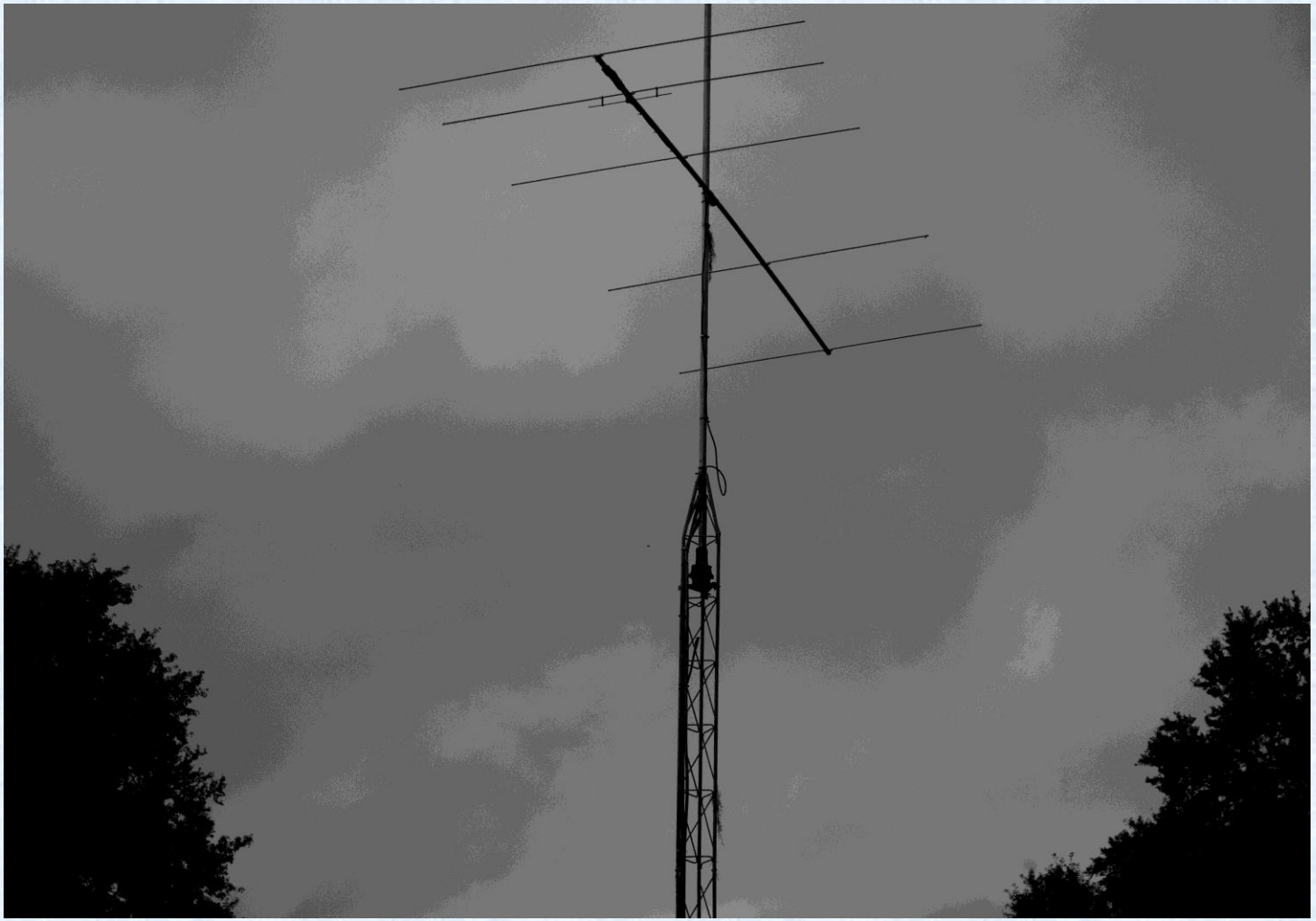
SSB and CW on VHF and UHF
(weak signal operation)



Buddy Morgan WB4OMG
Lakeland, FL
beamar@aol.com

This is an official presentation of the Florida Weak Signal Society

www.flwss.net

www.flwss.net

Walter Dail K4HV – President
Chuck Hoover K0VXM – Vice President
Jim Hagan NN4AA – Sec.-Treasurer

FLWSS meets quarterly

Weak Signal Operations

SSB, CW and narrow band digital terrestrial operation, on the bands above Ten-Meters.

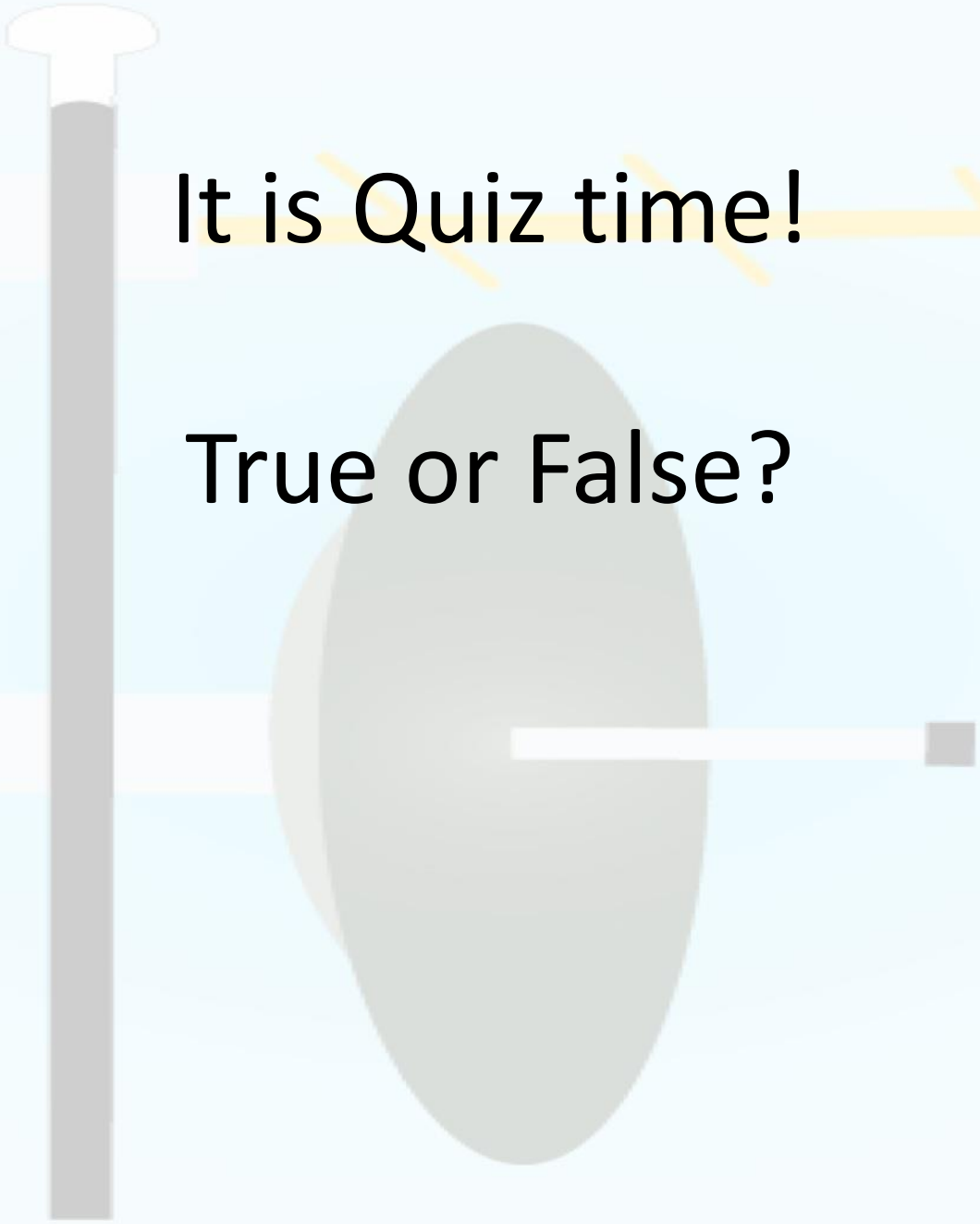
This presentation is just for fun!

- Grid Squares
- Inverse Square Law
- There is more to VHF Amateur Radio than repeaters
- You can talk farther on SSB than FM

The Electromagnetic Spectrum

- **V**ery **L**ow **F**requency 3 KHz ~ 30 KHz
- **L**ow **F**requency 30 KHz ~ 300 KHz (Longwave)
- **M**edium **F**requency 300 KHz ~ 3 MHz (Medium Wave)
- **H**igh **F**requency 3 MHz ~ 30 MHz (HF!)
- **V**ery **H**igh **F**requency 30 MHz ~ 300 MHz
- **U**ltra **H**igh **F**requency 300 MHz ~ 3 GHz
- **S**uper **H**igh **F**requency 3 GHZ ~ 30 GHz

- FM, TV and wide band digital (D Star, DMR, Fusion. NXDN, etc) are strong signal modes
- SSB, CW and WSJT (narrow digital) are weak signal modes
- AM is somewhere in between, but closer to FM than SSB
- You need a lot less signal strength for good communications with SSB vs. FM



It is Quiz time!

True or False?

The following radios only work FM on 6M, 2M and 440 MHz:

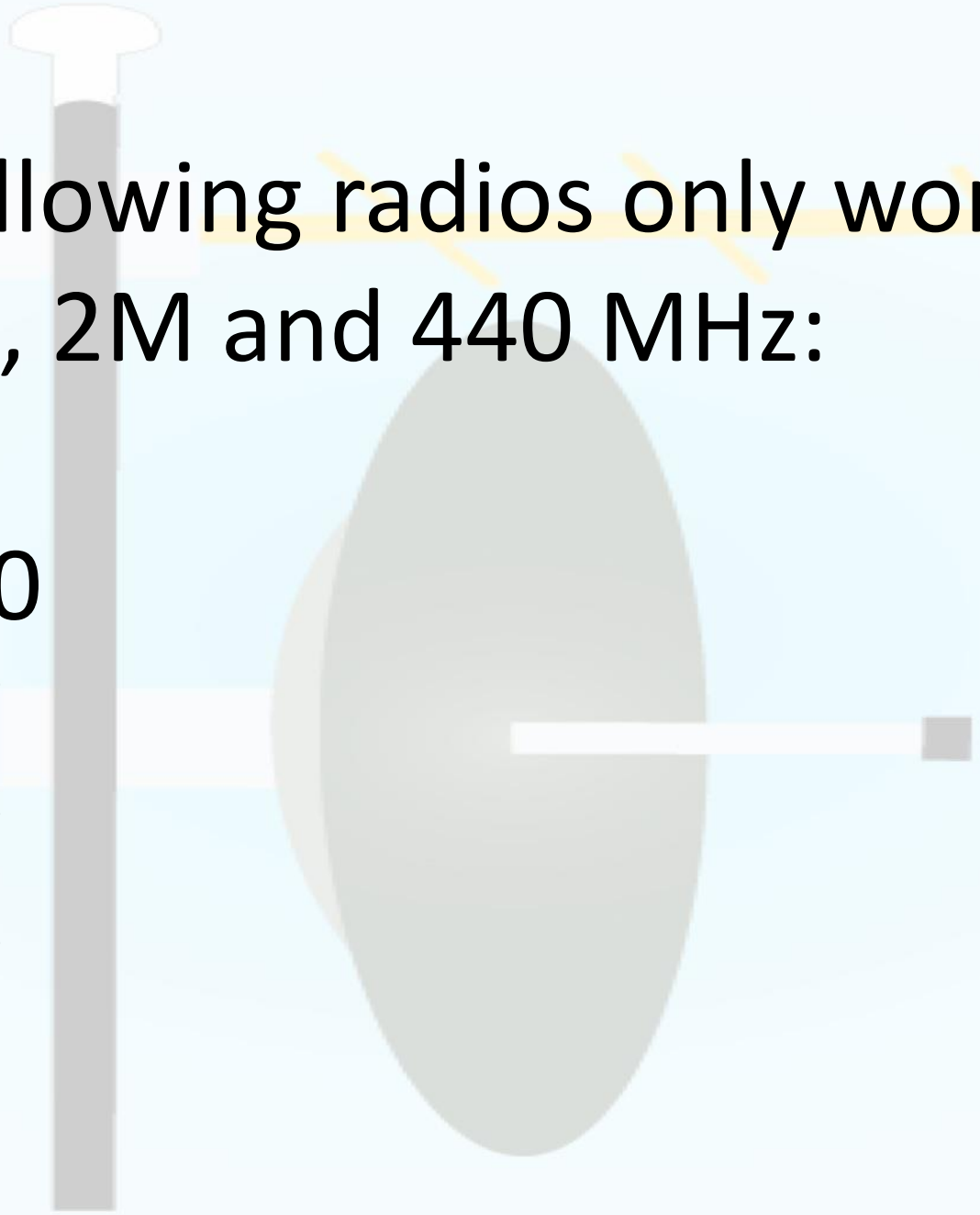
IC 706

IC 7000

FT 817

FT 857

FT 897



What can you do on VHF/UHF, SSB & CW?

