

SU update:

We have two-point measurements with two streamwise spacings

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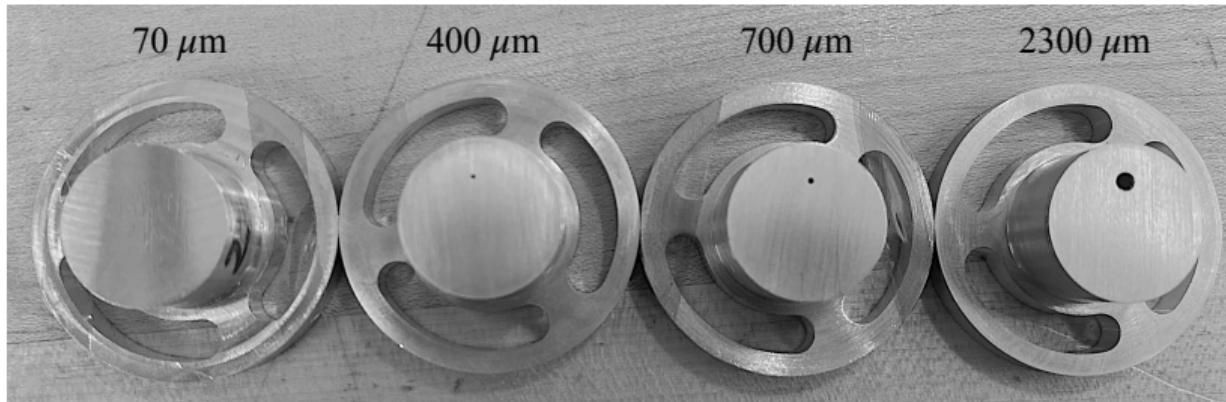
October 23, 2025

Thanks to DARPA for funding this work.

- $\delta \approx 0.035[\text{m}]$ ,  $U_e \approx 14[\text{m/s}]$ ,  $T^+ \equiv Tu_\tau^2/\nu = 10$

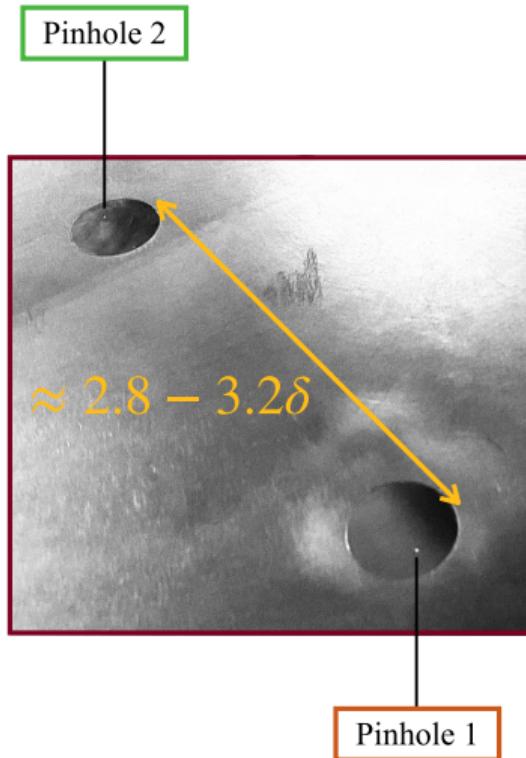
Pressure (psi)	0	50	100
$u_\tau [\text{m/s}]$	0.58	0.47	0.52
$\nu/u_\tau [\text{m}]$	$27 \times 10^{-6}$	$7.5 \times 10^{-6}$	$3.7 \times 10^{-6}$
$\nu [\text{m}^2/\text{s}]$	$15.7 \times 10^{-6}$	$3.52 \times 10^{-6}$	$1.92 \times 10^{-6}$
$Re_\tau$	1,300	4,700	9,500
$f(T^+ = 10) [\text{Hz}]$	2,100	4,700	14,100

## Pinhole diameters



- ▶ Testing pinhole diameters of  $d = 2300, 700, 400 \mu\text{m}$ 
  - ▶ Corresponds to  $d^+ \approx 85, 93, 108$
- ▶ Under the frozen turbulence assumption, these sit around  $T^+ \sim 10$

## Pinhole spacings

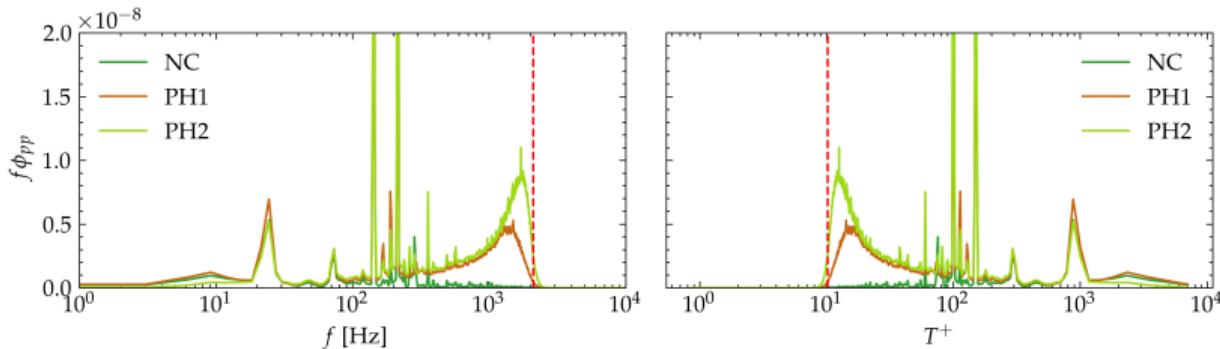


- ▶ We have two-point measurements at two streamwise spacings:  $3.2\delta$  and  $2.8\delta$
- ▶ Herein, we refer to these as 'far' and 'close' spacings
- ▶ The spectra are plotted in voltage and haven't yet been converted to pressure

