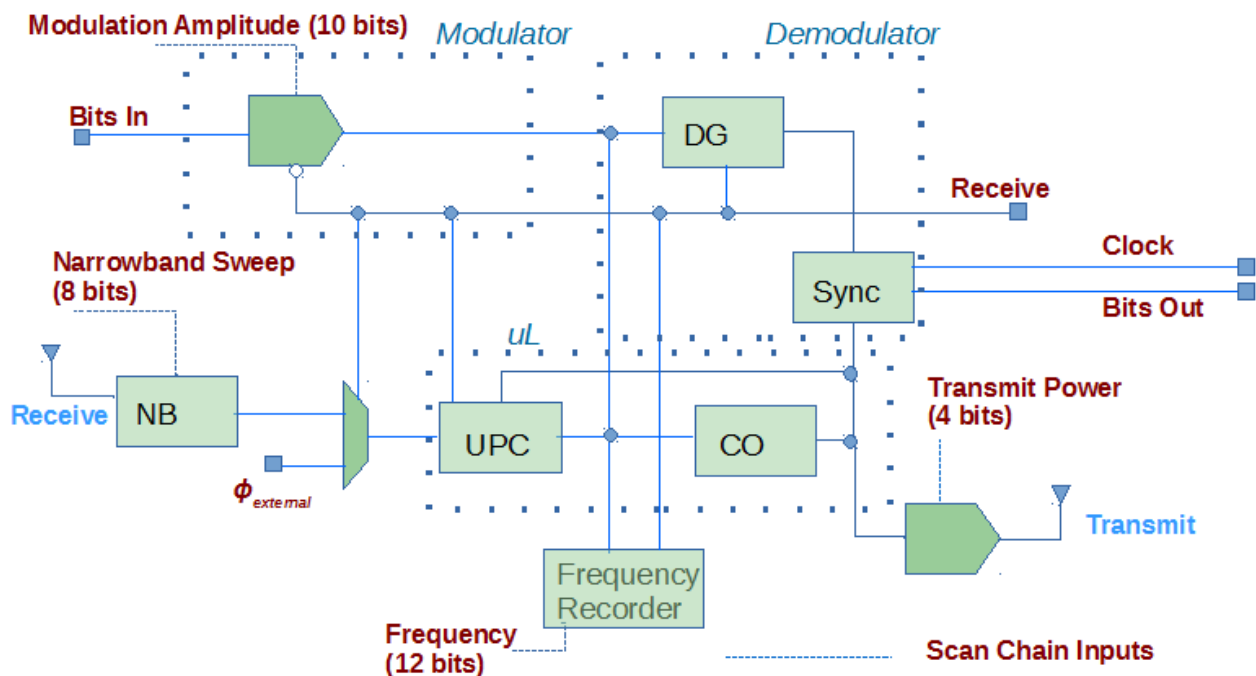




## iW5G

An instantaneous Wireless (iW) Transceiver designed in 55 nm process offers the following wireless advances over 256 QAM, the current technology with equivalent bitrates:

- 12x increase in transmission range
- $10^3$  improved BER, less re-transmissions
- 7x decrease in transmitted average bit energy
- Instantaneous demodulation
  - Elimination of interference from multipath reflections
  - Novel ultimate item-level tagging and increased positioning accuracy



