

See the Power of Software - Optimizing mobile applications

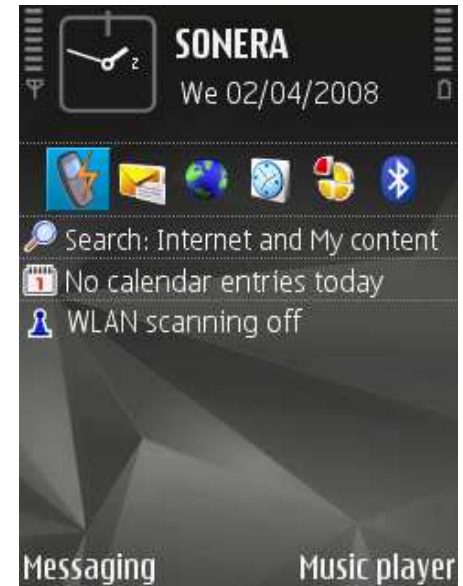
Gerard Bosch and Mika Kuulusa

29 April 2010

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Contents

- Background
- Nokia Energy Profiler
- Application examples, "power hogs"
- Guidelines
- Summary



Background

What is this all about.

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A close-up, side-profile shot of a man wearing a dark blue jacket and earbuds. He is looking down at a smartphone held in his hands. The background is blurred, showing a red structure with a white letter 'M'.

How many of you recharge
your mobile phone every day ?

Basic Units

Consumption

- Power consumption: W, watt.
- Power = Current x Voltage
- Current consumption: A, ampere (or mA)
- Voltage: V, volt (or mV)
- Energy: mAh, (milli-Ampere hour)

Examples

Backlight: 0.37 W =
0.1A x 3.7V
0.1A (100mA)
3.7V
100mAh (1 hour of 100mA)

Battery Capacity

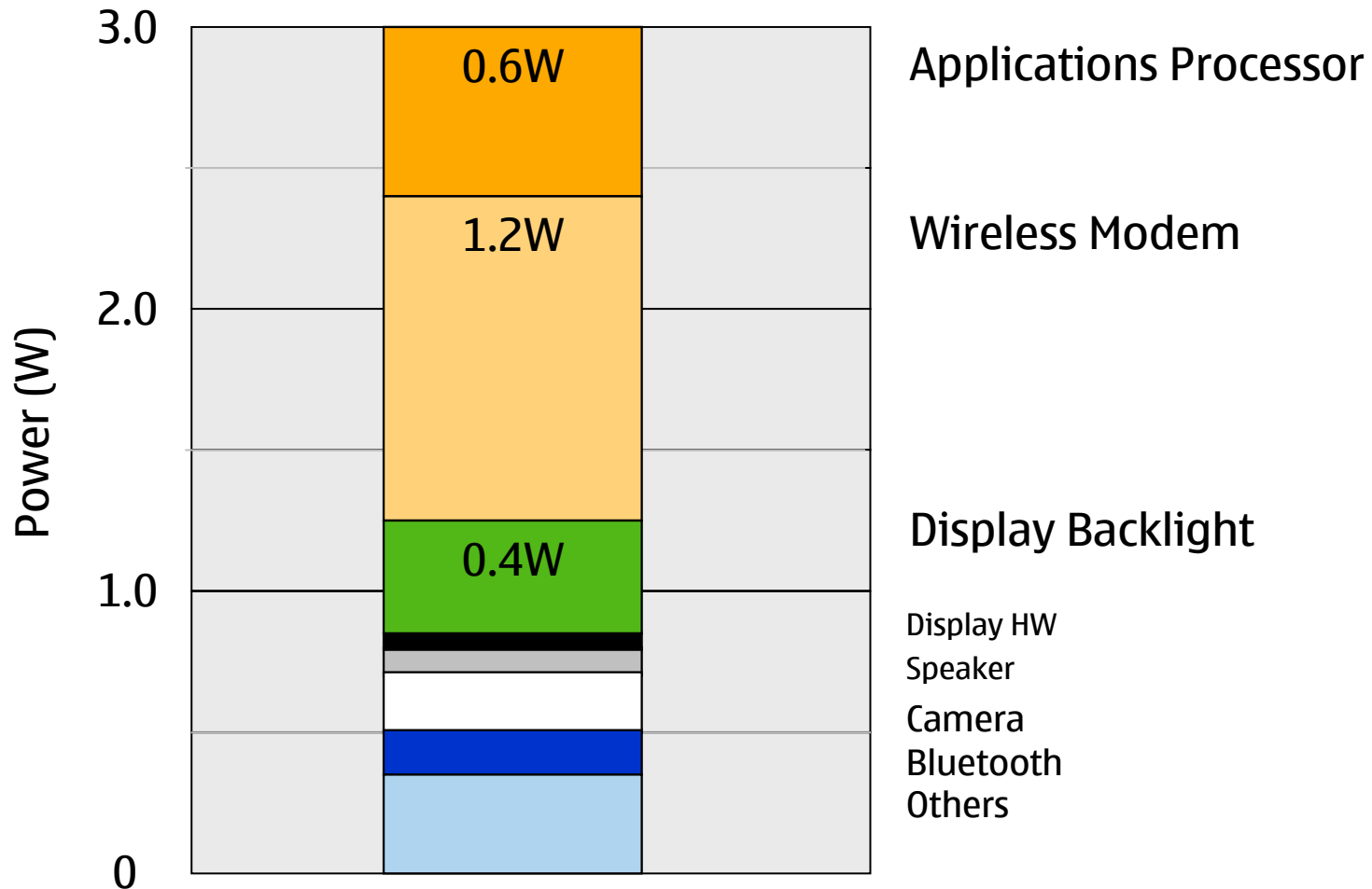
- Milli-ampere-hours: mAh
- Or watt-hours: Wh

Battery: 1000 mAh

100mA → 1000/100 = 10 hours

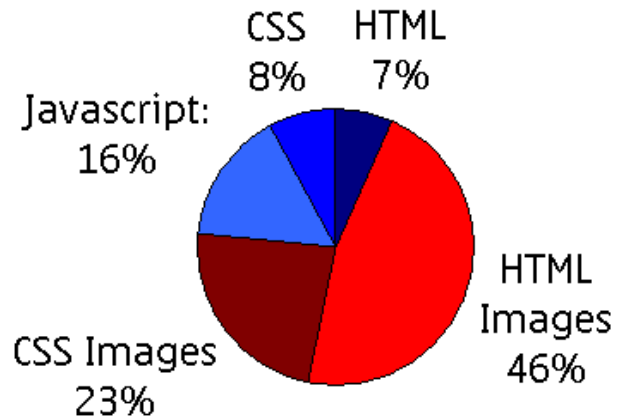
1000mAh = 3.7 Wh (at 3.7V)

The 3W Power Budget



Illustration

- Device: N95 8GB
- Software: V30.0.18 (23-07-08)
- Browser: S60 OSS Browser
- Location: Downtown Tampere, Finland.
- Web site: <http://www.yle.fi> (640 kBytes)



www.yle.fi



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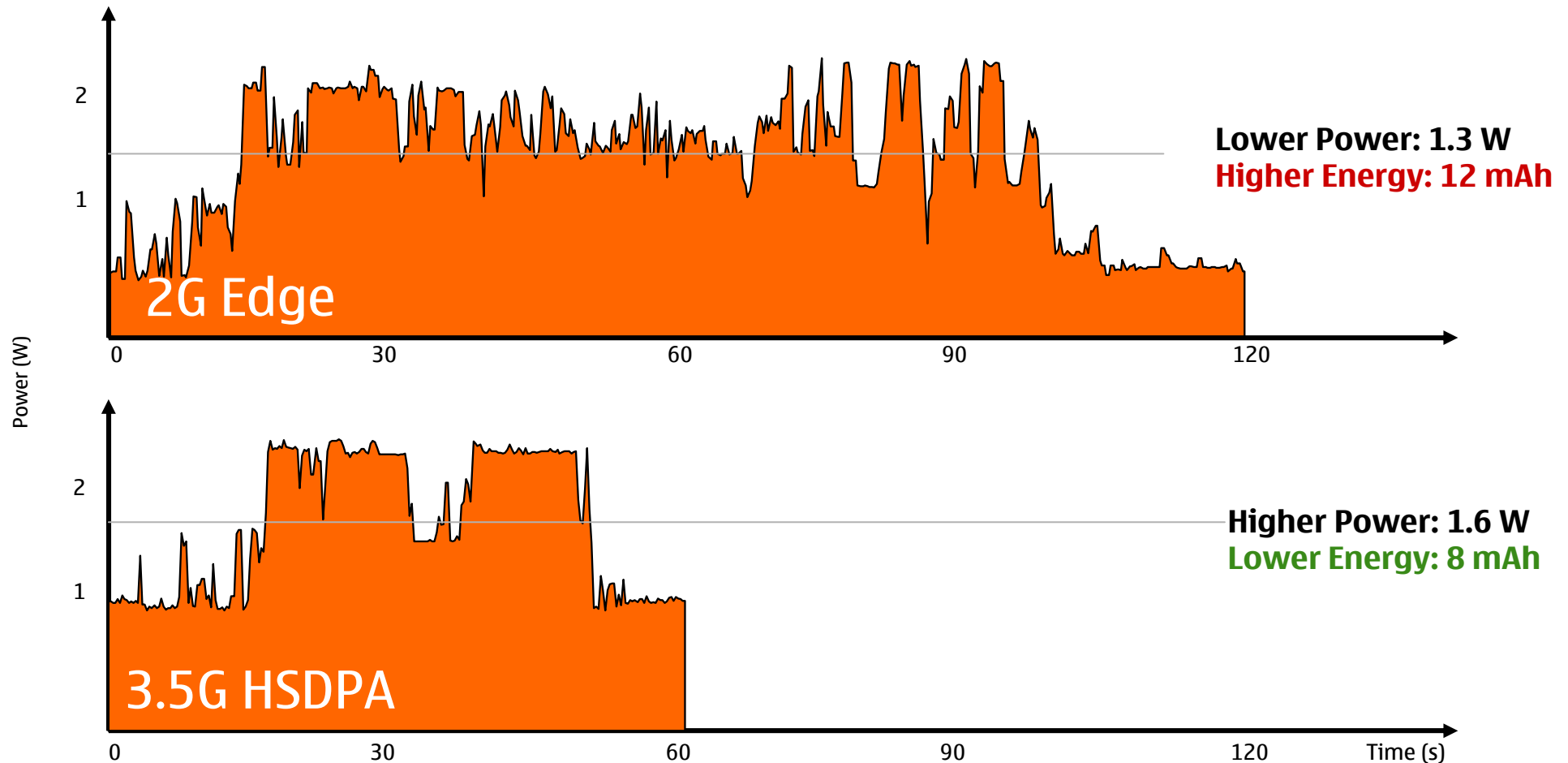
Nokia

