A software tool for plasmonic biosensors

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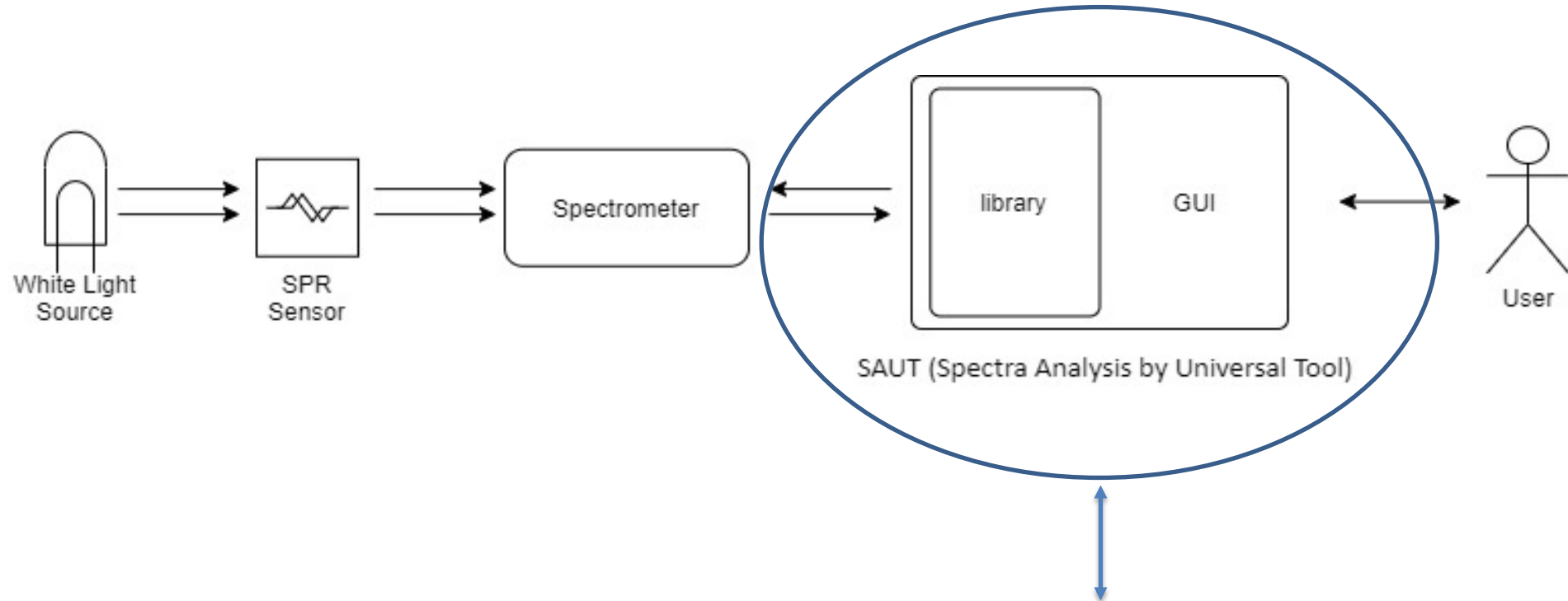20139 Milan, Italy

Outline

- Focus of the work

- Surface Plasmon Resonance Sensor Systems

- "SAUT" software and some experimental results

- Conclusions

The focus of the work

For the developed SPR sensors based on optical waveguides we want use **a universal experimental setup based on a simple equipment and a Universal Software.**

The focus of the work

White Light Source → **SPR Sensor** → **Spectrometer** → **SAUT (Spectra Analysis by Universal Tool)** [library | GUI] ↔ **User**

We want a tool simple to use and can be applied in several plasmonic sensor configurations, where the measurements can be carried out in spectral mode.

