FSR-Cavity Round Trip Time relationship

Wednesday, April 6, 2022 2:30 PM

The FSR of an optical resonator is the spacing of its axial modes in frequency.

For an empty standing-wave resonator of length L,

$\lambda_n = \frac{2L}{n}$ for the 'n'th mode

$\Delta\lambda = \frac{2L}{1}$

$\therefore \Delta\nu = \frac{c}{\Delta\lambda} = \frac{c}{2L}$

For a SWR filled with a medium of group index n_g,
standing wave resonator

$\Delta\nu = \frac{c}{2Ln_g} = \frac{c_m}{2L}$ where c_m is the group velocity in that medium

$\therefore \frac{1}{\Delta\nu} = \frac{2L}{c_m}$ which is equal to cavity round-trip time!!