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NOKIA
Connecting People

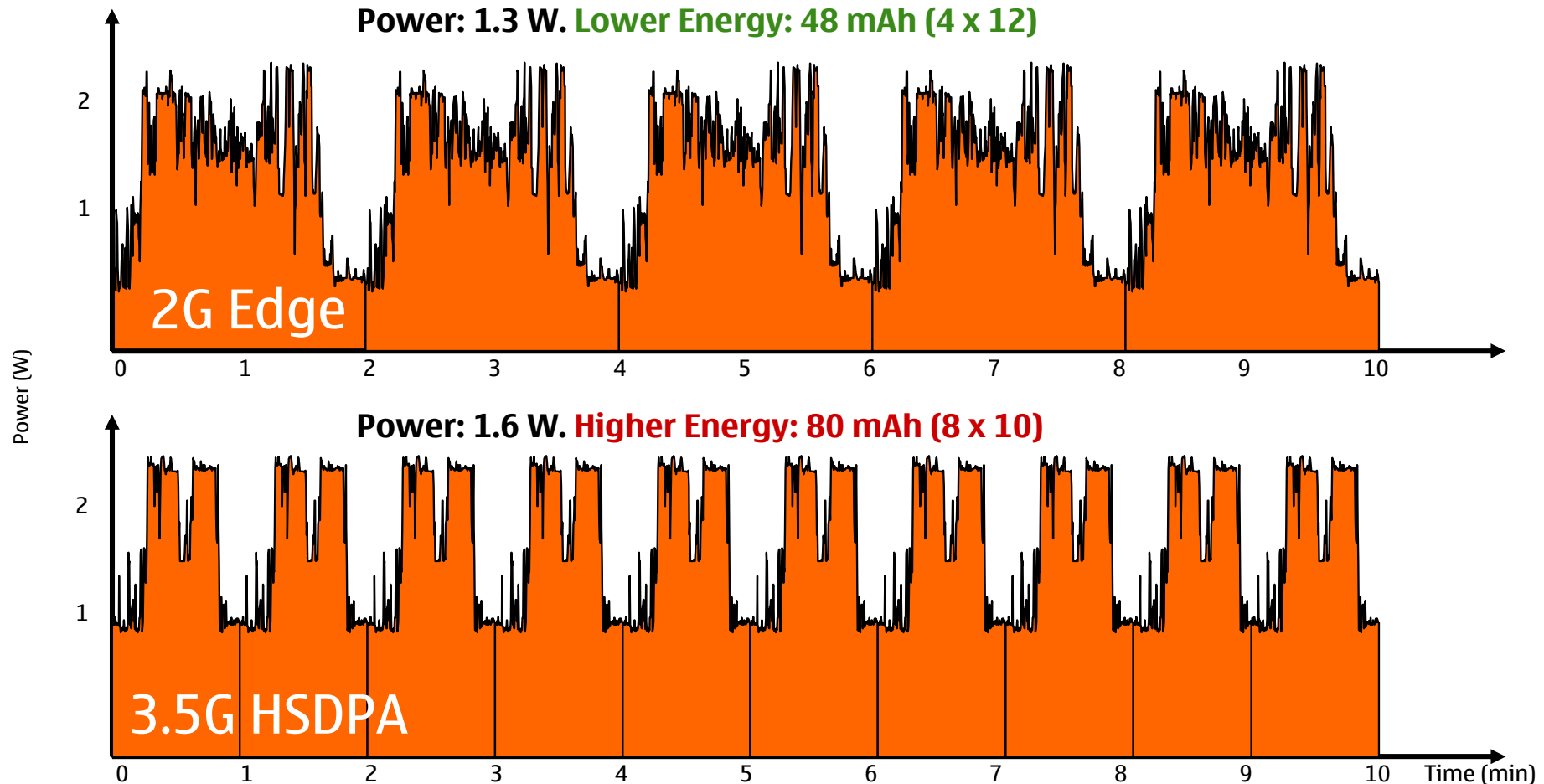
Which one is better?

Browsing 1 Page

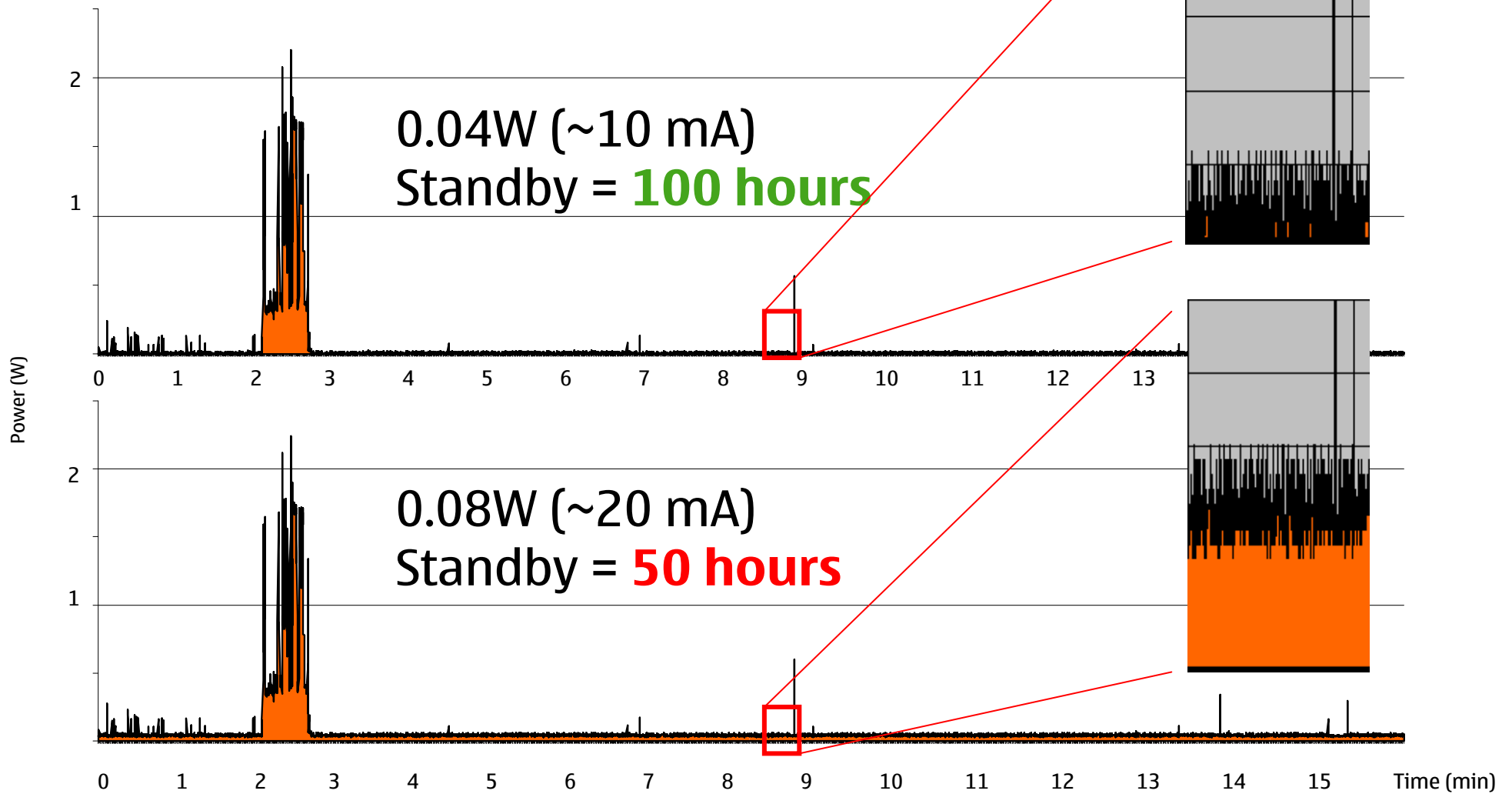


Which one is better?

