complete systems for digital
jäger computing & service
D-63517 Rodenbach Weid weg 8 GERMA
E-Mail: info@jaeger-edv.de
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http://www.jaeger-edv.de

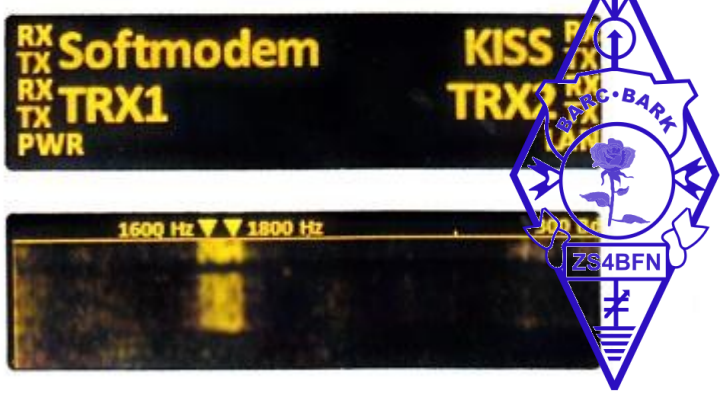
APRS Standalone Network I-Gate

Jä V & Dien stungen 49 (0)618 00 ttp://www.jae edv.de

Station DB0ASF Version 1.10

Overview | Comm | Modem | Station | IGate | Digipeater | Network | Dynamic DNS | Mail | WX | Messages | Display | Restart
Monitor | MHeard | Status | Changelog | About | Help

September 2015



Batteries for Portable Use

Eavesdropping on Apollo 11

Translated by DG7CM 18.01.2015

QUA

September 2015

Bloemfontein Amateur Radio Club
Bloemfontein Amateurradioklub

Bloemfontein Branch of the SARL - 1 July 1980 - 30 June 1996
Bloemfontein Amateur Radio Club - 1 July 1996 to

In terms of Rule 14.1.1 notice is hereby given of the Annual General Meeting of the Bloemfontein Amateur Radio Club to be held on Saturday 5 September 2015 at 16:00 at The Clubhouse at CBC School, Waverley Road, Bloemfontein. Following the AGM, a Bring & Braai will be held.

The business to be transacted at this AGM shall be:

1. To receive the report of the committee since the 2014 AGM
2. To receive the account of income and expenditure and the balance sheet.
3. To approve the subscriptions for the period 1 October 2015 to 30 September 2016.
4. To elect the members of the incoming committee.
5. To consider and transact such other business that may be or ought to be transacted at an AGM.

The following members of the Committee have indicated that they are not available for re-election - Frans Marais, ZS4FM, and Andre van Rensburg, ZS4APA.

In terme van Reël 14.1.1. word hiermee kennis gegee van die Algemene Jaarvergadering van die Bloemfontein Amateurradioklub op Saterdag 5 September 2015 om 16:00 by Die Klubhuis, CBC Skool, Waverleyweg, Bloemfontein. Na die AJV sal 'n Bring & Braai gehou word.

Die sake wat tydens die AJV hanteer sal word is:

1. Om die verslag van die komitee te ontvang vanaf die 2014 AJV.
2. Om die staat van inkomstes en uitgawes en die balanstaat te ontvang.
3. Om die ledegelde for die periode 1 Oktober 2015 tot 30 September 2016 goed te keur.
4. Om lede te verkies vir die inkomende komitee.
5. Om ander sake te oorweeg en hanteer wat by 'n AJV mag of moontlik hanteer word.

Die volgende lede van die Komitee het aangedui dat hulle nie beskikbaar is vir her-verkiesing nie - Frans Marais, ZS4FM en Andre van Rensburg, ZS4APA.

AGENDA

- Welcome / Verwelkoming
- Constitution of the meeting / Konstituering van die vergadering
- Presentation of Awards / Oorhandiging van Toekennings
- Minutes of the 2014 AGM / Notules van die 2014 AJV

(Continued on page 3)

Klub Bulletins
Maandag 19:30 op 145,600 MHz FM via die Naval Hill herhaler

Club Meetings
First Saturday of each month at 14:00 (winter) or 16:00 (summer) at the Club House at CBC School

Club meeting 16:00 on Saturday 1 August 2015
Klubvergadering 16:00 op Saterdag 1 Augustus 2015

More information in the Club bulletin on Monday evenings at 19:30 on 145,600 MHz FM

Meer inligting in die Klubbulletin op Maandae-aande om 19:30 op 145,600 MHz FM

www.zs4bfn.co.za

https://www.facebook.com/groups/zs4bfn/

Repeaters and Beacons
145,600 MHz FM Naval Hill
145,650 MHz FM Brandkop
145,700 MHz FM Springfontein
ZS4AFV Beacon
144,415 MHz CW
5 290 kHz WSPR

(Continued from page 2)

- Matters arising / Sake voortspruitend
- Reports / Verslae
- Chairman / Voorsitter
- Treasurer / Tesorier
- Motions / Mosies
  Membership fees / Ledegelde 2015/2016
- General / Algemeen

- Election of the new committee / Verkiesing van die nuwe komitee
- Closing / Sluiting

A Bring & Braai will follow the AGM / 'n Bring & Braai word gehou na afloop van die AJV

Batteries for Portable Use

Richard, G3CWI

A common question from people starting out with portable operating is what type of battery is best? As with many things, there is no single answer and what is best depends on many different factors. This article aims to explore some of the options with a view to allowing people to make an informed decision. However, a word of warning, battery technology is evolving so this article will become out of date but it is good for now - mid 2015.

