# 热烈祝贺

# 2022年校园宇宙线观测 暑期学校隆重开学

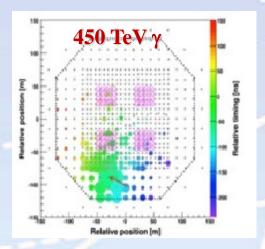


行员等金线观测联盟

2022237 [ 25 ]

# 我们的征程是粒子-宇宙

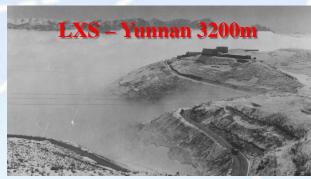
重大科学前沿问题:宇宙线的成分、起源、加速和传播机制,与天体形成和演化密切相关







LHAASO - 四川稻城 4410m

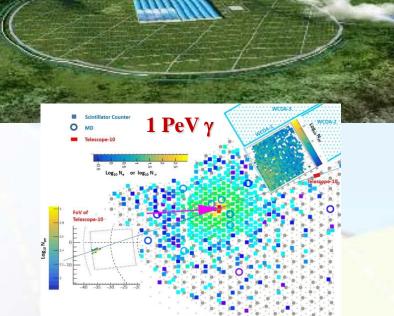


1950











# 校园宇宙线观测联盟

- 目的: 为了推进我国校园宇宙线观测网建设,普及宇宙线知识,开展宇宙线科学研究,加强相关国际交流,促进创新型人才培养,成立校园宇宙线观测联盟。
- 性质:校园宇宙线观测联盟是以推进学校开展校园宇宙线观测和研究、培养创新型人才为目标,科学普及、人才培养和科学研究三位一体,由成员自愿组成的、非盈利性的非法人协作单元。
- **职能:** 1、推进校园宇宙线观测站的建立,开展宇宙线观测与相关研究。2、推动宇宙线观测仪器设备的开发和数据采集与处理软件等方面的合作。3、促进联盟成员在宇宙线观测和研究方面的合作,建立宇宙线观测数据库,实现数据共享。4、组织培训班、研讨会,开展宇宙线观测研究的交流。5、加强校园宇宙线国际交流与合作,协调参与"国际宇宙线日"活动。6、基于宇宙线探测和研究,促进物理教师科研能力提升和学生中的创新型人才培养。

摘自:《校园宇宙线观测联盟章程》

# 校园宇宙线观测联盟第一届理事会

(按汉语拼音排序)

陈 陈 陈世明 崔树旺 刚 晨 韩 然 金红兵 刘长铭 顾 王 术 吴於人 齐明钢 钱祥利 闯 郑洪炜 郑文莉 祝凤荣 张

# 初步工作计划

- 推进校园宇宙线观测站建设
- 推动观测仪器和设备的开发
- 促进观测和研究方面的合作
- 组织宇宙线培训班、研讨会
- 协调"国际宇宙线日"活动
- 依托宇宙线观测开展科学教育

# 校园宇宙线观测联殿 工作汇报

中科院高能物理所 张 闯

機區宇宙經规則培训会

2022437 = 25 =

# 校园宇宙线观测联盟工作汇报

- 发展联盟会员
- 推进校园宇宙线观测站的建设
- 校园宇宙线数据共享
- 通过政协委员向全国政协提案
- 各工作组开展活动
- 组织参加国际宇宙日活动
- 校园宇宙线观测培训工作

# 一、发展联盟会员

## 团队会员 (2020.9.28)

单位/研究组	团队负责人	团队人数
中国科学院高能物理研究所宇宙线工作组	郑文莉	<b>2</b> 5
清华大学宇宙线工作组	顾 晨	3
西南交通大学宇宙线工作组	祝凤荣	7
航天五院宇宙线工作组	韩然	6
山东管理学院宇宙线工作组	钱祥利	2
河北师大-石家庄一中宇宙线工作组	崔树旺	11
北京市东直门中学宇宙线课程组	王术	7
江苏省姜堰高级中学	曹军	11
江苏省兴化高级中学宇宙线观测站	金红兵	6
江苏省王淦昌中学	高发圣	4
宇宙线扬中观测站	陈世明	13
四川成都石室天府中学	罗乐	5
中科科技培训中心	齐明钢	4

