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by Lukas Fritz and Lorenz Berker

Since the last test by DAV security research in 2017/18, a few new devices have come onto the market, others have been revised with software updates, and some have also disappeared. In order to find out to what extent the individual models differ and what advantages and disadvantages each individual device offers the user, DAV Security Research tested the current avalanche transceivers.

The procedure in the test and in the evaluation is in the section *test criteria* explain exactly. In the *summary table* the devices are shown in comparison with regard to various test criteria. Each individual criterion was rated in five classes, ranging from very good to acceptable to poor. Both *device characteristics* You can find detailed information, test results and tips for users on the individual devices. The table to the *technical details* provides an overview of the device data and special functions.

The test itself took place in March 2022. In order to achieve similar conditions for all test devices, each criterion was tested with all devices in a row. The devices were tested both with regard to their behavior in the search phases (signal search, general search, fine search) and with regard to their performance characteristics in the event of a multiple burial (MPV). A uniform evaluation of these main criteria can be found in the evaluation table.

 Deutscher Alpenverein Sicherheitsforschung LVS-Test 2022		Arva Evo 5 (Vers. 1.8.1)	Arva Neo BT Pro (Vers. 1.1)	Mammut Barryvox (Vers. 3.4)	Mammut Barryvox S (Vers. 3.4)	BCA Tracker4 (Vers. 6.4)	Pieps Pro BT/ BD Guide BT (Vers. 2.2)	Pieps Powder BT/ BD Recon BT (Vers. 2.2)	Pieps Micro Race BT (Vers. 3.2)	Black Diamond Recon LT (Vers. 1.2)	Ortovox Direct Voice (Testvers. 2.0)
Reichweite (stabiler Empfang)	x	46m	62m	57m	55m	42m	49m	50m	50m	43m	32m
	y	28m	39m	36m	38m	24m	38m	38m	36m	33m	22m
	z	17m	27m	26m	28m	9m	27m	27m	24m	23m	16m
Grobsuche	An waagrechten Sender 										
	An senkrechten Sender 										
Feinsuche	Mittlere Verschüttung 										
	Tiefe Verschüttung 										
	Unterstützung 										
MPV	Erkennen 										
	Markieren & Verfolgen 										

	sehr gut
	gut
	befriedigend
	ausreichend
	mangelhaft

Both the selection of the test scenarios and the evaluations were carried out with a focus on an objective but practical perspective. In addition to the evaluation criteria of the search phases and scenarios, we also checked the group check function - which can now be described as a standard not only for group leaders and mountain guides. Finally, in order to take a look at the handling of the devices, intuitive operation, carrying system and real additional functions, we have included aspects of usability in the device description.

All models in the test work with three-antenna technology. It is considered state-of-the-art and has completely penetrated the market with 96 percent of tourers (see "[Prepared for the worst case scenario](#)" in [Panorama 1/22](#)). Most of the current avalanche transceivers can also be updated. A sensible procedure, since manufacturers of modern devices can use the software to tweak a few small screws that can then have a direct impact on the performance of the devices. It is worth checking and updating the device regularly to ensure that the software is up-to-date. In the meantime, a few manufacturers also offer mobile applications of varying scope, which can be used, for example, to check or even update the software status. In addition, all manufacturers offer an extension of the warranty period when registering on their websites. Anyone who already owns an older three-antenna device can best have it checked by the manufacturer for errors in the summer (maintenance intervals in the technical table). Some manufacturers offer this service for free, some charge a fee for it. Tour leaders and sections with equipment rental in particular should make use of this offer at regular intervals!

For a long time, some manufacturers have been offering one or two cheaper, "slimmed down" versions in addition to their "top device". These devices usually have fewer special functions or more limited customization options (acoustics, display, etc.). They are aimed in particular at occasional winter sports enthusiasts who want to spend a little less or who do not have the necessary exercise routine to be able to confidently use the additional functions of the top equipment even in an emergency.

Despite all the technical refinements, one thing must be clear: every device is only as good as the person using it. And even more important than the obligatory command of one's own avalanche transceiver and the application of the most efficient situation-dependent search strategy (depending on e.g. size of the avalanche; number of searchers/shovelers in comparison to the buried subjects and the burial depth) is one of the conditions, one's own skills and Tour selection adapted to experience and adequate risk management on tour. Because: the best life insurance is not getting caught in an avalanche and being buried!

Avalanche size, search strip width

Typical avalanche sizes that affect recreational athletes range from around 4,000 to 10,000 square meters (Genswein & Eide 2009). If you want to derive a typical avalanche search field, i.e. the primary search area below the so-called vanishing point, then this results in a size of around 50x50 meters. Most manufacturers specify a search strip width of 50 meters or more for their devices. What sounds easy on paper quickly turns out to be a difficult undertaking in reality: people can only reasonably estimate horizontal distances and lose track of things more easily if the search strips are too large. The German training alpine sports associations therefore recommend selecting the search strip width based on the local conditions and the available resources ((wo-)manpower). At least 20 meters and if there are few searchers or a very large primary search area, this can be extended up to the manufacturer's specification. Do you know the recommended search strip width of your device straight away? And do you know what this distance means in nature?

Burial depths, duration and multi-person burial

Based on studies of cases from Switzerland, the median burial depth is 80 centimeters (Haegeli et al. 2011) and is valid throughout the Alps. This value is lower for the completely buried survivors (50 cm) and higher for the deceased (100 cm) (Rauch et al. 2020).

In avalanche accidents, shallower and deeper burials occur equally. Because weaknesses regarding the exact position of the transmitter below the receiving device and the presence of a larger area of the minimum display value become more apparent in the case of deep burials, we also tested these in the fine search. However, they represent an extreme case in an already extreme situation. The fine search with the avalanche transceiver is less of a problem with burial depths of more than 1.5 meters!

People who were dug up within the first 15 minutes after being buried survived an avalanche with total burial by 85 or 90 percent (Procter et al. 2016). From field trials *Genswein & Eide 2009* it can be seen that in an average search field it takes four minutes for the search phases from signal search to fine search (50 percent of which is fine search!) to be completed. Another 3.5 minutes are added by probing. So there is not much time left for collecting & organizing as well as digging out and salvaging! It's good if you're familiar with your own avalanche transceiver and it works flawlessly during the search phases.

The multi-person burial (MPV) remains a central part of the test. *Schweizer & Techel 2017* stated that 27 percent of fatal accidents in Switzerland over the past twenty years involved more than one person being completely buried. The biggest problem on the technical side is MPV in a confined space (Genswein & Harvey 2002). That is still valid today. In training, various scenarios should be practiced and mastered from a certain level of competence (advanced users to multipliers) - locating and digging out (!) one or two transmitters within the survival curve is, however, the most important thing for the broad masses.

Literature:

Genswein, M. & Eide, R. (2009): Efficiency of Companion Rescue with Minimal Training. In: Mountain and Climbing 1/09: 40-45.

Genswein M & Harvey S (2002) Statistical Analyzes on Multiple Burial Situations and Search Strategies for Multiple Burials.

Haegeli P, Falk M, Brugger H, Etter HJ, & Boyd J (2011): Comparison of avalanche survival patterns in Canada and Switzerland. In: Canadian Medical Association Journal 183(7): 789-795.

ICAR (2009): Recommendation REC L 0009 of the Commission for Avalanche Rescue of September 24, 2009 on the terms that describe the search phases in an avalanche rescue.

Procter, E., Strapazzon, G., Dal Cappello, T., Zweifel, B., Würtele, A., Renner, A., ... & Brugger, H. (2016). Burial duration, depth and air pocket explain avalanche survival patterns in Austria and Switzerland. *resuscitation*, 105, 173-176.

Rauch S, Koppenberg J, Josi D et al. (2022): Avalanche survival depends on the time of day of the accident: A retrospective observational study. In: *Resuscitation* 174: 47-52.

Schweizer, J. & Techel, F. (2017): Avalanche accidents in the Swiss Alps. Facts & figures from the last 20 years. In: Mountain and Climbing (98): 44-48.

Test criteria avalanche transceiver test 2022

According to the recommendation of the International Commission for Alpine Rescue (IKAR) for search phases, a distinction is made between signal search, general search, detailed search and point search (IKAR 2009). Although the time required for the point search depends on the quality of the fine search, it is not directly influenced by the device and does not play a role in connection with the evaluation of the performance of avalanche transceivers.

