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Scanning Rastered Images



A bad scan

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1. Introduction

Scanning already rastered prints can easily create Moiré effects - low frequency artifacts, as visible in the title image.

Several methods for optimal scanning are available:

1. The scanners descreening option, which works more or less satisfying.
2. Synchronous scanning for K-only prints (only black ink), as described here.
3. High resolution scanning, followed by Gaussian blur and downsampling.
4. Fourier methods. The image is converted into the frequency domain. Printed dot patterns appear as periodical peaks and can be suppressed. Then the data are converted back into the spatial domain.
This delivers slightly sharper results than the other methods, but special software is required.

Settings for Acrobat

Edit / Preferences / General / Page Display (since version 6)

Custom Resolution 72dpi and use zoom 100% or 200%

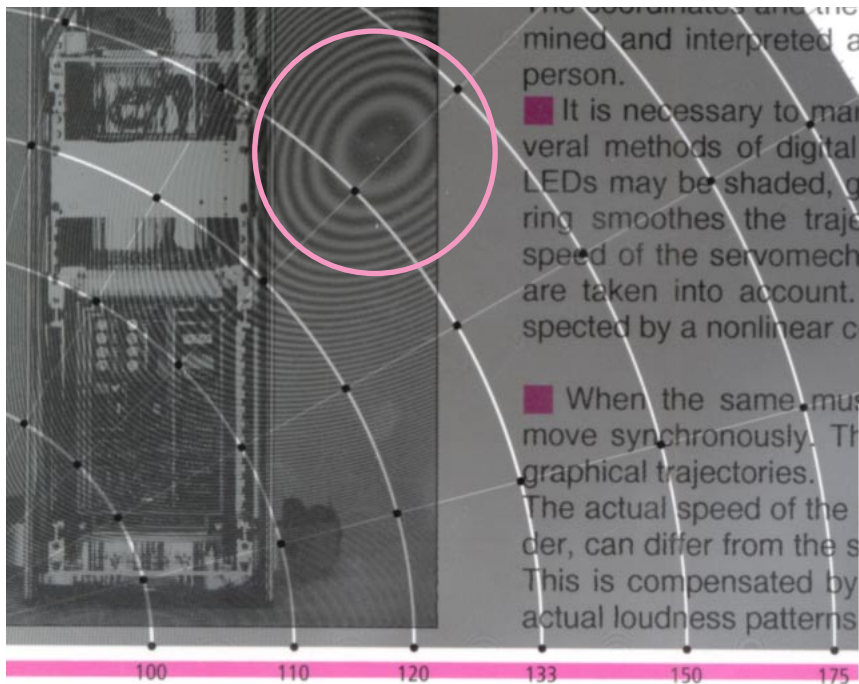
Edit / Preferences / General / Color Management (full version only)

