
900 MHz FM – Central Texas
2018 UPDATE

WHY 900 MHz ?

- 900 MHz is a new frontier for FM operation
- It is very much like 70 cm was 45 years ago
  - *Radios are modified commercial gear:*
    mostly Motorola or Kenwood
  - *Propagation is more challenging than lower frequency bands (2M – 70CM)*
  - *Technical interest*
  - *Weak signal compatible*

WHAT IS 900 MHz OPERATION LIKE ?

- Similar to 70 CM with
  - *Faster mobile flutter*
  - *More multipath*
  - *Greater building penetration due to reflections*
  - *A bit more path loss*
- A good antenna is extremely important
- 12W to 15W is adequate
- 30W radios are available
- Feed line losses are greater (use low loss coax)
- *900 MHz culture is not typical FM*

SOME HISTORY

- *August 2007 I visited friends in W. Texas*
- *We talked about 900 MHz and plans for ROIP linking*
- *I returned to Portland 'stoked' to get on 900 MHz*

- *My 1st 900 MHz repeater was operational in 2007 (Portland)*

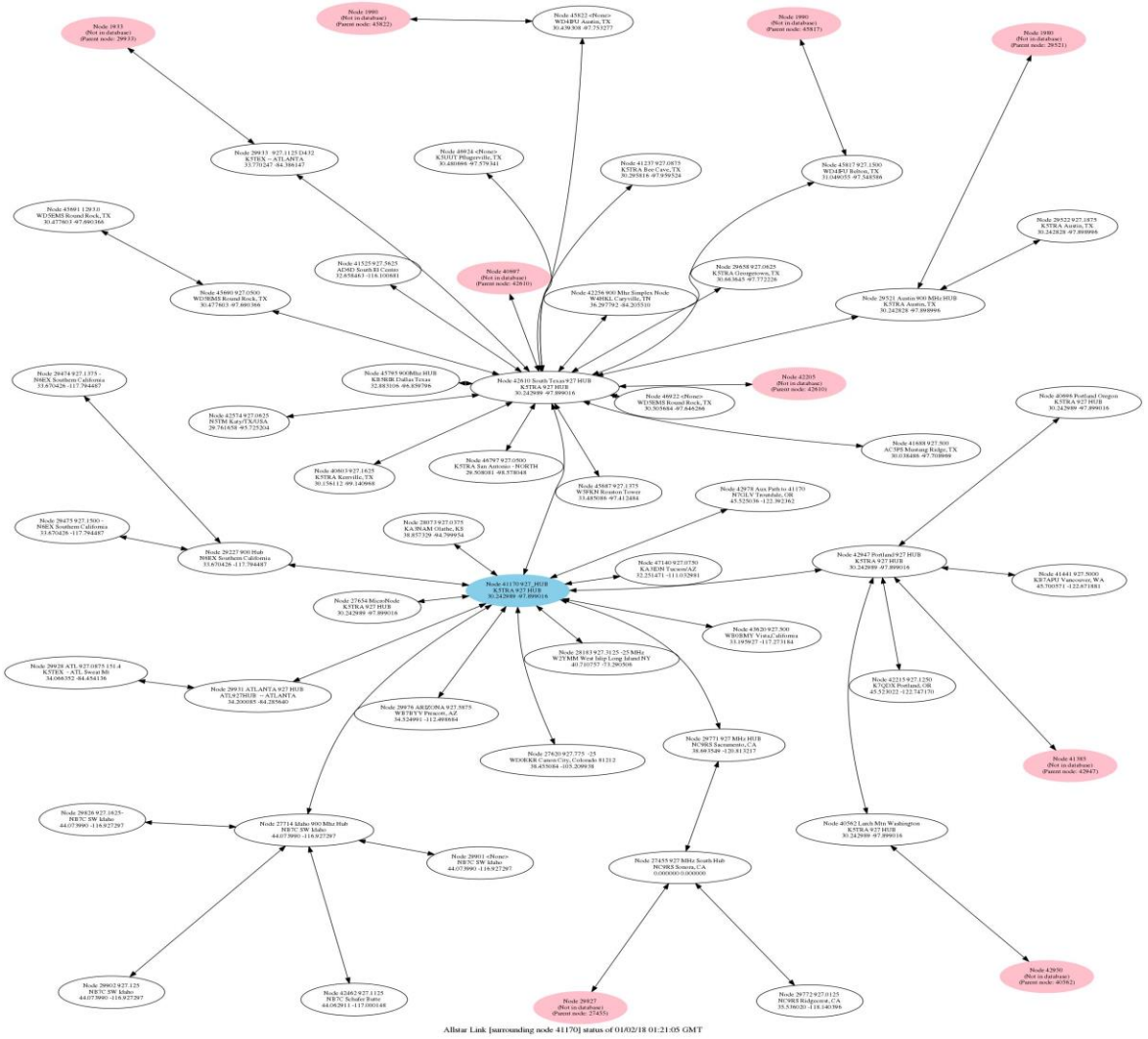
- *The 2nd machine on the air -March 2008 (Larch Mountain SW Washington)*

