Polaris Insight Series

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Bas van de Ven - van der Zanden

Pushing the Radar Frontier: From Streets to Ships

Bas van de Ven - van der Zanden is a PhD candidate at TU Eindhoven, exploring how to make radar systems smarter by eliminating self-interference. His journey through electronics, signal theory, and real-world prototyping brings together curiosity, practical skill, and collaboration — and is now extending from cars to ships within the Polaris programme.

From soldering kits to microchips

Bas grew up in Doetinchem, a town in the eastern Netherlands that proudly calls itself the “uncrowned capital of the Achterhoek.” As a kid, he enjoyed taking apart old devices and soldering together circuits based on simple schematics. Physics and math came naturally, but instead of following the well-worn path to Twente, Bas chose something different: Eindhoven.

> “Radar is fascinating. I instantly thought of bats — sending out a signal, listening, and getting something back.”

During his master’s, he spent time at the Ferdinand Braun Institute in Berlin, working on ultra-fast amplifiers based on indium phosphide — faster than conventional silicon technology. That research experience paved the way to a PhD offer in automotive radar, a topic that immediately sparked his interest.

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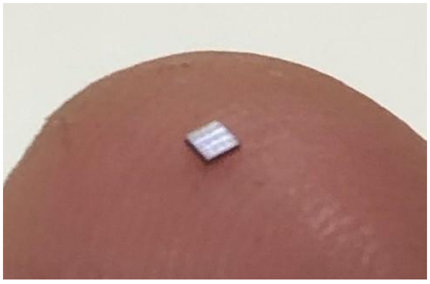
Spillover cancellation: subtracting your own voice

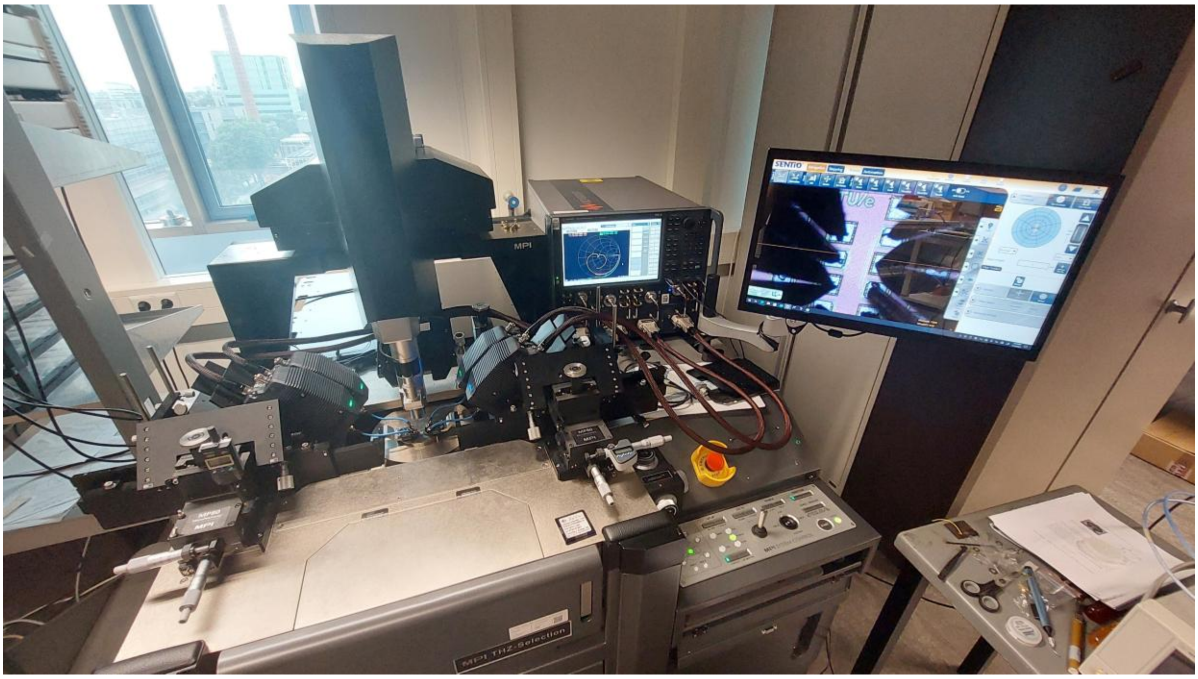
Bas’s research zeroes in on a key challenge in radar systems: **spillover**. In simple terms, radar systems transmit a signal and then listen for its echo. But what if, while listening, the receiver mostly hears itself?

