Primer on MIMO wireless systems

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IIT Kanpur

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Brief Introduction

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- Courses
  - MIMO wireless communications
  - 5G NR
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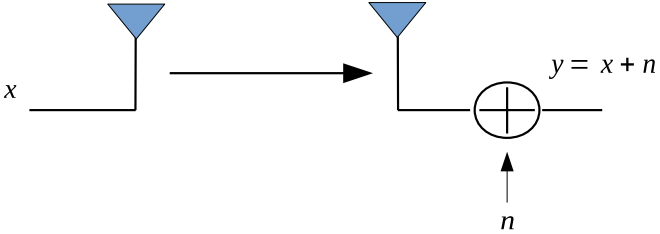
Modeling of a communication channel

- Consider additive white Gaussian channel (AWGN) channel



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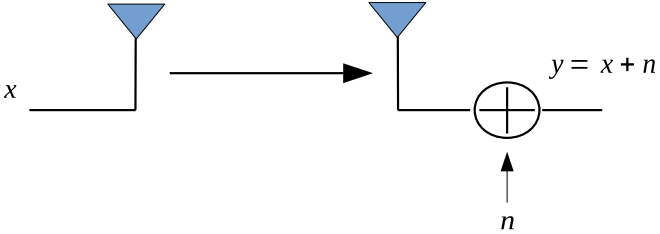

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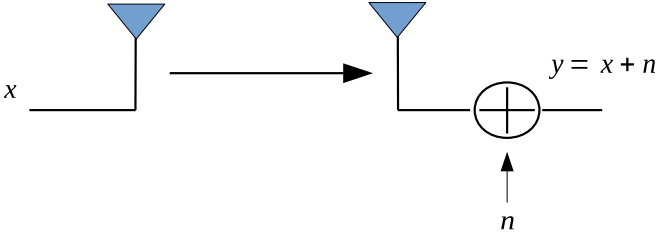

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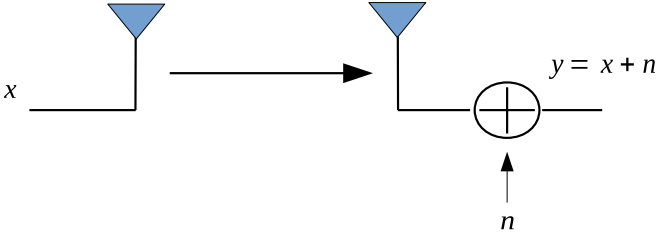

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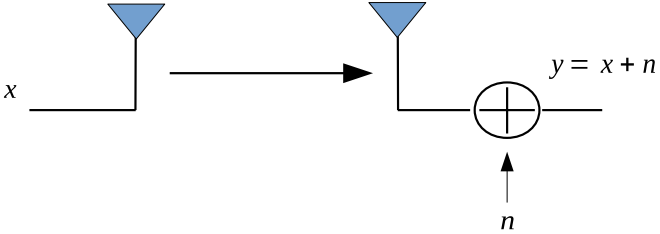

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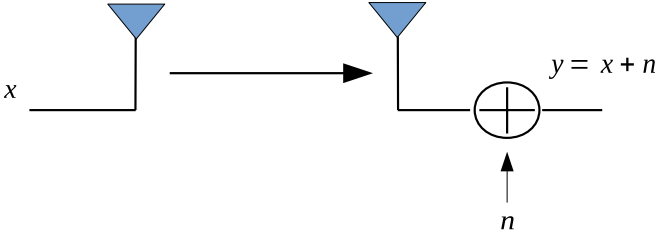

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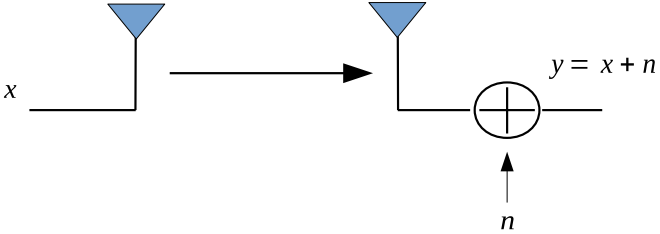

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  - Power of $n_1 + n_2 = 2N_0$

