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The TKØC Story

Introduction

TKØC in Corsica is now entering its 8th year. What started as a single-van expedition to ISØ (IIØC) in 2014 and continuing as a Multi-Single TKØC experiment in 2015, has evolved into a serious undertaking that aims at breaking EU records in all three CQ World Wide DX CW High-Power multioperator categories. The members of "Team Charlie" (Charlie comes from the S5ØC call sign of Radio Club Domžale) are enthusiastic contesters and homebrewers — just the right mix of experts to run Field Day-style contesting smoothly.

Procuring the proper location was a tedious task. Using modern tools (Google Maps, Booking.com, and HeyWhatsThat.com), we sought a seaside location on Corsica facing north that was fully open to the ocean –45° to 45° (US and JA), not too far from shore (cable lengths), has a house available for rent, and is not located too high above sea level (vertical radiation pattern for horizontally polarized Yagis). Last, but not least, it must have enough room for Beverage RX antennas.

The place we found matched our criteria nearly perfectly. Better yet, it is in a settlement of summer vacation private villas that are completely empty during Contest Season. It's located just a few kilometers north of Calvi on the northwest side of Corsica (JN42jo), 24 meters above sea level and 90 meters from the shore, with plenty of room to install antennas. The only drawback is quite a "wild" coast with furious waves when windy — and autumn can be very windy there.

The team consists of from 8 to 12 operators. We normally travel with one cargo van, one passenger van, and one passenger car. Getting to the location takes us a full day. On Sunday evening, we pack the cargo van with all the equipment. At 5 o'clock the next morning, we start out from Domžale (central Slovenia) to arrive at 2 PM at the Port of Livorno in Italy.

There, we embark on a 4-hour ferry journey to Bastia (east Corsica). Then we have to cross the island to get to the west side. That takes another windy 2-hour ride. We arrive at 9 PM and meet our host, Mousa. While we unpack the van, the FT8 fans would normally set up a simple antenna and start operating within an hour of our arrival.

The next 4 days are reserved for setting up all the antennas, laying feed lines (about 3 kilometers of coax all told), and preparing the shack. We split into three teams, each one responsible for installing a set of antennas. Over the years, we have refined our antennas to the point that they perfectly match our operating style.

The TKØC Operating Style

With our own operating style in

Figure 1 — The 2022 M2 team (L – R): Jane, S57L; Sine, S53RM; Branko, S57C; Sandi, S57K; Simon, S53ZO; Goran,S55OO; Ivo, S57AL; Matija, S53MM; Vinko, S53F; Ivo, S57VW; Robi, S53WW, and Boris, S53CC (missing is Boris, S53BB, who skipped the competition).

mind, our primary goal is to finish with the highest number of QSOs in the world, regardless of category. The second is to break the best hourly rate record. To make this happen, we cannot rely solely on the run station operating as fast as possible. The fact is, no matter how fast the run station makes contacts, half of the available contesting time still is wasted. Let me explain.

When the run station is receiving, time is lost for transmitting — and vice-versa. The method of fully utilizing available time is termed an "in-band" operation. In Single-Operator categories, the same time utilization goal is achieved via the two-band sequential interlaced QSO (2BSIQ) method. The idea is to let the run station run its "own contest" and have a set of in-band (INB) stations "fill" the run station's receive time (see Figure 2). The chart suggests a large number of INB transceivers, but, in reality, you only need a large number of INB receive stations.

Let's say 60 kilohertz of a band is available. With three stations per kilohertz, you need 180 INB receive stations. We restrict our contesting efforts to CW for a reason that goes beyond the pure joy of running CW pile-ups. The other reason is that setting up 180 INB receive stations has become trivial these days. Thanks to VE3NEA and technology advancements, one SDR and *CW Skimmer* software can do the job. You also can rely on the Reverse Beacon Network (RBN) and DX cluster sites. How many INB transmit stations are needed? We feel two is more than enough. To make this operating style really efficient requires:

1. A run station that is not aware of the presence of the INB stations. (I will explain later how to achieve this, but the basic requirement is that INB transmit does not create any interference for the run receiver, and vice-versa.)
2. PTT sequencing must be hardware-locked, with a visual indication of which station is transmitting.
3. Hardware-enforced "ping-pong" mode is instrumental to the success, and it only works with "low-ego operators."

