Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [**Super-orthogonal convolutional (SOC) coding for Tg4a**]

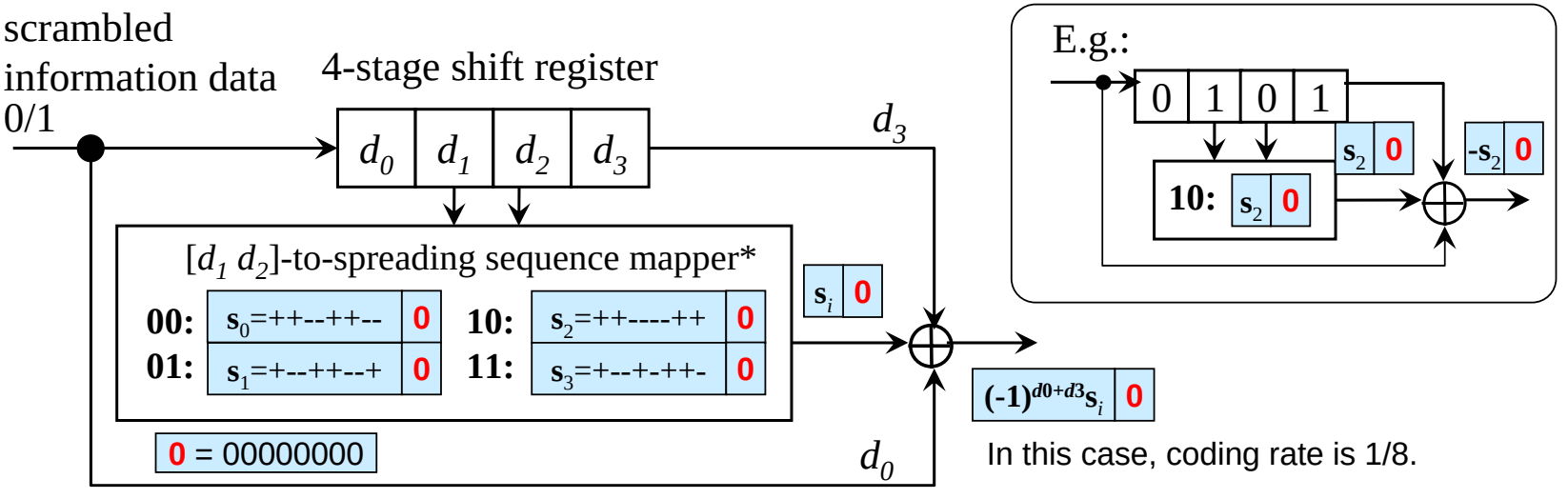
Date Submitted: [10 August 2005]

Source: [Ryuji Kohno, Kenichi Takizawa, Tomoko Matsumoto]
Company [National Institute of Information and Communications Technology (NICT)]
E-Mail: [takizawa@nict.go.jp]

Abstract [Simulation results of super-orthogonal convolutional (SOC) codes]

Purpose: [Assist the group in the selection of a modulation scheme]

K=4 SOC encoder for coherent receiver



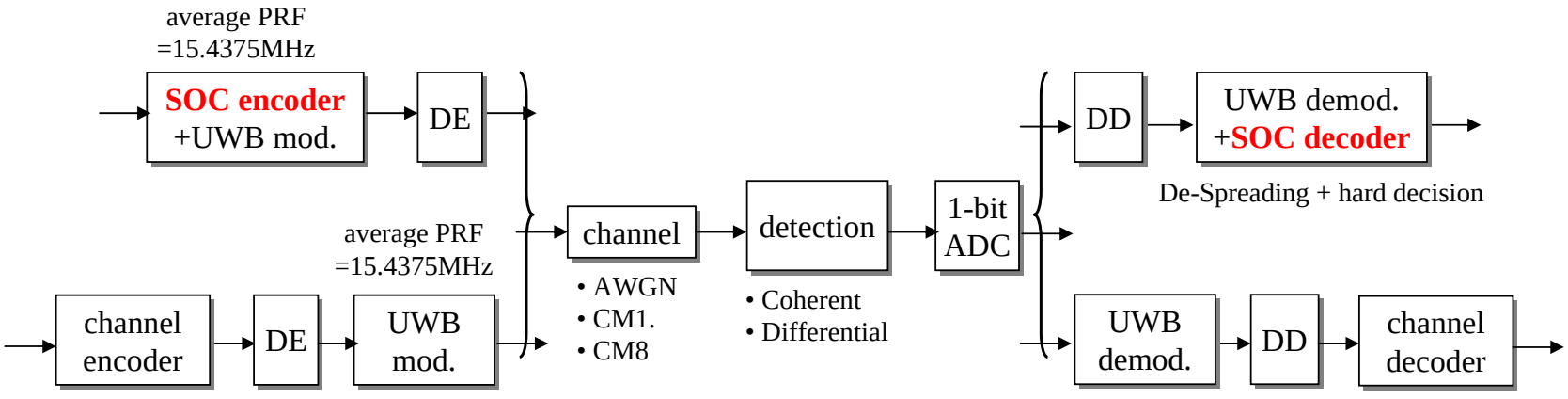
In this case, coding rate is 1/8.