The tool should be useful in different application fields, such as point-of-care applications, environment monitoring, Internet of things (IoT) applications, security, and industrial applications. The key features should be portability and performance, taking advantage of technological developments, either hardware and software
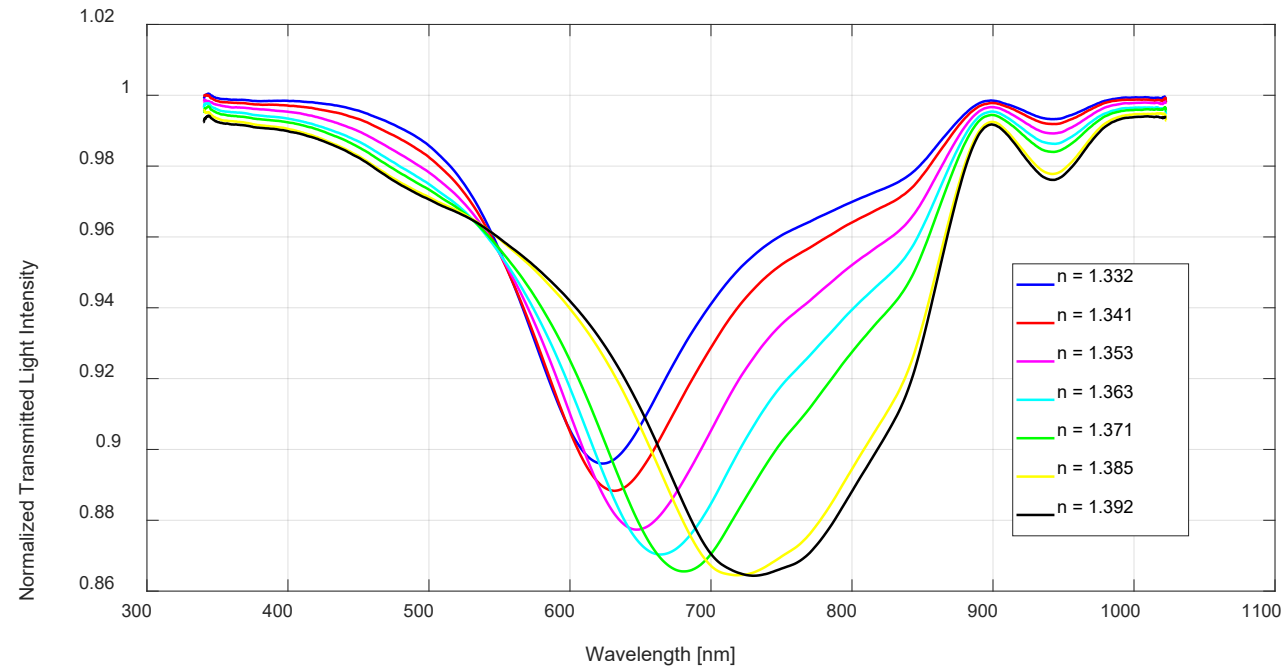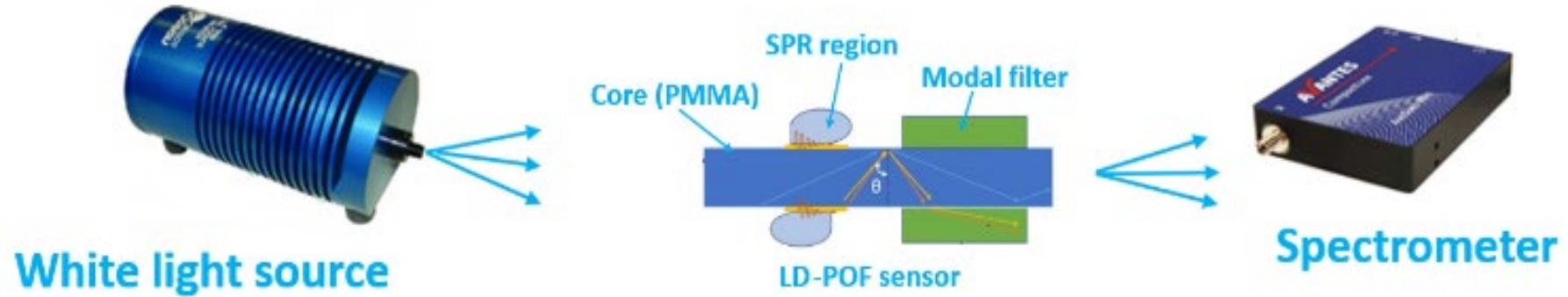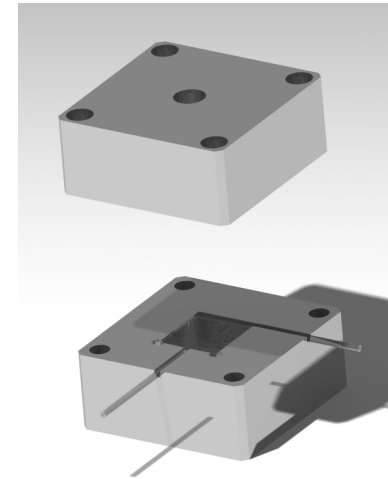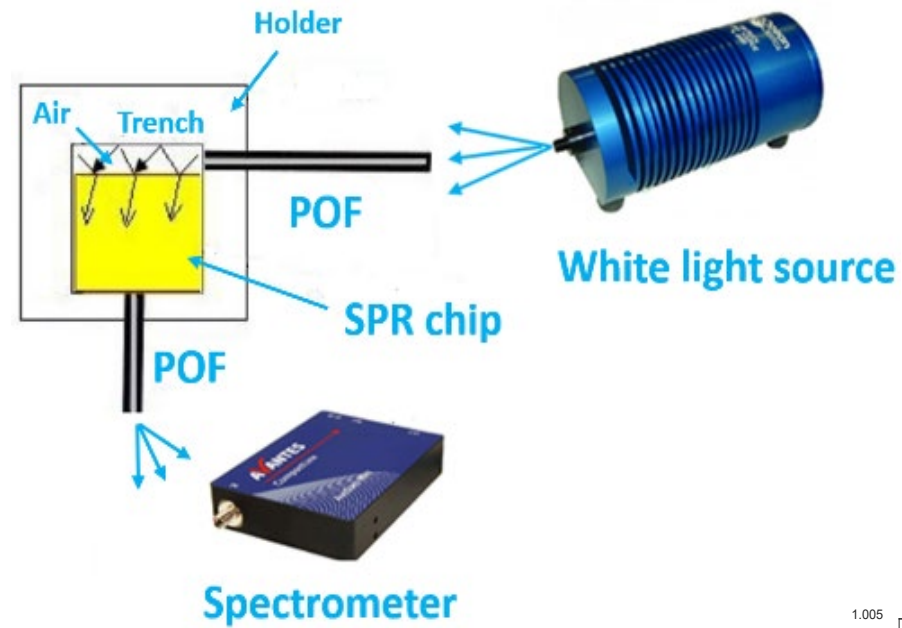
SPR-POF Sensor Configuration
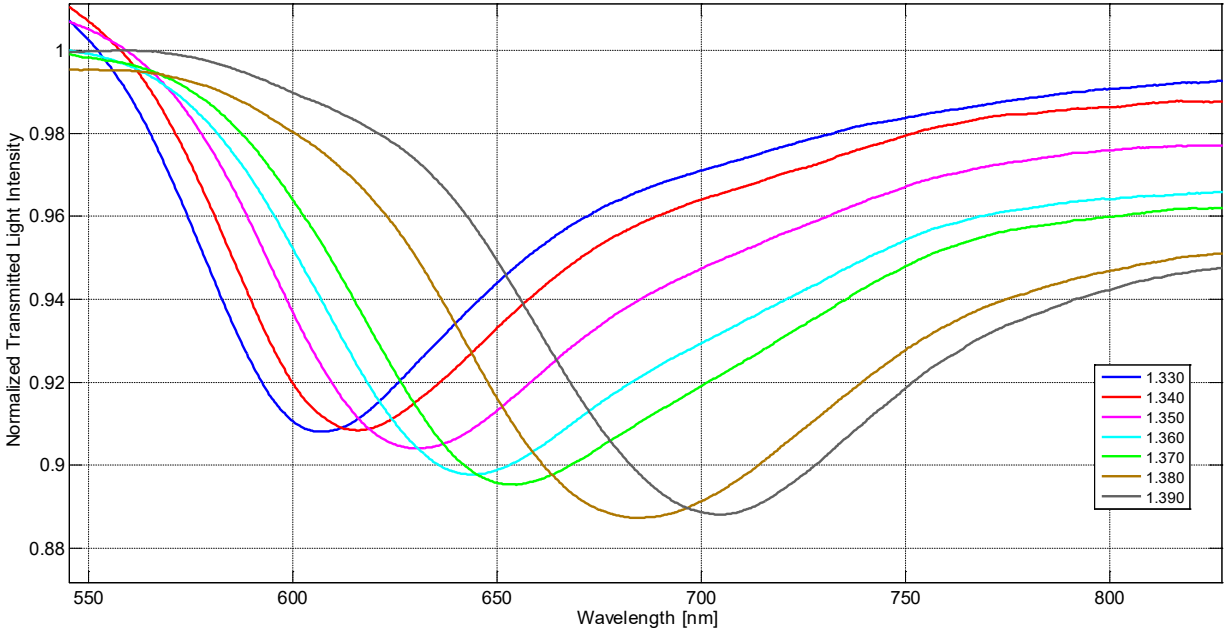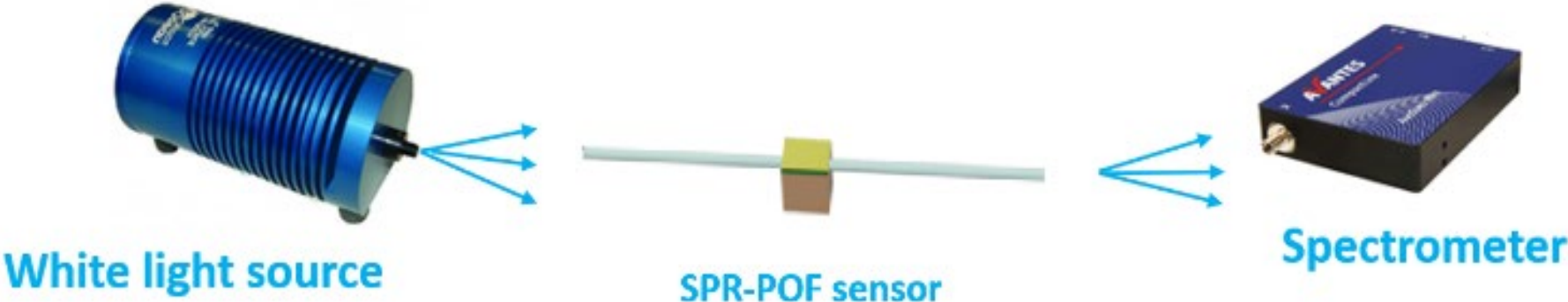
SPR Silica LDF Sensor Configuration

