1-D Rep and Comb Relationships

Definition:

$$x(t) \overset{CTFT}{\Leftrightarrow} X(f)$$

$$\mathrm{rep}_T\left[x(t)\right] = \sum_{k=-\infty}^{\infty} x(t-kT)$$

$$\mathrm{comb}_T\left[x(t)\right] = \sum_{k=-\infty}^{\infty} \delta(t-kT)x(t)$$

Transform Relationship:

$$\mathrm{comb}_T\left[x(t)\right] \quad \overset{CTFT}{\Leftrightarrow} \quad \frac{1}{T}\mathrm{rep}_{\frac{1}{T}}\left[X(f)\right]$$

$$\mathrm{rep}_T\left[x(t)\right] \quad \overset{CTFT}{\Leftrightarrow} \quad \frac{1}{T}\mathrm{comb}_{\frac{1}{T}}\left[X(f)\right]$$

2-D Rep and Comb Relationships

Definition:

$$f(x,y) \overset{CSFT}{\Leftrightarrow} F(u,v)$$

$$\mathrm{rep}_{X,Y}\left[f(x,y)\right] = \sum_{m=-\infty}^{\infty}\sum_{n=-\infty}^{\infty} f(x-mX, y-nY)$$

$$\mathrm{comb}_{X,Y}\left[f(x,y)\right] = \sum_{m=-\infty}^{\infty}\sum_{n=-\infty}^{\infty} \delta(x-mX, y-nY) f(x,y)$$

Transform Relationship:

$$\mathrm{comb}_{X,Y}\left[f(x,y)\right] \quad \overset{CSFT}{\Leftrightarrow} \quad \frac{1}{XY}\mathrm{rep}_{\frac{1}{X},\frac{1}{Y}}\left[F(u,v)\right]$$

$$\mathrm{rep}_{X,Y}\left[f(x,y)\right] \quad \overset{CSFT}{\Leftrightarrow} \quad \frac{1}{XY}\mathrm{comb}_{\frac{1}{X},\frac{1}{Y}}\left[F(u,v)\right]$$