



KRYPTEN and ITMO University Unveil NANOPRINT



Russian-based producer of holograms and other optical components KRYPTEN has teamed up with scientists from ITMO University (St Petersburg, Russia) to develop NANOPRINT – a novel inkjet printing technology for covert colour polarised images based on nanocrystalline cellulose. The latent images are invisible in regular (randomly polarised) lighting conditions and become visible in polarised light from a smartphone display.

The joint project combined the developments of KRYPTEN's Holographic Laboratory in the field of polarised hidden images – HITTM (Hidden Image Technology) and SMART-HITTM – and studies from ITMO University connected with the invention of ink based on cellulose nanoparticles. As a result, commercial inkjet printing technology for hidden images was obtained.

During their work, the researchers explored methods for the chemical synthesis of the ink and found new ways to apply the ink to a surface. The group developed programmes to apply the ink through inkjet printing to control the orientation of cellulose nanoparticles suspended in the ink to create an optical effect of coloured images visible only in polarised light.

Explaining the motivation behind the research, Andrey Smirnov, Head of KRYPTEN's Holographic Laboratory said: 'in Russia, there is mandatory labelling for a whole group of goods to trace their circulation from manufacturing to sale. However, this system does not guarantee package integrity and does not protect it against replacement of its contents. We actively cooperate with the leading Russian universities, study new methods of optical protection of goods against counterfeiting and develop security features ensuring the authenticity of goods'.

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Envisics Secures funding for In-Car Technology

Envisics, a UK start-up, has announced that it has raised \$50 million in a series B round of funding for its holographic technology that projects head-up display (HUD) images of mapping, navigation guidance and hazard warnings into the driver's direct line of sight.

Dr Jamieson Christmas, the founder of the company, said that the funding is being made at a valuation of over \$250 million. The capital is coming from a group of strategic investors that include Hyundai Mobis, General Motors Ventures, SAIC Motors and Van Tuyl Companies

'Envisics is already working with car companies to integrate its technology into vehicles. Initially, it's focusing on the higher end of the market and integrating its technology into electric vehicles made by GM', Christmas said. Mass production of vehicles using its technology is slated for 2023.

Christmas initially got into holographic displays through his first startup, Two Trees, which eventually got acquired in 2016 by Daqri, an AR glasses company that was apparently looking for more technology to better compete with Microsoft and its HoloLens.

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Holograms Help in the Fight Against Fake Academic Certificates

Putting the term ‘fake degree certificate’ into any search engine comes up with some disturbing, but not wholly unexpected, results. As academic certification fraud becomes more sophisticated, we take a look at the role holograms can play in defending these most prized of secure documents.

The fraudulent reproduction of certificates has increased significantly in recent years – affecting both employers and universities, who are duped by fake certificates, but also students who are cheated by them.

The impact of fake academic certificates goes beyond undermining the integrity of the education award system. In India, for instance, the terrorist behind a series of bomb blasts in 2008 used a fake certificate to get admission into one of the country's top universities.

According to a recent survey by UK's National Qualification Agency, only one in four university admission staff feel confident spotting fake qualifications documents. As in all document security, inspecting the design of the certificate is key. Authentic degrees and certificates from genuine educational institutions will often use paper with built-in security features such as watermarks and will be checked for any spelling errors – often an easy tell-tale sign for a fake.

But beyond these obvious traps that casual counterfeiters will fall into, there are a range of techniques that are available to prevent tampering or reproduction. Most of the legitimate educational institutions

will combine security print techniques such as microtext lines, UV invisible and anti-scanning inks with some physical optically variable device – most often a hologram. Any attempt to scan a real certificate so that personally identifiable information (PII) can be manipulated will not capture the colour shift or depth in the hologram.

While physical anti-counterfeiting features reduce the risk of tampering, digital solutions help in intelligence and identifying conspirators working within the system, as well as facilitating fast and convenient authentication.

Many universities are now using digital track and trace solutions such as the QR code. Prospective employers or university professionals can check the authenticity of the degree by scanning these QR codes. In some academic records management systems, the code provides a link to a database containing additional PII about the bearer of the document.