*: this is one example. We can also use the PPM mapping (Option ||| shown in doc.428-02).

00:	s_0=+ + - - + + - -	0 0 0 0 0 0 0 0	**10:**	s_1=+ - - + - + + -	0 0 0 0 0 0 0 0
01:	0 0 0 0 0 0 0 0	s_0=+ + - - + + - -	**11:**	0 0 0 0 0 0 0 0	s_1=+ - - + - + + -

By changing the set of spreading codes, SOC is applicable to Non Coherent receiver

System model

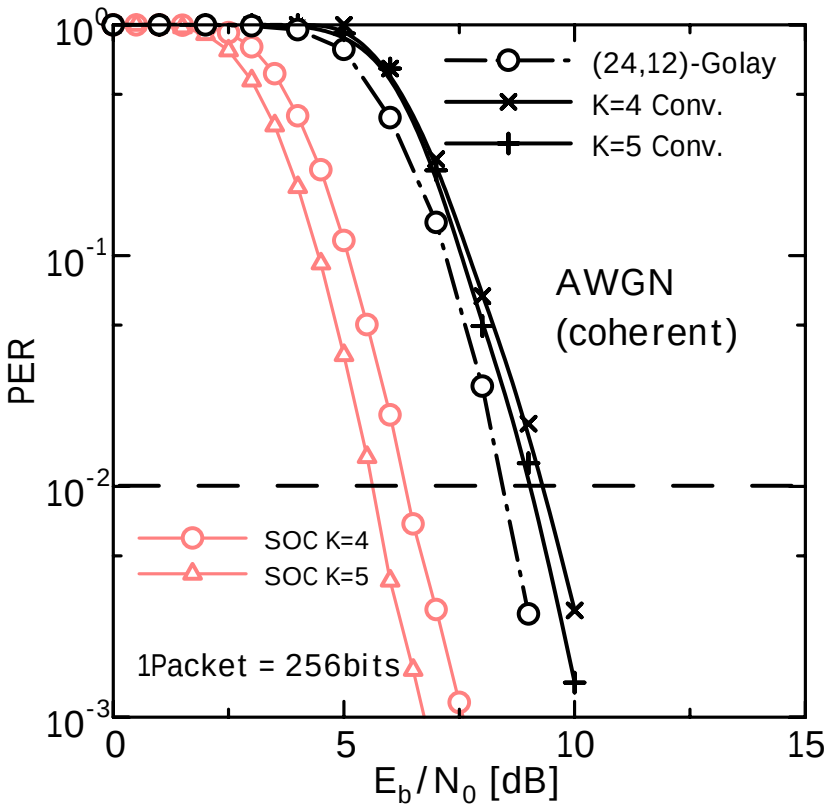


