

**Brazil - France - Collaboration - LIA -
"Subatomic physics: from theory to applications"
- 2018**

**Laboratório de Física Teórica e Computacional -
LFTC**

Universidade Cruzeiro do Sul - UCS

ITA - LIA - 2018

June 12, 2018

Start 2005 { **Universidade Cruzeiro do Sul – UCS**
Support = { **Fundação de Amparo á Pesquisa do Estado de São Paulo**
FAPESP
Conselho Nacional de Desenvolvimento Tecnológico

Group Start with:

- **Dr. João Pacheco B. C. de Melo**
- **Dr. Victo Santos Filho**
- **Dr. Jaime Sandro Veiga**

Today:

- **Dr. João Pacheco B. C. de Melo**
- **Dr. Bruno El-Bennich (2010)**
- **Dr. Kazuo Tsushima (2015)**
- **Dr. Gilberto Ramalho (2017, Research Fellow)**
- **Dr. S. Nakamura (Visit Professor- 2017-2018)**
- **Dr. Ana C. Machado (2017, Pos-doc)**
- **Dr. George Conto dos Santos (2018, Collaborator)**

Same year:

Fapesp Approve Two Projects:

- **Projeto: Métodos computacionais e Física das Partículas Elementares e do Núcleo.**

Coordenador: João Pacheco Bicudo Cabral de Melo.

Processo FAPESP: 05/55155-2 - 2005 - 2008.

- **Projeto de Cooperação Bilateral** *FAPESP, Brasil - CNRS, França - LFTC-UNICSUL - LPNHE - Paris VI & VII:*

Estudo Fenomenológico das Reações com Quarks Pesados

Processo FAPESP: 06/50343-8 - 2006 - 2008.

After 2005:

Projects*

J. Pacheco. C. de Melo	{	FAPESP	14 <i>Projects</i>
		CNPq	3 <i>Projects</i>
		CAPES	2 <i>Projects</i>
		FAPESP	1 <i>Project Submitted(2018)</i>
Bruno El-Bennich	{	FAPESP	10 <i>Projects</i>
		CNPq	7 <i>Projects</i>
		CAPES	3 <i>Project</i>
		SBF APS	1 <i>Project</i>
Kazuo Tsushima	{	CNPq	3 <i>Projects</i>
		FAPESP	3 <i>Project</i>
		CAPES	1 <i>Project</i>
Gilberto Ramalho	{	FAPESP	1 <i>Project</i>

Collaborations

- **Brazil** {
 - ★ **ITA, SP.**
 - ★ **IFT – UNESP, SP.**
 - ★ **IFUSP – USP, SP.**
 - ★ **IFSP, SP.**
 - ★ **IIP, UFRN, Natal, RN.**
 - ★ **UFRJ, RJ., RJ.**

World

- ★ LPNHE – Uni. Paris VI – France
- ★ La Sapienza – Uni. Roma I – Italy
- ★ Tour Vergatta – Uni. Roma II – Italy
- ★ North Carolina State University, NCSU – USA
- ★ Universidade de Coimbra, Portugal
- ★ Argonne National Lab, ANL , Chicago, USA
- ★ Universidade de Salamanca, Spain
- ★ Universidade de Medellin, Colombia
- ★ Universidade de Michoacan, Morelia, Mexico
- ★ University of Adeliade, CSSM, Australia
- ★ Tokio University of Science, Tokio Japan
- ★ University of Salamanca, Salamanca, Spain
- ★ Saha Institute of Nuclear Physics, Kolkata, India
- ★ Indian Institute of Technology, Roorkee, India
- ★ Department of Physics, Soongsil University, Seoul, Korea

Importante Projects

- **LFTC-FAPESP - Brazil / CNRS- France - (2005-2008)**
Title: Estudo fenomenológico das reações com quarks pesados
LFTC: J. Pacheco B. C. de Melo / LPNHE: Bruno El-Bennich
- **LFTC-FAPESP-Brazil / , NCSU, USA - (2014-2015)**
Title: Light-cone phenomenology of generalized parton distribution functions
LFTC: J. Pacheco B. C. de Melo / NCSU—: Prof. Chueng -R. Ji
- **LFTC-CNPq- PVE-Brazil / NCSU, USA (2015-2018)**
Title: - Light-Front Phenomenology of Hadronic structure on the lightt-cone
LFTC: J. Pacheco B. C. de Melo / NCSU—: Prof. Chueng -R. Ji

