

EL SABOR DE LA FÍSICA
Taller en celebración del 60 aniversario de **Gabriel López Castro**

José Herman Muñoz
Universidad del Tolima - Colombia



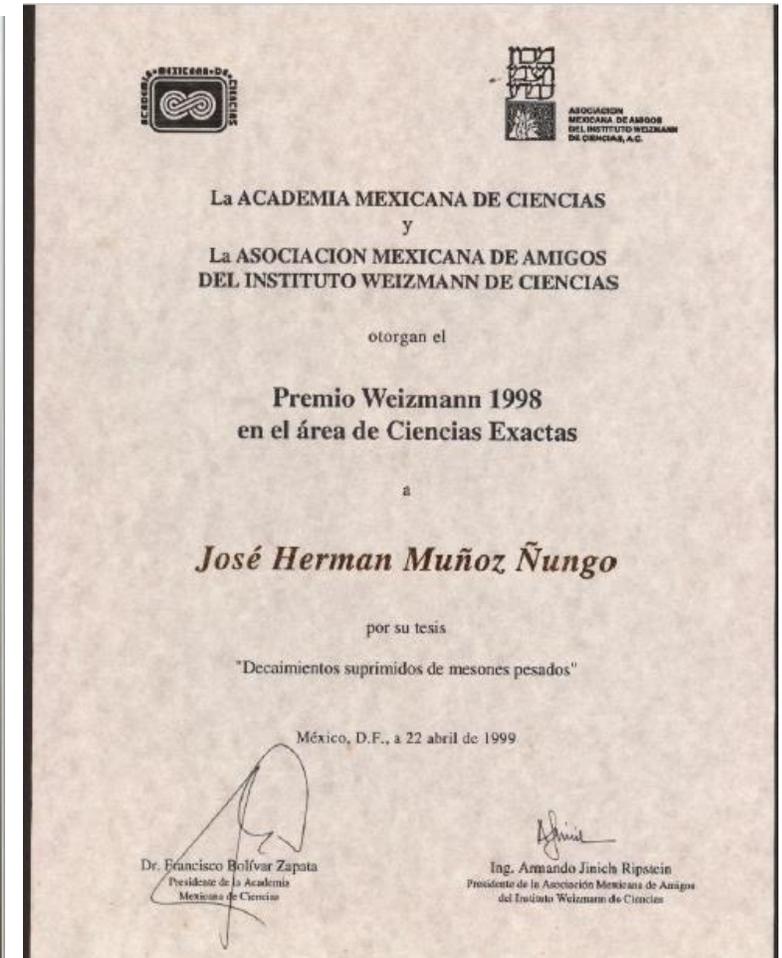
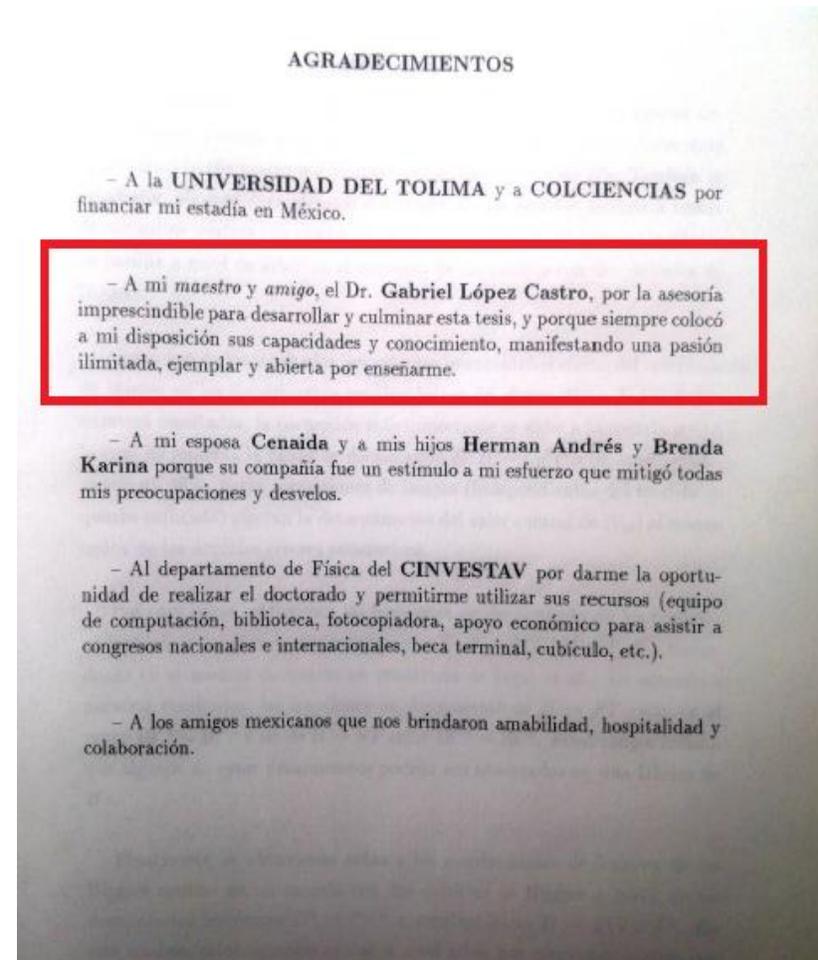
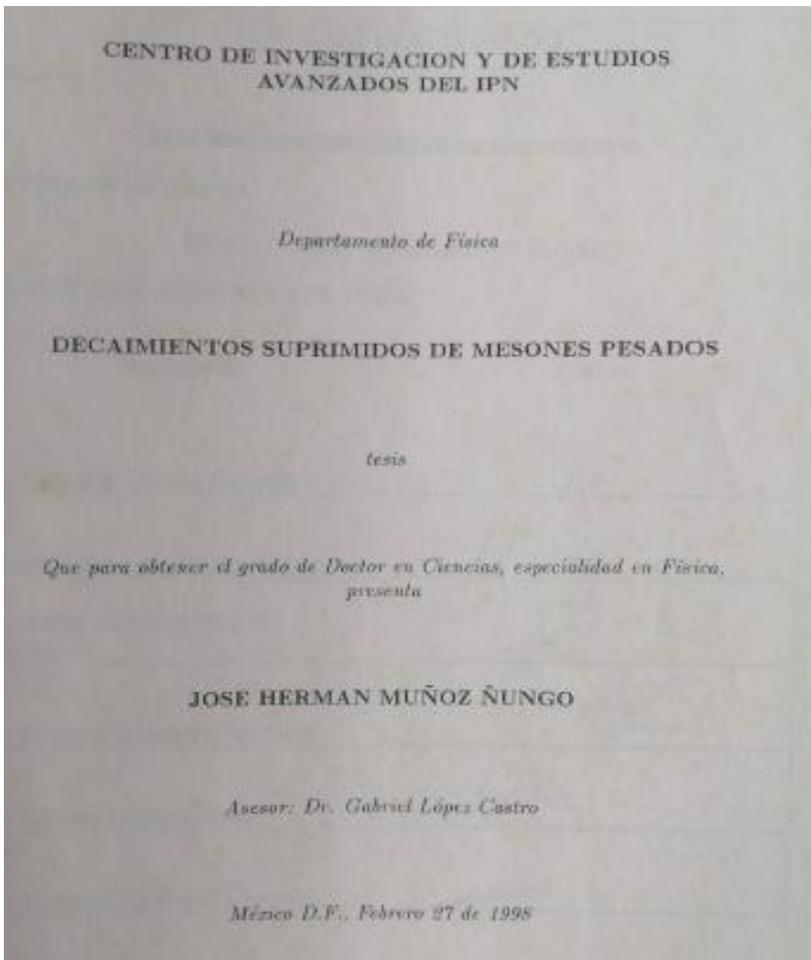
Ciudad de México, 7-8 de abril de 2022

