

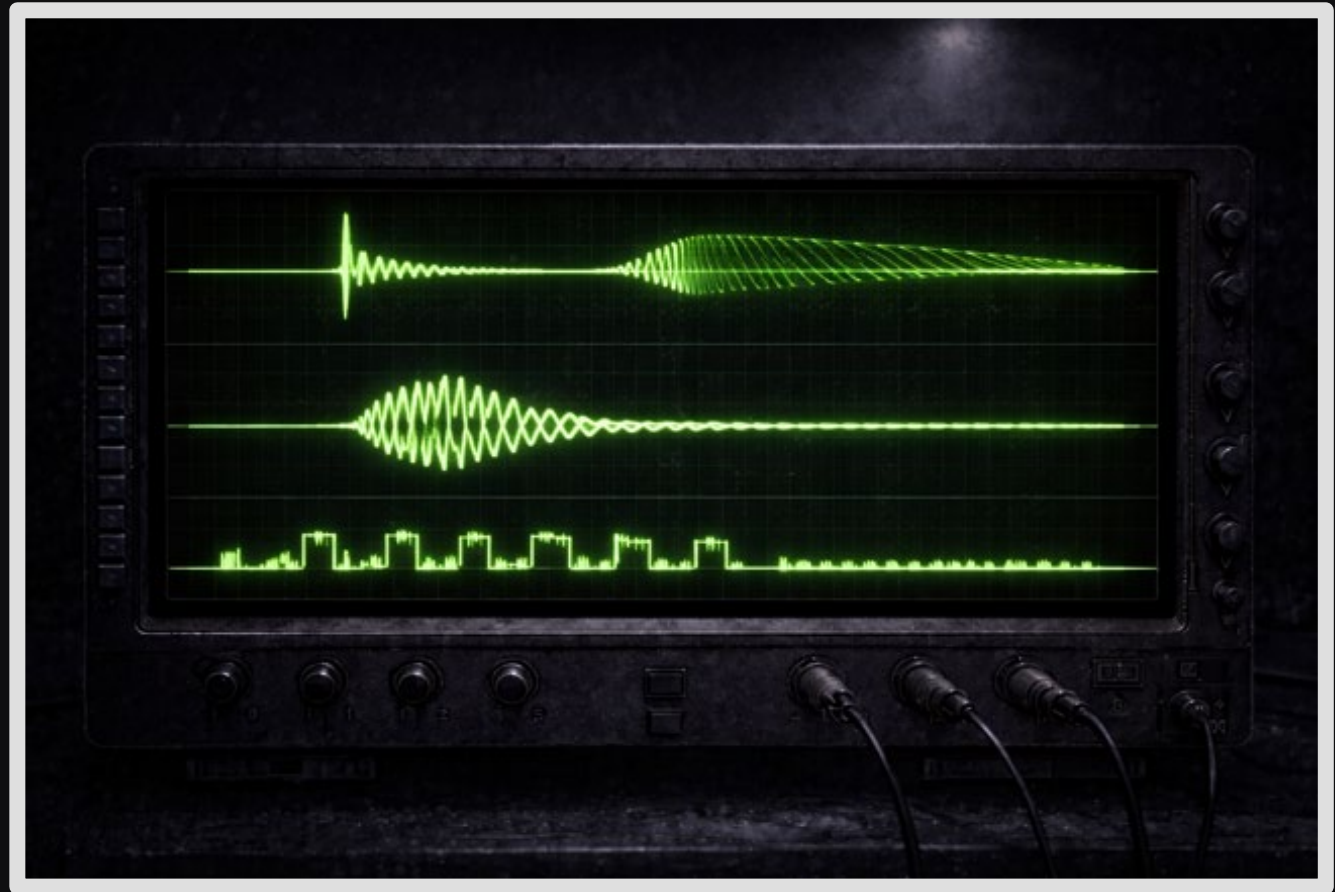
Radar Signals Have “Fingerprints” Too

Understanding Radar Emitter Identification Through Signal Signatures



Why Identifying Radar Emitters Matters

- Many radar systems operate simultaneously
- Signals often overlap in dense environments
- Electronic warfare systems must identify emitters quickly
- Accurate identification enables effective countermeasures



Find the signal → Identify the radar

Fingerprint ID vs Radar Pulse ID



Every system leaves a signature.

