Posizione Luna

Da Sabato 16 aprile 2011 a Domenica 17 aprile 2011 da JN53IW 850m.

LOC	UTC	MOON AZIM	MOON ELEV	MOON DOPP	SUN AZIM	SUN ELEV
18:40	16:40	103,06	2,61	308,00	271,02	13,74
19:00	17:00	106,53	5,78	301,00	274,46	10,17
19:20	17:20	110,09	8,97	293,00	277,88	6,64
19:40	17:40	113,75	12,11	283,00	281,30	3,20
20:00	18:00	117,54	15,18	270,00	284,76	0,17
20:20	18:20	121,48	18,11	256,00	288,27	-3,09
20:40	18:40	125,59	20,93	240,00	291,87	-7,37
21:00	19:00	129,90	23,63	222,00	295,57	-10,66
21:20	19:20	134,41	26,15	202,00	299,41	-13,85
21:40	19:40	139,16	28,48	181,00	303,40	-16,92
22:00	20:00	144,14	30,58	159,00	307,57	-19,85
22:20	20:20	149,36	32,42	136,00	311,94	-22,61
22:40	20:40	154,81	33,99	112,00	316,53	-25,19
23:00	21:00	160,47	35,24	87,00	321,35	-27,55
23:20	21:20	166,29	36,17	61,00	326,41	-29,67
23:40	21:40	172,24	36,74	35,00	331,71	-31,52
00:00	22:00	178,26	36,95	9,00	337,23	-33,07
00:20	22:20	184,28	36,79	-18,00	342,96	-34,29
00:40	22:40	190,24	36,27	-44,00	348,86	-35,16
01:00	23:00	196,08	35,39	-70,00	354,86	-35,67
01:20	23:20	201,75	34,18	-95,00	0,92	-35,79
01:40	23:40	207,22	32,65	-119,00	6,97	-35,54
02:00	00:00	212,45	30,84	-143,00	12,95	-34,91
02:20	00:20	217,44	28,76	-166,00	18,79	-33,92
02:40	00:40	222,19	26,45	-187,00	24,46	-32,59
03:00	01:00	226,70	23,93	-207,00	29,91	-30,94
03:20	01:20	230,99	21,24	-226,00	35,13	-29,00
03:40	01:40	235,08	18,41	-242,00	40,11	-26,80
04:00	02:00	238,98	15,46	-258,00	44,85	-24,36
04:20	02:20	242,71	12,37	-271,00	49,36	-21,72
04:40	02:40	246,31	9,20	-282,00	53,66	-18,90
05:00	03:00	249,80	5,96	-291,00	57,76	-15,92
05:20	03:20	253,18	2,74	-299,00	61,69	-12,80

WSJT

Weak Signal communication by K1JT – WSJT http://www.physics.princeton.edu/pulsar/K1JT/

Programma sviluppato da Joe Taylor, K1JT (Premio Nobel per la Fisica nel 1993).
http://en.wikipedia.org/wiki/Joseph_Hooton_Taylor,_Jr.

Implementa nuovi modi digitali adatti per comunicazioni in situazione di bassissimi segnali tra cui:

- FSK441, adatto a comunicazioni meteor scatter

- JT6M, adatto a comunicazioni ionospheric scatter (6m)

- JT65, adatto a comunicazioni EME (JT65A 50MHz, **JT65B** 144 Mhz, JT65C superiori)

JT65, grazie agli accorgimenti utilizzati (tipo di protocollo, modulazione), offre la possibilità di decodificare correttamente segnali di intensità -10/15 dB rispetto alle necessità "analogiche" (cw).

Sono in fase di sviluppo e di prova nuovi ulteriori modi digitali.

