# 2025 Poster Competition

Wednesday, 26 March 2025 - Wednesday, 26 March 2025

# Book of Abstracts

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# Test 2

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Test 2 for $Z_2$ something

**Poster Talks** / **3**

# RIXS study on van der Waals multiferroic $CuCrP_2S_6$,

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Characterized by the layered structures and weak interlayer interactions, van-der-Waals quasi-2D materials mark a significant milestone in the field of spintronics due to their unique electronic and magnetic properties. Incorporating multiferroicity, these materials exhibit highly-manipulative properties, allowing the exploration of new quantum phenomena and the potential for revolutionary advances in low-power,
non-volatile devices. $CuCrP_2S_6$, one of the van-der-Waals multiferroic materials, has ignited our curiosity. Here, we use high-resolution resonant inelastic X-ray scattering (RIXS) to probe its electronic excitations across the transition temperature 32K, 145K and 190 K. Photon energy- and polarization-dependent RIXS results of $CuCrP_2S_6$ will be presented and discussed.

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# Dealkylation and Metallation of a Hydrocarbon in On-Surface Synthesis

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On-Surface Synthesis is established for the creation of extended, one- and two-dimensional macromolecules by homo-coupling directly on a surface [1]. In comparison to classical solution based-chemistry, On-Surface Synthesis has a reduced parameter space (temperature, light) and currently focuses on developing reaction selectivity. Precursor design controls product formation. The build-up of non-stochastic hetero-coupled systems is highly desirable yet not achieved.

Here, we are studying with STM a picene derivative [2] as a precursor, named C12-PicDI, adsorbed on Au (111). Imide moieties, which are reactive to metal ions, are attached to both ends (PicDI). Initially, the reactive end groups are passivated by weakly bond alkyl chains (C12H25). We demonstrate temperature-controlled removal of the alkyls and discuss the system evolution under varying experimental parameters. Alkyl byproducts thermally desorb from and only PicDIs remain on the surface. Selectively removing passivating alkyl groups through controlled heating activates the imide moieties, enabling subsequent metal ion coordination. This work demonstrates a crucial step toward realizing complex, designed heterostructures on surfaces [3].

REFERENCES
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[2] Y. Guo, K. Yoshioka, S. Hamao, Y. Kubozono, F. Tani, K. Goto and H. Okamoto, RSC Adv. 10, 31547 (2020).
[3] G.-Y. Xing, Y.-C. Zhu, D.-Y. Li, and P.-N. Liu, J. Phys. Chem. Lett. 14, 4462 (2023).

**Poster Talks / 5**

## Could we have a Prism for Neutrinos?

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Neutrinos during propagation are influenced by matter effect. It turns out the refractive index depends on how neutrinos interact with a medium. This gives us an incentive to study neutrino dispersion phenomena under the facets of energy, flavour, and neutrino/antineutrino. We further investigate if there is a practical application.

**Poster Talks / 6**

## Electrical memorability in silver nanoparticle composite operated at the conductor-to-insulator percolation threshold

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The conductor-to-insulator (CtI) phase transition in silver-nanoparticle composites' static material and electrical properties has been explored for years, except for its potential for further applications based on dynamics, i.e., time-varying properties running. Traditional applied percolation theory suggested no hint of memorability demonstrated in our work. Then, our research examines the dynamic electrical behavior of silver-nanoparticle composites (SNPC), focusing on resistance change with time subjected to external pulses. As indicated by experimental results, an avalanche operating at SNPC's percolation CtI threshold resembled an enforcement process. The integrated time versus SNPC samples' critical exponent was also identified as an effective parameter for characterizing intrinsic properties. A thermal-based recovery treatment was then applied to erase stored information,

showing that written and rewritten samples retained similar critical exponents. Encoding and decoding two four-alphabet strings into an SNPC sample have been demonstrated before and after thermal recovery. These insights support ongoing research into optimizing SNPCs'material properties and operational parameters for enhanced performance in such applications.

