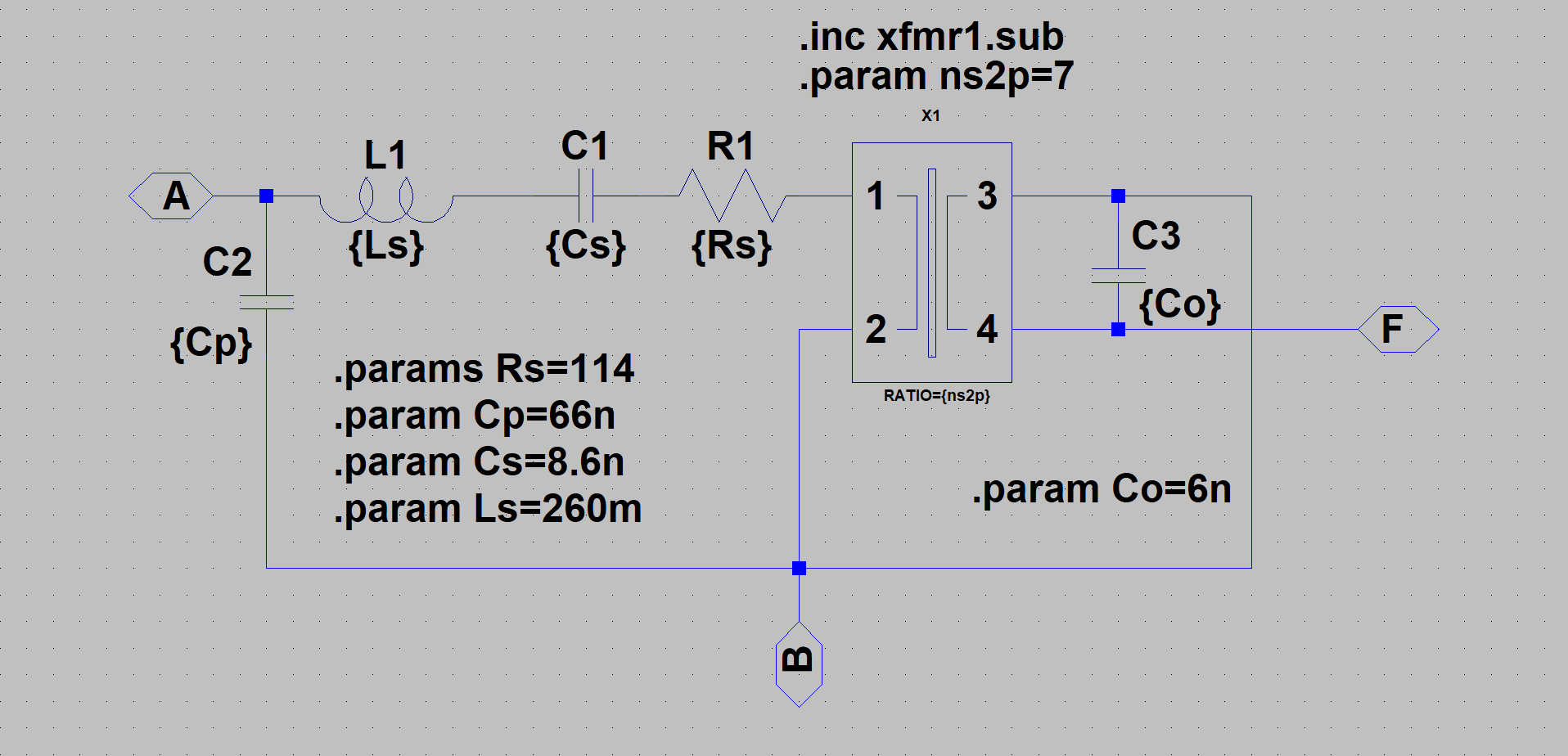
**Modelling the piezo-buzzer**

**2018.10 by Bill Wang**

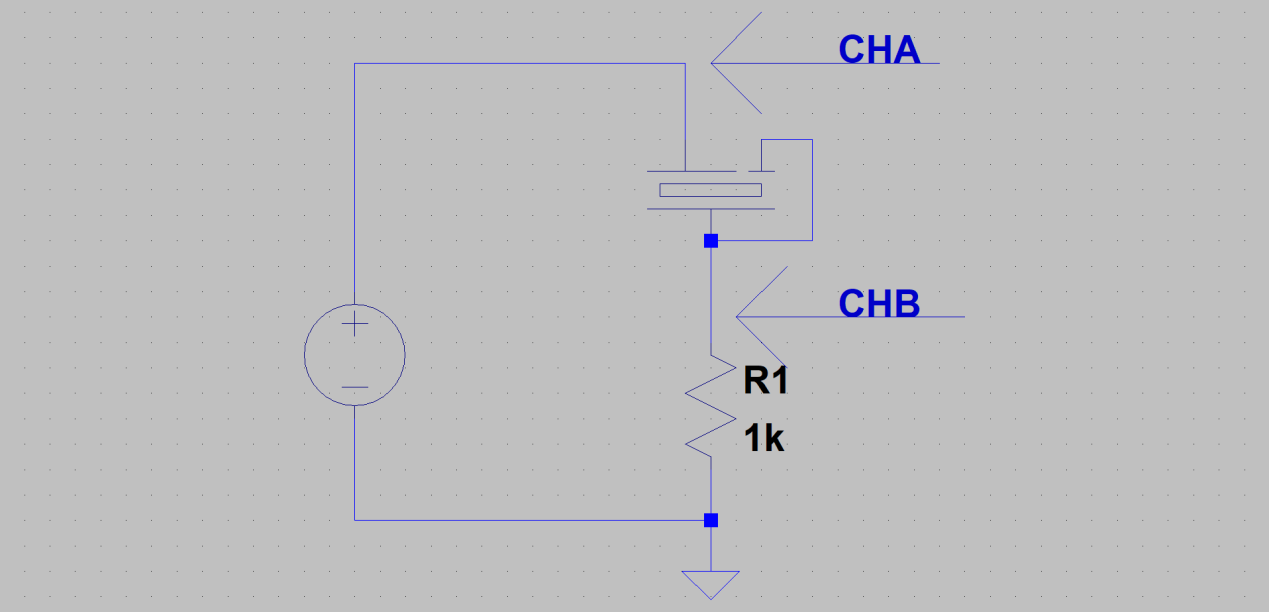
1. 含Feedback pin的等效電路:Cp, Ls, Cs, Rs, Co, ns2p.

