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Application of Chirp Transform Algorithm to Muzzle Velocity Measurement

Term Project

Advanced Digital Signal Processing

Presented By

나집

11th June 2013

Outline

- Introduction
- Previous Work
- Proposed Solution
- Simulation Results
- Conclusion

Introduction

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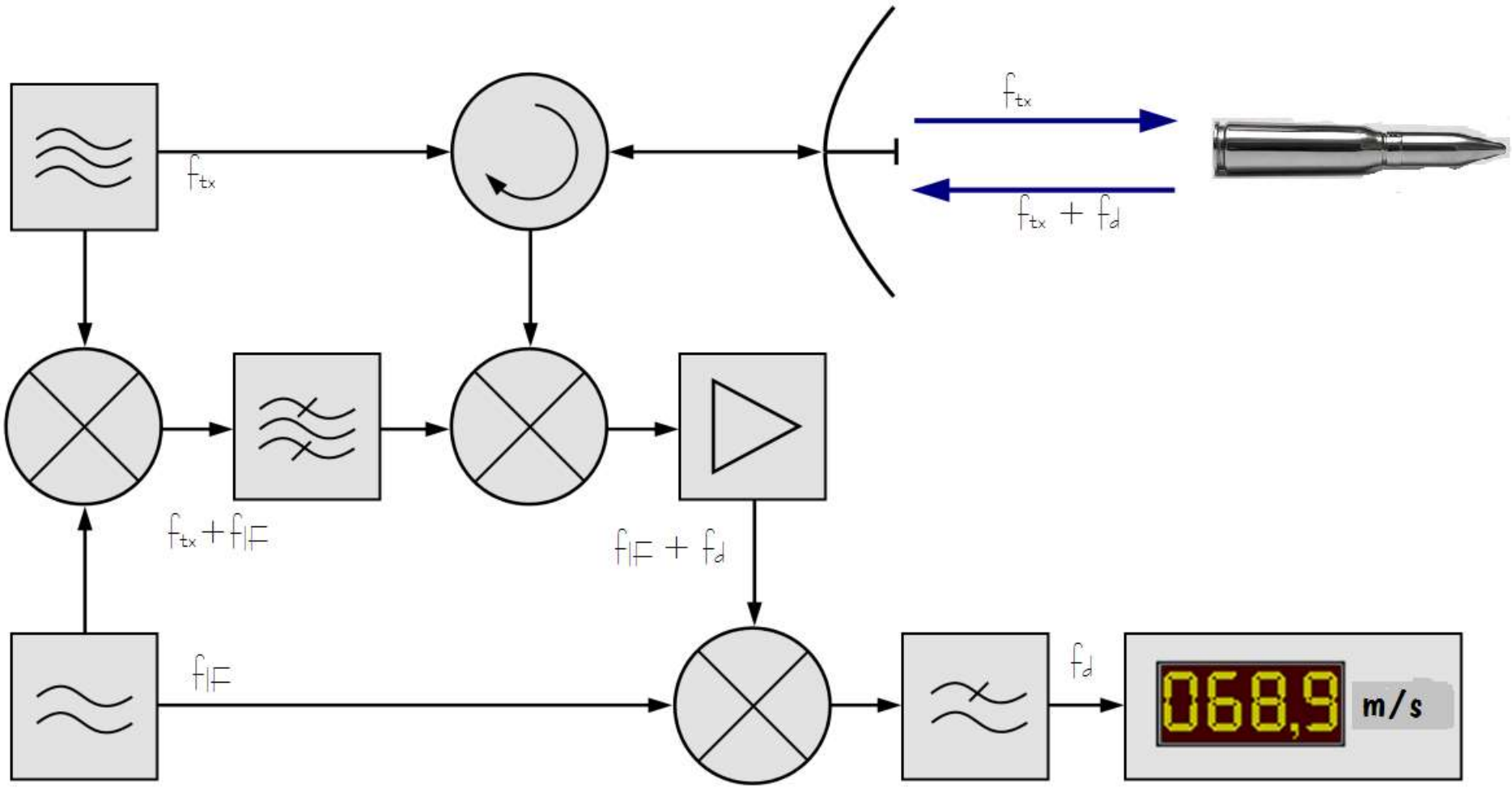
$$f_d = 2v\cos(\theta)/\lambda$$

