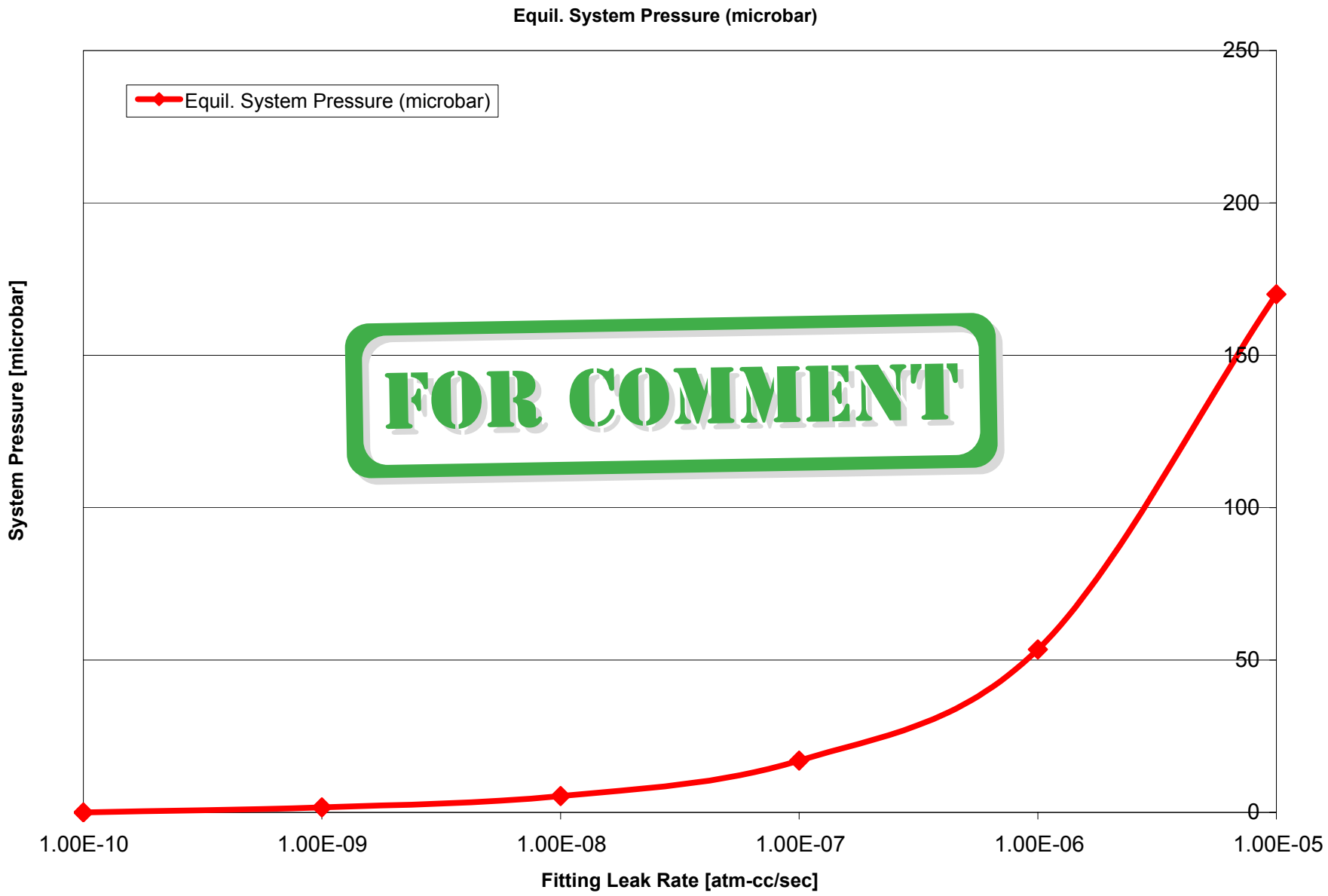
The following tests have been agreed on to qualify all seals in the pixel volume:

1.) He vacuum leak check (quanitative)
2.) 10 bar proof test (visual, assure that fitting doesn't mechanically explode, no more than 1 minute)
3.) 4 bar He pressurized leak check at 0 Celsius (quanitative)
4.) 1 bar He pressurized leak check at -35 Celsius (quanitative)
5.) He vacuum leak check (quanitative)
6.) Thermally cycle fitting assembly 50 times (20 to -50 C)
7.) Pressure cycle fitting assembly 50 times (1 to 4 bar)
8.) Repeat tests 1,3,4,5 (all quanitative, in that order)

Each potential seal type must have at least 10 specimens to run through the above sequence. If plastic seals are considered (as at LBNL) then an additional 10 fittings must undergo the same tests after irradiation, in order to compare with the control group.

As for the test requirements, we arrived at the following numbers:
1.) Permanent connections (welds, etc.) vacuum leak check to 1e-7 atm-cc/sec He.
2.) Seal leak rates under vacuum are 3e-5 atm-cc/sec He.
3.) Seal leak rates at 4 bar are 1e-4 atm-cc/sec He.

In order to determine if the system conductance is high enough to pump down to initial vacuum (before introducing C3F8), I calculated a ***rough estimate*** of the conductance and pressure for given fitting leak rates. I assumed 10 fittings per circuit, equal leak rates for all fittings, and a lumped global system conductance (meaning that all pipes and sizes are considered, but they are all lumped into one series conductance or resistance). This may be an optimistic estimate, so I am currently in the process of making a more exact calculation. I have attached a preliminary graph of my estimates, which shows that for the leak rate we propose for seals (3e-5), we will arrive at a minimum system pressure (in the capillary) of more than 175 microbar.


Equil. System Pressure (microbar)
Equil. System Pressure (microbar)
250
200
150
100
50
0
System Pressure [microbar]
1.00E-10
1.00E-09
1.00E-08
1.00E-07
1.00E-06
1.00E-05
Fitting Leak Rate [atm-cc/sec]
FOR COMMENT