

285 TechConnect Radio Club

Meeting for 2 April 2011

<http://www.naøtc.org/>

WGØAT

Steve

Old
Goat

Rooster

Peanut

QRO
Goat

QRP
Goat

5w QRP & Buddipole on Mt Herman, Colorado

See Rooster & Peanut in Action on: www.youtube.com/goathiker

Steve Galchutt - 3360 Schilling Ave - Monument, CO 80132 USA

Agenda

- Any New First-time Visitors/Guests?
- Presentation
 - "Ham Radio with Rooster & Peanut"
 - aka: Portable operating with Goat-power!
 - Using HFLINK (JT65A) for weak signal digital mode communications
- Club Business
- Questions & Answers
 - Answers to Previous Questions
 - New Questions
- Solve the Problem
- Info of General Interest

- **Steve (wGOAT)**

- **Topics:**

- **"Ham Radio with Rooster & Peanut"**

- aka: Portable operating with Goat-power!

- **Using HFLINK (JT65A) for weak signal digital mode communications**

- **Bio:**

- Started playing with radios at age 9

- He enjoys homebrewing & QRP

- Along the way, he picked up two hiking buddies: **Rooster & Peanut**


- He recently got his 200th Colorado Summit

- Qualified him as a SOTA (Summits on the Air) activator

- <http://www.sota.org.uk/>

- Steve has driven all the way from **Monument**

Club Business

- Member identification (badges/hats/?)
- Field Day POCs:
 - Denver Radio Club:?
 - QRP Club:?
 - Multiple sites
 - ?
- New Location for Meetings?
- TechFest:
 - Theme: ?
 - Presenters/Topics: ?
 - Location:
 - Red Rocks ? (move to Sunday?)
 - Other?
- ***We still need names for some ELMERs to list on our website!***
 - ***Recent Sign-ups:*** 
 - ***Pete NEOT***
- Future Topics/Projects for Meetings (see list)
- Suggestions? (send to NOCU@arrl.net)

Future Topics/Projects

285 TechConnect Radio Club Meeting Topics (3/28/2011)

| When | Topic | Presenter | | Length |
|-------|---|-----------|--------|--------|
| | | Name | Call | Hr |
| April | "Ham Radio with Rooster & Peanut" | Steve | wGOAT | 1 |
| | S Meters: The Good, the Bad, and the Erroneous | Bill | NOCU | 1/2 |
| May | Remoting an HF station | Jim | KCORPS | 1/2 |
| | ? | ? | ? | ? |
| June | ? | ? | ? | ? |
| | ? | ? | ? | ? |
| TBA | Cheap rotator thrust bearing | Bill | NOCU | 1/4 |
| TBA | How real components perform at RF | Bill | NOCU | 2 |
| TBA | Surface mount | Pete | NEOT | ? |
| TBA | Show & tell day | | | |
| | -New equipment | | | |
| | -Old equipment | | | |
| | -Completed projects day | | | |
| | -? | | | |
| TBA | Network analyzer- what does it do & how does it do it | Bill | NOCU | 1 |
| TBA | Reflections: Where does all that power go? | Bill | NOCU | 1 |
| TBA | Transmission lines | | | |

Partial List

Questions & Answers

- **New Questions?**

Solve the Problem

- **Typical Complaints with S Meters on HF Receivers:**
 - **Problem 1:** My S Meter doesn't move off "S0" on signals that sound really strong
 - **Problem 2:** My S Meter reads the same as other receivers on strong (S9 and higher) signals, but I can't copy weak signals that other receivers copy Q5
 - **Problem 3:** A nearby station with a similar antenna receives signals 2-3 S units stronger than I do

The “R-S-T” Code

- **Qualitative** measure
- Developed in the early 20th century and was in widespread use by 1912
- Digital modes use “R-S-Q”

Readability

1. Unreadable
2. Barely readable, occasional words distinguishable
3. Readable with considerable difficulty
4. Readable with practically no difficulty
5. Perfectly readable

Strength

1. Faint signal, barely perceptible
2. Very weak
3. Weak
4. Fair
5. Fairly good
6. Good
7. Moderately strong
8. Strong
9. Very strong signals

Tone

1. Sixty cycle a.c. or less, very rough and broad
2. Very rough a.c., very harsh and broad
3. Rough a.c. tone, rectified but not filtered
4. Rough note, some trace of filtering
5. Filtered rectified a.c. but strongly ripple-modulated
6. Filtered tone, definite trace of ripple modulation
7. Near pure tone, trace of ripple modulation
8. Near perfect tone, slight trace of modulation
9. Perfect tone, no trace of ripple or modulation of any kind

