



TECHNICAL NOTE

BeanDevice® (wireless sensor) power mode management



www.Beanair.com



Rethinking sensing technology

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BeanDevice® power management

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1. TECHNICAL SUPPORT

For general contact, technical support, to report documentation errors and to order manuals, contact **Beanair Technical Support Center** (BTSC) at:
tech-support@Beanair.com

For detailed information about where you can buy the Beanair equipment/software or for recommendations on accessories and components visit:




www.Beanair.com

To register for product news and announcements or for product questions contact Beanair 's Technical Support Center (BTSC).

Our aim is to make this user manual as helpful as possible. Please keep us informed of your comments and suggestions for improvements. Beanair appreciates feedback from the users.



2. VISUAL SYMBOLS DEFINITION

<i>Visual</i>	<i>Definition</i>
	<p><u>Caution or Warning</u> – Alerts the user with important information about Beanair wireless sensor networks (WSN), if this information is not followed, the equipment /software may fail or malfunction.</p>
	<p><u>Danger</u> – This information MUST be followed if not you may damage the equipment permanently or bodily injury may occur.</p>
	<p><u>Tip or Information</u> – Provides advice and suggestions that may be useful when installing Beanair Wireless Sensor Networks.</p>



3. ACRONYMS AND ABBREVIATIONS

AES	Advanced Encryption Standard
CCA	Clear Channel Assessment
CSMA/CA	Carrier Sense Multiple Access/Collision Avoidance
GTS	Guaranteed Time-Slot
kSps	Kilo samples per second
LLC	Logical Link Control
LQI	Link quality indicator
LDCDA	Low duty cycle data acquisition
MAC	Media Access Control
PAN	Personal Area Network
PER	Packet error rate
RF	Radio Frequency
SD	Secure Digital
WSN	Wireless sensor Network



4. RELATED DOCUMENTS

In addition to this User manual, please consult the application notes & technical notes:

4.1 APPLICATIONS NOTES

Document name (Click on the weblink)	Related product	Description
<u>AN_RF_007 : “Beanair WSN Deployment”</u>	All BeanAir products	Wireless sensor networks deployment guidelines
<u>AN_RF_006 – „How to extend your wireless range“</u>	All BeanAir products	A guideline very useful for extending your wireless range
<u>AN_RF_005 – BeanGateway® & Data Terminal Equipment Interface</u>	BeanGateway®	DTE interface Architecture on the BeanGateway®
<u>AN_RF_003 - “IEEE 802.15.4 2.4 GHz Vs 868 MHz”</u>	All BeanAir products	Comparison between 868 MHz frequency band and a 2.4 GHz frequency band.
<u>AN_RF_002 – “Structural Health monitoring on bridges”</u>	All BeanAir products	The aim of this document is to overview Beanair® products suited for bridge monitoring, their deployment, as well as their capacity and limits by overviewing various Data acquisition modes available on each BeanDevice®.



4.2 TECHNICAL NOTES

Document name (Click on the weblink)	Related product	Description
<u>TN RF 013 – « OPC configuration »</u>	BeanScape® Premium+	The aim of this document is to help deploying the OPC DA and all associated services.
<u>TN RF 012– « BeanDevice® battery life in streaming mode »</u>	All the products	The aim of this document is to describe the autonomy performance of the BeanDevice® SmartSensor® and ProcessSensor® product line in streaming packet mode.
<u>TN RF 011 – « Coexistence of Beanair WSN at 2.4GHz »</u>	All the products	This document aims to highlight the issues affecting co-existence of Beanair WSN (IEEE 802.15.4) in the presence of interference.
<u>TN RF 010 – « BeanDevice® Power Management »</u>	All the BeanDevice®	This technical note describes the sleeping & active power mode on the BeanDevice®.
<u>TN RF 009 – « BeanGateway® management on LAN infrastructure »</u>	BeanGateway®	BeanGateway® integration on a LAN infrastructure
<u>TN RF 008 – “Data acquisition modes available on the BeanDevice®”</u>	All the BeanDevice®	Data acquisition modes available on the BeanDevice®
<u>TN RF 007 – “BeanDevice® DataLogger User Guide ”</u>	All the BeanDevice®	This document presents the DataLogger feature on the BeanDevice®
<u>TN RF 006 – “WSN Association process”</u>	All the BeanDevice®	Description of the BeanDevice® network association
<u>TN RF 005 – “Pulse counter & binary Data acquisition on the BeanDevice® SUN-BN”</u>	BeanDevice® SUN-BN	This document presents Pulse counter (ex: energy metering application) and binary Data acquisition features on the BeanDevice® SUN-BN.
<u>RF TN 003- “Aggregation capacity of wireless sensor networks”</u>	All the products	Network capacity characterization of Beanair Wireless Sensor Networks
<u>RF TN 002 V1.0 - Current consumption in active & sleeping mode</u>	BeanDevice®	Current consumption estimation of the BeanDevice in active and sleeping mode
<u>RF TN 001 V1.0- Wireless range benchmarking</u>	BeanDevice®	Wireless range benchmarking of the BeanDevice®





