

Tobias Koch

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ACADEMIC BACKGROUND

- Oct'04–Jul'09 **Ph.D. in Electrical Engineering, ETH Zurich, Switzerland**
Dissertation: "On Heating Up and Fading in Communication Channels."
Advisor: Prof. Amos Lapidoth
- Oct'98–Jun'04 **M.Sc. in Electrical Engineering (with Distinction), ETH Zurich, Switzerland**
Master's Thesis: "On the Asymptotic Capacity of Multiple-Input Single-Output Fading Channels with Memory."
Thesis advisor: Prof. Amos Lapidoth

WORK EXPERIENCE

- since Nov'15 **Ramón y Cajal Research Fellow, Universidad Carlos III de Madrid, Spain**
- since Jun'12 **Profesor Visitante, Universidad Carlos III de Madrid, Spain**
- Jun'10–May'12 **Marie Curie Research Fellow, University of Cambridge, UK**
- Oct'04–Oct'09 **Research and Teaching Assistant, ETH Zurich, Switzerland**
Ph.D. Advisor: Prof. Amos Lapidoth
- Apr'07–Jun'07 **Internship, Universitat Pompeu Fabra, Barcelona, Spain**
Advisor: Prof. Ezio Biglieri
- Aug'04–Oct'04 **Internship, Bell Laboratories, Murray Hill, NJ, USA**
Advisor: Prof. Gerhard Kramer
- Nov'02–Feb'03 **Research Assistant, ETH Zurich, Switzerland**

GRANTS & AWARDS

- 2017–2022 ERC Starting Grant
- 2015–2020 Ramón y Cajal Research Fellowship
- 2015 Accreditation as *Profesor Titular de Universidad* by ANECA
- 2013–2017 Marie Curie Career Integration Grant
- 2013 Communication Theory Workshop (CTW) Best Poster Award
- 2010–2012 Marie Curie Intra-European Fellowship for Career Development
- 2009 SNSF Fellowship for Prospective Researchers (declined)

TEACHING EXPERIENCE

- since 2013 **Information Theory, Universidad Carlos III de Madrid, Spain**
Graduate level.
- 2013–2015 **Communication Theory, Universidad Carlos III de Madrid, Spain**
Undergraduate level.
- 2014–2015 **Advanced Communications, Universidad Carlos III de Madrid, Spain**
Graduate level. Taught together with P. M. Olmos.
- 2012 **Linear Systems, Universidad Carlos III de Madrid, Spain**
Undergraduate level. Taught together with F. Pérez-Cruz.
- 2011–2012 **Advanced Wireless Communications, University of Cambridge, UK**
Undergraduate level. Taught together with A. Guillén i Fàbregas (2011) and J. Sayir (2012).
- 2007 **Topics in Multi-Terminal Information Theory, ETH Zurich, Switzerland**
Graduate level. Taught together with A. Lapidoth, S. Tinguely, L. Wang, and M. Wigger.
- 2004–2009 **Applied Digital Information Theory, ETH Zurich, Switzerland**
Graduate level. Teaching assistant, taught by A. Lapidoth.
- 2005–2009 **Information Transfer, ETH Zurich, Switzerland**
Undergraduate level. Teaching assistant, taught by A. Lapidoth.

SUPERVISION

Ph.D. Students

- since Nov'14 Alejandro Lancho, "Wireless communications at finite blocklength," Universidad Carlos III de Madrid, Spain. **Main advisor.**
- since Oct'14 Yanfang Liu, "Hardware-optimized decoders for LDPC codes," Universidad Carlos III de Madrid, Spain. **Co-advisor** (together with P. M. Olmos).
- since Jan'14 Grace Silvana Villacrés Estrada, "Realistic information-theoretical limits for wireless networks," Universidad Carlos III de Madrid, Spain. **Main advisor.**
- Jun'10–Feb'12 Taufiq Asyhari, "Nearest neighbour decoding for fading channels," University of Cambridge, UK. **Co-advisor** (together with A. Guillén i Fàbregas).

