

CHANG DONG RHO

Curriculum Vitae

37-Ga-603, 163 Seoulsiripdae-ro, Dongdaemun-gu, Seoul 02504, Republic of Korea
(+82) 010 8725 2006 ◊ cdr397@uos.ac.kr

APPOINTMENT

2021 - Present	Outreach & communications coordinator (HAWC)	
2021 - Present	Researcher professor	<i>University of Seoul</i>
2020 - Present	Institutional representative (HAWC)	<i>University of Seoul</i>
2020 - 2021	Postdoctoral researcher	<i>University of Seoul</i>
2019 - 2019	Postdoctoral researcher	<i>Sungkyunkwan University</i>

EDUCATION

2015 - 2019	Ph.D. Physics	<i>University of Rochester</i>
2014 - 2015	M.A. Physics	<i>University of Rochester</i>
2009 - 2013	B.A. Physics	<i>University of Manchester</i>

RESEARCH EXPERIENCE

2022 - Present	Member of TA Collaboration (Cosmic Ray)
2020 - Present	Member of SWGO Collaboration (γ -ray)
2019 - Present	Member of SISA Experiment (Gravitational Wave)

1. Sensitivity calculation used for publication
2. Creating and managing wiki for the collaboration

2014 - Present	Member of HAWC Collaboration (γ -ray)
----------------	---

1. Discovery of TeV gamma-ray emission from SS 433 microquasar jets
2. Studying binary systems with time dependent analyses, stacked analyses, and applying theoretical models to explain observational results
3. Analysis of the confused LS 5039 region by deconvolving multiple sources contributing to gamma rays in its vicinity
4. Development of Gaussian galactic diffuse emission profile model for TeV gamma rays
5. Computing limits on the gamma-ray emission from the Andromeda galaxy
6. Numerous offsite and onsite shifts and other service works

2013	Analysis of ALPGEN $Z \rightarrow \mu\mu$ Monte Carlo samples from CERN
2012	Operation of 7 m radio telescope at the Jodrell Bank observatory

TEACHING EXPERIENCE

2018	OPT411: Math Methods of Optics and Physics	<i>University of Rochester</i>
2016	PHY403: Modern Statistics and Exploration	<i>University of Rochester</i>
2014	PHY122P: Electricity and Magnetism Self-Paced	<i>University of Rochester</i>

MENTORING EXPERIENCE

2022 - Present	Youngkwon Jo (researcher)	<i>University of Seoul</i>
2022 - Present	Woo-Hyeon Heo (undergraduate)	<i>University of Seoul</i>
2021 - Present	Youngwan Son (M.A. student)	<i>University of Seoul</i>
2021 - Present	Myeonghun Choi (M.A. student)	<i>University of Seoul</i>
2021 - Present	Baek Sun Jo (M.A. student)	<i>University of Seoul</i>
2021 - 2021	Se Yeon Hwang (M.A. student)	<i>University of Seoul</i>
2020 - 2020	Jua Kim (M.A. student)	<i>University of Seoul</i>
2017 - 2017	Ryan Rubenzahl (undergraduate)	<i>University of Rochester</i>

OUTREACH PROGRAMS

2018	University of Rochester Pre-College Summer Program
2018	IceCube MasterClass for High School Students
2017	IceCube MasterClass for High School Students
2017	University of Rochester Upward Bound Program
2016	University of Rochester Pre-College Summer Program
2016	University of Rochester Upward Bound Program

ACADEMIC HONORS, FELLOWSHIPS AND GRANTS

2017	American Physical Society Travel Grant 2017	
2009 - 2013	Annual scholarship throughout the four-year period	<i>University of Manchester</i>

INVITED CONFERENCE / SEMINAR TALKS

10/2021	<i>Multi-TeV Gamma-ray Sky Observed using HAWC - Highlights & Recent Results</i>	<i>TeVPA 2021</i>
10/2021	<i>Studying High-Energy Astrophysics with Gamma Rays (Snail Lecture)</i>	<i>APCTP</i>
03/2021	<i>Searching for TeV Gamma-ray Emission from SS 433 with the HAWC Observatory</i>	<i>KASI</i>
11/2019	<i>Searching for TeV Gamma-ray Emission from SS 433 with the HAWC Observatory</i>	<i>Uni. of Seoul</i>
11/2019	<i>Searching for TeV Gamma-ray Emission from SS 433 with the HAWC Observatory</i>	<i>Yonsei Uni.</i>
10/2019	<i>Searching for TeV Gamma-ray Emission from SS 433 with the HAWC Observatory</i>	<i>Seoul Nat. Uni.</i>
10/2019	<i>Searching for TeV Gamma-ray Emission from Compact Binaries with the HAWC Observatory</i>	<i>Korea Uni.</i>
08/2018	<i>Observation of TeV Gamma Rays from the Jet Interaction Regions of SS 433 with HAWC</i>	<i>TeVPA 2018</i>

