EME (Earth-Moon-Earth) communication   (user guide)

1 - EME

These notes are directed to the owner of a 2 m VHF station, with a good long yagi (8-10 m long). Up to now you were probably active in SSB via tropo, maybe with some FM activity on the local repeater. You qsoed with stations up to 500 km of distance, excepting those directions in which mountains block you. In summer you did go farther, maybe up to 800-1000 km, and in some very rare cases, in which there was Es and you were active at the right moment, you were delighted with DX at 1500-2000 km! But these are your limits, and you are a little envious of the possibilities allowed by HF, global communication. You are wrong, because also in VHF you can work the world, via EME (Earth-Moon-Earth), reflecting your signal on the Moon. With modern digital techniques, also your station can qso with at least some of the better equipped EME stations, and with just a little more you can enter this magical world. Lets start speaking of the antenna. A well equipped station has two or four long yagis, rotatable in azimuth and elevation in order to follow the Moon. But also with a single yagi and without elevation, if you are placed in an open zone without too many houses around, you can probably work via Moon for more than half an hour at moonrise and moonset. The help comes from Ground Gain, see Fig. 1.

Fig. 1 - Grafico elevazione, con effetto suolo, e senza effetto suolo
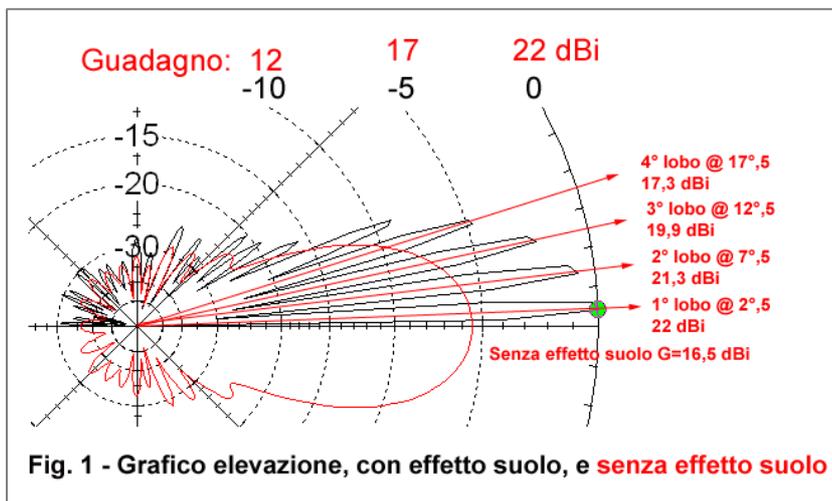
The red graph is your antenna, in elevation, without ground effects. Half of the outgoing rays hit the ground, from which they are reflected (in opposite phase) and get added to the rays outgoing up. If they are in the same phase, they add up, if of contrary phase they are cancelled. The total effect is the black graph, that shows many lobes, of which four have enough gain, greater than the gain without ground effects. They are wide about 3°. The Moon moves at about 15°/hour, so, during a period of 80 minutes, you have 4 periods of 12 minutes each of good gain towards the Moon, which you must follow in azimuth. Want to know where is the Moon? Use the free software "VK3UM EME Planner" which can be found at

http://www.vk3um.com/eme%20planner.html . Clic setup and input your data (position and time zone).

2 – The transceiver

I continue with my suggestions for becoming active in EME (Earth-Moon-Earth).
I have just received the qsl card of UX0FF, we had qsoed on 144 in year 1996 via Es, recently he has ventured also in EME, with a small addition, elevation, in order to be qrv continuously.

As you can see, he has a single yagi 9 m long, and good power, 900 W. To the usual station used for tropo, he has added elevation (during the qso he had the Moon at 32°). Additional ly he has interfaced the transceiver with a computer, on which he uses the software WSJT for MS and EME, and surely has a sequencer for isolating the preamplifier before txing, The 900 W PA was probably an earlier addition, for MS, which now is also helped by elevation. I will dedicate future articles specifically to these details, and all will basically refer to the 2 m band, where is my experience. I continue "bottom up", from transceiver towards the antenna.

1st case – VHF only transceiver: The noise figure is usually high, and frequency stability is usually moderate. In tropo the noise figure is not very important since the ambient noise level is high, but it is very important for EME where signals are below the noise floor. So, for EME, one should add a low noise preamplifier (NF around 0,3 dB), as near to the antenna as possible in order to avoid the additional losses of the coax cable descent. Also very good coax cables like H1000 and Aircom Plus loose 4.5 dB/100 m at 144 MHz, so, if you have 20 m of descent, the loss is 0.9 dB. If you place the preamplifier at the station, its 0,3 dB noise figure would become 1,2 dB, four times greater. Also stability is important. Almost every builder markets the high stability option, if you do not have it (for SSB it is not important) you should order it and add it, it is usually a simple operation. What is needed is that, during a tx minute at full power, the frequency change be less than 10 Hz. More on this in the article on WSJT.

