



# Player Analysis Technology Approval report

## Firstbeat Sports

Test code: PAT-19-024

Serial no: n/a

### Software versions:

Firstbeat Sports cloud (server): 20.7.2020

Firstbeat Sports Live app for coaches: v1.20.7 (16.6.2020)

### Firmware version:

V2.0 (13.5.2020)

Issue date: 27 August 2020

**Objective:** To test and evaluate Firstbeat Sports Player Analysis Technology according to Rule 31 of the 2020 Rules of Tennis.

**Result:** Approved



## SUMMARY

The Firstbeat Sports Sensor device (mass 10 g) is connected to a textile belt worn by the player around their chest. The device contains electrocardiogram and motion sensors to record the heart rate and movement of the player.

Real-time wireless data transfer is possible when the device is connected and in Bluetooth range of an auxiliary device using the Live app or Sports App. The device can also store data for post-match transfer to an auxiliary device.

Coaching information available on the auxiliary device includes heart rate metrics and movement loads.

Restrictions on the access by a player to Firstbeat Sports Sensor components during periods when coaching is not and is allowed are as follows:

COMPONENT	NO COACHING	COACHING
Firstbeat Sports Sensor	Permitted	Permitted
Auxiliary device (e.g. smartphone)	Not permitted	Permitted

## MAIN COMPONENTS

The main components of the system are described in table 1 and depicted in figure 1.

COMPONENT	FUNCTION(S)
Firstbeat Sports Sensor	Record, store and transmit data
Auxiliary device (e.g. smartphone)	Communicate and transmit data
Firstbeat Sports Live app for coaches	Analyse, store and communicate data
Firstbeat Sports app for athletes	Analyse, store and communicate data
Firstbeat Sports server	Store and transmit data
Firstbeat.com website	Communicate data

Table 1. Description of the components of the Firstbeat Sports system.



Figure 1. Components of the Firstbeat system (from left to right): Firstbeat Sports Sensor (front and back), Firstbeat Sports Sensor in textile belt and auxiliary device (iPad). Images are not to scale (iPad image credit: [Netspy CC BY 3.0](https://creativecommons.org/licenses/by/3.0/)).

## DATA CAPTURE AND TRANSMISSION

A Firstbeat Sports Sensor device (see figure 1) containing electronic sensors (an electrocardiogram sensor, triaxial accelerometer, triaxial gyroscope and triaxial magnetometer) is inserted into a textile belt worn by the player around the chest to measure their heart rate and movement (see figure 2). The device is 10 g and is 35 × 7 mm in size.

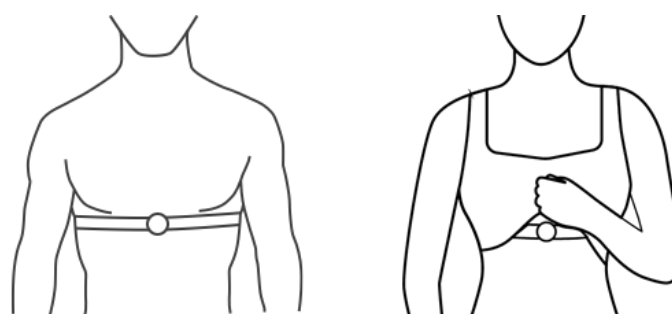


Figure 2. Location of the textile belt worn by players.

To ensure data security, the app requires the user to log in using registered credentials through the Firstbeat website before the Bluetooth connection between the Firstbeat Sports Sensor device and auxiliary device can be established. The Firstbeat Sports Sensor device is then assigned to the registered user account (i.e. data can only be transferred from the device to this account).

The device is prepared for data capture by pairing it with an auxiliary device. This is done by pressing the pins on the Firstbeat Sports Sensor device (see figure 3), to activate its pairing mode, and selecting it from the list of Bluetooth devices detected by the auxiliary device. The device can then be paired from within the app.



Figure 3. Pins for pairing and activating the device.

Data capture is started upon contact of the device with the player's skin. Once in contact with the player's skin, the sensor will begin data capture automatically. Data capture stops once the sensor is removed from the skin. There is a single LED on the device signalling the device is capturing data. Once capturing data, the LED will illuminate every 5 seconds. The device does not have to be in range of an auxiliary device to start data capture, as data can be downloaded retrospectively. During post-play analysis of data, sessions within the data capture period can be defined in the app by the user, including type of activity, start times, end times and rest periods.

Real-time data are available to a user or coach if the device is in range of a Bluetooth connection with an appropriate auxiliary device. Real-time data analysis starts once the device is selected from within a Firstbeat Sports App, if previously synced.

#### COMMENTS

Start/stopping data capture is player-driven by wearing/removing the device respectively. Transmission of data between the device and an auxiliary device is over a wireless (Bluetooth) connection.

Syncing the data with the Firstbeat Sports server requires an internet connection and a password-protected user account. Transmission of data from the Firstbeat Sports apps to the Firstbeat Sports server is data encrypted when in transit. Data are only stored in the secured server and not stored in client applications. These measures limit the system's susceptibility to hacking.

#### DATA PROCESSING AND COMMUNICATION

No coaching information is available on the device. Data analysis, real-time or offline, can be accessed via two Firstbeat Apps. The Live app allows coaches to view and capture data for several players simultaneously. The Sports app allows individual players to login to a personal account and access their own training information.

The Live App or Sports App on an auxiliary device and displays coaching information, such as:

1. Heart rate and percentage of maximum heart rate (intensity).

2. Estimated energy expenditure (kcal).
3. The product of intensity and duration (internal load).
4. Cumulative movement (external load).

Further data analysis is available via the Firstbeat website which requires access to an auxiliary device with an internet connection. A player can nominate a third-party (e.g. a coach) access to their data, subject to that individual having a registered account. Following login to their account, coaches can view all the players in dashboard view, while players can view only their own data.

#### COMMENTS

The device does not have a means to communicate data collected. An auxiliary device is required for real-time data transfer, processing and communication.

Coaching information is available on the auxiliary device. Therefore, players must not have access to auxiliary devices, e.g. smartphone, tablet, laptop, when coaching is prohibited.

#### ADDITIONAL INFORMATION

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**Date received:** 20 June 2020

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**Revision number:** 0

**NOTE** Approval does not attempt to, nor does it in fact, establish the accuracy or reliability of data or fidelity of its transmission.