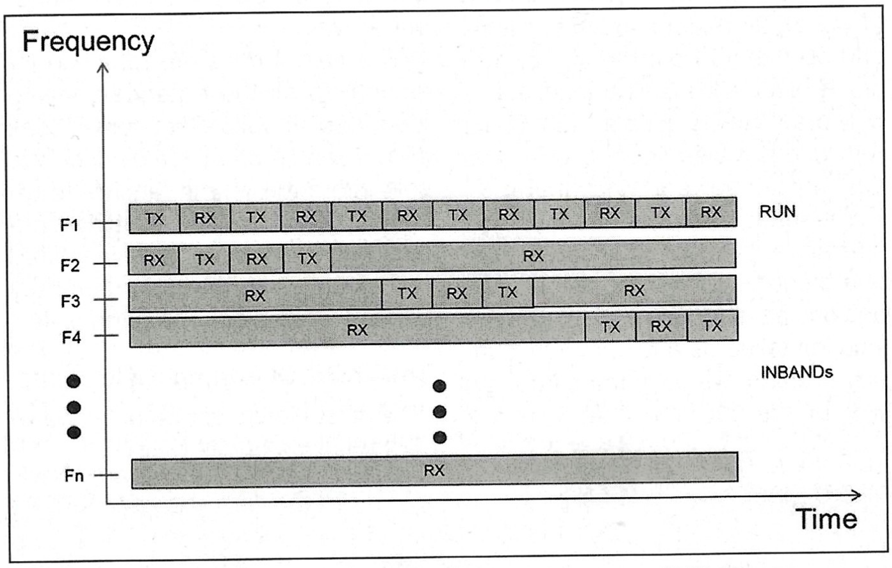

Figure 2 — Efficient utilization of the time-frequency space — 100% time on transmit and receive.

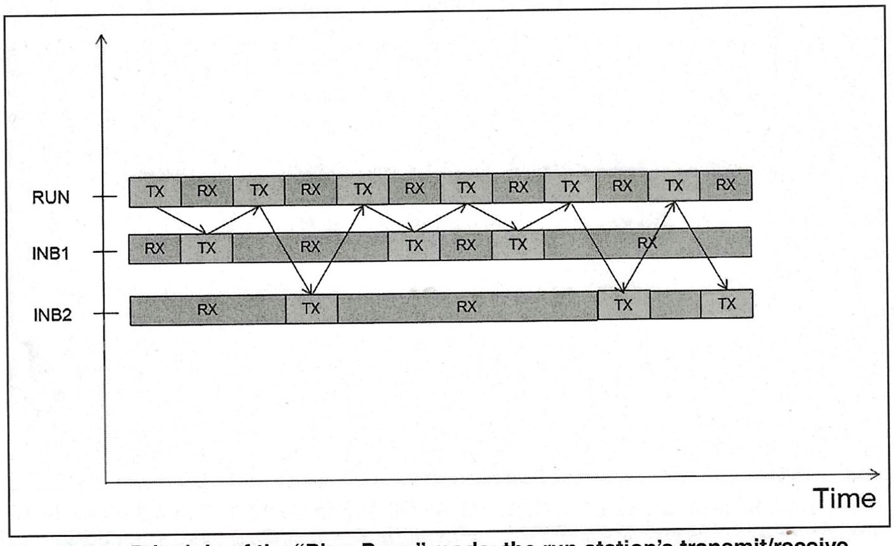

Figure 3 — Principle of the "Ping-Pong" mode: the run station's transmit/receive interval is uninterrupted.

In isolating the run operator from what the INB ops are doing, there is an absolute must not to break the op's TX/RX rhythm. The diagram shows what this means in practice. INB1 or INB2 are not allowed to transmit one after the other. After every INB transmit period, the run station must be allowed to transmit. This is like a ping-pong game. Where does the ego factor kick in? An INB operator cannot transmit until the run station stops transmitting. The interval is between one-half second and a second. Otherwise, the impact of INB transmitting on the run transmit/receive interval is too severe.