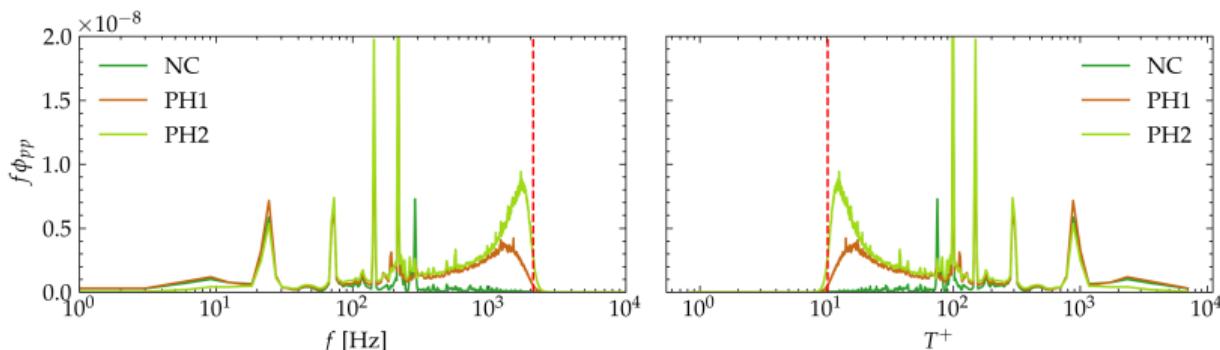
# Raw Data

Raw Data [Pa]:  $Re_\tau \approx 1,300$  ( $d = 700 \mu\text{m}$ )

$Re_\tau \approx 9,500$  (700μm) - Far-spaced

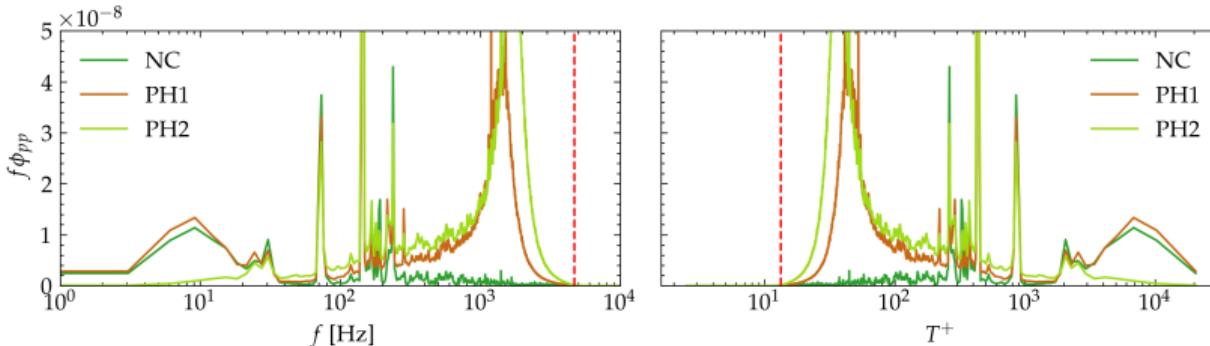


$Re_\tau \approx 9,500$  (700μm) - Close-spaced

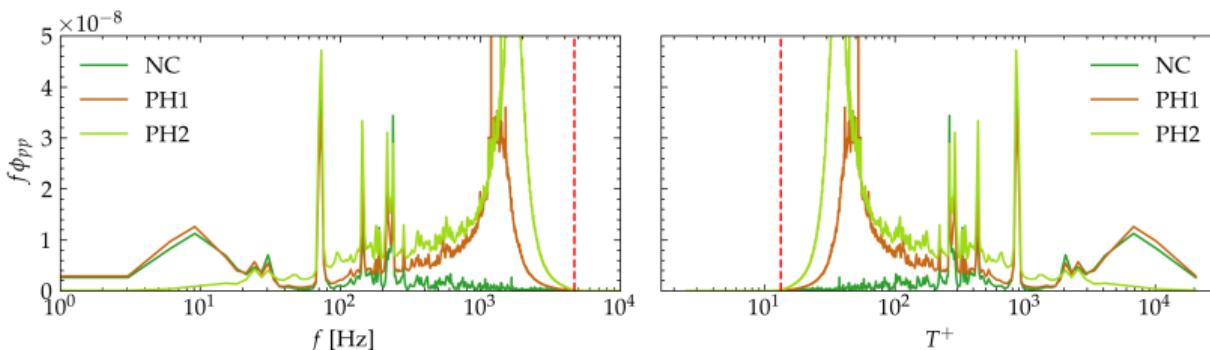


Raw Data [Pa]:  $Re_\tau \approx 4,700$  ( $d = 700 \mu\text{m}$ )

