Optimizing Combined AM Antenna Systems

By

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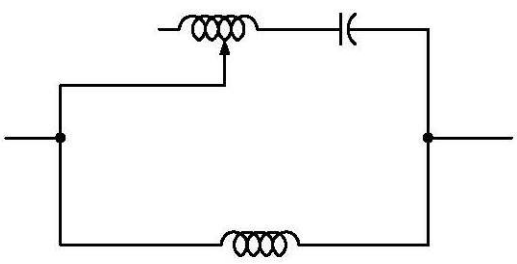
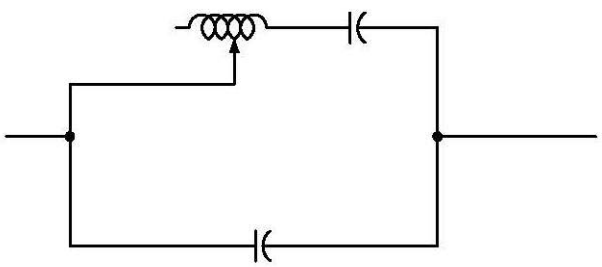
- Many AM stations are facing the reality that the land the existing transmitter site is more valuable than the station itself. Or, stations are locked in a lease that the cost is a major part of the station's expenses. A possible option is to co-locate AM stations to help minimize the operating cost. Before this is proposed, the station should look at some important considerations.
- 1. Make sure the frequency spacing between stations is adequate. Ideal conditions would allow at least 150 kHz spacing. Closer spacing can be done with careful design.
- 2. Check proposed site for FCC allocation to make sure station will have adequate radiation pattern for both Day and Night modes of operation.
- 3. Make sure proposed site towers and ground system will work at frequency to be moved.
- 4. Determine if there is space at existing site for phasor and transmitter, or if a new building is
- needed and if this can be accomplished, along with utility power.
- 5. Determine if a reasonable lease between both parties can be obtained.