其中的ns2p 為dc transformer的turn ratio, 目的是提供一180度反向的信號

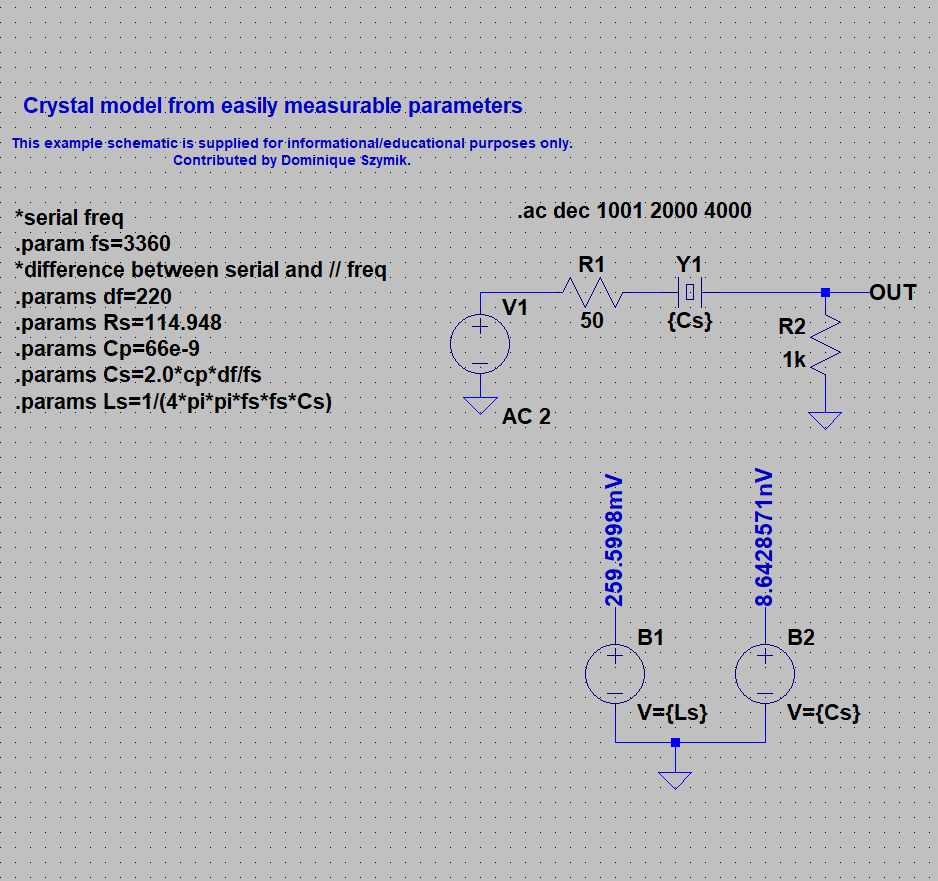
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1. 先量測低頻時FB短路時的Cp約66nF

