Tau Physics

Section Editors

BaBar: Mike Roney
Belle: Hisaki *Hayashii*
Theory: Tony Pich

Physics of the B-factories Book Meeting
LAPP 30 June 2011

Papers

BaBar

Published

1) Mtau
2)Various LFV
3) Various strange decays
4) various high muliplicity hadronic

Foreseen papers in time to be included in the book: IN OCT 2009

1) Universality (DONE)
2) strange spectral functions
3) R_tau
4) lifetime
5) 2nd class currents (DONE)

Belle

Published

1) Mtau
2) LFV
3) various strange decays
4)non-strange SF: Rtau (2pi)
5) EDM
6) various decays with eta's

Foreseen papers in time to be included in the book : IN OCT 2009

1) Strange spectral functions (Partial)
2) 2nd class current (Prelim)
3) CP violation in tau decays (DONE)
4) Vector/Axial Vector Scalar Form Factors

The Plan for Sections

1.Introduction

History

Overview

Tau Physics in B-Factory Experiment

Event Selection

Theory Section - still to determine where this is placed

2.Mass of the tau lepton (Hisaki)

3.Lifetime of the tau lepton (Hisaki)

4.EDM of the tau lepton (Hisaki)

5. tau Branching Fraction (Mike)

6. Test of Lepton Universality (Mike)

7. Measurement of |Vus| (Mike)

The Plan for Sections

8.Hadron Spectral Functions (Hisaki)

9.Search for lepton flavor violation in tau decays (Mike)

10.CP violation in tau decays (Hisaki)

2nd Class currents (still to determine where it is placed)

Inter-correlation

Section (Tau Physics)

(Subsection (Vus))

(Papers - various strange decays)

related to

OPE formalism

Section (?)

Foreseen resolution: cross-referencing & division of topics

...

Section (Tau Physics)

(Subsection (all))

(Paper (all))

related to

tools: PID

Foreseen resolution: cross-referencing

Section (Tau Physics)

(Subsection (Hadronic Rtau))

(Paper Belle)

related to

ISR pipi etc g-2

Foreseen resolution: combined section on g-2 ??

Section (Tau Physics)

Subsection: lifetime

No paper yet

related to

Charm lifetime ratios

Foreseen resolution: cross-referencing

17.3 EDM of the τ lepton

17.4 τ Branching Fractions:

In this section we present the measurements and average values of the τ branching fractions [1], including those which have been recently measured by the B-Factories. We take into account correlations between measurements, arising from common dependence on the τ−pair cross-section Banerjee, Pietrzyk, Roney, and Was (2008) and the assumed knowledge of the branching fractions for the background modes. For measurements from the same experiment, we treat the dependence on detector-specific systematics as sources of correlated systematic uncertainties.

We report here results from single-quantity averages, which includes correlations between the B-Factories, as well as the results from a global fit, which includes correlations between the different branching fractions. We label results from the former as "HFAG Average", and the latter as "HFAG Fit" in the following figures.

For the "HFAG Fit", we use 131 measurements from non-B-Factory experiments, which includes the set of 124 measurements used in the global fit performed by the PDG ?. The measurements from non-B-Factories include 37 measurements from ALEPH, 2 measurements from ARGUS, 1 measurement from CELLO, 36 measurements from CLEO, 6 measurements from CLEO3, 14 measurements from DELPHI, 2 measurements from HRS, 11 measurements from L3, 19 measurements from OPAL, and 3 measurements from TPC.

All of these measurements can be expressed as a linear function of the form $\frac{(\sum_i \alpha_i P_i)}{(\sum_j \beta_j P_j)}$ of few selected branching fractions (P_i), which are labelled as base modes. The base modes are chosen such that they sum up to unity.