MORE HISTORY

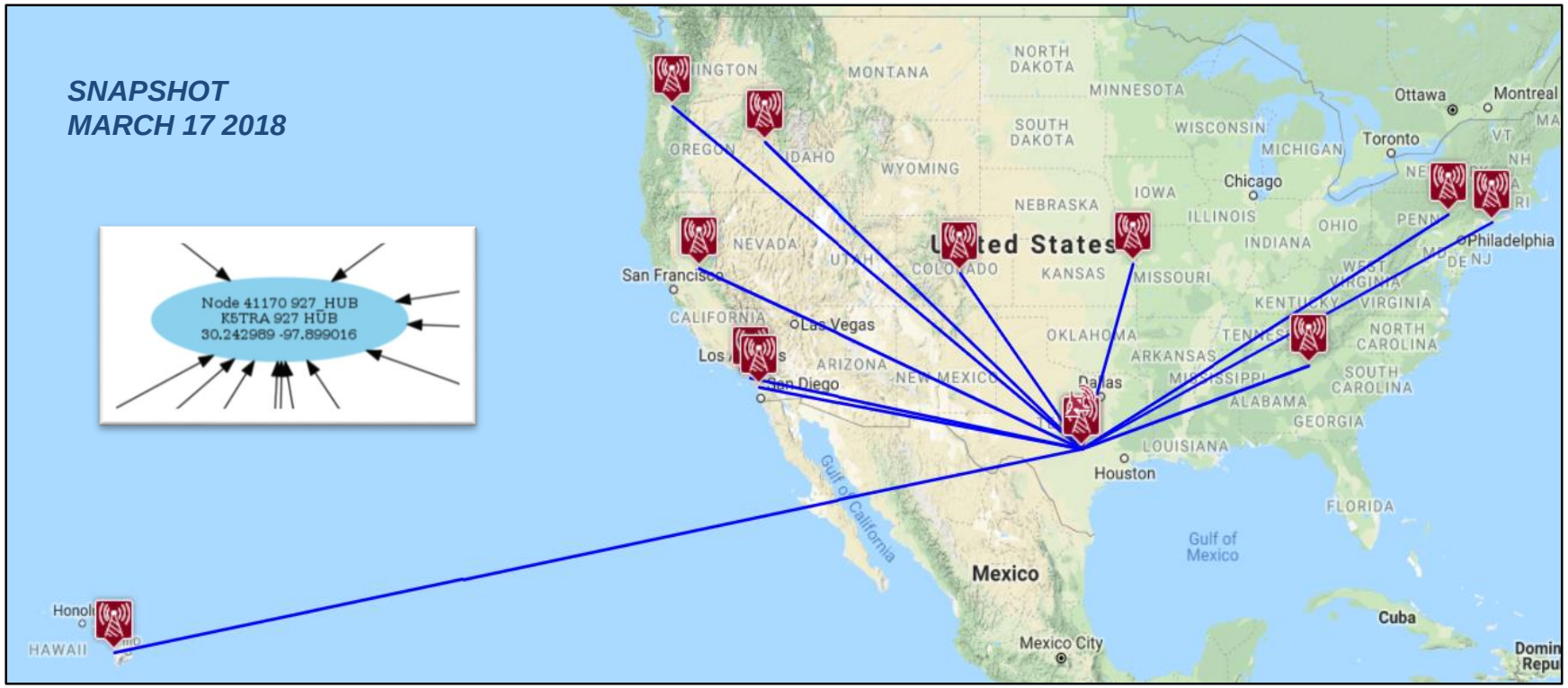
- *Early internet linking of 900 MHz began in 2008*
- *1st Austin 900 MHz repeater operational in 2009*
- *K5TRA moved back to TX in 2010*
  - *Several additional RF linked Austin area 900 repeaters added*
  - *Linked to other areas/states via ROIP*
- *Austin based 927 TECH linking HUB began in 2011*
  - *Many 900 MHz repeaters joined the network*
  - *EchoLink <u>private</u> linking conference*
- *Allstar link transition from EchoLink began early in 2013*
  - *Linux based control*
  - *Better audio BW*
  - *EchoLink HUB also maintained as 'back door' when traveling*
  - *Main 927 HUB is Allstar node 41170*
  - *Regional South Texas HUB is Allstar node 42610*

ELEVEN YEARS LATER

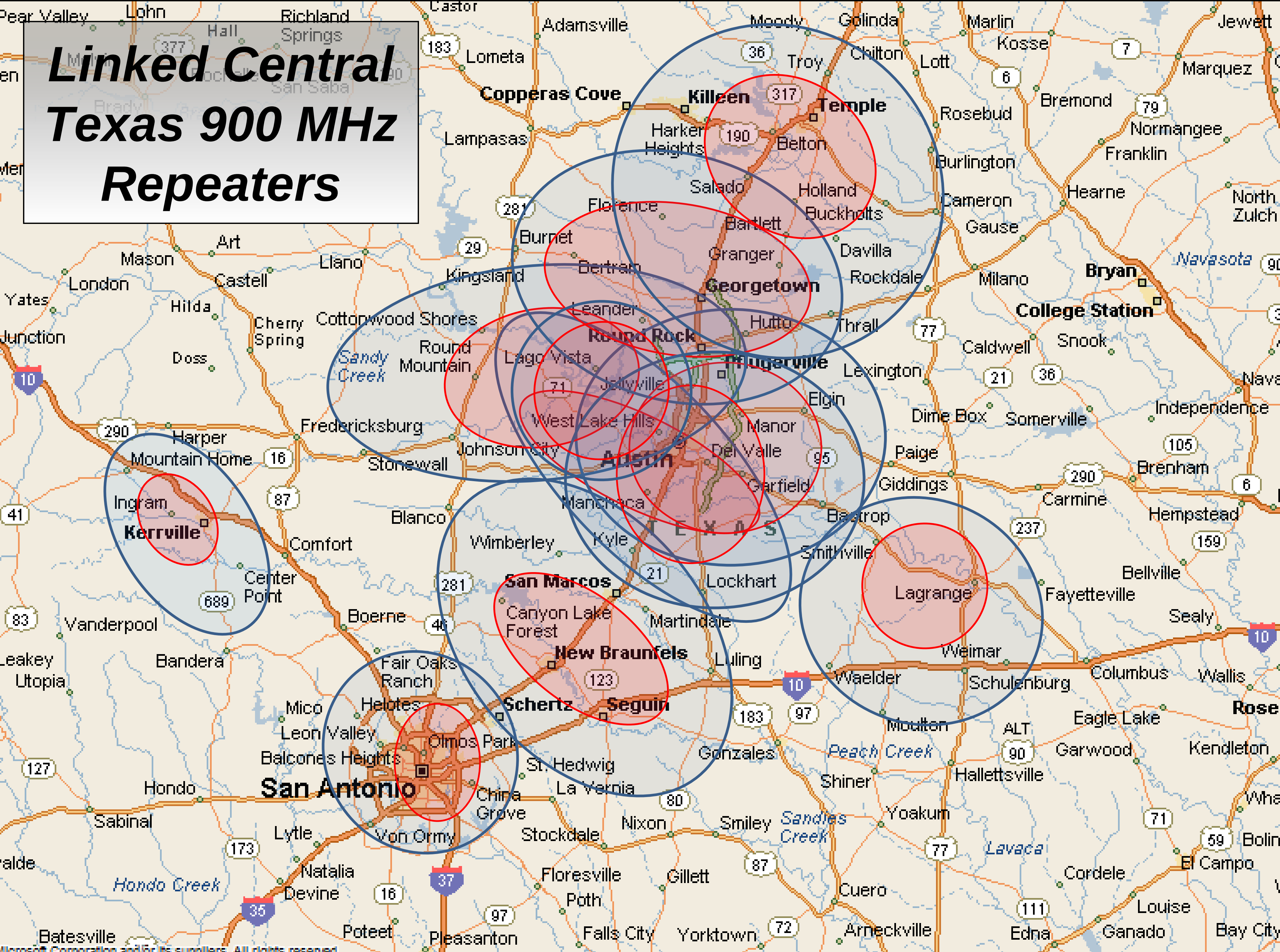
- *Main 927 HUB*
- *South Texas HUB*
- *Northern CA HUB*
- *Southern CA HUB*
- *Portland HUB*
- *Idaho HUB*
- *Also connections from:*
  - *Kansas City*
  - *Atlanta*
  - *Long Island*
  - *Colorado*
  - *Arizona*
  - *Hawaii*

