ANDEX

Vol. 13, No.6 December-January, 1986-87

The Birthday of HCJB - 55 Years

Excerpts from old issues of *ANDEX International*

Our story begins with the late Dr. Clarence Jones speaking. Dr. Jones was a cofounder of HCJB and its president for 29 years.

"Station HCJB in Quito, Ecuador, had a rather rough time getting off the ground and into the air. Our first transmitter boasted only 250 watts, at its best. After being custom built by our English engineer, Eric Williams, in Chicago, Illinois, it had suffered many severe bumps and falls in shipping to Ecuador. We were amazed that there were only a few dents in the panels when we finally unpacked it in August of 1931.

"Up in the Andes Mountains, at over 9,000 feet altitude, sea level circuits have a tendency to go crazy. Tubes overheat, condensers spark furiously, transformers get too hot, etc. In later years our engineers learned how to counteract these problems. It took us until Christmas Eve to get any kind of stability in the transmitter for testing. Then one of those blue mercury power rectifier tubes blew out just before Christmas, which was to be our on-the-air target date. In all Ecuador there was only one man who could help us, Carlos Cordovez in Riobamba. Carlos was an early world-known amateur operator who also broadcast a few programs a week under the name Radio Prado. So we raced the 120 miles to Riobamba to beg a blue tube from him and got back to Quito just in time to put our fledgling transmitter into operation by Christmas afternoon.

"We had put up two 50-foot telephone poles for antenna towers and strung a T-line wire antenna between them.

"Our studio was our living room in an ivy-covered cottage on the outskirts of Quito. We had cut a hole through its mud-brick wall to make an outside control room—some class! We had a wonderful carbon microphone hung inside a big packing box which we draped in red velvet for acoustic control. A bare light bulb hung overhead.

"The transmitter building had been a large sheepshed with dirt floor, tin roof and only two sides of adobe walls. We had cemented the floor, closed in the other two sides, whitewashed the whole deal, and that was HCJB. That Christmas Day the President of Ecuador came out to throw the switch."

The Sheepshed

The story continues with the words of the late Ruth Clark, missionary in Ecuador for 42 years.

"Nine people are gathered. The clock on the wall is preparing to strike the hour of three. An air of subdued excitement and expectancy pervades the room. Clarence Jones glances at the clock, then toward Anne Williams at the control window in the adjoining corridor. He gives the signal to Reuben Larsen (cofounder of HCJB) who steps up to the lonely little microphone in the center of the room. In stentorian tones he announces, 'Esta es la Voz de los Andes' (This is the Voice of the Andes). Are we really on the air? Is that homemade 250 watt transmitter out there in the old sheepshed actually working? Can engineer Eric Williams keep it perking for the long half-hour of this first broadcast? By the time Reuben Larsen has announced the first trio, fears, doubts and incredulity have been cast to the winds and the hearts of all in the studio are filled with wonder and praise. How great has been God's faithfulness! After a short but clear message based on that theme, Clarence Jones lifts his trombone to his lips and sends forth that exultant pean of praise, 'Great is Thy Faithfulness." Our hearts echo, 'This is His doing and it is marvelous in our

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ANTENNA CORNER: MATCHING ANTENNAS

By Don Hastings

Have you heard such antenna terms as radiation resistance, impedance, standing wave ratio or matching and wished you could know what they really mean? This article will introduce simple concepts to help understand these terms and show how matching can make an antenna function more effectively.

IMPEDANCE

Impedance is a complex electrical term which includes both resistance and reactance. Force is required to move anything through a medium. For example to run through air is easier than to run through water. Water impedes or resists motion more than air.

The same principle applies to electricity where the voltage provides the force to move electrons (electric current) through an electrical circuit. Stated simply, the resistance, measured in ohms, is the ratio of the magnitude (value) of the voltage to the amount of current flowing. If 50 volts applied to a circuit results in 1 ampere of current flow then the circuit has 50 ohms resistance.

Resistance is only one component, the real or power-carrying part, of impedence. Reactance, the so-called wattless component, acts upon the current to cause it to lag behind or flow ahead of (lead) the driving voltage in alternating current circuits such as transmitters and antennas. For example, the resonant half-wave dipole antenna has a purely resistive impedence, and as a result the current flowing into the dipole reaches its maximum value at the same instant that the driving voltage reaches maximum. If the dipole is longer than a half wave, its impedance contains inductive reactance as well as resistance and the current lags or reaches its maximum after the voltage reaches its peak value. Similarly, a dipole shorter than a half-wave resonant length has capacitive reactance and consequently its current leads or reaches the maximum value before the voltage peak.

