

Concatenated Irregular Variable Length Coding and Irregular Unity Rate Coding

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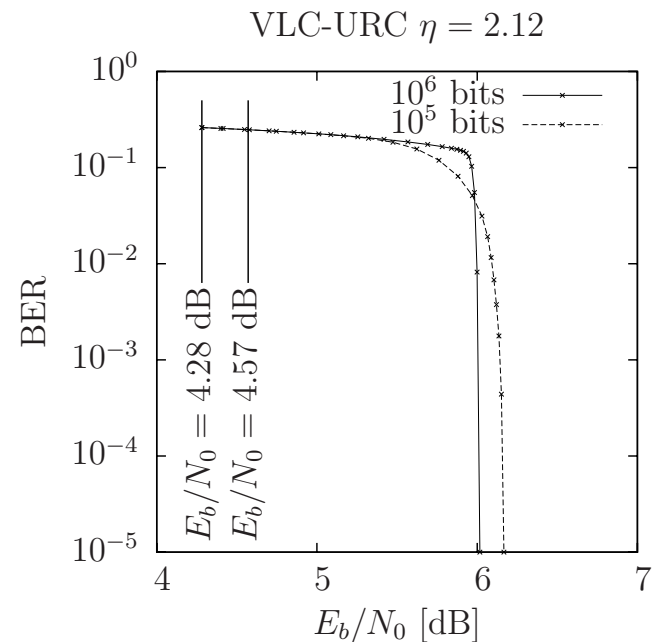
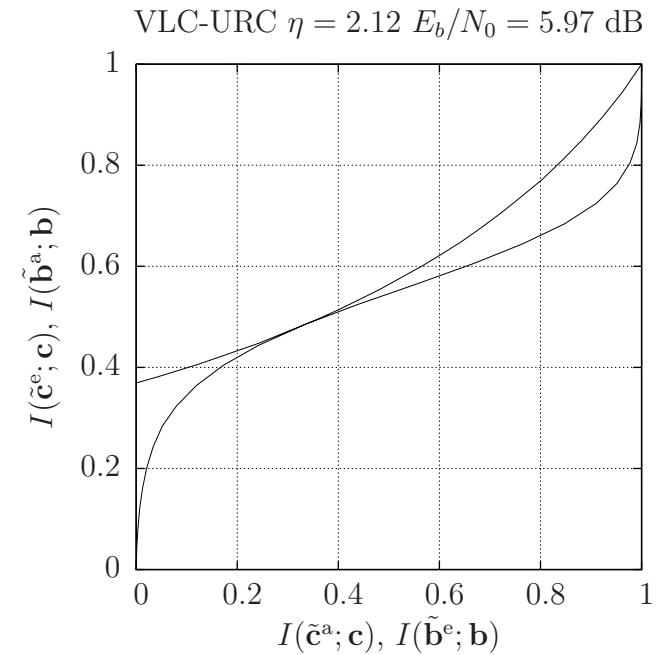
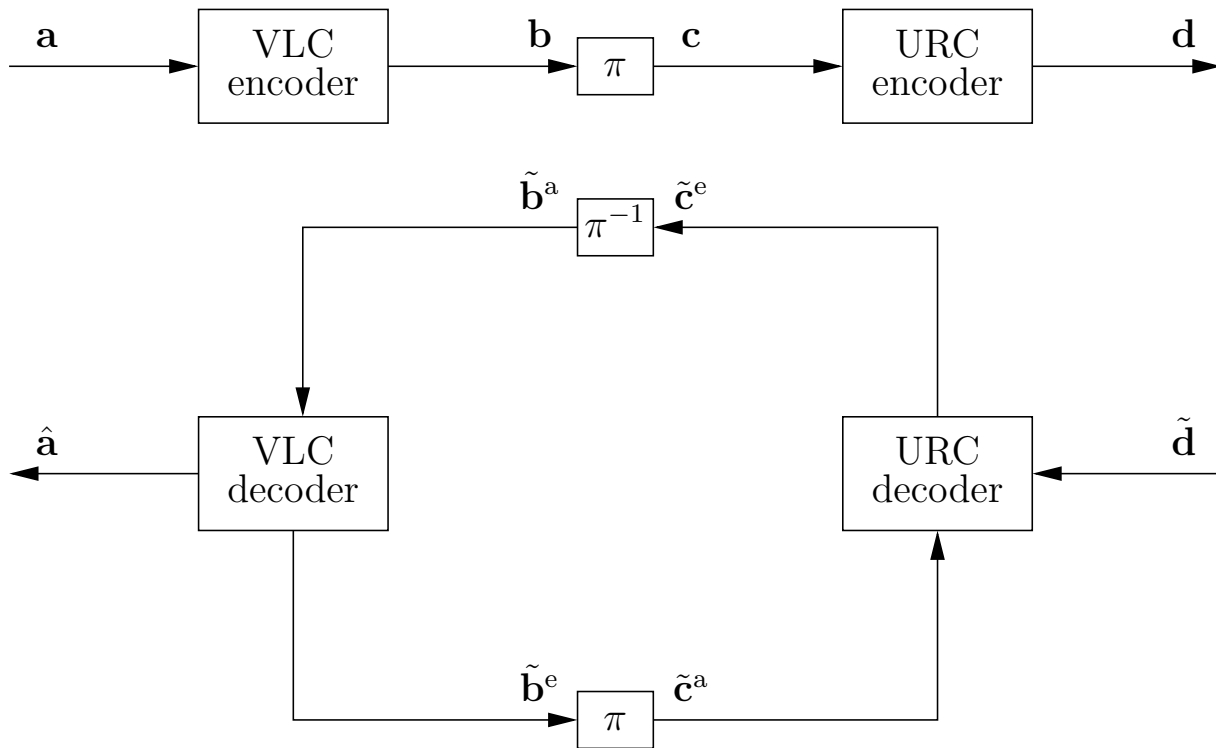