### 个人会员

- 刘长铭(中国教育学会高 中物理教学专业委员会)
- 陈冬 (原中科院人事局)
- 郑洪炜 (中国科普出版社)
- 吴於人 (同济大学)
- 叶竞波(美国Southern Methodist大学)

# 联盟成立后得到各方面的关心,联盟按照章程稳步发展会员(团队)

单位/研究组	团队负责人	团队人数	申请时间
深圳市华侨城中学	<b></b>	19	2020.9.24
福建泉州市奕聪中学	黄向荣	8	2020.9.30
河北张家口五中	常军	3	2020.10.9
北京市陈经纶中学	张国玉	3	2020.12.25
西藏大学宇宙线教育部重点实验室	陈天禄	4	2021.3.11
湖南师范大学附属中学	马顺存	3	2021.9.13
中山大学校园宇宙线观测团队	杨莉莉	30	2022.3.28
北京汇文中学垂杨柳校园宇宙线观测组	刘金艳	4	2022.7.8

# 校园宇宙线联盟成员的分布



市 沙 発 向

# 推进校园宇宙线观测站的建设

- 江苏省姜堰中学校园宇宙线观测站已完成设备制作和测试验收,具备安装条件;
- 江苏省兴化已落实经费,正在讨论实施方案和技术开发合同;
- 西藏大学和中山大学正在建设校园宇宙线观测站;
- 深圳市华侨城中学与高能所举行校园宇宙线项目推进会,并考察了东直门中学。







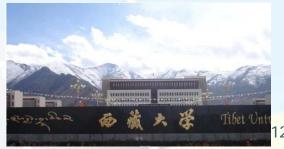












# 三、校园宇宙线数据共享

### 校园宇宙线观测联盟数据开放和使用办法

- 一、为了更好规范校园宇宙线观测联盟(以下简称联盟)各成员运行的宇宙线观测实验数据的开放共享,明确各方权利义务,依照**联盟章程第二章第五条第二款第**5项,制定本办法。
- 二、联盟成员运行的宇宙线观测实验所产生的数据应当在整个联盟内共享。数据也应该向公众用户开放。具体开放的数据范围可由成员和联盟协商确定。
- 三、本办法<mark>适用于联盟成员运行的宇宙线阵列产生的数据</mark>以联盟的名义进行开放共享,包括但不限于原始数据、衍生数据等。也包括数据处理所需要的软件、算法等。

四、为了提供统一和高效的服务,由成员学校提供原始数据,而联盟委托中科院高能物理研究所宇宙线工作组代表联盟统一进行数据的预处理和开放共享,并统计数据下载情况。为了方便公众的学习和使用,开放的数据为预处理以后的数据,其数据格式和数据量均经过优化。

五、汇交到联盟的数据归数据提供者及联盟共同所有,联盟有权根据需要进行数据产品的再加工、公开共享。

六、用户在使用开放的数据时,应遵守以下使用条款,特别是需要注明数据的来源。

••••

# 四、通过政协委员向全国政协提案

全国政协杨佳委员:

# 关于以宇宙线观测为抓手 加强科学教育的建议

- 1. 高度重视中小学科学课教学。
- 2. 改革科学课教学内容和教学方式。
- 3. 推动宇宙线观测走进校园。
- 4. 大力支持建设校园宇宙线观测站。

建议教育部协同中科院、中国科协、国家自然基金委等单位研究制定支持建设校园宇宙线观测站的具体办法,通过设立校园宇宙线观测科普项目等方式,从人财物等方面给予大力支持,同时鼓励各地出台更多类似北京市的"翱翔计划"(目前,建设一座4个探测器宇宙线观测站约需经费35万元)。















