

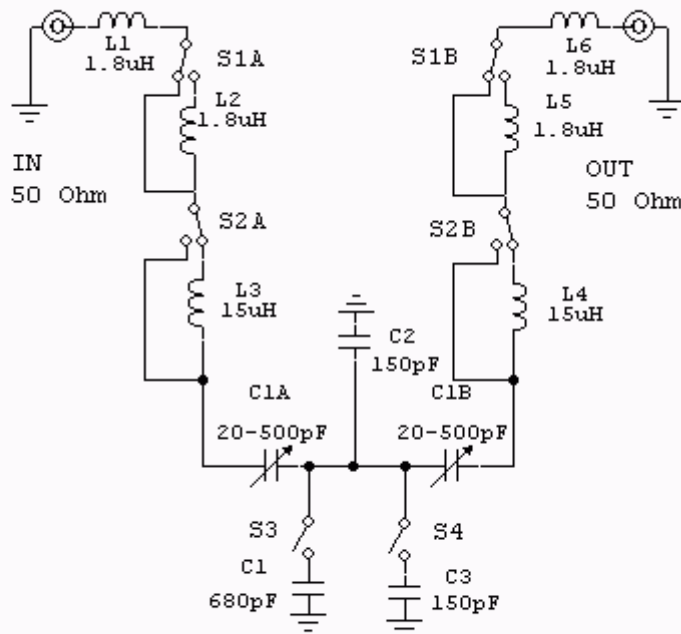
## TUNABLE BANDPASS FILTER FOR ALL HF BANDS (160m-10m)

Ing Tasic Sinisa –Tasa YU1LM/QRP GQRP10091

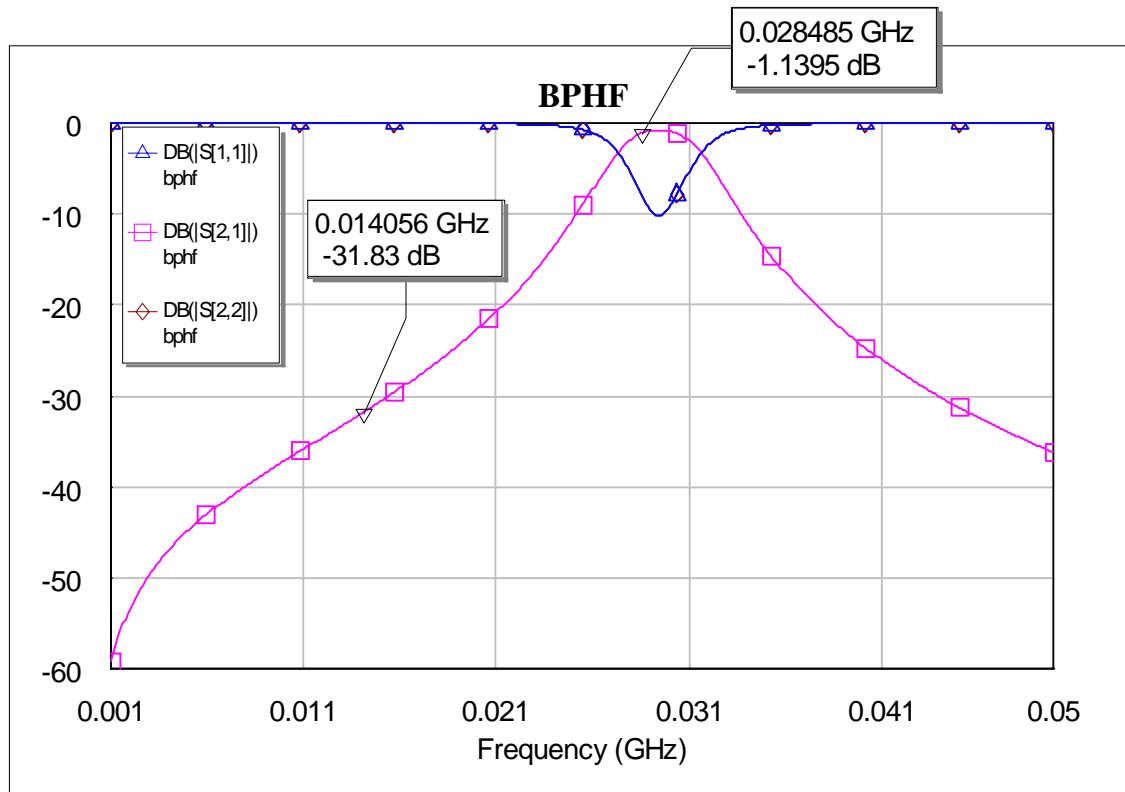
At the beginning of 80 I worked with stations which have serious problems with IMD products such as FT101B, this was very noticeable on lower bands 7, 3.5 and 1.8 MHz. In literature I saw very simple tunable bandpass filter designed by M. Martin DJ7VY in CQ-DL 7/84 which cure IMD problems substantially. Filter have 3 coils, double variable capacitors and few toggle switches for the frequency and bandwidth selection. Filter behaves as a tunable peak filter and insertion loss is changing very much with changing operation frequency from less than 1dB to 15dB. Bandwidth and selectivity is changing very much with operating frequency and because of that it was not suitable for use in transmitting systems. When you like to build HF bandpass filters especially for 50 Ohm system problem is how to design them that the realization have to be as simple as possible. Without appropriate measuring equipments adjustment will be a nightmare especially with unknown coils or coils with taps. I designed simple tunable bandpass filter for whole HF and it is one of my favorite **RF BRICK**-s for design on the table. It was designed and realized with the next design goal:

1. All HF frequencies (1.8-30MHz)
2. Insertion loss in range to max 3dB
3. Selectivity at harmonic related band in range of 30dB
4. input/output impedance 50 Ohm
5. coils with fixed inductance without taps

Tunable bandpass filter realization is very simple and compact made in one box based on PCB soldering, it is important to notice that double variable capacitors (both connection) are isolated from the ground. Inductors are made with toroid core but I tried BP filter with fixed molded chokes and results are similar except little bigger insertion loss (see example diagram for filter 3.5 MHz). It is possible because working Q in bandpass filter is small and sensitivity to component values is small too. It is possible to realize HF filter with only 2 coils (for example toroid T50-) with taps but it is not recommended for unexperienced builders. Filter schematic diagram is at the picture below, toggle switches S3, S4 is possible to change with one SPDT with one neutral position. It is possible also to use fixed values for C and L to make filters according to given component values.

