Adding phones to the whitelist

OVERVIEW

Not all phones models give accurate, repeatable results with Caddisfly. Before providing a user with a new phone for testing, it must be ensured that the phone is accurate within the limits prescribed by Caddisfly.

This document is meant to serve as a guideline for integrating new android phones to the Caddisfly whitelist. These are subject to changes in the android operating system, and the app. The current whitelist can be found here: https://github.com/akvo/akvo-caddisfly/wiki/Phones

Once a phone has been confirmed to work with Caddisfly, the github page should be updated accordingly.

Initial Requirements

An initial analysis of a phone's compatibility with Caddisfly can be made before buying it by checking the technical specifications on sites like gsmarena.com . Compare the manufacturer's specifications with the below table:

Requirements for Caddisfly phones			
All	Colorimetry	EC/USB tests	Strip Tests
Minimum Android v.4.4	Good camera + flash (>8MP)	USB OTG compatibility	Camera + Flash
GPS	Camera/Flash centered on the vertical axis of the phone	Good battery life	OpenCV app
1.2 Ghz or more CPU (Quad core recommended)	Less than 16mm spacing between camera and flash		
Accelerometer	OpenCV app		

Testing for compatibility: Colorimetric Tests

Even if the above criteria are met, there is a chance that a given smartphone will not be compatible with Caddisfly. This could be due to a number of factors, ranging from phone camera software to camera and flash inconsistency. In order to use an unverified phone model with Caddisfly, the phone must first be certified for compatibility.

Below is a summary of the activities required to certify a phone for colorimetric testing with Caddisfly:

Activity	Time
Selecting Phones and back cases	1 hour
Preparation of Caddisfly	3 hours
Calibration and testing of standards (fluoride)	2 hours
Repeatability testing (fluoride)	2 hours

1. **Back-case selection:**

When buying a back case for the smartphone you;ve chosen, look out for the following things:

- Should preferably be made of **opaque** SGP rubber, or plastic (avoid leather)
- Must have a smooth finish
- Should not be coated with paint

2. **Preparation:**

- Refer to this manual for setting up the phone attachment: web print
- Refer to this manual for assembling and filling the capsules: web print
- The latest version of Caddisfly can be downloaded from the playstore.
- The open Caddisfly instance of Flow can be downloaded from the following link: http://caddisfly.akvoflow.org/app2
- Prepare the following fluoride standards:

    - 0ppm (distilled water),

- 0.5ppm,
- 1.0ppm,
- 1.5ppm,
- 2ppm,
- Either 1.3ppm or 1.7ppm (These will be used for determining whether the calibration has been performed correctly.)

3. Calibration Test:

Once the phone has been ordered, and the back case has been prepared for testing, the best way to check the compatibility with Caddisfly is to perform a calibration and test with it.

1. Go to the "Calibration" section of the app, and select "Fluoride"
2. Calibrate the phone for each point
3. Test the *intermediate* point 1.3ppm or 1.7ppm.
4. If the error is more than a 10% error (+/- 0.1ppm), recalibrate the nearest points and test again
5. If the error does not disappear, the phone is not suitable for use with Caddisfly.

4. Repeatability Testing:

To perform the repeatability test, run three consecutive tests on a known sample value in a lab environment. If the results repeatedly vary from the known value by more than 0.05ppm, the phone is not suitable with use for Caddisfly. For best results, it would be good to perform the test on all calibration points and intermediates.

For a quick version of the repeatability test: test only the high range standards (1.3, 1.5 and 1.7) repeatedly.

Other points:

- When calibrating a single point, note the difference between the RGB values in the result screen. There should not be too much variation between them. (refer to Figure.1 for an example). For a more technical definition, the euclidean distance should not be more than **12** between any two points.

- Note the "d" values between points. If the "d" value between consecutive calibrated points is less than **15**, the app will not be able to generate sufficiently different swatches to give results. Figure.2 shows an example of a phone (Moto G4 Play) that has a very good distance between calibrated points.

- Note that the quantity of reagent in the capsules is a potential source of error when certifying a phone. If the user has filled the capsules themselves, make sure to have followed the instructions in the manual (particularly regarding the presence of bubbles and the chamber volume).

Figure.1	Figure.2