### **CPPCC** member:

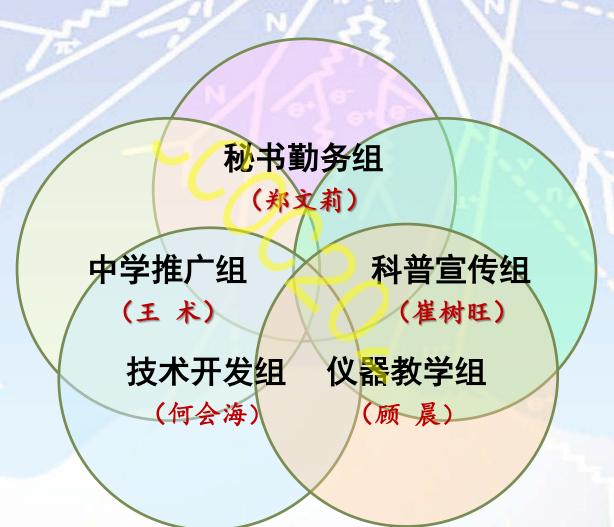
# Observation of cosmic rays could spark kids' interest in science

- Cosmic rays are mysterious, high-charged atomic particles traveling through space at the speed of light, which have baffled scientists for years. But for Yang Jia, a member of the National Committee of Chinese People's Political Consultative Conference (CPPCC), China's top political advisory body, the ability to see and study them could help generate interest in science and space among schoolchildren.
- Yang, also a professor and a member of the Jiusan Society, a democratic political party, proposed further promoting the study of cosmic rays on school campuses at this year's Two Sessions.
- An organization called Campus Cosmic Ray Observation Collaboration was established in September 2020 to promote the idea. Zhang, head of the organization, said they plan to build more stations on school campuses across China.
- Chinese scientist Shen Changquan, 79, has guided Dongzhimen High School workshop for seven years since his retirement. He said such activities can help increase young students' interest in science.

# 五、各工作组开展活动









Date and Time: 2022.3.15 16:00 (China Time)
Location: Room 415, Main Building IHEP
Zoom Meeting ID: 87477278322
Password: 427343

### Topic

In the talk she will give an overview of the outreach activities of DESY in Zeuthen, which techniques/experiments we use for this activity and in which networks we are involved. For example, she will talk about our offers in the student lab at DESY, as well as about the organization of the worldwide International Cosmic Day in the last 10 years.

### About the Speaker: Carolin Schwerdt

She works at DESY in Zeuthen, Germany, as a research assistant in the communication group. She designs, develops and supervises the offers for the project "measurements of cosmic particles" in the school laboratory "physik.begreifen" and she is responsible for the scien-tific coordination of the astroparticle project in the nationwide "Netzwerk Teilchenwelt".

More information: http://ccoc.ihep.ac.cn/

### **Discover Cosmic Rays**

# 加国际宇宙日活动

# INTERNATIONAL COSMIC DAY

**November 4 | 2020** 

Cosmic particles, these unnoticed particles that surround us all the time, are the focus of this day. Students, teachers and scientists get together to talk and learn about Cosmic Rays and answer questions like:

What are cosmic particles?
Where do they come from?
How can they be measured?
And what can we learn from them?

If you want to know more about the secrets they bring with and to be part of this day, get here more information:

Image Credit: DESY, Science Communication Lab

http://icd.desy.de https://www.facebook.com/InternationalCosmicDay

### 第九届国际宇宙日

International Cosmic Day (ICD) (2020年11月4日)

- 国际宇宙日关注我们身边每时刻都存在的宇宙射线。让我们 用一天时间来探索它们,并发现它们带给我们的秘密。
- ◆ 希望全世界对于宇宙粒子感兴趣的年轻人都有机会参加这一 天活动。
- ◆ 在这一天里, 学生、教师和科学家在一起讨论和学习宇宙线:
  - >宇宙粒子是什么?
  - >它们来自何处?
  - ▶如何测量它们?
  - ▶ 我们从能它们学到什么?
- 通过LiveStream共享著名科学家的讲座。













# 参加2021年第十届国际宇宙线日的单位



Cosmic particles, these unnoticed particles that surround us all the time, are the focus of this day. Students, teachers and scientists get together to talk and learn about Cosmic Rays and answer questions like:

> What are cosmic particles? Where do they come from? How can they be measured? And what can we learn from them?

