

Probing invisible decay of a dark photon at BESIII and a future Super Tau Charm Factory via monophoton searches

Yu Zhang^{1,2,*}, Wei-Tao Zhang¹, Mao Song², Xue-An Pan², Zhong-Ming Niu^{1,2} and Gang Li²

¹*Institutes of Physical Science and Information Technology, Anhui University, Hefei 230601, China*

²*School of Physics and Materials Science, Anhui University, Hefei 230039, China*



(Received 21 July 2019; published 6 December 2019)

We propose probing sub-GeV dark photon decays into lighter dark matter using monophoton events at the BESIII detector and future Super Tau Charm Factory (STCF). We compute the cross section due to the dark photon associated a standard model photon production, and study the corresponding standard model irreducible/reducible backgrounds. By using the luminosity about 14 fb^{-1} collected at the BESIII detector since 2012, we derive new expected leading limits of the mixing strength ϵ , $\epsilon \lesssim (1.3 - 1.7) \times 10^{-4}$, in the mass range of $0.04 \text{ GeV} \lesssim m_{A'} \lesssim 3 \text{ GeV}$. With the luminosity of 30 ab^{-1} , STCF running at $\sqrt{s} = 2 \text{ GeV}$, can probe ϵ down to 5.1×10^{-6} when $m_{A'} = 1 \text{ GeV}$. For models of scalar and fermionic light thermal dark matter production via dark photon, we present the constrains on the dimensionless dark matter parameter $y = \epsilon^2 \alpha_D (m_\chi/m_{A'})^4$ as function of the DM mass m_χ at BESIII and future STCF, conventionally assuming the dark coupling constant $\alpha_D = 0.5$ and $m_{A'} = 3m_\chi$. We find that BESIII can exclude models of scalar, Majorana, and pseudo-Dirac (with a small splitting) DM for the mass region $0.04\text{--}1 \text{ GeV}$, $0.05\text{--}1 \text{ GeV}$ and $0.4\text{--}1 \text{ GeV}$ respectively. For values $\alpha_D \lesssim 0.005$, combining the results from 2 GeV STCF with the luminosity of 30 ab^{-1} and BABAR, one can exclude the above three DM models in the mass region $0.001 \text{ GeV} \lesssim m_\chi \lesssim 1 \text{ GeV}$.

DOI: 10.1103/PhysRevD.100.115016

I. INTRODUCTION

To investigate the nature of dark matter (DM) particle is one of the most pressing issues in modern physics. So far, we have only been able to probe the DM through its gravitational effects with visible matter. It is widely postulated that DM interacts very weakly with ordinary matter, since terrestrial searches have not yielded any results yet. An exciting attempt is that, besides the gravity, one can introduce an extra $U_D(1)$ force carrier, also referred to as dark photon A' . The dark photon can provide a natural scenario for DM interactions, which is neutral under the SM gauge symmetries, but couples to the SM photon via kinetic mixing [1–6]. The kinetic mixing term can be described as

$$\mathcal{L}_{\text{kinetic mixing}} = -\frac{\epsilon}{2} F'_{\mu\nu} F^{\mu\nu} \quad (1)$$

and parameterized by the mixing strength $\epsilon \ll 1$. Here $F'_{\mu\nu} = \partial_\mu A'_\nu - \partial_\nu A'_\mu$ is the field strength of A' , resulting in the interaction

$$\mathcal{L}_{\text{int}} = \epsilon e A'_\mu J_{em}^\mu, \quad (2)$$

of dark photon with the electromagnetic current J_{em}^μ with a strength ϵe , where e is the electromagnetic coupling. In order to explain observational astroparticle anomalies, the dark photon should be relatively light, with a mass in the MeV to GeV range [5]. Furthermore, a sub-GeV A' with $\epsilon \simeq 10^{-3}$ can also explain the 3.6σ deviation from the SM prediction of the muon anomalous magnetic moment $(g-2)_\mu$ [7,8].

