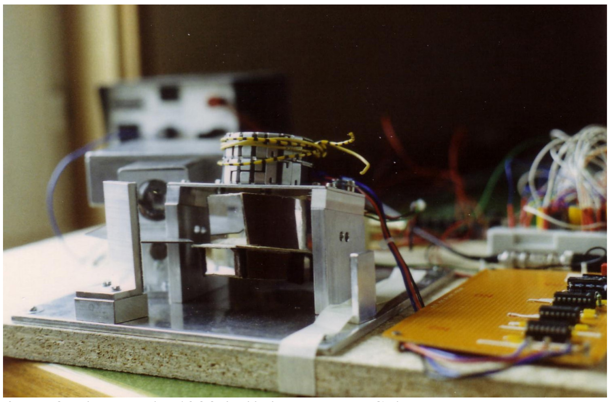
How to eat an elephant?
Simple, one bite at a time.
But start today!

CEO's Note – A breakthrough in my life!

Dear Readers,

In 1985 – one year after I graduated from the University for Applied Sciences in Zurich – something important in my professional life happened. For the first time, I came across distance measurement by the use of light. Actually, measuring the time of the travel of light from an emitter to a receiver. At that time, this technology was called LIDAR (LIght Detection And Ranging) and mainly used for meteorological, defense and space applications. All of them have in common, that the operating range is in the kilometer range with meter resolution, or let's say, in the long range field of use. I was fascinated by this principle and I thought this should also be possible in the close range regime. A dream was immediately born in my mind: To measure distances in the range of meters or tens of meters but with a resolution and accuracy of centimeters or even millimeters. The long range application is, in terms of distance measurement, quite simple. The time for light to travel one meter is about 3.3 nanoseconds. Time measurement in the nanosecond range is not very difficult nor was it back in 1985. However, if we want to measure millimeters, it's a different story. Time measurement in the picoseconds with a signal dynamic range of more than 80dB is needed! And, if this should be implemented into a low cost application like an automatic door sensor where it should take a complete 3D image with hundreds or thousands of frames per second. Today, this technology is known as 3D-TOF imaging.



3D-TOF imager in 1988 built by Beat De Coi

In 1988, I built my first 3D-TOF camera. It was based on a laser scanner and could reach 5 meters, 10,000 pixel per frame, 10 frames per second and an accuracy of some centimeters. However, it was very bulky and expensive since it needed a rotating mirror to deflect the laser beam and to project the receiver axis to the laser spot. The laser was pulsed with 25 Amps (!) with a pulse rise time of around 2 nanoseconds. The receiver circuit used an ultrafast photo diode and the electronics was full of gigahertz transistors. Not cheap at all! But it worked and it proved that the principle is feasible.

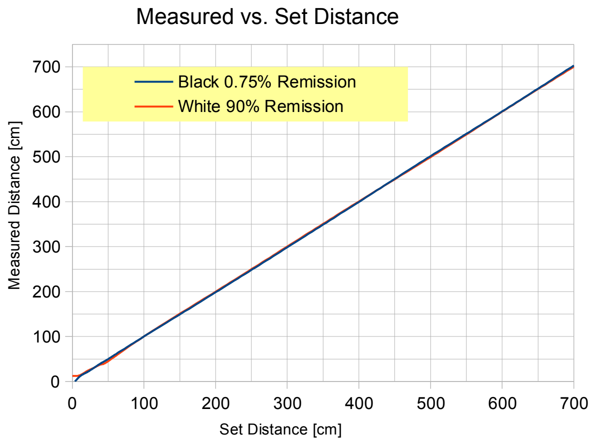
But something better had to be found. If the solution is not solid state, the cost will always be high, the size will be big, the performance limited, mechanical shock and vibration a killer, the response time and the power consumption beyond usability. This was the starting point for my 25 year journey through solid state technology based on silicon semiconductors. Since we could not find a foundry which was able to achieve the sensitivity we needed in the near infrared light domain, I almost gave up. The only way out of this dilemma was to develop our own technology: Our OHC15L process in our own semiconductor company, ESPROS Photonics Corporation, or in short, epc.

epc was established to continue this journey. Namely to provide 3D-TOF imagers with millimeter resolution, high accuracy, high frame rate, low power consumption and low cost. In March 2013 we achieved the breakthrough I had been working for, for the last 28 years. We achieved production readiness for our 3D-TOF chips epc600 and epc610. With single shot measurements, the distance noise is less than 3 Millimeters, the range is 7 Meters on an object with just 0.75% remission and frame rates of more than 1,000 frames per second are possible! And all of this with very low power consumption in the milliwatt range and at very low cost.

