Interpretation of the visibility profiles for double sources

The visibility function $V(u, v)$ from a circular source is proportional to the visibility of a unit point source, where the constant of proportionality is the flux (F) multiplied by the relative amplitude function $R(u, v)$. The relative amplitude is an exponential function of the wavenumber $k = \sqrt(u^2 + v^2)$ and the area $A = \pi a^2$ of the source:

$$R = e^{-2\pi^2 k^2 a^2} = e^{-2\pi k^2 A}$$

The visibilility of the circular source is therefore,

$$V = FRe^{i\mathbf{k}\cdot\mathbf{x}} \tag{1}$$

where $\mathbf{x}$ is the vectorial displacement of the source from map center.
For the two-source case, let the map center be at the geometrical midpoint of the two sources, which are then located at $-x_1$ and x_1. The visibility is then

$$V = R_1\ F_1 e^{-i\mathbf{k}\cdot\mathbf{x_1}} + R_2\ F_2 e^{i\mathbf{k}\cdot\mathbf{x_1}} \tag{2}$$

The amplitude $|V|$ may be written as:

$$|V| = [(R_1F_1)^2 + (R_2F_2)^2 + 2(R_1F_1)(R_2F_2)cos(2\mathbf{k}\cdot\mathbf{x_1})]^{1/2} \tag{3}$$

$$= [(R_1F_1 - R_2F_2)^2 + 4(R_1F_1)(R_2F_2)cos^2(\mathbf{k}\cdot\mathbf{x_1})]^{1/2} \tag{3'}$$

During a 4 s time interval, the RHESSI, $\mathbf{k}$ vector rotates 360°, and the visibility is modulated by this rotation. For a single relatively coarse subcollimator for which $|k|x_1 < \pi/2$, the amplitude $|V|$ varies nearly sinusoidally as a function of position angle with a minimum when $\mathbf{k}$ is parallel to $\mathbf{x_1}$ and a maximum when $\mathbf{k}\cdot\mathbf{x_1} = 0$. The position angle locations of the minima give the position angle of the line between the sources. The maxima are 90° away.

This gives a relation between F_1/F_2 and the source areas A_1 and A_2 (we assume $A_1 > A_2$):

$$(F_1/F_2)e^{-2*\pi k^2[(A_1-A_2)} = (1 - |V|_{min}/|V|_{max})/(1 + |V|_{min}/|V|_{max}) \tag{4}$$

For those (finer) grids for which $|k|x_1 \geq \pi/2$, the amplitude $|V|$ can have more than one extremum when $\mathbf{k}\cdot\mathbf{x_1} = \pi/2, 3\pi/2, \ldots$.

Taking the ratio of equation (4) for two different values of $|k|$ (i.e two different subcollimators) makes the flux ratio F_1/F_2 cancel out, and the quantity $(A_1 - A_2)$ can be determined. After that, the flux ratio may be determined from equation (4) for one of the subcollimators.