2nd case – HF transceiver + VHF/28 transverter

The above considerations on noise figure and stability apply in this case to the transverter.

The best models have the local oscillator thermostated for stability, and reasonably low noise figures, but a preamplifier near the antenna is nonetheless important.

On the market there are kits for thermostating crystals, for example the OH 40 A made by Kuhne (I do not receive commissions, hi), useful if you have excessive frequency drift.

3 – Interfacing the PC

In analog communication, both SSB and CW, the sound arrives at your brain, which has the job of decoding it. During transmission, your voice or your keying are sent to your correspondent for the same purpose, to be decoded for communication.

In digital communication instead, the decoding brain is the computer. It executes the operations that the brain of the software's author has assigned it. In order to do this, you must send it the audio signal received, and vice versa send to the transceiver the audio signal generated by the computer for transmission. Modern computers have incorporated a versatile audio card, that digitizes the analog signal received, and vice versa. If your computer does not have it, or the quality is low, there are very good audio cards that can be mounted internally in a desktop. So you have to interface an audio output from the radio to an audio input on the computer, and an audio output from the card to a modulation input of the radio. In addition one must command the transition from rx to tx and vice versa, so also the PTT command must be interfaced. On the radio, audio is almost always available on an auxiliary connector called ACC, with the advantage of being of fixed level (100-200 mV), independent from gain controls. On the computer, if not portable type, there are usually a line input and output, also built for 100-200 mV levels. In this case you can interface directly with two shielded cables.

Some times problems arise connecting computer ground to radio ground; in this case you should use isolation audio transformers, 1:1 ratio, 600 ohm impedance. The softwares PSK31 and WSJT were born at a time in which all computers had serial outputs (called COM). So the software sends the PTT command to a serial output. Recent computers have no more serial outputs but only USB type. In this case you need to add an external USB-to-serial converter. If all this is too complex for you, you can use a commercial interface. Digit on Google "pc radio interface" and you will find a great number of choices, both for self make and for commercial interfaces. For example, on the site of EA6VQ http://www.vhfdx.info/wsjtinterface.html you find these very simple schematics, Sch. 1 is valid when you do not need to isolate grounds,
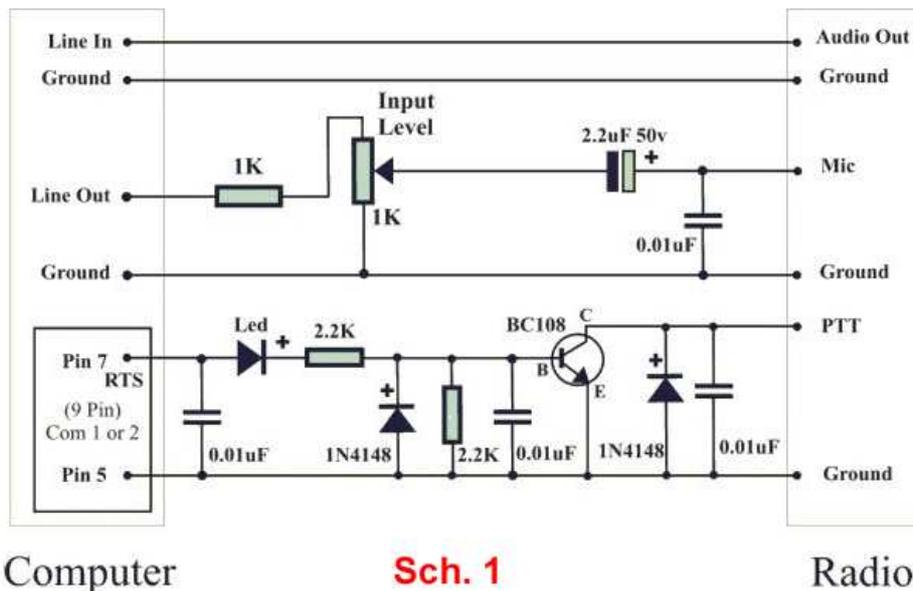
Sch. 2 for insulating them:

Sch. 2
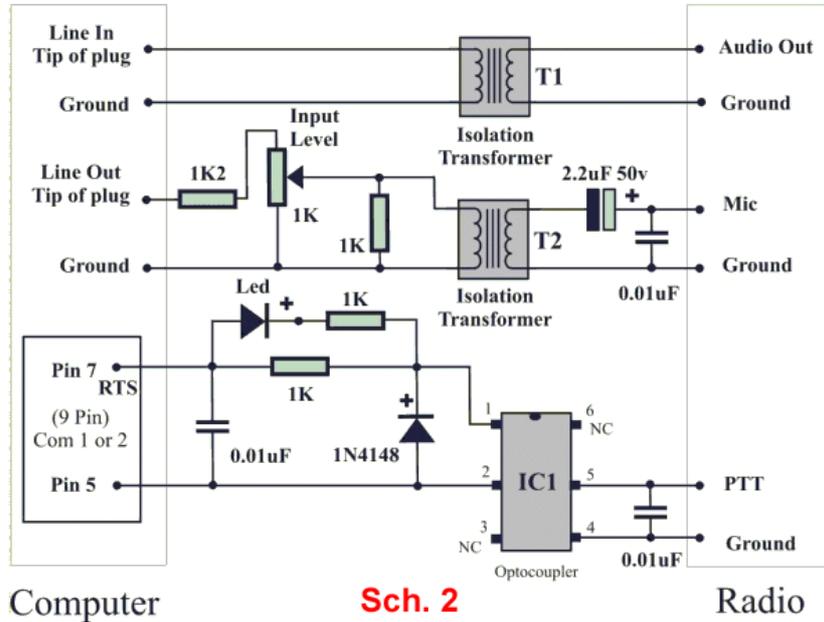
On this site you find explanations and component lists. Both are conceived for sending the modulation to a microphone input. If your radio has a higher level input, you can change attenuation by eliminating resistor 1k2. The connector with pins 5 and 7 are the serial output COM, if you do not have it on your computer, use a USB-to-serial converter and connect to it in the same way. Commercial interfaces are very similar to the schematics shown, and many have the USB-to-serial converter inside. Some have also an audio card, not useful unless your computer audio card is utilized by another application and you don't want to change connections each time. If in addition to the transceiver you have a Power Amplifier, and a Preamplifier near the antenna, remember you must use a sequencer for actuation of T/R and isolation relays and only after energize PA and transceiver. The PTT signal must be sent to the sequencer.

4 - Sequencing relays, PA and PRE
You have decided to develop your station by adding to the basic transceiver (TCVR) both a power amplifier (PA) and a remote preamplifier (PRE, near the antenna).
Some preamplifiers have internal bypass relays which protect them during transmission, but with a limit under 100 W, so you must add both some relays and a sequencer.
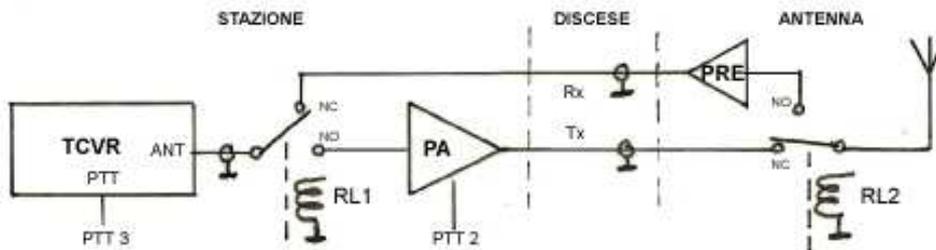This is your block diagram:

Fig. 1 - Diagramma a blocchi - Block Diagram

As you can see, the most used configuration is with two coax descents, one for reception and one for transmission, plus two coax relays. RL1 must carry only drive power, whilst RL2 must carry the full power of the PA. When the PA has bypass relays, you could use just one coax descent, moving RL1 near the PRE, but in this case it must be able to carry the full power of the PA. The relays are drawn in their rest position, so for reception RL2 must be kept energized. This configuration is useful when the station is inactive, since it maintains the PRE isolated from the antenna, protected from possible static electricity discharges during a thunder-storm. Since the preamplifier has 15-20 dB of gain, losses of some dBs in the rx coax will not degrade appreciably the overall noise figure. The tx coax instead must have the lowest losses possible. 3 dB loss on the rx cable will not give problems, whilst 3 dB loss on the tx cable will halve the power arriving at the antenna. Lets see the sequence of activation of relays and of sending PTT to PA and TCVR.

Fig. 2 - Sequenza commutazioni - Changeover sequence
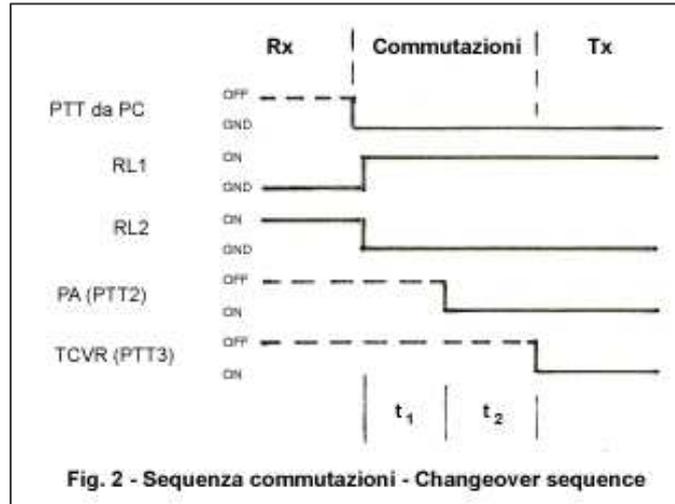
In Fig. 2 you find the correct sequencing. When the computer sends the PTT command for effecting the transition from rx to tx, the relays are commanded first.

