



TO MAGNIFICO RETTORE OF UNIVERSITA' DEGLI STUDI DI MILANO

ID CODE __6324__

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 Aldo Pontremoli__

Scientist- in - charge: _____ D'Angelo Davide _____

Shihong Fu

CURRICULUM VITAE

PERSONAL INFORMATION

Surname	Fu
Name	Shihong

PRESENT OCCUPATION

Appointment	Structure
Ph. D student	Institute of Modern Physics, Fudan University

EDUCATION AND TRAINING

Degree	Course of studies	University	year of achievement of the degree
Degree	Applied Physics (New Energy and Microelectronics)	Donghua University	2018
Specialization			
PhD	Particle Physics and Nuclear Physics	Fudan University	2018 - present
Master			
Degree of medical specialization			
Degree of European specialization			
Other			



REGISTRATION IN PROFESSIONAL ASSOCIATIONS

Date registration	of	Association	City

FOREIGN LANGUAGES

Languages	level of knowledge
English	B2
Italian	A2

AWARDS, ACKNOWLEDGEMENTS, SCHOLARSHIPS

Year	Description of award
2020	2020 State Scholarship Fund by China Scholarship Council
2017	2016-2017 National Scholarship by Chinese Ministry of Education

TRAINING OR RESEARCH ACTIVITY

description of activity
<p>« Borse di addestramento alla ricerca » with the CUORE/CUPID Experiments, from July 2021 to June 2023, as a Visiting Ph.D Student at Laboratori Nazionali del Gran Sasso (LNGS) in L'Aquila, Italy.</p> <ul style="list-style-type: none">· These activities have been carried out in the framework of the CUPID and CUORE experiments. My contributions have focused on cryogenics, with the participation in several R & D runs in the CUPID test facility and data analysis, mainly focused on the CUORE data.· I have developed a method that utilizes the delayed coincidence technique to measure the level of radioactive background. I have conducted precise measurements of the surface contamination level and bulk contamination level of the TeO₂ crystal of the CUORE detectors. In particular, I have measured the radioactive decay chain of ²³²Th, ²³⁵U and ²³⁸U. Using the time search characteristics of delayed coincidence, I have systematically investigated the energy range of major contamination events, including the α energy region and the β/γ energy region. I was able to measure the energy deposition of α recoils. The main research output is that it has been proven for the first time that the decay chain has reached secular equilibrium, and the obtained radioactive activity level is consistent with the established background model by using Monte Carlo methods.· I have initiated a method to eliminate vibration from the raw data stream of baseline measurements. The main principle is to use the phase matching of noise trace at nearby time window to subtract the noise underneath the measured triggered signal from the same channel. Because the subtraction is done in the time domain encompassing all noise frequencies. Technically, it can serve as a pre-noise-reduction for the Optimal Filter (OF), thereby achieving further noise suppression as a whole. The noise reduction effect I achieved is based on each individual detector channel, and it is extremely responsive in real time. This noise subtraction method is different from the current CUORE noise reduction scheme and we plan to continue to pursue this approach.· I have developed an additional analysis module for the CUORE data analysis chain, which uses the trigger threshold of the optimal filter (OF) as the input for the detector to perform coincidence analysis. This allows for the selection of the best response energy threshold for each detector, establishing a more uniform determination of event multiplicity. This allows many multiplicity events that are missing in the low energy range due to a higher energy threshold to be correctly identified as multi-detector response events, rather than being misidentified as single crystal energy deposition. This has improved the energy



resolution of the calibration peaks, and the better understanding of low energy tail side of the α full energy peak.

· Since July 2021, I have been fully involved in the CUPID Crystal Validation Run (CCVR) project. It aims to sample test the characteristics of batch crystals. I am engaged in the assembly, installation, and reading of light detectors and bolometers. In addition, I have gained experience in operating a dilution refrigerator and have participated in the operation of the cryogenic apparatus, further enhancing my skills in cryogenics.

Fudan University Exchange Program Scholarship for Doctoral Students, from September 2019 to March 2020, as a Visiting Ph.D student at University of Milano-Bicocca in Milano, Italy.

· I spent more than 6 months working with the group at University of Milano-Bicocca. To improve my knowledge and skills in the field of Fundamental Particle Physics, I attended a course of Data-Analysis for Physics and a Laboratory of Particle Detector. In October 2019, I was accepted as a member of the CUORE international collaboration, joining the background model Working Group.

· The main work I have completed involves fitting all γ peaks in the β energy region. By comparing with the branching ratio of its decay, I have verified the accuracy of the background model. I have also conducted some research on the quenching factor of the crystal.

