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CURRICULUM VITAE
RICHARD A. KLEMM

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PART I: @UCF: 2007-2016

@UCF PERSONAL HISTORY

2007-11 Research Professor, University of Central Florida, Orlando, FL 32816
2011-pr. Associate Professor (tenured in 2015), University of Central Florida, Orlando, FL 32816

@UCF SHORT TERM VISITING POSITIONS HELD

2008 University of Tsukuba, Tsukuba, Japan (May 1-June 30)
2009 University of Tsukuba, Tsukuba, Japan (July 19-August 13)

@UCF LANGUAGES SPOKEN

English (native), Deutsch (fliessendes), Español (muy bien), Français (un peu)

@UCF HOBBIES

violin, piano, swimming, hiking, camping, skiing

@UCF TEACHING EXPERIENCE

2007 Recitations for PHY 2053 (College Physics I), spring, fall (UCF)
2007, 09, 10, 12
Lecturer in PHZ 6428 (Condensed Matter Physics II) (graduate, spring, UCF)
2007, 08, 09, 11, 13
Lecturer in PHZ 6426 (Condensed Matter Physics I) (graduate, fall, UCF)
2008,09, 12, 13
Recitations for PHY 2054 (College Physics II) (spring 2008, fall 2008, spring 2009), (UCF)
2008, 12 Lecturer in PHY 6673 (Advanced Quantum Mechanics*) (graduate, spring, UCF)
and in PHZ 5405 (Condensed Matter Physics) (graduate and seniors, spring, UCF)
2009, 10 Lecturer in PHY 2048, Physics for scientists and engineers I (fall, spring), UCF)
2010 Lecturer in PHY 2049, Physics for Scientists and Engineers II (fall, UCF)
2011, 13 Lecturer in PHY 7669 (Quantum Field Theory II*) (Spring, UCF)
2011 Taught one graduate student (Asma Amjad) for 3 units of Independent Study
on magnetism (PHY 6908) (Spring, UCF).
2010-14 Supervising the Ph.D. of three theoretical UCF graduate students, Christopher
Loerscher (Ph. D. July 2014), Bianca Hall, and Gregory Katona (Abstract Quantum
Field Theory, working at Howard University with Prof. Tristan Hübsch) (Ph. D. 2013).
2010-14 Co-supervised the doctoral work of Jingchuan Zhang ,
(officially a student of Prof. Qiang Gu,

University of Science and Technology Beijing, Beijing, China) (Ph. D. June 2014).

2010-13 Co-supervised the doctoral work of Manabu Tsujimoto and Kaveh Delfanazari, (officially students of Prof. Kazuo Kadowaki, University of Tsukuba, Japan. Ph. D.'s for Tsujimoto and Delfanazari were both awarded in my presence on Feb. 20, 2013 in Tsukuba, Japan).

2010-15 On the UCF doctoral committees of Asma Amjad (Ph.D. 2013), Hajrah Quddusi (Ph.D. 2012), Pedro Regueiredo, and Rebecca Cebulka (Condensed Matter Experiment), Tracy Becker (Ph.D. December 2015), Emily Kramer (Ph.D. August 2014), Eric Robinett (left UCF in 2013), and Akbar Whizin (Ph.D. May 2016) (all 4 in Planetary Sciences), Benjamin Webb (Ph. D. May 2016) and Sudeep Jung Pandey (CREOL),

2015 Mahtab Khan and Sabine Pelton-Sudduth (Classical Algorithms), and

2015 Chi Hong (Isaac) Yuen (Molecular Collisions Theory).

2012 One graduate student (Bianca Hall) registered to take 3 units of PHY 6918 on *Layered Superconductors, Volume 1* (independent study)(Summer, UCF)

2012 One graduate student (Mr. Jingchuan Zhang) came from his host institution (USTB, Beijing) for five months to UCF to work with me on his doctoral thesis.

2013-14 Co-supervising the doctoral work of Mr. Jingxiang Zhao, (officially a student of Prof. Qiang Gu, USTB, Beijing, China)

2013-15 Supervised the UCF Ph.D. thesis of Bianca Hall. (Ph.D. December 2015).

2013 Lecturer in Honors 2048 C and PHY 4604 (Wave Mechanics I). Introduced I-clickers into this course for the first time**. Held recitations and supervised a Learning Assistant, Mr. Casey Eichstaedt. This was also the first time that an LA was employed to help in this class**. Typed class notes and detailed solutions to all the homework**.

2014 Lecturer in PHY 4605 (Wave Mechanics II). Using I-clickers and the same LA as in the fall semester with PHY 4604**. Also typed class notes and detailed solutions to all of the homework**.

2014 Spring. Directed Research Courses for UCF undergraduates, Mr. Manuel Morales (Since Fall 2015, Ph. D. student in Medical Physics at Harvard/MIT) and Dakota Murphy.

2014 Spring. Directed Research Course for Mr. Wade Wilson (UCF Engineering undergraduate).

2014 Summer Semester. Unofficially helped one PHY 4605 student (Mr. Jeffrey Nascimento) with a non-passing grade to retake the course privately. He easily passed, and graduated in physics from UCF in August 2014.***

2014 May 14: Dr. Jingchuan Zhang passed his doctoral defense (in Chinese), USTB, Beijing, China, in my presence.

2014 New graduate student: Ms. Aiying Zhao, a first-year Master's student at the USTB, decided to work with me for her doctorate in physics (co-supervising with Qiang Gu).

2014 July 1: Dr. Christopher Lörscher successfully defended his doctoral dissertation at UCF.

2014-16 Fall and Spring Lecturer in PHY 4604 and 4605. Using I-clickers, Manuel Morales as the LA, and typing class notes, exam, and homework solutions.

2014-15 Supervised the Honors in the Major (physics) theses of Mr. Manuel Morales (Spring 2015) and of Mr. Daniel Cerkoney (expected Fall 2015).

2014-15 Fall and Spring. In addition to ongoing research with UCF undergraduates Wade Wilson, Manuel Morales, Tyler Campbell, and Daniel Cerkoney, supervising the research of 5 new UCF undergraduate students: Matthew Benacquisto, Matthew Solarski, Constance Doty, Anuj Sultania, and Ashley Gramajo. All nine of these undergraduates worked on the THz emission from Bi2212. Mentoring Bianca Hall on her Ph.D. thesis work on the Knight shift in metals.

2015 Tyler Campbell admitted to the Ph.D. program in physics at UCF.

2015 New graduate student: Mr. Jingxiang Zhao, starting his last year of doctoral work with me at USTB (co-supervising with Qiang Gu).

2015-16 Aiying Zhao passed her doctoral qualifications, and is working with me full time for her doctorate on superconductivity at USTB (co-supervising with Qiang Gu). Arrived at UCF on March 24, 2016 to spend 4 months with me.

2015 Bianca Hall successfully defended her Ph. D. thesis on the first microscopic theory of the Knight shift.
John Vastola (superconductivity theory, Spring 2016)and Daniel Cerkoney (THz emission, Fall 2015) completed their Honors in the Major theses with me.

2015 Fall Semester: 9 undergraduates working with me on THz emission: Michael Balsz, Christopher Bozak, Daniel Cerkoney (Honors in Physics thesis, December 2015), Constance Doty (now entering grad school at UCF), Andrew Davis (Honors in Major thesis 2016-2017), Ashley Gramajo (a RAMP student in biomedical engineering), Tristan Reynoso, and Sean Wiggins (admitted for grad studies at Brown University).

2016 Spring semester: Also taught PHZ 3113 (Intro. to Theor. Methods of Physics). Used I-clickers, typed up solutions to homework and exams, and had Qing Wang as my LA.**

2016 Spring semester: John Vastola (Honors in Physics thesis, May 2016) on microscopic superconductivity theory.

2016 Constance Doty was admitted to the doctoral program in physics at UCF, and is doing her research on THz emission with me.

2016 Aiying Zhao (USTB) was at UCF for 4 months to work on her doctoral thesis, and she has made good progress on the upper critical field of 2D superconductors.

2016 Summer Semester: Qing Wang took research course PHY 4912 with me on THz emission

* First time taught from a condensed matter perspective at UCF.
** First time this was done in an upper division undergraduate course at UCF.
*** Not required, but was done to help the student graduate from UCF.

@UCF STUDENT MENTORING

Recently, I helped Manuel Morales obtain a scholarship from the Hispanic Scholarship Heritage Fund to support his last year (2014-2015) of undergraduate study at UCF. He also supported himself by being my Learning Assistant in my PHY 4604 and 4605 classes. I wrote letters of reference that helped him get admitted to doctoral programs in medical physics at Duke, Chicago, and Harvard/MIT, and he chose the Harvard (Medical School) and MIT (Engineering) combination, where he is currently enrolled with a full scholarship. I wrote letters of reference to graduate schools for Wade Wilson, a UCF engineering student (B. S. Spring 2015) who also worked with me on the THz emission from Bi2212, and he chose to attend the doctoral program at Duke University in Computer Engineering.

In addition, I helped John Vastola to obtain an Astronaut Scholarship for his upcoming senior year at UCF. He was the top student in my undergraduate PHY 4604 and 4605 classes, and was my Learning Assistant in PHY 4604 in the Fall 2015 and Spring 2016 semesters. He did his Honors in the Major Thesis with me on impurity effects in two-dimensional supercoductors with $d_{x^2-y^2}+id_{xy}$ order parameter symmetry. I helped him to get into graduate school at Vanderbilt, where he is now.

I also wrote letters of reference for my undergraduate QM students, Danielle Harper, Justin Reyes, and Tyler Campbell, who entered the doctoral programs in Optics, Physics, and Physics, respectively, at UCF in the Fall 2015 semester. I wrote many letters of reference for other UCF undergraduate students, especially for Daniel Heligman, Sean Wiggins (now at Brown University)

and Andrew Foster (now at Cornell University), and very many letters for Marisol Alcántara Ortigoza, Hari Paudel, and Kaveh Delfanazari (for faculty, postdoctoral, and postdoctoral positions, respectively) as well. Marisol now has a regular faculty position at Tuskegee University, Hari is finishing his first postdoctoral fellowship at Georgia State and is applying for his second postdoc position, and Kaveh Delfanazari was a postdoc at Southampton University in the UK for three years, and is now a postdoctoral fellow at the Cavendish Laboratory at the University of Cambridge, UK for the coming 3 years.

Dr. Christopher Lörscher is teaching at Seminole State College in Orlando, where he is doing very well, and is up for tenure this year. Dr. Jingchuan Zhang is working as a computer programmer in Anbei province of China, where he and his wife live. Bianca Hall started a full-time position teaching regular and AP physics at Holy Spirit Preparatory School, a private high school in Atlanta, GA, in August, 2015. She completed her doctoral thesis on the Knight shift in metals, and was awarded her doctorate in physics in December, 2015. The main paper of her thesis, "Microscopic model of the Knight shift in anisotropic and correlated metals", is the first microscopic theory of the effect in 60 years of measurements. It was published in 2016 as a 14-page letter, L31.

I mentored Mr. Ethan Pepmiller, one of my undergraduate quantum mechanics students, to get accepted for graduate studies in the experimental group of my main collaborator, Prof. Kazuo Kadowaki, at the University of Tsukuba, Tuskuba, Japan. He is there now, and will officially start graduate school in April 2017. I am also mentoring Nichole Merris, who was in my PHY 3113 class and will be in my PHY 4604 class in the Fall 2016 semester and is interested in the THz emission, and Jondé Bursch, who is majoring in physical therapy.

@UCF HONORS

2008 Selected by the editors of the APS journals as one of 2 Floridians
on the original list of 534 "Outstanding Referees"(out of 42,000 APS members)

@UCF CURRENT and PENDING DOMESTIC GRANTS and FUNDING

2016 August 1, 2016, participant in White Paper for a MURI Topic 4 proposal to the AFOSR, "High temperature superconducting nano-architectures activated with ultrafast photonics: Routes for generation and control of broadband microwave to THz radiation".
The lead is Prof. Michael Sumption (Ohio State Univ.), with Prof. Shane Cybart (UC Riverside), Prof. Dmitri Basov (Columbia U.), Prof. Gabriel Rebeiz (UCSD) and Prof. Eric Van Stryland (UCF), with part of the proposed UCF funds ($300,000.00/year for 5 years) earmarked for me. Notification of initial evaluation expected by August 22, 2016.

2016 Encouraged by and submitted powerpoint proposal to NSF EPMD program manager Dmitris Pavlidis, "Proposal to measure the anisotropy of the bulk superconducting gap in state-of-the-art samples of the high-T_c superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$ (BSCCO)". Pending. If approved, this would be sufficient to support my beginning UCF doctoral student, Constance Doty.

2016 February 2016,submitted SBIR proposal "Water and ammonia sensor for planetary and cometary atmospheres" to NASA, subcontractor. Denied

2015 Encouraged by NSF program manager Dr. Dmitris Pavlidis and submitted a proposal to the NSF EPMD on Nov. 2, 2015, "Tunable intrinsic Josephson junction terahertz emitter devices", $465,216 for 3 years. PI. Denied

2015 Submitted NASA PICASSO proposal "Water and ammonia sensor for planetary

and cometary atmospheres" on Nov. 13, 2015. $310,981 for 3 years. PI. Denied

2014 Invited in May, 2014 by Joe X. Qiu, the program manager, to submit a white paper to the U. S. Army Research Laboratory on THz emission. Submitted April 2, 2015. Denied.