$Re_\tau \approx 9,500$  (700μm) - Far-spaced

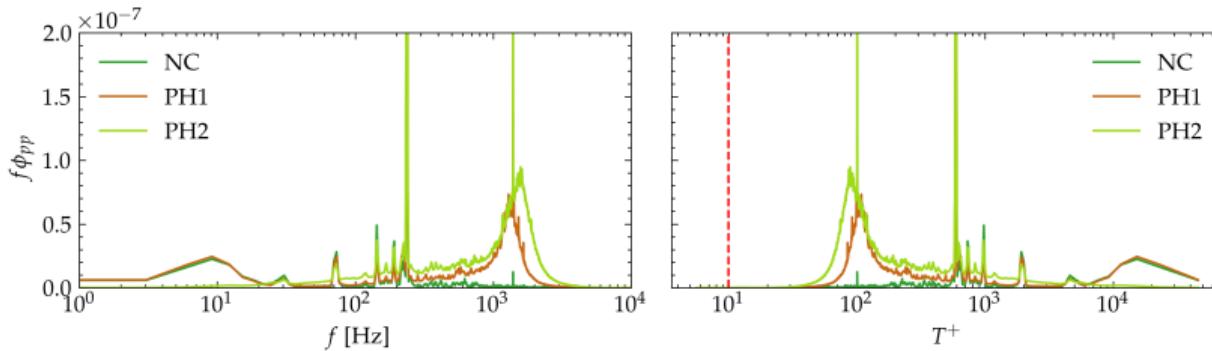


$Re_\tau \approx 9,500$  (700μm) - Close-spaced

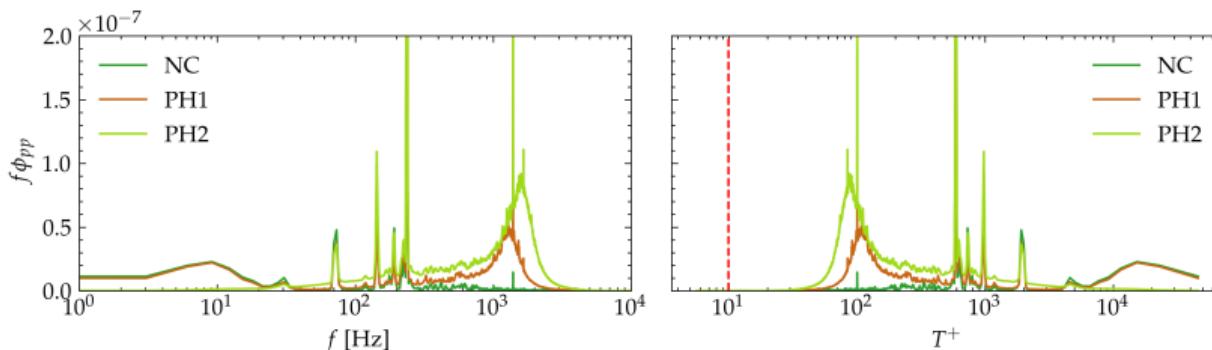


# Raw Data [Pa]: $Re_\tau \approx 9,500$ ( $d = 700 \mu\text{m}$ )

$Re_\tau \approx 9,500$  (700μm) - Far-spaced