Master's Theses

- Oct'05–Apr'06 Ligong Wang, "On fading channels at low SNR," ETH Zurich, Switzerland.
- Sep'06–Mar'07 Georg Böcherer, "The discrete noiseless channel," ETH Zurich, Switzerland.

Undergraduate Projects & Internships

- Dec'16–Oct'17 Veronica Sofia Rodriguez Ossio, "Capacity analysis of one-bit quantized multi-antenna systems," Universidad Carlos III de Madrid, Spain.
- Sep'11–Dec'11 David Sutter, "On the cut-off rate of the Gaussian channel with one-bit output quantization," University of Cambridge, UK.
- Nov'05–Jan'05 Oliver Nagy, "Numerical techniques for computing mutual information rates of channels with memory," ETH Zurich, Switzerland.
- Apr'05–Jul'05 Wenjie Xu, "Firm lower bounds on the capacity of non-coherent fading channels," ETH Zurich, Switzerland.

RESEARCH FUNDING & PROJECT PARTICIPATION

Principal Investigator in Research Projects

- Mar'17–Feb'22 **ERC Starting Grant**, European Research Council
Title: "Information Theory for Low-Latency Wireless Communications"
- Jan'14–Dec'16 **Proyecto I+D+i «Retos Investigación»**, Spanish Ministry of Economy & Competitiveness
Title: "Overhead-Throughput-Optimal Signaling Schemes for Next-Generation Wireless Networks"
- Jun'13–Jun'17 **Marie Curie Career Integration Grant**, European Commission
Title: "Towards an Efficient Mobile Internet"
- Jun'10–Jun'12 **Marie Curie Intra-European Research Fellowship**, European Commission
Title: "Reliable Communication in Integrated Circuits"

Project Member/Co-Investigator in Research Projects

- Oct'14–Sep'16 **CAM I+D en Tecnologías**, Comunidad de Madrid
Title: "CASI-CAM-CM: Conceptos y Aplicaciones de los Sistemas Inteligentes"
Principal investigator: A. Figueiras Vidal, UC3M
- Jan'13–Jan'16 **Junior Researcher Grant**, Swedish Research Council
Title: "Fundamental Limits of User Cooperation in Wireless Networks"
Principal investigator: G. Durisi, Chalmers
- Jan'13–Dec'16 **Plan Nacional de I+D+i**, Spanish Ministry of Economy & Competitiveness
Title: "Avances en Aprendizaje Estadístico, Comunicaciones y Teoría de la Información"
Principal investigator: F. Perez Cruz, UC3M
- Jan'11–Dec'15 **ERC Starting Grant**, European Research Council
Title: "Finite-Length Information Theory"
Principal investigator: A. Guillén i Fàbregas, UPF/Cambridge
- Jun'12–Jan'13 **Plan Nacional de I+D+i**, Spanish Ministry of Science & Innovation
Title: "Distributed Learning in Communication and Information Processing"
Principal investigator: A. Artés Rodríguez, UC3M
- Jun'10–Dec'11 **Isaac Newton Trust**, Isaac Newton Trust
Title: "Information Role Models in Cooperative Wireless Communications"
Principal investigator: A. Guillén i Fàbregas, UPF/Cambridge
- Jun'10–Jan'11 **FP7 Network of Excellence in Wireless Communications**, European Commission
Title: "Network of Excellence in Wireless Communications (NEWCOM++)"
Scientific director: S. Benedetto, Politecnico di Torino
- Jun'12–Dec'13 **CONSOLIDER-INGENIO**, Spanish Ministry of Science & Innovation
Title: "Foundations and Methodologies for Future Communications and Sensor Networks"
Coordinator: J. R. Fonollosa, Universitat Polytècnica de Catalunya

OTHER ACTIVITIES

→ Organizing Committees

11th International Symposium on Wireless Communication Systems (ISWCS 2014), **Special Session Organizer**

Joint IEEE-EURASIP Spain Spain Seminar on Signal Processing, Communication and Information Theory (2014), **Co-Chair**

2016 IEEE International Symposium on Information Theory, **Publications Chair**

2017 European School of Information Theory, **Co-Chair**.

→ Technical Program Committees

23rd Annual IEEE International Symposium on Personal Indoor and Mobile Radio Communications (PIMRC 2012), 2014 & 2016 International Zurich Seminar on Communications (IZS), 11th International Symposium on Wireless Communication Systems (ISWCS 2014), 2017 IEEE International Symposium on Information Theory.

