

# Status of Infusion Studies at Jlab

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Monday, February 3, 2020

# Summary, TTC 2019, Feb 5-8 2019

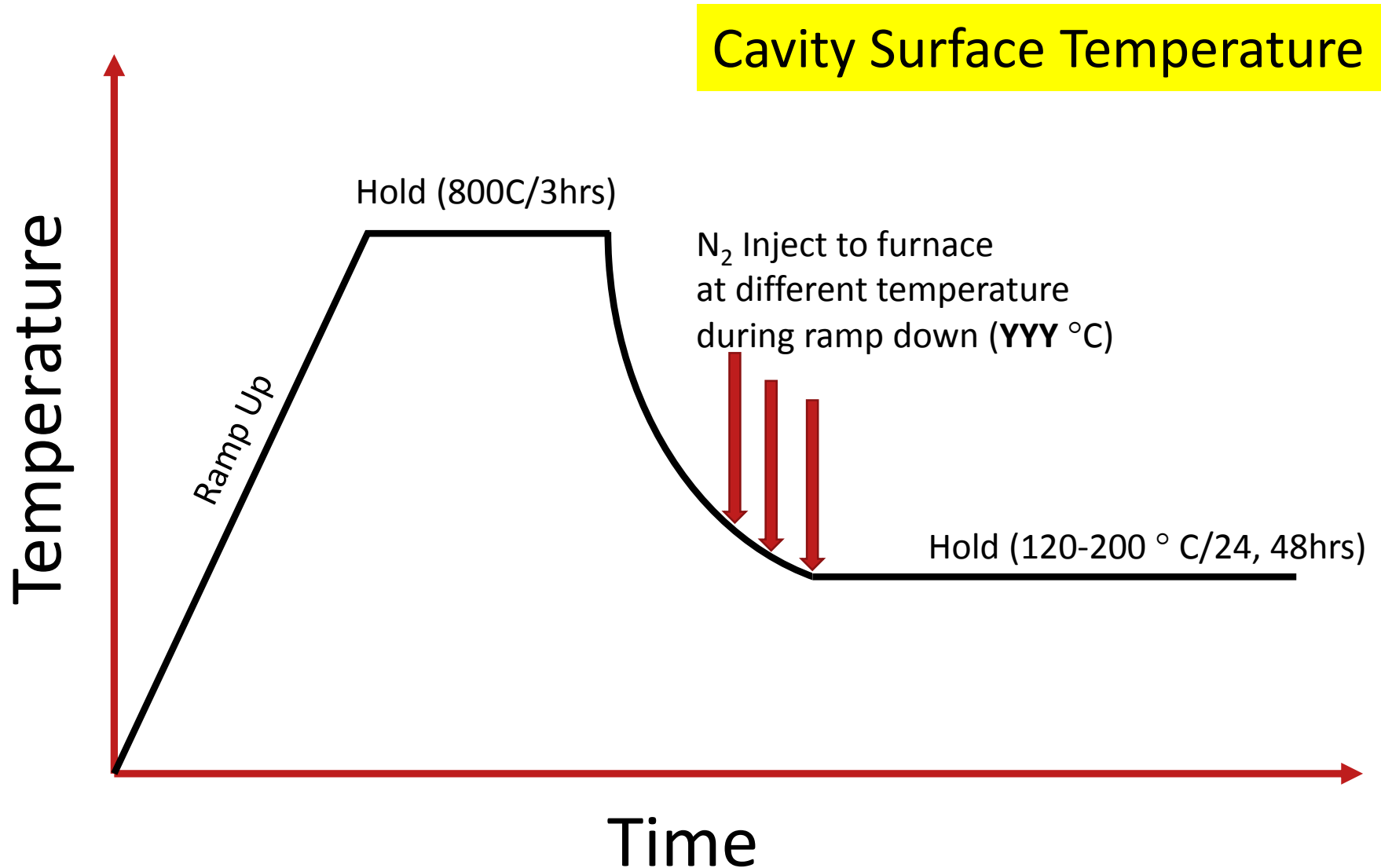
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- Earlier “Infusion” were reproducible when gas injected at higher temperature.
- ~75C hold for 4 hours during 120 C baking didn’t appear to be beneficial over the conventional 120C bake (statistics of 2 rf test).
- Furnace itself appeared to be clean after the recent upgrade evident from the rf (single cavity) test.
- First infusion run after furnace upgrade wasn’t as expected, probably due leak/contamination to gas injection line
- Work in progress to prepare some baseline cavities and infusion run once the furnace issue resolved.

