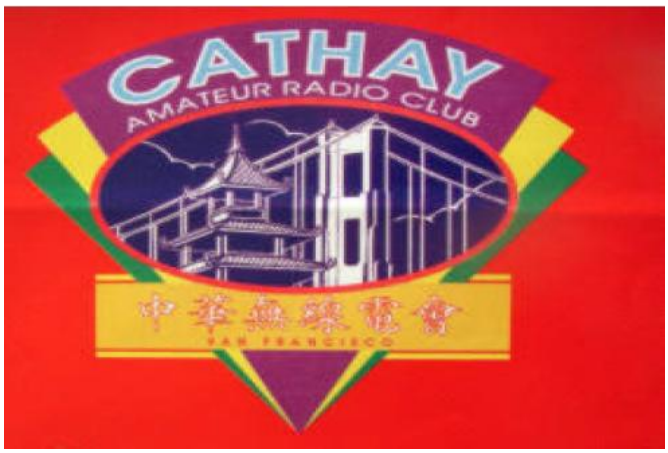

Cathay April 2026

www.cathayradio.org

President North: Leonard Tom, *NX6E* **email:**nx6e@sonic.net
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Secretary/Membership: Rodney Yee, *KJ6DZI* - **email:**rodyee2000@yahoo.com
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Treasurer: Rodney Yee, *KJ6DZI* - **email:**rodyee2000@yahoo.com
Web Master: Edison Fong – *WB6IQN* - **email:**edison_fong@hotmail.com
Mission: The Cathay Amateur Radio Club is basically an active social club of Ham Radio Operators and their spouses. We support local community requests for HAM emergency communications. Several of us are trained in CPR/ First Aid and are involved with community disaster preparedness.

Monday Night Net Time: 9 PM Local Time/PST, As of 8/21/2023 we are switching over from using Repeater: WB6TCS to **Nick Cassarino's Repeater: WA6GEL UHF 444.800 Mhz, Offset +5 Mhz, CTCCS/Tone PL 179.9 Hz on Monument Peak, Milpitas. If you are in the North Bay, one can use the WA6GEL repeater North Bay located on Mt. San Bruno - 444.8 MHz offset +5 Mhz, CTCCS/Tone PL173.3 Hz**

The CARC Monday night net is the best way to find out the latest club news. All check-in are welcome.

Message on Behalf of the President: Leonard Tom, *NX6E*

Hello CARC Members and Friends;

Many thanks to both Nick Cassarino for the use of repeater – WA6GEL for our CARC Monday Night Net.

Additional folks are needed to help out with conducting the CARC radio net on Monday nights. Please contact Ed Fong (edison_fong@hotmail.com) if you are interested.

Don't forget to mark your calendars on the upcoming ARRL Field Day June 27-28, 2026

I wish to thank our CARC members that set aside their valuable time to participate in our Monday night's nets.

Introduction - CARC Luncheon and Meeting Summary Write Up

We had a lovely CARC sponsored FREE Lunchon this past Saturday March 21, 2026 at 12:00 – 3:00 pm at Harry's Hofbrau in Redwood City.

