Weather, Antennas, and Feed Line: Getting the Most from VHF and UHF

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VHF and UHF operation is often described as “line of sight,” but any ham who has spent time on 2 meters or 70 centimeters knows the real world is far more interesting. Weather patterns, terrain, antenna choices, and feed line quality all play critical roles in determining how well your signal gets out — and how well you hear others. Understanding how these factors interact can dramatically improve your success on the VHF and UHF bands.

How Weather Affects VHF and UHF Propagation

Under normal conditions, VHF and UHF signals travel primarily by direct wave and ground reflection, following the curvature of the Earth slightly due to atmospheric refraction. However, changes in weather can significantly alter this behavior.

One of the most notable effects is **tropospheric propagation**, often called *tropo*. Temperature inversions — where warm air sits above cooler air — can create ducting layers in the lower atmosphere. These ducts can trap VHF and UHF signals and allow them to travel hundreds of miles beyond their normal range. Tropo is most common during high-pressure systems, particularly in the early morning or late evening, and is frequently observed over flat land or large bodies of water.

Rain and precipitation generally have minimal impact on VHF signals, but at UHF frequencies, especially above 1 GHz, heavy rain can cause noticeable attenuation. More commonly, weather affects VHF/UHF indirectly by shaping the atmosphere — pressure, temperature, and humidity gradients all influence how signals bend or scatter.

Understanding these conditions helps operators recognize when extended-range contacts are possible and when local conditions may be limiting performance.

Getting Out of Low-Lying Terrain

Many hams operate from less-than-ideal locations: valleys, urban areas, or sites surrounded by hills. Since VHF and UHF are largely line-of-sight, **height is king**. Even a modest increase in antenna elevation can result in dramatic improvements.

The first goal in antenna system design for these bands should be to get the antenna as high and as clear as possible. Raising an antenna from 20 feet to 40 feet above ground can often outperform adding several decibels of antenna gain. Clearing nearby obstructions — roofs, trees, and terrain — is far more important than squeezing every last dB out of the antenna design.

In low-lying areas, a practical approach includes:

- Mounting antennas on towers, masts, or rooftops rather than at ground level
- Placing antennas at the highest point on the property
- Using lightweight directional antennas that can be supported higher than heavier omnidirectional designs

In difficult terrain, even small directional antennas aimed toward population centers or repeater sites can significantly improve reliability.

The Importance of Low-Loss Feed Line

At VHF and especially UHF, feed line losses quickly become the silent killer of performance. Unlike HF, where coax loss may be tolerable, a poor-quality or overly long feed line can consume much of your transmitter power before it ever reaches the antenna.

For example, 100 feet of RG-58 may lose over half your power on 440 MHz. In contrast, high-quality low-loss coax such as LMR-400, 9913, or hardline dramatically reduces attenuation and effectively increases your radiated signal — without increasing transmitter power.

The same applies on receive. Every decibel lost in the feed line degrades your system noise figure, making weak signals harder to hear. Investing in better coax is often more effective than buying a higher-power radio.

As a rule of thumb:

- Use the lowest-loss feed line you can reasonably afford
- Keep feed lines as short as practical
- Pay close attention to connector quality and weatherproofing

High-Gain vs. Lower-Gain Directional Antennas

Directional antennas such as Yagis and log-periodics are powerful tools on VHF and UHF, but gain comes with trade-offs.

High-gain directional antennas focus energy into a very narrow beam. This provides excellent performance for weak-signal work, long-distance simplex contacts, contesting, moonbounce, or targeting distant repeaters. However, the narrow beamwidth requires accurate aiming, often using a rotator, and makes it easy to miss signals coming from other directions.

Lower-gain directional antennas have broader beamwidths and are often lighter, smaller, and easier to mount. While they provide less forward gain, they are more forgiving in aim and are ideal for:

- Fixed stations targeting a general direction
- Portable and rover operations
- Limited tower or mast capacity
- Operating in terrain where signals arrive via reflections or scattering

In practice, many stations benefit from a combination: a modest-gain directional antenna for general use, and a higher-gain antenna for specialized weak-signal or long-distance work.

Putting It All Together

Successful VHF and UHF operation is about system optimization rather than brute force. Weather can open remarkable propagation paths, but only if your signal reaches the atmosphere efficiently. Antenna height often matters more than antenna gain, and feed line quality can make or break your station.

By understanding propagation effects, designing antenna systems that overcome terrain limitations, choosing appropriate antennas for your operating goals, and minimizing feed line losses, you can dramatically improve your performance on the VHF and UHF bands — even from challenging locations.

In VHF and UHF work, a well-designed station doesn't just transmit power — it puts that power exactly where it counts.