

Quantum- and Physics-Inspired Computing for Blind MIMO Systems

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Research Team

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Thomas Trieu

Team Motivation

**Quantum Computing solves hard math
problems *FAST***

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**Increase
performance of
current systems**

Team Motivation

Quantum Computing solves hard math problems *FAST*

**Increase
performance of
current systems**

**Portable to future
Quantum
Computers**

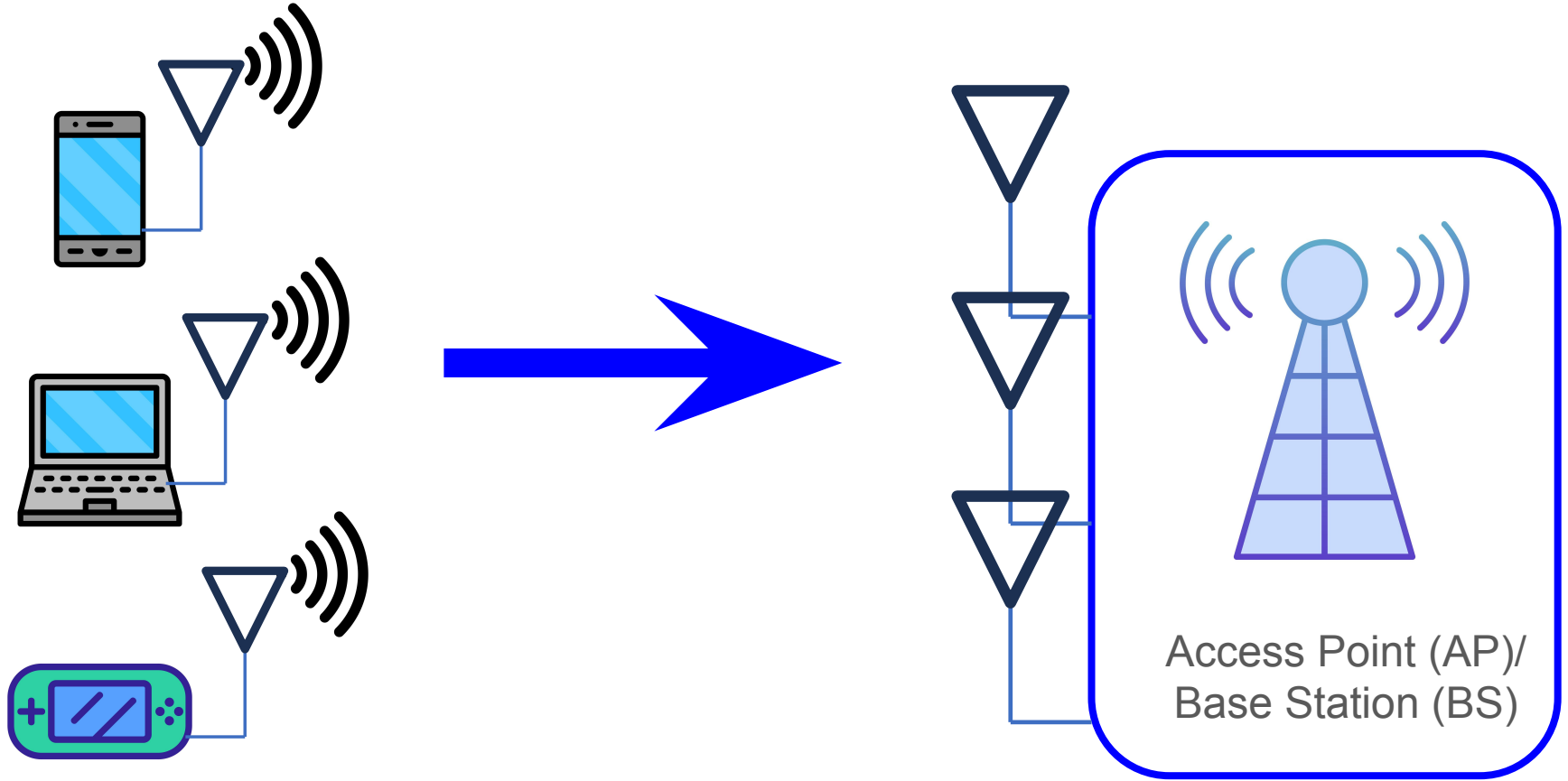
My Contribution

**Apply quantum inspired algorithms to
increase the capacity of Blind MIMO systems**

The background is a complex, abstract composition. It features a network of thin, light blue lines connecting various nodes, some of which are highlighted with larger, glowing blue circles. Interspersed among these network elements are numerous out-of-focus light sources, appearing as soft, circular bokeh in shades of yellow, orange, and white. The overall color palette is dominated by deep blues and teals, with the network lines and bokeh providing contrast and visual interest. The word "BACKGROUND" is centered horizontally across the middle of the image.