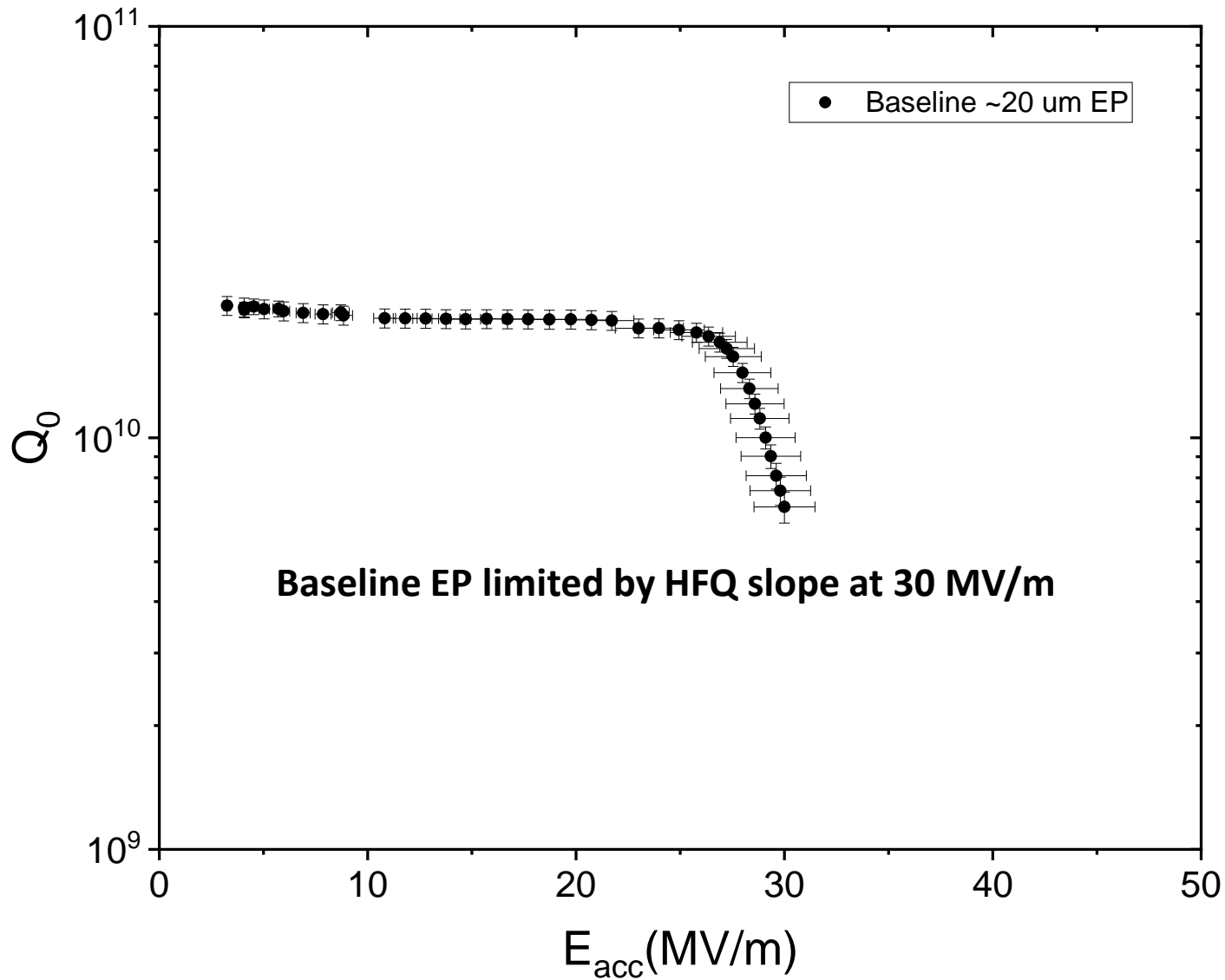
# Summary, SRF 2019, June 30-July 5, 2019

- High Q, high  $E_{acc}$  results are reproducible when gas injected at higher temperature (250-290 C).
- ~75C hold for 4 hours during 120 C baking didn't appear to be beneficial over the conventional 120C bake (statistics of 2 rf test).
- The influence of furnace contamination, cavity preparations before heat treatment plays significant role in the outcome of the cavity performance.
- Sample studies shows that the dirtier rf surface with  $NbN_{1-x}O_x$  phase underneath the topmost  $Nb_2O_5$  layer may be responsible for Q-rise.
- Explorations of several parameters such as the duration of bake time, optimal temperature and partial pressure of nitrogen is ongoing.

