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**IAM-9C**
NIST Traceable Color
Transmission Calibration Slide
Product Specifications

APPLIED IMAGE Inc.
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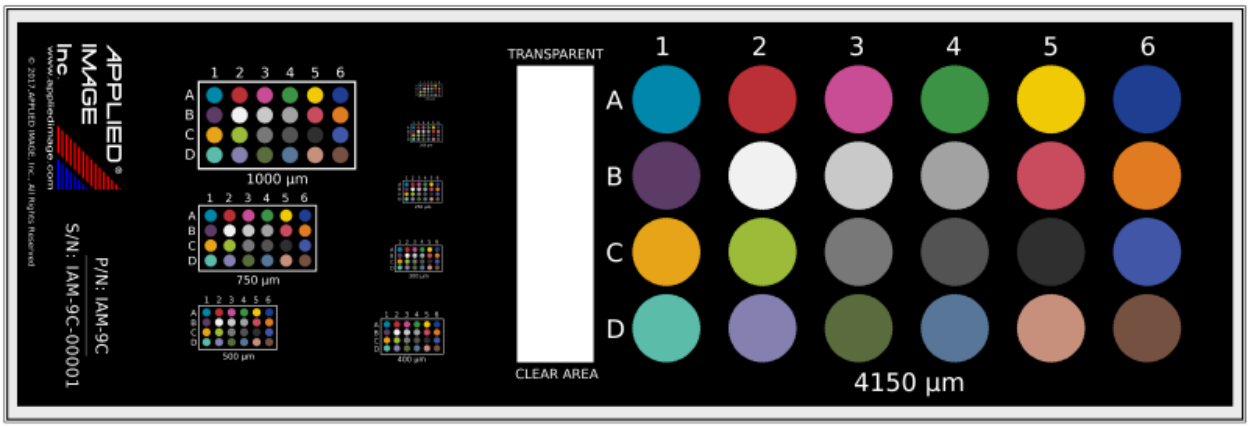
Catalog Part No: **IAM-9C-SECCAL**

Product Name: **NIST Traceable Color Transmission Calibration Slide - Calibrated**

Drawing / Photo of part:




The above image is an approximate representation of the actual product.
Specifications are subject to change without notice.

Description: Microscopy color patches for assessing color accuracy. NIST traceable calibration data for each large color patch is supplied as spectral transmission. By using the supplied spreadsheet, this data can be converted to the color space you need (such as Adobe RGB 1998, L*A*B*, XYZ, etc.)

-24 color patches plus large clear area
-Black background to minimize flare
-The 4150 µm diameter patches are individually calibrated for spectral transmission. (this allows accurate conversion (using the supplied spreadsheet) to other color space units)
-Smaller patches from 1000 µm diameter to 150 µm diameter are exposed and processed at the same time produce good correlation of the large calibrated patches to the smaller ones, but are not calibrated.
-Oil immersion objectives can be used because a standard 0.15 mm glass cover slip is permanently cemented over the color film.
-Film is permanently sandwiched between glass; atmospheric deterioration of the measured values is minimized.
-Each slide is individually serialized and calibrated.

Included with each slide:
Calibrated IAM-9C color microscope slide
Calibration Certificate
Calibration Data Report
Conversion Spreadsheet
USB flash drive with data and spreadsheet
Protective case

Why does Applied Image report the colors as spectral transmission (by wavelength)?
-The reported data is directly based on the NIST traceable transmission and wavelength. This has the most accuracy and lowest uncertainty.
-If we reported data in a color space such as CIE-L*A*B* or sRGB, the data becomes merged, simplified, and much less accurate. Also, the conversion from spectral transmission to color space is a one way path and not reversible.
-We do not know what color space the customer needs, so we leave that conversion open to them.

Traceability:
The supplied Spectral Data is traceable to NIST for wavelength and optical transmission. Calibration of each microscope slide is done by condenser/focused beam illumination, 340-830nm, with data reported every 5nm.
-Typical T (transmission), k=2 uncertainty values are; 0.75%T worst case for the wavelength and %T ranges measured.
-Typical wavelength uncertainty (k=2): 0.62 nm
-See supplied calibration documents for exact uncertainties.