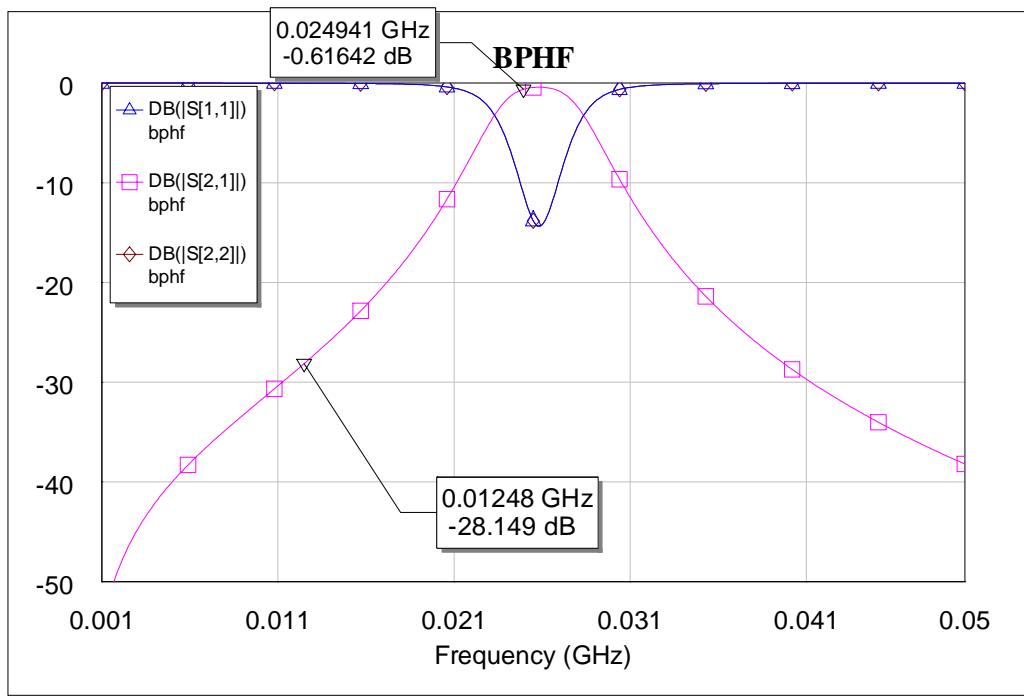


YU1LM/QRP GORP10091  
HF 1.8-30MHz TUNABLE BANDPASS FILTER

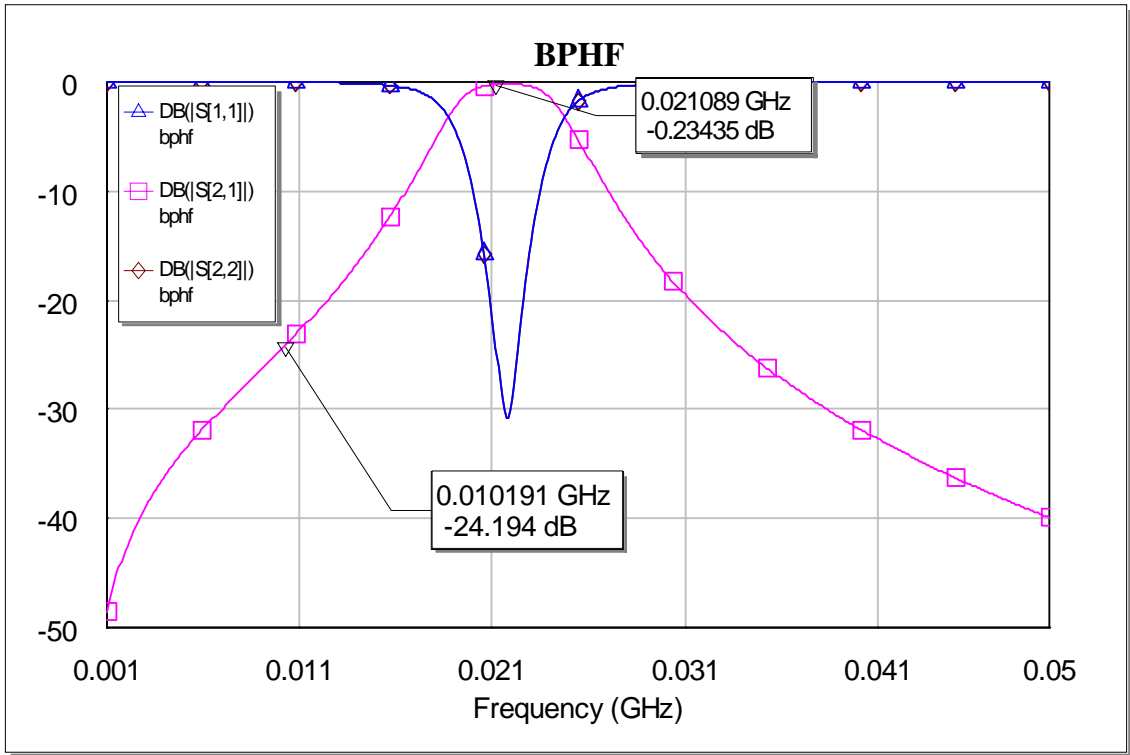


FILTER 28MHz  
L=1.8uH Q=100

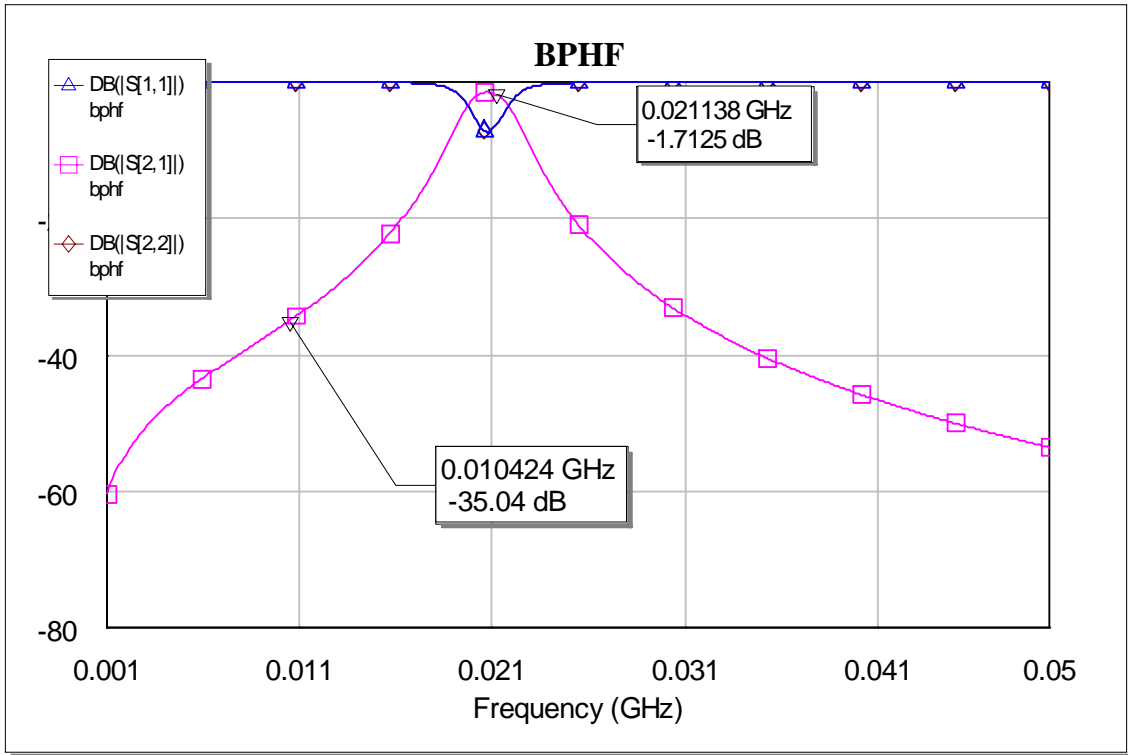
Cvar=20pF  
C1=150pF



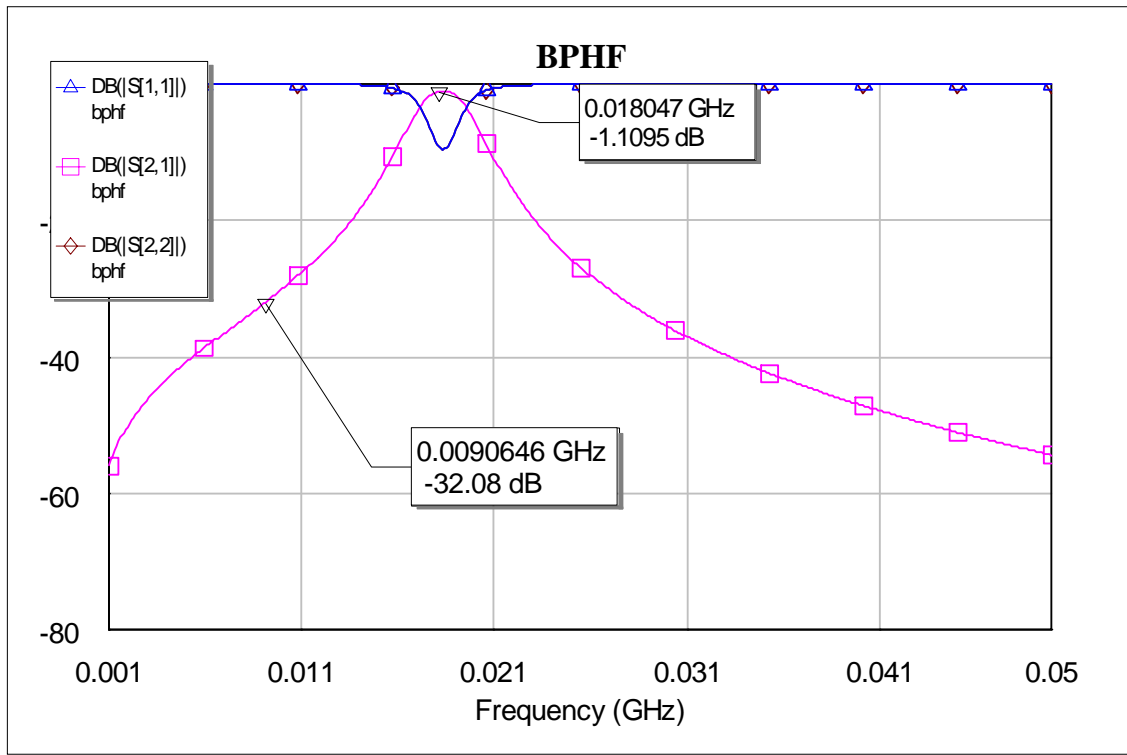
FILER 24MHz  
L=1.8uH Q=100  
Cvar=25pF  
C1=150pF



