# Correction to "On the Optimality of Beamforming with Quantized Feedback"

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***Abstract*—This correspondence corrects an error in our paper titled, "On the Optimality of Beamforming with Quantized Feedback", published in the IEEE Transactions on Communications, vol. 55, no. 12, pp. 2288-2302, Dec. 2007.**

***Index Terms*—Beamforming, multiple-input multiple-output (MIMO) channels, feedback.**

THE objective function in (19) is not concave in $\mathbf{b}$ (for the same reason that the function $\log(1 + ax^2)$ is not concave in $x$). Therefore, the condition presented in Theorem 1 is only a necessary condition. In its corrected form, Theorem 1 is stated as follows (changing "if and only if" to "only if").

*Theorem 1:* (Symmetry Condition): The unit vector $\mathbf{b}$ is the optimal beamforming direction given $\mathbf{h} \in \mathcal{D}_n$ only if

$$\mathbf{E}_{\mathbf{h}\in\mathcal{D}_n}\left[\frac{h_{||}h^*_{\perp j}}{1 + P|h_{||}|^2}\right] = 0 \qquad \forall 2 \leq j \leq M.$$

Consider any set of vectors $\{\mathbf{u}_1 = b, \mathbf{u}_2, \cdots, \mathbf{u}_{M-1}, \mathbf{u}_M\}$ that form an orthonormal basis in $M$-dimensional space. $h_{||}$ is the projection of the channel along $\mathbf{b}$ (i.e., $h_{||} = \mathbf{b}^\dagger\mathbf{h}$) while $h_{\perp j}$ is the projection along $\mathbf{u}_j$ for $j \geq 2$ (i.e., $h_{\perp j} = \mathbf{u}_j^\dagger\mathbf{h}$).

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