Talaria TWO™ EVB-A Evaluation Boards (INP3010/INP3011/INP3012/INP3013/INP3014/INP3015)

Ultra-Low Power Multi-Protocol Wireless Platform SoC

IEEE 802.11 b/g/n, BLE 5.0

User Guide for Talaria TWO Evaluation & Development Kit

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Revision History

Version	Date	Comments
1.0	07-04-2020	First version
1.1	09-14-2020	Updated for SDK 2.1.1 release
2.0	05-13-2021	Updated for SDK 2.2 release Updated block diagram to reflect v1.3 board and jumper settings
2.1	07-09-2021	Updated labels for INP1012/1013
2.2	07-30-2021	Updated Antenna details for INP1010/11/12/13
2.3	08-06-2021	Updated with additional Antenna information for INP10x modules
2.4	08-16-2021	Updated Antenna specifications table for INP10x modules
3.0	10-22-2021	Updated Antenna specifications for INP1014 & INP1015 modules
3.1	10-27-2021	Updated labels for INP1014/15 modules
4.0	12-13-2021	Updated Antenna requirements for INP1015 module
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5.0	08-26-2022	Updated with antenna specifications for INP1014 and INP1015

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Terms & Definitions

BLE	Bluetooth Low Energy
DMM	Digital Multimeter
DPDT	Double Pole Double Throw
FTDI	Future Technology Devices International
GPIO	General Purpose Input/Output
IO	Input Output
JTAG	Joint Test Action Group
LED	Light Emitting Diode
MPSEE	Multi-Protocol Synchronous Serial Engine
SCL	Serial Clock
SDA	Serial Data
SPI	Serial Peripheral Interface
SPDT	Single Pole Double Throw
UART	Universal Asynchronous Receiver-Transmitter
USB	Universal Serial Bus

Introduction

INP301x Talaria TWO evaluation board is designed as an evaluation platform for the INP101x modules. This user guide provides an overview of the evaluation board explaining its key features and functions.

INP301x Package Contents

The package contains:

1. INP3010*, INP3014*, INP3011**, INP3015**, INP3012 or INP3013 board
2. Micro USB cable
3. Antenna (INP3011 and INP3012 boards)
4. Battery box

