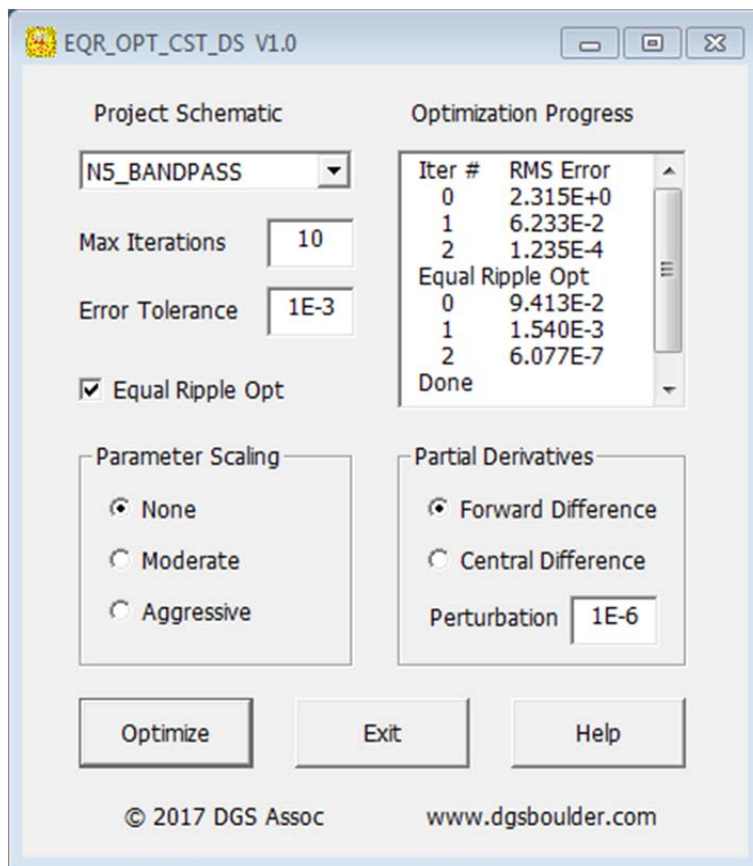


# Equal Ripple Optimization for CST Design Studio



Equal Ripple Optimization for CST Design Studio (EQR\_OPT\_CST\_DS) is a specialized engine for filter optimization. It leverages the Design Studio COM API and can optimize any filter that can be defined in the Design Studio environment. Unlike many general purpose optimizers, EQR\_OPT\_CST\_DS finds an exact equal ripple response. General purpose optimizers often fail to find all the reflection zeros in the passband, particularly for higher order filters. EQR\_OPT\_CST\_DS also controls the bandwidth of the filter exactly, which general purpose optimizers cannot easily do. This is particularly important for diplexers and multiplexers.

EQR\_OPT\_CST\_DS can optimize individual bandpass, lowpass and highpass filters. It can also optimize diplexers and multiplexers. Once an initial solution is found, it is easy to modify the bandwidth or shift the center frequency of the filter.

## Key Features

- Exact equal ripple optimization of any bandpass filter.
- Exact equal ripple optimization of diplexers and multiplexers.
- Exact control of the filter bandwidth and return loss.
- Rapid convergence with very few optimization iterations.
- Example files for many filter topologies are included.
- Tested and supported on 32 and 64 bit versions of Windows XP and Windows 7 thru 10.

# Equal Ripple Optimization for CST Design Studio

## Example 1: N=5 Comblne Bandpass Filter

The schematic below represents a simplified model of a combline bandpass filter. Ten variables are needed to define the resonator frequencies, the coupling between resonators and the return loss level. In this example we will detune the starting element values.

