CROSS COMPILATION FOR CHANNEL CODING TECHNIQUES

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BY:
SHIVANI TAMBATKAR
AMIRAJ NIGAM

SJSU SAN JOSÉ STATE UNIVERSITY

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- OBJECTIVE
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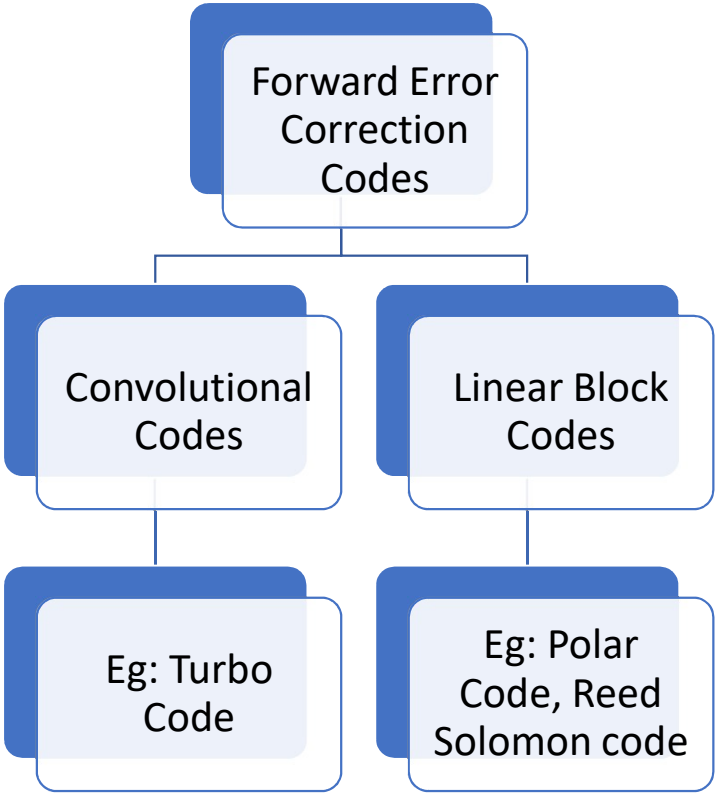
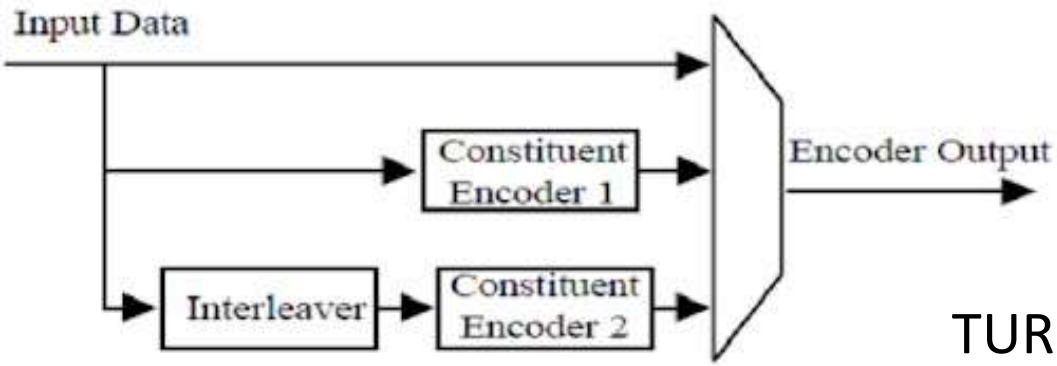
INTRODUCTION

