NOISEBERGS IN Z-GAUSSIAN INTERFERENCE CHANNELS

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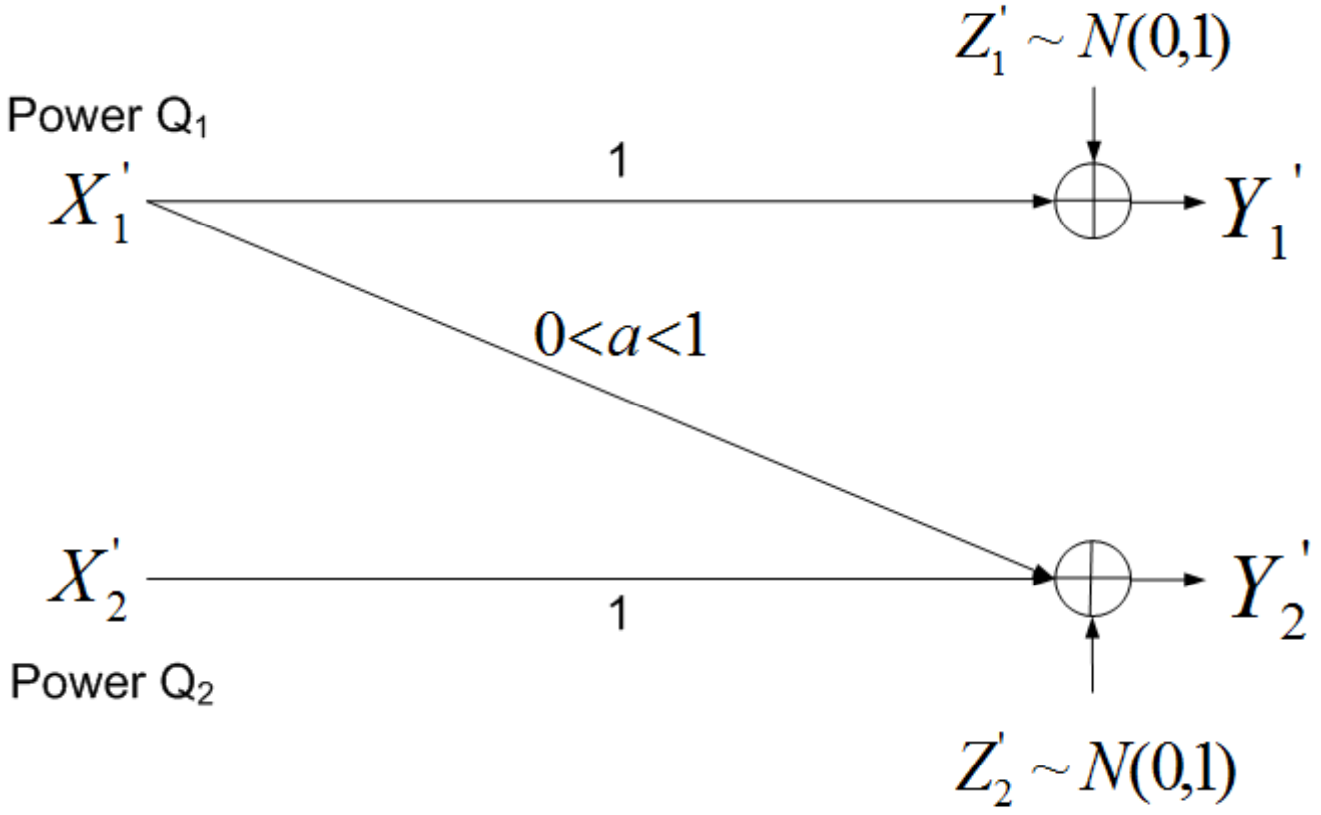
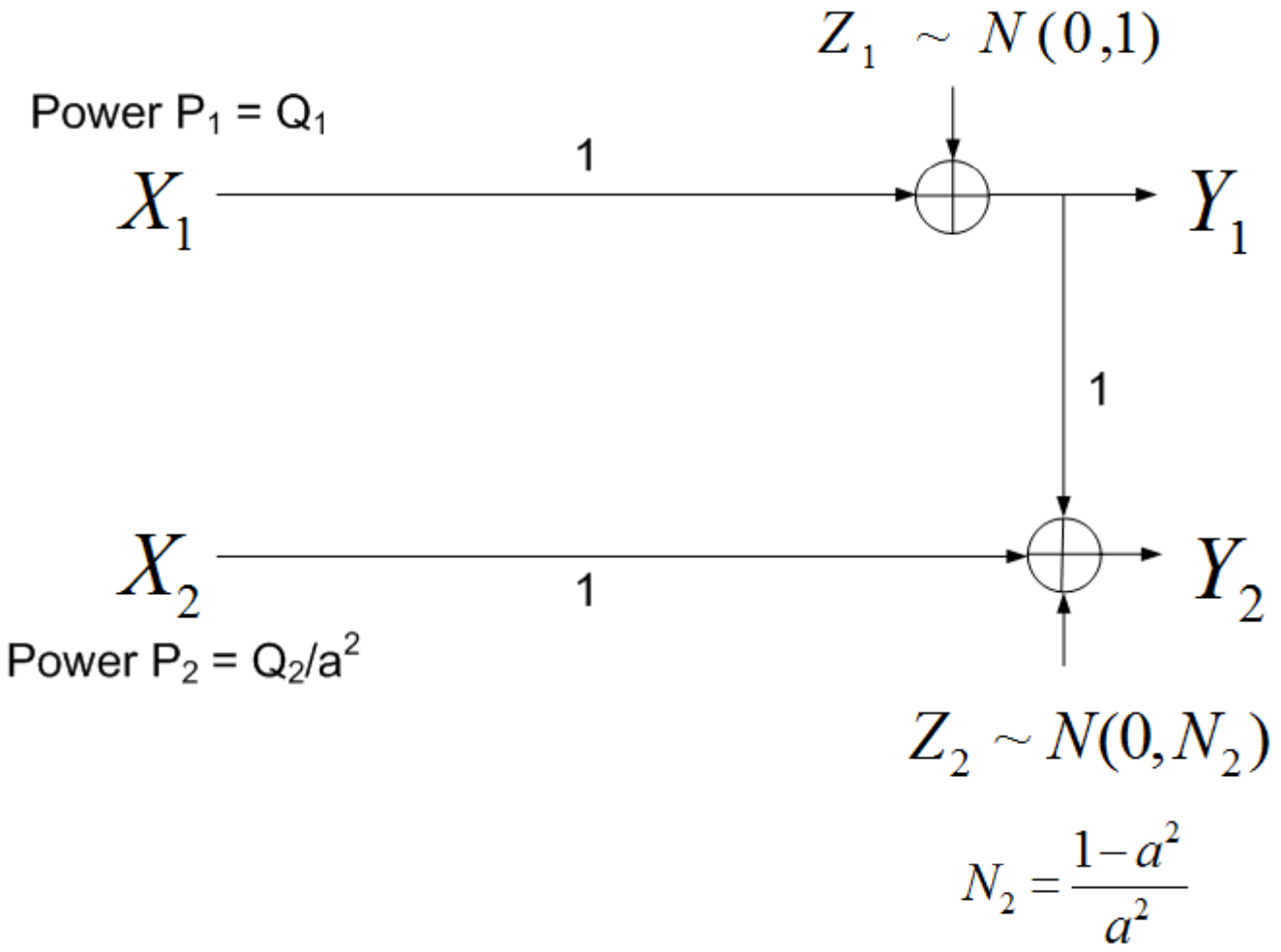
Summary

- Z-Gaussian Interference Channel as a degraded interference channel
- Discrete Memoryless Channel as a band limited channel
- Multiplex Region: growing **Noisebergs**
- Overflow Region: back to superposition

