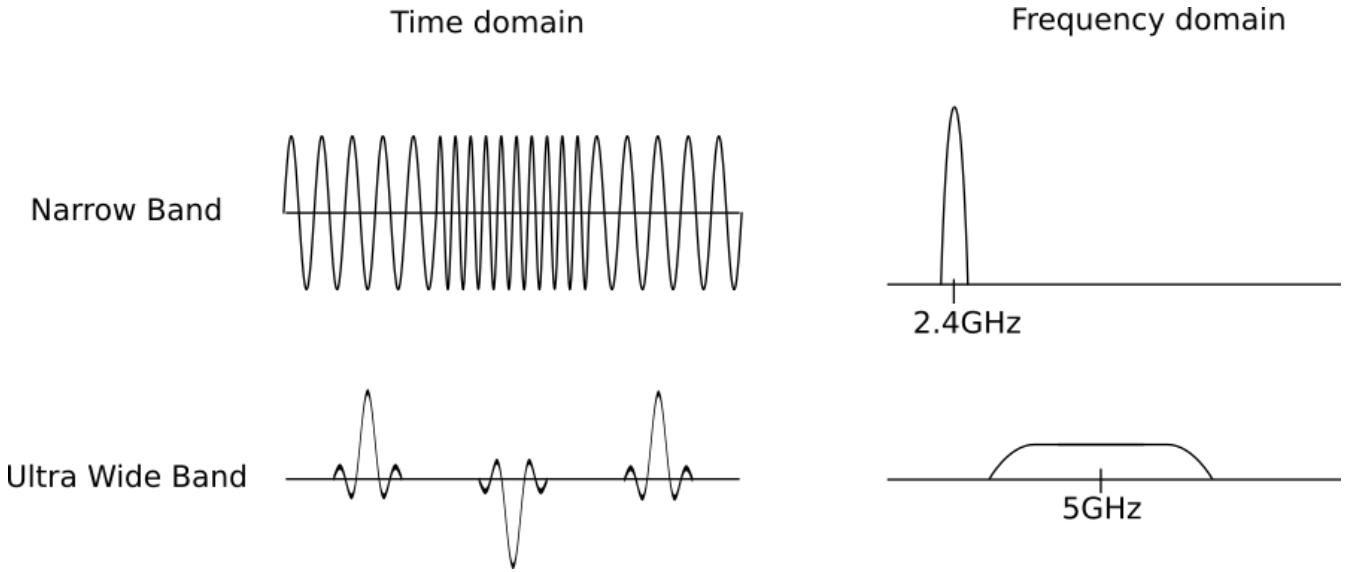
Ultra Wideband Basics

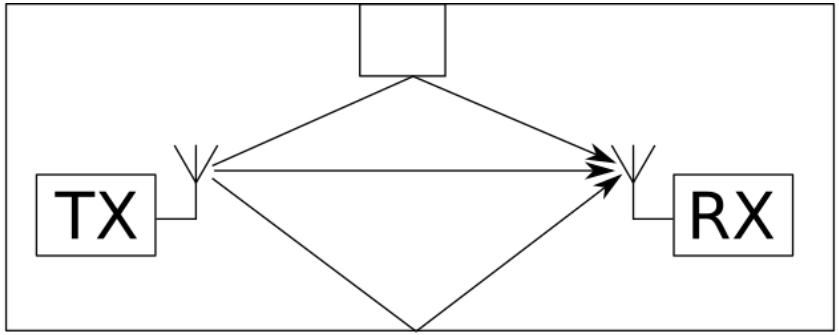
Goal

Basic understanding of UWB in ranging applications

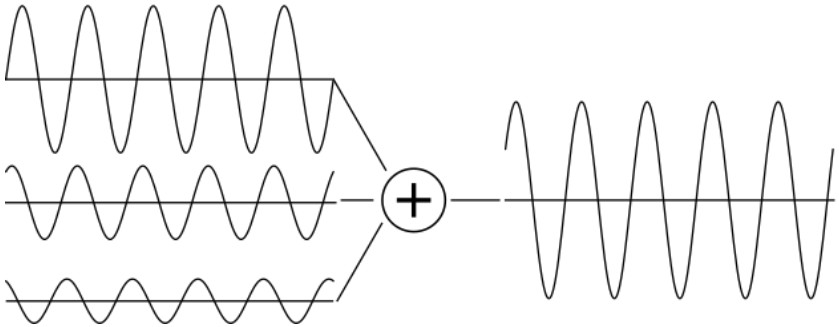
What is Ultra Wideband (UWB) radio?