- **LFTC-CNPq- PVE-Brazil/University of Adeliade,CSSM, Australia (2015-2018)**

Title: - Quark Structure of Hadrons, free and in-medium

LFTC: Prof. Kazuo Tsusmima / CSSM—: Prof. A. W. Thomas

- **FAPESP-SPRINT 2017/50328-3)**

Title: Quark-gluon tomography at the Electron-Ion Collider

**LFTC: Bruno El-Bennich (Cruzeiro do Sul) / Argonne National Lab,
USA: Ian Cloet**

Graduated Students: Master

- ① Elio B. Porcelli/Supervisor: Prof. V. dos Santos Filho (2010)
- ② Lindenberg Isac/Supervisor: Prof. J. P. B. C. de Melo (2011)
- ③ Edson Otoniel da Silva/Supervisor: Prof. J. P. B. C. de Melo (2012)
- ④ Clayton Santos Mello/Supervisor: Prof. J. P. B. C. de Melo (2013)
- ⑤ Adriano N. de Souza/Supervisor: Prof. V. dos Santos Filho (2013)
- ⑥ José de Paulo C. Filho/Supervisor: Prof. V. dos Santos Filho (2013)
- ⑦ Sérgio J. G. da Silva/Supervisor: Prof. V. dos Santos Filho (2014)
- ⑧ Anacé Nunes da Silva/Supervisor: Prof. J. P. B. C. de Melo (2014)
- ⑨ George Y. da Silva/Supervisor: Prof. J. P. B. C. de Melo (2015)
- ⑩ Samuel B. Soltau/Supervisor: Prof. J. P. B. C. de Melo (2015)
- ⑪ Jonatan Pantoja Paschoal/Supervisor: Prof. J. P. B. C. de Melo (2015)
- ⑫ Rômulo Moreira Moita/Supervisor: Prof. J. P. B. C. de Melo (2016)

Graduate Phd.

- **Fernado Serna / Supervisor: Prof. Gastão Krein (IFT)/ Bruno El-Bennich (LFTC) (2017)**
- **Clayton Santos Mello / Supervisor: Prof. Tobias Frederico (ITA)/ J. P. de Melo (LFTC) (2017)**

Today

- **Roberto Silveira** - Master (LFTC) Sup.: Bruno El-Bennich
- **Eduardo A. Costa** - Master (LFTC) Sup.: Kazuo Tsushima
- **Luiz A. Troiani** - Master (LFTC) Sup.: Ana C. Machado
- **G. Yabuzaki** - Phd. (ITA - LFTC) Sup.: W. de Paula (ITA) / J. P. B. de Melo (LFTC)
- **Rômulo Moita** - Phd. (ITA - LFTC) Sup.: Tobias Frederico (ITA) / J. P. B. de Melo (LFTC)

Pos-docs

- **Eduardo Rojas Peña (Colombia) (2012-2015)**

Support *FAPESP and LFTC*

Supervisor: João Pacheco B. C. de Melo

- **Ali Muhamed Paracha (Pakistan) (2013-2015)**

Support *FAPESP and LFTC*

Supervisor: Bruno El-Bennich

- **Isthiaq Ahmed (Pakistan) (2014-2015)**

Support *FAPESP and LFTC*

Supervisor: João Pacheco B. C. de Melo

- **Javier J. Cobos-Martínez (Mexico) (2016-2017)**

Support *CAPES and LFTC*

Supervisor: Kazuo Tsushima

- **Vitor Fernando Paiva Gigante (Brazil) 2016-2017**

Supervisor: João Pacheco B. C. de Melo

Support: *CNPq and LFTC*

- **Ana C. Machado (Brazil) 2017-present**

Support: *CAPES and LFTC*

Organizer (and Co-) Workshops

- ① *International Workshop On Relativistic Few-Body Physics-* (2006)
LFTC and ITA - Support: **FAPESP, CNPq and CAPES, UCS**
- ② **Light-Cone 2009: Relativistic Hadronic and Particle Physics**
ITA - LFTC - Support: **FAPESP, CNPq and CAPES**
- ③ **NonPerturbative QCD (QCD2012) (2012)**
LFTC, ITA and IFT - Support: **FAPESP, CNPq and CAPES, UCS.**
- ④ **NonPerturbative QCD (QCD2014) (2014)**
LFTC, ITA and IFT - Support:
FAPESP, CNPq, CAPES, ICTP, CLAF, UCS.
- ⑤ **Workshop: 10 Years LFTC - Hadrons Physics Group Celebration**
Laboratório de Física Teórica e Computacional - LFTC - Universidade
Cruzeiro do Sul, (2015). Support: LFTC- UCS
- ⑥ **Nonperturbative Quantum Chromodynamics in view of the upgraded
Jefferson Lab, FAIR and the Electron-Ion Collider (2018)**
LFTC, IFT and UNICAMP - Support: **FAPESP, CNPq and CAPES,
ICTP, UCS**

