

Curriculum Vitae

Dr. Moaz M. Altarawneh

Associate professor

Department of physics

Mutah University

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Personal information:

- **Name:** Moaz Mohammad Awad Altarawneh.
- **Date and place of birth:** Alkarak, 24-11-1980.
- **Nationality:** Jordanian.
- **Marital status:** Married.
- **Academic Rank:** Associate Professor.

Education:

- **Ph. D, Physics. Florida State University, Fall 2009. FL, USA.**

Dissertation title:

High Frequency Probes of Superconductivity and Magnetism in Anisotropic Materials in Very High Magnetic Field

- **Master of Science, General physics, New Mexico State University, Aug 2006. NM, USA. Non-thesis.**
- **Master of Science, General Physics, Mu'tah University, Jun 2004. Jordan.**

Thesis title:

The treatment of higher order regular Lagrangians as a first order singular Lagrangians.

- **Bachelor of Science in Applied Physics, Jordan University of Science and Technology (JUST), Jordan, February 2002.**
- **High school certificate/Al-Husseinyah secondary school. Alkarak, Jordan 1998.**

Experiences:

- **Faculty member, Higher colleges of technology/** Math and natural science department August 2018 to December 2020. **UAE**
- **Deputy Dean /** Faculty of sciences, Mutah University, September. 2017 September 2018. **JORDAN**
- **Head of physic Department/** Faculty of sciences, Mutah University, September. 2016-September-2017 **JORDAN**
- **Dean Assistant /** Faculty of sciences, Mutah University, Sept. 2012-Sept 2014 **JORDAN**
- **Associate Prof.** Physics department, Mutah University, September 2011-now. **JORDAN**
- **Post doctorate,** Los Alamos National Lab. JAN, 2010- JULY, 2011-July.
- **Research Assistant.** National High Magnetic Field Lab (**Los Alamos National Lab**) Los Alamos, New Mexico. 2008.**USA**
- **Research assistant. National High Magnetic Field Lab.** (Tallahassee, Florida) 2006-2008. **USA**
- **Teaching assistant.** Florida State University. Tallahassee, Florida. 2006-2007.**USA**
- **Teaching assistant.** New Mexico State University. Las Cruces, New Mexico, 2005-2006. **USA**
- **Physics Teacher,** Ministry of Education, 2002-2004 Al Karak, **Jordan.**

Fellowships, Assistantships and Awards:

- **Seaborg Fellowship,** Actinide science: Studying Plutonium and Uranium based superconductor, starting Jan. 19th 2010- july 15th 2011.
- **Graduate Research Assistantship (GRA),** Los Alamos National Lab. (magnet Lab.) Jun. 2008 – Dec. 2009.
- **Research Assistantship,** Florida State University, Jan. 2007- May 2008.
- **Teaching Assistantship,** New Mexico State University. Jan. 2005 - Aug. 2006.
- **Outstanding Academic Performance,** Mutah University, Al Karak Jordan (2004).

Research Interests:

- Dielectric properties of the nanomaterial-based phantoms for medical applications. For example, fabricating phantoms with electric properties similar to human body tissues doped with single wall carbon nanotubes.
- Thermal heating effects of Nano- compost in the microwaves range.
- In my research, I study f-electron systems (compounds) that composed of elements like Plutonium (Pu), Uranium (U) and Cerium (Ce) which have f-electrons in their valance bands. The f-electrons in the valance band play an important role in determining the physical properties in these systems. In f - electron system, one can find different critical phenomena under different variable conditions like temperature, pressure and magnetic field. These critical phenomena include phase transitions e.g., magnetic transitions, quantum criticality and unconventional superconductivity when the electrical resistivity becomes zero. In my research, I am focusing on two important systems: URu₂Si₂ (Ru: Ruthenium and Si: Silicon) and PuCoGa₅ (Pu based superconductivity, Co: Cobalt and Ga: Gallium). Also, I am working on developing a new method based of radio frequency for studying f-electron systems in extreme high magnetic fields and very low temperatures.
- Fractional Calculus.

