

spoiler: it's a grab bag of magic tricks!

Getting WiFi to go Faster!

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An Overview!

data

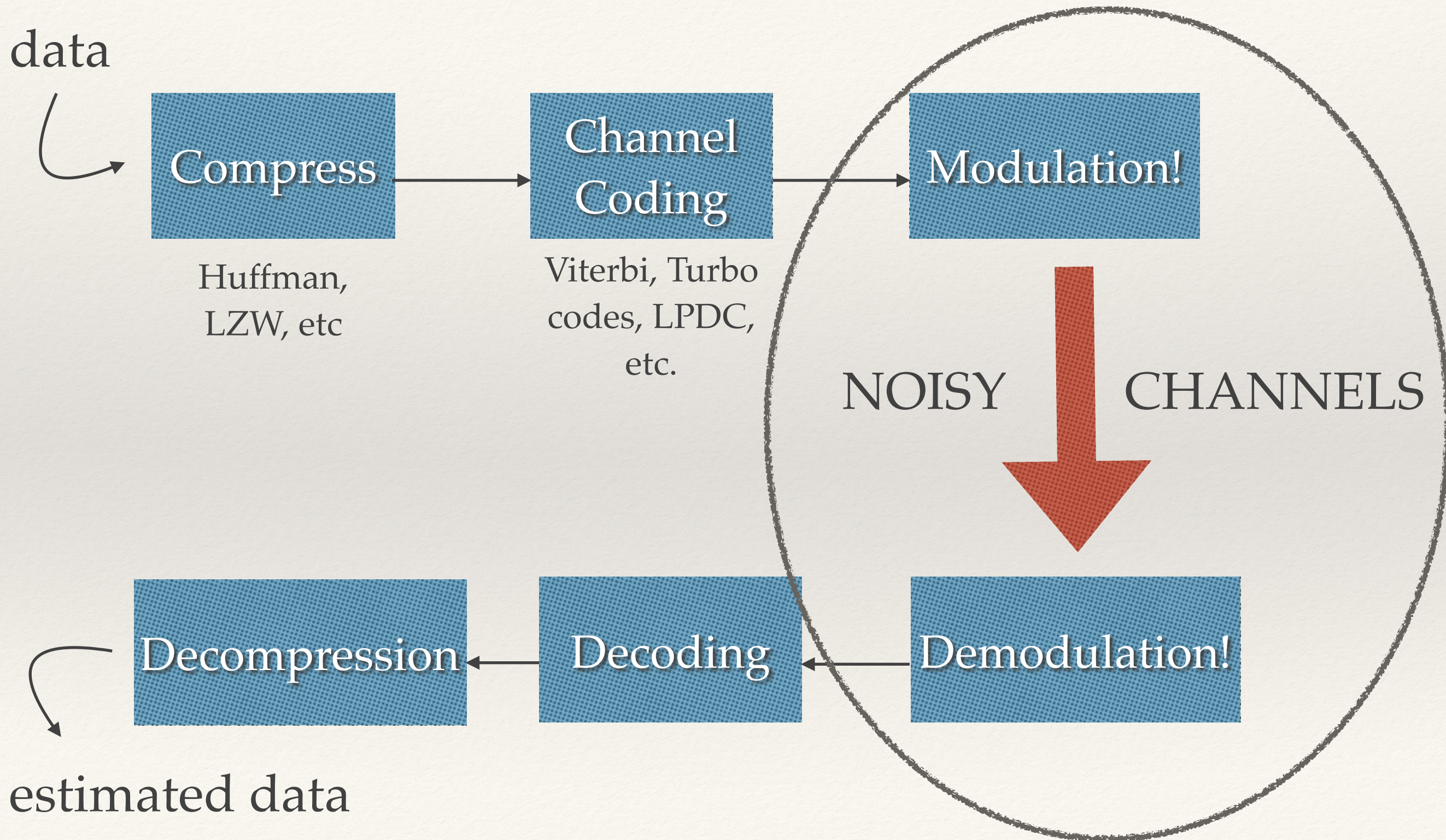


????