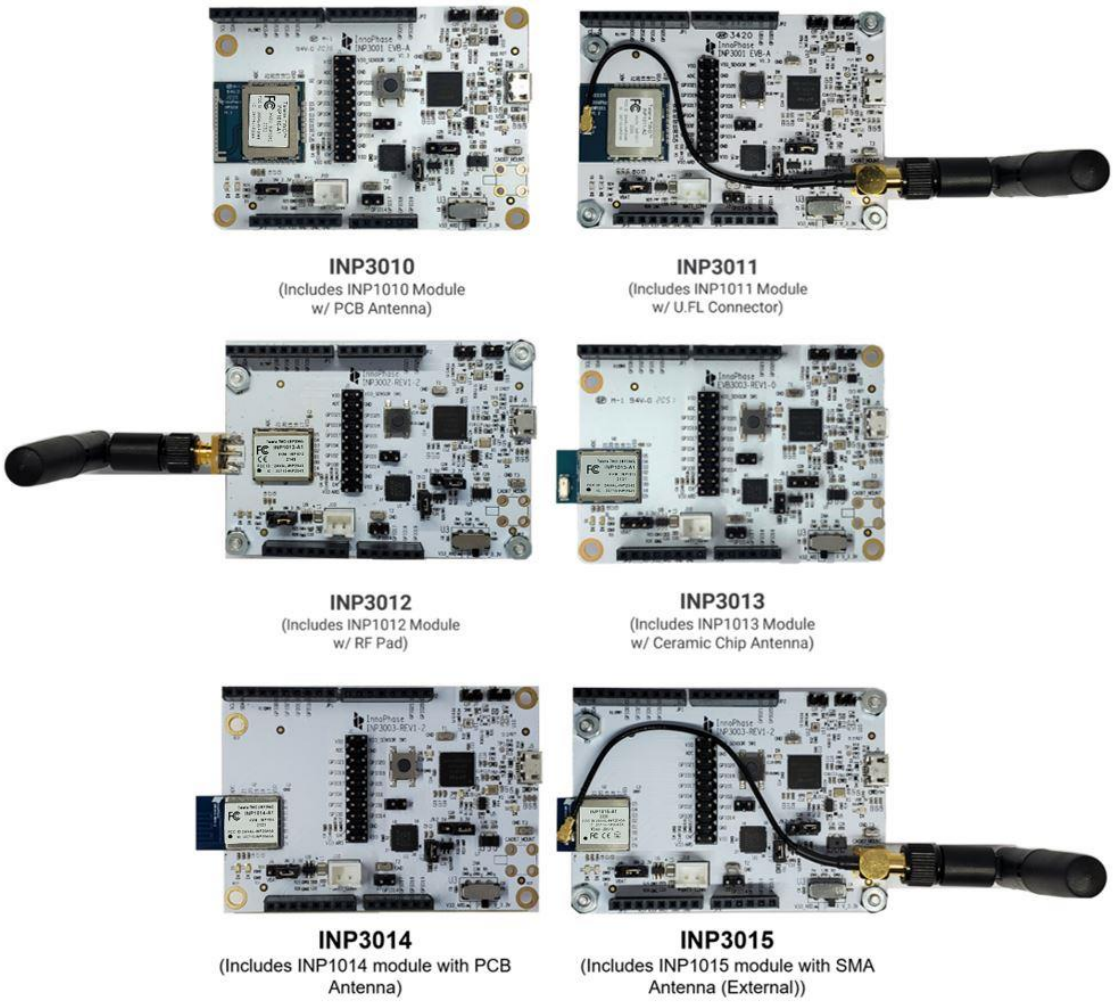

Figure 1: INP301x EVB-A Board with INP101x module board installed

Description of the Board

Block Diagram

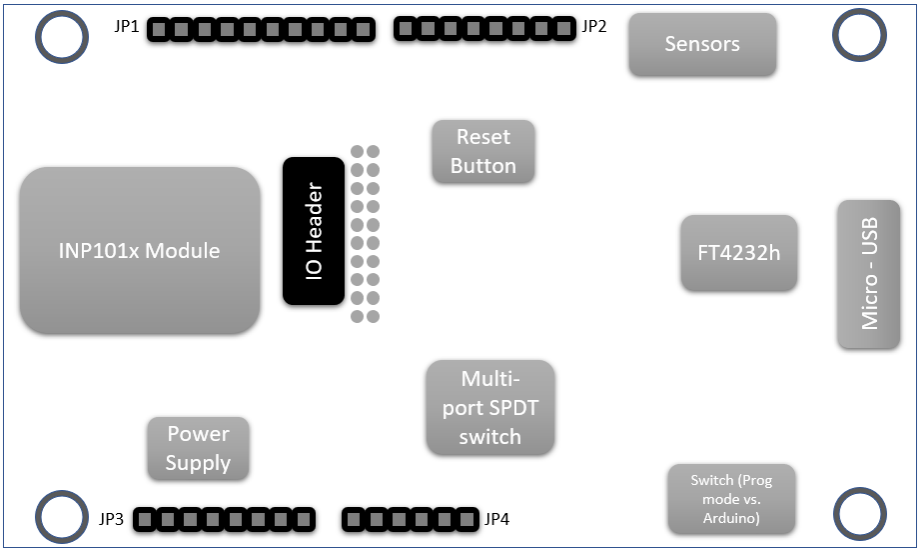

Figure 2: Block diagram of INP301x Evaluation Board

The block diagram of the INP301x Evaluation board is shown in Figure 2. The main component on the board is the INP101x module. Key features of the evaluation board are:

1. Standalone mode vs. Shield mode: Using the mode switch U3, either standalone mode or shield mode can be selected.
    a. In standalone mode, the INP101x can be accessed via micro-USB cable for programming and debugging. This mode is recommended for standalone application development.
    b. In shield mode, the INP101x module can be interfaced with any host CPU and can provide serial to Wi-Fi capabilities.
2. A peripheral IO header (J1) is available using which all the IO's of the INP101x module can be accessed.
3. Power supply section: Based on the mode, the power for module is derived from either USB or shield header. A battery header is available which can be used as power source as well.
    a. J4 at VM_3.3V for USB power
    b. J4 at VBAT and battery connect to J10 for Battery power
4. On board sensors are available to develop sensor to cloud applications.
5. Switch:
    a. Set U3 switch to V33_ARD for Shield mode
    b. Set U3 switch to V_3.3V for Standalone mode

Jumpers on the Board

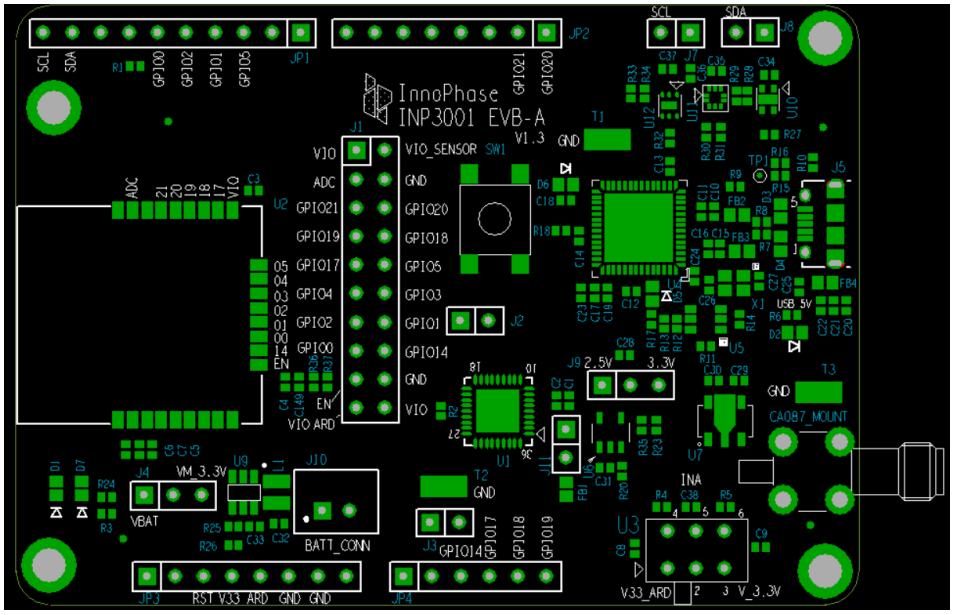

Figure 3: INP301x EVB-A control and connectivity points

Jumper	Mode and Operation
J1	IO header
J2	Used to enable Console logging in shield mode
J3	Connect LED D1 to GPIO14, for debug purposes
J4	Select power from USB or battery connector, also used for current measurements
J7	Connect SCL to GPIO4
J8	Connect SDA to GPIO3
J9	Select IO voltage for FTDI IOs
J10	Battery terminal
J11	Enable the multi-port SPDT switch
JP1 to JP4	Arduino UNO shield compatible header (3.3V support only)
U3	Switch between Stand-alone mode and Arduino Shield Mode

Table 1: Jumper Information

Power Supply and Mode Switch

The INP301x board is designed to supply power to the INP101x module in following ways:

1. In standalone mode, power is drawn from USB connector
2. In shield mode, power is drawn from shield connector
3. A battery header is also available to provide power to the module

