TSG-RAN Working Group1 meeting #7
Hannover, Germany, Aug.30-Sept.3, 1999

TSGR1#7(99)c49

Agenda Item : ad-hoc 3

Source : Nortel Networks

Title : Additional performance results for Golay-Hadamard preamble sequences

Document for : Decision

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1. Introduction

This document provides additional results for the Golay-Hadamard RACH preambles proposed by Nortel in R1-(99)990. These results show equivalent detection performance for Golay-Hadamard sequences as for PN-Hadamard sequences.

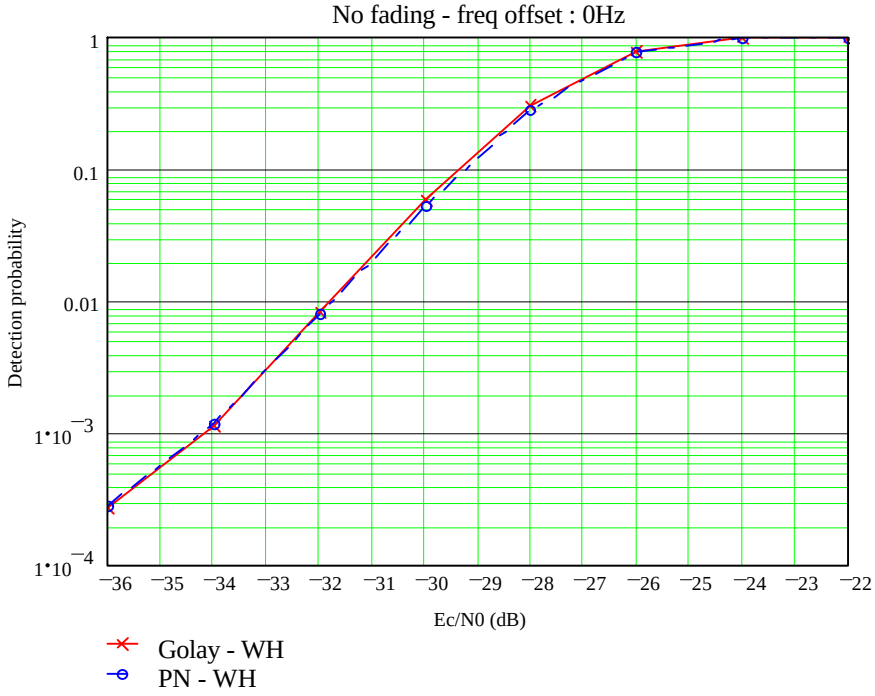
3. Performance Results

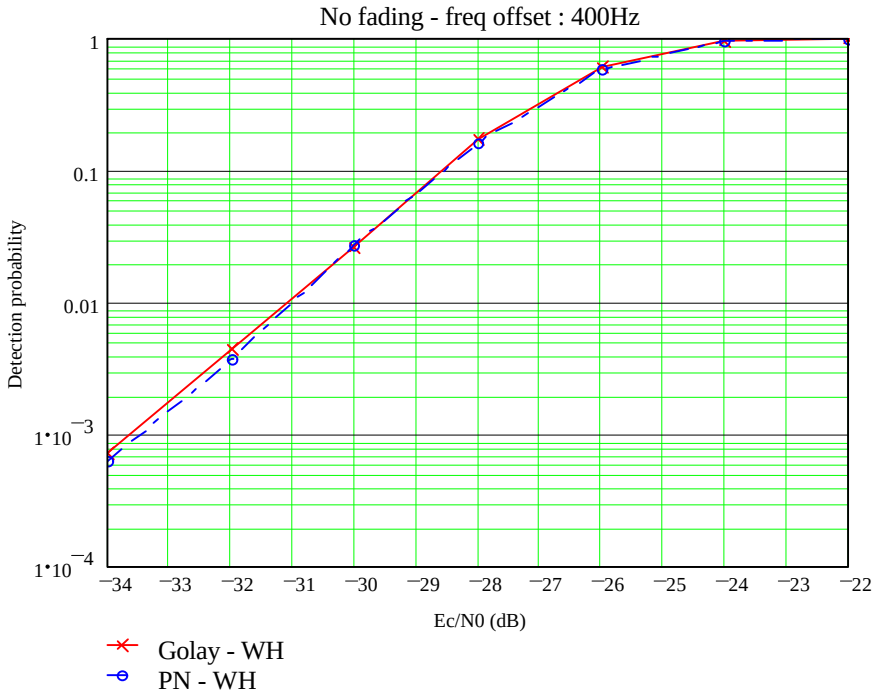
3.1 Simulation conditions:

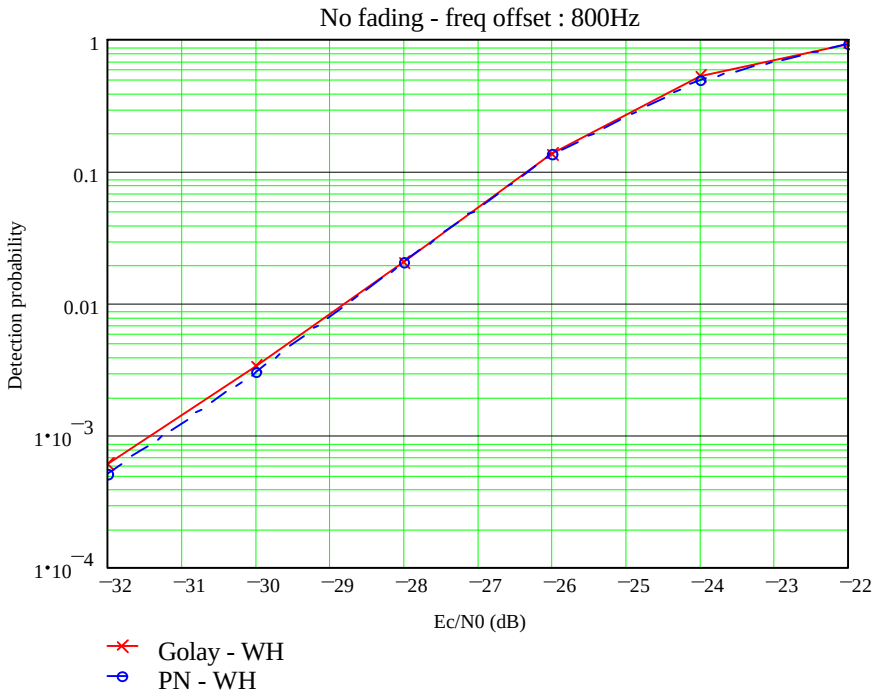
The simulations are conducted under the following conditions : an arbitrary selected preamble is transmitted with a transmission delay uniformly chosen within a window of 956 chips (cell size of 35 km), the decision statistics of the transmitted preamble is computed by using coherent accumulation for each Hadamard code (signature) and each position of the searching window. The maximum of the these statistics is selected and then compared to a threshold to make a hypothesis test to evaluate the preamble signature detection probability. The threshold is determined such that the false alarm probability is set to 0.001.

Two types tests are performed: (1) High frequency offset (2) High speed Rayleigh fading. In Figure 6,7 the preamble detection in the presence of high frequency offset are presented for both Golay-Hadamard signature and PN-Hadamard signature. In Figure 8,9 the high speed Rayleigh fading channel detection performance are presented

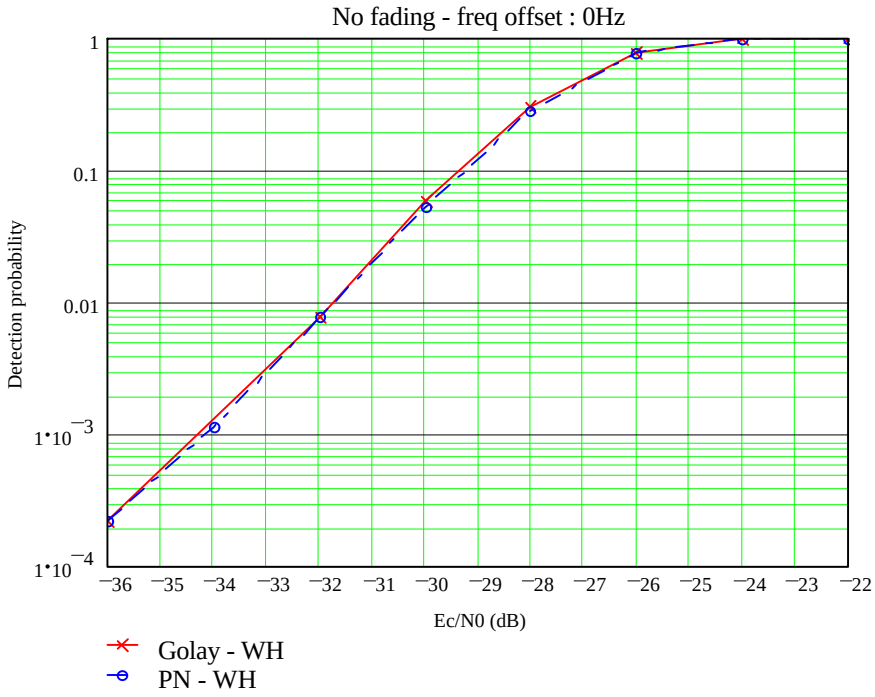
3.2 Frequency offset (searching window : 1016):

