RESEARCH & DEVELOPMENT TELECOMMUNICATIONS INSTITUTE

Implementation of channel estimation algorithms for DTMB demodulator

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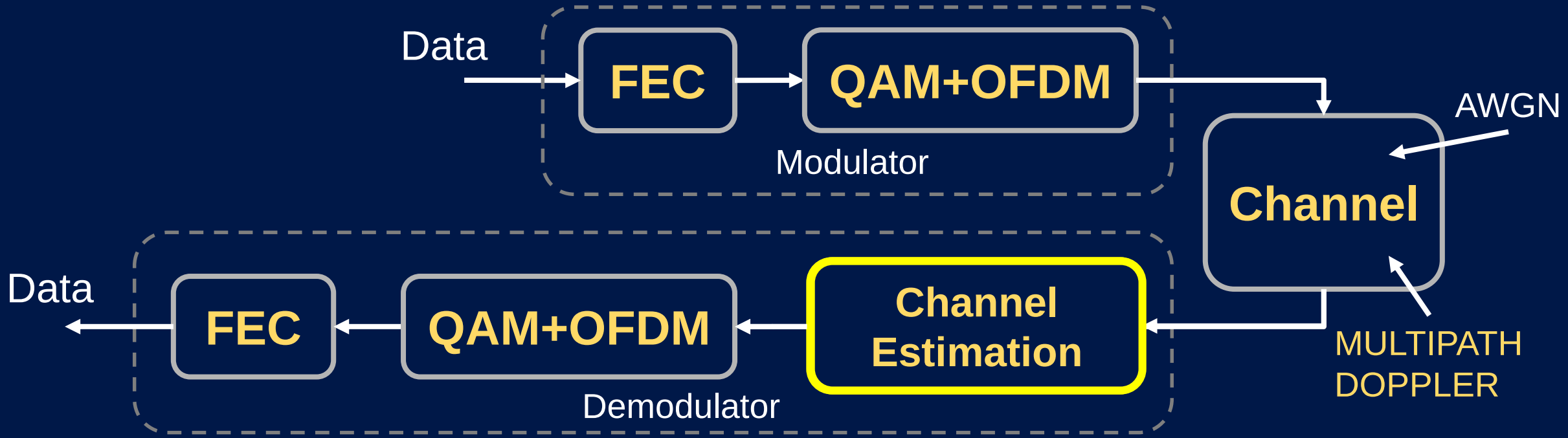
Outline

- Introduction
- Brief description of channel estimation stage
- Description and validation of proposed algorithms
- Results
- Conclusion

Introduction



Design and implement a channel estimation algorithm for DTMB demodulator

Transmitter

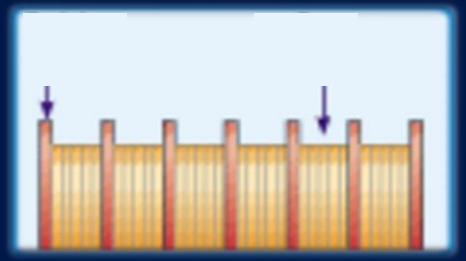
Channel

Estimation

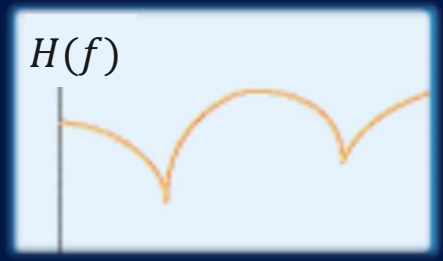
Equalization

…

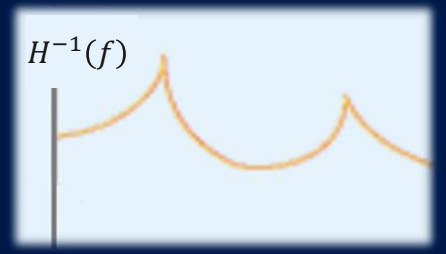
Receiver



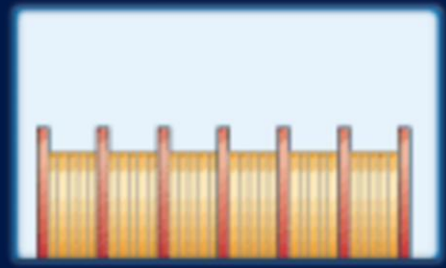
Transmitted spectrum



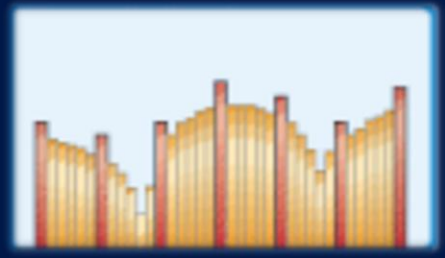
Multipath channel



Estimation



Recovered spectrum



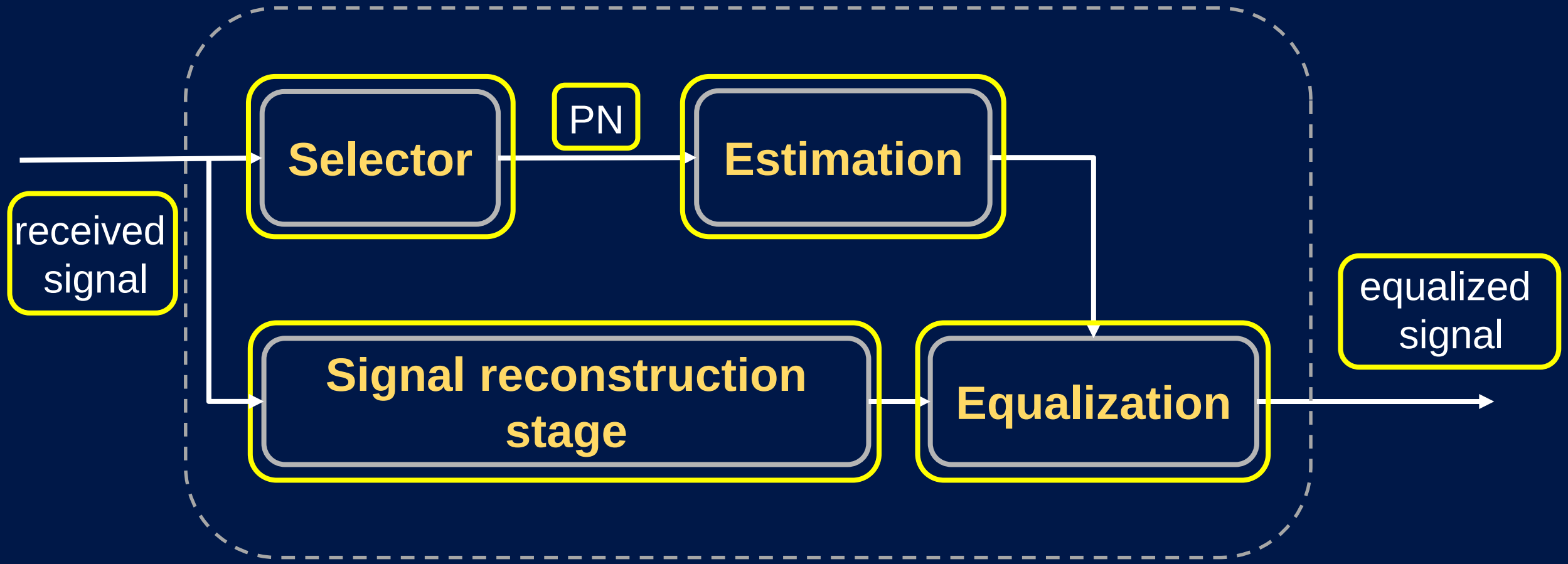
Received spectrum

What is Channel Estimation?

