

Performance comparison of the BatPi and the microSoundRecorderUltra, DD4WH 2018-07-07

The **BatPi** (fig 1) is an automatic recording device for bats' ultrasonic calls and has been developed by the German nature conservation agency NABU (working group for bat conservation). It uses a Raspberry Pi and the ultrasonic microphone/ADC combination Ultramic250K manufactured by Dodotronic. It is powered by a USB power bank and includes a timer by UUGear (Witty Pi2). Total cost is about 600,- to 700,- EURO. → <http://www.bat-pi.eu/>

The **microSoundRecorderUltra** (fig 2, 3) is an automatic recording device for bats' ultrasonic calls and has been developed by Walter MX Zimmer and Frank Dziock (DD4WH). It uses a Teensy 3.6 microcontroller (manufactured by PJRC) and an ultrasonic MEMS mic and a mic preamp with 41dB of gain (PCBs are available at ELV, I modified the preamp: 150kHz lowpass and the original OPamp was exchanged for the low noise TL972). It is powered by a USB power bank, but can also be powered by three AA batteries. Total cost is about 60,- to 70,- EURO. → <https://github.com/WMXZ-EU/microSoundRecorder/wiki>

For the comparison I recorded exactly the same bat call sequence at the same spatial position in the field (microphones < 20cm away from each other) and compared their appearance in the oscillogram and the spectrogram with Kaleidoscope.

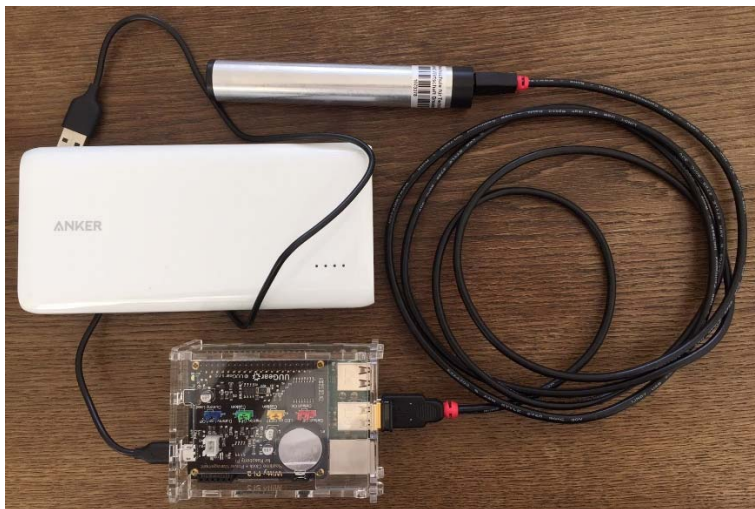


Fig 1: BatPi with Raspberry PI Model 2, USB power bank and Dodotronic UltraMic 250K

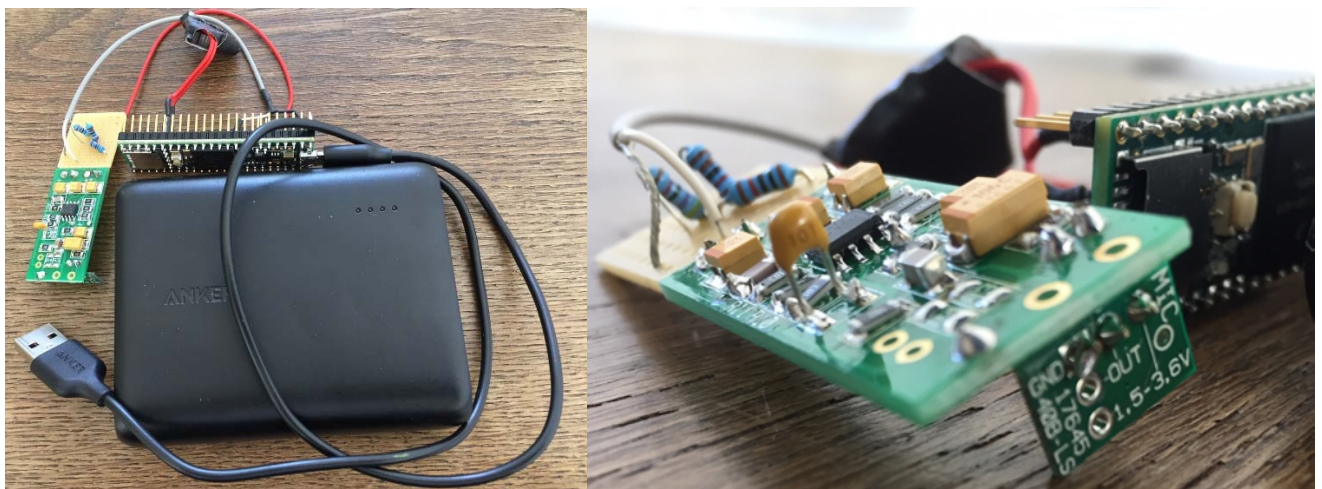


Fig 2: microSoundRecorderUltra with Teensy 3.6 and mic SP0410LR5H-QB & preamp with 41dB gain

