KOHAN ALEXABRU
831

Lab 3

1. Determinați azimutul și înălțimea deasupra orizontului la care se găsește steaua Alkaid (β UMa) de declinație $\delta = 28°$ și unghi orar $H = 23^h\ 48^m$, respectiv Gemma (α CrB) de declinație $\delta = 26°\ 39'$ și ascensie dreaptă $\alpha = 15^h\ 35^m$, observație de la Cluj Napoca ($\varphi = 46°\ 46'N$), la momentul de timp sideral $\theta = 19^h\ 19^m$.

$(H, \delta) \xrightarrow{\varphi} (A, h)$

$$\operatorname{tg} A = \frac{\sin H}{\sin\varphi \cos H - \operatorname{tg}\delta \cos\varphi}$$

$23^h\ 48^m = 23^h + \frac{48}{60}h =$

$= 23{,}8^h = (23{,}8 \cdot 15)^\circ = 357^\circ$

$$\operatorname{tg} A = \frac{\sin 357^\circ}{\sin 46^\circ 46' \cos 357^\circ - \operatorname{tg} 28^\circ \cdot \cos 46^\circ 46'} =$$

$$= \frac{-0{,}052}{\sin(46{,}76)^\circ \cos 357^\circ - \operatorname{tg} 28^\circ \cdot \cos(46{,}76}$$

$$= \frac{-0{,}052}{0{,}72 \cdot 0{,}99 - 0{,}53 \cdot 0{,}68} =$$

$$= \frac{-0{,}052}{0{,}71 - 0{,}36} = \frac{-0{,}052}{0{,}35} = -0{,}14$$

~~$\Rightarrow A = \operatorname{arctg}(-0{,}14) = -0{,}13$~~

$A = \operatorname{arctg}(-0{,}14) + k_2\pi,\ k \in \mathbb{Z}$

$H \in [12^h, 24^h] \Rightarrow A \in [180^\circ, 360^\circ]$

$\operatorname{arctg}(-0{,}14) = -0{,}139\ \text{rad} =$ [illegible]

$= -0{,}139 \cdot 57{,}3 \doteq -7{,}9^\circ$

$-7,9^\circ + \tilde{\pi} = -7,9 + 180 = 172,1^\circ$

$172,1 + 180 = 352,1^\circ \in [180^\circ, 360^\circ] \Rightarrow$

$\Rightarrow A = 352,1^\circ$

$\sin h = \sin\delta \sin\varphi + \cos\delta \cos\varphi \cos H$

$\sin h = 0,46 \cdot 0,72 + 0,88 \cdot 0,68 \cdot 0,99 =$

$= 0,33 + 0,59 = 0,92$

$h = (-1)^\circ \arcsin 0,92 + k_2 \tilde{\pi}$

$h = 1,16 \text{ rad} + k_2 \tilde{\pi}$

$h = 1,16 \cdot 57,3 + k_2 \tilde{\pi} = (66,9)^\circ + k_2 \overset{\pi}{0} \tilde{\pi} =$

$= 66,9^\circ$

Gemma: declinație $\delta = 26^\circ 39'$

$\alpha = 15^h 35^m$

$\varphi = 46^\circ 46' N$

timp sideral - $\theta = 19^h 19^m$

$H = \theta - \alpha = 19^h 19^m - 15^h 35^m =$

$= 3^h 44^m = \left(3 + \frac{44}{60}\right) h = 3,73 h =$

$= (3,73 \cdot 15)^\circ = 55,95^\circ$

$$\operatorname{tg} A = \frac{\sin H}{\sin \varphi \cos H - \operatorname{tg} \delta \cos \varphi}$$

$$= \frac{0,82}{\sin(46,76)^\circ \cos(55,95^\circ) - \operatorname{tg}(26,65)^\circ \cos(46,7}$$