Special Skills:

I develop radio frequency probes for studying magnetism and superconductivity in a very wide range of organic and inorganic materials under extreme conditions (low temperature and high magnetic field). In 2008, I have developed with Dr. Charles Mielke at Los Alamos National Lab. an alternative method for the traditional tunnel diode oscillator in all different kinds of magnets. I am working on developing a new rf transmission method that helps performing measurements in very high magnetic fields up to (300 tesla).

Research Projects:

Principle investigator for the project titled:

**Development of Radio Frequency Probes for studying carbon
Nanotubes based materials**

Grant amount: 160,710 US Dollar.

Project period: 17/3/2015 to 18/3/2017.

Publications:

- 1) **Moaz M. Altarawneh** Fractional Solution of Helical Motion of a Charged Particle under the Influence of Lorentz Force (in progress (2021)
- 2) **Moaz M. Altarawneh** and Motaz W. Al Adaileh Exploring the effect of Carbon Nanotubes Additives on Materials Shielding Properties against Gamma Radiation (in progress (2021)
- 3) **M. M. Altarawneh** , G. Harazneh, O. Madanat, Dielectric properties of Single Wall Carbon Nanotubes Based Gelatin Phantoms. *J. Adv. Dielect.* 8, 1850010 (2018).
- 4) Daisuke Nakamura, **M. M. Altarawneh**, Shojiro Takeyama, Self-resonant Coil for Contactless Electrical Conductivity Measurement under Pulsed Ultra-high Magnetic Fields. *Meas. Sci. Technol.* **29** 035901 (2018)
- 5) **M. M. Altarawneh**, Radio Frequency Transmission in Band Pass Filters Circuits for Performing Contactless Conductivity Measurements in High Magnetic Fields. *Sci.Int.(Lahore)*, **28** (2), 1961-1966 , (2016)
- 6) **M. M. Altarawneh**, Fractional Solution for the Cycloid Motion of a Charged Particle in Electric and Magnetic, *Mu'tah Lil-Buhuth wad-Dirasat*, Vol. 30, No. 1, 2015
- 7) Suchitra E Sebastian, N Harrison, F F Balakirev, **M. M. Altarawneh**, P. A. Goddard, Ruixing Liang, D A Bonn, W N Hardy, G G Lonzarich. Normal-state nodal electronic structure in underdoped high-Tc copper oxides. *Nature* 511, 61–64 (03 July 2014)
- 8) N. Harrison, P. J. W. Moll, S. E. Sebastian, L. Balicas, **M. M. Altarawneh**, J.-X. Zhu, P. H. Tobash, F. Ronning, E. D. Bauer, B. Batlogg. Magnetic field-tuned localization of the 5f-electrons in URu₂Si₂ . *Physical Review B*; 88:241108. (2013)
- 9) **M. M. Altarawneh** Radio Frequency LC Band-Stop Filter Circuit to perform contactless conductivity measurements in pulsed magnetic fields. *Rev. Sci. Instrum.* **83** , 9, 096102 (2012)
- 10) **M. M. Altarawneh**, G.-W. Chern, N. Harrison, C. D. Batista, A. Uchida, M. Jaime, D. G. Rickel, S. A. Crooker, C. H. Mielke, J. B. Betts, J. F. Mitchell and M. J. R. Hoch A Cascade of Magnetic Field Induced Spin Transitions in LaCoO₃ . (*Phys. Rev. Lett.* 109, 037201 (2012)
- 11) **M. M. Altarawneh**, N. Harrison, G. Li, L. Balicas, P. H. Tobash, F. Ronning and E. D. Bauer. Superconducting Pairs with Extreme Uniaxial Anisotropy in URu₂Si₂ *Phys. Rev. Lett.* 108, 066407 (2012)

