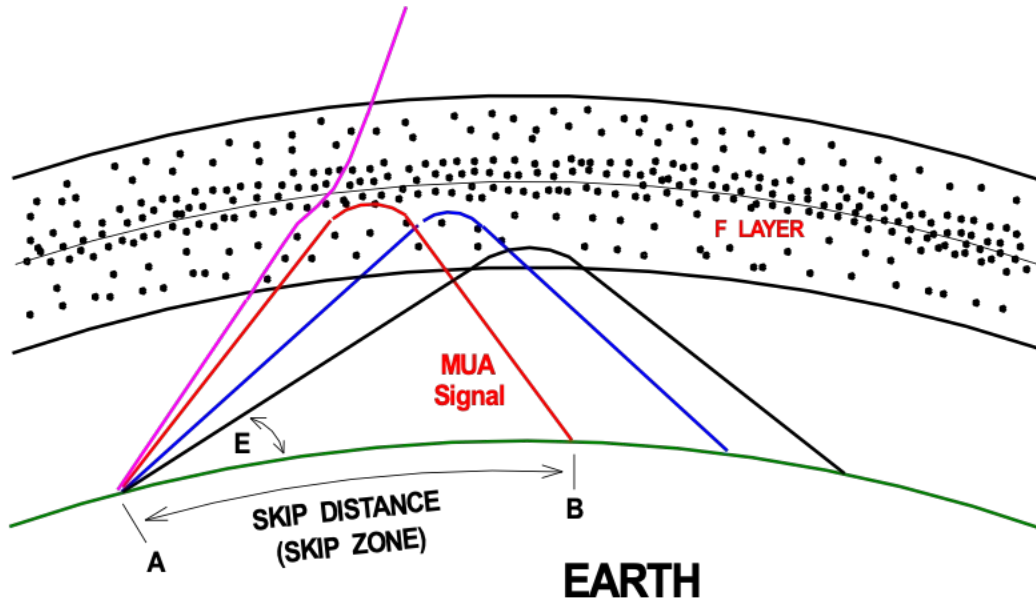
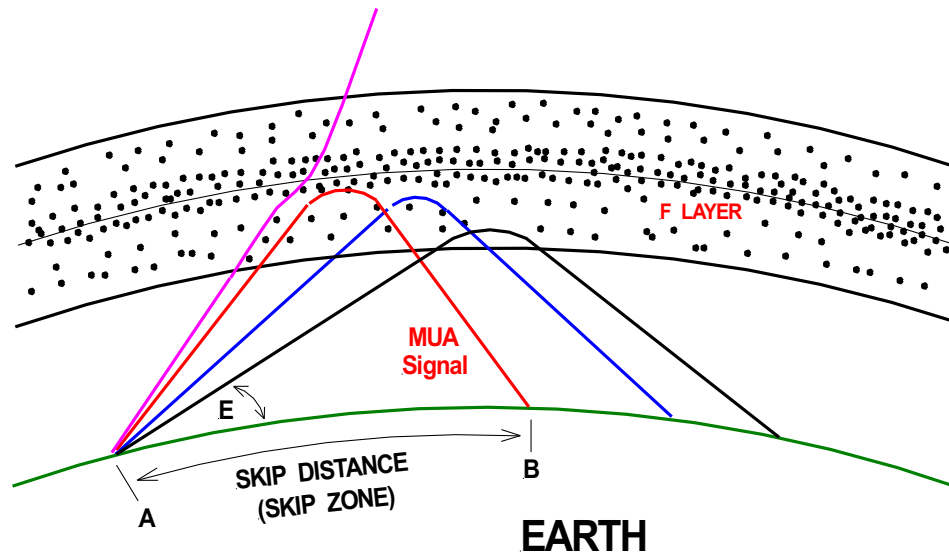


Skip Distance 20 Meter Test



Ken Larson KJ6RZ
February 2024
www.skywave-radio.org

20 Meter Skip Distance Test



Skip Zone Present if $f_c < f_o$

- Critical frequency f_c is nearly always less than the 20 meter operating frequency of 14.0 – 14.350 MHz
- Consequently, a skip zone is present on 20 meters most of the time

20 Meter Skip Distance Test Data – for 2/12/2024 @ 16:00 hours

Test Conditions

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 11 MHz
16:10	14105.000	W6BI	11	nc				Simi Valley, CA
16:11	14095.000	NR6V	20	nc				Northridge, CA
16:12	14106.500	AJ7C	31	nc				Culver City, CA
16:13	14102.700	KN6BKT	48	0:34				San Gabriel, CA
17:11	14111.000	K9NEY	68	nc				Chino Hills, CA
16:16	14094.000	XE2BC	160	nc				Tijuana, Mexico
16:18	14108.500	KO0OOO	252	nc				North Las Vegas, NV
16:19	14101.500	K7OI	301	nc				Meadview, AZ (E of Los Vegas in AZ)
16:20	14108.500	KD7NHC	320	0:47				Wellington, NV. [SE of Carson City]
16:21	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
17:12	14096.000	W7DEM	345	nc		QRM		Minden, NV [S of Carson City]
16:25	14113.500	N0DAJ	348	nc				Wickenburg, AZ. [NW of Phoenix]
16:26	14112.500	W6LHR	349	1:47				Lincoln, CA. [NE of Sacramento]
16:29	14094.900	KL7RI	368	nc		QRM		Reno, NV
16:30	14111.000	KJ7GSK	386	0:45				Chandler, AZ. [SE of Phoenix]
16:32	14096.500	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
16:42	14108.000	KD6OAT	585	0:16				Sandy, UT
16:36	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
16:37	14100.500	AG7MM	638	0:16				Burley, ID. [E of Twin Falls]
16:38	14102.000	KG7AV	693	0:17				Bend, OR
16:40	14103.000	W7FLO	731	0:18				Florence, OR
16:41	14106.700	KD7ZDO	795	0:18				Oregon City, OR. [S of Portland]
16:44	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
16:46	14103.500	W0VG	837	1:25				Evergreen, CO. [NW of Aspen]
16:48	14093.000	KD0SFY	845	0:16				Colorado Springs, CO
16:52	14094.700	WA7ROY	902	0:21				Roy, WA. [S of Tacoma]
16:53	14108.900	W7PLC	911	0:22				Olympia, WA. [SW of Tacoma]
16:55	14096.300	K7HTZ	917	0:17		QRM		Olympia, WA. [SW of Tacoma]
16:56	14100.200	N7LOB	920	0:16				Aberdeen, WA. [On coast W of Olympia]
16:57	14085.000	VA7PF	1054	0:25				BC, Canada
16:58	14105.500	VE7GN	1063	0:32				Gabriola, BC, Vancouver Island
17:00	14098.700	W0CBP	1209	0:19				Pierre, SD
17:01	14100.700	KD5VE	1237	0:50				Laredo, TX
17:03	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
17:05	14104.000	KD5EOC	1248	0:37				Denton, TX (N of Sallas)
17:07	14102.500	N5GR	1250	1:17		QRM		Muskogee, OK (E of Oklahoma City)
17:09	14108.500	K5RAV	1371	0:18				Harlingen, TX (Just N of Mexico on Gulf coast)

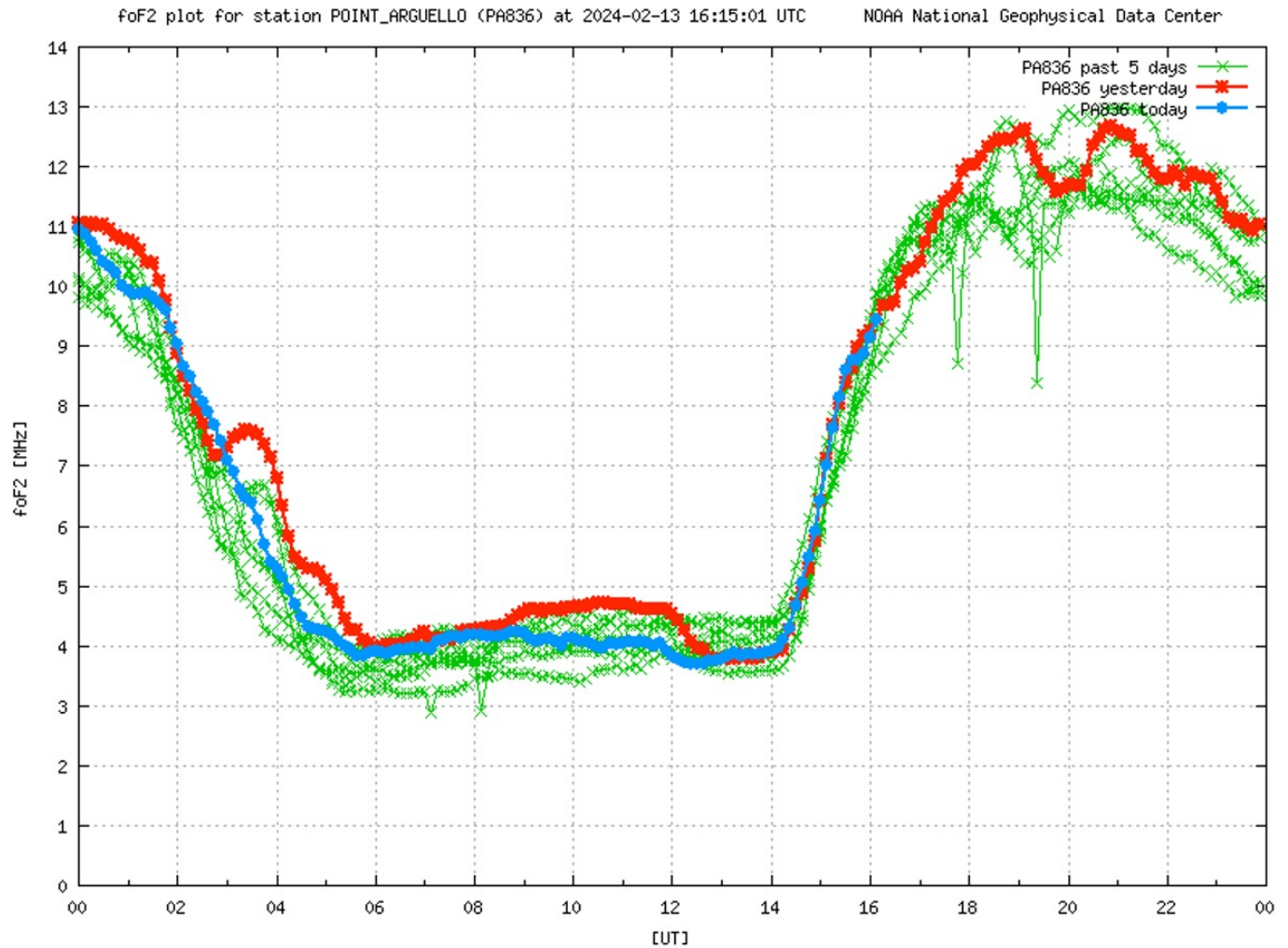
- 20 meter skip distance test for 16:00 thru 17:11 PST February 12, 2024 with:
Sun Rise @ 6:41, Sun Set @ 17:34, SFI = 208, X-Ray flux = C2.7, A Index = 4,
K Index = 0, SSN = 153, Antenna: 20 meter inverted V with apex at 32 ft
- VARA digital protocol; contact duration of 0.18 minutes considered a very good connection
- A station with no entry means that the station could not be reached because the frequency was in use by others, QRM means interference on channel, both commonly encountered problems

20 Meter Skip
Distance Test
Data - for
16:00 hours
2/12/2024

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 11 MHz
16:10	14105.000	W6BI	11	nc				Simi Valley, CA
16:11	14095.000	NR6V	20	nc				Northridge, CA
16:12	14106.500	AJ7C	31	nc				Culver City, CA
16:13	14102.700	KN6BKT	48	0:34				San Gabrile, CA
17:11	14111.000	K9NEY	68	nc				Chino Hills, CA
16:16	14094.000	XE2BC	160	nc				Tijuana, Mexico
16:18	14108.500	KO0000	252	nc				North Las Vegas, NV
16:19	14101.500	K7OI	301	nc				Meadview, AZ (E of Los Vegas in AZ
16:20	14108.500	KD7NHC	320	0:47				Wellington, NV. [SE of Carson City]
16:21	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
17:12	14096.000	W7DEM	345	nc		QRM		Minden, NV [S of Carson City]
16:25	14113.500	N0DAJ	348	nc				Wickenburg, AZ. [NW of Phoenix]
16:26	14112.500	W6LHR	349	1:47				Lincoln, CA. [NE of Sacramento]
16:29	14094.900	KL7RI	368	nc		QRM		Reno, NV
16:30	14111.000	KJ7GSK	386	0:45				Chandler, AZ. [SE of Phoenix]
16:32	14096.500	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
16:42	14108.000	KD6OAT	585	0:16				Sandy, UT
16:36	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
16:37	14100.500	AG7MM	638	0:16				Burley, ID. [E of Twin Falls]
16:38	14102.000	KG7AV	693	0:17				Bend, OR
16:40	14103.000	W7FLO	731	0:18				Florence, OR
16:41	14106.700	KD7ZDO	795	0:18				Oregon City, OR. [S of Portland]
16:44	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
16:46	14103.500	W0VG	837	1:25				Evergreen, CO. [NW of Aspen]
16:48	14093.000	KD0SFY	845	0:16				Colorado Springs, CO
16:52	14094.700	WA7ROY	902	0:21				Roy, WA. [S of Tacoma]
16:53	14108.900	W7PLC	911	0:22				Olympia, WA. [SW of Tacoma]
16:55	14096.300	K7HTZ	917	0:17		QRM		Olympia, WA. [SW of Tacoma]
16:56	14100.200	N7LOB	920	0:16				Aberdeen, WA. [On coast W of Olympia]
16:57	14085.000	VA7PF	1054	0:25				BC, Canada
16:58	14105.500	VE7GN	1063	0:32				Gabriola, BC, Vancouver Island
17:00	14098.700	W0CBP	1209	0:19				Pierre, SD
17:01	14100.700	KD5VE	1237	0:50				Laredo, TX
17:03	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
17:05	14104.000	KD5EOC	1248	0:37				Denton, TX (N of Sallas)
17:07	14102.500	N5GR	1250	1:17		QRM		Muskogee, OK (E of Oklahoma City)
17:09	14108.500	K5RAV	1371	0:18				Harlingen, TX (Just N of Mexico on Gulf coast)