Research Areas and Themes

- **J. Pacheco B. C. de Melo**
 - Light-Front Quantum Field Theory / Particle Physics
 - Electromagnetic Form Factors: Pion, Kaon, Nucleon, Rho, ...
 - Decays: Strong and semileptonic decays
 - Hadronic Systems in the medium: Pion , Kaon, Rho meson, Nucleon
- **Bruno El-Bennich**
 - Quantum Field Theory / Hadronic Physics
 - Schwinger-Dyson Approach
 - Electromagnetic Form Factors
 - Bounds States
 - Decays

● Kazuo Tsushima

- Main area: Hadron properties in medium, based on the quark-meson coupling (QMC) model, LF model, and NJL model.
- Neutrino mean path using the in-medium modified nucleon EM and Axial form factors
- In-medium properties of pion and rho-meson based on LF model plus QMC model
 - In-medium nucleon EMFFs based on the relativistic spin-coupling LF model
 - Heavy, single bottom properties in medium.
 - In-medium pion and kaon properties in the NJL model: phi-nuclear, J/Psi-nuclear, and η_c -nuclear (quarkonia-nuclear) bound states

● Gilberto Ramalho

- Electromagnetic structure of the nucleon and nucleon resonances in the space-like region
- Electromagnetic structure of baryons in the nuclear medium
- Nucleon Compton Scattering: contributions of the nucleon resonances, nucleon polarizabilities
- Holographic calculations of the structure of nucleon resonances
- Electromagnetic and axial structure of baryons with strange quarks

- **Satoshi Nakamura**
 - Pion photoproduction on the deuteron and extraction of neutron-target observables
 - Neutrino-induced pion production on the deuteron
- **Ana Machado and George C. Santos**
 - Standard Model Extensions - ($3 \times 3 \times 1$ Model)
 - Neutrino mass by means of multi - higgs models with additional discrete or continuous symmetries.
 - Phenomenology of new scalars in the LHC era.
 - Flavors change in neutral currents due to new scalar.
 - Neutrino magnetic moment due to new scalars.

Articles 2005 - 2018

- Articles / Scientific Publications Refereed Journals:

J. de Melo	46 (from 2005)
B. El-Bennich	24 (from 2010)
K. Tsushima	14 (from 2015)
G. Ramalho	5 (from 2017)
S. Nakamura	2 (from 2017)
Sum	91

- Exp.: APS (PRD, PRC, PRL), PLB, NPA, NPB, JPG, FBS, etc...

Astrophysics Group - Universidade Cruzeiro do Sul

- Prof. Dr. Gustavo Amaral Lanfranchi / NAT - UCS **Lider**
- Prof. Dr. Anderson Caproni / NAT - UCS
- Prof. Dr. Hugo Vicente Capelato / NAT - UCS
- Profa. Dra. Lucimara Pires Martins / NAT - UCS
- Profa. Dra. Tatiana Ferraz Laganá / NAT - UCS
- Prof. Dr. Grzegorz Kowal / NAT - UCS
- Prof. Dr. Caius Lucius Selhorst / NAT - UCS

Support by Universidade Cruzeiro do Sul

- **Prof. Dr. Renato Padovese - Diretor Acadêmico**
Grupo Educacional Cruzeiro do Sul
- **Prof. Luiz H. Amaral - Reitor**
Universidade Cruzeiro do Sul
- **Profa. Dra. Tania Cristina Pithon-Curi -**
Pró-reitoria de Pós-graduação e Pesquisa
Universidade Cruzeiro do Sul
- **Prof. Dr. Carlos Fernando de Araujo Jr. -**
Pró-reitoria de Educação á Distância
Universidade Cruzeiro do Sul

Abbreviation for Brazilian Institutions

- **IFUSP: Instituto de Física da Universidade de São Paulo, (São Paulo State, Brazil).**
Site: <http://portal.if.usp.br/ifusp/en>
- **FAPESP: Fundação de Amparo á Pesquisa do Estado de São Paulo, (Brazil).**
Site: <http://www.fapesp.br/>
- **CNPq: Conselho Nacional de Desenvolvimento Científico e Tecnológico, (Federal agency, Brazil).**
Site: <http://www.cnpq.br/web/guest/pagina-inicial>
- **CAPES: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, (Federal Agency, Brazil).**
Site: <http://www.capes.gov.br/>
- **MCTI: Ministério da Ciência, Tecnologia e Inovação, (Federal, Brazil).**
Site: <http://www.mctic.gov.br/portal>

- Support: **FAPESP** , **CNPq** and **CAPES**
Thanks (Obrigado)!!

