```python
import pybamm
import matplotlib.pyplot as plt
import numpy as np
import pybamm
import pandas as pd
from matplotlib import style
from scipy.interpolate import interp1d
import matplotlib.ticker as ticker

from sklearn.metrics import mean_squared_error
from sklearn.metrics import r2_score
pybamm.set_logging_level("NOTICE")

import pybamm.input
import pybamm.input.parameters
import pybamm.input.parameters.lithium_ion.Prada2013
```

Test data loading Function

```python
from pathlib import Path
import pandas as pd

from pathlib import Path
import pandas as pd

def get_test_data(excel_name, sheet_name):
    try:
        BASE_DIR = Path(__file__).resolve().parent
    except NameError:
        BASE_DIR = Path.cwd()

    excel_path = BASE_DIR / f"{excel_name}.xlsx"

    if not excel_path.exists():
        raise FileNotFoundError(f"Excel file not found: {excel_path}")

    df = pd.read_excel(excel_path, sheet_name=sheet_name)
    return df


# df1 = get_test_data("beginning_of_life", "Discharge")
# print(df1.head())
```

```python
model = pybamm.lithium_ion.SPM(
    {
        "open-circuit potential": ("current sigmoid", "current sigmoid"),
    }
)
params = pybamm.ParameterValues("Prada2013")
```

```python
params.update({
        # cell
        "Negative electrode thickness [m]": 3.4e-05,
        "Separator thickness [m]": 2.5e-05,
        "Positive electrode thickness [m]": 8e-05,
        "Electrode height [m]": 0.6,
```

```python
        "Electrode width [m]": 0.3,
        "Nominal cell capacity [A.h]": 2.3+0.2,
        "Current function [A]": 2.3+0.2,
        "Contact resistance [Ohm]": 0,
        # negative electrode
        "Negative electrode conductivity [S.m-1]": 215.0,
        "Maximum concentration in negative electrode [mol.m-3]": 30555,
        "Negative particle diffusivity [m2.s-1]": 3e-15,

        "Negative electrode lithiation OCP [V]": pybamm.input.parameters.lithium
        "Negative electrode delithiation OCP [V]":pybamm.input.parameters.lithiu

        "Negative electrode porosity": 0.36,
        "Negative electrode active material volume fraction": 0.58,
        "Negative particle radius [m]": 5e-6,
        "Negative electrode Bruggeman coefficient (electrolyte)": 1.5,
        "Negative electrode Bruggeman coefficient (electrode)": 1.5,
        "Negative electrode charge transfer coefficient": 0.5,
        "Negative electrode double-layer capacity [F.m-2]": 0.2,
        "Negative electrode exchange-current density [A.m-2]": pybamm.input.para
        "Negative electrode OCP entropic change [V.K-1]": 0,
        # positive electrode
        "Positive electrode conductivity [S.m-1]": 0.33795074,
        "Maximum concentration in positive electrode [mol.m-3]": 22806.0,
        "Positive particle diffusivity [m2.s-1]": 5.9e-18,

        "Positive electrode delithiation OCP [V]": pybamm.input.parameters.lithi
        "Positive electrode lithiation OCP [V]": pybamm.input.parameters.lithium


        "Positive electrode porosity": 0.426,
        "Positive electrode active material volume fraction": 0.374,
        "Positive particle radius [m]": 5e-08,
        "Positive electrode Bruggeman coefficient (electrode)": 1.5,
        "Positive electrode Bruggeman coefficient (electrolyte)": 1.5,
        "Positive electrode charge transfer coefficient": 0.5,
        "Positive electrode double-layer capacity [F.m-2]": 0.2,
        "Positive electrode exchange-current density [A.m-2]": pybamm.input.para
        "Positive electrode OCP entropic change [V.K-1]": 0,
        # separator
        "Separator porosity": 0.45,
        "Separator Bruggeman coefficient (electrolyte)": 1.5,
        # electrolyte
        "Initial concentration in electrolyte [mol.m-3]": 1200.0,
        "Cation transference number": 0.36,
        "Thermodynamic factor": 1.0,
        "Electrolyte diffusivity [m2.s-1]": 2e-10,
        "Electrolyte conductivity [S.m-1]": pybamm.input.parameters.lithium_ion.
        # experiment
        "Reference temperature [K]": 298,
        "Ambient temperature [K]": 298,
        "Number of electrodes connected in parallel to make a cell": 1.0,
        "Number of cells connected in series to make a battery": 1.0,
        "Lower voltage cut-off [V]": 2.5,
        "Upper voltage cut-off [V]": 3.5,
        "Open-circuit voltage at 0% SOC [V]": 2.5,
        "Open-circuit voltage at 100% SOC [V]": 3.5,

        # "Initial concentration in negative electrode [mol.m-3]": 0.81 * 30555,
        "Initial concentration in positive electrode [mol.m-3]": 0.0038 * 22806,
```

```
            "Initial temperature [K]": 298,

        }, check_already_exists=False
        )


params.update(
    {
        "Negative particle diffusivity [m2.s-1]": 3e-13,
        "Positive particle diffusivity [m2.s-1]": 5.9e-18,
        "Positive particle radius [m]": 5e-08,

        "Negative electrode thickness [m]": 3.4e-05*1.22,
        "Initial concentration in negative electrode [mol.m-3]": (0.81 * 30555*0
        "Maximum concentration in negative electrode [mol.m-3]": 30555*1.1,

    }, check_already_exists=False
)
```

In [31]:
```
# exp = pybamm.Experiment(
#     [
#         "Discharge at C/10 for 10 hours or until 2.5V (1 seconds period)",
#     ]
# )

exp = pybamm.Experiment(
    [
        (
            "Discharge at 0.5A until 2.5V (1 seconds period)",
            "Rest for 30 minutes (10 seconds period)",
            "Charge at 2.5A until 3.5V (1 seconds period)",
            "Hold at 3.5V until 0.05A (1 seconds period)"
        )
    ]
)
solver = pybamm.IDAKLUSolver()

sim = pybamm.Simulation(model= model, parameter_values=params, experiment=exp, s
# sol = sim.solve(initial_soc=1.0)
sol = sim.solve(calc_esoh=False)
sol.plot()
```

```
2025-12-23 16:06:11.454 - [NOTICE] logger.func(7): Cycle 1/1 (16.200 us elapsed)
--------------------
2025-12-23 16:06:11.456 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 0.5A until 2.5V (1 seconds period)
2025-12-23 16:06:11.608 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 16:06:11.633 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 16:06:11.743 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 16:06:11.887 - [NOTICE] logger.func(7): Finish experiment simulation,
took 432.184 ms
interactive(children=(FloatSlider(value=0.0, description='t', max=6.4734009927632
25, step=0.06473400992763226)…
```

Out[31]: <pybamm.plotting.quick_plot.QuickPlot at 0x1e5dca30830>

```python
### Test data
df = get_test_data("beginning_of_life", "Discharge")
test_voltage = df["1Ca Voltage [V]"].values
test_capacity = df["1Ca Capacity [Ah]"].values
####********************########

exp = pybamm.Experiment(
    [
        "Discharge at 2.5A until 2.5V (1 seconds period)",
    ]
)
solver = pybamm.IDAKLUSolver()
sim = pybamm.Simulation(model= model, parameter_values=params, experiment=exp, s
# sol = sim.solve(initial_soc=1.0)
sol = sim.solve(calc_esoh=False)

NE_cap = sol["Negative electrode capacity [A.h]"].entries[-1]
PE_cap = sol["Positive electrode capacity [A.h]"].entries[-1]
print("N/P ratio at", ":", NE_cap/PE_cap)


sim_cap = sol["Discharge capacity [A.h]"].entries - sol["Discharge capacity [A.h
print(sim_cap[-1])

sim_voltage = sol["Terminal voltage [V]"].entries
print(sim_voltage[0])

time = sol["Time [h]"].entries-sol["Time [h]"].entries[0]

plt.rcParams.update({
    "font.size": 14,            # base font size
    "axes.titlesize": 16,
    "axes.labelsize": 15,
    "xtick.labelsize": 13,
    "ytick.labelsize": 13,
    "legend.fontsize": 13
})

plt.figure(figsize=(8, 5))

plt.plot(test_capacity, test_voltage, color="red", linewidth=1.5, label="Test Da
plt.plot(sim_cap, sim_voltage, color="blue", linestyle="-", linewidth=1.5, label

plt.xlabel("Capacity (Ah)")
plt.ylabel("Voltage (V)")
plt.title("Voltage vs Capacity")

plt.grid(True, linestyle="--", linewidth=0.5, alpha=0.4)
plt.legend()
plt.tight_layout()
plt.show()

print(sim_voltage[0])
```
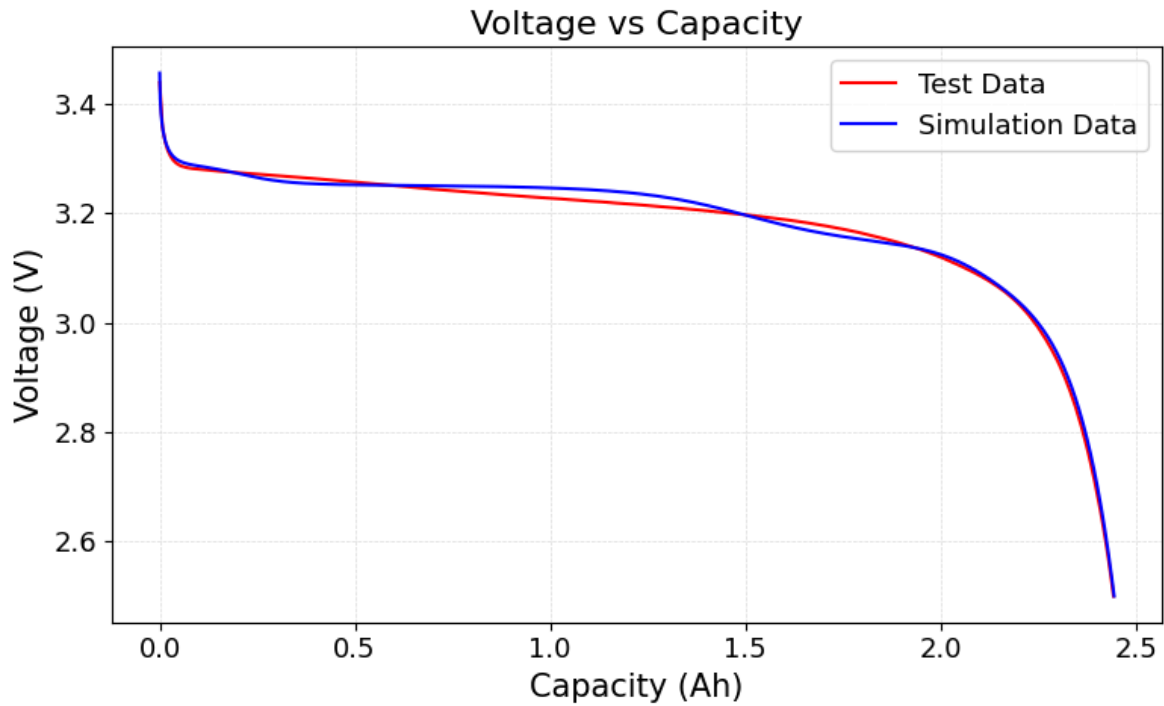
```
2025-12-23 15:59:54.024 - [NOTICE] logger.func(7): Cycle 1/1 (11.800 us elapsed)
--------------------
2025-12-23 15:59:54.024 - [NOTICE] logger.func(7): Cycle 1/1, step 1/1: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 15:59:54.099 - [NOTICE] logger.func(7): Finish experiment simulation,
took 76.500 ms
```

N/P ratio at : 1.18503453038674
2.444986415103455
3.456238788573819

Voltage vs Capacity

3.456238788573819

```python
In [23]: import numpy as np
import matplotlib.pyplot as plt
from sklearn.metrics import r2_score, mean_squared_error


# ========================
# Test data
# ========================
df = get_test_data("beginning_of_life", "Charge")
test_voltage = df["951 Voltage [V]"].values
test_time = df["951 Time [min]"].values


# ========================
# PyBaMM Simulation
# ========================
exp = pybamm.Experiment(
    [
        (
            "Discharge at 0.5A until 2.5V (1 seconds period)",
            "Rest for 30 minutes (10 seconds period)",
            "Charge at 2.5A until 3.5V (1 seconds period)",
            "Hold at 3.5V until 0.05A (1 seconds period)"
        )
    ]
)

solver = pybamm.IDAKLUSolver()
sim = pybamm.Simulation(
```

```python
    model=model,
    parameter_values=params,
    experiment=exp,
    solver=solver,
)

# sol = sim.solve(initial_soc=1.0)
sol = sim.solve(calc_esoh=False)

# sim_time_cc = sol.cycles[0].steps[2]["Time [min]"].entries - sol.cycles[0].ste
# sim_time_cv = sol.cycles[0].steps[3]["Time [min]"].entries - sol.cycles[0].ste

# sim_time = np.concatenate(
#     (sim_time_cc, sim_time_cv)
# )

sim_time = (
    sol.cycles[0].steps[2]["Time [min]"].entries
    - sol.cycles[0].steps[2]["Time [min]"].entries[0]
)

# sim_voltage_cc = sol.cycles[0].steps[2]["Terminal voltage [V]"].entries
# sim_voltage_cv = sol.cycles[0].steps[3]["Terminal voltage [V]"].entries

# sim_voltage = np.concatenate(
#     (sim_voltage_cc, sim_voltage_cv)
# )

sim_voltage = sol.cycles[0].steps[2]["Terminal voltage [V]"].entries


plt.rcParams.update({
    "font.size": 14,           # base font size
    "axes.titlesize": 16,
    "axes.labelsize": 15,
    "xtick.labelsize": 13,
    "ytick.labelsize": 13,
    "legend.fontsize": 13
})

plt.figure(figsize=(8, 5))

plt.plot(test_time, test_voltage, color="red", linewidth=1.5, label="Test Data")
plt.plot(sim_time, sim_voltage, color="blue", linestyle="-", linewidth=1.5, labe

plt.xlabel("Time (min)")
plt.ylabel("Voltage (V)")
plt.title("Voltage vs Time")

plt.grid(True, linestyle="--", linewidth=0.5, alpha=0.4)
plt.legend()
plt.tight_layout()
plt.show()
```

```
2025-12-23 15:59:54.446 - [NOTICE] logger.func(7): Cycle 1/1 (12.200 us elapsed)
--------------------
2025-12-23 15:59:54.446 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 0.5A until 2.5V (1 seconds period)
2025-12-23 15:59:54.524 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 15:59:54.549 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 15:59:54.622 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 15:59:54.718 - [NOTICE] logger.func(7): Finish experiment simulation,
took 268.935 ms
```
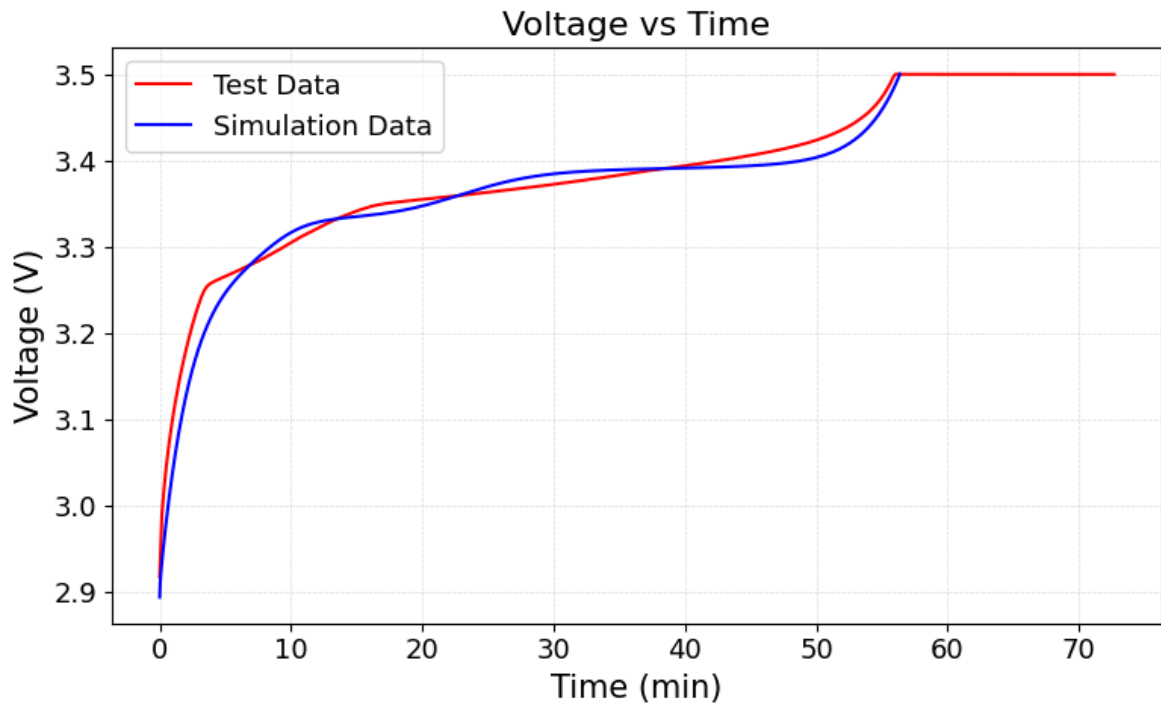


```python
In [24]:  import numpy as np
          import matplotlib.pyplot as plt
          from sklearn.metrics import r2_score, mean_squared_error


          # =======================
          # Test data
          # =======================
          df = get_test_data("beginning_of_life", "Discharge")
          test_voltage = df["1Ca Voltage [V]"].values
          test_capacity = df["1Ca Capacity [Ah]"].values


          # =======================
          # PyBaMM Simulation
          # =======================
          exp = pybamm.Experiment(
              ["Discharge at 2.5A until 2.5V (1 seconds period)"]
          )

          solver = pybamm.IDAKLUSolver()
          sim = pybamm.Simulation(
              model=model,
              parameter_values=params,
              experiment=exp,
              solver=solver,
          )
```

```python
# sol = sim.solve(initial_soc=1.0)
sol = sim.solve(calc_esoh=False)

sim_cap = (
    sol["Discharge capacity [A.h]"].entries
    - sol["Discharge capacity [A.h]"].entries[0]
)
sim_voltage = sol["Terminal voltage [V]"].entries

# =======================
# Remove NaNs from test data
# =======================
mask_test = np.isfinite(test_capacity) & np.isfinite(test_voltage)
test_capacity = test_capacity[mask_test]
test_voltage = test_voltage[mask_test]

# =======================
# Restrict to common capacity range
# =======================
cap_min = max(test_capacity.min(), sim_cap.min())
cap_max = min(test_capacity.max(), sim_cap.max())

mask_common = (test_capacity >= cap_min) & (test_capacity <= cap_max)

test_capacity = test_capacity[mask_common]
test_voltage = test_voltage[mask_common]

# =======================
# Interpolate simulation voltage
# =======================
sim_voltage_interp = np.interp(
    test_capacity,
    sim_cap,
    sim_voltage
)

# =======================
# Final NaN guard
# =======================
mask_final = np.isfinite(sim_voltage_interp) & np.isfinite(test_voltage)

capacity_f = test_capacity[mask_final]
test_voltage_f = test_voltage[mask_final]
sim_voltage_f = sim_voltage_interp[mask_final]

# =======================
# Error metrics
# =======================
voltage_error = (sim_voltage_f - test_voltage_f)*1000   ## mV

rmse = np.sqrt(mean_squared_error(test_voltage_f, sim_voltage_f))
r2 = r2_score(test_voltage_f, sim_voltage_f)

# =======================
# Plot
# =======================
plt.rcParams.update({
    "font.size": 14,
    "axes.titlesize": 16,
```

```python
    "axes.labelsize": 15,
    "xtick.labelsize": 13,
    "ytick.labelsize": 13,
    "legend.fontsize": 13
})

fig, ax1 = plt.subplots(figsize=(10, 6))

ax1.plot(capacity_f, test_voltage_f, 'r', lw=1.8, label="Test Voltage")
ax1.plot(capacity_f, sim_voltage_f, 'b', lw=1.8, label="Sim Voltage")

ax1.set_xlabel("Capacity (Ah)")
ax1.set_ylabel("Voltage (V)")
ax1.grid(True, ls="--", alpha=0.4)

ax2 = ax1.twinx()
ax2.plot(capacity_f, voltage_error, 'g--', lw=1, label="Voltage Error", alpha=0.

# >>> ADD THESE TWO LINES <<<
ax2.axhline(20, color="gray", linestyle="--", linewidth=1.2, alpha=0.5)
ax2.axhline(-20, color="gray", linestyle="--", linewidth=1.2, alpha=0.5)


ax2.set_ylabel("Voltage Error (mV)")
ax2.set_ylim(-40, 100)

lines1, labels1 = ax1.get_legend_handles_labels()
lines2, labels2 = ax2.get_legend_handles_labels()
ax1.legend(lines1 + lines2, labels1 + labels2)

ax1.set_title(
    f"Voltage vs Capacity | R2 = {r2:.3f}, RMSE = {rmse*1000:.2f} mV"
)

plt.tight_layout()
plt.show()
```
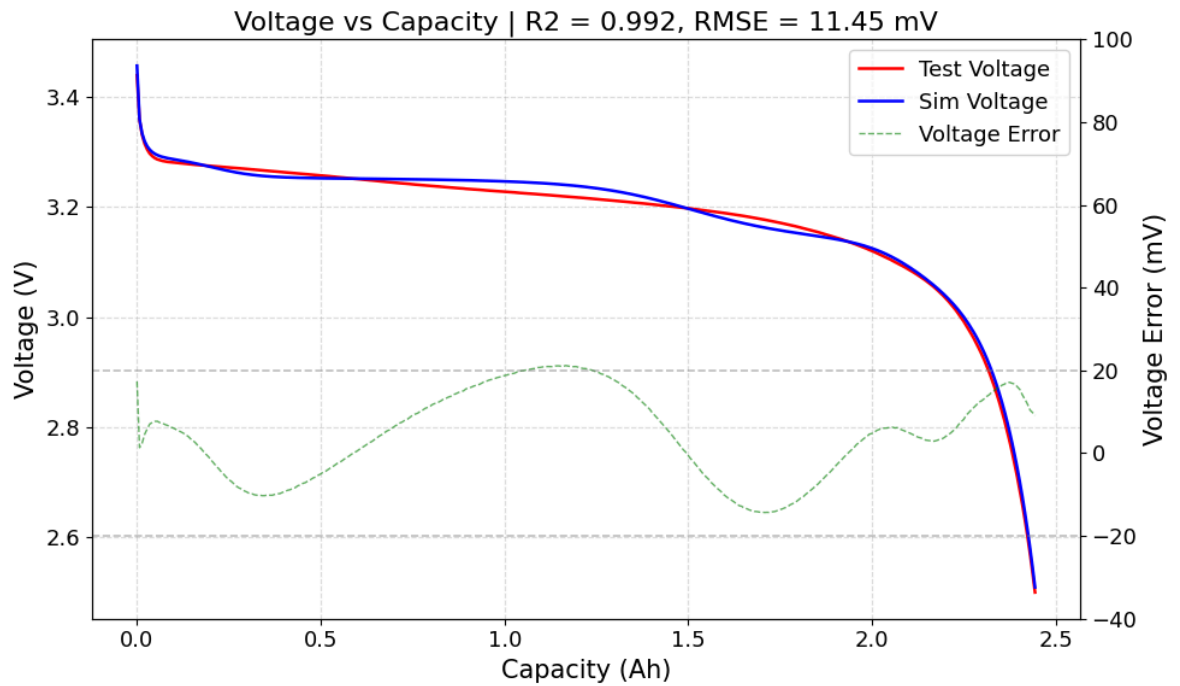
```
2025-12-23 15:59:54.959 - [NOTICE] logger.func(7): Cycle 1/1 (10.000 us elapsed)
--------------------
2025-12-23 15:59:54.959 - [NOTICE] logger.func(7): Cycle 1/1, step 1/1: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 15:59:55.042 - [NOTICE] logger.func(7): Finish experiment simulation,
took 80.732 ms
```

Voltage vs Capacity | R2 = 0.992, RMSE = 11.45 mV

```
In [25]:  import numpy as np
          import matplotlib.pyplot as plt
          from sklearn.metrics import r2_score, mean_squared_error


          # ========================
          # Test data
          # ========================
          df = get_test_data("beginning_of_life", "Charge")
          test_voltage = df["951 Voltage [V]"].values
          test_time = df["951 Time [min]"].values


          # ========================
          # PyBaMM Simulation
          # ========================
          exp = pybamm.Experiment(
              [
                  (
                      "Discharge at 2.5A until 2.5V (1 seconds period)",
                      "Rest for 30 minutes (1800 seconds period)",
                      "Charge at 2.5A until 3.5V (1 seconds period)",
                      "Hold at 3.5V until 0.05A (1 seconds period)"
                  )
              ]
          )

          solver = pybamm.IDAKLUSolver()
          sim = pybamm.Simulation(
              model=model,
              parameter_values=params,
              experiment=exp,
              solver=solver,
          )

          # sol = sim.solve(initial_soc=1.0)
          sol = sim.solve(calc_esoh=False)
          # sim_time = (
          #     sol.cycles[0].steps[2]["Time [min]"].entries
          #     - sol.cycles[0].steps[2]["Time [min]"].entries[0]
```

```python
# )

# sim_voltage = sol.cycles[0].steps[2]["Terminal voltage [V]"].entries

sim_time_cc = sol.cycles[0].steps[2]["Time [min]"].entries - sol.cycles[0].steps
sim_time_cv = sol.cycles[0].steps[3]["Time [min]"].entries - sol.cycles[0].steps

sim_time = np.concatenate(
    (sim_time_cc, sim_time_cv)
)

# sim_time = (
#     sol.cycles[0].steps[2]["Time [min]"].entries
#     - sol.cycles[0].steps[2]["Time [min]"].entries[0]
# )

sim_voltage_cc = sol.cycles[0].steps[2]["Terminal voltage [V]"].entries
sim_voltage_cv = sol.cycles[0].steps[3]["Terminal voltage [V]"].entries

sim_voltage = np.concatenate(
    (sim_voltage_cc, sim_voltage_cv)
)



# =======================
# Remove NaNs from test data
# =======================
mask_test = np.isfinite(test_time) & np.isfinite(test_voltage)
test_time = test_time[mask_test]
test_voltage = test_voltage[mask_test]

# =======================
# Restrict to common capacity range
# =======================
time_min = max(test_time.min(), sim_time.min())
time_max = min(test_time.max(), sim_time.max())

mask_common = (test_time >= time_min) & (test_time <= time_max)

test_time = test_time[mask_common]
test_voltage = test_voltage[mask_common]

# =======================
# Interpolate simulation voltage
# =======================
sim_voltage_interp = np.interp(
    test_time,
    sim_time,
    sim_voltage
)

# =======================
# Final NaN guard
# =======================
mask_final = np.isfinite(sim_voltage_interp) & np.isfinite(test_voltage)

capacity_f = test_time[mask_final]
test_voltage_f = test_voltage[mask_final]
sim_voltage_f = sim_voltage_interp[mask_final]
```

```python
# =======================
# Error metrics
# =======================
voltage_error = (sim_voltage_f - test_voltage_f)*1000    ## mV

rmse = np.sqrt(mean_squared_error(test_voltage_f, sim_voltage_f))
r2 = r2_score(test_voltage_f, sim_voltage_f)


# =======================
# Plot
# =======================
plt.rcParams.update({
    "font.size": 14,
    "axes.titlesize": 16,
    "axes.labelsize": 15,
    "xtick.labelsize": 13,
    "ytick.labelsize": 13,
    "legend.fontsize": 13
})

fig, ax1 = plt.subplots(figsize=(10, 6))

ax1.plot(capacity_f, test_voltage_f, 'r', lw=1.8, label="Test Voltage")
ax1.plot(capacity_f, sim_voltage_f, 'b', lw=1.8, label="Sim Voltage")

ax1.set_xlabel("Time (min)")
ax1.set_ylabel("Voltage (V)")
ax1.grid(True, ls="--", alpha=0.4)

ax2 = ax1.twinx()
ax2.plot(capacity_f, voltage_error, 'g--', lw=1, label="Voltage Error", alpha=0.

# >>> ADD THESE TWO LINES <<<
ax2.axhline(20, color="gray", linestyle="--", linewidth=1.2, alpha=0.5)
ax2.axhline(-20, color="gray", linestyle="--", linewidth=1.2, alpha=0.5)


ax2.set_ylabel("Voltage Error (mV)")
ax2.set_ylim(-40, 100)

lines1, labels1 = ax1.get_legend_handles_labels()
lines2, labels2 = ax2.get_legend_handles_labels()
ax1.legend(lines1 + lines2, labels1 + labels2)

ax1.set_title(
    f"Voltage vs Time | R2 = {r2:.3f}, RMSE = {rmse*1000:.2f} mV"
)

plt.tight_layout()
plt.show()
```

```
2025-12-23 15:59:55.467 - [NOTICE] logger.func(7): Cycle 1/1 (12.800 us elapsed)
--------------------
2025-12-23 15:59:55.467 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 15:59:55.543 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (1800 seconds period)
2025-12-23 15:59:55.576 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 15:59:55.676 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 15:59:55.782 - [NOTICE] logger.func(7): Finish experiment simulation,
took 311.999 ms
```


Voltage vs Time | R2 = 0.979, RMSE = 12.26 mV
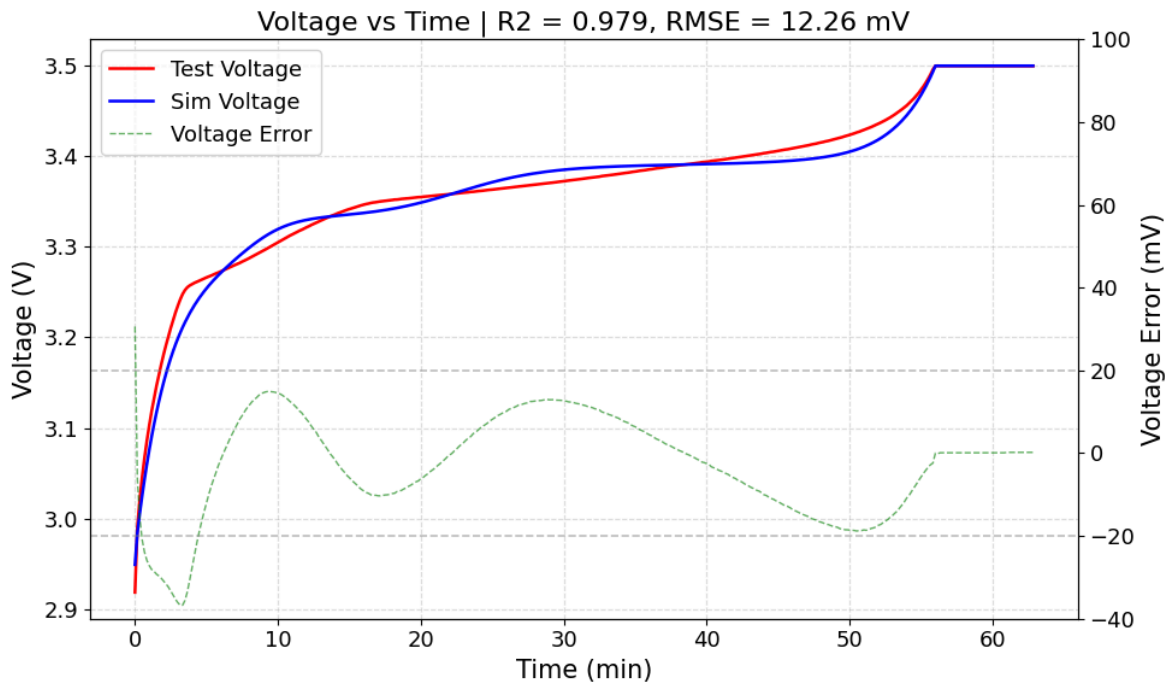
```python
# ================= USER DEFINITIONS =================
C_rates = {
    "C/2": "C/2",
    "1C": "1C",
    "2C": "2C",
    "3C": "3C",
}


model.variables["Anode potential [V]"] = model.variables[
    "Negative electrode surface potential difference at separator interface [V]"
]



solver = pybamm.IDAKLUSolver()

plt.figure(figsize=(8, 6))

# ================= LOOP OVER C-RATES =================
for label, C in C_rates.items():

    exp = pybamm.Experiment(
        [
            f"Discharge at {C} for 10 hours or until 2.5V (1 seconds period)",
        ]
```

```python
    )

    sim = pybamm.Simulation(
        model=model,
        parameter_values=params,
        experiment=exp,
        solver=solver,
    )

    sol = sim.solve(calc_esoh=False)

    # ---- Capacity (Ah) ----
    cap = sol["Discharge capacity [A.h]"].entries
    cap = cap - cap[0]   # normalize to zero start

    print("Discharge Capacity at", label, ":", cap[-1])

    # ---- Voltage (V) ----
    voltage = sol["Terminal voltage [V]"].entries

    NE_cap = sol["Negative electrode capacity [A.h]"].entries[-1]
    PE_cap = sol["Positive electrode capacity [A.h]"].entries[-1]

    print("N/P ratio at", label, ":", NE_cap/PE_cap)

    # ---- Plot ----
    plt.plot(cap, voltage, label=label)

# ================= PLOT FORMATTING =================
plt.xlabel("Discharge Capacity [Ah]", fontsize=12)
plt.ylabel("Terminal Voltage [V]", fontsize=12)
plt.title("Voltage vs Capacity at Different C-rates", fontsize=14)
plt.grid(True, linestyle="--", linewidth=0.5, alpha=0.4)
plt.legend()
plt.tight_layout()
plt.show()
```

```
2025-12-23 17:46:48.068 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 17:46:48.069 - [NOTICE] logger.func(7): Cycle 1/1, step 1/1: Discharge
at C/2 for 10 hours or until 2.5V (1 seconds period)
2025-12-23 17:46:48.115 - [NOTICE] logger.func(7): Finish experiment simulation,
took 46.924 ms
2025-12-23 17:46:48.175 - [NOTICE] logger.func(7): Cycle 1/1 (12.600 us elapsed)
--------------------
2025-12-23 17:46:48.176 - [NOTICE] logger.func(7): Cycle 1/1, step 1/1: Discharge
at 1C for 10 hours or until 2.5V (1 seconds period)
2025-12-23 17:46:48.220 - [NOTICE] logger.func(7): Finish experiment simulation,
took 44.215 ms
2025-12-23 17:46:48.274 - [NOTICE] logger.func(7): Cycle 1/1 (10.300 us elapsed)
--------------------
2025-12-23 17:46:48.274 - [NOTICE] logger.func(7): Cycle 1/1, step 1/1: Discharge
at 2C for 10 hours or until 2.5V (1 seconds period)
```
```
Discharge Capacity at C/2 : 2.4525936066275023
N/P ratio at C/2 : 1.18503453038674
Discharge Capacity at 1C : 2.444986415103455
N/P ratio at 1C : 1.18503453038674
```

```
2025-12-23 17:46:48.317 - [NOTICE] logger.func(7): Finish experiment simulation,
took 43.232 ms
2025-12-23 17:46:48.375 - [NOTICE] logger.func(7): Cycle 1/1 (10.300 us elapsed)
--------------------
2025-12-23 17:46:48.376 - [NOTICE] logger.func(7): Cycle 1/1, step 1/1: Discharge
at 3C for 10 hours or until 2.5V (1 seconds period)
2025-12-23 17:46:48.415 - [NOTICE] logger.func(7): Finish experiment simulation,
took 40.207 ms
```

```
Discharge Capacity at 2C : 2.4346581042570343
N/P ratio at 2C : 1.18503453038674
Discharge Capacity at 3C : 2.4266613355485793
N/P ratio at 3C : 1.18503453038674
```


