中国科学院高能物理研究所
Institute of High Energy Physics
Chinese Academy of Sciences

CCOC and Its Activities in China
校园宇宙线观测联盟

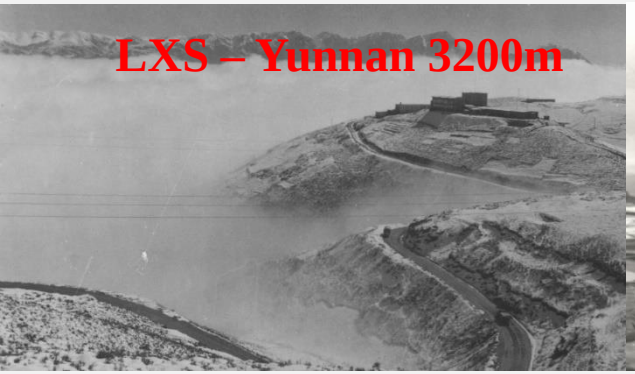
Institute of High Energy Physics
Chinese Academy of Sciences

IPPOG Global Cosmic Group Meeting
May 11,2022

History of cosmic ray research in China

- 2016: began construction
- Goal: discover high energy γ-ray sources; precisely measure the radiation spectrum of the γ-ray sources & energy spectra of cosmic ray species over a wide range
- 2021: LHAASO Discovers a Dozen PeVatrons and Photons Exceeding 1 PeV and Launches Ultra-High-Energy Gamma Astronomy Era

2016-2021



1954 1977 1988 1990 1998

About CCOC

Campus Cosmic-ray Observation Collaboration

- Established on September 28, 2020
- Connected to the Institute of High Energy Physics (IHEP), Chinese Academy of Sciences (CAS)
- Purpose :
  - ✓ To promote the campus cosmic-ray observation in China
  - ✓ Seeks cooperative ways

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Purpose

- ✓ to set up campus observation stations and network
- ✓ to popularize cosmic-ray knowledge
- ✓ to encourage cosmic-ray study
- ✓ to strengthen collaboration on cosmic-ray observation
- ✓ to facilitate student and teacher training
- ✓ To strengthen relevant international exchanges

Development

Apr., 2016

With the help of the IHEP, Beijing Dongzhimen High School has built the first cosmic-ray observation station on the campus of Chinese middle schools. School began to participate in the activites of the International Cosmic Day.

Jan., 2019

The seminar on cosmic ray research in middle schools was held in Beijing. Scientists from the IHEP spontaneously set up a campus cosmic -ray working group.

Jul., 2019

Cosmic-ray observation station in South-West Jiaotong University opened to obtain cosmic ray data.

Sep., 2019

Cosmic-ray observation station in Shijiazhuang No.1 High School started to run.

Sep., 2020

The founding meeting of CCOC was held at the Institute of High Energy. It was initiated by the IHEP, CAS.