- Work DX
- Contests (Five major and Ten minor contests)
- Chat with friends
- Collect Grid Squares – VUCC Awards, FFMA Award

- Grid Squares are a geographical coordinate system
- The most common system is latitude and longitude
- Grid square systems compress the lat/lon information into something easier to use

The Maidenhead Grid Square system

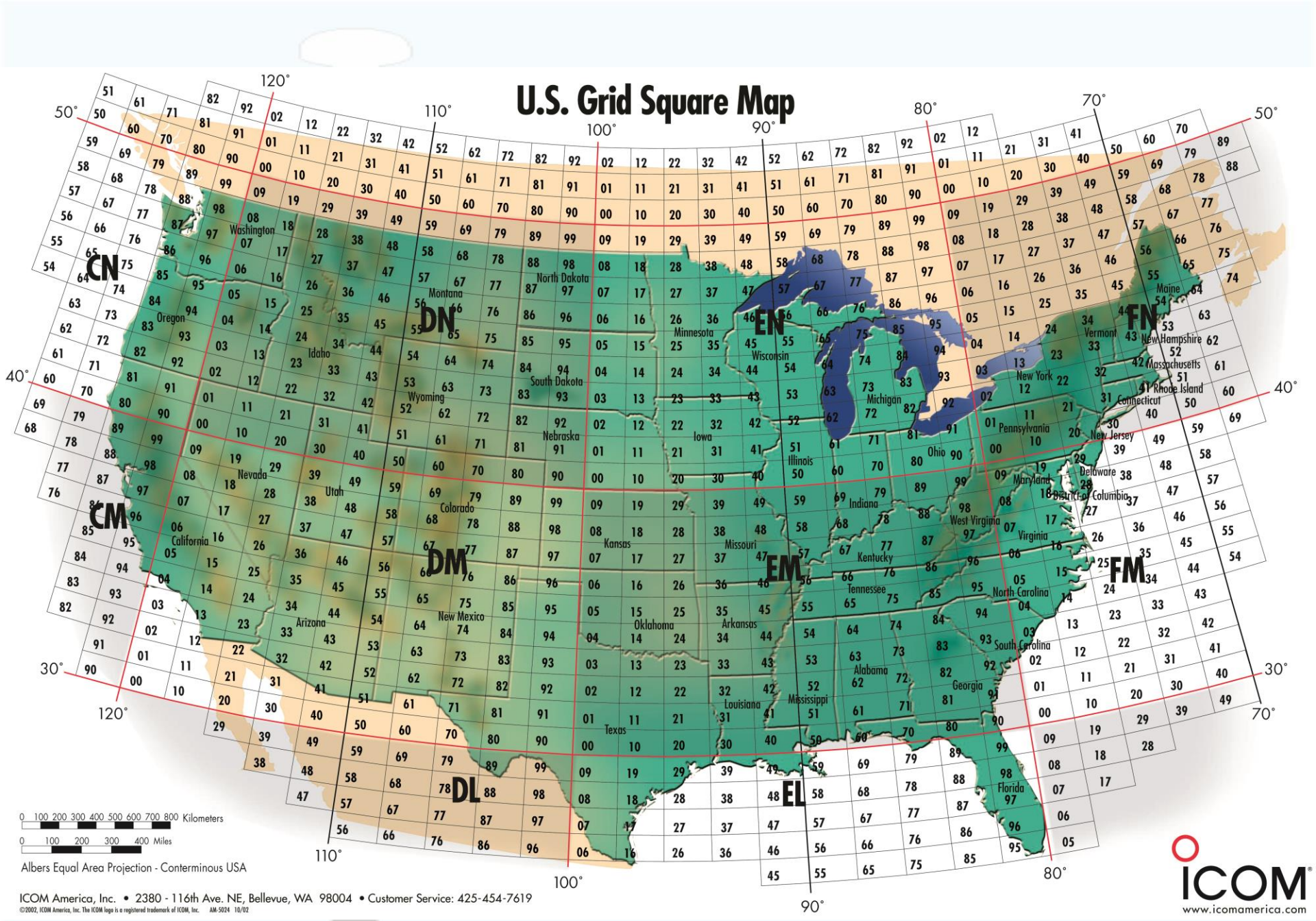
- Developed by John Morris, G4ANB
- Adopted at a meeting, of “VHF Managers”, at Maidenhead, in the UK, in 1980
- Establishes location by a series of alternating letters and numbers

Grid Squares

- Mostly used by weak signal operators to locate each other
- A concise, easy method to convey your location
- Grid Squares are a part of Amateur Radio and all hams should at least know what it is about

Maidenhead Grid Square System

- A rectangle that is two degrees of longitude wide and one degree of latitude high
- The world is divided up into 18 zones of longitude of 20 degrees each and 18 zones of latitude 10 degrees each
- These zones are encoded with the letters A through R. These zones are further subdivided into 10 sub zones, that are numbered 0~9



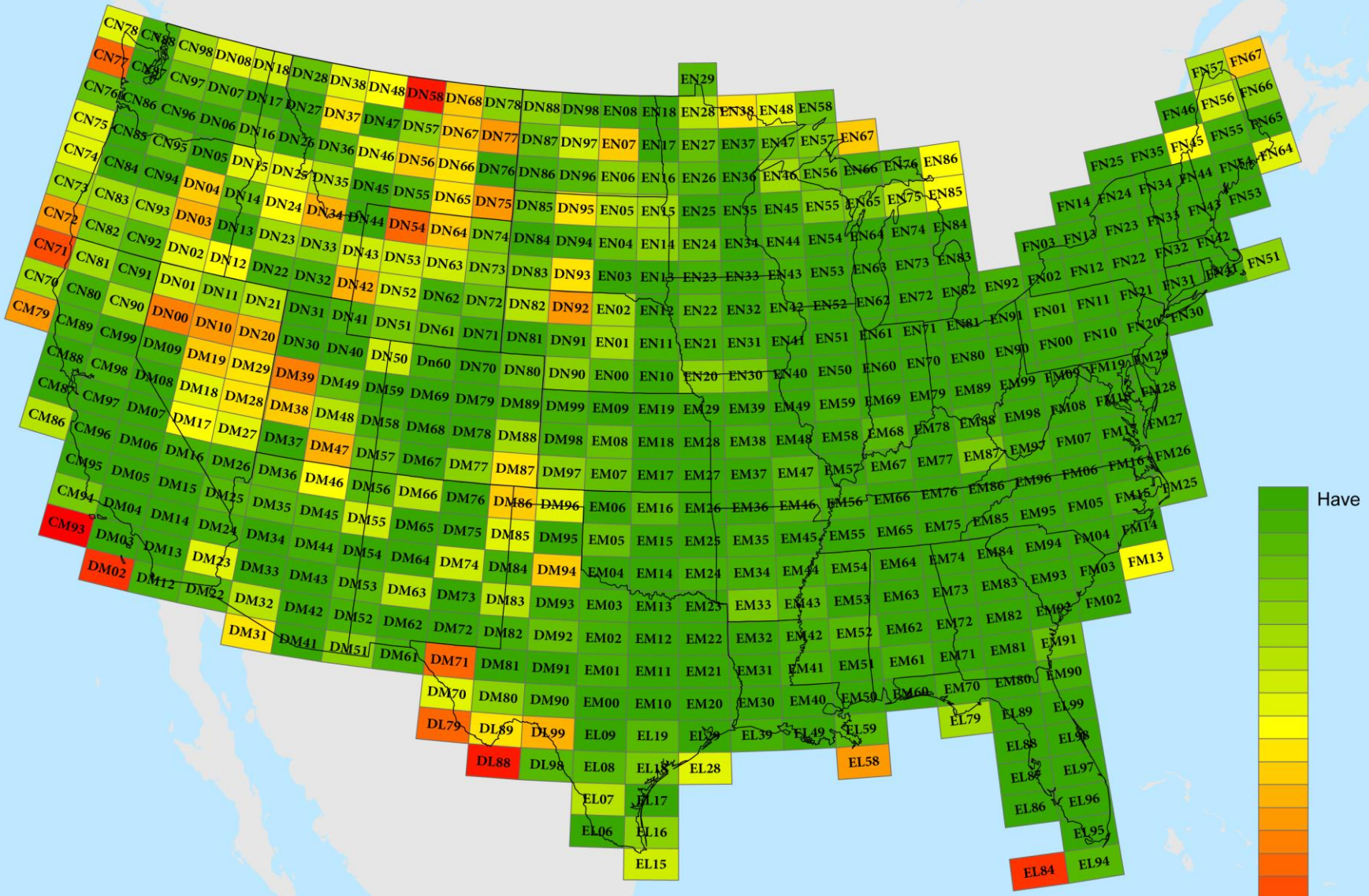
ICOM America, Inc. • 2380 - 116th Ave. NE, Bellevue, WA 98004 • Customer Service: 425-454-7619

ICOM
www.icomamerica.com

Grid Squares

- The grid square system starts out at AA00, somewhere around the Bering Sea, goes all the way around the world, West to East and winds up South of New Zealand, with RR99
- The most commonly used grid square designation is two letters and two numbers.
- I live in EL 98ad29. My hamshack is in EL98ad29hj. My tower is in EL 98ad29ij
- Right now we are in EL 98aa58fn

Fred Fish Memorial Award Most Wanted Grids



Available at http://www.merit.edu/~rjd/ffma.pdf
Produced by Russell Dwarshuis KB8U, December 30, 2010

What are some of the advantages of weak signal work?

- Antennas are small vs HF
- Portable and/or roving for people with HOA restrictions
- Roving is operating from more than one grid square, during a contest

WB4OMG/KF4TPW Rover

- IC 7100 (100 watts on 6M, 50W on 2M and 35 watts on 70 cm)
- 12 foot mast with a “drive over” mount
- Dipole for Six Meters
- Six Element Yagi for Two-Meters
- 18 Element Yagi for 70 cm
- Group 27 Gel Cell Battery

WA3RGQ/R on “Sugarloaf Mountain”, near Clermont, FL

More from “Sugarloaf”

Sandra, K4SME talking back to central Florida from the approaches to Jekyll Island, GA.

Photo by N2CEI

“When roving, always eat in nice restaurants.”