Nature's Unique Signature

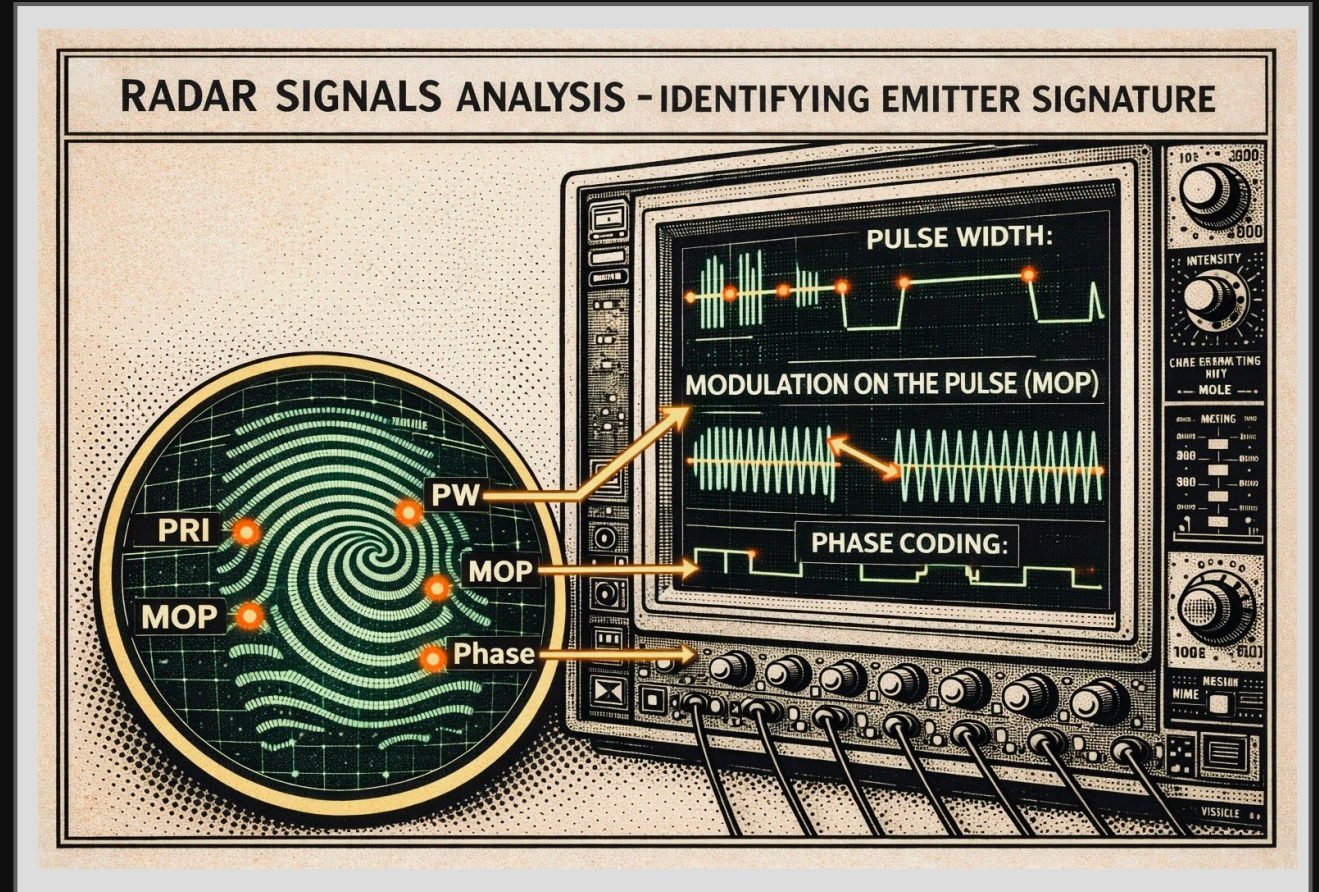
- One-of-a-Kind: No two fingerprints are the same – even in identical twins
- Created by Chance: Tiny ridge form randomly during development
- Never Changes: Your fingerprint pattern remains constant throughout your lifetime
- Natural ID: Used for unique identification of an individual



One print, one person – no exceptions.

