

Mega_Link 2

APPLICATION NOTE AN048 ***Average Current Consumption*** ***Measurements***

Summary

Mega_Link 2 is a versatile and secure radio telemetry system for passing instrumentation, measurement and control data between industrial plants and different site locations.

All transmitted data streams are encrypted using the AES-256 encryption standard.

Mega_Link 2 is classed as a Low Power Radio system.

This document provides measurements of typical average current consumption for the Low Power Radio 458 MHz UHF Radio and 4G communications systems.

For an outstation used to monitor digital inputs, the Mega_Link 2 operating with 458 MHz UHF radio typically requires as little as 115 mA average current for a 10 second scan rate and a 4G system of around 148 mA.

For an outstation used to monitor a single 4-20 mA analogue transducer, this requires the extra excitation voltage thus using more current, the worst-case condition of a 20 mA signal level means the Mega_Link 2 operating with 458 MHz UHF radio typically requires an average current of 161 mA for a 10 second scan rate and a 4G system requires about 182 mA.

This is a sufficiently low average current consumption that the use of a solar power supply is an option for continuous operation in the use case where a local mains supply is not available.

This document also gives recommendations on the sizing of solar panels for the UK.

1. Introduction

A Mega_Link 2 458 MHz UHF Radio basestation-outstation system was configured for inputs going from an outstation to a basestation. Measurements of the outstations average current consumption were taken without and with 1 digital output configured as a comms fail output at the outstation.

An OTII Arc current measurement system was used with a 12V power supply to monitor the current usage of the outstation. The system was run using different scan rates and with different configurations of analogue transducer inputs. The transducer 12V excitation being derived from the Mega_Link 2 outstation and hence included in the average current measurements.

Further average current measurements were taken with a 4G basestation – outstation pair running in 4G only mode.

2. 458 MHz UHF Radio

2.1 Results Table

Current measurements shown are average currents. The aerial connector was fitted with a 50Ω dummy load.

Set-up	Average Current Consumption at Scan or Poll Rate				
	10 secs	20 secs	30 secs	60 secs	120 secs
Radio 0Dig 0mA 0mA No Display	94 mA				
Radio 0Dig 0mA 0mA	115 mA	109 mA	108 mA	106 mA	105 mA
Radio 1Dig 0mA 0mA	132 mA				
Radio 1Dig 20mA 0mA	161 mA				
Radio 1Dig 20mA 20mA	182 mA				

0Dig is with no digital outputs

1Dig is with 1 digital Comms Fail output

20mA 0mA is with a simulated transducer at 20mA on analogue input #1.

20mA 20mA is with a simulated transducer at 20mA on analogue input #1 and on analogue input #2.

3. 4G Comms

3.1 Results Table

Set-up	Average Current Consumption at 10 secs Poll Rate
4G 0Dig 0mA 0mA No Display	112 mA
4G 0Dig 0mA 0mA	148 mA
4G 1Dig 0mA 0mA	160 mA
4G 1Dig 20mA 0mA	182 mA
4G 1Dig 20mA 20mA	212 mA

0Dig is with no digital outputs

1Dig is with 1 digital Comms Fail output

20mA 0mA is with a simulated transducer at 20mA on analogue input #1.

20mA 20mA is with a simulated transducer at 20mA on analogue input #1 and on analogue input #2.

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4. Solar Power Estimates

The following simulations use the Photovoltaic Geographical Information System (PGIS) website.

https://re.jrc.ec.europa.eu/pvg_tools/en/tools.html

Solar Power Calculations

Average current with 1x 20mA input transducer as worst case, the average current consumption has been measured at 182mA.

At 12 V this is $12 \times 0.182 = 2.2 \text{ W}$.