White light source

Core

Sensing medium

Gold

Cladding

Spectrometer

Silica LDF sensor
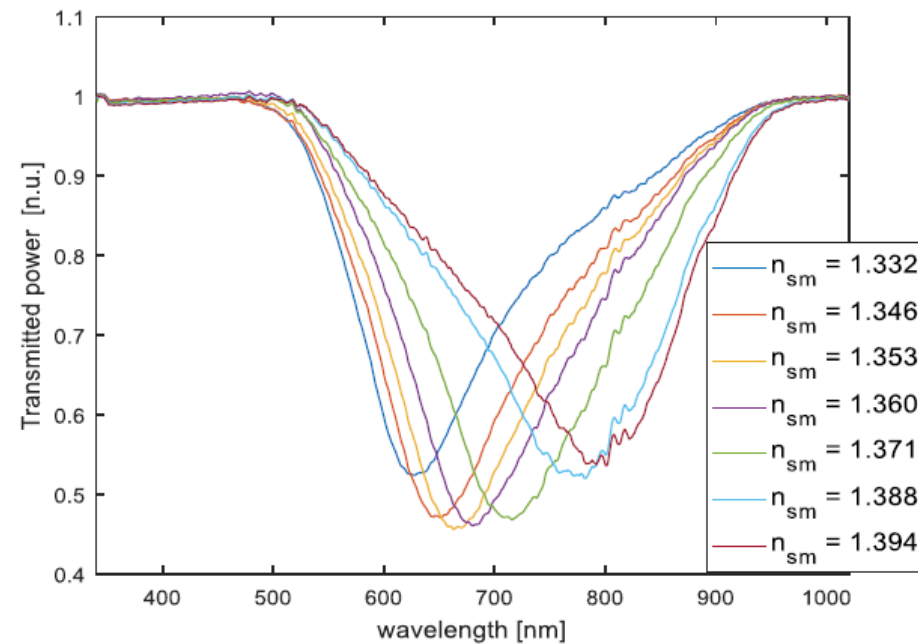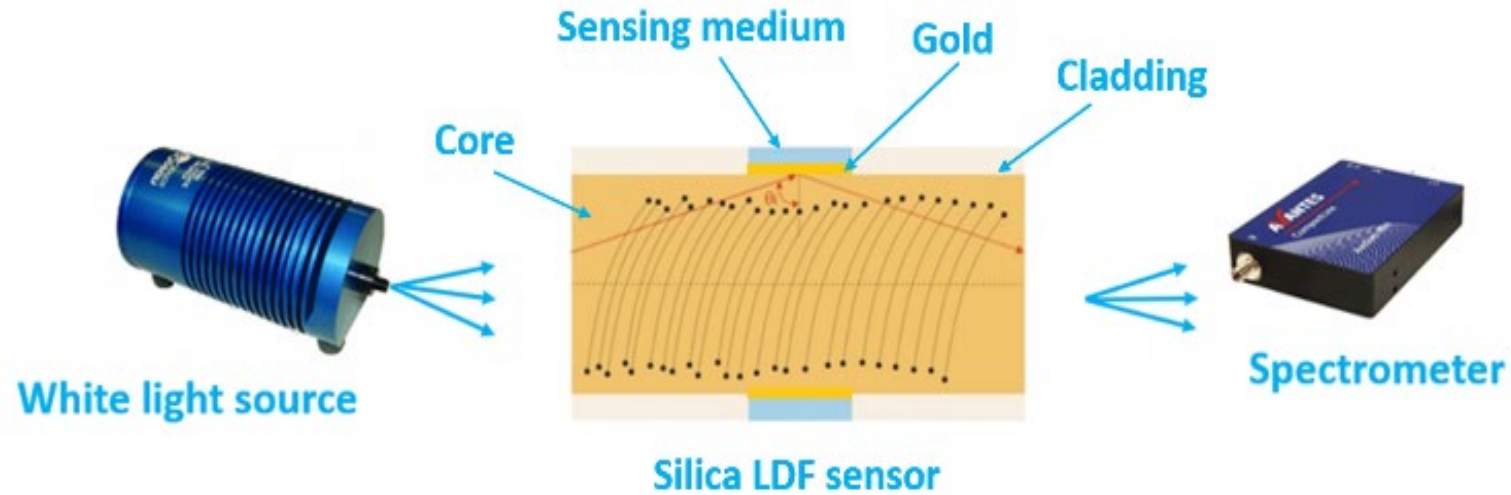
SPR-LD-POF Sensor Configuration

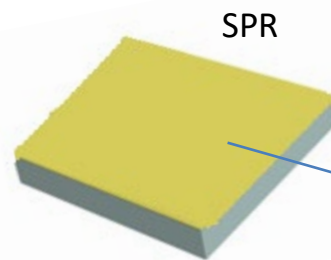# SPR/LSPR PMMA-Slab Sensor Configurations

Holder
Air Trench
POF
White light source