Outline

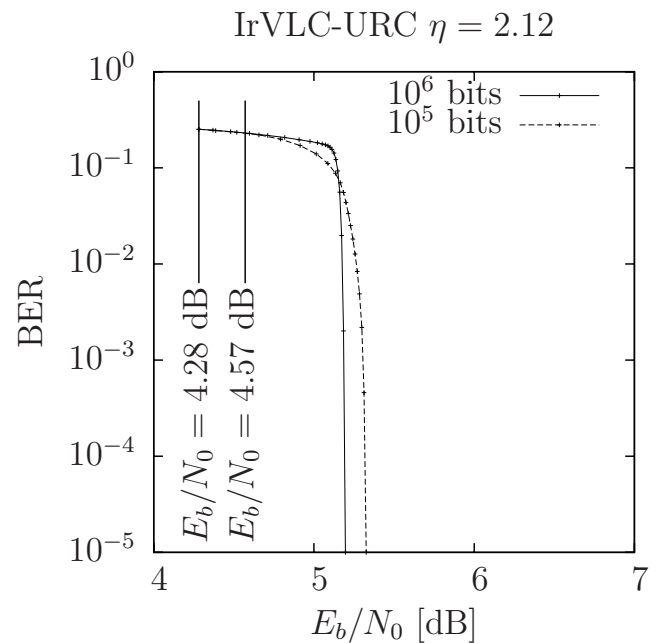
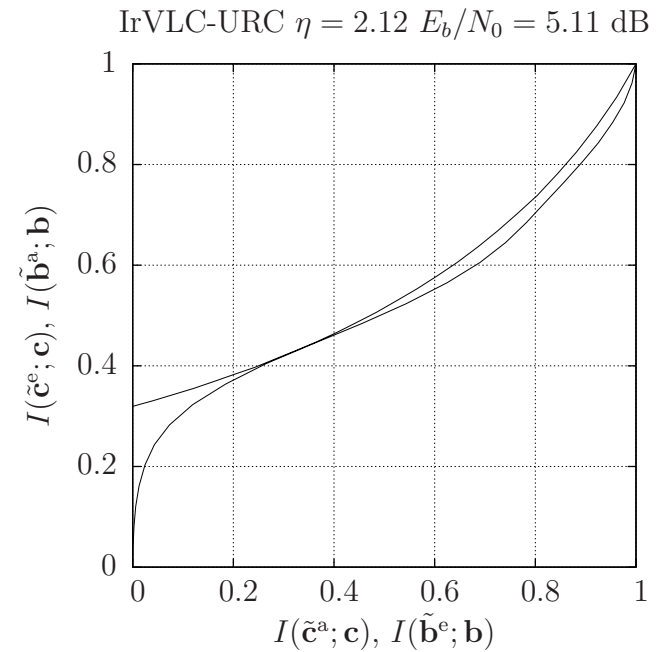
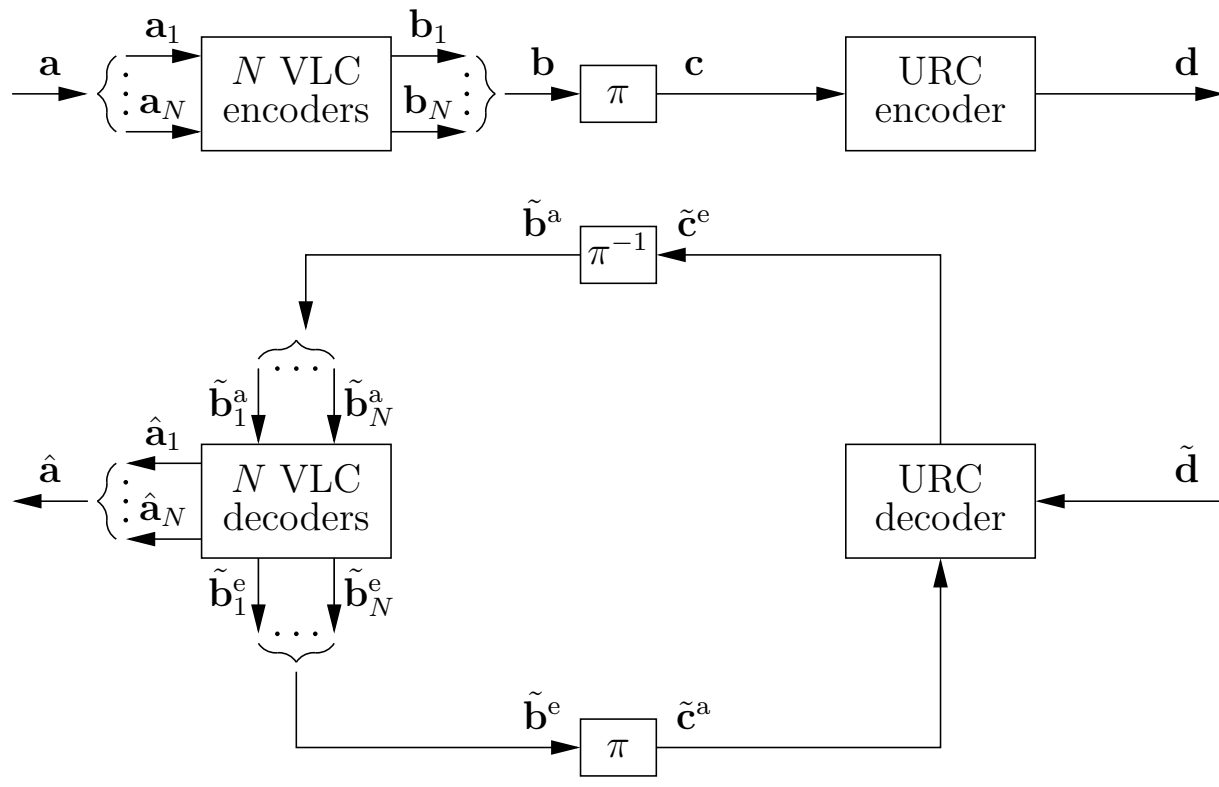
- ❑ Serial concatenations of regular and irregular codes
- ❑ EXIT chart matching
- ❑ BER and complexity performance results
- ❑ Summary