Technology's Unique Signature

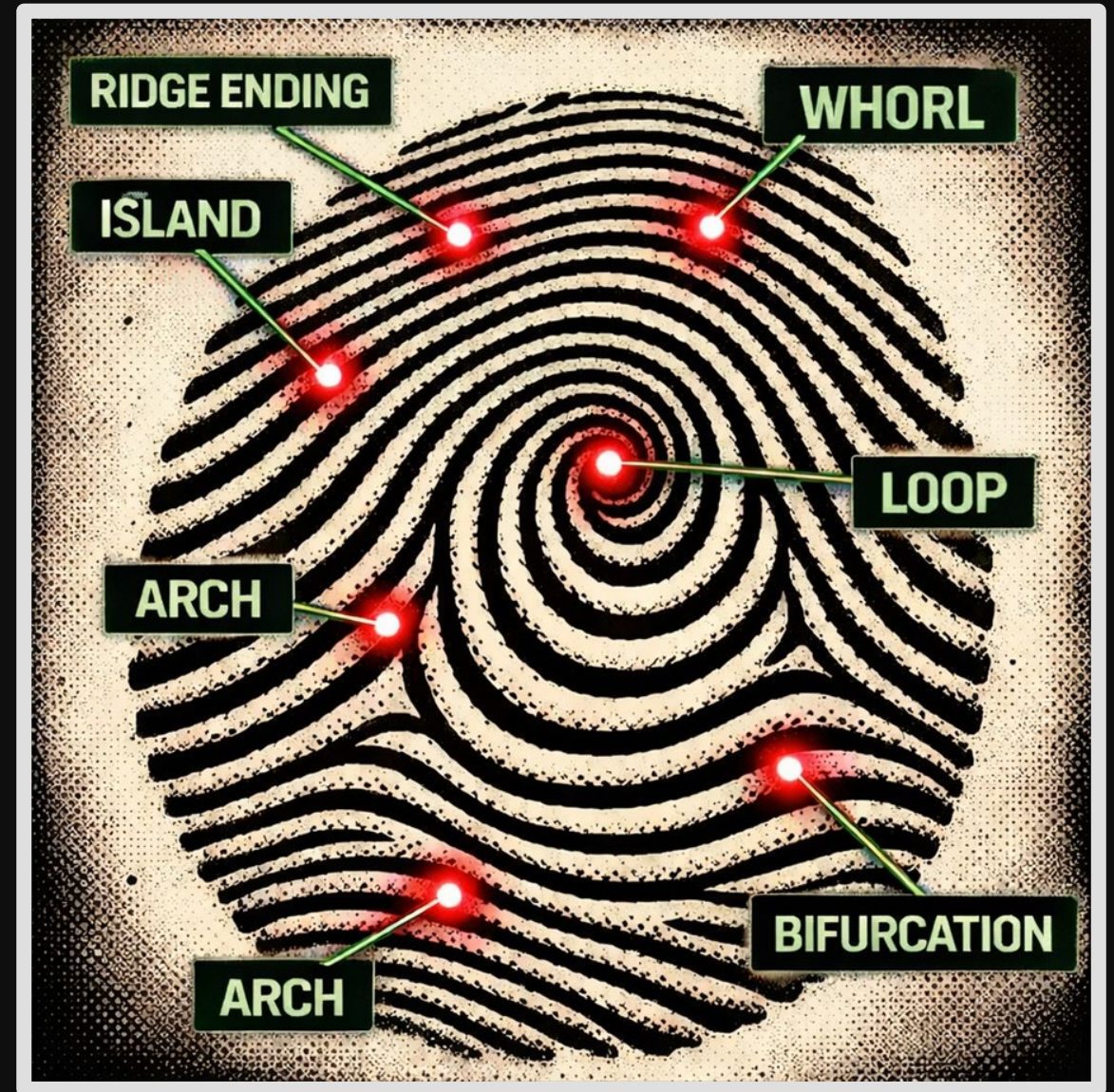
- One-of-a-Kind: No two radar signals are the same – even from identical systems
- Created by Chance: Tiny random differences occur when a signal is produced
- Never Changes: Patterns remain constant during operation
- Electronic ID: Used for unique identification of a specific radar



One signal, one radar – no exceptions.

