ON4CRD

Volume 06

Types of Antenna



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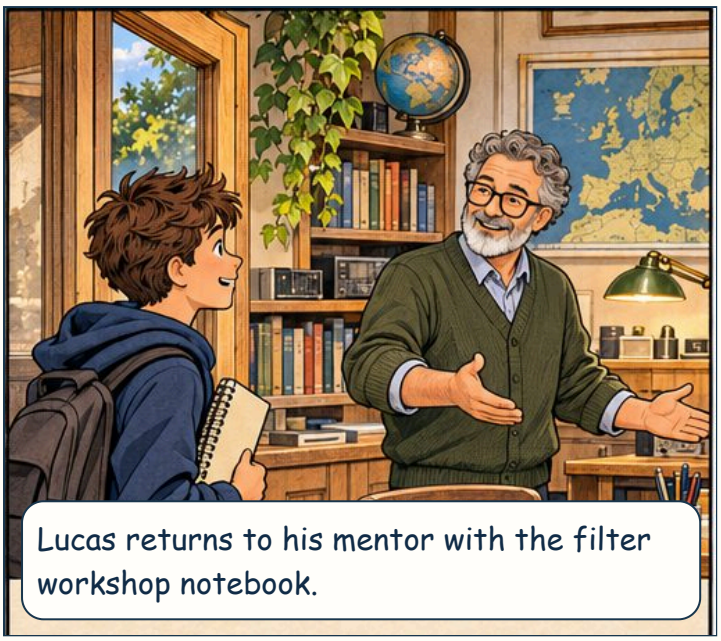
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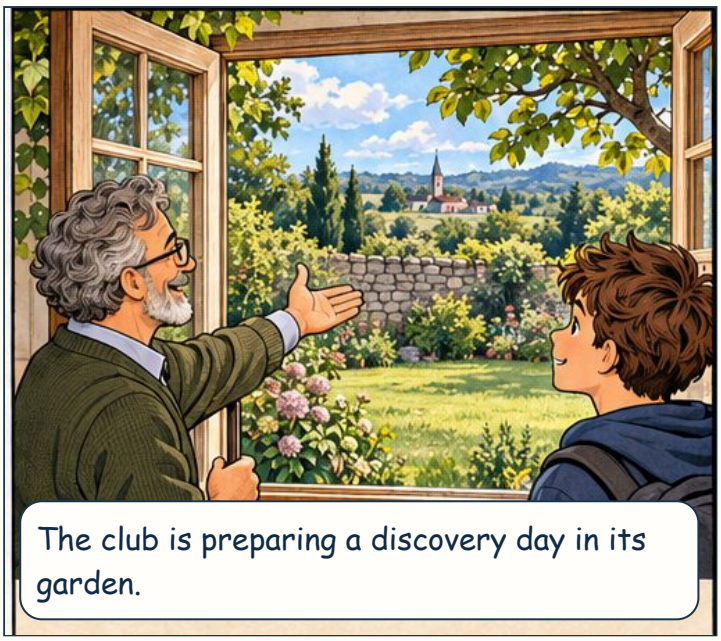
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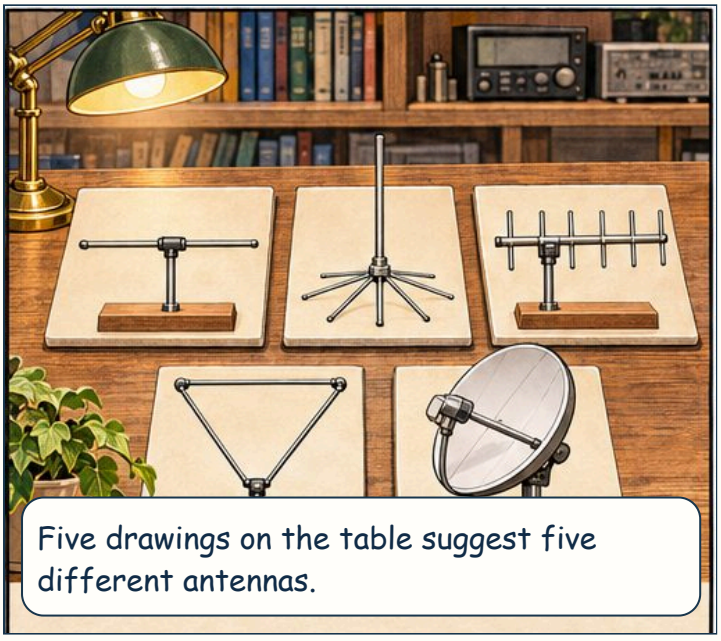
An antenna for the club day



Lucas returns to his mentor with the filter workshop notebook.



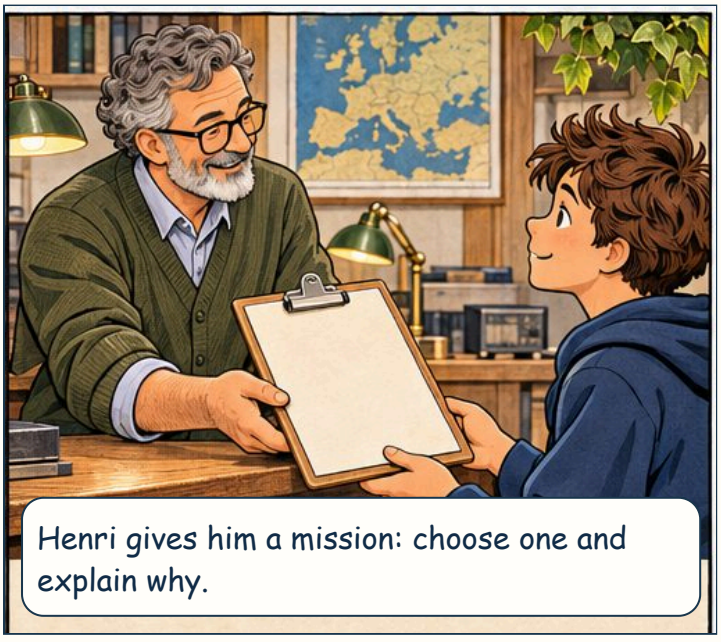
The club is preparing a discovery day in its garden.



Five drawings on the table suggest five different antennas.



“Will the biggest be the best?” asks the youngster.



Henri gives him a mission: choose one and explain why.

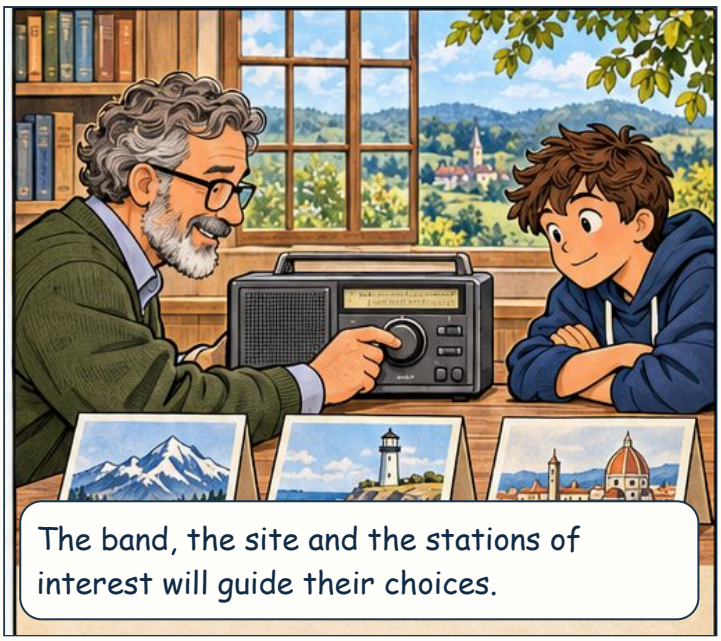


They plan an investigation, followed by a receiving demonstration.

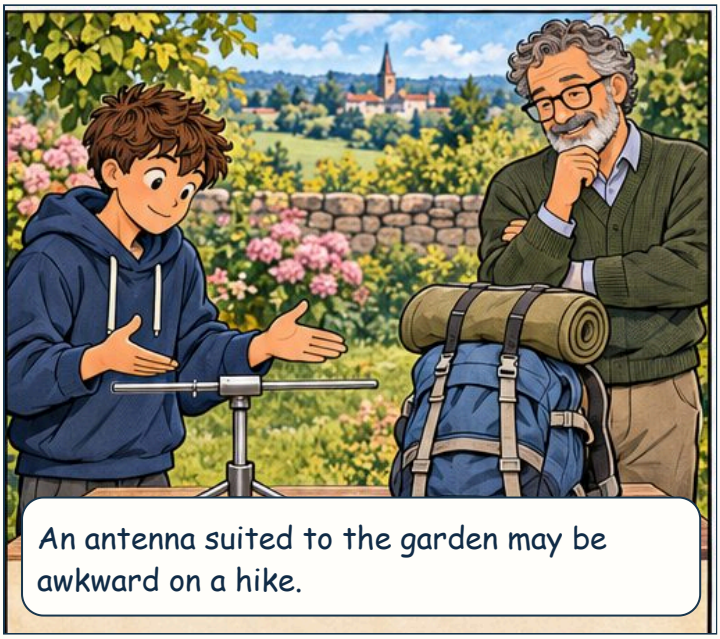
Start with a question



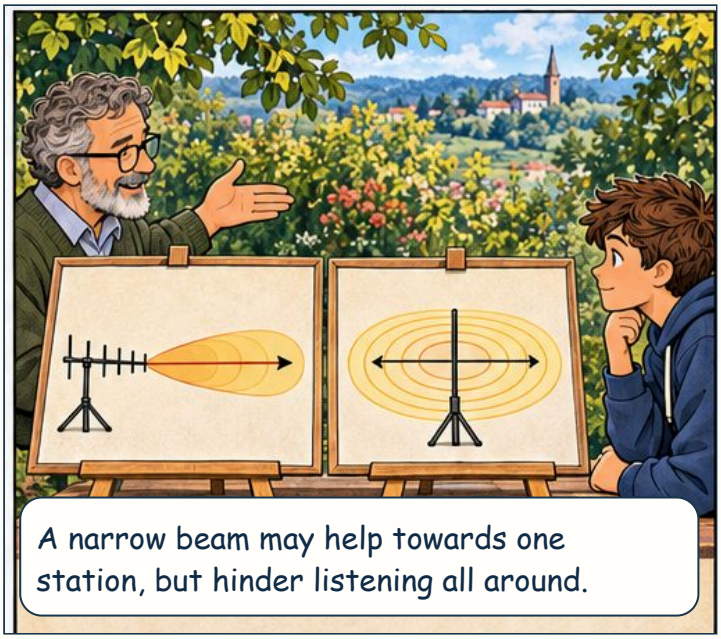
They want to hear local conversations and show how to aim an antenna.



The band, the site and the stations of interest will guide their choices.



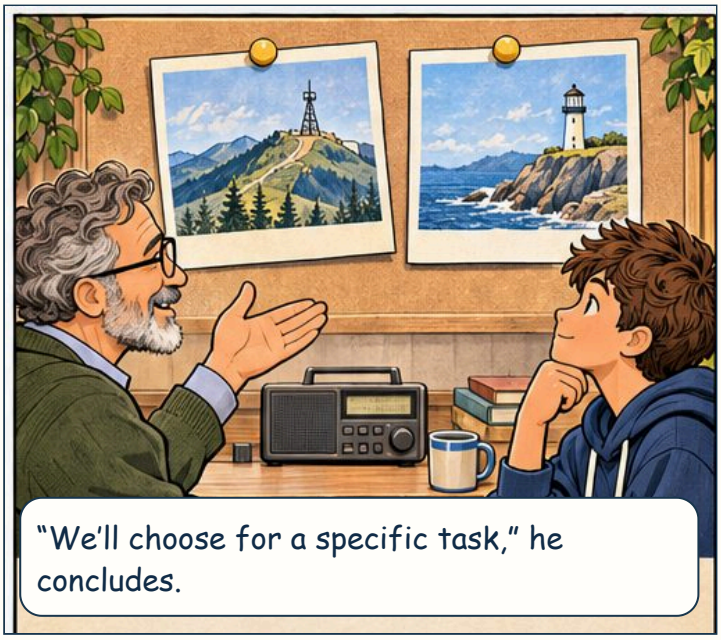
An antenna suited to the garden may be awkward on a hike.



A narrow beam may help towards one station, but hinder listening all around.

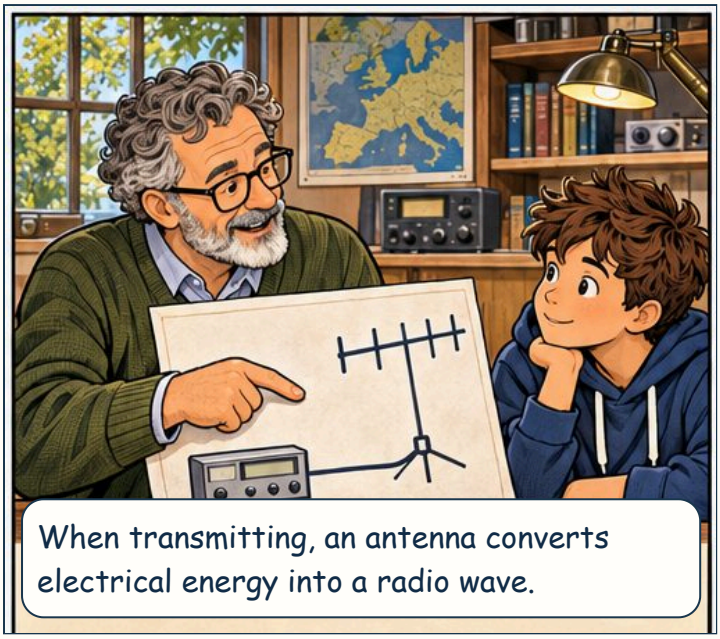


The youngster draws two aims: welcome visitors and aim in a direction.

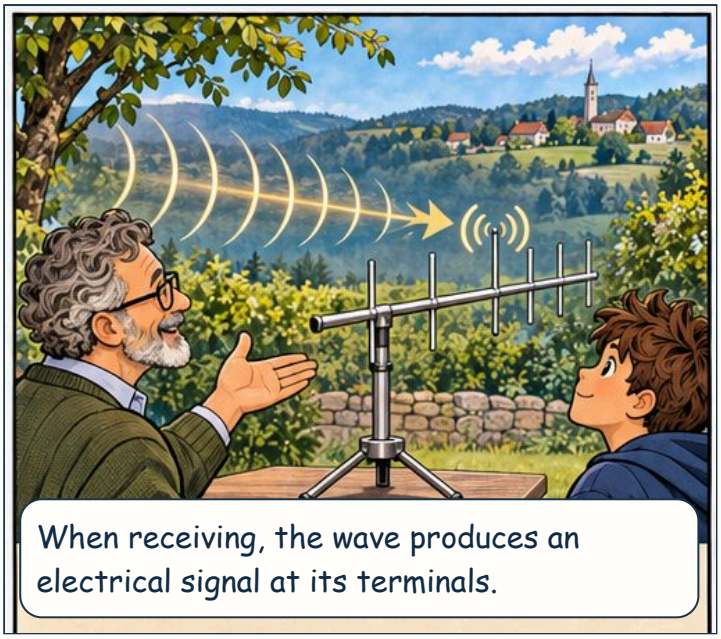


“We’ll choose for a specific task,” he concludes.

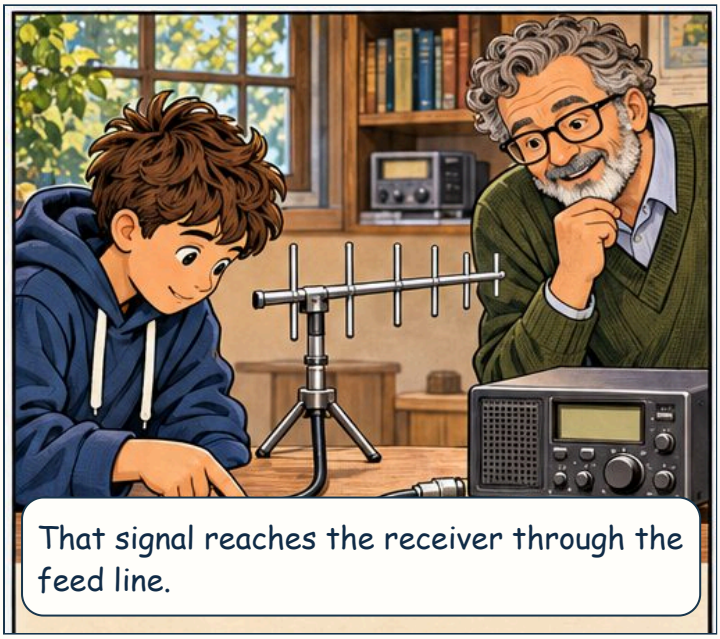
Between two worlds



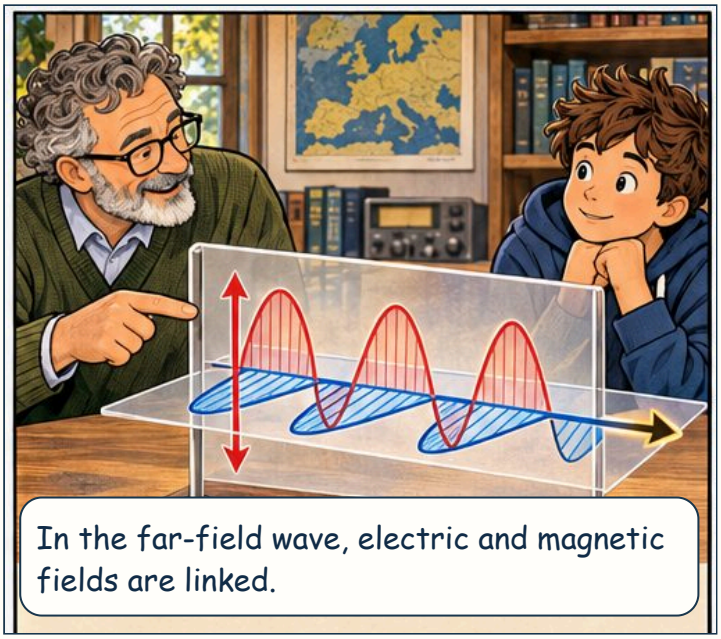
When transmitting, an antenna converts electrical energy into a radio wave.



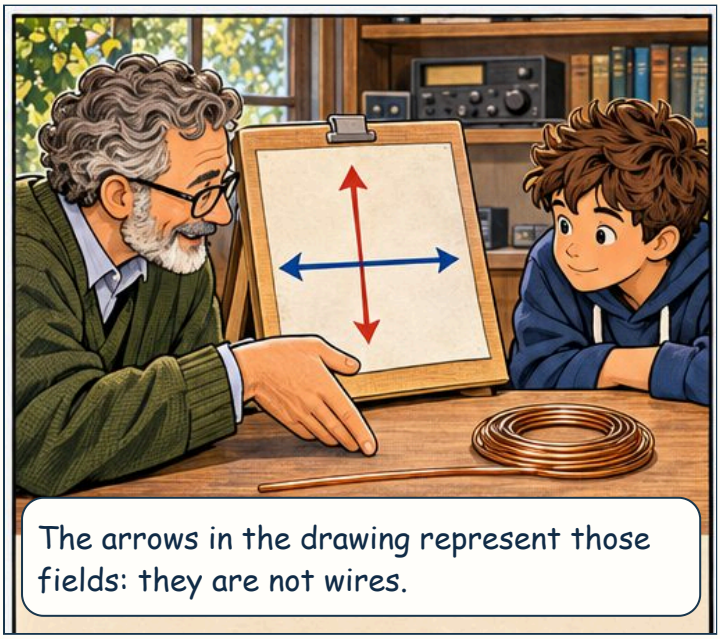
When receiving, the wave produces an electrical signal at its terminals.



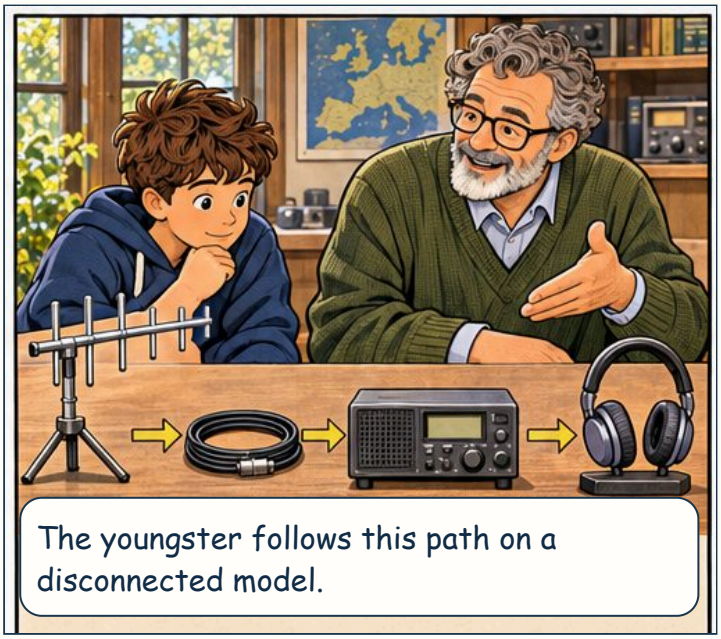
That signal reaches the receiver through the feed line.



In the far-field wave, electric and magnetic fields are linked.

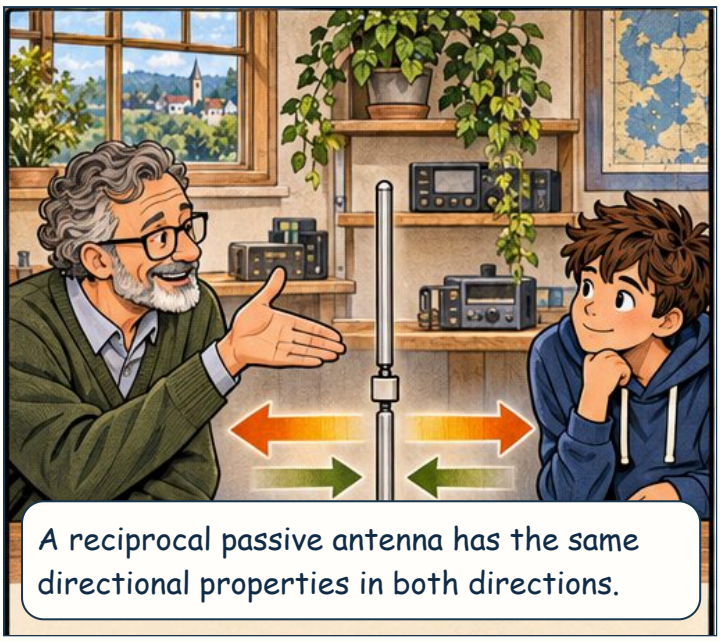


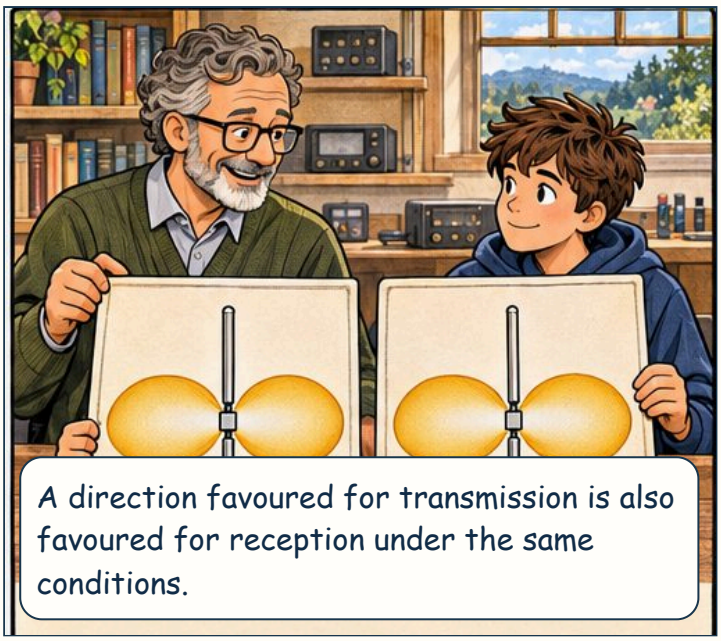
The arrows in the drawing represent those fields: they are not wires.

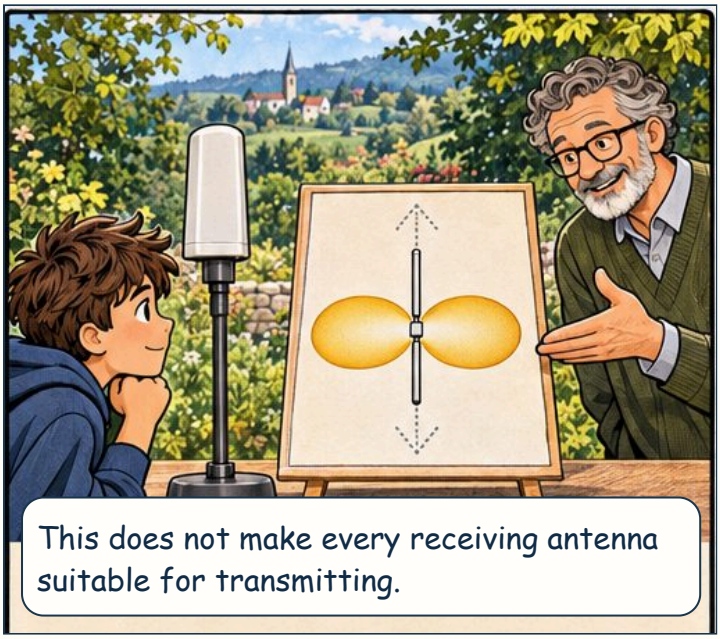


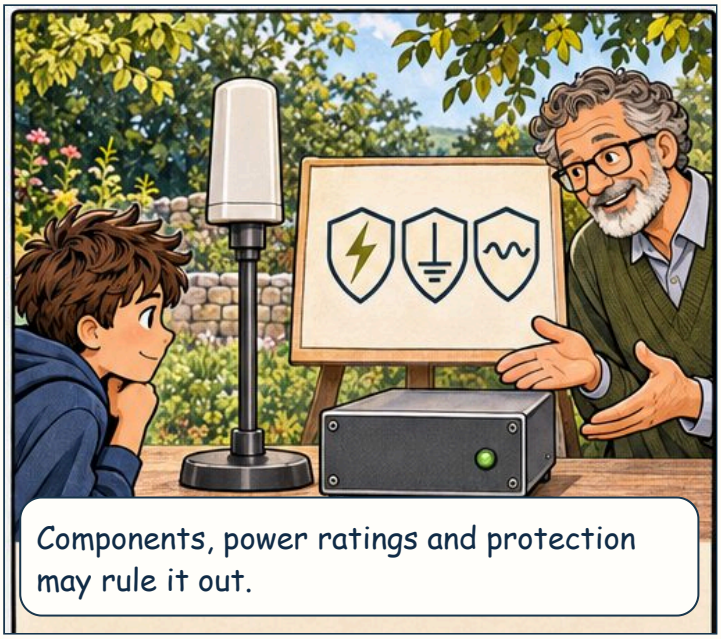
The youngster follows this path on a disconnected model.

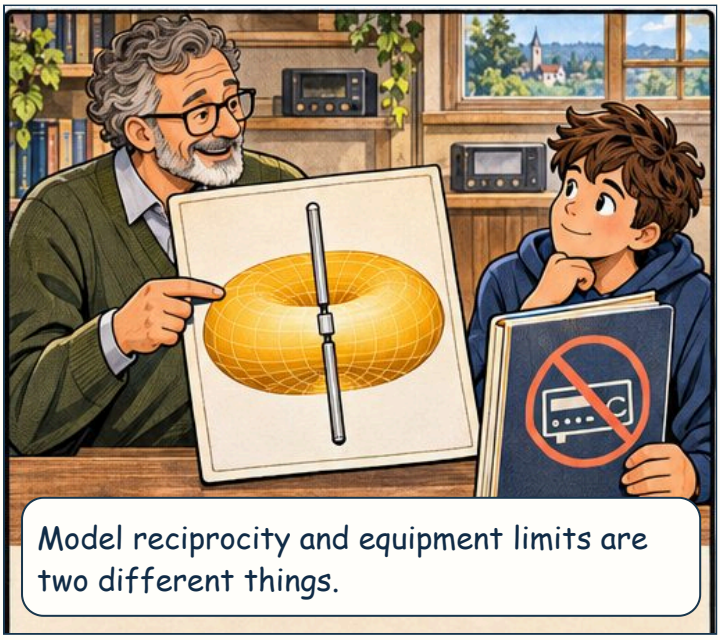
An antenna works both ways

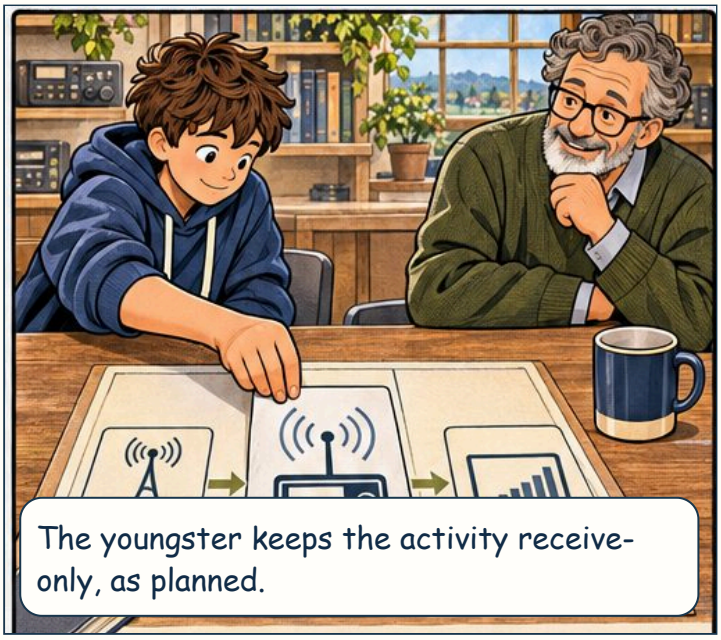




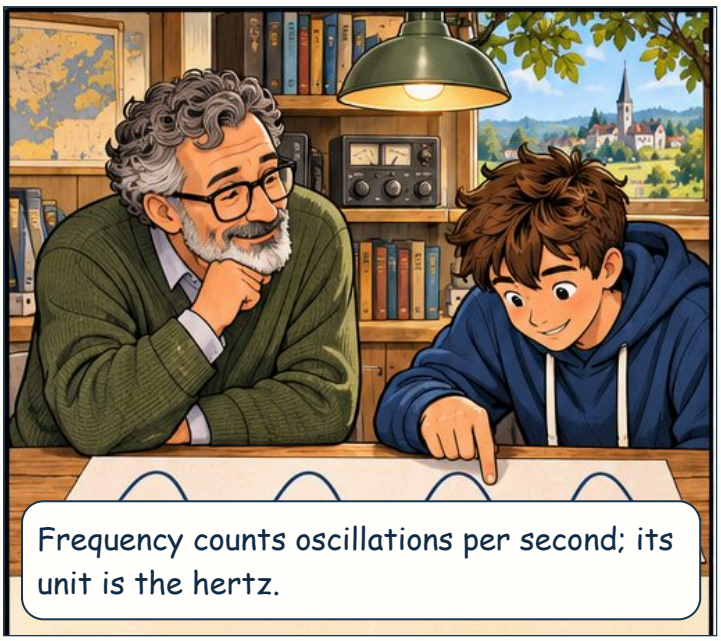




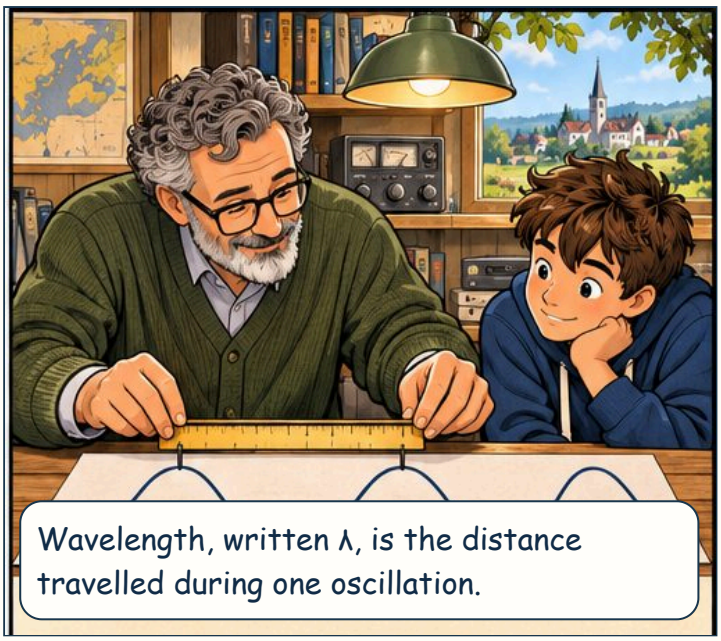




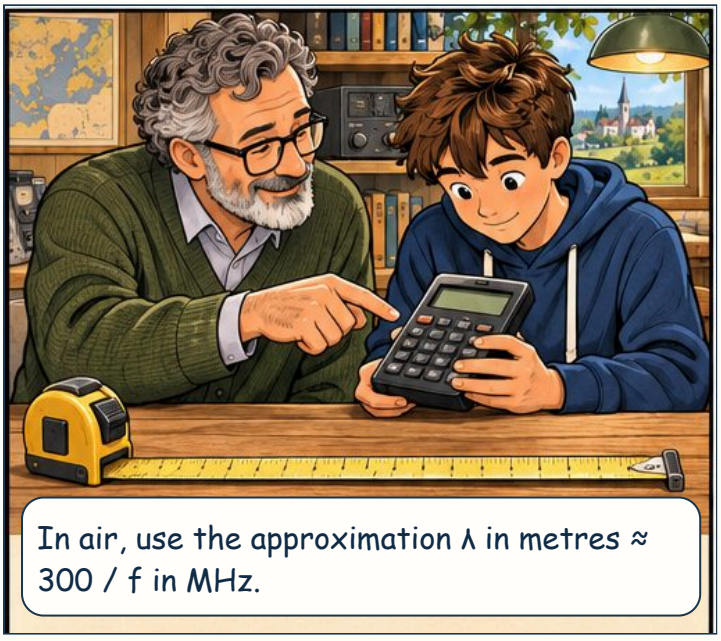
Frequency sets the scale



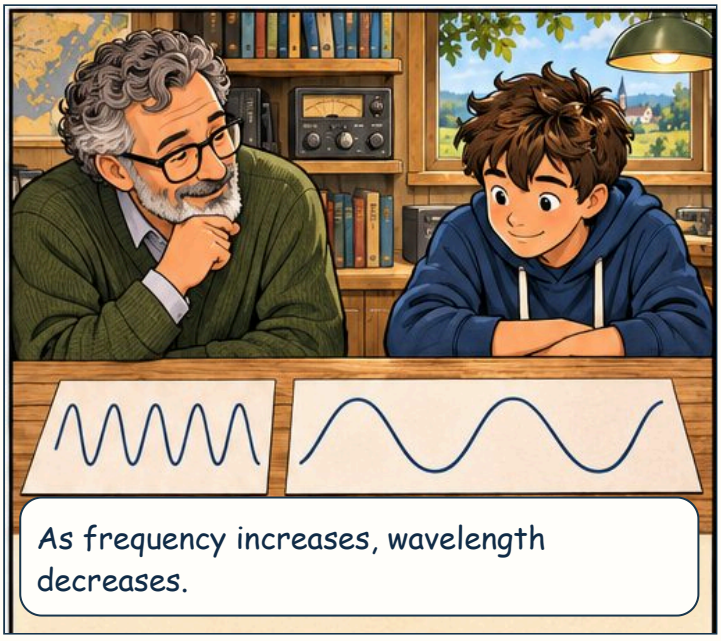
Frequency counts oscillations per second; its unit is the hertz.



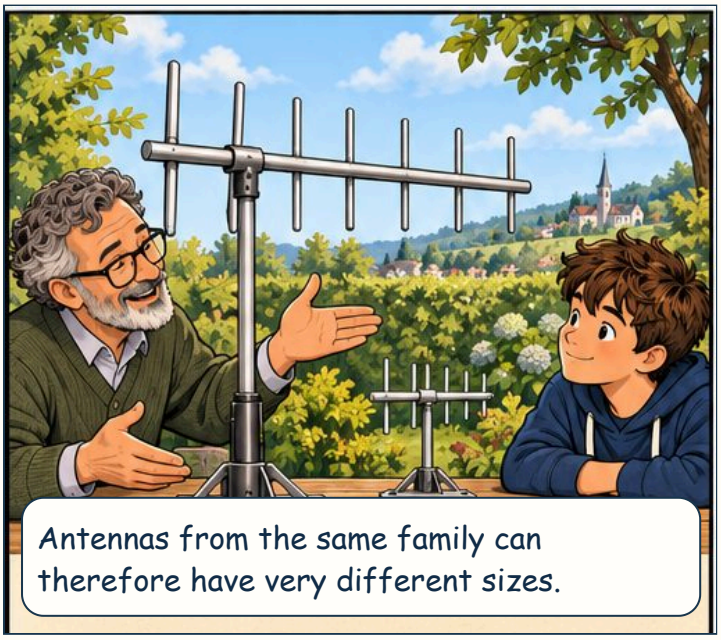
Wavelength, written λ, is the distance travelled during one oscillation.



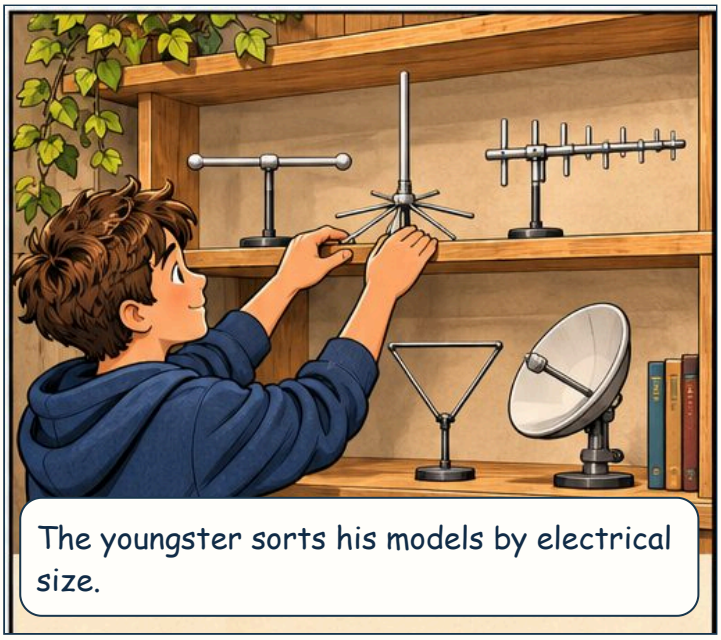
In air, use the approximation λ in metres ≈ 300 / f in MHz.



As frequency increases, wavelength decreases.

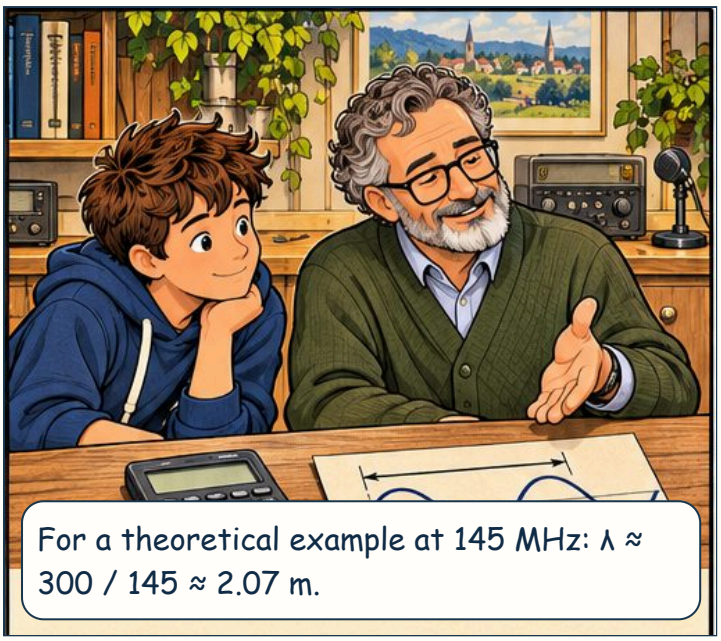


Antennas from the same family can therefore have very different sizes.

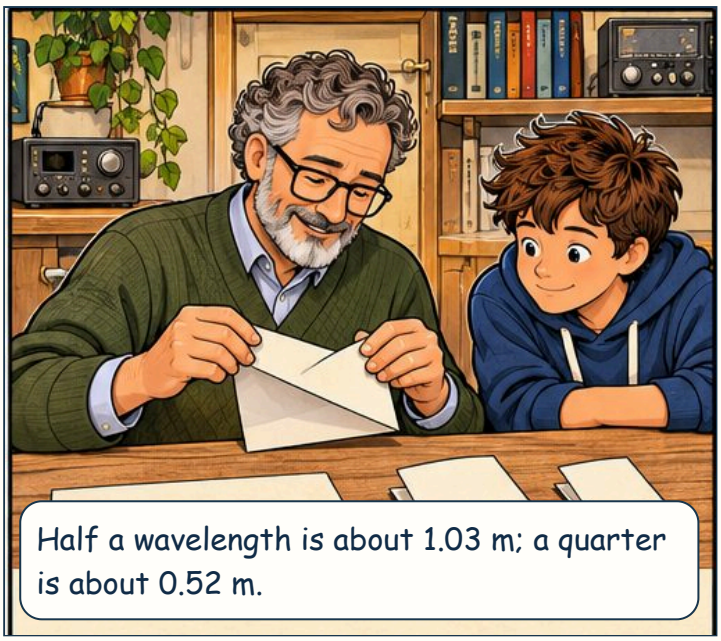


The youngster sorts his models by electrical size.

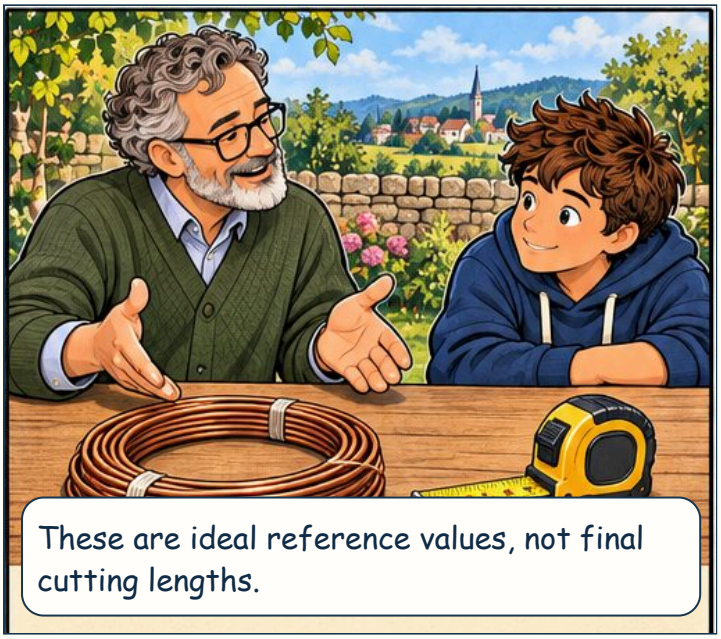
A calculation, not a cutting guide



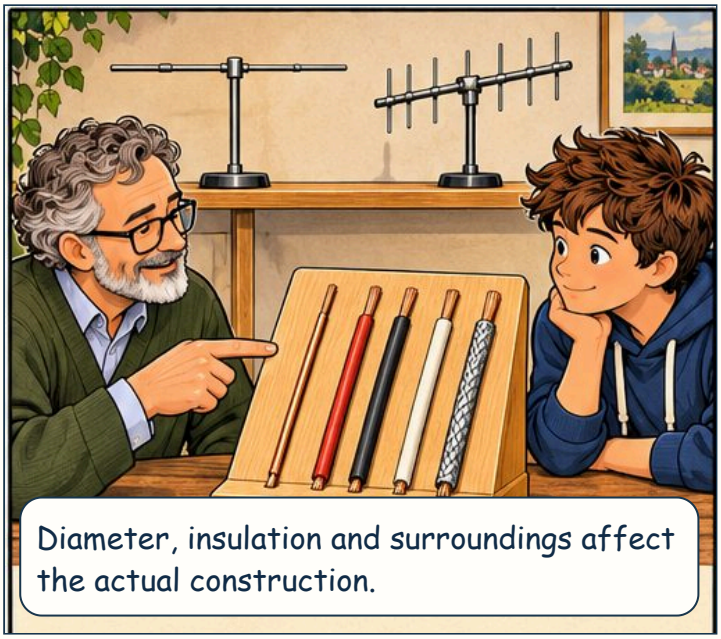
For a theoretical example at 145 MHz: λ ≈ 300 / 145 ≈ 2.07 m.



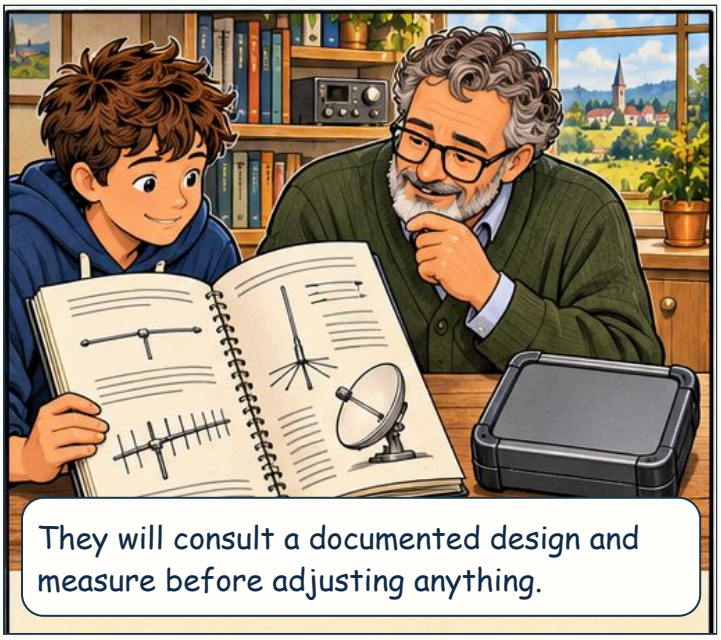
Half a wavelength is about 1.03 m; a quarter is about 0.52 m.