2014 Received an unsolicited offer of $25,000.00 from Dr. Qiang Li of Brookhaven National Laboratory (funded by the USDOE) to support a graduate student working on understanding advanced energy materials. This should have supported Bianca Hall for two semesters in 2015. The letter of intent was dated Sept. 19, 2014.
The proposal, "Knight shift in metals and superconductors," was submitted to Dr. Qiang Li on March 19, 2015, $25,000.00, with me as the PI (no co-I's), enough to support Bianca Hall for two summers. Due to a political shakeup at BNL with an unrelated scientist being indicted for providing trade secrets to China, the application was not acted upon. Hence, it is pending until further notice.
However, Dr. Qiang Li made a personal gift to me of $10,000.00, which I used to pay the out-of-state tuition of Bianca Hall for the summer 2015 (3 units) and fall 2015 (1 unit) semesters, and living expenses for the summer 2015 semester.
This was sufficient for her to graduate with the Ph. D. in the fall 2015 semester.
Dissertation, "Microscopic Theory of the Knight Shift", by Dr. Bianca Hall. 2015

2014 NASA NNH15ZDA001N-PICASSO Step-1 proposal submitted Sept. 14, "Water and ammonia sensor for planetary and cometary atmospheres" was "encouraged" for a Step-2 proposal due Nov. 13.
NSF EPMD program manager wrote that a proposal on THz emission would be "most welcome". Due November 2, 2015.
Bianca Hall passed her doctoral defense on Nov. 6, 2015.

@UCF FOREIGN SUPPORT OF UCF STUDENTS

I helped my former graduate student, Christopher Lörscher obtain a Chateaubriand Fellowship from the Government of France, which paid his travel ($2,500.00) and living expenses (1,400 Euros/month) for four months (total $7,300.00) in Grenoble, France, where he worked at the CEA under the direction of Dr. Jean-Pascal Brison on the magnetothermal conductivity of the p-wave superconductor UCoGe. I also arranged for Bianca Hall to obtain a small amount ($300.00) of funding for a translation from German to English of a book chapter on music performances written by Dr. Laszlo Marosi of the UCF Music Department. The total of these funds from France and Germany is therefore approximately $10,100.00.

@UCF FOREIGN SUPPORT OF TRAVEL AND FOREIGN STUDENTS

In the summer of 2008, Prof. Kazuo Kadowaki used some of his support from the Government of Japan for my travel to and living expenses for two months in Tsukuba, Japan. Nominally, this was to encourage me to finish my first book, *Layered Superconductors Volume 1*, but it was also to introduce me to the coherent terahertz emission from the high-temperature superconductor $Bi_2Sr_2CaCu_2O_{8+\delta}$ (Bi2212). In the summer of 2009, his grants also paid for my travel to Japan and living expenses for one month. His grants have since paid for six more collaborative trips to Japan, each of one-week's duration. His grants also paid for my travel and registration costs for invited talks in Loughborough, UK, Hirosaki, Japan, and Pohang, Korea.

Two experimental students, Mr. Manabu Tsujimoto and Mr. Kaveh Delfanazari, working in the laboratory of Prof. Kazuo Kadowaki, were also working with me over a period of three years during their doctoral work, as I was their co-advisor and was present during their doctoral defenses on Feb. 20, 2013. They were supported by the Government of Japan. I would estimate these costs that are attributable to me as follows: My travel to Japan (7 trips at $1,700/trip, housing for stays of 2

months, 1 month, and 5 times for 2 weeks each, as $11,900 for travel to Japan, $6,000 for housing, and $3,000 for food, totaling $20,000. In addition, my trips to Pohang, Loughborough, Hirosaki, and Tokyo cost the Government of Japan about $2,500/trip, or $10,000. Thus, the Government of Japan spent about $30,000 directly on me. In addition, the student Mr. Krsto Ivanovic, who was hired by the same grants to help me type my book, *Layered Superconductors Volume 1*, was paid for three months to do that, which is probably worth about $3,000, including his tuition and living expenses. However, since I was effectively the co-supervisor of the doctoral studies of Mr. Manabu Tsujimoto and Mr. Kavel Delfanazari, 50% of their support for three years of graduate school should be attributable to me. The equivalent amount if they were out-of-state UCF students would be about $39,000 per year per student, and 50% of six student years, the amount attributable to me, would therefore be about $117,000. Thus, the total amount that is attributable to me that was spent so far by the Government of Japan is $30,000 +$3,000+$117,000, or $150,000.

In addition, the grants of Prof. Gu Qiang from the Government of the People's Republic of China, have supported 8 trips to Beijing, each of two-weeks stay, and my trip to Nanjing to present an invited talk in 2013. One graduate student, Zhang Jingchuan, was mostly supported by these grants, and he also came for 5 months to UCF with this support, in order to work with me. His food was paid by my UCF startup funds. Since, I was his co-advisor, one-half of his support for 5 years from the Government of China should be attributable to me. That would be about $20,000 annually for his stipend, and $19,000 annually for non-resident tuition. Together, these sum to $195,000, plus his travel to the USA of about $1,500. Since only 50% of his support should be attributable to me, that amount is $98,250. Note that his support came from the Government of the People's Republic of China, but he was really working mostly with me. Now, there are two more graduate students, Mr. Zhao Jingxiang and Ms. Zhao Aiying, in Prof. Gu's group at the University of Science and Technology Beijing, that are working primarily with me, so 50% of their support from the Chinese Government should be credited to me. Since Mr. Zhao Jingxiang has already been working with me for about one year, that would be effectively 50% of $39,000, or $19,500 attributable to me so far. He will need about one more year to complete his doctorate, so the anticipated total of his expenses would be about $43,000 that could be attributed to me. Ms. Zhao Aiying just started working with me in May, 2014, but will most likely need about two more years to complete her doctorate. She is planning on coming for 3-5 months to UCF to work with me during the Spring 2016 and Summer 2016 semesters. I will provide her living expenses. In her case, the total for the two years of her 50% support and travel to UCF that would be attributable to me would be about the same as for Mr. Zhao Jingxiang, or another $43,000. Thus, the total amount of the anticipated support for these three Chinese students that could be attributable to me would be approximately $98,250 +$43,000+$43,000, or $184,250. Ms. Aiying Zhao is currently visiting me at UCF for four months March 25-July 30, 2015, paid for by the Chinese government funding with Prof. Gu Qiang, PI.

In addition, Prof. Gu Qiang has kindly paid for my eight trips to China, the latest during the period June 10-25, 2015, with housing and food expenses for the two weeks during each trip, which I would estimate as $500 per trip, and he also paid from his grant for me to present my invited talk at the Vortex 2013 Workshop in Nanjing, China. The trips costs vary according to the time of the year, but they average about $1,700 per trip, plus the $600 for the travel to Nanjing and the $800 registration fee for the Vortex workshop. Thus, the total amount that the Chinese Government paid for me to visit my students in China has so far come to about $20,000. Additional trips to Beijing are anticipated, which will also be paid by the Government of the People's Republic, unless I obtain some funding from the US Government. Prof. Gu Qiang has provided the support for my current graduate student, Ms. Aiying Zhao, to come to UCF to spend 4 months working with me on her doctoral thesis. He also has obtained funding for another trip for me to visit his group in

Beijing later in 2016. These current amounts are on the order of $20,000.

Thus, the total amount that foreign governments have spent on me and my students is approximately $40,000 + $184,200+$10,100+$150,000, or $384,300 during the past 8 years.

@UCF ATTEMPTED GRANTS and FUNDING

2007 Funding applied from the USDOE on "Understanding decoherence, macroscopic quantum tunneling, and multiferroic behavior in high-symmetry single molecule magnets" (R. A. Klemm, PI 100%) ($263,376 over 3 years). Denied

2008 Funding applied for with the USDOE on "Theoretical studies of ultrasmall nanomagnets and nanomagnet arrays" ($360,740 over 3 years) (R. A. Klemm, PI, %100). Denied

2009 Funding applied for with the NSF on "Physics and engineering of a Josephson simulated terahertz amplified (STAR)-emitter" (R. A. Klemm, PI, %100) ($255,541 over three years). Denied.

2009 Funding applied for with the NSF on "Critical fields of ferromagnetic triplet superconductors" ($375,511 over 3 years)(R. A. Klemm, PI, %100). Denied

2010 Funding applied for with the NSF on "Physics and engineering of a Josephson simulated terahertz amplified (STAR)-emitter" (R. A. Klemm, PI, %100) ($373,369 over three years). Denied.

2010 Funding applied for with the NSF on "Critical fields of ferromagnetic triplet superconductors," ($381,918 over three years, R. A. Klemm, PI %100). Denied.

2010-11 Funding as a co-PI was applied for with the NSF on "MRI: Development of a few-cycle high power infrared laser," ($1,350,001 over two years, R. A. Klemm, co-PI 20%). with Z. Chang (PI, 30%), R. Peale (co-PI, 10%), M. Richardson (co-PI, 10%), X. Gong (co-PI, 10%), A. Schulte (Senior Personnel, 10%), and R. Boreman (Senior Personnel, 10%). Denied.

2011 Funding was applied for with the NSF on "Critical fields of p-wave superconductors," ($435,601 over three years). Richard Klemm (PI, 50%) and Sergey Stolbov (co-PI, 50%). Denied.

2012 Application to the Science, Technology, Engineering, and Mathematics Division of the Embassy of France for a Chateaubriand Fellowship for Mr. Christopher Loerscher to perform experiments on ferromagnetic superconductors at the CEA in Grenoble, France, supervised by Pr. Dr. Jean-Pascal Brison, director (Amount: travel expenses and support (1,400 euros/month) for 4 months). **Approved!** This work began January 28, 2013 with Mr. Lörscher's arrival in Grenoble.

2012 Application for an in-house UCF COS ORC grant on "Angular Dependence of the upper critical field of polar and axial p-wave superconductors" ($10,000 over 1 year.) Richard Klemm (PI, 100%). Denied.

2012 Application for funding from the USDOE, "Modeling intrinsic Josephson junction terahertz emitters", was expected to be submitted by May 15, 2012, but the preapplication was ignored by the program manager, so the full application was not submitted. ($253,360 over three years. PI: Richard Klemm, 100%)

2012 Funding was applied for with the NSF on "Upper critical fields of unconventional superconductors," ($447,613 over three years).

Richard Klemm (PI, 100%). Denied.

2012 Funding was applied for with the NSF on "Tunable continuous intrinsic Josephson junction terahertz emitter devices". ($480,356 over three years. PI: Richard Klemm, 100%). Denied.

2012 Application to the Paul and Daisy Soros Foundation for New Americans for a Graduate Fellowship for Bianca Hall. Denied.

2012 Application to the NSF for a Graduate Fellowship for Bianca Hall. Denied.

2013 Preapplication was approved by the Program Manager, and a full application was submitted to the DOE-BES on"Upper critical fields of unconventional superconductors," ($447,613 over three years) Richard Klemm (PI, 100%). Denied.

2013 Application to the UCF COS/ORC SEED Grant program on "Compact highly-stable local oscillator for terahertz spectroscopy" was submitted to the UCF COS on Feb. 15. ($25,000 over one year) Richard Klemm (PI, 100%). Denied.

2013 Letter of Intent and Preliminary Proposal was submitted on Oct. 25 to the NSF-AFOSR on "Development of high-power coherent emission devices from a highly layered superconductor," ($1,073,706 over four years) Richard Klemm (PI, 100%). Not chosen for a Full Proposal.

2014 Application to the NASA 2014SBIR/STTR Solicitation S1.03 on "THz local oscillators based on the AC Josephson effect in a layered superconductor," ($124,883 over one year in Phase I) Chris Fredricksen, President, LRC Engineering, Inc., Orlando, FL (PI, 68%), Subcontract 32% (Richard Klemm PI 67%, Robert Peale Co-PI 33%), Denied.

2014 Full application allowed by the program manager and was submitted to the DOE-BES on "Resolving conflicting experiments on unconventional superconductors" ($447,613 over three years) Richard Klemm (PI, 100%). Denied.

2014 Application to the Foreign Student Exchange Program of the People's Republic of China was made by my fourth graduate student, Mr. Jingxiang Zhao of the USTB, Beijing, China for 100% of the funds to visit me at UCF for the academic year 2014-2015 (September 2104-August 2015) for the purpose of his doctoral research. The student's English score was too low.

2014 Submitted a step-1 proposal to the NASA PICASSO solicitation, with Robert Peale as the Co-I. The full proposal, "Water vapor sensor for planetary and cometary atmospheres", was encouraged, and submitted as 14-PICASSO14-0066, on Nov. 14, 2014, $298,364 for 3 years, with me as the PI, Peale and Vodopyanov as co-Is. Denied in April 2015.

@UCF PROFESSIONAL INVOLVEMENT

@UCF INVITED PRESENTATIONS AT NATIONAL CONFERENCES

2009 Invited Speaker, Symposium on *Spin Physics and Nanomagnetism*, Lehman College, CCNY, March 13-14.

2013 Invited Speaker, APS March Meeting, Baltimore, MD, March 20.

@UCF CONTRIBUTED PRESENTATIONS AT NATIONAL CONFERENCES

One or more contributed presentation given at every APS meeting from 2007-2015

@UCF INVITED PRESENTATIONS AT INTERNATIONAL CONFERENCES & WORKSHOPS

2007 Plenary Invited Speaker,
6th International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials,
Sydney, Australia, January 6-11, 2007.

2007 Invited Speaker, International Workshop on the
Road to Room Temperature Superconductivity, Loen, Norway, June 17-23, 2007.

2007 Invited Speaker, Coma-ruga III International Workshop on
Nanomagnetism, Coma-ruga, Spain, July 1-4, 2007.

2008 Invited Speaker, Plasma2008, Pohang, Korea, July 17-19.

2008 Invited Speaker, Condensed Matter Theories, Loughborough, UK, August 11-18.

2008 Invited Speaker, MiniWorkshop on Terahertz Radiation from
Superconductors, Tokyo, Japan, November 20-21.

2008 Invited Speaker, 3rd Annual Autumn Lectures on Nanoscience
and Engineering for Young Scientists, Tokyo, Japan, November 22-28.

2009 Invited Speaker, Coma-ruga V International Workshop on
Nanomagnetism and Superconductivity, Coma-ruga, Spain, July 7-9, 2009.
(could not participate)

2010 Invited Speaker, First JST-DFG Workshop on *Terahertz Superconductor Electronics*, Tsukuba, Japan, February 21-24.

2010 Invited Speaker, PLASMA2010, Hirosaki, Japan, April 30-May 2.

2010 Invited Speaker, International Workshop on
Quantum Coherent Properties of Spins III, UCF, Dec. 20-22.

2011 Invited Speaker, Second JST-DFG Workshop on *Terahertz Superconductor Electronics*, Blaubeuren, Germany, October 16-19.