sRGB

Euroscale Coated or ISO Coated or SWOP

Gray Gamma 2.2

2. Scanning rastered gray prints (K-only)



Purchase a raster tester from prepress supplier

Measure Raster Angle

$A=45^\circ$

Measure Raster Frequency

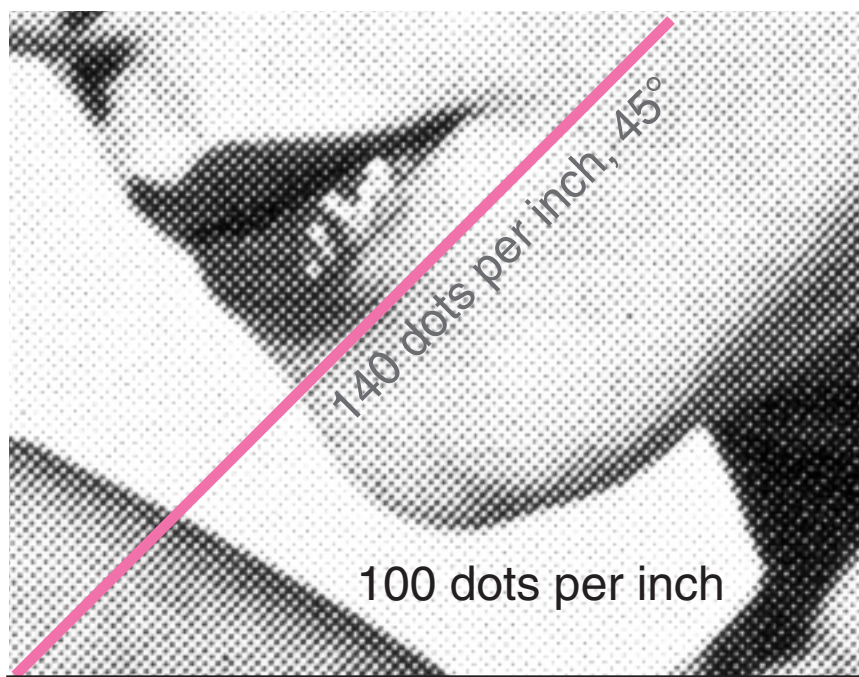
$F=140\text{ Lpi}$

Scanner Resolution

$S = F \cdot \cos(A)$ in dpi

$S = 140 \cdot \cos(45^\circ) = 99\text{ dpi}$

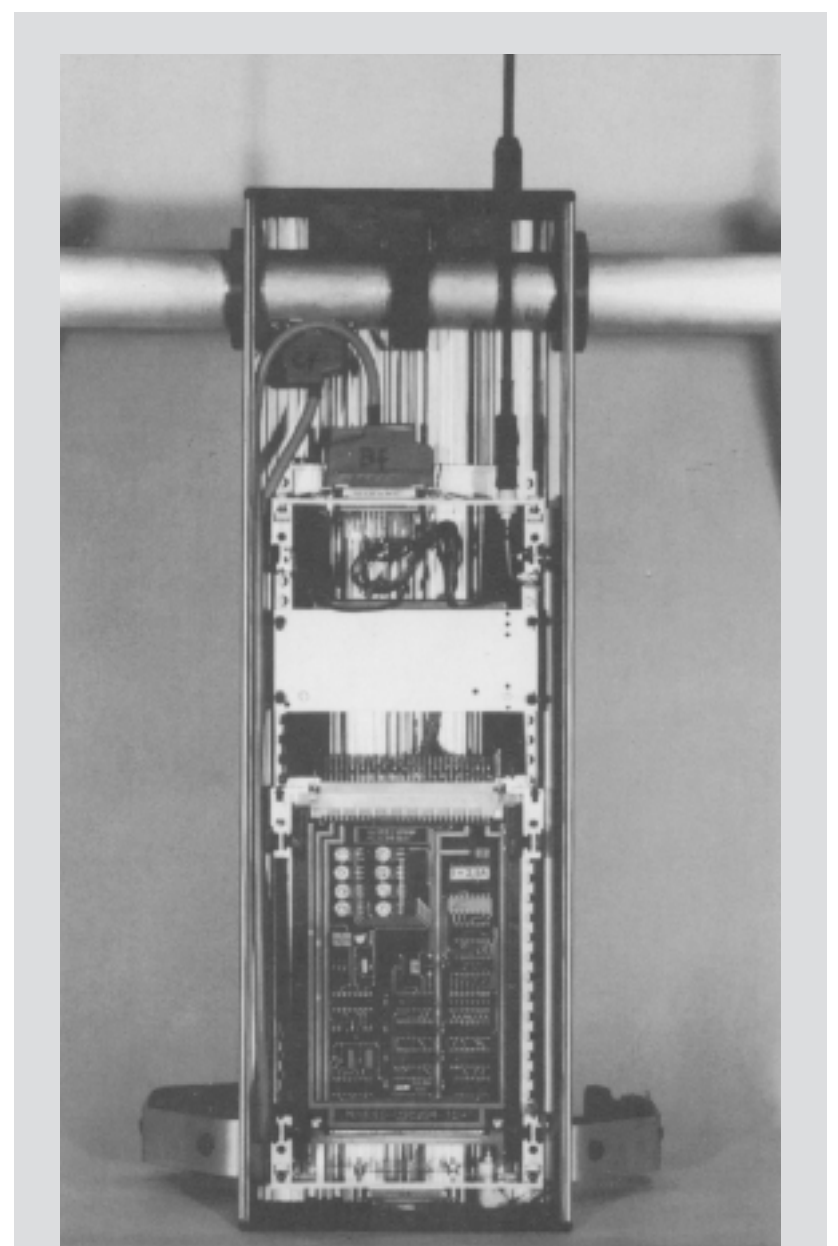
Scan with $S = 99\text{ dpi}$ or 100 dpi



