

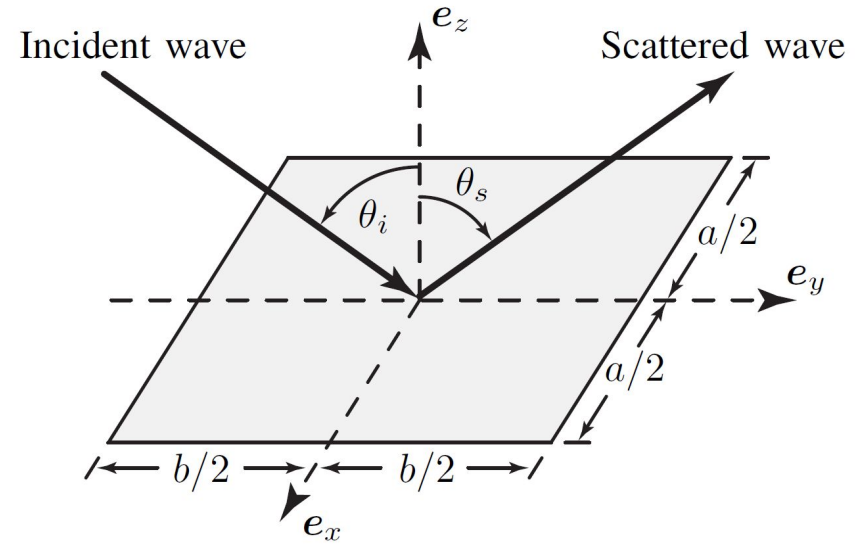


Department of Communication and
Computer Engineering
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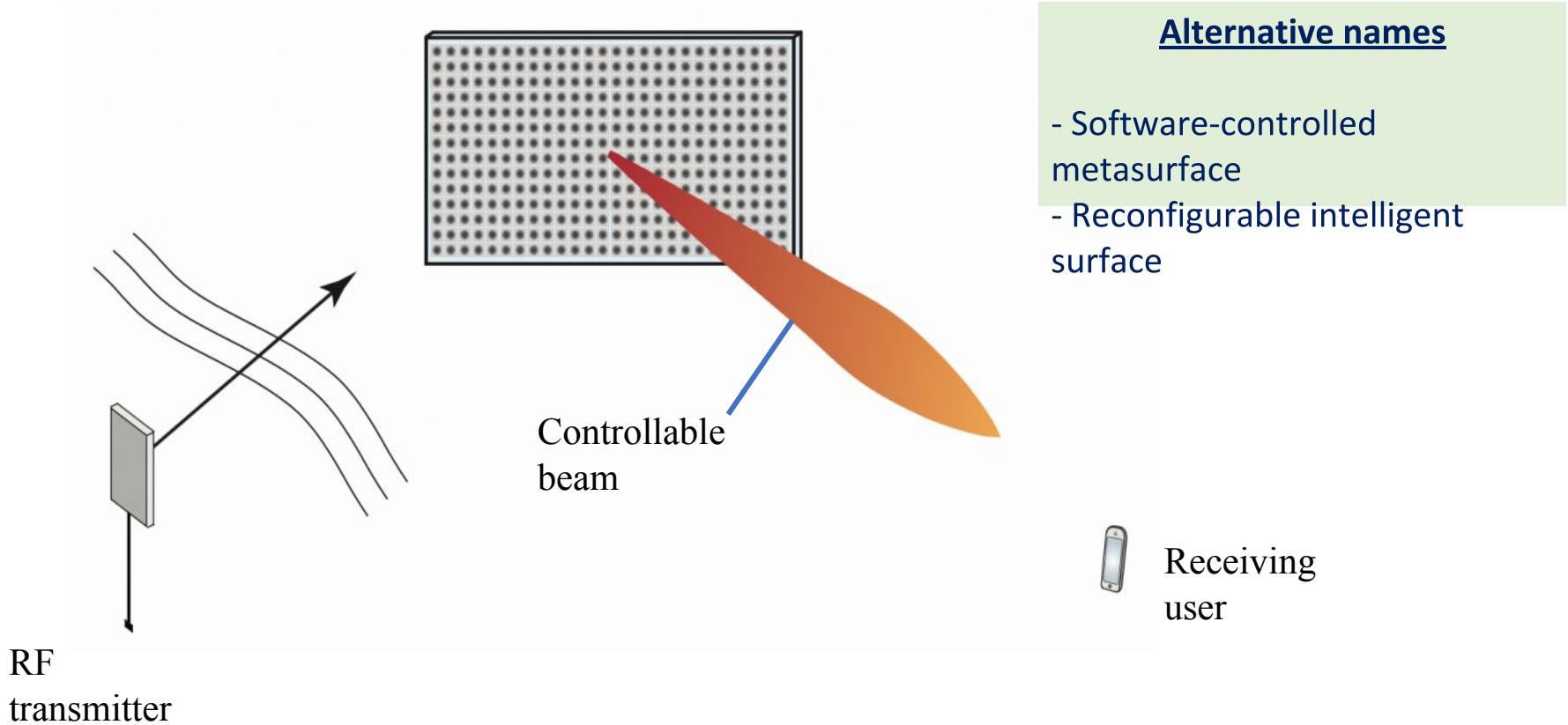
Intelligent Reflecting Surfaces for Future Wireless Communication Systems