For the 124 measurements used in the PDG global fit, there are 31 base modes. These results and their corresponding references are listed in Ref. ?. We first augment this set with 4 additional base modes of $B(\tau^- \to K^-\pi^0\eta\nu_\tau)$, $B(\tau^- \to \bar{K}^0\pi^-\eta\nu_\tau)$, $B(\tau^- \to \bar{K}^0\pi^-2\pi^0\nu_\tau)$ and $B(\tau^- \to \bar{K}^0h^-h^-h^+\nu_\tau)$, because 2 of these modes (containing η) have been recently measured by the B-Factories with significant precision. We also include 2 measurements from CLEO for the modes containing η, 2 measurements from ALEPH for the other modes, and 1 measurement from OPAL of $B(\tau^- \to \bar{K}^0\pi^- >= 1\pi^0\nu_\tau)$. We further include 1 measurement of $B(\tau^- \to \pi^-\pi^-\pi^+\eta\nu_\tau)$ from CLEO, 1 measurement of $B(\tau^- \to K^-\omega\nu_\tau)$ from CLEO3, and replace 1 base node of $B(\tau^- \to h^-\omega\nu_\tau)$ with 2 base nodes containing measurements of $B(\tau^- \to \pi^-\omega\nu_\tau)$ and $B(\tau^- \to K^-\omega\nu_\tau)$. This leads us to a global fit to a set of 131 measurements with 36 base nodes.

Finally we include the following 22 measurements from the B-Factories:

– 12 measurements from the BaBar collaboration: see Table 1.

– 10 measurements from the Belle collaboration: see Table 2.

where the uncertainties are statistical and systematic, respectively.

We add to the list of base nodes one additional measurement of $B(K^-\phi\nu_\tau(\phi \to KK)) = B(K^-K^+K^-\nu_\tau) \times (B(\phi \to K^+K^-) + B(\phi \to K^0_S K^0_L))$, which leads us to a global fit to a set of 153 measurements with 37 base nodes.

We try to take into account the correlations between measurements, and avoid applying the PDG-style scale factors to all our measurements. However, two of the measurements from the B-Factories have significant discrepancy with respect to each other. These are measurements of $B(\tau^- \to K^-K^+K^-\nu_\tau)$ from BaBar and Belle experiments, which are more than 5σ apart. We scale the errors from these measurements by a scale factor of 5.44 obtained from results of single-quantity "HFAG Average", using the same prescription as the PDG collaboration.

As far as possible, we try to include the measurements quoted in the original publications. For example, ALEPH presents results with the correlation matrix between measurements of hadronic modes in Ref. Schael et al. (2005). Their paper also quotes derived measurements for the pionic modes, after subtracting the kaonic contributions as measured by other experiments. PDG interpretes these published correlations between hadronic modes as correlations between the pionic modes, and uses the measurements of pionic modes. Our reasoning is that the B-Factories can measure the kaonic modes with better precision, thanks to the excellent particle-identification system in our respective experiments. Thus the estimates for the kaonic contribution subtracted from the hadronic modes should be revisited based on data from B-Factories.

We interpret the ALEPH data as measurements for the hadronic modes and treat their measured correlation matrix as between the following decay modes : $\tau^- \to e^-\bar{\nu}_e\nu_\tau$, $\tau^- \to \mu^-\bar{\nu}_\mu\nu_\tau$, $\tau^- \to h^-\nu_\tau$, $\tau^- \to h^-\pi^0\nu_\tau$, $\tau^- \to h^-2\pi^0\nu_\tau$, $\tau^- \to h^-3\pi^0\nu_\tau$, $\tau^- \to h^-4\pi^0\nu_\tau$, $\tau^- \to 3h^-\nu_\tau$, $\tau^- \to 3h^-\pi^0\nu_\tau$, $\tau^- \to 3h^-2\pi^0\nu_\tau$, $\tau^- \to 3h^-3\pi^0\nu_\tau$, $\tau^- \to 5h^-\nu_\tau$ and $\tau^- \to 5h^-\pi^0\nu_\tau$, where $h^- = \pi^-$ or K^-, as in the original publication. Since the ALEPH measurements of these branching fractions have been constrained to add up to unity, we exclude the weakest measurement of $\tau^- \to 3h^-3\pi^0\nu_\tau$ in our global fit, as in the PDG global fit.