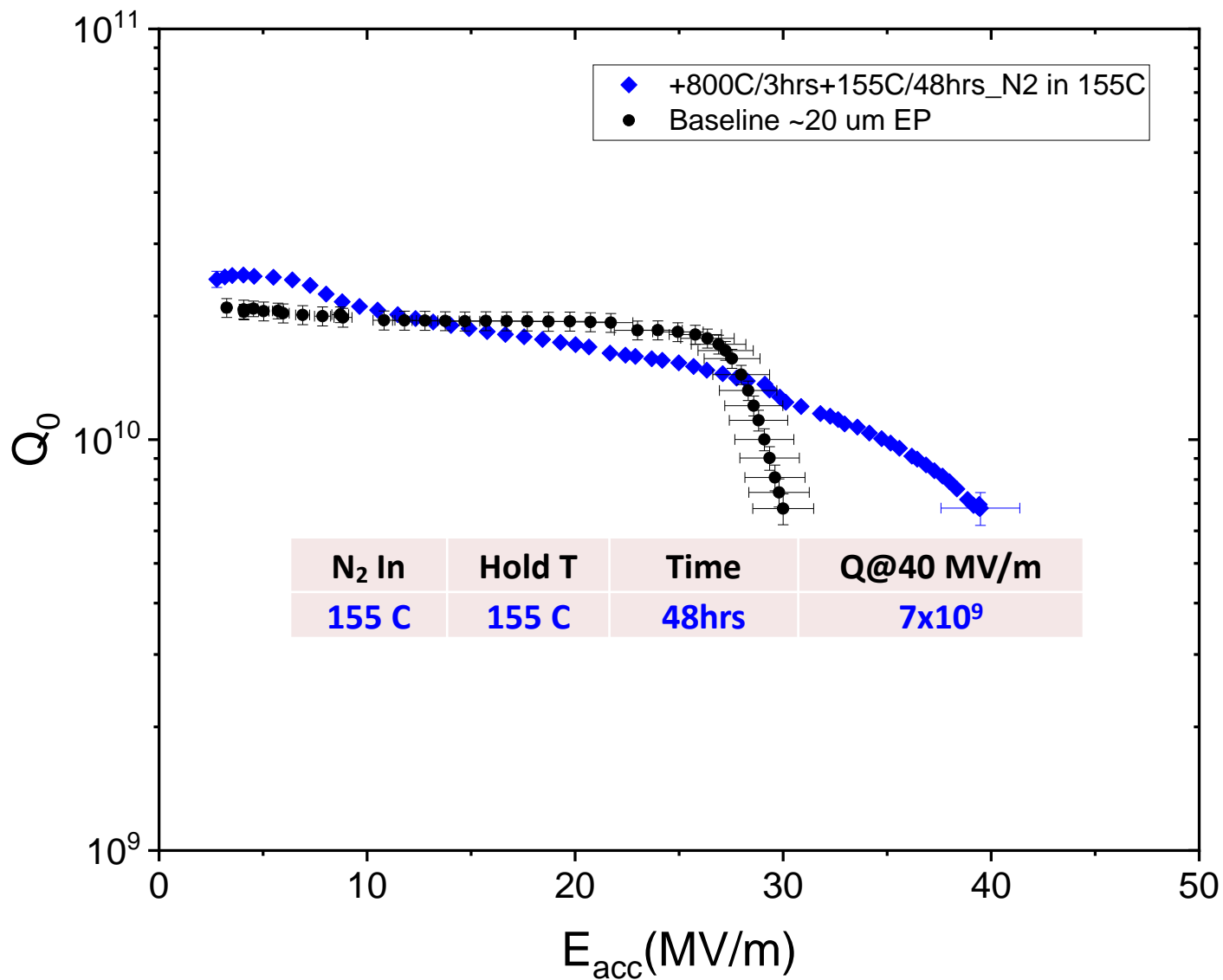
# Varying N2 Injection Temperature



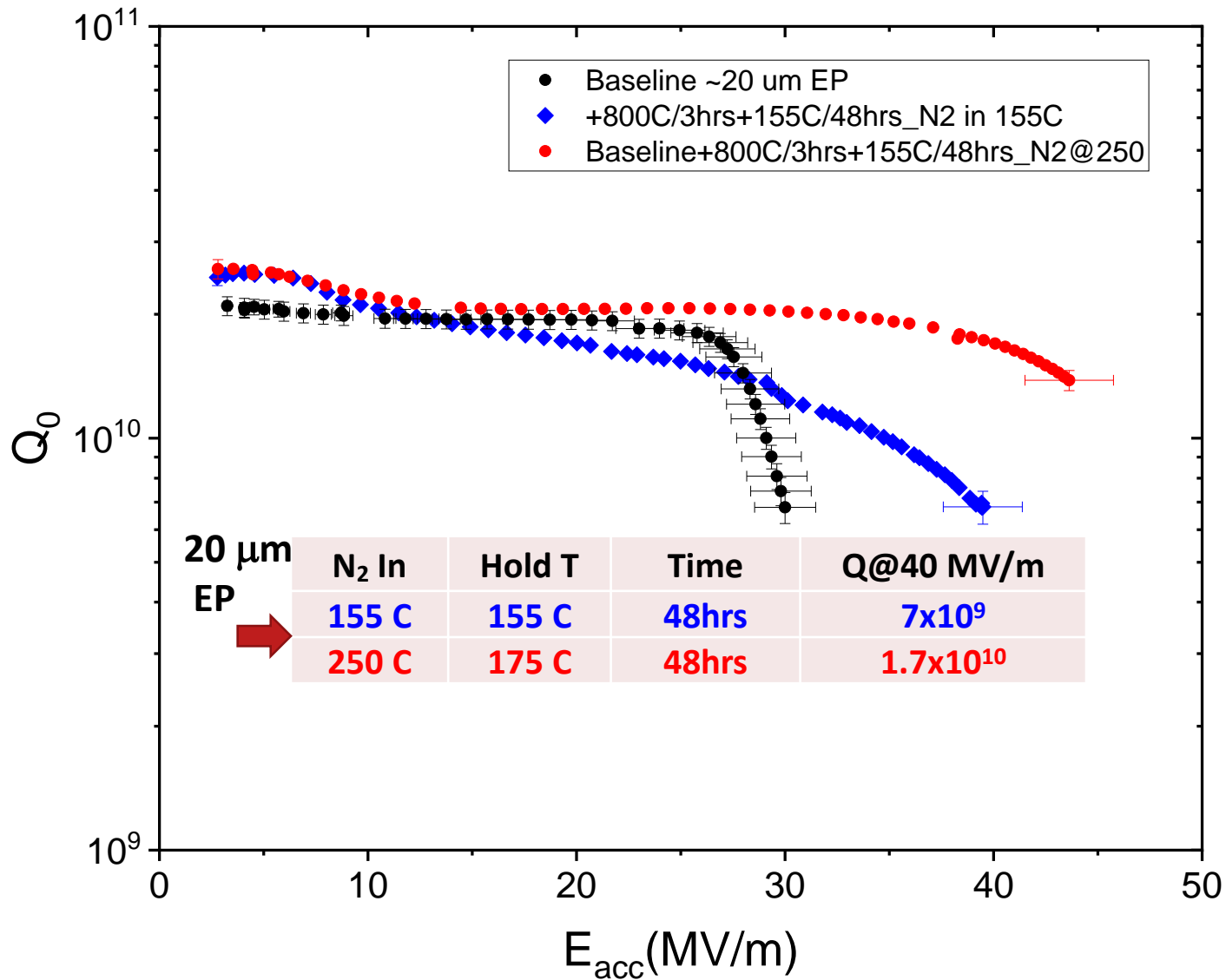
# RDT-06, 1.3 GHz