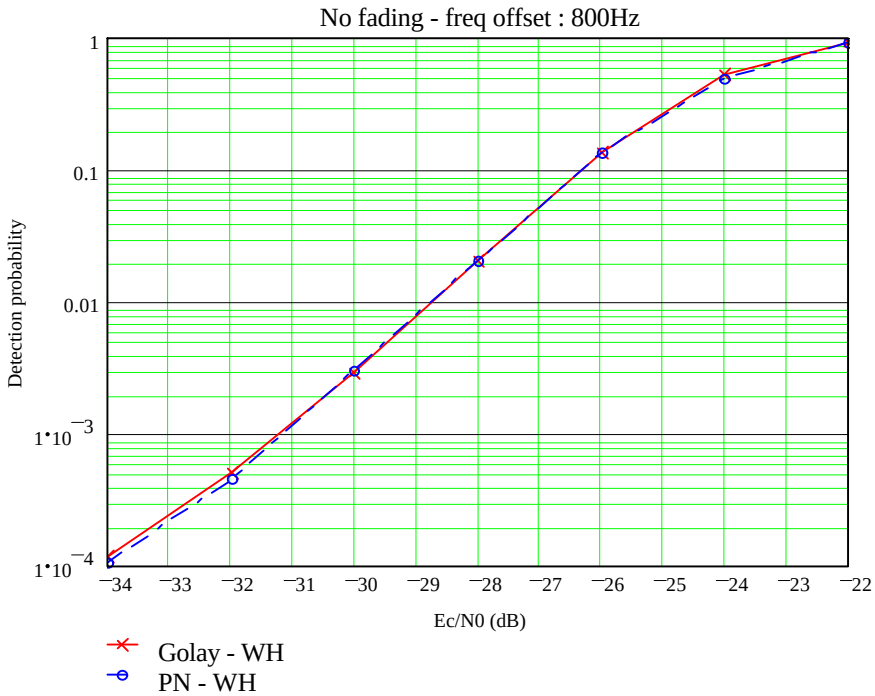




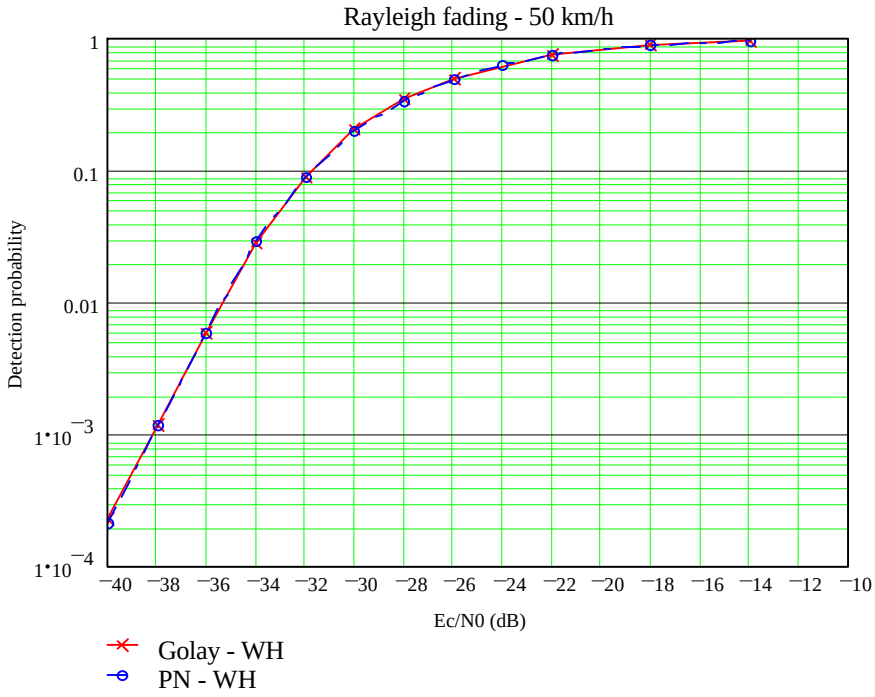

No fading - freq offset : 800Hz
Detection probability
1
0.1
0.01
1•10^−3
1•10^−4
−32
−31
−30
−29
−28
−27
−26
−25
−24
−23
−22
Ec/N0 (dB)
Golay - WH
PN - WH

