

A transit of Venus over the disk of the Sun will occur on June 5-6. The entire transit will be visible in eastern Asia, eastern Australia, northwestern North America, the Arctic, and the north Pacific Ocean.

The times provided in the following tables are given provisionally in Universal Time, using $\Delta T(A) = +67^{\text{s}}.0$. Once the value of ΔT is known, the data on these pages may be expressed in Universal Time as follows:

Define $\delta T = \Delta T - \Delta T(A)$, in units of seconds of time.

Change the times given in provisional Universal Time by subtracting δT .

Apply the correction $0.00417807 \delta T$ to the longitudes in such a way that if δT is positive, the longitudes shift to the east.

Leave all other quantities unchanged.

Longitude is positive to the east and negative to the west.

GEOCENTRIC PHASES

	UT	Position Angle P	Venus being in the Zenith in	
			Longitude	Latitude
	d h m s	$^{\circ}$	$^{\circ}$ ' "	$^{\circ}$ ' "
Ingress, exterior contact	June 5 22 09 40.6	40.7	-152 34.1	+22 52.0
Ingress, interior contact	5 22 27 28.7	38.2	-157 02.3	+22 51.8
Least angular distance	6 01 29 35.9		+157 13.5	+22 49.5
Egress, interior contact	6 04 31 42.8	292.7	+111 29.3	+22 47.2
Egress, exterior contact	6 04 49 30.9	290.1	+107 01.1	+22 46.9

Least angular distance: $9' 14''/4$

The position angle P of the point of contact is reckoned from the north point of the limb of the Sun towards the east as viewed at the geocenter.

The position angle V of the point of contact, reckoned from the vertex of the limb of the Sun towards the east, is found by:

$$V = P - C$$

where C , the parallactic angle, is given by:

$$\tan C = \frac{\cos \phi' \sin h}{\sin \phi' \cos \delta - \cos \phi' \sin \delta \cos h}$$

in which ϕ' is the geocentric latitude of the place, δ is the declination of the Sun, and h is the local hour angle of the Sun; $\sin C$ has the same algebraic sign as $\sin h$.

