

23 Nov 2023

14  
60  
840

UT 6  
7

GHA = 144 30.0  
159 1.2  
14 31.2 = 871.2  
14 19.0  
r = 12.2

$\delta = 1^{\circ} 33.7' N$   
 $d = \frac{150.7}{16.7}$

6  
19 44.5

144 30.0  
4 42.5  
4.0  
GHA = 149 16.5

1 33.7  
d corr 5.4  
 $\delta = 1^{\circ} 39.1'$

$\sin h(t) = \sin \varphi \sin \delta(t) + \cos \varphi \cos \delta(t) \cos t(t)$

$\cos h \frac{dh}{dt} = \sin \varphi \cos \delta \frac{d\delta}{dt} - \cos \varphi \left( \sin \delta \frac{d\delta}{dt} \cos t + \cos \delta \sin t \frac{dt}{dt} \right)$

$\frac{dh}{dt} = 0$  at culmination

$\Rightarrow \tan \varphi = \frac{\sin \delta \frac{d\delta}{dt} \cos t + \cos \delta \sin t \frac{dt}{dt}}{\cos \delta \frac{d\delta}{dt}} =$

$= \tan \delta \cos t + \frac{dt}{d\delta} \sin t = \{t \text{ small}\} =$

$\approx \tan \delta + t \frac{dt}{d\delta} \sin 1^{\circ}$ , where  $t$  is in degrees

$t = \frac{\tan \varphi - \tan \delta}{\frac{dt}{d\delta} \sin 1^{\circ}}$

$\left( \frac{dt}{d\delta} \sin 1^{\circ} \right)^{-1} = \left( \frac{871.2 \sin 1^{\circ}}{16.7} \right)^{-1}$

2.94012
1.22272
1.71740
8.2419
9.9593
0.0407

$h = \frac{89.60}{21^{\circ} 38.1'}$  (geocentric)  
 $z = 58 21.9$   
 $\delta = 1 39.1$

approx.  $\varphi = 60 1.0$   $\tan 0.0290$   
 $\tan 1.7332$   
 $1.7042$

$= \left\{ \begin{array}{l} 0.2315 \\ 0.0407 \\ 0.2722 \end{array} \right\} = 1.872 = 1^{\circ} 52'$

0.872  
60  
52320

check altitude:

$\varphi$	60 1	9.69875	$\rightarrow$	60 0	9.69897
$\delta$	1 39	9.99982			
$t$	1 52	6.12379			
		6.12236			6.12258
		0.00013			0.00013
$\varphi - \delta$	58 22	0.23776		58 21	0.23764
$h$	31 37	0.23789		31 38	0.23777

alt. 1' too low, try 1' less latitude

altitude ok

GHA 149 16'  
 $t = 1 52$   
 $\lambda \text{ west} = 147^{\circ} 24'$