

Minho Kwon | Curriculum vitae

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Summary

I am an experimental physicist studying quantum physics with atoms and lights.

Research interests

Laser cooling and trapping of atoms; Rydberg physics; Quantum computing and simulation; Nonlinear optics; Singular optics; Quantum optics.

Education

- **University of Wisconsin-Madison** **Madison, WI, USA**
Ph.D, Physics *April 2019*
Thesis : Rydberg-Mediated Atomic Ensemble Entanglement and Hyperfine Qubit Detection
Advisors : Mark Saffman and Thad Walker
- **Yonsei University** **Seoul, South Korea**
B.S. and B.E., Double majored in Electronic engineering and Physics. *August 2011*
Thesis : Simulating the effects of $[[7,1,3]]$ quantum error correcting code
against decoherence errors and operational errors based on trapped-ion implementation

Experience

Research.....

- **Group of Sebastian Will, Columbia University** **New York, NY**
Postdoctoral Research Scientist *March 2020 – Present*
Advisor : Sebastian Will
- **Group of Mark Saffman, University of Wisconsin-Madison** **Madison, WI**
Postdoctoral Research Associate *May 2019 – March 2020*
Advisor : Mark Saffman
Working towards neutral atom quantum computer experiment with the goal of demonstrating improved gate fidelity and the ability to run quantum algorithms on the neutral atom hardware.
 - Demonstration of two-qubit gate in a 2-D atomic array[2].

- **Group of Mark Saffman, University of Wisconsin-Madison** **Madison, WI**
Graduate Research Assistant *July 2013 – April 2019*
 Advisors : Mark Saffman and Thad Walker
 Studied coherent dynamics of laser-cooled atoms and atom-photon interactions in strong Rydberg blockade regime in the context of quantum information.

 - Low loss parallel detection of atomic hyperfine qubits[3].
 - First demonstration of ensemble-ensemble Rydberg blockade[4].
 - Demonstration of W-state coherence and microwave tomography[4].
 - Constructed 14 W, 770 nm frequency doubled light source for trapping atoms[1].
- **Group of Hui Deng, University of Michigan** **Ann Arbor, MI**
Visiting Research Investigator *January 2012 – July 2012*
 Advisor : Hui Deng
 Demonstrated high fidelity detection of orbital angular momentum of Laguerre-Gaussian beams[5].
 Financial support from Korean government through WEST program.
- **Experimental Nuclear Physics Lab, Yonsei University** **Seoul, South Korea**
Undergraduate Research Assistant *June 2006 – October 2007*
 Advisors : Young-il Kwon, Ju-hwan Kang
 Developed and tested silicon Stripixel sensors for Relativistic Heavy Ion Collider PHENIX experiments.

Teaching.....

- **University of Wisconsin-Madison** **Madison, WI**
Grader *Spring 2015 - Fall 2016*
 Graduate level Applied Optics(625), Atomic Physics(545) and Quantum Information(406).
- **University of Wisconsin-Madison** **Madison, WI**
Teaching Assistant *Fall 2012 – Spring 2013*
 Taught undergraduate General Physics(202) for two semesters.
 Received excellent evaluations.

Other Professional Employments.....

- **Korea Army Training Center** **Nonsan, South Korea**
Squad Leader/Sergeant *July 2008 – May 2010*
 Served compulsory military service as a drill instructor.
 Earned regimental commander's commendations for "Constructing database system of recruited soldiers" and for winning "The Best Drill instructor contest".

Professional and Community services

- **PRL, PRA** **APS**
Reviewer
- **Korean-American Scientists and Engineers Association** **Madison, WI**
Director of Basic Sciences *July 2019 - Feb 2020*
- **Korean-American Scientists and Engineers Association** **Madison, WI**
Director of Basic Sciences *September 2017 - September 2018*

- **Korean Scholars and Students Association, UW-Madison**
IT Specialist
- **Korean Scholars and Students Association, UW-Madison**
President

