

OPEN AND VIRTUALIZED NETWORKS

LABORATORIES RESULTS

PROJECT STRUCTURE

NETWORK ABSTRACTIONS

SIGNAL INFORMATION / LIGHTPATH

Transparent route (or path) over the network at a given wavelength.

The set of possible lighthpaths is called routing space.

Power
Path
Noise
Latency
Channel

NODE

Simulates the physical nodes of the given network: either a redistribution point or a communication endpoint.

Label
Position
Connected Nodes
Transceiver Strategy

LINE

Simulates a physical connection between nodes in the given network topology.

Label
Length
State
Physical Attributes

CONNECTION

Temporary dedicated communication path between two stations (end-to-end).

On each physical link, a logical channel is dedicated to the connection.

Input / Output Nodes
Signal Power
SNR
Latency
BitRate

NETWORK

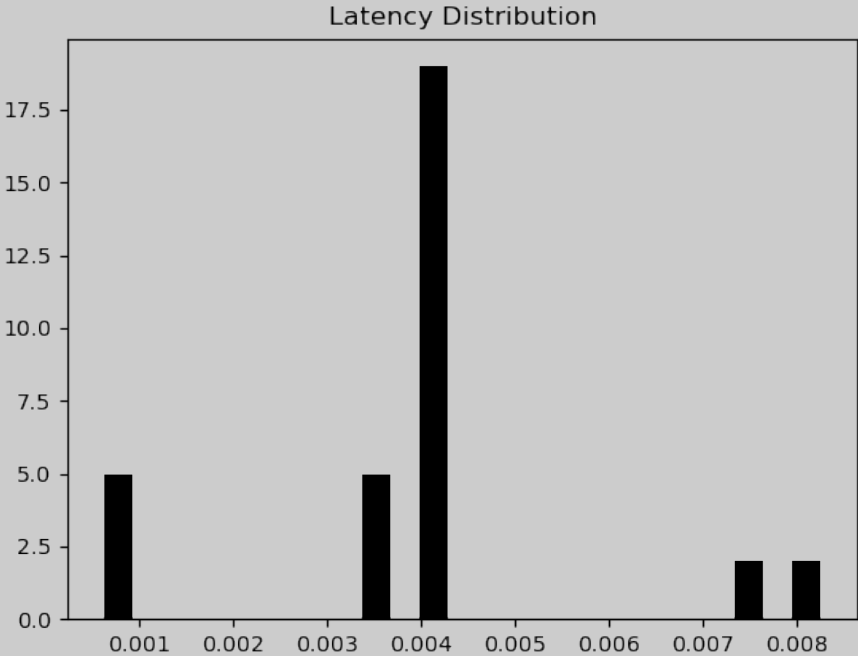
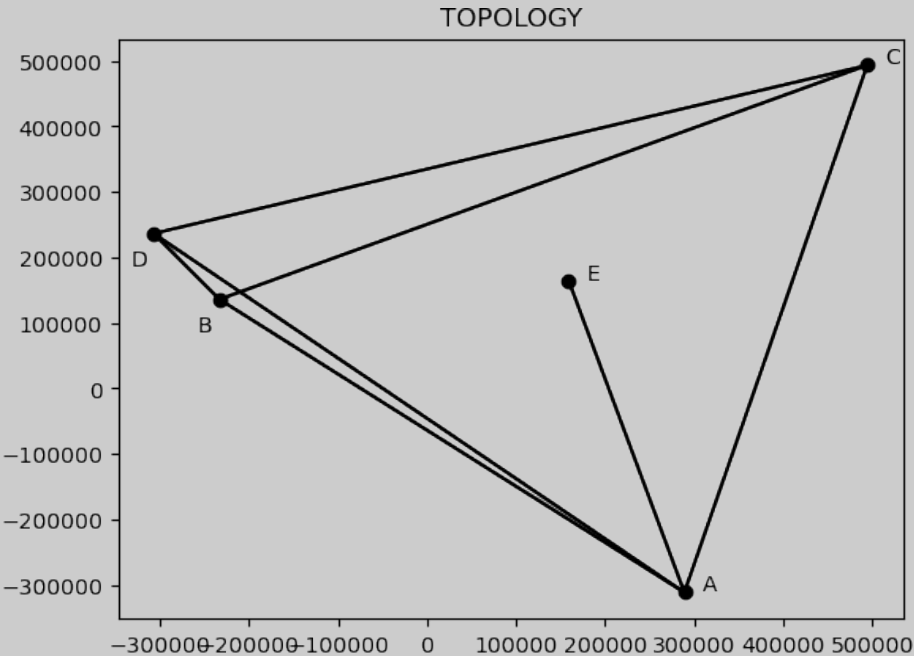
Abstraction of a physical network,
simulates connection requests and
manages routing.

