

# Analyse et optimisation de la consommation d'un produit



CA – 18/10/2022

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Le CRT CRESITT est soutenu par :



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L'Europe s'engage en région Centre-Val de Loire avec le Fonds européen de développement régional.

- Benchmark pour l'aide à la sélection
- Exemple Clavier domotique
- Exemple objet connecté

## Board Members

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## Subcommittee Members



## Tools vendors



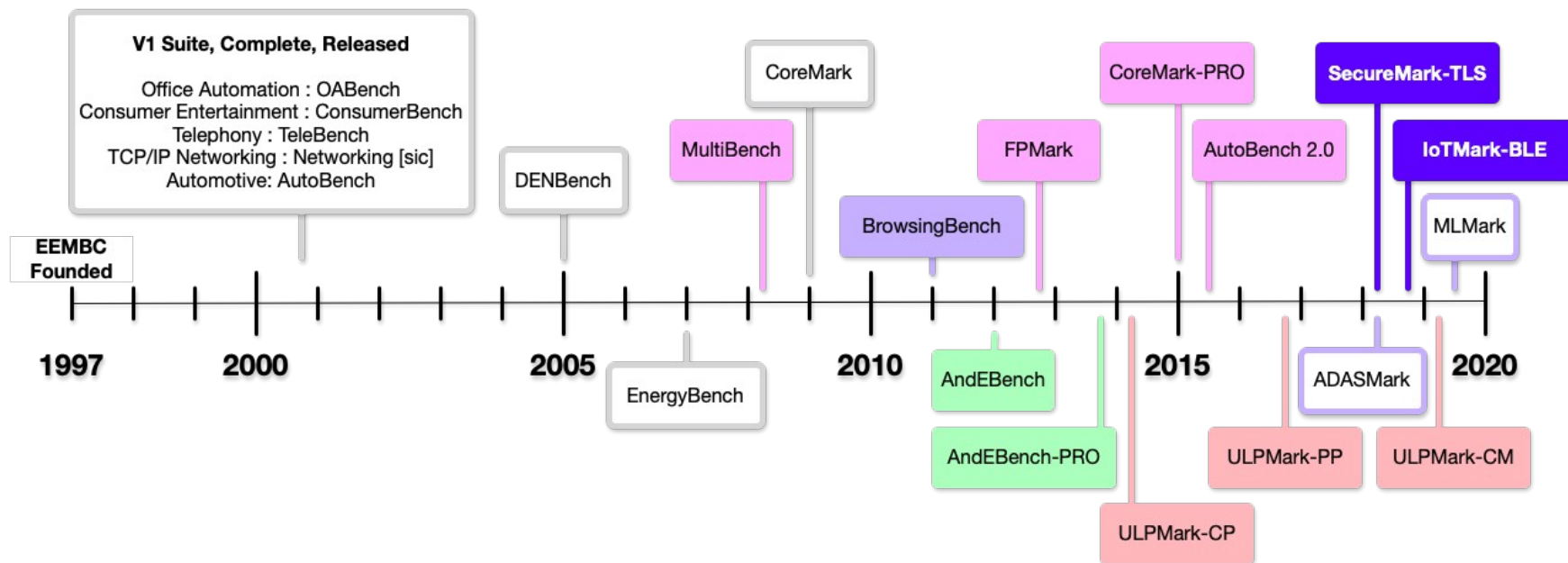
## Licences

- ... Airbus Defence and Space
- ... AMD
- ... Analog Devices
- ... Apple
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- Broadcom Corporation
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## EEMBC

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## Ultra-Low Power (ULP) and Internet of Things

The ULP subcommittee focuses on power and energy. The scores associated with the benchmarks are derived from measurements taking using the STMicroelectronics PowerShield.

### ULPMark®

In 2014, the ULP team introduced the **ULPMark-CoreProfile** (or -CP for short). The benchmark runs an active workload for a period of time, then goes to sleep. The energy measurement during the duty cycle reflects a real-life test of embedded low power beyond a simple sleep number.

The **ULPMark-PeripheralProfile** (or -PP for short) launched in 2016 examines the energy cost of four peripherals: real-time clock, pulse-width modulation, analog-to-digital conversion, and SPI communication.

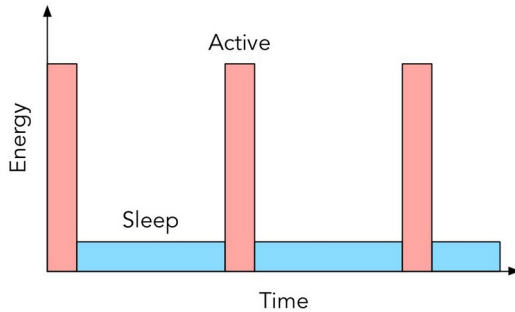
**ULPMark-CoreMark** (or ULPMark-CM for short) launched in 2019 measures the energy of CoreMark in a consistent environment. It is EEMBC's first active-power benchmark.

