

[SOLVED] - Oscillators for FM radio

Welcome to EDABoard.com

Welcome to our site! EDABoard.com is an international Electronics Discussion Forum focused on EDA software, circuits, schematics, books, theory, papers, asic, pld, 8051, DSP, Network, RF, Analog Design, PCB, Service Manuals... and a whole lot more! To participate you need to register. Registration is free. Click here to register now.

Thread starter [Chiranka K](#)

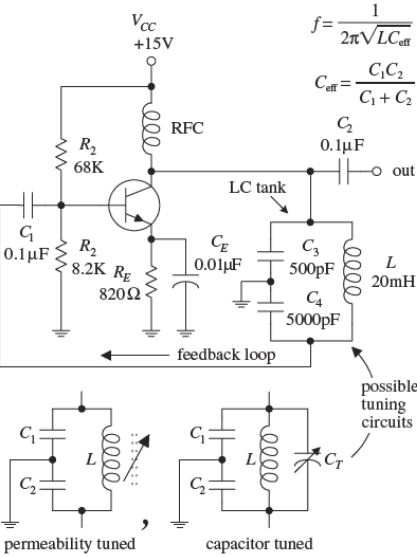
Start date [Dec 3, 2024](#)

Status  
Not open for further replies.

I was building a radio receiver for FM waves (87.5-108MHz), I want to build every block on my own (oscillators, mixers, demodulators) and then put them together. I was designing a oscillator, and came across 2 options

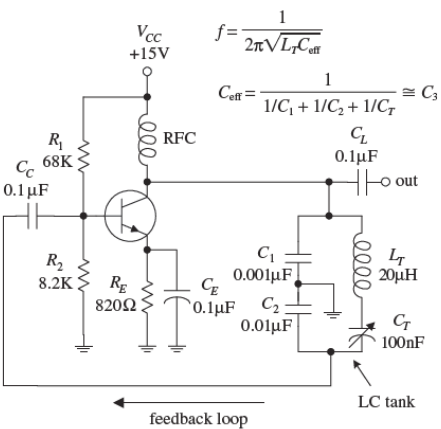
1. Colpitts

Colpitts LC Oscillator



2. Clapp

Clapp Oscillator



I had a few doubts

1. Which of these two performs better?
2. What range of frequency should my LO be able to give?
3. What IF frequency to use (I did my research and most of them show 10.7Mhz).
4. while running a simulation of this on LtSpice, what component should I use for RFC, and what BJT should I use?

Finally, do u think I should be building a receiver for AM or for FM as my first radio receiver?

Thank you.  
Chiranka K

1)

2) Thats receiver design and band targeted driven selection.

3) 10.7, because of component availability. But if doing LF or HF many receivers use 100Khz or 50 Khz or 455 Khz. Amateur Radio Handbook many discussions on receiver design.

4) BJT selection, low noise, fT of roughly 10X frequency of interest. Chokes -

Regards, Dana.

1)

2) Thats receiver design and band targeted driven selection.

3) 10.7, because of component availability. But if doing LF or HF many receivers use 100Khz or 50 Khz or 455 Khz. Amateur Radio Handbook many discussions on receiver design.

4) BJT selection, low noise, fT of roughly 10X frequency of interest. Chokes -

Regards, Dana.

Thanks Dana,  
Do you think my first radio project should be targeting FM band or AM band?

AM, it gets as simple as :

Coil: 1.6 inch o.d. 23awg Wire  
Antenna: 5 turns  
Detector: 30 turns tapped at 20turns.

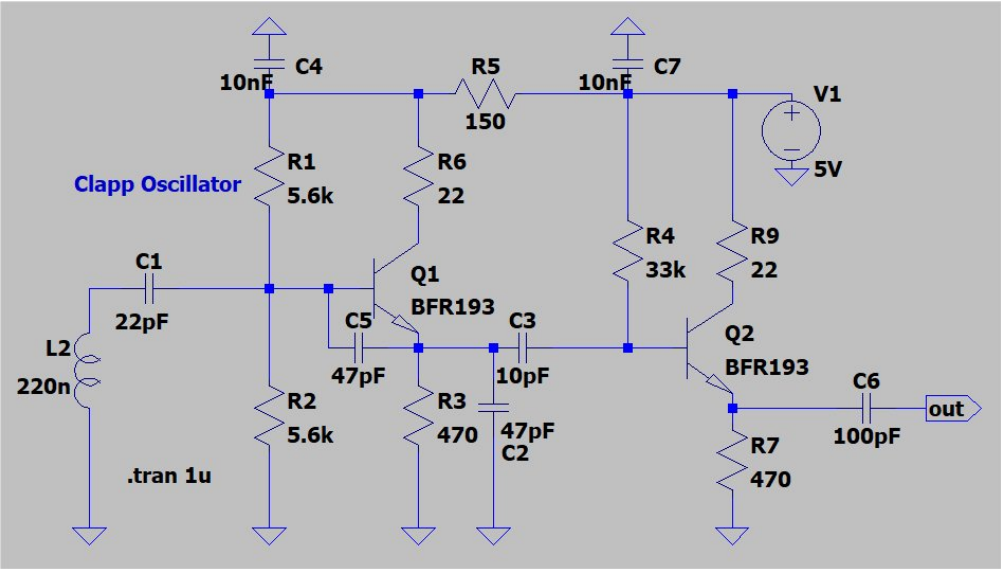
Shortwave Crystal Radio  
(c) 2002, D. Schmarider

