TRANSIT OF VENUS, 2004

A transit of Venus over the disk of the Sun will occur on June 8. The entire transit will be visible in Asia except the extreme eastern portion, Africa except the western portion, Europe except the extreme southwestern Iberian Peninsula, Greenland except the southern tip, and most of the Indian Ocean.

The times provided in the following tables are given provisionally in Universal Time, using $\Delta T(\mathrm{A}) = +68^{\mathrm{s}}$. Once the value of ΔT is known, the data on these pages may be expressed in Universal Time as follows:

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

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

Apply the correction $0.00417807\ \delta T$ degrees 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	°	° ′	° ′
Ingress, exterior contact	June	8	05	13	30.1	116.3	+101 38.7	+22 45.3
Ingress, interior contact		8	05	32	46.8	119.4	+ 96 48.2	+22 45.1
Least angular distance		8	08	19	40.8		+ 54 53.3	+22 43.1
Egress, interior contact		8	11	06	34.7	213.2	+ 12 58.4	+22 41.0
Egress, exterior contact		8	11	25	51.4	216.3	+ 8 07.9	+22 40.8

Least angular distance: 10′ 26″.9

The position angle *P* of the point of contact is reckoned from the north point of the limb of the Sun towards the east.

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 2004 JUNE 8

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*
United States	° ′	° ′	h m s	°	h m s	°	h m s	′ ″	h m s	°	h m s	°
Boston, MA	+42 20.0	− 71 05.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 48.3	211.8	11 25 36.2	215.1
New York, NY	+40 44.0	− 74 00.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 55.4	211.8	11 25 44.4	215.1
USNO, Washington, DC	+38 55.3	− 77 04.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 06 03.2	211.8	11 25 53.2	215.1
NRAO, Green Bank, WV	+38 25.8	− 79 50.5	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 06 00.9	211.8	11 25 52.2	215.1
Morehead Obs., NC	+35 54.8	− 79 03.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 06 21.6	211.8	11 26 11.9	215.1
Miami, FL	+25 45.0	− 80 15.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 07 34.9	212.0	11 27 22.7	215.3
Univ. of Fl. Radio Obs., FL	+29 31.7	− 83 02.1	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 06 59.5	211.9	11 26 50.1	215.2
Univ. of Alabama Obs., AL	+33 12.6	− 87 32.5	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 06 20.0	211.8	11 26 13.7	215.1
Goethe Link Obs., IN	+39 33.0	− 86 23.7	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 36.9	211.7	11 25 31.3	215.0
Chicago, IL	+41 50.0	− 87 38.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 17.2	211.6	11 25 12.5	215.0
Yerkes Obs., WI	+42 34.2	− 88 33.4	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 09.6	211.6	11 25 05.3	214.9
St. Louis, MO	+38 40.0	− 90 15.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 32.9	211.7	11 25 28.8	215.0
Clyde W. Tombaugh Obs., KS	+38 57.6	− 95 15.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 16.3	211.6	11 25 14.2	214.9
Houston, TX	+29 45.0	− 95 25.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 26 16.9	215.1
Fairbanks, AK	+64 50.0	−147 50.0	5 13 51.2	117.6	5 33 42.3	120.9	. .. .. .	.. .. .	.. ..	... .	.. ..	... .
Nome, AK	+64 30.0	−165 30.0	5 13 28.4	117.5	5 33 13.4	120.8	8 16 14.5	10 45.6	.. ..	... .	.. ..	... .
Canada												
Algonquin Radio Obs.	+45 57.3	− 78 04.4	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 08.5	211.7	11 25 00.3	215.0
Halifax	+44 38.0	− 63 35.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 40.9	211.8	11 25 25.8	215.1
Devon Astro. Obs., Edmonton	+53 23.4	−113 45.5	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 22 54.5	214.7
Iqaluit (Frobisher Bay)	+63 45.0	− 68 30.0	. .. .. .	.. .	. .. .. .	.. .	8 20 46.7	10 48.2	11 03 14.0	211.5	11 23 03.8	214.8
Ottawa River Solar Obs.	+45 23.2	− 75 53.6	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 05 16.8	211.7	11 25 07.6	215.0
Winnipeg	+49 53.0	− 97 10.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 03 57.6	211.5	11 23 56.7	214.8
Yellowknife	+62 30.0	−114 29.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 02 06.2	211.3	11 22 06.6	214.7
Nuuk, **Greenland**	+64 15.0	− 51 35.0	. .. .. .	.. .	5 38 02.6	121.3	8 21 15.7	10 47.5	11 03 20.7	211.6	11 23 05.4	214.9
Hamilton, **Bermuda**	+32 18.0	− 64 48.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 07 15.6	212.1	11 26 57.1	215.3
Arecibo Obs., **Puerto Rico**	+18 20.6	− 66 45.2	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 08 58.5	212.4	11 28 35.4	215.6
Kingston, **Jamaica**	+17 58.0	− 76 48.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 08 40.7	212.3	11 28 23.5	215.5
Merida, **Mexico**	+20 59.0	− 89 39.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 27 33.3	215.3
Tegucigalpa, **Honduras**	+14 05.0	− 87 14.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 28 25.9	215.5
Belmopan, **Belize**	+17 13.0	− 88 48.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 28 01.0	215.4
Managua, **Nicaragua**	+12 06.0	− 86 18.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 28 41.2	215.6
San Jose, **Costa Rica**	+ 9 59.0	− 84 04.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 29 00.4	215.6
Panama City, **Panama**	+ 8 57.0	− 79 30.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 09 36.9	212.5	11 29 17.3	215.7