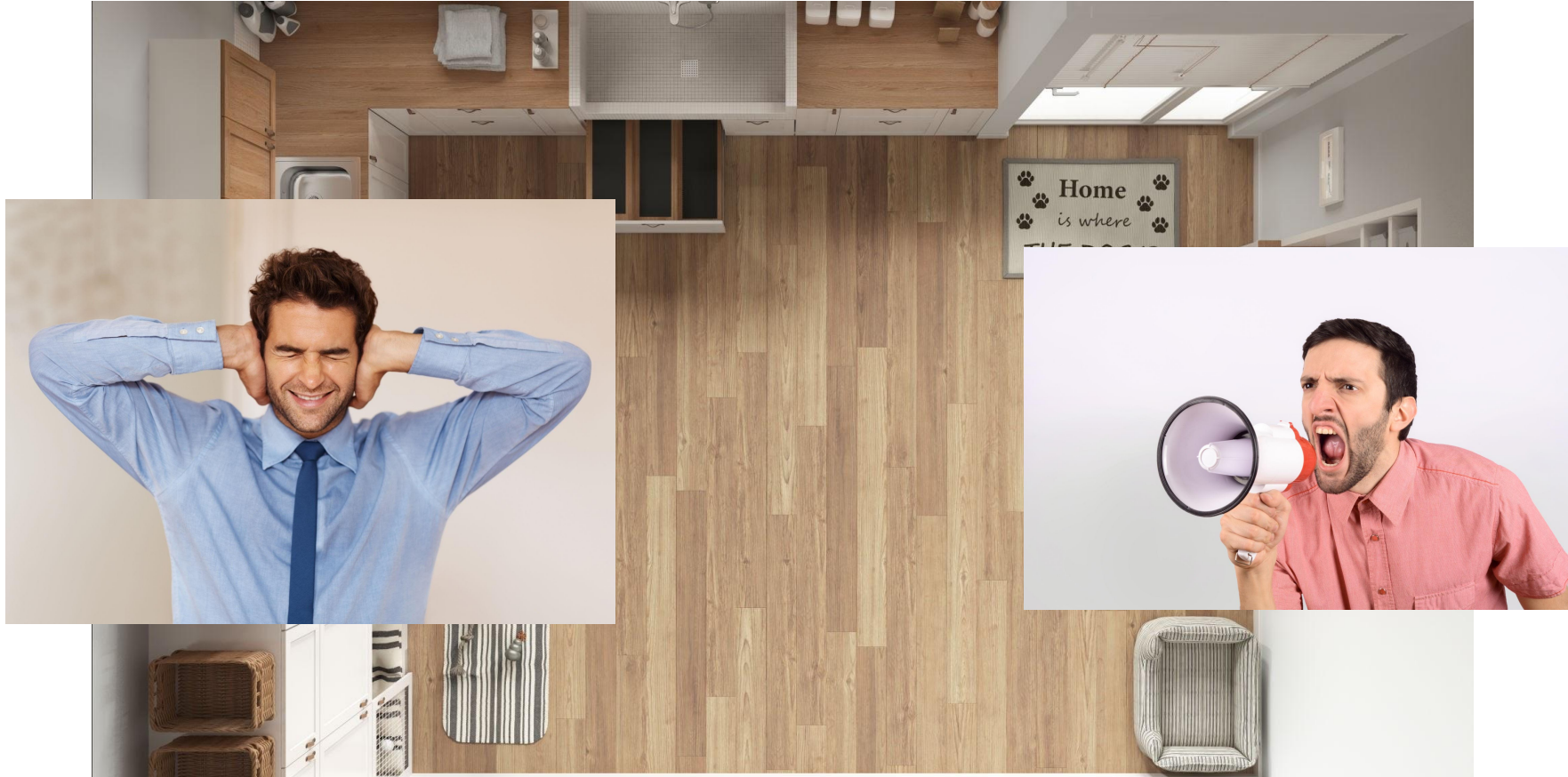
BACKGROUND

Uplink Multi User - Multiple Input Multiple Output



Wireless Sources of Error

Wireless Sources of Error



Wireless Sources of Error



MU-MIMO Sources of Error



Goal: Undo Error



Normal MIMO Systems

A

B

C

D

estimating error

reading data

BASE STATION



BLIND MIMO Systems



Motivation of quantum inspired compute

Motivation of quantum inspired compute

Conventional methods are *inaccurate*

Motivation of quantum inspired compute

Conventional methods are *inaccurate*

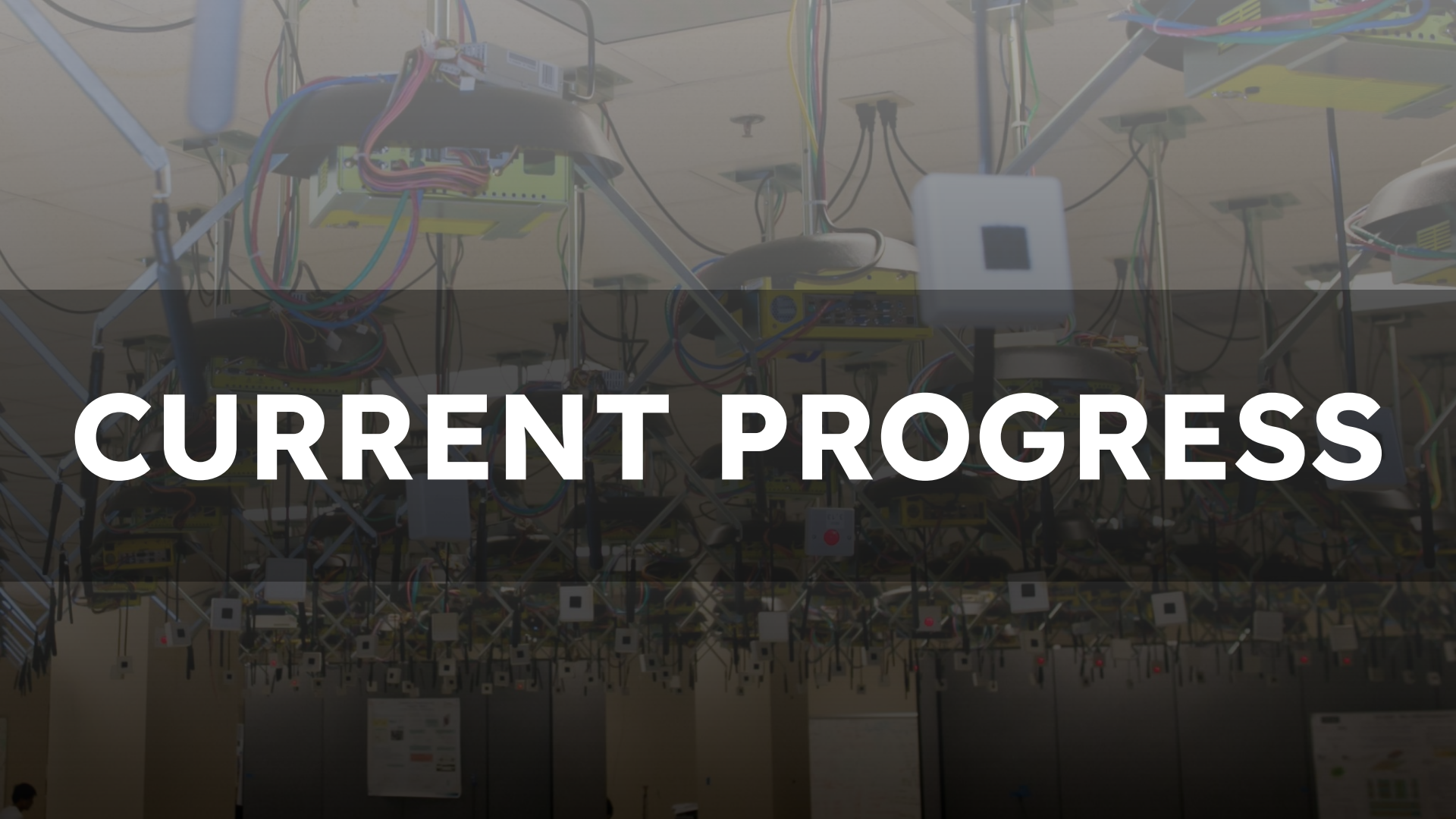
Theoretical methods are *slow*

Motivation of quantum inspired compute

Conventional methods are *inaccurate*

Theoretical methods are *slow*

Quantum inspired algorithms are
ACCURATE and FAST

The background image shows a complex scientific experiment setup. It features a dense network of colorful cables (red, blue, green, yellow) connected to various electronic components and sensors. A prominent white square sensor is visible in the upper right. The setup is mounted on a metal frame, and the overall scene is dimly lit, emphasizing the intricate wiring and components.

