Ben-Gurion University of the Negev

The Nano Fabrication Center

ILSE KATZ Center for Meso and Nanoscale Science and Technology

BGU NanoFabrication Facility Overview

BGU nanofabrication facility

- The BGU NanoFab center includes three clean rooms and two nano laboratories
  - Fab 1 opened in 2005
    - Thin films deposition (Sputter, Thermal evaporation, E-gun, PECVD) and etch (DSiE- Oxford Estrelas, DRIE- Oxford Cobra, IBM, Xatics- Si-isotropic XeF2) center
  - Fab 2 opened in 2007
    - Advanced lithography center (DWL, EBL – Raith EPBG5150, Mask aligner, Nanoimprint)
  - Fab 3 opened in 2014
    - Thin films deposition (LPCVD , CVD & E-gun)
  - Two nano lab
    - Packaging , FIB & Characterization
    - Electrical and optical characterization of devices
- Professional staff are employed by the center

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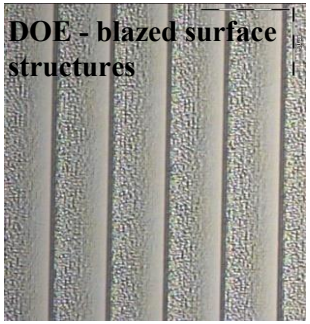
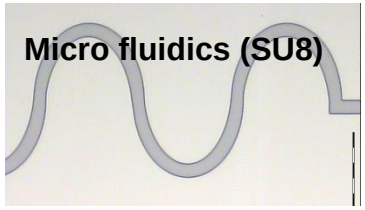
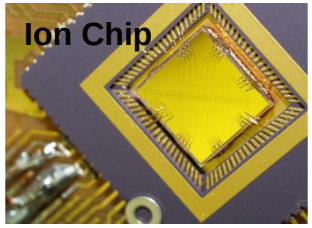
BGU NanoFabrication Capabilities Overview

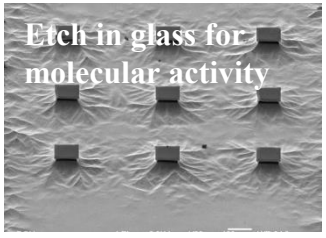
BGU nanofabrication facility

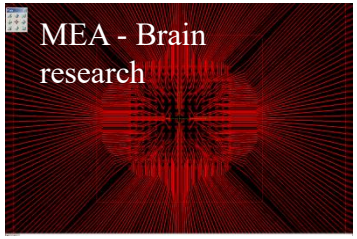
- The BGU Nano Fabrication center is a facility serving academic, industrial and governmental sectors
- The complex incorporates state-of-the-art R&D and prototype fabrication infrastructure for
  - Nano/Microelectronics
  - Nanophotonics and Optoelectronics
  - BioMEMS, BioChip,
  - Microfluids
  - Multielectrode array
  - Nano/ Micro systems (MEMS)

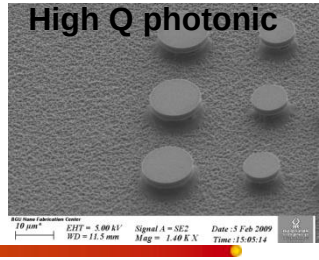












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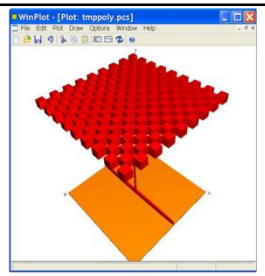
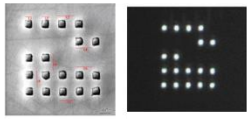
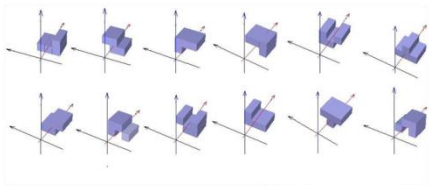
Photonics Devise Fabrication – BGUs' Researchers

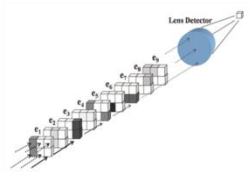
BGU nanofabrication facility



Integral mask structure



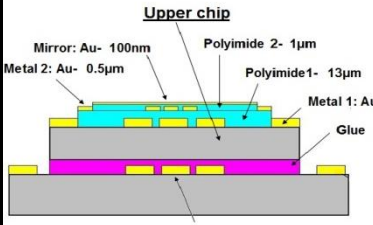


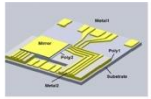


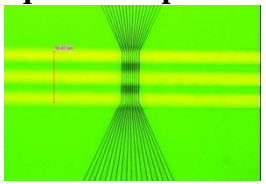
Nano-based optical computation model

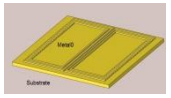
Applications: diffraction elements, optical computer, etc.