The "best" battery will depend on how you are intending to use it. The most appropriate battery to carry for mountaintop portable may well be different to one that you might take for use in a remote cottage with no electricity. Equally, the best battery to power a 100-Watt radio during a contest will be different to that used to power a low-power radio on a trip to a local park.

Most amateur radio equipment needs a DC voltage of 12 - 14 Volts for optimum performance. Some transceivers designed specifically for portable use may accept a wider range of voltages (especially lower voltages). An example is the popular FT-817, which is specified from 8 - 16 Volts. In such cases, voltages can be kept low for optimum efficiency.

Battery capacity

Batteries are usually described as having a capacity of a certain number of milliampere-hours or amp-hours. These capacity rating are often measured under artificial conditions that may not reflect the capacity under normal usage. For example, a 7 Ah lead-acid gel cell will be unlikely to provide 7 Amps for an hour but it will probably provide 70 mA for 100 hours.

You can calculate the approximate capacity of battery that you will need by looking at the current drawn by your equipment when receiving or transmitting. For example, let us say you want to use a FT-857 running 100 Watts for 4 hours on a special event station. The specification indicates that it will draw 1 Amp on receive and 22 Amps on transmit. Let us assume that you will spend 25% of the time (1 hour) on transmit and the remaining 3 hours on receive.

For the receiving (RX) time you will need a capacity of 3 x 1 Ah = 3 Ah.

The capacity for transmitting (TX) is slightly more complicated. The specification refers to the peak current drawn. This might be a good estimate for FM but for modes such as SSB or CW it will be an over estimate. For our example, we can assume that SSB will be used and we will use a de-rating factor of 70% (note: this

(Continued to page 4)

(Lithium Polymer Batteries for Amateur Radio from page 3)
is just a guess). Our 22 Amps peak falls to 22 x (1 – 0,7) = 6,6 Amp average. 6,6 Amps for an hour is 6,6 x 1 = 6,6 Ah.

Now we can work out our nominal battery capacity by adding the RX and TX figures up: 3 + 6,6 = 9,6 Ah

Of course, we made a few assumptions (guesses!) along the way so a reasonable battery capacity might be 15 Ah to give us a bit of a margin.

Battery technologies - overview

Batteries are often classified as being made up of either primary cells (non-rechargeable) or secondary cells (rechargeable). While this article will look mainly at secondary cell batteries, primary cells still have their place, as I will discuss later.

Lead Acid [ref. 1]

Years ago, the main secondary cell technology was the wet lead acid battery. These had to be regularly maintained and topped up with distilled water. They have largely been replaced by sealed gel and absorbed glass-mat lead acid batteries. Up to around 15 years ago, these were the battery of choice for many types of portable operating. They are rugged and reliable if looked after properly. Most portable equipment, with its nominal “12 Volt” (or 13,8 Volt) rating was designed with this sort of battery in mind. A fully charged lead acid battery of six cells will have a terminal Voltage of about 12,8 Volts. Lead acid batteries can be left to trickle charge, which has made them a popular choice for many types of standby power. Beware though as batteries that have been on trickle charge for years can often appear on the amateur market as new or nearly new but may have greatly reduced capacity.

[1] Note on LiPo batteries: 4 cell LiPo batteries have a terminal voltage of nearly 15 Volts. This is too much for many radios. The terminal voltage can be reduced by putting two diodes in series with the battery. The diodes need to be suitable for the maximum current that will be drawn by the radio. As they will turn some of the energy in the battery into heat, they effectively reduce the available useful energy capacity of the battery. The diodes will get hot if used to drop the voltage when running high-duty cycle modes (such as FM) at 100 Watts. Once the terminal Voltage of the battery has reduced a little, the diodes can be removed.

Excessive charging of lead acid batteries can cause the build up of hydrogen gas with a risk of explosion.

Lithium Polymer [ref. 2]

Lithium Polymer (LiPo) batteries are a relatively new technology. They are probably the most common battery type in consumer electronics devices. More accurately called Lithium-Ion batteries they consist of a malleable metallic pouch containing a gel or liquid electrolyte. While generally safe and reliable, they can fail due to misuse. In such cases, they can catch fire. Proper handling of these batteries will mitigate most risk however. They have a fully charged terminal voltage of 3,7 Volts which can make them tricky to use with some equipment as 3 cells give a nominal terminal voltage of 11,1 Volts while four give a voltage 14,8 Volts; either a bit too high or a bit too low for many radios!

LiPo batteries can easily be damaged by over-discharging them. Under no circumstances should the voltage of any cell be allowed to drop below about 3,1 Volts. Low-voltage alarms are readily available from various sources[1].

Lithium Iron Phosphate [ref. 3]

Another new battery technology, LiFePo4 batteries are similar in many ways to LiPo batteries. They have some advantages over LiPo batteries though -

A slightly lower cell voltage of 3,2 Volts makes them ideal for use with 12 volt radio systems.