Browsing for 10 Minutes



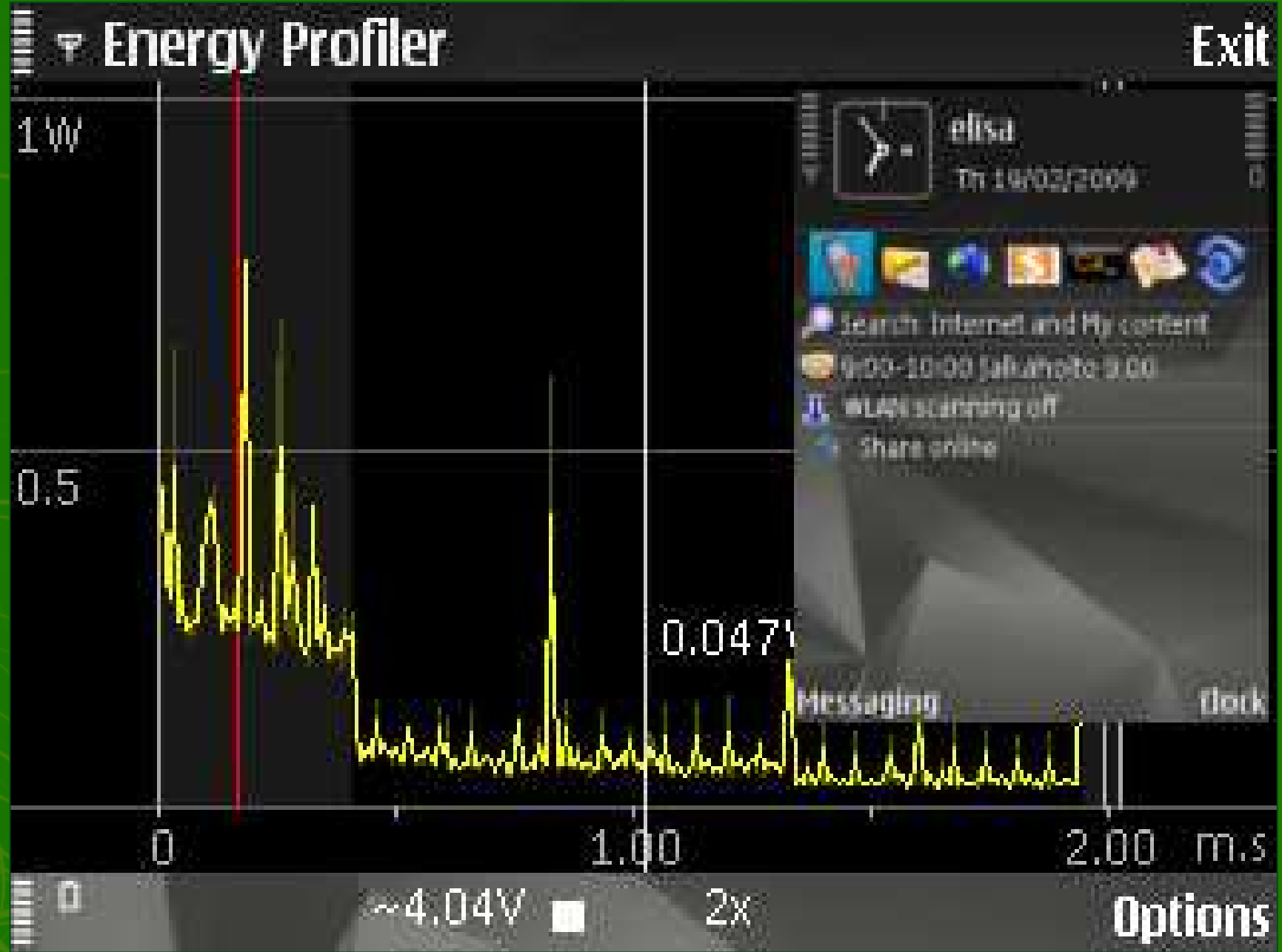
Standby Power Consumption (1000mAh)



Nokia Energy Profiler

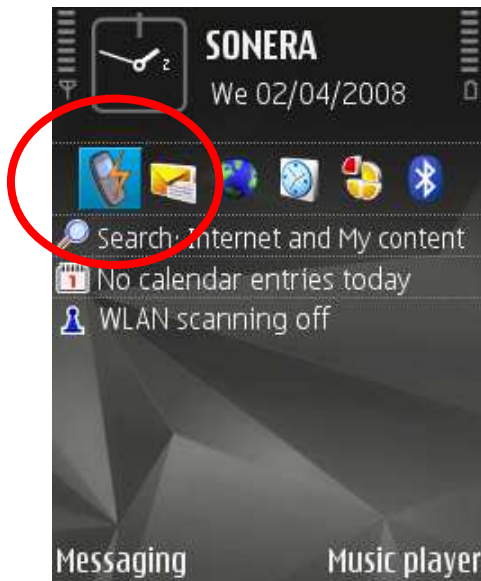
Now everybody can make battery last longer.

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Usage

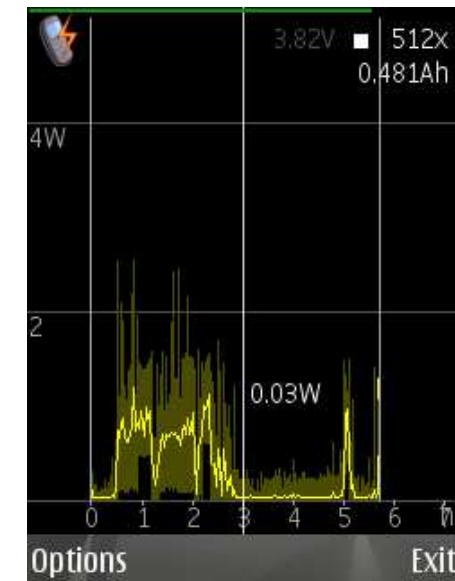
Start



Measure



Analyze & Optimize



in device itself

A	B	C	D	E	F	G	H	I	J
DATE	TIME	TIMESTAMP (s)	POWER (W)	CURRENT (mA)	VOLTAGE (V)	ENERGY (mAh)	CPU LOAD (%)	MEMORY (bytes)	DOWNL (bytes/s)
5.3.2009	09:18:49	41.500	1.011	270	0	0	0	7806386	70
5.3.2009	09:18:49	41.750	0.713	194	0	0	53		
5.3.2009	09:18:49	42.000	0.588	160	0	0	10		
5.3.2009	09:18:50	42.250	0.948	234	0	0	8		
5.3.2009	09:18:50	42.500	0.621	160	0	0	5	78180352	262
5.3.2009	09:18:50	42.750	0.654	170	0	0	20		
5.3.2009	09:18:50	43.000	0.667	166	0	0	4		
5.3.2009	09:18:51	43.250	1.379	375	0	0	48		
5.3.2009	09:18:51	43.500	0.592	161	0	0	16	78180352	156
5.3.2009	09:18:51	43.750	0.577	157	0	0	19		
5.3.2009	09:18:51	44.000	0.981	267	0	0	14		
5.3.2009	09:18:52	44.250	0.592	161	0	0	14		
5.3.2009	09:18:52	44.500	0.584	159	0	0	16	78155776	70

Nokia Energy Profiler

or in Excel spreadsheet.