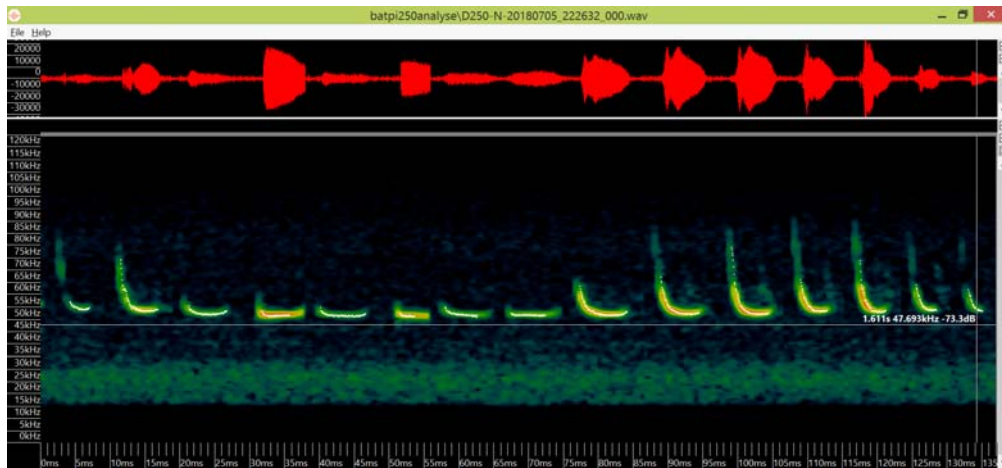


Fig 3: *Pipistrellus pygmaeus*, BatPi & Dodotronic Ultramic D250, sample rate 250kps, SNR 46dB, [after HP15k SNR is the same: 46dB]

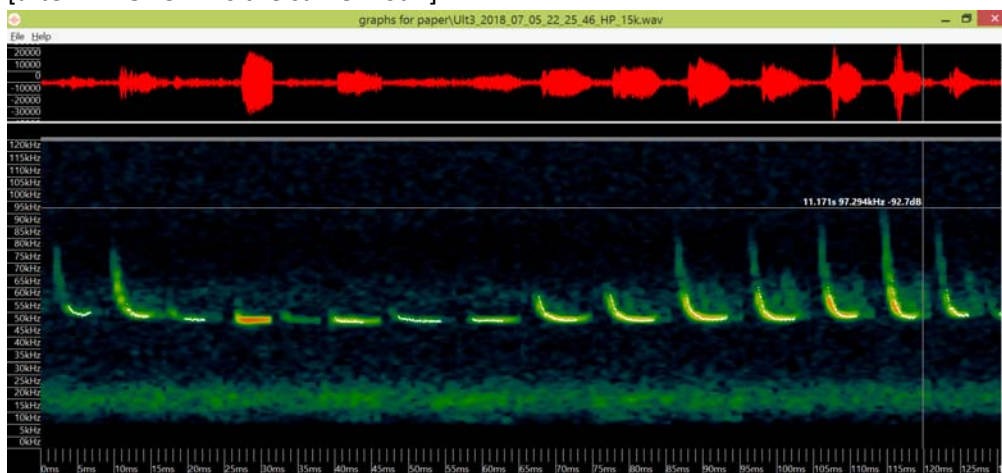


Fig 4: *Pipistrellus pygmaeus*, microSoundRecorderUltra with SP0410LR5H-QB & preamp (41dB gain), SR 250kps, highpass-filtered with Audacity [15kHz cutoff], SNR = 48dB

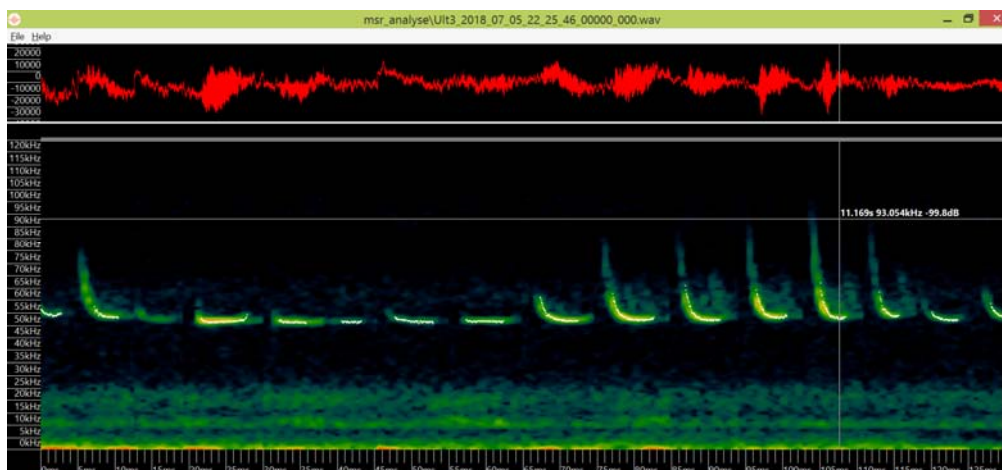


Fig 5: *Pipistrellus pygmaeus*, microSoundRecorderUltra with SP0410LR5H-QB & 41dB preamp, SR250

CONCLUSION:

- The performance of both recording devices is very similar
- The **BatPi** seems to slightly better resolve the oscillograms, but this could also be due to a slightly different positioning of the microphone

- The **microSoundRecorderUltra** seems to have an equal or even slightly better SNR and the spectrograms seem very similar
- The **microSoundRecorderUltra** has to be optimized by adding a highpass filter (look at the oscillograms in the third graph): the plan is to add a moderate analog highpass at 200Hz and a user-definable software highpass filter [1 to 20kHz]
- **BatPi** with Dodotronic Ultramic 250K costs about 600,- EURO, **microSoundRecorderUltra** costs about 70,- EURO
- In terms of cost-efficiency and performance, there seems to be no acceptable reason why one should spend 8 times more money on the **BatPi**/Ultramic D250 combination instead of assembling a **microSoundRecorderUltra**
- Another advantage of the **microSoundRecorderUltra** is the much lower power consumption and the smaller size, hence a much longer field session can be performed