STM32 Power Shield  
Accurate power measurement



## ULPMark<sup>®</sup>-CoreProfile

An EEMBC Benchmark



$$ULPMark_{CP} = \frac{1000}{1/50 \times \sum_{50} Avgpwr (\mu W)}$$

$$ULPMark_{PP} = \frac{1000}{1/14 \times \sum_{14} p\tilde{w}r(5) (\mu W)}$$

### Active

- Generate 20 GPIO pulses
- Perform an 8-bit linear interpolation
- Perform a 16-bit integration (filter)
- Compute a 7-segment LCD binary conversion (saving state)
- Search for a substring in a string
- Perform a small bubble-sort
- Permute the bits of a string based on input and previous state

### Sleep

- RAM retention

## ULPMark<sup>®</sup>-PeripheralProfile

An EEMBC Benchmark

Peripheral Profile Slot Descriptions

Slot	ADC	PWM	SPI	RTC
1	# samples: 64 Conversion rate: 1 kHz	Freq: 32,786 Hz, period: 255 Duty: 10%, fixed # pulses: 20		Setup & Start Timer
2	# samples: 64 Conversion rate: 1 kHz Buffered evaluation	Freq: 32,786 Hz, period: 255 Duty: 20%, increase # pulses: 40		
3	# samples: 1 Conversion rate: 1 Hz	Freq: 32,786 Hz, period: 255 Duty: 30%, fixed # pulses: 40		
4	# samples: 1 Conversion rate: 1 Hz	Freq: 32,786 Hz, period: 255 Duty: 40%, fixed # pulses: 100		Tx 128 B
5	# samples: 1 Conversion rate: 1 Hz	Freq: 32,786 Hz, period: 255 Duty: 50%, fixed # pulses: 100		Check last Rx Tx 128 B
6	# samples: 1 Conversion rate: 1 Hz	Freq: 32,786 Hz, period: 255 Duty: 60%, fixed # pulses: 100		Check last Rx Tx 128 B
7	# samples: 1 Conversion rate: 1 Hz	Freq: 32,786 Hz, period: 255 Duty: 70%, fixed # pulses: 100		Check last Rx Tx 128 B
8	# samples: 1 Conversion rate: 1 Hz	Freq: 32,786 Hz, period: 255 Duty: 80%, fixed # pulses: 100		Check last Rx Tx 128 B
9	# samples: 1 Conversion rate: 1 Hz	Freq: 1 MHz, period: 10,000 Duty: 10%, increase # pulses: 30		Check last Rx Tx 128 B
10	Off Check slots' 3-9 data	Off		Check last Rx Stop & check

Clear	Hardware	Vendor Score	Cert.	Core Profile (3.0 V)↓	Core Profile (User)	Periph. Profile (3.0 V)	Periph. Profile (User)	Date
<input type="checkbox"/>	onsemi RSL10 Rev 1.0	✓	✓	1090	1260 2.1V			2018-02-08
<input type="checkbox"/>	onsemi RSL15	✓	✓	1070	1220 1.8V			2021-09-22
<input type="checkbox"/>	Nanjing Low Power IC Technology Institute Co., Ltd LP5100 Rev.1	✓	✓	856				2020-11-18
<input type="checkbox"/>	Ambiq Micro APOLLO512-KBR Rev.A3	✓	✓	378				2015-11-07
<input type="checkbox"/>	Renesas Electronics R7F0E01182CFP	✓	✓	366	705 1.8V			2020-04-04
<input type="checkbox"/>	Microchip Technology ATSAML11E16A rev B	✓	✓	280	410 1.8V	118	167 1.8V	2019-03-01
<input type="checkbox"/>	Microchip Technology ATSAML10E16A rev B	✓	✓	277	396 1.8V	120	166 1.8V	2019-03-01
<input type="checkbox"/>	STMicroelectronics STM32L433	✓	✓	253				2017-04-10
<input type="checkbox"/>	STMicroelectronics STM32L412 Rev A	✓	✓	247	447 1.8V	94.0	167 1.8V	2018-10-17
<input type="checkbox"/>	Analog Devices ADuCM302x Rev1.0	✓	✓	246				2016-02-05
<input type="checkbox"/>	STMicroelectronics STM32L452	✓	✓	245				2017-04-10
<input type="checkbox"/>	Renesas Electronics R7FA2L1,Rev.1	✓	✓	244	304 1.8V			2020-09-22
<input type="checkbox"/>	STMicroelectronics STM32L496 Rev.2	✓	✓	217				2017-02-07
<input type="checkbox"/>	STMicroelectronics STM32WLEX/5x Rev Z	✓	✓	216	313 1.8V	73.9	138 1.8V	2021-04-02
<input type="checkbox"/>	Texas Instruments MSP432P401R Rev. C	✓	✓	192				2016-02-19
<input type="checkbox"/>	Renesas Electronics R7FA2E1,Rev.1	✓	✓	190	321 1.8V			2020-11-23

Clear	Hardware	Vendor Score	Cert.	Core Profile (3.0 V)	Core Profile (User)	Periph. Profile (3.0 V)↓	Periph. Profile (User)	Date
<input type="checkbox"/>	Renesas Electronics R7F100GLG	✓	✓			125		2022-02-22
<input type="checkbox"/>	Renesas Electronics R5F117GC	✓	✓			122	219 1.8V	2019-11-13
<input type="checkbox"/>	Microchip Technology ATSAML10E16A rev B	✓	✓	277	396 1.8V	120	166 1.8V	2019-03-01
<input type="checkbox"/>	Microchip Technology ATSAML11E16A rev B	✓	✓	280	410 1.8V	118	167 1.8V	2019-03-01
<input type="checkbox"/>	STMicroelectronics STM32L412 Rev A	✓	✓	247	447 1.8V	94.0	167 1.8V	2018-10-17
<input type="checkbox"/>	STMicroelectronics STM32WLEx/5x Rev Z	✓	✓	216	313 1.8V	73.9	138 1.8V	2021-04-02
<input type="checkbox"/>	STMicroelectronics STM32L433 Rev.1	✓	✓	181	347 1.8V	70.6	121 1.8V	2018-01-08
<input type="checkbox"/>	STMicroelectronics STM32L476 + 128KB SRAM retention	✓	✓	106	190 1.8V	63.0	102 1.8V	2018-01-08
<input type="checkbox"/>	STMicroelectronics STM32L476	✓	✓	152	294 1.8V	62.6	106 1.8V	2018-01-08
<input type="checkbox"/>	Analog Devices ADuCM4050 Rev 0.1	✓	✓	189		24.3		2018-07-04



analyseur de puissance N6705B doté d'un module de puissance 20W N6782A



- Mesure de courant 29nA – 3A
- Mesure de tension 105 $\mu$ V – 20V
- Datalogger Te max 20,48 $\mu$ s