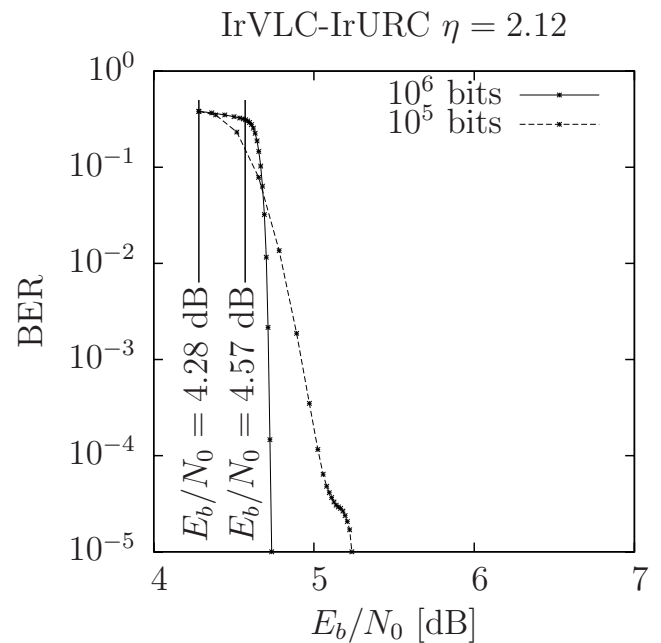
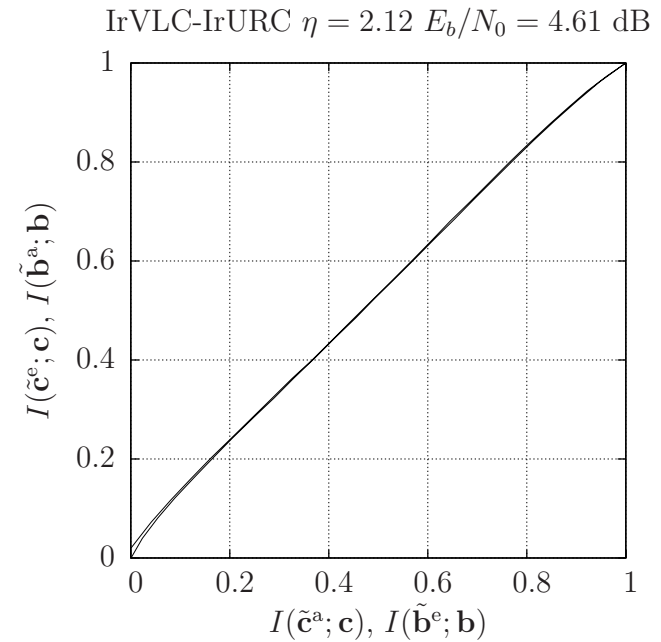
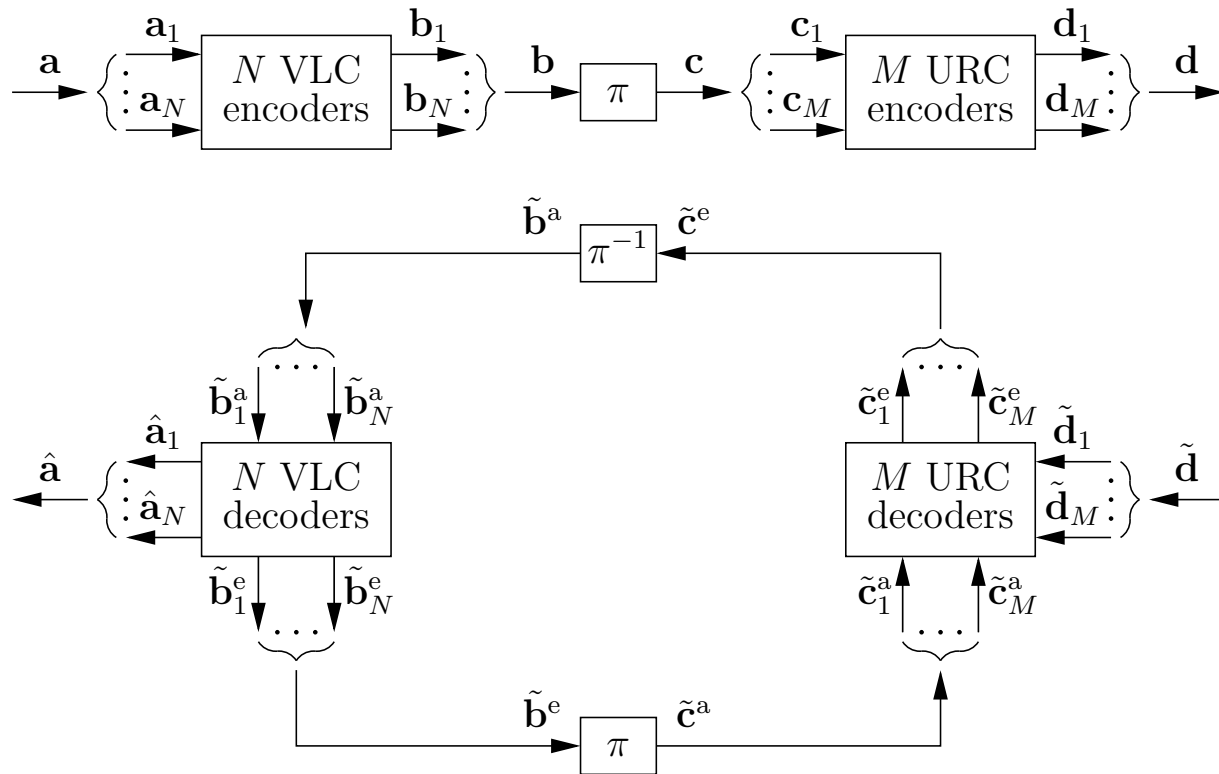
Concatenation of regular codes