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  - Useful at high SNR

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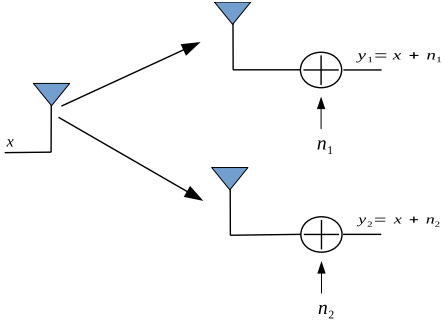

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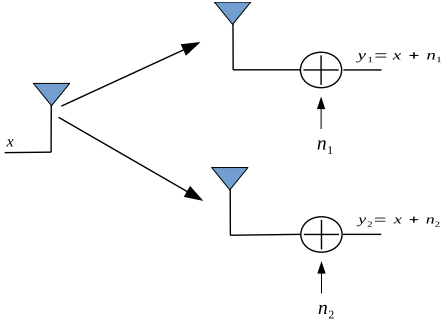

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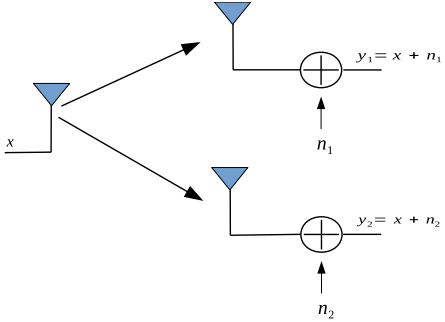

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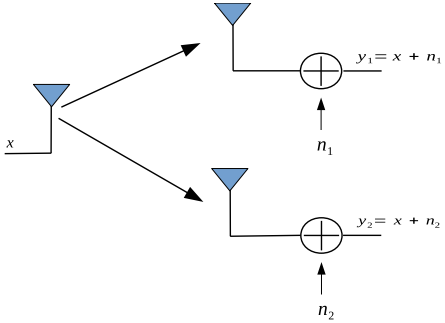

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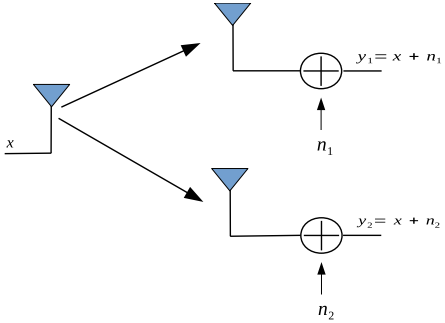

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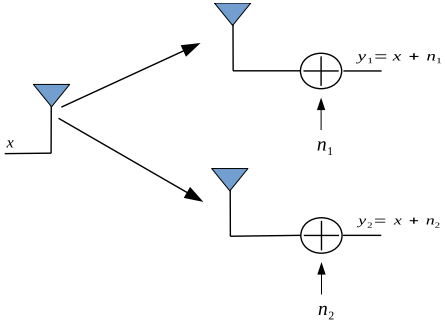

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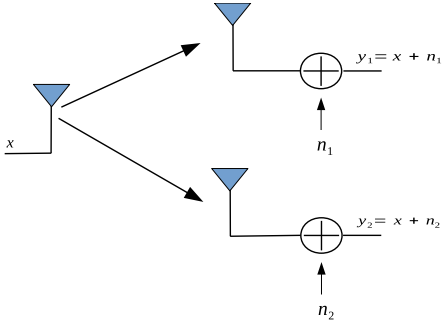

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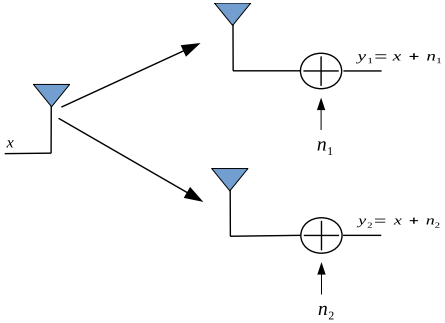

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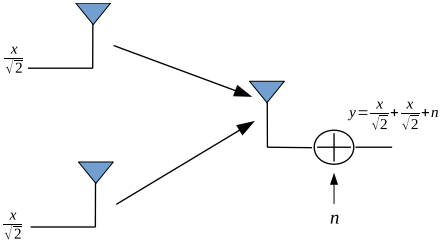

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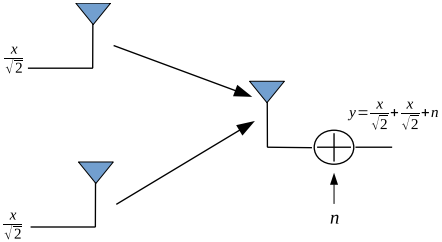

