

“The LIGO/PTA Connection”

Sam Finn
(Penn State)

Take-Home

- PTA, “LIGO” *GW* analysis problems and techniques are the same beast in different skins
- Same Beast?
 - Similar in data, noise, signal, analysis techniques
- Different Skins?
 - Physical origin of effects, language, quantity of data, ...

Different Skins

	PTA	LIGO
Data	<ul style="list-style-type: none">● Asynchronous time series of phase residuals● Pulse phase relative to model at epoch	<ul style="list-style-type: none">● Synchronous times series of phase residuals● Inter-arm light travel time differences relative to laser wavelength
Noise	<ul style="list-style-type: none">● Clock noise● Pulse shape variability● Scintillation● RFI	<ul style="list-style-type: none">● Laser frequency noise● Wavefront distortions● Scattering● Seismic, environmental disturbances

Different Skins

	PTA	LIGO
Signal	<ul style="list-style-type: none">● “Backend”<ul style="list-style-type: none">● Detect pulsar, find phase, timing residuals● Correlated timing residuals btwn pulsars	<ul style="list-style-type: none">● No analog (except maybe locking onto a fringe)● Correlated timing residuals btwn detectors
Analysis	<ul style="list-style-type: none">● Backend analysis<ul style="list-style-type: none">● Templates● Folding● Correlation of timing residuals btwn pulsars	<ul style="list-style-type: none">● No analog, but...<ul style="list-style-type: none">● Inspiral: template-based● CW: folding● Correlation of timing residuals btwn detectors

Summary

- PTA, LIGO data & analysis have much in common
 - Time series data
 - Signal in correlation between multiple detectors (pulsars)
- Similarities extend to character & treatment of noise
 - Notching, zapping, regression
- Communities have much to share with each other!