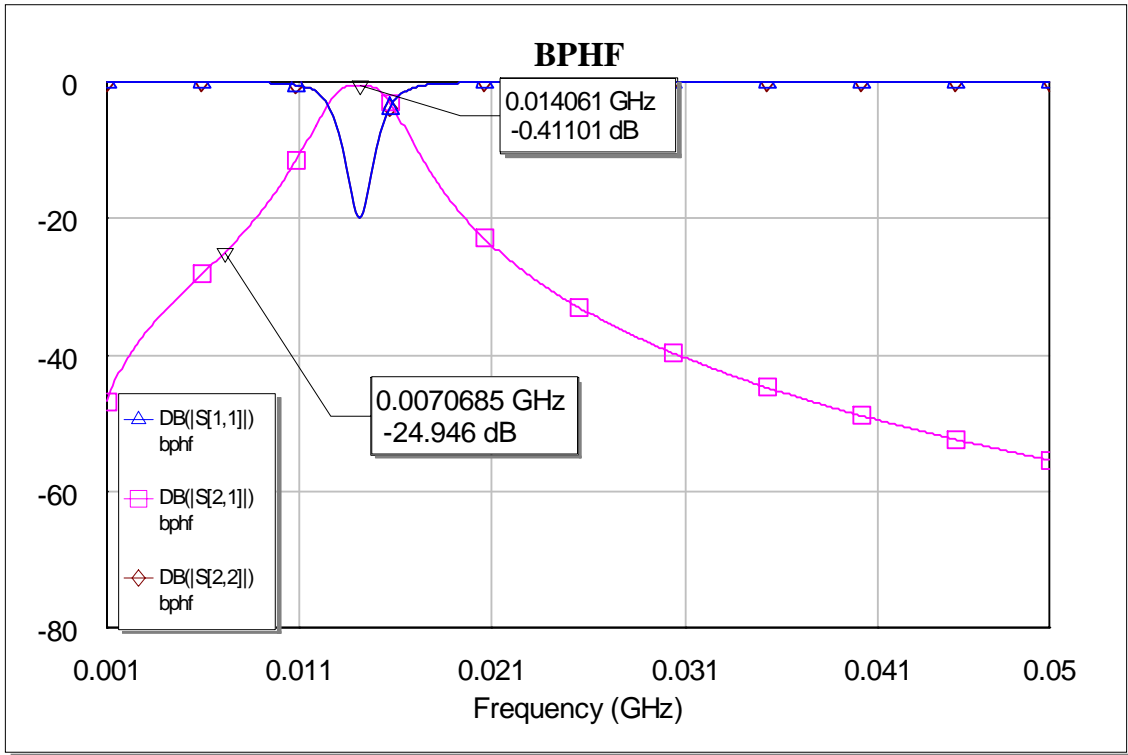
FILTER 21MHz  
L=1.8uH Q=100  
Cvar=36pF  
C1=150pF



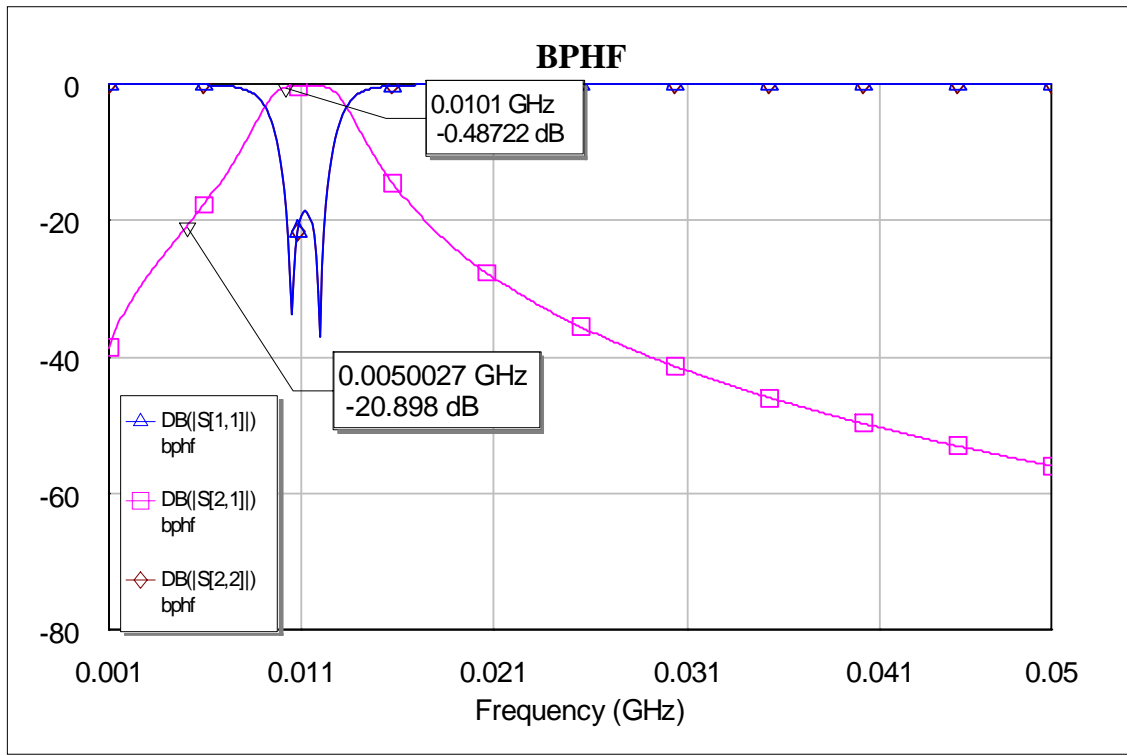
$L=1.8\mu\text{H}+1.2\mu\text{H}$   $Q=100$   
 $C_{\text{var}}=21\text{pF}$   
 $C1=150\text{pF}+100\text{pF}$