There is a fair amount of activity by hobbyists in this :

[vfone](#)

Advanced Member level 6

Usually Clapp oscillators have better frequency stability than Colpitts oscillators, due to series configuration of the LC resonator.  
In the schematic attached if vary C1 between 15pF and 36pF you get a 88MHz to 108MHz signal. C1 could be replaced by a varactor.



Usually Clapp oscillators have better frequency stability than Colpitts oscillators, due to series configuration of the LC resonator.  
In the schematic attached if vary C1 between 15pF and 36pF you get a 88MHz to 108MHz signal. C1 could be replaced by a varactor.

Is Q2 here used just to get a better gain?

Its to act as a buffer and unload the Clapp LC circuit.

Its to act as a buffer and unload the Clapp LC circuit.

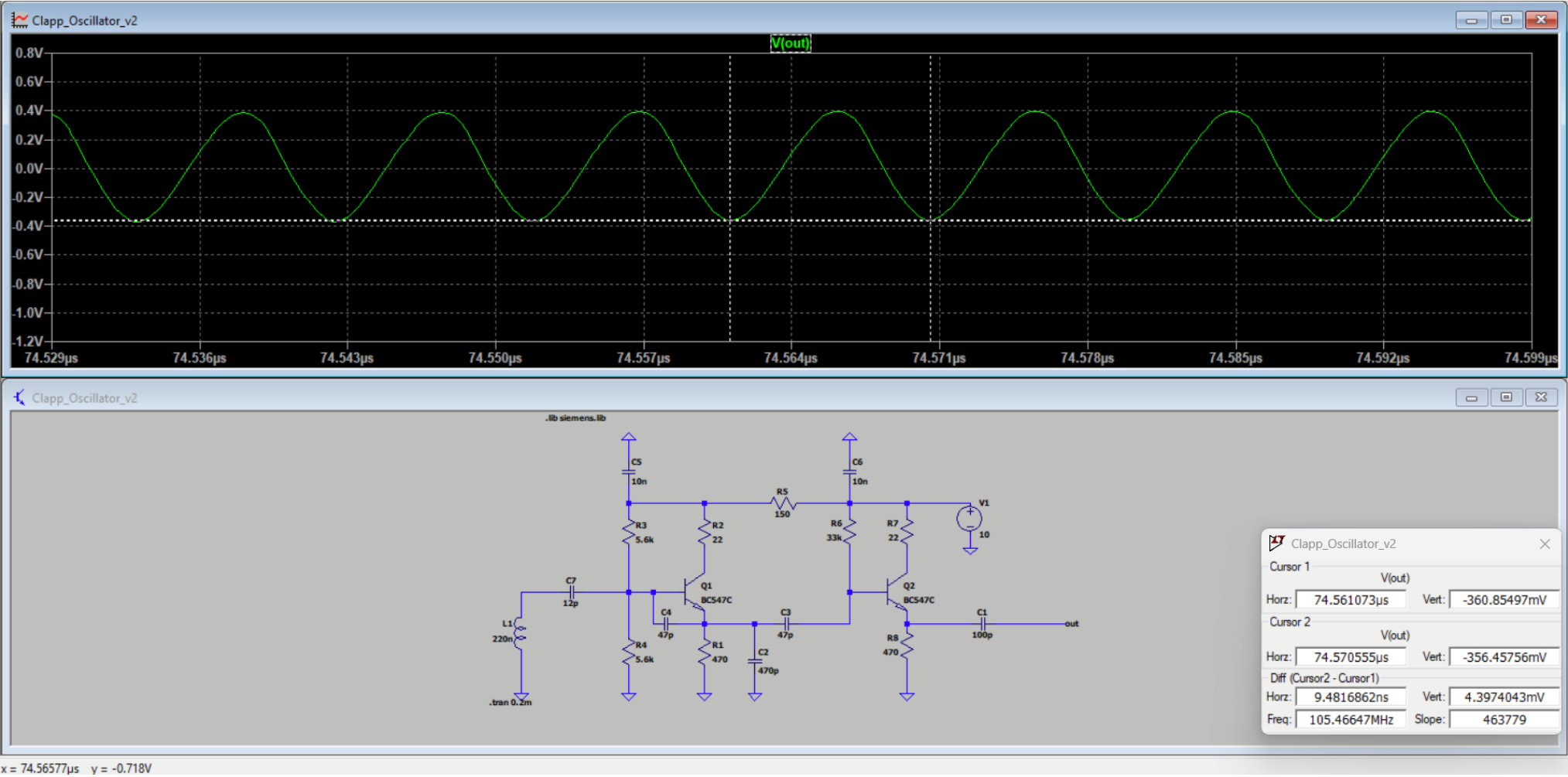
and why is the tank (LC series connection) at a different position compared to the other clapp circuits

