RFID Reliability Technique for Single Tag Interrogation

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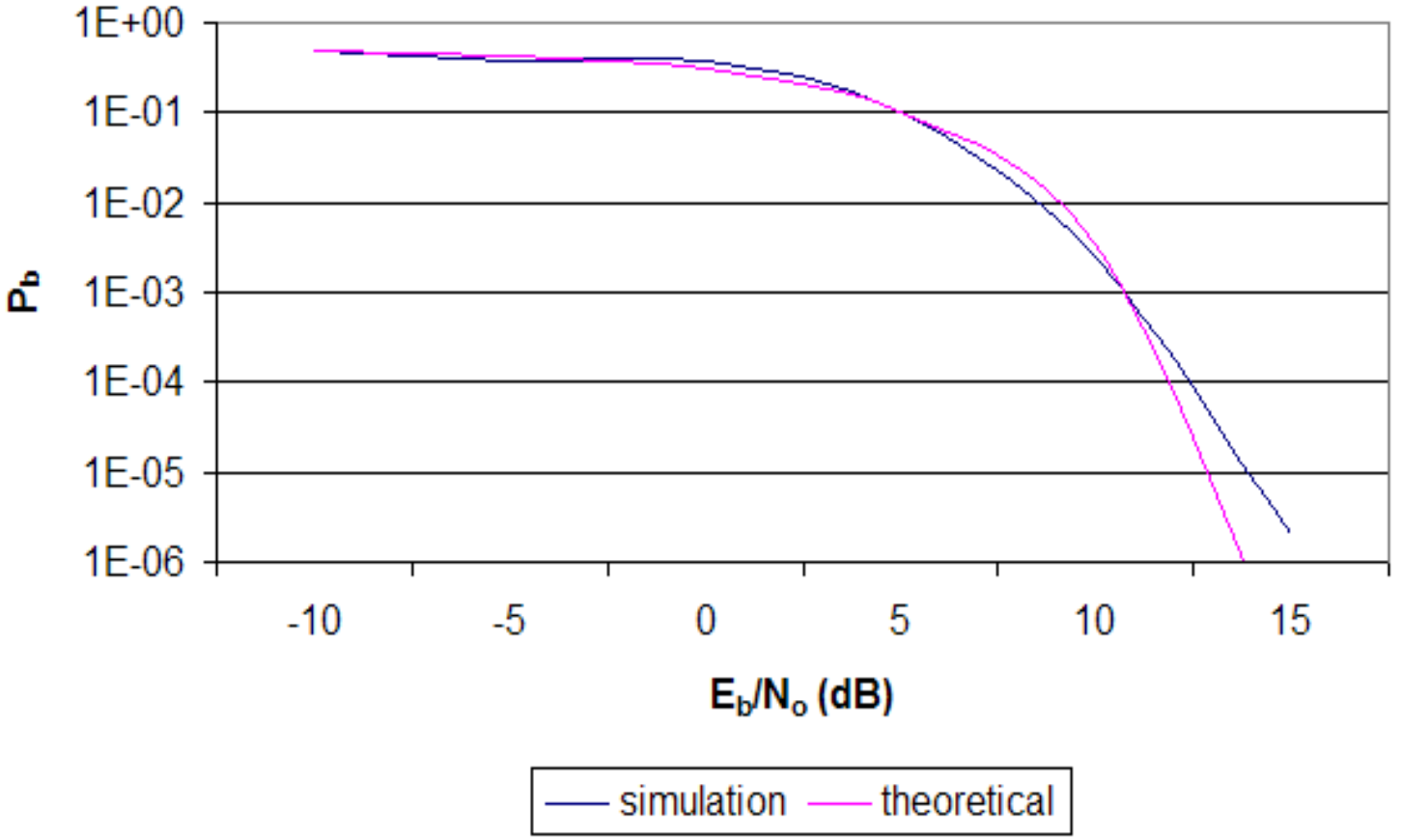
Purpose

Improving the read reliability of individual Radio Frequency Identification (RFID) tags is important to the military's goal of achieving a supply chain management system with item level tagging. Item level tagging improves the ability of suppliers to plan, meet demands and streamline business processes. The benefits to the military are a better inventory management, better productivity and improved asset tracking.