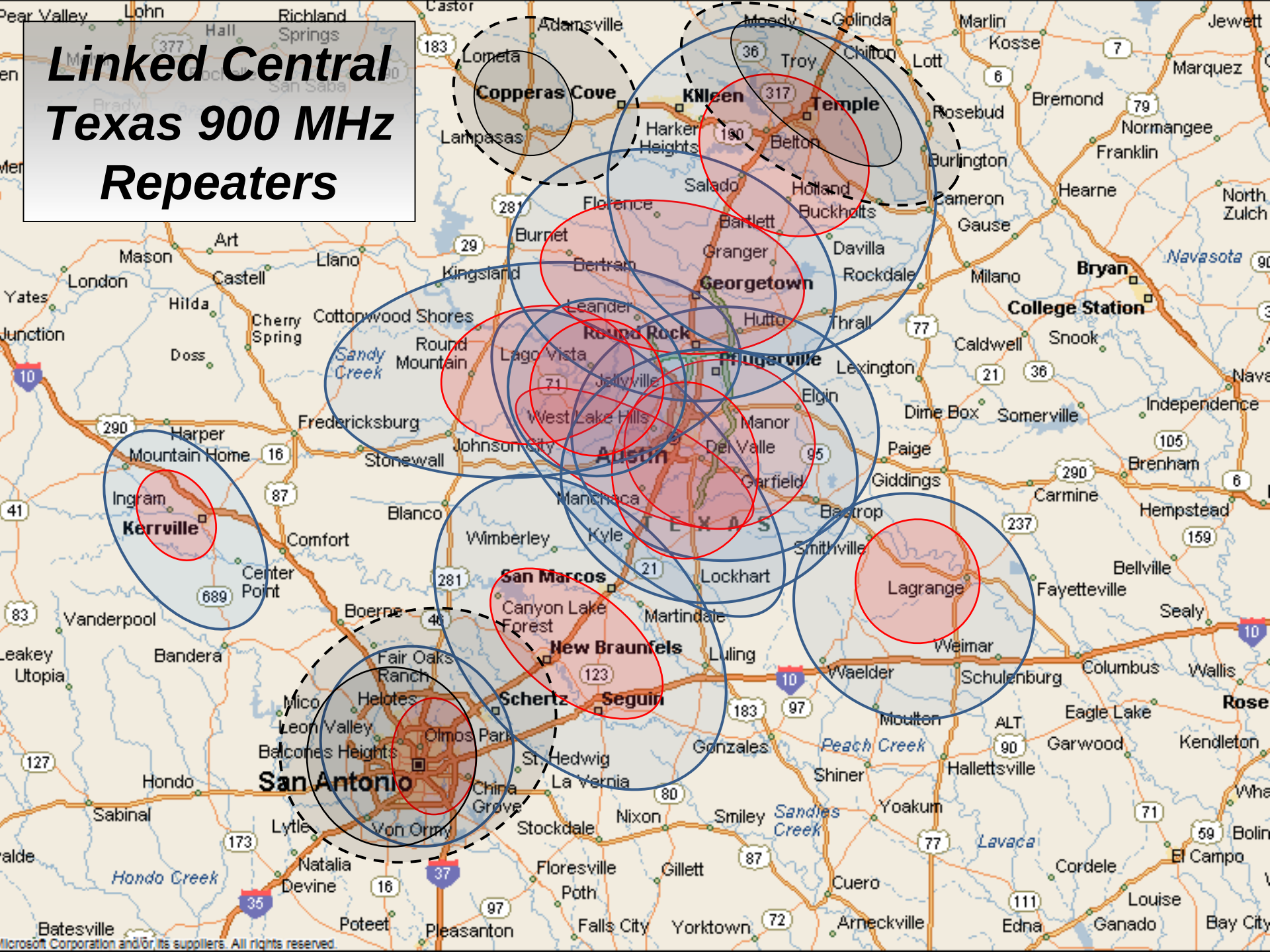


LINKED 900 MHz NETWORK MAP



Linked Central Texas 900 MHz Repeaters




Linked Central Texas 900 MHz Repeaters
Copperas Cove
Killeen
Temple
Georgetown
Round Rock
Austin
San Marcos
New Braunfels
Schertz
Seguin
San Antonio
Kerrville
Lagrange
Bryan
College Station
Pear Valley
Lohn
Richland Springs
Hall
Castor
Adamsville
Lometa
Lampasas
Moody
Golinda
Troy
Chilton
Lott
Marlin
Kosse
Jewett
Marquez
Bremond
Rosebud
Normangee
Franklin
Harker Heights
Belton
Burlington
Salado
Holland
Cameron
Hearne
North Zulch
Florence
Bartlett
Buckholts
Gause
Art
Mason
Llano
Burnet
Granger
Davilla
Navasota
London
Castell
Kingsland
Bertram
Rockdale
Milano
Yates
Hilda
Cherry Spring
Cottonwood Shores
Leander
Hutto
Thrall
Junction
Doss
Round Mountain
Sandy Creek
Lago Vista
Jollyville
Caldwell
Snook
Lexington
Elgin
West Lake Hills
Manor
Dime Box
Somerville
Independence
Fredericksburg
