

PHOENIX SUNDIAL

PHXvdec 10 inch column

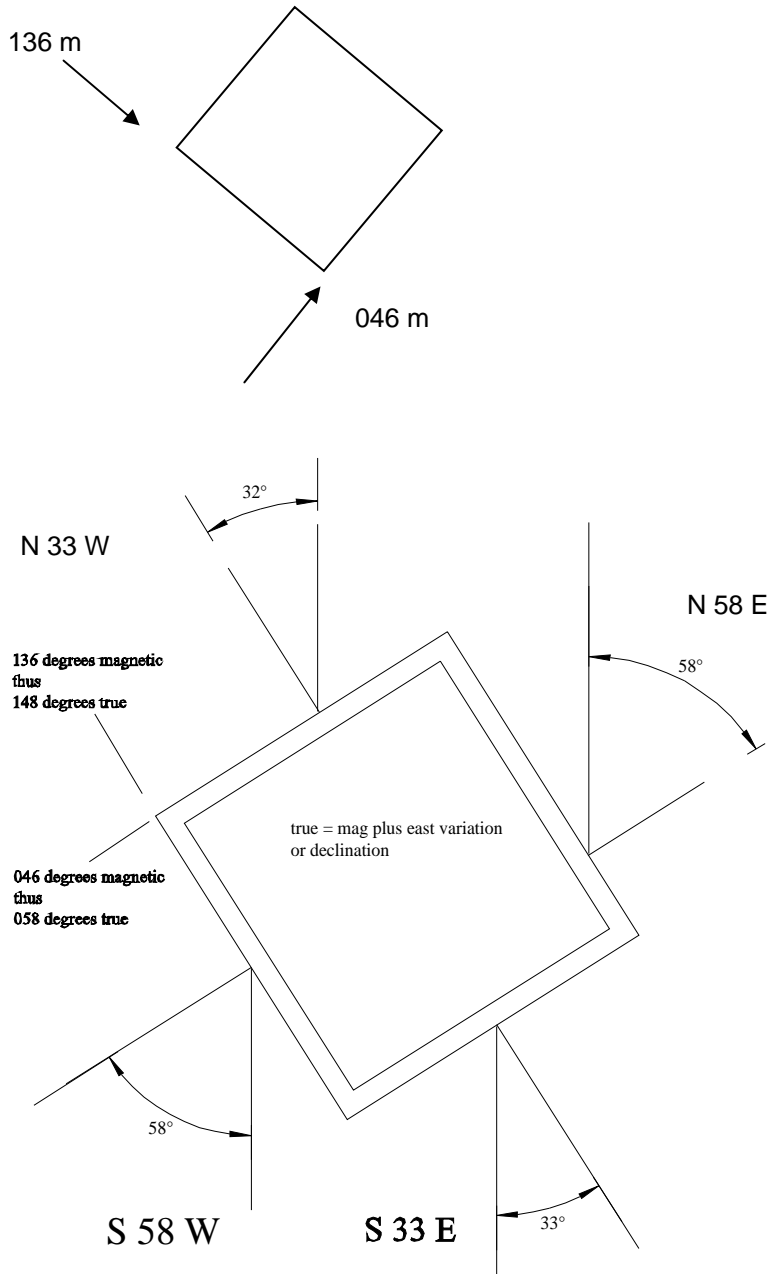


designed: Feb 12, 2012
completed: Feb 28, 2012

Measures:

PHX is 11.8 deg E magnetic
variation (pilots, navigators)
declination (sundial people)

Multiple readings were taken establishing the following



Then the dial plates were designed using DeltaCAD macro "MAIN-v-dials.bas" choice

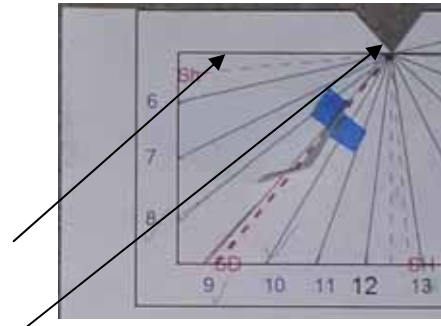
SE plate	SW plate	choice 3
NE plate	NW plate	choice 4

NOTE: in DeltaCAD macro
 N 33 W is
 S 147 W
 and: N 58 E is
 S 122 E
 ie: N (180-(90-decl))



The dial plates are shown later for these four orientations.

Saltillo Tile was used, in this case they were octagonal and were left over from a walkway project. The dial plate templates were placed on the Saltillo Tile, with the top horizontal line of the dial plate parallel to the top of the Saltillo Tile. The dial center on the paper was oriented on the tile so maximum space was available to the hour lines, then a "V" shape was cut in the paper template so the dial center was located at the optimum place on the tile. They were secured with masking tape.



