

# Channel Coding for NR

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- Good performance for variable data size
    - From small data to large data
    - With wide variation of coding rate
    - Support of IR as a baseline
  - Low decoding latency/complexity
    - Low complexity may lead to low energy consumption
  - Support of ultra high reliability
    - No error floor preferred for URLLC, if retransmission is not allowed
- ➔ Combination of requirements needs to be considered

- Multiple codes may be needed for NR to support full combinations of requirements

Low latency/complexity

Conv. code

LDPC/Turbo

Conv. code with  
LIST decoding

Polar?

LDPC (Turbo) with  
LIST decoding?

Small data  
performance

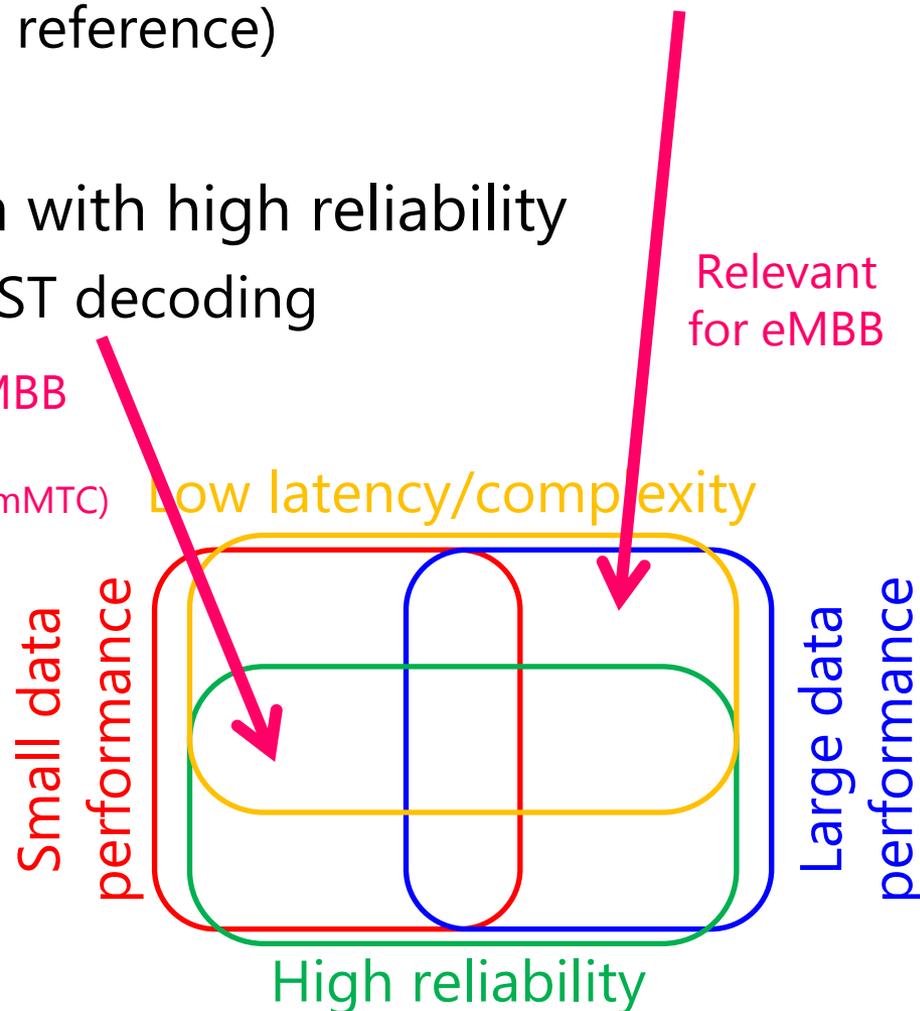
Large data  
performance

High reliability

# Proposed Primary Study Points <sup>NTT</sup> docomo

- The best code for large data with low latency/complexity
  - LDPC vs. Polar vs. Turbo (as reference)
- The best code for small data with high reliability
  - Polar vs. Conv. code with LIST decoding

Relevant for eMBB  
and URLLC  
(can be used also for mMTC)