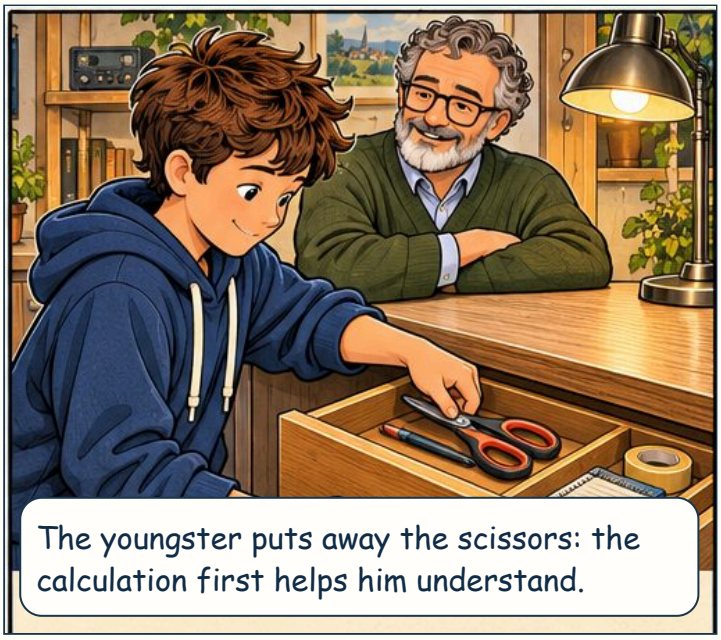
These are ideal reference values, not final cutting lengths.



Diameter, insulation and surroundings affect the actual construction.

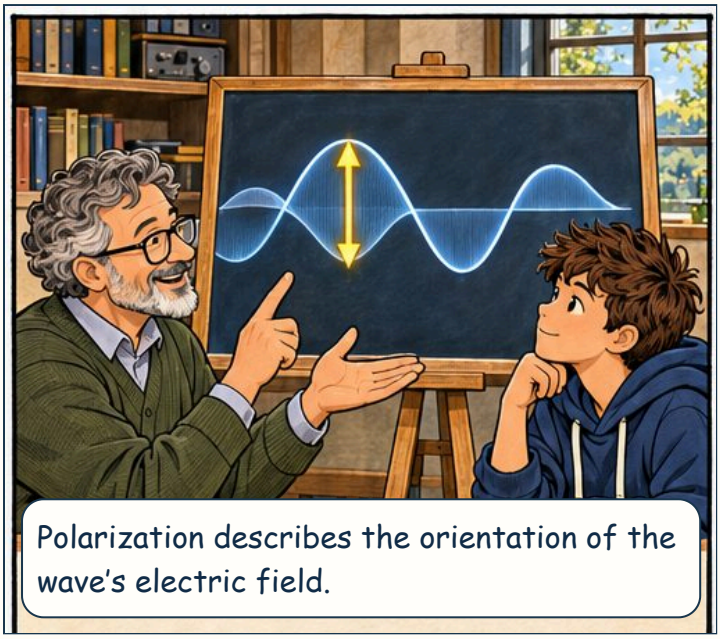


They will consult a documented design and measure before adjusting anything.

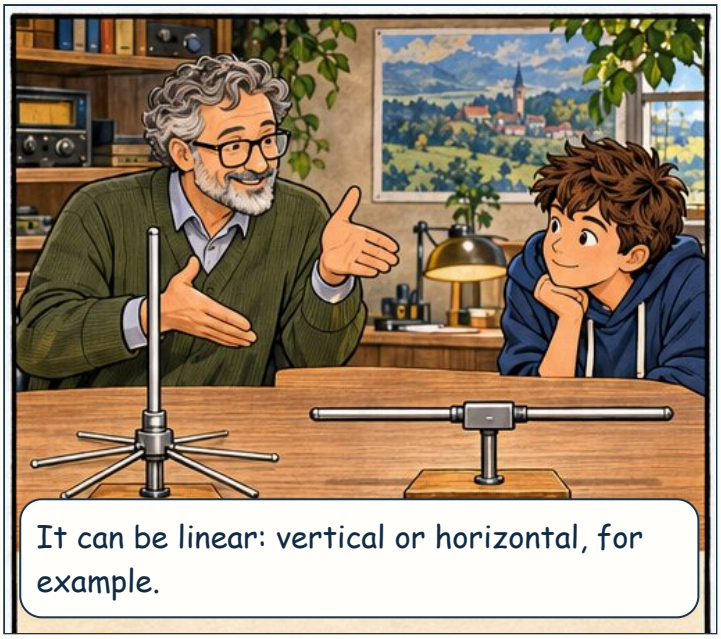


The youngster puts away the scissors: the calculation first helps him understand.

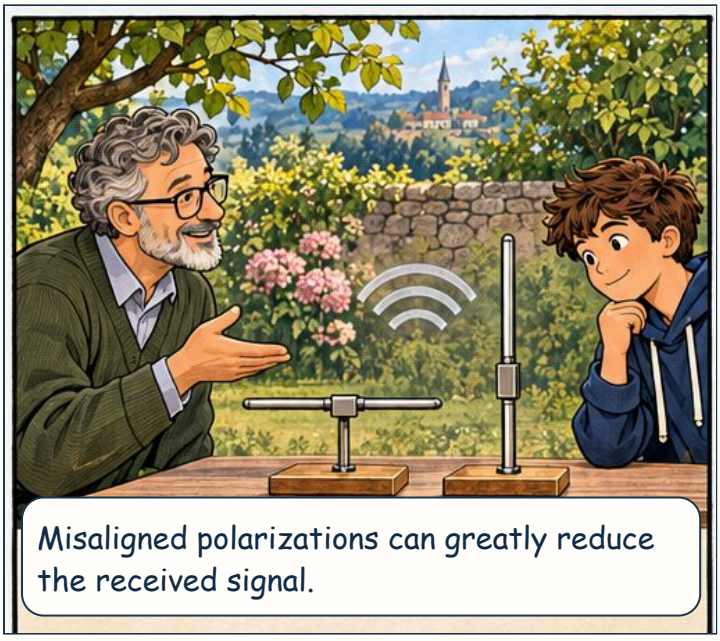
Which way does the field oscillate?



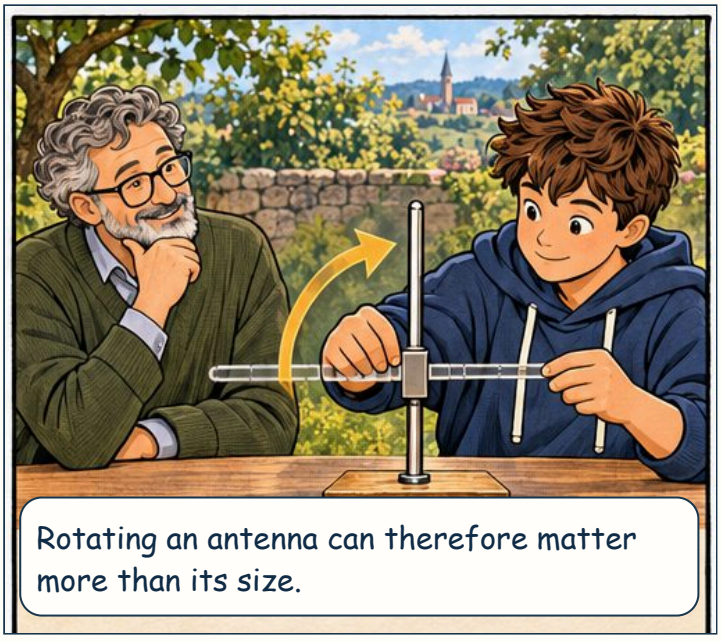
Polarization describes the orientation of the wave's electric field.



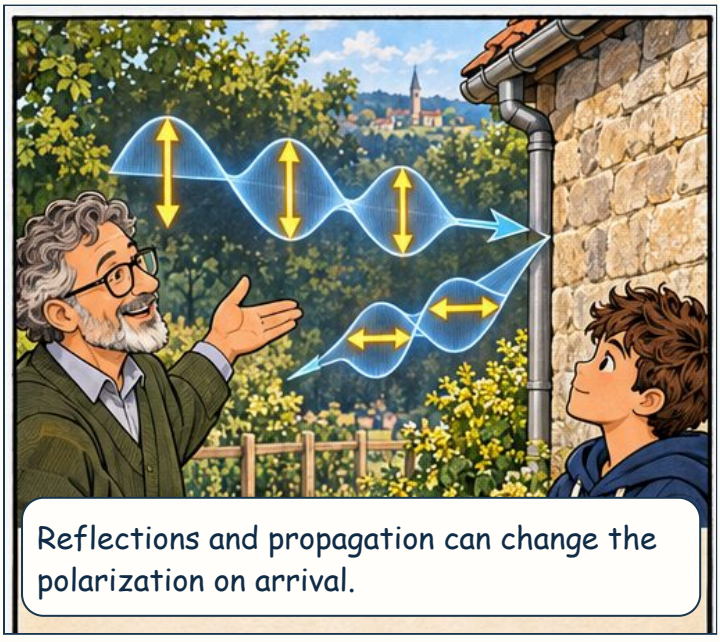
It can be linear: vertical or horizontal, for example.



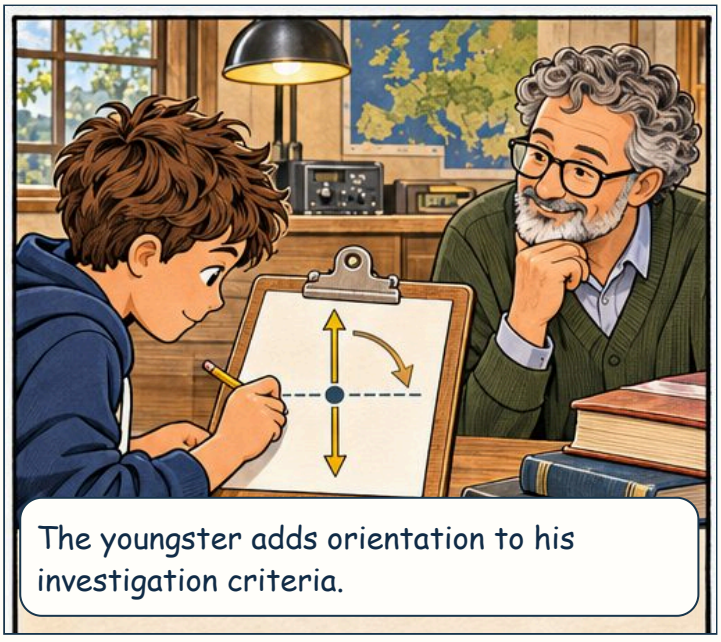
Misaligned polarizations can greatly reduce the received signal.



Rotating an antenna can therefore matter more than its size.

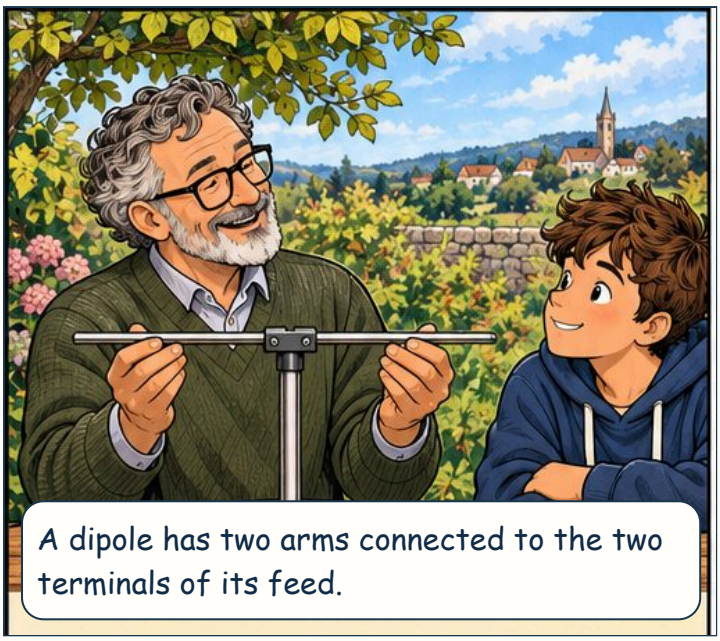


Reflections and propagation can change the polarization on arrival.

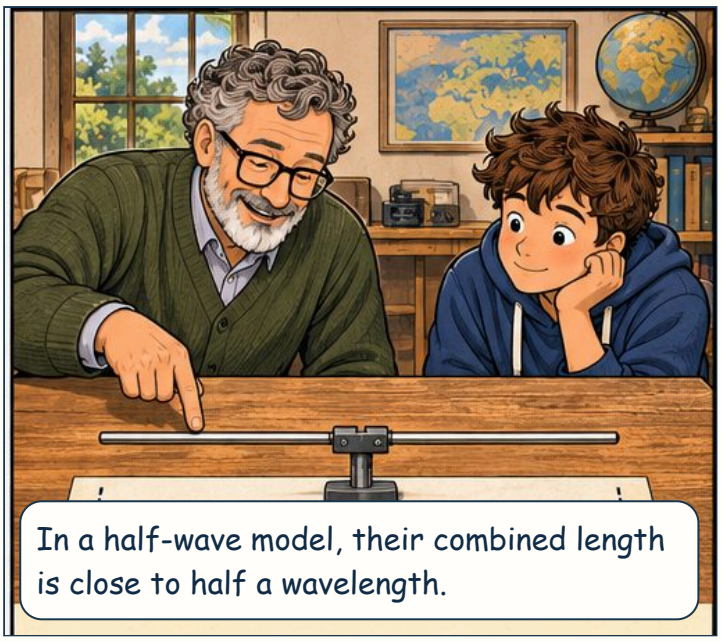


The youngster adds orientation to his investigation criteria.

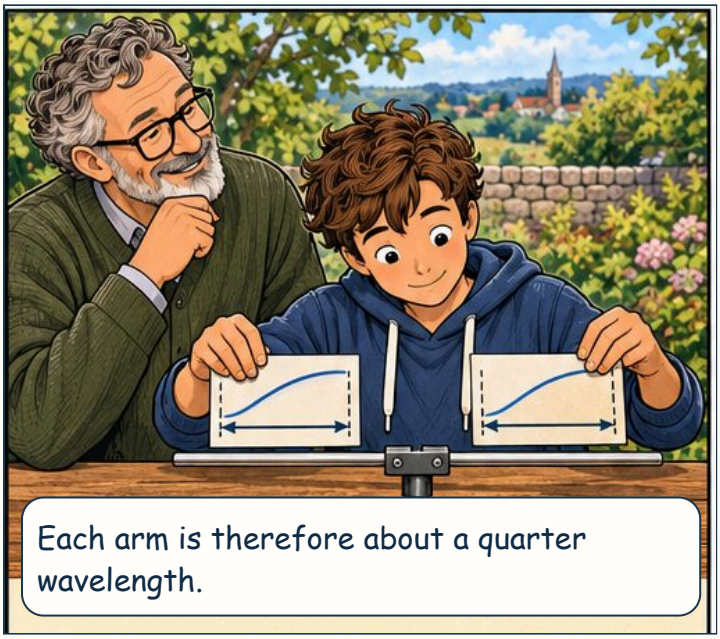
Two arms and a centre



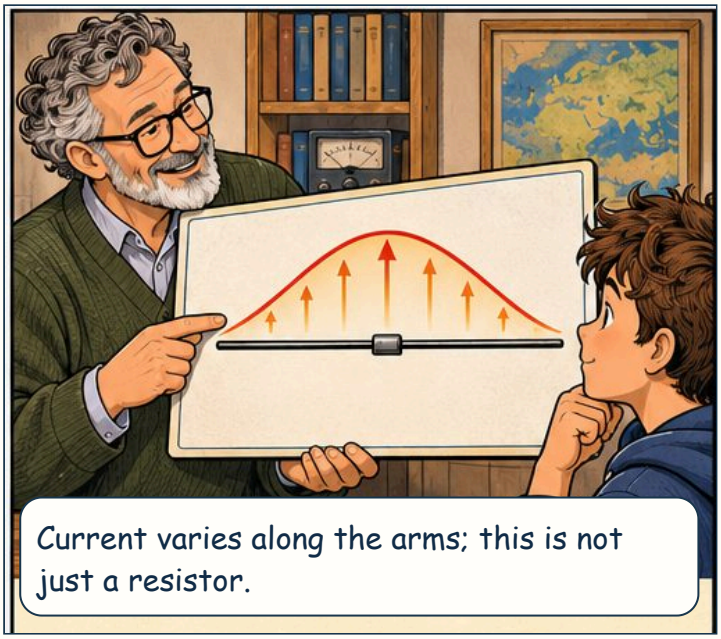
A dipole has two arms connected to the two terminals of its feed.



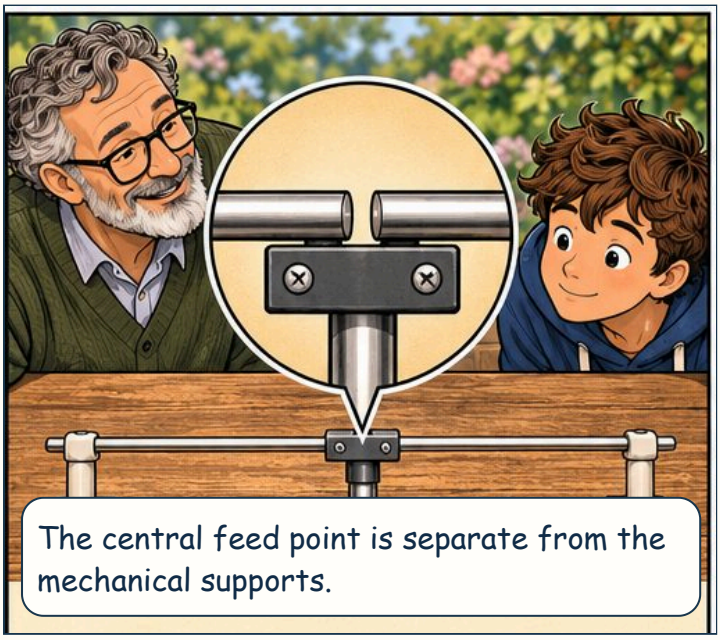
In a half-wave model, their combined length is close to half a wavelength.



Each arm is therefore about a quarter wavelength.



Current varies along the arms; this is not just a resistor.

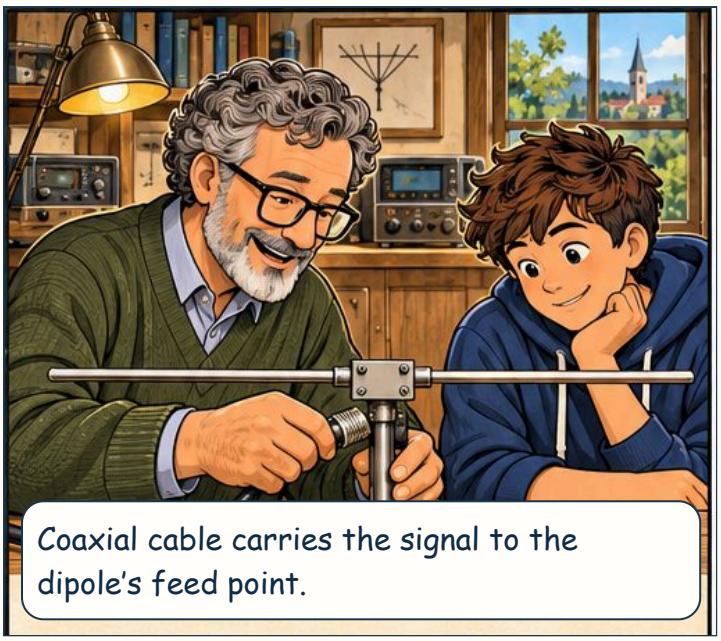


The central feed point is separate from the mechanical supports.



The youngster finally recognizes the drawing on the first card.

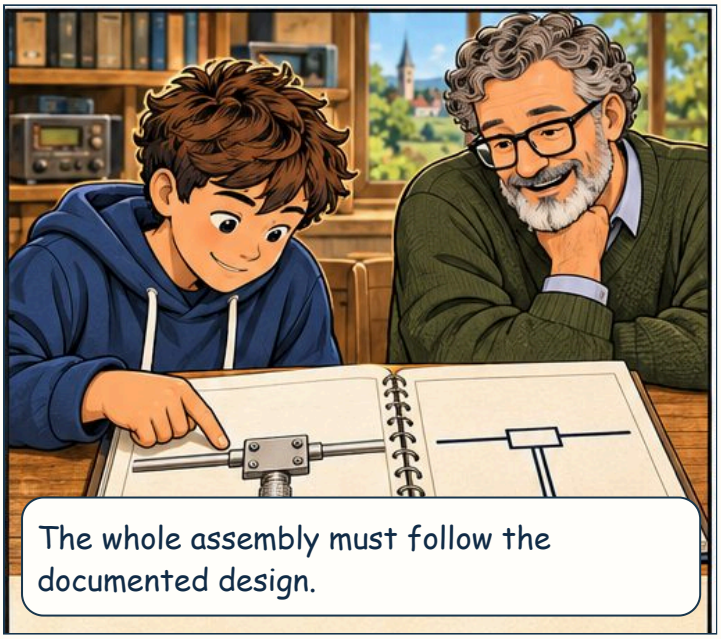
Connect without confusing roles



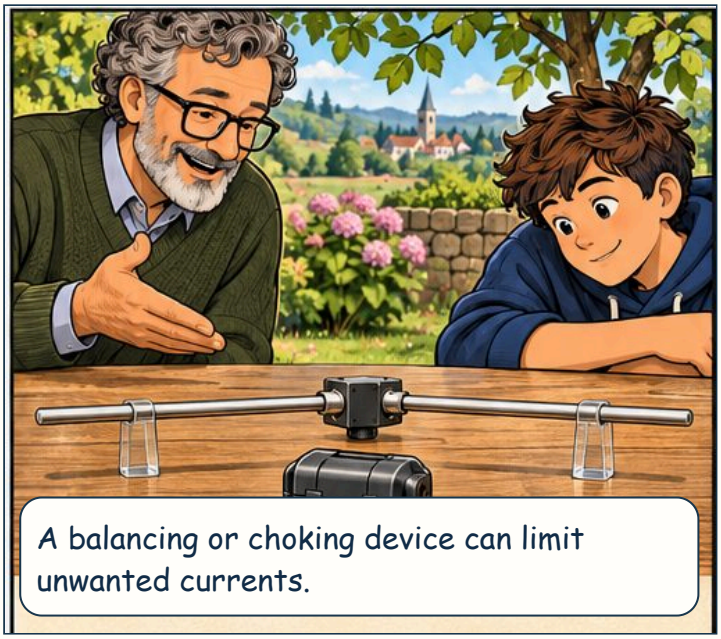
Coaxial cable carries the signal to the dipole's feed point.



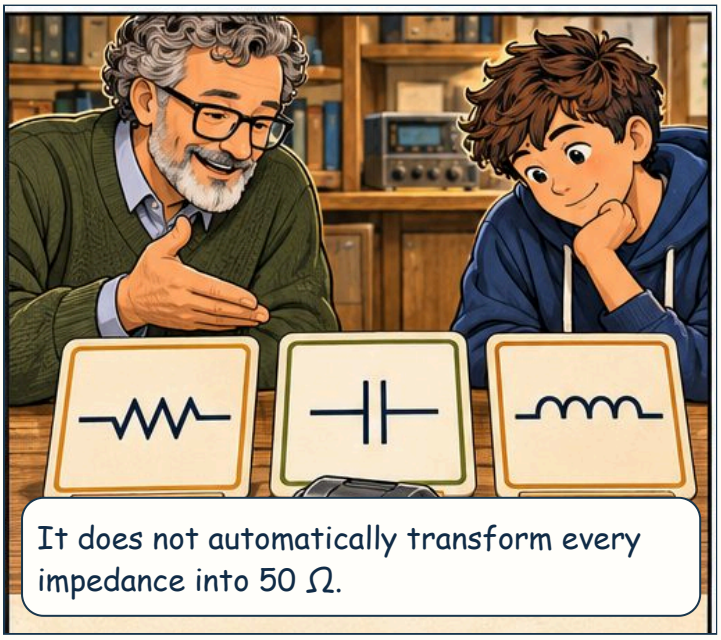
Its centre conductor and shield have different roles.



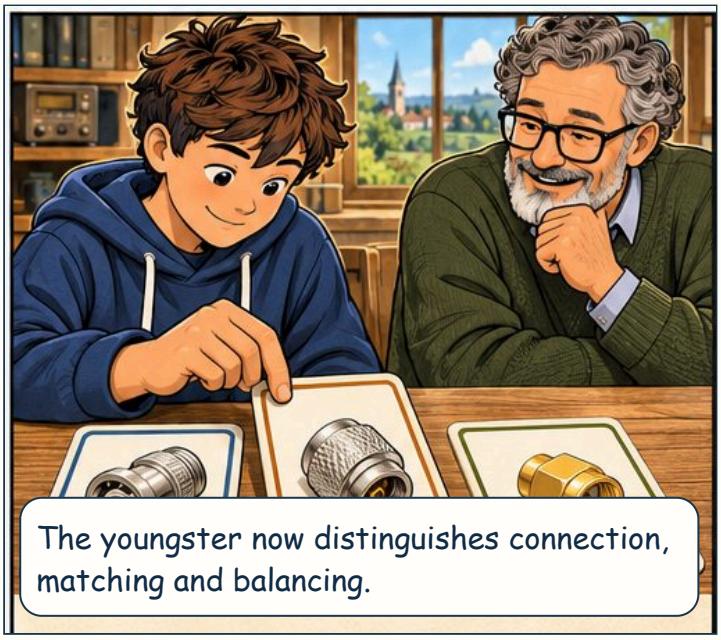
The whole assembly must follow the documented design.



A balancing or choking device can limit unwanted currents.

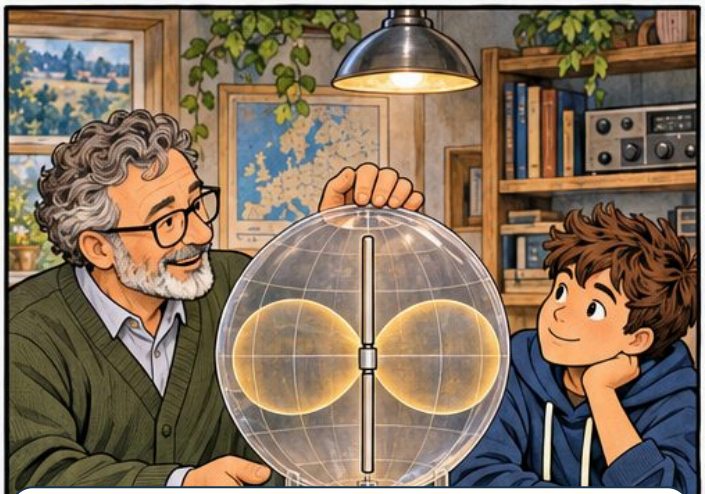


It does not automatically transform every impedance into 50 Ω.

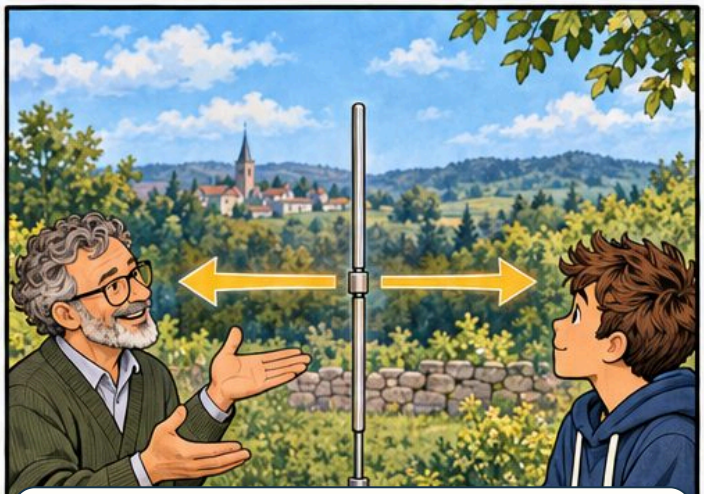


The youngster now distinguishes connection, matching and balancing.

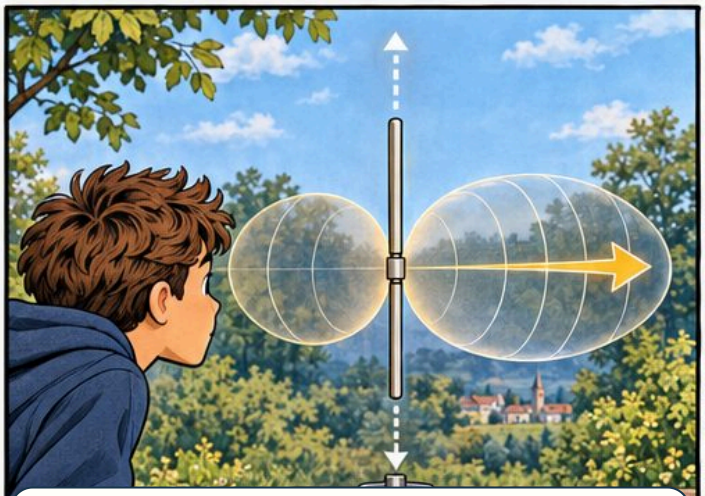
A pattern is not a bubble



A pattern describes reception or radiation versus direction.



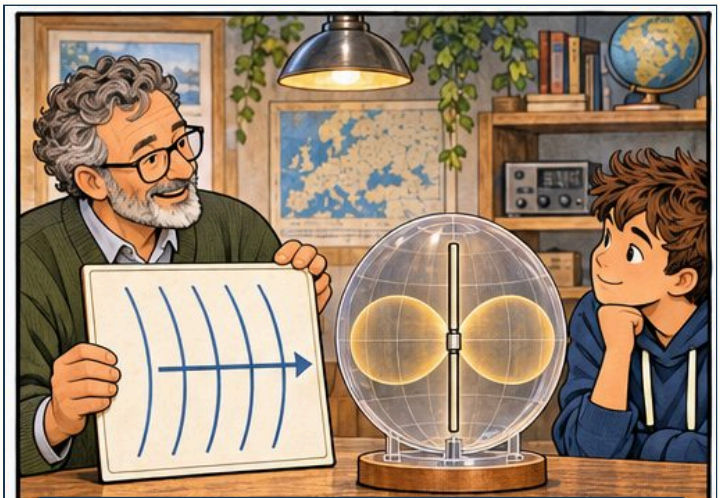
An ideal half-wave dipole in free space has its maximum broadside to the wire.



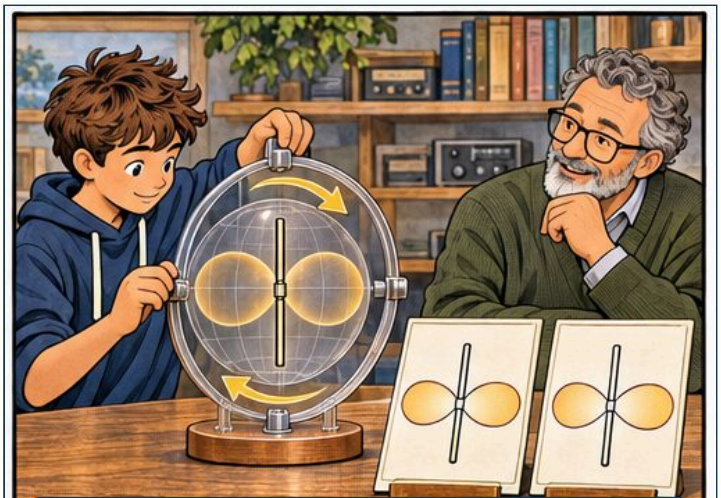
Along the arms' axis, radiation has deep nulls.



Its three-dimensional shape resembles a ring around the wire.

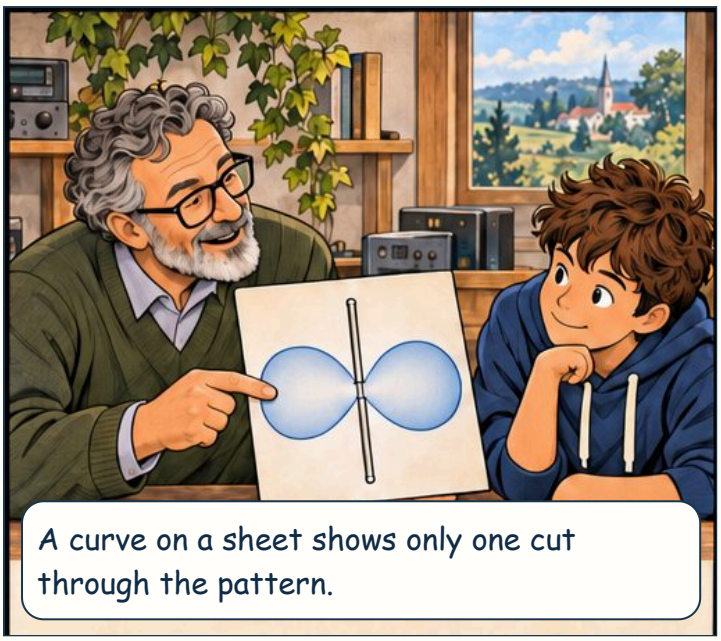


This drawing is neither a range boundary nor a frozen wave.

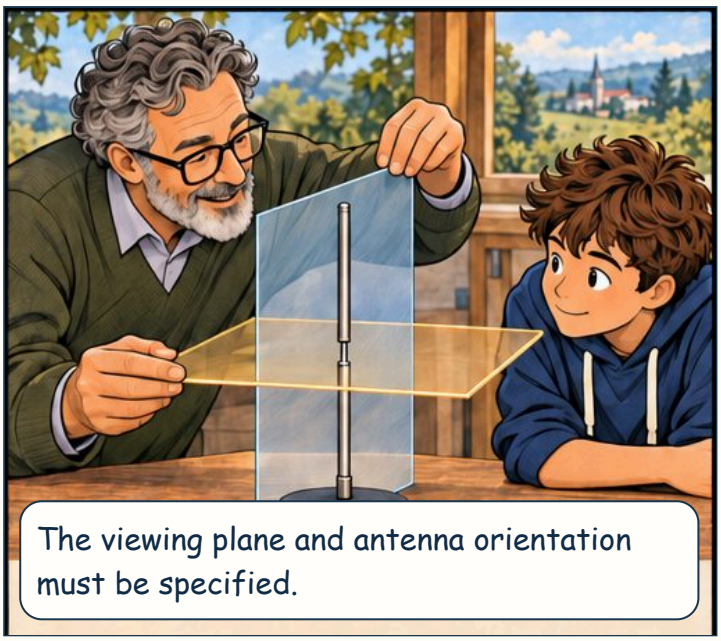


The youngster rotates the model to see the overlooked directions.

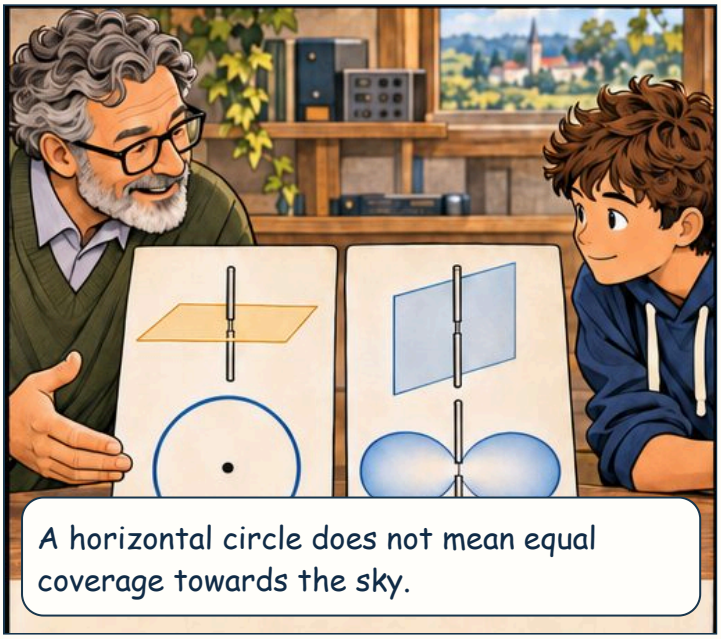
Look at the right cut



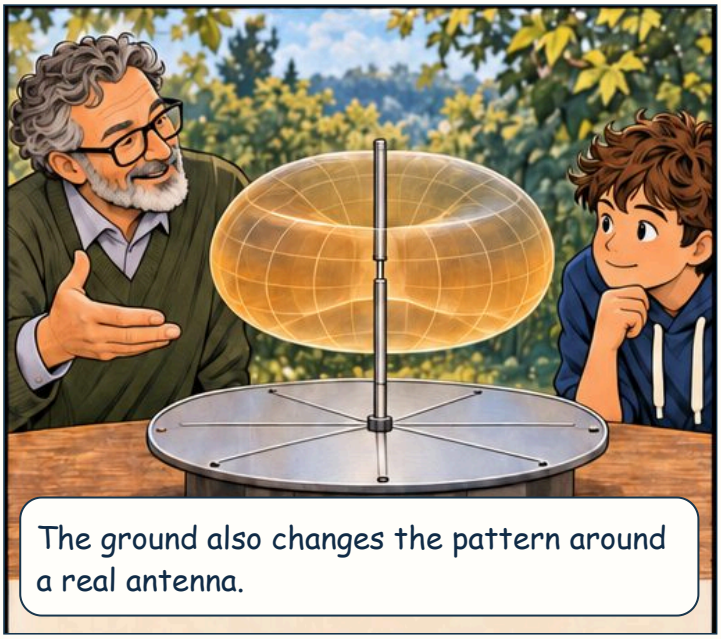
A curve on a sheet shows only one cut through the pattern.



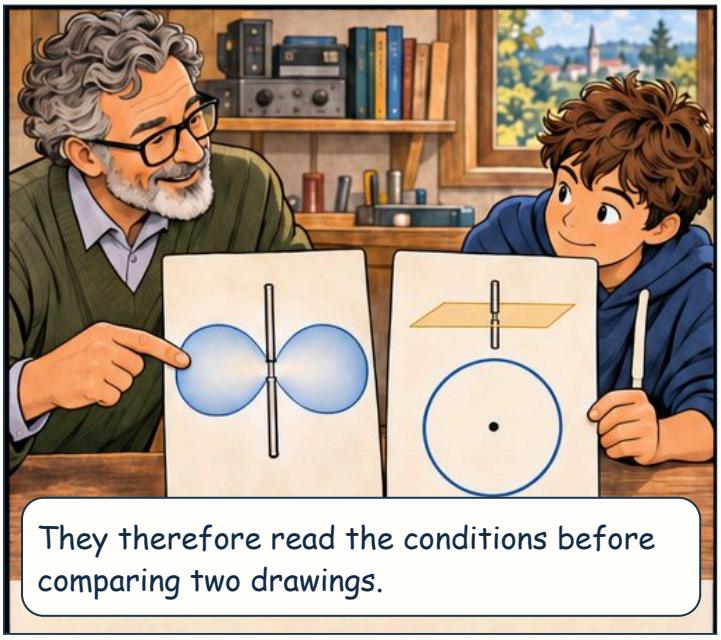
The viewing plane and antenna orientation must be specified.



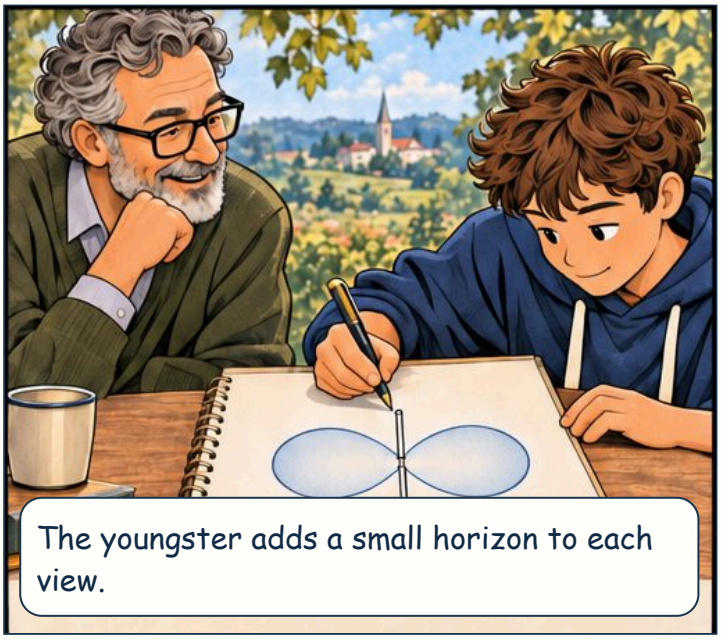
A horizontal circle does not mean equal coverage towards the sky.



The ground also changes the pattern around a real antenna.

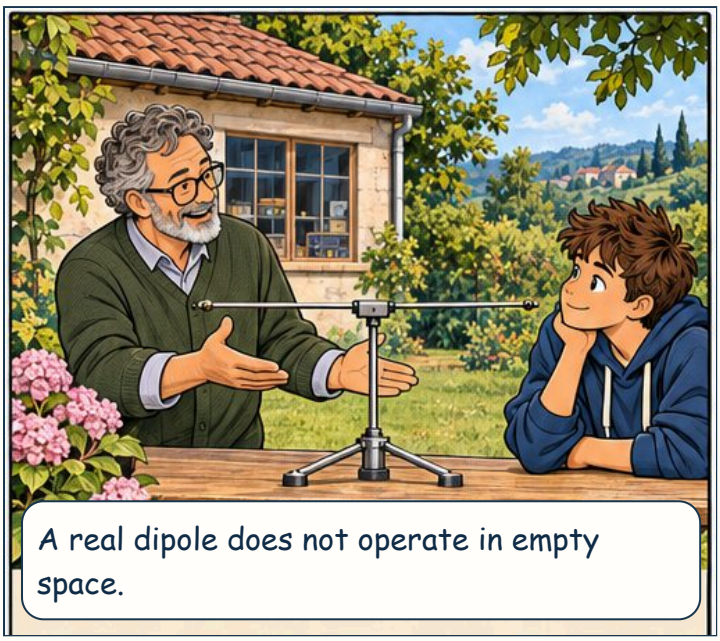


They therefore read the conditions before comparing two drawings.

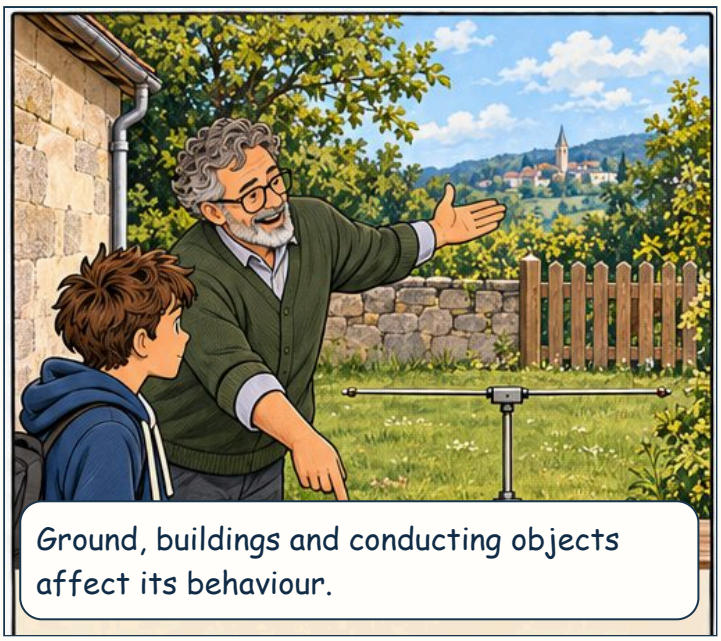


The youngster adds a small horizon to each view.

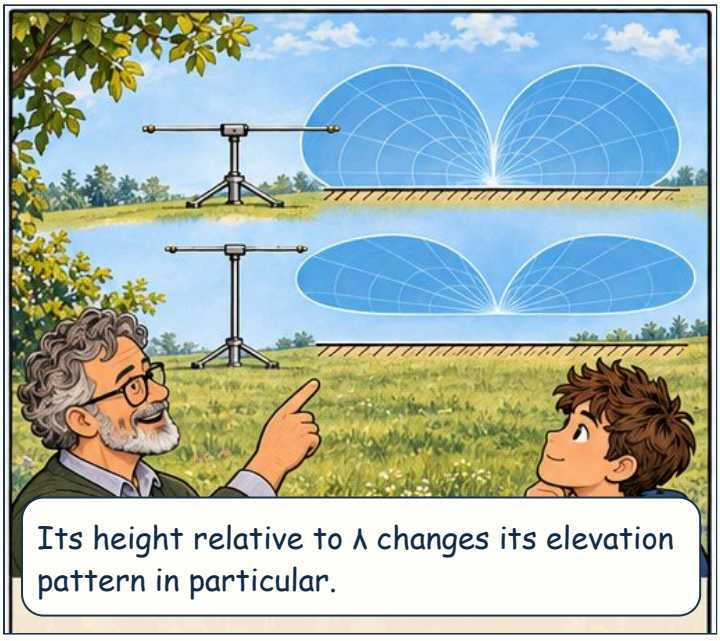
The wire and the landscape



A real dipole does not operate in empty space.



