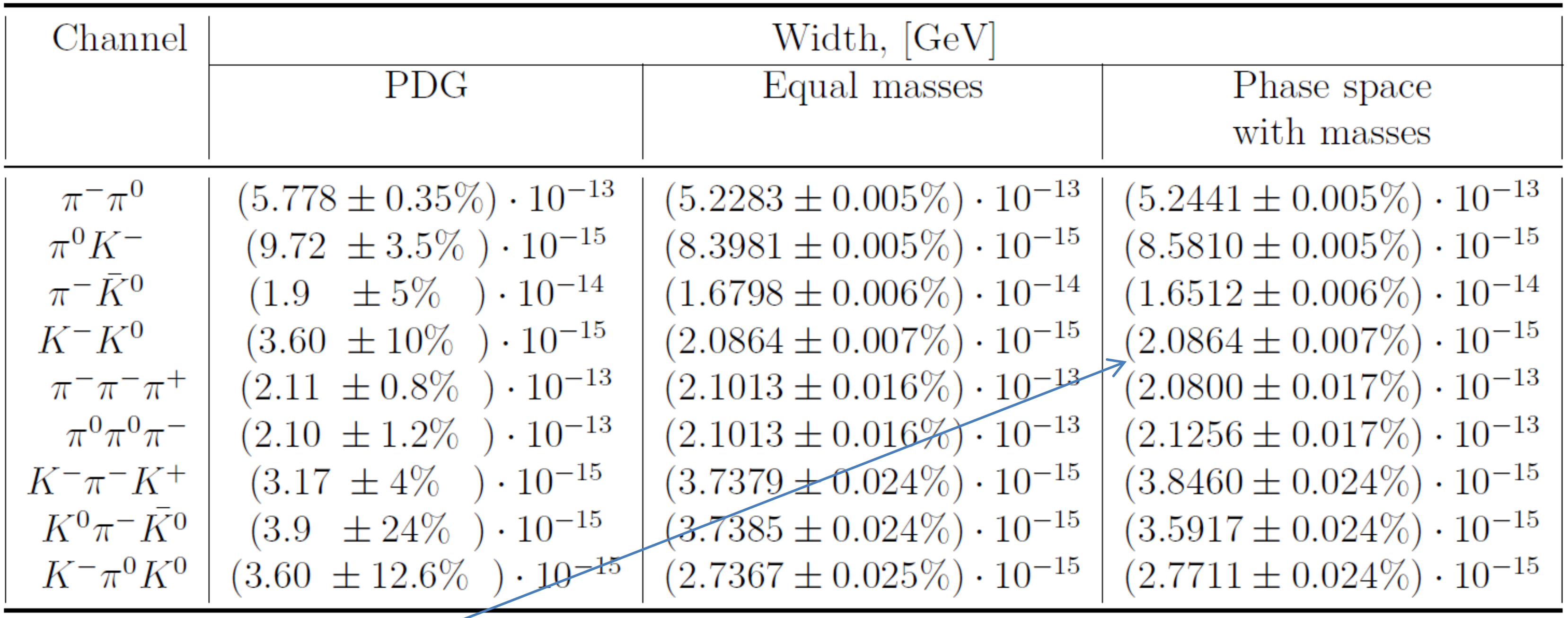
`new-currents/RChL-currents/value_parameter.f`