- At $f_c = 11$ MHz most stations from 11 out to 500 miles were difficult (duration $\gg 0.18$) if not impossible to reach (nc for no connection). They were in the 500 mile skip zone
- Most stations 585 to 1,371 miles out were easily reached. They were outside the skip zone

Ionosphere Critical Frequency @ Point Arguello

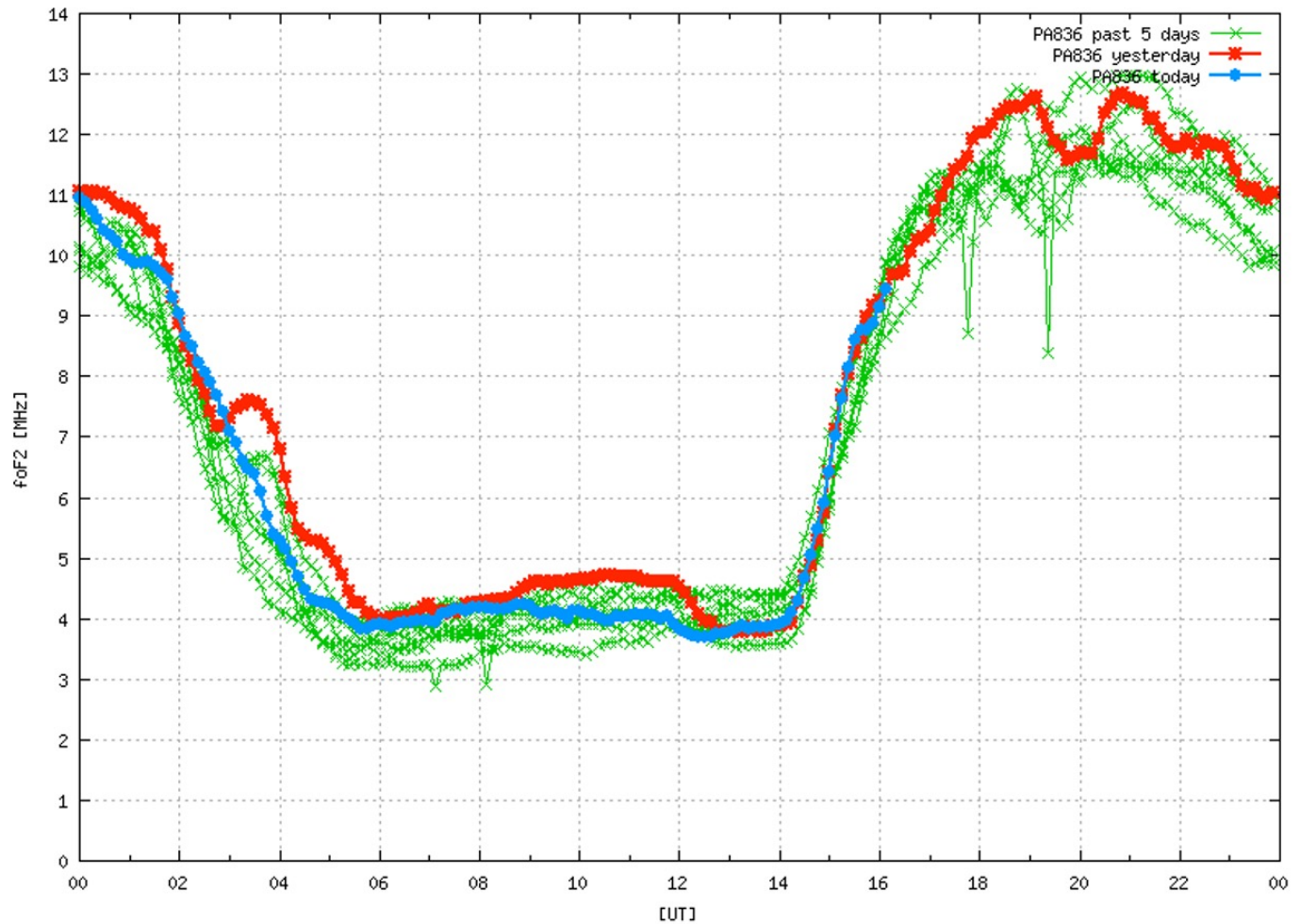


- This chart shows f_oF2 for the **past 5 days**, **yesterday**, and **today** in UT time for 2/13/24
- For 16:00 PST 2/12/24 use today **blue trace** at 00:00 UT = 16:00 PST, result $f_oF2 = 11$ MHz

20 Meter Skip
Distance Test
Data 18:00 hours
2/12/2024

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 9 MHz
17:45	14105.000	W6BI	11	nc				Simi Valley
17:46	14095.000	NR6V	20	abort		QRM		Northridge, CA
17:51	14106.500	AJ7C	31	nc				Culver City, CA
17:52	14102.700	KN6BKT	48	0:41				San Gabrile, CA
17:53	14111.000	K9NEY	68	nc				Chino Hills, CA
17:54	14094.000	XE2BC	160	nc				Tijuana, Mexico
17:56	14108.500	KO0000	252	nc				North Las Vegas, NV
17:57	14101.500	K7OI	301	nc				Meadview, AZ (E of Los Vegas in AZ)
17:58	14108.500	KD7NHC	320	0:43				Wellington, NV. [SE of Carson City]
18:00	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
	14096.000	W7DEM	345					Minden, NV [S of Carson City]
18:03	14113.500	N0DAJ	348	1:12				Wickenburg, AZ. [NW of Phoenix]
18:06	14112.500	W6LHR	349	2:05				Lincoln, CA. [NE of Sacramento]
18:12	14094.900	KL7RI	368	nc		QRM		Reno, NV
18:14	14111.000	KJ7GSK	386	0:46				Chandler, AZ. [SE of Phoenix]
18:17	14095.000	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
18:26	14108.000	KD6OAT	585	nc				Sandy, UT
18:19	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
18:20	14100.500	AG7MM	638	nc				Burley, ID. [E of Twin Falls]
18:21	14102.000	KG7AV	693	0:16				Bend, OR
18:22	14103.000	W7FLO	731	0:18				Florence, OR
18:24	14106.700	KD7ZDO	795	0:16				Oregon City, OR. [S of Portland]
18:27	14111.000	W7OWO	798	0:17				Dundee, OR. [SE of Portland]
18:28	14103.500	W0VG	837	0:18				Evergreen, CO. [NW of Aspen]
18:30	14093.000	KD0SFY	845	0:32				Colorado Springs, CO
18:31	14094.700	WA7ROY	902	0:23		QRM		Roy, WA. [S of Tacoma]
18:33	14108.900	W7PLC	911	0:22				Olympia, WA. [SW of Tacoma]
18:34	14096.300	K7HTZ	917	0:18		QRM		Olympia, WA. [SW of Tacoma]
18:36	14100.200	N7LOB	920	0:18				Aberdeen, WA. [On coast W of Olympia]
18:37	14085.000	VA7PF	1054	0:16				BC, Canada
18:38	14105.500	VE7GN	1063	nc				Gabriola, BC, Vancouver Island
18:40	14098.700	W0CBP	1209	0:18				Pierre, SD
18:44	14100.700	KD5VE	1237	nc				Laredo, TX
18:45	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
18:51	14104.000	KD5EOC	1248	0:38				Denton, TX (N of Sallas)
18:48	14102.500	N5GR	1250	nc				Muskogee, OK (E of Oklahoma City)
18:50	14108.500	K5RAV	1371	0:25				Harlingen, TX (Just N of Mexico on Gulf coast)

- At 18:00 PST, $f_c = 9$ MHz, skip distance has gone longer
- Most stations from 11 out to 638 miles were difficult (duration $\gg 0.18$) if not impossible to reach (nc for no connection). They were in the 650 mile skip zone
- Most stations 585 to 1,371 miles out were easily reached. They were outside the skip zone



Ionosphere Critical Frequency @ Point Arguello

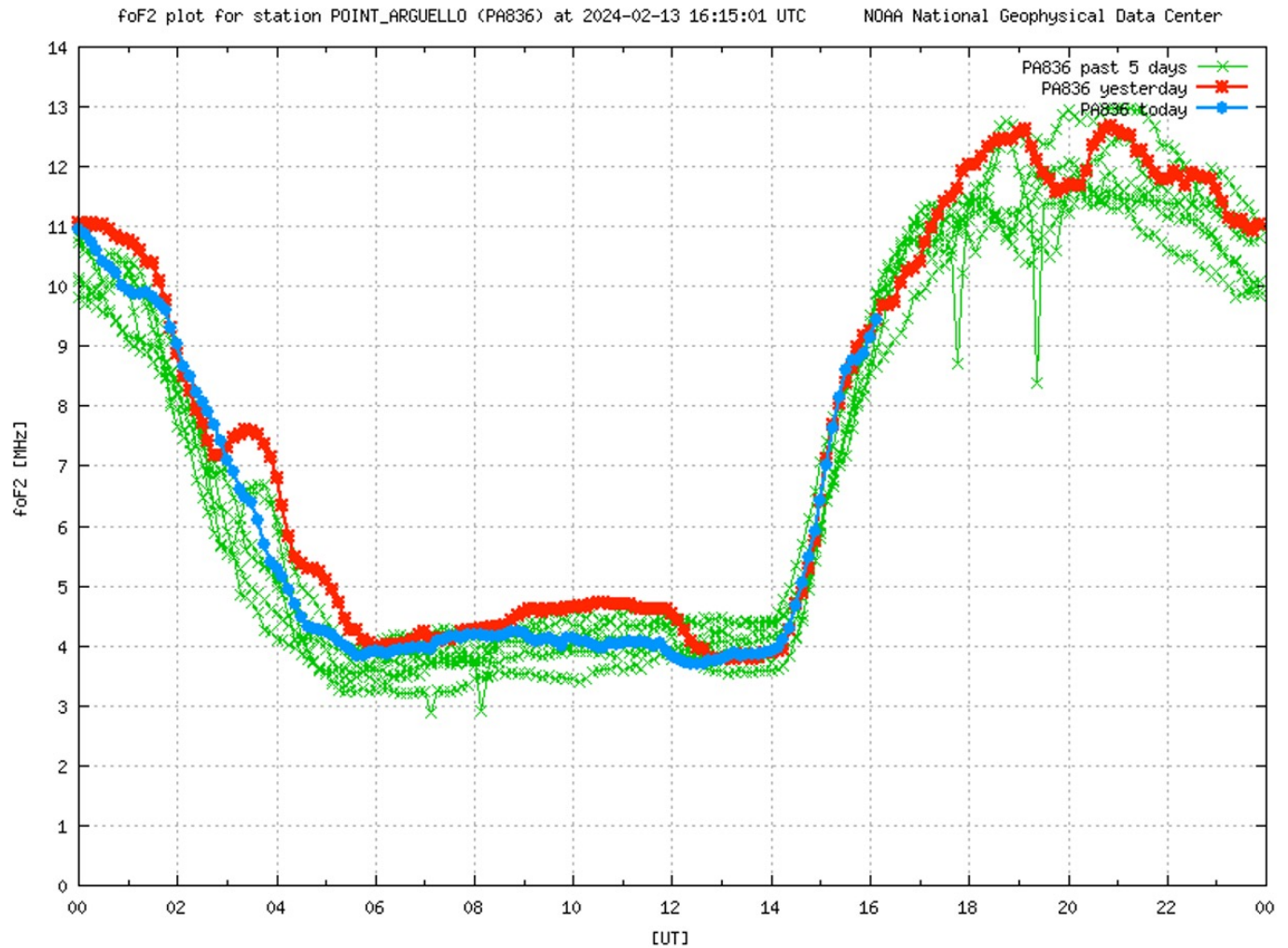
- For 18:00 PST 2/12/24 use today **blue trace** at 02:00 UT = 18:00 PST, result $f_cF2 = 9$ MHz