## Interface Ports

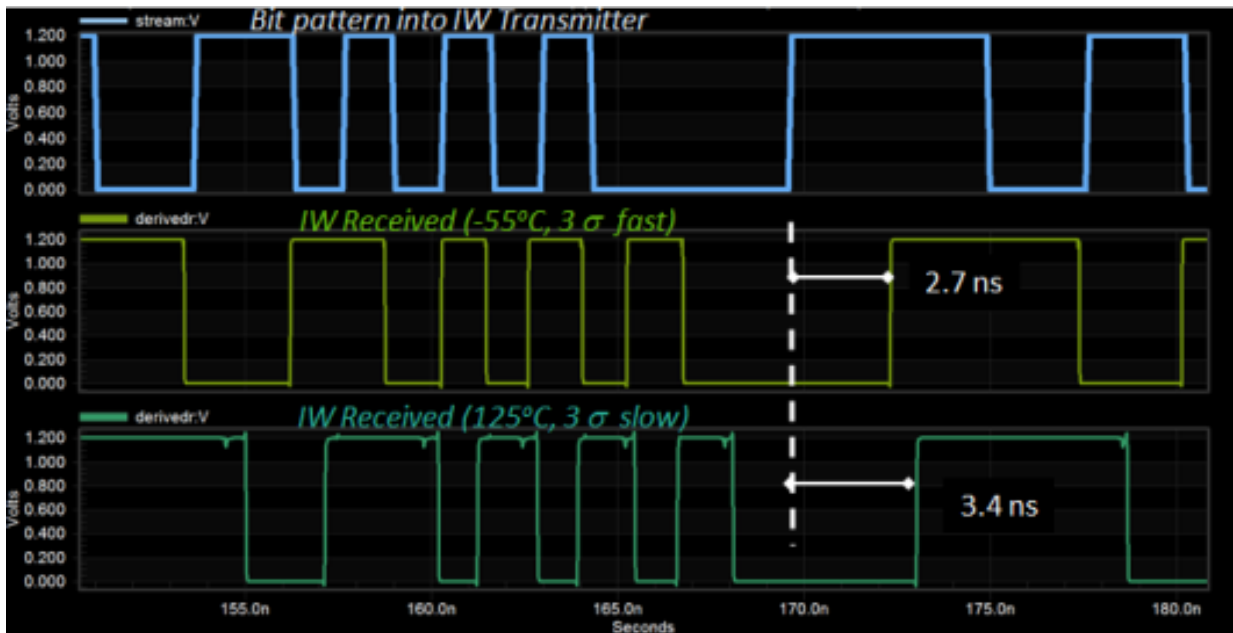
<i>Interface</i>	<i>Direction/serial</i>	<i>Description</i>
$\phi_{external}$	In	Input or reference clock
Transmit Power <3:0>	In/serial	Set power to transmit antenna
Narrowband Sweep <7:0>	In/serial	Set narrowband frequency 0.5 to 5 GHz
Frequency <11:0>	In, out/serial	Set transmit frequency
Modulation Amplitude <9:0>	In/serial	Set amplitude of modulation
Bits In	In	Bit pattern stream to transmit
Receive	In	Set to transmit mode when asserted
Clock	Out	Synchronized clock
Bits Out	Out	Received bit pattern stream



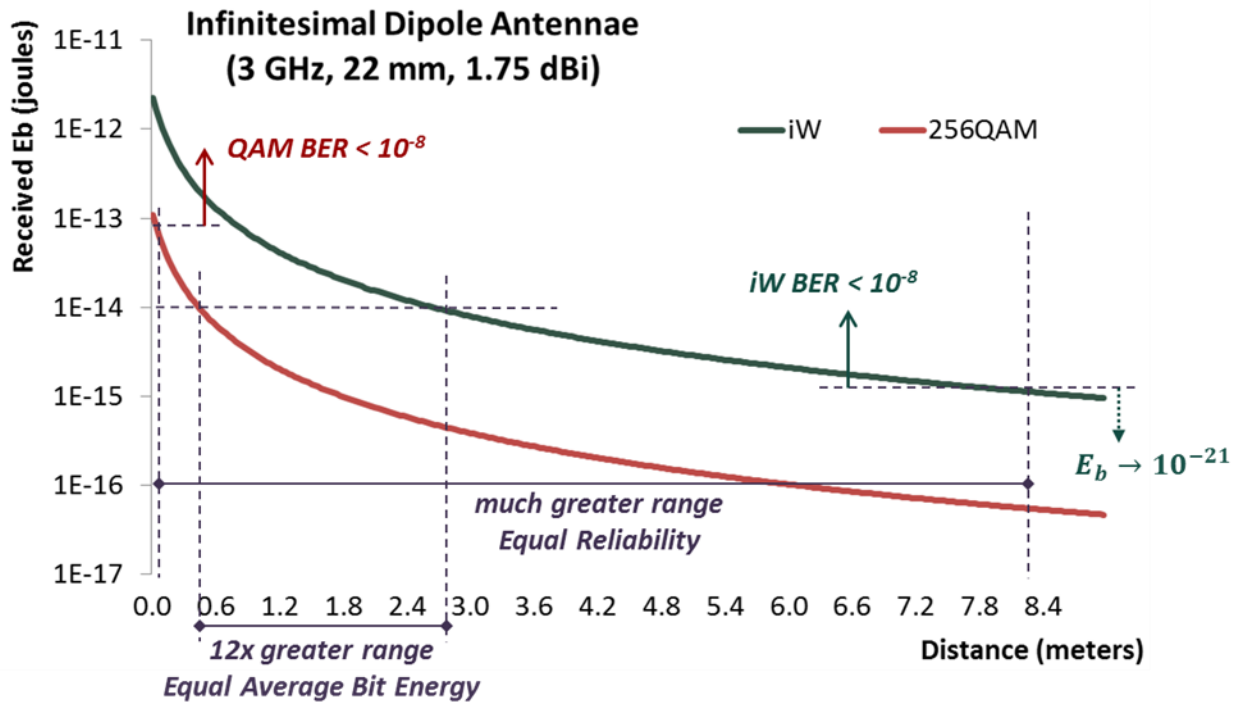
## Performance Specifications (-55 °C to 125 °C, 3 s skew material)

