

# Test Beam Results ECOGAS

September 18<sup>th</sup> - October 2<sup>nd</sup> 2024

EP-DT Gas Group - 21.10.2024



EP-DT  
Detector Technologies

# Overview

## Test Beam Sept-Oct 24

- RPC under test: 25
- Gases tested:
  - Standard Gas Mixture
  - ECO2
    - Mixtures tested both with the old mixer (CO<sub>2</sub> - collaboration), the new mixer @same flow (~10l/h total)
  - ECO3
- Read-out with a VME1730 Digitizer

# Timeline

## Test Beam Sept-Oct 24

- We tested all gas mixtures on the current mixer first (NEW), then switched to the CO<sub>2</sub> collaboration one (OLD).

### octombrie 2024

< Astăzi >

lun.	mar.	mie.	joi	vin.	sâm.	dum.	
16	17	18	19	20	21	22	
		Standard Gas Mixture NEW mixer	ECO2 NEW mixer	ECO2 NEW mixer	Standard Gas Mixture NEW mixer		
23	24	25	26	27	28	29	
		ECO3 NEW mixer	Standard Gas Mixture OLD mixer	ECO2 OLD mixer			
ECO2 NEW mixer	30	1 oct.	2	3	4	5	6

# Timeline

## Test Beam Sept-Oct 24

- First tested the **STD**, which when checked between the mixers, showed the same results.

### octombrie 2024

< Astăzi >

lun.	mar.	mie.	joi	vin.	sâm.	dum.	
16	17	18	19	20	21	22	
			<b>Standard Gas Mixture NEW mixer</b>	<b>ECO2 NEW mixer</b>	<b>ECO2 NEW mixer</b>	<b>Standard Gas Mixture NEW mixer</b>	
23	24	25	26	27	28	29	
		<b>ECO3 NEW mixer</b>	<b>Standard Gas Mixture OLD mixer</b>	<b>ECO2 OLD mixer</b>			
<b>ECO2 NEW mixer</b>	30	1 oct.	2	3	4	5	6

# Timeline

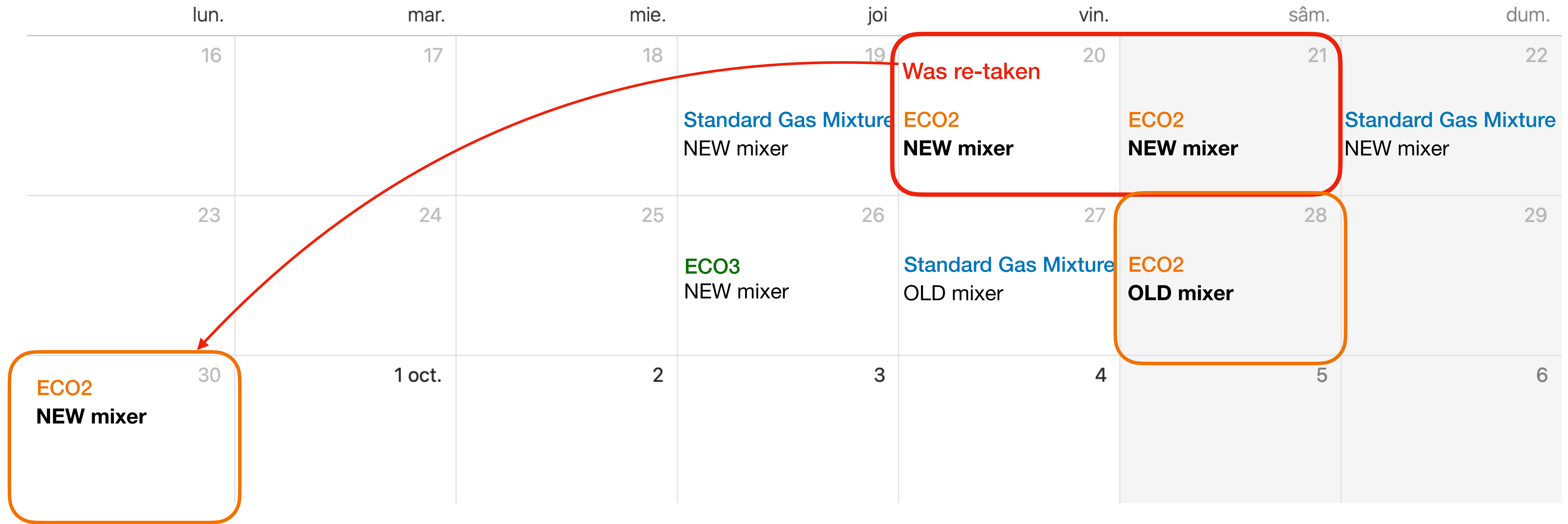
## Test Beam Sept-Oct 24

- When we checked ECO2, the results were not similar, so we decided to re-take the data for the new mixer.

### octombrie 2024

Flushed for ~14h @3.3l/h -> equivalent of ~14 volumes

< Astăzi >



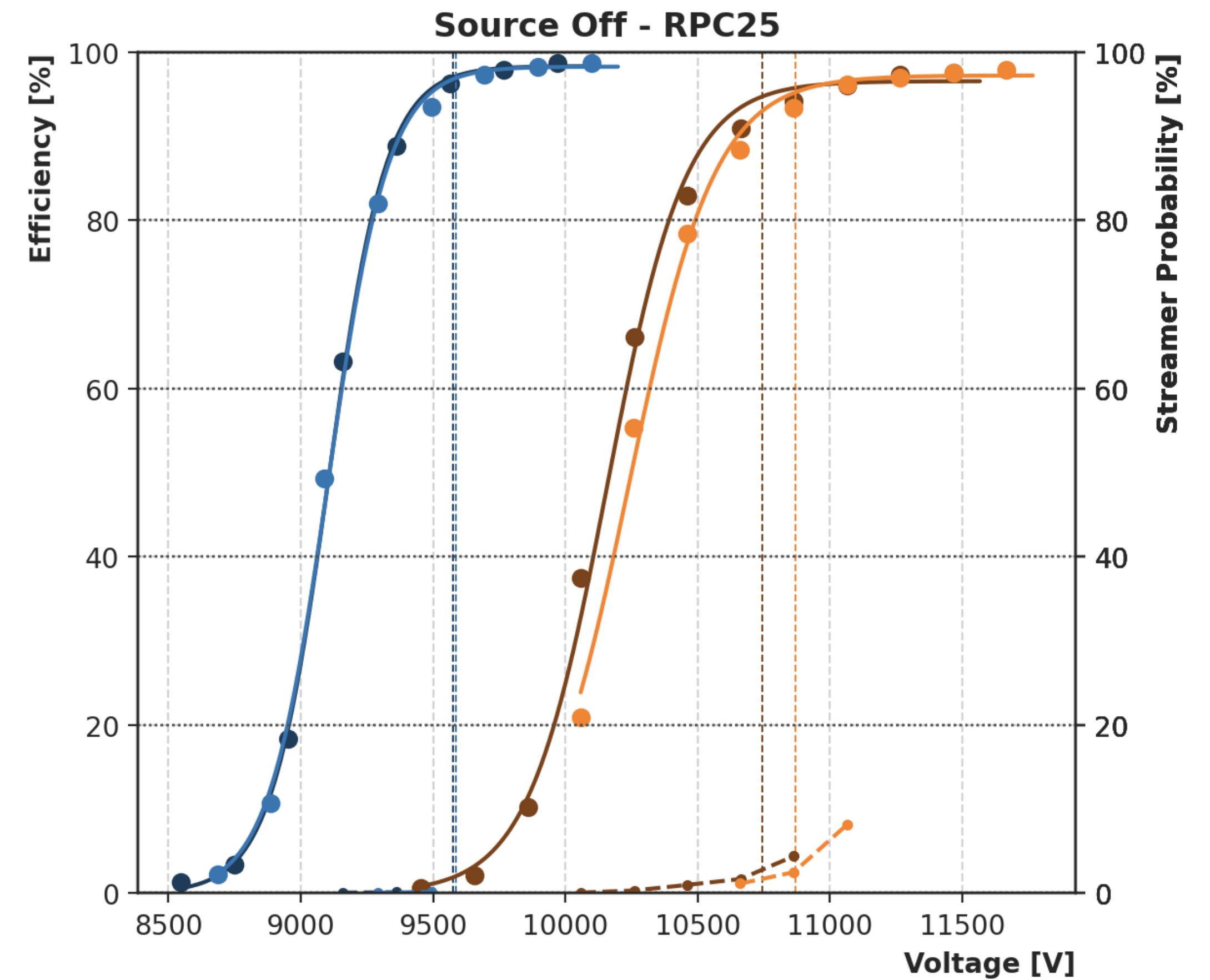
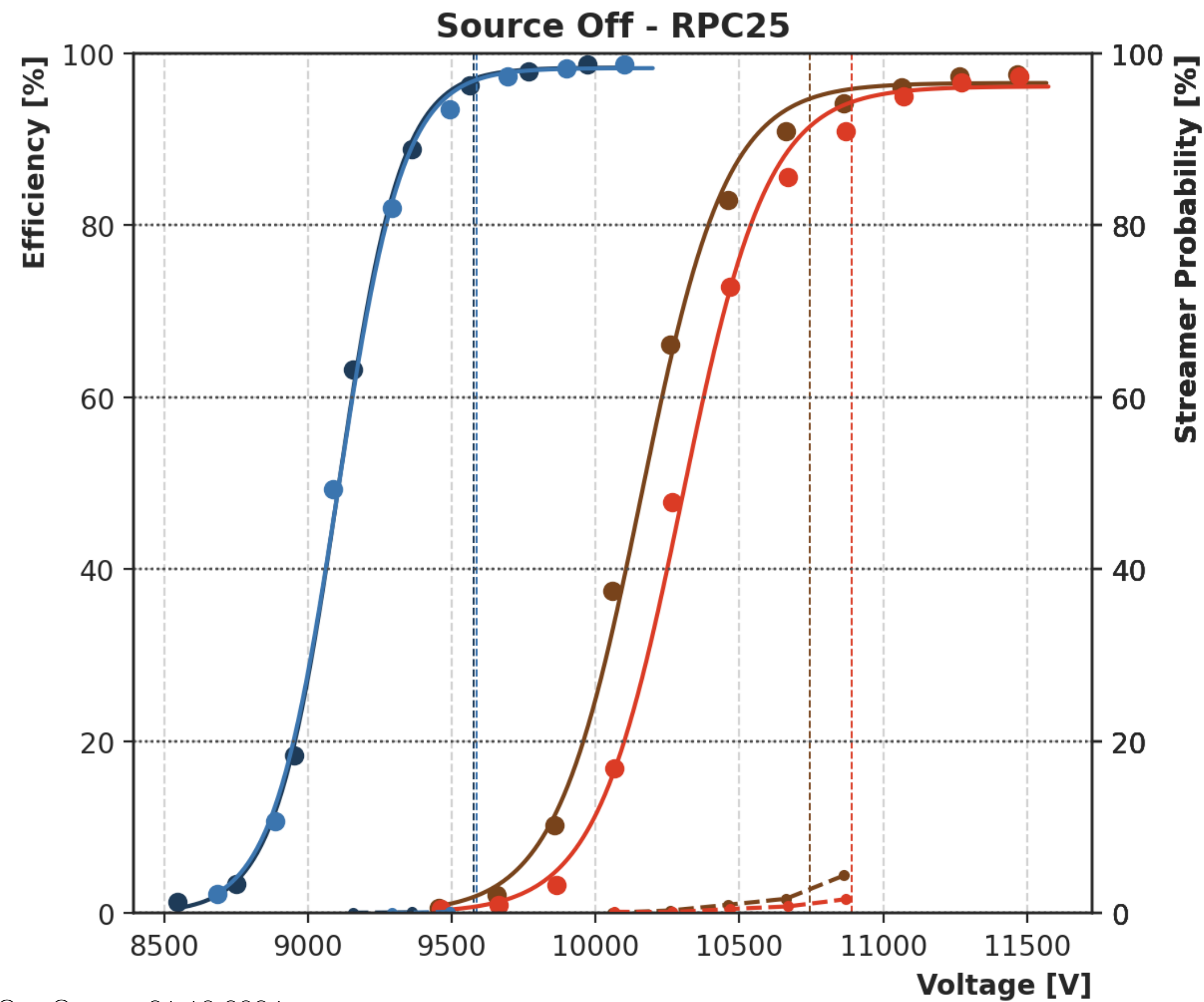
# Efficiency - old VS new Mixers