20 Meter Skip Distance Test Data for 2/12/2024 19:00 – 19:39 hours

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 5.5 MHz at 19:30 PST
18:54	14105.000	W6BI	11	nc				Simi Valley, CA
18:55	14095.000	NR6V	20	nc		QRM		Northridge, CA
18:56	14106.500	AJ7C	31	nc				Culver City, CA
18:57	14102.700	KN6BKT	48	0:54				San Gabriel, CA
18:59	14111.000	K9NEY	68	nc				Chino Hills, CA
19:00	14094.000	XE2BC	160	nc				Tijuana, Mexico
19:02	14108.500	KO0OOO	252	nc				North Las Vegas, NV
19:03	14101.500	K7OI	301	nc				Meadview, AZ (E of Los Vegas in AZ)
19:04	14108.500	KD7NHC	320	1:16				Wellington, NV. [SE of Carson City]
19:06	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
19:07	14096.000	W7DEM	345	nc		QRM		Minden, NV [S of Carson City]
19:08	14113.500	N0DAJ	348	nc				Wickenburg, AZ. [NW of Phoenix]
19:10	14112.500	W6LHR	349	nc				Lincoln, CA. [NE of Sacramento]
19:12	14094.900	KL7RI	368	nc		QRM		Reno, NV
19:13	14111.000	KJ7GSK	386	nc				Chandler, AZ. [SE of Phoenix]
19:17	14096.500	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
19:15	14108.000	KD6OAT	585	nc				Sandy, UT
19:16	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
19:17	14100.500	AG7MM	638	nc				Burley, ID. [E of Twin Falls]
19:18	14102.000	KG7AV	693	nc				Bend, OR
19:19	14103.000	W7FLO	731	nc				Florence, OR
19:20	14106.700	KD7ZDO	795	nc				Oregon City, OR. [S of Portland]
19:21	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
19:23	14103.500	W0VG	837	nc				Evergreen, CO. [NW of Aspen]
19:24	14093.000	KD0SFY	845	nc				Colorado Springs, CO
19:26	14094.700	WA7ROY	902	nc		QRM		Roy, WA. [S of Tacoma]
19:27	14108.900	W7PLC	911	0:29				Olympia, WA. [SW of Tacoma]
19:28	14096.300	K7HTZ	917	0:18		QRM		Olympia, WA. [SW of Tacoma]
19:29	14100.200	N7LOB	920	0:17				Aberdeen, WA. [On coast W of Olympia]
19:31	14085.000	VA7PF	1054	nc				BC, Canada
19:32	14105.500	VE7GN	1063	0:57				Gabriola, BC, Vancouver Island
19:34	14098.700	W0CBP	1209	0:18				Pierre, SD
19:35	14100.700	KD5VE	1237	nc				Laredo, TX
19:36	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
19:37	14104.000	KD5EOC	1248	nc				Denton, TX (N of Sallas)
19:38	14102.500	N5GR	1250	nc				Muskogee, OK (E of Oklahoma City)
19:39	14108.500	K5RAV	1371	0:16				Harlingen, TX (Just N of Mexico on Gulf coast)

- Critical frequency dropped from 6.8 MHz @ 19:00 to 5.5 MHz @ 19:39 PST
- Skip went long!
- The closest stations that could be reached were more than 900 miles away

Ionosphere Critical Frequency @ Point Arguello

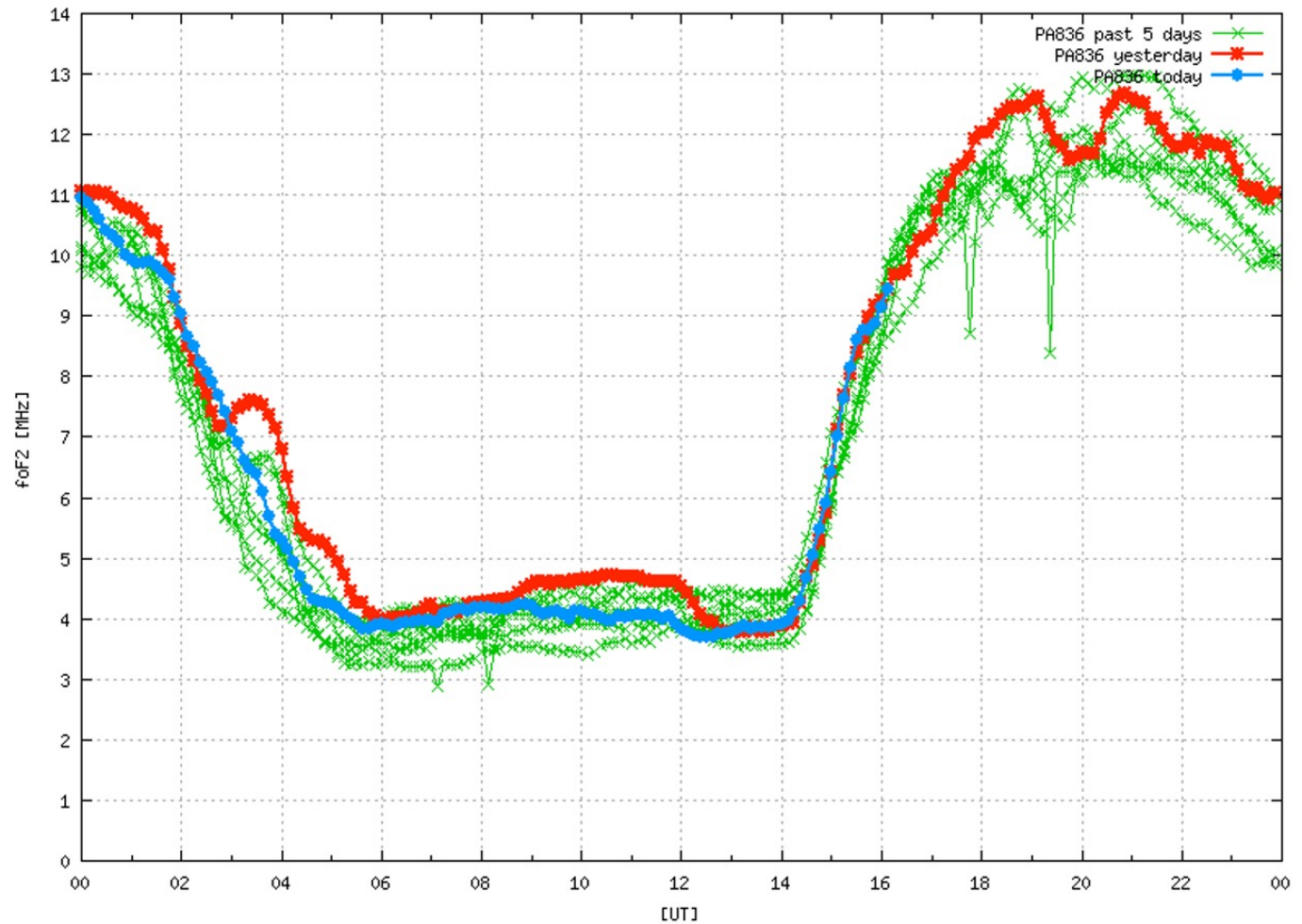


- For 19:00 PST 2/12/24 use today **blue trace** at 03:00 UT = 19:00 PST, result $f_cF2 = 6.8$ MHz
- For 19:30 PST using today **blue trace** at 03:30 UT = 19:30 PST, result $f_cF2 = 5.5$ MHz

20 Meter Skip Distance Test Data for 2/12/2024 20:00 hours

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 5 MHz
	14105.000	W6BI	11					Simi Valley, CA
	14095.000	NR6V	20					Northridge, CA
	14106.500	AJ7C	31					Culver City, CA
	14102.700	KN6BKT	48					San Gabrile, CA
	14111.000	K9NEY	68					Chino Hills, CA
	14094.000	XE2BC	160					Tijuana, Mexico
	14108.500	KO0OOO	252					North Las Vegas, NV
	14101.500	K7OI	301					Meadview, AZ (E of Los Vegas in AZ
	14108.500	KD7NHC	320					Wellington, NV. [SE of Carson City]
	14098.500	KB6HOH-12	338					Novato, CA [N of San Francisco]
	14096.000	W7DEM	345					Minden, NV [S of Carson City]
	14113.500	N0DAJ	348					Wickenburg, AZ. [NW of Phoenix]
	14112.500	W6LHR	349					Lincoln, CA. [NE of Sacramento]
	14094.900	KL7RI	368					Reno, NV
	14111.000	KJ7GSK	386					Chandler, AZ. [SE of Phoenix]
	14100.500	K7RRR	411					Gilbert, AZ. [SE of Phoenix]
	14108.000	KD6OAT	585					Sandy, UT
	14103.400	NS7K-10	606					Clearfield, UT. [N of Salt Lake City]
	14100.500	AG7MM	638					Burley, ID. [E of Twin Falls]
	14102.000	KG7AV	693					Bend, OR
19:45	14103.000	W7FLO	731	nc				Florence, OR
19:46	14106.700	KD7ZDO	795	nc				Oregon City, OR. [S of Portland]
19:48	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
19:49	14103.500	W0VG	837	nc				Evergreen, CO. [NW of Aspen]
19:50	14093.000	KD0SFY	845	nc				Colorado Springs, CO
19:52	14094.700	WA7ROY	902	nc				Roy, WA. [S of Tacoma]
19:53	14108.900	W7PLC	911	nc				Olympia, WA. [SW of Tacoma]
19:54	14096.300	K7HTZ	917	nc				Olympia, WA. [SW of Tacoma]
19:55	14100.200	N7LOB	920	2:54				Aberdeen, WA. [On coast W of Olympia]
19:59	14085.000	VA7PF	1054	nc				BC, Canada
20:00	14105.500	VE7GN	1063	nc				Gabriola, BC, Vancouver Island
20:03	14098.700	W0CBP	1209	nc				Pierre, SD
20:04	14100.700	KD5VE	1237	nc				Laredo, TX
20:05	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
20:06	14104.000	KD5EOC	1248	nc				Denton, TX (N of Sallas)
20:07	14102.500	N5GR	1250	nc				Muskogee, OK (E of Oklahoma City)
20:08	14108.500	K5RAV	1371	nc				Harlingen, TX (Just N of Mexico on Gulf coast)

- At 20:00 hours PST on 2/12/2024 with a critical frequency $F_c = 5$ MHz the 20 meter band was dead



Ionosphere Critical Frequency @ Point Arguello

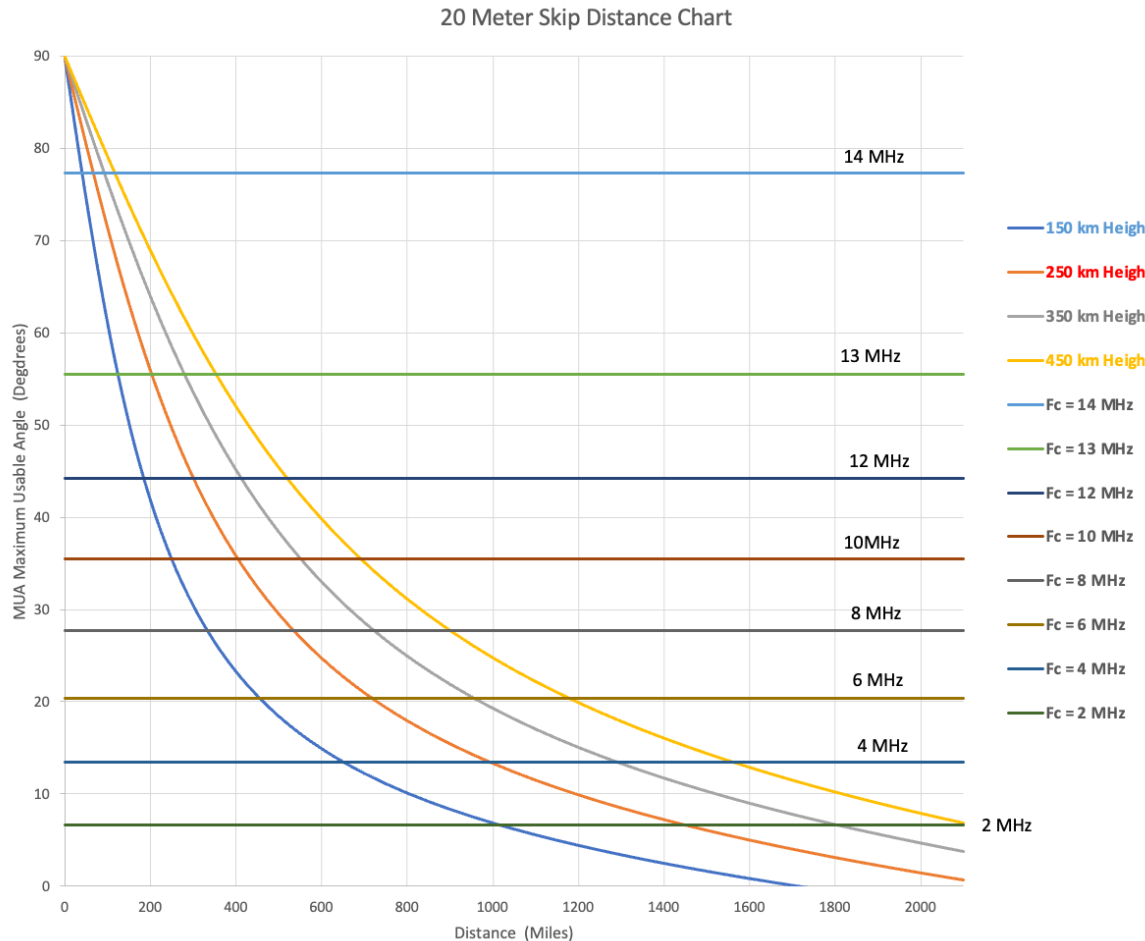
- For 20:00 PST 2/12/24 use today **blue trace** at 04:00 UT = 20:00 PST, result $f_cF2 = 5$ MHz