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*
	° ′	° ′	h m s	°	h m s	°	h m s	′ ″	h m s	°	h m s	°
Cordoba Ast. Obs., **Argentina**	−31 25.2	− 64 11.9	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 32 35.2	216.9
La Paz, **Bolivia**	−16 30.0	− 68 10.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 12 27.6	213.4	11 31 47.3	216.5
Brazil												
Abrahao de Moraes Obs., Sao Paulo	−23 00.1	− 46 58.1	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 13 09.1	213.8	11 32 12.6	216.9
Brasilia	−15 45.0	− 47 57.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 12 40.6	213.6	11 31 48.0	216.8
Manaus	− 3 06.0	− 60 00.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 11 30.2	213.1	11 30 51.8	216.3
Natal	− 5 46.0	− 35 15.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 11 44.6	213.5	11 30 48.7	216.7
Piedade Obs., Belo Horizonte	−19 49.3	− 43 30.7	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 12 56.5	213.8	11 31 59.3	216.9
Antofagasta, **Chile**	−23 40.0	− 70 23.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 32 09.9	216.7
Nat. Ast. Obs., Bogota, **Columbia**	+ 4 35.9	− 74 04.9	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 10 19.3	212.7	11 29 54.2	215.9
Quito Ast. Obs., **Ecuador**	− 0 13.0	− 78 29.9	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 30 13.9	216.0
Asuncion, **Paraguay**	−25 15.0	− 57 40.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 13 13.6	213.8	11 32 22.5	216.9
Peru												
Lima	−12 06.0	− 77 03.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	11 31 16.3	216.3
Iquitos	− 3 51.0	− 73 13.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 11 13.0	212.9	11 30 42.8	216.1
Paramaribo, **Suriname**	+ 5 52.0	− 55 14.0	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 10 39.2	212.9	11 30 02.3	216.1
Montevideo Obs., **Uruguay**	−34 54.3	− 56 10.4	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 13 40.1	214.0	11 32 43.7	217.1
Cagigal Obs., Caracas, **Venezuela**	+10 30.4	− 66 55.7	. .. .. .	.. .	. .. .. .	.. .	. .. .. .	.. .. .	11 09 54.0	212.6	11 29 27.3	215.8
Australia												
Anglo-Aust. Obs., Coonabarabran	−31 16.4	+149 03.7	5 07 27.3	114.9	5 26 05.1	117.9	. .. .. .	.. .. .	.. ..	... .	.. ..	... .
Aust. Nat. Radio Ast. Obs., Parkes	−33 00.0	+148 15.7	5 07 30.7	114.9	5 26 08.0	117.9	. .. .. .	.. .. .	.. ..	... .	.. ..	... .
Brisbane	−27 30.0	+153 00.0	5 07 14.1	115.0	5 25 54.4	118.0	. .. .. .	.. .. .	.. ..	... .	.. ..	... .
Darwin	−12 23.0	+130 44.0	5 08 57.9	115.3	5 27 32.4	118.3	8 14 02.3	10 15.7	.. ..	... .	.. ..	... .
Melbourne	−37 45.0	+144 58.0	5 07 45.1	114.8	5 26 20.8	117.8	. .. .. .	.. .. .	.. ..	... .	.. ..	... .
Mt. Stromlo Obs., Weston Creek	−35 19.2	+149 00.5	5 07 30.2	114.9	5 26 07.6	117.8	. .. .. .	.. .. .	.. ..	... .	.. ..	... .
Perth	−31 58.0	+115 49.0	5 09 48.7	114.9	5 28 16.4	117.9	8 16 00.2	10 09.4	.. ..	... .	.. ..	... .
Sydney	−33 55.0	+151 10.0	5 07 22.6	114.9	5 26 01.1	117.9	. .. .. .	.. .. .	.. ..	... .	.. ..	... .
Alice Springs	−23 42.0	+133 52.0	5 08 27.5	115.0	5 27 00.3	118.0	8 14 28.7	10 12.9	.. ..	... .	.. ..	... .
Suva (Viti Levu), **Fiji**	−18 08.0	+178 25.0	5 06 30.3	115.3	5 25 28.7	118.4	. .. .. .	.. .. .	.. ..	.. .	.. ..	... .
Majuro, **Marshall Islands**	+ 7 05.0	+171 08.0	5 07 33.6	115.9	5 26 38.3	119.0	. .. .. .	.. .. .	.. ..	.. .	.. ..	... .
Auckland Obs., **New Zealand**	−36 54.4	+174 46.7	5 06 42.7	115.0	. .. .. .	.. .	. .. .. .	.. .. .	.. ..	... .	.. ..	... .
Port Moresby, **Papau New Guinea**	− 9 30.0	+147 07.0	5 07 50.4	115.3	5 26 32.7	118.4	. .. .. .	.. .. .	.. ..	.. .	.. ..	... .