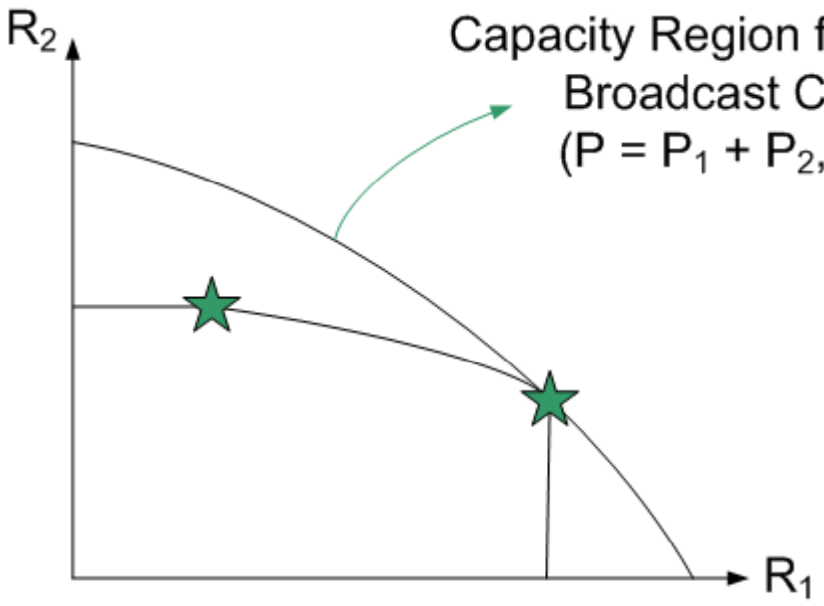
Z-Gaussian Interference Channel

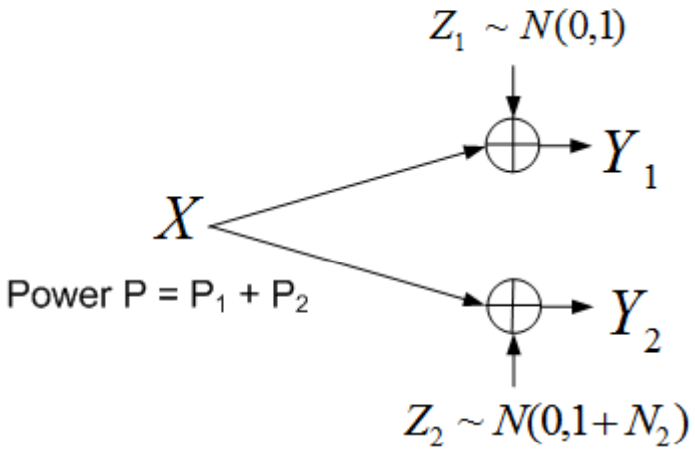


Degraded Gaussian Interference Channel



Gaussian Broadcast Channel





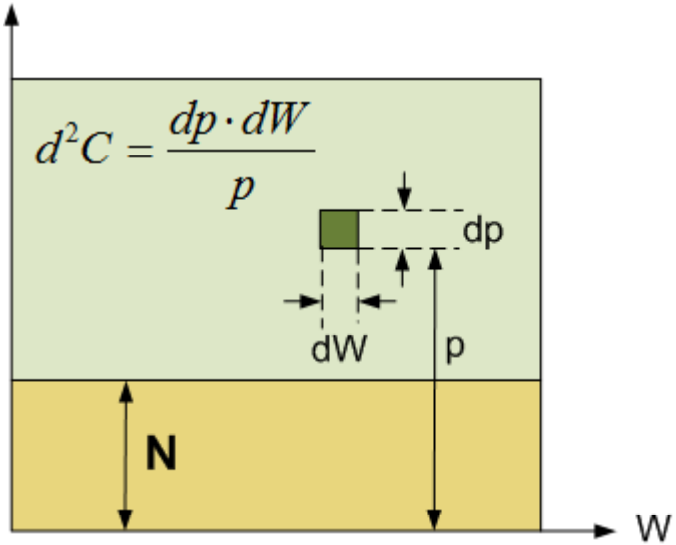
$$C_{BC}\{R_1, R_2\}:$$

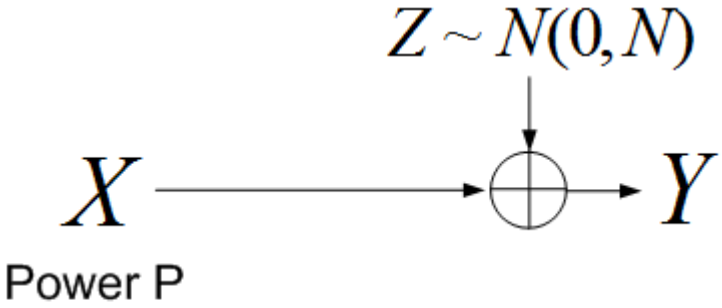
$$0 \le \alpha \le 1$$

$$0 \le R_1 \le \frac{1}{2}\log(1 + \alpha P)$$

$$0 \le R_2 \le \frac{1}{2}\log\left(1 + \frac{(1-\alpha)P}{1 + N_2 + \alpha P}\right)$$

Differential capacity

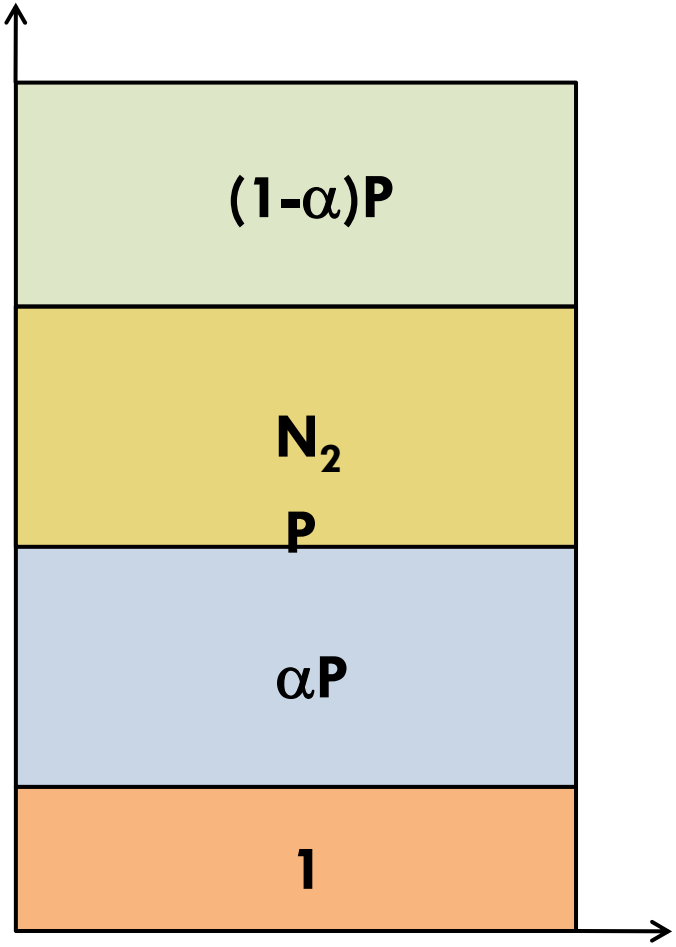


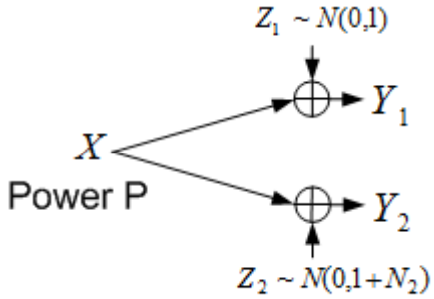


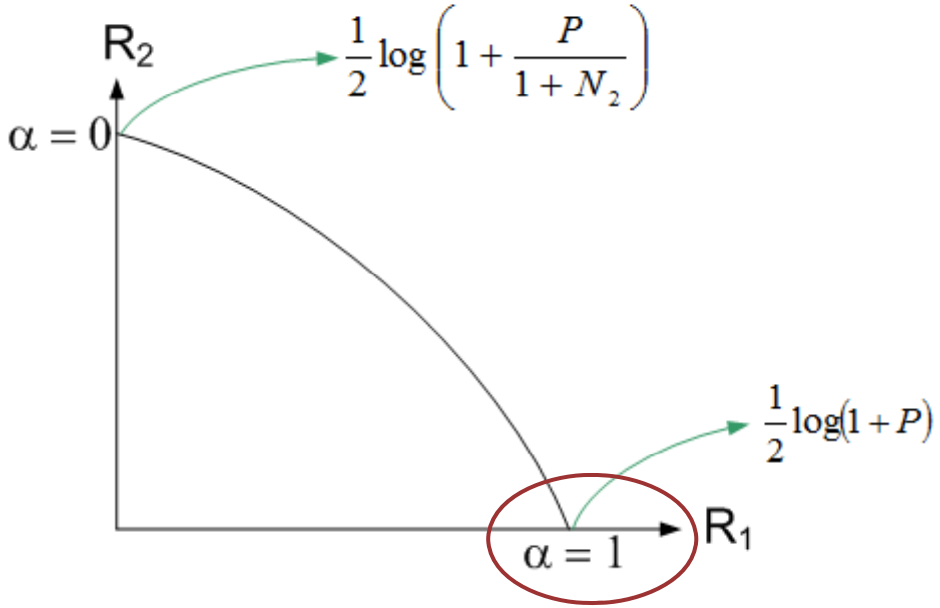
$$C = \iint d^2C = \frac{1}{2}\log\left(1+\frac{P}{N}\right)$$

