Conventional amplitude modulation (AM) radio stations use carrier frequencies spaced 10 kHz apart, over the range of 535 kHz to 1605 kHz. Demodulation occurs by frequency shifting the carrier down to the intermediate frequency (IF) of 455 kHz, and passing the signal through a fixed narrow-band filter with bandwidth 10 kHz, centered at 455 kHz. The ideal frequency response characteristic is the “brick-wall” bandpass filter shown below.

The 17 AM radio stations listed below are in the greater Spokane area. Note that two have the same carrier frequency (KOFE at 1240 AM in St. Maries, ID and KCVL at 1240 AM in Colville, WA) with one other station adjacent in frequency (KSBN at 1230 in Spokane, WA). What is the topography of the area between these three locations?
There are 11 AM radio stations within 12 miles of Spokane, with carrier frequencies 590, 630, 700, 790, 920, 970, 1050, 1230, 1280, 1330, and 1510 kHz. These are identified on the frequency spectrum plot below. The minimum separation between these stations is 40 kHz, implying a bandpass filter transition requirement of sufficient attenuation after a transition region of 30 kHz (e.g., from 595 kHz to 625 kHz). What is the attenuation 30 kHz away from the cutoff frequency of the second-order bandpass filter with center frequency the IF frequency of 455 kHz? From the design exercise results, it appears to be about -17 dB (a gain of about 0.14 on a linear scale). This is somewhat inadequate for a practical application, implying that a higher-order bandpass filter would be required.