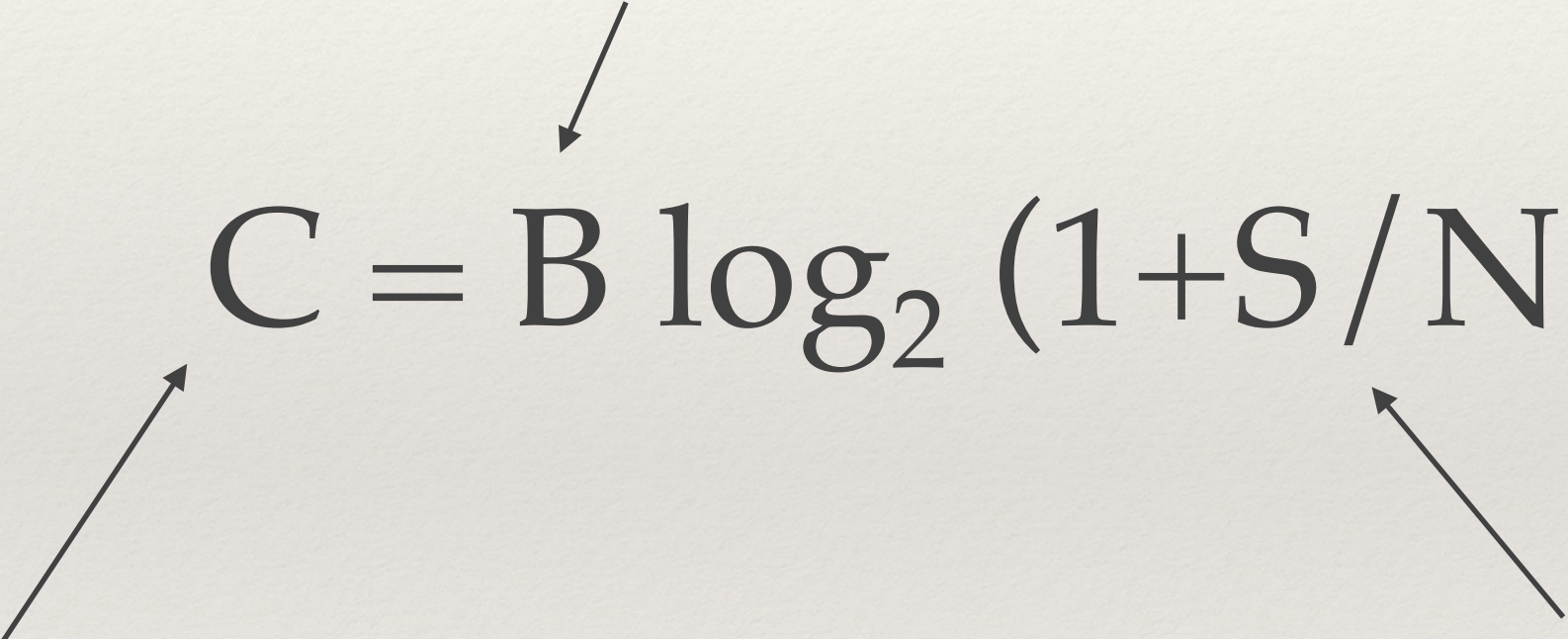
estimated data

An Overview!



Shannon-Hartley Theorem

bandwidth of the
channel



The diagram illustrates the components of the Shannon-Hartley Theorem equation. Three arrows point from descriptive text to parts of the equation: one from 'bandwidth of the channel' to 'B', one from 'Channel capacity in bits/s' to 'C', and one from 'signal-to-noise ratio' to 'S/N'.

