Comments and Corrections

Corrections to "Channel Power Optimization of WDM Systems Following Gaussian Noise Nonlinearity Model in Presence of Stimulated Raman Scattering"

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An error in the equations in the Appendix of [1] has been identified. The corrected equations fix a contradiction in the printed statement at the end of the Appendix.

The correct substitution of (34) of [1] gives (35) as

$$\begin{aligned} E_{NLI}(z,f) &= e^{-j\beta(f)z}\Psi(z,f)e^{\int_0^z -\alpha(\zeta,f)\partial\zeta} \\ &\times \int_0^z e^{j\beta(f)z'}\Psi^{-1}(z',f)e^{\int_0^{z'} \alpha(\zeta,f)\partial\zeta} Q_{NLI}(z',f)\partial z' \\ &= -j\gamma f_0^{\frac{3}{2}} e^{-j\beta(f)z}\Psi(z,f)e^{\int_0^z -\alpha(\zeta,f)\partial\zeta}\sum_{i=-\infty}^{\infty}\delta(f-if_0) \\ &\times \sum_{m,n,k\in\tilde{A}_i}\sqrt{G_{TX}(mf_0)G_{TX}(nf_0)G_{TX}(kf_0)}\xi_m\xi_n^*\xi_k \\ &\times \int_0^z e^{\int_0^{z'}[\alpha(\zeta,nf_0)-\alpha(\zeta,mf_0)-\alpha(\zeta,kf_0)-\alpha(\zeta,[m-n+k]f_0)]\partial\zeta} \\ &\times e^{j[\beta([m-n+k]f_0)-\beta(mf_0)+\beta(nf_0)-\beta(kf_0)]z'}\partial z'. \end{aligned} \tag{35}$$

This gives the correct version of (37) as

$$\begin{aligned} G_{NLI}(f) &= 2\gamma^2 f_0^3 e^{\int_0^z -2\alpha(\zeta,f)\partial\zeta}\sum_{i=-\infty}^{\infty}\delta(f-if_0) \\ &\times \sum_m\sum_k G_{TX}(mf_0)G_{TX}(kf_0)G_{TX}([m+k-i]f_0) \\ &\times \Bigg|\int_0^z e^{\int_0^{z'}[\alpha(\zeta,nf_0)-\alpha(\zeta,mf_0)-\alpha(\zeta,kf_0)-\alpha(\zeta,[m-n+k]f_0)]\partial\zeta} \\ &\times e^{j[\beta([m+k-i]f_0)-\beta(mf_0)+\beta(if_0)-\beta(kf_0)]z'}\partial z'\Bigg|^2, \end{aligned} \tag{37}$$

and the correct version of (38) as

$$\begin{aligned} G_{NLI}(f) &= 2\gamma^2 e^{\int_0^z -2\alpha(\zeta,f)\partial\zeta} \\ &\times \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} G_{TX}(f_1)G_{TX}(f_2)G_{TX}(f_1+f_2-f) \\ &\times \Bigg|\int_0^z e^{\int_0^{z'}[\alpha(\zeta,f)-\alpha(\zeta,f_1)-\alpha(\zeta,f_2)-\alpha(\zeta,f_1+f_2-f)]\partial\zeta} \\ &\times e^{j[\beta(f_1+f_2-f)-\beta(f_1)-\beta(f_2)+\beta(f)]z'}\partial z'\Bigg|^2\partial f_1\partial f_2. \end{aligned} \tag{38}$$

As printed, with signs for $\alpha(\zeta,f_1+f_2-f)$ and $\alpha(\zeta,f)$ interchanged, the last line of the Appendix is a contradiction. Using the correct signs for the attenuation coefficients from the corrected version of (38) above, the contradiction is resolved.

The corrected version of the final line of the Appendix is:

For the dominant XPM terms of (38), $f_1 = f$ or $f_2 = f$ such that $f_1+f_2-f = f_2$ or $f_1+f_2-f = f_1$. Thus $\alpha(\zeta,f)-\alpha(\zeta,f_1)-\alpha(\zeta,f_2)-\alpha(\zeta,f_1+f_2-f)$ reduces to $-2\alpha(\zeta,f_{\mathrm{XPM}})$, where f_{XPM} is the frequency of the XPM-interfering channel.

Lastly, this derivation gives the corrected version of (16) as

$$\begin{aligned} \rho'(f_1,f_2,f) &= \\ &\Bigg|\int_0^z e^{\int_0^{z'}[\alpha(\zeta,f)-\alpha(\zeta,f_1)-\alpha(\zeta,f_2)-\alpha(\zeta,f_1+f_2-f)]\partial\zeta} \\ &\times e^{j[\beta(f_1+f_2-f)-\beta(f_1)-\beta(f_2)+\beta(f)]z'}\partial z'\Bigg|^2 L_{\mathrm{eff}}^{-2}. \end{aligned} \tag{16}$$

The numerical results presented, including optimized power allocations and figures, used the incorrect model as printed. For the significantly tilted optimized power allocations considered and at the relatively low total fiber powers considered, using the correct model yields a negligible change to those results, so the interpretation and conclusions remain unaltered. The model as corrected here yields correct results at arbitrary power levels, including levels much higher than those considered in the paper.

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Reference

[1] I. Roberts, J. M. Kahn, J. Harley, and D. Boertjes, "Channel power optimization of WDM systems following Gaussian noise nonlinearity model in presence of stimulated Raman scattering," *J. Lightw. Technol.*, vol. 35, no. 23, pp. 5237–5249, Nov. 2017.