Multilayer Atom Chip, dedicated for quantum optics

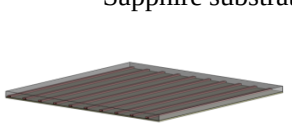


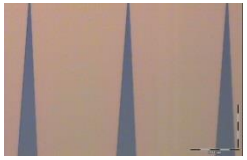


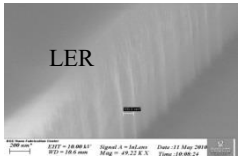




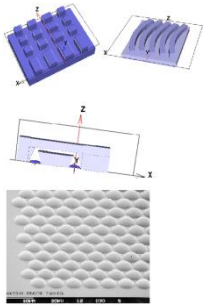
Fabrication of Chalcogenide waveguides on a Sapphire substrate-Amiel Ishaaya

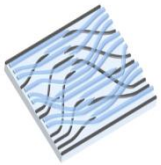




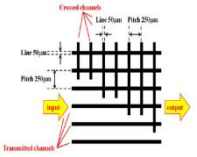


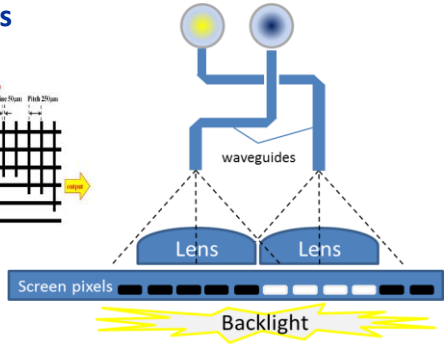
Crypto Glass



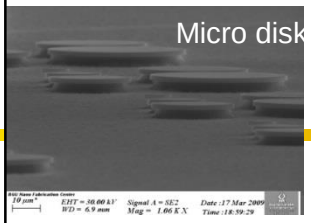


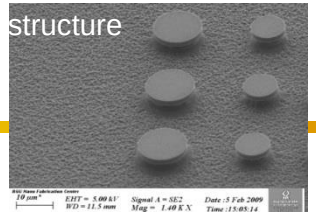
Waveguide bending and crossing.



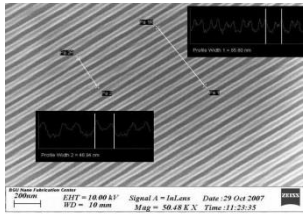


High quality monolithically fabricated micro resonators

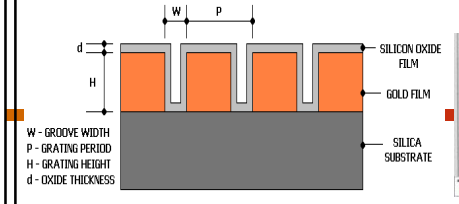


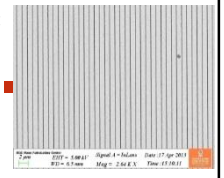


Plasmonics structure



Nanoslits structure





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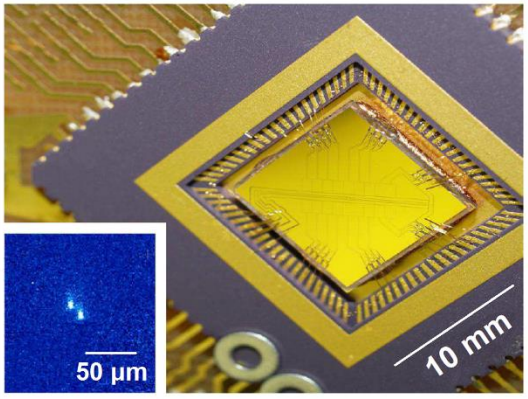
Collaboration with International Academia