The avalanche transceiver test is therefore divided into the individual search phases signal, general and fine search. In addition, the solving of multi-person burials was checked. Both the test scenarios and the evaluation criteria were chosen with the focus on an objective, practical perspective. In addition to the evaluation criteria, the group check function was checked and a detailed look at the usability of the devices was taken.

signal search

When searching for a signal, the reception range of an avalanche transceiver plays an important role. The ranges can be divided into three coupling positions: coaxial or x-antenna, y-antenna and z-antenna coupling position. The coaxial position is the best case for the devices, a vertical transmitter with the receiver rotated by 90° is the worst case, which is why the three ranges were determined in the test (Fig. 1). The values given in the overview table are the ranges averaged over three measurements in which a constant and stable signal was present. Earlier single pulses do not increase the stable reception range. Ultimately, however, the range must always be seen in connection with the quality of the general search. Early reception is only helpful if the signal can then be followed immediately. By moving in the search field, the relative position between the searching and the transmitting avalanche transceiver changes constantly. In practice, realistically speaking, neither the absolute best nor the worst coupling position occurs. However, the measured values are a good indicator of a potential reception area. Early reception makes it easier to find your way around the search field and helps you get closer to the transmitter.

From a technical point of view, long ranges often come at the expense of stable signal reception. One challenge for manufacturers is to couple the existing technology or processors (hardware) with good signal processing (software) so that signals can be recognized and verified from a great distance and also remain stable. This already works well with some devices, with others the blurred area is somewhat larger.

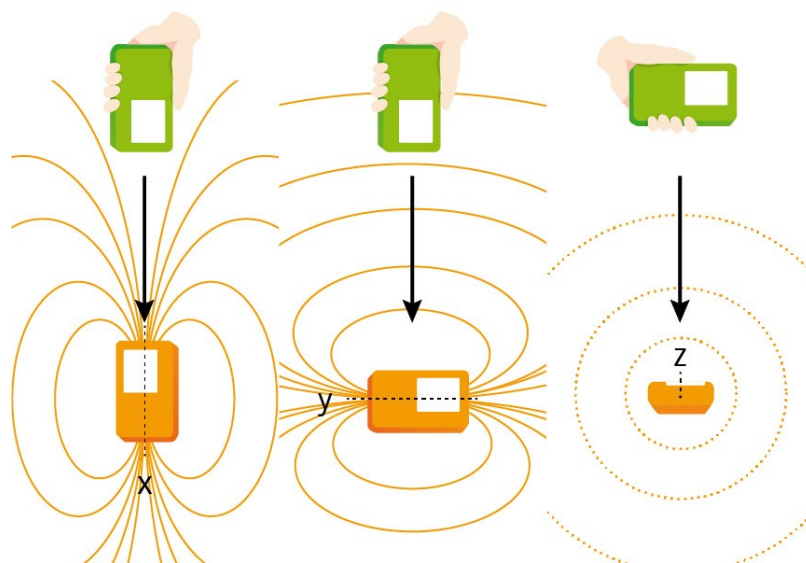


Figure 1- Signal search: range determination in the three axes

Background information search strips:

Since 2009 there has been an ICAR recommendation for the device-specific specification of the search strip width. The idea behind this is to select the width of the search strip in such a way that, for the most likely burial scenarios, it represents the optimal balance between a short walking distance and the probability of reception. This means that most avalanche victims will be found faster when using the specified search strip width when searching for a signal. At the same time, it is accepted here that in unfavorable, but less likely scenarios, buried persons can be overlooked in the first search for a signal and may therefore have to be searched for.

According to the current recommendation of the German alpine sports associations, the recommended standard search strip width is at least 20 meters. In the case of large avalanches and few searchers, it makes sense to expand this to a maximum of the search strip width recommended by the manufacturer. Experienced people know the search strip width of the manufacturer of their device, have strategies at hand if a first signal search does not detect all buried subjects and know about the device-specific range reduction after marking a transmitter so that they can take this into account for any further search that may be necessary.

coarse search

This search phase begins with the first reception and ends when you have approached to within about five meters of the buried transmitter.

The traceability of the transmission signal along the field line is evaluated with a horizontal and vertical transmission antenna (Fig. 2).

It is recommended if devices lead to the transmitters with a large offset - but only if this can be carried out directly with the help of a stable signal and directional arrow. A signal verification - i.e. a clear demarcation between signal reception and no signal reception - is advantageous for this. An unstable signal in the individual limit range of the devices has a disadvantageous effect on the search process, since misleading signals such as incorrect directions and signal losses may leave the searcher at a loss.

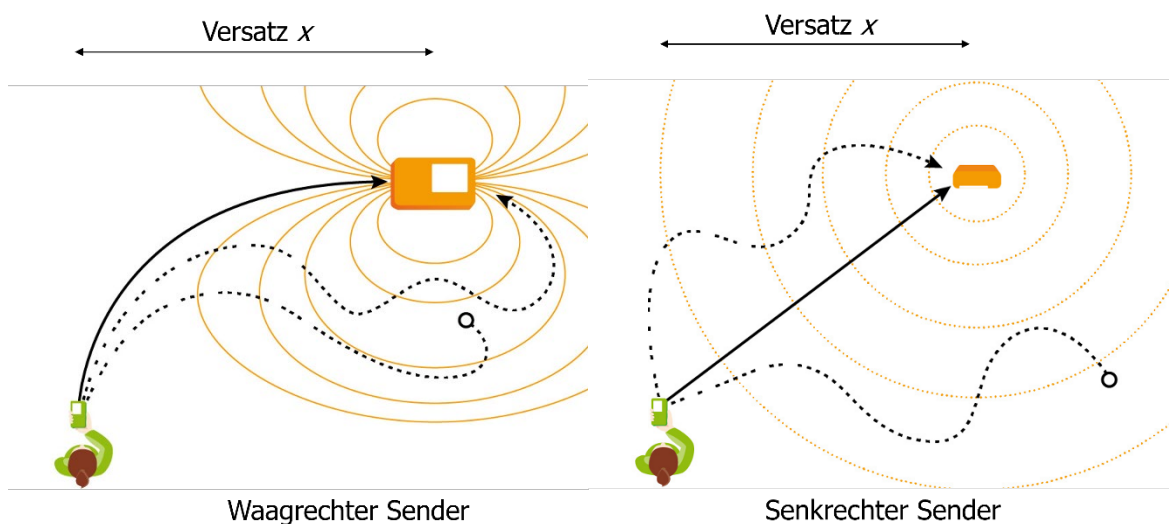


Figure 2 - coarse search: Approaching a horizontal (left) and vertical (right) transmitter with a lateral offset x . Qualitative examples of good lead-in (solid line) and poor lead-in in snaking lines and with signal losses (dashed line).

At the beginning, the rough search is tested with a lateral offset of 25 meters. If you cannot approach reliably with an avalanche transceiver with this lateral offset, the offset is reduced in 5-meter increments in the next run. The aim is to find an offset where the transmitter can be found reliably. With some devices, runs are also possible with a horizontal transmitter and 30 meters offset. The searcher does not know the position of the transmitter and the sides are alternated randomly.

Criteria:

An assessment is made of the lateral offset to the transmitter up to which the quality criteria for a reliable approach are fully met and up to which point they are only partially met.

The quality criteria are fully met if

- the transmitter is recognized
- a clear and unambiguous directional information is given as well as
- the approach is quick and direct (arrow + display values stable).

The quality criteria are partially met if

- the transmitter is recognized
- the approximation is possible, however
- small jumps in the direction arrow/display values occur.

The rating summarized:

very good	If the quality criteria are fully met at 25m offset.
Well	if with an offset of 20m the quality criteria are fully met and with an offset of 25m partially.
acceptable	if with an offset of 15m the quality criteria are fully met and with an offset of 20m partially.
problematic	If at 15m offset the quality criteria are partially met.
inadequate	If at 10m offset the quality criteria are partially met.

In the rough search, clear differences in the quality of the avalanche transceivers become apparent. Good devices are characterized by constantly decreasing, non-sudden display values and a reliable indication of the direction from the point of initial reception. A clear directional guidance enables a particularly effective approach. Differences between different devices are particularly evident in the long range of the coarse search with a distance display of over 20-25 meters and generally with a vertical transmitter. Apart from a few device-specific peculiarities, the devices usually work reliably at close range.

fine search

After the coarse search comes the fine search. In the close-up range (from display values smaller than 3-5 meters) the point with the lowest display value, the so-called minimum distance, is determined. First proceed in a straight line until the display value rises again; then back to the point with the lowest value. Here, at the right angle, no longer turning the device, cross out to the left and right laterally, and thus also find the lowest value on the y-axis. Start probing there.