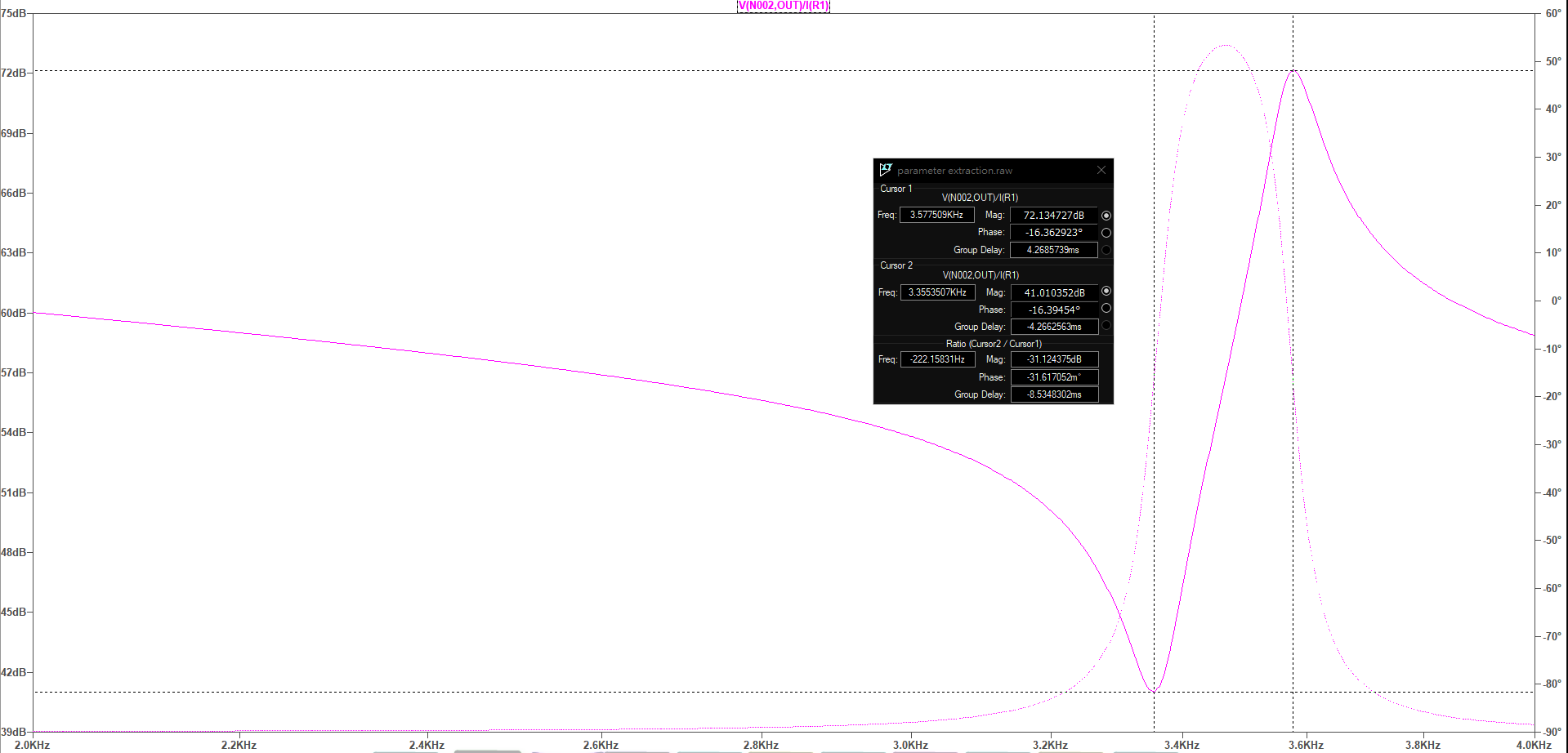


1. 以FRA量測2KHz~4KHz的impedance,量測結果如下
2. 在LTspice中代入fs,df,Rs,Cp, 