Anomalies

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 11 MHz
16:10	14105.000	W6BI	11	nc				Simi Valley, CA
16:11	14095.000	NR6V	20	nc				Northridge, CA
16:12	14106.500	AJ7C	31	nc				Culver City, CA
16:13	14102.700	KN6BKT	48	0:34				San Gabrile, CA
17:11	14111.000	K9NEY	68	nc				Chino Hills, CA
16:16	14094.000	XE2BC	160	nc				Tijuana, Mexico
16:18	14108.500	KO0000	252	nc				North Las Vegas, NV
16:19	14101.500	K7OI	301	nc				Meadview, AZ (E of Los Vegas in AZ)
16:20	14108.500	KD7NHC	320	0:47				Wellington, NV. [SE of Carson City]
16:21	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
17:12	14096.000	W7DEM	345	nc		QRM		Minden, NV [S of Carson City]
16:25	14113.500	N0DAJ	348	nc				Wickenburg, AZ. [NW of Phoenix]
16:26	14112.500	W6LHR	349	1:47				Lincoln, CA. [NE of Sacramento]
16:29	14094.900	KL7RI	368	nc		QRM		Reno, NV
16:30	14111.000	KJ7GSK	386	0:45				Chandler, AZ. [SE of Phoenix]
16:32	14096.500	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
16:42	14108.000	KD6OAT	585	0:16				Sandy, UT
16:36	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
16:37	14100.500	AG7MM	638	0:16				Burley, ID. [E of Twin Falls]
16:38	14102.000	KG7AV	693	0:17				Bend, OR
16:40	14103.000	W7FLO	731	0:18				Florence, OR
16:41	14106.700	KD7ZDO	795	0:18				Oregon City, OR. [S of Portland]
16:44	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
16:46	14103.500	W0VG	837	1:25				Evergreen, CO. [NW of Aspen]
16:48	14093.000	KD0SFY	845	0:16				Colorado Springs, CO
16:52	14094.700	WA7ROY	902	0:21				Roy, WA. [S of Tacoma]
16:53	14108.900	W7PLC	911	0:22				Olympia, WA. [SW of Tacoma]
16:55	14096.300	K7HTZ	917	0:17		QRM		Olympia, WA. [SW of Tacoma]
16:56	14100.200	N7LOB	920	0:16				Aberdeen, WA. [On coast W of Olympia]
16:57	14085.000	VA7PF	1054	0:25				BC, Canada
16:58	14105.500	VE7GN	1063	0:32				Gabriola, BC, Vancouver Island
17:00	14098.700	W0CBP	1209	0:19				Pierre, SD
17:01	14100.700	KD5VE	1237	0:50				Laredo, TX
17:03	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
17:05	14104.000	KD5EOC	1248	0:37				Denton, TX (N of Sallas)
17:07	14102.500	N5GR	1250	1:17		QRM		Muskogee, OK (E of Oklahoma City)
17:09	14108.500	K5RAV	1371	0:18				Harlingen, TX (Just N of Mexico on Gulf coast)

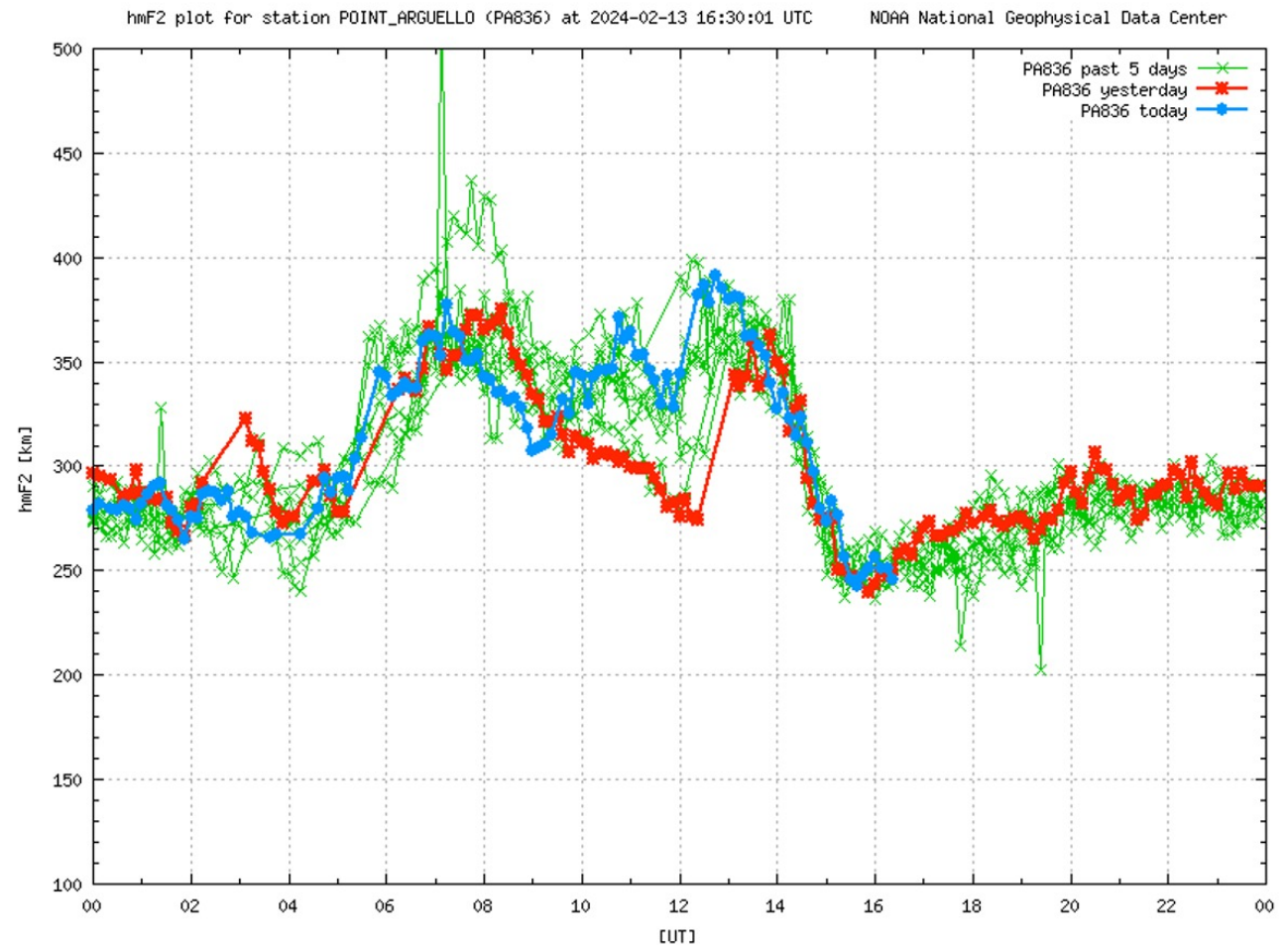
- It is interesting that KN6BKT (San Gabrile, CA), KD7NHC (Wellington, NV), W6LHR (Lincoln, CA), and KJ7GSK (Chandler, AZ), all well within the skip zone, were regularly contacted, although W6LHR was contacted poorly

20 Meter Skip Distance Chart



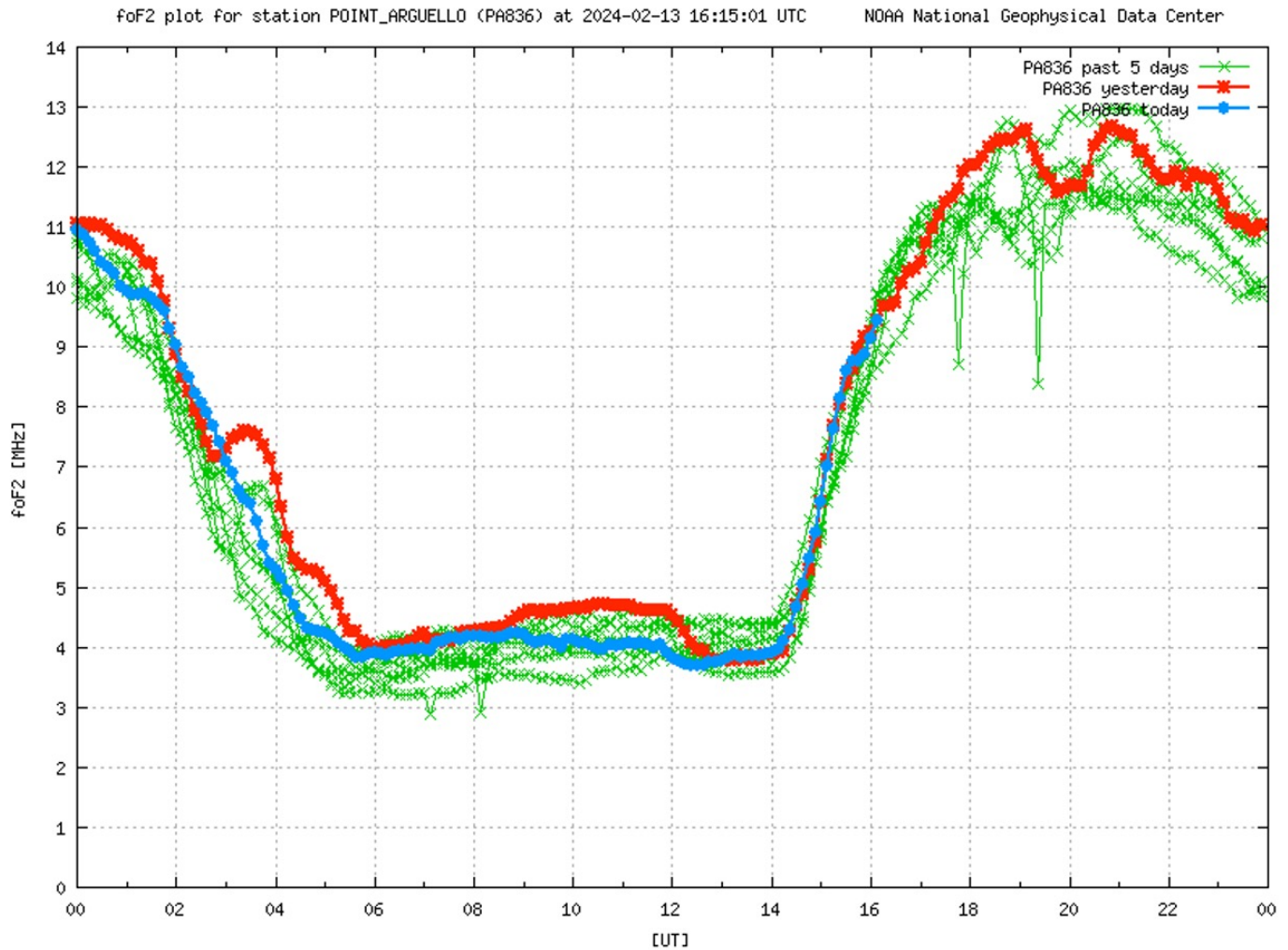
- Skip distance can be estimated using the 20m Skip Distance Chart by selecting the F2 layer ionospheric height $h_m F_2$ from the appropriate Ionosonde Site
- For California this is done by clicking on Ionogram under Current Conditions of website www.skywave-radio.org
- Then clicking on Point Arguello, CA $h_m F_2$
- Next determine the critical frequency from the Point Arguello critical frequency chart provided below