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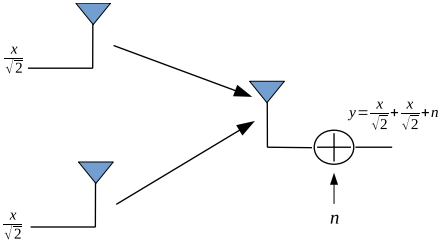

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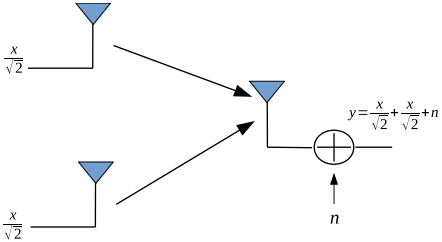

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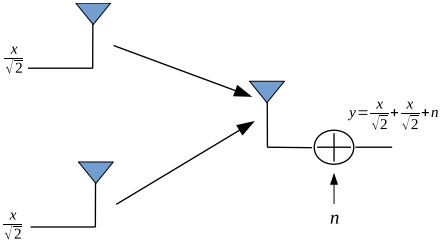

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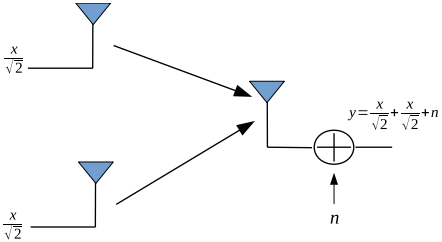

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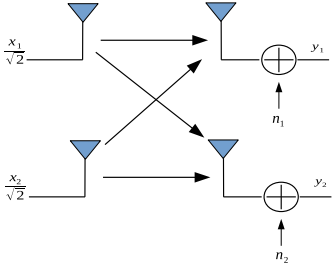

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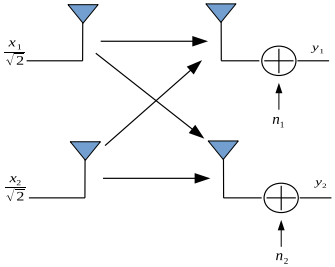

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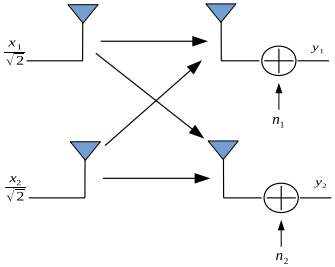

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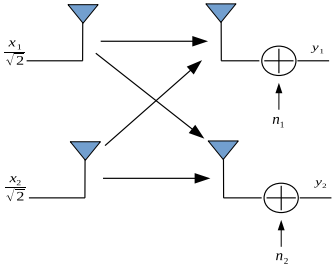

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- One equation two variables; cannot solve it

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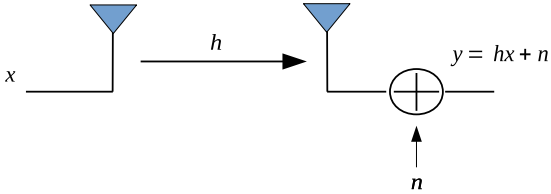

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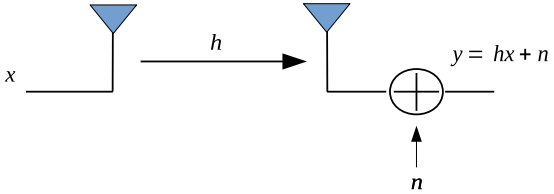

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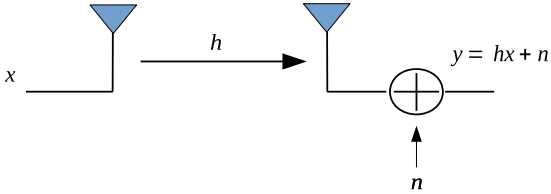

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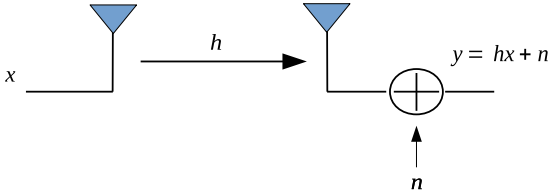

