Using Holographic Foil to Optimise Level 1 Features for Tax Stamp Security

Holograms are one of the foremost overt (or so-called Level 1) security features on tax stamps, enabling inspectors, distributors and even members of the public to authenticate the stamps without the use of special devices. Used by some half of the countries that issue tax stamps for tobacco or alcohol or both, their first appearance was in 1995 in Romania. But the technology has come a long way since then, as Florian Haider of Hueck Folien explained in his presentation at the *Tax Stamp Forum™* last September.

How do we at Hueck Folien use holographic foil to optimise the Level 1 authentication, design and counterfeit resistance properties of tax stamps? The answer is: by *not* limiting the reflection layer of holographic features to full-cover aluminium only – as is the case with classic holographic foil. Instead we go a few steps further. First, we apply partial aluminium metallisation in register to the hologram. Then we add a partial copper layer and finally a colour-switch effect. The result is what we call *security beyond holography,* which combines the benefits of the hologram with other security elements added to the reflection layer.

First rule of Level 1 authentication: attract attention

The first requirement of a Level 1 feature is to attract attention, and this is where complementary colours come in. Complementary colours are two colours that sit opposite one another on the colour wheel, such as orange and blue. They create high-visibility pairings that attract attention – and they are the reason why lifejackets are always orange.

In the same manner, copper and aluminium can be described as a high-contrast pairing, which is why they work well in a bimetallic holographic stripe.

Multiple related recognition elements

Another requirement for Level 1 features is that they should be comprised of multiple related recognition elements, which allow the user to establish with a high level of certainty that the item under examination is genuine.

In order to illustrate how we use holographic foil to maximise the use of multiple related recognition elements, let's compare these elements to the recognition elements of a human face. Let's imagine that the face in Fig 1 is a person you know. Even if you can only see the eyes and eyebrows of that person you should still be able to recognise her with a fair level of certainty.

The same is true for the classic hologram, where you can assess whether the holographic effects are as bright and shiny as a genuine hologram and, with a fair level of certainty, determine whether it is genuine.

Let's go further and add another related recognition element. In the case of the human face, we'll add the nose, and for the holographic stripe we'll add partial metallisation. This now provides three elements to check: the hologram, the partial metallisation and the register of the demetallised aluminium to the hologram. This gives us more certainty.

If we go one step further, we now have the full human face, which this time allows us to recognise someone with a very high level of certainty.

Florian Haider, Hueck Folien

The same is true for our holographic stripe when we add demetallised copper to it. We can now check the hologram, the demetallised aluminium in register, and the demetallised copper, in register to both the hologram and the partial aluminium.

A final element to add to the holographic stripe is the colour-switch effect, which would be like adding hair around the face of a person, and which would allow us to recognise that person with 100% certainty (Fig 2).

We can therefore conclude that multiple related recognition elements enhance unmistakable authentication, and this is what we have achieved with holographic foil.
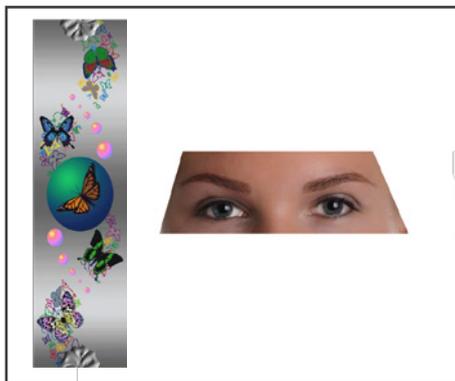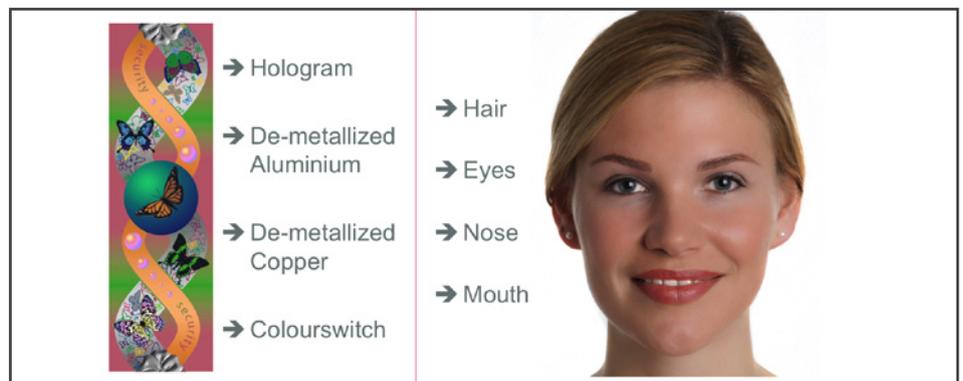

Fig 1 – According to Florian Haider, the level of certainty attached to authenticating a classic hologram is similar to that of recognising a person by their eyes only

Fig 2 – Using multiple related recognition elements to enhance unmistakable recognition

- Hologram
- De-metallized Aluminium
- De-metallized Copper
- Colourswitch

- Hair
- Eyes
- Nose
- Mouth

TECHNOLOGY PROFILE

Different designs for different product groups

So how can we use holographic foil to maximise the design possibilities for tax stamps? I would like to walk you through seven, progressive design versions, where it is important to remember that it is the reflection layer that changes each time to incorporate the different features, not the hologram; the hologram stays completely unchanged throughout.