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5. AIM OF THE DOCUMENT

The aim of this document is to provide a description of the power management on the BeanDevice®.



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6. ULTRA LOW POWER DESIGN

Having developed Beanair products based on the IEEE 802.15.4 protocol, Beanair went a step further in “Co-designing” hardware and software. This was done by manufacturing hardware with low current leakage on hardware analog blocks and software integrated with the Ultra-low power technology. Similarly, Beanair incorporated ultra-low power IC hardware for digital blocks. Ultimately, Beanair was able to achieve an Ultra-low power design without compromising on the performance.

Ultra-Low Power Design

Analog components
with low current
leakage

Ultra Low Power IC
Hardware

Wireless sensors
with several level of
sleeping with
network listening
mode



7. POWER MODE MANAGEMENT OVERVIEW

Three different types of power management are available on the BeanDevice®:

■ *"Battery Saver Disabled" power mode;*

■ *"Battery Saver Enabled" power mode;*

"Bat Saver disabled" power mode

- **Advantages:** The OTAC parameter is rapidly handled by the BeanDevice®
- **Constraint(s):** high power consumption

"Bat Saver enabled" power mode

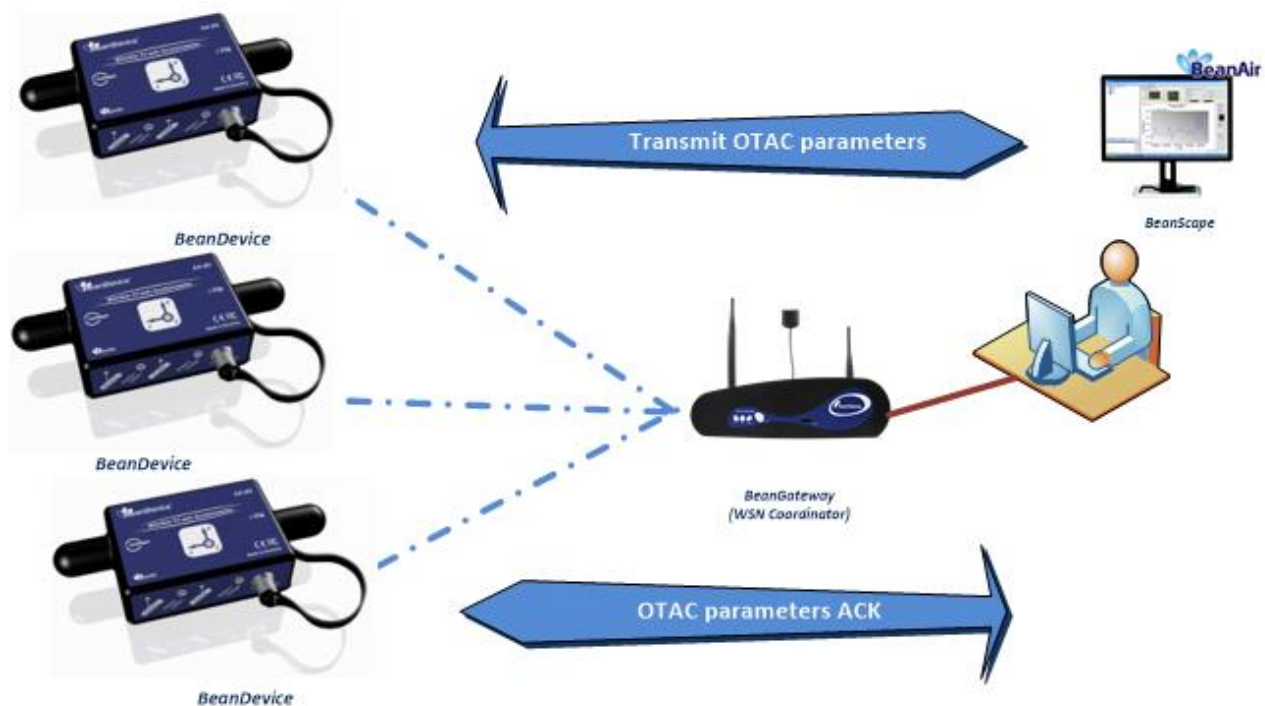
- **Advantages:** low power consumption, you can remotely configure the BeanDevice®
- **Constraints:** The BeanDevice® cannot be configured instantly, it depends on the Network Listening duty cycle specified by the user.