Harper
Mountain Home
Johnson City
Del Valle
Paige
Brenham
Stonewall
Garfield
Giddings
Carmine
Hempstead
Ingram
Manchaca
Blanco
Baatrop
Wimberley
Kyle
Smithville
Comfort
Center Point
Lockhart
Bellville
Fayetteville
Vanderpool
Martindale
Sealy
Boerne
Canyon Lake Forest
Leakey
Utopia
Bandera
Fair Oaks Ranch
Luling
Weimar
Waelder
Schulenburg
Columbus
Wallis
Rose
Mico
Helotes
Leon Valley
Olmos Park
Balcones Heights
St. Hedwig
Moulton
Eagle Lake
Peach Creek
Garwood
Kendleton
Gonzales
Hallettsville
Shiner
Hondo
China Grove
La Vernia
Yoakum
Sabinal
Nixon
Smiley
Sandies Creek
Lytle
Von Ormy
Stockdale
Lavaca
Cordele
El Campo
Natalia
Floresville
Gillett
Hondo Creek
Devine
Poth
Cuero
Louise
Batesville
Poteet
Pleasanton
Falls City
Yorktown
Arneckville
Edna
Ganado
Bay City
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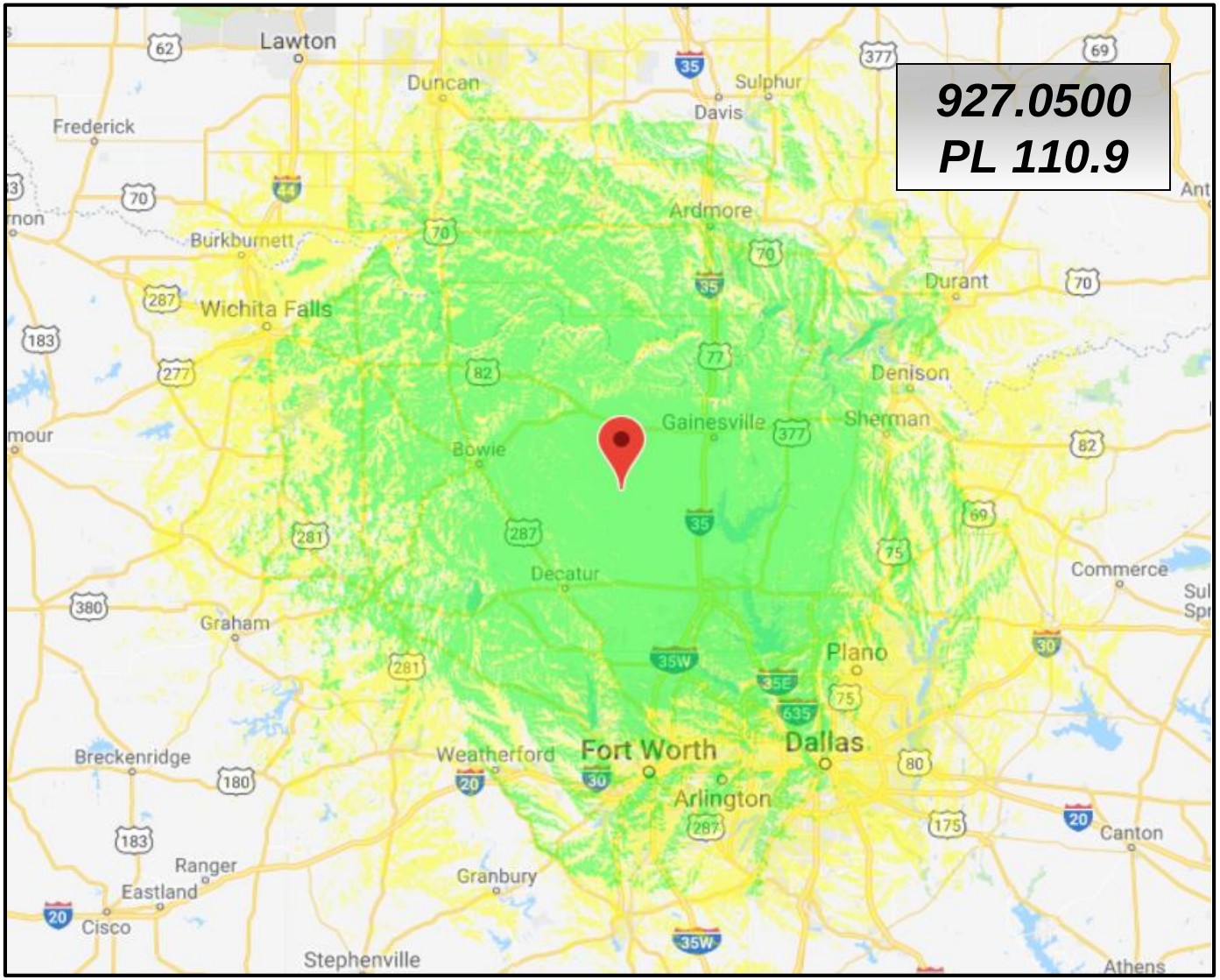
CENTRAL TEXAS 900 MHz REPEATERS