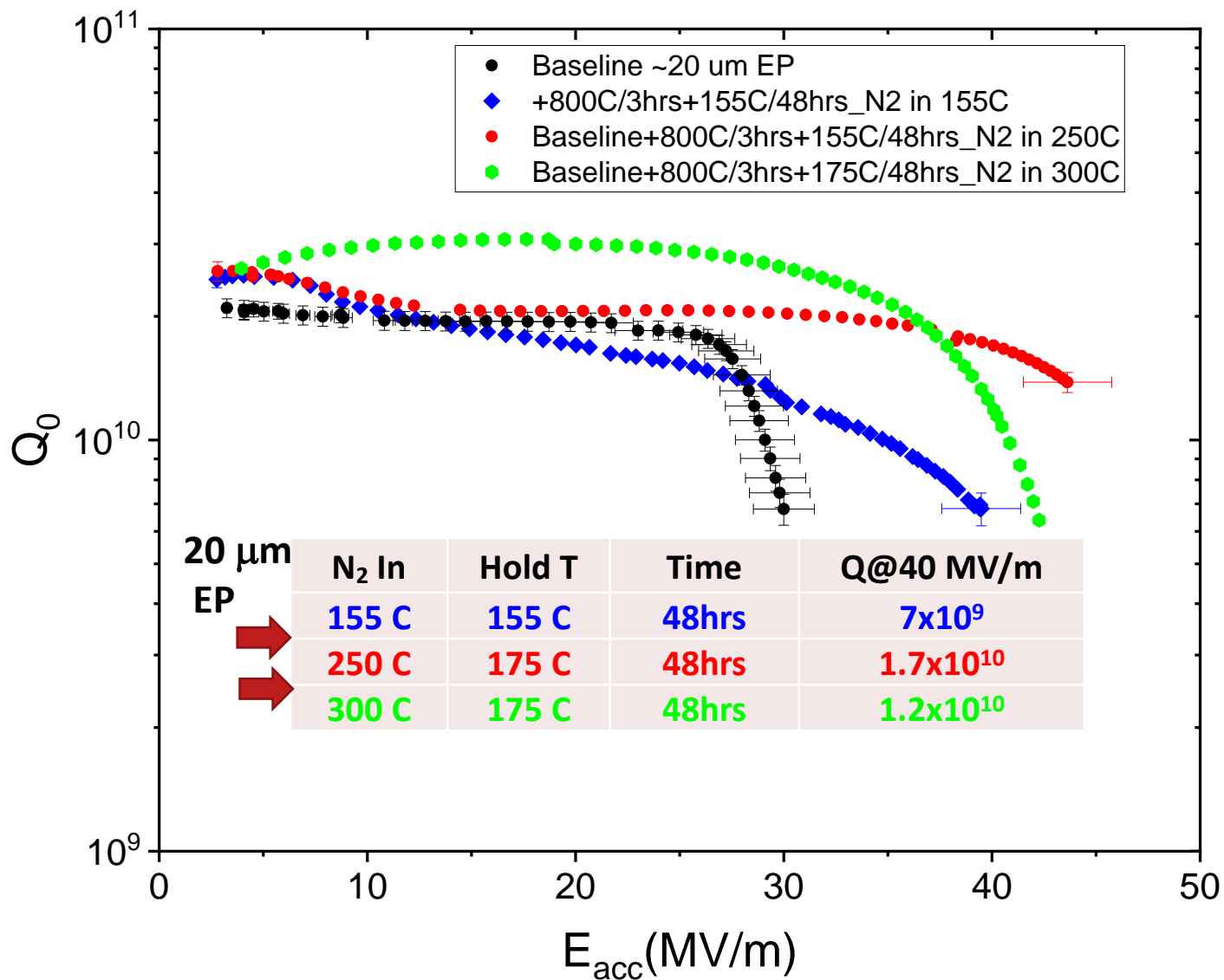
# RDT-06, 1.3 GHz



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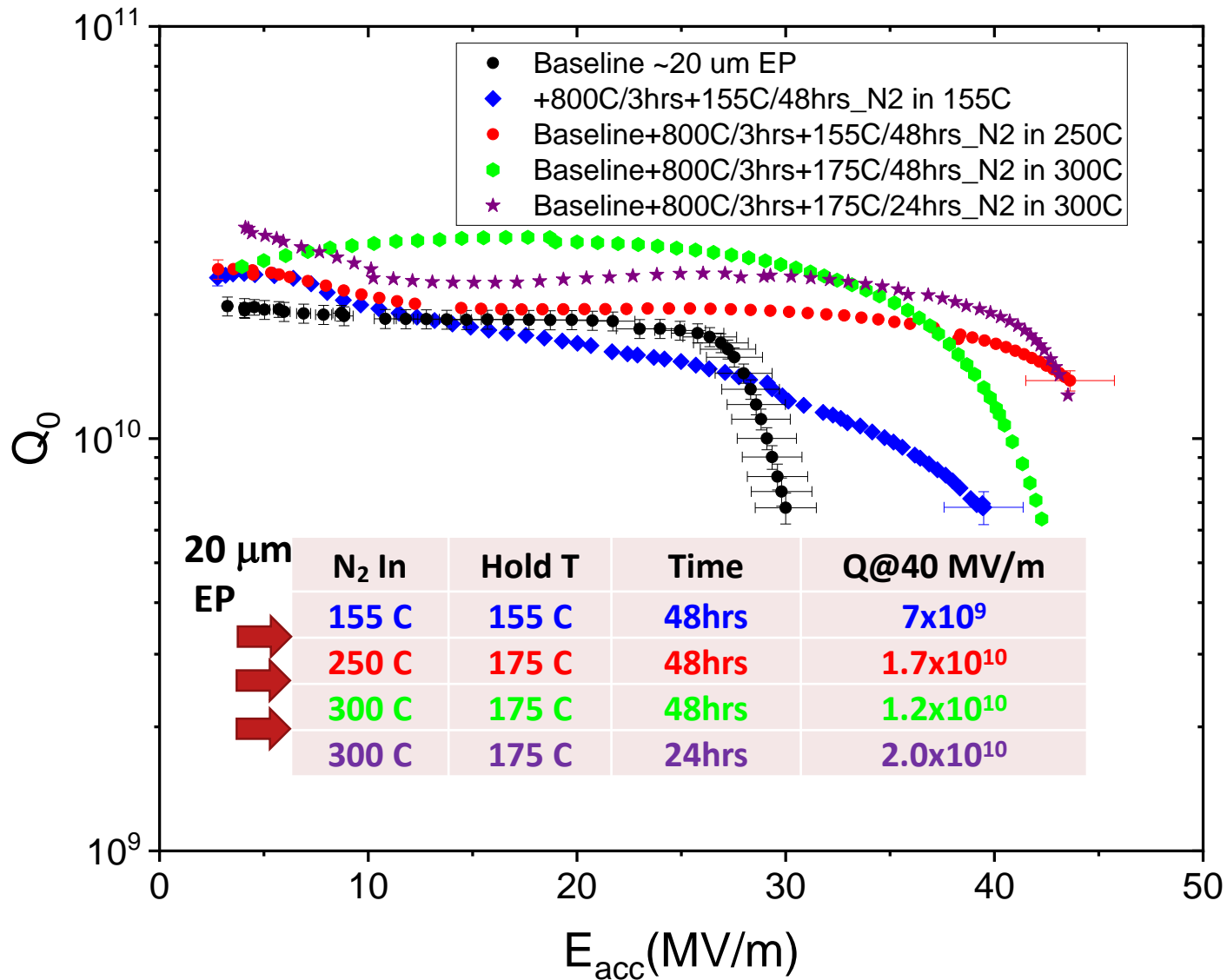