Jack WA2IID

Disadvantages:

- Lack of activity, at times.
- Small amount of technical knowledge required. (Help is available)

How do you get started in weak signal work?

Most HF radios built in the last 15 years have 6M. Some currently manufactured HF radios cover 2M and 70 cm.

Propagation on VHF and above

- In 1912 Frequencies above 1500 KHz were considered useless
- In 1925 40 Meters was considered of little value
- We got 10 Meters as a band, in 1927, but it was the early 1940's before it was deemed useful.

Propagation on VHF and above

- In 1945 Two Meters was called a “Flashlight band”
- In 1969, 220 MHz and higher were considered bands only for experimenters
- Today, many hams consider the frequencies above 450 MHz only to be useful for the military and cell phone companies

The free space attenuation of Electromagnetic waves is independent of frequency.

$$S = \frac{P_T}{4\pi d^2} \qquad \text{Watt/m}^2, \qquad (2)$$

The transmission loss then depends on how much of this power is captured by the receiving antenna, along the possible free space communication links. If the capture area, or effective aperture of this antenna is A_R, then the power P_R which can be delivered to the receiver (assuming no mismatch or feed line losses) is simply given as:

$$P_R = SA_R \qquad \text{Watt},$$

For the hypothetical isotropic receiving antenna (Kraus, 1988),

$$A_R = \frac{\lambda^2}{4\pi} \qquad \text{m}^2 \qquad (4)$$

Combining equations (2) and (4) into (2), yield:

$$P_R = P_T \left(\frac{\lambda}{4\pi d} \right)^2, \ \text{Watt}$$

The free space path loss between the isotropic antennas is P_R/P_T. Substituting $\lambda = c/f$ (where c, is the speed of light~3.0 $\times 10^8 ms\text{-}^1$) into Equation 5 to get:

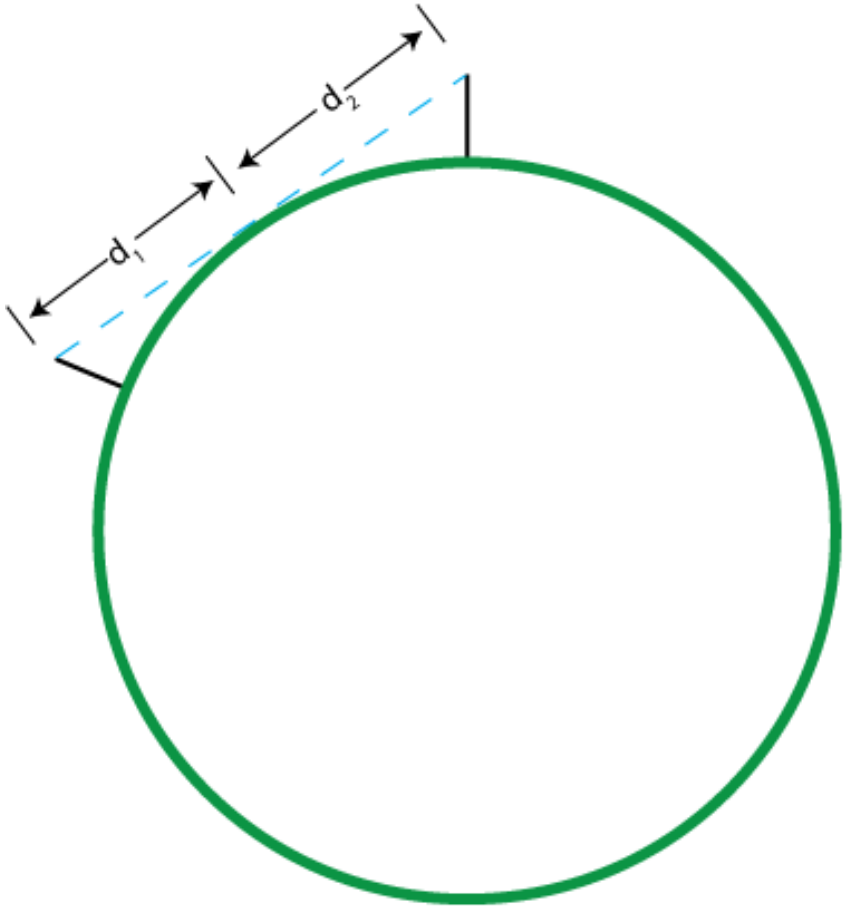
$$FSL = \left(\frac{4\pi}{c} \right)^2 f^2 d^2 ,$$

How to Cite this Article: Alade Olusope Michael, "Standardization of attenuation formula for radio waves propagation through free space (LOS) communication links" Science Journal of Physics, Volume 2012, Article ID sjp-281, 7 Pages, 2012. doi: 10.7237/sjp/281

Propagation Modes

- Line of Sight: typical of most FM and repeater operation
- Tropospheric Scatter
- Tropospheric Bending
- Sporadic E (Ionospheric) Skip
- Meteor Scatter
- Ionospheric Scatter
- F2 Layer (Ionospheric) Skip
- EME
- Rain Scatter

Line of Sight



$$d = 1.41\sqrt{h}$$

Line of Sight Distances

- Mobile to Mobile, six feet height–7 miles
- 25 foot high base station to another 25 foot high base station–14 miles
- Mobile to a 200 foot high repeater–23 miles
- Mobile to a 1000 foot high repeater–47 miles
- Two 100 foot high base stations–28 miles

Tropospheric Scatter

Troposcatter is always present, on the VHF and above bands.


Sun is now below the horizon


About five minutes after sunset

Tropospheric Scatter

All Electromagnetic waves are diffused or scattered by the atmosphere. This scattering, *by my reckoning*, seems to become recognizable around 12 Meters and continues to visible light. Optimal frequency for Troposcatter, *in my opinion*, is between 144 and 225 MHz.

Tropospheric Bending

Electromagnetic (Radio) waves are bent in the Troposphere. Mostly occurs on Two-Meters and higher in frequency. “A band opening”

Ionospheric Propagation

- F2 Layer Skip
- Sporadic E Skip
- Meteor Scatter
- Ionospheric Scatter

F2 Layer Skip

- The usual propagation mode on HF
- Does occur on Six Meters during Sunspot highs
- Occurs a lot more often on 6M than was previously believed

Sporadic E Skip

- Signals bounce off “clouds” in the E layer of the ionosphere
- Occurs often on 10M and 6M
- Happens a few times a year on Two-Meters
- Can occur anytime of the day or night, anytime of the year. But seems to occur more often on summer afternoons.

Meteor Scatter

- A meteor entering the earth's atmosphere leaves an ionized trail that will reflect radio waves for a few seconds.
- Mostly done during major meteor showers
- You have to be quick
- You have to be patient
- It takes two well equipped stations
- Mostly done on Six and Two meters

Ionospheric Scatter

- The Ionosphere will always reflect signals between (about) 30 MHz and 100 MHz, regardless of MUF, over 600~1400 mile paths
- Six meters is the only ham band that IS where is feasible
- High power and a large yagi are required

Miscellaneous Propagation Modes

- There are a lot of them!
- EME–Earth Moon Earth or Moonbounce
- Rain Scatter–mostly used on microwaves

Operating Techniques

- Not channelized; Not at all like FM
- Operating techniques are like HF
- All weak signal work is horizontally polarized and on the low end of the band

Six-Meters (50 MHz)

- The Magic Band
- Just about any propagation mode…
- F2, Es, EME, IS, MS are most common
- Tropo. Bending does occur on 6M
- EME is done every day. Have lots of real estate, a quiet location and be prepared to make a major investment in Antennas

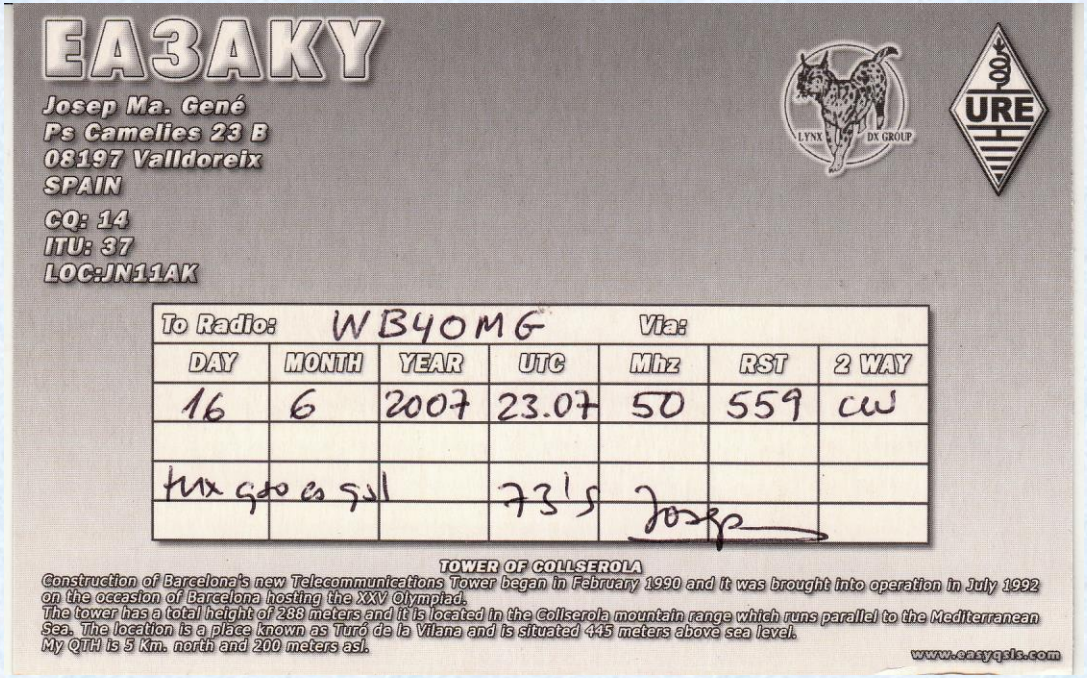
Six-Meters (continued)

- Meteor Scatter
- Ionospheric Scatter work around 1000 miles without a band opening using legal limit power
- EMC: Only Six TV Stations left on RF Channel 2. Closest in AZ
- Many HF Rigs work on 6M

Six-Meters (continued)

- Don’t need Heliax, LMR 400 type cables: .9 db loss per 100 feet @ 6M
- A modest station can work Es, F2 and 100+ miles locally
- 100 watts and a Horizontal Three element yagi @ 35 feet is “a nice 6M station”

100 watts and a three element beam @ 35 feet on Six Meters



Six-Meters (continued)

- Tropospheric propagation not as good as higher bands
- For local contacts and Tropo. more height, helps
- Impulse noise is a problem with 6M as compared to the higher bands
- If you want to do something serious, like EME or IS you need a quiet location

Six-Meters (continued)

- 50.125 is the domestic SSB calling frequency 50.110 International
- Lots of CW during openings between 50.080 and 50.100
- During F2 openings, or multi hop E skip openings, you can work the world!
- Brandon ARS Net 50.200 MHz, 7 pm Tuesdays

Getting on Six-Meters SSB

- Antenna needs to be horizontal
- Build a dipole
- Buy a Omni Directional Loop from Par or M^2
- Buy a yagi
- Get the antenna as high as you can and use good quality coaxial cable
- HF antennas with tuners are OK, but, that's all

Four-Metres

- 70.0~70.5 MHz in most European and African Countries
- Not a US band, our TV Channel 4
- Interesting propagation
- Only two TV stations left on RF Channel 4
- Write your congressman

Two-Meters (144 MHz)

- Everybody owns a 2M FM radio
- Many own a FT897 or IC 706 and never pushed the SSB button above 10M.
- 2M is our most active Amateur band
- Tropo, MS and Es usual enhanced modes
- Antennas are 1/3 the size of Six-Meters