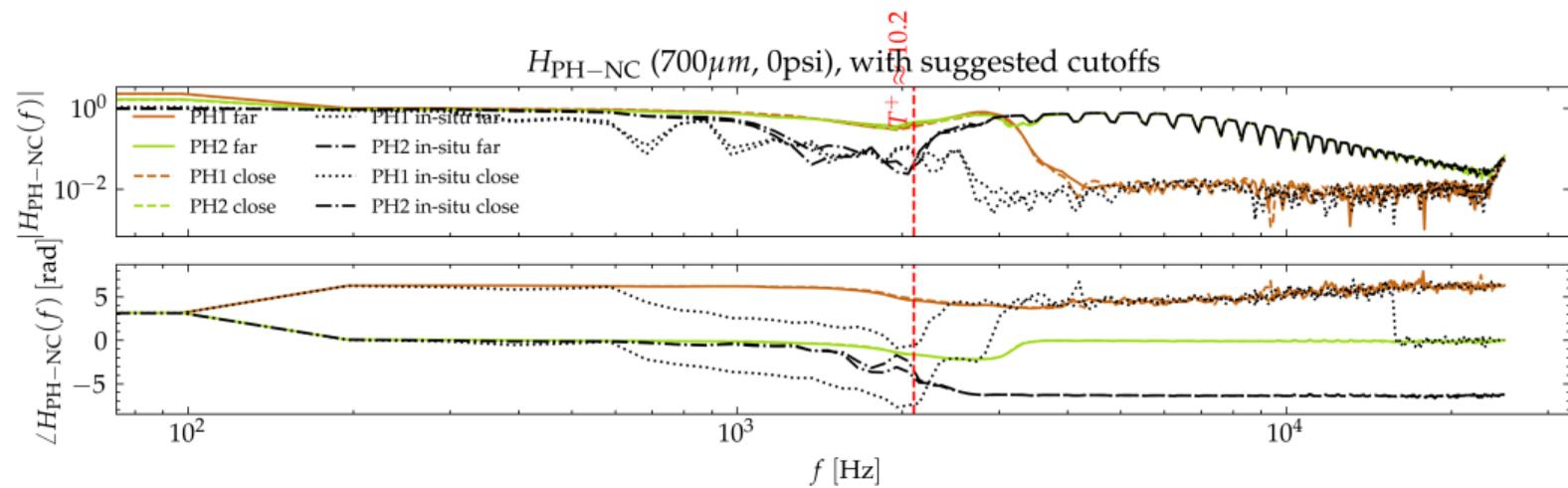


$Re_\tau \approx 9,500$  (700μm) - Close-spaced

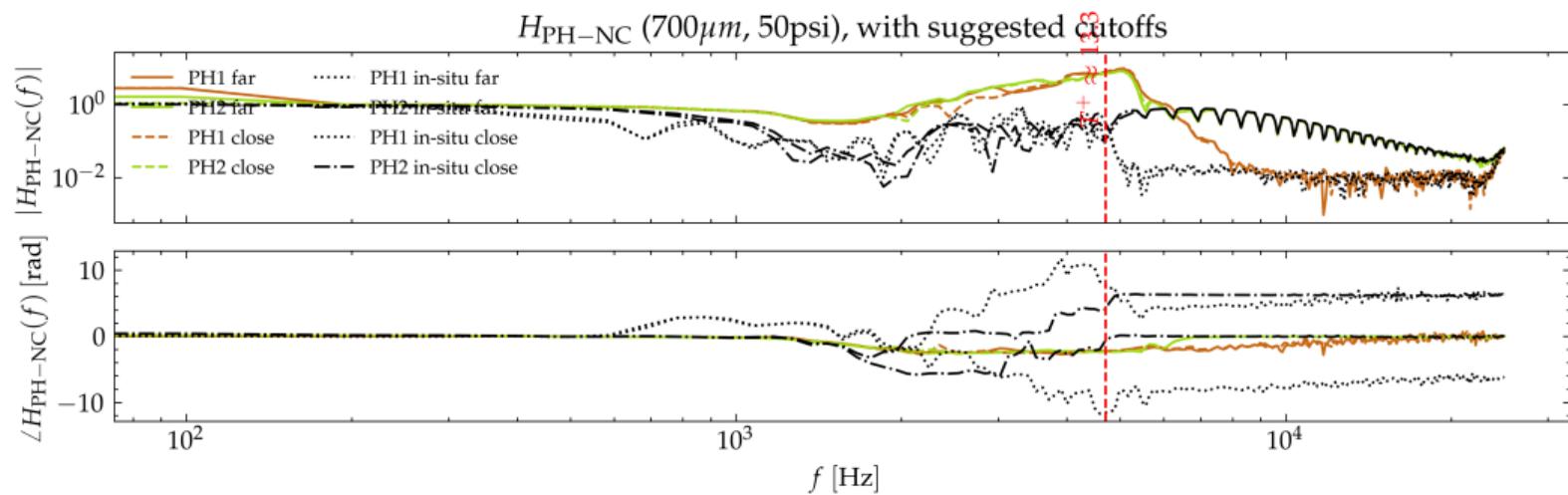


# Transfer Functions

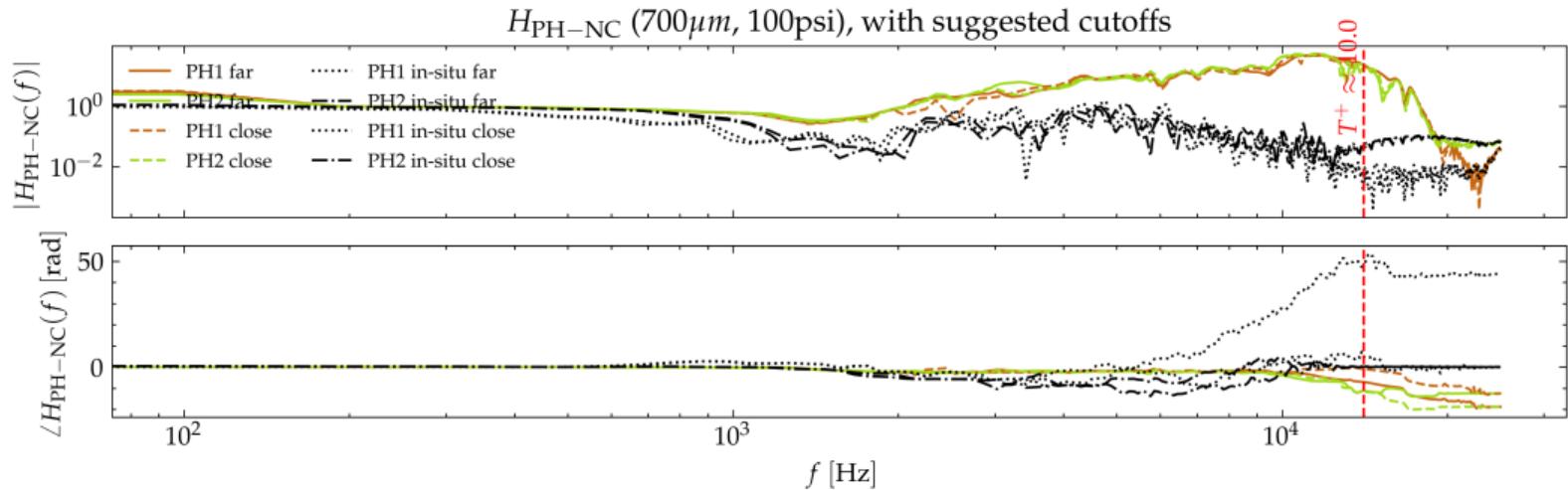
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Transfer Function:  $Re_\tau \approx 4,700$  ( $d = 700 \mu\text{m}$ )



