

# A Table for Quickly Determining Planes of Focus for a Scintillation Tomocamera

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Due to the recent interest in new techniques using the scintillation camera for imaging planes of interest at various organ depths (tomography) (1-3), requirements are continually arising for the development of procedures for using such complex equipment more efficiently. This communication describes a procedure for quickly and conveniently determining the operating parameters for the Searle Radiographics Tomocamera (Model 3124).

The tomocamera uses a rotating collimator with parallel slanted holes to record data in either of two modes. One mode uses the rotating collimator and a stationary table to give planar images called tomoplanes, which are focused at fixed distances of 1, 2, 3, and 4 in. from the surface of the collimator. The other mode uses the rotating collimator and a synchronously rotating table to give four tomoplanes (TP) which are equally spaced (TS) and which occur at distances from the surface of the collimator as a function of the particular geometric focal plane distance (GFD). Each tomoplane is based on electronically corrected data from the geometric focal plane (GFP)

(Fig. 1). One oscilloscope on the tomocamera displays the geometric focal plane as a normal camera image while a second oscilloscope simultaneously displays all four tomoplane images in reduced size.

The geometric focal plane may be set for a desired depth from 0 to 5.5 in. from the collimator surface for tomoplane space settings of 0.5, 1.0, or 1.5 in. These manipulations can be performed rather quickly. However, manually calculating the distance for each of the four tomoplanes is not only time consuming in a rushed clinical situation but is also prone to mathematical errors. To minimize these factors, a listing of the distances for all four tomoplanes from the surface of the collimator for various geometric focal plane distances and tomoplane spacings is presented in Table 1.

The four tomoplane distances can be calculated using the following relationships: TP1 is  $GFD - 1.5 TS$ , TP2 is  $GFD - 0.5 TS$ , TP3 is  $GFD + 0.5 TS$ , and TP4 is  $GFD + 1.5 TS$ , where TP (1,2,3,4) are the tomoplane distances to be calculated.

A computer program employing the above formulas was used to calculate the tomoplane distances for the three tomoplane spacings, namely, 0.5, 1.0, and 1.5 in. for geometric focal distances of 0-5.5 in. The geometric focal distance is incremented by 0.125 in., the smallest division which can be accurately estimated. Small geometric focal distances give tomoplanes which are above the surface of the collimator and are represented by negative values in Table 1. Increments of the geometric focal distance less than 0.5 in. are included

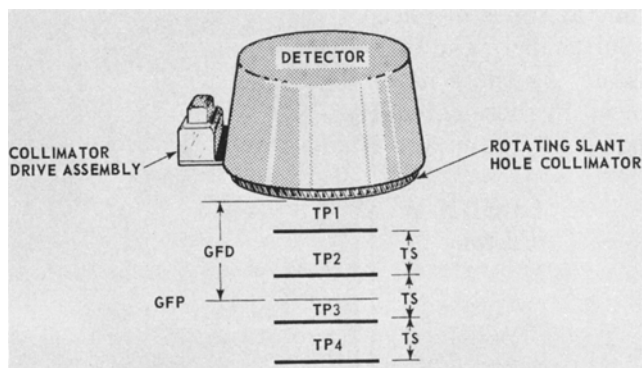


FIG. 1. "Table" on mode showing interrelationships of tomoplanes, tomoplane spacings, geometric focal plane distance, and position of geometric focal plane.