Two-Meters (continued)

- Tropo openings much easier with SSB than with FM
- E skip can be really fun
- To do really well your antenna should be above the trees
- Buy the largest yagi you can afford
- Noise is much less of a problem on 2M, than the lower bands

Two-Meters (continued)

- Troposcatter is the usual local propagation mode (dead band)
- 25 watts and a small yagi: 125 miles easy
- Legal Limit Power and a long yagi above local obstructions: 500+ miles under dead band conditions
- 144.200 is the calling frequency
- North Georgia Net 144.210 Monday @ 8 pm

Mobile Operation on Two-Meters

Mobile Operation on Two-Meters

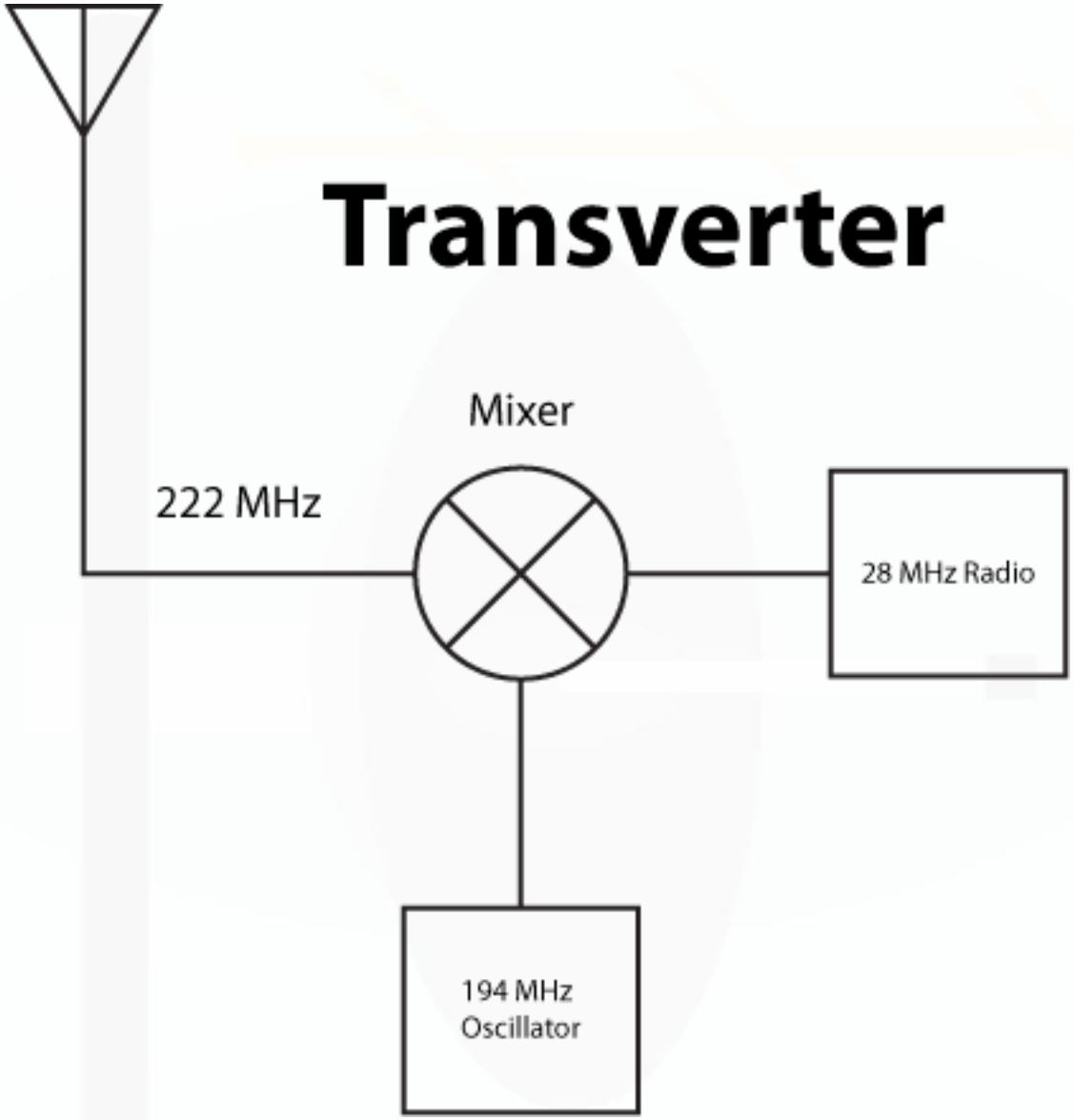
- Horizontal Loops available from several companies
- 10+ mile range, mobile to mobile with 4 watts
- 25 mile range, mobile to mobile with 50 watts
- Using 50 watts: 125+ miles to a fixed station with a yagi above the trees
- I have worked mobiles over 200 miles, under dead band conditions

Type N Connector

222 MHz (1.25 or 1 ¼ M)

- Not as active as 2M or 432
- A IARU Region II Band
- Ionospheric propagation rarely occurs
- Tropo bending can be better than 2M
- Transverters only

Transverter



222 MHz (continued)

- Antenna above the trees is more important than on 2M
- Feedline loss more of a problem, use 5/8” Heliax
- Seriously Consider using something other than a UHF connector
- Normal Troposcatter is similar to 2M
- 222.1 MHz is the calling frequency

432 MHZ (70 cm)

- All the bands above 225 MHz are shared bands
- Amateur Radio is a secondary allocation
- RADAR
- Ionospheric propagation virtually unknown
- Troposcatter not quite as good as 2M. Deep quick fades
- ~500 miles under dead band conditions is doable, between well equipped stations

432 MHZ (continued)

- During Tropo. openings, usually can’t talk as far as on 2M or 222 MHz
- Lots of Radios that work 70 cm SSB
- Feedline losses much more of a problem, use 7/8” Heliax
- You really ought to be using N Connectors
- Having your antenna in the clear is very important

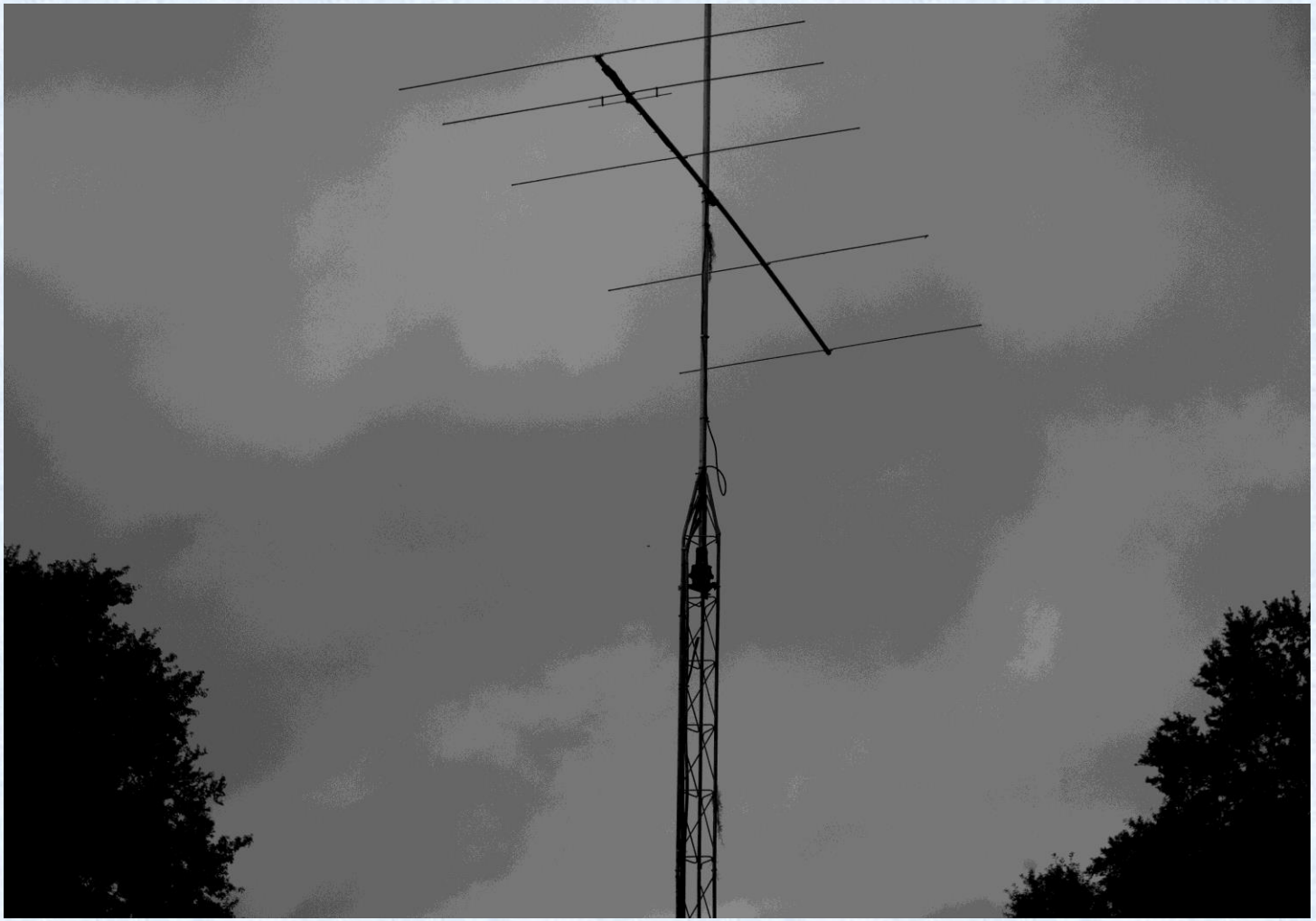
432 MHZ (continued)

- 50 watt power limitation here in Florida
- Antenna patterns are sharp
- Used to coordinate higher band contacts
- 432.100 is the calling frequency
- FLWSS Net 8:30 pm, Thursdays 432.090 USB
- East Coast Net 432.090 Wednesdays 9:00 pm

900 MHz (33 cm)

- A IARU Region II Band
- Propagation similar to 432
- Transverter
- Feedline losses much higher, use 1 1/4” Heliax
- N, TNC, BNC or SMA Connectors are mandatory
- Loop Yagis are the norm

Linear Yagi



Loop Yagi

Photo courtesy of Directive Systems

900 MHz (continued)

- ISM and LMRS band – hams way down the list
- Interference can be a problem
- LMRS antennas and Power Amplifiers are available
- Your antenna **needs** to have a clear view of the horizon

1296 MHz (23 cm or 1.2 GHz)

- RADAR is a problem in some areas
- Power Line noise and static crashes are close to non existent
- Not going to talk as far as the lower bands
- Transmission line and power are expensive

1296 MHz (continued)

- Highest Frequency band you can buy everything you need from the mass merchant amateur radio supply stores
- Icom IC 9100, Kenwood TS 2000 or a Transverter
- 1 ¼” or 1 5/8” Heliax
- Loop Yagis seem to work a little better than Linear yagis
- Accurately determining your frequency is a problem

1296 MHz (continued)

- 0.5 parts per million frequency stability
- On 80 meters, .5 ppm is two Hertz
- On 23 cm (1296 MHz or 1.2 GHz) .5 ppm is 648 Hz
- 1296.100 MHz is the call frequency

2304 (13 cm) and 3456 MHz (9 cm)

- For those truly interested
- 2304 is the highest band that a linear yagi is available
- 3456 is the highest band that a loop yagi is available
- 2304 is highest band that you can get Bird 43 slugs
- Transverters only

2304 and 3456 MHz (continued)

- 15 watts and a Loop Yagi in the clear: 100 miles perfect copy SSB
- I have worked 325 miles on 2304, under dead band conditions with 12 watts
- 3456 is the highest frequency rag-chew band

2304 and 3456 MHz (continued)

- Frequency accuracy is a problem
- GPS frequency standard: 42 parts per trillion, at home
- OCXO, 1 part per billion Standard, Portable
- A lot of people mount their transverters on their tower

5760 MHz (6 cm)

- Also a WiFi and Commercial band
- If you are going to talk very far, you are going to use a dish
- Highest frequency band that coaxial cable is feasible
- 80 miles under dead band conditions with 2.5 watts and a Two-foot dish @ Six feet
- More people with portable stations than home stations, for example – me!

