CP1GJ 2019 6m EME DXpedition to Bolivia

Another "first moonbounce" operation from a rare DXCC!

INTRODUCTION

The landlocked country of Bolivia has been very rare around the world on many amateur bands. Most of the limited number of amateur radio operators there are located in the noisy urban centers, which makes weak signal communication very difficult. Obstacles encountered by potential DXpeditions to quieter locations in Bolivia are the high altitude, mountainous topography, lack of widespread email use, and the unusually difficult process of obtaining an amateur license to operate there. Because of the large worldwide interest in contacting Bolivia on the 6m amateur band, it was selected as a candidate for activation for the first time using EME (Earth-Moon-Earth, or "moonbounce).

In addition to finding a quiet location, one of the challenges is finding a suitable site for 6m EME is locating enough space to for my 43' long 6M8GJ yagi. The site chosen was the Onkel Inn on the southern outskirts of Copacabana on the shore of Lake Titicaca (elevation of 12,530'), three miles from the Peruvian border. The hotel affords a large grassy area between the guest rooms and the building that serves as the reception and breakfast area, provides reliable 230 VAC power, and provides intermittent internet service. Danilo, the hotel manager, speaks excellent English and was most helpful in arranging transportation to and from the international airport in La Paz, and in accommodating the special needs involved in erecting an EME antenna and operating the station. As with many people in Bolivia, the most reliable way to make arrangements with

the hotel was via the cell phone program, *WhatsApp*.

As with all my 6m EME DXpeditions, I try to schedule these trips to avoid rainy seasons, as well as to fall in between the fall/autumn TEP seasons and the winter/summer Es seasons, to try to minimize potential ionospheric interference with the EME signals.

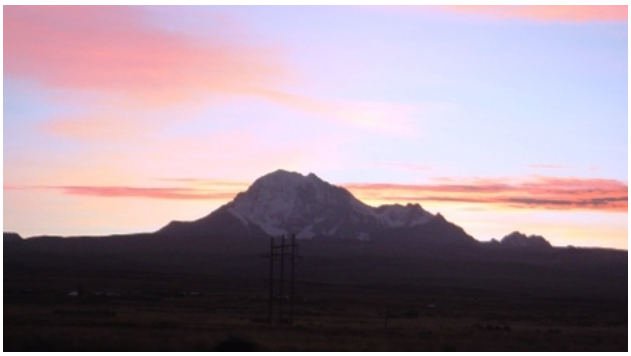
LICENSING

It was easy to obtain a form for an amateur radio license from the ATT in La Paz. However, it eventually became clear that the Bolivian license could not simply be granted by the ATT. Fortunately, Enrique CP6UA helped me prepare my application in Spanish and connected me with Pablo CP1PA of the La Paz Radio Club, who agreed to coordinate the submission of the application to the ATT. Since the license has to be issued legislatively, the process took months. Fortunately, I received a copy of the license via *WhatsApp* the week before flying down to Bolivia.

TRAVEL

My wife Karen and I started down to Bolivia Sunday morning May 5, and arrived in La Paz at 0400 local time on the morning of Monday May 6. Bolivian customs held us up for two hours at the airport, claiming that they did not have the required approval documents to let me enter the country with over 200 pounds of electronics. Fortunately, Pablo met us at the airport with the original government issued license, and negotiated an arrangement with the customs officials that permitted me to enter the country with all this unusual equipment, provided I also left the country with everything, including official government documentation.

We loaded all the gear into the minivan arranged for us by Danilo at the Onkel Inn, and headed off in the pre-dawn hours on the four hour drive to Copacabana.



You may be wondering why it takes so long to get travel between two points that are less than 70 miles apart as the crow flies. First of all, the main highway route goes through La Paz, which is quite congested. But another reason is that the highway is under *major* reconstruction the farther you get from La Paz. It actually is dirt in places.

And then there is the fact that old wooden ferry barges are used to transport cars across a narrow strait in Lake Titicaca at Tiquina to get over to the peninsula from Peru on which Copacabana is located. And once on that peninsula, the mountain roads are very narrow and winding. But we reached the narrow, congested stone

streets of Copcacabana by mid-morning and drove through town to the Onkel Inn.

SETUP

By 10:00 am I started assembling and siting the mast outside our ground floor room (*Suite 1, Tower 1*) at the Onkel Inn. One of the first things I noticed was that the hotel grounds were home to four alpacas, which were rotated around the grounds to keep the grass neatly trimmed.