Carbon paper was placed between the tile and the template. In place of carbon paper, you can use a pencil on the back of the template to fill in with pencil lead, the places you will be marking. Either way, the Saltillo Tile now has faint hour lines, AND the style distance (SD) marked.

A vibrating engraver is used first, and run along a ruler or straight edge, this makes a small indentation in the tile, but it is a jagged line. Then a Dremel with an appropriate bit is run lightly first, then with more pressure to make the indentation deeper and smoother.



The Dremel uses the extension so you can more easily control the drill bit.

The lines are highlighted in one of two ways. One way is to run a pencil back and forth along the grooves, and then seal the entire plate with a tile sealer. Another way is to seal the plate before engraving, then mix some black grout, swab the grout all over the plate, then clean the plate off. Then seal it. However, this will work almost as well if the tile is sealed first; almost as well, but not as good.

The equation of time template was penciled on the back, and a pencil run over the template affixed to the tile. Then it was engraved also.

While all this was going on, the 12 inch wide column was built, its base down to below the frost line.

Versabond thinset was used to secure the dial plates to the cube on the column. Then a mortar used to stucco the final dial, and then a grey grout used to finish the entire structure.



The column base is below the frost line.

Concrete is filled in the lower part of the column to move the column's center of gravity lower. Dial plates affixed with Versabond.

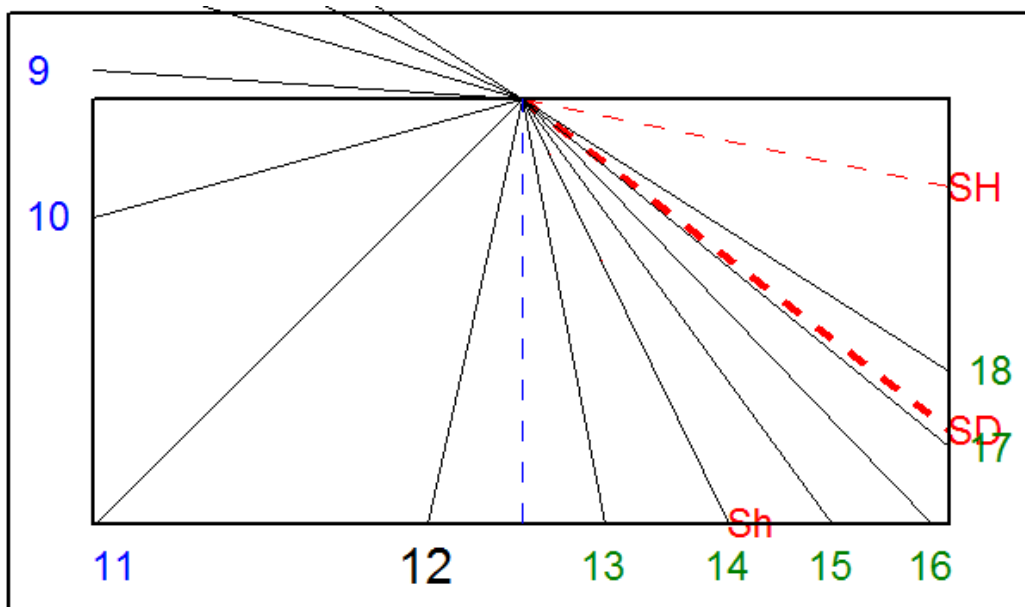


A stucco finished the column, and a final grout can be used if so desired.

The equation of time depiction.



S 58 W



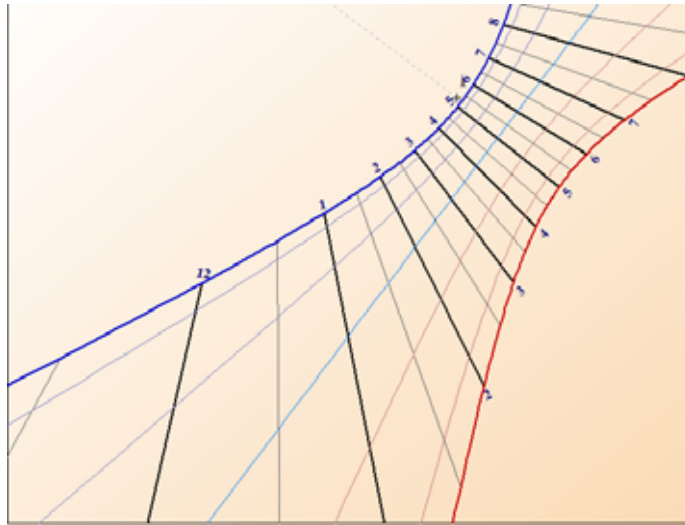
Hour and hour line angle VERTICAL DECLINER DL= -78.1

6 7 8 9 10 11 12 13 14 15 16 17 18

57.4 64.7 73.7 86.2 -74.4 -44.9 -12.4 11.0 25.8 36.0 43.8 50.7 57.4

Lat: 33.5 Long: 112.1 Dec: -58 SW *\
SD: 52.0 SH: 26.2

If you prefer to use other software, here is a dial plate template from ShadowsPro. Remember when using ShadowsPro software that even if you enter a longitude, it DOES NOT adjust for that longitude UNLESS you tell it to use that longitude.