2012 Invited Speaker, PLASMA2012, Cesme, Turkey, June 10-13.

2012 Invited Speaker, Superstripes 2012, Erice, Sicily, Italy, July 11-18.

2013 Invited Speaker, Vortex 2013, Nanjing, China, May 21-28.

2014 Invited Speaker, Kyoto-THz-Plasma-2014, Kyoto, Japan, Nov. 30-Dec. 3.

2016 Invited Speaker, EMN Terahertz 2016, San Sebastin, Spain, May 14-18.

2016 Invited Speaker, Plasma 2016, Nanjing, China, October 9-12.

@UCF OTHER SIGNIFICANT PROFESSIONAL INVOLVEMENT

2009 Invited lecturer (three lectures), University of Science and Technology Beijing,
Beijing, China, May 17-21.

2009 Invited lecturer, Chongqing University, Chongqing, China, May 22.

2010 Invited colloquium, University of North Florida, Oct. 1.

2011 Invited colloquium, Institute of Physics, Chinese Academy of Sciences, Beijing, China, Dec. 14.

2011 Invited colloquium, University of Science and Technology Beijing, Beijing, China, Dec. 16.

2011 Dustin R. Morley (UCF physics undergraduate) and Erica R. LaBerge (UCF environmental engineering undergraduate) performed research with me,
leading to publication J96.

2012-13 Candy Reid (2012 UCF physics graduate) was engaged in research with me.

2013 Invited Colloquium, Department of Physics, Peking University, Beijing, China, June 10.

2013-14 Wade Wilson (UCF engineering undergraduate), Manuel Morales, and Dakota Murphy (both UCF physics undergraduates) were engaged in research with me.

2013 Invited Seminar, Institute of Physics, Chinese Academy of Sciences, Beijing, China, Dec. 11

2013 Invited two-hour lecture for the class on "Physical Properties of Quantum Materials" at the International Center for Quantum Materials, Peking University, Beijing, China, Dec. 12

2014 Two Invited Seminars, University of Science and Technology Beijing, Beijing, China, May 16 and May 22.
2014 4.5 hour meeting with Sir Anthony J. Leggett at Tsinghua University, Beijing, China, May 24.
2015 Invited Seminar, Institute of Physics, Chinese Academy of Sciences, Beijing, China, June 23
2015 Two Invited Seminars, University of Science and Technology Beijing, Beijing, China, June 19 and June 24.
2015 Invited Seminar, University of Tsukuba, Tsukuba, Japan, June 29, 2015
2015 Invited Colloquium, Physics Department, Southern University, Baton Rouge, LA, Nov. 4, 2015.
2016 Invited Colloquium, Physics Department and Superconductivity Laboratory, University of Houston, Houston, TX, Jan. 26, 2016
2016 Session P25 Chair, APS March Meeting, Baltimore, MD, March 16.
2017 Invited Speaker, SueFest, honoring Robert E. Fassnacht and Vilas Professor Susan Coppersmith, Univ. Wisconsin, a member of National Academy of Sciences of the USA, on her 60th birthday, Aspen, CO March 3-4.

@UCF REFEREEING*

Referee for Science (new in 2015), Physical Review B, Physical Review Letters, Physical Review X (new in 2015), Physica Scripta (new in 2015), IEEE Photonics (new in 2016), Journal of Low Temperature Physics, Applied Physics Letters, Journal of Applied Physics, Europhysics, Physica C, Journal of Physics: Condensed Matter, Superconductor Science and Technology, and various conference proceedings.
*See @UCF HONORS above.

@UCF UNIVERSITY SERVICE

@UCF PHYSICS DEPARTMENT SERVICE

2008-16 Chairman, Physics Department Colloquium Committee
2011-15 Chairman, Awards Committee
2015-16 Chairman, Condensed Matter Experimental Faculty Search Committee
Of the 89 applicants, 10 were interviewed briefly by Skype, and five were brought to UCF for full interviews. In the end, we settled on Dr. Yasuyuki Nakajima, who will join our faculty in November, 2016.

@UCF NON-DEPARTMENTAL UNIVERSITY SERVICE

2009-16 Faculty Advisor, UCF student representative organization of Amnesty International, the international human rights organization.
2011-14 Violinist, UCF Symphony Orchestra
2015-16 Violinist, UCF Symphony Orchestra
2011,13 Violinist, UCF Chamber Orchestra (Spring)

@UCF ORGANIZING INTERNATIONAL CONFERENCES & WORKSHOPS

2007 Co-Chairman, 6th International Conference on *New Theories, Discoveries,*

and Applications of Superconductors and Related Materials,
Sydney, Australia, January 6-11, 2007.

2009 Co-Chairman, Awards Committee Chairman, and Proceedings Editor,
*7th International Conference on New Theories, Discoveries,
and Applications of Superconductors and Related materials*,
Beijing, China, May 13-16.

@UCF U. S. PATENTS ISSUED

1. International idea patent for a method to raise the output power of a Josephson STAR-emitter, July 17, 2008* (with K. Kadowaki and Tokyo Instruments).
* During the summer of 2008 when I did not have a contract with UCF.

@UCF U. S. AND INTERNATIONAL PATENTS APPLIED FOR

1. Added on June 10, 2016 as 6% owner-inventor of Japanese Patent Application 2015-122057, "Terahertz Emitter Devices and Terahertz Emitter", filed June 17, 2015 in Japan, [Takanari Kashiwagi (32%), Kazuo Kadowaki (31%), Hidetoshi Minami (31%), and Richard A. Klemm (6%)] (including UCF as a 6% institutional owner).

Note: Mr. John Miner and the other UCF patent attorneys intend to file for U. S. patent protection on the same device description, once the translation of the above Japanese patent application is finalized. This should occur later in 2016.

@UCF PROFESSIONAL SOCIETY MEMBERSHIPS

Member, Optical Society of America, since 2013

Fellow, American Physical Society (since 1994)

Member, IEEE and IEEE Photonics, July 4, 2016

@UCF REFEREED PUBLICATIONS IN PRINT

@UCF BOOKS

B1. Richard A. Klemm, *Layered Superconductors, Volume 1*, (Oxford University Press, Oxford, UK and New York, NY, 2012) ISBN13: 978-0-19-959331-6 (576 pages, 300 b/w line and halftone illustrations, December 22, 2011).
Refereed by two persons, a brief description of the report of one referee is online at the Oxford University Press website (http://ukcatalogue.oup.com/product/9780199593316.do).

@UCF REVIEWS

R4. K. Delfanazari, H. Asai, M. Tsujimoto, T. Kashiwagi, T. Kitamura, K. Ishida, C. Watanabe, S. Sekimoto, T. Yamamoto, H. Minami, M. Tachiki, R. A. Klemm, T. Hattori, and K. Kadowaki, *Terahertz oscillating devices based upon the intrinsic Josephson junctions in a high temperature superconductor*, J. Infrared Milli Terahz Waves **35**, 131-146 (2014). DOI: 10.1007/s10762-013-0027-y.

R5 R. A. Klemm, *Pristine and intercalated transition metal dichalcogenide superconductors*, Physica C **514**, 86-94 (2015). DOI: 10.1016/j.physc.2015.02.023.

@UCF REFEREED JOURNAL LETTERS

L18. K. Kadowaki, M. Tsujimoto, K. Yamaki, H. Minami, T. Yamamoto, M. Tachiki, and R. A. Klemm, *Evidence for a dual-source mechanism of THz radiation from rectangular mesas of single*

crystalline $Bi_2Sr_2CaCu_2O_{8+\delta}$ *intrinsic Josephson junctions*, J. Phys. Soc. Jpn. **79**, 023703 (2010). doi: 10.1143/JPSJ.79.023703.

L19. M. Tsujimoto, K. Yamaki, K. Deguchi, T. Yamamoto, T. Kashiwagi, H. Minami, M. Tachiki, K. Kadowaki, and R. A. Klemm, *Geometrical resonance conditions for THz radiation from the intrinsic Josephson junctions in* $Bi_2Sr_2CaCu_2O_{8+\delta}$, Phys. Rev. Lett. **105**, 037005 (2010). doi: 10.1103/PhysRevLett.105.037005.

L20. R. A. Klemm and K. Kadowaki, *Output from a Josephson stimulated terahertz amplified radiation emitter*, J. Phys.: Condens. Matter **22**, 375701 (2010) (Fast Track Communication). doi: 10.1088/0953-8984/22/37/375701.

L21. M. Tsujimoto, T. Yamamoto, K. Delfanazari, R. Nakayama, T. Kitamura, M. Sawamura, T. Kashiwagi, H. Minami, M. Tachiki, K. Kadowaki, and R. A. Klemm, *Broadly Tunable Sub-Terahertz Emission from Internal Current-Voltage Characteristic Branches Generated from* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *Single Crystals*, Phys. Rev. Lett. **108**, 107006 (2012). doi: 10.1103/PhysRevLett.108.107006.

L22. S. Sekimoto, C. Watanabe, H. Minami, T. Yamamoto, T. Kashiwagi, R. A. Klemm, and K. Kadowaki, *Continuous* 30 μW *terahertz source by a high-*T_c *superconductor mesa structure*, Appl. Phys. Lett. **103**, 182601 (2013). doi: 10.1063/1.48270941.

L23. T. Kashiwagi, K. Nakade, Y. Saiwai, H. Minami, T. Kitamura, C. Watanabe, K. Ishida, S. Sekimoto, K. Asanuma, T. Yasui, Y. Shibano, M. Tsujimoto, T. Yamamoto, B. Marković, J. Mirković, R. A. Klemm, and K. Kadowaki, *Computed tomography image using sub-terahertz waves generated from a high-*T_c *superconducting intrinsic Josephson junction oscillator*, Appl. Phys. Lett. **104**, 082603 (2014). doi: 10.1063/1.4866898.

L24. Chiharu Watanabe, Hidetoshi Minami, Takashi Yamamoto, Takanari Kashiwagi, Richard A. Klemm, and Kazuo Kadowaki, *Spectral investigation of hot spot and cavity resonance effects on the terahertz radiation emitted from high-*T_c *superconducting* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *mesas*, J. Phys.: Condens. Matter **26**, 172201 (2014) (Fast Track Communication). doi: 10.1088/0953-8984/26/17/172201.

L25. Jingchuan Zhang, Christopher Lörscher, Qiang Gu, and Richard A. Klemm, *Is the angular dependence of the upper critical field of* Sr_2RuO_4 *consistent with a helical p-wave pair state?*, J. Phys.: Condens. Matter **28**, 252201 (2014) (Fast Track Communication). doi: 10.1088/0953-8984/26/25/252201.

L26. Jingchuan Zhang, Christopher Lörscher, Qiang Gu, and Richard A. Klemm, *First-order chiral to non-chiral transition in the angular dependence of the upper critical induction of the Scharnberg-Klemm p-wave pair state*, J. Phys.: Condens. Matter **28**, 252202 (2014) (Fast Track Communication). doi: 10.1088/0953-8984/26/25/252202.

L27. T. Kitamura, T. Kashiwagi, T. Yamamoto, M. Tsujimoto, C. Watanabe, K. Ishida, S. Sekimoto, K. Asanuma, T. Yasui, K. Nakade, Y. Shibano, Y. Saiwai, H. Minami, R. A. Klemm, and K. Kadowaki, *Broadly tunable, high-power terahertz radiation up to 73 K from a stand-alone* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *mesa*, Appl. Phys. Lett. **105**, 202603 (2014).

L28. C. Watanabe, H. Minami, T. Kitamura, K. Asanuma, K. Nakade, T. Yasui, Y. Saiwai,

Y. Shibano, T. Yamamoto, T. Kashiwagi, R. A. Klemm, and K. Kadowaki, *Influence of the local heating position on the terahertz emission power from high-T_c superconducting* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *mesas*, Appl. Phys. Lett. **106**, 042603 (2015). doi: 10.1083/1.4906708.

L29. Takanari Kashiwagi, Takashi Yamamoto, Takeo Kitamura, Kentaro Asanuma, Chiharu Watanabe, Kurama Nakade, Takaki Yasui, Yoshihiko Saiwai, Yuuki Shibano, Hidetoshi Minami, Manabu Tsujimoto, Ryozo Yoshizaki, Kaveh Delfanazari, Richard A. Klemm, and Kazuo Kadowaki, *Generation of electromagnetic waves from 0.3 to 1.6* THz *with a high-T_c superconducting* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *intrinsic Josephson junction emitter*, Appl. Phys. Lett. **106**, 092601 (2015). doi: 10.1063/1.4914083.

L30. Takanari Kashiwagi, Kazuki Sakamoto, Hiroyuki Kubo, Yuuki Shibano, Takashi Yamamoto, Takeo Kitamura, Kentaro Asanuma, Chiharu Watanabe, Kurama Nakade, Takaki Yasui, Yoshihiko Saiwai, Takuya Katsuragawa, Ryozo Yoshizaki, Hidetoshi Minami, Richard A. Klemm, and Kazuo Kadowaki, *A high-T_c intrinsic Josephson junction emitter tunable from 0.5 to 2.4 terahertz*, Appl. Phys. Lett. **107**, 082601 (2015). DOI: 10.1063/1.4929715.

L31. Bianca E. Hall and Richard A. Klemm, *Microscopic theory of the Knight shift in anisotropic and correlated metals*, J. Phys.: Condens. Matter **28**, 03LT01 (2016). DOI: 10.1088/0953-8984/28/3/03LT01.

@UCF REFEREED JOURNAL ARTICLES

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J88. R. A. Klemm and K. Kadowaki, *Angular dependence of the radiation power of a Josephson STAR-emitter*, J. Supercond. and Novel Magn. **23**, 613 (2010). doi: 10.1007/s10948-010-0719-7.

