

Evolution of optical pulse coding in fiber-optic distributed Brillouin sensors

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This presentation will provide a comprehensive review of the key factors that limit the performance of distributed fiber-optic Brillouin sensors, with a particular focus on the intrinsic trade-offs between spatial resolution, measurement range, and signal-to-noise ratio. A key discussion will be the use of optical pulse coding as an effective strategy to overcome these trade-offs and enhance the overall sensor performance.

The talk will trace the evolution of optical pulse coding techniques over the past 15 years, highlighting major milestones and innovations that have contributed to improved sensitivity and resolution in distributed Brillouin sensing. A retrospective analysis will be presented, examining the technical challenges and limitations encountered in different implementations, covering from the earliest proof-of-concept demonstrations to the most advanced recent systems.

Finally, the presentation will outline ongoing research directions and future challenges to further improve this technique.



Short Bio:

Marcelo A. Soto received the PhD degree in Innovative Technologies of ICT Engineering, with a major in Optical Communications, from Scuola Superiore Sant'Anna, Italy, in 2011. During 2010–2011, he was a Research Fellow at Scuola Sant'Anna, where he worked on Raman and

Brillouin distributed fiber sensors. Later, from 2011 to 2017, he was a Postdoctoral Researcher at EPFL Swiss Federal Institute of Technology of Lausanne, Switzerland, where he worked on high-performance Brillouin and Rayleigh distributed sensing, nonlinear fiber optics, optical signal processing, and optical Nyquist pulse generation. In 2018, he



joined Universidad Técnica Federico Santa María, Chile, where he is now an Associate Professor since 2022 and leads a research group on distributed fiber sensing. Between 2018 and 2021, he also had an invited position as one of the "100 distinguished invited professors" at Guangzhou University, China. Dr. Soto is author or coauthor of over 230 publications in international journals and conferences, 3 book chapters and 9 patents in the fields of optical communications and optical fiber sensing. He has served as a Technical Committee Program Member of several major conferences in the field of optical fiber sensing. He has also been an Associate Editor of the Optical Fiber Technology Journal and the IEEE Journal of Lightwave Technology.