The devices are tested in the fine search in two scenarios and several variants. On the one hand with a burial depth of 0.8 meters and a horizontal transmitter position, which corresponds to the value of a typical burial. Secondly, in the case of a deep burial (1.5 and 2.5 meters) both with a vertical and with a horizontal transmitting antenna (Fig. 3).

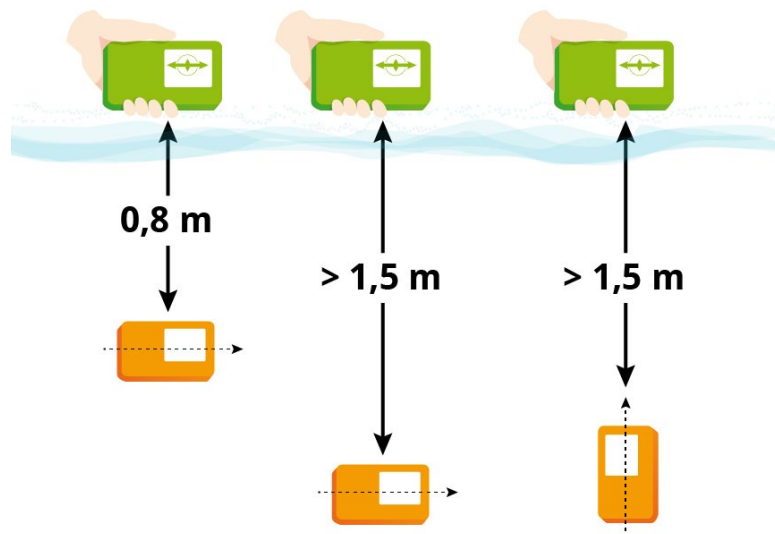


Figure 3 - Fine search: Determination of the area with the smallest display value (distance minimum) by ticking at average deep and (very) deep burial

In the various scenarios with different burial depths, the devices are compared with regard to the following criteria:

- Position of the minimum display value below the transmitter
- Size of the area in which the smallest display value (minimum) is displayed
- Deviation of the real burial depth from the displayed value
- Switch to fine search mode
- Stability of the display values when turning the device

In summary, an assessment is made for an average burial depth (0.8 m) and a deep burial (>1.5 m).

In addition, the devices are evaluated with regard to their functions that support the fine search. We consider the following criteria:

- Acoustic and visual aids as well as facilitating the approach to the minimum value
- Speed and readability of the display values in a new position
- Supporting functions or symbols in approach and crossing out
- Guide the device to the ground in connection with the carrying system

Danger!

In this search phase most mistakes are made and most time is lost. The most commonly observed errors are:

- the device is not guided down to the snow surface
- the device is moved too fast
- the device is not guided in a straight line
- the first straight line when crossing is not made long or wide enough or it is searched too often

In this phase in particular, each searcher must precisely adhere to the optimal working speed and the position of the device used. Training is particularly important here!

Multiple Person Burial (MPV):

First of all, the fact that more than one person is buried is referred to as a multi-person burial. This raises questions about the efficient use of the resources available to the rescuers (primarily the number of searchers and their competence) as well as the technical limitations of the avalanche transceivers. While various strategies used to have to be used in order to log out of the primary signal and into the next, all devices in the field have a so-called marking function with one special exception.

The idea behind it: If there are several rescuers, the search can be continued after the first minimum distance has been located, while others probe and dig up the first person located. This usually saves time and increases the chances of survival for other victims! In the test, this search phase is the most complex evaluation category. Signals can overlap and the processor of the searching device may need some time before another signal is recognized as independent. Under certain circumstances, the marking of the previous stations can also be canceled again. Therefore, the devices are tested in three different scenarios and with several repetitions.

At the **first scenario** two transmitters can be found at a distance of 90 meters. The signals from the two transmitters do not overlap. The question is whether the second station can be found after the first has been marked. In the past, there were devices that suppressed all other transmitters that came into the reception area when they were marked. In the test, all devices recognize the second transmitter (Fig. 4).

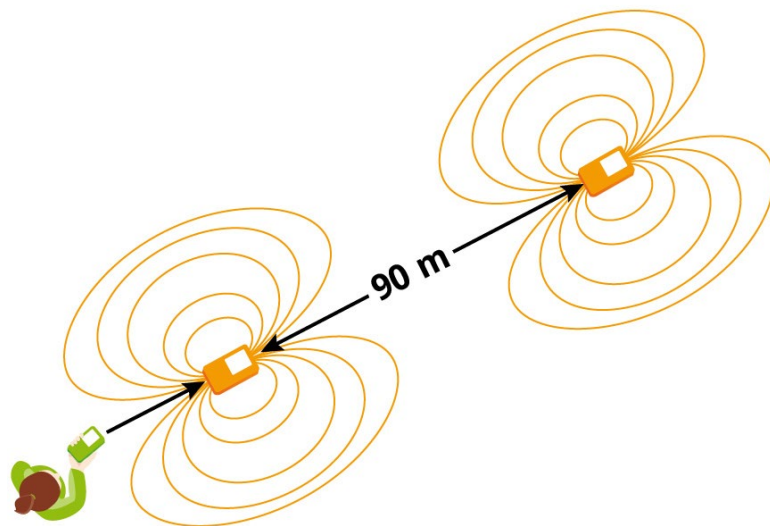


Figure 4: MPV scenario 1 - two non-overlapping transmitters

in the **second scenario**—the most likely MPV scenario in practice - the signals from two transmitters are superimposed. One is in the coaxial antenna coupling position in the path of the person searching, the second transmitter in the y-antenna coupling position 15 meters behind it. Here it is noted when the second device is discovered by the person searching and how direct the lead is (Fig. 5).

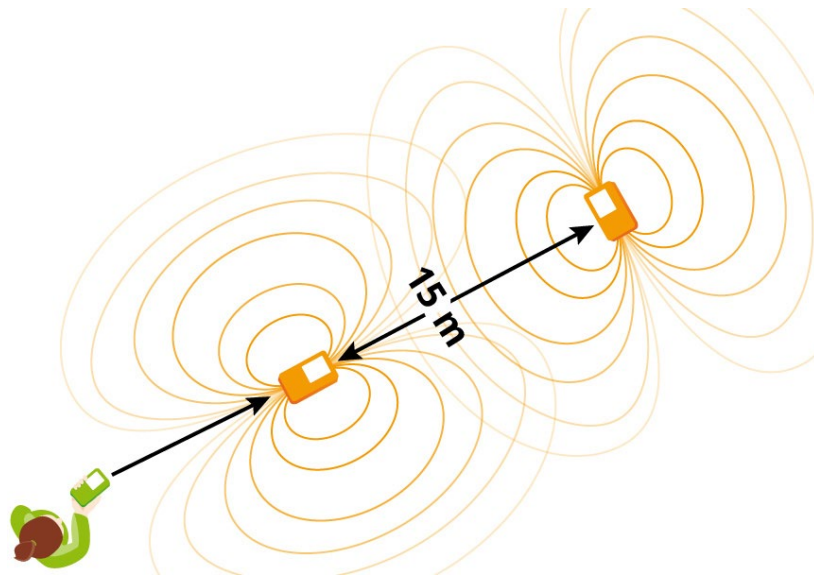


Figure 5: MPV Scenario 2 - two overlapping transmitters

in the **third scenario** three transmitters that are close together and therefore overlap must be recognized, found and marked. Two transmitters are within a radius of two meters and one is about seven meters away from the others. The devices are covered and the location is not apparent to those searching (Fig. 6).

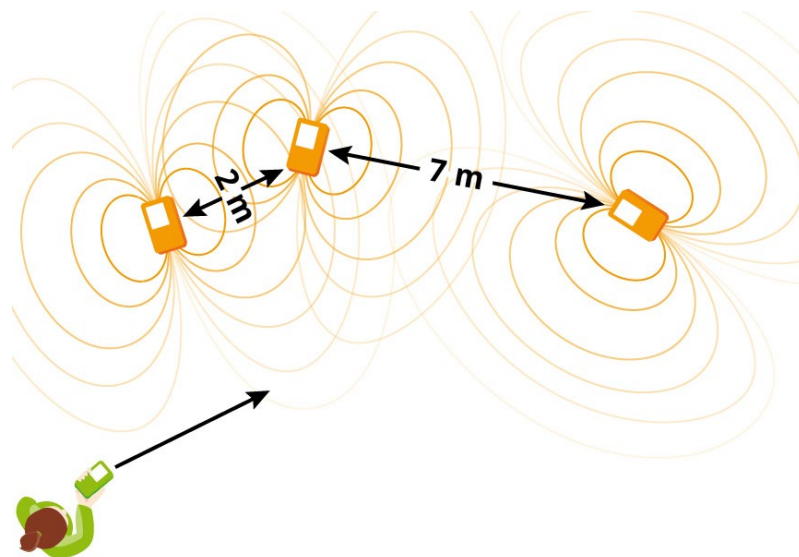


Figure 6: MPV Scenario 3 - three overlapping transmitters

In the case of multiple burials, it is evaluated how reliable others are **devices detected** (Fig. 7). On the other hand, whether and in what form the searching avalanche transceiver displays information on the number of receiving transmitters, distance and direction to the strongest signal after marking and at what time all transmitters are displayed in the receiving area of the device.