927.0125	TPL 225.7	Austin, TX (N)	*moved from 927.1375*
927.0375	TPL 141.3	Canyon Lake, TX	
927.0500	TPL 110.9	Round Rock, TX	*WD5EMS REPEATER*
927.0625	TPL 203.5	Georgetown, TX	
927.0625	TPL 203.5	Katy, TX	*N5TM REPEATER*
927.0750	TPL 218.1	San Antonio, TX	
927.0875	TPL 151.4	Bee Cave, TX	
927.1125	DPL 432	Austin, TX (S)	
927.1250	TPL 103.5	Lago Vista, TX	
927.1500	TPL 114.8	Belton, TX	*WD4IFU REPEATER*
927.1625	TPL 151.4	Kerrville, TX	
927.1625	TPL 151.4	La Grange, TX	
927.1750	TPL 110.9	Austin, TX (NW)	*KA5D REPEATER*
927.1875	TPL 151.4	Austin, TX (Oak Hill)	

ROSSTON TOWER - 900 MHz REPEATER



900 MHz MOBILE RADIOS

KENWOOD TK-981

GOOD CHOICES

MOTOROLA MCS-2000 -3

KENWOOD TK-941

MOTOROLA MCS-2000 -2

KENWOOD TK-931

MOTOROLA SPECTRA

MOTOROLA MCS-2000 -1

900 MHz PORTABLE RADIOS – GOOD CHOICES

GOOD CHOICES

KENWOOD TK-481

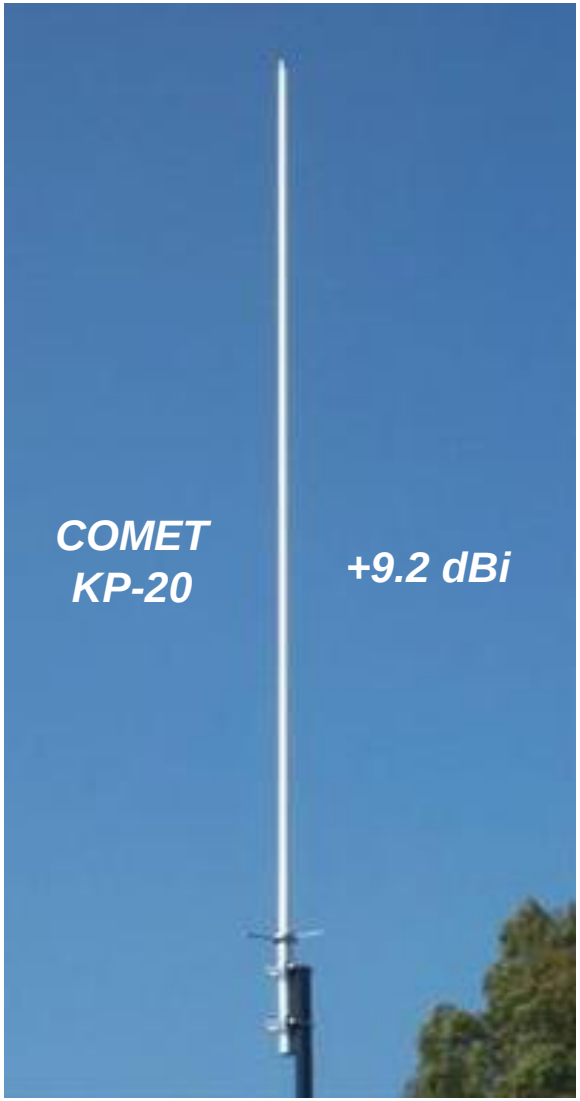