Nodes / Lines Information
Weighted Path
Route Space
Propagate Method
Stream Method

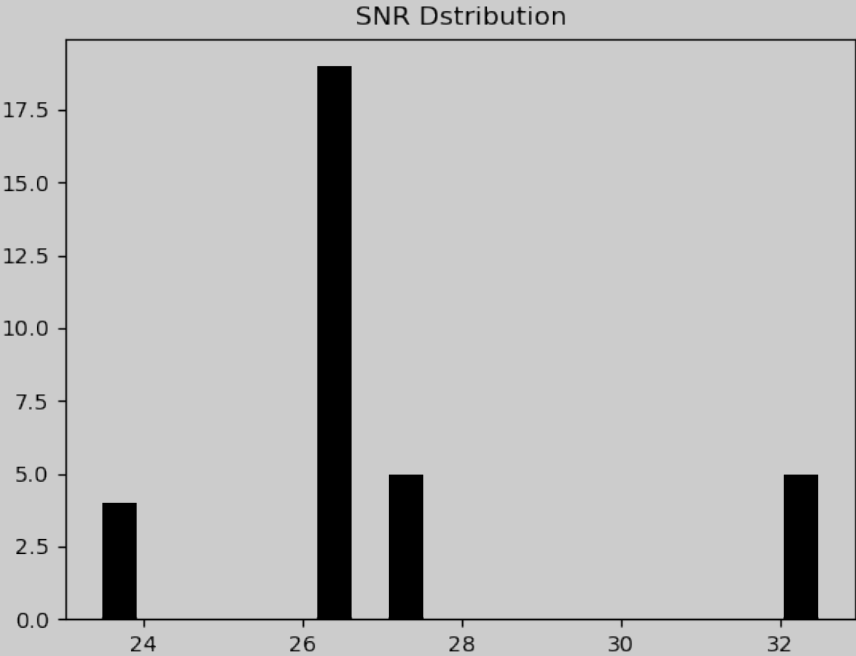
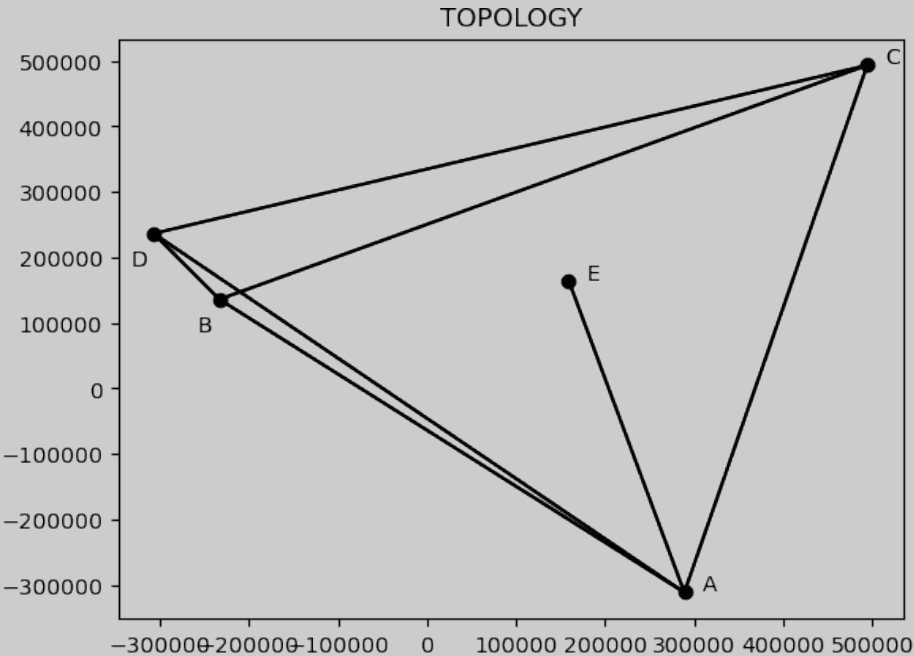
NETWORK TOPOLOGY

