

Belka 0.1-31 Mhz Allmode Receiver

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I heard about the Belka receiver a couple of months ago, when I saw in SWB that an Italian DXer had acquired one. Of course, I became very curious, and after getting more information via videos on Youtube and reviews on eHam.net, where Belka is praised and in many cases raised to the skies, I decided to get one of my own. Having now been the owner of this little radio for a few weeks, I can't help but join the chorus of praise. This little receiver delivers and performs at a level I've never experienced a portable receiver capable of. We are therefore talking about a full-fledged SDR receiver whose front panel is slightly larger than a credit card and whose volume is slightly smaller than a deck of cards! And the best of all: the price at the time of writing is no more than just over SEK 1,600!

Belka?

Belka is designed and constructed by Belarusian radio amateur Alex Buevsky EU1ME, who together with his wife Katerina has started the small company Belrig.by. Alex takes care of technology, support and product development and Katerina takes care of administration and finances. By the way, Belka is Russian/Belarusian and means «squirrel», not a bad name for this little crab. The first version of the receiver came a few years ago, and it then covered 3.5-31 MHz. In the later half of 2021 came the «Belka DX», an upgraded version that covers 1.5-31 MHz and is still available for purchase on eBay. However, it is no longer manufactured, as it has been replaced by the third generation Belka, which thus covers the entire frequency spectrum 0.1-31 MHz. The radio can be ordered from a dealer in Bulgaria, but the best and cheapest is to order directly from Alex and Katerina. It takes a little longer, but Katerina follows up the shipment all the way from start to finish and you are prompted to notify her when you have received your Belka. Shipping will not be expensive either, as the small package is sent as registered mail. Here in Norway, I could pick up the recommended shipment at the Post without having to pay any additional fees, but how it is in Sweden, where it is Postnord that takes care of all handling of shipments from abroad, I dare not comment on. The radio can be ordered with or without a built-in speaker. If you already have a Belka without it, it is possible to supplement it with a speaker module afterwards. I have the version without built-in speaker. In addition, the radio is delivered with an 80 cm telescopic whip antenna which is integrated with a BNC connector (male). Nothing more than that. You download the manual yourself in .pdf format. More about Belka and antennas later.

Specifications and some technical data

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|--------------------------------------|---|
| Dimensions: | 85 x 50 x 20 mm |
| Weight: | 125 gram |
| Frequency range: | 0.1-31 MHz |
| Sensitivity: | -138 dBm |
| Modulation types: | LSB, USB, CW, AM, AM «PseudoSync», Narrow FM |
| Selectivity: | SSB, AM, NFM: High cutoff can be adjusted between 2-4 kHz Low cutoff can be adjusted between 50-300 Hz CW: 500 Hz-1 kHz |
| AGC: | Delivered individually optimized for each mode of traffic/modulation type |
| Tuning steps | 10, 20, 50, 100 Hz and 1, 5, 9 och 50 kHz |
| Extern voltage source / charging: | 5-5.5 V via Micro-USB |
| Power consumption: | C:a 85 mA |
| Load current: | 700 mA |
| Operating time: | 10-15 hours (version with built-in speaker) |

Memories: Up to 27 hours with headphones and display backlight switched off
 I/Q-output: 36 cells
 Can be connected to PC with SDR software for waterfall/pan adapter function.

Using the Belka



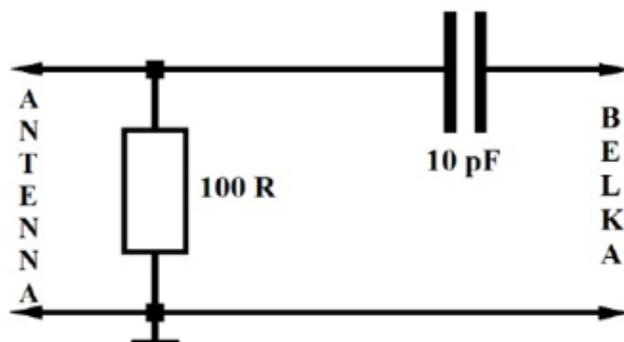
Some may be skeptical of menu-driven receivers, but don't be! Belka is incredibly easy and logical to use, and you're up and running after a learning curve of less than 10 minutes. The radio is easily operated using four buttons and the VFO knob, which is also a «button». Let's go through the most important and common features:

- VOL:** Press the button once and adjust to the desired volume with the VFO knob. The radio returns to normal display after 5 seconds. Press this button twice and you can adjust the sensitivity of the receiver (RF-Gain).
- MOD:** Press the button once and select traffic mode/mode by turning the VFO knob. Press once more to set High Cut-off with the VFO knob, then press a third time to set Low Cut-off. Press once more and the set values are stored and the display returns to normal display.
- MEM:** Here you retrieve frequencies from memory. The VOL button then gets a new function (Load) which means that the radio goes to the stored frequency shown on the display. How do you «browse» among stored frequencies then? Guessed right! With the VFO knob of course. If you instead want to store the frequency you are currently on, you press the MEM button, which here has been given the function (Save). Use the VFO knob to scroll to a free memory cell, otherwise the frequency previously stored at the current memory location will be overwritten. When either VOL (Load) or MEM (Save) is pressed, the display returns to normal display again.
- PWR:** Self-marking. Here you turn the radio on and off. The button is also used, in combination with the VFO knob, to select different variants of how you want the radio to be switched on, options for power saving (e.g. turning off the light in the display), timer and a few other things. Can't go deeper than this.
- VFO-knob:** Press the VFO knob once to select tuning steps. You can also hold it down while turning it, and then you tune the radio in large frequency jumps, depending on which tuning step you are currently using. A kind of «quick QSY» over larger frequency ranges.

It is not more difficult than that. You quickly learn to use the Belka, and you definitely don't have to sit with the manual in one hand and wade through countless menu hierarchies to make a simple setting or adjustment. It's just «honk and drive». However: if you connect your own speaker or headphones to the radio, it must be a device with a stereo plug! A mono plug risks short-circuiting and damaging the receiver's audio amplifier.

A little technology – Belka and antennas

In the very concise, but clear and easy-to-understand manual for Belka, it is pointed out that the receiver has a high impedance antenna input and that the front/end circuit is optimized for the 80cm telescopic whip antenna that is delivered with the radio. The Belka is very sensitive! I was surprised myself at what the receiver is able to perform on shortwave with only the telescopic antenna connected. Furthermore, it is recommended in the manual to connect a 1m counterweight/ground plane (counterpoise), with e.g. a crocodile clip to the ground side/outer casing of the BNC connector, which improves the sensitivity even further. This of course requires that you listen in a QRM-free environment, which nowadays and in our «civilized» society means outdoors and away from homes and all the QRM generators they contain. A rather unpleasant activity up here in the Nordics in the middle of winter. But yes, Belka impresses with just the telescopic antenna and a counterweight of 1m.



It is not recommended to connect our large antennas, which most often via baluns, un-uns or other impedance transformers are either 50 or 75 Ohm, directly to the Belka. If so, the little squirrel «bounces» straight up into the nearest pine top and hides. In short, the receiver gets too much signal to work with, and the result is that it overdrives. It can also be directly harmful to the receiver's front/end circuits to attempt such an exercise. Therefore, the manual recommends building the above small circuit, which partly adapts a 50 or 75 Ohm antenna to the receiver's high impedance input, partly attenuates the signal somewhat. I built the circuit before connecting the Belka to my big Super-KAZ loops, and it works. However, I thought that it dampened the signal a little too much, especially on medium wave - which is the band where we prefer to stay. Instead, I use a 10dB attenuator which is integrated into a BNC plug and which can easily be connected directly to the antenna input and then you connect your antenna coax to the other end of the attenuator. Very smooth, and it works great. Should the receiver still receive too much input signal, just adjust the sensitivity.