1 – RL1 connects the TCVR to the PA (still inactive) input, and RL2 isolates the PRE and connects the antenna to the PA output (cold changeover, no power must be involved)

2 – Second step is activation of PA

3 – third step is activation of TCVR and start of transmission.

The transition tx to rx is specular. The computer stops sending the modulation signal and removes the PTT from the sequencer.

3 – The TCVR is inactivated

2 – The PA is inactivated

1 – With no power involved, RL1 and RL2 are changed over to their rx position.

Time interval t_1 allows relays to complete switching (15-30 msec) and stop bouncing (some tens of msec). I suggest using 100-200 msec. Time t_2 depends on what is needed by the PA when it gets PTT. If there are relays involved, it is best to use here also 100-200 msec.

Important note: RL2 must have a very high isolation at your frequency of the open contact. If this were only 50 dB, corresponding to an attenuation of 1/100,000, an output power of 500 W would cause 5 mW to be sent to the PRE input, with a possible risk of damage. There are no sure data on max input levels of preamplifiers, generally, at least 60 dB isolation is used. The more prudent operators, me included, use a second relay on the PRE input, that during transmission disconnects it from the T/R relay and switches it to a 50 ohm load.

Other important note: Disconnect the PTT pushbutton on your microphone, hereon you must always use the sequencer, otherwise you will burn the PRE. If besides digital modes you intend continuing with SSB, you should have a manual or foot switch for sending the PTT to the sequencer. This must not be in parallel with the command coming from the pc (a positive signal).

Sequencer: This is the right moment for some self-made equipment. If you digit on Google
 "rx tx sequencer", you will find a lot of proposals, both for self building and commercial equipment, follow your fancy.

5 – WSJT installation

Your station is interfaced with the computer, you are now ready to try digital EME.

You must install a program, WSJT. It is the work of Joe Taylor K1JT, who had already demonstrated his genius as an astrophysicist by winning the Nobel Prize in 1993 for the study of the first binary pulsar and its evolution. But since he has been from young age a ham, he dedicated his geniality also to the problem of VHF weak signals for two communication modes, Meteorscatter (MS) and EME. At those times CW was used for both, high speed for MS, low speed for EME. But specifically for EME one needed very powerful stations. Studying the problem, K1JT understood that the coding of the message could be very much improved in respect to the dot and dash alphabet of CW, and wrote a first version of WSJT for MS in December 2001, followed quickly in June 2002 by the mode JT44 for EME. It was a revolutionary event, one could decode signals 10 dB (10 times) lower than the lowest decodable CW signal, and opened the way to a widespread use of EME for normal stations.

Go on his Home Page http://www.physics.princeton.edu/pulsar/K1JT/ and click WSJT on the menu on the left. In the page that appears, download the installation program of WSJT9 in a temporary directory. Download also the Supplement to the Manual, then, lower in that page where the manuals are listed in many languages, click on the language you prefer and you get the Manual for WSJT6, save it. The Manual is very accurate, it refers to version 6, the differences of succeeding versions have been explained in the Supplement, but they are slight.

For those that don't like studying them, I describe the first steps (but please, after, read them !)

Presently the installation program is WSJT9_r2226.exe long about 9 MB.

Start it, accept that it will be placed in Programs/WSJT9 (note: WSJT4 is proposed, change it to WSJT9). After having completed the installation look in this directory, create a connection on the desktop to WSJT.EXE and start it. On the monitor you will see three displays; a black one called WSJT9, one called SpecJT, and one called WSJT 9.02.
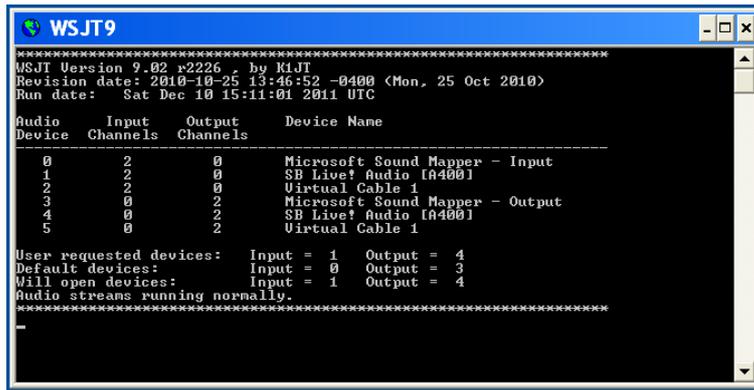
On the black display you can see the possible audio channels that the software has found, the figure refers to my case. The first column "Audio Device" shows that my added Sound Card type SB Live is device 1 and 4, note the numbers corresponding to the sound card found on your computer