The S Meter Scale

Signal Power

S9+60dB

S9

S8

S7

S6

S5

S4

S3

S2

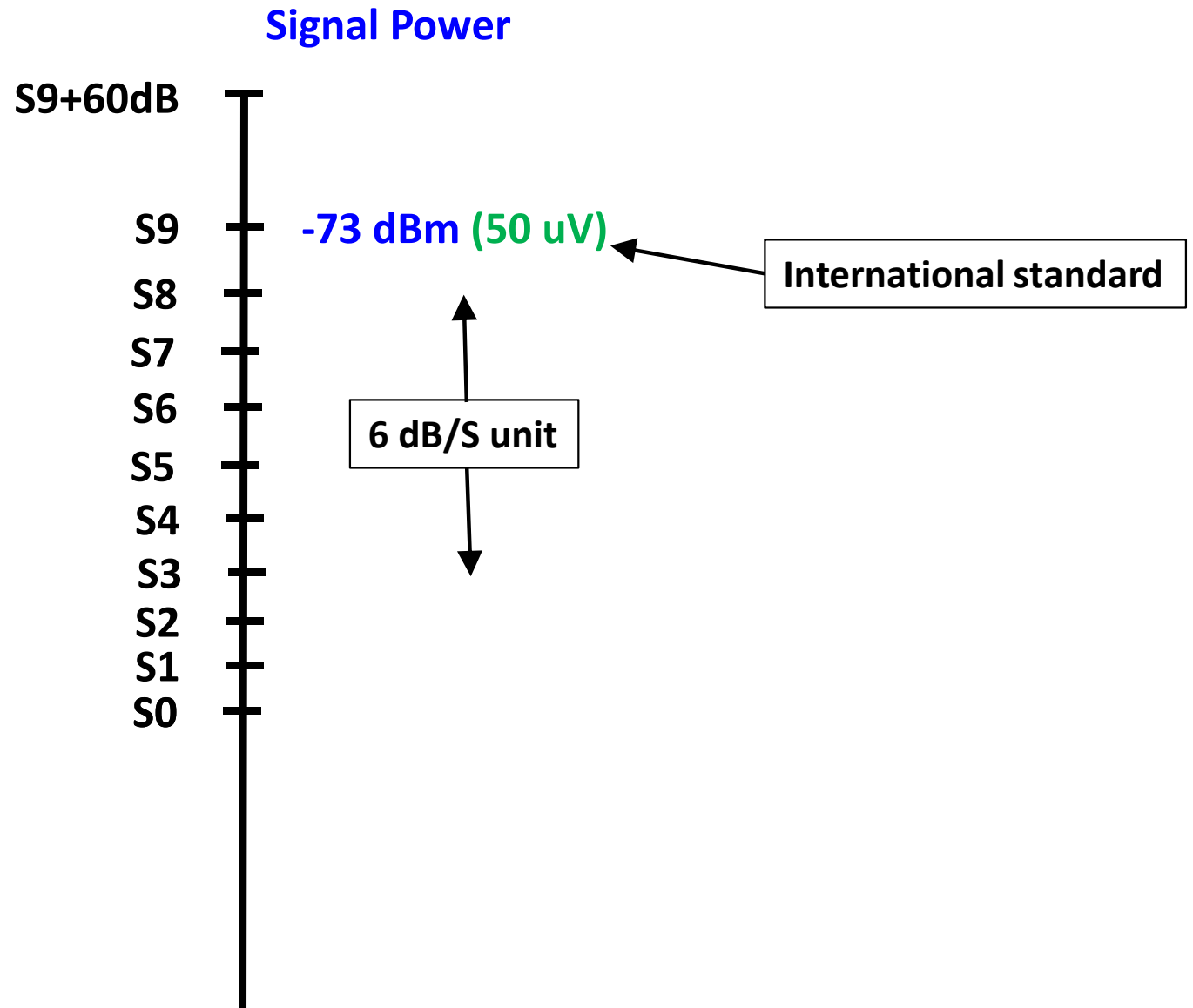
S1

S0

Need to define:

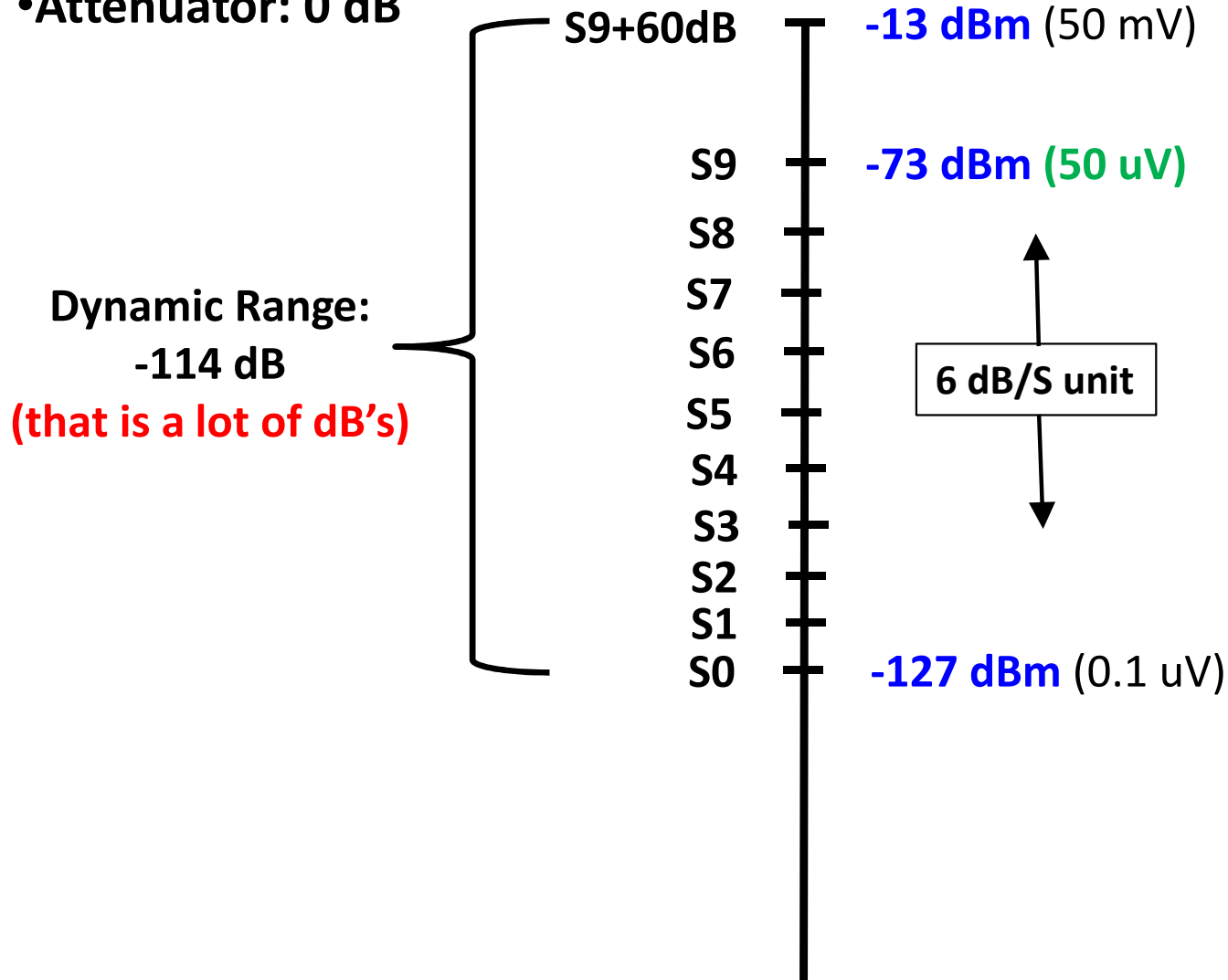
- “S” in absolute power level
- “S unit” in dB