We use four different-colored LEDs placed in a ping-pong ball to indicate where things stand. A red light indicates the run station is transmitting. The INB operator watches and waits for the red light to turn off, and only when the corresponding station is in almost perfect sync with the run station's receive/transmit period can the operator transmit (see Figure 3).

The only person-to-person communication is between the two INB ops. For example, INB1 initiates a QSO, and the op raises a hand to INB2 *not* to steal the next (and final) transmit interval. With some training, this method works so smoothly that we can easily achieve a 2:1 run-to-in-band QSO rate ratio (i.e., 200 run station QSOs to 100 INB QSOs for a 300 QSO/hour rate). This rate is available to us only in the first hour, unfortunately. Nonetheless, we hold worldwide best hour rate records in Multi-Single (MS), with 416 QSOs/hour (2019), and Multi-Two (M2), with 606 QSOs/hour (2021).

It is hard to estimate how many more QSOs result from using this technique. The only solid metric is the percentage of in-band QSOs. We regularly make 25% to 30% of QSOs by S&P. A direct comparison with competitors provides additional insight. For example, in our 2021 Multi-Multi (MM) effort, we made 17,365 QSOs, surpassing the second station on the list by 2,352 QSOs (+13%). But this comparison is tricky. We are in Europe with some "call sign gain," while the second highest on the number of contacts was in Zone 33 (also MM, with lower call sign gain but much better geographical position).

In our 2019 MS effort, we made just 255 QSOs more than the next station down on the list of highest QSO numbers in MS (also from Zone 33) —a mere 3%.

We are confident that in-band operation yields more contacts. The lower the call sign gain, the more INB QSOs can be made. One very important prerequisite, though, is that the in-band antennas must be nearly as good as the run station's antennas. (see Table 2.)

Antennas

The main difference between in-band and 2BSIQ operating is that all INB stations operate on the same band as the run station. This requires high-performance transceivers, i.e., very low composite transmit noise and high receive blocking dynamic range. Our workhorse radio is the Kenwood TS-590SG. There also

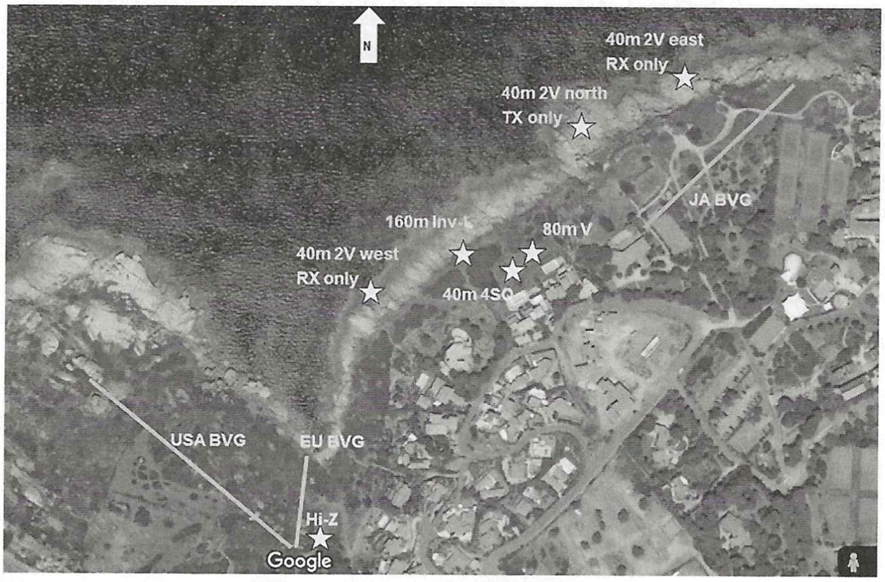

Figure 4 — Locations of the antennas for 160, 80, and 40 meters.