Voltage vs Capacity at Different C-rates
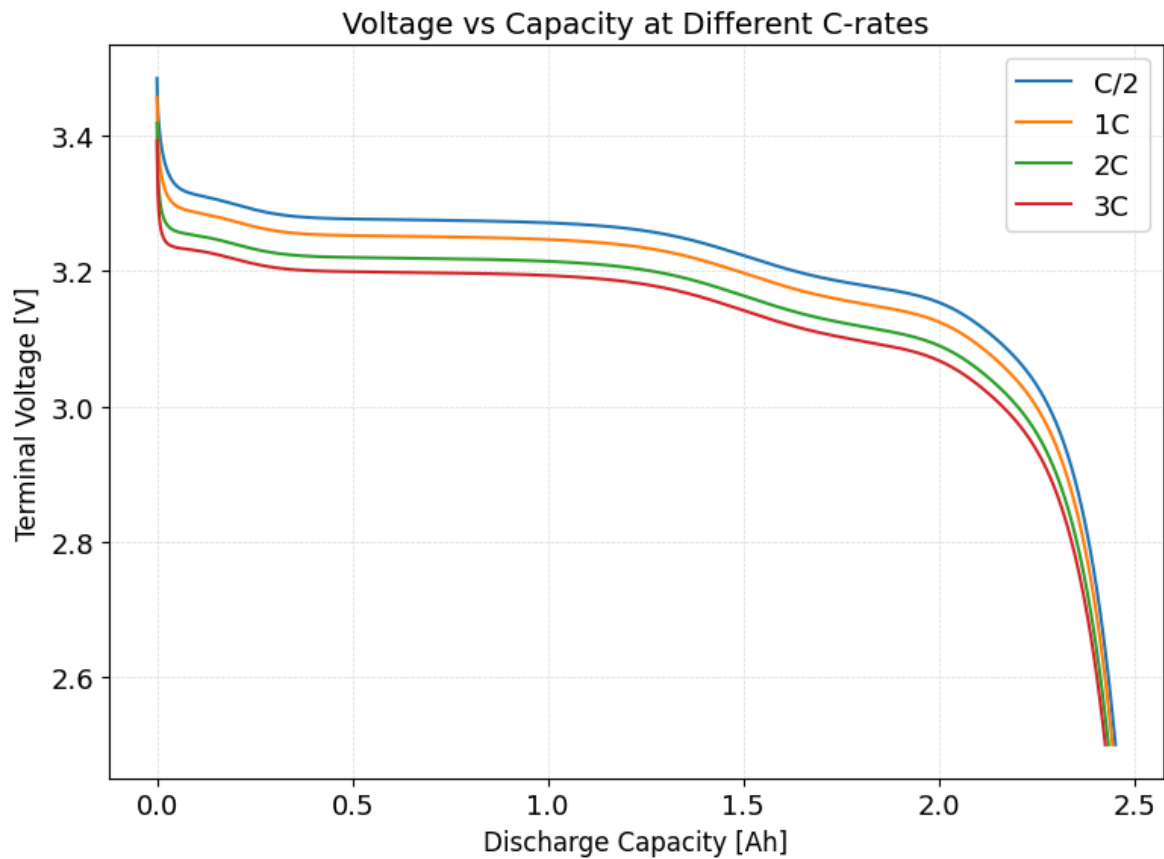
In [41]:
```python
# =========================
# C-rate definitions
# =========================
C_rates = {
    "C/2": "C/2",
    "1C": "1C",
    "2C": "2C",
    "3C": "3C",
}


# =========================
# Alias anode potential
# =========================
model.variables["Anode potential [V]"] = model.variables[
    "Negative electrode surface potential difference at separator interface [V]"
]

# =========================
# Solver
# =========================
solver = pybamm.IDAKLUSolver()
```

```python
# =========================
# Storage
# =========================
results = {}

# =========================
# Run simulations
# =========================
for label, C in C_rates.items():

    exp = pybamm.Experiment(
        [
            (f"Discharge at {C} for 10 hours or until 2.5V (1 second period)",
            "Rest for 30 minutes (60 seconds period)",
            f"Charge at {C} until 3.5V (1 second period)",
            "Hold at 3.5V until 0.01A (1 second period)",)
        ]
    )

    sim = pybamm.Simulation(
        model=model,
        parameter_values=params,
        experiment=exp,
        solver=solver,
    )

    sol = sim.solve(calc_esoh=False)

    # =========================
    # Extract CHARGING steps only
    # =========================
    charge_cycles = sol.cycles[0]   # single cycle experiment
    charge_step_CC = charge_cycles.steps[2]  # Charge at C
    charge_step_CV = charge_cycles.steps[3]  # Hold at 3.5V

    # Concatenate CC + CV
    t = np.concatenate([
        charge_step_CC["Time [min]"].entries,
        charge_step_CV["Time [min]"].entries
    ])
    t = t - t[0]

    I = np.abs(np.concatenate([
        charge_step_CC["Current [A]"].entries,
        charge_step_CV["Current [A]"].entries
    ]))

    V = np.concatenate([
        charge_step_CC["Terminal voltage [V]"].entries,
        charge_step_CV["Terminal voltage [V]"].entries
    ])

    anode_V = np.concatenate([
        charge_step_CC["Anode potential [V]"].entries,
        charge_step_CV["Anode potential [V]"].entries
    ])

    cap = np.abs(np.concatenate([
        charge_step_CC["Discharge capacity [A.h]"].entries,
```

```python
        charge_step_CV["Discharge capacity [A.h]"].entries
    ]) - charge_step_CC["Discharge capacity [A.h]"].entries[0])

    SOC = 100 * cap / cap[-1]

    results[label] = {
        "t": t,
        "I": I,
        "V": V,
        "anode_V": anode_V,
        "SOC": SOC,
    }

# =========================
# Plotting (CHARGE ONLY)
# =========================
fig, axes = plt.subplots(2, 2, figsize=(12, 8))

for label, d in results.items():
    axes[0, 0].plot(d["t"], d["I"], label=label)
    axes[0, 1].plot(d["t"], d["V"])
    axes[1, 0].plot(d["t"], d["anode_V"])
    axes[1, 1].plot(d["t"], d["SOC"])


# Titles
axes[0, 0].set_title("Charging Current [A]")
axes[0, 1].set_title("Charging Voltage [V]")
axes[1, 0].set_title("Anode Potential during Charge [V]")
axes[1, 1].set_title("State of Charge [%]")

# Formatting
for ax in axes.flat:
    ax.set_xlabel("Time [min]")
    ax.set_facecolor("white")
    ax.tick_params(axis="both", labelsize=10)
    ax.grid(False)

axes[0, 0].legend(title="C-rate")

plt.suptitle("LFP Cell Charging Behaviour (CC + CV)", fontsize=14)
plt.tight_layout()
plt.show()
```

```
2025-12-23 17:47:16.203 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 17:47:16.204 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at C/2 for 10 hours or until 2.5V (1 second period)
2025-12-23 17:47:16.248 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (60 seconds period)
2025-12-23 17:47:16.261 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
C/2 until 3.5V (1 second period)
2025-12-23 17:47:16.299 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.01A (1 second period)
2025-12-23 17:47:16.396 - [NOTICE] logger.func(7): Finish experiment simulation,
took 192.656 ms
2025-12-23 17:47:16.570 - [NOTICE] logger.func(7): Cycle 1/1 (11.500 us elapsed)
--------------------
2025-12-23 17:47:16.571 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 1C for 10 hours or until 2.5V (1 second period)
2025-12-23 17:47:16.611 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (60 seconds period)
2025-12-23 17:47:16.635 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
1C until 3.5V (1 second period)
2025-12-23 17:47:16.660 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.01A (1 second period)
2025-12-23 17:47:16.757 - [NOTICE] logger.func(7): Finish experiment simulation,
took 186.050 ms
2025-12-23 17:47:16.929 - [NOTICE] logger.func(7): Cycle 1/1 (10.400 us elapsed)
--------------------
2025-12-23 17:47:16.929 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2C for 10 hours or until 2.5V (1 second period)
2025-12-23 17:47:16.975 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (60 seconds period)
2025-12-23 17:47:16.993 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2C until 3.5V (1 second period)
2025-12-23 17:47:17.012 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.01A (1 second period)
2025-12-23 17:47:17.111 - [NOTICE] logger.func(7): Finish experiment simulation,
took 182.661 ms
2025-12-23 17:47:17.277 - [NOTICE] logger.func(7): Cycle 1/1 (10.700 us elapsed)
--------------------
2025-12-23 17:47:17.278 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 3C for 10 hours or until 2.5V (1 second period)
2025-12-23 17:47:17.313 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (60 seconds period)
2025-12-23 17:47:17.334 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
3C until 3.5V (1 second period)
2025-12-23 17:47:17.362 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.01A (1 second period)
2025-12-23 17:47:17.495 - [NOTICE] logger.func(7): Finish experiment simulation,
took 218.737 ms
```

LFP Cell Charging Behaviour (CC + CV)
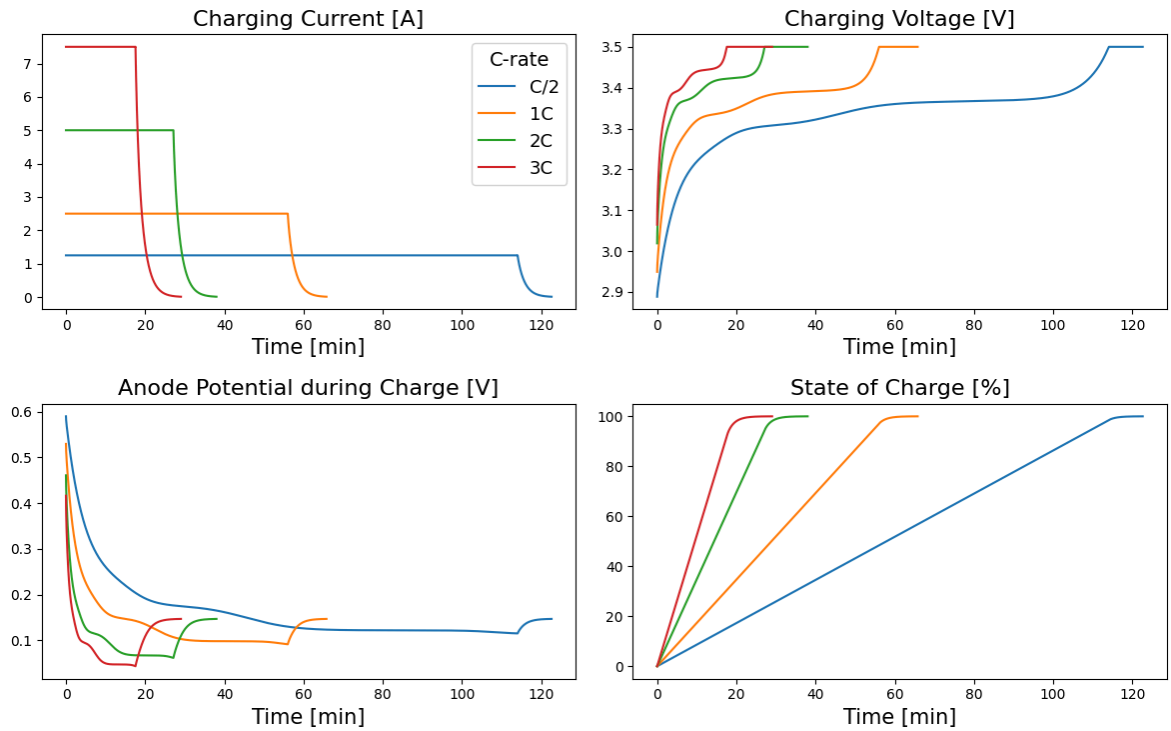
## HPPC Charging Protocol (Test data 951 HPPC)

In [26]:
```python
df_HPPC = get_test_data("beginning_of_life", "HPPC 951")
# print(df.head())

plt.figure(figsize=(15, 5))

plt.plot(
    df_HPPC["Time [s]"],
    df_HPPC["Current [A]"],
    color="red",
    linewidth=1,
    label="Current [A]"
)

plt.xlabel("Time (s)")
plt.ylabel("Current (A)")
plt.title("HPPC Data - Current Profile")

plt.grid(True, linestyle="--", alpha=0.4)
plt.legend()
plt.tight_layout()
plt.show()
```

HPPC Data - Current Profile
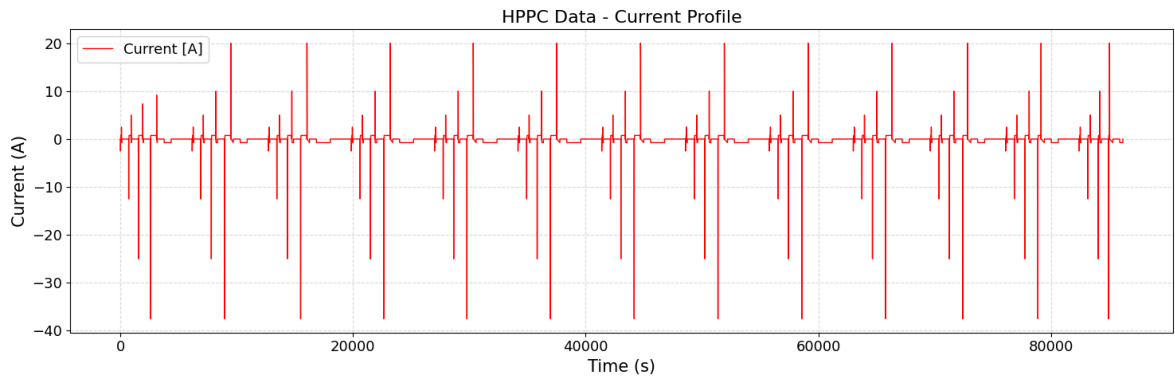
Retracted Protocol for Pybamm Simulation

```
In [27]:  df_HPPC_Protocol = get_test_data("beginning_of_life", "HPPC Protocol")
          # print(df.head())

          plt.figure(figsize=(15, 5))

          plt.plot(
              df_HPPC_Protocol["End_Time_s"],
              df_HPPC_Protocol["Mean_Current_A"],
              color="red",
              linewidth=1,
              label="Current [A]"
          )

          plt.xlabel("Time (s)")
          plt.ylabel("Current (A)")
          plt.title("HPPC Protocol Extracted - Current Profile")

          plt.grid(True, linestyle="--", alpha=0.4)
          plt.legend()
          plt.tight_layout()
          plt.show()
```


HPPC Protocol Extracted - Current Profile
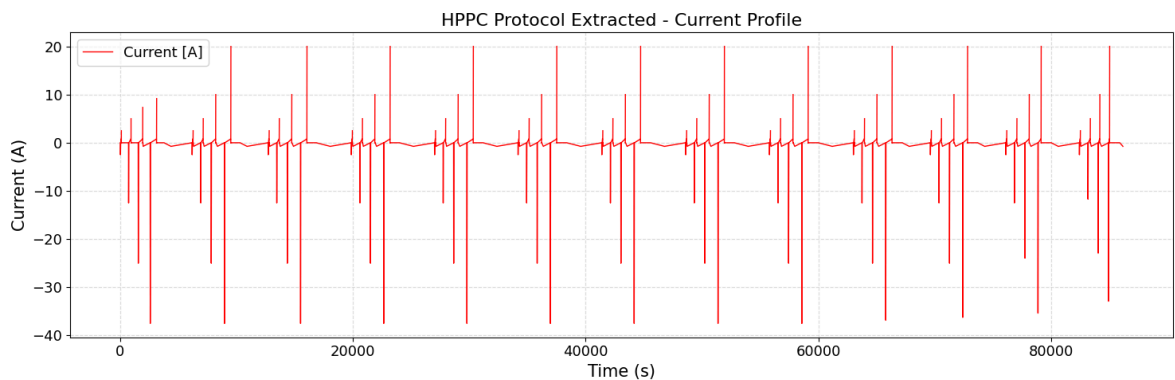
```
In [43]:  experiment_steps = []

          for _, row in df_HPPC_Protocol.iterrows():
              step_type = row["Step_Type"]
              duration = row["Step_Time_s"]
              current = row["Mean_Current_A"]

              # ---- Skip zero-duration steps ----
              if duration <= 0:
                  continue
```

```python
    duration_str = f"{duration:.3f} seconds"

    if step_type == "Rest":
        experiment_steps.append(
            f"Rest for {duration_str} (1 seconds period)"
        )

    elif step_type == "Charge":
        experiment_steps.append(
            f"Charge at {abs(current):.6f} A for {duration_str} or until 3.5V (0
        )

    elif step_type == "Hold":
        experiment_steps.append(
            f"Hold at 3.5V until 0.05A (0.1 seconds period)"
        )


    elif step_type == "Discharge":
        experiment_steps.append(
            f"Discharge at {abs(current):.6f} A for {duration_str} or until 2.5V
        )

    else:
        raise ValueError(f"Unknown Step_Type: {step_type}")

# ----------------------------------------
# Create PyBaMM Experiment
# ----------------------------------------
exp = pybamm.Experiment(experiment_steps)

# ----------------------------------------
# Print for verification
# ----------------------------------------
for s in experiment_steps[:10]:
    print(s)

print(f"\nTotal experiment steps: {len(experiment_steps)}")



solver = pybamm.IDAKLUSolver()
HPPC_sim = pybamm.Simulation(
    model=model,
    parameter_values=params,
    experiment=exp,
    solver=solver
)
HPPC_sol = HPPC_sim.solve(calc_esoh=False)
# HPPC_sol = HPPC_sim.solve(calc_esoh=False)

plt.figure(figsize=(15, 5))

plt.plot(
    HPPC_sol["Time [s]"].entries,
    -1*HPPC_sol["Current [A]"].entries,
    color="red",
    linewidth=1,
    label="Current [A]"
)
```

```python
plt.xlabel("Time (s)")
plt.ylabel("Current (A)")
plt.title("HPPC Protocol Extracted - Current Profile")

plt.grid(True, linestyle="--", alpha=0.4)
plt.legend()
plt.tight_layout()
plt.show()
```

Rest for 9.903 seconds (1 seconds period)
Discharge at 2.497200 A for 9.896 seconds or until 2.5V (0.1 seconds period)
Rest for 19.895 seconds (1 seconds period)
Charge at 0.751200 A for 23.691 seconds or until 3.5V (0.1 seconds period)
Hold at 3.5V until 0.05A (0.1 seconds period)
Rest for 19.917 seconds (1 seconds period)
Charge at 2.497300 A for 1.756 seconds or until 3.5V (0.1 seconds period)
Hold at 3.5V until 0.05A (0.1 seconds period)
Rest for 9.907 seconds (1 seconds period)
Rest for 599.031 seconds (1 seconds period)

Total experiment steps: 531

```
2025-12-23 18:21:51.859 - [NOTICE] logger.func(7): Cycle 1/531 (11.800 us elapse
d) --------------------
2025-12-23 18:21:51.860 - [NOTICE] logger.func(7): Cycle 1/531, step 1/1: Rest fo
r 9.903 seconds (1 seconds period)
2025-12-23 18:21:51.879 - [NOTICE] logger.func(7): Cycle 2/531 (18.975 ms elapse
d) --------------------
2025-12-23 18:21:51.879 - [NOTICE] logger.func(7): Cycle 2/531, step 1/1: Dischar
ge at 2.497200 A for 9.896 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:21:51.904 - [NOTICE] logger.func(7): Cycle 3/531 (44.850 ms elapse
d) --------------------
2025-12-23 18:21:51.905 - [NOTICE] logger.func(7): Cycle 3/531, step 1/1: Rest fo
r 19.895 seconds (1 seconds period)
2025-12-23 18:21:51.907 - [NOTICE] logger.func(7): Cycle 4/531 (47.512 ms elapse
d) --------------------
2025-12-23 18:21:51.907 - [NOTICE] logger.func(7): Cycle 4/531, step 1/1: Charge
at 0.751200 A for 23.691 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:51.932 - [WARNING] simulation.solve(942): Step 'Charge at 0.7512
00 A for 23.691 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:21:51.933 - [NOTICE] logger.func(7): Cycle 5/531 (73.150 ms elapse
d) --------------------
2025-12-23 18:21:51.933 - [NOTICE] logger.func(7): Cycle 5/531, step 1/1: Hold at
3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:21:51.982 - [WARNING] simulation.solve(942): Step 'Hold at 3.5V unt
il 0.05A (0.1 seconds period)' is infeasible at initial conditions, but skip_ok i
s True. Skipping step.
2025-12-23 18:21:51.983 - [NOTICE] logger.func(7): Cycle 6/531 (124.331 ms elapse
d) --------------------
2025-12-23 18:21:51.984 - [NOTICE] logger.func(7): Cycle 6/531, step 1/1: Rest fo
r 19.917 seconds (1 seconds period)
2025-12-23 18:21:51.986 - [NOTICE] logger.func(7): Cycle 7/531 (127.097 ms elapse
d) --------------------
2025-12-23 18:21:51.986 - [NOTICE] logger.func(7): Cycle 7/531, step 1/1: Charge
at 2.497300 A for 1.756 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:52.010 - [WARNING] simulation.solve(942): Step 'Charge at 2.4973
00 A for 1.756 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:21:52.010 - [NOTICE] logger.func(7): Cycle 8/531 (151.681 ms elapse
d) --------------------
2025-12-23 18:21:52.011 - [NOTICE] logger.func(7): Cycle 8/531, step 1/1: Hold at
3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:21:52.019 - [WARNING] simulation.solve(942): Step 'Hold at 3.5V unt
il 0.05A (0.1 seconds period)' is infeasible at initial conditions, but skip_ok i
s True. Skipping step.
2025-12-23 18:21:52.020 - [NOTICE] logger.func(7): Cycle 9/531 (160.574 ms elapse
d) --------------------
2025-12-23 18:21:52.020 - [NOTICE] logger.func(7): Cycle 9/531, step 1/1: Rest fo
r 9.907 seconds (1 seconds period)
2025-12-23 18:21:52.022 - [NOTICE] logger.func(7): Cycle 10/531 (163.093 ms elaps
ed) --------------------
2025-12-23 18:21:52.023 - [NOTICE] logger.func(7): Cycle 10/531, step 1/1: Rest f
or 599.031 seconds (1 seconds period)
2025-12-23 18:21:52.024 - [NOTICE] logger.func(7): Cycle 11/531 (165.509 ms elaps
ed) --------------------
2025-12-23 18:21:52.026 - [NOTICE] logger.func(7): Cycle 11/531, step 1/1: Discha
rge at 12.496400 A for 9.913 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:21:52.049 - [NOTICE] logger.func(7): Cycle 12/531 (189.256 ms elaps
ed) --------------------
2025-12-23 18:21:52.049 - [NOTICE] logger.func(7): Cycle 12/531, step 1/1: Rest f
or 19.896 seconds (1 seconds period)
```

```
2025-12-23 18:21:52.051 - [NOTICE] logger.func(7): Cycle 13/531 (192.010 ms elaps
ed) --------------------
2025-12-23 18:21:52.052 - [NOTICE] logger.func(7): Cycle 13/531, step 1/1: Charge
at 0.751200 A for 156.840 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:52.053 - [WARNING] simulation.solve(942): Step 'Charge at 0.7512
00 A for 156.840 seconds or until 3.5V (0.1 seconds period)' is infeasible at ini
tial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:21:52.054 - [NOTICE] logger.func(7): Cycle 14/531 (194.613 ms elaps
ed) --------------------
2025-12-23 18:21:52.054 - [NOTICE] logger.func(7): Cycle 14/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:21:53.102 - [NOTICE] logger.func(7): Cycle 15/531 (1.244 s elapsed)
--------------------
2025-12-23 18:21:53.103 - [NOTICE] logger.func(7): Cycle 15/531, step 1/1: Rest f
or 19.904 seconds (1 seconds period)
2025-12-23 18:21:53.106 - [NOTICE] logger.func(7): Cycle 16/531 (1.247 s elapsed)
--------------------
2025-12-23 18:21:53.107 - [NOTICE] logger.func(7): Cycle 16/531, step 1/1: Charge
at 4.994600 A for 0.446 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:53.128 - [WARNING] simulation.solve(942): Step 'Charge at 4.9946
00 A for 0.446 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:21:53.129 - [NOTICE] logger.func(7): Cycle 17/531 (1.270 s elapsed)
--------------------
2025-12-23 18:21:53.129 - [NOTICE] logger.func(7): Cycle 17/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:21:53.142 - [WARNING] simulation.solve(942): Step 'Hold at 3.5V unt
il 0.05A (0.1 seconds period)' is infeasible at initial conditions, but skip_ok i
s True. Skipping step.
2025-12-23 18:21:53.143 - [NOTICE] logger.func(7): Cycle 18/531 (1.284 s elapsed)
--------------------
2025-12-23 18:21:53.144 - [NOTICE] logger.func(7): Cycle 18/531, step 1/1: Rest f
or 9.902 seconds (1 seconds period)
2025-12-23 18:21:53.148 - [NOTICE] logger.func(7): Cycle 19/531 (1.288 s elapsed)
--------------------
2025-12-23 18:21:53.149 - [NOTICE] logger.func(7): Cycle 19/531, step 1/1: Rest f
or 599.031 seconds (1 seconds period)
2025-12-23 18:21:53.153 - [NOTICE] logger.func(7): Cycle 20/531 (1.294 s elapsed)
--------------------
2025-12-23 18:21:53.154 - [NOTICE] logger.func(7): Cycle 20/531, step 1/1: Discha
rge at 24.997900 A for 9.892 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:21:53.191 - [NOTICE] logger.func(7): Cycle 21/531 (1.331 s elapsed)
--------------------
2025-12-23 18:21:53.192 - [NOTICE] logger.func(7): Cycle 21/531, step 1/1: Rest f
or 19.894 seconds (1 seconds period)
2025-12-23 18:21:53.196 - [NOTICE] logger.func(7): Cycle 22/531 (1.337 s elapsed)
--------------------
2025-12-23 18:21:53.197 - [NOTICE] logger.func(7): Cycle 22/531, step 1/1: Charge
at 0.751200 A for 323.617 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:53.204 - [NOTICE] logger.func(7): Cycle 23/531 (1.345 s elapsed)
--------------------
2025-12-23 18:21:53.205 - [NOTICE] logger.func(7): Cycle 23/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:21:54.382 - [NOTICE] logger.func(7): Cycle 24/531 (2.523 s elapsed)
--------------------
2025-12-23 18:21:54.383 - [NOTICE] logger.func(7): Cycle 24/531, step 1/1: Rest f
or 19.907 seconds (1 seconds period)
2025-12-23 18:21:54.385 - [NOTICE] logger.func(7): Cycle 25/531 (2.526 s elapsed)
--------------------
2025-12-23 18:21:54.385 - [NOTICE] logger.func(7): Cycle 25/531, step 1/1: Charge
```

```
at 7.337100 A for 9.908 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:54.408 - [WARNING] simulation.solve(942): Step 'Charge at 7.3371
00 A for 9.908 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:21:54.409 - [NOTICE] logger.func(7): Cycle 26/531 (2.550 s elapsed)
-------------------
2025-12-23 18:21:54.409 - [NOTICE] logger.func(7): Cycle 26/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:21:55.534 - [NOTICE] logger.func(7): Cycle 27/531 (3.674 s elapsed)
-------------------
2025-12-23 18:21:55.535 - [NOTICE] logger.func(7): Cycle 27/531, step 1/1: Rest f
or 9.918 seconds (1 seconds period)
2025-12-23 18:21:55.537 - [NOTICE] logger.func(7): Cycle 28/531 (3.678 s elapsed)
-------------------
2025-12-23 18:21:55.538 - [NOTICE] logger.func(7): Cycle 28/531, step 1/1: Discha
rge at 0.748700 A for 13.288 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:21:55.568 - [NOTICE] logger.func(7): Cycle 29/531 (3.708 s elapsed)
-------------------
2025-12-23 18:21:55.569 - [NOTICE] logger.func(7): Cycle 29/531, step 1/1: Rest f
or 599.031 seconds (1 seconds period)
2025-12-23 18:21:55.573 - [NOTICE] logger.func(7): Cycle 30/531 (3.714 s elapsed)
-------------------
2025-12-23 18:21:55.574 - [NOTICE] logger.func(7): Cycle 30/531, step 1/1: Discha
rge at 37.496800 A for 9.908 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:21:55.610 - [NOTICE] logger.func(7): Cycle 31/531 (3.750 s elapsed)
-------------------
2025-12-23 18:21:55.610 - [NOTICE] logger.func(7): Cycle 31/531, step 1/1: Rest f
or 19.897 seconds (1 seconds period)
2025-12-23 18:21:55.612 - [NOTICE] logger.func(7): Cycle 32/531 (3.753 s elapsed)
-------------------
2025-12-23 18:21:55.612 - [NOTICE] logger.func(7): Cycle 32/531, step 1/1: Charge
at 0.751200 A for 490.764 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:55.620 - [NOTICE] logger.func(7): Cycle 33/531 (3.760 s elapsed)
-------------------
2025-12-23 18:21:55.620 - [NOTICE] logger.func(7): Cycle 33/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:21:56.735 - [NOTICE] logger.func(7): Cycle 34/531 (4.876 s elapsed)
-------------------
2025-12-23 18:21:56.736 - [NOTICE] logger.func(7): Cycle 34/531, step 1/1: Rest f
or 19.906 seconds (1 seconds period)
2025-12-23 18:21:56.739 - [NOTICE] logger.func(7): Cycle 35/531 (4.880 s elapsed)
-------------------
2025-12-23 18:21:56.739 - [NOTICE] logger.func(7): Cycle 35/531, step 1/1: Charge
at 9.166900 A for 9.904 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:57.131 - [WARNING] simulation.solve(942): Step 'Charge at 9.1669
00 A for 9.904 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:21:57.132 - [NOTICE] logger.func(7): Cycle 36/531 (5.273 s elapsed)
-------------------
2025-12-23 18:21:57.132 - [NOTICE] logger.func(7): Cycle 36/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:21:58.321 - [NOTICE] logger.func(7): Cycle 37/531 (6.466 s elapsed)
-------------------
2025-12-23 18:21:58.321 - [NOTICE] logger.func(7): Cycle 37/531, step 1/1: Rest f
or 9.903 seconds (1 seconds period)
2025-12-23 18:21:58.328 - [NOTICE] logger.func(7): Cycle 38/531 (6.469 s elapsed)
-------------------
2025-12-23 18:21:58.328 - [NOTICE] logger.func(7): Cycle 38/531, step 1/1: Rest f
or 589.014 seconds (1 seconds period)
2025-12-23 18:21:58.330 - [NOTICE] logger.func(7): Cycle 39/531 (6.472 s elapsed)
```

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2025-12-23 18:21:58.330 - [NOTICE] logger.func(7): Cycle 39/531, step 1/1: Discha
rge at 0.748700 A for 589.518 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:21:58.335 - [NOTICE] logger.func(7): Cycle 40/531 (6.478 s elapsed)
--------------------
2025-12-23 18:21:58.335 - [NOTICE] logger.func(7): Cycle 40/531, step 1/1: Rest f
or 1800.026 seconds (1 seconds period)
2025-12-23 18:21:58.342 - [NOTICE] logger.func(7): Cycle 41/531 (6.483 s elapsed)
--------------------
2025-12-23 18:21:58.343 - [NOTICE] logger.func(7): Cycle 41/531, step 1/1: Discha
rge at 2.497200 A for 9.910 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:21:58.346 - [NOTICE] logger.func(7): Cycle 42/531 (6.487 s elapsed)
--------------------
2025-12-23 18:21:58.346 - [NOTICE] logger.func(7): Cycle 42/531, step 1/1: Rest f
or 19.914 seconds (1 seconds period)
2025-12-23 18:21:58.348 - [NOTICE] logger.func(7): Cycle 43/531 (6.490 s elapsed)
--------------------
2025-12-23 18:21:58.350 - [NOTICE] logger.func(7): Cycle 43/531, step 1/1: Charge
at 0.748700 A for 23.772 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:58.372 - [NOTICE] logger.func(7): Cycle 44/531 (6.514 s elapsed)
--------------------
2025-12-23 18:21:58.374 - [NOTICE] logger.func(7): Cycle 44/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:21:59.475 - [NOTICE] logger.func(7): Cycle 45/531 (7.616 s elapsed)
--------------------
2025-12-23 18:21:59.475 - [NOTICE] logger.func(7): Cycle 45/531, step 1/1: Rest f
or 19.902 seconds (1 seconds period)
2025-12-23 18:21:59.477 - [NOTICE] logger.func(7): Cycle 46/531 (7.619 s elapsed)
--------------------
2025-12-23 18:21:59.477 - [NOTICE] logger.func(7): Cycle 46/531, step 1/1: Charge
at 2.499800 A for 9.905 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:21:59.502 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.905 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:21:59.503 - [NOTICE] logger.func(7): Cycle 47/531 (7.644 s elapsed)
--------------------
2025-12-23 18:21:59.504 - [NOTICE] logger.func(7): Cycle 47/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:00.633 - [NOTICE] logger.func(7): Cycle 48/531 (8.773 s elapsed)
--------------------
2025-12-23 18:22:00.633 - [NOTICE] logger.func(7): Cycle 48/531, step 1/1: Rest f
or 9.892 seconds (1 seconds period)
2025-12-23 18:22:00.635 - [NOTICE] logger.func(7): Cycle 49/531 (8.777 s elapsed)
--------------------
2025-12-23 18:22:00.635 - [NOTICE] logger.func(7): Cycle 49/531, step 1/1: Discha
rge at 0.748700 A for 23.371 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:00.639 - [NOTICE] logger.func(7): Cycle 50/531 (8.780 s elapsed)
--------------------
2025-12-23 18:22:00.639 - [NOTICE] logger.func(7): Cycle 50/531, step 1/1: Rest f
or 599.044 seconds (1 seconds period)
2025-12-23 18:22:00.641 - [NOTICE] logger.func(7): Cycle 51/531 (8.783 s elapsed)
--------------------
2025-12-23 18:22:00.641 - [NOTICE] logger.func(7): Cycle 51/531, step 1/1: Discha
rge at 12.496400 A for 9.912 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:00.645 - [NOTICE] logger.func(7): Cycle 52/531 (8.786 s elapsed)
--------------------
2025-12-23 18:22:00.645 - [NOTICE] logger.func(7): Cycle 52/531, step 1/1: Rest f
or 19.908 seconds (1 seconds period)
2025-12-23 18:22:00.648 - [NOTICE] logger.func(7): Cycle 53/531 (8.789 s elapsed)
--------------------
```

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2025-12-23 18:22:00.649 - [NOTICE] logger.func(7): Cycle 53/531, step 1/1: Charge
at 0.751200 A for 156.799 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:00.653 - [NOTICE] logger.func(7): Cycle 54/531 (8.794 s elapsed)
--------------------
2025-12-23 18:22:00.654 - [NOTICE] logger.func(7): Cycle 54/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:01.691 - [NOTICE] logger.func(7): Cycle 55/531 (9.833 s elapsed)
--------------------
2025-12-23 18:22:01.691 - [NOTICE] logger.func(7): Cycle 55/531, step 1/1: Rest f
or 19.902 seconds (1 seconds period)
2025-12-23 18:22:01.691 - [NOTICE] logger.func(7): Cycle 56/531 (9.836 s elapsed)
--------------------
2025-12-23 18:22:01.691 - [NOTICE] logger.func(7): Cycle 56/531, step 1/1: Charge
at 4.999700 A for 9.906 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:01.718 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.906 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:01.719 - [NOTICE] logger.func(7): Cycle 57/531 (9.860 s elapsed)
--------------------
2025-12-23 18:22:01.720 - [NOTICE] logger.func(7): Cycle 57/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:02.780 - [NOTICE] logger.func(7): Cycle 58/531 (10.921 s elapse
d) --------------------
2025-12-23 18:22:02.780 - [NOTICE] logger.func(7): Cycle 58/531, step 1/1: Rest f
or 9.897 seconds (1 seconds period)
2025-12-23 18:22:02.784 - [NOTICE] logger.func(7): Cycle 59/531 (10.926 s elapse
d) --------------------
2025-12-23 18:22:02.786 - [NOTICE] logger.func(7): Cycle 59/531, step 1/1: Discha
rge at 0.748700 A for 56.557 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:02.790 - [NOTICE] logger.func(7): Cycle 60/531 (10.931 s elapse
d) --------------------
2025-12-23 18:22:02.792 - [NOTICE] logger.func(7): Cycle 60/531, step 1/1: Rest f
or 599.054 seconds (1 seconds period)
2025-12-23 18:22:02.798 - [NOTICE] logger.func(7): Cycle 61/531 (10.938 s elapse
d) --------------------
2025-12-23 18:22:02.798 - [NOTICE] logger.func(7): Cycle 61/531, step 1/1: Discha
rge at 25.000400 A for 9.912 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:02.835 - [NOTICE] logger.func(7): Cycle 62/531 (10.976 s elapse
d) --------------------
2025-12-23 18:22:02.836 - [NOTICE] logger.func(7): Cycle 62/531, step 1/1: Rest f
or 19.901 seconds (1 seconds period)
2025-12-23 18:22:02.839 - [NOTICE] logger.func(7): Cycle 63/531 (10.980 s elapse
d) --------------------
2025-12-23 18:22:02.839 - [NOTICE] logger.func(7): Cycle 63/531, step 1/1: Charge
at 0.751200 A for 327.418 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:02.845 - [NOTICE] logger.func(7): Cycle 64/531 (10.985 s elapse
d) --------------------
2025-12-23 18:22:02.845 - [NOTICE] logger.func(7): Cycle 64/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:03.869 - [NOTICE] logger.func(7): Cycle 65/531 (12.015 s elapse
d) --------------------
2025-12-23 18:22:03.869 - [NOTICE] logger.func(7): Cycle 65/531, step 1/1: Rest f
or 19.897 seconds (1 seconds period)
2025-12-23 18:22:03.877 - [NOTICE] logger.func(7): Cycle 66/531 (12.018 s elapse
d) --------------------
2025-12-23 18:22:03.877 - [NOTICE] logger.func(7): Cycle 66/531, step 1/1: Charge
at 9.999400 A for 9.915 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:03.901 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.915 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
```

