UNIVERSITÀ DEGLI STUDI DI MILANO

TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO **ID CODE ____4680_____**

I the undersigned asks to participate in the public selection, for qualifications and examinations, for the awarding of a type B fellowship at **Dipartimento di Fisica**_____

Scientist- in – charge: Prof. Aniello Mennella _____

Federico Incardona

CURRICULUM VITAE

PERSONAL INFORMATION

Surname	Incardona
Name	Federico
Date of birth	13/02/1990

PRESENT OCCUPATION

Appointment	Structure
Occasional employment	Università degli Studi di Milano – Dipartimento di Fisica

EDUCATION AND TRAINING

Degree	Course of studies	University	year of achievement of the degree
Degree	Physics	Milano Statale	2016
Specialization			
PhD	Physics	Milano Statale	2020
Master			
Degree of medical specialization			
Degree of European specialization			
Other			

REGISTRATION IN PROFESSIONAL ASSOCIATIONS

Date of registration	Association	City

Università degli Studi di Milano – Direzione Risorse Umane
Ufficio Contratti di formazione e Ricerca
Via Sant'Antonio 12 - 20122 Milano, Italia
Assegni.ricerca@unimi.it

FOREIGN LANGUAGES

Languages	level of knowledge
Italian	Mother Tongue
English	Independent user
French	Basic

AWARDS, ACKNOWLEDGEMENTS, SCHOLARSHIPS

Year	Description of award

TRAINING OR RESEARCH ACTIVITY

I worked mainly on simulations and data analysis for CMB experiments. I exploited mathematical and statistical methods such as maximum likelihood estimation, multivariate analysis, conjugate gradient, Monte Carlo simulations, and Fourier analysis. I acquired knowledge on high-performance and parallel computing, and on code handling. I presented the results of my work in several conferences, through talks and poster expositions. I regularly presented the progress of my work in Collaboration meetings. I collaborated in two projects:

LSPE

I developed a large part of the code to simulate and study the scanning strategy of the LSPE/STRIP instrument, a ground-based telescope that will observe the polarized emission of the sky at 40 and 90 GHz from the "Observatorio del Teide" (Tenerife) starting in 2021. The high-frequency instrument of LSPE is an independent balloon-born telescope, working at 140, 220, and 240 GHz, called SWIPE. Together, the two instruments of LSPE aim to constrain the B-modes and to study the polarized emission of the Milky Way at a sensitivity level higher than Planck satellite. My analysis demonstrated that a reasonable baseline is a survey performed by spinning the STRIP telescope around the azimuth axis with a constant elevation angle from the zenith. This will allow STRIP to scan over atmospheric layers of constant airmass as well as to cover a large portion of the Northern Sky. At the same time, the observed sky region will overlap the one observed by SWIPE. Eventually, I found that it is possible to improve further the STRIP scanning strategy by slowly modulating the elevation of the telescope, obtaining a more uniform sky coverage. Besides, I was strongly involved in the unit-level tests on the STRIP polarimeters, which are coherent receivers able to detect directly the polarization of the incoming radiation. I performed functionality and performance cryogenic tests to asses their best disposition on the focal plane. I, also, developed the code to analyze the detector noise characteristics. My work was essential to optimize the STRIP focal plane polarimeters deployment.

QUBIC

I collaborate to the "Q&U Bolometric Interferometer for Cosmology" (QUBIC) since my Master Thesis, when I studied the impact of the band-pass response and of the finite size of the detectors on the synthesized beam, which is the optical response of the instrument to the observed sky signal. QUBIC will observe the sky at 150 and 220 GHz through an array of 400 back-to-back feedhorns (constructed at UniMI) that act as

diffractive pupils. The multi-peaked interference fringe pattern arising from all pairs of apertures produces a synthesized beam. The two focal planes (one for each frequency) are composed by 992 square bolometers cooled to 0.3 K. Bolometric interferometry is one of a kind concept, with systematic effects that are very different from the ones of all the others working or under development experiments. A technological demonstrator is currently being tested and will be installed in Argentina, at the Alto Chorrillos site, within 2020. My work was crucial to bring out an original and thorough understanding of the instrument, leading to a new way to use it as a spectro-imager. In particular, I strongly improved the QUBIC simulation pipeline, and I performed simulations to help estimate the signal-to-noise ratio thanks to the application of the spectro-imaging.

PROJECT ACTIVITY

Year	Project

PATENTS

Patent

CONGRESSES AND SEMINARS

Date	Title	Place
3/04/2018	The LSPE/STRIP instrument: measuring large-scale polarization in the Northern millimeter sky	EWASS 2018 European Week of Astronomy and Space Science, Liverpool, UK.
27/11/2017	Scanning the sky with the LSPE/STRIP instrument	Meeting of Ph.D. students on Astrophysics in the Milan area, Milan, Italy.
09/10/2017	Preliminary scanning strategy analysis for the LSPE/STRIP instrument	LSPE Collaboration meeting, Rome, Italy.