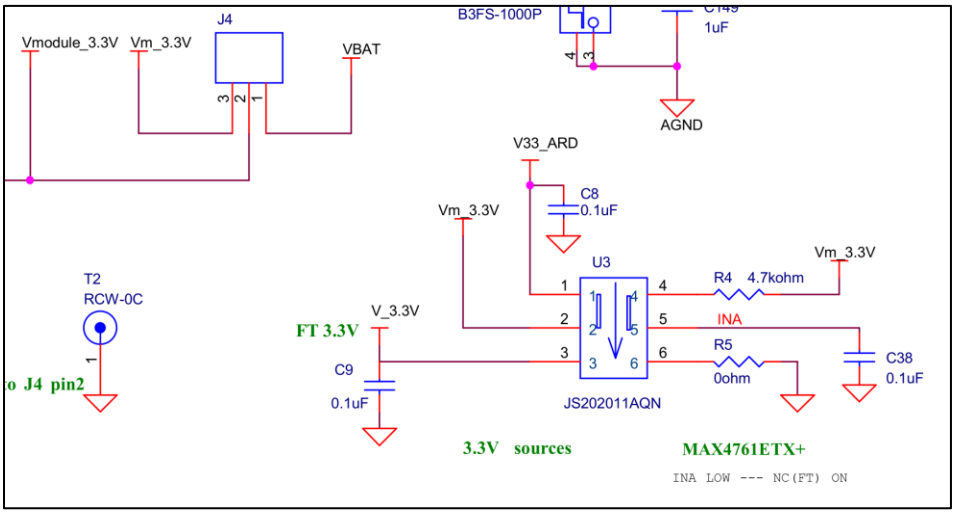

Figure 4: Power supply section

The power supply section is shown in Figure 4. The INP101x module requires 3.3V supply. The DPDT switch (U3) selects between USB and Arduino header supply using the common net Vm_3.3V. The jumper J4 is used to select between battery supply and Vm_3.3V. The same jumper can be used for measuring current consumption of the module.

IO Header (J1)

The J1 header brings out all the IOs from INP101x module. These IOs can be used for debug, and/or any external interfacing needs. The pinout of this header is shown in Figure 5. To work with on board sensor, pins 1 & 2 needs to be shorted.

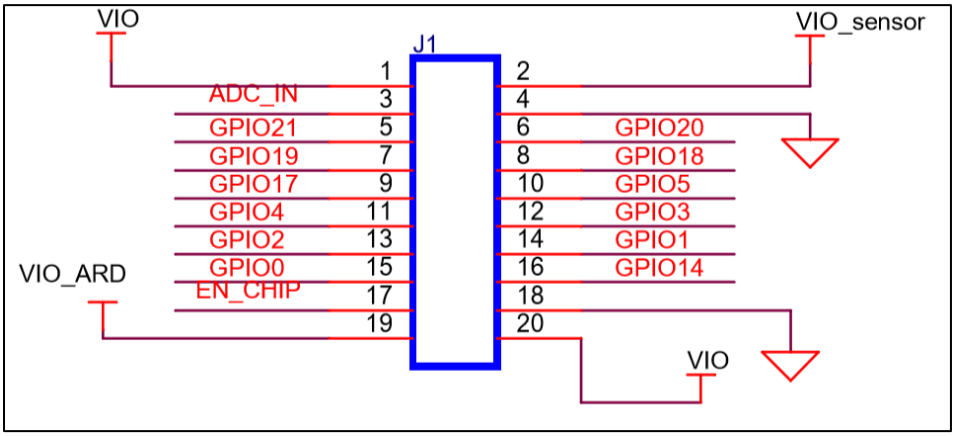

Figure 5: IO Header

Shield Headers (JP1 to JP4)

Arduino UNO compatible headers are available in the INP301x board to interface with any compatible host micro-controller.

The GPIOs assigned to shield headers are carefully chosen to achieve following capability:

1. INP101x's SPI slave pins available on JP1
2. INP101x's I2C master pins available on JP1
3. Remaining GPIOs are available on JP2 and JP4

Note that INP301x supports 2.5V IO as the default configuration. The shield header connections are as shown in JP2 of Figure 6.