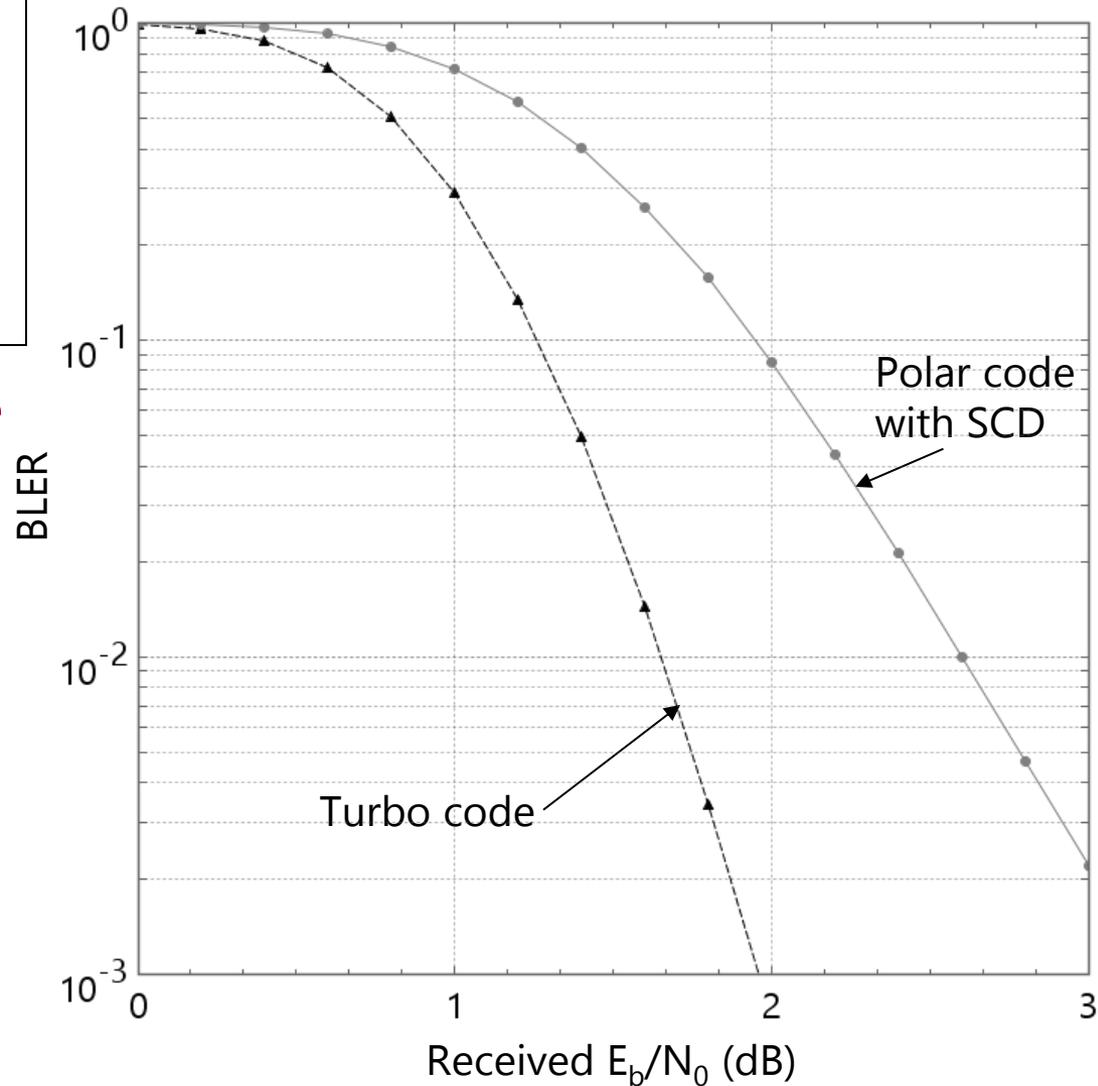
- LDPC (or Turbo) + Polar codes
  - LDPC (or Turbo) for large data with low latency/complexity
  - Polar for small data and/or high reliability
- LDPC (or Turbo) + Conv. codes
  - LDPC (or Turbo) for large data with low latency/complexity
  - Conv. code for small data with low latency/complexity
    - With LIST decoding for high reliability?
- Polar code only (if feasible...)