8. POWER MANAGEMENT DESCRIPTION

8.1 BAT SAVER DISABLED POWER MODE

In Bat Saver disabled mode, the BeanDevice® is active every time. The radio link between the BeanDevice® and the BeanGateway® is always conserved.



If your BeanDevice® is set to “**Bat Saver Enabled**” power mode, your battery may drain quickly. If you want to extend your battery autonomy, you must configure your BeanDevice® in “**Bat Saver Disabled**” power mode.

In Bat Saver Disabled mode, your BeanDevice® is always active; it will receive instantly your OTAC command.



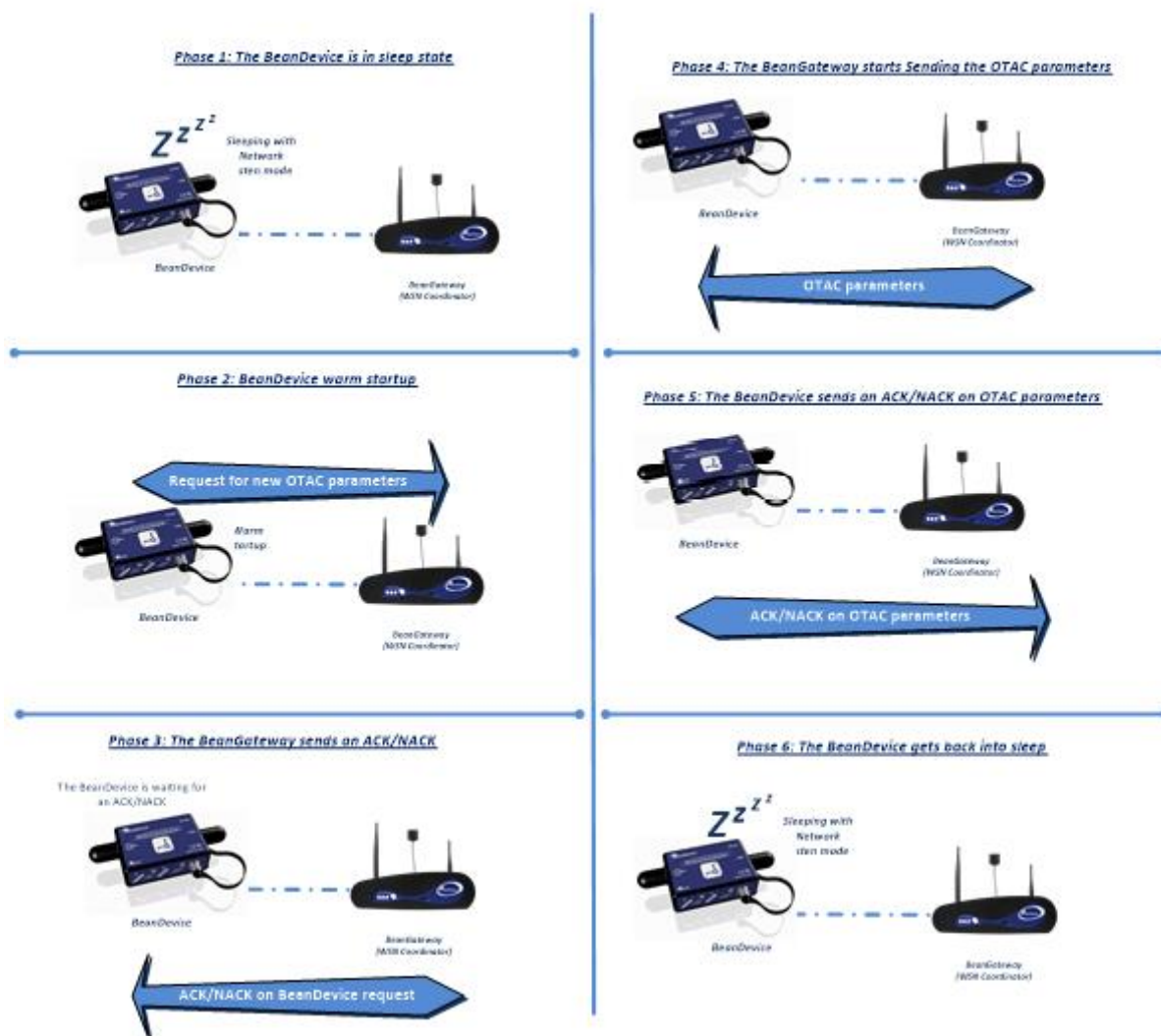
8.2 BATTERY SAVER ENABLED POWER MODE

8.2.1 Principle of function

When the BeanDevice® operates in “Bat Saver enabled power mode”, it sends periodically a request (called listening cycle) to the BeanGateway® for an OTAC command.

The user can easily configure the listening cycle depending on the data acquisition low duty cycle. In sleep with network ultra-low power consumption.

The following diagram shows the listening; it is possible to remotely transmit an OTAC configuration to the BeanDevice® without sacrificing its operation of the Bat Saver enabled mode:





Example 1: If the Data Acquisition Low Duty Cycle set to 20 seconds and the coefficient network listening round is set at 5, every 100s then the BeanDevice® sends a request to the BeanGateway® to know if any Over the Air Configuration (OTAC) is available.



If this power mode is configured on your BeanDevice®, OTAC command cannot be updated in real time. If OTAC command must take effect instantly, it will be advisable to run your BeanDevice® in “Bat Saver Disabled” power mode.



9. OTAC (OVER-THE-AIR CONFIGURATION) PROCESS

OTAC (Over-the-air configuration) concerns all the configuration parameters which are transmitted by radio to the BeanDevice®. These parameters are generated by the BeanScope® supervision software.

BeanDevice® OTAC process is as following:

- ✓ Enter a new value in the field configuration
- ✓ Click on the button validate
- ✓ A new window occurs with the confirmation that the message was transmitted to the BeanGateway®
- ✓ The OTAC command is transmitted to the BeanGateway®
- ✓ The BeanGateway® confirms the good reception of the OTAC command



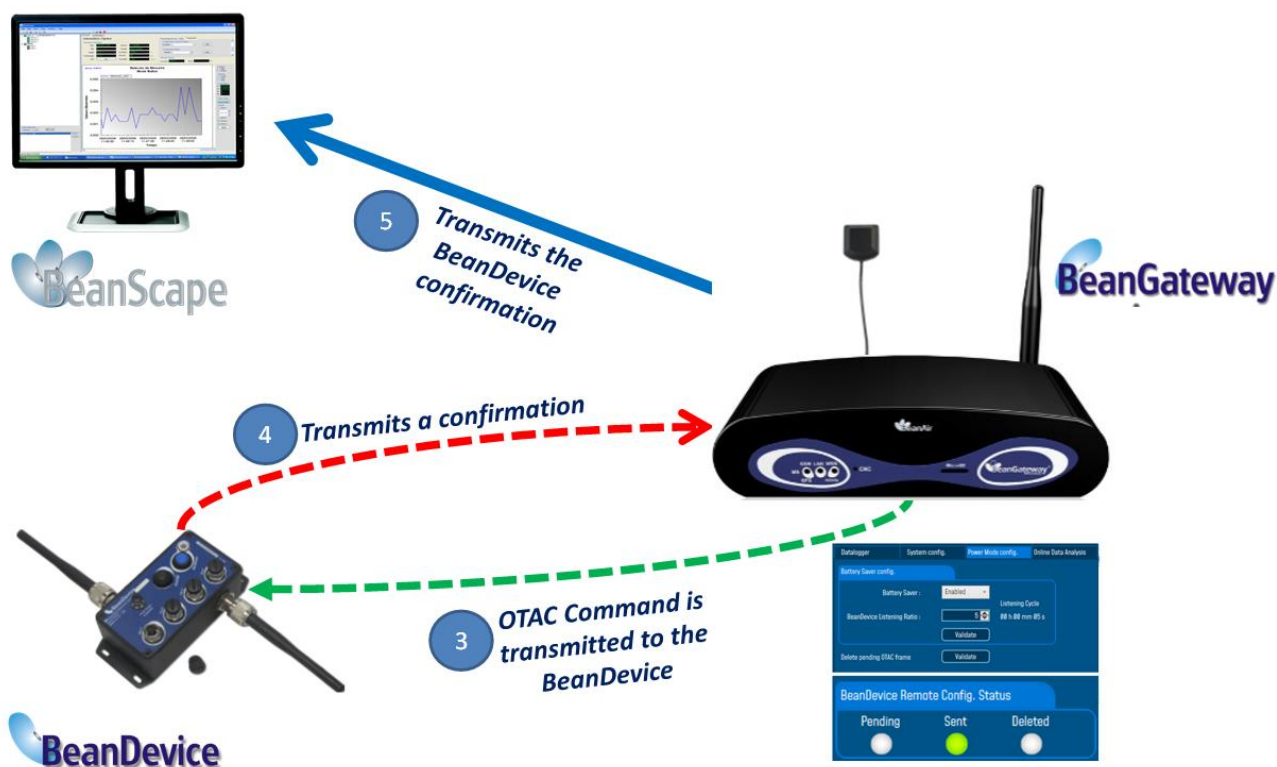
Depending on the power mode used by the BeanDevice®, the OTAC command is transmitted to the BeanDevice® in different way. The following section describes this process.



