

Detecting moiré patterns on bank notes.

Moiré patterns are designs that are created by the interference of 2 separate patterns. There are many sources available that provide techniques to remove moiré patterns, since it is usually visually desirable. Of course, to banknote makers, the opposite is true. This is because moiré patterns tend to disintegrate when copied – a highly desirable security feature.

The first instance of a technical paper in the banknote industry touting the value of this phenomenon I have found is “How to Protect Banknotes Using Moiré Fringes” by Dr. Peter Koeze of De Nederlandsche Bank, the National Central Bank of the Netherlands, in 1974. After Joh. Enschede en Zonen, printers to De Nederlandsche Bank, the paper was sent, on request, to delegates of other National Central Banks participating in the Banknote Printers’ Conference. At the time Dr. Koeze noted the most menacing of all possible banknote forgeries was a screened three or four color reproduction in litho-offset. Today, modern ink jet printing can duplicate banknotes, but these same moiré patterns remain removed from the fakes produced.

A great majority of banknotes and test notes produced contain moiré patterns. Indeed, I have checked Japanese Invasion notes from World War II which display moiré patterns. In fact, many notes with fine line engraved portraits dating back at least to the 1920s show moiré patterns. Most moirés display straight or wavy lines, but some are made to show a hidden message. The reverse is also true – the moiré pattern highlights a hidden message that is not part of the pattern.

I would not be able to display examples here were it not for a generous donation of a clear reader, trade name The CheckMate®. This was back in 2001 when my son entered a district science fair with a project called “Is Your Money Safe?

Optical and Tactile Anti-Counterfeiting Devices in World Currency” (3rd place!). One must only move the clear lens over a note to spot the moirés.

Rotating the lens 90° will produce a change in the existing pattern or a new pattern. The notes “jump” when the lens is moved or by simply changing the angle of view of the note. I wish this reader was still available, but the company may be defunct since the web site listed on the reader is available for sale now.

To illustrate the ability to spot counterfeit notes with a moiré reader, here is the only test note produced by the Thailand Security Printing Works. The first one is the real note with the reader, the second from an inkjet printer copy of the note.



THAI-101 with moiré evident



THAI-101 fake with no moiré

Here is an example of the same moiré pattern on a note, viewed by rotating The CheckMate®.



Kuwait P14c/BB209b 5 Dinars, stolen by the Iraqi Forces during the Invasion in 1990

Here is an example of different moiré patterns on the same note, viewed by rotating The CheckMate®.



Bermuda P57b/BB230a 2 Dollars hybrid note



Maldives PA26/BB222a 5 Rufiyaa polymer note

Here are examples of different notes with hidden moiré images viewed by The CheckMate – “BNA”, “1000”, “AMB”, and “2000”.



Angola P135/BB526a 1000 Kwanza



Argentina P317b 1000 Pesos



Azerbaijan P18b/BB308b 100 Manat



Sierra Leone P31/BB126a 2000 Leones

Here are examples of different notes with hidden images highlighted by moiré background patterns viewed by The CheckMate® - “5” in Arabic and “50”:



Egypt P63b/BB329b 5 Pounds



Pakistan P47a/BB234a 50 Rupees

Here are examples of different notes with circle or square moiré patterns viewed by The CheckMate®.



Russia P269a/BB818a 50 Rubles



Trinidad & Tobago P36d/BB211d

I add a final note worth mentioning. All the images shown here were made using a camera. I attempted to use my scanner with the reader, but the images showed no or a reduced moiré pattern effect. Apparently the scanner program included illumination of moiré patterns!

Hopefully there are other commercial moiré readers available that IBNS members are aware of and can provide contact information for fellow bank note collectors with interest in security features.

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