Presenter: Dr. Ahmad Nashwan Al-Dabbagh

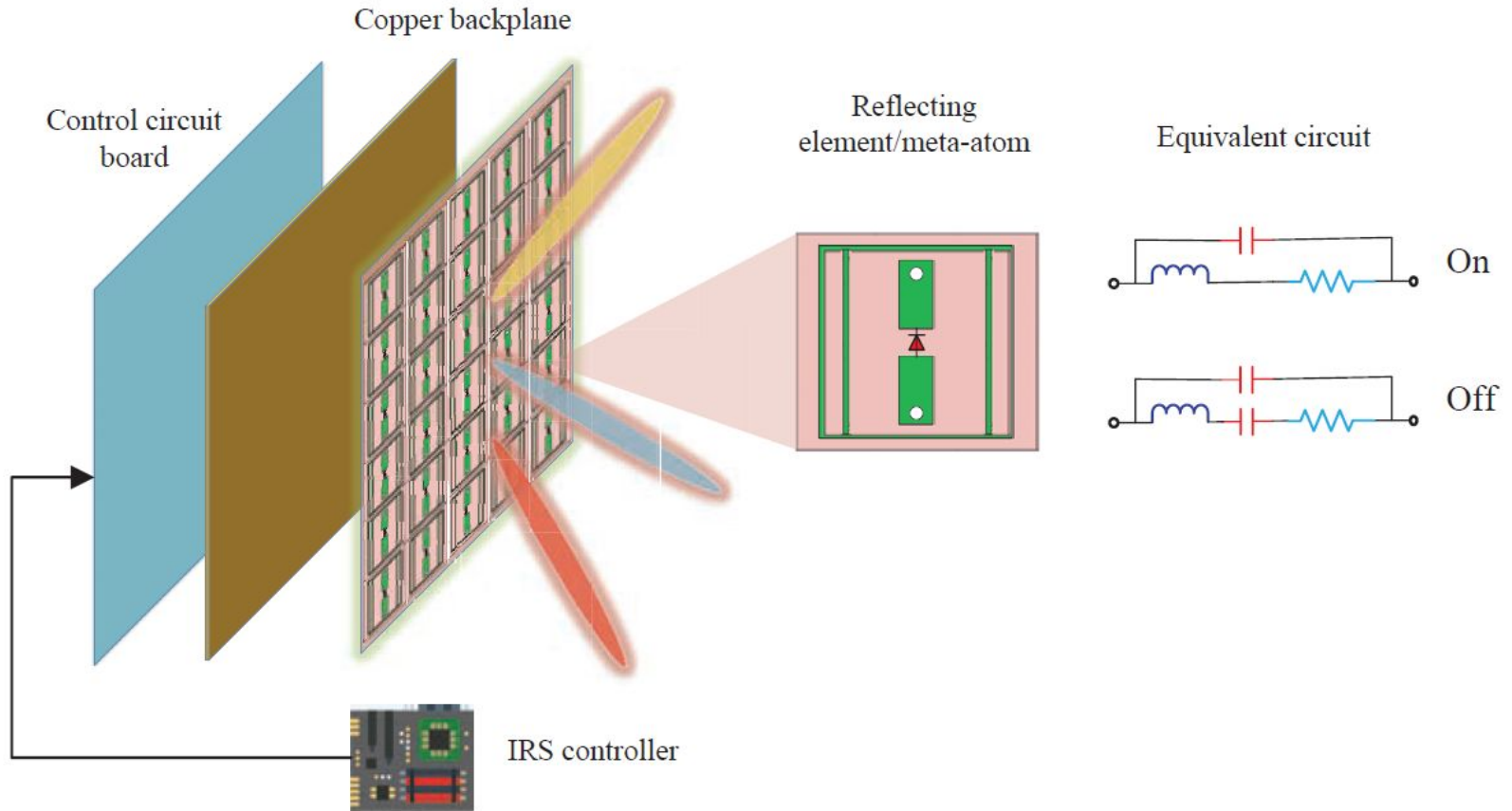
What is a Reflecting Surface?