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## Investigation of Moiré Structures and Excitonic Behaviors in WS 2 Twisted Homobilayers

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Moiré excitons in transition metal dichalcogenides have attracted considerable attention in recent years due to their unique electronic and optical properties. However, experimentally exploring the connection between moiré pattern and electronic structures remains challenging . In this study, we report the fabrication of $WS_2$ twisted homobilayers on hollow substrates, enabling the study of excitonic properties and microscopic moiré structures using transmission electron microscopy. Through photoluminescence and differential reflectance measurements, we detect a unique low energy signal, which we attribute to moiré excitons. This versatile platform provides new opportunities to explore the interplay between moiré structure and excitonic behavior.
Key words
:transitional metal dichalcogenides , van der Waals bilayer, moiré exciton

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## Rotation measure analysis of shocks and sloshing fronts in a cluster merger simulation

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One of the methods for studying large scale magnetic field structure of the intracluster medium (ICM) is through rotation measure (RM) analysis. By measuring how the linear polarization of background light sources change through the ICM, we may infer the properties of the medium, such as its magnetic field orientations and the electron density distributions. Recent RM observations of the Fornax cluster revealed Mpc-scale depolarization features, which may be linked to merger shocks or sloshing motions. To investigate this, we analyze the RM maps from a cluster merger scenario in the FLASH simulation. Our results show RM enhancements at the shock fronts, while sloshing motions reduce RM magnitude near the cluster center, likely due to turbulence-induced depolarization. Using polarized radiative transfer (PRT) calculations, we find that the uniform background light is more depolarized at the cluster center, with this effect becoming more pronounced as the background intensity decreases.

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## High-quality blue quantum emitters in hexagonal boron nitride without background fluorescence.

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Single-photon sources in wide-band gap hexagonal boron nitride (hBN) hold great promise for applications in quantum communication and quantum key distribution. However, the production of high-quality quantum light sources in hBN remains a challenge. In this work, we focus on fabricating blue quantum emitters (near 436 nm) via electron bombardment, combined with thermal annealing and plasma treatment to effectively eliminate background fluorescence. By removing surface contaminants that previously caused spectral interference, we achieve stable and clean quantum dots. Polarization-resolved photoluminescence measurements further demonstrate excellent crystal alignment. Our findings are crucial for advancing defect engineering and practical applications of quantum optical technologies.

**Poster Talks / 11**

## Proximity-Effect-Driven Superconductivity in Two-Dimensional Bi Thin Films on Al(111)

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Two-dimensional superconductors are crucial for exploring quantum phenomena and understanding high-temperature superconductivity. They are vital for developing superconducting nanoelectronics and exhibit unique transitions under magnetic fields. By depositing or sandwiching a metal thin film with strong spin orbital coupling on a bulk superconductor is a promising route to realize 2D superconductors. In this study, we have deposited Bi on Al(111) substrate at T = 250K using a E-beam evaporator. Our findings revealed distinct phases by using low-temperature scanning tunneling microscopy (LT-STM). We observed the Bi/Al(111) hexagonal $(\sqrt{3}\times\sqrt{3})$30°, Kagome-(3 × 3) and honeycomb-(3 × 3) with respect to the (1 × 1) unit cell of Al(111) substrate have identified. Moreover, based on the atomically resolved STM images and bias-dependent line profiles, and density functional theory (DFT), we have constructed structural models for all phases, as well as atomically localized density of state spectra are measure with scanning tunneling spectroscopy (STS). Line spectroscopy measurements can also reveal the proximity effect on superconductivity substrates in relation to different phases. In future, we have planned to systematically study the band structure by angle resolved photoemission spectroscopy (ARPES) to realize the how electrons affect Cooper pairs in superconducting substrate.

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## Microwave Hybrid System in Carbonization and Graphitization

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The manufacturing process of carbon fiber can be divided into four parts including stabilization, pre-carbonization, post-carbonization and graphitization. Among four parts, post-carbonization and graphitization must be carried out in higher temperature. According to some research, using microwave heating can get better efficiency in comparison with conventional heating. However, plasma is generated when microwaves are in higher temperature, and plasma damages carbon fiber. As a result, the goal of this experiment is to design a continuous microwave hybrid system to finish the carbonization and graphitization. To construct the microwave cavity, we use HFSS to simulate some parameters in order to
meet the desired specification. And we will do some measurements to test whether the properties of products are up to the standard.

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## Exploring Moiré Excitons in Transition Metal Dichalcogenide and Complex Oxide Heterostructures

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Transition metal dichalcogenides (TMDs) have recently emerged as a promising platform for exploring novel moiré physics. So far, however, moiré excitons have only been observed and studied in semiconducting TMD heterostructures. In this work, we explore the unique properties of moiré excitons formed in heterostructures combining TMDs and complex oxides. By integrating these two material systems, we aim to exploit the multifunctional capabilities of moiré excitons and complex oxides. Utilizing photoluminescence and differential reflectance spectroscopy, we probe the signatures of moiré exciton emissions in these heterostructures. This research paves the way for potential applications in tunable moiré superlattices and optoelectronic devices, while also broadening the understanding of excitonic interactions in hybrid material systems.