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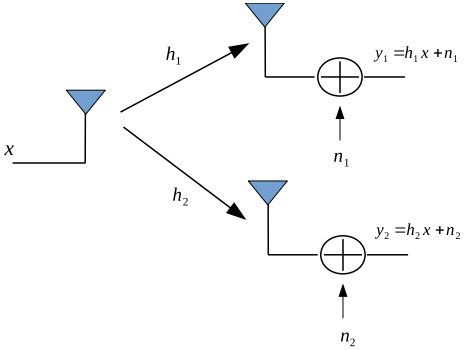
- Also know as transmission mode 1 in LTE

Single transmit and multiple receive antennas wireless channel



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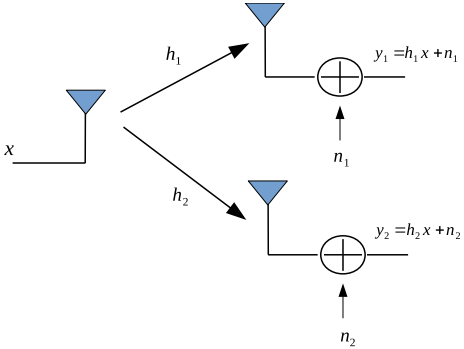

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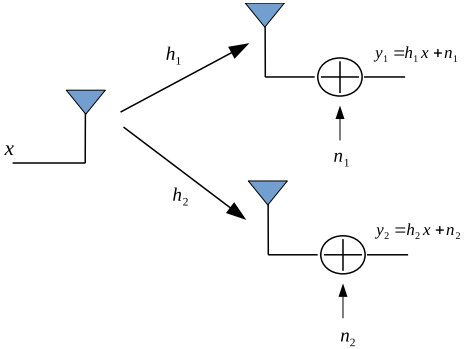

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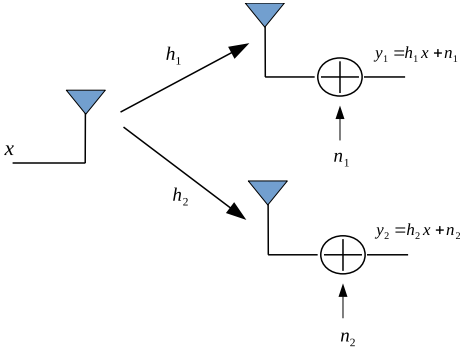

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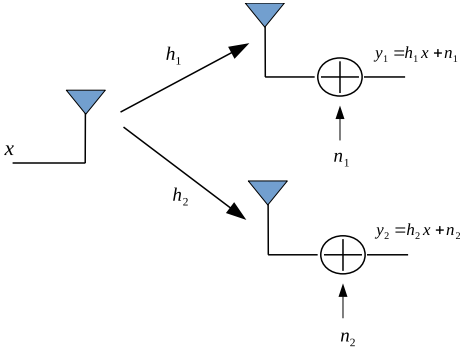

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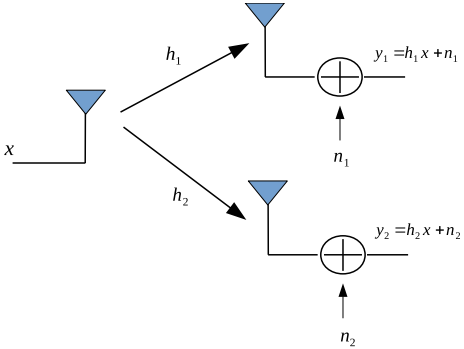

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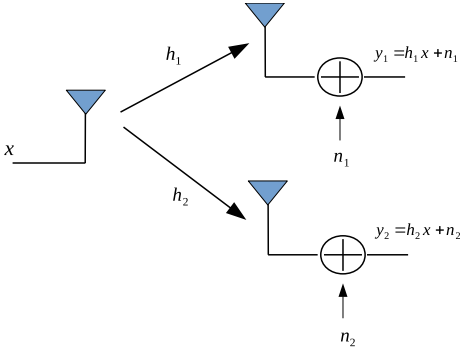

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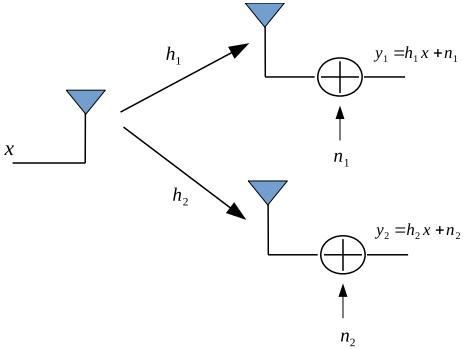