SPR chip
POF
Spectrometer

PMMA chip dimensions
10 mm x 10 mm x 0.5 mm

SPR

LSPR & SPR

Normalized Transmitted Light Intensity vs Wavelength [nm]

Legend:
1.332
1.345
1.353
1.363
1.374
1.385
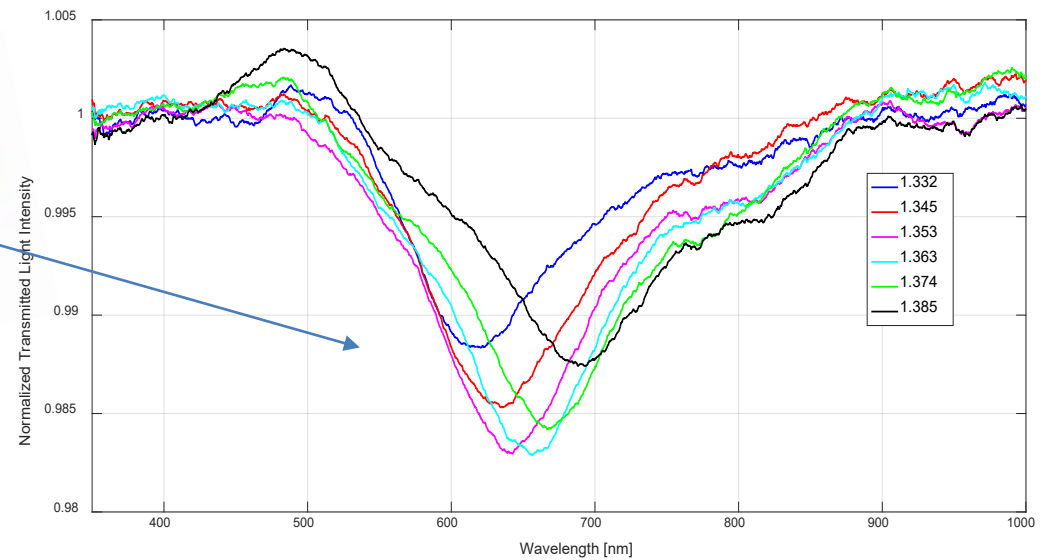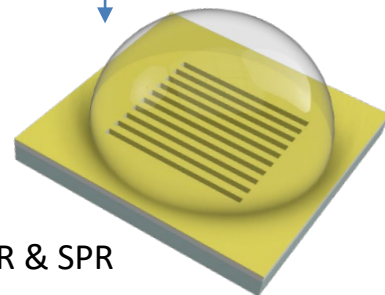
Spectra Analysis by Universal Tool (SAUT)

