MAYO CLINIC

Enhanced Electrophysiology Recording Improves Signal Acquisition & Differentiation

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Disclosures

- **BioSig Technologies**
  - **Tom Foxall**
  - **Sina Fakhar**
  - **Budimir Drakulic**
- **Consultants**
  - **Samuel Asirvatham**
  - **K L Venkatachalam**

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Introduction

- **Success rate of ablation inadequate**
  - **Suboptimal ablation techniques**
  - **Signal acquisition systems**

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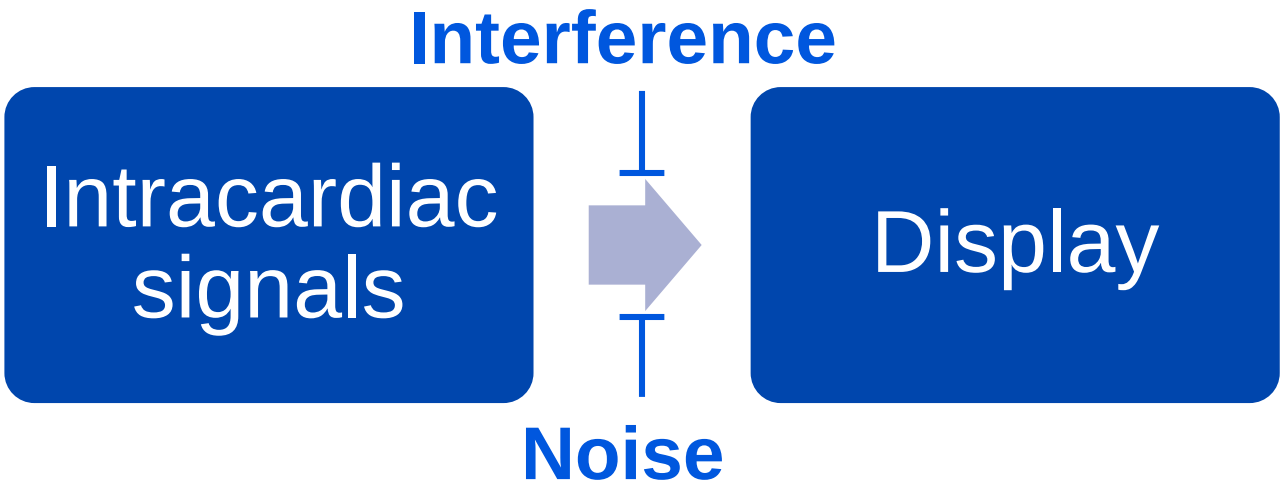
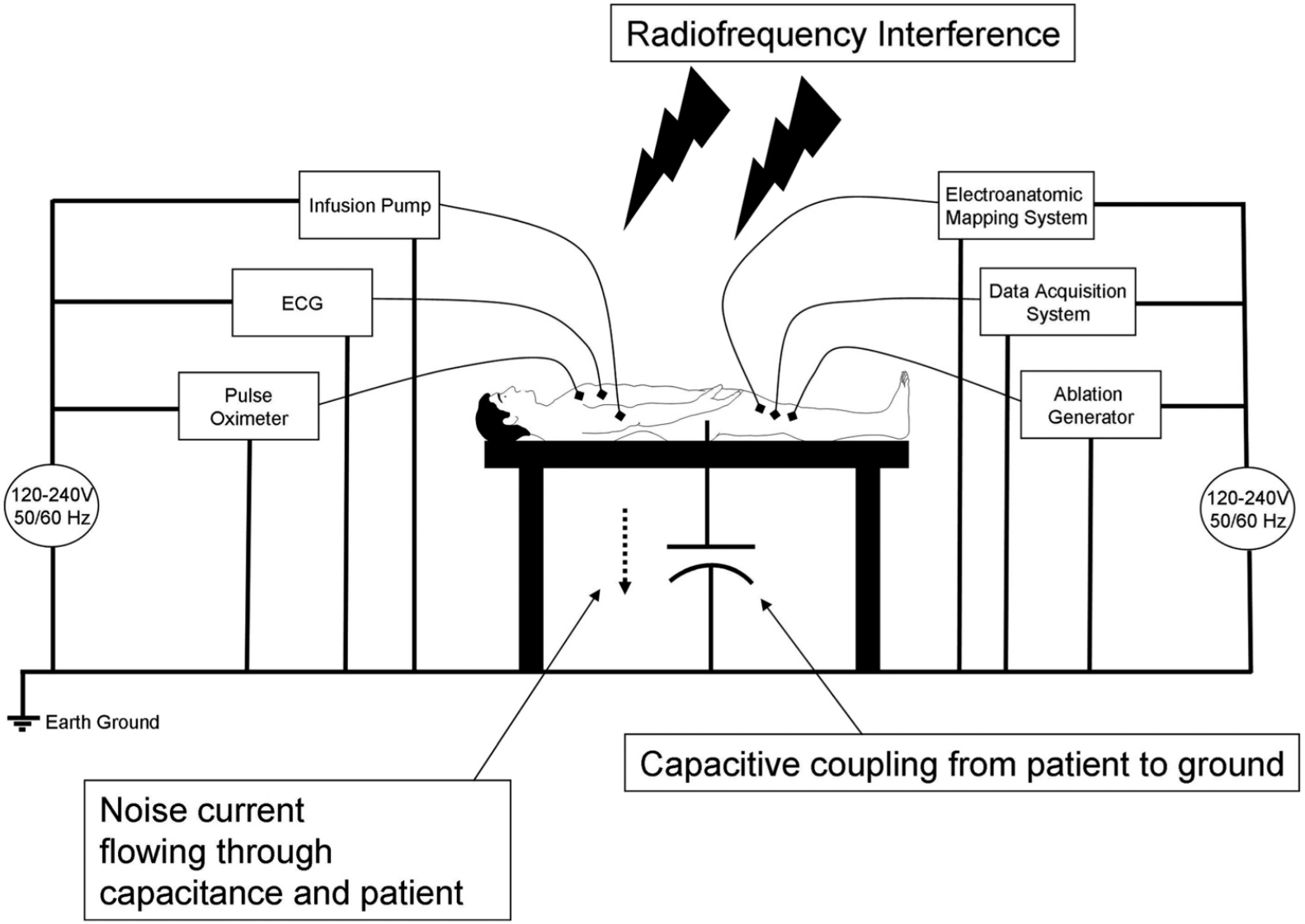
Introduction