求出Cs = 8.6n,Ls =260mH. Df是fp和fs的差頻

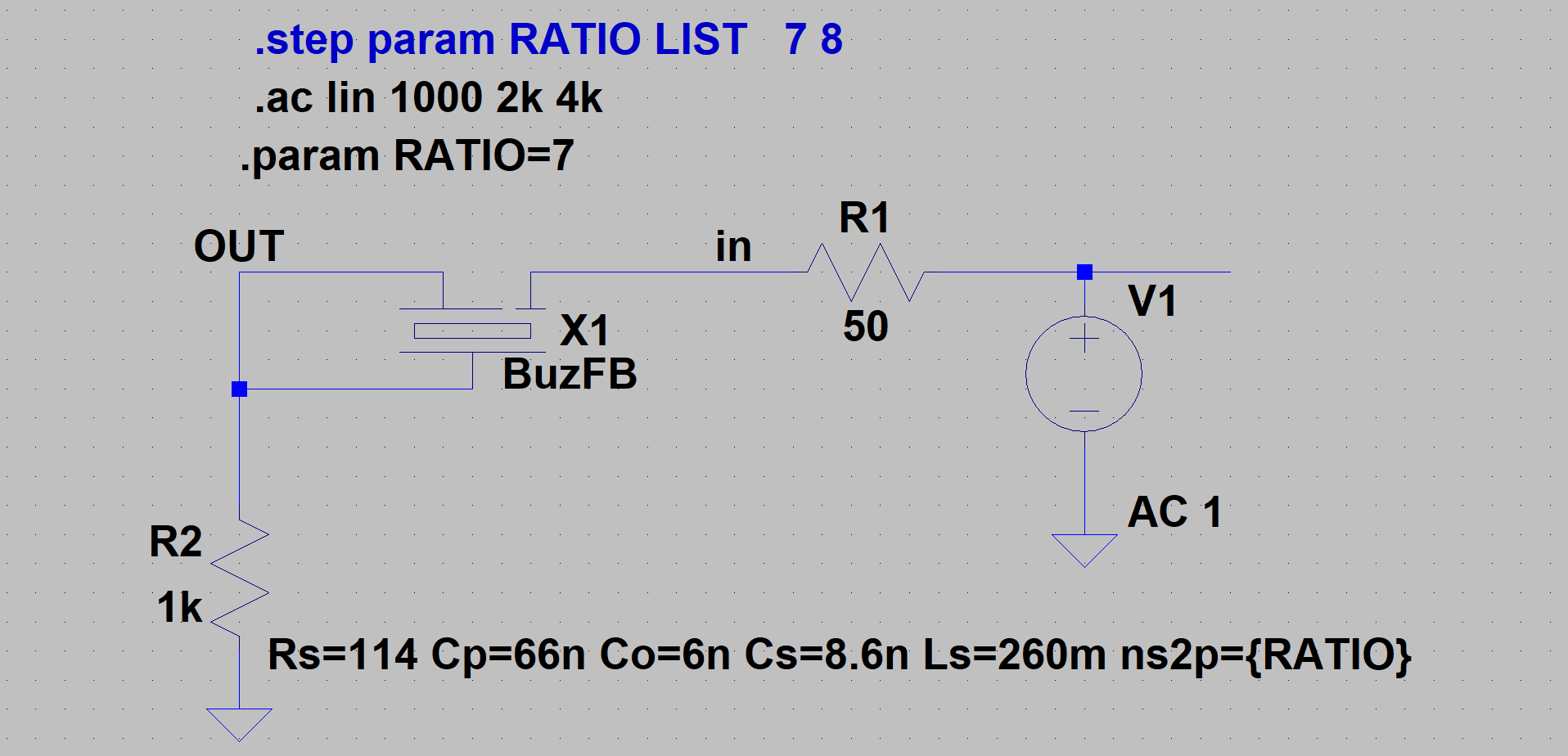




Impedance模擬結果如下:

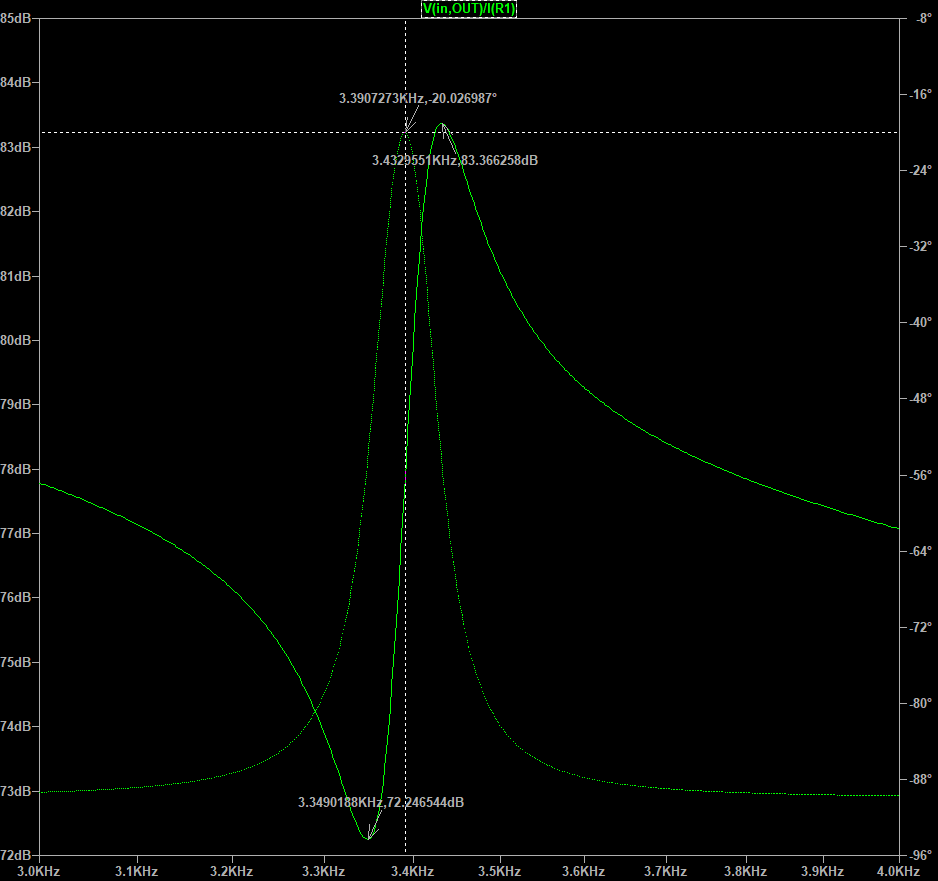


1. 量測低頻時輸入短路時的Co約6nF
2. 以FRA量測輸入短路時2KHz~4KHz的impedance,量測結果如下
3. LTSPICE模擬電路如下,調整RATIO參數,使其盡量吻合量測結果

