

Postdoctoral Position Universidade de São Paulo Brazil

Marcelo G. Munhoz

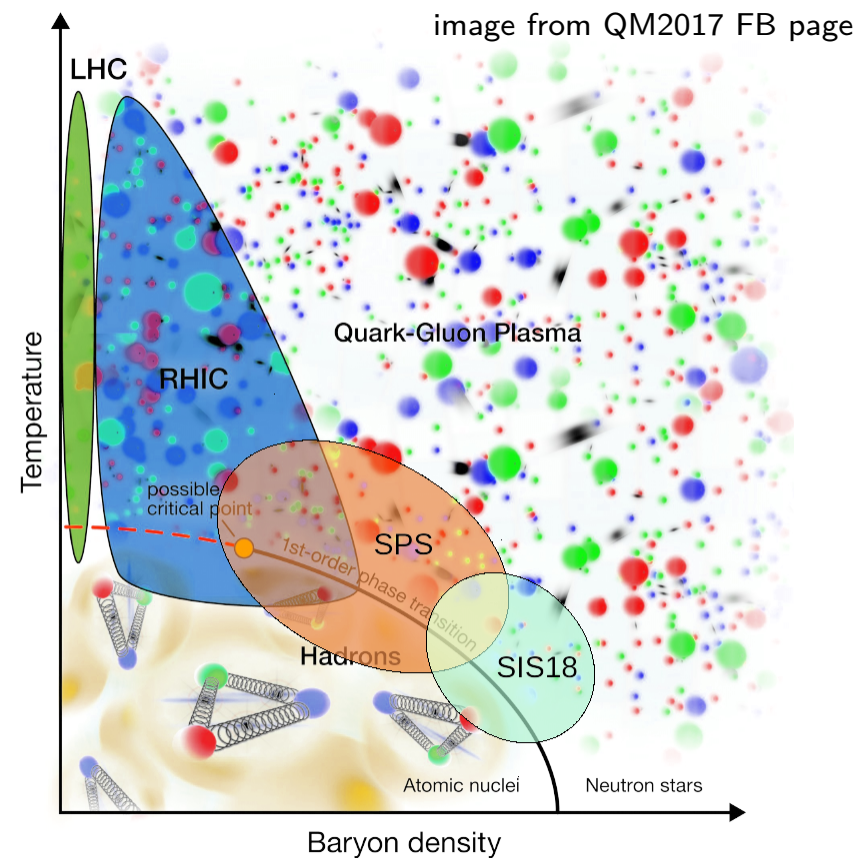


Main Research Topic

- **Data analysis in heavy flavour and/or jet physics in the ALICE experiment**

Nuclear matter phase diagram

- Probe nuclear matter in extreme conditions
 - QCD predicts the formation of the quark-gluon plasma (QGP)
- It can be done experimentally through high energy nuclear collisions