Organization

Technical development WG
H.H.He

Advisor
C.Q.Shen

Director General
C. Zhang

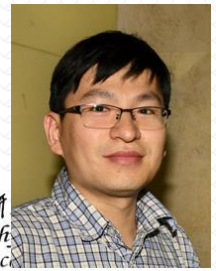
Member of the Council
G.Chen

Y.D.Cheng

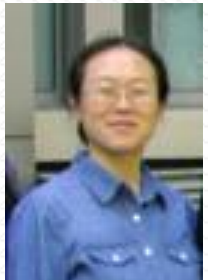
J.Liu

Z.C.Tang

J.L.Xu



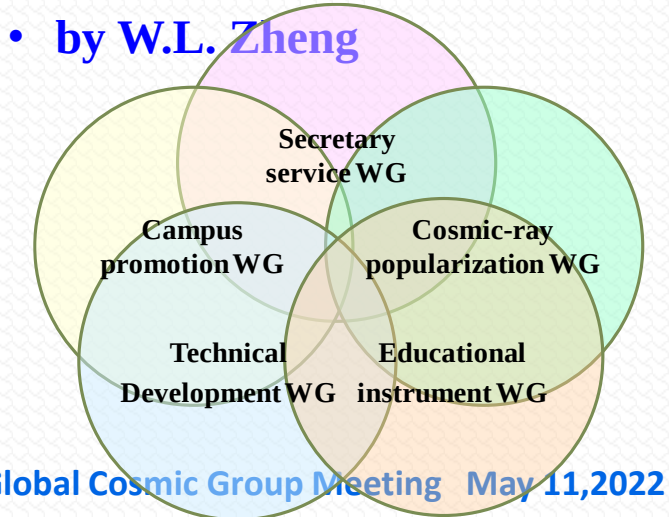
H.M.Zhao



Secretary General
W.L.Zheng

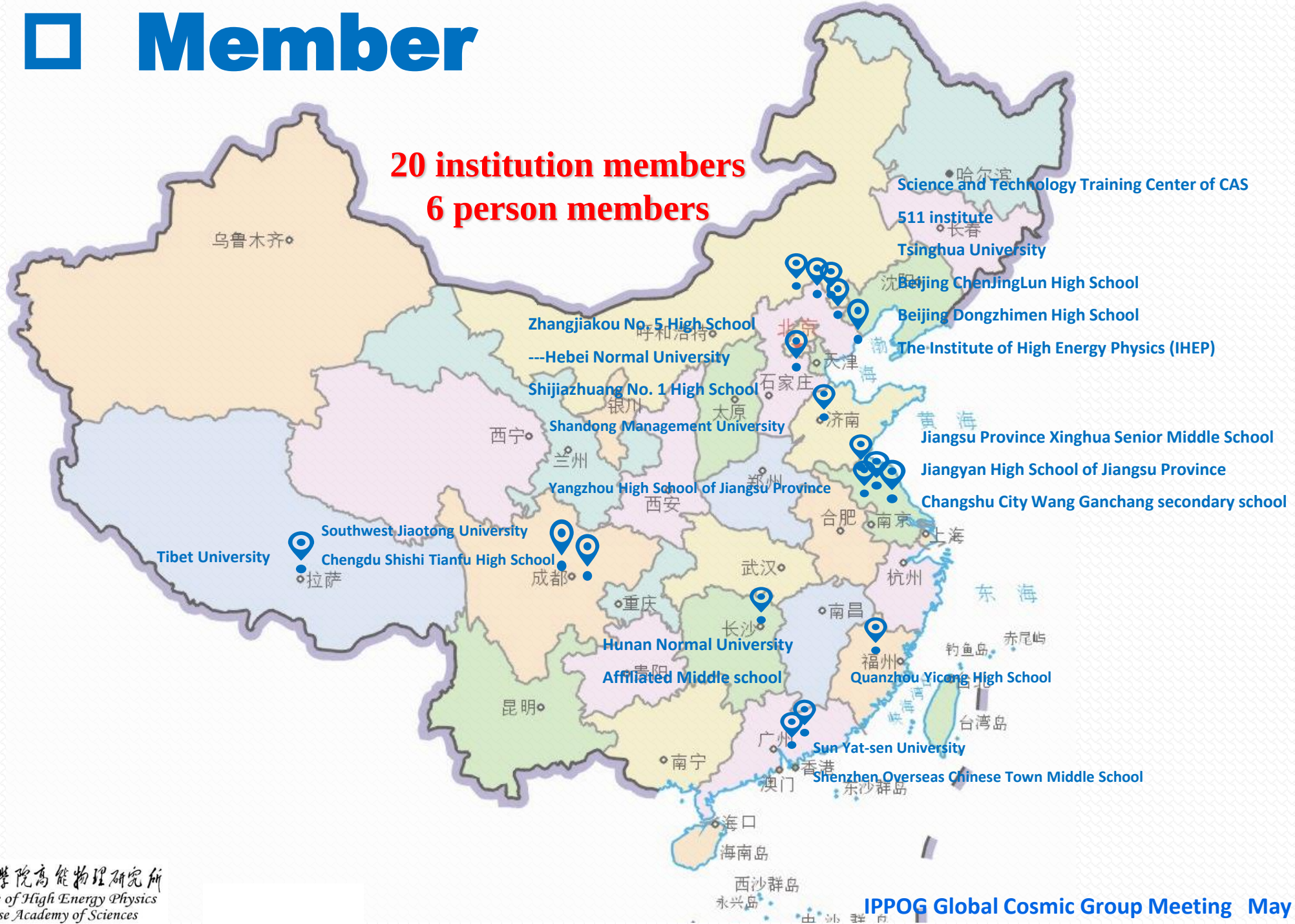
Working Groups

- Technical development WG
  - by H.H. He
- Educational instrument WG
  - by C. Gu
- Campus promotion WG
  - by S. Wang
- Cosmic-ray popularization WG
  - by S.W. Cui
- Secretary service WG
  - by W.L. Zheng