Their chemistry makes them less prone to fire hazards

They can withstand more charge/discharge cycles without loss of capacity.

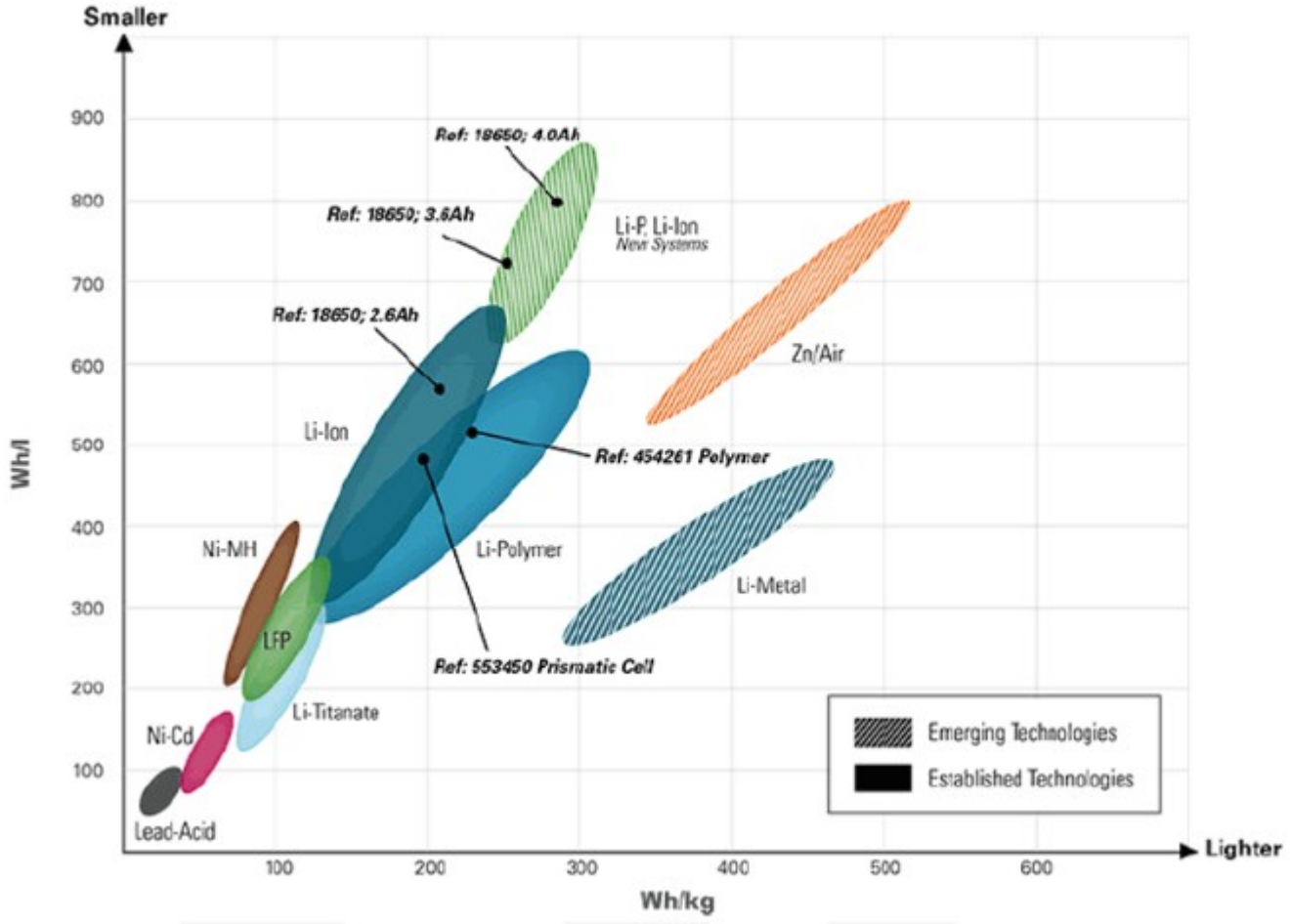
Nickel Cadmium [ref. 4]

NiCad batteries are still found in some amateur radio equipment but they are getting less common. A combination of poor capacity, relatively high internal resistance and limited recharge cycles makes them not worth considering in most cases. Their nominal cell voltage is 1,2 Volts.

Nickel Metal Hydride [ref. 5]

With a much higher energy density than

(Continued to page 5)



(Lithium Polymer Batteries for Amateur Radio from page 4)

NiCad cells and simple charging arrangements, NiMH batteries are common. They tend to be most useful in lower current applications (a few amps) and make a good replacement for primary AA and AAA sized cells. Their nominal cell voltage is 1,2 Volts.

How to decide?

Having looked briefly at the main contenders, the next question is surely how to decide which one to use. We will look at some characteristics of the main types to compare them.

The graph above compares a number of different battery chemistries. In essence, the further towards the upper right-hand side of the graph the chemistry type is the smaller and lighter will be a battery for a given capacity.

(Continued on page 6)

Comparison of the characteristics of the six most commonly used rechargeable battery systems in terms of energy density, cycle life, exercise requirements and cost. The figures are based on average ratings of commercially available batteries at the time of publication.