Typical Filter Circuits

REJECT LOWER FREQUENCY



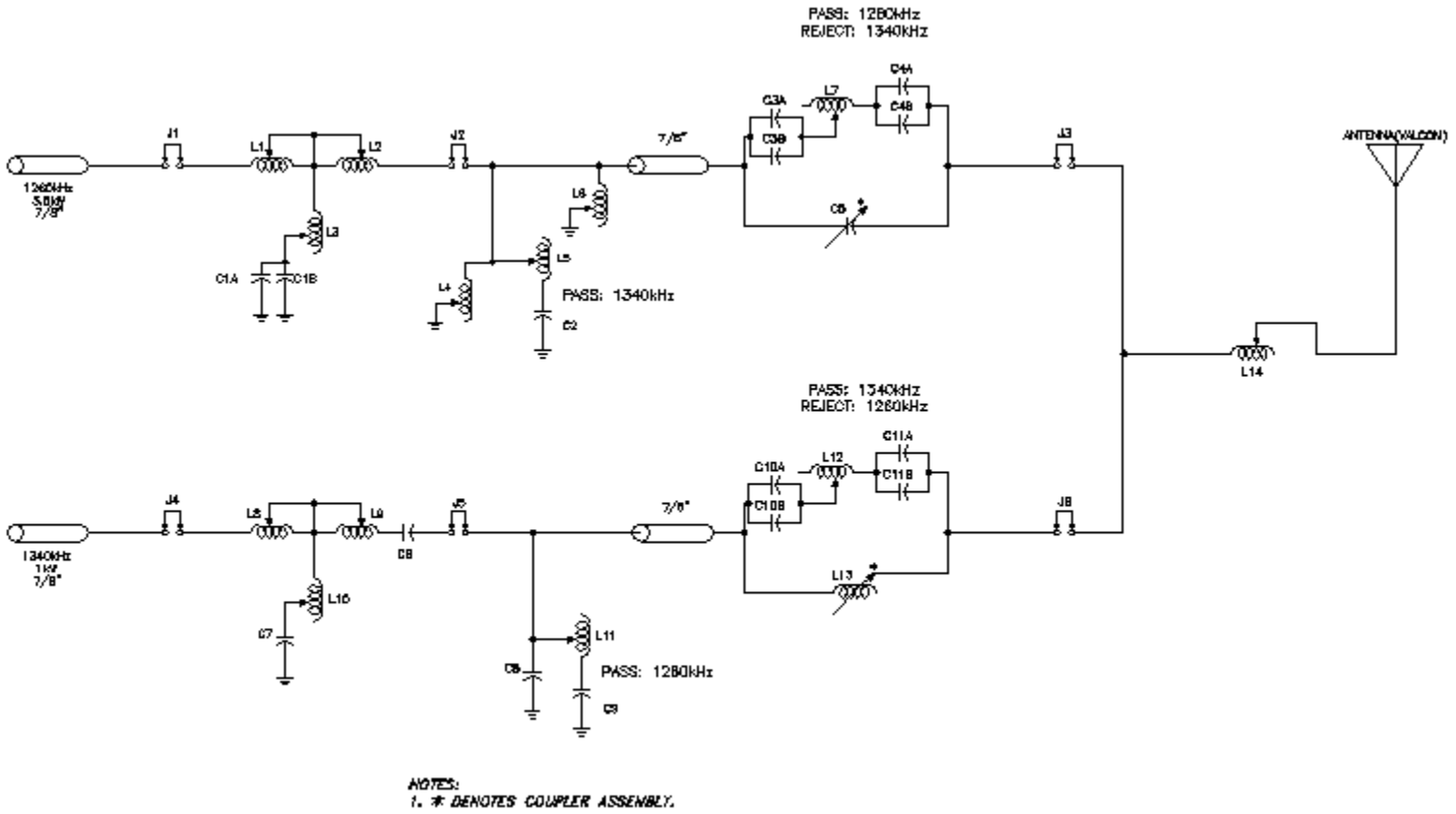
REJECT HIGHER FREQUENCY



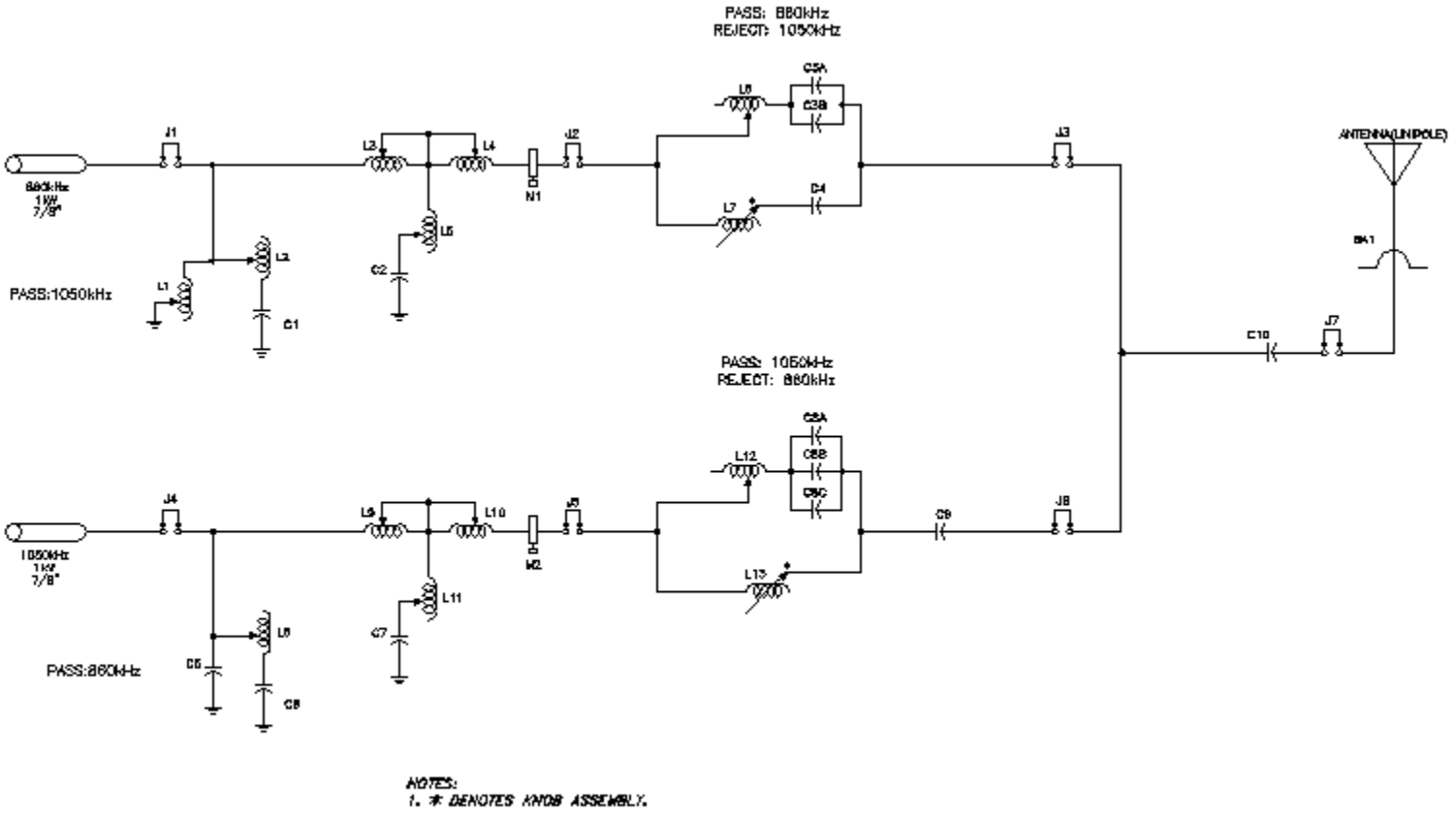
Placement of Filter Circuits

- 1. Each case may vary depending upon the situation
- 2. Filters are placed in series where a high impedance is desired.
- 3. Filters are placed in parallel to ground at locations where a low impedance is desired.
- 4. Series filters on the output of a “T” matching network have the most effect on input impedance characteristics.
- 5. Multiple filter circuits may be needed depending upon the frequency separation and operating voltages.

Typical Diplexer
Shunt Filters on Load Side of “T”