The decay modes of the dark photon depend on its mass and couplings, as well as on the particle spectrum of the dark sector. Since there are no firm predictions for the dark photon, various experiments have been searched for it over a wide range of its mass and decay modes [9–11]. If the dark photon is lightest in the dark sector, its dominant decays are to the visible SM particles. The searches for such dark photon with the mass below a few GeV have been mainly performed in beam dump [12–23], fixed target [24–26], collider [27–32] and rare meson decay [33–43] experiments using narrow peak in the e^+e^- or $\mu^+\mu^-$ invariant mass spectra. If the lowest-mass DM state χ is sufficiently light, in particular $m_\chi < m_{A'}/2$, the A' would predominantly decay invisibly into the DM particles provided that $e_D > \epsilon e$. e_D is the coupling constant of the $U_D(1)$ gauge interactions. There are limits on invisible

*dayu@ahu.edu.cn, dayu@nju.edu.cn

Published by the American Physical Society under the terms of the Creative Commons Attribution 4.0 International license. Further distribution of this work must maintain attribution to the author(s) and the published article's title, journal citation, and DOI. Funded by SCOAP³.

论文收录引用检索报告

编号:2024070314

检索项目	检索作者张伟涛 (Zhang, WeiTao) 2019 年发表指定论文被 SCIE 收录情况和中科院分区情况。							
检索工具	国内: 中科院分区、中科院分区升级版 国外: SCIE							
检索式	Ti=委托人提供文章列表							
检索结果	SCIE 收录							
	序号	篇名	一作或通讯	期刊名	中科院基础版分区	中科院升级版分区/WOS 影响因子	出版年	文献类型
	1	Probing invisible decay of a dark photon at BESIII and a future Super Tau Charm Factory via monophoton searches	均否	PHYSICAL REVIEW D	小类: ASTRONOMY & ASTROPHYSICS 天文与天体物理 2 区 小类: PHYSICS, PARTICLES & FIELDS 物理: 粒子与场物理 2 区 大类: 物理 1 区 4.394	小类: ASTRONOMY & ASTROPHYSICS 天文与天体物理 2 区 小类: PHYSICS, PARTICLES & FIELDS 物理: 粒子与场物理 2 区 大类: 物理与天体物理 2 区 WOS 影响因子:4.833	2019	Article
检索结论	经 SCIE 数据库检索, 2019 年作者张伟涛 (Zhang, WeiTao) 发表论文被收录 1 篇。							

详情见附件, 特此证明。



安徽大学图书馆信息咨询部

2024 年 07 月 16 日

附件

SCIE 检索结果

第 1 条, 共 1 条

文献标题: Probing invisible decay of a dark photon at BESIII and a future Super Tau Charm Factory via monophoton searches

作者: Zhang, Y (Zhang, Yu),Zhang, WT (Zhang, Wei-Tao),Song, M (Song, Mao),Pan, XA (Pan, Xue-An),Niu, ZM (Niu, Zhong-Ming),Li, G (Li, Gang)

文献类型: Article

出版物名称: PHYSICAL REVIEW D 卷: 100 期: 2470-0010 页数: None DOI: 10.1103/PhysRevD.100.115016 出版日期: DEC 6 2019 出版年: 2019

Web of Science 核心刊的“被引频次”: 15

被引频次合计: 16

入藏号: WOS:000501488500010

作者地址: [Zhang, Yu; Zhang, Wei-Tao; Niu, Zhong-Ming] Anhui Univ, Inst Phys Sci & Informat Technol, Hefei 230601, Anhui, Peoples R China;[Zhang, Yu; Song, Mao; Pan, Xue-An; Niu, Zhong-Ming; Li, Gang] Anhui Univ, Sch Phys & Mat Sci, Hefei 230039, Anhui, Peoples R China

通讯作者地址: Zhang, Y (corresponding author), Anhui Univ, Inst Phys Sci & Informat Technol, Hefei 230601, Anhui, Peoples R China;Zhang, Y (corresponding author), Anhui Univ, Sch Phys & Mat Sci, Hefei 230039, Anhui, Peoples R China.