TRANSIT OF VENUS OF 2012 JUNE 5-6

Location	Position		Ingress				Ingress				Least		Egress				Egress			
	Latitude	Longitude	Exterior Contact		Interior Contact		Angular Distance		Separation		Interior Contact		Exterior Contact							
	°	'	UT	P	UT	P	UT	Separation	UT	P	UT	P	UT	P						
United States																				
Hartford, CT	+41	46.2	-	72	40.6	22 03 46.1	41.2	22 21 17.3	38.8	h m s	°	h m s	°	h m s	°					
Boston, MA	+42	20.0	-	71	05.0	22 03 42.3	41.3	22 21 13.6	38.8	..	..	..	..	..	..
New York, NY	+40	44.0	-	74	00.0	22 03 49.9	41.2	22 21 21.1	38.8	..	..	..	..	..	..
Washington, DC	+38	53.7	-	77	02.2	22 03 59.1	41.2	22 21 30.2	38.7	..	..	..	..	..	..
Raleigh, NC	+35	49.1	-	78	38.7	22 04 07.8	41.1	22 21 39.3	38.6	..	..	..	..	..	..
Atlanta, GA	+33	45.3	-	84	23.4	22 04 27.9	41.0	22 21 58.9	38.5	..	..	..	..	..	..
Miami, FL	+25	45.0	-	80	15.0	22 04 34.6	40.8	22 22 08.0	38.3	..	..	..	..	..	..
Montgomery, AL	+32	21.7	-	86	16.8	22 04 36.7	40.9	22 22 07.8	38.4	..	..	..	..	..	..
Detroit, MI	+42	19.9	-	83	02.8	22 04 10.1	41.2	22 21 39.3	38.7	..	..	..	..	..	..
Indianapolis, IN	+39	47.5	-	86	08.9	22 04 22.0	41.1	22 21 51.8	38.7	..	..	..	..	..	..
Chicago, IL	+41	50.0	-	87	38.0	22 04 23.2	41.2	22 21 52.4	38.7	..	..	..	..	..	..
Milwaukee, WI	+43	03.0	-	87	57.0	22 04 22.4	41.2	22 21 51.4	38.7	1 26 07.2	9 02.4	..	..	..	..	
Minneapolis, MN	+44	58.8	-	93	15.1	22 04 34.8	41.2	22 22 03.0	38.8	1 26 03.5	9 02.5	..	..	..	..	
St. Louis, MO	+38	40.0	-	90	15.0	22 04 36.0	41.1	22 22 05.5	38.6	..	..	..	..	..	..
Louisville, KY	+38	15.3	-	85	45.6	22 04 23.4	41.1	22 21 53.5	38.6	..	..	..	..	..	..
Lincoln, NE	+40	48.6	-	96	40.5	22 04 52.1	41.1	22 22 20.5	38.6	1 25 52.6	9 04.1	..	..	..	..	
Oklahoma City, OK	+35	28.9	-	97	32.0	22 05 06.6	41.0	22 22 35.7	38.5	1 25 44.2	9 05.9	..	..	..	..	
Denver, CO	+39	44.4	-	104	59.1	22 05 22.1	41.1	22 22 50.0	38.6	1 25 43.8	9 05.5	..	..	..	..	
Salt Lake City, UT	+40	45.0	-	111	55.0	22 05 44.0	41.1	22 23 11.2	38.6	1 25 42.6	9 05.9	..	..	..	..	
Dallas, TX	+32	47.0	-	96	48.2	22 05 10.8	40.9	22 22 40.6	38.4	1 25 42.0	9 06.6	..	..	..	..	
Houston, TX	+29	45.0	-	95	25.0	22 05 14.1	40.8	22 22 44.6	38.3	..	..	..	..	..	..
Albuquerque, NM	+35	06.6	-	106	36.6	22 05 40.2	40.9	22 23 08.6	38.4	1 25 36.1	9 07.1	..	..	..	..	
Las Vegas, NV	+36	10.6	-	115	08.2	22 06 09.4	41.0	22 23 37.1	38.4	1 25 35.0	9 07.8	..	..	..	..	
Los Angeles, CA	+34	03.0	-	118	15.0	22 06 28.7	40.9	22 23 56.5	38.4	1 25 32.3	9 08.9	..	..	..	..	
San Diego, CA	+32	42.9	-	117	09.7	22 06 29.0	40.9	22 23 57.1	38.3	1 25 30.6	9 09.2	..	..	..	..	
San Francisco, CA	+37	46.8	-	122	25.2	22 06 32.2	41.0	22 23 59.3	38.5	1 25 38.6	9 08.0	..	..	..	..	
Portland, OR	+45	32.0	-	122	40.0	22 06 08.2	41.2	22 23 34.4	38.7	1 25 52.5	9 05.4	..	..	..	..	
Seattle, WA	+47	36.6	-	122	20.0	22 06 01.1	41.2	22 23 27.1	38.8	1 25 56.8	9 04.7	..	..	..	..	
Fairbanks, AK	+64	50.0	-	147	50.0	22 06 15.9	41.7	22 23 41.8	39.2	1 26 59.2	9 00.8	4 31 15.8	291.4	4 48 52.7	289.0					
Nome, AK	+64	30.0	-	165	30.0	22 06 50.1	41.7	22 24 16.4	39.3	1 27 19.3	9 01.2	4 31 04.5	291.5	4 48 38.8	289.1					
Unalaska, AK	+53	53.3	-	166	31.6	22 07 44.8	41.5	22 25 11.3	39.1	1 27 03.4	9 04.6	4 29 51.0	291.8	4 47 28.0	289.3					
Honolulu, HI	+21	18.5	-	157	49.6	22 10 10.6	40.7	22 27 41.2	38.1	1 26 19.8	9 16.4	4 26 42.1	292.5	4 44 33.0	290.0					
Canada																				
St. John's, Nfld.	+47	34.1	-	52	42.4	22 03 14.6	41.5	22 20 47.7	39.1	..	..	..	..	..	..
Moncton, N.B.	+46	07.0	-	64	48.2	22 03 29.4	41.4	22 21 00.9	39.0	..	..	..	..	..	..
Halifax, N.S.	+44	38.0	-	63	35.0	22 03 27.7	41.4	22 20 59.7	38.9	..	..	..	..	..	..
Charlottetown, P.E.I.	+46	14.4	-	63	08.4	22 03 26.8	41.4	22 20 58.6	39.0	..	..	..	..	..	..
Montreal, Que.	+45	30.5	-	73	33.2	22 03 45.4	41.3	22 21 15.9	38.9	..	..	..	..	..	..