$$= \frac{0,82}{0,72 \cdot 0,55 - 0,5 \cdot 0,68}$$

$$= \frac{0,82}{0,39 - 0,34} = \frac{0,82}{0,05} =$$

$$= 16,4$$

$H = 3,73 h \in [0^h, 12^h] \Rightarrow A \in [0^\circ, 180^\circ]$

$A = \operatorname{arctg}(16,4) + k\pi, k \in \mathbb{Z}$

$A = (1,5) \text{rad} + k\pi$

$A = 1,5 \cdot 57,3 + k\pi = 85,95^\circ + k\pi$

~~$A = 85{,}95° + 180°$~~

$k = 0 \Rightarrow 85{,}95° + 0\pi = 85{,}95° \in [0°, 180°]$

$k = 1 \Rightarrow 85{,}95° + 180° = 265{,}95° \notin [0°, 180°]$

$\Rightarrow A = 85{,}95°$

$\sin h = \sin\delta \sin\varphi + \cos\delta \cos\varphi \cos H$

$\sin h = \sin(26{,}65)° \sin(46{,}76)° +$

$+ \cos(26{,}65)° \cos(46{,}76)° \cos(55{,}95)° =$

$\Rightarrow \sin h = 0{,}44 \cdot 0{,}72 + 0{,}89 \cdot 0{,}68 \cdot 0{,}55 =$

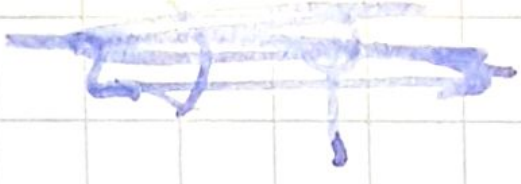
$\Rightarrow \sin h = 0{,}31 + 0{,}33 = 0{,}64$

$k = 0$

$h = (-1)^0 \arcsin(0{,}64) + 0\pi$

$h = \arcsin(0{,}64) = 0{,}69 \text{ rad} =$

$= (0{,}69 \cdot 57{,}3)° = (39{,}71)°$



2) $\varphi = 46^\circ 46' N = (46,76)^\circ$

$\theta = 19^h 19^m$

Latura: $A = 3^\circ 54' = (3,9)^\circ$

$h = 20^\circ 42' = (20,7)^\circ$

Ascensie dreaptă? $\Rightarrow \alpha = ?$

Declinație? $\Rightarrow \delta = ?$

$$\operatorname{tg} H = \frac{\sin A}{\operatorname{tg} h \cos \varphi + \sin \varphi \cos A}$$

$$\operatorname{tg} H = \frac{0,06}{0,37 \cdot 0,68 + 0,72 \cdot 0,99} =$$

$$= \frac{0,06}{0,25 + 0,71} =$$

$$= \frac{0,06}{0,96} = 0,06$$

$$H = \operatorname{arctg}(0,06) + k\pi, \; k \in \mathbb{Z}$$

$A = (3,9)^\circ \in [0^\circ; 180^\circ] \Rightarrow$

$\Rightarrow H \in [0^h, 12^h]$

$H = 0,05 + k\pi$

$H = (0,05 \cdot 57,3)^\circ + k\pi$

$H = 3,43^\circ + k\pi$

$k = 0 \Rightarrow H = 3,43^\circ = \left(\frac{3,43}{15}\right)^h \; k =$

$= 0,22^h \in [0^h, 12^h]$

$B = 1 \Rightarrow (3,43 + 180)^\circ = 183,43^\circ =$

$= 12,22^h \in [0,12^h]$

$\Rightarrow H = 3,43^\circ$

$\alpha = \theta - H = 19^h\,19^m - 3,43^\circ =$

$= 19,31^h - 3,43^\circ = 289,65^\circ - 3,43^\circ =$

$= 286,22^\circ = 19,08^h =$

$= 19^h\,4,8' = 19^h\,4'\,48''$

Saturn

$$\sin\delta = \sin h \sin\varphi - \cos h \cos\varphi \cos A$$

$$\sin\delta = \sin(20,7)^\circ \sin(46,76)^\circ -$$

$$- \cos(20,7)^\circ \cos(46,76)^\circ \cos(3,9)^\circ$$

$$\sin\delta = 0,35 \cdot 0,72 - 0,93 \cdot 0,66 \cdot 0,99 =$$

$$= 0,25 - 0,62 = -0,37$$

$h_a = 0 \Rightarrow$

$$\Rightarrow \delta = (-1)^k \arcsin(-0,37) + k\pi$$

$$\Rightarrow \delta = (-0,37 \text{ rad} = (-21,2)^\circ$$

Capella:

