Errata: Reanalysis of turbulence effects on short-exposure passive imaging

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This article [Opt. Eng. 50(1), 016001 (2011)] was originally published on 6 January 2011 with errors in Eqs. (51) to (57). They are corrected below.

The approximation written in Eq. (51) should have included an $\omega^2$ dependence inside the exponential:

$$MT(Q, X, \omega) \approx \exp\left\{+(2.1X)^{5/3}N(Q, X) \omega^2\right\}.$$  (51)

The expression for $A$ in Eq. (54) should have been written using the limits

$$A = \begin{cases} 
0.840 + 0.116\Sigma(q_a), & q_a = 1.35(q + 1.50); q > -1.50; \\
0.840 + 0.280\Sigma(q_c), & q_c = 0.51(q + 1.50); q \leq -1.50.
\end{cases}$$  (54)

The negative sign in Eq. (56) should have been inside the exponent:

$$MS(\omega) = M_0(\omega)MS_A(Q, X, \omega) = M_0(\omega)\exp\{-(2.1X)^{5/3}[1 - V(Q, X) \omega^{1/3}]}\}.$$  (56)

A factor of $2\pi$ was missing from Eq. (57):

$$RX = 2\pi\Omega_0^2 \int_0^1 \omega M_X(\omega)d\omega.$$  (57)

The use of $V(Q, X)$ was based on the approximation of Eq. (51) where the primary $\omega$ dependence was quadratic. The function was evaluated at the $-3$ dB point of the $MS(\omega)$ curve that yielded $V > 1$ under certain conditions. This was incorrectly interpreted as super-resolution behavior. Further research indicates the approximation expression improves performance at low to moderate frequencies but overestimates responses at high frequencies at moderate turbulence levels. In general $V$ is a moderate function of $\omega$, $V(Q, X, \omega)$, that falls below unity at high frequencies $\omega$ in such a way that diffraction limits are maintained. Enhanced responses $(V > 1)$ often appear for $Q > 1$ and $\omega \approx 1/3$. 