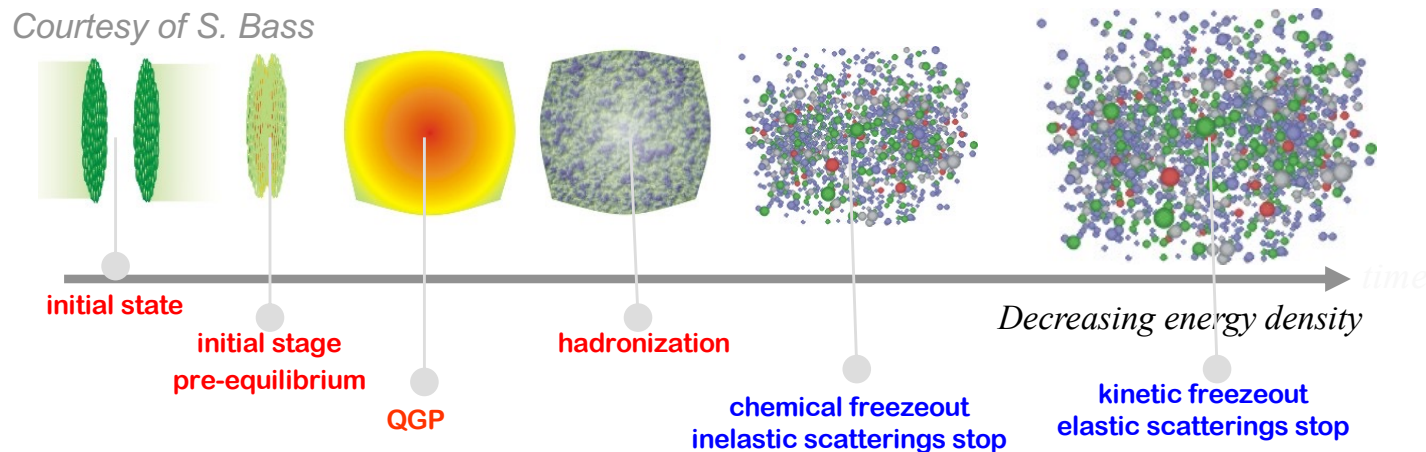


Quark-Gluon Plasma (QGP)

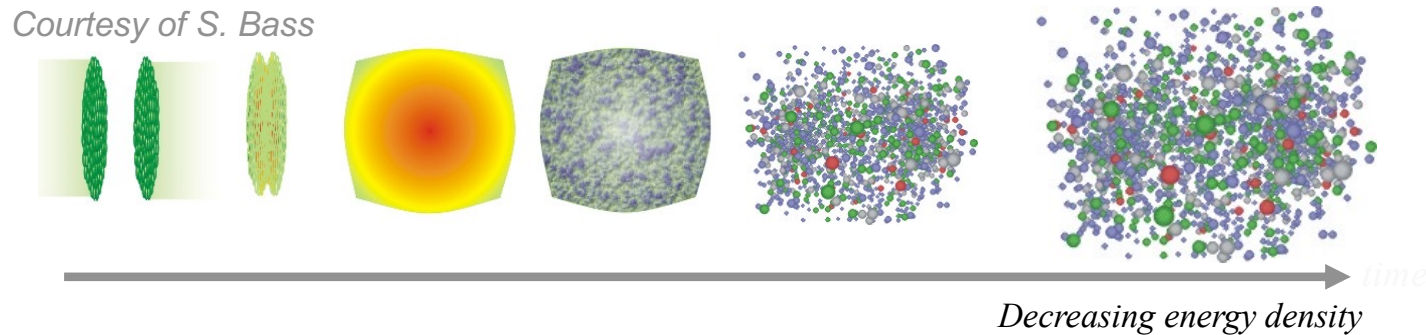
- *“A locally thermally equilibrated state of matter in which quarks and gluons are **deconfined** from hadrons, so that color degrees of freedom become manifest over nuclear, rather than merely nucleonic, volumes.”*
(STAR Collaboration’s Critical Assessment of the Evidence from RHIC Collisions - 2005)
- *“It is the simplest form of complex matter that we know of, ..., most directly connected to the fundamental laws that govern all matter in the universe.”*
(W. Busza, K. Rajagopal and W. van der Schee, Ann. Rev. Nucl. Part. Sci. 2018. 68:1–49)

Relativistic heavy-ion collisions

- Describe the dynamics of relativistic heavy ion collisions
 - Access to fundamental QCD processes
- Schematic description of collisions time evolution:



How to study the QGP?



- **Microscopic (short wavelength or quasi-particle) characterization of QGP**
 - High energy probes (Hard Probes)
- **Macroscopic (long wavelength) characterization of QGP**
 - Global (bulk) observables of the freeze-out state
- In both cases, comparison with more elementary collisions, p-p and p-Pb types, is essential.