Gli indirizzi utili

http://www.on4kst.com/chat Chat

http://www.chris.org/cgi-bin/jt65emeA

```
04/06 16:15 Anatoly now -16 ( had to find moon )        (PA1BVM Rick xx JO21ro 82.171.55.205)
04/06 16:15 161300  1  -32        52  4   RRR     (RK3FG/4X15/HV/K Anatoly xx KO86hp 62.181.46.43)
04/06 16:14 YO8RHI TNX Adi - ur best was the RRR  at -27 dB     (W7GJ/16X17/8877 Lance MT DN27ub 71.217.152.130)
04/06 16:14 PA1BVM Rick GE! TNX (RK3FG/4X15/HV/K Anatoly xx KO86hp 62.181.46.43)
04/06 16:13 TI2SW can we try please?   (SV8CS Spiros xx KM07js 94.68.53.127)
04/06 16:13 RK3FG -25dB here     (PA1BVM Rick xx JO21ro 82.171.55.205)
04/06 16:13 ++++++   CQ 1ST 144.142 ++++++   (LZ2HM/4X12H/QRO Andy xx KN12qp 46.40.123.61)
04/06 16:12 161000  1  -24  4.3  -54  4 *   CQ IZ0FWE JN62  (TK5JJ/4X8/KW Jeanj xx JN41iw 86.206.220.144)
04/06 16:12 160600  5  -20  4.0  -57  3 *   CQ IZ0FWE JN62     (TK5JJ/4X8/KW Jeanj xx JN41iw 86.206.220.144)
04/06 16:12 160600  5  -20  4.0  -57  3 *   CQ IZ0FWE JN62   (TK5JJ/4X8/KW Jeanj xx JN41iw 86.206.220.144)
04/06 16:11 TI2SW Arnie Pse continue TX (RK3FG/4X15/HV/K Anatoly xx KO86hp 62.181.46.43)
04/06 16:11 RA9WE, tnx qso best -18 fb 73 gl !  (SM5CFS/4X19H/K Bjorn xx JO99iq 213.65.182.206)
04/06 16:11 SM5CFS  Bjorn Tnx for QSO! &#! Bye! (RA9WE/4X12H/300 Sergey xx LO74bc 66.240.171.76)
04/06 16:11 161000  4  -20  2.7  151  2 #    YO8RHI W7GJ DN27    OOO    1   0  (YO8RHI/2X17/350 Adi xx KN37te 82.137.10.116)
04/06 16:11 TI2SW Arnie ......hi....hi....     (RK3FG/4X15/HV/K Anatoly xx KO86hp 62.181.46.43)
04/06 16:10 tnx for several calls. at least u knowuare bouncing in america full sun behind moon (TI2SW Arnie MN EJ79vw 196.40.10.217)
04/06 16:10 160900  0  -28 -0.2   57  3 #    RK3FG TI2SW EJ79    O ?   (RK3FG/4X15/HV/K Anatoly xx KO86hp 62.181.46.43)
04/06 16:09 IZ0FWE Carlo, rx your QSL, you should have mine 73  (W4AS/4X9H/350 Sebastian FL EL95to 99.56.101.119)
04/06 16:08 RW3PX MNI TNX best hr was -22 dB    (W7GJ/16X17/8877 Lance MT DN27ub 71.217.152.130)
04/06 16:08 now strong comin   (TI2SW Arnie MN EJ79vw 196.40.10.217)
04/06 16:08 TI2SW Arnie Here not good condx via EME, here AURORA, STOP TX      (RK3FG/4X15/HV/K Anatoly xx KO86hp 62.181.46.43)
04/06 16:08 HB9DSU  Pete mon email maintenant est : gerard.francon2@sfr.fr    (F6BEG/2X3WL/300 Gerard xx JN25js 62.181.46.43)
04/06 16:07 W7GJ tnx qso best -25db   (RW3PX/9EL/800W Yuri xx KO84te 66.240.171.76)
04/06 16:07 ur sig down 3 db   (TI2SW Arnie MN EJ79vw 196.40.10.217)
04/06 16:06 CQ TEST DE IZ0FWE 144135FIRST      (IZ0FWE/4X16JXX/ Carlo xx JN62iq 2.159.169.241)
04/06 16:06 SW6KRW/4X8/350W George 15.03.11 sended  ra3wdk.qrz.ru/news  (RA3WDK/800/13EL Ivan xx KO81br 188.113.16.125)
04/06 16:05 I am sending      (TI2SW Arnie MN EJ79vw 196.40.10.217)
04/06 16:05 SW6KRW/4X8/350W George  i recived today , And sended 1 week ago    (RA3WDK/800/13EL Ivan xx KO81br 188.113.16.125)
04/06 16:05 TI2SW sri Arnie I got no cards fer R/Us and myself.....   (DK3WG/6X14/KW Jurg xx JO72gi 77.185.177.64)
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Le istruzioni di EA6VQ

Introduzione al modo JT65

Do you have a directional antenna, a 2m SSB transceiver with 50 W output and a PC?

If your answer is **YES** then, believe it or not, you are capable of making a QSO with EA6VQ (and other stations) using the Moon as a reflector. Please continue reading this page and you will discover a new world of DX communications, where you can work stations all around the world on 144 MHz.

