http://fer3.com/arc/m2.aspx/Recent-occultation-Walden-jun-2022-g52759 *220620 - Antoine M. Couëtte*

Recent occultation From: Dave Walden **Date:** 2022 Jun 15, 04:02 -0700

It's 13 June 2022, 2h 20m 8.1s UT. You see delta Scorpii (Dschubba) disappear behind the moon.

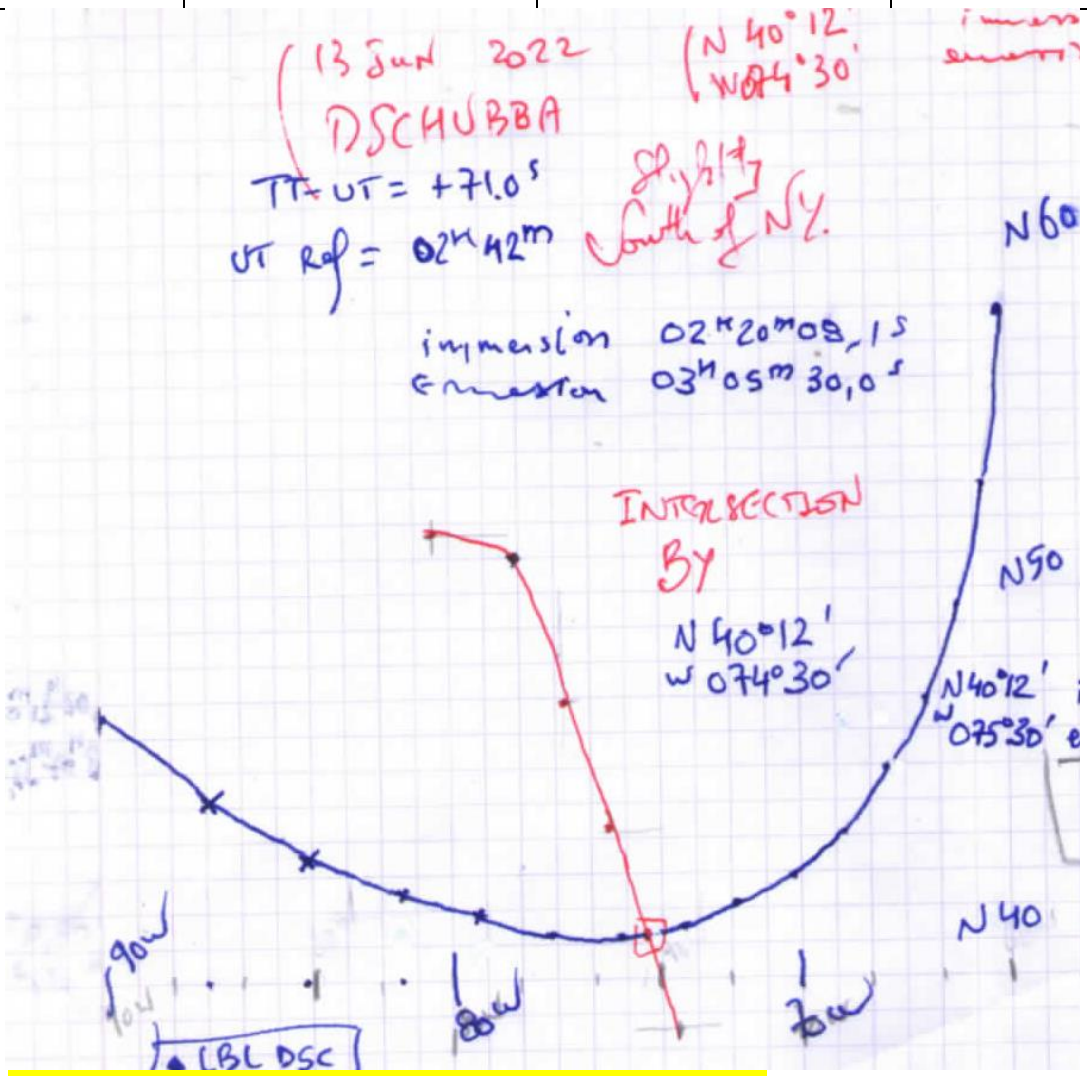
At 3h 5m 30s, you see it reappear. Where are you?

http://simbad.u-strasbg.fr/simbad/sim-basic?Ident=Dschubba **del Sco** - Spectroscopic Binary