$A = 200^\circ\ 35' = (200{,}58)^\circ$

$h = 6^\circ\ 37' = (6{,}61)^\circ$

$$\alpha = \theta - H$$

$$\operatorname{tg} H = \frac{\sin A}{\operatorname{tg} \theta \cos \varphi + \sin \varphi \cos A}$$

$$\operatorname{tg} H = \frac{-0,35}{0,11 \cdot 0,68 + 0,72 \cdot (-0,93)} =$$

$$= \frac{-0,35}{0,04 + (-0,66)} = \frac{-0,35}{-0,59} = 0,59$$

$$H = \operatorname{arctg}(0,59) + k_2 \pi, \quad k_2 \in \mathbb{Z}$$

$$A = (200,58)^\circ \in [180^\circ, 360^\circ]$$

$$\Rightarrow H \in [12^R, 24^R]$$

$$H = (0,53 \cdot 57,3)^\circ + k_2 \vec{\pi}$$

$$H = (30,36)^\circ + k_2 \vec{\pi}$$

$$k_2 = 0 \Rightarrow (30,36 + 0)^\circ = \left(\frac{30,36}{15}\right)^R =$$

$= 2,02 h$

$h = 1 \Rightarrow (30,36 + 180)^\circ = [illegible] (210,36)^\circ$

$= \frac{210,36}{15} = 14,02 h \in [12^h, 24^h]$

$\Rightarrow H = 14,02 h$

$\alpha = 19^h 15^m - 14,02 h =$

$= 19,31 h - 14,02 h = [illegible] 5^h 29^m$

Capella:

$$\sin\delta = \sin h \sin\varphi - \cos h \cos\varphi \cos A$$

$$\sin\delta = 0{,}11 \cdot 0{,}72 - 0{,}99 \cdot 0{,}68 \cdot (-0{,}93)$$

$$= 0{,}07 + 0{,}6 = 0{,}67$$

$$h = 0 \Rightarrow \delta = (-1)^k \arcsin(0{,}67) + k\pi \qquad k \in \mathbb{Z}$$

$$\delta = 0{,}73 \text{ rad} = (41{,}81)^\circ$$

3) $\theta = 19^h\ 19^m = 19,31^h$

zenit, nadir, punctele cardinale,
meridianul locului, axa lumii,
Polul ceresc N și ecuatorul ceresc
Albireo, Gemma, Capella, Saturn