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J90. Takanari Kashiwagi, Kazuhiro Yamaki, Manabu Tsujimoto, Kouta Deguchi, Naoki Orita, Takashi Koike, Ryo Nakayama, Hidetoshi Minami,Takashi Yamamoto, Richard A. Klemm, Masashi Tachiki, and Kazuo Kadowaki, *Geometrical Full-Wavelength Resonance Mode Generating Terahertz Waves from a Single Crystalline* $Bi_2Sr_2CaCa_2O_{8+\delta}$ *Rectangular Mesa*, J. Phys. Soc. Jpn. **80**, 094709 (2011). doi: 10.1143/JPSJ.80.094709.

J91. Takanari Kashiwagi, Manabu Tsujimoto, Takashi Yamamoto, Hidetoshi Minami, Kazuhiro Yamaki, Kaveh Delfanazari, Kota Deguchi, Naoki Orita, Takashi Koike, Ryo Nakayama, Takeo Kitamura, Masashi Sawamura, Shota Hagino, Kazuya Ishida, Krsto Ivanovic, Hidehiro Asai, Masashi Tachiki, R. A. Klemm, and Kazuo Kadowaki, *High temperature superconductor terahertz emitters: Fundamental physics and its applications*, Jap. J. Appl. Phys. **51**, 010113 (2012). doi: 10.1143/JJAP.51.010113.

J92. K. Delfanazari, H. Asai, M. Tsujimoto, T. Kashiwagi, T. Kitamura, T. Yamamoto, M. Sawamura, K. Ishida, R. A. Klemm, T. Hattori, and K. Kadowaki, *Tunable terahertz emission from triangular mesas of layered high-T_c superconducting* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *intrinsic Josephson junctions*, Opt. Express **21**, 2171 (2013). (#179100 28 January 2013/Vol. 21, No. 2/ OPTICS EXPRESS 2171-2184).

J93. Christopher Lörscher, Jingchuan Zhang, Qiang Gu, and Richard A. Klemm, *Anomalous angular dependence of the upper critical induction in ferromagnetic superconductors with completely broken p-wave symmetry*, Phys. Rev. B **88**, 024504 (2013). DOI: 10.1103/PhysRevB.88.024504.

J94. Hidetoshi Minami, Chiharu Watanabe, Kota Sato, Shunsuke Sekimoto, Takashi Yamamoto, Takanari Kashiwagi, Richard A. Klemm, and Kazuo Kadowaki, *Local* SiC *photoluminescence of hot spot formation and sub-THz coherent emission from a rectangular* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *mesa*, Phys. Rev. B **89**, 054503 (2014). DOI: 10.1103/PhysRevB.89.054503.

J95. Kaveh Delfanazari, Hidehiro Asai, Manabu Tsujimoto, Takanari Kashiwagi, Takeo Kitamura, Takashi Yamamoto, Tasashi Tachiki, Wade Wilson, Richard A. Klemm, T. Hattori, and K. Kadowaki, *Effect of bias electrode position on terahertz radiation from pentagonal mesas of superconducting* $Bi_2Sr_2CaCu_2O_{8+\delta}$, IEEE Trans. THz Sci. Tech. **5**, 505 (2015). DOI: 10.1109/TTHZ.2015.2409552.

J96. T. Kashiwagi, T. Yamamoto, H. Minami, M. Tsujimoto, R. Yoshizaki, K. Delfanazari, T. Kitamura, C. Watanabe, K. Nakade, T. Yasui, K. Asanuma, Y. Saiwai, Y. Shibano, T. Enomoto, H. Kubo, K. Sakamoto, T. Katsuragawa, B. Marković, J. Mirković, R. A. Klemm, and K. Kadowaki, *Efficient fabrication of intrinsic Josephson junction terahertz oscillators with greatly reduced self-heating effects*, Phys. Rev. Applied **4**, 054018 (2015). DOI: 10.1103/PhysRevApplied.4.054018.

J97. H. Minami, C. Watanabe, T. Kashiwagi, T. Yamamoto, K. Kadowaki, and Richard A. Klemm, *0.43 THz emission from high-T_c superconducting emitters optimized at 77 K*, J. Phys.: Condens. Matter **28**, 025701 (2016). DOI: 10.1088/0953-8984/28/2/025701.

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J99. C. Watanabe, H. Minami, T. Kitamura, Y. Saiwai, Y. Shibano, T. Katsuragawa, H. Kubo, K. Sakamoto, T. Kashiwagi, R. A. Klemm, and K. Kadowaki, *Electrical Potential Distribution in Terahertz-Emitting Rectangular Mesa Devices of High-T_c Superconducting* $Bi_2Sr_2CaCu_2O_{8+\delta}$, *Super. Sci. Tech.* **29**, 065022 (2016). http://dx.doi.org/10.1088/0953-2048/29/6/065022.

@UCF REFEREED CONFERENCE PROCEEDINGS

P59. R. A. Klemm and G. B. Arnold, *Josephson (001) tilt grain boundary junctions of high-temperature superconductors*, Int. J. Mod. Phys. B **21**, 3194 (2007). doi: 10.1142/S0217979207044172.

P60. Richard A. Klemm, Christopher Lörscher, Jingchuan Zhang, and Qiang Gu, *Upper critical field of p-wave ferromagnetic superconductors with orthorhombic symmetry*, Proceedings of the 26th International Conference on Low Temperature Physics LT-26, J. Phys. Conf. Ser. **400**, 022055 (2012). doi: 10.1088/1742-6596/400/2/022055.

P61. K. Kadowaki, T. Kashiwagi, H. Asai, M. Tsujimoto, M. Tachiki, K. Delfanazari, and R. Klemm, *Terahertz wave emission from intrinsic Josephson junctions in* $Bi_2Sr_2CaCu_2O_{8+\delta}$. Proceedings of the 26th International Conference on Low Temperature Physics LT-26, J. Phys. Conf. Ser. **400**, 022041 (2012). doi: 10.1088/1742-6596/400/2/022041.

P62. Richard A. Klemm, Kaveh Delfanazari, Manabu Tsujimoto, Takanari Kashiwagi, Takeo Kitamura, Takashi Yamamoto, Masashi Sawamura, Kazuya Ishida, Toshiaki Hattori, and Kazuo Kadowaki, *Modeling the electromagnetic cavity mode contributions to the THz emission from triangular* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *mesas*, Physica C **491**, 30 (2013). doi: 10.1016/j.physc.2012.11.006).

P63. K. Delfanazari, H. Asai, M. Tsujimoto, T. Kashiwagi, T. Kitamura, T. Yamamoto, M. Sawamura, K. Ishida, M. Tachiki, R. A. Klemm, T. Hattori, and K. Kadowaki, *Study of coherent and continuous terahertz wave emission in equilateral triangular mesas of superconducting* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *intrinsic Josephson junctions*, Physica C **491**, 16 (2013). doi: 10.1016/j.physc.2012.12.009.

P64. K. Kadowaki, M. Tsujimoto, K. Delfanazari, T. Kitamura, M. Sawamura, H. Asai, T. Kashiwagi, H. Minami, and R. A. Klemm, *Quantum terahertz electronics (QTE) using coherent radiation from high temperature superconductor* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *intrinsic Josephson junctions (IJJ's)*, Physica C **491**, 2 (2013). doi: 10.1016/j.physc.2013.04.011.

P65. K. Kadowaki, M. Tsujimoto, K. Delfanazari, T. Kitamura, M. Sawamura, T. Kashiwagi, H. Minami, M. Tachiki, and R. A. Klemm, *High power THz radiation from high-T_c superconducting intrinsic Josephson junctions*, 37^{th} International Conference on Infrared, Millimeter, and Terahertz Waves 2012 Proceedings (IRMMW-2012), **IEEE Xplore** (2012). doi: 10.1109/IRMMW-THz.2012.6380236.

P66. K. Delfanazari, H. Asai, M. Tsujimoto, T. Kashiwagi, T. Kitamura, M. Sawamura, K. Ishida, T. Yamamoto, T. Hattori, R. A. Klemm, and K. Kadowaki, *Experimental and theoretical studies of mesas of several geometries for terahertz wave radiation from the intrinsic Josephson junctions in superconducting* $Bi_2Sr_2CaCu_2O_{8+\delta}$, 37^{th} International Conference on Infrared, Millimeter, and Terahertz Waves 2012 Proceedings (IRMMW-2012), **IEEE Xplore** (2012). doi: 10.1109/IRMMW-THz.2012.6380230.

@UCF MANUSCRIPTS IN PREPARATION

1. Christopher Lörscher, Jingchuan Zhang, Qiang Gu, and Richard A. Klemm, *Double ellipsoidal Fermi surface model of the normal state of ferromagnetic superconductors*, submitted for publication in Phys. Rev. B. (ArXiv: 1312.0644)

2. Daniel P. Cerkoney, Candy Reid, Constance M. Doty, Ashley Gramajo, Tyler D. Campbell, Manuel A. Morales, Kaveh Delfanazari, Manabu Tsujimoto, Takanari Kashiwagi, Takashi Yamamoto, Chiharu Watanabe, Hidetoshi Minami, Kazuo Kadowaki, and Richard A. Klemm, *Cavity mode enhancement of terahertz emission from equilateral triangular microstrip antennas of the high-T_c superconductor* $Bi_2Sr_2CaCu_2O_{8+\delta}$, accepted September 8, 2016 publication in J. Phys.: Cond. Matter.

3. Richard A. Klemm, Andrew E. Davis, and Qing X. Wang, *Terahertz emission from thermally-managed square intrinsic Josephson junction microstrip antennas*, submitted to the IEEE Journal

on Special Topics on Quantum Electronics: Terahertz Photonics.

4. Daniel P. Cerkoney, Manuel A. Morales, Qing Wang, Tyler D. Campbell, Kaveh Delfanazari, Manabu Tsujimoto, Takanari Kashiwagi, Takashi Yamamoto, Chiharu Watanabe, Kazuo Kadowaki, and Richard A. Klemm, *Modeling the angular distribution of the emission from pie-shaped wedge microstrip antennas of superconducting* $Bi_2Sr_2CaCu_2O_{8+\delta}$, to be submitted for publication in J. Phys.: Cond. Matter.

5. Manabu Tsujimoto, Kazuo Kadowaki, and Richard A. Klemm, *Broadly tunable emission of coherent terahertz waves from stacks of intrinsic Josephson junctions in high-temperature cuprate superconductors*, Review article to be submitted to Applied Physics Reviews.

6. Aiying Zhao, Qiang Gu, and Richard A. Klemm, *Upper critical field of two-dimensional superconductors*, to be submitted to Science.

7. R. A. Klemm, *Layered Superconductors, Volume 2*, Under contract to be published by Oxford University Press (estimated 500 ±100 pages).

@UCF AREAS OF INTEREST

When I arrived at UCF, my main research interest was in the physics of nanomagnetism, especially with the problems associated with magnetic recording and with the quantum states of single molecule magnets, which might be useful in recording and possibly also in quantum computing. In nanomagnetism, most of my work has been on single molecule magnets. After an initial pre-UCF interest in classical models of the dynamics of a few spins interacting via the Heisenberg interaction, I shifted to quantum treatments of the low-temperature behavior. Since the most-studied single molecule magnets contain eight or more spins in a cluster, the interactions between those spins are likely to be much more complicated than has commonly been assumed in the literature, as evidenced by existing experiments on smaller clusters. Starting prior to my @UCF period, I therefore focussed upon the much simpler systems with as few as two spins in a cluster. Dmitri Efremov (TU-Dresden) and I solved exactly the most general model of local and global (or giant) spin anisotropy in dimer single molecule magnets of arbitrary spin, and provided accurate analytic expressions for the low-temperature magnetization, specific heat, inelastic neutron scattering cross-section, and electron paramagnetic resonance spectrum. Our results should prove useful in fits to the combined data obtained from those experiments on antiferromagnetic dimers of high-spin ions. While @UCF, we then extended our work to larger single molecule magnets, focussing presently on equal-spin tetramers. We studied high-symmetry tetramer single molecule magnets, in which we solved for the single-spin matrix elements of four arbitrary spins exactly, and worked out the single-ion and anisotropic exchange Hamiltonians for the six high-symmetry cases of tetramers with T_d, D_{2d}, S_4, D_{4h}, C_{4h}, and C_{4v} molecular point group symmetry. This published work (J86) has been highly relevant to a great deal of experimental work on tetramer single molecule magnets.

I have long had a strong research interest in the area of layered superconductors, of which the high-temperature superconducting cuprates are the most famous examples. While @UCF, I began a joint theoretical-experimental collaboration with Prof. Kazuo Kadowaki of the University of Tsukuba. Since the summer of 2008, we have been working on the coherent terahertz radiation emitted from mesas of the extremely layered high-temperature superconductor, $Bi_2Sr_2CaCu_2O_{8+\delta}$, or Bi2212 (BSCCO). In these studies, a mesa is constructed from a Bi222 single crystal by either Ar milling or by focused ion beam techniques. The mesa is a stack of Josephson junctions, and the dc

voltage generates coherent terahertz radiation from the mesa. To date, output power from a single mesa of up to 30μW has been observed, and the combined coherent output of 0.6 mW from an array of three mesas was estimated by the Argonne group [T. M. Benseman *et al.*, Appl. Phys. Lett. **103**, 022602 (2013)]. The focus of our work is three-fold. First, we want to understand the basic physics of the coherent radiation. This involves understanding the high degree of synchronization of the emission from the many intrinsic Josephson junctions in a mesa, and the narrow linewidths (as low as $\sim$ 12 MHz at the central frequency of 500 GHz) that have been observed [M. Li *et al.*, Phys. Rev. B **86**, 060505 (2012)]. Second, we want to find a way to increase the output power to 1 mW, so that the device could be suitable for many applications. Third, we want to increase the tunability of the output frequency. We first focussed upon rectangular mesas, as those were the ones everybody had been studying. The problem with those mesas is that the two basic models of the radiation generation, the cavity model, with a magnetic surface current density source, and the electric dipole model, with an electric current density source, gave harmonic radiation frequency patterns that were indistinguishable. The angular dependence of the output power is distinguishable, but the experiments did not provide a clear signal that only one mechanism was at work. Subsequently, we decided to study cylindrical mesas. In this case, the electric dipole model, which assumes the ac Josephson current itself is the radiation source, again leads to a harmonic output frequency spectrum. However, since the cylinder cavity modes have frequencies obtained from Bessel functions, they are distinctly anharmonic. Hence, at most one frequency could be amplified by the cavity. In the experiments on three samples, higher harmonics were observed, providing proof that the electric dipole model was the correct one. We showed that the internal current-voltage characteristic branches could also emit radiation. Although this radiation also obeyed the Josephson relation, it was broadly tunable at a fixed bath temperature, making this procedure a potentially useful device. The two PRL's on these topics comprised the main part of the doctoral thesis of Dr. Manabu Tsujimoto in Tsukuba. Most recently, we found that the fundamental equilateral triangular mesa cavity mode is six-fold degenerate, possibly allowing for a stable source that could be useful as a heterodyne detector. In addition, acute triangular mesas shapes were shown to lead to the most tunable radiation emitted from the outer current-voltage branch of any mesas shape studied to date. I did the theory of these modes, and these results comprised the main part of the doctoral thesis of Dr. Kaveh Delfanazari, also in Tsukuba. We will be filing for patents on published and unpublished work which can lead to a powerful device.