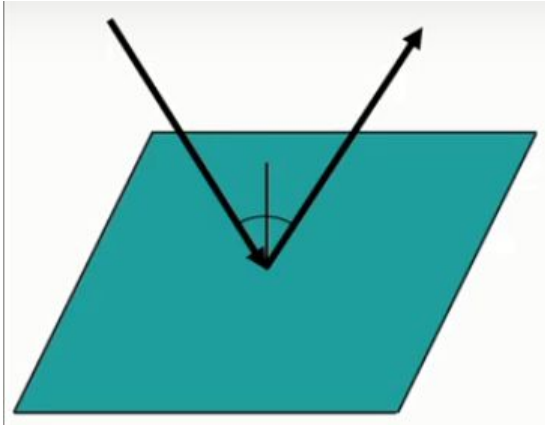
Intelligent Reflecting Surface (IRS)



Architecture of IRS

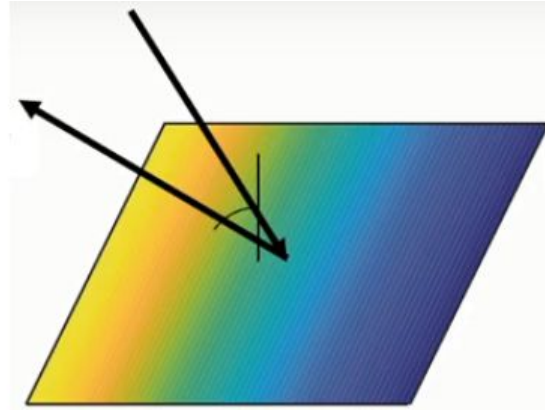


Intelligent Reflecting Surface (IRS)



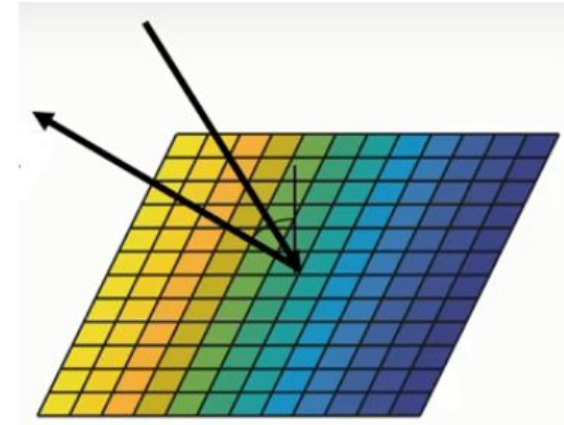
Metal plate
(Snell's
law)

