RF

ORANGE COUNTY AMATEUR RADIO CLUB, INC.

VOL. XLIII NO. 5 P.O. BOX 3454, TUSTIN, CA 92861-3454 May 2002

HDSCS Responds to Metrolink Train Crash

or

No Drill Today, It's the Real Thing!

by **Joe Moell KØOV**

Approximately four times a year, the hospitals and emergency responders in Orange County hold large-scale drills to test the patient triage and transportation procedures that must be followed in the event of a mass casualty incident (MCI). HDSCS (Hospital Disaster Support Communications System) is always asked to participate. Hospitals verify procedures for activating us in accordance with their Incident Command System. We test our deployment and net procedures and get an opportunity to practice handling realistic disaster-related traffic. On Tuesday, 23 April 2002, two dozen HDSCS members awaited their assignments for a mock hazardous material incident, to be staged on a shopping street in Brea, California at 9 AM.

But at 8:10 AM, just 5-1/2 miles away in the city of Placentia, a 6000-ton mile-long freight train collided with a Metrolink double-decker commuter train. Two passengers were killed and over 200 were injured, many seriously. HDSCS Net Control WA6OPS immediately assigned the drill-ready hams to the fourteen hospitals expected to receive patients from the crash. For the next 41/2 hours, a total of 28 HDSCS hams provided vital links between these hospitals, the county's Central Point ambulance dispatch, and the county's Emergency Medical Service agency.

-- see **HDSCS** cont'd on page 5 --

The Prez Sez:

by Cory KE6WIU

QST, QST, QST DE W6ZE
VVV VVV VVV
OPS NEEDED FER FLD DAY:
YNG & OLD CU THERE
JUNE 22 / 23, 2002
PORTOLA PARK, SANTA ANA
WX: BRT & SNY, TEMP: 75 DGS
HVNT WRKD RDO FER AWHL,
NOT A PRBLM, MNY RIGS & ANT
BRNG FRND,
GD TYM 2B HAD 4 ALL
CNTCT LARRY K6VDP FER INFO
OR CU AT THE GNL MTG ON FRI.
73 DE W6ZE

See you all at the meeting and 73's--Cory

May PROGRAM:

The program speaker will be Dennis Kidder - WA6NIA and Fred Wagner - KQ6Q who will provide a presentation entitled:

"PSK31 Digital Communications"

Use the low-bands to talk near and far. High power is not required. They will have working stations for their demonstrations.

Don't miss it. All members and visitors are welcome.

The next regular meeting will be:

Friday, May 17th
@ 7:30 PM

We will be meeting in Anaheim Room in the east **Red Cross** Bldg.

In This Issue:

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Monthly Events:

General Meeting:
Third Friday of the month
at 7:30 PM
American Red Cross
(near Tustin Ave & 4th St)
Santa Ana, CA

Club Breakfast:
First Saturday of the
month at 8:00 AM
CowGirl's Cafe, Too
2610 S. Harbor Blvd
(just south of Warner)
Santa Ana, CA

Club Nets (Listen for **W6ZE**):
Wednesday Evenings

28.375± MHz SSB
7:30 PM - 8:30 PM
Bob AF6C, Net Control

146.55 MHz Simplex FM
8:30 PM - 9:30 PM
Bob, WB6IXN, Net Control

VISIT OUR WEB SITE

http://www.w6ze.org

for up-to-the-minute club information, the latest membership rosters, special activities, back issues of RF, links to ham-related sites, vendors and manufacturers, pictures of club events and much much more.

Club Dues:
Regular Members ...$20
Family Members* ...$10
Teenage Members ..$10
Club Badge** …....$3

Dues run from January thru Dec and are prorated for new members.
*Additional members in the family of a regular member pay the family rate up to $30 per family.
**There is a $1 charge if you'd like to have your badge mailed to you.

Tech Talk #17

S/N Ratios and Error Rates for Digital Communications

by
Ken Konechy - W6HHC

(This is the fourth part of a Tech Talk series to explore Digital Communications)

In April, I explored how to compress the voice stream of 1s and 0s using VoCoder (voice coding) technology. This month we will look at the laws pertaining to error-free reception of digital signals and the trade-offs that are available. Sometimes the math needed gets "pretty ugly", so I will simplify some of the equations so you can get a better feel of the principles at play (without getting buried in symbols).