Discrete memoryless channel as a band limited channel

Superposition coding



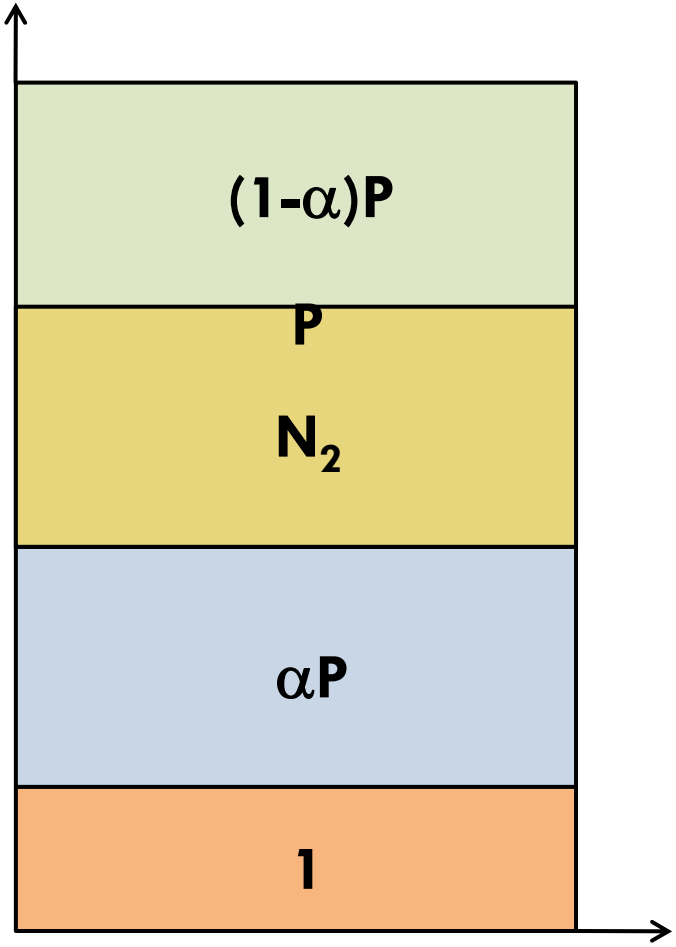


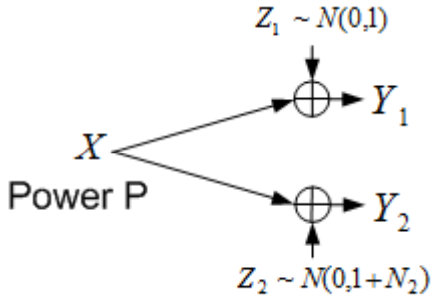


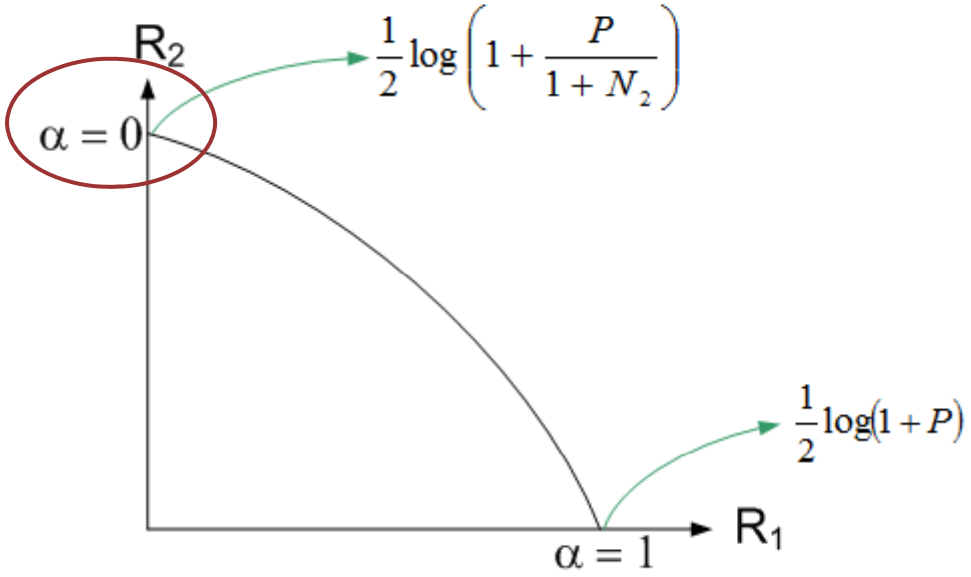
$$\frac{1}{2}\log\left(1+\frac{P}{1+N_2}\right)$$