Constant
surface
impedance



Ideal Metasurface
(Generalized Snell's
law)

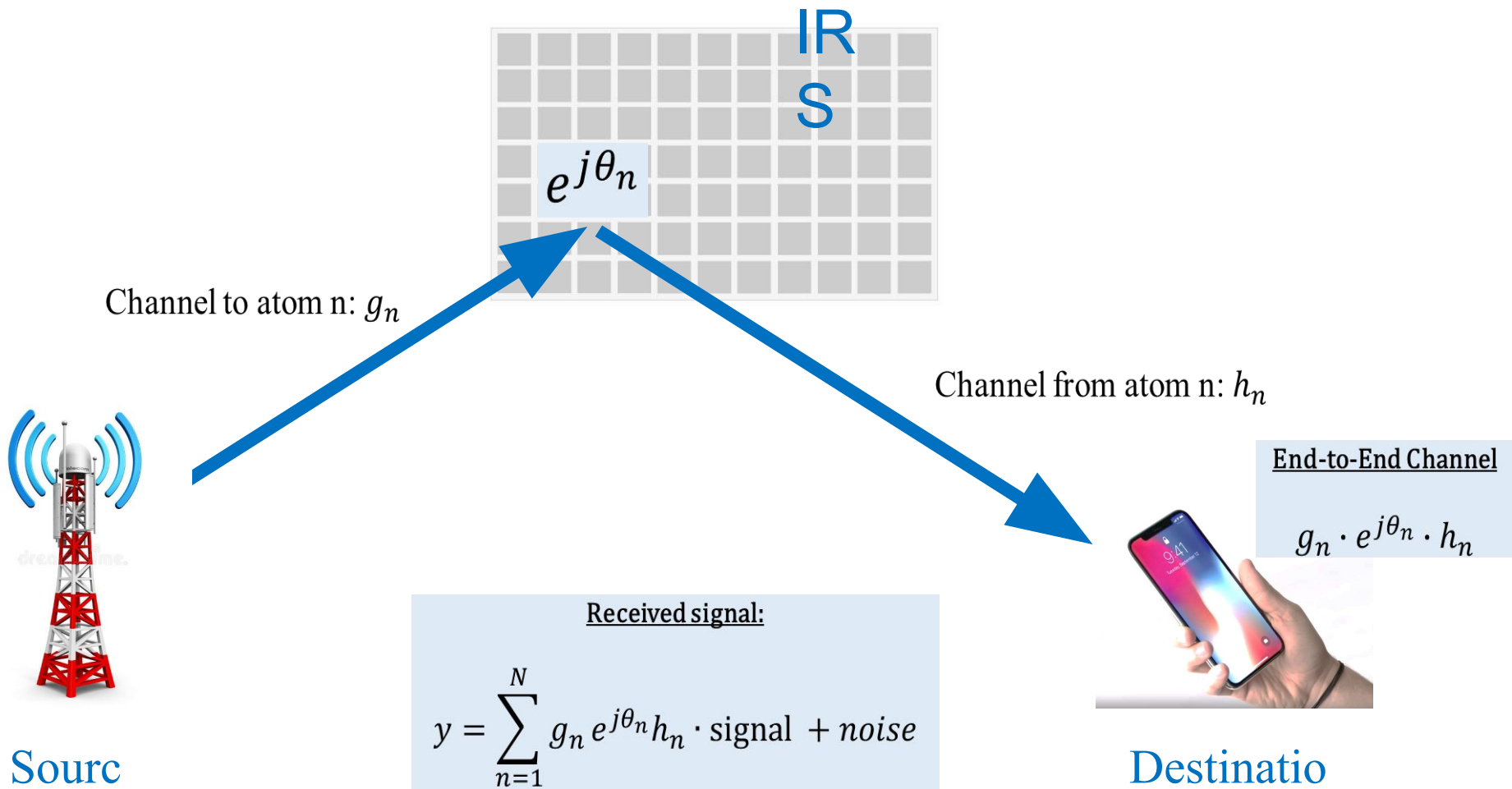
Altering surface
Impedance to
phase-shift
reflection