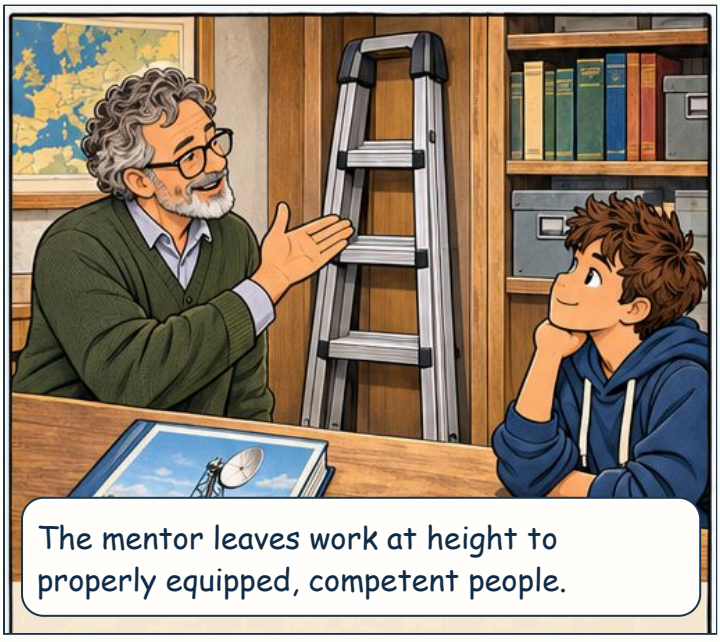
Ground, buildings and conducting objects affect its behaviour.



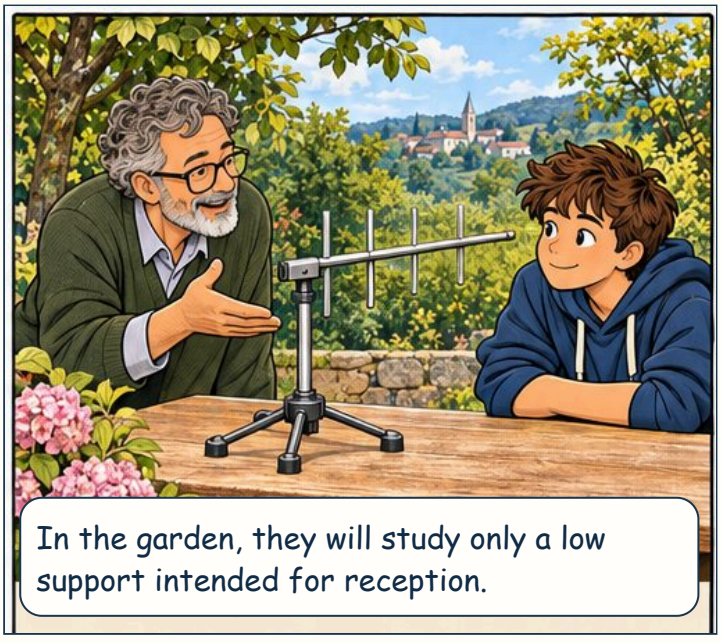
Its height relative to λ changes its elevation pattern in particular.



Raising it does not guarantee better results for every contact.



The mentor leaves work at height to properly equipped, competent people.



In the garden, they will study only a low support intended for reception.

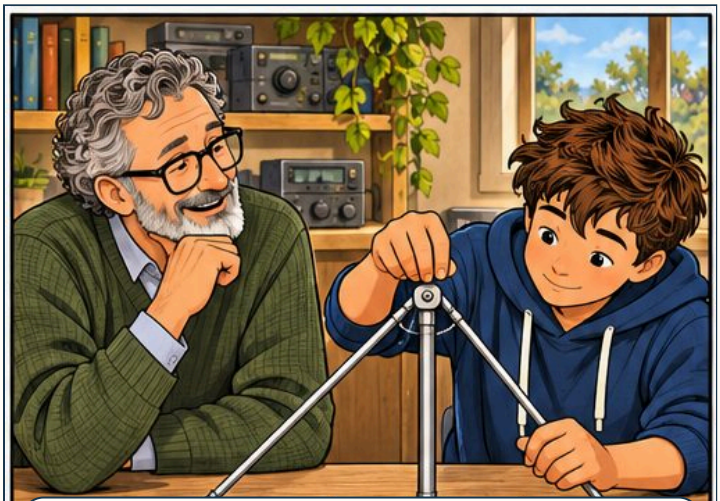
The inverted V



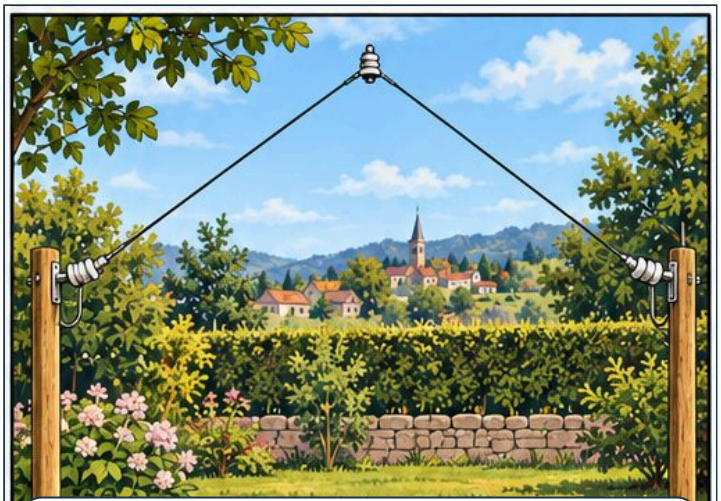
A dipole can also form an inverted V, with its centre higher up.



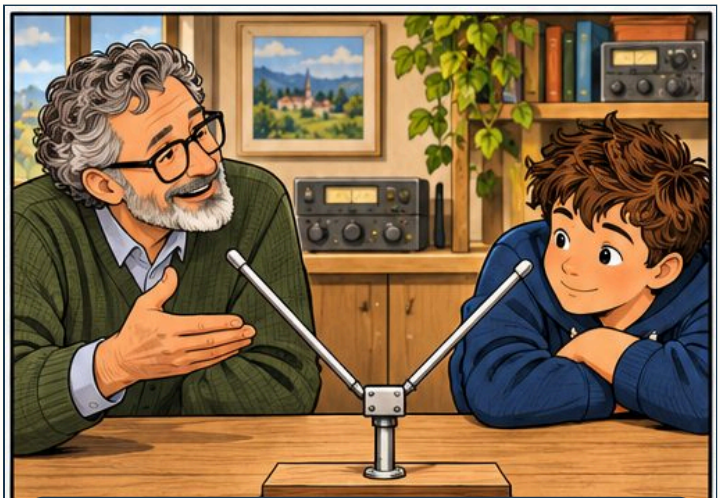
This shape can simplify installation using one central support.



The arm angle affects impedance and pattern.



The ends must remain out of reach and securely attached.

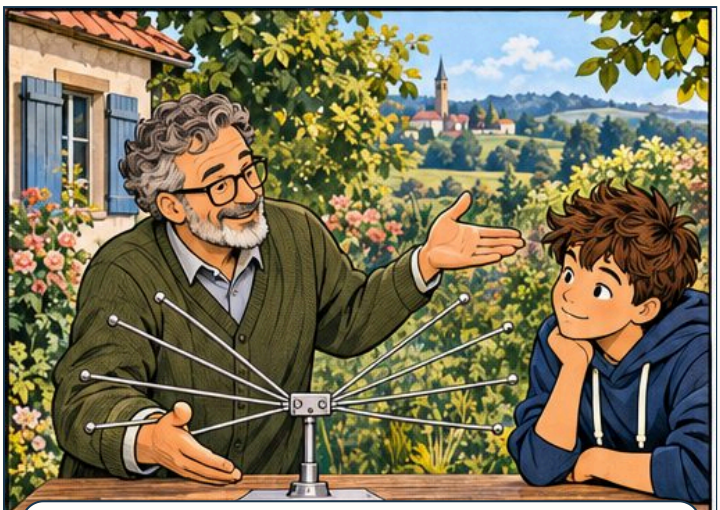


Their model stays unpowered and in clear view.

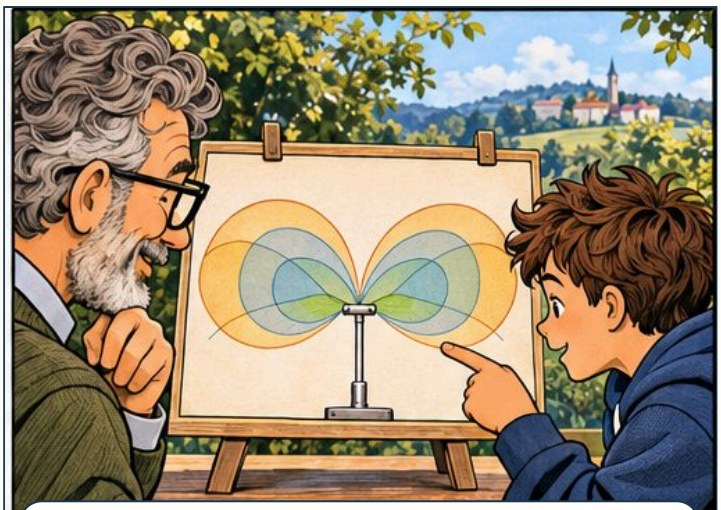


The youngster chooses the shape for the site, not just its appearance.

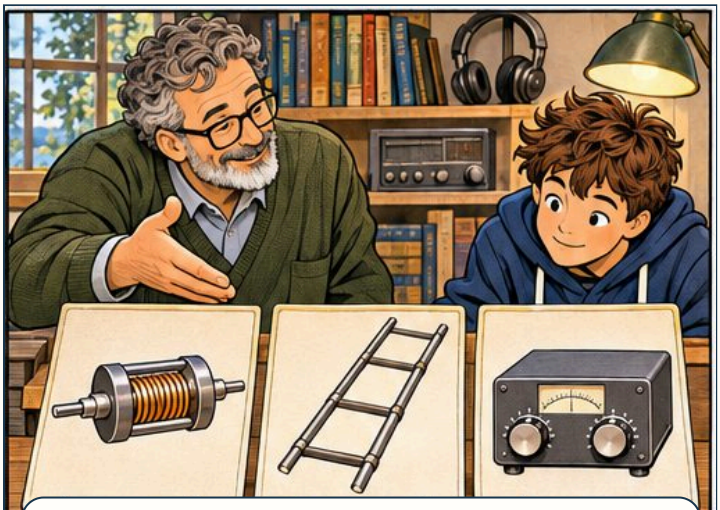
Several bands, several compromises



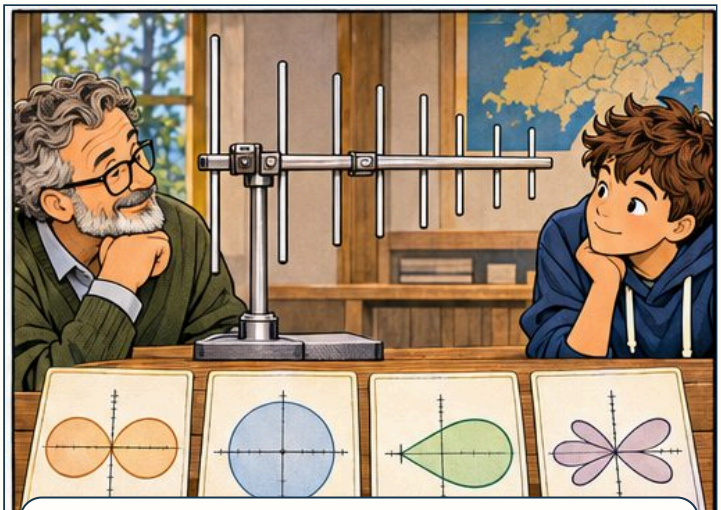
A fan dipole joins several pairs of arms at the same feed point.



These arms interact: each pair cannot be adjusted as if it were alone.



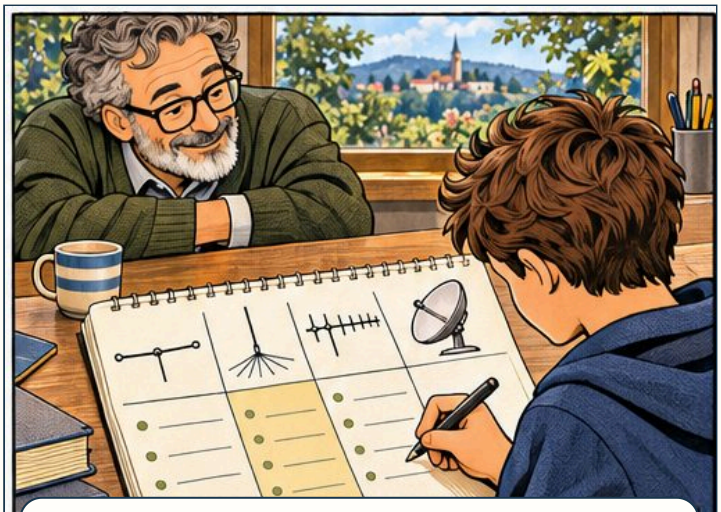
Other designs use traps, or a suitable line and antenna tuner.



Multiband does not mean identical performance everywhere.

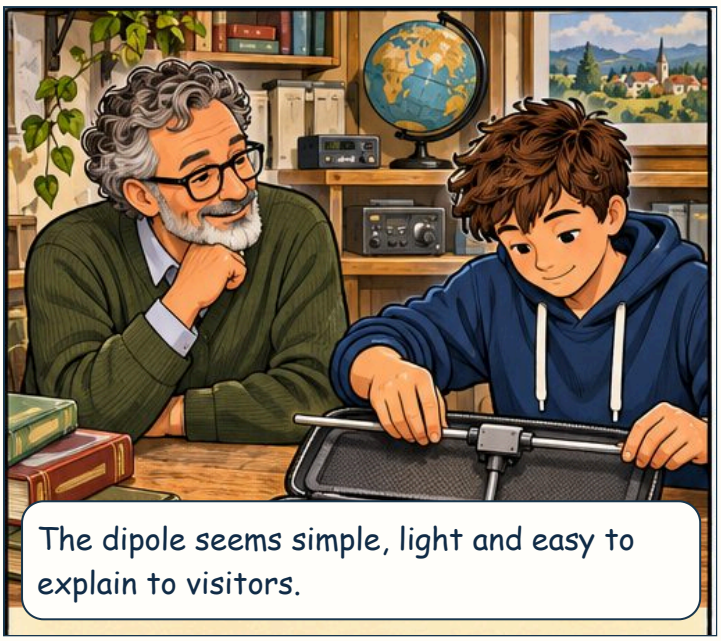


Read the intended bands, installation requirements and design limits.

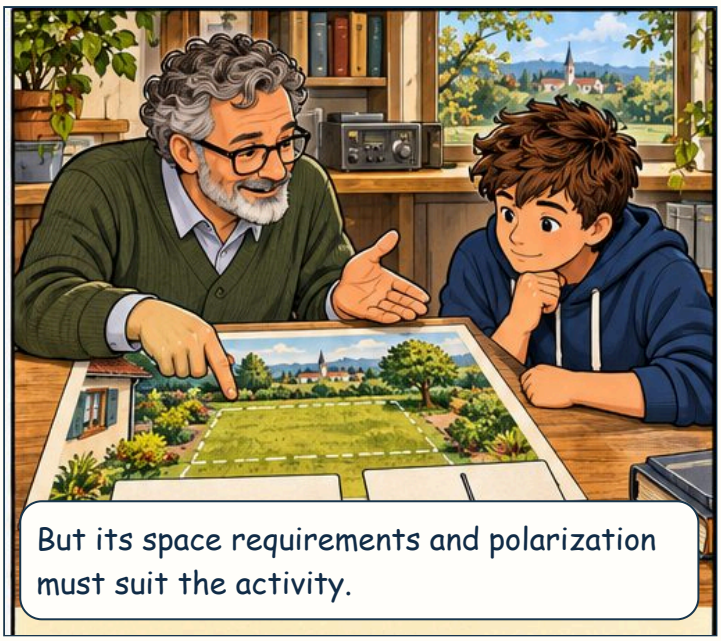


The youngster adds a column for compromises.

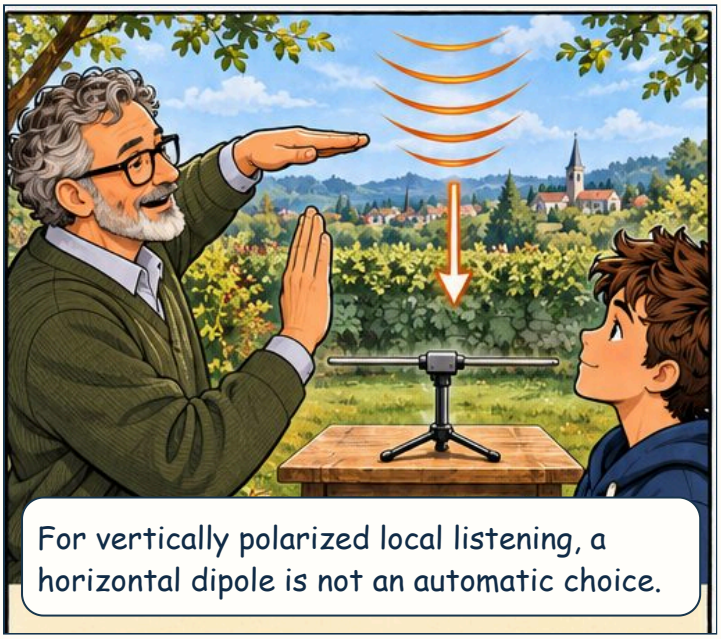
A first provisional choice



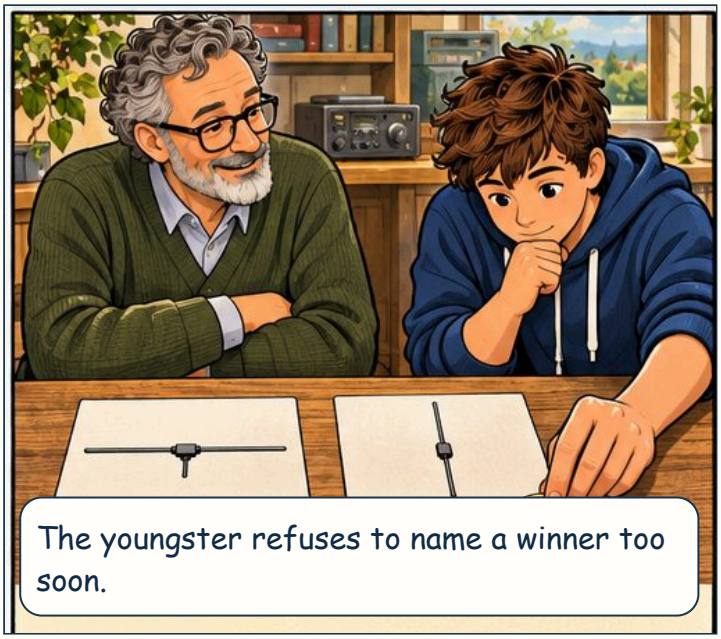
The dipole seems simple, light and easy to explain to visitors.



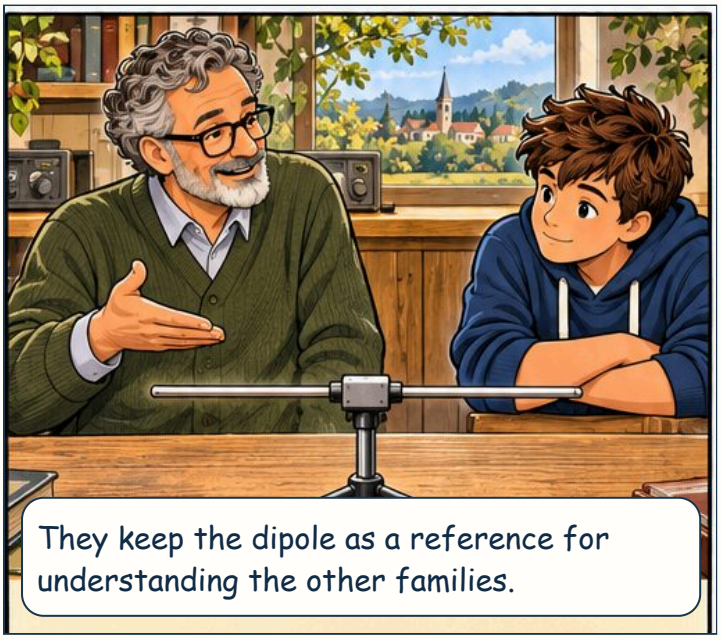
But its space requirements and polarization must suit the activity.



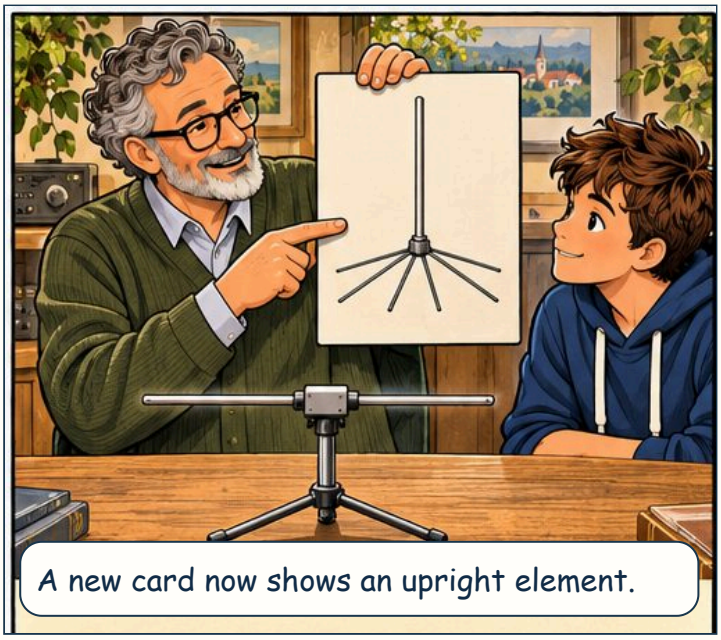
For vertically polarized local listening, a horizontal dipole is not an automatic choice.



The youngster refuses to name a winner too soon.

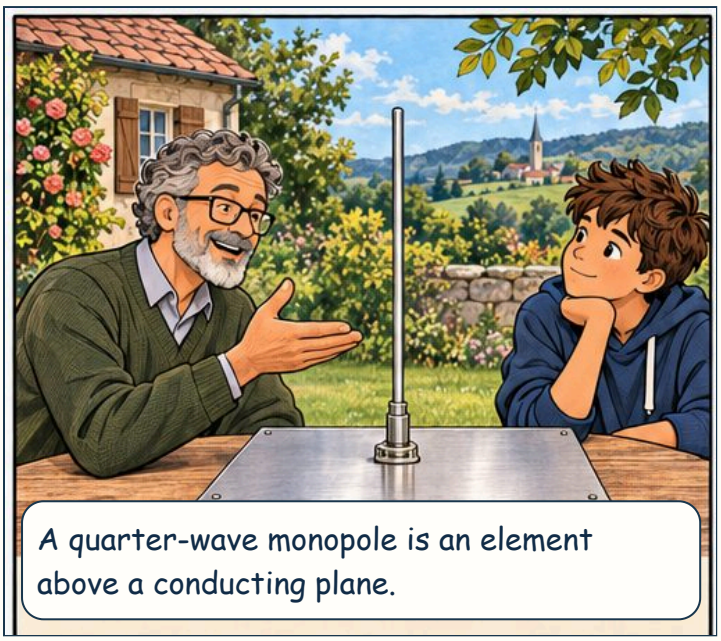


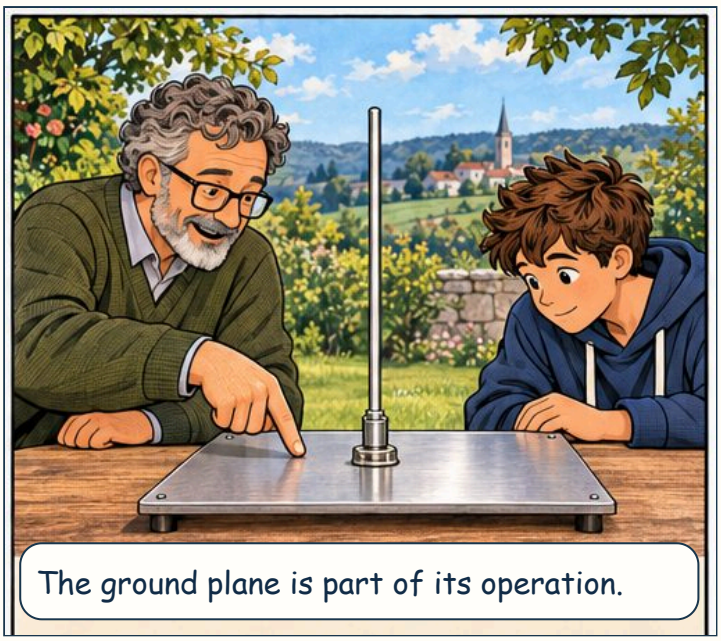
They keep the dipole as a reference for understanding the other families.

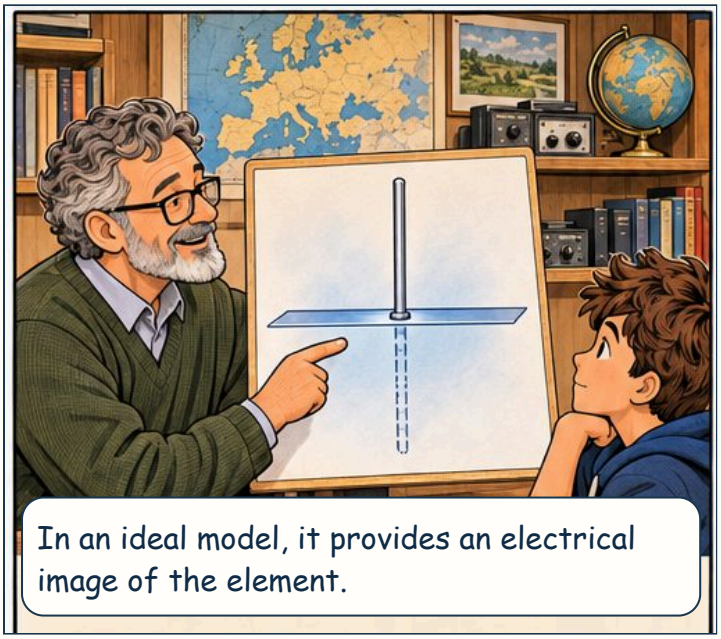


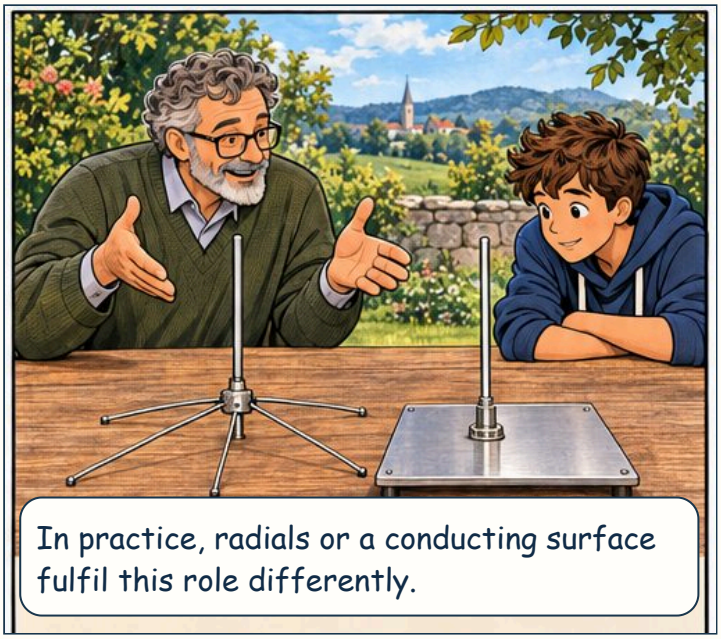
A new card now shows an upright element.

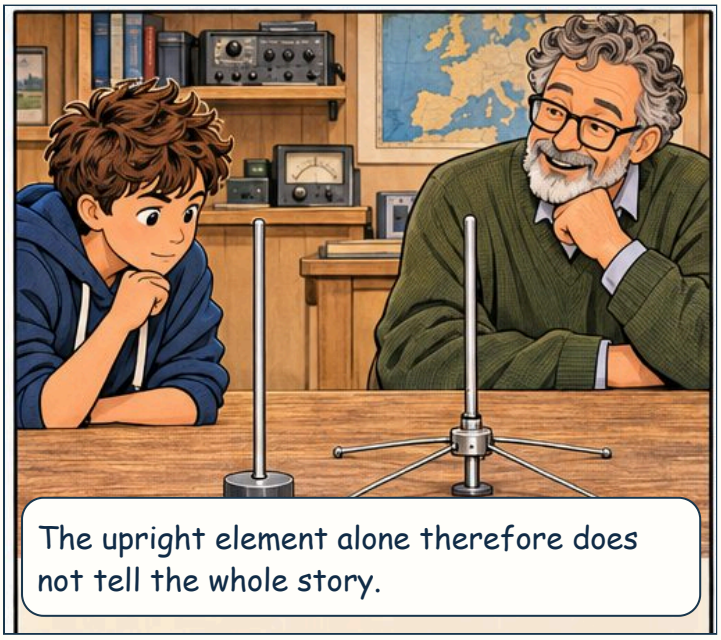
The vertical and its other half

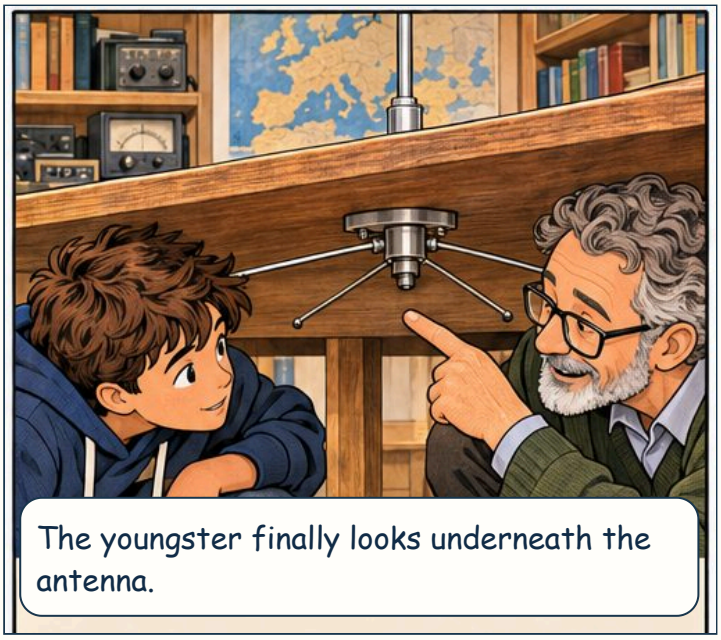




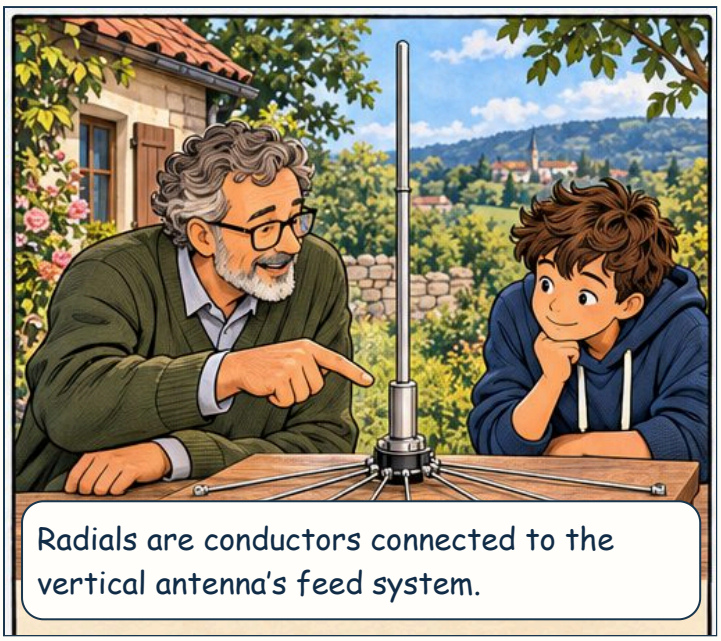




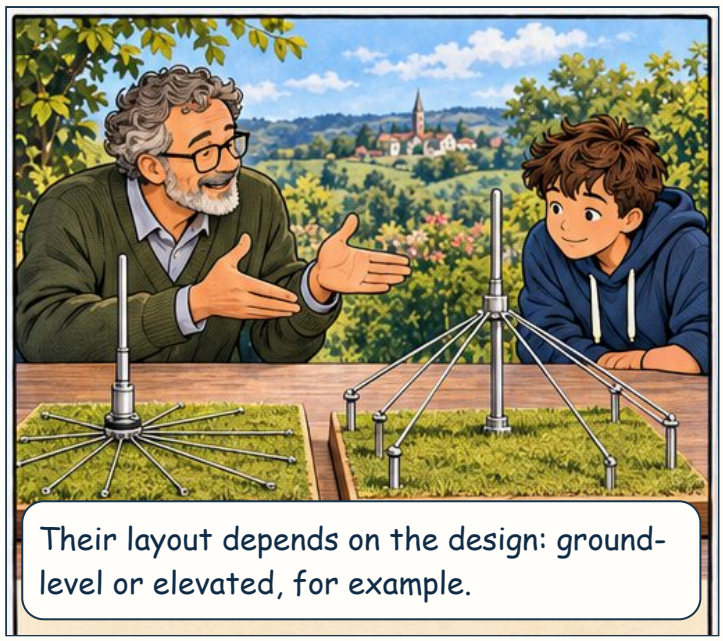




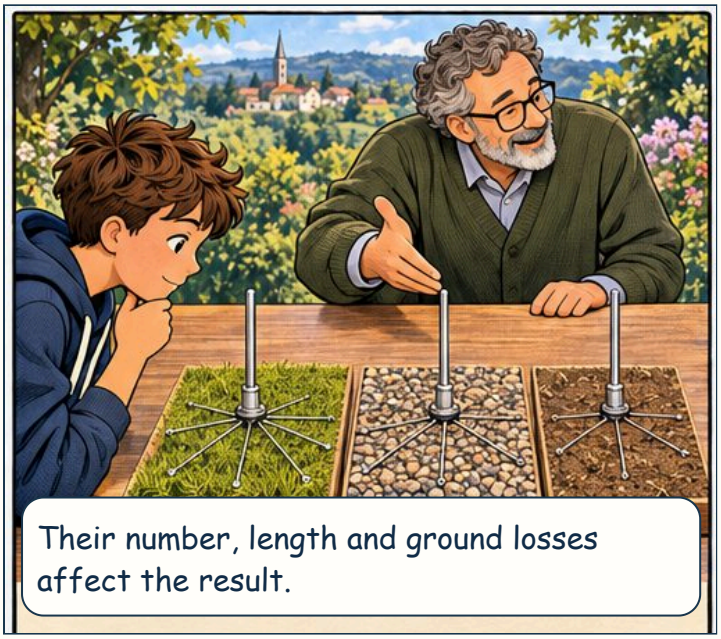
Radials matter



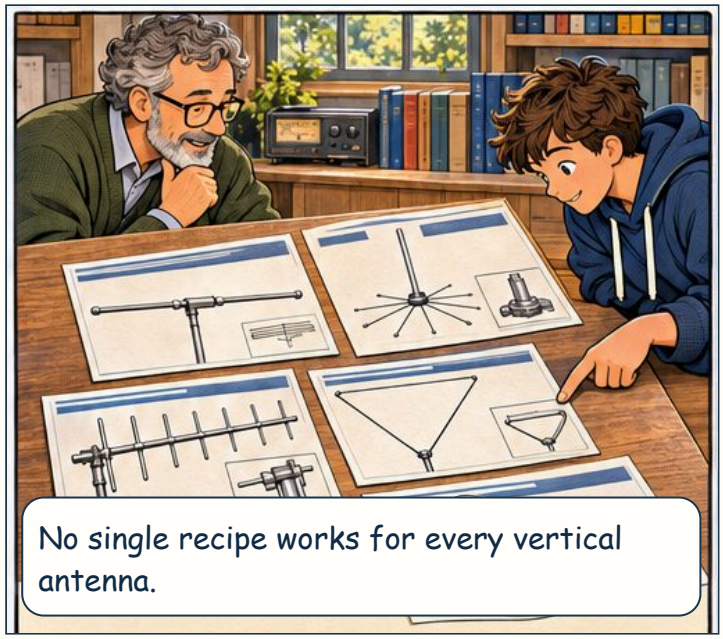
Radials are conductors connected to the vertical antenna's feed system.



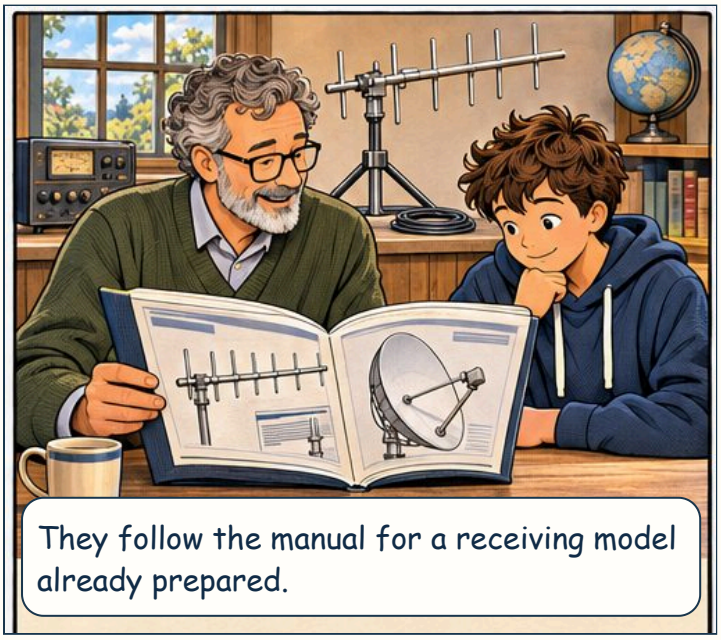
Their layout depends on the design: ground-level or elevated, for example.



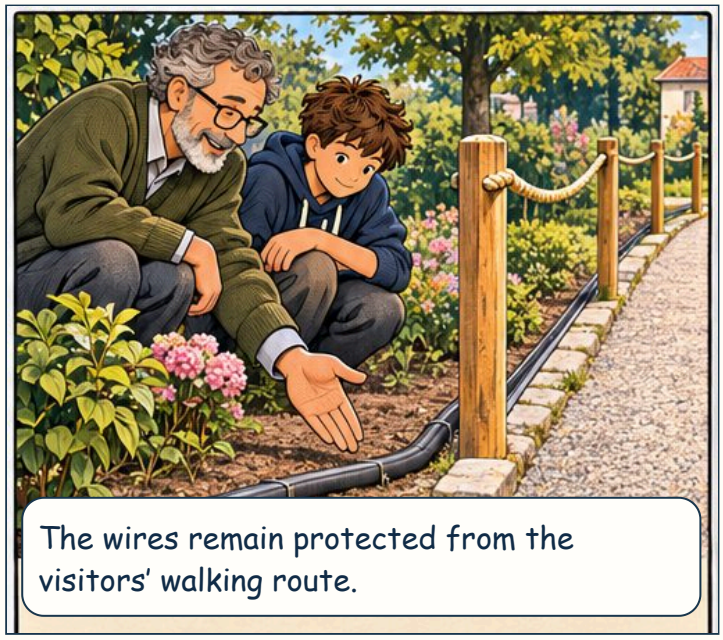
Their number, length and ground losses affect the result.



No single recipe works for every vertical antenna.

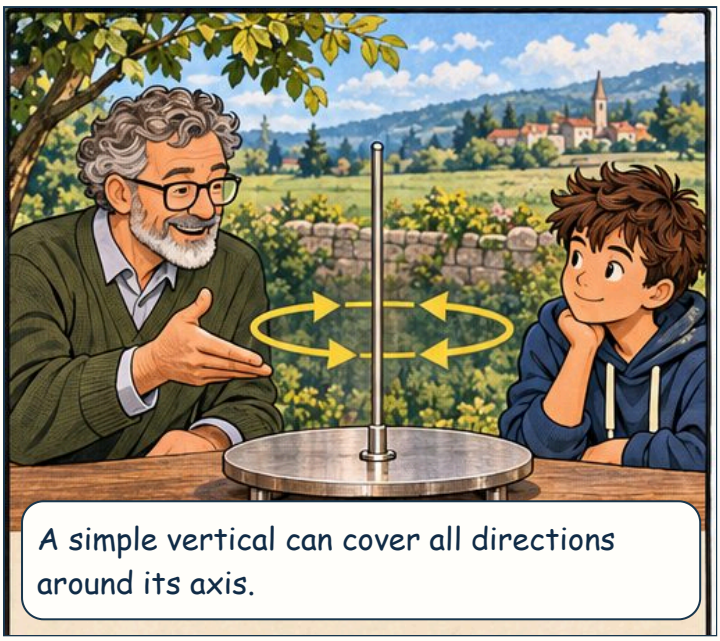


They follow the manual for a receiving model already prepared.

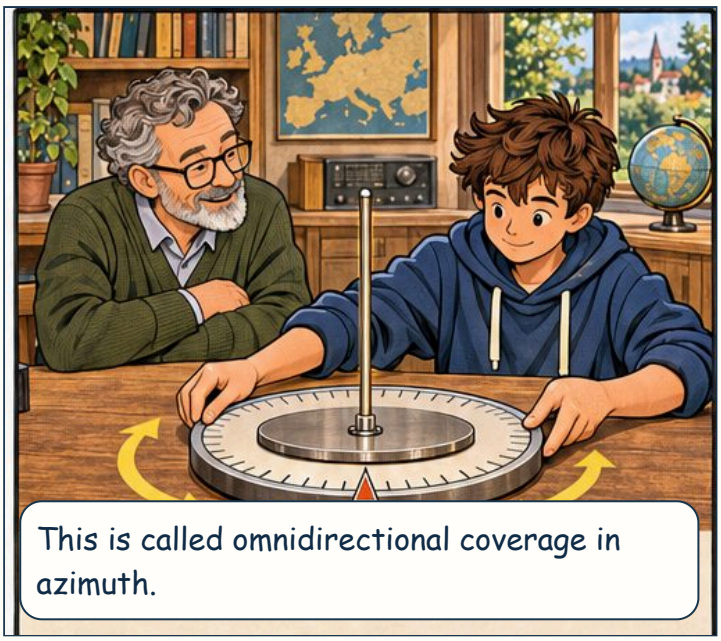


The wires remain protected from the visitors' walking route.

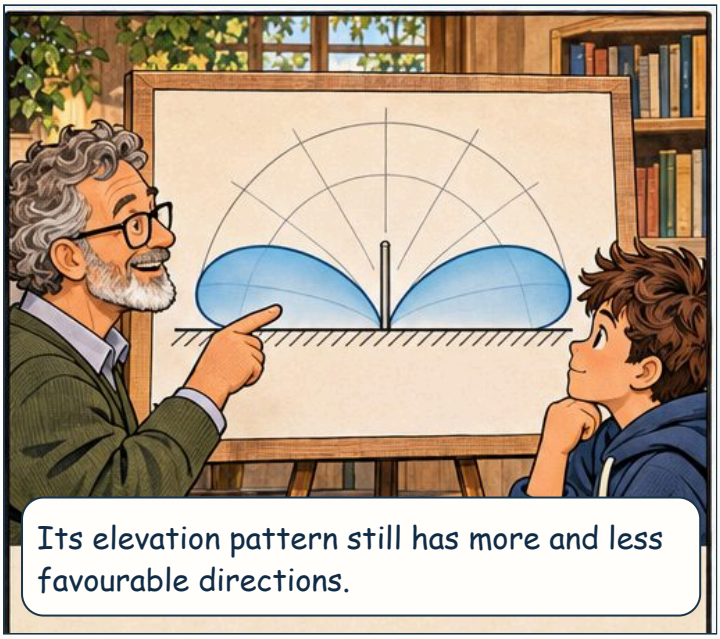
All around, but not everywhere



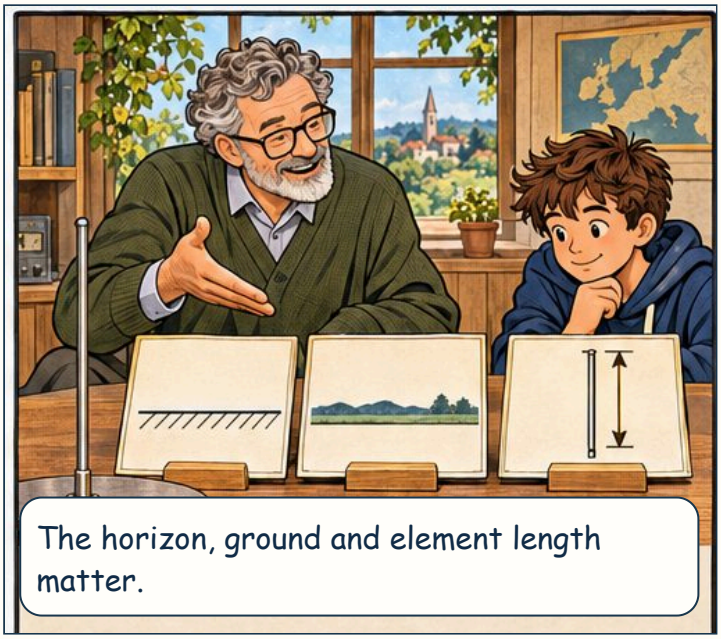
A simple vertical can cover all directions around its axis.



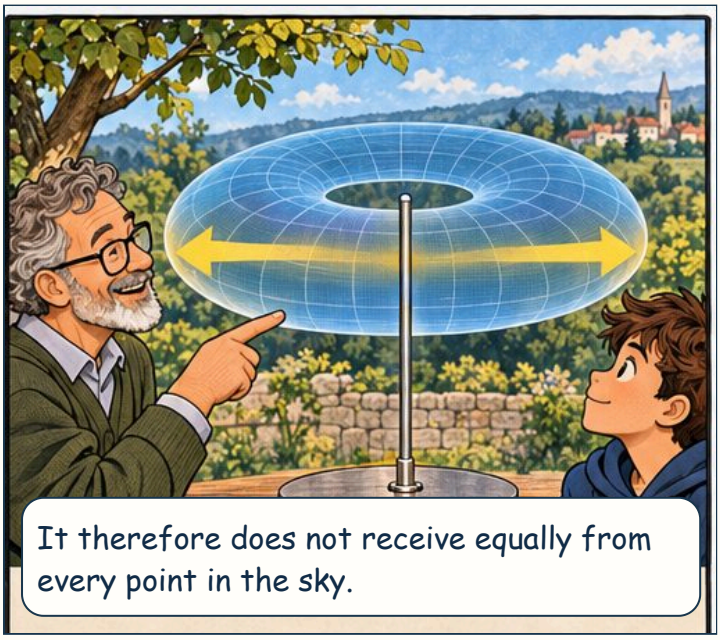
This is called omnidirectional coverage in azimuth.