Fingerprint Pattern Characteristics

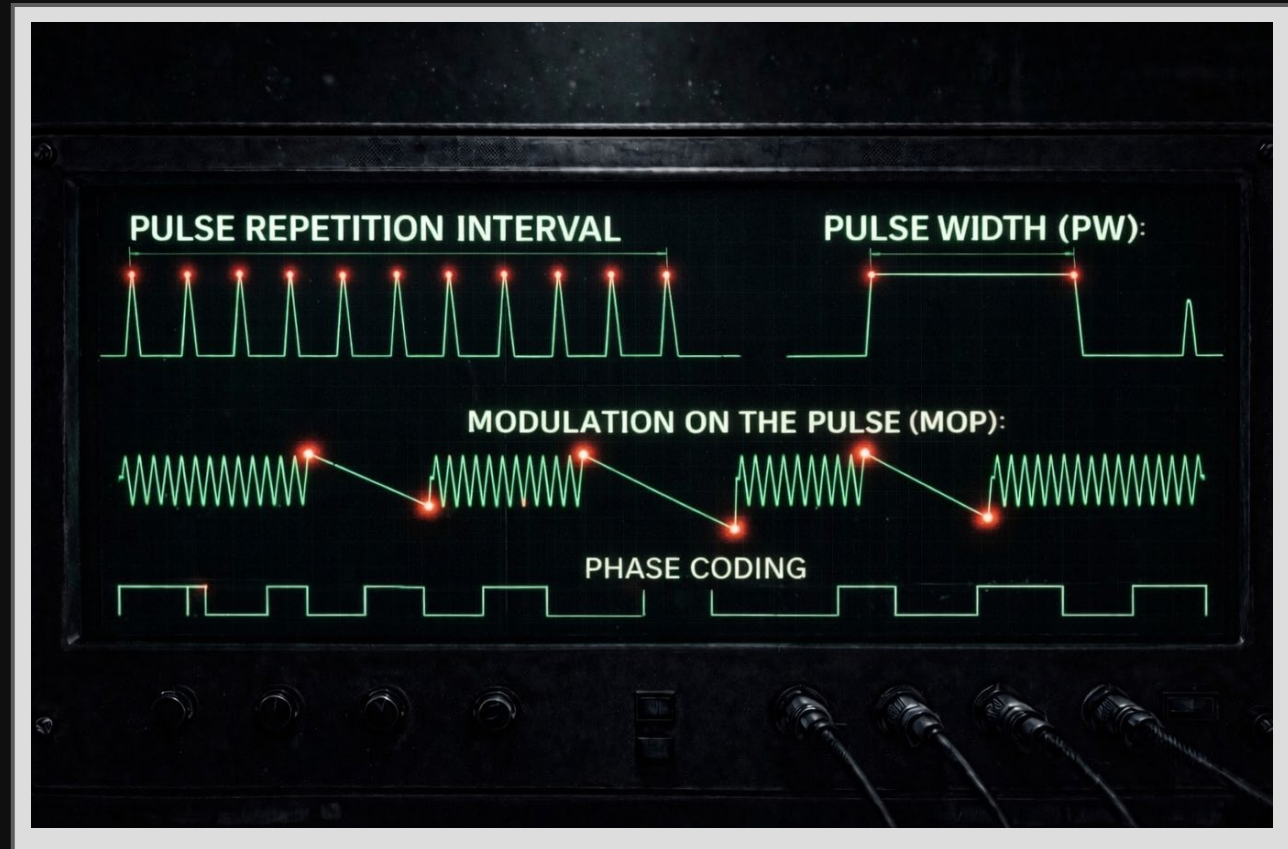
- Three Pattern Classes: Loop, Whorl, Arch
- Ridge Flow: Overall path – looping back, circling, or arching across
- Minutiae: Endings, splits (bifurcations), dots, islands, spurs
- Identity: Pattern, flow, and minutiae together identify the print



Patterns → Flow → Minutiae → Identity

Radar Signal Characteristics

- Four Parameter Classes: PRI, PW, MOP, Phase Coding
- Signal Flow: The overall rhythm – PRI sets pulse spacing, PW defines burst length
- Signal Minutiae: Small internal variations – small modulation and phase patterns within each pulse
- Identity: Classes, flow, and minutiae together form a unique radar signature



Parameters → Timing → Modulation → Signature

Signals Have Fingerprints Too