- **Information from recording system fundamental to diagnosis of arrhythmias**





K.L. Venkatachalam et al. Circ Arrhythm Electrophysiol. 2011;4:974-981

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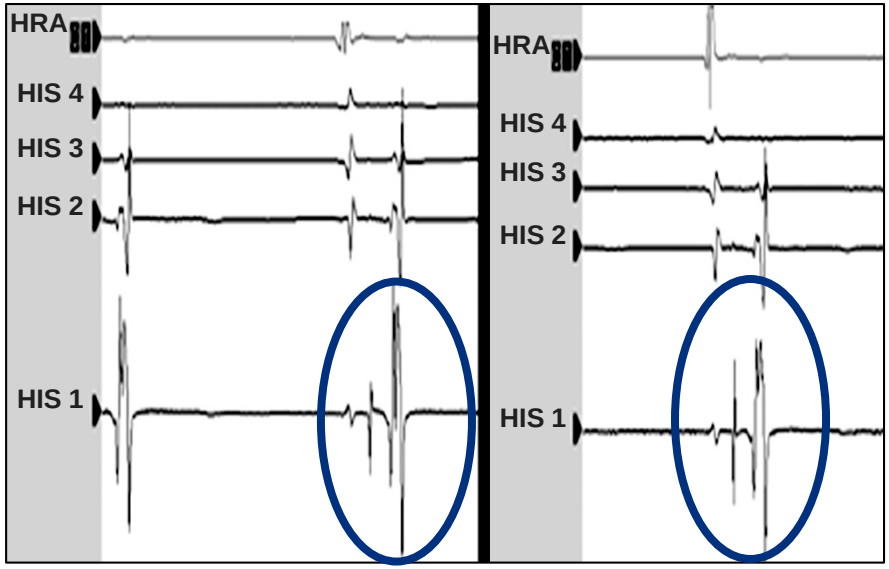
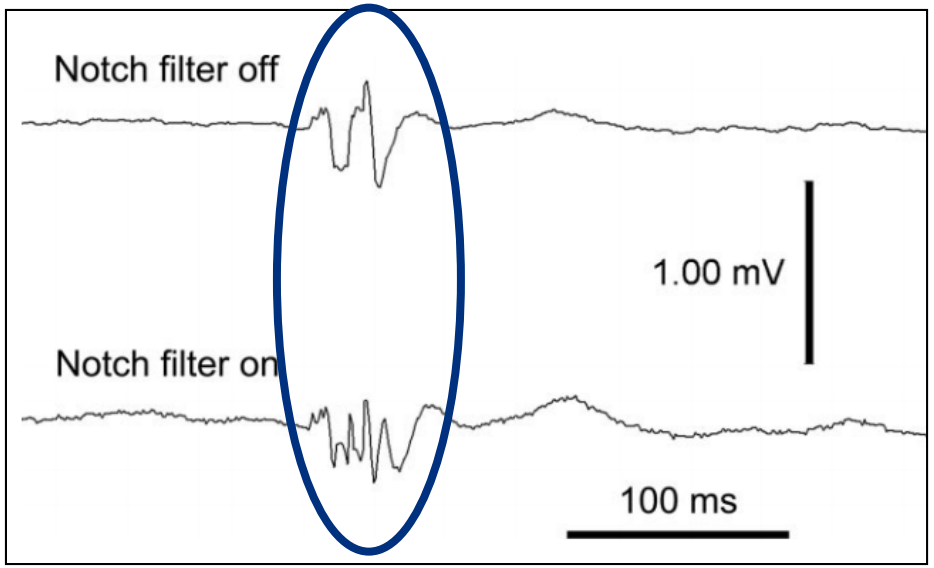
Introduction

150 Hz LPF 1000 Hz LPF



Signal amplitude change with LPF

Signal amplitude change with notch



K.L. Venkatachalam et al. Circ Arrhythm Electrophysiol. 2011;4:974-981
J.M.T. de Bakker et. al. Circ Arrhythm Electrophysiol. 2010;3:204-213

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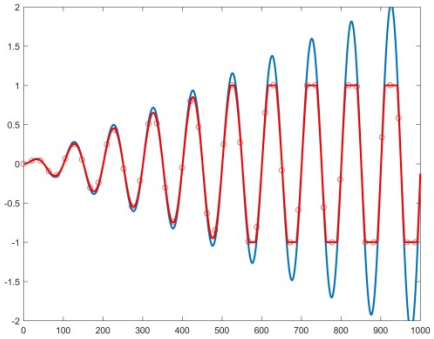
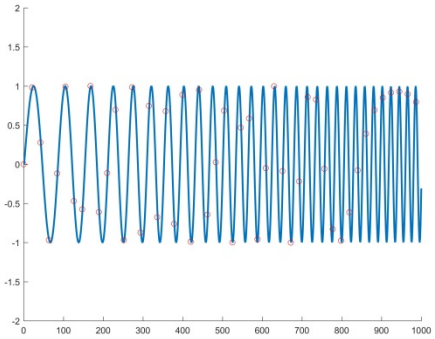
Introduction

- **Current recording systems**
  - **Restricted dynamic range**
  - **Low sampling rate**
  - **Amplification**
    - **Saturation**
    - **Artifact**





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Aim

To test a new signal recording system (PURE-EP™) against traditional recording system