You could also use a spreadsheet such as:- illustratingShadows.xls which has a graphical depiction, BUT the aspect ratio needs adjusting, which is why there is a “V” in the dial plate, pull or push the side of that graph until the “V” is a 90 degree “V”.

Vertical Decliner	lat	lng	ref	dec (+ve)
long diff =	7	33.50	112.10	105
				58
time:				Dial Faces SW
				v.decliner angle
6				-67.35
7				-64.68
8				-73.98
9				-86.15
10				-74.41
11				-44.89
12				12.42
13				-76.91
14				-25.81
15				-35.39
16				-43.92
17				-50.67
18				-57.36
19				-64.68
hour	SD	52.03	SH	26.22

late pm
early am
HERE

You may change the declination box since it is yellow. The

For NW use SE pm
for NE use SW am

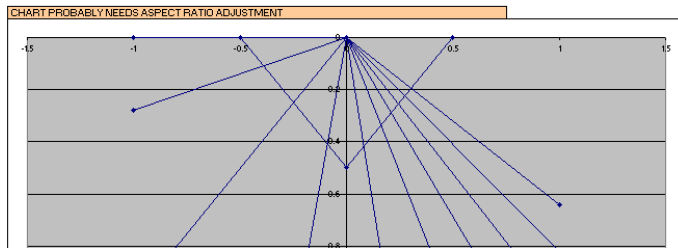
STYLE:SD 52.0 SD
STYLE:SH 26.2 SH
D.LONG 78.1 DL degrees

The hour line angle formula here is the one

NOTE: Analemma for vertical decliners use THIS ANGLE is the gnomon offset from 11 THIS ANGLE is the angle between the stgk dlong is a pseudo difference in longitude v i.e. when the vertical decliner's longitude ot dial to use, whose latitude is SH

The Android spreadsheet for the cell phone: 51aDroidvDec.xls has no graphical depiction, but its angles are listed. This spreadsheet will work with “e-Droid-cell Light”, which is free.

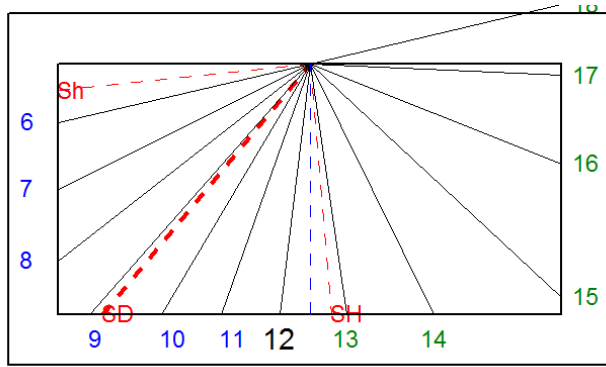
	A	B	C	D	E	F
1	51vDec.xls ~ hour line angles from vertical					
2	LATITUDE:	33.6	LNG:	112.1	REF:	105
3			Corr:	-7.1	Corr h:	-0.47
4	Declination:	-45	SW is +ve, SE is -ve			
5	TIME	Faces SE				
6	hh:hh					
7	6.00	-70.1	+ve angles			
8	7.00	-59.6	-ve angles			
9	8.00	-50.4	If conditional format			
10	9.00	-41.6	is supported			
11	10.00	-32.2				
12	10.50	-27.0				
13	11.00	-21.4				
14	11.50	-15.0				
15	12.00	-7.8				
16	13.00	10.0				
17	13.50	21.0				
18	14.00	33.0				
19	14.50	45.7				
20	15.00	58.1				
21	16.00	80.2				
22	17.00	-82.9				
23	18.00	-70.1				
24	STYLE:SD	46.9	SD			
25	STYLE:SH	36.1	SH			
26						
27	Some keyboards wont allow a minus sign...					
28	To enter a negative number in e-Droid-cell,					
29	either...tell it that it is a formula and enter =-nnn					
30	or... tell it is text and enter -nnn.					