Location	Position		Ingress Exterior Contact		Ingress Interior Contact		Least Angular Distance		Egress Interior Contact		Egress Exterior Contact	
	Latitude	Longitude	UT	P	UT	P	UT	Separation	UT	P	UT	P
Canada	° ′	° ′	h m s °		h m s °		h m s ′ ″		h m s °		h m s °	
Toronto, Ont.	+43 43.0	- 79 20.4	22 03 59.4	41.3	22 21 29.4	38.8	. . . . .		. . . . .		. . . . .
Thunder Bay, Ont.	+48 22.9	- 89 14.8	22 04 20.1	41.3	22 21 48.4	38.9	1 26 14.8	9 01.2	. . . . .		. . . . .
Winnipeg, Man.	+49 54.0	- 97 08.0	22 04 39.6	41.3	22 22 06.9	38.9	1 26 09.4	9 01.7	. . . . .		. . . . .
Edmonton, Alta.	+53 34.6	-113 31.0	22 05 20.2	41.4	22 22 46.3	38.9	1 26 10.3	9 02.2	. . . . .		. . . . .
Iqaluit, Nunavut	+63 44.9	- 68 31.2	22 03 49.1	41.7	22 21 18.1	39.3	1 27 15.2	8 56.3	. . . . .		. . . . .
Yellowknife, N.W.T.	+62 26.5	-114 23.8	22 05 09.3	41.6	22 22 35.3	39.2	1 26 35.9	8 59.9	4 31 59.6	291.3	4 49 41.1	288.8
Vancouver, B.C.	+49 15.0	-123 06.0	22 05 59.0	41.3	22 23 24.9	38.8	1 26 00.7	9 04.3	. . . . .		. . . . .
Whitehorse, Y.T.	+60 43.0	-135 03.0	22 06 00.8	41.6	22 23 26.4	39.1	1 26 37.1	9 01.5	4 31 06.2	291.4	4 48 46.4	289.0
Martinique Fort-de-France	+14 36.0	- 61 05.0	22 04 20.4	40.7	22 22 00.3	38.2	. . . . .		. . . . .		. . . . .
Bermuda Hamilton	+32 18.0	- 64 48.0	22 03 41.8	41.1	22 21 16.2	38.6	. . . . .		. . . . .		. . . . .
Puerto Rico San Juan	+18 29.0	- 66 08.0	22 04 18.1	40.7	22 21 56.0	38.2	. . . . .		. . . . .		. . . . .
Haiti Port-au-Prince	+18 32.0	- 72 20.0	22 04 33.4	40.7	22 22 10.0	38.2	. . . . .		. . . . .		. . . . .
Jamaica Kingston	+17 58.0	- 76 48.0	22 04 47.9	40.6	22 22 24.0	38.1	. . . . .		. . . . .		. . . . .
Bahamas Nassau	+25 03.6	- 77 20.7	22 04 27.9	40.8	22 22 02.0	38.3	. . . . .		. . . . .		. . . . .
Cuba Havana	+23 08.0	- 82 23.0	22 04 48.7	40.7	22 22 22.5	38.2	. . . . .		. . . . .		. . . . .
Mexico												
Mexico City	+19 25.0	- 99 10.0	22 06 02.5	40.5	22 23 35.0	38.0	. . . . .		. . . . .		. . . . .
Monterrey	+25 40.0	-100 20.0	22 05 45.2	40.7	22 23 16.0	38.2	1 25 32.6	9 09.4	. . . . .		. . . . .
Guadalajara	+20 40.0	-103 21.0	22 06 15.0	40.6	22 23 46.8	38.0	1 25 27.9	9 11.5	. . . . .		. . . . .
Veracruz	+19 26.1	- 96 23.0	22 05 51.3	40.5	22 23 24.1	38.0	. . . . .		. . . . .		. . . . .
Guatemala Guatemala City	+14 38.0	- 90 22.0	22 05 46.0	40.4	22 23 21.0	37.9	. . . . .		. . . . .		. . . . .
El Salvador San Salvador	+13 40.0	- 89 10.0	22 05 45.3	40.4	22 23 20.7	37.9	. . . . .		. . . . .		. . . . .
Honduras Tegucigalpa	+14 05.0	- 87 14.0	22 05 36.5	40.5	22 23 12.1	37.9	. . . . .		. . . . .		. . . . .
Belize Belmopan	+17 13.0	- 88 48.0	22 05 30.5	40.5	22 23 04.9	38.0	. . . . .		. . . . .		. . . . .
Nicaragua Managua	+12 06.0	- 86 18.0	22 05 40.9	40.4	22 23 17.2	37.9	. . . . .		. . . . .		. . . . .
Venezuela Caracas	+10 30.0	- 66 55.0	22 04 48.3	40.5	22 22 28.4	38.0	. . . . .		. . . . .		. . . . .
Costa Rica San Jose	+ 9 59.0	- 84 04.0	22 05 41.6	40.4	22 23 18.9	37.8	. . . . .		. . . . .		. . . . .
Panama Panama City	+ 8 57.0	- 79 30.0	22 05 30.4	40.4	22 23 08.7	37.8	. . . . .		. . . . .		. . . . .
Colombia												
Medellin	+ 6 14.2	- 75 34.5	22 05 29.5	40.3	22 23 09.5	37.8	. . . . .		. . . . .		. . . . .
Bogota	+ 4 38.0	- 74 05.0	22 05 32.1	40.3	22 23 12.9	37.8	