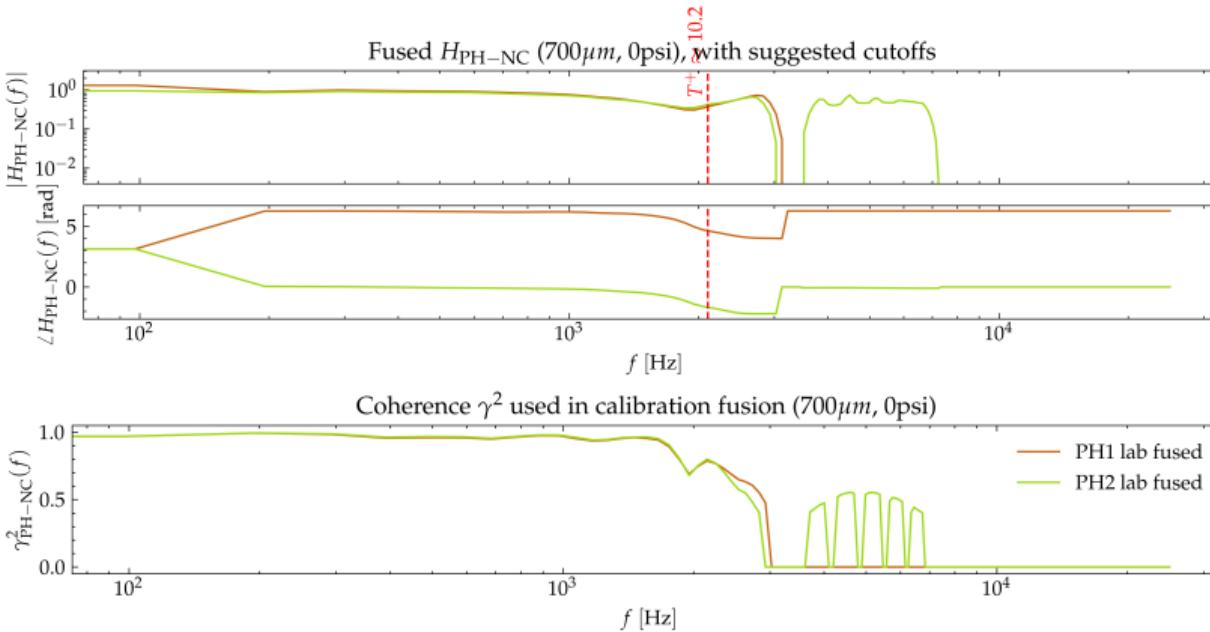
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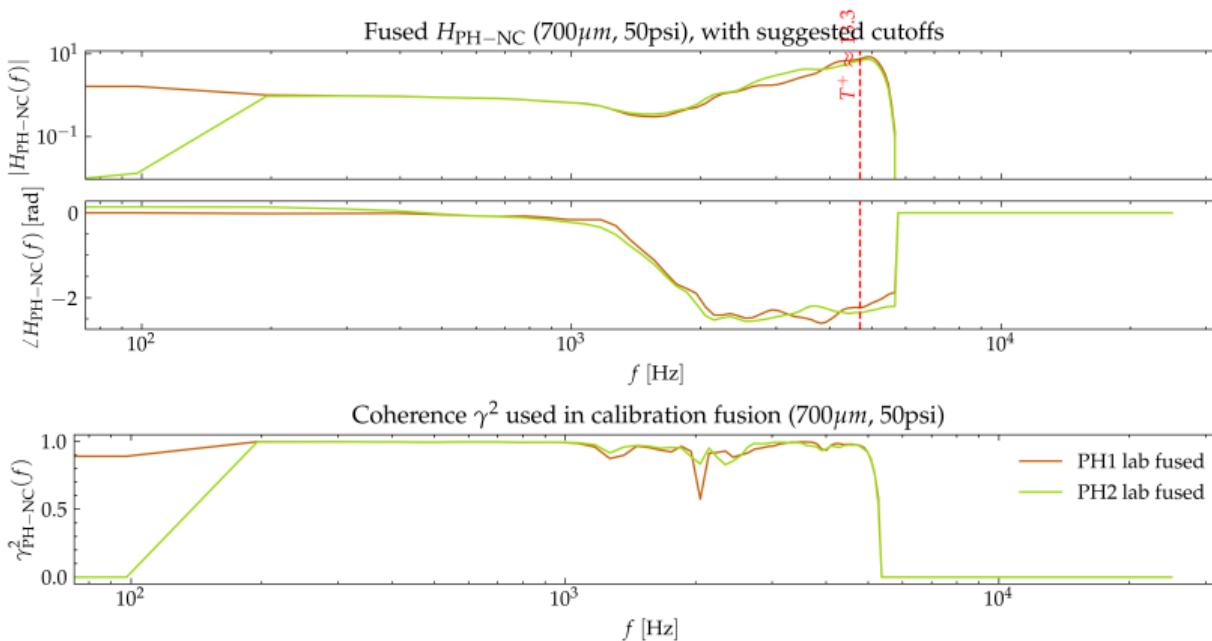
- ▶ The transfer functions appear to be similar, but not identical.
- ▶ Small discrepancies can lead to large differences in the final spectra
- ▶ We are working on methods to combine the 4 transfer functions into one robust estimate
- ▶ With high confidence, we can fuse the two anechoic transfer functions into one robust estimate