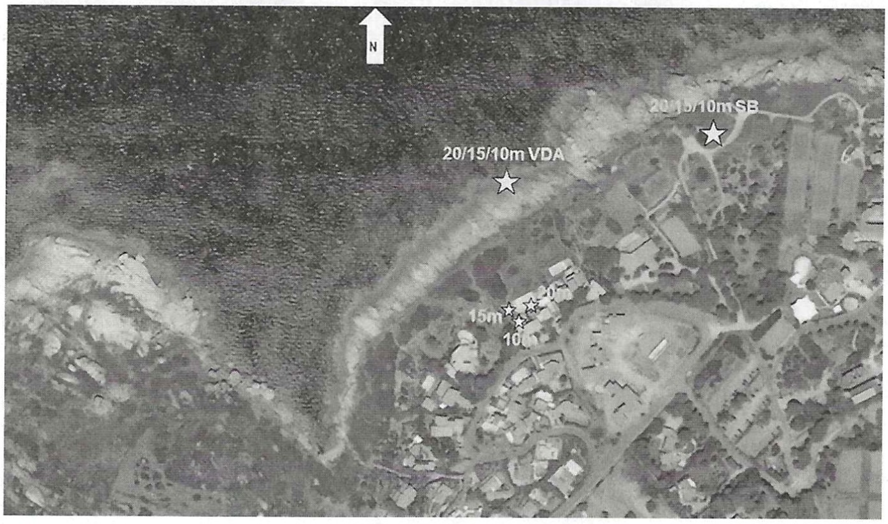

Figure 5 — Locations of the antennas for 20, 15, and 10 meters.

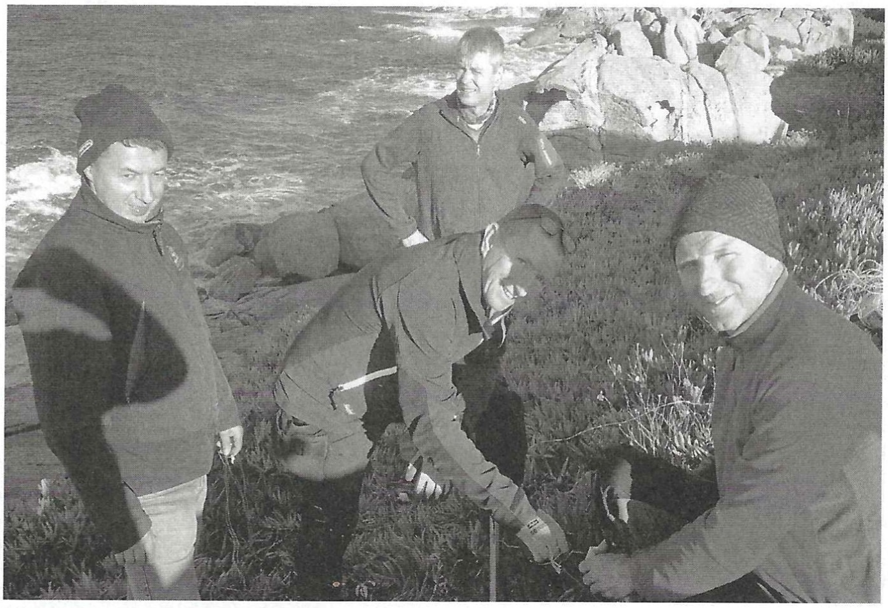
Figure 6 — Terminating the JA Beverage.

needs to be enough isolation between run and INB antennas.

If the aim is to install two INB stations, then three antennas per band with high isolation among them are needed. How much isolation is needed depends on the band, on antenna noise levels, on the transceiver, and on output power levels.

For Corsica, the aim is to keep antenna-to-antenna isolation better than the numbers in Table 1. Isolation is measured between the transmitter coax after the amplifier of the run antenna and receiver coax connected to the transceiver using the INB antenna. With that level of antenna-to-antenna isolation, using a Yaesu FTDX101 transceiver with a legal-limit amp, typically the noise increase should be less than 3 dB at 5 kHz or more offset. The increase in required isolation at higher frequencies is due to lower antenna noise. What these numbers tell is easy to understand by comparing them to the free-space loss at 500 meters (the maximum distance between antennas allowed by the contest rules). For example, on 28 MHz, the 500-meter free-space loss is 55 dB. Finding another 35 dB is extremely difficult. At TKØC, we exploit all available methods to further increase the isolation: antenna separation and optimal placement, orthogonal polarization, terrain shielding, and radiation pattern nulling.