10, 24 and 47 GHz

- All the challenges of the lower bands
- Aiming your dish can be difficult
- Waveguide
- Tower Mounted Equipment or portable

“WA3PTV at FN00wc, 2100 feet, working AF1T in Rhode Island, on 10 GHz, 400 miles over many mountain ranges, to a station at sea level, but very little of the path was over water. It was a real tough contact. It was a tough path even on 2 meters.”

Don, WA3RGQ, Winter Haven, FL.

Steve, N2CEI, on the left. Wil WJ9B, formerly of Gainesville on the right.
Photo by N2CEI

The higher bands, lots of challenges:

76 GHz

No Commercially available transverters, available.

Commercial Dish available from one manufacturer

123 GHz

No Commercial equipment or antennas available

141 GHz

No Commercially available transverters.

Commercial Dish available from one manufacturer

241 GHz and above

You are own your own!

Laser using the Ramsey Kits

So, how far can you talk using SSB or CW on VHF?

If you can talk to someone on 10M Skywave, you can do it on 6M, but not as often. 6M Tropo is actually easier than 10M.

The higher bands are another story…

The following slides are from a presentation from Chuck Hoover, K0VXM, Merritt Island, FL

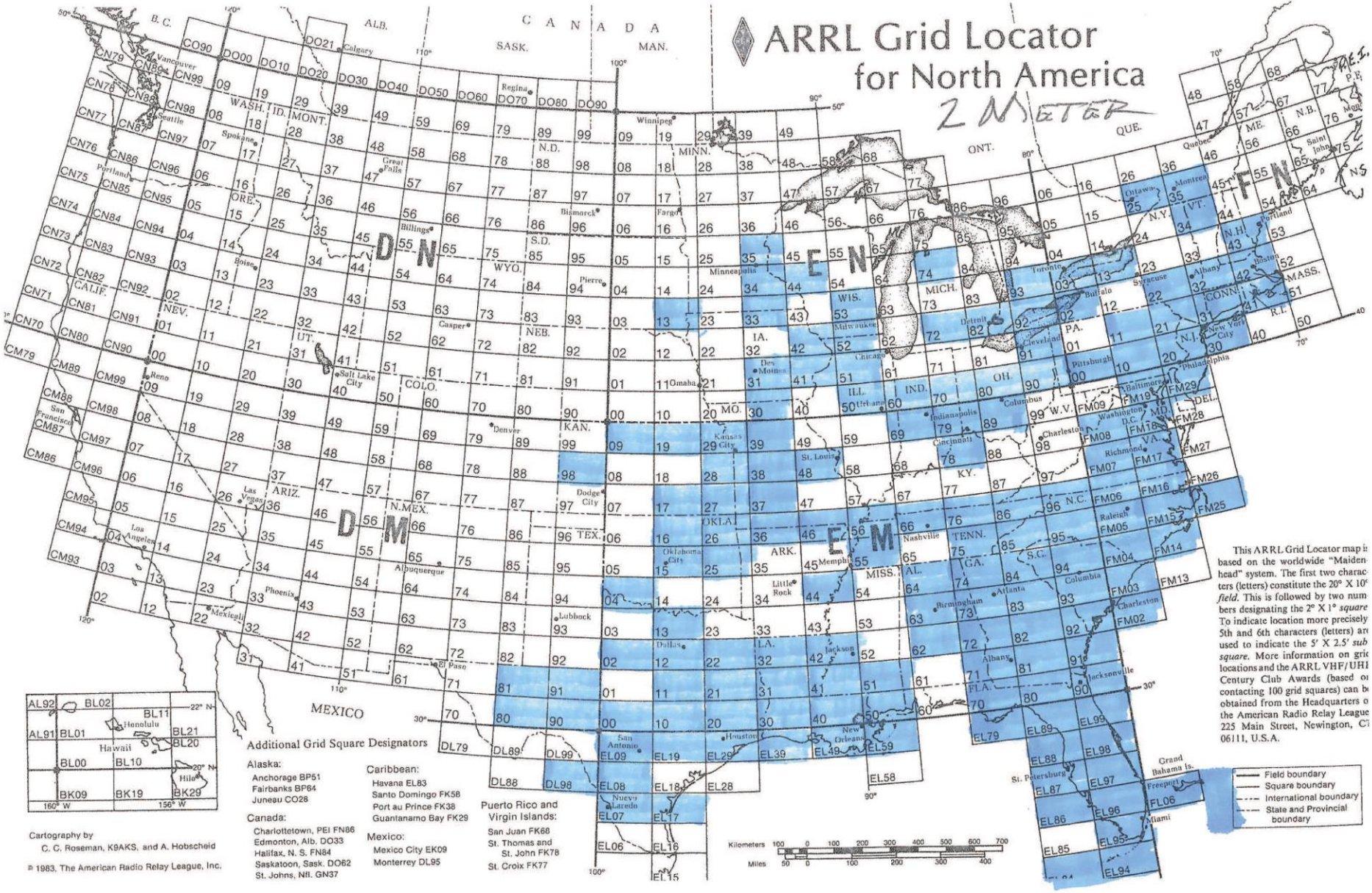
Used with permission

Chuck’s Station

K0VXM Power on each band

- 6M & 2M 100 watts
- 222 150 watts
- 432 30 watts
- 902 80 watts
- 1296 15 watts
- 2304 50 watts
- 3456 20 watts
- 5760 7 watts
- 10 GHz 7 watts

Chuck's antennas are all between 30 and 40 feet high


ARRL Grid Locator
for North America
2 METER
CANADA
B.C.
ALB.
SASK.
MAN.
ONT.
QUE.
MEXICO
WASH.
ORE.
CALIF.
NEV.
IDAH.
MONT.
WYO.
N.D.
S.D.
NEB.
COLO.
UTAH
ARIZ.
N.MEX.
KAN.
OKLA.
TEX.
MINN.
IOWA
MO.
ARK.
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WIS.
ILL.
MICH.
IND.
OHIO
KY.
TENN.
MISS.
ALA.
GA.
FLA.
S.C.
N.C.
VA.
W.V.
PA.
N.Y.
MD.
DEL.
N.J.
CONN.
R.I.
MASS.
VT.
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ME.
Vancouver
Seattle
Portland
Spokane
Great Falls
Billings
Bismarck
Fargo
Minneapolis
Winnipeg
Calgary
Regina
Boise
Pierre
Casper
Reno
Salt Lake City
Denver
Omaha
Des Moines
Chicago
Milwaukee
Detroit
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Buffalo
Ottawa
Montreal
Quebec
Saint John
Portland
Boston
Albany
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Washington D.C.
Columbus
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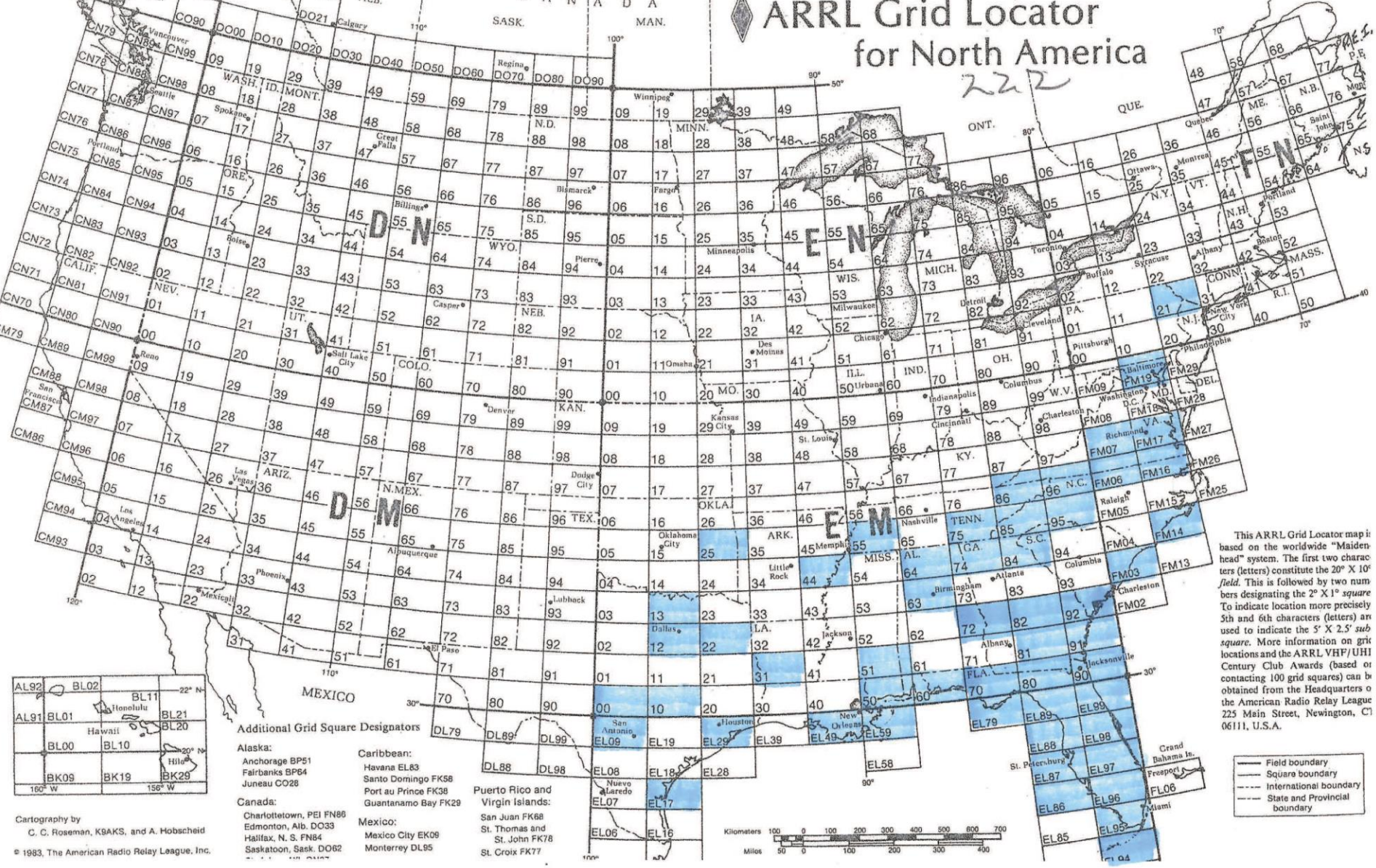
Charleston
Richmond
Raleigh
Nashville
Memphis
Little Rock
Kansas City
St. Louis
Oklahoma City
Dodge City
Dallas
Lubbock
Albuquerque
El Paso
Las Vegas
Phoenix
Los Angeles
San Francisco
Mexicali
Honolulu
Hawaii
Hilo
Houston
San Antonio
New Orleans
Jackson
Birmingham
Atlanta
Albany
Columbia
Charleston
Jacksonville
Miami
St. Petersburg
Grand Bahama Is.
Freeport
Nuevo Laredo
Additional Grid Square Designators
Alaska:
Anchorage BP51
Fairbanks BP64
Juneau CO28
Canada:
Charlottetown, PEI FN86
Edmonton, Alb. DO33
Halifax, N. S. FN84
Saskatoon, Sask. DO62
St. Johns, Nfl. GN37
Caribbean:
Havana EL83
Santo Domingo FK58
Port au Prince FK38
Guantanamo Bay FK29
Mexico:
Mexico City EK09
Monterrey DL95
Puerto Rico and Virgin Islands:
San Juan FK68
St. Thomas and St. John FK78
St. Croix FK77
Cartography by
C. C. Roseman, K9AKS, and A. Hobscheid
© 1983, The American Radio Relay League, Inc.
Kilometers
Miles
Field boundary
Square boundary
International boundary
State and Provincial boundary
This ARRL Grid Locator map is based on the worldwide "Maidenhead" system. The first two characters (letters) constitute the 20° X 10° field. This is followed by two numbers designating the 2° X 1° square. To indicate location more precisely 5th and 6th characters (letters) are used to indicate the 5' X 2.5' subsquare. More information on grid locations and the ARRL VHF/UHF Century Club Awards (based on contacting 100 grid squares) can be obtained from the Headquarters of the American Radio Relay League 225 Main Street, Newington, CT 06111, U.S.A.