$$\frac{1}{2}\log(1+P)$$

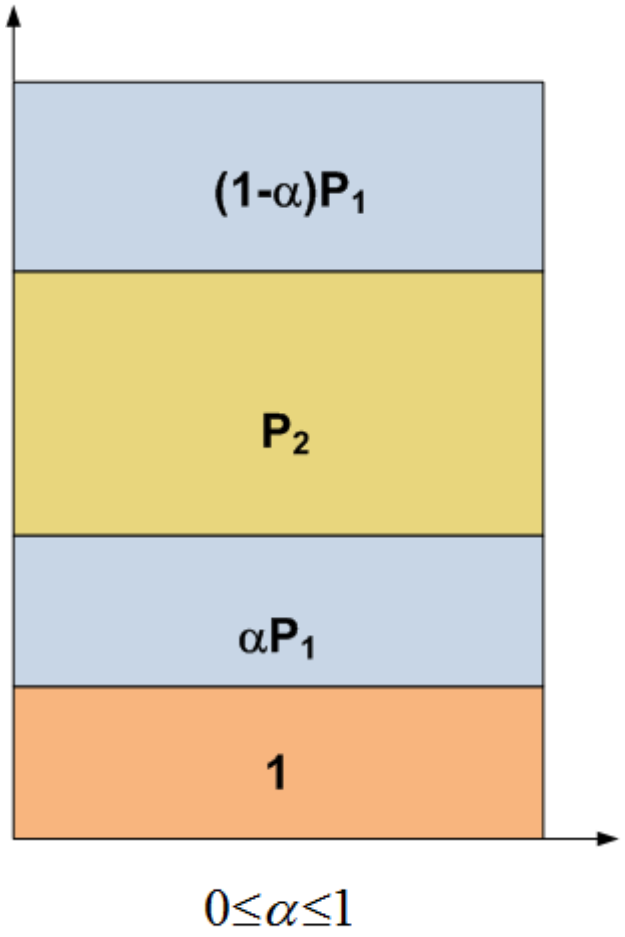
Superposition coding

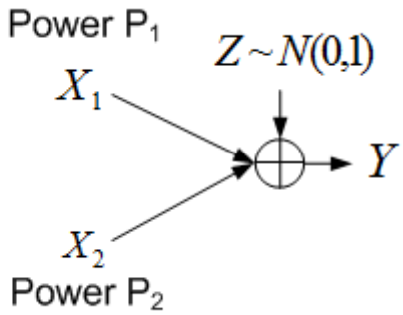


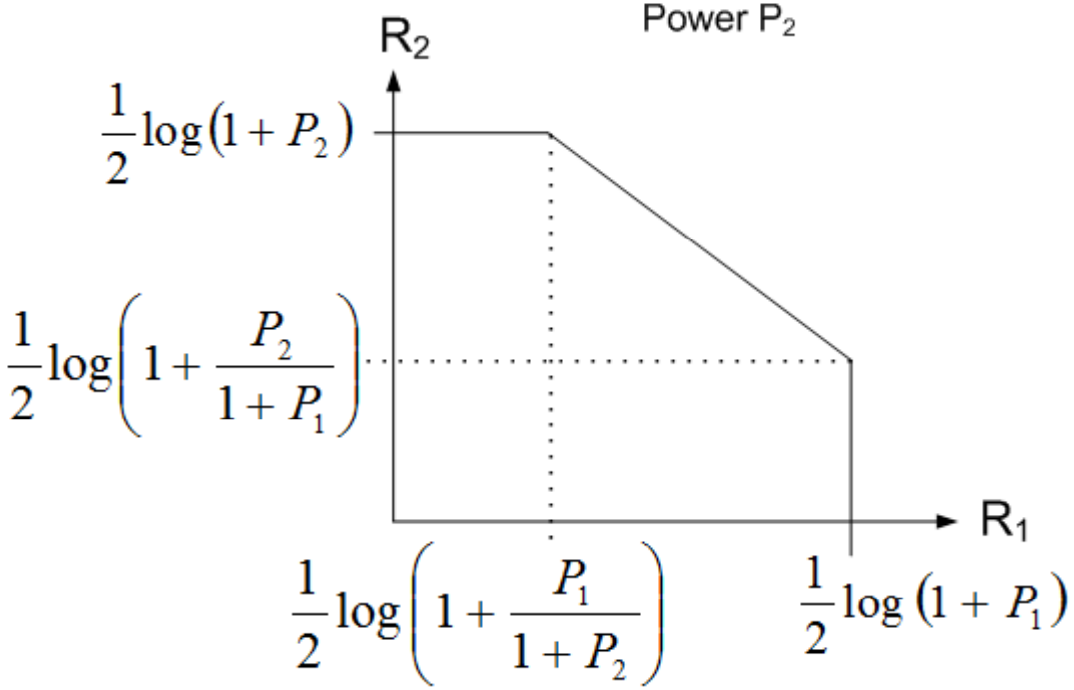




Multiple Access Channel

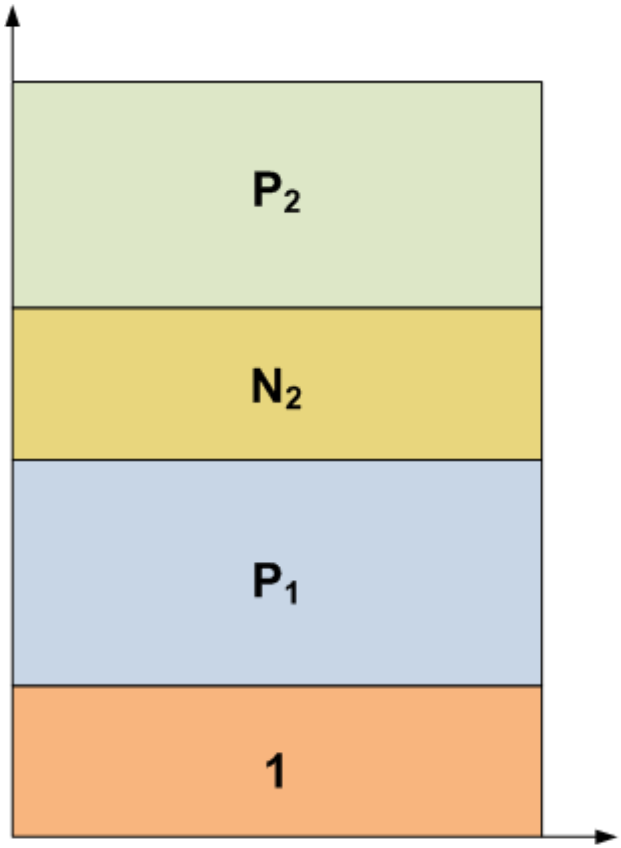