LATENCY AND SNR PLOTS

LATENCY



SNR



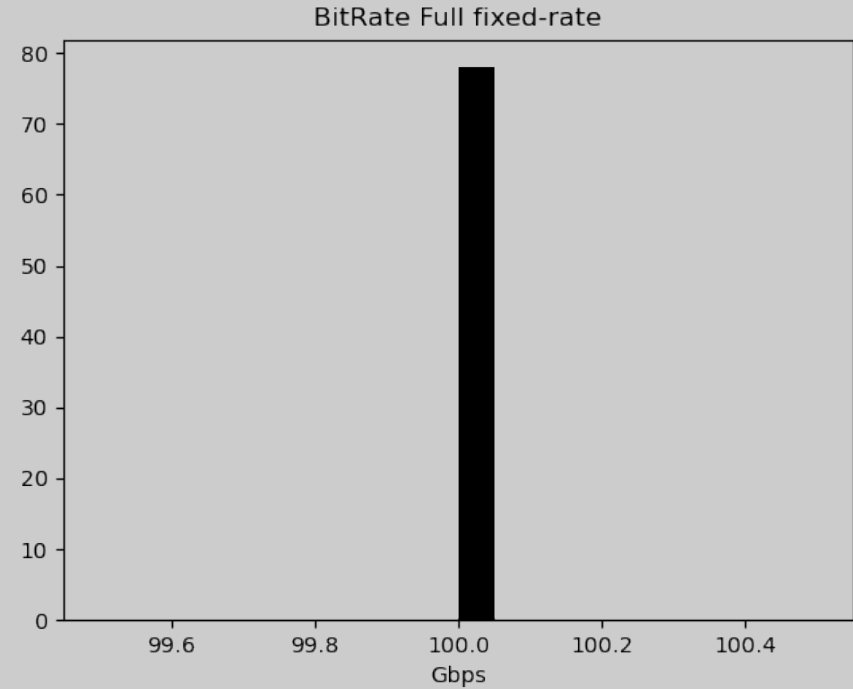
TRANSCIVER STRATEGIES

GSNR AND TOTAL CAPACITY

FIXED RATE

Fixed-rate transceiver strategy,
assuming PM-QPSK Modulation

Total Capacity : 7900 Gbps
Average Capacity : 100 Gbps



FLEX RATE

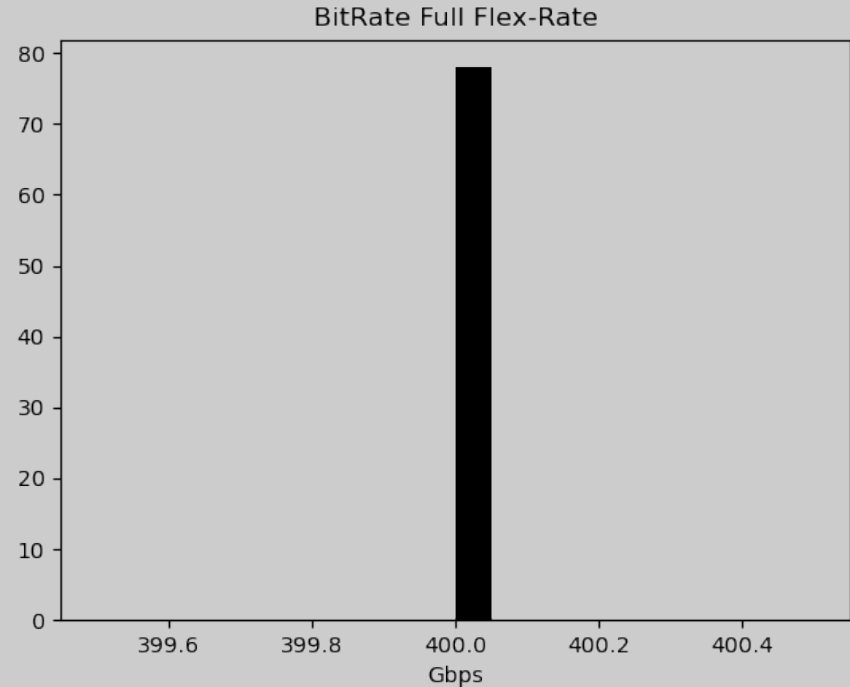
Flex-rate transceiver strategy, assuming