CONTRIBUTED CONFERENCE TALKS AND POSTERS

09/2021	<i>Studying High-Mass Microquasars with HAWC (Talk)</i>	<i>Microquasar Workshop</i>
07/2021	<i>Studying High-Mass Microquasars with HAWC (Talk)</i>	<i>ICRC 2021</i>
04/2021	<i>Searching for High-Mass Microquasars with HAWC (Talk)</i>	<i>APS April</i>
07/2020	<i>The TeV Gamma-Ray Sky as Seen by 300 Water Tanks - HAWC Overview and Results (Talk)</i>	<i>KPS Spring</i>

07/2019	<i>Discovery of the TeV Emission from the Jet Interaction Regions of SS 433 with HAWC</i> (Talk)	ICRC 2019
03/2019	<i>Discovery of TeV Gamma Rays from the SS 433 Jet Interaction Regions with HAWC</i> (Poster)	AAS HEAD
04/2018	<i>Studying Galactic Compact Binary Systems with HAWC at Multi-TeV Energies</i> (Talk)	APS April
07/2017	<i>Searching for TeV Gamma-ray Emission from Binary Systems with HAWC</i> (Talk)	ICRC 2017
07/2017	<i>Techniques for Measuring Galactic Diffuse Emission Flux and their Preliminary Results in Confused Regions</i> (Poster)	ICRC 2017
01/2017	<i>Analysis on TeV Gamma-ray Binary Systems and Candidates in the Northern Hemisphere with HAWC</i> (Talk)	APS April

PUBLICATIONS AS FIRST / CORRESPONDING AUTHOR

1. A. Albert et al. HAWC search for high-mass microquasars. *Astrophys. J. Lett.*, 912(1):L4, apr 2021
2. A. Albert et al. Constraints on the Emission of Gamma-Rays from M31 with HAWC. *Astrophys. J.*, 893(1):16, 2020
3. A. U. Abeysekara et al. Very high energy particle acceleration powered by the jets of the microquasar SS 433. *Nature*, 562(7725):82–85, 2018. [Erratum: Nature564,no.7736,E38(2018)]

PUBLICATIONS AS CO-AUTHOR

1. S. Safi-Harb et al. Hard x-ray emission from the eastern jet of ss 433 powering the w50 “manatee” nebula: Evidence for particle reacceleration. *The Astrophysical Journal*, 935(2):163, aug 2022
2. A. Albert et al. Probing the extragalactic mid-infrared background with HAWC. *The Astrophysical Journal*, 933(2):223, jul 2022
3. R. Alfaro et al. Gamma/hadron separation with the hawc observatory. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 1039:166984, 2022
4. A. Albert et al. Long-term spectra of the blazars mrk 421 and mrk 501 at TeV energies seen by HAWC. *The Astrophysical Journal*, 929(2):125, apr 2022
5. A. Albert et al. HAWC study of the ultra-high-energy spectrum of MGRO j1908+06. *The Astrophysical Journal*, 928(2):116, mar 2022
6. A. Albert et al. Cosmic ray spectrum of protons plus helium nuclei between 6 and 158 TeV from HAWC data. *Phys. Rev. D*, 105(6):063021, 2022
7. A. Albert et al. Characterization of the background for a neutrino search with the hawc observatory. *Astroparticle Physics*, 137:102670, 2022
8. I.H. Park et al. Stellar interferometry for gravitational waves. *Journal of Cosmology and Astroparticle Physics*, 2021(11):008, nov 2021
9. H. Abdalla et al. TeV Emission of Galactic Plane Sources with HAWC and H.E.S.S. *Astrophys. J.*, 917(1):16, 2021
10. A. Albert et al. Probing the Sea of Cosmic Rays by Measuring Gamma-Ray Emission from Passive Giant Molecular Clouds with HAWC. *Astrophys. J.*, 914(2):106, 2021
11. C. Alvarez et al. HAWC as a Ground-Based Space-Weather Observatory. *Solar Phys.*, 296(6):89, 2021

