

## Interview with Héctor J. De Los Santos, author of ‘Understanding Communications Systems Principles — A Tutorial Approach’

In this interview Héctor J. De Los Santos, NanoMEMS Research, discusses his new book ‘Understanding Communications Systems Principles – A Tutorial approach’, which acts as an introduction to the field, addressing the principles of communications and sensing systems. The book introduces the field and its fundamental principles, then goes on to cover various current applications, from 5G and MIMO to aerospace and electronic warfare radar.

### ***First, what was your motivation to do this book? Why is a book like this important now?***

Héctor J. De Los Santos: The motivation for writing the book was twofold. On the one hand, we have the explosion in the field of wireless communications, exemplified by the rapid ever-increasing functionality of cell phones and the proliferation of wireless networks that enable ubiquitous connectivity at faster and faster data rates. This rapid development in wireless technology has been heroic given the scarcity of much needed technical personnel trained in the field. This need is exacerbated by the fact that, in addition to cell phone applications, there is a plethora of other competing technologies, such as for Communications Satellites and Electronic/Warfare RADAR, that fiercely compete to attract technical talent from same scarce pool. It was clear then that, in addition to traditional academic training, there was the need for a learning resource that, besides enhancing the training of undergraduate and graduate students interested in wireless communications, could be amenable to quickly bring up to speed practicing electrical engineers interested in the abundant employment opportunities available in this growing field.

On the other hand, this perception of the sense of urgency in the development of technical talent in wireless communications became synergistic with the possibility to accelerate the learning/training experience by exposing students to a tutorial-type learning style/environment in which there would be a quick immersion into real life-like situations simulating the workplace. And this was the case enabled by the collaboration with Keysight software tools, in particular, SystemVue, to affect such learning/training.

### ***Why is a book like this important now?***

Héctor J. De Los Santos: The timing of the book is perfect, given the exploding economic activity in the field of wireless communications, from Internet in Space, to 5G, to new government and military programs.

### ***How does this relate to your work with NanoMEMS Research, LLC?***

Héctor J. De Los Santos: In the wireless communications area, my work at NanoMEMS deals with the research and development of techniques and concepts to enable SECURE wireless communications. Thus, with an intimate knowledge of wireless communications systems at the heart of our activities, we aim at studying and exploiting physics, e.g., Quantum Field Theory, to render wireless systems that are impossible to hack or intercept. We also address concepts to identify wireless communications intruders/eavesdroppers.

### ***We are currently seeing the role out of 5G wireless system technologies, which is one of the technologies covered in the book. What are your thoughts about what is the next big step for wireless communications?***

Héctor J. De Los Santos: The potential of 5G is indeed high and the book examines its underpinnings and challenges. One such challenge pertains to realizing multi-input multiple-output (MIMO) systems architectures employing phased array antennas possessing thousands of elements. The realization of large-number-of-elements MIMO

systems is a dream that might very well become a nightmare. Thus, a sober exposition of the technology is addressed as, despite the currently high expectations, the field may well be accompanied by a great dose of speculative visions which, in the end, may or may not be fully realizable.

***Any final thoughts on what readers will be able to take away from this book?***

*Héctor J. De Los Santos:* I believe that readers of this book will take away a fundamental understanding of wireless communications and sensing systems. In particular, their understanding will include key building blocks making up the systems and how they are interconnected, how information signals of interest are transmitted, received, and processed by these systems and how to gauge the degree of performance quality of these systems in the presence of the deleterious effects of the environment, whether natural or man-made.

The book ‘Understanding Communications Systems Principles — A Tutorial Approach’ is now available from the [River Publishers website](#).

The book also comes with free temporary access to Keysight’s SystemVue system simulation, which further enhances reader learning through hands-on tutorial exercises.