The seven different versions are:

1. Classic, full-face aluminium stripe;

2. Demetallised aluminium stripe;

3. Metallised copper stripe;

4. Partial copper stripe;

5. Combination of demetallised aluminium and metallised copper (this is where the complementary colours come into play);

6. Combination of partially metallised aluminium and copper;

7. Combination of holography, two metals (aluminium and copper) and colour-switch effect.

These different versions not only look good but have a practical application.

Let's assume a country uses different tax stamps for different product groups because the groups are taxed differently. In this case, the country may decide to use the full-face stripe for beer, a more secure demetallised aluminium stripe for wine, and a demetallised aluminium and copper stripe for spirits: the higher the tax, the higher the security.

Using holographic foils in this way can significantly help to distinguish between different stamps.

More complex = more difficult to counterfeit

Finally, let's look at how we can use holographic foil to maximise the counterfeit resistance of tax stamps. And here I would like to draw a very simple relationship, as shown by the graph in Fig 3.

The X axis indicates the complexity of each version of holographic stripe described above and the Y axis indicates the difficulty in counterfeiting these versions.

Not surprisingly, the more complex the features, the more difficult they are to counterfeit. To counterfeit the first version of the holographic stripe, we would 'only' need to fake the hologram and the full-face aluminium reflection layer.

But to counterfeit the last version we would have to copy a total of seven elements: the hologram, the aluminium metallisation, the demetallisation in register to the hologram, the copper metallisation, the copper demetallisation in register to the hologram and partial aluminium, and the colour-switch effect.

By combining the benefits of the hologram with additional security features in the reflection layers, we can optimise the Level 1 authentication, design and counterfeiting resistance of a holographic stripe. Such optimisation in turn contributes to the creation of more advanced, multifunctional tax stamps.

Our tax stamp customers have recognised the value of our solutions and have subsequently incorporated different versions of our holographic stripe into their stamps. This includes the seventh, top-of-the-range version which comprises aluminium and copper demetallisation, and colour-switch effects.

Hueck Folien is a company of about 260 employees, headquartered in Austria, with sales subsidiaries in Germany and Hong Kong. The company's 2013 turnover was €50 million. It develops, produces and sells high-security features in the form of holographic stripes, security threads and security laminates for application in and on banknotes, personal documents and tax stamps.
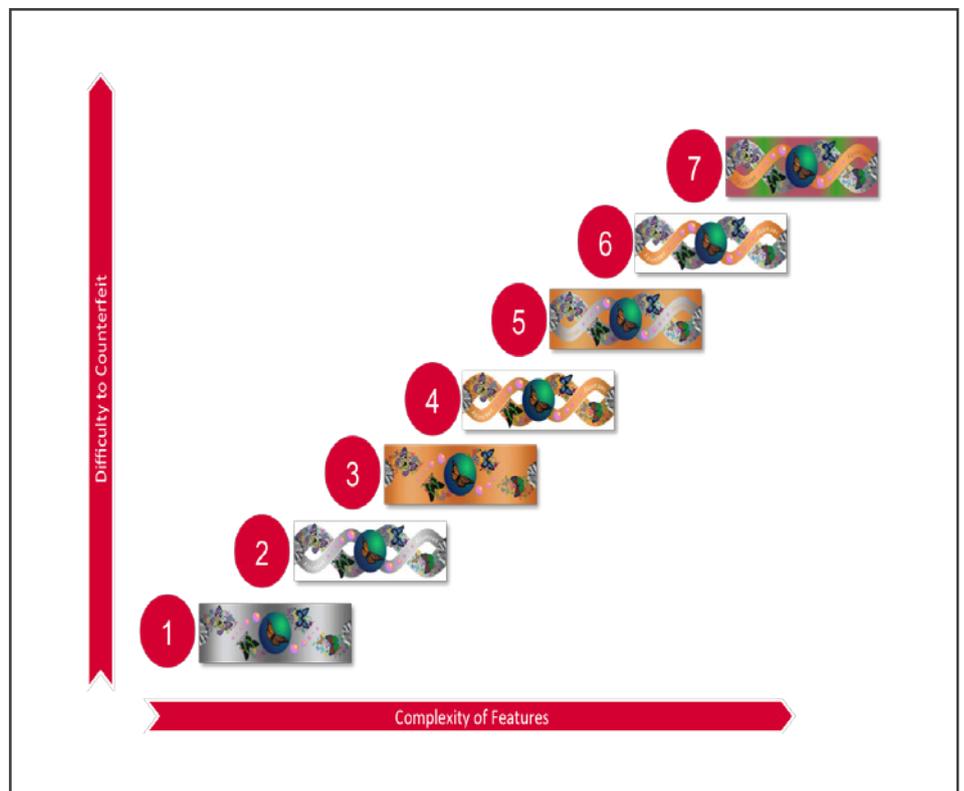
www.hueck-folien.com

Fig 3 – The more complex the features the more difficult they are to counterfeit