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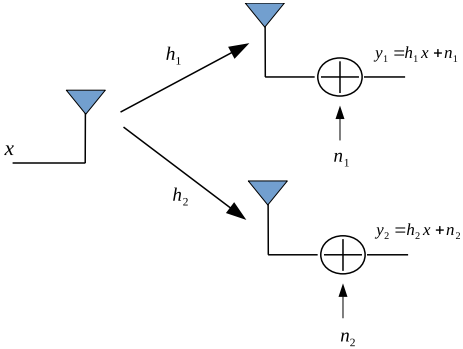

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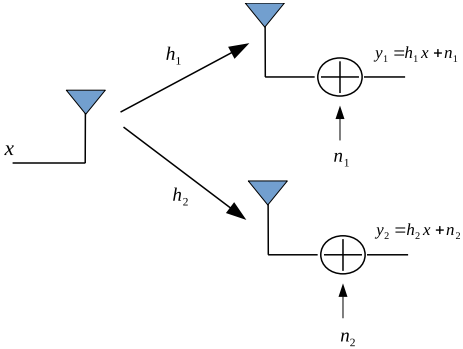

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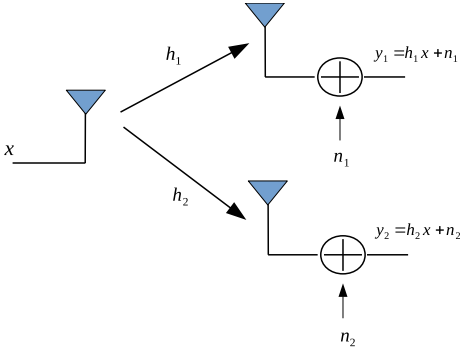

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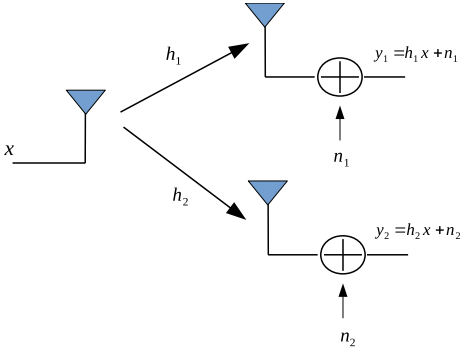

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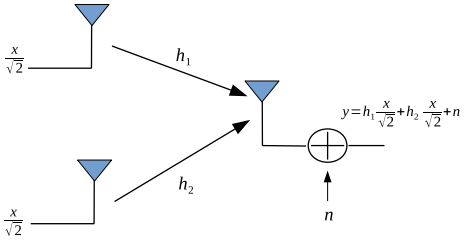

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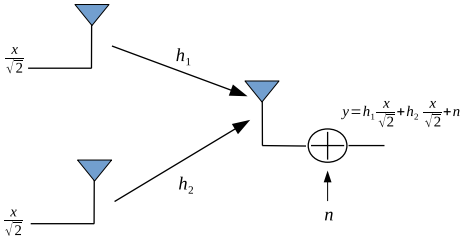

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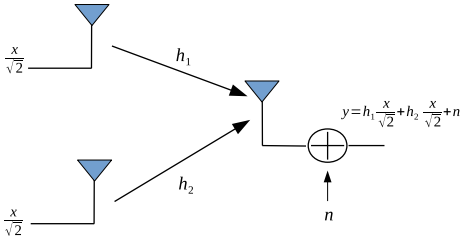

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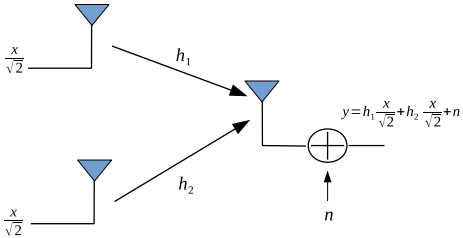

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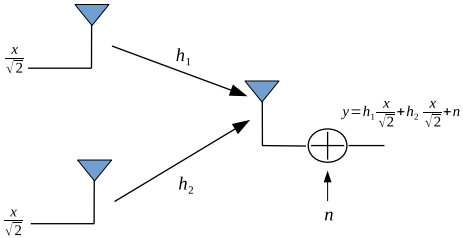