# Fused Transfer Functions

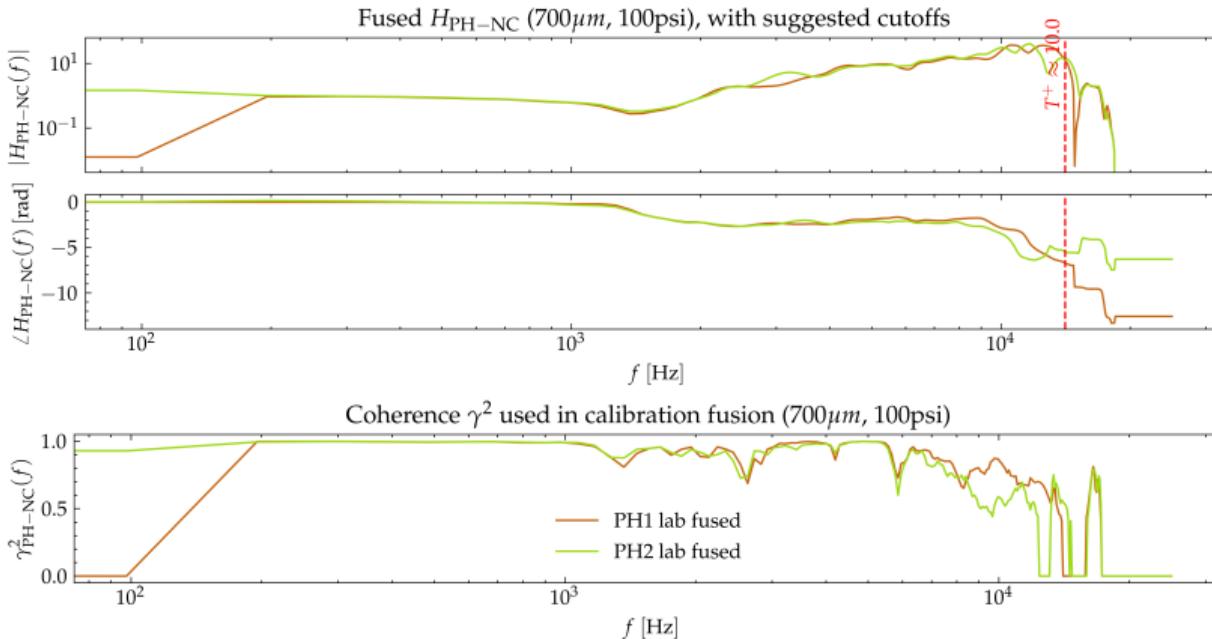
# Anechoic Fused Transfer Function: $Re_\tau \approx 1,300$ ( $d = 700 \mu\text{m}$ )



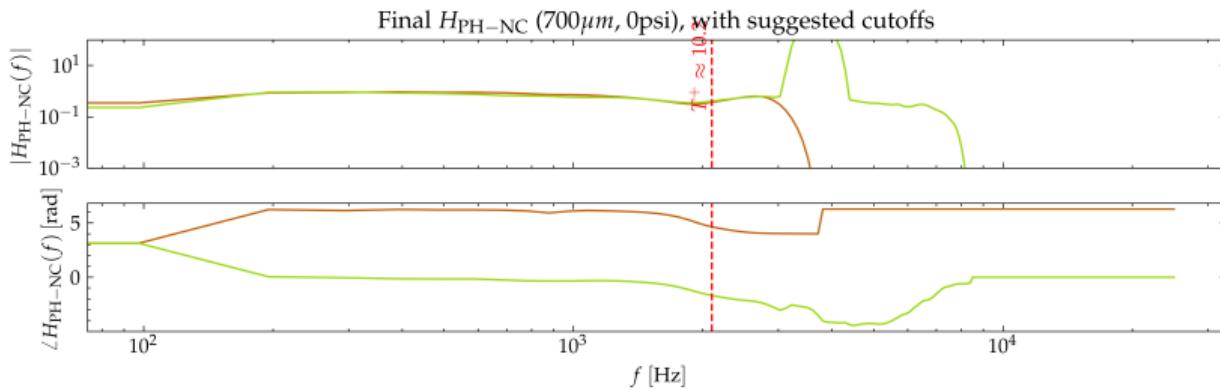
# Anechoic Fused Transfer Function: $Re_\tau \approx 4,700$ ( $d = 700 \mu\text{m}$ )



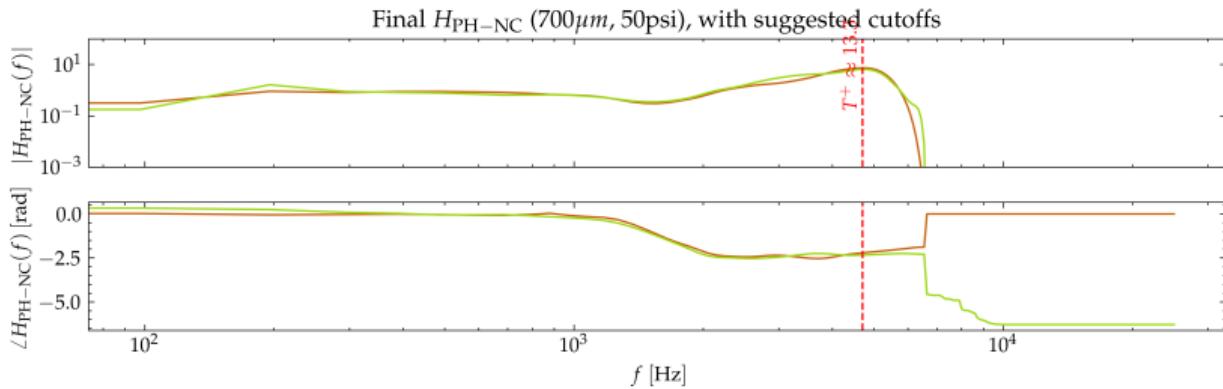
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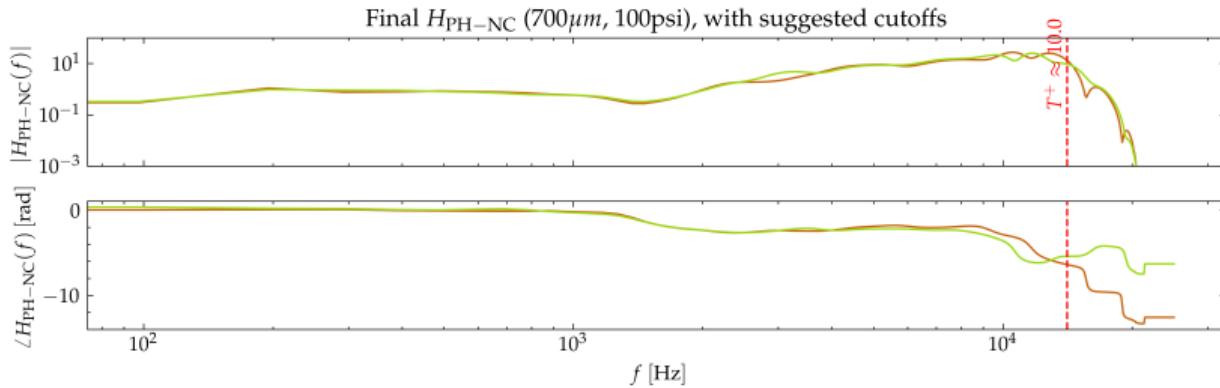
# Anechoic + In-Situ Fused Transfer Function: $Re_\tau \approx 1,300$ ( $d = 700 \mu\text{m}$ )