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2025-12-23 18:22:03.901 - [NOTICE] logger.func(7): Cycle 67/531 (12.042 s elapse
d) --------------------
2025-12-23 18:22:03.901 - [NOTICE] logger.func(7): Cycle 67/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:04.992 - [NOTICE] logger.func(7): Cycle 68/531 (13.133 s elapse
d) --------------------
2025-12-23 18:22:04.994 - [NOTICE] logger.func(7): Cycle 68/531, step 1/1: Rest f
or 9.888 seconds (1 seconds period)
2025-12-23 18:22:04.998 - [NOTICE] logger.func(7): Cycle 69/531 (13.138 s elapse
d) --------------------
2025-12-23 18:22:04.998 - [NOTICE] logger.func(7): Cycle 69/531, step 1/1: Discha
rge at 0.748700 A for 123.107 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:05.003 - [NOTICE] logger.func(7): Cycle 70/531 (13.143 s elapse
d) --------------------
2025-12-23 18:22:05.004 - [NOTICE] logger.func(7): Cycle 70/531, step 1/1: Rest f
or 599.049 seconds (1 seconds period)
2025-12-23 18:22:05.008 - [NOTICE] logger.func(7): Cycle 71/531 (13.149 s elapse
d) --------------------
2025-12-23 18:22:05.010 - [NOTICE] logger.func(7): Cycle 71/531, step 1/1: Discha
rge at 37.499300 A for 9.902 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:05.046 - [NOTICE] logger.func(7): Cycle 72/531 (13.187 s elapse
d) --------------------
2025-12-23 18:22:05.047 - [NOTICE] logger.func(7): Cycle 72/531, step 1/1: Rest f
or 19.901 seconds (1 seconds period)
2025-12-23 18:22:05.050 - [NOTICE] logger.func(7): Cycle 73/531 (13.191 s elapse
d) --------------------
2025-12-23 18:22:05.050 - [NOTICE] logger.func(7): Cycle 73/531, step 1/1: Charge
at 0.751200 A for 490.347 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:05.054 - [NOTICE] logger.func(7): Cycle 74/531 (13.198 s elapse
d) --------------------
2025-12-23 18:22:05.054 - [NOTICE] logger.func(7): Cycle 74/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:06.212 - [NOTICE] logger.func(7): Cycle 75/531 (14.353 s elapse
d) --------------------
2025-12-23 18:22:06.212 - [NOTICE] logger.func(7): Cycle 75/531, step 1/1: Rest f
or 19.905 seconds (1 seconds period)
2025-12-23 18:22:06.216 - [NOTICE] logger.func(7): Cycle 76/531 (14.357 s elapse
d) --------------------
2025-12-23 18:22:06.216 - [NOTICE] logger.func(7): Cycle 76/531, step 1/1: Charge
at 19.988600 A for 9.902 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:06.242 - [WARNING] simulation.solve(942): Step 'Charge at 19.988
600 A for 9.902 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:06.243 - [NOTICE] logger.func(7): Cycle 77/531 (14.383 s elapse
d) --------------------
2025-12-23 18:22:06.243 - [NOTICE] logger.func(7): Cycle 77/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:07.364 - [NOTICE] logger.func(7): Cycle 78/531 (15.505 s elapse
d) --------------------
2025-12-23 18:22:07.365 - [NOTICE] logger.func(7): Cycle 78/531, step 1/1: Rest f
or 9.899 seconds (1 seconds period)
2025-12-23 18:22:07.369 - [NOTICE] logger.func(7): Cycle 79/531 (15.510 s elapse
d) --------------------
2025-12-23 18:22:07.369 - [NOTICE] logger.func(7): Cycle 79/531, step 1/1: Rest f
or 589.012 seconds (1 seconds period)
2025-12-23 18:22:07.372 - [NOTICE] logger.func(7): Cycle 80/531 (15.513 s elapse
d) --------------------
2025-12-23 18:22:07.373 - [NOTICE] logger.func(7): Cycle 80/531, step 1/1: Discha
rge at 0.748700 A for 589.564 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:07.379 - [NOTICE] logger.func(7): Cycle 81/531 (15.520 s elapse
```

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d) -------------------
2025-12-23 18:22:07.380 - [NOTICE] logger.func(7): Cycle 81/531, step 1/1: Rest f
or 1800.024 seconds (1 seconds period)
2025-12-23 18:22:07.384 - [NOTICE] logger.func(7): Cycle 82/531 (15.525 s elapse
d) -------------------
2025-12-23 18:22:07.385 - [NOTICE] logger.func(7): Cycle 82/531, step 1/1: Discha
rge at 2.497200 A for 9.926 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:07.389 - [NOTICE] logger.func(7): Cycle 83/531 (15.530 s elapse
d) -------------------
2025-12-23 18:22:07.389 - [NOTICE] logger.func(7): Cycle 83/531, step 1/1: Rest f
or 19.906 seconds (1 seconds period)
2025-12-23 18:22:07.393 - [NOTICE] logger.func(7): Cycle 84/531 (15.534 s elapse
d) -------------------
2025-12-23 18:22:07.393 - [NOTICE] logger.func(7): Cycle 84/531, step 1/1: Charge
at 0.751200 A for 23.751 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:07.397 - [NOTICE] logger.func(7): Cycle 85/531 (15.538 s elapse
d) -------------------
2025-12-23 18:22:07.398 - [NOTICE] logger.func(7): Cycle 85/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:08.502 - [NOTICE] logger.func(7): Cycle 86/531 (16.644 s elapse
d) -------------------
2025-12-23 18:22:08.504 - [NOTICE] logger.func(7): Cycle 86/531, step 1/1: Rest f
or 19.897 seconds (1 seconds period)
2025-12-23 18:22:08.507 - [NOTICE] logger.func(7): Cycle 87/531 (16.648 s elapse
d) -------------------
2025-12-23 18:22:08.507 - [NOTICE] logger.func(7): Cycle 87/531, step 1/1: Charge
at 2.499800 A for 9.909 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:08.509 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.909 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:08.509 - [NOTICE] logger.func(7): Cycle 88/531 (16.651 s elapse
d) -------------------
2025-12-23 18:22:08.509 - [NOTICE] logger.func(7): Cycle 88/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:09.634 - [NOTICE] logger.func(7): Cycle 89/531 (17.774 s elapse
d) -------------------
2025-12-23 18:22:09.634 - [NOTICE] logger.func(7): Cycle 89/531, step 1/1: Rest f
or 9.911 seconds (1 seconds period)
2025-12-23 18:22:09.638 - [NOTICE] logger.func(7): Cycle 90/531 (17.780 s elapse
d) -------------------
2025-12-23 18:22:09.640 - [NOTICE] logger.func(7): Cycle 90/531, step 1/1: Discha
rge at 0.748700 A for 23.254 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:09.646 - [NOTICE] logger.func(7): Cycle 91/531 (17.787 s elapse
d) -------------------
2025-12-23 18:22:09.646 - [NOTICE] logger.func(7): Cycle 91/531, step 1/1: Rest f
or 599.031 seconds (1 seconds period)
2025-12-23 18:22:09.650 - [NOTICE] logger.func(7): Cycle 92/531 (17.792 s elapse
d) -------------------
2025-12-23 18:22:09.650 - [NOTICE] logger.func(7): Cycle 92/531, step 1/1: Discha
rge at 12.496400 A for 9.908 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:09.654 - [NOTICE] logger.func(7): Cycle 93/531 (17.796 s elapse
d) -------------------
2025-12-23 18:22:09.654 - [NOTICE] logger.func(7): Cycle 93/531, step 1/1: Rest f
or 19.900 seconds (1 seconds period)
2025-12-23 18:22:09.658 - [NOTICE] logger.func(7): Cycle 94/531 (17.800 s elapse
d) -------------------
2025-12-23 18:22:09.660 - [NOTICE] logger.func(7): Cycle 94/531, step 1/1: Charge
at 0.751200 A for 156.953 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:09.670 - [NOTICE] logger.func(7): Cycle 95/531 (17.811 s elapse
d) -------------------
```

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2025-12-23 18:22:09.670 - [NOTICE] logger.func(7): Cycle 95/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:11.094 - [NOTICE] logger.func(7): Cycle 96/531 (19.235 s elapse
d) --------------------
2025-12-23 18:22:11.095 - [NOTICE] logger.func(7): Cycle 96/531, step 1/1: Rest f
or 19.904 seconds (1 seconds period)
2025-12-23 18:22:11.098 - [NOTICE] logger.func(7): Cycle 97/531 (19.239 s elapse
d) --------------------
2025-12-23 18:22:11.099 - [NOTICE] logger.func(7): Cycle 97/531, step 1/1: Charge
at 4.999700 A for 9.914 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:11.102 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.914 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:11.103 - [NOTICE] logger.func(7): Cycle 98/531 (19.243 s elapse
d) --------------------
2025-12-23 18:22:11.103 - [NOTICE] logger.func(7): Cycle 98/531, step 1/1: Hold a
t 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:12.219 - [NOTICE] logger.func(7): Cycle 99/531 (20.367 s elapse
d) --------------------
2025-12-23 18:22:12.219 - [NOTICE] logger.func(7): Cycle 99/531, step 1/1: Rest f
or 9.901 seconds (1 seconds period)
2025-12-23 18:22:12.230 - [NOTICE] logger.func(7): Cycle 100/531 (20.371 s elapse
d) --------------------
2025-12-23 18:22:12.230 - [NOTICE] logger.func(7): Cycle 100/531, step 1/1: Disch
arge at 0.748700 A for 56.551 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:12.235 - [NOTICE] logger.func(7): Cycle 101/531 (20.376 s elapse
d) --------------------
2025-12-23 18:22:12.235 - [NOTICE] logger.func(7): Cycle 101/531, step 1/1: Rest
for 599.046 seconds (1 seconds period)
2025-12-23 18:22:12.240 - [NOTICE] logger.func(7): Cycle 102/531 (20.381 s elapse
d) --------------------
2025-12-23 18:22:12.241 - [NOTICE] logger.func(7): Cycle 102/531, step 1/1: Disch
arge at 24.997900 A for 9.919 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:12.244 - [NOTICE] logger.func(7): Cycle 103/531 (20.385 s elapse
d) --------------------
2025-12-23 18:22:12.244 - [NOTICE] logger.func(7): Cycle 103/531, step 1/1: Rest
for 19.895 seconds (1 seconds period)
2025-12-23 18:22:12.246 - [NOTICE] logger.func(7): Cycle 104/531 (20.388 s elapse
d) --------------------
2025-12-23 18:22:12.246 - [NOTICE] logger.func(7): Cycle 104/531, step 1/1: Charg
e at 0.751200 A for 327.014 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:12.255 - [NOTICE] logger.func(7): Cycle 105/531 (20.396 s elapse
d) --------------------
2025-12-23 18:22:12.256 - [NOTICE] logger.func(7): Cycle 105/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:13.383 - [NOTICE] logger.func(7): Cycle 106/531 (21.526 s elapse
d) --------------------
2025-12-23 18:22:13.386 - [NOTICE] logger.func(7): Cycle 106/531, step 1/1: Rest
for 19.899 seconds (1 seconds period)
2025-12-23 18:22:13.388 - [NOTICE] logger.func(7): Cycle 107/531 (21.530 s elapse
d) --------------------
2025-12-23 18:22:13.388 - [NOTICE] logger.func(7): Cycle 107/531, step 1/1: Charg
e at 9.999400 A for 9.915 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:13.391 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.915 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:13.391 - [NOTICE] logger.func(7): Cycle 108/531 (21.533 s elapse
d) --------------------
2025-12-23 18:22:13.391 - [NOTICE] logger.func(7): Cycle 108/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
```

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2025-12-23 18:22:14.521 - [NOTICE] logger.func(7): Cycle 109/531 (22.662 s elapse
d) --------------------
2025-12-23 18:22:14.521 - [NOTICE] logger.func(7): Cycle 109/531, step 1/1: Rest
for 9.904 seconds (1 seconds period)
2025-12-23 18:22:14.521 - [NOTICE] logger.func(7): Cycle 110/531 (22.666 s elapse
d) --------------------
2025-12-23 18:22:14.521 - [NOTICE] logger.func(7): Cycle 110/531, step 1/1: Disch
arge at 0.748700 A for 123.230 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:14.529 - [NOTICE] logger.func(7): Cycle 111/531 (22.670 s elapse
d) --------------------
2025-12-23 18:22:14.529 - [NOTICE] logger.func(7): Cycle 111/531, step 1/1: Rest
for 599.025 seconds (1 seconds period)
2025-12-23 18:22:14.533 - [NOTICE] logger.func(7): Cycle 112/531 (22.675 s elapse
d) --------------------
2025-12-23 18:22:14.535 - [NOTICE] logger.func(7): Cycle 112/531, step 1/1: Disch
arge at 37.496800 A for 9.900 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:14.539 - [NOTICE] logger.func(7): Cycle 113/531 (22.679 s elapse
d) --------------------
2025-12-23 18:22:14.539 - [NOTICE] logger.func(7): Cycle 113/531, step 1/1: Rest
for 19.894 seconds (1 seconds period)
2025-12-23 18:22:14.542 - [NOTICE] logger.func(7): Cycle 114/531 (22.683 s elapse
d) --------------------
2025-12-23 18:22:14.542 - [NOTICE] logger.func(7): Cycle 114/531, step 1/1: Charg
e at 0.751200 A for 491.375 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:14.548 - [NOTICE] logger.func(7): Cycle 115/531 (22.690 s elapse
d) --------------------
2025-12-23 18:22:14.549 - [NOTICE] logger.func(7): Cycle 115/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:15.708 - [NOTICE] logger.func(7): Cycle 116/531 (23.849 s elapse
d) --------------------
2025-12-23 18:22:15.709 - [NOTICE] logger.func(7): Cycle 116/531, step 1/1: Rest
for 19.906 seconds (1 seconds period)
2025-12-23 18:22:15.712 - [NOTICE] logger.func(7): Cycle 117/531 (23.853 s elapse
d) --------------------
2025-12-23 18:22:15.712 - [NOTICE] logger.func(7): Cycle 117/531, step 1/1: Charg
e at 19.993700 A for 9.902 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:15.738 - [WARNING] simulation.solve(942): Step 'Charge at 19.993
700 A for 9.902 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:15.738 - [NOTICE] logger.func(7): Cycle 118/531 (23.879 s elapse
d) --------------------
2025-12-23 18:22:15.739 - [NOTICE] logger.func(7): Cycle 118/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:16.908 - [NOTICE] logger.func(7): Cycle 119/531 (25.049 s elapse
d) --------------------
2025-12-23 18:22:16.909 - [NOTICE] logger.func(7): Cycle 119/531, step 1/1: Rest
for 9.910 seconds (1 seconds period)
2025-12-23 18:22:16.912 - [NOTICE] logger.func(7): Cycle 120/531 (25.053 s elapse
d) --------------------
2025-12-23 18:22:16.912 - [NOTICE] logger.func(7): Cycle 120/531, step 1/1: Rest
for 589.042 seconds (1 seconds period)
2025-12-23 18:22:16.914 - [NOTICE] logger.func(7): Cycle 121/531 (25.055 s elapse
d) --------------------
2025-12-23 18:22:16.915 - [NOTICE] logger.func(7): Cycle 121/531, step 1/1: Disch
arge at 0.748700 A for 1189.091 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:16.925 - [NOTICE] logger.func(7): Cycle 122/531 (25.066 s elapse
d) --------------------
2025-12-23 18:22:16.926 - [NOTICE] logger.func(7): Cycle 122/531, step 1/1: Rest
for 1800.024 seconds (1 seconds period)
2025-12-23 18:22:16.930 - [NOTICE] logger.func(7): Cycle 123/531 (25.072 s elapse
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d) --------------------
2025-12-23 18:22:16.931 - [NOTICE] logger.func(7): Cycle 123/531, step 1/1: Disch
arge at 2.497200 A for 9.902 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:16.936 - [NOTICE] logger.func(7): Cycle 124/531 (25.077 s elapse
d) --------------------
2025-12-23 18:22:16.937 - [NOTICE] logger.func(7): Cycle 124/531, step 1/1: Rest
for 19.919 seconds (1 seconds period)
2025-12-23 18:22:16.939 - [NOTICE] logger.func(7): Cycle 125/531 (25.081 s elapse
d) --------------------
2025-12-23 18:22:16.941 - [NOTICE] logger.func(7): Cycle 125/531, step 1/1: Charg
e at 0.748700 A for 23.697 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:16.944 - [NOTICE] logger.func(7): Cycle 126/531 (25.084 s elapse
d) --------------------
2025-12-23 18:22:16.944 - [NOTICE] logger.func(7): Cycle 126/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:18.021 - [NOTICE] logger.func(7): Cycle 127/531 (26.164 s elapse
d) --------------------
2025-12-23 18:22:18.021 - [NOTICE] logger.func(7): Cycle 127/531, step 1/1: Rest
for 19.908 seconds (1 seconds period)
2025-12-23 18:22:18.027 - [NOTICE] logger.func(7): Cycle 128/531 (26.168 s elapse
d) --------------------
2025-12-23 18:22:18.027 - [NOTICE] logger.func(7): Cycle 128/531, step 1/1: Charg
e at 2.499800 A for 9.905 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:18.029 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.905 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:18.029 - [NOTICE] logger.func(7): Cycle 129/531 (26.171 s elapse
d) --------------------
2025-12-23 18:22:18.029 - [NOTICE] logger.func(7): Cycle 129/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:19.184 - [NOTICE] logger.func(7): Cycle 130/531 (27.325 s elapse
d) --------------------
2025-12-23 18:22:19.185 - [NOTICE] logger.func(7): Cycle 130/531, step 1/1: Rest
for 9.895 seconds (1 seconds period)
2025-12-23 18:22:19.188 - [NOTICE] logger.func(7): Cycle 131/531 (27.330 s elapse
d) --------------------
2025-12-23 18:22:19.190 - [NOTICE] logger.func(7): Cycle 131/531, step 1/1: Disch
arge at 0.748700 A for 23.252 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:19.191 - [NOTICE] logger.func(7): Cycle 132/531 (27.334 s elapse
d) --------------------
2025-12-23 18:22:19.191 - [NOTICE] logger.func(7): Cycle 132/531, step 1/1: Rest
for 599.035 seconds (1 seconds period)
2025-12-23 18:22:19.198 - [NOTICE] logger.func(7): Cycle 133/531 (27.339 s elapse
d) --------------------
2025-12-23 18:22:19.199 - [NOTICE] logger.func(7): Cycle 133/531, step 1/1: Disch
arge at 12.496400 A for 9.915 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:19.201 - [NOTICE] logger.func(7): Cycle 134/531 (27.343 s elapse
d) --------------------
2025-12-23 18:22:19.201 - [NOTICE] logger.func(7): Cycle 134/531, step 1/1: Rest
for 19.909 seconds (1 seconds period)
2025-12-23 18:22:19.206 - [NOTICE] logger.func(7): Cycle 135/531 (27.347 s elapse
d) --------------------
2025-12-23 18:22:19.206 - [NOTICE] logger.func(7): Cycle 135/531, step 1/1: Charg
e at 0.751200 A for 156.808 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:19.209 - [NOTICE] logger.func(7): Cycle 136/531 (27.353 s elapse
d) --------------------
2025-12-23 18:22:19.209 - [NOTICE] logger.func(7): Cycle 136/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:20.299 - [NOTICE] logger.func(7): Cycle 137/531 (28.439 s elapse
d) --------------------
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2025-12-23 18:22:20.300 - [NOTICE] logger.func(7): Cycle 137/531, step 1/1: Rest
for 19.916 seconds (1 seconds period)
2025-12-23 18:22:20.303 - [NOTICE] logger.func(7): Cycle 138/531 (28.444 s elapse
d) --------------------
2025-12-23 18:22:20.304 - [NOTICE] logger.func(7): Cycle 138/531, step 1/1: Charg
e at 4.999700 A for 9.910 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:20.306 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.910 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:20.306 - [NOTICE] logger.func(7): Cycle 139/531 (28.447 s elapse
d) --------------------
2025-12-23 18:22:20.307 - [NOTICE] logger.func(7): Cycle 139/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:21.486 - [NOTICE] logger.func(7): Cycle 140/531 (29.631 s elapse
d) --------------------
2025-12-23 18:22:21.486 - [NOTICE] logger.func(7): Cycle 140/531, step 1/1: Rest
for 9.907 seconds (1 seconds period)
2025-12-23 18:22:21.486 - [NOTICE] logger.func(7): Cycle 141/531 (29.635 s elapse
d) --------------------
2025-12-23 18:22:21.486 - [NOTICE] logger.func(7): Cycle 141/531, step 1/1: Disch
arge at 0.748700 A for 56.631 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:21.499 - [NOTICE] logger.func(7): Cycle 142/531 (29.640 s elapse
d) --------------------
2025-12-23 18:22:21.499 - [NOTICE] logger.func(7): Cycle 142/531, step 1/1: Rest
for 599.040 seconds (1 seconds period)
2025-12-23 18:22:21.506 - [NOTICE] logger.func(7): Cycle 143/531 (29.646 s elapse
d) --------------------
2025-12-23 18:22:21.508 - [NOTICE] logger.func(7): Cycle 143/531, step 1/1: Disch
arge at 24.997900 A for 9.892 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:21.511 - [NOTICE] logger.func(7): Cycle 144/531 (29.653 s elapse
d) --------------------
2025-12-23 18:22:21.512 - [NOTICE] logger.func(7): Cycle 144/531, step 1/1: Rest
for 19.902 seconds (1 seconds period)
2025-12-23 18:22:21.517 - [NOTICE] logger.func(7): Cycle 145/531 (29.658 s elapse
d) --------------------
2025-12-23 18:22:21.519 - [NOTICE] logger.func(7): Cycle 145/531, step 1/1: Charg
e at 0.751200 A for 323.826 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:21.530 - [NOTICE] logger.func(7): Cycle 146/531 (29.670 s elapse
d) --------------------
2025-12-23 18:22:21.531 - [NOTICE] logger.func(7): Cycle 146/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:22.694 - [NOTICE] logger.func(7): Cycle 147/531 (30.835 s elapse
d) --------------------
2025-12-23 18:22:22.695 - [NOTICE] logger.func(7): Cycle 147/531, step 1/1: Rest
for 19.905 seconds (1 seconds period)
2025-12-23 18:22:22.698 - [NOTICE] logger.func(7): Cycle 148/531 (30.838 s elapse
d) --------------------
2025-12-23 18:22:22.698 - [NOTICE] logger.func(7): Cycle 148/531, step 1/1: Charg
e at 9.996800 A for 9.910 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:22.722 - [WARNING] simulation.solve(942): Step 'Charge at 9.9968
00 A for 9.910 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:22.723 - [NOTICE] logger.func(7): Cycle 149/531 (30.864 s elapse
d) --------------------
2025-12-23 18:22:22.724 - [NOTICE] logger.func(7): Cycle 149/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:23.833 - [NOTICE] logger.func(7): Cycle 150/531 (31.974 s elapse
d) --------------------
2025-12-23 18:22:23.834 - [NOTICE] logger.func(7): Cycle 150/531, step 1/1: Rest
for 9.895 seconds (1 seconds period)
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2025-12-23 18:22:23.837 - [NOTICE] logger.func(7): Cycle 151/531 (31.977 s elapse
d) --------------------
2025-12-23 18:22:23.838 - [NOTICE] logger.func(7): Cycle 151/531, step 1/1: Disch
arge at 0.748700 A for 123.131 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:23.842 - [NOTICE] logger.func(7): Cycle 152/531 (31.983 s elapse
d) --------------------
2025-12-23 18:22:23.845 - [NOTICE] logger.func(7): Cycle 152/531, step 1/1: Rest
for 599.034 seconds (1 seconds period)
2025-12-23 18:22:23.851 - [NOTICE] logger.func(7): Cycle 153/531 (31.991 s elapse
d) --------------------
2025-12-23 18:22:23.852 - [NOTICE] logger.func(7): Cycle 153/531, step 1/1: Disch
arge at 37.496800 A for 9.905 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:23.856 - [NOTICE] logger.func(7): Cycle 154/531 (31.997 s elapse
d) --------------------
2025-12-23 18:22:23.857 - [NOTICE] logger.func(7): Cycle 154/531, step 1/1: Rest
for 19.900 seconds (1 seconds period)
2025-12-23 18:22:23.861 - [NOTICE] logger.func(7): Cycle 155/531 (32.002 s elapse
d) --------------------
2025-12-23 18:22:23.862 - [NOTICE] logger.func(7): Cycle 155/531, step 1/1: Charg
e at 0.751200 A for 495.516 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:23.872 - [NOTICE] logger.func(7): Cycle 156/531 (32.013 s elapse
d) --------------------
2025-12-23 18:22:23.873 - [NOTICE] logger.func(7): Cycle 156/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:24.983 - [NOTICE] logger.func(7): Cycle 157/531 (33.124 s elapse
d) --------------------
2025-12-23 18:22:24.984 - [NOTICE] logger.func(7): Cycle 157/531, step 1/1: Rest
for 19.898 seconds (1 seconds period)
2025-12-23 18:22:24.986 - [NOTICE] logger.func(7): Cycle 158/531 (33.128 s elapse
d) --------------------
2025-12-23 18:22:24.986 - [NOTICE] logger.func(7): Cycle 158/531, step 1/1: Charg
e at 19.991100 A for 9.896 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:25.007 - [WARNING] simulation.solve(942): Step 'Charge at 19.991
100 A for 9.896 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:25.007 - [NOTICE] logger.func(7): Cycle 159/531 (33.155 s elapse
d) --------------------
2025-12-23 18:22:25.007 - [NOTICE] logger.func(7): Cycle 159/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:26.109 - [NOTICE] logger.func(7): Cycle 160/531 (34.250 s elapse
d) --------------------
2025-12-23 18:22:26.110 - [NOTICE] logger.func(7): Cycle 160/531, step 1/1: Rest
for 9.903 seconds (1 seconds period)
2025-12-23 18:22:26.114 - [NOTICE] logger.func(7): Cycle 161/531 (34.255 s elapse
d) --------------------
2025-12-23 18:22:26.116 - [NOTICE] logger.func(7): Cycle 161/531, step 1/1: Rest
for 589.024 seconds (1 seconds period)
2025-12-23 18:22:26.120 - [NOTICE] logger.func(7): Cycle 162/531 (34.261 s elapse
d) --------------------
2025-12-23 18:22:26.121 - [NOTICE] logger.func(7): Cycle 162/531, step 1/1: Disch
arge at 0.748700 A for 1189.018 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:26.137 - [NOTICE] logger.func(7): Cycle 163/531 (34.279 s elapse
d) --------------------
2025-12-23 18:22:26.138 - [NOTICE] logger.func(7): Cycle 163/531, step 1/1: Rest
for 1800.014 seconds (1 seconds period)
2025-12-23 18:22:26.144 - [NOTICE] logger.func(7): Cycle 164/531 (34.286 s elapse
d) --------------------
2025-12-23 18:22:26.145 - [NOTICE] logger.func(7): Cycle 164/531, step 1/1: Disch
arge at 2.497200 A for 9.899 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:26.150 - [NOTICE] logger.func(7): Cycle 165/531 (34.291 s elapse
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d) -------------------
2025-12-23 18:22:26.152 - [NOTICE] logger.func(7): Cycle 165/531, step 1/1: Rest
for 19.908 seconds (1 seconds period)
2025-12-23 18:22:26.156 - [NOTICE] logger.func(7): Cycle 166/531 (34.297 s elapse
d) -------------------
2025-12-23 18:22:26.156 - [NOTICE] logger.func(7): Cycle 166/531, step 1/1: Charg
e at 0.751200 A for 23.388 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:26.161 - [NOTICE] logger.func(7): Cycle 167/531 (34.302 s elapse
d) -------------------
2025-12-23 18:22:26.162 - [NOTICE] logger.func(7): Cycle 167/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:27.338 - [NOTICE] logger.func(7): Cycle 168/531 (35.479 s elapse
d) -------------------
2025-12-23 18:22:27.339 - [NOTICE] logger.func(7): Cycle 168/531, step 1/1: Rest
for 19.912 seconds (1 seconds period)
2025-12-23 18:22:27.342 - [NOTICE] logger.func(7): Cycle 169/531 (35.483 s elapse
d) -------------------
2025-12-23 18:22:27.343 - [NOTICE] logger.func(7): Cycle 169/531, step 1/1: Charg
e at 2.499800 A for 9.891 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:27.345 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.891 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:27.346 - [NOTICE] logger.func(7): Cycle 170/531 (35.487 s elapse
d) -------------------
2025-12-23 18:22:27.347 - [NOTICE] logger.func(7): Cycle 170/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:28.497 - [NOTICE] logger.func(7): Cycle 171/531 (36.637 s elapse
d) -------------------
2025-12-23 18:22:28.497 - [NOTICE] logger.func(7): Cycle 171/531, step 1/1: Rest
for 9.897 seconds (1 seconds period)
2025-12-23 18:22:28.500 - [NOTICE] logger.func(7): Cycle 172/531 (36.641 s elapse
d) -------------------
2025-12-23 18:22:28.501 - [NOTICE] logger.func(7): Cycle 172/531, step 1/1: Disch
arge at 0.748700 A for 23.208 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:28.507 - [NOTICE] logger.func(7): Cycle 173/531 (36.647 s elapse
d) -------------------
2025-12-23 18:22:28.508 - [NOTICE] logger.func(7): Cycle 173/531, step 1/1: Rest
for 599.043 seconds (1 seconds period)
2025-12-23 18:22:28.512 - [NOTICE] logger.func(7): Cycle 174/531 (36.652 s elapse
d) -------------------
2025-12-23 18:22:28.512 - [NOTICE] logger.func(7): Cycle 174/531, step 1/1: Disch
arge at 12.496400 A for 9.916 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:28.515 - [NOTICE] logger.func(7): Cycle 175/531 (36.656 s elapse
d) -------------------
2025-12-23 18:22:28.516 - [NOTICE] logger.func(7): Cycle 175/531, step 1/1: Rest
for 19.910 seconds (1 seconds period)
2025-12-23 18:22:28.520 - [NOTICE] logger.func(7): Cycle 176/531 (36.660 s elapse
d) -------------------
2025-12-23 18:22:28.520 - [NOTICE] logger.func(7): Cycle 176/531, step 1/1: Charg
e at 0.751200 A for 156.994 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:28.526 - [NOTICE] logger.func(7): Cycle 177/531 (36.666 s elapse
d) -------------------
2025-12-23 18:22:28.527 - [NOTICE] logger.func(7): Cycle 177/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:29.661 - [NOTICE] logger.func(7): Cycle 178/531 (37.802 s elapse
d) -------------------
2025-12-23 18:22:29.662 - [NOTICE] logger.func(7): Cycle 178/531, step 1/1: Rest
for 19.914 seconds (1 seconds period)
2025-12-23 18:22:29.665 - [NOTICE] logger.func(7): Cycle 179/531 (37.805 s elapse
d) -------------------
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2025-12-23 18:22:29.665 - [NOTICE] logger.func(7): Cycle 179/531, step 1/1: Charg
e at 4.999700 A for 9.905 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:29.667 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.905 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:29.668 - [NOTICE] logger.func(7): Cycle 180/531 (37.809 s elapse
d) --------------------
2025-12-23 18:22:29.668 - [NOTICE] logger.func(7): Cycle 180/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:30.769 - [NOTICE] logger.func(7): Cycle 181/531 (38.911 s elapse
d) --------------------
2025-12-23 18:22:30.771 - [NOTICE] logger.func(7): Cycle 181/531, step 1/1: Rest
for 9.915 seconds (1 seconds period)
2025-12-23 18:22:30.773 - [NOTICE] logger.func(7): Cycle 182/531 (38.917 s elapse
d) --------------------
2025-12-23 18:22:30.773 - [NOTICE] logger.func(7): Cycle 182/531, step 1/1: Disch
arge at 0.748700 A for 56.650 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:30.780 - [NOTICE] logger.func(7): Cycle 183/531 (38.922 s elapse
d) --------------------
2025-12-23 18:22:30.783 - [NOTICE] logger.func(7): Cycle 183/531, step 1/1: Rest
for 599.029 seconds (1 seconds period)
2025-12-23 18:22:30.785 - [NOTICE] logger.func(7): Cycle 184/531 (38.927 s elapse
d) --------------------
2025-12-23 18:22:30.785 - [NOTICE] logger.func(7): Cycle 184/531, step 1/1: Disch
arge at 25.000400 A for 9.905 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:30.791 - [NOTICE] logger.func(7): Cycle 185/531 (38.933 s elapse
d) --------------------
2025-12-23 18:22:30.793 - [NOTICE] logger.func(7): Cycle 185/531, step 1/1: Rest
for 19.909 seconds (1 seconds period)
2025-12-23 18:22:30.798 - [NOTICE] logger.func(7): Cycle 186/531 (38.940 s elapse
d) --------------------
2025-12-23 18:22:30.799 - [NOTICE] logger.func(7): Cycle 186/531, step 1/1: Charg
e at 0.751200 A for 323.652 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:30.806 - [NOTICE] logger.func(7): Cycle 187/531 (38.949 s elapse
d) --------------------
2025-12-23 18:22:30.806 - [NOTICE] logger.func(7): Cycle 187/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:31.926 - [NOTICE] logger.func(7): Cycle 188/531 (40.068 s elapse
d) --------------------
2025-12-23 18:22:31.926 - [NOTICE] logger.func(7): Cycle 188/531, step 1/1: Rest
for 19.915 seconds (1 seconds period)
2025-12-23 18:22:31.930 - [NOTICE] logger.func(7): Cycle 189/531 (40.072 s elapse
d) --------------------
2025-12-23 18:22:31.930 - [NOTICE] logger.func(7): Cycle 189/531, step 1/1: Charg
e at 9.999400 A for 9.912 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:31.933 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.912 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:31.933 - [NOTICE] logger.func(7): Cycle 190/531 (40.075 s elapse
d) --------------------
2025-12-23 18:22:31.933 - [NOTICE] logger.func(7): Cycle 190/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:33.088 - [NOTICE] logger.func(7): Cycle 191/531 (41.233 s elapse
d) --------------------
2025-12-23 18:22:33.088 - [NOTICE] logger.func(7): Cycle 191/531, step 1/1: Rest
for 9.896 seconds (1 seconds period)
2025-12-23 18:22:33.096 - [NOTICE] logger.func(7): Cycle 192/531 (41.237 s elapse
d) --------------------
2025-12-23 18:22:33.096 - [NOTICE] logger.func(7): Cycle 192/531, step 1/1: Disch
arge at 0.748700 A for 123.334 seconds or until 2.5V (0.1 seconds period)
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2025-12-23 18:22:33.103 - [NOTICE] logger.func(7): Cycle 193/531 (41.243 s elapse
d) -------------------
2025-12-23 18:22:33.103 - [NOTICE] logger.func(7): Cycle 193/531, step 1/1: Rest
for 599.033 seconds (1 seconds period)
2025-12-23 18:22:33.108 - [NOTICE] logger.func(7): Cycle 194/531 (41.249 s elapse
d) -------------------
2025-12-23 18:22:33.117 - [NOTICE] logger.func(7): Cycle 194/531, step 1/1: Disch
arge at 37.496800 A for 9.902 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:33.124 - [NOTICE] logger.func(7): Cycle 195/531 (41.265 s elapse
d) -------------------
2025-12-23 18:22:33.128 - [NOTICE] logger.func(7): Cycle 195/531, step 1/1: Rest
for 19.899 seconds (1 seconds period)
2025-12-23 18:22:33.135 - [NOTICE] logger.func(7): Cycle 196/531 (41.275 s elapse
d) -------------------
2025-12-23 18:22:33.136 - [NOTICE] logger.func(7): Cycle 196/531, step 1/1: Charg
e at 0.751200 A for 490.520 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:33.145 - [NOTICE] logger.func(7): Cycle 197/531 (41.287 s elapse
d) -------------------
2025-12-23 18:22:33.147 - [NOTICE] logger.func(7): Cycle 197/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:34.283 - [NOTICE] logger.func(7): Cycle 198/531 (42.425 s elapse
d) -------------------
2025-12-23 18:22:34.283 - [NOTICE] logger.func(7): Cycle 198/531, step 1/1: Rest
for 19.917 seconds (1 seconds period)
2025-12-23 18:22:34.288 - [NOTICE] logger.func(7): Cycle 199/531 (42.430 s elapse
d) -------------------
2025-12-23 18:22:34.288 - [NOTICE] logger.func(7): Cycle 199/531, step 1/1: Charg
e at 19.998700 A for 9.903 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:34.305 - [WARNING] simulation.solve(942): Step 'Charge at 19.998
700 A for 9.903 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:34.305 - [NOTICE] logger.func(7): Cycle 200/531 (42.456 s elapse
d) -------------------
2025-12-23 18:22:34.305 - [NOTICE] logger.func(7): Cycle 200/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:35.423 - [NOTICE] logger.func(7): Cycle 201/531 (43.564 s elapse
d) -------------------
2025-12-23 18:22:35.425 - [NOTICE] logger.func(7): Cycle 201/531, step 1/1: Rest
for 9.916 seconds (1 seconds period)
2025-12-23 18:22:35.430 - [NOTICE] logger.func(7): Cycle 202/531 (43.572 s elapse
d) -------------------
2025-12-23 18:22:35.432 - [NOTICE] logger.func(7): Cycle 202/531, step 1/1: Rest
for 589.016 seconds (1 seconds period)
2025-12-23 18:22:35.435 - [NOTICE] logger.func(7): Cycle 203/531 (43.577 s elapse
d) -------------------
2025-12-23 18:22:35.435 - [NOTICE] logger.func(7): Cycle 203/531, step 1/1: Disch
arge at 0.748700 A for 1188.900 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:35.455 - [NOTICE] logger.func(7): Cycle 204/531 (43.596 s elapse
d) -------------------
2025-12-23 18:22:35.456 - [NOTICE] logger.func(7): Cycle 204/531, step 1/1: Rest
for 1800.022 seconds (1 seconds period)
2025-12-23 18:22:35.463 - [NOTICE] logger.func(7): Cycle 205/531 (43.604 s elapse
d) -------------------
2025-12-23 18:22:35.464 - [NOTICE] logger.func(7): Cycle 205/531, step 1/1: Disch
arge at 2.497200 A for 9.902 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:35.467 - [NOTICE] logger.func(7): Cycle 206/531 (43.608 s elapse
d) -------------------
2025-12-23 18:22:35.468 - [NOTICE] logger.func(7): Cycle 206/531, step 1/1: Rest
for 19.915 seconds (1 seconds period)
2025-12-23 18:22:35.471 - [NOTICE] logger.func(7): Cycle 207/531 (43.612 s elapse
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d) --------------------
2025-12-23 18:22:35.471 - [NOTICE] logger.func(7): Cycle 207/531, step 1/1: Charg
e at 0.748700 A for 23.511 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:35.475 - [NOTICE] logger.func(7): Cycle 208/531 (43.616 s elapse
d) --------------------
2025-12-23 18:22:35.476 - [NOTICE] logger.func(7): Cycle 208/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:36.666 - [NOTICE] logger.func(7): Cycle 209/531 (44.808 s elapse
d) --------------------
2025-12-23 18:22:36.667 - [NOTICE] logger.func(7): Cycle 209/531, step 1/1: Rest
for 19.901 seconds (1 seconds period)
2025-12-23 18:22:36.671 - [NOTICE] logger.func(7): Cycle 210/531 (44.812 s elapse
d) --------------------
2025-12-23 18:22:36.671 - [NOTICE] logger.func(7): Cycle 210/531, step 1/1: Charg
e at 2.499800 A for 9.907 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:36.674 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.907 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:36.675 - [NOTICE] logger.func(7): Cycle 211/531 (44.816 s elapse
d) --------------------
2025-12-23 18:22:36.676 - [NOTICE] logger.func(7): Cycle 211/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:37.861 - [NOTICE] logger.func(7): Cycle 212/531 (46.002 s elapse
d) --------------------
2025-12-23 18:22:37.862 - [NOTICE] logger.func(7): Cycle 212/531, step 1/1: Rest
for 9.932 seconds (1 seconds period)
2025-12-23 18:22:37.866 - [NOTICE] logger.func(7): Cycle 213/531 (46.007 s elapse
d) --------------------
2025-12-23 18:22:37.866 - [NOTICE] logger.func(7): Cycle 213/531, step 1/1: Disch
arge at 0.748700 A for 23.233 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:37.872 - [NOTICE] logger.func(7): Cycle 214/531 (46.012 s elapse
d) --------------------
2025-12-23 18:22:37.872 - [NOTICE] logger.func(7): Cycle 214/531, step 1/1: Rest
for 599.023 seconds (1 seconds period)
2025-12-23 18:22:37.876 - [NOTICE] logger.func(7): Cycle 215/531 (46.017 s elapse
d) --------------------
2025-12-23 18:22:37.877 - [NOTICE] logger.func(7): Cycle 215/531, step 1/1: Disch
arge at 12.496400 A for 9.912 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:37.881 - [NOTICE] logger.func(7): Cycle 216/531 (46.022 s elapse
d) --------------------
2025-12-23 18:22:37.882 - [NOTICE] logger.func(7): Cycle 216/531, step 1/1: Rest
for 19.917 seconds (1 seconds period)
2025-12-23 18:22:37.885 - [NOTICE] logger.func(7): Cycle 217/531 (46.027 s elapse
d) --------------------
2025-12-23 18:22:37.886 - [NOTICE] logger.func(7): Cycle 217/531, step 1/1: Charg
e at 0.751200 A for 156.721 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:37.893 - [NOTICE] logger.func(7): Cycle 218/531 (46.034 s elapse
d) --------------------
2025-12-23 18:22:37.894 - [NOTICE] logger.func(7): Cycle 218/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:39.076 - [NOTICE] logger.func(7): Cycle 219/531 (47.217 s elapse
d) --------------------
2025-12-23 18:22:39.076 - [NOTICE] logger.func(7): Cycle 219/531, step 1/1: Rest
for 19.896 seconds (1 seconds period)
2025-12-23 18:22:39.080 - [NOTICE] logger.func(7): Cycle 220/531 (47.221 s elapse
d) --------------------
2025-12-23 18:22:39.081 - [NOTICE] logger.func(7): Cycle 220/531, step 1/1: Charg
e at 4.999700 A for 9.907 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:39.083 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.907 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi

al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:39.084 - [NOTICE] logger.func(7): Cycle 221/531 (47.225 s elapse
d) -------------------
2025-12-23 18:22:39.085 - [NOTICE] logger.func(7): Cycle 221/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:40.136 - [NOTICE] logger.func(7): Cycle 222/531 (48.277 s elapse
d) -------------------
2025-12-23 18:22:40.137 - [NOTICE] logger.func(7): Cycle 222/531, step 1/1: Rest
for 9.905 seconds (1 seconds period)
2025-12-23 18:22:40.142 - [NOTICE] logger.func(7): Cycle 223/531 (48.282 s elapse
d) -------------------
2025-12-23 18:22:40.143 - [NOTICE] logger.func(7): Cycle 223/531, step 1/1: Disch
arge at 0.748700 A for 56.676 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:40.149 - [NOTICE] logger.func(7): Cycle 224/531 (48.290 s elapse
d) -------------------
2025-12-23 18:22:40.151 - [NOTICE] logger.func(7): Cycle 224/531, step 1/1: Rest
for 599.048 seconds (1 seconds period)
2025-12-23 18:22:40.156 - [NOTICE] logger.func(7): Cycle 225/531 (48.297 s elapse
d) -------------------
2025-12-23 18:22:40.157 - [NOTICE] logger.func(7): Cycle 225/531, step 1/1: Disch
arge at 25.000400 A for 9.891 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:40.162 - [NOTICE] logger.func(7): Cycle 226/531 (48.303 s elapse
d) -------------------
2025-12-23 18:22:40.164 - [NOTICE] logger.func(7): Cycle 226/531, step 1/1: Rest
for 19.921 seconds (1 seconds period)
2025-12-23 18:22:40.168 - [NOTICE] logger.func(7): Cycle 227/531 (48.309 s elapse
d) -------------------
2025-12-23 18:22:40.169 - [NOTICE] logger.func(7): Cycle 227/531, step 1/1: Charg
e at 0.751200 A for 324.043 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:40.177 - [NOTICE] logger.func(7): Cycle 228/531 (48.318 s elapse
d) -------------------
2025-12-23 18:22:40.177 - [NOTICE] logger.func(7): Cycle 228/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:41.302 - [NOTICE] logger.func(7): Cycle 229/531 (49.442 s elapse
d) -------------------
2025-12-23 18:22:41.302 - [NOTICE] logger.func(7): Cycle 229/531, step 1/1: Rest
for 19.905 seconds (1 seconds period)
2025-12-23 18:22:41.306 - [NOTICE] logger.func(7): Cycle 230/531 (49.447 s elapse
d) -------------------
2025-12-23 18:22:41.306 - [NOTICE] logger.func(7): Cycle 230/531, step 1/1: Charg
e at 9.999400 A for 9.904 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:41.309 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.904 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:41.310 - [NOTICE] logger.func(7): Cycle 231/531 (49.451 s elapse
d) -------------------
2025-12-23 18:22:41.310 - [NOTICE] logger.func(7): Cycle 231/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:42.417 - [NOTICE] logger.func(7): Cycle 232/531 (50.563 s elapse
d) -------------------
2025-12-23 18:22:42.417 - [NOTICE] logger.func(7): Cycle 232/531, step 1/1: Rest
for 9.905 seconds (1 seconds period)
2025-12-23 18:22:42.417 - [NOTICE] logger.func(7): Cycle 233/531 (50.567 s elapse
d) -------------------
2025-12-23 18:22:42.417 - [NOTICE] logger.func(7): Cycle 233/531, step 1/1: Disch
arge at 0.748700 A for 123.400 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:42.433 - [NOTICE] logger.func(7): Cycle 234/531 (50.573 s elapse
d) -------------------
2025-12-23 18:22:42.433 - [NOTICE] logger.func(7): Cycle 234/531, step 1/1: Rest
for 599.047 seconds (1 seconds period)

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2025-12-23 18:22:42.439 - [NOTICE] logger.func(7): Cycle 235/531 (50.581 s elapse
d) --------------------
2025-12-23 18:22:42.441 - [NOTICE] logger.func(7): Cycle 235/531, step 1/1: Disch
arge at 37.496800 A for 9.909 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:42.445 - [NOTICE] logger.func(7): Cycle 236/531 (50.587 s elapse
d) --------------------
2025-12-23 18:22:42.447 - [NOTICE] logger.func(7): Cycle 236/531, step 1/1: Rest
for 19.897 seconds (1 seconds period)
2025-12-23 18:22:42.451 - [NOTICE] logger.func(7): Cycle 237/531 (50.592 s elapse
d) --------------------
2025-12-23 18:22:42.452 - [NOTICE] logger.func(7): Cycle 237/531, step 1/1: Charg
e at 0.751200 A for 490.843 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:42.461 - [NOTICE] logger.func(7): Cycle 238/531 (50.602 s elapse
d) --------------------
2025-12-23 18:22:42.463 - [NOTICE] logger.func(7): Cycle 238/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:43.469 - [NOTICE] logger.func(7): Cycle 239/531 (51.618 s elapse
d) --------------------
2025-12-23 18:22:43.478 - [NOTICE] logger.func(7): Cycle 239/531, step 1/1: Rest
for 19.892 seconds (1 seconds period)
2025-12-23 18:22:43.478 - [NOTICE] logger.func(7): Cycle 240/531 (51.622 s elapse
d) --------------------
2025-12-23 18:22:43.482 - [NOTICE] logger.func(7): Cycle 240/531, step 1/1: Charg
e at 20.001300 A for 9.899 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:43.507 - [WARNING] simulation.solve(942): Step 'Charge at 20.001
300 A for 9.899 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:43.507 - [NOTICE] logger.func(7): Cycle 241/531 (51.649 s elapse
d) --------------------
2025-12-23 18:22:43.507 - [NOTICE] logger.func(7): Cycle 241/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:44.532 - [NOTICE] logger.func(7): Cycle 242/531 (52.672 s elapse
d) --------------------
2025-12-23 18:22:44.533 - [NOTICE] logger.func(7): Cycle 242/531, step 1/1: Rest
for 9.888 seconds (1 seconds period)
2025-12-23 18:22:44.533 - [NOTICE] logger.func(7): Cycle 243/531 (52.677 s elapse
d) --------------------
2025-12-23 18:22:44.537 - [NOTICE] logger.func(7): Cycle 243/531, step 1/1: Rest
for 589.022 seconds (1 seconds period)
2025-12-23 18:22:44.537 - [NOTICE] logger.func(7): Cycle 244/531 (52.681 s elapse
d) --------------------
2025-12-23 18:22:44.537 - [NOTICE] logger.func(7): Cycle 244/531, step 1/1: Disch
arge at 0.748700 A for 1189.111 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:44.556 - [NOTICE] logger.func(7): Cycle 245/531 (52.697 s elapse
d) --------------------
2025-12-23 18:22:44.556 - [NOTICE] logger.func(7): Cycle 245/531, step 1/1: Rest
for 1800.023 seconds (1 seconds period)
2025-12-23 18:22:44.566 - [NOTICE] logger.func(7): Cycle 246/531 (52.706 s elapse
d) --------------------
2025-12-23 18:22:44.567 - [NOTICE] logger.func(7): Cycle 246/531, step 1/1: Disch
arge at 2.497200 A for 9.910 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:44.572 - [NOTICE] logger.func(7): Cycle 247/531 (52.713 s elapse
d) --------------------
2025-12-23 18:22:44.572 - [NOTICE] logger.func(7): Cycle 247/531, step 1/1: Rest
for 19.912 seconds (1 seconds period)
2025-12-23 18:22:44.576 - [NOTICE] logger.func(7): Cycle 248/531 (52.718 s elapse
d) --------------------
2025-12-23 18:22:44.576 - [NOTICE] logger.func(7): Cycle 248/531, step 1/1: Charg
e at 0.748700 A for 23.505 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:44.583 - [NOTICE] logger.func(7): Cycle 249/531 (52.723 s elapse
```