Also available for cell phones are:-

1. SPIRIT LEVEL PLUS (also free) by Androidka
The calibrate function works better for me than other spirit levels that I have tried.
2. Compass Pro by Mobile Essentials A bit more functional for me than other compasses I tried
3. a clock widget

S 33 E



Hour and hour line angle VERTICAL DECLINER DL= 42.5

6	7	8	9	10	11	12	13	14	15	16	17	18
-76.8	-63.4	-51.9	-41.2	-30.6	-19.4	-06.8	08.3	26.3	47.0	68.2	87.3	-76.8

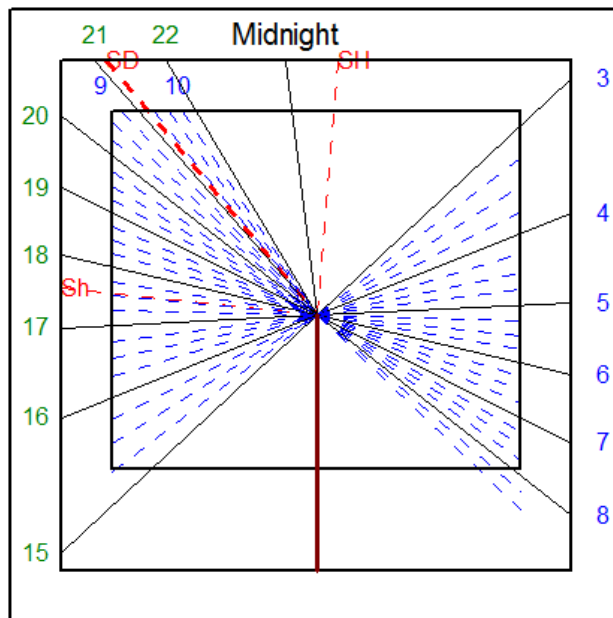
Lat: 33.5 Long: 112.1 Dec: 33 SE /*
 SD: -39.4 SH: 44.4

N 33 W

NOTE:

in DeltaCAD macro

N 33 W is
 S 147 W



POLAR VERTICAL DECLINER Hour:Hourline angle

3	4	5	6	7	8	16	17	18	19	20	21	22
-47.0	-68.2	-87.3	76.8	63.4	51.9	-68.2	-87.3	76.8	63.4	51.9	41.2	30.6
			13.2	26.6	38.1			13.2	26.6	38.1	48.8	59.4
43.0	21.8	02.7				21.8	02.7					

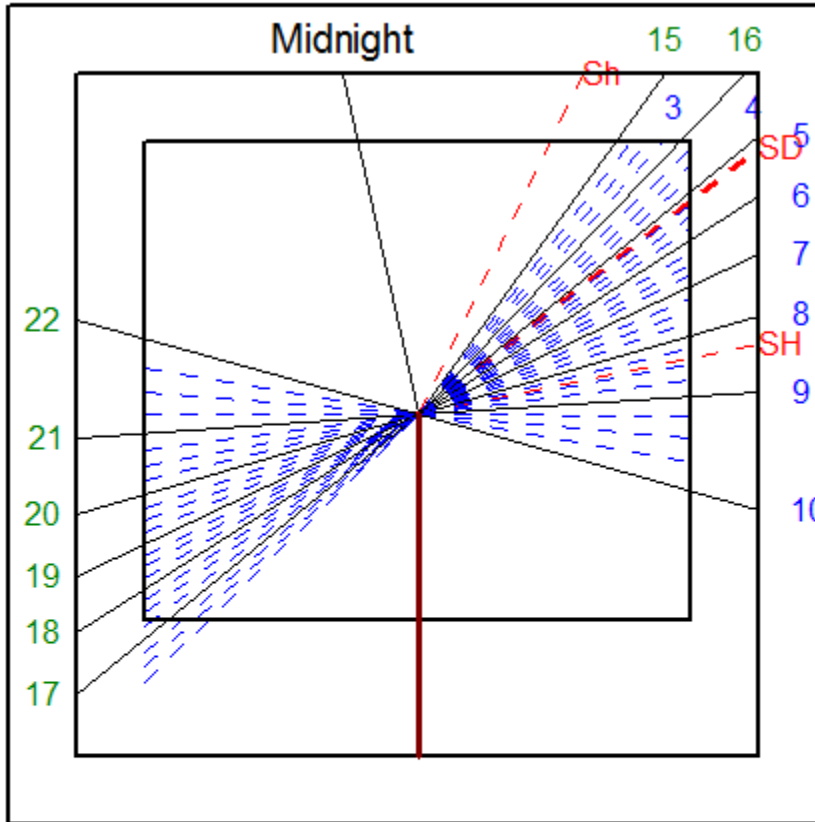
Lat: 33.5 Long: 112.1 Dec: -147 NW /*
 SD: -39.4 SH: -44.4