9.1 OTAC PROCESS IN “BATTERY SAVER DISABLED” POWER MODE

If the Power mode on your BeanDevice® is configured with “*Battery Saver Disabled power mode*”:

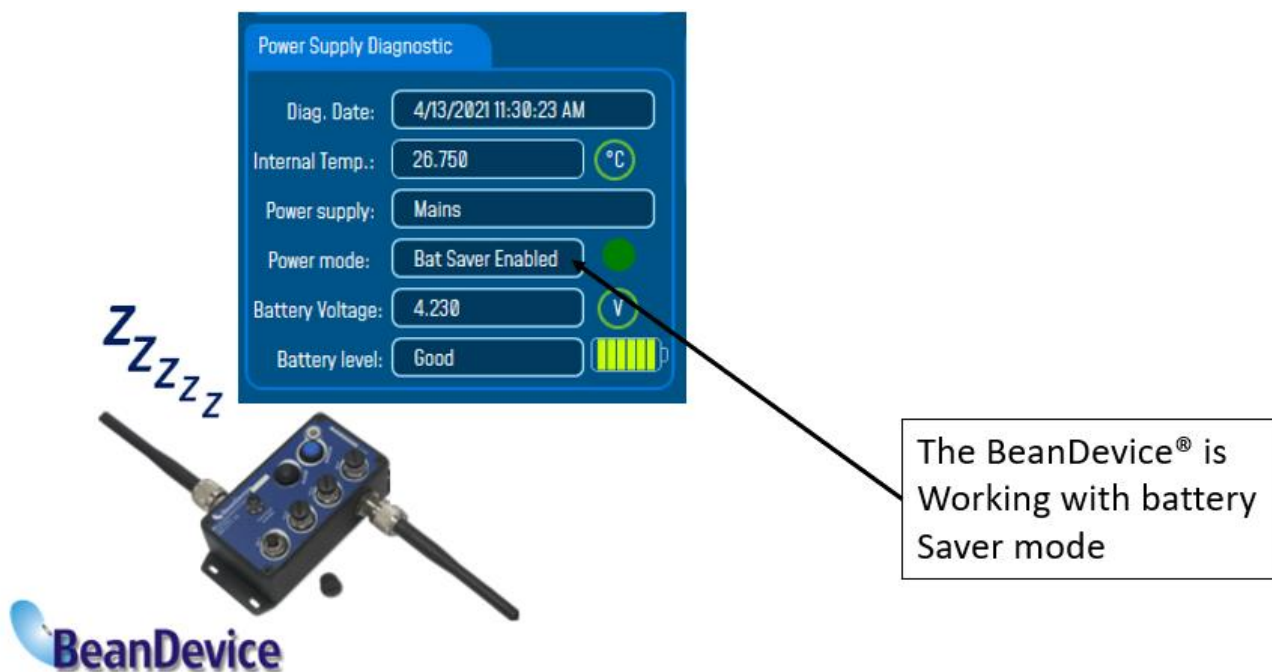
- ✓ The OTAC parameter is transmitted instantly to the BeanDevice®
- ✓ The BeanDevice® transmits a confirmation to the BeanGateway® which is already forwarded to the BeanScape®

