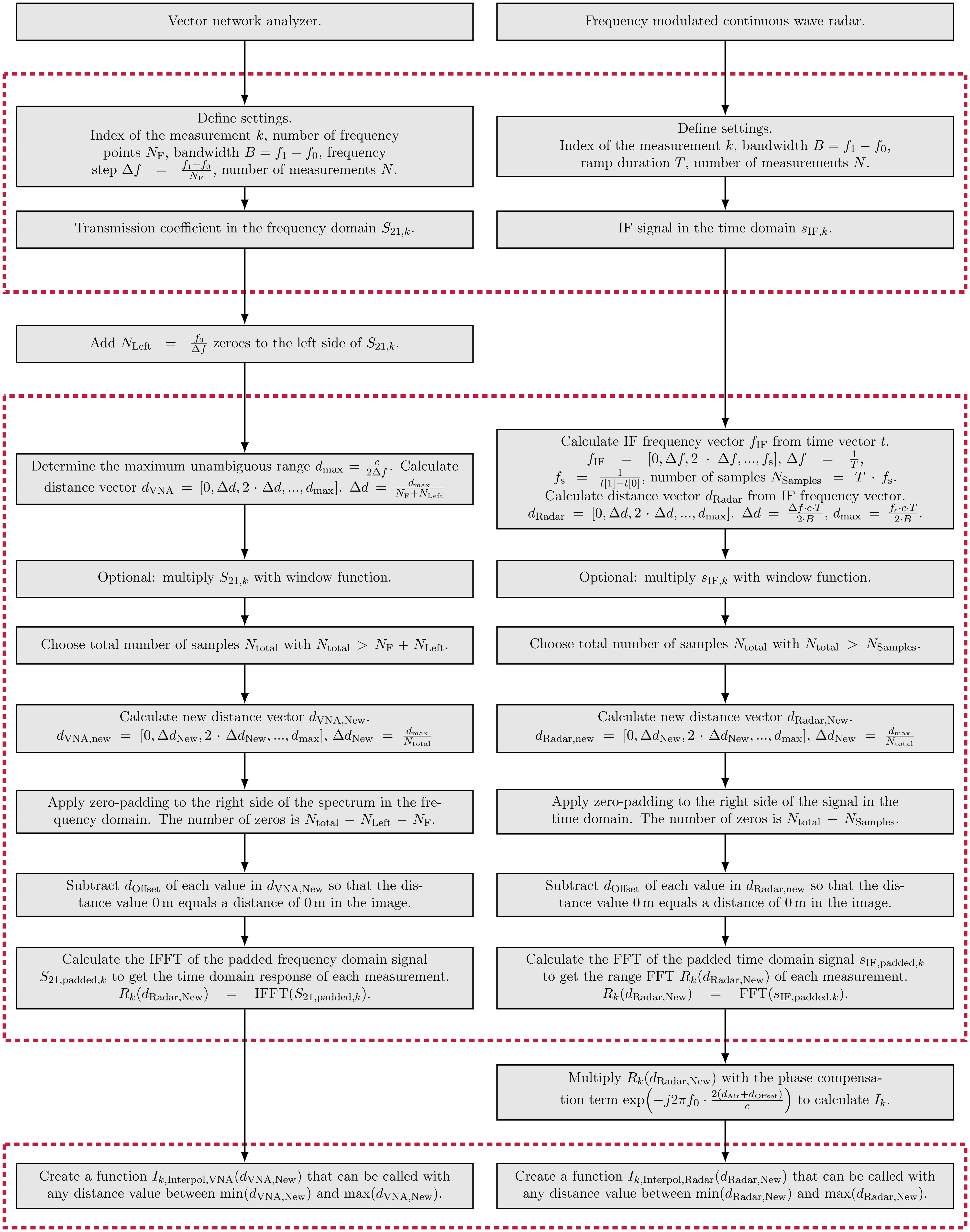

Vector network analyzer.
Frequency modulated continuous wave radar.
Define settings. Index of the measurement k, number of frequency points N_F, bandwidth $B = f_1 - f_0$, frequency step $\Delta f = \frac{f_1 - f_0}{N_\mathrm{F}}$, number of measurements N.
Define settings. Index of the measurement k, bandwidth $B = f_1 - f_0$, ramp duration T, number of measurements N.
Transmission coefficient in the frequency domain $S_{21,k}$.