## Test Beam Sept-Oct 24

- September 2024 - STD - old mixer, EffMax: 98.33%, SP: 0.28%, WP: 9577V, Rate: 17Hz/cm<sup>2</sup>
- September 2024 - STD - new mixer, EffMax: 98.26%, SP: 0.33%, WP: 9587V, Rate: 14Hz/cm<sup>2</sup>
- September 2024 - ECO2 - old mixer, EffMax: 96.54%, SP: 2.82%, WP: 10745V, Rate: 16Hz/cm<sup>2</sup>
- September 2024 - ECO2 - new mixer, EffMax: 96.13%, SP: 1.91%, WP: 10890V, Rate: 11Hz/cm<sup>2</sup>

Re-taken

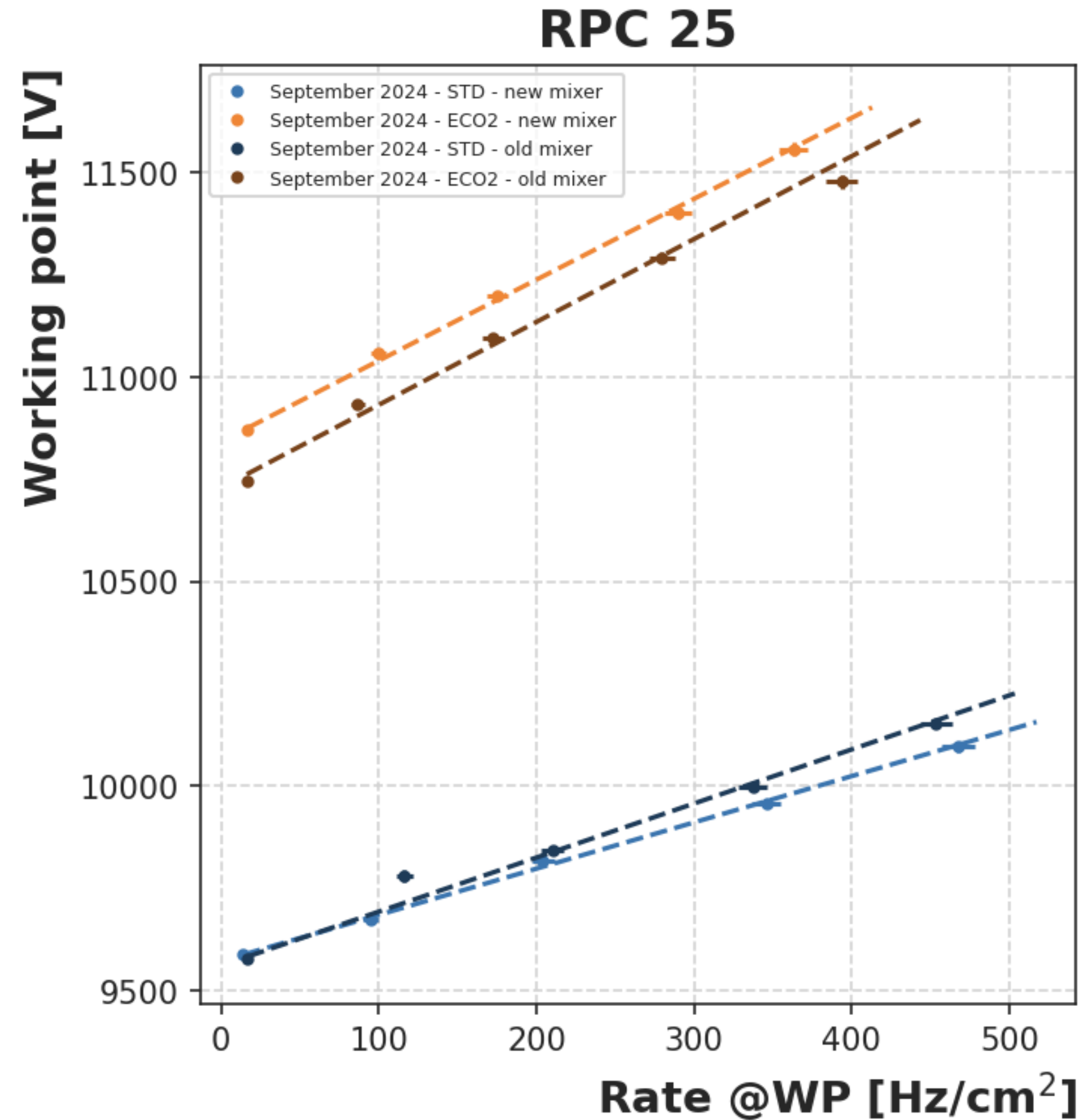
- September 2024 - STD - old mixer, EffMax: 98.33%, SP: 0.28%, WP: 9577V, Rate: 17Hz/cm<sup>2</sup>
- September 2024 - STD - new mixer, EffMax: 98.26%, SP: 0.33%, WP: 9587V, Rate: 14Hz/cm<sup>2</sup>
- September 2024 - ECO2 - old mixer, EffMax: 96.54%, SP: 2.82%, WP: 10745V, Rate: 16Hz/cm<sup>2</sup>
- September 2024 - ECO2 - new mixer, EffMax: 97.21%, SP: 2.71%, WP: 10870V, Rate: 17Hz/cm<sup>2</sup>