If you want to know more about the secrets they bring with and to be part of this collaboration, get here more

https://www.facebook.com/InternationalCosmicDay









### · 多年集有表现中春

Measurement of intensity for extensive air shower depending on zenith angle near sea level

### 江苏省姜堰中学

Jiangyan High School of Jiangsu Province,C Data Analysis

† The EAS intensity of cosmic rays

lecreases with the increase of zenith angle

↑ The comparison of cosmic ray EAS at

different senith angles of day and night

. ...

Experimental conclusion

We found that the EAS intensity of cosmic rays decreases with the increase of zenith angle After the zenith angle degree increases to a certain value, the EAS intensity decreases significantly and becomes gentle with zenith

We also found that there is no significan difference in the change of cosmic ray EAS intensity with zenith angle during the day and night. This shows that solar activity has little effect on the EAS intensity of cosmic rays



REPORTS

On the following pages, we have compiled your contributions for this booklet. These contributions document your new insights obtained on ICD with images, comments, notes or measurement results and data analysis - as scientists do when they submit and publish a proceeding after a conference. We have sorted the contributions by countries in alphabetical order. Let's start with...

INTERNATIONAL COSMIC DA

### CHINA



Xinghua High School of Jiangsu Province Successfully Participated in the 10th International Space Day Exchange Activity

### 江苏省兴华中学

Xinghua High School of Jiangsu Province, China

Who are you?

At 13:30 GMT on November 10, 2021, nine students from Xinghua High School of Jiangsu Province successfully participated in the 10th International Space Day international exchange activity!

The Video Call

### International Cosmic Day

students of Xinghua High had an interactive discussion in English with five other cosmological ray research teams from different countries and showed foreign researchers their experimental data and research conclusions drawn through their cosmic ray

encourage college and middle school students to collect cosmic ray data, exchange research methods and results, and directly participate in the forefront of contemporary cosmic ray By means of such global joint activity, students leachers, scientists, the general public, anyone interested, will have a broad nderstanding of such questions; What are

nd how to measure cosmic rays?

The activity on the International Cosmic Day

intended to make more people pay attention to

the cosmic rays existing around them at all times,

In 2019, Xinghua High School of Jiangsu Province and the Chinese Academy of Sciences established the relationship of 'cooperation between the

smic rays? Where do cosmic rays come from?

Chinese Academy of Sciences and Xinghua High'. In order to cultivate more backup falents for scientific and technological innovation and give more students the opportunity to join the talent plan under the guidance of colleges and universities, Xinghua High has promoted their school-rur philosophy Institutional Cooperation, Joint Development for the Cultivation of Innovative Talents' to the 'Taizhou Excellent Education Project', aimed at further promoting the improvement of students scientific and technological attainments while continuously pushing forward quality-oriented education. As a consequence, the core members of the program will be engaged as mentors for the building of the Local Integrated Practice and Research-based Learning Curriculum.

To carry out cosmic ray research in middle schools is an effective way to combine science popularization with scientific research. When scientists and schools work together, with

CCOC, we are from China!

### 校园宇宙线联盟

Affiliated to Institute of High Energy Physics, Chinese Academy of Sciences, F

Campus Cosmic-ray Observation Collaboration

What have we done?

Campus Cosmic-ray Observation Collaboration (CCOC) organized to participate in the activities of international Cosmic Day 2021 in China.

Six CCOC member institutions participated in the Liu Jia, member of the campus cosmic-ray

working group of the Institute of High Energy Physics, associate researcher of the core backbone of the Large High Altitude Air Shower Observatory (LHAASO) project, presented a report of "LHAASO and Campus Cosmic-ray Observation", focusing on the completion of LHAASO, major innovative achievements and the progress of the CCOC in promoting the campus cosmic-ray observation project.





What's your take-home message?

More activities in ICD! More fun!