MOTOROLA MTX-9250

ALINCO DJ-G29

MOTOROLA MTS-2000

900 MHz ANTENNAS

BASE



MOBILE

PHANTOM ANTENNAS

LAIRD

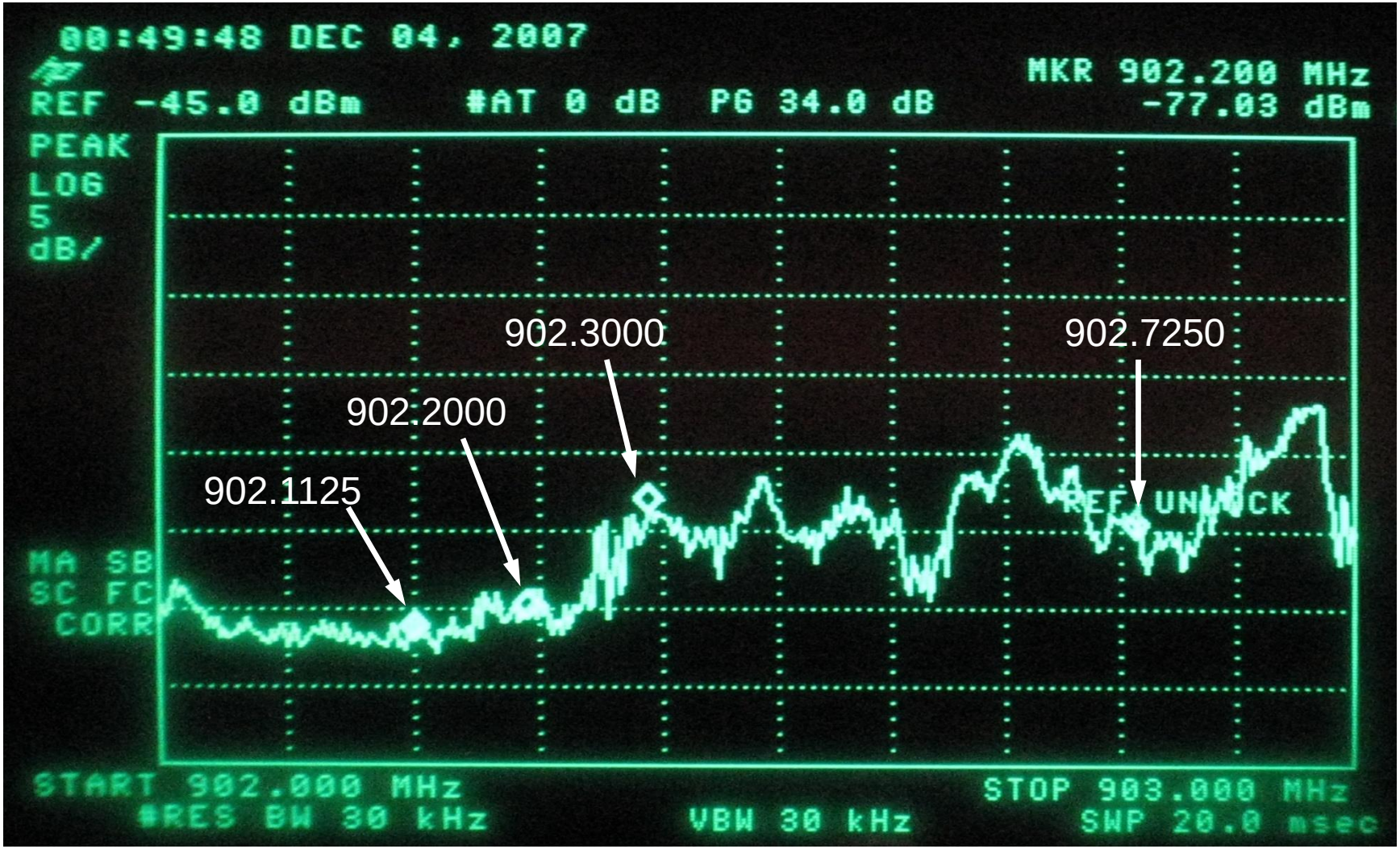
NMO3E900B ***NMO5T900B***

LARSEN

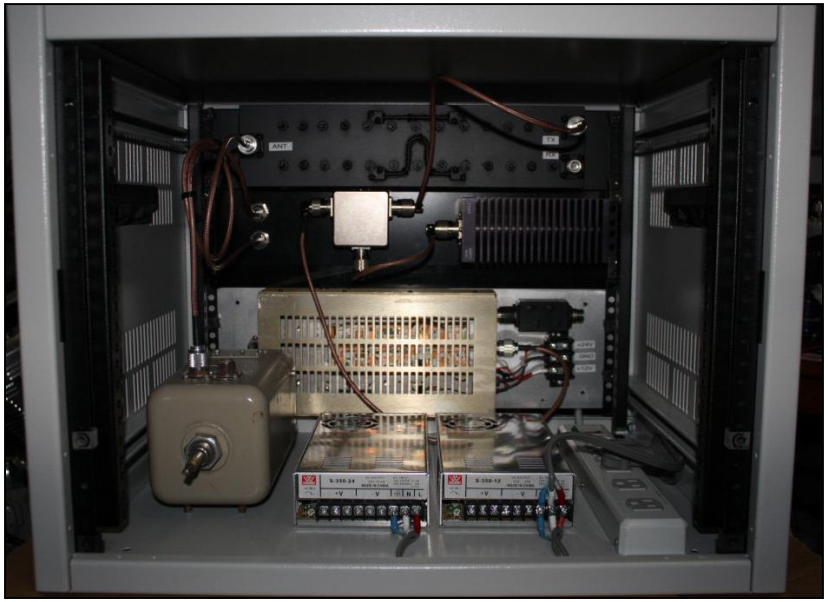
900 MHz BAND UTILIZATION

- In 1985 ARRL's band plan: 12 MHz split for FM repeaters
  - Not used due to available equipment limitations
- > 400 repeaters are 927 MHz – 902 MHz (25 MHz split)
- Weak signal SSB/CW and FM share the band very well
  - Both groups are populated by "Techies"
  - In many areas weak signal hams also have 900 MHz FM
  - High power repeater outputs are at 927 MHz (far from 902)
- Repeater inputs are in the 902 - 903 MHz
  - Some areas begin FM at 927.1125 (1st channel above 902.1)
  - Some share the lower 100 KHz
  - Noise floor often degrades above 902.2 MHz due to interference from spread spectrum transmitters that share the band