12. A. Albert et al. Spectrum and Morphology of the Very-high-energy Source HAWC J2019+368. *Astrophys. J.*, 911(2):143, 2021
13. A. Albert et al. Evidence that Ultra-high-energy Gamma Rays Are a Universal Feature near Powerful Pulsars. *Astrophys. J. Lett.*, 911(2):L27, 2021
14. A. U. Abeysekara et al. Hawc observations of the acceleration of very-high-energy cosmic rays in the cygnus cocoon. *Nature Astronomy*, 5(5):465–471, 2021
15. A. Albert et al. Evidence of 200 TeV photons from HAWC j1825-134. *Astrophys. J.*, 907(2):L30, jan 2021
16. A. Albert et al. A survey of active galaxies at TeV photon energies with the HAWC gamma-ray observatory. *Astrophys. J.*, 907(2):67, jan 2021
17. H. A. Ayala Solares et al. Multimessenger gamma-ray and neutrino coincidence alerts using HAWC and IceCube subthreshold data. *Astrophys. J.*, 906(1):63, jan 2021
18. A. Albert et al. 3hwc: The third HAWC catalog of very-high-energy gamma-ray sources. *Astrophys. J.*, 905(1):76, dec 2020
19. S. Akiyama et al. Interplanetary magnetic flux rope observed at ground level by HAWC. *Astrophys. J.*, 905(1):73, dec 2020
20. A. Albert et al. HAWC and Fermi-LAT Detection of Extended Emission from the Unidentified Source 2HWC J2006+341. *Astrophys. J. Lett.*, 903(1):L14, 2020
21. A. Albert et al. HAWC J2227+610 and its association with G106.3+2.7, a new potential Galactic PeVatron. *Astrophys. J. Lett.*, 896:L29, 2020
22. A. Albert et al. Constraints on Lorentz Invariance Violation from HAWC Observations of Gamma Rays above 100 TeV. *Phys. Rev. Lett.*, 124(13):131101, 2020
23. A. Albert et al. Search for gamma-ray spectral lines from dark matter annihilation in dwarf galaxies with the High-Altitude Water Cherenkov observatory. *Phys. Rev. D*, 101(10):103001, 2020
24. A. Albert et al. Constraining the Local Burst Rate Density of Primordial Black Holes with HAWC. *JCAP*, 04:026, 2020
25. A. U. Abeysekara et al. Multiple Galactic Sources with Emission Above 56 TeV Detected by HAWC. *Phys. Rev. Lett.*, 124(2):021102, 2020
26. A. U. Abeysekara et al. Measurement of the Crab Nebula Spectrum Past 100 TeV with HAWC. *Astrophys. J.*, 881:134, 2019
27. M. L. Ahnen et al. MAGIC and Fermi-LAT gamma-ray results on unassociated HAWC sources. *MNRAS*, 2019
28. A. U. Abeysekara et al. All-Sky Measurement of the Anisotropy of Cosmic Rays at 10 TeV and Mapping of the Local Interstellar Magnetic Field. *Astrophys. J.*, 871(1):96, 2019
29. A. U. Abeysekara et al. Searching for Dark Matter Sub-structure with HAWC. *JCAP*, 1907(07):022, 2019
30. A. U. Abeysekara et al. VERITAS and Fermi-LAT Observations of TeV Gamma-Ray Sources Discovered by HAWC in the 2HWC Catalog. *Astrophys. J.*, 866(1):24, 2018
31. A. Albert et al. Constraints on Spin-Dependent Dark Matter Scattering with Long-Lived Mediators from TeV Observations of the Sun with HAWC. *Phys. Rev. D*, 2018. [Phys. Rev.D98,123012(2018)]