The S Meter Scale



The S Meter Scale

- Pre-Amp: OFF
- Attenuator: 0 dB



Signal Levels vs. Power

| | Power into 50Ω | | | S Unit | Voltage | | | | | | Current | | | | | |
|---|----------------|---------|-------|--------|---------|------|------|------|-----------|------|---------|------|------|------|-----------|----|
| | Milliwatts | Watts | dBm | | RMS | | Peak | | Peak-Peak | | RMS | | Peak | | Peak-Peak | |
| R E C E I V E R | 1.9E-13 | 1.9E-16 | -127 | 0 | 0.10 | uV | 0.14 | uV | 0.28 | uV | | | | | | |
| | 7.6E-13 | 7.6E-16 | -121 | 1 | 0.20 | uV | 0.28 | uV | 0.55 | uV | | | | | | |
| | 3.1E-12 | 3.1E-15 | -115 | 2 | 0.39 | uV | 0.55 | uV | 1.10 | uV | | | | | | |
| | 1.2E-11 | 1.2E-14 | -109 | 3 | 0.78 | uV | 1.10 | uV | 2.21 | uV | | | | | | |
| | 4.9E-11 | 4.9E-14 | -103 | 4 | 1.56 | uV | 2.21 | uV | 4.42 | uV | | | | | | |
| | 2.0E-10 | 2.0E-13 | -97 | 5 | 3.13 | uV | 4.42 | uV | 8.84 | uV | | | | | | |
| | 7.8E-10 | 7.8E-13 | -91 | 6 | 6.25 | uV | 8.84 | uV | 17.7 | uV | | | | | | |
| | 3.1E-09 | 3.1E-12 | -85 | 7 | 12.5 | uV | 17.7 | uV | 35.4 | uV | | | | | | |
| | 1.3E-08 | 1.3E-11 | -79 | 8 | 25.0 | uV | 35.4 | uV | 70.7 | uV | | | | | | |
| | 5.0E-08 | 5.0E-11 | -73 | 9 | 50.0 | uV | 70.7 | uV | 141 | uV | | | | | | |
| | 5.0E-07 | 5.0E-10 | -63 | S9+10 | 158 | uV | 224 | uV | 447 | uV | | | | | | |
| | 5.0E-06 | 5.0E-09 | -53 | S9+20 | 0.50 | mV | 0.71 | mV | 1.41 | mV | | | | | | |
| | 5.0E-05 | 5.0E-08 | -43 | S9+30 | 1.58 | mV | 2.24 | mV | 4.47 | mV | | | | | | |
| | 5.0E-04 | 5.0E-07 | -33 | S9+40 | 5.00 | mV | 7.07 | mV | 14.1 | mV | | | | | | |
| 5.0E-03 | 5.0E-06 | -23 | S9+50 | 15.8 | mV | 22.4 | mV | 44.7 | mV | | | | | | | |
| 5.0E-02 | 5.0E-05 | -13 | S9+60 | 50.0 | mV | 70.7 | mV | 141 | mV | | | | | | | |
| T R A N S M I T T E R | 1 | 0.00 | 0.0 | | 0.22 | V | 0.32 | V | 0.63 | V | 4.47 | mA | 6.32 | mA | 12.6 | mA |
| | 2 | 0.00 | 3.0 | | 0.32 | V | 0.45 | V | 0.89 | V | 6.32 | mA | 8.94 | mA | 17.9 | mA |
| | 5 | 0.01 | 7.0 | | 0.50 | V | 0.71 | V | 1.41 | V | 10.0 | mA | 14.1 | mA | 28.3 | mA |
| | 10 | 0.01 | 10.0 | | 0.71 | V | 1.00 | V | 2.00 | V | 14.1 | mA | 20.0 | mA | 40.0 | mA |
| | 20 | 0.02 | 13.0 | | 1.00 | V | 1.41 | V | 2.83 | V | 20.0 | mA | 28.3 | mA | 56.6 | mA |
| | 50 | 0.05 | 17.0 | | 1.58 | V | 2.24 | V | 4.47 | V | 31.6 | mA | 44.7 | mA | 89.4 | mA |
| | 100 | 0.10 | 20.0 | | 2.24 | V | 3.16 | V | 6.32 | V | 44.7 | mA | 63.2 | mA | 126 | mA |
| | 200 | 0.20 | 23.0 | | 3.16 | V | 4.47 | V | 8.94 | V | 63.2 | mA | 89.4 | mA | 179 | mA |
| | 500 | 0.50 | 27.0 | | 5.00 | V | 7.07 | V | 14.1 | V | 100 | mA | 141 | mA | 283 | mA |
| | 1000 | 1.00 | 30.0 | | 7.07 | V | 10.0 | V | 20.0 | V | 141 | mA | 200 | mA | 400 | mA |
| | | 10.0 | 40.0 | | 22.4 | V | 31.6 | V | 63.2 | V | 0.45 | A | 0.63 | A | 1.26 | A |
| | | 20.0 | 43.0 | | 31.6 | V | 44.7 | V | 89.4 | V | 0.63 | A | 0.89 | A | 1.79 | A |
| | | 50.0 | 47.0 | | 50.0 | V | 70.7 | V | 141 | V | 1.00 | A | 1.41 | A | 2.83 | A |
| | | 100 | 50.0 | | 70.7 | V | 100 | V | 200 | V | 1.41 | A | 2.00 | A | 4.00 | A |
| | | 500 | 57.0 | | 158 | V | 224 | V | 447 | V | 3.16 | A | 4.47 | A | 8.94 | A |
| | | 1000 | 60.0 | | 224 | V | 316 | V | 632 | V | 4.47 | A | 6.32 | A | 12.6 | A |
| | 1100 | 60.4 | | 235 | V | 332 | V | 663 | V | 4.69 | A | 6.63 | A | 13.3 | A | |
| | 1200 | 60.8 | | 245 | V | 346 | V | 693 | V | 4.90 | A | 6.93 | A | 13.9 | A | |
| | 1300 | 61.1 | | 255 | V | 361 | V | 721 | V | 5.10 | A | 7.21 | A | 14.4 | A | |
| | 1400 | 61.5 | | 265 | V | 374 | V | 748 | V | 5.29 | A | 7.48 | A | 15.0 | A | |
| | 1500 | 61.8 | | 274 | V | 387 | V | 775 | V | 5.48 | A | 7.75 | A | 15.5 | A | |

Want a copy of the Excel spreadsheet?
Send email to: n0cu@arrrl.net

Sherwood Engineering Inc.