Concatenation of irregular and regular codes

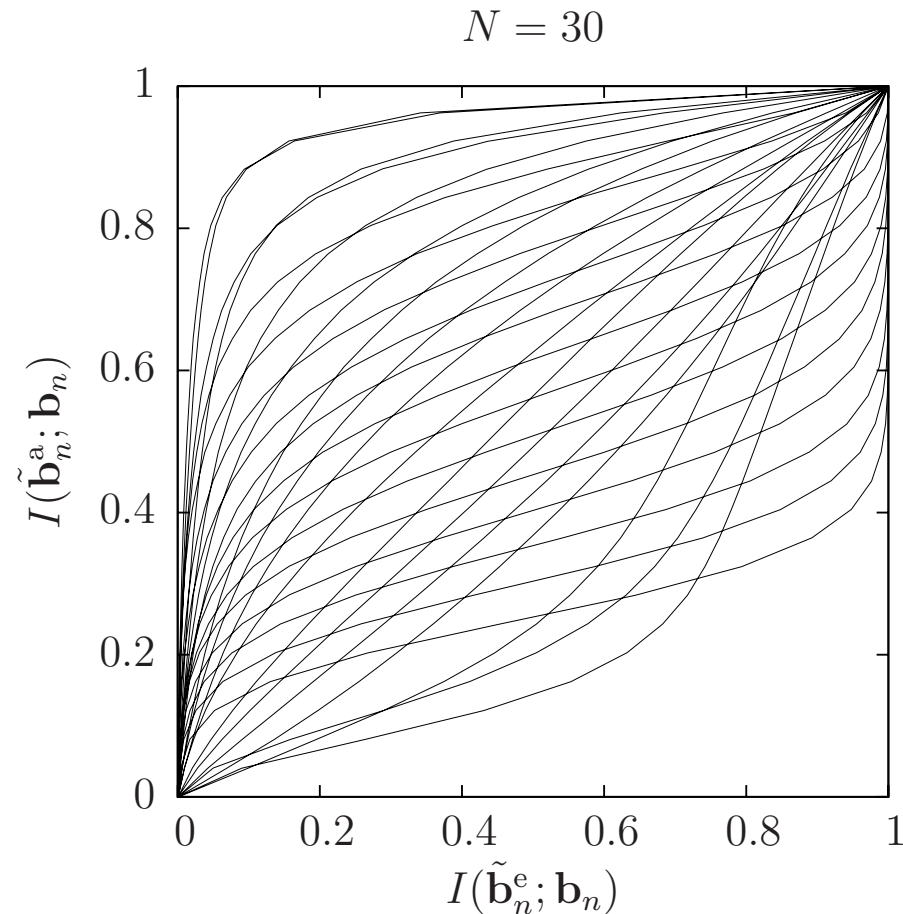


Concatenation of irregular codes



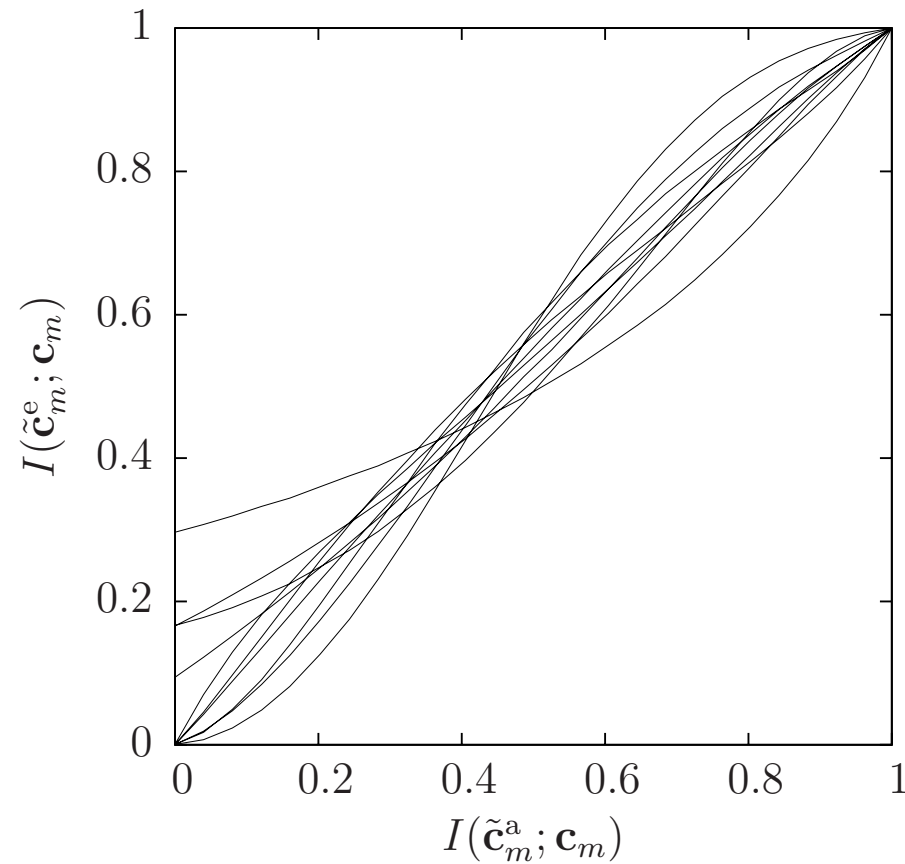
GA for designing component VLC codebooks

- ❑ Arbitrary EXIT curve
- ❑ Near-unity VLC-encoded bit entropy
- ❑ Low decoding complexity



Full search for selecting component URC codes

$M = 10, E_b/N_0 = 4.74$ dB



EXIT chart matching