Whilst no secure document is immune from counterfeit threats, academic institutions are becoming increasingly aware that holograms and other anti-counterfeit technologies can make illegal copying or reproduction difficult and provide a means to verify legitimate credentials.

What is also becoming clear is that the issuance of these certificates must be tightly controlled by each educational institution so that electronic verification can be easily conducted on credentials presented for employment.

In-Car Holographic Display Technology *(Continued)*

Christmas said that while Daqri was focused on headsets, he still saw an opportunity to work on holographic technology for automakers and so in 2018, Christmas separated out Envisics as a separate corporate entity to focus on the holographic automotive opportunity.

As opposed to the current interest in autonomous vehicles, the company's tools are not a replacement for human drivers but enhance how a human can drive.

According to the company's website, Envisics' Dynamic Holography Platform overlays multiple layers of visual information on separate planes and at different distances. It adapts instantly to ambient light changes, enhancing the view of the road ahead irrespective of the lighting conditions in the surrounding environment.

Part of its success comes from its advances in optical engineering, which provide greater magnification, improved image quality and images displayed at multiple distances simultaneously.

But the final word goes to a company that should know about the potential for holographic HUDs in the automotive market – a car manufacturer. 'GM is very impressed with Envisics' holographic augmented reality-enhanced head-up display technology,' said Matt Tsien, president of GM Ventures. 'This technology will help us revolutionise the in-vehicle experience with a variety of safe, highly integrated and intuitive applications, including applications that will enhance the hands-free driving experience in the future.'

IQ Structures Changes Structure



Eight years after its creation, the IQ Structures business is transforming into a holding structure. The holding company IQS Group sro now has three subsidiaries, each dedicated to a specific area of business.

The original brand IQ Structures will continue to focus on the strongest part of the group to date – protection against counterfeiting. The company, which produces holographic security features for polycarbonate identification documents, banknotes and securities, will address its main target groups, which are governments and state and private security printers, under the brand IQ Structures.

The division dealing in unique nano-structured optics will form a new company and operate under the name IQS NANOPTIQS. A third company developing a completely new approach to 3D nano-printing technology continues under the name IQS nano.

‘3D nano-printing, security and the optical part of our business group operate in markets with different business conditions and habits. Individual companies will now be able to enter into business relationships in accordance with the specifics of their business segments and develop independently,’ said CEO of parent company IQS Group Tomáš Těthal.

At present, about 70% of IQS Group's turnover is generated from security features, and about 30% is NANOPTIQS. 3D nano-printing is in the development stage of a new generation of nano-printers for mass production.

The transition to a holding structure is part of a long-term strategy, with the business separated into companies that have teams and resources fully focused on their key area of business.

‘Currently, we provide high-end optical effects for protection of various documents and products. In securing ID cards, passports and banknotes, we want to be stable among the three largest companies in the world,’ explained Petr Franc, CEO of IQ Structures.

The new company IQS NANOPTIQS takes its name from the nano-structured optics it designs, develops and produces for the international LED lighting market. David Brož, CEO of the new company, added: ‘we were among the first in the world to master the development and production of micro- and nano-structured diffractive optics. We have opened this market segment and are gradually expanding it. In the future, we want to remain number one in this direction on the global market. Its potential is in hundreds of millions of euros.’

The third company, IQS nano, plans to use its more than 20 years of experience in synthetic holography, micro-optics and lithographic technologies to develop a technology for writing three-dimensional objects with a resolution of hundreds of nanometres.

The companies IQS Group, IQ Structures, IQS NANOPTIQS and IQS nano are based in Řež near Prague, Czech Republic. They also share another establishment – a nano-centre in Brno – and IQS Group now holds a total of 23 patents and patent applications.

KRYPTEN and ITMO University

(Continued)

He also noted that ‘the project with our colleagues from ITMO’s Chembio Cluster (a network of leading research laboratories) offers new prospects for applying polarised latent images in protecting goods. NANOPRINT is a robust and cost-efficient technology manufacturers can use to protect their goods against counterfeiting’.