Member

20 institution members
6 person members



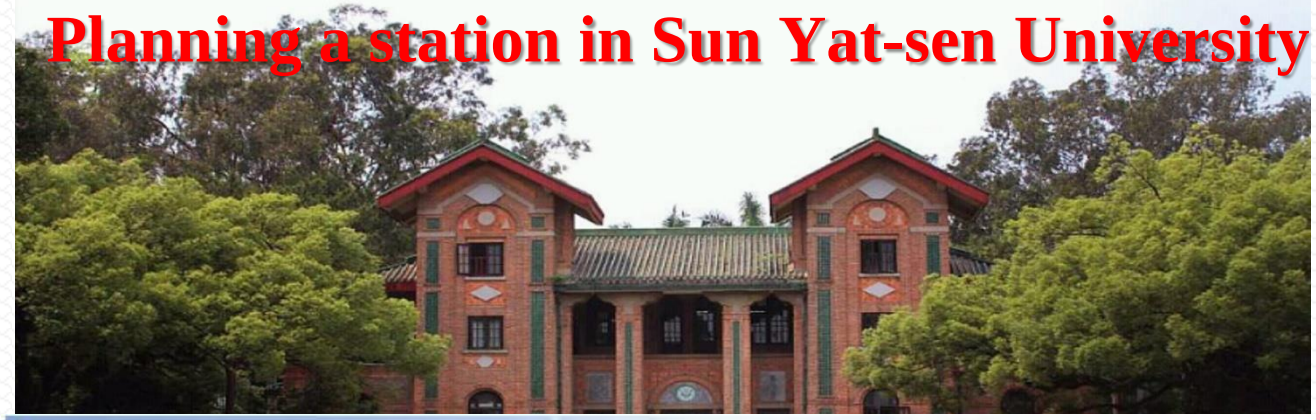
Activity

1. Set up cosmic-ray observation stations in campuses

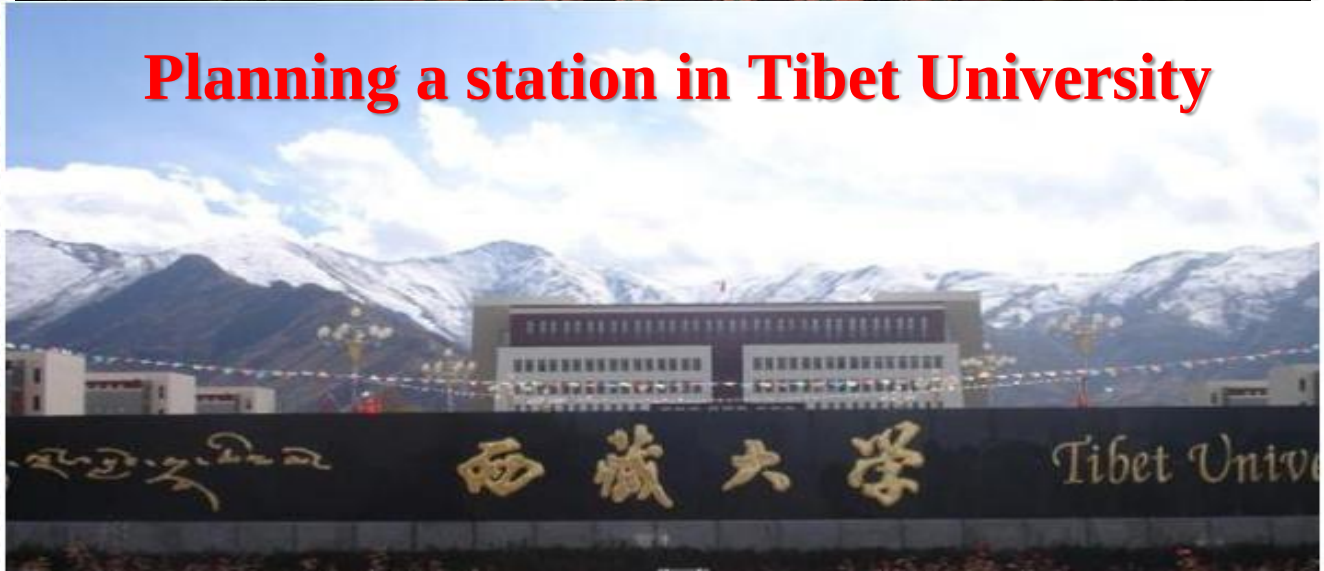
Planning a station in Xinghua High School