- PM-QPSK (100Gbps)
- PM-8-QAM (200Gbps)
- PM-16QAM (400Gbps)

modulations, given a BERt of 10^{-3}

Total Capacity : 31600 Gbps

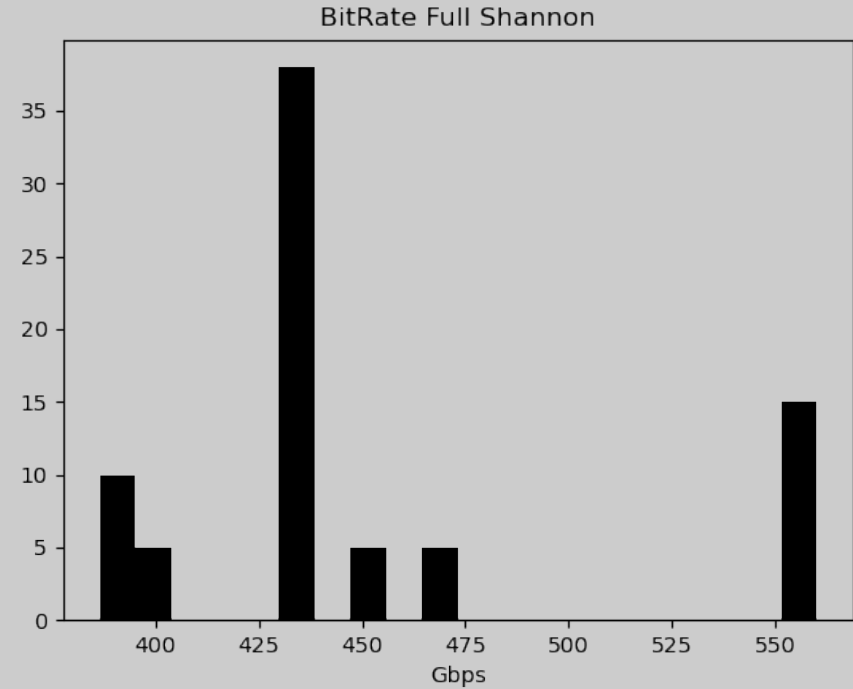
Average Capacity : 400 Gbps



SHANNON RATE

Maximum theoretical Shannon rate
with an ideal Gaussian modulation

Total Capacity : 35360.6 Gbps
Average Capacity : 447.6 Gbps



TRAFFIC MATRIX

SATURATION PARAMETER M

TRAFFIC MATRIX