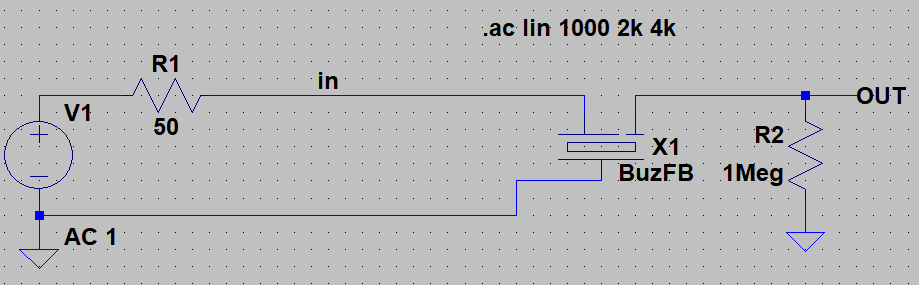




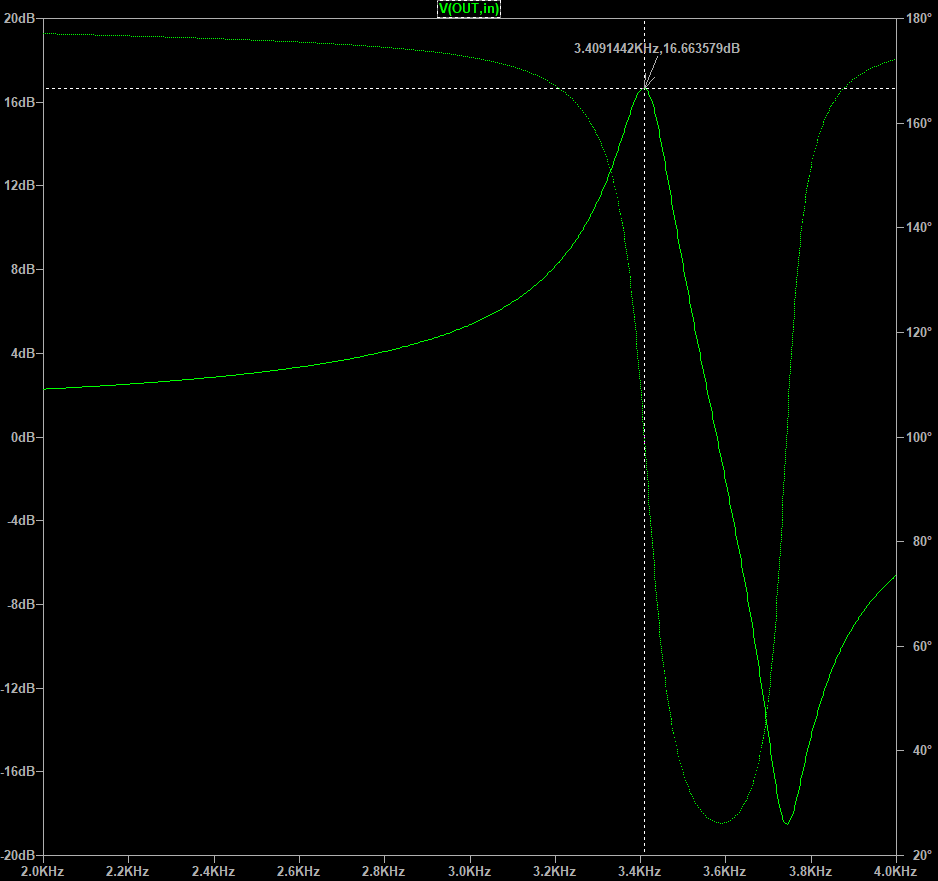
1. 當RATIO=7時模擬結果最吻合,可觀察到phase永遠都在0度以下



1. 量測輸入和輸出的gain,phase
2. 模擬電路如下,比對結果在gain最大時結果蠻接近的