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**Table 1. Tomoplane Distances for Various Tomoplane Spacings and Geometric Focal Plane Distances**

TS = 0.5 (in.)					TS = 1.0 (in.)					TS = 1.5 (in.)				
GFD (in.)	TP1 (in.)	TP2 (in.)	TP3 (in.)	TP4 (in.)	GFD (in.)	TP1 (in.)	TP2 (in.)	TP3 (in.)	TP4 (in.)	GFD (in.)	TP1 (in.)	TP2 (in.)	TP3 (in.)	TP4 (in.)
0.000	-0.750	-0.250	0.250	0.750	0.000	-1.500	-0.500	0.500	1.500	0.000	-2.250	-0.750	0.750	2.250
0.125	-0.625	-0.125	0.375	0.875	0.125	-1.375	-0.375	0.625	1.625	0.125	-2.125	-0.625	0.875	2.375
0.250	-0.500	0.000	0.500	1.000	0.250	-1.250	-0.250	0.750	1.750	0.250	-2.000	-0.500	1.000	2.500
0.375	-0.375	0.125	0.625	1.125	0.375	-1.125	-0.125	0.875	1.875	0.375	-1.875	-0.375	1.125	2.625
0.500	-0.250	0.250	0.750	1.250	0.500	-1.000	0.000	1.000	2.000	0.500	-1.750	-0.250	1.250	2.750
0.625	-0.125	0.375	0.875	1.375	0.625	-0.875	0.125	1.125	2.125	0.625	-1.625	-0.125	1.375	2.875
0.750	0.000	0.500	1.000	1.500	0.750	-0.750	0.250	1.250	2.250	0.750	-1.500	0.000	1.500	3.000
0.875	0.125	0.625	1.125	1.625	0.875	-0.625	0.375	1.375	2.375	0.875	-1.375	0.125	1.625	3.125
1.000	0.250	0.750	1.250	1.750	1.000	-0.500	0.500	1.500	2.500	1.000	-1.250	0.250	1.750	3.250
1.125	0.375	0.875	1.375	1.875	1.125	-0.375	0.625	1.625	2.625	1.125	-1.125	0.375	1.875	3.375
1.250	0.500	1.000	1.500	2.000	1.250	-0.250	0.750	1.750	2.750	1.250	-1.000	0.500	2.000	3.500
1.375	0.625	1.125	1.625	2.125	1.375	-0.125	0.875	1.875	2.875	1.375	-0.875	0.625	2.125	3.625
1.500	0.750	1.250	1.750	2.250	1.500	0.000	1.000	2.000	3.000	1.500	-0.750	0.750	2.250	3.750
1.625	0.875	1.375	1.875	2.375	1.625	0.125	1.125	2.125	3.125	1.625	-0.625	0.875	2.375	3.875
1.750	1.000	1.500	2.000	2.500	1.750	0.250	1.250	2.250	3.250	1.750	-0.500	1.000	2.500	4.000
1.875	1.125	1.625	2.125	2.625	1.875	0.375	1.375	2.375	3.375	1.875	-0.375	1.125	2.625	4.125
2.000	1.250	1.750	2.250	2.750	2.000	0.500	1.500	2.500	3.500	2.000	-0.250	1.250	2.750	4.250
2.125	1.375	1.875	2.375	2.875	2.125	0.625	1.625	2.625	3.625	2.125	-0.125	1.375	2.875	4.375
2.250	1.500	2.000	2.500	3.000	2.250	0.750	1.750	2.750	3.750	2.250	0.000	1.500	3.000	4.500
2.375	1.625	2.125	2.625	3.125	2.375	0.875	1.875	2.875	3.875	2.375	0.125	1.625	3.125	4.625
2.500	1.750	2.250	2.750	3.250	2.500	1.000	2.000	3.000	4.000	2.500	0.250	1.750	3.250	4.750
2.625	1.875	2.375	2.875	3.375	2.625	1.125	2.125	3.125	4.125	2.625	0.375	1.875	3.375	4.875
2.750	2.000	2.500	3.000	3.500	2.750	1.250	2.250	3.250	4.250	2.750	0.500	2.000	3.500	5.000
2.875	2.125	2.625	3.125	3.625	2.875	1.375	2.375	3.375	4.375	2.875	0.625	2.125	3.625	5.125
3.000	2.250	2.750	3.250	3.750	3.000	1.500	2.500	3.500	4.500	3.000	0.750	2.250	3.750	5.250
