Sharif University of Technology

Communication Circuits

Problem set 1

Due Date: Tuesday, 25 mehr

You may submit your solutions in class or in the box.

1. Consider the 11g sliding-IF reciever shown in figure1: (the input RF range:[f1,f2]).
    - Determine the required LO frequency range.
    - Determine the image frequency range.
    - Is this architecture preferable to that in figure 2? Why?
    - Determine some of the mixing spurs in the architecture of figure 1.

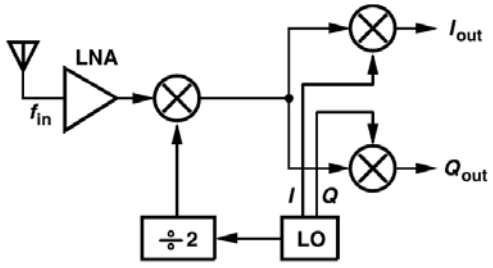

Figure 1 sliding IF reciever for 11g

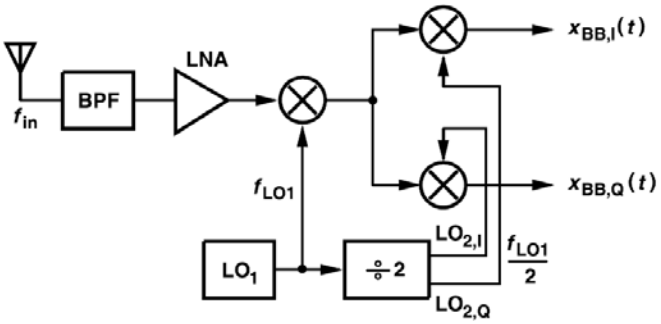

Figure 2 sliding IF hetrodyne reciever

2. A 1GHz reciever with 1MHz channel spacing must tolerate an alternate adjacent channel blocker 15dB higher than desired signal. Caculate the Q of second-order LC filter required to suppress this interferer by 33dB.
3. Downconversion to what minimum itermediate frequency avoids self-corruption of asymetric signals.
4. Calculate the input-referred gain, NF, and IIP3 of the following reciever. Assume the input LNA is matched to 50Ω, while the LNA/mixer interface is 300Ω, and the mixer load is 1kΩ differential. The filter input impedance is capacitive (high-Z), and VGA drives a 10kΩ//5pF differential load.

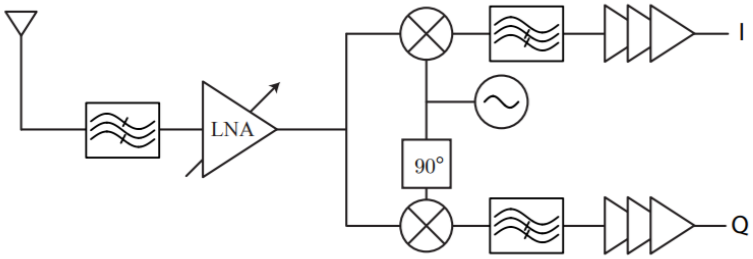

Figure 3 simple reciever

Block	Gain	NF	IIP3
RF Filter	-1dB	1dB	+100dBm
LNA	15dB	1.5dB	+0dBm
mixer	10dB	8dB	+16dBm
IF filter	-5dB	5dB	+100dBm(referred to 50Ω)
VGA	+65dB	15dB	+20dBm(referred to 50Ω)

Figure 4 spec for each block

Voltage Gain	91.78dB
NF	2.74dB
IIP3	-9.71dBm

Figure 5 overall performance