

Timing Offset Synchronization using Gardner Timing Error Detector (TED) Algorithm

Theresh Babu, Sandeep Kumar and G V V Sharma*

CONTENTS

1 Gardner TED 1

1. GARDNER TED

Let the m th sample in the r th received symbol time slot be

$$Y_r(m) = X_r + V_r(m), \quad r = 1, \dots, N, m = 1, \dots, M. \quad (1.0.1)$$

where X_r is the m th transmitted symbol in the r th slot and $V_r(m) \sim \mathcal{N}(0, \sigma^2)$. The decision variable for the r th symbol is

$$U_r = Y_{r-1} \left(\frac{M}{2} \right) [Y_r(M) - Y_{r-1}(M)] \quad (1.0.2)$$

*The authors are with the Department of Electrical Engineering, Indian Institute of Technology, Hyderabad 502285 India e-mail: gadepall@iith.ac.in.