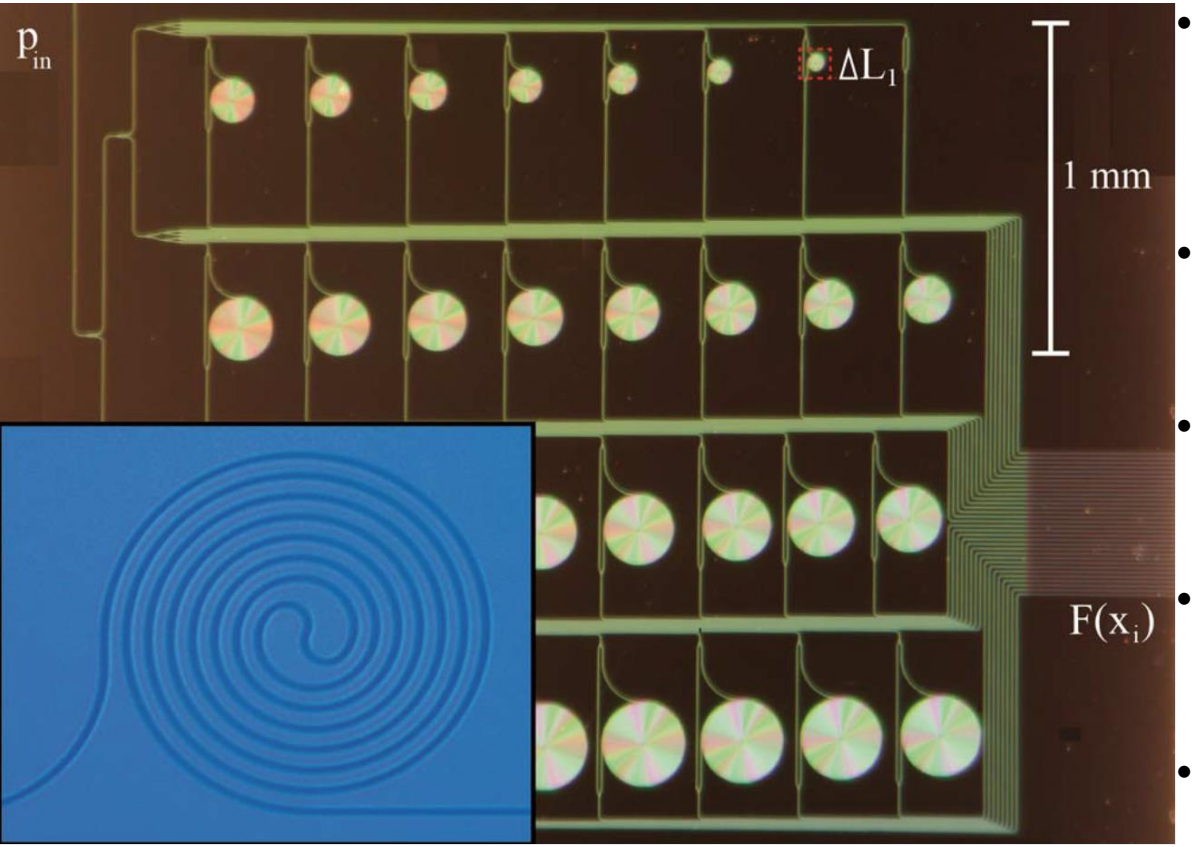
C2.c Task 2.3 – Establish metrology for waveguide-based photonic devices (**CSIC**, JCM, WWU)

- **Spatial Heterodyne Fourier Transform (SHFT) Spectrometer**

  Based on the classical Fourier Transform Spectroscopy, but performs all interferometric measurements in parallel, with no moving elements.



- Resolution is only limited by optical path difference of the longest interferometer.
- Using **Silicon on Insulator**, we can implement tightly coiled spirals.
- We have reached a **42 pm** resolution in a **12 mm^2** device.
- Enables multiaperture configurations
- Both a recipient of the advances of this project, and a practical metrology tool.

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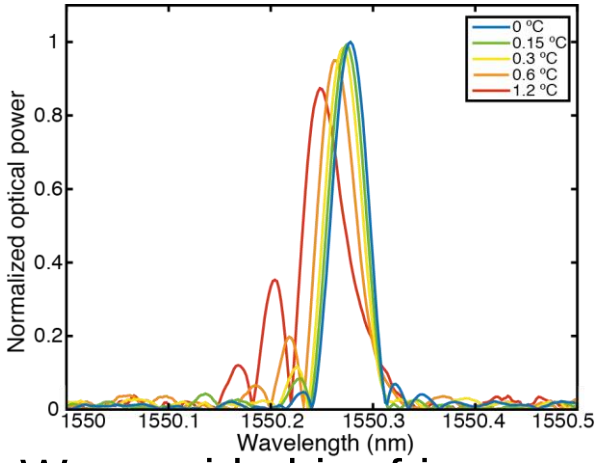
PROBLEMS & OPORTUNITIES

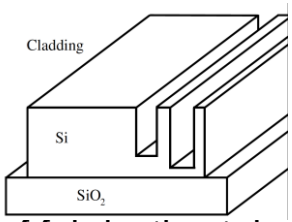
- Temperature dependence



- Waveguide birrefringence
- Fabrication tolerance
- Multi-aperture configuration

PROJECT ACTIVITIES

- **ANALYSIS:** Study of refractive index changes impact on device performance
- **SOFTWARE:** Development of new spectral retrieval algorithms with multiple calibration matrices
- **HARDWARE:** Development of new spectrometers with athermal waveguide structures.
- Development of ultracompact polarisation converters, based on wire waveguides with subwavelength trenches.
  - Current performance: 97.5% conversion in a 10 μm length.



- Numerical study of fabrication tolerance impact, in order to develop more robust devices
- Develop fiber to chip couplers (task 2.2.)