Comparison of unfocused processor designs

Method 1

1. Projected antenna beam on ground = $\frac{r\lambda}{\ell}$

2. Burst cycle time = $\frac{r\lambda}{v\ell}$

3. Doppler bandwidth = $\frac{2v}{\lambda}\frac{r\lambda}{\ell}\cdot\frac{1}{r} = \frac{2v}{\ell}$

4. # pulses = $\frac{r\lambda}{\ell}\cdot\frac{1}{\delta_{az}}$

   if $\delta_{az} = \sqrt{\lambda r}$ # pulses = $\frac{r\lambda}{\ell}\cdot\frac{1}{\sqrt{r\lambda}} = \frac{\sqrt{\lambda r}}{\ell}$

Method 2

1. Start with δ_{az} as before

2. Pulse spacing = $\frac{v}{\text{Doppler Bw}} = \frac{v\cdot\ell}{2v} = \frac{\ell}{2}$

3. # pulses = $\frac{\delta_{az}\cdot 2}{\ell}$, if $\delta_{az} = \sqrt{\lambda r}$, # pulses = $\frac{2\sqrt{r\lambda}}{\ell}$

So, for the two to be the same

pulses (1) = # pulses (2), or $\frac{r\lambda}{\ell}\frac{1}{\delta_{az}} = \frac{\delta_{az}\cdot 2}{\ell}$

$\Rightarrow \frac{r\lambda}{\delta_{az}} = 2\delta_{az} \Rightarrow \delta_{az} = \sqrt{\frac{r\lambda}{2}}$