TRANSIT OF VENUS OF 2004 JUNE 8

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*
Japan	° ′	° ′	h m s	°	h m s	°	h m s	′ ″	h m s	°	h m s	°
National Ast. Obs., Tokyo	+35 40.3	+139 32.5	5 11 15.9	116.6	5 30 21.2	119.7	8 13 43.7	10 33.3	.. ..	... .	.. ..	... .
Kyoto Univ. Ast. Dept. Obs.	+35 01.7	+135 47.2	5 11 26.7	116.5	5 30 30.1	119.7	8 13 49.6	10 32.7	.. ..	... .	.. ..	... .
Norikura Solar Obs., Nagano	+36 06.8	+137 33.3	5 11 25.6	116.6	5 30 30.4	119.7	8 13 48.7	10 33.2	.. ..	... .	.. ..	... .
Osaka	+34 40.0	+135 30.0	5 11 25.9	116.5	5 30 29.0	119.7	8 13 49.3	10 32.5	.. ..	... .	.. ..	... .
Sapporo	+43 05.0	+141 21.0	5 11 51.2	116.8	5 31 02.8	120.0	8 14 05.1	10 35.9	.. ..	... .	.. ..	... .
Korea Ast. Obs., **Korea, Rep. of**	+36 23.9	+127 22.3	5 12 08.2	116.6	5 31 10.1	119.7	8 14 14.8	10 32.4	.. ..	... .	.. ..	... .
China, People's Republic of												
Purple Mtn. Obs., Nanjing	+32 04.0	+118 49.3	5 12 28.7	116.5	5 31 25.1	119.6	8 14 33.8	10 30.1	10 59 40.0	212.5	.. ..	... .
Yunnan Obs.	+25 01.5	+102 47.3	5 13 30.2	116.4	5 32 19.3	119.4	8 15 37.2	10 26.6	11 00 31.4	212.9	11 19 43.1	216.0
Beijing	+39 55.0	+116 26.0	5 13 13.2	116.7	5 32 15.6	119.9	8 14 59.3	10 32.8	10 59 25.8	212.3	11 18 52.6	215.5
Wuhan	+30 35.0	+114 19.0	5 12 45.7	116.5	5 31 40.2	119.6	8 14 49.2	10 29.3	10 59 50.4	212.6	.. ..	... .
Harbin	+45 50.0	+126 40.0	5 12 57.2	116.9	5 32 06.7	120.0	8 14 45.3	10 35.5	10 59 08.7	212.1	.. ..	... .
Victoria, Hong Kong	+22 16.0	+114 13.0	5 12 14.5	116.2	5 31 02.7	119.3	8 14 40.2	10 26.2	11 00 18.6	212.9	.. ..	... .
Ulaanbaatar, **Mongolia**	+47 54.0	+106 52.0	5 14 27.0	117.0	5 33 35.4	120.1	8 15 53.9	10 35.2	10 59 29.2	212.2	11 18 56.1	215.4
Taipei Obs., **Taiwan**	+25 04.7	+121 31.6	5 11 45.9	116.3	5 30 37.5	119.4	8 14 12.8	10 27.8	.. ..	... .	.. ..	... .