If some hours are in an opposite quadrant, reverse them

N 58 E

NOTE: the DeltaCAD macro uses declination from the south: so

N 58 E Is S (180 – 58) E or S 122 E



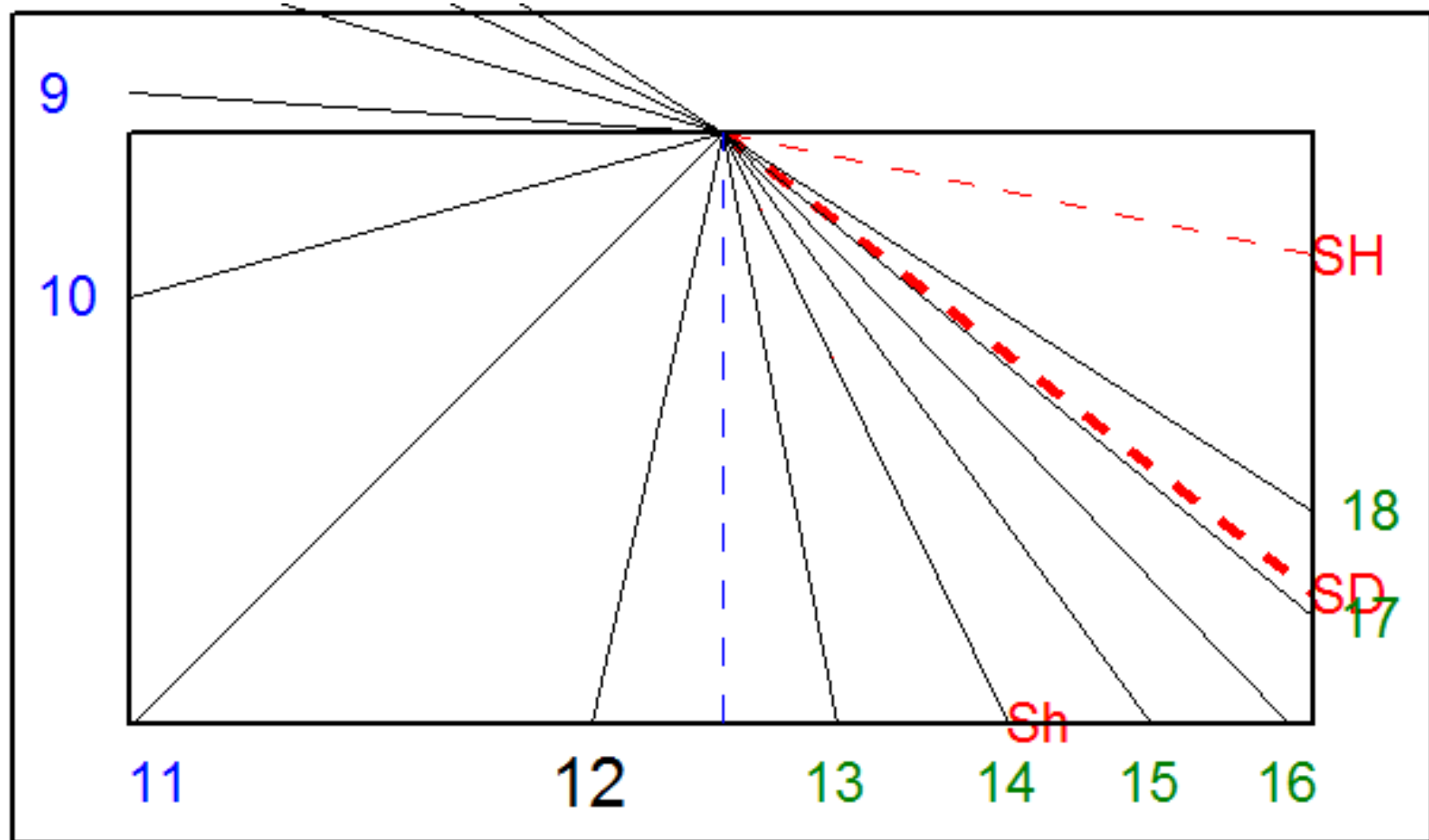
POLAR VERTICAL DECLINER Hour:Hourline angle

3	4	5	6	7	8	16	17	18	19	20	21	22
-36.0	-43.8	-50.7	-57.4	-64.7	-73.7	-43.8	-50.7	-57.4	-64.7	-73.7	-86.2	74.4
												15.6
54.0	46.2	39.3	32.6	25.3	16.3	46.2	39.3	32.6	25.3	16.3	03.8	