FILTER 18MHz  
L=1.8uH+1.2uH Q=100  
Cvar=28pF  
C1=150pF+100pF

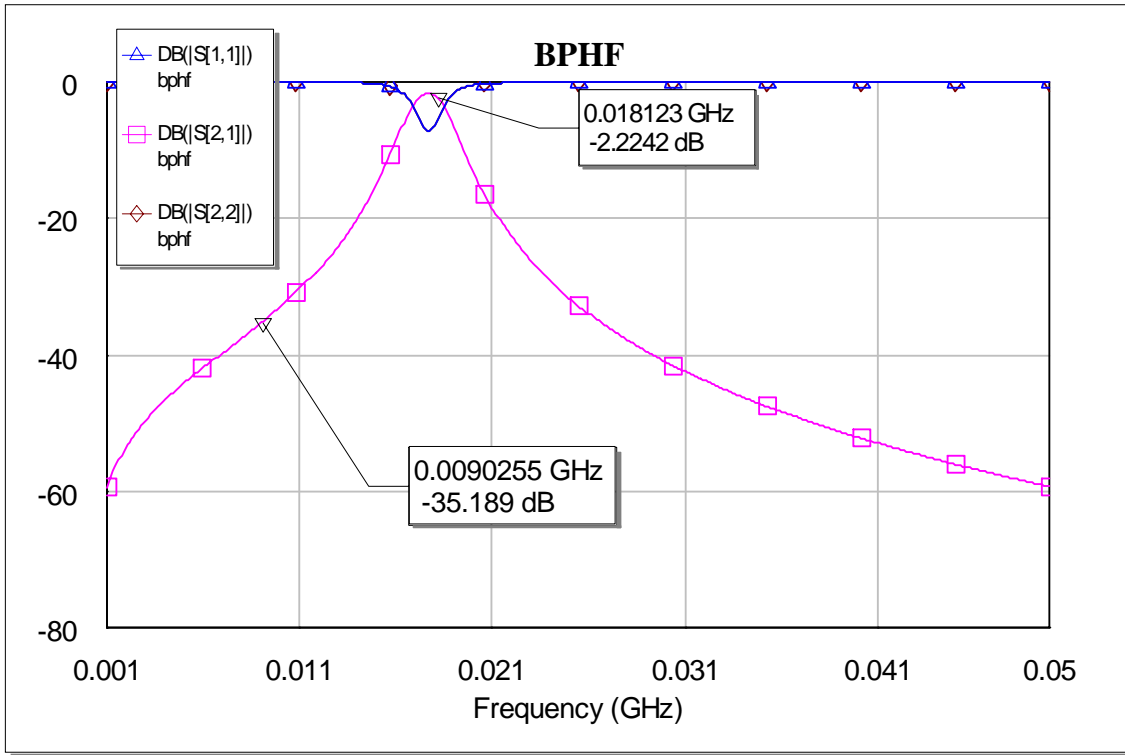


FILTER 14MHz  
 $L=1.8\mu H+1.2\mu H$   $Q=100$   
 $C_{var}=50pF$   
 $C1=150pF+100pF$

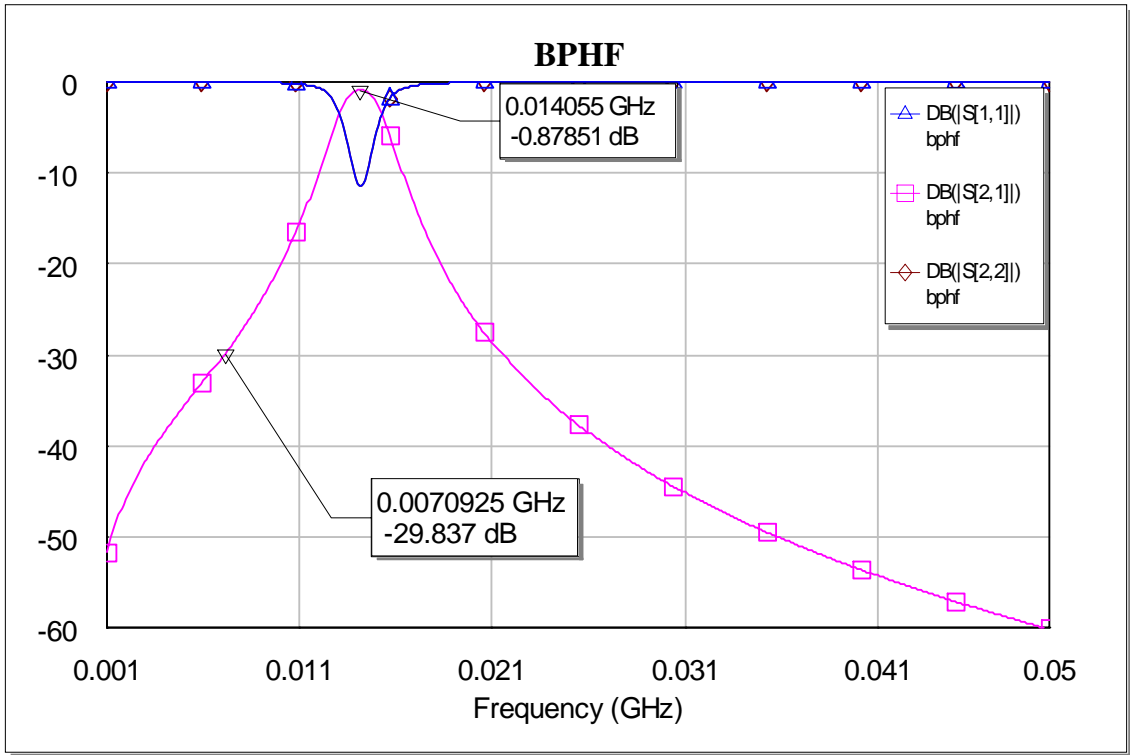


FILER 10.1MHz  
 $L=1.8\mu\text{H}+1.2\mu\text{H}$   $Q=100$   
 $C_{\text{var}}=88\text{pF}$   
 $C1=150\text{pF}+100\text{pF}$   
 Alternative value