RADIATION RESISTANCE

A radio wave traveling through space is made up of electric and magnetic fields whose relative magnitudes are determined by what is called "space impedance," a constant whose value is 377 ohms per square. This space impedance is coupled to the antenna through its voltages and currents and their associated fields which produce the propagating radio wave. This coupled impedance is purely resistive and is called the radiation resistance of the antenna.

Radiation resistance is not constant but is dependant on the length of the antenna which determines the coupling to space. In general, the longer the antenna the stronger the coupling and the higher the radiation resistance becomes until the pattern begins to split into additional lobes resulting in a drop in radiation resistance. The radiation resistance of the well-known half-wave dipole described above is about 73 ohms. The value increases to about 214 ohms when the dipole is 0.9 wave long and drops to about 200 for a full-wave dipole. For dipoles shorter than a half wave the radiation resistance drops rapidly; the value for a center-fed quarter-wave dipole is only about 8 ohms (not to be confused with the 20 ohm end-fed quarter-wave radiator over a spoke ground plane). For really short antennas the radiation resistance can be in the hundredths of ohms, which indicates the very low coupling to space. This explains why short antennas are so difficult to make effective.

REFLECTION

The impedance at the terminals of an antenna is usually not the same as the radiation resistance. Terminal impedence depends on nearby antennas or on the ground, or on the reactance if the antenna is non-resonant, and on where the terminals are located on the antenna. This terminal impedence must be matched to the transmission line delivering power to the antenna if all the power is to be radiated.

The art of antenna matching consists of adjusting the ratio of voltage to current...

Consideration of the simple resonant half-wave dipole will help to understand why matching is necessary. The terminal impedence of this dipole is about 73 ohms, the same as the radiation resistance. For the total power delivered to the antenna to be radiated into space, the voltage and current applied must be in the ratio 73 volts for each ampere of current. If the transmission line is a 75 ohm coaxial line, which delivers power in the ratio 75 volts per ampere of current, the drive requirements are approximately met and the antenna is matched.

If, however, the coaxial line is 50 ohms, which delivers an ampere of current for each 50 volts, the system is mismatched.

The antenna will only accept about 0.7 ampere of current for 50 volts of drive and the remaining 0.3 ampere delivered by the coaxial line is reflected from the antenna back down the line.

The forward and reflected currents combine on the transmission line to form standing waves, which has lead to the well known standing wave ratio (SWR) method to define and measure the amount of reflection or mismatch of antenna systems.

Since antennas are reciprical, they behave the same in receiving as in transmitting.

In receiving, the reflected power is re-radiated back into space instead of proceeding to the radio set.

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MATCHING ANTENNAS
Continued

ANTENNA MATCHING

The art of antenna matching consists of adjusting the ratio of voltage to current, both resistive and reactive, such that the antenna will accept essentially all the power delivered to its terminals. In the above example the voltage/current ratio delivered by the 50 ohm line can be transformed to the desired 73 volts per ampere ratio by adding a quarter-wave section of 60 ohm line (if such exists) between the end of the 50 ohm line and the antenna terminals. This is an example of transformer matching.

Most antennas are much more complex than the above example and are more difficult to match. Most of our HCJB "curtain" antennas are arrays of 4 to 16 dipoles located in front of a reflector screen and using ground reflections to help form the beams. These antennas usually are matched over two shortwave bands such as 25 and 31 meters. The matching networks consist of several transformers and shorted transmission line stubs, both inductive and capacitive, of varying characteristic impedence. Occasionally lumped inductors and capacitors are used as well.

The matching procedure is to measure the terminal impedance of the antenna with an impedance bridge (SWR is not adequate to permit matching complex antennas), then to calculate the locations and dimensions of transformers and stubs to supply the correct ratio of real and reactive currents to the antenna from those supplied by our open wire transmission lines.

Most of you have simpler antennas which may be adequately matched by a cut and try approach. This method works best with gamma or J-matched systems that usually can match any impedence. By alternately varying resistive and reactive elements of the match while watching a SWR meter a good match usually results.