The Jiangyan High School station will be installed

Planning a station in Sun Yat-sen University

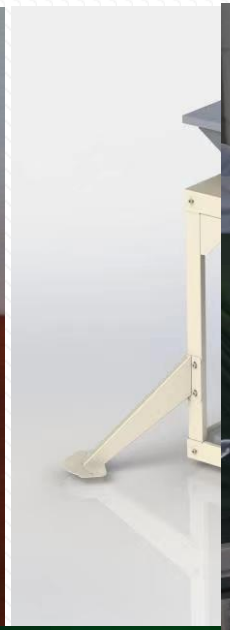


Planning a station in Tibet University



□ Activity

2. Push forward R&D of instruments



☐ Activity

3. Facilitate the cosmic-ray observation and study

- Create the cosmic-ray observation database
- The data from existing campus stations are stored
- The data can be shared by all the members of CCOC
- Incorporated with CCOC website (ccoc.ihep.ac.cn)

ccoc.ihep.ac.cn/datacenter/

校园宇宙线数据中心

首页 图集 校园站点 校园宇宙线联盟

欢迎!

这里是校园宇宙线联盟数据中心。

依托校园宇宙线联盟，作为一个高能物理及宇宙线科研与科普结合的项目，我们通过布置在中学校园和高等院校里的小型探测阵列进行宇宙线观测，推动科学前沿与教育教学的有机结合。同时通过共享这些探测站点的数据，不具备建设条件的学校也可以参与到其中。

本网站将提供科学数据展示，原始数据共享，培训文档等功能。具体请查看相应的页面。

数据中心分享平台提供现有站点的历史数据查询和下载功能，网站上也提供数据处理的教程。可供感兴趣的学校使用，进行数据处理，进行自己的学生科普实践和宇宙线研究。 数据平台上的提供的数据包括文本格式和ROOT格式，包括全部的初级数据和相应的在线刻度数据，以及经过选择和重建的大气簇射事例。 数据平台上还提供了部份事例的示意图以及统计信息图表。

校园宇宙线观测联盟
Campus Cosmic-ray Observation Collaboration

首页 关于联盟 新闻动态 科普天地 数据中心 高山宇宙线

簇射事例

数据记录了簇射事例，包括每个事例的时间，单元数，各单元的输出幅度、每个单元的击中时间，以及简单计算的大气簇射来源方向的方位角与天顶角。 示例如下：

\# 数据日期：2018年01月01日

# 天	秒	计数	粒子数									相对时间 (纳秒)									方位角,天顶角 (度)	
0	1	3	0	0	0	0	0.5	0.3	0.6	0	0	0	0	0	0	16	17	1	0	0	85.9	24.9
0	2	3	0	0	0.4	1.1	0	0	0	1.4	0	0	0	16	10	0	0	0	1	0	97.1	14.0
0	4	5	0	0.7	0.6	0.5	0	0.5	0.3	0	0	0	53	14	12	0	1	4	0	0	117.0	60.8
0	8	3	0	0	0	0.6	0.5	0	0.8	0	0	0	0	0	14	1	0	12	0	0	171.3	23.2
0	11	5	1.0	0	1.7	0.7	0	0	0	1.0	0.9	40	0	73	1	0	0	0	13	30	47.1	69.0
0	19	5	0	0	1.2	0	1.5	1.8	1.6	0	1.4	0	0	1	0	17	12	22	0	25	271.0	19.3
0	20	3	0	0	0	1.0	0	1.2	0	0.5	0	0	0	0	16	0	1	0	22	0	240.9	27.6
0	26	4	0.8	1.0	0.4	0	0	0	0.5	0	0	52	16	1	0	0	0	58	0	0	190.5	51.0
0	26	3	0	1.1	0	0.5	1.5	0	0	0	0	0	1	0	21	9	0	0	0	0	213.7	25.6
0	33	4	1.5	0	0	0.8	0.5	0	0	1.1	0	46	0	0	1	21	0	0	15	0	51.9	76.3
0	34	5	0	0.6	0.6	0	0.6	0.4	0	0.6	0	0	24	37	0	35	13	0	1	0	98.1	25.1
0	34	3	0.5	0	0	0	0	0	0.6	0.8	0	1	0	0	0	0	0	10	9	0	257.5	7.9
0	37	7	1.0	0.4	0	2.2	1.9	0	0.7	1.2	5.7	47	48	0	26	28	0	1	14	27	63.8	39.4
0	42	3	0.8	0	0	0	0	0.7	0	0.7	0	63	0	0	0	0	1	0	10	0	148.2	56.6
0	45	3	0.8	0.5	0	0	0	0	0.3	0	0	1	27	0	0	0	0	3	0	0	357.8	51.3
0	46	4	0.8	0	0.5	0	0.4	0	0	0.6	0	20	0	31	0	19	0	0	1	0	64.9	22.8
0	47	3	0.6	0	0.7	0	0	0	0	0	0.6	12	0	3	0	0	0	0	0	1	167.5	7.9
0	47	3	0.8	0	0.3	0	1.4	0	0	0	0	1	0	39	0	18	0	0	0	0	6.0	34.9