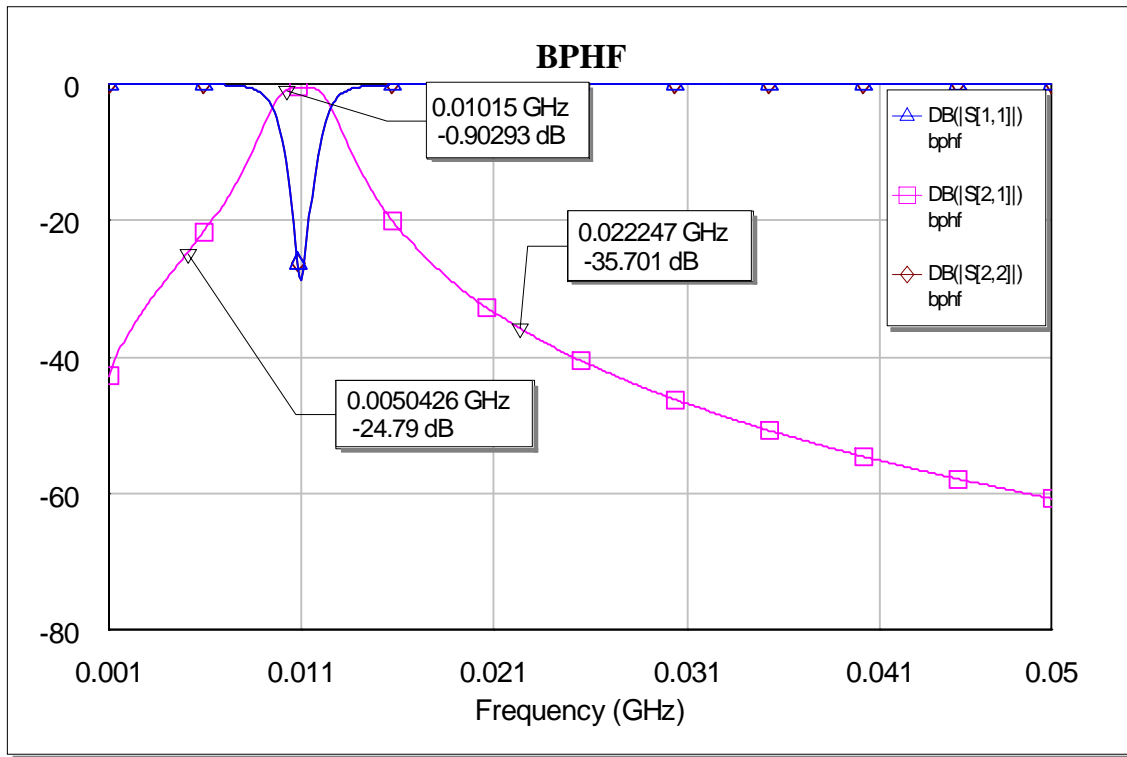




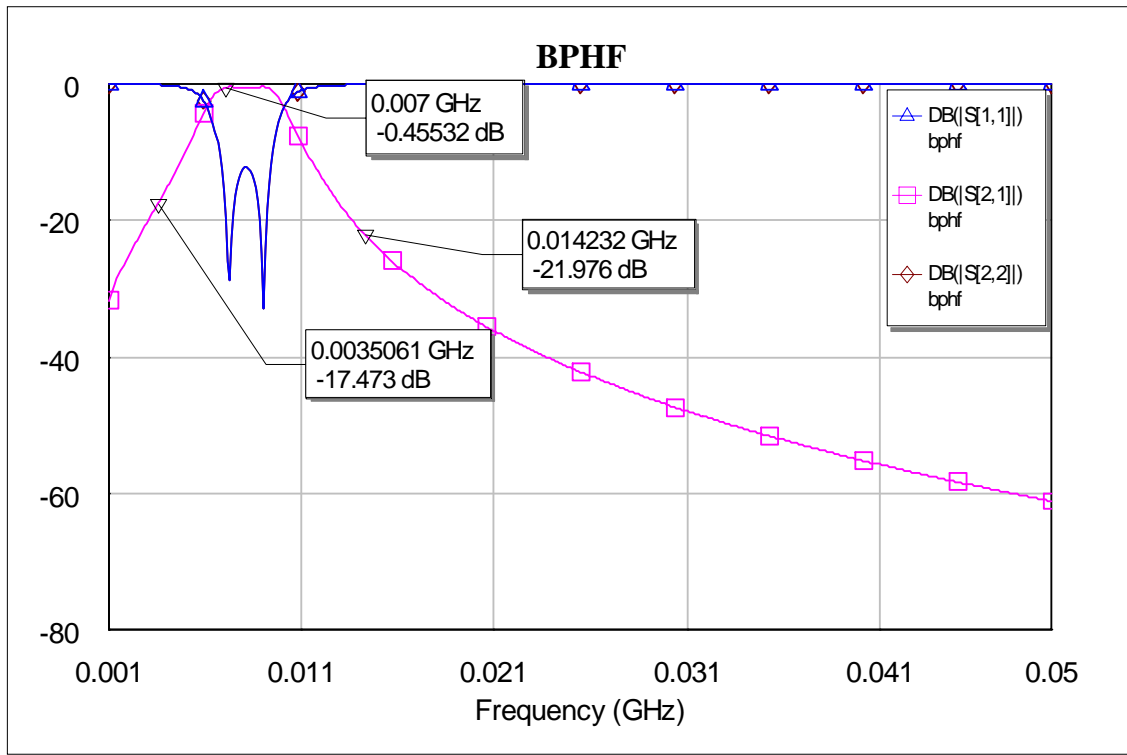
FILTER 18.1MHz  
 $L=1.8\mu\text{H}+1.8\mu\text{H}$   $Q=100$   
 $C_{\text{var}}=24\text{pF}$   
 $C1=150\text{pF}+150\text{pF}$



FILTER 14MHz  
 $L=1.8\mu\text{H}+1.8\mu\text{H}$   $Q=100$   
 $C_{\text{var}}=39\text{pF}$   
 $C1=150\text{pF}+150\text{pF}$



FILTER 10.1MHz  
 $L=1.8\mu\text{H}+1.8\mu\text{H}$   $Q=100$   
 $C_{\text{var}}=70\text{pF}$   
 $C1=150\text{pF}+150\text{pF}$

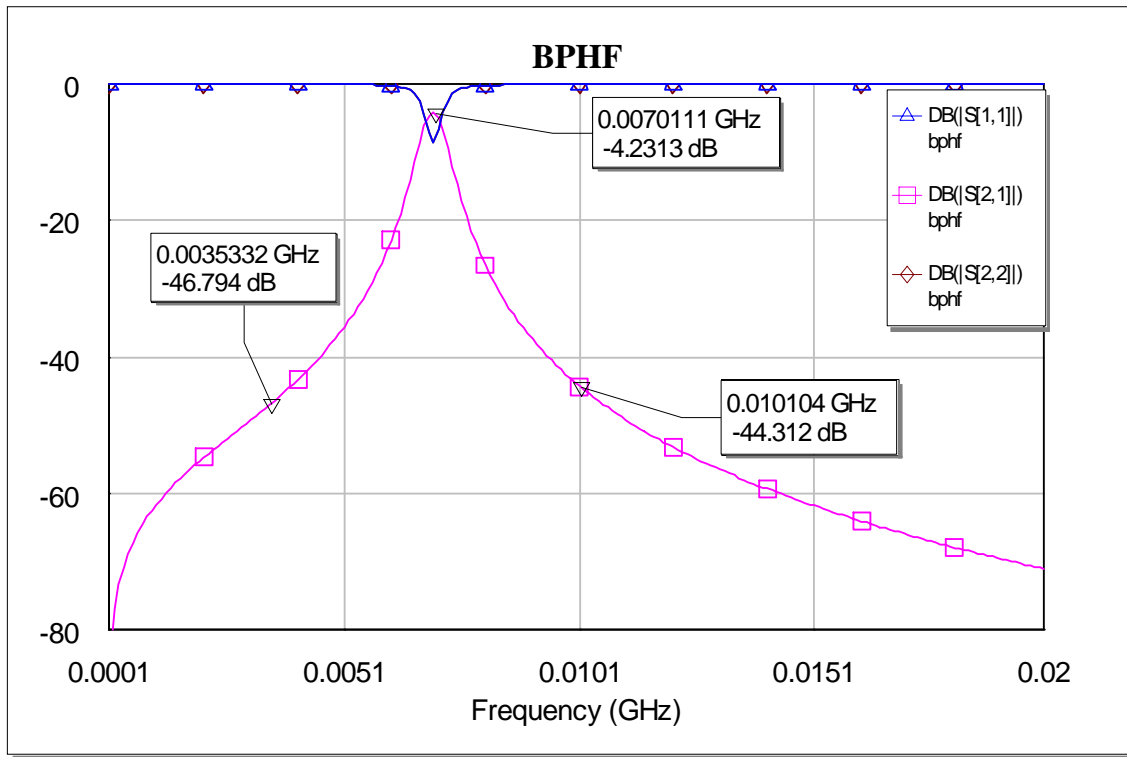


FILTER 7MHz

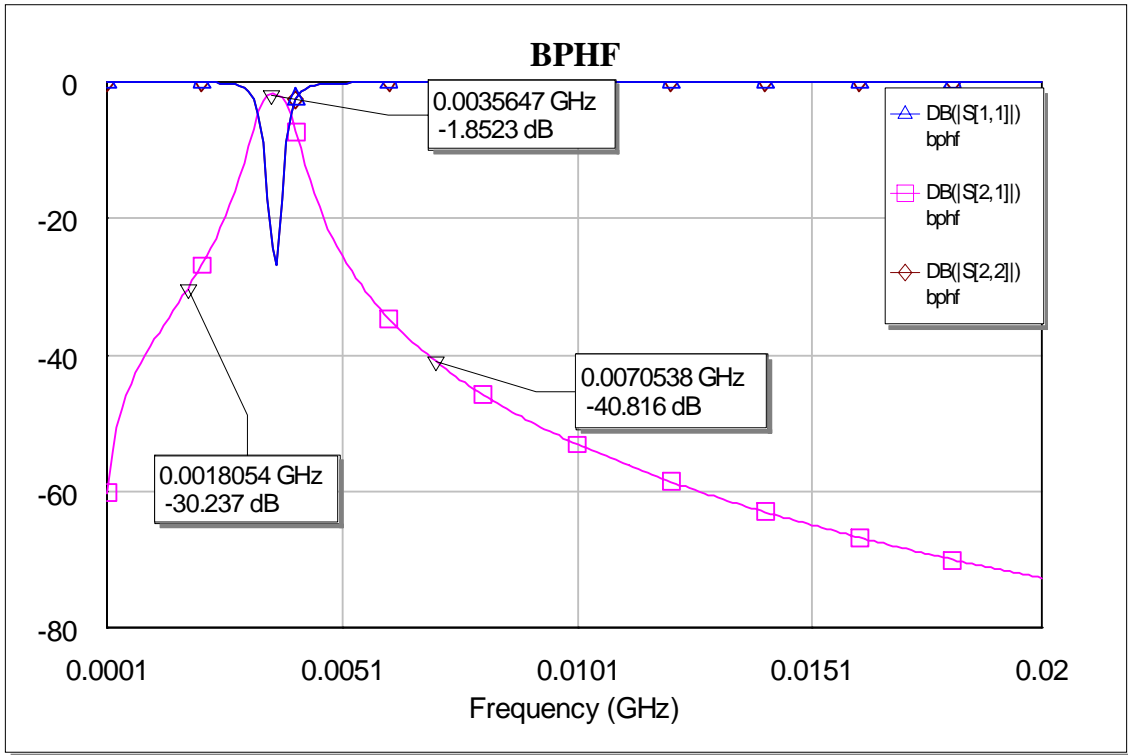
$L=1.8\mu\text{H}+1.8\mu\text{H}$   $Q=100$