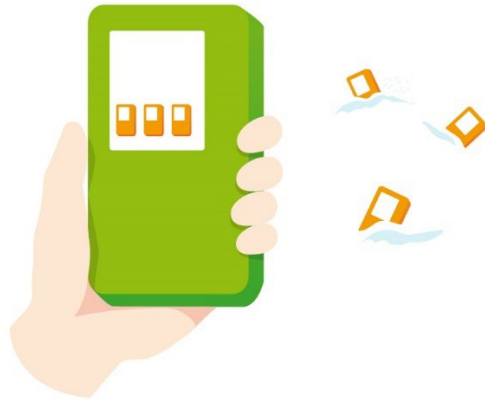


Figure 7: Evaluation criterion for detecting an MPV

The second big point is the real thing **Solve** (Marking & Tracking) of a multi-person burial (Fig. 8). It is about

- whether the hiding (marking) of channels found works quickly and is permanent,
- whether direct tracking to the transmitter is possible, and
- how quickly and reliably the device works overall in the situation (impression).



Figure 8: Evaluation criterion solving (tagging & tracking) of MPV

All in all, solving a complex multi-person burial is certainly the greatest technical challenge for an avalanche transceiver. However, the function should not be overestimated, as complex multi-person burials are relatively rare. If it does happen, it is reassuring to know that your own device can reliably recognize and mark several transmitters and that you know what to do yourself.

group check

Since the group check is standard at the beginning of each tour, it is an important function. It should be easy to activate, be able to clearly distinguish between transmitters and reliably display errors. In order to examine the function, we complete a group check course with the devices.

- The first task is a correctly performed check of two transmitters at a distance of two meters in order to test the function when handled correctly.
- The second task is two transmitters only one meter apart. In practice, the required distances (between two and five meters depending on the manufacturer) are not always maintained. Can the transmitters be clearly distinguished or is there a risk of confusion? Is it clearly recognizable when one of the two devices is not transmitting? Is there an error message that the transmitters are too close together?
- The third task is a transmitter that transmits at 457.1 kHz – i.e. outside the standard frequency. Does the device show an error message? If yes, how detailed is it?
- The last task is a transmitter that transmits at the limit of the norm with a period of 1300 ms. Does the device show the deviation or not?

The most important point for the practical test carried out is that the transmitters can be clearly distinguished. The greatest danger is that someone forgets to switch on their avalanche transceiver at all. This application error must be easily and clearly recognizable in a group check. Distinction is considered to be unequivocal if there is feedback via a display value or an acoustic signal in the close range that the device just checked is also sending the received signal.

The device error tasks determine whether the device detects the error and makes it visible. Special features of the devices and observations worth mentioning are listed in the device descriptions.

usability

The tested hard facts of the devices are the basis for a successful search. Fortunately, very few of us ever find ourselves in the situation of having to look for someone in an emergency. However, how practical, intuitive and comfortable is the operation of the device in everyday use? To do this, we checked various aspects of usability for each of the tested devices:

- Usability of the switches with gloves, switch geometry and handling
- Design & functionality of the carrying system
- Additional functions
- Battery and update management

We have added the most important abnormalities or useful functions to the respective device description.

device characteristics

Arva Evo 5	13
Arva Neo BT Pro	15
BCA trackers 4	17
mammoth Barryvox	19
mammoth Barryvox S	21
beep Per Bt/BlackDiamondGuide B.T	23
beep Powder BT/BlackDiamondRecon BT	25
beep Micro Race BT	27
BlackDiamond Recon LT	29
Ortovox Direct Voice	31

Arva Evo 5 (Version 1.8.1)

The successor to the Evo 4 is a simple and lightweight avalanche transceiver from the French manufacturer Arva. Even if it is a slight improvement over its predecessor, it still has some not insignificant weaknesses.



Signal search:

In the best coupling position, stable reception could be achieved at a good 46m. With a range of 28m in the y-position and only 17.5m in the worst coupling position, the performance drops off rapidly there. With a horizontal (x,y) transmitter, the considerable difference between

First reception and stable signal of 17 and 11m on average. Nevertheless: In all coupling layers a significant increase compared to the predecessor Evo4. In the case of surrounding interference signals, this is displayed and the recommended search strip width is reduced from 50m to 20m.

coarse search:

Horizontal transmitter: Vertical transmitter:

In the rough search, the Evo 5 still has some room for improvement. With a horizontal transmitter, the device can still be rated as "acceptable", but with the vertical transmitter, the introduction was not without problems even with a 10m offset and is therefore rated as "poor". The approach in the border area was characterized by wavy lines and signal losses.

fine search:

Average burial depth: Depth VST: Search support:

The Evo 5 has two minima in all scenarios, which are however less than half a meter away from the actual minimum, which can therefore be probed in practice; it also reacts relatively sensitively to rotary movements with distance jumps of up to 0.5 m in the deep burial scenario, which is why you should aim for as straight a crossing as possible without turning the device around its own axis. Ease of use is good. An acoustic and optical aid supports the transition to the fine search mode or in this itself. The display values are stable, the computing speed of the chip allows a quick procedure.

Multiple Burial:

Recognize: Solve:

If there were two transmitters that were further apart, the second was only recognized after the first had been selected! As far as tagging and following other channels in closely spaced channels is concerned, the result was once hui, once ugh. One has the impression that if the device has a signal once in a run, the isolation of the transmitters also works excellently. If this is not the case, however, the device leaves the person searching rather at a loss. In the assessment of the MPV, recognition can therefore be classified as just about acceptable, marking and tracking as acceptable.

Group check function:

Pleasant: In the group check mode, which can be activated intuitively, the searching device can be brought very close to the one to be checked. If an error occurs, the audio frequency changes briefly on the device. Small distances between two transmitters were not displayed. The deviation in frequency was detected and communicated acoustically and visually.

Usability:

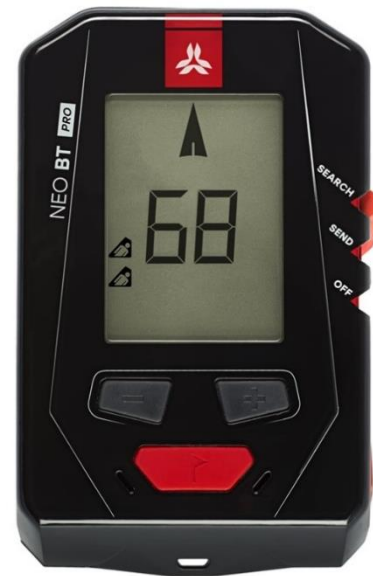
The low weight and the handy size of the device are positive. The toggle switch, which has to be pushed with quite a lot of force, is less pleasing, as is the somewhat small lock button, which is difficult to impossible to operate with gloves. In the field, the Evo5 is the only one that comes standard without its own carrying system (optionally available); Leaving it out and stowing it in your trouser pocket is a good idea due to the small dimensions and thanks to the enclosed strap (to tie around the stomach as a belt). When switching off, a warning tone sounds and it must also be confirmed with the marking button. A security hurdle, but in practice it happens, especially in practice scenarios, that the device continues to transmit quite invisibly (slide switch to Off).

Arva Neo BT Pro (software 1.1)

For its new Pro model Neo BT Pro, ARVA specifies a remarkable 80m search strip width. With an analog sound mode and other features, the French manufacturer classifies it as a professional device.