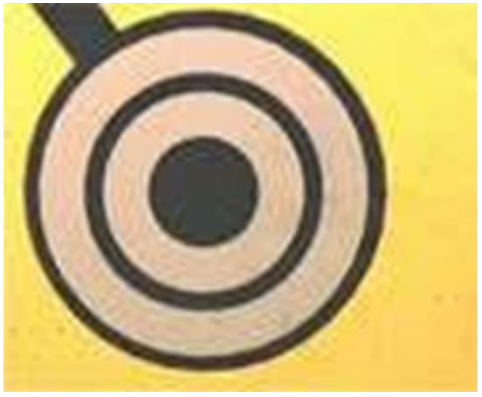
BGU nanofabrication facility

Chips Designed and Fabricated at BGU for our International Collaborations

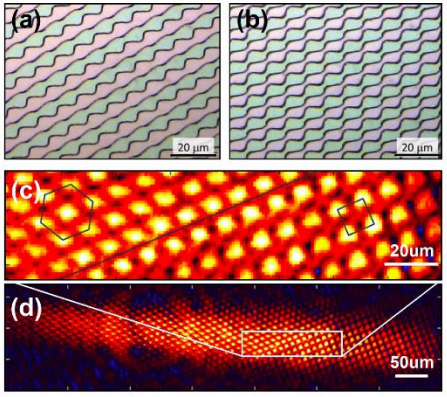
Ion Chip
for testing advanced technologies,
made for the University of Mainz*



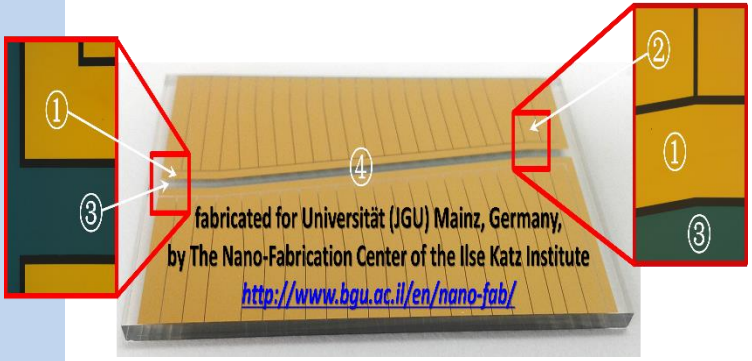
Loops for Sagnac Interferometry
for rotation sensing (inertial navigation),
made for the University of Nottingham*



Permanent-Magnet Atom Chip
for ultra-short-periodicity lattices
(for quantum computing)
made for the University of Amsterdam*



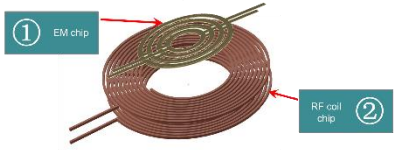
Ion Chip Trap with Transparent ITO Electrodes
Fabricated for University of Mainz, Germany



RF-based Atom Chip for a Guided Sagnac Interferometer
Fabricated for University of Nottingham

Conceptual design

① *Top chip:* two layers of 2 x 70 µm gold planer spirals.
Spacing between coils 3 µm. DC current flows in the coils.

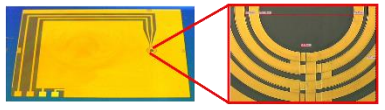


② *Bottom chip:* two layers of 40 x 40 µm copper planar spirals.
Spacing between coils = 200 µm.
AC current (~3A, 2-3MHz) flows in the coils.

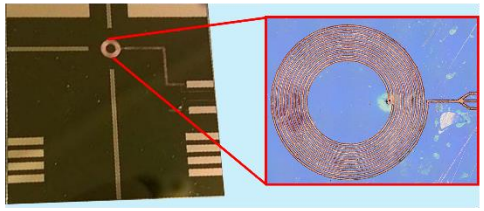
Process highlights:

- etch a 40 x 40 µm trench
- create vias to the other side
- deposit gold seed layer at the bottom of the trench
- copper electroplating
- repeat these procedures on the other side

① **Fabricated EM chip**



② **Fabricated RF coil chip**



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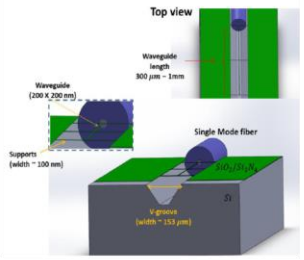
BGU Nano-Fabrication Center Supporting Israeli Universities