Introduction



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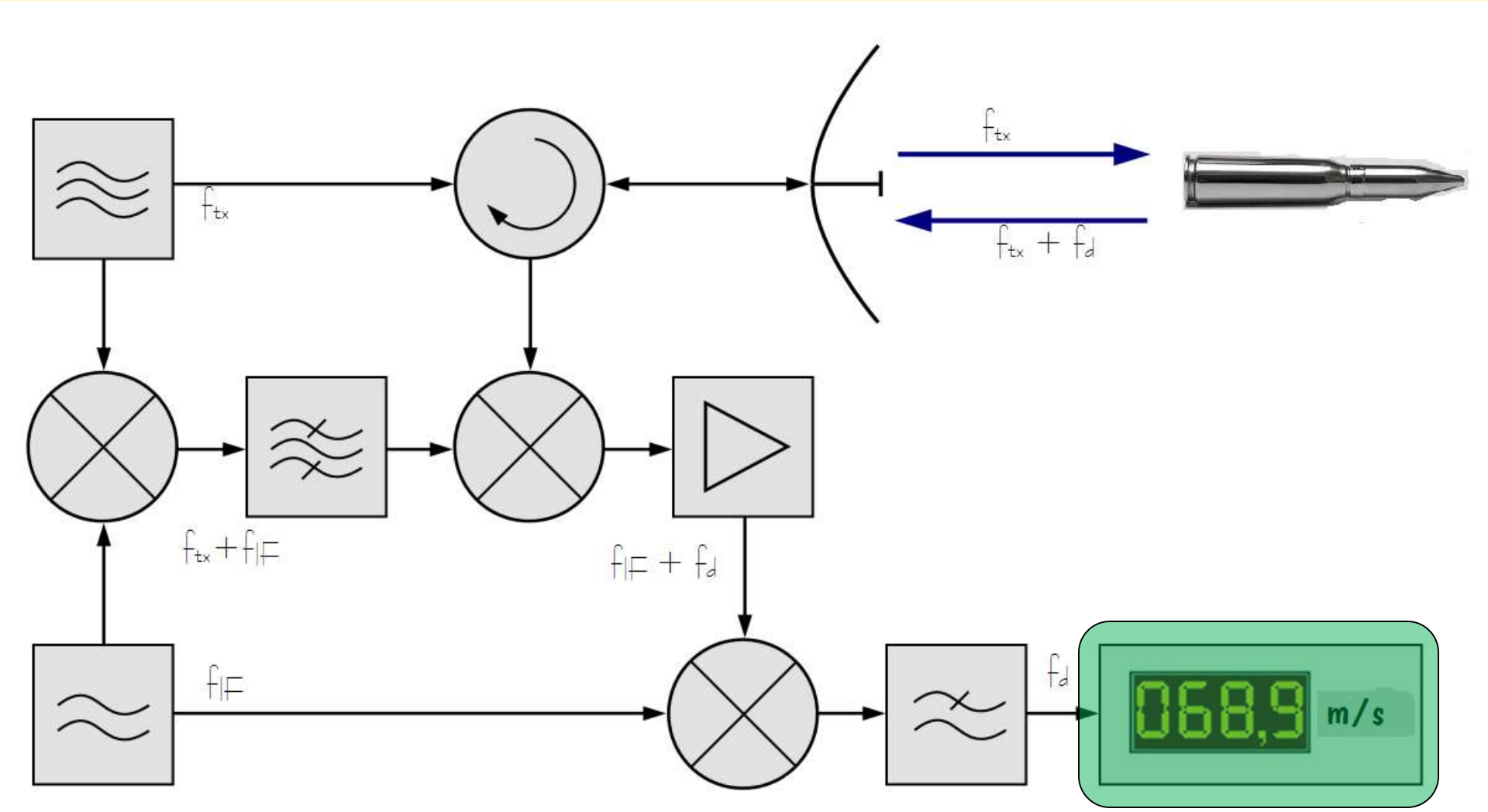

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- FFT has a resolution of $2\pi/N$ and we have very low N available
- Resulting in a very poor frequency resolution and consequently large errors in velocity estimation.

