



# Whitepaper BibTag System (UHF)

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## Introduction

MYLAPS sports timing is the new brand by AMB i.t. and ChampionChip. As a result of the merger, the combined system offering for the active market (running, triathlon, cycling, swimming and skating) existed of a ProChip (active) system and a ChampionChip (LF) system.

On October 30th MYLAPS announced a new, third timing system for the active market (mainly running): the BibTag System.

Please find attached an overview of technical specifications and test results. This is a first version. More details will be shared shortly.

If you have any questions regarding this whitepaper, please contact your MYLAPS sales representative for active sports.

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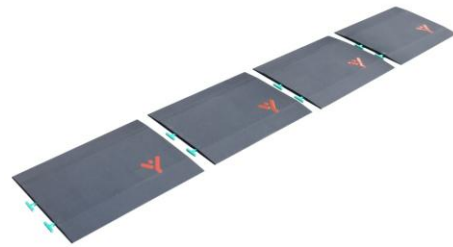
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## System components and benefits

### Mat system

- Lightweight
- Modular
- Easy to set up
- Expandable from one to four or one to eight meters with one Decoder
- Can be secured into the ground to prevent movement
- Anti-slip
- Replaceable components (RF connectors and cables)
- Easy to transport



### Portable decoder

- Lightweight (< 12 kg (26.5 lbs) for 4 m (13.1 ft) set up and < 13 kg (28.7 lbs) for 8 m (26.2 ft) set up)
- Easy to transport
- Proven technology
- Best-in-class readers
- Modern seamless and familiar Toolkit and ccNet servers support
- Direct GPRS and Ethernet link
- Has all connections that exist for DigiCase available:
  - 110/220V
  - 12V
  - battery LEDs
  - status LEDs
  - display
- Accurate GPS time
- Replaceable components (RF connectors and cables)

### Toolkit software

- Easy to set up a system for an event
- All timelines in one overview, offering better control over data collected
- Less trained staff required
- Improved real-time management of the timing system

### BibTag

- The BIB (chest) is the official measure point for a run
- Easy handling of tags
- Full integration with the BIB, no need to peel off
- No need to bend or fold the BIB (racetimer)
- Pre-race integrated print and handling process available:
  - Role of coded BibTags
  - BibTags on (standard) BIB
  - Full service BibTags on your customized BIB
- No post-race handling required at the event for the timer
- Optimal runners' experience:
  - Clear usage
  - No handling required by participant
  - Reduced risk of errors



## FAQs

### Overall system performance

#### How accurate and reliable is the BibTag System?

- Accuracy: appr. 0,5 sec.
- Reliability: appr. 99,5%
- Density : 700 passings/minute on a 4 m (13.1 ft) system
- For a more detailed image of the accuracy of the system, please read the test results.

#### How does the BibTag System determine a (split) time?

When a BibTag comes in the vicinity of a detection mat, the BibTag starts sending out messages with its unique ID continuously. The antennas in the detection mat receive these ID messages and transfer them to the Decoder. The Decoder determines the (split) time of a BibTag based on the ID message by using the received signal strength from that BibTag. Because the electromagnetic field produced by the antennas in the detection mat is strongest above the middle of the detection mat, the Decoder algorithms can determine the exact passing above the middle of an antenna line. The split time is this calculated time. This leads to an accuracy of around 0.5 seconds.

#### What would inhibit/block the signal of the BibTag? What interference can be a risk?

MYLAPS doesn't expect interference with other signals or systems as the frequency band is reserved for UHF (Ultra High Frequency) systems.

#### Do wet weather conditions cause problems for signal detection? Systems of other producers have had problems with this. Has this been tested?

We have tested the BibTag System under different weather conditions. Rain and mist do not affect the quality of the signal detection and the detection mats work properly even if they are wet. The reception reliability is however reduced if many sections of the mats are fully submerged in water. In view of the electrical integrity of the system, it is recommended to avoid submersion in water during operation.

#### Can a pacemaker cause noise or be affected by the BibTag signal? Are there any other health issues involved in wearing the BibTag on the chest?

The operating frequency of the BibTag does not affect pacemakers and the BibTag itself is also not influenced by pacemakers. All components of the BibTag Timing System are CE and FCC approved and there are no restrictions.

### Mat specifications

#### What are the dimensions of the mat?

1 m by 0.77 m (39" by 30") per mat.

#### What is the minimum and maximum number of mat modules that can be used for a timeline?

Two types of systems are available. A version that is expandable from one to four meters and a version that is expandable from one to eight meters with one Decoder. A minimum of one module is required. With two systems the mats can be expanded up to 16 m (52.5 ft) wide using timelines without interruption.

#### What is the weight of a mat module?

About 5 kg (11 lbs) per module. The mat is thinner and lighter than many other UHF ramps/mats.

#### Will the mat get slippery when it rains?

No. The mat modules are prepared with an anti-slip coating for wet conditions.