Flow chart diagram of the algorithm
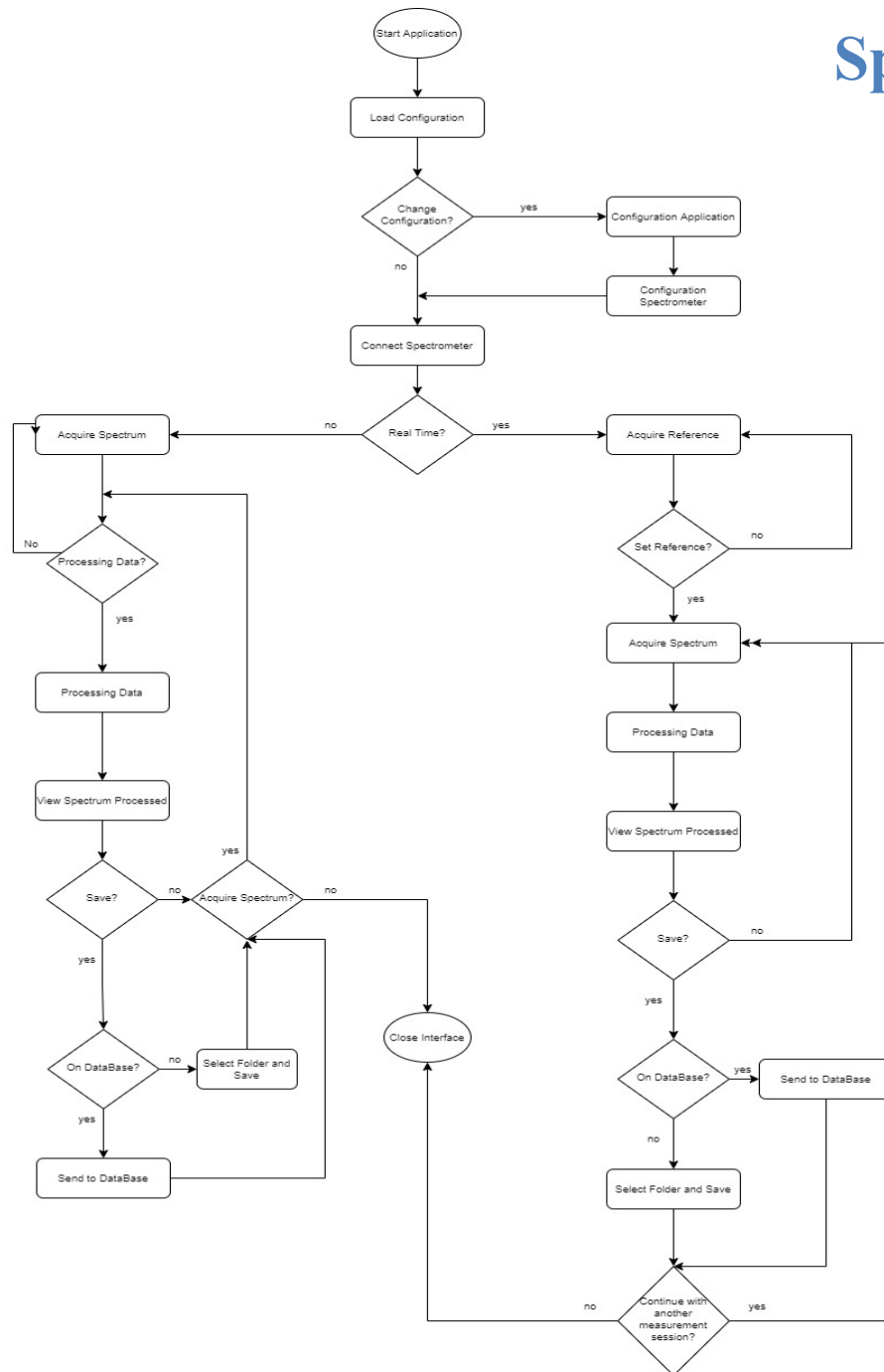
It is possible to distinguish two principal operating modes, called "Static Mode" and "Real-Time Mode", each of which with a dedicated user interface