It took 28 years of my life to achieve this. And it was not only me: All the stakeholders of epc believed in the idea I had a very long time ago. Now, the doors are open for many fantastic applications. 3D-TOF is now available on chip scale. And the next products with high resolutions are already in the pipeline.

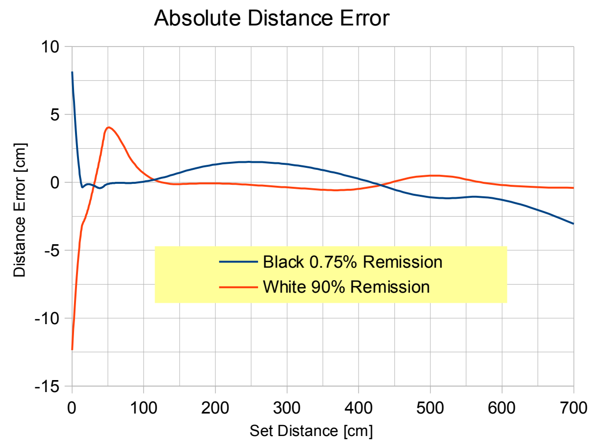
Beat De Coi

The following data were created with an epc600 Evaluation Kit. The kit is based on a simple camera design with only 2 illumination LEDs which are directly driven by the chip. It uses a basic industrial polycarbonate lens system with near filed limit of approx. 50cm.



This graph shows the distance output of the epc600 chip (vertical axis) vs. a set distance on a 90% and a 0.75% reflecting target (horizontal axis)

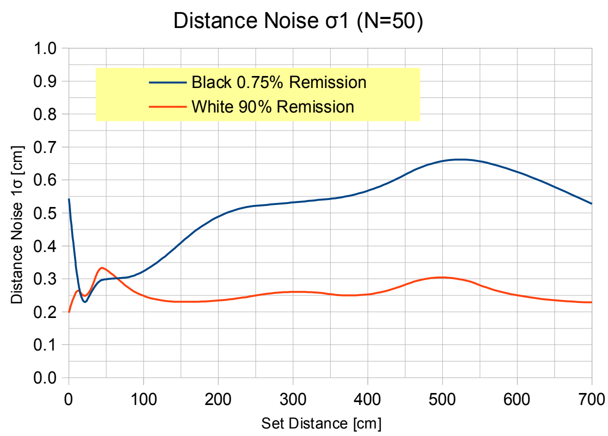
These data clearly illustrate a strong argument: There is simply no other optical detector product available on today's markets to match this – let alone taking the high integration grade and the cost aspects into account.



The lens of the epc600 evaluation kit is optimized for long range applications. The tradeoff is a distance error in the close range. The absolute measurement error is just a few centimeters in a range of 0.1 to 7m on a black and a white target.

These fully integrated 3D camera chips by epc are highly advanced sensor systems on an area of only 2.6 by 2.6 millimeters. With a few passive components and a couple of LEDs, they can be completed to form a distance sensor with stunning performance. With an appropriate system design, these devices will reach measuring ranges of hundred meters and more with resolution in the millimeter range. Measurement cycle times of less than one millisecond are possible. With such a performance, the 3D-TOF chips epc600 and epc610 open sensational new possibilities for a multitude of industrial applications. Such applications include light control sensors, distance monitoring, proximity detection, gesture control, contact less push buttons, security and surveillance systems and many more. With the epc600/610, the realm for innovative sensor solutions has grown and we are looking forward to supporting our customers in realizing such new products. An easy-to-use evaluation kit and comprehensive documentation is available to get them started.

Don't miss out, start now!



The one-sigma distance noise is in the mm range, even with very weak receiving light signal at 7m on the black target. The dynamic signal range varies over 94dB between the maximum on white at 35cm and black at 7m. Note that the individual measurements were taken in single "shots", with integration time between 1.59µs at close distance and 400µs at 7m on white.

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