Madison, WI
April 2014 - March 2015

Madison, WI
April 2013 - March 2014

Honors and Awards

- **National Engineering Math Competition**
Prize of Excellence

Korean Mathematical Society
November 2007

Publications

1. **Minho Kwon**, Yang, P., Huft, P., Young, C., Ebert, M. & Saffman, M. Generation of 14.0 W of single-frequency light at 770 nm by intracavity frequency doubling. *Opt. Lett.* **45**, 339–342 (Jan. 2020).
2. Graham, T. M., **Minho Kwon**, Grinkemeyer, B., Marra, Z., Jiang, X., Lichtman, M. T., Sun, Y., Ebert, M. & Saffman, M. Rydberg-Mediated Entanglement in a Two-Dimensional Neutral Atom Qubit Array. *Phys. Rev. Lett.* **123**, 230501 (Dec. 2019).
3. **Minho Kwon**, Ebert, M., Walker, T. G. & Saffman, M. Parallel Low-Loss Measurement of Multiple Atomic Qubits. *Phys. Rev. Lett.* **119**, 180504 (Oct. 2017).
4. Ebert, M., **Minho Kwon**, Walker, T. G. & Saffman, M. Coherence and Rydberg Blockade of Atomic Ensemble Qubits. *Phys. Rev. Lett.* **115**, 093601 (Aug. 2015).
5. Bierdz, P., **Minho Kwon**, Roncaioli, C. & Deng, H. High fidelity detection of the orbital angular momentum of light by time mapping. *New Journal of Physics* **15**, 113062 (2013).

Invited Talks

1. **Minho Kwon**. *Programmable atomic tweezer arrays* Columbia University. June 2020.
2. **Minho Kwon**. *Rydberg mediated Quantum Information Processing with neutral Rb ensembles* Korea Institute of Science and Technology. Mar. 2017.

Contributed Talks

1. **Minho Kwon**, Ebert, M., Kim, D., Walker, T. & Saffman, M. *Rydberg blockade of atomic ensemble qubits* APS DAMOP (May 2015), M5.003.
2. **Minho Kwon**, Ebert, M., Walker, T. & Saffman, M. *Rydberg atoms and Ensemble Blockade* *Midwestern Cold Atom Workshop* (Nov. 2014).
3. Ebert, M., Gill, A., Gibbons, M., **Minho Kwon**, Saffman, M. & Walker, T. *Atomic Fock State Preparation and Rydberg Dynamics* APS DAMOP (May 2014), T3.007.

Contributed Posters

1. **Minho Kwon**, Young, C., Ebert, M., Malewicz, S., Radzom, B., Yang, P., Walker, T. & Saffman, M. *Progress towards entanglement of atomic ensemble qubits via Rydberg blockade* *Midwestern Cold Atom Workshop* (Nov. 2018).
2. **Minho Kwon**, Young, C., Ebert, M., Malewicz, S., Radzom, B., Walker, T. & Saffman, M. *Progress towards entanglement of atomic ensemble qubits via Rydberg blockade* *Advanced SRITP and GiRYD School on Giant Interactions in Rydberg Systems* (Sept. 2018).
3. **Minho Kwon**, Young, C., Ebert, M., Malewicz, S., Radzom, B., Walker, T. & Saffman, M. *Progress towards entanglement of atomic ensemble qubits via Rydberg blockade* *26th International Conference on Atomic Physics* (July 2018).
4. **Minho Kwon**, Young, C., Ebert, M., Walker, T. & Saffman, M. *Progress towards entangling neutral atom ensemble qubits using Rydberg interactions* APS DAMOP (May 2018), E1.124.

5. **Minho Kwon**, Ebert, M., Young, C., Walker, T. & Saffman, M. *Ensemble qubits and non-destructive state readout with an EMCCD camera* *Midwestern Cold Atom Workshop* (Nov. 2017).
6. **Minho Kwon**, Ebert, M., Young, C., Walker, T. & Saffman, M. *Nondestructive fluorescence detection of hyperfine states of Rb using an EMCCD camera* *APS DAMOP* (Apr. 2017), K1.103.
7. **Minho Kwon**, Ebert, M., Walker, T. & Saffman, M. *Progress towards Rydberg gate experiments with Non-destructive, Hyperfine state-selective Readout using EMCCD camera* *Midwestern Cold Atom Workshop* (Nov. 2016).
8. **Minho Kwon**, Ebert, M., Walker, T. & Saffman, M. *Progress towards Rydberg gate experiments with Non-destructive hyperfine state selective readout using an EMCCD camera* *25th International Conference on Atomic Physics* (July 2016).
9. Ebert, M., **Minho Kwon**, Saffman, M. & Walker, T. *W-State Characterization and Progress Toward Non-Destructive State-Selective Measurements with an EMCCD Camera in Rb* *APS DAMOP* (May 2016), K1.081.
10. **Minho Kwon**, Ebert, M., Walker, T. & Saffman, M. *Directional photon emission from entangled atomic ensembles* *APS DAMOP* (May 2015), D1.047.

References

- Prof. Sebastian Will : sw3151@columbia.edu
- Prof. Mark Saffman : msaffman@wisc.edu
- Prof. Thad G. Walker : tgwalker@wisc.edu
- Prof. Hui Deng : dengh@umich.edu