I .Background

NOVEMBER 10 | 2021

**EAS Changed With Zenith Angle** 

湖南师范大学附属中学

Cosmic rays usually consist of high-energy particles from space. On the way high-energy

cosmic rays shoot from space to earth, they need to pass through the atmosphere and it is

the time that they interact with atomic nuclei in the atmosphere, knocking out various

secondary particles. These secondary particles will interact with atomic nuclei in the

atmosphere again during the flight, producing more secondary particles, which are

sprinkled from the air to the earth like a rainstorm, and conducting cascade reactions

continue to occur in this way. This process is also known as "air shower". More specific.

these secondary particles produced by cosmic rays repeatedly act to produce more

secondary particles until the average energy is equal to a certain critical value, and the

number of secondary particles reaches the maximum value, which is called shower

maximum. After that, the particles gradually decay or are affected by the atmosphere.

High-energy cosmic rays can form "showers" with large area, which produce a large

By measuring these charged particles arriving at the same time, the "shower" cases can be

obtained. Scientists usually study on cosmic rays by indirectly detecting these "showers"

reaching the surface of the earth. In general, the higher the energy of cosmic rays, the

larger the shower area that reaches the surface. In practical experimental setup, detector

In this article, we analyzed the data detected by the detector array of Dongzhimen Middle

School in Beijing, China(39,933\*N latitude, 116,417°E longitude, 46,4 meters above sea

level). The detector array is composed of 9 scintillation detectors, separated by 10 meters,

set in a 3×3 matrix pattern, and the sensitive area of each detector is 0.5 square meters.

number of secondary charged particles reaching the ground almost simultaneously.

Absorption, so that the number of secondary particles gradually decreases.

**INTERNATIONAL COSMIC DAY** 

Who are you?

What have you done?

An investigation on the relationship between Muon Flux with Zenith Angle

What's your take-home message?

A maximum Muon Flux at O degree zenith angle

NOVEMBER 10 | 2021

An Investigation on the Relationship of

High School Affiliated to Renmin University of Chi

中国人民大学附属中学

Lang Ji, Yingiun Ma, Shuangyi Zhou, Fengyi Wang, Shangchen Wu A team of student-body Cosmic Ray enthusiasts dedicated to explore and publicize particle physics

Directed by Xiaohui Chen, Xiangcui Lei, Yaping Cheng, Ran Han

**Cosmic Muon Flux and Zenith Angle** 

What did you find out?

A great qualitative fit between experimental data and referenced approximation

### ANALYSIS OF THE DETECTOR COUNTING RATE

### 西南交通大学

Continuous symmetrical decline of Muon Flux with increasing/accreasing zenith angle. A qualitative validation is made to the reference empirical approximation. The results of our experiment can be utilized in interpreting the internal structure of

concealed objects, (e.g. nuclear plants) and cosmic ray detection in outer space.

Southwest Jiaotong University,

What did we find out?

Team Introduction

We are the Institute of Astroparticle Physics which consists of 12 teachers, 5 doctoral candidates, some master degree candidates and undergraduates

Southwest Jiaotong University has five ed detector arrays, which are placed on the roof of the teaching building. The five detectors upstairs transmit the information to the clock synchronization system downstairs through the photoelectric composite cable, and then store it in the computer, so that we can process the data

We focus on the reasons for the change of counting rate, such as whether the atmosphere pollution in Chengdu will lead to the change of counting rate, and whether the counting rate will change suddenly during the period of thunder and

This is the chart drawn by our team. It is the counting rate of the three detectors collected on September 8. From these three diagrams, we can see that the change of the counting rate has the same trend, and the sudden change of those curves maybe affected by the outside.

The take-home message

We analyzed the data of five detectors, focusing on the study of counting rate, and analyzed the relationship between atmospheric environment and sudden change of counting rate curve.