CURRENT PROGRESS

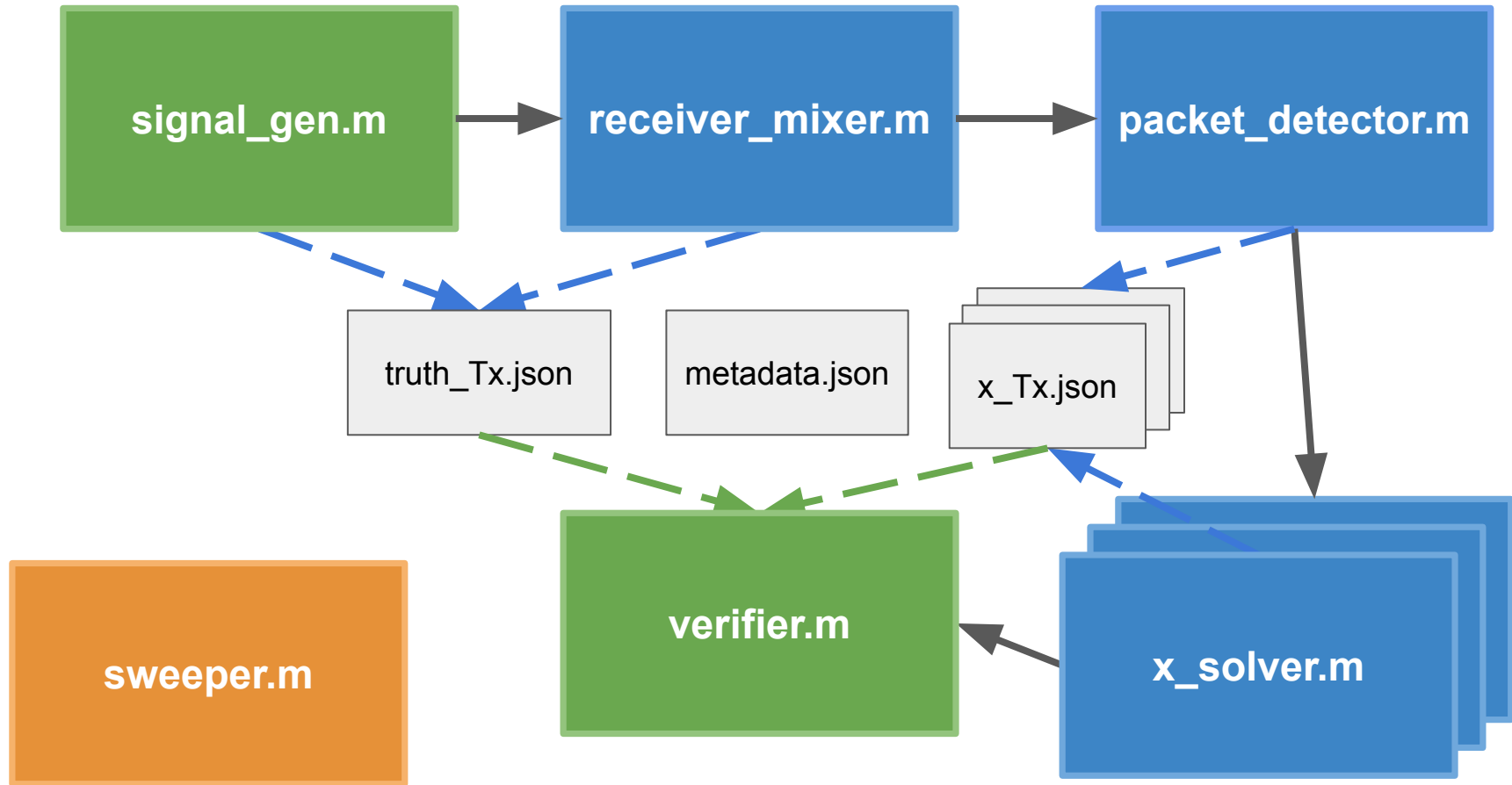
BLIND MIMO Simulator

**Demonstrate
limitations of
current systems**



**Showcase
quantum
inspired
improvements**

BLIND MIMO Simulator Structure



Key Metrics

Key Metrics

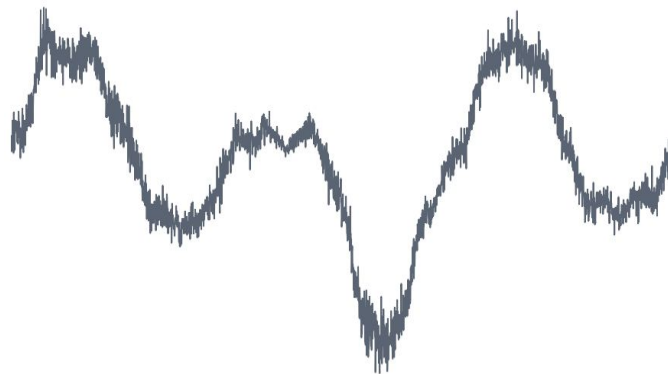
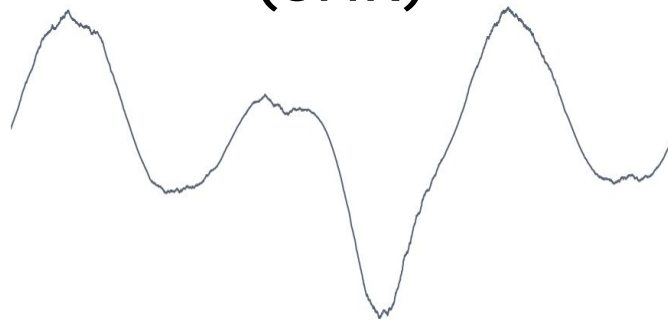
Bit Error Rate (BER)