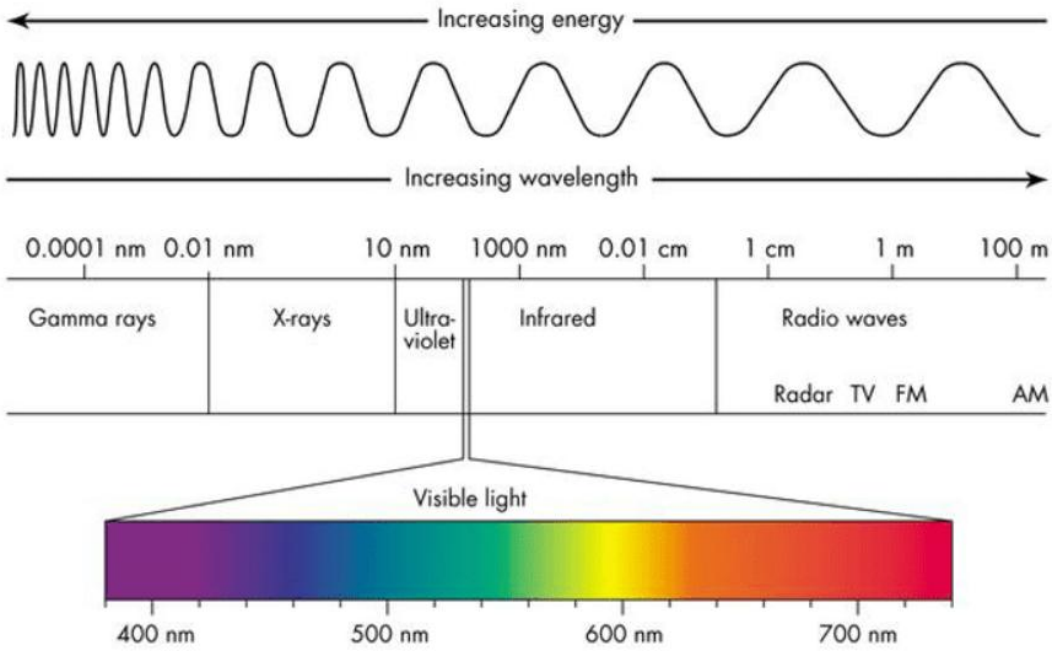
Additional write up at bottom of this newsletter.

Introduction – Tech Article

Gamma rays are high-energy, massless electromagnetic radiation (photons) emitted from atomic nuclei, featuring extremely short wavelengths and high frequencies. Key properties include an inability to be deflected by magnetic fields, extremely high penetration power requiring dense materials like lead for shielding, high ionisation potential (though lower than alpha/beta), and the capability to cause significant biological damage

Earth's atmosphere serves as a vital shield against high-energy cosmic gamma radiation, absorbing it ~10 miles above the surface. While blocking space radiation, the atmosphere also produces its own gamma rays, acts as a detector for cosmic-ray interactions, and is affected by terrestrial gamma-ray flashes (TGFs) from lightning.

Terrestrial gamma-ray radiation refers to high-energy electromagnetic radiation (gamma rays) that originates from natural sources on Earth's surface or within its atmosphere. Unlike cosmic gamma rays that arrive from space, these sources are inherent to the planet itself.



For further information, please read at the bottom of this newsletter.
CARC Final News Wrap Up

Chat sub s'em to all you CARC members! - Leonard Tom, *NX6E*

Public Service Announcements

HAM CRAM / HAM Licensing

For upcoming HAM Licensing locations please refer to:
http://www.arrl.org/find-an-amateur-radio-license-exam-session

Auxiliary Communications Service (ACS)

The Auxiliary Communications Service (ACS) is a unit of trained professionals who supply communications support to the agencies of the City and County of San Francisco, particularly during major events/incidents. ACS goals are the support of gathering and distribution of information necessary to respond to and recover from a disaster.

The ACS Net begins at 1930 hours (7:30 p.m. PT) local time each Thursday evening, on the WA6GG repeater at 442.050 MHz, positive offset, tone 127.3 Hz. The purpose of this net is to practice Net Control skills,practice checking in with deployment status in a formal net, and to share information regarding upcoming ACS events. Guests are welcome to check in. ACS members perform Net Control duty on a regular basis. On the second Thursday of each month, the net is conducted in simplex mode on the output frequency of the WA6GG repeater, 442.050 MHz no offset, tone 127.3 Hz.

ACS holds its General Meetings on the third Tuesday of each month
from 1900 hours to 2100 hours local time. Currently meetings are exclusively conducted over Zoom during the COVID-19 pandemic, ACS looks forward to meeting in person again as soon as possible.

Upcoming meeting dates in 2026 are:

- May 20, 2026
- June 17, 2026
- July 15, 2026

Location of in person future ACS meetings are yet to be determined as the regular location is under reconstruction. All interested persons are welcome to attend. For further information contact Corey Siegel KJ6LDJ <kj6ldj@gmail.com>.

For more information, please attend an ACS meeting, check in on the ACS radio net, or call 415-558-2717.

