

Mobile Power

By William Lumpkins

As the ecosystem of mobile devices expands to more than four devices per person in the growing technically savvy community of information users, and with battery technology advancement stagnating, the need for expanding or extending battery life is paramount. The days of a cell phone only needing to be charged every three or five days are gone as cell phones become smart devices merging cell phones, music players, video players, game systems, social networking enablers, location enablers (GPSs/mapping systems), cameras, scanners, airline tickets, loyalty cards, mobile coupons, and a multitude of other devices waiting to be thought up. These smart devices need to be charged sometimes every three to four hours or be plugged into a constant power source, thus losing the advantage of being a “mobile” device.

Thus, the idea and/or proliferation of mobile power has taken off. Mobile power is really just a stand-alone battery device with no real function but to act as a charging station for a mobile device, while allowing continued mobility, i.e., not being plugged into a wall or car charging socket. These devices range in size and battery life [milliamp hours (mAh)]; this article will review a few of these mobile power devices and share some of the pros and cons of each device as tested.

As reviewed in the April 2014 issue of *IEEE Consumer Electronics Magazine*, the Wi-Copy (DW-21) from Apotop (Figure 1) is a multifunction Wi-Fi device targeted for the mobile consumer. Apotop, which is an abbreviation of



FIGURE 1. The Wi-Copy (DW-21) from Apotop.



FIGURE 2. The Lepow Moonstone (3,000 mAh). (Photo courtesy of Lepow International LLC.)



FIGURE 3. Fast mode and standard mode of Lepow Moonstone. (Photo courtesy of Lepow International LLC.)

“approaching the top,” is a brand line for Carry Ltd. (www.carry.com.tw/en/), a Taiwanese company that made its business about 20 years ago with memory as an external power source (5,200 mAh). Apotop carries its own in power charging capability. It is bland in appearance but very functional in use as

previously reviewed; a switch selector change is required to put the unit into battery storage or recharging mode. This is both a good and a bad concept: if it happens to have been left in the access point mode, it will waste power trying to connect to devices, but, if the last setting was off, it will conserve its battery power for many weeks.

The Lepow Moonstone (3,000 mAh) (Figure 2) is a fashionable alternative in the mobile power space; it comes in a soft, kitten-like carrying case, which children reviewers thought was cute. The Moonstone 3,000 that was tested had two modes: standard mode, 500 mA, and fast-charge mode, 1,200 mA. The difference in the modes relates to the amount of current that can be sourced during the recharging time, e.g., an Apple iPad would need the fast mode as it draws or consumes more power than an Apple iPhone. Although putting the Moonstone in fast charge mode could charge the iPhone faster, some charging capability would be lost overall, i.e., the efficiency would be less (see Figure 3). The only downside of the product, which is common for devices with external buttons, is the button on top of the device, which could be depressed in a purse or handbag/backpack. Lepow International LLC, a newcomer to the consumer development space, started in China with its development now in the United States; Lepow hopes to garner the attention of young people with their sleek designs and functional products (www.lepowglobal.com).

As stated in a Lepow press release: Lepow International LLC is a developer, manufacturer, and marketer of unique accessories for mobile devices. Founded in 2011,

Table 1. Features of the mobile power devices reviewed.

Product Name	Manufacturer	Power (mAh)	Dimensions	Weight (g)	Cost	Comments (Extras)
Second-Generation Astro	Anker	6,000	93 × 46 × 25 mm	135	US\$59.99	Motion sensitive, as low as US\$29.99
DW-21	Apotop	5,200	88.9 × 73.66 × 22.86 mm	191.9	US\$89.99	Wi-Fi router, SD copy, file server, cloud
Moonstone	Lepow	3,000	82 × 80 × 5 mm	97	US\$39.99	As low as US\$19.99, dual charge modes
PocketCell	Innergie	2,850	90.9 × 29.8 × 21.1 mm	72	US\$59.99	Depressed switch, as low as US\$37.00

Lepow blends high design with functionality to give consumers superior products that match the style of today's cutting-edge smartphones and tablets and make their digital life more enjoyable. Its new take on mobile accessories with fun designs and colors has earned Lepow a prestigious Red Dot design award. Lepow globally markets its high-quality products from their U.S. headquarters in California. For more information, visit www.lepowglobal.com.

The Anker, coming in at 6,000 mAh at 3.7 V, is a marvel in action; it is sleek, black, and very functional in use with a nifty power ring on the top,

sleep until it is moved. This seems great, but our testers found that if you keep the product in your backpack or handbag and walk around, for example, at a conference, the device thinks you want to use it, so it is always on. After a day of walking around, we found that it lost about a quarter of its charge, and when we flew with it in our carry-on luggage (which may have been a federal offense, I won't tell if you won't), it also lost its charge during flight. The good news is that with 6,000 mAh, which is enough energy to recharge an Apple iPhone three times, the discharging did not become an issue, but it would have if we had not checked it in the hotel room before walking around on the showroom floor (Figure 5).