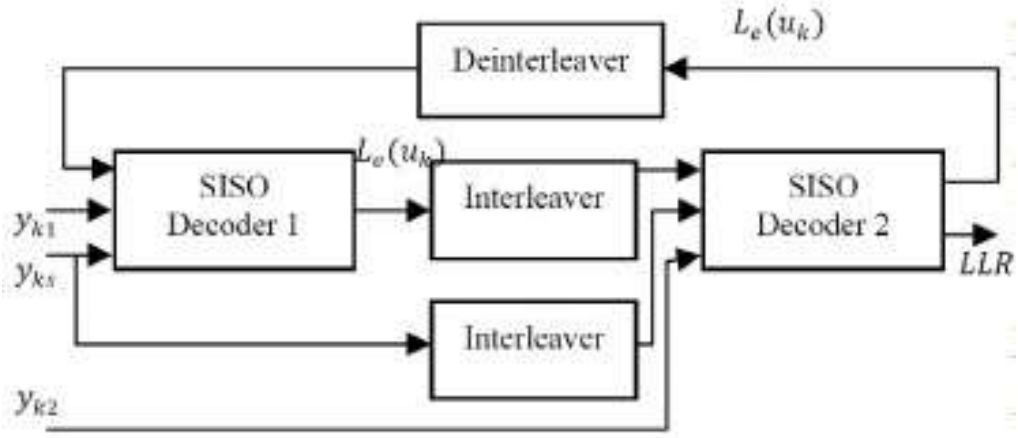
TYPES OF CHANNEL CODING TECHNIQUES



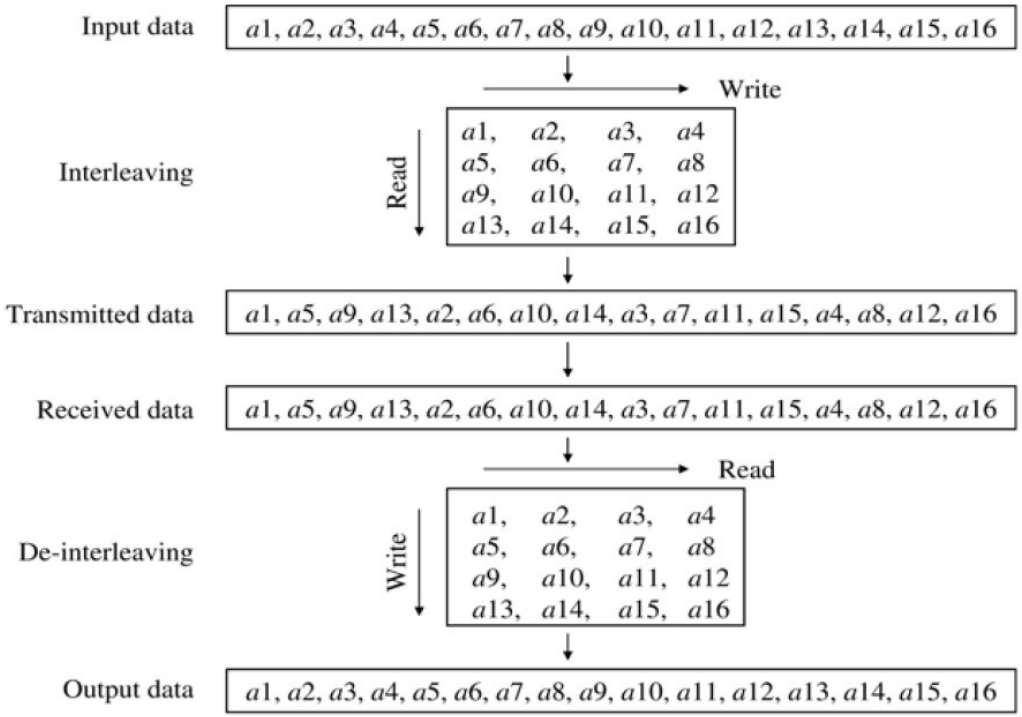
TURBO ENCODER: RSC Encoder + Interleaver