On the display WSJT 9.02, click on menu "Setup" (2nd in the upper line) and choose "Options".
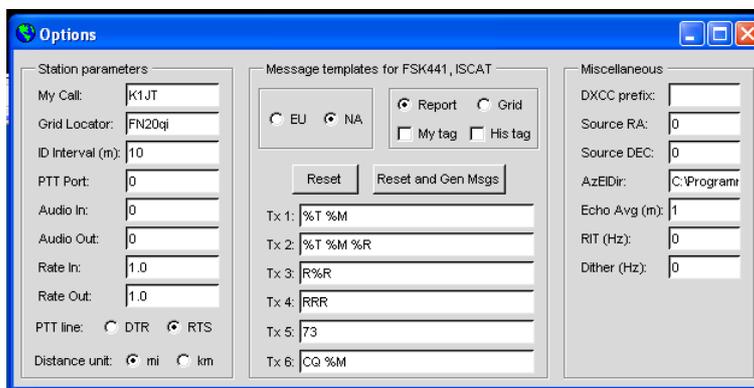
-Input your data, Call and Locator
-put 0 in "ID interval" unless in your country a CW identification every 10 minutes of operation is mandatory.
- in "PTT Port" insert the COM used for outputting the PTT command (if you had to use an USB/serial converter, use the number it gives you)
-in "Audio In" and "Audio Out" put the numbers found for the audio card in the black display, in my case they were 1 and 4, which will now be found in the black display as "User Requested Devices".
-"Rate In" and "Rate Out" are corrections used if your sound card samples at a slightly different frequency from the nominal 96 kHz, you will find this mentioned in the next part, Use of WSJT, for the moment leave them at 1.0
-"Distance units", choose miles or kilometres
-choose EU instead of NA if you will use it for MS, in North America this mode is used slightly differently.
- leave the rest unchanged.
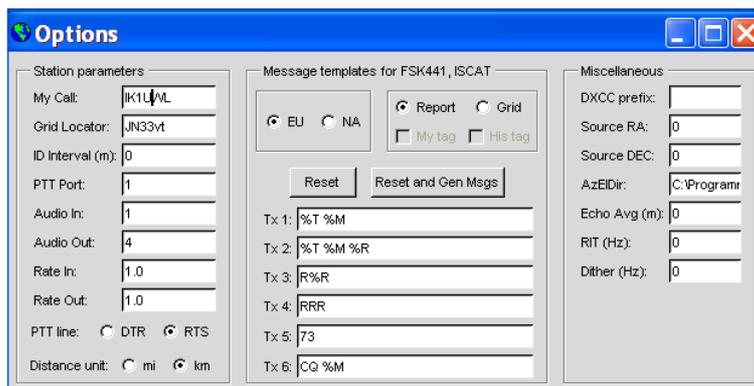
The second figure refers to my setup. The last three choices refer to the Echo mode, more on this later.
Close "Options" your data will be saved in WSJT.INI.
-On the display WSJT 9.02 click "Mode" and choose the one applicable.
For MS, FSK441 is used. For EME, JT65 is used, type A for HF and 50 MHz band, type B for the144 and 432 MHz bands, type C for higher bands. There are many other modes briefly explained in the Supplement to the Manual, leave them alone
-Click "Band" and select the one you will be using.
The black display is not used during operation, minimize it or leave it in the back of the other two displays.
On the monitor place "SpecJT" up, and WSJT 9.02 under it. If they overlap exceedingly, increase the resolution of your screen.

Now you are ready to start operating.

6 – Use of WSJT

Mode JT65, how it works

This mode alternates 1 minute periods, one for transmission and one for reception.

So an important aspect is the accuracy of the computer clock, possibly with not more than 1 sec error. The majority of emers uses Dimension4, a free software that is available on http://www.thinkman.com/dimension4. This program synchronizes, via internet, the computer clock to a publicly available time server with an atomic clock, I use the Galileo Ferraris institute. Use the nearest server in order to minimize time delays. The messages (CQ; two calls; two calls and a report) are digitally coded, then an error correcting code is added. This 378 bit binary number can be considered to be composed form 6 bit groups, of which a maximum of 64 types can exist. So the transmission consists of audio tones, each representing one of the 64 groups. Since the returning signal from the Moon is generally changed in frequency by the Doppler effect, and since ham radios can have frequency errors amounting to some hundredths of Hertz, a reference signal is needed. This sync tone (both for frequency and time) is sent at 1270,5 Hz, alternated with the message tones, for about 50% of the time. Transmission starts at second 1 and ends at second 47.8 of the minute dedicated to transmission. The next minute is dedicated to reception. The receiver (in mode USB) passband is sampled in 5 Hz large portions (JT65 mode) looking for the tones. in the first 52 seconds a table amplitude/frequency is thus obtained. Random noise gives practically a uniform contribute at all frequencies, letting emerge the tones. The decoding process starts at time 52 s. First operation is finding the sync tone, which thanks to the high repetition emerges from the other tones, so finding the time error dT and frequency error dF (you will see them in the data associated to each decode). This allows correcting the frequency of the decoded tones, in order to have the correct frequencies representing the 6 bit groups. The complete message is assembled and sent in readable form on the main display (WSJT 9.02).

If your computer speed is high, this decoding operation is completed in 2-3 seconds, leaving you the last 5 seconds for choosing the answer message. In addition to this type of message, there are three "shorthand" messages, RO, RRR, 73, which are sent by two alternating tones, the sync tone and a higher second tone spaced respectively 108, 162, 215 Hz.