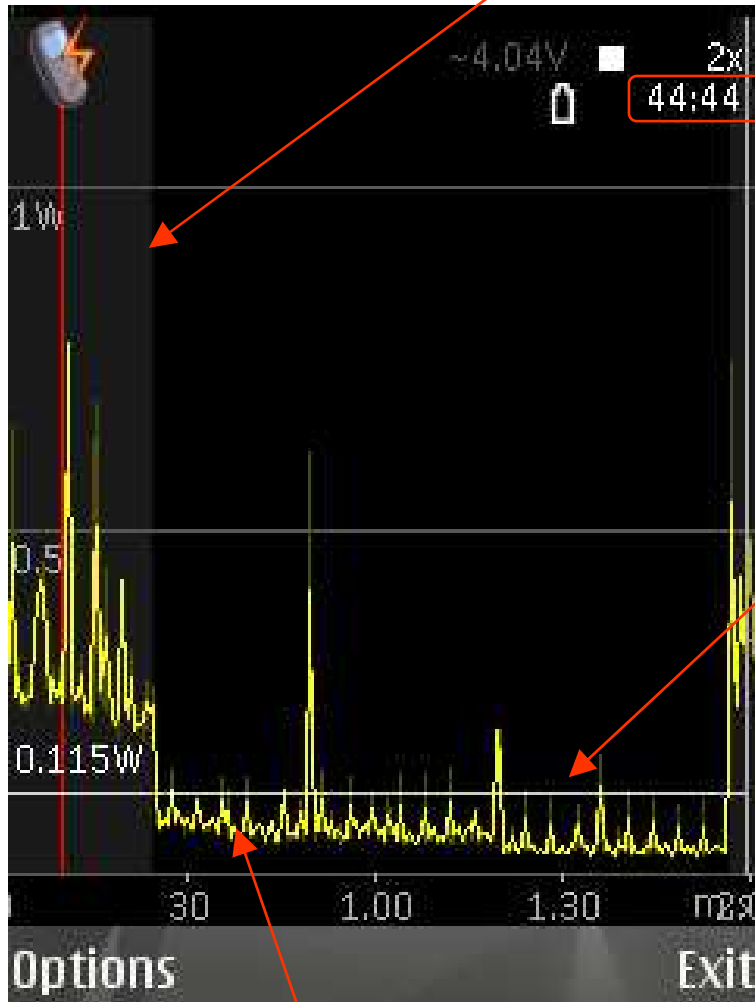
Basic Features

Backlight on/off

Battery Time

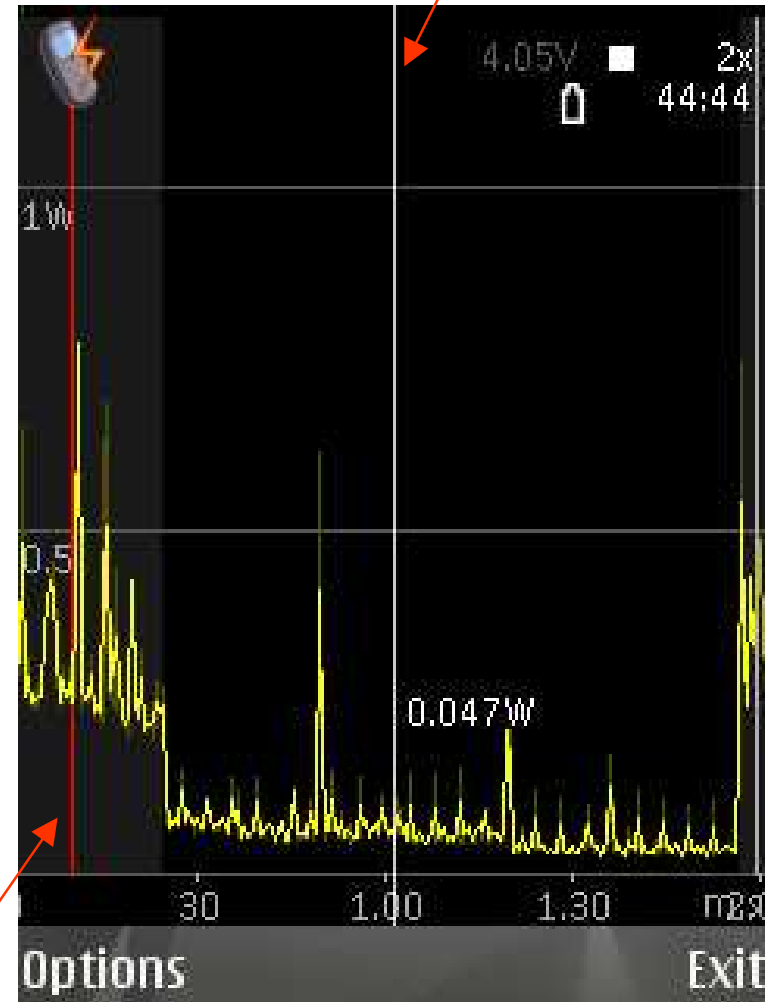
Based on average power over entire measurement.

Instant bar

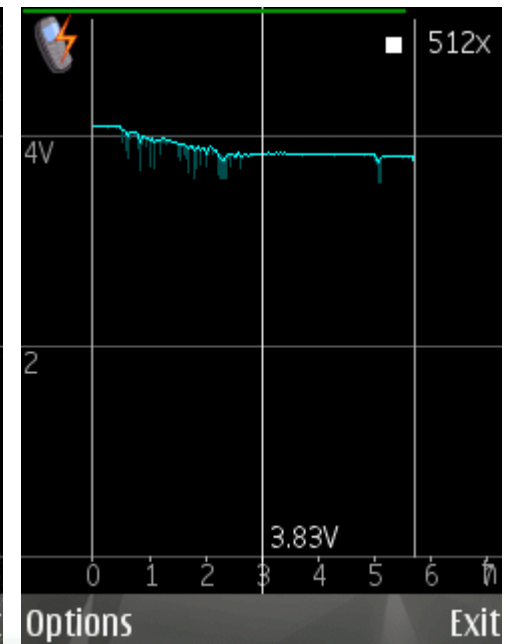
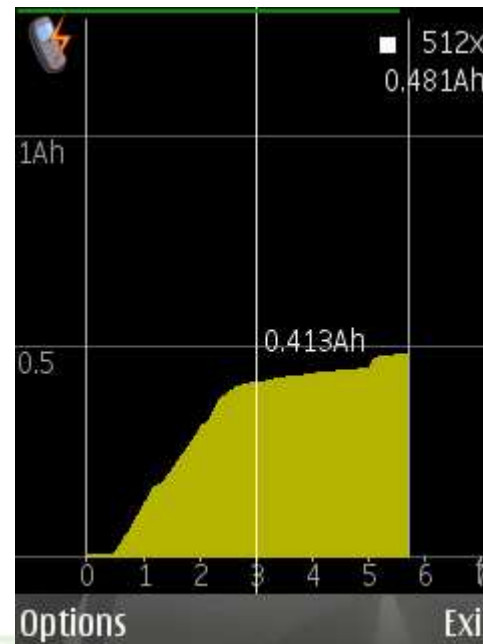
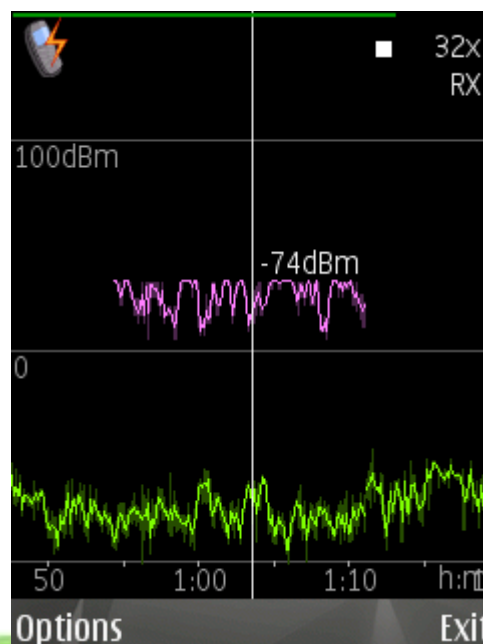
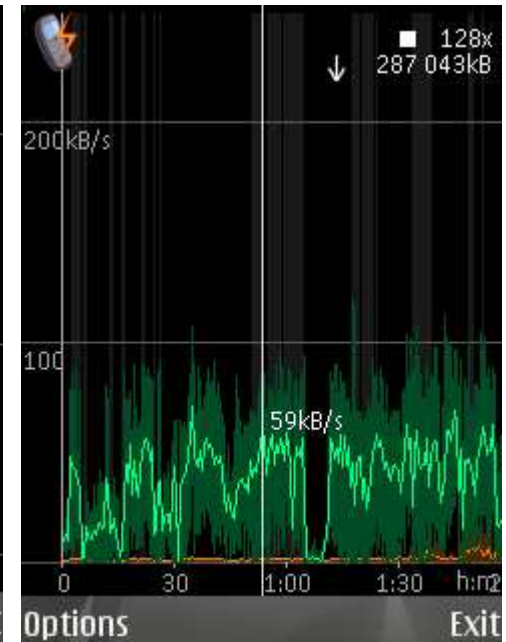
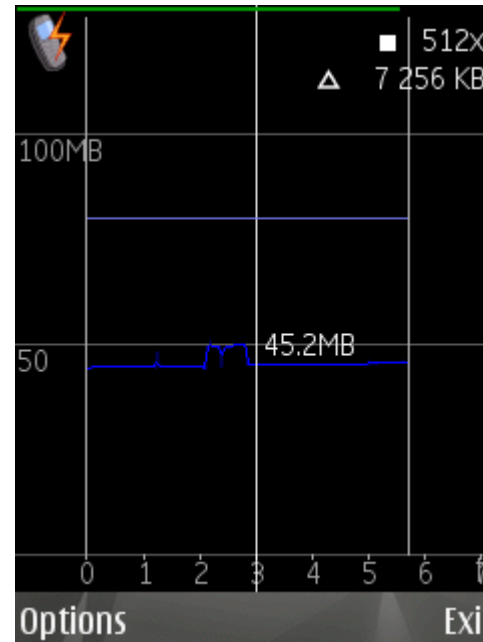
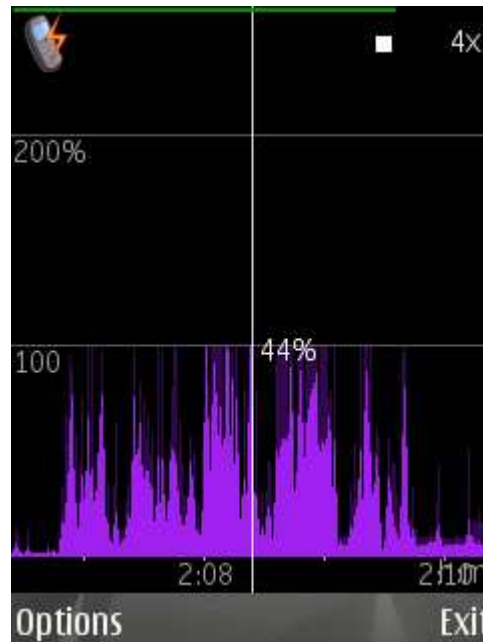
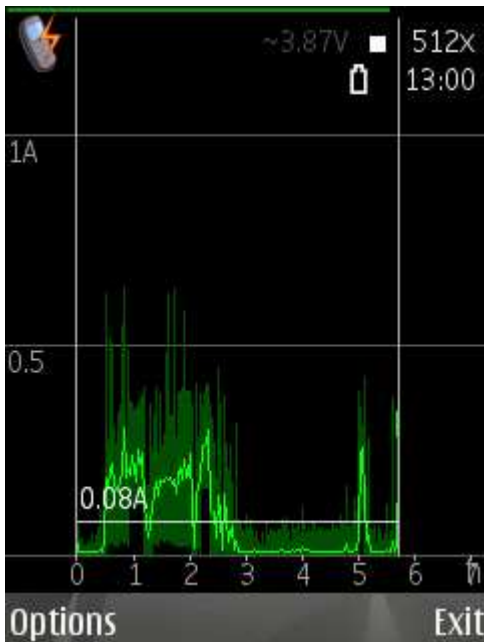


