Mohamed Ezzat, MSc

Doctoral student at Geothermal Energy and Geofluids
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Research interests include

Geothermal Energy, Plasma Physics, Plasma Modeling, Plasma Pulse Geo Drilling, Rock Mechanics, Solids Electric Breakdown, MultiPhysics Modeling,

Positions

2018-**present**: **Doctoral student**, Geothermal Energy and Geofluids, ETH-Zurich, Switzerland.
2021-**present**:* **A. Lecturer**, Physics Department, Faculty of Science, MU**, Egypt.
2015-2021:* **Teaching Assistant**, Physics Department, Faculty of Science, MU**, Egypt.
*On study leave, **Mansoura University.

Education

2018-**present**: **Ph.D in Plasma Pulse Geo Drilling**, GEG group, ETH-Zurich, Switzerland.
Supervisor: Prof. Dr. Martin O. Saar;
Thesis Title: Plasma Pulse Geo Drilling under Ambient and High-Pressure Conditions Study with Modeling and Lab Experiment.

2016-2018: **MSc in Plasma Physics and Nuclear Fusion with Great Distinction**;
Joint Degree (Stuttgart University, Germany; UC3M, Spain; Ghent University, Belgium);
Supervisor: Dr. José M. García-Regaña;
Thesis Title: Advanced neoclassical impurity transport modelling with its experimental comparison for TJ-II (Link).

2011-2015: **BSc in Physics**, Mansoura University, Egypt. **Excellent with honor (Ranked** 1^{st}**)**.

Awards and Scholarships

Oct 2018: Four years **Ph.D. contract**, ETH-Zürich, Switzerland.
Sept 2016: Two years **Erasmus Mundus Scholarship**, Fusion-EP MSc.
Nov 2015: **Distinction Award** for ranking the 1^{st} in BSc of Physics, **Mansoura University**.
Apr 2015: **Ideal student**, academic year 2014/2015, Faculty of Science, **Mansoura University**.

Publications

Journals

[1] **Ezzat, M.**; Adams, B.M.; Saar, M.O.; Vogler, D. *Numerical Modeling of the Effects of Pore Characteristics on the Electric Breakdown of Rock for Plasma Pulse Geo Drilling. Energies*, **2022**, 15, 250. doi.org/10.3390/en15010250

[2] **Ezzat, M.**; Vogler, D.; Saar, M.O.; Adams, B.M. *Simulating Plasma Formation in Pores under Short Electric Pulses for Plasma Pulse Geo Drilling (PPGD). Energies*, **2021**, 14, 4717. doi.org/10.3390/en14164717

[3] Horacek, J., et al., **M. Ezzat**, et al., Scaling of L-mode heat flux for ITER and COMPASS-U divertors, based on five tokamaks, *Nuclear Fusion*, 60/6, **2020**.

[4] Ascasíbar, E., et al., **M. Ezzat**, et al., J. M. García-Regaña, et al., and the TJ-II team, Overview of recent TJ-II stellarator results, *Nuclear Fusion*, 59/11, **2019**.

Conferences

[1] **Ezzat, M.**, B. M. Adams, M. O. Saar, and D. Vogler. Numerical Modeling to Study the Impact of Pore Characteristics on the Electric Breakdown of Rock for Plasma Pulse Geo Drilling (PPGD). *Oral presentation in EGW 2021, Online*, 23-24 September **2021**.

[2] **Ezzat, M.**, D. Vogler, M. O. Saar, and B. M. Adams. Simulating plasma formation in pores to investigate key parameters governing Plasma Pulse Geo-Drilling (PPGD). *Poster in SGM 2020, Online*, 6-7 November **2020**.

Schools

11-15.09.'17 **IPP Summer University for Plasma Physics and Fusion Research**, Max-Planck Institute of Plasma Physics, Garching, Germany.

21-25.08.'17 **Plas@Par Summer school**, Plas@Par, Banuyls Sur Mer, France.

20-24.03.'17 **9th ITER International School (Disruptions and Control)**, Aix Marseille University, France.

10-17.07.'16 **PlasmaSurf School on Plasma Physics, Intense Lasers and Nuclear Fusion**, IPFN, Lisbon University, Lisbon, Portugal.

25-27.05.'16 **1st Spring Plasma School**, Port Said University, Port Said, Egypt.

12-14.10.'15 **2nd Workshop in Plasma Physic**, Port Said University, Port Said, Egypt.

Other scientific activities

2017-**present** **Co-Founder** of the Egyptian Plasma Society (EGYPlasma).