Our last device in this product category was the Innergie PocketCell, 2,850 mAh at 5 V; it was small but had enough energy for at least one full charge on an Apple iPad (10 W) and possibly two charges on an Apple iPhone (5 W). The two interesting features were an accessory lock-slot so that it could be attached to a key chain or handbag/backpack, and, oddly, the best feature is a depressed switch. No, the switch is not sad for being lower than the body case, but rather, being lower than the rest of the case helps with the bumping and jostling of the product in handbags/backpacks. We found that the user has to intentionally press the switch to turn on the device. We traveled for a few weeks and never found it turned on by mistake; it was on par with the Apotop device but much sleeker and lighter. All of the



FIGURE 4. The Anker (6,000 mAh at 3.7 V). (Photo courtesy of Anker.)



FIGURE 5. The built-in accelerometer of the Anker that enables it to start when it senses motion. (Photo courtesy of Anker.)

which indicates the level of charge. Some designer put a lot of thought into this design, kudos (Figure 4). That being said, they may have put too much thought into it. Figure 5 shows an incredible feature at first glance. There is no power button or switch to turn the device on or off, but there is a built-in accelerometer or motion-sensing chip inside, so if the device is sitting on the desk and is not being used, it goes to

products reviewed are great products; really what it comes down to is which feature fits your particular use: longer life, smaller gadget, fashionable, or whatnot. Table 1 presents some of the key factors that you may consider.

Interestingly enough, the IEEE Consumer Electronics Society's Future Directions Committee, led by Tom Coughlin and his dedicated team of

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industrial researchers, is developing a white paper on the future of mobile power. Dr. Coughlin is interested in hearing your feedback and ideas on what you consider to be the key aspects of mobile power. He can be reached at tom@tom-coughlin.com. I have had the honor of being able to participate in some of Dr. Coughlin's research meetings, which are quite exciting.

As always, the views expressed in this article are the views of the author and should not be misconstrued as any form of support from the IEEE on any given company's product. If you would like to recommend a product for review or if your company would like me to review one of its products, feel free to contact me at xillia@ieee.org or any of the magazine's editorial staff for a

product review. We are all a bunch of geeks, and we love it.

ABOUT THE AUTHOR

William Lumpkins (xillia@ieee.org) is the vice president of engineering for O & S Services (www.ons-services.com). He is a senior editor of *IEEE Consumer Electronics Magazine* and a Senior Member of the IEEE.

Driverless Cars and Driverless Vacuums: Will the Madness Never End?

By William Lumpkins

Google's announcement that it has released a new prototype of its driverless car elicited a puzzled reaction from robot vacuum manufacturer Neato Robotics.

"What's the big deal? We've had a self-driving robot without a steering wheel and brakes for many years," said Nancy Nunziati, Neato's vice president of marketing.

"Neato Robotics makes popular driverless home robot vacuums that automatically navigate through a household, work without human intervention and pick up dirt and pet hair, something the Google driverless car can't do," said Nunziati. "There are lots of similarities but Neato is available now, and you don't need seat belts or approval from the U.S. Department of Transportation to use it." For a comparison of the Google driverless car and the Neato Robotics driverless vacuum, see Figure 1.

At *IEEE Consumer Electronics Magazine*, we wondered about the differences of simultaneous localization and mapping (SLAM; <http://openslam.org/>)-based robotic vehicles, such as

SLAM is a type of algorithm that, when used in a mobile robotic entity, determines where it is in relation to its environment through a mapping algorithm.

Google's autonomous vehicle, versus the Neato robotic vacuum cleaner. We also wondered if we could debunk any of the hype, so we reached out to Google and Neato for a sample of each product. Oddly, only Neato Robotics was able to send us their Robotic Vacuum for testing. Google mentioned something about exorbitant shipping fees to send a driverless car from Mountain View, California, to Murphy, Texas, just for a magazine product review. Oh well, maybe next time. Of course the car could have just driven itself to our product review office, but I suppose Google had other priorities.

For those who are unfamiliar with SLAM, SLAM is a type of algorithm that, when used in a mobile robotic entity,

determines where it is in relation to its environment through a mapping algorithm.

Mapping is the problem of integrating the information gathered with the robot's sensors into a given representation. It can be described by the question, "what does the world look like?" Central aspects in mapping are the representation of the environment and the interpretation of sensor data. In contrast to this, localization is the problem of estimating the pose of the robot relative to a map. In other words, the robot has to answer the question, "where am I?" Typically, one distinguishes between pose tracking, where the initial pose of the vehicle is known, and global localization, in which no a priori knowledge about the starting position is given.

Simultaneous localization and mapping (SLAM) is, therefore, defined as the problem of building a map while, at the same time, localizing the robot within that map. In practice, these two problems cannot be solved independently of each other. Before a