Spectra Analysis by Universal Tool.
Some Key points

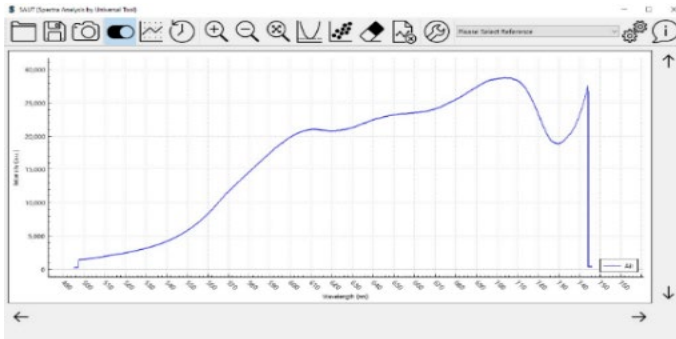The tool, "Spectra Analysis by Universal Tool" (SAUT), has been developed through the "QT Creator" development environment with the language C++ and various packages (starting from open source code and adding parts for our needs), such as interface graphics essential to visualize and to study the obtained results.

The software has been realized with the logic of the modules, i.e. Graphic User Interface (GUI) and library (e.g. .dll .so); in this way, for instance, when changing the spectrometer it's necessary to change only the library and, for the user, no functionality will change and the other way around.

The application gives the possibility to configure all the instrumentation, configure the database and folder to save the results, to acquire a simple spectrum and to acquire in real-time. In particular, it is possible to distinguish two principal operating modes, called "Static Mode" and "Real-Time Mode", each of which with a dedicated user interface.
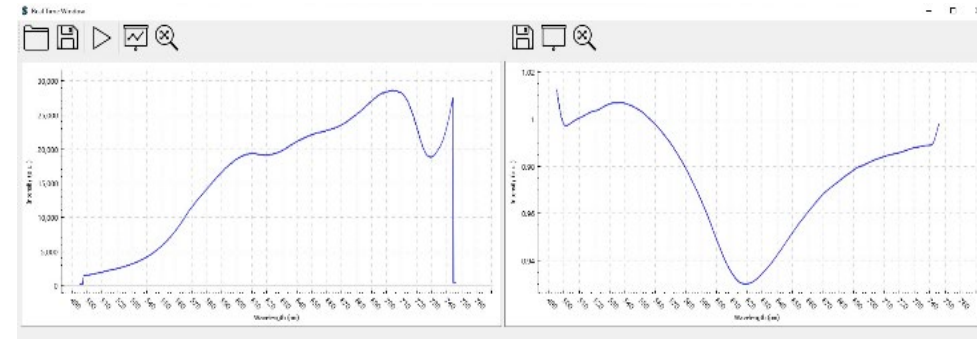
SAUT interfaces

"Static Mode" (see Figure) foresees that the transmitted spectra can be acquired through the GUI whenever the user desires. Moreover, it is possible to visualize the normalized spectra on the screen by simple selecting, from the previously acquired ones, a reference spectrum with the help of a combo box.

On opposite, when "Real-Time Mode" is selected (see Figure), the visualization screen is split in two different panels. In particular, the transmitted spectrum is acquired and shown on the left panel time continuously; in the same time, by fixing a reference spectrum, on the right panel it is also possible to show the normalized spectrum in real time as well.

SAUT interface for "Static Mode"

SAUT interface for "Real-Time Mode".