TYPICAL 900 MHz NOISE FLOOR

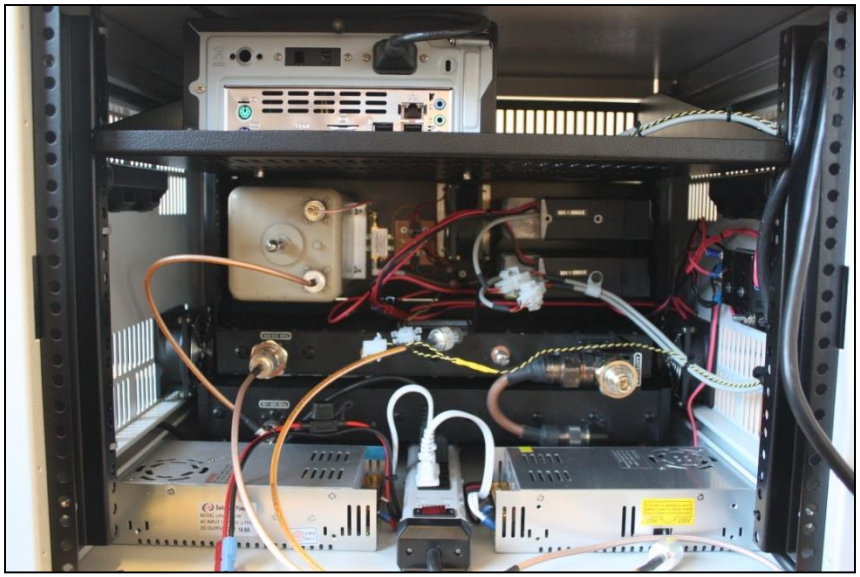


RF LINKED REPEATER



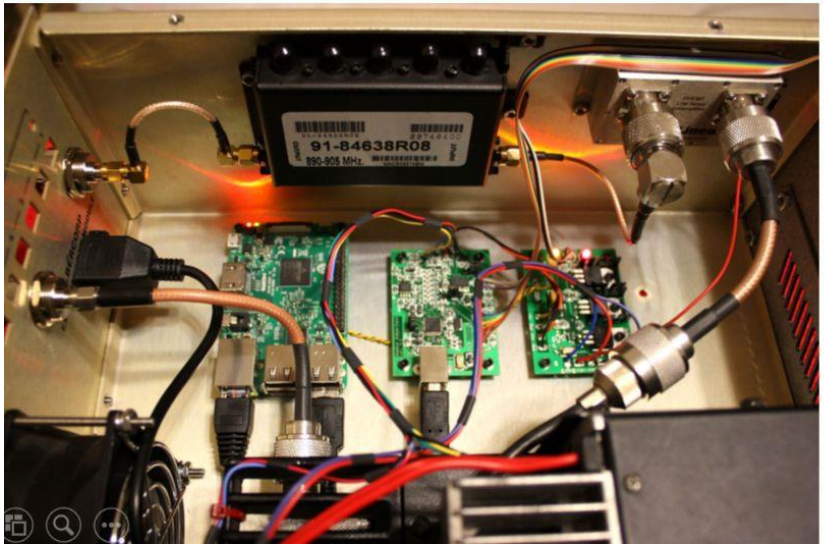
- TK-941 TX / RX and TK-840 Link
- Angle Linear LNA with Wacom preselector cavities
- Motorola 120W cellular PA (in TPL housing)
- Celwave Isolator
- Narda cellular combline duplexer
- ICS Linker-IIa controller

ALLSTAR LINKED REPEATER

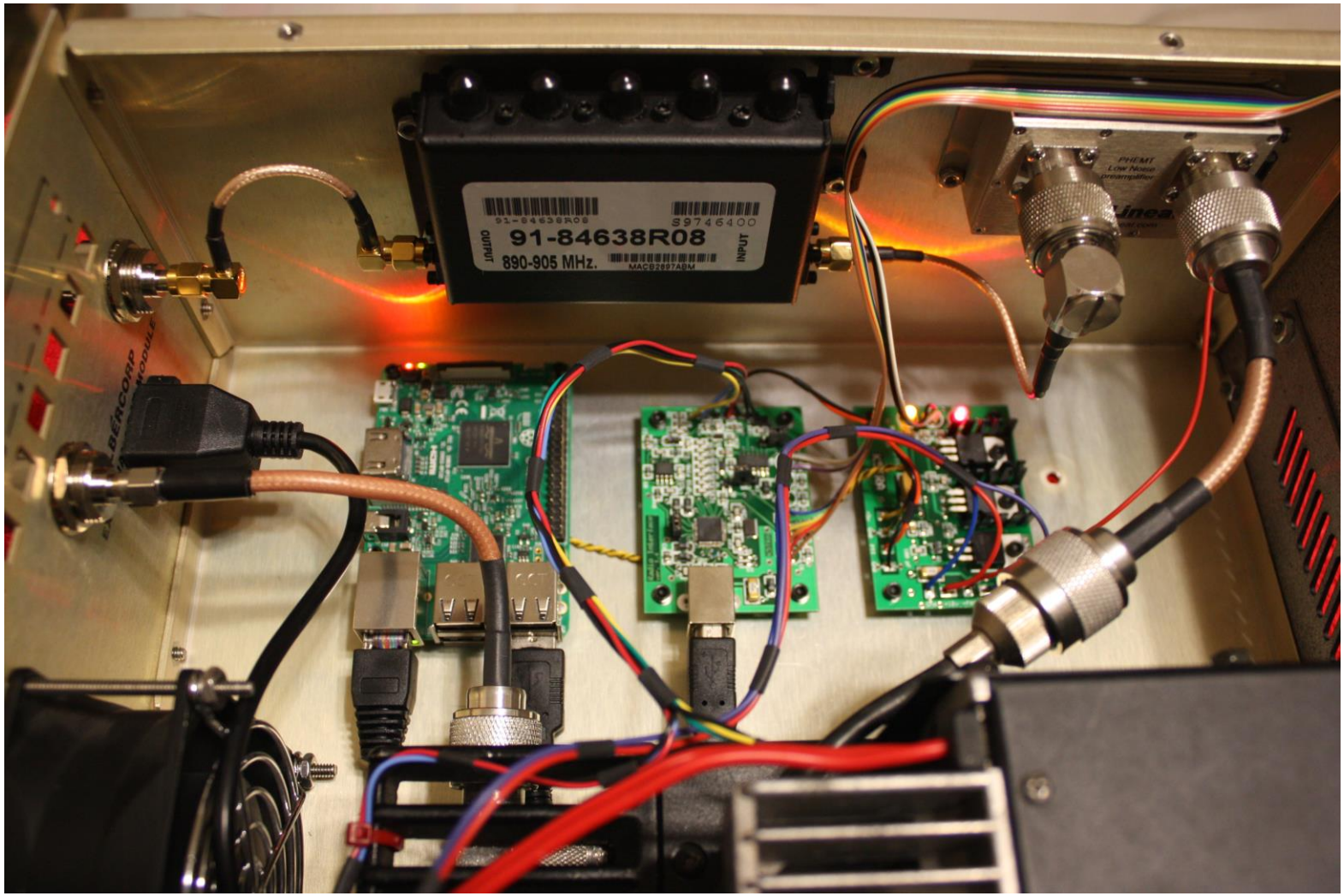


- TK-941 TX / RX and Linux Allstar Link (mini-ITX / SSD)
- Minicircuits LNA with Telewave preselector cavity
- GE MASTR-III 110W PA (w/ integrated isolator)
- WACOM combline duplexer
- NO controller board: Allstar controller !