Parameter	Var. name	Default	[suggested range]
M_ρ	mro	0.77554	$[0.770, 0.777]$
M_ρ	mro	0.775	$[0.770, 0.777]$
M_{a_1}	mma1	1.12	$[1.00, 1.24]$
$M_{\rho'}$	mrho1	1.453	$[1.44, 1.48]$
$M_{\rho'}$	mrho1	1.465	$[1.44, 1.48]$
$\Gamma_{\rho'}$	grho1	0.50155	$[0.32, 0.39]$
$\Gamma_{\rho'}$	grho1	0.4	$[0.32, 0.39]$
$M_{\rho''}$	mrho2	1.8105	$[1.68, 1.78]$
$\Gamma_{\rho''}$	grho2	0.4178	$[0.08, 0.20]$
γ	coef_ga	0.14199	$[0.077, 0.099]$
δ	coef_de	-0.12623	$[-0.035, -0.012]$
ϕ_1	phi_1	-0.17377	$[0.5, 0.7]$
ϕ_2	phi_2	0.27632	$[0.5, 1.1]$
$M_{K^{*\pm}}$	mksp	0.89166	$[0.891, 0.892]$
$M_{K^{*0}}$	mks0	0.8961	$[0.895, 0.897]$
M_{K^*}	mkst	0.8953	$[0.8951, 0.8955]$
M_{K^*}	mkst	$(M_{K^{*\pm}} + M_{K^{*0}})/2$	
m_{K^*}	mkst	0.94341	$[0.9427, 0.9442]$
Γ_{K^*}	gamma_kst	0.0475	$[0.047, 0.048]$
γ_{K^*}	gamma_kst	0.06672	$[0.0655, 0.0677]$
$\Gamma_{K^{*\prime}}$	gamma_kstpr	0.206	$[0.155, 0.255]$
$\gamma_{K^{*\prime}}$	gamma_kstpr	0.240	$[0.120, 0.380]$
$M_{K^{*\prime}}$	mkstpr	1.307	$[1.270, 1.350]$
$m_{K^{*\prime}}$	mkstpr	1.374	$[1.330, 1.450]$
F	fpi_rpt	0.0924	$[0.0920, 0.0924]$
F_K	fk_rpt	1.198F	$[0.94F, 1.2F]$
F_V	fv_rpt	0.18	$[0.12, 0.24]$
G_V	gv_rpt	F^2/F_V	$[0.xxF^2/F_V, 1.xxF^2/F_V]$
F_A	fa_rpt	0.149	$[0.10, 0.20]$
β_ρ	beta_rho	-0.25	$[-0.36, -0.18]$
$\gamma_{K\pi}$	gamma_rcht	-0.043	$[-0.033, -0.053]$
$\gamma_{K\pi}$	gamma_rcht	-0.039	$[-0.023, -0.055]$
θ_V	THETA	35.26°	$[15^o, 50^o]$

FIXED

Numerical results

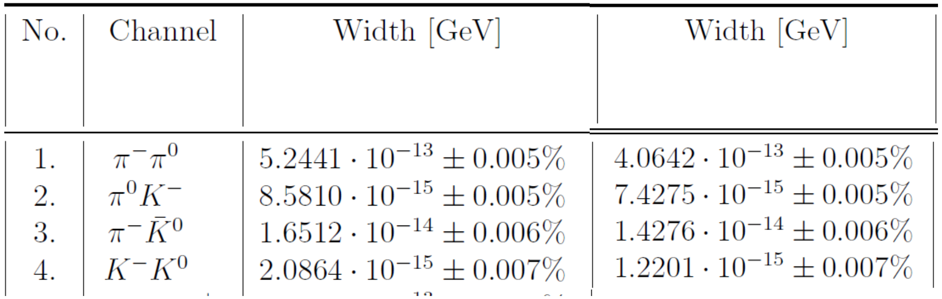


Channel	Width, [GeV]		
	PDG	Equal masses	Phase space with masses
$\pi^-\pi^0$	$(5.778 \pm 0.35\%)\cdot 10^{-13}$	$(5.2283 \pm 0.005\%)\cdot 10^{-13}$	$(5.2441 \pm 0.005\%)\cdot 10^{-13}$
$\pi^0 K^-$	$(9.72 \pm 3.5\%)\cdot 10^{-15}$	$(8.3981 \pm 0.005\%)\cdot 10^{-15}$	$(8.5810 \pm 0.005\%)\cdot 10^{-15}$
$\pi^-\bar{K}^0$	$(1.9 \pm 5\%)\cdot 10^{-14}$	$(1.6798 \pm 0.006\%)\cdot 10^{-14}$	$(1.6512 \pm 0.006\%)\cdot 10^{-14}$
K^-K^0	$(3.60 \pm 10\%)\cdot 10^{-15}$	$(2.0864 \pm 0.007\%)\cdot 10^{-15}$	$(2.0864 \pm 0.007\%)\cdot 10^{-15}$
$\pi^-\pi^-\pi^+$	$(2.11 \pm 0.8\%)\cdot 10^{-13}$	$(2.1013 \pm 0.016\%)\cdot 10^{-13}$	$(2.0800 \pm 0.017\%)\cdot 10^{-13}$
$\pi^0\pi^0\pi^-$	$(2.10 \pm 1.2\%)\cdot 10^{-13}$	$(2.1013 \pm 0.016\%)\cdot 10^{-13}$	$(2.1256 \pm 0.017\%)\cdot 10^{-13}$
$K^-\pi^-K^+$	$(3.17 \pm 4\%)\cdot 10^{-15}$	$(3.7379 \pm 0.024\%)\cdot 10^{-15}$	$(3.8460 \pm 0.024\%)\cdot 10^{-15}$
$K^0\pi^-\bar{K}^0$	$(3.9 \pm 24\%)\cdot 10^{-15}$	$(3.7385 \pm 0.024\%)\cdot 10^{-15}$	$(3.5917 \pm 0.024\%)\cdot 10^{-15}$
$K^-\pi^0K^0$	$(3.60 \pm 12.6\%)\cdot 10^{-15}$	$(2.7367 \pm 0.025\%)\cdot 10^{-15}$	$(2.7711 \pm 0.024\%)\cdot 10^{-15}$