Activity

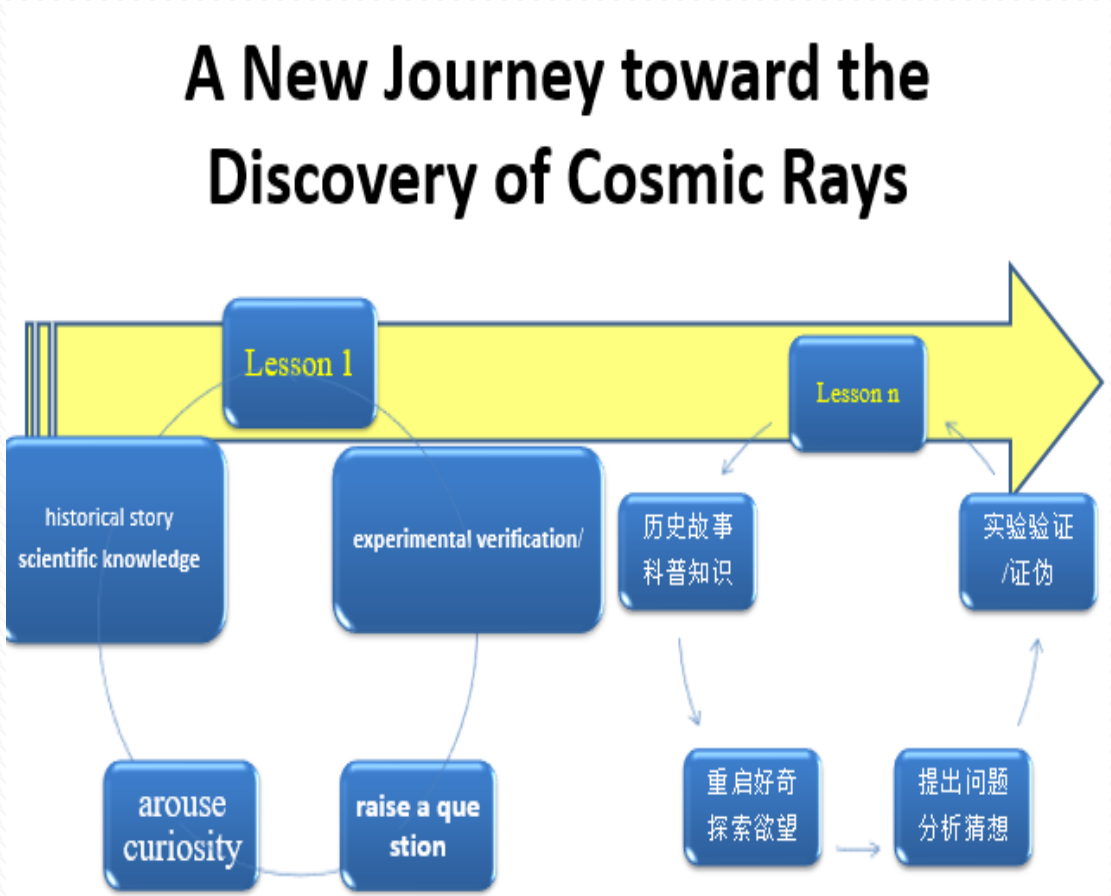
4. Organize training courses and workshops