# Anechoic + In-Situ Fused Transfer Function: $Re_\tau \approx 4,700$ ( $d = 700 \mu\text{m}$ )

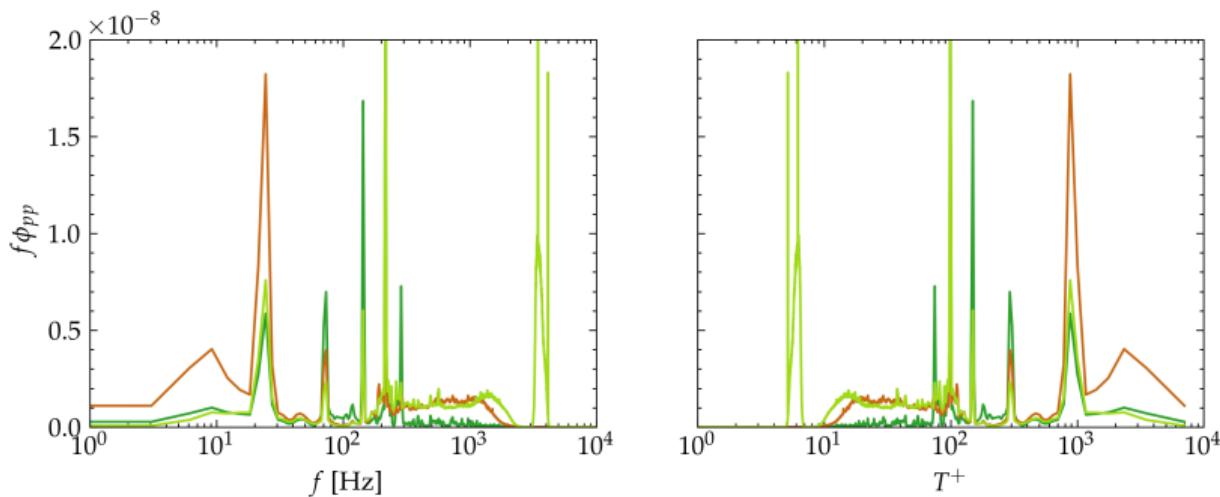


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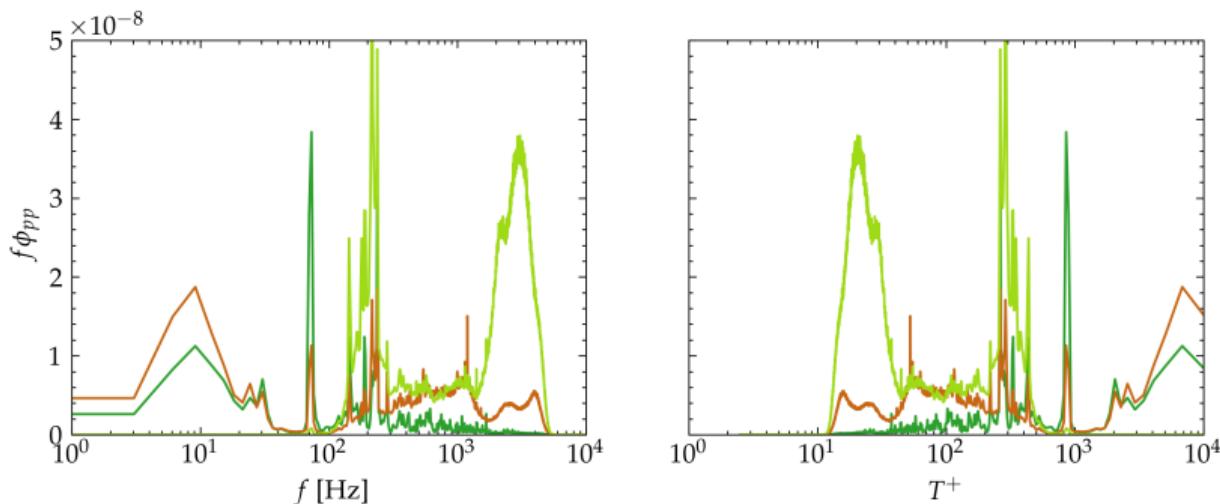


