EASTMAN KODAK COMPANY

PLEASE ADDRESS REPLY TO
RESEARCH LABORATORIES

ROCHESTER, NEW YORK 14650

TELEPHONE
AREA CODE 716 458-1000

March 18, 1971

Mr. R. Kuehni, Technical Dept.
Verona Corporation
P.O. Box 385
Iorio Court
Union, New Jersey 07083

Dear Mr. Kuehni:

I have redone the fitting of your data, using the corrected definition of the angle that you told me about by telephone.

With the ξ,η formulas that I published in Applied Optics, the average radius of your 20 ellipses corresponds to 2.18 units of color difference, with a root-mean-square error of 36.8% of that mean, or 0.8 units of color difference. One of the radii of the F ellipse corresponds to 0.74 units of color difference. Radii of ellipses E and Rob are nearly as small. One of the radii of ellipse M amounts to 3.46 units and one of each of the B, J and K ellipses amounts to nearly 3.35 units.

I re-optimized the coefficients of the formulas for ξ,η, keeping the average radius at 2.75. The r.m.s. error is 19.9% or 0.548 units of color difference. The smallest radius is in ellipse M and is 1.48 units of color difference, according to the modified formulas. The next smallest is 1.525, in the Robinson ellipse. Other than those, no ellipses have radii less than 1.78 units. The largest radius, 3.62 units, is in ellipse T. The next to the longest is in ellipse M, with a semimajor axis of 3.57 units.

The formulas for ξ,η, modified to fit your estimated 50% acceptance ellipses are

$$\xi = -4067a^2-133a^4-1675b^2-38280b^3+46479ab-12064a^2b$$

$$-2806ab^2-37a^3b+843a^{\frac{1}{2}}-10254a^{\frac{1}{4}},$$

where $a = 10x/(2.5x+34y+1)$ and $b = 10y/(2.5x+34y+1)$.

$$\eta = 343b-125b^2-41b^3+31a+41a^3+4a^4-4ab^2-75a^2b^2-85a^2b+137ab^3$$

where $a = 10x/(4.3y-1x+1)$, $b = 10y/(4.3y-1x+1)$.

These formulas should not be used outside the polygon on the chromaticity diagram that just encloses the ellipses you specified. Emphatically, they should not be applied to chromaticities on or near the spectrum locus. So you should not use them to plot a spectrum locus. Much more uniformly distributed ellipses, and more self-consistent data, are necessary for derivation of such formulas.

I do not recommend these formulas for general use and trust that you will not circulate or publish them. I supply them to you merely for your use to determine what is the highest correlation that can be obtained with the Davidson-Friede-Robinson data, by use of formulas tailored specifically for them. I doubt if 75% correlation can be attained; the data simply are not that self-consistent.

Very truly yours,

David L. MacAdam

DLMacAdam:jwj

Research Laboratories