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## Enhanced Quantum Emitter Density in Hexagonal Boron Nitride via Organic Solvent Treatment

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Single-photon emitters (SPEs) are vital components for advanced quantum communication technologies. Hexagonal boron nitride (hBN), with its wide bandgap and van der Waals properties, presents a promising platform for room-temperature SPE operation. In this study, we substantially increase the density of quantum emitters in hBN by immersing the materiaes l in organic solvents, followed by thermal annealing in an argon (Ar) gas environment. This process not only enhances the yield of quantum emitters but also stabiliztheir emission properties, offering a robust and scalable method for producing ultrabright single-photon sources.

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## Exploration of polarization properties and Stark effect of blue quantum emitters in hexagonal boron nitride

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This study explores the polarization properties and Stark effect of blue quantum emitters within hexagonal boron nitride (hBN), highlighting their potential as future tunable quantum light sources. The emitters are created by lattice defects in hBN using focused electron beam irradiation. Photoluminescence (PL) spectroscopy reveals unique polarization properties in both absorption and emission spectra. Furthermore, the application of a vertical electric field allows a detailed analysis of the Stark effect, revealing distinct polarizability and electric dipole moments. These findings make a significant contribution to the development of tunable quantum light sources.

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## From Simulations to Spectra: Investigating AGN Wind-Disk Interactions and Asymmetric Galactic Outflows

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We use 3D special relativistic hydrodynamic (SRHD) simulations to study AGN-driven winds in a disk galaxy. Our results reveal an early-stage (t ~ 0.1 Myr) asymmetry in bubble formation, with one bubble reaching velocities up to 2000 km/s while the other remains underdeveloped due to interactions with the clumpy disk. This aligns with JWST observations of NGC 7469, which show a circumnuclear starburst ring and one-sided high-velocity outflows.
To explore observational signatures, we generate mock spectra using TRIDENT, finding that the asymmetry is detectable in the [NeV] line at optical wavelengths, as TRIDENT produces spectra comparable to HST rather than JWST. Phase diagrams suggest that matching observed emission requires the disk density in our simulations to be at least an order of magnitude lower. These findings provide insight into AGN wind-disk interactions and offer a potential explanation for the asymmetric outflows in NGC 7469.

**Poster Talks / 17**

## Optimizing Quantum Subchannel Discrimination: One-Way Communication and Device-Independent Security

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Steerable states provide a quantum advantage in subchannel discrimination tasks. In this work, we experimentally demonstrate a discrimination task with high-dimensional entanglement and show how local filtering operations can enhance its success probability. By distilling the steerable states, we boost the discrimination probability close to 100%. Our work also confirm the generality of this approach, which is valid across any dimension with appropriately chosen filters. This study establishes subchannel discrimination as a practical application of partially untrusted devices, deepening our understanding of their operational significance.

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## 6U CubeSat VERTECS: Data Downlink Pipeline

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What is the origin of the Extragalactic Background Light (EBL)? Observations have shown that the integrated light from individual galaxies in near-infrared is insufficient to explain the near-infrared EBL. Two candidates for the excess EBL light are first-generation stars and intra-halo light, which predict distinct EBL in the visible wavelength. To uncover the true origin of the EBL, precise measurements across the visible spectrum are essential. VERTECS (Visible Extragalactic background RadiaTion Exploration by CubeSat) is an astronomical 6U CubeSat designed to measure the EBL in the visible wavelength. It will survey over 40% of the sky, covering wavelengths from 0.4 to 0.8 microns. VERTECS will measure the blank sky intensity with four filters, then subtract the zodiacal light, diffuse Galactic light, and integrated starlight to get the EBL. In this work, we present the development of the data downlink pipeline of the VERTECS. During the data downlink process from the satellite to the ground station, missing or corrupted data may be encountered. Our data downlink pipeline will identify the missing and corrupted data, send commands to require the desired data again from the satellite, and convert the binary files into the widely-used format known as the Flexible Image Transport System (FITS). This pipeline ensures data integrity and accessibility by enabling error detection, data recovery, and conversion into the FITS format for scientific analysis.