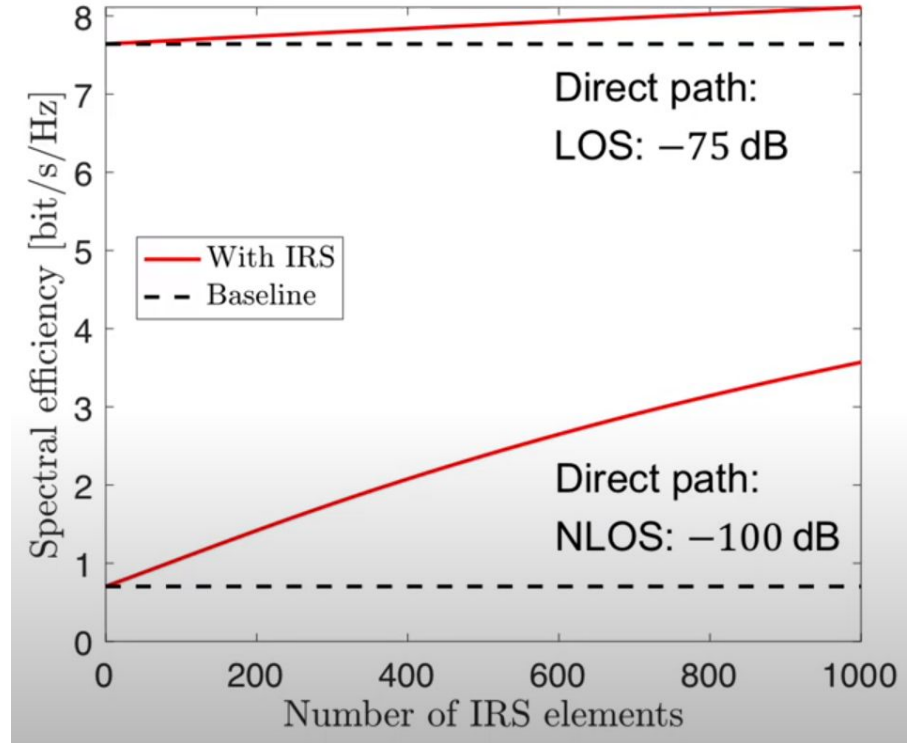
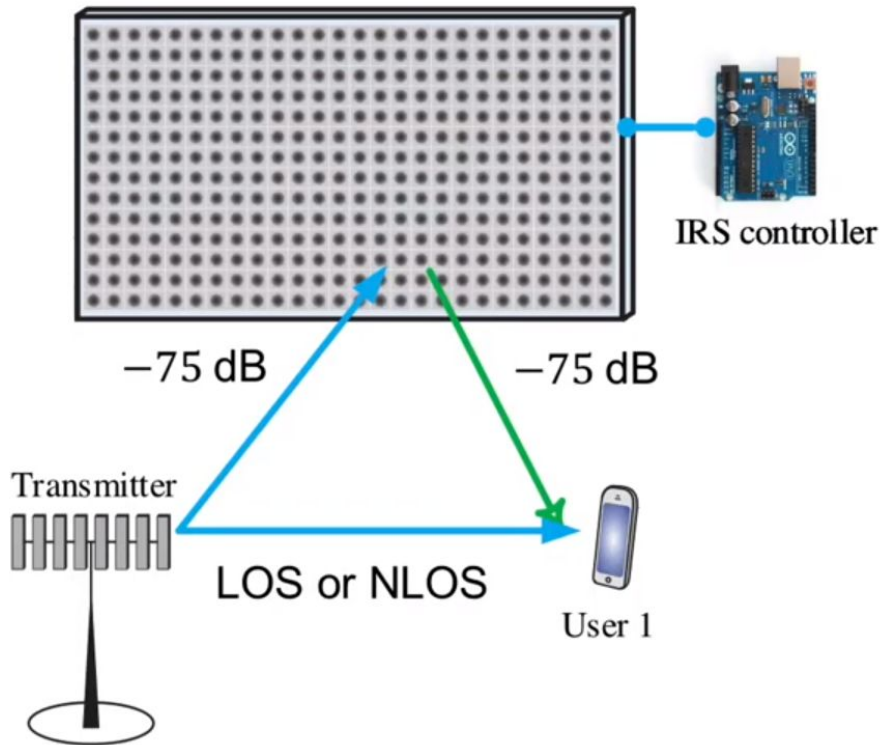
Practical
Metasurface
(Discretization)