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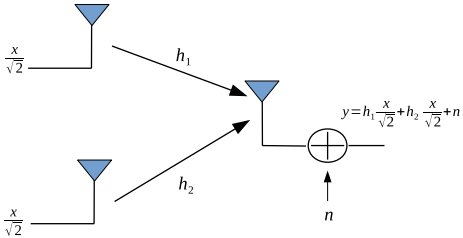

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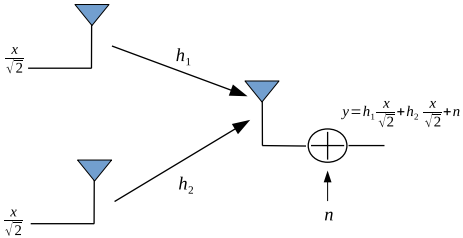

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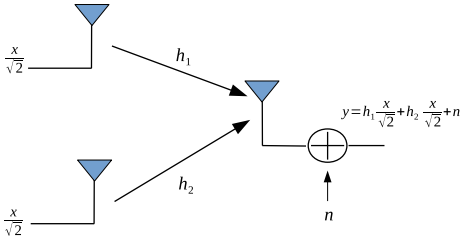

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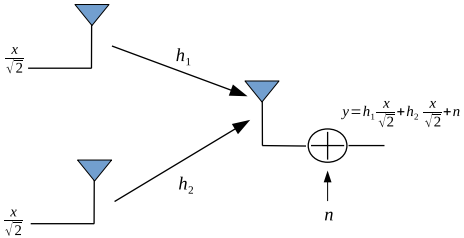

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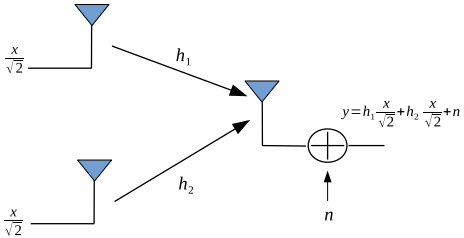

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- 10-times reduction in SNR.

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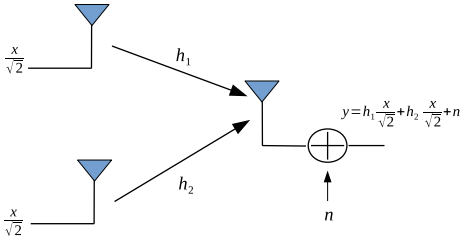

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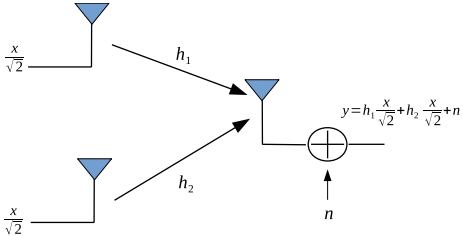
- 10-times reduction in SNR. Can we do better?

Multiple transmit and single receive antennas wireless channel (2)



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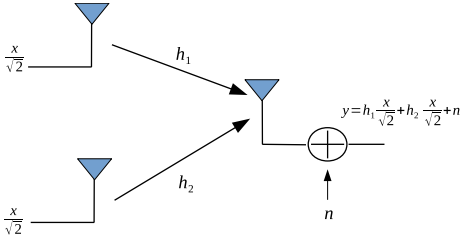

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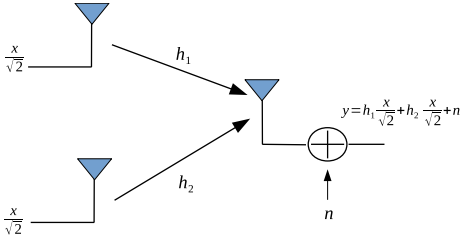

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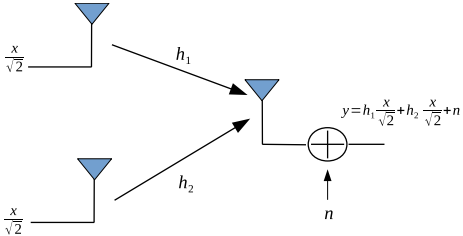
Multiple transmit and single receive antennas wireless channel (2)



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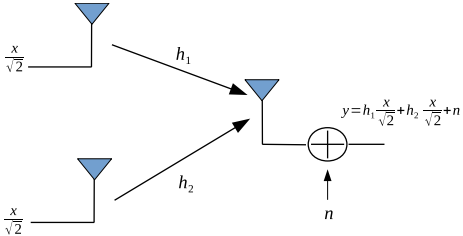