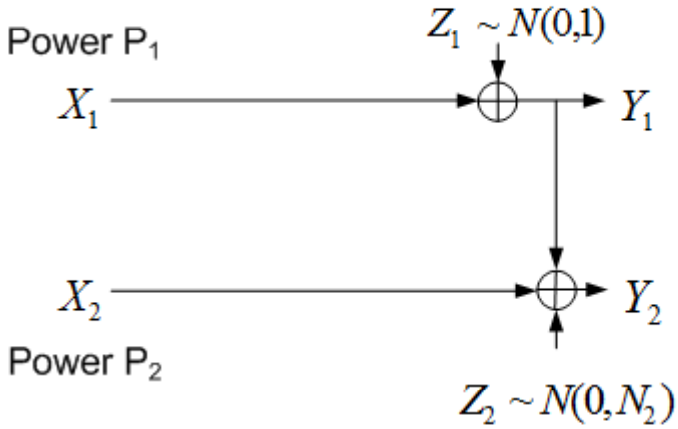


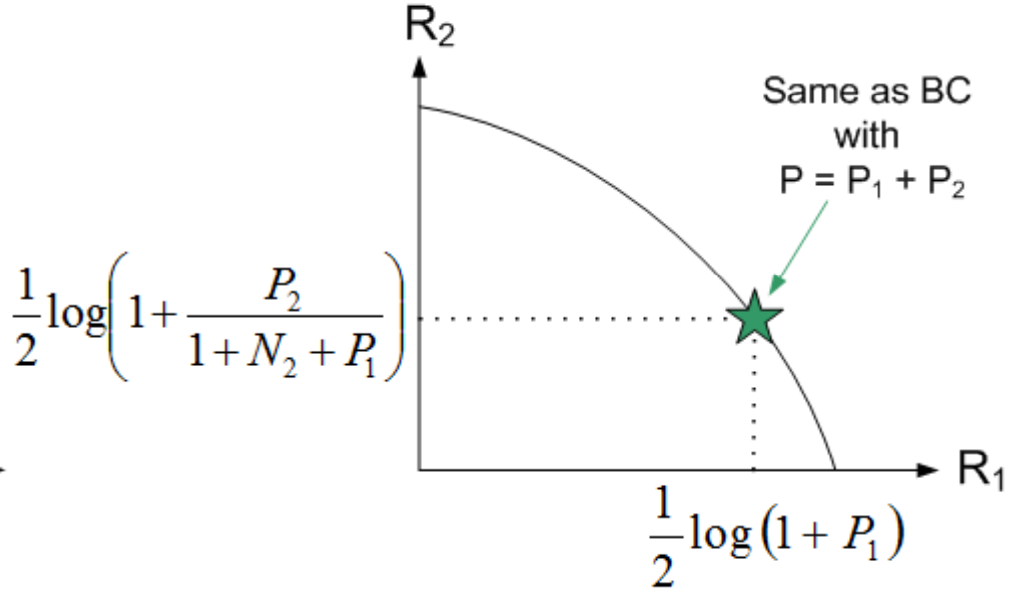


Degraded Interference Channel

- One Extreme Point

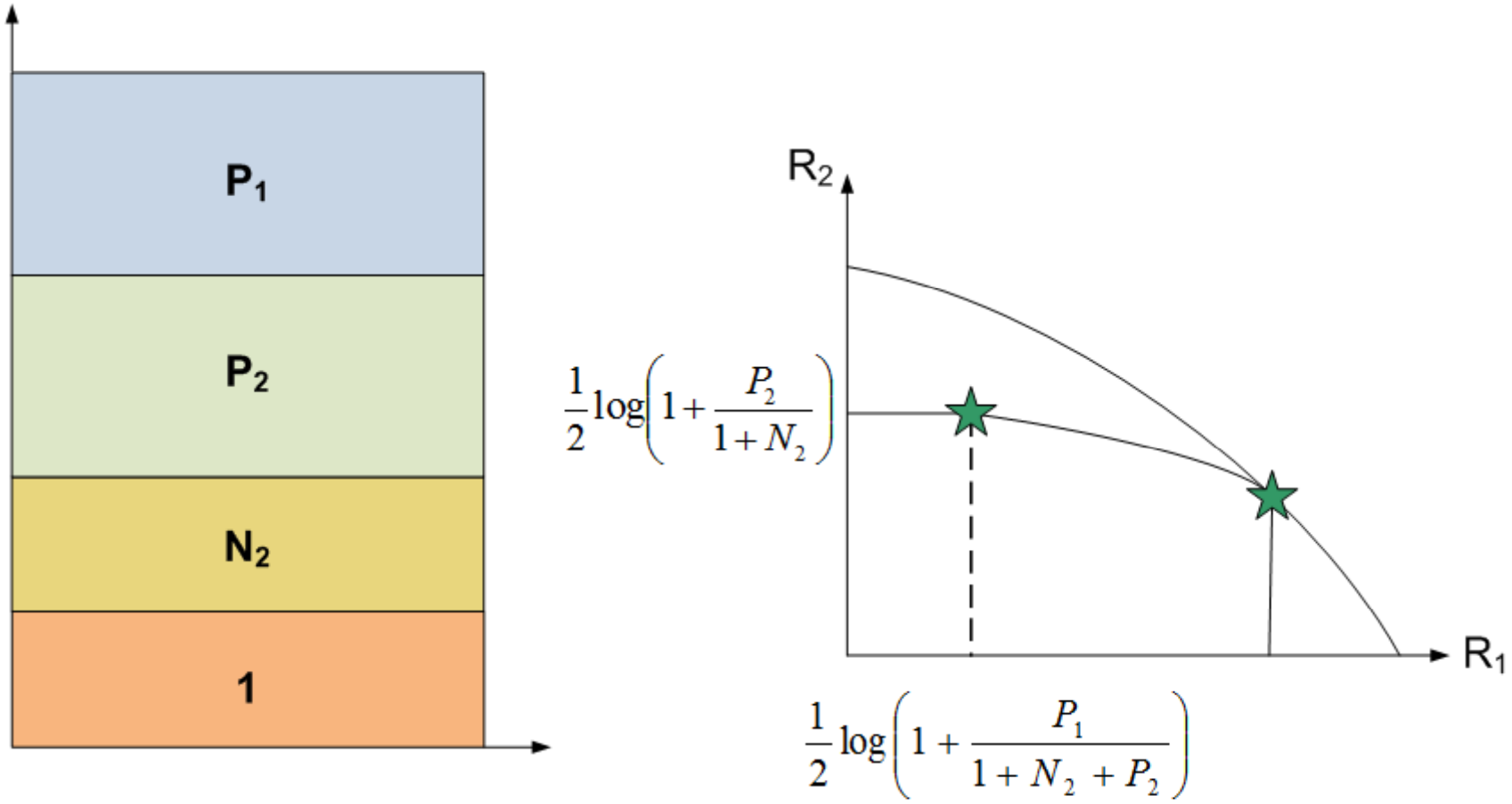




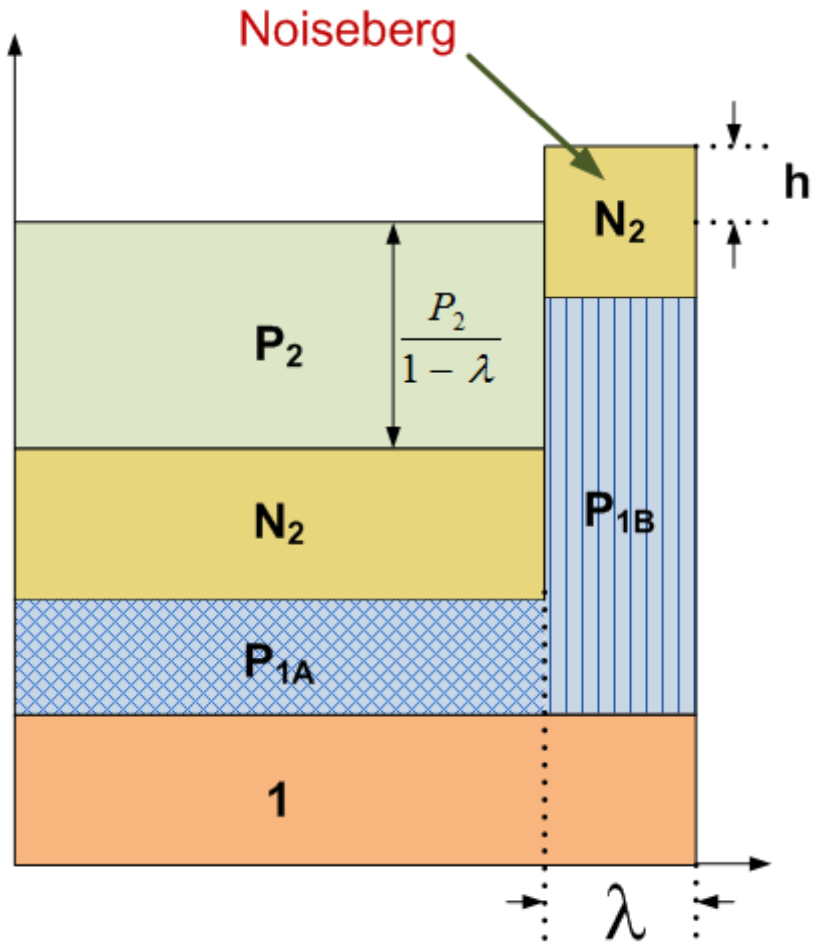


Degraded Interference Channel