Disclaimer: 2m EME communications can be addictive and if you try them you are likely to get side effects, like losing interest in other hobbies, in other bands and in other DX modes. If you don't want to take this risk you had better leave this page right now.

EME with a single Yagi and 50 W?

There is still some confusion about Moon Bounce operation and the station requirements for making a QSO in the VHF bands using the Moon as a reflector. Might be you have read in the past that only very large stations with four antenna arrays and Kw amplifiers (and skilled CW operators) were capable of working via EME (**E**arth-**M**oon-**E**arth). This was true till 2002, but nowadays thanks to the JT65B digital mode provided by the WSJT program, any station having an 2m. SSB

transceiver capable of delivering 50 W and a directional antenna can make successful contacts via EME. And furthermore, no CW knowledge is required!

But, I can't elevate the antenna to track the moon...

In order to make an EME QSO, the most important requirement is (obviously) that both stations can see the Moon simultaneously (what is called "to have a common window"). If you have a typical tropo/MS antenna you are likely not to be capable of elevating it, but YOU STILL CAN make EME contacts when the moon is near the horizon.

A single Yagi antenna pointing to the horizon normally allows to work EME till the Moon is up to 15 or 18 degrees above the horizon. If you have a clear take off towards your moonrise/moonset this means about 90+90 minutes (3 hours) of possible operation every day!

Do I need a good preamplifier?

A preamplifier with a low noise figure, mounted as close to the antenna as possible is always a very good help, but it's not strictly necessary to make your first contacts. The larger EME stations are normally using a lot of power and somehow this will compensate your little reception. You can always get a preamplifier later, when you decide it's time to improve your reception.

You are only 7 steps away from making your first MoonBounce QSO! Keep reading...

Step 1. Get the WSJT free program

WSJT is a digital communications program written by K1JT and specially intended for weak signal communications in the VHF&up bands. It provides different modes adapted to different modes of propagation and bands. For 2m MoonBounce you will use the JT65B mode. You can download it from K1JT's WEB site.

Once you have downloaded the setup program you will have to install it your PC. If you are familiar with installing Windows applications this will be very easy, as you simply have to accept the default options offered by the setup program, however if you want you can also have a look at the WSJT setup procedure.

Step 2. Connect the PC to the radio.

If you have already worked some kind of digital communications (RTTY, Packet, PSK-31,etc) you will possibly be able to use the same interface for the WSJT program, and you could skip this step.

If you have never connected your PC to the transceiver then you will need some kind of interface to connect them. If you can afford it the best is to buy a commercial interface, such as the RigBlaster (available at West Mountain Radio).