The method is based on the assumption that the scanner applies a correct interpolation, simulating a view through a quadratic aperture with width $1/\text{dpi}$.

Sometimes it is better to use double the calculated resolution (frequency) and downscale later by factor 0.5, as shown by the second example on the last page.

Scanning by four times the calculated resolution delivers a maximum of information, but visible printed spots. Then it is essential to apply a softening filter (Gaussian blur) in actual pixel view in advance to any scaling or rotation, until no primary raster is visible.



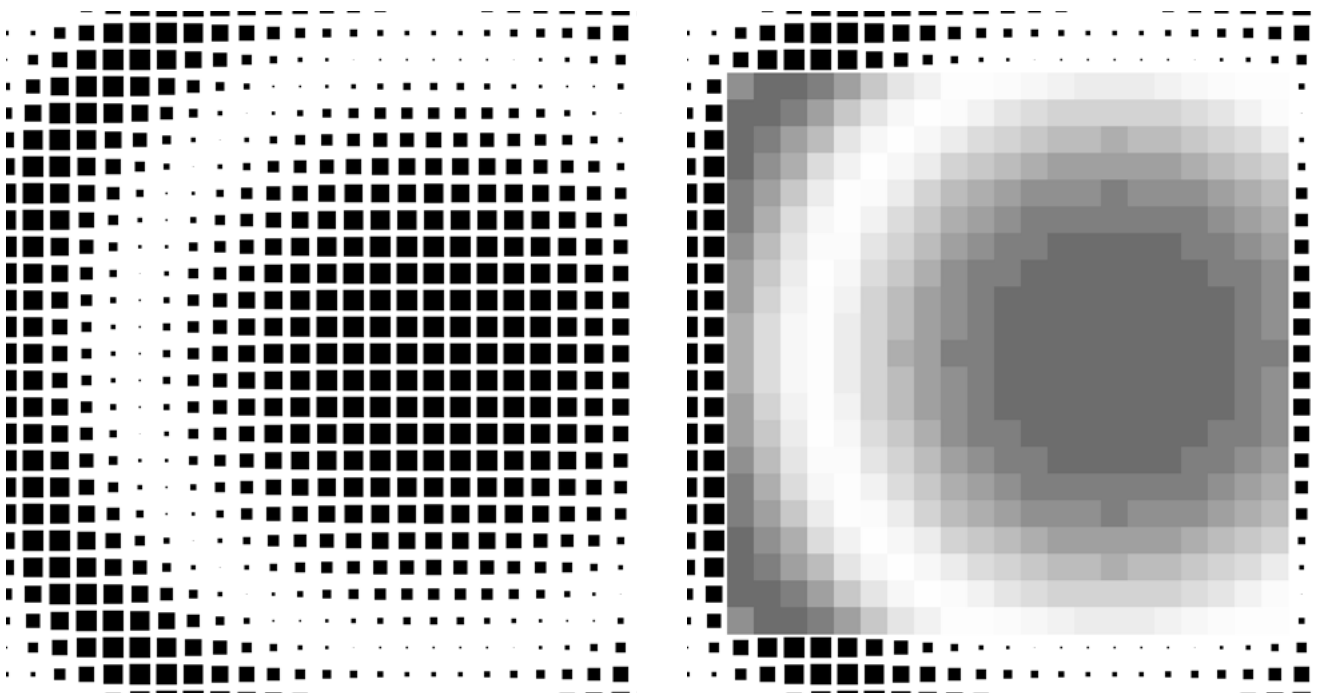
Raw scan
140 Lpi / 45° , 100 dpi
270 x 451 px
No sharpening

3. Simulated scanning

For angle $\leq 45^\circ$ use $\text{ScanFrequency} = \text{RasterFrequency} \times \cos(\text{RasterAngle})$.
For Angle $> 45^\circ$ use $\text{ScanFrequency} = \text{RasterFrequency} \times \cos(90^\circ - \text{RasterAngle})$.