An experimental test
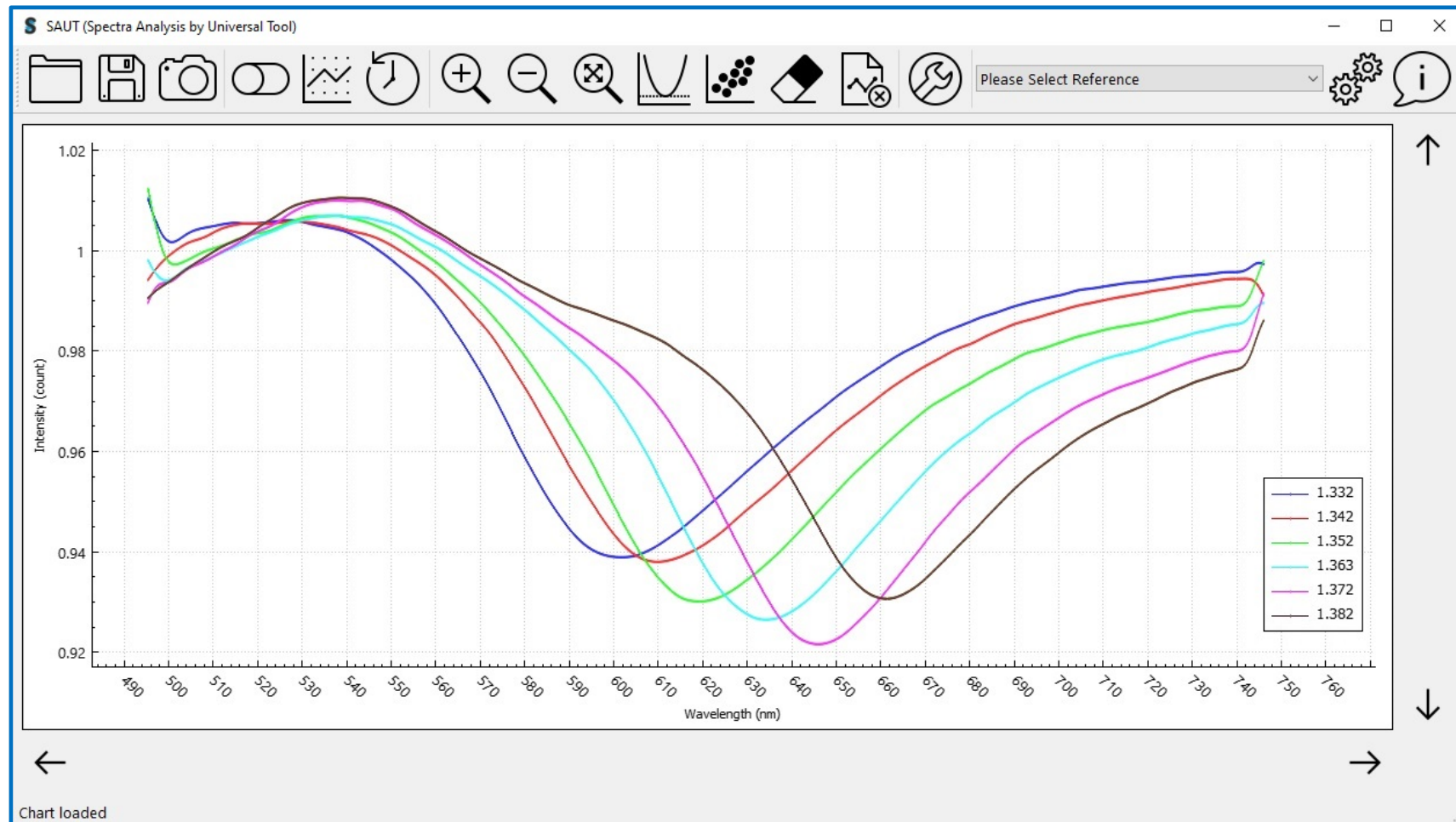
Results obtained by six different water-glycerine solutions
with a refractive index ranging from 1.332 to 1.382

Conclusions

•We have developed and tested an universal software tool for SPR sensors.

•The presented tool is compatible with several SPR sensor configurations, based on spectral mode interrogation, such as the plasmonic sensor configurations here briefly described.

•The tool also contemplates the possibility to communicate with external servers, in order to be a suitable solution for novel applications where IoT sensing is required.

Thank you for your attention

V:

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