THE DESIGN CHALLENGE

Make the protocol loop around frequency high enough for real-time control – and still play by the rules!

27 MHz • HALF-DUPLEX • DIGITAL

I NEED SPEED!

FOLLOW THE RULES!

CONTROL VALUES TO SUBMARINE

PROCESS VALUES TO SHORE

ONE CHANNEL, TWO DIRECTIONS, ONE CHALLENGE!

RADIO REGULATIONS

THE BALANCE MAKES IT WORK!

HIGH LOOP RATE FOR REAL-TIME CONTROL

- Fast update rate
- Low latency
- Reliable control
- Smooth operation

STAY WITHIN THE RULES

- 10 kHz channel spacing
- Max duty cycle
- Out-of-band emissions
- Fair use, no interference

WHAT SLOWS THE LOOP?

- Slow processing
- Long packet or overhead
- Collisions & retries
- Noise & fading
- Low power margin

PROTOCOL LOOP AROUND FREQUENCY

TOO SLOW | JUST RIGHT! | TOO SLOW

WHAT BREAKS THE RULES?

- Too much transmit time
- Too wide spectrum
- Interference with others
- Exceeding power limits
- Non-compliant operation

THE GOAL: FAST, RELIABLE, AND COMPLIANT COMMUNICATION.
REAL-TIME CONTROL – RESPONSIBLE USE.

HAPPY SUB, HAPPY OPERATOR, HAPPY SPECTRUM!