电子邮件地址: dayu@ahu.edu.cn

国际标准期刊号 (ISSN): 2470-0010

长度为 29 个字符的来源文献名称缩写: PHYS REV D ISO 来源文献名称缩写: Phys. Rev. D

语种: English

Web of Science 类别: Astronomy & Astrophysics,Physics, Particles & Fields

文献传递号: JU2EO

学科类别: Astronomy & Astrophysics,Physics

证明

兹证明安徽大学物质科学与信息技术研究院特聘研究员张
宇为张伟涛（学号 Q18201126）的导师。

安徽大学物质科学与信息技术研究院

2024 年 7 月 16 日





OPEN ACCESS

Stellar Chromospheric Activity Database of Solar-like Stars Based on the LAMOST Low-Resolution Spectroscopic Survey

Weitao Zhang¹, Jun Zhang¹, Han He^{2,3}, Zhiping Song¹, Ali Luo^{3,4}, and Haotong Zhang^{3,4}

¹ School of Physics and Optoelectronics Engineering, Anhui University, Hefei 230601, People's Republic of China; zjun@ahu.edu.cn

² CAS Key Laboratory of Solar Activity, National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100101, People's Republic of China
hehan@nao.cas.cn

³ University of Chinese Academy of Sciences, Beijing 100049, People's Republic of China

⁴ CAS Key Laboratory of Optical Astronomy, National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100101, People's Republic of China
Received 2022 May 16; revised 2022 September 19; accepted 2022 September 20; published 2022 November 9

Abstract

A stellar chromospheric activity database of solar-like stars is constructed based on the Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST) Low-Resolution Spectroscopic Survey. The database contains spectral bandpass fluxes and indexes of Ca II H and K lines derived from 1,330,654 high-quality LRS spectra of solar-like stars. We measure the mean fluxes at line cores of the Ca II H and K lines using a 1 Å rectangular bandpass and a 1.09 Å FWHM triangular bandpass, as well as the mean fluxes of two 20 Å wide pseudocontinuum bands on the two sides of the lines. Three activity indexes, S_{rec} based on the 1 Å rectangular bandpass and S_{tri} and S_L based on the 1.09 Å FWHM triangular bandpass, are evaluated from the measured fluxes to quantitatively indicate the chromospheric activity level. The uncertainties of all the obtained parameters are estimated. We also produce spectrum diagrams of Ca II H and K lines for all the spectra in the database. The entity of the database is composed of a catalog of spectral sample and activity parameters and a library of spectrum diagrams. Statistics reveal that the solar-like stars with a high level of chromospheric activity ($S_{\text{rec}} > 0.6$) tend to appear in the parameter range of T_{eff} (effective temperature) < 5500 K, $4.3 < \log g$ (surface gravity) < 4.6 , and $-0.2 < [\text{Fe}/\text{H}]$ (metallicity) < 0.3 . This database, with more than 1 million high-quality LAMOST LRS spectra of Ca II H and K lines and basal chromospheric activity parameters, can be further used for investigating activity characteristics of solar-like stars and the solar–stellar connection.

Unified Astronomy Thesaurus concepts: Stellar activity (1580); Astronomy databases (83); Sky surveys (1464); Solar analogs (1941); Spectroscopy (1558); Stellar chromospheres (230)

1. Introduction

With detailed observations of solar activity for several centuries, many features and phenomena of the Sun, such as sunspots, plagues, flares, etc., have been discovered and thoroughly studied. These features and phenomena are the manifestations of magnetic field activity on the Sun (Hale 1908). Observations for solar-like stars (Cayrel de Strobel 1996) revealed that magnetic activity is also common on other stars, and the connection between stellar activity and solar activity (i.e., solar–stellar connection) has become a topic of wide interest (Noyes 1996). Choudhuri (2017) collected various stellar activity data and explored the extrapolation of solar dynamo models for explaining magnetic activity of solar-like stars. The knowledge of activity of solar-like stars in turn is very helpful for understanding the activity status of the Sun (Güdel 2007). According to the classification by Gomes da Silva et al. (2021), the Sun is located in the high-variability region of the inactive main-sequence star zone. Reinhold et al. (2020) illustrated that the Sun is less active compared with other solar-like stars.

