Homework 2 (version 2): (PHY249 Plasma Accelerator Physics, Fall 2021, Tajima)

Deadline: Oct. 19 Monday, 2021, 5pm to ttajima@uci.edu (cc: to Greg: huxtablg@uci.edu)

(Your **collaboration among your colleagues** is encouraged. If you work together to work out the homework, please show your colleagues' names together in your submission. (If you wish to submit your homework answer collectively together as a group, that is also OK with showing on who are your co-authors. If you have any questions, feel free to ask me).

A.

Argue why higher the (longitudinal) plasma wave phase velocity v_{ph} is, it is more robust. Show which plasma electrons are trapped [ref. T. O'Neil, Phys. Plasma **8**, 2255 (1965)] by such a wave whose trapping width is $v_{tr.}$.Then, derive the Tajima-Dawson field $E_{TD} = m\ \omega\_p\ c / e$ when you set v_{tr} is the ultimate phase velocity of $v_{ph} = c$.

B.

Show that if you set the wakefield phase velocity lower than the speed of light c, say at v_{ph}, then we obtain the saturation field E_{ph} of wakefield as $E_{ph} = E_{TD}(v_{ph} / c)$.

(Your derivation may be either mathematical, or verbal, or their mixture).