TRANSIT OF VENUS OF 2012 JUNE 5-6

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Location	Position		Ingress Exterior Contact				Ingress Interior Contact				Least Angular Distance		Egress Interior Contact				Egress Exterior Contact			
	Latitude	Longitude	UT	P	UT	P	UT	Separation	UT	P	UT	P	UT	P	UT	P				
Ecuador Quito	0 15.0	- 78 35.0	22 06 08.8	40.2	22 23 50.4	37.6	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Peru Lima	-12 06.0	- 77 03.0	22 07 05.3	39.9	22 24 51.4	37.3	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Easter Island Hanga Roa	-27 09.0	-109 26.0	22 10 27.7	39.4	22 28 15.7	36.8	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Pitcairn Islands Adamstown	-25 04.0	-130 06.0	22 11 46.8	39.5	22 29 32.9	36.8	1 26 35.7	9 29.6	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
French Polynesia Papeete, Tahiti	-17 32.0	-149 34.0	22 12 41.0	39.7	22 30 24.3	37.0	1 26 45.9	9 29.1	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Cook Islands Avarua, Rarotonga	-21 12.0	-159 46.0	22 13 37.1	39.7	22 31 22.4	37.0	1 27 19.1	9 30.5	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
American Samoa Pago Pago, Tutuila	-14 16.8	-170 42.0	22 13 51.9	39.9	22 31 35.4	37.3	1 27 37.2	9 28.7	4 24 55.0	293.6	4 42 53.8	291.0				
Tokelau Fakaofu	- 9 21.9	-171 12.9	22 13 33.8	40.0	22 31 15.5	37.4	1 27 30.3	9 27.2	4 25 01.2	293.5	4 42 58.2	290.9				
Tonga Nuku'alofa, Tongatapu	-21 08.0	-175 12.0	22 14 31.4	39.8	22 32 18.1	37.2	1 28 05.2	9 30.5	4 24 54.8	293.8	4 42 54.1	291.1				
Chatham Islands Waitangi	-43 57.1	-176 33.7	22 15 25.2	39.5	22 33 20.9	36.8	1 29 00.0	9 34.8	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .
Tuvalu Vaiaku, Funafuti	- 8 31.3	+179 11.9	22 14 01.7	40.2	22 31 44.2	37.5	1 28 02.8	9 26.8	4 25 13.1	293.6	4 43 06.1	290.9				
Fiji Suva, Viti Levu	-18 08.0	+178 25.0	22 14 40.5	40.0	22 32 26.8	37.3	1 28 21.6	9 29.5	4 25 04.0	293.8	4 43 00.0	291.1				
New Zealand																				
Auckland	-36 51.0	+174 47.0	22 15 36.1	39.6	22 33 30.0	36.9	1 29 09.1	9 33.6	4 25 20.8	294.2	4 43 21.4	291.5				
Wellington	-41 17.3	+174 46.6	22 15 41.7	39.6	22 33 37.3	36.9	1 29 17.9	9 34.3	4 25 29.2	294.2	4 43 31.0	291.5				
Christchurch	-43 31.8	+172 37.2	22 15 47.8	39.5	22 33 44.5	36.9	1 29 28.4	9 34.5	4 25 37.8	294.2	4 43 39.6	291.6				
Kiribati Island South Tarawa	+ 1 19.5	+172 59.0	22 13 34.5	40.5	22 31 14.4	37.9	1 28 13.0	9 23.3	4 25 47.1	293.3	4 43 34.1	290.7				
Marshall Islands Delap-Uliga-Djarrit	+ 7 05.0	+171 22.9	22 13 09.4	40.6	22 30 47.7	38.0	1 28 12.6	9 21.2	4 26 08.3	293.2	4 43 52.7	290.6				
Australia																				
Brisbane	-27 28.1	+153 01.7	22 15 54.5	40.0	22 33 48.1	37.4	1 30 09.6	9 30.2	4 26 13.3	294.1	4 44 03.5	291.4				
Sydney	-33 51.6	+151 12.7	22 16 07.2	39.9	22 34 03.4	37.3	1 30 22.9	9 31.5	4 26 21.7	294.2	4 44 13.8	291.5				
Melbourne	-37 48.8	+144 57.8	22 16 14.9	39.9	22 34 13.3	37.2	1 30 47.2	9 31.7	4 26 47.7	294.2	4 44 39.5	291.6				
Adelaide	-34 55.7	+138 36.1	22 16 12.5	40.0	22 34 11.0	37.4	1 31 06.5	9 30.4	4 27 13.3	294.2	4 45 02.2	291.5				
Alice Springs	-23 42.0	+133 52.2	22 15 50.2	40.3	22 33 46.0	37.7	1 31 17.0	9 27.1	4 27 42.1	294.0	4 45 24.9	291.4				
Darwin	-12 23.0	+130 44.0	22 15 13.2	40.6	22 33 05.8	38.0	1 31 20.2	9 23.4	4 28 16.0	293.7	4 45 53.2	291.1				
Perth	-31 57.1	+115 51.5	. . . . .	. . . . .	. . . . .	. . . . .	1 32 17.2	9 26.9	4 29 09.0	294.1	4 46 51.3	291.4				
Papua New Guinea Port Moresby	- 9 25.0	+147 17.0	22 15 03.9	40.5	22 32 52.1	37.9	1 30 11.6	9 24.6	4 26 55.2	293.7	4 44 36.4	291.1				
Guam Hagatna (Agana)	+13 28.7	+144 45.0	22 13 12.5	41.1	22 30 53.6	38.5	1 29 52.9	9 16.5	4 28 09.0	293.1	4 45 41.7	290.5				
Fed. States of Micronesia Palikir, Pohnpei	+ 6 55.1	+158 11.1	22 13 36.5	40.8	22 31 17.0	38.2	1 29 06.2	9 20.3	4 26 49.2	293.3	4 44 28.6	290.7				
Vanuatu Port Vila, Efate	-17 45.0	+168 18.0	22 15 04.5	40.1	22 32 52.1	37.4	1 28 58.5	9 28.9	4 25 26.3	293.8	4 43 18.3	291.2				