ICRS coord. *(ep=J2000) :*	16 00 20.00528 -22 37 18.1431 (Optical)
Proper motions *mas/yr* :	-10.21 -35.41
Radial velocity / Redshift / cz :	V(km/s) -6.00
Parallaxes *(mas)*:	6.64 [0.89] A
Fluxes (8) :	V 2.32 [~] C

1 - Paper drawing Intersection of Cylinder and Sphere (no refraction) to get graphical approximate position

02h20m08.1 s	SINGLE CURVE	03h05m30 s	SINGLE CURVE
-40.0	**50.0 96.1**	-75.0	**57.1 80.4**
-35.0	**46.4 90.7**	-70.0	**51.0 78.2**
…///…	**…///…**	-65.0	**46.7 76.8**
-10.0	**40.3 77.2**	-60.0	**43.2 75.6**
-05.0	**40.2 75.3**	-55.0	**40.2 74.5**
00.0	**40.5 73.5**	-50.0	**37.7 73.4**
05.0	**41.1 71.9**	-45.0	**35.4 72.3**
…///…	**…///…**	…///…	**…///…**
40.0	**57.9 64.2**	75.0	**50.2 28.8**



Graphical approximate position AP1: N40°12' / W074°30' (one intersection only)

(2) First numerical Approximation from AP1 on Ellipsoid with refraction (zero altitude)

Starting from AP1 : N40°12' / W074°30'

imm. : immersion (star disappears behind Moon) *em.* : emersion (star again visible)
In the "Local LAT/LON Coordinates system" with AP1 = (0,0) and LAT/LON units in degrees :
a and b : Coefficients of straight line (1) (*ax+by-ab = 0*) of equal immersion times equal to 02h20m08.1 s
c and d : Coefficients of straight line (2) (*cx+dy-cd = 0*) of equal emersion times equal to 03h05m30.0 s
ΔX and ΔY are the local coordinates (i.e. centered onto AP1) of the intersection of (1) and (2) .
Therefore the intersection of (1) and (2) is an improved position derived from AP1.

			N41°12' W074°30'	*imm. 02h19m18.8s* *em. 03h06m15,5s*	a = 0.46179 b = 7.69091
N4012' W075°30'	*imm.02h20m44,9s* *em. 03h02m23.6s*	c = 0.27663 d = -0.10296	N40°12' W074°30'	*imm. 02h20m50.4s* *em. 03h05m12.6s*	**ΔX = 0.06741°** **ΔY = 0.45774°**

From AP1, compute AP2 with:

- **LAT(AP2) = LAT(AP1) + ΔY = N 40°39.464'**
- **LON(AP2) = LON(AP1) + ΔX = W 074°34.045'**

Numerical check : at AP2, immersion UT = 02h20m05,9s / emersion UT = 03h05m31.8s

(Benchmarks : imm. at 02h20m08.1s and em. 03h05m30,0s)

(3) Second numerical Approximation from AP2 on Ellipsoid with refraction (zero altitude)

Starting from AP2 : N40°39.464' / W074°34.045'

imm. : immersion (star disappears behind Moon) *em.* : emersion (star again visible)
In the "Local LAT/LON Coordinates system" with AP2 = (0,0) and LAT/LON units in degrees :
a and b : Coefficients of straight line (1) (*ax+by-ab = 0*) of equal immersion times equal to 02h20m08.1 s
c and d : Coefficients of straight line (2) (*cx+dy-cd = 0*) of equal emersion times equal to 03h05m30.0 s
ΔX and ΔY are the local coordinates (i.e. centered onto AP2) of the intersection of (1) and (2) .
Therefore the intersection of (1) and (2) is an improved position derived from AP2.

			N 41°39.464' W074°34.045'	*imm. 02h18m39.8s* *em. 03h06m30,8s*	a = -0.02555 b = -0.25287
N 40°39.464' W075°34.045'	*imm.02h19m57,2s* *em. 03h02m47.5s*	c = -0.03051 d = 0.01096	N 40°39.464' W074°34.045'	*imm. 02h20m05.9s* *em. 03h05m31.8s*	**ΔX = 0.00172°** **ΔY = - 0.02572°**

From AP2, compute AP3 with:

- **LAT(AP3) = LAT(AP2) + ΔY = N 40°37.921'**
- **LON(AP3) = LON(AP2) + ΔX = W 074°34.148'**

Numerical check : at AP3, immersion UT = 02h20m08.3s / emersion UT = 03h05m29.9s

(Benchmarks : imm. at 02h20m08.1s and em. 03h05m30,0s)

No need for further refinement.

Solution : N 40°37.9' / W 074°34.1' on the WGS84 Ellipsoid with refraction and at Sea Level

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Jun 20th, 2022
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