<i>Parameter</i>	<i>IW Specification</i>	<i>Quadrature Specification</i>	<i>iW Improvement</i>
Transmit Frequency (GHz)	0.5 to 5	5	
Bitrate <sup>1</sup> (Mbps per channel)	1250 (2 constellations)	866 (256 constellations)	1.44x
Range <sup>2</sup> (m) 3 GHz, 22 nm, 2.64 dBi	2.8	0.23	12x
BER <sup>3</sup> ( $E_b$ at $1 \times 10^{-14}$ )	0	$2.3 \times 10^{-9}$	$\infty$
Startup time <sup>4</sup> (s)	$8 \times 10^{-9}$	$> 8 \times 10^{-3}$	$> 10^6 \times$
Sensitivity <sup>3</sup> , BER $10^{-8}$ (dBm)	-180	-120 (best modulation)	$10^6 \times$
Transmit Power (W)	0.3	1.5	5x
Transmitted $E_b$ (joules)	$5.6 \times 10^{-10}$	$3.5 \times 10^{-9}$	6.5x
Received $E_b$ (joules)	$1 \times 10^{-14}$	$1 \times 10^{-14}$	1x
$E_b 10^{-13}$ spectral density <sup>5</sup> (dBm/Hz)	-52	-12	$10^3 \times$
Static, Dynamic Power (mW)	15	150	10x
Probability of multipath overlap	$\sim 0$	1	$\infty$
Transition to transmit <sup>4</sup> (s)	$8 \times 10^{-9}$	$> 0.5$	$> 62.5 \times 10^6 \times$
Transition to receive <sup>4</sup> (s)	$20 \times 10^{-9}$	$> 0.5$	$> 25 \times 10^6 \times$
Die area (mm) <sup>2</sup>	2.25	22.5	10x



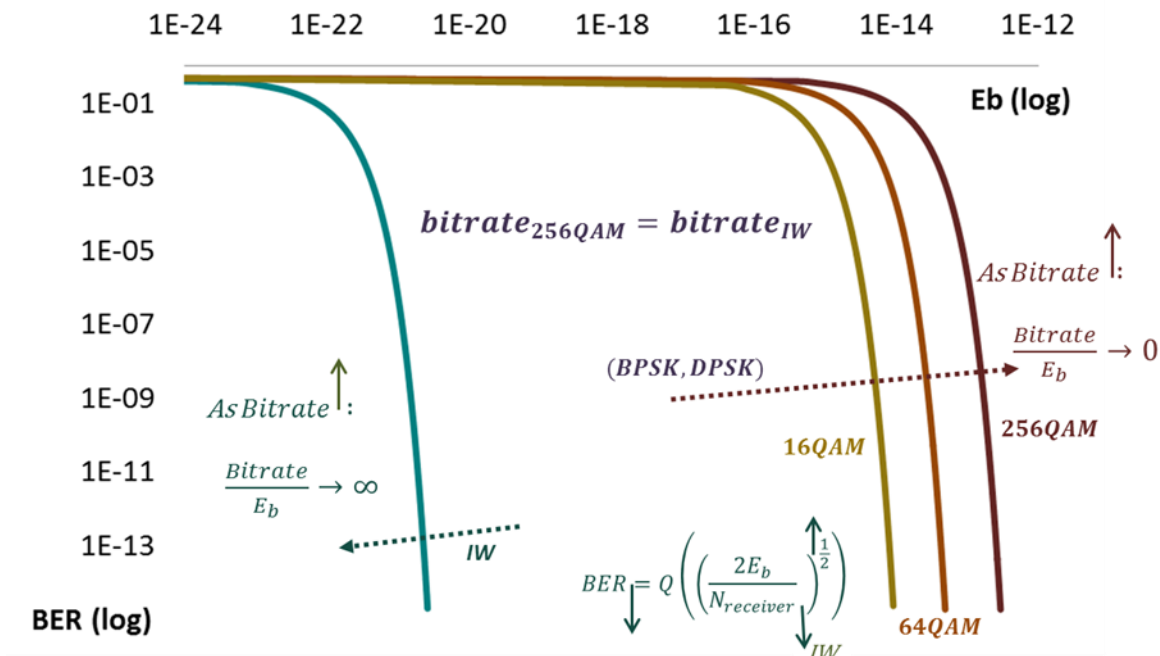


<sup>1</sup>No down conversion of iW leads to fast bitrates and instantaneous demodulation.