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d) --------------------
2025-12-23 18:22:44.584 - [NOTICE] logger.func(7): Cycle 249/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:45.717 - [NOTICE] logger.func(7): Cycle 250/531 (53.858 s elapse
d) --------------------
2025-12-23 18:22:45.717 - [NOTICE] logger.func(7): Cycle 250/531, step 1/1: Rest
for 19.905 seconds (1 seconds period)
2025-12-23 18:22:45.722 - [NOTICE] logger.func(7): Cycle 251/531 (53.865 s elapse
d) --------------------
2025-12-23 18:22:45.722 - [NOTICE] logger.func(7): Cycle 251/531, step 1/1: Charg
e at 2.499800 A for 9.907 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:45.729 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.907 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:45.729 - [NOTICE] logger.func(7): Cycle 252/531 (53.871 s elapse
d) --------------------
2025-12-23 18:22:45.729 - [NOTICE] logger.func(7): Cycle 252/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:46.933 - [NOTICE] logger.func(7): Cycle 253/531 (55.073 s elapse
d) --------------------
2025-12-23 18:22:46.933 - [NOTICE] logger.func(7): Cycle 253/531, step 1/1: Rest
for 9.914 seconds (1 seconds period)
2025-12-23 18:22:46.937 - [NOTICE] logger.func(7): Cycle 254/531 (55.078 s elapse
d) --------------------
2025-12-23 18:22:46.938 - [NOTICE] logger.func(7): Cycle 254/531, step 1/1: Disch
arge at 0.748700 A for 23.213 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:46.943 - [NOTICE] logger.func(7): Cycle 255/531 (55.084 s elapse
d) --------------------
2025-12-23 18:22:46.944 - [NOTICE] logger.func(7): Cycle 255/531, step 1/1: Rest
for 599.019 seconds (1 seconds period)
2025-12-23 18:22:46.947 - [NOTICE] logger.func(7): Cycle 256/531 (55.089 s elapse
d) --------------------
2025-12-23 18:22:46.948 - [NOTICE] logger.func(7): Cycle 256/531, step 1/1: Disch
arge at 12.496400 A for 9.924 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:46.952 - [NOTICE] logger.func(7): Cycle 257/531 (55.093 s elapse
d) --------------------
2025-12-23 18:22:46.952 - [NOTICE] logger.func(7): Cycle 257/531, step 1/1: Rest
for 19.909 seconds (1 seconds period)
2025-12-23 18:22:46.956 - [NOTICE] logger.func(7): Cycle 258/531 (55.097 s elapse
d) --------------------
2025-12-23 18:22:46.957 - [NOTICE] logger.func(7): Cycle 258/531, step 1/1: Charg
e at 0.751200 A for 156.922 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:46.965 - [NOTICE] logger.func(7): Cycle 259/531 (55.105 s elapse
d) --------------------
2025-12-23 18:22:46.966 - [NOTICE] logger.func(7): Cycle 259/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:48.066 - [NOTICE] logger.func(7): Cycle 260/531 (56.207 s elapse
d) --------------------
2025-12-23 18:22:48.066 - [NOTICE] logger.func(7): Cycle 260/531, step 1/1: Rest
for 19.897 seconds (1 seconds period)
2025-12-23 18:22:48.070 - [NOTICE] logger.func(7): Cycle 261/531 (56.211 s elapse
d) --------------------
2025-12-23 18:22:48.071 - [NOTICE] logger.func(7): Cycle 261/531, step 1/1: Charg
e at 4.999700 A for 9.912 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:48.073 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.912 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:48.073 - [NOTICE] logger.func(7): Cycle 262/531 (56.215 s elapse
d) --------------------
2025-12-23 18:22:48.074 - [NOTICE] logger.func(7): Cycle 262/531, step 1/1: Hold
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at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:49.108 - [NOTICE] logger.func(7): Cycle 263/531 (57.249 s elapse
d) -------------------
2025-12-23 18:22:49.109 - [NOTICE] logger.func(7): Cycle 263/531, step 1/1: Rest
for 9.893 seconds (1 seconds period)
2025-12-23 18:22:49.112 - [NOTICE] logger.func(7): Cycle 264/531 (57.253 s elapse
d) -------------------
2025-12-23 18:22:49.112 - [NOTICE] logger.func(7): Cycle 264/531, step 1/1: Disch
arge at 0.748700 A for 56.648 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:49.117 - [NOTICE] logger.func(7): Cycle 265/531 (57.258 s elapse
d) -------------------
2025-12-23 18:22:49.118 - [NOTICE] logger.func(7): Cycle 265/531, step 1/1: Rest
for 599.030 seconds (1 seconds period)
2025-12-23 18:22:49.122 - [NOTICE] logger.func(7): Cycle 266/531 (57.263 s elapse
d) -------------------
2025-12-23 18:22:49.123 - [NOTICE] logger.func(7): Cycle 266/531, step 1/1: Disch
arge at 24.997900 A for 9.895 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:49.127 - [NOTICE] logger.func(7): Cycle 267/531 (57.268 s elapse
d) -------------------
2025-12-23 18:22:49.127 - [NOTICE] logger.func(7): Cycle 267/531, step 1/1: Rest
for 19.911 seconds (1 seconds period)
2025-12-23 18:22:49.131 - [NOTICE] logger.func(7): Cycle 268/531 (57.272 s elapse
d) -------------------
2025-12-23 18:22:49.131 - [NOTICE] logger.func(7): Cycle 268/531, step 1/1: Charg
e at 0.751200 A for 323.733 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:49.140 - [NOTICE] logger.func(7): Cycle 269/531 (57.281 s elapse
d) -------------------
2025-12-23 18:22:49.140 - [NOTICE] logger.func(7): Cycle 269/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:50.271 - [NOTICE] logger.func(7): Cycle 270/531 (58.422 s elapse
d) -------------------
2025-12-23 18:22:50.282 - [NOTICE] logger.func(7): Cycle 270/531, step 1/1: Rest
for 19.893 seconds (1 seconds period)
2025-12-23 18:22:50.285 - [NOTICE] logger.func(7): Cycle 271/531 (58.427 s elapse
d) -------------------
2025-12-23 18:22:50.285 - [NOTICE] logger.func(7): Cycle 271/531, step 1/1: Charg
e at 9.999400 A for 9.901 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:50.289 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.901 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:50.289 - [NOTICE] logger.func(7): Cycle 272/531 (58.430 s elapse
d) -------------------
2025-12-23 18:22:50.289 - [NOTICE] logger.func(7): Cycle 272/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:51.316 - [NOTICE] logger.func(7): Cycle 273/531 (59.457 s elapse
d) -------------------
2025-12-23 18:22:51.316 - [NOTICE] logger.func(7): Cycle 273/531, step 1/1: Rest
for 9.895 seconds (1 seconds period)
2025-12-23 18:22:51.318 - [NOTICE] logger.func(7): Cycle 274/531 (59.462 s elapse
d) -------------------
2025-12-23 18:22:51.322 - [NOTICE] logger.func(7): Cycle 274/531, step 1/1: Disch
arge at 0.748700 A for 123.168 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:51.323 - [NOTICE] logger.func(7): Cycle 275/531 (59.467 s elapse
d) -------------------
2025-12-23 18:22:51.323 - [NOTICE] logger.func(7): Cycle 275/531, step 1/1: Rest
for 599.014 seconds (1 seconds period)
2025-12-23 18:22:51.328 - [NOTICE] logger.func(7): Cycle 276/531 (59.471 s elapse
d) -------------------
2025-12-23 18:22:51.328 - [NOTICE] logger.func(7): Cycle 276/531, step 1/1: Disch
arge at 37.496800 A for 9.915 seconds or until 2.5V (0.1 seconds period)

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2025-12-23 18:22:51.334 - [NOTICE] logger.func(7): Cycle 277/531 (59.476 s elapse
d) --------------------
2025-12-23 18:22:51.334 - [NOTICE] logger.func(7): Cycle 277/531, step 1/1: Rest
for 19.903 seconds (1 seconds period)
2025-12-23 18:22:51.340 - [NOTICE] logger.func(7): Cycle 278/531 (59.480 s elapse
d) --------------------
2025-12-23 18:22:51.340 - [NOTICE] logger.func(7): Cycle 278/531, step 1/1: Charg
e at 0.751200 A for 495.874 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:51.347 - [NOTICE] logger.func(7): Cycle 279/531 (59.487 s elapse
d) --------------------
2025-12-23 18:22:51.347 - [NOTICE] logger.func(7): Cycle 279/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:52.446 - [NOTICE] logger.func(7): Cycle 280/531 (1 minute, 1 sec
ond elapsed) --------------------
2025-12-23 18:22:52.446 - [NOTICE] logger.func(7): Cycle 280/531, step 1/1: Rest
for 19.899 seconds (1 seconds period)
2025-12-23 18:22:52.450 - [NOTICE] logger.func(7): Cycle 281/531 (1 minute, 1 sec
ond elapsed) --------------------
2025-12-23 18:22:52.451 - [NOTICE] logger.func(7): Cycle 281/531, step 1/1: Charg
e at 20.001300 A for 9.897 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:52.453 - [WARNING] simulation.solve(942): Step 'Charge at 20.001
300 A for 9.897 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:52.453 - [NOTICE] logger.func(7): Cycle 282/531 (1 minute, 1 sec
ond elapsed) --------------------
2025-12-23 18:22:52.454 - [NOTICE] logger.func(7): Cycle 282/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:53.474 - [NOTICE] logger.func(7): Cycle 283/531 (1 minute, 2 sec
onds elapsed) --------------------
2025-12-23 18:22:53.475 - [NOTICE] logger.func(7): Cycle 283/531, step 1/1: Rest
for 9.906 seconds (1 seconds period)
2025-12-23 18:22:53.478 - [NOTICE] logger.func(7): Cycle 284/531 (1 minute, 2 sec
onds elapsed) --------------------
2025-12-23 18:22:53.479 - [NOTICE] logger.func(7): Cycle 284/531, step 1/1: Rest
for 589.025 seconds (1 seconds period)
2025-12-23 18:22:53.482 - [NOTICE] logger.func(7): Cycle 285/531 (1 minute, 2 sec
onds elapsed) --------------------
2025-12-23 18:22:53.483 - [NOTICE] logger.func(7): Cycle 285/531, step 1/1: Disch
arge at 0.748700 A for 1189.011 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:53.496 - [NOTICE] logger.func(7): Cycle 286/531 (1 minute, 2 sec
onds elapsed) --------------------
2025-12-23 18:22:53.497 - [NOTICE] logger.func(7): Cycle 286/531, step 1/1: Rest
for 1800.025 seconds (1 seconds period)
2025-12-23 18:22:53.501 - [NOTICE] logger.func(7): Cycle 287/531 (1 minute, 2 sec
onds elapsed) --------------------
2025-12-23 18:22:53.502 - [NOTICE] logger.func(7): Cycle 287/531, step 1/1: Disch
arge at 2.499800 A for 9.905 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:53.529 - [NOTICE] logger.func(7): Cycle 288/531 (1 minute, 2 sec
onds elapsed) --------------------
2025-12-23 18:22:53.530 - [NOTICE] logger.func(7): Cycle 288/531, step 1/1: Rest
for 19.906 seconds (1 seconds period)
2025-12-23 18:22:53.534 - [NOTICE] logger.func(7): Cycle 289/531 (1 minute, 2 sec
onds elapsed) --------------------
2025-12-23 18:22:53.534 - [NOTICE] logger.func(7): Cycle 289/531, step 1/1: Charg
e at 0.748700 A for 23.494 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:53.539 - [NOTICE] logger.func(7): Cycle 290/531 (1 minute, 2 sec
onds elapsed) --------------------
2025-12-23 18:22:53.540 - [NOTICE] logger.func(7): Cycle 290/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:54.623 - [NOTICE] logger.func(7): Cycle 291/531 (1 minute, 3 sec
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onds elapsed) --------------------
2025-12-23 18:22:54.624 - [NOTICE] logger.func(7): Cycle 291/531, step 1/1: Rest
for 19.908 seconds (1 seconds period)
2025-12-23 18:22:54.628 - [NOTICE] logger.func(7): Cycle 292/531 (1 minute, 3 sec
onds elapsed) --------------------
2025-12-23 18:22:54.629 - [NOTICE] logger.func(7): Cycle 292/531, step 1/1: Charg
e at 2.499800 A for 9.899 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:54.631 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.899 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:54.631 - [NOTICE] logger.func(7): Cycle 293/531 (1 minute, 3 sec
onds elapsed) --------------------
2025-12-23 18:22:54.632 - [NOTICE] logger.func(7): Cycle 293/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:55.748 - [NOTICE] logger.func(7): Cycle 294/531 (1 minute, 4 sec
onds elapsed) --------------------
2025-12-23 18:22:55.749 - [NOTICE] logger.func(7): Cycle 294/531, step 1/1: Rest
for 9.887 seconds (1 seconds period)
2025-12-23 18:22:55.753 - [NOTICE] logger.func(7): Cycle 295/531 (1 minute, 4 sec
onds elapsed) --------------------
2025-12-23 18:22:55.754 - [NOTICE] logger.func(7): Cycle 295/531, step 1/1: Disch
arge at 0.748700 A for 23.372 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:55.758 - [NOTICE] logger.func(7): Cycle 296/531 (1 minute, 4 sec
onds elapsed) --------------------
2025-12-23 18:22:55.759 - [NOTICE] logger.func(7): Cycle 296/531, step 1/1: Rest
for 599.028 seconds (1 seconds period)
2025-12-23 18:22:55.763 - [NOTICE] logger.func(7): Cycle 297/531 (1 minute, 4 sec
onds elapsed) --------------------
2025-12-23 18:22:55.763 - [NOTICE] logger.func(7): Cycle 297/531, step 1/1: Disch
arge at 12.496400 A for 9.916 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:55.767 - [NOTICE] logger.func(7): Cycle 298/531 (1 minute, 4 sec
onds elapsed) --------------------
2025-12-23 18:22:55.768 - [NOTICE] logger.func(7): Cycle 298/531, step 1/1: Rest
for 19.901 seconds (1 seconds period)
2025-12-23 18:22:55.777 - [NOTICE] logger.func(7): Cycle 299/531 (1 minute, 4 sec
onds elapsed) --------------------
2025-12-23 18:22:55.779 - [NOTICE] logger.func(7): Cycle 299/531, step 1/1: Charg
e at 0.751200 A for 157.037 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:55.789 - [NOTICE] logger.func(7): Cycle 300/531 (1 minute, 4 sec
onds elapsed) --------------------
2025-12-23 18:22:55.790 - [NOTICE] logger.func(7): Cycle 300/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:56.921 - [NOTICE] logger.func(7): Cycle 301/531 (1 minute, 5 sec
onds elapsed) --------------------
2025-12-23 18:22:56.922 - [NOTICE] logger.func(7): Cycle 301/531, step 1/1: Rest
for 19.903 seconds (1 seconds period)
2025-12-23 18:22:56.925 - [NOTICE] logger.func(7): Cycle 302/531 (1 minute, 5 sec
onds elapsed) --------------------
2025-12-23 18:22:56.926 - [NOTICE] logger.func(7): Cycle 302/531, step 1/1: Charg
e at 4.999700 A for 9.897 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:56.928 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.897 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:56.929 - [NOTICE] logger.func(7): Cycle 303/531 (1 minute, 5 sec
onds elapsed) --------------------
2025-12-23 18:22:56.929 - [NOTICE] logger.func(7): Cycle 303/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:58.117 - [NOTICE] logger.func(7): Cycle 304/531 (1 minute, 6 sec
onds elapsed) --------------------
2025-12-23 18:22:58.117 - [NOTICE] logger.func(7): Cycle 304/531, step 1/1: Rest

for 9.898 seconds (1 seconds period)
2025-12-23 18:22:58.123 - [NOTICE] logger.func(7): Cycle 305/531 (1 minute, 6 sec
onds elapsed) --------------------
2025-12-23 18:22:58.123 - [NOTICE] logger.func(7): Cycle 305/531, step 1/1: Disch
arge at 0.748700 A for 56.661 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:58.128 - [NOTICE] logger.func(7): Cycle 306/531 (1 minute, 6 sec
onds elapsed) --------------------
2025-12-23 18:22:58.128 - [NOTICE] logger.func(7): Cycle 306/531, step 1/1: Rest
for 599.032 seconds (1 seconds period)
2025-12-23 18:22:58.133 - [NOTICE] logger.func(7): Cycle 307/531 (1 minute, 6 sec
onds elapsed) --------------------
2025-12-23 18:22:58.134 - [NOTICE] logger.func(7): Cycle 307/531, step 1/1: Disch
arge at 25.000400 A for 9.895 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:22:58.138 - [NOTICE] logger.func(7): Cycle 308/531 (1 minute, 6 sec
onds elapsed) --------------------
2025-12-23 18:22:58.138 - [NOTICE] logger.func(7): Cycle 308/531, step 1/1: Rest
for 19.905 seconds (1 seconds period)
2025-12-23 18:22:58.142 - [NOTICE] logger.func(7): Cycle 309/531 (1 minute, 6 sec
onds elapsed) --------------------
2025-12-23 18:22:58.142 - [NOTICE] logger.func(7): Cycle 309/531, step 1/1: Charg
e at 0.751200 A for 323.426 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:58.152 - [NOTICE] logger.func(7): Cycle 310/531 (1 minute, 6 sec
onds elapsed) --------------------
2025-12-23 18:22:58.152 - [NOTICE] logger.func(7): Cycle 310/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:22:59.234 - [NOTICE] logger.func(7): Cycle 311/531 (1 minute, 7 sec
onds elapsed) --------------------
2025-12-23 18:22:59.234 - [NOTICE] logger.func(7): Cycle 311/531, step 1/1: Rest
for 19.907 seconds (1 seconds period)
2025-12-23 18:22:59.234 - [NOTICE] logger.func(7): Cycle 312/531 (1 minute, 7 sec
onds elapsed) --------------------
2025-12-23 18:22:59.234 - [NOTICE] logger.func(7): Cycle 312/531, step 1/1: Charg
e at 9.999400 A for 9.906 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:22:59.234 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.906 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:22:59.248 - [NOTICE] logger.func(7): Cycle 313/531 (1 minute, 7 sec
onds elapsed) --------------------
2025-12-23 18:22:59.248 - [NOTICE] logger.func(7): Cycle 313/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:00.385 - [NOTICE] logger.func(7): Cycle 314/531 (1 minute, 9 sec
onds elapsed) --------------------
2025-12-23 18:23:00.385 - [NOTICE] logger.func(7): Cycle 314/531, step 1/1: Rest
for 9.894 seconds (1 seconds period)
2025-12-23 18:23:00.392 - [NOTICE] logger.func(7): Cycle 315/531 (1 minute, 9 sec
onds elapsed) --------------------
2025-12-23 18:23:00.392 - [NOTICE] logger.func(7): Cycle 315/531, step 1/1: Disch
arge at 0.748700 A for 123.153 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:00.400 - [NOTICE] logger.func(7): Cycle 316/531 (1 minute, 9 sec
onds elapsed) --------------------
2025-12-23 18:23:00.401 - [NOTICE] logger.func(7): Cycle 316/531, step 1/1: Rest
for 599.034 seconds (1 seconds period)
2025-12-23 18:23:00.408 - [NOTICE] logger.func(7): Cycle 317/531 (1 minute, 9 sec
onds elapsed) --------------------
2025-12-23 18:23:00.410 - [NOTICE] logger.func(7): Cycle 317/531, step 1/1: Disch
arge at 37.496800 A for 9.902 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:00.414 - [NOTICE] logger.func(7): Cycle 318/531 (1 minute, 9 sec
onds elapsed) --------------------
2025-12-23 18:23:00.416 - [NOTICE] logger.func(7): Cycle 318/531, step 1/1: Rest
for 19.887 seconds (1 seconds period)