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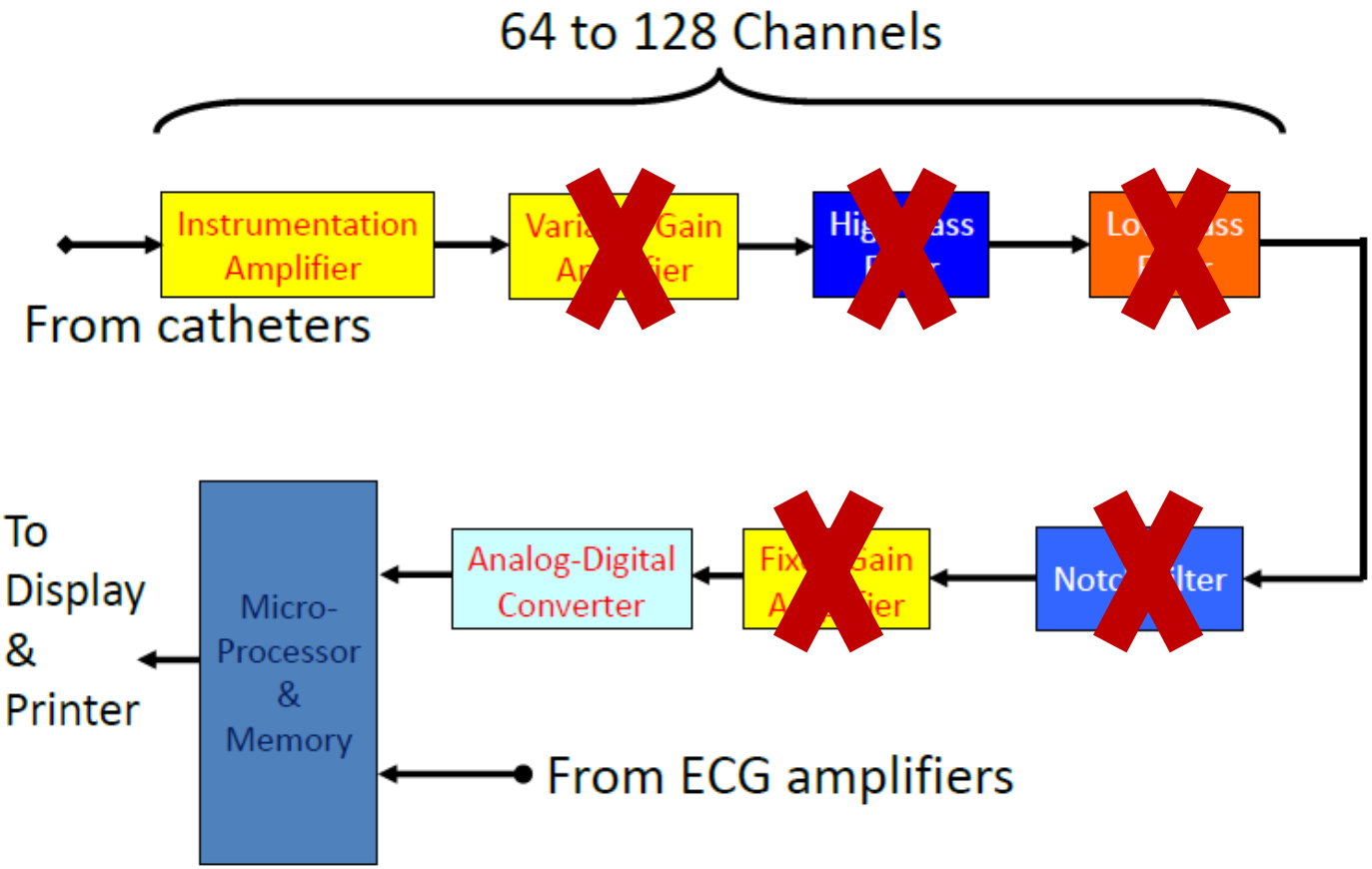
Typical data acquisition system



System comparison

	System A	PURE-EP™
Bandwidth	0.05-500 Hz (Based on 977 s/s)	0.05-1,000 Hz
Sampling rate	977 Samples/sec	2,000 Samples/sec
Dynamic range	N/A (Noise unknown)	105 dB
A/D converter	12-bit	24-bit
Minimum CMRR @ 60 Hz	100 dB	110 dB
Input impedance	$>10^9\ \Omega$	>500 MΩ
Noise		1 µV RMS
Gain	Programmable (From 50-10,000 in 8 steps)	10