Average bar

Power Consumption

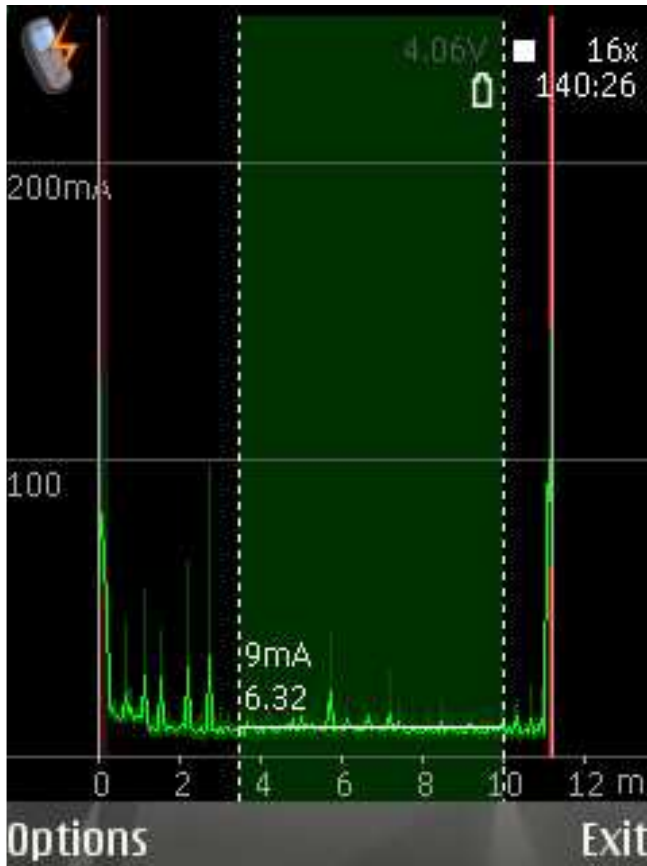


Screen Shot

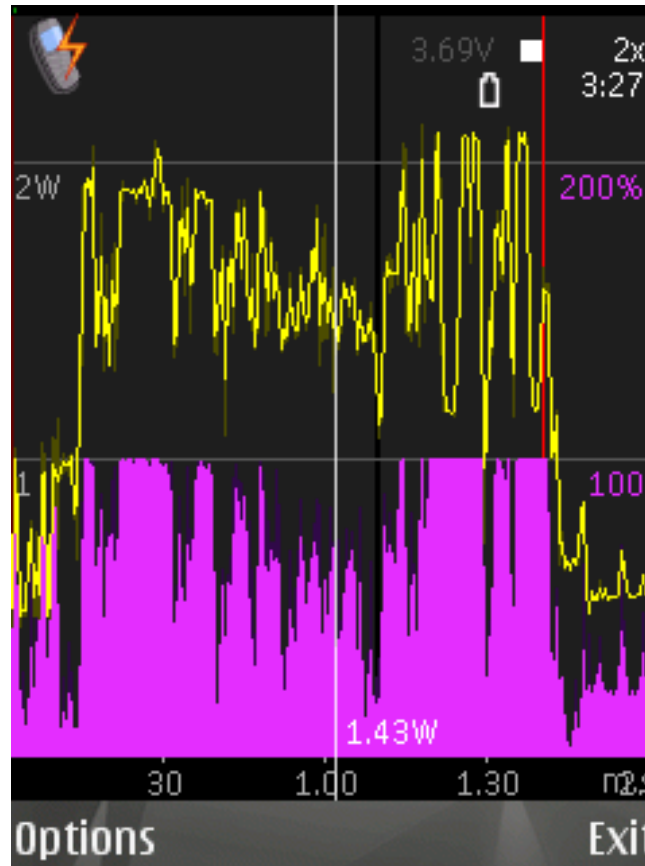


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Advanced Features



Time selection

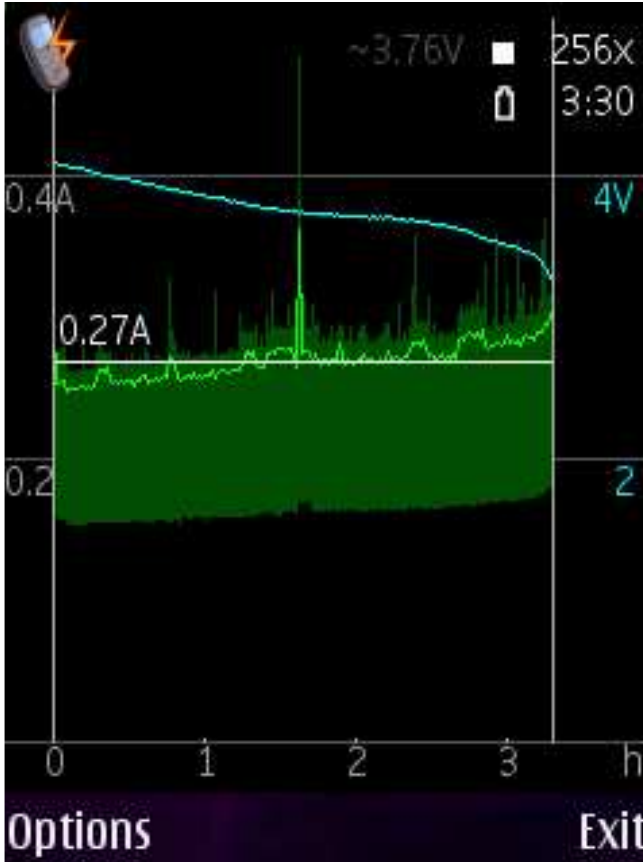


Dual view.

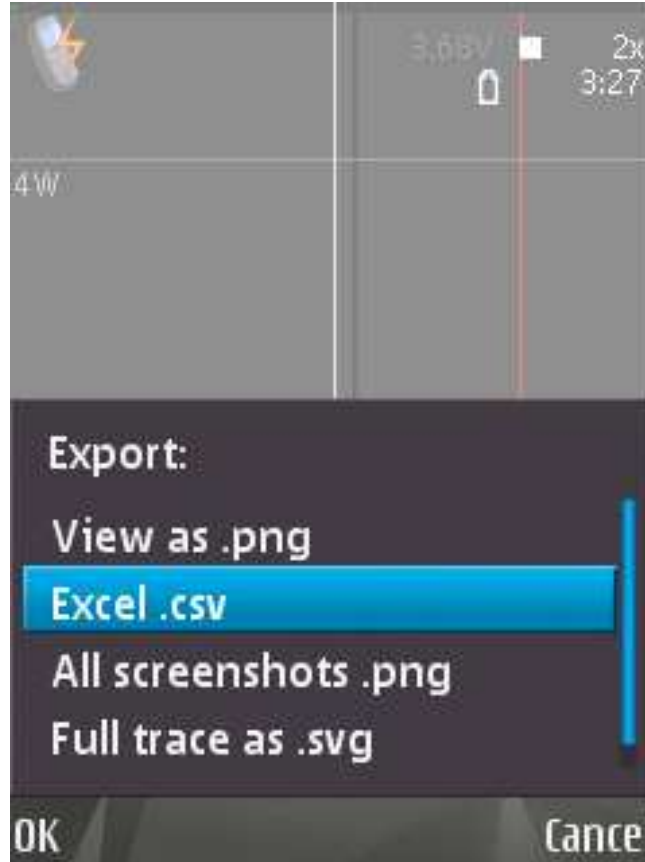


3G Timers
(dual view in use)

Advanced Features Cont'd



Emergency save



Export data as CSV or view as PNG image.



Direct download thru SMS and e-mail messages.