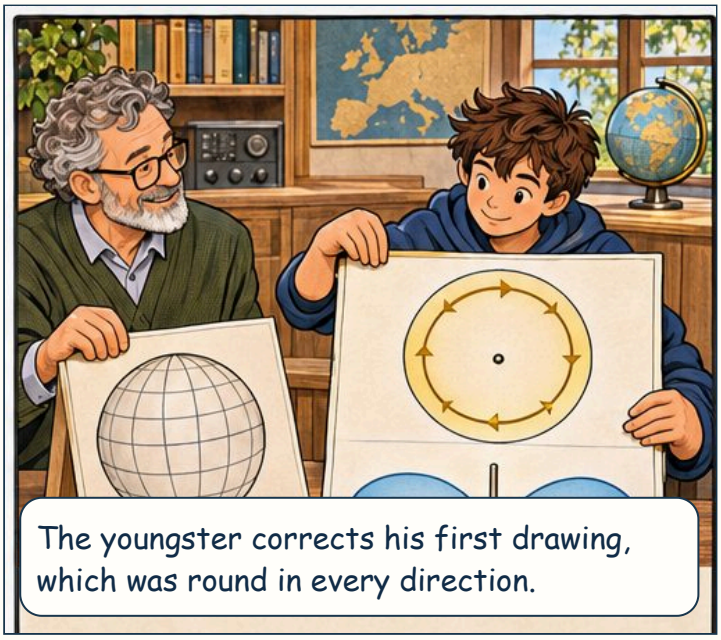
Its elevation pattern still has more and less favourable directions.



The horizon, ground and element length matter.



It therefore does not receive equally from every point in the sky.



The youngster corrects his first drawing, which was round in every direction.

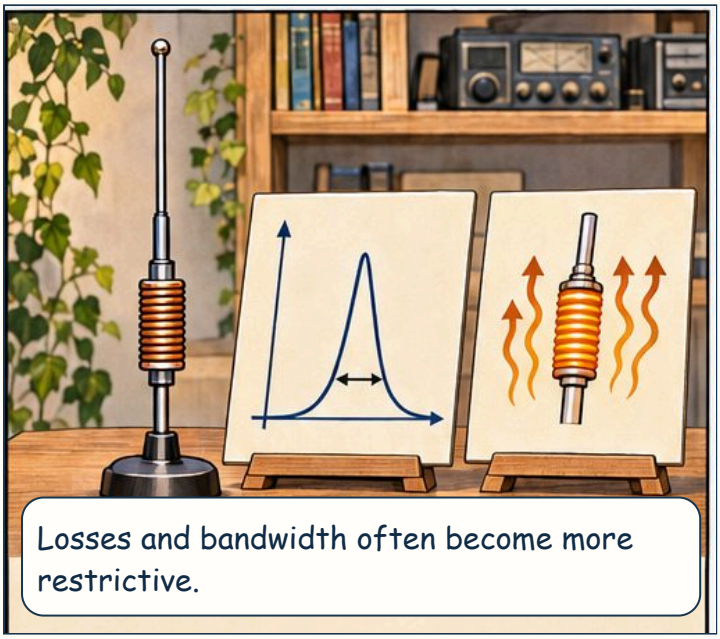
A short antenna pays for its space



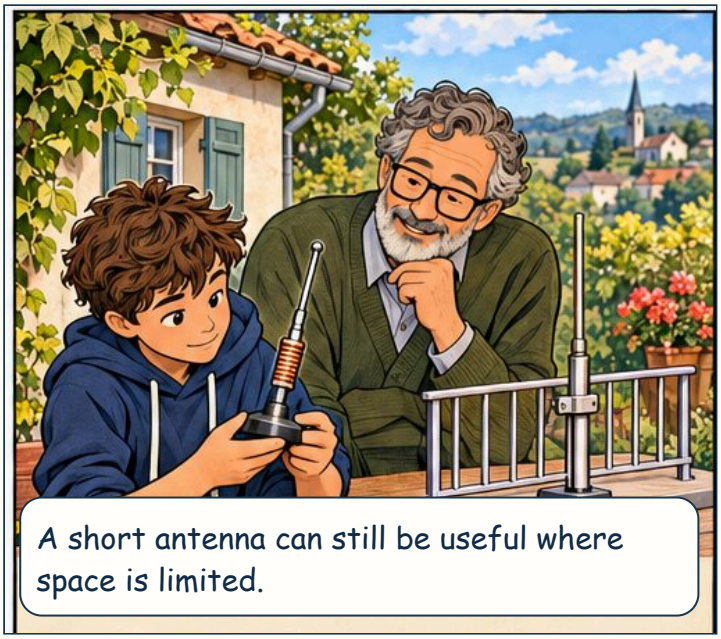
A loading coil can make some antennas more compact.



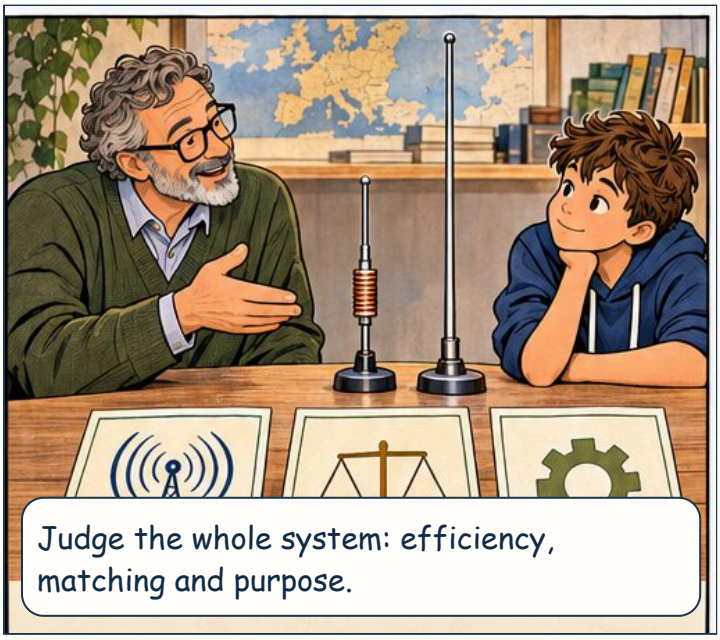
It does not recreate a long conductor for free.



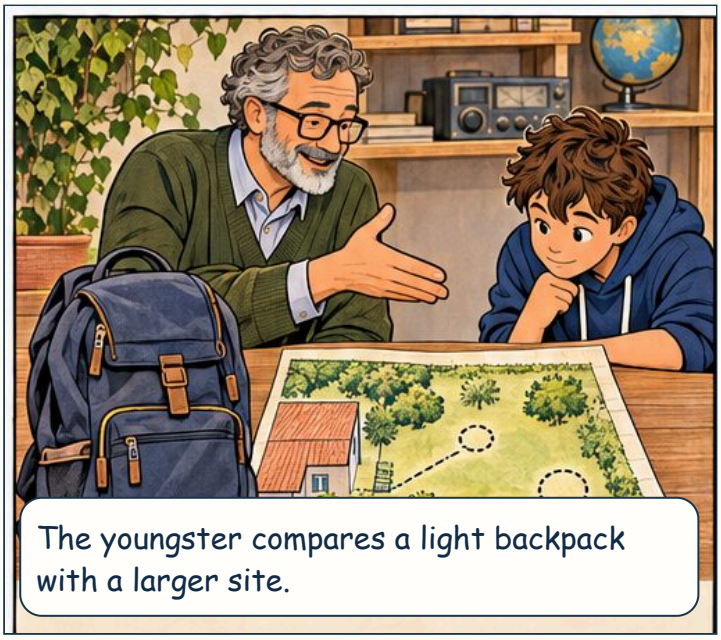
Losses and bandwidth often become more restrictive.



A short antenna can still be useful where space is limited.

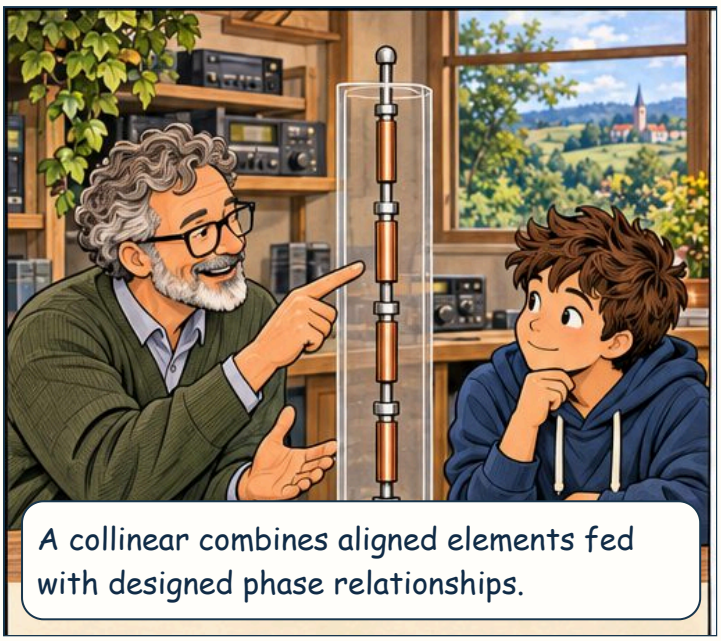


Judge the whole system: efficiency, matching and purpose.

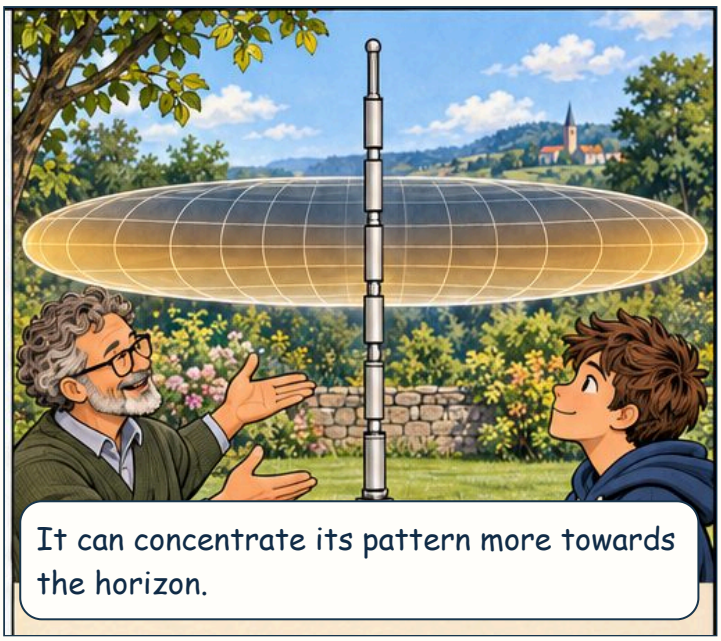


The youngster compares a light backpack with a larger site.

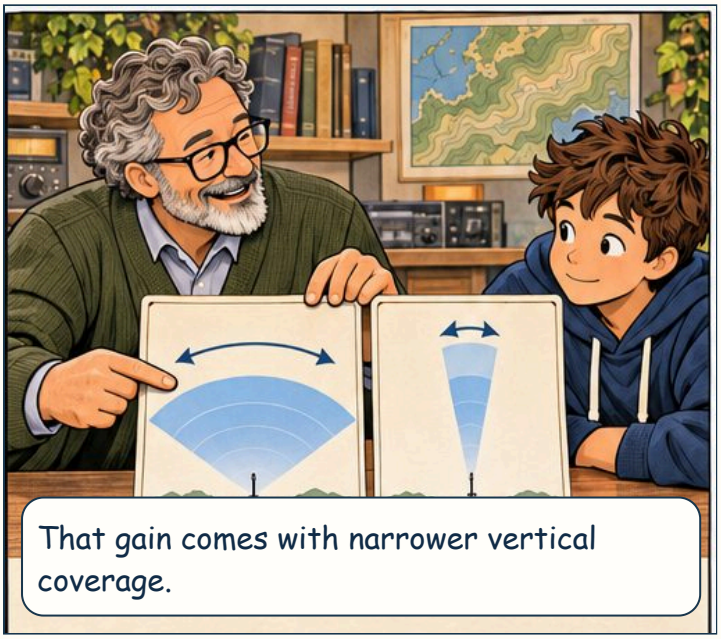
The collinear favours the horizon



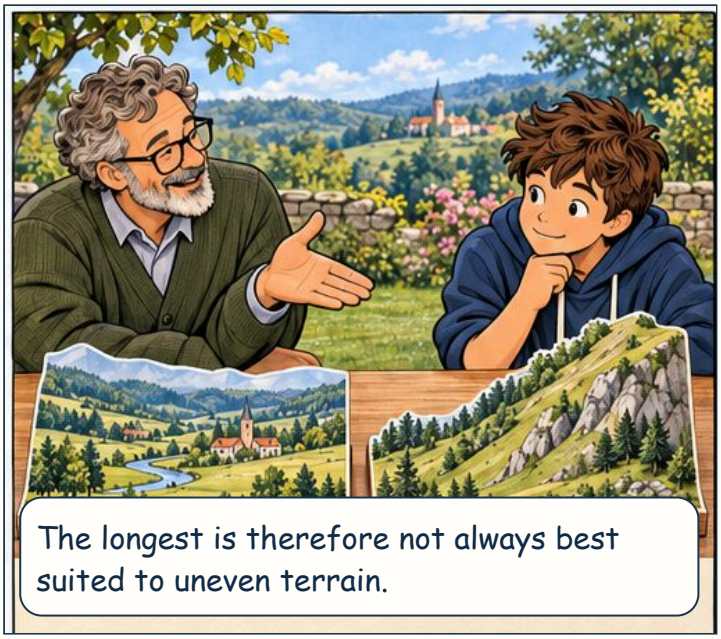
A collinear combines aligned elements fed with designed phase relationships.



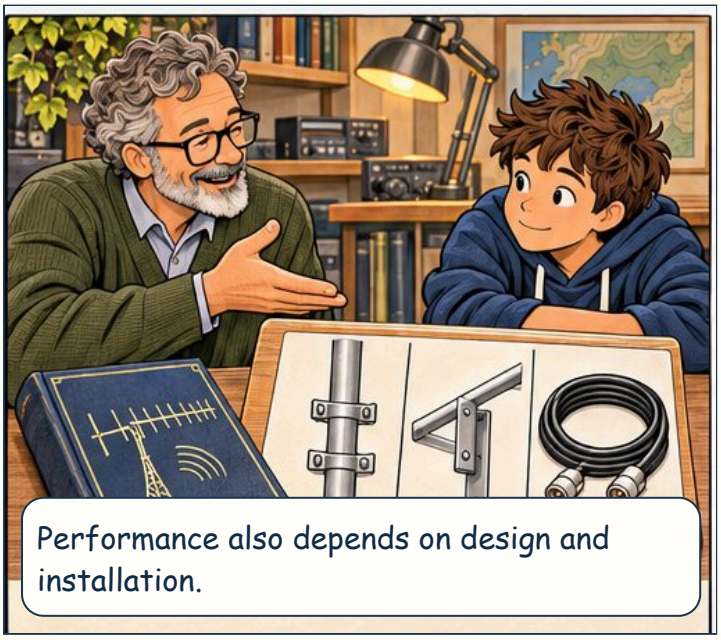
It can concentrate its pattern more towards the horizon.



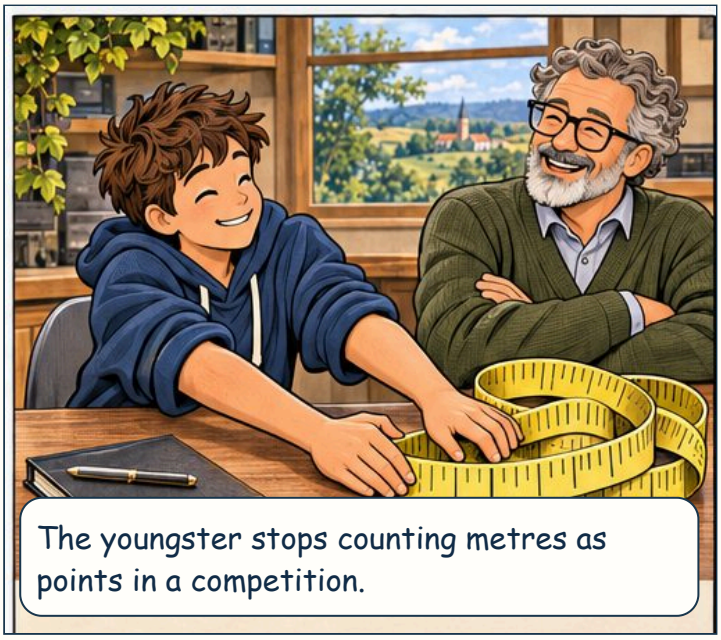
That gain comes with narrower vertical coverage.



The longest is therefore not always best suited to uneven terrain.



Performance also depends on design and installation.

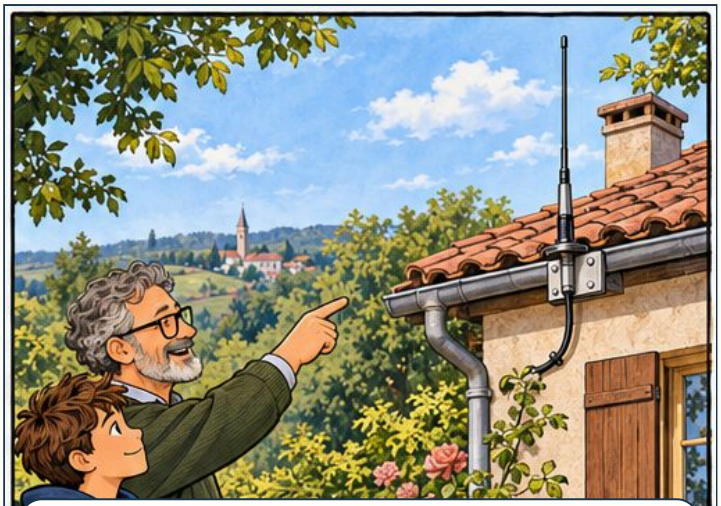


The youngster stops counting metres as points in a competition.

A whip on a vehicle



On a vehicle, a mobile antenna often uses the bodywork as a ground plane.



Its mount and electrical contact depend on the design.



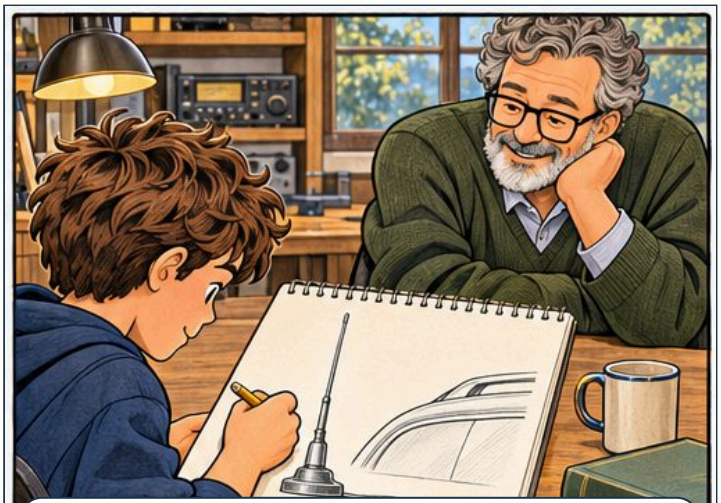
A magnetic mount alone does not ensure every required function.



Cable routing, weatherproofing and road safety are part of the choice.



The characters inspect a parked vehicle without installing anything.

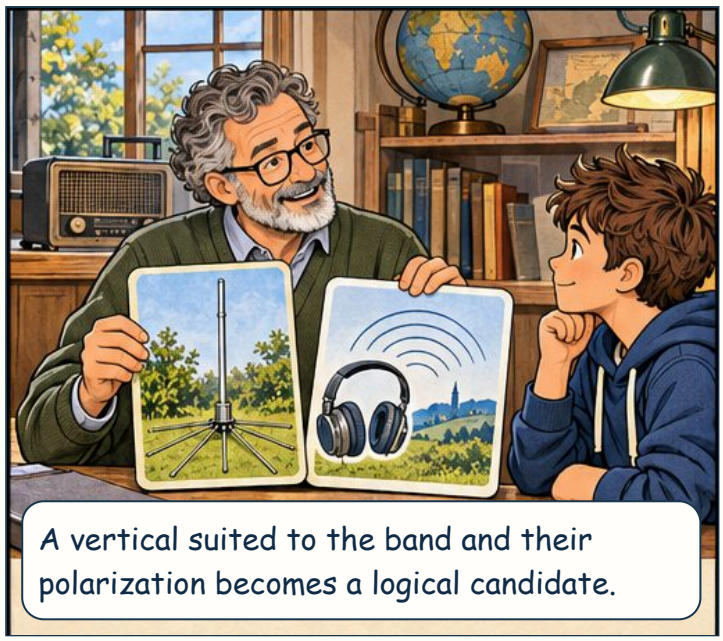


The youngster keeps this example for a future supervised activity.

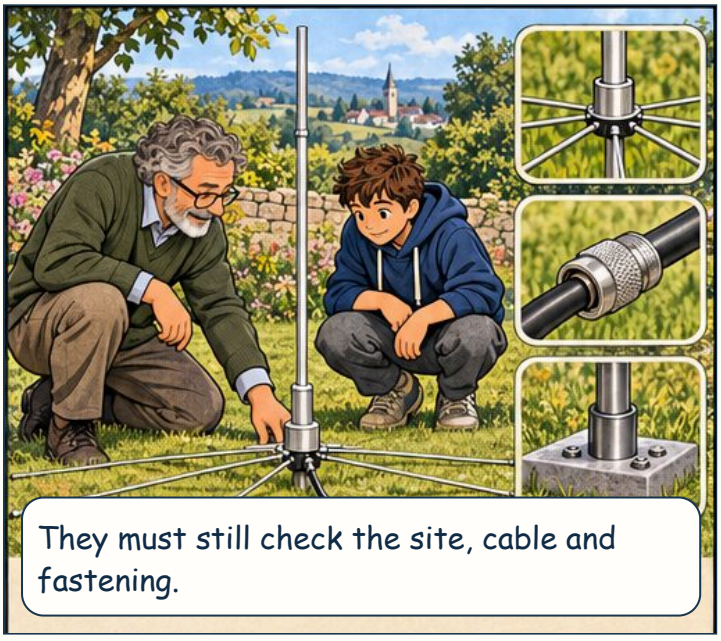
The local need becomes clearer



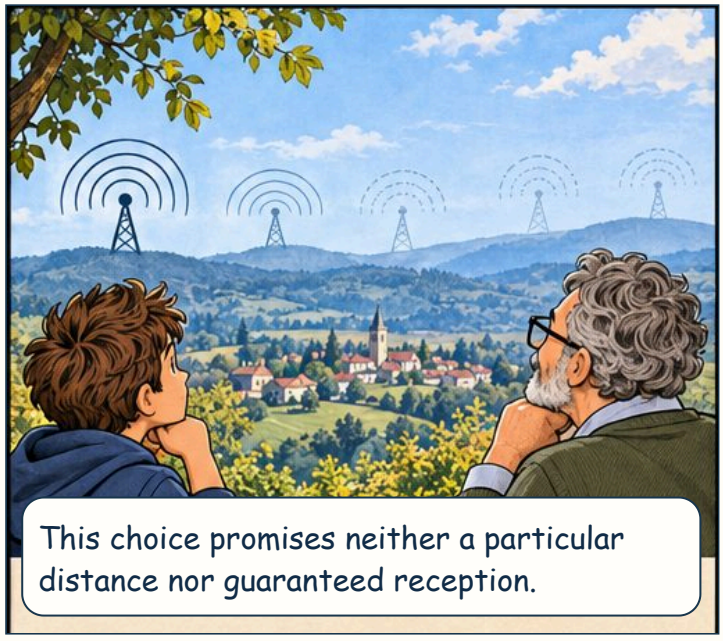
For welcoming visitors, they want to hear stations around the garden.



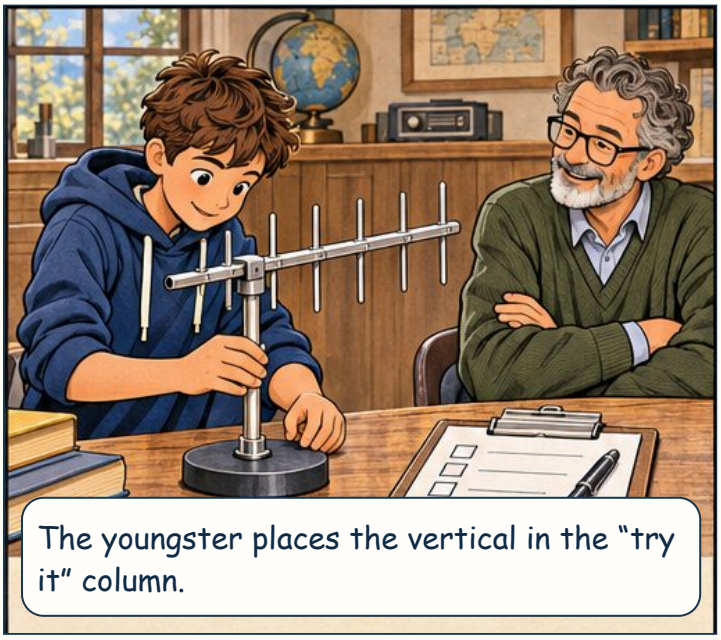
A vertical suited to the band and their polarization becomes a logical candidate.



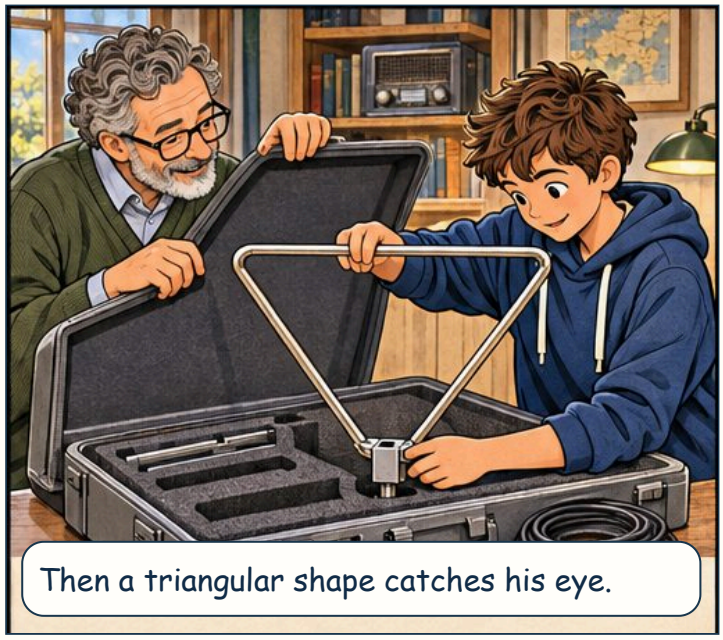
They must still check the site, cable and fastening.



This choice promises neither a particular distance nor guaranteed reception.

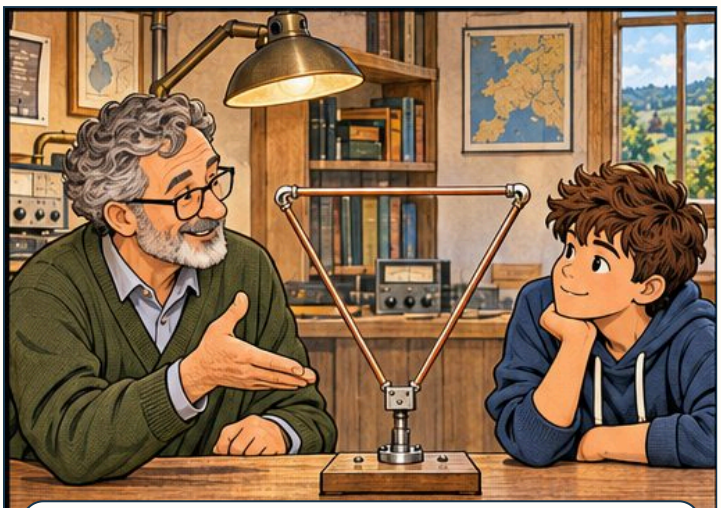


The youngster places the vertical in the “try it” column.

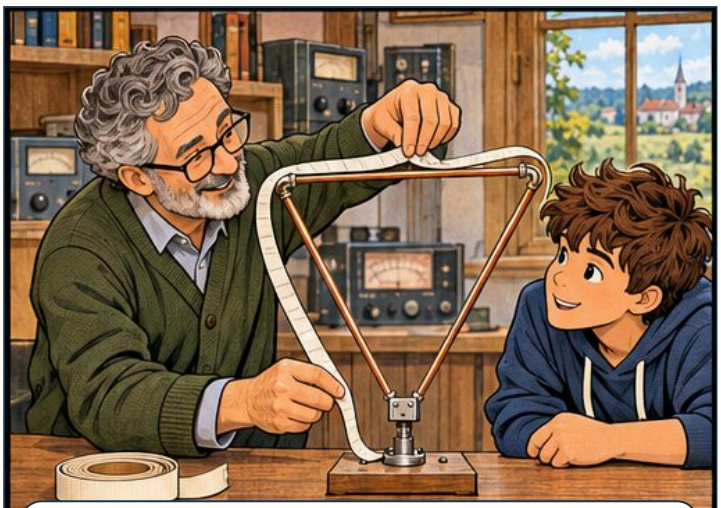


Then a triangular shape catches his eye.

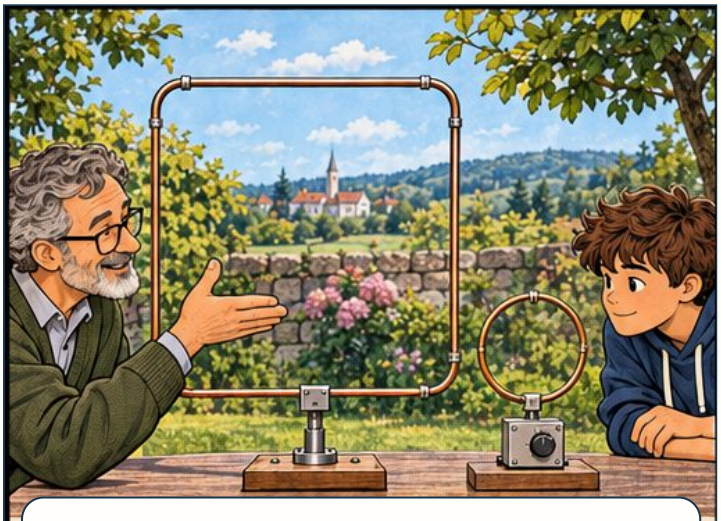
One loop, several families



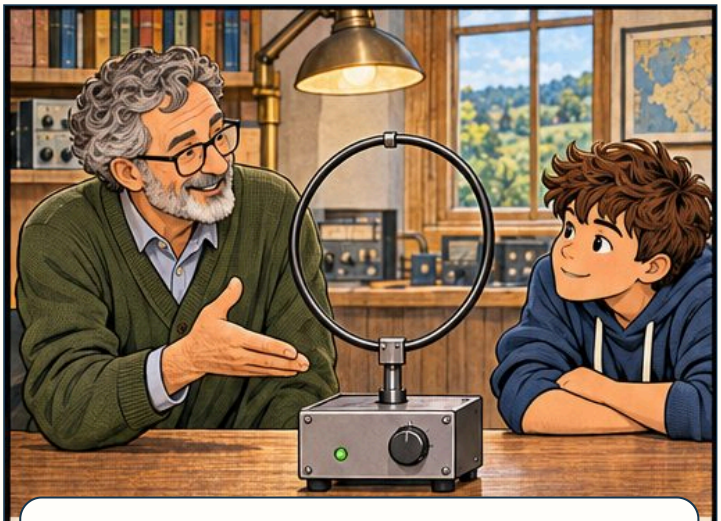
A loop is a conductor forming a closed path, with a suitable feed.



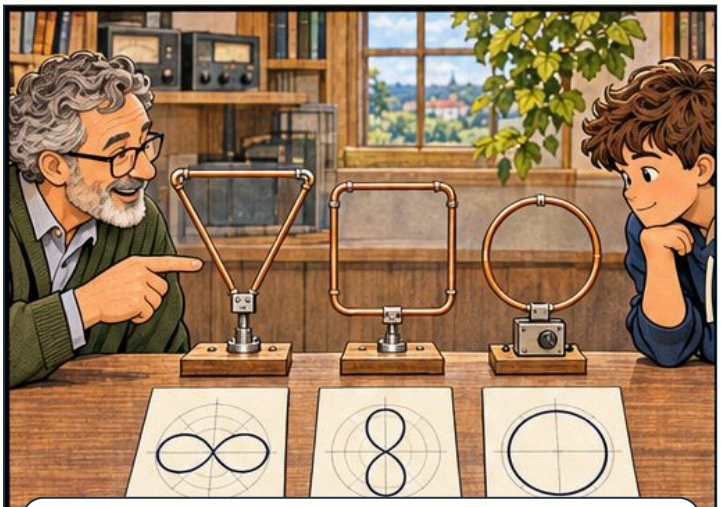
Its electrical perimeter helps distinguish very different behaviours.



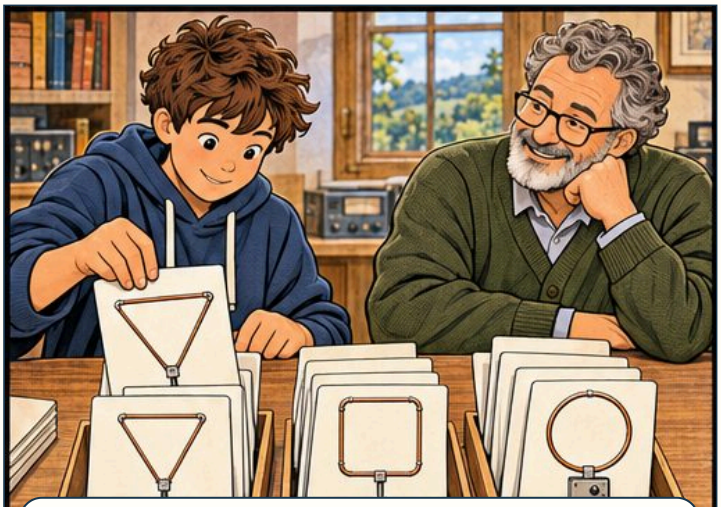
A large loop close to one wavelength is not a small tuned loop.



An active receiving loop is another implementation again.

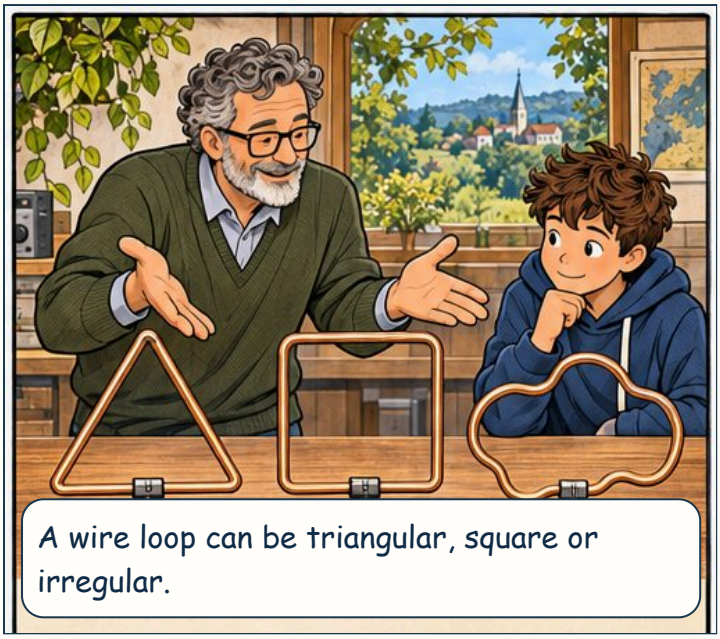


The word loop alone therefore cannot predict the pattern.

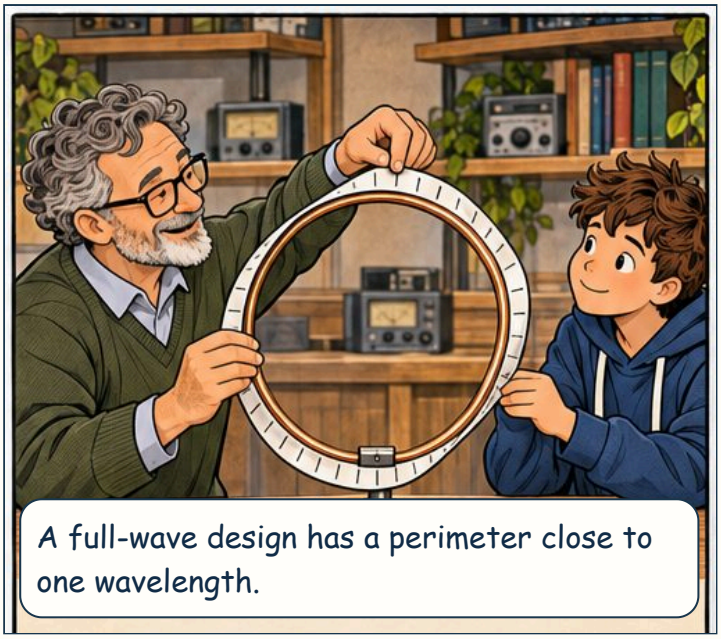


The youngster separates three cards he had filed together.

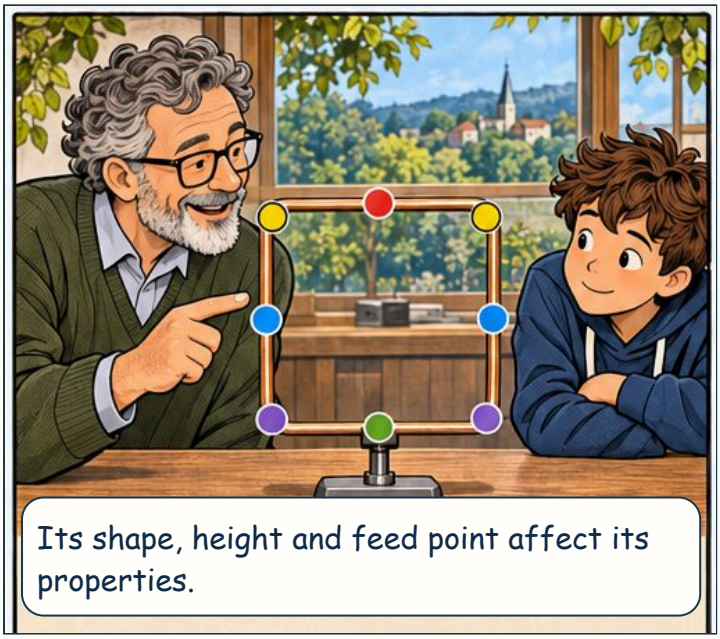
The large wire loop



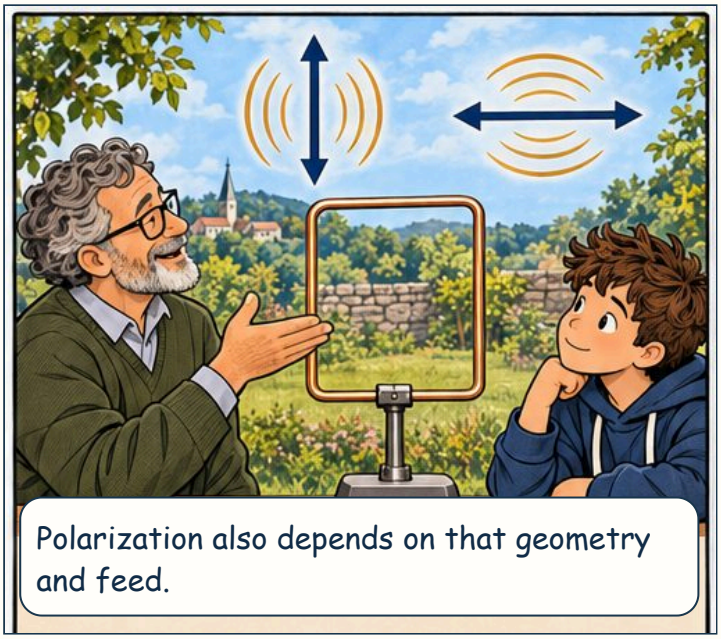
A wire loop can be triangular, square or irregular.



A full-wave design has a perimeter close to one wavelength.



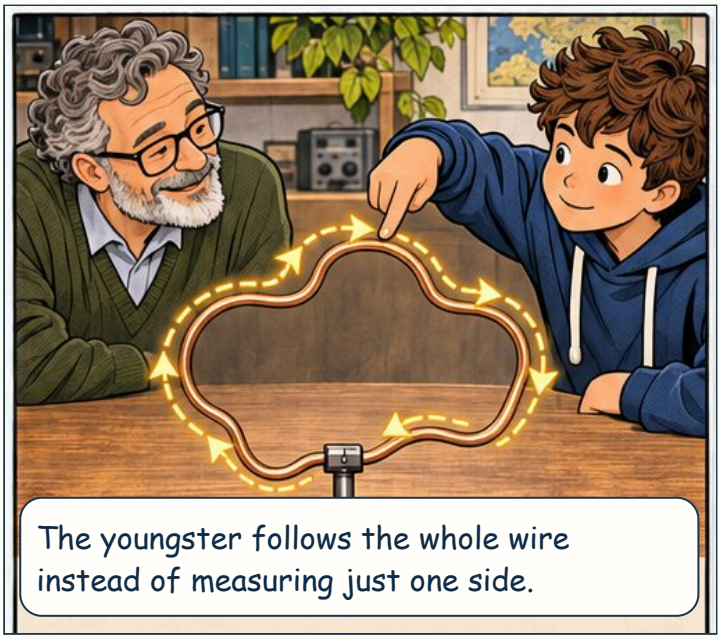
Its shape, height and feed point affect its properties.



Polarization also depends on that geometry and feed.

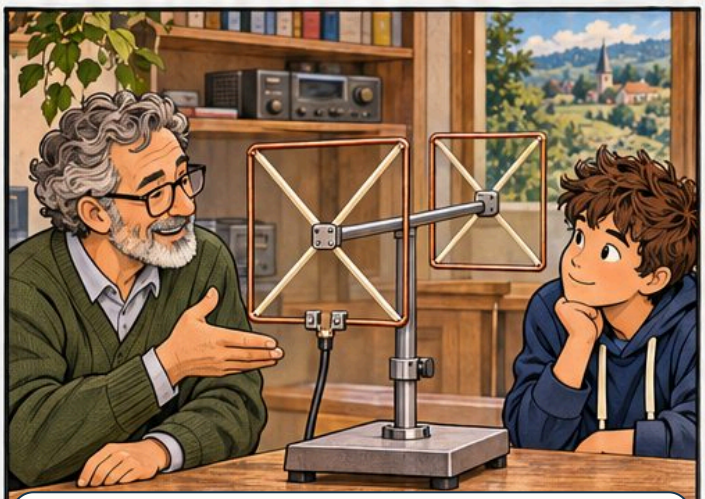


They therefore cannot infer everything from a triangle alone.

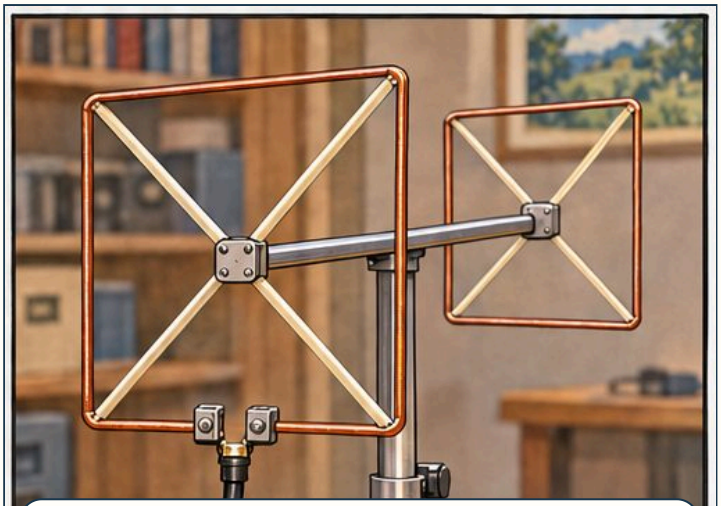


The youngster follows the whole wire instead of measuring just one side.

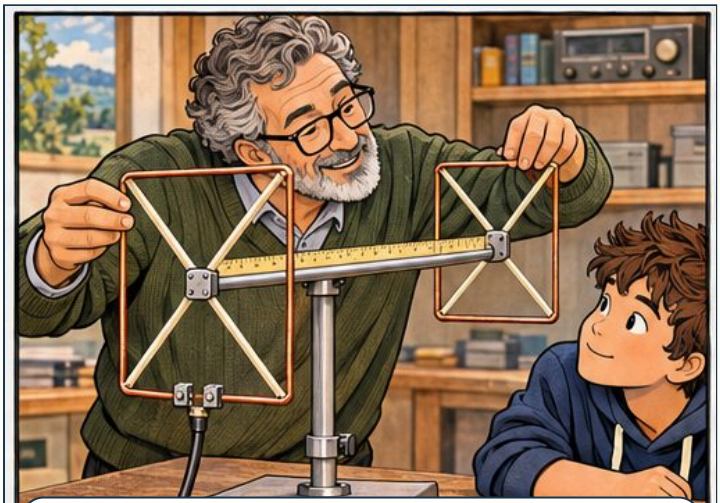
The quad combines frames



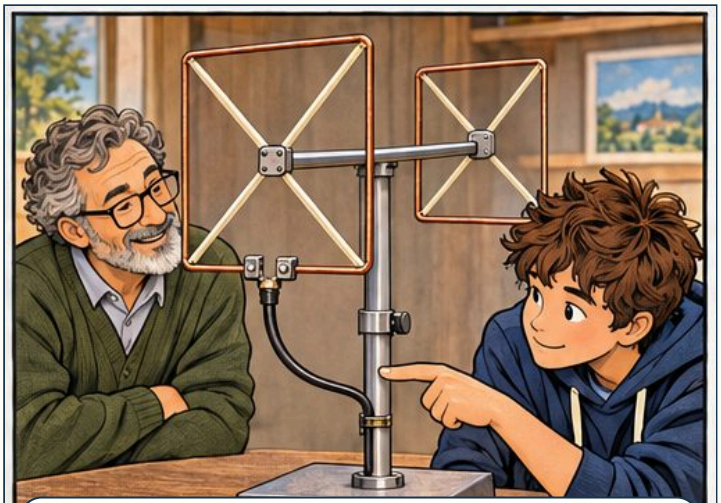
A directional quad can combine frames arranged one behind another.