$$C = B \log_2 (1 + S/N)$$

Channel capacity
in bits/s

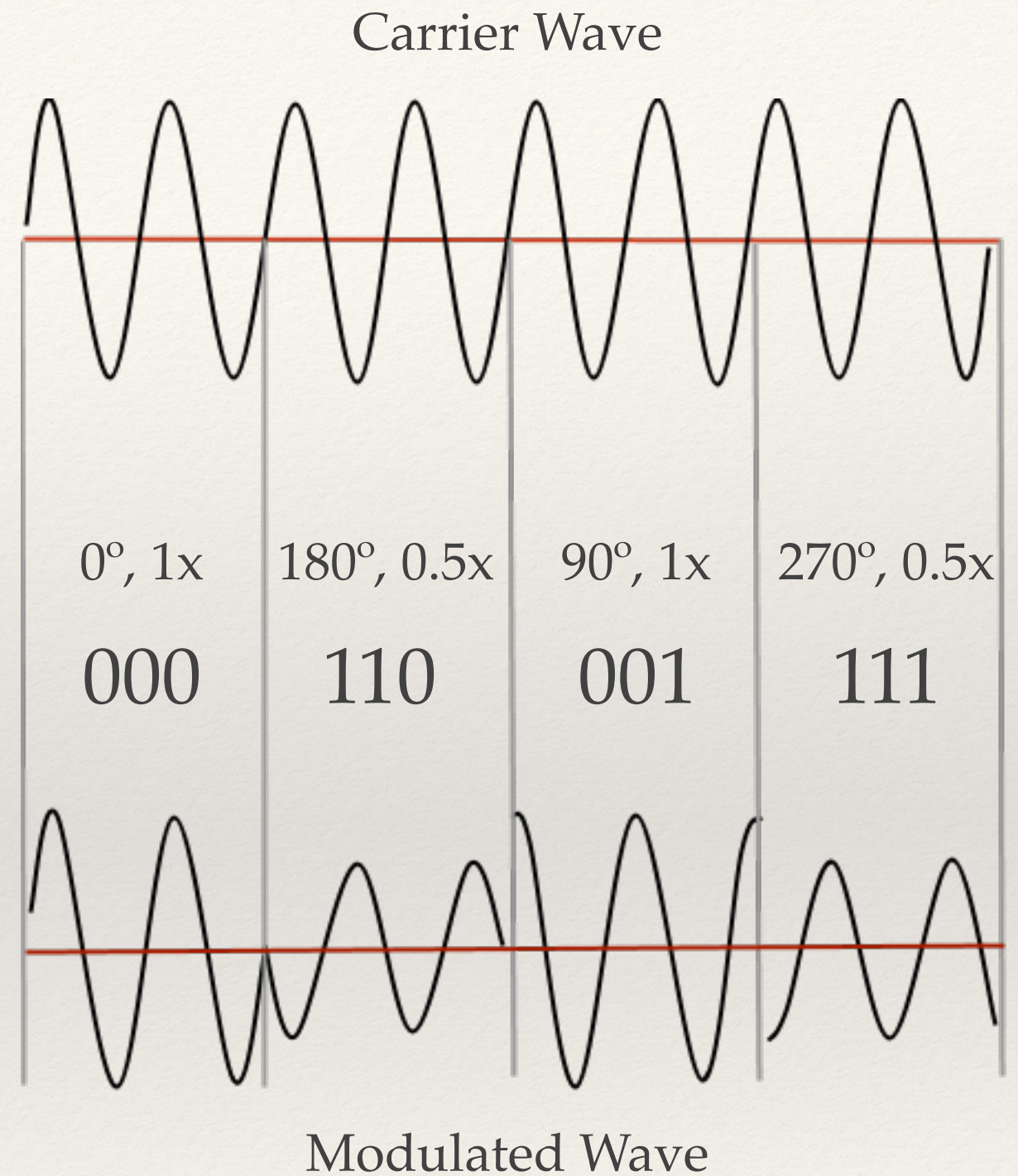
signal-to-noise
ratio

Getting More out of your Bandwidth

if you have more space, you can encode more information!