Of significant importance was the last statements made in the first two Klemm-Kadowaki papers [J88 and L20], in which we noted that removal of the superconducting Bi2212 substrate, and replacement of it by an insulating or (better yet) metallic substrate, would lead to much greater output power values. It is now standard in the field that "stand-alone" mesas, consisting of a Bi2212 mesa with thin Ag and Au layers on its top and bottom, are sandwiched between thick insulating layers of either MgO (in the Kleiner-Wang groups in Tübingen and Nanjing, respectively), or sapphire (in the Kadowaki group). These stand-alone mesa structures [L22, L27, and especially L29 and submitted papers 3, 4] have greatly reduced the Joule heating problem that plagued the field [L24,L28, J94], allowing for much larger applied dc voltage biases and correspondingly high emission frequencies. In L29, we led to the world record high of 1.6 THz coherent emission from a superconductor, and our world record was just broken by us in our recently accepted paper L30 (in press), with tunable laser emissions from 0.5 to 2.4 THz. I inquired with the ORC about filing for a USA patent on these stand-alone mesa structures, and I believe that is still under consideration. Kadowaki has already filed for Japanese patents on these papers, but nobody has filed in the USA yet. This letter L30 describes the first laser that is tunable over the entire range of the present "terahertz gap" region of 1.4 THz to 2.0 THz. We will be working to measure the angular dependence of the emission from this cylindrical stand-alone mesa during the fall of 2015, and I will travel to Tsukuba in December 2015 (at Japanese expense) to help with the experiments

and to write the papers. I will also nominate representatives from the various experimental groups to provide an invited session at the 2016 APS March Meeting on these breakthrough results.

This work has led to refereed journal letters L18-L24, L27-30, refereed journal articles J88-J92 and J94-J99, and refereed conference proceedings P61-P66. It has also led to submitted Manuscript 2 and unsubmitted Manuscripts 3-4.

More papers with UCF undergraduate students are currently in the works. One of these papers (J89) involved two undergraduate UCF students, Dustin Morley and Erica LaBerge worked with me on fitting the angular dependence of the radiation emitted from a rectangular BSCCO mesa. Subsequently, Wade Wilson, a UCF engineering undergraduate (now in graduate school at Duke University in Computer Engineering), worked with me on fitting the emission from a regular pentagonal mesa, which was published as J95. Daniel Cerkoney and Manual Morales, both Honors in the Major theses under my supervision (Cerkoney is entering graduate school at Rutgers in August 2016, and Morales has completed one year as a graduate student in Medical Physics at Harvard/MIT), were joined by Candy Reid (a former UCF physics student, now at Lockheed-Martin in Orlando), Ashley Gramajo, Tyler Campbell, and Constance Doty, working on fits to the emission from equilateral triangular mesas and to the expected modes and emission patterns at the higher frequencies appropriate for ideal equilateral triangular microstrip antennas. This was just submitted for publication. Cerkoney, Morales, and Qing Wang are working with me on the much more difficult fitting of the emission from acute isosceles triangular mesas, using the pie-shaped wedge model that I used to calculate the mode frequencies. The angular dependence of such modes has not previously been calculated, and it is actually rather difficult. But they have done it numerically, and worked very hard. This work is begin written up for publication now.

Second, while @UCF, I have recently become re-interested in triplet superconductivity. I have started a new collaboration with Prof. Qiang Gu and his students at the University of Science and Technology Beijing, and our first paper on the subject was published in 2009. This paper (J87)studied the Stoner model of itinerant ferromagnetism, which can lead to p-wave superconductivity in a parallel-spin pair state. The Scharnberg-Klemm paper (Ref. L7) of the upper critical field of a p-wave superconductor with broken symmetry was recently used by Hardy and Huxley, Phys. Rev. Lett. **94**, 247006 (2005) to quantitatively fit the upper critical field data on the heavy fermion superconductor URhGe, providing strong evidence that URhGe has a p-wave polar state with completely broken symmetry. Moreover, Huy *et al.*, Phys. Rev. Lett. **100**, 077002 (2008) used the Scharnberg-Klemm theory to argue that UCoGe has a p-wave axial state with broken symmetry. Those authors (A. de Visser *et al.*, U. Amsterdam) specifically requested that I extend that calculation to the upper critical field of p-wave superconductors to an axial state, appropriate for UCoGe. I put my first UCF graduate student, Mr. Christopher Loerscher, and Mr. Jingchuan Zhang, a graduate student of Qiang Gu, who just completed his doctoral work under my co-supervision, on it, and we just published L25, L26, J93, and P60, and have one more paper under review. Mr. Loerscher figured out how to incorporate ellipsoidal normal-state effective mass anisotropy into the calculations of the upper critical field at an arbitrary direction. The still unpublished paper is a preliminary calculation of the normal (non-superconducting) state of a ferromagnetic superconductor with distinct ellipsoidal Fermi surfaces for the two electron spin directions in an Ising-like ferromagnet. Mr. Zhang came to UCF for 5 months in 2012 to finish his doctoral thesis with me, and I went to Beijing in June, 2013 and December 2013 to help him finish his thesis work, and he just passed his doctoral defense on May 14, 2014 in my presence in Beijing. I applied for NSF and DOE funding for this work. Mr. Loerscher was awarded a Chateaubriand Fellowship to perform experimental work on the ferromagnetic superconductors at the CEA in Grenoble, France, which nicely complemented his theoretical work on the same subject. This was approved by the French Embassy in Washington DC on April 23, 2012 for four months plus travel expenses, and worked in Grenoble for the spring 2013 semester.

During the past two years, UCF graduate student Bianca Hall decided to work with me for her doctorate in this area of research. Her chosen thesis topic is the Knight shift in metals and superconductors, with specific interest in the highly anisotropic layered superconductor Sr_2RuO_4. She attended the APS Winter School in January 2013 in Tallahassee, FL, and noted that there seemed to be a lot of interest in that material as a purported classic example of a parallel-spin chiral p-wave superconductor. As noted in my book published while @UCF, the primary evidence of this consists of multiple ^{17}O and ^{101}Ru Knight shift measurements for magnetic field directions both parallel and perpendicular to the layers, none of which exhibited any temperature dependence below the low transition temperature T_c. These data were widely claimed to be consistent with a parallel-spin pair state. If so, Sr_2RuO_4 would have an upper critical field $H_{c2}(T)$ perpendicular to the layers that would be that of the SK state (the commonly accepted terminology for the Scharnberg-Klemm state), and Loerscher, Zhang, Gu, and I showed that $H_{c2}(T)$ would be that of the polar state for the field parallel to the layers, also first calculated by Scharnberg and me in 1980 (J27). However, the experiments on Sr_2RuO_4 clearly show that for the field parallel to the layers, $H_{c2}(T)$ bends downward with decreasing T, providing strong evidence of Pauli limiting, or the breaking of superconducting pairs due to an antiparallel-spin pair state such as the most common singlet spin state, and strongly inconsistent with the polar state. Since the two published H_{c2} studies were done by thermodynamic specific heat and magnetization measurements at various fields and temperatures, and the Knight shift measurements detect by nuclear magnetic resonance the local nuclear spins interacting only *indirectly* with the superconducting electrons, it is extremely unlikely that the Knight shift measurements would prove to be more reliable than the thermodynamic H_{c2} measurements. Very recently, in L25 and L26, we showed that the the only way to obtain a quantitative fit to the complete set of upper critical field data is to fix the $\boldsymbol{d}$-vector describing the triplet spin state configuration to the layers by strong spin-orbit coupling, having a component parallel to the field direction when the field is parallel to the layers. This fit is in complete disagreement with the assumption made by those favoring the Knight shift measurements, that the $\boldsymbol{d}$-vector could rotate to be always perpendicular to the applied magnetic field. In addition, recent point contact tunneling experiments by the Grenoble group with which Chris Loerscher worked showed that Sr_2RuO_4 has an isotropic superconducting gap consistent with weak-coupling Bardeen-Cooper-Schrieffer (BCS) theory for a single s-wave superconducting gap, even though there are three Fermi surfaces. Thus, there is very strong evidence that the indirect Knight shift measurements gave at least some wrong results in Sr_2RuO_4, and those incorrect measurements have confused a large segment of the superconductivity community. The community needs to recognize that although URhGe and UCoGe are indeed both parallel-spin superconductors, Sr_2RuO_4 is unlikely to be.

There is also evidence that the Knight shift measurements are inconsistent with the $H_{c2}(T)$ measurements in a number of other heavy fermion and layered superconductors. Bianca Hall has therefore decided to write her doctoral thesis on the theory of the Knight shift, in order to understand why those measurements failed so miserably in Sr_2RuO_4. We have therefore constructed the first microscopic model of the Knight shift in metals and superconductors. This model consists of a Hamiltonian consisting of Zeeman, hyperfine, Anderson, and BCS-like pairing interaction terms. The previously omitted Anderson-like Hamiltonian involves excitations of electrons in local atomic orbitals about the nuclear spins probed by the Zeeman interaction to the conduction bands. We have already shown that this model can explain many of the anomalous Knight shift measurements on layered and heavy fermion superconductors, and Bianca Hall is working out the details. She published her paper on the first microscopic theory of the Knight shift in metals. A second paper on the Knight shift in superconductors is anticipated to be completed in 2017, but that will have to be done by a subsequent graduate student.

Most recently, two new graduate students, Mr. Jingxiang Zhao and Ms. Aiying Zhao, whose official doctoral thesis advisor is also Prof. Qiang Gu of the University of Science and Technology

Beijing, Beijing, China, have started their doctoral study with me on spin-orbit coupling in layered superconductors. Ms. Aiying Zhao has started to work on H_{c2} in transition metal dichalcogenides using an s-wave model with conventional Pauli-limiting for the field parallel to the layers under the assumption of strong spin-orbit coupling. In particular, H_{c2} parallel to the layers of the misfit compound $(LaSe)_{1.14}(NbSe_2)$ violates the Pauli limit by more than a factor of 8, the record for an s-wave superconductor. She came to UCF for the Spring 2016 semester to start on the work for her Ph. D. thesis with me. The travel funds for her visit were completely paid by the University of Science and Technology Beijing. She stayed at our house, but her food was paid for by the University of Science and Technology Beijing. She has made excellent progress on the upper critical field of two-dimensional superconductors such as gated MoS_2. Since this is a very hot topic these days, and Aiying has managed to find an exact solution to the expresion for upper critical field at arbitrary angles with respect to the superconducting plane and arbitrary impurity scattering (both clean and dirty limits with spin-orbit scattering in the ladder approximation), and can easily be generated to include spin-orbit coupling band structure effects, this work is expected to generate a great deal of interest, so we anticipate submitting it to Science.

Very recently, a major new development relevant to the orbital symmetry of the superconducting order parameter in the high-temperature superconductor Bi2212 (and presumably all of the cuprates) has unexpectedly occurred. There were two proximity experiments [E. Wang *et al.*, Nature Phys. **9**, 621 (2013) doi: 10.1038/nphys2744 and P. Zareapour *et al.*, Nature Comm. **3**, 1056 (2012) doi: 10.1038/ncomms2042] involving Bi2212 and the "topological insulators" Bi_2Se_3 and/or Bi_2Te_3, in which superconductivity was induced up to 60 K or higher into the insulating Bi_2Se_3 (and/or Bi_2Te_3) by its proximity to Bi2212 along their mutual c axes. In the more recent paper, the gap induced into the Bi_2Se_3 was found by angle-resolved photoemission spectroscopy (ARPES) to be essentially *isotropic* in the ab plane, which is entirely consistent with the result of the Li *et al.* experiment (L16), which I proposed and wrote. In addition, a new measurement of the penetration depth $\lambda_{ab}(T)$ from the velocity-matching Eck modes of the internal Josephson junctions in Bi2212 [S. O. Katterwe and V. M. Krasnov, Phys. Rev. B **84**, 214519 (2011)]. In this very interesting paper, for the applied field parallel to the ab-plane, the penetration depths λ_{ab} and λ_c are perpendicular and parallel to the layers, respectively, as shown in my first book (B1). The result of these measurements involving only the internal Josephson junctions of Bi2212 are that $\lambda_{ab}(T)$ has the BCS temperature T dependence of an isotropic superconducting gap, such as for an isotropic s-wave superconductor, as first claimed in the Li *et al.* experiment (L16). I have been having extensive discussions with Sir Anthony J. (Tony) Leggett on this issue, which culminated in a 4.5 hour meeting at Tsinghua University during the morning of May 24, 2014 before my flight back to the USA that afternoon. Tony now agrees that the combination of the Li *et al.* c-axis twist bicrystal Josephson junction experiment, the Katterwe-Krasnov velocity-matching Eck mode experiment, and the Eryin Wang proximity experiments, all involving the c-axis transport of Bi2212, demonstrate that the superconducting gap in the bulk of Bi2212 is isotropic in the ab plane. The Katterwe-Krasnov determinations of an s-wave-like $\lambda_{ab}(T)$ are completely different than all previous penetration depth results for $\lambda_{ab}(T)$, which were nearly linear in T. Krasnov and I believe this is due to extreme oxygen loss from all surfaces of Bi2212, rendering all surface measurements of the superconducting order parameter unreliable in that material. Leggett claims that the so-called "phase-sensitive" experiments made on the surface of Bi2212 [and especially of other cuprates such as $YBa_2Cu_3O_{7-\delta}$ (YBCO)] might not be so strongly affected by such extreme oxygen loss. Leggett proposed that the superconducting order parameter could have the $d_{x^2-y^2}$ form on the surfaces and the two-dimensional $d_{x^2-y^2} + id_{xy}$ form proportional to $e^{2i\phi_{\boldsymbol{k}}}$ in the superconducting layers of the bulk of Bi2212. This form would have an isotropic superconducting gap proportional to $|e^{2i\phi_{\boldsymbol{k}}}| = 1$, independent of the pair wave vector $\boldsymbol{k}$. I pointed out to Tony that there was once a c-axis Josephson junction experiment [M. Mössle and R. Kleiner, Phys. Rev. B **59**, 4486 (1999)]