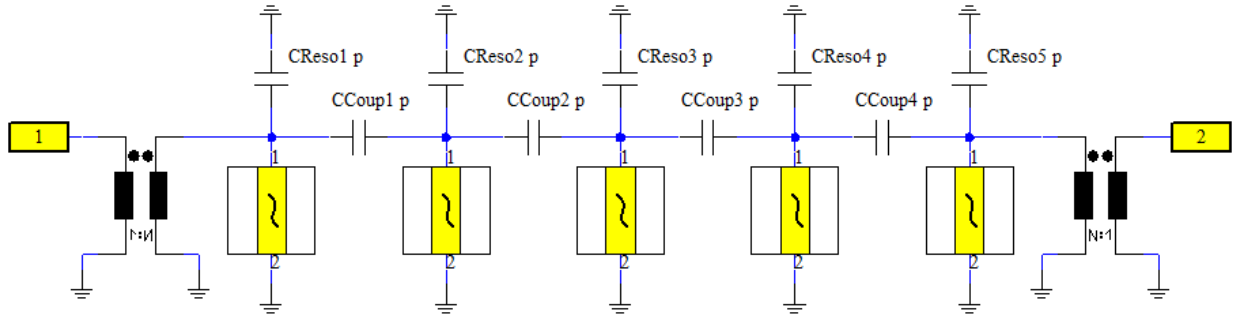


Figure 1. CST Design Studio schematic for an N=5 combline bandpass filter.

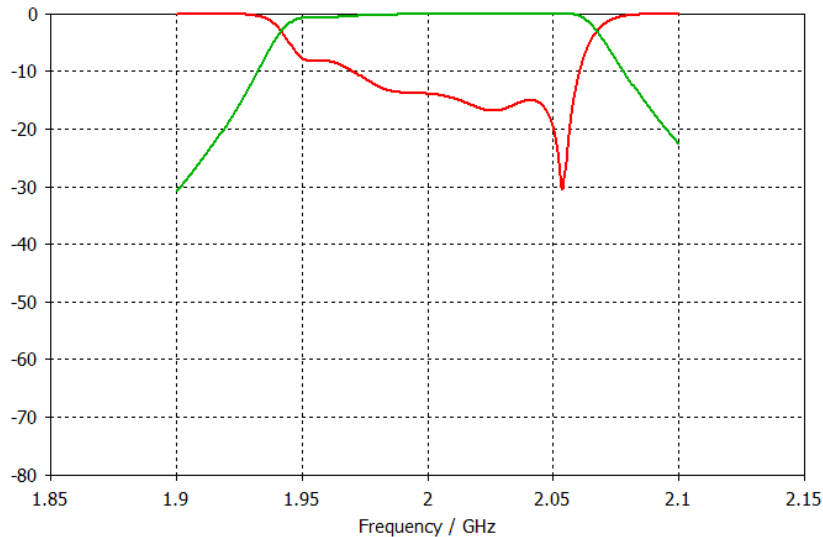


Figure 2. Detuned optimization starting point.

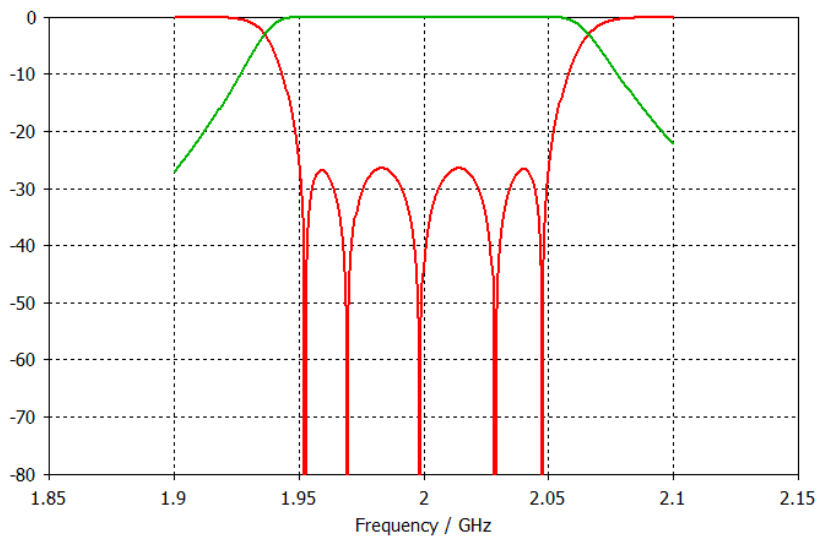


Figure 3. Optimized result after 7 iterations.

# Equal Ripple Optimization for CST Design Studio

## Example 2: N=5 Comblin Diplexer

The schematic below represents a simplified model of a combline diplexer. Ten variables are needed for each channel to define the resonator frequencies, the coupling between resonators and the return loss level. Twenty variables are varied simultaneously in the optimization. In this example we will detune the starting element values.