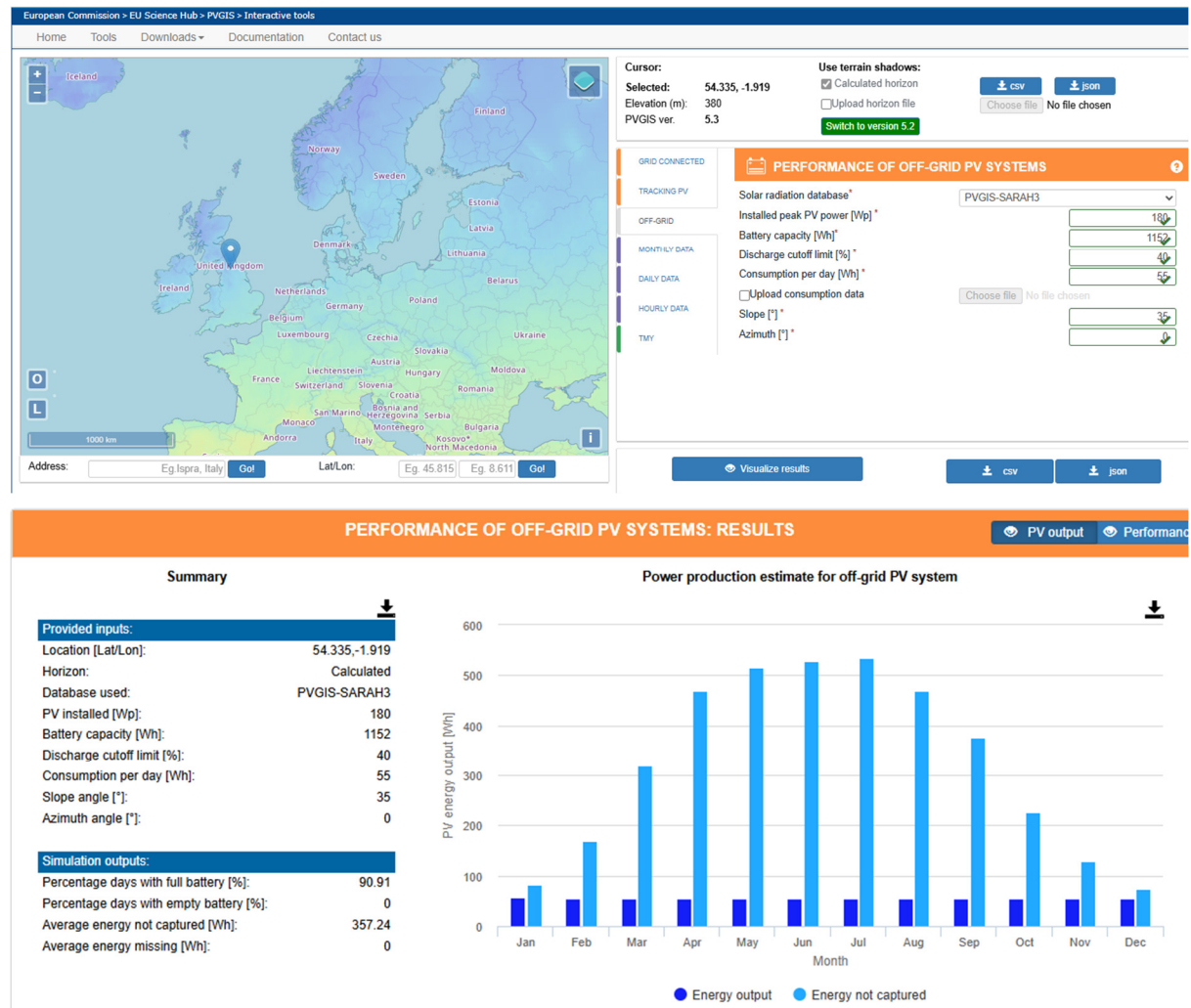
Over 24 hours this requires $24 \times 2.2 = \sim 55 \text{ Wh}$ (Watt Hours). Required per day.

Example #1 – Location: Mid UK

2x90 Watt Panels = 180W (12V)

96 Ah battery, $96 \times 12 = 1152 \text{ Wh}$

Slope from horizontal = 35 degrees.



This shows 0% days with empty battery.

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Example #2 - Location: Top Scotland UK

4x90 Watt Panels = 360W (12V)

2x 96 Ah battery, 192 x 12 = 2304 Wh

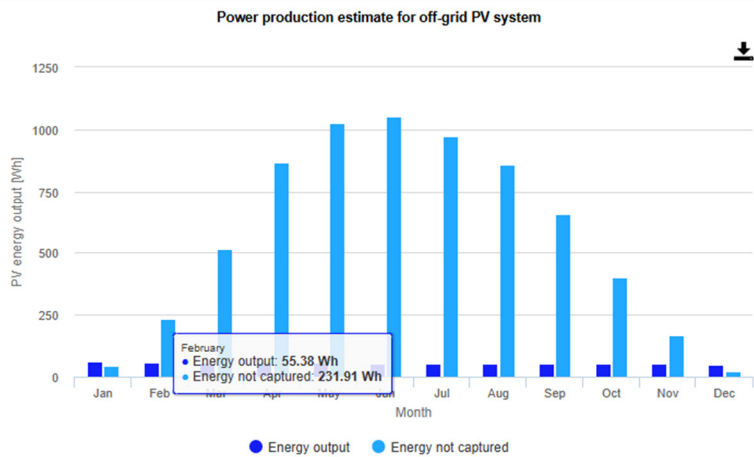
Slope from horizontal = 35 degrees.