!!!! Nuestro homenajeador !!!



Zanatepec Oaxaca: Personajes Ilustres

Parte I. Recapitulación de trabajo (cómo han evolucionado mis objetivos)



Isospin corrections to charmless semileptonic $B \rightarrow V$ transitions

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(Received 12 January 1996)

We compute isospin corrections to the charmless semileptonic $B \rightarrow V$ transitions arising from ρ - ω mixing and discuss its relevance in the determination of $|V_{ub}|$. [S0556-2821(96)02715-4]

PACS number(s): 13.20.He, 11.30.Hv, 12.15.Hh, 12.40.Vv

The first measurement of an exclusive charmless semileptonic B decay has been reported recently by the CLEO Collaboration [1,4]. The yields for $B^+ \rightarrow \pi^0 l^+ \nu_l$ reported in Refs. [1,4] turn out to be strongly dependent on the theoretical

measurements reported by the CLEO Collaboration on $B \rightarrow \pi l \nu$ [1,4] and the upper limit set on $B \rightarrow \rho l \nu$ [6] rely on the assumptions

Further remarks on isospin breaking in charmless semileptonic B decays

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(Received 28 May 1997; revised manuscript received 4 August 1997)

We consider the isospin-breaking corrections to charmless semileptonic decays of B mesons. Both the recently measured branching ratios of exclusive decays by the CLEO Collaboration and the end-point region of the inclusive lepton spectrum in form factor models can be affected by these corrections. Isospin corrections can affect the determination of $|V_{ub}|$ from exclusive semileptonic B decays at a level comparable to present statistical uncertainties. [S0556-2821(97)06821-5]

PACS number(s): 13.20.He, 11.30.Hv, 12.15.Hh

The first measurements of the exclusive charmless semileptonic decays of B mesons have been reported recently by the CLEO Collaboration [1]. A comparison between CLEO's results for the branching ratios of $B^0 \rightarrow \pi^+ l^- \nu$ and $B^0 \rightarrow \rho^- l^+ \nu$ and the theoretical expressions for their decay

these isospin breaking corrections enter at first order in the charge of vector weak transitions without violating the Ademollo-Gatto theorem.