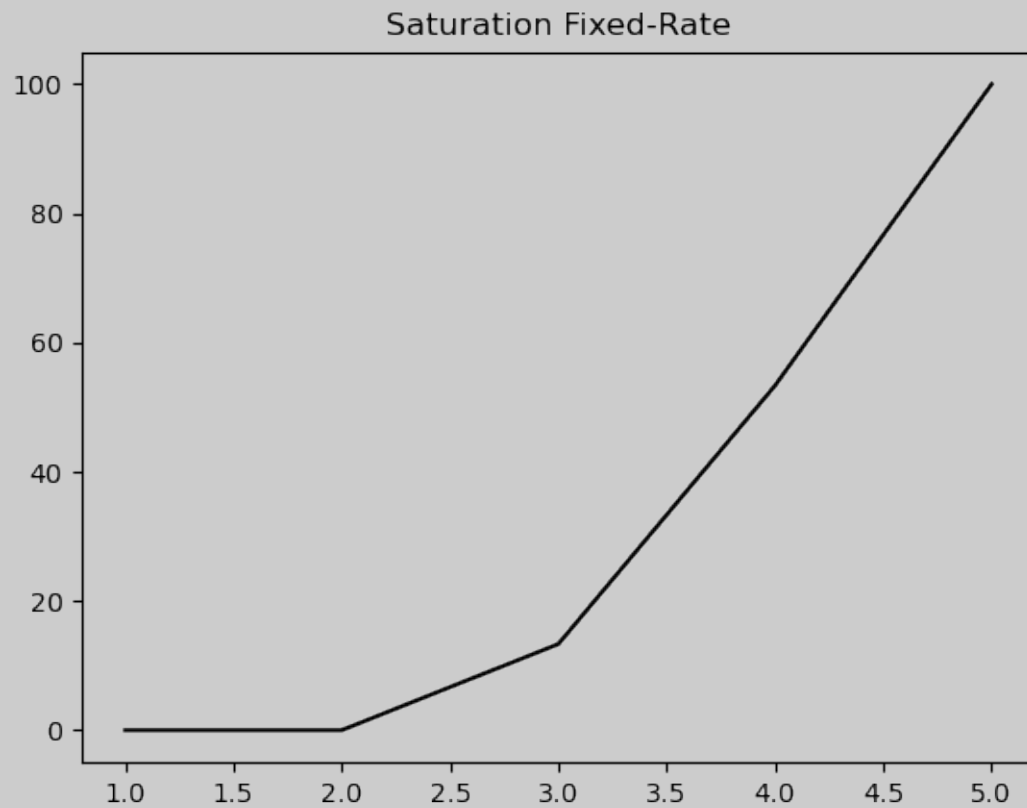
Each element $M_{i,j}$ represents the bit rate request between the nodes i, j .

Uniform distribution: all node pair requests always the same bit rate of $100 * M$ Gbps, where M is an increasing integer number

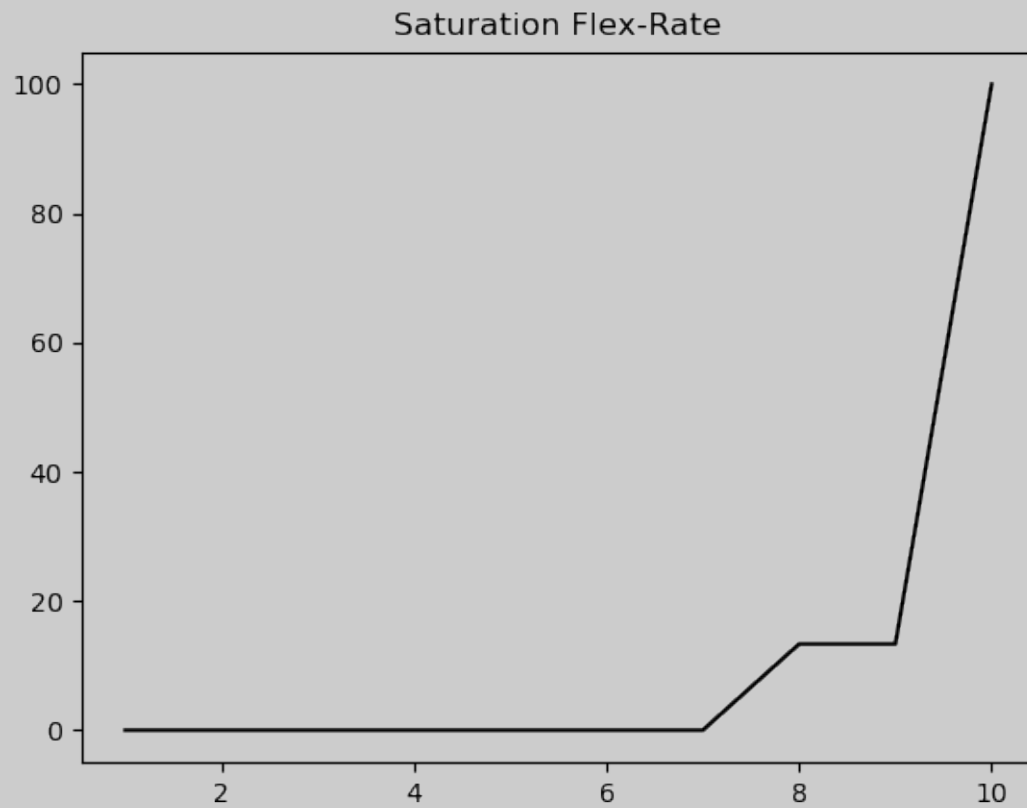
- $M_{i,j} = 0$ --> no connection (request)
- $M_{i,j} = \text{Inf}$ --> all possible traffic is allocated