between Bi2212 and Pb, which provided evidence for at least a very small amount of an s-wave order parameter component in Bi2212. Although Leggett and I proposed different possible explanations for this, I argued that this very small s-wave component [orders of magnitude smaller than that observed between Pb and the c-axis of detwinned YBCO by R. Kleiner *et al.* Phys. Rev. Lett. **76**, 2161 (1996)] might be due to the even stronger oxygen loss due to the presence of the Pb counterelectrode, which sucks up the oxygen from th eBii212, and was observed to drive the transition temperature T_c of the top superconducting Bi2212 layers down from 80-90 K to 35 K. I then proposed that a different counter-electrode, such as a selenide or telluride, which enabled proximity-induced superconductivity up to at least 60 K in insulating Bi_2Se_3 from a depth λ_{ab} into the c-axis of Bi2212, might lead to a stronger s-wave c-axis Josephson junction signal. Tony Leggett and I agreed that a new c-axis Josephson junction experiment involving Bi2212 and an s-wave superconducting (not topological insulating) selenide or telluride, such as $2H$-$NbSe_2$ or FeSe, could potentially settle the issue. I mentioned this experiment to several groups, including Kleiner (Tübingen, Germany), Kadowaki (Tsukuba, Japan), and the Chinese groups at Peking University (Jian Wang) and Tsinghua University (Xi Chen and Shuyun Zhou), where the E. Wang proximity experiment was performed, and one of these groups has confirmed that they are presently preparing to perform such experiments. Several others have also expressed interest. Tony Leggett agreed to also encourage such experiments.

In addition, the Kadowaki group and I are planning new experiments to test the orbital symmetry of the superconducting order parameter relevant for the internal Josephson junctions in Bi2212. We will use our pioneering technique of stand-alone cylindrical mesa sandwich structure (manuscript #4), and measure the linewidth and azimuthal anisotropy of the radiation at the large internal electromagnetic cavity enhancement(s) at 1.0 THz. This emission from a cylindrical mesa of radius 40 μm could be from either the thin cylindrical transverse magnetic TM(0,1) or TM(2,1) modes (see L18). If the relevant order parameter had nodes in the Bi2212 crystallographic a and b directions, then any possible emission would vanish along those directions, possibly consistent with the thin cylindrical cavity TM(2,1) mode. On the other hand, if no such nodes were present in the bulk for the c-axis Josephson propagation (as determined in the Li *et al.* experiment [L16], then the emission from either one of these modes in a stand-alone cylindrical mesa would be isotropic in the azimuthal direction. Of course, it would be extremely difficult to imagine that a highly monotonic (and especially phase coherent) laser signal could arise from a nodal superconducting order parameter. But a precise experimental proof of this could be done using our stand-alone cylindrical mesas. These experiments could also confirm or refute the Leggett proposal of a $d_{x^2-y^2} + id_{xy}$ superconducting order parameter in the bulk of Bi2212. A powerpoint proposal on this topic was encouraged by the NSF EPMD program manager, Dr. Dmitris Pavlidis, and was submitted to him on June 28, 2016.

Meanwhile, I have started writing *Layered Superconductors Volume 2*. At present, 9 UCF graduate students and 2 UCF physics faculty members have purchased *Volume 1* from me at my author discounted rate, and three more students have ordered copies. *Volume 1* is selling at a rate better than expected, and the Oxford editorial staff is anxious to receive the manuscript for *Volume 2*.

PART II: PRE UCF (1948-2006)

PRE-UCF PERSONAL HISTORY

1948 Birth on March 13, 1948, Bloomington, IN 47405
1966 High School Graduation, Walnut Hills H. S., Cincinnati, OH 45207

1969 B. S., Stanford University, Stanford,CA 94305 (physics)
1969-70 Research Technician, Synvar Research Institute, Palo Alto, CA 94304
(later Syva Corp., a present division of Behring Diagnostics, San Jose, CA 97161)
1972 M. A., Harvard University, Cambridge, MA 02138 (physics)
1974 Ph. D., Harvard University (physics)
Thesis Title: *Layered Superconductors*
1974-76 Postdoctoral Fellow, Stanford University, Stanford, CA 94305
1976-81 Assistant Professor, Iowa State University, Ames, IA 50011
1981 Associate Professor, Iowa State University (tenured)
1982-84 Staff Physicist, Exxon Research and Engineering Co., Annandale, NJ 08801
1984-86 Senior Staff Physicist, Exxon Res. and Eng. Co.
1986-88 Visiting Full Professor, Univ. California at San Diego, La Jolla, CA, 92093
1988-89 Visiting Scientist, Ames Laboratory, Ames, IA 50011
1989-90 Senior Staff Scientist, Solid State Division,
Oak Ridge National Laboratory, Oak Ridge, TN 37831
1990-92 Technical Staff Member, Argonne National Laboratory, Argonne, IL 60439
1992-00 Technical Staff–Scientist, Argonne National Laboratory, Argonne, IL 60439
1998-00 Visiting Professor, Department of Physics & Astronomy,
Northwestern University, Evanston, IL 60208
2001-03 Visiting Scientist, Max-Planck-Institut für Physik komplexer Systeme,
Dresden, 01187, Germany
2003-04 Visiting Professor, University of North Dakota, Grand Forks, ND 58202-7129
2004-06 Visiting Professor, Kansas State University, Manhattan, KS 66506

PRE-UCF SHORT TERM VISITING POSITIONS HELD

1975-6 AT&T Bell Laboratories, Murray Hill, NJ (Dec. - Jan.)
1976 Universität Köln, Köln, West Germany (June - Aug.)
1978 Univ. of British Columbia, Vancouver, B. C., Canada (June - Aug.)
1979 Simon Fraser University, Burnaby, B. C., Canada (June - Aug.)
1980 Universität Hamburg, Hamburg, West Germany (June - Aug.)
1981 Zentralinstitut für Tieftemperaturforschung, Garching,
West Germany (June - July)
1981 Universität Hamburg, Hamburg, West Germany (July - Aug.)
1986 University of California, La Jolla, CA 92093(Feb. - March)
1987 Universität Hamburg, Hamburg, West Germany (June - Aug.)
1989 Argonne National Laboratory, Argonne, IL 60439 (July - Aug.)
2000 University of Notre Dame, Notre Dame, IN 46556 (June)

PRE-UCF LANGUAGES SPOKEN

English (native), Deutsch (fliessendes), Español (muy bien), Français (un peu)

PRE-UCF HOBBIES

violin, piano, swimming, hiking, camping, skiing

PRE-UCF TEACHING EXPERIENCE

1972-4 Teaching Fellow, “Physics for Poets”, Recitations of Freshman Chemistry,

Organic Chemistry Laboratory, and Organic Chemistry, Harvard Univ.

1974-6 Reading Courses for 3-4 Graduate Students, Stanford Univ.

1976-81 11 Sections of Freshman Physics Recitations, 2 Sections of "Physics of Music" Laboratory; Lecturer in: "Physical Aspects of Environmental Problems", Statistical Mechanics (graduate level, 3 years), "Physics of Music", Quantum Mechanics (undergraduate). Ph. D. student supervised: Daniel Youngner, 1980, Iowa State Univ.

1986-7 Lecturer in Undergraduate Quantum Mechanics, Self-paced course on Freshman Thermodynamics, Kinetic Theory, etc., UCSD.

1987-8 Lecturer in Undergraduate Mechanics, Lecturer in Undergraduate Electricity and Magnetism, UCSD.

1989 1 Section of Freshman Physics Recitation and Lab., Iowa State Univ.

1999 Lecturer in Graduate Special Topics Course on Layered Superconductors, Northwestern University.

2000 Lecturer in Intensive Freshman Physics, Univ. of Notre Dame (June).

2003-04 Lecturer in Solid States Physics (graduate) and Quantum Mechanics (undergrad.), UND.

2005 Lecturer in Physics of Nanostructured Materials (KSU)

PRE-UCF HONORS

1967-68 NSF Undergraduate Research Participant (at the University of Oregon)

1970-72 NSF Graduate Fellow (at Harvard University)

1974-75 IBM Postdoctoral Fellow (at Stanford University)

1994 American Physical Society Fellow

PRE-UCF GRANTS AND FUNDING

1996-97 NATO Research Collaboration Grant, jointly with Prof. Kurt Scharnberg, Universität Hamburg, Germany (approved).

1998-99 NATO Research Collaboration Grant renewed.

2003-04 NSF Grant NER-0304665 "Single Molecule Magnets for Quantum Computing", jointly with Prof. Talat S. Rahman, Kansas State University ($100,000.00 for one year) (approved).

PRE-UCF PROFESSIONAL INVOLVEMENT

PRE-UCF INVITED PRESENTATIONS AT REGIONAL CONFERENCES

1976 Invited Speaker, 4^{th} Midwest Solid State Theory Symposium October, 1976, Univ. of Chicago, Chicago, IL

1995 Invited Speaker, 23rd Midwest Solid State Theory Conference, Kansas State University, Manhattan, KS

2000 Invited Speaker, 48th Midwest Solid State Physics Symposium, University of North Dakota, Grand Forks, ND, October 14-15

PRE-UCF INVITED PRESENTATIONS AT NATIONAL CONFERENCES

1984 Invited Speaker, Gordon Conf. on *Quantum Solids and Fluids*, Wolfeboro, NH
1986 Invited Speaker, APS March Meeting, Las Vegas, NV
1988 Invited Speaker, Conf. on *Phenomenology of High Temperature Superconductivity*, Los Alamos, NM
1989 Invited Speaker, APS March Meeting, St. Louis, MO
1989 Invited Speaker, Gordon Conf. on *Phenomenology of High Temperature Superconductors*, Wolfeboro, NH
1991 Invited Speaker, U. Miami Workshop on *Electronic Structure and Mechanisms for High Temperature Superconductivity*, Miami, FL
1992 Invited Speaker, APS March Meeting, Indianapolis, IN
1992 Invited Speaker, Sixth Annual Conference on *Superconductivity*, Buffalo, NY
1994 Invited Speaker, SPIE Technical Conference on *Superconducting Superlattices and Multilayers*, Los Angeles, CA
1995 Invited Speaker, Miami Conference on *Superconductivity*, Miami, FL.
1995 Invited Speaker, APS March Meeting, San Jose, CA
1996 Invited Speaker, SPIE Conference on *Oxide Superconductors: Physics and Nanoengineering II*, San Jose, CA
1998 Invited Speaker, SPIE Conference 3480 on *Superconducting Superlattices II: Native and Artificial*, San Diego, CA.
1999 Invited Speaker, 1999 University of Miami Conference on *High Temperature Superconductivity*, Miami, FL.
1999 Invited Speaker, Workshop on *Electronic Phenomena in Layered Molecular Conductors and Superconductors*, Argonne National Laboratory, Argonne, IL.
2000 Invited Speaker, Gordon Conference on *Superconductivity*, Harbortown Resort, Ventura, CA.
2001 Invited Speaker, APS March Meeting, Seattle, WA.
2002 Invited Speaker, University of Tennessee-Knoxville Workshop on Chemical Physics, Knoxville, TN, February 7-8.
2004 Invited Speaker, 2004 University of Miami Conference on *High Temperature Superconductivity*, Miami, FL Jan. 11-16, 2004.
2006 Invited Speaker, APS March Meeting, Baltimore, MD

PRE-UCF CONTRIBUTED PRESENTATIONS AT NATIONAL CONFERENCES

One or more contributed presentation given at every APS meeting from 1973-2006

PRE-UCF INVITED PRESENTATIONS AT NATIONAL CONFERENCES

1984 Invited Speaker, Gordon Conf. on *Quantum Solids and Fluids*, Wolfeboro, NH
1986 Invited Speaker, APS March Meeting, Las Vegas, NV
1988 Invited Speaker, Conf. on *Phenomenology of High Temperature Superconductivity*, Los Alamos, NM
1989 Invited Speaker, APS March Meeting, St. Louis, MO
1989 Invited Speaker, Gordon Conf. on *Phenomenology of High Temperature Superconductors*, Wolfeboro, NH
1991 Invited Speaker, U. Miami Workshop on *Electronic Structure and*

Mechanisms for High Temperature Superconductivity, Miami, FL

1992 Invited Speaker, APS March Meeting, Indianapolis, IN

1992 Invited Speaker, Sixth Annual Conference on *Superconductivity*, Buffalo, NY

1994 Invited Speaker, SPIE Technical Conference on *Superconducting Superlattices and Multilayers*, Los Angeles, CA

1995 Invited Speaker, Miami Conference on *Superconductivity*, Miami, FL.

1995 Invited Speaker, APS March Meeting, San Jose, CA

1996 Invited Speaker, SPIE Conference on *Oxide Superconductors: Physics and Nanoengineering II*, San Jose, CA

1998 Invited Speaker, SPIE Conference 3480 on *Superconducting Superlattices II: Native and Artificial*, San Diego, CA.

1999 Invited Speaker, 1999 University of Miami Conference on *High Temperature Superconductivity*, Miami, FL.

1999 Invited Speaker, Workshop on *Electronic Phenomena in Layered Molecular Conductors and Superconductors*, Argonne National Laboratory, Argonne, IL.