**振盪器模擬**

1.single end driver, 兩種接法比較,共振頻率有差異

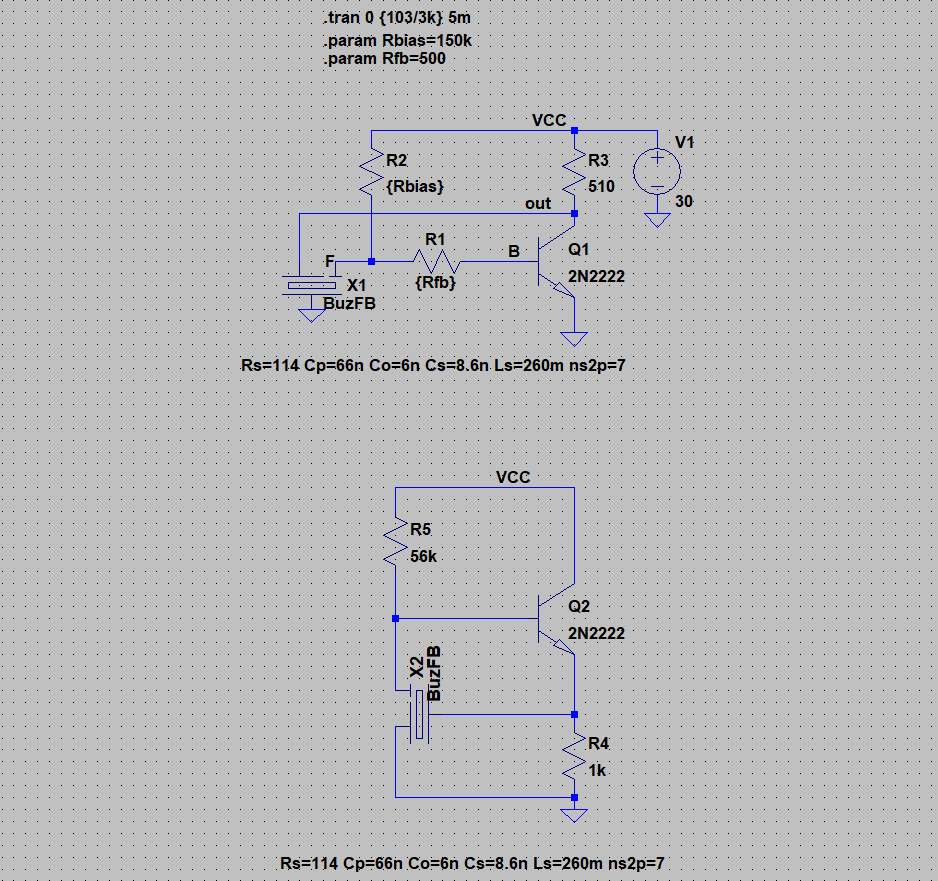


Fig1

Fig2



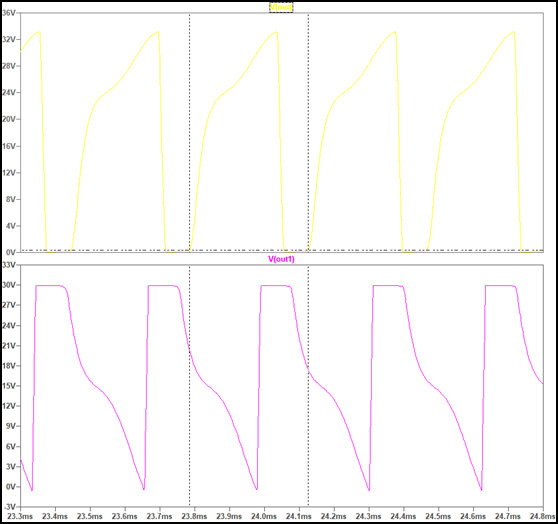
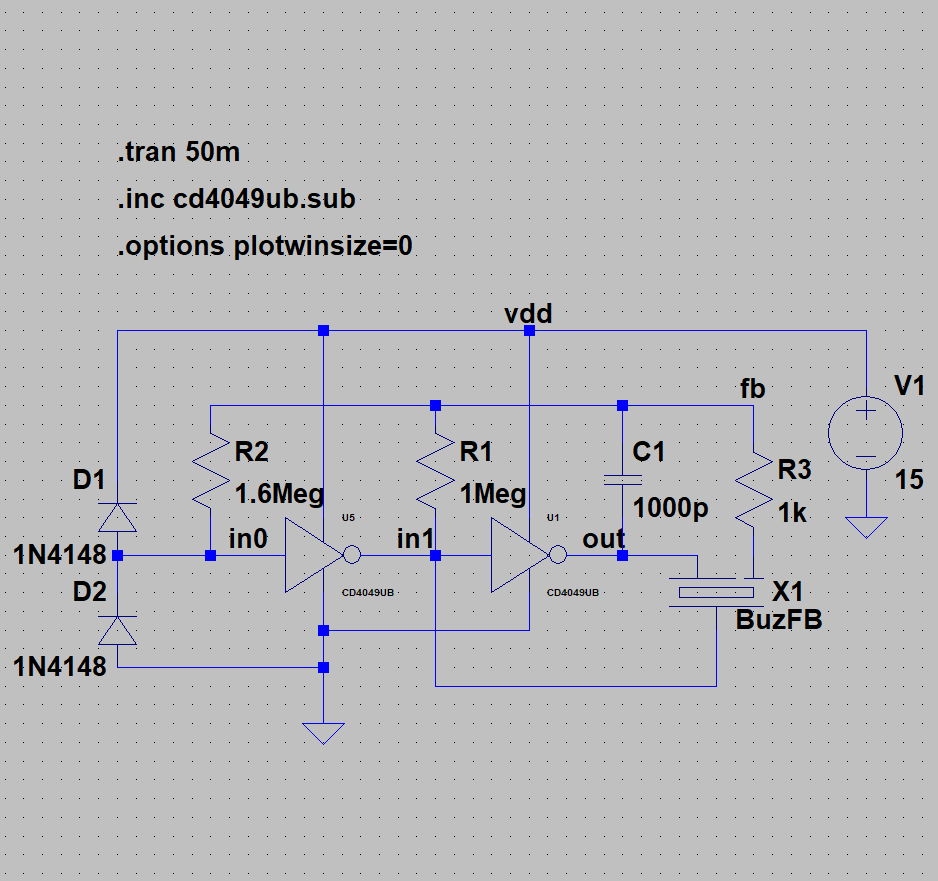