The screenshot shows the PVGIS 'PERFORMANCE OF OFF-GRID PV SYSTEMS' configuration page. The location is set to 58.257, -4.336. The system parameters are: Solar radiation database: PVGIS-SARAH3; Installed peak PV power [Wp]: 360; Battery capacity [Wh]: 2304; Discharge cutoff limit [%]: 40; Consumption per day [Wh]: 55; Slope [°]: 35; Azimuth [°]: 0. The interface includes a map of Europe, a cursor information box, and buttons for downloading results in CSV or JSON format.

PERFORMANCE OF OFF-GRID PV SYSTEMS: RESULTS

Summary

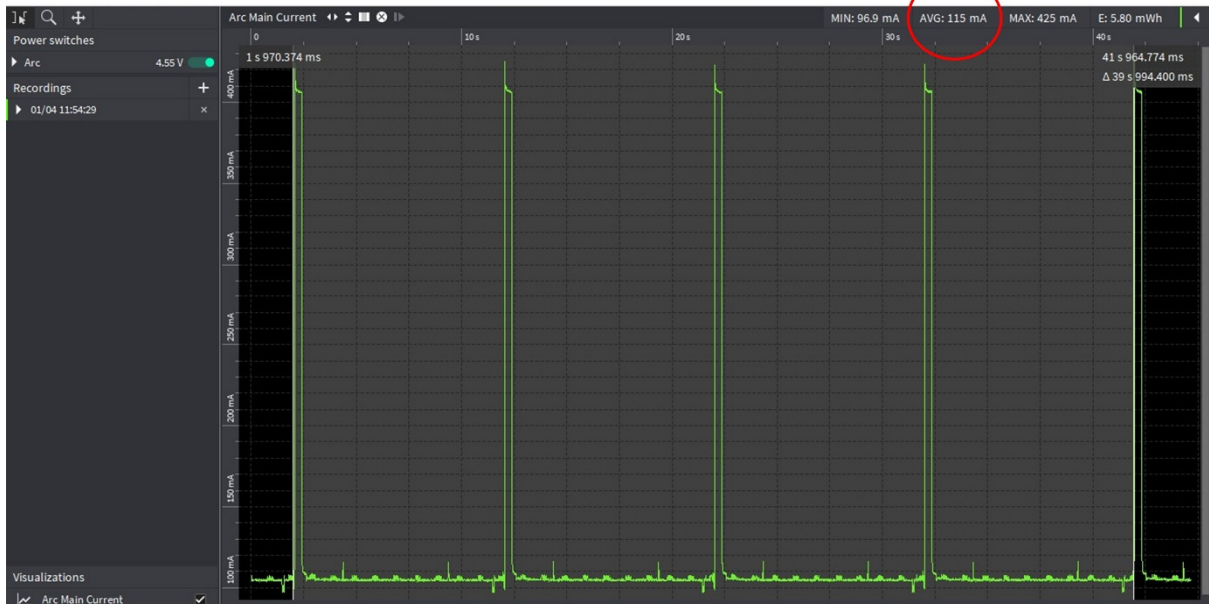
Provided inputs:	
Location [Lat/Lon]:	58.257,-4.336
Horizon:	Calculated
Database used:	PVGIS-SARAH3
PV installed [Wp]:	360
Battery capacity [Wh]:	2304
Discharge cutoff limit [%]:	40
Consumption per day [Wh]:	55
Slope angle [°]:	35
Azimuth angle [°]:	0
Simulation outputs:	
Percentage days with full battery [%]:	86.73
Percentage days with empty battery [%]:	0
Average energy not captured [Wh]:	655.46
Average energy missing [Wh]:	0



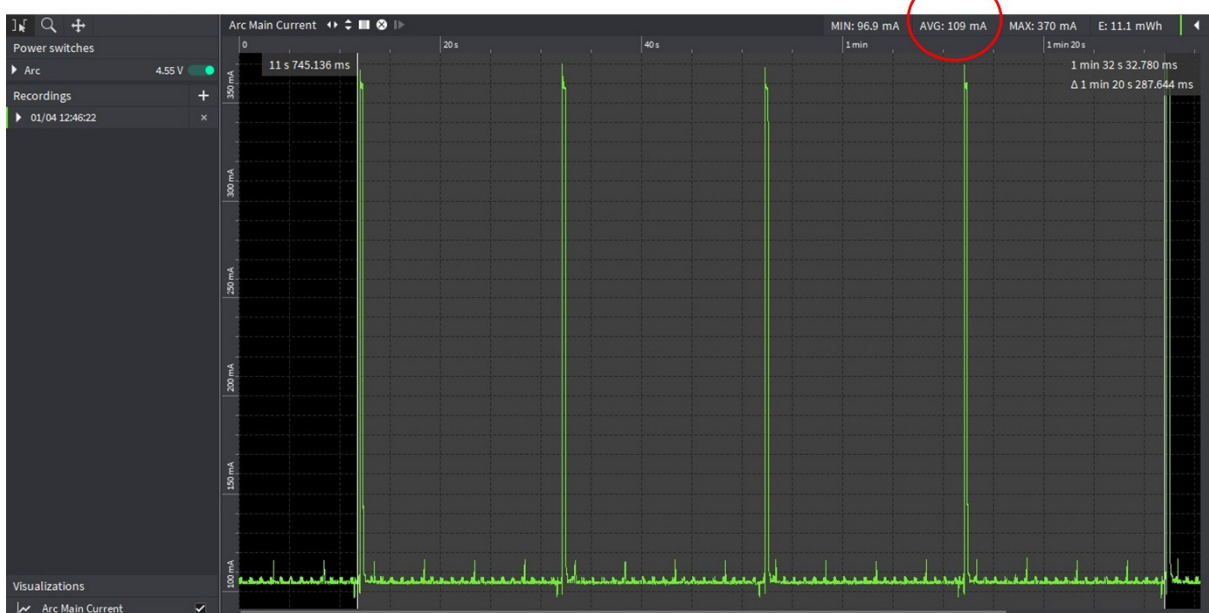
This shows 0% days with empty battery.