Misc Details

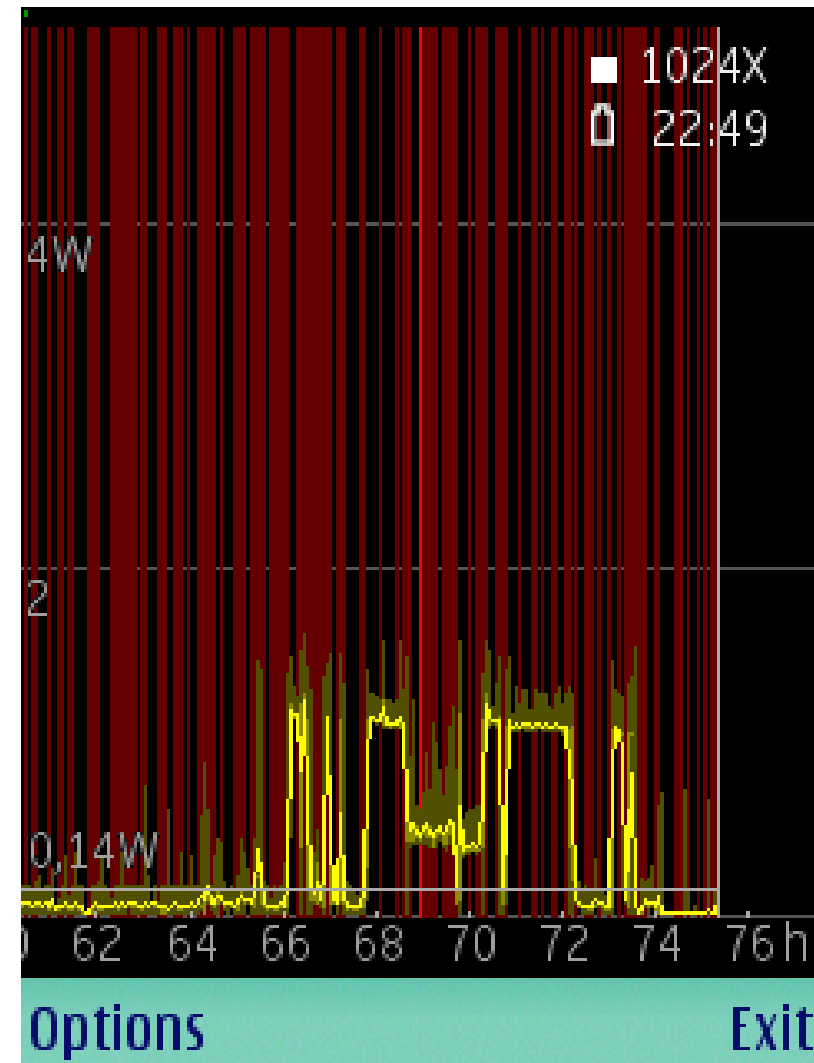
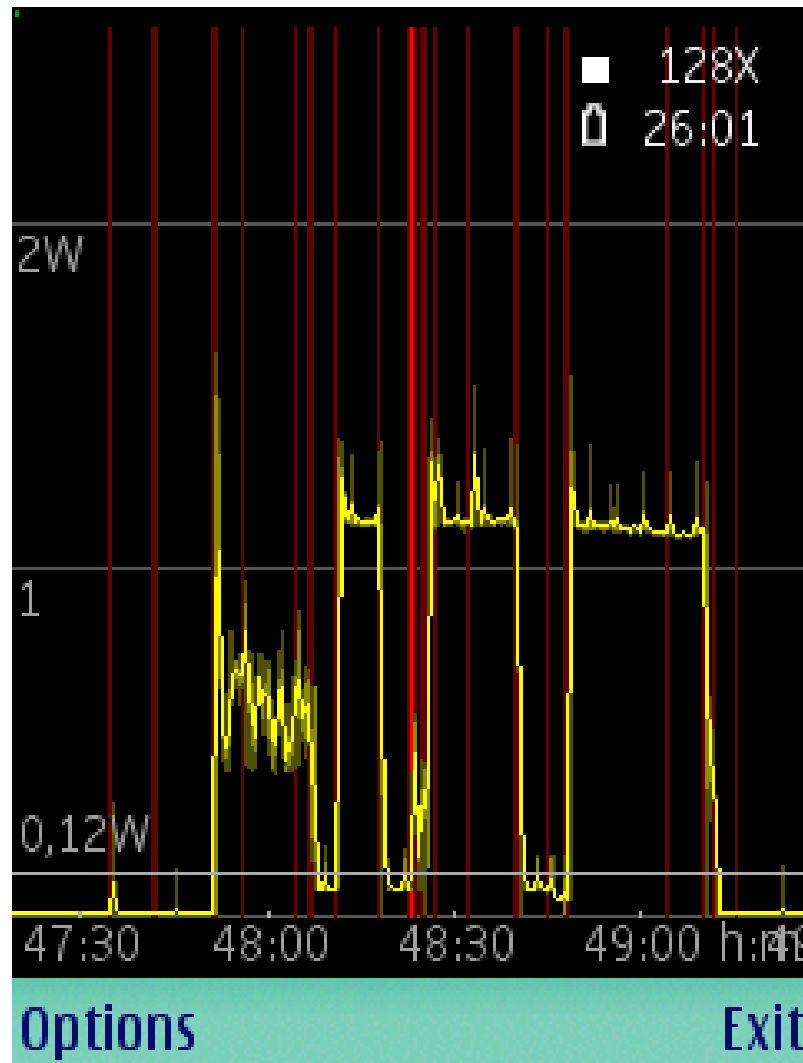
- Settings>Views>Measurement Speed: 0.25, 1 and 5 seconds.
- Active use cases: -2% in 0.4W (100mA) region $NEP_mA = 0.98 \times True_mA$
- Standby accuracy: -30% in 0.04W (10 mA) region $NEP_mA = 0.7 \times True_mA$
- Use 1 or 5 second Measurement Speed and all other views Off for best power consumption accuracy.
- Current consumption is lower for full battery (4.1V) than soon empty (3.1V). Power should be voltage independent.
- Use Nokia Energy Profiler External API to control NEP from your application (start/stop/take_screenshot) and read measurements.
- Options>Instructions actually has useful information.

Application Examples

Sucking the juice out of your battery.

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Example 1: GSM/3G Call (Wireless is Dynamic)

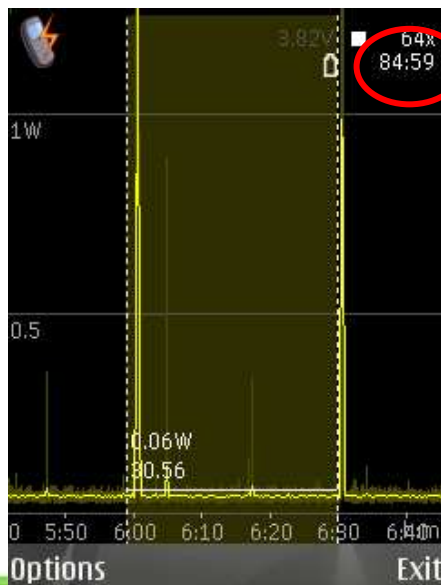
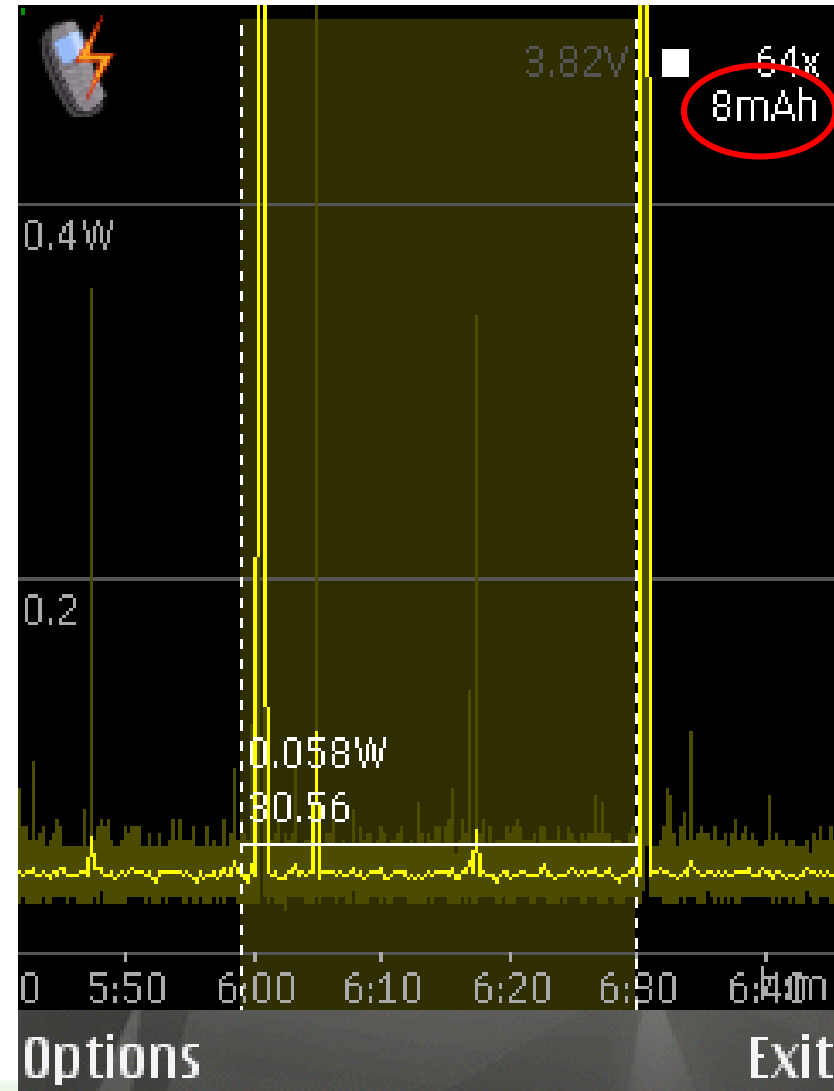
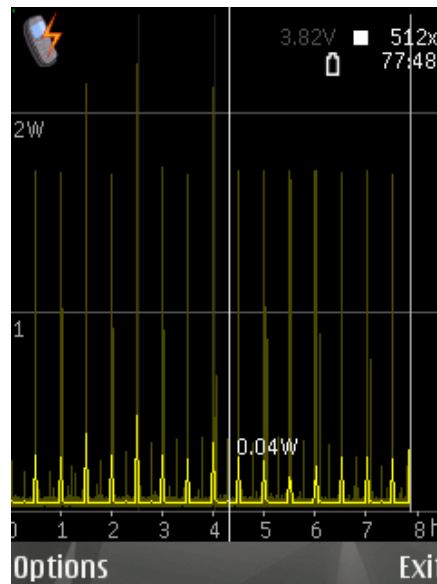


Example 2: PhoNetInfo 1.2 (100% CPU Load on BG)



Example 3: Mail for Exchange (Periodic)

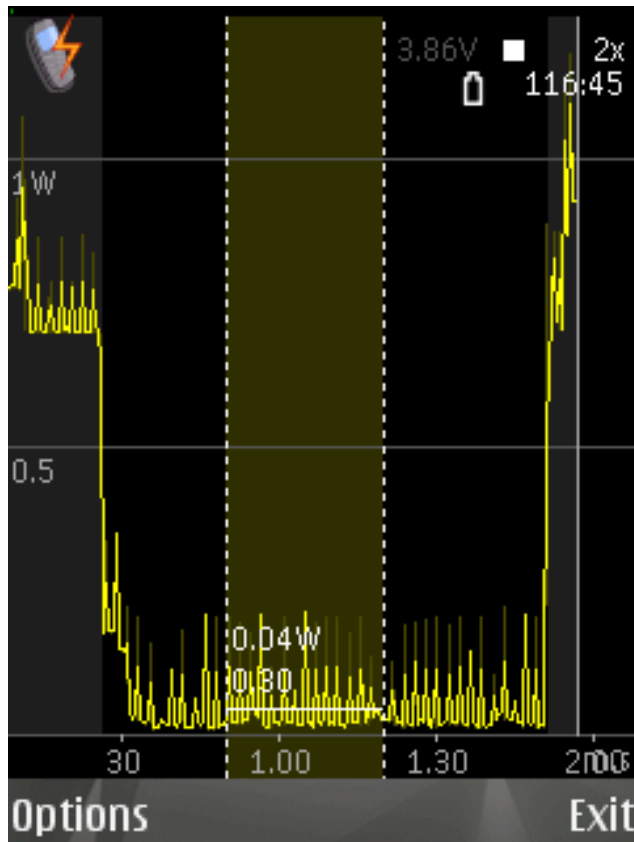
Phone: N95 8GB 1250mAh.
Sync Every 15 mins over 3G..