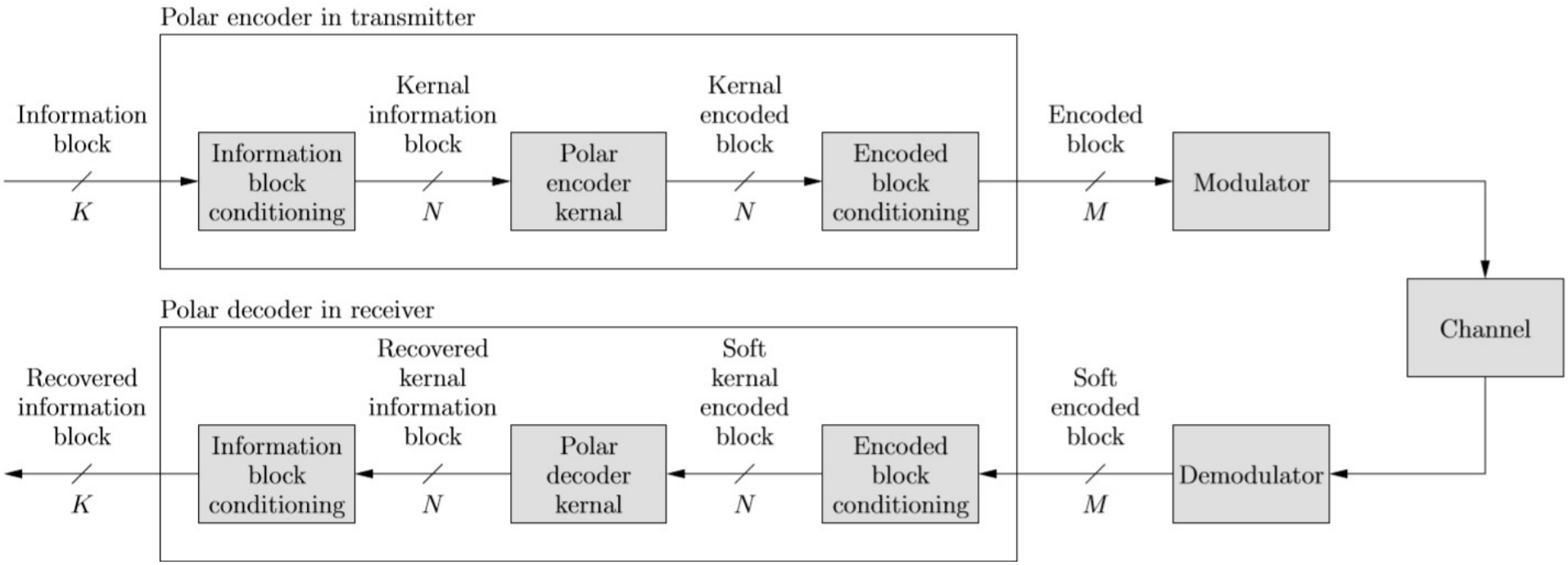
TURBO DECODER: Maximum A Posterior



Interleaver is used to make the outputs
of the two encoders uncorrelated from each other
to increase the error correction performance



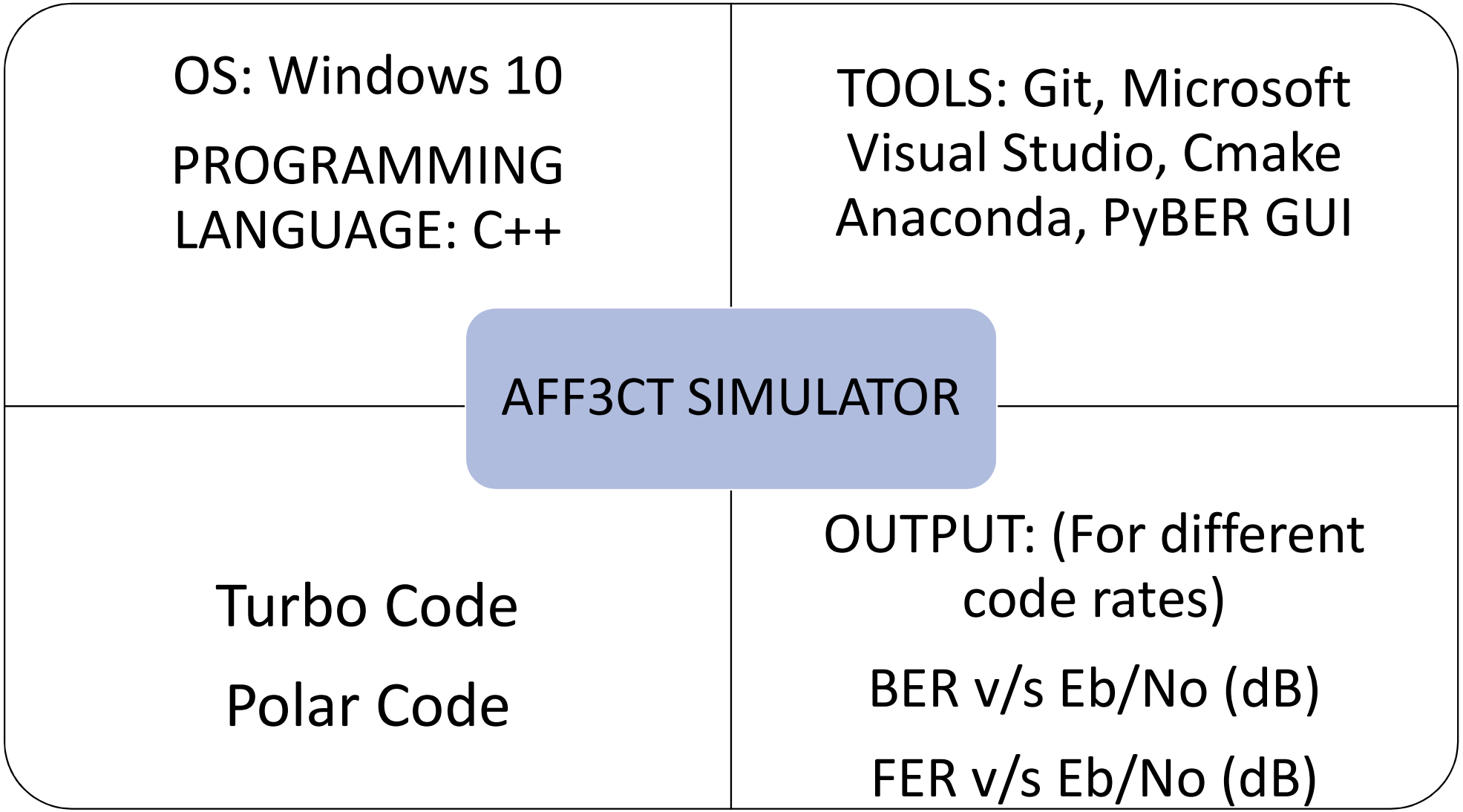
Polar Encoder: Information block conditioning + Polar encoder kernel + Encoded block conditioning