# RDT-06, 1.3 GHz

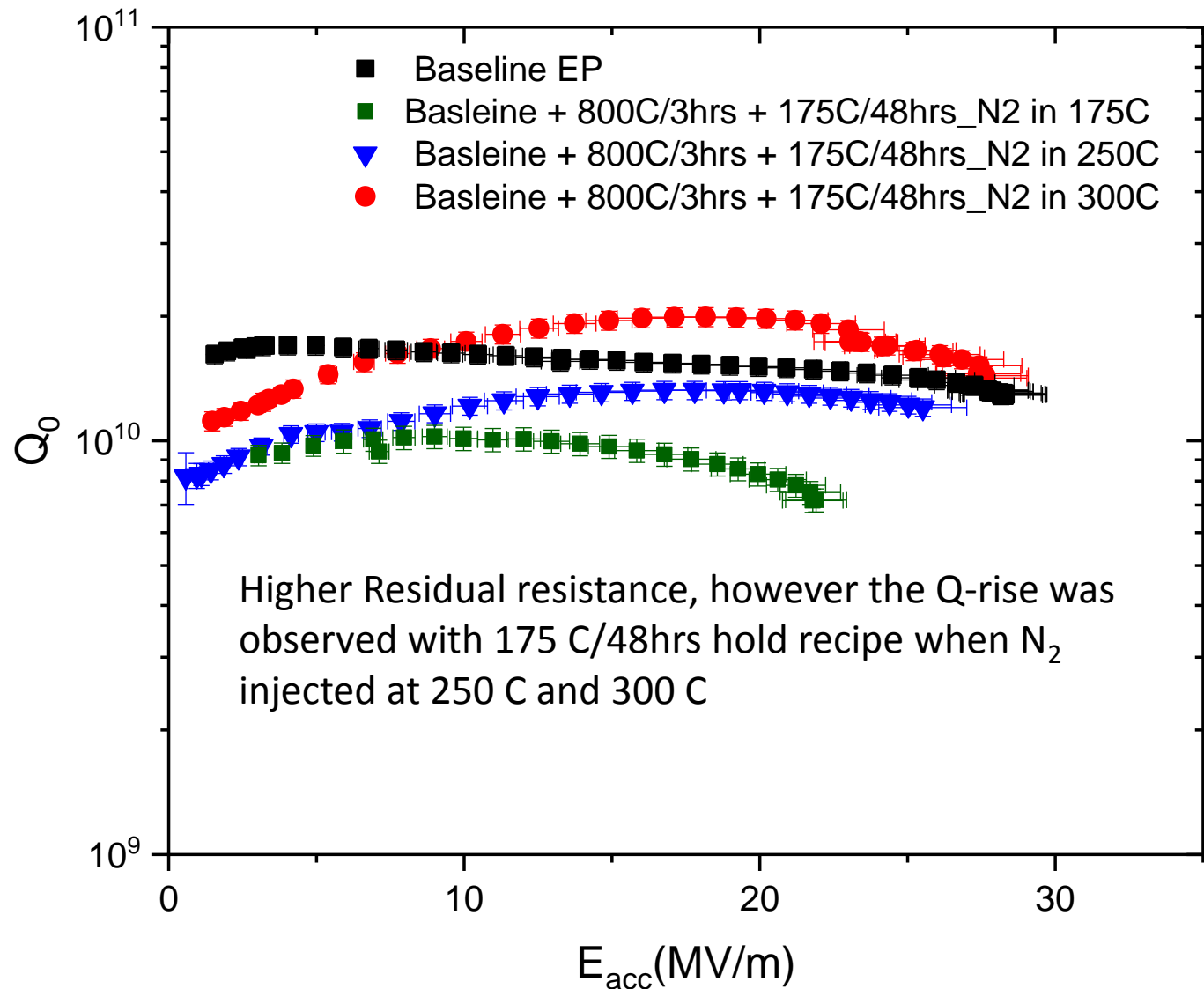




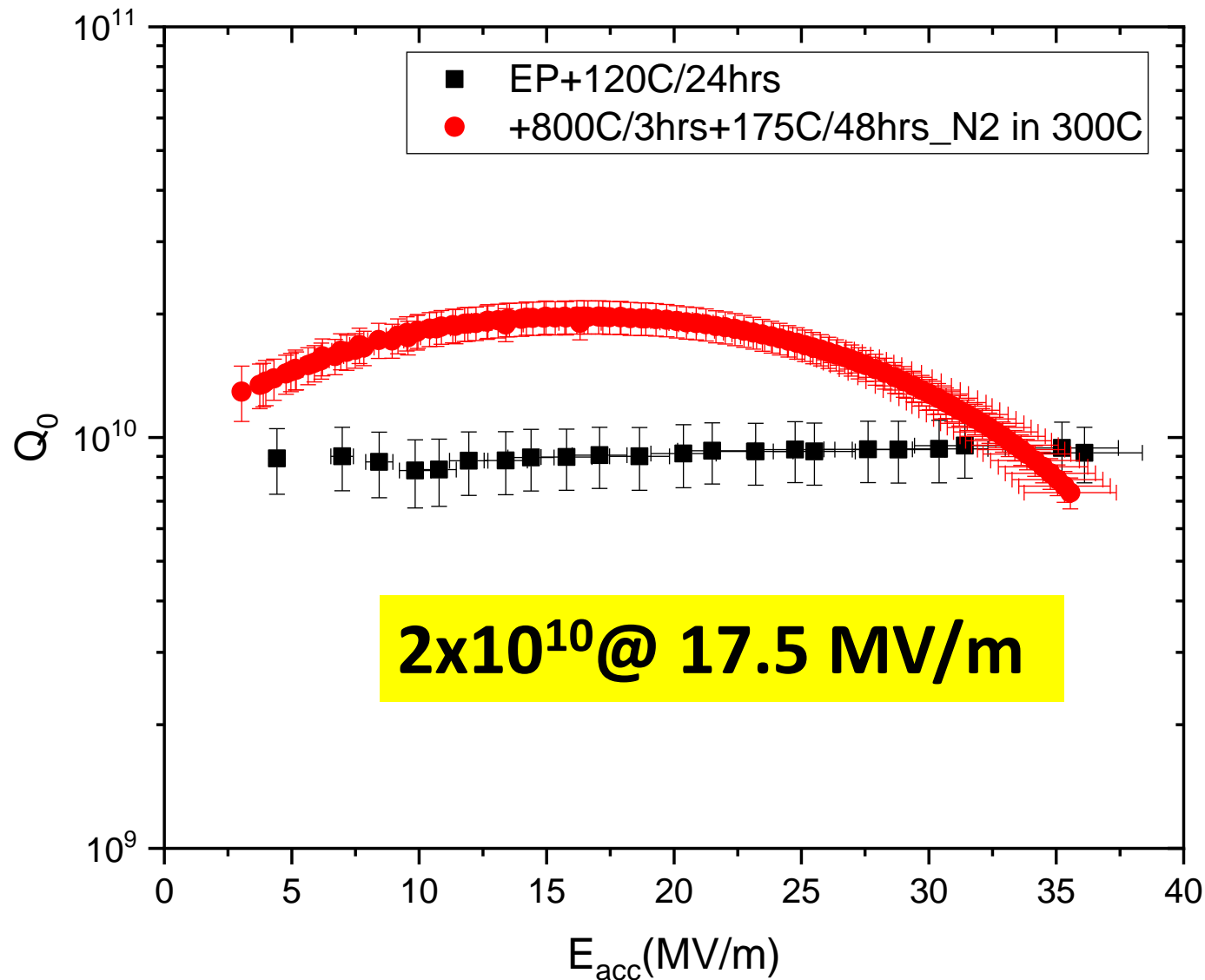