Ionosphere Height h_mF2 @ Point Arguello



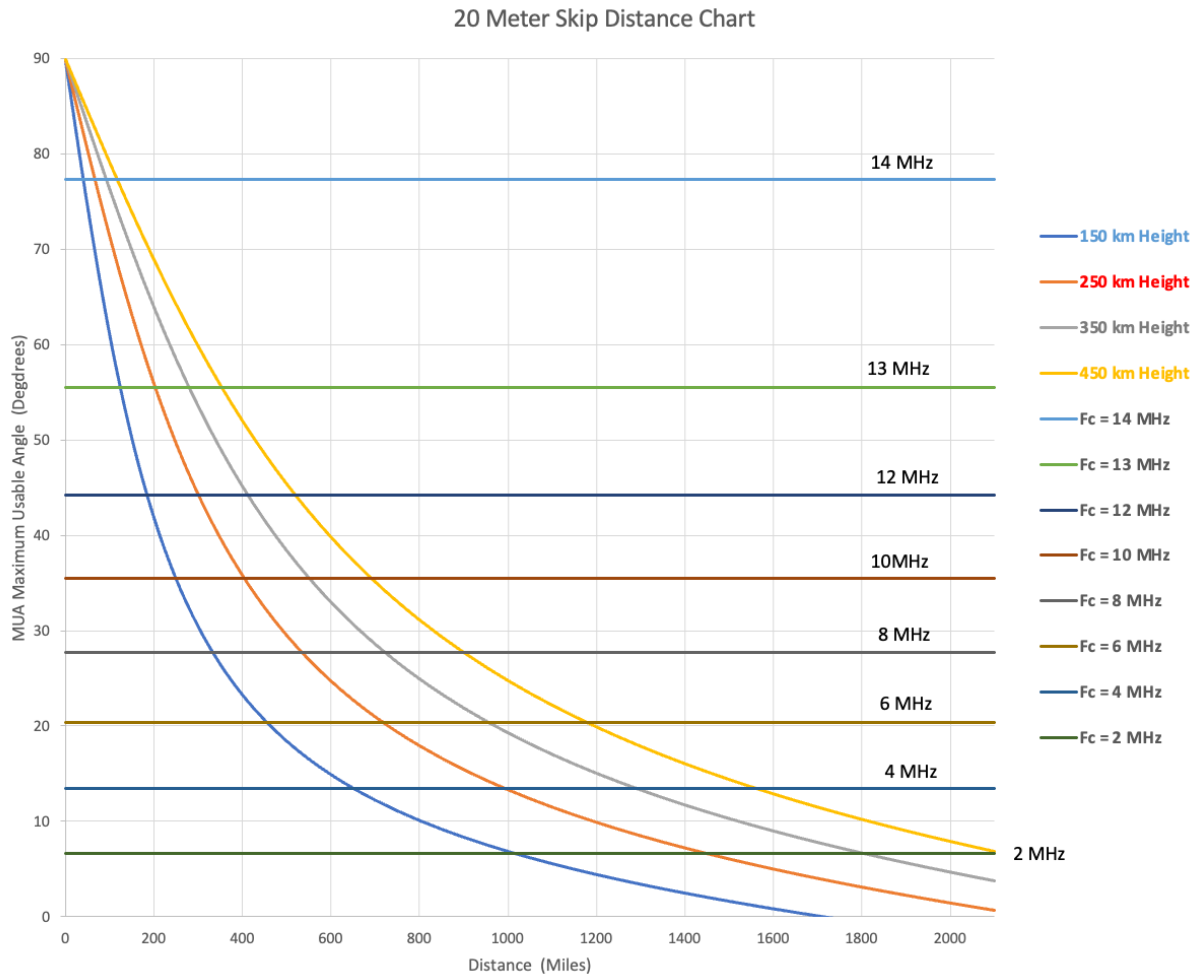
- This chart shows h_mF2 for the **past 5 days**, **yesterday**, and **today** in UT time for 2/13/24
- For 16:00 PST 2/12/24 use **today trace** at 00:00 UT = 16:00 PST
- The result is $h_mF2 = 275$ km

Ionosphere Critical Frequency @ Point Arguello



- This chart shows f_cF2 for the **past 5 days**, **yesterday**, and **today** in UT time for 2/13/24
- For 16:00 PST 2/12/24 use today **blue trace** at 0:00 UT = 16:00 PST, result $f_cF2 = 11$ MHz

20 Meter Skip Distance Chart - for 16:00 PST



For

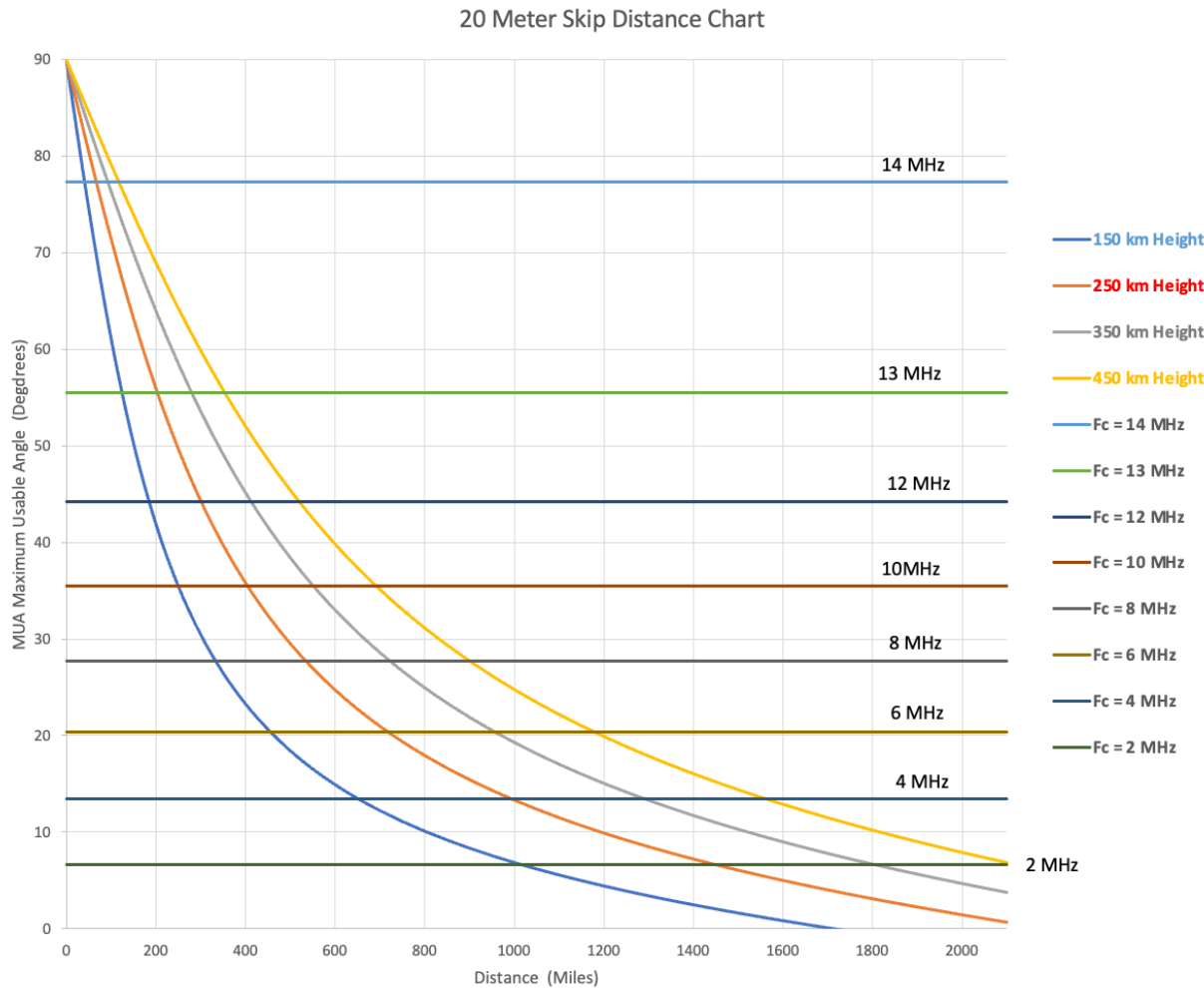
- $f_c F2 = 11$ MHz, and
- $h_m F2 = 275$ km
- The estimated skip distance given by the Skip Distance Chart is found by reading down to the Distance axis from the intersection of $F_c = 11$ MHz and $F2$ layer height = 275 km
- The estimated skip distance is approximately 400 miles
- The 16:00 test data indicated that the skip distance was around 500 miles

20 Meter Skip
Distance Test
Data - for
16:00 hours
2/12/2024

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 11 MHz
16:10	14105.000	W6BI	11	nc				Simi Valley, CA
16:11	14095.000	NR6V	20	nc				Northridge, CA
16:12	14106.500	AJ7C	31	nc				Culver City, CA
16:13	14102.700	KN6BKT	48	0:34				San Gabriel, CA
17:11	14111.000	K9NEY	68	nc				Chino Hills, CA
16:16	14094.000	XE2BC	160	nc				Tijuana, Mexico
16:18	14108.500	KO0OOO	252	nc				North Las Vegas, NV
16:19	14101.500	K7OI	301	nc				Meadview, AZ (E of Los Vegas in AZ)
16:20	14108.500	KD7NHC	320	0:47				Wellington, NV. [SE of Carson City]
16:21	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
17:12	14096.000	W7DEM	345	nc		QRM		Minden, NV [S of Carson City]
16:25	14113.500	N0DAJ	348	nc				Wickenburg, AZ. [NW of Phoenix]
16:26	14112.500	W6LHR	349	1:47				Lincoln, CA. [NE of Sacramento]
16:29	14094.900	KL7RI	368	nc		QRM		Reno, NV
16:30	14111.000	KJ7GSK	386	0:45				Chandler, AZ. [SE of Phoenix]
16:32	14096.500	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
16:42	14108.000	KD6OAT	585	0:16				Sandy, UT
16:36	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
16:37	14100.500	AG7MM	638	0:16				Burley, ID. [E of Twin Falls]
16:38	14102.000	KG7AV	693	0:17				Bend, OR
16:40	14103.000	W7FLO	731	0:18				Florence, OR
16:41	14106.700	KD7ZDO	795	0:18				Oregon City, OR. [S of Portland]
16:44	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
16:46	14103.500	W0VG	837	1:25				Evergreen, CO. [NW of Aspen]
16:48	14093.000	KD0SFY	845	0:16				Colorado Springs, CO
16:52	14094.700	WA7ROY	902	0:21				Roy, WA. [S of Tacoma]
16:53	14108.900	W7PLC	911	0:22				Olympia, WA. [SW of Tacoma]
16:55	14096.300	K7HTZ	917	0:17		QRM		Olympia, WA. [SW of Tacoma]
16:56	14100.200	N7LOB	920	0:16				Aberdeen, WA. [On coast W of Olympia]
16:57	14085.000	VA7PF	1054	0:25				BC, Canada
16:58	14105.500	VE7GN	1063	0:32				Gabriola, BC, Vancouver Island
17:00	14098.700	W0CBP	1209	0:19				Pierre, SD
17:01	14100.700	KD5VE	1237	0:50				Laredo, TX
17:03	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
17:05	14104.000	KD5EOC	1248	0:37				Denton, TX (N of Sallas)
17:07	14102.500	N5GR	1250	1:17		QRM		Muskogee, OK (E of Oklahoma City)
17:09	14108.500	K5RAV	1371	0:18				Harlingen, TX (Just N of Mexico on Gulf coast)

- At $f_c = 11$ MHz most stations from 11 out to 500 miles were difficult (duration $\gg 0.18$) if not impossible to reach (nc for no connection) resulting in a 500 mile skip distance

20 Meter Skip Distance Chart - for 18:00 PST



For

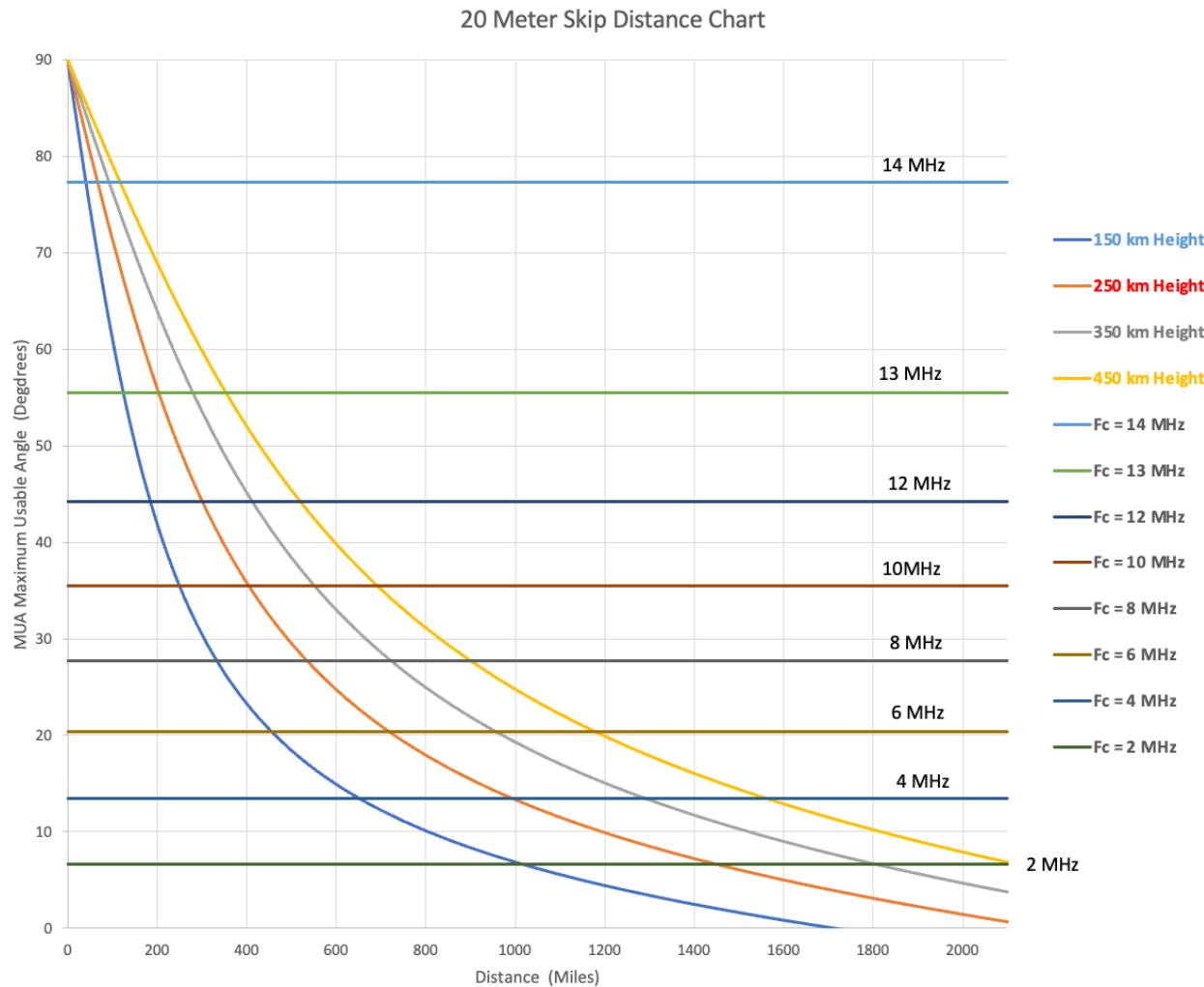
- $f_c F2 = 9 \text{ MHz}$, and
- $h_m F2 = 275 \text{ km}$
- The estimated skip distance given by the Skip Distance Chart is found by reading down to the Distance axis from the intersection of $F_c = 9 \text{ MHz}$ and $F2 \text{ layer height} = 275 \text{ km}$
- The estimated skip distance is approximately 500 miles
- The 18:00 test data indicated that the skip distance was around 638 miles