Research Objective

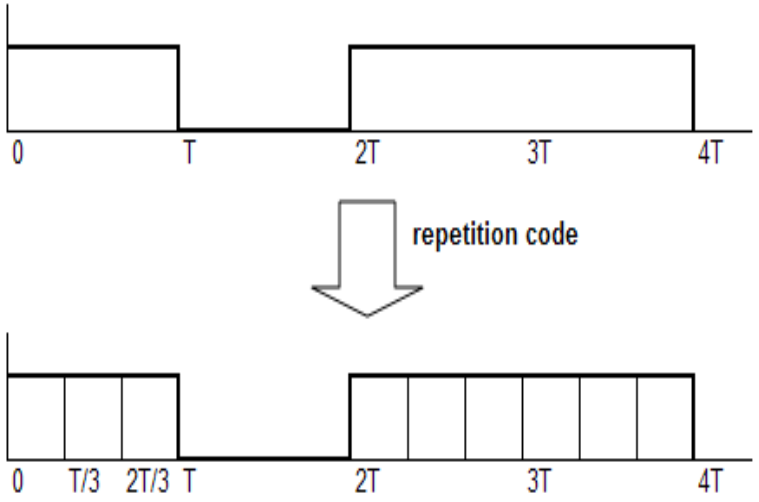
The objective of this study is to improve the read reliability of RFID systems. This study looks at the current RFID technology, focusing on the problems and limitations of the technology, when deployed in a single tag to single reader environment.



Simulation results showing the bit error probability for non-coherent detection of OOK signals