Free Disaster Preparedness Classes In San Francisco – NERT Taught by San Francisco Fire Department (SFFD).

https://sf-fire.org/nert/nert-calendar-meetings-trainings-events

Training Classes: see above website. TBD

+ Recertifications
TBD

***SFFD DOT** is the Fire Department Division of Training. All participants walking, biking or driving **enter through the driveway gate on 19th St.** between Folsom and Shotwell. Parking is allowed along the back toward the cinderblock wall.

Visit ***www.sfgov.org/sffdnert*** to learn more about the training, other locations, and register on line. Upcoming Special NERT Events.

San Francisco Police Department: Auxiliary Law Enforcement Response Team (ALERT)

The Auxiliary Law Enforcement Response Team (ALERT) is a citizen disaster preparedness program designed. The ALERT program is for volunteers 16 years of age or older, who live, work, or attend high school in San Francisco.

Graduates of the San Francisco Police Activities League (P.A.L) Law Enforcement Cadet Academy are also eligible to join.

ALERT volunteers will no longer need to complete the Fire Department's Neighborhood Emergency Response Team (NERT) (www.sfgov.org/sfnert) training and then graduate into two 8 hour Police Department course specifically designed for ALERT team members.

ALERT members will work closely with full-time and/or Reserve Police Officers in the event they are deployed after a disaster. The Basic ALERT volunteer will have no law enforcement powers other than those available to all citizens.

SFPD ALERT Training (New Members)

The next SFPD ALERT training class has been scheduled for: TBD

*Class date indicated are only for new members

IMPORTANT- All participants must complete the background interview process in order to be eligible to attend the ALERT training class.

Eligible ALERT participants may register fora training class by contacting the ALERT Program Coordinator, marina.chacon@sfgov.org, or by telephone at 415-401-4615.

SFPD ALERT Practice/Training Drill

All active/trained ALERT members are asked to join us for our next training drill, via scheduled for on TBD

For more information on the San Francisco Police Department ALERT Program, email us at sfpdalert@sfgov.org, or call Lt. Marina Chacon (SFPD Ret.), SFPD ALERT Program Coordinator, at (415) 401-4615.

For additional information on the web please refer to:
https://sfgov.org/policecommission/alert

Tech Section:

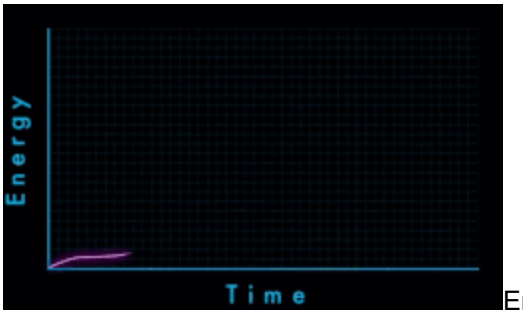
WIKIPEDIA
25 years of the free encyclopedia

Terrestrial gamma-ray flash

URL: https://en.wikipedia.org/wiki/Terrestrial_gamma-ray_flash

A **terrestrial gamma-ray flash** (**TGF**), also known as **dark lightning**, is a burst of gamma rays produced in Earth's atmosphere. TGFs have been recorded to last 0.2 to 3.5 milliseconds, and have energies of up to 20 million electronvolts. It is speculated that TGFs are caused by intense electric fields produced above or inside thunderstorms. Scientists have also detected energetic positrons and electrons produced by terrestrial gamma-ray flashes.[1][2]

Discovery



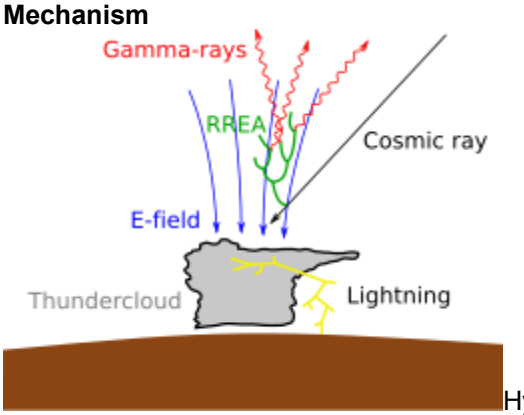
Energy plot of a typical TGF event, with artist's conception of a gamma-ray flash superimposed.[2]