Location	Position		Ingress Exterior Contact		Ingress Interior Contact			Least Angular Distance		Egress Interior Contact			Egress Exterior Contact		
	Latitude	Longitude	UT	P	UT	P	UT	Separation	UT	P	UT	P	UT	P	
	° ' "	° ' "	h m s °	°	h m s °	°	h m s ' "	' "	h m s °	°	h m s °	°	h m s °	°	
Nauru Yaren	- 0 33.0	+166 55.0	22 13 58.0	40.5	22 31 39.5	37.9	1 28 39.6	9 23.6	4 25 58.3	293.4	4 43 43.6	290.8			
New Caledonia Noumea	-22 16.5	+166 27.5	22 15 22.2	40.0	22 33 11.7	37.3	1 29 12.4	9 30.0	4 25 29.3	293.9	4 43 22.2	291.3			
Solomon Islands Honiara, Guadalcanal	- 9 26.0	+159 57.0	22 14 50.0	40.4	22 32 35.9	37.7	1 29 19.7	9 25.9	4 26 02.6	293.7	4 43 48.4	291.0			
Japan															
Sapporo	+43 05.0	+141 21.0	22 10 03.2	41.7	22 27 37.0	39.3	1 29 21.9	9 05.8	4 30 25.6	292.2	4 47 51.6	289.7			
Tokyo	+35 42.0	+139 42.9	22 10 53.1	41.6	22 28 28.8	39.1	1 29 38.7	9 08.1	4 29 59.5	292.4	4 47 26.0	289.9			
Osaka	+34 42.0	+135 30.0	22 10 58.9	41.6	22 28 35.6	39.2	1 29 54.4	9 08.0	4 30 13.9	292.4	4 47 39.5	289.9			
Palau Koror	+ 7 21.6	+134 28.7	22 13 45.8	41.1	22 31 31.0	38.5	1 30 42.5	9 17.4	4 28 42.5	293.2	4 46 13.8	290.7			
Timor-Leste Dili	- 8 33.0	+125 35.0	22 14 53.1	40.8	22 32 45.5	38.2	1 31 35.9	9 21.4	4 28 53.8	293.6	4 46 28.1	291.0			
Philippines Quezon City	+14 38.0	+121 02.0	22 12 51.0	41.4	22 30 36.6	38.9	1 31 20.9	9 12.9	4 30 22.1	293.0	4 47 48.0	290.4			
Brunei Bandar Seri Begawan	+ 4 53.4	+114 56.5	22 13 32.8	41.2	22 31 22.9	38.7	1 31 57.4	9 15.2	4 30 32.9	293.2	4 48 00.1	290.7			
Indonesia Jakarta	- 6 08.0	+106 45.0	. . . . .	. . . . .	. . . . .	. . . . .	1 32 36.2	9 17.6	4 30 57.8	293.4	4 48 27.3	290.9		
Thailand Bangkok	+13 44.0	+100 30.0	. . . . .	. . . . .	. . . . .	. . . . .	1 32 24.5	9 09.8	4 32 27.6	292.9	4 49 50.2	290.3		
Korea, Republic of Seoul	+37 30.0	+127 00.0	22 10 34.6	41.8	22 28 12.1	39.3	1 30 15.7	9 06.1	4 31 04.0	292.3	4 48 27.4	289.9			
China, People's Republic of															
Shanghai	+31 12.0	+121 30.0	22 11 09.6	41.7	22 28 49.9	39.2	1 30 46.2	9 07.4	4 31 10.4	292.5	4 48 33.3	290.0			
Xuzhou	+34 16.0	+117 10.0	22 10 43.2	41.8	22 28 23.3	39.3	1 30 51.9	9 05.8	4 31 42.6	292.4	4 49 04.3	289.9			
Jining	+35 24.0	+116 34.0	22 10 34.9	41.8	22 28 14.8	39.4	1 30 50.8	9 05.4	4 31 49.0	292.4	4 49 10.6	289.9			
Beijing	+39 55.0	+116 26.0	22 10 05.3	41.9	22 27 43.9	39.4	1 30 39.7	9 04.0	4 32 02.7	292.2	4 49 24.0	289.8			
Shijiazhuang	+38 02.6	+114 29.9	22 10 14.2	41.9	22 27 53.7	39.4	1 30 49.6	9 04.3	4 32 07.0	292.3	4 49 28.1	289.8			
Chongqing	+29 33.0	+106 30.4	22 10 51.1	41.8	22 28 34.7	39.3	1 31 32.4	9 05.8	4 32 28.3	292.5	4 49 48.9	290.0			
Lanzhou	+36 03.0	+103 48.0	22 10 04.4	41.9	22 27 46.3	39.5	1 31 21.0	9 03.5	4 32 57.5	292.3	4 50 17.3	289.8			
Hong Kong	+22 16.0	+114 13.0	22 11 53.1	41.6	22 29 37.6	39.1	1 31 28.2	9 09.2	4 31 24.8	292.7	4 48 47.6	290.2			
Taiwan Taipei	+25 02.0	+121 38.0	22 11 49.1	41.6	22 29 31.2	39.1	1 30 59.0	9 09.4	4 30 50.2	292.7	4 48 14.0	290.2			
Mongolia Ulan Bator	+47 55.2	+106 55.2	22 08 57.5	42.1	22 26 35.3	39.6	1 30 38.5	9 00.7	4 33 06.4	292.0	4 50 26.5	289.5			
Vietnam															
Ho Chi Minh City	+10 46.2	+106 40.9	. . . . .	. . . . .	. . . . .	. . . . .	1 32 13.4	9 11.9	4 31 40.9	293.0	4 49 05.1	290.5		
Hanoi	+21 02.0	+105 51.0	. . . . .	. . . . .	22 29 27.3	39.2	1 31 54.9	9 08.3	4 32 11.8	292.7	4 49 33.5	290.2		
Malaysia Kuala Lumpur	+ 3 08.0	+101 42.0	. . . . .	. . . . .	. . . . .	. . . . .	1 32 39.5	9 13.6	4 31 54.0	293.2	4 49 19.6	290.6		
Myanmar Yangon (Rangoon)	+16 48.0	+ 96 09.0	1 32 28.3	9 08.1	4 33 01.8	292.7	4 50 23.3	290.2			