2018-**present** **Co-Organizer** of the Spring Plasma School, Egypt, (Sponsors: BUE, ICTP and AVHF).

2019-**present** **Co-Organizer** of the Basic Plasma Summer Course, Egypt, (Sponsors: BUE and AVHF).

2018-**present** **Co-Organizer** of the FusionEPtalks, Fusion-EP and FuseNet.

Internships

26.02-03.03.2018: **Studying landau damping using VLASOV code:** In this hands-on project, we studied the competition between Landau damping and collision. IRFM, CEA Cadarache, France.

19-23.02.2018: **Analysing COMPASS data for the heat flux decay length:** We developed a python script to automatically analyze the divertor-probes data of COMPASS Tokamak, thereby constructing the heat flux profile. Ultimately, our work has been implemented in a published paper. We performed this work at IRFM, CEA Cadarache, France, and we accessed the COMPASS data remotely using the ABACUS cluster of IPP, Prague, Czech Republic.

03-16.12.2017: **Shoulder formation vs Collisionality campaign@COMPASS:** My task was calculating the diverotr-collisionality profile using the divertor-probes array. I had created a python routine for data acquisition, analysis, and constructing the collisionality profile, eventually. COMPASS Tokamak, IPP, Prague, Czech Republic.

Experimental skills

WS 2020 **Rock Mechanics Practical Laboratory**, ETH-Zurich, Switzerland. (Report View).
We performed the mechanical failure tests (i.e., Point Load, Brazilian Tensile, Uniaxial Compression, and Triaxial Compression), which we employed to estimate the tensile strength and UCS to construct the failure envelopes, i.e., Mohr-Coulomb and Hoek-Brown.

SS 2017 **Electrical Probes in Plasmas**, Stuttgart University, Germany. (Report View).
We have measured the plasma parameters of the glow discharge using the single and double Langmuir probes in helium and argon gases. Also, we have obtained Paschen curves of the glow discharge for both gases.

SS 2017 **Wave Phenomena in Plasma**, Stuttgart University, Germany. (Report View).
We used the double plasma device to obtain the plasma density using the plasma oscillation method. Then, we have constructed the dispersion relation and the calculated the damping factor of the ion-acoustic waves (IAW). Finally, we have observed the shock wave transition and used it to calculate the ion plasma frequency.

Numerical skills

Codes

1. **MOOSE:** Multiphysics Object-Oriented Simulation Environment.
2. **Zapods:** A MOOSE Framework application for the simulation of plasmas.
3. **EUTERPE:** Gyrokinetic Monte Carlo - PIC - δf code. Used in the MSc.

Courses

1. Measure the density profile using reflectometry technique. (Report View)
2. Investigation of the mode propagation in the corrugated waveguides. (Report View)

Programming	HPC & clusters	OS	Editing tools
Python, Fortran,	Euler@Ciemat and ETH	Linux	LaTex,
Matlab, HTML,	Marconi@Italy	OSX	Microsoft office,
CSS, SQL, PHP	MARENostrum@Barcelona	Windows	Inkscape, Inventor

References

Prof. Martin Saar
Ph.D. Supervisor
Chair of Geothermal Energy and Geofluids, ETH-Zürich, Switzerland. (Profile) - Email: saarm@ethz.ch & Tel: +41 44 632 3465

Dr. Daniel Vogler
Ph.D. Co-Supervisor
Former Senior Research Assistant, Geothermal Energy and Geofluids, ETH-Zürich, Switzerland. (Profile) - Email: davogler@ethz.ch

Dr. Benjamin Adams
Ph.D. Co-Supervisor
Former Post-Doctoral Associate, Geothermal Energy and Geofluids, ETH-Zürich, Switzerland. (Profile) - Email: adam0068@umn.edu

Dr. José M. G. Regaña
MSc Supervisor
Post-Doctoral Associate, National Fusion Laboratory, CIEMAT, Madrid, Spain. Email: jose.regana@ciemat.es & Tel: +34 91 346 6434

Prof. Waleed Moslem
CO-Organizer, Plasma School
Head of Physics Department, Faculty of Science, Port Said University, Egypt. (Profile) - Email: wmmoslem@sci.psu.edu.eg & Tel: +20 1092529985

Dr. Jan Horacek
Internship Supervisor
Institute of Plasma Physics, Prague, Czech Republic. (Profile)
Email: horacek@ipp.cas.cz & Tel: +420 731879237

Prof. Essam Abulwafa
BSc Thesis Supervisor
Emeritus Professor, Faculty of Science, Mansoura University, Egypt. (Profile) - Email: abulwafa@mans.edu.e & Tel: +20 1000722805