“In CW radars — especially the ones in cars — you're transmitting and receiving at the same time. But your own signal leaks directly into the receiver. It’s so strong that it can block or distort the very reflections you’re trying to detect.”



Bas developed a circuit-level technique to cancel that interfering signal — essentially “subtracting your own voice” from the recording.

In automotive radar, this spillover comes from the close proximity of the transmitting and receiving antennas. The reflected signal from a distant object is orders of magnitude weaker. The result: interference that can overwhelm your system, or worse, damage sensitive components.



At the Heart of the Hardware.
The chip under test is smaller than the tip of a needle — but it’s designed to handle massive radar signals. To validate its performance, a delicate setup of micro-probes makes contact with the chip’s surface, connecting it to a landscape of precision measurement equipment. The surrounding test rig looks like a miniature lab within a lab. On the nearby screen, data scrolls by — intentionally blurred for security reasons, but silently confirming whether the design works as expected.

From highway to high seas

Through Polaris, Bas is now extending that cancellation approach from cars to **naval radar**. And that's a major leap. "In cars, you might want to see 200 or 300 meters ahead. But on a naval ship, the distances are much greater, and the power levels are on a completely different scale."

This shift means reevaluating not just the design, but also the physics and architecture of the radar systems. "The key challenge is: how do these problems show up in maritime radar? And can I adapt the techniques I used in automotive systems to this environment?"

That's where collaboration comes in. Bas is preparing to present his work to experts at **Thales** and **TNO**, two key Polaris partners in radar technology. "I'm really looking forward to sitting down with them, learning how spillover behaves in their systems, and exploring how my circuits might help."

Circuit design with a deadline

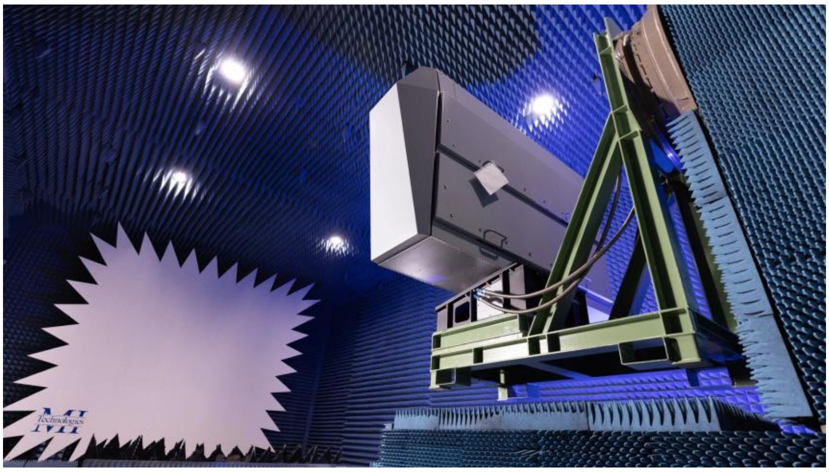
What sets Bas apart is his drive to turn theory into hardware. His PhD involves full chip development: from schematic and layout to actual **fabrication and testing**. "Eventually, you hit that tape-out deadline — the moment the design goes to the chip factory. Three months later, you receive these tiny chips back, and finally get to see if your ideas work."

This is the part he enjoys most: debugging, measuring, adjusting — and seeing physical results.

Why Polaris?

Bas was drawn to Polaris not only by the research challenge but also by its industry connection.

"I still remember visiting Thales during my first year as a student — seeing those massive radars and walking through their **anechoic chamber**. That really left an impression on me."



Now, years later, he's working on circuits that may one day be part of those same systems. "I love that Polaris brings together fundamental research and real-world application. And the scale of the programme — with so many researchers and partners — makes it feel like we're part of something much bigger."

Gravel roads and granite walls

Outside the lab, Bas spends his time climbing and biking. He’s a regular in the climbing gym, and during summer months you’ll find him on his gravel bike, often with camping gear packed for multi-day trips. “Just riding for hours, through forests and fields, totally unplugged — that’s when I reset.”

Building the future of radar

Bas is one year into his PhD, and already laying the groundwork for real impact in Polaris. By bridging automotive and maritime radar, and working closely with both industry and academia, he’s turning signal theory into tangible innovation.

> “Ultimately, I want to design something that gets built, tested, and used. That’s what drives me.”