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Location	Position		Ingress Exterior Contact				Ingress Interior Contact				Least Angular Distance		Egress Interior Contact				Egress Exterior Contact			
	Latitude	Longitude	UT	P	UT	P	UT	P	UT	Separation	UT	P	UT	P	UT	P				
Andaman and Nicobar Islands Port Blair	+11 40.2	+ 92 45.6	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 46.3	9 09.2	4 33 11.8	292.8	4 50 34.3	290.3
Nepal Kathmandu	+27 43.0	+ 85 22.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 20.1	9 03.1	4 34 24.6	292.3	4 51 44.0	289.9
India																				
Kolkata	+22 34.2	+ 88 22.2	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 29.7	9 05.1	4 33 59.9	292.5	4 51 20.0	290.0
Delhi	+28 36.6	+ 77 13.8	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 27.1	9 01.7	4 35 09.4	292.2	4 52 28.7	289.8
Mumbai	+18 58.5	+ 72 49.6	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 57.9	9 03.8	4 35 22.8	292.4	4 52 43.7	290.0
Sri Lanka Colombo	+ 6 56.1	+ 79 50.6	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 33 16.7	9 08.7	4 34 21.5	292.8	4 51 44.9	290.3
Pakistan																				
Lahore	+31 33.0	+ 74 20.6	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 20.2	9 00.6	4 35 26.0	292.1	4 52 45.2	289.7
Karachi	+24 51.6	+ 67 00.6	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 44.7	9 01.4	4 35 58.5	292.2	4 53 18.9	289.8
Kazakhstan Almaty	+43 16.7	+ 76 53.7	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 31 37.0	8 58.2	4 35 15.9	291.9	4 52 34.8	289.4
Uzbekistan Tashkent	+41 16.0	+ 69 13.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 31 48.8	8 57.8	4 35 49.2	291.8	4 53 08.4	289.4
Afghanistan Kabul	+34 31.5	+ 69 08.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 13.1	8 59.2	4 35 51.4	292.0	4 53 10.7	289.6
Turkmenistan Ashgabat	+37 56.0	+ 58 22.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 01.6	8 57.3	4 36 34.7	291.8	4 53 55.0	289.4
United Arab Emirates Abu Dhabi	+24 28.0	+ 54 22.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 36 55.1	292.1	4 54 17.3	289.6
Iran Tehran	+35 40.0	+ 51 26.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 32 06.4	8 57.1	4 37 01.8	291.8	4 54 23.3	289.4
Azerbaijan Baku	+40 22.8	+ 49 53.5	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	1 31 48.4	8 56.0	4 37 00.9	291.7	4 54 22.4	289.3
Saudi Arabia Riyadh	+24 39.0	+ 46 46.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 23.8	292.0	4 54 47.4	289.5
Iraq Baghdad	+33 19.5	+ 44 25.3	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 26.7	291.8	4 54 49.7	289.3
Yemen Sana'a	+15 20.9	+ 44 12.4	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 28.9	292.2	4 54 54.8	289.7
Lebanon Beirut	+33 53.2	+ 35 30.8	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 49.5	291.6	4 55 14.3	289.2
Israel Tel Aviv	+32 04.0	+ 34 47.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 53.4	291.7	4 55 18.7	289.3
Egypt Cairo	+30 03.5	+ 31 13.7	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 38 03.1	291.7	4 55 29.6	289.3
Turkey Istanbul	+41 01.0	+ 28 58.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 48.4	291.5	4 55 14.2	289.1
Russia																				
Novosibirsk	+55 01.0	+ 83 00.0	22 07 24.4	42.2	22 25 02.8	39.8	1 30 46.2	8 56.8	4 34 48.3	291.7	4 52 08.0	289.2								
Yekaterinburg	+56 50.0	+ 60 35.0	. . . . .	. . . . .	. . . . .	. . . . .	1 30 46.6	8 54.7	4 35 56.7	291.5	4 53 17.7	289.1				
Nizhny Novgorod	+56 20.0	+ 44 00.0	. . . . .	. . . . .	. . . . .	. . . . .	1 30 41.4	8 53.7	4 36 37.0	291.4	4 53 59.8	289.0				
Magadan	+59 34.0	+150 48.0	22 08 09.4	41.9	22 25 39.3	39.4	1 28 37.1	9 01.5	4 31 19.7	291.8	4 48 46.8	289.3								
Vladivostok	+43 08.0	+131 54.0	22 10 00.4	41.8	22 27 35.6	39.3	1 29 49.7	9 04.9	4 31 03.3	292.2	4 48 27.3	289.7								