Classification of channel estimation techniques

- Correlation algorithm of PN sequences in time domain
- Frequency algorithm
- Iterative methods

Proposed implementation



Estimation methods

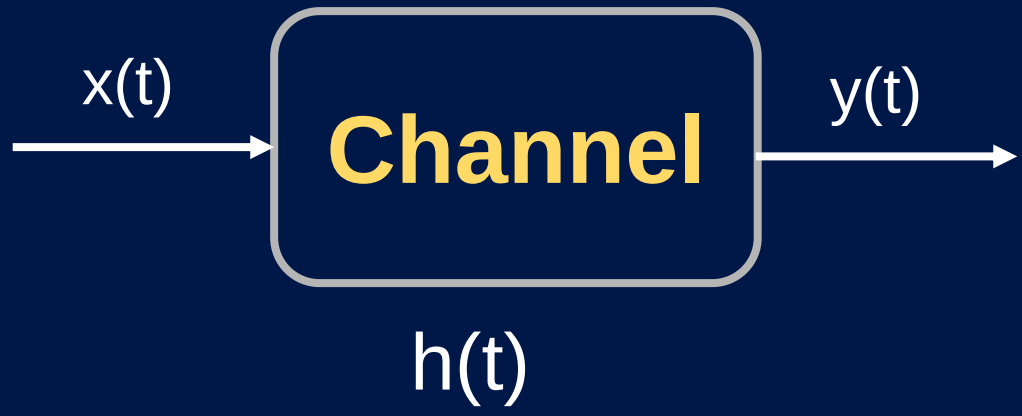
Frequency algorithm:

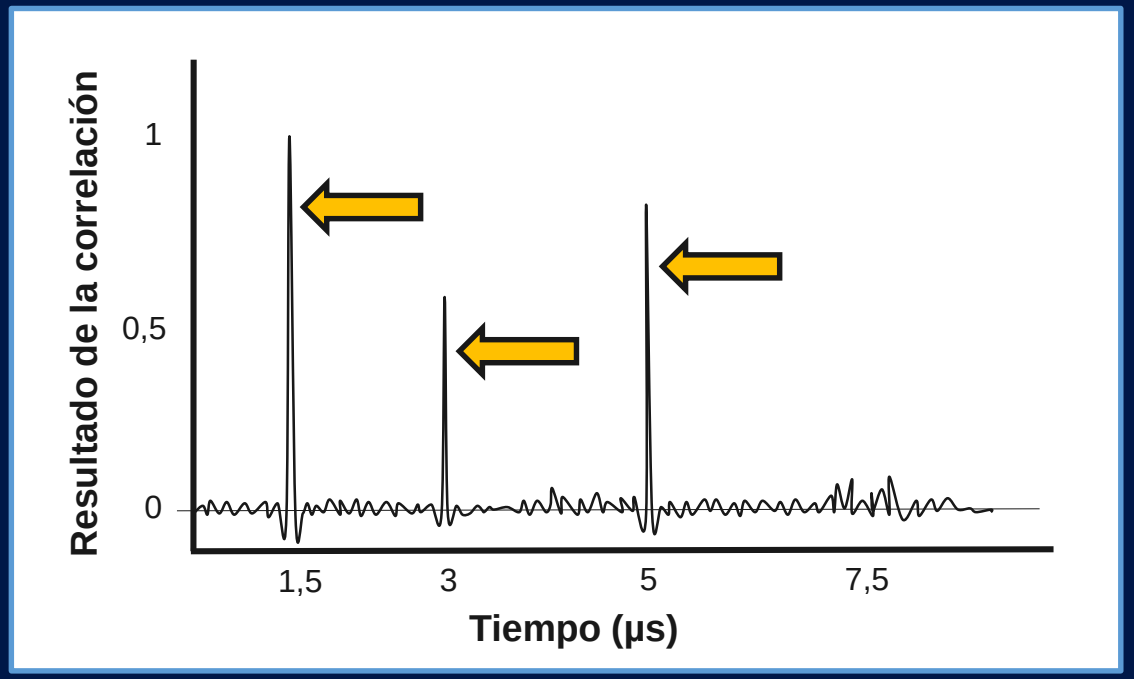
$$Y(f) = X(f) \cdot H(f)$$

Estimation methods

Time algorithm:

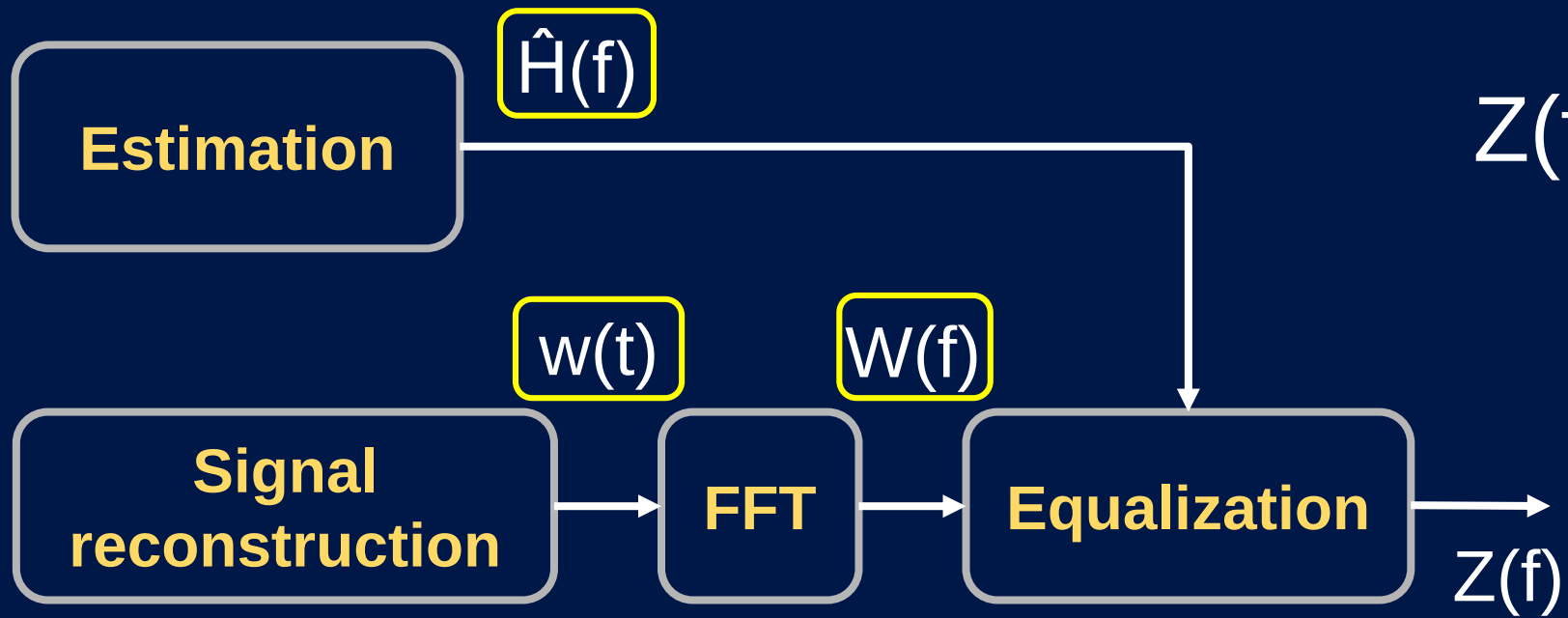
xcorr(,)