The new ink consists of special particles about 10 nanometres wide and around 200 nanometres long. In the initial solution they are organised chaotically. NANOPRINT technology modifies the properties of nanoparticles in the solution (applying an electric field to exert an ionic force) so that the particle dynamics arranges them parallel to each other.

As a result, cellulose nanoparticles are arranged on the surface, not in a random order, but along an axis and form a specific ordered structure. After drying, the ink creates an optically active coating. A certain thickness of image is set to create the polarised effect. The interference effect is obtained when the coating thickness is at least 10 microns.

The technology allows printing of high-resolution image elements, including digits, letters, logos and patterns that offer new opportunities for protecting goods against counterfeiting. Hidden images are visualised in polarised light from a smartphone, LCD screen or ordinary polariser. Product identification does not require any complex devices or equipment. The effect of the invisible image might capture the buyer’s attention, as well as proving the authenticity of the product.

Nanocrystalline cellulose ink offers the prospect of reducing the cost of hidden image printing compared to more expensive liquid crystals featuring similar optical effects. Inkjet printing is a fast and relatively inexpensive method of commercial printing which would make it feasible to use NANOPRINT technology in the serial production of security features to protect documents, packaging or applied to security labels.

Manoj Kochar – in His Own Words

India has, for many years, been a hothouse for the development of commercial holography and Holoflex Limited has been active in the Indian market, and beyond, since 1991. The company, based in Kolkata, is a member of and award winner from the International Hologram Manufacturers Association (IHMA) and the Authentication Solution Providers' Association (ASPA).



So, Holography News thought it about time to catch up with one of its Directors, Manoj Kochar, to find out a bit more about the company, its plans and ambitions.

Q: Can you give some background on yourself and how you got involved in commercial holography?

A: I graduated in the Commerce stream from St Xavier's College, Kolkata, and sometime in 1990 was introduced to this emerging technology called holography that seemed very apt for the Indian markets. I was struck by the almost hypnotic effect a hologram had (still has, at least for me), and how it engaged the viewer.

Since the technology was still evolving in those days, it did seem risky for a first-generation entrepreneur, but I, along with my partner Mr Kamal Surana, decided to take the plunge, and incorporated Holoflex Limited in 1991. Thankfully, there hasn't been a single moment when we have regretted our decision. It was a great experience – learning about the technology, and then explaining what a hologram is and what it does, to everyone who cared to listen.

Since then it has been a fantastic journey, and I am proud that Holoflex has made its presence felt with satisfied customers all over the globe.

Q: What do you consider to be your greatest achievement as the IHMA Chairman?

A: Being elected as the first Chairman of IHMA from Asia was indeed a proud privilege for me. It was humbling and at the same time exciting as I now had an opportunity to contribute to the growth and the direction in which the industry was headed.

I was no doubt helped by my experience as the President of Authentication Solution Providers Association (ASPA) for two years. I was also very fortunate to receive the guidance and advice of a very active Board and an able Secretariat with Mark Deakes at the helm.

One positive development that happened during my tenure was the commencement of the relationship between South Korean Holography Forum and the IHMA. I visited Seoul to make a presentation about IHMA activities, which led to the Hologram Forum becoming an IHMA member, and opened the doors for a closer interaction between the IHMA and South Korea's hologram communities.

Q: What was it like in the early years of Holoflex?

A: Holography was making its presence felt in the early nineties practically all over the world. The Visa hologram on the Visa credit card was a big reference that a lot of us referred to in those days to gain credibility for the technology. There were sceptics, who doubted the potential of the technology, but I have myself seen many of them converted to staunch believers once they saw the technology at work.

In those days holography also had a huge novelty value. One of our initial breakthrough projects was the hologram for the Cricket World Cup that was held in India in 1996. We supplied hologram labels that were affixed on all the entry tickets to the matches in India. Around the same time, a hologram was also made mandatory on the Indian voters' identity card. Some time later the hologram also made its appearance on the liquor tax stamp. Such developments were very good references to gain credibility for the technology.