Signal search:

In the best coupling position, the device actually has the longest range in the field with an average of 62.5m. The first, unstable pulses were received a few meters earlier. The mean values for the y and z coupling position are 39 and 27 m, respectively. In the event of interference signals, this is displayed on the screen and the recommended search strip width is reduced to 30m.



coarse search:

Horizontal transmitter: Vertical transmitter:

Due to the long range in a good coupling position and solid lead-in, the Neo Pro BT works very well with a horizontal transmitter. On the other hand, the device was only acceptable when the transmitter was vertical. There, an approach was only possible with a lateral offset of 15m without problems and with 20m with small restrictions. The detected abrupt drop in display value 14 in the fine search is a shortcoming, here it can happen that the target (transmitting device) is exceeded when moving quickly.

fine search:

Average burial depth: Depth VST: Search support:

The device switched to fine search mode when the displayed values were 3m (measured distance of 2.6m). Small jumps occurred when turning the device in fine search. If the burial is deep and the transmitter is vertical, the device shows the minimum display value within a fairly large radius of 0.9 m. Overall, the Neo BT Pro performs very well in the fine search with a burial depth of 0.8 m and with a good burial depth. The search support is also good due to the quickly displayed and acoustically graded values.

Multiple Burial:

Recognize: Solve:

In the case of multiple burials, the device performed well overall, whereby in the scenario with the three devices lying close together, marking and tracking was very possible and recognizing other devices after the first transmitter was good.

Group check function:

Switching on the group check function is quite intuitive thanks to the flashing symbol. The group check requires a distance of less than one meter between the searching and transmitting device. The distance values to the transmitter are displayed quickly, the audio frequency

in the group check changes compared to the conventional pulse tone and thus facilitates the assignment. An error message was displayed for the transmitter outside the standard frequency and the distance between two transmitters to be checked was also displayed. It is also positive that the group check can still be activated up to 20 minutes after switching on by pressing a key combination.

Usability:

All the buttons on the device are large enough for thick fingers or those wearing gloves to be able to use them straight away. The existing + and - buttons are intended for the analog search mode and changing the station in MPV mode. Switching on the Neo Pro takes the longest of the entire field, but switching it off is pleasantly counted down. The case is made entirely of hard plastic, and there is no rubber on the edge. There is a bit too much strap material for adjusting the size of the carrying system. Power is supplied by 3xAAA batteries either alkaline or lithium. The battery status indicator did not seem to be very constant during our test and dropped quite quickly. Arva also announced an app that can be used to connect to the Neo Pro BT via Bluetooth, to update and configure the device. However, this was not available at the time of our test.

BCA Tracker 4 (Software 6.4)

The new generation of the tracker series remains true to its line. The unique selling point is above all the red LED display, which makes a backlight obsolete. The strengths are the fast signal processing, but it shows weaknesses when finding vertical transmitters.



Signal search:

With the Tracker4, the average distance for a stable first signal (x/y/z position) is 42.5/24/9m. The device is therefore very sensitive to the influence of the coupling position. The reduction of the y and z position to the x position is 44% and 79%, respectively. Interesting: while the transmitter is vertical the Tracker4 only received stable at 9m in the worst coupling position, the range increased when turning the device close to the y-values, which indicates a strongly elliptical reception area. From our point of view, it can therefore be advisable to pan the device as with the older 1- or 2-antenna transceivers while searching for a signal.

coarse search:

Horizontal transmitter: Vertical transmitter:

The Tracker4 features a fast display and a distinctive tone. In the long range, the coarse search was characterized by short signal losses and distance jumps in both scenarios. At close range, the introduction was then without any problems. It was possible to find the transmitter with a horizontal transmitter at a displacement of 25m with slight jumps, but with a vertical transmitter only at 15m.

fine search:

Average burial depth: Depth VST: Search support:

In the fine search, the Tracker4 performed very well for medium burial depths and good for deep burial scenarios. In all scenarios, the device displays a single minimum that is within a radius of only 25 cm from the point directly above the transmitter. Small jumps in distance were only displayed when rotating the device. The displayed value is slightly higher than the measured distance, so the device only does not switch to fine search mode at all if it is more than 1.6m above the transmitter - the directional arrow that is still present can then be misleading for the user. Positive are the displayed values that are displayed quickly, which enable a quick (but not too hasty!) crossing out; the fine acoustic tuning also has a supporting effect.

Multiple Burial:

Recognize: Solve:

Since the marking of a transmitter from several buried subjects is solved differently with the tracker than with the competitors, the device quickly reaches its limits in some scenarios of multiple burials that we have carried out - especially with more than two transmitters.

In both scenarios carried out with two transmitters that are far apart, the device recognizes the second transmitter quite late; when the first channel is faded out, the person searching must move relatively quickly out of the reception area, otherwise the first channel will be displayed again once the signal suppression has expired. In the scenario with the three transmitters that are close together, it was possible to hide and route to the other transmitters in one run. In another case, however, the hide did not work reliably and it was not possible to lead to the other transmitters. With a long press of the Option button, an overview of the MPV situation can be obtained in "Big Picture Mode" by displaying the respective distances to the devices.

Group check function:

The Tracker4 does not have a group check function. Whether switched-on devices of other group members are also transmitting correctly has to be checked in the normal search mode, as it used to be and is now a bit unusual - cumbersome for larger groups or crowds. Devices with incorrect transmission parameters were displayed without any abnormalities.

Usability:

The case looks robust and is heavily rubberized on the sides. The slightly protruding switch can be easily moved to the desired position - and stays there. The revision of the icons for Off, Send and Search are now unmistakable compared to their predecessor. In a test example, the rotary switch was slightly overturned. The device continued to function, but the switch position was no longer consistent. The elastic band, which can be quickly attached to the carrying strap, offers plenty of scope - comfortable when searching, a bit too long to just let it hang. The device can only be put upside down in the pocket of the holder with the elastic band. A small key for opening the battery compartment is also attached to this (3xAAA alkaline). Updates can be uploaded to the computer via a USB cable.

Mammoth Barryvox (Software 3.4)

The Barryvox is the all-round device from the Swiss company and has been on the market since 2018. Since then, updates have improved a few things. The usability is solid as usual and can also be learned intuitively and quickly by new users.



Signal search:

In terms of range, the Barryvox is one of the strongest devices, but after an early initial reception there is a small area of fuzziness until a stable signal remains (57/36/26m). In the case of strong sources of interference, the recommended search strip width is reduced from 70m to 20m and this is clearly shown on the display.

coarse search:

Horizontal transmitter: Vertical transmitter:

From the first reception, the person searching is always guided in a targeted manner to the transmitter. The display values decrease only slowly from the first reception, then continuously and in the transition area from the coarse to the fine search (from a display value of approx. 15m) there are sometimes large jumps. With the Barryvox, users have to be even more attentive than usual at the threshold of the two search phases, otherwise you run the risk of simply "walking over" the buried person if you walk too fast. However, if you know that, you shouldn't have any problems approaching the Barryvox. In the rough search, however, there were differences between the vertical and horizontal transmitters. With the former, signal losses and unrecognizable 180° errors occurred in some passes with an offset of 25 m.

fine search:

Average burial depth: Depth VST: Search support:

In the fine search, the Barryvox showed strengths both in the deep and in the less deep burial scenario. The person searching is supported acoustically when approaching, the visual aid when changing from the coarse to the fine search from 3m could be clearer. The displayed value remains stable when rotating and is therefore also suitable for beginners.

Multiple Burial:

Recognize: Solve:

Similar to the coarse and fine search, larger jumps in the displayed values for the distance also occurred here. All three transmitters were detected in all runs, with the third transmitter in the complex scenario only being detected in the close range of the first transmitter. However, the signal processing after marking a station is annoying, as it took quite a long time before another traceable signal was displayed. 180° errors were recognized and also displayed.

Group check function:

The group check is easy to activate. However, the transmitters to be checked must not be too close, otherwise an error tone sounds - a bit annoying in cramped situations and not always 100% clear. A transmitter is only displayed via an acoustic signal, but not via a distance display. A transmitter outside the standard frequency was not detected.

Usability:

Overall, the device makes a valuable impression, the button selection works without any problems even when wearing gloves and is always clear. The carrying system is well thought out, but looks a bit clumsy. The device fits in there in only one way (display to the stomach). It is pleasant that the device can still be switched on (=send) even when the device is stowed away. Updates can be installed via a service center (manufacturer or partner shops) or via another previously updated Barryvox device.

Mammoth Barryvox S (Software 3.4)

The professional device from the Swiss manufacturer Mammut offers several individual setting options and animated displays in the search phases and is therefore something for (tech-savvy) users. The Barryvox S is one of the three devices in the test in which an analogue tone can be switched on to help, for example in environments that are very susceptible to interference.