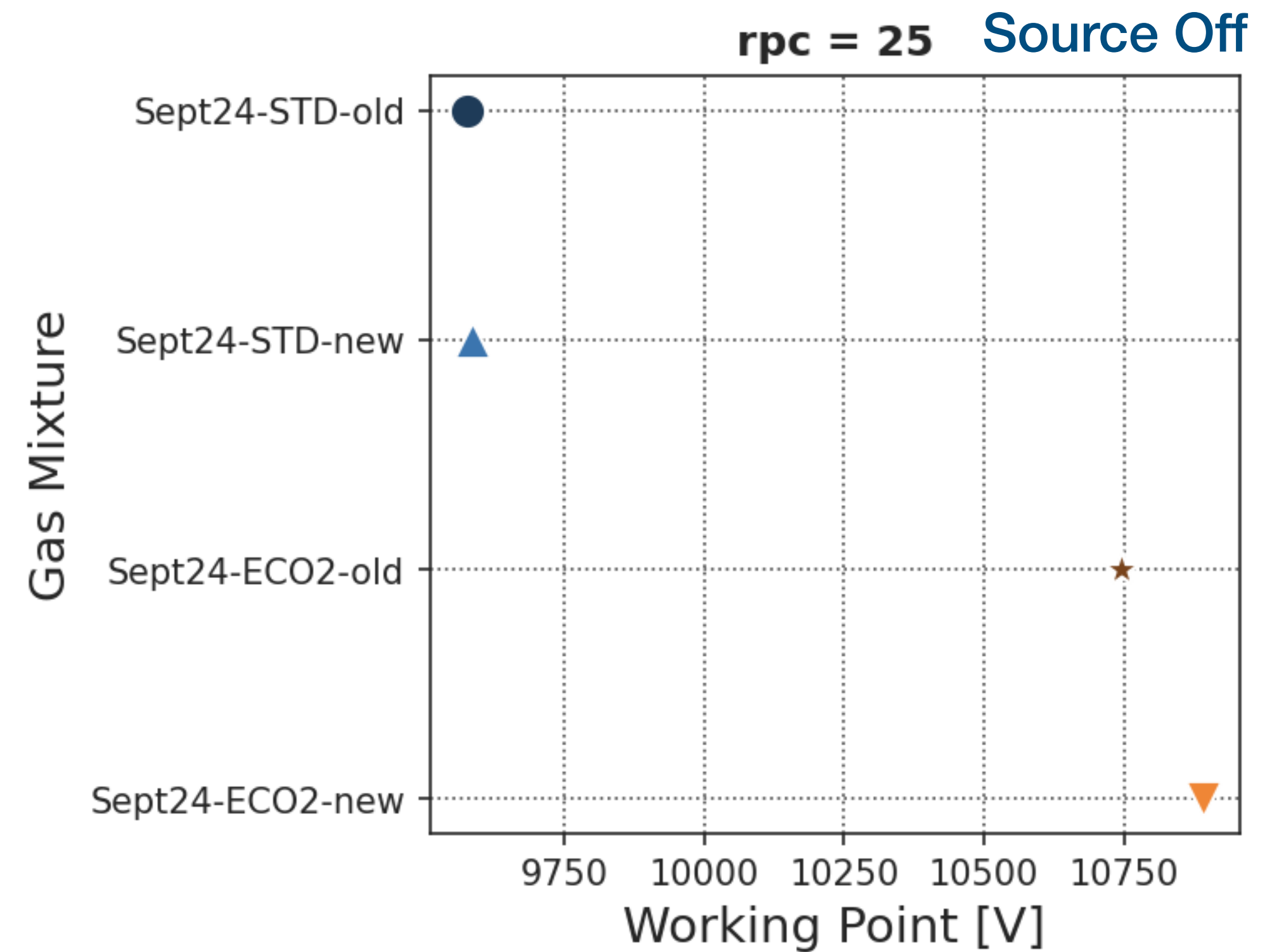


# Working Points - old VS new Mixers

Test Beam Sept-Oct 24

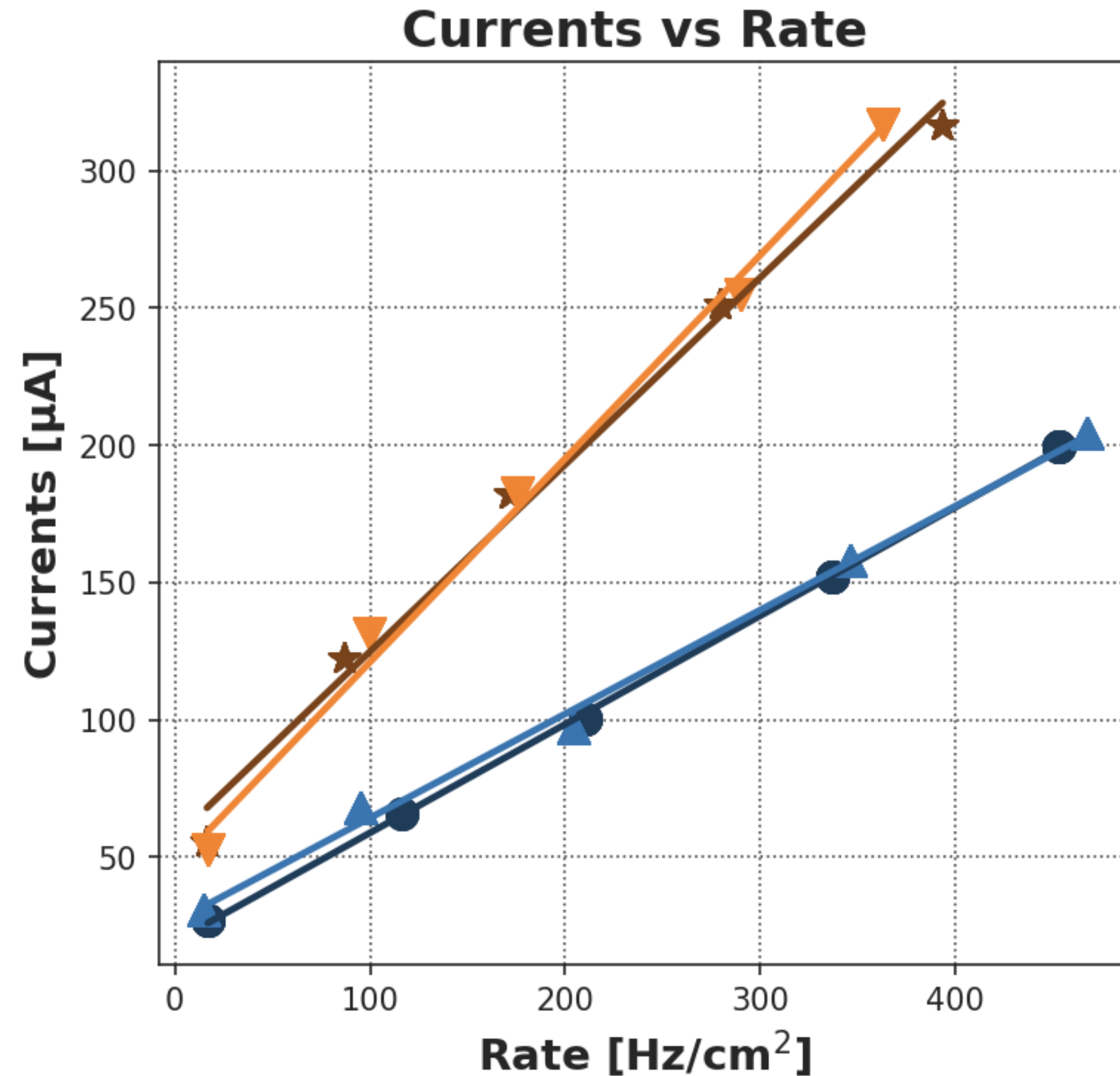
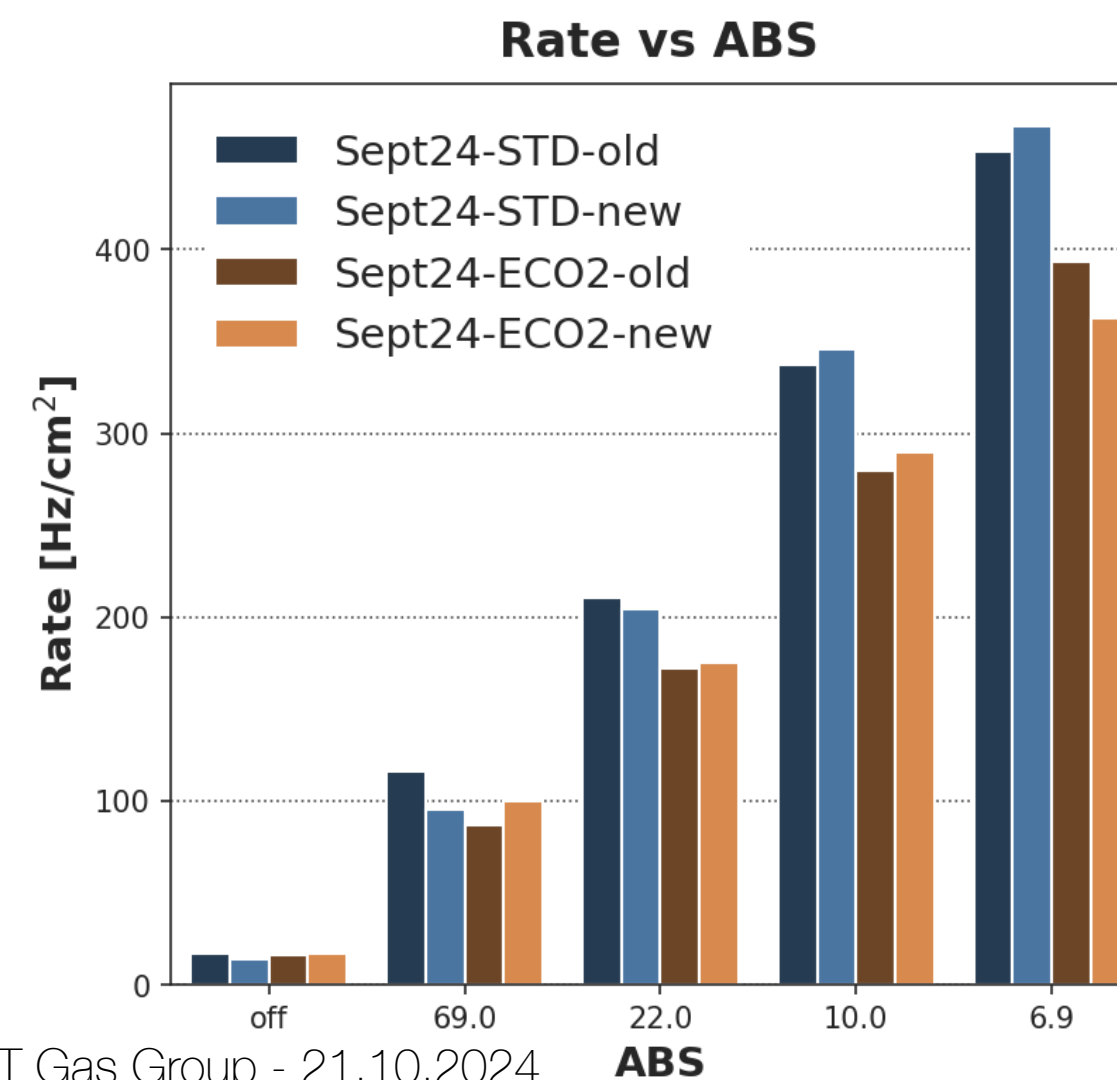
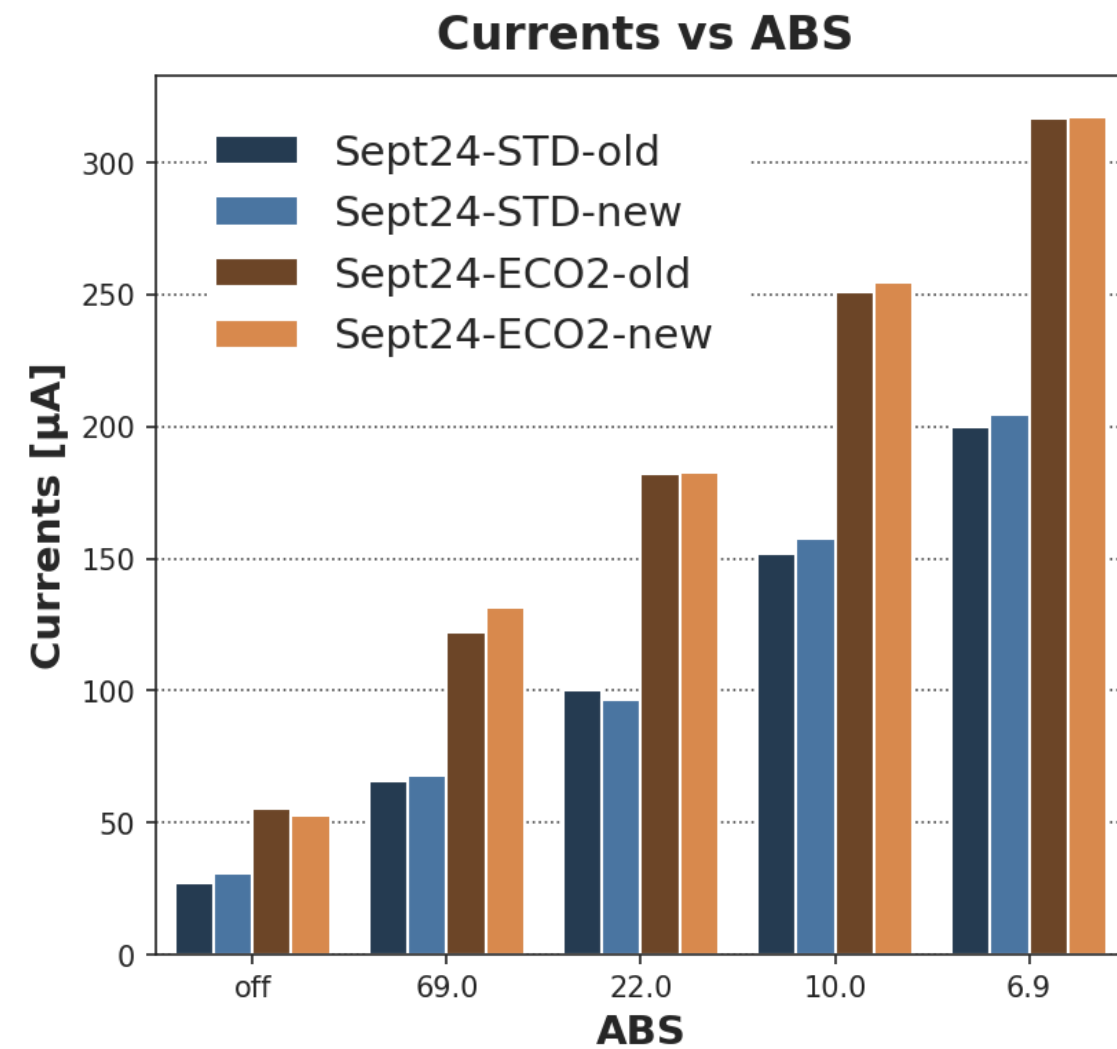