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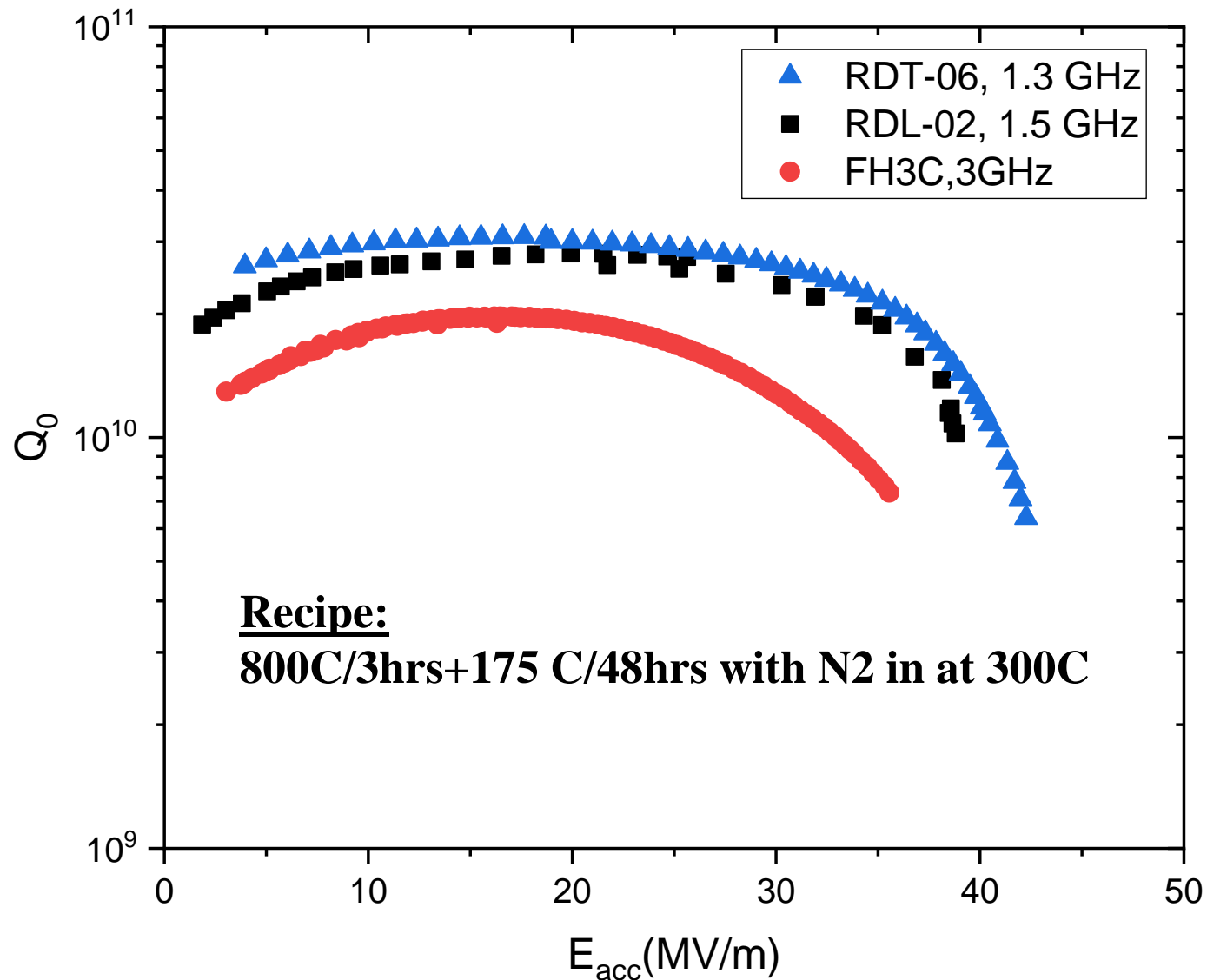
# RDL-0, 1.5 GHz