This further led to a stupendous growth in the brand protection segment. Many leading brands adopted the hologram in those days to protect and identify their brand, to differentiate themselves, and to enhance the perceived value of their product. Several promotions were designed around holography that intertwined the inherent security and the novelty of the product to create memorable campaigns.

India had very high rates of import taxes in those days. Hence in a low-cost market such as India, we were forced to develop home-grown materials and develop our own know-how to make the product work. Getting a consistent tamper evident film in those days was difficult, as the film would delaminate on the release paper and would not show signs of tampering all once affixed to the product. Gradually an entire eco system has developed in India with several reputed suppliers of the foils, adhesives, coatings and release liners to help the technology stabilise.

I am happy to state that there are several Indian companies that export finished hologram labels, foils and films and also the raw material to the industry all over the world.

Q: Do you have in-house origination and plate making capabilities?

A: Yes, we have in-house origination and plate making capability at Holoflex. We got a dot matrix and also a 2D/3D origination lab almost 20 years ago. Since then we also invested in a hi-res mastering system from Kinemax.

We design and make our own master for almost all the holograms produced by us, as we recently did for the Aadhaar card hologram. The Aadhaar card is the resident Indian citizen's identification card. All Indian citizens are issued an Aadhaar card and it is widely used by them to establish their identity. The Aadhaar card has recently been launched as a plastic card in credit card size with several high security features. Holoflex is proud to be selected as the exclusive hologram vendor for this project. This hologram was designed and produced in-house and is a great example of the 'Make in India' initiative launched by our Prime Minister Mr Narendra Modi.

Q: What are the current production capabilities of the company?

A: In keeping with the changing times, Holoflex has evolved from being only a hologram producer to a provider of authentication and labelling solutions. Security is the backbone of our company and is what we have done for the better part of our existence and it still is the biggest share of our business.

We do holograms for payment cards, identification cards, driving licences, tax stamps, vehicle security, toll tax protection, brand protection and secure promotions. Besides this we also produce labelling solutions for all kinds of industries such as pharmaceutical and healthcare, automotive, agriculture, food and beverage, and FMCG.

We have several technologies at work – security designing, flexo printing, variable data printing, demetallisation, taggant technology, security ink integration with holograms and labels etc. Our endeavour is to ensure that we are able to provide a customised solution to all our buyers.

Q: *What do you see as the growth opportunities for the commercial holography industry?*

A: We believe that holography remains the most potent identification feature by an untrained eye. However, no industry or technology can retain its pre-eminent stature if it does not innovate and stay relevant to the changing times, and holography can be no different.

Like the other leading players in the industry, Holoflex realised this quite some time back. We have since then developed several new products that carry a hologram as a key identification feature – speciality label substrates, induction seals, shrink sleeves. Each of these products is witnessing good growth due to value addition from holography, flexo printing and other conversion technologies.

In the Indian market we see consistent growth in the brand protection and tax stamp business. The Indian government has been evaluating the possibility of incorporating holograms on Indian banknotes and also a holographic overlay for the Indian passport, and this is a huge opportunity for the Indian holography industry.

I am of the firm belief that the holography industry will keep growing in the foreseeable future, and India will see a large chunk of this growth.

Q: *What plans do you have for the company and how has it been impacted by the COVID-19 pandemic?*

A: Holoflex has recently completed an expansion where we invested over \$2 million in new equipment. The pandemic started almost immediately thereafter, which did not help our plans. Since April we have lost two months of total production, and for the two months after that we were operating at barely half the capacity. We are currently almost touching the same volumes as pre-COVID-19 levels, and with some luck hope to close the financial year at almost similar revenues as the last financial year.

Interactive Holographic Labels Promote Wine Provenance and Fight Fraud

The National Office of Vine and Vitivinicultural Products (ONVPV) in Romania is using holographic labelling from security printer Eltronis to promote the provenance of its regional wines and protect drinkers from potential counterfeits.



The new labels combine an instantly identifiable holographic brand design with several layers of security features, including a unique code and serial number that enables verification online and via smartphones.