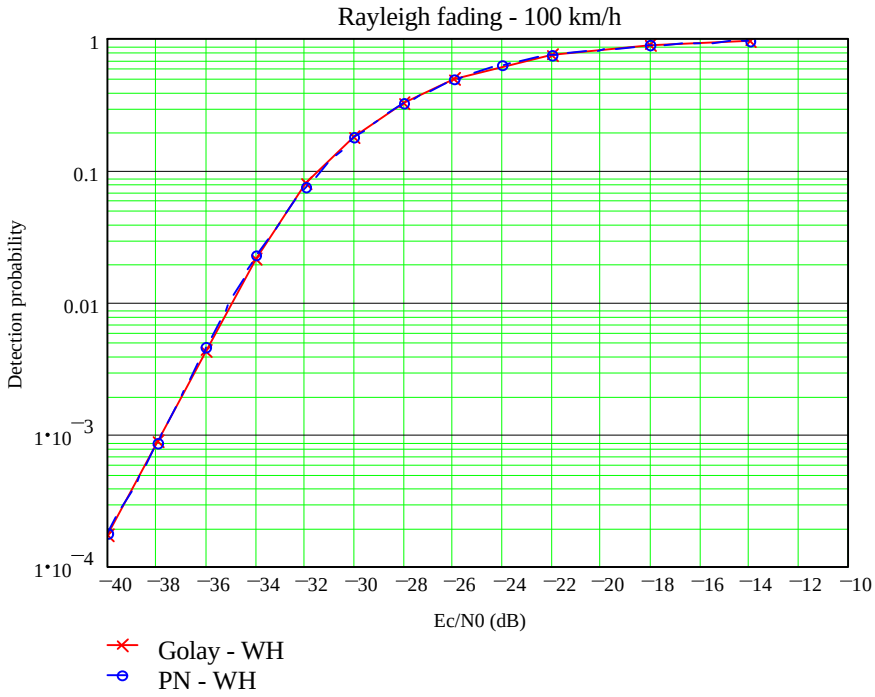
3.3 Frequency offset (searching window = 552 chips)



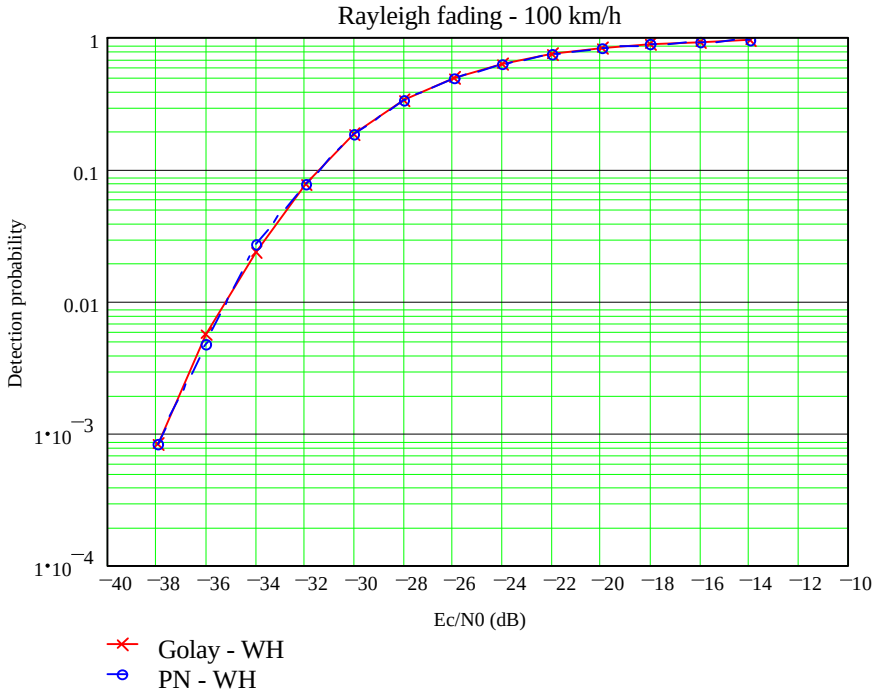


3.4 Rayleigh fading (searching window 1016 chips)





3.5 Rayleigh fading (searching window 552 chips)



5. Conclusions

The simulations results presented in this document confirm that the performance of Golay-Hadamard based preambles are the same as PN-Hadamard. Thus, taking into account the potential complexity reduction due to Golay properties, Golay-Hadamard sequences are proposed to be adopted as UTRA RACH preamble.