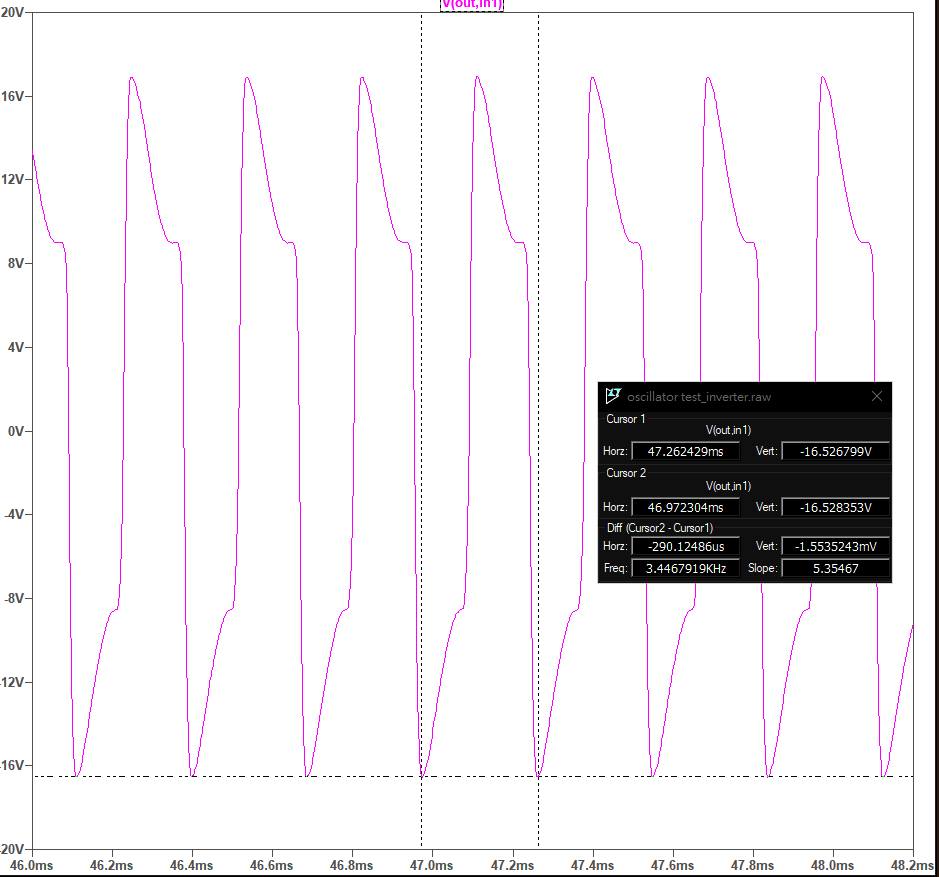
Fig2: 3.1 KHz

Fig1:2.93KHz

2. differential drive







模擬結果,頻率為3.45kHz, Differential 自激式比較接近共振頻率