IF signal in the time domain $s_{\mathrm{IF},k}$.
Add $N_\mathrm{Left} = \frac{f_0}{\Delta f}$ zeroes to the left side of $S_{21,k}$.
Calculate IF frequency vector f_IF from time vector t. $f_\mathrm{IF} = [0, \Delta f, 2 \cdot \Delta f, ..., f_\mathrm{s}]$, $\Delta f = \frac{1}{T}$, $f_\mathrm{s} = \frac{1}{t[1]-t[0]}$, number of samples $N_\mathrm{Samples} = T \cdot f_\mathrm{s}$. Calculate distance vector d_Radar from IF frequency vector. $d_\mathrm{Radar} = [0, \Delta d, 2 \cdot \Delta d, ..., d_\mathrm{max}]$. $\Delta d = \frac{\Delta f \cdot c \cdot T}{2 \cdot B}$, $d_\mathrm{max} = \frac{f_\mathrm{s} \cdot c \cdot T}{2 \cdot B}$.
Determine the maximum unambiguous range $d_\mathrm{max} = \frac{c}{2\Delta f}$. Calculate distance vector $d_\mathrm{VNA} = [0, \Delta d, 2 \cdot \Delta d, ..., d_\mathrm{max}]$. $\Delta d = \frac{d_\mathrm{max}}{N_\mathrm{F} + N_\mathrm{Left}}$
Optional: multiply $S_{21,k}$ with window function.
Optional: multiply $s_{\mathrm{IF},k}$ with window function.
Choose total number of samples N_total with $N_\mathrm{total} > N_\mathrm{F} + N_\mathrm{Left}$.
Choose total number of samples N_total with $N_\mathrm{total} > N_\mathrm{Samples}$.
Calculate new distance vector $d_\mathrm{VNA,New}$. $d_\mathrm{VNA,new} = [0, \Delta d_\mathrm{New}, 2 \cdot \Delta d_\mathrm{New}, ..., d_\mathrm{max}]$, $\Delta d_\mathrm{New} = \frac{d_\mathrm{max}}{N_\mathrm{total}}$
Calculate new distance vector $d_\mathrm{Radar,New}$. $d_\mathrm{Radar,new} = [0, \Delta d_\mathrm{New}, 2 \cdot \Delta d_\mathrm{New}, ..., d_\mathrm{max}]$, $\Delta d_\mathrm{New} = \frac{d_\mathrm{max}}{N_\mathrm{total}}$
Apply zero-padding to the right side of the spectrum in the frequency domain. The number of zeros is $N_\mathrm{total} - N_\mathrm{Left} - N_\mathrm{F}$.
Apply zero-padding to the right side of the signal in the time domain. The number of zeros is $N_\mathrm{total} - N_\mathrm{Samples}$.
Subtract d_Offset of each value in $d_\mathrm{VNA,New}$ so that the distance value 0 m equals a distance of 0 m in the image.
Subtract d_Offset of each value in $d_\mathrm{Radar,new}$ so that the distance value 0 m equals a distance of 0 m in the image.
Calculate the IFFT of the padded frequency domain signal $S_{21,\mathrm{padded},k}$ to get the time domain response of each measurement. $R_k(d_\mathrm{Radar,New}) = \mathrm{IFFT}(S_{21,\mathrm{padded},k})$.
Calculate the FFT of the padded time domain signal $s_{\mathrm{IF,padded},k}$ to get the range FFT $R_k(d_\mathrm{Radar,New})$ of each measurement. $R_k(d_\mathrm{Radar,New}) = \mathrm{FFT}(s_{\mathrm{IF,padded},k})$.
Multiply $R_k(d_\mathrm{Radar,New})$ with the phase compensation term $\exp\left(-j2\pi f_0 \cdot \frac{2(d_\mathrm{Air} + d_\mathrm{Offset})}{c}\right)$ to calculate I_k.
Create a function $I_{k,\mathrm{Interpol,VNA}}(d_\mathrm{VNA,New})$ that can be called with any distance value between $\min(d_\mathrm{VNA,New})$ and $\max(d_\mathrm{VNA,New})$.
Create a function $I_{k,\mathrm{Interpol,Radar}}(d_\mathrm{Radar,New})$ that can be called with any distance value between $\min(d_\mathrm{Radar,New})$ and $\max(d_\mathrm{Radar,New})$.