One of my qsos (saved automatically by the software in the file all.txt) In EME you don't chat, a minimum qso is already a miracle. It consists of a reciprocal exchange of calls and reports.

UTC Date: 2007 Sep 21

```
212600  Transmitting: JT65B   CQ IK1UWL
212700  2  -16  3.0   48  1 *    IK1UWL K1JT FN20        1  10
212800  Transmitting: JT65B   K1JT IK1UWL JN33 OOO
212900 10  -19       48  2  RO
213000  Transmitting: JT65B   RRR                (Shorthand)
213100  4  -16  3.1   46  2 *    TU -21 GIO 73        1   0
213200  Transmitting: JT65B   HI JOE -16 WOW
213300 10  -21       44  2  73
213400  Transmitting: JT65B   73                (Shorthand)
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What took place:

1 – On the main display I choose the message "Tx6" CQ IK1UWL JN33, and have turned "AUTO" on.

212600 Transmitting: JT65B   CQ IK1UWL

2 – On the main display "Monitor" is turned on, meaning the system is receiving, and on the waterfall display SpecJT I see a bright line (sync tone) and many points to its right.

In order to simplify sampling and make decode easier, I click on the sync tone centering on it the sampling band, and on the main display I choose "Freeze" and reduce "Tol" to 50 Hz.

This operation is often useful, separating eventual birdies and peaks of noise.
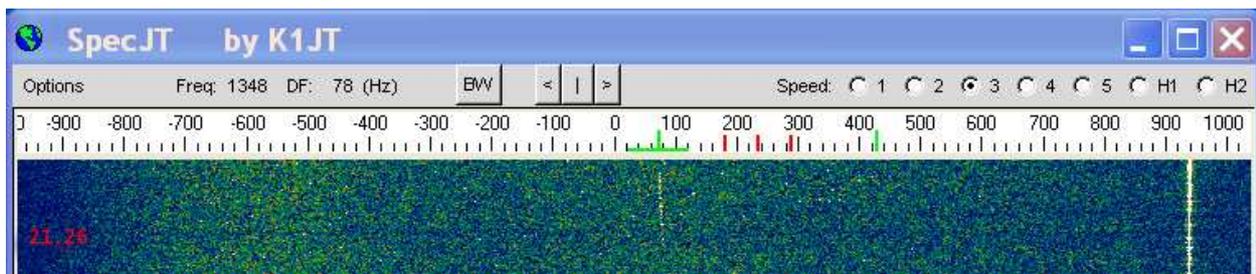

At second 52 I see "Decode" illuminating, and some seconds later I get the message :

212700 2 -16 3.0 48 1 *   IK1UWL K1JT FN20   1 10

i.e. Joe K1JT is calling me (!!!) from locator FN20.

The decode line shows also many additional data, 2 (Sync quality 2), -16 (dB, rx level), 3.0 (dT, our clocks are well synchronized but the signal took almost 3 seconds to make the 800,000 km journey Earth-Moon-Earth), 68 (dF, frequency error, radio precision + Doppler), 1 (Hz bandwidth of Sync signal), and after the text 1 10, meaning the main decoder had success, and also Deep Search (explanation in next part). I double click on K1JT; the call is automatically transferred in the message field, and I choose answer message "Tx2"
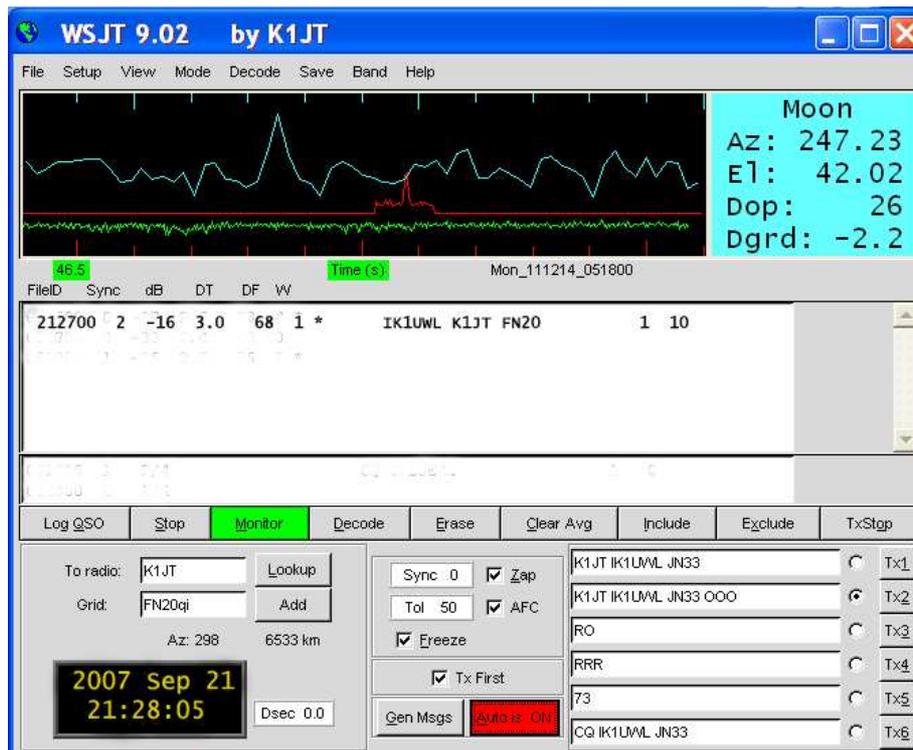
3 – **212800 Transmitting: JT65B   K1JT IK1UWL JN33 OOO**
4 – On the waterfall display two parallel lines appear, with about 100 Hz spacing, and I understand that I will get RO. Without awaiting decode I choose answer "Tx4" RRR, then the expected decode arrives:
212900 10 -19   48 2 RO
213000 Transmitting: JT65B   RRR   (Shorthand)
5,6 – At time 21.31 the system starts again reception. Normally, at this point one expects to see the two parallel lines of 73, instead I see the sync tone of a message. I understand that he is sending something more (he remembered me since I sent him the Italian translation of the manual) and in my turn I prepare in "Tx5", instead of 73, the message "HI JOE -16 WOW" which including spaces is 13 characters long.
My guess was right
213100 4 -16 3.1 46 2 *   TU -21 GIO 73   1   0
213200 Transmitting: JT65B   HI JOE -16 WOW
7,8 – We end exchanging the traditional 73s, which signify the qso is finished.
213300 10 -21   44 2 73
213400 Transmitting: JT65B   73   (Shorthand)

I suggest to everybody interested in getting a deeper knowledge of JT65 and of the genial intuitions of Joe K1JT, to go to the WSJT Home Page at http://www.physics.princeton.edu/pulsar/K1JT/ , click "References and download number 4 – The JT65 Communications Protocol.

7 – JT65, the decodes
JT65 decodes twice.
K-V decoder
The main decode of the Reed Solomon (63, 12) code, with which the message was coded, is effected by the K-V algoritm, licence given free to K1JT by Code Vector Technologies of Koetter and Vardy. It is very efficient, and outputs the correct message or nothing.
The steep transition from "almost always decoding" to " nearly always failing" occurs when the signal/noise ratio falls under -23 to -25 dB. With no interference from other signals, false decodes are so rare that you may never see one.