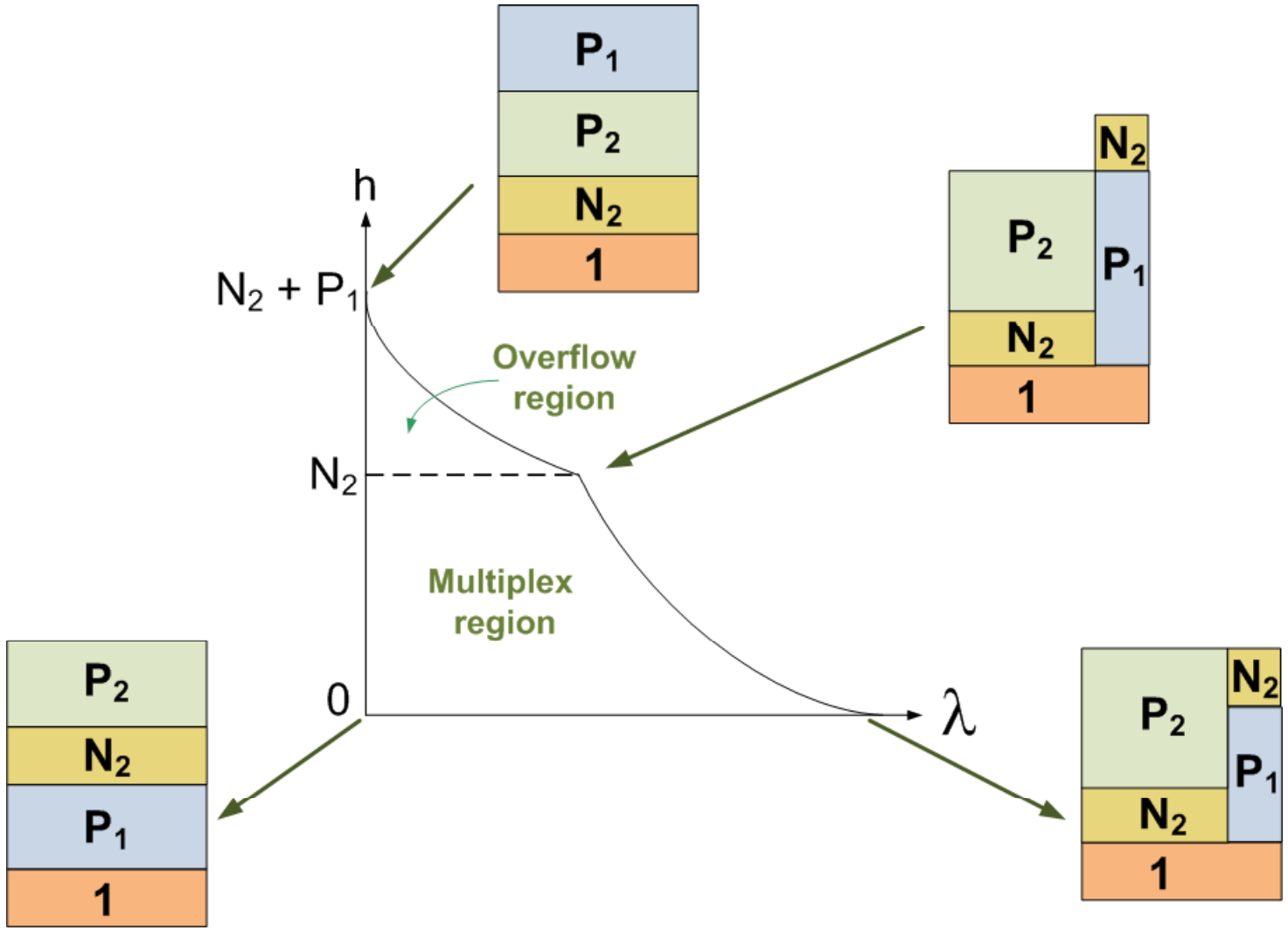
- Another Extreme Point



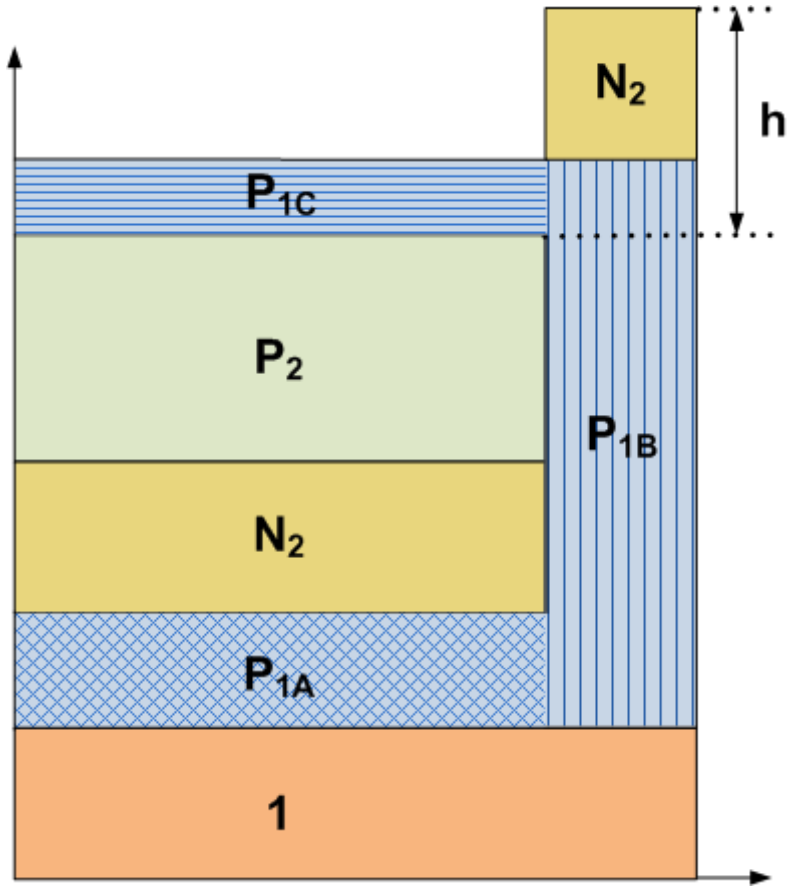
Intermediary Points (Multiplex Region)



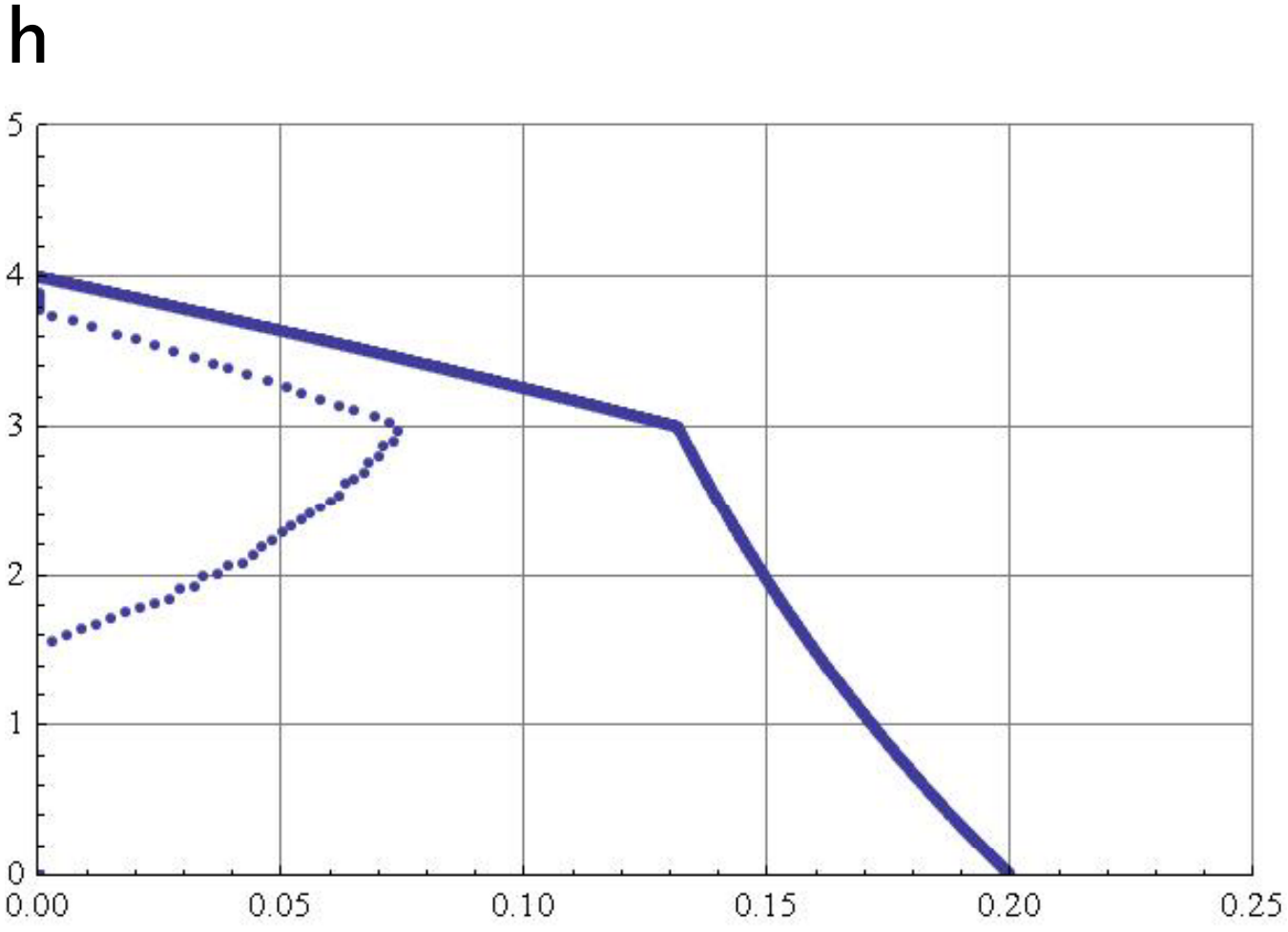
Admissible region for (λ, h)



Intermediary Point (Overflow Region)