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## Impact of binary systems on massive star evolution

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In recent years, research on magnetars has become popular, making the search for progenitor stars of rapidly rotating compact objects an important topic. Accreting stars in binary systems can gain additional angular momentum through Roche Lobe Overflow (RLOF) from the donor star, affecting the rotation rate of the accreting star. Therefore, they are considered a way to produce fast rotating compact objects. This study uses MESA to simulate the evolution of massive binary systems and compares it with the evolution of single stars to understand how binary systems influence the progenitors of supernovae. Results show a higher initial rotation rate reduces mass accretion due to the expansion of the orbit. After RLOF, the accretor accelerates, possibly reaching critical rotation. Lower initial rotation has more mass transfer, leading to even greater acceleration. Mass transfer also alters surface helium abundance, making the accretor's composition differ from single star evolved.

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## Yu-Shiba-Rusinov States of Magnetic Fe Adatoms on Superconducting Ni Kagome Lattice

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Topological superconductors are important materials in condensed matter physics and have potential applications in quantum computing and technology. Introducing magnetic impurities to a superconductor induces magnetic exchange interaction coupling with the Cooper pairs in superconductor. In this work, we have studied the Yu-Shiba-Rusinov (YSR) states of Fe adatoms on Ni Kagome lattice on Pb(111) substrate by scanning tunneling microscopy/spectroscopy (STM/STS) with a superconducting tip. From the STM topographic overview, two types of Fe atomic structures were observed, which are defined as monomer and trimer. We applied a deconvolution method to remove the superconducting tip gap from the dI/dU spectra to obtain the original YSR states from the sample. Spatial mapping of the dI/dU provided us with the opportunity to directly visualize the contributions of different orbitals to the YSR states, which have been further supported by theoretical calculations.

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## Can Supernovae Blast Eliminate Alien Civilizations?

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Why can't we see alien civilizations in this vast universe? This is an age-old question known as the Fermi paradox, which still has no answer today. In a simulation-based study conducted by Zackrisson et al (2015), a Kardashev type-III alien colony could control 50% of the Milky Way (MW) galaxy within 25 Myr when it originated in our solar system. Similar research conducted by Wright et.al (2021) also provides results that the transition from Kardashev type-II to Kardashev type-III alien colonies in the MW galaxy can occur quickly due to assistance from the rotation of stars in the galaxy. However, these two studies still cannot answer why in the real world we still cannot see aliens. Therefore, we try to resolve the Fermi paradox using some astrophysical events, namely supernovae (SN) as an example. SN is chosen as a representative of astrophysical events that can eliminate aliens due to the emission of high-energy particles during their explosion. In this study,

we tried to simulate the effect of SN explosions on the transition of Kardashev type-II alien colonies into Kardashev type-III colonies. Based on our results, the presence of supernovae in the MW galaxy is not strong enough to affect the transition of alien colonies in the MW galaxy. Because 50% of the MW galaxy is colonized in 35 Myr and in accordance with the typical time scale of alien colonization in Sagan & Newman (1980) despite the SN explosion. These results are also in line with the research arguments by Burns & Parsons (2022). This is because the star formation rate in the MW galaxy is very low. However, if alien colonies attempt to invade Ultra-Luminous InfraRed Galaxies (ULIRGs), the time for aliens to colonize 50% of ULIRGs is delayed due to the high rate of star formation.

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## Investigating Cold Gas Filaments in Cool-core Clusters

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Aims. Cold gas ( $T \sim 10^4$ K) filamentary structures with H$\alpha$ emissions were found around central regions of some cool-core galaxy clusters. We wish to compare the results between observation of the Perseus cluster and our simulation in order to interpret velocity structures of observed filaments.
Methods. We perform hydrodynamic simulations to trace gas motions in the Perseus cluster.
Results. In our simulation, filaments with a chaotic velocity structure dominate the population, while those with a uniform velocity structure are secondary. The simulation also produces an overall low velocity dispersion.
Conclusions. The cold gas motions present chaotic more often, whereas observations suggest an uniform structure. On the other hand, the velocity dispersion in the simulation is consistent with the observation results.

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## Lifshitz Josephson Junction

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Scaling symmetry of space time plays important role in many physical phenomena. For example, the CMB spectrum of cosmology and critical phenomena in condensed matter physics are governed by scaling symmetry. In this project, we consider anisotropic scaling symmetry in non-relativistic system and study its effect on quantum mechanics. As an example, we consider an anisotropic Josephson junction and show that its efficiency can be greatly enhanced by tuning the degree of anisotropy. Such anisotropic Josephson junction can be realized with a special form of lattice, which is realizable with the help of modern computational materials science.