- 12) Rongwei Hu, Eun Deok Mun, **M. M. Altarawneh**, C. H. Mielke, V. S. Zapf, S. L. Bud'ko, P. C. Canfield. Upper critical fields and two-band superconductivity in $\text{Sr}_{1-x}\text{Eu}_x(\text{Fe}_{0.89}\text{Co}_{0.11})_2\text{As}_2$ ($x=0.20$ and 0.46) Phys. Rev. B 85, 064511 (2012).
- 13) E. D. Bauer, **M. M. Altarawneh**, P. H. Tobash, K. Gofryk, J. N. Mitchell, R. D. McDonald, C. H. Mielke, F. Ronning, J.-C. Griveau, E. Colineau, R. Eloirdi, R. Caciuffo, B. L. Scott, O. Janka, S. M. Kauzlarich, and J. D. Thompson. J. Phys.: Condens. Matter, 052206 (2012).
- 14) Mike Sutherland, D. J. Hills, B. S. Tan, **M. M. Altarawneh**, N. Harrison, J. Gillett, E. C. T. O'Farrell, T. M. Benseman, I. Kokanovic, P. Syers, J. R. Cooper, and Suchitra E. Sebastian. Evidence for Dirac nodes from quantum oscillations in SrFe_2As_2 Phys. Rev. B 84, 180506 (2011).
- 15) Suchitra E. Sebastian, N. Harrison, **M.M. Altarawneh**, Ruixing Liang, D.A. Bonn W.N. Hardy, G.G. Lonzarich. Chemical potential oscillations from nodal Fermi surface pocket in the under-doped high-temperature superconductor $\text{YBa}_2\text{Cu}_3\text{O}_{6+x}$ *Nature Communications* 2, 1468 (2011).
- 16) E. D. Mun, **M. M. Altarawneh**, C. H. Mielke, V. S. Zapf, R. Hu, S. L. Bud'ko, and P. C. Canfield. Anisotropic H_{c2} of $\text{K}_{0.8}\text{Fe}_{1.76}\text{Se}_2$ determined up to 60 T. Phys. Rev. B 83, 100514 (2011).
- 17) **M. M. Altarawneh**, N. Harrison, C. H. Mielke, P. H. Tobash, F. Ronning and E. D. Bauer. Sequential spin polarization of the Fermi surface pockets in URu_2Si_2 and its implications for the hidden order URu_2Si_2 . Phys. Rev. Lett. 106, 146403 (2011)
- 18) O.E. Ayala-Valenzuela, J .G. Analytis, J. H. Chu, **M. M. Altarawneh**, I. R. Fisher, R.D. McDonald. *The surface-state of the topological insulator Bi_2S_3 revealed by cyclotron resonance* (arXiv:1004.2311v1), (2010).
- 19) **M. M. Altarawneh**, N. Harrison, R. D. McDonald, F. F. Balakirev, C. H. Mielke, P. H. Tobash, J.-X. Zhu, J. D. Thompson, F. Ronning and E. D. Bauer. *Fermi surface of CePt_2In_7 : a two-dimensional analog of CeIn_3* . (Phy. Rev. B, 83, 081103(R)), (2010).
- 20) F. Nasreen, K. Kothapalli, **M. M. Altarawneh**, H. Nakotte, N. Harrison, E. Brück. *RF skin-depth measurement of UIrGe in high magnetic fields*. J. Phys.: Conf. Ser. 246, (2010)
- 21) S. E. Sebastian, N. Harrison, **M. M. Altarawneh**, R. Liang, D.A. Bonn, W. N. Hardy, and G. G. Lonzarich. *Fermi-liquid behavior in an under-doped high- T_c superconductor*, Phys. Rev. B, 81, 140505 (2010).
- 22) S. E. Sebastian, N. Harrison, **M. M. Altarawneh**, C. H. Mielke, R. Liang, D. A. Bonn, W. N. Hardy and G. G. Lonzarich. *Metal-insulator quantum critical point*

beneath the high T_c superconducting dome, **P. Natl. Acad. Sci. U.S.A.**, **107** (14), 6175-6179 (2010).