$C_{\text{var}}=155\text{pF}$

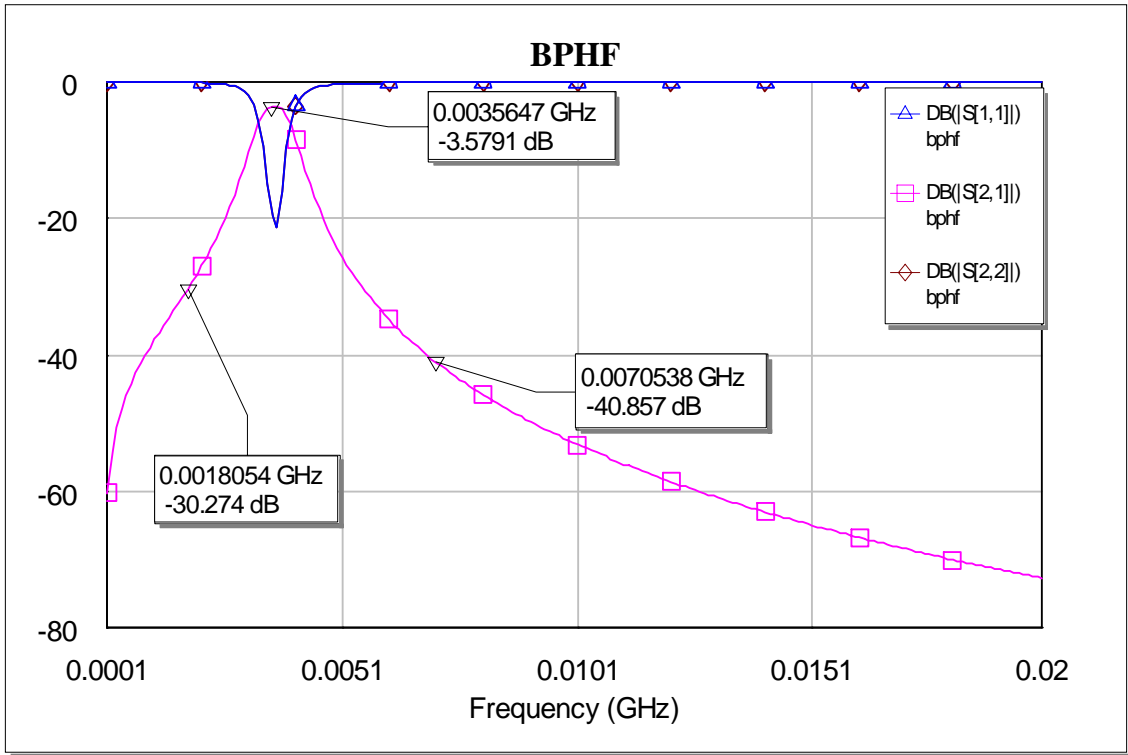
$C1=150\text{pF}+150\text{pF}$



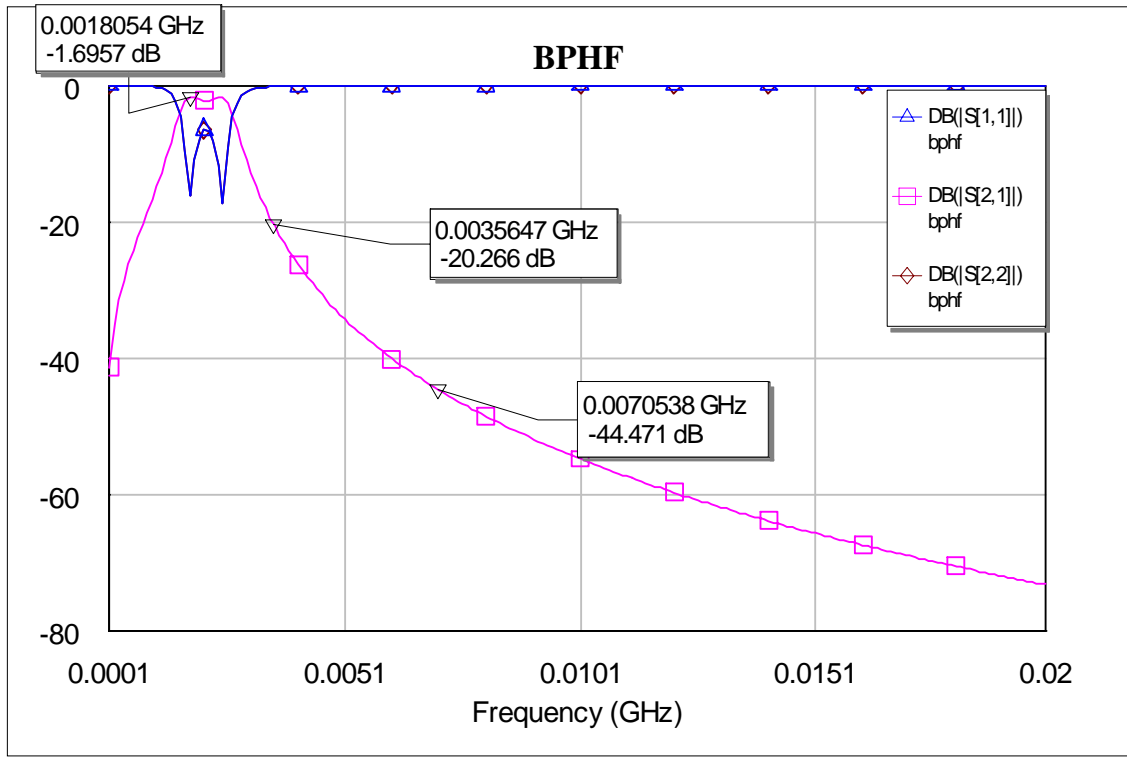
FILTER 7MHz  
 $L=1.8\mu\text{H}+15\mu\text{H}$   $Q=100$   
 $C_{\text{var}}=32\text{pF}$   
 $C1=150\text{pF}+680\text{pF}$



FILTER 3.5MHz  
 $L=1.8\mu\text{H}+15\mu\text{H}$   $Q=100$   
 $C_{\text{var}}=130\text{pF}$   
 $C1=150\text{pF}+680\text{pF}$