-	$M * 100$	$M * 100$	$M * 100$	$M * 100$
$M * 100$	-	$M * 100$	$M * 100$	0
$M * 100$	$M * 100$	-	$M * 100$	0
$M * 100$	$M * 100$	$M * 100$	-	0
$M * 100$	0	0	0	-

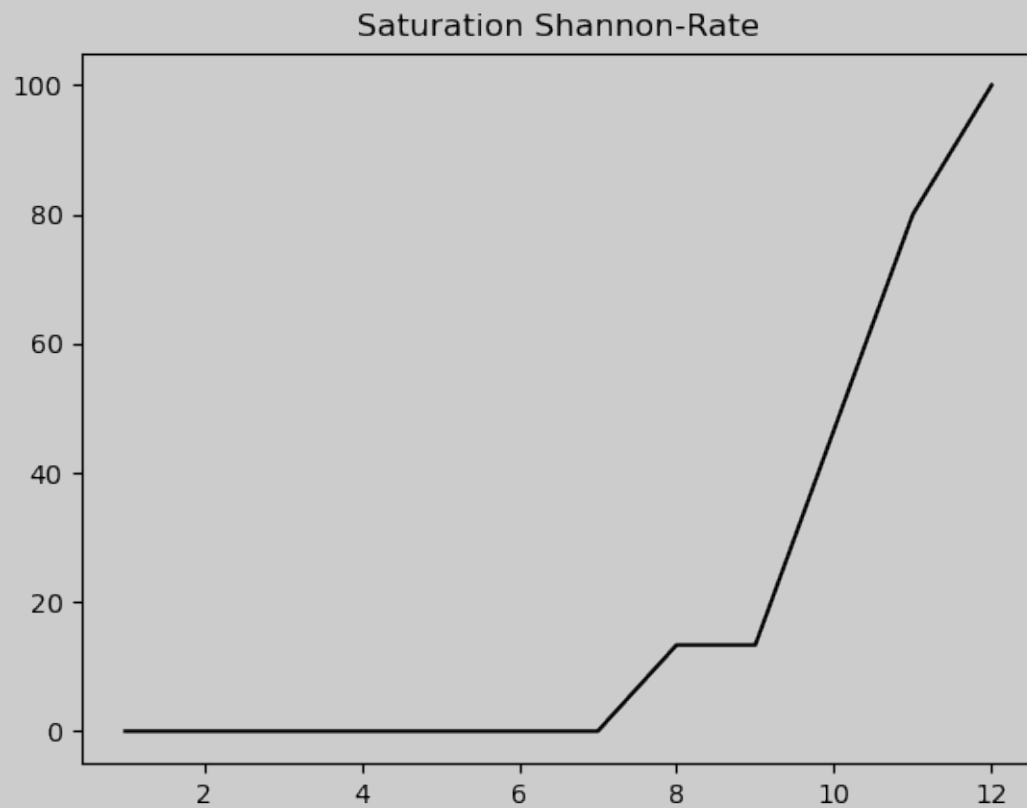
