Introduction of power consumption mode

XIAO ESP32C3 can be switched between different power consumption modes:

- **Active**: General operating mode, where both CPU and chip RF are in operating state. In this mode, the chip will receive, transmit and listen to signals normally.
- **Modem-sleep**: The CPU is active with variable clock frequency (80MHz/160MHz, which will be switched automatically depending on CPU load and peripherals used). The baseband and RF of Wi-Fi and BLE are turned off, but both will stay connected. While the Wi-Fi is enabled, the chip will cut back to Active mode from time to time, and the power consumption will be changed between the both modes.
- **Light-sleep**: CPU suspended. Any wake-up event (MAC, host, RTC timer or external interrupt) will wake up the chip. Wi-Fi or BLE will stay connected.
- **Deep-sleep**: CPU and most peripherals are suspended, only the timer and memory of the RTC are working. Wi-Fi connection data is stored in the RTC.

Compared to competing products, there is a 32.768 kHz crystal clock circuit on XIAO ESP32C3, which providing a low-frequency RTC clock for the CPU. This allows the XIAO ESP32C3 to run in Deep-sleep low-power mode for extremely low standby power consumption (44µA) and long standby time with external batteries, providing a more diverse range of low-power application scenarios. The operating states of the ESP32-C3 modules in different power consumption modes are shown below.
Test results

The low power mode summary test results of XIAO ESP32C3 are shown in the following table:

<table>
<thead>
<tr>
<th></th>
<th>Active</th>
<th>Modem-sleep</th>
<th>Light-sleep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current with Wi-Fi</td>
<td>74.7mA</td>
<td>24.4mA</td>
<td>3.6mA</td>
</tr>
<tr>
<td>enabled</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current with BLE</td>
<td>/</td>
<td>26.8mA</td>
<td>9.7mA</td>
</tr>
<tr>
<td>enabled</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Current in Deep-sleep mode: 44.0µA

Detailed Test Procedure

**Note:** ESP32-C3 needs AT firmware pre-burned, and AT command sent through serial port to set the power consumption mode.

**Power consumption test with Wi-Fi enabled**

Reference of AT command:

```
AT+CWMODE=1 -> Configure to Station mode.
AT+CWJAP="SSID","Password" -> Connect to the AP.
AT+SLEEP=0 -> Configure to Active mode.
AT+SLEEP=1 -> Configure to Modem-sleep mode.
AT+SLEEP=2 -> Configure to Light-sleep mode.
```

Test results in Active mode:
Test results in Modem-sleep mode:

Test results in Light-sleep mode:
Power consumption test with BLE enabled

Reference of AT command:

```
AT+CWMODE=0 -> Turn off Wi-Fi RF.
AT+BLEINIT=2 -> Configure to Server mode.
AT+BLEADVSTART -> Turn on BLE broadcast.
AT+SLEEP=1 -> Configure to Modem-sleep mode.
AT+SLEEP=2 -> Configure to Light-sleep mode.
```

Test results in Modem-sleep mode:
Test results in Light-sleep mode:

Power consumption test in Deep-sleep mode

Reference of AT command:

```AT+GSLP=sleeptime -> Configure to Deep-sleep mode and hold for 'sleeptime'```
Test results in Deep-sleep mode:

Reference

- [Datasheet | ESP32C3 Series](https://www.espressif.com/docs/datasheets/ESP32C3 datasheet.pdf)