*Note : Te 40,96 $\mu$ s max pour 2 voie (tension & courant)*

## Mode alimentation

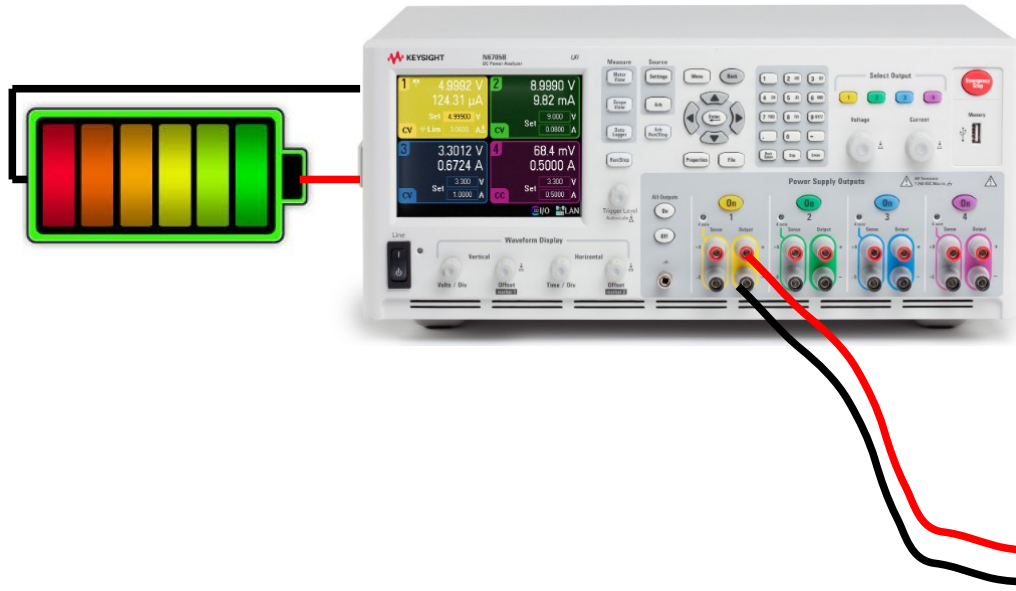


DUT  
means  
Device Under Test

by [allacronyms.com](http://allacronyms.com)



## Mode test batterie



DUT  
means  
Device Under Test  
[by allacronyms.com](http://byallacronyms.com)



## Clavier d'un système domotique

Alimentation par pile 3,6V LS14500 2,6Ah

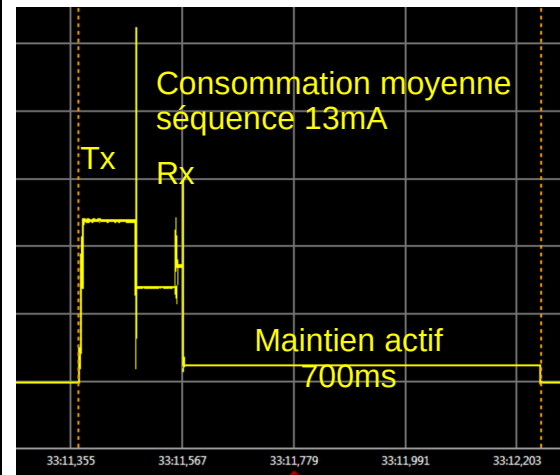
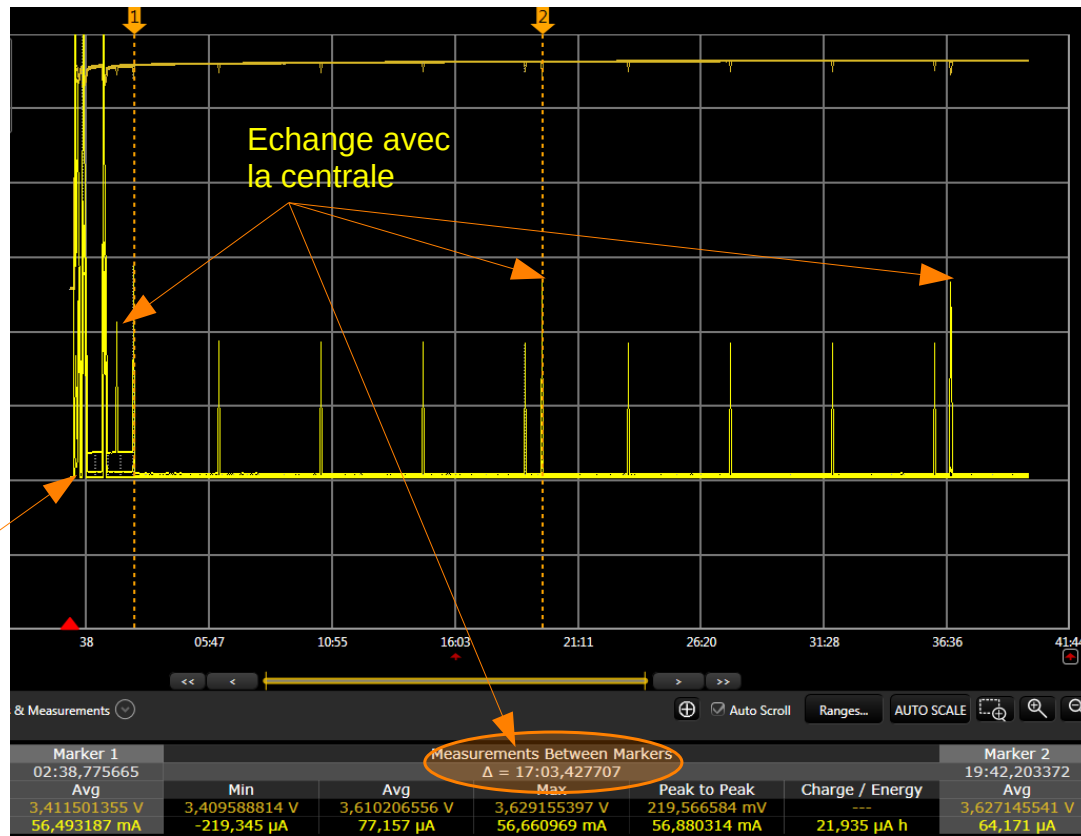
Information constructeur :