32. A. Albert et al. First HAWC Observations of the Sun Constrain Steady TeV Gamma-Ray Emission. *Phys. Rev.*, D98(12):123011, 2018
33. M. G. Aartsen et al. Multimessenger observations of a flaring blazar coincident with high-energy neutrino IceCube-170922A. *Science*, 361(6398):eaat1378, 2018
34. A. U. Abeysekara et al. Observation of Anisotropy of TeV Cosmic Rays with Two Years of HAWC. *Astrophys. J.*, 865(1):57, 2018
35. A. Albert et al. Search for Dark Matter Gamma-ray Emission from the Andromeda Galaxy with the High-Altitude Water Cherenkov Observatory. *JCAP*, 1806(06):043, 2018
36. A. U. Abeysekara et al. Constraining the \bar{p}/p ratio in TeV cosmic rays with observations of the Moon shadow by HAWC. *Phys. Rev.*, D97(10):102005, 2018
37. A. Albert et al. Dark Matter Limits From Dwarf Spheroidal Galaxies with The HAWC Gamma-Ray Observatory. *Astrophys. J.*, 853(2):154, 2018
38. A. U. Abeysekara et al. A Search for Dark Matter in the Galactic Halo with HAWC. *JCAP*, 1802(02):049, 2018
39. A. U. Abeysekara et al. Extended gamma-ray sources around pulsars constrain the origin of the positron flux at Earth. *Science*, 358(6365):911–914, 2017
40. B. P. Abbott et al. Multi-messenger Observations of a Binary Neutron Star Merger. *Astrophys. J.*, 848(2):L12, 2017
41. R. Alfaro et al. All-particle cosmic ray energy spectrum measured by the HAWC experiment from 10 to 500 TeV. *Phys. Rev.*, D96(12):122001, 2017
42. R. Alfaro et al. Search for very-high-energy emission from Gamma-ray Bursts using the first 18 months of data from the HAWC Gamma-ray Observatory. *Astrophys. J.*, 843(2):88, 2017
43. A. U. Abeysekara et al. The HAWC real-time flare monitor for rapid detection of transient events. *Astrophys. J.*, 843(2):116, 2017
44. A. U. Abeysekara et al. Daily monitoring of TeV gamma-ray emission from Mrk 421, Mrk 501, and the Crab Nebula with HAWC. *Astrophys. J.*, 841(2):100, 2017
45. A. U. Abeysekara et al. Search for Very High-energy Gamma Rays from the Northern Fermi Bubble Region with HAWC. *Astrophys. J.*, 842(2):85, 2017
46. M. G. Aartsen et al. Multiwavelength follow-up of a rare IceCube neutrino multiplet. *Astron. Astrophys.*, 607:A115, 2017
47. A. U. Abeysekara et al. The 2HWC HAWC Observatory Gamma Ray Catalog. *Astrophys. J.*, 843(1):40, 2017
48. A. U. Abeysekara et al. Observation of the Crab Nebula with the HAWC Gamma-Ray Observatory. *Astrophys. J.*, 843(1):39, 2017

CONFERENCE PROCEEDINGS

1. Chang Dong Rho, Ke Fang, Se Yeon Hwang, and Youngwan Son. Studying High-Mass Microquasars with HAWC. volume ICRC2021, page arXiv:2108.00594, 2021
2. Chang Dong Rho, Hao Zhou, and Segev BenZvi. Discovery of the TeV Emission from the Jet Interaction Regions of SS 433 with HAWC. In *36th International Cosmic Ray Conference (ICRC 2019) Madison, Wisconsin, USA, July 24-August 1, 2019*, 2019

3. Hao Zhou, Chang Dong Rho, and Giacomo Vianello. Probing Galactic Diffuse TeV Gamma-Ray Emission with the HAWC Observatory. In *The Fluorescence detector Array of Single-pixel Telescopes: Contributions to the 35th International Cosmic Ray Conference (ICRC 2017)*, volume ICRC2017, page 689, 2018. [35,689(2017)]
4. Chang Dong Rho, Hugo Ayala, and Hao Zhou. Techniques for Measuring Galactic Diffuse Emission Flux and their Preliminary Results in Confused Regions. In *The Fluorescence detector Array of Single-pixel Telescopes: Contributions to the 35th International Cosmic Ray Conference (ICRC 2017)*, volume ICRC2017, page 741, 2018. [35,741(2017)]
5. Chang Dong Rho, Ryan Rubenzahl, and Segev BenZvi. Searching for TeV Gamma-ray Emission from Binary Systems with HAWC. In *The Fluorescence detector Array of Single-pixel Telescopes: Contributions to the 35th International Cosmic Ray Conference (ICRC 2017)*, volume ICRC2017, page 742, 2018. [35,742(2017)]
6. Chad Brisbois, Petra Huentemeyer, Henrike Fleischhack, Binita Hona, and Chang Rho. A First Look at Periodicity in HAWC with TeV Binaries. In *The Fluorescence detector Array of Single-pixel Telescopes: Contributions to the 35th International Cosmic Ray Conference (ICRC 2017)*, volume ICRC2017, page 698, 2018. [35,698(2017)]
7. Juan Carlos Diaz Velez et al. Combined Analysis of Cosmic-Ray Anisotropy with IceCube and HAWC. In *The Fluorescence detector Array of Single-pixel Telescopes: Contributions to the 35th International Cosmic Ray Conference (ICRC 2017)*, volume ICRC2017, page 539, 2018
8. A. U. Abeysekara et al. HAWC Contributions to the 34th International Cosmic Ray Conference (ICRC2015). In *Proceedings, 34th International Cosmic Ray Conference (ICRC 2015): The Hague, The Netherlands, July 30-August 6, 2015*, 2015