Annex 1 - 458MHz UHF Radio

ML2 Radio 0D – 10 secs



ML2 Radio 0D – 20 secs

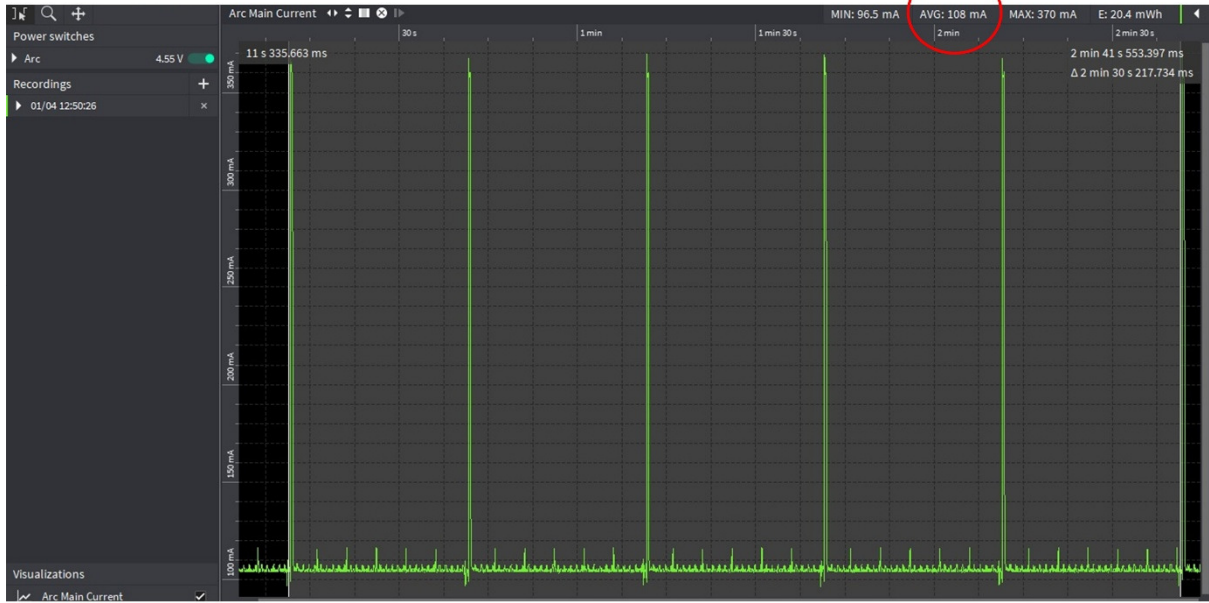


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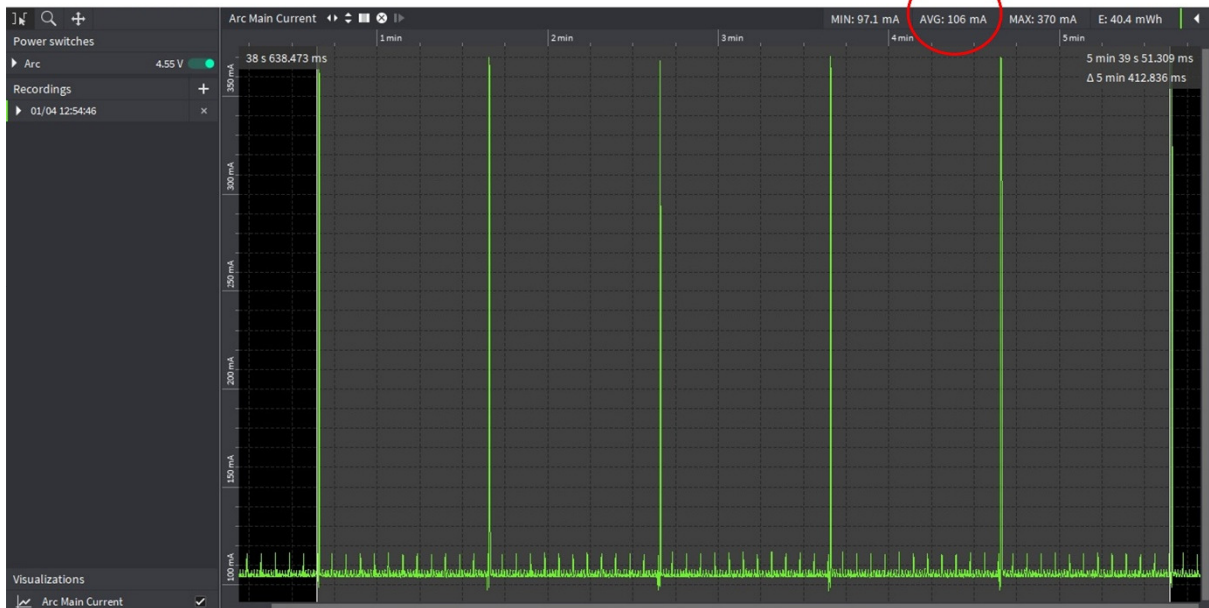
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ML2 Radio OD – 30 secs