12.5 dB E_b/N_o for 10^{-4} bit error probability

Repetition Code

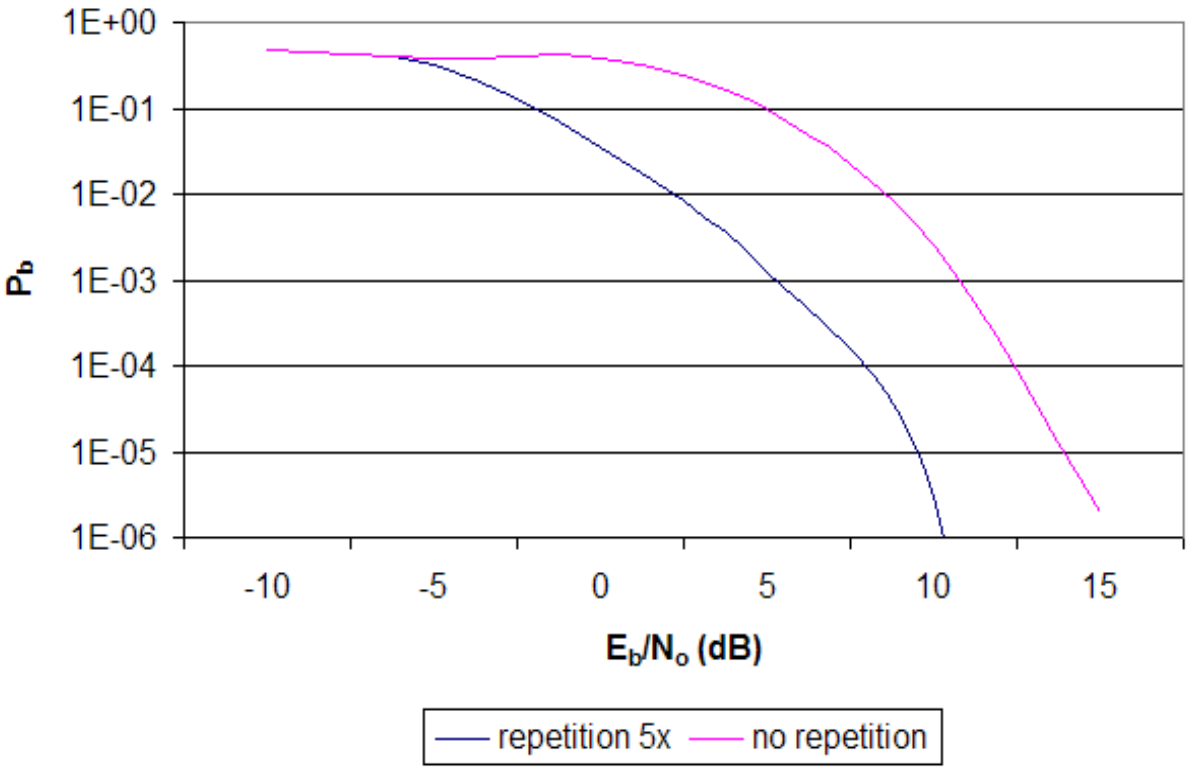


For a bit error rate, $P_b = 10^{-4}$,

an improvement of close to

4 dB is observed.

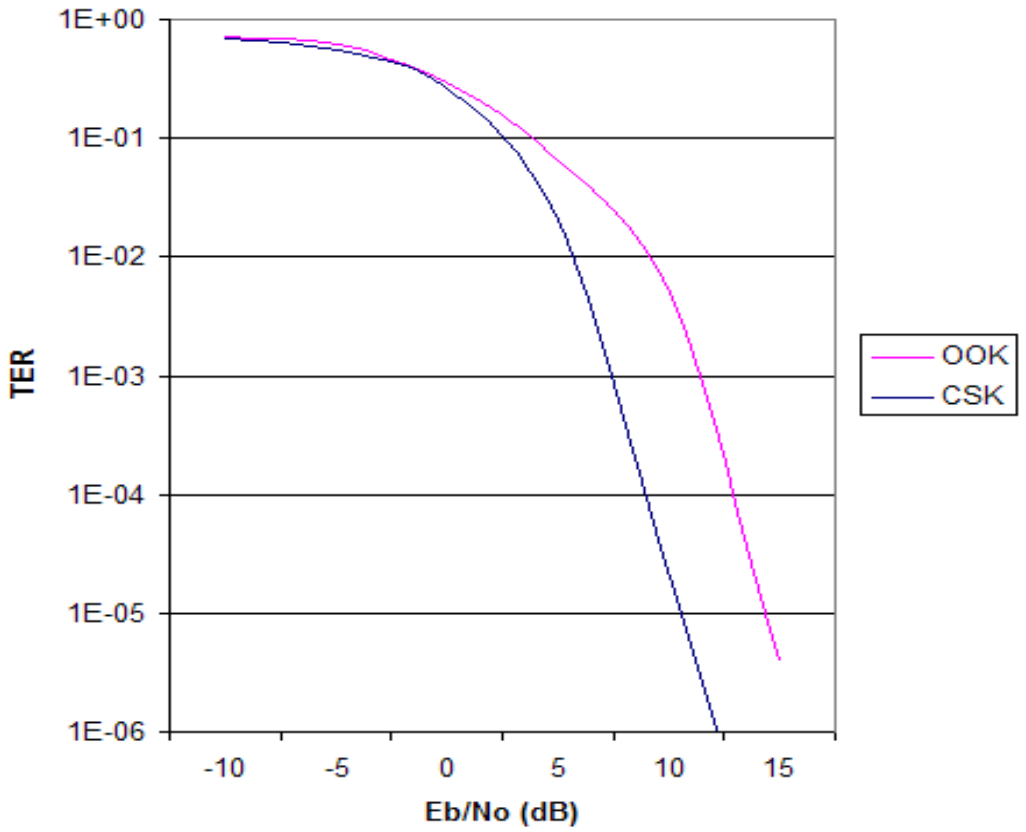
As repetition increases, performance increases but consumes large amount of bandwidth.