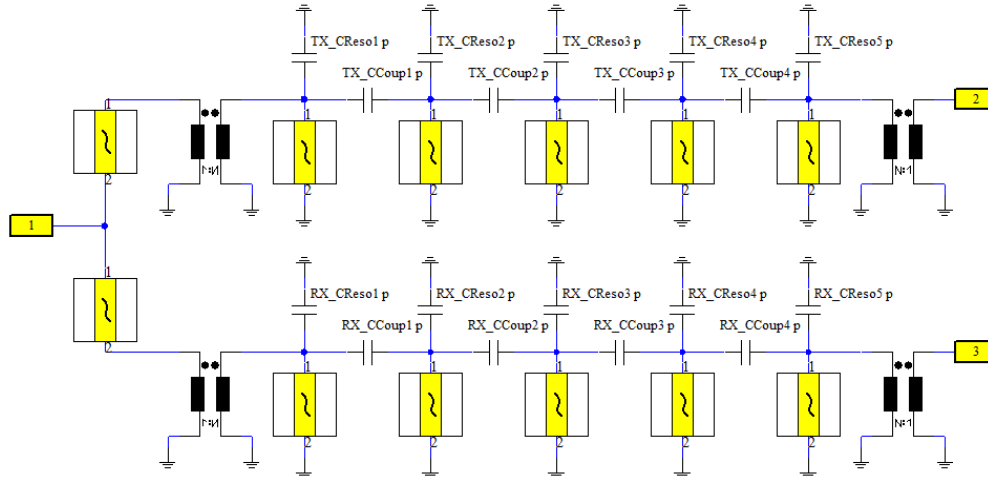


Figure 4. CST Design Studio schematic for an N=5 combline diplexer.

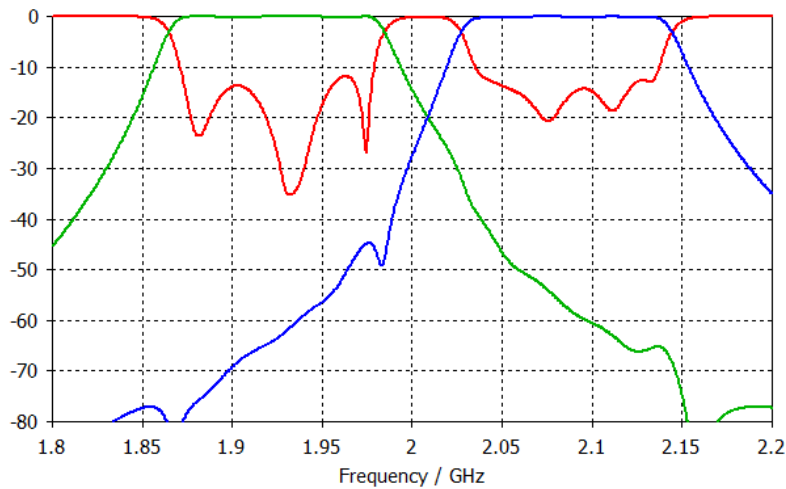


Figure 5. Detuned optimization starting point.

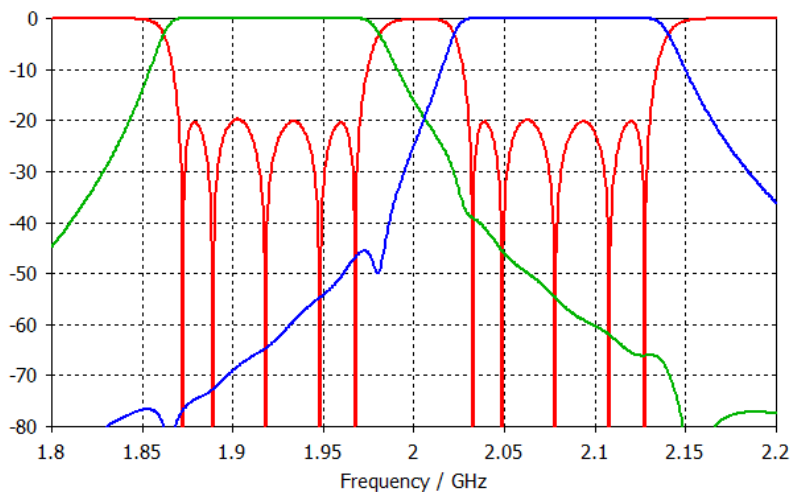


Figure 6. Optimized result after 5 iterations.