Temasek Defence Systems Institute

PERFORMANCE EVALUATION OF RAISED-COSINE SHAPED INTERFERENCE IN COMMUNICATION SYSTEMS

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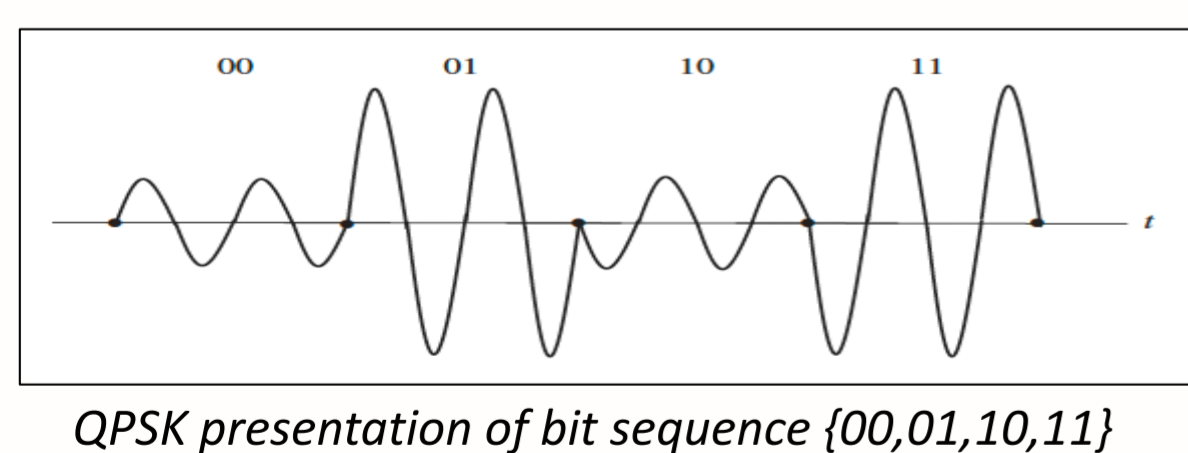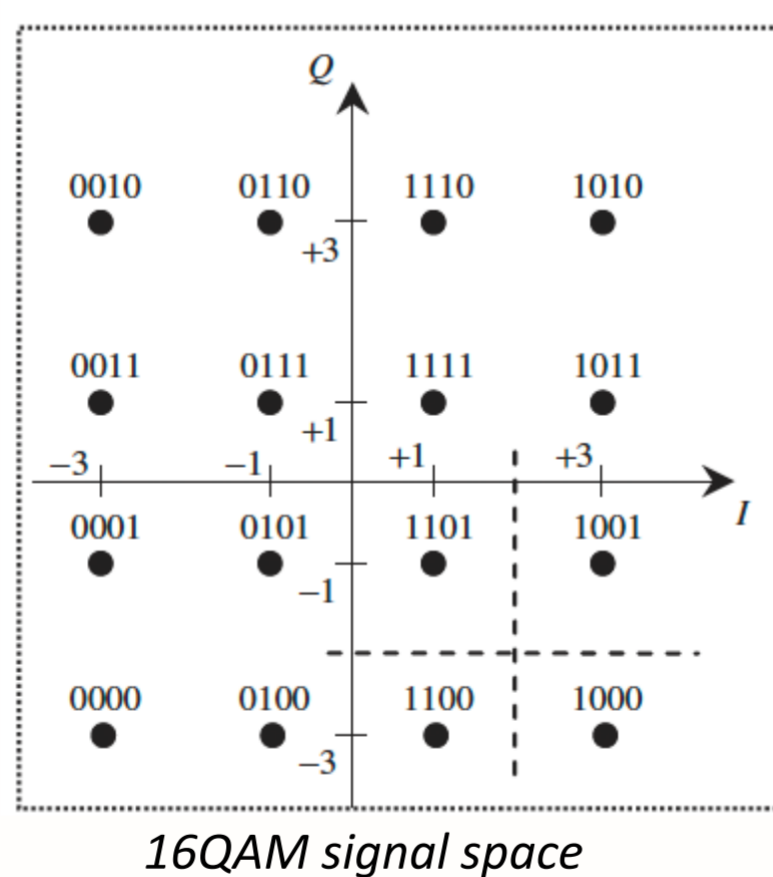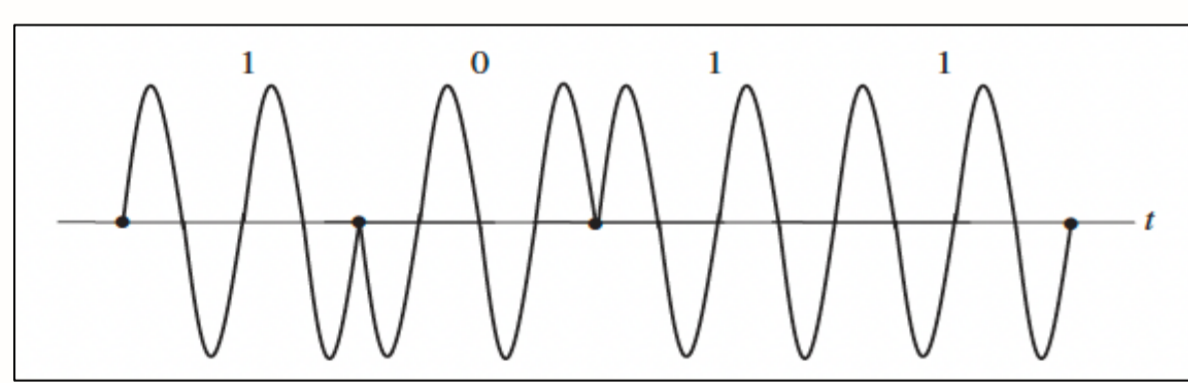
Research Question:

- To evaluate the effect on performance of raised-cosine shaped noise interference on various communications modulations. Specifically, we investigate the degradation effects on probability of bit errors or bit error rate (BER).

Parameters:

- <u>Pseudo-raised cosine (PRC) pulse</u> is used as the transmit signal, which is the main lobe of a raised-cosine pulse.
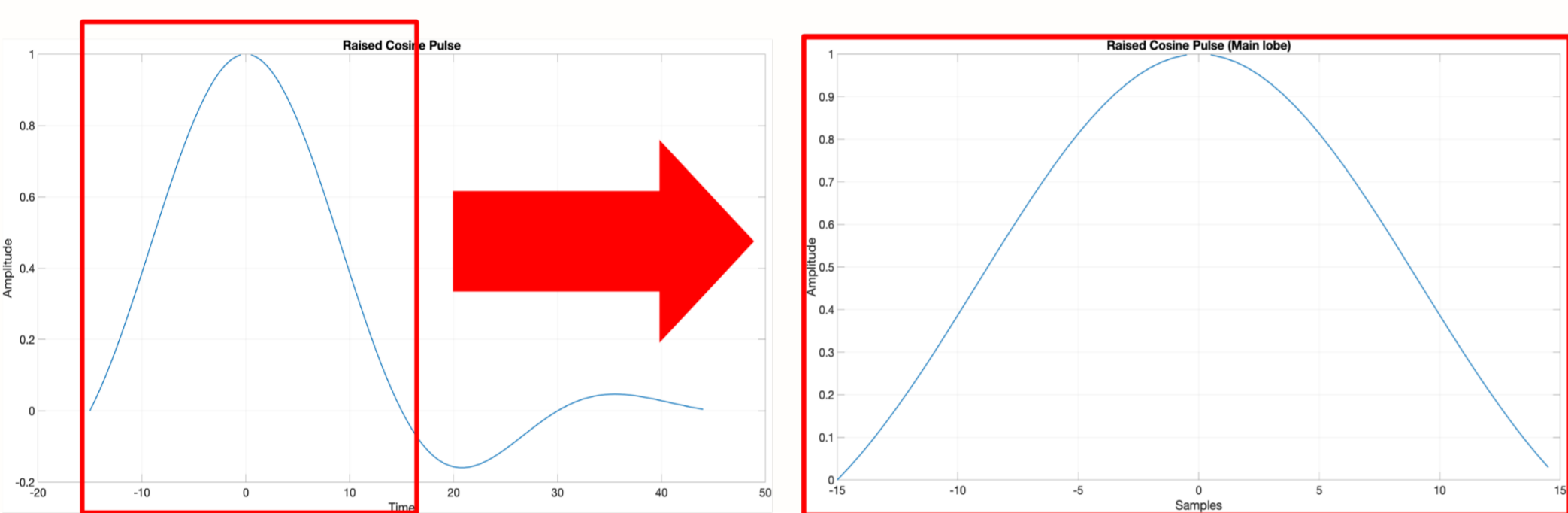
- Raised-cosine shaped interference models after transmit signal, which the term ***pseudo-raised-cosine noise jammer (PRC-NJ)*** can be used to represent the interference.

- <u>BPSK</u>, <u>QPSK</u> & <u>16QAM</u> modulations are used in the research.

BPSK presentation of bit sequence {1,0,1,1}

QPSK presentation of bit sequence {00,01,10,11}

16QAM signal space

- Received signal in BPSK comms system demodulated using a <u>matched filter</u> (also known as correlator).