Commercially available antenna matchers are even easier to use and are best for matching receiving antennas. They can often improve reception a lot where the same antenna is used for all shortwave bands. These simple matching devices cannot be used at HCJB because our power levels are far too high.

Birthday of HCJB, continued

eyes!' Finally came a prayer of dedication and this embryo radio ministry was committed to the God who promised 'Not by might nor by power but by my Spirit, saith the Lord.'

"The Voice had gone out. Had it been heard? As if to strengthen trembling faith, the telephone rang. One of our number left the room to answer. Returning with shining face, he anounced, 'The Parras called to say they heard the whole broadcast perfectly.' At least one of the six radio receivers known to be in Quito had tuned in!

"That broadcast began the ministry of HCJB. How appropriate that the first broadcast telling the world about the Lamb of Calvary should have originated from a former sheepshed!"

Season's Greetings from the HCJB Staff

Special DXers

Mike Gater

Mike Gater, ANDEX 5266, is our Special DXer from England. He lives at 268 Main Road, New Duston, Northampton, NN5 6PP England. Mike writes:

"I have been interested in shortwave radio since 1948 when I built my first simple receiver. I have recently built a similar receiver using two transistors instead of valves (tubes), but using the original plug-in coils. It can pick up anything that my Trio R 1000 does. I use the Trio R 1000 with dipoles for the broadcast bands and a Sony ICF 7600D with its whip antenna for portable use.

"I am a chartered surveyor by profession, 54 years old, married and have three sons.

"I am a radio ham with the call sign G4ICC and I enjoy experimenting with antennas. Apart from radio my hobbies include cycling, sailing, genealogy and chess.

"In addition to ANDEX I am a member of the Radio Society of Great Britain, the Royal Signals Amateur Radio Society, The Radio Amateurs Old Timers' Association and the International Shortwave League."

The photo shows Mike with his extensive equipment for working the ham bands and for listening to shortwave radio. Maybe some of you experienced DXers can identify the different pieces. We wish many more years of successful DXing and SWLing to M.J.E. Gater and congratulate him on his selection as Special DXer.

RECEPTION REPORT WORD SEARCH

L O Y S S E R D D A Y M
E T I C A S L I A T E D
H I N A N R T M O R B C
D E D A T E A A F G L M
I C J K O R U P T Q R P
N T S A G T U Q V I M H
W U T O P N I S E P O I
Z A R H S L V O K R A N
R P F M Y N A M E G F P

David Callender

We're happy to introduce Special DXer David Callender, ANDEX 4914, who lives at 207 Winton Drive, Richmond, Kentucky 40475. He used to live in Bardsville, Kentucky, site of the home that inspired Stephen Foster to write the famous song "My Old Kentucky Home." David also lived in Louisville, Kentucky. Anyone who has played much baseball or softball has seen "Louisville, Kentucky" stamped on a baseball bat, since more bats are made in Louisville than anywhere else. No doubt this contributed to David's interest in baseball which began when he was three years old and led to him attending baseball schools during high school.

After high school he went on to college and earned a degree in recreation. He has been in various civic clubs including the Junior Chamber of Commerce, the Asia Students International Association and the local Special Olympics. A poem he wrote was published in a magazine that circulated nation-wide, and he has received a Governor's Merit Award.

Six years ago David discovered the world of shortwave listening. He joined ANDEX in early 1984. His radio, shown in the photo, is a Panasonic RF 4800. His 175 foot longwire antenna runs along the side of his house and into his back yard.

We hope you will receive many notes of congratulations, David, on being chosen a Special DXer of ANDEX. May shortwave listening and DXing afford you much enjoyment in the coming years.

RECEPTION REPORT WORD SEARCH

Circle the 9 words which denote things included in reception reports. These words are spelled out horizontally, vertically, inverted or diagonally. Look for the completed word search in the next issue of *ANDEX International*.

The Big Four

By Kenneth D. MacHarg

When HCJB took to the air from Quito, Ecuador on Christmas Day 1931, it was the first Christian missionary radio station and the only such facility on the air for a number of years. Today there are over 50 missionary stations circling the globe with gospel broadcasts in more than 100 languages.

