Swiss Birdradar Solution AG

Dählenweg 17
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BirdScan MR1 – Fact Sheet

The bio monitoring systems measures the bird and bat movement using a rotating horn antenna. In addition to the analyses of the spatiotemporal distribution, the system offers real time classification and quantification represented as mean traffic rate. Data are stored in raw format and is available for further processing.

Company: Swiss BirdRadar Solution AG
Status: In production and available
Web http://swiss-birdradar.com

General description: BirdScan MR1 is a compact radar system for the quantitative long-term monitoring of birds and bats. It uses a vertically directed conically shaped wide aperture beam with a nutating movement. This setup allows to record a rich set of information for each target:

- Precise recording of target's height above ground.
- Wing flapping pattern which is necessary to exclude non-bird and non-bat echos like insects and allows classification of bird echos into sub-groups. See Figure 1.
- Precise knowledge of surveyed volume which is necessary to estimate the number of birds aloft per volume, i.e. to compute Migration Traffic Rate for specific altitude layers (birds / horizontal km * hour). See Figures 3 a-c.
- Flight direction and speed of target is obtained from the nutating beam.
- Shape of target (long vs. round) is obtained from circularly polarized beam.
- X-band radar which can detect even small birds (e.g. small passerines) and bats up to 1000 m and large birds (e.g. gulls) up to 2000 m.

Comparison to traditional bird-radars: Traditional horizontally or vertically rotating bird-radars only illuminate a target for a fraction of second and wing-flapping pattern cannot be recorded. Therefore non-bird echos like insects cannot be properly excluded. In traditional rotating radars the surveyed volume is generally not well-defined and therefore computation of MTR is problematic.

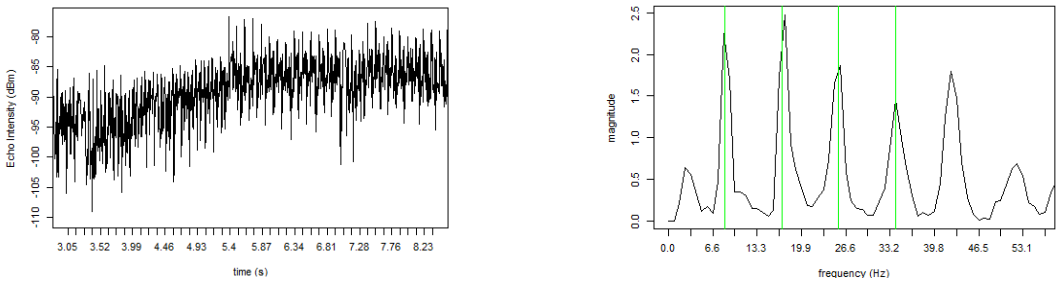

Figure 1. Example of echo from a bird recorded by MR1 system (left). The wing-flapping pattern is recorded with the signal and can be extracted automatically with our analytics modules (right), here a continuously flapping bird with 8 wing-beats per second.

Placement with respect to wind turbines: The MR1 radar can be placed as close as 150 m off the turbine. Like for any radar, a rotating blade within the measurement range would produce strong disturbances and would make it hard to properly detect all birds.

Characteristics in detail: Birds and bats are detected using pulsed radar that emits beams vertically across a conically-shaped field from a corrugated Horn-antenna with a wide aperture angle. BirdScan consists of a transmitter/receiver unit and a computer and analysis unit. The system can be monitored remotely if connected to the internet.

Offshore deployment of BirdScan MR1: BirdScan MR1 can also be deployed offshore on any platform. It needs to be protected for offshore conditions. See Fig. 2 a-c.

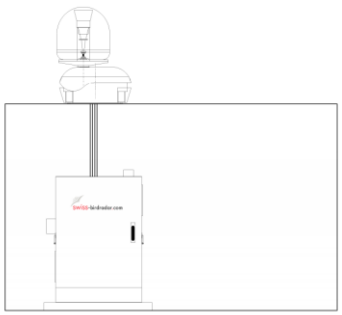

Figure 2a. Option one. Server and processing module protected in a container; radar antenna on top of container protected by a small radome.

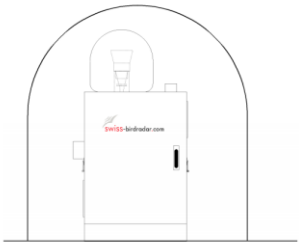

Figure 2b. Option two. Standard compact MR1 system protected by a larger radome (approx. 1.5 m width * 1.6 m height).

Figure 2c. BirdScan MT1 has been used by Schulz *et al.* (2014) at Alpha Ventus. It was situated at the FINO1 research platform.

