



# Corrections to "On Transmit-Diversity for Spatial Modulation MIMO: Impact of Spatial-Constellation Diagram and Shaping Filters at the Transmitter"

Marco Di Renzo

## ► To cite this version:

Marco Di Renzo. Corrections to "On Transmit-Diversity for Spatial Modulation MIMO: Impact of Spatial-Constellation Diagram and Shaping Filters at the Transmitter". 2013. hal-00847574

HAL Id: hal-00847574

<https://hal-supelec.archives-ouvertes.fr/hal-00847574>

Submitted on 23 Jul 2013

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

# Corrections to “On Transmit–Diversity for Spatial Modulation MIMO: Impact of Spatial–Constellation Diagram and Shaping Filters at the Transmitter”

Marco Di Renzo, *Member, IEEE*

## Abstract

In this comment, we correct some typographical errors in a paper that has recently appeared in this Transactions [1].

## Index Terms

Multiple–Input–Multiple–Output Systems, Spatial Modulation, Transmit–Diversity, Single–Stream Decoding.

## I. INTRODUCTION

In [1], the authors have proposed a new unified space–time–coded transceiver for Multiple–Input–Multiple–Output (MIMO) systems that exploits the recently proposed concept of Spatial Modulation (SM). Furthermore, the authors have introduced a Maximum–Likelihood (ML–) optimum single–stream demodulator for the proposed transmission scheme. In the present comment, we correct some typographical errors in some equations in [1, Sec. VI].

Manuscript received July 12, 2013

M. Di Renzo is with the Laboratory of Signals and Systems (L2S), French National Center for Scientific Research (CNRS) – École Supérieure d’Électricité (SUPÉLEC) – University of Paris–Sud 11, 3 rue Joliot–Curie, 91192 Gif–sur–Yvette (Paris), France, E–Mail: marco.direnzo@lss.supelec.fr.

### A. Corrections to Section VI

The correct expression of [1, Eq. (15)] is as follows:

$$\begin{aligned}
 (\hat{\alpha}, \hat{\mu}_1, \hat{\mu}_2) &= \arg \min_{\mathbf{a}(\tilde{\alpha}) \in \mathcal{A}, \tilde{\mu}_1 \in \mathcal{M}, \tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_1(\tilde{\alpha}, \tilde{\mu}_1) + \Lambda_2(\tilde{\alpha}, \tilde{\mu}_2) \} \\
 &\stackrel{(1)}{=} \left\{ \begin{array}{l} \arg \min_{\mathbf{a}(\tilde{\alpha}) \in \mathcal{A}} \left\{ \min_{\tilde{\mu}_1 \in \mathcal{M}, \tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_1(\tilde{\alpha}, \tilde{\mu}_1) + \Lambda_2(\tilde{\alpha}, \tilde{\mu}_2) \} \right\} \mapsto \hat{\alpha} \\ \arg \min_{\tilde{\mu}_1 \in \mathcal{M}} \{ \Lambda_1(\hat{\alpha}, \tilde{\mu}_1) \} \mapsto \hat{\mu}_1 \\ \arg \min_{\tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_2(\hat{\alpha}, \tilde{\mu}_2) \} \mapsto \hat{\mu}_2 \end{array} \right. \quad (1) \\
 &\stackrel{(2)}{=} \left\{ \begin{array}{l} \arg \min_{\mathbf{a}(\tilde{\alpha}) \in \mathcal{A}} \left\{ \min_{\tilde{\mu}_1 \in \mathcal{M}} \{ \Lambda_1(\tilde{\alpha}, \tilde{\mu}_1) \} + \min_{\tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_2(\tilde{\alpha}, \tilde{\mu}_2) \} \right\} \mapsto \hat{\alpha} \\ \arg \min_{\tilde{\mu}_1 \in \mathcal{M}} \{ \Lambda_1(\hat{\alpha}, \tilde{\mu}_1) \} \mapsto \hat{\mu}_1 \\ \arg \min_{\tilde{\mu}_2 \in \mathcal{M}} \{ \Lambda_2(\hat{\alpha}, \tilde{\mu}_2) \} \mapsto \hat{\mu}_2 \end{array} \right.
 \end{aligned}$$

where (1) and (2) are described in [1]. The mistakes originated from typing  $\arg \min \{ \cdot \}$  instead of  $\min \{ \cdot \}$ .

The correct expression of [1, Eq. (17)] is as follows:

$$\hat{\alpha} = \arg \min_{\mathbf{a}(\tilde{\alpha}) \in \mathcal{A}} \{ \Lambda_1(\tilde{\alpha}, \hat{\mu}_1(\tilde{\alpha})) + \Lambda_2(\tilde{\alpha}, \hat{\mu}_2(\tilde{\alpha})) \} \quad (2)$$

The mistakes originated from typing  $\hat{\mu}_i(\tilde{\alpha})$  instead of  $\Lambda_i(\tilde{\alpha}, \hat{\mu}_i(\tilde{\alpha}))$  for  $i = 1, 2$ .

The correct expression of [1, Eq. (19)] is as follows:

$$\left\{ \begin{array}{l} \hat{\mu}_m(\tilde{\alpha})|_{m=1,2,\dots,N_M} = \arg \min_{\tilde{\mu}_m \in \mathcal{M}} \left\{ \Lambda_m(\tilde{\alpha}, \tilde{\mu}_m) = \sum_{r=1}^{N_r} \left[ (E_S/2) \left( \sum_{\tau=1}^{N_{\tilde{\alpha}}} |\mathbf{H}_{r,\tilde{\tau}}|^2 \right) |\tilde{\mu}_m|^2 - 2\sqrt{E_S/2} \operatorname{Re} \left\{ \Psi_m^{(\text{HX})}(\mathbf{t}, \tilde{\mathbf{t}}; r) \tilde{\mu}_m^* \right\} \right] \right\} \\ \hat{\alpha} = \arg \min_{\mathbf{a}(\tilde{\alpha}) \in \mathcal{A}} \left\{ \sum_{m=1}^{N_M} \Lambda_m(\tilde{\alpha}, \hat{\mu}_m(\tilde{\alpha})) \right\} \\ \hat{\mu}_m|_{m=1,2,\dots,N_M} = \hat{\mu}_m(\tilde{\alpha} = \hat{\alpha})|_{m=1,2,\dots,N_M} \end{array} \right. \quad (3)$$

which follows from the correct expression in (2).

## II. CONCLUSION

In this comment, some typographical errors in [1] have been corrected. It is worth emphasizing that the numerical results in [1] are obtained by using the correct equations in (1)–(3).

## REFERENCES

- [1] M. Di Renzo and H. Haas, “On transmit–diversity for spatial modulation MIMO: Impact of spatial–constellation diagram and shaping filters at the transmitter”, *IEEE Trans. Veh. Technol.*, vol. 62, no. 6, pp. 2507–2531, July 2013.