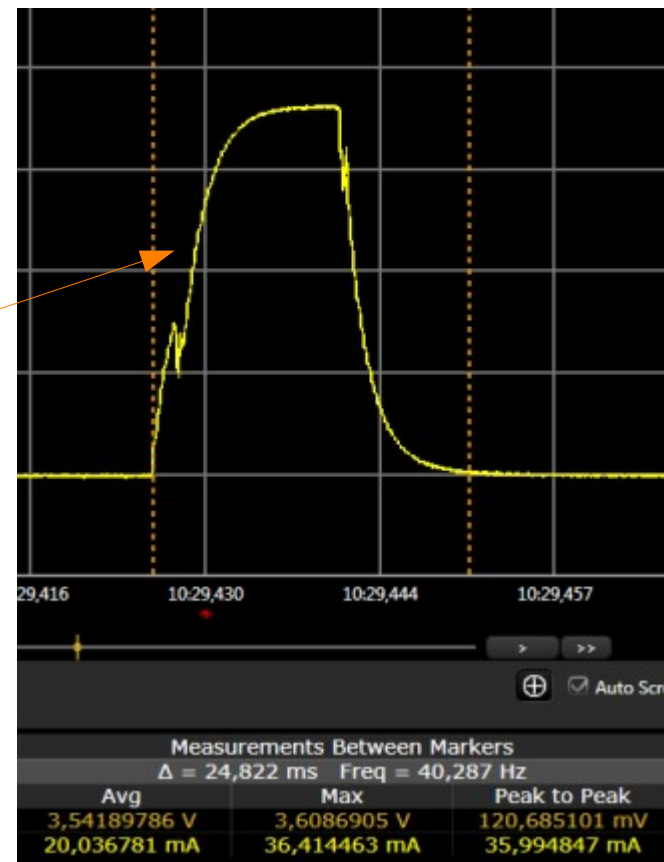
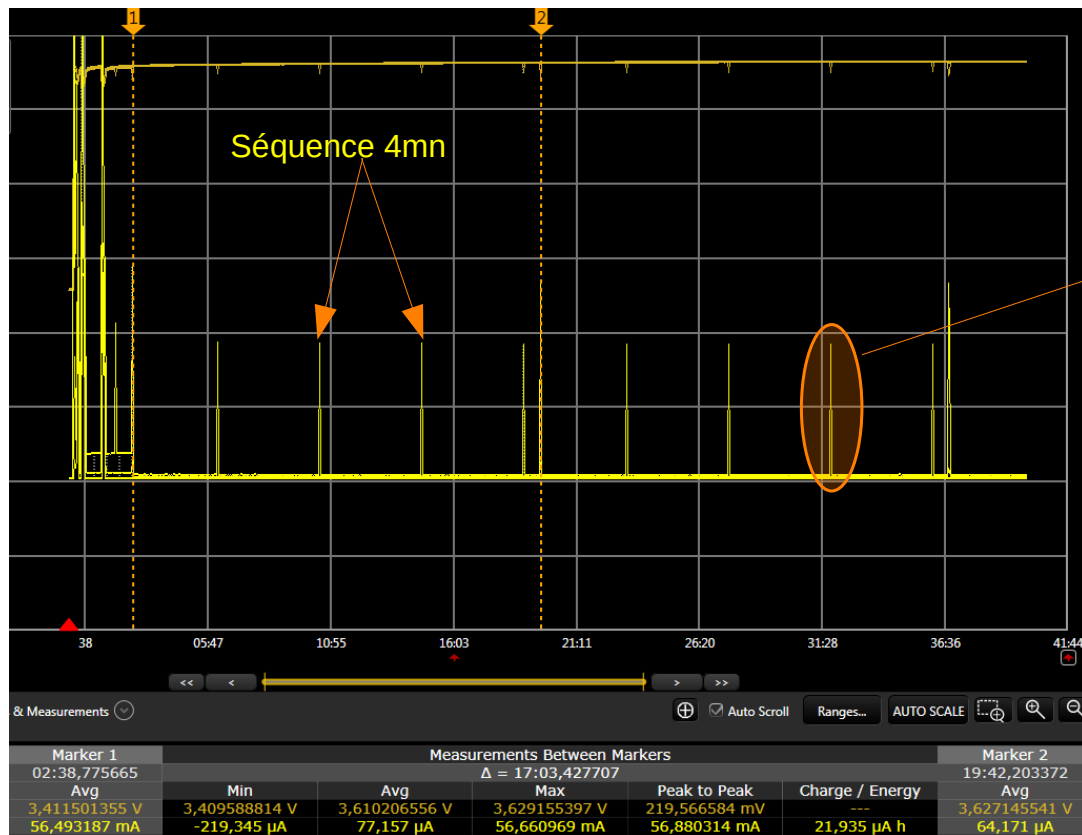
Consommation Tx : 63mA pendant 105ms