If the unitarity constraint is dropped from the global fit to 124 measurements, sum of the 31 base modes fall short from unity by 1.0 σ (0.9 σ) in the scenario when ALEPH correlation matrix is modified (un-modified). From the global fit to 153 measurements including those from B-Factories, sum of the 37 base modes fall short from unity by 1.6 σ (1.9 σ) when ALEPH correlation matrix is modified (un-modified).

A summary of quality of these global fits are presented in Table 3 for the constrained and unconstrained cases with data from non-B-Factories and including those from B-Factories. The results of the global fit to 131 and 153 measurements are presented in Tables 4 and 5 for the constrained and unconstrained cases, respectively.

[1] Charge conjugate τ decays are implied throughout.

Table 1. Branching fraction measurements from the BaBar collaboration.

$B(\tau^- \to \mu^- \bar{\nu}_\mu \nu_\tau)/B(\tau^- \to e^- \bar{\nu}_e \nu_\tau) = (0.9796 \pm 0.0016 \pm 0.0036)$	(Aubert, 2010),
$B(\tau^- \to \pi^- \nu_\tau)/B(\tau^- \to e^- \bar{\nu}_e \nu_\tau) = (0.5945 \pm 0.0014 \pm 0.0061)$	(Aubert, 2010),
$B(\tau^- \to K^- \nu_\tau)/B(\tau^- \to e^- \bar{\nu}_e \nu_\tau) = (0.03882 \pm 0.00032 \pm 0.00057)$	(Aubert, 2010),
$B(\tau^- \to K^- \pi^0 \nu_\tau) = (0.416 \pm 0.003 \pm 0.018)\%$	(Aubert, 2007)
$B(\tau^- \to \bar{K}^0 \pi^- \nu_\tau) = (0.840 \pm 0.004 \pm 0.023)\%$	(Aubert, 2009)
$B(\tau^- \to \bar{K}^0 \pi^- \pi^0 \nu_\tau) = (0.342 \pm 0.006 \pm 0.015)\%$	(Parameswaran, 2009)
$B(\tau^- \to \pi^- \pi^- \pi^+ \nu_\tau\ (\text{ex. } K^0)) = (8.834 \pm 0.007 \pm 0.127)\%$	(Aubert, 2008a)
$B(\tau^- \to K^- \pi^- \pi^+ \nu_\tau\ (\text{ex. } K^0)) = (0.273 \pm 0.002 \pm 0.009)\%$	(Aubert, 2008a)
$B(\tau^- \to K^- \pi^- K^+ \nu_\tau) = (0.1346 \pm 0.0010 \pm 0.0036)\%$	(Aubert, 2008a)
$B(\tau^- \to K^- K^- K^+ \nu_\tau) = (1.58 \pm 0.13 \pm 0.12) \times 10^{-5}$	(Aubert, 2008a)
$B(\tau^- \to 3h^- 2h^+ \nu_\tau\ (\text{ex. } K^0)) = (8.56 \pm 0.05 \pm 0.42) \times 10^{-4}$	(Aubert, 2005)
$B(\tau^- \to 2\pi^- \pi^+ \eta \nu_\tau\ (\text{ex. } K^0)) = (1.60 \pm 0.05 \pm 0.11) \times 10^{-4}$	(Aubert, 2008b)

Table 2. Branching fraction measurements from the Belle collaboration.