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2025-12-23 18:23:00.422 - [NOTICE] logger.func(7): Cycle 319/531 (1 minute, 9 sec
onds elapsed) --------------------
2025-12-23 18:23:00.422 - [NOTICE] logger.func(7): Cycle 319/531, step 1/1: Charg
e at 0.751200 A for 490.345 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:00.435 - [NOTICE] logger.func(7): Cycle 320/531 (1 minute, 9 sec
onds elapsed) --------------------
2025-12-23 18:23:00.436 - [NOTICE] logger.func(7): Cycle 320/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:01.484 - [NOTICE] logger.func(7): Cycle 321/531 (1 minute, 10 se
conds elapsed) --------------------
2025-12-23 18:23:01.485 - [NOTICE] logger.func(7): Cycle 321/531, step 1/1: Rest
for 19.908 seconds (1 seconds period)
2025-12-23 18:23:01.487 - [NOTICE] logger.func(7): Cycle 322/531 (1 minute, 10 se
conds elapsed) --------------------
2025-12-23 18:23:01.490 - [NOTICE] logger.func(7): Cycle 322/531, step 1/1: Charg
e at 20.001300 A for 9.898 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:01.492 - [WARNING] simulation.solve(942): Step 'Charge at 20.001
300 A for 9.898 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:01.492 - [NOTICE] logger.func(7): Cycle 323/531 (1 minute, 10 se
conds elapsed) --------------------
2025-12-23 18:23:01.492 - [NOTICE] logger.func(7): Cycle 323/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:02.602 - [NOTICE] logger.func(7): Cycle 324/531 (1 minute, 11 se
conds elapsed) --------------------
2025-12-23 18:23:02.603 - [NOTICE] logger.func(7): Cycle 324/531, step 1/1: Rest
for 9.907 seconds (1 seconds period)
2025-12-23 18:23:02.607 - [NOTICE] logger.func(7): Cycle 325/531 (1 minute, 11 se
conds elapsed) --------------------
2025-12-23 18:23:02.607 - [NOTICE] logger.func(7): Cycle 325/531, step 1/1: Rest
for 589.027 seconds (1 seconds period)
2025-12-23 18:23:02.609 - [NOTICE] logger.func(7): Cycle 326/531 (1 minute, 11 se
conds elapsed) --------------------
2025-12-23 18:23:02.610 - [NOTICE] logger.func(7): Cycle 326/531, step 1/1: Disch
arge at 0.748700 A for 1188.923 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:02.622 - [NOTICE] logger.func(7): Cycle 327/531 (1 minute, 11 se
conds elapsed) --------------------
2025-12-23 18:23:02.623 - [NOTICE] logger.func(7): Cycle 327/531, step 1/1: Rest
for 1800.033 seconds (1 seconds period)
2025-12-23 18:23:02.628 - [NOTICE] logger.func(7): Cycle 328/531 (1 minute, 11 se
conds elapsed) --------------------
2025-12-23 18:23:02.629 - [NOTICE] logger.func(7): Cycle 328/531, step 1/1: Disch
arge at 2.497200 A for 9.902 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:02.633 - [NOTICE] logger.func(7): Cycle 329/531 (1 minute, 11 se
conds elapsed) --------------------
2025-12-23 18:23:02.633 - [NOTICE] logger.func(7): Cycle 329/531, step 1/1: Rest
for 19.896 seconds (1 seconds period)
2025-12-23 18:23:02.637 - [NOTICE] logger.func(7): Cycle 330/531 (1 minute, 11 se
conds elapsed) --------------------
2025-12-23 18:23:02.637 - [NOTICE] logger.func(7): Cycle 330/531, step 1/1: Charg
e at 0.751200 A for 23.533 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:02.642 - [NOTICE] logger.func(7): Cycle 331/531 (1 minute, 11 se
conds elapsed) --------------------
2025-12-23 18:23:02.643 - [NOTICE] logger.func(7): Cycle 331/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:03.739 - [NOTICE] logger.func(7): Cycle 332/531 (1 minute, 12 se
conds elapsed) --------------------
2025-12-23 18:23:03.740 - [NOTICE] logger.func(7): Cycle 332/531, step 1/1: Rest
for 19.902 seconds (1 seconds period)
2025-12-23 18:23:03.745 - [NOTICE] logger.func(7): Cycle 333/531 (1 minute, 12 se
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conds elapsed) --------------------
2025-12-23 18:23:03.746 - [NOTICE] logger.func(7): Cycle 333/531, step 1/1: Charg
e at 2.499800 A for 9.916 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:03.750 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.916 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:03.751 - [NOTICE] logger.func(7): Cycle 334/531 (1 minute, 12 se
conds elapsed) --------------------
2025-12-23 18:23:03.751 - [NOTICE] logger.func(7): Cycle 334/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:04.938 - [NOTICE] logger.func(7): Cycle 335/531 (1 minute, 13 se
conds elapsed) --------------------
2025-12-23 18:23:04.939 - [NOTICE] logger.func(7): Cycle 335/531, step 1/1: Rest
for 9.898 seconds (1 seconds period)
2025-12-23 18:23:04.944 - [NOTICE] logger.func(7): Cycle 336/531 (1 minute, 13 se
conds elapsed) --------------------
2025-12-23 18:23:04.945 - [NOTICE] logger.func(7): Cycle 336/531, step 1/1: Disch
arge at 0.751200 A for 23.360 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:04.974 - [NOTICE] logger.func(7): Cycle 337/531 (1 minute, 13 se
conds elapsed) --------------------
2025-12-23 18:23:04.975 - [NOTICE] logger.func(7): Cycle 337/531, step 1/1: Rest
for 599.032 seconds (1 seconds period)
2025-12-23 18:23:04.978 - [NOTICE] logger.func(7): Cycle 338/531 (1 minute, 13 se
conds elapsed) --------------------
2025-12-23 18:23:04.979 - [NOTICE] logger.func(7): Cycle 338/531, step 1/1: Disch
arge at 12.496400 A for 9.903 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:04.982 - [NOTICE] logger.func(7): Cycle 339/531 (1 minute, 13 se
conds elapsed) --------------------
2025-12-23 18:23:04.982 - [NOTICE] logger.func(7): Cycle 339/531, step 1/1: Rest
for 19.895 seconds (1 seconds period)
2025-12-23 18:23:04.986 - [NOTICE] logger.func(7): Cycle 340/531 (1 minute, 13 se
conds elapsed) --------------------
2025-12-23 18:23:04.987 - [NOTICE] logger.func(7): Cycle 340/531, step 1/1: Charg
e at 0.751200 A for 158.536 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:04.993 - [NOTICE] logger.func(7): Cycle 341/531 (1 minute, 13 se
conds elapsed) --------------------
2025-12-23 18:23:04.994 - [NOTICE] logger.func(7): Cycle 341/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:06.106 - [NOTICE] logger.func(7): Cycle 342/531 (1 minute, 14 se
conds elapsed) --------------------
2025-12-23 18:23:06.107 - [NOTICE] logger.func(7): Cycle 342/531, step 1/1: Rest
for 19.902 seconds (1 seconds period)
2025-12-23 18:23:06.112 - [NOTICE] logger.func(7): Cycle 343/531 (1 minute, 14 se
conds elapsed) --------------------
2025-12-23 18:23:06.112 - [NOTICE] logger.func(7): Cycle 343/531, step 1/1: Charg
e at 4.999700 A for 9.908 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:06.114 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.908 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:06.115 - [NOTICE] logger.func(7): Cycle 344/531 (1 minute, 14 se
conds elapsed) --------------------
2025-12-23 18:23:06.115 - [NOTICE] logger.func(7): Cycle 344/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:07.175 - [NOTICE] logger.func(7): Cycle 345/531 (1 minute, 15 se
conds elapsed) --------------------
2025-12-23 18:23:07.176 - [NOTICE] logger.func(7): Cycle 345/531, step 1/1: Rest
for 9.904 seconds (1 seconds period)
2025-12-23 18:23:07.179 - [NOTICE] logger.func(7): Cycle 346/531 (1 minute, 15 se
conds elapsed) --------------------
2025-12-23 18:23:07.180 - [NOTICE] logger.func(7): Cycle 346/531, step 1/1: Disch
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arge at 0.748700 A for 57.280 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:07.184 - [NOTICE] logger.func(7): Cycle 347/531 (1 minute, 15 se
conds elapsed) -------------------
2025-12-23 18:23:07.185 - [NOTICE] logger.func(7): Cycle 347/531, step 1/1: Rest
for 599.052 seconds (1 seconds period)
2025-12-23 18:23:07.189 - [NOTICE] logger.func(7): Cycle 348/531 (1 minute, 15 se
conds elapsed) -------------------
2025-12-23 18:23:07.189 - [NOTICE] logger.func(7): Cycle 348/531, step 1/1: Disch
arge at 24.997900 A for 9.907 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:07.193 - [NOTICE] logger.func(7): Cycle 349/531 (1 minute, 15 se
conds elapsed) -------------------
2025-12-23 18:23:07.194 - [NOTICE] logger.func(7): Cycle 349/531, step 1/1: Rest
for 19.896 seconds (1 seconds period)
2025-12-23 18:23:07.198 - [NOTICE] logger.func(7): Cycle 350/531 (1 minute, 15 se
conds elapsed) -------------------
2025-12-23 18:23:07.198 - [NOTICE] logger.func(7): Cycle 350/531, step 1/1: Charg
e at 0.751200 A for 323.727 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:07.209 - [NOTICE] logger.func(7): Cycle 351/531 (1 minute, 15 se
conds elapsed) -------------------
2025-12-23 18:23:07.210 - [NOTICE] logger.func(7): Cycle 351/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:08.319 - [NOTICE] logger.func(7): Cycle 352/531 (1 minute, 16 se
conds elapsed) -------------------
2025-12-23 18:23:08.319 - [NOTICE] logger.func(7): Cycle 352/531, step 1/1: Rest
for 19.907 seconds (1 seconds period)
2025-12-23 18:23:08.323 - [NOTICE] logger.func(7): Cycle 353/531 (1 minute, 16 se
conds elapsed) -------------------
2025-12-23 18:23:08.323 - [NOTICE] logger.func(7): Cycle 353/531, step 1/1: Charg
e at 9.999400 A for 9.901 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:08.327 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.901 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:08.327 - [NOTICE] logger.func(7): Cycle 354/531 (1 minute, 16 se
conds elapsed) -------------------
2025-12-23 18:23:08.327 - [NOTICE] logger.func(7): Cycle 354/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:09.466 - [NOTICE] logger.func(7): Cycle 355/531 (1 minute, 18 se
conds elapsed) -------------------
2025-12-23 18:23:09.467 - [NOTICE] logger.func(7): Cycle 355/531, step 1/1: Rest
for 9.898 seconds (1 seconds period)
2025-12-23 18:23:09.470 - [NOTICE] logger.func(7): Cycle 356/531 (1 minute, 18 se
conds elapsed) -------------------
2025-12-23 18:23:09.470 - [NOTICE] logger.func(7): Cycle 356/531, step 1/1: Disch
arge at 0.748700 A for 123.369 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:09.475 - [NOTICE] logger.func(7): Cycle 357/531 (1 minute, 18 se
conds elapsed) -------------------
2025-12-23 18:23:09.475 - [NOTICE] logger.func(7): Cycle 357/531, step 1/1: Rest
for 599.019 seconds (1 seconds period)
2025-12-23 18:23:09.483 - [NOTICE] logger.func(7): Cycle 358/531 (1 minute, 18 se
conds elapsed) -------------------
2025-12-23 18:23:09.483 - [NOTICE] logger.func(7): Cycle 358/531, step 1/1: Disch
arge at 37.496800 A for 9.900 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:09.485 - [NOTICE] logger.func(7): Cycle 359/531 (1 minute, 18 se
conds elapsed) -------------------
2025-12-23 18:23:09.489 - [NOTICE] logger.func(7): Cycle 359/531, step 1/1: Rest
for 19.917 seconds (1 seconds period)
2025-12-23 18:23:09.492 - [NOTICE] logger.func(7): Cycle 360/531 (1 minute, 18 se
conds elapsed) -------------------
2025-12-23 18:23:09.492 - [NOTICE] logger.func(7): Cycle 360/531, step 1/1: Charg
e at 0.751200 A for 490.621 seconds or until 3.5V (0.1 seconds period)

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2025-12-23 18:23:09.505 - [NOTICE] logger.func(7): Cycle 361/531 (1 minute, 18 se
conds elapsed) --------------------
2025-12-23 18:23:09.505 - [NOTICE] logger.func(7): Cycle 361/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:10.645 - [NOTICE] logger.func(7): Cycle 362/531 (1 minute, 19 se
conds elapsed) --------------------
2025-12-23 18:23:10.646 - [NOTICE] logger.func(7): Cycle 362/531, step 1/1: Rest
for 19.902 seconds (1 seconds period)
2025-12-23 18:23:10.652 - [NOTICE] logger.func(7): Cycle 363/531 (1 minute, 19 se
conds elapsed) --------------------
2025-12-23 18:23:10.652 - [NOTICE] logger.func(7): Cycle 363/531, step 1/1: Charg
e at 19.998700 A for 9.898 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:10.655 - [WARNING] simulation.solve(942): Step 'Charge at 19.998
700 A for 9.898 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:10.656 - [NOTICE] logger.func(7): Cycle 364/531 (1 minute, 19 se
conds elapsed) --------------------
2025-12-23 18:23:10.656 - [NOTICE] logger.func(7): Cycle 364/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:11.751 - [NOTICE] logger.func(7): Cycle 365/531 (1 minute, 20 se
conds elapsed) --------------------
2025-12-23 18:23:11.752 - [NOTICE] logger.func(7): Cycle 365/531, step 1/1: Rest
for 9.924 seconds (1 seconds period)
2025-12-23 18:23:11.756 - [NOTICE] logger.func(7): Cycle 366/531 (1 minute, 20 se
conds elapsed) --------------------
2025-12-23 18:23:11.757 - [NOTICE] logger.func(7): Cycle 366/531, step 1/1: Rest
for 589.019 seconds (1 seconds period)
2025-12-23 18:23:11.760 - [NOTICE] logger.func(7): Cycle 367/531 (1 minute, 20 se
conds elapsed) --------------------
2025-12-23 18:23:11.761 - [NOTICE] logger.func(7): Cycle 367/531, step 1/1: Disch
arge at 0.748700 A for 1189.104 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:11.773 - [NOTICE] logger.func(7): Cycle 368/531 (1 minute, 20 se
conds elapsed) --------------------
2025-12-23 18:23:11.773 - [NOTICE] logger.func(7): Cycle 368/531, step 1/1: Rest
for 1800.027 seconds (1 seconds period)
2025-12-23 18:23:11.779 - [NOTICE] logger.func(7): Cycle 369/531 (1 minute, 20 se
conds elapsed) --------------------
2025-12-23 18:23:11.779 - [NOTICE] logger.func(7): Cycle 369/531, step 1/1: Disch
arge at 2.497200 A for 9.913 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:11.784 - [NOTICE] logger.func(7): Cycle 370/531 (1 minute, 20 se
conds elapsed) --------------------
2025-12-23 18:23:11.786 - [NOTICE] logger.func(7): Cycle 370/531, step 1/1: Rest
for 19.903 seconds (1 seconds period)
2025-12-23 18:23:11.792 - [NOTICE] logger.func(7): Cycle 371/531 (1 minute, 20 se
conds elapsed) --------------------
2025-12-23 18:23:11.794 - [NOTICE] logger.func(7): Cycle 371/531, step 1/1: Charg
e at 0.751200 A for 23.884 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:11.800 - [NOTICE] logger.func(7): Cycle 372/531 (1 minute, 20 se
conds elapsed) --------------------
2025-12-23 18:23:11.801 - [NOTICE] logger.func(7): Cycle 372/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:12.884 - [NOTICE] logger.func(7): Cycle 373/531 (1 minute, 21 se
conds elapsed) --------------------
2025-12-23 18:23:12.884 - [NOTICE] logger.func(7): Cycle 373/531, step 1/1: Rest
for 19.918 seconds (1 seconds period)
2025-12-23 18:23:12.884 - [NOTICE] logger.func(7): Cycle 374/531 (1 minute, 21 se
conds elapsed) --------------------
2025-12-23 18:23:12.884 - [NOTICE] logger.func(7): Cycle 374/531, step 1/1: Charg
e at 2.499800 A for 9.909 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:12.892 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
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00 A for 9.909 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:12.892 - [NOTICE] logger.func(7): Cycle 375/531 (1 minute, 21 se
conds elapsed) --------------------
2025-12-23 18:23:12.892 - [NOTICE] logger.func(7): Cycle 375/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:13.976 - [NOTICE] logger.func(7): Cycle 376/531 (1 minute, 22 se
conds elapsed) --------------------
2025-12-23 18:23:13.976 - [NOTICE] logger.func(7): Cycle 376/531, step 1/1: Rest
for 9.895 seconds (1 seconds period)
2025-12-23 18:23:13.983 - [NOTICE] logger.func(7): Cycle 377/531 (1 minute, 22 se
conds elapsed) --------------------
2025-12-23 18:23:13.983 - [NOTICE] logger.func(7): Cycle 377/531, step 1/1: Disch
arge at 0.748700 A for 23.509 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:13.990 - [NOTICE] logger.func(7): Cycle 378/531 (1 minute, 22 se
conds elapsed) --------------------
2025-12-23 18:23:13.991 - [NOTICE] logger.func(7): Cycle 378/531, step 1/1: Rest
for 599.028 seconds (1 seconds period)
2025-12-23 18:23:13.998 - [NOTICE] logger.func(7): Cycle 379/531 (1 minute, 22 se
conds elapsed) --------------------
2025-12-23 18:23:14.000 - [NOTICE] logger.func(7): Cycle 379/531, step 1/1: Disch
arge at 12.498900 A for 9.905 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:14.038 - [NOTICE] logger.func(7): Cycle 380/531 (1 minute, 22 se
conds elapsed) --------------------
2025-12-23 18:23:14.038 - [NOTICE] logger.func(7): Cycle 380/531, step 1/1: Rest
for 19.898 seconds (1 seconds period)
2025-12-23 18:23:14.038 - [NOTICE] logger.func(7): Cycle 381/531 (1 minute, 22 se
conds elapsed) --------------------
2025-12-23 18:23:14.038 - [NOTICE] logger.func(7): Cycle 381/531, step 1/1: Charg
e at 0.751200 A for 157.051 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:14.050 - [NOTICE] logger.func(7): Cycle 382/531 (1 minute, 22 se
conds elapsed) --------------------
2025-12-23 18:23:14.051 - [NOTICE] logger.func(7): Cycle 382/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:15.216 - [NOTICE] logger.func(7): Cycle 383/531 (1 minute, 23 se
conds elapsed) --------------------
2025-12-23 18:23:15.216 - [NOTICE] logger.func(7): Cycle 383/531, step 1/1: Rest
for 19.908 seconds (1 seconds period)
2025-12-23 18:23:15.216 - [NOTICE] logger.func(7): Cycle 384/531 (1 minute, 23 se
conds elapsed) --------------------
2025-12-23 18:23:15.216 - [NOTICE] logger.func(7): Cycle 384/531, step 1/1: Charg
e at 4.999700 A for 9.909 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:15.216 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.909 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:15.216 - [NOTICE] logger.func(7): Cycle 385/531 (1 minute, 23 se
conds elapsed) --------------------
2025-12-23 18:23:15.216 - [NOTICE] logger.func(7): Cycle 385/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:16.285 - [NOTICE] logger.func(7): Cycle 386/531 (1 minute, 24 se
conds elapsed) --------------------
2025-12-23 18:23:16.285 - [NOTICE] logger.func(7): Cycle 386/531, step 1/1: Rest
for 9.899 seconds (1 seconds period)
2025-12-23 18:23:16.291 - [NOTICE] logger.func(7): Cycle 387/531 (1 minute, 24 se
conds elapsed) --------------------
2025-12-23 18:23:16.291 - [NOTICE] logger.func(7): Cycle 387/531, step 1/1: Disch
arge at 0.748700 A for 56.528 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:16.295 - [NOTICE] logger.func(7): Cycle 388/531 (1 minute, 24 se
conds elapsed) --------------------
2025-12-23 18:23:16.295 - [NOTICE] logger.func(7): Cycle 388/531, step 1/1: Rest

for 599.045 seconds (1 seconds period)
2025-12-23 18:23:16.304 - [NOTICE] logger.func(7): Cycle 389/531 (1 minute, 24 se
conds elapsed) -------------------
2025-12-23 18:23:16.305 - [NOTICE] logger.func(7): Cycle 389/531, step 1/1: Disch
arge at 25.000400 A for 9.910 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:16.310 - [NOTICE] logger.func(7): Cycle 390/531 (1 minute, 24 se
conds elapsed) -------------------
2025-12-23 18:23:16.310 - [NOTICE] logger.func(7): Cycle 390/531, step 1/1: Rest
for 19.898 seconds (1 seconds period)
2025-12-23 18:23:16.316 - [NOTICE] logger.func(7): Cycle 391/531 (1 minute, 24 se
conds elapsed) -------------------
2025-12-23 18:23:16.317 - [NOTICE] logger.func(7): Cycle 391/531, step 1/1: Charg
e at 0.751200 A for 323.538 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:16.328 - [NOTICE] logger.func(7): Cycle 392/531 (1 minute, 24 se
conds elapsed) -------------------
2025-12-23 18:23:16.328 - [NOTICE] logger.func(7): Cycle 392/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:17.341 - [NOTICE] logger.func(7): Cycle 393/531 (1 minute, 25 se
conds elapsed) -------------------
2025-12-23 18:23:17.341 - [NOTICE] logger.func(7): Cycle 393/531, step 1/1: Rest
for 19.902 seconds (1 seconds period)
2025-12-23 18:23:17.341 - [NOTICE] logger.func(7): Cycle 394/531 (1 minute, 25 se
conds elapsed) -------------------
2025-12-23 18:23:17.341 - [NOTICE] logger.func(7): Cycle 394/531, step 1/1: Charg
e at 9.996800 A for 9.914 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:17.349 - [WARNING] simulation.solve(942): Step 'Charge at 9.9968
00 A for 9.914 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:17.349 - [NOTICE] logger.func(7): Cycle 395/531 (1 minute, 25 se
conds elapsed) -------------------
2025-12-23 18:23:17.349 - [NOTICE] logger.func(7): Cycle 395/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:18.416 - [NOTICE] logger.func(7): Cycle 396/531 (1 minute, 27 se
conds elapsed) -------------------
2025-12-23 18:23:18.417 - [NOTICE] logger.func(7): Cycle 396/531, step 1/1: Rest
for 9.895 seconds (1 seconds period)
2025-12-23 18:23:18.421 - [NOTICE] logger.func(7): Cycle 397/531 (1 minute, 27 se
conds elapsed) -------------------
2025-12-23 18:23:18.421 - [NOTICE] logger.func(7): Cycle 397/531, step 1/1: Disch
arge at 0.748700 A for 123.266 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:18.430 - [NOTICE] logger.func(7): Cycle 398/531 (1 minute, 27 se
conds elapsed) -------------------
2025-12-23 18:23:18.431 - [NOTICE] logger.func(7): Cycle 398/531, step 1/1: Rest
for 599.038 seconds (1 seconds period)
2025-12-23 18:23:18.439 - [NOTICE] logger.func(7): Cycle 399/531 (1 minute, 27 se
conds elapsed) -------------------
2025-12-23 18:23:18.440 - [NOTICE] logger.func(7): Cycle 399/531, step 1/1: Disch
arge at 36.831900 A for 9.907 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:18.478 - [NOTICE] logger.func(7): Cycle 400/531 (1 minute, 27 se
conds elapsed) -------------------
2025-12-23 18:23:18.479 - [NOTICE] logger.func(7): Cycle 400/531, step 1/1: Rest
for 19.910 seconds (1 seconds period)
2025-12-23 18:23:18.486 - [NOTICE] logger.func(7): Cycle 401/531 (1 minute, 27 se
conds elapsed) -------------------
2025-12-23 18:23:18.488 - [NOTICE] logger.func(7): Cycle 401/531, step 1/1: Charg
e at 0.751200 A for 489.729 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:18.497 - [NOTICE] logger.func(7): Cycle 402/531 (1 minute, 27 se
conds elapsed) -------------------
2025-12-23 18:23:18.498 - [NOTICE] logger.func(7): Cycle 402/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)

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2025-12-23 18:23:19.599 - [NOTICE] logger.func(7): Cycle 403/531 (1 minute, 28 se
conds elapsed) -------------------
2025-12-23 18:23:19.600 - [NOTICE] logger.func(7): Cycle 403/531, step 1/1: Rest
for 19.914 seconds (1 seconds period)
2025-12-23 18:23:19.604 - [NOTICE] logger.func(7): Cycle 404/531 (1 minute, 28 se
conds elapsed) -------------------
2025-12-23 18:23:19.605 - [NOTICE] logger.func(7): Cycle 404/531, step 1/1: Charg
e at 20.001300 A for 9.920 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:19.607 - [WARNING] simulation.solve(942): Step 'Charge at 20.001
300 A for 9.920 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:19.608 - [NOTICE] logger.func(7): Cycle 405/531 (1 minute, 28 se
conds elapsed) -------------------
2025-12-23 18:23:19.608 - [NOTICE] logger.func(7): Cycle 405/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:20.735 - [NOTICE] logger.func(7): Cycle 406/531 (1 minute, 29 se
conds elapsed) -------------------
2025-12-23 18:23:20.735 - [NOTICE] logger.func(7): Cycle 406/531, step 1/1: Rest
for 9.910 seconds (1 seconds period)
2025-12-23 18:23:20.743 - [NOTICE] logger.func(7): Cycle 407/531 (1 minute, 29 se
conds elapsed) -------------------
2025-12-23 18:23:20.743 - [NOTICE] logger.func(7): Cycle 407/531, step 1/1: Rest
for 589.008 seconds (1 seconds period)
2025-12-23 18:23:20.748 - [NOTICE] logger.func(7): Cycle 408/531 (1 minute, 29 se
conds elapsed) -------------------
2025-12-23 18:23:20.749 - [NOTICE] logger.func(7): Cycle 408/531, step 1/1: Disch
arge at 0.748700 A for 589.415 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:20.759 - [NOTICE] logger.func(7): Cycle 409/531 (1 minute, 29 se
conds elapsed) -------------------
2025-12-23 18:23:20.759 - [NOTICE] logger.func(7): Cycle 409/531, step 1/1: Rest
for 1800.018 seconds (1 seconds period)
2025-12-23 18:23:20.759 - [NOTICE] logger.func(7): Cycle 410/531 (1 minute, 29 se
conds elapsed) -------------------
2025-12-23 18:23:20.759 - [NOTICE] logger.func(7): Cycle 410/531, step 1/1: Disch
arge at 2.497200 A for 9.902 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:20.768 - [NOTICE] logger.func(7): Cycle 411/531 (1 minute, 29 se
conds elapsed) -------------------
2025-12-23 18:23:20.768 - [NOTICE] logger.func(7): Cycle 411/531, step 1/1: Rest
for 19.922 seconds (1 seconds period)
2025-12-23 18:23:20.774 - [NOTICE] logger.func(7): Cycle 412/531 (1 minute, 29 se
conds elapsed) -------------------
2025-12-23 18:23:20.774 - [NOTICE] logger.func(7): Cycle 412/531, step 1/1: Charg
e at 0.751200 A for 23.506 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:20.778 - [NOTICE] logger.func(7): Cycle 413/531 (1 minute, 29 se
conds elapsed) -------------------
2025-12-23 18:23:20.778 - [NOTICE] logger.func(7): Cycle 413/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:21.892 - [NOTICE] logger.func(7): Cycle 414/531 (1 minute, 30 se
conds elapsed) -------------------
2025-12-23 18:23:21.892 - [NOTICE] logger.func(7): Cycle 414/531, step 1/1: Rest
for 19.899 seconds (1 seconds period)
2025-12-23 18:23:21.901 - [NOTICE] logger.func(7): Cycle 415/531 (1 minute, 30 se
conds elapsed) -------------------
2025-12-23 18:23:21.901 - [NOTICE] logger.func(7): Cycle 415/531, step 1/1: Charg
e at 2.499800 A for 9.898 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:21.905 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.898 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:21.906 - [NOTICE] logger.func(7): Cycle 416/531 (1 minute, 30 se
conds elapsed) -------------------
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2025-12-23 18:23:21.906 - [NOTICE] logger.func(7): Cycle 416/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:23.019 - [NOTICE] logger.func(7): Cycle 417/531 (1 minute, 31 se
conds elapsed) --------------------
2025-12-23 18:23:23.019 - [NOTICE] logger.func(7): Cycle 417/531, step 1/1: Rest
for 9.900 seconds (1 seconds period)
2025-12-23 18:23:23.026 - [NOTICE] logger.func(7): Cycle 418/531 (1 minute, 31 se
conds elapsed) --------------------
2025-12-23 18:23:23.027 - [NOTICE] logger.func(7): Cycle 418/531, step 1/1: Disch
arge at 0.748700 A for 23.358 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:23.033 - [NOTICE] logger.func(7): Cycle 419/531 (1 minute, 31 se
conds elapsed) --------------------
2025-12-23 18:23:23.033 - [NOTICE] logger.func(7): Cycle 419/531, step 1/1: Rest
for 599.040 seconds (1 seconds period)
2025-12-23 18:23:23.041 - [NOTICE] logger.func(7): Cycle 420/531 (1 minute, 31 se
conds elapsed) --------------------
2025-12-23 18:23:23.042 - [NOTICE] logger.func(7): Cycle 420/531, step 1/1: Disch
arge at 12.496400 A for 9.895 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:23.046 - [NOTICE] logger.func(7): Cycle 421/531 (1 minute, 31 se
conds elapsed) --------------------
2025-12-23 18:23:23.047 - [NOTICE] logger.func(7): Cycle 421/531, step 1/1: Rest
for 19.912 seconds (1 seconds period)
2025-12-23 18:23:23.052 - [NOTICE] logger.func(7): Cycle 422/531 (1 minute, 31 se
conds elapsed) --------------------
2025-12-23 18:23:23.055 - [NOTICE] logger.func(7): Cycle 422/531, step 1/1: Charg
e at 0.751200 A for 158.279 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:23.066 - [NOTICE] logger.func(7): Cycle 423/531 (1 minute, 31 se
conds elapsed) --------------------
2025-12-23 18:23:23.067 - [NOTICE] logger.func(7): Cycle 423/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:24.184 - [NOTICE] logger.func(7): Cycle 424/531 (1 minute, 32 se
conds elapsed) --------------------
2025-12-23 18:23:24.184 - [NOTICE] logger.func(7): Cycle 424/531, step 1/1: Rest
for 19.901 seconds (1 seconds period)
2025-12-23 18:23:24.184 - [NOTICE] logger.func(7): Cycle 425/531 (1 minute, 32 se
conds elapsed) --------------------
2025-12-23 18:23:24.184 - [NOTICE] logger.func(7): Cycle 425/531, step 1/1: Charg
e at 4.999700 A for 9.927 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:24.184 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.927 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:24.184 - [NOTICE] logger.func(7): Cycle 426/531 (1 minute, 32 se
conds elapsed) --------------------
2025-12-23 18:23:24.184 - [NOTICE] logger.func(7): Cycle 426/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:25.249 - [NOTICE] logger.func(7): Cycle 427/531 (1 minute, 33 se
conds elapsed) --------------------
2025-12-23 18:23:25.249 - [NOTICE] logger.func(7): Cycle 427/531, step 1/1: Rest
for 9.917 seconds (1 seconds period)
2025-12-23 18:23:25.255 - [NOTICE] logger.func(7): Cycle 428/531 (1 minute, 33 se
conds elapsed) --------------------
2025-12-23 18:23:25.255 - [NOTICE] logger.func(7): Cycle 428/531, step 1/1: Disch
arge at 0.748700 A for 57.365 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:25.266 - [NOTICE] logger.func(7): Cycle 429/531 (1 minute, 33 se
conds elapsed) --------------------
2025-12-23 18:23:25.266 - [NOTICE] logger.func(7): Cycle 429/531, step 1/1: Rest
for 599.049 seconds (1 seconds period)
2025-12-23 18:23:25.273 - [NOTICE] logger.func(7): Cycle 430/531 (1 minute, 33 se
conds elapsed) --------------------
2025-12-23 18:23:25.276 - [NOTICE] logger.func(7): Cycle 430/531, step 1/1: Disch

arge at 24.997900 A for 9.911 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:25.280 - [NOTICE] logger.func(7): Cycle 431/531 (1 minute, 33 se
conds elapsed) -------------------
2025-12-23 18:23:25.281 - [NOTICE] logger.func(7): Cycle 431/531, step 1/1: Rest
for 19.910 seconds (1 seconds period)
2025-12-23 18:23:25.285 - [NOTICE] logger.func(7): Cycle 432/531 (1 minute, 33 se
conds elapsed) -------------------
2025-12-23 18:23:25.285 - [NOTICE] logger.func(7): Cycle 432/531, step 1/1: Charg
e at 0.751200 A for 324.018 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:25.299 - [NOTICE] logger.func(7): Cycle 433/531 (1 minute, 33 se
conds elapsed) -------------------
2025-12-23 18:23:25.299 - [NOTICE] logger.func(7): Cycle 433/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:26.416 - [NOTICE] logger.func(7): Cycle 434/531 (1 minute, 35 se
conds elapsed) -------------------
2025-12-23 18:23:26.416 - [NOTICE] logger.func(7): Cycle 434/531, step 1/1: Rest
for 19.903 seconds (1 seconds period)
2025-12-23 18:23:26.423 - [NOTICE] logger.func(7): Cycle 435/531 (1 minute, 35 se
conds elapsed) -------------------
2025-12-23 18:23:26.423 - [NOTICE] logger.func(7): Cycle 435/531, step 1/1: Charg
e at 9.999400 A for 9.899 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:26.427 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.899 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:26.427 - [NOTICE] logger.func(7): Cycle 436/531 (1 minute, 35 se
conds elapsed) -------------------
2025-12-23 18:23:26.427 - [NOTICE] logger.func(7): Cycle 436/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:27.566 - [NOTICE] logger.func(7): Cycle 437/531 (1 minute, 36 se
conds elapsed) -------------------
2025-12-23 18:23:27.566 - [NOTICE] logger.func(7): Cycle 437/531, step 1/1: Rest
for 9.904 seconds (1 seconds period)
2025-12-23 18:23:27.566 - [NOTICE] logger.func(7): Cycle 438/531 (1 minute, 36 se
conds elapsed) -------------------
2025-12-23 18:23:27.566 - [NOTICE] logger.func(7): Cycle 438/531, step 1/1: Disch
arge at 0.748700 A for 123.443 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:27.584 - [NOTICE] logger.func(7): Cycle 439/531 (1 minute, 36 se
conds elapsed) -------------------
2025-12-23 18:23:27.585 - [NOTICE] logger.func(7): Cycle 439/531, step 1/1: Rest
for 599.051 seconds (1 seconds period)
2025-12-23 18:23:27.594 - [NOTICE] logger.func(7): Cycle 440/531 (1 minute, 36 se
conds elapsed) -------------------
2025-12-23 18:23:27.596 - [NOTICE] logger.func(7): Cycle 440/531, step 1/1: Disch
arge at 36.243100 A for 7.264 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:27.638 - [NOTICE] logger.func(7): Cycle 441/531 (1 minute, 36 se
conds elapsed) -------------------
2025-12-23 18:23:27.638 - [NOTICE] logger.func(7): Cycle 441/531, step 1/1: Rest
for 19.891 seconds (1 seconds period)
2025-12-23 18:23:27.644 - [NOTICE] logger.func(7): Cycle 442/531 (1 minute, 36 se
conds elapsed) -------------------
2025-12-23 18:23:27.644 - [NOTICE] logger.func(7): Cycle 442/531, step 1/1: Charg
e at 0.751200 A for 360.163 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:27.649 - [NOTICE] logger.func(7): Cycle 443/531 (1 minute, 36 se
conds elapsed) -------------------
2025-12-23 18:23:27.649 - [NOTICE] logger.func(7): Cycle 443/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:28.716 - [NOTICE] logger.func(7): Cycle 444/531 (1 minute, 37 se
conds elapsed) -------------------
2025-12-23 18:23:28.717 - [NOTICE] logger.func(7): Cycle 444/531, step 1/1: Rest
for 19.910 seconds (1 seconds period)