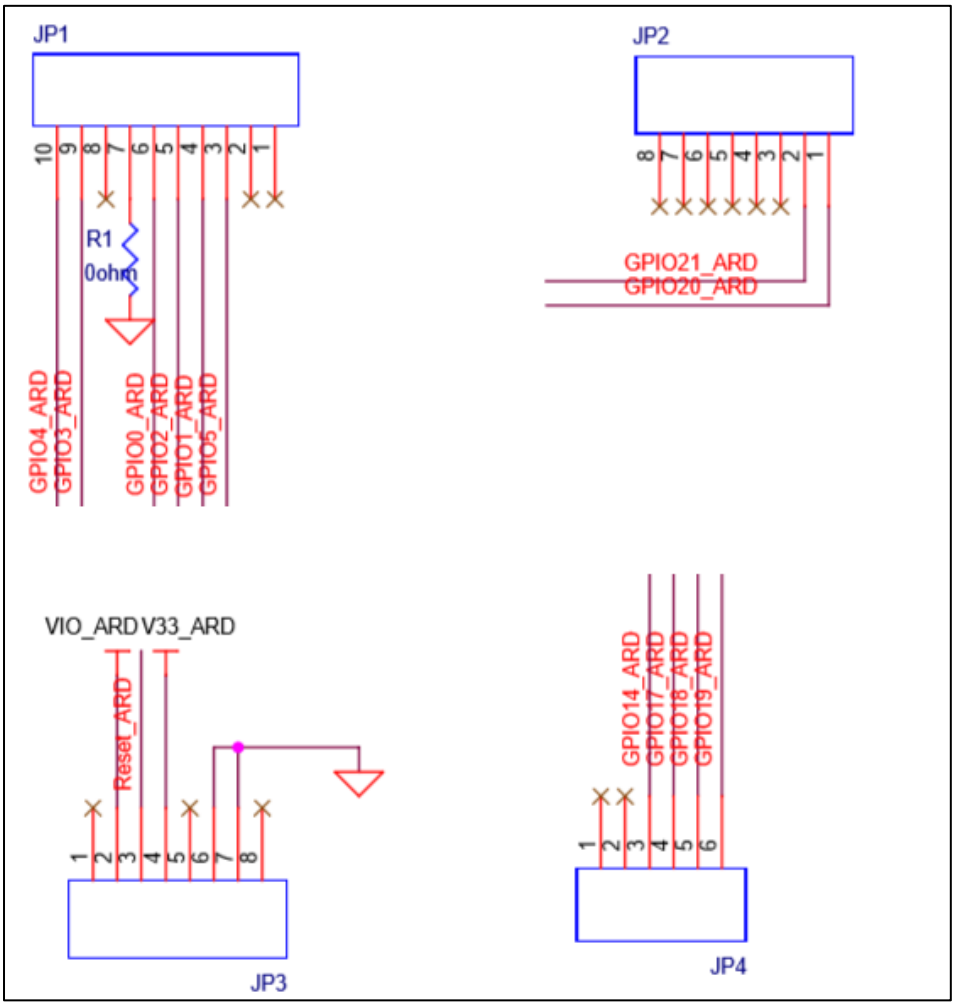

Figure 6: Arduino UNO shield compatible jumpers

On Board Sensors

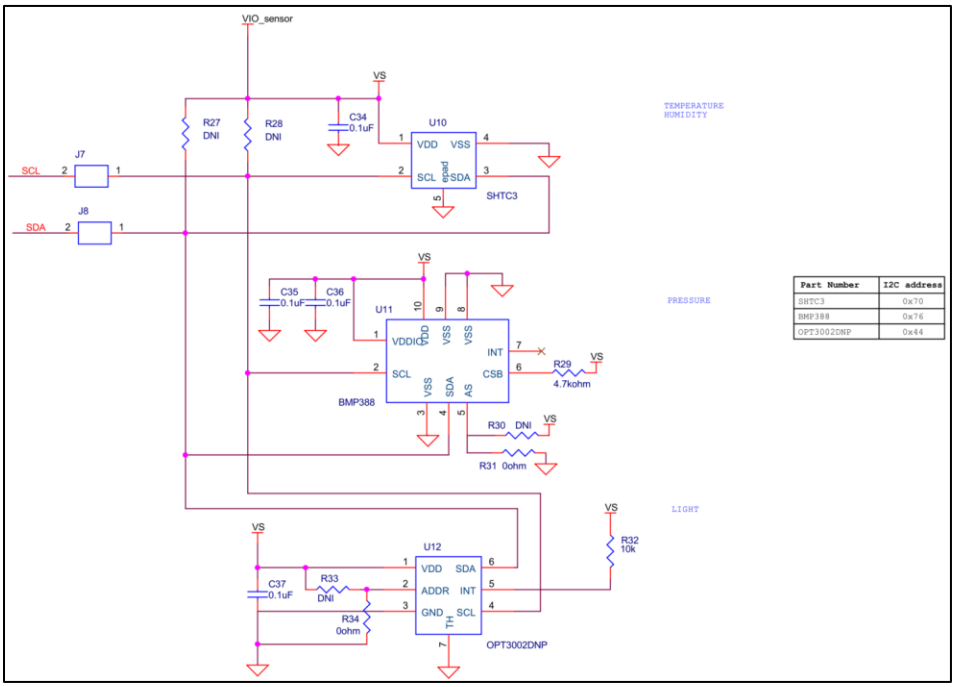

Figure 7: On board sensors

The INP301x board has following sensors available on board for quick prototyping/testing:

1. Temperature/Humidity (Sensirion SHTC3)
2. Pressure (Bosch BMP388)
3. Light (TI OPT3002)

To use the sensors, J7, J8, pins 1 & 2 of J1 should be connected. This enables power connection to the sensors on board, I2C connection on GPIOs 3 & 4.

Functional Description

Following are the functional modes that can be achieved in the INP301x board:

1. Stand-alone mode (host-less)
2. Shield mode (hosted)

More details about each mode are available in subsequent sections. Switching between the modes is handled by DPDT switch U3 for power, and multi-port SPDT switch U1 for the GPIOs.

Stand-alone Mode

The stand-alone mode is intended for following use cases:

1. Host-less application development on INP101x modules
2. Programing access to INP101x modules

In stand-alone mode, the U3 switch is pushed towards pin 3, which disconnects power and IO from shield headers and connects them to FTDI. The FTDI port layout is shown in Table 2.

FTDI Bus	Interface to Talaria TWO
A	JTAG
B	RESET
C	UART