$$I(\tilde{\mathbf{x}}^e; \mathbf{x}) = f_{\mathbf{x}} [I(\tilde{\mathbf{x}}^a; \mathbf{x})]$$

IrVLC EXIT function...

$$f_{\mathbf{b}} = \sum_{n=1}^N \alpha_n f_{\mathbf{b}_n},$$

where

$$\begin{aligned} \sum_{n=1}^N \alpha_n &= 1, \\ \alpha_n &\geq 0 \quad \forall n \in [1 \dots N], \\ R &= \sum_{n=1}^N \alpha_n R_n. \end{aligned}$$

IrURC EXIT function...

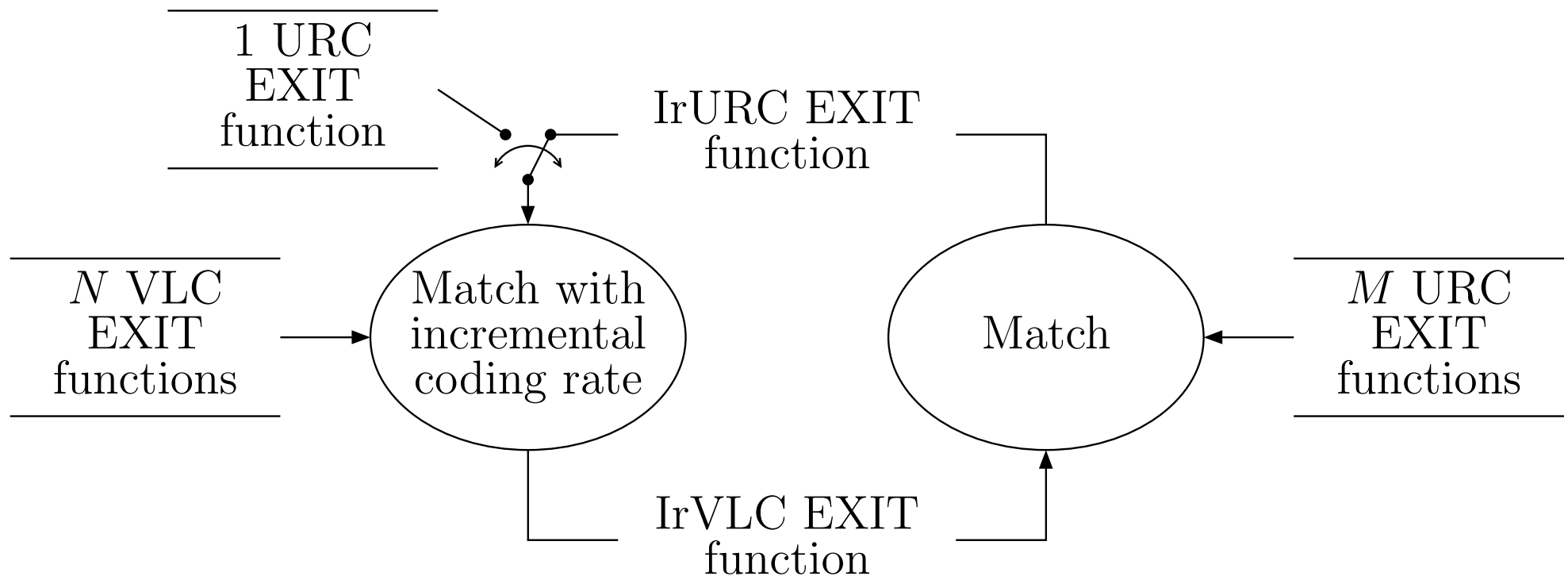
$$f_{\mathbf{c}} = \sum_{m=1}^M \alpha_m f_{\mathbf{c}_m},$$