Hanoi, **Vietnam**	+21 01.0	+105 52.0	5 12 58.6	116.2	5 31 45.0	119.3	8 15 19.5	10 25.3	11 00 39.8	213.0	11 19 50.9	216.1
Yangon, **Myanmar**	+16 47.0	+ 96 10.0	5 13 44.8	116.2	5 32 28.3	119.2	8 16 12.2	10 23.3	11 01 23.2	213.2	11 20 26.9	216.3
Bangkok, **Thailand**	+13 44.0	+100 30.0	5 13 08.2	116.1	5 31 49.6	119.1	8 15 48.1	10 22.3	11 01 25.3	213.3	11 20 29.5	216.3
Manila, **Philippines**	+14 37.0	+120 58.0	5 11 08.4	116.0	5 29 52.7	119.0	8 14 07.5	10 23.9	.. ..	... .	.. ..	... .
Kuala Lumpur, **Malaysia**	+ 3 08.0	+101 42.0	5 12 28.5	115.8	5 31 04.0	118.8	8 15 48.1	10 18.6	11 02 17.5	213.6	.. ..	... .
Bosscha Obs., Bandung, **Indonesia**	− 6 49.5	+107 37.0	5 11 23.0	115.5	5 29 54.4	118.5	8 15 29.0	10 15.5	.. ..	... .	.. ..	... .
India												
Bombay	+18 56.0	+ 72 51.0	5 16 15.4	116.4	5 35 04.5	119.5	8 18 36.4	10 24.3	11 02 35.7	213.4	11 21 31.2	216.4
New Delhi	+28 37.0	+ 77 13.0	5 16 09.8	116.7	5 35 04.5	119.8	8 18 02.5	10 27.8	11 01 36.3	213.0	11 20 39.4	216.1
Calcutta	+22 30.0	+ 88 20.0	5 14 49.7	116.4	5 33 37.8	119.5	8 16 57.5	10 25.4	11 01 22.6	213.1	11 20 26.0	216.2
Vainu Bappu Obs.	+12 34.6	+ 78 49.6	5 15 23.4	116.2	5 34 06.8	119.3	8 18 02.7	10 21.8	11 02 43.3	213.5	11 21 37.0	216.6
Colombo, **Sri Lanka**	+ 6 55.0	+ 79 52.0	5 15 01.6	116.0	5 33 41.6	119.1	8 18 01.0	10 19.7	11 03 09.1	213.7	11 22 00.2	216.7
Kabul, **Afghanistan**	+34 30.0	+ 69 10.0	5 17 02.9	116.9	5 36 04.3	120.0	8 18 46.2	10 30.3	11 01 42.9	212.9	11 20 48.0	216.0
Qaraghandy, **Kazakhstan**	+49 53.0	+ 73 07.0	5 16 57.9	117.2	5 36 11.0	120.4	8 18 17.9	10 35.7	11 00 43.5	212.4	11 20 01.0	215.6
Tashkent Obs., **Uzbekistan**	+41 19.5	+ 69 17.6	5 17 09.1	117.0	5 36 16.0	120.2	8 18 40.4	10 32.8	11 01 18.5	212.7	11 20 28.7	215.8