Signal search:

In terms of range, the Barryvox S is one of the strongest devices, but after an early initial reception there is a small area of fuzziness until a stable signal remains (55.5/38.5/28.5m). In the case of strong sources of interference, the recommended search strip width is reduced from 70m to 20m and this is clearly shown on the display.

coarse search:

Horizontal transmitter: Vertical transmitter:

The device performed well in the coarse search with both a horizontal and a vertical transmitter. From the first reception, there are no more signal losses, although there are still larger jumps in the distance values. The direction display is slightly better nuanced than on the "normal" Barryvox - the annoying jumps during the approach when changing from coarse to fine search are, however, even more pronounced (10 - 3m). If the searcher is aware of this fact and reduces the search speed significantly from a display value of <15m, the device will lead you directly and without detours to the transmitter. If a 180° error occurs, the device clearly indicates this and prompts you to turn it over.

fine search:

Average burial depth: Depth VST: Search support:

In the fine search, the Barryvox showed strengths both in the deep and in the less deep burial scenario (very good). The device has two fine search modes that can be selected in the basic settings of the device. With the so-called guided fine search (called 'standard'), the device instructs the person searching where to move the device in order to get to the point with the smallest distance to the transmitter. In the 'classic' mode, the usual cross appears below the 3m display value as an indication for crossing out. Experienced users will prefer the classic mode; with standard mode, non-beginners can end up moving the device in exactly the wrong direction.

Multiple Burial:

Recognize: ● Solve: ●

Several transmitters are recognized solidly. Tracking transmitters that are far apart is no problem. If these are close together, the device needs quite a long time before it can distinguish the "new" signal from the previously marked one. 180° errors are not uncommon in such scenarios; however, they are reliably recognized and displayed by the Barryvox S. The list of all stations found on the right-hand side of the display is also very helpful. The signal being traced is boxed. Marked stations can be selected using the arrow keys and the marking can also be removed again.

Group check function:

While the normal group check is active, a pro-check can be selected. If the required distance of 5 m between two transmitters is observed, both the frequency and the period duration and length are displayed with numerical values. This function is unique in the entire field of applicants and may be of interest to those responsible for larger groups. In the conventional group check, the device emits a false tone if transmitters are too close - a bit annoying in cramped situations and not always 100% clear.

Usability:

Overall, the device makes a valuable impression, the button selection works without any problems even when wearing gloves and is always clear. Various settings can be made directly in the device using the additional side buttons. The display is slightly larger than the Barryvox - useful for the various animated displays in the search phases that support users. The carrying system is well thought out, but a little clumsy. The device fits in there in only one way (display to the abdomen). It is pleasant that it can still be switched to transmission mode while it is in the holder. Compared to the Barryvox, leak-proof lithium batteries can be inserted in the S version, which increases the specified running time to 400 hours.

Pieps Pro BT / Black Diamond Guide BT (Software 2.2)

The devices Pro BT and Guide BT from Pieps/Black Diamond have additional features compared to the Powder/Recon BT, but these are not mandatory components of an avalanche transceiver.



Signal search:

The Pro/Guide receives a signal at an average of 49/38.5/27m in the x/y/z position. When receiving for the first time, the device vibrates to support it, the signal remains stable and is no longer lost.

coarse search:

Horizontal transmitter: Vertical transmitter:

From the first signal there is a traceable signal, even if the directional arrow is somewhat ambiguous at first. From a display value of around 40m, the distance values decrease constantly and the directional arrow guides the person searching very well into the close-up range. At 25m, both scenarios (transmitter vertical/transmitter horizontal) worked without problems. A 180 degree error can only be seen from the increasing direction values and requires an attentive searcher.

fine search:

Average burial depth: Depth VST: Search support:

The Pro/Guide achieved a very good result at a burial depth of 0.8m. In the case of deeper burials, the displayed value deviates somewhat from the actual burial depth. The correct minimum extends over a fairly large area (plateau). The devices hardly react to rotation, the display values are output quickly and are stable. We see the late change to the fine search mode <2m as a shortcoming (with a horizontal transmitter and a depth of 1.6m only directly above the transmitter). Apart from the disappearance of the arrows, there is no additional information about crossing out when entering the close range - not exactly an advantage for beginners. In the fine search mode itself, the acoustics no longer change either. Experienced searchers will not have any problems with most fine search scenarios, despite the cutbacks.

Multiple Burial:

Recognize: Solve:

Additional stations are displayed in a stable manner well before the first one is reached. Approaching the second transmitter in the simpler scenarios was easily possible and straight forward, regardless of the transmitter's location. In the complex scenario, all three transmitters were displayed well before the first transmitter was approached, even if the third transmitter was briefly gone. In one pass, a 180° error was not recognizable and the station being tracked changed from time to time. All in all, signal recognition after successful (and always stable!) marking takes a little longer than with the fastest devices in the field of applicants. Scan button (two different modes) can be used to get an overview of the MPV situation.

Group check function:

If the distance between two transmitters to be checked is too small, this is not displayed, which is due to the design of the group check (small distance possible). A station deviating from the standard frequency was displayed with the error code 'ER'. In the conventional group check, the mark button has to be held down the whole time, which is tedious for larger groups. In the Pieps app, the per group check mode (pulse period duration) can be switched on and activated with a pressed scan button.

Usability:

The Pro/Guide has analog tone, inclinometer and is compatible with TX600 transmitters (backup transmitters for dogs or similar off-frequency). Switching between the modes using the slide switch takes some getting used to, but if done correctly, it's actually logical. As a reminder: First release the latch, then all the way up into search mode, release the latch and then (!) down into transmit mode. The very high specified battery life of 600 hours with leak-proof lithium batteries in transmission mode is worth mentioning. With the help of the Pieps app, the device can be connected via Bluetooth, settings can be made and software updates can be installed. In addition, the app offers an extensive training mode.

Pieps Powder BT / Black Diamond Recon BT (Software 2.2)

The all-round models Powder BT and Recon BT are in no way inferior to the top models from Pieps/Black Diamond when it comes to the basic parameters of signal, coarse and fine search. If you can do without the scan version, the extended or pro group check and other smaller features, you get a solid device at a reduced price.



Signal search:

The Powder/Recon BT achieved a stable maximum range of 50/38/27m in x/y/z position. From the first reception, the device quickly receives a stable signal that is no longer lost.

coarse search:

Horizontal transmitter: Vertical transmitter:

After the first signal there is no more signal loss, but the direction arrow changes quickly between approx. 45° left and 45° right of the x-direction. If the person searching does not follow every little twitch, but roughly stays in the main direction, the directional arrow levels off after just a few meters and the distance display then decreases constantly. Even if you make a wrong turn at the beginning, the directional arrow will promptly correct you in the right direction. The further introduction to the transmitters is designed without hesitation in both scenarios. Despite similar for the first reception, the real, stable first reception takes place around 5-7m earlier and the approach is more direct than with the micro. A 180 degree error can only be seen from the increasing direction values and requires an attentive searcher.

fine search:

Average burial depth: Depth VST: Search support:

The Powder BT/Recon BT achieved a very good result at a burial depth of 0.8m. In the case of deeper burials, the display value deviates somewhat and a fairly large plateau forms, within which the correct minimum is displayed, but the scenario can still be rated as good. The devices hardly react to rotation, the display values are output quickly and are stable. We see the late change to the fine search mode <2m as a shortcoming (with a horizontal transmitter and a depth of 1.6m only directly above the transmitter). Except for the disappearance of the arrows, no additional hint to cross out when entering the close range appears. In the fine search mode itself, the acoustics no longer change either. Experienced searchers will not have any major problems with most fine search scenarios, despite the cutbacks.

Multiple Burial:

Recognize: Solve:

The device reliably detects multiple transmitters regardless of the scenario. Once a station has been marked, it usually remains marked as stable. However, if three transmitters were close together, the same transmitter was marked twice in one run; the third

remained "unnoticed" in the stressful situation because the subject only noticed afterwards that the same transmitter had been marked twice. On the other hand, recognizing, tracking and marking all channels worked again without any problems during the repeat pass.

Group check function:

The device detected a device transmitting outside the standard frequency. In both tests, you can get close to the transmitter, which means that errors can be largely ruled out - the reception range is generally limited to one meter for the group check. The fact that the marking button has to be pressed the whole time for the group check is not solved as pleasantly as with all Pieps devices.

Usability:

Switching between the modes using the slide switch takes some getting used to, but if done correctly, it's actually logical. As a reminder: First release the latch, then all the way up into search mode, release the latch and then (!) down into transmit mode. With the help of the Pieps app, the device can be connected via Bluetooth, settings can be made and software updates can be installed. In addition, the app offers an extensive training mode.