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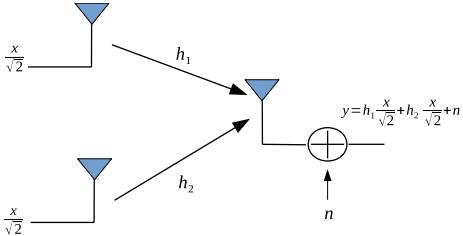

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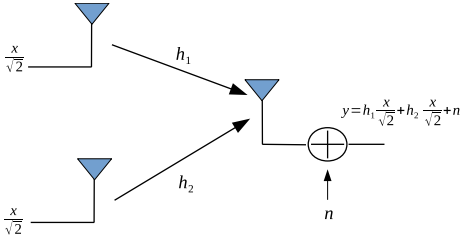
Multiple transmit and single receive antennas wireless channel (2)



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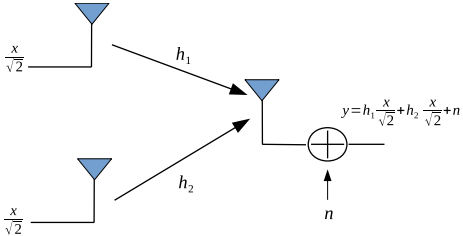

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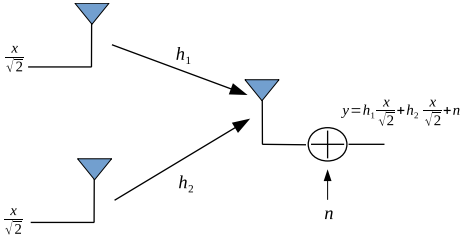

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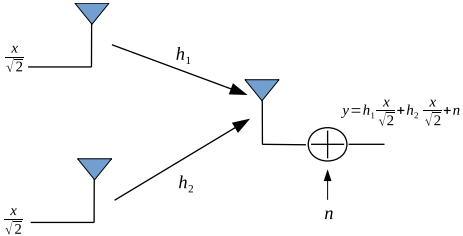

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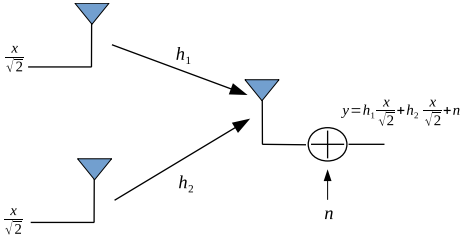

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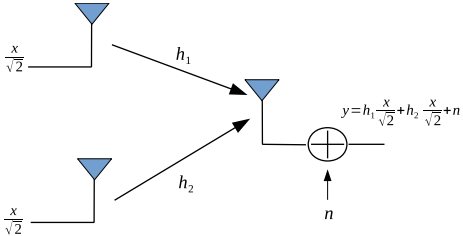

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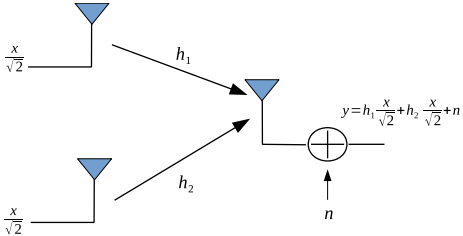

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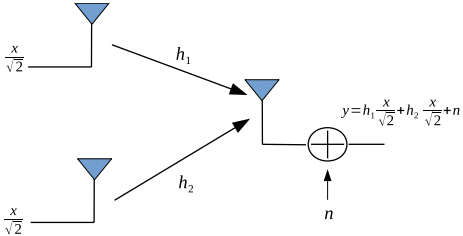

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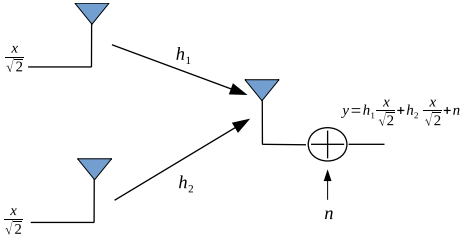

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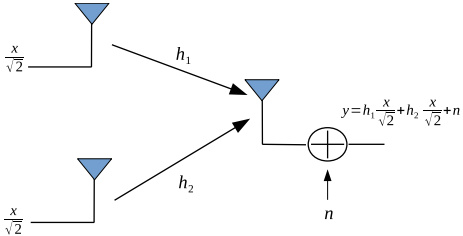