Many of today's missionary stations are local in nature, with shortwave frequencies intended to serve remote areas of the host country. Examples of these stations include TIFC, the Lighthouse of the Caribbean in San Jose, Costa Rica, which covers that Central American nation with AM, FM and shortwave broadcasts; HRVC in Honduras; TGNA in Guatemala; 4VEH in Haiti; plus dozens of others in the Caribbean, South America, Africa and Asia. The majority of these stations serve their nations well and have never been led to expand to larger facilities. A few Christian broadcasters however, have grown until they have become major international voices.

Of these, four have become known worldwide and recently have joined together in a cooperative effort known as Project 2000 to assure that all people of the world have the opportunity to hear the gospel in their own language by the turn of the century. Because the "big four" can easily be heard by most shortwave listeners, it might be helpful to know a bit more about them.

HCJB, "The Voice of the Andes," was the pioneer missionary broadcaster. The station's cofounders had a vision of using radio to extend the Christian missionary enterprise. HCJB has indeed pioneered the way for other Christian broadcasters, developing and building their own antennas and many of their transmitters, and leading the way with contemporary Christian programming. Recently the newspaper *USA Today* listed HCJB as the seventh largest radio station in the world. HCJB broadcasts in 12 languages to all continents of the world.

FEBC—"The Call of the Orient" went on the air in 1948 with a primary target of Asia and the South Pacific. FEBC was the dream of three men, a pastor in California, a U.S. Navy officer, and a man already involved in Christian broadcasting. Now that dream has grown into one of the world's major broadcasting operations, with facilities in the Philippines and Korea, plus additional shortwave stations KGEI in San Francisco, California, KFBS on the Pacific island of Saipan, and FEBA broadcasting to Southern Asia, Africa and the Middle East from the Seychelles Islands off the east coast of Africa. The effectiveness of FEBC's broadcasts has been attested by hundreds of Christian leaders, including one 75 year old pastor from mainland China who said in the United States last year that Christian broadcasts, particularly those from FEBC Manila were what kept the Christian church alive in China during the tumultuous years of the Cultural Revolution.

ELWA—"Eternal Love Winning Africa," the smallest of the "big four" Christian stations, took to the air in 1953 from the West African nation of Liberia. Affiliated with SIM (The Sudan Interior Mission), ELWA has an enviable record of Christian witness throughout Africa and the Middle East, reaching remote tribes and nomadic groups which logistically are almost impossible for missionary work. ELWA provides a different sound from many of the other Christian broadcasters in that most of its programming is produced by indigenous speakers from their target area. Broadcasting from ocean-front facilities in Liberia, ELWA stepped in when ETLF, the Radio Voice of the Gospel in Ethiopia was taken off the air by the Ethiopian government in the late 1970s. Today it provides many hours per week of programs for the Middle East, as well as its primary target of Northern Africa.

TWR—"Trans World Radio," called by some the largest private radio network in the world, Trans World Radio also began broadcasting in 1953 from the now-defunct Voice of Tangier radio station in Morrocco. Later TWR moved to Monte Carlo to transmit from facilities originally built but never used, by Adolph Hitler. From that base, TWR has expanded until today it transmitts gospel programming from super power stations in Monte Carlo, Cyprus, Swaziland in Southern Africa, Bonaire in the Caribbean, Guam in the Pacific (KTWR), and Sri Lanka off the coast of India. TWR has also experimented successfully with powerful medium wave transmitters at all of its broadcast sites. Their 500,000 watt transmitter on Bonaire can be heard over much of Latin America and the southern United States on 800 kc medium wave.

Other international Christian stations can be heard on the bands: WYFR-Family Radio from Florida and Taiwan; KCBI from Texas; KNLS from Alaska; Vatican Radio; and WHRI, World Harvest Radio from Indiana.

While most international shortwave stations are owned by governments, the privately-owned Christian stations provide an alternative program style as they broadcast the Good News of the Savior of the world to the ends of the earth.