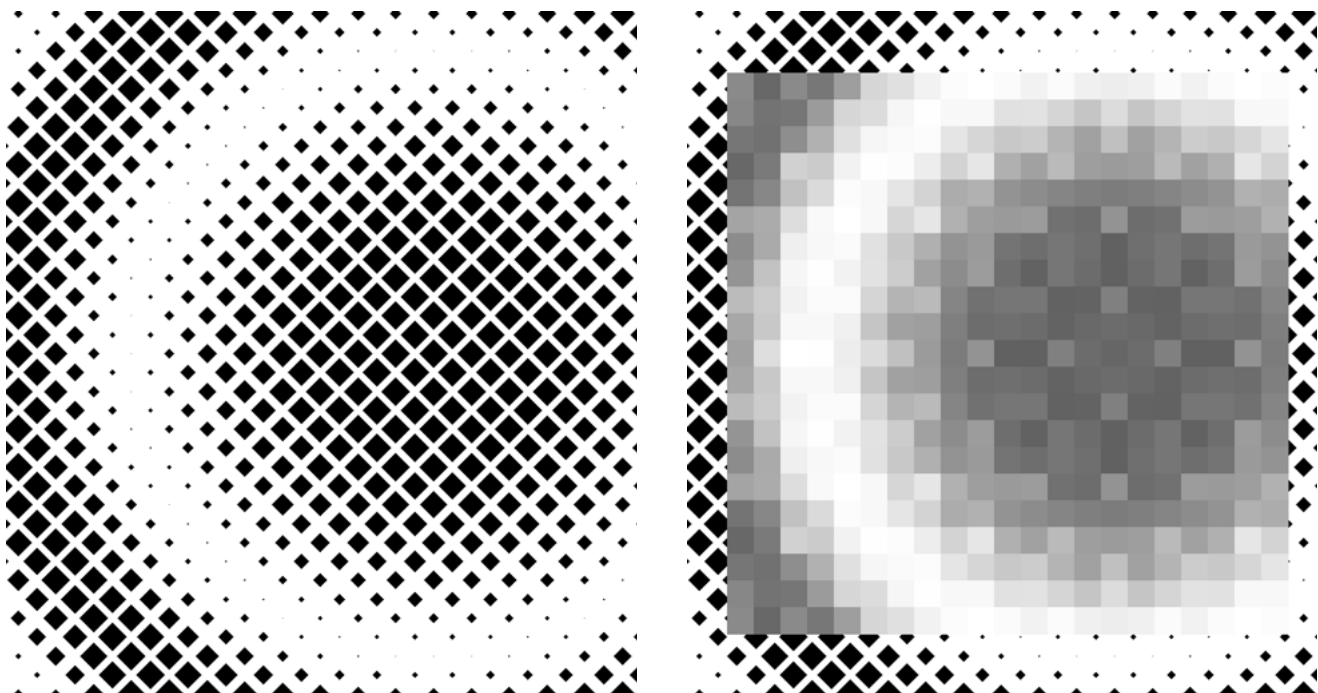
Measure RasterAngle and RasterFrequency by a transparent raster gauge.
The simulation shows:
RasterFrequency 100 Lpi
RasterAngle 0°
ScanFrequency 100 dpi