Terrestrial gamma-ray flashes were first discovered in 1994 by BATSE, or Burst and Transient Source Experiment, on the Compton Gamma Ray Observatory, a NASA spacecraft.[3] A subsequent study from Stanford University in 1996 linked a TGF to an individual lightning strike occurring within a few milliseconds of the TGF. BATSE detected only a small number of TGF events in nine years (76), due to it having been constructed to study gamma ray bursts from outer space, which last much longer.

In the early 2000s, the Ramaty High Energy Solar Spectroscopic Imager (RHESSI) satellite observed TGFs with much higher energies than those recorded by BATSE.[4] The RHESSI data led scientists to estimate that approximately 50 TGFs occur each day,[5] more than previously thought but still only representing a very small fraction of the total lightning on Earth (3–4 million lightning events per day on average).

A few years later, scientists using NASA's Fermi Gamma-ray Space Telescope, which was designed to monitor gamma rays, estimated that about 500 TGFs occur daily worldwide, but most go undetected.[6]

Mechanism



Hypothetical TGF production above a thundercloud driven by decaying fields after a large lightning discharge.

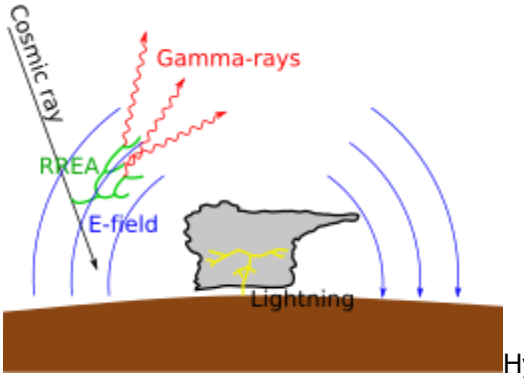
Though the details of the mechanism are uncertain, there is a consensus forming about the physical requirements. It is presumed that TGF photons are emitted by electrons traveling at speeds very close to the speed of light that collide with the nuclei of atoms in the air and release their energy in the form of gamma rays (bremsstrahlung[7]).

Large populations of energetic electrons can form by avalanche growth driven by electric fields, a phenomenon called relativistic runaway electron avalanche (RREA).[8][9] The electric field is likely provided by lightning, as most TGFs have been shown to occur within a few milliseconds of a lightning event (Inan et al. 1996).[10][11][12]

Beyond this basic picture the details are uncertain. Recent research has shown that electron-electron (Bremsstrahlung) [13] leads first to an enrichment of high-energy electrons and subsequently enlarges the number of high-energy photons.

Some of standard theoretical frameworks have been borrowed from other lightning-associated discharges like sprites, blue jets, and elves, which were discovered in the years immediately preceding the first TGF observations. For instance, that field may be due to the separation of charges in a thundercloud ("DC" field) often associated with sprites, or due to the electromagnetic pulse (EMP) produced by a lightning discharge, often associated with elves.

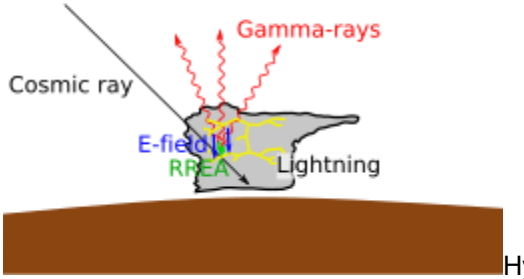
There is also some evidence that certain TGFs occur in the absence of lightning strikes, though in the vicinity of general lightning activity, which has evoked comparisons to blue jets.



Hypothetical TGF production near a thundercloud driven by electromagnetic waves radiated by a large lightning current pulse.