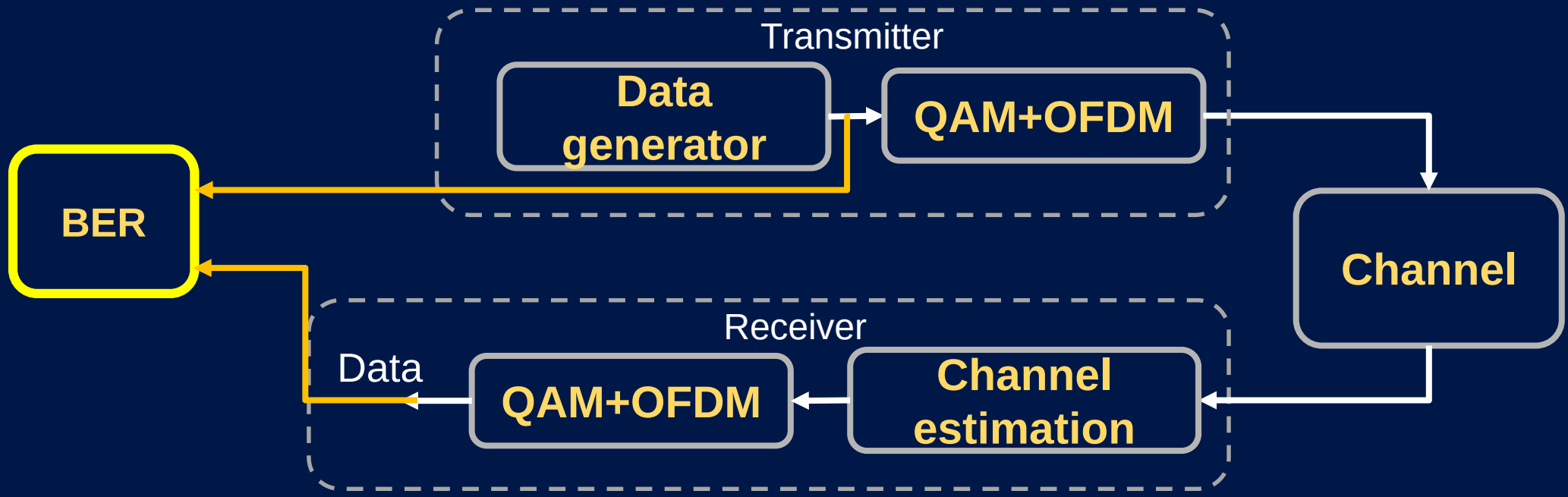
$$y(t) = x(t) * h(t)$$

Equalization algorithm



$$Z(f) = \frac{W(f)}{\hat{H}(f)}$$

Validation scheme



MATLAB & SIMULINK

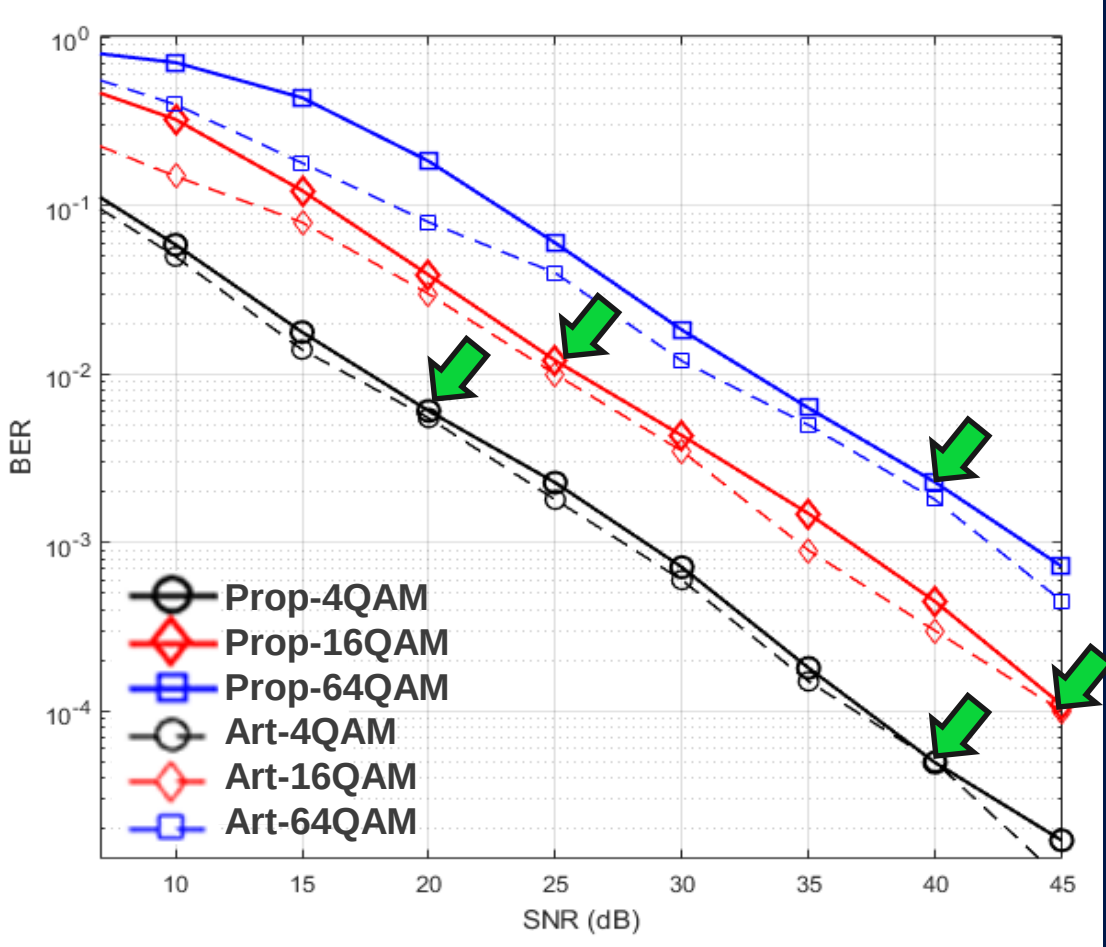
900 OFDM frames simulated

Validation

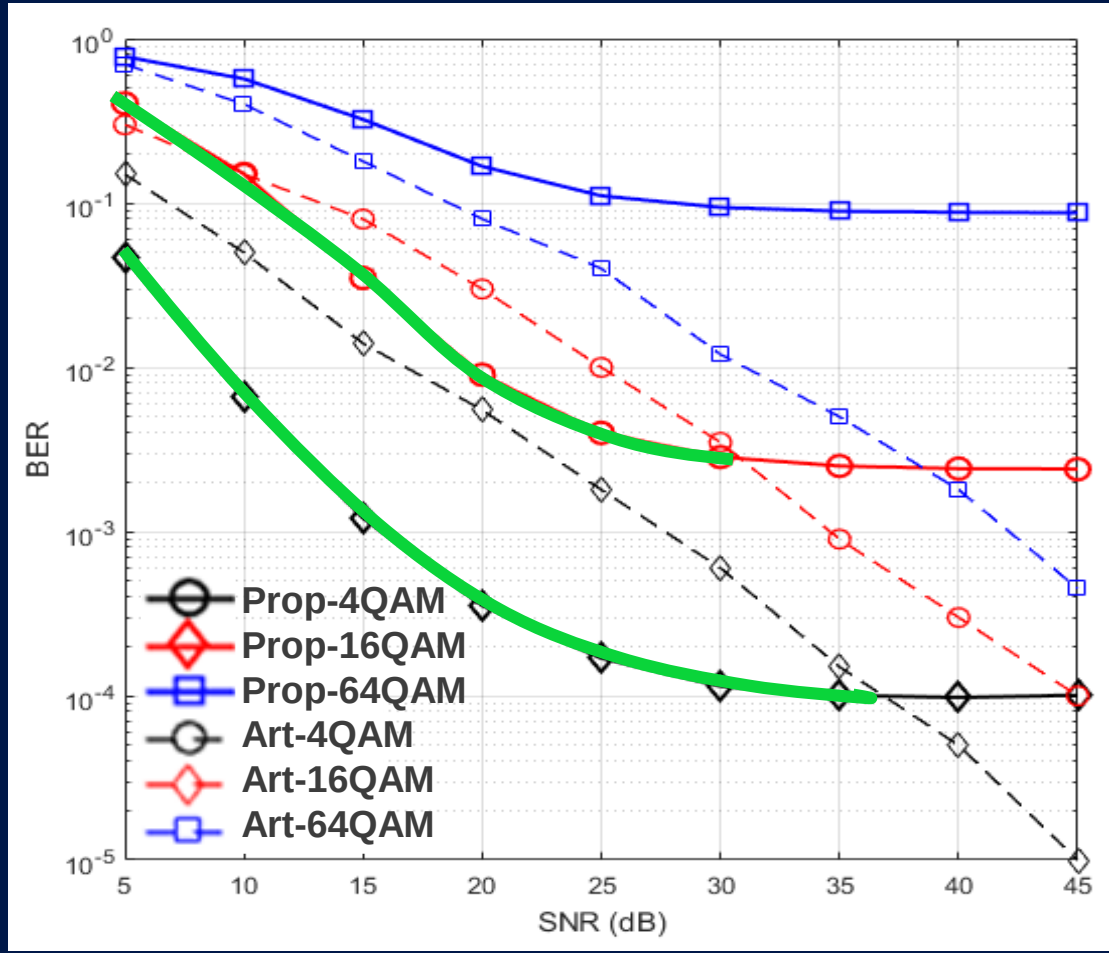
- Brazil A and Brazil B channels
- 4QAM, 16QAM and 64QAM modulation

"article", Muhammad. S y Ahmed A., 2011

Results (Brazil A channel)