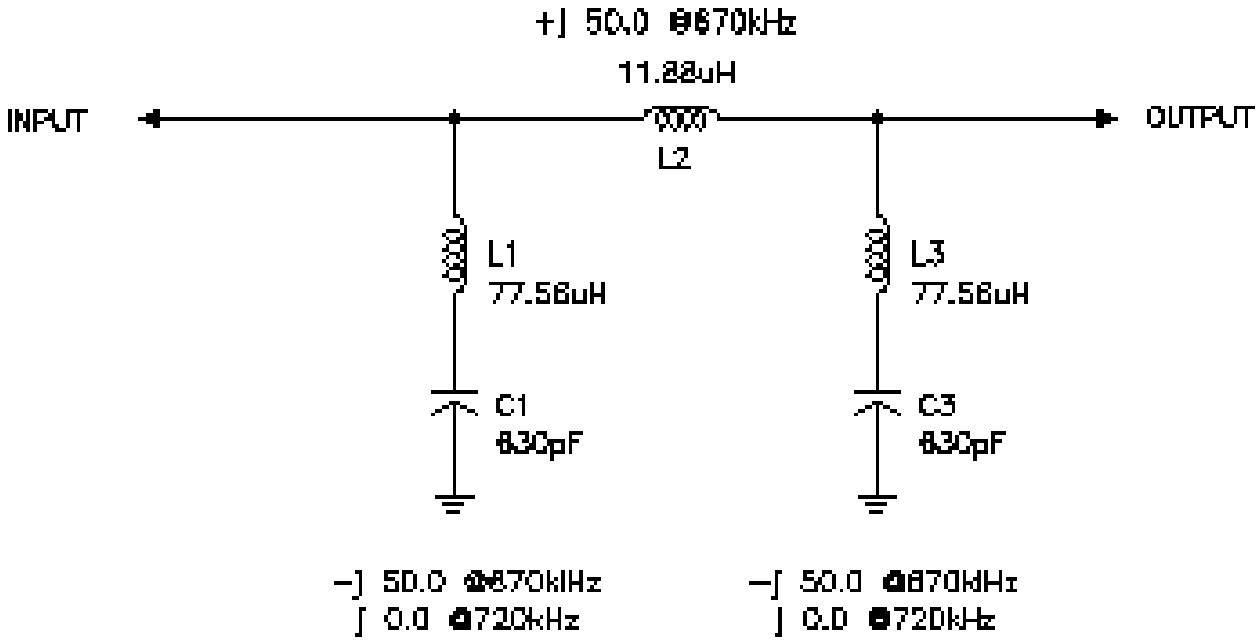


Typical Diplexer
Shunt Filters at Input

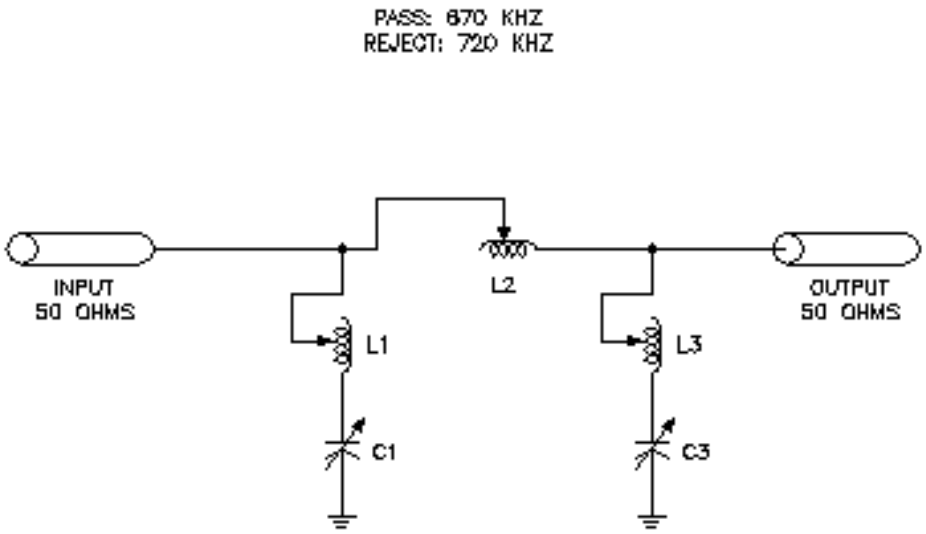


- During the design of the filtering circuitry required to multiplex AM stations, we typically look at the operating parameters of both the existing and the proposed. At this time, it may be possible to place filtering circuitry that will improve the input impedance characteristics to the existing. Many older systems do not have any impedance optimization, and therefore do not have the best impedance bandwidth that they could.
- Typical non-directional systems with low antenna impedances can gain improved impedance bandwidth by placing filtering at the input to the matching network. In addition, this can provide impedance rotation to the transmitter's output port.
- On many directional systems, a filter circuit can be placed at the common point to rotate the sideband impedances and "slope" the sideband reactances.
- When modifying a directional system, tower ATU circuitry can be modified to provide a better impedance match to each transmission line. This will help the overall input impedance.
- Common tower circuitry in the system will not only reduce voltages at the frequency mix point, but also can be used to improve sideband impedances.
- Filter circuits that are incorporated in a "pi" or "T" configuration can be used to optimize impedances while providing rejection to unwanted frequencies when place at 50 ohm points in the system.
- The multiplex system design must take into account all circuitry for operating frequencies. This will allow to most optimization possible.