**Poster Talks** / **24**

## Noise-robust quantum LiDAR with temporal long single photon and phase-modulation technique

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Quantum LiDAR is a method that combines quantum light sources with LiDAR techniques, leveraging quantum characteristics for sensing applications. However, in practical scenarios, immense noise and low reflection rates often cause quantum light to be overwhelmed by classical light, reducing its efficiency. Inspired by the spread spectrum technique, we implement phase modulation at both the sender and receiver, which serves as an encoding and decoding scheme to effectively filter out unwanted noise. In this poster, we demonstrate the effectiveness of the LiDAR system by achieving a high signal-to-noise ratio in a noisy environment and analyze the impact of transmission rate variations on the target, highlighting its advantages and potential applications. We believe this technique has great potential to enhance the practical viability of quantum LiDAR and bring it closer to real-world conditions.

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## Interference between two independent photons for scalable quantum key distribution

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We demonstrate high-visibility Hong-Ou-Mandel (HOM) interference between two independent attenuated lasers, each probabilistically producing single photons at telecom wavelength (near 1550nm). By employing precise frequency locking, polarization alignment, intensity balancing, and temporal synchronization, we achieve visibility close to the theoretical limit of 50%. Our results are promising for achieving high key rates, enhanced security, and reduced QBER in measurement-device-independent (MDI) QKD, thereby enabling scalable quantum networks.

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## Effects on polarization properties of radio galaxies by magnetized AGN jets

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Radio galaxies are a subtype of active galactic nuclei (AGN) generated by supermassive black hole jets. Polarization measurements of the radio lobes could potentially probe the magnetic field geometry and initial magnetization of the jets. Previous polarization observations have found magnetic field aligned with the jet axis; however, the connection between the magnetization of the jets and the observed polarized emission remains poorly understood. In this research, we use 3D magnetohydrodynamic code GAMER-2 to simulate magnetized AGN jets with a toroidal field geometry within an isolated cluster. We perform simulations with different jet magnetization, and study their difference in the evolution of field geometry within the lobes, and polarization and rotation measure maps.

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# Investigating Quantum Size Effect in Monolayer Mn on Ag(111) by Scanning Tunneling Microscopy/Spectroscopy

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Quantum size effect has received much attention because of its fundamental importance and potential applications in nanoscale electronic devices. Our group focuses on investigating quantum size effect in monolayer manganese (ML Mn) on Ag(111) by scanning tunneling microscopy (STM). According to scanning tunneling spectroscopy (STS) measurements and theoretical calculations, we observe two peaks roughly located at 1.2V and 1.6V and these two peaks are mainly from Mn 3d out-of-plane orbitals. Furthermore, we found that these two peaks will shift or even merge together while the island sizes reduce. This results indicate that the quantum size effect has a significant influence on electronic structures of ML Mn on Ag(111).

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# Resolving Atomic-Scale Complex Magnetic Order in an Antiferromagnetic Ultrathin Film by Spin-polarized Scanning Tunneling Microscopy

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Antiferromagnets are crucial in fundamental research and spintronic applications.According to Gao et al., the noncollinear antiferromagnetic structure was observed in Mn monolayer on Ag(111). In this work, we have systematically studied the strain-tailored nonollinear spin structures in the Mn bilayer on Ag(111) by using spin-polarized scanning tunneling microscopy and DFT calculations. Interestingly, two crystalline structures have been found on the Mn bilayer, and they show different magnetic spin textures. The first one is psudomorphic phase with a conical spin spiral state, the second one is reconstructed phase with a cycloidal spin spiral state. The DFT calculations provide further detailed theoretical insights on how these complex magnetic orders affected by a uniaxial strain relief.

**Poster Talks / 29**

## Exploring the Degree of Freedom Beyond Standard Model via Primordial Black Hole Evaporation with Memory Burden Effect

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Primordial black holes (PBHs) formed during the early universe provide a unique probe of physics beyond the Standard Model. In this study, we investigate the impact of additional degrees of freedom from supersymmetry (SUSY) particles and the memory burden effect (MBE) on the evaporation process of PBHs formed via first-order phase transitions. By analyzing how these factors influence the PBH lifetime, we aim to provide insights into potential new physics and constraints on early universe phase transitions. Our findings may offer indirect evidence supporting the existence of first-order phase transitions, contributing to a deeper understanding of high-energy physics and cosmology.