Correct - no Moiré



RasterFrequency 100 Lpi
RasterAngle 45°
ScanFrequency 100 dpi

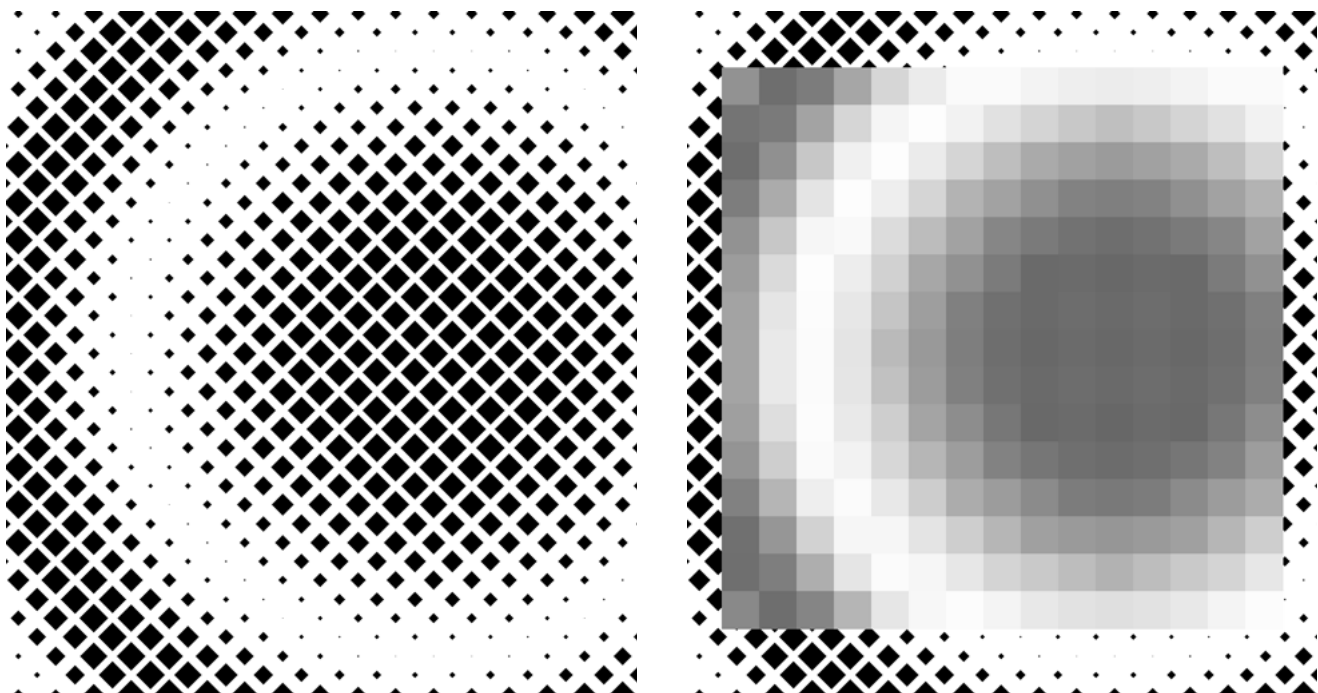
Wrong - Moiré patterns



$\cos(0^\circ) = 1.0000$
 $\cos(15^\circ) = 0.9659$
 $\cos(30^\circ) = 0.8660$
 $\cos(45^\circ) = 0.7071$