**Does the mat have a fixed or loose antenna?**

The mat has a fixed antenna with cables that can be replaced.

**What is the advised distance between the main and backup timeline?**

To eliminate interference, we advise a minimal distance of 3 m (9.8 ft).

**When using tags, the distance from mats is not detected. Can we set a noise squelch?**

This is usually the case when runners do pick up their start package with their BibTag but then not participate in the race but still stand near the timelines during the race. Both the decoder and the timing software (Toolkit) have a built-in “*time-between-same-chip*” functionality. Moreover, we offer the possibility to disregard all registered passings prior to or after a specified (gunshot) time. For mass starts we can configure the protocol so that it is less prone to early detection.

**Will the middle of a mat move when a lot of runners pass it? What will happen with the locks to connect multiple mats?**

MYLAPS did many field tests with the mats, without any problem. The mats remain in place. Test results from independent institutions support the quality of the mats.

**How will these mats behave on grass and turf?**

MYLAPS did many field tests with the mats without any problem. The mats remain in place. Test results from independent institutions supporting the quality of the mats.

**Is it possible to use the mats with cross country spikes?**

No, the mats are not suitable to be walked over by spikes. For cross country events, we advice to use the MYLAPS ProChip System. Visit our [website](#) for more information about the MYLAPS ProChip System.

**Decoder specifications**

**Technical specs:**

Exterior Dimensions (L x W x D)	47 x 35.7 x 17.6 cm (18.50" x 14.06" x 6.93")
AC input voltage / current	100-240V AC at 50/60 Hz
Operating temperature (charging)	0 to + 45 °C (+ 32 to +104 ° F)
Operating temperature (charged)	-20 to + 50 °C (- 4 to +122 ° F)
Storage temperature	-20 - + 25 °C (- 4 to + 77 ° F)
Long term storage temperature	-20 - + 40 °C (- 4 to +104 ° F)
Relative humidity	Max. 90 [%], non condensing
GPS/GPRS modem box	<ul style="list-style-type: none"> <li>• Replaceable SIM card</li> <li>• Can be attached to fence to improve reception (using a clip magnet and a quality extension cable)</li> </ul>

**Features:**

- High quality, user friendly Energy Manager that registers everything. Indication on LED panel and status information in menu and Toolkit. Also offers security warnings to LED and Toolkit.
- GPIO interface for start gun etc.
- Operates on AC power, external 12V and internal battery
- Direct feedback (to beeper, display, Toolkit) without delay
- Can be operated via Toolkit or by menu
- Large chip storage
- GPS time

**How can I connect the Decoders in case I use a 16 m (52.5 ft) system setup?**

The Decoders can be connected with an Ethernet cable or wireless, by means of GPRS (UMTS).

**Which connections does the Decoder support?**

The normal connections are Ethernet and GPRS (UMTS). In addition, a USB stick can be connected to the Decoder.

**Does the protocol support the detection of the first passing on a timeline (for TV purposes)?**

Yes. It is possible to switch from first detection to actual passing time after the Elite runners have passed the timeline. The BibTag System response is just like all MYLAPS equipment near real time.

**How robust are the portable decoders?**

The decoders are of the same quality as the ChampionChip system components that you are used to. They are built for outdoor usage and all weather conditions.

**Is the frequency used the same for Europe and the US?**

The frequency for Europe is different from that used in the US.

**I want to place the Decoder in a car or under a tent to shield it from severe weather condition. How long can the cables be between the end of the mats and the Decoder? Will the length of the cable affect the signal?**

The Decoder is completely weather proof and it is not necessary to place it in a car or under a tent. The box can be closed completely when the system is operational and there are no open lids. It is recommended to place the Decoder near the mats to optimize the signal detection. The cables come in various lengths ranging from 2 to 10 m (6.6 to 32.8 ft).

**Which type of internal battery does the Decoder have? Can it be taken on a plane (this is a problem with some systems of other producers)?**

MYLAPS uses special prepared LiPo batteries, which are certified for transportation by plane.

**How long does the internal battery of the Decoder last?**

The battery lifetime for an 8 m (26.2 ft) system is 12 hours; for a 4 m (13.1 ft) system this is 20 hours.

**Software specifications****What other specifications do we have for software?**

Work in progress

## **BibTag specifications**

**How long will the battery of the BibTag last when used actively?**

**What is shelf life?**

Lifetime of the battery: 30 months after production (shelf lifetime is the same as active lifetime).

**Is the BibTag battery always on, or only when sending?**

The battery is only on when the BibTag is in the vicinity of a detection mat and sends out ID messages.

**Does the battery of the BibTag contain toxic materials?**

The patent protected and environmentally friendly battery of the BibTag is contained in a thin and flexible label alongside the chip and antenna and does not contain toxic materials. All materials used in the battery cells are classified by the US federal government as non-hazardous waste. The BibTag can be disposed after use in normal municipal waste facilities.