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Methods

- Canine studies
  - Extensive mapping
- Unipolar & bipolar
- Blazer II 4mm RF catheter
- PURE-EP™ System vs. traditional system
  - Signals recorded simultaneously

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Results
3 acute canine studies

Site mapped	# times mapped
Atria	7
Ventricles	13
Pulmonary veins	4
Conduction system	7
Other	6

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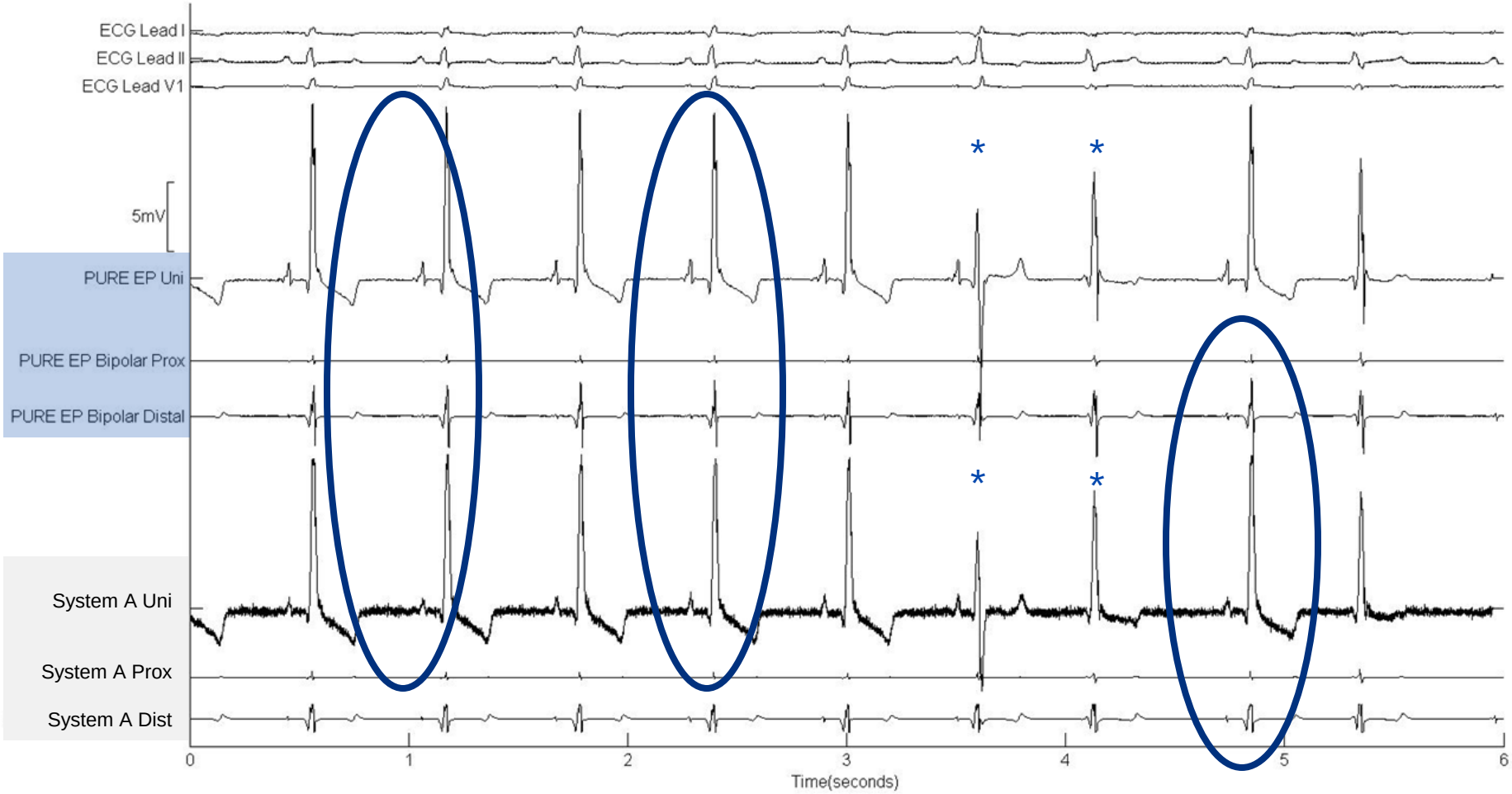
Results
Pulmonary vein