Consumers simply scan the QR code, which is uniquely linked to each bottle of wine. This provides access to a wide variety of information on the wine's pedigree and production, as well as confirming that it is genuine. If the scanned label contains an invalid or duplicate code, the ONVPV is automatically alerted.

The ONVPV oversees national vineyard management and winemaking in Romania and supports traditional methods of wine production in this designated geographical area.

Dorin Ștefan Dușa, General Manager at ONVPV, said: 'holographic markings that certify the origin and authenticity of wine are an important part in our efforts to promote our producers and a very effective tool against counterfeiters.'

'With our latest label design, consumers can interact much more easily via their smartphones, giving them access to the latest information on their wines. This has proved very popular and already led to the annual volume of labels used by winemakers more than doubling – and we expect this upward trend to continue.'

Across the world, wine fraud is becoming increasingly prevalent, with online sales making it easier for fraudsters to trick consumers and replace genuine wines

with fakes. By adding a holographic label to wine bottles, the ONVPV is helping to counter this trend, promoting the provenance of the region and building protection against potential counterfeiting.

Founded in 2003, with headquarters in the UK and manufacturing in Eastern Europe, Eltronis used its experience of holographic techniques and materials gained from protecting high security identification documents in the production of this label. The holographic design contains multiple security features, making it difficult to reproduce, while the label material allows it to be applied to a variety of different substrates.

With high thermal, mechanical and chemical resistance the label cannot be removed without damaging it, thus making it impossible to reuse on other products. In addition, a special sub-surface printing technique is used for the variable data, making the label both more durable and extremely resistant to potential alteration.



Pete Smallwood, Business Development Manager for Eltronis, said: 'the use of holograms to identify and protect products of geographic importance is well known due to their highly visual effect and instant recognition by consumers'.

He went on to say: 'with the addition of the QR code and latest holographic features, not only are they delivering greater brand impact on shelf, their security has been taken to another level with this new design, combining the best of physical and digital protection'.

A Journey Into Invention

At this year's Optical Document Security Conference™, Charlie Gale from start-up company Pulse Tech Security, based in Leicester (UK), outlined the company's journey from road signs and QR codes to producing Denisyuk holograms for authentication by smartphones.

Charlie Gale is an inventor, entrepreneur, director of Pulse Tech Security and a product designer, and is currently a senior industrial designer for Dyson's (the same Dyson that has revolutionised domestic appliances) new product innovation department, where he has continued to work for the past six years.

During his final year at university, Charlie was challenged to repackage an existing technology to solve an everyday problem. Like many of the best inventions, the problem that he chose to solve was triggered by a bad experience of his own. He had received a speeding ticket which he blamed on not being able to see the road sign clearly. Goaded by the experience, Charlie set about enhancing road signs by the addition of a lenticular lens onto the front of road signs, thereby making them more visible and legible to road users.

Road signs

Prototype road signs were produced incorporating arrows that rotated clockwise as the driver approached and drove around the sign, thereby enhancing the visibility of the signs. However, there were concerns that the signs would be a distraction to drivers and so the focus moved to developing 'pulsing' road signs or varying the retro reflectivity of the signs.

Pulsing road signs were produced using an innovative and patented lenticular phase mask method involving varying the thickness of the ink printed on the back of the lenticules of the lenticular lens.

However, despite Charlie's hope that this would be a 'light switch' moment, there was little commercial interest and the local governments responsible for road signage weren't interested in upgrading their technology unless legislated to do so.

QR code stimulus

Sometime after the lenticular road signs project, Charlie attended a concert and noticed the entry ticket incorporated a QR code. This gave him the idea that the QR code represented different things to different people in the information chain. The end user may want to scan the QR code to obtain ticket authentication, entry or event analytics, but distributors and the venue organisers might want access to different and perhaps more overt and covert information. This provided the stimulus for the idea that both overt and covert information could be built into the QR code.



Schematic of different users accessing different types of information from a QR code.

Pulse Tech Security's vision was to combine the benefits of QR codes, being unique and digital, with the security of a volume hologram to build a new type of digital holographic security marker.