RasterFrequency 100 Lpi
RasterAngle 45°
ScanFrequency 71 dpi

Correct - no Moiré



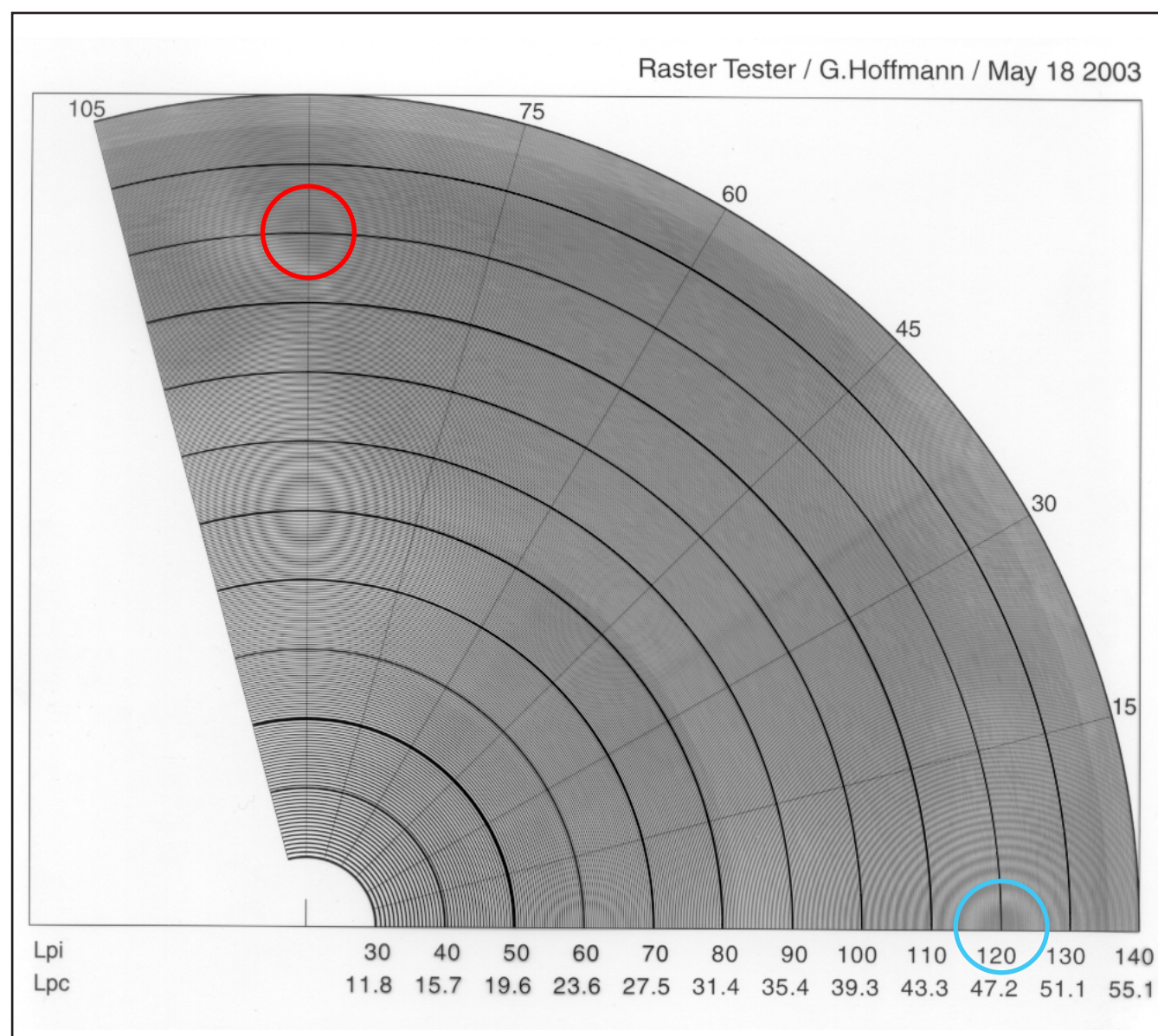
4. Errors

The method was tested by three HP scanners: 4C, 7400C, 6300V.

The first two are working correctly, but 6300C seems to apply an erroneous interpolation or averaging:

The scanner resolution is 120dpi.

We expect no Moiré at 120 Lpi in horizontal and in vertical direction and at $120/0.707=170$ Lpi in 45° direction. The interpolation in **horizontal** direction is correct, but wrong in **vertical** direction. Therefore also wrong in 45° direction.



5. Print your own Raster Tester

30-140 Lpi and 110-220 Lpi, printable on film by imagesetter

<http://http://docs-hoffmann.de/raster16052003.pdf>

6. Scanner descreening



Best view: zoom 200% 72 dpi

René Bouillot
Curso de tratamiento digital de la imagen
Ediciones Omega, Barcelona 2007
Photos by G.Hoffmann

Descreening by Scanner Epson 4990 Photo
Does not require the screen frequency
The right zoom shows that the descreening
is not complete.

7. Scanning rastered color prints

Color prints can be scanned only by high resolution, because the four different raster angles for CMYK prevent any synchronization between the primary raster and the scanner resolution. It is necessary to overscan by factor four or to apply the highest optical scan frequency. 600 dpi is usually enough. Then use a softening filter, as mentioned above.

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Website
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