Lat: 33.5 Long: 112.1 Dec: 122 NE *

SD: 52.0 SH: -26.2

If some hours are in an opposite quadrant, reverse them

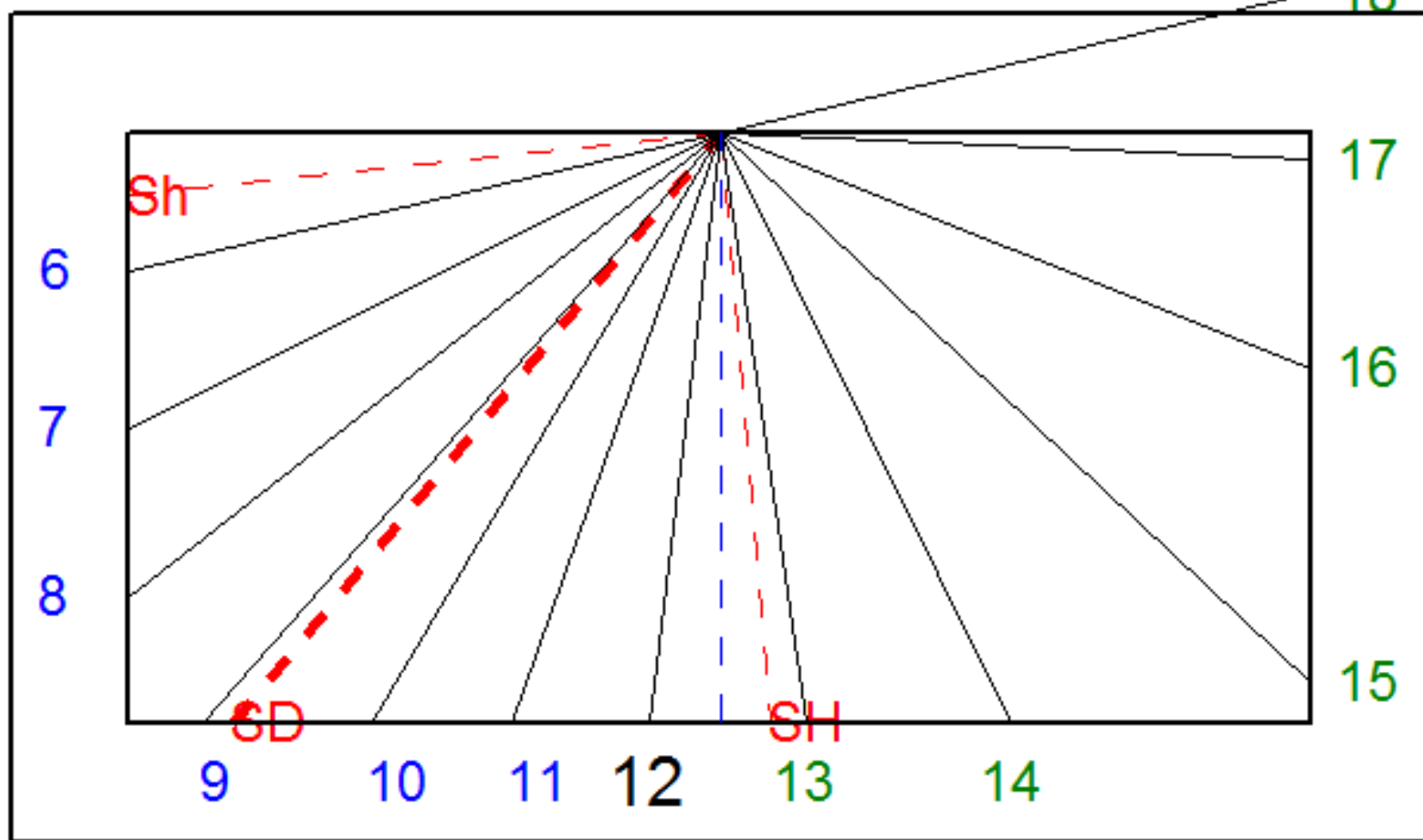


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Lat: 33.5 Long: 112.1 Dec: -58 SW *\
 SD: 52.0 SH: 26.2