- There was no considerable difference in the working point between the two mixers.



# Currents & Rate - old VS new Mixers

Test Beam Sept-Oct 24



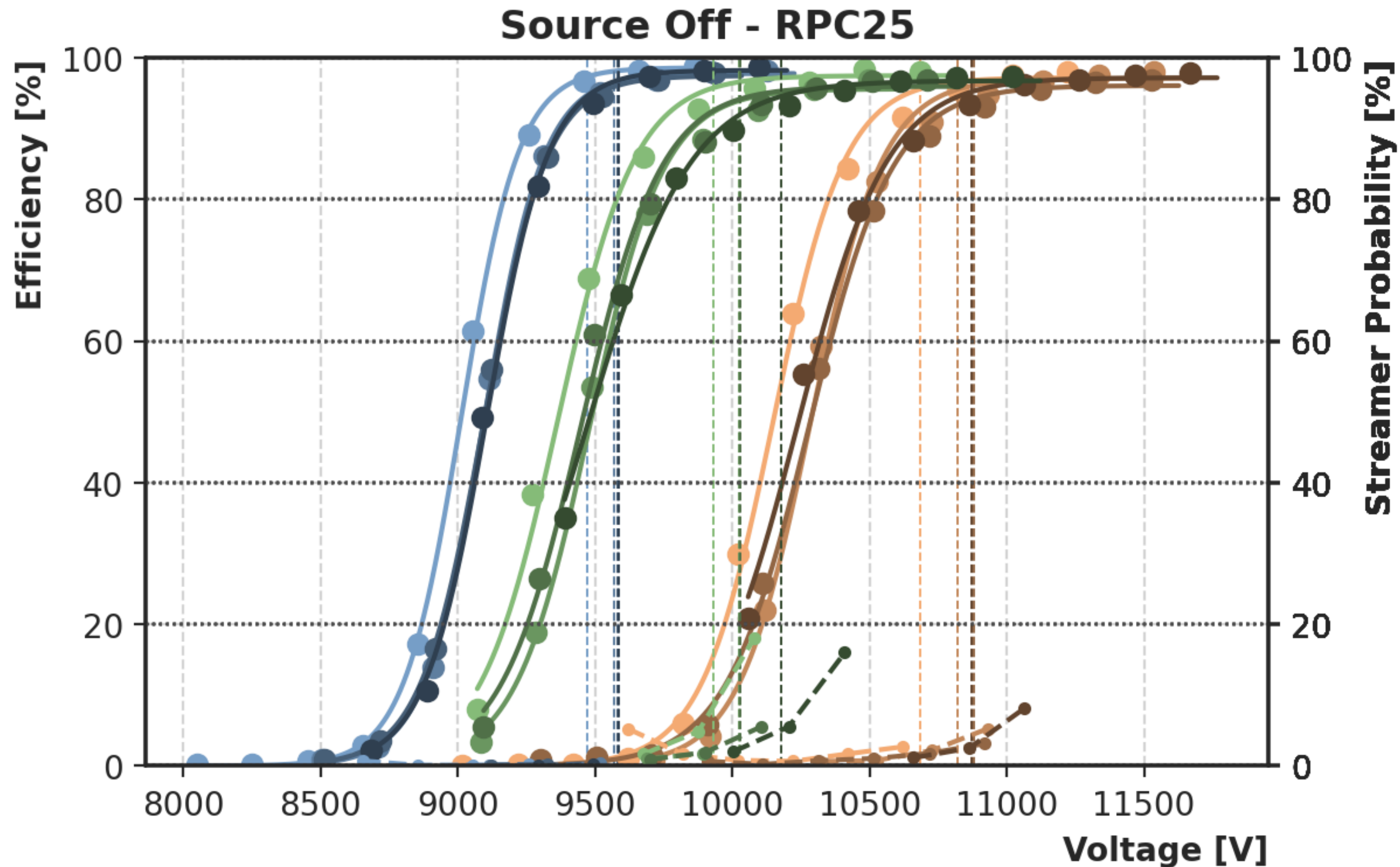
- mix\_take
- Sept24-STD-old
  - ▲ Sept24-STD-new
  - ★ Sept24-ECO2-old
  - ▼ Sept24-ECO2-new

- Both the currents and rates are consistent between the two mixers, for both gas mixtures: STD and ECO2.



# Efficiency Curves

Test Beam Sept-Oct 24



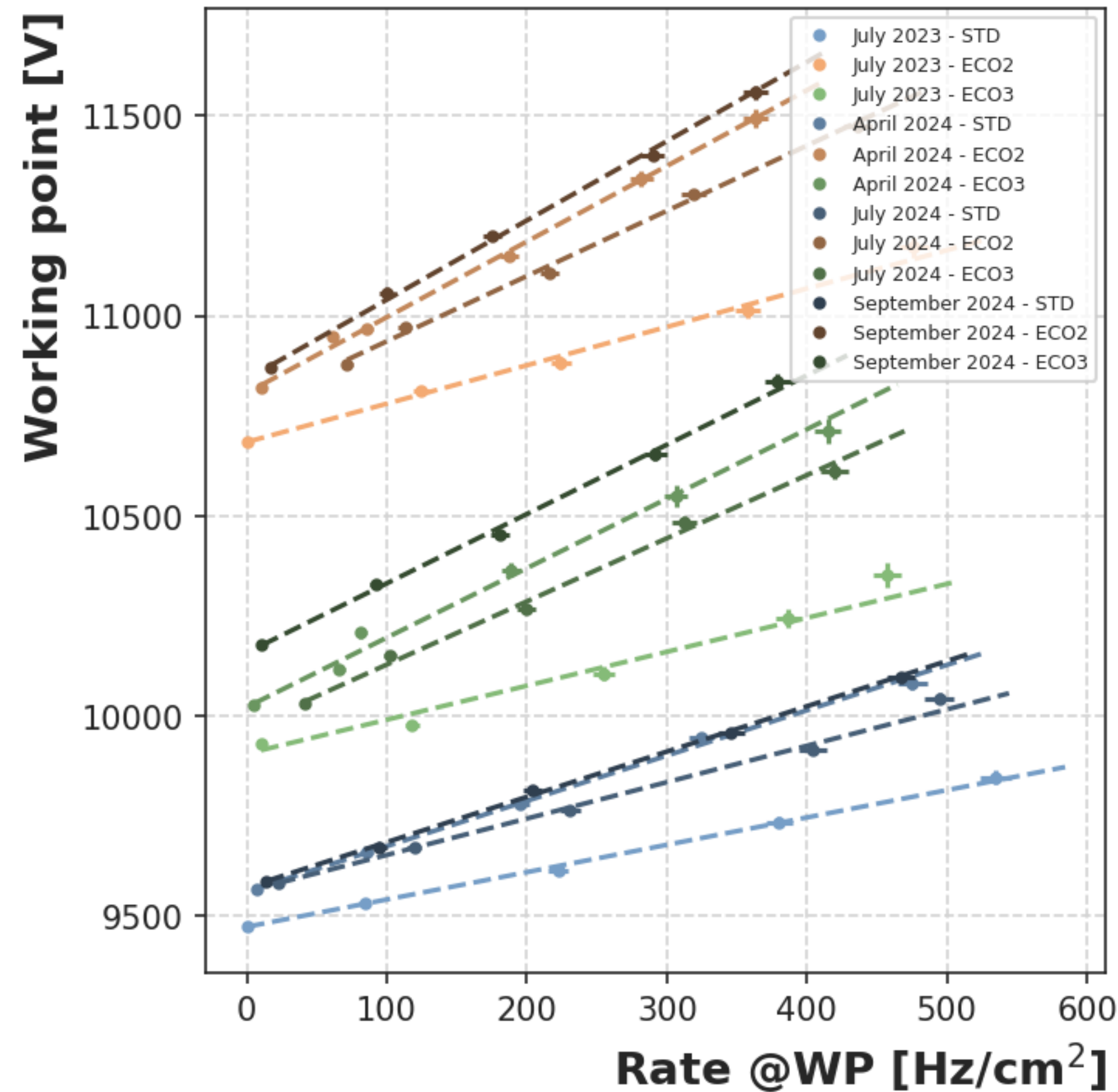
- Same shape as in the last 2 test beams.