Although the charmless semileptonic rates of B mesons cannot be measured with a similar precision as K_{e3} decays,

Nonleptonic B decays involving tensor mesons

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(Received 21 August 1996)

Two-body nonleptonic decays of B mesons into PT and VT modes are calculated using the nonrelativistic quark model of Isgur *et al.* The predictions obtained for $B \rightarrow \pi D_s^*$, ρD_s^* are a factor of 3–5 below present experimental upper limits. Interesting patterns are obtained for ratios of B decays involving mesons with different spin excitations and their relevance for additional tests of forms factor models are briefly discussed. [S0556-2821(97)02409-0]

PACS number(s): 13.25.Hw, 12.39.Jh, 14.40.Nd

Weak nonleptonic decays of B mesons involving mesons of intrinsic orbital momentum $l \geq 1$ in final states are expected to be very suppressed [1,2]. The experimental values for B decay into orbitally excited charmed mesons, which

both for Cabibbo-favored and Cabibbo-suppressed modes, are reported in the literature [1]. Furthermore, according to the Particle Data Group (see p. 99 in Ref. [1]), the multiplet of tensor mesons is well established among the ones for the

FCNC's in leptonic and semileptonic decays of D mesons in a general two-Higgs-doublet model

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(Received 20 October 1997; published 29 June 1998)

Large long-distance standard model effects in flavor-changing neutral current (FCNC) semileptonic D decays can make observable these processes in future measurements. Eventual disagreements in this sector and/or the observation of lepton-family-violating (LFV) D decays would require an explanation beyond the standard model framework. In this paper we confront present experimental data on leptonic and semileptonic FCNC and LFV D meson decays with a version of the two-Higgs-doublet model that allows these effects to occur at the tree level. The stringent bounds on the parameters of the model are obtained from $D^0 \rightarrow l^+ l'^-$ and $D \rightarrow \pi^+ l' l'^-$ decays. The consistency of the model requires that the branching fractions of $D \rightarrow V l^+ l'^-$ decays should be below the 10^{-9} level. [S0556-2821(98)06713-7]

PACS number(s): 12.15.Mm, 12.60.Fr, 13.20.Fc

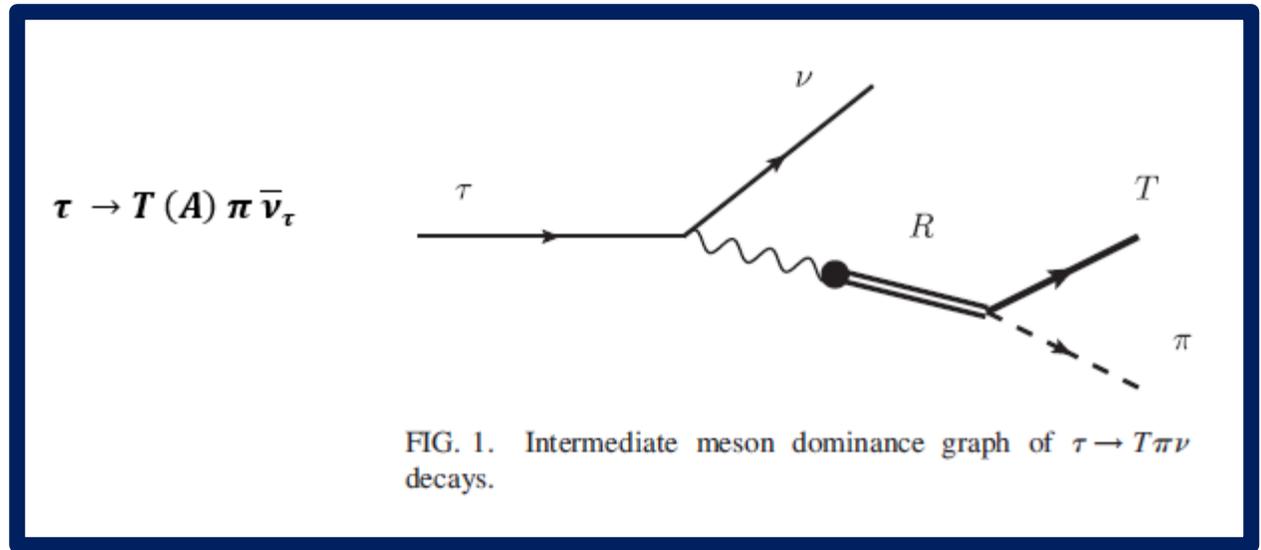


$$H \rightarrow M_1 M_2$$

$$H \rightarrow M_1 \tau \bar{\nu}_\tau$$

$$H = D_q, B_q, B_c$$

$$M_{1(2)} = P, V; S, A, T; P(2S), V(2S)$$



Fundador y Coordinador de grupo del
investigación *Física de Partículas –
teórico (QUARK)* reconocido por
COLCIENCIAS