Two schemes at maximum should be supported in NR Phase I

# Preliminary Evaluation of Polar Code

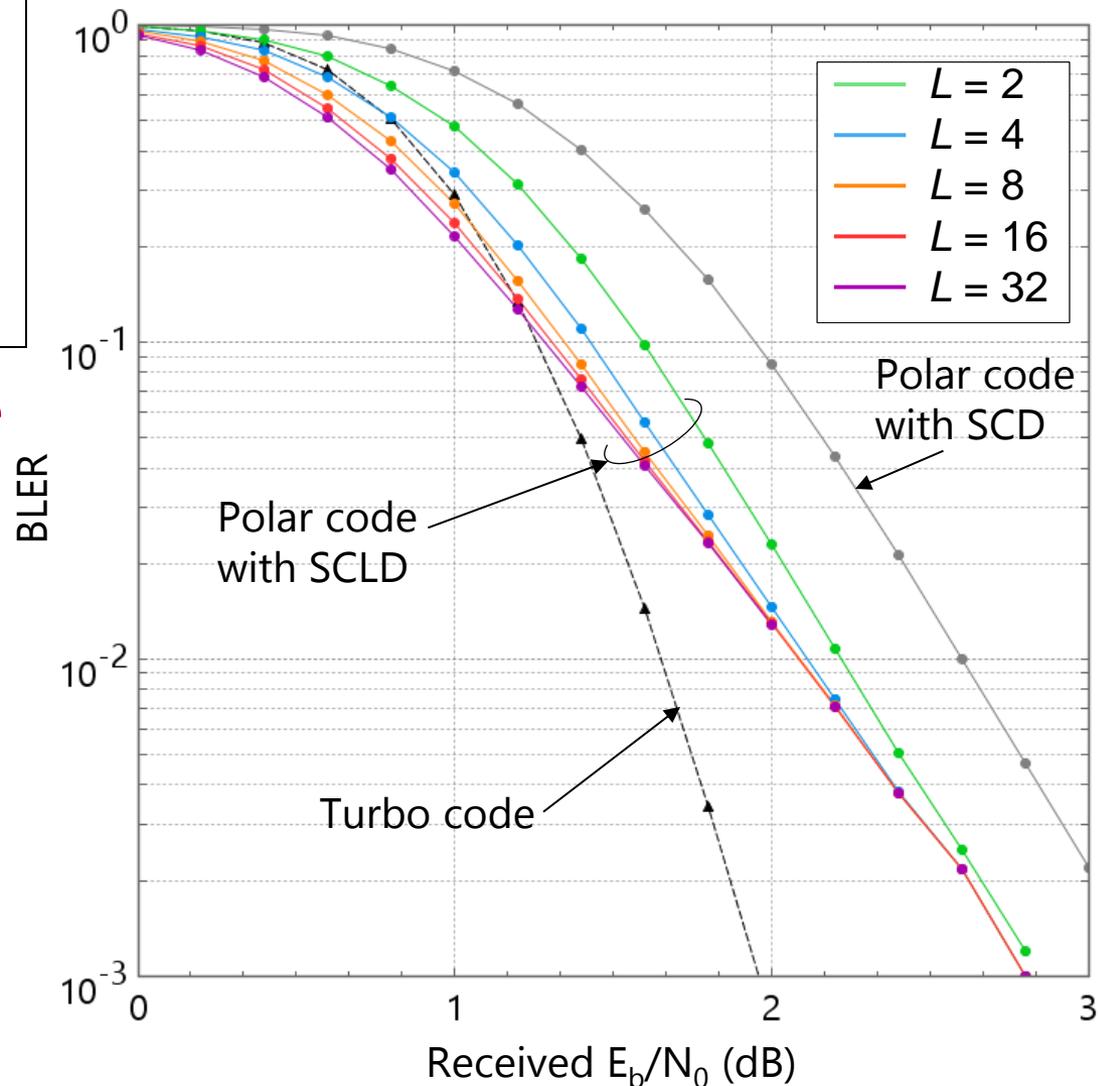
# Preliminary Evaluation

- Evaluation condition
  - Information bit = 512
  - Coding rate = 1/2
  - LTE Turbo code (8 iterations) as reference
- Polar code with **Successive Cancellation Decoder**
  - Worse than Turbo code