Admissible region



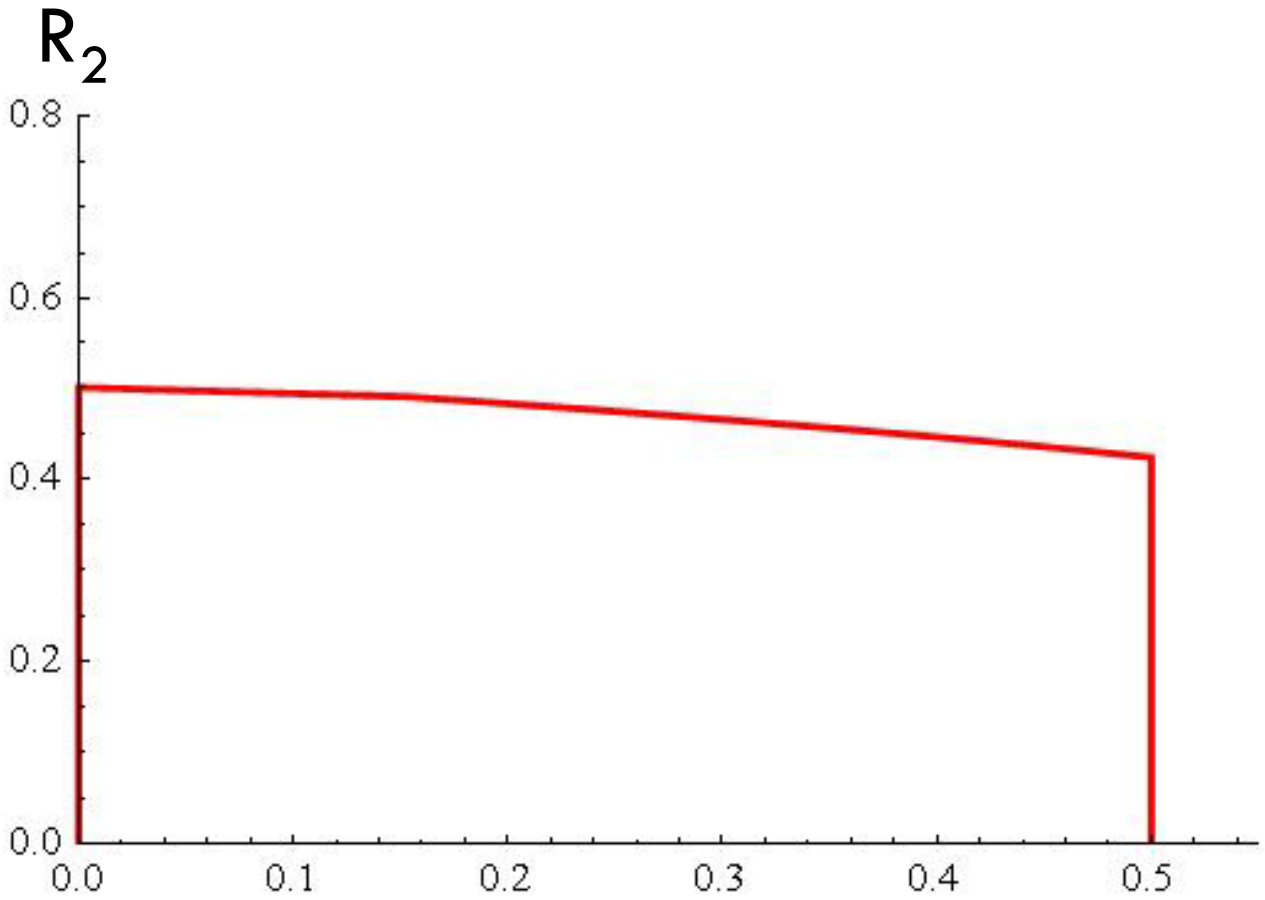
$Q_1 = 1$

$Q_2 = 1$

$a = 0.5$

$N_2 = 3$

The Z-Gaussian Interference Channel Rate Region



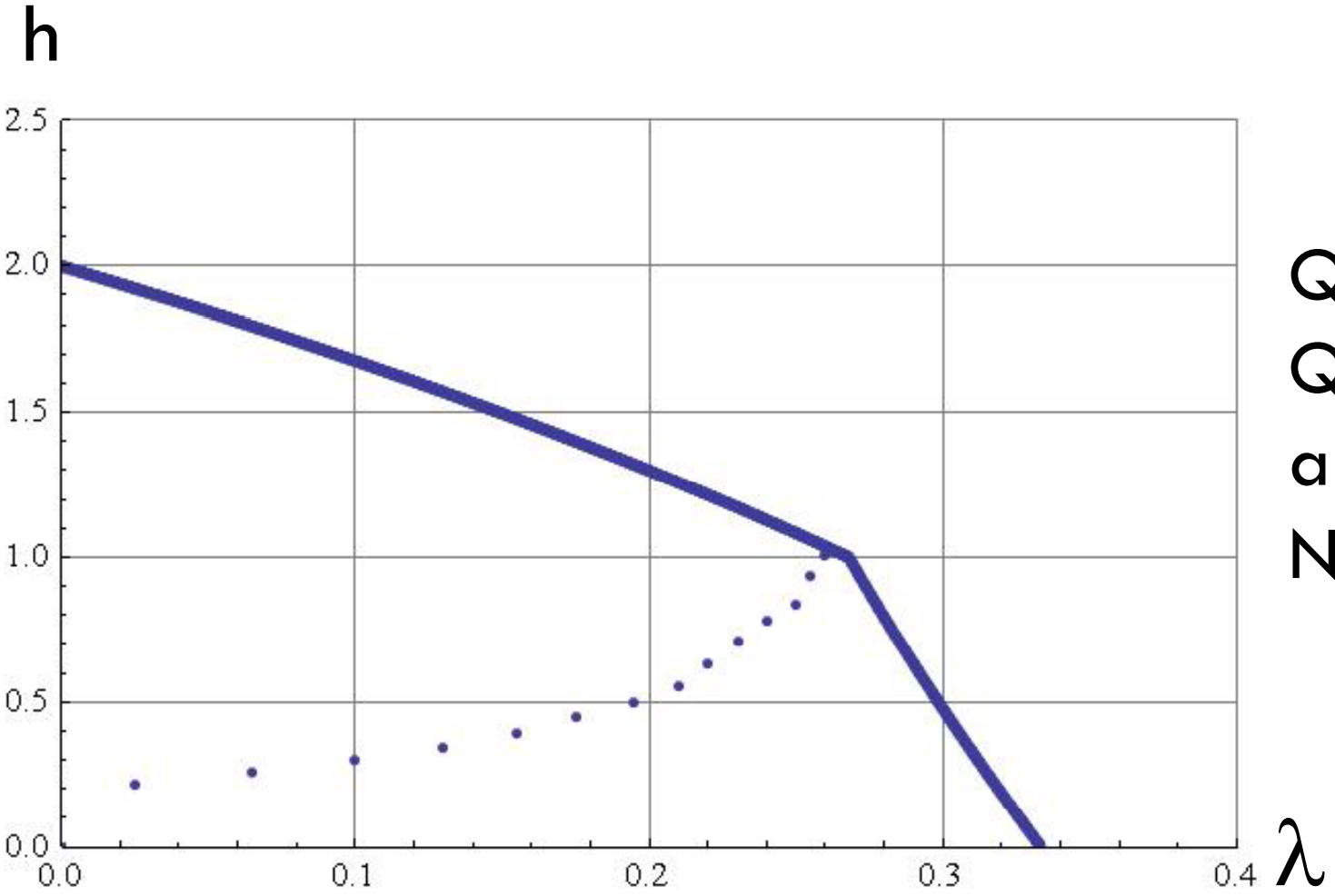
$Q_1 = 1$

$Q_2 = 1$

$a = 0.5$

$N_2 = 3$

Admissible region



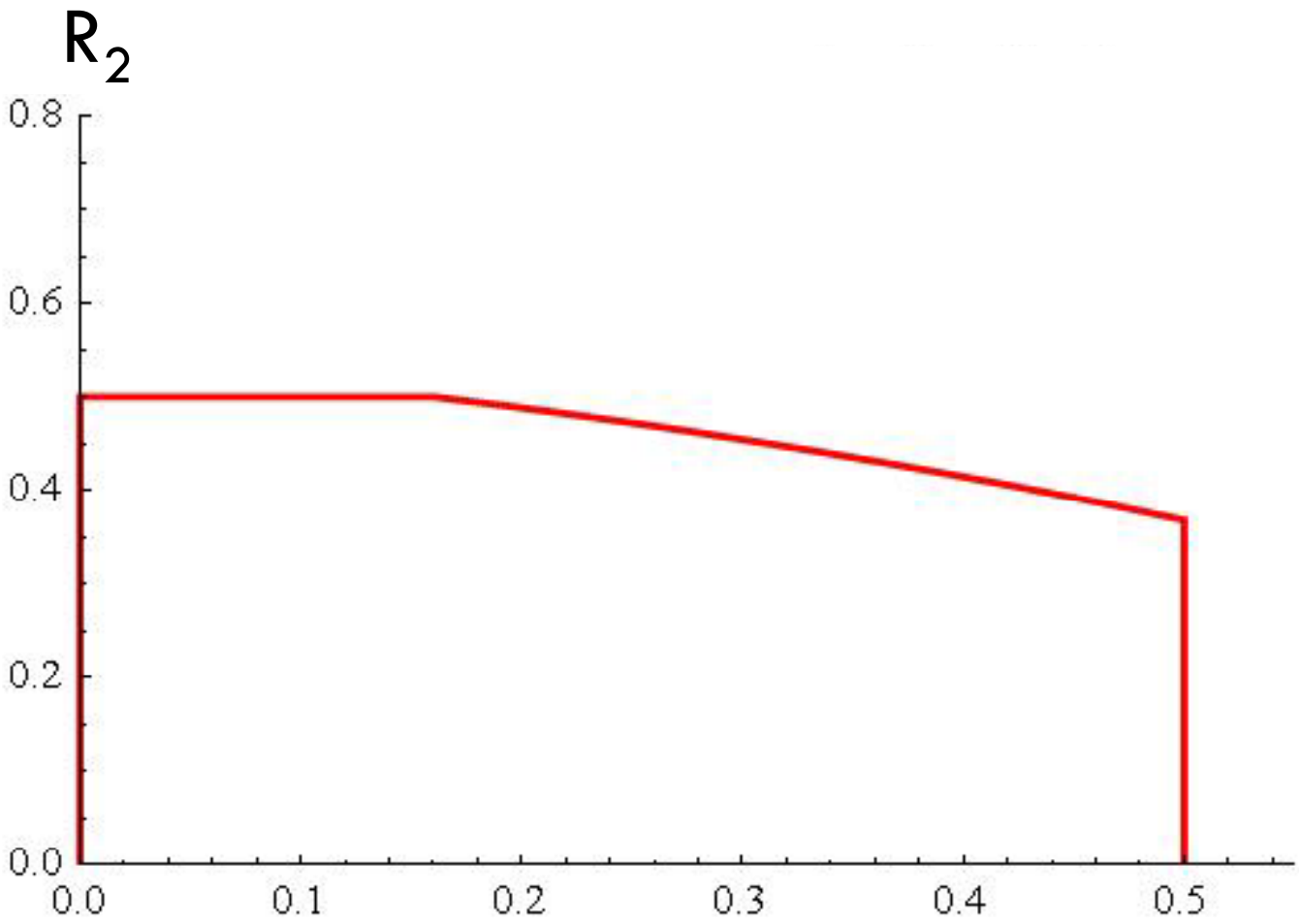
$Q_1 = 1$

$Q_2 = 1$

$a = 0.707$

$N_2 = 1$

The Z-Gaussian Interference Channel Rate Region



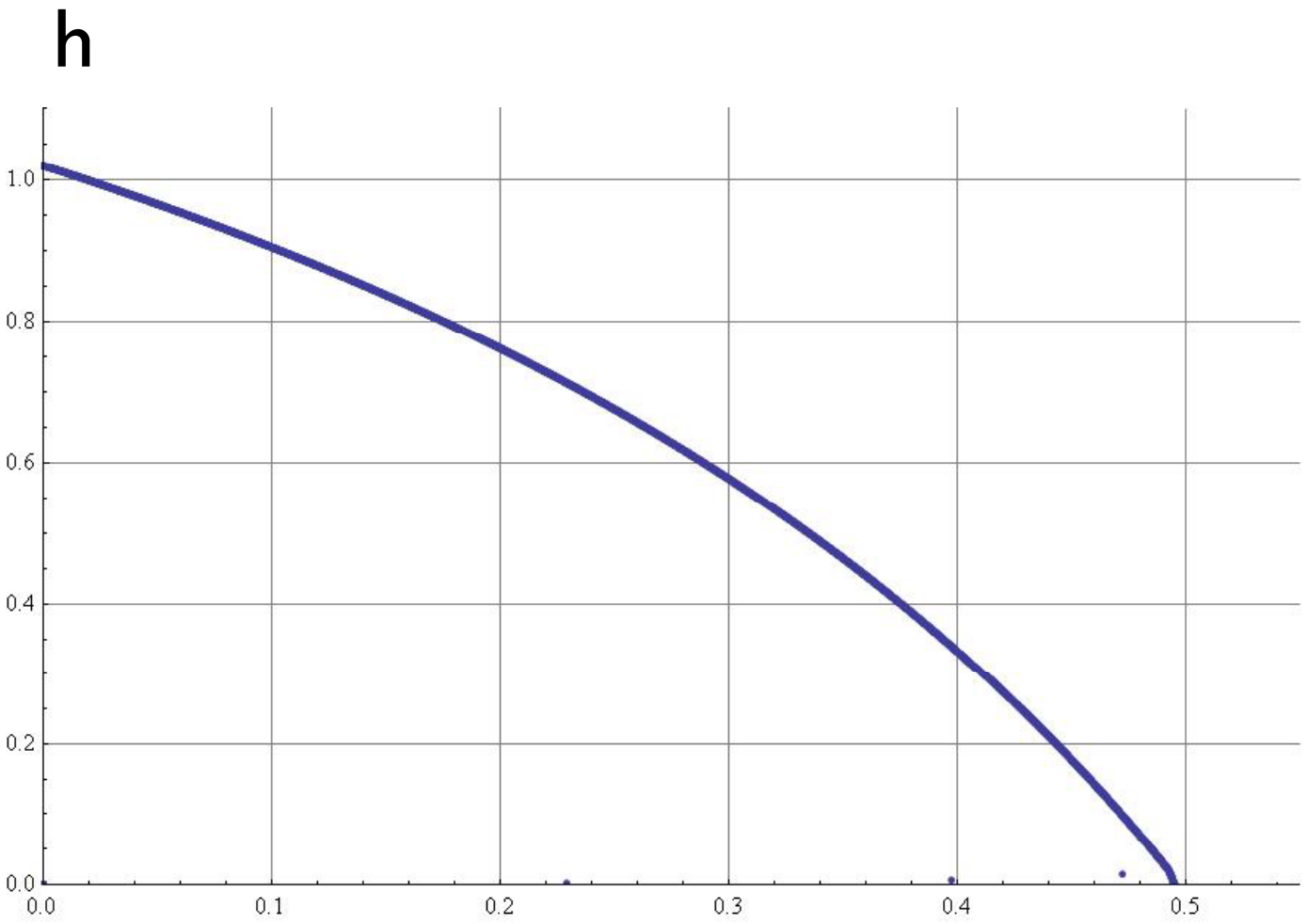