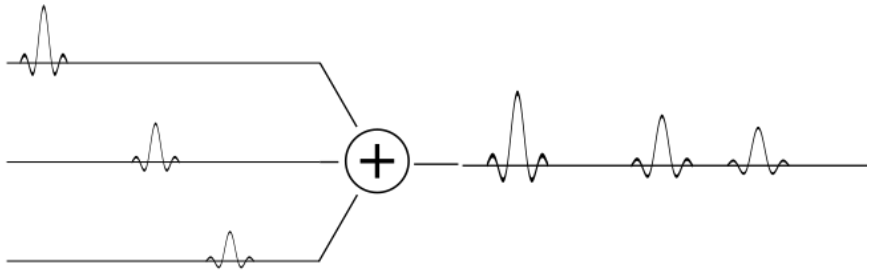
Multipath



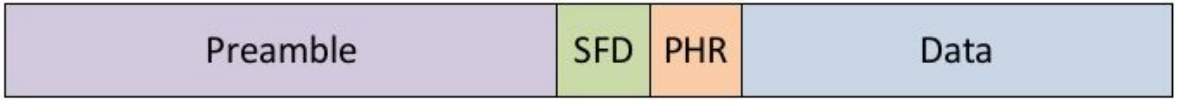
Narrow band



Ultra Wideband

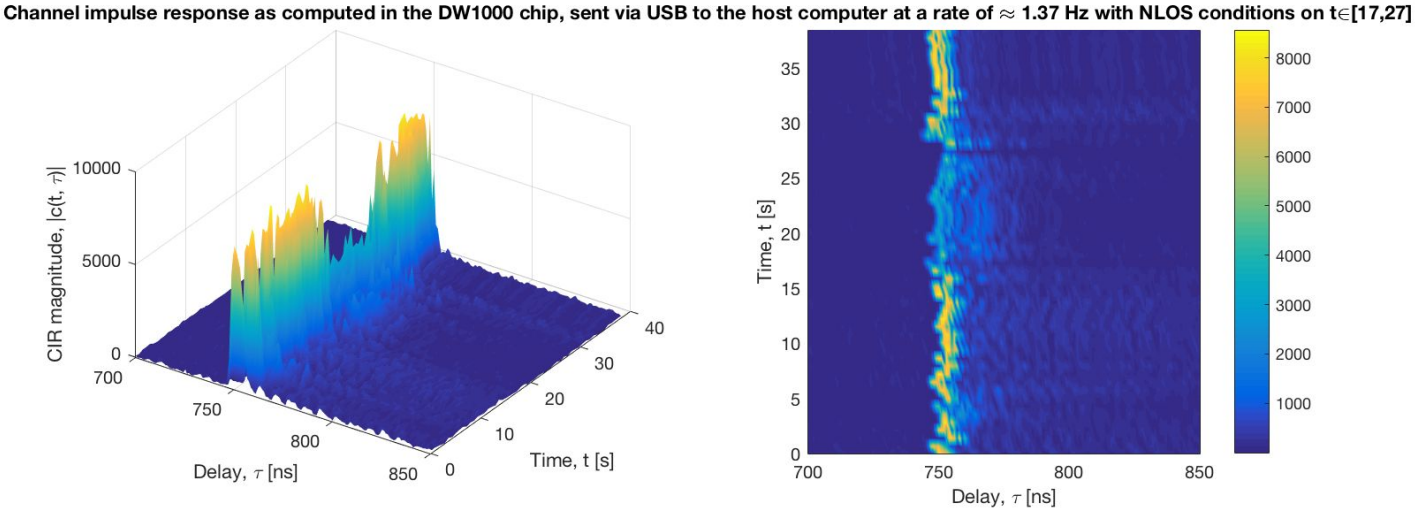


Packet format and timing



- Very long preamble
- SFD (start frame delimiter) is the time stamped instant
- Packets can carry up to 127 Bytes of data
- 1024 with a Decawave proprietary extension
- Packets contains source and destination address
- IEEE802 MAC header (MAC addresses)

Preamble detection



It is possible to detect the packet with good timing characteristics even when there is an obstacle in the way.

UWB in ranging applications - timestamping

- Precise timestamping of packets at transmission and reception
- 64GHz timer, 1.5ps timer tick -> ~5mm
- Decawave DW1000 specifies +/-100mm distance measurement accuracy
- Robust to multipath
- Not so robust to non-line-of-sight (NLOS)
- NLOS induces an offset measurement

Conclusions

- Radio messages containing addresses and data
- Precise timing ⇒ possible to measure time of flight from transmitter to receiver
- Robust to multipath ⇒ better indoors
- Works best without obstacles