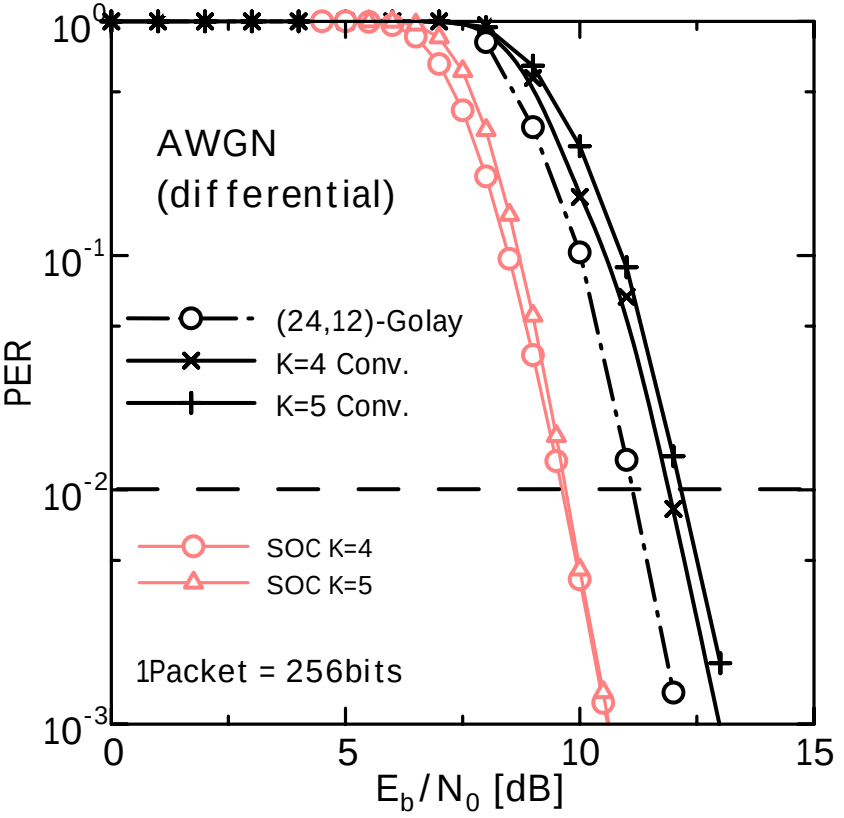
- Convolutional code (K=4 [15,17] or K=5 [23,35])
- (24,12)-Extended Golay

DE: Differential encoding DD: Differential decoding

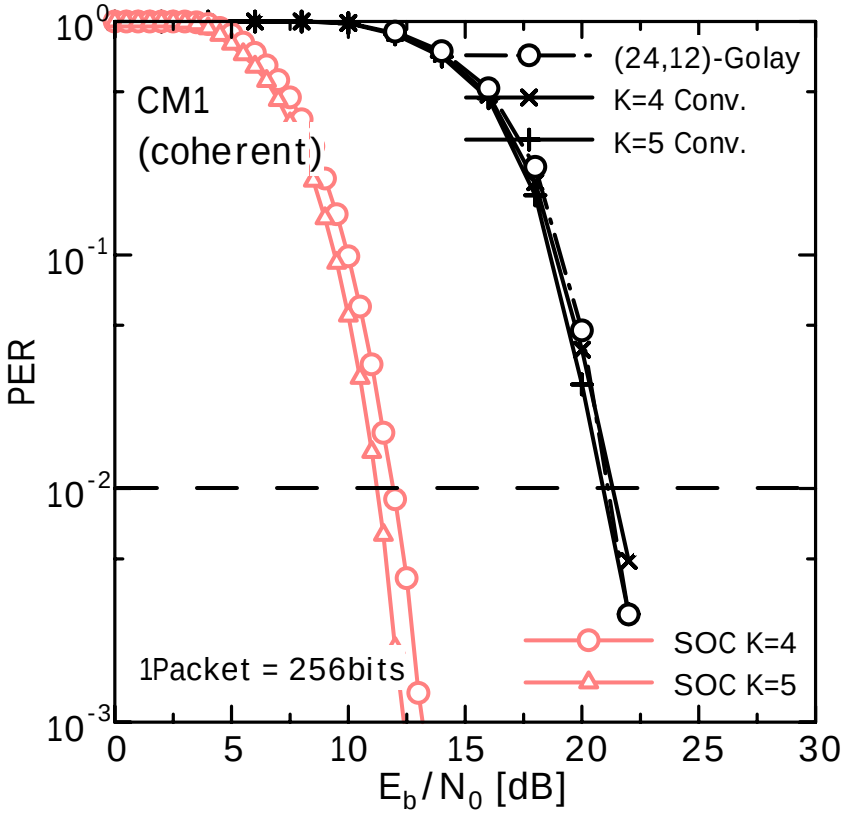
	K=4 SOC	K=5 SOC	K=4 Conv.	K=5 Conv.	(24,12)-Golay
Coding rate	1/4	1/8	1/2	1/2	1/2
Spreading rate	1/4	1/2	1/8	1/8	1/8
Gate count (decoder)	~8K	~32K	~4K	~8K	~1K