If you want to build your own interface, you will need to make the serial port cable from your computer be able to key the PTT line of your transmitter. You also must isolate and attenuate the audio from the computer sound card (Line output / Speaker), so it can be connected to the transmitter MIC input. Information on how to do this can be found in many places, but here you have two simple designs.

And finally, you will have to split the audio output from your receiver, and run an audio line over to your computer sound card (Line input / Mic). This will permit your computer to also hear your receiver, and process the signals coming in.

Step 3. Automatically synchronize the PC Time.

WSJT modes (and specially the JT65x) require of a very accurate PC time in order to achieve good

results. So accurate that in fact it's not enough to update the PC time manually. It's necessary to update it automatically according to some reliable source.

The most common way to do it is through Internet by using a Time Synchronization program, such as Dimension 4 or Automachron, and configuring them to synchronize the time every 5 minutes or so.

It is important that you select one of the time servers that will provide accurate and reliable time corrections to your computer from your particular location and internet connection. You can verify that the time has been properly set within a half second, by listening to WWV and watching the seconds display on the Dimension 4 program screen. If the time server you select doesn't seem to match WWV, or there seem to be corrections >.1 second when you repeatedly manually set the time with Dimension 4 or Automachron, try selecting a different time server from the optional list provided.

However, if you don't have an Internet connection in your radio shack then you still have other alternatives to achieve an accurate PC time synchronization:

- Use the time signals broadcasted in LW and MW and a program like Radio Clock that keeps the PC time synchronized simply connecting the speaker output of the receiver to the line input of the PC sound card.

- Use a GPS receiver connected to the PC and the free GPS Utility program to update the PC time with the GPS time.

Step 4. Run WSJT for the first time and Configure it

Configuring the WSJT options properly is important in order to make successful QSO, so please read carefully the page on configuration.

Step 5. Rig setup

Make sure your transmitter is set to USB position and that the receiver is set to the widest filter width. If you have bandpass adjustment on your receiver, make sure it is set to pass tones from 1200 Hz - 1800 Hz (usually by turning the bandpass off). In general you could leave the noise blanker active, but make sure you turn the AGC off. If your rig has a Mic. compressor or speech. processor button you should also activate it, to insure that you are sending each of the tones at full power.

Step 6. Program operation

You should definitively read the operating manual provided with the program as it covers almost all details you need to know, however you could also find interesting to watch the following visual examples of real JT65B EME QSO.

- Answering a station who is calling CQ
- Calling CQ and waiting for calls

Step 7. Get on the air

Now you are ready for your first WSJT EME QSO. However here there are some additional suggestions for you:

- Always make your first attempts arranging a "sked" with some of the bigger stations (8 Yagis or more). Please contact me and I will be pleased to calculate the most favourable date and time for trying a 2m EME QSO with you.
- Scanning the band looking for signals is not a very good idea. Only stations with large arrays can detect the weak EME signals by ear. You had better look for the frequency of the

stations calling CQ, in the DX-Cluster or in the [JT65 EME chat](#) or in the [ON4KST EME chat](#) or in [LiveCQ on 144 MHz,](#). Then you can try to detect their signal and answer to their CQ.

- Don't expect to hear the signals on the speaker or headphones. Although you could eventually listen to the signals of the most powerful stations, that won't be the rule in JT65B EME operation. You should pay attention to the SpecJT waterfall display and you will see signals that are too weak to be heard by the human ear, but that could be neatly decoded by the program.
- Don't give up if you don't succeed in you first EME attempts. There are many factors affecting the Earth-Moon-Earth path and some of them are unpredictable. Often you will have to try several times till succeeding in a QSO.
- Don't give up if you don't get an answer in the first minutes. EME conditions change very quickly, mainly due to polarization changes, and quite often you will need up to 30 minutes to complete a QSO. Continue transmitting all you periods so that your partner station will have to chance to copy you when signal improves.
- Don't get obsessed trying to detect your own echo off the Moon. If you have a single Yagi and a few hundred watts it would be really surprising that you could detect them. Even when you can't detect your own signal after the reflection off the moon many other stations with larger antennas will be able to detect it, and that is the really important thing in order to achieve a QSO.

Esempio QSO n.1

This is an example of a real QSO made by EA6VQ that could help understand beginners the right procedure for answering a station who is calling CQ via the Moon. *(Please notice that the values of date, time, azimuth, elevation, etc. shown are not the real values but the values when I recreated the QSO from the WAV files in order to make this page)*

In this case I knew in advance from the [DX-News page](#) that S79HP EME expedition was going to operate on 144.144 MHz, always transmitting the first period (even minutes), so I:

- Tuned the transceiver to that frequency
- Entered his callsign and grid in the corresponding input boxes
- Unchecked the "Tx first" box (as I had to TX second this time)
- Pressed the "Gen Std Msgs" to generate the messages and have them ready to transmit.
- Pressed also the "Monitor" button, and waited for some signal.

.
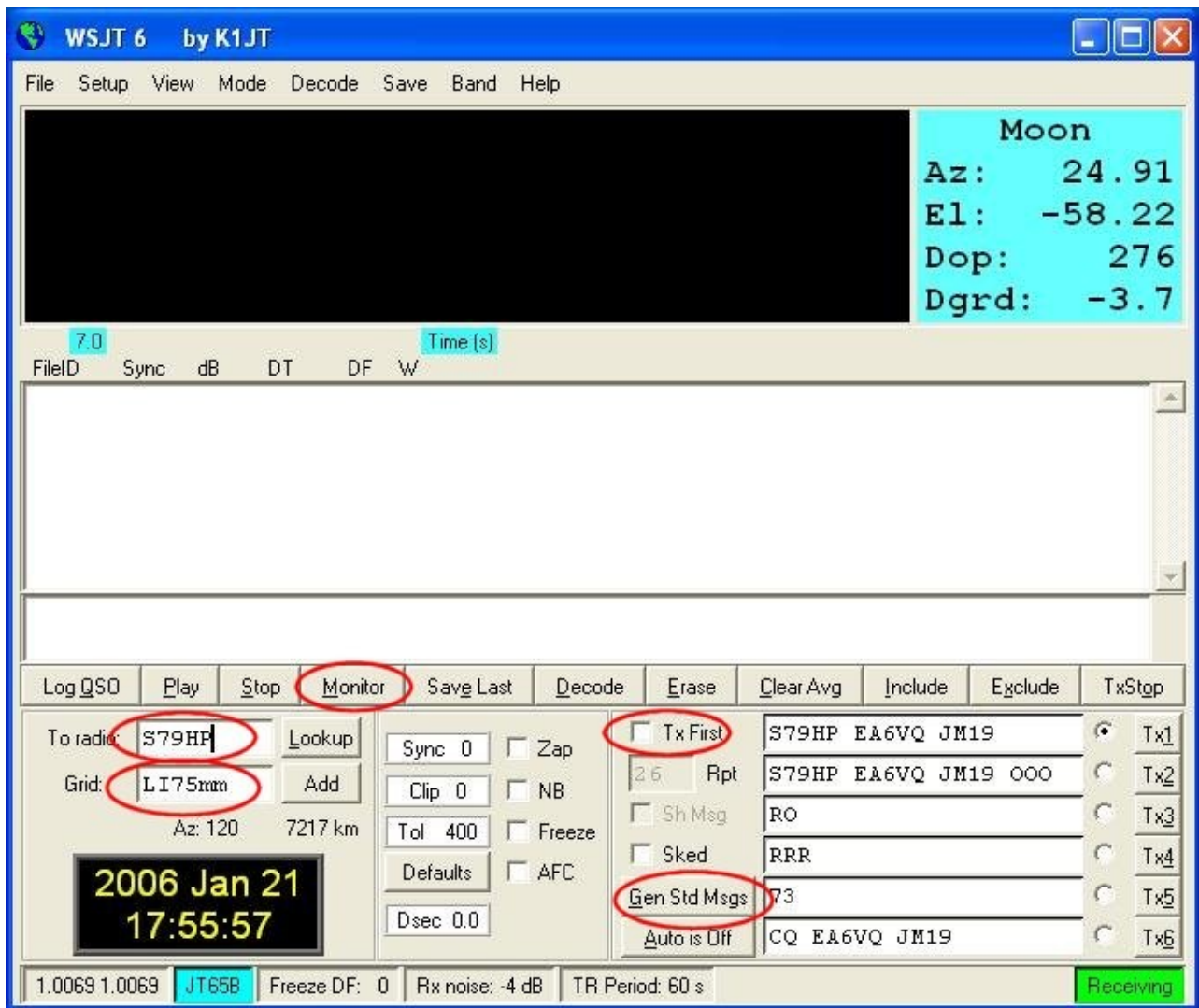
After some time I began to see a signal in the "SpecJT" window.
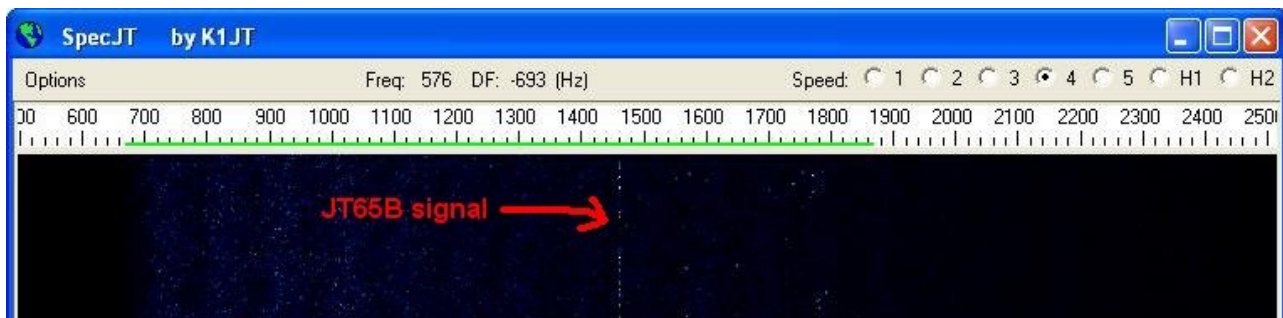
When the one-minute period was over, WSJT easily decoded the CQ call of S79HP. So I:

- Clicked with the mouse on the red spike (that corresponds to the frequency of the JT65B Sync tone) and checked the "Freeze" box. With this simple actions I told the program that I wanted it to concentrate on decoding signals which Sync tone was right on that frequency.