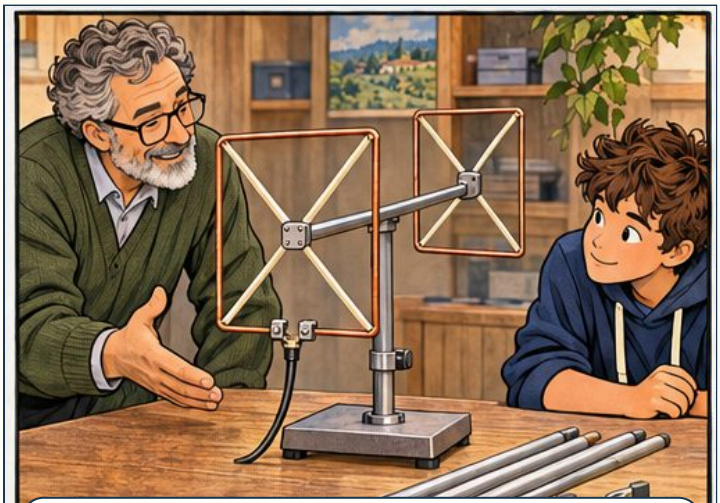
One frame is driven; others shape the pattern through coupling.



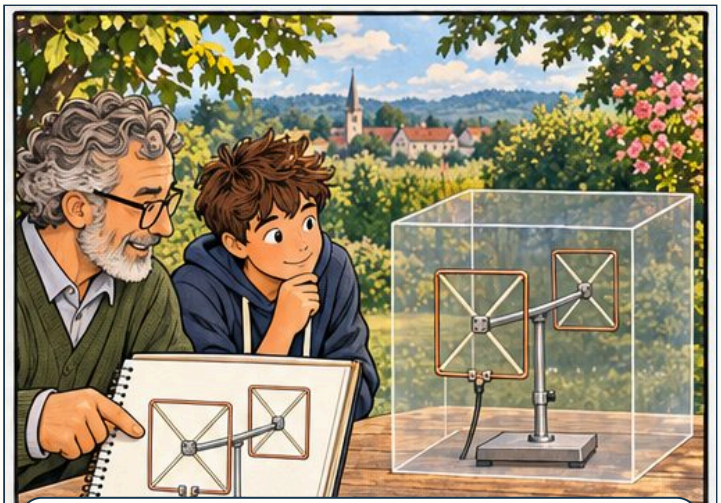
Spacing and dimensions form part of a precise design.



The coupled frames do not each have a separate feed cable in this version.

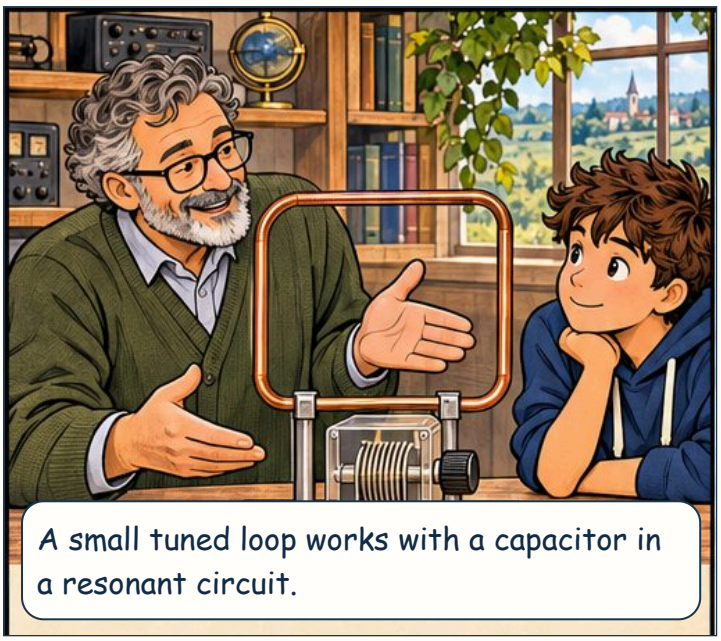


The structure can be light but occupies volume.



The youngster checks its space requirements before admiring its outline.

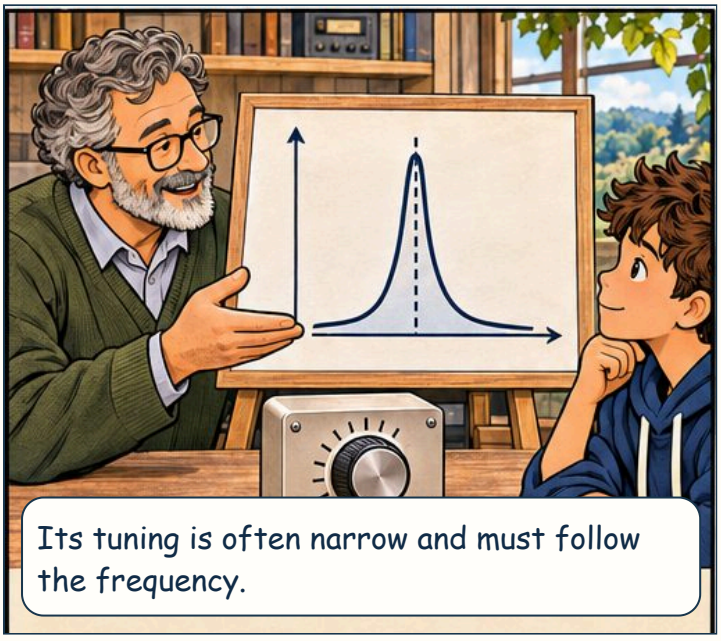
The small tuned loop



A small tuned loop works with a capacitor in a resonant circuit.



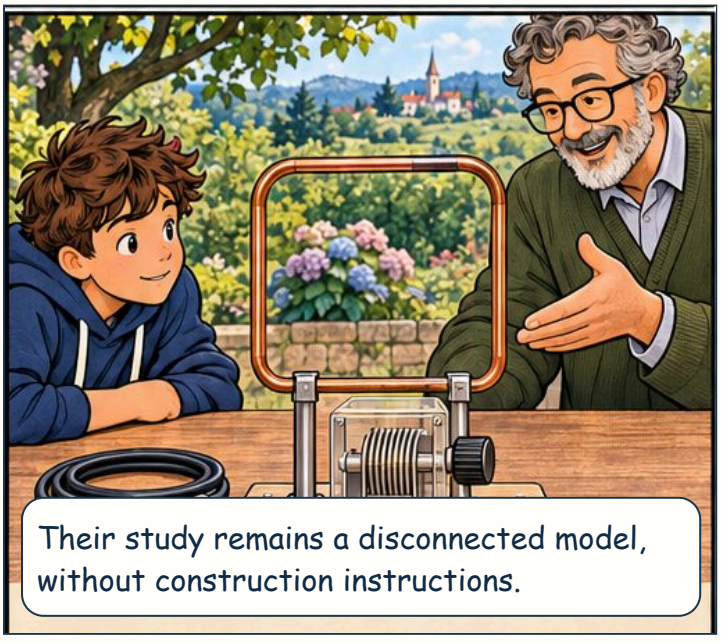
Its losses can strongly affect its efficiency.



Its tuning is often narrow and must follow the frequency.



High voltages and currents can occur during transmission.



Their study remains a disconnected model, without construction instructions.



The youngster observes behind a guard and keeps his questions.

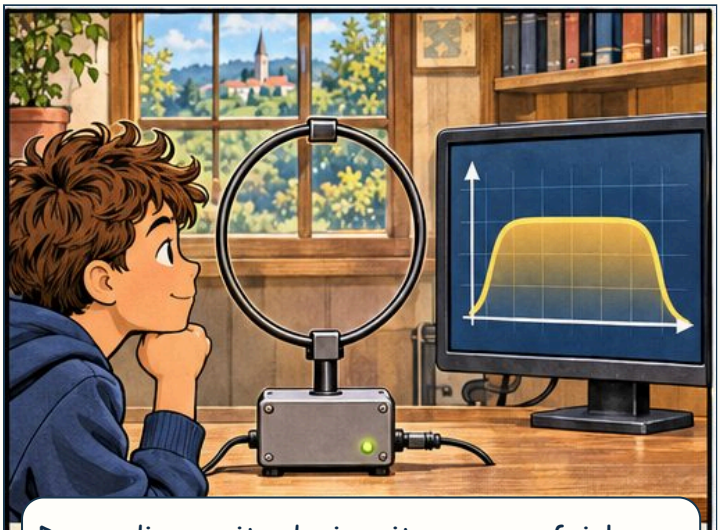
The loop made for listening



An active receiving loop uses an amplifier suited to weak signals.



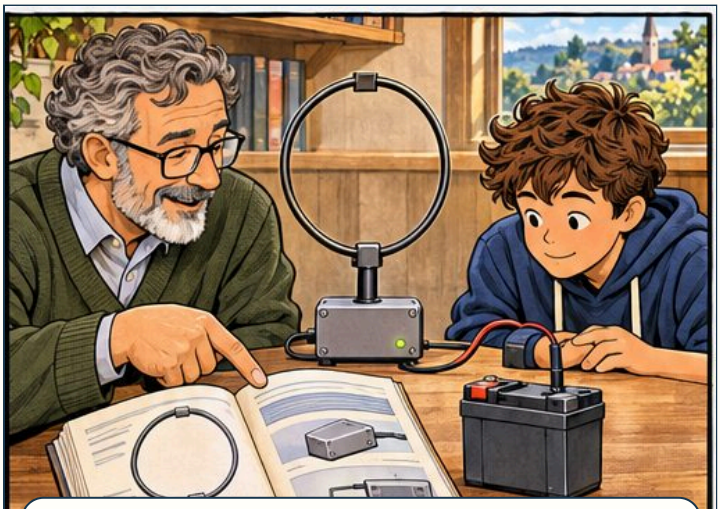
It must not be connected to a transmitter output.



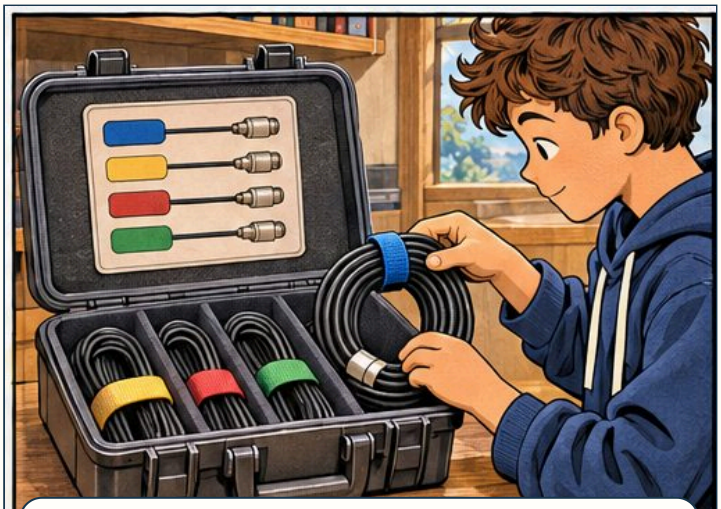
Depending on its design, it covers a fairly broad frequency range.



It also amplifies some noise: location remains crucial.

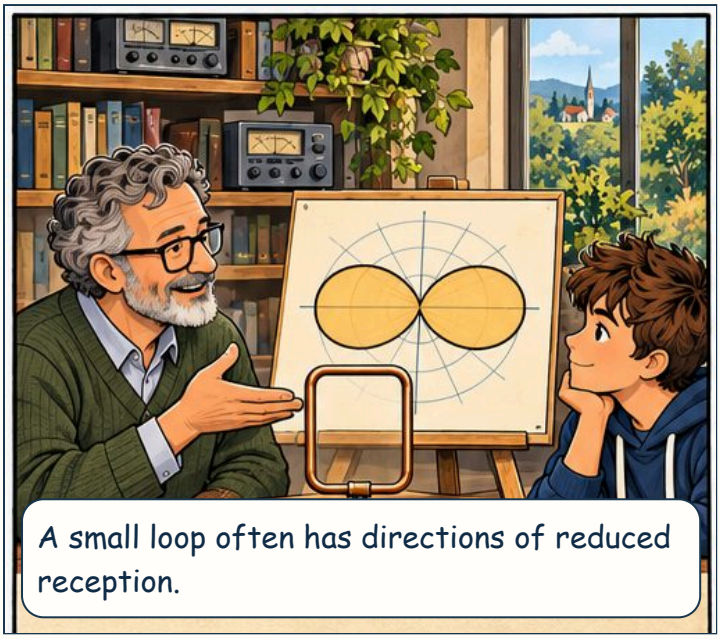


The manual specifies the power supply and input protection.

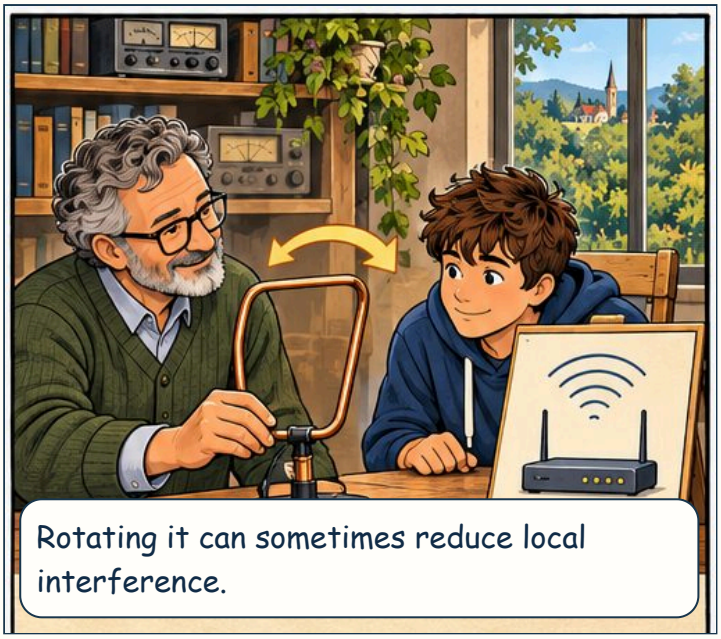


The youngster stores its cable in the receive-only box.

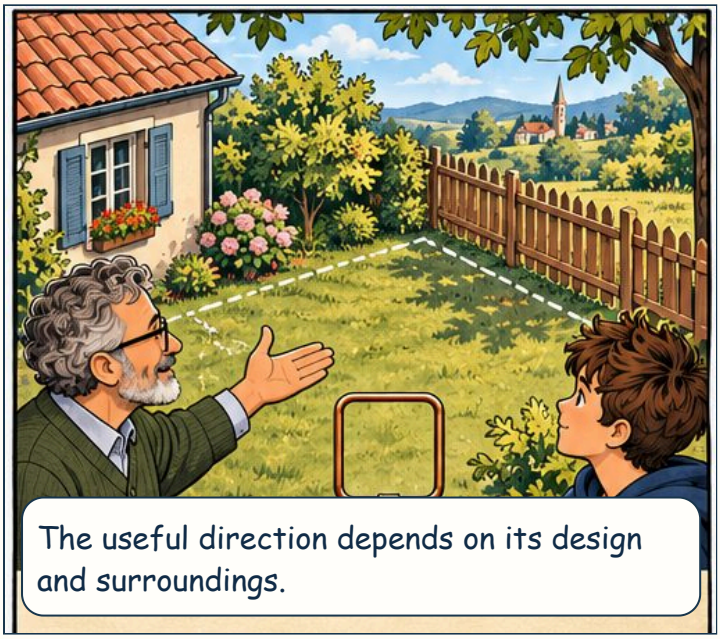
Rotate to hear less



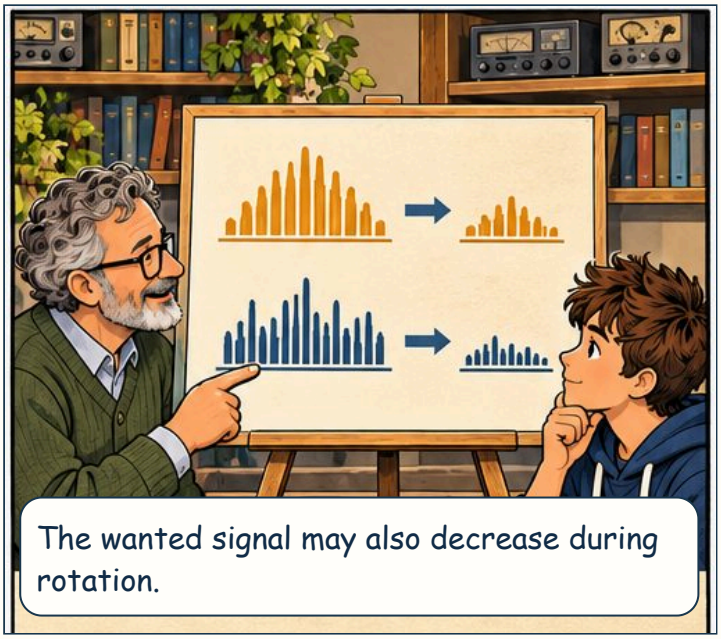
A small loop often has directions of reduced reception.



Rotating it can sometimes reduce local interference.



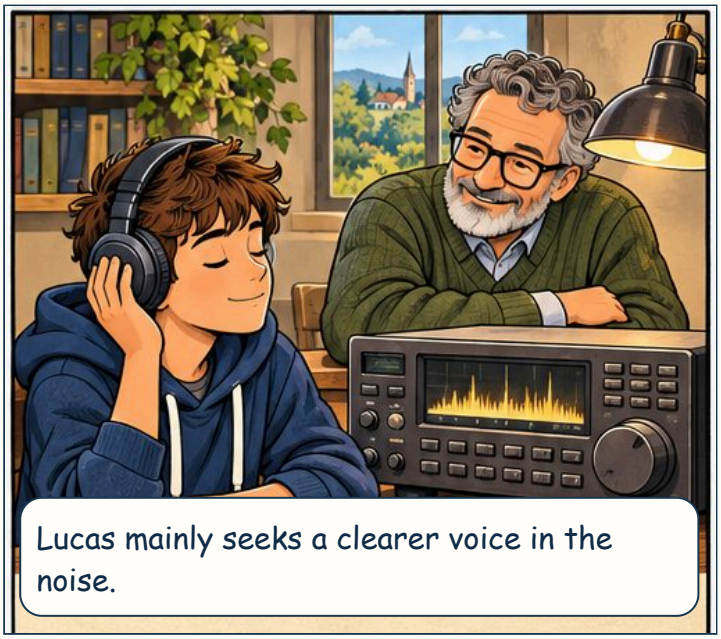
The useful direction depends on its design and surroundings.



The wanted signal may also decrease during rotation.

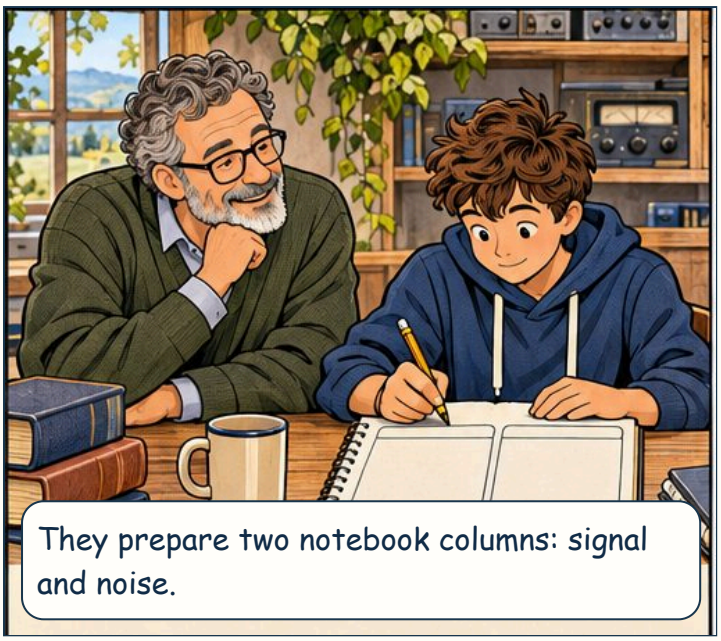


The best result is not always the loudest sound.

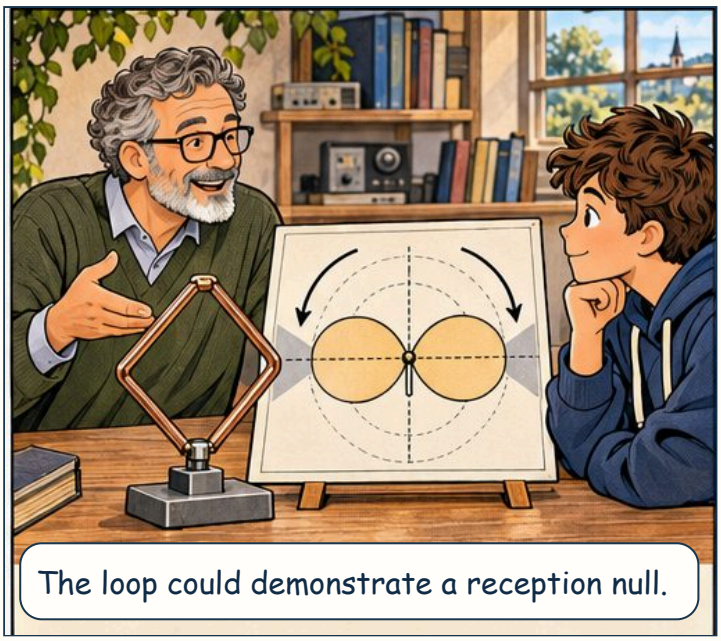


Lucas mainly seeks a clearer voice in the noise.

Silence becomes information



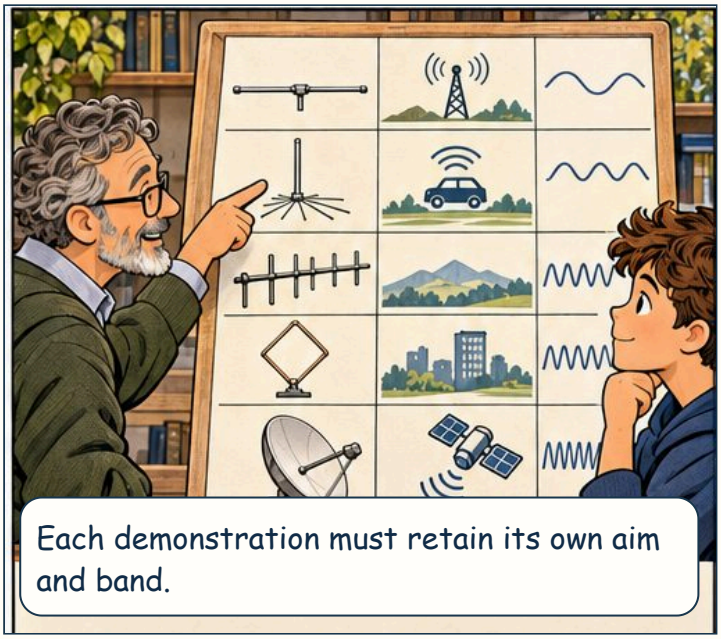
They prepare two notebook columns: signal and noise.



The loop could demonstrate a reception null.



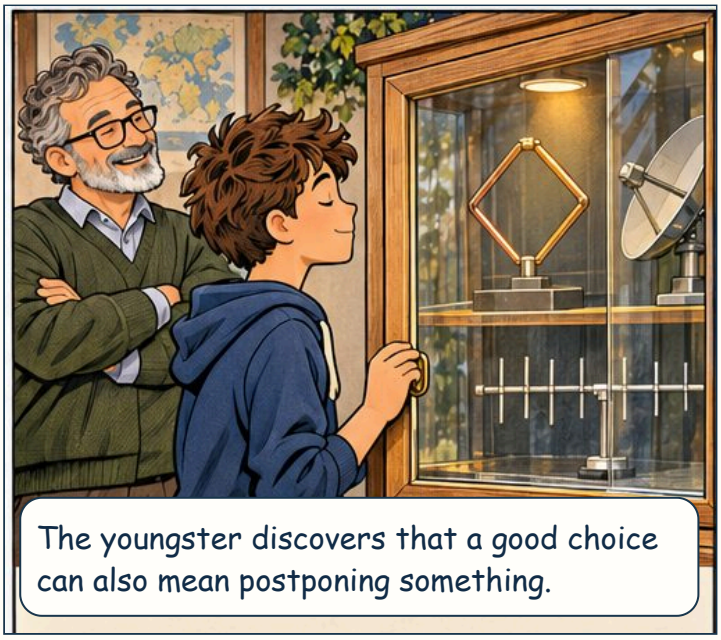
But it does not automatically replace the antenna for local listening.



Each demonstration must retain its own aim and band.

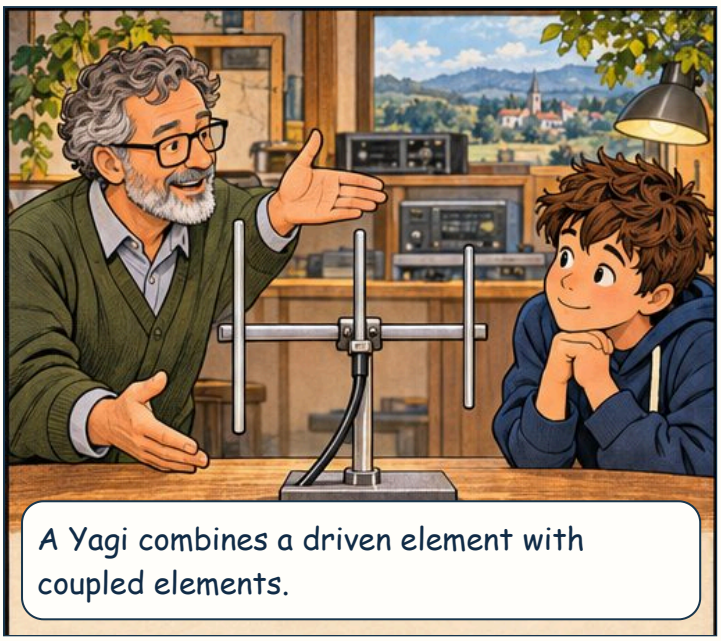


They keep this possibility for a dedicated receiving workshop.

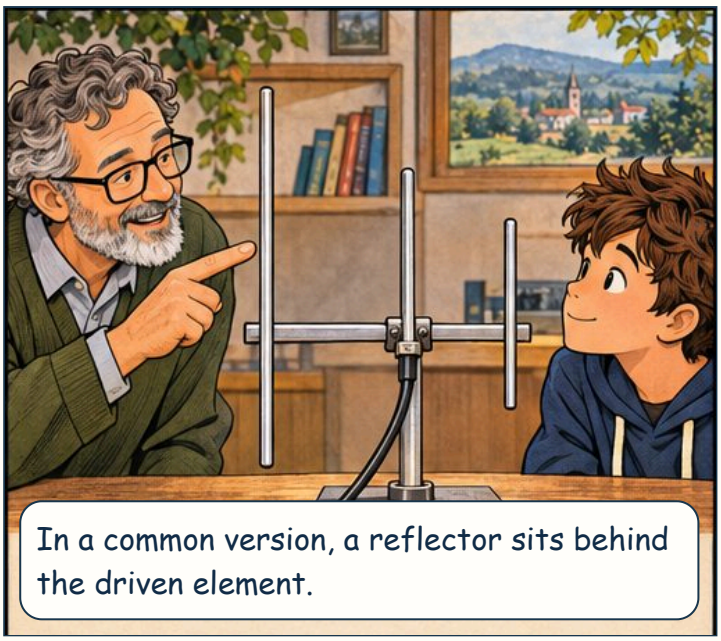


The youngster discovers that a good choice can also mean postponing something.

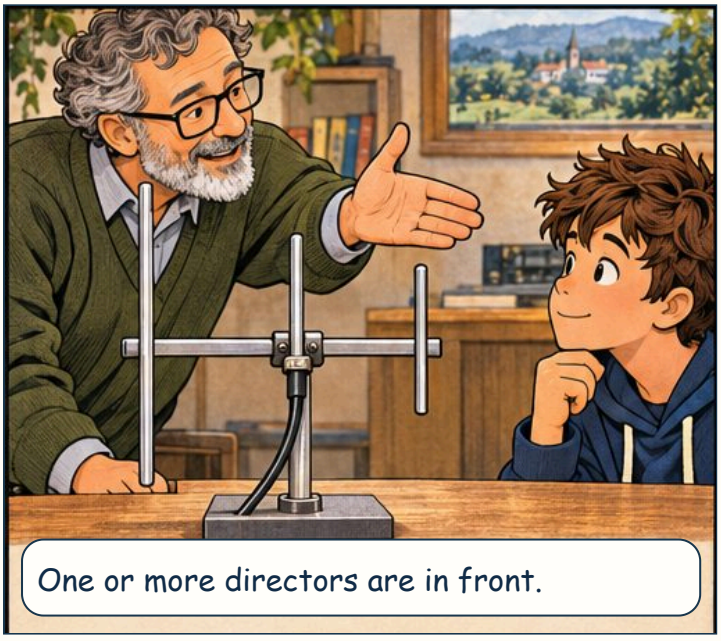
The Yagi's elements



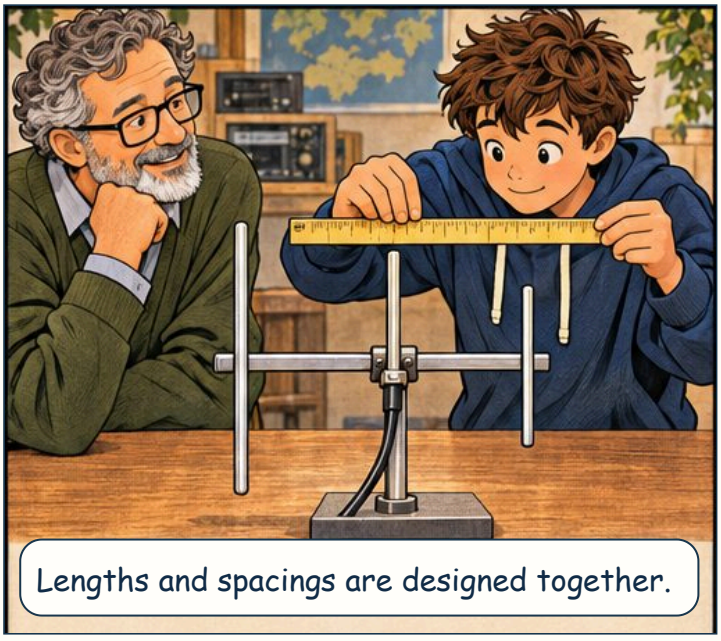
A Yagi combines a driven element with coupled elements.



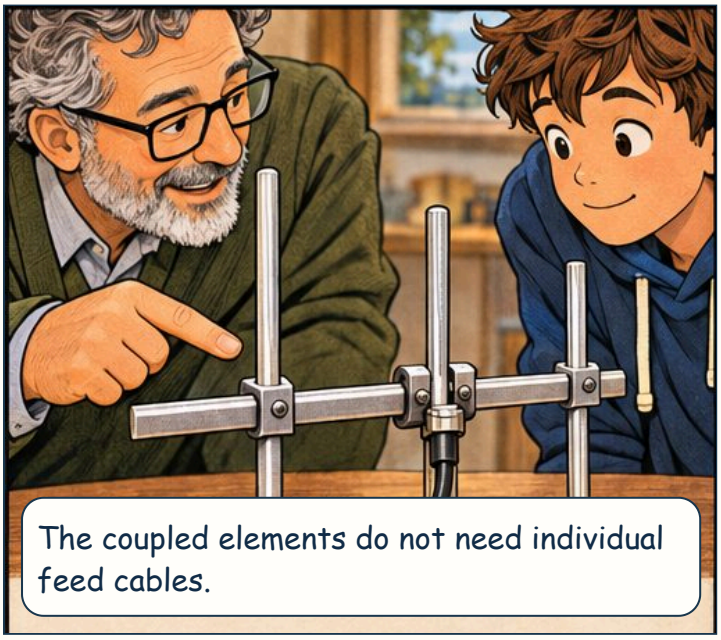
In a common version, a reflector sits behind the driven element.



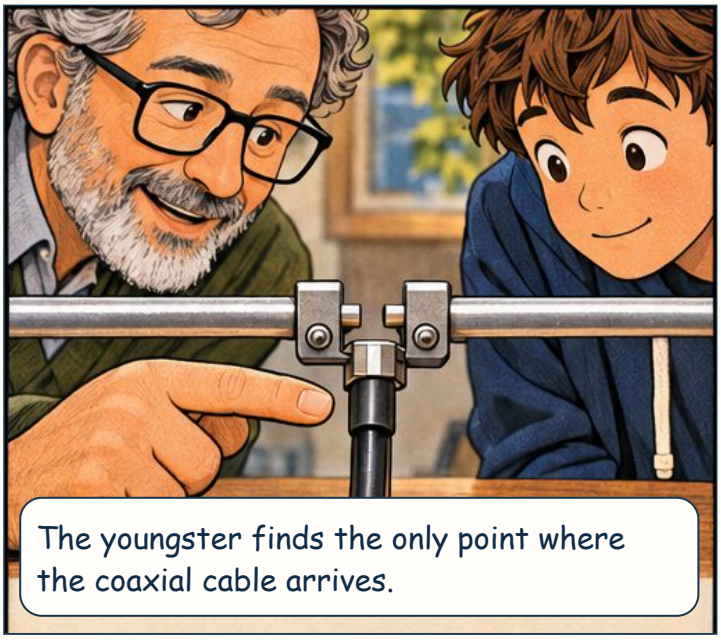
One or more directors are in front.



Lengths and spacings are designed together.

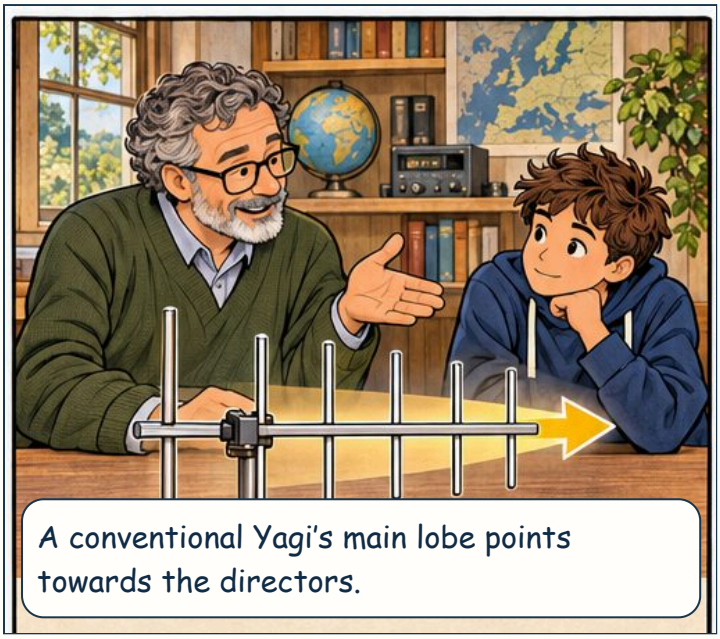


The coupled elements do not need individual feed cables.

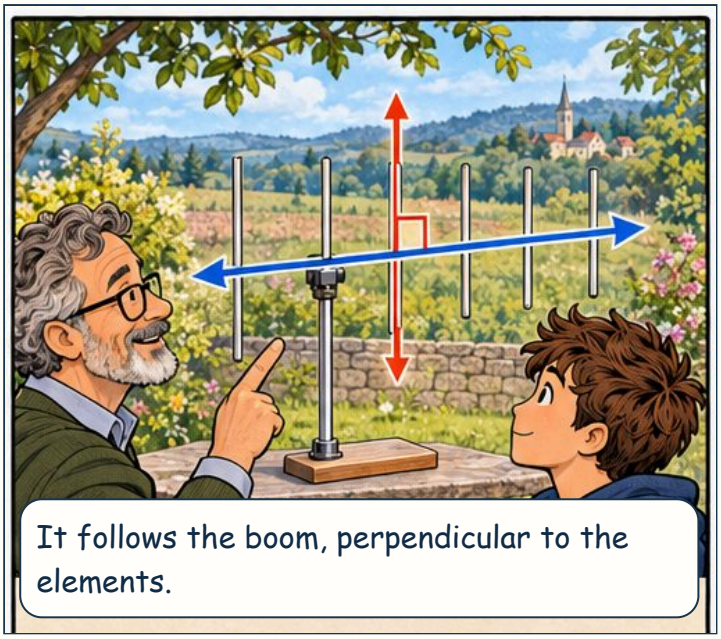


The youngster finds the only point where the coaxial cable arrives.

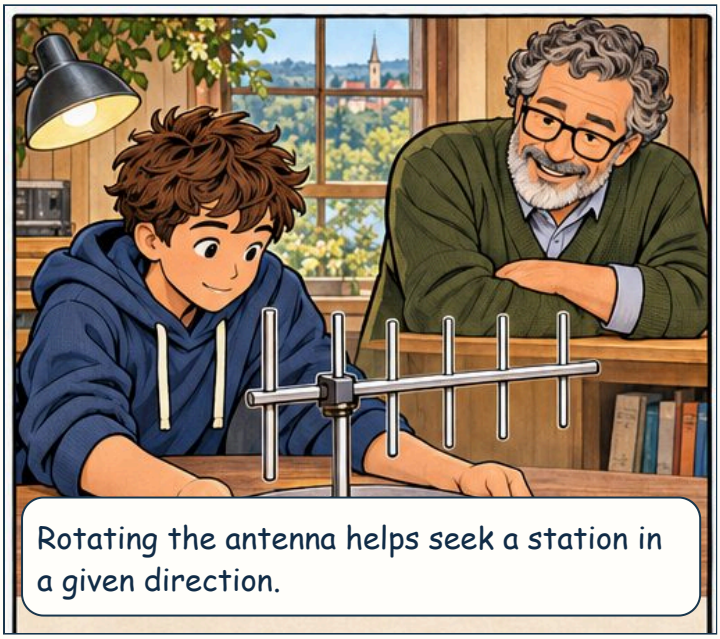
Along the boom



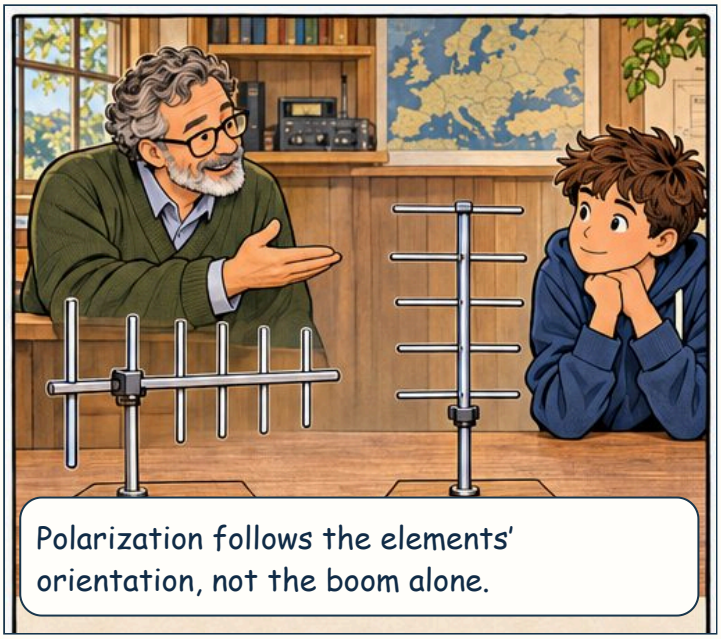
A conventional Yagi's main lobe points towards the directors.



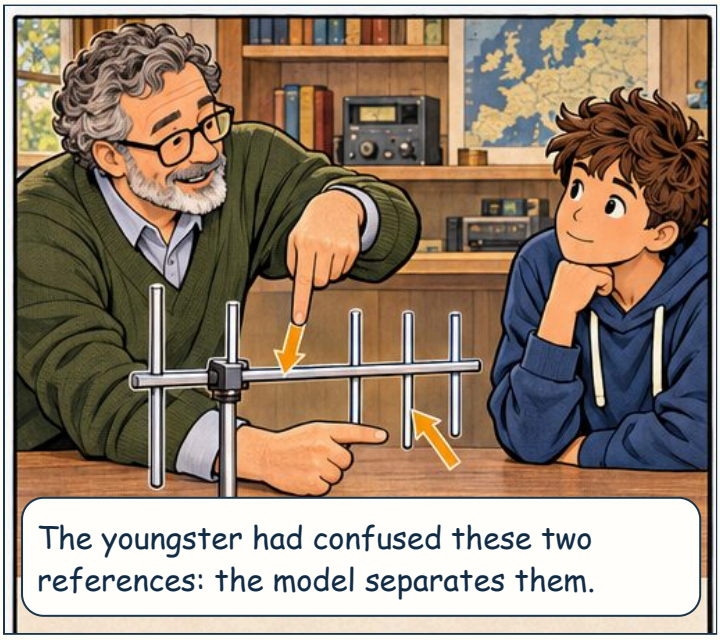
It follows the boom, perpendicular to the elements.



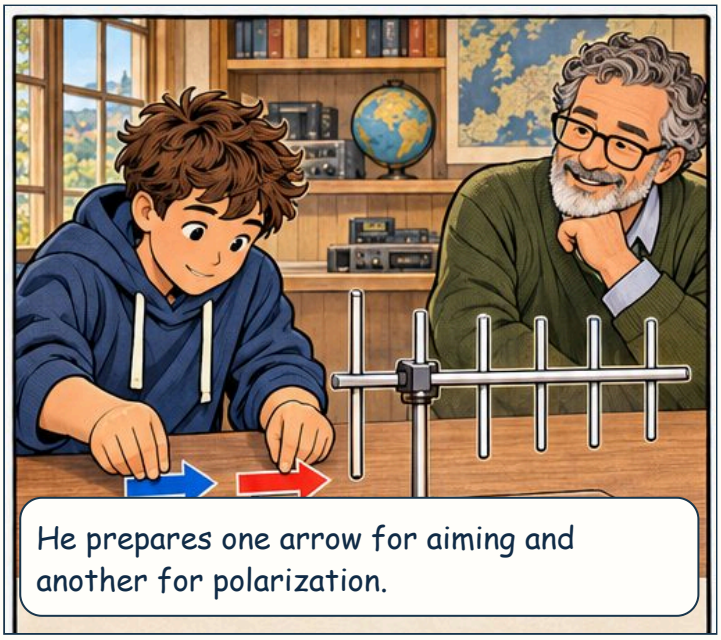
Rotating the antenna helps seek a station in a given direction.



Polarization follows the elements' orientation, not the boom alone.



The youngster had confused these two references: the model separates them.

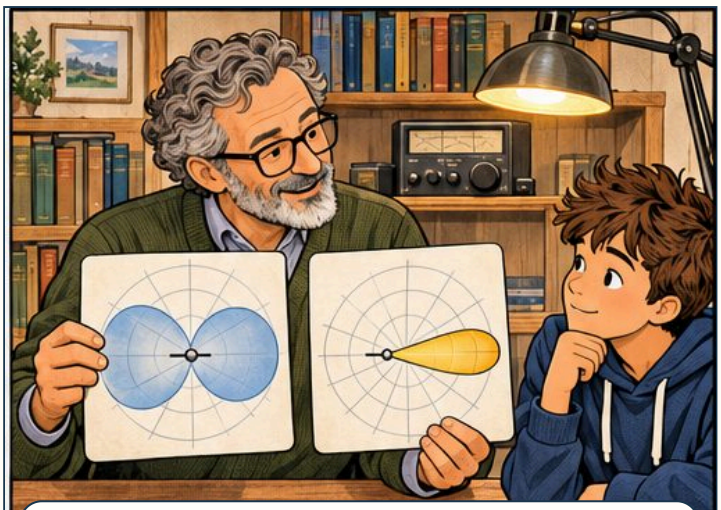


He prepares one arrow for aiming and another for polarization.

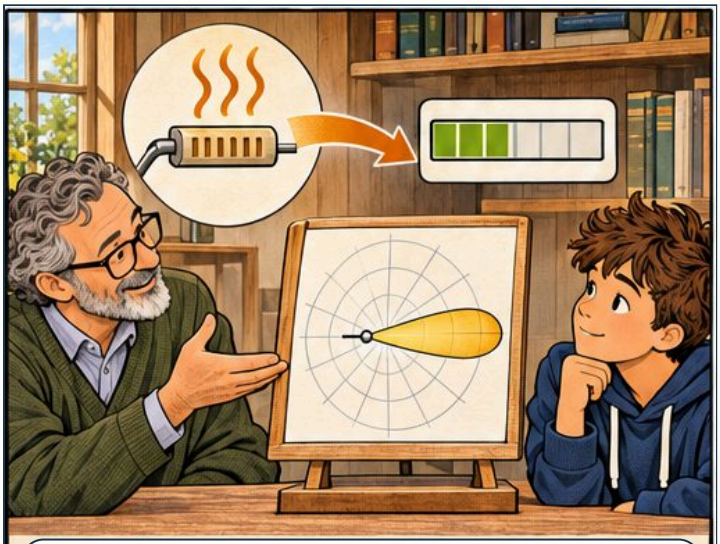
Gain creates no energy



A passive antenna does not manufacture its signal's power.



Directivity describes how it favours certain directions.



Gain also accounts for its internal losses.



High gain in one direction does not mean an advantage everywhere.