As with most places I have operated, properly locating the mast so the antenna could be raised in between local obstructions took longer than anticipated. The front of the yagi would have to be positioned between bushes along the property wall, and the rear would have to be raised up between the wooden posts used for supporting hammocks. The guy lines for the mast

also had to be installed out to the northeast, northwest, southeast and southwest of the mast. This provides the greatest clearance for the reflector when the yagi is aimed at its maximum elevation. In order to provide higher aiming capability, I extended the top mast section a few feet on this trip, so that the pivot on the elevation mount was only a couple inches below the top of the 24' high mast. I also spaced the four mast guy rope anchors around 12' (instead of 15') from the mast, in order to provide more clearance when the yagi was elevated. Once the mast was installed and the guy ropes were all tightened, it was lowered onto the prop support to await addition of the yagi. Then it was time to start assembling the yagi.

I assembled the elements and mounted them all on the boom, which was resting on deck chairs.

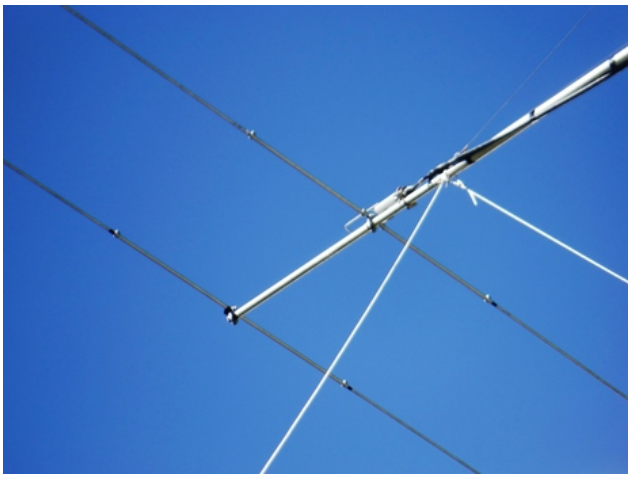
Unfortunately, the 8-32 screw in the last director mounting block was stripped, and it took me an

hour to borrow tools and remove the damaged nut and screw so it could be replaced with one of my spares. By then it was starting to get dark, so I decided to wait until Tuesday morning to finish aligning the elements and raise the antenna.With some helpers in the morning, it was easy to interleave the finished yagi between the local obstructions, and mount it onto the end of the mast. Then I added the tie-down lines, and connected the 50' length of LMR600UF coaxial cable to get the antenna ready to raise.

The antenna went up quickly, as shown in this video:
https://www.youtube.com/watch?v=QhCZyO1xU5I

The base was anchored, and the aiming circle then was calibrated by taping my pointer onto the mast above the laminated aiming circle. I had put a stake in the ground marking due north the previous day, based on a printout from GJTRACKER for the sun.

Two tie down lines are used front and rear to aim the antenna in azimuth and elevation and secure the antenna when it is not in use. In order to prevent stressing the boom, the tie down lines are tied around the boom through the screw eyes where the pair of boom guy lines are also attached to the front and rear.



Often one of the front lines is simply adjusted to provide tension to keep the front of the antenna

at a certain elevation as the direction is adjusted with the two rear lines.

Danilo provided ropes with flags around the antenna area to discourage guests and alpacas from entering the area. I added the *DANGER RF RADIATION HAZARD AREA* signs I always bring along with me, although I don't think the alpacas could read English. The biggest hazard is that someone might run into the end of the antenna reflector element during a transmit sequence and get an RF burn. However, with the higher mast, even when the antenna is elevated as high as it will go, the reflector is out of reach of children and alpacas.

As planned, the antenna as located with the extended mast was high enough to view out over the hotel reception building. The antenna therefore had a good view of moonset over the lake, 75' below the antenna.

The AC outlets in the rooms were not wired with a ground. The outlets only provided two conductors - the 230 VAC and a neutral wire. So, it was necessary to add a separate ground for my equipment.