	NiCd	NiMH	Lead Acid	Li-ion	Li-ion polymer	Reusable Alkaline
Gravimetric Energy Density (wh/kg)	45 - 80	60 - 120	30 – 50	110 - 160	100 – 130	80 (initial)
Internal Resistance (includes peripheral circuits) in mΩ	100 to 200[1] 6 v pack	200 to 300[1] 6 v pack	<100[1] 12 v pack	150 to 250[1] 7,2 v pack	200 to 300[1] 7,2 v pack	200 to 2 000[1] 6 v pack
Cycle Life (to 80% of initial capacity)	1 500[2]	300 to 500[2,3]	200 to 300[2]	500 to 1 000[3]	300 to 500	50[3] (To 50%)
Fast Charge Time	1 h typical	2 to 4 h	8 to 16 h	2 to 4 h	2 to 4 h	2 to 3 h
Overcharge Tolerance	moderate	low	high	very low	low	moderate
Self-discharge/Month (room temperature)	20%[4]	30%[4]	5%	10%[5]	-10%[5]	0,3%
Cell Voltage (nominal)	1,25 v[6]	1,25 v[6]	2 v	3,6 v	3,6 v	1,5 v

	NiCd	NiMH	Lead Acid	Li-ion	Li-ion poly-mer	Reusable Alkaline
Load Current						
- peak	20 C	5 C	5 C[7]	>2 C	>2 C	0,5 C
- best result	1 C	0,5 C or lower	0,2 C	1 C or low-er	1 C or low-er	0,2 C or lower
Operating Temperature (discharge only)[8]	-40 to 60 °C	-20 to 60 ° C	-20 to 60 °C	-20 to 60 °C	0 to 60 °C	0 to 65 °C
Maintenance Requirement	30 to 60 days	60 to 90 days	3 to 6 months[9]	Not re-quired	Not re-quired	Not required
Typical Battery Cost[10] (US$, reference only)	$50 (7,2 v) R661	$60 (7,2 v) R794	$25 (6 v) R330	$100 (7,2 v) R1 324	$100 (7,2 v) R1 324	$5 (9 v) R66
Cost per Cycle (US$)[11]	$0,04 R0,53	$0,12 R1,59	$0,10 R1,32	$0,14 R1,85	$0,29 R3,84	$0,10 to 0,50 R1,32 to 6,62
Commercial use since	1950	1990	1970	1991	1999	1992

Figure 1: Characteristics of commonly used rechargeable batteries

[1] Internal resistance of a battery pack varies with cell rating, type of protection circuit and number of cells. Protection circuit of Li-ion and Li-polymer adds about 100 mΩ.
[2] Cycle life is based on battery receiving regular maintenance. Failing to apply periodic full discharge cycles may reduce the cycle life by a factor of three.
[3] Cycle life is based on the depth of discharge. Shallow discharges provide more cycles than deep discharges.
[4] The discharge is highest immediately after charge, then tapers off. The NiCd capacity decreases 10% in the first 24 h then declines to about 10% every 30 days thereafter. Self-discharge increases with higher temperature.
[5] Internal protection circuits typically consume 3% of the stored energy per month.
[6] 1,25 V is the open cell voltage. 1,2 V is the commonly used value. There is no difference between the cells; it is simply a method of rating.
[7] Capable of high current pulses.
[8] Applies to discharge only; charge temperature range is more confined.
[9] Maintenance may be in the form of 'equalizing' or 'topping' charge.
[10] Cost of battery for commercially available portable devices.
[11] Derived from the battery price divided by cycle life. Does not include the cost of electricity and chargers.
Source: ref. 7.

(20 m Ground Plane from page 5)

The graph makes it clear why Apple does not supply iPads with lead-acid batteries!

Some real figures (see the table on page 6 and above) help to make the comparison clear. The gravimetric energy density (highlighted) shows the relative merits of the different cell chemistries. Note that LiFePo4 is not listed but is similar to LiPo.

The table shows that while lead acid batteries are cheap, their low energy density makes them a poor choice for applications where the weight and size of a battery will be important. The lithium chemistries stand out for their high energy densities - but at a cost.

The table below and on page 7 offer a simplified comparison of the various battery chem-

(Continued on page 7)

Characteristics comparison table	Lead acid	LiPo	LiFePo	NiCad	NiMH
Energy density	*	****	****	**	***
Cost (lowest)	****	***	**	***	**
Recharge cycles	**	***	****	****	****
Nearest to 12,8 volts	****	*	****	***	****
Perceived safety	****	**	***	****	****

Application suitability table	Lead acid	LiPo	LiFePo	NiCad	NiMH
SOTA/backpacking	**	****	****	**	***
Operating from RV/motorhome	****	***	****	**	*
Special event station - off grid	****	***	***	*	*

(5 MHz Beacon from page 6)

istries.

Charging batteries

With lead-acid batteries, charging is very simple. A car-battery charger will do the job nicely. Lithium batteries are much more critical and do require the use of a proper charger. Do not be tempted to substitute chargers. If the battery that you are charging has much more capacity than, say a laptop battery it is a good idea to keep an eye on it while it charges. LiPo batteries will start to deform (blow up like a balloon) if they are over charged. This is non-reversible and a deformed battery is hazardous and must be treated accordingly.