20 Meter Skip
Distance Test
Data 18:00 hours
2/12/2024

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 9 MHz
17:45	14105.000	W6BI	11	nc				Simi Valley
17:46	14095.000	NR6V	20	abort		QRM		Northridge, CA
17:51	14106.500	AJ7C	31	nc				Culver City, CA
17:52	14102.700	KN6BKT	48	0:41				San Gabrile, CA
17:53	14111.000	K9NEY	68	nc				Chino Hills, CA
17:54	14094.000	XE2BC	160	nc				Tijuana, Mexico
17:56	14108.500	KO0000	252	nc				North Las Vegas, NV
17:57	14101.500	K7OI	301	nc				Meadview, AZ (E of Los Vegas in AZ)
17:58	14108.500	KD7NHC	320	0:43				Wellington, NV. [SE of Carson City]
18:00	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
	14096.000	W7DEM	345					Minden, NV [S of Carson City]
18:03	14113.500	N0DAJ	348	1:12				Wickenburg, AZ. [NW of Phoenix]
18:06	14112.500	W6LHR	349	2:05				Lincoln, CA. [NE of Sacramento]
18:12	14094.900	KL7RI	368	nc		QRM		Reno, NV
18:14	14111.000	KJ7GSK	386	0:46				Chandler, AZ. [SE of Phoenix]
18:17	14095.000	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
18:26	14108.000	KD6OAT	585	nc				Sandy, UT
18:19	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
18:20	14100.500	AG7MM	638	nc				Burley, ID. [E of Twin Falls]
18:21	14102.000	KG7AV	693	0:16				Bend, OR
18:22	14103.000	W7FLO	731	0:18				Florence, OR
18:24	14106.700	KD7ZDO	795	0:16				Oregon City, OR. [S of Portland]
18:27	14111.000	W7OWO	798	0:17				Dundee, OR. [SE of Portland]
18:28	14103.500	W0VG	837	0:18				Evergreen, CO. [NW of Aspen]
18:30	14093.000	KD0SFY	845	0:32				Colorado Springs, CO
18:31	14094.700	WA7ROY	902	0:23		QRM		Roy, WA. [S of Tacoma]
18:33	14108.900	W7PLC	911	0:22				Olympia, WA. [SW of Tacoma]
18:34	14096.300	K7HTZ	917	0:18		QRM		Olympia, WA. [SW of Tacoma]
18:36	14100.200	N7LOB	920	0:18				Aberdeen, WA. [On coast W of Olympia]
18:37	14085.000	VA7PF	1054	0:16				BC, Canada
18:38	14105.500	VE7GN	1063	nc				Gabriola, BC, Vancouver Island
18:40	14098.700	W0CBP	1209	0:18				Pierre, SD
18:44	14100.700	KD5VE	1237	nc				Laredo, TX
18:45	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
18:51	14104.000	KD5EOC	1248	0:38				Denton, TX (N of Sallas)
18:48	14102.500	N5GR	1250	nc				Muskogee, OK (E of Oklahoma City)
18:50	14108.500	K5RAV	1371	0:25				Harlingen, TX (Just N of Mexico on Gulf coast)

- At 18:00 PST, $f_c = 9$ MHz, skip zone has gone longer
- Most stations from 11 out to 638 miles were difficult (duration $\gg 0.18$) if not impossible to reach (nc for no connection) resulting in a 638 mile skip distance

20 Meter Skip Distance Chart - for 19:30 PST



For

- $f_c F2 = 5.5$ MHz, and
- $h_m F2 = 275$ km
- The estimated skip distance given by the Skip Distance Chart is found by reading down to the Distance axis from the intersection of $F_c = 5.5$ MHz and $F2$ layer height = 275 km
- The estimated skip distance is approximately 850 miles
- The 19:30 test data indicated that the skip distance was around 900 miles

20 Meter Skip Distance Test Data for 2/12/2024 19:00 – 19:39 hours

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 5.5 MHz at 19:30 PST
18:54	14105.000	W6BI	11	nc				Simi Valley, CA
18:55	14095.000	NR6V	20	nc		QRM		Northridge, CA
18:56	14106.500	AJ7C	31	nc				Culver City, CA
18:57	14102.700	KN6BKT	48	0:54				San Gabrile, CA
18:59	14111.000	K9NEY	68	nc				Chino Hills, CA
19:00	14094.000	XE2BC	160	nc				Tijuana, Mexico
19:02	14108.500	KO0OOO	252	nc				North Las Vegas, NV
19:03	14101.500	K7OI	301	nc				Meadview, AZ (E of Los Vegas in AZ
19:04	14108.500	KD7NHC	320	1:16				Wellington, NV. [SE of Carson City]
19:06	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
19:07	14096.000	W7DEM	345	nc		QRM		Minden, NV [S of Carson City]
19:08	14113.500	N0DAJ	348	nc				Wickenburg, AZ. [NW of Phoenix]
19:10	14112.500	W6LHR	349	nc				Lincoln, CA. [NE of Sacramento]
19:12	14094.900	KL7RI	368	nc		QRM		Reno, NV
19:13	14111.000	KJ7GSK	386	nc				Chandler, AZ. [SE of Phoenix]
19:17	14096.500	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
19:15	14108.000	KD6OAT	585	nc				Sandy, UT
19:16	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
19:17	14100.500	AG7MM	638	nc				Burley, ID. [E of Twin Falls]
19:18	14102.000	KG7AV	693	nc				Bend, OR
19:19	14103.000	W7FLO	731	nc				Florence, OR
19:20	14106.700	KD7ZDO	795	nc				Oregon City, OR. [S of Portland]
19:21	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
19:23	14103.500	W0VG	837	nc				Evergreen, CO. [NW of Aspen]
19:24	14093.000	KD0SFY	845	nc				Colorado Springs, CO
19:26	14094.700	WA7ROY	902	nc		QRM		Roy, WA. [S of Tacoma]
19:27	14108.900	W7PLC	911	0:29				Olympia, WA. [SW of Tacoma]
19:28	14096.300	K7HTZ	917	0:18		QRM		Olympia, WA. [SW of Tacoma]
19:29	14100.200	N7LOB	920	0:17				Aberdeen, WA. [On coast W of Olympia]
19:31	14085.000	VA7PF	1054	nc				BC, Canada
19:32	14105.500	VE7GN	1063	0:57				Gabriola, BC, Vancouver Island
19:34	14098.700	W0CBP	1209	0:18				Pierre, SD
19:35	14100.700	KD5VE	1237	nc				Laredo, TX
19:36	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
19:37	14104.000	KD5EOC	1248	nc				Denton, TX (N of Sallas)
19:38	14102.500	N5GR	1250	nc				Muskogee, OK (E of Oklahoma City)
19:39	14108.500	K5RAV	1371	0:16				Harlingen, TX (Just N of Mexico on Gulf coast)

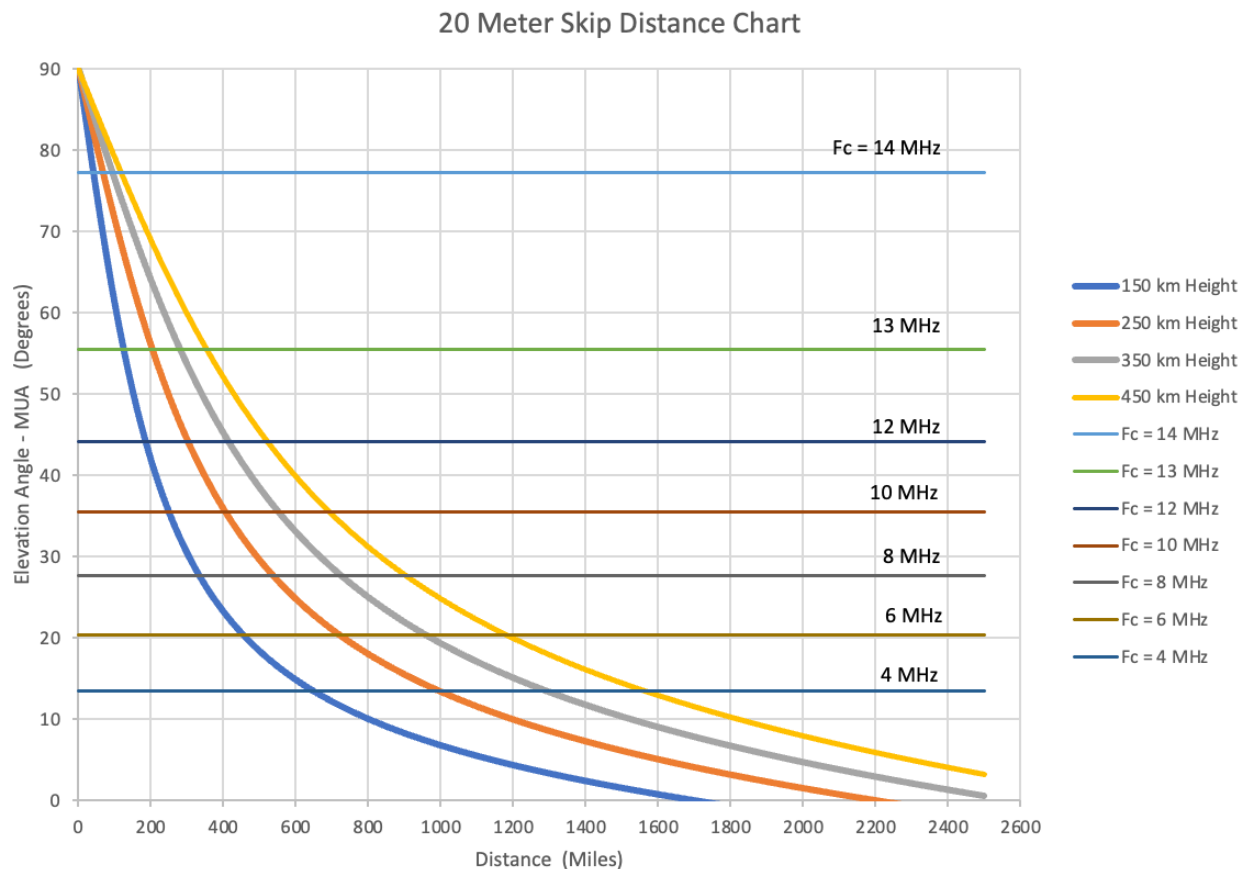
- Critical frequency dropped from 6.8 MHz @ 19:00 to 5.5 MHz @ 19:39 PST
- Skip went long!
- The closest stations that could be reached were more than 900 miles away

20 Meter Skip Distance Test Data for 2/12/2024 20:00 hours

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 5 MHz
	14105.000	W6BI	11					Simi Valley, CA
	14095.000	NR6V	20					Northridge, CA
	14106.500	AJ7C	31					Culver City, CA
	14102.700	KN6BKT	48					San Gabrile, CA
	14111.000	K9NEY	68					Chino Hills, CA
	14094.000	XE2BC	160					Tijuana, Mexico
	14108.500	KO0OOO	252					North Las Vegas, NV
	14101.500	K7OI	301					Meadview, AZ (E of Los Vegas in AZ
	14108.500	KD7NHC	320					Wellington, NV. [SE of Carson City]
	14098.500	KB6HOH-12	338					Novato, CA [N of San Francisco]
	14096.000	W7DEM	345					Minden, NV [S of Carson City]
	14113.500	N0DAJ	348					Wickenburg, AZ. [NW of Phoenix]
	14112.500	W6LHR	349					Lincoln, CA. [NE of Sacramento]
	14094.900	KL7RI	368					Reno, NV
	14111.000	KJ7GSK	386					Chandler, AZ. [SE of Phoenix]
	14100.500	K7RRR	411					Gilbert, AZ. [SE of Phoenix]
	14108.000	KD6OAT	585					Sandy, UT
	14103.400	NS7K-10	606					Clearfield, UT. [N of Salt Lake City]
	14100.500	AG7MM	638					Burley, ID. [E of Twin Falls]
	14102.000	KG7AV	693					Bend, OR
19:45	14103.000	W7FLO	731	nc				Florence, OR
19:46	14106.700	KD7ZDO	795	nc				Oregon City, OR. [S of Portland]
19:48	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
19:49	14103.500	W0VG	837	nc				Evergreen, CO. [NW of Aspen]
19:50	14093.000	KD0SFY	845	nc				Colorado Springs, CO
19:52	14094.700	WA7ROY	902	nc				Roy, WA. [S of Tacoma]
19:53	14108.900	W7PLC	911	nc				Olympia, WA. [SW of Tacoma]
19:54	14096.300	K7HTZ	917	nc				Olympia, WA. [SW of Tacoma]
19:55	14100.200	N7LOB	920	2:54				Aberdeen, WA. [On coast W of Olympia]
19:59	14085.000	VA7PF	1054	nc				BC, Canada
20:00	14105.500	VE7GN	1063	nc				Gabriola, BC, Vancouver Island
20:03	14098.700	W0CBP	1209	nc				Pierre, SD
20:04	14100.700	KD5VE	1237	nc				Laredo, TX
20:05	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
20:06	14104.000	KD5EOC	1248	nc				Denton, TX (N of Sallas)
20:07	14102.500	N5GR	1250	nc				Muskogee, OK (E of Oklahoma City)
20:08	14108.500	K5RAV	1371	nc				Harlingen, TX (Just N of Mexico on Gulf coast)