Crowding Users onto a Channel

An important ratio in digital communications is $\mathbf{E_b/I_o}$, where:

$\mathbf{E_b}$ is the energy per bit of received signal

$\mathbf{I_o}$ is the frequency density of interference.

$\mathbf{E_b}$ is the power of the signal you want to receive, **P**, divided by the bit rate, **R**, that is carrying the digital information. For example, if **P** is 10 microwatts (10×10^{-6}) and the bit rate of data is 4,800 bps, then

$\mathbf{E_b}$ = (10×10^{-6} Watts) / (4.8×10^{-3} per Sec)

$\mathbf{E_b}$ = 2.08×10^{-3} Watt-Sec

$\mathbf{I_o}$ is the interference density of all of the adjacent stations on the channel plus thermal noise density generated within the receiver.

The capacity of channel for multiple access can be expressed as the following (slightly simplified) equation in Equation 1:

$$\mathbf{N} = \frac{W/R}{Eb/Io}$$

Equation 1 – Equation for number of channel users

Where:

N is the number of active pairs of stations that can be supported on the channel.

W is the bandwidth of the channel (Hz)

R is the data bit rate (bps)

W/R a ratio normally called "coding gain"

For cell phone technology (CDMA), typical values for the reverse channel (mobile) are:

N = (W/R) / (Eb/Io) = 128 / 7dB = 128 / 5

N = 25.6 users

In order to increase the number of users, we either have to increase the "digital gain", **W/R**, and/or decrease the required $\mathbf{E_b/I_o}$ ratio (very much related to Signal-to-Noise Ratio, **SNR**)

SHANNON's Capacity Theorem

Claude Shannon (from the US) was a mathematician who greatly contributed to the understanding of communications, especially digital communications. Shannon worked at both MIT and Bell Labs.

Equation 2 shows Shannon's important equation for determining the maximum bit rate that we can use without errors, called **C** (for Capacity)

$$\mathbf{C = W \times LOG_2(1 + S/N)}$$

Equation 2 – Shannon's Theorem for Maximum Bit-Rate Capacity

- see **TechTalk** cont'd on page 4 -

Tech Talk #17 - Cont'd from Pg 3

In Equation 2:

C is the capacity (maximum error-free bit rate)

W is the bandwidth of the channel

S is the average received signal power

N is the average noise power (note that in this equation, N does NOT mean "number of users")

Shannon's capacity theorem works when the noise is "Additive White Gaussian Noise" (AWGN).

The significance of this Equation 2 is that it allows you to trade off (1) faster data rates (time)…against (2) more bandwidth…against (3) improved S/N ratio (power).

This relationship of tradeoffs among TIME, BANDWIDTH, and S/N is called "Shannon's Guiding Principle" as shown in Figure 3.

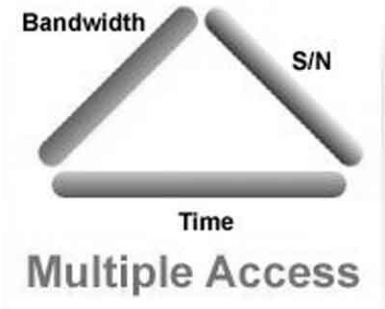


Fig 3 - Shannon's Guiding Principle

Equation 2 allows us make the following choices:

Need Higher Data Rate?

- increase the bandwidth

Can't increase Bandwidth for higher data rate?

- increase the power

Error Rate is too High?

- decrease the data rate

Notice that increasing bandwidth, **W**, is directly proportional to an increase in error-free data rate capacity, **C**. But, increasing power, **S**, only improves the error-free data rate capacity by a factor of $\log_2$. It is better to improve bandwidth than just let all the stations run higher power!!

Probability of Error Rates

In order to accomplish successful communications, we need to be error-free or at least have a very low rate of errors.

One of the most widely used mathematical density functions is Gaussian (or Normal) density function. Many events in nature, including some types of noise/interference follow Gaussian density laws.

If the digital communication noise (usually called $\mathbf{I_o}$ for noise-density, but sometimes labeled **N** for noise-power as in S/N) is Gaussian noise, then the Signal-to-Noise ratios can predict the error rate.