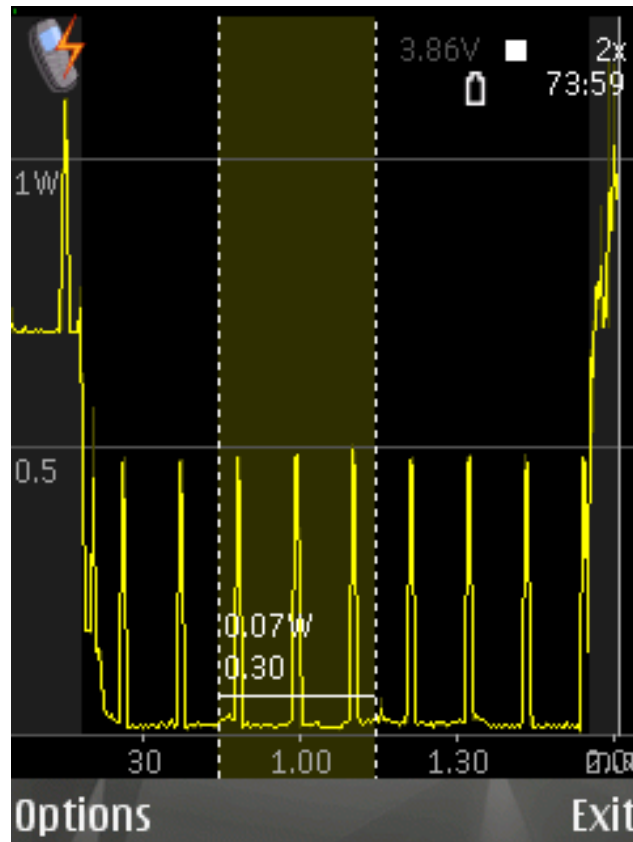
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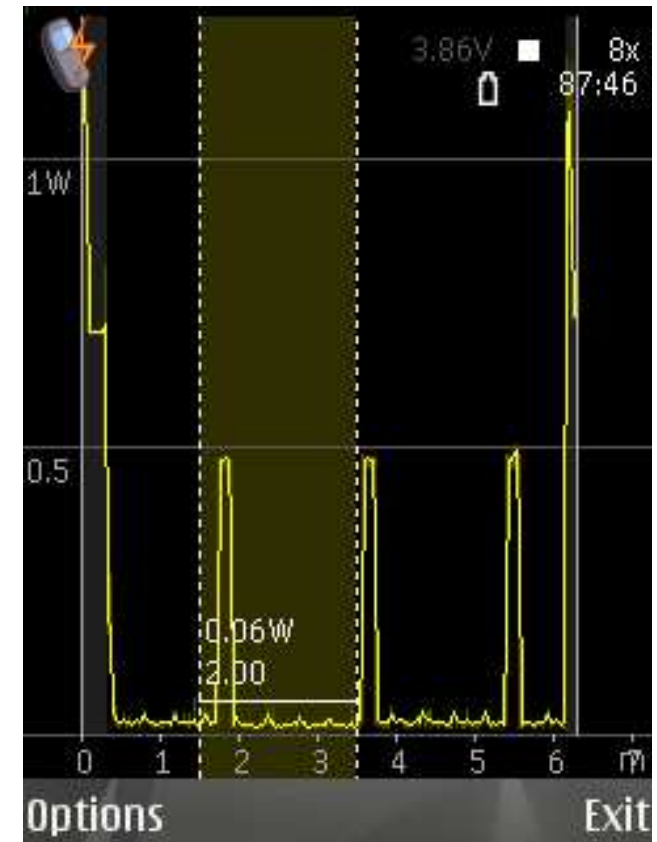
Example 4: Periodic with 10% Duty Cycle



0.1 s processing every 1 s

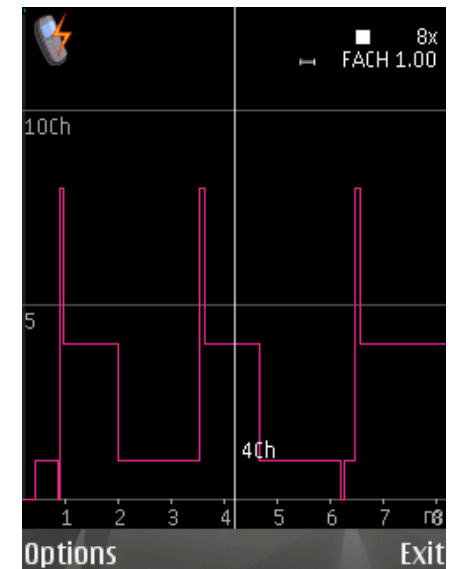
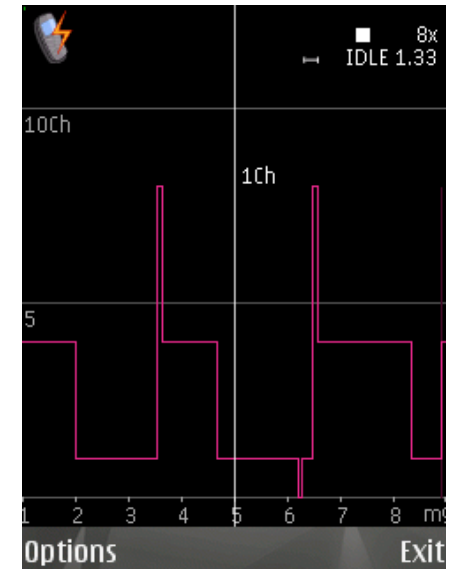
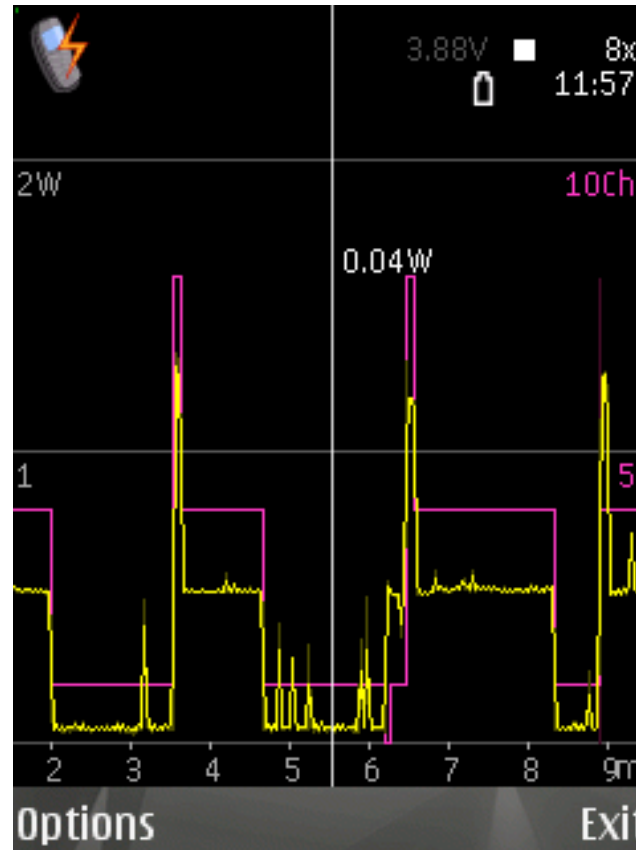
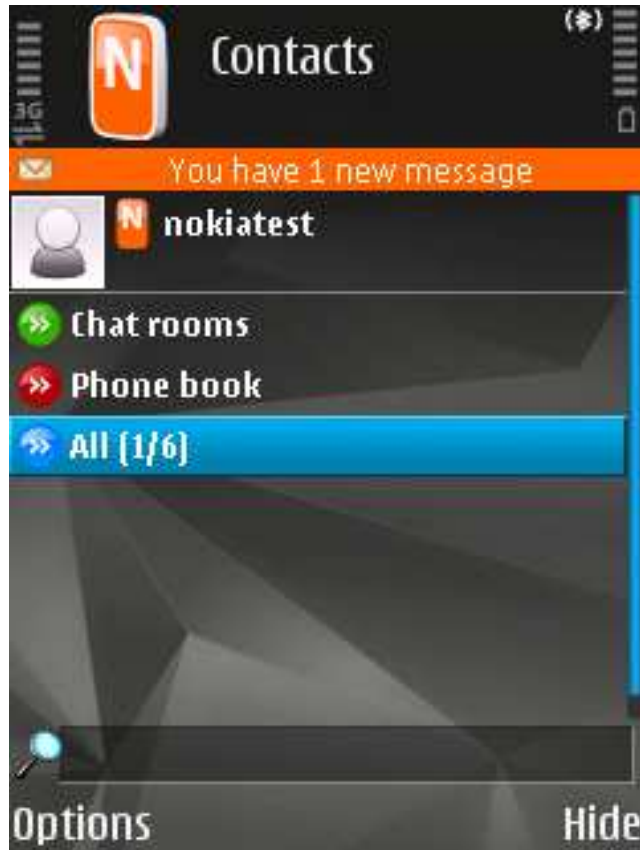


1 s processing every 10 s



10 s processing every 100 s

Example 5: Nimbuzz 1.1 IM (Network)



Guidelines

For SW experts that know what they are doing.

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1. Minimize number of clicks needed.

Fast UI is energy-efficient. Make common application usage super quick - click-click.

2. Avoid unnecessary or fast timers.

Reduces standby time significantly. Synchronize periodic processing.

