Dear Yun

The problem you have with strong-strong simulation is much the same as encountered in simulating coherent
synchrotron radiation from short electron bunches in the short bend elements of chicane bunch compressors.

R. Talman, N. Malitsky, and F. Stulle
Emittance growth due to static and radiative space charge forces in an electron bunch compressor
PhysRevSTAB.12.014201.pdf

In my paper

R. Talman,
String formulation of space charge forces in a deflecting bunch
Phys. Rev. STAB. 7, 100701 (2004)

I model point charges as longitudinally aligned strings (for which the transverse force varies as 1/r
rather than 1/r^2). This reduces the divergence to be only logarithmic in the transverse distance of
closest approach. The electric field of short strings is given in my paper.

A briefer discussion is contained in my book

R. Talman, Accelerator X-Ray Sources (Wiley-VCH, Weinheim, 2006), Chap. 13.

One then has only to demonstrate that the effect of these close encounters has become negligibly small for
strings long compared to the electron and short compared to everything else. This provides an appropriate
value for the string lenth in the simulation.

Best
Richard