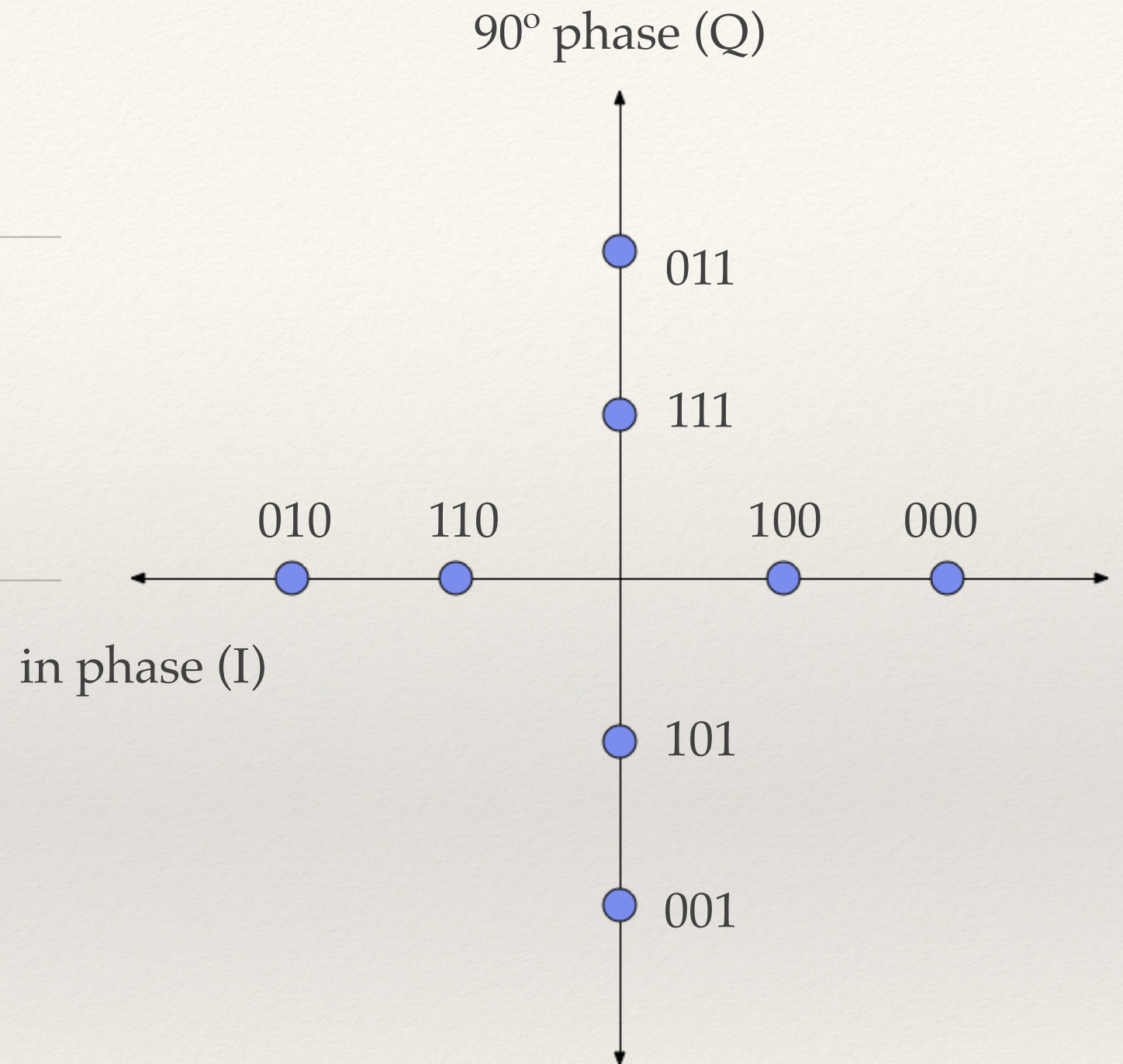
Phase-Amplitude Modulation

4 phases, 2 amplitudes = 8 symbols

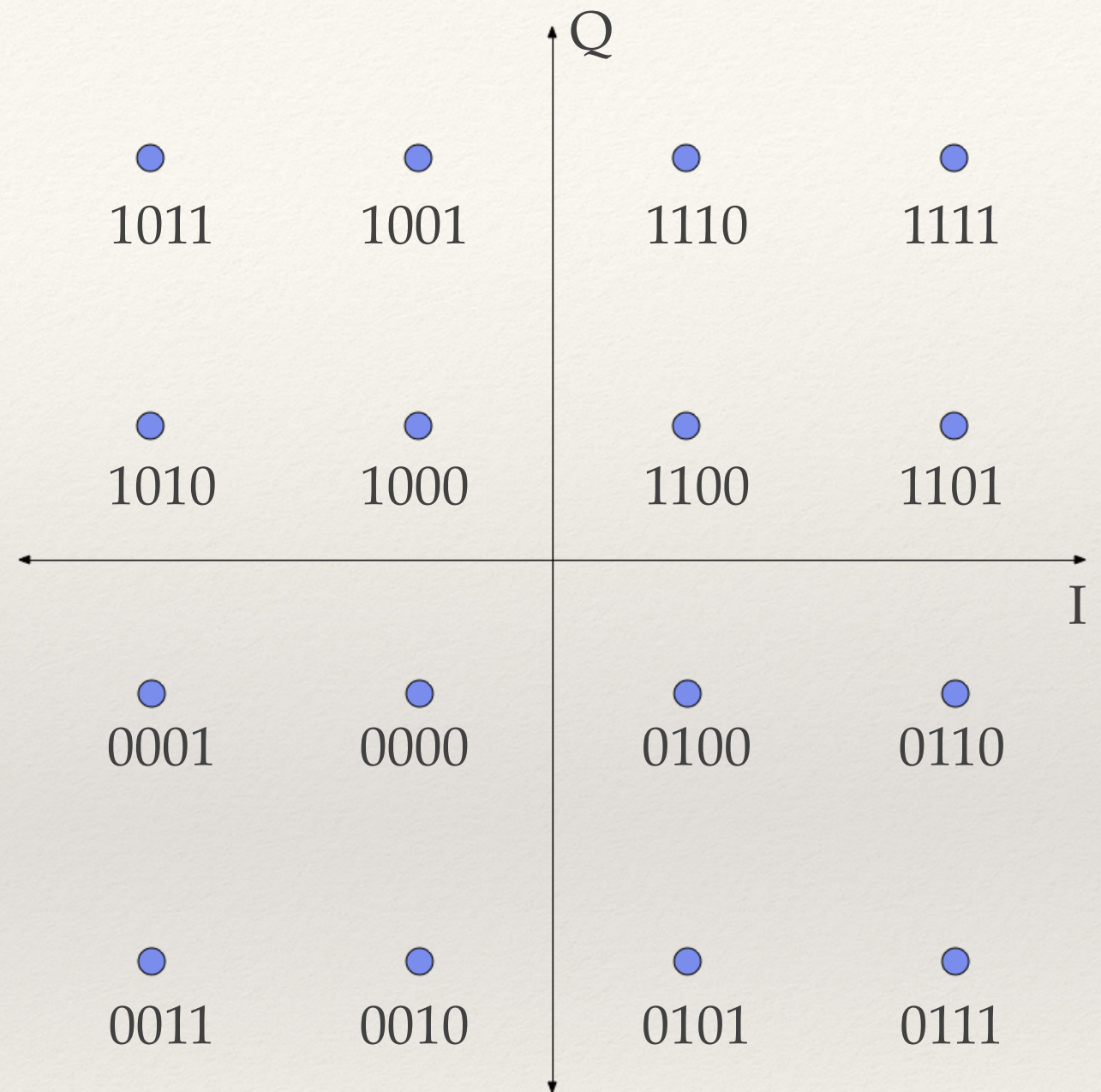