only ρ

with ρ' (parameters from pion mode) $(2.6502 \pm 0.008\%)\cdot 10^{-15}$ GeV

FSI effects

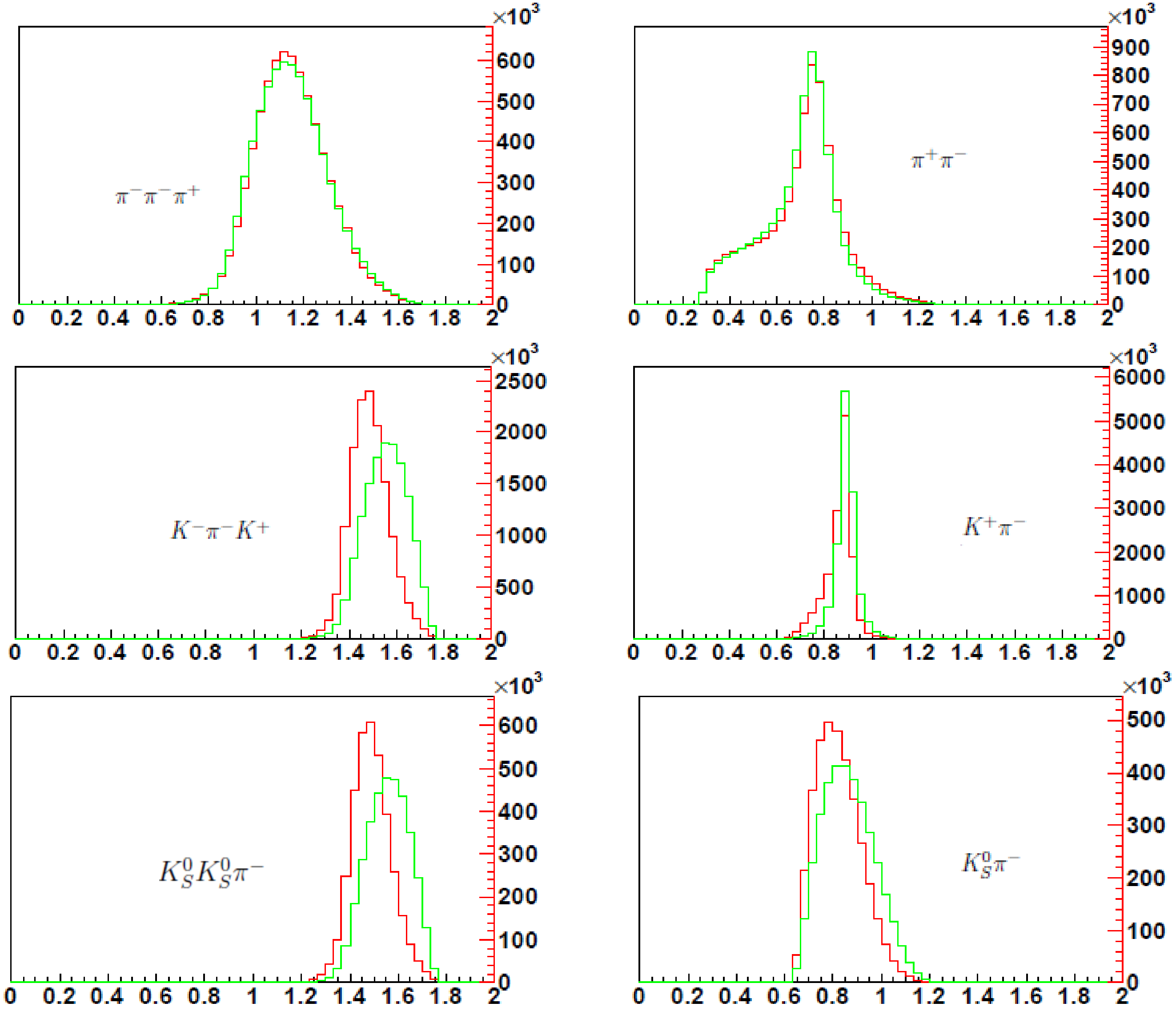


No.	Channel	Width [GeV]	Width [GeV]
1.	$\pi^-\pi^0$	$5.2441\cdot 10^{-13} \pm 0.005\%$	$4.0642\cdot 10^{-13} \pm 0.005\%$
2.	π^0K^-	$8.5810\cdot 10^{-15} \pm 0.005\%$	$7.4275\cdot 10^{-15} \pm 0.005\%$
3.	$\pi^-\bar{K}^0$	$1.6512\cdot 10^{-14} \pm 0.006\%$	$1.4276\cdot 10^{-14} \pm 0.006\%$
