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Dear Ms. Chatterjee,

I am writing to express my appreciation for the assistance provided by the SLAC ACD code development group ComPASS team last year in helping to understand a beam break up (BBU) issue in the CEBAF accelerator. Utilizing the advanced codes developed under the SciDAC program they were able to accurately model the superconducting cavity configuration installed in our prototype cryomodule and from external measurements “reverse engineer” what must have happened during assembly. This particular cavity had a non-standard preparation history that resulted in a mechanical distortion of the shape. Although the cavity performed well in the normal operating mode, a higher-order mode (HOM) that should have been damped was tilted away from the coupler designed to extract it. By using the unique and highly accurate algorithms and solvers developed at SLAC, Volkan Akcelik, Zenghai Li and their colleagues were able to reconstruct the cell-by-cell distortions that must have occurred to produce this effect. They predicted that this should have resulted in the cavity being shorter than the usual length by about 8mm (within the acceptable range but more than usual). Examination of inspection records from the cavity’s history revealed that this was indeed the case. The effect of this distortion in the dynamics of the CEBAF Linac was also confirmed by beam-based measurements. With this understanding we are now able to develop improved procedures to check future cavities and prevent a reoccurrence of this undesirable effect.

In general we have found that the codes and parallel solvers developed over the years by the SLAC code group under Kwok Ko, Cho Ng and their colleagues have by far the best accuracy and most sophistication of any available for the kind of electromagnetic problems that we encounter in our work. We continue to use these codes to investigate the higher frequency modes in our 12 GeV upgrade cavity design which will push the BBU threshold higher still to support a wider range of potential user requirements. Such precise simulation results, supported by our measurement data, save us large amounts of time during structure development and prototyping. We are very appreciative of the contributions this group has made to this effort and to the field in general.

Please feel free to contact me if you would like any further information on this successful collaboration.



R.A. Rimmer  
JLab SRF Institute Director.