- At 20:00 hours PST on 2/12/2024 with a critical frequency $F_c = 5$ MHz the 20 meter band was dead

The 20 Meter Skip Distance Chart - continued

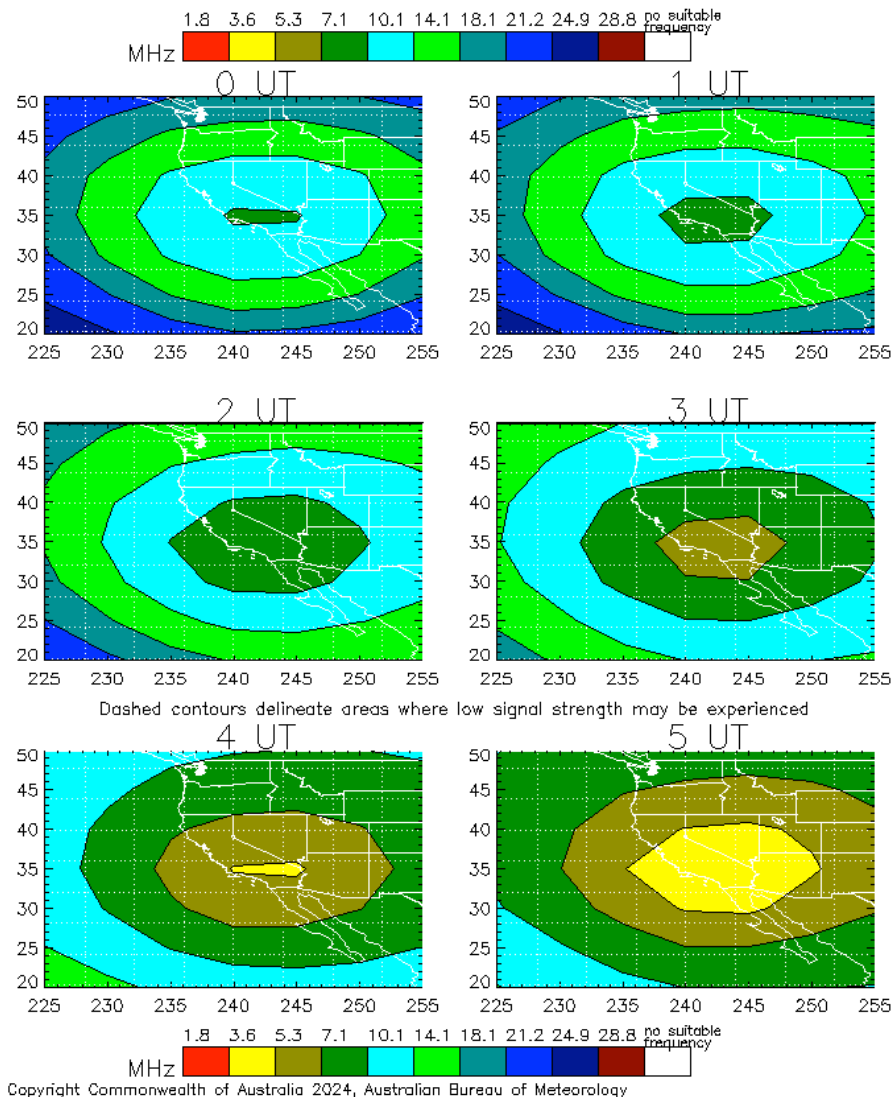


- The Skip Distance Chart is underestimating the actual skip distance
- For selecting reachable WinLink RMS stations it is better to underestimate skip distance
- Overestimating skip distance causes RMS stations to be rejected when they could be reached

20 Meter HAP Chart Data - for 2/12/2024 @ 16:00 PST (00:00 UT)

Base: LOS ANGELES Date: 13 February, 2024 Tindex: 108

On-Line Hourly Area Predictions (HAP)



- The HAP Chart for 16:00 hours (00:00 UT) indicates that the closest 20 meter stations that can be reached are about 570 miles for Los Angeles
- This distance is the boundary between optimum 30 meter coverage (blue region) and 20 meter coverage (green region)
- 20 meter stations closer than this boundary can not be reached
- This skip distance estimate of 570 miles is very close to the skip distance test data of 500 miles shown on the next slide
- The HAP chart is slightly over estimating the skip distance

20 Meter Skip
Distance Test
Data - for
16:00 hours
2/12/2024

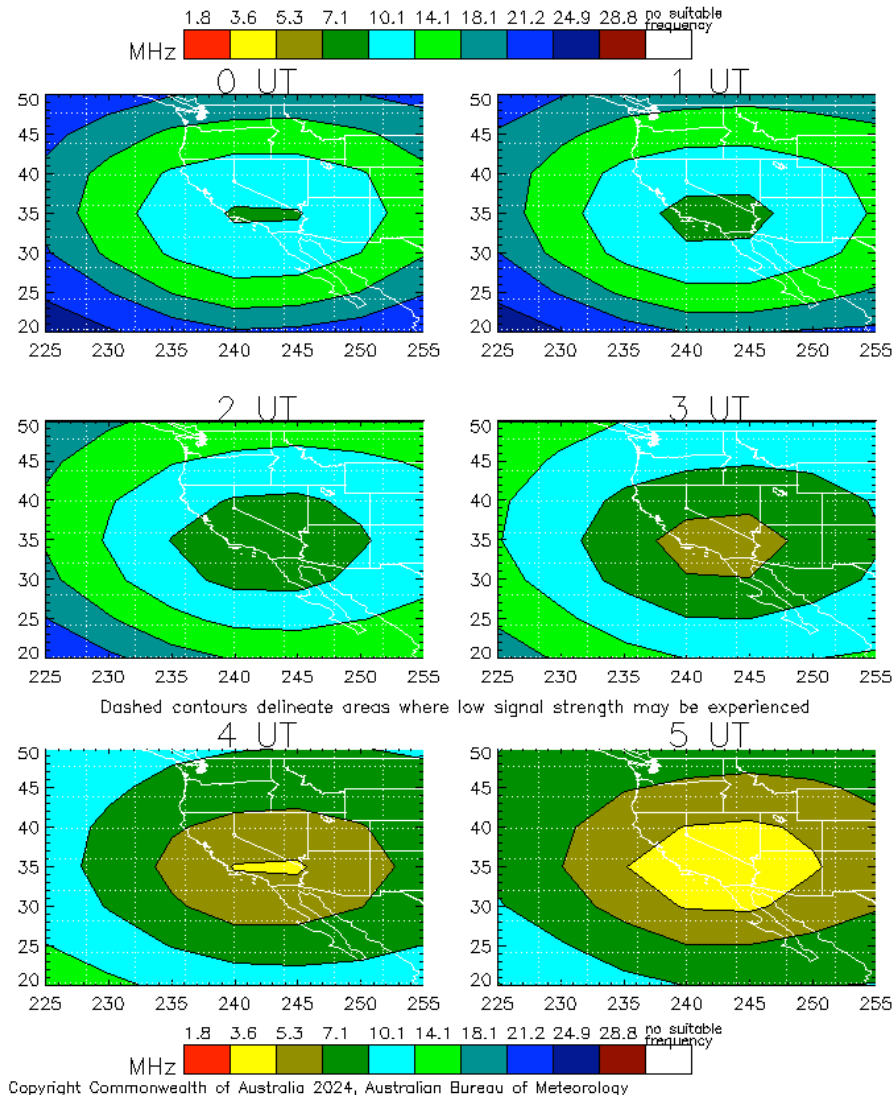
Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 11 MHz
16:10	14105.000	W6BI	11	nc				Simi Valley, CA
16:11	14095.000	NR6V	20	nc				Northridge, CA
16:12	14106.500	AJ7C	31	nc				Culver City, CA
16:13	14102.700	KN6BKT	48	0:34				San Gabriel, CA
17:11	14111.000	K9NEY	68	nc				Chino Hills, CA
16:16	14094.000	XE2BC	160	nc				Tijuana, Mexico
16:18	14108.500	K00000	252	nc				North Las Vegas, NV
16:19	14101.500	K7OI	301	nc				Meadview, AZ (E of Los Vegas in AZ)
16:20	14108.500	KD7NHC	320	0:47				Wellington, NV. [SE of Carson City]
16:21	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
17:12	14096.000	W7DEM	345	nc		QRM		Minden, NV [S of Carson City]
16:25	14113.500	N0DAJ	348	nc				Wickenburg, AZ. [NW of Phoenix]
16:26	14112.500	W6LHR	349	1:47				Lincoln, CA. [NE of Sacramento]
16:29	14094.900	KL7RI	368	nc		QRM		Reno, NV
16:30	14111.000	KJ7GSK	386	0:45				Chandler, AZ. [SE of Phoenix]
16:32	14096.500	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
16:42	14108.000	KD6OAT	585	0:16				Sandy, UT
16:36	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
16:37	14100.500	AG7MM	638	0:16				Burley, ID. [E of Twin Falls]
16:38	14102.000	KG7AV	693	0:17				Bend, OR
16:40	14103.000	W7FLO	731	0:18				Florence, OR
16:41	14106.700	KD7ZDO	795	0:18				Oregon City, OR. [S of Portland]
16:44	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
16:46	14103.500	W0VG	837	1:25				Evergreen, CO. [NW of Aspen]
16:48	14093.000	KD0SFY	845	0:16				Colorado Springs, CO
16:52	14094.700	WA7ROY	902	0:21				Roy, WA. [S of Tacoma]
16:53	14108.900	W7PLC	911	0:22				Olympia, WA. [SW of Tacoma]
16:55	14096.300	K7HTZ	917	0:17		QRM		Olympia, WA. [SW of Tacoma]
16:56	14100.200	N7LOB	920	0:16				Aberdeen, WA. [On coast W of Olympia]
16:57	14085.000	VA7PF	1054	0:25				BC, Canada
16:58	14105.500	VE7GN	1063	0:32				Gabriola, BC, Vancouver Island
17:00	14098.700	W0CBP	1209	0:19				Pierre, SD
17:01	14100.700	KD5VE	1237	0:50				Laredo, TX
17:03	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
17:05	14104.000	KD5EOC	1248	0:37				Denton, TX (N of Sallas)
17:07	14102.500	N5GR	1250	1:17		QRM		Muskogee, OK (E of Oklahoma City)
17:09	14108.500	K5RAV	1371	0:18				Harlingen, TX (Just N of Mexico on Gulf coast)

- At $f_c = 11$ MHz most stations from 11 out to 500 miles were difficult (duration $\gg 0.18$) if not impossible to reach (nc for no connection) resulting in a 500 mile skip distance

20 Meter HAP Chart Data - for 2/12/2024 @ 19:00 PST (03:00 UT)

Base: LOS ANGELES Date: 13 February, 2024 Tindex: 108

On-Line Hourly Area Predictions (HAP)



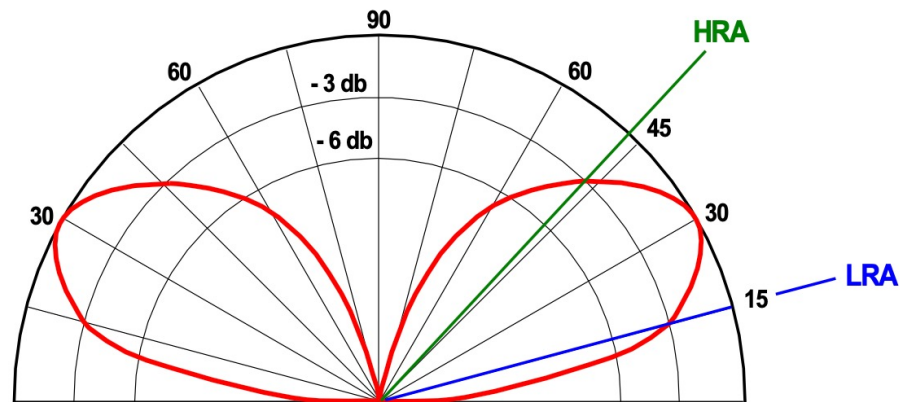
- The HAP Chart for 19:00 hours (03:00 UT) indicates that the closest 20 meter stations that can be reached are on the order of 1,000 miles for Los Angeles
- Again this distance is the boundary between optimum 30 meter coverage (blue region) and 20 meter coverage (light green region)
- 20 meter stations closer than this boundary can not be reached
- This skip distance estimate of 1,000 miles is very close to the skip distance test data of 900 miles shown on the next slide
- Again, the HAP chart is slightly over estimating the skip distance