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2025-12-23 18:23:28.721 - [NOTICE] logger.func(7): Cycle 445/531 (1 minute, 37 se
conds elapsed) --------------------
2025-12-23 18:23:28.721 - [NOTICE] logger.func(7): Cycle 445/531, step 1/1: Charg
e at 20.001300 A for 9.912 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:28.724 - [WARNING] simulation.solve(942): Step 'Charge at 20.001
300 A for 9.912 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:28.724 - [NOTICE] logger.func(7): Cycle 446/531 (1 minute, 37 se
conds elapsed) --------------------
2025-12-23 18:23:28.725 - [NOTICE] logger.func(7): Cycle 446/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:29.838 - [NOTICE] logger.func(7): Cycle 447/531 (1 minute, 38 se
conds elapsed) --------------------
2025-12-23 18:23:29.839 - [NOTICE] logger.func(7): Cycle 447/531, step 1/1: Rest
for 9.900 seconds (1 seconds period)
2025-12-23 18:23:29.844 - [NOTICE] logger.func(7): Cycle 448/531 (1 minute, 38 se
conds elapsed) --------------------
2025-12-23 18:23:29.844 - [NOTICE] logger.func(7): Cycle 448/531, step 1/1: Rest
for 589.049 seconds (1 seconds period)
2025-12-23 18:23:29.849 - [NOTICE] logger.func(7): Cycle 449/531 (1 minute, 38 se
conds elapsed) --------------------
2025-12-23 18:23:29.850 - [NOTICE] logger.func(7): Cycle 449/531, step 1/1: Disch
arge at 0.748700 A for 589.396 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:29.860 - [NOTICE] logger.func(7): Cycle 450/531 (1 minute, 38 se
conds elapsed) --------------------
2025-12-23 18:23:29.862 - [NOTICE] logger.func(7): Cycle 450/531, step 1/1: Rest
for 1800.022 seconds (1 seconds period)
2025-12-23 18:23:29.868 - [NOTICE] logger.func(7): Cycle 451/531 (1 minute, 38 se
conds elapsed) --------------------
2025-12-23 18:23:29.872 - [NOTICE] logger.func(7): Cycle 451/531, step 1/1: Disch
arge at 2.497200 A for 9.910 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:29.882 - [NOTICE] logger.func(7): Cycle 452/531 (1 minute, 38 se
conds elapsed) --------------------
2025-12-23 18:23:29.883 - [NOTICE] logger.func(7): Cycle 452/531, step 1/1: Rest
for 19.899 seconds (1 seconds period)
2025-12-23 18:23:29.891 - [NOTICE] logger.func(7): Cycle 453/531 (1 minute, 38 se
conds elapsed) --------------------
2025-12-23 18:23:29.892 - [NOTICE] logger.func(7): Cycle 453/531, step 1/1: Charg
e at 0.751200 A for 23.793 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:29.902 - [NOTICE] logger.func(7): Cycle 454/531 (1 minute, 38 se
conds elapsed) --------------------
2025-12-23 18:23:29.903 - [NOTICE] logger.func(7): Cycle 454/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:31.081 - [NOTICE] logger.func(7): Cycle 455/531 (1 minute, 39 se
conds elapsed) --------------------
2025-12-23 18:23:31.082 - [NOTICE] logger.func(7): Cycle 455/531, step 1/1: Rest
for 19.910 seconds (1 seconds period)
2025-12-23 18:23:31.087 - [NOTICE] logger.func(7): Cycle 456/531 (1 minute, 39 se
conds elapsed) --------------------
2025-12-23 18:23:31.087 - [NOTICE] logger.func(7): Cycle 456/531, step 1/1: Charg
e at 2.499800 A for 9.928 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:31.091 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998
00 A for 9.928 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:31.091 - [NOTICE] logger.func(7): Cycle 457/531 (1 minute, 39 se
conds elapsed) --------------------
2025-12-23 18:23:31.091 - [NOTICE] logger.func(7): Cycle 457/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:32.172 - [NOTICE] logger.func(7): Cycle 458/531 (1 minute, 40 se
conds elapsed) --------------------
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2025-12-23 18:23:32.173 - [NOTICE] logger.func(7): Cycle 458/531, step 1/1: Rest for 9.909 seconds (1 seconds period)
2025-12-23 18:23:32.180 - [NOTICE] logger.func(7): Cycle 459/531 (1 minute, 40 seconds elapsed) --------------------
2025-12-23 18:23:32.181 - [NOTICE] logger.func(7): Cycle 459/531, step 1/1: Discharge at 0.748700 A for 23.202 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:32.187 - [NOTICE] logger.func(7): Cycle 460/531 (1 minute, 40 seconds elapsed) --------------------
2025-12-23 18:23:32.187 - [NOTICE] logger.func(7): Cycle 460/531, step 1/1: Rest for 599.034 seconds (1 seconds period)
2025-12-23 18:23:32.193 - [NOTICE] logger.func(7): Cycle 461/531 (1 minute, 40 seconds elapsed) --------------------
2025-12-23 18:23:32.193 - [NOTICE] logger.func(7): Cycle 461/531, step 1/1: Discharge at 12.496400 A for 9.909 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:32.197 - [NOTICE] logger.func(7): Cycle 462/531 (1 minute, 40 seconds elapsed) --------------------
2025-12-23 18:23:32.197 - [NOTICE] logger.func(7): Cycle 462/531, step 1/1: Rest for 19.913 seconds (1 seconds period)
2025-12-23 18:23:32.206 - [NOTICE] logger.func(7): Cycle 463/531 (1 minute, 40 seconds elapsed) --------------------
2025-12-23 18:23:32.206 - [NOTICE] logger.func(7): Cycle 463/531, step 1/1: Charge at 0.751200 A for 156.925 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:32.216 - [NOTICE] logger.func(7): Cycle 464/531 (1 minute, 40 seconds elapsed) --------------------
2025-12-23 18:23:32.217 - [NOTICE] logger.func(7): Cycle 464/531, step 1/1: Hold at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:33.328 - [NOTICE] logger.func(7): Cycle 465/531 (1 minute, 41 seconds elapsed) --------------------
2025-12-23 18:23:33.329 - [NOTICE] logger.func(7): Cycle 465/531, step 1/1: Rest for 19.910 seconds (1 seconds period)
2025-12-23 18:23:33.333 - [NOTICE] logger.func(7): Cycle 466/531 (1 minute, 41 seconds elapsed) --------------------
2025-12-23 18:23:33.333 - [NOTICE] logger.func(7): Cycle 466/531, step 1/1: Charge at 4.997100 A for 9.908 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:33.363 - [WARNING] simulation.solve(942): Step 'Charge at 4.997100 A for 9.908 seconds or until 3.5V (0.1 seconds period)' is infeasible at initial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:33.364 - [NOTICE] logger.func(7): Cycle 467/531 (1 minute, 42 seconds elapsed) --------------------
2025-12-23 18:23:33.365 - [NOTICE] logger.func(7): Cycle 467/531, step 1/1: Hold at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:34.469 - [NOTICE] logger.func(7): Cycle 468/531 (1 minute, 43 seconds elapsed) --------------------
2025-12-23 18:23:34.470 - [NOTICE] logger.func(7): Cycle 468/531, step 1/1: Rest for 9.902 seconds (1 seconds period)
2025-12-23 18:23:34.474 - [NOTICE] logger.func(7): Cycle 469/531 (1 minute, 43 seconds elapsed) --------------------
2025-12-23 18:23:34.474 - [NOTICE] logger.func(7): Cycle 469/531, step 1/1: Discharge at 0.748700 A for 56.640 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:34.478 - [NOTICE] logger.func(7): Cycle 470/531 (1 minute, 43 seconds elapsed) --------------------
2025-12-23 18:23:34.479 - [NOTICE] logger.func(7): Cycle 470/531, step 1/1: Rest for 599.056 seconds (1 seconds period)
2025-12-23 18:23:34.485 - [NOTICE] logger.func(7): Cycle 471/531 (1 minute, 43 seconds elapsed) --------------------
2025-12-23 18:23:34.485 - [NOTICE] logger.func(7): Cycle 471/531, step 1/1: Discharge at 23.970000 A for 9.570 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:34.513 - [NOTICE] logger.func(7): Cycle 472/531 (1 minute, 43 seconds elapsed) --------------------
2025-12-23 18:23:34.514 - [NOTICE] logger.func(7): Cycle 472/531, step 1/1: Rest

```
for 19.906 seconds (1 seconds period)
2025-12-23 18:23:34.518 - [NOTICE] logger.func(7): Cycle 473/531 (1 minute, 43 se
conds elapsed) --------------------
2025-12-23 18:23:34.519 - [NOTICE] logger.func(7): Cycle 473/531, step 1/1: Charg
e at 0.751200 A for 313.629 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:34.527 - [NOTICE] logger.func(7): Cycle 474/531 (1 minute, 43 se
conds elapsed) --------------------
2025-12-23 18:23:34.528 - [NOTICE] logger.func(7): Cycle 474/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:35.668 - [NOTICE] logger.func(7): Cycle 475/531 (1 minute, 44 se
conds elapsed) --------------------
2025-12-23 18:23:35.669 - [NOTICE] logger.func(7): Cycle 475/531, step 1/1: Rest
for 19.908 seconds (1 seconds period)
2025-12-23 18:23:35.673 - [NOTICE] logger.func(7): Cycle 476/531 (1 minute, 44 se
conds elapsed) --------------------
2025-12-23 18:23:35.674 - [NOTICE] logger.func(7): Cycle 476/531, step 1/1: Charg
e at 9.999400 A for 9.907 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:35.677 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.907 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:35.677 - [NOTICE] logger.func(7): Cycle 477/531 (1 minute, 44 se
conds elapsed) --------------------
2025-12-23 18:23:35.678 - [NOTICE] logger.func(7): Cycle 477/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:36.783 - [NOTICE] logger.func(7): Cycle 478/531 (1 minute, 45 se
conds elapsed) --------------------
2025-12-23 18:23:36.783 - [NOTICE] logger.func(7): Cycle 478/531, step 1/1: Rest
for 9.902 seconds (1 seconds period)
2025-12-23 18:23:36.795 - [NOTICE] logger.func(7): Cycle 479/531 (1 minute, 45 se
conds elapsed) --------------------
2025-12-23 18:23:36.795 - [NOTICE] logger.func(7): Cycle 479/531, step 1/1: Disch
arge at 0.748700 A for 123.147 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:36.801 - [NOTICE] logger.func(7): Cycle 480/531 (1 minute, 45 se
conds elapsed) --------------------
2025-12-23 18:23:36.802 - [NOTICE] logger.func(7): Cycle 480/531, step 1/1: Rest
for 599.043 seconds (1 seconds period)
2025-12-23 18:23:36.806 - [NOTICE] logger.func(7): Cycle 481/531 (1 minute, 45 se
conds elapsed) --------------------
2025-12-23 18:23:36.807 - [NOTICE] logger.func(7): Cycle 481/531, step 1/1: Disch
arge at 35.357400 A for 4.360 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:36.888 - [NOTICE] logger.func(7): Cycle 482/531 (1 minute, 45 se
conds elapsed) --------------------
2025-12-23 18:23:36.890 - [NOTICE] logger.func(7): Cycle 482/531, step 1/1: Rest
for 19.897 seconds (1 seconds period)
2025-12-23 18:23:36.899 - [NOTICE] logger.func(7): Cycle 483/531 (1 minute, 45 se
conds elapsed) --------------------
2025-12-23 18:23:36.902 - [NOTICE] logger.func(7): Cycle 483/531, step 1/1: Charg
e at 0.751200 A for 214.636 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:36.908 - [NOTICE] logger.func(7): Cycle 484/531 (1 minute, 45 se
conds elapsed) --------------------
2025-12-23 18:23:36.909 - [NOTICE] logger.func(7): Cycle 484/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:38.006 - [NOTICE] logger.func(7): Cycle 485/531 (1 minute, 46 se
conds elapsed) --------------------
2025-12-23 18:23:38.007 - [NOTICE] logger.func(7): Cycle 485/531, step 1/1: Rest
for 19.904 seconds (1 seconds period)
2025-12-23 18:23:38.011 - [NOTICE] logger.func(7): Cycle 486/531 (1 minute, 46 se
conds elapsed) --------------------
2025-12-23 18:23:38.012 - [NOTICE] logger.func(7): Cycle 486/531, step 1/1: Charg
e at 20.001300 A for 9.904 seconds or until 3.5V (0.1 seconds period)
```

2025-12-23 18:23:38.015 - [WARNING] simulation.solve(942): Step 'Charge at 20.001 300 A for 9.904 seconds or until 3.5V (0.1 seconds period)' is infeasible at init ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:38.016 - [NOTICE] logger.func(7): Cycle 487/531 (1 minute, 46 se conds elapsed) -------------------
2025-12-23 18:23:38.016 - [NOTICE] logger.func(7): Cycle 487/531, step 1/1: Hold at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:39.143 - [NOTICE] logger.func(7): Cycle 488/531 (1 minute, 47 se conds elapsed) -------------------
2025-12-23 18:23:39.145 - [NOTICE] logger.func(7): Cycle 488/531, step 1/1: Rest for 9.899 seconds (1 seconds period)
2025-12-23 18:23:39.149 - [NOTICE] logger.func(7): Cycle 489/531 (1 minute, 47 se conds elapsed) -------------------
2025-12-23 18:23:39.149 - [NOTICE] logger.func(7): Cycle 489/531, step 1/1: Rest for 589.036 seconds (1 seconds period)
2025-12-23 18:23:39.149 - [NOTICE] logger.func(7): Cycle 490/531 (1 minute, 47 se conds elapsed) -------------------
2025-12-23 18:23:39.149 - [NOTICE] logger.func(7): Cycle 490/531, step 1/1: Disch arge at 0.748700 A for 589.582 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:39.159 - [NOTICE] logger.func(7): Cycle 491/531 (1 minute, 47 se conds elapsed) -------------------
2025-12-23 18:23:39.164 - [NOTICE] logger.func(7): Cycle 491/531, step 1/1: Rest for 1800.020 seconds (1 seconds period)
2025-12-23 18:23:39.169 - [NOTICE] logger.func(7): Cycle 492/531 (1 minute, 47 se conds elapsed) -------------------
2025-12-23 18:23:39.169 - [NOTICE] logger.func(7): Cycle 492/531, step 1/1: Disch arge at 2.497200 A for 9.902 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:39.173 - [NOTICE] logger.func(7): Cycle 493/531 (1 minute, 47 se conds elapsed) -------------------
2025-12-23 18:23:39.173 - [NOTICE] logger.func(7): Cycle 493/531, step 1/1: Rest for 19.903 seconds (1 seconds period)
2025-12-23 18:23:39.173 - [NOTICE] logger.func(7): Cycle 494/531 (1 minute, 47 se conds elapsed) -------------------
2025-12-23 18:23:39.173 - [NOTICE] logger.func(7): Cycle 494/531, step 1/1: Charg e at 0.751200 A for 23.800 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:39.185 - [NOTICE] logger.func(7): Cycle 495/531 (1 minute, 47 se conds elapsed) -------------------
2025-12-23 18:23:39.185 - [NOTICE] logger.func(7): Cycle 495/531, step 1/1: Hold at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:40.307 - [NOTICE] logger.func(7): Cycle 496/531 (1 minute, 48 se conds elapsed) -------------------
2025-12-23 18:23:40.307 - [NOTICE] logger.func(7): Cycle 496/531, step 1/1: Rest for 19.902 seconds (1 seconds period)
2025-12-23 18:23:40.311 - [NOTICE] logger.func(7): Cycle 497/531 (1 minute, 48 se conds elapsed) -------------------
2025-12-23 18:23:40.312 - [NOTICE] logger.func(7): Cycle 497/531, step 1/1: Charg e at 2.499800 A for 9.896 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:40.315 - [WARNING] simulation.solve(942): Step 'Charge at 2.4998 00 A for 9.896 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:40.316 - [NOTICE] logger.func(7): Cycle 498/531 (1 minute, 48 se conds elapsed) -------------------
2025-12-23 18:23:40.316 - [NOTICE] logger.func(7): Cycle 498/531, step 1/1: Hold at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:41.412 - [NOTICE] logger.func(7): Cycle 499/531 (1 minute, 50 se conds elapsed) -------------------
2025-12-23 18:23:41.413 - [NOTICE] logger.func(7): Cycle 499/531, step 1/1: Rest for 9.899 seconds (1 seconds period)
2025-12-23 18:23:41.417 - [NOTICE] logger.func(7): Cycle 500/531 (1 minute, 50 se conds elapsed) -------------------

```
2025-12-23 18:23:41.417 - [NOTICE] logger.func(7): Cycle 500/531, step 1/1: Disch
arge at 0.748700 A for 23.517 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:41.420 - [NOTICE] logger.func(7): Cycle 501/531 (1 minute, 50 se
conds elapsed) -------------------
2025-12-23 18:23:41.420 - [NOTICE] logger.func(7): Cycle 501/531, step 1/1: Rest
for 599.038 seconds (1 seconds period)
2025-12-23 18:23:41.426 - [NOTICE] logger.func(7): Cycle 502/531 (1 minute, 50 se
conds elapsed) -------------------
2025-12-23 18:23:41.429 - [NOTICE] logger.func(7): Cycle 502/531, step 1/1: Disch
arge at 11.704600 A for 9.106 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:41.463 - [NOTICE] logger.func(7): Cycle 503/531 (1 minute, 50 se
conds elapsed) -------------------
2025-12-23 18:23:41.465 - [NOTICE] logger.func(7): Cycle 503/531, step 1/1: Rest
for 19.903 seconds (1 seconds period)
2025-12-23 18:23:41.469 - [NOTICE] logger.func(7): Cycle 504/531 (1 minute, 50 se
conds elapsed) -------------------
2025-12-23 18:23:41.472 - [NOTICE] logger.func(7): Cycle 504/531, step 1/1: Charg
e at 0.751200 A for 143.446 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:41.482 - [NOTICE] logger.func(7): Cycle 505/531 (1 minute, 50 se
conds elapsed) -------------------
2025-12-23 18:23:41.483 - [NOTICE] logger.func(7): Cycle 505/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:42.588 - [NOTICE] logger.func(7): Cycle 506/531 (1 minute, 51 se
conds elapsed) -------------------
2025-12-23 18:23:42.589 - [NOTICE] logger.func(7): Cycle 506/531, step 1/1: Rest
for 19.887 seconds (1 seconds period)
2025-12-23 18:23:42.593 - [NOTICE] logger.func(7): Cycle 507/531 (1 minute, 51 se
conds elapsed) -------------------
2025-12-23 18:23:42.593 - [NOTICE] logger.func(7): Cycle 507/531, step 1/1: Charg
e at 4.999700 A for 9.907 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:42.597 - [WARNING] simulation.solve(942): Step 'Charge at 4.9997
00 A for 9.907 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:42.598 - [NOTICE] logger.func(7): Cycle 508/531 (1 minute, 51 se
conds elapsed) -------------------
2025-12-23 18:23:42.598 - [NOTICE] logger.func(7): Cycle 508/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:43.635 - [NOTICE] logger.func(7): Cycle 509/531 (1 minute, 52 se
conds elapsed) -------------------
2025-12-23 18:23:43.635 - [NOTICE] logger.func(7): Cycle 509/531, step 1/1: Rest
for 9.900 seconds (1 seconds period)
2025-12-23 18:23:43.649 - [NOTICE] logger.func(7): Cycle 510/531 (1 minute, 52 se
conds elapsed) -------------------
2025-12-23 18:23:43.649 - [NOTICE] logger.func(7): Cycle 510/531, step 1/1: Disch
arge at 0.748700 A for 56.564 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:43.649 - [NOTICE] logger.func(7): Cycle 511/531 (1 minute, 52 se
conds elapsed) -------------------
2025-12-23 18:23:43.649 - [NOTICE] logger.func(7): Cycle 511/531, step 1/1: Rest
for 599.044 seconds (1 seconds period)
2025-12-23 18:23:43.660 - [NOTICE] logger.func(7): Cycle 512/531 (1 minute, 52 se
conds elapsed) -------------------
2025-12-23 18:23:43.660 - [NOTICE] logger.func(7): Cycle 512/531, step 1/1: Disch
arge at 22.896500 A for 2.600 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:43.729 - [NOTICE] logger.func(7): Cycle 513/531 (1 minute, 52 se
conds elapsed) -------------------
2025-12-23 18:23:43.733 - [NOTICE] logger.func(7): Cycle 513/531, step 1/1: Rest
for 19.909 seconds (1 seconds period)
2025-12-23 18:23:43.741 - [NOTICE] logger.func(7): Cycle 514/531 (1 minute, 52 se
conds elapsed) -------------------
2025-12-23 18:23:43.743 - [NOTICE] logger.func(7): Cycle 514/531, step 1/1: Charg
```

e at 0.751200 A for 79.653 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:43.751 - [NOTICE] logger.func(7): Cycle 515/531 (1 minute, 52 se
conds elapsed) --------------------
2025-12-23 18:23:43.751 - [NOTICE] logger.func(7): Cycle 515/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:44.819 - [NOTICE] logger.func(7): Cycle 516/531 (1 minute, 53 se
conds elapsed) --------------------
2025-12-23 18:23:44.819 - [NOTICE] logger.func(7): Cycle 516/531, step 1/1: Rest
for 19.901 seconds (1 seconds period)
2025-12-23 18:23:44.834 - [NOTICE] logger.func(7): Cycle 517/531 (1 minute, 53 se
conds elapsed) --------------------
2025-12-23 18:23:44.834 - [NOTICE] logger.func(7): Cycle 517/531, step 1/1: Charg
e at 9.999400 A for 9.891 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:44.840 - [WARNING] simulation.solve(942): Step 'Charge at 9.9994
00 A for 9.891 seconds or until 3.5V (0.1 seconds period)' is infeasible at initi
al conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:44.840 - [NOTICE] logger.func(7): Cycle 518/531 (1 minute, 53 se
conds elapsed) --------------------
2025-12-23 18:23:44.840 - [NOTICE] logger.func(7): Cycle 518/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:45.948 - [NOTICE] logger.func(7): Cycle 519/531 (1 minute, 54 se
conds elapsed) --------------------
2025-12-23 18:23:45.949 - [NOTICE] logger.func(7): Cycle 519/531, step 1/1: Rest
for 9.892 seconds (1 seconds period)
2025-12-23 18:23:45.953 - [NOTICE] logger.func(7): Cycle 520/531 (1 minute, 54 se
conds elapsed) --------------------
2025-12-23 18:23:45.953 - [NOTICE] logger.func(7): Cycle 520/531, step 1/1: Disch
arge at 0.748700 A for 123.249 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:45.953 - [NOTICE] logger.func(7): Cycle 521/531 (1 minute, 54 se
conds elapsed) --------------------
2025-12-23 18:23:45.953 - [NOTICE] logger.func(7): Cycle 521/531, step 1/1: Rest
for 599.046 seconds (1 seconds period)
2025-12-23 18:23:45.966 - [NOTICE] logger.func(7): Cycle 522/531 (1 minute, 54 se
conds elapsed) --------------------
2025-12-23 18:23:45.967 - [NOTICE] logger.func(7): Cycle 522/531, step 1/1: Disch
arge at 32.872800 A for 0.915 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:45.992 - [NOTICE] logger.func(7): Cycle 523/531 (1 minute, 54 se
conds elapsed) --------------------
2025-12-23 18:23:45.992 - [NOTICE] logger.func(7): Cycle 523/531, step 1/1: Rest
for 19.895 seconds (1 seconds period)
2025-12-23 18:23:46.000 - [NOTICE] logger.func(7): Cycle 524/531 (1 minute, 54 se
conds elapsed) --------------------
2025-12-23 18:23:46.000 - [NOTICE] logger.func(7): Cycle 524/531, step 1/1: Charg
e at 0.751200 A for 39.839 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:46.003 - [NOTICE] logger.func(7): Cycle 525/531 (1 minute, 54 se
conds elapsed) --------------------
2025-12-23 18:23:46.003 - [NOTICE] logger.func(7): Cycle 525/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:47.067 - [NOTICE] logger.func(7): Cycle 526/531 (1 minute, 55 se
conds elapsed) --------------------
2025-12-23 18:23:47.067 - [NOTICE] logger.func(7): Cycle 526/531, step 1/1: Rest
for 19.914 seconds (1 seconds period)
2025-12-23 18:23:47.067 - [NOTICE] logger.func(7): Cycle 527/531 (1 minute, 55 se
conds elapsed) --------------------
2025-12-23 18:23:47.067 - [NOTICE] logger.func(7): Cycle 527/531, step 1/1: Charg
e at 20.001300 A for 9.885 seconds or until 3.5V (0.1 seconds period)
2025-12-23 18:23:47.082 - [WARNING] simulation.solve(942): Step 'Charge at 20.001
300 A for 9.885 seconds or until 3.5V (0.1 seconds period)' is infeasible at init
ial conditions, but skip_ok is True. Skipping step.
2025-12-23 18:23:47.082 - [NOTICE] logger.func(7): Cycle 528/531 (1 minute, 55 se

```
conds elapsed) --------------------
2025-12-23 18:23:47.082 - [NOTICE] logger.func(7): Cycle 528/531, step 1/1: Hold
at 3.5V until 0.05A (0.1 seconds period)
2025-12-23 18:23:48.216 - [NOTICE] logger.func(7): Cycle 529/531 (1 minute, 56 se
conds elapsed) --------------------
2025-12-23 18:23:48.216 - [NOTICE] logger.func(7): Cycle 529/531, step 1/1: Rest
for 9.919 seconds (1 seconds period)
2025-12-23 18:23:48.225 - [NOTICE] logger.func(7): Cycle 530/531 (1 minute, 56 se
conds elapsed) --------------------
2025-12-23 18:23:48.225 - [NOTICE] logger.func(7): Cycle 530/531, step 1/1: Rest
for 589.029 seconds (1 seconds period)
2025-12-23 18:23:48.229 - [NOTICE] logger.func(7): Cycle 531/531 (1 minute, 56 se
conds elapsed) --------------------
2025-12-23 18:23:48.229 - [NOTICE] logger.func(7): Cycle 531/531, step 1/1: Disch
arge at 0.748700 A for 258.245 seconds or until 2.5V (0.1 seconds period)
2025-12-23 18:23:48.237 - [NOTICE] logger.func(7): Finish experiment simulation,
took 1 minute, 56 seconds
```


HPPC Protocol Extracted - Current Profile
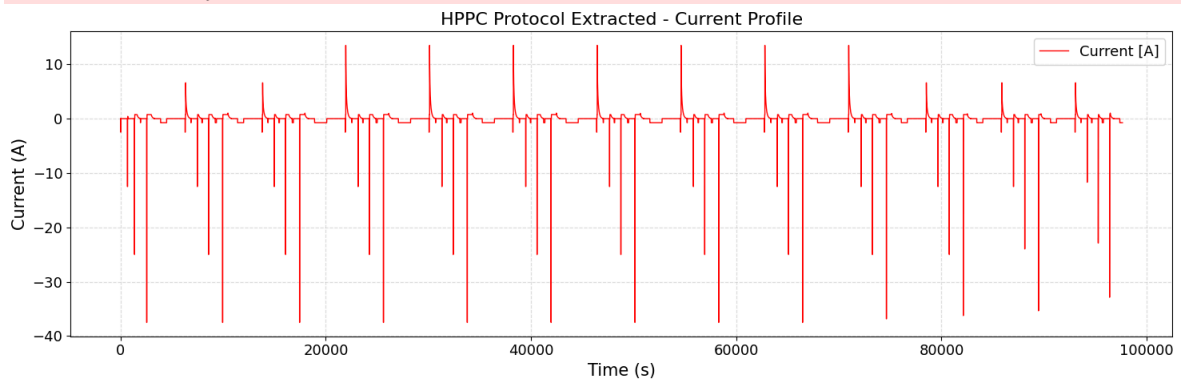
In [47]:
```python
test_time_HPPC = df_HPPC["Time [s]"].values
test_voltage_HPPC = df_HPPC["Voltage [V]"].values
test_current_HPPC = df_HPPC["Current [A]"].values


sim_time_HPPC = HPPC_sol["Time [s]"].entries
sim_voltage_HPPC = HPPC_sol["Terminal voltage [V]"].entries
sim_current_HPPC = HPPC_sol["Current [A]"].entries


# =======================
# Plot
# =======================
plt.rcParams.update({
    "font.size": 14,
    "axes.titlesize": 16,
    "axes.labelsize": 15,
    "xtick.labelsize": 13,
    "ytick.labelsize": 13,
    "legend.fontsize": 13
})

fig, ax1 = plt.subplots(figsize=(15, 6))

ax1.plot(test_time_HPPC, test_voltage_HPPC, 'r', lw=1.8, label="Test Voltage")
ax1.plot(sim_time_HPPC, sim_voltage_HPPC, 'b', lw=1.8, label="Sim Voltage")

ax1.set_xlabel("Time (s)")
ax1.set_ylabel("Voltage (V)")
ax1.grid(True, ls="--", alpha=0.4)
# ax1.set_xlim(0, 50)
# ax2 = ax1.twinx()
```

```python
# ax2.plot(test_time_f, voltage_error, 'g--', lw=1, label="Voltage Error", alpha

# # >>> ADD THESE TWO LINES <<<
# ax2.axhline(20, color="gray", linestyle="--", linewidth=1.2, alpha=0.5)
# ax2.axhline(-20, color="gray", linestyle="--", linewidth=1.2, alpha=0.5)


# ax2.set_ylabel("Voltage Error (mV)")
# ax2.set_ylim(-40, 100)

lines1, labels1 = ax1.get_legend_handles_labels()
ax1.legend(lines1 + lines2, labels1)

ax1.set_title(
    f"Voltage vs Time"
)

plt.tight_layout()
plt.show()
```
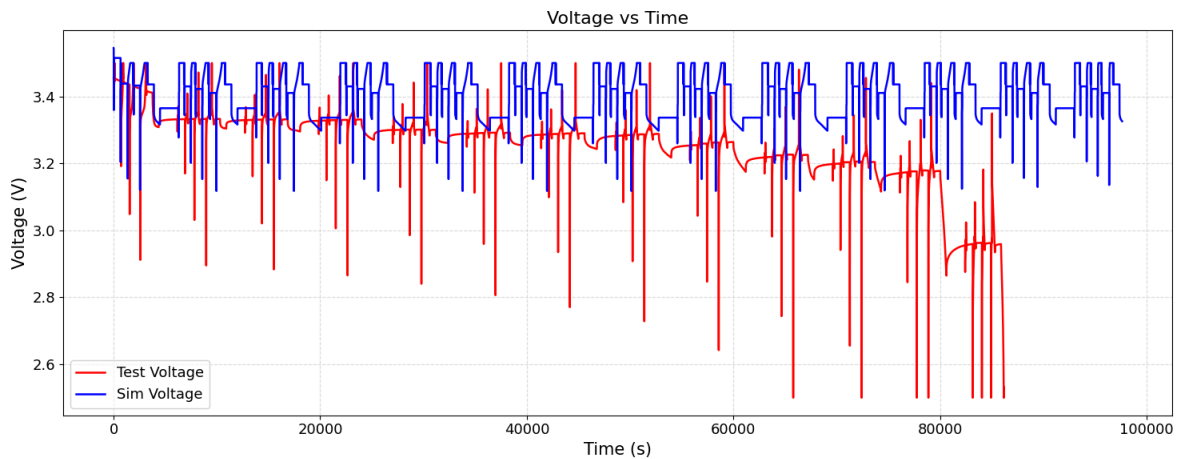

Parameter Sensitivity Analysis

```python
In [50]:    # ===========================================================
            # PyBaMM Parameter Sensitivity Analysis across 4 C-rates (0.5C, 1C, 2C, 3C)
            # ===========================================================
            import pybamm
            import numpy as np
            import matplotlib.pyplot as plt
            from copy import deepcopy
            import pandas as pd


            # ===========================================================
            # 1. Define Experiments and Crates
            # ===========================================================
            # exp1 = pybamm.Experiment(
            #     [
            #         (
            #             # "Rest for 30 minutes",
            #             "Discharge at 0.5A until 2.5 V (1 seconds period)"
            #         )
            #     ]
            # )

            # exp2 = pybamm.Experiment(
            #     [
```

```python
#            (
#                # "Rest for 30 minutes",
#                "Discharge at 2.5A until 2.5 V (1 seconds period)"
#            )
#        ]
# )

# exp3 = pybamm.Experiment(
#        [
#            (
#                # "Rest for 30 minutes",
#                "Discharge at 5A until 2.5 V (1 seconds period)"
#            )
#        ]
# )

# exp4 = pybamm.Experiment(
#        [
#            (
#                # "Rest for 30 minutes",
#                "Discharge at 10A until 2.5 V (1 seconds period)"
#            )
#        ]
# )

# experiments = [exp1, exp2, exp3, exp4]
# crates = ["0.2C", "1C", "2C", "4C"]

exp = pybamm.Experiment(
    [
        (
            "Discharge at 2.5A until 2.5V (1 seconds period)",
            "Rest for 30 minutes (10 seconds period)",
            "Charge at 2.5A until 3.5V (1 seconds period)",
            "Hold at 3.5V until 0.05A (1 seconds period)"
        )
    ]
)

experiments = [exp]
crates = ["1C"]


# ============================================================
# # 2. Load Experimental Test Data
# # ============================================================
# try:
#     df = get_test_data(test_datasheet_names[0], "Discharge_constant_amb_25degC
#     test_data = []
#     for c in ["0.5", "1", "2", "3"]:
#         cap = df[f"{c}C_CE_cap (Ah)"].dropna().values
#         volt = df[f"{c}C_CE Voltage (V)"].dropna().values
#         test_data.append((cap, volt))
#     print("✅ Experimental data loaded successfully.")
# except Exception as e:
#     print(f"⚠️ Could not load experimental data: {e}")
#     test_data = [None, None, None]

# except Exception as e:
```

```python
#      print(f"⚠️ Could not load experimental data: {e}")
#      test_data = [None, None, None, None]




# ##### Need to optimize
a = "Negative particle diffusivity [m2.s-1]"
b = "Positive particle diffusivity [m2.s-1]"
c = "Negative electrode conductivity [S.m-1]"
d = "Positive electrode conductivity [S.m-1]"
e = "Negative electrode porosity"
f = "Positive electrode porosity"
g = "Separator porosity"
h = "Maximum concentration in positive electrode [mol.m-3]"
i = "Initial concentration in positive electrode [mol.m-3]"
j = "Maximum concentration in negative electrode [mol.m-3]"
k = "Initial concentration in negative electrode [mol.m-3]"
l = "Negative particle radius [m]"
m = "Positive particle radius [m]"
n = "Negative electrode thickness [m]"
o = "Positive electrode thickness [m]"
p = "Electrode width [m]"
q = "Negative electrode Bruggeman coefficient (electrolyte)"
r = "Negative electrode Bruggeman coefficient (electrode)"
s = "Positive electrode Bruggeman coefficient (electrode)"
t = "Positive electrode Bruggeman coefficient (electrolyte)"
u = "Total heat transfer coefficient [W.m-2.K-1]"




# === Step 3: Define parameter bounds ===
bounds = {
    a: [0.01 * params[a], 100*params[a]],
    b: [0.01 * params[b], 100*params[b]],
    c: [0.5*params[c], 5*params[c]],
    d: [0.5*params[d], 5*params[d]],
    e: [0.25, 0.4],
    f: [0.3, 0.46],
    g: [0.4, 0.5],
    h: [0.5*params[h], 1.5*params[h]],
    i: [0.5*(params[i]), 1.5*(params[i])],
    j: [0.5*params[j], 1.5*params[j]],
    k: [0.5*params[k], 1.5*params[k]],
    l: [0.01*params[l], 50*params[l]],
    m: [0.01*params[m], 50*params[m]],
    n: [0.9*params[n], 1.10*params[n]],
    o: [0.9*params[o], 1.10*params[o]],
    p: [0.9*params[p], 1.10*params[p]],
    q: [0.25*params[q], 3*params[q]],
    r: [0.25*params[r], 3*params[r]],
    s: [0.25*params[s], 3*params[s]],
    t: [0.25*params[t], 3*params[t]],
    # u: [0.5*params[u], 10*params[u]],
}

# ==========================================================
# 4. Helper Function: Run Simulation
# ==========================================================
def run_simulation(exp, param_dict):
    try:
```

```python
        local_params = deepcopy(params)
        local_params.update(param_dict)
        sim = pybamm.Simulation(model, parameter_values=local_params, experiment
        sol = sim.solve(calc_esoh=False)
        cap = sol["Discharge capacity [A.h]"].entries - sol["Discharge capacity
        volt = sol["Terminal voltage [V]"].entries
        return cap, volt
    except Exception as e:
        print(f"✖ Simulation failed for {list(param_dict.keys())[0]}: {e}")
        return None, None


# # ============================================================
# # 5. Sensitivity Analysis for Each Parameter (4 Experiments)
# # ============================================================
# def sensitivity_analysis_multi_expt(bounds_dict):
#     """
#     Sensitivity analysis for all parameters in bounds_dict.
#     For each parameter:
#         - Run simulations for lower, base, upper values.
#         - Compare with experimental curves at 4 C-rates.
#         - Show results in a 2x2 grid of subplots.
#     """
#     n_exp = len(experiments)
#     assert n_exp == 4, f"Expected 4 experiments, got {n_exp}"
#     # assert len(test_data) == 4, f"Expected 4 test datasets, got {len(test_da

#     for param_name, (low, high) in bounds_dict.items():
#         base = params[param_name]
#         values = [low, base, high]
#         labels = ["Lower Bound", "Base", "Upper Bound"]

#         # Create 2x2 subplot grid for 4 C-rates
#         fig, axes = plt.subplots(2, 2, figsize=(12, 8), sharex=True, sharey=Tr
#         axes = axes.flatten()
#         plt.suptitle(f"Sensitivity of {param_name}", fontsize=15)

#         color_cycle = plt.cm.viridis(np.linspace(0, 1, len(values)))

#         for j, exp in enumerate(experiments):
#             ax = axes[j]
#             crate = crates[j]

#             # Run simulations for lower, base, upper bounds
#             for i, val in enumerate(values):
#                 pset = {param_name: val}
#                 cap, volt = run_simulation(exp, pset)
#                 if cap is not None:
#                     ax.plot(cap, volt,
#                             color=color_cycle[i],
#                             lw=1,
#                             label=f"{labels[i]} ({val:.2e})")

#             # Add experimental curve
#             # cap_exp, volt_exp = test_data[j]
#             # ax.plot(cap_exp, volt_exp, "k--", lw=1.25, label=f"Exp {crate}")

#             # Formatting
#             ax.set_title(f"{crate} Discharge", fontsize=12)
#             ax.set_xlabel("Capacity (Ah)", fontsize=11)
#             ax.set_ylabel("Voltage (V)", fontsize=11)
```

```python
#             ax.grid(True, linestyle="--", linewidth=0.6, alpha=0.7)
#             ax.legend(fontsize=8)

#         plt.tight_layout(rect=[0, 0, 1, 0.94])
#         plt.show()




# ============================================================
# 5. Sensitivity Analysis (ONE plot per parameter, all C-rates)
# ============================================================
def sensitivity_analysis_multi_expt(bounds_dict):

    for param_name, (low, high) in bounds_dict.items():

        base = params[param_name]
        values = [low, base, high]
        bound_labels = ["Lower", "Base", "Upper"]
        linestyles = ["--", "-", ":"]

        plt.figure(figsize=(9, 6))
        plt.title(f"Sensitivity of {param_name}", fontsize=14)

        # Color per C-rate
        colors = plt.cm.tab10(np.linspace(0, 1, len(experiments)))

        for j, exp in enumerate(experiments):
            crate = crates[j]
            color = colors[j]

            for i, val in enumerate(values):
                pset = {param_name: val}
                cap, volt = run_simulation(exp, pset)

                if cap is not None:
                    plt.plot(
                        cap,
                        volt,
                        color=color,
                        linestyle=linestyles[i],
                        lw=1.6,
                        label=f"{crate} | {bound_labels[i]}"
                    )

        # Formatting
        plt.xlabel("Capacity [Ah]", fontsize=12)
        plt.ylabel("Voltage [V]", fontsize=12)
        plt.grid(True, linestyle="--", alpha=0.6)

        # Clean legend (remove duplicates)
        handles, labels = plt.gca().get_legend_handles_labels()
        unique = dict(zip(labels, handles))
        plt.legend(unique.values(), unique.keys(), fontsize=9, ncol=2)

        plt.tight_layout()
        plt.show()
```

```python
# ===========================================================
# 6. Run the Sensitivity Study
# ===========================================================
if __name__ == "__main__":
    sensitivity_analysis_multi_expt(bounds)
```

```
2025-12-23 18:46:23.668 - [NOTICE] logger.func(7): Cycle 1/1 (18.300 us elapsed)
--------------------
2025-12-23 18:46:23.670 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:23.840 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:23.875 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:24.083 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:24.301 - [NOTICE] logger.func(7): Finish experiment simulation,
took 636.752 ms
2025-12-23 18:46:24.536 - [NOTICE] logger.func(7): Cycle 1/1 (14.300 us elapsed)
--------------------
2025-12-23 18:46:24.537 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:24.622 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:24.642 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:24.793 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:24.939 - [NOTICE] logger.func(7): Finish experiment simulation,
took 402.738 ms
2025-12-23 18:46:25.134 - [NOTICE] logger.func(7): Cycle 1/1 (10.100 us elapsed)
--------------------
2025-12-23 18:46:25.134 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:25.218 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:25.236 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:25.327 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:25.451 - [NOTICE] logger.func(7): Finish experiment simulation,
took 314.950 ms
```