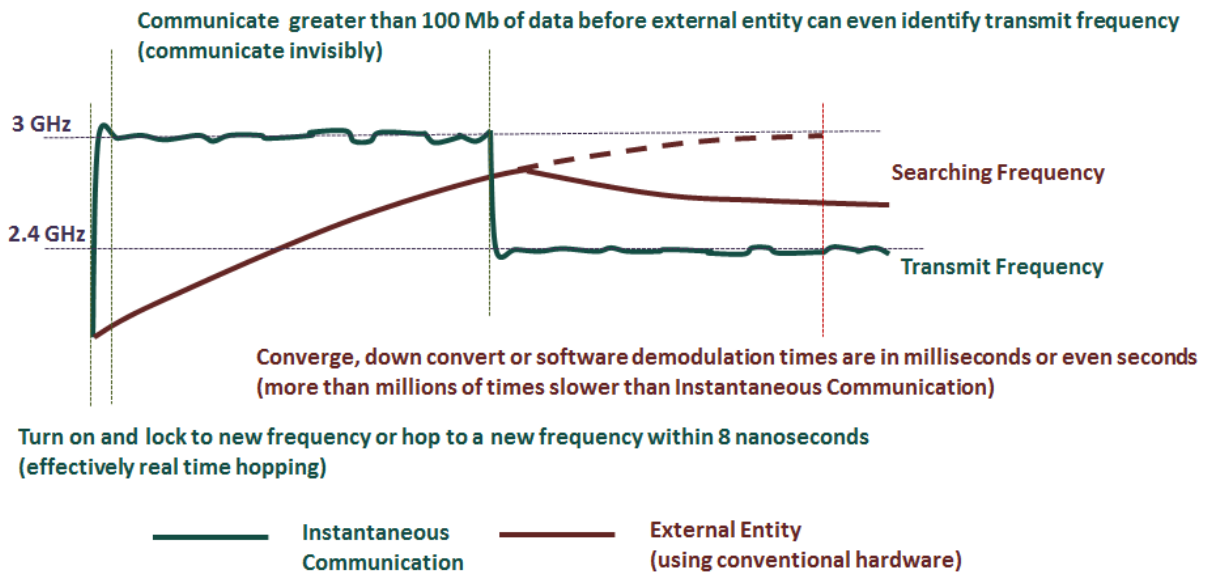


<sup>2</sup>Greater range due to intrinsic low noise of IW, 12x longer at equal received average bit energy.



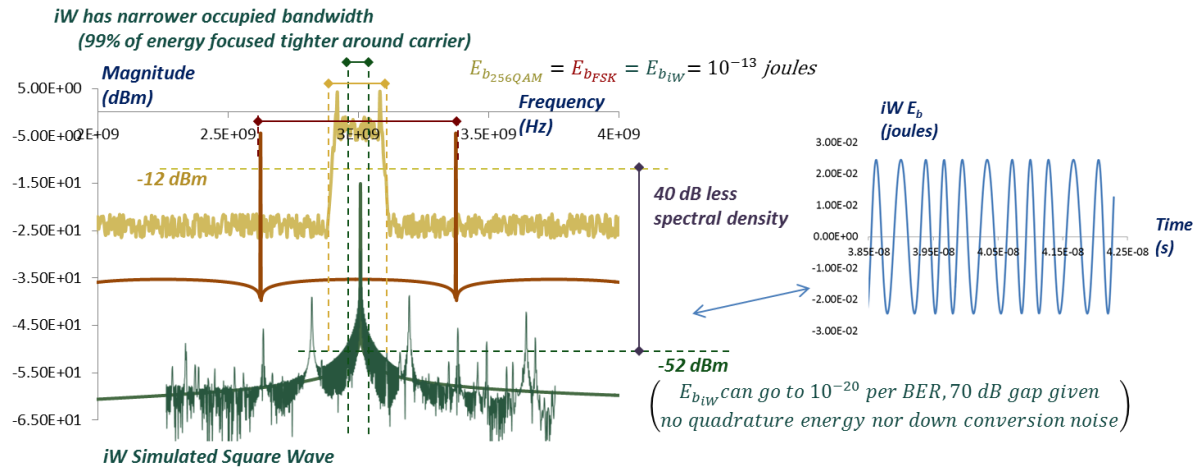


<sup>3</sup>Orders of magnitude,  $10^7$ , greater reliability due to low noise of IW.



<sup>4</sup>Millions of times faster startup and transition times allows secure communication by frequency hopping with negligible decrease to bitrate.





<sup>5</sup>Spectra for equal average bit energy well below that of comparable 256 QAM.