Special flameproof safety pouches are available for storing lithium batteries while they are being charged. The use of a balanced charger will reduce the possibility of one cell within a battery pack being overcharged. Some sources recommend charging higher capacity batteries outside although this may not be necessary (or practical) for many people.

Carrying batteries on aircraft [ref. 8]

Different airlines have different policies, and of course, policies can change. In respect of batteries airlines classify them according to their power capacity - not their milliampere hour rating. To calculate the power capacity of your battery, multiply the current by the nominal terminal Voltage. For example, let us calculate the power capacity of a 7000 mAh 4 cell (45) lipo battery.

7000 mA = 7 Amps. The nominal terminal voltage of a 4 cell LiPo is 14,8 Volts

Power capacity is P= V x I

14,8 x 7 = 104 Wh.

It is prudent to check what conditions your airline requires for the carriage of batteries. In any event making sure that the connections of the battery cannot short out under any circumstances is a necessary precaution. It can be helpful to print out your airline's requirements to take with you to the airport. Bear in mind that if the airport security staff really do not want you to take a battery through into the airport, it is often in your best interests to acquiesce (annoying though that may be). Do not be too worried though as radio amateur's travel with batteries of various sorts every day of the year and very few encounter any problems.

Storing batteries [ref. 9]

Portable batteries get used from time-to-time but mostly they spend their lives in storage. Different manufacturers offer advice on getting the best life out of their stored batteries. As a rule, never store batteries without some charge in them. Always store batteries in a cool place (below 15 degrees C is good). Do not store batteries where they may be frozen.

LiPo batteries are best stored with a partial charge of between 40 and 50 % or 3,82 Volts per cell. Check the battery terminal voltage periodically to ensure that the battery is retaining some charge - all batteries will self-discharge over time.

While there is little clear information, it appears LiFePo4 batteries are also best stored with a partial charge of between 40 and 50 % or 3,25 Volts per cell. Check the battery terminal voltage periodically to ensure that the battery is retaining some charge - all batteries will self-discharge over time.

12 Volt Lead-acid batteries should be stored charged and recharged if the terminal voltage falls below 12,42 Volts.

Marking Batteries

It is a good idea to mark rechargeable batteries with their date of purchase and a unique identifier. This makes it easy to differentiate between them and is especially useful if a battery of cells starts to lose capacity.

Primary cells - non-rechargeable batteries

Non-rechargeable alkaline batteries remain a useful option for low power portable operating. AA size cells have a reasonable energy density and are available in most parts of the world. They have a great advantage in being supplied fully charged and ready-to-roll. Therefore, if you are travelling overseas, a battery case for your radio suitable for taking AA cells is a useful fall back. You do not need to take

(Continued to page 8)

(20 m Ground Plane from page 7)
the batteries as you can buy them at your destination.

Battery connections [ref. 10]

Batteries come with a variety of connectors (or none). Many radio amateurs have standardised their systems to use Andersen Powerpole connectors. There is a standard way of using these connectors, which will allow your batteries and equipment to work with other people's set-ups. If you want to change the connectors on a high capacity battery, it must be done carefully - one lead at a time. Do not simply try to cut the existing connector off as in doing so you will short out the battery. It is sometimes safer to make up a special adapter lead with Powerpoles on one end and a suitable connector for the battery on the other end.

Never be tempted to connect a radio to a battery using reversible connections such as 4 mm banana plugs of crocodile clips. Many radios have been damaged because of these methods.

Batteries can safely be connected in parallel to increase the current capability of a system. If doing this the batteries should be of the same chemistry, the same capacity and same voltage. Using Powerpole connectors with a simple distribution board makes this easy.

Disposing of batteries

If a battery has a reduced capacity or is damaged you will need to dispose of it. Batteries of any type must not be simple thrown away with general rubbish. Ideally, they should be discharged, wrapped individually and returned to a recycling facility. Some internet sources suggest immersing spent lithium batteries in a bucket of salt water although this is not suggested by any of the more authoritative sources.

References

1. https://en.wikipedia.or2/wiki/Lead%E2%80%93acid_battery
2. https://en.wikibedia.or2/wiki/Lithium_polymer_battery
3. https://en.wikinedia.or2/wiki/Lithium_iron_phosphate_battery
4. https://en.wikipedia.org/wiki/Nickel%E2%80%93cadmium_battery
5. https://en.wikipedia.org/wiki/Nicke|%E2%80%93metal_hydride_battery
6. http://www.iccnexergy.com/batterxgystems/battery-energy-density-comparison
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Birthdays, Anniversaries and other events