ML2 Radio OD – 60 secs

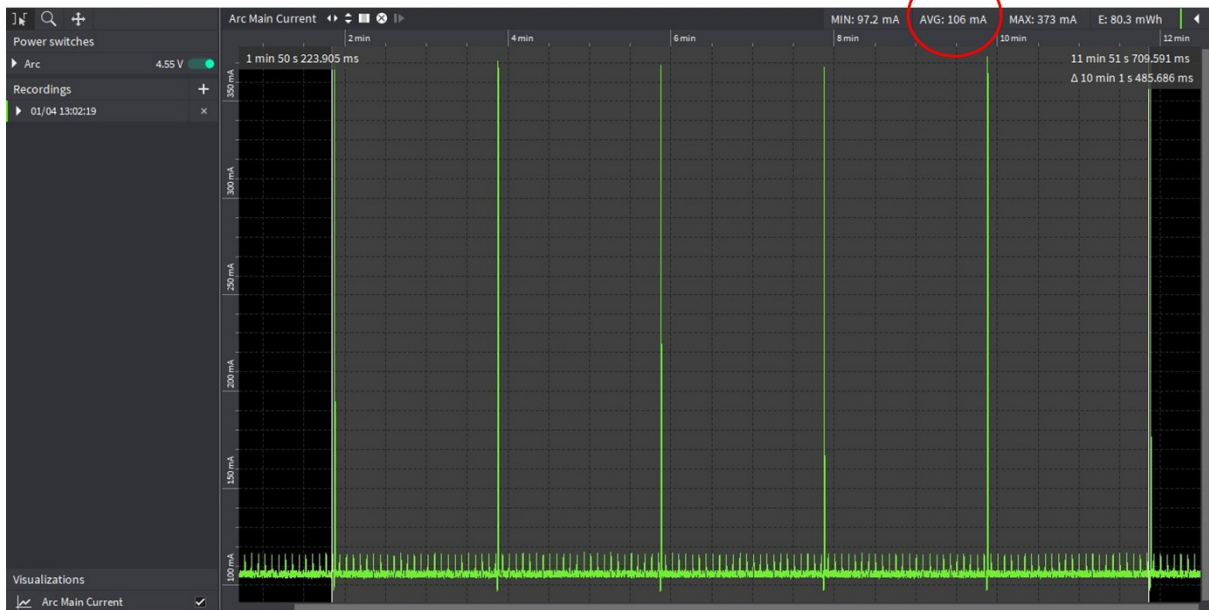


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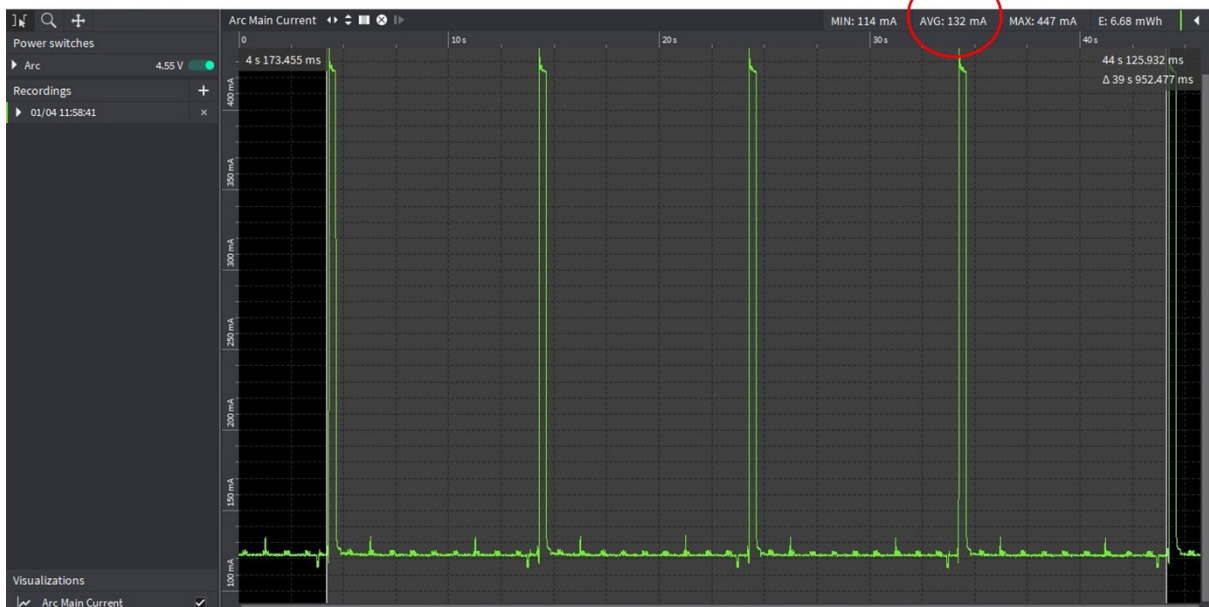
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ML2 Radio 0D – 120 secs



