BabyLux

Newsletter n° 5

December 2015 / June 2016

News

Babylux prototype: a step away from the starting blocks

Demonstration tests in laboratory settings are finalizing the BabyLux prototype and, in a few months, things will be ready for clinical demonstration in Milan, at Ospedale Maggiore Policlinico, and Copenhagen, Rigshospitalet. As a matter of fact, in a continuous and strenuous process of improvement, BabyLux has already come to a second version of the tool. The design has changed significantly to allow a better integration of all components, which means that it grew bigger and more complex as Ignacio Rochetti, from Loop, tells us.

As a result **a second version** has been delivered anew with: updated components for the TRS module, to improve measure accuracy, robustness and easiness in operation; an updated DCS module with the benefits of reducing costs and improving accuracy, timing reliability, and the selectivity to the cerebral tissues; an updated fibre-optical probe to support a better shielding of the DCS fibre to ambient light; the implementation of a second DCS detection channel to improve signal quality. Some major innovations have been introduced to the software as well (updated GUI for the TRS module, the first TRS module work flow, the development and implementation of the I/O controller firmware, and the full implementation of the FPGA correlator as well as a new release of the TH260 pico libraries).

The internal design has been reorganized to accommodate a more powerful cooling system and the new optical components, with new safety board to cope with the clinical high standard security requirements. The external case has been reshaped to accommodate the new components, a lid covers the connectors and drawers host calibration instruments.

People

IGNACIO ROCCHETTI
Loop

Loop has more than 20 years of experience in the market defining new business models by creating and developing new products and new user experiences. Thanks to its highly qualified background, it is in charge of the product design, the user experience, the interface design, and prototype manufacturing. Ignacio Rochetti tells us more about it…

BabyLux prototype is almost ready to be tested in a clinical environment. We know it will be a robust and non-invasive tool, easy to operate by busy clinical staff. To what extent is the design pivotal from this point of view?

This is actually the second prototype that has been assembled during the project. The first one was just a look-alike, a mock up built last year and used to collect information for the final users, in order to show what the product would be like and the kind of interaction they might have with it. The current product, the second prototype, might be a little bit more complicated, but it has more components inside. They turned out to be necessary to reach the level of performance we are expecting from the tool. As a matter of fact, we found out that we had to include more internal components to introduce the TRS and the

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DCS. This is the reason why the second instrument is bigger than the first one and probably a little bit more complex, but we are quite comfortable with the results. What's more, the current prototype can be used in two ways: as a stand-up with wheels, in order to move in the hospital; and in a desktop position, in order to be more versatile.

What are the challenges that are still to be faced?

Now we are adjusting a few details as to be ready to start with the clinical proofs. The next challenge is that of improving the user interface of the product in order to adapt to the needs of the people who will work with it, especially doctors and nurses.

Any complications or difficulties that could have been avoided so far?

Honestly none. We are very happy to take part to this project. The team works very well and it is very good to see how people from different countries, with different knowledge, can work together so well.

ROBERTA RAMPONI
Photonics 21

Roberta Ramponi, Full Professor at Politecnico di Milano, is the Director of the Institute of Photonics and Nanotechnology of the National Research Council (IFN-CNR) in Italy. She is vice-president of the International Commission of Optics (ICO) and a member of the Board of the Stakeholders and of the Executive Board of the European Technology Platform Photonics21. It has been a honor for us to interview her during ICT 2015, where, together with Alessandro Torricelli presenting BabyLux, she took part to the session "A strong ICT for a Strong Economy"…

Photonics has passed from being a niche activity to a key enabling technology, playing a central role in a wide variety of contexts, from industry, to communication, to health care. In this respect, how do you evaluate the potentialities of the BabyLux project?

Photonics is displaying a central role in many activities and in various industrial developments that impact on numerous of the present societal challenges. One of the key areas where photonics is playing an essential role is health care. In this respect, the BabyLux project addresses a real need that is not met by any of the existing technologies and shows a very good example of strong cooperation between academia, where a new method for testing and monitoring blood flow inside tissues has been developed, and industry, which can promote the application of these basic research results to build a prototype and something that can really become a product for the market, impacting on medical care.

How do you reduce the gap between research and the market in this kind of projects?

Well, the present situation suffers from the problem of some kind of lack of education in academic researchers to move to the market and somehow, let's say, to really transfer their knowledge and their results to real products that can be used for different applications. On the other side, from the industrial point of view, there is sometimes a lack of trust in the academia, assuming that academic people are interested only in having good academic results but they don't care so much about applications. The real key point is to have them to work together since the very beginning, sharing the final goals of the research so that they see a common aim. This helps a lot to create a strong trust between academia and industry and, in the end, in promoting real innovation.

Basic research vs applied research; public-funded research vs privately-funded research. How do you evaluate the state of the art and what are, in your opinion, the competitive processes that should be set in motion, especially in a European context such as the one that's hosting us in Lisbon today?

Well, financial support is a big problem, especially in Europe where venture capitalism is not so easy to find. The role of public funding is really essential in this respect. The problem is to find schemes that go beyond the traditional, usual frames to be able to finance this cooperation between industry and academia. Within a European project called "Act fast", a network of advanced research facilities support the development of industrial products that are brought to the panel, let's say to the network, directly by industry. Industry puts forward a project and asks for support and the support is given with the funding of the European Commission. So, I think that this is a scheme that really promotes innovation with a very, very efficient use of public resources.

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As a member of the Executive Board of the European Technology Platform "Photincs 21", what are, in your opinion, the main challenges of photonics in the next future?