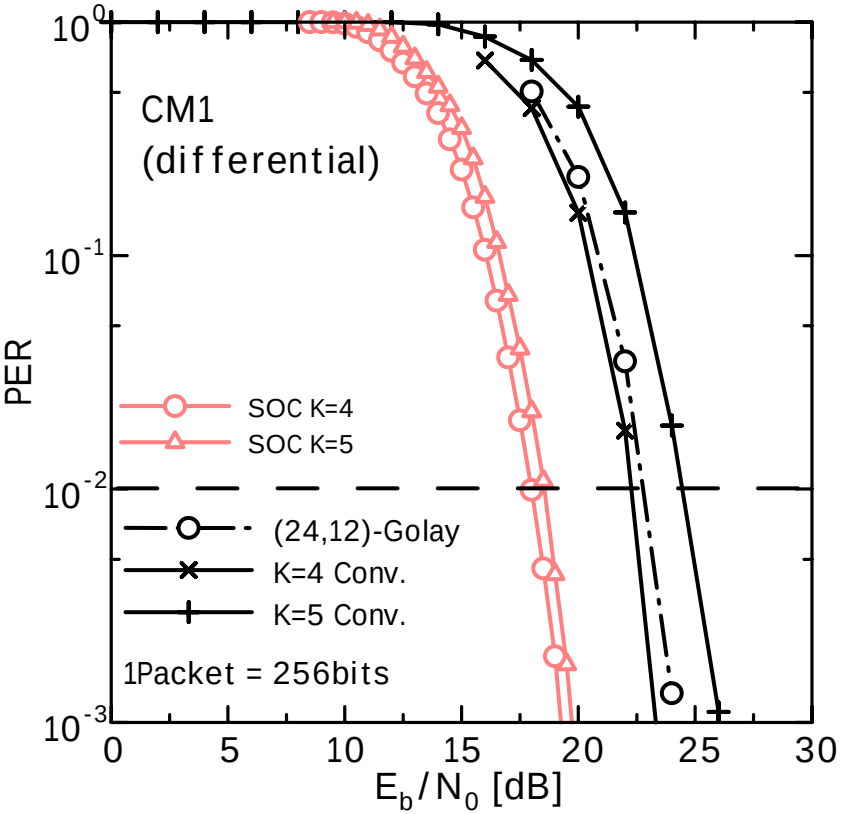
Simulation results (AWGN)