20 Meter Skip Distance Test Data for 2/12/2024 19:00 – 19:39 hours

Time	Frequency KHZ	Call	Distance Miles	Contact Duration (min)	Power Watts	Antenna	Tries	Comments
					50	Yellow		Fc = 5.5 MHz at 19:30 PST
18:54	14105.000	W6BI	11	nc				Simi Valley, CA
18:55	14095.000	NR6V	20	nc		QRM		Northridge, CA
18:56	14106.500	AJ7C	31	nc				Culver City, CA
18:57	14102.700	KN6BKT	48	0:54				San Gabrile, CA
18:59	14111.000	K9NEY	68	nc				Chino Hills, CA
19:00	14094.000	XE2BC	160	nc				Tijuana, Mexico
19:02	14108.500	KO0OOO	252	nc				North Las Vegas, NV
19:03	14101.500	K7OI	301	nc				Meadview, AZ [E of Los Vegas in AZ]
19:04	14108.500	KD7NHC	320	1:16				Wellington, NV. [SE of Carson City]
19:06	14098.500	KB6HOH-12	338	nc				Novato, CA [N of San Francisco]
19:07	14096.000	W7DEM	345	nc		QRM		Minden, NV [S of Carson City]
19:08	14113.500	N0DAJ	348	nc				Wickenburg, AZ. [NW of Phoenix]
19:10	14112.500	W6LHR	349	nc				Lincoln, CA. [NE of Sacramento]
19:12	14094.900	KL7RI	368	nc		QRM		Reno, NV
19:13	14111.000	KJ7GSK	386	nc				Chandler, AZ. [SE of Phoenix]
19:17	14096.500	K7RRR	411	nc		QRM		Gilbert, AZ. [SE of Phoenix]
19:15	14108.000	KD6OAT	585	nc				Sandy, UT
19:16	14103.400	NS7K-10	606	nc				Clearfield, UT. [N of Salt Lake City]
19:17	14100.500	AG7MM	638	nc				Burley, ID. [E of Twin Falls]
19:18	14102.000	KG7AV	693	nc				Bend, OR
19:19	14103.000	W7FLO	731	nc				Florence, OR
19:20	14106.700	KD7ZDO	795	nc				Oregon City, OR. [S of Portland]
19:21	14111.000	W7OWO	798	nc				Dundee, OR. [SE of Portland]
19:23	14103.500	W0VG	837	nc				Evergreen, CO. [NW of Aspen]
19:24	14093.000	KD0SFY	845	nc				Colorado Springs, CO
19:26	14094.700	WA7ROY	902	nc		QRM		Roy, WA. [S of Tacoma]
19:27	14108.900	W7PLC	911	0:29				Olympia, WA. [SW of Tacoma]
19:28	14096.300	K7HTZ	917	0:18		QRM		Olympia, WA. [SW of Tacoma]
19:29	14100.200	N7LOB	920	0:17				Aberdeen, WA. [On coast W of Olympia]
19:31	14085.000	VA7PF	1054	nc				BC, Canada
19:32	14105.500	VE7GN	1063	0:57				Gabriola, BC, Vancouver Island
19:34	14098.700	W0CBP	1209	0:18				Pierre, SD
19:35	14100.700	KD5VE	1237	nc				Laredo, TX
19:36	14107.000	W5RMW	1244	nc				Kirby, TX (E of San Antonio)
19:37	14104.000	KD5EOC	1248	nc				Denton, TX (N of Sallas)
19:38	14102.500	N5GR	1250	nc				Muskogee, OK (E of Oklahoma City)
19:39	14108.500	K5RAV	1371	0:16				Harlingen, TX (Just N of Mexico on Gulf coast)

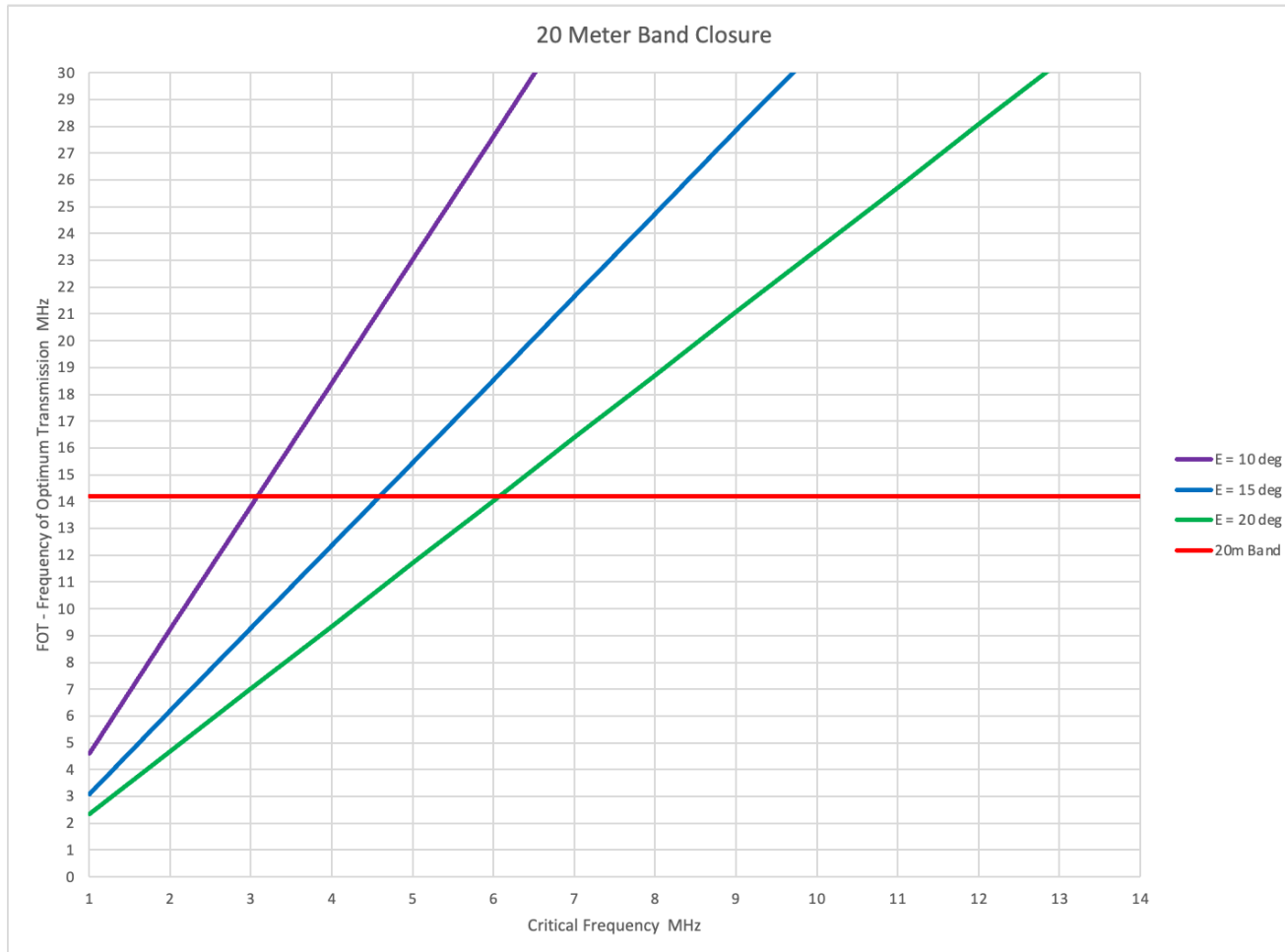
- Critical frequency dropped from 6.8 MHz @ 19:00 to 5.5 MHz @ 19:39 PST
- Skip went long!
- The closest stations that could be reached were more than 900 miles away

20 Meter Band Closure



- Lowest Radiated Angle (LRA) is the lowest elevation angle E_m at which an antenna can radiate a signal
- LRA is the angle at which the antenna's radiated power drops 3 db below its maximum radiated power
- Beyond this point the antenna's radiated power drops very quickly
- The LRA for a 20 meter dipole antenna is typically about 15 degrees
- Its Highest Radiated Angle (HRA) is around 48 degrees

20 Meter Band Closure - continued

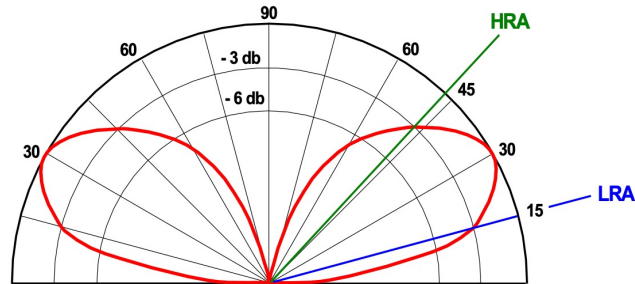


- At an elevation angle of $E_m = \text{LRA}$, the Freq of Optimum Transmission (FOT) given by

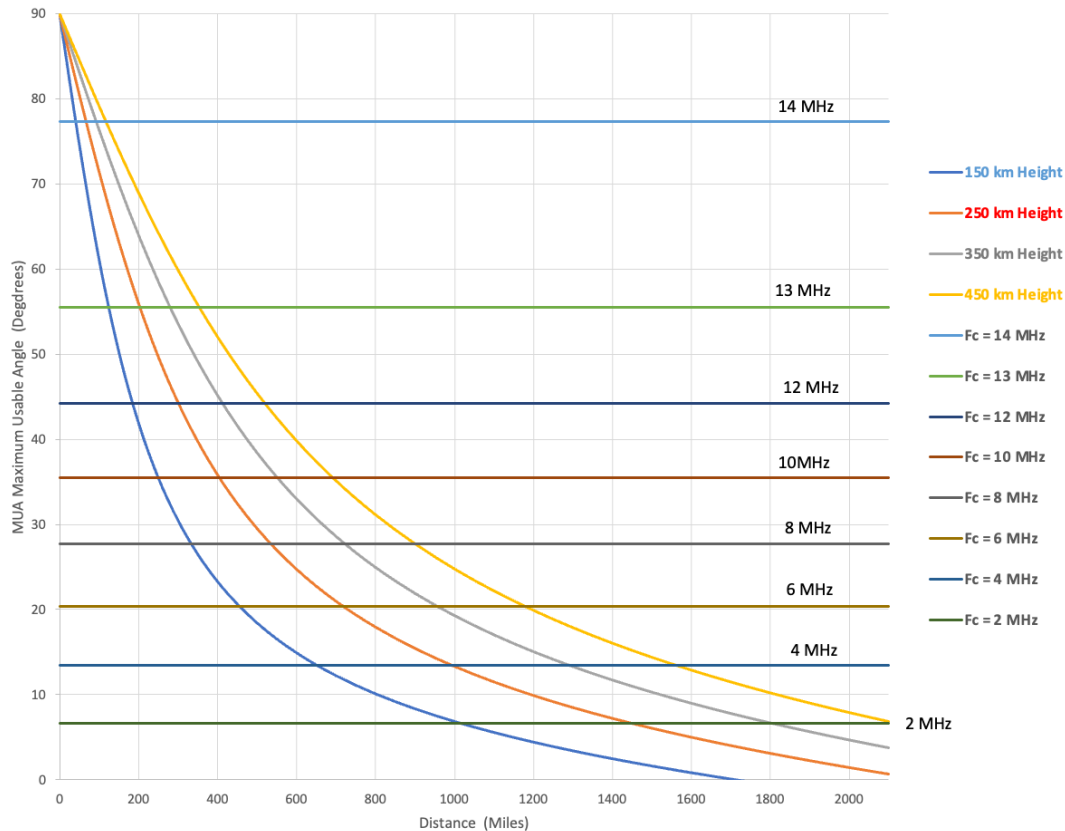
$$FOT = \frac{0.8 f_c}{\sin E_m}$$

- steadily decreases as the ionosphere's critical frequency f_c drops
- At $E_m = 17$ degrees &
- $f_c = 5$ MHz,
- The FOT goes below 14 MHz
- At this point the 20 meter frequency band goes dead, as illustrated by the 20:00 hours test data

20 Meter Band Closure - continued



20 Meter Skip Distance Chart



- **Equivalently**, the band becomes dead when the ionosphere's Maximum Usable Angle (MUA) drops below the antenna's LRA
- At a critical frequency of $f_c = 5$ MHz the MUA = 18 degrees which is approximately equal to the antenna's LRA = 17 degrees
- At a frequency just slightly less than $f_c = 5$ MHz, MUA drops below the LRA
- When this occurs, the 20 meter band becomes dead since all of the antenna's radiated energy (radiated at an angle $LRA > MUA$) penetrates the ionosphere and is lost to outer space