Apoyo a creación de
programas en la UT

Maestría en física (2008)
Pregrado en física (2022)

Formación de recurso humano en la UT

Trabajos de grado dirigidos

pregrado: 7

Especialización en física: 4

Maestría en física: 11. De ellos 5 continuaron con
estudios doctorales

Mentor: +20 estudiantes del Tolima
para que hagan doctorado. La
mayoría en CINVESTAV.

Parte II. Trabajo actual (a qué me dedico?)

Profesor de planta, tiempo completo en la
Universidad del Tolima (UT)

Formación de recurso humano
Trabajos que estoy dirigiendo:

Pregrado: 1

Maestría en física: 4

Doctorado en física: 1

Posdoctorado: 1

Investigación

Anomalías **cargadas** ($b \rightarrow c \tau \bar{\nu}_\tau$) y **neutras** ($b \rightarrow s \mu^+ \mu^-$) del mesón B: *Triplet Vector Boson Model* y *Leptoquarks* (U_1).

Colaboración: N. Quintero (U. Santiago de Cali), E. Rojas (UNINARIÑO), J. M. Cabarcas (U. Santo Tomás), Cristian García (UNIQUINDÍO)

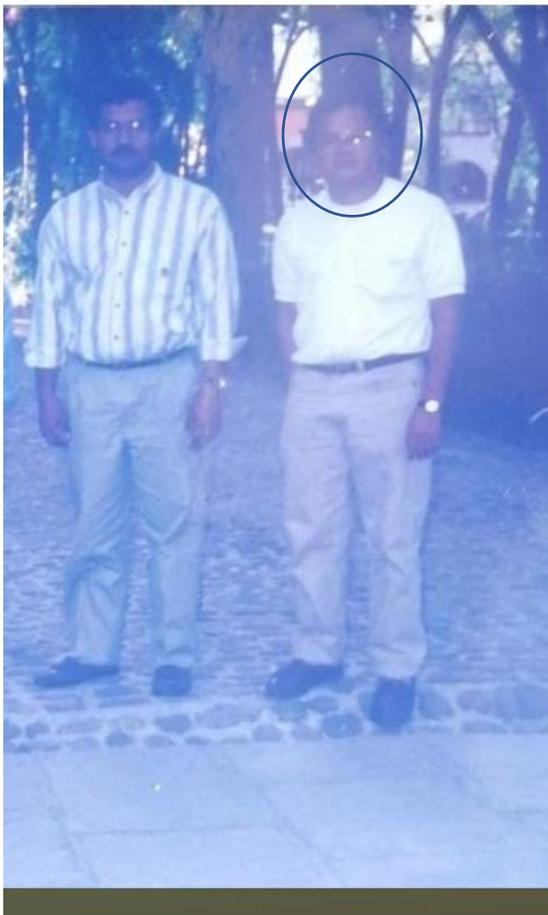
J. Phys. G 48, 035001 (2021); PRD 103, 073003 (2021); arXiv:2203.14172

Enseñanza de la Física: Uso de software libre (GeoGebra, simulador PhET, Tracker) como herramienta didáctica para enseñar física.

Parte III. Visión del futuro del campo

- **Acciones para establecer colaboraciones:** co-dirección, jurado evaluador, conferencista, temas comunes de investigación.
 - Apoyo: **pasantías** de estudiantes
- **Física de sabores pesados:** fenomenología de mesones D , $B_{u,d,s}$, B_c y el leptón τ .
 - **Amplitudes de helicidad**

Para finalizar...



Muchas gracias, *maestro y amigo*, por la formación que me dio. Colocó a mi disposición sus capacidades y su conocimiento, manifestando una pasión ilimitada, ejemplar y abierta por enseñarme. Actitud que aún permanece en Usted.

Es agradable afirmar que tuve un director de tesis todos los días, dispuesto a atender mis inquietudes y que nunca me hizo sentir fatigado.

Este seguro que en el Tolima hemos logrado formar una escuela con su impronta.



Anécdotas – Consejos a un joven científico 

• **!!!!!! GRACIAS !!!!!**

$R(D), R(D^*); R(J/\Psi); R(X_c); P_\tau(D^*); F_L(D^*); R(\Lambda_c); B_c \rightarrow \tau \bar{\nu}$

$R(K), R(K^*); R(Y(nS))$