Two Meters


ARRL Grid Locator
for North America
222
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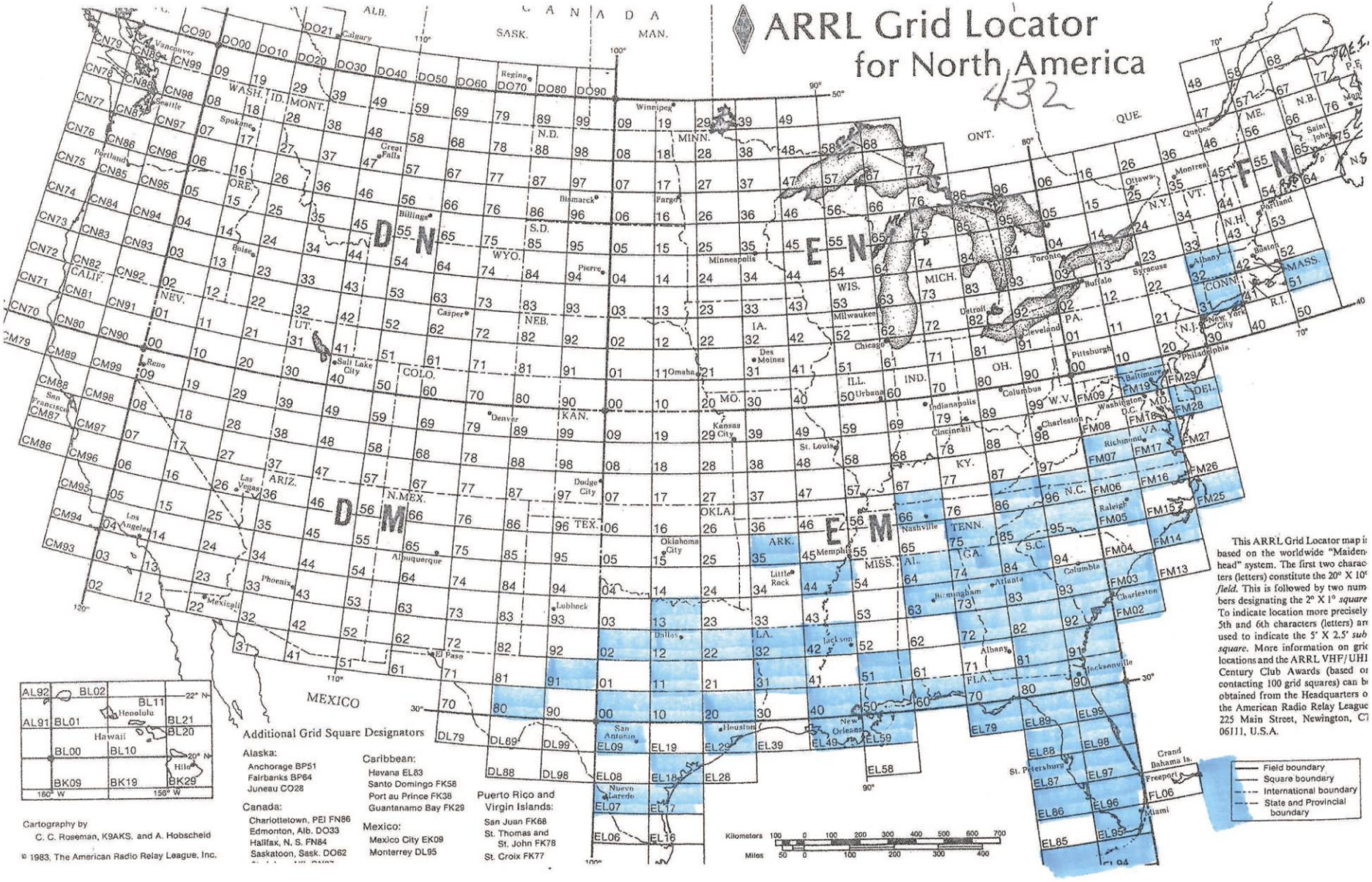
Square boundary
International boundary
State and Provincial boundary
Kilometers
Miles

222 MHz


ARRL Grid Locator
for North America
432
CANADA
ALB.
SASK.
MAN.
ONT.
QUE.
MEXICO
Hawaii
Honolulu
Additional Grid Square Designators
Alaska:
Anchorage BP51
Fairbanks BP64
Juneau CO28
Canada:
Charlottetown, PEI FN86
Edmonton, Alb. DO33
Halifax, N. S. FN84
Saskatoon, Sask. DO62
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Havana EL83
Santo Domingo FK58
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San Juan FK68
St. Thomas and St. John FK78
St. Croix FK77
Cartography by
C. C. Roseman, K9AKS, and A. Hobscheid
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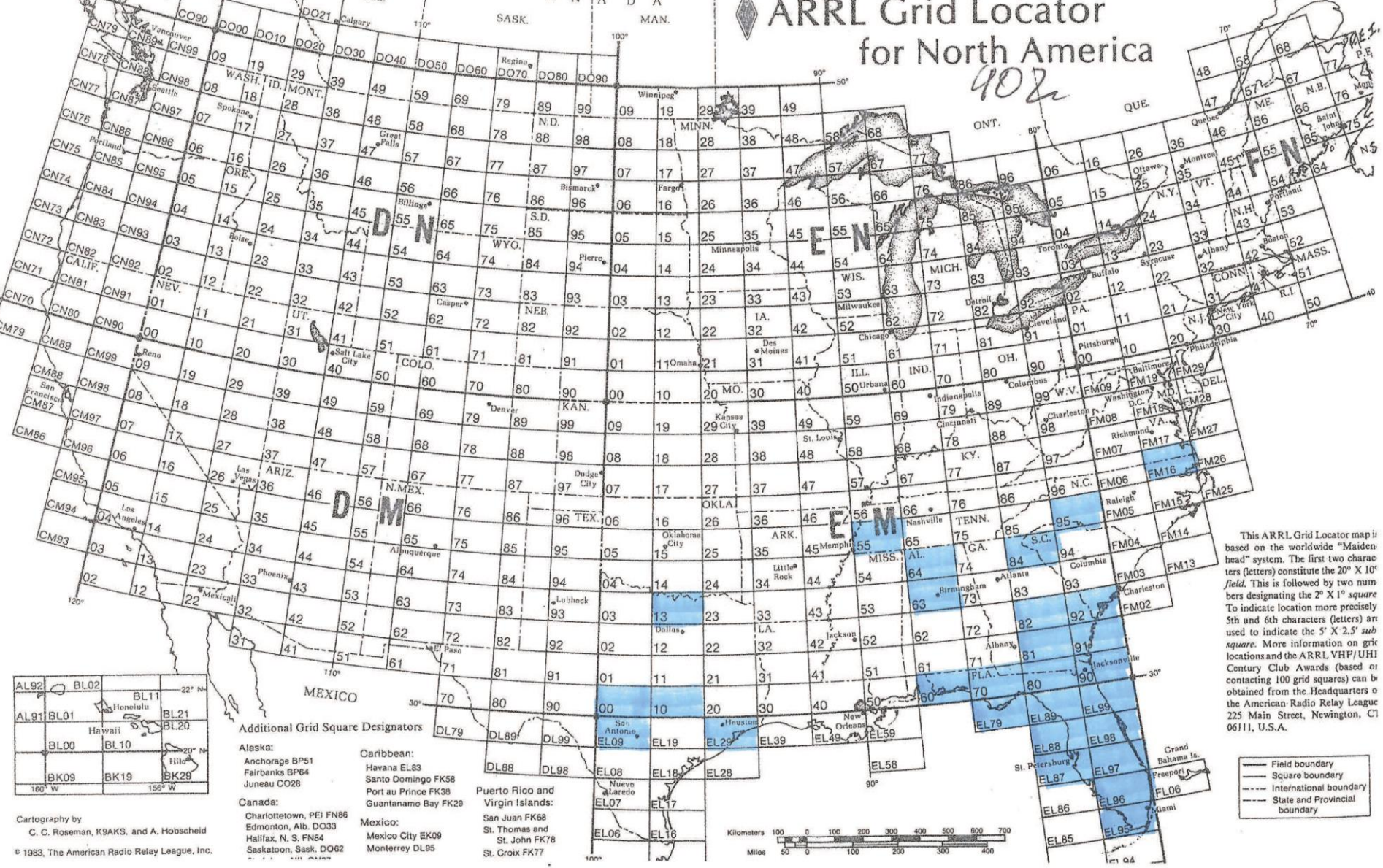
Field boundary
Square boundary
International boundary
State and Provincial boundary
Kilometers
Miles