Gaussian noise allows you to determine the error rate probability, $\mathbf{P_{error}}$, for a given SNR based on the equation in Equation 4.

$$P_{error} = Q\left(\sqrt{\frac{2E_b}{Io}}\right)$$

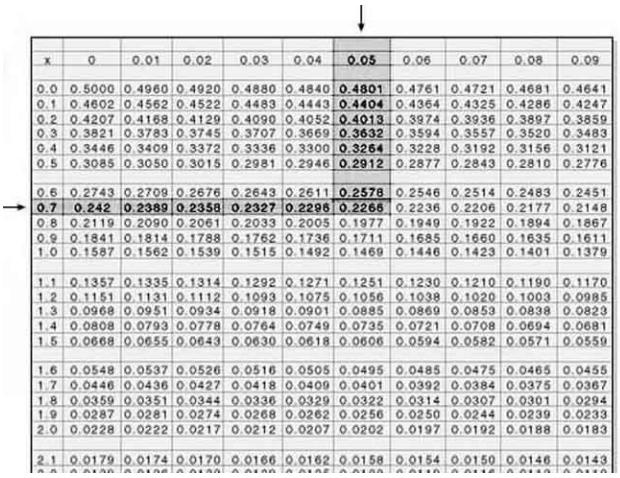
Equation 4 – Error Rate, P, for BPSK data using Q function

In Equation 4, the error rate probability of a BPSK modulation scheme can be determined by using the Gaussian Q function. The equation for determining the value of Q is very complex. It is easier to use a "Q(x) Table". Fig 5 shows a sample of a Q(x) Table.

In the example within Figure 5, if the value, x, inside the bracket for Q(x) has a value of 0.75, then the value of error-rate probability,

see **TechTalk** cont'd on page 5

Tech Talk #17 - Cont'd from Pg 4



x	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.242	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143

Fig 5 – Sample of Q(x) Table. Looking up Q(0.75) to determine probability is 0.2266

P_{error}, is 0.2266 or 22.6%. This would be a terrible error rate…because 22% of the bits are received incorrectly!!!

To get a decent error rate of 10^{-5} (that is one bad bit in 100,000 bits), the value of x for Q(x) in the Q(x)Table must be around 4.0. That is:

$\sqrt{\frac{2Eb}{Io}} \approx 4.0$ So, if we want the error rate to have a value of 10^{-5} , then values of **E_b/I_o** need to be achieved to allow x to equal 4.0. Since $\sqrt{16}$ = $\sqrt{(2)(8)}$ = 4, **E_b/I_o** must be equal to 8. And finally 8 is equal to 9 dB, so **E_b/I_o** must achieve 9 dB.

Well, this has been a difficult TechTalk article in the series because of the math. But, hopefully you have become acquainted with (and maybe appreciate) the parameters that designers of digital communications have to work with…..power, bandwidth, data rates, SNR, predicting error rates and trying to make interference look like Gaussian Noise.

In the next TechTalk article on Digital Communications, I will discuss "Orthogonal coding" and let you see how this is one of the technologies that reduces interference from other signals on the channel.

HDSCS-MetroLink - Cont'd from Pg 1

Amateur Radio net messages (traffic) included verifying victim dispatch and patient counts, locating victims prior to completion of the EMS database, providing hospitals with information for inquiring victim families, and liaison with hams supporting the Red Cross. Within some hospitals, hams provided direct communications between triage areas, Emergency Departments, and Command Posts. Assistant Coordinator Dennis Kidder WA6NIA explained the importance of internal communications at the hospital where he was assigned: "We were repeatedly told by staff and the hospital Incident Commander how much they appreciated our being there. Early on, their internal communications were in a bit of turmoil because their own walkie-talkies weren't working, so we provided an immediate backup for them between the Emergency Department and the Command Post, because they were hurting really bad for that."

This was the 75th hospital communications emergency response in the 21-year history of HDSCS. If the Brea drill had taken place, it would have been the 119th time that HDSCS has participated in a drill with hospitals in Orange County.