Approximation with
discrete elements,
e.g., $\frac{\lambda}{5} \times \frac{\lambda}{5}$

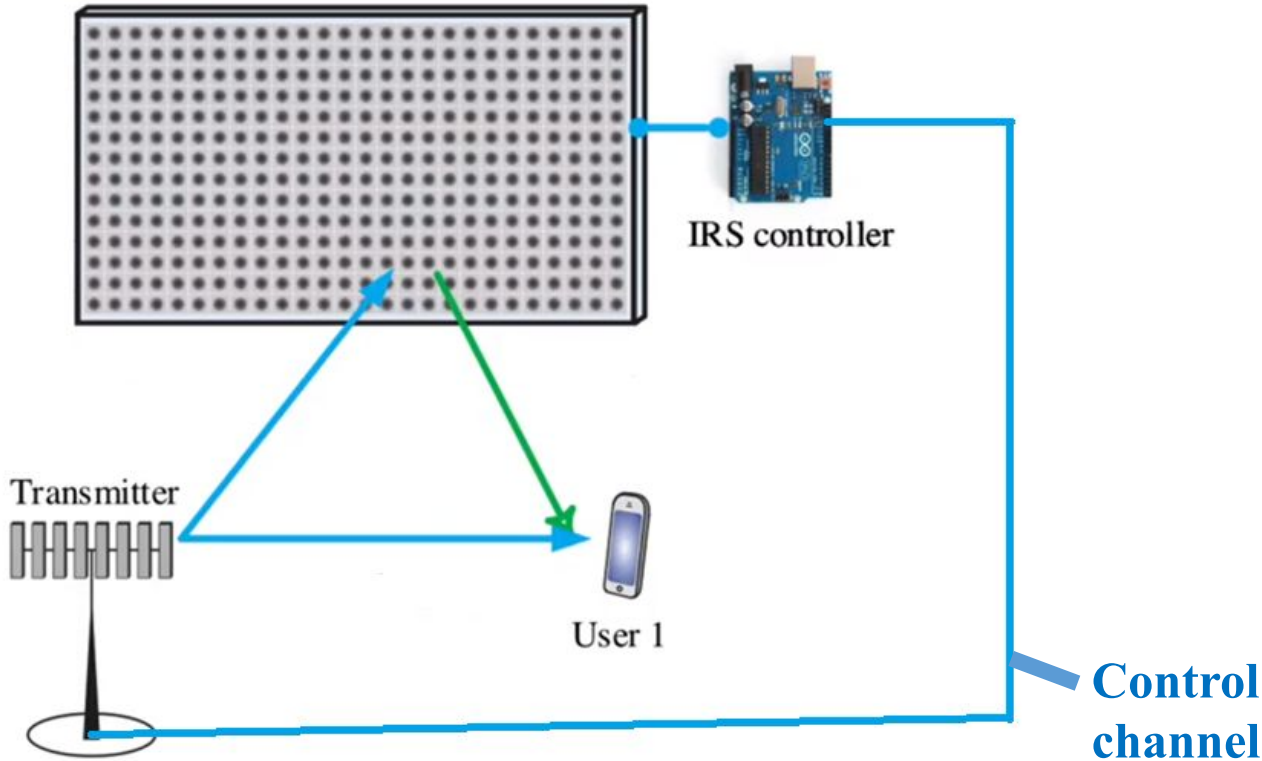
Communication System Model



Simulation done by Emil Björnson



Simulation done by Emil Björnson