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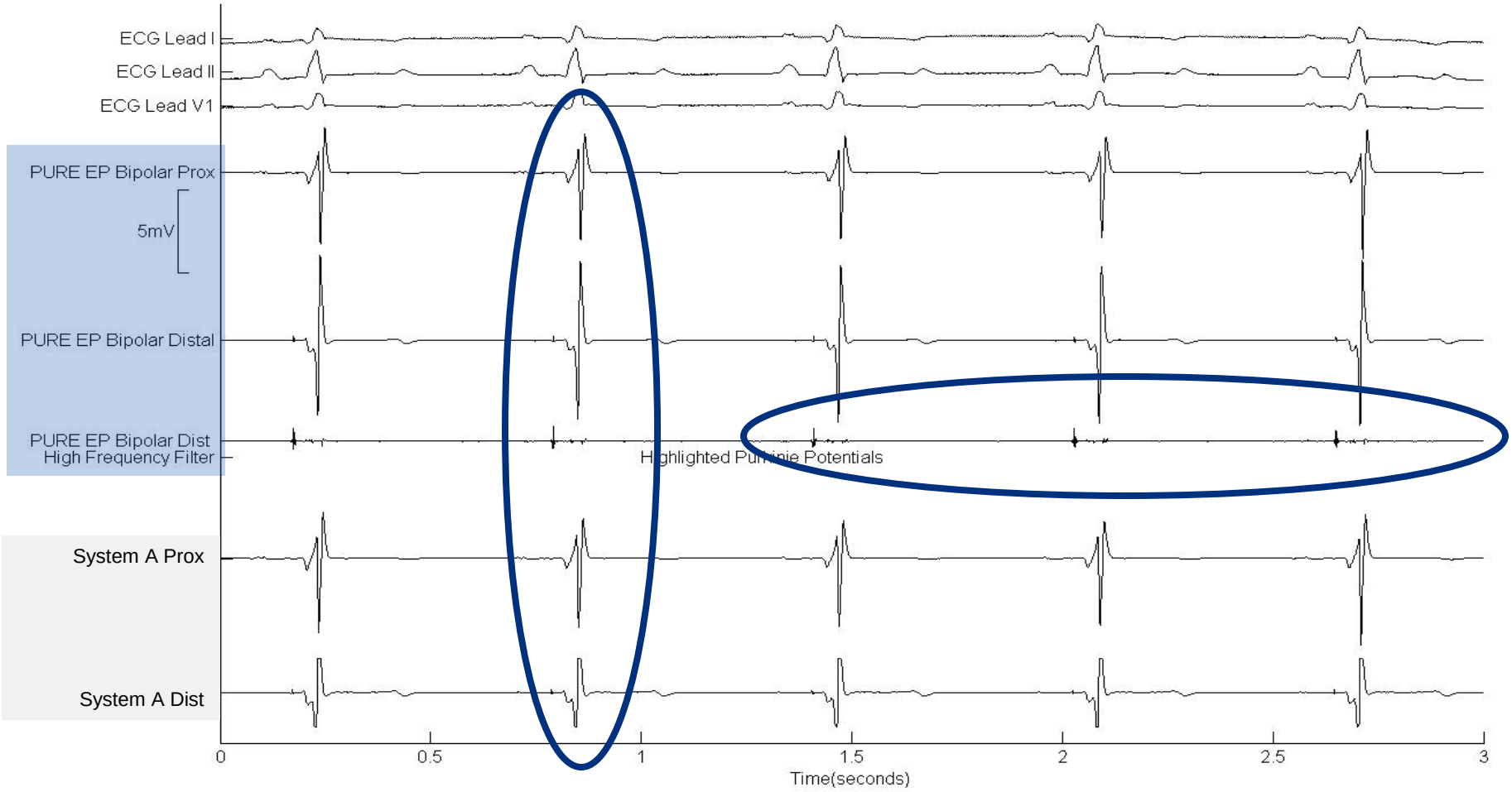
Results
Papillary muscle