Deep Search
There is a second type of decode: Deep Search.
It starts with a list of plausible calls and locators, listed in file call3.txt in the WSJT directory. Known EME operators worldwide are listed. In the WSJT deep search decoder, each list entry is paired with "CQ" and with the home callsign of the WSJT user, thereby creating hypothetical messages. These fully encoded messages are tested for good match with the observed spectra. If a reasonable match is found for one message, this is shown, together with a vote, from 1 to 10, and with ? if the vote is low.
All decodes are followed by two numbers.
The first regards the K-V decoder, 1 if successful and 0 if it has failed. The second is the vote for Deep Search, 0 if the call was not in the list, 1 to 10 if some match is found.
The list provided with WSJT contains about 5000 calls of stations known to be active in EME worldwide, and can be maintained by you adding or deleting calls. Digit a call in the field "To Radio" and click "Lookup", if the call is in the list you will see its locator appear in the field "Grid". If not, digit the locator in "Grid" and click "Add". You will be asked if it is an EME call, answer "Yes" and it will be added to the list. CW operators used to have a mental or written list of emers, and in presence of a very low signal of which only some letters had been understood, this list was helpful in completing the decode. This is also the reason for which a prearranged CW sked is easier than a random qso with an unknown call. DS works similarly, and is able to propose reasonably valid decodes with signal levels 4 dB lower of the K-V decoder limit. I show you an example.In September there was the **7P8EME** expedition to Lesotho. I recall that they had problems with the PA and operated with reduced power. In the figure you see their faint trace in SpecJT at dF 233 Hz. Once discovered

the trace I made "Freeze" on it with 50 Hz Tol (green segment in the frequency axis) to facilitate decoding. Before, I had prepared messages with call and locator, and had added them to the list. The K-V decoder failed (0, -30 dB), but there has been a full decode (vote 10) from Deep Search. Thanks to this I managed to make a qso.

Average: There is also a third decode. Each reception period, the received spectra are placed in a register, and a decode is tried. After some periods of the same signal, a decode appears in the Average Field. In the example shown there was no average decode because there was only one reception period.

8 – Loggers
A digital EME station cannot be found tuning the band (in 2 m from 144.080 to 144.160) because in general it is not audible. Thanks to the extremely high sensitivity of JT65, the greater part of the stations arrives under the noise level.
In order to find correspondents, one usually visits a chat, the one more used for 2 m is the logger of Chris N0UK, free on http://www.chris.org/cgi-bin/jt65emeA .
Chris is a fan of VHF&UP, and has placed a server, usable by all WSJT users, with a software that accumulates all arriving messages in a list. The list of the last 50 messages appears on the monitor of who is connected.
There are lists for each mode, FSK441 for meteorscatter (PingJockeyCentral), Terrestrial JT65, and JT65 EME. This is the header:

Of the various pages I have chosen the EME page; and since I am also interested in sending messages, I registered as User clicking on "**Update User Details**" and putting in my name (Gio, shorter, and easier for Anglo-Saxons instead of Giorgio), my call and locator. Since these data appear together with the message, I added to the call a brief description of my conditions, "4x14X/K", meaning 4 crossed yagis with 14 elements and QRO power. This info remains memorized, and reappears each time you open the site.
I show you a small part of the page, to give you an idea of what is exchanged:

```
MM/DD  UTC
12/16 06:54 IW3HVB Giulio, grazie della qsl     (IK1UWL/4X14X/K Gio xx JN33vt 151.60.212.179)
12/16 06:54 stopped cq on 143   (G6PHH/4X11/400/ Philip xx IO91lv 90.207.22.114)
12/16 06:53 I have a good trace -23 but no decode yet QRZ     (IW3HVB/2X19LLY Giulio xx JN65bl 79.51.6.27)
12/16 06:53 IW3HVB Buongiorno Giulio Bel segnale qui ..73     (TK5JJ/4X9LFA Jeanj xx JN41iw 90.15.165.112)
12/16 06:50 #### CQ First 144.121 ####  (OE3FVU/4MXP28KW Franz xx JN78ve 66.240.171.76)
12/16 06:50 +++++++++++ cq 139 dj 1-st ++++++++ (RN6DJ/4X10H/500 Sergej xx KN96vc 66.240.171.76)
12/16 06:48 SM5DIC GM Gus 73  TNX  RPT  (TK5JJ/4X9LFA Jeanj xx JN41iw 90.15.165.112)
12/16 06:48 UA3PTW priwet Dmitrij - Skype ?   (DK3WG/6X14/HOME Jurg xx JO72gi 77.185.186.171)
12/16 06:47 064600  3  -15  1.9  -16  4 *    xxxxxx TK5JJ JN41      1   0 (SM5DIC/4X15H/KW Gus xx JO89jt 78.69.245.247)
12/16 06:47 CQ 144.132 1-ST LAST 10 MIN (UX0FF/4X9H/KW Nikolay xx KN45kj 178.92.207.67)
```

I list from the bottom up (increasing time) some comments:

06.47 – UX0FF (4 Hor. 9 el. Yagis and kW) announces CQ on 144.132, 1st period
06.47 – SM5DIC is monitoring the QRG of TK5JJ, and sends as report his decode of TK5JJ's call. For not invaliditating the qso, he does not publish the others call, only *****
06.48 – DK3WG (manager of many Russian stations) says hello to UA3PTW and proposes a Skype connection
06.48 – TK5JJ says hello to Gus (SM5DIC) and thanks for report
06.50 – RN6DJ announces CQ on (144.)139, DJ 1st period
06.50 – OE3FVU announces CQ on 144.121, 1st period
06.53 – TK5JJ has tuned the QRG of Giulio (IW3HVB) and says he is hearing him well, probably an indirect message meaning he is calling him
06.53 – IW3HVB announces he has a good trace at -23 level, but no decode, QRZ
06.54 – G6PHH stops cqing on (144.)143
06.54 – I thank IW3HVB Giulio for the qsl card just arrived

As you can see, the logger functions both as a chat, and for self spotting, so eventual other stations, interested in that call, country, or locator, can tune on his QRG and qso.
If the message is for everyone, it must be in English.
The display is updated every 90 seconds. The calls, that when registering added also their e-mail, appear in light blue, otherwise white. Clicking on a light blue call makes appear the e-mail form, already addressed, useful if you want to communicate with something more than a single line. If it is urgent, one sends the mail, and then puts on the logger the message "xxnnyy, you have mail".
For North American stations, after the name you find the initial of the USA state or the Canadian province, for the rest of the world you see only xx.
HB9Q Chat
99% of the messages on the N0UK logger are for the 2 m band.
Instead, the use of the HB9Q Chat is increasing on the other bands; there is a different page per band, from 50 MHz to 2.3 GHz.
Go to http://hb9q.ch/version2/index.php/loggedin-loggers, click "Create an account" and put in your data, then click "Register". You will receive a confirmation e-mail with an activation code. Follow instructions, then go to http://hb9q.ch/version2/, click on "Log in to EME loggers" (upper right corner), then log in with call and password, click "Sitemap" (4th choice in upper right corner), then click "EME loggers" and choose your band of interest.
For the 1296 band you get:

It is very similar to the other chat. I saved this image while writing this part, clearly it was not one of the more active moments, but I needed an image. With this I finish the series "Possibilities in VHF – EME", I hope to have induced some of you readers to try this fascinating and highly technological EME world.
73, Gio IK1UWL