- Decreased the value of "Tol" to 50 (50 Hz). This is like setting a passband filter of that width, so the program will not take care of other Sync signals, even although you still could see them in the SpecJT window.

- Made sure that I had "Text 1" selected, that is the right text to send when answering a CQ

- Set the "Auto" to ON, so that the program would initiate the TX and RX sequencing automatically.

After sending Text 1 during my transmission period, the programs passed to RX mode and I could see a signal again on SpecJT.
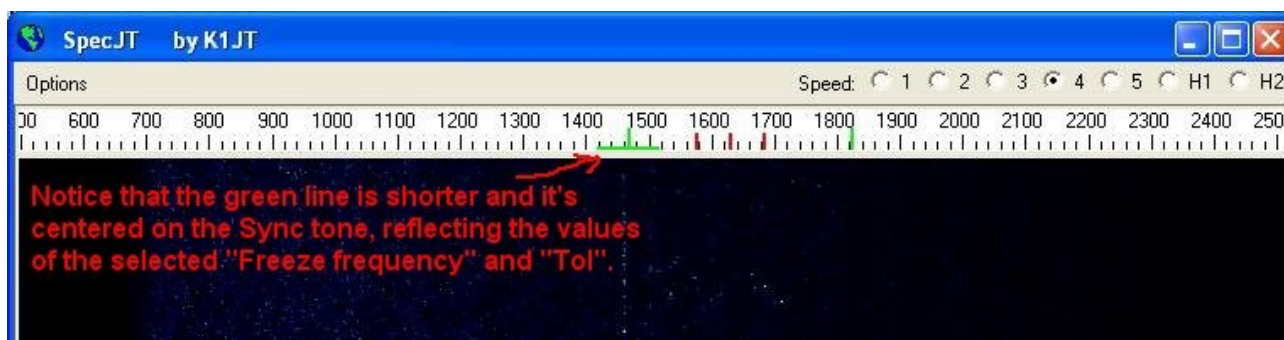
Then, the program shown the new decode...and "bingo", S79HP had received me and it was sending me the O report ("OOO"). I selected the "Text 3" (RO) to confirm him I had received his "O" report and at the same time send him an "O" report as well. *(Please notice that in EME it's not meaningful to use the RST report because the signals are almost always too weak, so the normal is to exchange an "O" report, meaning that both stations are capable of copying each other.)*
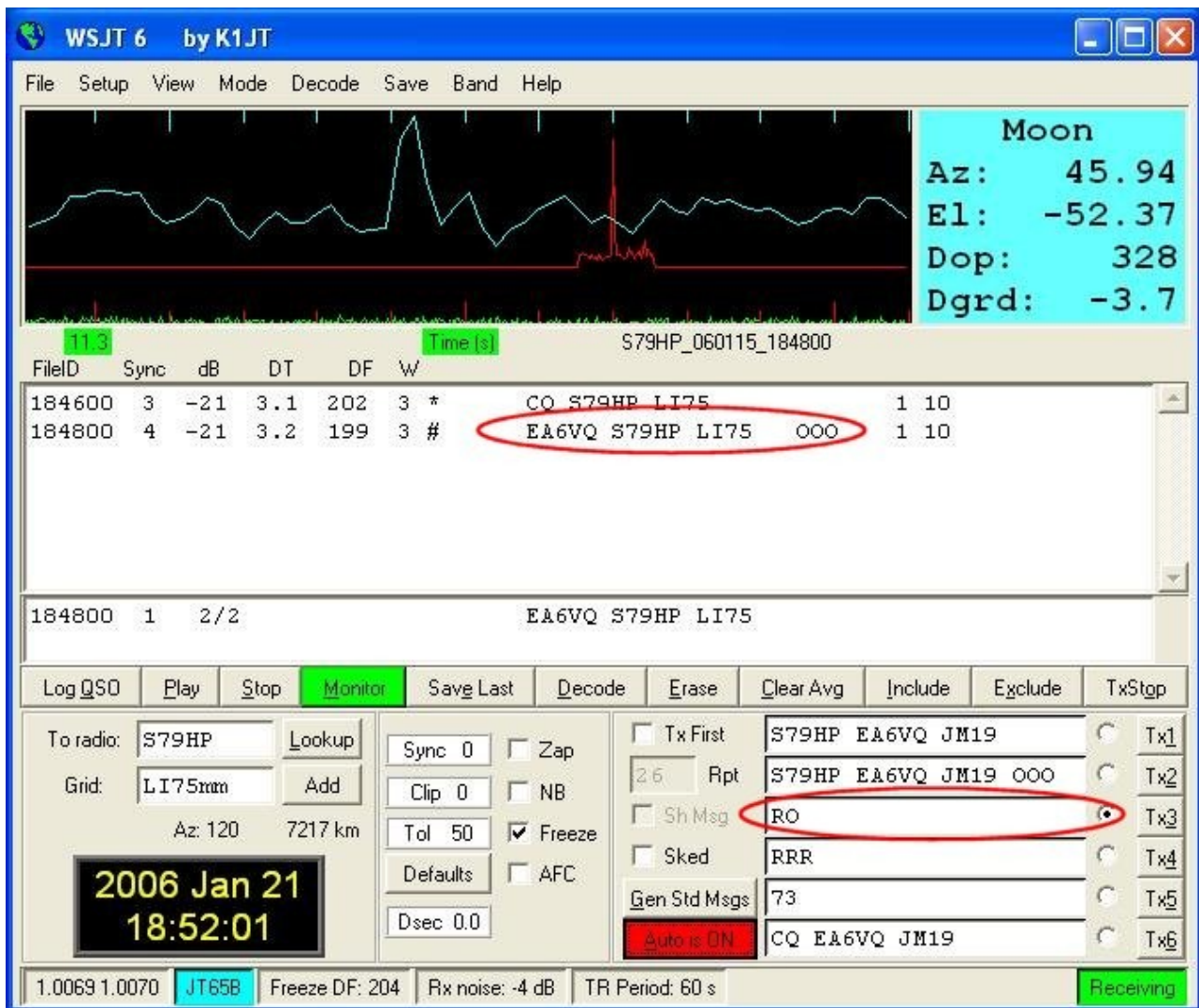
WSJT transmitted my "RO" message and then passed to RX again. This time I could see the following in SpecJT.
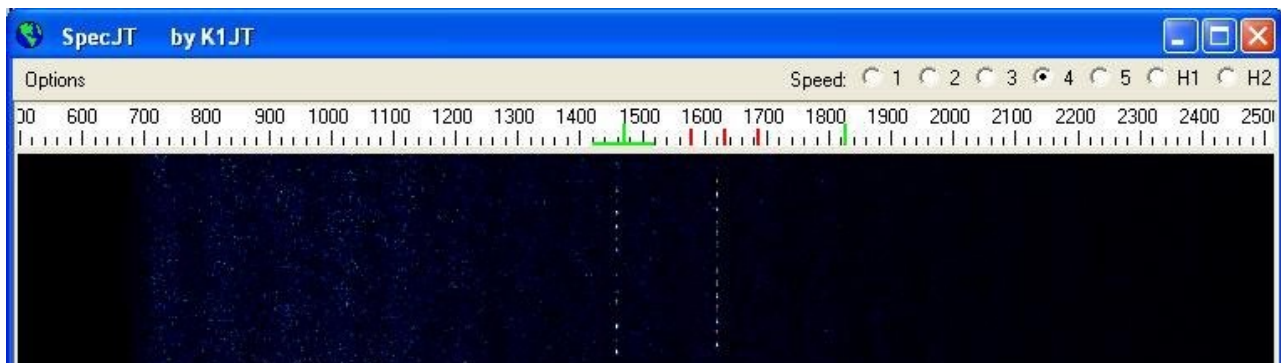
And when the program decoded it I could see that S79HP had sent "RRR" that is the message confirming he had received my "RO" and so **at this point the QSO was complete** *(An EME QSO is considered complete when one of the stations receives the "RRR", not before)*. I selected the "Text 5" (73) as a final courtesy message. Although sending/receiving "73" is not required to consider the QSO as complete but it's a common practice to send it once, after having received the "RRR" from the partner station.

Sent the 73 message for **only one period** and selected "Auto" to OFF in order not to transmit any more on his frequency..

Easy, isn't it?

Esempio QSO n.1

This is an example of a real QSO made by EA6VQ that could help understand beginners the right procedure for calling CQ and making a QSO via the Moon. *(Please notice that the values of date, time, azimuth, elevation, etc. shown are not the real values but the values when I recreated the QSO from the WAV files in order to make this page)*

In this case I was going to call CQ on my usual frequency (144.139 MHz) and transmitting the first period (even minutes), so I:

- Tuned the transceiver to that frequency
- Blanked the "To radio" and "Grid" input boxes, pressing the F4 key
- Checked the "Tx first" box (as I had to TX first period)
- Unchecked the "Freeze" box, so that the program would try to decode any signal he could detect.

- Selected the Text 6 (CQ....)
- Set the "Auto" to ON so that the program would control the TX and RX sequencing automatically.
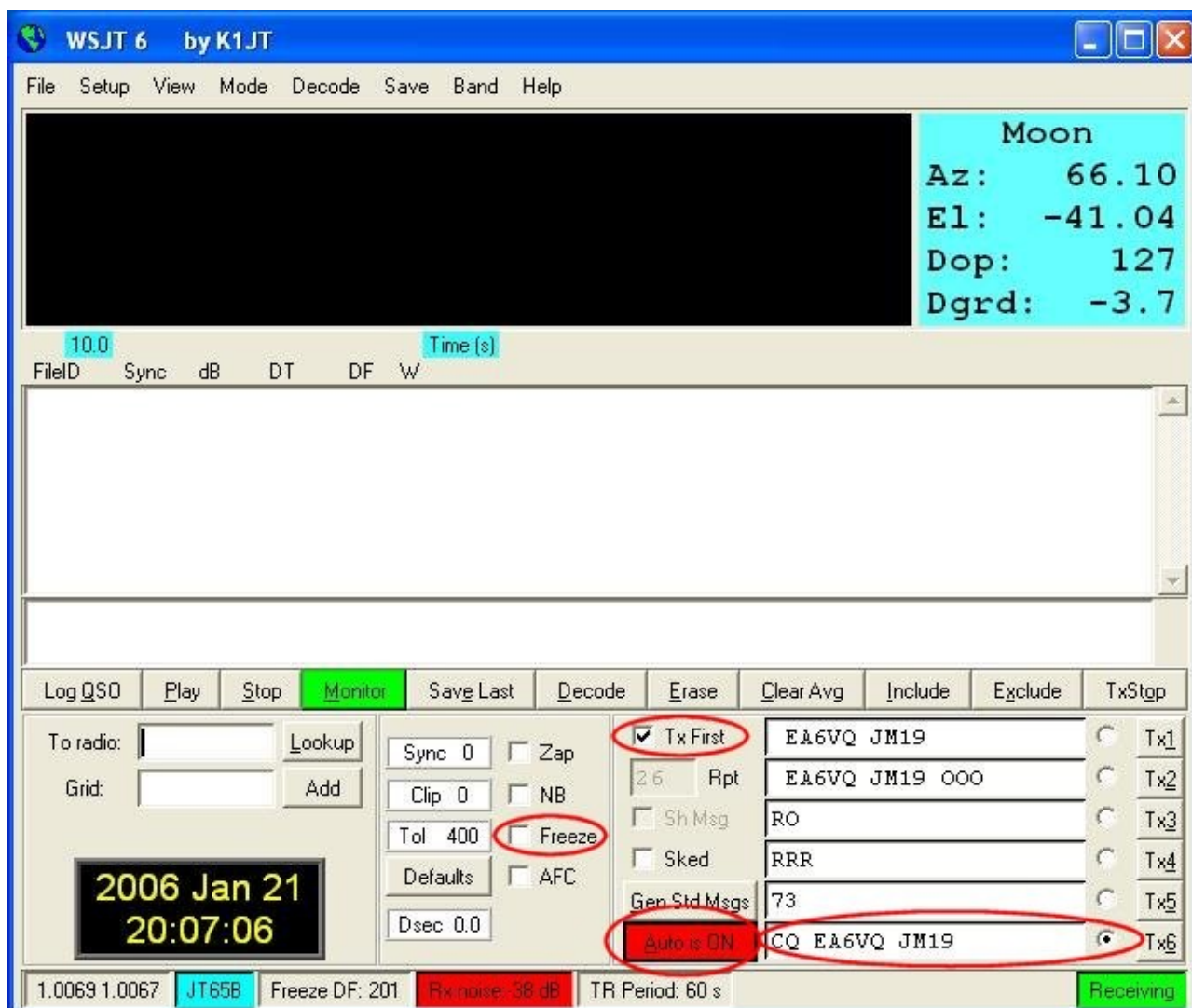
In this way the program was transmitting my CQ the first periods (even minutes) and listening the second periods (odd minutes). After some time I could see a strong signal in the SpecJT window.
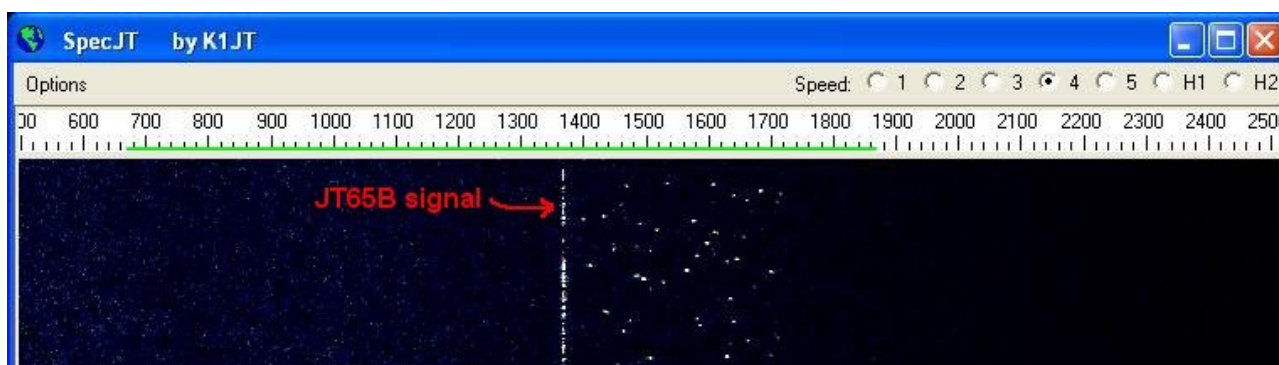
And when the program decoded I could see it was S52LM answering my CQ. Then I:

- Double clicked on the "S52LM" text. This simple action performs automatically the following:

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1. Fills the "To Radio" box with the text you have double clicked on
2. Looks for that callsign in the CALLS3.TXT file and if it finds it fills the "Grid" box with the corresponding grid square