Stellar activity is closely related to the rotation period (e.g., Noyes et al. 1984b; Wright & Drake 2016; Zhang et al. 2020a) and age (e.g., Mamajek & Hillenbrand 2008; Lorenzo-Oliveira et al. 2018; Zhang et al. 2019) of stars. In general, stellar

activity level will decrease with an increase in stellar rotation period or age. On the other hand, Maehara et al. (2012) found that the maximum energy of stellar flares is not correlated with stellar rotation period. Investigation of the relation between stellar activity cycle and rotation by Reinhold et al. (2017) reveals that the activity cycle period slightly increases for longer rotation period.

As an important aspect of stellar activity, the chromospheric activity of solar-like stars has always been a popular research subject (Hall 2008). A detailed review of stellar chromosphere modeling and spectroscopic diagnostics has been given by Linsky (2017). Stellar chromospheric activity of solar-like stars can be indicated by line core emissions of the Ca II H and K lines in the violet band of the visible spectrum (e.g., Baliunas et al. 1995; Hall et al. 2007), the H α line in the red band (e.g., Delfosse et al. 1998; Newton et al. 2017), the Ca II infrared triplet (Ca II IRT) lines (e.g., Soderblom et al. 1993; Notsu et al. 2015), etc. The emission of Ca II H and K lines of the Sun has long been known to have a strong correlation with the solar chromospheric activity (see a comprehensive review by Linsky & Avrett 1970). With the discovery of the emissions of Ca II H and K lines from other stars (e.g., Eberhard & Schwarzschild 1913), people began to explore whether it comes from the same mechanism as the solar activity and whether it has a long-term cyclic variation as does the solar cycle. Wilson (1963) at the Mount Wilson Observatory (MWO) investigated the relationship between intensity of stellar Ca II H and K emission and stellar physical nature and concluded that the chromospheric activity of main-sequence stars decreases with age. Wilson (1978) found the long-



Original content from this work may be used under the terms of the Creative Commons Attribution 4.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.

论文收录引用检索报告

编号: 2024070020

检索项目	检索作者张伟涛 (Zhang, WeiTao) 2022 年发表指定论文被 SCIE 收录情况。					
检索工具	国内: 中科院分区升级版 国外: SCIE					
检索式	Ti=委托人提供文章列表					
检索结果	SCIE 收录					
	序号	篇名	一作或通讯	期刊名	中科院升级版分区/WOS 影响因子	出版年 文献类型
	1	Stellar Chromospheric Activity Database of Solar-like Stars Based on the LAMOST Low-Resolution Spectroscopic Survey	一作	ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES	小类: ASTRONOMY & ASTROPHYSICS 天文与天体物理 1 区 大类: 物理与天体物理 1 区 WOS 影响因子: 8.7	2022 Article
检索结论	经 SCIE 数据库检索, 2022 年作者张伟涛 (Zhang, WeiTao) 发表论文被收录 1 篇。其中第一作者身份 1 篇。					

详情见附件, 特此证明。

安徽大学图书馆信息咨询部

2024 年 07 月 08 日

附件

SCIE 检索结果

第 1 条, 共 1 条

文献标题: Stellar Chromospheric Activity Database of Solar-like Stars Based on the LAMOST Low-Resolution Spectroscopic Survey

作者: Zhang, WT (Zhang, Weitao), Zhang, J (Zhang, Jun), He, H (He, Han), Song, ZP (Song, Zhiping), Luo, AL (Luo, Ali), Zhang, HT (Zhang, Haotong)