[vfone](#)

Advanced Member level 6

In the Clapp oscillator in #1, the resonator components (Lt and Ct) are also in series.

In the Clapp oscillator in #1, the resonator components (Lt and Ct) are also in series.



I did a simulation and got a wave form similar to this, i can tune C7 from 12p to 18p to get my desired frequency range.  
However the waves are not pure sine, will it have any problem in mixing stage and on the overall receiver?

Usually Clapp oscillators have better frequency stability than Colpitts oscillators, due to series configuration of the LC resonator.  
In the schematic attached if vary C1 between 15pF and 36pF you get a 88MHz to 108MHz signal. C1 could be replaced by a varactor.

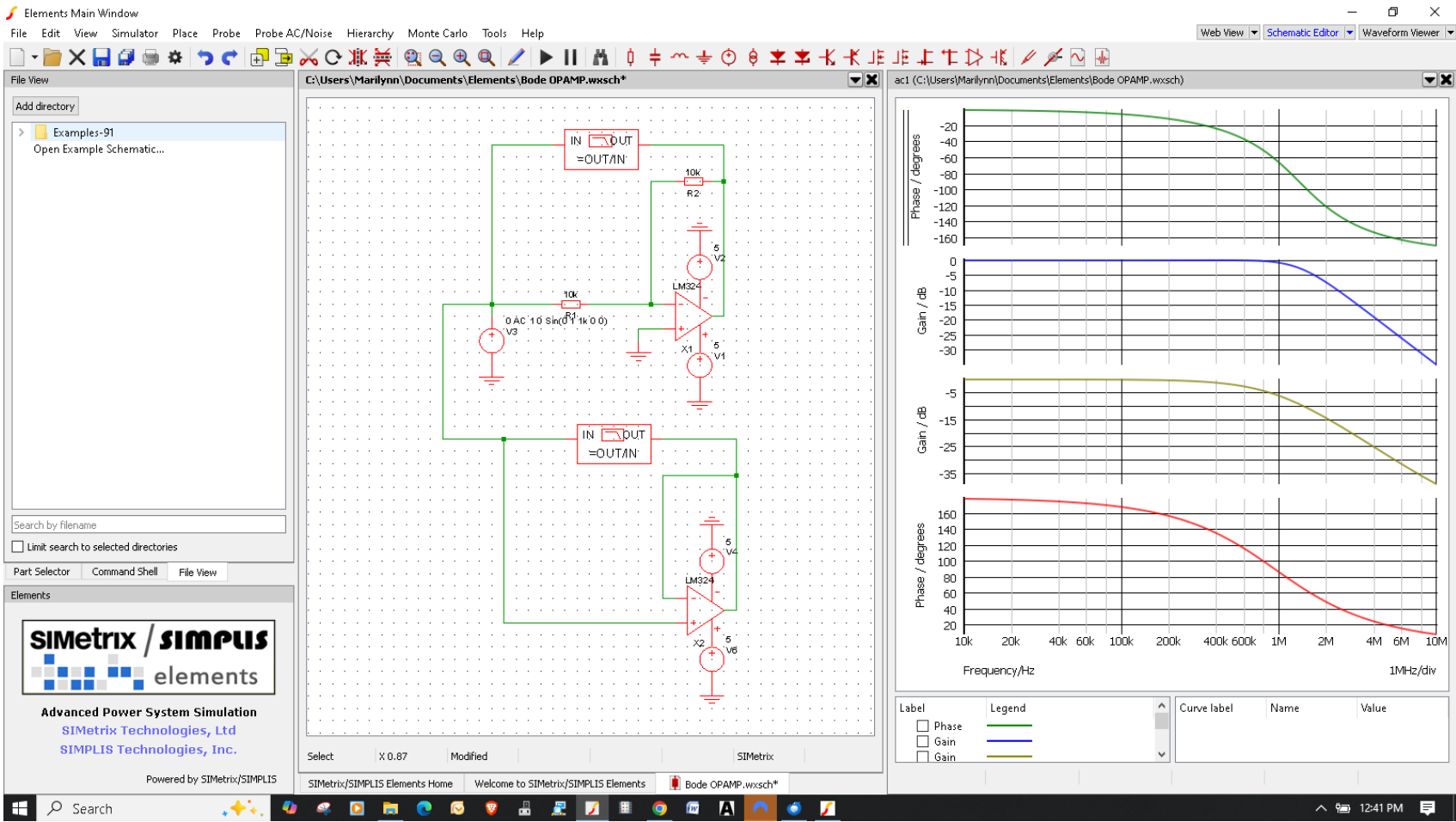
How can i do a small signal analysis, i want to plot the BODE of open loop gain,