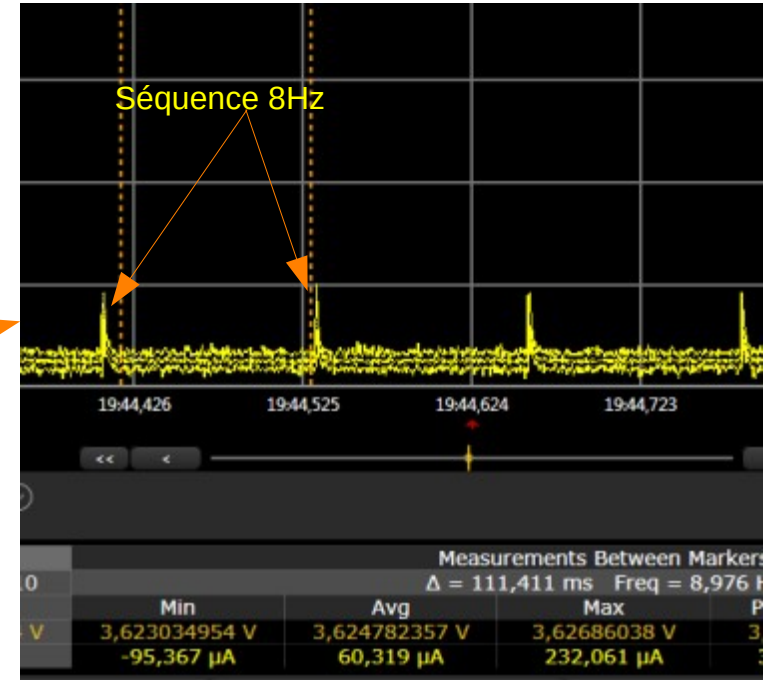
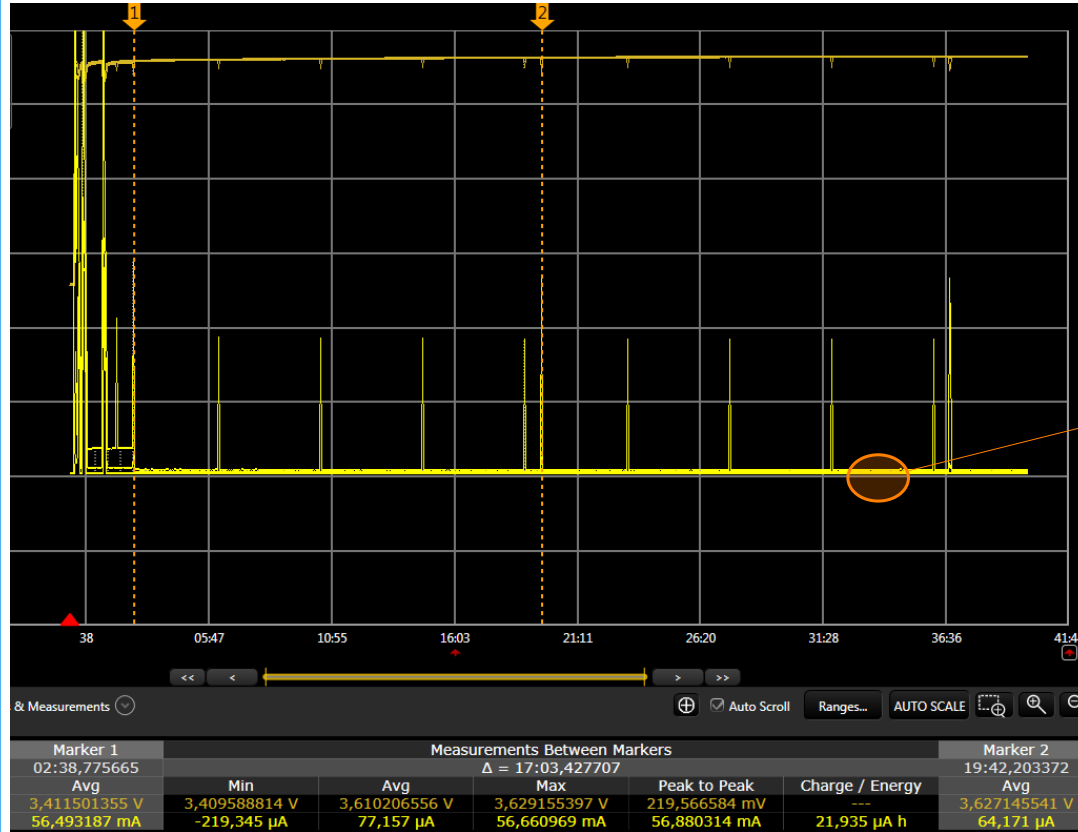
Consommation Rx : 32mA pendant 75ms

Réveil toutes les 17mn pour échange avec la centrale, le reste du temps en veille

