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Towards Greater Integration in Banknote DOVIDs

The recently announced €5 note shows the direction banknote design is now taking. This can be summarised as integration and sophistication combined with simplicity for authentication, i.e. hard for the counterfeiter, easy for the authenticator. This approach can also be seen in a number of the latest demonstration or 'house notes' from producers of DOVIDs for banknotes; in the January Holography News® we reported on Hueck's Signet® banknote foil, here we give details of Kurz/OVD Kinegram's offering.

Most banknotes in circulation have multi-layered security, with the different features occupying their own space on the basis they would be more obvious and easy to check. The evolving alternative to this separate-features philosophy is integration, clearly demonstrated by the diffractive optically variable image device (DOVID) stripe on the new €5 (see HN Vol 26 No 11) which has distinct images in the stripe, which is registered to the banknote so that all stripes will have identical images in the same position on every banknote. The four images – a euro symbol, a portrait, architectural feature and denomination number – appear one or more times elsewhere on

the banknote and therefore can be easily cross-referenced with the DOVID stripe, which is further integrated into the banknote with overlapping printing and precise demetallisation (which also improves its security).

The house notes considered here that further demonstrate the philosophy of DOVID integration are the Jules Verne note and the Anatomy note. Jules Verne is a Guardian® polymer note, produced in conjunction with Swiss banknote machinery producers KBA-NotaSys, ink producers SICPA, security printers Orell Fussli and designer Roger Pfund. Anatomy is a Kurz house note series produced on traditional cotton based substrate, one

of the notes having two windows.

Kurz the Market Leader

German foil producer Leonhard Kurz has been the main supplier of DOVIDs for banknotes since it produced the first patch to go on a banknote in 1988 (Austria 50 Schilling). It then dominated the market around the turn of the century by supplying most of the foil for the 12-13 billion Euro banknotes for the launch in January 2002. Through its subsidiary OVD Kinegram it supplied the master for the stripe used in the €5, €10 and €20 notes, while Hologram Industries supplied the master for the patch on the €50, €100, €200 and €500.

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Kodak to Coat Polygrama's Darol PP

Lynx, the Brazilian company which has been supporting the development of Polygrama's Darol holographic photopolymer (see HN Vol 25 No 6) has made an agreement with Kodak for the coating of this polymer on to film and is moving its photopolymer R&D facility and marketing operation to Florida. Kodak will start coating its first batch of material on March 15.

Polygrama's DAROL photopolymer is a recording material for holography which only needs dry processing. Currently it is designed for use with blue-green (488 to 535 nm) and red (610 to 660 nm) lasers. It records a reflection hologram that must be thermally developed in a single process to deliver a hologram with high diffraction efficiency. Darol films are available as 10 by 12 cm sheets with a 12 µm

thick photopolymer on optically clear polyester with laminated thin PET or HDPE cover. Colour sensitivity peaks at 488-532 nm (blue-green) and 635-670 nm (red) with a sensitivity of 2-15 mJ/cm² $\delta n \leq 0.08$ on thermally developed reflection holograms.

The most recent development is an improved photopolymer which is slightly harder than Polygrama's previous product. This means that there is almost no material shrinkage introduced in recorded holograms. Polygrama intends to introduce a panchromatic version for recording colour holograms in the near future, intending to supply the document security industry with a panchromatic photopolymer for producing colour security holograms. Andre Jacobovitz, CEO of Lynx,

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Colour Reflection Holograms

HoLoFoS LED Lights to Optimise Holo-Colour

The Hellenic Institute of Holography (HIH) has designed LED luminaires to optimise the accuracy of colour reproduction in full-colour reflection holograms, specifically its holograms of historical art objects which it has named *OptoClones*®, coined from 'optical clones of art objects'.

production of artworks is the replay of the correct colours in the hologram. It is well-known that colour reflection holograms need to be recorded by three lasers – red, green and blue – but the best wavelengths to use has been the subject of much research and debate, with different holographers

est developments in LEDs to create the *Holofos III* and *Holofos IV*, spotlights designed for illuminating reflection holograms.

Holofos III uses single chip red, green and blue LEDs, with independent precision current control for each colour. The colour gamut achievable by the selected LEDs can be covered by varying the driving currents. The light emitted by each LED is collected by a small lens and steered through two dichroic combiners that mix the three beams into a coaxial exit beam. Holofos IV is fitted with a multi-chip RGBW LED with independent precision current control per channel and two biconvex lenses for beam shaping. Full beam characteristics and colour specification are available on the HIH website, but this is a case where a picture is worth a thousand words, as the illustrations compare the same hologram lit by a Holofos III, IV and a tungsten halogen spotlight.



The same colour reflection hologram illuminated (L-R) with Holofos III, Holofos IV and tungsten halogen spotlights.

Over recent years HIH, founded by Alkis Lembessis, has focused on making lifelike holograms of *objets d'art*, primarily of Greek antiquities (see HN Vol 23 No 11). Its work has concentrated on the complementary strands of the recording apparatus and the accurate reproduction of the object in a reflection hologram. It has developed digital recording systems (ie making videos of the artworks for conversion to digital holograms), but in the last couple of years it has been working on on-site laser recording of holograms, culminating in the *ZZZyclops*, a self-contained three-laser portable recording illumination apparatus, which is matched by a portable self-contained exposure and plate-development dark-room.

Replay Colour Accuracy

Another aspect of the accurate re-

or research teams preferring different variations. HIH has recognised that it is also important that the reconstruction illumination matches the recording wavelength for the most accurate colour rendition, and has taken the lat-



HoLoFoS IV prototype

HIH has developed a fully-functional prototype modular design in a cast aluminium body for HoLoFoS IV. With a jointed arm for positional adjustment, this can be mounted on a wall or flat surface, with its current controls and dials built in to the base. Lembessis demonstrated this 'intelligent illuminant' during the Holography Technical Group meeting at the 2013 Photonics West, balancing the LEDs to illuminate different types of digital and analogue holograms to achieve the correct colour-mix balance of the luminaire for the optimal replay of each hologram.

This remains work in progress but HIH plans to establish production of Holofos later this year.

www.hih.org.gr

Towards Greater Integration in Banknote DOVIDs... cont'd

form of the athlete. At the base of the note the foil has another detailed, fine line transformation. In the centre of the note is the number '60' representing the denomination, above which is a demetallised image of a heart, both in matt silver. In transmitted light the number 60, a demetallised image, and the veins of the heart can be seen in the *KINEGRAM REVIEW*® windows. Viewed from the reverse, the banknote's two windows show mirror im-

ages of these demetallised images, but each has unique diffractive features, the top one's foil has small '60's which are exactly the same size and design as printed '60's surrounding the window, and the lower window has microtext.

Again, the integrated note is complex and sophisticated yet easy to authenticate using the foil feature.

The €5 will be released into circulation in May this year. The other notes of the new euro Europa series

will follow existing themes and colours and are all most likely to have integrated designs along the lines of the €5. House notes are produced to show what is possible – they push the frontiers. But today's frontiers were displayed in yesterday's house notes, so expect DOVIDs on banknotes to start looking very different in the not too distant future.

www.kurz.de