1268 South Ogden Street Denver, Colorado 80210 USA

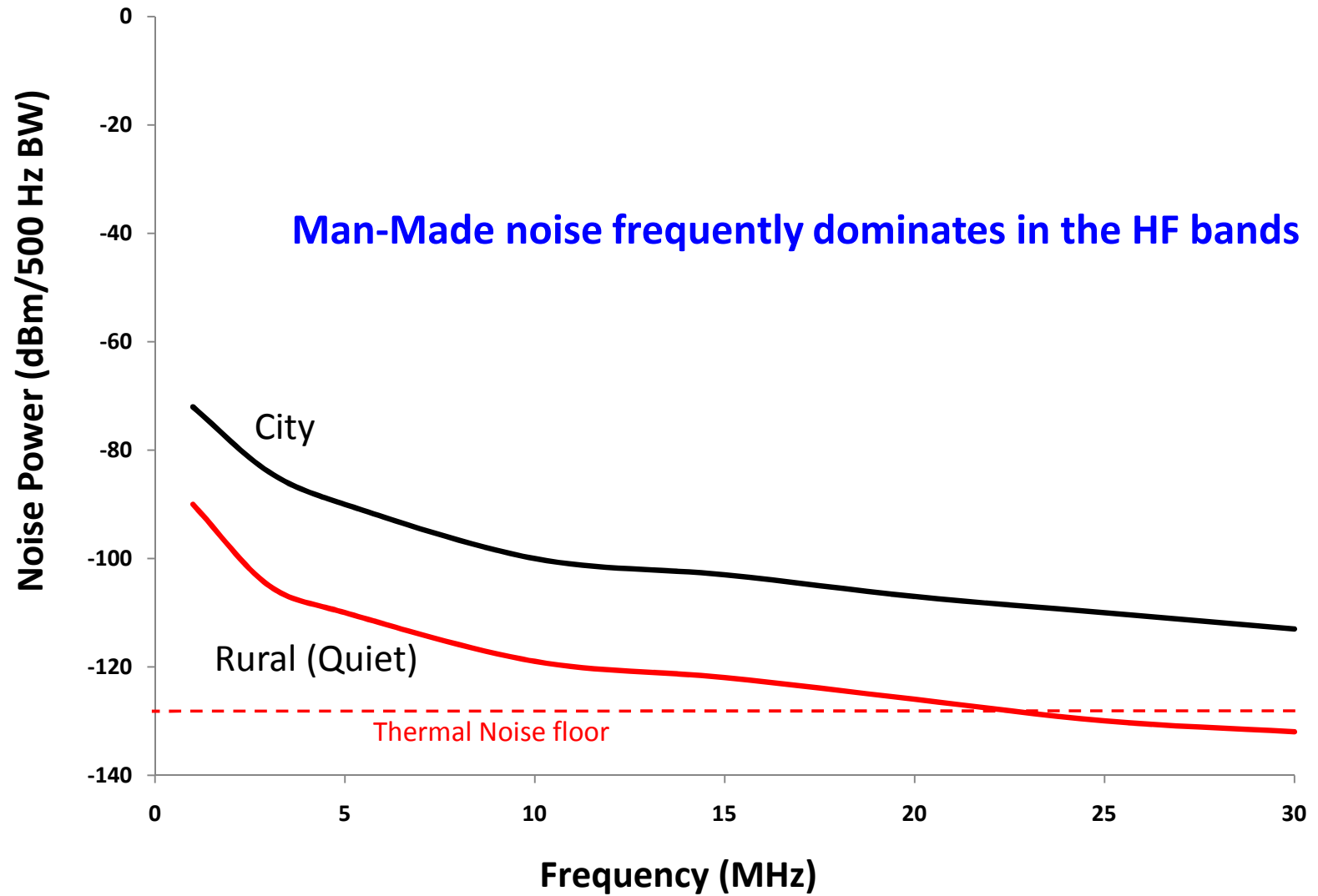
[email](#) Phone: **303-722-2257** FAX: **303-744-8876**

9 a.m. - 5 p.m. MST Monday - Friday

| Device | Noise | AGC | | 100kHz | | LO Noise | Spacing | Front End | Filter | Dynamic Range | | Dynamic Range | |
|--|---|---|----|----------------------|------------------------|----------|---------|-------------|----------------------|---------------|-----|--|-------------------|
| Under Test | Floor | Thrshld | dB | Blocking | Sensitivity | (dBc/Hz) | kHz | Selectivity | Ultimate | Wide Spaced | kHz | Narrow Spaced | kHz |
| | (dBm) | (uV) | | (dB) | (uV) | | | | (dB) | (dB) | | (dB) | |
| Added 12/01/10 Yaesu FTdx-5000D | -123 -135b -141b1 | 4.6 1.2b 0.33b1 | 3 | 127s | 0.13b1 | 135 | 10 | B Band Pass | 90f | 104 | 20 | 101f | 2 |
| Added 2/15/08 Elecraft K3 | -130 -138b | 2.1 0.6b | 3 | 140s | 0.19b | 138 | 10 | B Band Pass | 105 | 104 | 20 | 101 ^{pf} 96qf 95r | 2 |
| Updated 7/2/09 Perseus | -123 -125b | 0.75 0.1b | 3 | 125 | 0.6b | 147 | 10 | B Band Pass | 109f | 99 | 20 | 99 | 2 |