1 1 0 0 1 0 1 1

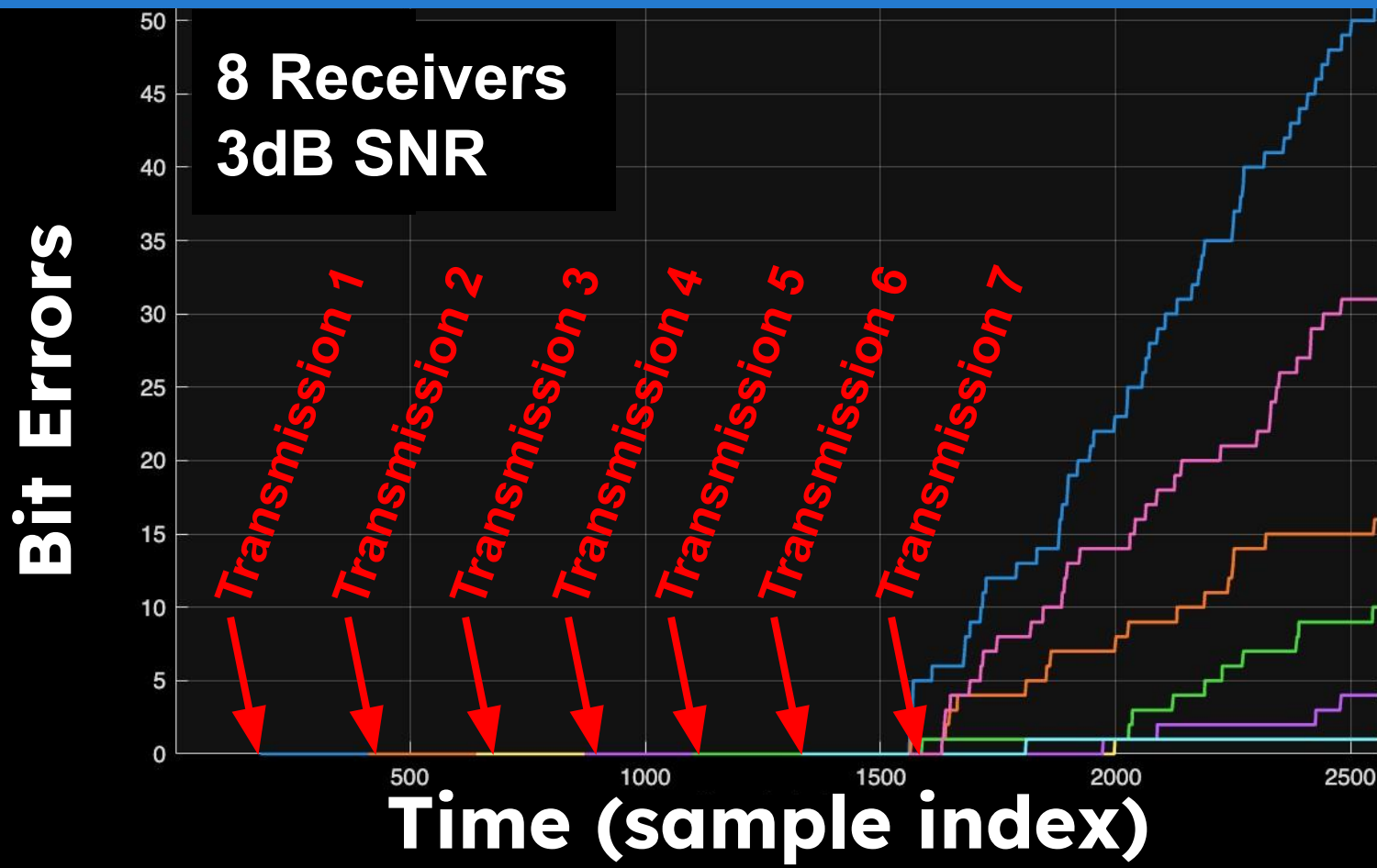


1 0 0 1 0 0 0 1