Measurement of intensity for extensive air shower depending on zenith angle near sea level

### 北京市东直门中学

### 1. Equipment

When a very high energy primary cosmic ray arriving atmosphere, it collides with air nuclei, and by interaction produces a several secondary particles. All secondary particles with very high energy collide with air nuclei again, through strong or electric-magnetic interaction profuce more secondary particles. Such cascade interaction forms a great number of particles flight down as a shower. Such phenomenon is called as Extensive Air Shower

On the roof of our school, we built a detectors array to measure EAS, as shown in Figure 1. It consists of 9 scintillation detectors, spaced 10 meters apart as a 3×3 matrix and each detector has a sensitive area of 0.5 square meters. It is located at: latitude 39.933°N. longitude 116.417°E, altitude 46.4 meters above sea level. The electronics digitalize each signal from detectors, a computer continuously acquires data and controls all the equipment online. Whenever a charged particles of cosmic ray passes through our each detector, the GPS time with nanosecond accurancy, amplitude of signal, and triggered detector's location

Fig. 1. An EAS array on the



2. Data analysis

Some procedures to reconstruct the measured tracks of EAS have done, they reconstruct only the EAS event in 400 square meters covered by our array with coincident fold ≥3. We analyzed the direction of each EAS event during t=3 days since Beijing time 0 o'clock on 16th October 2021, and obtained the events number Ni in each range of the i=9 zenith angle uniform ranges from 0 ° to 90 °. Its standard error oi=Ni0.5 . For the zenith angle range A to B, it covers a stereoscopic angle Ω=2π (cos A-cos B), and the effective area of the array is 400m2 ×COS6i (6 is the median of zenith angle range i). By this way, we get the average EAS intensity li=Ni+ (3×Ωi×COSθi) in each zenith angle range within the unit steradian range and 1 day. Its standard error oli =σi+ (3×Ωi×COSθ).

INTERNATIONAL COSMIC DAY

**NOVEMBER 10 | 2021** 

Measurement of intensity for extensive air shower depending on zenith angle near

**Beijing Donzhimen High Schoo** 

The experimental data are listed in table 1 below, and the corresponding curves are shown in

Table 1, Measurement data for EAS intensity 91 138 139 199 74.9 50.8 33.8 23.9 13.

Covered steradian Oi(sr) 0.00500 0.2035 0.0029 0.0202 0.7744 0.0077 0.0026 1.000 1.001 li(er' · day' · 400m') 29038 23188 15449 7753 3417 1674 1018 694 603 = Ni + (3 • O i • COSθi) Figure 2. The EAS intensity depending on

4. Discussion

When the primary cosmic ray flights down through atmosphere, the number of EAS particles increases first, then it decreases gradually after reaching a maximum value since the energy of all particles reduces and decaying or stoped probability

increase. The higher the initial energy, the more EAS particles survive and reach ground. Only when the detectable particle density reaches threshould value of the ground detector array, such EAS can be

40 60 Zenith angle (degree)

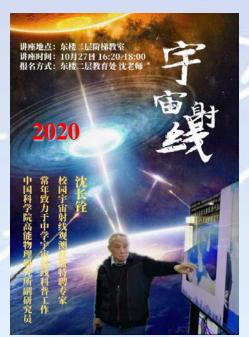
detected. Therefore the energy threshold of detectable EAS of a ground array increases with the increase of atmospheric depth.

Because the integral intensity of isotropy primary cosmic ray is approximately proportional to E-2, the EAS intensity is the descending function of zenith angle.

When zenith angle increases, the depth of the atmosphere increases. Therefore, for a ground array the detectable EAS energy threshold Eincreases with the increase of the zenith angle.

INTERNATIONAL COSMIC DAY **NOVEMBER 10 | 2021** INTERNATIONAL COSMIC DAY NOVEMBER 10 | 2021 INTERNATIONAL COSMIC DAY NOVEMBER 10 | 2021 INTERNATIONAL COSMIC DAY NOVEMBER 10 | 202 INTERNATIONAL COSMIC DAY NOVEMBER 10 | 2021