Do you remember how to do it? That's right, press the VOL button twice and adjust with the VFO knob. Simple as that! And, having said this - no, I have not yet found the slightest reason to use an additional preamp for the Belka. One such, in addition to the preamps that are connected to the respective feed point on my loops, is simply not needed.



It is also important to point out that the above is not a discussion of the receiver's large-signal characteristics. This is about the importance of connecting the receiver to an antenna that is properly matched to its input circuitry. If you do that, the Belka exhibits exceptionally good large-signal characteristics.

Listening with the Belka

One thing that struck me very early on, is that I quite immediately found the Belka to have a very pleasant audio and sound image. I experience the audio as crystal clear, even when I listen with narrow filters. The inherent noise in the receiver is almost non-existent, and the audio is powerful and full. I often listen with a filter where the High Cut-off is 2.7 kHz and the Low Cut-off is adjusted to 50 Hz. This gives a passband of 2.65 kHz. Many may think that it is a too narrow filter for pleasant listening, but I do not feel at all that the audio becomes «canned» in any way. Like many other things, this is a matter of taste, and you can set your filters pretty much any way you like, by choosing a High Cut-off from 2 to 4 kHz and a Low Cut-off from 50 to 300 Hz.

AGC is also subject to discussion, and here again it is a matter of taste. Belka has pre-set AGC time constants that are optimized for the mode you are currently using. LSB/USB has a time constant, CW has one, and AM has one - and so on. CW has the shortest AGC time constant, AM the «slowest». Consequently, LSB/USB is somewhere in between. Many people probably prefer to be able to adjust the AGC themselves, but for being fixed and preset time constants, they are well balanced in Belka. Personally, I find the AGC in SSB mode to be pleasant.

Listening to slightly stronger stations in AM mode is quite simply a joy. Lately Radio New Zealand International has been going very strong and nice here in the late afternoon on 7390 kHz. I have several times had fun listening in AM mode with 4 kHz High Cut-off and 50 Hz Low Cut-off, i.e. a passband of 3.95 kHz. The audio has been brilliant and very pleasant. Having said that, I haven't listened very much in AM «Pseudo-sync», simply because I prefer classic ECSS listening. CW works fine as expected. Narrow FM (NFM) I have not tried at all.

Belka compared to other receivers

Doing a side-by-side test between Belka and Perseus would be downright unfair. The Belka is intended as a portable radio, and should be both regarded and respected as such. But of course I have tested Belka against Perseus, with the same antennas via a small active antenna splitter. The conclusion was that Belka stands up really well against Perseus. Everything that can be heard with Perseus is also heard with Belka. The difference is that Perseus, with the help of advanced software such as Jaguar and SDR console, is able to get better readability on signals that are affected by splash and other QRM. That is the main difference and I think we draw the line there for further comparisons between these two.

In order to make a slightly fairer test, I have compared the Belka against my Sony ICF-2001D (ICF-2010), which I have until now considered my absolute best portable receiver. The Sony has all the KIWA modifications, filters that are better than the original filters and some other "goodies", and it's still a very good receiver. Despite all this, it turned out to be a terribly unfair test, and that's not really surprising. The ICF-2001D, which is a construction/design from 1985, had to find itself being completely overtaken by Belka, which is an SDR receiver from the 2020s. On the Sony, for example, WWKB can be heard on 1520 kHz, but more or less drowned in splash from Radio Panj on 1521, also in LSB or in AM-Sync LSB. Belka hears WWKB with full readability and nice audio. And so it continues. Everything is better in the Belka. Audio, selectivity, sensitivity. All. And then, after all, the ICF-2001D is known for its performance, which is still considered respectable.