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*
	° ′	° ′	h m s	°	h m s	°	h m s	′ ″	h m s	°	h m s	°
Baku, **Azerbaijan**	+40 22.0	+49 53.0	5 18 34.1	117.2	5 37 47.2	120.4	8 20 23.1	10 33.6	11 02 31.3	212.7	11 21 38.0	215.9
Tehran, **Iran**	+35 40.0	+51 26.0	5 18 28.2	117.1	5 37 37.3	120.2	8 20 24.6	10 31.8	11 02 46.1	212.9	11 21 49.2	216.0
Sanaa, **Yemen**	+15 24.0	+44 14.0	5 18 42.7	116.7	5 37 42.5	119.8	8 21 46.7	10 25.2	11 05 01.6	213.6	11 23 50.0	216.6
Riyadh, **Saudi Arabia**	+24 39.0	+46 46.0	5 18 43.1	116.9	5 37 47.1	120.0	8 21 13.6	10 28.3	11 03 59.8	213.3	11 22 54.3	216.4
Amman, **Jordan**	+31 57.0	+35 56.0	5 19 29.0	117.2	5 38 43.6	120.3	8 21 56.5	10 32.0	11 04 07.2	213.0	11 23 07.1	216.1
F. and G. Wise Obs., **Israel**	+30 35.8	+34 45.8	5 19 33.2	117.2	5 38 47.7	120.3	8 22 06.4	10 31.6	11 04 19.4	213.0	11 23 18.4	216.2
Kottamia Obs., Cairo, **Egypt**	+29 55.9	+31 49.5	5 19 42.9	117.2	5 38 58.8	120.3	8 22 23.3	10 31.7	11 04 35.3	213.1	11 23 34.0	216.2
Alger Obs., **Algeria**	+36 48.1	+ 3 02.1	5 20 29.8	117.6	5 40 07.4	120.8	8 23 49.6	10 37.6	11 05 36.6	212.7	11 24 46.7	215.9
Morocco												
Rabat	+34 02.0	− 6 51.0	. .. .. .	.. .	5 40 16.1	120.8	8 24 25.0	10 38.2	11 06 23.2	212.7	11 25 34.9	215.9
Marrakech	+31 49.0	− 8 00.0	. .. .. .	.. .	5 40 17.6	120.8	8 24 37.4	10 37.7	11 06 41.9	212.7	11 25 52.6	215.9
Dakar, **Senegal**	+14 38.0	−17 27.0	. .. .. .	.. .	. .. .. .	.. .	8 25 55.7	10 33.9	11 09 06.7	213.2	11 28 11.1	216.3
Monrovia, **Liberia**	+ 6 20.0	−10 46.0	. .. .. .	.. .	. .. .. .	.. .	8 26 06.5	10 30.1	11 09 43.4	213.5	11 28 39.8	216.6
Khartoum, **Sudan**	+15 33.0	+32 32.0	5 19 30.5	116.8	5 38 37.7	119.9	8 22 55.9	10 26.6	11 05 55.3	213.5	11 24 44.0	216.6
Addis Ababa, **Ethiopia**	+ 9 03.0	+38 42.0	5 18 54.7	116.6	5 37 54.4	119.7	8 22 31.8	10 23.5	11 06 04.0	213.7	11 24 48.6	216.8
N'Djamena, **Chad**	+12 10.0	+14 59.0	5 20 13.3	117.0	5 39 31.1	120.1	8 24 32.3	10 27.9	11 07 33.6	213.5	11 26 23.3	216.7
Tombouctou, **Mali**	+16 49.0	− 2 59.0	. .. .. .	.. .	. .. .. .	.. .	8 25 23.4	10 32.3	11 08 11.2	213.2	11 27 10.1	216.4
Abuja, **Nigeria**	+ 9 10.0	+ 7 06.0	5 20 18.9	117.0	5 39 41.2	120.1	8 25 11.0	10 28.1	11 08 24.2	213.6	11 27 14.6	216.7
Yaounde, **Cameroon**	+ 3 51.0	+11 31.0	5 20 01.2	116.8	5 39 17.5	119.9	8 25 03.1	10 25.6	11 08 38.7	213.8	11 27 24.8	216.9
Nairobi, **Kenya**	− 1 17.0	+36 50.0	5 18 35.1	116.3	5 37 30.9	119.4	8 22 57.4	10 20.2	11 07 12.6	214.0	11 25 52.0	217.1
Dar es Salaam, **Tanzania**	− 6 51.0	+39 18.0	5 18 06.4	116.2	5 36 58.2	119.2	8 22 47.6	10 18.1	11 07 32.3	214.2	11 26 09.3	217.2
Luanda, **Angola**	− 8 50.0	+13 15.0	. .. .. .	.. .	5 38 25.3	119.5	8 25 07.4	10 21.1	11 09 42.9	214.1	11 28 22.9	217.2
Lusaka, **Zambia**	−15 26.0	+28 20.0	5 18 12.6	116.1	5 37 08.1	119.1	8 23 54.8	10 16.8	11 09 10.7	214.4	11 27 45.6	217.4
South Africa, Republic of												
South African Ast. Obs.	−33 56.1	+18 28.7	. .. .. .	.. .	. .. .. .	.. .	8 24 25.4	10 13.0	11 11 15.2	214.7	11 29 48.6	217.7
Pretoria	−25 45.0	+28 12.0	5 17 23.4	115.8	5 36 15.6	118.8	8 23 51.9	10 13.8	11 10 02.0	214.6	11 28 34.8	217.6
Antananarivo, **Madagascar**	−18 52.0	+47 30.0	5 16 43.1	115.8	5 35 26.0	118.8	8 22 03.6	10 13.5	11 08 00.5	214.5	11 26 34.2	217.5