The antenna set-up approach is different for the lower bands than for the upper bands. On 160, 80, and 40 meters, we separate antennas for transmit and receive, so just one antenna is used for transmit by all three stations (run, INB1, and INB2). We use inverted Ls on 160, a vertical on 80, and two phased-verticals on 40 meters. The receive antennas are then used by all stations in any combination (see Figure 4).

On 20, 15, and 10 meters, we separate antennas by station type. The run station uses monoband Yagis installed close to the shack (three elements on 20, four elements on 15, and five elements on 10) at about 12 meters (40 feet) above ground. INB1 uses a vertical dipole array (a two-element vertical Yagi) that is installed at the shore. This is the only location where a vertical dipole array performs as well as the Yagi. INB2 uses a three-band Spiderbeam installed about 200 meters (646 feet) from the shack (see Figure 5).

We reserve a few hours to perform thorough antenna-isolation measurements. By comparing the results with values from previous years, we can easily spot any installation issues.

The Contest

Friday before the contest is a rest day for the team, assuming the weather has been cooperative and installation of antennas, shack, and

Figure 7 — The vertical dipole array is 20 meters into the wild sea.

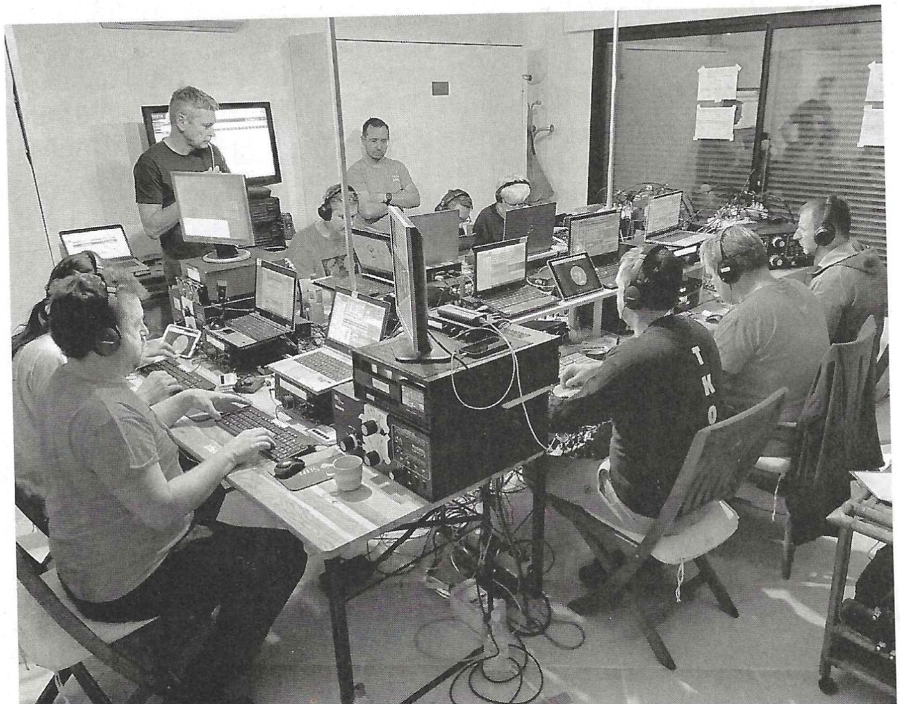

Figure 8 — A few minutes into the contest (MM in 2022).

computer network went smoothly beforehand. An hour before the start, we dim the lighting in the shack. The first team is seated at their operating positions some 15 minutes before the start. We would normally engage six ops in MS, eight in M2, and 10 in MM on the first night. As the first hour is the best hour for us, everything and everyone is chasing the goal of breaking the best hour rate record (again). Frankly, it takes us 10 to 15 minutes to warm up and remove all the tiny issues that pop up out of the blue. After that, we start running like a well-oiled machine. Sharing our score online with close competitors makes the contest even more fun.

Going Back Home

What was set up in 3 full days gets dismantled in a few hours. On Tuesday morning, we depart and get home late in the evening. Another contest is behind us, and plans for next year are already in the making.

