MAXImum VCSEL Polarization Switching – Reflections on Intrinsic and Extrinsic Causes of Asymmetries

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Conventional wisdom, normally a useful guide bordering on intuition, often unnecessarily constrains both our imaginations and our understanding of physical phenomena. A case in point was the conventional wisdom about the causes of polarization and spatial pattern bistability and dynamics of Vertical Cavity Surface Emitting Lasers. Not surprisingly, the conventional (engineering) approach to explain and understand these phenomena presumed that breaking of cylindrical symmetry arose from physical imperfections, including structural/mechanical imperfections, intrinsic birefringence and asymmetric external reflections. While better fabrication techniques helped to reduce these causes, the multistability, switching and dynamical behavior persisted. Quite unexpectedly, a revival by MSM of the insights about polarization dynamics from atomic gas lasers (sometimes called Vector Lasers) proved to provide an elegant explanation for much of the observed VCSEL polarization switching and dynamics. I will take this occasion to compare and contrast theoretical and experimental results and their explanations as they emerged in Mallorca & Massachusetts from groups with which I had some firsthand contact.