Heavy flavor

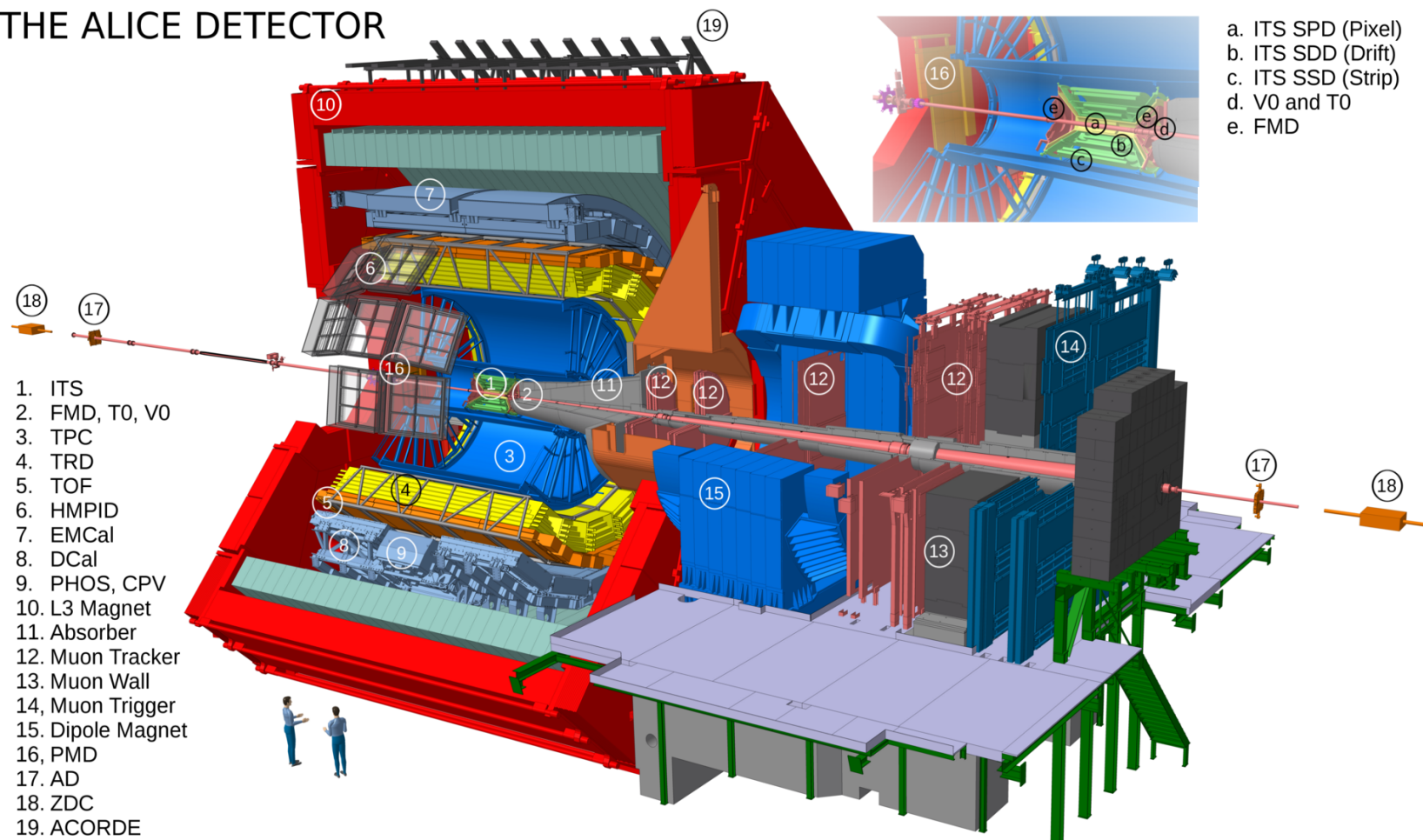
- **Heavy quarks produced at the early stages of the collision and survive the QGP lifetime**
 - Production time $\tau_p \sim 1/m_Q \sim 0.05 - 0.15 \text{ fm}/c$
- **Probe thermalization in the QGP (low p_T)**
 - Medium transport properties
- **Energy loss in the QGP (high p_T)**
 - Heavy quarks are expected to lose less energy than light quarks and gluons
 - Medium density and size





ALICE (Version 1)

THE ALICE DETECTOR



1. ITS
2. FMD, T0, V0
3. TPC
4. TRD
5. TOF
6. HMPID
7. EMCal
8. DCal
9. PHOS, CPV
10. L3 Magnet
11. Absorber
12. Muon Tracker
13. Muon Wall
14. Muon Trigger
15. Dipole Magnet
16. PMD
17. AD
18. ZDC
19. ACORDE

- a. ITS SPD (Pixel)
- b. ITS SDD (Drift)
- c. ITS SSD (Strip)
- d. V0 and T0
- e. FMD



ALICE Collaboration



- 40 countries, 174 institutes (including 18 associates)
- 2001 members (1030 authors)
- 403 papers on Run 1 and 2 data (period of 2009-2018)