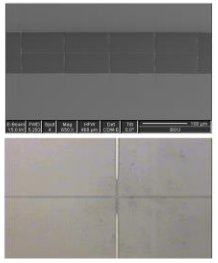
BGU nanofabrication facility

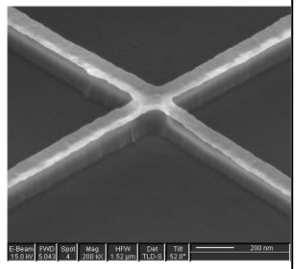
מכון ויצמן למדע
WEIZMANN INSTITUTE OF SCIENCE

Dr. Ofer Firstenberg
Department of Physics of Complex Systems

suspended waveguide

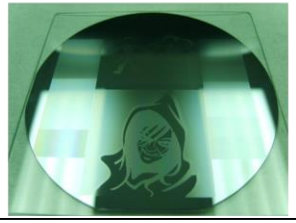


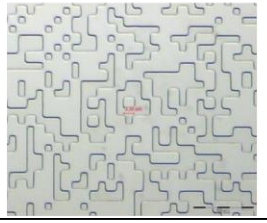


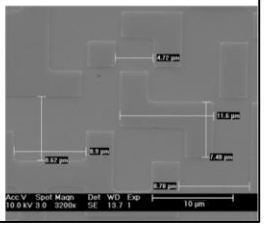


Professor Anat Levin
Department of Computer Science and Applied Mathematics

holographic device



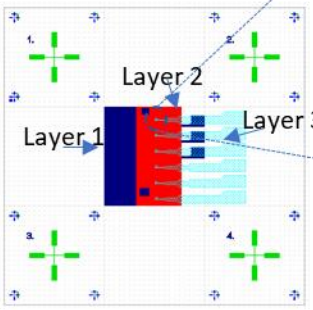




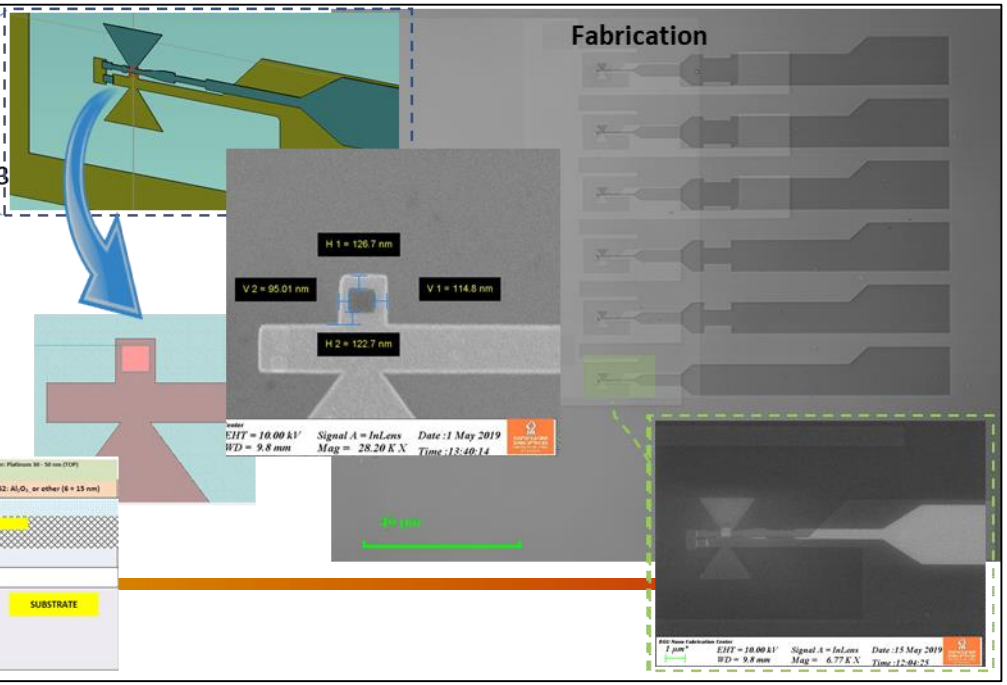
MIM Photonic Circuit

Dr. Shlomo Goldin and Alexander Rozin, Dept. of Physics/Electro-Optic *Engineering (funded by the Ministry of Energy)*

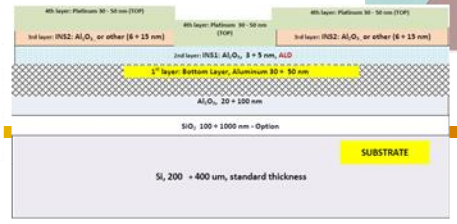
Design



Fabrication



Layer Structure



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Lev Academic Center

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