$\alpha = \theta - H$ $\theta = 19^h 19^m$

Albireo: $\delta = 28°$ $A = 352,1°$

$H = 23^h 48^m$ $h = 66,9°$

Gamma: $\delta = 26° 39'$ $A = 85,95°$

$\alpha = 15^h 35^m$ $h = 39,4°$

Saturn: $A = 3° 54'$

$h = 20° 42'$ $H = 3,43°$

$\delta = -21,2°$

Capella: $A = 200° 35'$

$h = 6° 34'$ $H = 210°$

$\delta = 41,8°$

Albireo: $\alpha = \theta - H = 19^h 19^m - 23^h 48^m =$

$= 19^h 19^m + (24^h - 23^h 48^m) =$

$= 19^h 19^m + 12^m = 19^h 31^m$

Gamma: $H = \theta - \alpha = 19^h 19^m - 15^h 35^m$

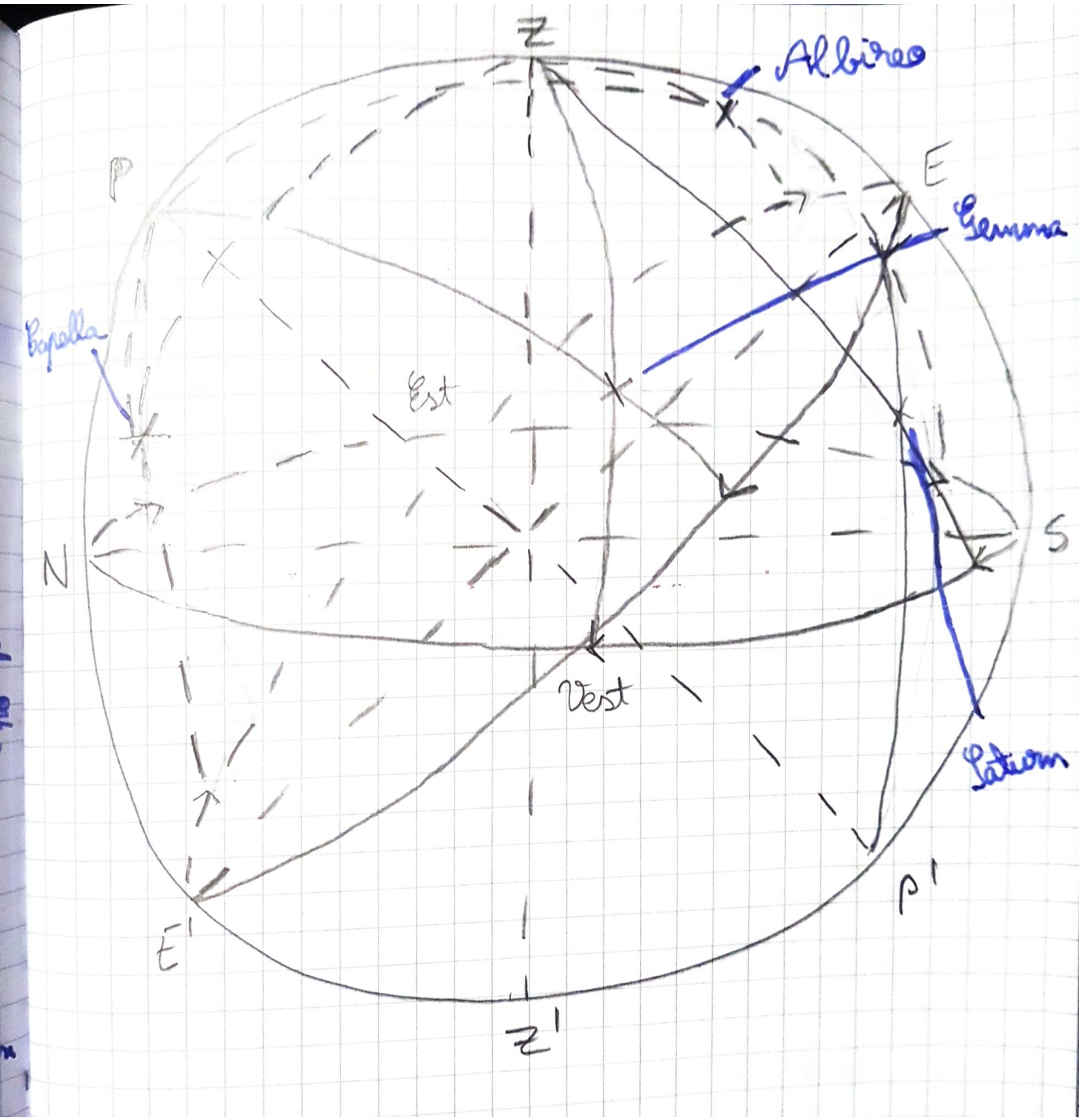
$= 3^h 44^m = 3,43^h = 55,95°$

Saturn: $H = 0,22^h = 13^m$

$\alpha = 19^h 19^m - 13^m = 19^h 6^m$

Capella: $H = 14,02^h = 14^h 1^m$

$\alpha = 19^h 19^m - 14^h 1^m = 5^h 18^m$


Z
Albireo
P
E
Gemma
Bopalla
Est
N
S
Vest
Latiom
P'
E'
Z'