Séquence d'initialisation

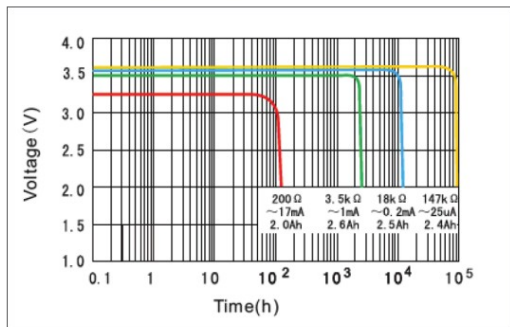




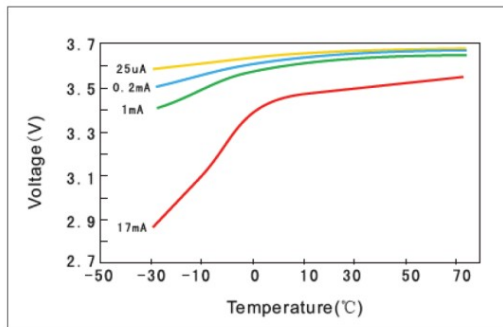


## COURBES DE PERFORMANCE PERFORMANCE CURVES

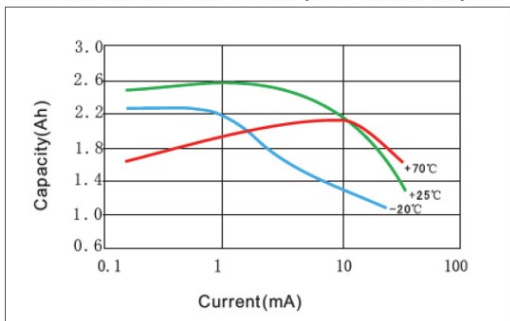
COURBE DE DÉCHARGE À 25°C  
DISCHARGE CHARACTERISTICS AT 25°C



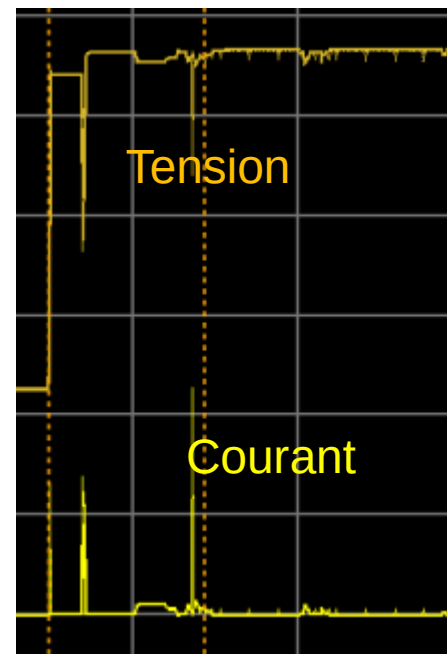
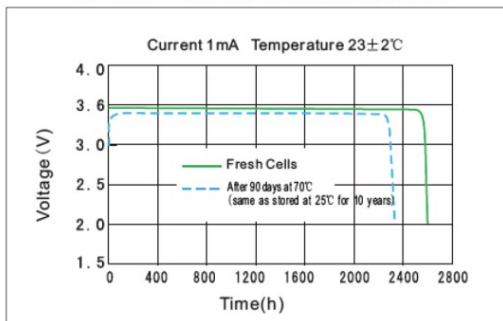
TENSION VS COURBE DE TEMPÉRATURE  
VOLTAGE VS TEMPERATURE CURVE



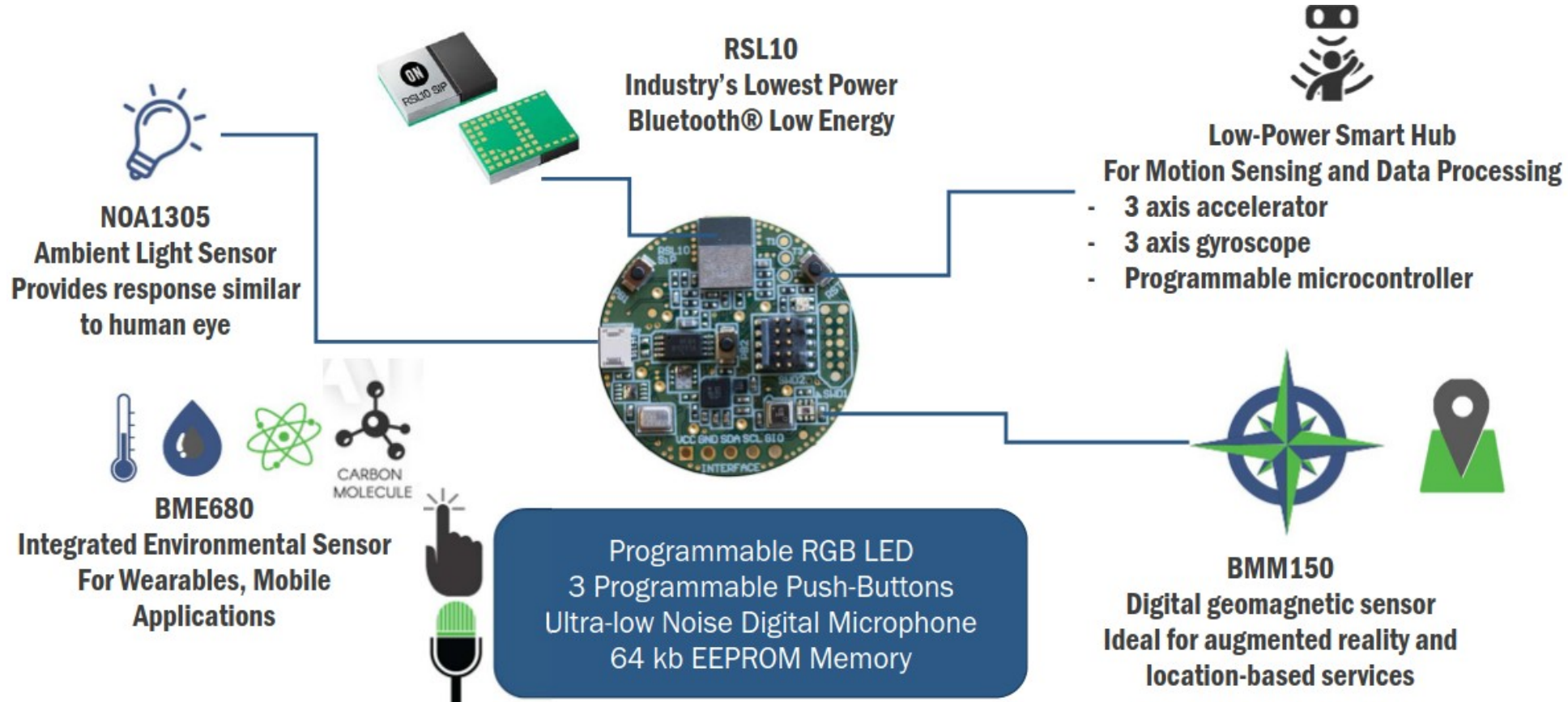
COURANT VS CAPACITÉ (TENSION D'ARRÊT À 2.0V)  
CAPACITY VS CURRENT CURVE (CUT OFF WITH 2.0V)