$B(\tau^- \to h^- \pi^0 \nu_\tau) = (25.67 \pm 0.01 \pm 0.39)\%$	(Fujikawa, 2008)
$B(\tau^- \to \bar{K}^0 \pi^- \nu_\tau) = (0.808 \pm 0.004 \pm 0.026)\%$	(Epifanov, 2007)
$B(\tau^- \to \pi^- \pi^- \pi^+ \nu_\tau\ (\text{ex. } K^0)) = (8.420 \pm 0.003\ ^{+0.260}_{-0.258})\%$	(Lee, 2010)
$B(\tau^- \to K^- \pi^- \pi^+ \nu_\tau\ (\text{ex. } K^0)) = (0.330 \pm 0.001\ ^{+0.016}_{-0.017})\%$	(Lee, 2010)
$B(\tau^- \to K^- \pi^- K^+ \nu_\tau) = (0.155 \pm 0.001\ ^{+0.006}_{-0.005})\%$	(Lee, 2010)
$B(\tau^- \to K^- K^- K^+ \nu_\tau) = (3.29 \pm 0.17\ ^{+0.19}_{-0.20}) \times 10^{-5}$	Lee (2010)
$B(\tau^- \to \pi^- \pi^0 \eta \nu_\tau) = (1.35 \pm 0.03 \pm 0.07) \times 10^{-3}$	(Inami, 2009)
$B(\tau^- \to K^- \eta \nu_\tau) = (1.58 \pm 0.05 \pm 0.09) \times 10^{-4}$	(Inami, 2009)
$B(\tau^- \to K^- \pi^0 \eta \nu_\tau) = (0.46 \pm 0.11 \pm 0.04) \times 10^{-4}$	(Inami, 2009)
$B(\tau^- \to \bar{K}^0 \pi^- \eta \nu_\tau) = (0.88 \pm 0.14 \pm 0.04) \times 10^{-4}$	(Inami, 2009)

In the following, we present results of branching fractions of modes separated according to one or three or five charged tracks ("prongs") in the final state, or decays containing K^0, η, K^{*0}:

- 1-prong decays with 0 or 1 π^0:
  The measurements and average values of $B(\tau^- \to \mu^- \bar{\nu}_\mu \nu_\tau)$, $B(\tau^- \to \pi^- \nu_\tau)$, $B(\tau^- \to K^- \nu_\tau)$, $B(\tau^- \to h^- \nu_\tau)$, where $h^- = \pi^-$ or K^-, are presented in Figure 2, and those of $B(\tau^- \to \pi^- \pi^0 \nu_\tau)$, $B(\tau^- \to K^- \pi^0 \nu_\tau)$ and $B(\tau^- \to h^- \pi^0 \nu_\tau)$ decays are presented in Figure 3.
- 3-prong decays with 0 π^0, 0 K^0:
  The measurements and average values of $B(\tau^- \to h^- h^- h^+ \nu_\tau\ (\text{ex. } K^0))$, $B(\tau^- \to \pi^- \pi^- \pi^+ \nu_\tau\ (\text{ex. } K^0))$, $B(\tau^- \to \pi^- K^- \pi^+ \nu_\tau\ (\text{ex. } K^0))$, $B(\tau^- \to \pi^- K^- K^+ \nu_\tau)$ and $B(\tau^- \to K^- K^- K^+ \nu_\tau)$, where $h^- = \pi^-$ or K^-, are presented in Figures 4 and 5.
  The measurements of $B(\tau^- \to K^- \phi \nu_\tau)$ are also presented in Figure 5, along with results from the single-quantity averaging procedure. While the BaBar measurement uses the same data set as in the measurements of $B(\tau^- \to K^- K^- K^+ \nu_\tau)$, Belle measurement uses a different data set for $B(\tau^- \to K^- \phi \nu_\tau)$ measurement than used for their $B(\tau^- \to K^- K^- K^+ \nu_\tau)$ measurement. To avoid redundancy, we do not use measurements of $B(\tau^- \to K^- \phi \nu_\tau)$ in the global fit, and no results for this mode from "HFAG Fit" are quoted in Figure 5.
  The BaBar experiments also reports $B(\tau^- \to \pi^- \phi \nu_\tau) = (3.42 \pm 0.55 \pm 0.25) \times 10^{-5}$ Aubert (2008a). Since it is the only measurement for this channel, no averaging has been performed.
- 5-prong decays with 0 π^0, 0 K^0:
  The measurements and average values of $B(\tau^- \to h^- h^- h^- h^+ h^+ \nu_\tau\ (\text{ex. } K^0))$ and $B(\tau^- \to \pi^- f_1(1285) \nu_\tau)$ are presented in Figure 6. The $f_1(1285)$ content is determined from $2\pi^- 2\pi^+$ as well as $\pi^- \pi^+ \eta$ final states Aubert (2008b). The average value of $B(\tau^- \to \pi^- f_1(1285) \nu_\tau)$ from the single-quantity averaging procedure is also quoted in Figure 6.
- decays with K^0:
  The measurements and average values of $B(\tau^- \to \pi^- \bar{K}^0 \nu_\tau)$ and $B(\tau^- \to \pi^- \pi^0 \bar{K}^0 \nu_\tau)$ are presented in Figure 7.
- decays with η:
  The measurements and average values of $B(\tau^- \to K^- \eta \nu_\tau)$, $B(\tau^- \to \pi^- \bar{K}^0 \eta \nu_\tau)$ and $B(\tau^- \to K^- \pi^0 \eta \nu_\tau)$ are presented in Figure 8. The K^{*-} content is determined from $\tau^- \to \pi^- K^0_S \eta \nu_\tau$ and $\tau^- \to K^- \pi^0 \eta \nu_\tau$ decay modes. The measurements and average values for $B(\tau^- \to K^{*-} \eta \nu_\tau)$ are also presented in Figure 8.
  The measurements and average values of $B(\tau^- \to \pi^- \pi^0 \eta \nu_\tau)$ and $B(\tau^- \to \pi^- \pi^- \pi^+ \eta \nu_\tau\ (\text{ex. } K^0))$ are presented in Figure 9.
- decays with K^{*0}:
  The measurements and average values for $B(\tau^- \to K^- K^{*0} \nu_\tau)$ are presented in Figure 10. The Belle experiments also reports $B(\tau^- \to K^- K^{*0} \pi^0 \nu_\tau) = (2.39 \pm 0.46 \pm 0.26) \times 10^{-5}$?, which is the first measurement for this mode.

Table 5. Results for branching fractions (in %) from unitarity constrained fit to data from non-B-Factories and including those from B-Factories.