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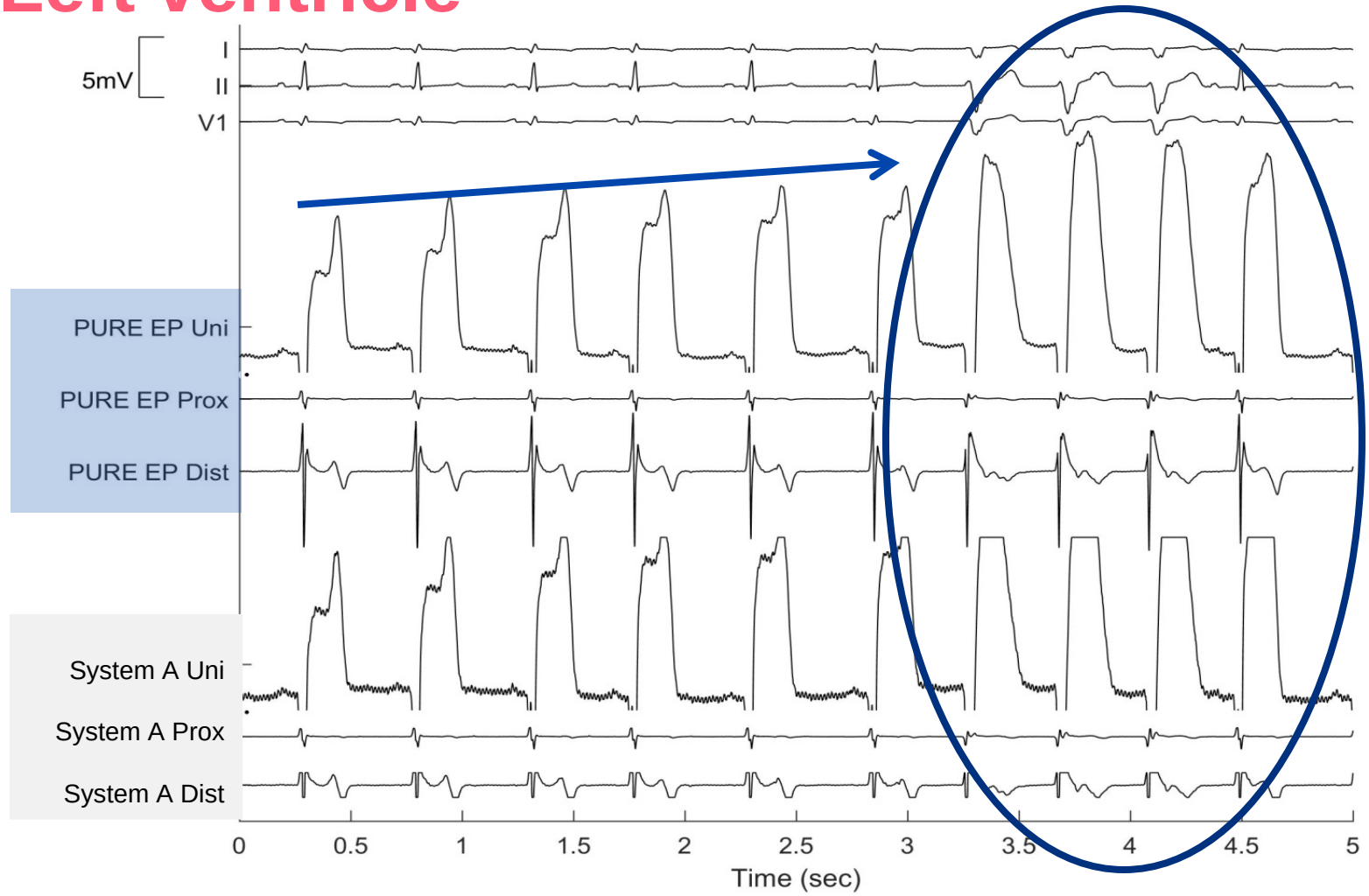
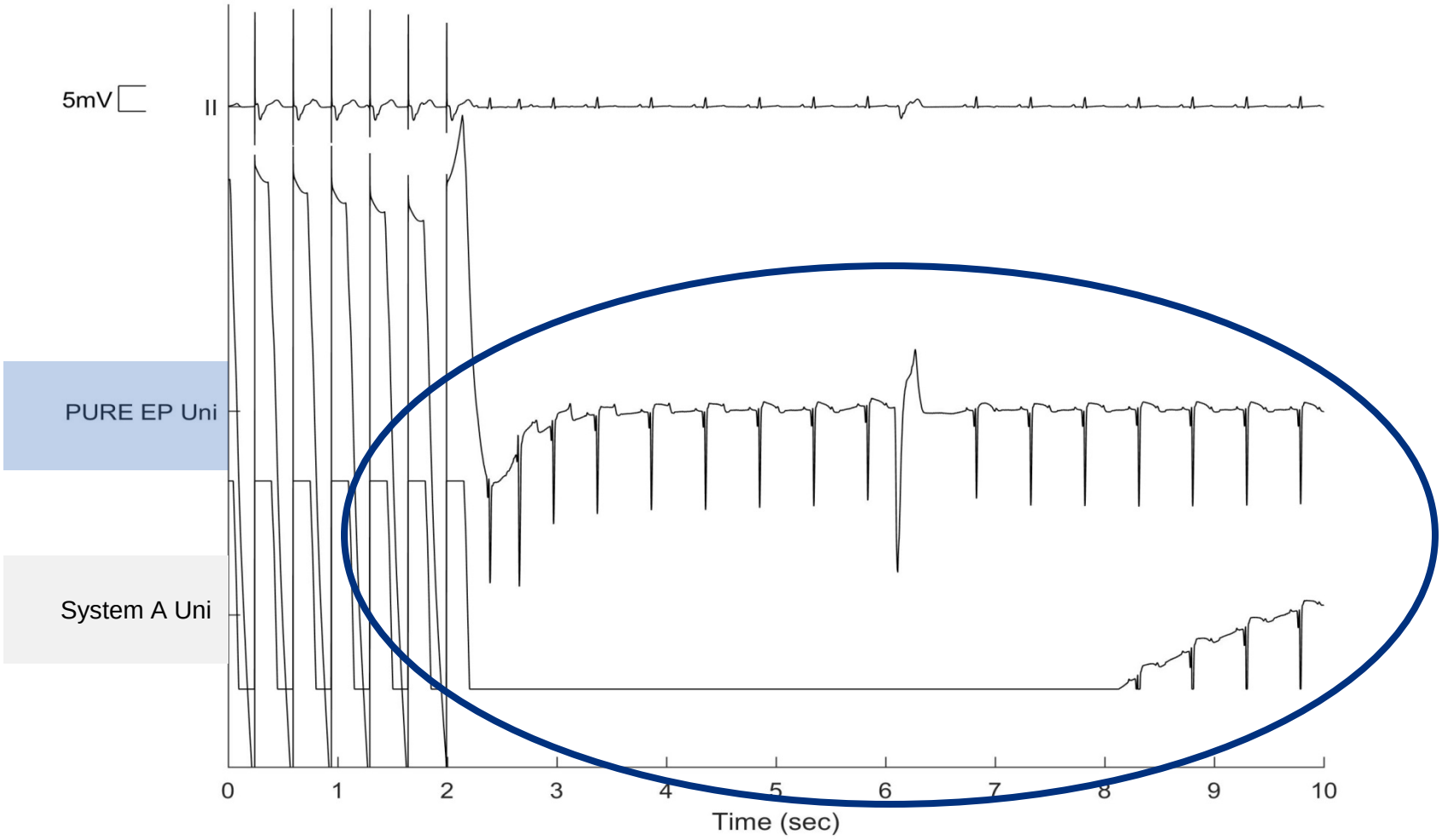
Results
Left ventricle



Results
LV pacing



Conclusion

- Improved cardiac signal recording
  - Signal-to-noise ratio
  - Visualization of juxtaposed signals
- Likely of value in EP procedures
- Further work needed

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Thank you

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