The main conclusion I have managed to draw from my extremely unscientific tests, is that the Belka cannot or even compares to other receivers. Yes, it is slightly overshadowed by Perseus, but not by much. As a receiver, Belka stands up very well against Perseus. After all, Perseus, and above all the

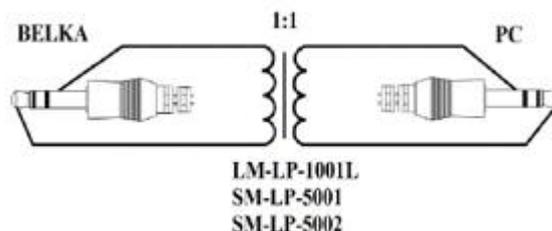
software that is used together with Perseus, has an arsenal of «bells and whistles» that the Belka naturally does not have. As a portable receiver, I consider the Belka to be totally superior to anything else I have previously listened to or with. After Belka's run over the ICF-2001D, I realized that a test between Belka and other portable radios from eg Tecsun, CC Crane, Etón and others would just be ridiculous. To even compare Alex's creation to a cheap Chinese radio would be nothing short of disrespectful!



Other possibilities with the Belka

As previously mentioned, the Belka is equipped with an I/Q output that allows the receiver to be connected to a PC with SDR software. You can then get a pan adapter and/or waterfall function. One of the softwares that support this are HSDR. I haven't tested this, so I won't say too much about it. However, it opens up thoughts about a special version of Jaguar in which you

can process and handle the I/Q signal from Belka. Without extensive modifications, it is probably not possible to control the receiver from an SDR software. Tuning, and some other things can still be done directly on the radio. If one intends to connect Belka's I/Q output to a PC, it is important to do so via a small galvanic isolator, such as a Bourns LM-LP-1001L, SM-LP-5001 or 5002.



Summary

Well, what can one say? Having now played with and tested the Belka for some time, sometimes in quite demanding situations, I can only say that I am impressed with what this receiver is capable of. A third-generation Belka would be the Ultralight DXer's dream, even though it lacks a built-in ferrite antenna. Any small loops, ferrites and other antenna types must therefore be connected to the antenna input and not inductively. I've seen that some UL-DXers have already started building small tunable ferrite loops to fit the Belka. The possibilities for experimentation are thus endless.

For those of us who occasionally engage in «Car-DX», the Belka seems to be optimal, and I am impatiently waiting for a little better weather and maybe a few more degrees of heat in the air, so that I can bring the Belka, pull out a couple of three hundred meters BOG at some beach here on Jæren to see what can be unearthed in a really, really QRM-free environment! As they say in English, «it's a keeper»!

It is mentioned in the manual that the display can cause interference on medium wave and long wave. I haven't noticed anything like that at all. It is possible that I can hear something small on individual frequencies if I listen without an antenna connected, but when the radio is connected to the antenna, the possible interference is still drowned in the normal band noise. Thus a non-issue.

It must also be emphasized that the Belka is a very robust receiver. The appliance box is made in aluminum and the radio feels very solid when you hold it in your hand. It really "screams" to be taken outdoors. I have already tested that the Belka can withstand a shock, when I accidentally dropped it on the floor the other day. Not a scratch on the Belka, but a small mark in the parquet. Buttons and VFO knob feel very firm, without «rattle». In short, the Belka is a very solid construction.

If you order the Belka directly from Alex and Katerina, via their website belrig.by, a Belka costs 410 Belarusian rubles (approx. cheap. A Belka with a built-in speaker costs 435 Belarusian rubles, and if you already have a speakerless Belka and wish to add a speaker module, it costs 50 Belarusian rubles.

After a visit to belrig.by very recently, I see that Alex is out of stock receivers, but do not despair! As of February 1, you can pre-order Belka again.

- Belkas Website: www.belrig.by For ordering. Here you can download the manual.
Reviews at eHam: www.eham.net/reviews/view-product?id=14803 Here it is mainly the previous version «Belka DX» that is reviewed, but the latest reviews apply to the latest version.
- The SWLing Post: <https://swling.com/blog/2022/10/13dka-reviews-the-new-2022-belka-generation-3-general-coverage-receiver/> Good review of the latest, third-generation Belkan.
Youtube: www.youtube.com Search for «Belka receiver». Tons of videos.
- KE2YK: <https://ke2yk.com/2022/08/16/the-hottest-pocket-sized-hf-receiver/> KE2YK's nice review of the previous version «Belka DX». Also includes an almost 10 minute long video. Very nice!