D	CONSOLE (UART)

Table 2: FTDI Layout

The A & B bus of FTDI device supports MPSEE protocol, hence JTAG is assigned to A-bus. The BDBUS7 is connected EN_CHIP of the INP101x module. The C & D bus of FTDI device used as UARTs, with C-bus connected to peripheral UART of INP101x module and D-bus connected is CONSOLE port (GPIO17) of INP101x module.

The JTAG on A-bus is used for debugging applications on the INP101x module. The UART on C-bus is used for programming the INP101x module. The CONSOLE port is a unidirectional UART from INP101x module that operates at high baud rate of 2457600, used for debug prints.

Shield Mode

This mode will make the EVB-A board to act as a Wi-Fi/BLE5 shield. To enable this mode, flip the switch U3 towards V33_ARD. This also pulls up the INA pin of the multi-port SPDT device MAX4761ETX, which then routes the GPIOs from the INP101x module to the shield headers JP1, JP2, JP3 and JP4. In the shield mode a suitable firmware (such as Serial to Wi-Fi application available in the SDK) should be pre-flashed in the INP101x.

EVB-A as Wi-Fi Shield with STM32 Nucleo Board

A comprehensive set of host application packages are available to download via the InnoPhase website to demonstrate the use of EVB-A as a Wi-Fi/BLE5 shield board.