**How does the BibTag stick to a rough cloth cotton surface?**

It is possible to stick a tag to a rough cloth cotton surface. This is another type of tag than the standard BibTag.

**Can I use a chip scanner to check if the battery of the BibTag is powered?**

During the fulfillment process every BibTag will be checked before shipment. The lifetime of the tag after shipment is at least 24 months. MYLAPS will be develop a hand scanner for checking the BibTag.



## Test results

As with every MYLAPS product, we have thoroughly tested the BibTag System. Over 50,000 real passings have been recorded in over 20 different kind of races. Please find below the test results of one of these races. We will publish more test results shortly.

### Marikenloop 2009

#### Situation

- Date and place: 17 May 2009 in Nijmegen
- Type of event: 10K ladies run
- Nr. of participants: appr. 7,000 participants
- Measured density: 120 participants per minute

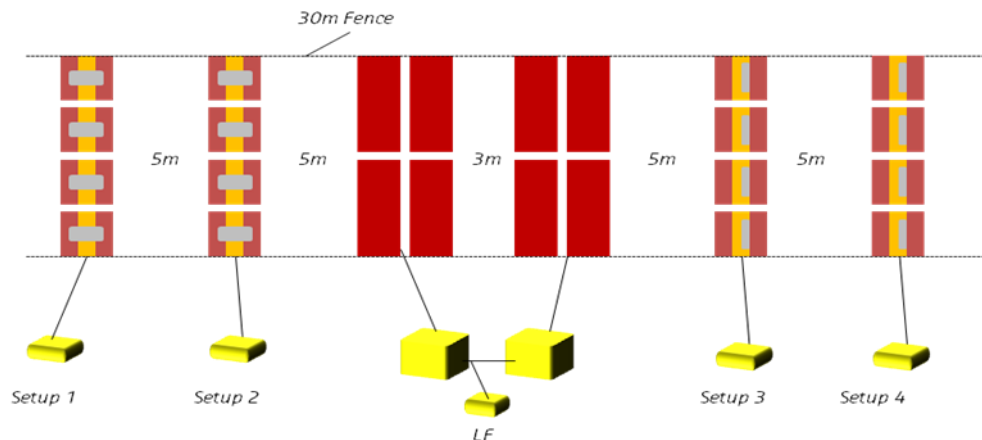
#### Test setup

A test setup was created at 1 split point. On that split point 6 timing systems were installed:

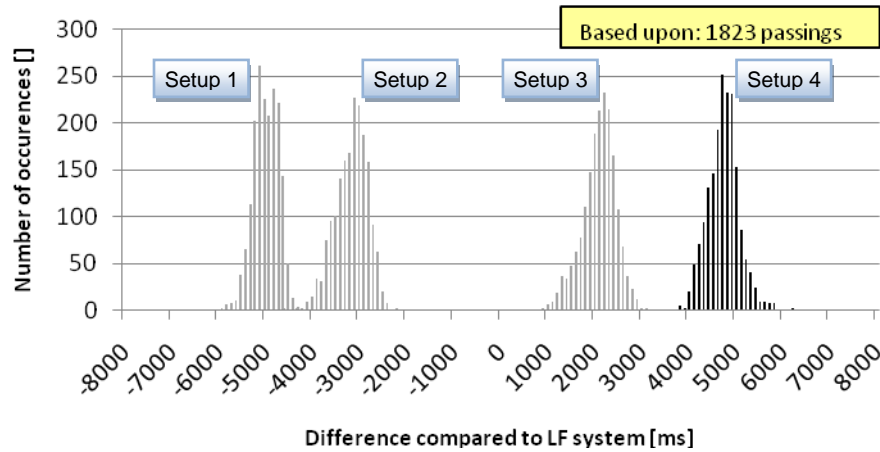
- 4 different UHF configurations
- 2 LF systems (1 main + 1 backup)

Every runner wore a LF and a UHF chip, resulting in 5 separate split times per runner (one for every UHF configuration and one for the LF reference system). The situation is depicted in the image below.

The 4 different UHF configurations were tested against the LF reference system. The measured split times of each UHF configuration were compared to the split points measured by the LF system. In addition, the number of recorded passings was set against the number of actual passings to give an indication on the BibTag System's accuracy.



## UHF accuracy histogram



### Reliability

Reliability numbers for the 'winning' UHF system:

- 99,86% detection rate for active BibTags.
- 99,58% detection rate for passive BibTags.

### Accuracy

We have analyzed the difference between the UHF split times and the LF split time (reference split time). The differences are depicted in the graph above. Please note that the offset in time differences is a result of the distances between the different configurations (see test setup image).

The standard deviation of the calculated differences for the fourth UHF system (shown in black lines in the bar chart) is 333ms, meaning that 68% of the runners is being detected with an accuracy of 333ms. The accuracy of the remaining 32% is within 1 second. Based on the narrow spread, the fourth UHF configuration has been chosen as the final configuration for the BibTag System.

For more details please contact your MYLAPS sales representative.