Base modes from τ^- decay	No B-Factory Data	With B-Factory Data
leptonic modes		
$e^-\bar{\nu}_e\nu_\tau$	17.838 ± 0.048	17.833 ± 0.040
$\mu^-\bar{\nu}_\mu\nu_\tau$	17.352 ± 0.046	17.408 ± 0.038
non-strange modes		
$\pi^-\nu_\tau$	10.903 ± 0.064	10.831 ± 0.051
$\pi^-\pi^0\nu_\tau$	25.495 ± 0.095	25.531 ± 0.090
$\pi^-2\pi^0\nu_\tau$ (ex. K^0)	9.233 ± 0.099	9.278 ± 0.097
$\pi^-3\pi^0\nu_\tau$ (ex. K^0)	1.031 ± 0.075	1.046 ± 0.074
$h^-4\pi^0\nu_\tau$ (ex. K^0,η)	0.098 ± 0.039	0.107 ± 0.039
$K^-K^0\nu_\tau$	0.153 ± 0.016	0.160 ± 0.016
$K^-\pi^0K^0\nu_\tau$	0.154 ± 0.020	0.162 ± 0.019
$\pi^-K^0_SK^0_S\nu_\tau$	0.024 ± 0.005	0.024 ± 0.005
$\pi^-K^0_SK^0_L\nu_\tau$	0.108 ± 0.025	0.119 ± 0.024
$\pi^-\pi^-\pi^+\nu_\tau$ (ex. K^0,ω)	8.952 ± 0.061	8.983 ± 0.050
$\pi^-\pi^-\pi^+\pi^0\nu_\tau$ (ex. K^0,ω)	2.749 ± 0.069	2.751 ± 0.069
$h^-h^-h^+2\pi^0\nu_\tau$ (ex. K^0,ω,η)	0.085 ± 0.037	0.097 ± 0.036
$h^-h^-h^+3\pi^0\nu_\tau$	0.028 ± 0.005	0.032 ± 0.003
$\pi^-K^-K^+\nu_\tau$	0.153 ± 0.007	0.144 ± 0.003
$\pi^-K^-K^+\pi^0\nu_\tau$	0.006 ± 0.002	0.006 ± 0.002
$3h^-2h^+\nu_\tau$ (ex. K^0)	0.081 ± 0.005	0.082 ± 0.003
$3h^-2h^+\pi^0\nu_\tau$ (ex. K^0)	0.019 ± 0.003	0.020 ± 0.002
$\pi^-\pi^0\eta\nu_\tau$	0.175 ± 0.024	0.139 ± 0.007
$\pi^-\omega\nu_\tau$	1.953 ± 0.064	1.959 ± 0.064
$h^-\pi^0\omega\nu_\tau$	0.404 ± 0.042	0.409 ± 0.042
strange modes		
$K^-\nu_\tau$	0.686 ± 0.022	0.697 ± 0.010
$K^-\pi^0\nu_\tau$	0.453 ± 0.027	0.431 ± 0.015
$K^-2\pi^0\nu_\tau$ (ex. K^0)	0.057 ± 0.023	0.060 ± 0.022
$K^-3\pi^0\nu_\tau$ (ex. K^0,η)	0.036 ± 0.022	0.039 ± 0.022
$\bar{K}^0\pi^-\nu_\tau$	0.888 ± 0.037	0.831 ± 0.018
$\bar{K}^0\pi^-\pi^0\nu_\tau$	0.358 ± 0.035	0.350 ± 0.015
$\bar{K}^0\pi^-2\pi^0\nu_\tau$	0.027 ± 0.023	0.035 ± 0.023
$\bar{K}^0h^-h^-h^+\nu_\tau$	0.023 ± 0.020	0.028 ± 0.020
$K^-\pi^-\pi^+\nu_\tau$ (ex. K^0,ω)	0.334 ± 0.023	0.293 ± 0.007
$K^-\pi^-\pi^+\pi^0\nu_\tau$ (ex. K^0,ω,η)	0.039 ± 0.014	0.041 ± 0.014
$K^-\phi\nu_\tau$ ($\phi \to KK$)		0.004 ± 0.001
$K^-\eta\nu_\tau$	0.027 ± 0.006	0.016 ± 0.001
$K^-\pi^0\eta\nu_\tau$	0.018 ± 0.009	0.005 ± 0.001
$\bar{K}^0\pi^-\eta\nu_\tau$	0.022 ± 0.007	0.009 ± 0.001
$K^-\omega\nu_\tau$	0.041 ± 0.009	0.041 ± 0.009
Sum of strange modes	3.0091 ± 0.0722	2.8796 ± 0.0501
Sum of all modes	100.00	100.00

value of $m_s(2\,\mathrm{GeV}) = 94 \pm 6$ MeV Jamin, Oller, and Pich (2006), which contributes to an error of 0.0010 on $|V_{us}|$. We note that this error is equivalent to half the difference between calculations of $|V_{us}|$ obtained using fixed order perturbation theory (FOPT) and contour improved perturbation theory (CIPT) calculations of $\delta R_{\mathrm{theory}}$ Maltman (2010), and twice as large as the theoretical error proposed in Ref. Gamiz, Jamin, Pich, Prades, and Schwab (2008).