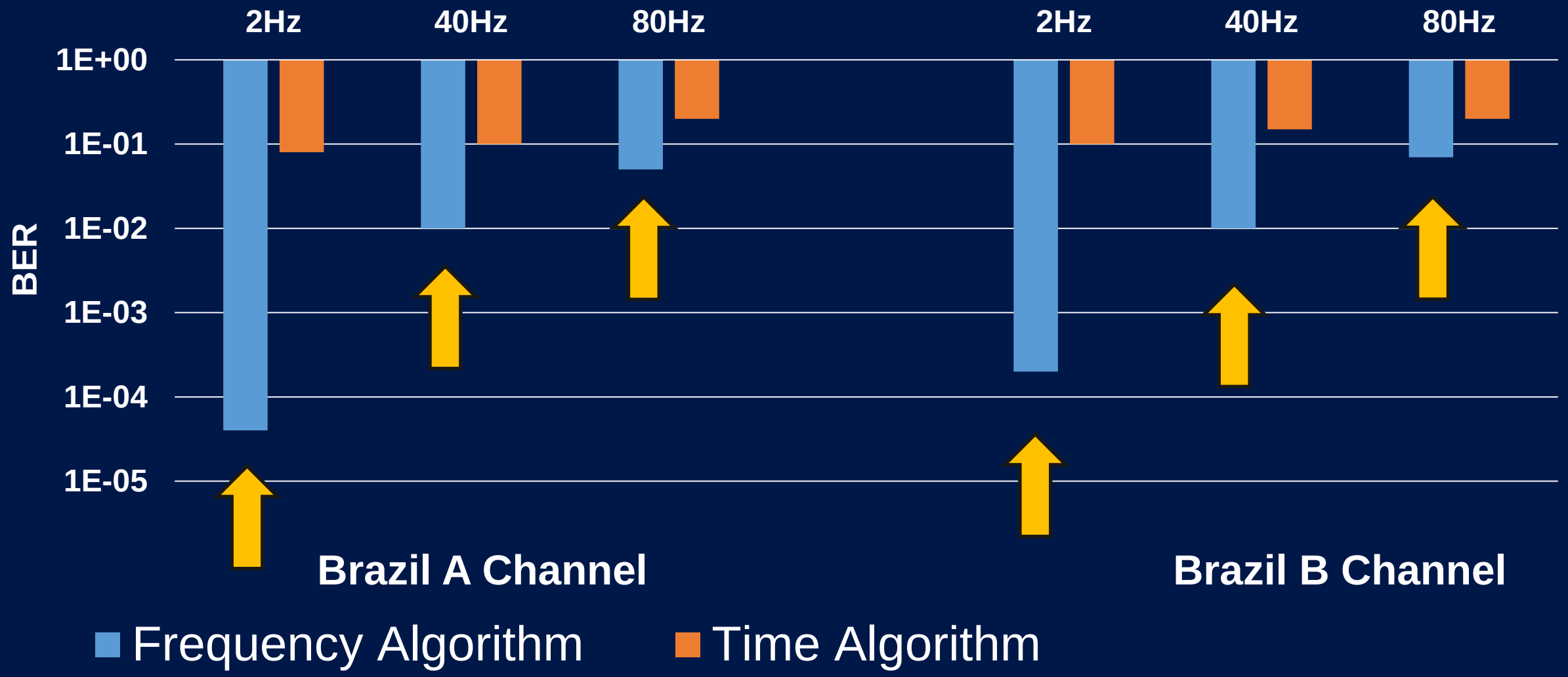


Frequency algorithm



Time algorithm

Results (Brazil A and Brazil B channels)

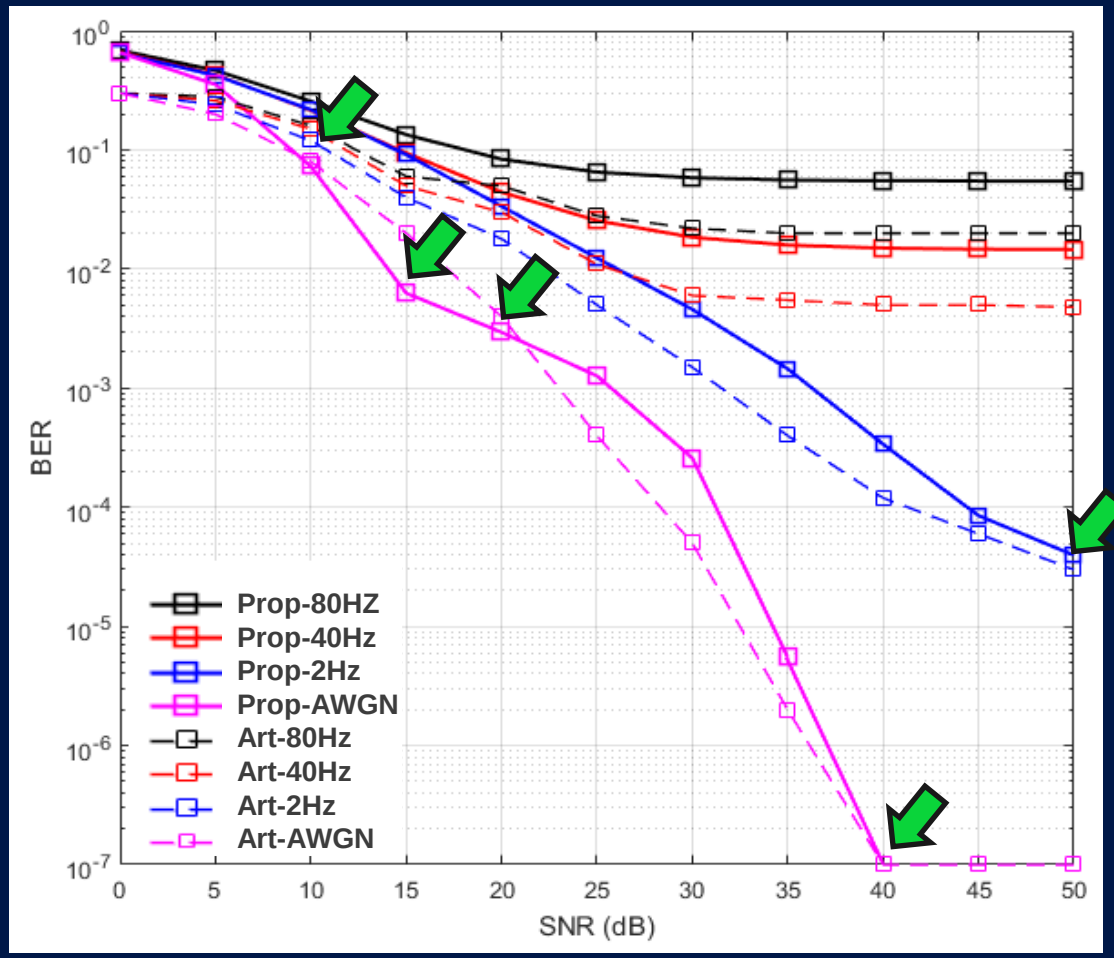


Validation

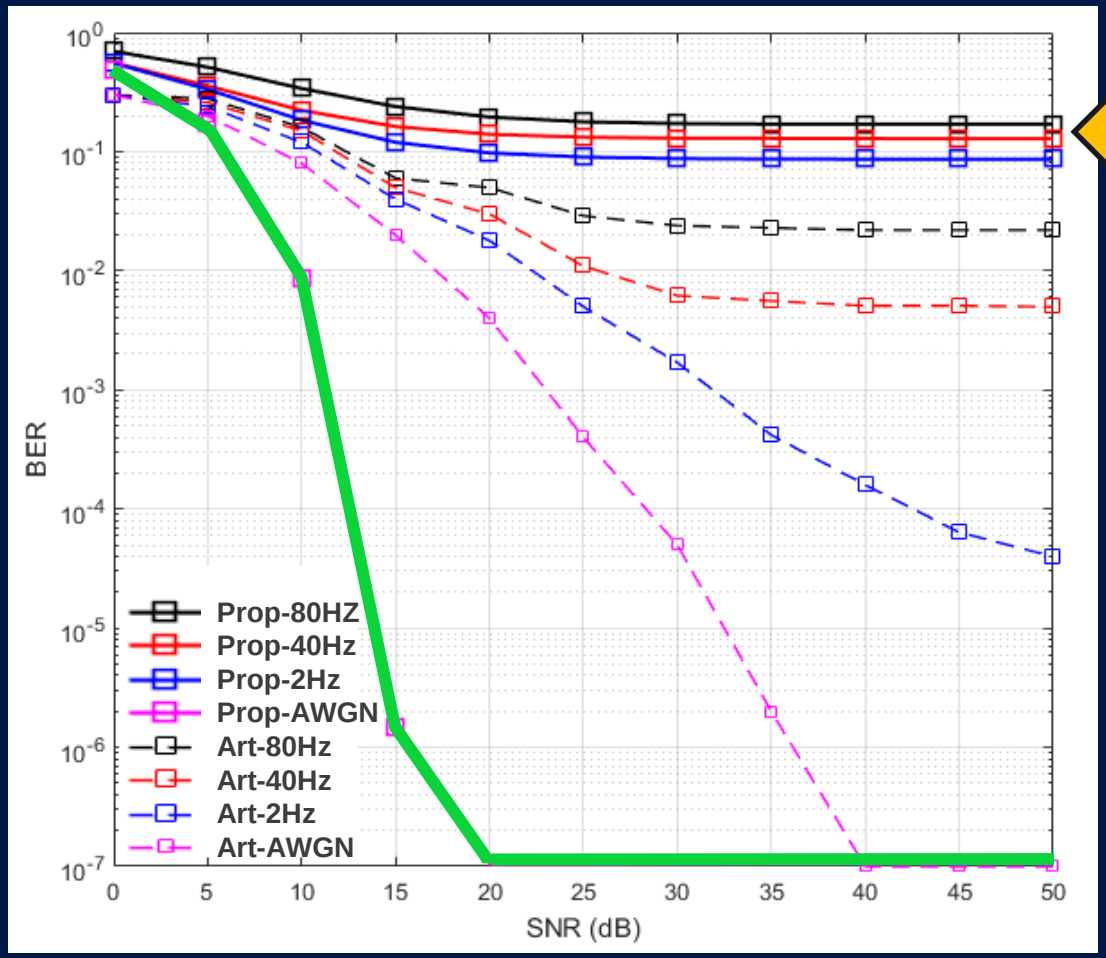
- TU6 and CT8 channels
- 16QAM modulation
- Doppler at 2Hz, 40Hz y 80Hz