3. Generate the appropriate transmission texts
4. Select the "Text 2" as the text to send (When someone answer your CQ you should send him the "O" report [OOO])

- Clicked with the mouse on the red spike (that corresponds to the frequency of the JT65B Sync tone) and checked the "Freeze" box. With this simple actions I told the program that I wanted it to concentrate on decoding signals which Sync tone was right on that frequency.

- Decreased the value of "Tol" to 50 (50 Hz). This is like setting a passband filter of that width, so the program will not take care of other Sync signals, even although you still could see them in the SpecJT window.

So, the next TX period the program sent the "Text 2" (Callsigns and "O" report) and then passed to RX. Then I could see the following in the SpecJT window.
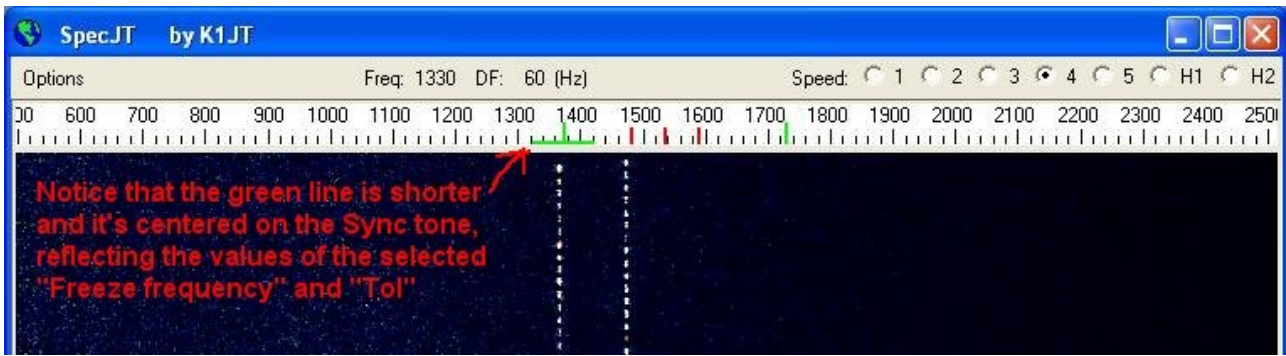
and after the decoding I could see that S52LM had send me an "RO", confirming that he had received my "O" report and at the same time sent me an "O" report as well. *(Please notice that in EME it's not meaningful to use the RST report because the signals are almost always too weak, so the normal is to exchange an "O" report, meaning that both stations are capable of copying each other.)* I selected the "Text 4" (RRR) to confirm him I had received his "RO".

WSJT transmitted my "RRR" message and then passed to RX again. This time I could see the following in SpecJT.
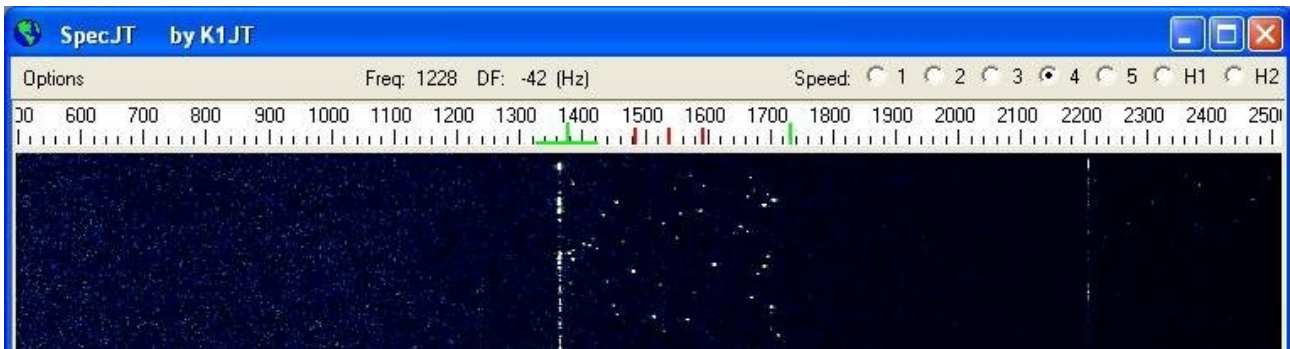
And when WSJT decoded the message I could see that S52LM was sending me a 73 message. *(An EME QSO is considered complete when one of the stations receives the "RRR", not before. Sending or receiving the "Text 5" (73) as a final courtesy message is not required to consider the QSO as complete but it's a common practice to send it once, after having received the "RRR" or "73" from the partner station*). So I selected "Text 5".

After having sent "73" for one period I was ready to continue calling CQ, so I:

- Pressed the F4 key, that blanks the "To radio" and "Grid" boxes, and unchecks the "Freeze"
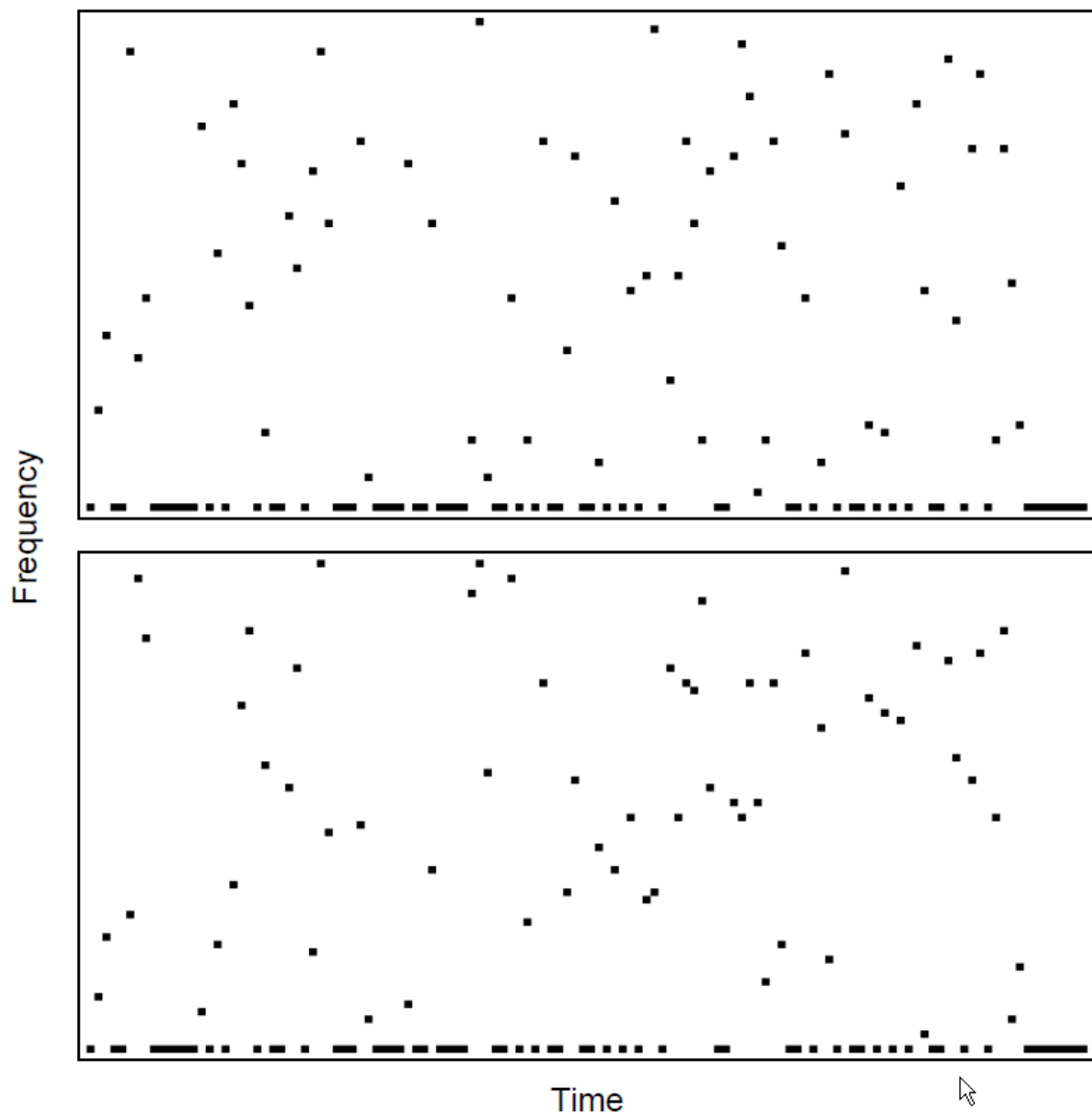- Selected the "Text 6" ("CQ .....")

- Clicked the "Erase" button to clear the received texts area
- Clicked the "Clear Avg" button to reset the message averaging
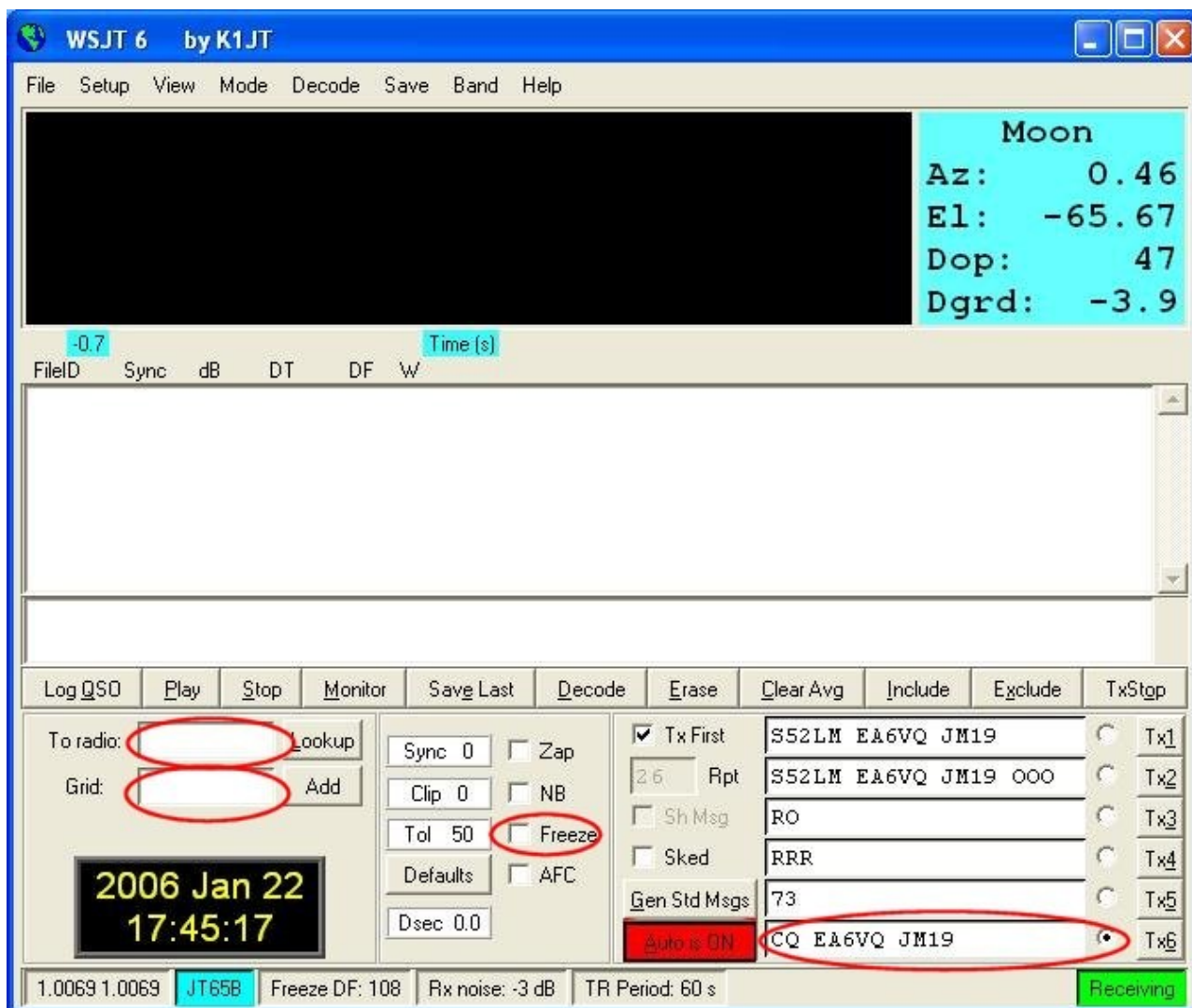
So, In next TX period I continued CQing, waiting for more calls.

Easy, isn't it?

Solo un puntino... JT65

VK7MO K1JT FN20 (sopra)

VK7MP K1JT FN20 (sotto)

L'asse X rappresenta 46,8 secondi, l'asse Y rappresenta i 65 differenti toni utilizzati da JT65. I puntini neri indicano i toni trasmessi corrispondenti ai canali codificati. La maschera pseudo-casuale lungo la base rappresenta il tono di sincronismo.

La semplice variazione di un solo carattere (da O a P) ha generato due messaggi estremamente differenti.

JT65 è un protocollo digitale ideato per le comunicazioni Radioamatoriali con segnali estremamente bassi. E' stato progettato per ottimizzare contatti EME sulle bande VHF in modo conforme agli standard e alle procedure in uso per questa tipologia di QSO. JT65 include caratteristiche di correzzione degli errori che lo rende molto solido, anche con segnali molto al di sotto dell'udibile.

Al messaggio originario viene codificato e utilizzato per generare il corrispondente codice FEC con il metodo Reed Solomon code RS(63,12).