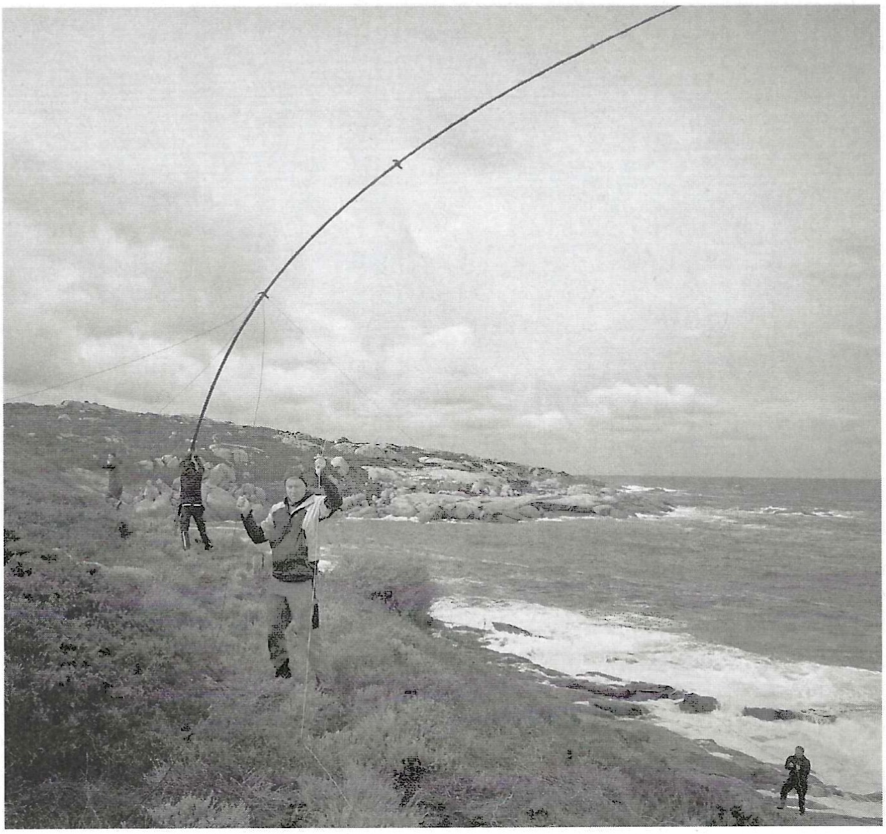

Figure 9 — Setting up the 160-meter fiberglass pole.