●	July 2023 - STD, EffMax: 98.64%, SP: 0.50%, WP: 9473V, Rate: 0Hz/cm <sup>2</sup>
●	April 2024 - STD, EffMax: 97.81%, SP: 0.47%, WP: 9568V, Rate: 7Hz/cm <sup>2</sup>
●	July 2024 - STD, EffMax: 97.50%, SP: 0.60%, WP: 9584V, Rate: 22Hz/cm <sup>2</sup>
●	September 2024 - STD, EffMax: 98.26%, SP: 0.33%, WP: 9587V, Rate: 14Hz/cm <sup>2</sup>
●	July 2023 - ECO2, EffMax: 97.23%, SP: 4.50%, WP: 10684V, Rate: 0Hz/cm <sup>2</sup>
●	April 2024 - ECO2, EffMax: 97.13%, SP: 3.58%, WP: 10820V, Rate: 11Hz/cm <sup>2</sup>
●	July 2024 - ECO2, EffMax: 96.11%, SP: 2.88%, WP: 10880V, Rate: 72Hz/cm <sup>2</sup>
●	September 2024 - ECO2, EffMax: 97.21%, SP: 2.71%, WP: 10870V, Rate: 17Hz/cm <sup>2</sup>
●	July 2023 - ECO3, EffMax: 97.52%, SP: 8.33%, WP: 9930V, Rate: 10Hz/cm <sup>2</sup>
●	April 2024 - ECO3, EffMax: 95.62%, SP: 5.03%, WP: 10027V, Rate: 5Hz/cm <sup>2</sup>
●	July 2024 - ECO3, EffMax: 95.99%, SP: 4.19%, WP: 10030V, Rate: 42Hz/cm <sup>2</sup>
●	September 2024 - ECO3, EffMax: 96.81%, SP: 5.04%, WP: 10176V, Rate: 11Hz/cm <sup>2</sup>

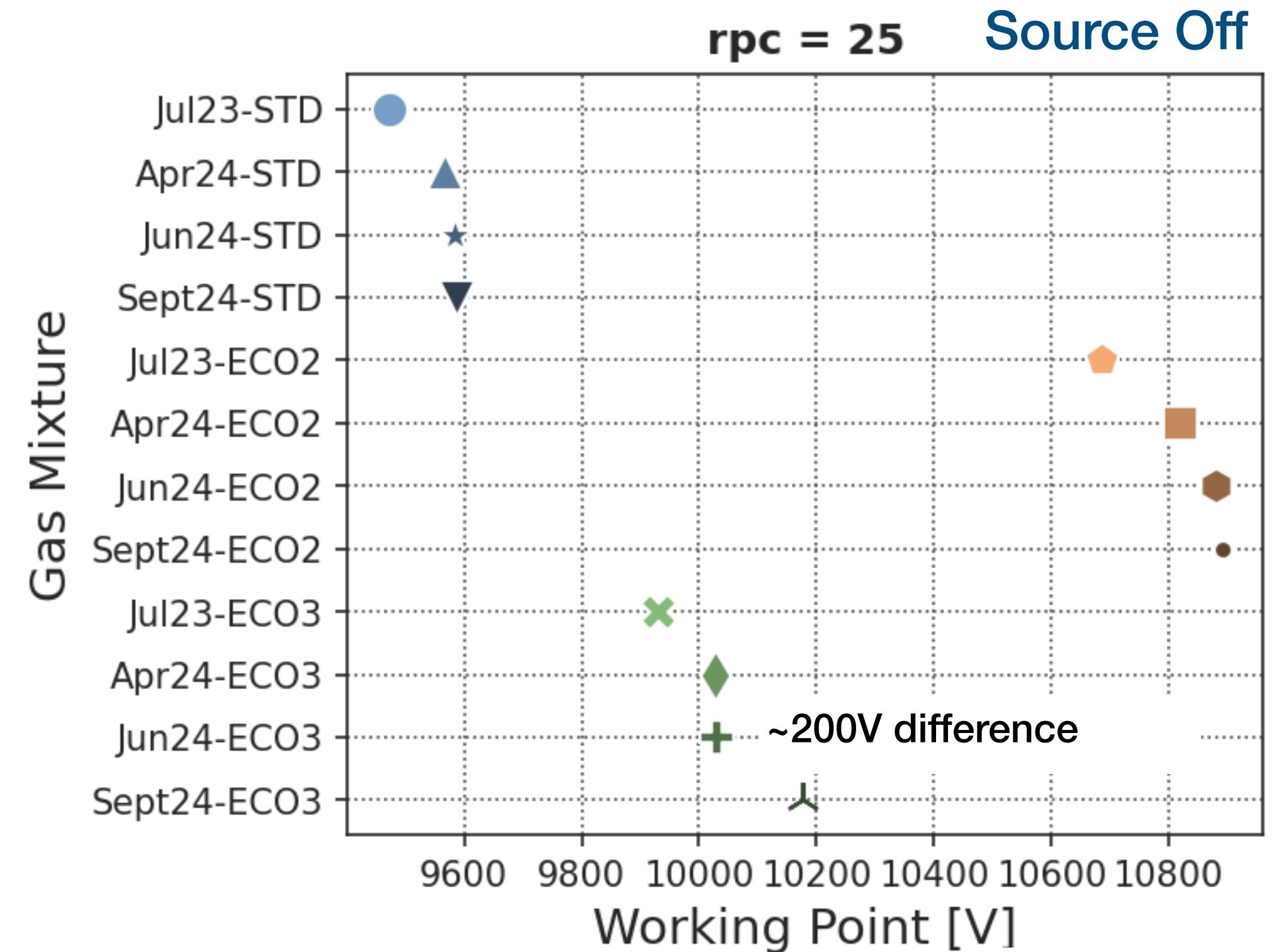
# Working Point VS Rates

Test Beam Sept-Oct 24

RPC 25



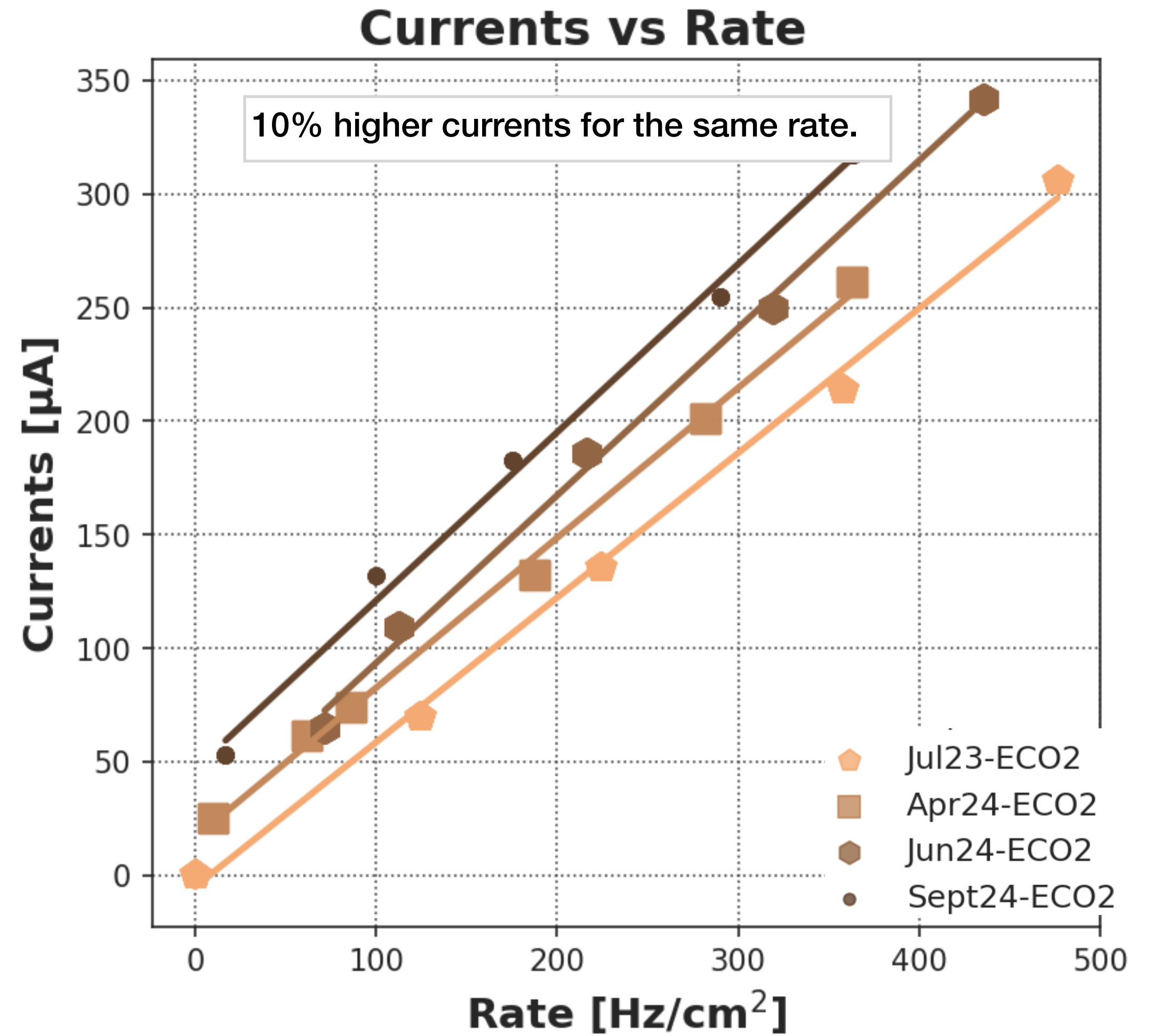
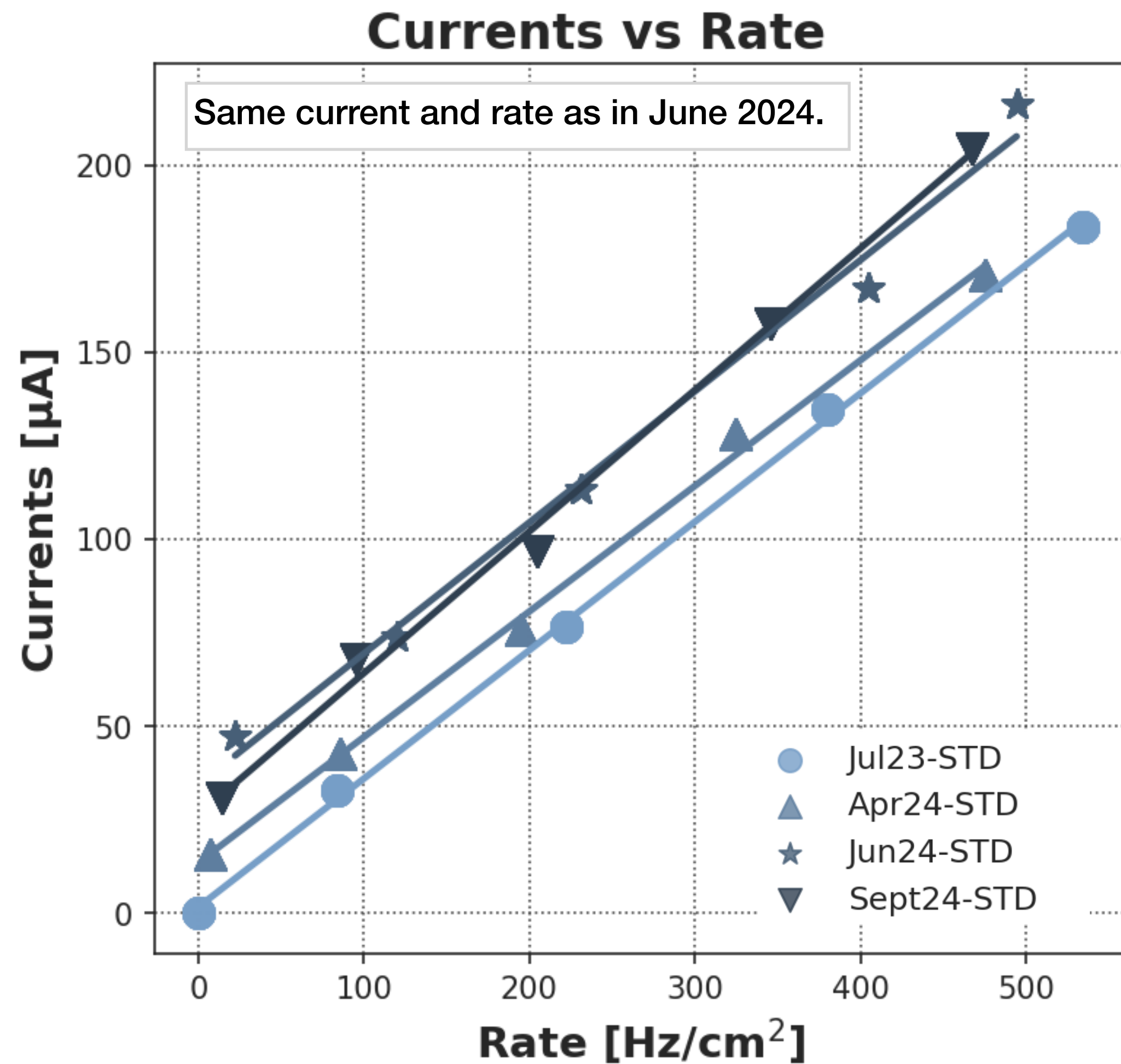
- There is little change in the working point over time.
- It's more noticeable in the ECO3 mixture, where there is a shift of ~200V.