ML2 Radio 1D – 10 secs

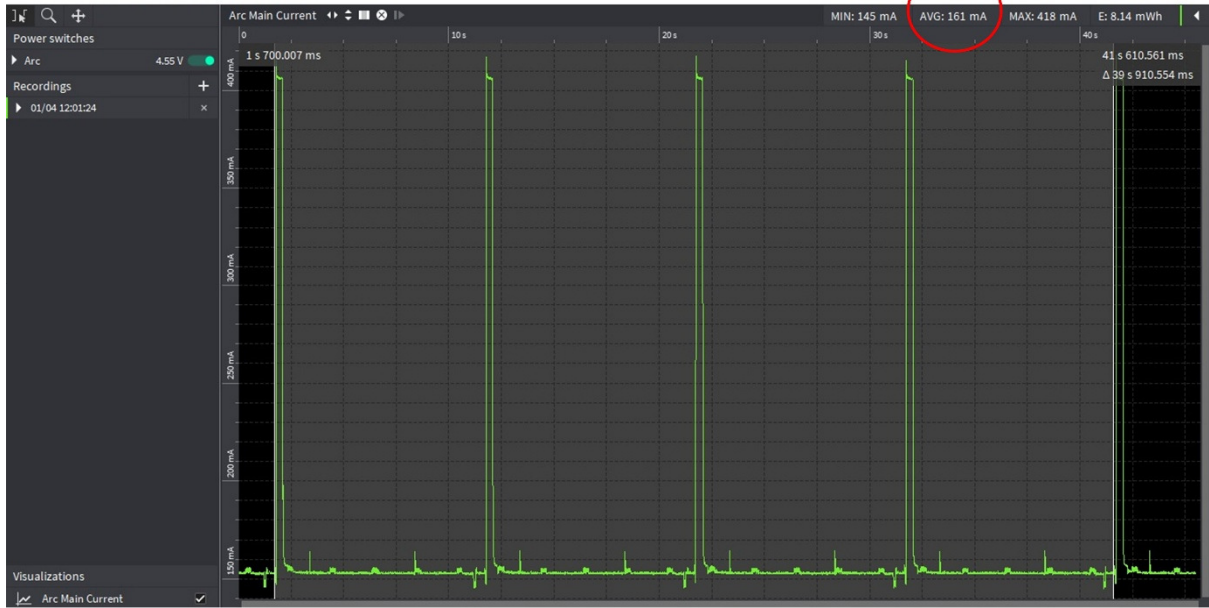


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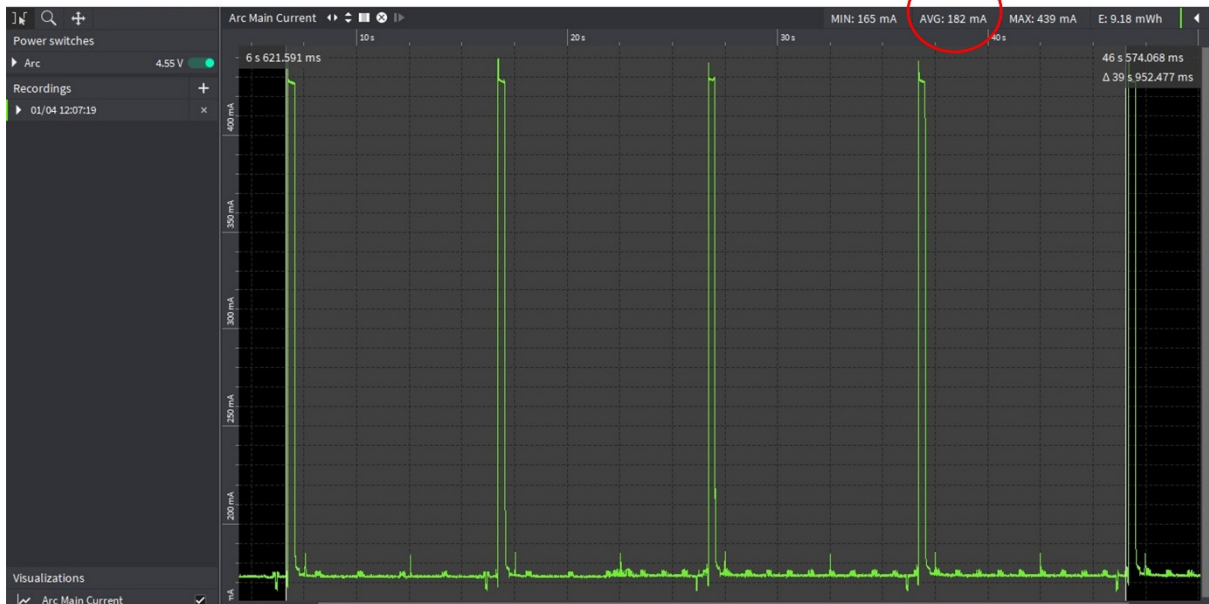
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ML2 Radio 1D 20mA 0mA – 10 secs