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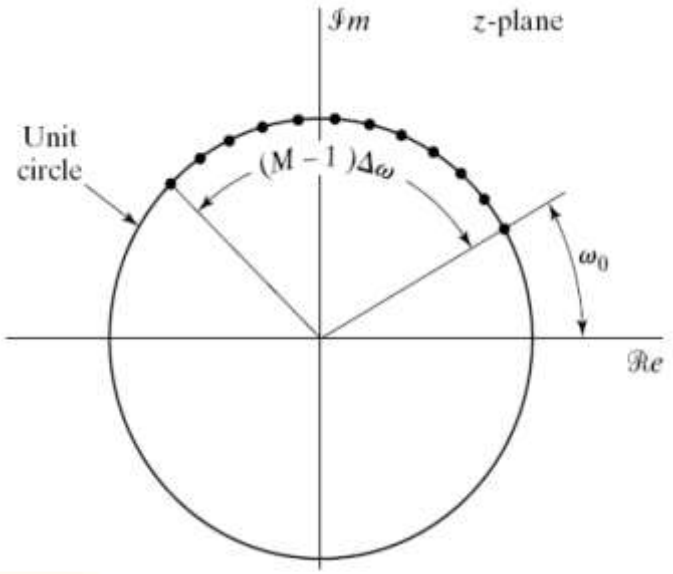

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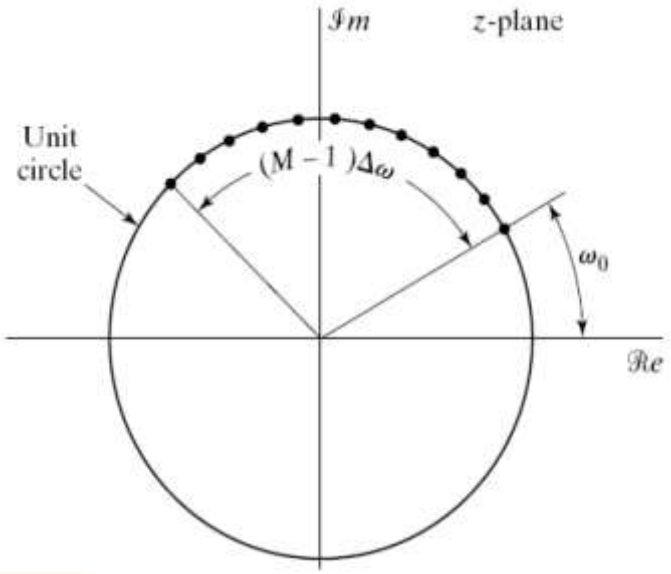

- $\omega_k = \omega_0 + k\,\Delta\omega$

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- Where

$$g[n] = x[n]e^{-jw_0 n}W^{n^2/2} \qquad W = e^{-j\Delta w}$$

$$h[n] = \begin{cases} W^{-n^2/2} & -(N-1) \le n \le M-1 \\ 0 & otherwise \end{cases}$$

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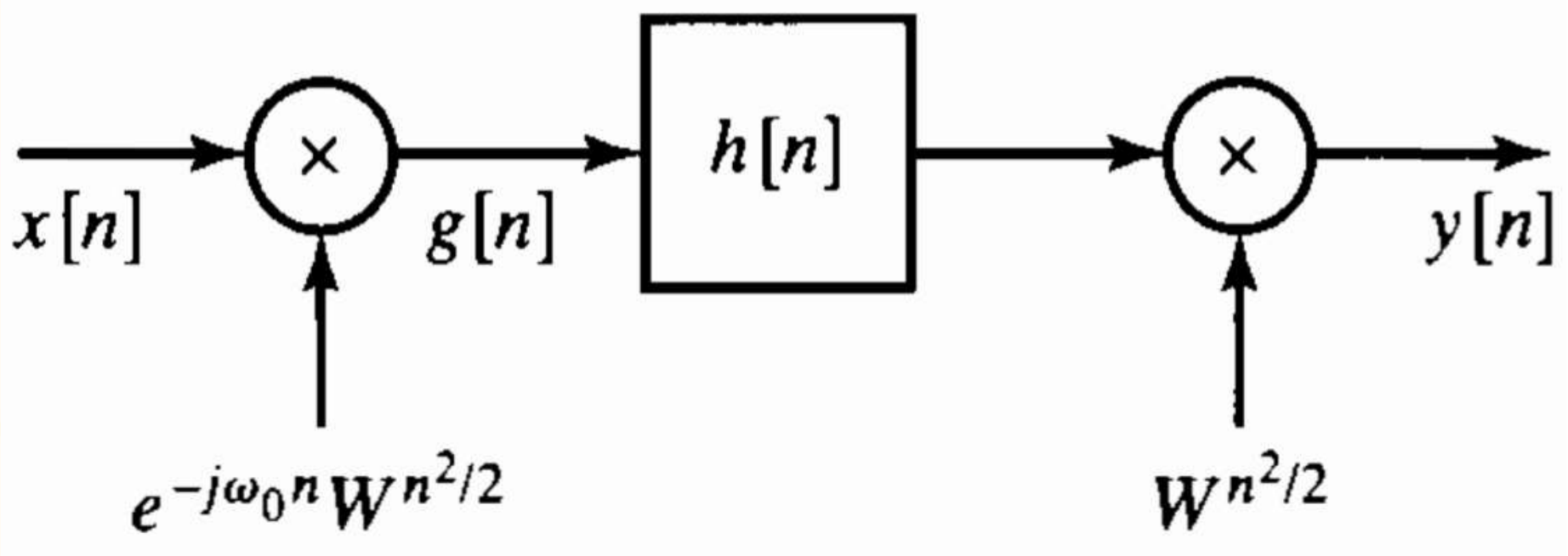
- The block diagram of CTA is shown