2000 Invited Speaker, Gordon Conference on *Superconductivity*, Harbortown Resort, Ventura, CA.

2001 Invited Speaker, APS March Meeting, Seattle, WA.

2002 Invited Speaker, University of Tennessee-Knoxville Workshop on Chemical Physics, Knoxville, TN, February 7-8.

2004 Invited Speaker, 2004 University of Miami Conference on *High Temperature Superconductivity*, Miami, FL Jan. 11-16, 2004.

2006 Invited Speaker, APS March Meeting, Baltimore, MD

PRE-UCF CONTRIBUTED PRESENTATIONS AT NATIONAL CONFERENCES

One or more contributed presentation given at every APS meeting from 1973-2013

PRE-UCF INVITED PRESENTATIONS AT INTERNATIONAL CONFERENCES & WORKSHOPS

1985 Invited Speaker, International Conference on *Charge Density Waves in Solids*, Budapest, Hungary

1986 Invited Speaker, 17th Rare Earth Conf., Hamilton, ON, Canada

1986 Invited Speaker, XV Yamada Conference on *Charge-density Waves*, Lake Kawaguchi, Japan

1987 Invited Speaker, 3rd International Workshop on *Condensed Matter Theories*, Oulu, Finland

1993 Invited Speaker, AMS-SIAM-IMS Summer Research Conf. On *Mathematics of Superconductivity*, Univ. Washington, Seattle, WA

1995 Invited Speaker, 1995 Taiwan International Conference on *Superconductivity*, Hualien, Taiwan, R.O.C.

1996 Plenary Invited Speaker, Adriatico Research Conference on *Fluctuation Phenomena in High Temperature Superconductors*, ICTP Trieste, Italy

1996 Plenary Invited Speaker, International Workshop on *High Temperature Superconductivity–Ten Years After Its Discovery*, Jaipur, India

1998 Plenary Invited Speaker, First International Conference on *New*

Theories, Discoveries, and Applications of Superconductors and Related Materials, Baton Rouge, LA.

1998 Plenary Invited Speaker, NATO Advanced Research Workshop on *Symmetry and Pairing in Superconductivity*, Yalta, Crimea, Ukraine.

1999 Invited Speaker, Second International Conference on *New Theories, Discoveries, and Applications of Superconductors and Related Materials*, Las Vegas, NV.

2000 Invited Speaker, International Conference on *Materials and Mechanisms of Superconductivity (M2S-HTSC-VI)*, Houston, TX.

2000 Invited Lecturer, 25th International Nathiagali Summer College, Nathiagali, Pakistan, June 26-July 15, 2000.

2001 Invited Speaker, NATO ARW Workshop on *New Trends in Superconductivity*, Yalta, Ukraine, September 16-20.

2002 Invited Speaker, SCRM 2002 Meeting on *Superconductivity, CRM, and Related Materials*, Giens, France, June 1-8.

2002 Invited Speaker, STS 2002 Conference on *Formation of Correlations*, Bad Honnef, Germany, June 24-28.

2002 Invited Speaker, 23rd International Conference on Low Temperature Physics (LT23), Hiroshima, Japan, August 20-27.

2003 Invited Speaker, STS 2003 Conference on *Nonequilibrium Physics at Short Time Scales*, Dresden, Germany, May 5-16.

2003 Invited Speaker, International Conference on *Dynamic Inhomogeneities in Complex Oxides*, Bled, Slovenia, June 14-20.

2003 Invited Speaker, International Workshop on *Quantum Transport in Synthetic Metals & Quantum Functional Semiconductors, 2003*, Seoul, Korea, November 19-22.

2004 Plenary Invited Speaker, 5th International Conference on *New Theories, Discoveries, and Applications of Superconductors and Related Materials*, Chongqing, China, June 10-15, 2004.

2004 Invited Speaker, 4th International Conference on *Nanoscale Heterogeneity and Quantum Phenomena in Complex Oxides (Stripes 2004)*, Rome, Italy, Sept. 26- Oct. 2, 2004.

PRE-UCF POSTDOCTORAL FELLOWS SUPERVISED

1977-78 Kazushige Machida, Iowa State University, Ames, IA.

1978-79 Surendra N. Gadekar, Iowa State University, Ames, IA.

1984-85 Mark O. Robbins*, Exxon Research & Engineering Co., Annandale, NJ.

1993-95 Marko Ledvij, Argonne National Laboratory, Argonne, IL.

2001-03 Marco Ameduri, Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany

2001-03 Amit K. Chattopadyay, Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany

2001-03 Dmitri V. Efremov, Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany

2001-03 Qiang Gu, Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany

2001-03 Debanand Sa, Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany

*cosupervised with Aaron Bloch

PRE-UCF OTHER SIGNIFICANT PROFESSIONAL INVOLVEMENT

1977 Participant, Joint US-USSR Symposium on Condensed Matter Theory, Aspen, CO
1997 Invited Lecturer, Department of Industrial Chemistry,
Tokyo University, Tokyo, Japan, April 7-18, 1997.
1997 Invited Lecturer, Institut für Theoretische Festkörperphysik,
Universität Hamburg, Hamburg, Germany, July 4-11, 1997.
2000 Opponent, Ph. D. Thesis Defense of Dr. Johan Axnäs,
Kungliga Tekniska Högskolan, Stockholm, Sweden, March 10, 2000.

PRE-UCF SERVICE

PRE-UCF PROFESSIONAL SERVICE

PRE-UCF ORGANIZING REGIONAL CONFERENCES AND WORKSHOPS

1979 Chairman, 27^{th} Midwest Solid State Physics Conference, Ames, IA
1997 Chairman, 25th Midwest Solid State Theory Symposium,
Argonne National Laboratory.

PRE-UCF ORGANIZING INTERNATIONAL CONFERENCES & WORKSHOPS

1993 Chairman, Workshop on *Electronic Properties of Disordered Systems*,
Argonne National Laboratory, Argonne, IL
1995 Chairman, Workshop on *Magnetism in Multilayered and Reduced Dimensional Systems*, Argonne National Laboratory, Argonne, IL
2001 Co-Chairman, Third International Conference
on *New Theories, Discoveries, and Applications of Superconductors and Related Materials*, January 16-19, Honolulu, Hawaii.

PRE-UCF REFEREEING

Referee for Physical Review B, Physical Review Letters, Journal of Low Temperature Physics, Applied Physics Letters, Journal of Applied Physics, Europhysics, Physica C, Journal of Physics: Condensed Matter, Superconductor Science and Technology, and various conference proceedings.

PRE-UCF U. S. PATENTS ISSUED

1. U.S. Patent 3,766,064, for the intercalation of TaS_2 with organic molecules. (1973).

PRE-UCF REFEREED PUBLICATIONS IN PRINT

PRE-UCF REVIEWS

R1. R. A. Klemm, *Theory of the Superconducting Properties of Quasi-One-Dimensional Materials*, in *Electronic Properties of Inorganic Quasi-One-Dimen-sional Materials, I*, edited by P. Monceau (Reidel, Amsterdam, 1985), pp 195-241.

R2. R. A. Klemm, *Origin of the Pseudogap in High Temperature Superconductors*, in *Nonequilibrium Physics at Short Time Scales. Formation of Correlations*, ed. by K. Morawetz (Springer, Berlin, 2004), pp. 381-400.

R3. R. A. Klemm, *The phase-sensitive c-axis twist experiments on* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *and their implications*, Phil. Mag. **85**(8), pp. 801-853, (2005).

PRE-UCF REFEREED JOURNAL LETTERS

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P8. J. P. Stokes, M. O. Robbins, S. Bhattacharya, and R. A. Klemm, *Broadband Noise in Orthorhombic* TaS_3. In *Charge Density Waves in Solids*, ed. by Gy. Hutiray and J. Sólyom. Published in *Lecture Notes in Physics* (Turkish J. Pediatrics, Samapazari) **217**, 301 (1985).

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P10. R. A. Klemm, M. O. Robbins, and J. R. Schrieffer, *The Single Domain Model of Charge-Density Wave Transport.* In *Charge-Density Waves in Solids*, ed. by Gy. Hutiray and J. Sólyom, Published in *Lecture Notes in Physics* (Turkish J. Pediatrics, Samapazari) **217**, 178 (1985) (invited paper).

P11. M. O. Robbins and R. A. Klemm, *Charge-Density Wave Conduction of Small Samples*, *Mol. Cryst. Liq. Cryst.* **121**, 95 (1985).

P12. R. A. Klemm and K. Scharnberg, *Upper Critical Field in p-wave Superconductors with Anisotropic Pairing Interaction*, *Physica* **135B**, 53 (1985).

P13. R. A. Klemm and K. Scharnberg, *Upper Critical Field in p-wave Superconductors with Broken Symmetry*, *J. Magn. Magn. Mat.* **54-57**, 381 (1986).

P14. S. N. Coppersmith and R. A. Klemm, *Ultrasonic Attenuation in Clean Anisotropic Superconductors*, *Physica* **135B**, 27 (1985).

P15. D. C. Johnston, J. P. Stokes, and R. A. Klemm, *Relationships between Magnetic Susceptibility and Single Particle Transport in Quasi One-Dimensional Conductors*, *J. Magn. Magn. Mat.* **54-57**, 1317 (1986).

P16. S. N. Coppersmith and R. A. Klemm, *Ultrasonic Attenuation in Clean Anisotropic Superconductors*, *J. Magn. Magn. Mat.* **54-57**, 1539 (1986).

P17. R. A. Klemm and M. O. Robbins, *Charge-Density Wave Conduction: Dynamics and Finite Size Effects*, *Physica* **143B**, 76 (1986) (invited talk).

P18. R. A. Klemm, *Crystal Field Effects upon the Heavy Electron Superconducting Properties*, *J. Less Comm. Met.* **127**, 311 (1987) (invited paper).

P19. R. A. Klemm, *Heavy Electron Superconductors: Axial or Polar State?* In *Theoretical and Experimental Aspects of Valence Fluctuations and Heavy Fermions*, ed. by L. C. Gupta and S. K. Malik, (Plenum, New York, 1987), p 505.

P20. R. A. Klemm, *Some Thoughts on the New High T_c Superconductors*, *Condensed Matter Theories* **3**, 185, edited by J. S. Arponen, R. F. Bishop, and M. Manninen, (Plenum, New York), (1988) (invited paper).

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P22. K. Scharnberg, D. Walker, R. A. Klemm, and C. T. Rieck, *Electromagnetic Response of Unconventional Superconductors*, *Physica C* **153-155**, 715 (1988).

P23. S. H. Liu and R. A. Klemm, *Interlayer Pairing: A Possible New Type of Superconductivity in Layered Materials*, *Chin. J. Phys. (Taiwan)* **29**, 157 (1991) (invited talk).

P24. R. A. Klemm and S. H. Liu, *Interlayer Pairing and c-axis versus ab-plane Gap Anisotropy in High T_c Superconductors.* In *High Temperature Superconductivity*, edited by J. Ashkenazi and G. Vezzoli, (Plenum, New York, 1991), p. 609. (invited talk).

P25. U. Welp, S. Fleshler, W. K. Kwok, R. A. Klemm, V. M. Vinokur, J. Downey, and G. W. Crabtree, *Scaling Behavior of the Fluctuations in Magnetization and Conductivity of Untwinned* $YBa_2Cu_3O_{7-\delta}$, *Physica C* **185-189**, 1785 (1991).

P26. U. Welp, S. Fleshler, W. K. Kwok, R. A. Klemm, V. M. Vinokur, J. Downey, and G. W. Crabtree, *Reversible Magnetization of Copper Oxide Superconductors in the Mixed State.* In *High Temperature Superconductivity*, ed. by S. K. Malik and S. S. Shah (Nova Science Publishers, New York, 1992) pp. 349-381 (1992).

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P29. K. D. Carlson, J. M. Williams, U. Geiser, A. M. Kini, H. H. Wang, R. A. Klemm, S. K. Kumar, J. A. Schlueter, J. R. Ferraro, K. R. Lykke, P. Wurz, D. H. Parker, J. D. B. Sutin, J. E. Schirber, E. L. Venturini, and P. Stout, *The central bond* $^{13}C = {}^{13}C$ *isotope effect for superconductivity in the high T_c* β^*-$(ET)_2I_3$ *phase and its implications regarding the superconducting pairing mechanism in* TTF*-based organic superconductors*, *Mol. Cryst. Liq. Cryst. A* **234**, 127 (1993).

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August 4-11, 1993, *Physica B* **194-196**, 1367 (1994).

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P32. R. A. Klemm and S. H. Liu, *Intra- versus Interlayer Pairing in the Copper Oxide Superconductors: Response to a Magnetic Field*, in *SPIE Proceedings on Superconducting Superlattices and Multilayers*, ed. by I. Bozovic (Los Angeles, January 24-25, 1994), **2157**, 27 (1994) (invited talk).

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P34. R. A. Klemm, M. Ledvij, and S. H. Liu, *Surface State and Normal Layer Effects*, *Chin. J. Phys. (Taiwan)* **34**, 201 (1996). (refereed invited talk).

P35. R. A. Klemm, M. Ledvij, and S. H. Liu, *Surface State and Normal Layer Effects in High-T_c Superconductors*, in *SPIE Proceedings on Oxide Superconductor Physics and Nano-Engineering II*, ed. by I. Bozovic (San Jose, January 30-February 2, 1996), **2697**, 44 (1996) (invited talk).

P36. R. A. Klemm and S. H. Liu, *Simple Model of the Anisotropic Penetration Depth in High T_c Superconductors*, Proceedings of the Twentyfirst International Conference on Low Temperature Physics *LT21*, Prague, Czech Republic, August 8-14, 1996, *Czechoslovak J. Phys.* **46**, Suppl. S2, 1135 (1996).

P37. R. A. Klemm, *Fluctuation Phenomena in Layered Superconductors*, Proceedings of the Adriatico Research Conference on Fluctuation Phenomena in High Critical Temperature Superconducting Ceramics, ICTP Trieste, Italy, August 3-8, 1996, ed. by M. Ausloos and A. Varlamov, (Kluwer NATO Series, Dordrecht, The Netherlands) pp. 377-384 (1997).