```
Message #1: G3LTF DL9KR JO40
Packed message, 6-bit symbols: 61 37 30 28 9 27 61 58 26 3 49 16
Channel symbols, including FEC:
14 16 9 18 4 60 41 18 22 63 43 5 30 13 15 9 25 35 50 21 0
36 17 42 33 35 39 22 25 39 46 3 47 39 55 23 61 25 58 47 16 38
39 17 2 36 4 56 5 16 15 55 18 41 7 26 51 17 18 49 10 13 24

Message #2: G3LTE DL9KR JO40
Packed message, 6-bit symbols: 61 37 30 28 5 27 61 58 26 3 49 16
Channel symbols, including FEC:
20 34 19 5 36 6 30 15 22 20 3 62 57 59 19 56 17 35 2 9 41
10 23 24 41 35 39 60 48 33 34 49 54 53 55 23 24 59 7 9 39 51
23 17 2 12 49 6 46 7 61 49 18 41 50 16 40 8 45 55 45 7 24

Message #3: G3LTF DL9KR JO41
Packed message, 6-bit symbols: 61 37 30 28 9 27 61 58 26 3 49 17
Channel symbols, including FEC:
47 27 46 50 58 26 38 24 22 3 14 54 10 58 36 23 63 35 41 56 53
62 11 49 14 35 39 60 40 44 15 45 7 44 55 23 12 49 39 11 18 36
26 17 2 8 60 44 37 5 48 44 18 41 32 63 4 49 55 57 37 13 25
```

Analogie:

QSO TIPO

1. CQ VK7MO QE37
2.   VK7MO K1JT FN20
3. K1JT VK7MO QE37 OOO
4.   RO
5. RRR
6.   TNX REX 73 GL
7. FB SIG JOE 73

IQ5AE 20 ANNI