# Preliminary Evaluation

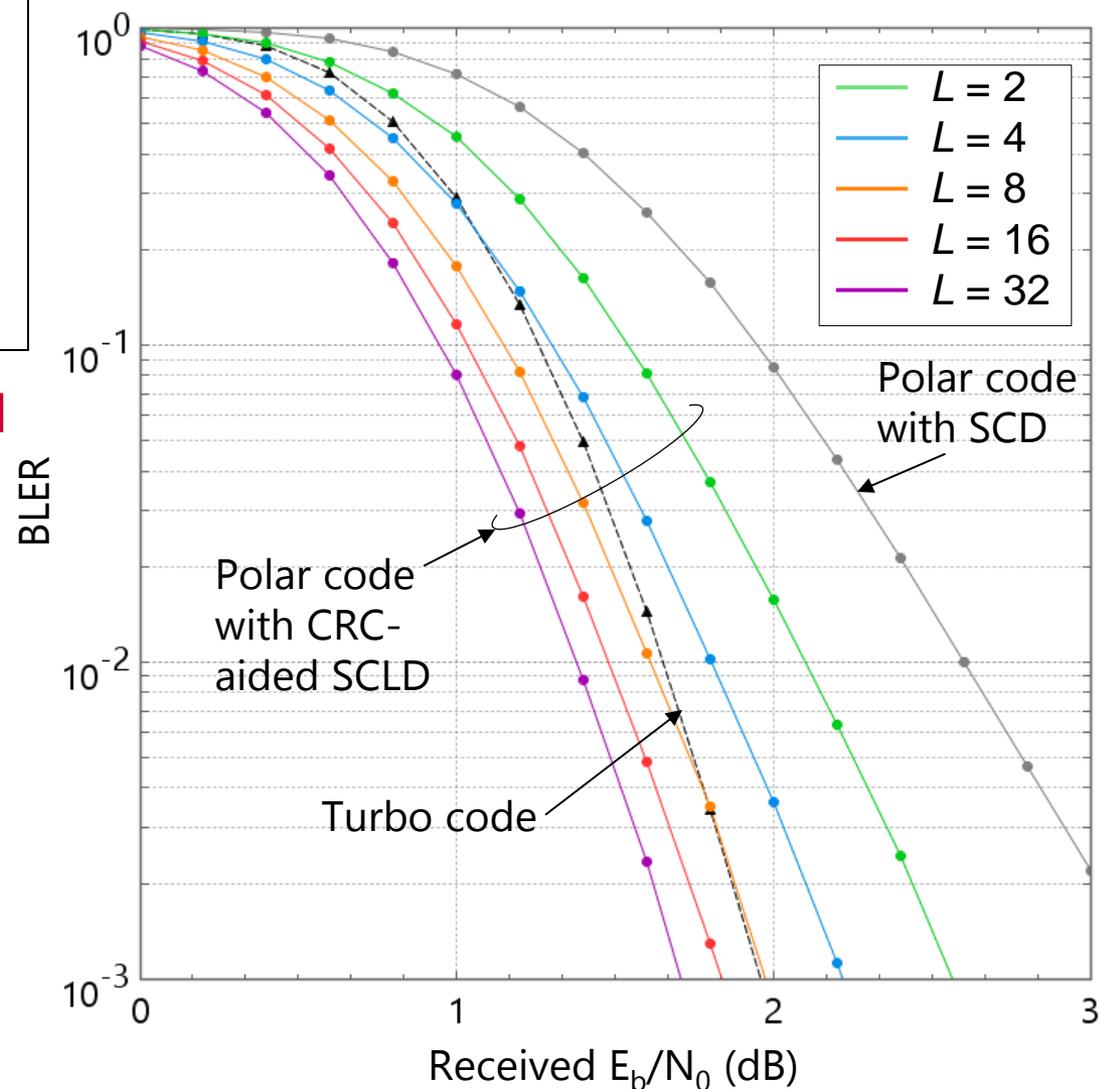
- Evaluation condition
  - Information bit = 512
  - Coding rate = 1/2
  - LTE Turbo code (8 iterations) as reference
- Polar code with **Successive Cancellation List Decoder (SCLD)** List size:  $L$ 
  - Still worse than Turbo code



# Preliminary Evaluation

- Evaluation condition
  - Information bit = 512
  - Coding rate = 1/2
  - LTE Turbo code (8 iterations) as reference

- Polar code with CRC-aided SCLD List size:  $L$ 
  - Compatible or better than Turbo code



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