Early prototypes using silver halide materials proved that a covert QR code could be embedded into a volume hologram and read by a smartphone in diffuse lighting when produced using RGB (Red, Green and Blue) lasers.

Having succeeded with the early overt QR holographic prototypes, focus shifted onto exploring covert QR codes where it was possible to embed QR codes up to 7cm in depth beneath the volume hologram surface, which would be difficult for counterfeiters to find unless using laser light.

The next step was to combine both the overt and covert QR codes together into one volume hologram using photopolymer material but without losing clarity or brightness. A demonstration sample on a tax stamp using photopolymer material was produced.

QR code stack

As the development progressed, the idea emerged of a QR code stack incorporated within photopolymer prototypes. This would comprise an overt visible QR code viewable by an end user, and readily scannable in diffuse lighting conditions, combined with several covert QR code layers beneath the surface that could be viewable by different laser lights for inspectors or other supply chain partners.

As the development evolved, the use of lenticular phase masks initially used on road signs were explored to present different codes viewable at different angles.

However, such a structure creates a thickness issue. This problem was solved by using interlaced QR codes so that at very similar angles different codes can be observed.

A prototype hologram using photopolymer incorporating interlaced QR codes was produced, in collaboration with OpSec Security, which enabled different QR codes to be viewed at different angles.



Holographic interlaced QR code prototypes using photopolymer produced by OpSec Security.

So far in his journey, Charlie has developed a new type of security marker that combines both overt and covert QR codes and that can combine different data sets with volume holography.

Next steps in the journey include experimenting with different techniques (software and hardware) to read and authenticate the interlaced QR codes and the incorporation of a spatial light modulator (SLM) to produce a process to generate a unique digital information/code per security marker.

New Dates for Practical Holography at Photonics West

The new dates for Practical Holography XXXV, which is part of the OPTO section of Photonics West, have been announced as 6-11 March, 2021. The revised dates provide more space at the conference venue, The Moscone Center, San Francisco, to accommodate the programme and the exhibition as new health and safety guidelines and requirements are implemented.

The Practical Holography conference has an open call for papers which fall into three categories.

Displays

- Techniques and concepts in display holography
- 'Electro-holography', meaning the electronic generation, transmission, or display of holographic image information, and the creation of dynamic or interactive holographic images
- Spatial light modulators, computational methods, and related technologies relevant to advances in digital holographic imaging
- Perceptual issues related to viewing of holographic images.

Materials

- Materials for holography and diffractive optics
- Holographic performance and optical properties
- Mechanism of image formation
- Modelling and analysis of holographic performance
- Durability and environmental testing of materials and devices, and materials issues affecting device construction
- HOEs and DOEs utilising materials properties for enhanced performance
- Improved processing of materials, including techniques and processes for production of holograms, HOEs, and DOEs
- Real-time and active holographic materials and processes for information storage and dynamically switchable holograms
- Wavelength-division multiplexing (WDM) applications of holographic materials
- Applications and demonstrations of new or improved materials in display holography, security holograms, HOEs, DOEs, holographic information storage, and real-time holography.

Applications

- 3D imaging for application in industry, medicine, education, advertising, and other visual communication areas, with an emphasis on the visualisation of 3D digital data by holographic means; holographic stereograms and computer-generated image holograms (which are areas of strong current interest), including HOEs in autostereoscopic 3D systems
- Processes, hardware, and techniques: new systems and applications for the recording, producing, manufacturing, or optimising of holograms and diffractive elements
- Digital reconstructions of holograms for image analysis
- Metrology, microscopy, non-destructive testing, and holographic optical elements, emphasising the application and engineering issues rather than the underlying scientific principles or component fabrication issues
- Artistic applications of holography and the use of holography in recording and display of historical items.

The 'Call for Papers' can be found [here](#).

DDS 2021 (3-4 February) – a Shift from Physical to Digital

The Digital Document Security™ (DDS) Conference is a response to the introduction of digital systems into the secured document field – from the use of smartphones to authenticate physical documents or act as carriers for ID documents, to the deployment of artificial intelligence, big data, and blockchain for security document applications.