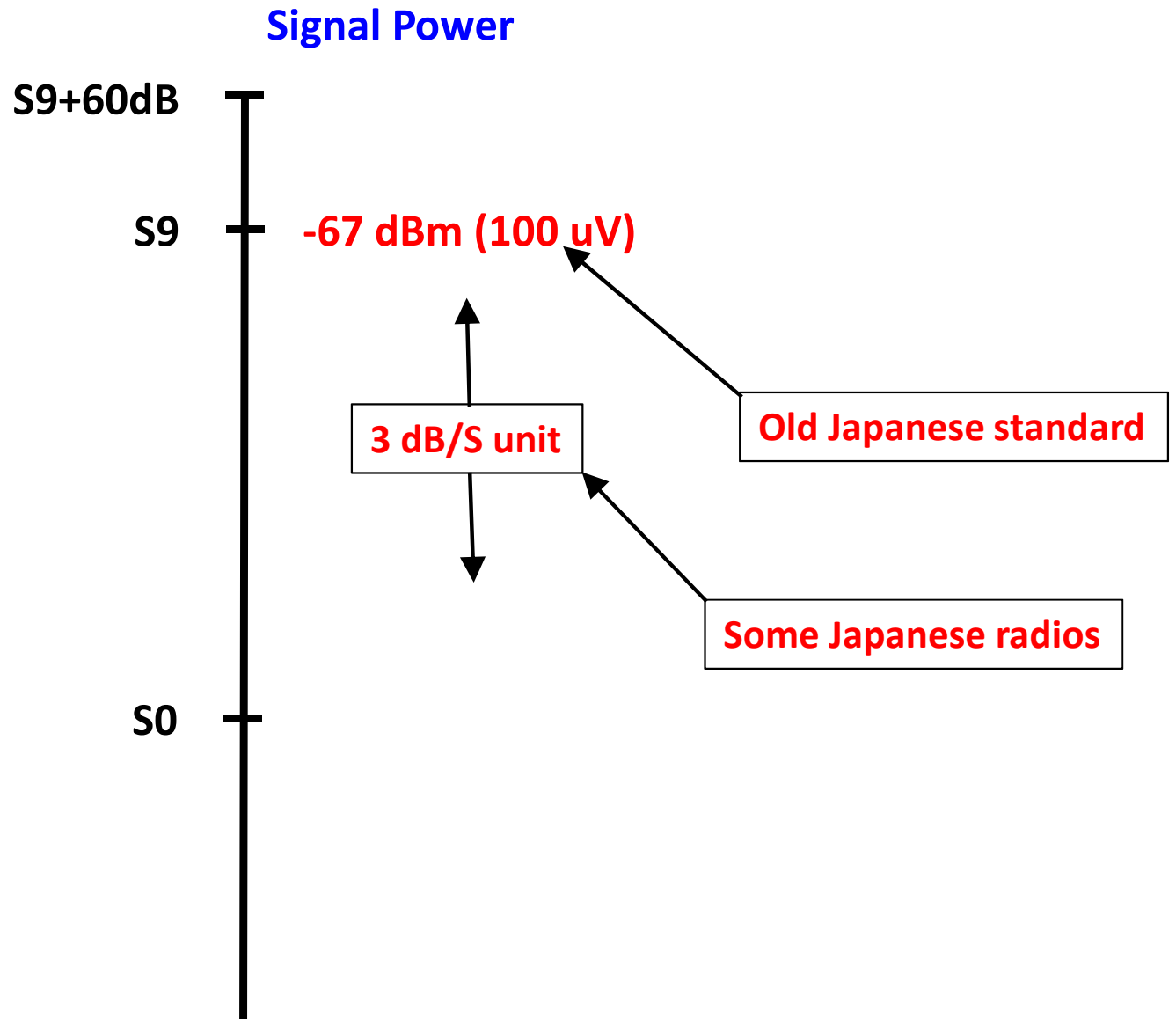
<http://www.sherweng.com/table.html>

Man-Made Noise Levels



The S Meter Scale

- Pre-Amp: OFF
- Attenuator: 0 dB



The S Meter Scale

- Pre-Amp: OFF
- Attenuator: 0 dB

Signal Power

S9+60dB -13 dBm (50 mV)

S9 -73 dBm (50 uV)

S6 -91 dBm

S3

S0 -127 dBm (0.1 uV)

Varies with mfg/model/alignment

Typical Receiver AGC Threshold ("S0") varies over ~20 dB

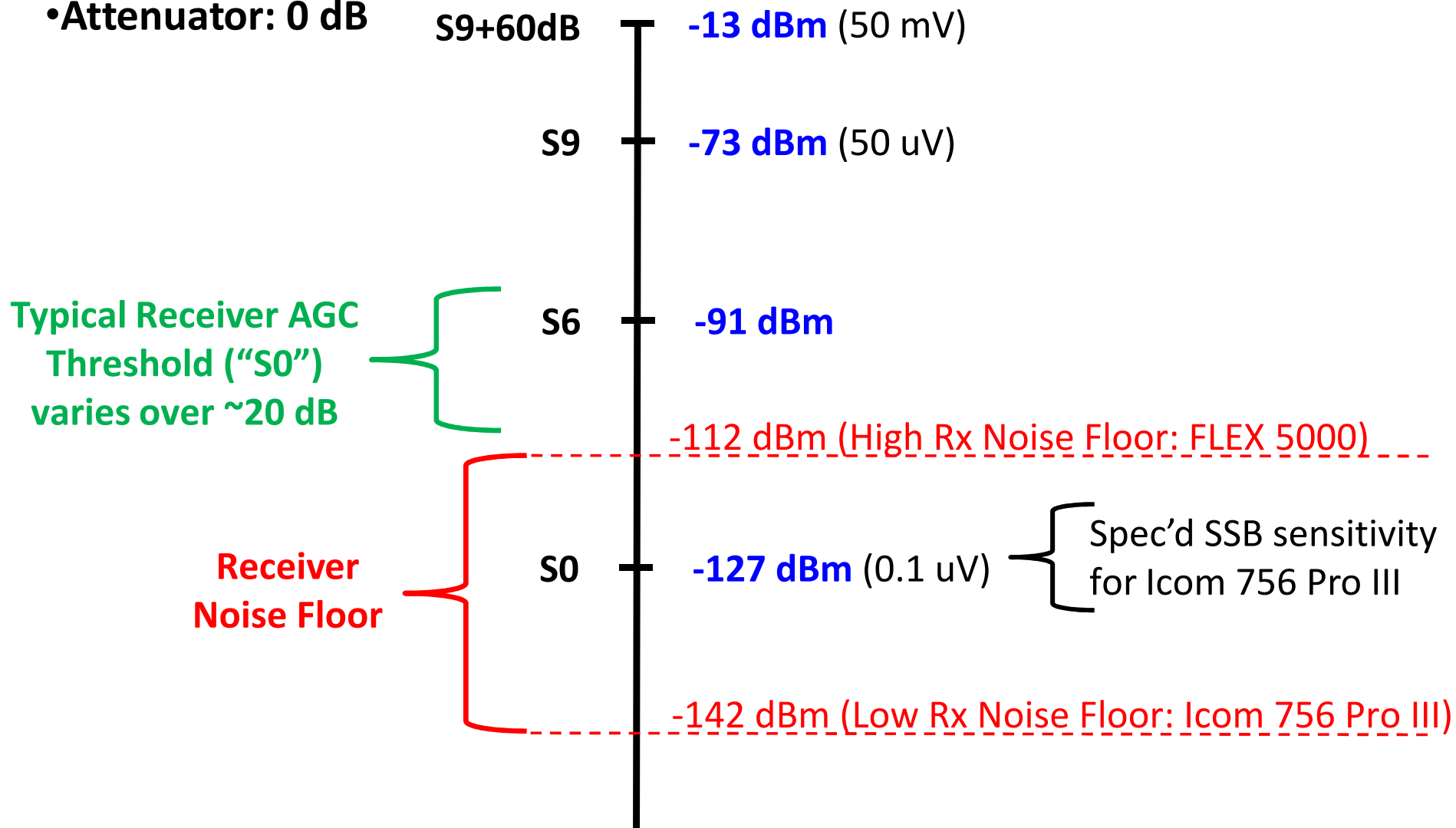
"S0" on meter usually 20-40 dB above true "S0"