→ Conference Session Chair

International Zurich Seminar on Communications (2012), IEEE International Symposium on Information Theory (2012–2016), IEEE Information Theory Workshop (2013).

→ Reviewing activities (journals & books)

Foundations and Trends in Communications and Information Theory, IEEE Transactions on Information Theory, IEEE Transactions on Communications, IEEE Transactions on Wireless Communications, IEEE Transactions on Signal Processing, Transactions on Emerging Telecommunications Technologies.

→ Reviewing activities (conferences)

IEEE International Symposium on Information Theory (ISIT), IEEE Information Theory Workshop (ITW), International Symposium on Information Theory and its Applications (ISITA), IEEE International Conference on Communications (ICC), International Zurich Seminar on Communications (IZS), International Symposium on Wireless Communication Systems (ISWCS).

Senior Member of the IEEE

2013–2016 **Vice Chair of Spain Chapter of the IEEE Information Theory Society**

SKILLS

→ *Languages:* German (native), English (fluent), Spanish (fluent), French (moderate).

→ *Programming:* Matlab, C.

INVITED TALKS

- ➔ “Rate-distortion bounds via “duality” for entropy-constrained scalar quantization,” ETH Zurich, Switzerland, January 9, 2017.
- ➔ “On Shannon’s lower bound and Rényi’s information dimension,” ETH Zurich, Switzerland, July 29, 2015.
- ➔ “Fundamental limits of short-packet wireless communications,” NEWCOM# Workshop, University of Cambridge, UK, June 26, 2015.
- ➔ “Improved capacity lower bounds for fading channels with imperfect CSI using rate splitting,” Chalmers University of Technology, Gothenburg, Sweden, Sept. 5, 2014.
- ➔ “Diversity versus multiplexing at finite blocklength,” Int. Symp. on Wireless Comm. Systems (ISWCS), Aug. 29, 2014.
- ➔ “How I learned to stop worrying and love outage capacity,” Int. Workshop on Frontiers of Telecommunications & Coding (in honor of Ezio Biglieri’s 70th birthday), Feb. 14, 2014.
- ➔ “On the dither-quantized Gaussian channel at low SNR,” ITA Workshop, Feb. 11, 2014.
- ➔ “The capacity loss of dense constellations,” ETH Zurich, Switzerland, Jul. 11, 2012.
- ➔ “One-bit output quantization and the power loss of hard-decision decoding,” Chalmers University of Technology, Gothenburg, Sweden, Mar. 27, 2012.
- ➔ “Hard decisions do not cause a 2dB power loss,” COMONSENS PCC6 Meeting, Universidad Politécnica de Madrid (UPM), Madrid, Spain, Feb. 6, 2012.
- ➔ “At low SNR asymmetric quantizers are better,” Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Barcelona, Spain, Oct. 28, 2011.
- ➔ “On bandlimited fading channels at high SNR,” 4th Int. Symp. on Appl. Sciences in Biomed. and Comm. Techn. (ISABEL), Barcelona, Spain, Oct. 26, 2011.
- ➔ “At low SNR asymmetric quantizers are better,” Universitat Pompeu Fabra, Barcelona, Spain, Oct. 20, 2011.
- ➔ “Hard decisions do not cause a 2dB power loss,” ETH Zurich, Switzerland, July 13, 2011.
- ➔ “Hard decisions do not cause a 2dB power loss,” Universidad Carlos III de Madrid, Spain, May 12, 2011.
- ➔ “Is the assumption of perfect channel-state information in fading channels a good assumption?,” 2nd Int. Symp. on Appl. Sciences in Biomed. and Comm. Techn. (ISABEL), Bratislava, Slovak Republic, Nov. 26, 2009.