TRANSIT OF VENUS OF 2004 JUNE 8

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*
	° ′	° ′	h m s	°	h m s	°	h m s	′ ″	h m s	°	h m s	°
Univ. of Ankara, **Turkey**	+39 50.6	+32 46.8	5 19 33.9	117.4	5 38 55.1	120.5	8 21 47.5	10 35.0	11 03 37.3	212.7	11 22 43.7	215.9
National Obs. of Athens, **Greece**	+37 58.4	+23 43.2	5 19 59.6	117.4	5 39 24.9	120.6	8 22 33.5	10 35.4	11 04 20.7	212.8	11 23 26.6	215.9
Italy												
Bologna Univ. Obs.	+44 15.5	+11 20.2	5 20 09.0	117.6	5 39 44.6	120.9	8 22 50.4	10 38.7	11 04 23.6	212.5	11 23 36.9	215.7
Rome Obs.	+41 55.3	+12 27.1	5 20 12.8	117.6	5 39 46.7	120.8	8 22 58.0	10 37.9	11 04 34.8	212.6	11 23 46.0	215.8
Palermo Univ. Ast. Obs.	+38 06.7	+13 21.5	5 20 18.3	117.5	5 39 50.0	120.7	8 23 12.2	10 36.7	11 04 55.7	212.7	11 24 03.8	215.9
Spain												
National Ast. Obs., Madrid	+40 24.6	− 3 41.1	5 20 24.4	117.7	5 40 07.5	120.9	8 23 47.3	10 39.5	11 05 30.1	212.5	11 24 45.1	215.7
Barcelona	+41 25.0	+ 2 10.0	5 20 21.9	117.7	5 40 01.7	120.9	8 23 29.3	10 39.0	11 05 08.0	212.5	11 24 21.7	215.8
Naval Obs., San Fernando	+36 27.9	− 6 12.3	5 20 30.3	117.6	5 40 13.7	120.9	8 24 12.0	10 38.7	11 06 04.2	212.6	11 25 17.4	215.8
Lisbon Ast. Obs., **Portugal**	+38 42.7	− 9 11.2	5 20 25.0	117.7	5 40 10.9	120.9	8 24 05.6	10 39.7	11 05 55.3	212.5	11 25 11.2	215.7
United Kingdom												
Univ. of London Obs.	+51 36.8	− 0 14.4	5 19 54.8	117.8	5 39 39.0	121.1	8 22 38.8	10 41.8	11 04 06.0	212.2	11 23 27.9	215.5
Armagh Obs.	+54 21.2	− 6 38.9	5 19 44.3	117.9	5 39 32.2	121.1	8 22 32.1	10 43.0	11 04 00.4	212.1	11 23 26.1	215.4
Cambridge Univ. Observatories	+52 12.8	+ 0 05.6	5 19 52.7	117.8	5 39 36.9	121.1	8 22 34.6	10 41.9	11 04 01.4	212.2	11 23 23.6	215.5