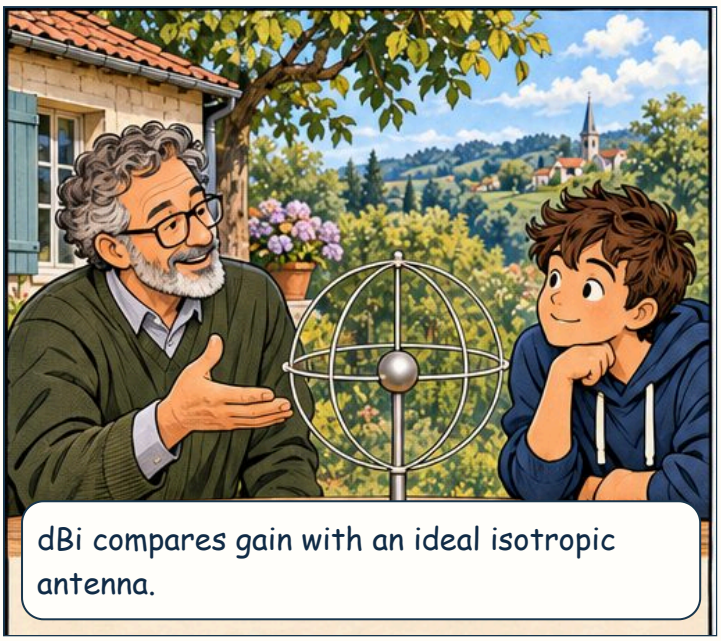


When receiving, this selection can help towards a particular station.

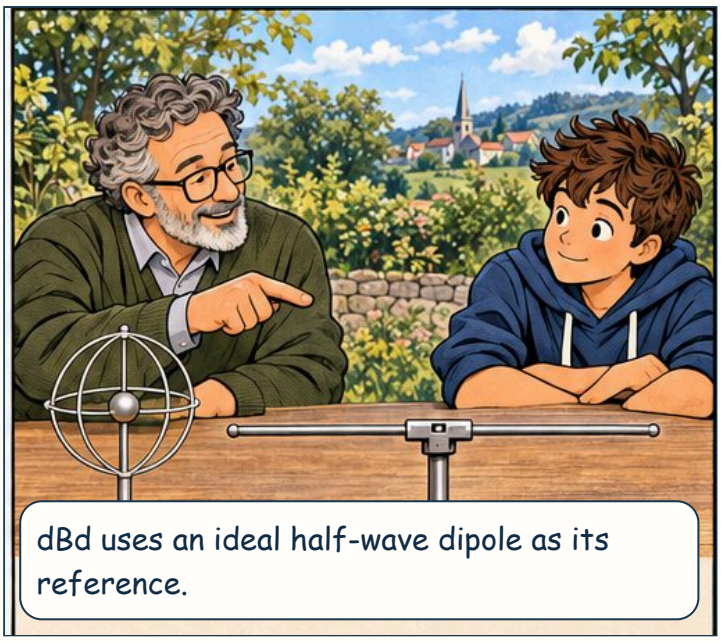


The youngster finally sees why aiming is part of using it.

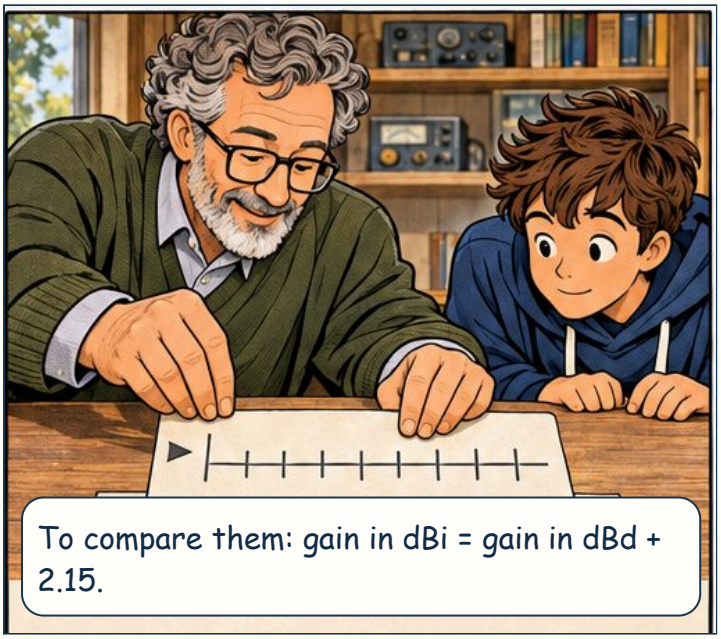
Two references for one figure



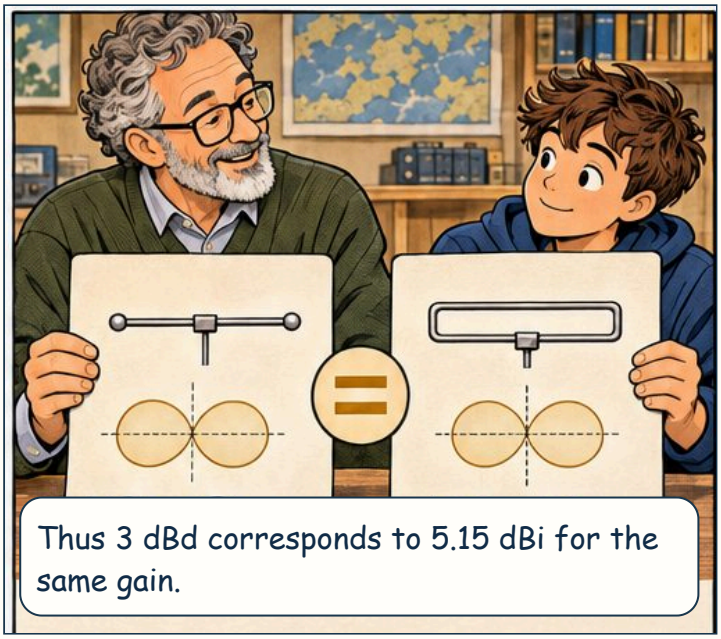
dBi compares gain with an ideal isotropic antenna.



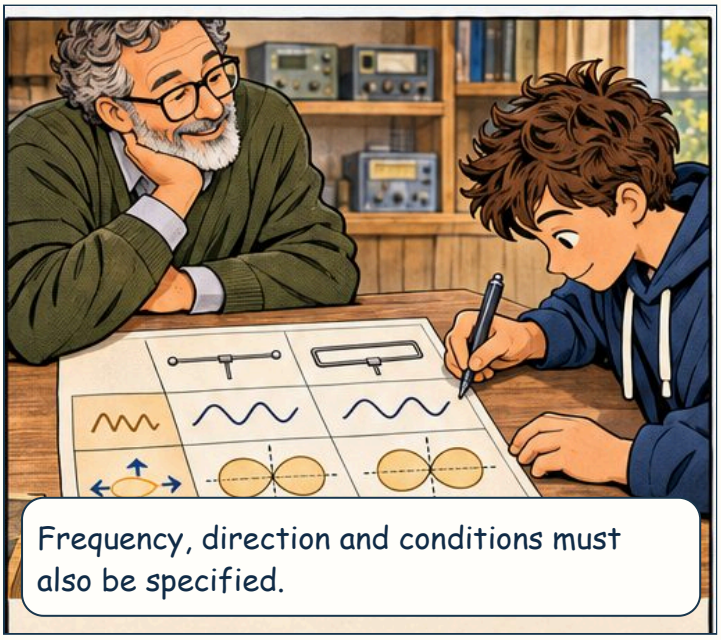
dBd uses an ideal half-wave dipole as its reference.



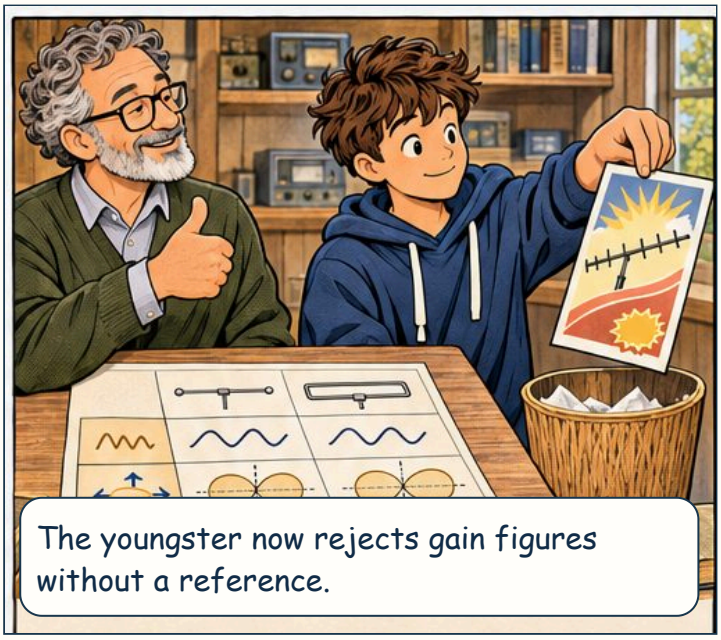
To compare them: gain in dBi = gain in dBd + 2.15.



Thus 3 dBd corresponds to 5.15 dBi for the same gain.

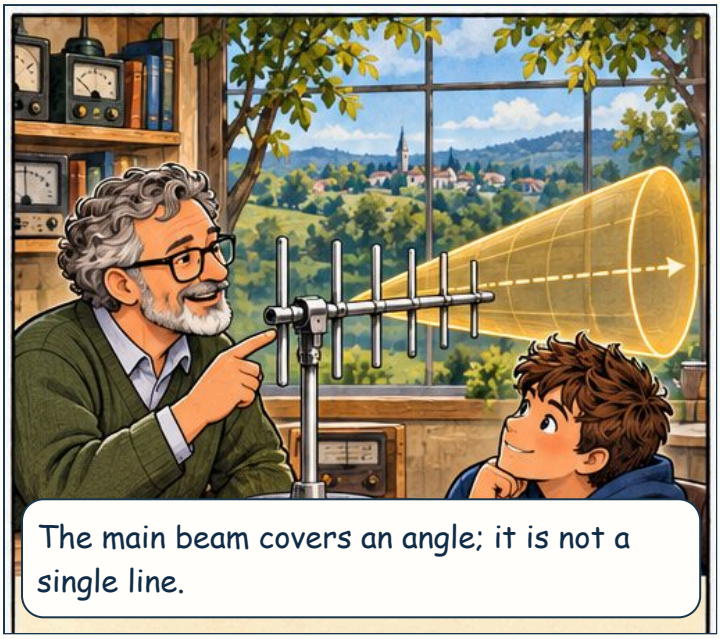


Frequency, direction and conditions must also be specified.



The youngster now rejects gain figures without a reference.

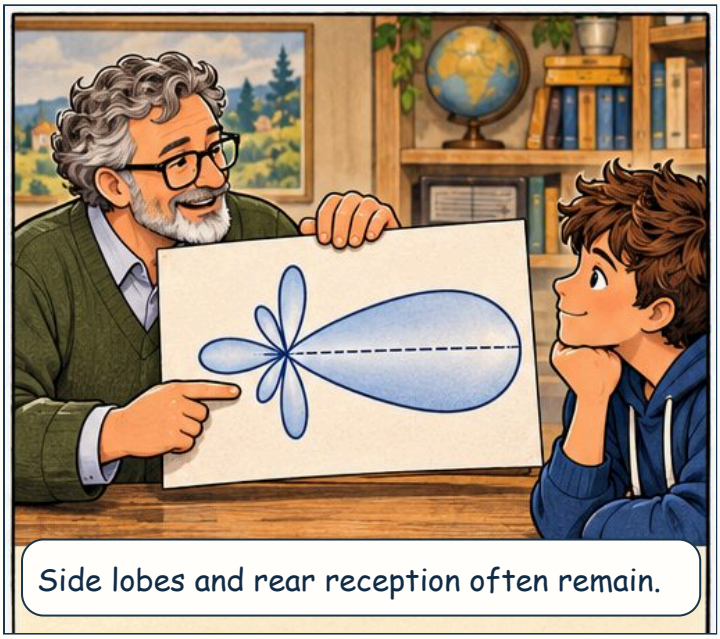
The beam has a width



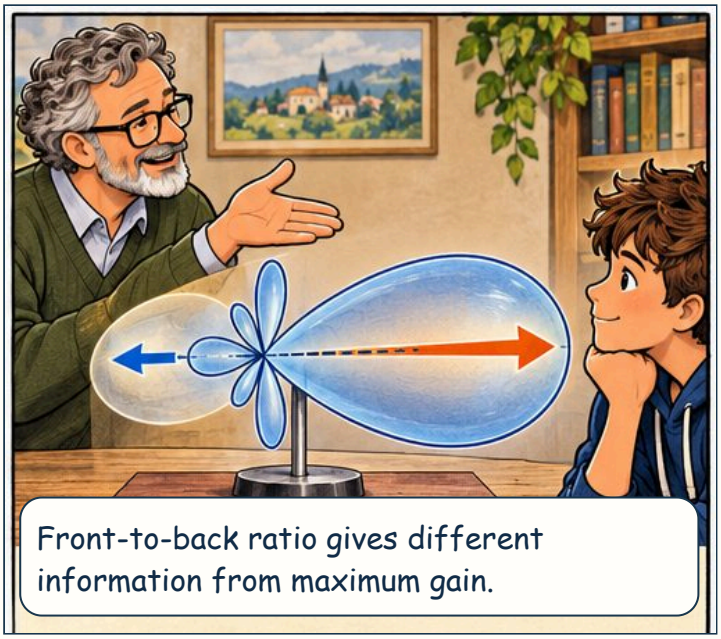
The main beam covers an angle; it is not a single line.



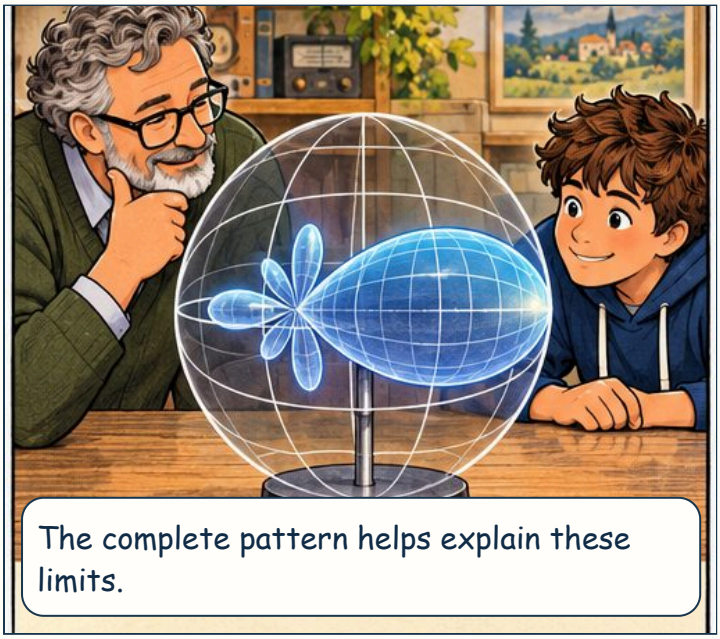
A narrower beam requires more careful aiming.



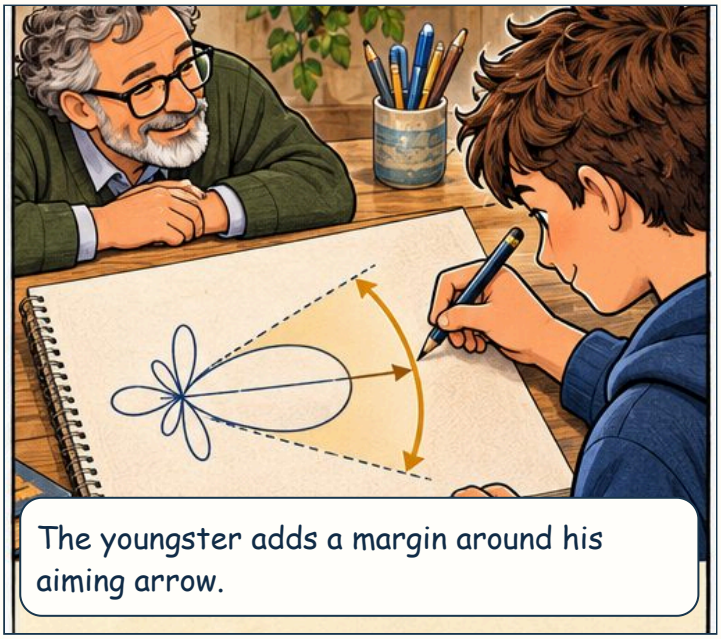
Side lobes and rear reception often remain.



Front-to-back ratio gives different information from maximum gain.

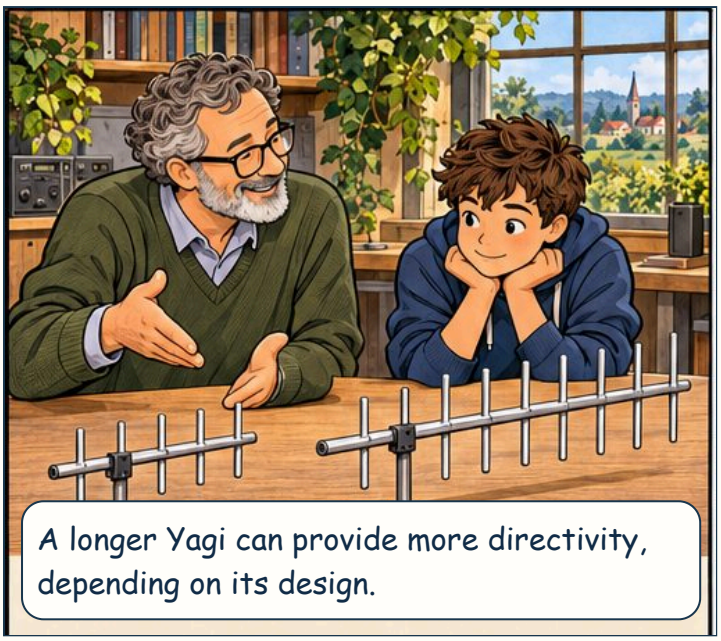


The complete pattern helps explain these limits.



The youngster adds a margin around his aiming arrow.

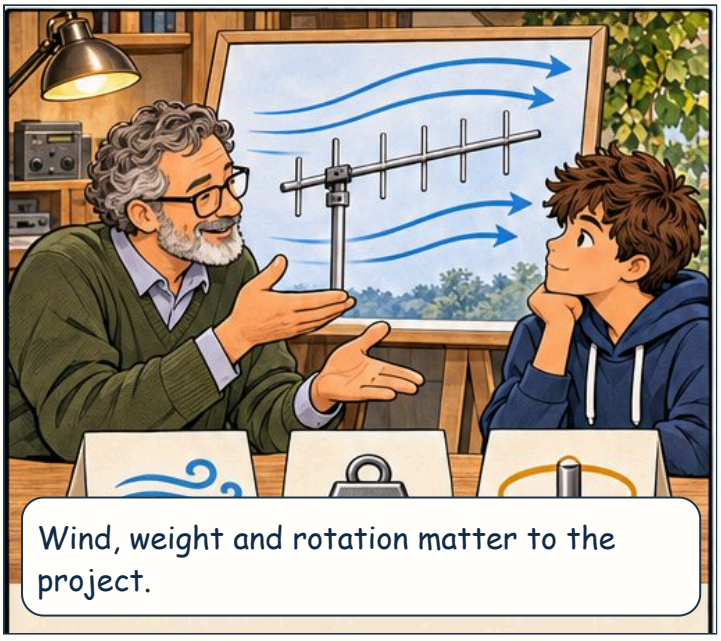
More elements, more demands



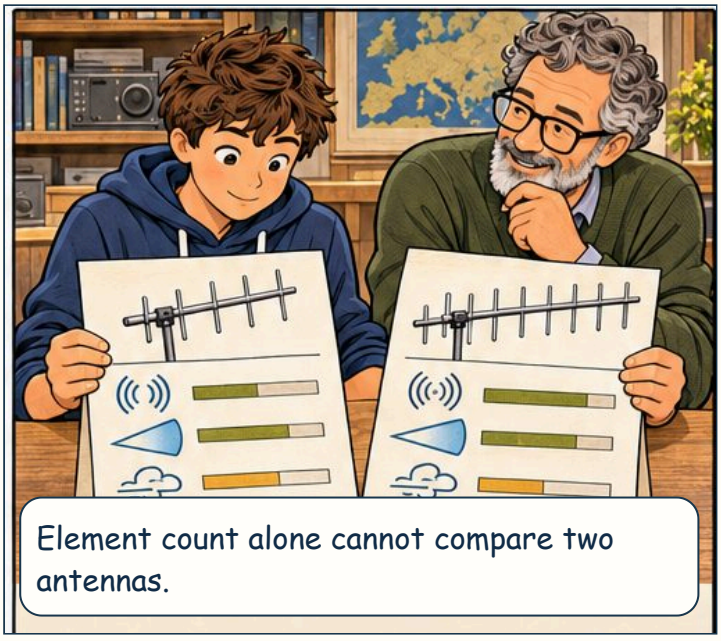
A longer Yagi can provide more directivity, depending on its design.



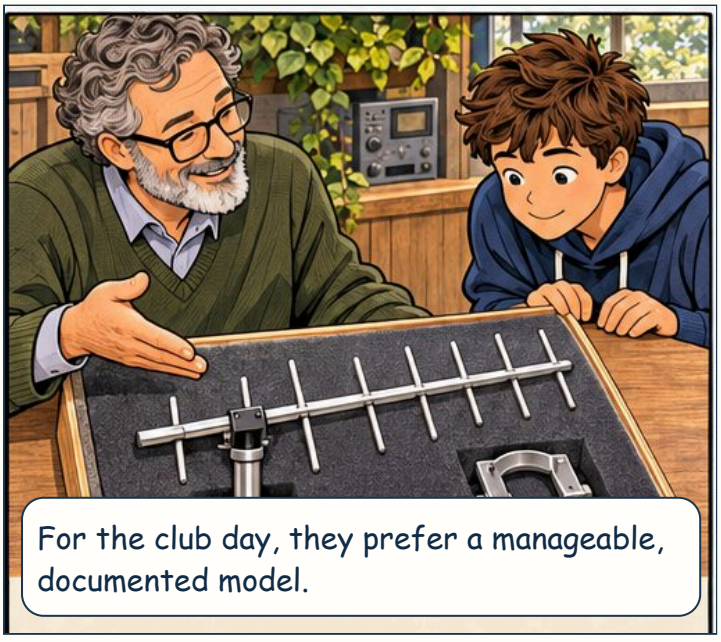
It also needs more space and a suitable mounting.



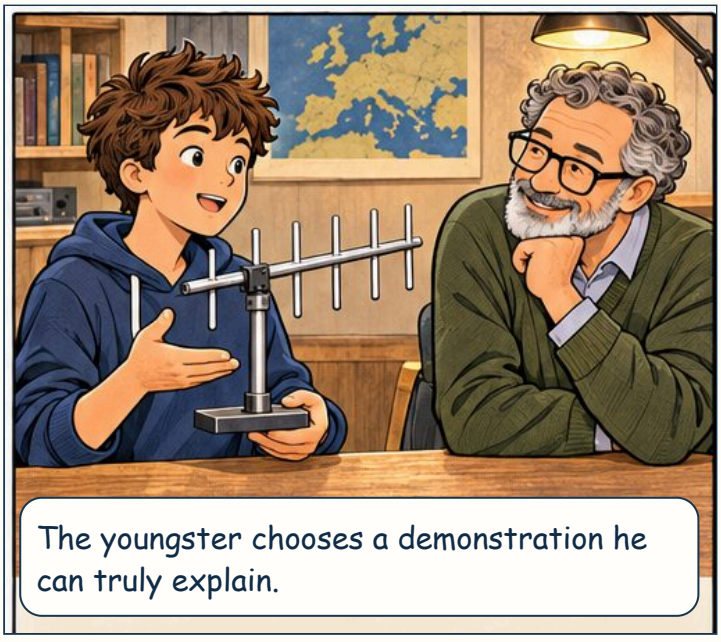
Wind, weight and rotation matter to the project.



Element count alone cannot compare two antennas.

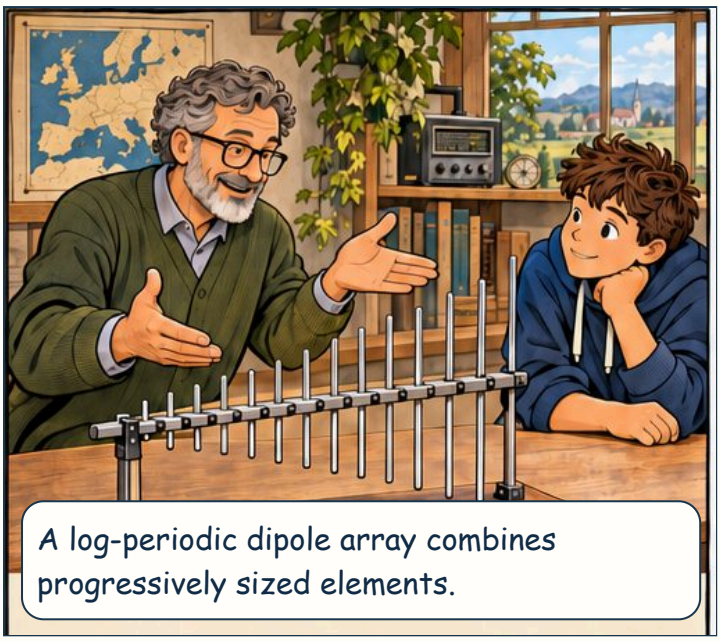


For the club day, they prefer a manageable, documented model.

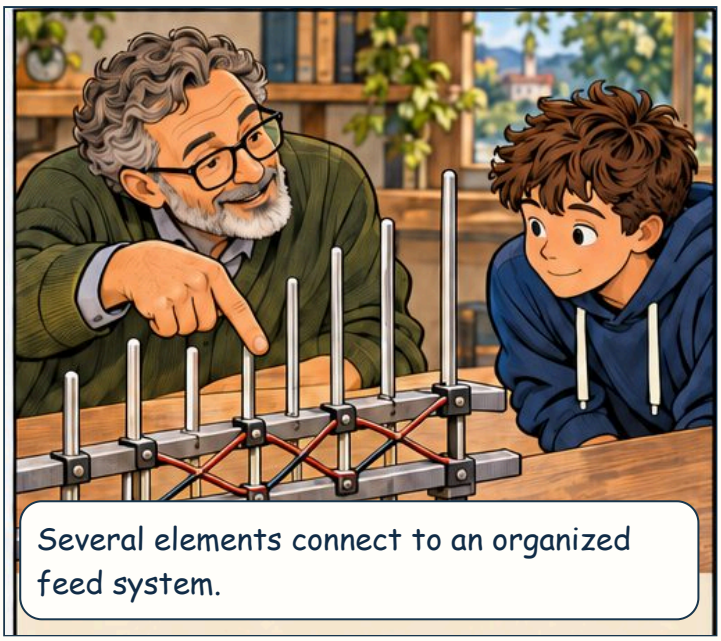


The youngster chooses a demonstration he can truly explain.

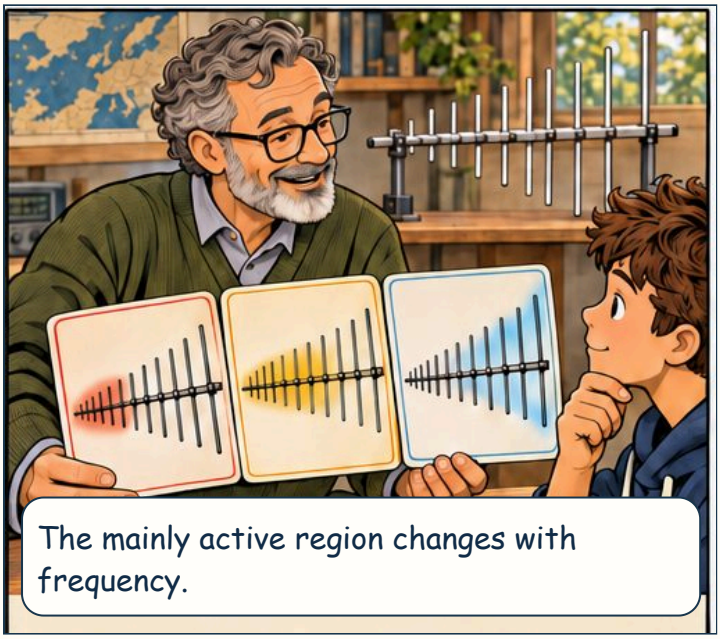
The log-periodic changes scale



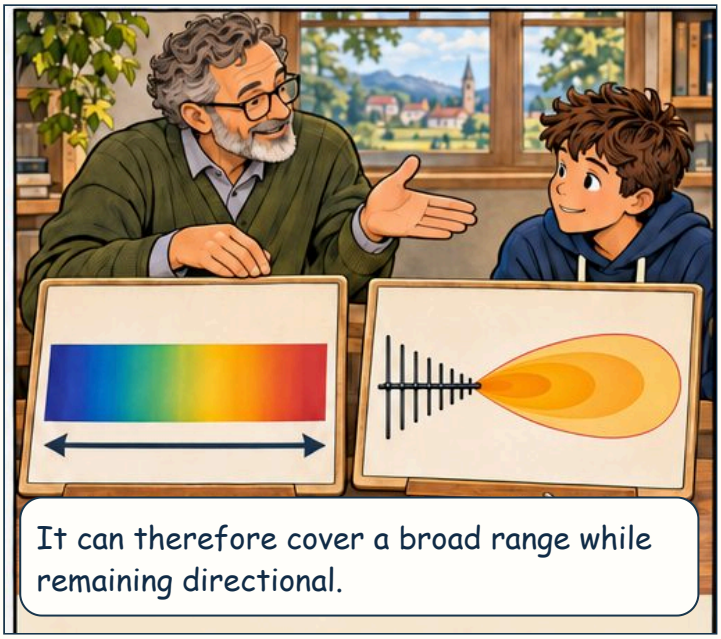
A log-periodic dipole array combines progressively sized elements.



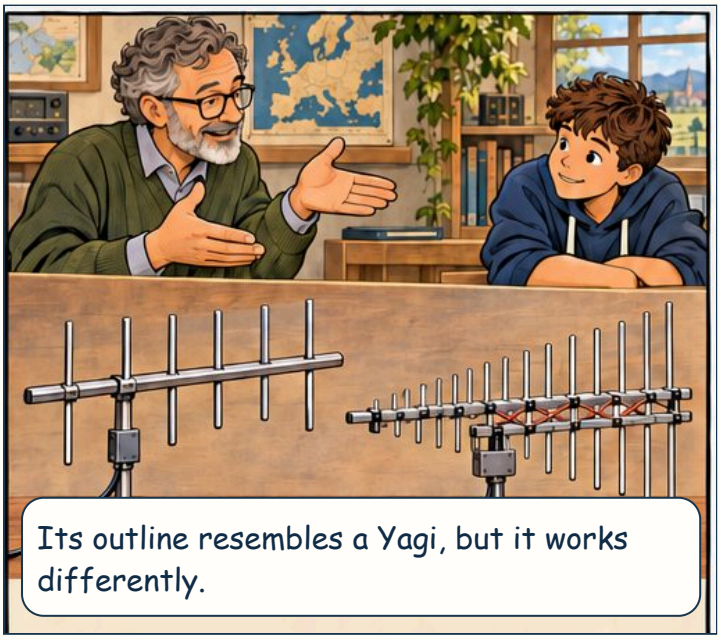
Several elements connect to an organized feed system.



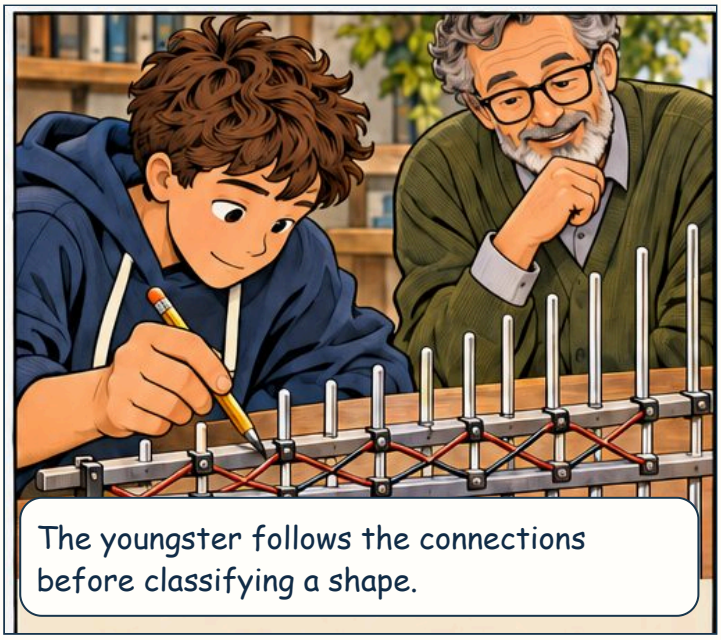
The mainly active region changes with frequency.



It can therefore cover a broad range while remaining directional.

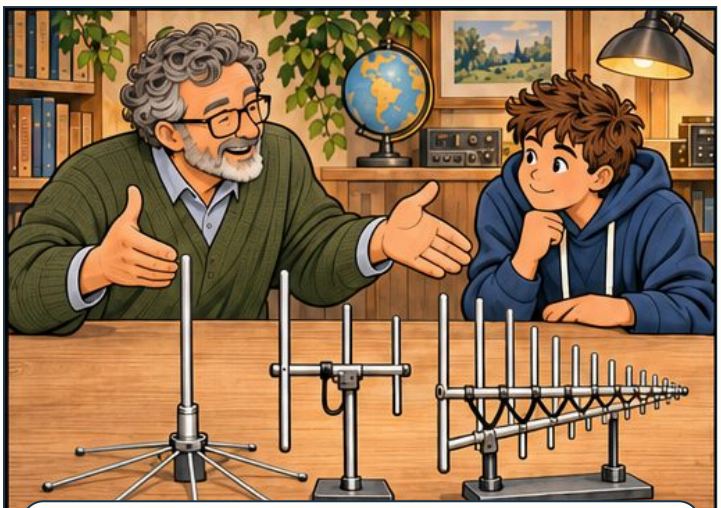


Its outline resembles a Yagi, but it works differently.

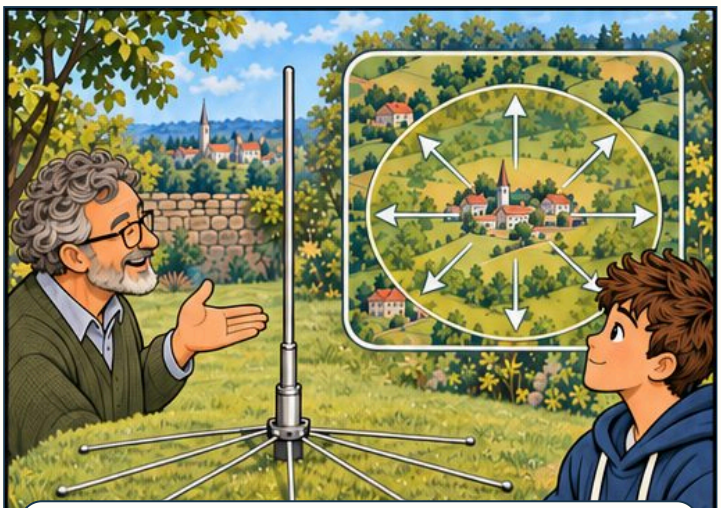


The youngster follows the connections before classifying a shape.

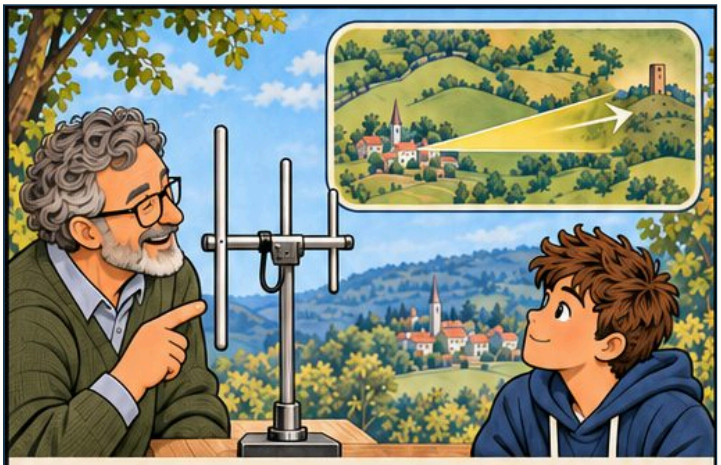
Three antennas, three purposes



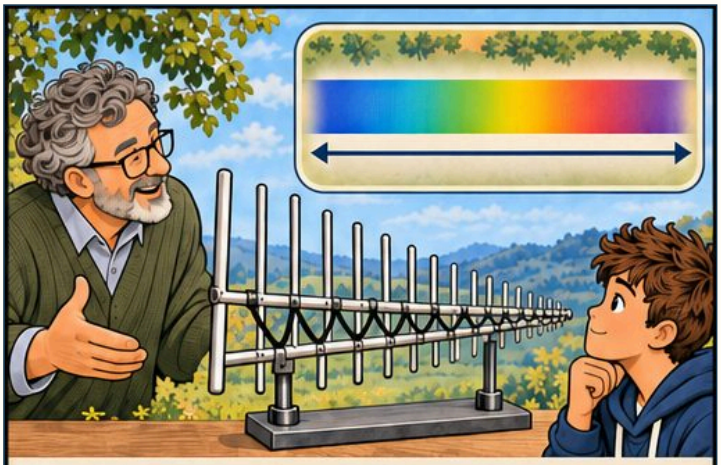
They bring a vertical, a Yagi and a log-periodic together.



The vertical serves their need for coverage around the garden.



The Yagi will demonstrate aiming in one direction.



The log-periodic illustrates broader frequency coverage.



No card replaces reading the real specifications.

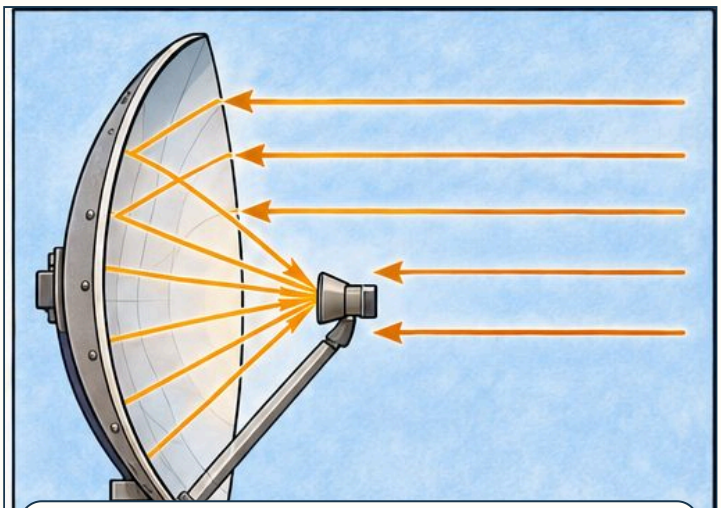


The youngster starts linking each family to a need.

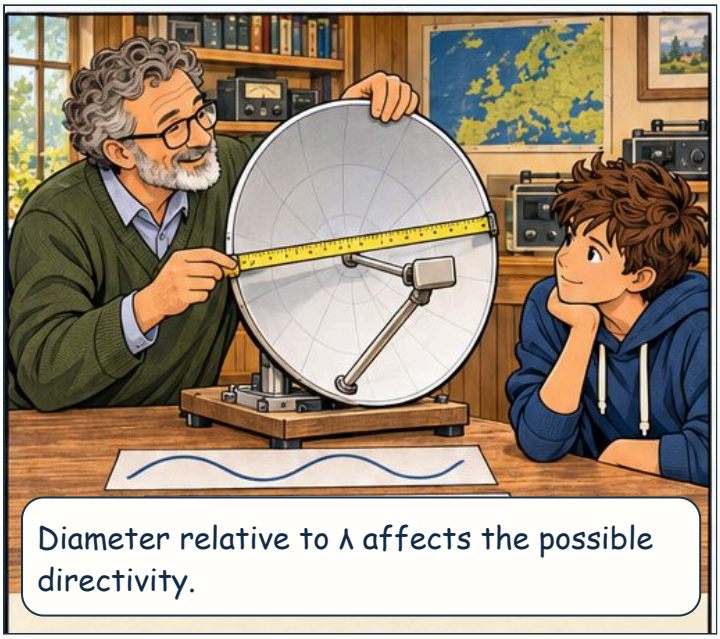
A dish and its focus



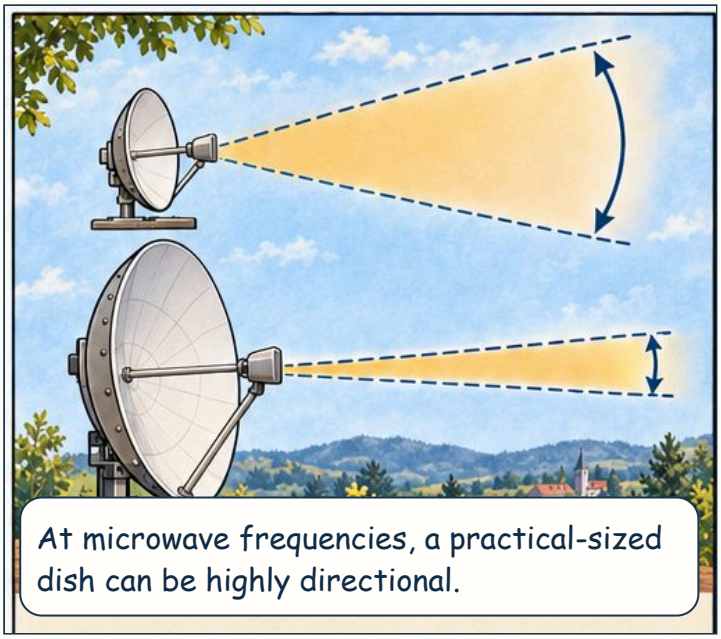
A parabolic antenna combines a reflector with a feed near the focus.



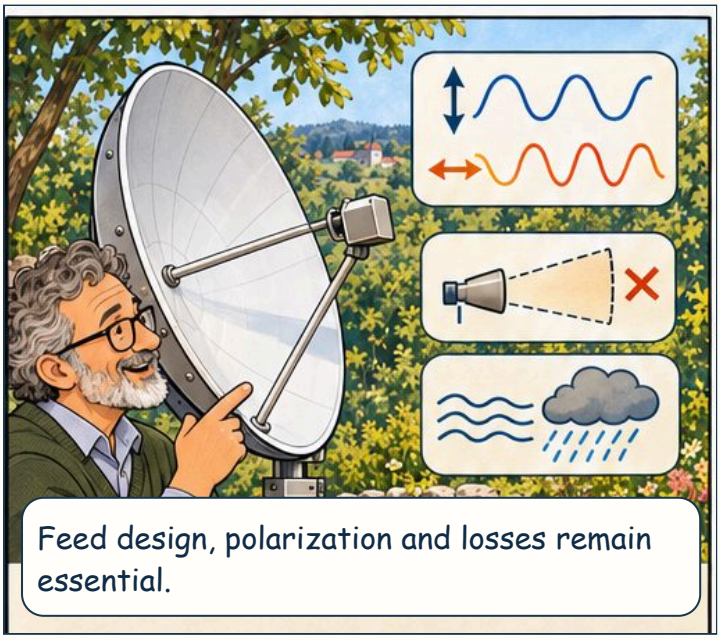
When receiving, the reflector directs waves towards that feed.



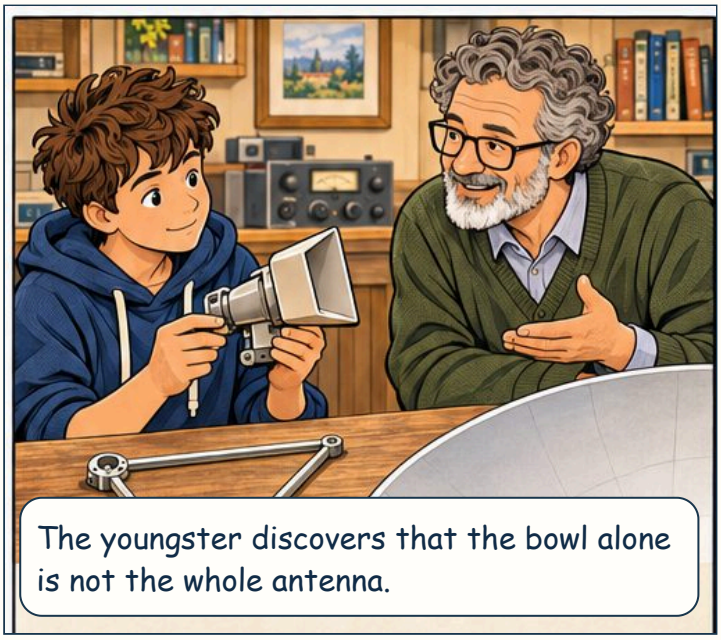
Diameter relative to λ affects the possible directivity.



At microwave frequencies, a practical-sized dish can be highly directional.



Feed design, polarization and losses remain essential.

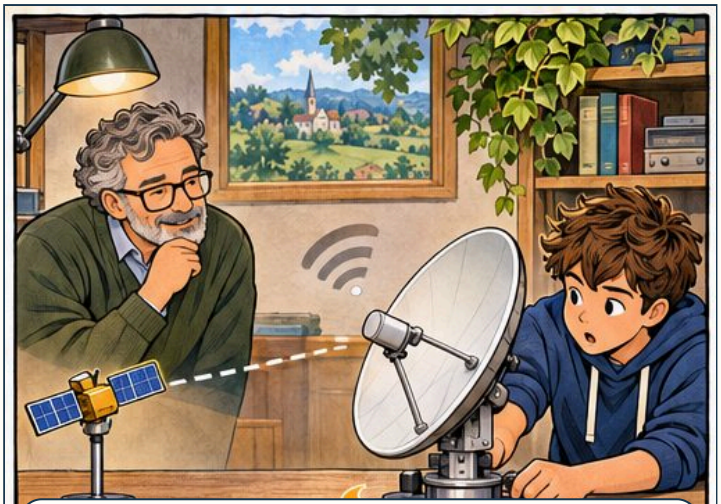


The youngster discovers that the bowl alone is not the whole antenna.