432 MHz


ARRL Grid Locator
for North America
902
Additional Grid Square Designators
Alaska:
Anchorage BP51
Fairbanks BP64
Juneau CO28
Canada:
Charlottetown, PEI FN86
Edmonton, Alb. DO33
Halifax, N. S. FN84
Saskatoon, Sask. DO62
Caribbean:
Havana EL83
Santo Domingo FK58
Port au Prince FK38
Guantanamo Bay FK29
Mexico:
Mexico City EK09
Monterrey DL95
Puerto Rico and Virgin Islands:
San Juan FK68
St. Thomas and St. John FK78
St. Croix FK77
Cartography by
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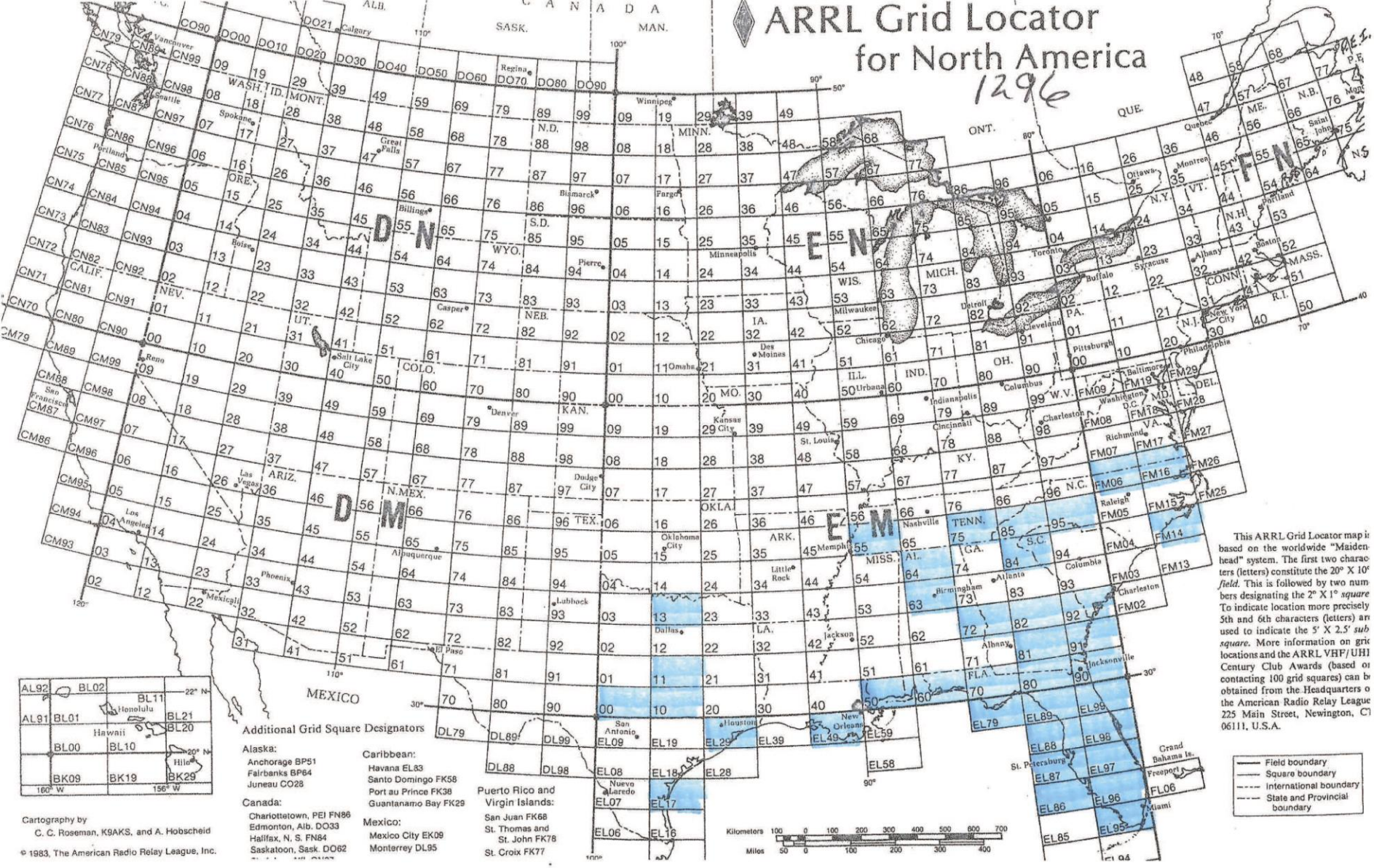
Field boundary
Square boundary
International boundary
State and Provincial boundary
Kilometers
Miles
MEXICO

902 MHz


ARRL Grid Locator
for North America
1296
CANADA
ALB.
SASK.
MAN.
ONT.
QUE.
MEXICO
Additional Grid Square Designators
Alaska:
Anchorage BP51
Fairbanks BP64
Juneau CO28
Canada:
Charlottetown, PEI FN86
Edmonton, Alb. DO33
Halifax, N. S. FN84
Saskatoon, Sask. DO62
Caribbean:
Havana EL83
Santo Domingo FK58
Port au Prince FK38
Guantanamo Bay FK29
Mexico:
Mexico City EK09
Monterrey DL95
Puerto Rico and Virgin Islands:
San Juan FK68
St. Thomas and St. John FK78
St. Croix FK77
Hawaii
Honolulu
Hilo
Cartography by
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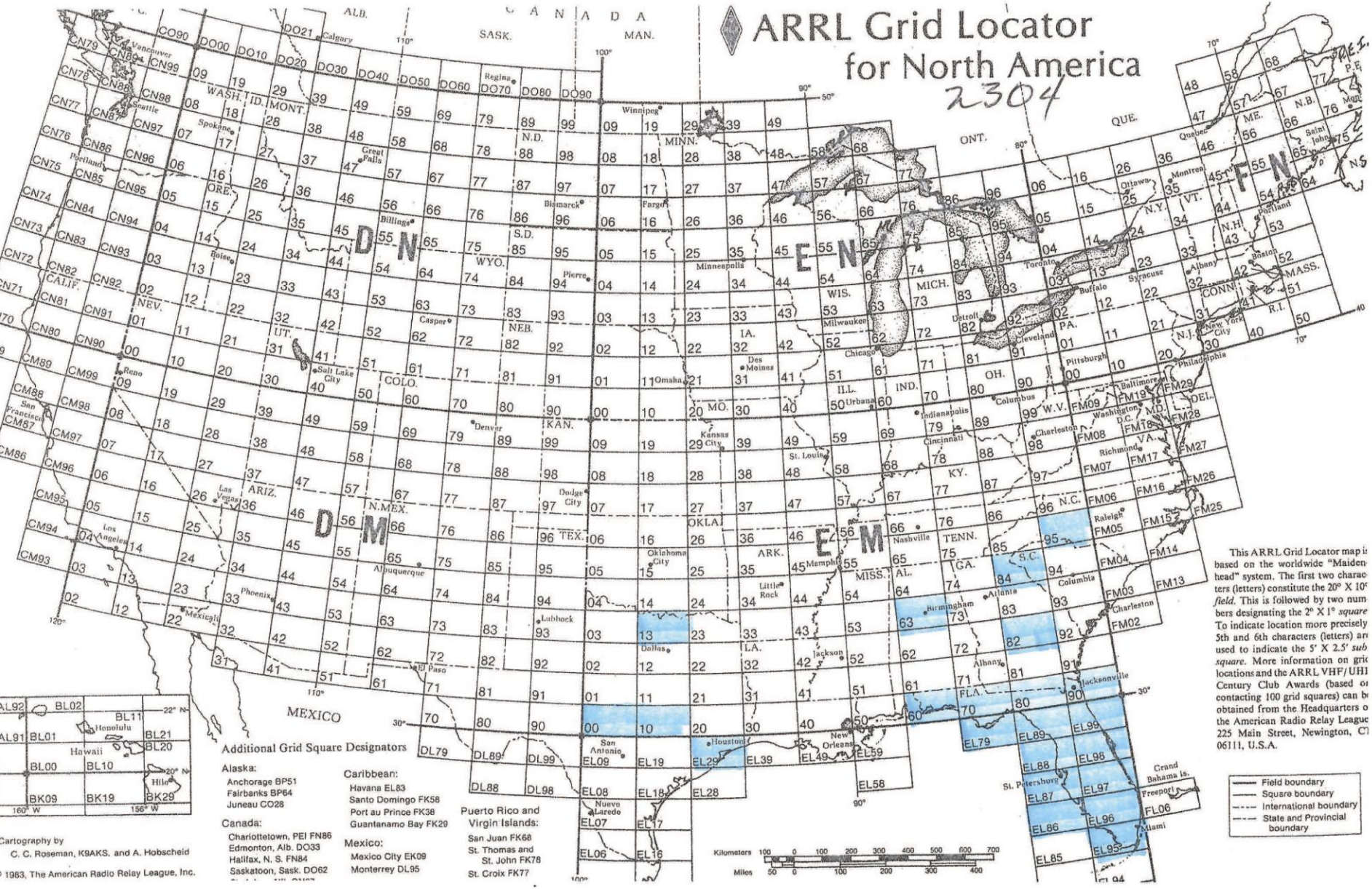
Field boundary
Square boundary
International boundary
State and Provincial boundary
Kilometers
Miles

1296 MHz


ARRL Grid Locator
for North America
2304
CANADA
ALB.
SASK.
MAN.
ONT.
QUE.
MEXICO
Additional Grid Square Designators
Alaska:
Anchorage BP51
Fairbanks BP64
Juneau CO28
Canada:
Charlottetown, PEI FN86
Edmonton, Alb. DO33
Halifax, N. S. FN84
Saskatoon, Sask. DO62
Caribbean:
Havana EL83
Santo Domingo FK58
Port au Prince FK38
Guantanamo Bay FK29
Mexico:
Mexico City EK09
Monterrey DL95
Puerto Rico and Virgin Islands:
San Juan FK68
St. Thomas and St. John FK78
St. Croix FK77
Hawaii
Honolulu
Hilo
Cartography by
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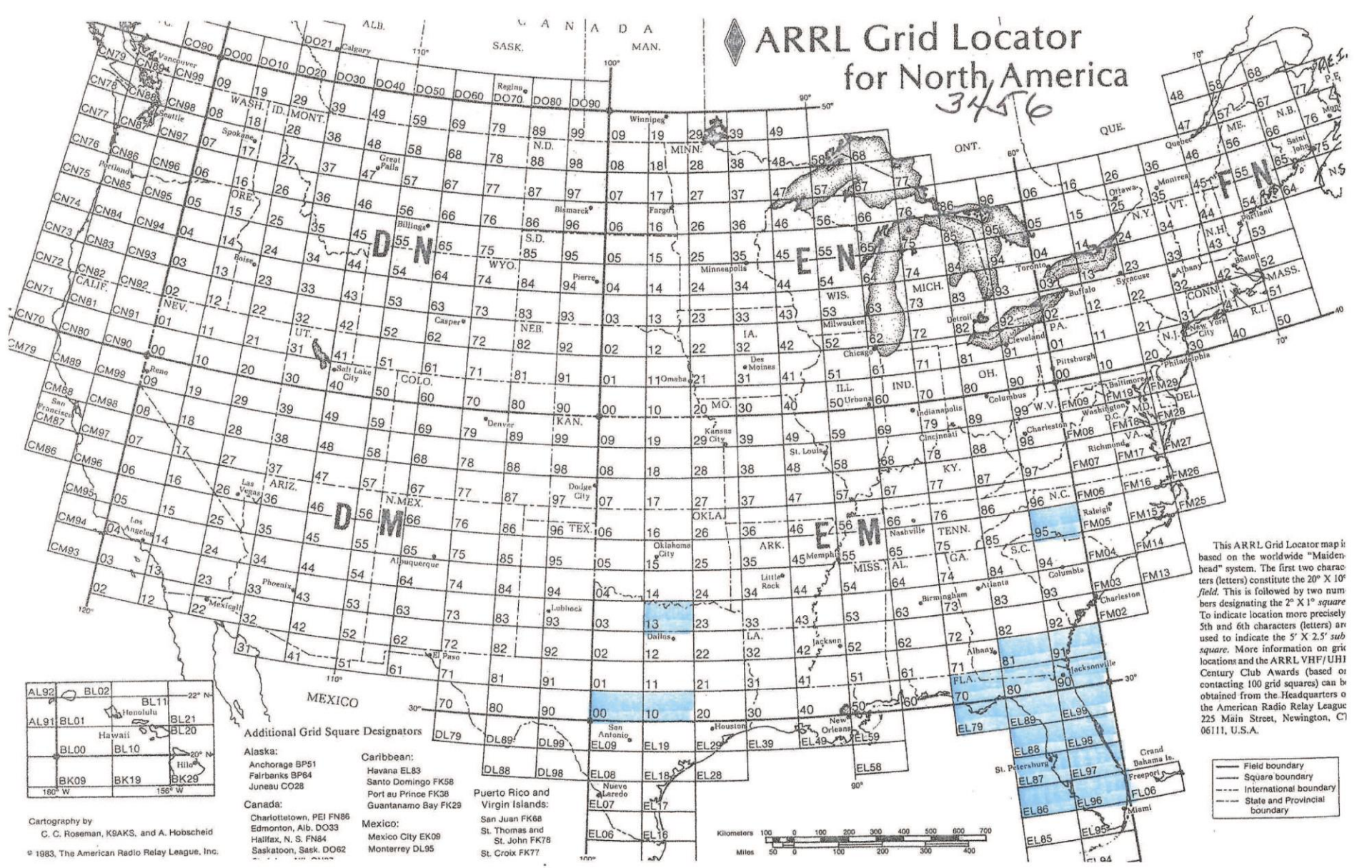
Field boundary
Square boundary
International boundary
State and Provincial boundary
Kilometers
Miles