Photo from local television coverage of the MetroLink accident.

see **HDSCS** cont'd on page 6

HDSCS-MetroLink - Cont'd from Pg 5

List of HDSCS participants, in alphabetical order by name:

Name and call sign	Responded to
Bruce Chappell KE6TSM	UCI Med Ctr
Jean Creason KC6PPY	St. Joseph Med Ctr
Sam Creason K6EW	Base station
Tom Curlee WB6UZZ	Los Alamitos Gen Hosp
David Daniel KE6NVJ	St. Jude Med Ctr
Tom Gaccione WB2LRH	UCI Med Ctr
John Gillette N6NVR	St. Jude Med Ctr
Ed Green AD6SR	Western Med Ctr – S.A.
Dennis Kidder WA6NIA	St. Jude Med Ctr
Fred Lochner WA6FRA	Anaheim General Hosp
April Moell WA6OPS	Net Control Station
Dave Mofford W7KTS	Base station
Harry Mortimer N6KSC	Western Med Ctr – S.A.
Dick Schmieter KM6MH	Central Point at OC EOC
Mike Scofield N6OKG	West Anaheim Med Ctr
Cheryl Simpson KD6MWZ	Brea Community Hosp
Ken Simpson W6KOS	Central Point at OC EOC
Keith Soesbe WR6R	Western Med Ctr - Anah
Clay Stearns KE6TZR	St. Joseph Med Ctr
Ralph Swanson WB6JBI	Anaheim Mem'l Med Ctr
George Thompson KD6GQF	Brea Community Hosp
Jay Thompson W6JAY	Garden Grove Hosp
Richard Thompson WA6NOL	Garden Grove Hosp
Fred Wagner KQ6Q	UCI Med Ctr
John Walker AC7GK	Chapman General Hosp
Al Way KC6LNP	Anaheim Mem'l Med Ctr
Jack Woolf KF6YQQ	Placentia-Linda Hosp
Larry Woolf KF6YCM	Kaiser Perm' Hosp- Anah

Some debriefing comments from HDSCS responders:

Cheryl Simpson KD6MWZ: "Usually I monitor our net with an earphone, but the hospital Command Post people wanted me to leave the speaker on so that they could listen to our net for additional information."

Larry Woolf KF6YCM: "The hospital looked to the hams for a lot of info and we did not let them down. The fact that we were able to get information quickly impressed them greatly! I think they now really consider us a major component of their response team."

Fred Wagner KQ6Q: "Handling inquiries to locate crash victims/patients are a superb public confidence builder. When a hospital staffer has tried to locate a victim who is a fellow staffer at that hospital, has already tried the established and published methods, comes to the hams, asks for help, and has the victim located in minutes - they know that the hams have their act together, and the word spreads informally."

April Moell WA6OPS: "It was amazing how much this actual communications emergency seemed like 'just another drill' for us. All of our HDSCS operators went to their reassigned hospitals and got onto the net quickly, without having to ask for directions or further instructions. Their message-handling procedures were excellent. Having drilled with our hospitals over a hundred times has paid off well for us and for them."

HDSCS responder John Gillette N6NVR (far left) stands with his radio at the entrance to St. Jude Medical Center's Emergency Department, providing direct communications to an HDSCS operator at that hospital's Command Post.

Comments from served hospitals:

Mary Massey, Pre-Hospital Care Coordinator at Anaheim Memorial Medical Center: "Tell your people what a FANTASTIC job they did for us Tuesday. It is one area that always comes through for us."

Ann Scott, Pre-Hospital Care Coordinator at St. Jude Medical Center: "I got more instantaneous information from my ham operator, so that I was able to prepare. He was right out there -- he was wonderful!"

Marla Gayne, Interim Pre-Hospital Care Coordinator at UCI Medical Center: "Our ham operator was totally invaluable. He provided us with a lot of information that we didn't have access to, so it was really wonderful having him there. He knew what was going on throughout the county and kept us informed about patient dispatches."

General Meeting Minutes

19-April

The General meeting was called to order at 8:33pm. All officers present except Phil N7PA and Bob KD6BWH.

Program: Bill Phinizy – K6WHP (and friends) presented an outstanding review of QRP and current equipment available. See PIX below:

VP: The May program will be on PSK31.

Treasurer: Balances: Checking $2828.07, Cash $60.00

Secretary: Letter for Ken W6HHC from Santa Ana RE Field Day

Membership: 45 members on current roster

Activities: Substituting in for Activities chair is Allan Avnet.

Publicity, Technical: Nothing to report

Old Business:
B2V: New OCARC member Virgil is helping.

Field Day: Ken W6HHC attended successful meeting with city of S.A. about Portola Park as our Field Day site. We will be able to use it again, with no fees as before. We had no complaints from last year, which helped with our credibility in the eyes of the city officials.