“article”, Lai Hui Chen, 2015

Results (TU6 channel)

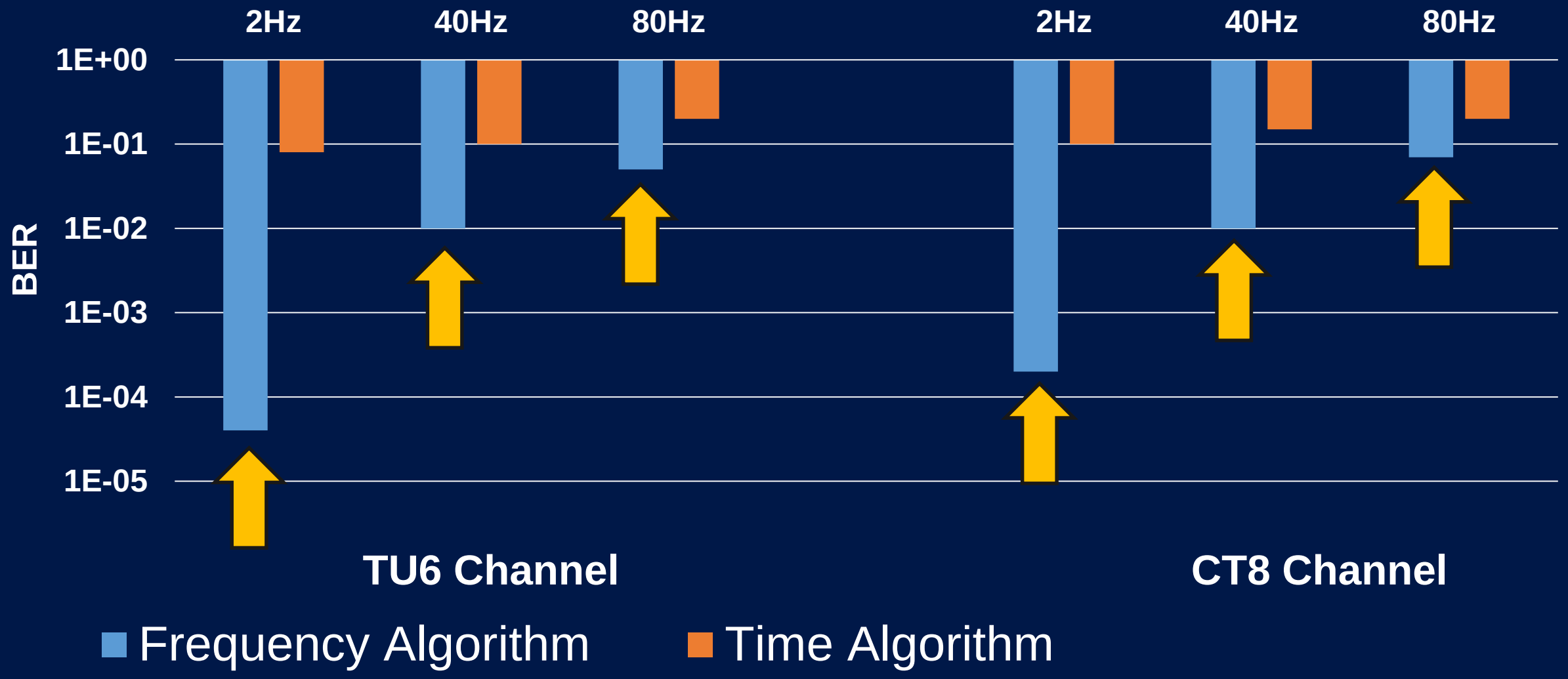


Frequency algorithm