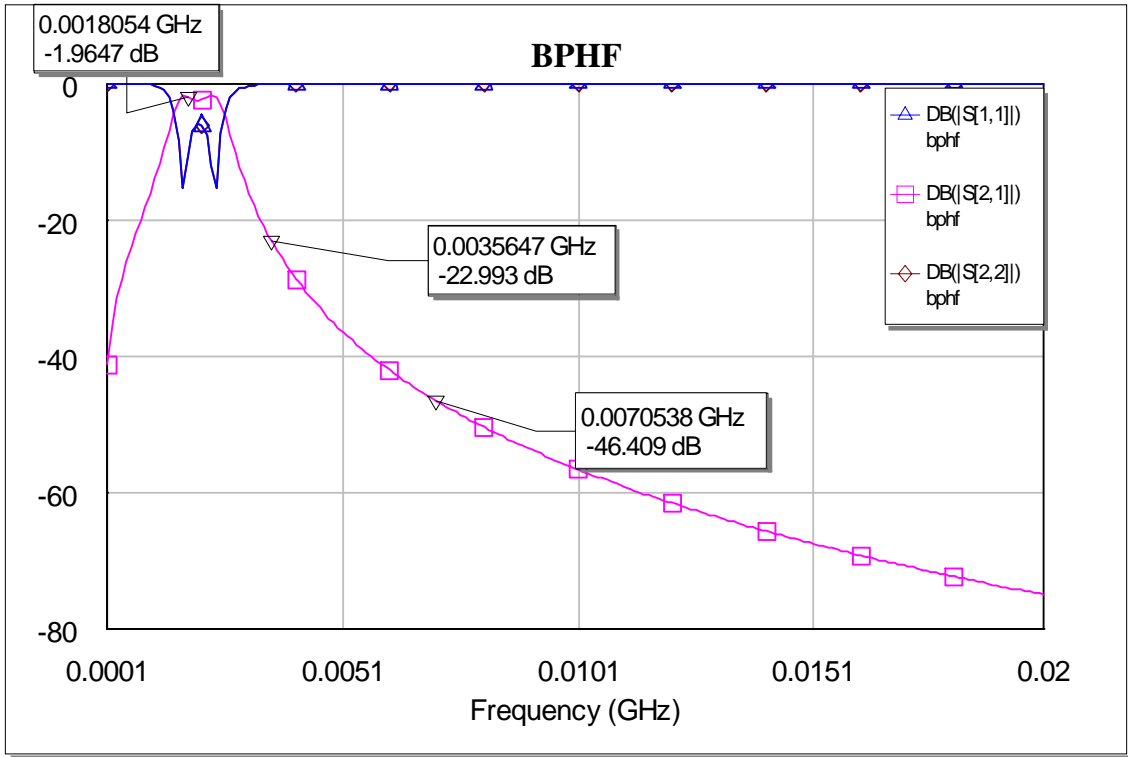


Filer for 3.5 MHz same as previously but Q=50 typical value for molded chokes

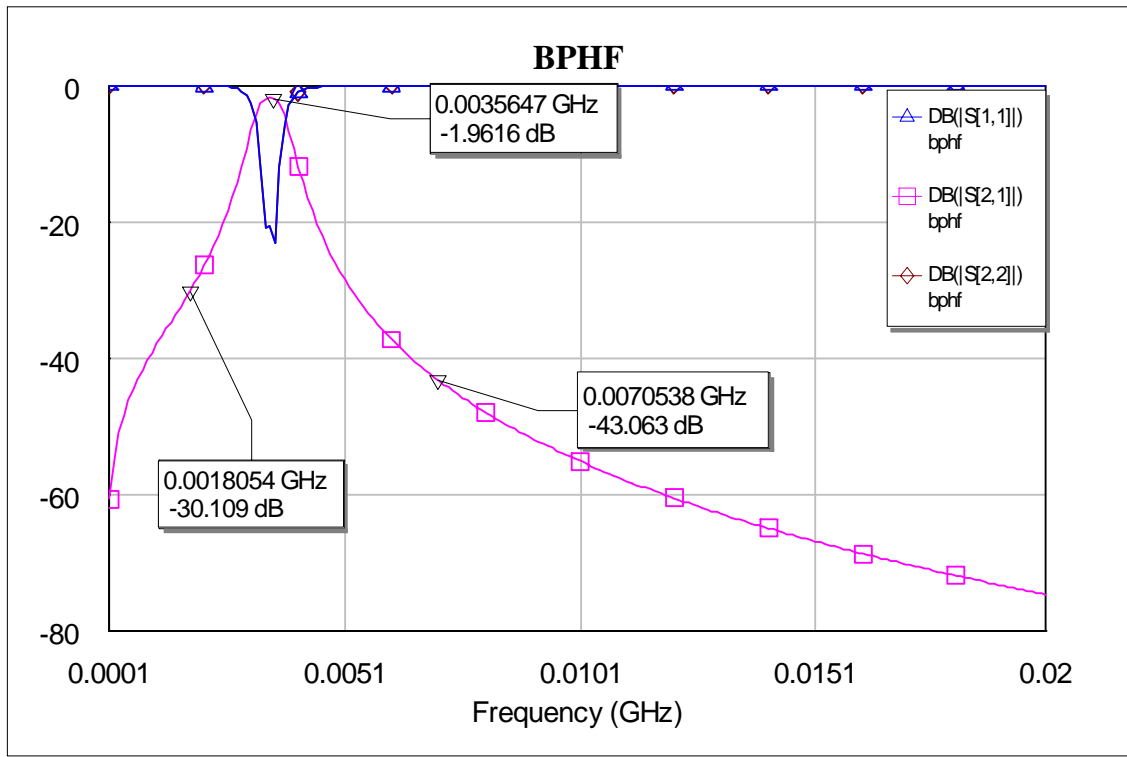


FILER 1.8MHz  
 $L=1.8\mu\text{H}+15\mu\text{H}$   $Q=100$   
 $C_{\text{var}}=500\text{pF}$   
 $C1=150\text{pF}+680\text{pF}$

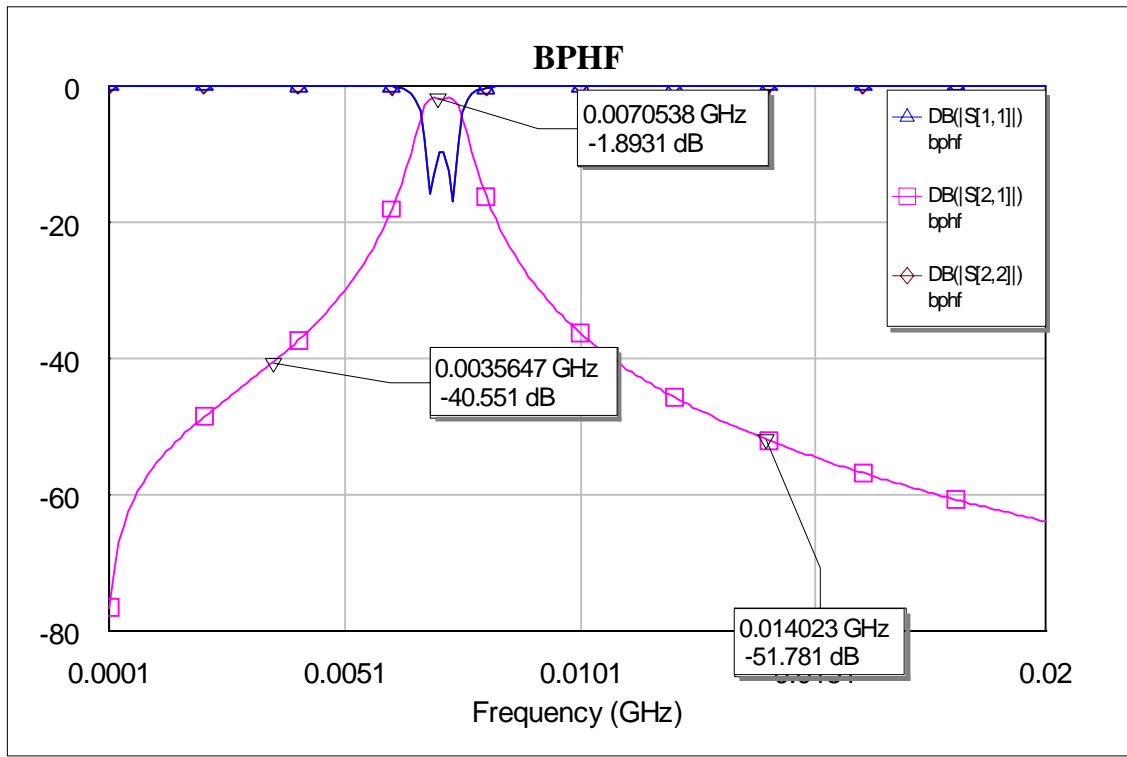




FILTER 1.8 MHZ  
 $L=1.8\mu\text{H}+1.8\mu\text{H}+15\mu\text{H}$   
 $C_{\text{var}}=500\text{pF}$   
 $C1=150\text{pF}+680\text{pF}$



FILTER 3.5MHz  
 $L=1.8\mu\text{H}+1.8\mu\text{H}+15\mu\text{H}$   $Q=100$   
 $C_{\text{var}}=127\text{pF}$   
 $C1=150\text{pF}+680\text{pF}$