文献类型: Article

出版物名称: ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES 卷: 263 期: 0067-0049

页数: DOI: 10.3847/1538-4365/ac9406 出版日期: NOV 1 2022 出版年: 2022

Web of Science 核心刊的“被引频次”: 6

被引频次合计: 6

入藏号: WOS:000882607300001

作者地址: [Zhang, Weitao; Zhang, Jun; Song, Zhiping] Anhui Univ, Sch Phys & Optoelect Engn, Hefei 230601, Peoples R China; [He, Han] Chinese Acad Sci, CAS Key Lab Solar Act, Natl Astron Observ, Beijing 100101, Peoples R China; [He, Han; Luo, Ali; Zhang, Haotong] Univ Chinese Acad Sci, Beijing 100049, Peoples R China; [Luo, Ali; Zhang, Haotong] Chinese Acad Sci, CAS Key Lab Opt Astron, Natl Astron Observ, Beijing 100101, Peoples R China

通讯作者地址: [Zhang, Jun] (corresponding author), Anhui Univ, Sch Phys & Optoelect Engn, Hefei 230601, Peoples R China

电子邮件地址: zjun@ahu.edu.cn; hehan@nao.cas.cn

国际标准期刊号 (ISSN): 0067-0049

长度为 29 个字符的来源文献名称缩写: None

ISO 来源文献名称缩写: ASTROPHYS J

SUPPL S

语种: English

Web of Science 类别: Astronomy & Astrophysics

文献传递号: 6D3PR

学科类别: Astronomy & Astrophysics



Stellar chromospheric activity database of solar-like stars based on the LAMOST Low-Resolution Spectroscopic Survey

II. The bolometric and photospheric calibration★

Weitao Zhang¹, Jun Zhang¹, Han He^{2,3}, Ali Luo^{2,3,4} and Haotong Zhang^{2,3,4}

¹ School of Physics and Optoelectronic Engineering, Anhui University, Hefei 230601, PR China

e-mail: zjun@ahu.edu.cn

² National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100101, PR China

e-mail: hehan@nao.cas.cn

³ University of Chinese Academy of Sciences, Beijing 100049, PR China

⁴ CAS Key Laboratory of Optical Astronomy, Chinese Academy of Sciences, Beijing 100101, PR China

Received 18 December 2023 / Accepted 15 May 2024

ABSTRACT

Context. The dependence of stellar magnetic activity on stellar parameters is inspired by the chromospheric activity studies based on the large-scale spectroscopic surveys.

Aims. The main objective of this project is to provide the chromospheric activity parameter database for the LAMOST Low-Resolution Spectroscopic Survey (LRS) spectra of solar-like stars and explore the overall property of stellar chromospheric activity.

Methods. The Ca II H and K lines were employed to construct indicators for assessing and studying the chromospheric activity of solar-like stars. We investigated the widely used bolometric- and photospheric-calibrated chromospheric activity index R'_{HK} , derived from the method in the classic literature ($R'_{\text{HK,classic}}$) and the method based on the PHOENIX model ($R'_{\text{HK,PHOENIX}}$). Since the detailed stellar atmospheric parameters, effective temperature (T_{eff}), surface gravity ($\log g$), and metallicity ($[\text{Fe}/\text{H}]$) are available for LAMOST, we estimated the chromospheric activity index $R'_{\text{HK,PHOENIX}}$, along with the corresponding bolometric calibrated index $R_{\text{HK,PHOENIX}}$, taking these parameters into account.

Results. We provided the database of the derived chromospheric activity parameters for 1 122 495 LAMOST LRS spectra of solar-like stars. Our calculations show that $\log R'_{\text{HK,PHOENIX}}$ is approximately linearly correlated with $\log R'_{\text{HK,classic}}$. The results based on our extensive archive support the view that the dynamo mechanism of solar-like stars is generally consistent with the Sun; and the value of the solar chromospheric activity index is located at the midpoint of the solar-like star sample. We further investigated the proportions of solar-like stars with different chromospheric activity levels (very active, active, inactive, and very inactive). The investigation indicates that the occurrence rate of high levels of chromospheric activity is lower among the stars with effective temperatures between 5600 and 5900 K.