Univ. of Glasgow Obs.	+55 54.1	− 4 18.3	5 19 39.2	117.9	5 39 26.2	121.1	8 22 19.4	10 43.1	11 03 45.9	212.1	11 23 12.0	215.4
Univ. of St. Andrews Obs.	+56 20.2	− 2 48.9	5 19 37.7	117.9	5 39 24.1	121.1	8 22 14.6	10 43.0	11 03 40.4	212.1	11 23 06.4	215.4
Dunsink Obs., Dublin, **Ireland**	+53 23.3	− 6 20.2	5 19 47.9	117.9	5 39 35.5	121.1	8 22 37.7	10 42.8	11 04 06.4	212.2	11 23 31.3	215.4
France												
Paris Obs.	+48 50.2	+ 2 20.2	5 20 03.0	117.8	5 39 45.2	121.0	8 22 49.5	10 40.9	11 04 18.3	212.3	11 23 37.5	215.6
Pic du Midi Obs.	+42 56.2	+ 0 08.7	5 20 19.3	117.7	5 40 00.8	120.9	8 23 26.2	10 39.7	11 05 03.0	212.5	11 24 18.5	215.7
Lyon	+45 46.0	+ 4 50.0	5 20 10.6	117.7	5 39 50.4	120.9	8 23 00.4	10 39.8	11 04 32.1	212.4	11 23 48.2	215.7
Strasbourg Obs.	+48 35.0	+ 7 46.2	5 20 01.0	117.7	5 39 40.2	121.0	8 22 38.3	10 40.2	11 04 06.4	212.4	11 23 24.0	215.6
Marseille	+43 18.0	+ 5 22.0	5 20 16.3	117.7	5 39 54.9	120.9	8 23 11.8	10 39.1	11 04 46.7	212.5	11 24 00.8	215.7
Germany												
Archenhold Obs., Berlin	+52 29.2	+13 28.7	5 19 43.7	117.7	5 39 21.5	121.0	8 22 03.1	10 40.6	11 03 28.3	212.3	11 22 47.6	215.5
Hamburg Obs.	+53 28.9	+10 14.5	5 19 43.5	117.8	5 39 23.1	121.0	8 22 06.0	10 41.2	11 03 30.5	212.3	11 22 51.2	215.5
Effelsberg Radio Obs., Bonn	+50 31.6	+ 6 53.1	5 19 55.7	117.7	5 39 36.0	121.0	8 22 30.1	10 40.8	11 03 56.6	212.3	11 23 15.8	215.5
Copenhagen Univ. Obs., **Denmark**	+55 41.2	+12 34.6	5 19 33.6	117.8	5 39 13.0	121.0	8 21 48.5	10 41.5	11 03 12.2	212.2	11 22 34.2	215.4
Leiden Obs., **Netherlands**	+52 09.3	+ 4 29.1	5 19 51.7	117.8	5 39 33.7	121.0	8 22 26.4	10 41.4	11 03 52.1	212.3	11 23 13.1	215.5
Royal Obs. of Belgium, **Belgium**	+50 47.9	+ 4 21.5	5 19 56.2	117.8	5 39 37.9	121.0	8 22 34.2	10 41.1	11 04 00.9	212.3	11 23 21.0	215.5