The following are the conditions for use of Portola Park:
1) MARK SPOTS FOR GROUND RODS
2) Send out letters to surrounding neighbors
3) Key for Restrooms will be given
4) Insurance endorsement must be available
5) KEEP GENERATORS MORE TOWARDS WESTERN SIDE OF PARK

Can be on site from 6am Saturday to 1pm Sunday. No noisy activities before 7:30am on Saturday.

New Business: None

Good of Club: Bob AF6C can laminate copies of the small version your license, to make it into a handy "ID tag" similar to our club badges. Bob will bring the laminator to the meeting next month.
Nightcap at El Ranchito after the meeting.

Respectfully submitted:
Matt K6LNX

Our QRP guest speakers (standing L-R)
Dick Palmer, WB6JDH
Bill Phinizy, K6WHP
Bill Chambers, K6BNC
..from the Lake Perris QRP Society

May Board Meeting

The board meeting was called to order at 8:40 AM by president Cory KE6WIU. All officers were present except for VP Lowell KQ6JD, secretary Matt K6LNX and Bob KD6BWH.

Treasurer Al N6TEZ reported that his truck was broken into and the club's Financial briefcase was taken. He cancelled our checking account at Washington Mutual bank. Al later managed to recover the checkbook, receipt book, and most of the OCARC papers. Approximately $60 in cash was lost. A new bank is to be chosen as soon as possible.
(Editor's note: a new account has been set-up at O.C. Credit Union.)

The membership chairman Chris W6KFW reported that we have 46 paid members and 3 renewals today for a total of 49.

Larry K6VDP has provided a Field Day write-up of our FD plans for the RF Newsletter. Matt and Cindy are handling the publicity article for FD.

Bob AF6C will take the monthly raffle prizes to the meeting as Phil N7PA will be absent.

Frank WA6VKZ suggested that we send out SASE renewal notices to members. The date will be determined at a later time.

Cory will contact Mimi's Café in July to set up a date for our Christmas dinner.

The meeting was adjourned at 9:08
Submitted by Larry K6VDP

Or. Co. Wireless Net OCWN
Has announced a new time for the CW net. Look for them at:

Sunday morning 9AM
28.110 MHz

Field Day is Coming!!

by Larry K6VDP
OCARC FD Chairman

Field Day is coming up fast. It is the 4th weekend in June (22-June & 23-June) and will be held in Portola Park, on Santa Clara Avenue in Santa Ana. This is the club's major yearly event.

The rules have changed a bit for this year. We will be operating Class 4A with four simultaneous stations on the air (plus VHF/ UHF) for the 24-hour period. The operations begin at 11 AM on Saturday and will end at 11 AM on Sunday. We need all the help we can get, even if you can come for only a few hours.

10M/80M - Larry Beilin - K6VDP (714-557-7217) is the team captain for the 10M/80M station. This team will operate 10M while open and 75M/80M at night. This location will also set up a VHF station in the 10M/80M shelter.

15M - Ken Konechy - W6HHC (714-744-0217) is the team captain for 15 meters. This station will remain on while the band is open.

20M - Cory Terando - KE6WIU (714-894-3817) is the captain for 20 meters. She will need operators to stay on the air for the 24 hour period.

40M - Chris Winter - W6KFW (714-543-6943) is the team captain for 40 meters. We need a shelter (tent or motorhome/camper) for the 40 meter station. Larry, KR6LO will be there to operate CW and SSB.

BONUS STATION - The team captains for the bonus station will be Tom Thomas - WA6PFA and Bud Barkhurst - WA6VPP. We can get lots of bonus points as listed below.

- Public information table-100 pts. We need to make hand out sheets and visitor log.
- Alternate power-100 pts. We need to make a minimum of 5 contacts on solar power.
- Demonstration-100 points each for a demonstration of APRS, ATV, and SSTV.
- Site visitor-100 points for a visit to our site by a government or Red Cross official.

Fone contacts count 1 pt each and CW/digital contacts count 2 pts each. I challenge each station to make a few CW contacts.

Set-up starts at 7:30 AM on Saturday morning. The OCARC will provide meals to all for Saturday Dinner and Sunday Breakfast. Traditionally, the Team Captains have provided for Saturday Lunch.

Be sure to come out and join the fun.

ORANGE COUNTY AMATEUR RADIO CLUB, INC
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TUSTIN, CA 92781-3454

First Class Mail

Time Dated Material.
Please Expedite!!