Key words. stars: activity – stars: chromospheres

1. Introduction

Stellar chromospheric activity, known as the performance of stellar magnetic activity, is expected to reveal the physical mechanism of stars (Hall 2008). The emission in the line cores of Ca II H and K lines is commonly recognized as being sensitive to stellar chromospheric activity. An empirical chromospheric activity index S_{MWO} was introduced to quantify the emission of Ca II H and K lines observed in the Mount Wilson Observatory (MWO) (Wilson 1968; Vaughan et al. 1978). Since S_{MWO} is defined as the ratio between the emission flux in the line cores of Ca II H and K lines and the pseudo-continuum flux (the flux of two 20 Å reference bands in the violet and red sides), it is concise and effective for characterizing the stellar activity cycle (Wilson 1978). However, S_{MWO} is related to the continuum flux, which is governed by the stellar effective temperature (or, equivalently, the color index) (Middelkoop 1982). As a result, it would

be inflexible for comparing the emission of Ca II H and K lines among stars of different spectral types.

The ratio between the stellar surface flux in the line core of Ca II H and K lines and the stellar bolometric flux, denoted as R_{HK} , is considered to be marginally affected by the stellar effective temperature (or the color index) and can be derived from S_{MWO} (Linsky et al. 1979; Middelkoop 1982; Rutten 1984). Middelkoop (1982) and Rutten (1984) introduced the bolometric factor C_{cf} (depends on the color index $B - V$) and the factor K to convert S_{MWO} to the stellar surface flux in the line cores of Ca II H and K lines. Meanwhile, the photospheric fluxes contained in the line cores of Ca II H and K lines could not be ignored, especially for solar-like stars (Hartmann et al. 1984; Noyes et al. 1984). The photospheric contribution, R_{phot} , which represents the photospheric flux normalized by the stellar bolometric flux, can analogously be deduced as a function of $B - V$ (Noyes et al. 1984). Subtracting R_{phot} from R_{HK} , one can derive the widely used bolometric- and photospheric-calibrated chromospheric activity index R'_{HK} .

The R'_{HK} is frequently employed to characterize the relationships between stellar chromospheric activity and other stellar

★ A copy of the catalog is available at the CDS ftp to cdsarc.cds.unistra.fr (130.79.128.5) or via <https://cdsarc.cds.unistra.fr/viz-bin/cat/J/A+A/688/A23>

论文收录引用检索报告

编号: 2024080032

检索项目	检索作者张伟涛 (Zhang, WeiTao) 2024 年发表指定论文被 SCIE 收录情况。					
检索工具	国内: 中科院分区升级版 国外: SCIE					
检索式	Ti=委托人提供文章列表					
检索结果	SCIE 收录					
	序号	篇名	一作或通讯	期刊名	中科院升级版分区/WOS 影响因子	文献类型
	1	Stellar chromospheric activity database of solar-like stars based on the LAMOST Low-Resolution Spectroscopic Survey II. The bolometric and photospheric calibration☆	一作	ASTRONOMY & ASTROPHYSICS	小类: ASTRONOMY & ASTROPHYSICS 天文与天体物理 2 区 大类: 物理与天体物理 2 区 WOS 影响因子: 5.4	Article
检索结论	经 SCIE 数据库检索, 2024 年作者张伟涛 (Zhang, WeiTao) 发表论文被收录 1 篇。其中第一作者身份 1 篇。					

详情见附件, 特此证明。

安徽大学图书馆信息咨询部

2024 年 08 月 28 日

附件

SCIE 检索结果

第 1 条, 共 1 条

文献标题: Stellar chromospheric activity database of solar-like stars based on the LAMOST Low-Resolution Spectroscopic Survey II. The bolometric and photospheric calibration★