As in Ref. Davier, Hocker, and Zhang (2006), we improve upon the estimate of electronic branching fraction by averaging its direct measurement with its estimates of $(17.899 \pm 0.040)\%$ and $(17.794 \pm 0.062)\%$ obtained from the averaged values of muonic branching fractions and the averaged value of the lifetime of the τ lepton $= (290.6 \pm 1.0) \times 10^{-15}$ s ?, assuming lepton universality and taking into account the correlation between the leptonic branching fractions. This gives a more precise estimate for the electronic branching fraction: $B_e^{uni} = (17.852 \pm 0.027)\%$.

Assuming lepton universality, the total hadronic branching fraction can be written as: $B_{\mathrm{had}} = 1 - 1.972558\, B_e^{uni}$, which gives a value for the total τ hadronic width normalized to the electronic branching fraction as $R_{\mathrm{had}} = 3.6291 \pm 0.0086$.

The non-strange width is $R_{\mathrm{non-strange}} = R_{\mathrm{had}} - R_{\mathrm{strange}}$, where the estimate for the strange width $R_{\mathrm{strange}} = 0.1613 \pm 0.0028$ is obtained from the sum of the strange branching fractions with the unitarity constrained fit as listed in Table 5. This gives a value of $|V_{us}| = 0.2174 \pm 0.0022$, which is $3.3\,\sigma$ lower than the CKM unitarity prediction.

A similar estimation using results from the unconstrained fit to the branching fractions gives $|V_{us}| = 0.2166 \pm 0.0023$, which is $3.6\,\sigma$ lower than the CKM unitarity prediction. Since the sum of base modes from our unconstrained fit is less than unity by $1.6\,\sigma$, instead of using $B_{\mathrm{non-strange}} = 1 - B_{\mathrm{leptonic}} - B_{\mathrm{strange}}$, we also evaluate $|V_{us}|$ from the sum of the averaged non-strange branching fractions. This gives $|V_{us}| = 0.2169 \pm 0.0023$, which is $3.5\,\sigma$ lower than the CKM unitarity prediction.

Summary of these $|V_{us}|$ values are plotted in Figure 12, where we also include values from kaon decays obtained from Ref. Antonelli et al. (2010) and from hyperon decays obtained from Ref. Jamin (????).

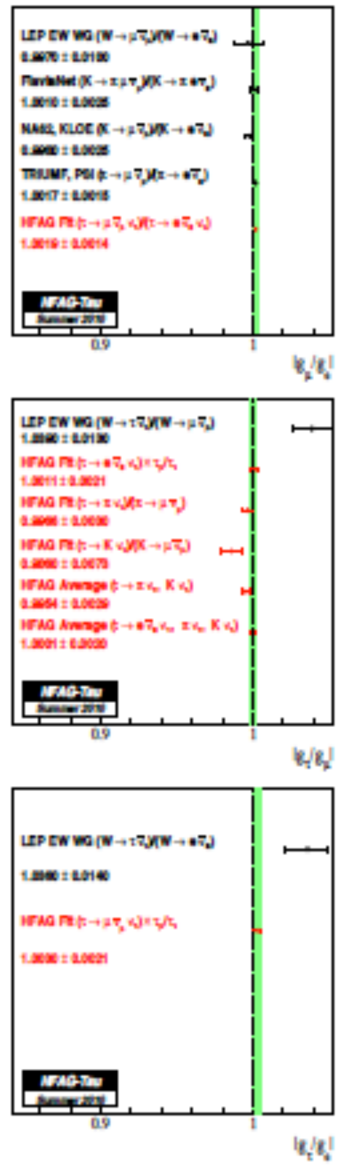

Fig. 11. Measurements of lepton universality from W, kaon, pion and tau decays.

Summary

- Planning is in place – a few questions about particular sections- still need to bring Tony Pich into the theory section writing process
- Text is coming together
- Trying to phone-meet ~every 2-3 weeks (Hisaki & Mike)
- Still Need to bring in more contributors