Pieps Micro BT Race (Software 3.2)

The Micro BT Race (formerly Button) scores as light & fast and still solid in performance. Like all Pieps devices, it convinces with a stable signal from the first reception. And: The device reacts the same in all runs - very pleasant when the user knows how his/her avalanche transceiver reacts in certain situations. The device will no longer be available from the 2022/23 season. For the sake of completeness, we still tested the Micro Race.



Signal search:

The Micro BT Race receives a signal at an average of 50/36/24.5m in x/y/z position. When receiving for the first time, the device vibrates to support it, the signal remains stable and is no longer lost.

coarse search: Horizontal transmitter: Vertical transmitter:

From the first reception, the device leads to the transmitter stably and without signal loss. If the transmitter is vertical and there is a large lateral offset (>25m), signal tracking becomes a guessing game - if you decide on the right side, the approach will take place without any problems. A 180 degree error can only be seen from the increasing direction values and requires an attentive searcher. In the long-distance range after initial reception, one should not be discouraged by the direction arrows that jump back and forth and not follow every twitch of the direction arrow immediately, because after a short time the approach is safe and straight.

fine search: Average burial depth: Depth VST: Search support:

In the fine search, the device performed very well in the scenario with a medium burial depth (0.8m). In the case of deeper burials, the late change to the fine search mode below 2m (with a horizontal transmitter and a depth of 1.6m only directly above the transmitter) is to be criticized. In addition, the discrepancy between AW and real value and the plateau of the minimum are growing somewhat. Nevertheless, the deep burial can be rated as good, the values remain stable and do not change when the device is rotated. As with all Pieps devices, the change to the fine search is not indicated separately, either acoustically or visually. Only the directional arrows disappear. The acoustic gradation also does not change when approaching. When it comes to supporting the searcher in the fine search, the device therefore only performs acceptably.

Multiple Burial: Recognize: Solve:

The Micro Race made a good impression at the MPV - even a tad better than the brand's own colleagues. Even in the complex MPV situation with three closely spaced transmitters, there was no long pause after marking until the new signal was clearly processed and could therefore be tracked. In all scenarios, all channels were always displayed correctly and stably; marking also worked without any problems.

Group check function:

Although Pieps specifies a minimum distance in the instructions for use, you can get very close to the transmitter to be checked. It is a bit tedious that the marking button has to be kept pressed the entire time during the avalanche transceiver check (display "CH"). During the check itself, the displayed distance to the transmitter allows a perfect assignment. If there are several devices within 1m, CH appears and an additional symbol appears. The faulty transmission frequency was detected.

Usability:

The carrying system is spartan and the waist belt takes some getting used to, but not uncomfortable. The on/off switch in the carrying system is secured to prevent the device from being switched off unintentionally. Without a fuse, the switch seems a bit smooth-running. Despite its small dimensions, the device fits comfortably in the hand, the hard plastic of the housing is not rubberized on the side, but only ribbed for better grip. Unfortunately, the speaker is in an unfavorable position and with a normal hand position, it is easily covered and you hardly hear a "beep" when searching. With the help of the Pieps app, the device can be connected via Bluetooth, settings can be made and software updates can be installed. In addition, the app offers an extensive training mode.

Black Diamond Recon LT (software 1.2)

The Recon LT, which was only released last winter, is exclusively distributed by Black Diamond. Its shape is reminiscent of the Pieps Micro series – but turned upside down. A completely different housing concept and most of the search parameters are largely convincing in the test.



Signal search:

A stably traceable signal was given in the x, y and z coupling position at 43, 33 and 23.5 m. Thus, the values were all slightly lower than the devices of the Pieps Micro series.

coarse search:

Horizontal transmitter: Vertical transmitter:

With a horizontal transmitter, a signal can be received and tracked stably even with a lateral offset of 30m (very good). Initially, the display values do not drop constantly, but after about 10m both the distance display and the direction arrow are stable. With a vertical transmitter, the coarse search can still be rated as good. The 25m lateral offset was the limit of what the Recon LT could do, with brief loss of signal occurring on half the passes. In the test scenario, after signal reception, the directional arrow jumped between right and left a little more often than in the related devices, making it a little more difficult to approach in the long-distance range. A 180 degree error can only be seen from the increasing direction values and requires an attentive searcher.

fine search:

Average burial depth: Depth VST: Search support:

In the fine search, the device performed very well in the scenario with an average burial depth (0.8 m). In the case of deeper burials, the late change to the fine search mode below 2m (with a horizontal transmitter and a depth of 1.6m only directly above the transmitter) is to be criticized. In addition, the discrepancy between the displayed value and the real burial depth increases, as does the plateau of the minimum distance. Nevertheless, the deep burial can be rated as good, the values remain stable and do not change when the device is rotated. As with all Pieps devices, the change to the fine search is not indicated separately, either acoustically or visually. Only the directional arrows disappear. The acoustic gradation also does not change when approaching.

Multiple Burial:

Recognize: Solve:

Both recognizing and tracking several transmitters, even those that are close together, are no problem. In the complex scenario, the "small" devices from Pieps and Black Diamond tended to perform even better/faster than the larger models.

Group check function:

Pleasant: You can get very close to the transmitter to be checked. Because of this and thanks to the distance display, it is possible to assign the transmitter precisely, even in cramped situations or with group members standing close together. A recognized station is displayed with the same audio frequency as in the fine search. Less pleasant: The somewhat small marking button has to be kept pressed all the time, which is relatively tedious with gloves and/or large fingers. A station outside the standard frequency was reliably displayed, but not two stations that were too close together.

Usability:

The Recon LT is very light and feels good in the hand. The striking rotary knob is secured against unintentional switching by a large slide switch with a lock. However, for the intended change, some force has to be used to push the lock to the side. The carrying system is spartan, but sufficient. However, it no longer offers any mechanical protection against impacts. The elastic band is just long enough to be able to guide the device close to the snow surface in fine search. With the help of the Pieps app, the device can be connected via Bluetooth, settings can be made and software updates can be installed. In addition, the app offers an extensive training mode.

Ortovox Direct Voice (test software 2.0)

After the extensive test, the new Diract in the "Diract Voice" language version from Ortovox showed the known weaknesses of its predecessors, but also new strengths, especially in fine search and user-friendliness. We tested two software versions. Due to minor but not insignificant improvements, owners of devices with software 1.1 should definitely update them to the latest software as soon as they become available.



Signal search:

The x and y positions are 32 and 22m, respectively. In the worst coupling position, the range is half as high at 16 meters. From the first reception, the signal is always stable and no longer makes any irritating jumps, both the direction arrow and the regarding distance display. In the case of nearby sources of interference, this is made visually clear and the recommended search strip width is reduced to 20m.

coarse search:

Horizontal transmitter: ● Vertical transmitter: ●

While the rough search is to be rated "good" with a horizontal transmitter, the short range in a poor coupling position has a negative effect on the rough search (15m lateral offset was the absolute maximum in one pass with the vertical transmitter) and is then closed with "problematic". evaluate. However, if the device receives a signal, the directional arrow is finely tuned, the introduction to the transmitter is very good and if a 180° error occurs, the user is reliably guided through the voice control.

fine search:

Average burial depth: ● Depth VST: ● Search support: ●

The Diract performed very well in both fine search scenarios. Optical and acoustic support is excellent, the displayed minimum agrees well with the real burial depth, even with the deep burial, which should enable the fine search to be completed quickly. And: The voice control support is very helpful in two particularly critical phases in connection with the fine search - the airport approach at the beginning ("Go down to the snow surface") and unnoticed exceeding a previous minimum distance ("You were already closer").

Multiple Burial:

Recognize: ● Solve: ●

The recognition of several transmitters works better and worse depending on the scenario. Additional stations are sometimes only displayed in the immediate vicinity of the first station or only after it has been marked, which can have a negative effect on search management. In addition, further stations are not displayed in the fine search, which is suboptimal in the stressful situation in order to maintain an overview; However, signals are not lost, but are displayed "in sequence". At the

The Ortovox thus performs acceptable in terms of recognition. On the other hand, the voice navigation, which quickly drew attention to any 180° errors, was particularly pleasant in this situation. Overall, this makes for a good at tagging and tracking.