PUBLICATIONS

Books
Observing the polarized Cosmic Microwave Background from the Earth : scanning strategy and polarimeters test for the LSPE / STRIP instrument. PhD thesis, University of Milan, Jan 2020

Articles in reviews
Progress Report on the Large-Scale Polarization Explorer. The LSPE Collaboration. Journal of Low Temperature Physics, April 2020
The large scale polarization explorer (LSPE) for CMB measurements: performance forecast. The LSPE Collaboration. arXiv e-prints, page arXiv:2008.11049, August 2020
Angular resolution at map level in the QUBIC instrument. The QUBIC Collaboration. Boletin de la Asociacion Argentina de Astronomia La Plata Argentina, 61B:155–158, July 2020

QUBIC: Using NbSi TESs with a Bolometric Interferometer to Characterize the Polarization of the CMB. The QUBIC Collaboration. Journal of Low Temperature Physics, April 2020
QUBIC: The Q & U Bolometric Interferometer for Cosmology. The QUBIC Collaboration. Journal of Low Temperature Physics, 199(1-2):482–490, February 2020
TES Bolometer Arrays for the QUBIC B-Mode CMB Experiment. The QUBIC Collaboration. Journal of Low Temperature Physics, January 2020
QUBIC: Exploring the Primordial Universe with the Q&U Bolometric Interferometer. The QUBIC Collaboration. Universe, 5(2):42, January 2019
QUBIC: Measuring CMB polarization from Argentina. The QUBIC Collaboration. Boletin de la Asociacion Argentina de Astronomia La Plata Argentina, 60:107–114, August 2018
QUBIC VI: cryogenic half wave platerotator, design and performances. The QUBIC Collaboration. arXiv e-prints, arXiv:2008.10667, August 2020
QUBIC V: Cryogenic system design and performance. The QUBIC Collaboration. arXiv e-prints, arXiv:2008.10659, August 2020
QUBIC VIII: Optical design and performance. The QUBIC Collaboration. arXiv e-prints, arXiv:2008.10119, August 2020
QUBIC III: Laboratory Characterization. The QUBIC Collaboration. arXiv e-prints, arXiv:2008.10056, August 2020

Congress proceedings
Preliminary scanning strategy analysis for the LSPE-STRIP instrument. F. Incardona, M. Benetti, M. Bersanelli, C. Franceschet, D. Maino, A. Mennella, S. Realini, and M. Tomasi. In Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, volume 10708, page 107082F, July 2018
The STRIP instrument of the Large Scale Polarization Explorer: microwave eyes to map the Galactic polarized foregrounds. The LSPE-STRIP Collaboration. In Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, volume 10708 of Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, page 107081G, July 2018
The QUBIC instrument for CMB polarization measurements. The QUBIC Collaboration. In Journal of Physics Conference Series, volume 1548 of Journal of Physics Conference Series, page 012016, May 2020
Performance of NbSi transition-edge sensors readout with a 128 MUX factor for the QUBIC experiment. In Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, volume 10708, page 1070845, July 2018
Thermal architecture for the QUBIC cryogenic receiver. The QUBIC Collaboration. In Millimeter, Submillimeter, and Far-Infrared Detectors and Instrumentation for Astronomy IX, volume 10708 of Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, page 107083V, July 2018
Simulations and performance of the QUBIC optical beam combiner. The QUBIC Collaboration. In Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, volume 10708, page 107082I, July 2018
QUBIC: the Q and U bolometric interferometer for cosmology. The QUBIC Collaboration. In Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, volume 10708, page 107082B, July 2018
Optical modelling and analysis of the Q and U bolometric interferometer for cosmology. The QUBIC Collaboration. In Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, volume 10531 of Society of Photo-Optical Instrumentation Engineers (SPIE) Conference Series, page 105310G, February 2018
QUBIC: the Q&U Bolometric Interferometer for Cosmology. The QUBIC Collaboration. A novel way to look at the polarized Cosmic Microwave Background. In Proceedings of the European Physical Society Conference on High Energy Physics, page 44, July 2017

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Congress posters
Preliminary scanning strategy analysis for the LSPE-STRIP instrument. F. Incardona, M. Benetti, M. Bersanelli, C. Franceschet, D. Maino, A. Mennella, S. Realini, and M. Tomasi. In SPIE Astronomical Telescopes + Instrumentation 2018, Austin, Texas, 10-15 June 2018
The scanning strategy for the LSPE-STRIP instrument. F. Incardona, M. Bersanelli, S. Caprioli, C. Franceschet, D. Maino, A. Mennella, S. Realini, and M. Tomasi. In Tensions between the Early and the Late Universe, Santa Barbara, California, 15-17 July 2019

In preparation
Spectro-Polarimetry with Bolometric Interferometry. J.C. Hamilton, P. Chanial, G. Dashyan, F. Incardona, J. Kaplan, N. Krachmalnicoff, M. Piat, M. Stolpovskiy, A. Tartari, and M. Tristram. Expected within 2020

OTHER INFORMATION

Declarations given in the present curriculum must be considered released according to art. 46 and 47 of DPR n. 445/2000.

The present curriculum does not contain confidential and legal information according to art. 4, paragraph 1, points d) and e) of D.Lgs. 30.06.2003 n. 196.

Place and date: ____Milano_____, ____10/09/2020___

SIGNATURE

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