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- For the above simulation parameters the FFT and CTA were compared using Matlab

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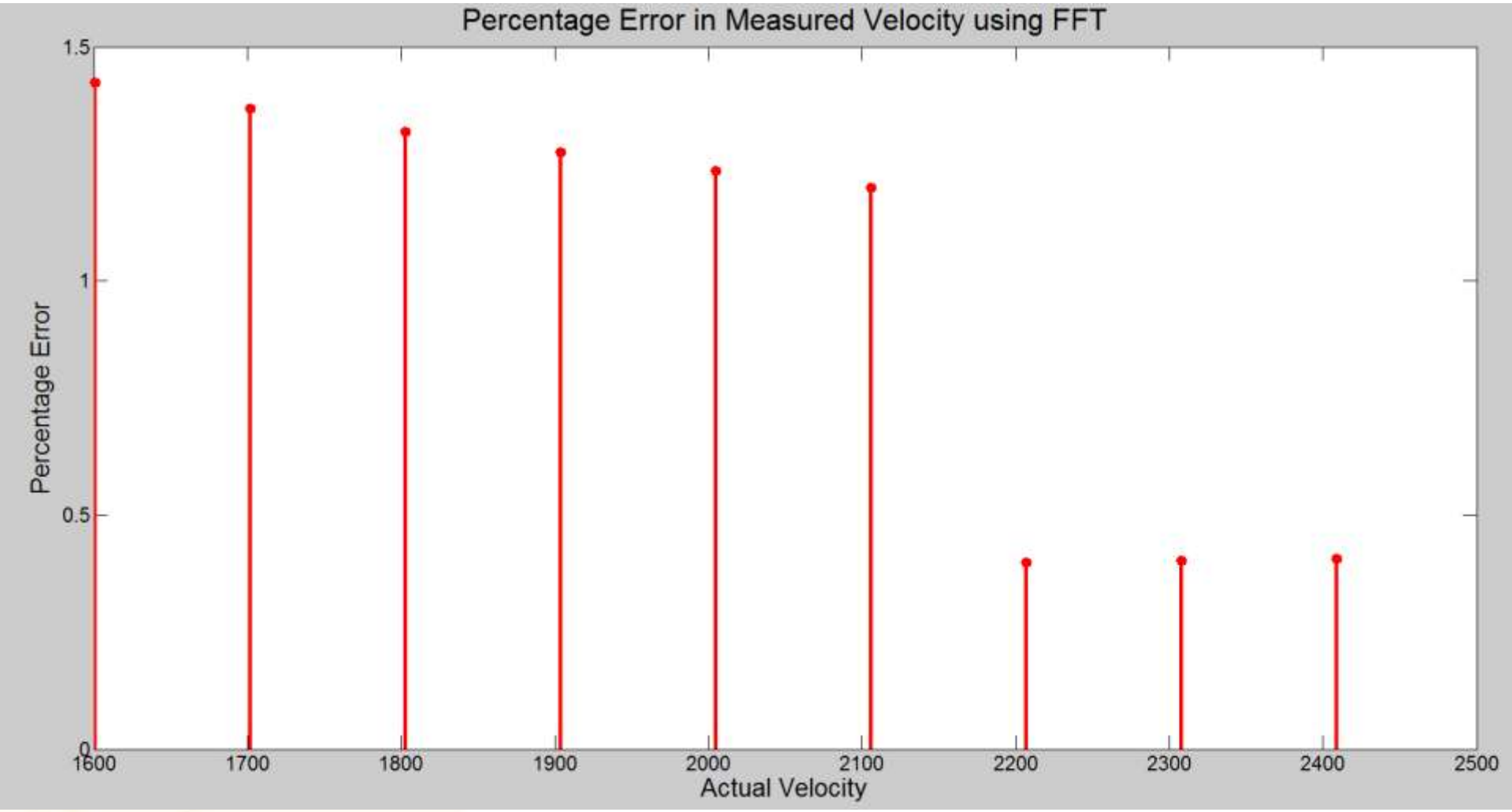