Sensitivity of Negative particle diffusivity [m2.s-1]
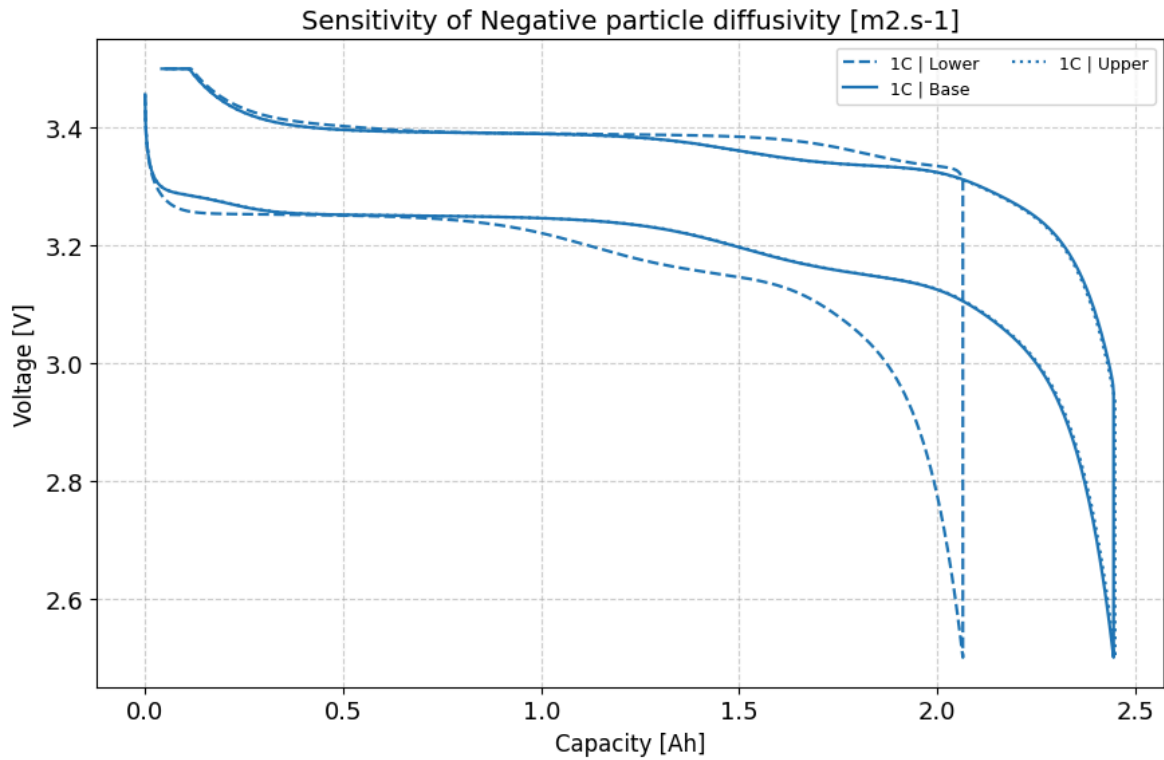

```
2025-12-23 18:46:25.752 - [NOTICE] logger.func(7): Cycle 1/1 (10.200 us elapsed)
--------------------
2025-12-23 18:46:25.752 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:25.855 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:25.876 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:25.979 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:26.119 - [NOTICE] logger.func(7): Finish experiment simulation,
took 352.706 ms
2025-12-23 18:46:26.359 - [NOTICE] logger.func(7): Cycle 1/1 (11.300 us elapsed)
--------------------
2025-12-23 18:46:26.359 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:26.460 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:26.480 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:26.573 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:26.677 - [NOTICE] logger.func(7): Finish experiment simulation,
took 318.880 ms
2025-12-23 18:46:26.867 - [NOTICE] logger.func(7): Cycle 1/1 (24.700 us elapsed)
--------------------
2025-12-23 18:46:26.868 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:26.994 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:27.012 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:27.112 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:27.261 - [NOTICE] logger.func(7): Finish experiment simulation,
took 393.155 ms
```

Sensitivity of Positive particle diffusivity [m2.s-1]
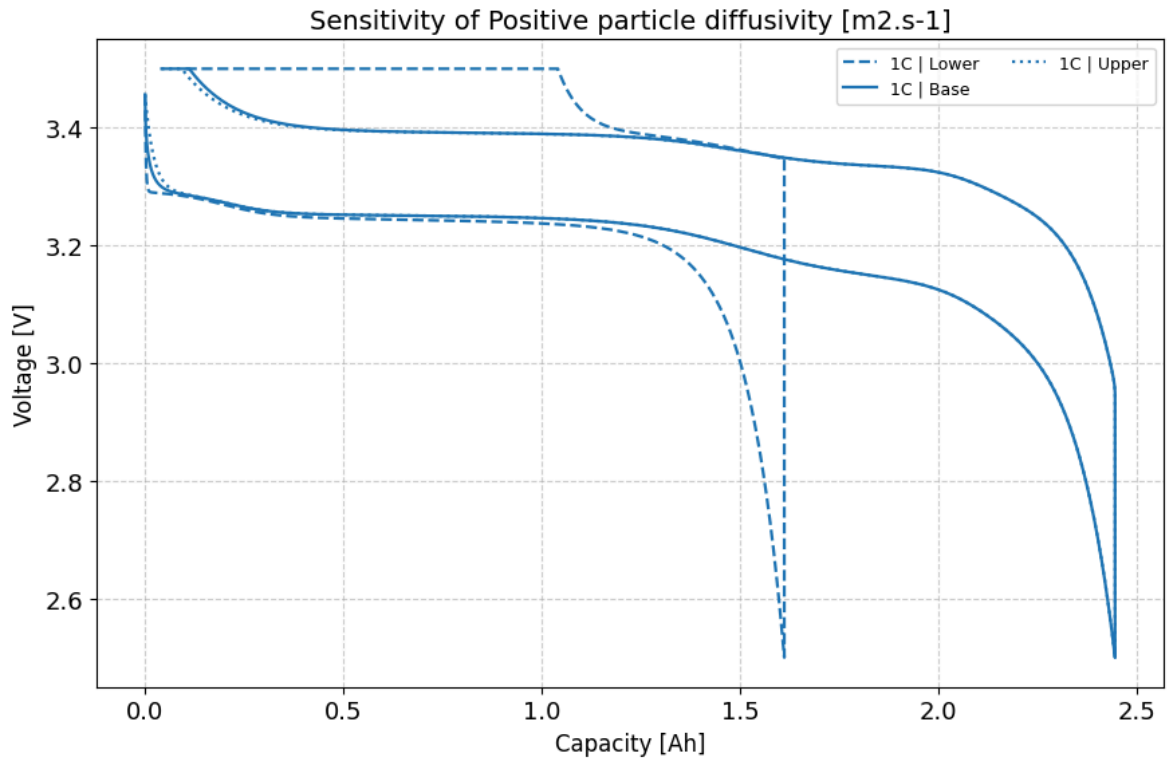

```
2025-12-23 18:46:27.632 - [NOTICE] logger.func(7): Cycle 1/1 (13.300 us elapsed)
--------------------
2025-12-23 18:46:27.633 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:27.727 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:27.749 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:27.823 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:27.951 - [NOTICE] logger.func(7): Finish experiment simulation,
took 318.203 ms
2025-12-23 18:46:28.137 - [NOTICE] logger.func(7): Cycle 1/1 (10.100 us elapsed)
--------------------
2025-12-23 18:46:28.137 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:28.220 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:28.245 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:28.323 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:28.423 - [NOTICE] logger.func(7): Finish experiment simulation,
took 282.149 ms
2025-12-23 18:46:28.611 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 18:46:28.611 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:28.711 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:28.727 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:28.806 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:28.907 - [NOTICE] logger.func(7): Finish experiment simulation,
took 293.348 ms
```

Sensitivity of Negative electrode conductivity [S.m-1]
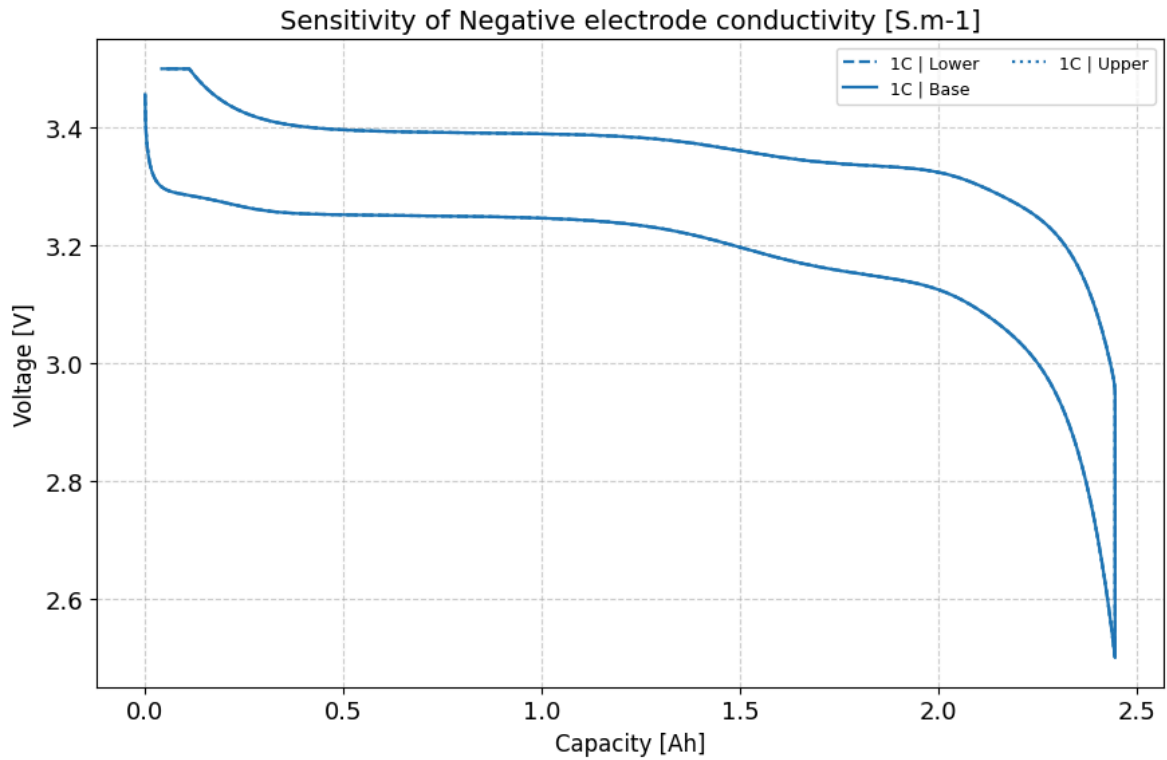

```
2025-12-23 18:46:29.207 - [NOTICE] logger.func(7): Cycle 1/1 (10.700 us elapsed)
--------------------
2025-12-23 18:46:29.210 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:29.300 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:29.319 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:29.384 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:29.486 - [NOTICE] logger.func(7): Finish experiment simulation,
took 286.730 ms
2025-12-23 18:46:29.667 - [NOTICE] logger.func(7): Cycle 1/1 (10.000 us elapsed)
--------------------
2025-12-23 18:46:29.667 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:29.751 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:29.767 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:29.851 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:29.953 - [NOTICE] logger.func(7): Finish experiment simulation,
took 271.028 ms
2025-12-23 18:46:30.139 - [NOTICE] logger.func(7): Cycle 1/1 (22.700 us elapsed)
--------------------
2025-12-23 18:46:30.139 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:30.223 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:30.240 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:30.324 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:30.429 - [NOTICE] logger.func(7): Finish experiment simulation,
took 283.799 ms
```

Sensitivity of Positive electrode conductivity [S.m-1]
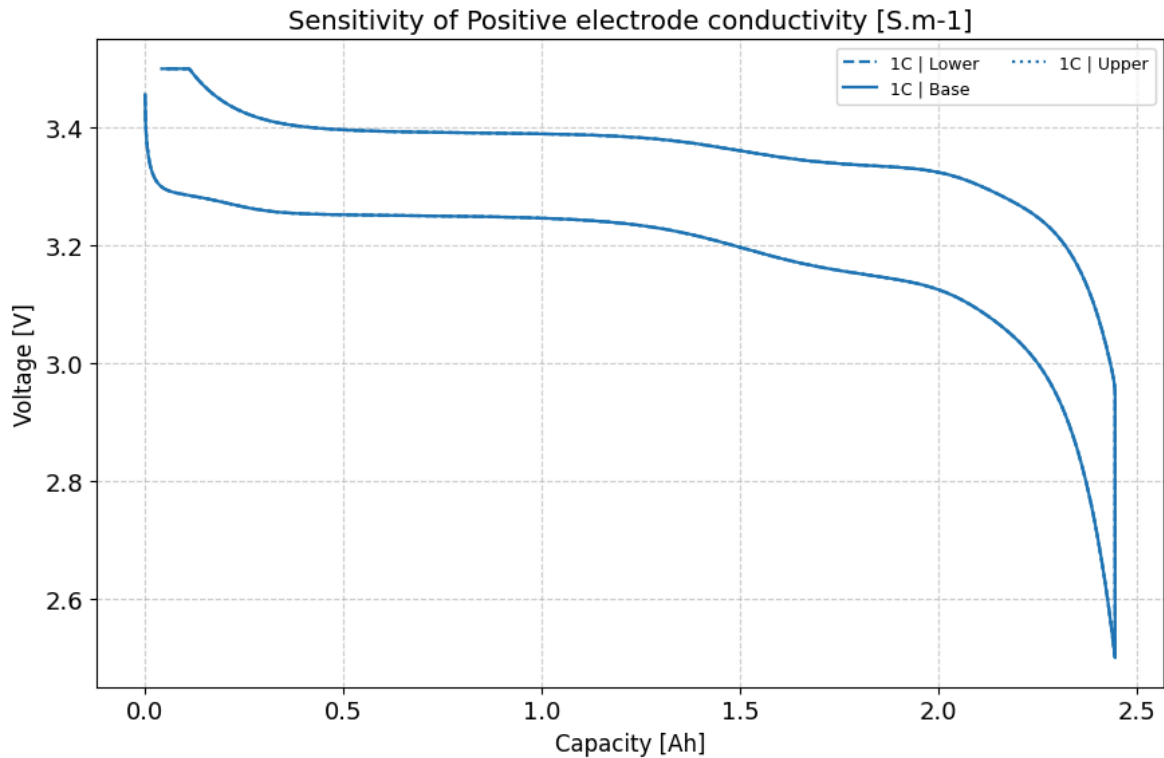

```
2025-12-23 18:46:31.355 - [NOTICE] logger.func(7): Cycle 1/1 (10.400 us elapsed)
--------------------
2025-12-23 18:46:31.356 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:31.439 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:31.459 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:31.533 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:31.622 - [NOTICE] logger.func(7): Finish experiment simulation,
took 267.590 ms
2025-12-23 18:46:31.826 - [NOTICE] logger.func(7): Cycle 1/1 (10.000 us elapsed)
--------------------
2025-12-23 18:46:31.826 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:31.890 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:31.907 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:31.973 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:32.067 - [NOTICE] logger.func(7): Finish experiment simulation,
took 241.202 ms
2025-12-23 18:46:32.258 - [NOTICE] logger.func(7): Cycle 1/1 (10.400 us elapsed)
--------------------
2025-12-23 18:46:32.258 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:32.331 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:32.340 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:32.424 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:32.510 - [NOTICE] logger.func(7): Finish experiment simulation,
took 250.531 ms
```

Sensitivity of Negative electrode porosity
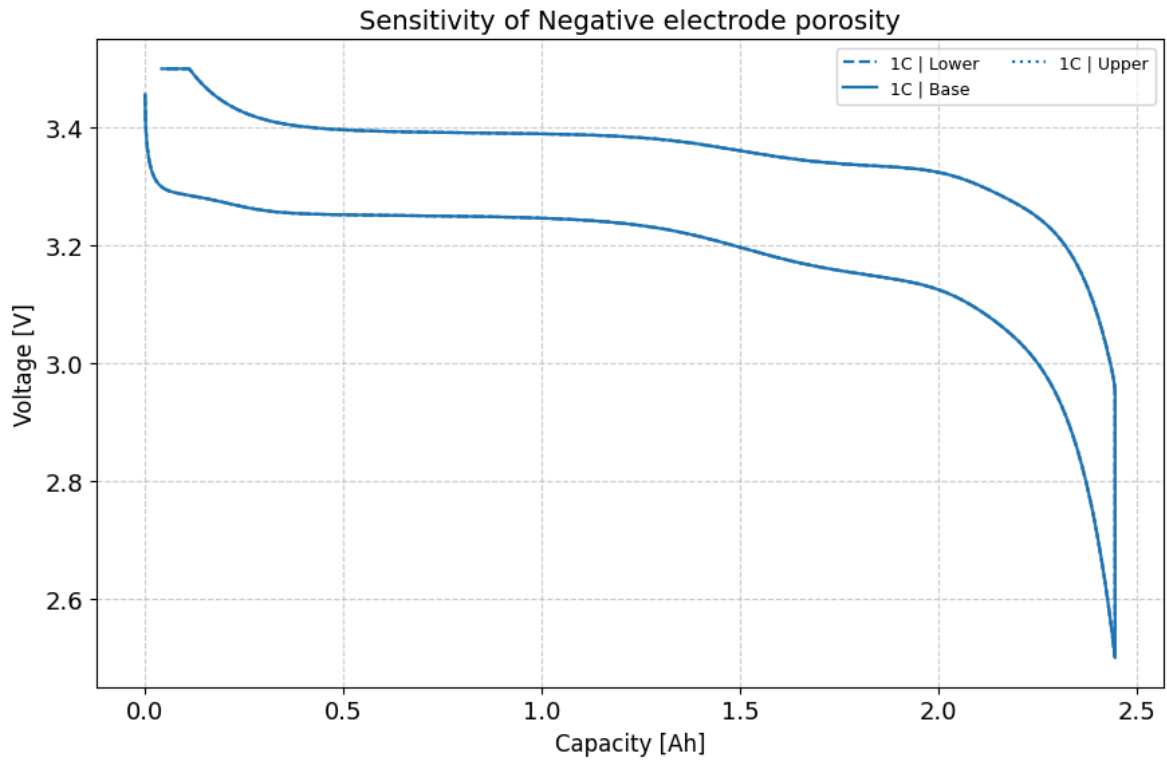

```
2025-12-23 18:46:32.813 - [NOTICE] logger.func(7): Cycle 1/1 (10.600 us elapsed)
--------------------
2025-12-23 18:46:32.813 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:32.913 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:32.923 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:32.999 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:33.086 - [NOTICE] logger.func(7): Finish experiment simulation,
took 272.188 ms
2025-12-23 18:46:33.272 - [NOTICE] logger.func(7): Cycle 1/1 (9.600 us elapsed) -
--------------------
2025-12-23 18:46:33.272 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:33.343 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:33.351 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:33.430 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:33.516 - [NOTICE] logger.func(7): Finish experiment simulation,
took 242.352 ms
2025-12-23 18:46:33.713 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 18:46:33.713 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:33.787 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:33.806 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:33.869 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:33.951 - [NOTICE] logger.func(7): Finish experiment simulation,
took 248.391 ms
```

Sensitivity of Positive electrode porosity
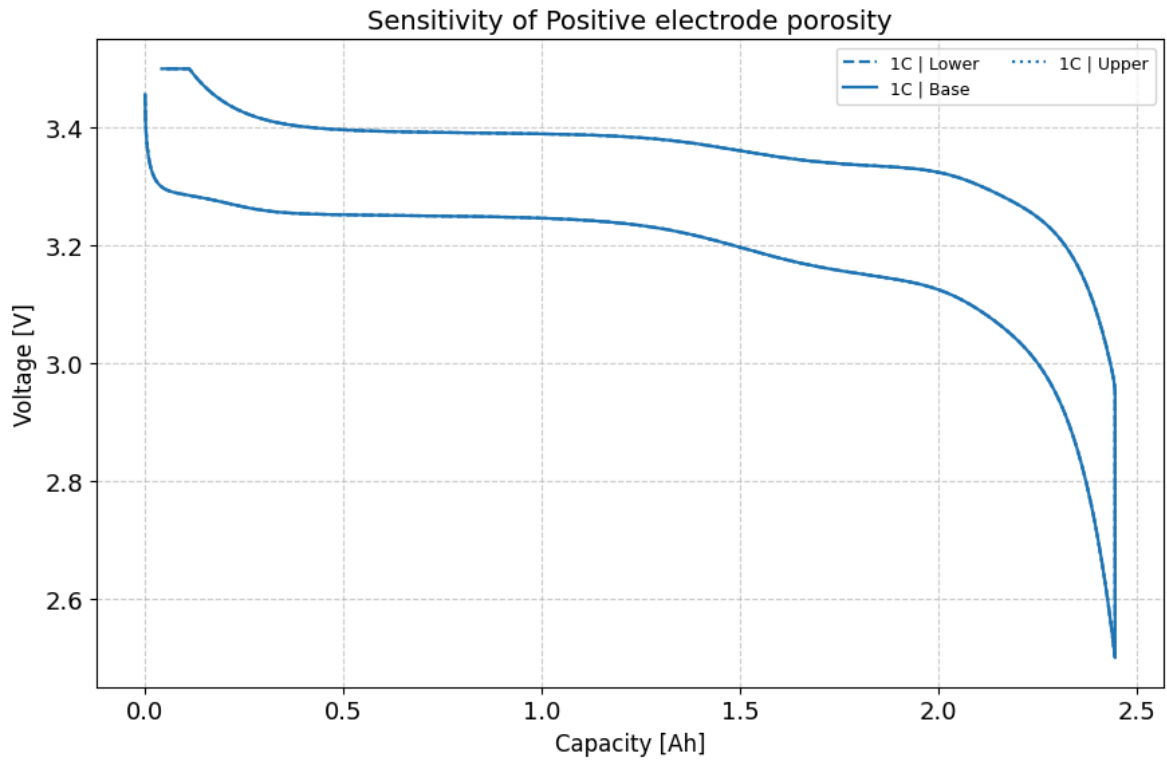

```
2025-12-23 18:46:34.250 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 18:46:34.250 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:34.334 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:34.356 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:34.434 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:34.530 - [NOTICE] logger.func(7): Finish experiment simulation,
took 269.565 ms
2025-12-23 18:46:34.737 - [NOTICE] logger.func(7): Cycle 1/1 (10.600 us elapsed)
--------------------
2025-12-23 18:46:34.737 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:34.801 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:34.821 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:34.901 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:34.983 - [NOTICE] logger.func(7): Finish experiment simulation,
took 257.093 ms
2025-12-23 18:46:35.183 - [NOTICE] logger.func(7): Cycle 1/1 (11.000 us elapsed)
--------------------
2025-12-23 18:46:35.183 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:35.253 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:35.272 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:35.352 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:35.433 - [NOTICE] logger.func(7): Finish experiment simulation,
took 259.978 ms
```

Sensitivity of Separator porosity
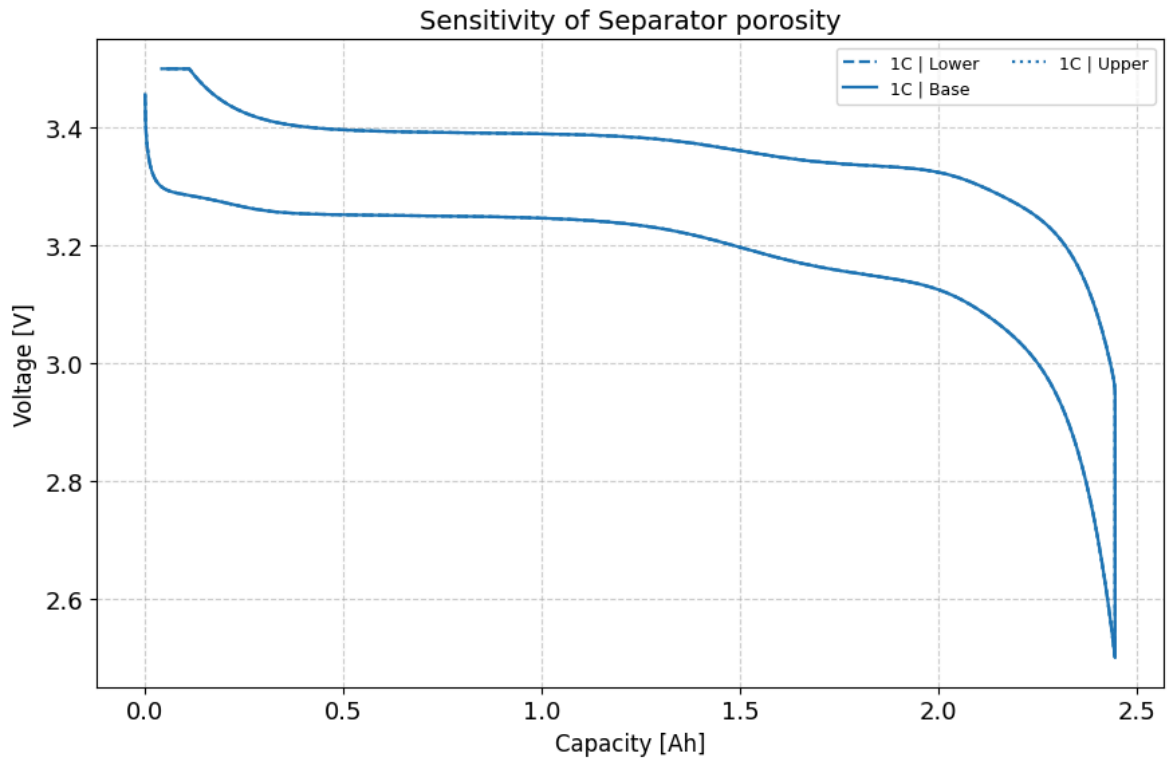

```
2025-12-23 18:46:35.750 - [NOTICE] logger.func(7): Cycle 1/1 (10.400 us elapsed)
--------------------
2025-12-23 18:46:35.750 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:35.838 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:35.857 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:35.933 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:36.026 - [NOTICE] logger.func(7): Finish experiment simulation,
took 275.283 ms
2025-12-23 18:46:36.218 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 18:46:36.219 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:36.295 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:36.314 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:36.398 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:36.494 - [NOTICE] logger.func(7): Finish experiment simulation,
took 275.895 ms
2025-12-23 18:46:36.687 - [NOTICE] logger.func(7): Cycle 1/1 (10.100 us elapsed)
--------------------
2025-12-23 18:46:36.688 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:36.766 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:36.786 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:36.890 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:36.987 - [NOTICE] logger.func(7): Finish experiment simulation,
took 299.183 ms
```
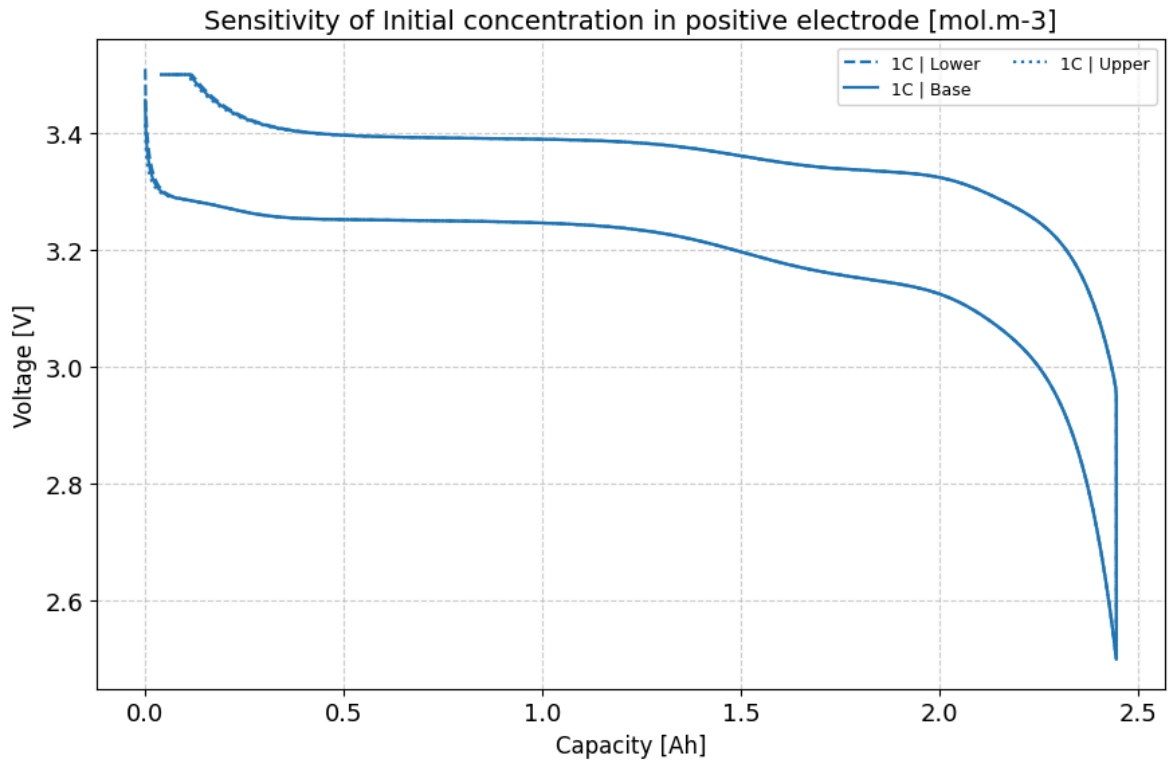
Sensitivity of Maximum concentration in positive electrode [mol.m-3]
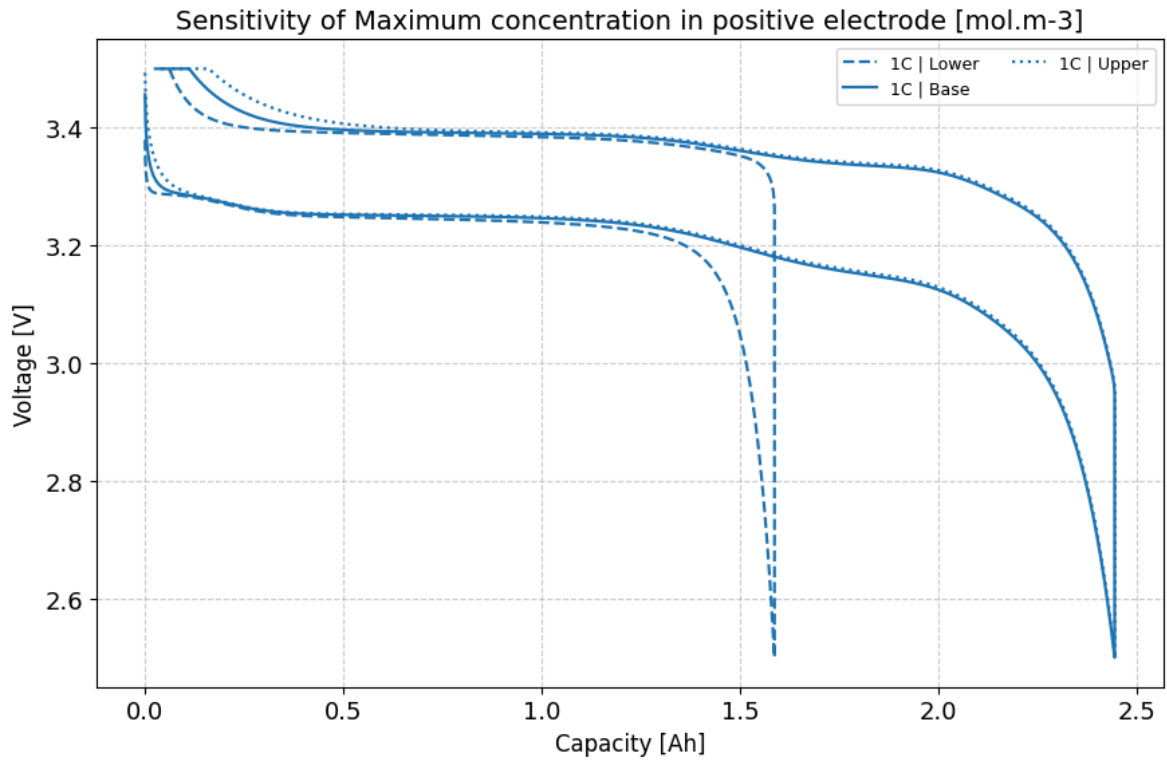

```
2025-12-23 18:46:37.951 - [NOTICE] logger.func(7): Cycle 1/1 (9.800 us elapsed) -
-------------------
2025-12-23 18:46:37.951 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:38.027 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:38.034 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:38.110 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:38.185 - [NOTICE] logger.func(7): Finish experiment simulation,
took 227.490 ms
2025-12-23 18:46:38.368 - [NOTICE] logger.func(7): Cycle 1/1 (10.400 us elapsed)
--------------------
2025-12-23 18:46:38.368 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:38.448 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:38.466 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:38.528 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:38.605 - [NOTICE] logger.func(7): Finish experiment simulation,
took 230.191 ms
2025-12-23 18:46:38.800 - [NOTICE] logger.func(7): Cycle 1/1 (17.900 us elapsed)
--------------------
2025-12-23 18:46:38.800 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:38.867 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:38.882 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:38.964 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:39.054 - [NOTICE] logger.func(7): Finish experiment simulation,
took 255.803 ms
```

Sensitivity of Initial concentration in positive electrode [mol.m-3]


```
2025-12-23 18:46:39.362 - [NOTICE] logger.func(7): Cycle 1/1 (11.200 us elapsed)
--------------------
2025-12-23 18:46:39.362 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:39.385 - [ERROR] callbacks.on_experiment_error(235): Simulation
error: Events ['Maximum voltage [V]'] are non-positive at initial conditions
2025-12-23 18:46:39.517 - [NOTICE] logger.func(7): Cycle 1/1 (54.200 us elapsed)
--------------------
2025-12-23 18:46:39.518 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
```

❌ Simulation failed for Maximum concentration in negative electrode [mol.m-3]:
Events ['Maximum voltage [V]'] are non-positive at initial conditions

```
2025-12-23 18:46:39.589 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:39.601 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:39.667 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:39.772 - [NOTICE] logger.func(7): Finish experiment simulation,
took 254.602 ms
2025-12-23 18:46:39.984 - [NOTICE] logger.func(7): Cycle 1/1 (11.900 us elapsed)
--------------------
2025-12-23 18:46:39.984 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:40.060 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:40.067 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:40.151 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:40.234 - [NOTICE] logger.func(7): Finish experiment simulation,
took 256.000 ms
```

Sensitivity of Maximum concentration in negative electrode [mol.m-3]
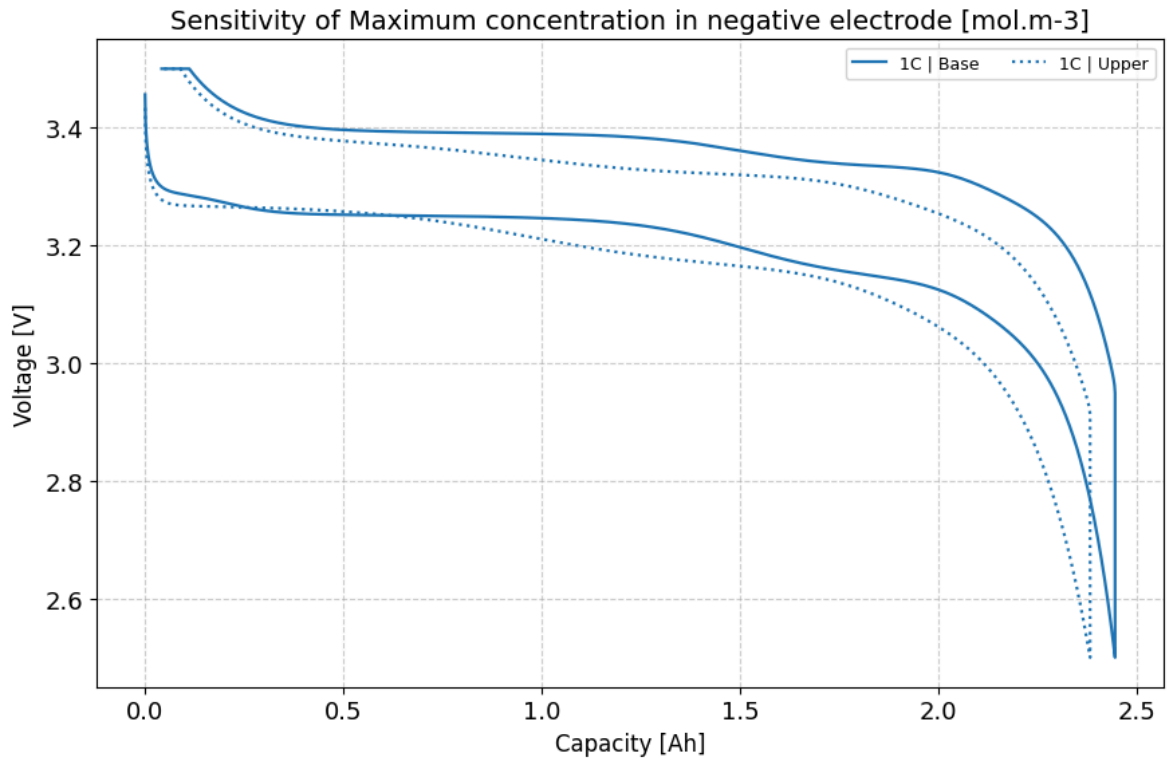

```
2025-12-23 18:46:40.534 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 18:46:40.534 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:40.620 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:40.651 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:40.726 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:40.823 - [NOTICE] logger.func(7): Finish experiment simulation,
took 276.451 ms
2025-12-23 18:46:41.019 - [NOTICE] logger.func(7): Cycle 1/1 (11.700 us elapsed)
--------------------
2025-12-23 18:46:41.020 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:41.084 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:41.100 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:41.184 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:41.266 - [NOTICE] logger.func(7): Finish experiment simulation,
took 260.289 ms
2025-12-23 18:46:41.469 - [NOTICE] logger.func(7): Cycle 1/1 (10.000 us elapsed)
--------------------
2025-12-23 18:46:41.469 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:41.551 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:41.555 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:41.652 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:41.740 - [NOTICE] logger.func(7): Finish experiment simulation,
took 274.071 ms
```