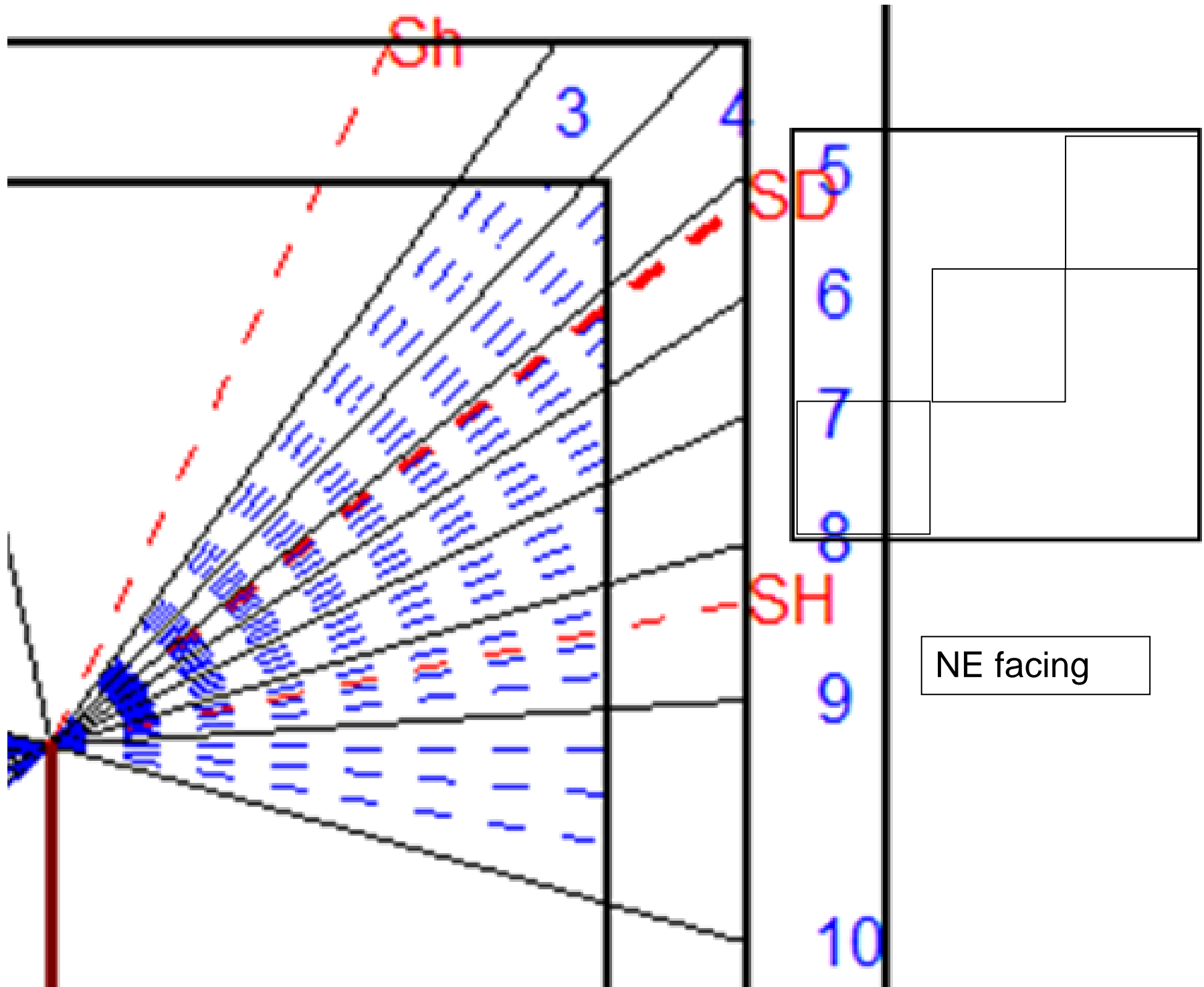


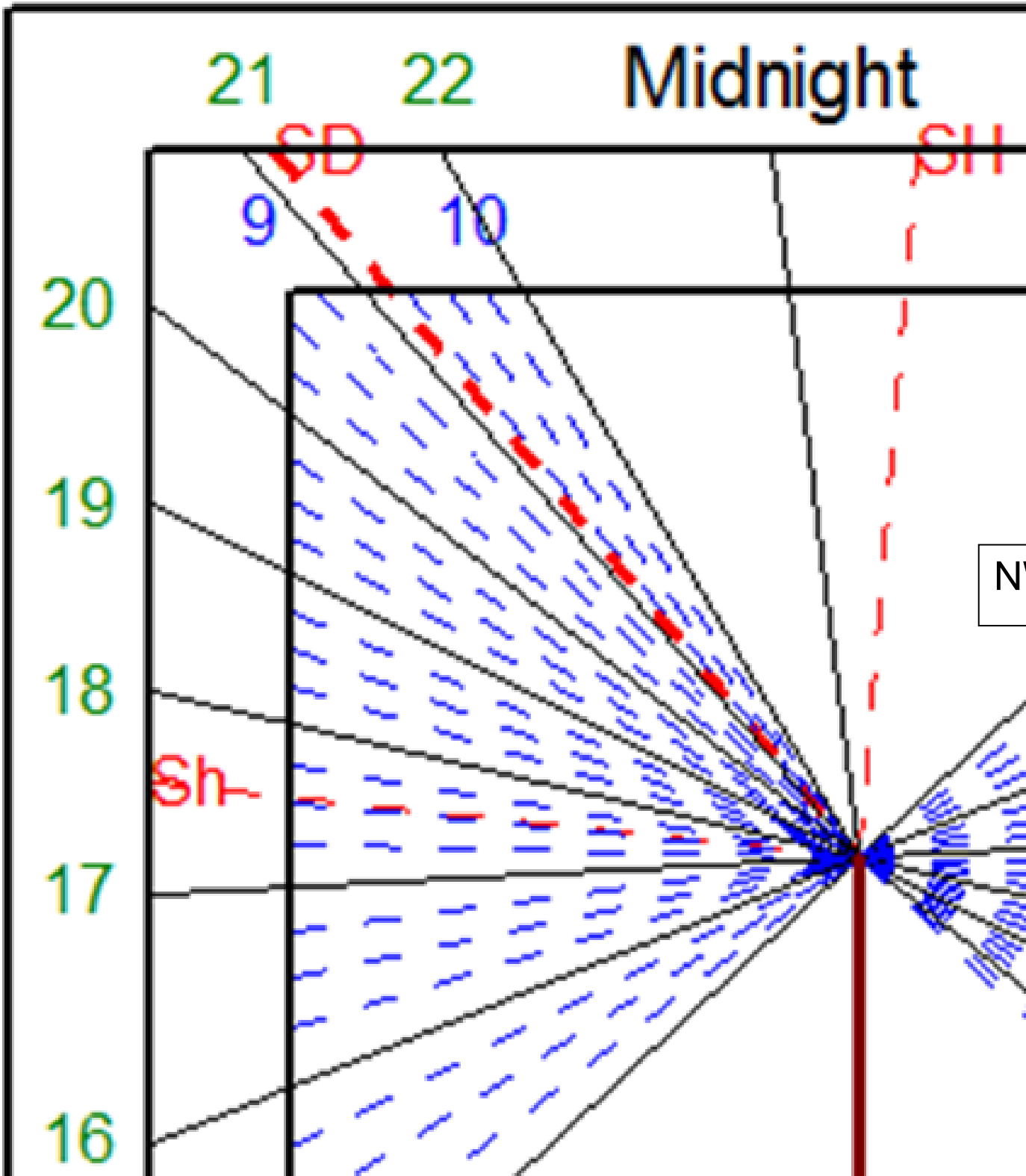
Hour and hour line angle VERTICAL DECLINER DL= 42.5