Aiming takes precision



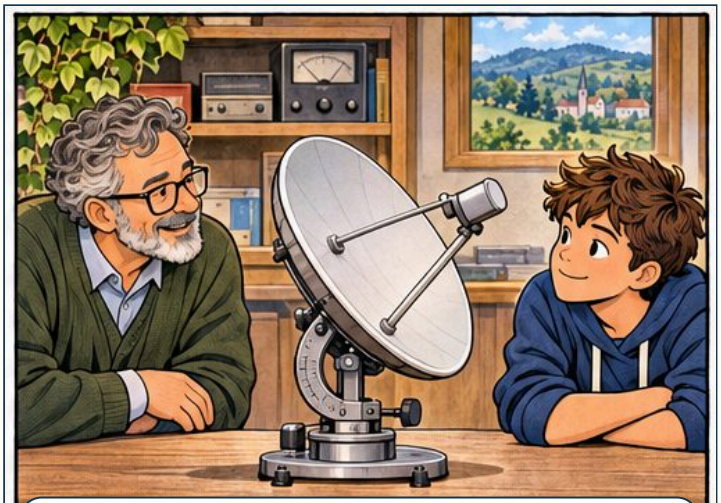
A directional dish needs accurate aiming in azimuth and elevation.



An aiming error can greatly reduce the received signal.



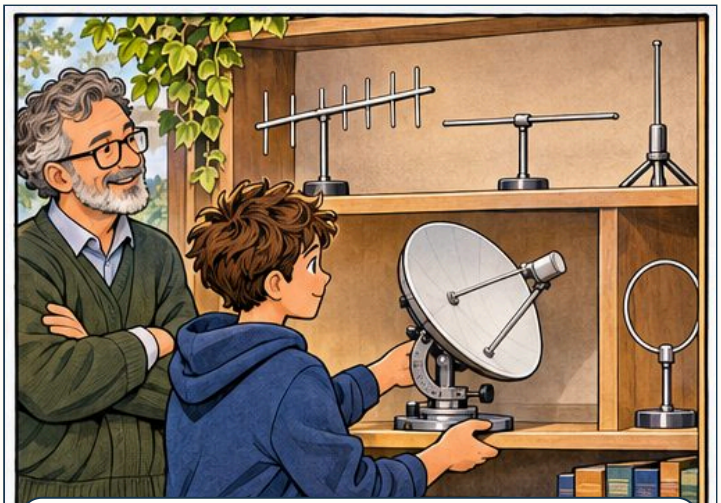
A moving satellite would also need suitable tracking.



They only inspect a model on a stable support.



The dish does not suit their all-around local listening.



The youngster keeps it in the story, but out of the garden equipment box.

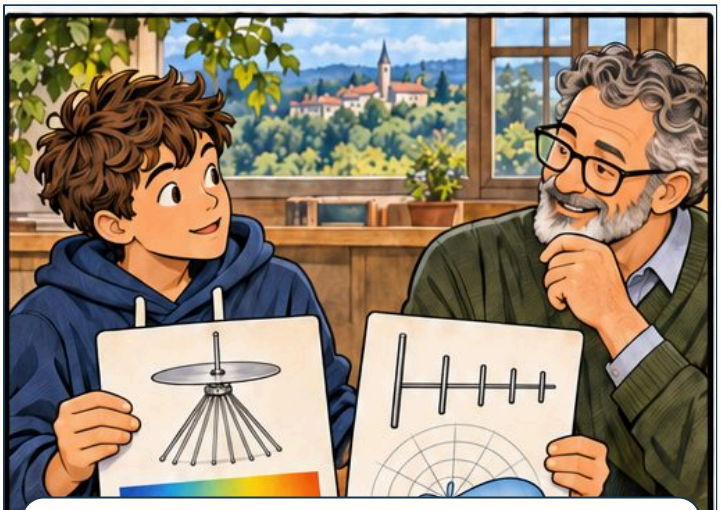
The broadband discone



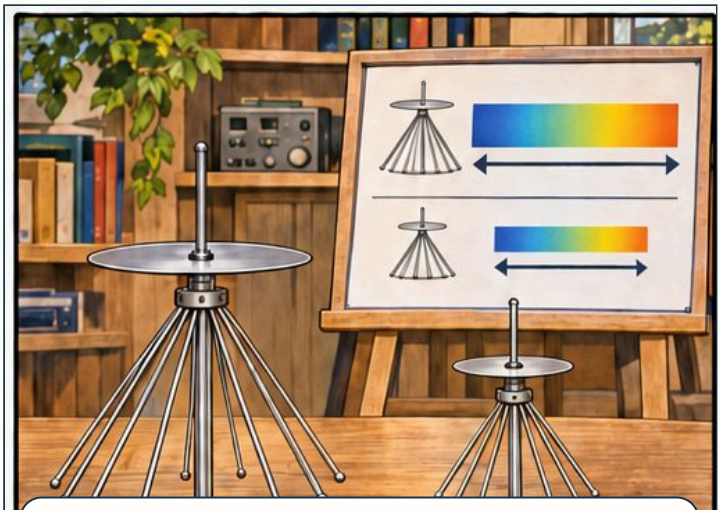
A discone combines a disc and a cone around a central feed.



It is often used for receiving over a broad frequency range.



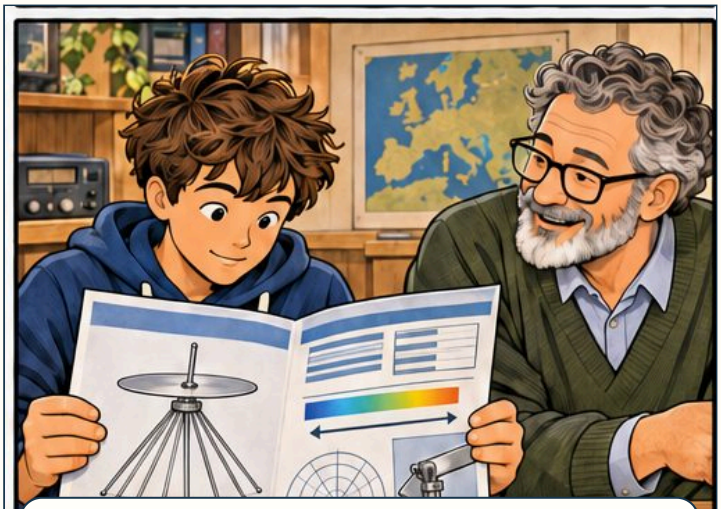
That breadth does not mean high gain in every direction.



Its frequency limits depend partly on its dimensions.

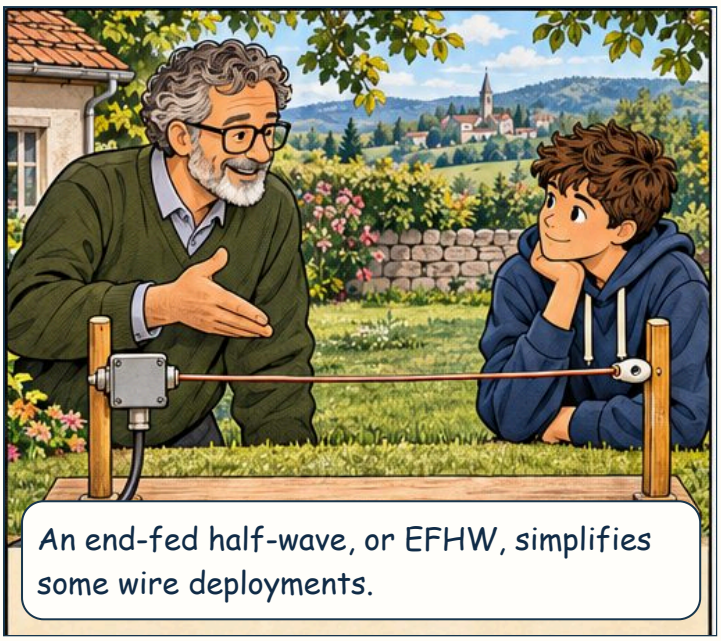


A receiving version is not automatically designed for transmitting.

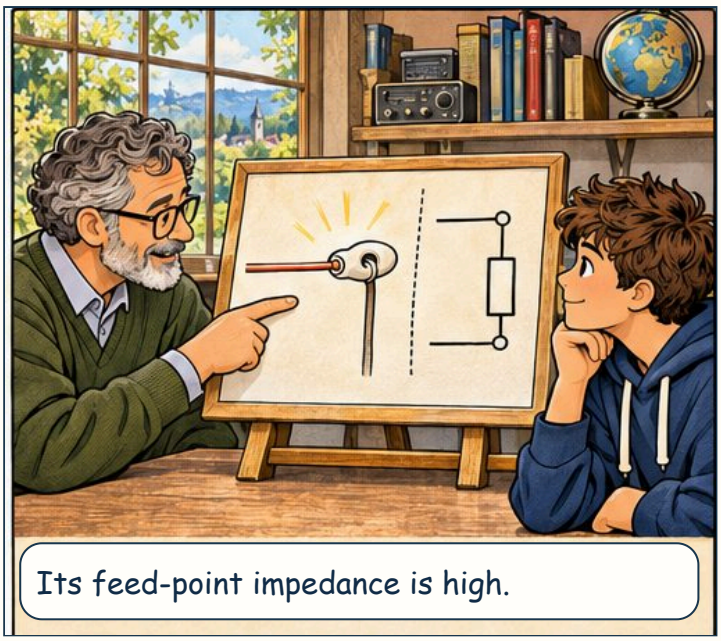


The youngster reads the specification before assigning it a role.

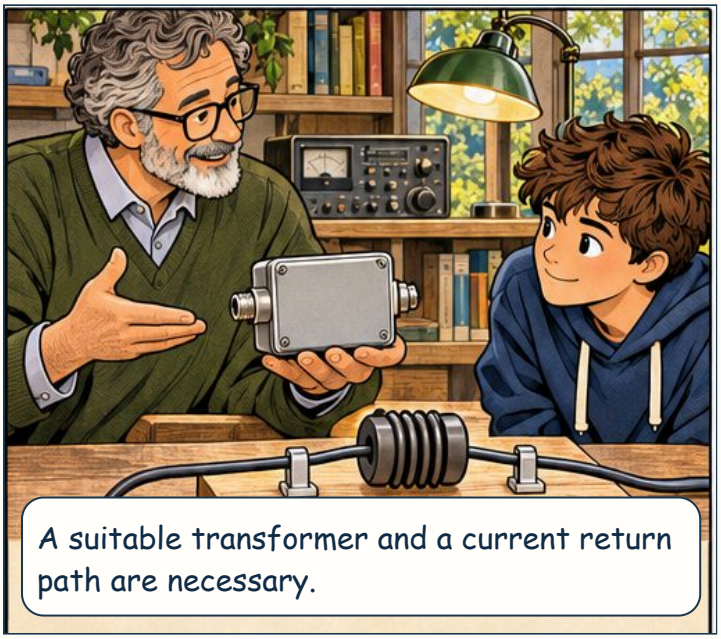
A wire fed at one end



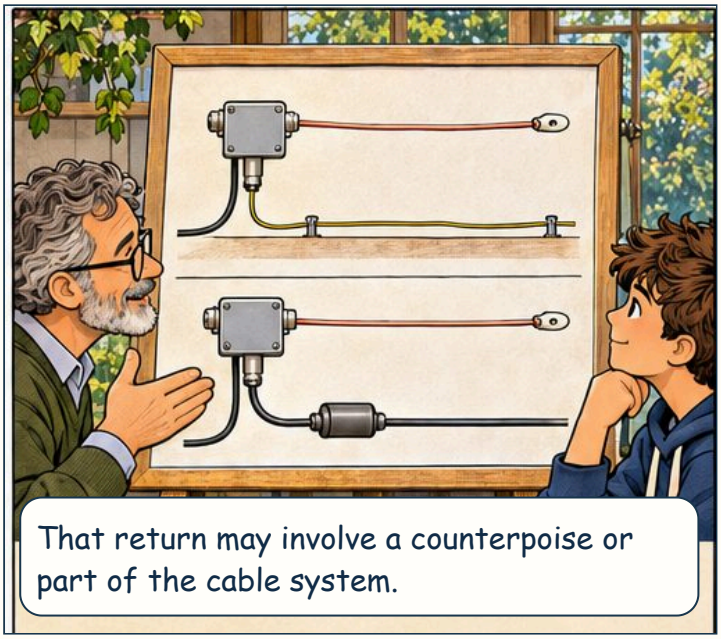
An end-fed half-wave, or EFHW, simplifies some wire deployments.



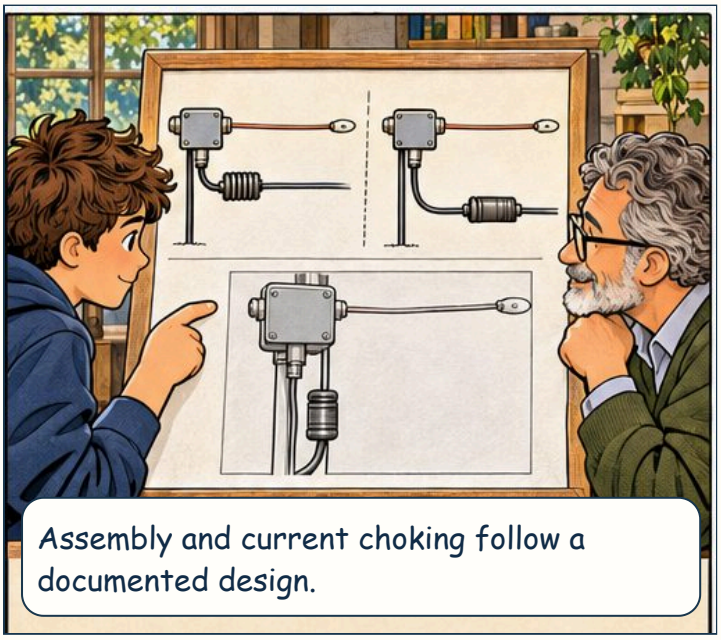
Its feed-point impedance is high.



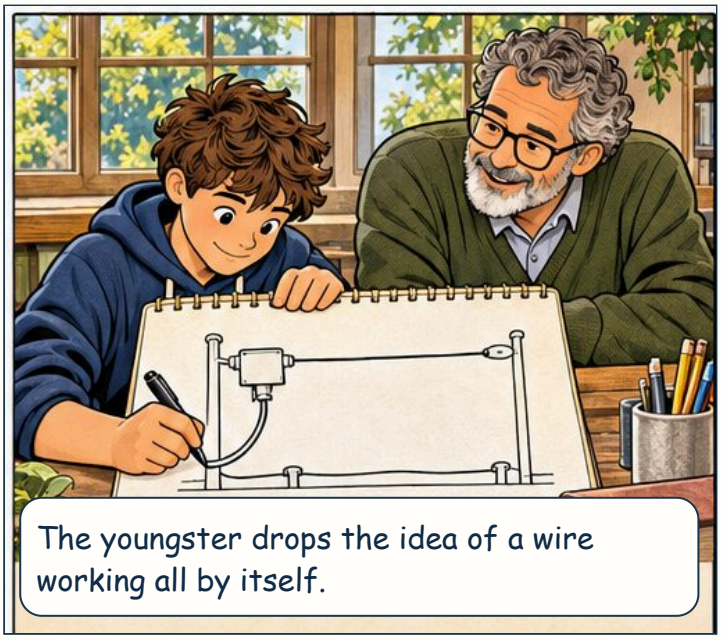
A suitable transformer and a current return path are necessary.



That return may involve a counterpoise or part of the cable system.

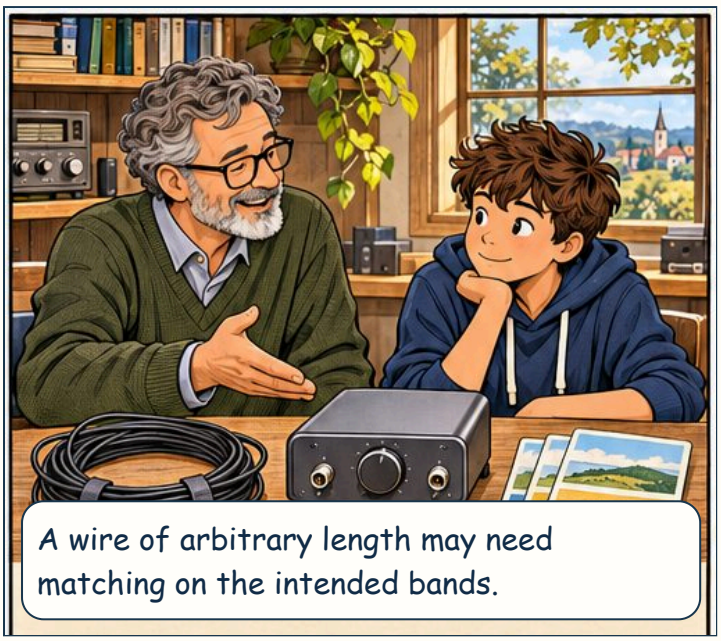


Assembly and current choking follow a documented design.

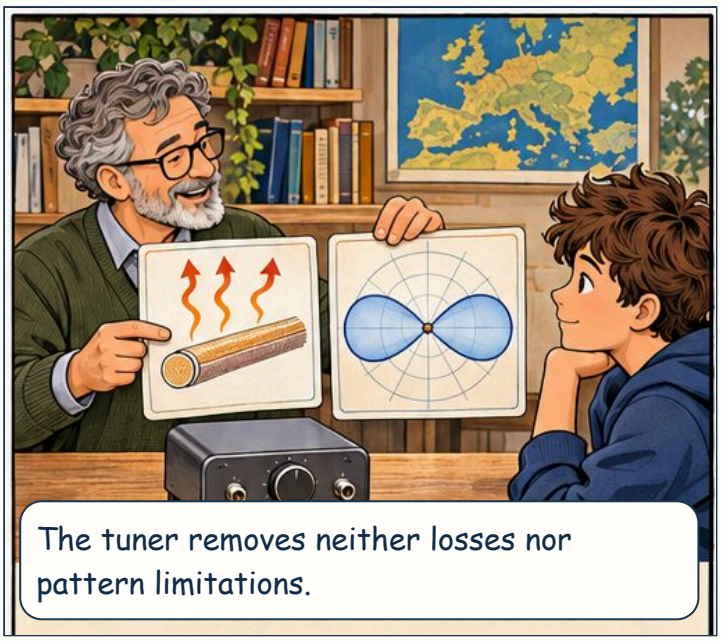


The youngster drops the idea of a wire working all by itself.

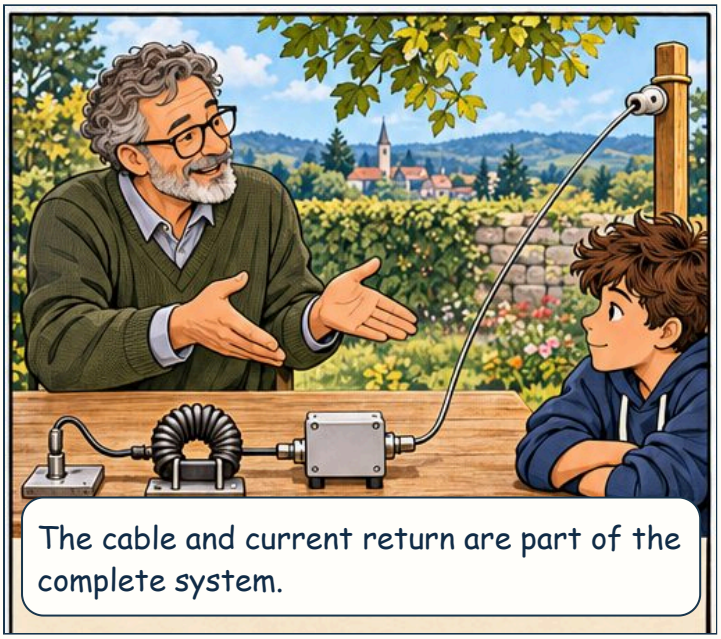
Any old wire cannot do everything



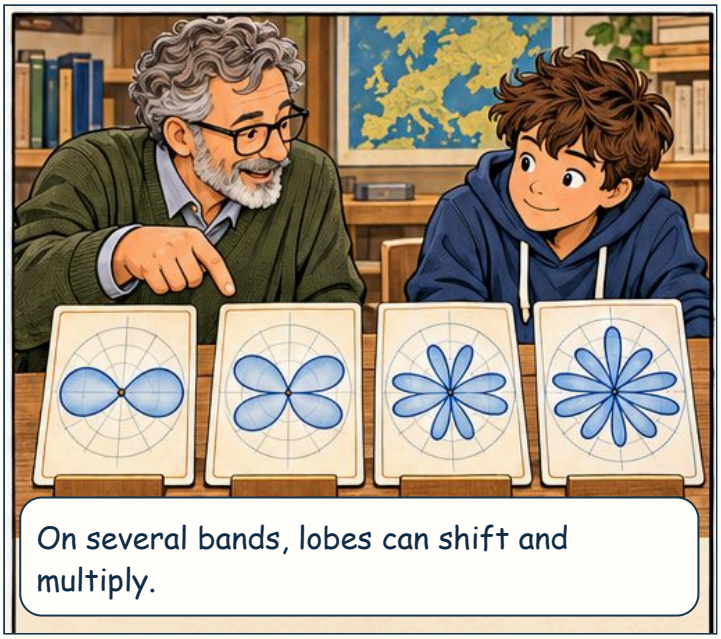
A wire of arbitrary length may need matching on the intended bands.



The tuner removes neither losses nor pattern limitations.



The cable and current return are part of the complete system.



On several bands, lobes can shift and multiply.

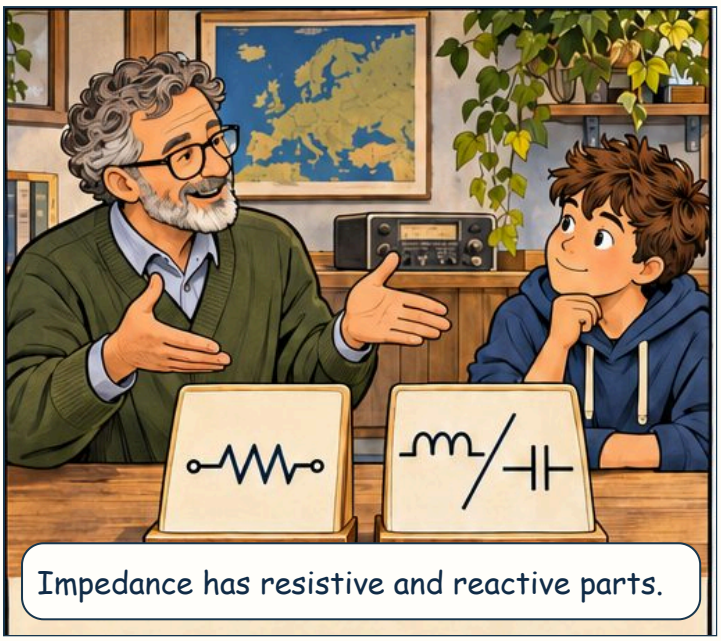


Easy transport remains an advantage, with compromises.

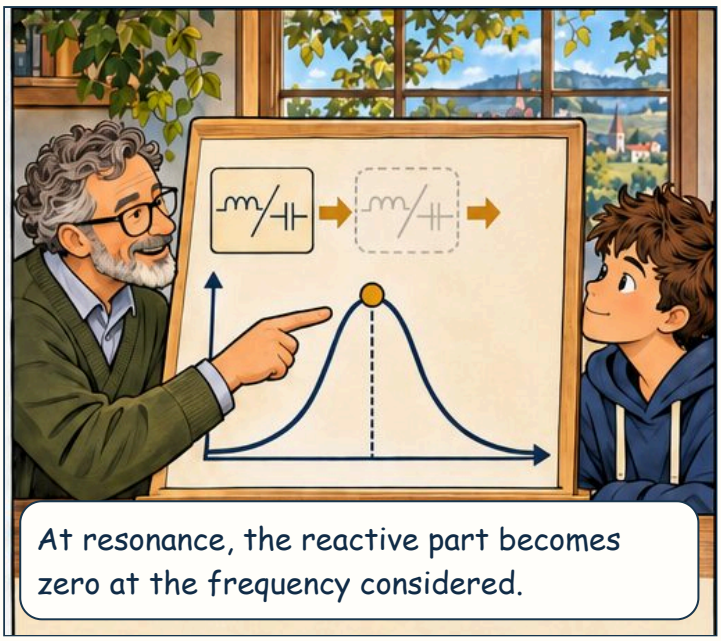


The youngster now prepares choices rather than a catalogue of shapes.

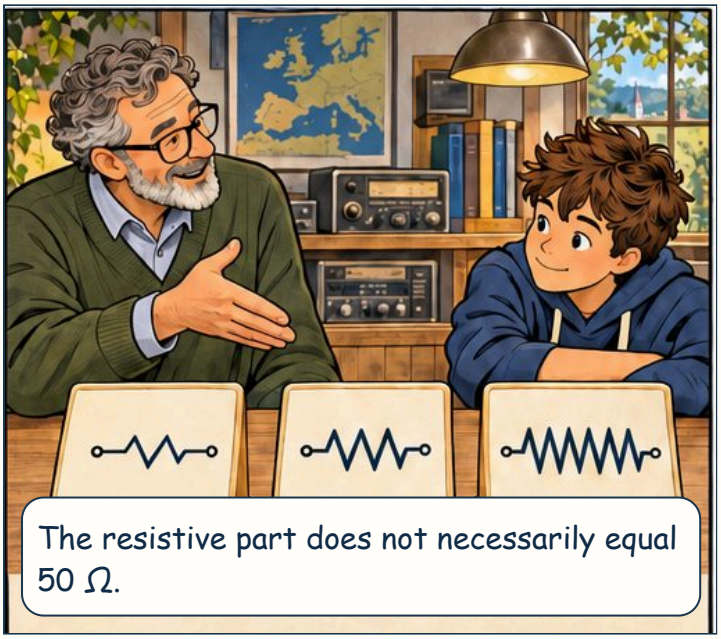
Resonance does not mean matching



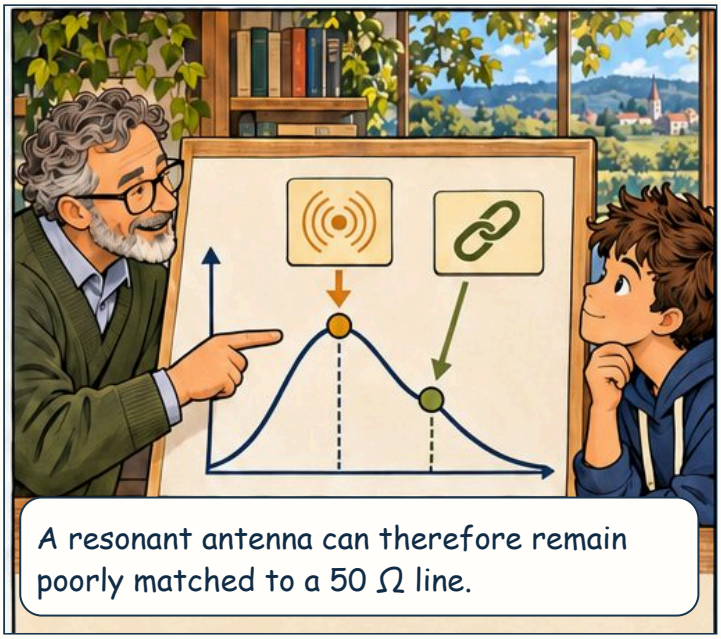
Impedance has resistive and reactive parts.



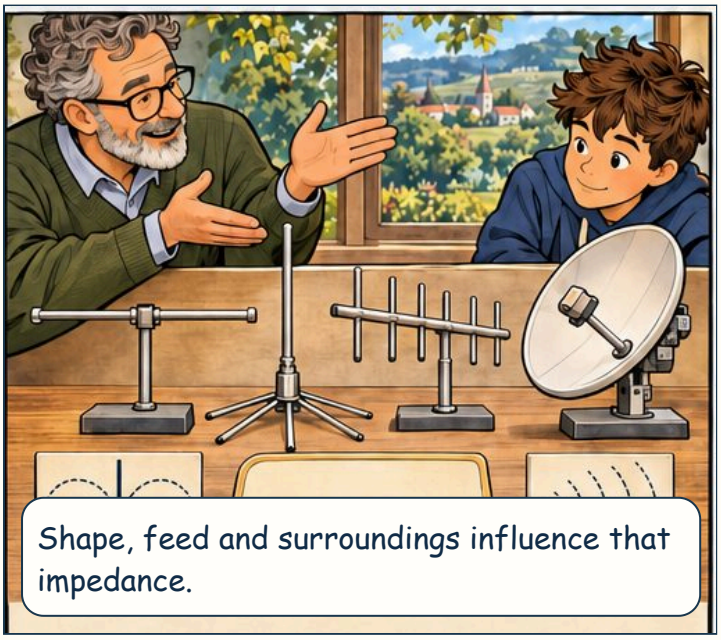
At resonance, the reactive part becomes zero at the frequency considered.



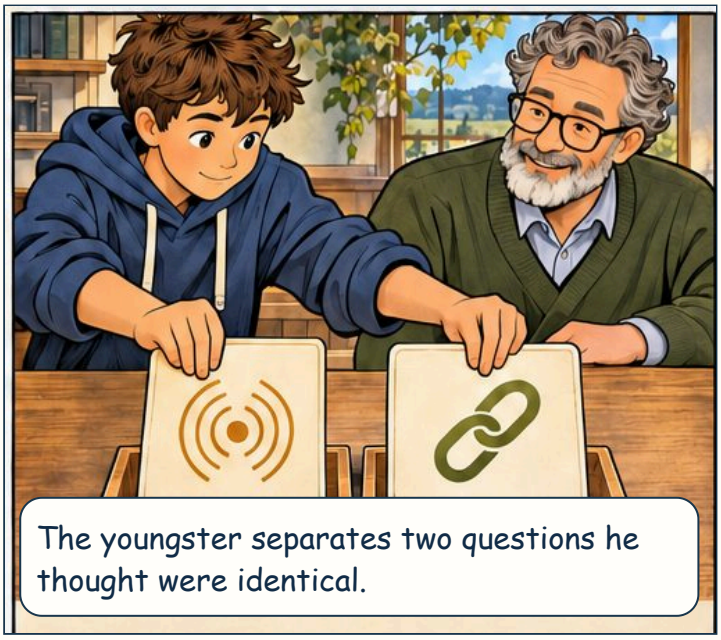
The resistive part does not necessarily equal 50 Ω.



A resonant antenna can therefore remain poorly matched to a 50 Ω line.

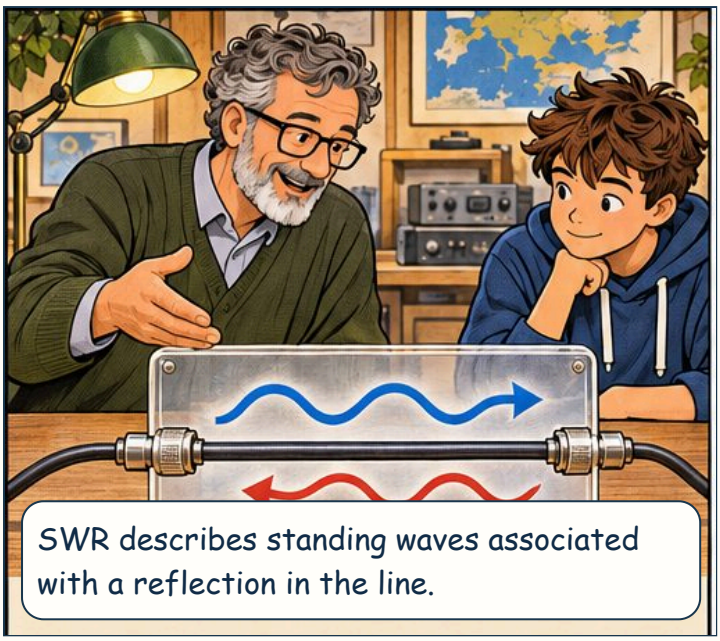


Shape, feed and surroundings influence that impedance.

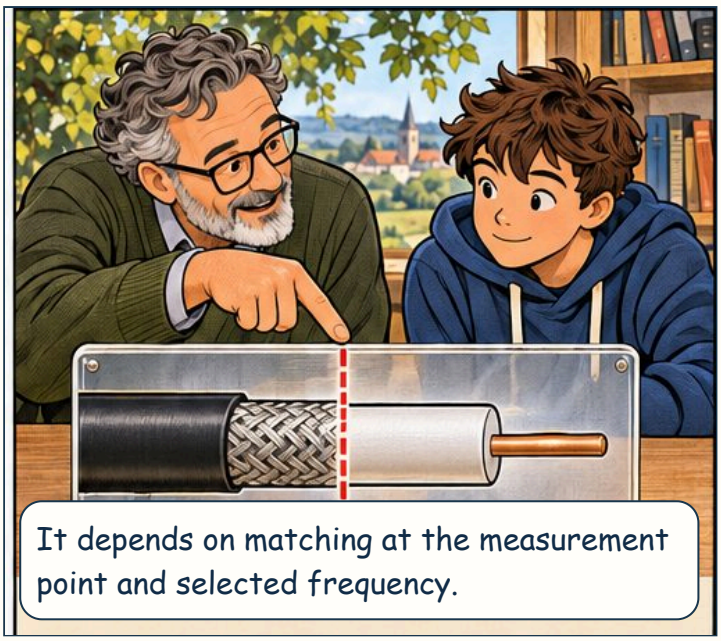


The youngster separates two questions he thought were identical.

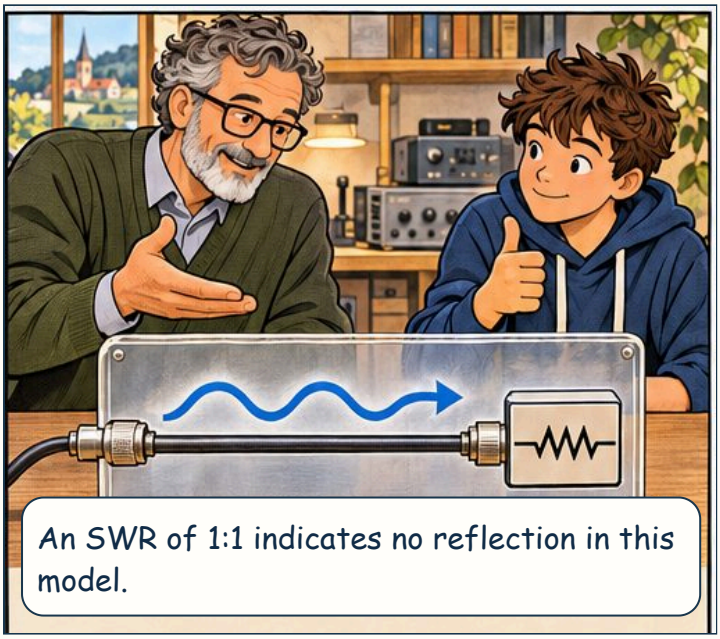
What SWR tells us



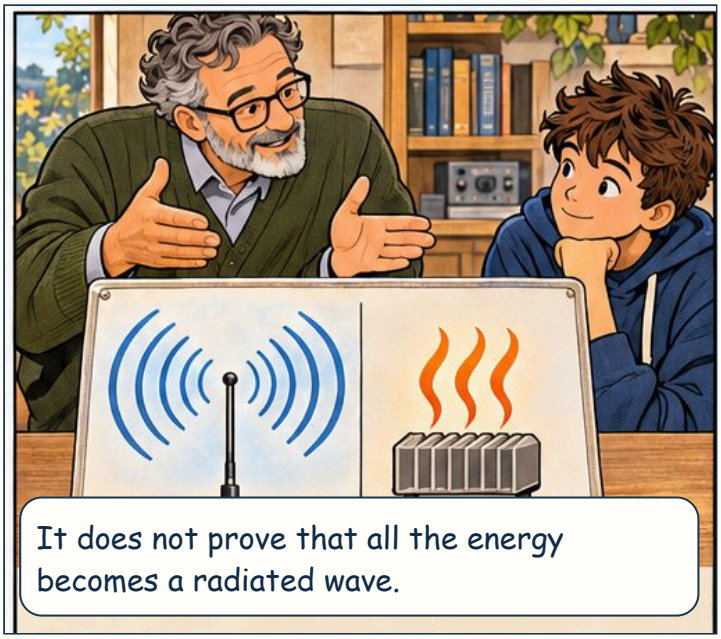
SWR describes standing waves associated with a reflection in the line.



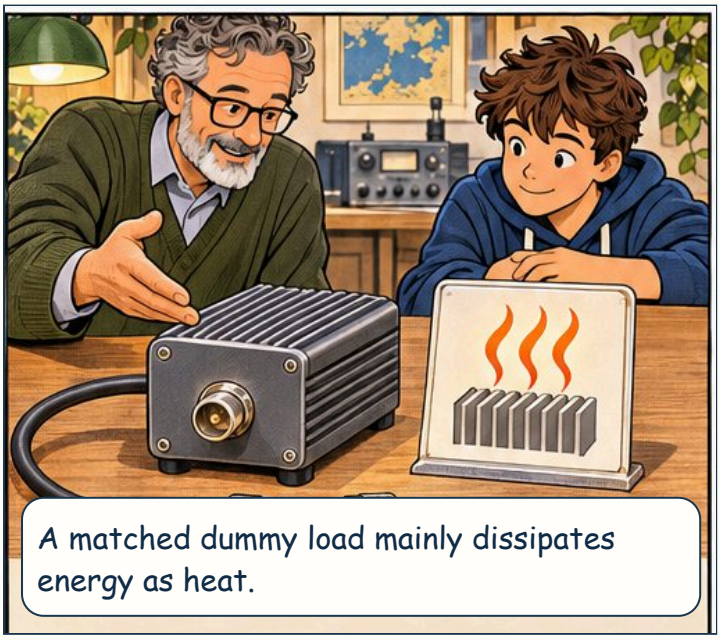
It depends on matching at the measurement point and selected frequency.



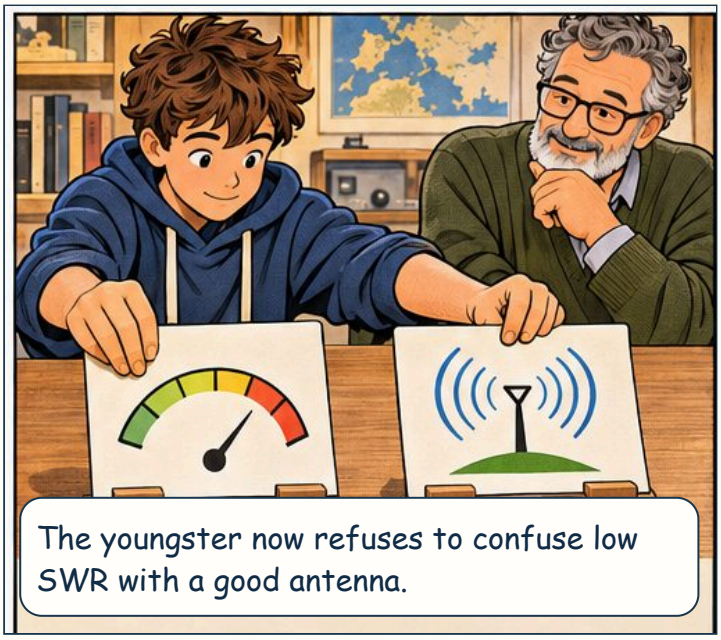
An SWR of 1:1 indicates no reflection in this model.



It does not prove that all the energy becomes a radiated wave.



A matched dummy load mainly dissipates energy as heat.



The youngster now refuses to confuse low SWR with a good antenna.

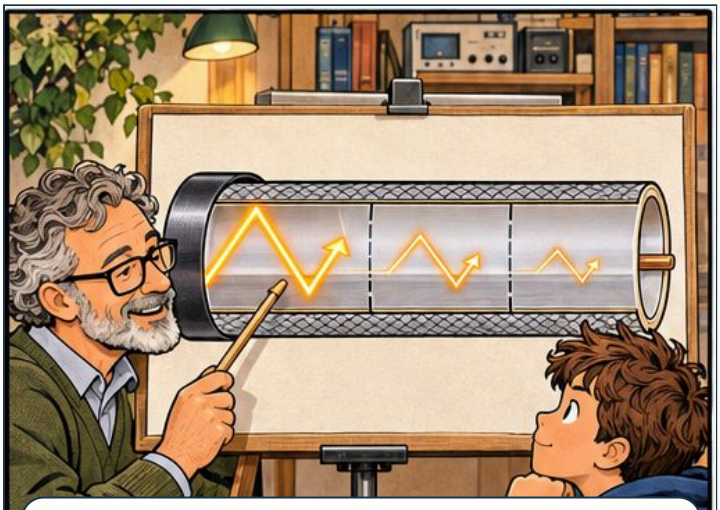
Losses also hide in the cable



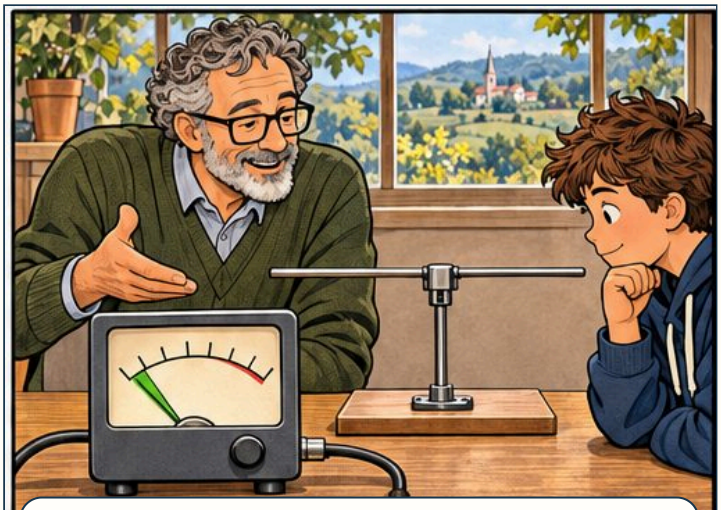
A real cable attenuates the signal between antenna and receiver.



Losses depend partly on its length, type and the frequency.



They can also hide some reflection when viewed from the station.



Better-looking SWR through a long cable therefore does not prove an improvement.

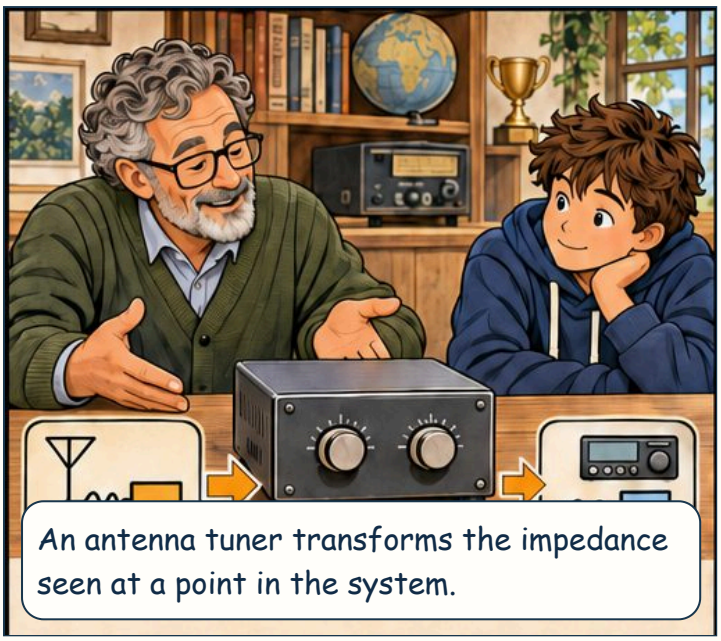


Damaged connectors can complicate matters further.

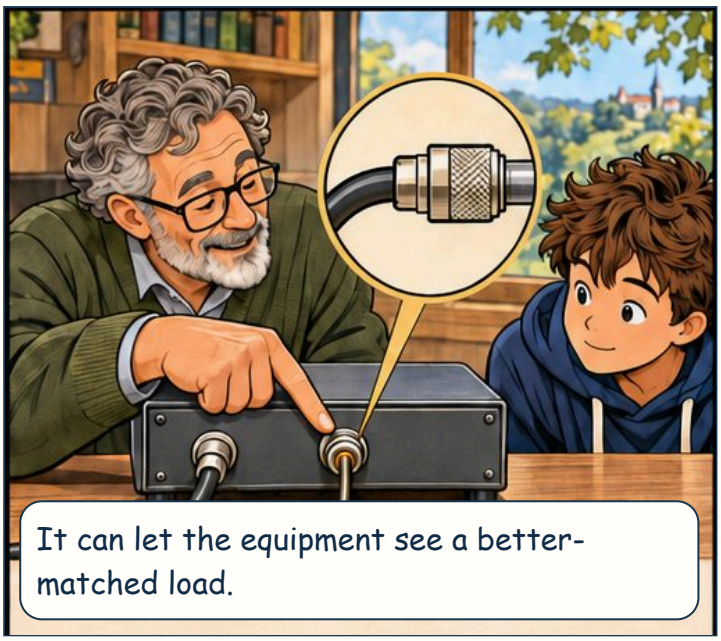


The youngster checks disconnected cables before the test.