Sensitivity of Initial concentration in negative electrode [mol.m-3]
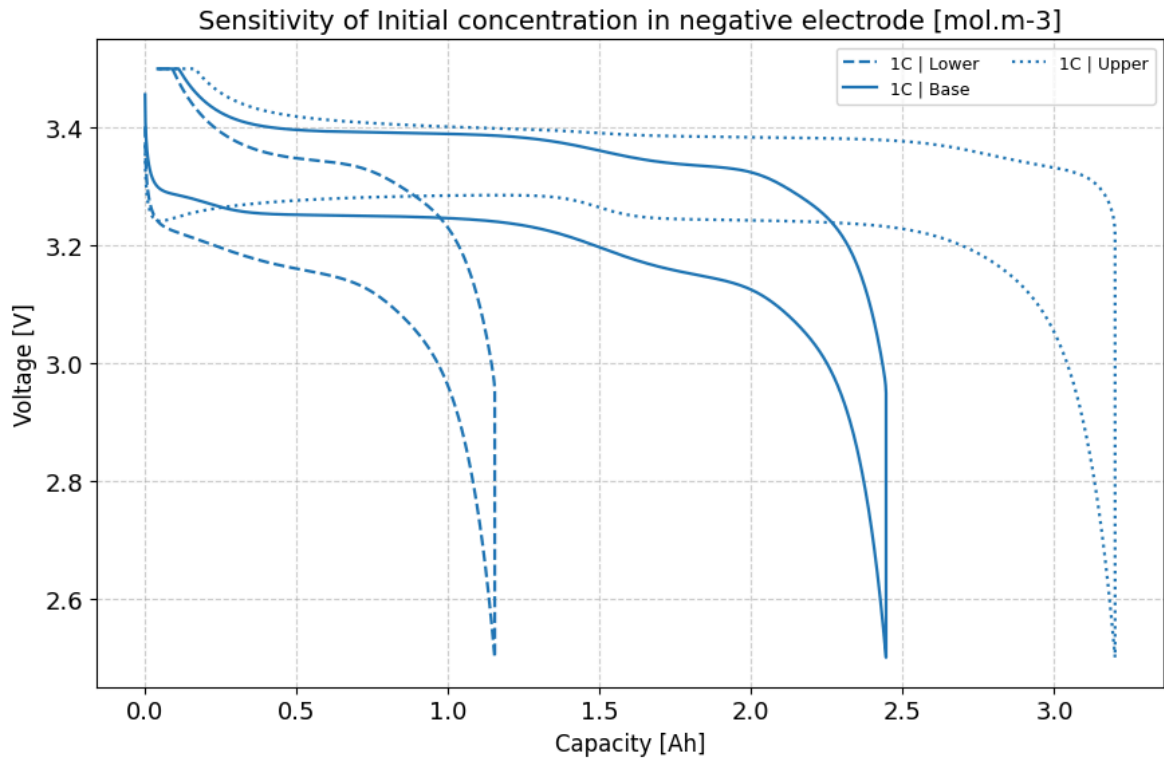

```
2025-12-23 18:46:42.057 - [NOTICE] logger.func(7): Cycle 1/1 (9.800 us elapsed) -
-------------------
2025-12-23 18:46:42.057 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:42.144 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:42.169 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:42.239 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:42.372 - [NOTICE] logger.func(7): Finish experiment simulation,
took 316.393 ms
2025-12-23 18:46:42.576 - [NOTICE] logger.func(7): Cycle 1/1 (10.700 us elapsed)
--------------------
2025-12-23 18:46:42.576 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:42.654 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:42.672 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:42.752 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:42.855 - [NOTICE] logger.func(7): Finish experiment simulation,
took 278.489 ms
2025-12-23 18:46:43.077 - [NOTICE] logger.func(7): Cycle 1/1 (11.800 us elapsed)
--------------------
2025-12-23 18:46:43.078 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:43.154 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:43.173 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:43.189 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:43.312 - [NOTICE] logger.func(7): Finish experiment simulation,
took 234.827 ms
```

Sensitivity of Negative particle radius [m]
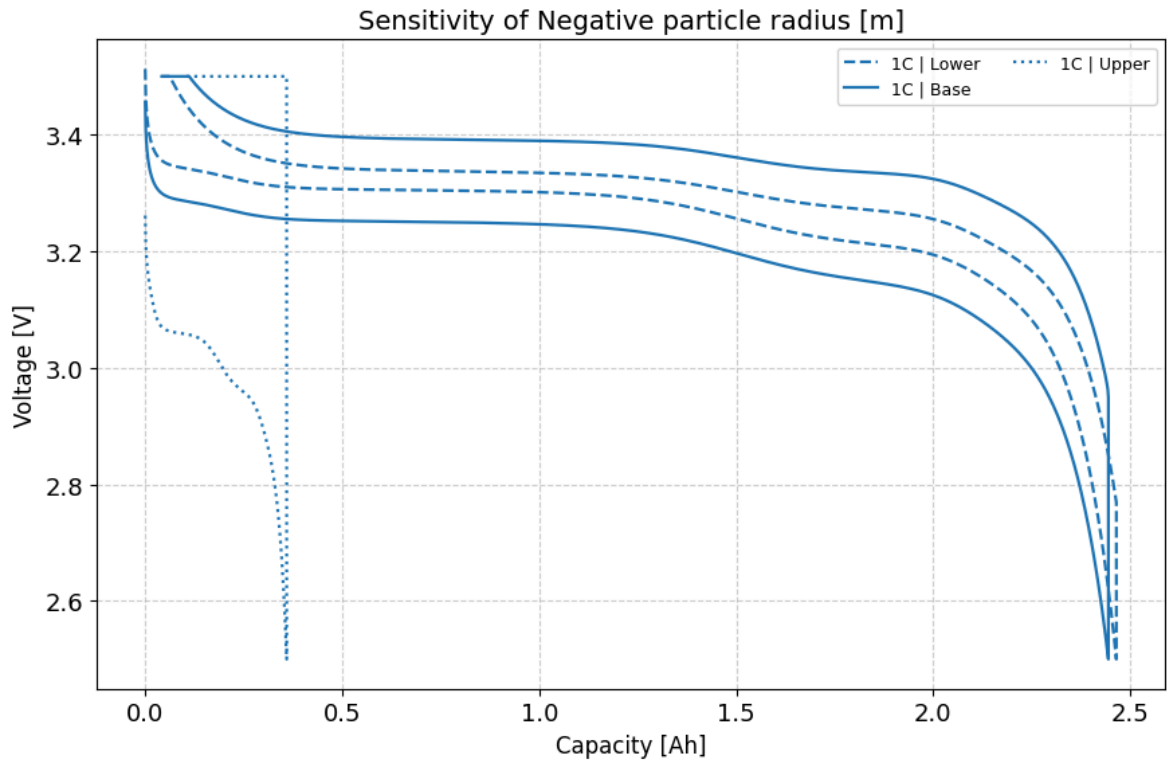

```
2025-12-23 18:46:44.351 - [NOTICE] logger.func(7): Cycle 1/1 (10.700 us elapsed)
--------------------
2025-12-23 18:46:44.351 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:44.472 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:44.489 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:44.559 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:44.651 - [NOTICE] logger.func(7): Finish experiment simulation,
took 295.492 ms
2025-12-23 18:46:44.848 - [NOTICE] logger.func(7): Cycle 1/1 (10.600 us elapsed)
--------------------
2025-12-23 18:46:44.849 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:44.922 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:44.941 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:45.011 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:45.103 - [NOTICE] logger.func(7): Finish experiment simulation,
took 254.367 ms
2025-12-23 18:46:45.290 - [NOTICE] logger.func(7): Cycle 1/1 (10.100 us elapsed)
--------------------
2025-12-23 18:46:45.290 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:45.367 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:45.385 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:45.466 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:45.559 - [NOTICE] logger.func(7): Finish experiment simulation,
took 261.224 ms
```

Sensitivity of Positive particle radius [m]
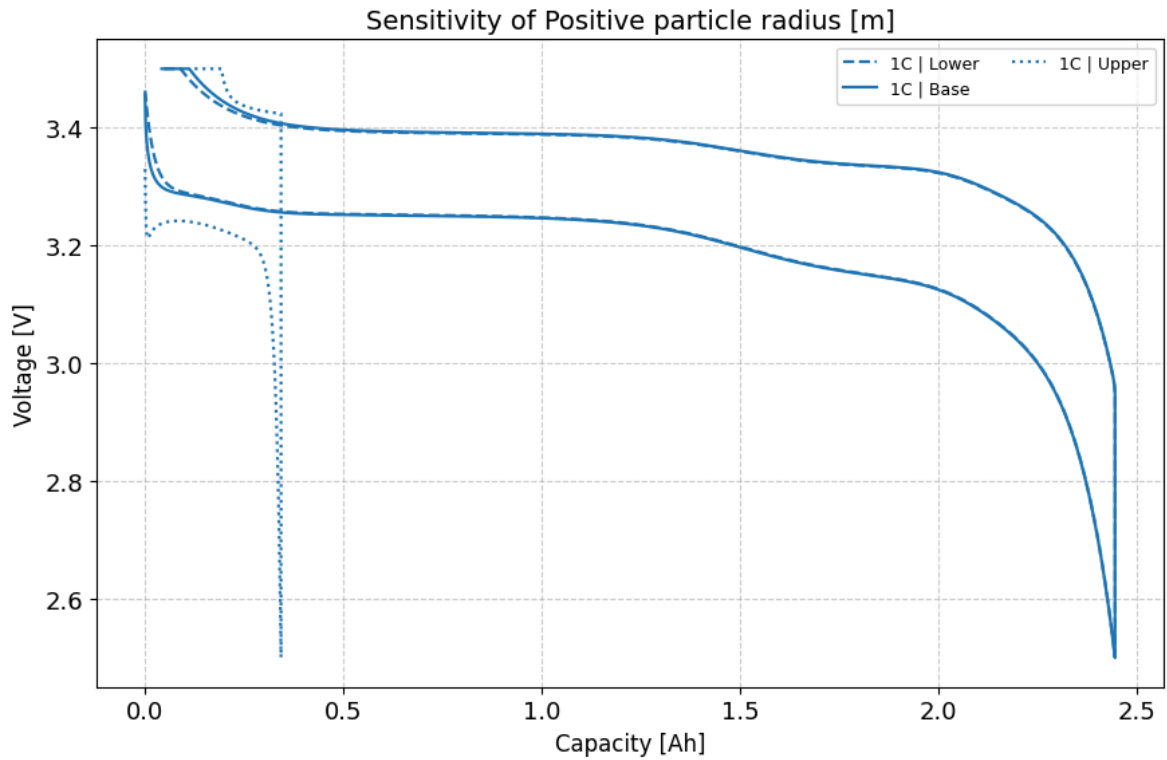

```
2025-12-23 18:46:45.863 - [NOTICE] logger.func(7): Cycle 1/1 (11.200 us elapsed)
--------------------
2025-12-23 18:46:45.864 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:45.940 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:45.958 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:46.039 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:46.136 - [NOTICE] logger.func(7): Finish experiment simulation,
took 272.589 ms
2025-12-23 18:46:46.323 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 18:46:46.325 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:46.404 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:46.427 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:46.505 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:46.598 - [NOTICE] logger.func(7): Finish experiment simulation,
took 274.403 ms
2025-12-23 18:46:46.795 - [NOTICE] logger.func(7): Cycle 1/1 (11.000 us elapsed)
--------------------
2025-12-23 18:46:46.796 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:46.870 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:46.888 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:46.965 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:47.058 - [NOTICE] logger.func(7): Finish experiment simulation,
took 263.335 ms
```

Sensitivity of Negative electrode thickness [m]
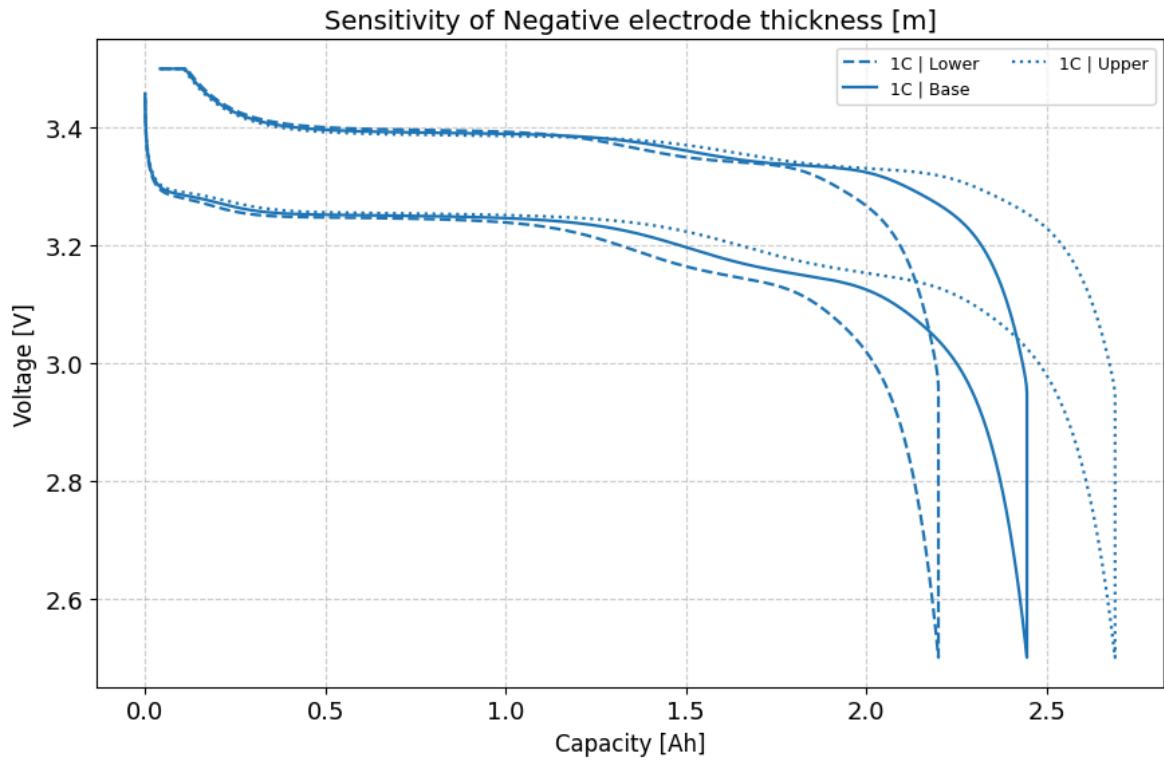

```
2025-12-23 18:46:47.391 - [NOTICE] logger.func(7): Cycle 1/1 (14.700 us elapsed)
--------------------
2025-12-23 18:46:47.392 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:47.480 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:47.498 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:47.579 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:47.685 - [NOTICE] logger.func(7): Finish experiment simulation,
took 294.538 ms
2025-12-23 18:46:47.926 - [NOTICE] logger.func(7): Cycle 1/1 (13.000 us elapsed)
--------------------
2025-12-23 18:46:47.927 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:48.034 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:48.060 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:48.149 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:48.249 - [NOTICE] logger.func(7): Finish experiment simulation,
took 323.509 ms
2025-12-23 18:46:48.448 - [NOTICE] logger.func(7): Cycle 1/1 (9.700 us elapsed) -
--------------------
2025-12-23 18:46:48.449 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:48.529 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:48.547 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:48.631 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:48.737 - [NOTICE] logger.func(7): Finish experiment simulation,
took 288.376 ms
```

Sensitivity of Positive electrode thickness [m]
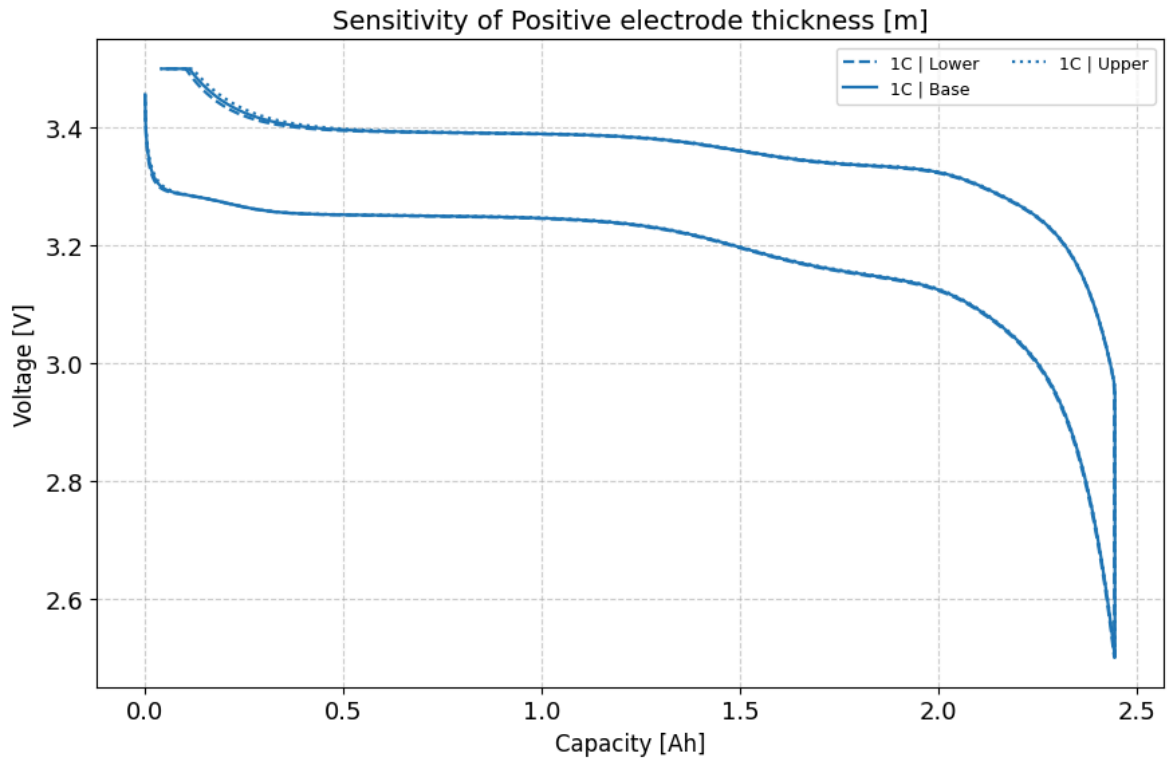
2025-12-23 18:46:49.044 - [NOTICE] logger.func(7): Cycle 1/1 (9.600 us elapsed) -
----
2025-12-23 18:46:49.045 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:49.129 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:49.146 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:49.221 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:49.320 - [NOTICE] logger.func(7): Finish experiment simulation,
took 274.957 ms
2025-12-23 18:46:49.511 - [NOTICE] logger.func(7): Cycle 1/1 (20.900 us elapsed)

2025-12-23 18:46:49.512 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:49.584 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:49.602 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:49.677 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:49.778 - [NOTICE] logger.func(7): Finish experiment simulation,
took 267.037 ms
2025-12-23 18:46:49.992 - [NOTICE] logger.func(7): Cycle 1/1 (10.200 us elapsed)

2025-12-23 18:46:49.992 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:50.074 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:50.093 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:50.173 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:50.270 - [NOTICE] logger.func(7): Finish experiment simulation,
took 277.254 ms

Sensitivity of Electrode width [m]
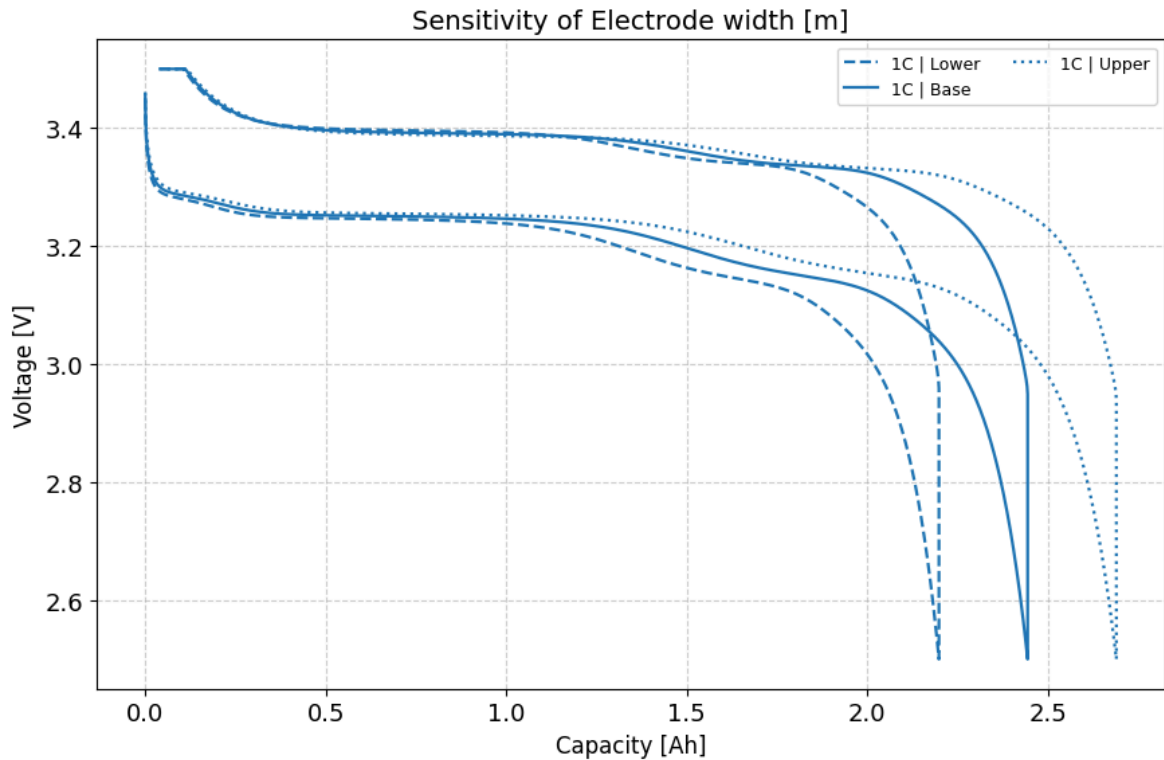

```
2025-12-23 18:46:51.244 - [NOTICE] logger.func(7): Cycle 1/1 (11.000 us elapsed)
--------------------
2025-12-23 18:46:51.245 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:51.328 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:51.348 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:51.426 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:51.509 - [NOTICE] logger.func(7): Finish experiment simulation,
took 265.732 ms
2025-12-23 18:46:51.710 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 18:46:51.712 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:51.785 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:51.804 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:51.874 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:51.968 - [NOTICE] logger.func(7): Finish experiment simulation,
took 257.915 ms
2025-12-23 18:46:52.151 - [NOTICE] logger.func(7): Cycle 1/1 (9.800 us elapsed) -
--------------------
2025-12-23 18:46:52.151 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:52.238 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:52.257 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:52.317 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:52.399 - [NOTICE] logger.func(7): Finish experiment simulation,
took 247.573 ms
```

Sensitivity of Negative electrode Bruggeman coefficient (electrolyte)
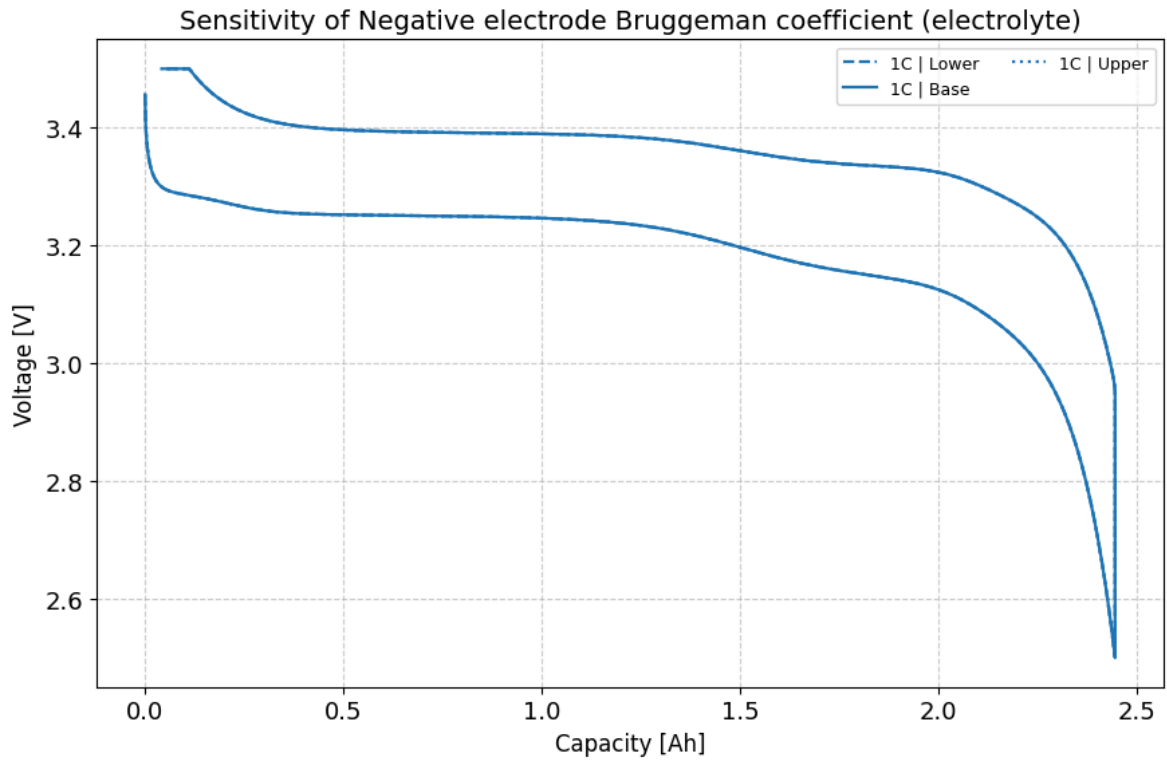

```
2025-12-23 18:46:52.708 - [NOTICE] logger.func(7): Cycle 1/1 (10.400 us elapsed)
--------------------
2025-12-23 18:46:52.719 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:52.786 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:52.806 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:52.915 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:52.999 - [NOTICE] logger.func(7): Finish experiment simulation,
took 284.094 ms
2025-12-23 18:46:53.201 - [NOTICE] logger.func(7): Cycle 1/1 (10.100 us elapsed)
--------------------
2025-12-23 18:46:53.201 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:53.285 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:53.305 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:53.381 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:53.466 - [NOTICE] logger.func(7): Finish experiment simulation,
took 265.299 ms
2025-12-23 18:46:53.665 - [NOTICE] logger.func(7): Cycle 1/1 (10.700 us elapsed)
--------------------
2025-12-23 18:46:53.665 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:53.770 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:53.788 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:53.871 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:53.969 - [NOTICE] logger.func(7): Finish experiment simulation,
took 298.502 ms
```

Sensitivity of Negative electrode Bruggeman coefficient (electrode)
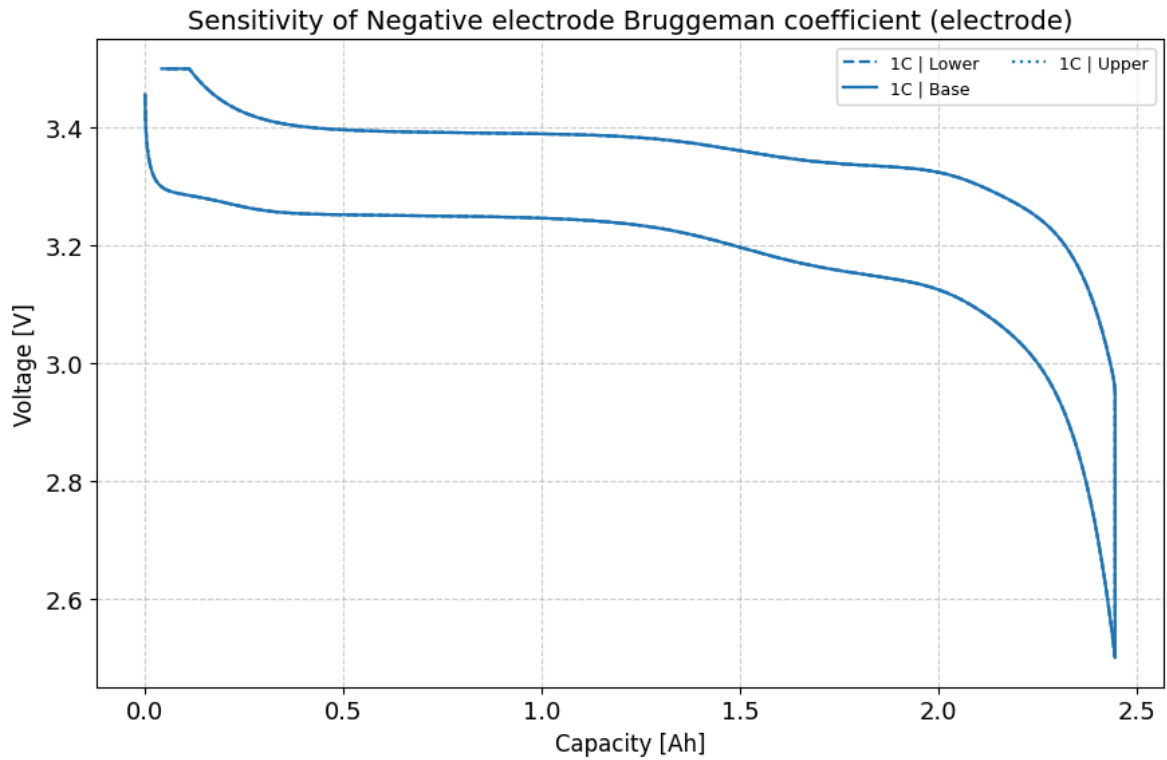

```
2025-12-23 18:46:54.287 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 18:46:54.287 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:54.369 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:54.389 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:54.467 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:54.563 - [NOTICE] logger.func(7): Finish experiment simulation,
took 272.183 ms
2025-12-23 18:46:54.755 - [NOTICE] logger.func(7): Cycle 1/1 (10.500 us elapsed)
--------------------
2025-12-23 18:46:54.755 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:54.833 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:54.853 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:54.939 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:55.034 - [NOTICE] logger.func(7): Finish experiment simulation,
took 276.614 ms
2025-12-23 18:46:55.222 - [NOTICE] logger.func(7): Cycle 1/1 (10.200 us elapsed)
--------------------
2025-12-23 18:46:55.222 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:55.300 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:55.317 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:55.396 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:55.492 - [NOTICE] logger.func(7): Finish experiment simulation,
took 269.557 ms
```

Sensitivity of Positive electrode Bruggeman coefficient (electrode)
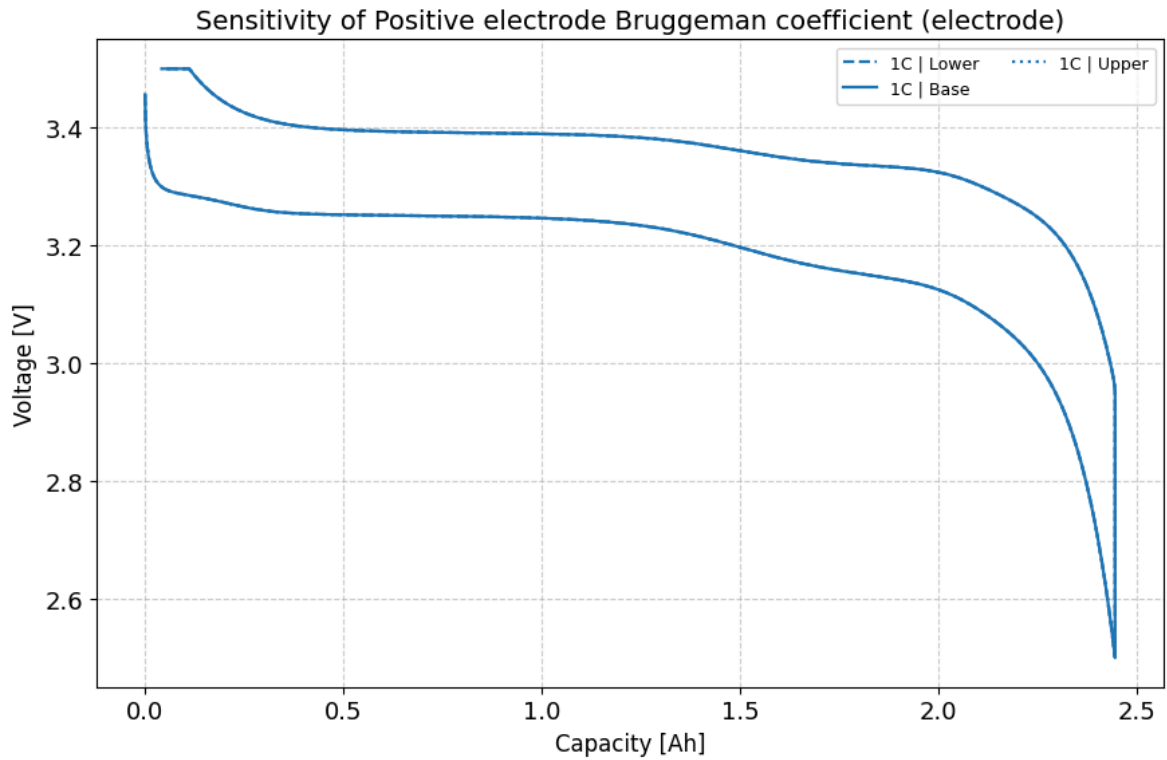

```
2025-12-23 18:46:55.803 - [NOTICE] logger.func(7): Cycle 1/1 (10.300 us elapsed)
--------------------
2025-12-23 18:46:55.804 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:55.908 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:55.926 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:56.005 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:56.101 - [NOTICE] logger.func(7): Finish experiment simulation,
took 299.037 ms
2025-12-23 18:46:56.319 - [NOTICE] logger.func(7): Cycle 1/1 (12.500 us elapsed)
--------------------
2025-12-23 18:46:56.320 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:56.414 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:56.433 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:56.529 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:56.639 - [NOTICE] logger.func(7): Finish experiment simulation,
took 320.161 ms
2025-12-23 18:46:56.850 - [NOTICE] logger.func(7): Cycle 1/1 (11.100 us elapsed)
--------------------
2025-12-23 18:46:56.851 - [NOTICE] logger.func(7): Cycle 1/1, step 1/4: Discharge
at 2.5A until 2.5V (1 seconds period)
2025-12-23 18:46:56.936 - [NOTICE] logger.func(7): Cycle 1/1, step 2/4: Rest for
30 minutes (10 seconds period)
2025-12-23 18:46:56.960 - [NOTICE] logger.func(7): Cycle 1/1, step 3/4: Charge at
2.5A until 3.5V (1 seconds period)
2025-12-23 18:46:57.052 - [NOTICE] logger.func(7): Cycle 1/1, step 4/4: Hold at
3.5V until 0.05A (1 seconds period)
2025-12-23 18:46:57.161 - [NOTICE] logger.func(7): Finish experiment simulation,
took 309.873 ms
```

Sensitivity of Positive electrode Bruggeman coefficient (electrolyte)