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*
	° ′	° ′	h m s	°	h m s	°	h m s	′ ″	h m s	°	h m s	°
Warsaw Univ. Ast. Obs., **Poland**	+52 05.4	+ 21 25.2	5 19 34.2	117.7	5 39 08.0	120.9	8 21 42.2	10 39.7	11 03 09.4	212.3	11 22 27.0	215.6
Norway												
Skibotn Ast. Obs.	+69 20.9	+ 20 21.9	5 18 28.1	117.8	5 38 09.4	121.1	8 20 19.1	10 43.7	11 01 49.0	211.9	11 21 20.7	215.1
Oslo	+59 56.0	+ 10 45.0	5 19 18.6	117.8	5 39 00.1	121.1	8 21 29.2	10 42.5	11 02 52.5	212.1	11 22 18.1	215.3
Longyearbyen (Svalbard)	+78 12.0	+ 15 40.0	5 17 44.2	117.9	5 37 29.0	121.1	8 19 36.9	10 45.3	11 01 19.5	211.7	11 20 58.2	215.0
Univ. of Helsinki Obs., **Finland**	+60 09.7	+ 24 57.3	5 19 01.8	117.7	5 38 37.8	121.0	8 20 54.4	10 41.5	11 02 20.5	212.1	11 21 44.3	215.4
Sweden												
Lund Obs.	+55 41.9	+ 13 11.2	5 19 33.0	117.8	5 39 12.1	121.0	8 21 47.0	10 41.4	11 03 10.7	212.2	11 22 32.6	215.4
Stockholm	+59 20.0	+ 18 05.0	5 19 14.1	117.8	5 38 52.4	121.0	8 21 16.0	10 41.8	11 02 40.0	212.1	11 22 04.0	215.4
Russia												
Irkutsk Ast. Obs.	+52 16.7	+104 20.7	5 14 52.1	117.1	5 34 04.5	120.3	8 16 13.9	10 36.6	10 59 30.1	212.1	11 18 58.6	215.3
Pulkovo Obs., St. Petersburg	+59 46.4	+ 30 19.6	5 18 54.3	117.7	5 38 28.1	120.9	8 20 41.2	10 41.0	11 02 09.6	212.1	11 21 32.6	215.4
Moscow	+55 45.0	+ 37 42.0	5 18 50.8	117.6	5 38 19.4	120.8	8 20 33.0	10 39.4	11 02 07.2	212.3	11 21 26.5	215.5
Murmansk	+68 59.0	+ 33 08.0	5 18 15.2	117.8	5 37 52.9	121.0	8 19 55.9	10 43.0	11 01 29.3	211.9	11 20 59.8	215.2
Tomsk Univ. Obs.	+56 28.1	+ 84 56.8	5 16 17.1	117.3	5 35 34.1	120.5	8 17 32.2	10 37.8	11 00 04.2	212.2	11 19 29.4	215.4
Tiksi	+71 40.0	+128 45.0	5 15 03.4	117.5	5 34 35.6	120.8	8 16 39.7	10 43.0	10 59 31.9	211.6	11 19 15.8	214.9
Magadan	+59 38.0	+150 50.0	5 13 12.2	117.2	5 32 39.6	120.5	8 15 12.9	10 41.4	.. ..	. . .	.. ..	. . .
Vladivostok	+43 09.0	+131 53.0	5 12 23.9	116.8	5 31 32.6	120.0	8 14 23.4	10 35.1	.. ..	. . .	.. ..	. . .
Urania Obs., Budapest, **Hungary**	+47 29.1	+ 19 03.8	5 19 50.7	117.6	5 39 23.4	120.8	8 22 10.9	10 38.7	11 03 41.5	212.5	11 22 55.7	215.7
Bucharest Ast. Obs., **Romania**	+44 24.8	+ 26 05.8	5 19 44.0	117.5	5 39 11.4	120.7	8 21 58.9	10 37.1	11 03 36.4	212.6	11 22 47.1	215.8
Charles Univ. Ast. Inst., **Czech Rep.**	+50 04.6	+ 14 23.7	5 19 50.2	117.7	5 39 26.5	120.9	8 22 12.9	10 39.9	11 03 39.9	212.4	11 22 57.0	215.6
Urania Obs., Vienna, **Austria**	+48 12.7	+ 16 23.1	5 19 52.8	117.6	5 39 27.3	120.9	8 22 16.1	10 39.2	11 03 45.1	212.4	11 23 00.5	215.6
Zimmerwald Obs., **Switzerland**	+46 52.7	+ 7 28.0	5 20 06.0	117.7	5 39 44.8	120.9	8 22 48.0	10 39.8	11 04 18.0	212.4	11 23 34.2	215.6
Sarajevo, **Bosnia**	+43 52.0	+ 18 26.0	5 20 00.1	117.6	5 39 31.4	120.8	8 22 29.3	10 37.8	11 04 04.3	212.6	11 23 15.8	215.8
Kiev Univ. Obs., **Ukraine**	+50 27.2	+ 30 29.9	5 19 20.9	117.6	5 38 49.5	120.8	8 21 18.4	10 38.5	11 02 51.4	212.4	11 22 06.6	215.6
Vilnius Ast. Obs., **Lithuania**	+54 41.0	+ 25 17.2	5 19 19.8	117.7	5 38 53.0	120.9	8 21 18.4	10 40.1	11 02 45.7	212.3	11 22 04.9	215.5
Reykjavik, **Iceland**	+64 09.0	− 21 58.0	5 18 52.9	118.0	5 38 46.8	121.3	8 21 36.8	10 45.7	11 03 13.2	211.8	11 22 49.2	215.1

Dot leaders indicate the phenomenon occurs below the horizon. Blanks indicate the phenomenon does not occur for the location.