# FH3C, 3 GHz

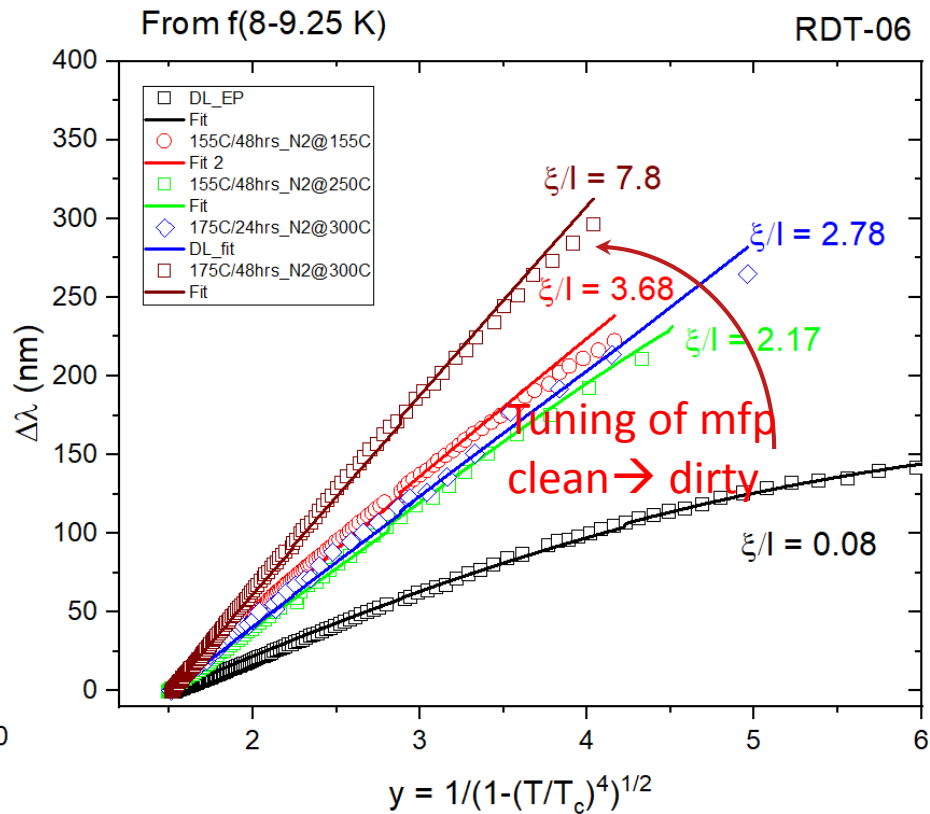
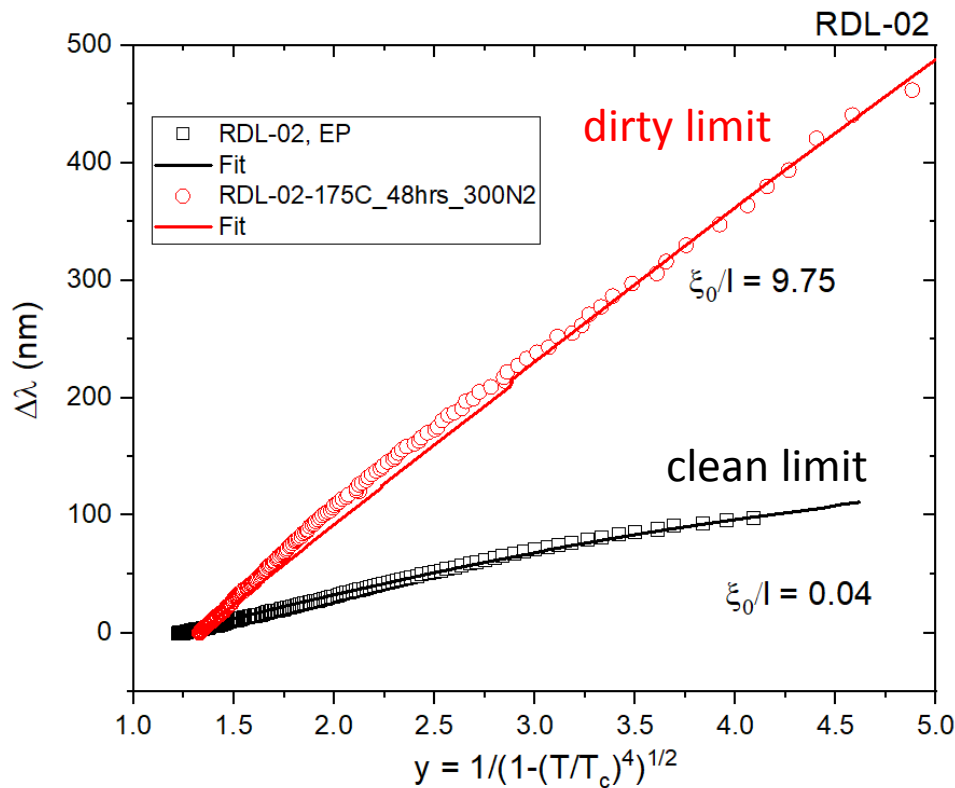