WHERE TO TUNE

Most shortwave listeners can hear the major Christian shortwave stations. The following times and frequencies for English language broadcasts are taken from the 1986 *World Radio TV Handbook.*

FEBC-Manila
- To Malaysia, Indonesia, Singapore
  - 23:00-24:00 UTC 15445
  - 07:00-09:30 UTC 15350
- To Australia, New Zealand
  - 07:00-10:00 UTC 11890
- To India, Pakistan, Sri Lanka
  - 00:00-03:00 UTC 15445
  - 13:00-15:00 UTC 11850
  - 14:00-16:00 UTC 9515

FEBA - Seychelles
- To South Aisa
  - 07:12-08:45 UTC (Sunday)
  - 15120, 17780
  - 14:58-16:08 UTC 15325
  - 15:15-16:08 UTC 11865
- To East Africa
  - 14:58-16:08 UTC 11760

KGEI- San Francisco
- 21:30-22:00 UTC

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Variations On The Theme

The best in contemporary Christian music is offered on the program VARIATIONS ON THE THEME, hosted by Judi Harrison. Each program is built around a variation of the theme "Life in Jesus Christ."

Some of the "variations" that have been featured in the past include "Loneliness," "Light Christianity in a Heavy World" and "Where is God When it Hurts."

Judi often uses special excerpts from her favorite books and magazines to tie the music together and this results in a challenging, informative musical half hour.

Judi is an HCJB staff musician. She is often heard on HCJB TODAY playing the piano and flute and singing, usually with her husband Jack. Ocassionally on VARIATIONS ON THE THEME you'll hear a selection from one of Judi and Jack's many records.

VARIATIONS ON THE THEME can be heard in the Americas Saturday at 0330 UTC and Sunday at 1400 UTC, in Europe Tuesday at 2130 UTC, and in the South Pacific Saturday at 0900 UTC.

Judi Harrison

The Big Four, continued

ELWA-Monrovia, Liberia
To West and Central Africa
07:00-08:00 UTC (Sunday) 11830
13:45-16:30 UTC (Sunday) 11830
20:15-21:35 UTC 11830

TRANS WORLD RADIO-Swaziland
04:30-07:00 UTC 7295, 3200
05:30-07:35 UTC 6070
06:15-07:35 UTC 11760
16:30-17:00 UTC 9550, 9830, 4790
18:00-18:45 UTC 5055
19:00-20:15 UTC 3200

TRANS WORLD RADIO-Monte Carlo
06:00-08:00 UTC 7160
08:00-10:00 UTC 9610
18:00-18:30 UTC 9495

TRANS WORD RADIO, Bonaire, Netherlands Antilles
06:00-07:30 UTC 9535
11:10-13:00 UTC 11815
(Saturdays, to 14:05)

TRANS WORLD RADIO-KTWR, Guam
07:00-08:30 UTC 15115
13:00-14:30 UTC 9870

Giving My Heart

An excerpt from VARIATIONS ON THE THEME with Judi Harrison.

At Christmas time we are always so concerned with choosing gifts for our friends and relatives that we often neglect our gift to the Savior. One of my favorite Christmas poems is called "My Gift," written by Christina Rosseti:

What can I give Him
Poor as I am?
If I were a shepherd
I would give Him a lamb,
If I were a wise man,
I would do my part -
But what I can I give Him,
I give my heart.

Yes, as far as God is concerned the best way to celebrate Chirstmas is to tend to our hearts.

Into my heart, Into my heart,
Come into my heart, Lord Jesus.
Come in today, Come into stay,
Come into my heart, Lord Jesus.

By Harry D. Clarke

Let Jesus come into YOUR heart so you can spend eternity with Him.

Pen Pals

UWE KUSCHMANN - Dr. Rud. Breitscheid-Str. 7, 6500 Gera, German Democratic Republic - ANDEX 5412 - 23 years old and single - Hobbies are DXing, collecting postcards, patches, and stickers, writing to pen pals and music.

JUKKA MARIN - Ruskeisentie 24, 70900 Toivala, Finland - ANDEX 5736 - would like pen pals who are users of the Commodore computer.

ANDEX International

HCJB

is the official bi-monthly publication of Andes DXers International, a DX Club operated in conjunction with DX Party Line broadcast over Radio Station HCJB and sponsored by the World Radio Missionary Fellowship, Inc.

ANDEX INTERNATIONAL HCJB QUITO, ECUADOR

DX Party Line Host — John Beck

ADDRESS MAIL (with funds) to: HCJB-ANDEX, P.O. Box 553000, Opa Locka (Miami), Florida, 33055-0401, USA

ANDEX Director - Doris Hastings

ADDRESS MAIL (NO funds) to: ANDEX Internationl, Casilla 691, Quito, Ecuador

Write for a list of ANDEX offices in other countries for your payment convenience.

Printed in Ecuador, S.A. by Imprenta Vozandes