Location	Position		Ingress Exterior Contact				Ingress Interior Contact				Least Angular Distance				Egress Interior Contact				Egress Exterior Contact			
	Latitude	Longitude	UT	P	UT	P	UT	Separation	UT	P	UT	P	UT	P	UT	P	UT	P				
Russia																						
Tiksi	+71 38.0	+128 52.0	22 06 51.5	42.1	22 24 22.1	39.7	1 28 56.7	8 57.4	4 33 01.4	291.5	4 50 26.5	289.1										
Moscow	+55 45.1	+ 37 37.1	. . . . .	. . . . .	. . . . .	. . . . .	1 30 37.9	8 53.4	4 36 50.4	291.3	4 54 14.2	288.9						
Murmansk	+68 58.0	+ 33 05.0	22 04 54.8	42.2	22 22 30.0	39.8	1 29 41.4	8 53.0	4 35 59.6	291.2	4 53 25.2	288.8										
St. Petersburg	+59 57.0	+ 30 19.0	. . . . .	. . . . .	. . . . .	. . . . .	1 30 13.5	8 52.9	4 36 43.7	291.2	4 54 08.8	288.8						
Somalia Mogadishu	+ 2 02.0	+ 45 21.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 03.8	292.5	4 54 33.1	290.0						
Tanzania Dar es Salaam	- 6 48.0	+ 39 17.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 00.7	292.7	4 54 34.5	290.2						
Ethiopia Addis Ababa	+ 9 01.8	+ 38 44.4	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 39.2	292.2	4 55 08.1	289.8						
Kenya Nairobi	- 1 17.0	+ 36 49.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 23.9	292.5	4 54 56.5	290.0						
Mozambique Maputo	-25 58.0	+ 32 35.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 36 00.2	293.1	4 53 43.5	290.6						
Uganda Kampala	+ 0 18.8	+ 32 34.9	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 39.1	292.4	4 55 12.4	289.9						
Sudan Khartoum	+15 38.0	+ 32 32.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 38 03.0	292.0	4 55 31.9	289.6						
Mauritius Port Louis	-20 10.0	+ 57 31.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 35 02.1	293.2	4 52 37.5	290.7						
Rodrigues Island Port Mathurin	-19 41.0	+ 63 25.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 34 36.3	293.3	4 52 10.7	290.8						
Seychelles Victoria, Mahe	- 4 37.0	+ 55 27.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 36 04.8	292.8	4 53 34.3	290.3						
Madagascar Antananarivo	-18 56.0	+ 47 31.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 35 48.0	293.1	4 53 24.7	290.6						
Maldives Male	+ 4 10.5	+ 73 30.5	. . . . .	. . . . .	. . . . .	. . . . .	1 33 27.8	9 08.6	4 34 52.7	292.8	4 52 17.2	290.3						
Kerguelen Islands Port-aux-Francais	-49 21.0	+ 70 13.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 32 01.6	294.0	4 49 50.2	291.4						
Comoros Islands Moroni	-11 45.0	+ 43 12.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 36 31.2	292.8	4 54 05.9	290.4						
Zimbabwe Harare	-17 51.8	+ 31 01.8	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 36 41.3	292.9	4 54 21.7	290.4						
Zambia Lusaka	-15 25.0	+ 28 17.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 36 57.2	292.8	4 54 37.4	290.3						
Libya																						
Benghazi	+32 07.0	+ 20 04.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 38 16.2	291.5	4 55 45.6	289.1						
Tripoli	+32 54.1	+ 13 11.1	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 38 18.7	291.4	4 55 50.0	289.1						
Central African Republic Bangui	+ 4 22.0	+ 18 35.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 38 11.2	292.1	4 55 47.9	289.7						
Chad N'Djamena	+12 06.7	+ 15 02.1	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 38 24.8	291.9	4 56 00.4	289.5						
Tunisia Tunis	+36 48.0	+ 10 11.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 38 11.6	291.4	4 55 43.1	289.0						
Algeria Algiers	+36 42.0	+ 3 13.0	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 38 08.8	291.3	4 55 42.6	288.9						
Albania Tirana	+41 19.8	+ 19 49.2	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . . .	4 37 57.9	291.4	4 55 26.0	289.0						