where

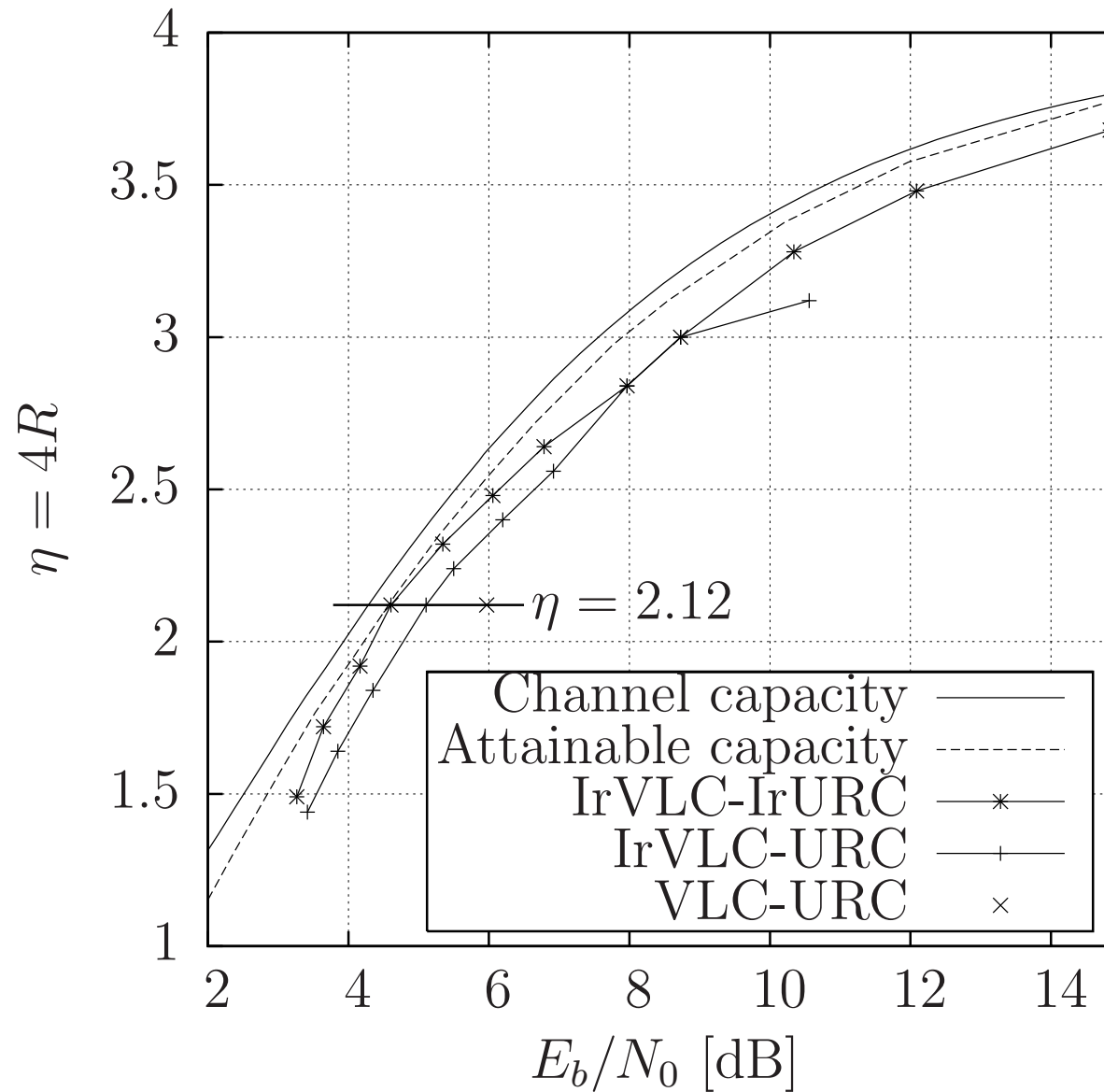
$$\begin{aligned} \sum_{m=1}^M \alpha_m &= 1, \\ \alpha_m &\geq 0 \quad \forall m \in [1 \dots M]. \end{aligned}$$