4.	K^-K^0	$2.0864\cdot 10^{-15} \pm 0.007\%$	$1.2201\cdot 10^{-15} \pm 0.007\%$

$14\% - 32\%$

FSI **No FSI**

Comparison between CLEO and TAUOLA2011



TAUOLA2011

CLEO

$\tau \rightarrow \pi^-\pi^-\pi^+\nu_\tau$

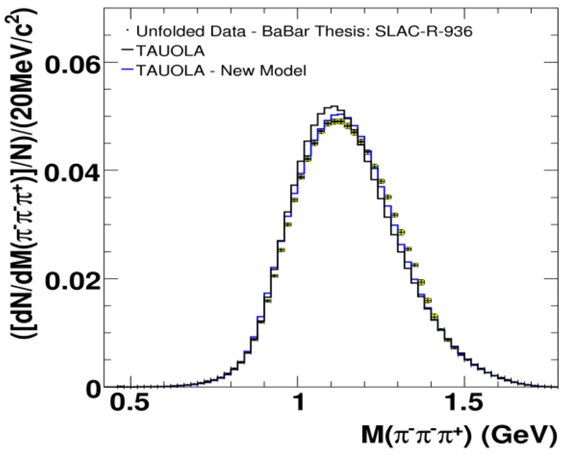
$\tau \rightarrow K^-\pi^-K^+\nu_\tau$

$\tau \rightarrow K^0\pi^-\bar{K}^0\nu_\tau$

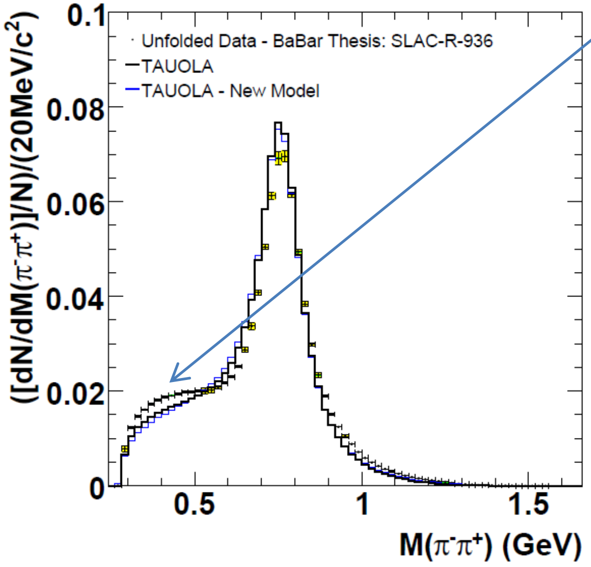
http://annapurna.ifj.edu.pl/~wasm/RChL/RChL.htm

