$$
\begin{array}{ccccc}
S_1 J_0(k_1 a_1) & . & . & . & S_5 J_0(k_1 a_5) = 0 \\
. & . & . & . & . \\
. & . & . & . & . \\
S_1 J_0(k_4 a_1) & . & . & . & S_5 J_0(k_4 a_5) = 0
\end{array}
\qquad (3)
$$

The fifth required equation is obtained when the designer chooses the total area of the rings S_s

$$S_1 + S_2 + S_3 + S_4 + S_5 = S_s \qquad (4)$$

As before the values of k_i are defined by the roots of J_1 and are listed in the last column of Table 1. The five unknowns in the four equation matrix may be reduced to four by dividing each of the S_j values by S_1 to produce the four unknowns $s_j = S_j/S_1$

The matrix then becomes:

$$
\begin{aligned}
0.629\, s_2 + 0.217\, s_3 - 0.161\, s_4 - 0.377\, s_5 + 0.923 &= 0 \\
0.029\, s_2 - 0.398\, s_3 - 0.170\, s_4 + 0.236\, s_5 + 0.754 &= 0 \\
-\,0.366\, s_2 - 0.062\, s_3 + 0.269\, s_4 - 0.143\, s_5 + 0.520 &= 0 \\
-\,0.328\, s_2 + 0.300\, s_3 - 0.200\, s_4 + 0.066\, s_5 + 0.256 &= 0
\end{aligned}
\qquad (3a)
$$

Solving for s_j gives

$$s_2 = 2.142$$

$$s_3 = 3.463$$

$$s_4 = 4.917$$

$$s_5 = 5.929$$

If $S_s = \dfrac{S_D}{10}$ (5)

$$= \frac{\pi a^2}{10}$$

then

$$S_1\ (1 + 2.142 + 3.463 + 4.917 + 5.929) = \frac{\pi a^2}{10}$$

$$S_1 = 0.018a^2$$

$$S_2 = 0.0386a^2$$

$$S_3 = 0.0623a^2$$

$$S_4 = 0.0885a^2$$

$$S_5 = 0.1067a^2$$