The DC field model requires a very large thundercloud charge to create sufficient fields at high altitudes (e.g. 50–90 km, where sprites form). Unlike the case of sprites, these large charges do not seem to be associated with TGF-generating lightning.[10] Thus the DC field model requires the TGF to occur lower down, at the top of the thundercloud (10–20 km) where a local field can be stronger.

This hypothesis is supported by two independent observations. First, the spectrum of the gamma-rays seen by RHESSI matches very well to the prediction of relativistic runaway at 15–20 km.[14] Second, TGFs are strongly concentrated around Earth's equator when compared to lightning.[15] (They may also be concentrated over water compared to lightning in general.) Thundercloud tops are higher near the equator, and thus the gamma-rays from TGFs produced there have a better chance of escaping the atmosphere. The implication would then be that there are many lower-altitude TGFs not seen from space, particularly at higher latitudes.



Hypothetical TGF production within a thundercloud.

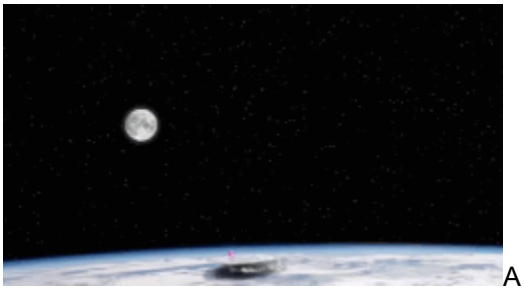
An alternative hypothesis, the EMP model,[16] relaxes the requirement on thundercloud charge but instead requires a large current pulse moving at very high speed. The required current pulse speed is very restrictive, and there is not yet any direct observational support for this model.

Another hypothetical mechanism is that TGFs are produced within the thundercloud itself, either in the strong electric fields near the lightning channel or in the static fields that exist over large volumes of the cloud. These mechanisms rely on extreme activity of the lightning channel to start the process (Carlson et al. 2010) or on strong feedback to allow even small-scale random events to trigger production.[17]

The Atmosphere-Space Interactions Monitor (ASIM), dedicated to measuring simultaneously optical signals of lightning and signals of terrestrial gamma-ray flashes, revealed that TGFs are usually associated with optical flashes, strongly suggesting that relativistic electrons as precursors of TGFs are produced in the strong electric fields in the proximity of lightning channels.[18][19]

TGFs may be generated in the huge columns of a volcanic eruption, such as the Hunga Tonga–Hunga Ha'apai eruption[20] of 2022.

Conjugate events


A terrestrial gamma-ray flash event (magenta) with associated electron/positron beams (yellow/green) moving along a magnetic field line which can eventually bounce back on the magnetic mirror point.[2]

It has been suggested that TGFs must also launch beams of highly relativistic electrons and positrons which escape the atmosphere, propagate along Earth's magnetic field and precipitate on the opposite hemisphere.[21][22] A few cases of TGFs on RHESSI, BATSE, and Fermi-GBM have shown unusual patterns that can be explained by such electron/positron beams, but such events are very unusual.

Calculations have shown that TGFs can liberate not only positrons, but also neutrons and protons.[23][24] Neutrons have already been measured in electric discharges,[25] whereas there is no experimental confirmation of discharge related protons (2016). Recent research has shown that the fluence of these neutrons lies between 10^{-9} and 10^{-13} per ms and per m^2 depending on the detection altitude. The energy of most of these neutrons, even with initial energies of 20 MeV, decreases down to the keV range within 1 ms.[24]

Other research

Terrestrial gamma-ray flashes pose a challenge to current theories of lightning, especially with the discovery of the clear signatures of antimatter produced in lightning.[26]

It has been discovered in the past 15 years that among the processes of lightning is some mechanism capable of generating gamma rays, which escape the atmosphere and are observed by orbiting spacecraft. Brought to light by NASA's Gerald Fishman in 1994 in an article in *Science*,[3] these so-called terrestrial gamma-ray flashes (TGFs) were observed by accident, while he was documenting instances of extraterrestrial gamma ray bursts observed by the Compton Gamma Ray Observatory (CGRO). TGFs are much shorter in duration, however, lasting only about 1 ms.

