Parametric oscillator

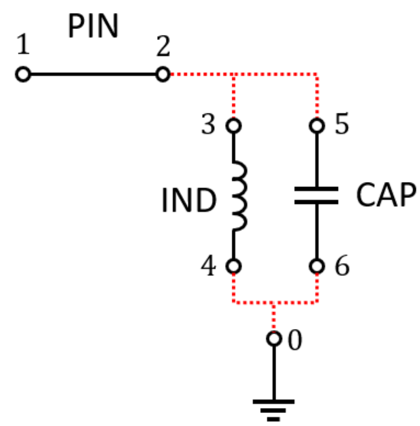

Figure 1. Schematic of elements connection

We modulate capacitor at the frequency f_{mod}:

$$C(t) \ = C_0 + dC \cos 2\pi f_{mod} t$$

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clear
SI_units

C0 = 15*pF;
L = 1.7*nH;
dC = 5*pF;

crt = FloquetCircuit(); % create a new CFSM circuit
crt.freq = linspace(0.001,1,300)*GHz; % specify frequency range
crt.freq_mod = 2*GHz; % specify modulation frequency
crt.N_orders = 1; % number of Fourier-harmonics to simulate, here [-1,0,1]


% Next, we provide the function C(t) where t=[0…T]. Note that since C(t) the FFT is used
% to compute the harmonics, the number of elements in t should be the power of 2 for
% accuracy. The modulation profile can be arbitrary but must be always over 1 period.
t = linspace(0, 1./crt.freq_mod, 2^10);
C = C0 + dC*cos(2*pi*crt.freq_mod*t);

add_capacitor(crt, 'CAP', C)
add_inductor(crt, 'IND', L);
add_pin(crt, 'PIN');

connect_by_ports(crt, 'PARAMETRIC', {'PIN','CAP','IND'}, {[2,3,5], [4,6,0]});

crt.analyze();

figure
% We want to see gain in the 0-th harmonic and also observe the behavior of -1st and +1st
% harmonics. To do so, after {'S(1,1)'} we specify the harmonics to- and harmonics from
% which we want to plot. So, we are plotting three curves:
%       S11(f_{-1}, f_{0})
%       S11(f_{0}, f_{0})
%       S11(f_{+1}, f_{0})
$ where f_{n} = f_{0}+n*f_mod
plot_sparam_mag(crt, 'PARAMETRIC', {'S(1,1)'}, -1:1, 0, 'XUnits', 'GHz');
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