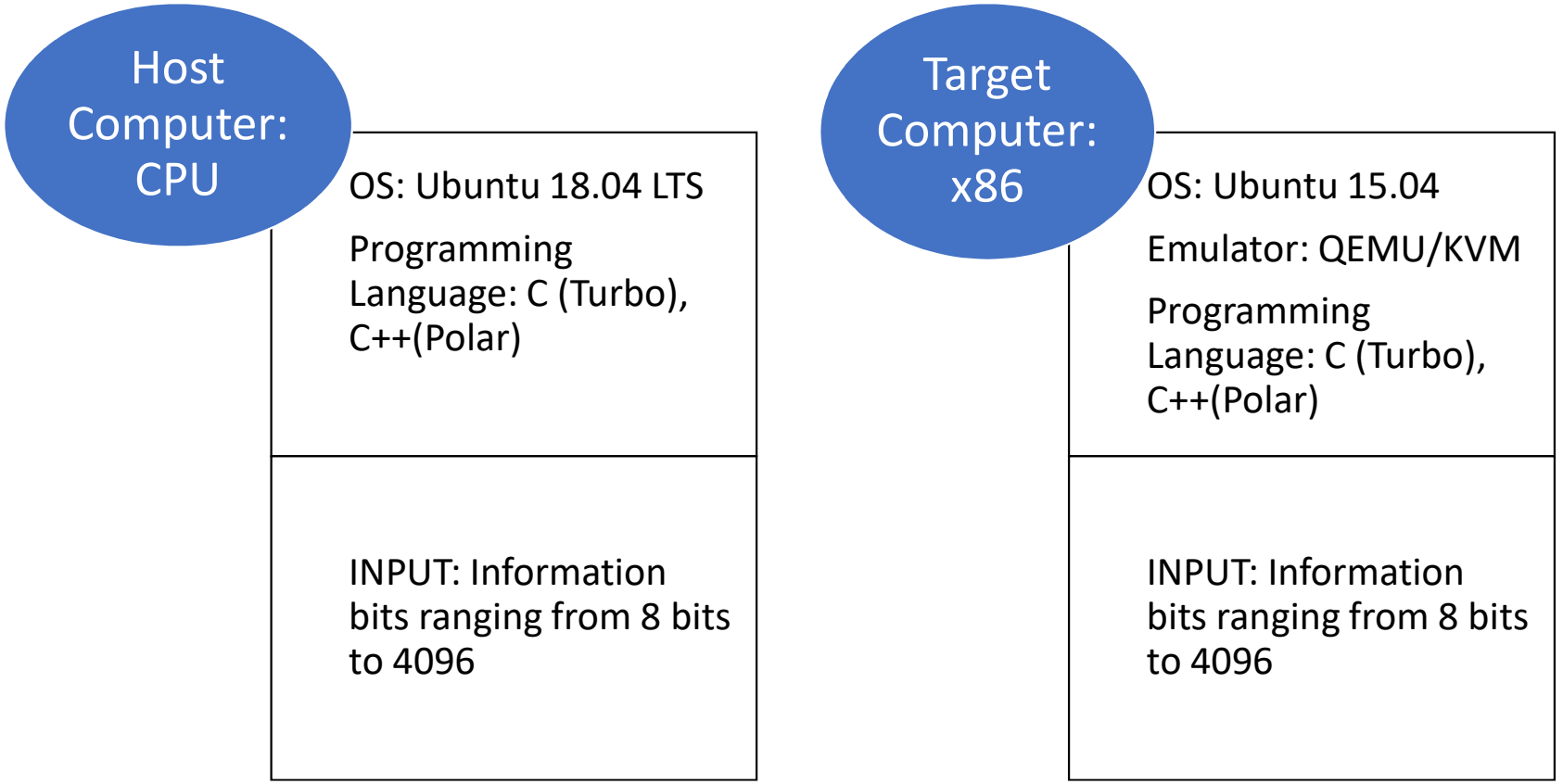
OBJECTIVE

TO COMPARE CHANNEL CODING TECHNIQUES ON DIFFERENT PROCESSOR PLATFORMS

CONTRIBUTION


OS: Windows 10
PROGRAMMING LANGUAGE: C++
TOOLS: Git, Microsoft Visual Studio, Cmake Anaconda, PyBER GUI
AFF3CT SIMULATOR
Turbo Code
Polar Code
OUTPUT: (For different code rates)
BER v/s Eb/No (dB)
FER v/s Eb/No (dB)

Environment used for performing Cross Compilation for Turbo Code and Polar codes :