Ironically, the conference itself is now following the same route from physical to digital as the conference organisers, Reconnaissance, announce that DDS 2021 will be an online event (3-4 February, 2021), allowing participants from across the globe to attend without the cost and inconvenience of travelling in these days of COVID-19.

As the physical conference was to have been in Vienna, you might say that what you lose in strudels, you gain in convenience – or is that stretching the analogy of the trade-off between the benefits of physical and digital a bit too far!

DDS 2021 connects the communities at the interface between these physical and digital domains of document security to create a forum to meet, share ideas and establish mutual understanding for innovation in this important field.

People involved in the digital transaction, identity and authentication communities, as well as specifiers, designers, producers and issuers of secure documents will find DDS 2021 a valuable forum to learn, network and explore possibilities.

DDS 2021 will also help the established secure document community come to understand the disruptive potential of the digital world.

In the run up to the conference, Reconnaissance is staging a series of Great ID Debates, that take on some of the biggest issues in the digital document security industry and debate them in an online forum. The first debate examined the motion that 'this house believes that we are rushing into an unknown digital future'.

The lively exchanges between proposer Ian Lancaster, Chairman of the Digital Document Security Conference, and Joshua Mármol, Managing Director of GET Secure ID Corp, opposing the motion, stimulated strong audience participation in the Q&A section of the event.

The next debate is scheduled for the middle of December. If you would like to suggest a topic to be debated please contact francis@recon-intl.com.

And don't panic, yet! If you would like to present at the conference there's still time to [click here](#) and send your proposal for consideration.

With no hotel or travel costs to consider, DDS 2021 would be the ideal opportunity for a group of colleagues to gather at this truly global event for the industry. To register [click here](#).

IHMA Steps Up to Partner The Holography Conference Online (THCO)

The International Hologram Manufacturer's Association (IHMA) will be holding its AGM and Excellence in Holography Awards as part of THCO (8-9 December).

The aim of THCO is to provide an online forum for the exchange of information and experience between hologram suppliers, producers and users, and the sharing and showcasing of the latest technologies, production techniques, new applications and markets, as well as industry-wide issues that we now face in a COVID-19 world.

THCO will be a fully interactive and virtual event. Appealing to people from all over the world, this truly international event will take place for three hours a day over two days. Individual presentations as well as panel style formats will allow the audience to be completely involved in the conversation, in the form of Q&As, polls and audience-led discussion. There will be plenty of opportunity for networking as well as the chance to get up to date with all the developments from within the industry from the comfort of your home or office.

In amongst the presentations, discussions and Q&As, The Excellence in Holography Awards will build into a sparkling online Awards Ceremony in the following categories:

- Innovation in Holographic Technology
- Best Origination
- Best Display or Emerging Technology Application of Holography
- Best Applied Security Product
- Best Applied Decorative/ Packaging Product.



Over the two days of THCO there will be plenty of opportunity to see presentations from runners-up in the competition leading up to the disclosure of the winner towards the end of the conference on 9 December.

At the end of the first day of the conference (8 December) the IHMA will hold its Annual General Meeting (AGM), giving all members a chance to review the work of the association and plan for its future. To allow members of the IHMA an opportunity to attend the AGM without signing up for THCO, the event will be held on a separate platform.

It seems fitting that as holography continues to merge the physical with the digital that we should be meeting virtually this year, so click [here](#) to register or sponsor the event.

You can nominate a project for The Excellence in Holography Awards by clicking [here](#). The deadline for nominations is 6 November.

With no hotel or travel costs to consider this year, THCO would be the ideal opportunity for a group of colleagues to gather at the industry's one truly global event. For a group booking, please contact Samantha Burns for more information – sam@recon-intl.com.

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Events

8–9 DECEMBER 2020

THE HOLOGRAPHY CONFERENCE ONLINE
theholographyconference.com

3–4 FEBRUARY 2021

DIGITAL DOCUMENT SECURITY ONLINE
digitaldocumentsecurity.com

8–10 MARCH 2021

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