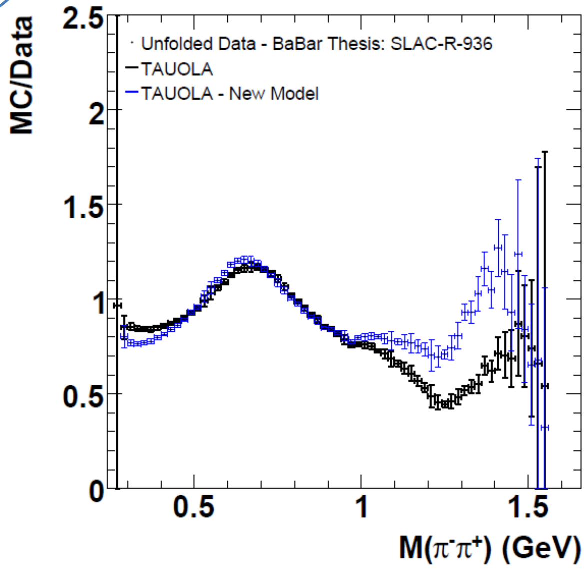
http://annapurna.ifj.edu.pl/~wasm/RChL/RChL.htm

Comparison with BABAR data: *Ian M. Nugent, (Victoria U.) . SLAC-R-936, Dec16, 2009. Ph.D. Thesis (Advisor: Dr. J. Michael Roney).*



Low energy region is not described well by both models CPC (LO ChT) RChT (NLO ChT)





?sigma meson?
not estimated yet

Talk of Pablo Roig

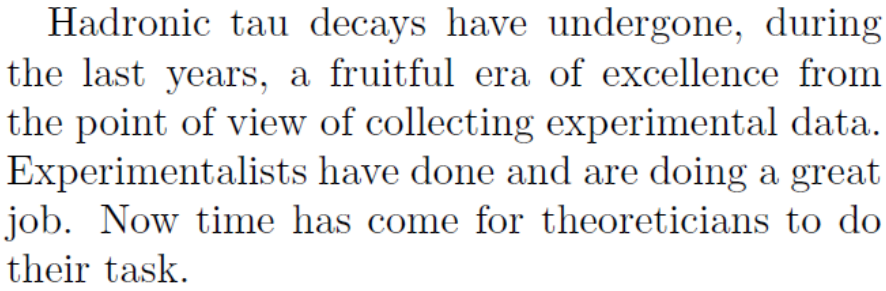
CONCLUSION

- released version, *http://annapurna.ifj.edu.pl/~wasm/RChL/RChL.htm*
- done under SVN code manager
- **$2\pi\tau$, $2K\tau$, $K\pi\tau$, $3\pi\tau$, $KK\pi\tau$** **88% of tau hadronic width**
- first comparison with data

TAUOLA2012

- common work with experimentalists (I. Nugent, D. Epifanov) → fit of parameters
- higher energy resonances in 3 pseudoscalar modes
- scalar FF in Kpi mode, FSI for 2 pseudoscalar modes (*TALK OF P.ROIG*)
- 4 pion modes in RChT to get 97% hadronic width, G.Ecker, R. Unterdorfer, Eur.Phys. JC24 (2002) 535
- ??? sigma meson ???

Jorge Portoles: TAU04
hep-ph/0411333



Hadronic tau decays have undergone, during the last years, a fruitful era of excellence from the point of view of collecting experimental data. Experimentalists have done and are doing a great job. Now time has come for theoreticians to do their task.

Common work: theory + experiment

We invite theoreticians and experimentslists to participate TAUOLA

WORKSHOP tau lepton decays:
hadronic currents from data of Belle and BaBar and new physics signatures at LHC
14-19 May 2012

Institute of Nuclear Physics PAN, Cracow Poland, Radzikowskiego 152 , http://www.ifj.edu.pl

Organizers/contact persons:

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Main topics:

-A- modelling of hadronic currents for tau decays
-B- fits of such currents to tau decay data
-C- use of tau lepton decays in LHC experiments.
Another theme:
-D- bremsstrahlung in decays of Z W and inter-relation with reconstruction of electrons/ muons

Detailed program *http://www.cern.ch/wasm/public/meetingB.pdf*