INTERMEDIATE SAMPLING OR UNDER-SAMPLING

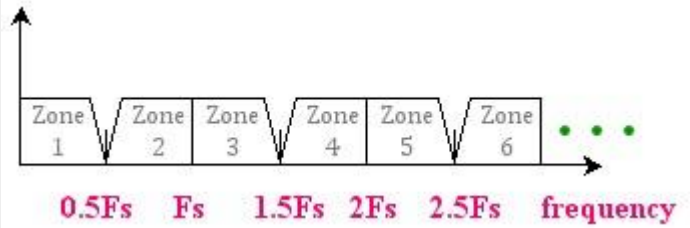
If the signal is a bandpass signal with bandwidth Fb (Bandwidth is simply the difference between the lowest and the highest frequency present in the signal).

"In order for a faithful reproduction and reconstruction of a bandpass analog signal with bandwidth – Fb, the signal should be sampled at a Sampling frequency (Fs) that is greater than or equal to twice the maximum bandwidth of the signal."

$$F_s \geq 2F_b$$

Consider a bandpass signal extending from 150Hz to 200Hz. The bandwidth of this signal is Fb=200Hz-150Hz=50Hz. In order to faithfully represent the above signal in the digital domain the sampling frequency must be Fs>=100Hz (2*Fb). Note that the sampling frequency 100Hz is far below the maximum content of the signal (which is 200Hz). That is why the bandpass sampling is also called "under-sampling". As long as the sampling frequency is greater than or equal to twice the bandwidth of the signal, the reconstruction back to analog domain will be error free.

Going back to the aliasing zone figure, if the signal of interest is in the zone other than zone 1, it is called a bandpass signal and the sampling operation is called**"Intermediate Sampling"** or **"Harmonic Sampling"** or **"Under Sampling"** or **"Bandpass Sampling"**.



Folding Frequencies and Aliasing Zones

Note that zone 1 is a mirror image of zone 2 (with frequency reversal). Similarly zone 3 is a mirror image of zone 4 etc.., Also, any signal in zone 1 will be reflected in zone 2 with frequency reversal which inturn will be copied in zone 3 and so on.

Lets say the signal of interest lies in zone 2. This will be copied in all the other zones. Zone 1 also contains the sampled signal with frequency reversal which can be correct by reversing the order of FFT in digital domain.

No matter in which zone the signal of interest lies, zone 1 always contains the signal after sampling operation is performed. If the signal of interest lies in any of the even zones, zone 1 contains the sampled signal with frequency reversal. If the signal of interest lies in any of the odd zones, zone 1 contains the sampled signal without frequency reversal.

Source: http://www.gaussianwaves.com/2011/07/sampling-theorem-bandpass-or-intermediate-or-under-sampling-2/