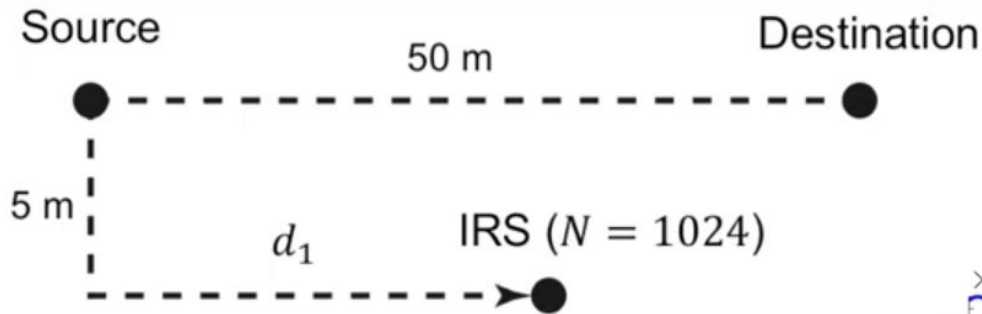
Send pilot signals via IRS?

Change the IRS
simultaneously
to achieve more
information

Use parametric models?

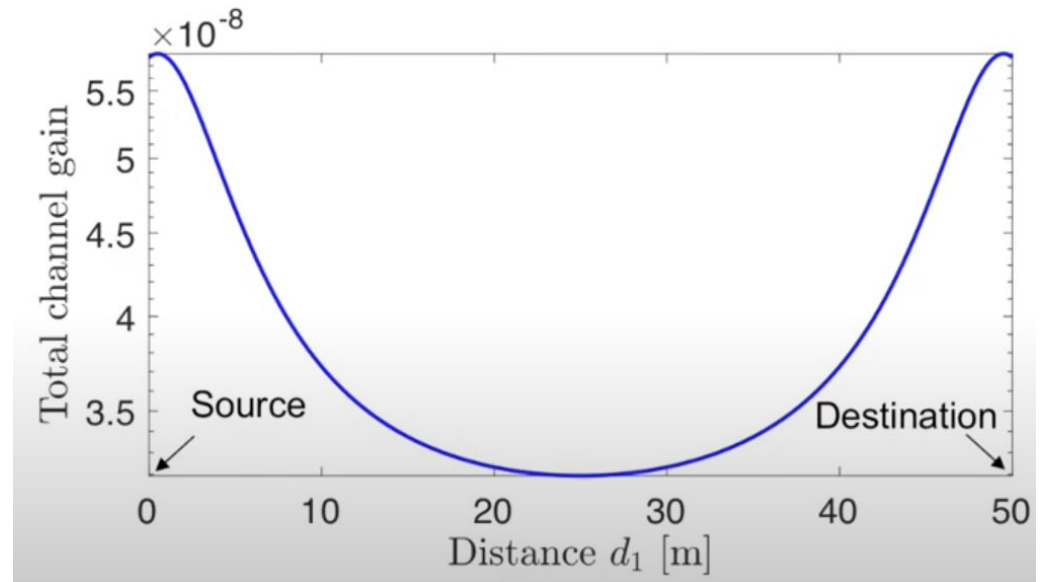
Estimate position or angle to
the user

Where shall we place the Metasurface?

