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## High quality plasma wakefield acceleration experiment in linear regime at SPARC\_LAB

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The possibility to design an high quality beam driven plasma based accelerator in linear regime will be investigated. The high quality requirements for a driving bunch in order to create a plasma wakefield in blow-out regime will be stated. Starting from the very well established cold fluid plasma model a set of equations will be presented in order to describe the fields generated by a low quality driver. Those equations will be used to fix the trailing bunch requirements for an high quality acceleration. High brightness trailing bunch will result to suffer a lower degradation while accelerated in a linear regime plasma wakefield. The beam loading effect results to be not negligible for this kind of trailing bunches in realistic situations. It will be showed how in this case, assuming energy spread compensation, the transverse matching of the trailing bunch doesn't depend on driving bunch parameters. The design of a scheme involving low quality driving bunch and high quality trailing bunch will result to be compatible with high quality acceleration. The requirements of the working point will be compared to the simulation results for the SPARC\_LAB injector, obtained via the hollow beam velocity bunching scheme.

### Summary

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