Breaking the loop : <https://www.planetanalog.com/the-basics-of-op-amp-loop-stability-analysis-breaking-the-loop/>

Above closed loop method.

Tradition break the fdbk loop and sweep input with a sine gen (simulation or bench) to get at phase/gain plots. But as above article points out that changes the I/O port Z's and is not as realistic as perturbing the loop and performing the analysis.

This is a closed loop case analysis (the OpAmp is configured closed loop) :



Regards, Dana.

Last edited: Dec 5, 2024

al

Usually Clapp oscillators have better frequency stability than Colpitts oscillators, due to series configuration of the LC resonator. In the schematic attached if vary C1 between 15pF and 36pF you get a 88MHz to 108MHz signal. C1 could be replaced by a varactor.

also, i think thiss is a colpits oscillator?

[vfone](#)

Advanced Member level 6



This is a Clapp oscillator.  
About #11, the oscillator output waveform is fine for the mixer. To get a better sinus waveform place a LPF at the output (e.g. 33pF-82nH-33pF).  
For open loop gain analysis remove L1 from the ground, and use that pin for the input signal..

This is a Clapp oscillator.  
About #11, the oscillator output waveform is fine for the mixer. To get a better sinus waveform place a LPF at the output (e.g. 33pF-82nH-33pF).  
For open loop gain analysis remove L1 from the ground, and use that pin for the input signal..

thanks for your response,  
However i had a few doubts, in the circuit uve sent, the resonator tank is connected to emitter, and in most of the clapp oscillator circuits i found, they are connected to the collector. Is there something im missing?  
In #2, the images are taken form "practical electronics for inventors" book.  
However the circuit uve attached in #3 works, so im not gonna complain.

Just wanted to know why the differences are coming.



Usually I see Colpitts having a resonating loop with only two capacitors and inductor. Clapp type has a third capacitor inline with the inductor.

If Colpitts contains a third capacitor it's in a different section than the resonating loop.

[vfone](#)

Advanced Member level 6



Usually I see Colpitts having a resonating loop with only two capacitors and inductor. Clapp type has a third capacitor inline with the inductor.

If Colpitts contains a third capacitor it's in a different section than the resonating loop.

1. yeah this makes sense, although my doubt was, the feedback loop is usually taken form the collector, but in #5 its taken from the emitter side, how does this work.
2. Is it just another configuration of the oscillator.
3. Does not getting a perfect sine wave have any effect on the receiver
4. What should be the peak-to-peak output generally for the LO



There are different configurations of Colpitts & Clapp.

Maybe how the transistor is operated (com. emitter or collector or base).

Maybe whether the power supply is contained within the resonating loop.

Maybe whether oV ground is connected to the node between the two caps.

Maybe whether the LCC tank develops high Amperes or low, or whether supply voltage is a few volts or high.

Maybe whether output is taken from the LCC tank or from a node at the transistor.

Status

Not open for further replies.

- [Requesting Mentorship for Ham-Radio.](#)
  - Started by Chiranka K
  - Nov 18, 2024
  - Replies: 14
- [Building a FM transmitter and receiver.](#)
  - Started by Chiranka K
  - Aug 13, 2024
  - Replies: 11
- [Mc3361 Fm Ic AFC control problem](#)
  - Started by dr pepper
  - May 6, 2024
  - Replies: 2
-