Phase-Amplitude Modulation

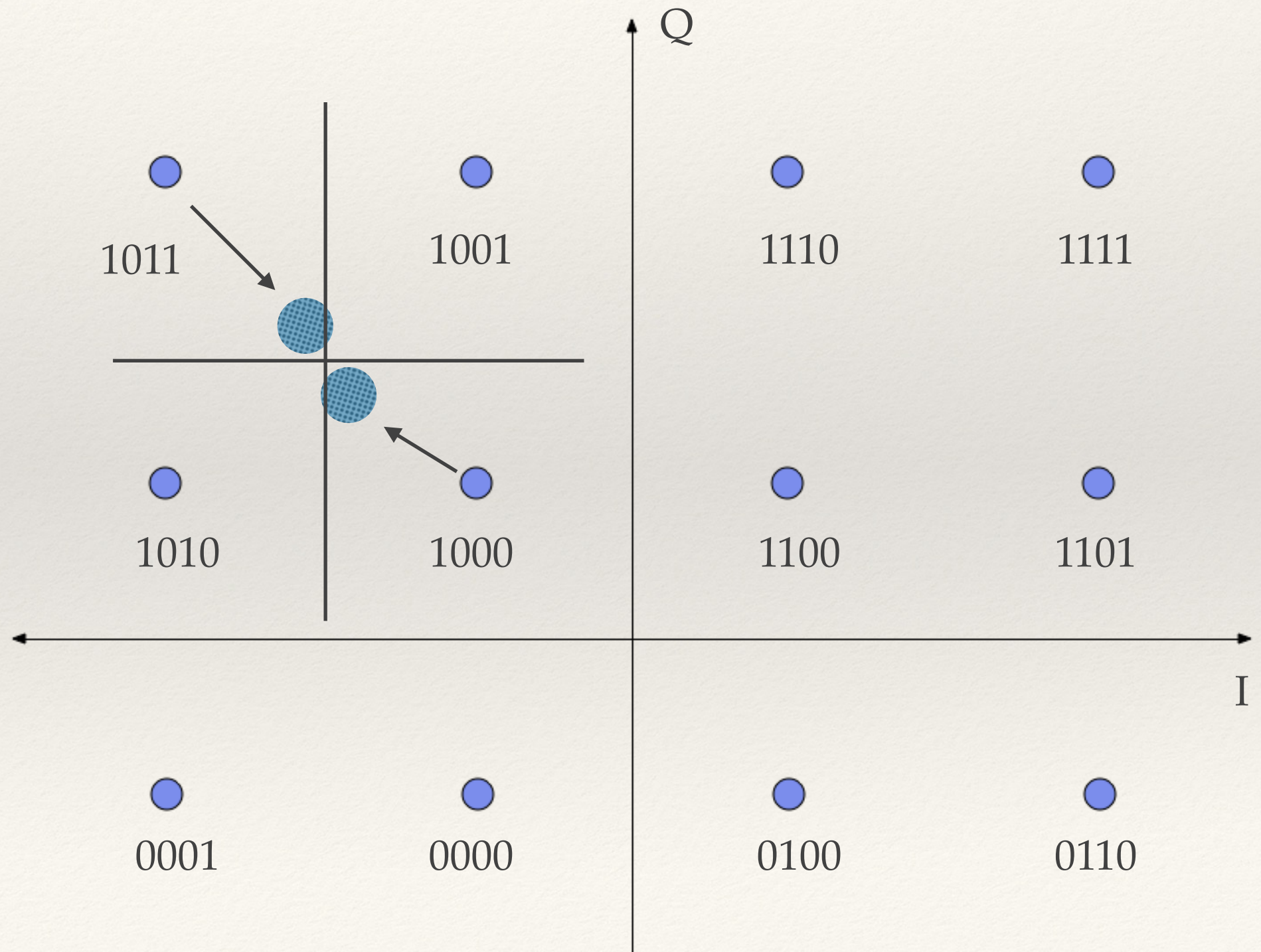
4 phases, 2 amplitudes = 8 symbols



Optimizing Bandwidth

