Low Dimensional Phase-Locking in Laser-Plasma Non-Linear Interactions[*], G.I. DE OLIVEIRA, L.P.L. DE OLIVEIRA, and <u>F.B. RIZZATO</u>, IF-UFRGS, Caixa Postal 15051, BR 91501-970 Porto Alegre, RS, Brasil - In this paper we identify phase-locked states among the solutions of the equations describing the interaction of high-frequency laser waves with low-frequency electrostatic wake field modes[1]. Locked states appear as resonant island chains in the appropriate Poincaré plots. These plots allow an accurate canonical description of the system immediately after an inverse pitchfork bifurcation de-stabilizing an initially homogeneous steady-state. If one is very close to the bifurcation point, nonlinear saturation of the initial instability is provided by quasi-static integrable density fluctuations but as one proceeds away from that point, resonant nonintegrable fluctuations become gradually more important; we show that the phase-locked states result from those resonant fluctuations[2].

1 G.I. de Oliveira, F. Rizzato, and A.C.-L. Chian, Phys. Rev. E 52, 2025 (1995).
2 G.I. de Oliveira, L.P.L. de Oliveira, and F. Rizzato, Phys. Rev. E submitted (1996).