The supplied spreadsheet allows conversion from traceable spectral transmission to the following types of color space:

| Standard Observers | Reference Illuminants | Colorimetry | Density | Working Space RGB |
|---|---|---|---|---|
| • 2°<br>• 10° | • A<br>• B<br>• C<br>• D (any temperature)<br>• E<br>• Blackbody radiator (any temperature)<br>• User defined | • XYZ<br>• xyY<br>• Lab<br>• $LCH_{ab}$<br>• Luv<br>• $LCH_{uv}$ | • Status A<br>• Status E<br>• Status M<br>• Status T<br>• Visual<br>• Type 1<br>• Type 2 | Adobe RGB (1998)<br>Apple RGB<br>Best RGB<br>Beta RGB<br>Bruce RGB<br>CIE RGB<br>ColorMatch RGB<br>Don RGB 4<br>ECI RGB v2<br>Ekta Space PS5 RGB<br>NTSC RGB<br>PAL/SECAM RGB<br>ProPhoto RGB<br>SMPTE-C RGB<br>sRGB<br>Wide gamut RGB |

Transmission Measurement:
The measurements are made with direct transmission of the light beam, with no diffuser. This yields different results than photographic diffuse optical density.

Substrate Size: 75mm x 25mm (approx. 3.0 inch x 1.0 inch)

Substrate Type: 0.2 mm (0.007") thick polyester photo-film mounted onto 0.9 to 1 mm water white Soda-lime Glass with a 0.15 mm (0.006") glass coverslip for protection (exact thickness is subject to change)

Image Forming Material: Photo Emulsion/Color Dye

Image Description: 24 unique color patches in 9 different sizes, ranging from 4.150 mm diameter to 0.150 mm diameter, and a large clear film area. Only the large patches (and clear area) are directly calibrated, but all patches are imaged and processed at the same time.

Polarity: Negative (clear and color patches on a black background)

Reading Direction: Right Read Emulsion Up (RREU)

Typical Soda Lime Glass Flatness:
Flatness better than 10µ and a maximum bow of 200µ.

History / Typical Use: For use as a traceable reference of transmission color.

Cleaning/Handling: This is a glass part so normal glass handling care must be used. The part has a microscope slide cover glass mounted to prevent damage to the photographic films contained inside. Gentle wiping with lens cleaner, alcohol, or acetone is permissible, but the edges must be avoided.

Storage: Store below 25 degrees C (10 degrees C is even better).

Results of Fading Tests:

1) 10 scans were taken from same center location of the B4 color patch on a test slide and exposed on a microscope with condenser illumination and tungsten light source, using high illuminance for about 88 hours

10 scans were taken again at the same position at to determine if a change occurred. The typical change in transmission was on the order of 0.09% or less after exposure to the microscope light.

**Fading:** Typical change after 88 hours on microscope stage

| Patch B4, | | Peak 415nm | Peak 500nm | Peak 605nm | Adobe 1998 RGB | D65 10 degree CIE L*A*B* | CIE 1976 Delta E |
|---|---|---|---|---|---|---|---|
| | Before | 6.74%T | 10.52%T | 7.99%T | 73, 77, 70 | 31.54, -5.31, 4.57 | 0.245 |
| | After | 6.74%T | 10.51%T | 8.08%T | 73, 77, 70 | 31.60, -5.10, 4.68 | |

2) 2 samples were cycled 40 times from -40C to +80C at 1.8 degrees/min. rate of change, over a period of several days. No damage or delamination was noted.

**Fading**: Typical change after 40 cycles of -40C to +80C Patch B3

| Patch B3, Neutral 18 (~30%T) | | Peak 415nm | Peak 500nm | Peak 605nm | Adobe 1998 RGB | D65 10 degree CIE L*A*B* | CIE 1976 Delta E |
|---|---|---|---|---|---|---|---|
| | Before | 28.04%T | 40.77%T | 38.93%T | 160, 161, 151 | 66.48, -2.97, 6.16 | 1.53 |
| | After | 28.02%T | 41.76%T | 39.81%T | 162, 163, 151 | 67.22, -3.57, 7.36 | |

**Fading**: Typical change after 40 cycles of -40C to +80C Patch C4

| Patch C4, Neutral3.5 (~5%T) | | Peak 415nm | Peak 500nm | Peak 605nm | Adobe 1998 RGB | D65 10 degree CIE L*A*B* | CIE 1976 Delta E |
|---|---|---|---|---|---|---|---|
| | Before | 7.25%T | 10.39%T | 8.82%T | 78, 77, 73 | 32.29, -1.76, 3.6 | 2.39 |
| | After | 7.12%T | 11.12%T | 9.24%T | 79, 80, 73 | 33.38, -3.22, 5.16 | |