# 七、校园宇宙线观测培训





# 校园宇宙线联盟 介绍数据共享平台下载和使用 数据方法 指导用Excel处理共享数据 画天顶角分布以及 测量各时间宇宙线强度,研究其变化的物理规

作和物理原因 2021





2021 CCOC 暑期学校



# 2021年校园宇宙线观测暑期交流培训会

线上地址: https://meeting.tencent.com/s/YEcnaxYqH75F 腾讯会议 ID: 272 908 922

时间	会议内容
08:30-08:45	领导致辞
08:45-08:55	张闯:校园宇宙线观测联盟工作汇报
08:55-09:15	何会海:高海拔宇宙线观测站(LHAASO)及其重大成果
09:15-09:45	沈长铨:宇宙线 <mark>观测和科普</mark>
09:45-10:00	照相、休息
10:00-10:30	刘佳:校园宇宙线观测装置及课程教案
10:30-10:45	唐志成:校园宇宙线数据 <mark>共享</mark> 平台
10:45-11:00	徐吉磊:科普装置介绍
11:00-11:15	张颖: 东直门中学宇宙线观测
11:15-11:30	祝凤荣:西南交通大学宇宙线观测
11:30-11:45	崔树旺:河北师范大学和石家庄一中宇宙线观测
11:45-12:00	曹军:江苏省姜堰中学宇宙线观测活动计划
12:00-14:00	学术交流、工作餐
14:00-17:00	参观北京东直门中学宇宙线实验室 校园宇宙线观测联盟理事大会

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时 间	内容	主讲人
09:00 - 09:15	领导致辞	TVZ
09:15 - 09:30	校园宇宙线观测联盟工作报告	张 闯
09:30 - 10:10	科普报告	卢方军
10:10 - 10:20	云参观"慧眼"及粒子天体物理实验室	卢方军
10:20 - 10:35	休息、合影	
10:35 - 10:45	课程一概述:重走宇宙线发现之旅(10')	何会海
10:45 - 10:55	云参观—高海拔宇宙线观测 LHAASO 装置	刘佳
10:55 - 11:35	课程 1: 空气电离之谜—谁偷走了电荷	熊峥
11:35 - 12:05	实验 1: 探测原理一让我们看见粒子	徐吉磊
12:05 - 13:30	午休	
13:30 - 14:30	仰望星空脚踏实地云游物理	顾 晨
14:30 - 14:40	校园宇宙线观测 APP 设计方案	程耀东
14:40 - 15:20	课程 2: 每秒有多少宇宙线在穿过我们的身体一宇宙线流强	马玲玲
15:20 - 15:50	实验 2: 宇宙线流强测量演示一真的有粒子穿过我们的身体吗?	赵静
15:50 - 16:00	休息	1
16:00 - 16:40	课程 3: 来自宇宙的光速炮弹一宇宙线速度的测量	吕洪魁
16:40 - 17.10	实验 3: 宇宙线速度测量演示—这些粒子有多快	张笑鹏
17:10 - 17:50	课程互动	张 闯
17:50	休会	-

时 间	内容	主讲人
08:30 - 09:10	科普报告一恒星的灾变爆发	王晓锋
09:10 - 09:20	云参观—江门中微子实验 JUNO 装置	徐吉磊
09:20 - 10:00	课程 4: 大气保护了地球生命一什么是广延大气簇射	左 雄
10:00 - 10:10	休息	
10:10 - 14:00	实验 4: 广延大气簇射—"手拉手"的宇宙线	刘佳
10:40 - 11:10	数据分析 1: 事例率—原初宇宙线的"烫衣抛弹"频率怎么样	董绪强
11:10 - 11:30	数据分析 2: 方向重建—原初宇宙线方向	武莎
11:30 - 11:40	校园宇宙线观测数据共享平台介绍	唐志成
11:40 - 12:00	数据分析 3: "向日葵"—如何跟踪我们的目标	高卫
12:00 - 13:30	午休	
13:30 - 14:10	课程 5: 宇宙线是从哪里来的一太阳是否为宇宙线源	南云程
14:10 - 14:50	课程 6: 宇宙线有无带电一宇宙线是否是带电粒子	李骢
14:50 - 15:00	休息	
15:00 - 15:40	课程 7: 东斜西独一宇宙线电荷正负问题	侯 超
15:40 - 16:20	课程互动	刘佳
16:20 - 16:40	云参观—高能同步辐射光源 HEPS、中国散裂中子源 CSNS	张 闯
16:40 - 17:10	工作研讨会	郑文莉
17:10 - 17:30	颁发证书、结业总结	张 闯
17:30	结束	23

# 祝校园宇宙线观测暑期学校园满成功



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