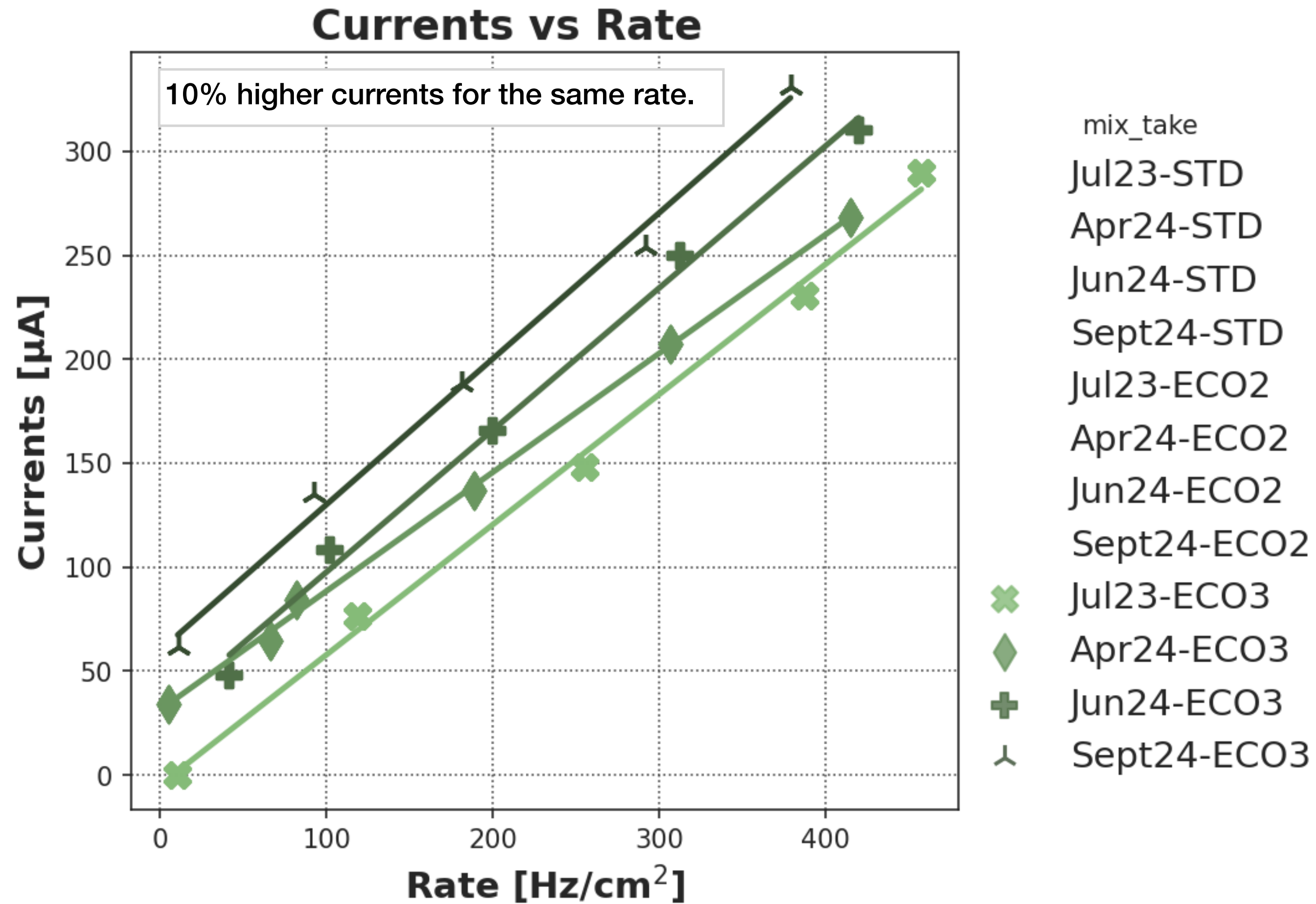
# Currents VS Rates

Test Beam Sept-Oct 24



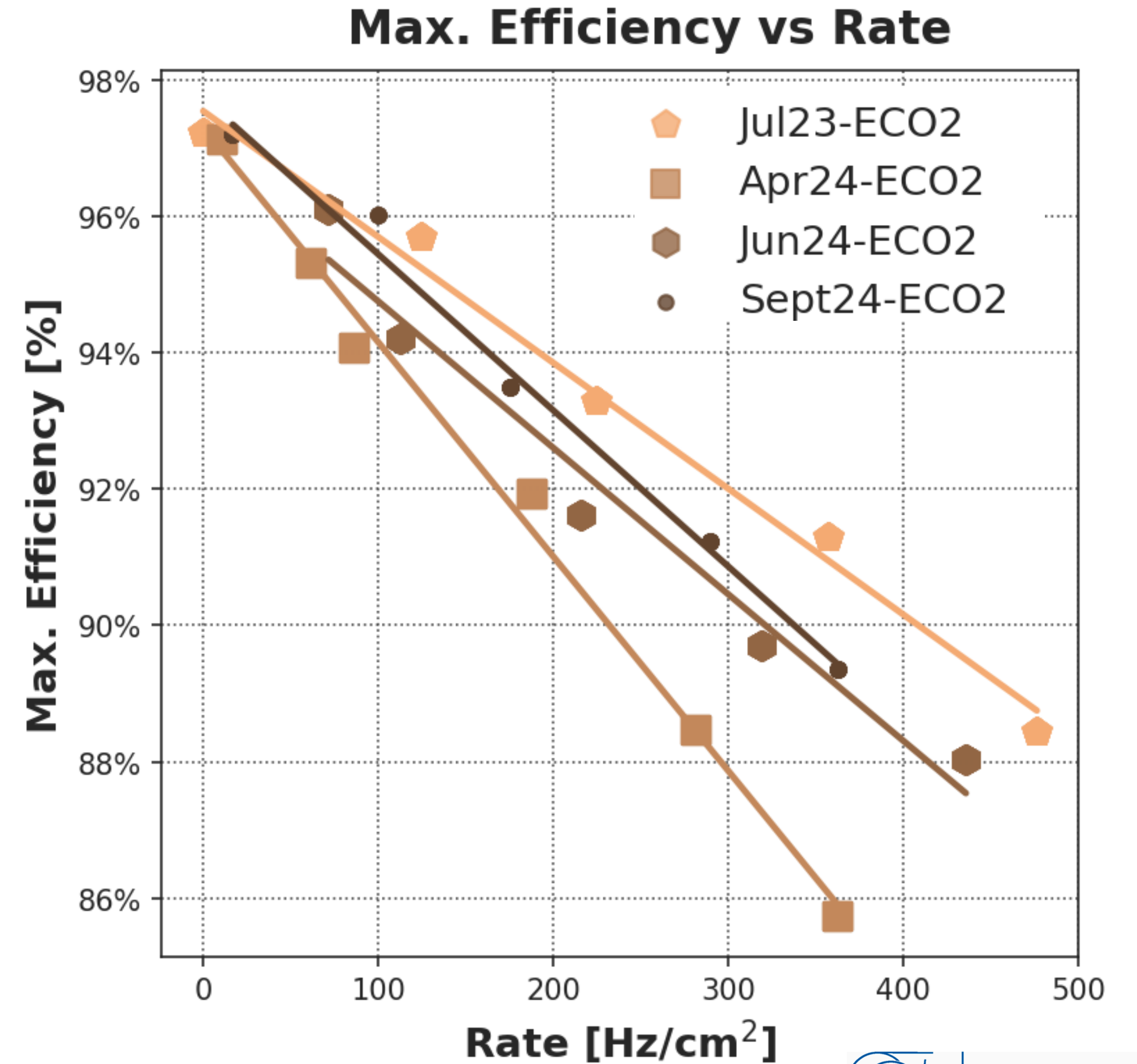
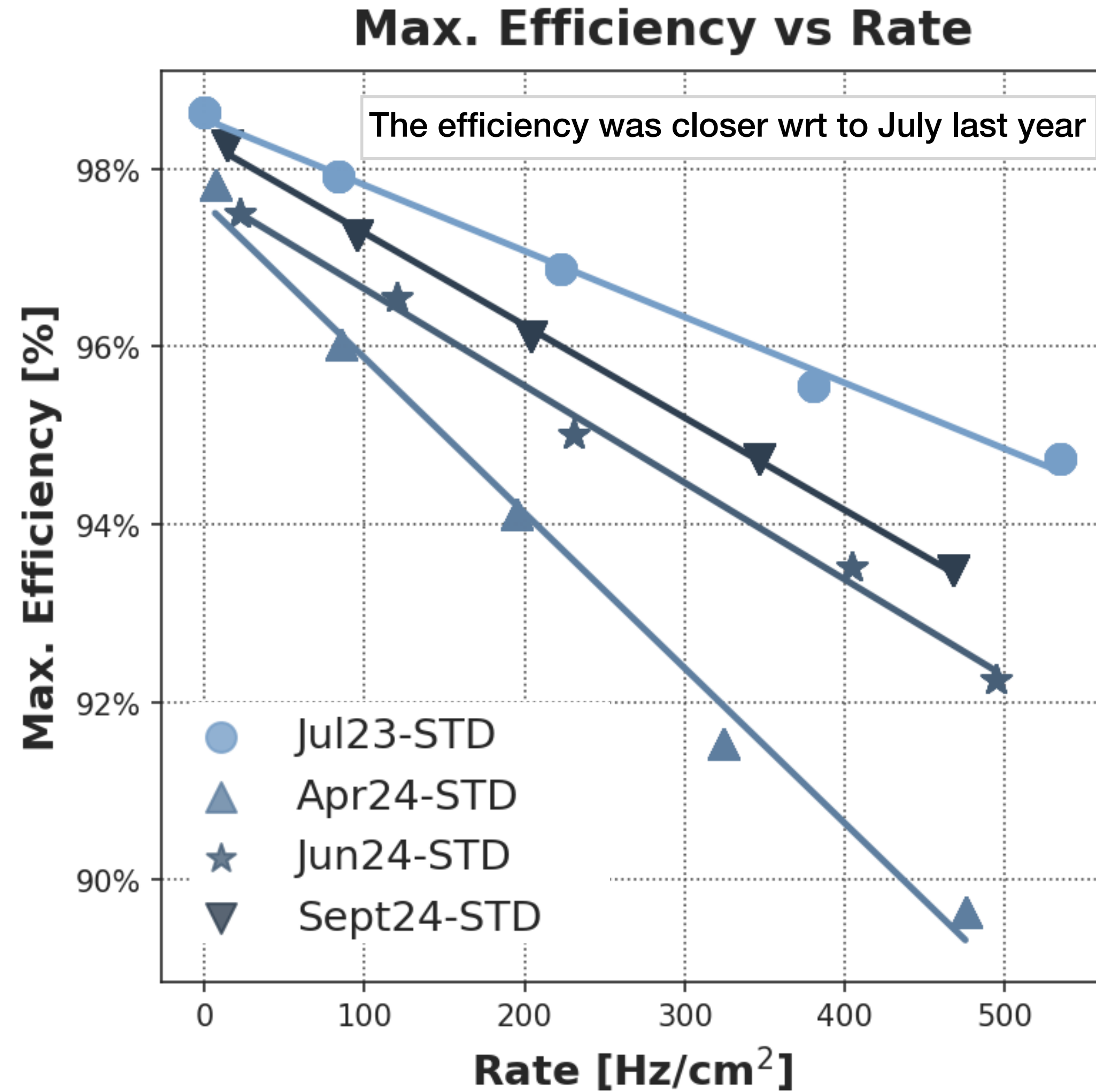
# Currents VS Rates

