



Institution	Faculty of Physics - Experimental Physics
Remuneration group	TV-L E13
Full-time / Part-time	Part-time (66%)
Start date	as soon as possible (limited to three years)
Application deadline	2024-12-31

About us:

The Chair of **Experimental Physics – Medical Physics** in the Faculty for Physics of the Ludwig-Maximilians-Universität München (LMU) aims to promote research and teaching in the field of medical physics, with special focus on advances in pre-clinical and clinical radiotherapy for a wide range of beam modalities, from established conventional sources of photons and hadrons up to laser-based systems.

We are looking for you:

PhD position for acoustic / ultrasonic imaging (m/f/x)

in Garching

Your tasks and responsibilities:

Particle therapy with protons and heavier ion beams is rapidly emerging as a promising radiation therapy modality due to the superior ability to concentrate energy deposition in the tumor, while better sparing normal tissue and critical organs compared to widely established photons. Despite considerable recent technological advances, full clinical exploitation of the favorable ballistic properties of ion beams is still hampered by the yet unsolved problem of range uncertainties in tissue. In this context, ionoacoustics has been identified over the last years as a promising modality to localize the maximum energy deposition (so-called Bragg peak) [1]. However, the strength and shape of the ionoacoustic signal crucially depend on the spatial distribution and temporal structure of the heating process, i.e., dose deposition. In clinical scenarios, this leads to weak pressures (up to some mPa) in the tenth of kHz frequency range [2], making the detection of the ionoacoustic waves a technological challenge. To overcome this challenge, our team proposed the use of contrast agents [3], aiming to enhance the ionoacoustic emissions and improve the co-registration with other imaging modalities (e.g., ultrasound or X-ray imaging). This will be the topic that the successful candidate will have the opportunity to investigate with our team in the framework of the recently granted DFG project “Contrast enHanced-IonoAcoustics in Proton and heavy Ion beam therapy” CHI-API, see [also](#).

As a part of the team, you will be actively involved in the assessment of novel contrast agents and the development of dedicated imaging strategies, including:

Simulation workflow for in-silico assessment of the expected contrast agent performances *in vivo* in realistic clinical scenarios

- Reconstruction of the dose in patients from contrast-enhanced sonoacoustic signals
- Co-registration of sonoacoustics with patient anatomy from ultrasound morphological imaging and additional pre-treatment images (e.g., X-ray CT)
- Experimental demonstration and validation of the combined sonoacoustic/ultrasound imaging in a realistic phantom at clinical proton beamlines.

Your qualifications:

- Master's degree in physics or biomedical engineering
- Fluent English knowledge (spoken and written)
- A transdisciplinary research orientation with demonstrated research experience or interest
- Ability to work independently and collaboratively in a team environment
- Motivated and self-driven with a passion for scientific research and innovation.

Assessment criteria and other qualifications

The candidates will be evaluated based on their qualifications, suitability for the research topics, and potential as researchers. The following merits are seen as strong advantages:

- Solid background in programming (preferably Python and Fortran)
- Experience in Monte Carlo simulations in ion/proton therapy (preferably FLUKA code)
- Familiarity with photoacoustics and/or sonoacoustics with experience in thermoacoustic simulations (e.g., k-Wave toolbox)
- Practical experience with data acquisition and image reconstruction techniques
- Experience in carrying out research in international and multidisciplinary teams.

Benefits:

We offer you an interesting and fulfilling job with good opportunities for further training and development. Your workplace is located at the Forschungszentrum Garching and is easily accessible by public transport. You will be paid in TV-L E13 66% according **TV-L salary scale**, depending on your professional qualifications. This position is initially limited to three years with the possibility of extension.

Further benefits at the LMU:

- Easily accessible by public transport
- Company pension scheme
- Capital-forming benefits
- Compatibility of family and career
- Mobile working
 - Flexible working hours
- Childcare support (e.g. offers for vacation and emergency care)
- Further education and training program at all career levels
- Participation in symposia and conferences
- Health promotion offers
- Theater and culture: special events, discounts and vouchers
- Mobility: discount on public transport (Job-Tickets), charging stations for electric cars and discounted membership of Share Now (car sharing).

People with disabilities who are equally as qualified as other applicants will receive preferential treatment.

Contact:

Please send your complete application (CV, certificates, list of publications, letter of motivation and two references/reference letters) by e-mail (single pdf file not exceeding 10MB) to Prof. Dr. Katia Parodi **by December 31st, 2024** at the latest: sekretariat.parodi@physik.uni-muenchen.de

Prof. Dr. Katia Parodi
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References

- [1] K. Parodi and W. Assmann 2015 Mod. Phys. Lett. A 30 1540025
- [2] S. Lehrack *et al* 2017 Phys. Med. Biol. 62 L20
- [3] J. Lascaud *et al* 2021 Sci. Rep., 11(1), 2725

Where knowledge is everything.

LMU researchers work at the highest level on the great questions affecting people, society, culture, the environment and technology – supported by experts in administration, IT and tech. **Become part of LMU Munich!**

In the course of your application for an open position at Ludwig-Maximilians-Universität (LMU) München, you will be required to submit personal information. Please be sure to refer to our **LMU Privacy Policy**. By submitting your application, you confirm that you have read and understood our data protection guidelines and privacy policy and that you agree to your data being processed in accordance with the selection process.