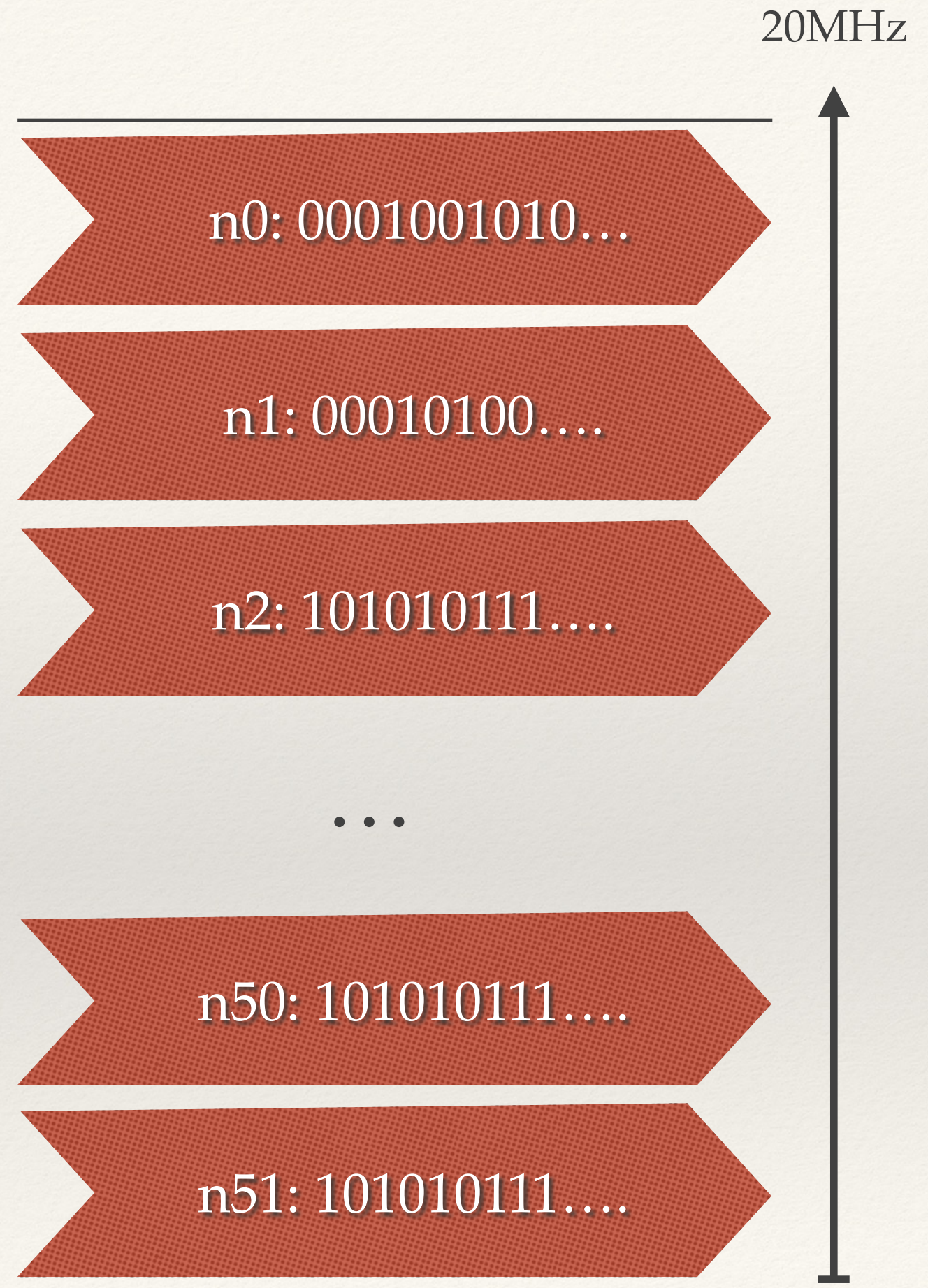


Tradeoff: Yelling over Noisy Channels



Optimizing Bandwidth: more!

52 independent streams in
20 MHz.