Test Beam Sept-Oct 24



# Max. Efficiency VS Rate

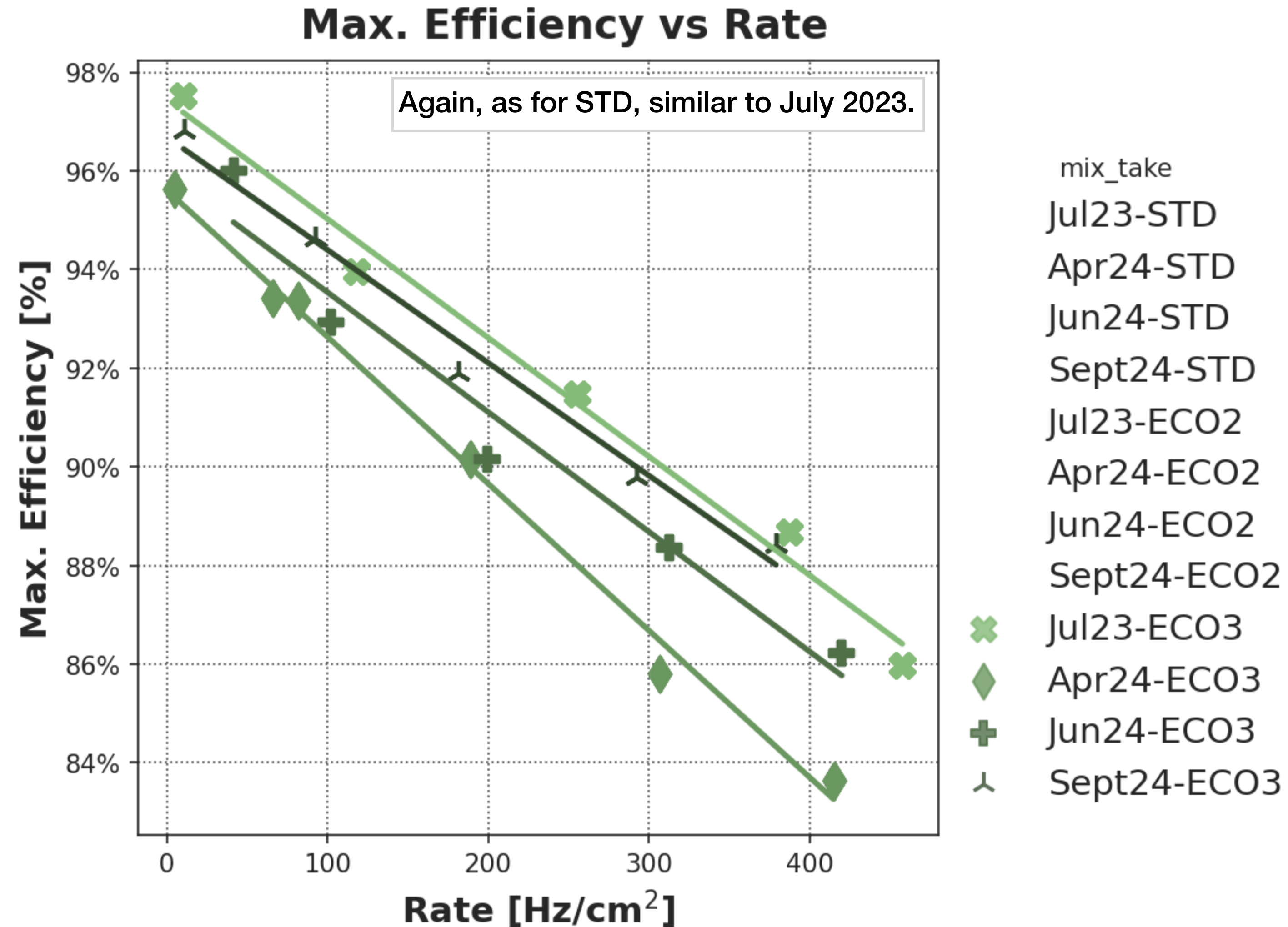
Test Beam Sept-Oct 24





# Max. Efficiency VS Rate

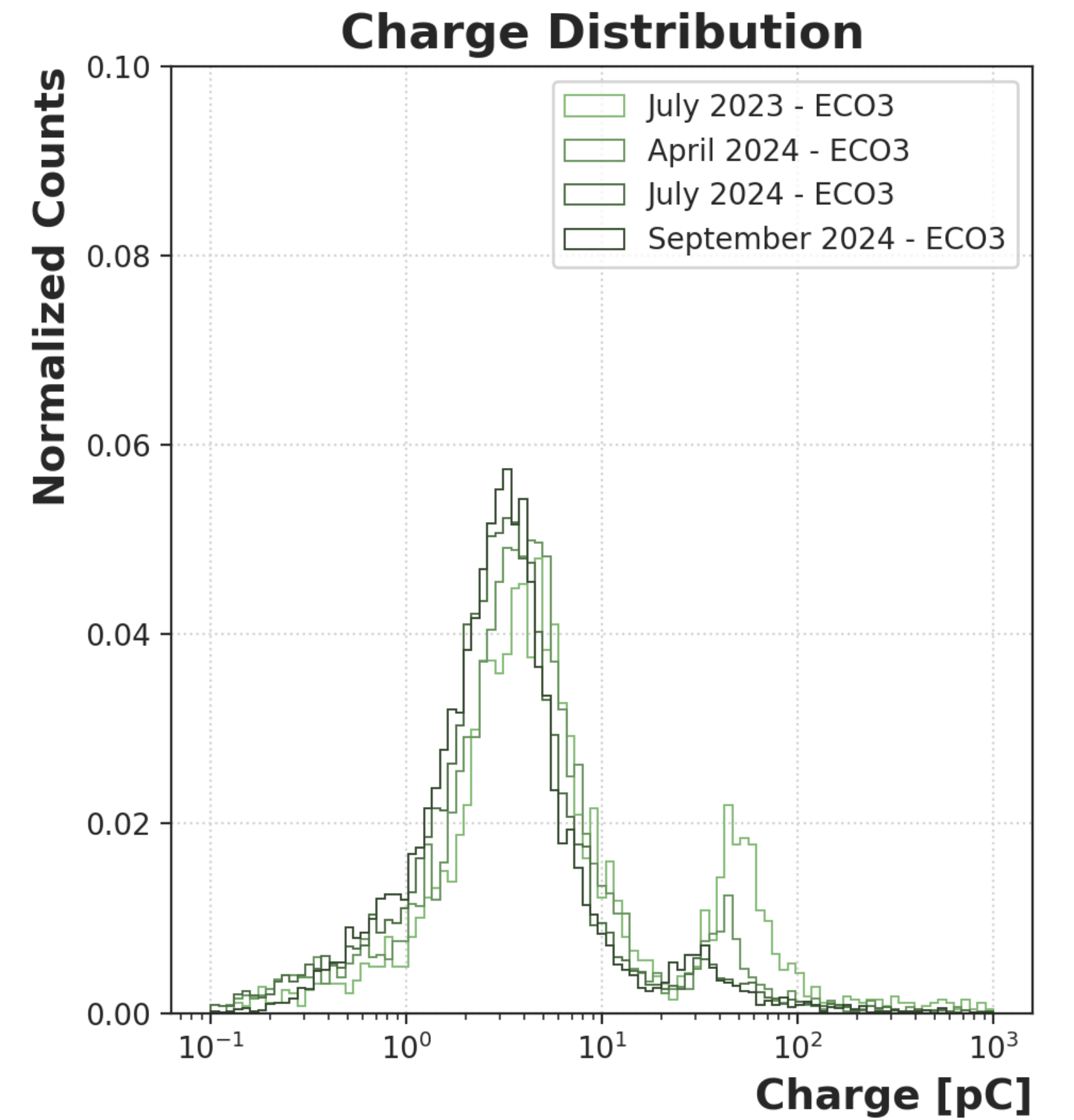
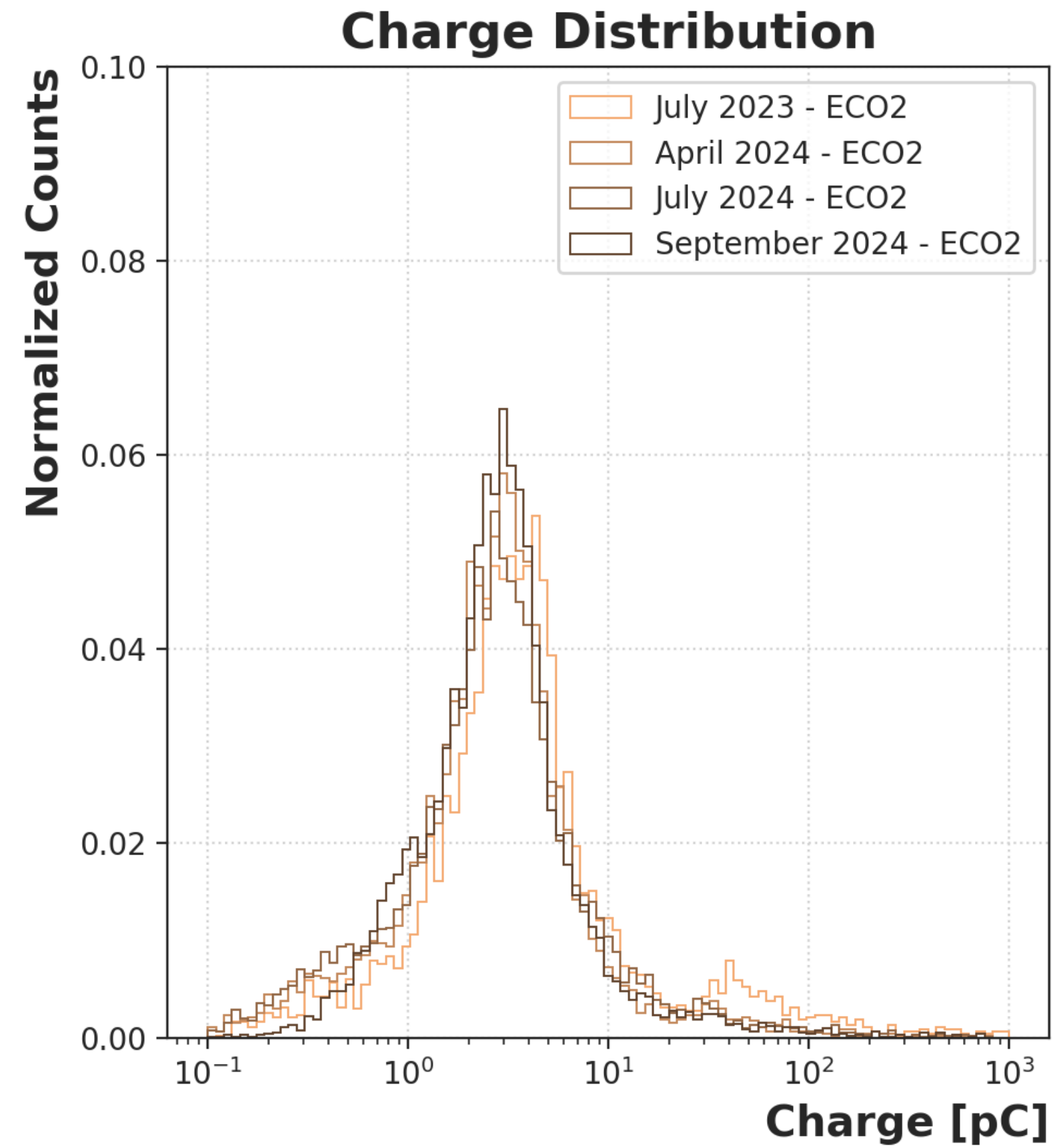
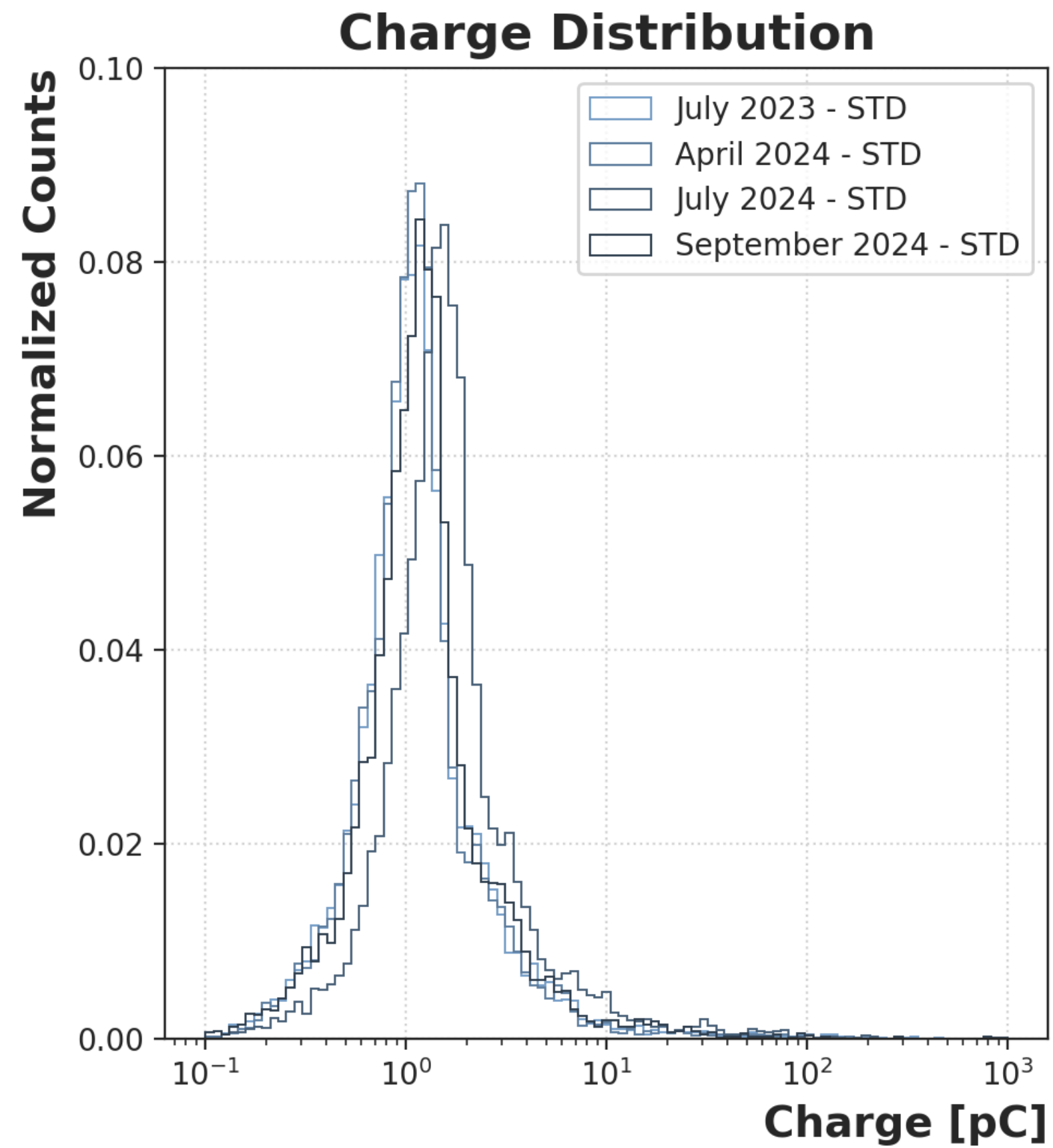
Test Beam Sept-Oct 24



# Charge Distribution

## Test Beam Sept-Oct 24

- Small shift towards smaller charge for STD and ECO2 over the irradiation period.



# Summary

## Test Beam Sept-Oct 24

- No difference between the two mixers - NEW and OLD (CO<sub>2</sub>-collaboration).
  - For both gas mixtures checked: STD & ECO2
- With respect to previous test beams:
  - **Small increase in the working point for the ECO3 mix**
  - **Higher currents ~10% for both ECO2 and ECO3**