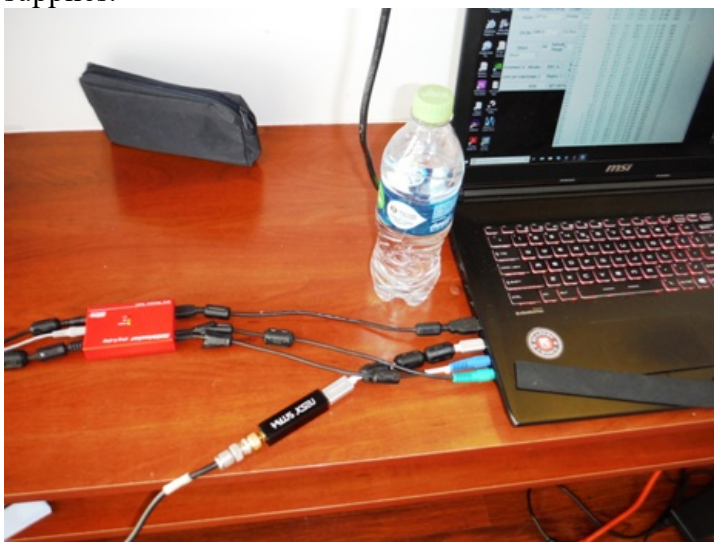
Fortunately, my 50’ long piece of LMR600UF from the antenna just barely reached to the slider opening, and I decided that would be a convenient place to attach an earth ground for my system. I added on a 4’ long LMR600 jumper to get the feedline inside the room, and sealed the slider opening with foam packing material I had brought.

I grounded the coaxial connection at the end of the 50’ LMR600UV with a doubled up grounding braid run to a 23” long copper clad steel ground rod. The reason for the short rod is that was all I could add to the antenna bag and still get it to comply with the 50 pound maximum weight! I then covered the joint with a plastic pill bottle that I use to protect the antenna balun during shipment.

With the antenna up, it was time to begin assembling the station inside the room so I could get on the air. I had to use both my extension cords to reach the equipment over by the slider where the cable entered and ran to my wattmeter.

Note the liberal use of ferrite filters on all the leads coming out of the computer and any piece

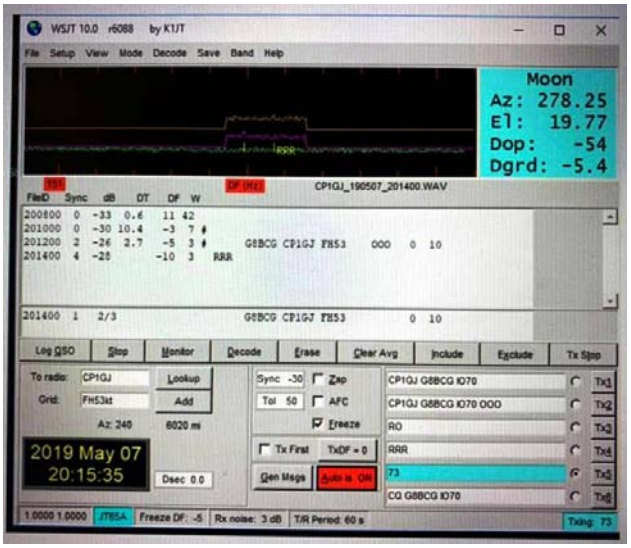
of equipment, especially the switching power supplies.

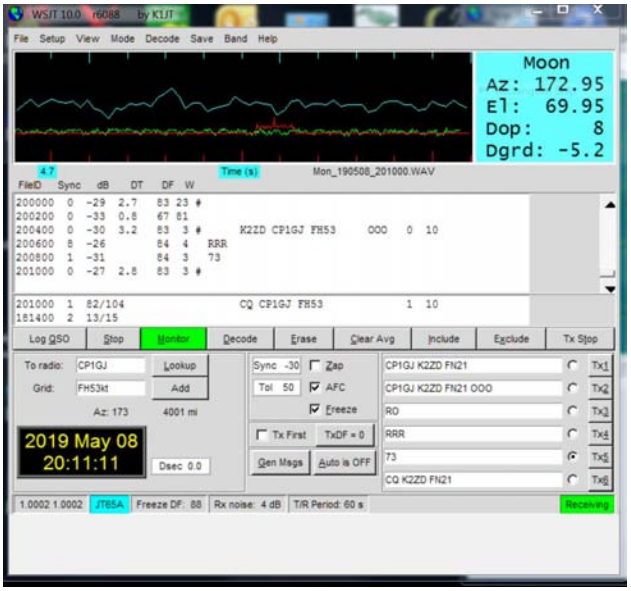


I always bring along a pair of 4' long LMR600 jumpers and a pair of LMR400 jumpers in addition to some short RG58 cables to connect all the equipment. I also had an extra 25' length of LMR600 coax that I did not need to add to the feedline this trip.

OPERATING

The first contact was KG7H, at 1906 UTC (just after 3:00 pm Tuesday afternoon), quickly followed by ON4GG, W7JW and others.





I continued operating until the moonset that day, and then operating completely throughout each of the following seven moon passes.