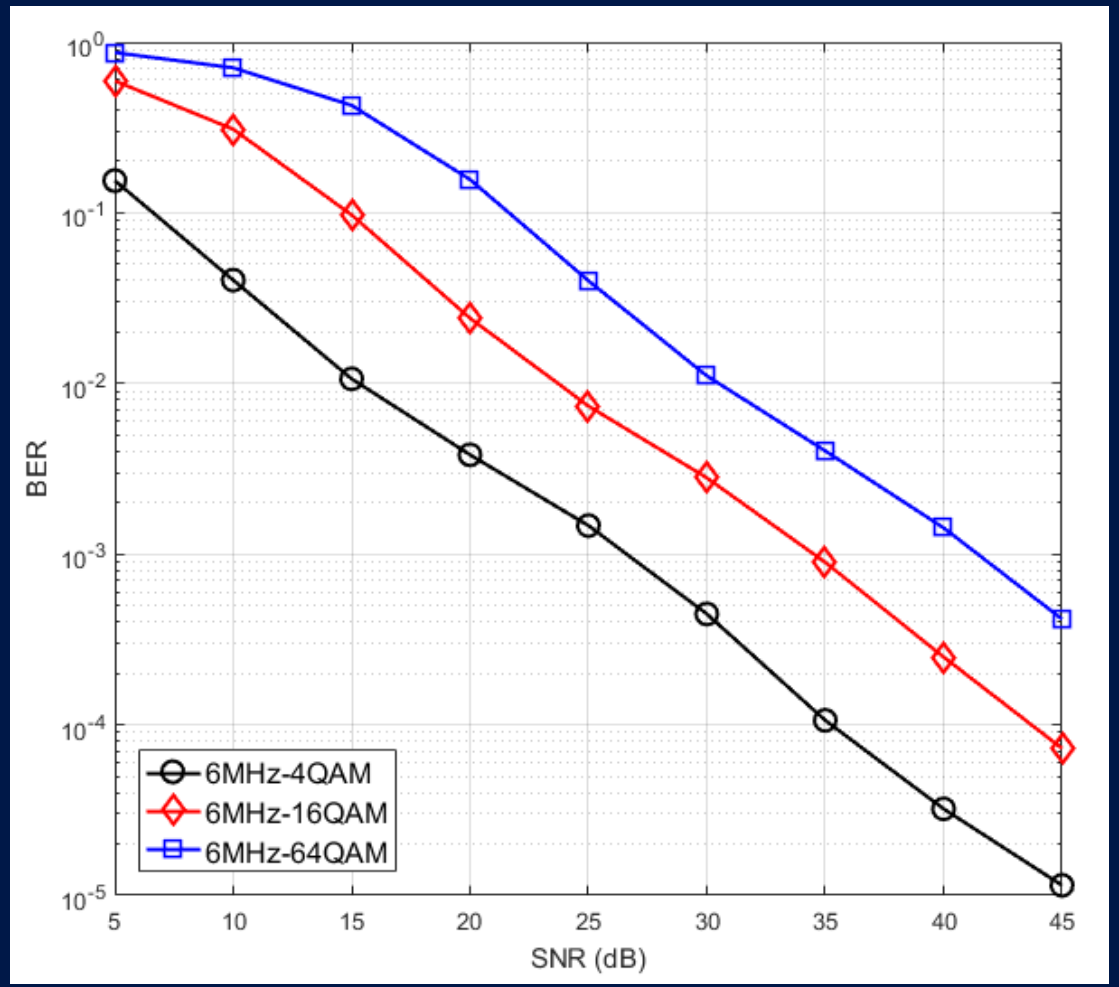


Time algorithm

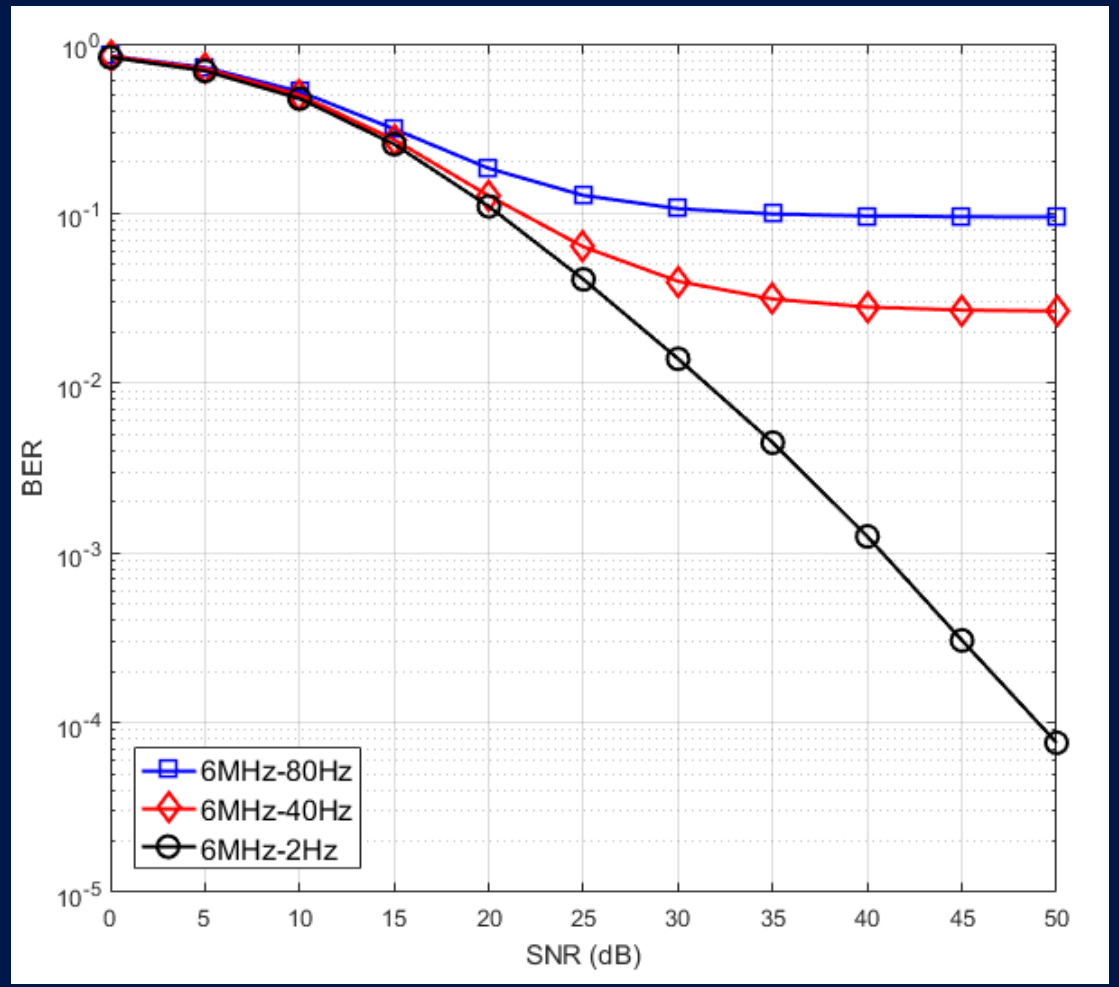
Results (TU6 and CT8 channels)



Results (6MHz)