Mount the Talaria TWO EVB on the STM32 board on Arduino connector. Connect GPIO4 of Talaria TWO (J1 Connector) to Pin2 of CN6 connector. Talaria TWO uses this GPIO4 pin to interrupt ST when Talaria TWO wants to send data/notification to ST.

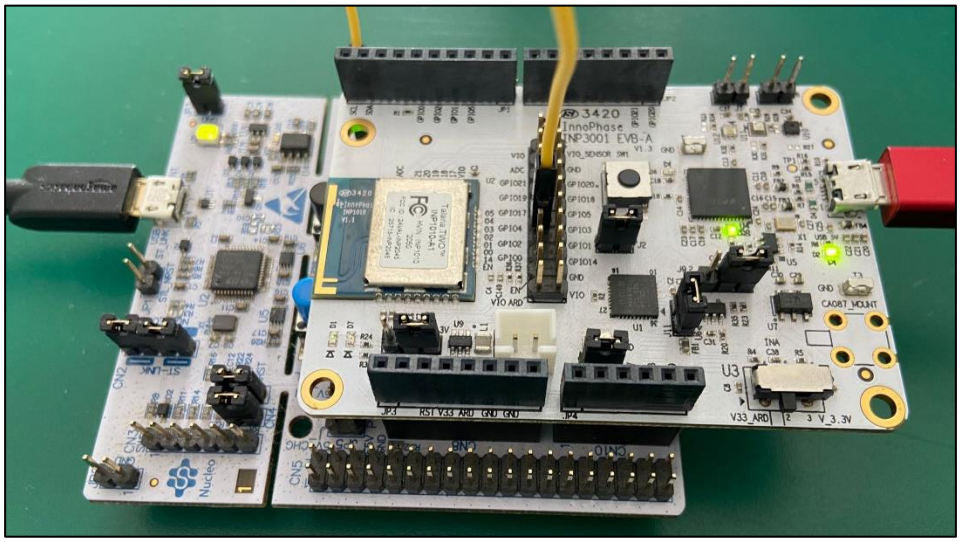

Figure 8: INP3010 EVB-A as Wi-Fi Shield

Power Measurement

The power consumption of the INP101x module is measured by either connecting a DMM on the jumper J4 or supplying power directly on J4 using specialty power supplies like Otti Arc from Qiotech. Figure 9 shows the connection setup to measure current consumption using Otti Arc.

Figure 9: Current measurement setup using Otti Arc

Using Battery as Power Source

Header J4 will switch between VBat and Vm_3.3V. Figure 10 shows VBat connection.

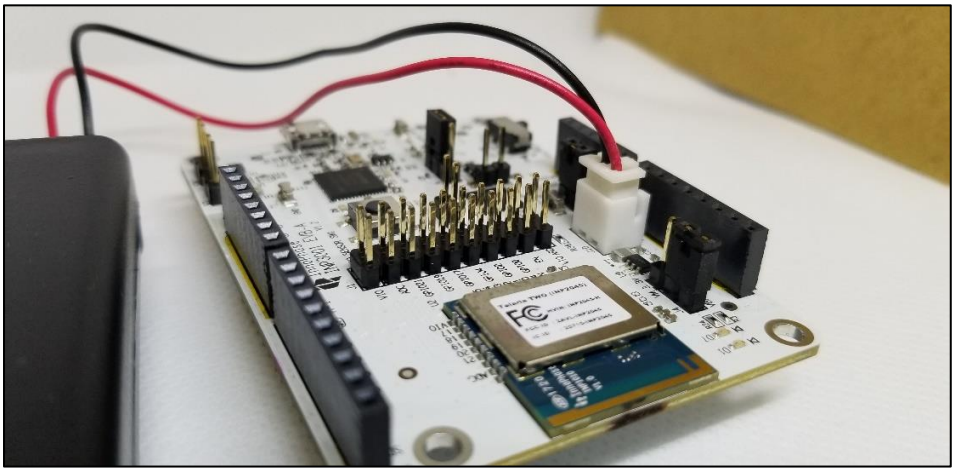

Figure 10: J10 Battery connection

Note: When using a battery as a power source there will be an additional current draw from LED (D7 or D12 depending on board version). If attempting to measure an accurate module current draw from the battery connection, the LED series resistor must be removed to disconnect the LED.