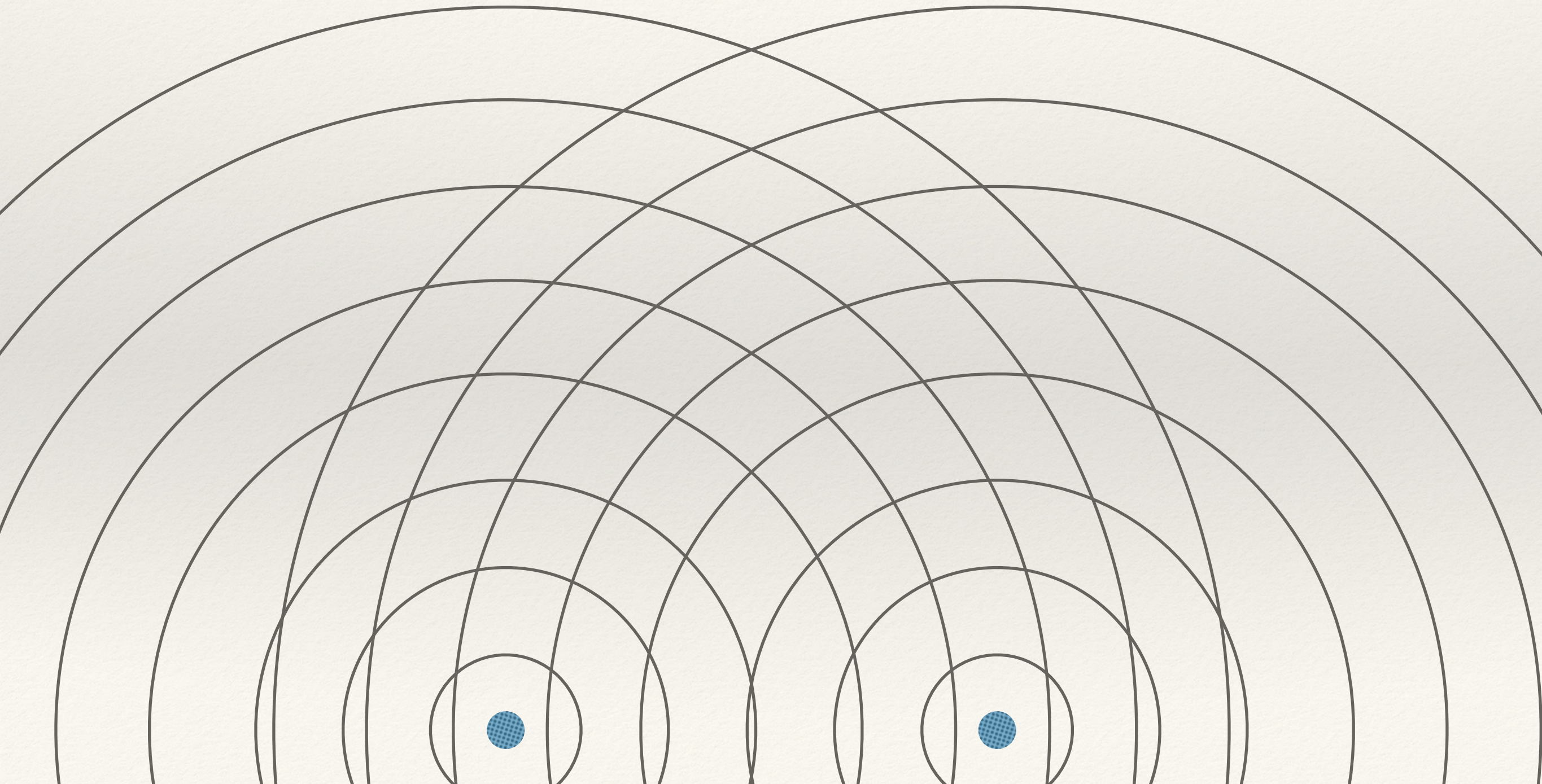
Tradeoff: Interference

Getting more out of your SNR

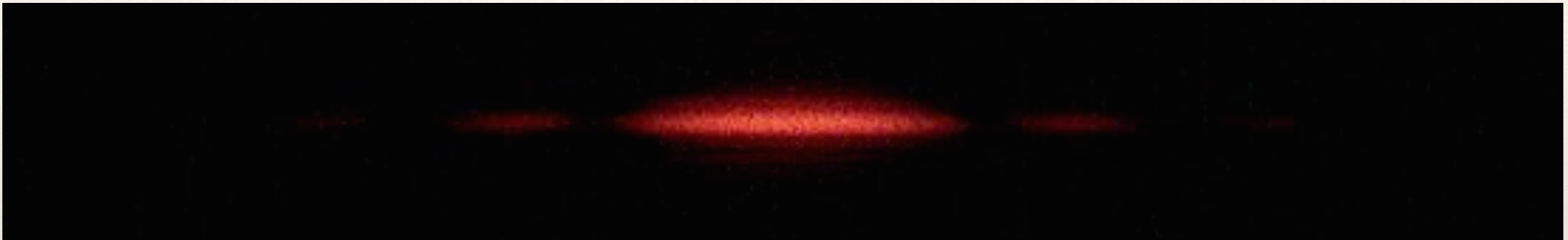
if you speak louder, you can speak faster!

Improving SNR: Beamforming

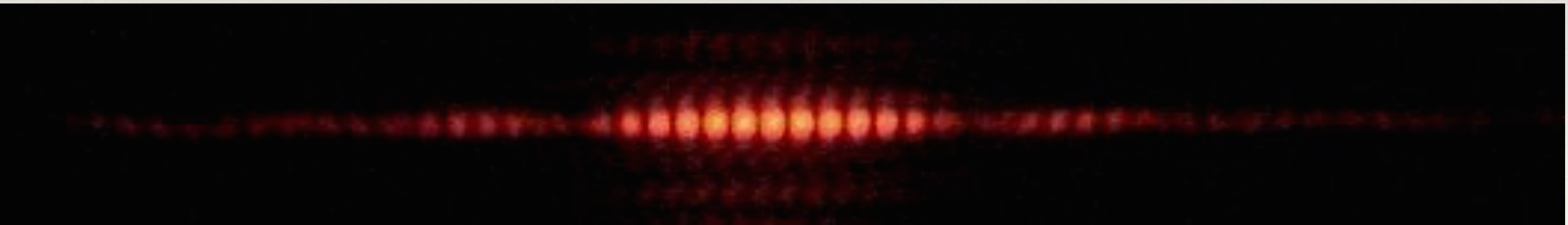
send out the same signal twice at $1/2$ the power