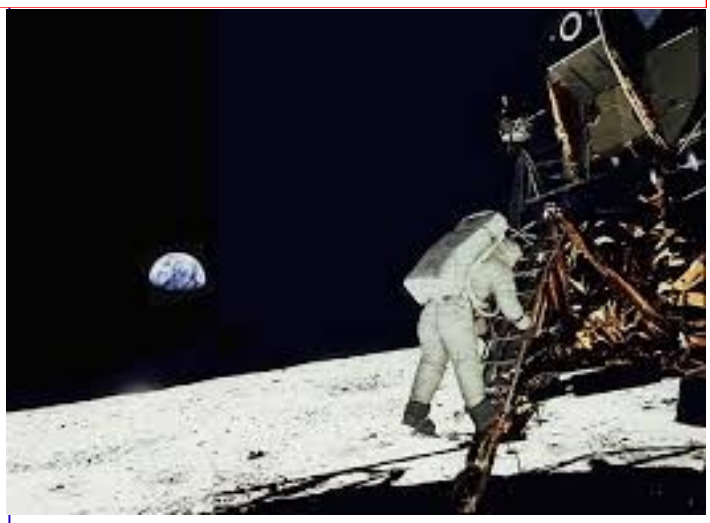
2 – Quintus, ZS4Q; Secretary's Day
3 - Closing date October RAE
4 – Shane, ZS4TW, and Alta - wedding anniversary; Casual Day; 1 SA Tank Regiment Night Shoot
5 – **Bloemfontein ARC AGM**; SA Armour Museum Open Day; Kattebakbasaar by Inniskuur
6 – Andre, ZS4APA, and Anne-Marie - wedding anniversary; Closing date for HF CW Logs; Cellar Rats Wine Festival, The Old Mill, Magaliesburg
5 and 6 - IARU Region 1 SSB Field Day
12 and 13 – SARL National Field Day
14 and 15 - Rosh Hashanah
14 - Mark, ZS4D
15 - Martin, ZS4MS
16 – World Ozone Day
19 - Amateur Radio in Action, Innovation Hub, Pretoria
19 and 20 – SARL VHF/UHF Contest
20 – Closing date for National Field Day logs
23 - Yom Kippur; Spring Equinox
24 – Lizelle, daughter of Johan, ZS4PP; National Braai Day (National Heritage Day)
25 – School holiday
26 - Namaqua West Coast Heritage Weekend, Doringbaai; Crafters Market at Bobbies Park
26 and 27 - CQ WW RTTY Contest
27 – Closing date for VHF/UHF logs

Eavesdropping on Apollo 11

Chris Graney, christopher.graney@kctcs.edu

The nearly forgotten story of how a radio amateur successfully detected transmissions from the first men to land on the Moon.

In July of 1969, an amateur radio operator and amateur radio astronomer by the name of Larry Baysinger, W4EJA, accomplished an amazing feat. He independently detected radio transmissions from the Apollo 11 astronauts on the lunar surface. Fortunately, Glenn Rutherford, a young reporter for the Louisville (Kentucky) Courier-Journal, recorded his accomplishments. "Lunar Eavesdropping: Louisvillians hear moon walk talk on homemade equipment," sporting Rutherford's by-line, appeared in the Wednesday 23 July 1969 issue of that paper.



Rutherford opened the *Courier* story with, "Thanks to some homemade electronic equipment, including a rebuilt 20 year old radio receiver from an Army tank (see Figure 2) and an antenna made of spare pieces of aluminium, nylon cord and chicken wire (see Figure 3 and 4), a small band of Louisvillians was able to 'eavesdrop' Sunday (July 20) night on the American astronauts' conversation directly from the moon."

The story discussed how Baysinger recorded 35 minutes of conversation from VHF signals transmitted between astronauts Armstrong, Aldrin and Collins (he did not attempt to pick up the encoded S-band signals from the main Moon-Earth communication link).[1] These 35 minutes included the time during which President Richard Nixon transmitted a message of congratulations to the astronauts.

Rutherford's story briefly mentioned how Baysinger had been previously successful in constructing a device to detect radio signals from Jupiter and in tracking and reproducing pictures transmitted from Earth-orbiting satellites. It briefly described the antenna used for the lunar eavesdropping project - a fully steerable 8 × 12 foot "corner horn" - and it briefly discussed the amazing sensitivity of the receiver, which Baysinger specially modified for the lunar eavesdropping project. Rutherford finished the story with "Needless to say, the receiver worked to perfection Sunday night."

Baysinger's accomplishment earned him some brief recognition - a meeting with the Collins Radio Company, which supplied the communications systems for the Apollo spacecraft. Collins was impressed with Baysinger's work. Then the story faded into the mists of time. "Lunar Eavesdropping" quietly sat in the rolls of microfilmed *Courier-Journal* editions in the reference sections of (mostly Kentucky) libraries, awaiting rediscovery.

Providence brought "Lunar Eavesdropping" back to light this summer. Rutherford, now an assistant editor of the central Kentucky newspaper *The Record*, was interviewing me concerning the productive history-of-astronomy research program operated out of the Jefferson Community & Technical College observatory. Our discussion drifted into the subject of science being done in unexpected places by a small homegrown operation (such as a Kentucky community college observatory).

This prompted Rutherford to mention Baysinger's work and the attention he got from the Collins Company as another example of interesting, home-grown, small-operation science in Louisville. I was immediately intrigued, especially when Rutherford said he did a story on it that appeared in the *Courier-Journal*.[2] He could not recall the exact date, so a few days later I was rummaging through the microfilm collection at the University of Louisville library. I found Rutherford's story within an hour (with the help of my wife Tina and son Joe).

When I got back to Rutherford about how I was interested in the story and had found it in the July 23, 1969 *Courier-Journal*, he men-

(Continued on page 10)

(National Field Day from page 9)
tioned that Baysinger actually still lived in Louisville - retired from a radio career but still active in amateur radio. In short order, I was talking to Baysinger via phone and e-mail, learning more about the lunar eavesdropping project.