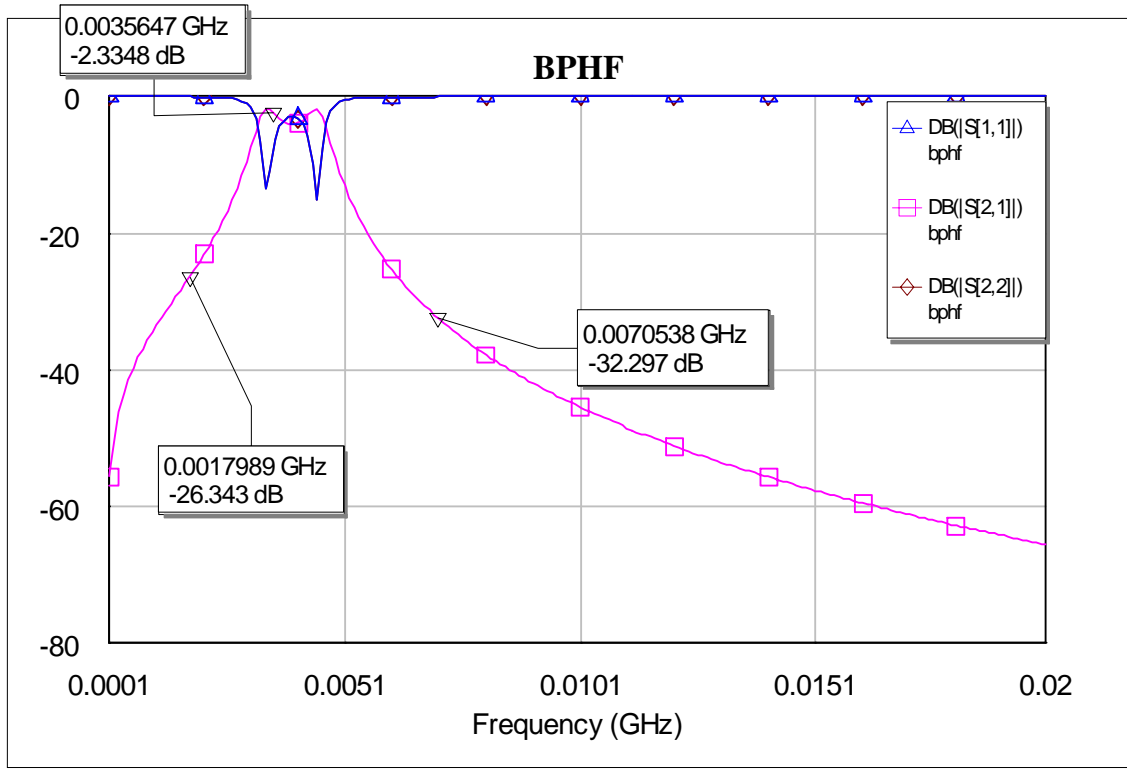


FILTER 7MHz

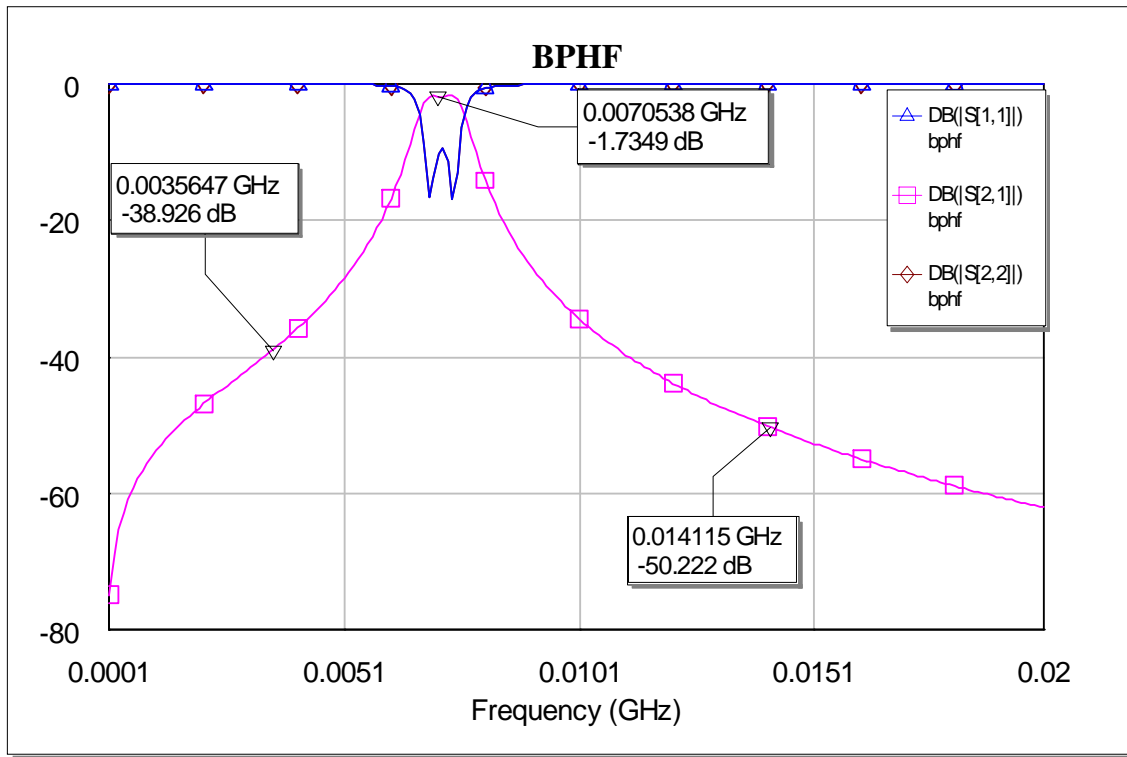
$L=1.8\mu\text{H}+1.8\mu\text{H}+15\mu\text{H}$   $Q=100$

$C_{\text{var}}=29\text{pF}$

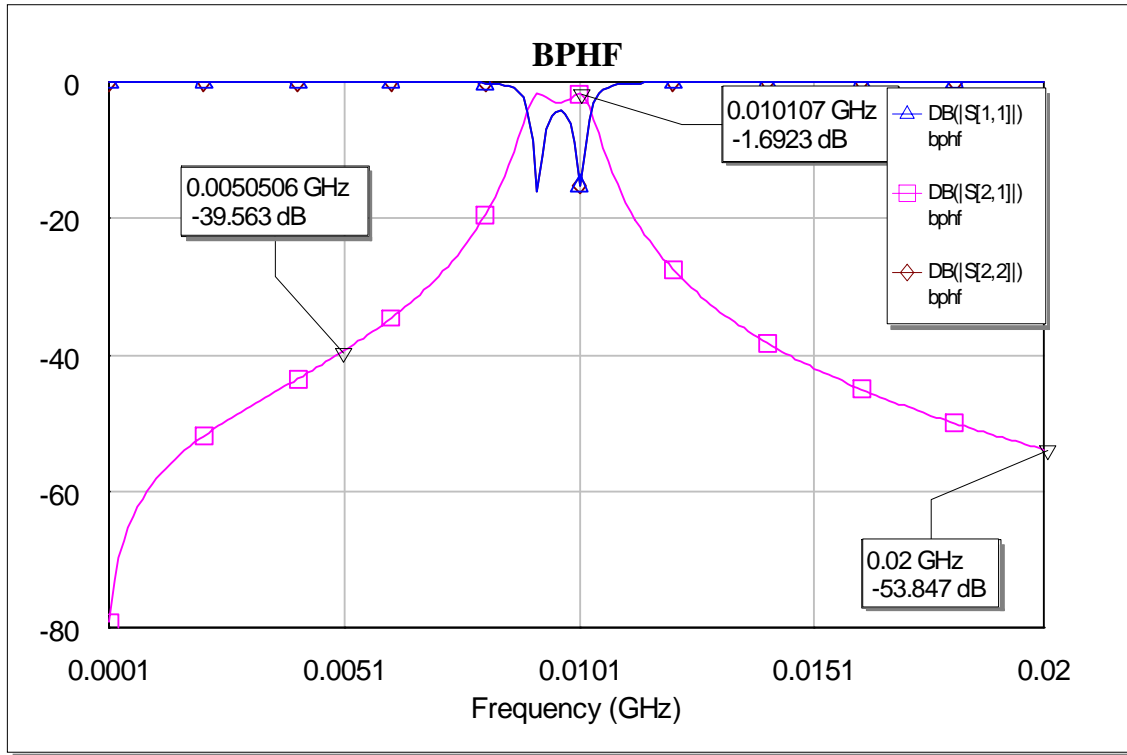
$C1=150\text{pF}+150\text{pF}$



FILTER 3.5MHz  
 $L=1.8\mu\text{H}+1.8\mu\text{H}+15\mu\text{H}$   
 $C_{\text{var}}=118\text{pF}$   
 $C1=150\text{pF}+150\text{pF}$



FILTER 7MHz  
 $L=1.8\mu\text{H}+15\mu\text{H}$   
 $C_{\text{var}}=32\text{pF}$   
 $C1=150\text{pF}+150\text{pF}$



FILTER 10.1MHz

$L=1.8\mu H+15\mu H$   $Q=100$

$C_{var}=18pF$  (some variable capacitor can reach this value)

$C1=150pF$