Spec'd SSB sensitivity for Icom 756 Pro III

The S Meter Scale

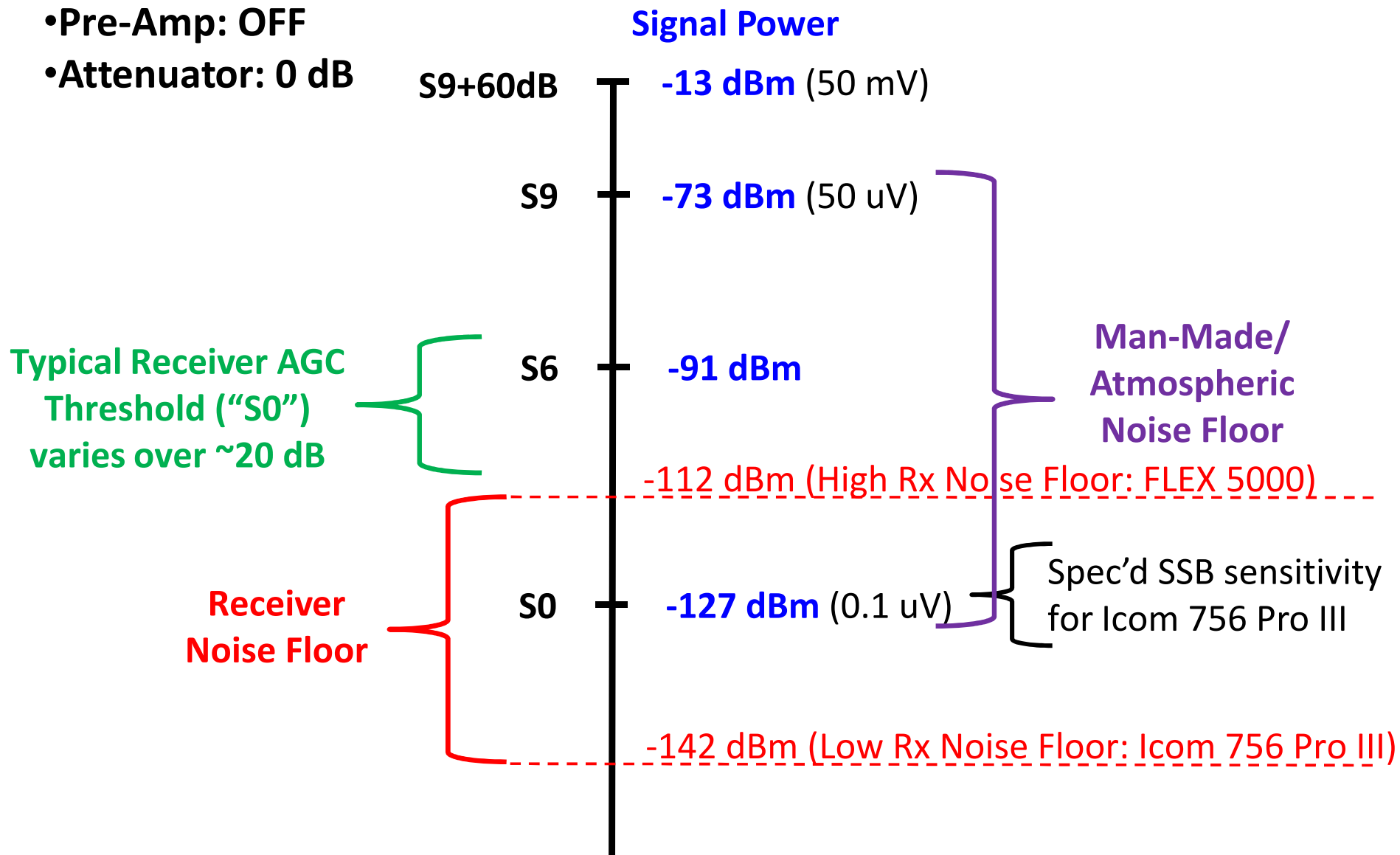
- Pre-Amp: OFF
- Attenuator: 0 dB

Signal Power



The S Meter Scale

- Pre-Amp: OFF
- Attenuator: 0 dB



- **S Meters: The Good, the Bad, and the Erroneous**

- **The Good**

- “S9” to “S9+60” can be fairly accurate

- **The Bad**

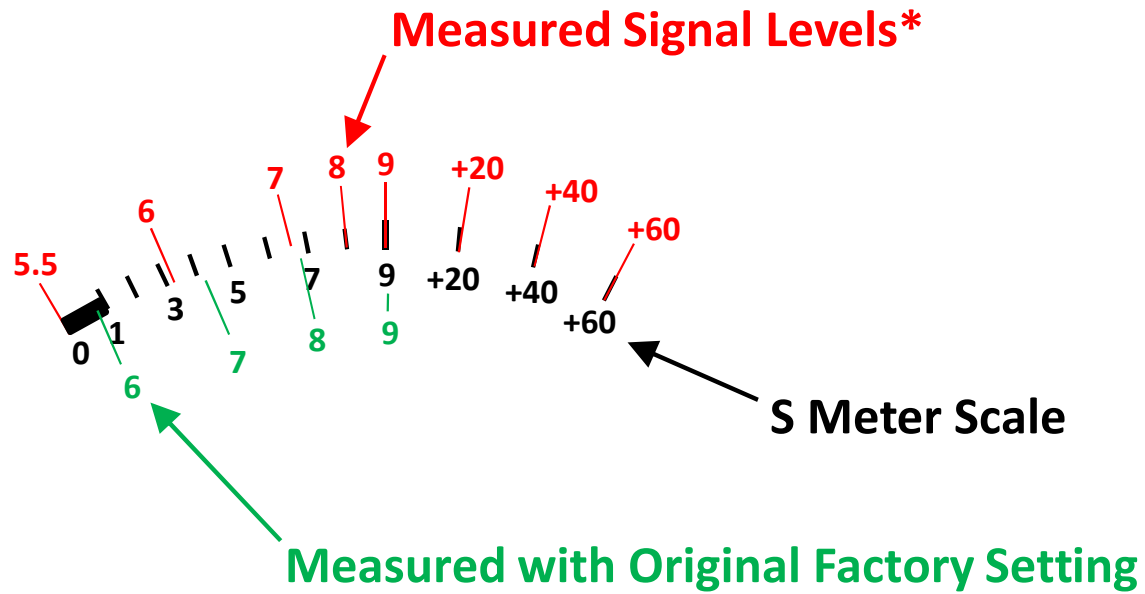
- “S9” defined as **50 uV** or **100 uV** (old Japanese standard)

- **The Erroneous**

- “S0” (AGC threshold) can be anywhere from S0 to S6
- Entire S meter scale usually moves:
 - **UP** with **Pre-Amp gain** (15-20 dB => 2-3 S units)
 - **Down** with **Attenuator** setting (15-20 dB => 2-3 S units)
- Scale may not be 6 dB per S unit (3 dB for the IC-756 PRO series, +?)
- Accuracy depends on one or more pot settings
- Some SDRs compensate for gain/attenuation adjustments

Icom IC-756 PROIII S Meter

- Pre-Amp: OFF
- Attenuator: 0 dB



* After scale re-adjusted to be closer to 6 dB per S unit

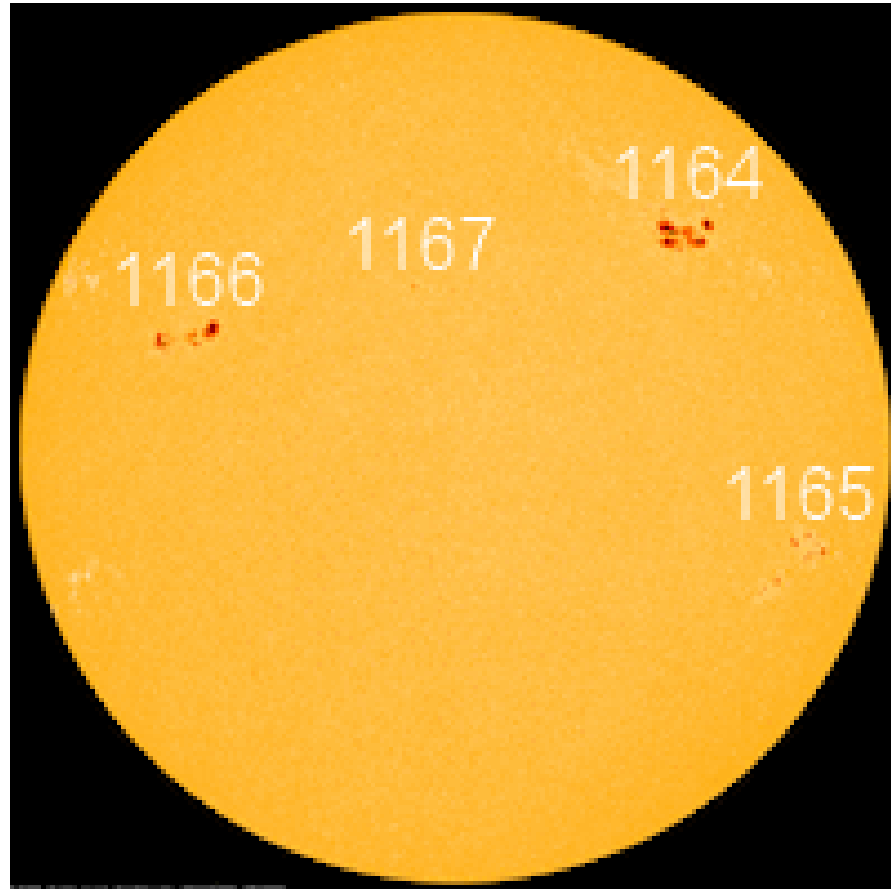
Common S Meter Problems

- **Problem 1:** My S Meter doesn't move off "S0" on signals that sound really strong
 - "S0" on a typical meter is usually somewhere between "S5-S6"
 - Most HF receivers can copy SSB signals down to "S0"
- **Problem 2:** My S Meter reads the same as other receivers on strong (S9 and higher) signals, but I can't copy weak signals that other receivers copy Q5
 - A failure in the RF front-end can increase the Net Noise Figure by more than 20 dB, and the IF gain can be increased by 20 dB (simple pot adjustment) to make the S meter read "S9" with a 50 uV signal
- **Problem 3:** A nearby station with a similar antenna receives signals 2-3 S units stronger than I do
 - AGC (ie, S meter) alignment = ?
 - RF pre-amp/attenuator settings (can change S meter by +/- 2-3 Sunits)
 - Intentionally inflated reports (I never give out a 5x0 report)

Propagation Update:

- **Readings on Sunday 8 March:**
 - Highest numbers since 2005
 - Daily sunspot number: **137**
 - 10.7 cm solar flux: **155** sfu
 - Two “X” rated flares in past month (none in previous 4 years)