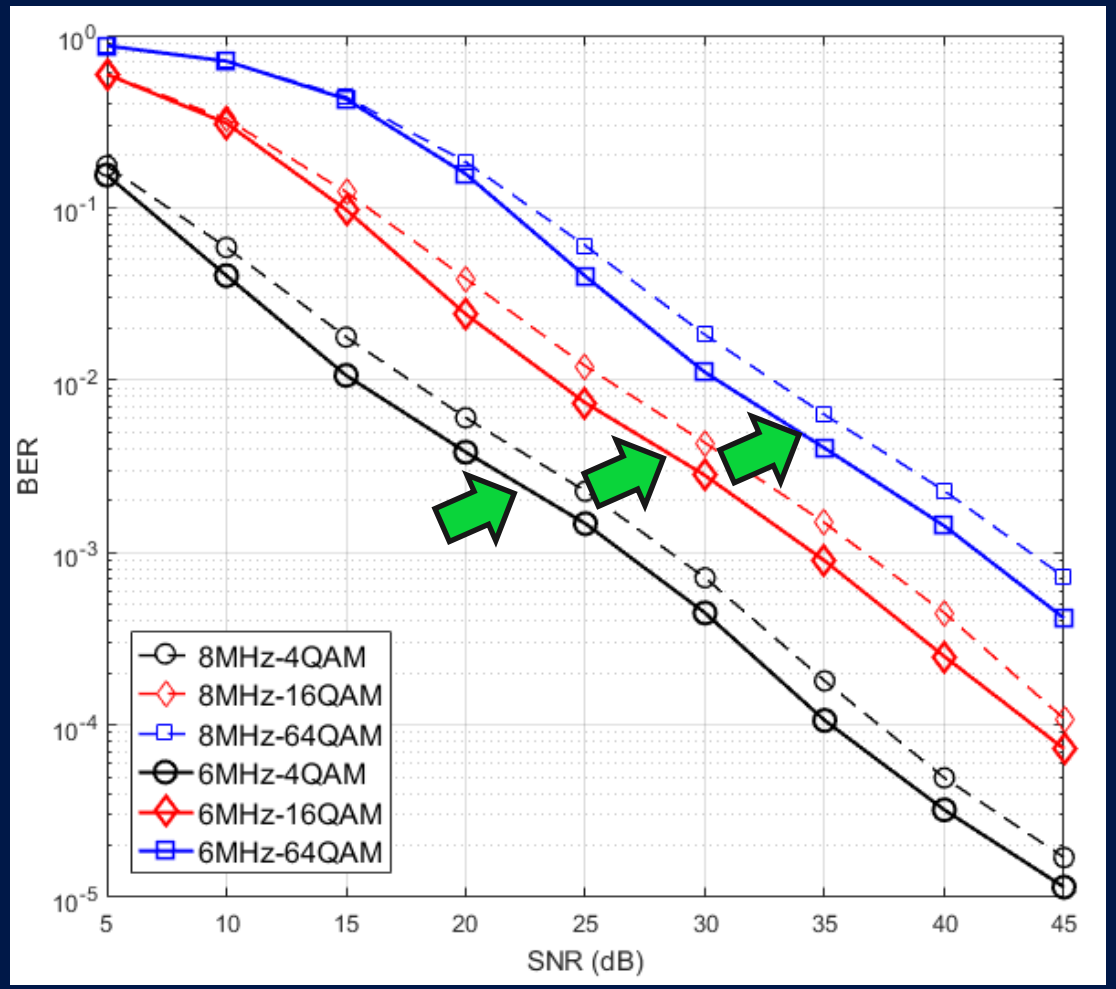


Modulations

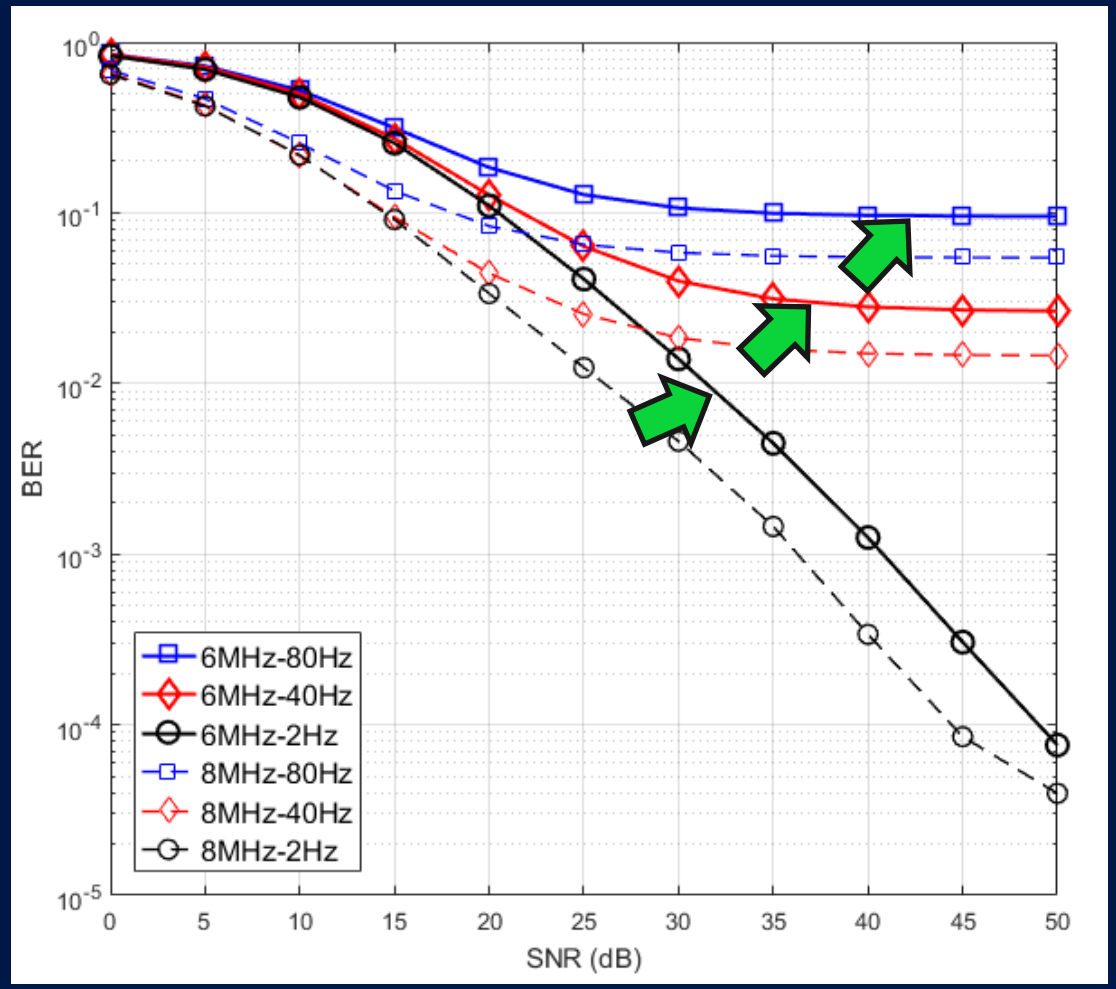


Doppler

Results (6MHz)



Modulations



Doppler

Conclusion

- Correlation algorithm of PN sequences in time domain and frequency algorithm were implemented.
- The proposed scheme was validated on Matlab's Simulink software.
- The results for the 8MHz and 6MHz channeling were presented.

Conclusion

- The behavior of the methods is affected to a greater extent by the Doppler effect.
- An increase in the size of the constellation implies that the performance of the methods decreases.
- For multipath channels that introduce fewer delays, such as TU6 and Brazil A, better erroneous bit ratio values are obtained.

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