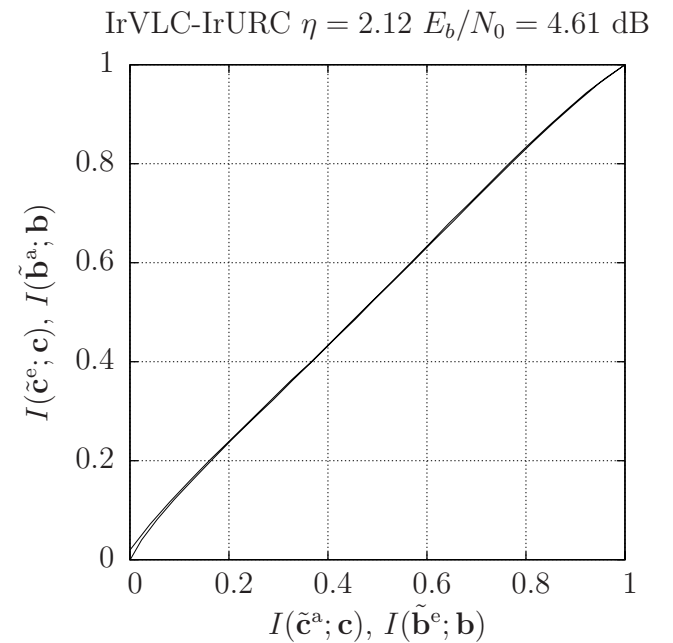
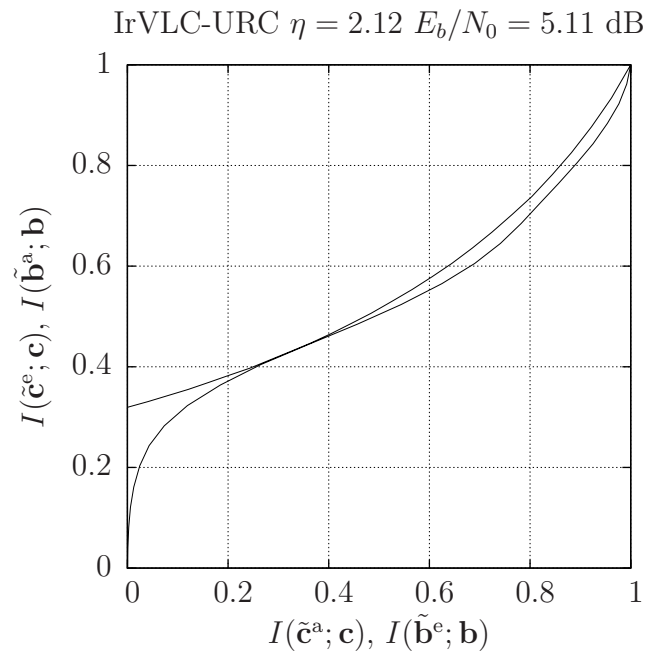
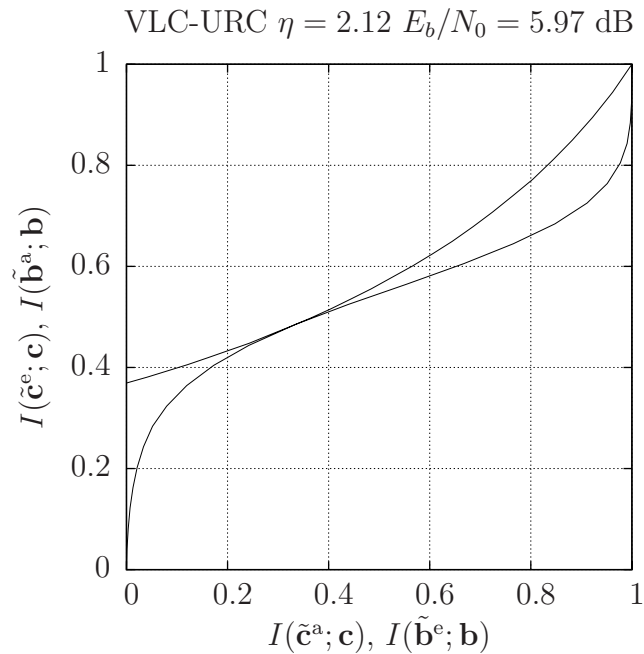
Joint EXIT chart matching algorithm