作者: Zhang, WT (Zhang, Weitao), Zhang, J (Zhang, Jun), He, H (He, Han), Luo, AL (Luo, Ali), Zhang, HT (Zhang, Haotong)

文献类型: Article

出版物名称: ASTRONOMY & ASTROPHYSICS 卷: 688 期: 0004-6361 页数: None DOI: 10.1051/0004-6361/202348988 出版日期: JUL 31 2024 出版年: 2024

Web of Science 核心刊的“被引频次”: 0

被引频次合计: 0

入藏号: WOS:001281292800002

作者地址: [Zhang, Weitao; Zhang, Jun] Anhui Univ, Sch Phys & Optoelect Engn, Hefei 230601, Peoples R China; [He, Han; Luo, Ali; Zhang, Haotong] Chinese Acad Sci, Natl Astron Observ, Beijing 100101, Peoples R China; [He, Han; Luo, Ali; Zhang, Haotong] Univ Chinese Acad Sci, Beijing 100049, Peoples R China; [Luo, Ali; Zhang, Haotong] Chinese Acad Sci, CAS Key Lab Opt Astron, Beijing 100101, Peoples R China

通讯作者地址: Zhang, J (corresponding author), Anhui Univ, Sch Phys & Optoelect Engn, Hefei 230601, Peoples R China.

电子邮件地址: zjun@ahu.edu.cn; hehan@nao.cas.cn

国际标准刊号 (ISSN): 0004-6361

长度为 29 个字符的来源文献名称缩写: ASTRON ASTROPHYS

ISO 来源文献名称缩写:

Astron. Astrophys.

语种: English

Web of Science 类别: Astronomy & Astrophysics

文献传递号: A3A6X

学科类别: Astronomy & Astrophysics

期刊收录证明

委托编号: 2024070353

检索数据库: JCR 分区、中科院分区

经过检索, 以下期刊被 SCIE 收录:

1. 经过检索, ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES 属于 SCI 期刊

ISSN:0067-0049 eISSN:1538-4365
2022 年的影响因子:8.7 五年影响因子:8.7
2022 年该刊在 JCR 分区:

Categories	Rank	Quartile	JIF Percentile
ASTRONOMY & ASTROPHYSICS	7/69	Q1	None

2022 年该刊在中科院分区(升级版):

分类	学科名称	分区	Top 期刊
小类	ASTRONOMY & ASTROPHYSICS 天文与天体物理	1	
大类	物理与天体物理	1	是

2. 经过检索, PHYSICAL REVIEW D 属于 SCI 期刊

ISSN:2470-0010 eISSN:2470-0029
2019 年的影响因子:4.833 五年影响因子:4.012
2019 年该刊在 JCR 分区:

Categories	Rank	Quartile	JIF Percentile
PHYSICS, PARTICLES & FIELDS	6/29	Q1	None
ASTRONOMY & ASTROPHYSICS	16/68	Q1	None

2019 年该刊在中科院分区(升级版):

分类	学科名称	分区	Top 期刊
小类	ASTRONOMY & ASTROPHYSICS 天文与天体物理	2	
小类	PHYSICS, PARTICLES & FIELDS 物理: 粒子与场物理	2	
大类	物理与天体物理	2	是

3. 经过检索, ASTRONOMY & ASTROPHYSICS 属于 SCI 期刊

ISSN:0004-6361 eISSN:1432-0746
2023 年的影响因子:5.4 五年影响因子:5.5
2023 年该刊在 JCR 分区:

Categories	Rank	Quartile	JIF Percentile
ASTRONOMY & ASTROPHYSICS	11/84	Q1	None

2023 年该刊在中科院分区(升级版):

分类	学科名称	分区	Top 期刊
小类	ASTRONOMY & ASTROPHYSICS 天文与天体物理	2	
大类	物理与天体物理	2	是

以上结果均由委托人张伟涛提交确认!

