The workshop is devoted to a practical presentation of research possibilities of “Laboratory of Teleinformatic Technologies and Photonics” and discussions on its future cooperation with the research groups and teleinformatic firms.

In frames of the practical part students, divided into two person groups, will have an opportunity to make the experiments in the Laboratory. We offer eight different experimental modules including short introduction to the subject and demonstration of the equipment done by our colleagues and time for measurements conducted by students.

Every student can propose own choice of up to six modules from the following offer:

**In teleinformatic technologies:**

TT 1 - Interferometric tests of ferrule ends of fiber optic connectors (one module)
TT 2 - Measurements of transmission properties of fiber optic connectors (one module)
TT 3 - Measurements of basic parameters of a fiber optic line (two modules)
TT 4 - Use of RSOFT OPTSIM software for the evaluation of the chromatic dispersion and four wave mixing on the transmission quality in a optic fiber path (two modules)

**In photonics:**

F 1 – Non-linear two wave mixing in a photorefractive crystal (two modules)
F 2 – Light beam self-focusing in photorefractive materials (two modules)
F 3 – Examination of light propagation in microstructured optic fibers (two modules)
F 4 – Modelling of light propagation in waveguide structures using OptiBPM software (one module)

Registration for the workshop: foton@zut.edu.pl

Information about the Laboratory: www.foton.zut.edu.pl
1. Laboratory of Teleinformatic Network Components
   Lab carer – Andrzej Niesterowicz

**TT 1 (3 hours)**

**Interferometric tests of ferrule ends of fiber optic connectors**

Introduction to measurements
- presentation of various types of fiber optic connectors,
- definitions of the parameters characterizing the quality of connectors,
- principle of measurements,
- interferometer operation.

Measurements
- preparation of connectors for measurements,
- example measurements,
- method of measurement results recording.

Upon previous arrangements with the lab carer, workshop participants will have an opportunity to measure samples brought with them.

**TT 2 (3 hours)**

**Measurements of transmission properties of fiber optic connectors**

Introduction to measurements
- definitions of the parameters characterizing the quality of fiber optic connectors,
- operation of insertion loss and reflectance meter.

Tests of resistance of selected fiber optic connectors to:
- stretching, twisting, bending,
- vibrations,
- pressure on ferrule-end faces,
- comparing results with IEC standards.

Upon previous arrangements with the lab carer, workshop participants will have an opportunity to measure samples brought with them.
2. Laboratory of Reference Optical Teleinformatic Networks
   Lab carer – Jerzy Gajda

**TT 3 – (2 x 3 hours)**

**Measurements of basic parameters of a fiber optic line**

Introduction to measurements
- possibilities of setting up a fiber optic link from segments (fiber optic cables, couplers, active elements) available at the lab,
- description of measured parameters – attenuation, chromatic and polarization mode dispersion,
- definitions of quantities characterizing the investigated properties of a fiber optic line.

**Reflectometric measurements**
- principle of the measurement,
- operation of reflectometer,
- reflectogram interpretation,
- measurement data recording,
- example measurements.

**Chromatic dispersion measurements**
- principle of the measurement,
- measuring instrument,
- measurement data recording,
- example measurements,

**Measurements of polarization mode dispersion**
- principle of the measurement,
- measuring instrument,
- measurement data recording,
- example measurements.
1. **Laboratory of Photonic Devices**
   Lab carer – Andrzej Ziółkowski

   **F 1 – (2 x 3 hours)**
   **Non-linear two wave mixing in a photorefractive crystal**
   The stand equipped with an argon-krypton laser will be used for setting up a system enabling interference of coherent laser beams inside an SBN crystal. A diffraction grating formed in the crystal via the photorefractive effect leads to an unreciprocal energy transfer from one beam to another (photorefractive two wave mixing).

   **Introduction:**
   - presentation of fundamentals of the photorefractive effect, recording of the holographic grating in an electro-optic crystal and two wave mixing phenomenon,
   - properties of photorefractive SBN crystal,
   - discussion of the experimental setup.

   The experiment will include: measurements of signal beam gain, determination of the grating spatial period through Bragg’s diffraction, dependence of coupling efficiency on the fringe contrast of an interference pattern and the value of voltage applied to the crystal.

   **F 2 – (2 x 3 hours)**
   **Light beam self-focusing in photorefractive materials**
   An experiment will be carried out at a stand equipped with a laser system composed of: high power pumping laser, titanium-sapphire oscillator generating femtosecond pulses, optical parametric oscillator and pulse picker.

   **Introduction:**
   - fundamentals of photorefractive self-focusing and spatial solitons,
   - basic information on photorefractive SBN crystal,
   - discussion of the experimental setup.

   During the experiment the system will be set up for observations of:
   - effects of laser beam self-focusing and defocusing,
   - formation of a spatial optical soliton.

   The planned measurements include:
   - assessment of the effectiveness of non-linear phenomena occurring in SBN crystals for various light wavelengths,
   - determination of time needed to obtain the self-focusing effect in a tested material.

   Upon previous arrangements with the lab carer, workshop participants will have an opportunity to measure samples brought with them.
WORKSHOP ON NONLINEAR PHOTONICS AND TELEINFORMATIC TECHNOLOGIES

Exercises offered by:
PHOTONIC LABORATORIES
Lab Head: Ewa Weinert-Rączka

2. Laboratory of Microstructured Optic Fibers
Lab carer – Grzegorz Żegliński

F 3 – (2 x 3 hours)
Examination of light propagation in microstructured optic fibers
Introduction:
- presentation on ‘Microstructured optic fibers’,
- scope of research done at the Lab,
- description of experimental setup and measuring instruments,
Example measurements of selected microstructured optic fibers.
Upon previous arrangements with the lab carer, workshop participants will have an opportunity to measure samples brought with them.

3. Laboratory of Numerical Research
Lab carer – Marek Wichtowski

F4 – (1 x 3 hours)
Modelling of light propagation in waveguide structures using OptiBPM software
Computers equipped with OptiBPM software developed by Optiwave will offer possibilities of numerical modelling of light propagation in waveguide structures. The software based on the BPM method permits to design and examine different waveguides and integrated optics components, such as: interferometers, directional couplers, multiplexers, light modulators, waveguide sensors etc.
Introduction:
- fundamentals of basic integrated optics components,
- basic information on the OptiBPM software.
The following numerical simulations are proposed:
- investigating the distribution of light field of modes in strip waveguides,
- designing and testing of an electro-optic light modulator based on a Mach-Zehnder interferometer,
- testing of linear and non-linear directional couplers.
3. Laboratory of Numerical Research
Lab carer – Marek Wichtowski

TT4 – (2 x 3 hours)
Use of RSOFTOPTSIM software for the evaluation of the chromatic dispersion and four wave mixing on the transmission quality in an optic fiber path

The computers equipped with RSOFTOPTSIM software will allow to perform numerical modeling of transmission in optic fiber line. Particularly, the effect of various phenomena on transmission quality can be examined by different methods, e.g. eye-diagram analysis.

Introduction:
- basic information on RSOFT OPTSIM software,
- chromatic dispersion phenomenon and methods of its compensation,
- chromatic dispersion compensation in the OPTSIM program,
- four wave mixing phenomenon and techniques allowing to estimate its effect on transmission quality.

During the workshop, the participant will choose numerical problems for analysis, concerning e.g.:
- pre- and post-compensation, and symmetric compensation of chromatic dispersion,
- four wave mixing in DWDM systems.