Q0 accuracy

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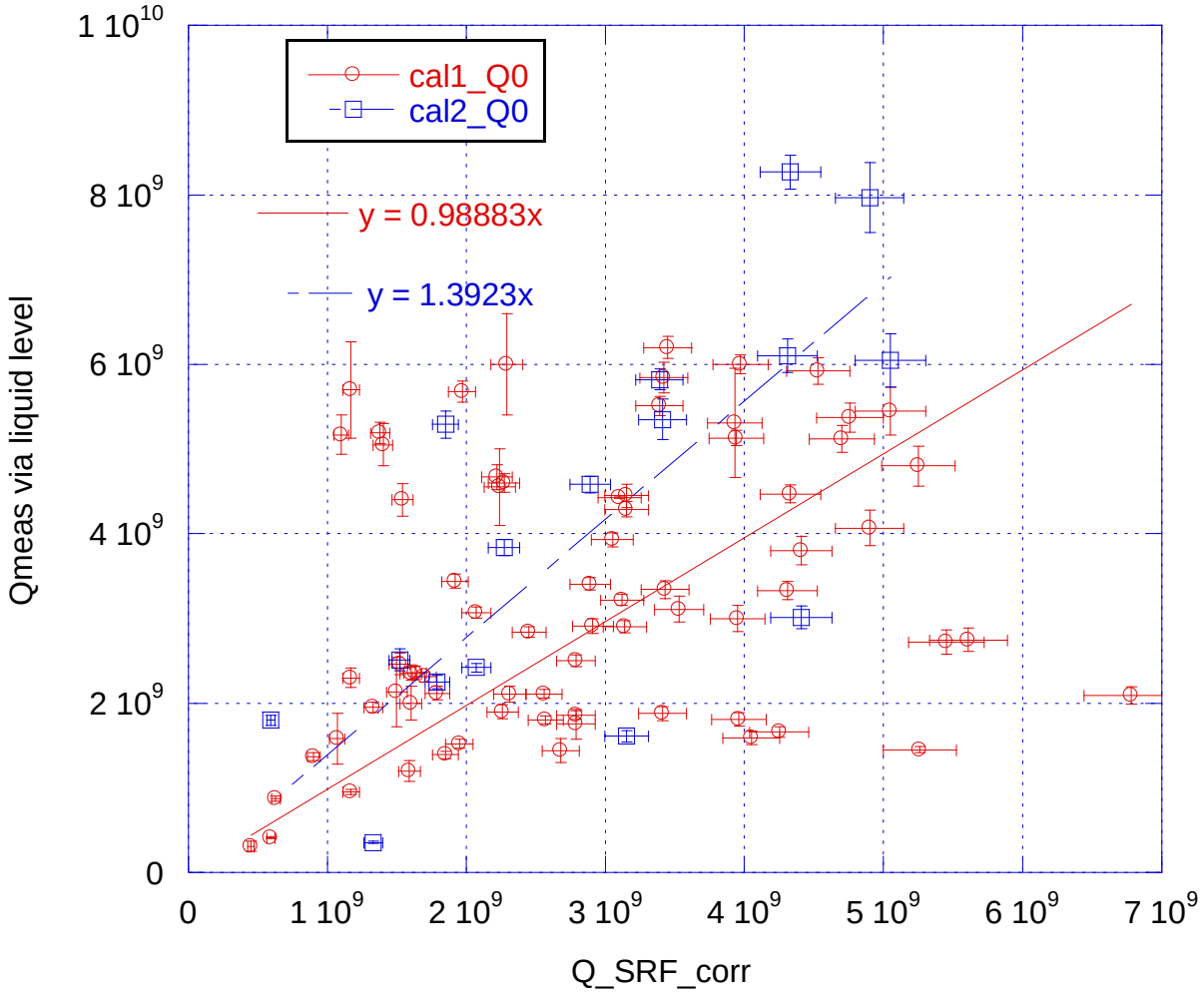
Cryo preference

- Cryogenics likes to run with ~5 W of heater margin per module, aka 5W of electric heat plus RF heat.
- Prior to helium processing, perhaps 50W RF heat for C20 and 100W for C50. After, perhaps 100W each.
- 5W/100W = 5%
- Per cavity Q0 accuracy ~15% yields ~5% per zone, ~20% per cavity yields ~7% per zone
- Note that these are one-sided: higher actual Qs tolerable, lower Qs an issue because electric heat drops to zero.
- Per-cavity goal Q0(meas) = Q0(actual) -20% +0%

Q comparison II – from 4/14 retreat



5% error bars used for SRF measurement (x), many SRF plots use 10%.

Q measurement program error bars used in y.