From Spaceweather.com

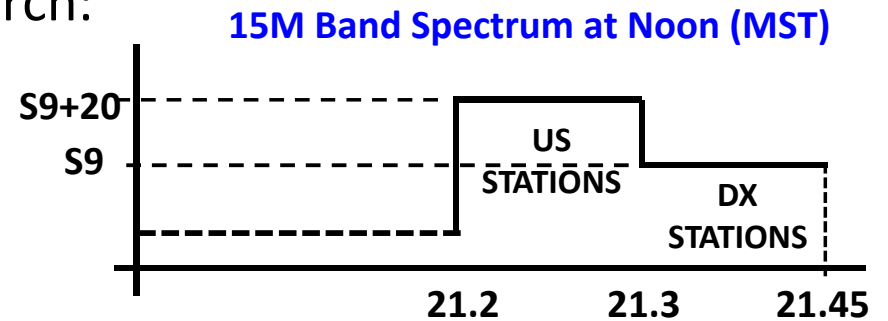


Propagation Update:

- **ARRL Phone DX Contest from N0CU:**

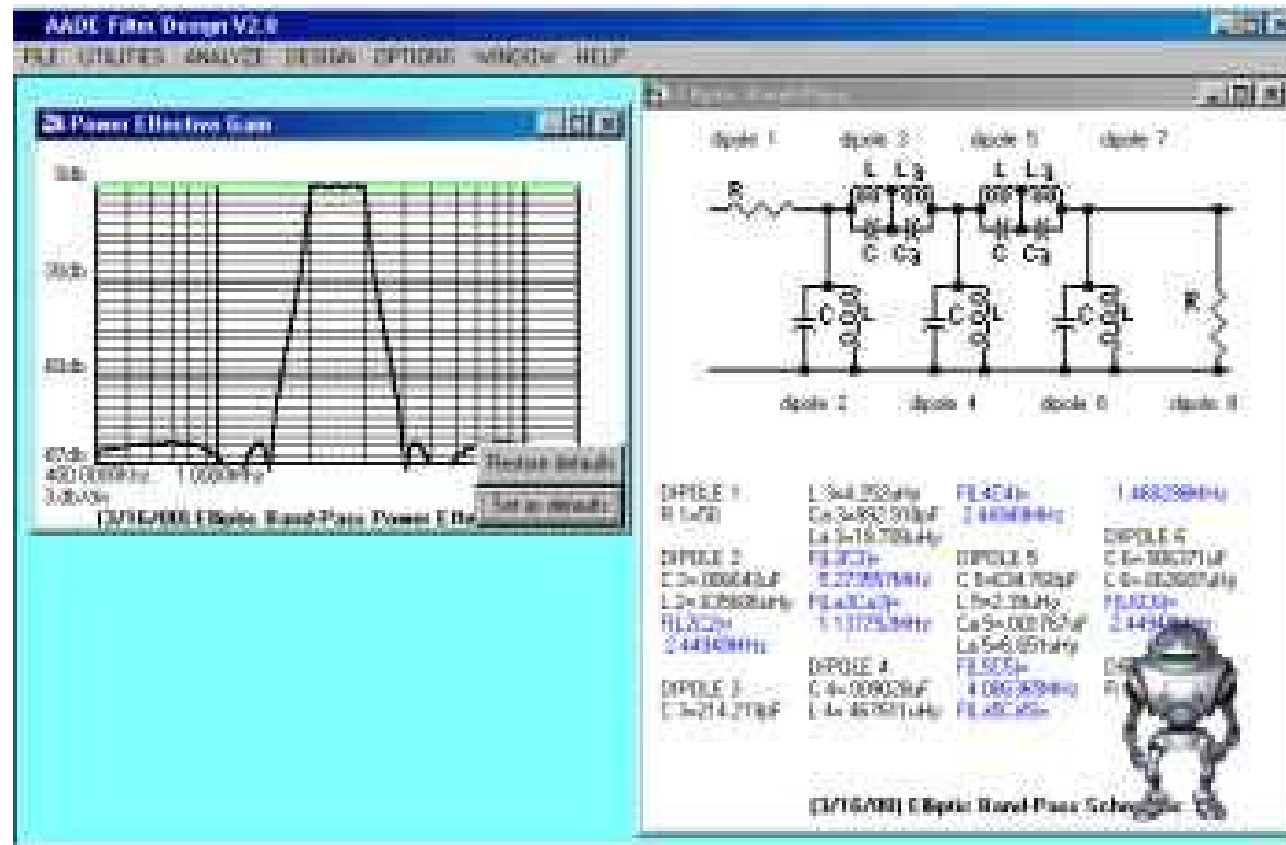
Between 6 am-Noon on Sunday 8 March:

- 15M wide open
 - Band was *packed* with stations
 - 145 DX contacts
 - 45 different countries
 - Many signals were S9+20 dB
 - Many DX stations were only running 100-400 watts with a modest antennas
- 10M open, but not many signals and most were S7 or less
- 20M open, but not as many signals as on 15M
 - Most signals were S9 or less
 - Open in evenings to Middle East (Kuwait), South Pacific & South America simultaneously until 10 p.m. (India was Q4xS5 with **10 watts**)
- 40M open to Europe, Africa, & Asia
 - Not many signals and not very strong
- 80M open to Europe & Asia
 - Not many signals and relatively weak



Info of General Interest

- Filter Design & Analysis Program (Free):
 - **Almost All Digital Electronics:**
 - <http://www.aade.com/filter32/download.htm#download>



- **Beam headings: North Jersey DX Association**

- <http://www.njdx.org/dx-tools/beam-headings.php>

Upcoming Events

- Next Club meeting: **7 May**
- Swapfests:
 - PPRAA Megafest (July 16)
 - DRC Hamfest (August 21)
 - BARCFest (Sept 25)
 - ?
- Edge of Space Sciences (EOSS) Balloon Launches:
 - 16-Apr-2011
 - 11-Jun-2011
- CQ Colorado (<http://cqcolorado.org/Events.aspx>):
 - Dayton Hamvention (May 20-22)
 - 2011 ARRL Rocky Mountain Division Convention (August 5-7)
 - New Mexico
 - Colorado QSO Party 2011 (Sept 3-4)
- **Sparkfun** in Boulder is having its next class on the Arduino micro-controller on April 30
- **Other events to list?**

Presentations

<http://www.naotc.org/>

"Ham Radio with Rooster & Peanut"

(aka: Portable operating with Goat-power!)

STEPHEN GALCHUTT

wGOAT