ML2 Radio 1D 20mA 20mA – 10 secs



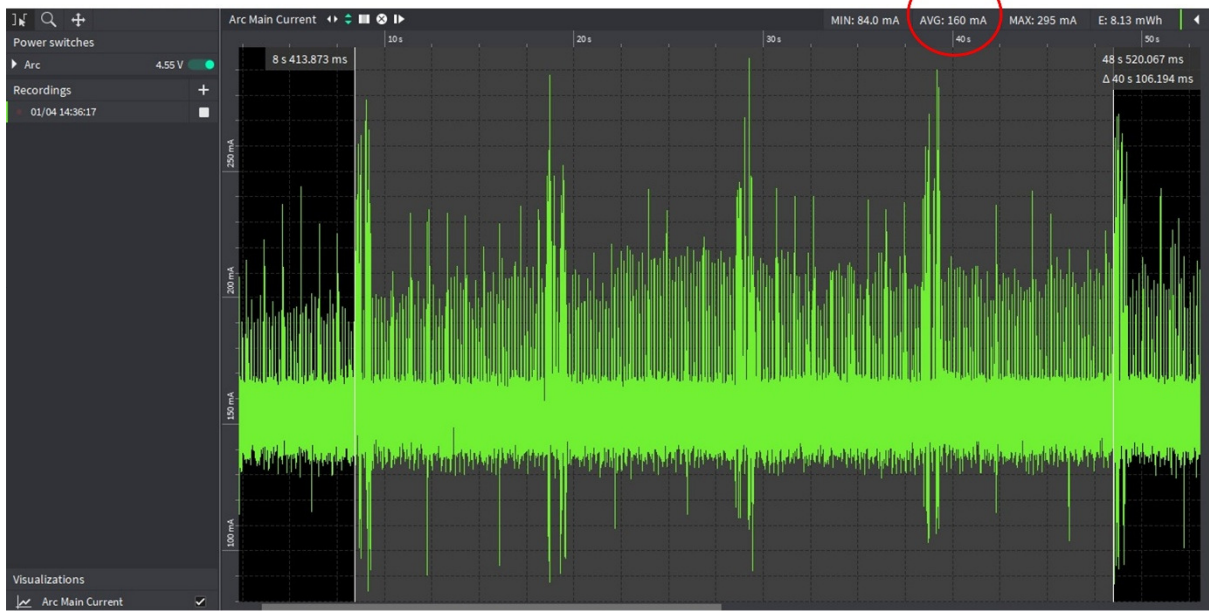
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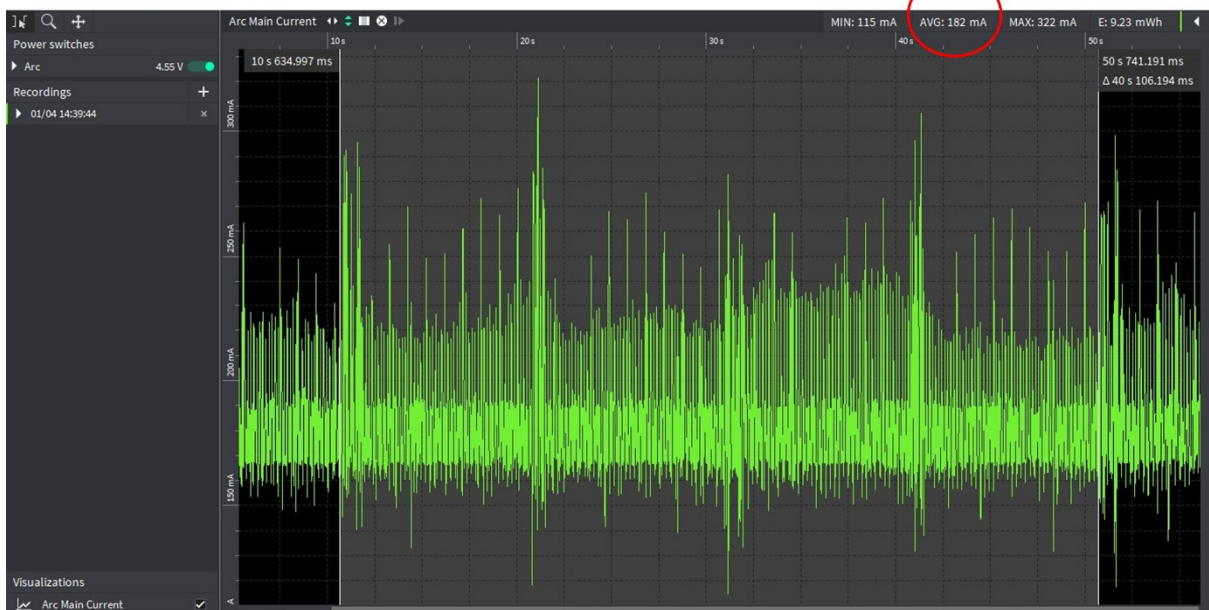
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Annex 1 - 458MHz UHF Radio