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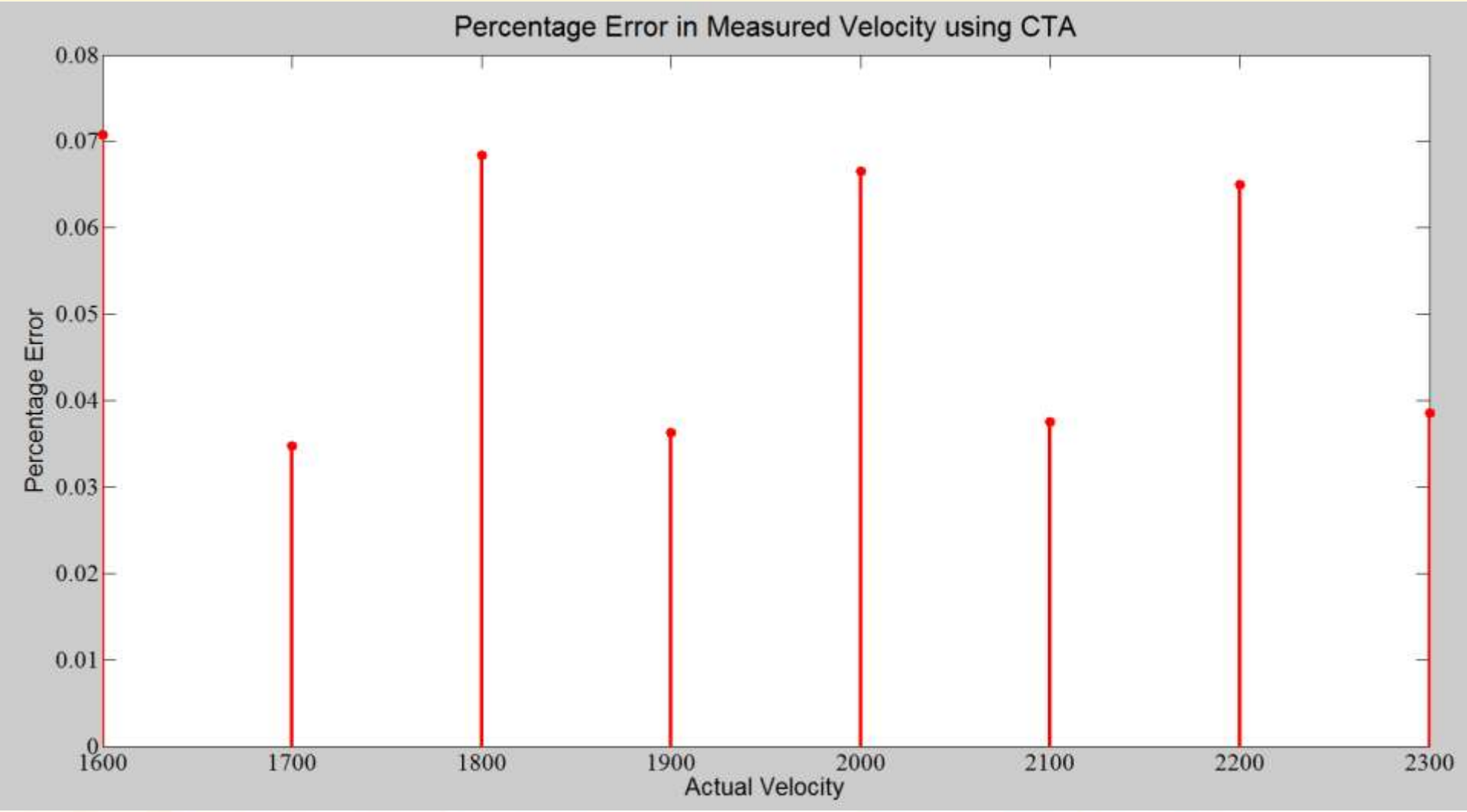

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- The Chirp Transform Algorithm was introduced as a useful tool to get high resolution in a particular frequency band
- Comparing the results of FFT and CTA we observed that the CTA provide better accuracy than FFT