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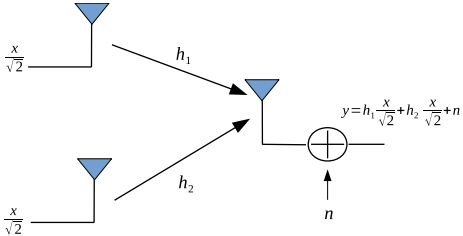

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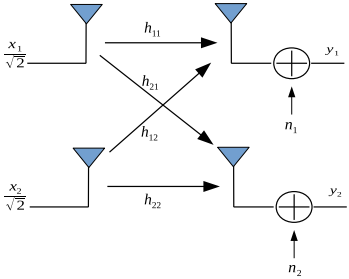
- Same SNR (capacity) as that of the SIMO channel – crucial that transmitter knows the channel
- Transmission mode 9/6 depending on how channel is estimated/fed back

Multiple transmit and receive antennas wireless channel (1)



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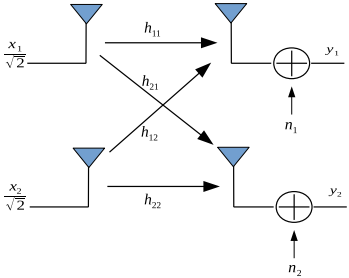

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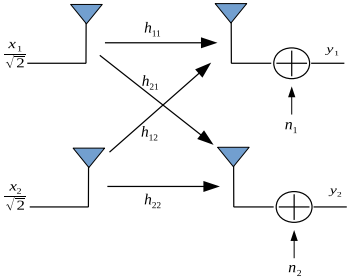

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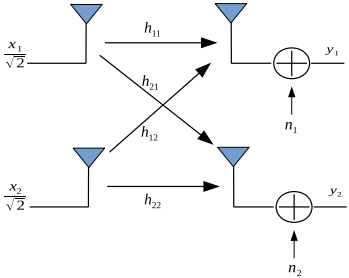

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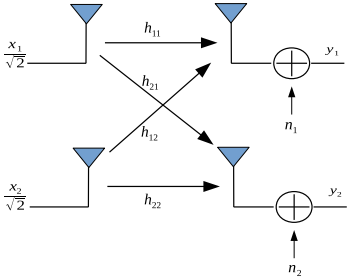

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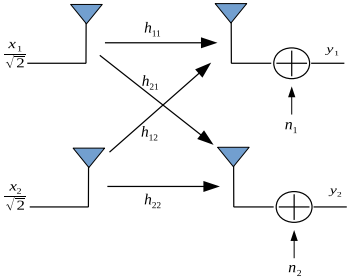

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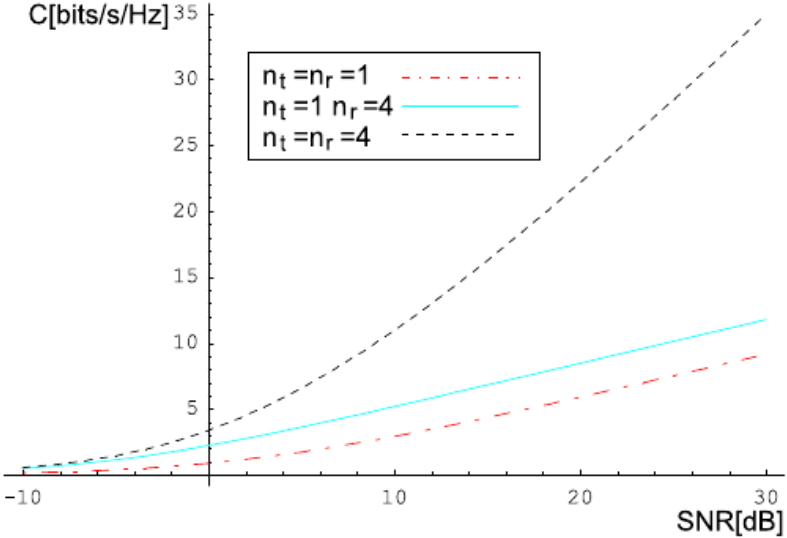
- Two symbols are simultaneously transmitted from two antennas
- Also known as transmission mode 3 – open loop spatial multiplexing

MIMO wireless systems capacity -comparison



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Thank you