Antenna

The antennas integrated with INP2045 are listed in Table 3 have been approved for FCC/ISED, EU(RED) and TELEC.

Module ID	Antenna Type	Model Number	Antenna Manufacturer	Max Peak Antenna Gain (dBi)
INP1010	PCB Antenna	INP1010 PCB TRACE	InnoPhase	0.9
INP1011	SMA Antenna (External Antenna)	W24-ASMA-M	Inventek	2.15
INP1012	SMA Antenna (External Antenna)	W24-ASMA-M	Inventek	2.15
INP1013	SMD Chip Antenna	2450AT42B100	Johanson	0
INP1014	PCB Antenna	1014 PCB Trace	InnoPhase	5.33
INP1015	SMA Antenna (External Antenna)	W24-ASMA-M	Inventek	2.15

Table 3: Module ID with Antenna details

INP1010

Talaria TWO INP1010 module has a proprietary integrated/printed antenna. It is a Double-sided Inverted F (IFA) antenna and has been implemented as printed PCB elements.

By design and verification, Antenna does not require any additional matching component if the module is used as standalone product. This INP1010 PCB antenna integrated with INP2045 has been approved for FCC/ISED, EU(RED) and TELEC.

Module ID	Antenna Type	Model Number	Max Peak Antenna Gain (dBi)
INP1010	PCB Antenna	INP1010 PCB TRACE	0.9

Table 4: INP1010 - Antenna specifications

INP1011/INP1012/INP1015

Talaria TWO INP1011/INP1012/INP1015 module has been certified with External SMA antenna W24-ASMA-M which has been approved for FCC/ISED, EU(RED) and TELEC.

Module ID	Antenna Type	Model Number	Max Peak Antenna Gain (dBi)
INP1011/012/015	SMA Antenna (External Antenna)	W24-ASMA-M	2.15

Table 5: INP1011/012/015 - Antenna specifications

INP1013

Talaria TWO INP1013 module has been certified with SMD chip antenna 2450AT42B100 which has been approved for FCC/ISED and TELEC.

Module ID	Antenna Type	Model Number	Max Peak Antenna Gain (dBi)
INP1013	SMD chip antenna	2450AT42B100	0

Table 6: INP1013 - Antenna specifications

INP1014

Talaria TWO INP1014 module has a proprietary integrated/printed PCB antenna. By design and verification, antenna does not require any additional matching components if the module is used as a stand-alone product. INP1014 PCB antenna integrated with INP2045 has been approved for FCC/ISED and TELEC.

Module ID	Antenna Type	Model Number	Max Peak Antenna Gain (dBi)
INP1014	PCB Antenna	1014 PCB Trace	5.33

Table 7: INP1014 Antenna specifications

FCC/ISED Regulatory Notices

Modification Statement

Changes or modifications made to this equipment not expressly approved by InnoPhase IoT, Inc. may void the FCC authorization to operate this equipment.

Interference Statement

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

Radio Frequency Radiation Exposure Statement

This device complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment.

The device should be installed and operated with minimum distance of 20 CM between the device/antenna and all persons. This device must not be co-located or operating in conjunction with any other antenna or transmitter without further RF Exposure evaluation.

RF Exposure Statement for Module Integration

Talaria TWO modules listed above have been granted modular approval for mobile applications. Host products integrators may use the module in their final products with the same antenna without additional FCC certification if they meet the following conditions. Otherwise. additional FCC approvals must be obtained.

1. The host product with the module installed must be evaluated for simultaneous transmission requirements
2. The user manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC IC RF exposure guidelines.

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