Lost in the Archives

Today a person can sneeze and let the whole world know about it through Twitter or Facebook, so it is hard to believe that the lunar eavesdropping project could have almost completely disappeared into the microfilm drawers - but so it had. Extensive searches through Google, as well as through the EBSCO and JSTOR databases, turned up no references to it at all.[3]

So how did Larry Baysinger come to be eavesdropping on Apollo 11 the night of 20 July 1969? Baysinger told me that he got interested in radio in the early 1950s, when building a radio from scratch or modifying a military surplus device was common practice. Surplus WWII equipment was both available and inexpensive at that time and Baysinger has fond memories of high school road trips to Lexington (Kentucky) and Indianapolis (Indiana) where a radio enthusiast could find particularly good hunting for military surplus.

Staff Photo by Jay Thomas

LARRY BAYSINGER looks over the antenna he designed to receive voice communications from the Apollo astronauts during their walk on the lunar surface of the moon Sunday night.

His interest and talents in radio eventually led him to career with WHAS 840 AM radio in Louisville. (The Bingham family of Louisville owned both WHAS and the Courier-Journal and it was through this connection that Rutherford met Baysinger and became aware of his work.) By the late 1960s, Baysinger was working professionally for WHAS and experimenting on the side with radio astronomy and satellite tracking.

The lunar eavesdropping project arose because he had an interest in independently verifying the information that NASA had been providing about the Apollo program. Could he get unedited, unfiltered information about the Apollo 11 landing by eavesdropping on the radio signals transmitted from the lunar surface? Maybe he could find out things that NASA did not want the public to know about. In addition, successfully detecting a transmission from the lunar surface would be a great technical accomplishment. Various “experts” had told him that it could not be done.

Aiming for the Moon

Baysinger says that on the night of the Apollo 11 landing, he and Rutherford had to essentially aim the antenna at the Moon by getting behind it and sighting it like a gun. This was difficult since the weather was cloudy and the Moon not easily visible. The antenna, which was originally built for Baysinger’s radio astronomy work, had a motorised steering mechanism but it had to be manually guided.

Its “beam” or “field of view” was such that, once pointed at the Moon, it could be let go for a little while, but pretty soon it would have to be re-aimed because the motions of the Earth and Moon caused the Moon to drift out of the antenna’s field and the signal to be lost. In fact, this was one piece of evidence that the Apollo 11 signals the receiver picked up were indeed from the Moon - if the antenna was not kept aimed at the Moon, the signal disappeared. Baysinger’s wife and daughter watched the

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Apollo 11 landing on TV while Baysinger and Rutherford listened via Baysinger's equipment. The signal on the home-built equipment came through approximately 5-10 seconds earlier than the signal on TV. It was noisy, but you could hear what was going on.

I asked Baysinger whether he found anything that NASA edited out - comments about things going wrong, the astronauts being loose with their language or exclamations about meeting space aliens. He said no - absolutely everything was transmitted to the public on TV. In fact, he said, "That was kind of disappointing." Part of the idea of the project was to hear the unedited "real story," and it turned out there was nothing edited. Indeed, Rutherford's story makes no mention of hearing anything unusual.

Perhaps because there was nothing to hear that could not be heard on CBS, Baysinger did not attempt to eavesdrop on any other Apollo missions. After Apollo 11, he moved on to other projects. Rutherford moved on to other stories. "Lunar Eavesdropping" was moved on to microfilm.

An unanswered question in this story is whether there were other lunar eavesdropping projects conducted by Amateur Radio operators. This is something that *QST* readers with long memories can help with. My searching through Google and various databases, asking among those knowledgeable in the history of astronomy and querying various print and Web Amateur Radio publications has turned up only one other case of independent detection of Apollo transmission from the Moon. Sven Grahn and Richard Flagg picked up transmissions from the Apollo 17 command module in orbit around the Moon using a 30 foot radio telescope dish, but they heard only two recognizable voice transmissions, each consisting of only a few words.[4]

It is possible that there had been other projects like Larry Baysinger's and perhaps these

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Lunar Eavesdropping

Louisvillians Hear Moon Walk Talk on Homemade Equipment

By GLENN RUTHERFORD
Courier-Journal Staff Writer

Thanks to some homemade electronic equipment, including a rebuilt 20-year-old radio receiver from an Army tank and an antenna made of spare pieces of aluminum, nylon cord and chicken wire, a small band of Louisvillians was able to "eavesdrop" Sunday night on the American astronauts' conversation directly from the moon.

The odds and ends of equipment recorded only 35 minutes of conversation between astronauts Neil Armstrong and Edwin Aldrin on the lunar surface and their orbiting companion Michael Collins. But the signals were received directly from the moon, over a quarter of a million miles away, not through the Houston Space Center.

The success of the jerry-built equipment provided a just reward for Larry Baysinger, an electronics technician for WHAS, Inc., and the "brain" behind the activities of the Louisville UFO Investigations Committee.

Crowded into the control room, actually a converted bedroom in the Baysinger home at 7115 Deanna Drive, were Larry, his wife, Mary, his daughter, Sandy, and this reporter. The room was full of flashing, blinking lights, dials and indicators—just like in science fiction movies.