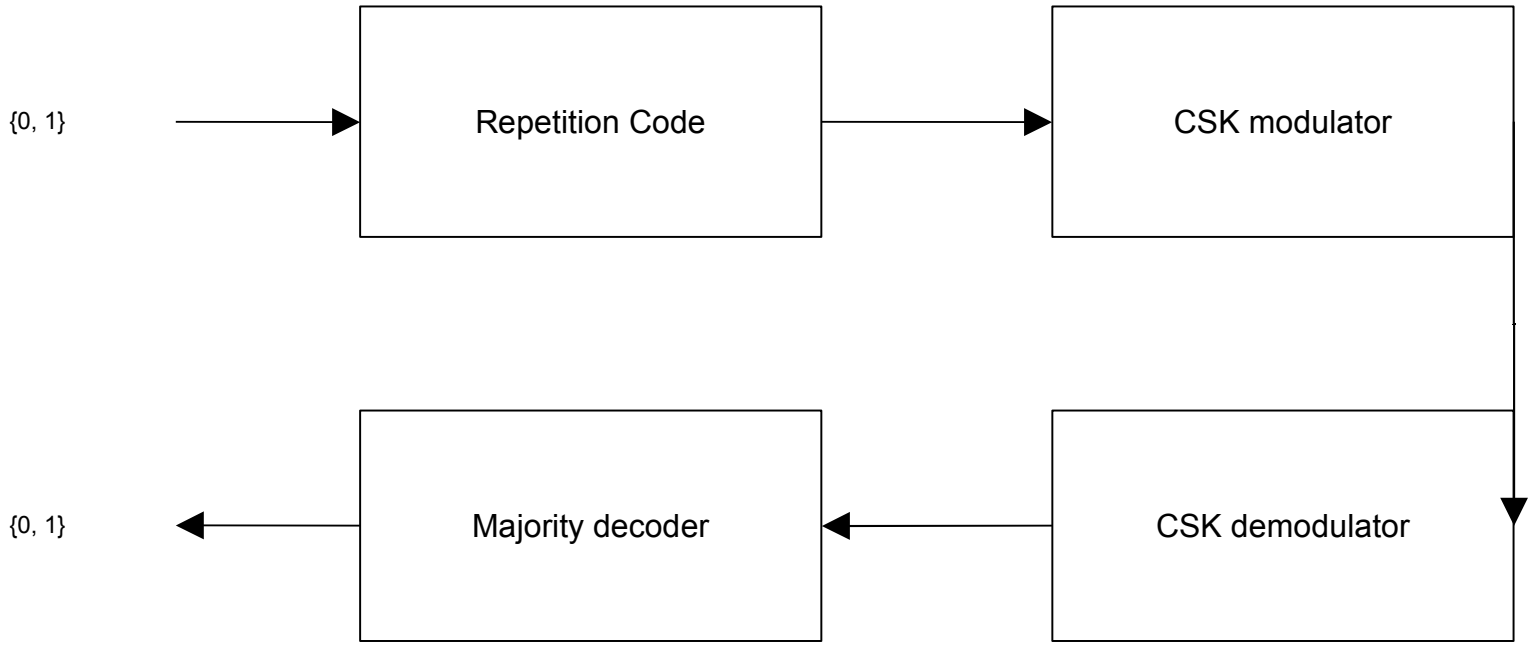
Code Shift Keying

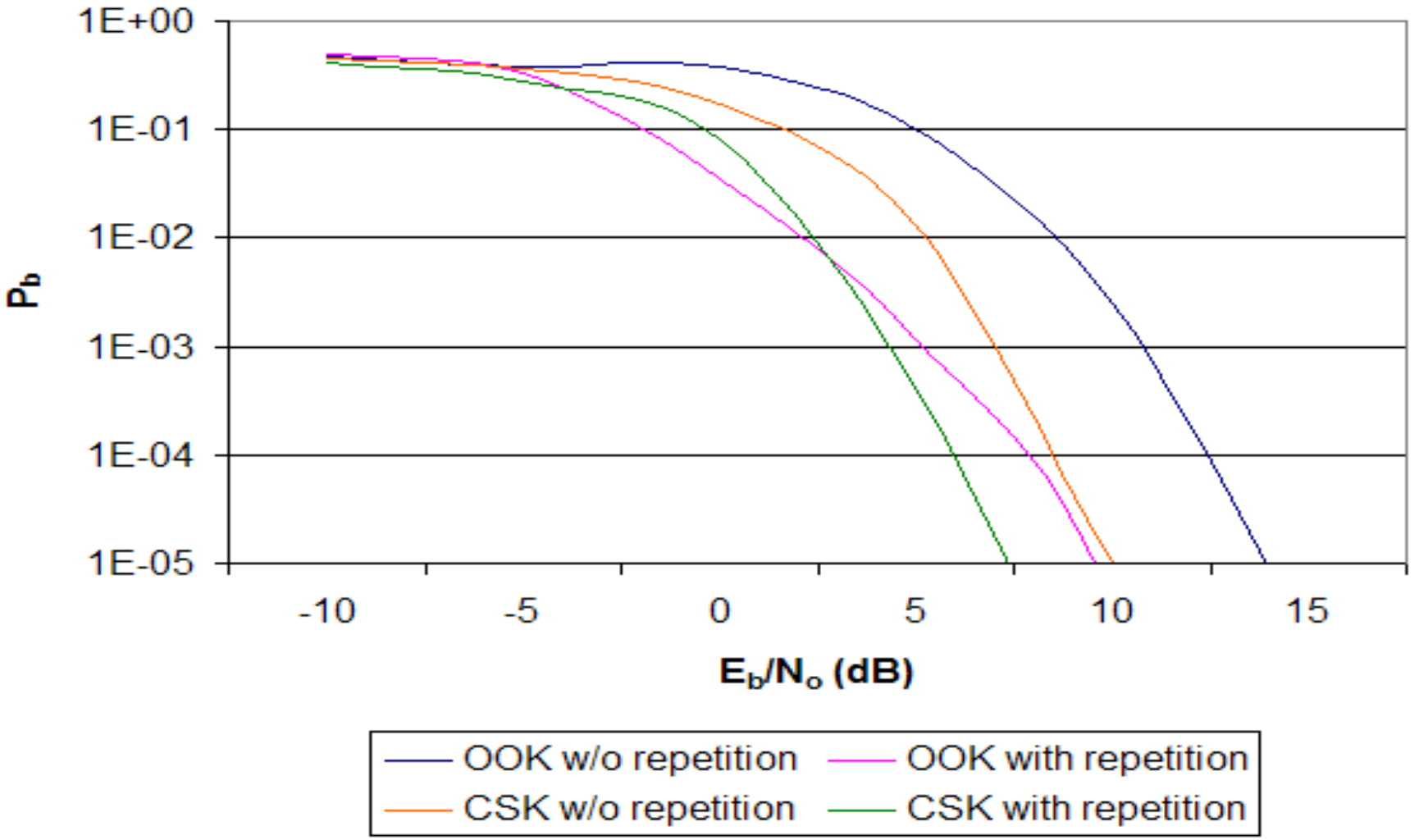
Utilizes a set of $M=2^k$ orthogonal sinusoidal Walsh functions to represent a set of M distinct k-bit symbols, where M is a power of 2.

At a tag error rate of 10^{-5}, an improvement of close to 4 dB is observed.



Repetition Code and Code Shift Keying Combo





Repetition before CSK improves the performance, e.g., 10^{-4} P_b requires around 6 dB of SNR as compared to OOK wich requires 12.5 dB.