- 23) S. E. Sebastian, N. Harrison, P. A. Goddard, **M. M. Altarawneh**, C. H. Mielke, R. Liang, D. A. Bonn, W. N. Hardy, O. K. Andersen and G. G. Lonzarich, *Compensated electron and hole pockets in an underdoped high-T_c superconductor*, **Phys. Rev. B**, **81**, 214524 (2010).
- 24) J. Singleton, C. de la Cruz, R. D. McDonald, S. Li, **M. M. Altarawneh**, P. Goddard, I. Frank, D. G. Rickel, C. H. Mielke, X. Yao, and P. Dai. Magnetic Quantum oscillations in YBa₂Cu₃O 6.69 in field up to 85T: patching the hole in the roof of the superconducting dome, **Phys. Rev. Lett.** **104**, 086403 (2010).
- 25) M. Alsmadi, S. Alyones, C. H. Mielke, R. D. McDonald, V. Zapf, **M. M. Altarawneh**, and A. Lacerda, S. Chang, S. Adak, K. Kothapalli and H. Nakotte, Radio-Frequency Measurements of UNiX Compounds (X = Al, Ga, Ge) in High Magnetic Fields. **J. Magn. Mater.** **321**, 3712-3718 (2009).
- 26) K. M. Purcell, D. Graf, M. Kano, J. Bourg, E. C. Palm, T. Murphy, R. McDonald, C. H. Mielke, **M. M. Altarawneh**, C. Petrovic, Rongwei Hu, T. Ebihara, J. Cooley, P. Schlottmann, and S. W. Tozer. Pressure evolution of a field-induced Fermi surface reconstruction and of the Néel critical field in CeIn₃. **Phys. Rev. B** **79**, 214428 (2009).
- 27) M. Alsmadi, S. Alyones, C. H. Mielke, R. D. McDonald, V. Zapf, **M. M. Altarawneh**, A. Lacerda, S. Chang, S. Adak, K. Kothapalli, and H. Nakotte, , *Complex conductivity of UTX compounds in high magnetic fields*, **J. Appl. Phys.**, **105**, 07E108 (2009).
- 28) **M. M. Altarawneh**, C. H. Mielke, and J. S. Brooks. Proximity detector circuits: An alternative to tunnel diode oscillators for contactless measurements in pulsed magnetic field environments. **Rev. Sci. Instrum**, **80**, 066104, (2009).
- 29) **M. M. Altarawneh**, K. Collar, and C. H. Mielke, Determination of anisotropic H_{c2} up to 60 T in Ba_{0.55}K_{0.45}Fe₂As₂ single crystals. **Phy. Rev. B**, **78**, 220505 (R), (2008).
- 30) Eqab M. Rabei and **M. M. Altarawneh**. *The Quantization of Higher Order Regular Lagrangians as First Order Singular Lagrangians*. **International Journal of Theoretical Physics**. **46**, Number 4. April, (2007).

Talks:

- **M. M. Altarawneh** advances in rf contactless conductivity in high magnetic field. ISSP, university of Tokyo Japan (2012).
- **M. M. Altarawneh** Sequential Spin Polarization of the Fermi Surface Pockets in URu₂Si₂ and Its Implications for the Hidden Order. Seaborg Institute Fellowships.(2011)

- **M. M. Altarawneh** The Fermi surface of CePt₂In₇: a two-dimensional analog of CeIn₃ APS march meeting (2011).
- **M. M. Altarawneh**, C. H. Mielke Advances in rf contactless methods for conductivity measurements in pulsed high magnetic fields. User Committee meeting 2009. NHMFL, Tallahassee Florida, USA.
- C. H. Mielke, **M. M. Altarawneh**, and K. Collar Determination of anisotropic H_{c2} up to 60 T in Ba_{0.55}K_{0.45}Fe₂As₂ single crystals. American Physical Society March Meeting, Pittsburgh, Pennsylvania, 20th of March (2009).
- R. D. McDonald, O. A. yala Valenzuela , **M. M. Altarawneh** , J. Analytis , J. Chu , I. Fisher. Coexistence of 2D-surface and 3D-bulk Fermi surfaces in Bi₂Se₃. American Physical Society March Meeting, Portland, Oregon, 15th of March (2010).
- Suchitra E. Sebastian, N. Harrison, **M. M. Altarawneh**, C. H. Mielke, P. Goddard, R. Liang, D.A. Bonn and W.N. Hardy. Size, shape and carrier type of multiple Fermi surface pockets in YBCO from two-axis angular quantum oscillation measurements. American Physical Society March Meeting, Portland, Oregon, 18th of March (2010).