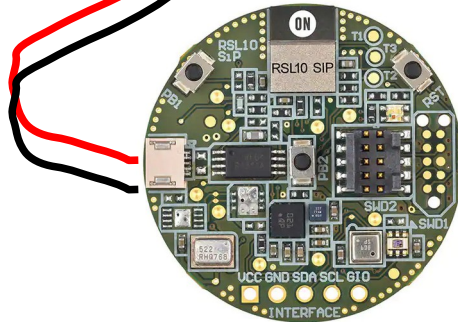
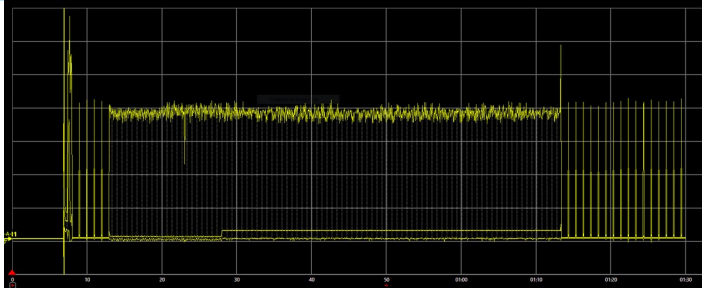


DÉCHARGE APRÈS PÉRIODE DE STOCKAGE  
DISCHARGE CHARACTERISTICS AFTER STORAGE









The Summary pane uses tabs to display packets by technology, profile and errors for easy sorting, viewing and troubleshooting.

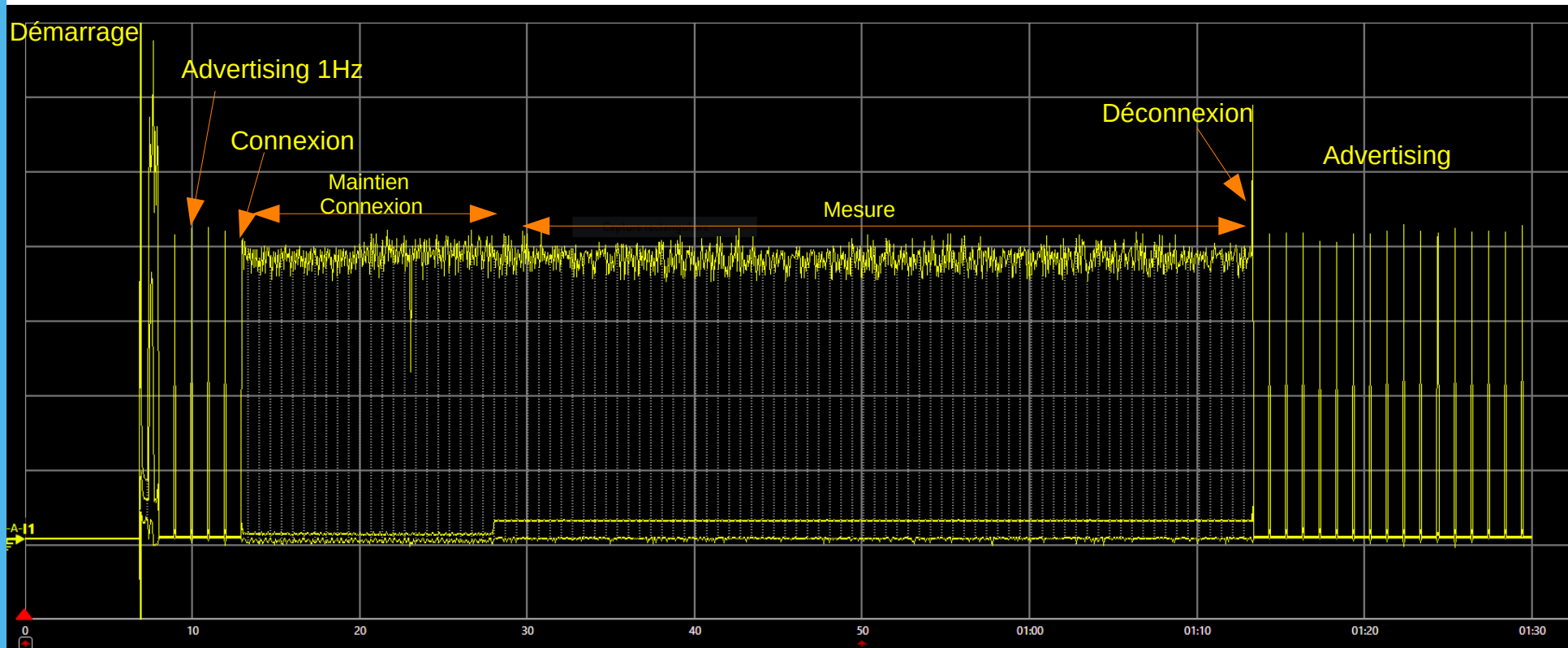
View average throughput and airtime utilization by technology for a holistic view of your device's transmitted traffic.