FIXED RATE



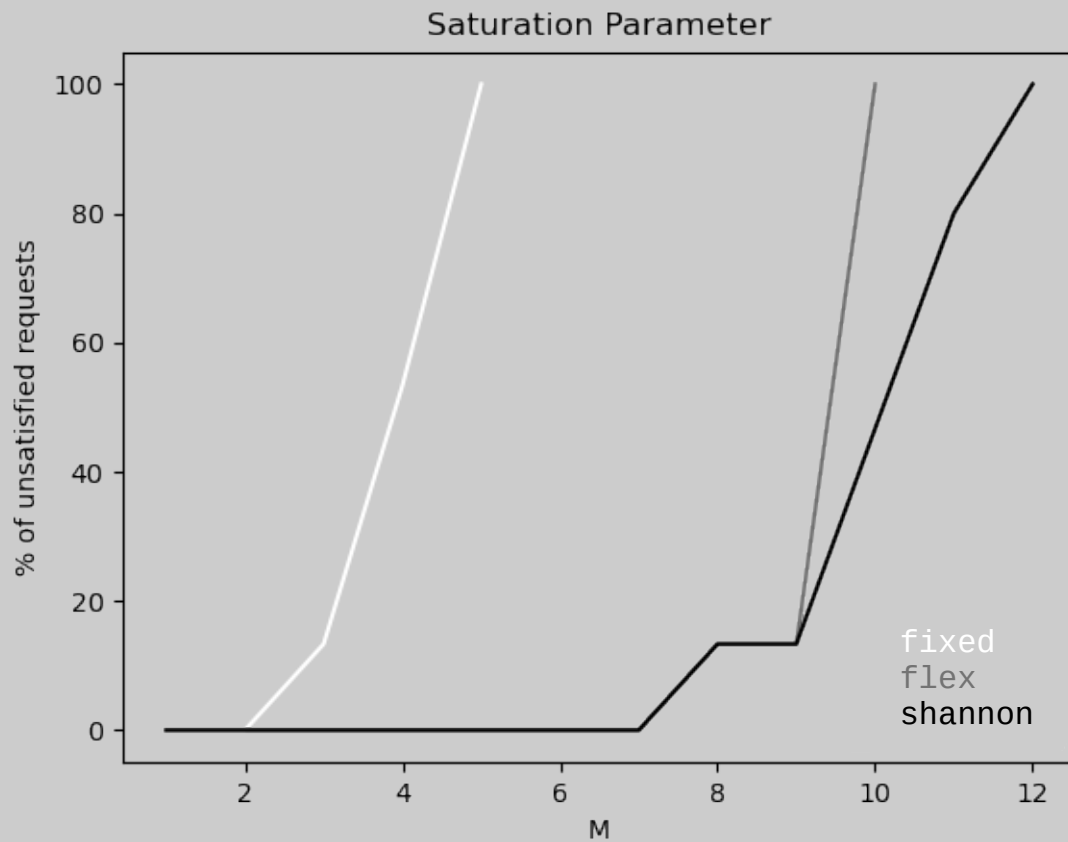
FLEX RATE



SHANNON RATE



SATURATION COMPARISON

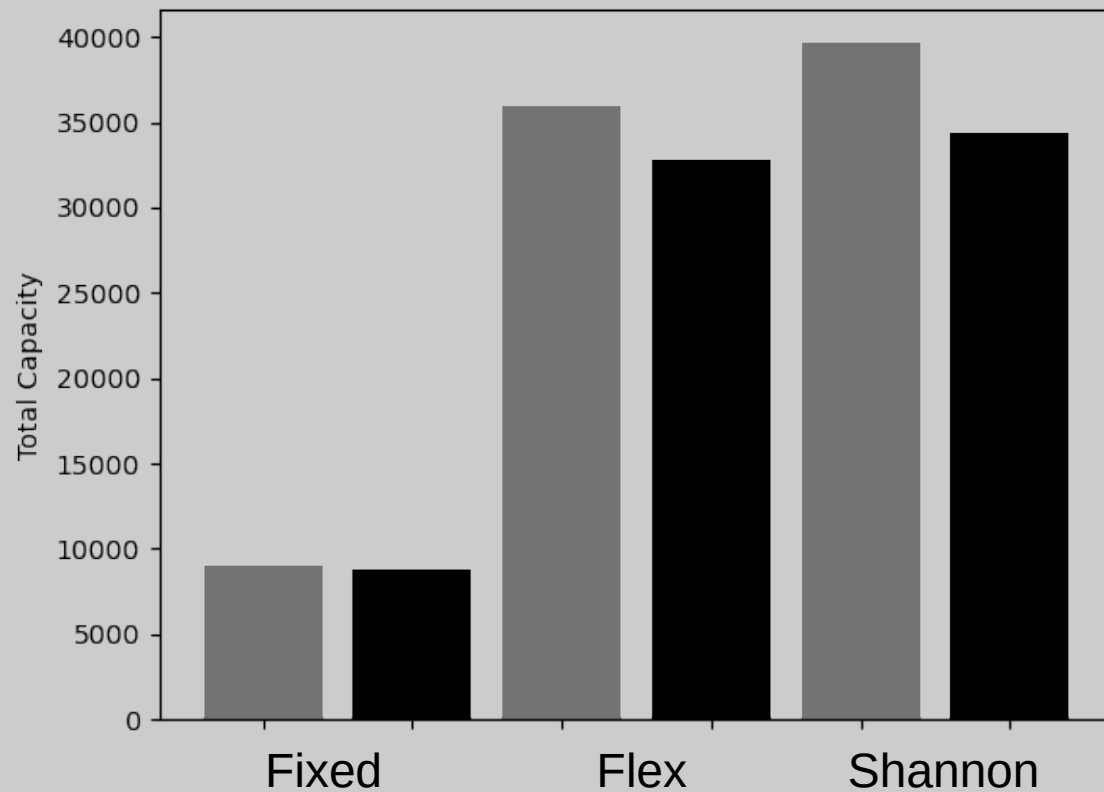


GSNR AND TOTAL CAPACITY