# Resulting Spectra

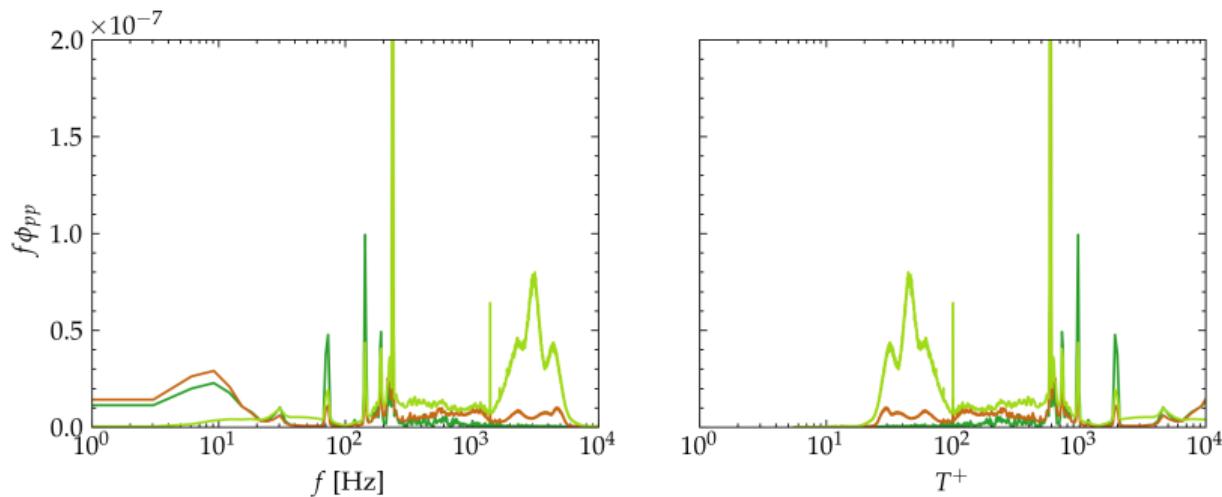
# Calibrated Spectra: $Re_\tau \approx 1,300$ ( $d = 700 \mu\text{m}$ )



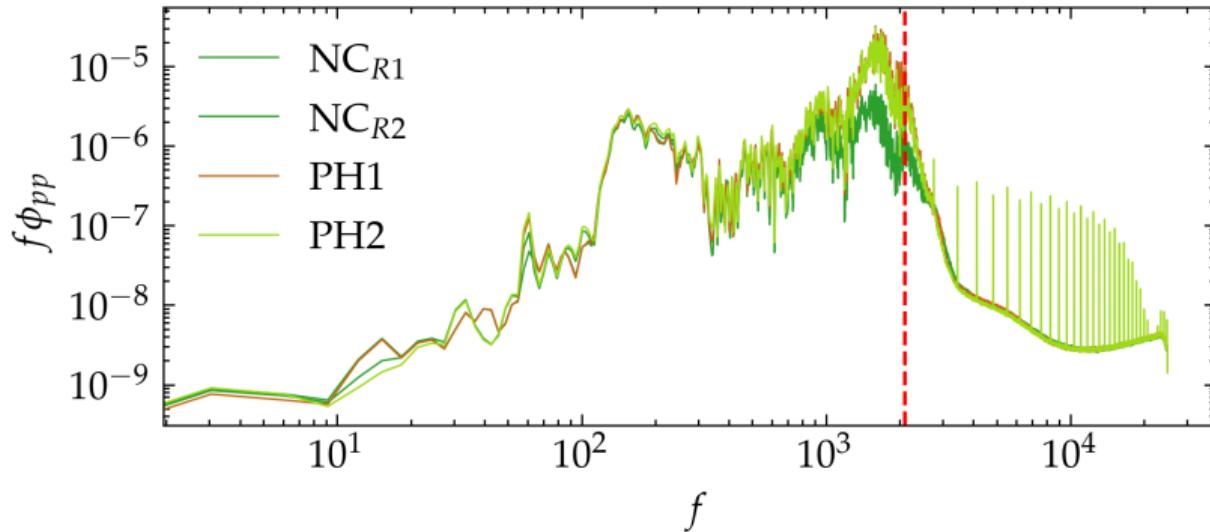
Calibrated Spectra:  $Re_\tau \approx 4,700$  ( $d = 700 \mu\text{m}$ )



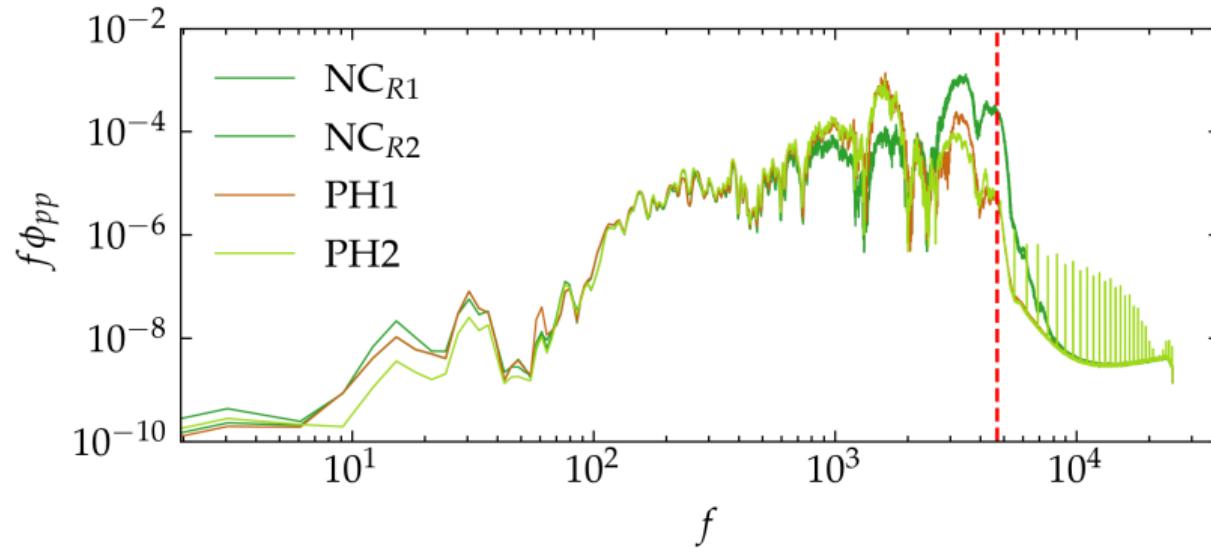
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