And out in the back yard, the hand-built chicken-wire antenna was monitoring the 30-watt, VHF signals from the lunar surface and the orbiting spacecraft.

The majority of the communications between the astronauts and the control center in Houston was carried over an S-band radio frequency. The S-band signal is carried on an extremely high frequency which is beamed between spacecraft and earth in "pulse modulated codes." Computers aboard the spacecraft and in the Houston control room simultaneously decipher the codes and change the signal into understandable human voices.

The small group in the bedroom control center could not receive the S-band signals. And even if it could have, it had no way to de-code the message.

But the equipment Baysinger hand-built from scraps over the past year and a half, averaging only four to five hours [illegible] a night in the process, [illegible] and monitor the voice communications between the astronauts and Houston as they talked to Collins circling above them.

This also was heard by television viewers, of course, but it was relayed by equipment of the National Aeronautics and Space Administration at Houston.

When the receiver at the homemade tracking station at the Baysinger home crackled with the astronauts' voices, back-pounding, hand-shaking, head-rubbing jubilation erupted.

Baysinger had difficulty in convincing committee members the tracking station would work. But now the system which he designed himself was working perfectly, and he was savoring every minute of it.

During the jumping, whooping and hollering, no one checked the tape recorder. And sure enough, just as Edwin Aldrin was describing how his vision was impaired when he walked out of the sun into the shadows, the recorder ran out of tape.

A new reel was installed in about 15 seconds and about 35 minutes of the astronauts' conversations were recorded —including the entire text of President Nixon's message of congratulations.

Baysinger began toying with the idea of tracking and monitoring manned space missions over a year ago. But despite the fact that he had constructed and successfully operated a device for recording radio waves from the planet Jupiter, and another device for tracking and reproducing pictures transmitted by orbiting satellites, no one in the committee was very confident of receiving signals from the Apollo spacemen.

After all, the government built a multi-billion-dollar tracking network that stretches across the face of the globe and still has occasional problems maintaining communications with men in space.

But Baysinger persisted. To receive such a weak signal, Larry said we would need to build a highly receptive antenna and a powerful one. The "monster," as committee members call it, is a completely steerable, 8- by 12-foot corner horn.

The antenna rotates both vertically and horizontally to track spaceships, satellites, or whatever we want it to track.

The potency of the rebuilt receiver used to hear the astronauts was demonstrated during a test one day prior to launch, when Baysinger inserted a three-inch wire for use as an antenna, rather than connecting it to the "monster." The receiver was supposed to pick up a signal from a generator in another room. Instead, it picked up Air Force refueling operations over the Pacific Ocean — near Hawaii!

Needless to say, the receiver worked to perfection Sunday night.

BAYSINGER CHECKS RADIO RECEIVER IN "CONTROL ROOM"

(National Field Day from page 11)

projects were told in articles like Glenn Rutherford's. Those projects and their stories might be sitting in a drawer somewhere, waiting for a *QST* reader to bring them to light.

Lunar Eavesdropping Link

More information on Larry's lunar eavesdropping, including some audio clips, can be found on Christopher Graney's Otter Creek-South Harrison Observatory Web page, Lunar Eavesdropping in Louisville, Kentucky http://legacy.jefferson.kctcs.edu/observatory/apollo11/.

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[1] The S-band covers 2 - 4 GHz, which encompasses the 2,3 - 2,31 GHz, 2,39 - 2,45 GHz and 3,3 - 3,5 GHz amateur bands, — *Ed*,

[2] I was intrigued due to my interest in astronomy's history (this being an interesting story of radio astronomy). I was also intrigued because both in my classes and in our observatory public outreach programs I encounter people who ask whether I think we really went to the Moon. I thought it would be wonderful in those instances to have "on tap" a story of a local person independently verifying the presence of astronauts on the Moon.

[3] These searches were done in August 2009. Since then I have discussed "Lunar Eavesdropping" with many people, including those on a history of astronomy e-mail list, so more references to it may now exist. The *Courier-Journal* has an electronic database of articles, but it does not go back to 1969.

[4] *QST* readers interested in this story may want to look at Grahn's Tracking Apollo 17 from Florida http://www.svengrahn.pp.se/trackind/Apollo17/APOLLO17.htm or Flagg's University of Florida Student Satellite Tracking Station Web pages http://www.svengrahn.pp.se/trackind/UoFSTS/UoFSTSx.htm

You can visit http://legacy.jefferson.kctcs.edu/observatory/apollo11/ to read more.

This article comes from ARRL News via Southgate ARC News.

Afrika Wysheid

Vele hande maak ligte werk
(Abema hamoi basindika eitara)
Haya: Tanzanië

Werk jy gewoonlik alleen? Baie mense glo dat net hulle self 'n bepaalde taak kan verrig, Daarop vra hulle nooit ander om te help nie. Ongelukkig beperk dit dikwels juis sulke mense se prestasies. Een mens kan nie alles doen nie, ons het mekaar nodig. In Nehemia 3 word vertel van die herbou van die muur van die ou Jerusalem. Dis net naam op naam van mense wat saamgewerk het aan die projek wat te groot was vir een persoon om af te handel.

Gaan jy hierdie week alleen werk, of gaan jy hulp vra?