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Non-linear propagation effects in Fast Radio Bursts

The discovery of Fast Radio Bursts (FRBs), bright flashes of millisecond duration, has been a major breakthrough in radio astronomy. Sufficiently close to the engine, electrons in the field of the FRB electromagnetic wave oscillate with relativistic velocities. In this regime, the propagation of FRBs is subject to non-linear effects, including modulation/filamentation instabilities. I will show that the dispersion relation of FRBs is strongly modified because FRBs are filamented, and argue that this effect can explain the substantial fluctuations of the FRB dispersion measure on short time scales. I will show that the radiation filaments are scattered and interfere with each other as they propagate outwards, and discuss the imprint of this process on the spectrum of FRBs. Finally, I will show that the modulation of the wave intensity along the direction of propagation can explain the fast variability of FRB light curves.

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