3. Avoid unnecessary processing with CPU.

Use fast algorithms, process data while charging or in the server. Process quickly.

4. Optimize the server side.

Preprocess, compress, burstify.

5. Exploit platform features smartly.

Switch things OFF, we are not kidding here. Use lights API, location, caching, etc.

6. Experiment energy-performance tradeoffs.

Usually fastest code is the best for Active use. Standby is the most important.

7. Experiment with different S60 devices.

They are different. ARM9 and ARM11. Chipsets. Connectivity. Field test your app.

8. Use Nokia Energy Profiler for sanity checks.

Summary

Next one is the last slide.

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Summary

- Phone users expect that they do not need to recharge their phones constantly.
- Make "sanity checks" during the application development - not when it is ready to be released.
- Understand the difference of Power and Energy.
- Try to apply the 8 Guidelines to your application.
- Standby power consumption has "20x importance" against active power. This according to common active/standby user profiles.
- Energy-efficient S60 and Java software will be a competitive advantage in the future.
- Nokia Energy Profiler has 1M+ downloads. Everyone can really make the battery last longer!



Q&A



A group of people are gathered around a mobile phone. In the foreground, a woman is holding the phone, and a red laser line is visible on her wrist. The background shows other people looking at the phone. The text "Thank you!" is overlaid in the top right corner.

Thank you!

- **Download: Nokia Energy Profiler**
 - www.forum.nokia.com/energyprofiler
- **Nokia Energy Profiler External API (new version 1.2)**
- **Quick Start Guide**
 - Google search with "energy profiler"
- **Discussion thread in www.Forum.Nokia.com**
 - Symbian C++ > Tools and SDKs > Sticky: Nokia Energy Profiler
- **Book: Mobile Phone Programming Application to Wireless Networking**
 - "Optimizing Mobile Software with Built-in Power Profiling" chapter.
 - Springer 2007 (ISBN 978-1-4020-5968-1)
- **Carbide.C++ Performance Investigator**
 - Google search "carbide performance investigator"

Backup

Slides.

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November 2007

Jaiku | damn, the Nokia Energy Profiler is probably the coolest Symbian application i have ever seen.. :-)

Home Take the Tour Channels Explore

afr said:

 damn, the Nokia Energy Profiler is probably the coolest Symbian application i have ever seen.. :-)

3 days, 10 hours ago in Zurich, Switzerland.

12 comments so far

- Link? 3 days, 10 hours ago by atmosphere.
- <http://www.symbian60.mobi/2007/11/28/nok...> 3 days, 10 hours ago by afr.
- it's really scary how much power the mp3 player t 3 days, 10 hours ago by afr.
- and in contrast, how little the WiFi interface uses, 3 days, 10 hours ago by afr.
- Just installed ... 3 days, 10 hours ago by atmosphere.
- interesting: it's actually not the switched-on accel

Nokia Releases Cellphone Power Monitor | Gadget Lab from Wired.com - Mozilla Firefox

http://blog.wired.com/gadgets/2007/12/nokia-releases.html

WIRED BLOG NETWORK

gadget lab hardware that rocks your world

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Nokia Releases Cellphone Power Monitor

By Charlie Sorrel | December 03, 2007 | 5:11:13 AM | Categories: Phones, Software

Nokia users suffering from Obsessive Compulsive Disorder, stay away. The Finnish company has released an application for S60 phones which will measure and chart power usage, giving you one more thing to obsess over.

The Nokia Energy Profiler will show you just how much juice the WiFi and Bluetooth are pulling, and you'll be able to spot which poorly coded applications are killing the battery. It even exports graphs, or, for the true stat-junkie, Excel.csv files.

The real advantage, though, will be when developers start tuning their software to go a little easier on



The Register: Sci/Tech News for the World - Mozilla Firefox

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Nokia sweetens juice-monitor app • The Register - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.theregister.co.uk/2009/03/10/nokia_energy_profiler/

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Nokia sweetens juice-monitor app
Data rates, signal strength and RAM, oh my!
By **Bill Ray** • [Get more from this author](#)
Posted in [Mobile](#), 10th March 2009 08:02 GMT

Forum Nokia's very-useful-to-a-select-minority power usage logger has been expanded to log a load more system states, which should equally expand the interested market for the app.

Nokia's Energy Profiler, an application that monitors and logs the power consumed on a S60 FP1+ device, has been updated. Version 1.2 can now log CPU load, RAM consumption, network data flow, network signal strength, Wi-Fi signal strength and 3G Timers state as well as power consumption via a variety of metrics - all at the tap of a finger, where supported by the device.

The application has been developing since

ADOBE ACROBAT 9 PRO

REVIEW: SONIM ENDURO XP3

Done

Mary-Jo Foley & Gavin Clarke
Microsoft Mixes it in Vegas
with Silverlight, Azure and IE 8

MOST READ **MOST COMMENTED**

- 02 to axe iPhone prices?
- iPhone 3.0 gossip lassos MMS, tethering, cut-and-paste...
- TfL cans mobiles on the tube plan
- Google tosses free texting
- Fanbois will abandon iPhone for Palm, says Wikisugardaddy

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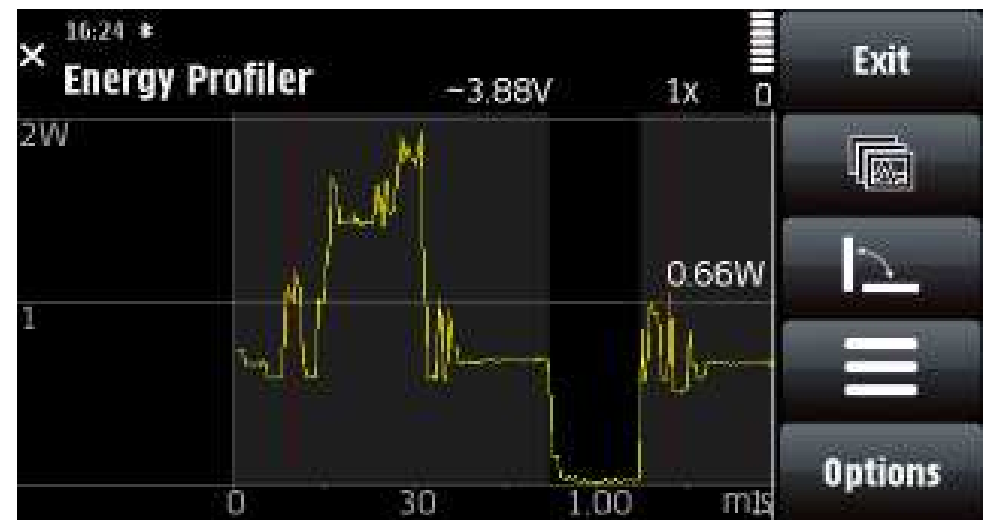
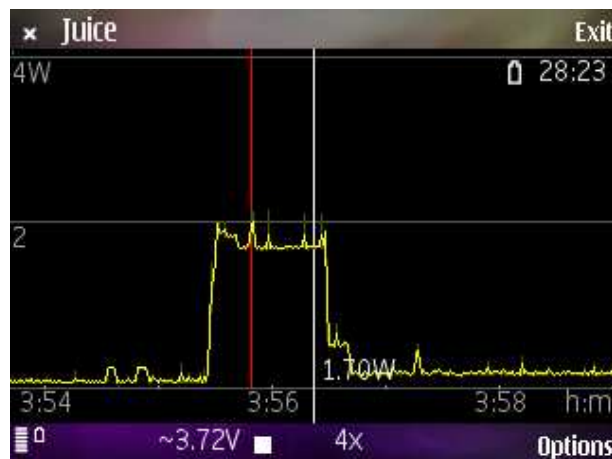
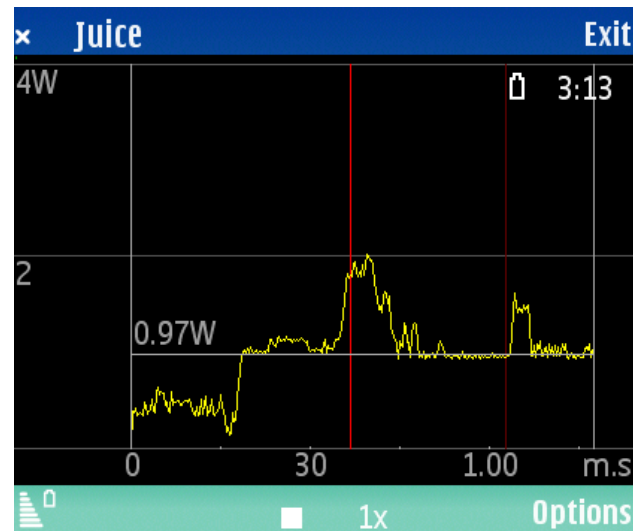
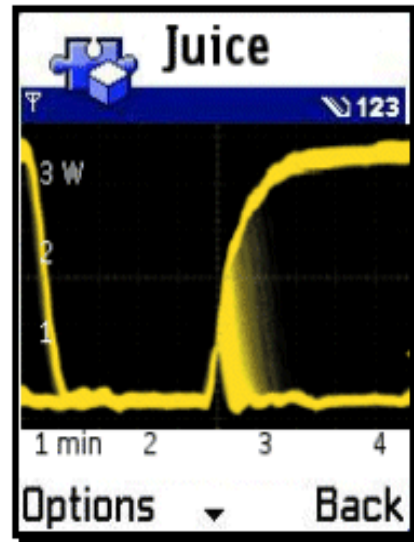
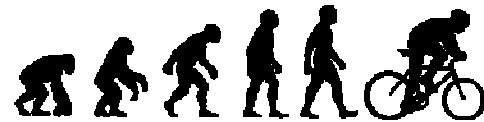
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Evolution



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