System	Year(s)	v_{sNN} (TeV)	L_{int}
Pb-Pb	2010, 2011	2.76	75 μb^{-1}
	2015, 2018	5.02	800 μb^{-1}
Xe-Xe	2017	5.44	0.3 μb^{-1}
p-Pb	2013	5.02	15 nb^{-1}
	2016	5.02, 8.16	3 nb^{-1} , 25 nb^{-1}
pp	2009-2013	0.9, 2.76, 7, 8	200 μb^{-1} , 100 nb^{-1}
	2015, 2017	5.02	1.5 pb^{-1} , 2.5 pb^{-1}
	2015-2018	13	1.3 pb^{-1} , 36 pb^{-1}

Brazil in ALICE

- Contribute to the study of the Quark-Gluon Plasma through a relevant participation in the **ALICE** experiment
 - Physics analysis
 - Development of state-of-the-art instrumentation



ALICE

USP



UNICAMP



UFABC



UFRGS



Brazil in ALICE

- Current personnel:
 - 4 Institutes
 - 11 faculty researchers (1.75% of ALICE)
 - 12 PhD thesis defended + 8 PhD active students (1.4% of ALICE)



Universidade de São Paulo

ALICE Group

- 4 faculty researchers
 - Marcelo Munhoz (Team leader and supervisor of the position)
 - Alexandre Suaide
 - Marco Bregant
 - Tiago Fiorini
- 7 PhD students

Contract Conditions

- Candidates are supposed to have:
 - A recent Ph.D. degree in high-energy nuclear or particle physics
 - Knowledge of English language
 - Experience in C++ programming
 - At least one publication in a peer reviewed journal.

Contract Conditions

- Supported by the state of São Paulo funding agency FAPESP
 - <https://fapesp.br/en/postdoc>
- Salary: **R\$9.047,40 (~US\$1750,00)**
 - No taxes
 - Brazilian average income: **R\$2.300,00**
- Initially for a period of two years, but renewable for an extra one or two years

Contract Conditions

- Within this period of time, a stay of one year abroad can also be requested
 - <https://fapesp.br/en/bepe>
 - Salary depends on the country. At CERN, for instance, the income is **CHF 4,230.00**
- The positions also include a research grant that can be used for equipment and travel to conferences
 - It is 15% of total annual income

Expected Deliverables (ALICE Position)

- Data Analysis (with analysis notes and participation in papers committees)
- Presentations in conferences
- Leadership within the collaboration
- Tutoring of PhD students
- Desirable participation in phenomenological papers interpreting the data

Universidade de São Paulo



STAFF

Faculty	5,190
Technical-administrative	13,144

CULTURAL AND EXTENSION ACTIVITIES

Extracurricular courses	1,374
Museums	19
Orchestras	3
Choirs	4
Theater	1
Movie theaters	4

UNDERGRADUATE PROGRAMS

Programs	329
Yearly Enrollment	14,052
Applications for the Admission Exam	130,768
Enrolled students	60,817

GRADUATE PROGRAMS

Programs	264
Students	29,454
Regular students in Master Programs	13,980
Regular students in Doctorate Programs	15,474

SCIENTIFIC OUTPUT

Docs in databases Web of Sciences	15,343
Scopus	18,626

INTERNATIONALIZATION

Partnerships and protocols	1,729
Foreign students - Undergraduate	584
Foreign students - Graduate	1,447

Universidade de São Paulo

- QS World University Rankings 2023: **85th**
- SCImago Institutions Rankings (SIR): **50th**
- Center for World University Rankings (CWUR): **109th**
- Academic Ranking of World Universities (ARWU): **101-150th**
- Times Higher Education World University Rankings: **201–250th**

São Paulo - Brazil

- São Paulo is a metropolis of many faces. At the same time, it is the most important economic center of Brazil and it is the capital of culture in Latin America
 - 101 museums, 282 movie theaters, 146 libraries and around 40 cultural centers
 - 111 parks spread out around the city
 - 15 thousand restaurants and 20 thousand bars

Applications

- Interest candidates should send their CV and two recommendation letters to **Marcelo Munhoz (munhoz@if.usp.br)**
- Further information can also be obtained through this e-mail address
- This position will remain open until it is filled