High quality offline-analytics: BirdScan MR1 radar systems can reliably detect even small passerines and small bats. Hundreds of thousands echos per month can be recorded. To leverage the full potential of this data, our experts can provide detailed off-line analytic services to crunch the data and deliver high quality analyses and reports for impact assessment reports or scientific publications. A few examples of display items are shown for illustration in Figures 3 a-e.

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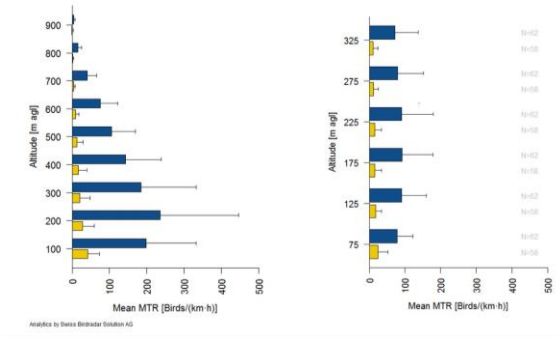

Figure 3a. BirdScan radar systems provide a precise estimation of altitude above ground of each detected bird or bat allowing to compute Migration Traffic Rate for specific altitude layers. Here standard altitude of 100 m (left) or 50 m (right).

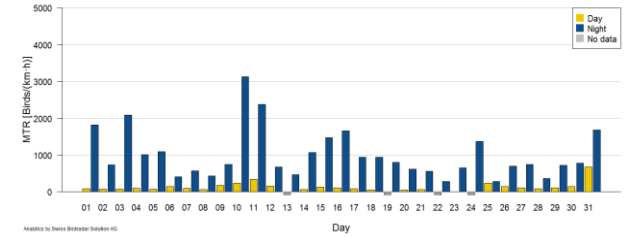

Figure 3b. Based on onset of dawn and dusk, the Migration Traffic Rate can be computed on a per day basis. Here for altitudes in 50 - 1000 m. Custom altitude and time resolutions are also possible.

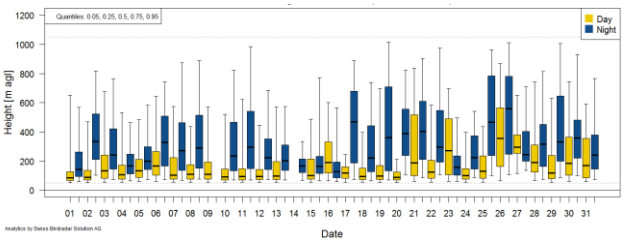

Figure 3c. Detailed time*height migration profile. For each day and each night altitude distribution is plotted as box-plots. This allows a detailed assessment of collision risks at specific heights.

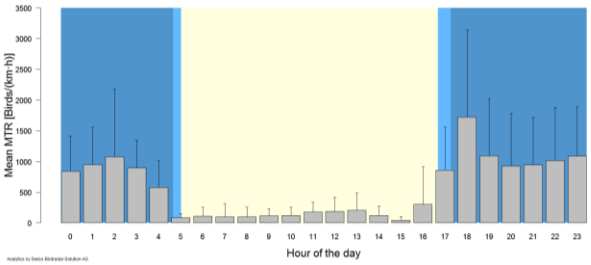

Figure 3d. Per-hour mean MTR can be computed from seasonal or monthly data. Relevant information can be plotted jointly (here-light/dark periods).

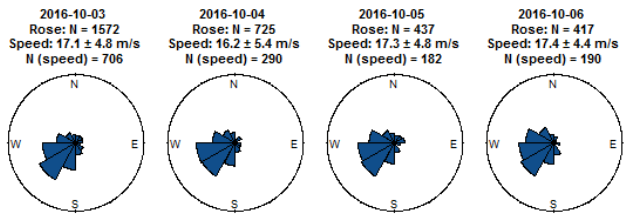

Figure 3e. Thanks to its slight rotation, MR1 can measure the flight directions of individual birds and bats. This allows to derive detailed flight direction profiles. In this example for four consecutive nights.

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Product Specification

usage	biomonitoring
area of application	research, environmental studies, continuous long term monitoring
sensing technology	pulse radar
antenna system	corrugated horn (rotating)
transmitter frequency	x-band fixed
transmitting power	25 kW peak
range (height)	2000 m
resolution in space	10m
spatiotemporal distribution	height, speed, direction
classification	per species group
mean traffic rate	selectable heights
raw data	available for offline analyses
operation	automatic 24 h
electrical connection	1x230V 300W
communication	LAN / WAN / GPRS
weight	Approx. 100 kg
environmental design	MIL STD 810 F
climate kit (optional)	HVAC, 1x230V 700W, 30kg
offshore kit (optional)	available