On Friday during moonrise of the fourth moon pass, I encountered problems decoding the JT65A mode signals from the moon. I later found the problem to be related to the Virtual Audio Cable connection inside my computer. After updating the VAC software program to a newer version, everything worked smoothly again.

I did have “birdies” on certain frequencies, probably due in large part to the transmitters on the mountain directly behind the hotel (to the southeast).

Fortunately, I was able to announce my frequency changes using the internet capability at the hotel, and I finally settled on the reasonably clear frequency of 50.174 MHz.

My moonrises were generally blocked below about 10 degrees, and I did have increased noise toward moonset when I lowered my antenna to the horizon and aimed over the hotel reception area and toward the power lines that ran along the frontage road between the hotel and the beach. However, for the most part, I was able to hear very well, and I was able to complete 6m EME contacts with 111 stations in 30 DXCC and copied 23 others in 2 more DXCC. I contacted a number of single yagi stations, but I think the smallest was the 6 element yagi at EI3KD in Ireland.

By Wednesday, May 15, I had decided to discontinue my EME activity and instead use the afternoon moonrise periods to try for some ionospheric propagation to the north. The mid-day electron “fountain” on the north side of the geomagnetic equator turned out still to be adequate for propagation into the Caribbean, and I contacted WP4G in Puerto Rico. At the same time, the North American East Coast was enjoying some early season Es propagation to the south, and I was able to link into that. I contacted 19 stations using FT8 mode, from Nova Scotia to Florida, as well as stations in Puerto Rico and Venezuela. The following day, I called to the north for six hours, but the electron density in the northern geomagnetic bulge had faded too much, and there was no link from my location to the north.

TEARDOWN

On Friday morning after breakfast, I lowered the mast down onto the prop, removed the antenna and coaxial cable from the mast, and placed the 43’ long 6M8GJ yagi on the same chairs where it had been assembled.

Then I proceeded to dismantle the mast and antenna and pack it all up for the return trip. All

the hardware is stored in labeled zip-lock bags in a box in one of my suitcases, along with boxes containing the elevation mount, ground stakes, and guy lines.

The horizontal fiberglass cross piece for the antenna boom guy lines, along with the mast from the elevation mount, the mast prop, the falling derrick and all the aluminum tubing from both the antenna and mast are all magically telescoped into a compact package no longer than 44".

When the package of tubing is inserted into the 46" long nylon carrying bag, with ¼" thick HDPE end plates, the bag weighs 49.5 pounds and also complies with the accepted airline dimensions for standard checked baggage.

ABOUT TOWN

When I was not bouncing signals off the moon, there were some opportunities to explore Copacabana. As if assembling the antenna and running outside to repeatedly aim it at the moon at 12,550' was not enough exercise! You must realize that everything in Copacabana is *steeply uphill* from the lake so exploring the town can be quite a workout!

One of the first outings was a hike up to the top of a hill on the east side of town to *Horca del Inca.* This ancient stone monument shaped like the Greek letter *pi*
was used in conjunction with holes in the rocks which aligned with the rising sun at important times of the year, such as the Summer Solstice. Traditional farmers still make the pilgrimage up the hill on the Solstice to see if the sun will shine on the old monument, indicating that they will have a good growing season and a successful harvest.

Another ancient relic on the outskirts of town are the mysterious “seats” carved in the rocks at *Inti Kala*, or the *Inca’s Tribunal*. The carvings are the only visible remnants of ruins of an entire settlement, which is now buried underground.

The central square on the hill in downtown Copacabana features a large, elaborate church with a museum as well as a cactus garden with monuments.

Just off the main square is the open air market area, where people buy all their fresh produce. There are no supermarkets in town. Below are

pictured cactus fruit, vegetables and various kinds of potatoes for sale.

There is even a large indoor area where prepared meals are served, and we enjoyed a great lunch of local lake trout and potatoes.

We also enjoyed a lunch at a small family run café outside of downtown, right next door to the Onkel Inn, so with that facility, and the ability to order "take out" food delivered to our room, the Onkel Inn proved to be a very convenient DXpedition location!

ISLA DEL SOL

For the last two nights of our visit to Lake Titicaca, we booked passage on a ferry and stayed out on Isla del Sol, the birthplace of the

Incan religion. When arriving at the port of Yumani, the immediate impression is that it looks like a very steep trek up the 600' to the village!

The famous three springs of the Incans and the steps up to Yumani meet arriving visitors at the port.