Professor Umran Inan of Stanford University linked a TGF to an individual lightning stroke occurring within 1.5 ms of the TGF event,[27] proving for the first time that the TGF was of atmospheric origin and associated with lightning strikes.

CGRO recorded only about 77 events in 10 years; however, more recently the Reuven Ramaty High Energy Solar Spectroscopic Imager (RHESSI) spacecraft, as reported by David Smith of UC Santa Cruz, has been observing TGFs at a much higher rate, indicating that these occur about 50 times per day globally (still a very small fraction of the total lightning on the planet). The energy levels recorded exceed 20 MeV.

Scientists from Duke University have also been studying the link between certain lightning events and the mysterious gamma ray emissions that emanate from the Earth's own atmosphere, in light of newer observations of TGFs made by RHESSI. Their study suggests that this gamma radiation fountains upward from starting points at surprisingly low altitudes in thunderclouds.

Steven Cummer, from Duke University's Pratt School of Engineering, said, "These are higher energy gamma rays than those coming from the Sun. And yet here they are coming from the kind of terrestrial thunderstorm that we see here all the time."[28]

Early hypotheses of this pointed to lightning generating high electric fields and driving relativistic runaway electron avalanche at altitudes well above the cloud where the thin atmosphere allows gamma rays to easily escape into space, similar to the way sprites are generated. Subsequent evidence however, has suggested instead that TGFs may be produced by driving relativistic electron avalanches within or just above high thunderclouds. Though hindered by atmospheric absorption of the escaping gamma rays, these theories do not require the exceptionally intense lightning that high altitude theories of TGF generation rely on.

The role of TGFs and their relationship to lightning remains a subject of ongoing scientific study.
In 2009, the Fermi Gamma-ray Space Telescope in Earth orbit observed intense burst of gamma rays corresponding to positron annihilations coming out of a storm formation.

Scientists would not have been surprised to see a few positrons accompanying any intense gamma ray burst, but the lightning flash detected by Fermi appeared to have produced about 100 trillion positrons. This was reported by news media in January 2011, and had never been previously observed.[29][30]

The Atmosphere-Space Interactions Monitor (ASIM), an experiment dedicated to study TGFs, was launched to the International Space Station on 2 April 2018 and was mounted on the Columbus External Payload Facility on 13 April 2018.[31]

See also

Wikimedia Commons has media related to ***Terrestrial gamma-ray flashes***.

- Gamma-ray bursts
- Red sprite
- Blue jet
- Lightning

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Further reading

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Recap of CARC Luncheon 2026

by Ed Fong, *WB6IQN*

Summary – We held a CARC group luncheon on Saturday March 21, 2026 at Harry's Hofbrau of Redwood City.

The food was great as usual at Harry's Hofbrau and the weather was perfect. I had the beef stroganoff and only ate about a 1/3 of it and took the rest home for both my wife and myself for dinner. For $14 my individual huge lunch dish was a deal.

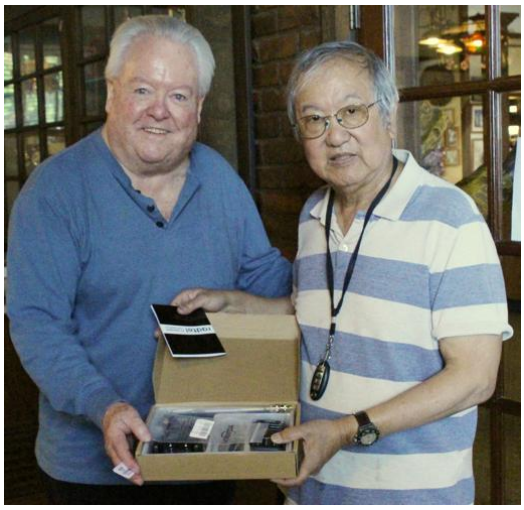
The nice thing about the CARC Luncheon is that the club flip / absorbed the entire bill. Cost for the 20+ folks that attended was $390.00. We currently have plenty of money in our club treasury to cover the cost of the luncheon just on the interest appreciation alone.