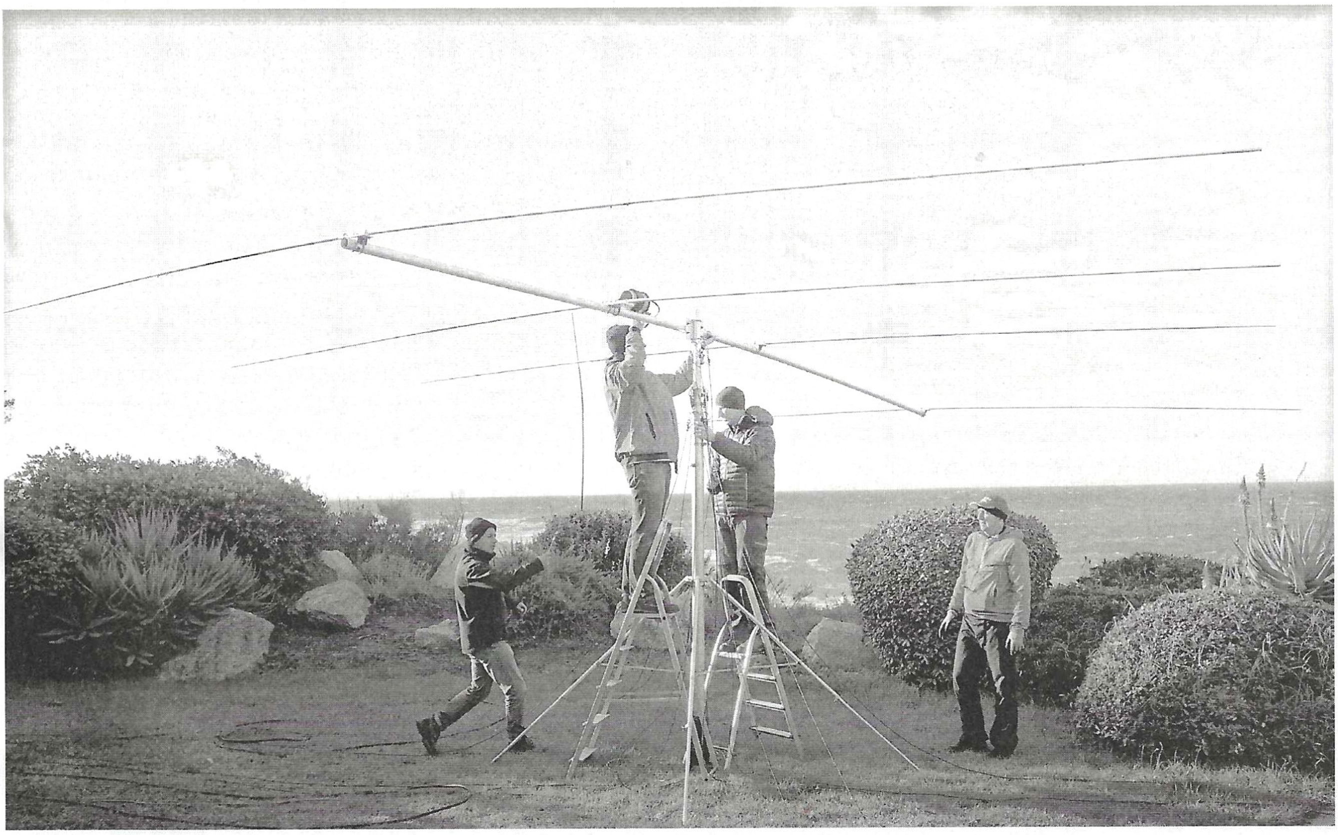

Figure 10 — Setting up the 15-meter antenna.

Figure 11 — It takes many wires to go "wireless."

Table 1
Antenna-to-antenna isolation figures.

Band	*Required*	*Achieved*
160	50 dB	60 – 80 dB
80	55 dB	60 – 70 dB
40	60 dB	55 – 70 dB
20	75 dB	65 – 70 dB
15	85 dB	60 – 85 dB
10	90 dB	80 – 95 dB

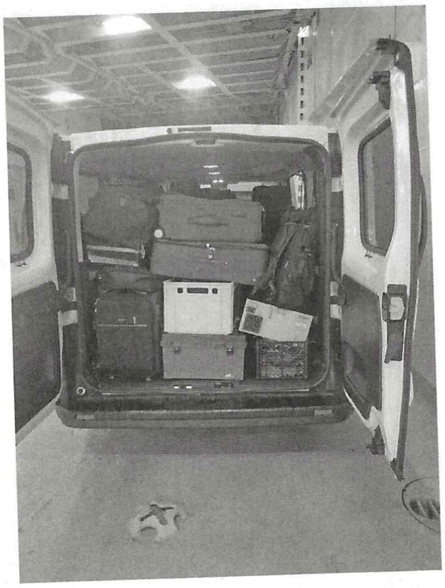

Figure 13 — Our passenger van parked on the ferry.

Figure 12 — Assembling 40-meter verticals.

Table 2
Score history.

Year	CALL	Category	Score	QSO	RANK EU	RANK World	best hour rate
2014	II0C	M/S	8,613,932	5,877	18	33	258
2015	TK0C	M/S	14,327,304	8,756	6	12	303
2016	TK0C	M/2	16,800,224	11,790	1	7	460
2017	TK0C	M/2	17,719,440	12,892	1	6	527
2018	TK0C	M/2	17,258,072	12,295	1	5	574
2019	TK0C	M/S	15,456,264	9,470	1	4	416
2020		not qrv					
2021	TK0C	M/M	24,945,742	17,365	1	3	797
2022	TK0C	M/2	24,533,550	14,233	1	3	606