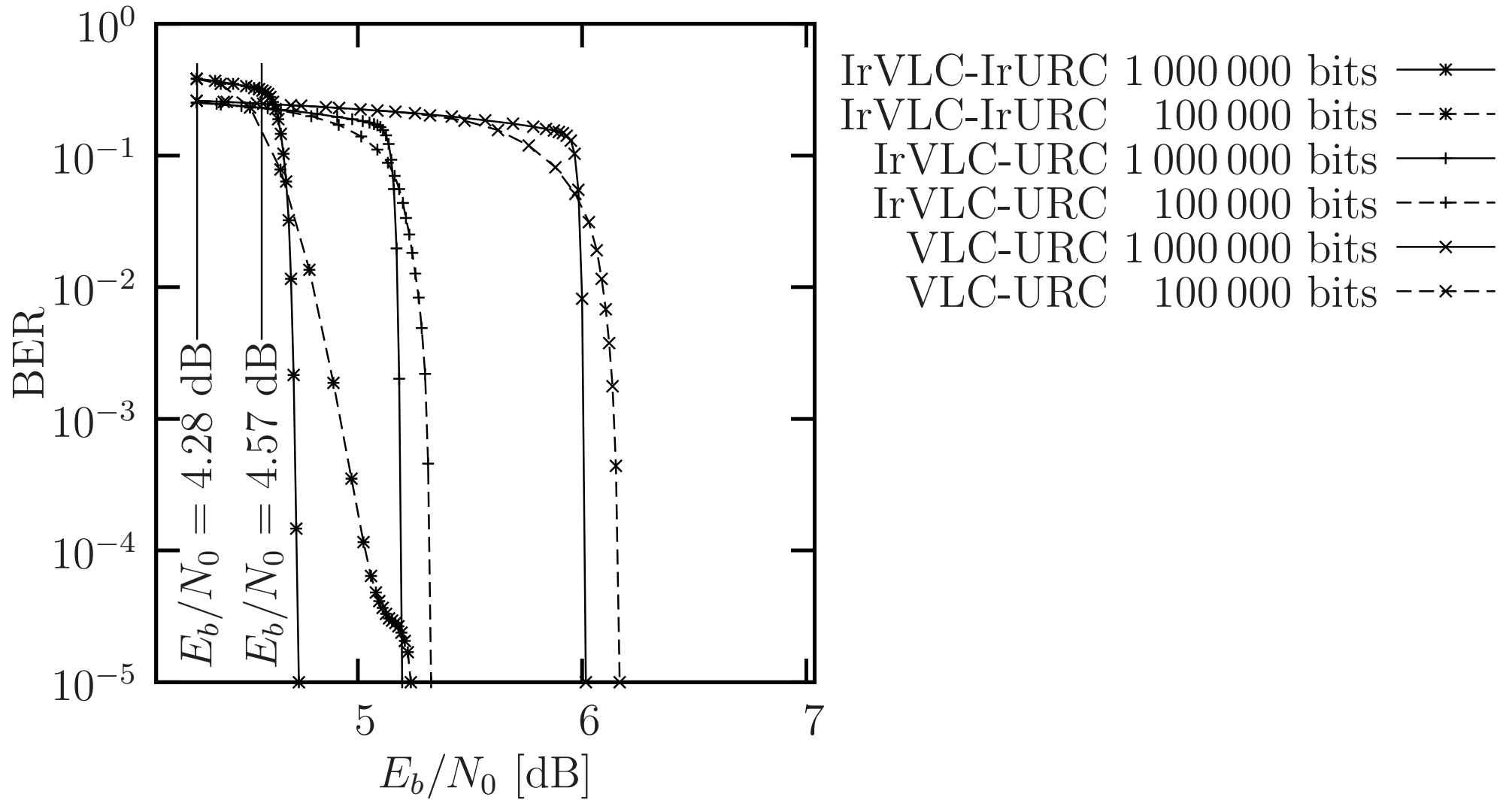
EXIT chart matching accuracy



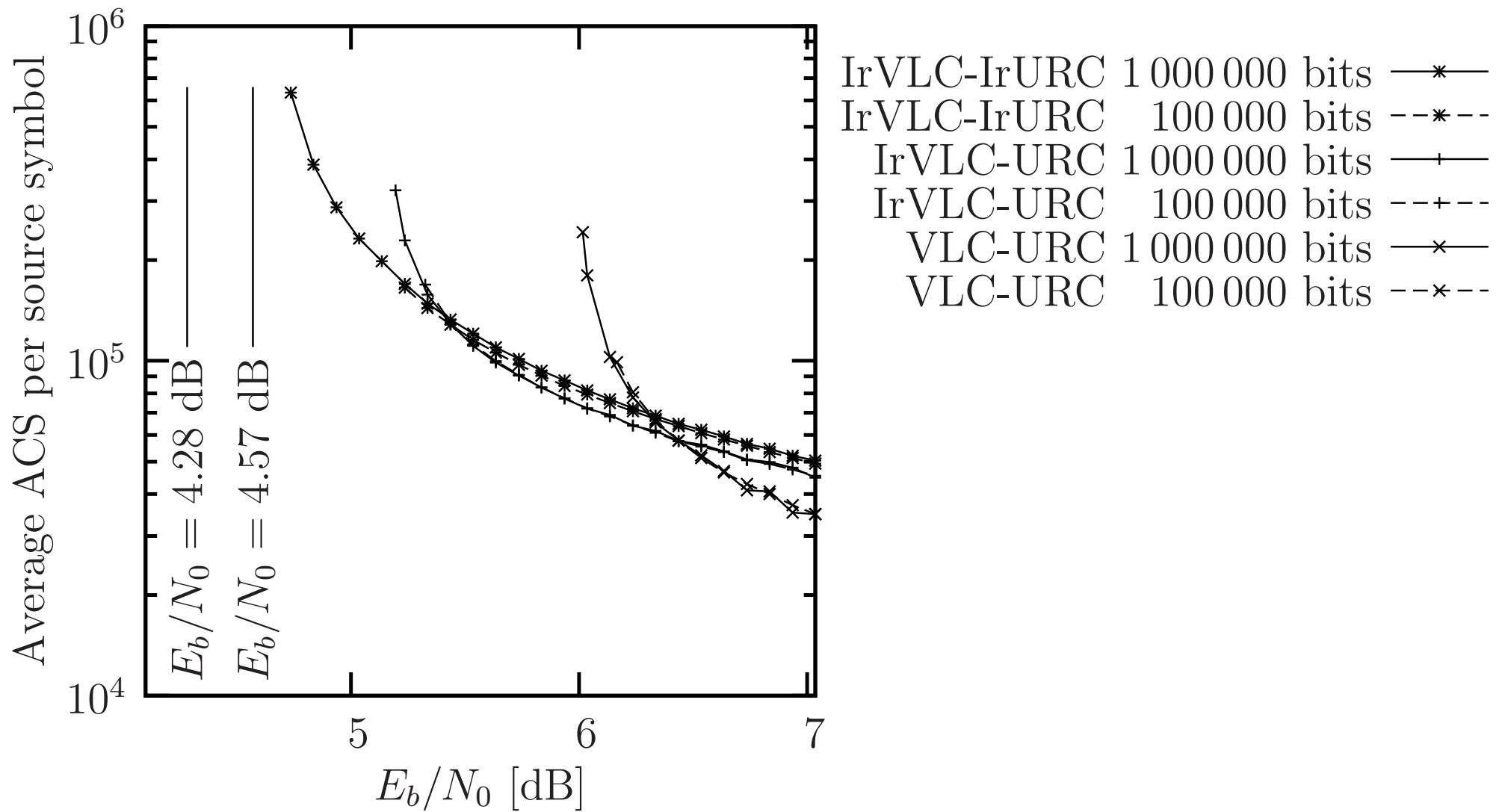
EXIT charts



BER performance



Decoding complexity



Summary

- ❑ Serial concatenations of regular and irregular codes
- ❑ EXIT chart matching
- ❑ BER and complexity performance results