The Timeline View makes it easy to follow and analyze all Master and Slave connections, including packet and error type information.

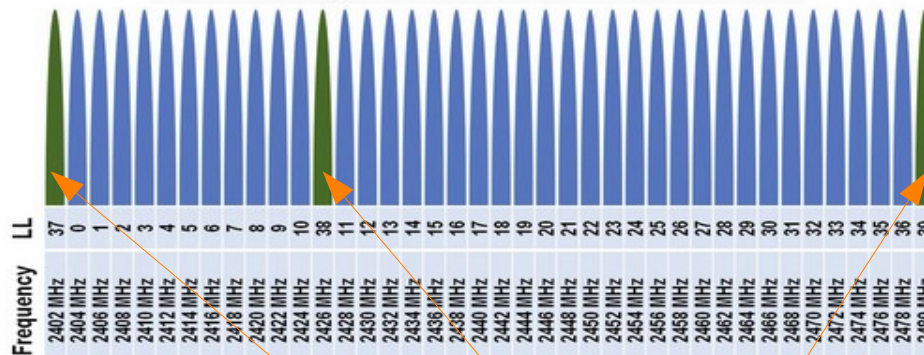
Coeexistence View time-syncs packets of different technologies over optional spectrum data to help identify interference in the air.

The Packet Error Rate provides a bird's eye view of channel usage along with the quality of the packets transmitted over those channels.

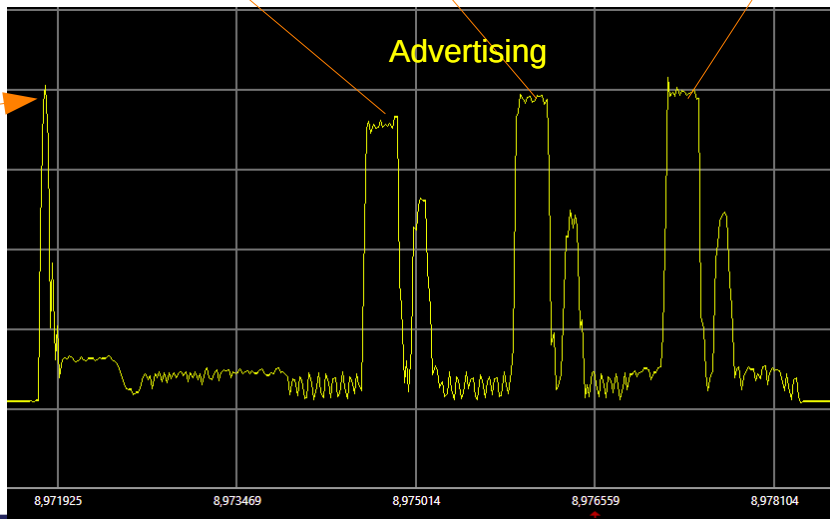
Select a packet in pane and drill do of that selected decode pane for



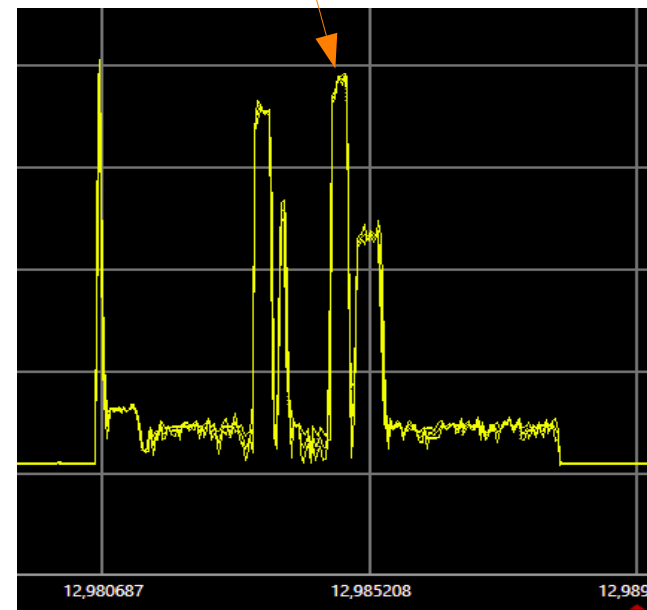
3 Advertising Channels and 37 Data Channels



Démarrage étage Radio



Connexion Smartphone





## Contacts



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## Démonstration Stand CRESITT