2304 MHz


ARRL Grid Locator
for North America
3456
CANADA
ALB.
SASK.
MAN.
ONT.
QUE.
MEXICO
Additional Grid Square Designators
Alaska:
Anchorage BP51
Fairbanks BP64
Juneau CO28
Canada:
Charlottetown, PEI FN86
Edmonton, Alb. DO33
Halifax, N. S. FN84
Saskatoon, Sask. DO62
Caribbean:
Havana EL83
Santo Domingo FK58
Port au Prince FK38
Guantanamo Bay FK29
Mexico:
Mexico City EK09
Monterrey DL95
Puerto Rico and Virgin Islands:
San Juan FK68
St. Thomas and St. John FK78
St. Croix FK77
Cartography by
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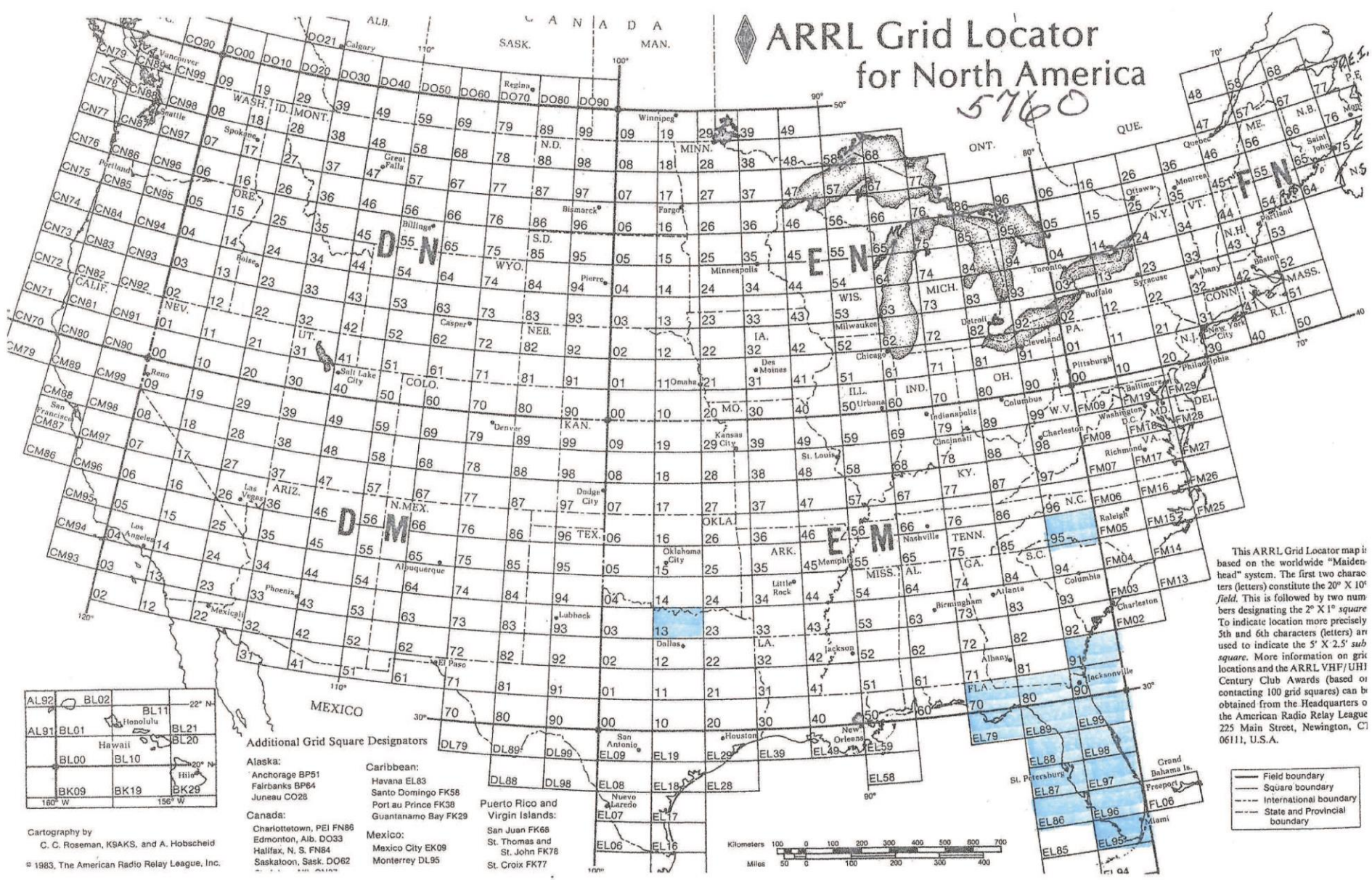
Field boundary
Square boundary
International boundary
State and Provincial boundary

3456 MHz


ARRL Grid Locator
for North America
5760
CANADA
ALB.
SASK.
MAN.
ONT.
QUE.
MEXICO
WASH.
ID.
MONT.
ORE.
CALIF.
NEV.
ARIZ.
UT.
COLO.
WYO.
N.MEX.
N.D.
S.D.
NEB.
KAN.
OKLA.
TEX.
MINN.
IOWA
MO.
ARK.
LA.
WIS.
ILL.
MICH.
IND.
OHIO
KY.
TENN.
MISS.
ALA.
GA.
FLA.
S.C.
N.C.
VA.
W.V.
PA.
N.Y.
MD.
DEL.
N.J.
CONN.
R.I.
MASS.
VT.
N.H.
ME.
N.B.
P.E.I.
N.S.
D N
E N
D M
E M
F N
Additional Grid Square Designators
Alaska:
Anchorage BP51
Fairbanks BP64
Juneau CO28
Canada:
Charlottetown, PEI FN86
Edmonton, Alb. DO33
Halifax, N. S. FN84
Saskatoon, Sask. DO62
Caribbean:
Havana EL83
Santo Domingo FK58
Port au Prince FK38
Guantanamo Bay FK29
Mexico:
Mexico City EK09
Monterrey DL95
Puerto Rico and Virgin Islands:
San Juan FK68
St. Thomas and St. John FK78
St. Croix FK77
Hawaii
Cartography by
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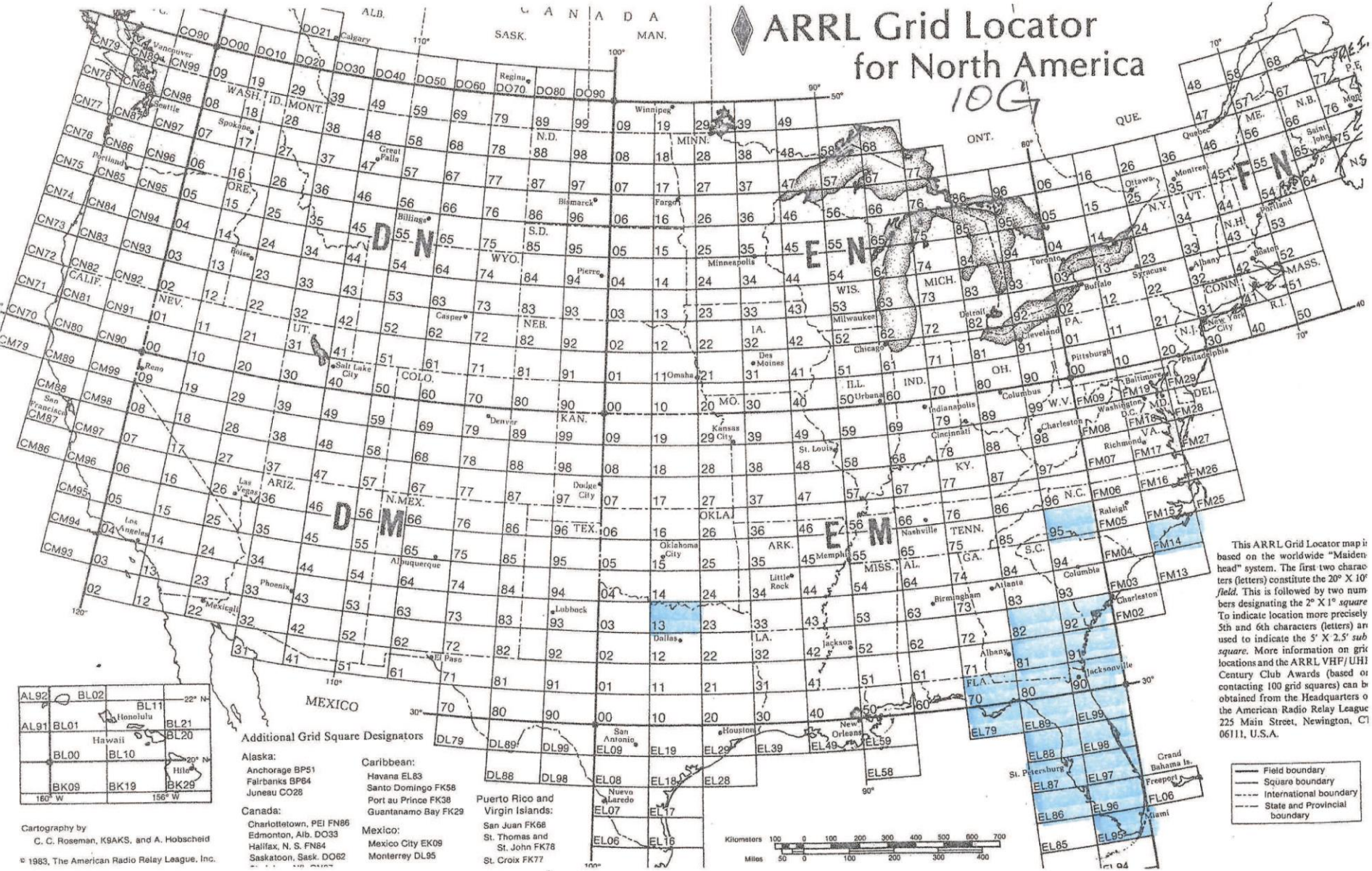
Field boundary
Square boundary
International boundary
State and Provincial boundary
Kilometers
Miles

5760 MHz


ARRL Grid Locator
for North America
10G
CANADA
ALB.
SASK.
MAN.
ONT.
QUE.
MEXICO
Additional Grid Square Designators
Alaska:
Anchorage BP51
Fairbanks BP64
Juneau CO28
Canada:
Charlottetown, PEI FN86
Edmonton, Alb. DO33
Halifax, N. S. FN84
Saskatoon, Sask. DO62
Caribbean:
Havana EL83
Santo Domingo FK58
Port au Prince FK38
Guantanamo Bay FK29
Mexico:
Mexico City EK09
Monterrey DL95
Puerto Rico and Virgin Islands:
San Juan FK68
St. Thomas and St. John FK78
St. Croix FK77
Hawaii
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Field boundary
Square boundary
International boundary
State and Provincial boundary
Kilometers
Miles

10 GHz

It does not take a Mega station to talk a long ways and have a lot of fun, on VHF

To get started

Put your radio on a VHF or UHF band and punch the SSB or CW button, put up a horizontal antenna and look up your grid square, on QRZ.com.

www.flwss.net

Come to our meeting, at the Orlando Hamfest, HIPS III
11 am til Noon, on Saturday
Check into the FLWSS Net, 432.090 USB
@ 8:30 pm, Thursdays