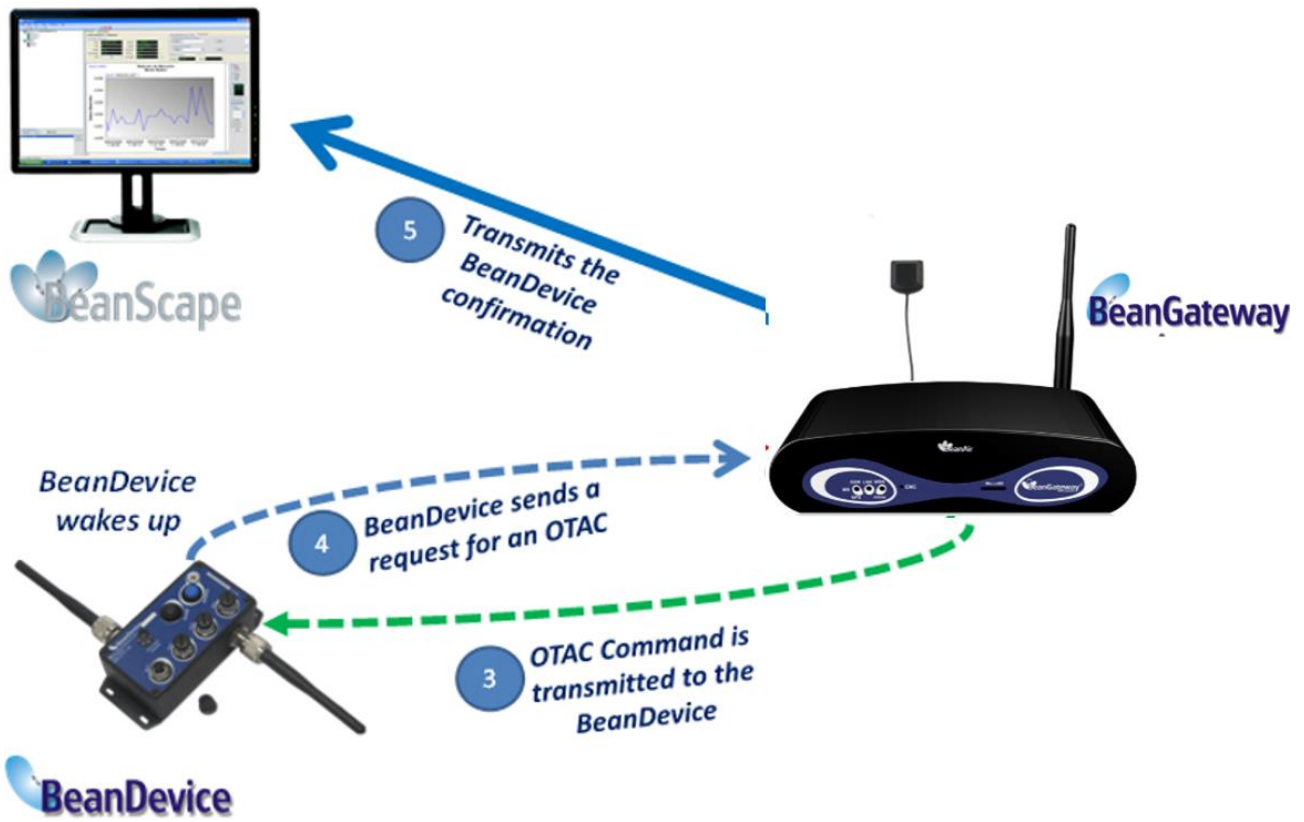


9.2 OTAC PROCESS IN “BATTERY SAVER ENABLED” POWER MODE

If the Power mode on your BeanDevice® is configured in *“Battery saver enabled mode”*:

- ✓ The OTAC parameter is not transmitted instantly to the BeanDevice®, the BeanDevice® is sleep most of the time;
- ✓ When the BeanDevice® wakes up, it sends periodically a request to the BeanGateway® for an OTAC parameter;
- ✓ If an OTAC parameter is waiting on the BeanGateway®, it will be transmitted to the BeanDevice®;
- ✓ The BeanDevice® transmits a confirmation to the BeanGateway® which is already forwarded to the BeanGateway®;