$Q_1 = 1$

$Q_2 = 1$

$a = 0.707$

$N_2 = 1$

Admissible region



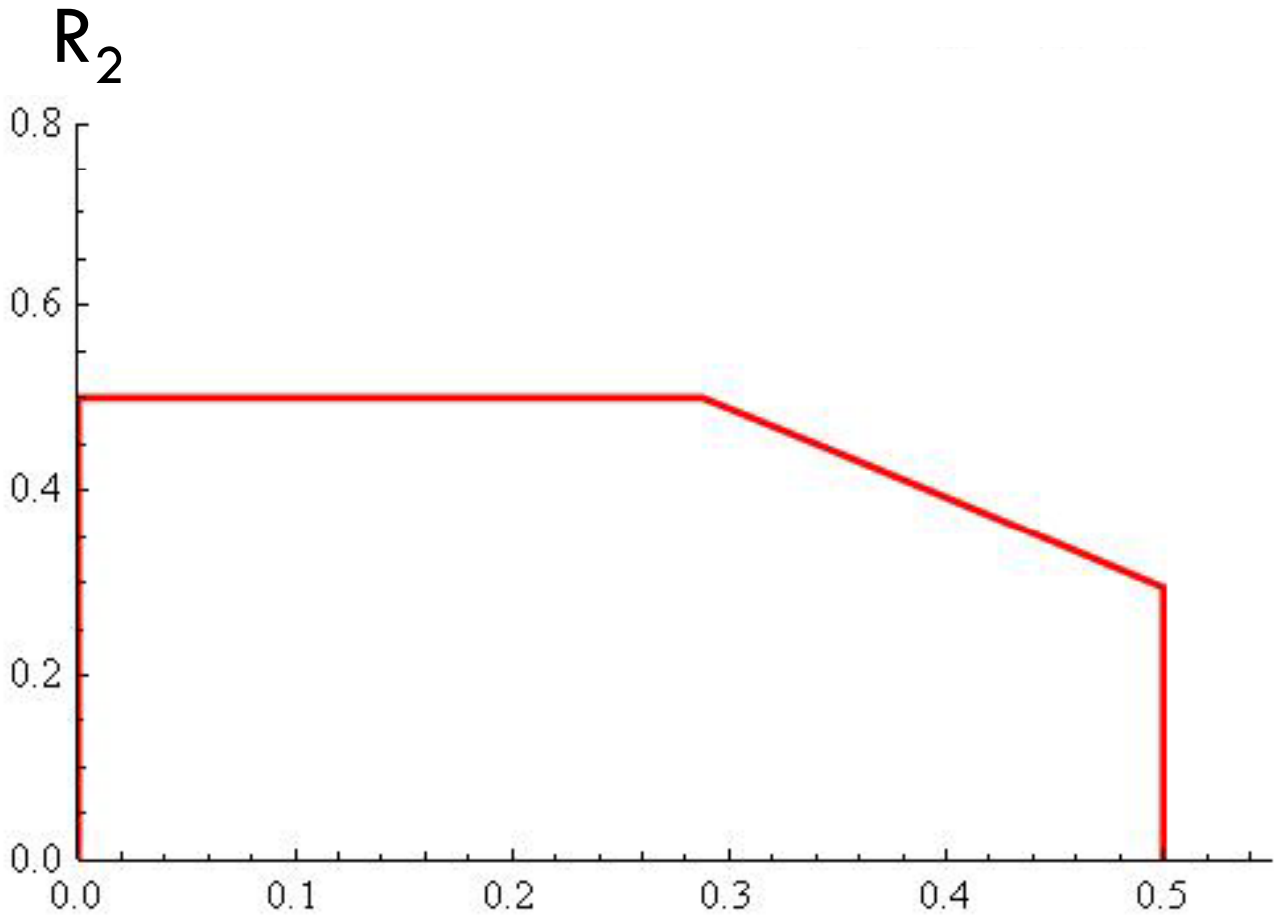
$Q_1 = 1$

$Q_2 = 1$

$a = 0.99$

$N_2 = 0.02$

The Z-Gaussian Interference Channel Rate Region



$Q_1 = 1$

$Q_2 = 1$

$a = 0.99$

$N_2 = 0.02$

Conclusions

- Optimized achieveable region for Gaussian signaling
- Simple 2-D parameter space: (λ, h)
- Needs entropy power-like inequality to establish capacity region