# Frequency Dependence

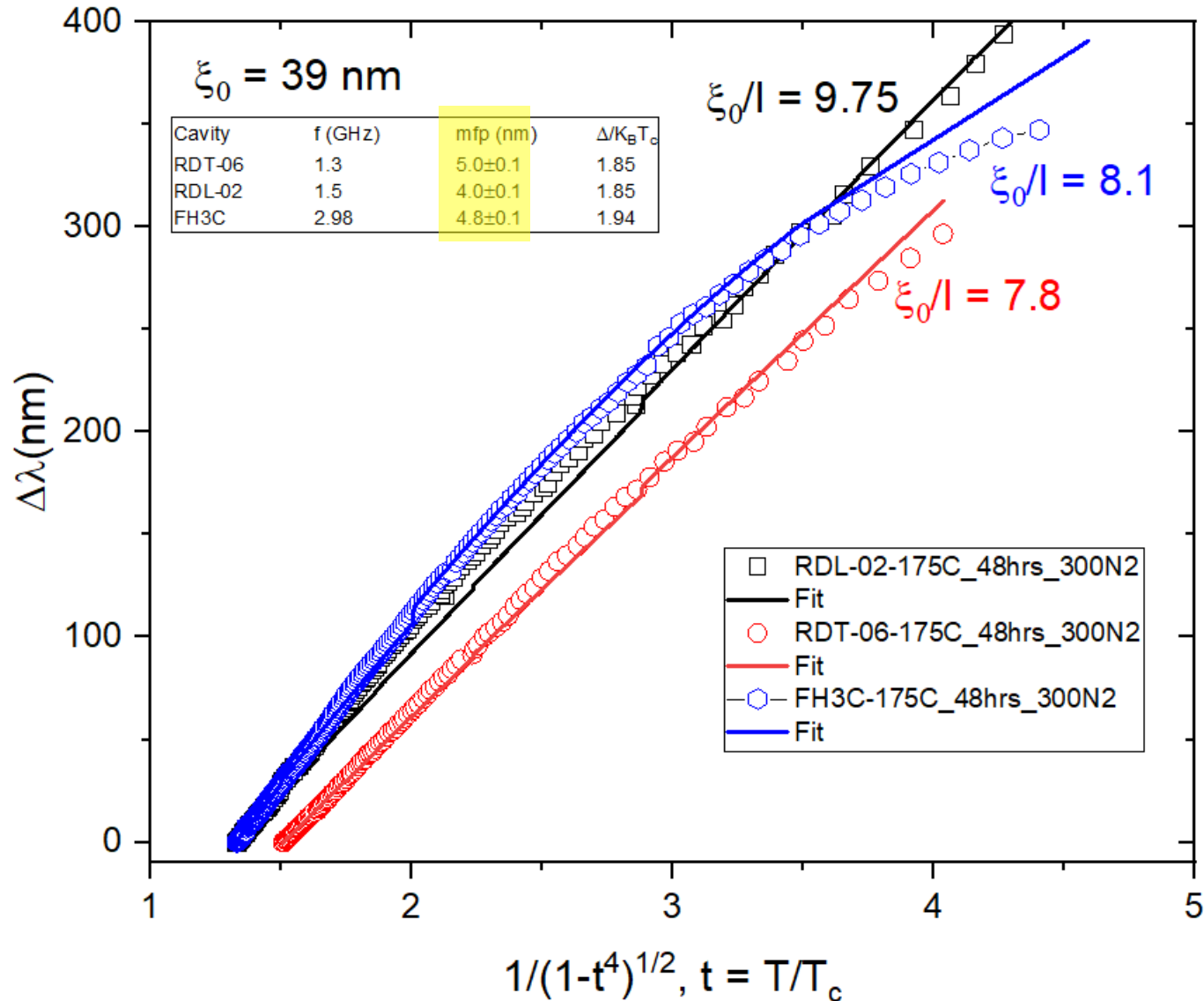


# Mean free path from f vs T data

Resonant frequency was tracked during the cavity warm up. The change in penetration depth with temperature was fitted with BCS theory in the temperature range (8-9.25K).  $T_c$ ,  $\lambda_0$ ,  $\xi_0$  was fixed as material parameters and  $\Delta/K_B T_c = 1.85$  in some cases, when wasn't available from  $R_s(T)$  fits



# Mean free path via $f$ vs $T$ data



# Summary

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- **RF performance of SRF cavity was tuned depending on the gas injection temperature, hold temperature and time.**
- **The same recipe applied to three different cavities with different frequency, showing the similar  $Q(E)$  dependence.**
- **The recipe will be applied to multi-cell cavities to reproduce the single cell results.**

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*Thank  
you*