6 7 8 9 10 11 12 13 14 15 16 17 18

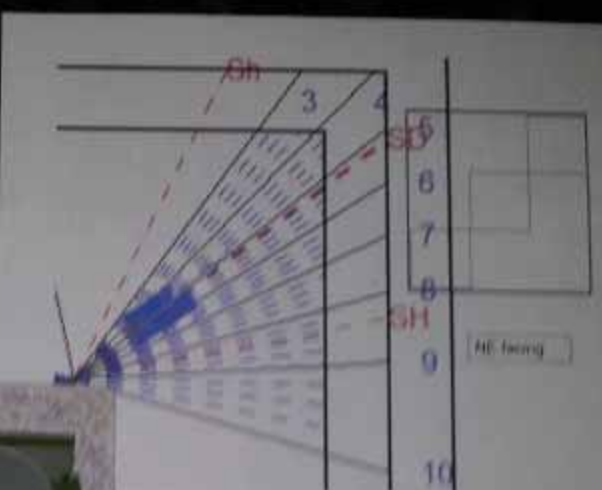
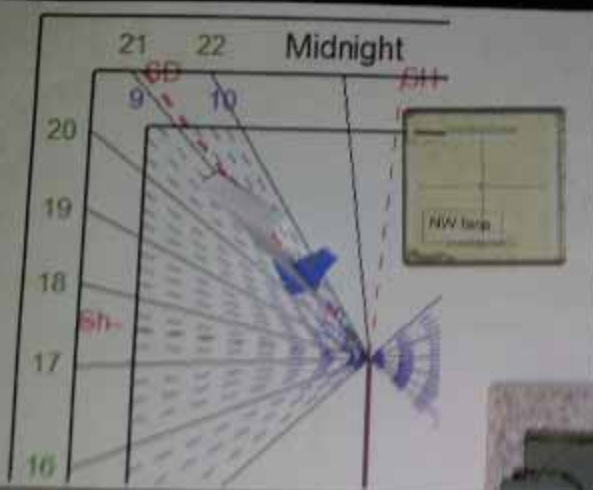
-76.8 -63.4 -51.9 -41.2 -30.6 -19.4 -06.8 08.3 26.3 47.0 68.2 87.3 -76.8

Lat: 33.5 Long: 112.1 Dec: 33 SE /*
 SD: -39.4 SH: 44.4





NW face



Hour and hour line angle VERTICAL DECLINER DL = 48.1

6 7 8 9 10 11 12 13 14 15 16 17 18

19 20 21 22 23 24 25 26 27 28 29 30 31

32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70



Hour and hour line angle VERTICAL DECLINER DL = 46.8

6 7 8 9 10 11 12 13 14 15 16 17 18

19 20 21 22 23 24 25 26 27 28 29 30 31

32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50

51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70

Equation of Time (EOT) Table 3-wave