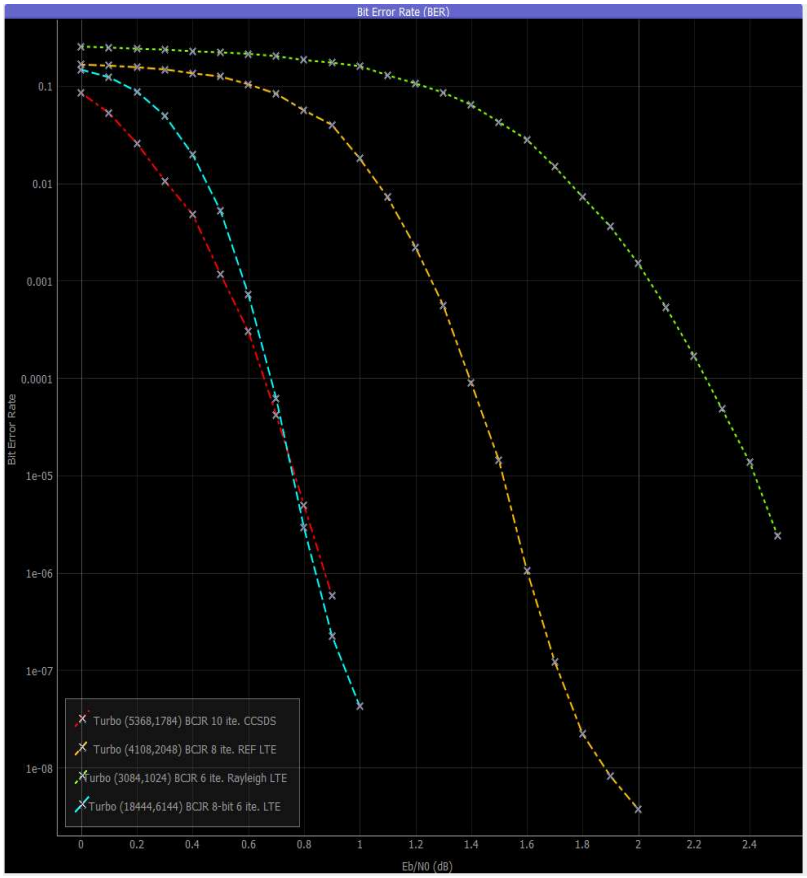


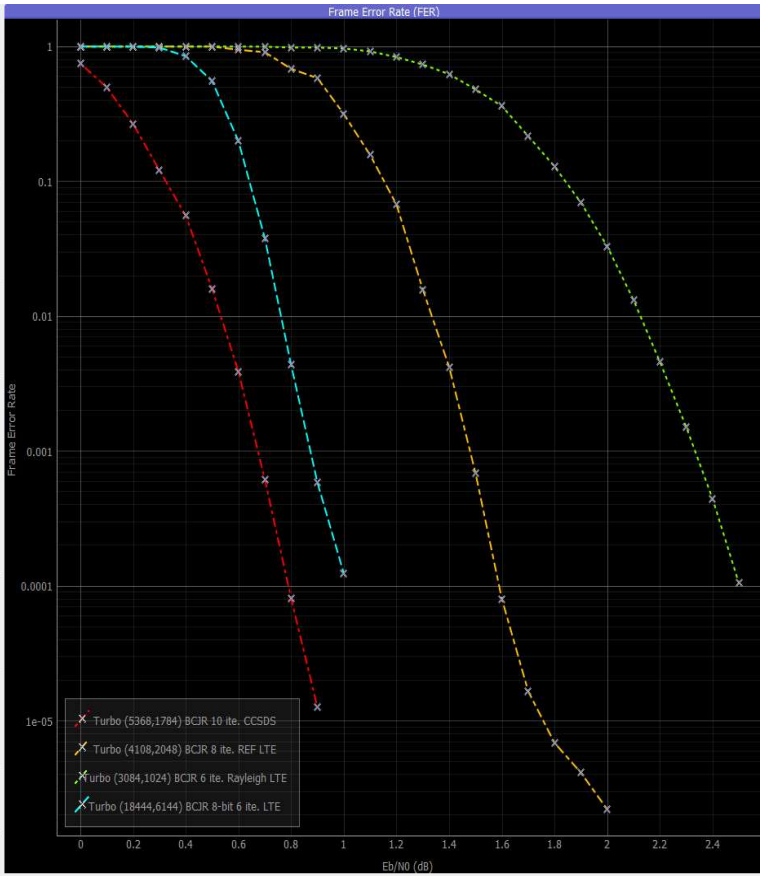
Parameters chosen to compare performance:

- Code Execution Time