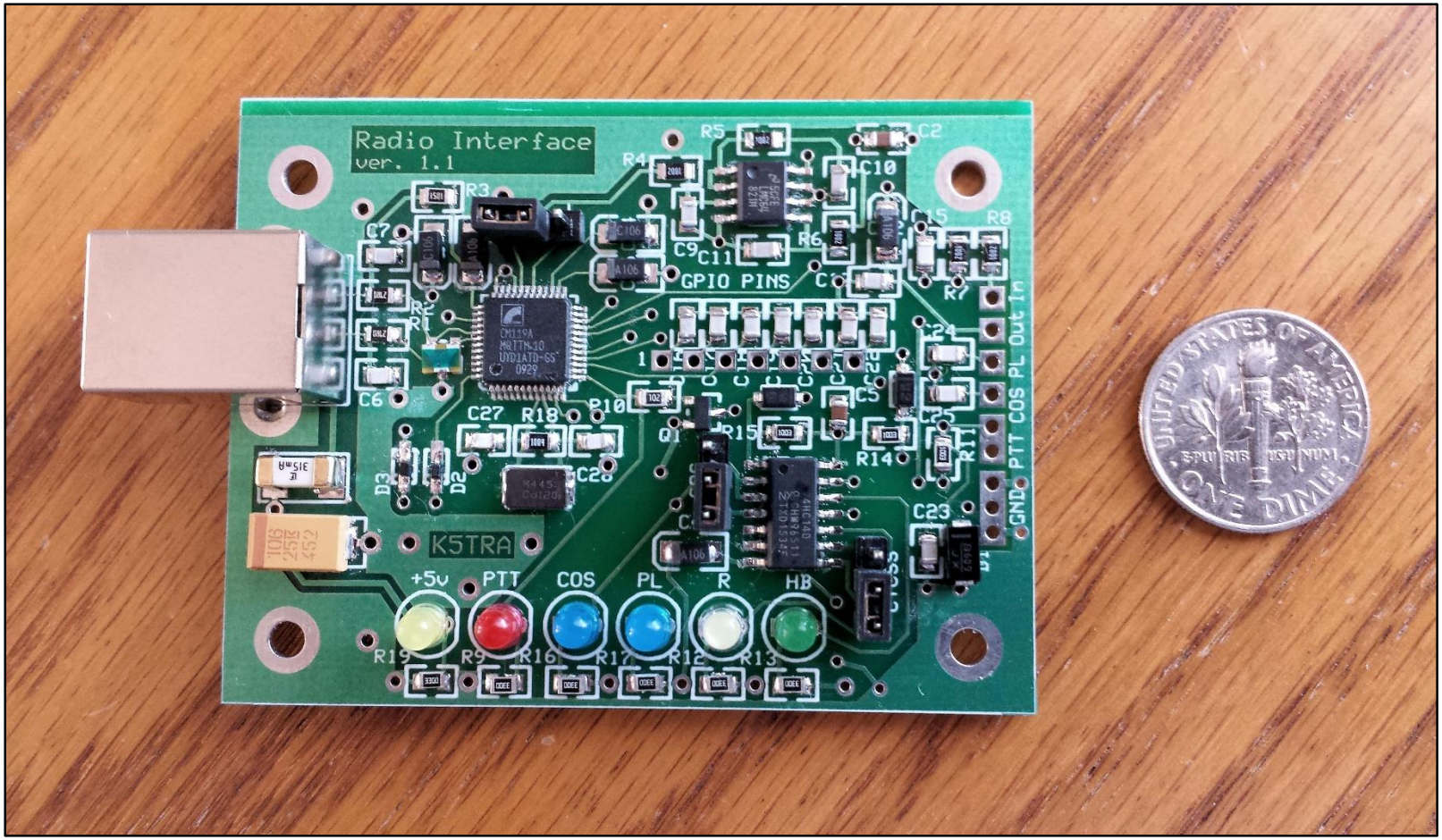
COMPACT ALLSTAR LINKED REPEATER



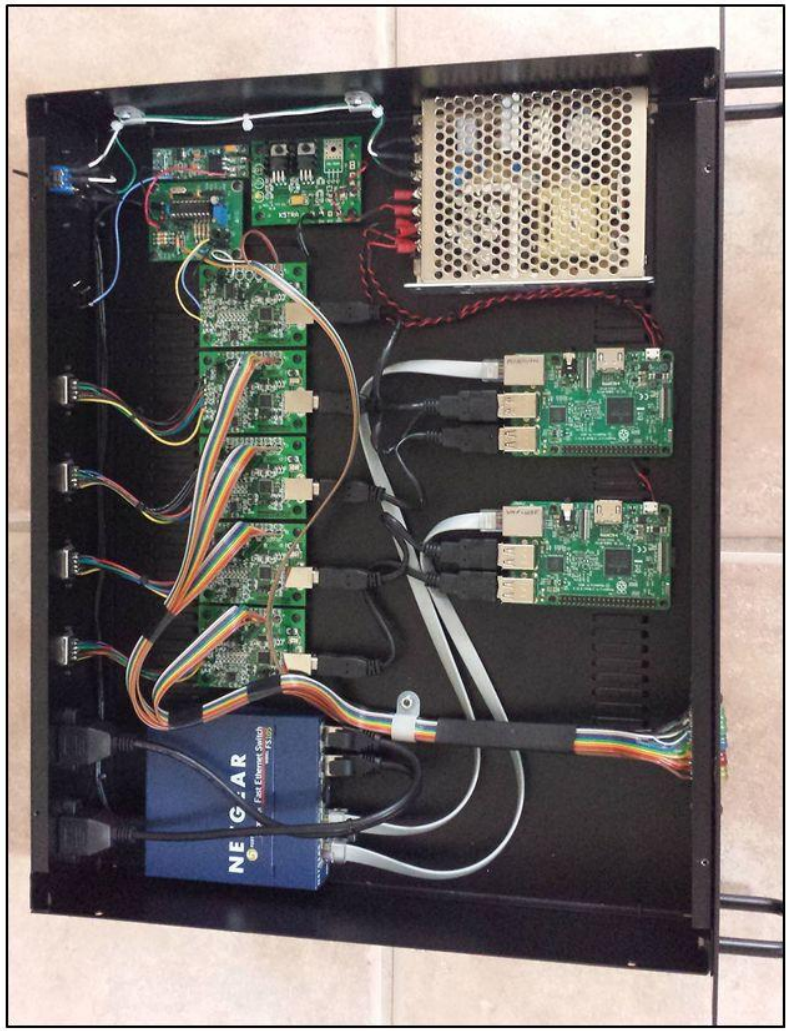
RASPBERRY Pi-3 CONTROLLER and ALLSTAR LINKER



ALLSTAR USB – RADIO INTERFACE



FOUR REPEATER CONTROLLER and ALLSTAR LINKER



LARCH MOUNTAIN SITE

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Looking to Portland and Salem from Larch Mountain