· As a full member of CUORE/CUPID, I have spent many hours working in the underground laboratory and have the capability to independently carry out research projects in the lab.

PROJECT ACTIVITY

Year	Project
2022 Present	- CUORE 2ton-year data production reprocessing
	<ul style="list-style-type: none">· I am involved in the reprocessing of the CUORE datasets. This reprocessing is performed at Centro Nazionale Analisi Fotogrammi (CNAF) starting from November 2022. The plan includes the reprocessing of data adding up to 2 ton · year.· At The XVIII International Conference on Topics in Astroparticle and Underground Physics 2023, by combining the results of the 2nd ton · year with those of the 1st ton · year, we updated the latest limit on the half-life of neutrinoless double beta decay of ^{130}Te.
2022 Present	- Member of LUCE collaboration group
	<ul style="list-style-type: none">· The LUCE (LUtetium sCintillation Experiment) project is designed to search for the ^{176}Lu electron capture based on a milli-Kelvin calorimetric approach.· In Phase-I, I conducted a room-temperature spectral measurement using a $4\times 4\times 20\text{ mm}^3$ (Lu, Y)$_2\text{SiO}_5$:Ce (LYSO:Ce) crystal and a photomultiplier tube (PMT). This enabled me to observe the intrinsic radiation. Additionally, I performed an initial comparison with simulations.
2021 Present	- Member of the Research and Development (R & D) group for CUPID
	<ul style="list-style-type: none">· I am part of the Research and Development (R & D) group for CUPID. The primary goal of CUPID is to enhance sensitivity by utilizing scintillating crystal calorimeters and light detectors to reject background events.· My key contributions include conducting background reconstruction and data analysis. I have evaluated the expected sensitivity and discovery potential of various detector configurations and isotopes. Furthermore, I have performed bolometric measurements on lithium molybdate ($\text{Li}_2^{100}\text{MoO}_4$) enriched crystals, which will be used for CUPID, and be studied their radiopurity and performance.



2019 Present	- Member of CUORE collaboration group
	<ul style="list-style-type: none">· I have covered 92 days of Detector Operation shift, an indispensable role which enable CUORE to maintain a continuous and stable operation ensuring a high duty cycle.· I participated in the periodic maintenance of the cryogenic apparatus also providing emergency response availability.
2021 - 2023	First CCVR cold run in the CUPID R & D facility
	<ul style="list-style-type: none">· My responsibility ensured that the cool-down was performed correctly and safely, without causing damage to the delicate detectors. I also participated in the improvement and maintenance of the dilution refrigerator cryostat.
2022	CUORE 2ton-year analysis critical tasks
	I developed a Channel-Dependent Optimum Trigger (OT) thresholds algorithm. Taking into account the unique characteristics and requirements of each channel, this algorithm is designed to determine the optimal threshold values for different channels in a system. This algorithm has passed validation and has been tested and proven to work as expected in a variety of scenarios
2020 - 2021	Electromagnetic Calorimeter (EMCal) production for sPHENIX
	<ul style="list-style-type: none">· The sPHENIX experiment at the Relativistic Heavy Ion Collider (RHIC) is designed to explore the physics of quantum chromodynamics (QCD) matter. The Electromagnetic Calorimeter (EMCal) is a key component, aiding in the reconstruction of jet total transverse energy. The EMCal block is composed of scintillating fibers supported by copper screens, embedded in a tungsten powder and epoxy absorber.· 20% of the block production occurred in China, with Fudan University playing a significant role. The blocks underwent rigorous Quality Assurance (QA) procedures, including evaluations of tungsten powder and fiber scintillation. I was responsible for full production process and partially for the QA.· Overall, the blocks we produced stand out in various aspects such as geometric dimensions, density, completeness of fiber numbers, and luminous capability.
2016 - 2018	National Students' Innovative Training Program
	<ul style="list-style-type: none">· Analysis of the « Products of Plasma VOCs Degradation by Dielectric Barrier Discharge » was completed. The project involves mass spectrometry, chemical bond energy analysis, programming, image processing.
2015 - 2018	Shanghai Students' Innovative Training Program
	<ul style="list-style-type: none">· « Urban High Point Panoramic Intelligent Monitoring System » was developed with other graduate students. The project involves image processing, thermal monitoring, high-definition camera, image transmission.