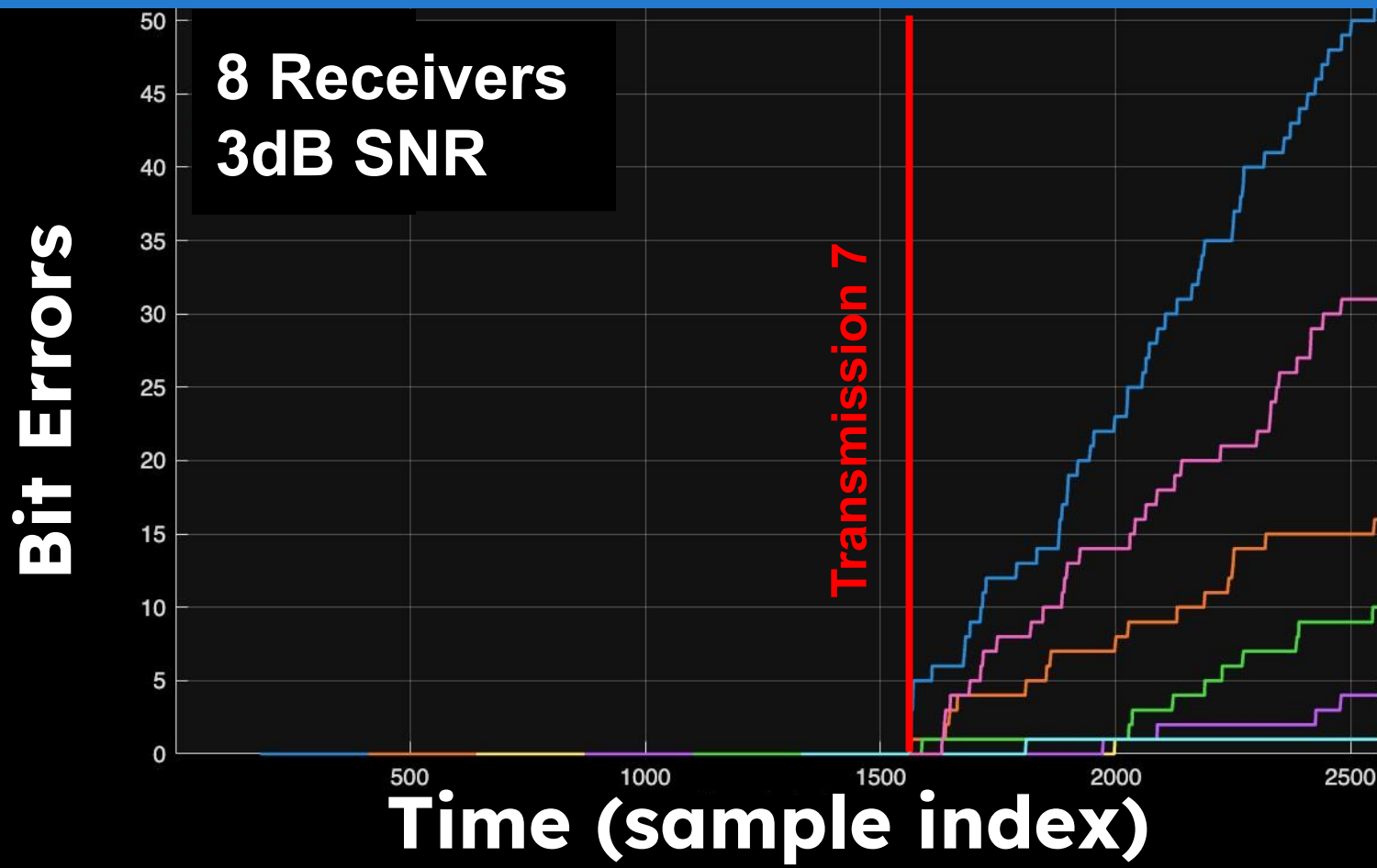
Signal to Noise Ratio (SNR)