Group check function:

The Diract Voice was the only device to recognize a longer period of a station to be checked. However, no error was reported in the test scenario with a different frequency. However, the device then takes significantly longer to process the signal. If two transmitters are too close together, the device only recognizes this immediately and then shows an icon with several people on the display. The visual and acoustic support during the group check is very good. The visual prompt "Group Check" after switching on the device may persuade one or the other to carry out the group check in a sensible way.

Usability:

The Ortovox is relatively wide, but still feels good in the hand thanks to its shape and the rubber on the side. The switch geometry takes some getting used to, but is designed in such a way that it is almost impossible to switch off the device unintentionally during the tour and is easy to operate with gloves. The carrying system is quite light and equipped with a Recco reflector. Carabiner connection and elastic are well loosened. The low frequency of the transmission display is not quite ideal - since the switch position does not indicate whether the device is on or off, it is easy to forget to switch it off. By using a Li battery with USB-C connection for the first time, charging is quick and easy. The voice output offers newcomers as well as experienced users interesting additional support in stressful situations - and since it can be expanded by the manufacturer via the software, there is also potential for further development. The device can be updated via an associated app. A connection to the device can be established there via Bluetooth, configurations can be carried out and the knowledge content provided can be accessed.

Transceiver test 2022 by DAV security research		Arva		Bca	mammoth		Beep / Black Diamond			Ortovox		
DEVICE DATA		Evo 5 	Neo BT Pro 	trackers 4 	Barryvox 	Barryvox S 	Per BT/Guide BT 	Powder BT/ Recon BT 	MicroBT Race/Sensor 	Recon LT 	Direct/Direct Voice 	
Except for switch-on times, all information according to the manufacturer and without guarantee												
Classification target group		all round	professional	all round	all round	professional	professional	all round	all round	all round	all round	
current software		1.8.1	1.1	6.4	3.4	3.4	2.2	2.2	3.2	1.2	1.1 / 2.1 from Jan 23	
TECHNOLOGY	number of antennas	3	3	3	3	3	3	3	3	3	3	
	Display lighting (when switching on and search mode)	Yes	Yes	Yes (LED)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
	battery format	AA x1	AAA x3	AAA x3	AAA x3	AAA x3	AAA x3	AAA x3	AA x1	AA x1	Li-Io battery	
	battery life in broadcast mode	220h	350h/450*h	250 hours	300 hours	300/400*h	400/600*h	200/300*h	200/350*h	200/350*h	300 hours	
	Group check function	Yes	Yes	no	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Parameters are checked	transmission frequency and transmission power		-	frequency and transmission level	Per test: ad frequency, period and pulse values	Advanced: frequency, Pulse-, period**	Simply: frequency and distance	Advanced: Signal, Frequency, Pulse and period**		pulse width and period duration		
AUTOMATIC SWITCHING FROM SEARCH TO SEND		Yes	Yes	Yes**	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
without moving after		8 mins	Off/2/4(default)/8min**	1 min	4 mins	4 minutes (default), adjustable	60/90/120 s**	60/90/120 s**	60/90/120 s**	60/90/120 s**	2 mins	
can be deactivated		no	Yes	Yes	no	Yes	By default disabled **	By default disabled **	no	Yes**	Yes	
LOOKING FOR	Recommended search strip width (max. range)	50m	80m/ Similar to 90m	50m (60m)	70m	70m/ Similar to 100m	60m (60m)	60m (60m)	50m	50m	50m	
	Analog audio available	no	Yes	no	no	Yes	Yes	no	no	no	no	
	marking function	Yes	Yes	No marking function -Signal suppression 1 min	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
	Marking can be canceled individually	no	no	no	no	Yes*	Yes	Yes	no	no	no	
FUNCTION		Switch-on time before sending	8 sec	24 sec	7 sec	4.5 sec	6 sec	7 sec	7 sec	7.5 sec	9.5 sec	16.5 sec
Switching time to search		instantly	2 sec	4 sec	3 sec	2-6 sec	4.5 sec	5 sec	5 sec	4 sec	3 sec	
Additional functions / special features		Reverse Function (U-Turn Alarm)		Big Picture Mode signal suppression	Reverse Function (U-Turn Alarm) W link		Auto Antenna Switch iProbe Support			voice navigation** SmartAntenna inverse function (U turn alarm) standby function Recco in holder		
			standby function MPV list			per search MPV list Rescue Send vital data	scan button inclinometer TX-600 support					
Software updateable		no	Yes**	Yes***	Yes***	Yes***	Yes**				Yes	
Mobile app available with Bluetooth connection		no	Yes	no	no	no	Yes				Yes	
maintenance intervals		1 year at professional users 3 years at private individuals	2 years at professional users 3 years at private individuals	5 years, after 3 years review and update	3 years or 3000 operating h; Next maintenance query: at shut down Select "About".	3 years Next maintenance query: At shut down "Maintenance" choose	1st review after 3 years from the date of purchase 2nd inspection after 5 years from the date of purchase. Annual inspection thereafter				first service after 5 years, then all 2 years	
warranty		2 + 3*** years		5 years	2 + 3 years ****		2 + 3 years***		2 + 1 years***	2 + 3 years***	2 + 3*** years	
weight		165g	214g	215g	210g	210g	230g	220g	150g	160g	210g	
Price		€ 265.-	€ 330.-	€ 340.-	€ 300.-	€ 400.-	€ 400.-	€ 300.-	€ 320/340.- (race/sensor)	€ 320.-	€ 390**/330.-	

Notes on the table	* with lithium batteries				
** Arva App adjustable *** with registration at Arva	** must be restored every time you turn it on with pressed Option button activated will *** above cable connection to <small>personal computer</small>	*** Device-to-device updateable or Mammut Service Point *** with registration at barryvox.com	** Adjustable in Pieps app *** with registration via Pieps Service Portal or Pieps App	** Direct Voice *** Upon registration	

Explanation of terms for the different manufacturer technologies

ARVA

standby mode

Standby mode that allows the user not to turn off their device during the shoveling phase.

BCA

signal suppression

Suppresses the strongest signal and shows the second strongest signal. Returns to default search mode after 1 minute. Big

Picture Mode

Overview mode: Shows distances and directions of all transceivers in range.

MAMMOTH

W-Link communication

W-Link is an additional communication channel for transmission and reception of vital signs. Frequency regulations in some countries do not allow changing the frequency band - in these countries the W-Link can be deactivated. Per Search:

Alternate Search Mode/Range+

Alternate search mode shows distance and direction to the strongest signal and plays analog search tone. With range+, the search strip width is increased to 100m, signal search then without a display with analogue sound. rescue

broadcast mode

In the rescue transmission mode, the transmission signal is temporarily suppressed so as not to disturb the search for the buried subjects. Switches to transmit mode after 4 minutes if motionless. vital data

Highly sensitive motion sensor detects the smallest of movements, giving the chance of survival only to other W-Link devices (triage). The Barryvox S also records the duration of the burial.

BEEP / BLACK DIAMOND

Auto antenna switch

If the transmitting antenna is negatively influenced by external interference (e.g. mobile phone), the device automatically transmits with the strongest antenna iProbe

Support

Avalanche transceivers with iProbe support are automatically deactivated when probing with the Pieps iProbe electronic probe - receiver transceiver automatically displays the next strongest signal iProbe: Probe that emits signal tones depending on the distance to the transmitter.

backup mode

The avalanche PIEPS with activated backup mode is in transmission mode, but the transmission function is temporarily deactivated in order not to disturb the rescuers who are busy searching for an avalanche transceiver. vibra :

Vibration motor: Present on the Pro/Guide BT and Micro series. Vibrates on initial reception and when switched to transmit mode. TX-600

TX-600

The TX600 mode allows to receive the PIEPS TX600. The PIEPS TX600 is a mini dog/equipment transmitter that transmits at 456 kHz. scan button

The regular SCAN provides an overview of all buried avalanche transceivers within the reception range at defined distances. This mode is the default. The detailed SCAN shows the direction and distance of each buried avalanche transceiver, enabling the selection of a buried avalanche transceiver. This mode can be activated in the device manager of the PIEPS APP.

inclinometer :

The slope can be measured by pressing the scan button on the Pro BT/Guide BT.

ORTOVOX

voice navigation

Supporting voice commands are issued in each search phase. smart

antenna

Analyzes the position of the device in the avalanche and automatically transmits with the best (horizontal) antenna, thereby excluding the worst coupling position (vertical transmission antenna). RECCO

reflector

Integrated RECCO reflector serves as an additional backup, can only be found by professional Recco search devices (organized rescue). standby

function

In order not to disturb other devices when searching, without having to turn off the device. Switches to normal transmission mode when motionless.