- CPU Cycle count
- Instructions per cycle

RESULTS

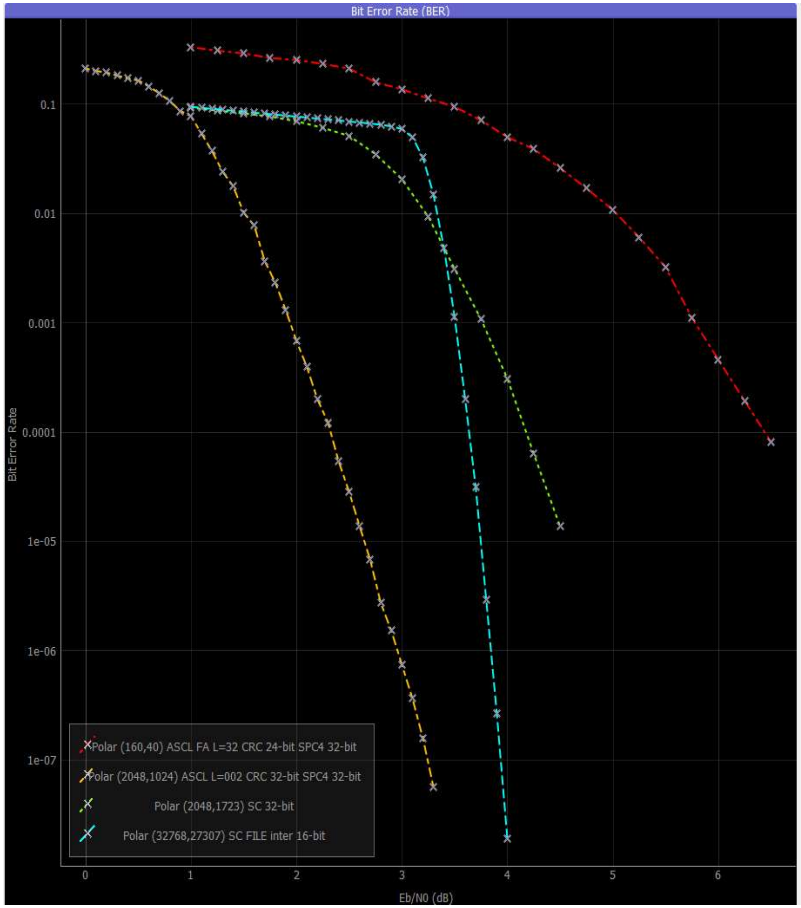
Turbo code operate at low SNR and have poor performance at low BER