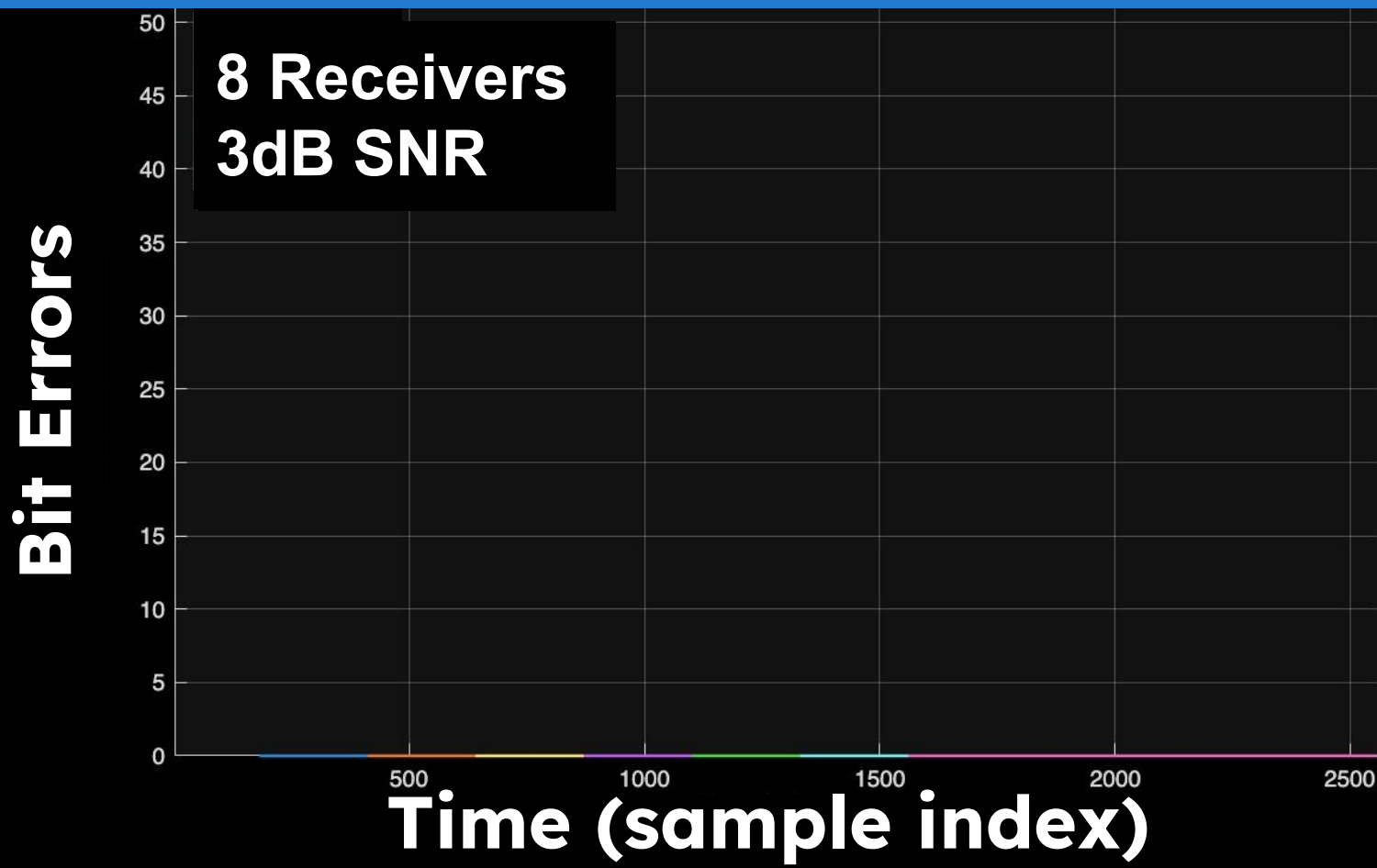
Simulation of Conventional Algorithm



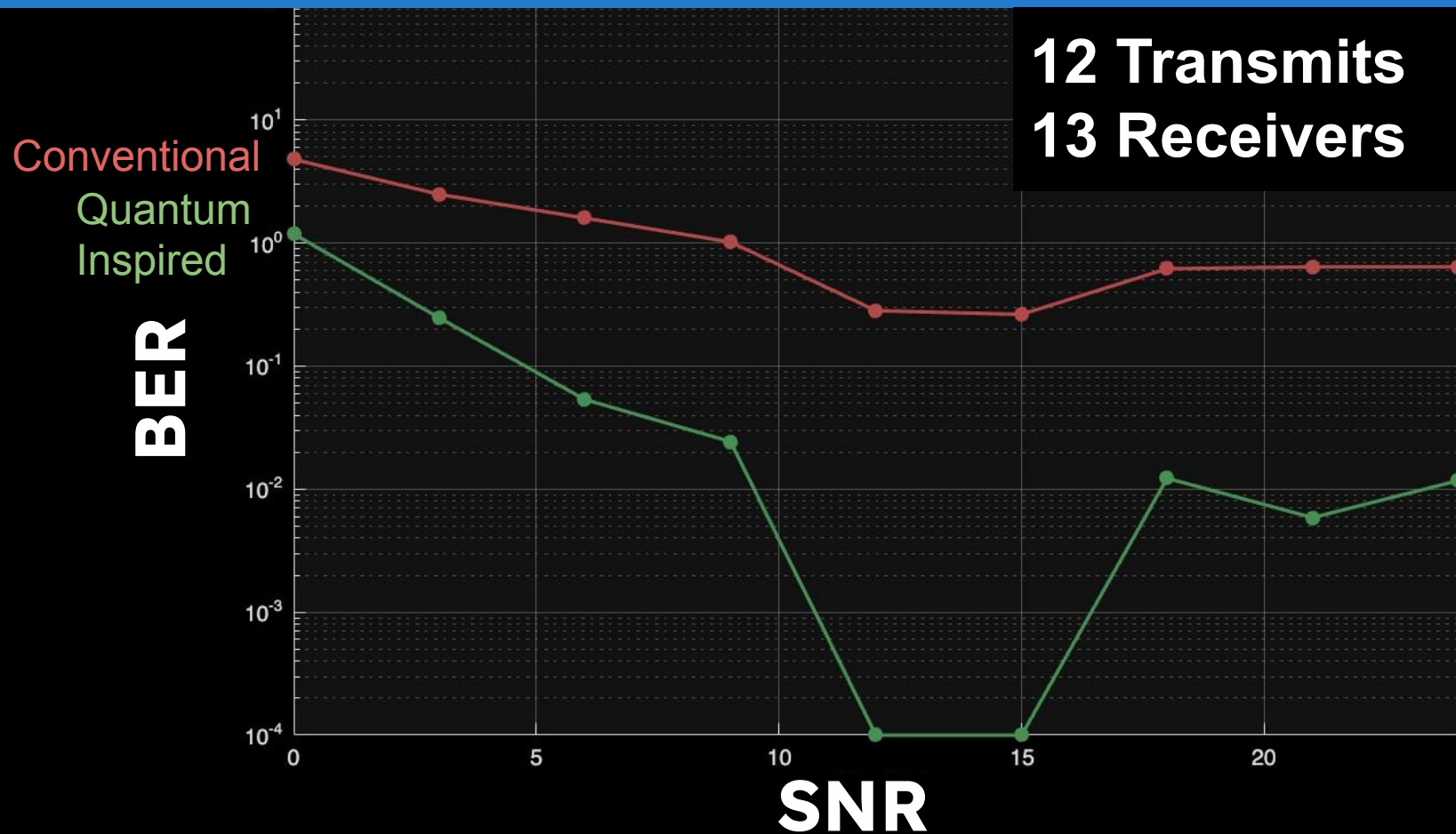
Simulation of Conventional Algorithm



Simulation of Quantum-Inspired Algorithm



Quantum-Inspired vs. Conventional Systems



Summary

Summary

Built a *robust* and
modular wireless
simulator

Summary

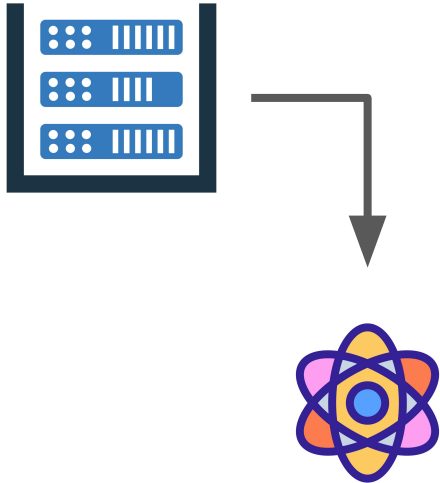
Built a *robust* and
modular wireless
simulator

Demonstrated the
benefits of
quantum-inspired