3.125	2.375	2.875	3.375	3.875	3.125	1.625	2.625	3.625	4.625	3.125	0.875	2.375	3.875	5.375
3.250	2.500	3.000	3.500	4.000	3.250	1.750	2.750	3.750	4.750	3.250	1.000	2.500	4.000	5.500
3.375	2.625	3.125	3.625	4.125	3.375	1.875	2.875	3.875	4.875	3.375	1.125	2.625	4.125	5.625
3.500	2.750	3.250	3.750	4.250	3.500	2.000	3.000	4.000	5.000	3.500	1.250	2.750	4.250	5.750
3.625	2.875	3.375	3.875	4.375	3.625	2.125	3.125	4.125	5.125	3.625	1.375	2.875	4.375	5.875
3.750	3.000	3.500	4.000	4.500	3.750	2.250	3.250	4.250	5.250	3.750	1.500	3.000	4.500	6.000
3.875	3.125	3.625	4.125	4.625	3.875	2.375	3.375	4.375	5.375	3.875	1.625	3.125	4.625	6.125
4.000	3.250	3.750	4.250	4.750	4.000	2.500	3.500	4.500	5.500	4.000	1.750	3.250	4.750	6.250
4.125	3.375	3.875	4.375	4.875	4.125	2.625	3.625	4.625	5.625	4.125	1.875	3.375	4.875	6.375
4.250	3.500	4.000	4.500	5.000	4.250	2.750	3.750	4.750	5.750	4.250	2.000	3.500	5.000	6.500
4.375	3.625	4.125	4.625	5.125	4.375	2.875	3.875	4.875	5.875	4.375	2.125	3.625	5.125	6.625
4.500	3.750	4.250	4.750	5.250	4.500	3.000	4.000	5.000	6.000	4.500	2.250	3.750	5.250	6.750
4.625	3.875	4.375	4.875	5.375	4.625	3.125	4.125	5.125	6.125	4.625	2.375	3.875	5.375	6.875
4.750	4.000	4.500	5.000	5.500	4.750	3.250	4.250	5.250	6.250	4.750	2.500	4.000	5.500	7.000
4.875	4.125	4.625	5.125	5.625	4.875	3.375	4.375	5.375	6.375	4.875	2.625	4.125	5.625	7.125
5.000	4.250	4.750	5.250	5.750	5.000	3.500	4.500	5.500	6.500	5.000	2.750	4.250	5.750	7.250
5.125	4.375	4.875	5.375	5.875	5.125	3.625	4.625	5.625	6.625	5.125	2.875	4.375	5.875	7.375
5.250	4.500	5.000	5.500	6.000	5.250	3.750	4.750	5.750	6.750	5.250	3.000	4.500	6.000	7.500
5.375	4.625	5.125	5.625	6.125	5.375	3.875	4.875	5.875	6.875	5.375	3.125	4.625	6.125	7.625
5.500	4.750	5.250	5.750	6.250	5.500	4.000	5.000	6.000	7.000	5.500	3.250	4.750	6.250	7.750

to allow for accuracy in setting the controls and for completeness of Table 1; however, the real clinical value has not yet been established.

Examples using the tomoplane table include the following:

1. If a geometric focal plane is set at 3.5 in. with 0.5-in. tomoplane spacings, the four tomoplane values taken from Table 1 are 2.750, 3.250, 3.750, and 4.250 in.
2. If an area of interest is estimated to be 2 in. below the surface of the collimator and tomoplane distances of 2, 3, 4, and 5 in. are desired, the geometric focal distance with a tomoplane spacing of 1 in. is 3.5 in.

In conclusion, tomographic data acquisition can be facilitated by the use of the tomoplane table herein described to quickly assign tomoplane values to a specific geometric focal plane. Conversely, geometric focal plane distances can be assigned to various tomoplane depths of interest.

### References

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