

Covid-19: The real-world applications of photonics equipment

Techniques such as PCR and medical imaging are vital in the fight against the coronavirus, and rely on the continued supply of components by manufacturers such as Hamamatsu Photonics

The novel coronavirus (Sars-Cov-2) continues to spread across the world, impacting everything from daily life to the global economy.

In these challenging times, the healthcare sector plays a particularly important role. In addition to protective clothing, respiratory masks and respirators, the ability to test rapidly and accurately is vital. However, rapid testing demands the availability of various laboratory analysers.

Meeting the demand for analytical instruments requires that manufacturers continue production, to ensure the continuous supply of critical components across the world. Hamamatsu Photonics is part of the supply chain for products and devices used in the fight against the virus. Our products are integrated into many laboratory analysers and we also work closely with point of care diagnostic manufacturers to develop new instrumentation for rapid testing.

But never forget: The safety and well-being of our employees is our top priority. We are monitoring the guidance of the World Health Organisation and other public health bodies closely, and are taking appropriate measures to provide our employees with a safe and healthy working environment.

How to fight the virus?

Researchers around the globe are striving to develop an effective vaccine against Sars-Cov-2, but this still requires time.

To combat the further spread of the coronavirus efficiently, immediate detection of the virus is of crucial importance. The aim is to reduce the chain of infection and thus the

infection rate. But to identify who is and who is not infected requires as many tests as possible performed. Tedros Adhanom Ghebreyesus, head of the World Health Organisation (WHO), famously said during a press conference in March: 'Test, test, test.'

Rapid tests and test analysers

To test thousands of people, thousands of rapid tests are required, which in turn calls for great numbers of analytical devices for their evaluation.

One common analysis method of these devices is the polymerase chain reaction (PCR). This method is widely used in molecular biology to multiply the patient's DNA.

How does the PCR test work?

First, a smear is taken from the patient's mouth, nose or throat. This sample is then sent to a laboratory. Each virus can be identified by a specific characteristic section of its genetic material. However, the quantity of the genetic material from the smear must be multiplied

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in order for there to be sufficient material to determine whether the pathogen is present or not.

For this purpose, so-called thermocyclers are used, which initiate the polymerase chain reaction. In 30 to 50 cycles, the DNA is amplified exponentially.

If the pathogen is present in the sample, its genetic material will multiply and will be detected. If there is no genome of the pathogen, it will not go through the multiplication process and therefore not be detected.

Using a fluorescence dye, the amplification of the pathogen genome can be monitored in real time. This is called real-time PCR.

It usually takes several days before the patient receives the test result. To send the sample to the laboratory takes the longest time, the test itself takes up to five hours.



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Hamamatsu Photonics has decades of expertise in the development and manufacture of optical technologies. Several manufacturers of laboratory devices choose Hamamatsu Photonics for products such as photomultiplier tubes (PMTs), photodiodes and cameras that allow the optical detection of the target DNA sequence. We are proud to supply our products to manufacturers of laboratory analysers all over the world that are contributing to fighting the virus.

Medical imaging as a further diagnostic tool

Severe cases of Covid-19 are associated with pneumonia, which can lead to changes in lung tissue.

As a further diagnostic tool of coronavirus, medical imaging techniques such as computed tomography (CT) and conventional radiography of the thorax are used. Changes of lung tissue are visible in the images obtained through these methods.

In some cases, the changes of lung tissue are already visible despite the test results of PCR being negative. However, a negative CT result does not mean the patient is negative for coronavirus. With computed tomography or thorax x-rays, the severity of the disease can be assessed and the clinical indication in severe cases monitored.

Compared to PCR, an advantage of medical imaging is that the results are available immediately. On the other hand, ionising radiation is used in CT and x-rays, so the health benefit for the patient must outweigh the radiation risk.

Hamamatsu Photonics' contribution in the field of x-ray detection is apparent by a portfolio of suitable x-ray detectors, which it supplies to numerous medical equipment manufacturers around the globe. **EO**

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