Hiking up from the port to the village on the ridge affords spectacular views of the snow capped Andes to the east.

Our room on Isla del Sol was at the lodging of Palla Khasa, just northwest along the ridge from upper Yumani, at an elevation of 13,100'! The comforters on the beds were the thickest I have ever seen!

Near the island's southern peak, llamas graze next to potato fields.

There are no vehicles on Isla del Sol – the only transportation is by foot. Donkeys haul supplies

up from the port. Below, local women travel the path to a local community meeting above the ruins of the Incan Temple to the Sun (shown on my QSL card).

Here, locals prepare to board the last ferry of the day back to the mainland.

RETURN TRIP

On Monday May 20, we started our return trip by boarding the 3:00 pm ferry for the 90 minute passage from Yumani back to Copacabana. We picked up the bulk of our luggage from storage at the Onkel Inn and by 5:30 pm were on our way toward the airport in La Paz.

We crossed the narrow strait in the minibus on the ferry barges at Tiquina just as darkness fell, and we arrived at the airport at 9:30 pm. We waited for the next 3 hours for the airline ticket counter to open for our 02:31 am departing flight to Bogota. Gratefully, Pablo showed up at 10:00 pm and patiently waited with us until the ticket counter opened. Our names had been flagged by the airline and they would not issue our boarding passes until customs agents approved our leaving the country with our usual luggage. Fortunately, Pablo found two customs agents and presented them with very official looking government documents and they were very pleased to approve our exit. We were glad to be able to let Pablo and his wife finally leave the airport to go home and sleep!

After Bogota, came Houston, then Denver and 31 hours after leaving Copacabanad, we arrived in Missoula, Montana. And all our luggage arrived with us! The weather greeting us in Montana was very similar to the weather we had left in Bolivia – cold at night and mild during the day – except that Montana in May is much wetter than the arid climate of Bolivia as they move into their dry winter season.

Although it was a long journey, it was a very interesting and successful trip. I noticed that my Bolivian VISA is good for 10 years and the CP1GJ license is good for 5 more years. Hmm…

RESULTS

SOME SELECTED STATIONS WORKED ON 6M EME

AJ7LL	JA9SJI	KD7KPE	N8RR	S59RR	W7JW
EA8DBM	JG1TSG	KG7H	NJ6P	SP3RNZ	W7KNT
EI3KD	JG2BRI	KJ9I	NN7J	SP4MPB	W8IW
ES6RQ	JN1JFC	KL7HBK	OH2BC	SP7VC	W8OI
F6BKI	JO1PSX	LY2BAW	OH3SR	UB7K	W8PAT
FK8CP	JR2SQZ	LY2IJ	OH5VY	UR0MC	W8TN
G3WOS	JS2CQA	LZ2CC	OH6MIK	US0LW	W9GA
G4BWP	K2ZD	N1DG	OH7KM	UT7QF	W9JN
G4FUF	K4JWA	N2RVU	ON4AOI	VE1JF	WA8WV
G5WQ	K4PI	N2TIN	ON4GG	VK4MA	WA9LFO
G8BCG	K6EME	N3XX	ON4IQ	VK4WTN	WG8Q
G8VR	K7CW	N6JV	OZ4VV	W3UUM	WT8V
GD0TEP	K7KX	N7FZU	PA9RX	W4TAA	YL2AO
GM3POI	K8RRT	N7IP	S51DI	W5ADD	YU7EF
HA0DU	K9TVG	N7NW	S51ZO	W6TOD	ZL3NW
HA7TM	KA8SYV	N8DX	S59Z	W6UC	ZS4TX
IW5DHN	KA9CFD	N8GTI	S59A	W6XU	ZS6NK
JA7QVI	KB7Q/7	N8JX	S59P	W7GJ	

STATIONS COPIED BUT NOT WORKED ON 6M EME

F5LNU	JE3GRQ	KR7O	N9IW	VP8EME
HA8CE	JF3BDN	KX4R	NT0V	W4IMD
HA8FK	JR1LZK	LA8AJA	SM6LPF	W8HC
I4EAT	K7RWT	LZ2DF	VK5PJ	
IW5BPE	K8MFO	LZ2WO	VK8MS	

STATIONS WORKED ON 6M IONOSPHERIC PROPAGATION

AC4TO	KA1R	N7NR	W2OR	WP4G
K1SIX	KO1DX	VE1JF	W4IMD	YV4DYJ
K2ZD	KP4AJ	VE3LYC	WA1EAZ	K1TOL
K5XI	N1KWF	W1JJ	WB4JWM