$J_\theta(p)$ is Radon transform of image $f(x, y)$

$$J_\theta(p) = \int_{-\infty}^{\infty} f(p\cos\theta - q\sin\theta, p\sin\theta + q\cos\theta)dq,$$

where

$$\begin{aligned} p &= x\cos\theta + y\sin\theta \\ q &= -x\sin\theta + y\cos\theta \\ x &= p\cos\theta - q\sin\theta \\ y &= p\sin\theta + q\cos\theta. \end{aligned} \tag{1}$$

Easy way to reconstruct the image $f(x, y)$ is to use backprojection (2). Reconstructed image $\hat{f}(x, y)$ is computed as

$$\hat{f}(x, y) \approx \int_0^\pi J_\theta(p)d\theta. \tag{2}$$

Note that this is only approximate reconstruction of the image f.

The second option is to reconstruct the image $f(x, y)$ using a filtered backprojection. Let $S_\theta(\omega)$ be the 1D Fourier transform of the projection $J_\theta(p)$

$$S_\theta(\omega) = \int_{-\infty}^{\infty} J_\theta(p)e^{-j2\pi\omega p}dp. \tag{3}$$

The reconstructed image $\hat{f}$ is computed using backprojection (2) of the filtered projection $J^*_\theta(p)$

$$f(x, y) = \int_0^\pi J^*_\theta(p)d\theta, \tag{4}$$

where $J^*_\theta(p)$ is the projection $J_\theta(p)$ after filtering

$$f(x, y) = \int_0^\pi \int_{-\infty}^{\infty} |\omega|S_\theta(\omega)e^{j2\pi\omega(x\cos\theta + y\sin\theta)}d\omega d\theta \tag{5}$$

$$\begin{aligned} J^*_\theta(p) &= \int_{-\infty}^{\infty} |\omega|S_\theta(\omega)e^{j2\pi\omega(x\cos\theta + y\sin\theta)}d\omega \\ &= \int_{-\infty}^{\infty} |\omega|S_\theta(\omega)e^{j2\pi\omega p}d\omega \\ &= \mathcal{F}^{-1}\{|\omega|S_\theta(\omega)\} \\ &= \mathcal{F}^{-1}\{|\omega|\} \otimes \mathcal{F}^{-1}\{S_\theta(\omega)\} \\ &= \mathcal{F}^{-1}\{|\omega|\} \otimes J_\theta(p) \\ &= \mathcal{F}^{-1}\{|\omega|\mathcal{F}\{J_\theta(p)\}\}, \end{aligned} \tag{6}$$

where $\mathcal{F}$ is the symbol for Fourier transformation and $\otimes$ is the convolution operator.