methods

Next Steps

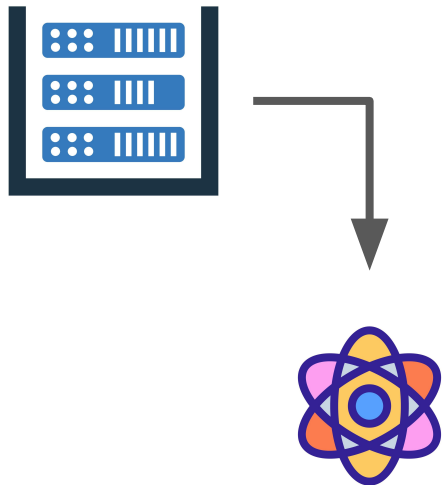
Next Steps

**More quantum
inspired
methods**

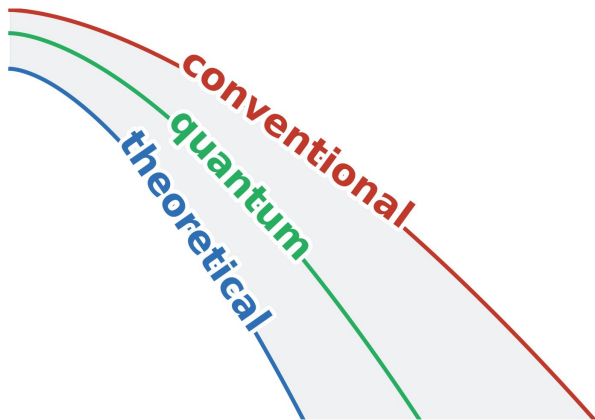


Next Steps

**More quantum
inspired
methods**

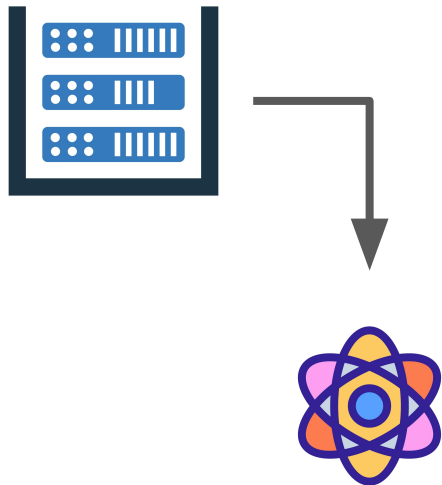


**Benchmark
theoretically
optimal**

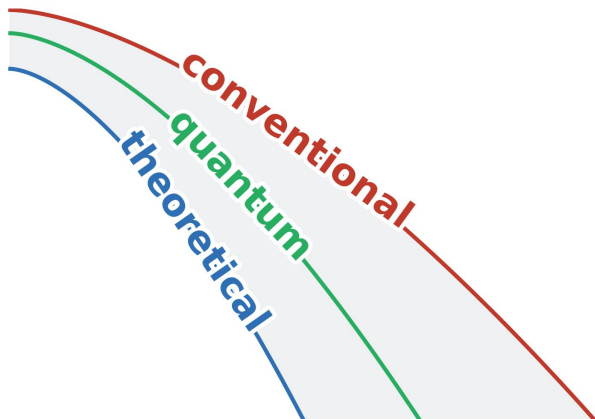


Next Steps

**More quantum
inspired
methods**



**Benchmark
theoretically
optimal**



**Testing
physical
deployment**



Q&A



Link to project wiki