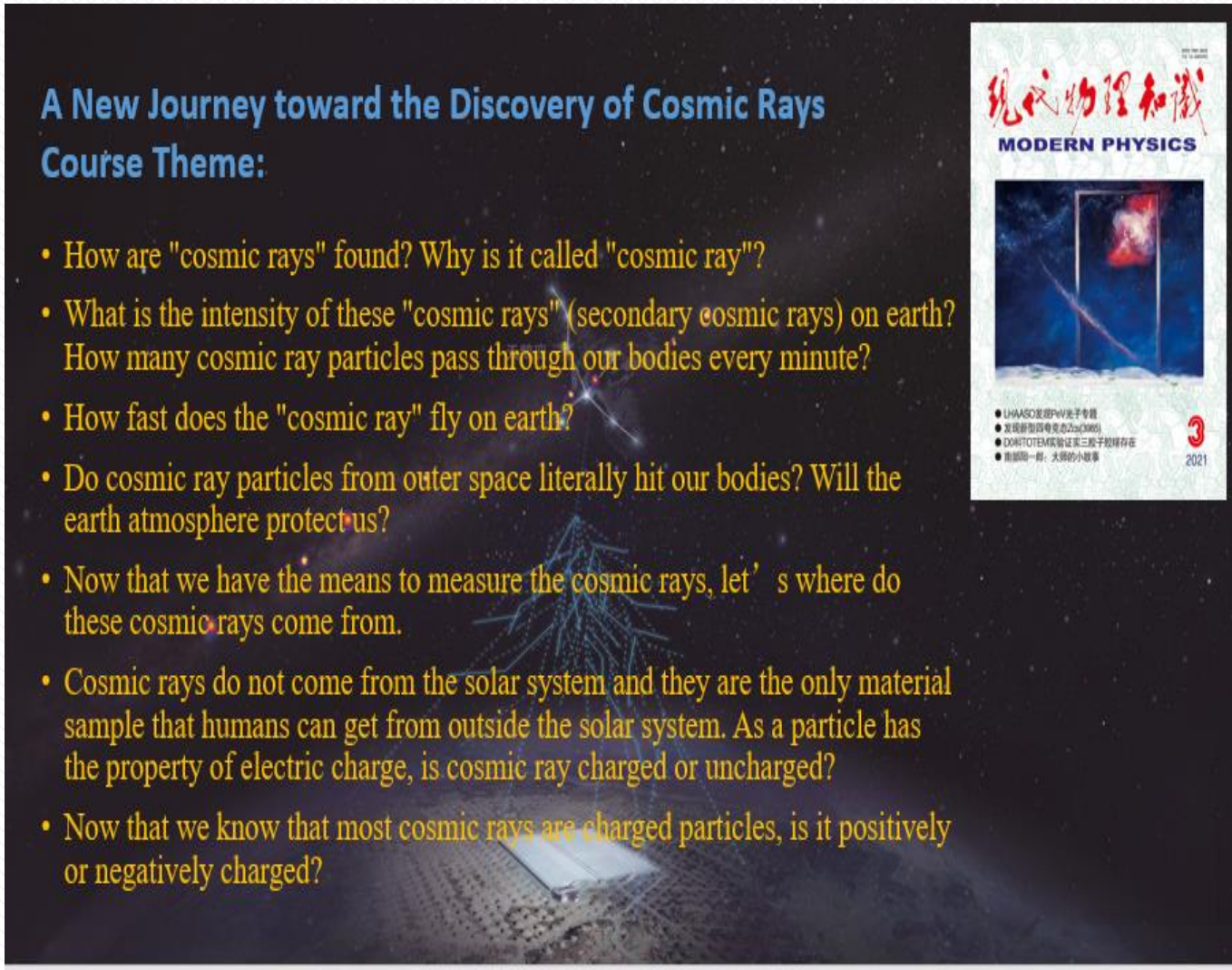
CCOC training for ICD

2021 CCOC Summer School

Activity

5. Carry on cosmic-ray education





Activity

6. Coordinate International Cosmic Day in China

On the ICD of 2021, China has seven units participating independently, six of which belong to the CCOC, reaching the largest scale over the years.

IHEP, CAS, Beijing

Dongzhimen Middle School, Beijing

Jiangyan Middle School, Jiangsu

School Att. Hunan Normal University

Southwest Jiaotong University

Video for 10th anniversary of ICD

□ Measurement

Cosmic ray detector array

- Measurement of Extensive air shower (EAS), which is generated by primary cosmic ray
- Measure the direction of EAS with accuracy better than 2° degree
- Measure the arriving time of EAS with accuracy better than 2 nanosecond
- Measure the energy of EAS with core inside the array
- Measure the cosmic ray muon counting rate (flux)

Muon telescope

- Measure the cosmic ray muon flux in any specific direction (all differate zenith angle and differate azimuth angle)
- Measure the speed of cosmic ray muon
- Measure the life of muon
- Measure the east-west different effect of cosmic ray flux indused by earth magnetic field

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X. L. Bian
Y. O. Jiang

Campus Cosmic-ray Observation Collaboration

Thanks for your attention

谢谢！