P38. R. A. Klemm, *Why We Still Don't Know the Symmetry of the Order Parameter in High Temperature Superconductors*, Proceedings of the International Workshop on High Temperature Superconductivity – Ten Years After its Discovery, Jaipur, India, December 16-21, 1996, ed. by S. M. Bose and K. B. Garg, (Narosa Publishing House, New Delhi, 1998) pp. 179-191.

P39. R. A. Klemm, *What is the Symmetry of the Order Parameter in High Temperature Superconductors?*, in J. D. Fan, ed., Proceedings of the First International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials, Baton Rouge, LA, February 19-24, 1998, Int. J. Mod. Phys. B **12**, (29-31), pp. 2920-2931 (1998) (plenary invited talk).

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P41. R. A. Klemm, C. T. Rieck, and K. Scharnberg, *Angular Dependence of the Josephson Critical Current Across c-Axis Twist Junctions of Layered Superconductors*, in *Superconducting Superlattices II: Native and Artificial*, San Diego, CA, July 20-22, 1998, ed. by I. Bozovic and D. Pavuna,

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P42. R. A. Klemm, C. T. Rieck, and K. Scharnberg, *c-Axis Twist* $Bi_2Sr_2CaCu_2$-$O_{8+\delta}$ *Josephson Junctions: A New Phase-Sensitive Test of Order Parameter Symmetry*, in AIP Conference Proceedings 483 on *High Temperature Superconductivity*, edited by S. E. Barnes *et al.* (AIP, Woodbury, New York, 1999), pp. 259-264. (invited talk).

P43. R. A. Klemm, G. Arnold, A. Bille, C. T. Rieck, and K. Scharnberg, *c-Axis Twist* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *Josephson Junctions: A New Phase-Sensitive Test of Order Parameter Symmetry*, in J. D. Fan, ed., *Proceedings of the Second International Conference on New Theories, Discoveries, and Applications of Superconductors and Related Materials*, Las Vegas, NV, May 31-June 4, 1999, Int. J. Mod. Phys. B **13**, (29-31) pp. 3449-3454. (1999) (invited talk).

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P45. R. A. Klemm, *Striking Similarities Between the Pseudogap Phenomena in Cuprates and in Layered Organic and Dichalcogenide Superconductors*, M2S-HTSC-VI (Houston, February 22, 2000), *Physica C* **341-348**, 839 (2000) (invited talk).

P46. R. A. Klemm. G. Arnold, A. Bille, and K. Scharnberg, *Theory of c-Axis Twist* Bi2212 *Josephson Junctions: Strong Evidence for Incoherent Tunneling and s-Wave Superconductivity*, M2S-HTSC-VI (Houston, February 22, 2000), *Physica C* **341-348**, 1663 (2000).

P47. R. A. Klemm and K. Scharnberg, *Theory of c-Axis Twist Bicrystal Josephson Junctions*, Int. J. Mod. Phys. B **15** (24 & 25), 3164 (2001)(invited talk).

P48. R. A. Klemm, $Bi_2Sr_2CaCu_2O_{8+\delta}$ *c-Axis Bicrystal Twist Josephson Junctions: A New Phase -Sensitive Test of Order Parameter Symmetry*, in *New Trends in Superconductivity*, J. Annett and S. Kruchinin, (eds.), (Kluwer, Dordrecht, 2002), pp. 85-94 (invited talk in Yalta, Ukraine).

P49. R. A. Klemm, *Theory of the Phase-Sensitive* BSCCO *c-Axis Twist Josephson Junction Experiments*, *J. Superconductivity: Incorporating Novel Magnetism* **16**, 529 (2003) (invited talk at SCRM2002, Giens, France, June, 2002).

P50. R. A. Klemm, $Bi_2Sr_2CaCu_2O_{8+\delta}$ *Bicrystal c-Axis Twist Josephson Junctions: A New Phase-Sensitive Test of Order Parameter Symmetry*, *Physica B* **329-333 P2**, 1325 (2003) (invited talk at LT23 in Hiroshima, Japan).

P51. R. A. Klemm, *The Pseudogap and the Superconducting Order Parameter in Inhomogeneous* $Bi_2Sr_2CaCu_2O_{8+\delta}$, J. Supercond.: Incorporating Novel Magnetism **17** (1), 69 (2004) (invited talk in Bled, Slovenia).

P52. R. A. Klemm, $Bi_2Sr_2CaCu_2O_{8+\delta}$ *Bicrystal c-Axis Twist Josephson Junctions: The Superior Phase-Sensitive Test of Order Parameter Symmetry*, *Curr. Appl. Phys.* **4/5**, 509 (2004)(invited talk in Seoul, Korea).

P53. I. Olejniczak, J. Choi, J. L. Musfeldt, Y. J. Wang, J. A. Schlueter, and R. A. Klemm, *Magnetic field dependent vibrational modes in* κ-$(ET)_2Cu(SCN)_2$ *organic superconductor*, J. Phys. IV France **114**, 361 (2004).

P54. R. A. Klemm, $Bi_2Sr_2CaCu_2O_{8+\delta}$ *c-axis bicrystal twist and cross-whisker experiments*, in J. Ashkenazi *et al.*, Eds., *New Challenges in Superconductivity: Experimental Advances and Emerging Theories*, (NATO Science Series, Springer, Netherlands) **183**, pp. 43-48 (2005) (invited talk in Miami).

P55. R. A. Klemm, *c-Axis twist bicrystal, artificial and natural cross-whisker Bi2212 Josephson junctions*, Int. J. Mod. Phys. B **19**, (1-3) 177 (2005) (plenary invited talk in Chongqing, China).

P56. R. A. Klemm, *Bi2212 c-Axis twist bicrystal and artificial and natural cross-whisker Josephson junctions: Strong evidence for s-wave superconductivity and incoherent c-axis tunneling.* J. Supercond.: Incorporating Novel Magnetism **18**, (6) 97 (2005) (invited talk in Rome, Italy).

P57. R. A. Klemm and D. V. Efremov, *Local spin anisotropy effects upon the magnetization of dimer single molecule magnets*, Proceedings of the 24th International Conference on Low Temperature Physics, AIP Conference Proceedings **850**, 1151 (2006).

P58. R. A. Klemm, *The phase-sensitive c-axis twist experiments on* $Bi_2Sr_2CaCu_2O_{8+\delta}$ *and their implications*, Proceedings of the 24th International Conference on Low Temperature Physics, AIP Conference Proceedings **850**, 519 (2006).

PRE-UCF NON-REFEREED CONFERENCE PROCEEDINGS

NRP1. R. A. Klemm, *Origin of the Pseudogap in High Temperature Superconductors*, 25th Nathiagali Summer College Lectures, Nathiagali, Pakistan, July 4, 2000. (invited talk available in pdf format)

NRP2. R. A. Klemm, $Bi_2Sr_2CaCu_2O_{8+\delta}$ *c-Axis Bicrystal Twist Josephson Junctions: A New Phase -Sensitive Test of Order Parameter Symmetry*, 25th Nathiagali Summer College Lectures, Nathiagali, Pakistan, July 5, 2000. (invited talk available in pdf format)

ISI WEB OF SCIENCE CITATION INDEX CORE COLLECTION

As of 10/13/16 there were 5,377 citations

Rank	Journal Reference	Journal Paper #	**citations**
1	Phys. Rev. B **12**, 877 (1975).	J13	**464** (+10)
2	Science **168**, 568 (1970).	L1	**272**(+1)
3	Phys. Rev. Lett. **67**, 3180 (1991).	L12	**235**
4	Phys. Rev. Lett. **63**, 1012 (1989).	L11	**162**
5	Phys. Rev. B **21**, 1868 (1980).	J24	**154** (+3)
6	Phys. Rev. **181**, 137 (1969).	J3	**140**
7	Phys. Rev. Lett. **83**, 4160 (1999).	L16	**126**
8	Phys. Rev. **176**, 49 (1968).	J1	**125**
9	Phys. Rev. B **15**, 2984 (1977).	J17	**110**
10	Phys. Rev. B **48**, 12 951 (1993).	J62	**108** (+4)
11	Phys. Rev. B **53**, 791 (1996).	J67	**100**

Table 1: Papers with 100 or more citations. (+n) indicates n incorrect citations

Rank	Journal Reference	Paper #	**citations**
12	Phys. Rev. Lett. **51**, 47 (1983).	L6	**91** (+2)
13	J. Org. Chem. **34**, 347 (1969).	J2	**89**
14	Phys. Rev. Lett. **105**, 077005 (2010).	L19*	**86**
15	Phys. Rev. B **41**, 2073 (1990).	J44	**85** (+4)
16	Phys. Rev. B **22**, 5233 (1980).	J27	**74**
17	J. Low Temp. Phys. **16**, 607 (1974).	J12	**68**
18	Phys. Rev. Lett. **108**, 107006 (2012).	L21*	**63**(+1)
19	J. Chem. Phys. **51**, 4643 (1969).	J4	**63**
20	Phys. Rev. Lett. **74**, 2343 (1995).	L18	**62**
21	Phys. Rev. Lett. **54**, 2453 (1985).	L9	**62**
22	J. Phys. Soc. Jpn. **79**, 023703 (2010).	L18*	**58**(+1)
23	Phys. Rev. B **14**, 1086 (1976)	J16	**57** (+1)
24	Phys. Rev. B **19**, 2520 (1979).	J20	**56**
25	Phys. Rev. Lett. **59**, 1849 (1987).	L10	**52**
26	J. Heterocyclic Chem. **7**, 373 (1970).	J6	**51**
27	Jap. J. Appl. Phys. **51**, 010113 (2012).	J91*	**51**
28	Phys. Rev. B **14**, 1073 (1976).	J15	**49**
29	Phys. Rev. B **44**, 7526 (1991).	J48	**48** (+4)
30	Z. Phys. B **72**, 139 (1988).	J39	**48** (+1)
31	Phys. Rev. B **8**, 5072 (1973).	J9	**47** (+5)
32	Phys. Rev. B **58**, 1051 (1998).	J70	**43**
33	J. Phys.: Cond. Matter **22**, 375701 (2010).	L20*	**41**(+3)
34	Phys. Rev. Lett. **54**, 2445 (1985).	L7	**40**
35	Phil. Mag. **85**, 801 (2005).	R3	**40**
36	J. Org. Chem. **36**, 2169 (1971).	J8	**38**
37	Phys. Rev. Lett. **73**, 1019 (1994).	L14	**37** $\leftarrow$ h-index
38	J. Phys. C: Sol. State Phys. **12**, L735 (1979).	L4	**34** (+3)
39	Phys. Rev. B **20**, 316 (1979).	J22	**33**
40	Physica C2 **341**, 839 (2000).	P45	**33**
41	Sol. State Commun. **60**, 535 (1986).	J36	**32**
42	Physica C **170**, 195 (1990).	J45	**32**
43	Physica C **191**, 224 (1992).	J50	**32**
44	Phys. Rev. B **61**, 5913 (2000).	J72	**32**
45	Phys. Rev. B **58**, 14 203 (1998).	J71	**31**
46	J. Low Temp. Phys. **16**, 381 (1974).	J11	**30** (+1)
47	Phys. Rev. A **68**, 031604 (2003).	J80	**29**(+1)
48	Phys. Rev. B **21**, 3890 (1980).	J25	**29**
49	Phys. Rev. Lett. **73**, 1871 (1994).	LCR3	**29**
50	Appl. Phys. Lett. **103**, 182601 (2013).	L22*	**28**(+1)
51	Phys. Rev. B **51**, 3269 (1995).	J63	**28**
52	Phys. Rev. Lett. **40**, 1397 (1978).	L2	**27**
53	Int. J. Mod. Phys. B **12**, 2920 (1998).	P39	**27**
54	Phys. Rev. B **62**, 661 (2000).	J72	**26**
55	Phys. Rev. B **24**, 6361 (1981).	J29	**26**
56	Phys. Rev. B **70**, 094517 (2004).	J82	**26**
57	Phys. Rev. B **64**, 174507 (2001).	J75	**25**
58	Phys. Rev. B **89**, 054503 (2014).	J94*	**25**

Table 2: Other papers with 25 or more citations. *@UCF publication

Rank	Journal Reference	Paper #	**citations**
59	Phys. Rev. B **45**, 415 (1992).	J49	**23** (+9)
60	Phys. Rev. Lett. **46**, 496 (1981).	L5	**23**
61	Phys. Rev. B **38**, 6552 (1988).	J40	**23**
62	Physica C **204**, 399 (1993).	J56	**22**
63	Phys. Rev. B **67**, 174509 (2003).	J79	**22**
64	Phys. Rev. Lett. **56**, 1870 (1986).	L9	**21**
65	J. Phys. Soc. Jpn. **80**, 094709 (2011).	J90*	**21**
66	Phys. Rev. B **77**, 184410 (2008).	J86*	**21**
67	Physica C **176**, 189 (1991).	J47	**20**
68	Appl. Phys. Lett. **105**, 202603 (2014).	L27*	**20**
69	Phys. Rev. B **66**, 174427 (2002).	J76	**20**
70	Phys. Rev. B **47**, 14 630 (1993).	J57	**19**
71	J. Phys.: Condens. Matter **23**, 025701 (2011).	J89*	**19**
72	Phys. Rev. B **38**, 6641 (1988).	J41	**18**
73	Inorg. Chem. **31**, 3346 (1992).	J54	**18**
74	Phys. Rev. B **55**, 14649 (1997).	LCR5	**18**
75	Physica B **135**, 53 (1985).	P12	**16**
76	J. Supercond. Nov. Magn. **23**, 613 (2010).	J88*	**16**
77	Phys. Rev. A **1**, 1063 (1970).	J7	**15**
78	Phys. Rev. B **52**, 12552 (1995).	J66	**15**
79	Opt. Express **21**, 2171 (2013).	J92*	**15**

Table 3: Other papers with 15 or more citations. *@UCF publication