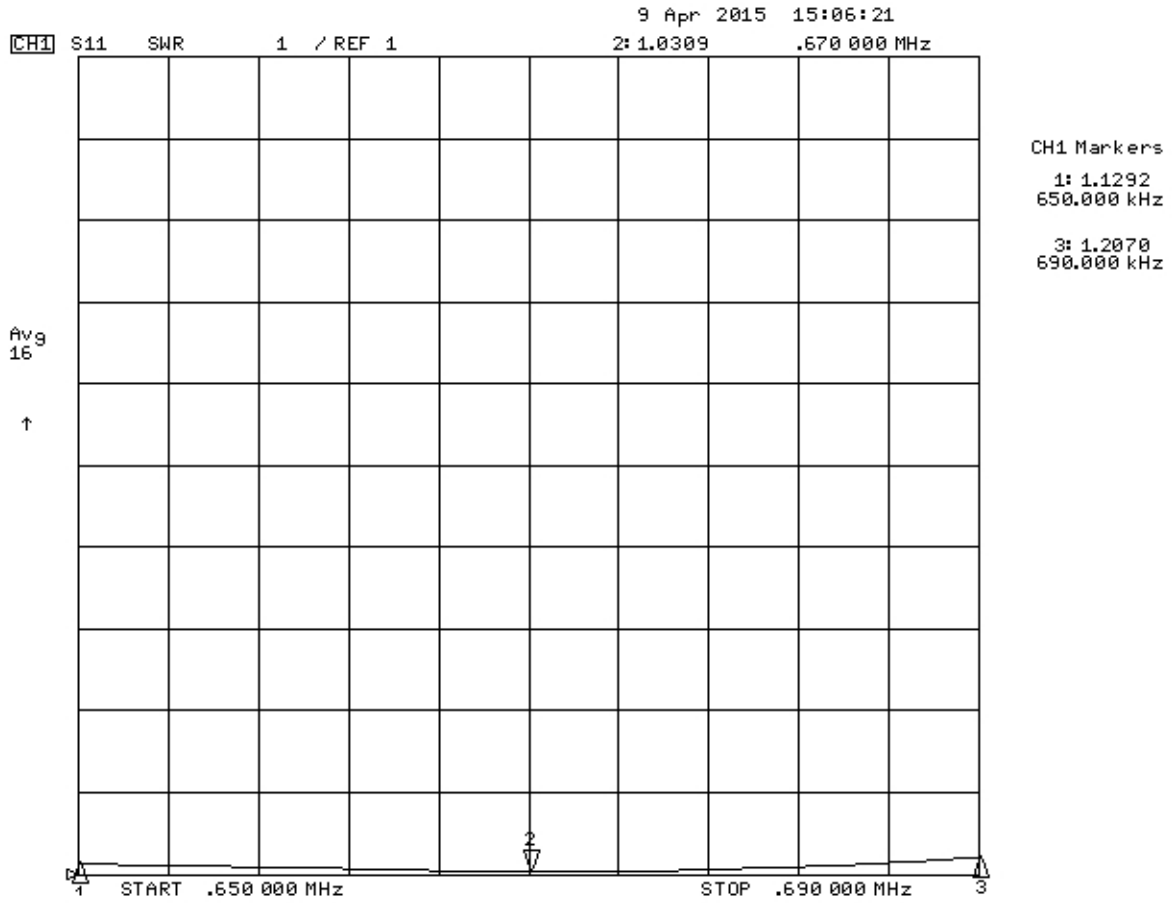
PI Filter Circuit



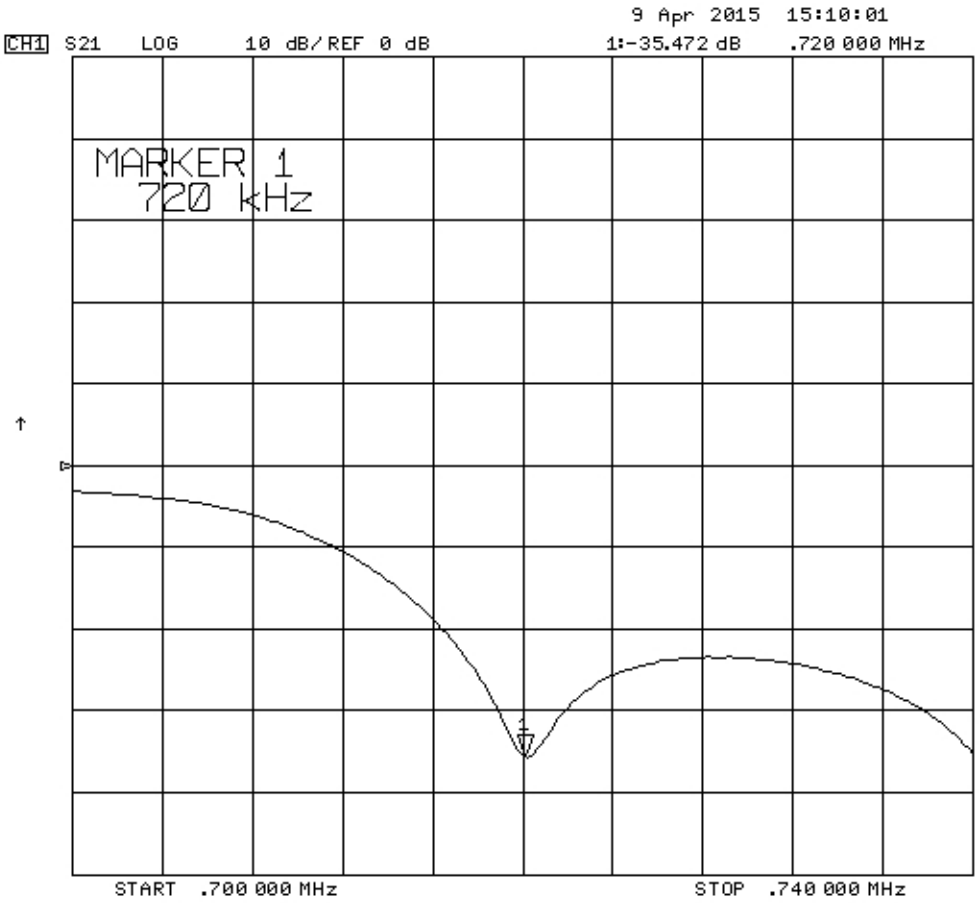
PI Filter Overall



PI Filter Measured Input VSWR



PI Filter Measured Attenuation



PI Filter to Reject Two Frequencies