Sampling rate conversion of bandpass signals

You don't specify what you intend to do with the samples, but you don't sit in any of the two frequencies you're thinking. The notes sampling formulas (bandpass) indicate that if your purpose is to reconstruct the original signal from its samples, it is possible to sample 4 kHz, anywhere between 6 and 8 kHz, or greater than 12 kHz. However, these calculations are valid only if there is no sign to the spectrum ends, which is not true in your case. This means that you should not sample exactly 4, 6, 8 or 12 kHz. (Remember that a continuous signal championship at $ F_S $ will keep its original spectrum, and also its spectrum will be replicated and moved up and down to all full multiples of $ F_S $.) If you run the 12 kHz sample, The rectangular spectrum at 4-6 kHz will be adjacent to a rectangular replica at 6-8 kHz. I would like to taste more than 12 kHz to avoid this. If 6 kHz sample, you will receive two adjacent rectangles, one A -2 to 0 kHz and another at 0 to 2 kHz. This is also undesirable. If you want to demonstrate the signal using the bandwass sampling, you can sample at 5 kHz. This gives you a replica of the spectrum centered at 0 Hz, and with a little care you might be able to filter in a low-pass way is appropriately. Fig. 1: The 10 graphics Top 2 depict Fourier's transformations of 2 different functions that produce the same results when sampled to a particular tariff. The base band function is sampled fastest than its Nyquist rate and the bandPASS function is subjected to convert effectively based on base band. The lower graphs indicate how the identical spectral results are created by the alias of the sampling process. Sample rates texture (Y axis) against the upper edge frequency (X axis) for a band of width 1; The gray areas are combinations that are "allowed" in the sense that no two frequencies in the band alias at the same frequency. The darkest gray areas correspond to a submarine with the maximum value of N in the equations of this section. In signal processing, submot or sampling of the bandwass is a technique in which a filtered signal to Bandda is performed on a sampling frequency under its nyquist speed (twice the upper cut frequency), but it is still Able to reconstruct the signal. When one emphasizes a bandwass signal, the samples are indistinguishable from the samples of a low-frequency alias of the high frequency signal. This sampling is also known as Bandwass sampling, harmonious sampling, if sampling and direct-to-digital direct conversion. [1] Description Fourier transformations of real value functions are symmetrical around the Axis 0 Hz. After sampling, only a periodic summation of the Fourier transform is still available (called Fourier discrete transformation). The individual copies transformed in frequency of the original transform are called alias. The frequency offset between adjacent alias is the sampling rate, indicated by FS. When the alias are mutually exclusive (spectrally), the original transformation and the original continuous function or a frequency moved version (if desired), can be recovered from the samples. The first and third graph of figure 1 describe a spectrum of the base band before and after being championship at a speed that completely separates the alias. The second graph of figure 1 describes the frequency profile of a bandwass function that occupies the band (A, A + B) (shaded blue) and its specular image (shaded beige). The condition for a non-destructive sampling frequency is that the aliases of both bands do not overlap when they have moved from all integers of FS. The fourth chart depicts the spectral result of At the same speed as the base band function. The rate was chosen by finding the lowest rate that is a whole sub-multiple of A and also satisfies the Nyquist base criterion: FSÃ,> 2b.Ã ¢ consequently, the bandpass function was actually converted into Base band base. All other rates that avoid overlapping are provided by these more general criteria, where A and A + B are replaced by FL and FH, respectively: [2] [3] 2 f h n Ã ¢ Ã ¢ Â¤ f f Ã ¢ â € 2 fln Ã, '1 {displaystyle {frac {2f_ {h}} {n}} leq f_ {s} leq {frac {2f_ {l}} {n-1}} }, For any integer N that meets: 1 Ã ¢ Â¤ Â¤ Ã ¢ Å "Å¡ F HFH Ã ¢ 'FL Ã ¢ Å" 1, then the conditions translate into what is sometimes indicated as a subjection, bandwass sampling or using a sampling speed lower than the Nyquist rate (2FH). For the case of a given sampling frequency, the simpler formulas for constraints on the spectral band signal are shown below. Spectrum of the FM radio band (88 "108 MHz) and its base band alias below 44 MHz (n = 5) sampling. There is a fairly tight anti-alias filter for the FM radio band, and there is not there Space for stations in the nearby expansion channels as 87.9 without aliasing. Spectrum of the FM radio band (88 "108 MHz) and its base band aliases under the sampling of 56 MHz (n = 4), showing a lot of space for Transition bands of the anti-aliasing bandpass filter. The image of the base band is frequently inverse in this case (also N). Example: consider the FM radio to illustrate the idea of the submarine. In the United States, the FM radio works on the frequency band from FL = 88 MHz to FH = 108 MHz. The bandwidth is given by W = FH Ã ¢ 'FL = 108 MH Z Ã ¢' 88 Ã ¢ MH Z = 20 Ã ¢ mh z {displaystyle w = f_ {h} -f_ {l} = 108 mathrm {mhz} -88 mathrm {mhz} = 20 mathrm {mhz}} The sampling conditions I am satisfied for 1 Ã ¢ â € œ â € ¢ Ã ¢ å "å¡ 5.4 Ã ¢ å"