Lines provided for author's amusement.

cal1 and cal2 represent successive attempts on a given cavity, same x value

Ops cannot measure individual cavity Q0 via LL sensor to better than 50%

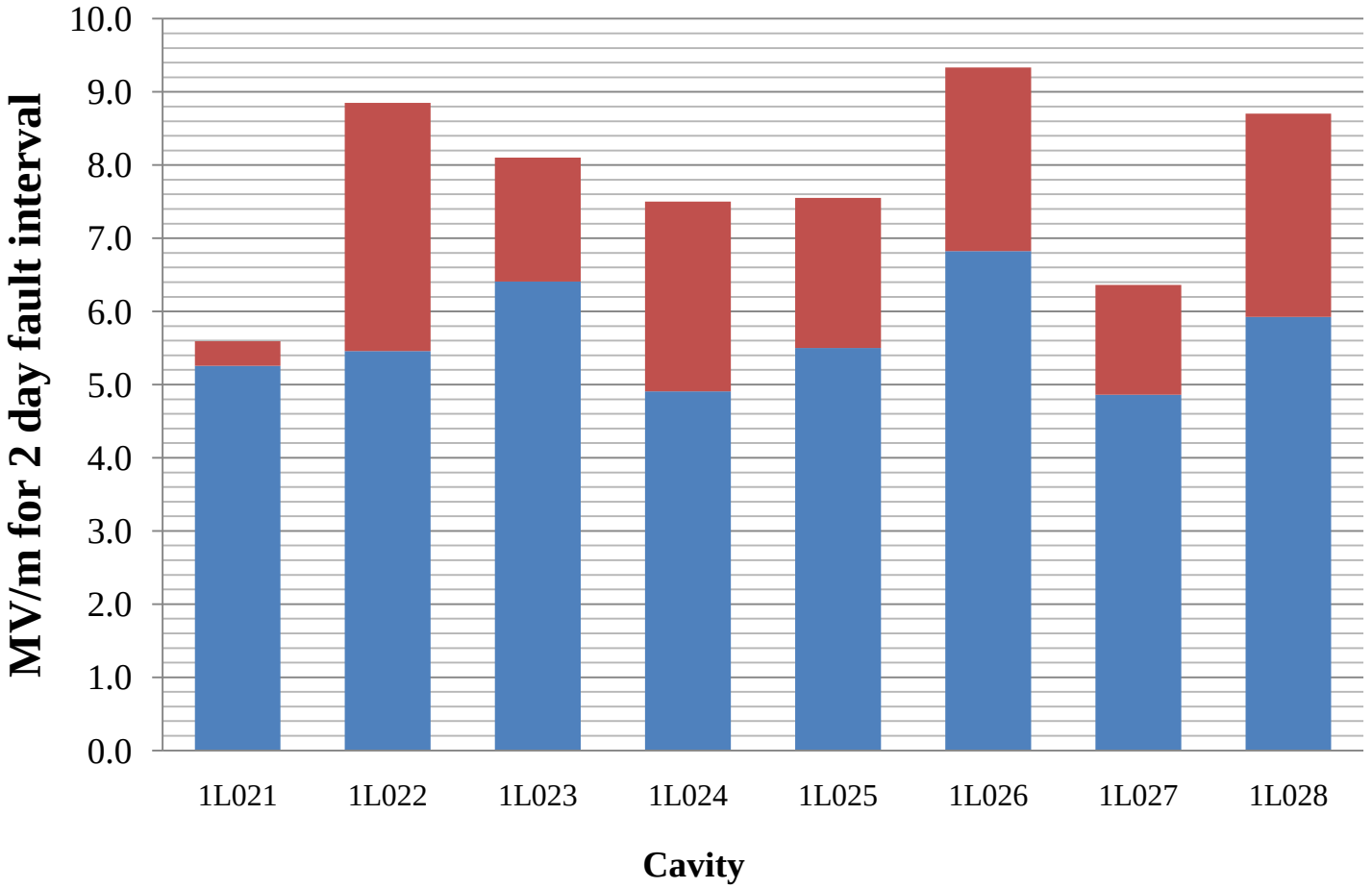
Suggestion

- Measure average Q of old zones instead
- Calibrate LL sensor delta vs electric heat ~80W with all RF in zone off, LL range ~90-75%.
- Turn all zone cavities on at gradients expected for 1090/linac and allow LL to drop to 75% or until a cavity quenches, whichever comes first. Calculate Q.
- This should provide average Q for zone to better than 5% at typical operating voltage, all that cryo really needs. If one wants more data, either increase or decrease gradients by constant increment in V^2 and repeat measurement.

C100s

- No LL range available for such measurement
- Assume Q0=1E10 throughout
- Set all cavities at 18 MV/m via ODVH
- Lem will set RF heat
- Observe JT valve over a couple of hours: does it open, close, or remain stable? How much is heater heat moving? Adjust Q0 in CED for each module as needed to get RF heat calculation within 5 W of reality.

NL02 Helium Processing 2015



Post-processing data obtained in ten dedicated shifts using FaultFinder program (CJS) and subsequently during Spring 2015 operations. Improvement (red) sum 16.8 MV/m = 8.4 MeV