DIFFERENT β_2 AND NOISE FIGURE VALUES

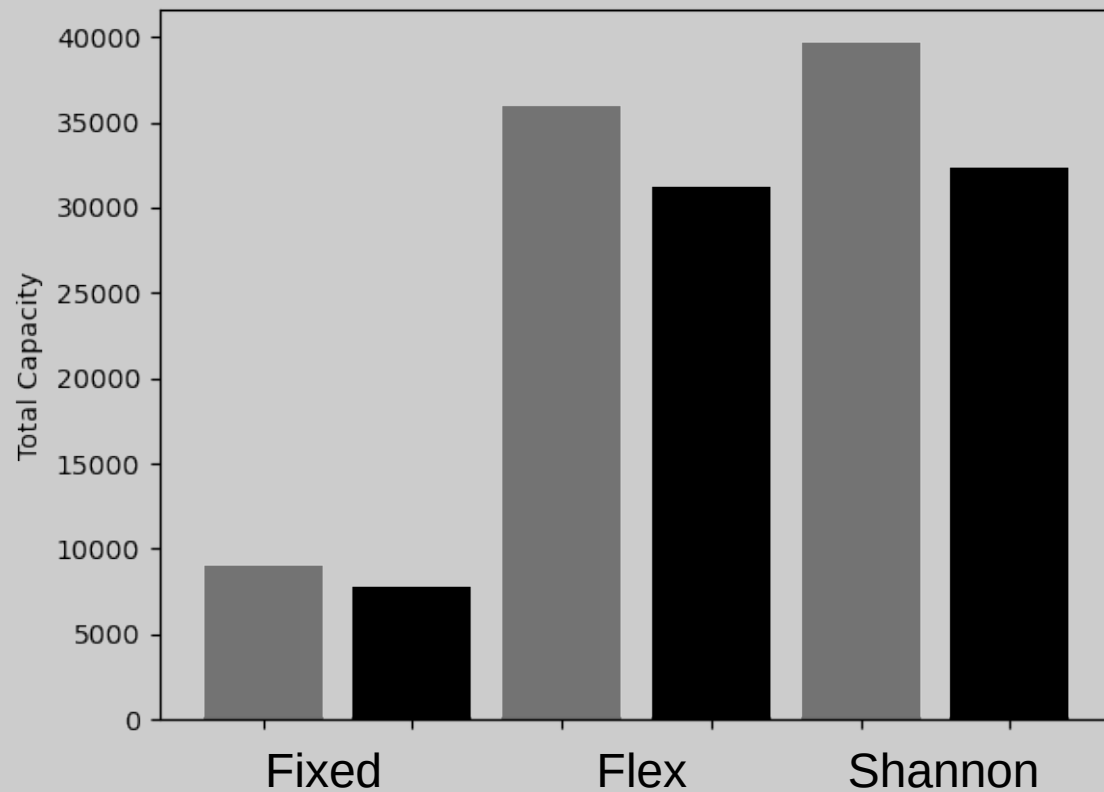
β_2

From $2.3e^{-26}$ to $0.6e^{-26} \text{ (mHz}^2\text{)}^{-1}$



NOISE FIGURE

From 3 to 5 dB



THANK YOU

END OF THE PRESENTATION