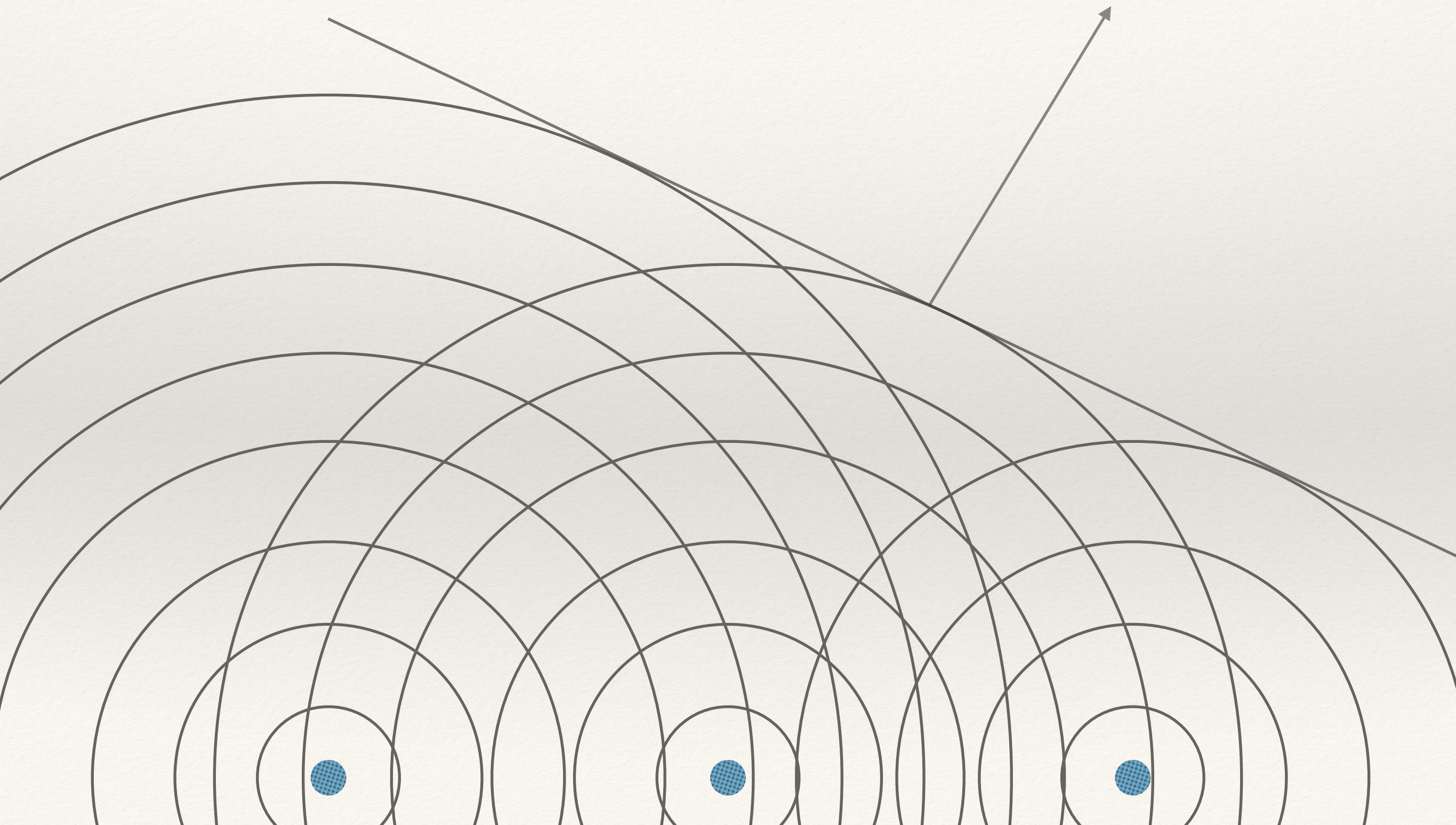
Improving SNR: Beamforming



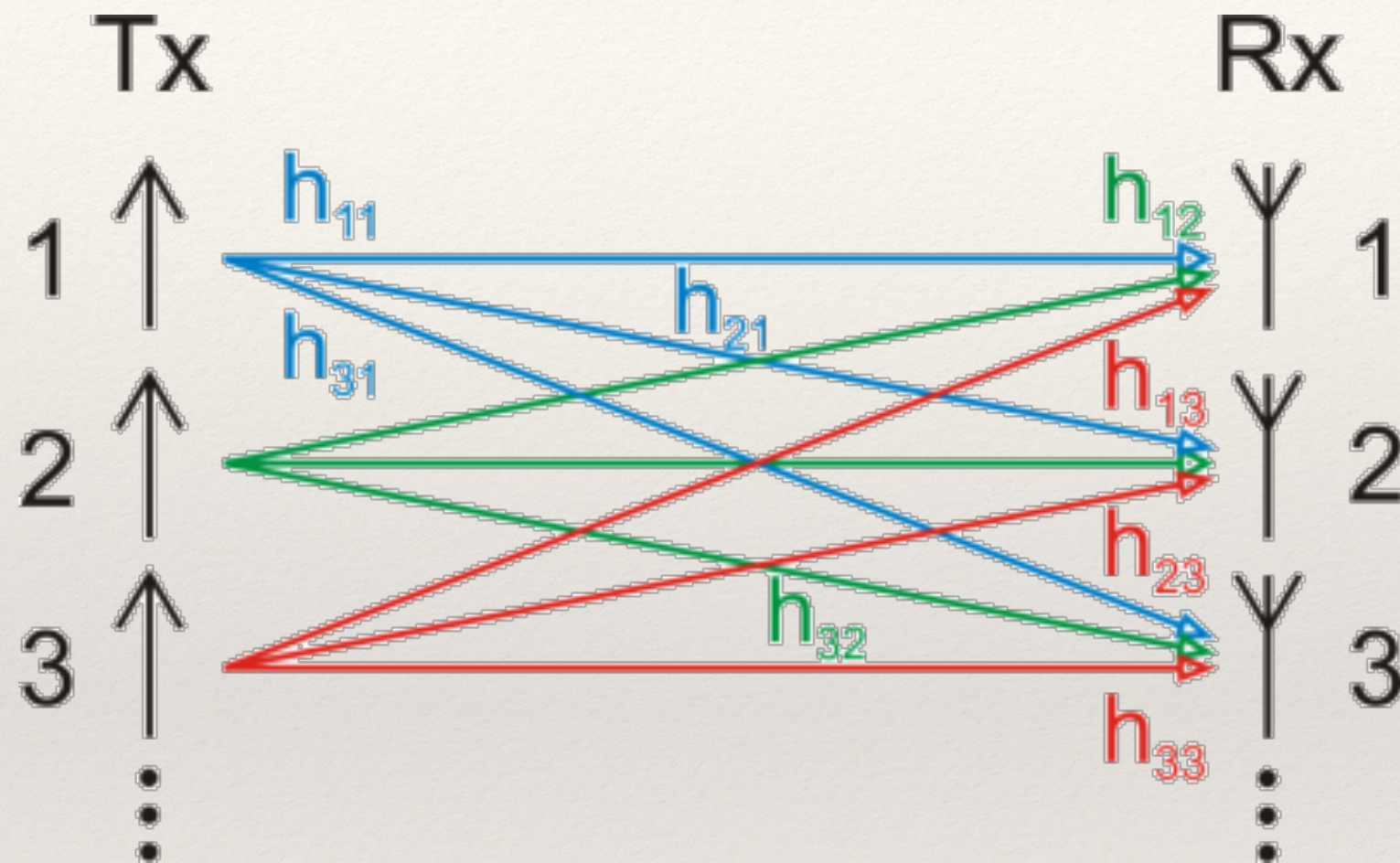
double the intensity at points!



Improving SNR: Beamforming



Improving SNR: spatial multiplexing



THE FUTURE

- ❖ MU-MIMO
- ❖ more bandwidth at 60GHz: 2 GHz!!
- ❖ ???

LINKS

- ❖ <http://apenwarr.ca/>
- ❖ wikipedia!
- ❖ whitepapers!