Posters:

- **M. M. Altarawneh**, Microwave Thermal Heating Effect in Single Wall Carbon Nanotubes Based Composites. International Conference on Current Nanotechnology and its Application (ICCNA2018)
- **M. M. Altarawneh**, N. Harrison, R. D. McDonald, F. F. Balakirev, C. H. Mielke, P. H. Tobash, J.-X. Zhu, J. D. Thompson, F. Ronning and E. D. Bauer. *Fermi surface of CePt₂In₇: a two-dimensional analog of CeIn₃. PPHMF - Physical Phenomena at High Magnetic Fields VII Tallahassee, FL (2010).*
- **M. M. Altarawneh**, N. Harrison, R. D. McDonald, C. H. Mielke, E. D. Bauer and F. Ronning. *Science at 100 Tesla field tuned transitions in f-electron systems in strong magnetic fields. 100T magnet project review for office of Energy Sciences Department of Energy. USA government (2010).*
- **M. M. Altarawneh**, N. Harrison, C. H. Mielke, P. Tobash, J. Thompson, J. Zhu, E. D. Bauer, F. Ronning and J. N. Mitchell. *Superconductivity in high magnetic field. LDRD project review, Superconductivity by design, (2010).*
- **M. M. Altarawneh**, C. H. Mielke, R. D. McDonald, J. N. Mitchell, F. Ronning, J. A. Kennison³, E. D. Bauer. *Superconductivity in PuCoGa₅, Strongly Correlated Electron Systems (SCES), Santa Fe, (2010).*

Computer skills:

- **LabView**, National Instrument (beginner to Intermediate level).

- **Igor Pro** and **Origin Pro** (data analysis Software).
- **Maple** (tool for Mathematics and Modeling).
- **ICDL**

Instrumentation Experience:

- **300 tesla single turn coil magnet**, Los Alamos National Lab., Operation, diagnostic and measurements, Los Alamos National Lab. (skin depth and magnetization).
- **100 tesla multi-shot pulse magnet** (*highest pulse field in the world in this category*), Los Alamos National Lab., (skin depth and magnetization).
- **65 tesla short pulse magnet**, Los Alamos National Lab., Operation, diagnostic and measurements (skin depth, magnetization).
- **45tesla Hybrid magnet** (*highest dc magnet in the world*) measurements of skin depth, Transport and magnetization.
- **Superconducting magnets** (Oxford system), Operation and measurements (skin depth, Transport and magnetization).
- **Commercial Physical Properties Measurements system (PPMS)**, Operation and measurements.
- Experience in handling **cryogenic liquids** of Nitrogen and Helium isotopes (^4He and ^3He) from room temperature down to 0.5K.

International collaborator:

1. Pulsed magnetic field facility at Los Alamos National Lab, New Mexico, USA
2. National High Magnetic Field Lab NHMFL at Florida, USA.
3. Institution of Solid State Physics (ISSP), University of Tokyo Japan.

Teaching Interests

- General physics 101.
- General physics 102.
- Calculus I
- Calculus II
- Quantum Mechanics.

- Electromagnetic theory.
- Nuclear physics.
- Computational physics.
- Atomic and molecular physics.
- Vibrations and waves.
- Nuclear physics (graduate).
- Atomic Physics (graduate).
- Electrodynamics (graduate)

References:

- **Rateb Albtoush**, Dean of science –Mutah University –Jordan

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Mutah University ,
(61710), Mutah, Jordan

- **Neil Harrison**, Ph.D. NHMFL-Pulsed Field Facility Staff Member, National High Magnetic Field Laboratory Los Alamos National Laboratory. NM, USA. (**Research colleague and advisor**)

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- **Prof. Hussian Omari**. Physics department, Mutah University, Alkarak-Jordan.

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