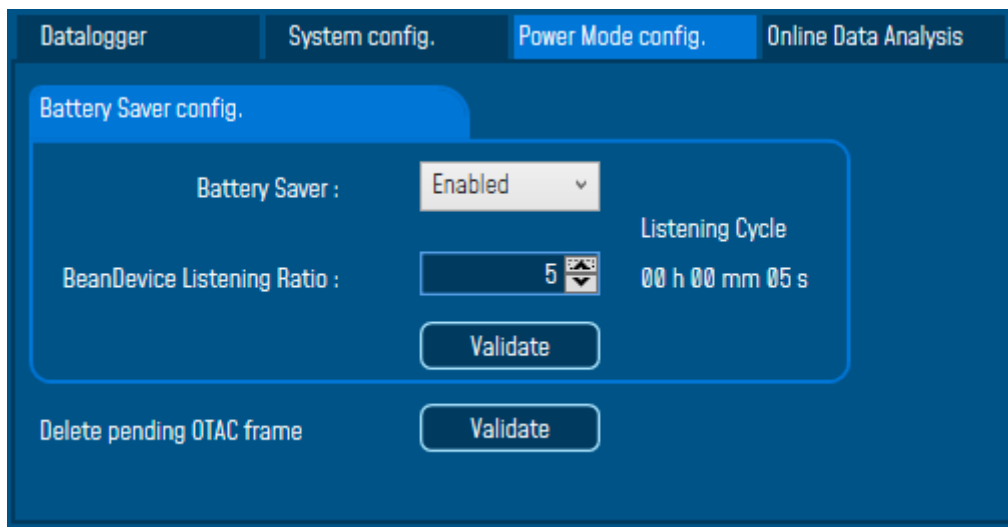
10. POWER MODE MANAGEMENT FROM THE BEANSCAPE®



10.1 TAB : POWER MODE MANAGEMENT

This Tab is composed of three frames:

- ✓ **Bat Saver configuration:** Configure the Power mode on your BeanDevice®
- ✓ **Sleep mode with listening config.:** Configuration settings for Sleep mode with network listening



Parameter	Description
Bat Saver configuration	<p>Disabled: The BeanDevice® operates in Bat Saver Disabled mode.</p> <p>Enabled: The BeanDevice® operates in Bat Saver Enabled mode.</p> <p>Ratio: Fix the Ratio of the listening cycle depending on the data acquisition low duty cycle.</p> <p>Example: If the data acquisition is 30 seconds, the Listening cycle will be 150 seconds.</p>
Sleep mode with listening config	<p>Delete pending OTAC frame: By clicking on “validate”, the pending OTAC frame is deleted</p>



Bat Saver enabled mode is vital if you want to extend the battery life of your BeanDevice®. But it requires some precautionary principles: by activating Bat Saver enabled mode, the radio receiver of your BeanDevice® will also operate in Bat Saver enabled mode.

Any OTAC parameter won't be received by the device unless:

Solution 1	<p>Restart your BeanDevice: you BeanDevice will consider the latest OTAC parameter sent by the user during his sleep.</p>
Solution 2	<p>Wait for the listening cycle: the BeanDevice will listen to the latest OTAC parameter sent by the user at every listening cycle.</p> <p>Example: If your BeanDevice is operating in LowDutyCycle mode with 1 min and you have a listening ratio of 5, then you'll have to wait for 5 min until the BeanDevice wakes up from sleep to listen for your OTAC.</p>
Solution 3	<p>Press the magnet to the Network button for more than 2s, you can reset to factory settings</p>




10.2 POWER MODE STATUS

Power Supply Diagnostic


Diag. Date: 12/9/2020 9:50:11 AM

Internal Temp.: 23.250 °C

Power supply: Mains

Power mode: down 

Battery Voltage: 4.177 V

Battery level: Good 


Blue LED: The BeanDevice is powered off

Power Supply Diagnostic


Diag. Date: 12/9/2020 10:49:33 AM

Internal Temp.: 32.000 °C

Power supply: Mains

Power mode: Bat Saver Enabled 

Battery Voltage: 4.113 V

Battery level: Good 

Battery Saver mode is enabled (sleep)


Green LED: The BeanDevice is on battery saver mode

Power Supply Diagnostic


Diag. Date: 12/9/2020 10:53:07 AM

Internal Temp.: 25.000 °C

Power supply: Mains

Power mode: Bat Saver Disabled 

Battery Voltage: 4.230 V

Battery level: Good 

Active power mode (Mains or Bat)

Yellow LED: The BeanDevice is on active power mode

