



# Player Analysis Technology Approval report

## Catapult OptimEye S5

**Test code:** PAT-19-020

**Serial no:** n/a

**Software versions:**

OpenField 1.22.0 Build #40005 (Windows)

**Firmware version:**

OptimEye S5: 7.42

OptimEye TRX: 7.42



**Issue date:** 23 May 2019

**Objective:** To test and evaluate Catapult OptimEye S5 Player Analysis Technology according to Rule 31 of the 2019 Rules of Tennis.

**Result:** Approved

### SUMMARY

The Catapult OptimEye S5 'pod' (mass 67 g) containing electronic sensors is inserted into a vest worn by the player to record position, orientation, velocity and acceleration of the body. Real-time wireless data transfer is possible when the pod is paired to a Catapult OptimEye TRX receiver unit, which in turn is connected to an auxiliary device, e.g. a laptop.

Coaching information available on the auxiliary device includes average and peak velocity, distance travelled and player location heat maps.

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

COMPONENT	NO COACHING	COACHING
Catapult OptimEye S5 pod	Permitted	Permitted
Catapult OptimEye TRX receiver	Permitted	Permitted
Auxiliary device, e.g. laptop	Not permitted	Permitted

## MAIN COMPONENTS

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

COMPONENT	FUNCTION(S)
Catapult OptimEye S5 pod	Record position, orientation, velocity and acceleration of the player; store and transmit data
Catapult OptimEye TRX receiver	Receive data
Catapult OpenField software	Analyse, transmit and communicate (display) data
Catapult OpenField Cloud	Analyse and communicate data
Catapult OpenField app	Record and transmit timing data
Auxiliary device, e.g. laptop	Communicate and transmit data

Table 1. Description of the components of the Catapult system.



Figure 1. Components of the Catapult system (from left to right): Catapult S5 pod; Catapult TRX receiver, auxiliary device (laptop). Not to scale.

## DATA CAPTURE AND TRANSMISSION

A 'pod' (see figure 1) containing electronic sensors (GPS receiver, triaxial accelerometer, triaxial gyroscope and triaxial magnetometer) is inserted into a vest worn by the player. The sensors in the pod measure the position, acceleration and orientation of the player. The pod is 96 × 52 × 14 mm in size, with a mass of 67 g.

Data capture is started by pressing the power button (see figure 2). The top of three LEDs on the device flashes rapidly to indicate the pod is on and searching for a GPS lock. If a GPS lock is established the LED flashes once intermittently. If no GPS lock is established (i.e. if the pod is being used indoors) the LED flashes twice intermittently. Data capture is stopped by pressing the power button and then holding for three seconds, which switches the pod off. When the device is connected to an auxiliary device (e.g. a laptop) via a USB cable, the middle LED will flash intermittently.

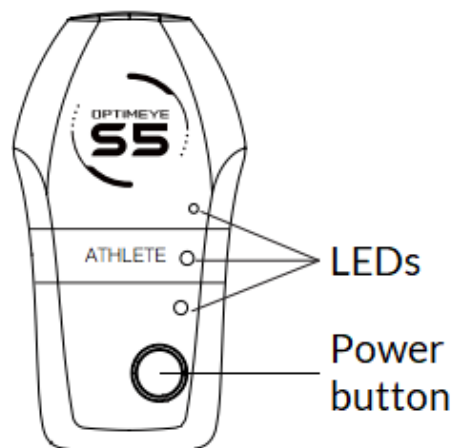


Figure 2. Pod power button and LEDs.

When charging the pod, the top LED will stay solid red, before turning green to indicate full charge. When in use, the battery status can be shown by pressing the power button once quickly. The three LEDs will illuminate to indicate full charge (three LEDs) to low charge (one LED).

Data can be transmitted to an auxiliary device in real-time using Catapult's OptimEye TRX receiver unit (see figure 1). Unique firmware on both the pod and receiver are used to create a secure connection. Data are also stored on the pod and can be downloaded to the auxiliary device via a USB cable. In both cases, the data transfer is managed through Catapult's OpenField software (see figure 3). The pod (and data) are assigned to a pre-registered user account prior to data transfer.



Figure 2. Catapult OpenField software and iPhone app.

During real-time data transfer, the OpenField software processes and visualises some of the data captured and transmitted by the pod. This excludes the inertial sensor data due to bandwidth limitations. Start times, end times and descriptions of specific activities or drills (e.g. training sessions, matches) can be defined at this point, through either the OpenField software or the OpenField+ iPhone app. Further to this, GPS coordinates defining the boundaries of the area of activity (i.e. the tennis court) can be input. These data can be determined by using the GPS receiver in the pod.

Once a session has ended, the data are transferred to Catapult's OpenField Cloud service through an active internet connection (with end-to-end encryption). OpenField Cloud synchronises, e.g. the GPS data from the pod and timing data from the mobile app, and further processes the data.

## COMMENTS

Start/stopping data capture is player-driven. Transmission of data between the pod and auxiliary device is either over a secure wireless or wired connection. Transmission of data from the auxiliary device to Catapult's OpenField Cloud service is via an encrypted wireless or wired internet connection. These limit the system's susceptibility to hacking.

Data are assigned to a registered user account via proprietary software installed on an auxiliary device. The user account also permits access to the data through Catapult's OpenField web services, protecting against unauthorised access.

## DATA PROCESSING AND COMMUNICATION

The auxiliary device displays coaching information, such as session times, average and peak accelerations and velocities. Further data processing and communication are available via the Catapult OpenField Cloud and web services, which requires both an internet connection and for the user to log in to their account. Coaching information, such as distance travelled and player location heat maps, are accessible.

A user can nominate a third-party (e.g. a coach) access to their data, subject to that individual having a registered account.

## COMMENTS

The pod does not have a means to communicate data collected. An auxiliary device is required for real-time data transfer, processing and communication. Additional transfer, processing and communication are available when the auxiliary device has an active internet connection.

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

### **Client:**

Catapult Sports  
Calls Wharf, 2 The Calls  
Leeds LS2 7JU  
UK

**Date received:** 23 January 2019

**Report prepared by:** James Spurr  
**Report authorised by:** Jamie Capel-Davies  
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**NOTE** Approval does not attempt to, nor does it in fact, establish the accuracy or reliability of data or fidelity of its transmission.