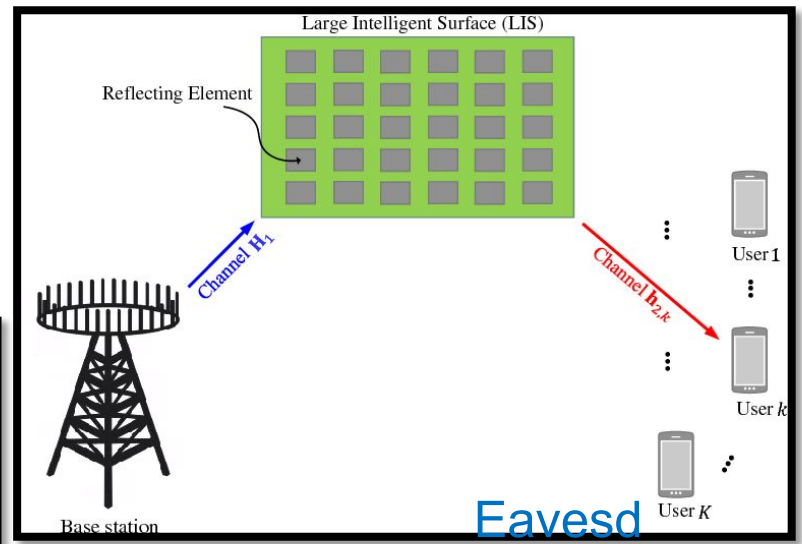


Preferred choice:

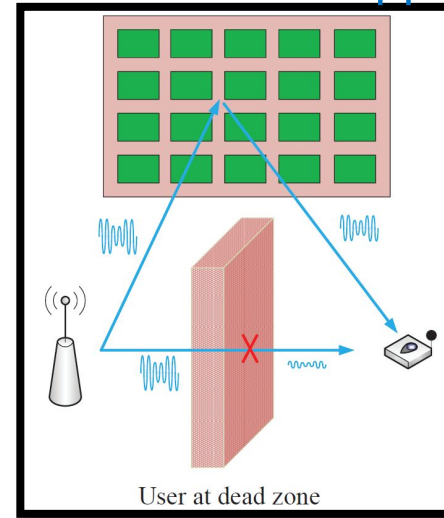
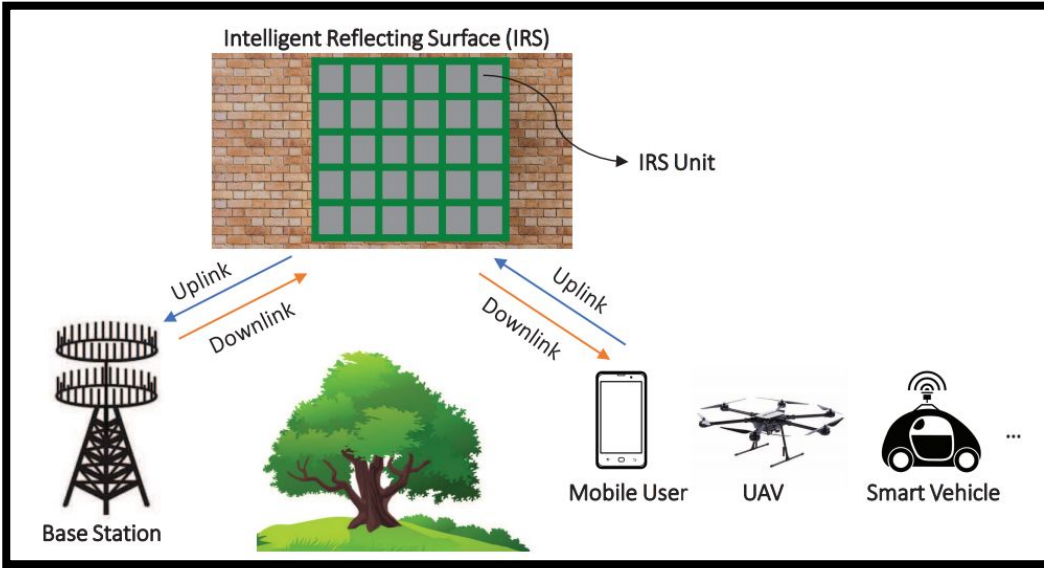
Close to source or destination



Applications of IRS



Eavesdropper



Summary

- Compared to active wireless relay, IRS does not use any active transmit module (e.g., power amplifier), but only reflects the received signal as a passive array.
- The change in this technology is considered as a phase shift only to the incident signal, so that an IRS consumes no transmit power.
- “Reconfigurable surface” means that the angle of reflection can be reconfigured (via software) regardless of the angle of incidence.
- Example places to put IRSs are walls, building facades, and ceilings.

Thanks for your listening