The main challenges of photonics in the next future are to address the societal challenges and somehow to go beyond, let's say, the scheme of industrial competitiveness where academia and industry have been working together. I think that photonics is a very good example of how academia and industry can share a roadmap for real innovation. But I think that once we reach and maintain an industrial competitiveness, we also need to address the end-users with greater strength, because, in the end, the market has to find its applications with products that must be useful to them. So I think that looking at the end-users' needs and also looking at the other cats that can bring added value to photonics, that is working on a crossed-cat scheme, can really be the challenge to be met for the future.

BabyLux Talks
Episode #6

Watch the extended video interview

www.youtube.com/watch?v=0mJ5ru_cl_I

The voice of the EU and the one of common people drawing nearer…

"BabyLux has a high potential of deploying photonics solutions, especially in the health care sector. Nowadays, the photonic sector is growing very quickly and BabyLux project specifically is a kind of pilot demonstration that helps to bring the project quickly to the market. So, it is not a typical research project, it's a demonstration in the hospital with the aim of saving babies' lives… The European challenges for the future are many… The health issue has a huge importance for the general public. " (Tanya Nikolova, Photonic Unit, European Commission at ICT 2015, LISBOA, 20-22 October 2015)

BabyLux Talks
Episode #5

Watch the extended video interview

https://www.youtube.com/watch?v=9iJfrKk3bB0

"I express all my respect, admiration and wonder for the project" … " The fact that 1% of babies' lives can be saved means a lot. It is extraordinary!" … "If we could develop a non-invasive system that helps us to monitor the central nervous system, that would be unbelievable" (Visitors at "Meet me Tonight", MILAN, 25-26 September 2015)

BabyLux Talks
Episode #4

Watch the extended video interview

https://www.youtube.com/watch?v=dLP_owlR0Vs

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Prototype technical features

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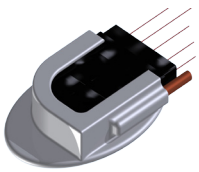
An optical neuro-monitor of cerebral oxygen metabolism and blood flow for neonatology

Near–infrared diffuse correlation spectroscopy (DCS) & time resolved near-infrared spectroscopy (TRS)

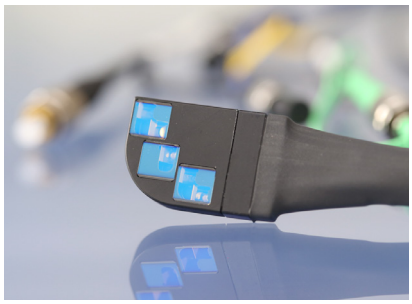
combined in a portable device for non–invasive cerebral oxygen metabolism & blood flow monitoring

BabyLux takes up complete R&D works and **extends already tested prototypes to the level of demonstrator**, bridging the gap between research products and commercialization. The project aims to provide a non-invasive, portable and highly reliable tool, easy to operate by busy clinical staff. The device can be brought to the bedside, measurements can be done in a few minutes and repeatedly, if the condition is critical.

The system is based on near-infrared diffuse correlation spectroscopy (DCS) and time resolved near-infrared spectroscopy (TRS). Both technologies work in a wavelength range called the “physiological window” (600nm-900nm) which allows to reach deeper tissue layers, sampling at the depth of the cerebral cortex. DCS provides tissue hemodynamic information, the local micro-vascular cerebral blood flow (CBF), and TRS measures locally the optical tissue properties allowing to deduce information on oxygen saturation and total hemoglobin concentration. By this innovative combination of an accurate state-of-the-art TRS and DCS for the first time in a single robust instrument a set of information for monitoring the local cerebral oxygen metabolism becomes accessible.



BabyLux TRS/DCS HYBRID Sensor. Dimensions 40x26mm.



TRS/DCS HYBRID SENSOR, second prototype.

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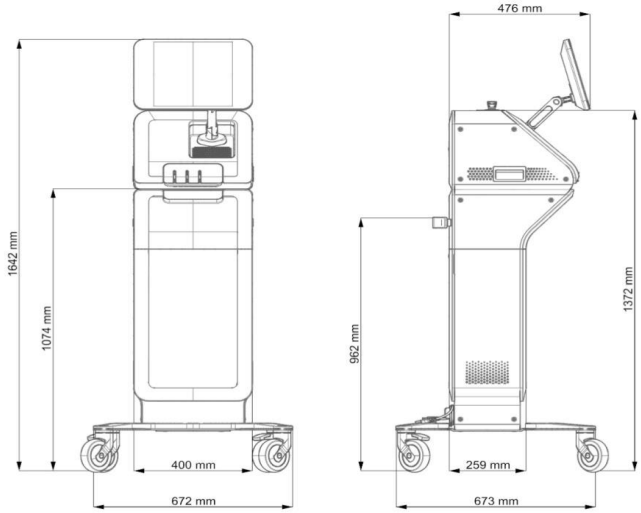
Essential features:

1 The **stand-up configuration** is the main configuration to be used in normal conditions, though it can be used in a **desktop position** as well. Both modules (main and battery module) are connected to preserve the basic functions of the device without electrical power connection and avoid set-up times between device uses and movements.
The main module and the battery module can also be detached in order to use the main module in the desktop position as a stand-alone device.

2 With its bottom trolley, the device is **easily movable** by means of the rear handle. For final placement, the two wheel lock system assures stable positioning in the ICU room.



3 The main idea is to have an intermediate clamp between the device and the head sensors to be fixed in the cot. This is **more comfortable for the baby** for not adding any weight of fibres to the sensor, in particular when he/she moves the head. Moreover, it avoids that any accidental movement of the fiber strains the baby's head.

4 The **graphical user interface and data representation** is designed for two principal application scenarios. First, as an easy control monitor with large number representation of main parameters and second, as continuous monitor providing graphical representation of the parameter evolution over time. Furthermore, additional information is offered on demand by changing between the main window and secondary windows.

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