- Received signal in QPSK & 16QAM comms system demodulated by <u>calculating minimum Euclidean distance</u> between the received signal and coordinates in a rectangular constellation.

PRC-NJ Performance Results & Analysis*:

- PRC-NJ is compared with spot-noise jammer (SNJ) (also known as barrage-noise jammer).

- ### <u>QPSK BER PRC-NJ vs SNJ @ JSR 10dB.</u>
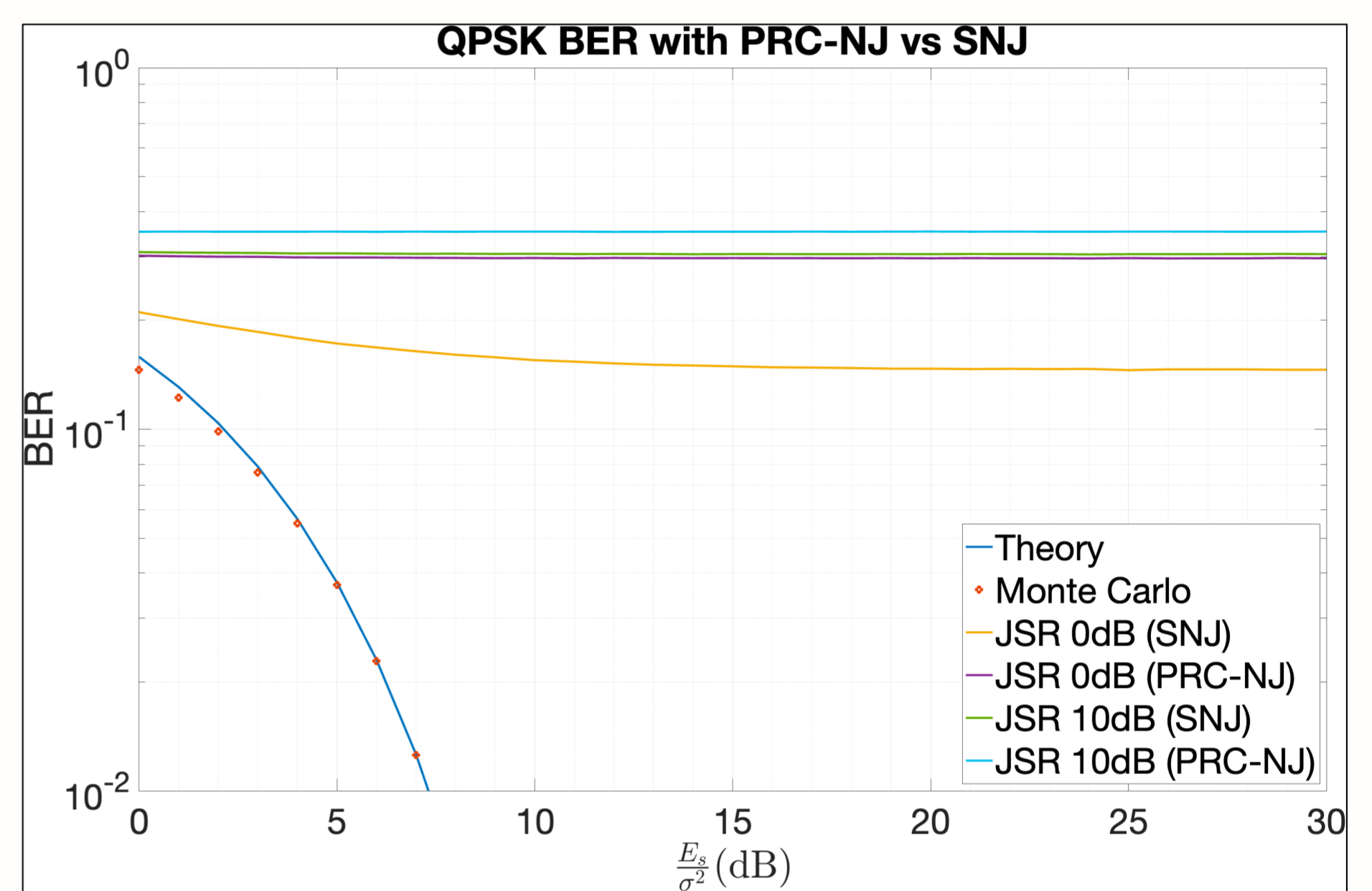
BER w/o jammer at E_s/N_0 7dB	Resulting BER with SNJ	Ratio of Resulting BER (SNJ) vs BER w/o jammer	Resulting BER with PRC-NJ	Ratio of Resulting BER (PRC-NJ) vs BER w/o jammer
1.25×10^{-2}	3.10×10^{-1}	24.80	3.52×10^{-1}	28.16

BER degradation caused by PRC-NJ is 1.14 times more superior than a SNJ.

