

TABLE 4

**PHYSICAL EPHEMERIS OF THE UMBRAL SHADOW
TOTAL SOLAR ECLIPSE OF 2009 JULY 22**

$\Delta T = 65.9 \text{ s}$

Universal Time	Central Line		Diameter	Eclipse	Sun	Sun	Path	Major	Minor	Umbra	Central
	Latitude	Longitude	Ratio	Obscur.	Alt °	Azm °	Width km	Axis km	Axis km	Veloc. km/s	Durat.
00:52.9	20°21.7'N	070°31.1'E	1.0610	1.1258	0.0	68.3	205.5	-	200.3	-	03m09.4s
00:55	24°22.4'N	081°53.2'E	1.0648	1.1339	11.7	72.9	216.6	1049.3	212.1	4.703	03m38.4s
01:00	27°05.9'N	091°02.1'E	1.0679	1.1405	21.5	77.5	225.1	606.9	221.5	2.427	04m06.1s
01:05	28°34.2'N	097°06.2'E	1.0699	1.1447	28.1	81.0	230.4	484.1	227.6	1.795	04m26.3s
01:10	29°30.9'N	101°58.2'E	1.0715	1.1480	33.5	84.1	234.5	421.2	232.3	1.472	04m43.5s
01:15	30°08.2'N	106°08.4'E	1.0727	1.1508	38.3	87.0	237.9	381.8	236.2	1.269	04m58.7s
01:20	30°31.8'N	109°50.3'E	1.0738	1.1531	42.5	89.7	240.8	354.5	239.4	1.128	05m12.4s
01:25	30°44.7'N	113°11.4'E	1.0748	1.1551	46.5	92.3	243.3	334.3	242.3	1.024	05m24.9s
01:30	30°49.0'N	116°16.1'E	1.0756	1.1569	50.2	94.9	245.6	318.8	244.7	0.945	05m36.4s
01:35	30°46.0'N	119°07.6'E	1.0763	1.1584	53.7	97.4	247.5	306.5	246.9	0.882	05m46.8s
01:40	30°36.8'N	121°48.0'E	1.0769	1.1598	57.1	100.0	249.3	296.6	248.8	0.831	05m56.2s
01:45	30°22.0'N	124°18.9'E	1.0775	1.1610	60.3	102.5	250.9	288.5	250.5	0.790	06m04.6s
01:50	30°02.2'N	126°41.5'E	1.0780	1.1620	63.4	105.1	252.3	281.8	251.9	0.756	06m12.2s
01:55	29°38.0'N	128°56.9'E	1.0784	1.1629	66.4	107.9	253.6	276.3	253.2	0.729	06m18.8s
02:00	29°09.7'N	131°05.9'E	1.0788	1.1637	69.4	110.9	254.6	271.8	254.3	0.706	06m24.4s
02:05	28°37.6'N	133°09.2'E	1.0791	1.1644	72.3	114.3	255.6	268.0	255.2	0.688	06m29.2s
02:10	28°01.9'N	135°07.5'E	1.0793	1.1650	75.1	118.3	256.3	265.0	256.0	0.673	06m33.0s
02:15	27°22.9'N	137°01.2'E	1.0795	1.1654	77.8	123.3	257.0	262.6	256.6	0.662	06m35.9s
02:20	26°40.7'N	138°51.0'E	1.0797	1.1658	80.4	130.4	257.5	260.8	257.1	0.654	06m38.0s
02:25	25°55.5'N	140°37.2'E	1.0798	1.1660	82.9	141.4	257.9	259.5	257.4	0.649	06m39.1s
02:30	25°07.4'N	142°20.4'E	1.0799	1.1661	84.9	161.0	258.2	258.8	257.6	0.646	06m39.4s
02:35	24°16.4'N	144°00.9'E	1.0799	1.1662	85.9	195.1	258.4	258.5	257.7	0.646	06m38.9s
02:40	23°22.7'N	145°39.2'E	1.0799	1.1661	85.1	231.1	258.5	258.7	257.6	0.648	06m37.5s
02:45	22°26.2'N	147°15.7'E	1.0798	1.1660	83.2	252.6	258.6	259.3	257.4	0.653	06m35.4s
02:50	21°27.0'N	148°50.8'E	1.0797	1.1657	80.8	264.3	258.5	260.5	257.1	0.660	06m32.5s
02:55	20°25.1'N	150°25.1'E	1.0795	1.1654	78.2	271.4	258.4	262.2	256.6	0.670	06m28.8s
03:00	19°20.4'N	151°58.9'E	1.0793	1.1649	75.5	276.3	258.1	264.4	255.9	0.682	06m24.4s
03:05	18°12.8'N	153°32.8'E	1.0790	1.1643	72.7	279.8	257.8	267.3	255.1	0.697	06m19.3s
03:10	17°02.2'N	155°07.4'E	1.0787	1.1637	69.8	282.5	257.4	270.9	254.2	0.716	06m13.5s
03:15	15°48.5'N	156°43.2'E	1.0784	1.1629	66.9	284.7	256.9	275.3	253.1	0.739	06m07.0s
03:20	14°31.5'N	158°21.0'E	1.0779	1.1619	63.9	286.5	256.3	280.6	251.8	0.766	05m59.9s
03:25	13°10.9'N	160°01.7'E	1.0774	1.1609	60.8	288.0	255.5	287.0	250.3	0.799	05m52.1s
03:30	11°46.4'N	161°46.2'E	1.0769	1.1597	57.5	289.4	254.5	294.8	248.7	0.838	05m43.7s
03:35	10°17.4'N	163°35.9'E	1.0763	1.1583	54.2	290.5	253.3	304.4	246.8	0.886	05m34.6s
03:40	08°43.6'N	165°32.2'E	1.0755	1.1568	50.7	291.4	251.8	316.2	244.6	0.946	05m24.8s
03:45	07°03.9'N	167°37.3'E	1.0747	1.1550	47.0	292.3	250.0	331.1	242.2	1.021	05m14.2s
03:50	05°17.3'N	169°54.2'E	1.0738	1.1530	43.1	292.9	247.8	350.4	239.4	1.118	05m02.9s
03:55	03°22.0'N	172°27.2'E	1.0727	1.1507	38.9	293.5	244.9	376.4	236.1	1.249	04m50.5s
04:00	01°15.4'N	175°23.1'E	1.0715	1.1480	34.2	293.8	241.3	413.5	232.3	1.437	04m37.0s
04:05	01°07.5'S	178°54.1'E	1.0700	1.1448	28.9	294.0	236.7	471.7	227.7	1.734	04m21.7s
04:10	03°56.8'S	176°33.3'W	1.0680	1.1407	22.4	293.8	230.4	581.1	221.8	2.294	04m03.9s
04:15	07°46.2'S	169°32.1'W	1.0652	1.1346	13.4	293.0	220.4	920.7	213.1	4.043	03m40.1s
04:17.8	12°54.7'S	157°41.3'W	1.0608	1.1253	0.0	290.8	204.7	-	199.6	-	03m08.7s