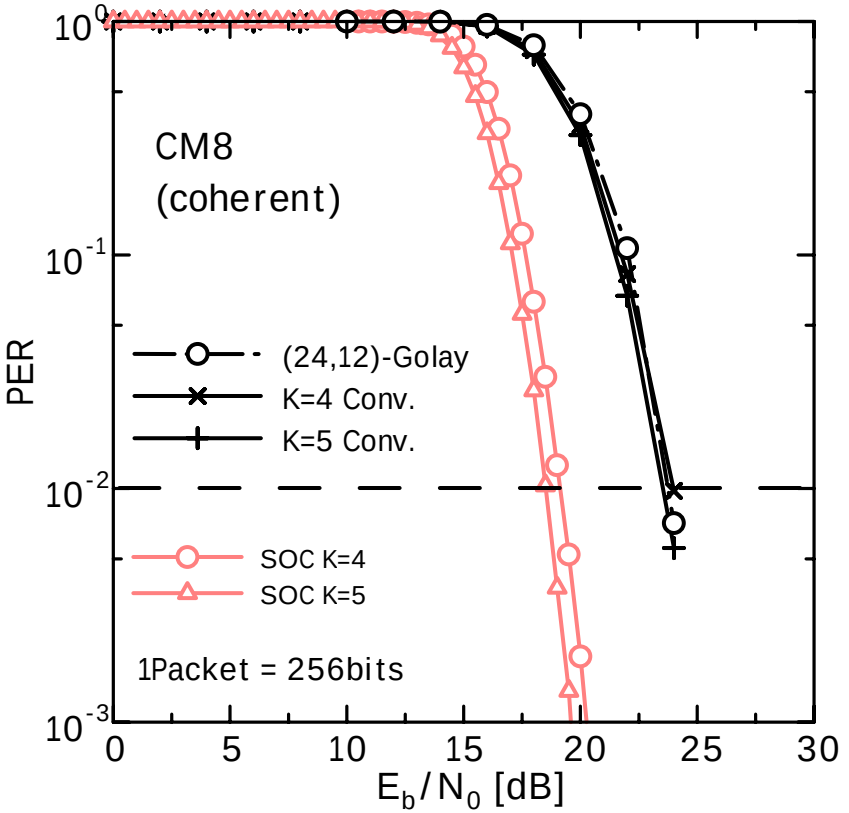


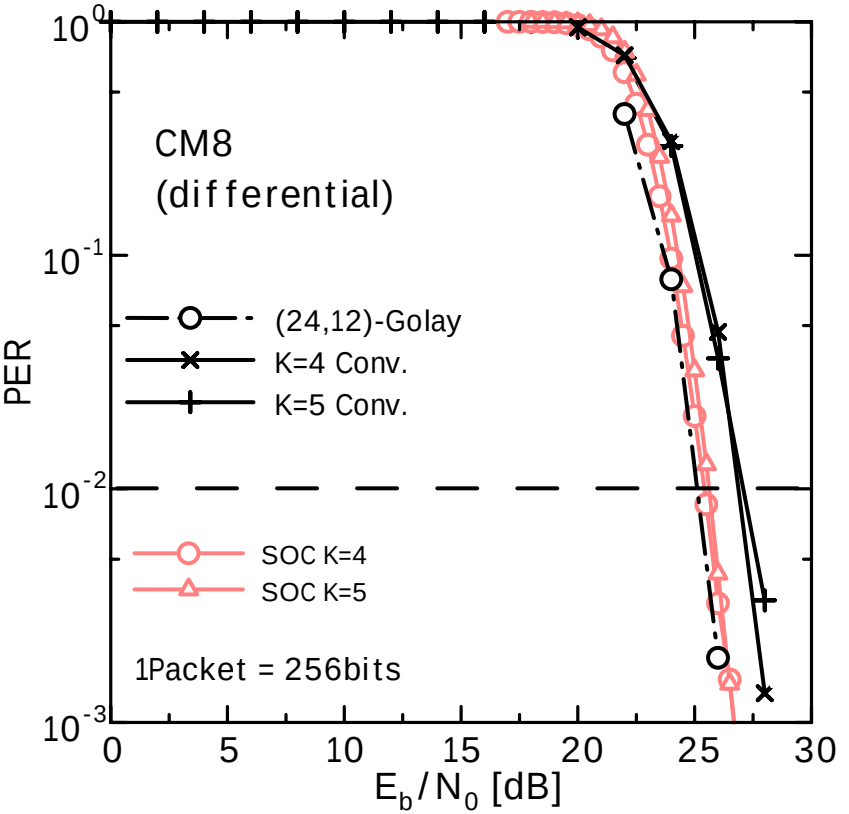
Simulation results (CM1)





Simulation results (CM8)





Conclusions

	PER performance			Decoder complexity (gate count)
	AWGN	CM1	CM8	
K=4 SOC	+/++	+/++	+/+	**~8K**
K=5 SOC	++/+	++/+	++/+	~32K
K=4 Convolutional	-/-	-/-	-/+	~4K
K=5 Convolutional	-/-	-/-	-/+	~8K
(24,12)-Golay	-/-	-/-	-/++	~1K

Since K=4 SOC provides good performance with low complexity, we recommend it as an error correcting code for Tg4a.