

PhD POSITION — FULLY FUNDED

Design and Optimisation of Low-Loss Nanophotonic Waveguides for Enhanced Photon–Phonon Overlap in Integrated Brillouin Devices

Institut Teknologi Bandung (ITB), Indonesia × University of Twente (UT), The Netherlands

THE PROJECT

Stimulated Brillouin scattering (SBS) couples light to GHz-frequency acoustic phonons and underpins a new generation of ultra-narrow-linewidth on-chip lasers, microwave-photonic filters and precision frequency references. The strength of every SBS device is set by one quantity: the spatial overlap between the optical and acoustic modes in the waveguide. This joint ITB–UT project will design, computationally optimise, fabricate and characterise integrated waveguide cross-sections — on Si_3N_4 , thin-film lithium niobate (TFLN) and $\text{TeO}_2/\text{Si}_3\text{N}_4$ platforms — that maximise this overlap, using a genetic-algorithm optimiser coupled to COMSOL multiphysics, and translate the result into an on-chip Brillouin laser.

THE PHD ROLE

Based at ITB and co-supervised across both institutions, the successful candidate will lead the theoretical and computational core of the project, with hands-on exposure to fabrication and measurement during research visits to UT. Key activities:

- **Multiphysics modelling:** build and run coupled optical (Maxwell) and acoustic (elastodynamic) finite-element simulations of waveguide cross-sections in COMSOL.
- **Optimisation:** develop a Python-driven genetic-algorithm loop that maximises the optoacoustic overlap integral subject to fabrication constraints.
- **Theory:** apply electromagnetic and elastic-wave theory to compute Brillouin gain, mode overlap and laser-threshold scaling.
- **Collaboration:** work with the UT Nonlinear Nanophotonics group and the MESA+ NanoLab on device fabrication and Brillouin characterisation.

QUALIFICATION REQUIREMENTS

- MSc (or near completion) in Physics, Electrical Engineering, Photonics or a closely related field.
- **Strong physics foundation**, with particular depth in electromagnetic theory; familiarity with acoustics, solid mechanics or optomechanics is an advantage.
- **Fluency in COMSOL Multiphysics** (RF and/or Structural Mechanics modules); experience with eigenmode and FEM convergence studies preferred.
- **Programming proficiency**, ideally Python (NumPy/SciPy); experience with optimisation methods or scripting COMSOL via LiveLink is a plus.
- Analytical rigour, scientific curiosity, and the ability to work independently within an international collaboration.
- Good written and spoken English; willingness to undertake research visits to the University of Twente.

WHAT WE OFFER

- A fully funded PhD position with co-supervision by Prof. A. A. P. Iskandar (ITB) and Prof. D. A. I. Marpaung (UT).
- Funded research visits to UT and access to the world-class MESA+ NanoLab cleanroom and Brillouin measurement facilities.
- A frontier topic at the interface of photonics, acoustics and nanofabrication, with strong publication and conference opportunities.

HOW TO APPLY

Send (1) a CV, (2) a one-page motivation letter, (3) MSc transcripts, and (4) arrange recommendation letters from two referees to be sent to a.a.iskandar@itb.ac.id with the subject line “PhD – Photon–Phonon Overlap”. Review of applications begins **8 June 2026** and continues until the position is filled. Informal enquiries are welcome at the same address.