TRANSIT OF VENUS OF 2012 JUNE 5-6

Location	Position		Ingress				Least		Egress		Egress			
	Latitude	Longitude	Exterior Contact		Interior Contact		Angular Distance		Interior Contact		Exterior Contact			
			UT	<i>P</i>	UT	<i>P</i>	UT	Separation	UT	<i>P</i>	UT	<i>P</i>		
	° ' "	° ' "	h	m	s	°	h	m	s	°	h	m	s	°
Ukraine Kiev	+50 27.0	+ 30 31.4	.	.	.	.	.	.	.	.	4 37 19.4	291.3	4 54 44.4	288.9
Hungary Budapest	+47 28.3	+ 19 03.0	.	.	.	.	.	.	.	.	4 37 40.6	291.3	4 55 08.3	288.9
Moldova Chisinau	+47 00.6	+ 28 52.1	.	.	.	.	.	.	.	.	4 37 32.6	291.4	4 54 58.0	289.0
Belarus Minsk	+53 54.0	+ 27 34.0	.	.	.	.	.	.	.	.	4 37 10.9	291.3	4 54 36.4	288.9
Romania Bucharest	+44 25.9	+ 26 06.2	.	.	.	.	.	.	.	.	4 37 43.5	291.4	4 55 09.7	289.0
Finland Helsinki	+60 10.3	+ 24 56.3	.	.	.	.	.	1 30 06.0	8 52.8	.	4 36 47.6	291.2	4 54 13.6	288.8
Latvia Riga	+56 56.9	+ 24 06.4	.	.	.	.	.	.	.	.	4 37 02.0	291.2	4 54 28.2	288.8
Greece Athens	+37 58.0	+ 23 43.0	.	.	.	.	.	.	.	.	4 38 02.2	291.5	4 55 29.6	289.1
Bulgaria Sofia	+42 42.0	+ 23 20.0	.	.	.	.	.	.	.	.	4 37 51.3	291.4	4 55 18.3	289.0
Poland Warsaw	+52 13.8	+ 21 00.7	.	.	.	.	.	.	.	.	4 37 22.8	291.2	4 54 49.7	288.9
Serbia and Montenegro Belgrade	+44 49.2	+ 20 27.7	.	.	.	.	.	.	.	.	4 37 47.9	291.3	4 55 15.4	288.9
Bosnia-Herzegovina Sarajevo	+43 50.9	+ 18 21.4	.	.	.	.	.	.	.	.	4 37 52.1	291.3	4 55 20.3	288.9
Svalbard Longyearbyen	+78 13.0	+ 15 33.0	22 04 41.0	42.1			22 22 13.1	39.8	1 28 55.5	8 53.4	4 35 16.0	291.1	4 52 44.1	288.7
Sweden Stockholm	+59 21.0	+ 18 04.0	.	.	.	.	.	.	.	.	4 36 55.2	291.2	4 54 22.4	288.8
Austria Vienna	+48 12.5	+ 16 22.4	.	.	.	.	.	.	.	.	4 37 39.5	291.3	4 55 07.7	288.9
Croatia Zagreb	+45 49.0	+ 15 59.0	.	.	.	.	.	.	.	.	4 37 47.4	291.3	4 55 15.9	288.9
Czech Republic Prague	+50 05.0	+ 14 25.0	.	.	.	.	.	.	.	.	4 37 33.6	291.2	4 55 02.1	288.8
Germany														
Munich	+48 08.0	+ 11 34.0	.	.	.	.	.	.	.	.	4 37 40.7	291.2	4 55 10.1	288.8
Stuttgart	+48 46.7	+ 9 10.8	.	.	.	.	.	.	.	.	4 37 38.3	291.2	4 55 08.3	288.8
Dusseldorf	+51 14.2	+ 6 47.0	.	.	.	.	.	.	.	.	4 37 28.9	291.2	4 54 59.2	288.8
San Marino San Marino	+43 56.0	+ 12 26.0	.	.	.	.	.	.	.	.	4 37 53.8	291.3	4 55 23.6	288.9
Italy														
Rome	+41 54.0	+ 12 30.0	.	.	.	.	.	.	.	.	4 37 59.5	291.3	4 55 29.5	288.9
Milan	+45 27.8	+ 9 11.4	.	.	.	.	.	.	.	.	4 37 49.1	291.2	4 55 19.5	288.9
Denmark Copenhagen	+55 40.6	+ 12 34.1	.	.	.	.	.	.	.	.	4 37 12.2	291.2	4 54 40.7	288.8
Norway Oslo	+59 57.0	+ 10 45.4	.	.	.	.	.	.	.	.	4 36 53.6	291.1	4 54 22.2	288.7
Switzerland Zurich	+47 22.0	+ 8 33.0	.	.	.	.	.	.	.	.	4 37 42.9	291.2	4 55 13.2	288.8

Location	Position		Ingress				Ingress				Least		Egress			Egress		
	Latitude	Longitude	Exterior Contact		Interior Contact		Interior Contact		Angular Distance		Interior Contact		Exterior Contact		Exterior Contact			
	° ' "	° ' "	UT	P	UT	P	UT	P	UT	Separation	UT	P	UT	P	UT	P		
Netherlands Amsterdam	+52 22.4	+ 4 53.5	.	.	.	.	.	.	.	.	.	.	4 37 23.9	291.1	4 54 54.4	288.8
France																		
Ajaccio, Corsica	+41 55.6	+ 8 44.2	.	.	.	.	.	.	.	.	.	.	4 37 59.2	291.3	4 55 30.2	288.9
Marseille	+43 17.8	+ 5 22.2	.	.	.	.	.	.	.	.	.	.	4 37 54.1	291.2	4 55 26.0	288.9
Paris	+48 51.4	+ 2 21.0	.	.	.	.	.	.	.	.	.	.	4 37 35.0	291.2	4 55 06.8	288.8
Spain Barcelona	+41 23.0	+ 2 11.0	.	.	.	.	.	.	.	.	.	.	4 37 57.2	291.2	4 55 30.3	288.9
United Kingdom																		
London	+51 30.5	- 0 07.5	.	.	.	.	.	.	.	.	.	.	4 37 23.8	291.1	4 54 55.7	288.7
Birmingham	+52 29.0	- 1 53.6	.	.	.	.	.	.	.	.	.	.	4 37 18.6	291.1	4 54 50.8	288.7
Edinburgh	+55 57.0	- 3 09.6	.	.	.	.	.	.	.	.	.	.	4 37 04.0	291.1	4 54 36.0	288.7
Taunton	+51 01.1	- 3 06.0	.	.	.	.	.	.	.	.	.	.	4 37 22.7	291.1	4 54 55.5	288.7
Ireland Dublin	+53 20.9	- 6 15.6	.	.	.	.	.	.	.	.	.	.	4 37 10.7	291.1	4 54 43.8	288.7
Faroe Islands Torshavn	+62 00.0	- 6 47.0	22 03 46.4	42.0	.	.	.	.	.	.	.	.	4 36 34.8	291.0	4 54 06.5	288.7
Iceland Reykjavik	+64 08.0	- 21 56.0	22 03 36.9	42.0	22 21 10.3	39.6	.	.	.	.	.	.	4 36 05.6	291.0	4 53 39.7	288.6
Greenland Nuuk	+64 10.0	- 51 44.0	22 03 36.0	41.8	22 21 06.6	39.4	1 27 42.0	8 55.0	.	.	.	.	.	.	.	.

Dot leaders indicate the phenomenon occurs below the horizon.



This symbol indicates that these data or auxiliary material may also be found on *The Astronomical Almanac Online* at <http://asa.usno.navy.mil> and <http://asa.hmnao.com>