Group photo of folks that when to Galileo HS

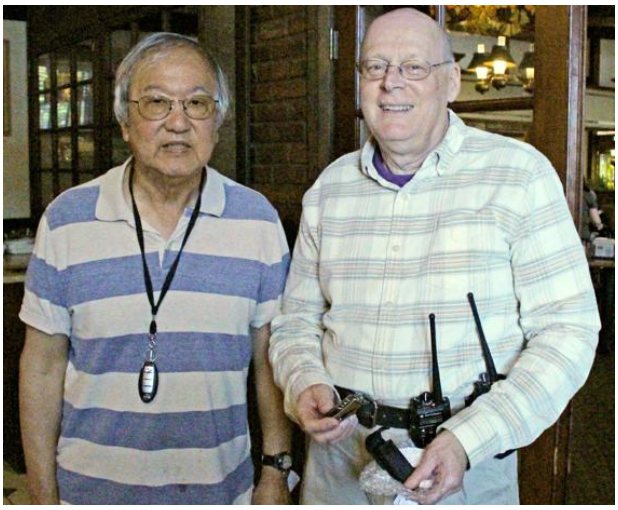
Table full of raffle prizes

Group photo of folks enjoying their luncheon

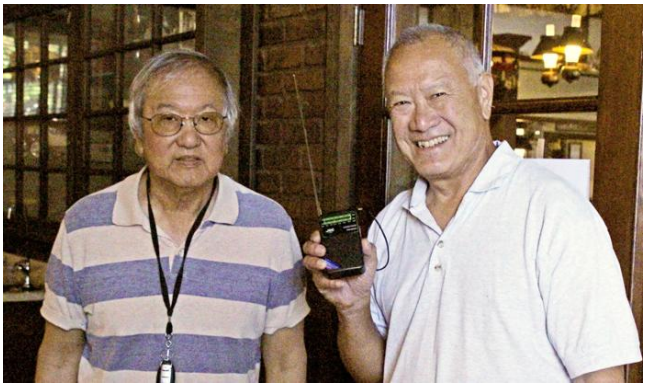
Group photo of CARC luncheon attendees



Bill Hudson W6CBS and Ed Fong



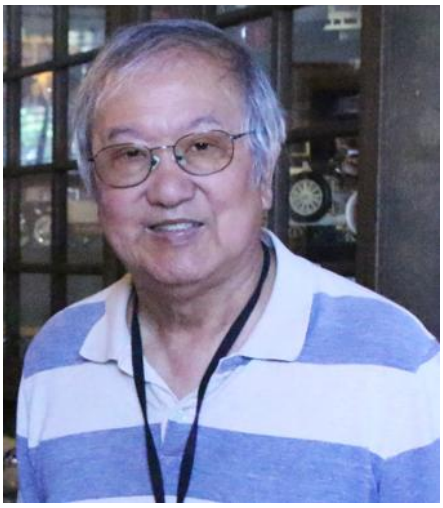
Ed Fong and Ralph Kruger KC6YDH



Ed Fong and Norman Gok

Robert Lai KM6QP and Ed Fong

Ed Fong and Dave Chan WZ6X



Ed Fong - *WB6IQN,* host of luncheon

Bob Lai KM6QP won the grand prize and took uSDX+ qrp transceiver. He has been having a great time with it. About the size of a novel book with built in 4Amphr LiOn battery it has all features to operate SSB and CW (with all DSP filters) in the field.

Bill Hudson W6CBS won the Radtel RET860. That is a great triband handheld with a full featured SDR HF receiver capable of SSB and CW with filters from 4KHz to 100 Hz.

Here are the full list of winners of the prizes.

- uSDX+ radio - Robert Lai KM6QP $110
- Radtel RT600 - Bill Hudson W6CBS $55
- AM/FM/SW - Norman Gok radio $7
- Milspec flashlight - Dave Chan WZ6X $6
- Journey's knife - Ralph Kruger KC6YDH $10

It was great seeing and meeting up with our CARC members. Harry Hofbrau of Redwood City gave us their private room just for our club luncheon.

Looking forward to doing it again next year.

73, Ed Fong, *WB6IQN*