- ### <u>16QAM BER PRC-NJ vs SNJ @ JSR 10dB.</u>
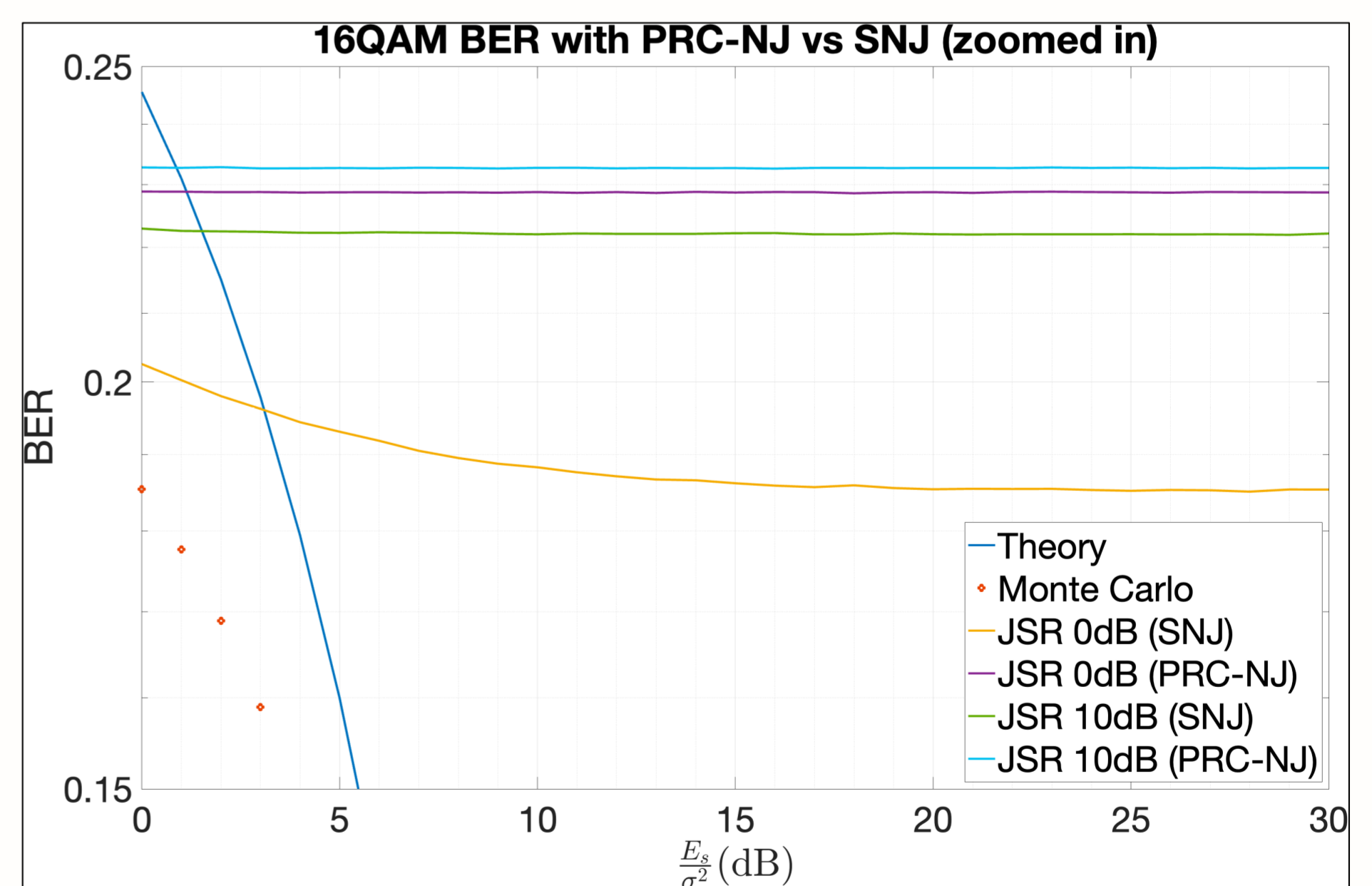
BER w/o jammer at E_s/N_0 5dB	Resulting BER with SNJ	Ratio of Resulting BER (SNJ) vs BER w/o jammer	Resulting BER with PRC-NJ	Ratio of Resulting BER (PRC-NJ) vs BER w/o jammer
1.60×10^{-1}	2.22×10^{-1}	1.39	2.33×10^{-1}	1.46

BER degradation caused by PRC-NJ is 1.05 times more superior than a SNJ.

*Only results of QPSK & 16QAM are presented in this poster.

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