ML2 4G 1D – 10 secs



ML2 4G 1D 20mA 0mA – 10 secs

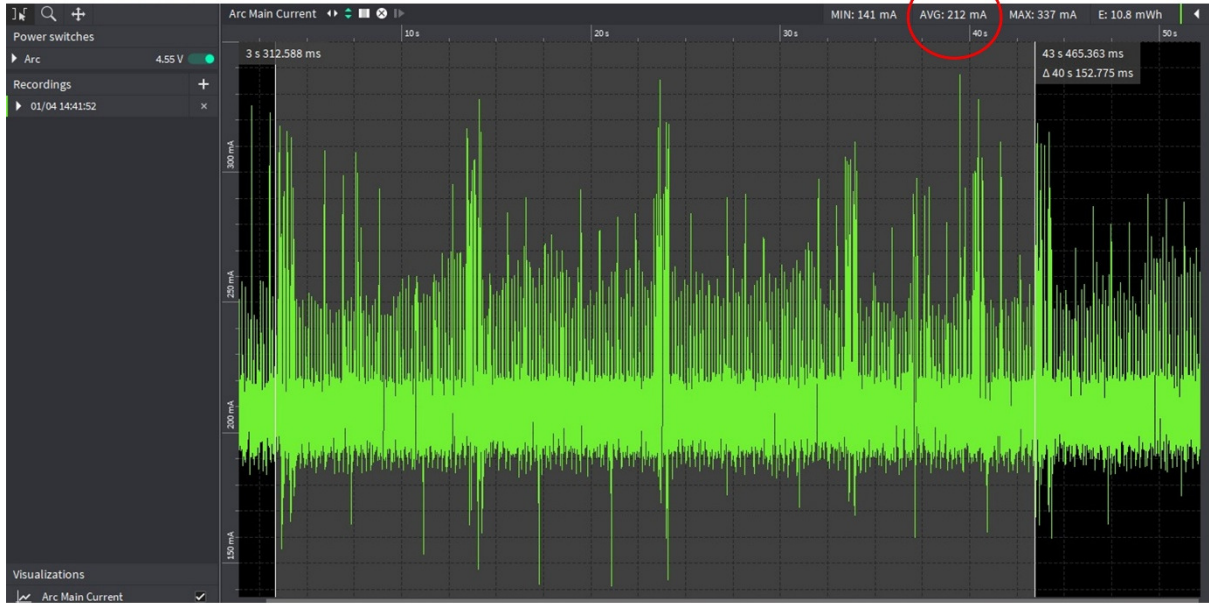


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ML2 4G 1D 20mA 20mA – 10 secs



End.

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