PATENTS

Patent



CONGRESSES AND SEMINARS

Date	Title	Place
August 20-30, 2023	Latest results from the CUORE experiment	The 21st Lomonosov Conference on Elementary Particle Physics, online, Moscow, Russia (Virtual)
September 5-8, 2022	CUORE experiment results	The 2022 International Workshop on Baryon and Lepton Number Violation (BLV2022), Brussels, Belgium
July 23-28, 2023	The CUORE-CUPID cryostat: current performance and future upgrades (poster)	The 20th International Conference on Low Temperature Detectors (LTD20), Daejeon, South Korea
July 23-28, 2023	LUCE (LUtetium sCintillation Experiment): A milli-Kelvin calorimeter experiment to study the electron-capture of Lu-176 (poster)	The 20th International Conference on Low Temperature Detectors (LTD20), Daejeon, South Korea
May 30 - June 4, 2022	The CUORE cryostat: current performance and future upgrade towards CUPID (poster)	The XXX International Conference on Neutrino Physics and Astrophysics (Neutrino 2022), online, Seoul, South Korea (Virtual)

PUBLICATIONS

Books

Articles in reviews
D. Q. Adams et al., Search for Majorana neutrinos exploiting millikelvin cryogenics with CUORE. 2022 Nature 604.7904 P53-58.
K. Alfonso et al., Optimization of the first CUPID detector module. 2022 The European Physical Journal C 82.9 P810.
D. Q. Adams et al., Measurement of the $2\nu\beta\beta$ Decay Half-Life of ^{130}Te with CUORE. 2021 Phys. Rev. Lett. 126 P171801.
K. Alfonso et al. A first test of CUPID prototypal light detectors with NTD-Ge sensors in a pulse-tube cryostat. 2023 JINST 18 P06033.
K. Alfonso et al. Twelve-crystal prototype of Li_2MoO_4 scintillating bolometers for CUPID and CROSS experiments. 2023 JINST 18 P06018
J. Beeman et al. Characterization of a kg-scale archaeological lead-based PbWO_4 cryogenic detector for the RES-NOVA experiment. 2023 Applied Radiation and Isotopes 194 P110704.
D. Q. Adams et al. New Direct Limit on Neutrinoless Double Beta Decay Half-Life of ^{128}Te with CUORE. 2022 PHYSICAL REVIEW LETTERS 129, P222501
D.Q. Adams et al. An energy-dependent electro-thermal response model of CUORE cryogenic calorimeter. 2022 JINST 17 P11023
J. W. Beeman et al. Radiopurity of a kg-scale PbWO_4 cryogenic detector produced from archaeological Pb for the RES-NOVA experiment. 2022 The European Physical Journal C 82.8 P692.
D. Q. Adams et al. Search for neutrinoless $b+\text{EC}$ decay of ^{120}Te with CUORE 2022 Phys. Rev. C 105 P065504.



A. Armato et al. Novel technique for the study of pileup events in cryogenic bolometers 2021 Phys. Rev. C 104 P015501.

Congress proceedings

OTHER INFORMATION

L'INFN al Festival della scienza di Genova on 2022 October 26, 2022. « Nel Cuore della Montagna » in L'Aquila, Italy.

· I was involved in showcasing the work done at the Gran Sasso National Laboratories (LNGS) to younger audiences. Through live television, I reached out to hundreds of students aged 16 to 19, explaining how the CUORE experiment works. I used easy-to-understand sentences to help the students grasp the concepts more deeply. This approach was not merely aimed at presenting information, but also at enhancing their engagement and learning outcomes.

SHARPER - SHaring Researchers' Passion for Enhanced Roadmaps on September 30, 2022. « EXTREME - Luoghi Estremi Dove Fare Ricerca » in L'Aquila, Italy.

· I was involved in presenting research related to underground laboratories through an interactive journey with scientific instruments, exhibits, and multimedia tools. This event, which attracted more than 20,000 visitors in downtown L'Aquila, provided the public with an opportunity to experience and enhance their understanding of science.

SHARPER - SHaring Researchers' Passion for Enhanced Roadmaps on September 24, 2021. « Viaggio all'Origine dell'Universo » in L'Aquila, Italy.

· I was involved in designing a journey that spanned from the infinitely small particles to the immensely large galaxies. In particular, I designed a session about the application of physics in daily life. Along with other LNGS-GSSI researchers, I showcased experiments and technological applications of physics. My work involved guiding visitors through an exciting journey. This interactive and educational journey attracted more than 20,000 visitors in downtown L'Aquila, providing them with a unique opportunity to experience and understand the fascinating world of physics.

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.

Please note that CV WILL BE PUBLISHED on the University website and It is recommended that personal and sensitive data should not be included. This template is realized to satisfy the need of publication without personal and sensitive data.

Please DO NOT SIGN this form.

Place and date: Shanghai, 07/02/2024