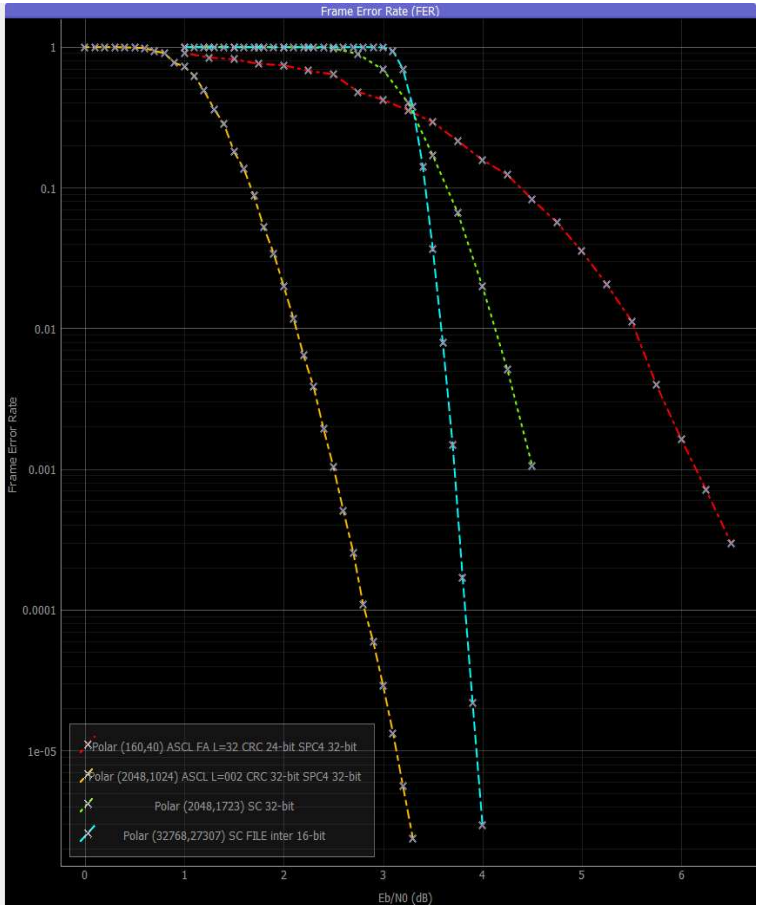




Code Rate: 0.33 N= 5368 k= 1784
Code Rate: 0.49 N= 4108 k= 2048
Code Rate: 0.34 N= 3084 k= 1024
Code Rate: 0.33 N= 18444 k= 6144

Polar Code works better for higher information bits.





Code Rate: 0.25 N= 160 k= 40
Code Rate: 0.84 N= 2048 k= 1723
Code Rate: 0.516 N= 2048 k= 1024
Code Rate: 0.833 N= 32768 k= 27307

Comparison show that Performance of Turbo codes is better on x86 processor.

x86 Processor

k	EXECUTION TIME (in secs)	CPU CYCLES (in million)	IPC
8	2.116	5	1.7
64	2.129	5	1.72
128	2.360	7	1.73
512	1.991	4	1.75
1024	1.237	4	1.8
4096	2.464	0.6	1.79

HOST COMPUTER

k	EXECUTION TIME (in secs)	CPU CYCLES (in million)	IPC
8	2.821	7	1.23
64	12.623	7	1.24
128	10.152	10	0.93
512	16.8117	9	0.77
1024	11.497	8	1.17
4096	10.875	1	0.82

Comparison show that Performance of Polar codes is better on Host computer processor.

x86 Processor

K	EXECUTION TIME	CPU CYCLES (in billion)	IPC
8	4min 13.892secs	610	1.45
64	4min 15.401secs	612	1.43
128	4min 15.765secs	615	1.42
256	4min 17.604secs	617	1.42
512	4min 17.612secs	618	1.41
1024	4min 16.270secs	620	1.40
4096	4min 17.193secs	622	1.39

HOST COMPUTER

k	EXECUTION TIME	CPU CYCLES (in billion)	IPC
8	3min 40.271secs	588	1.85
64	3min 41.217secs	590	1.85
128	3min 39.903secs	588	1.85
256	3min 42.092secs	591	1.84
512	3min 42.271secs	592	1.84
1024	3min 45.993secs	599	1.82
4096	3min 43.938secs	594	1.83

CONCLUSION

- Performance of Polar codes is better on Host computer processor.

- Performance of Turbo codes is better on x86 processor

THANK YOU