**Poster Talks / 30**

## Periodic Boundary Condition of Partons in the Kitaev Model

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The Kitaev honeycomb model is an exactly solvable model that hosts a quantum spin liquid ground state, a novel phase of matter characterized by non-trivial many-body entanglement. This phase exhibits phenomena such as excitations with fractional statistics and topological features. Parton construction can decouple the up and down spin sectors of the Kitaev honeycomb model, leading to the convenience of theoretical analysis. Many literatures, including Kitaev's original work, analyze the model with infinite lattice sites, but investigating finite-size systems is necessary for both numerical studies and computing physical quantities for experiments. However, when doing so, some issues related to the periodic boundary condition arise due to the emergent gauge redundancy. In this research, we investigate the periodic boundary condition of partons in the Kitaev honeycomb model. The result turns out that the parton solution highly depends on the type of periodic boundary condition we chose. This research may help us to understand more about the properties of the parton technique, especially its application to the analysis of quantum spin liquids.

**Poster Talks / 31**

## Investigating the nature of magnetic turbulence in Tycho's SNR using X-ray observation

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Supernova remnants (SNRs) are considered the primary sources of Galactic cosmic ray acceleration. Particles are energized at the shock front through the diffusive shock acceleration mechanism, gaining energy by repeatedly crossing the shock. Magnetic turbulence plays a crucial role in scattering these particles back and forth; therefore, investigating this turbulence is essential for understanding the acceleration mechanism. The two-point correlation function can be used to study the magnetic energy spectrum using observational data. In this study we have employed poissonian based generalized morphological component analysis method to separate non-thermal emission in the Tycho's SNR and have employed two-point correlation method on the X-ray flux image and X-ray rim thickness around the forward shock which is directly dependent on the magnetic field strength to study the magnetic energy spectrum.

**Poster Talks / 32**

# Random singlets and permutation symmetry in the disordered spin-2 Heisenberg chain: A tensor network renormalization group study

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We study random \( S = 2 \) antiferromagnetic Heisenberg chains with alternating bond strengths using the tensor network renormalization group method. In the clean limit,\cite{Damle2002} dimerization induces two quantum critical points separating three valence bond solid (VBS) phases: \( (\sigma, 4 - \sigma) = (2,2), (3,1), (4,0) \), characterized by \( \sigma \) valence bonds on even links and \( 4 - \sigma \) on odd links. Introducing bond randomness, we compute disorder-averaged twist order parameters and spin correlations to classify the resulting random VBS phases. The twist order parameter changes sign with \( \sigma \)'s parity, distinguishing between even and odd VBS phases. Our results reveal a multicritical point at intermediate disorder and finite dimerization, where the three VBS phases converge. This point lies at the junction of three phase boundaries in the \( R\text{-}D \) plane. In the undimerized limit (\( D = 0 \)), the multicritical point separates a gapless Haldane phase from an infinite-randomness critical line. We further identify the (3,1)-(4,0) boundary as an infinite-randomness line even at weak disorder, and observe similar behavior near the (2,2)-(3,1) boundary close to the multicritical point.

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# The Dynamic of Molecular Gas of NGC 7538 IRS 1 in 345 GHz Using SMA

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The NGC7538 IRS1 is a hyper-compact HII region located in Perseis at 2.65kpc. The luminosity of IRS1 is around , suggesting it embeds the O6 star. Previous the outflow, magnetic structure, and abundant molecular line have been studied. The P-Cygni and inverse P-Cygni profiles have shown in different lines, associated with distinct dynamics structures. We present 345GHz. SMA observation with high spatial and frequency resolution. The seven sources have been detected as larger than . One of the brightest source is called MM1, identifying the strength of molecular lines like ,.

**Poster Talks / 34**

## Physics-Inspired Neural Network for Kilonova Modeling

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Physics-inspired neural networks (PINNs) have gained considerable importance in recent years in the domain of Astronomy & Astrophysics, particularly, being a potential tool to solve differential equations within the given boundary conditions, not limiting to accurate predictions but also providing efficient approach for large computations. In this work, we have focused on solving the kilonova equations adopted from a specific kilonova model, through direct implementation of the PINN on the differential equations and respected boundary conditions provided in the model. The PINN architecture is trained on differential equations, conditioned on certain boundary conditions, hence learning the evolution of KNe light curves based on certain ranges of physical parameters. To test the performance, after successful training, predictions of light curve for a known set of physical parameters are given as an input and comparison is made between true and predicted light curves. Current results points to stable training with significant recovery of the light curves having a low mean squared error between them. It is important to note that training and prediction of the light curves in under 2 hours. The final target for this work is to accurately predict and hence develop a PINN based KNe model that can provide light curves and perform parameter estimation under low latency.