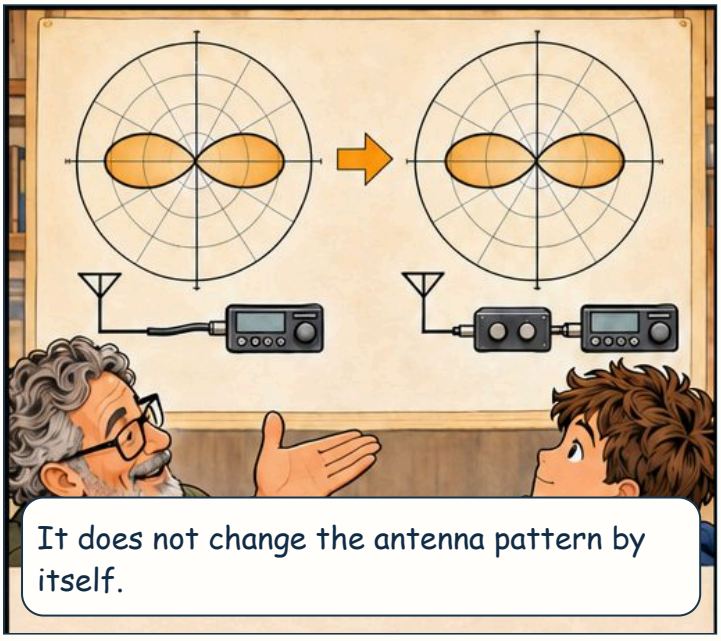
The tuner has a precise role



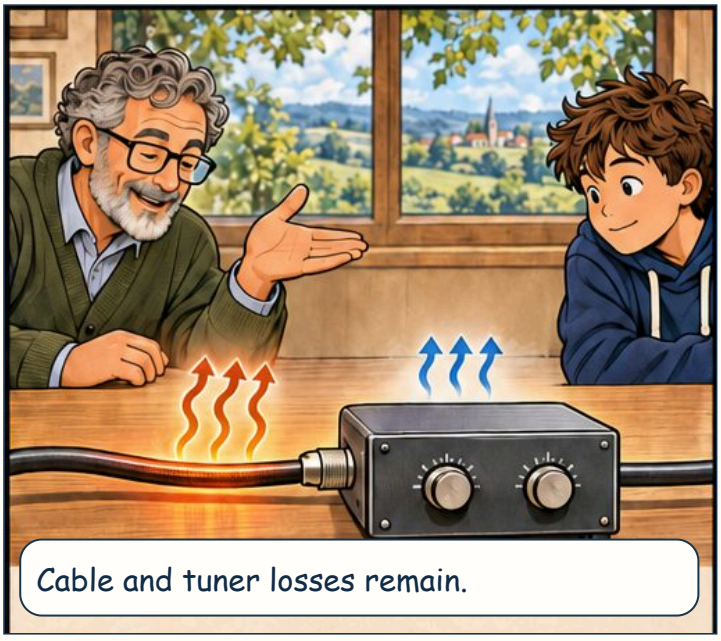
An antenna tuner transforms the impedance seen at a point in the system.



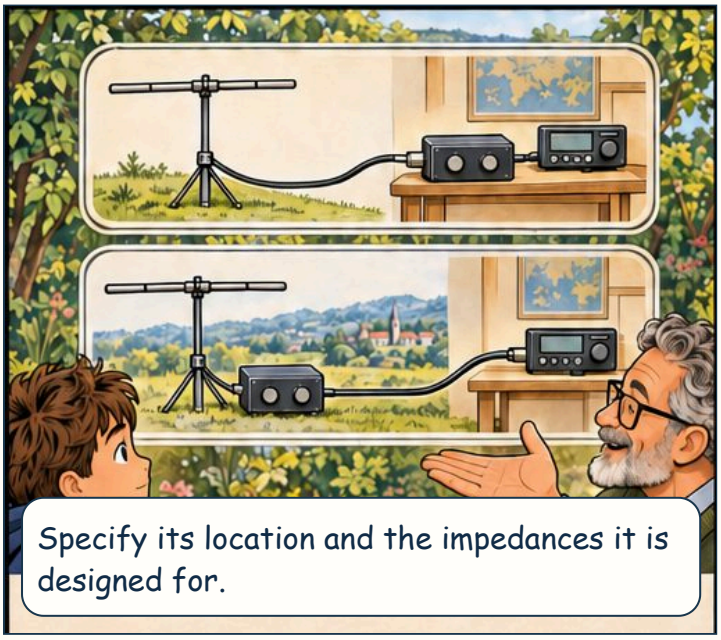
It can let the equipment see a better-matched load.



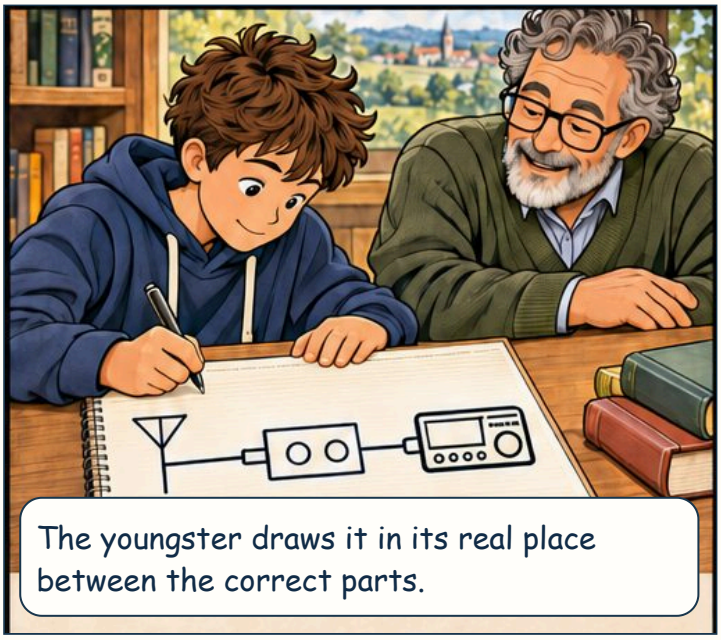
It does not change the antenna pattern by itself.



Cable and tuner losses remain.

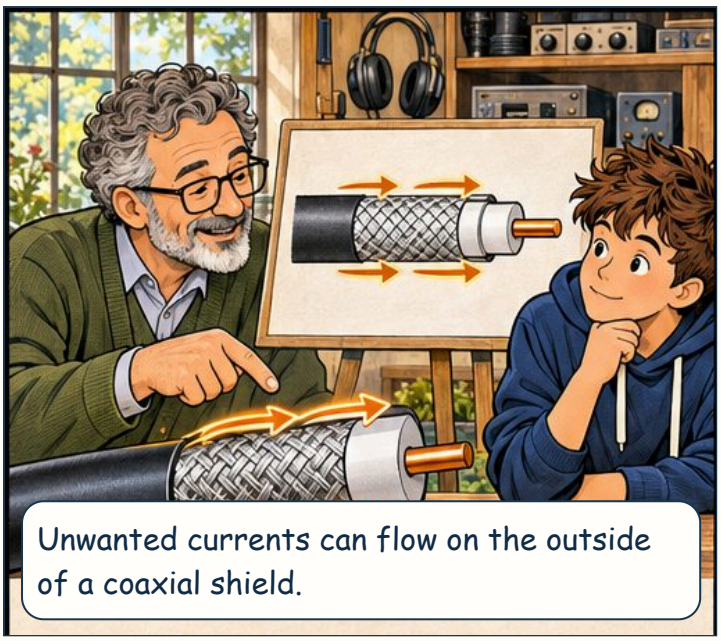


Specify its location and the impedances it is designed for.

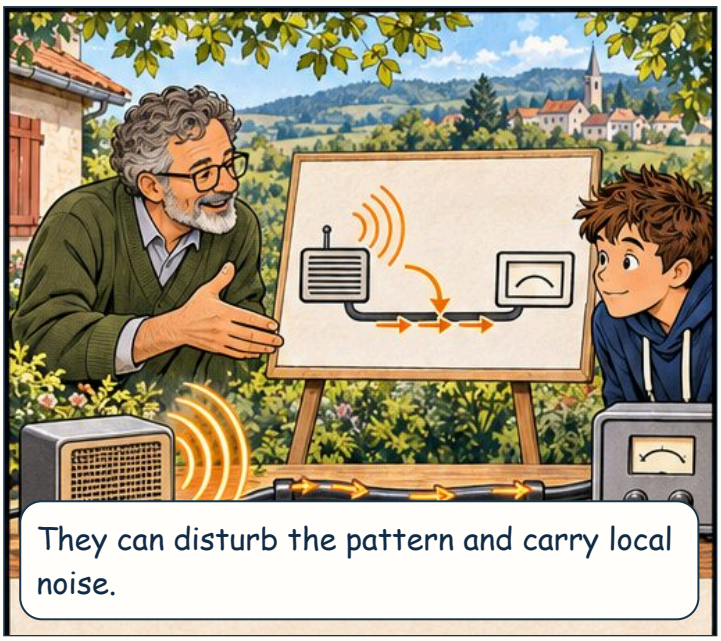


The youngster draws it in its real place between the correct parts.

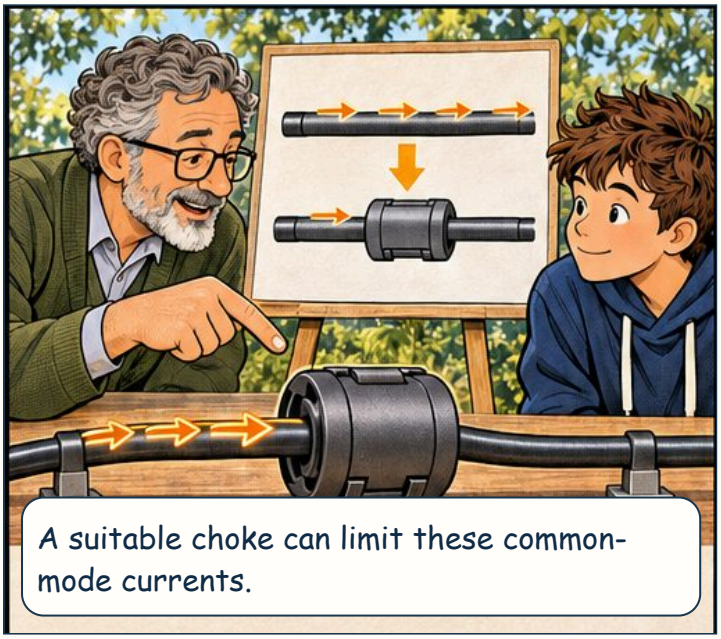
A current takes a detour



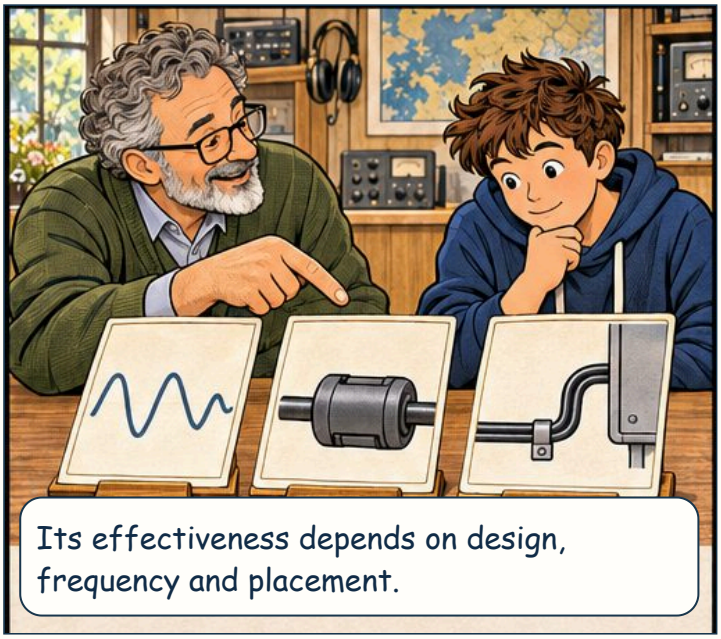
Unwanted currents can flow on the outside of a coaxial shield.



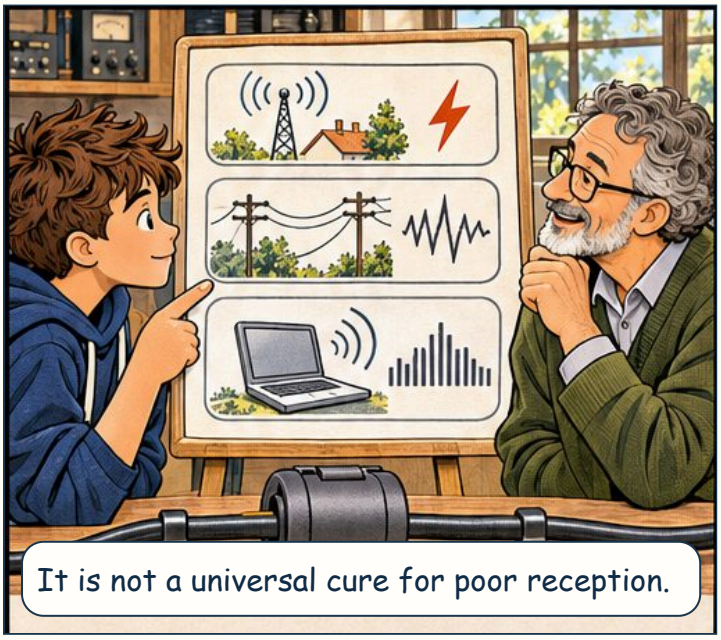
They can disturb the pattern and carry local noise.



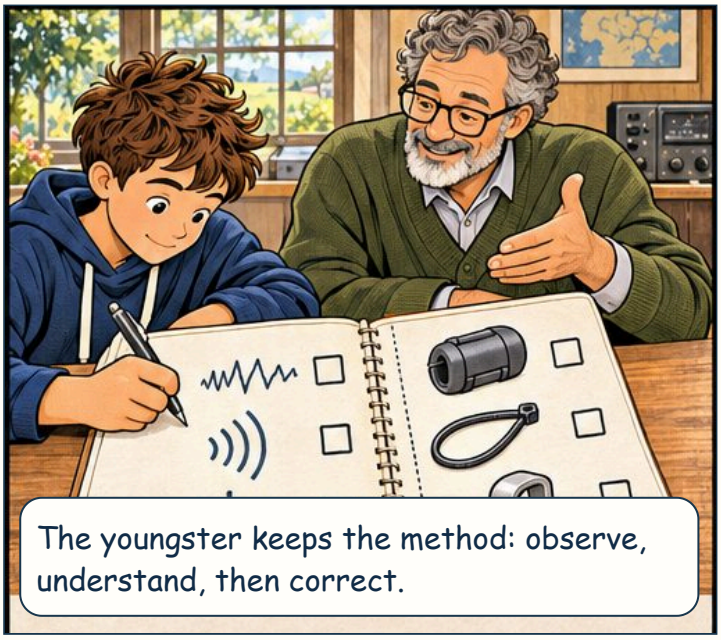
A suitable choke can limit these common-mode currents.



Its effectiveness depends on design, frequency and placement.

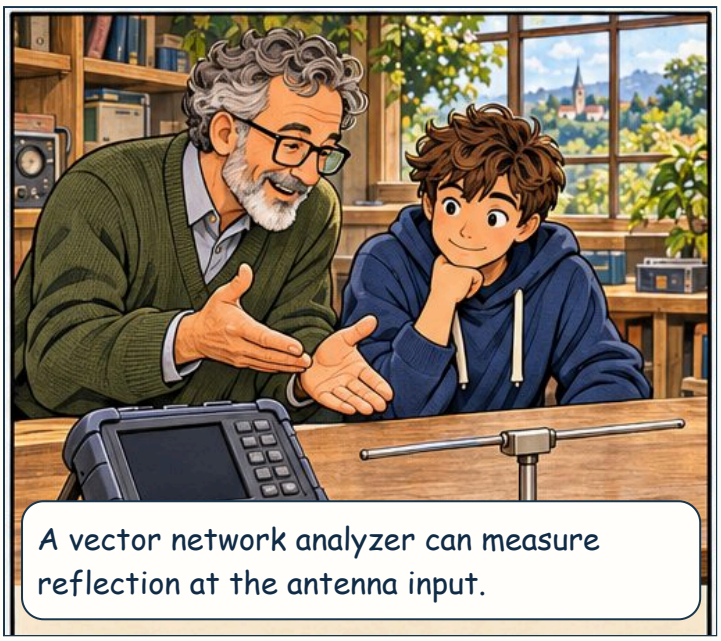


It is not a universal cure for poor reception.

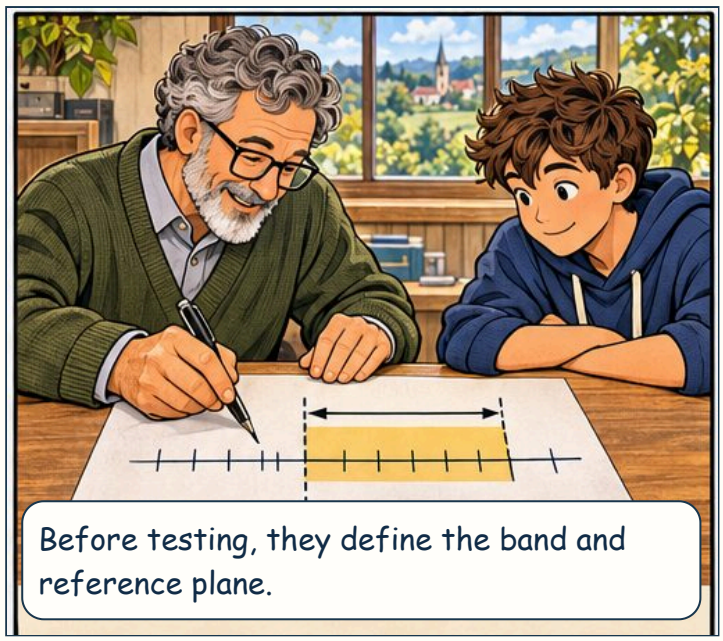


The youngster keeps the method: observe, understand, then correct.

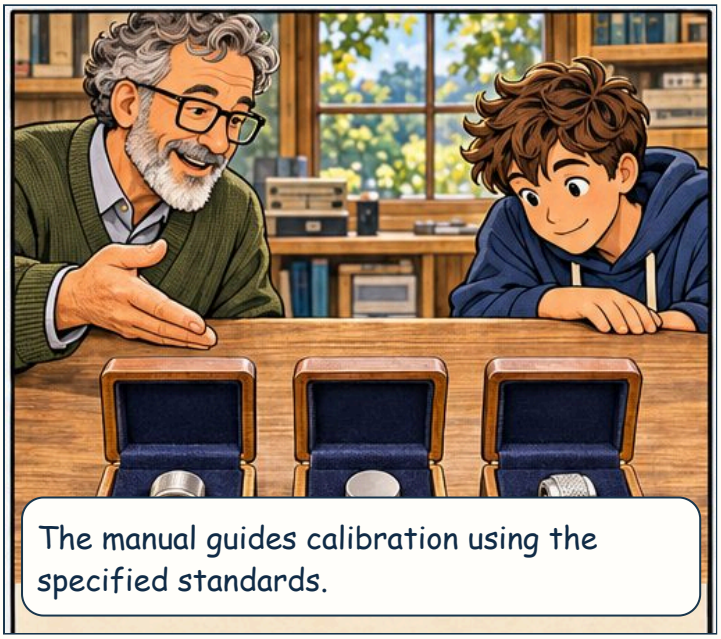
The analyzer asks another question



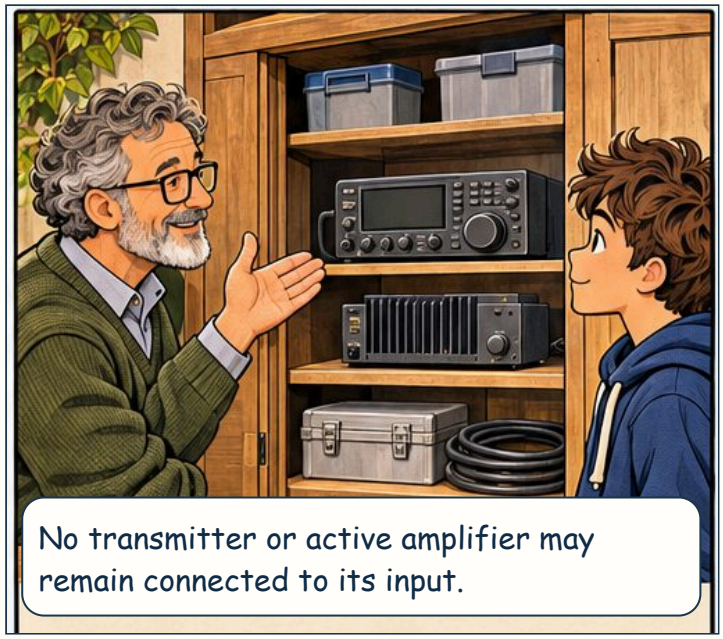
A vector network analyzer can measure reflection at the antenna input.



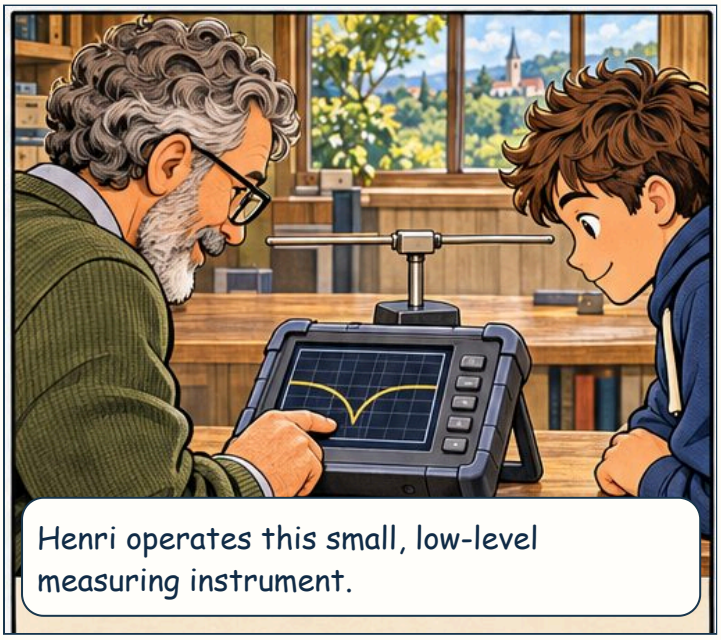
Before testing, they define the band and reference plane.



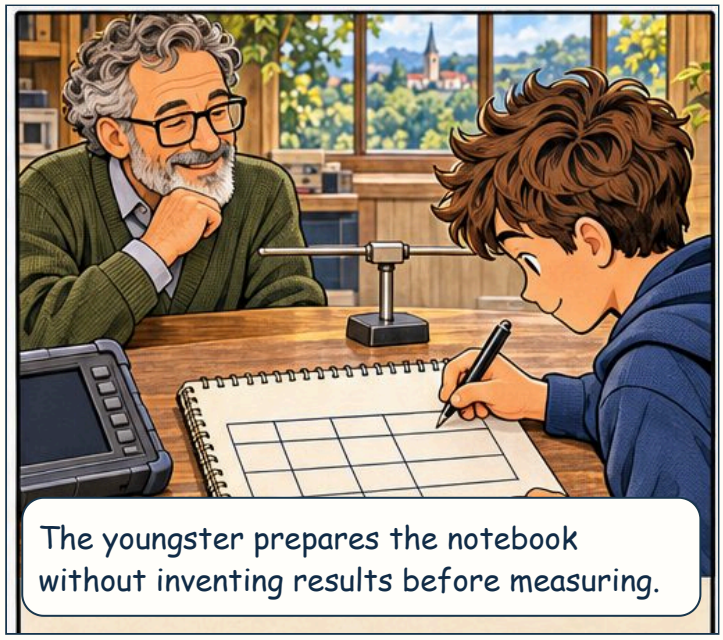
The manual guides calibration using the specified standards.



No transmitter or active amplifier may remain connected to its input.

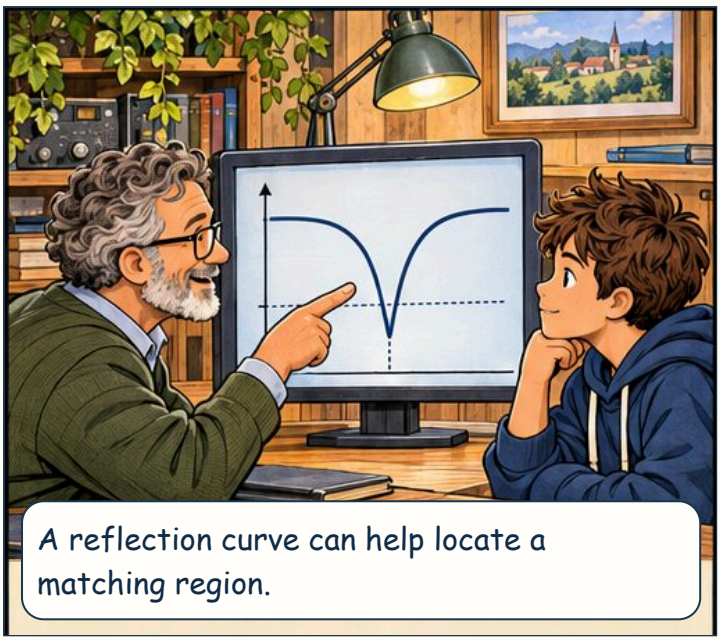


Henri operates this small, low-level measuring instrument.

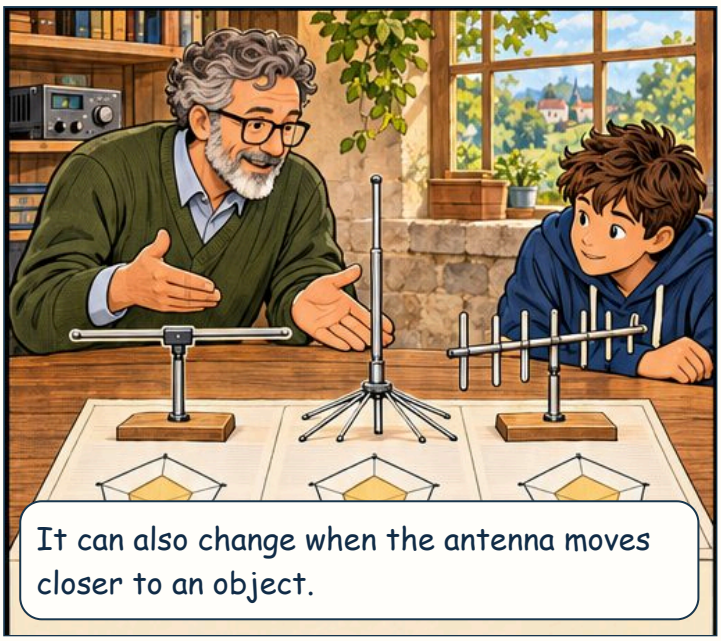


The youngster prepares the notebook without inventing results before measuring.

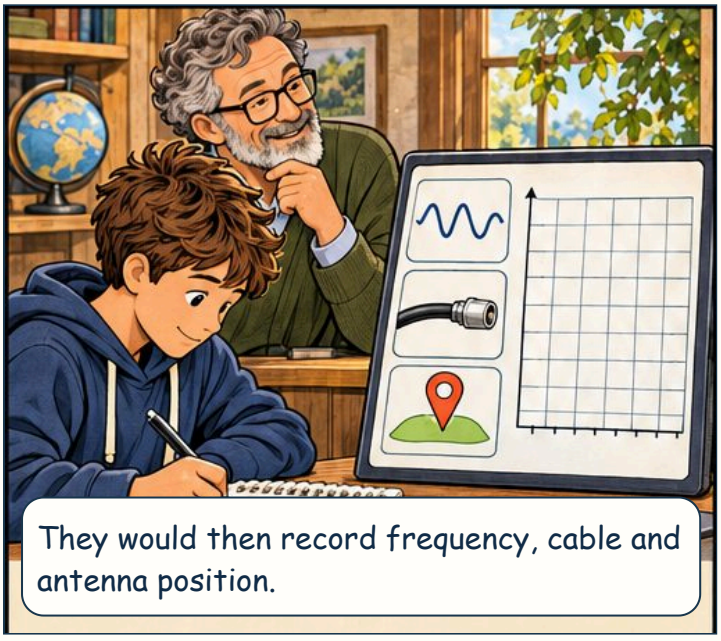
Measuring without claiming efficiency



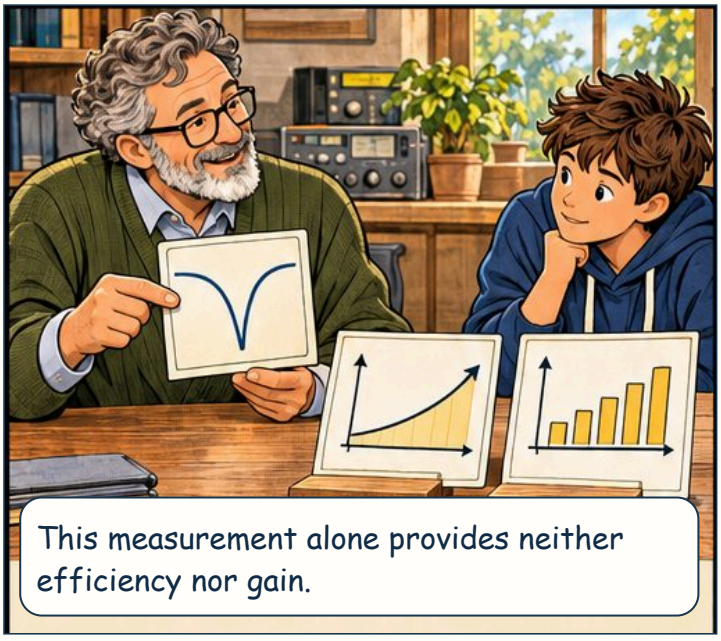
A reflection curve can help locate a matching region.



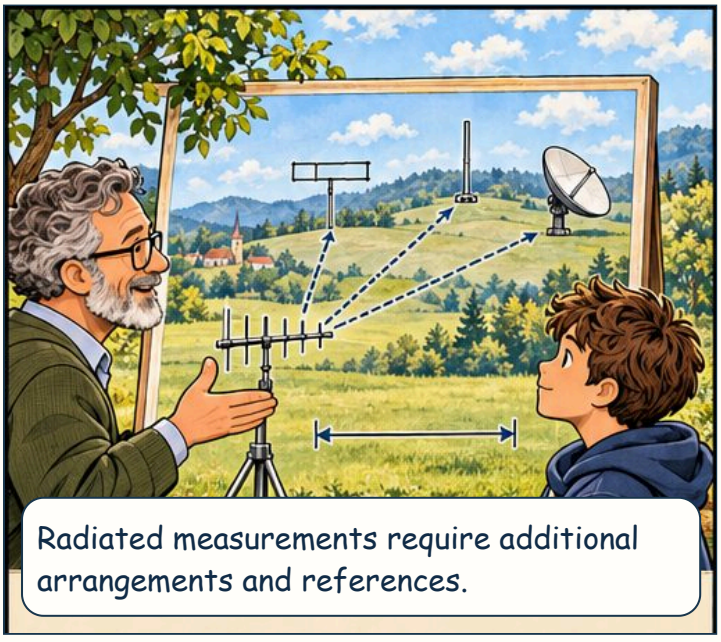
It can also change when the antenna moves closer to an object.



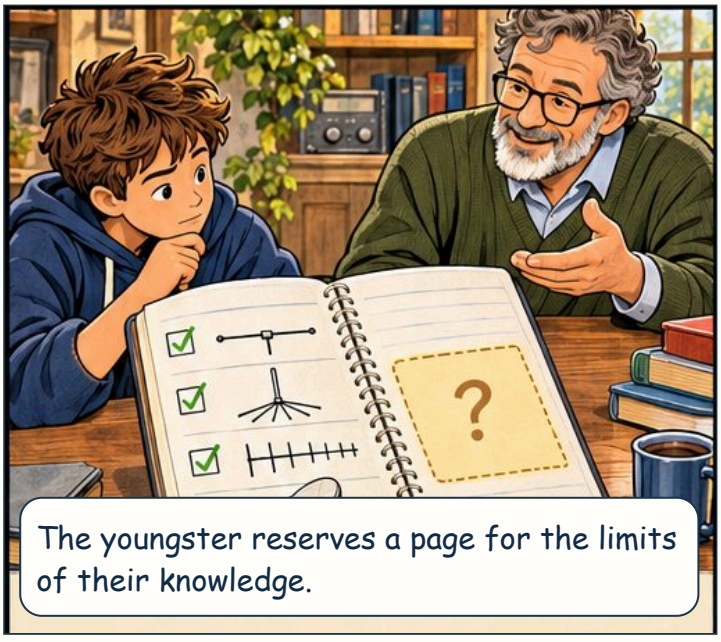
They would then record frequency, cable and antenna position.



This measurement alone provides neither efficiency nor gain.

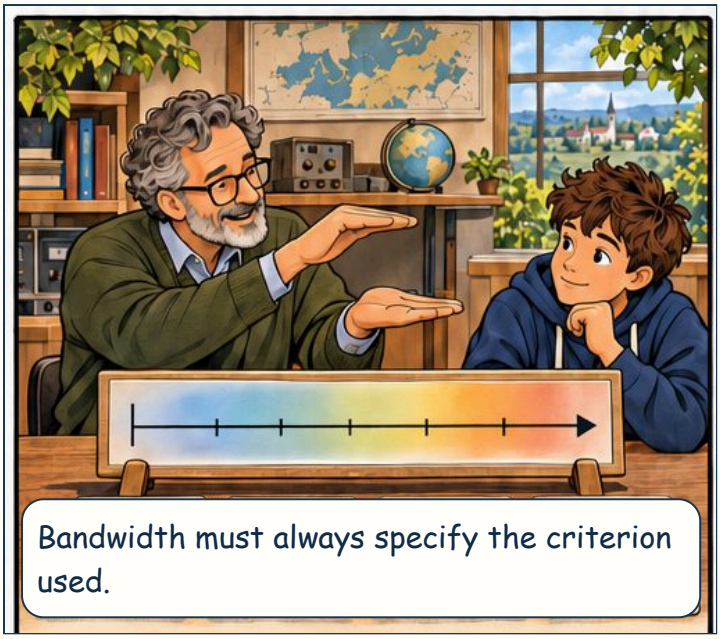


Radiated measurements require additional arrangements and references.

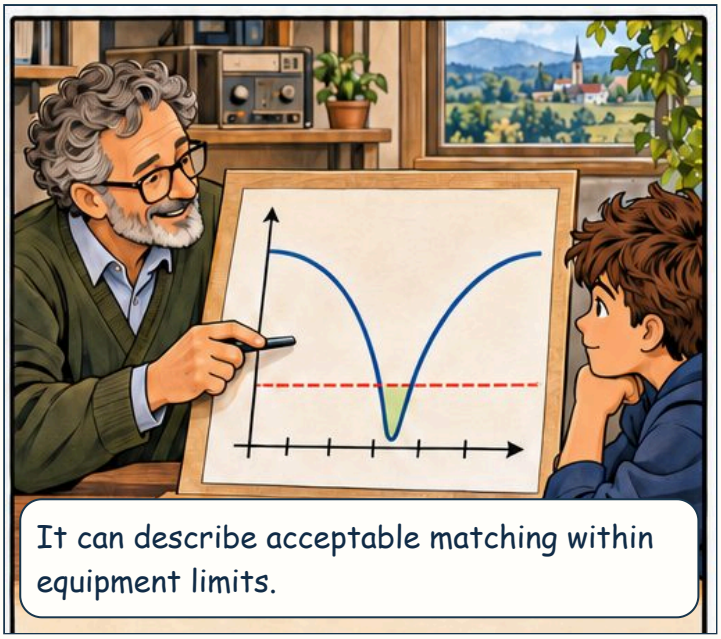


The youngster reserves a page for the limits of their knowledge.

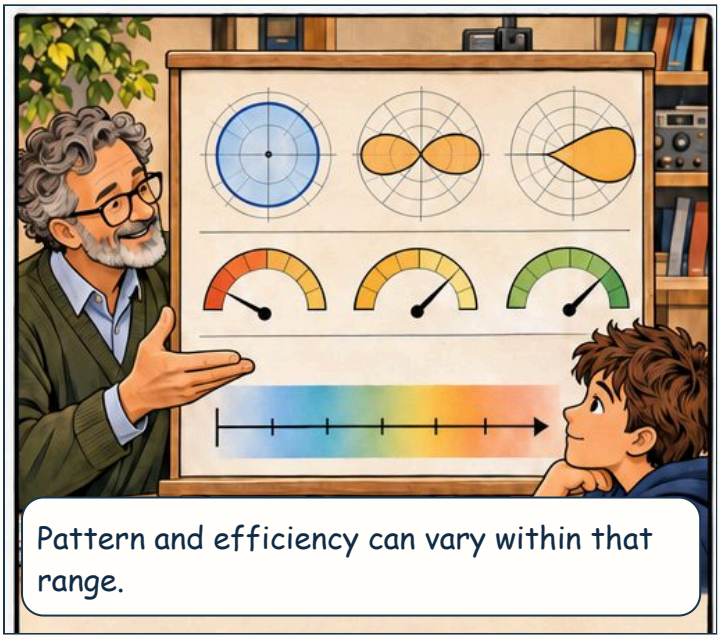
Bandwidth according to which criterion?



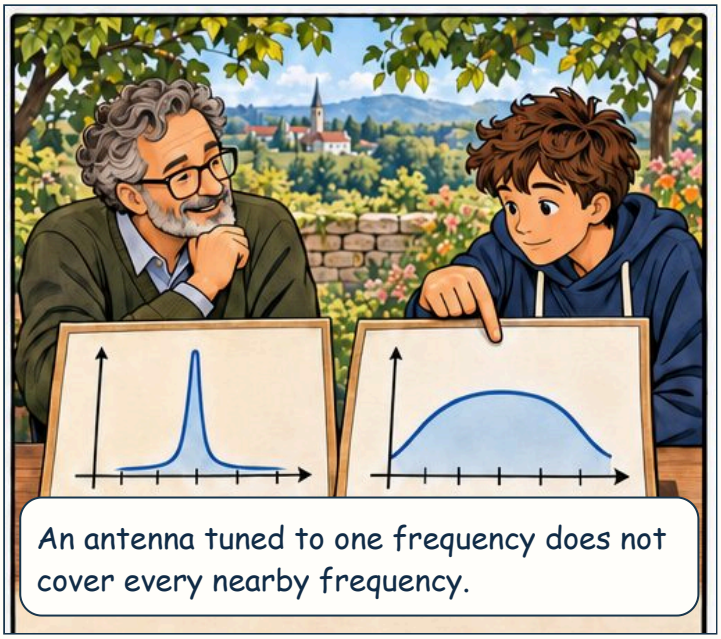
Bandwidth must always specify the criterion used.



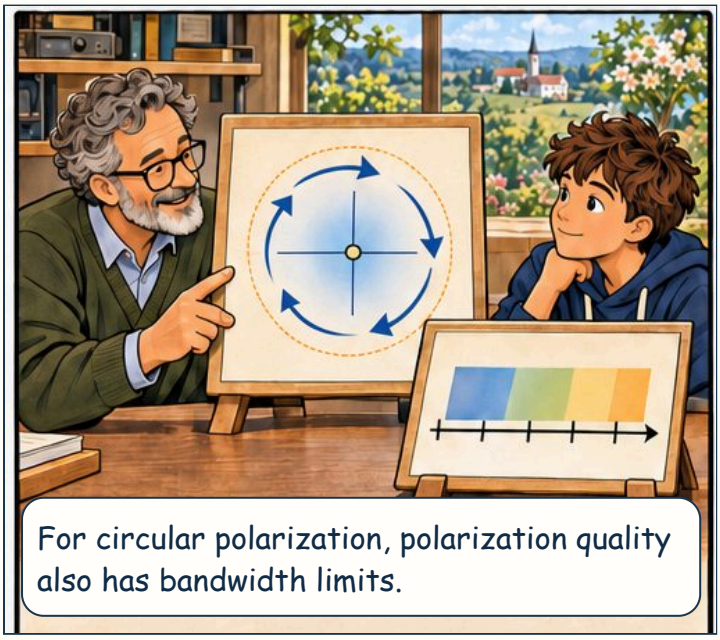
It can describe acceptable matching within equipment limits.



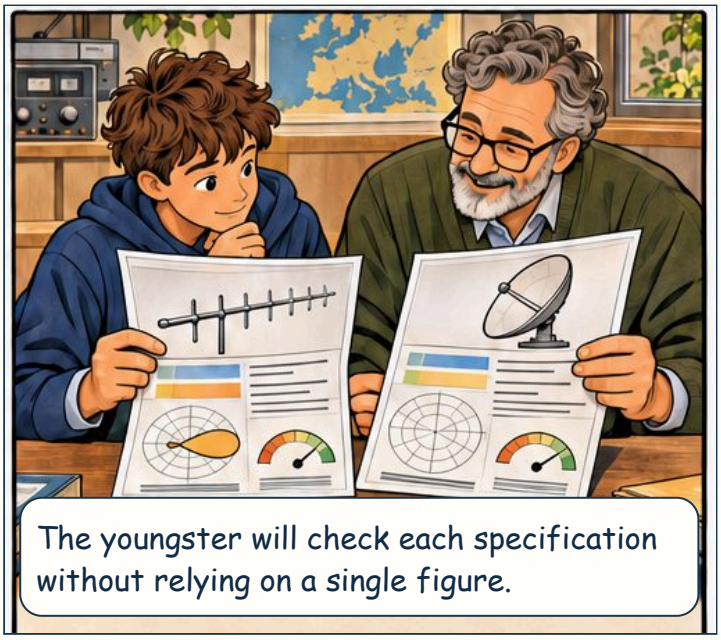
Pattern and efficiency can vary within that range.



An antenna tuned to one frequency does not cover every nearby frequency.



For circular polarization, polarization quality also has bandwidth limits.



The youngster will check each specification without relying on a single figure.

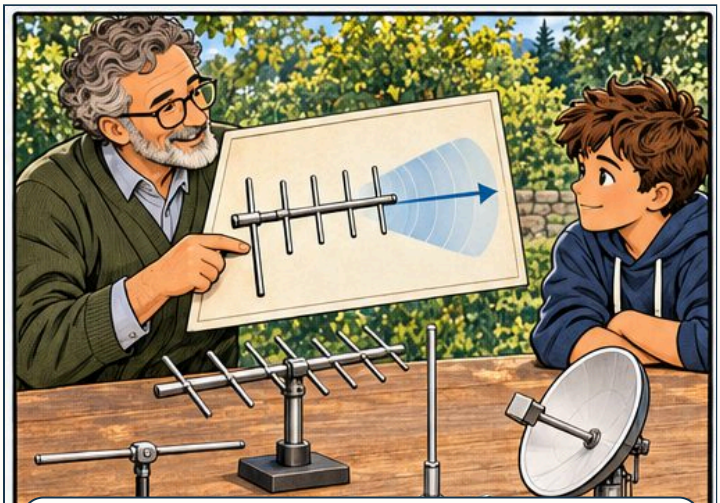
The garden sets the requirements



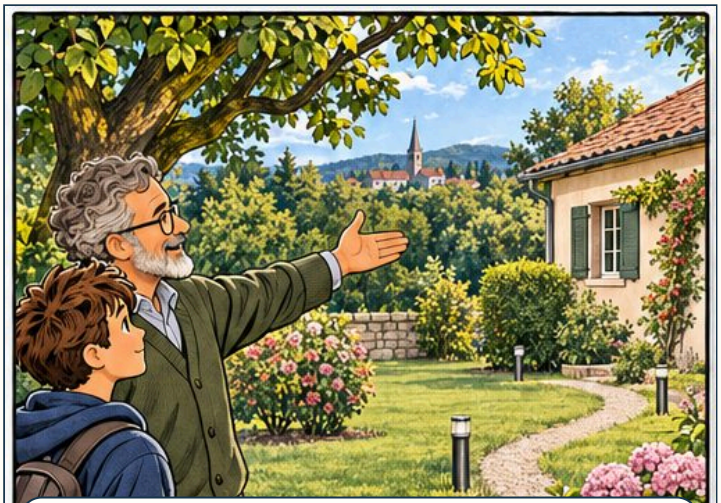
They return to the garden with their two receiving aims.



The welcoming antenna must cover the useful local directions.



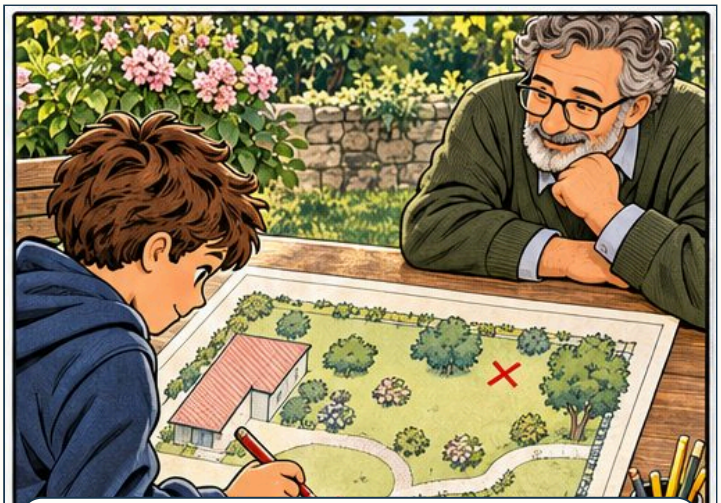
The second must allow a demonstration of aiming.



Available space, obstacles and walkways limit support locations.



The mentor checks permission to use the site and its rules.

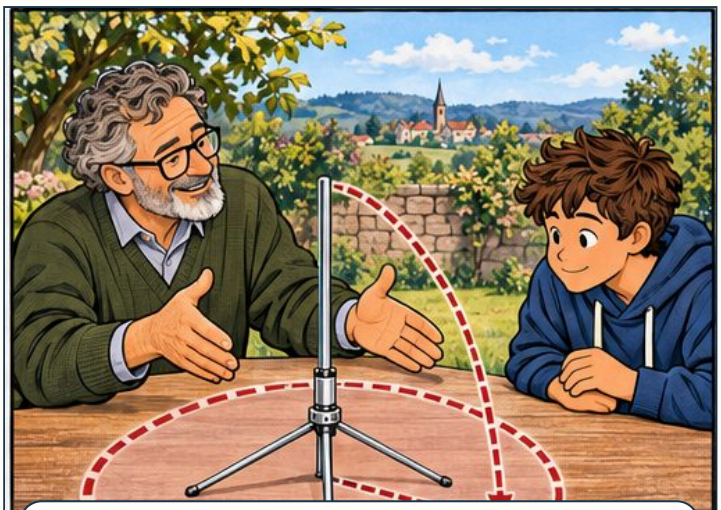


The youngster marks two provisional locations on the plan.

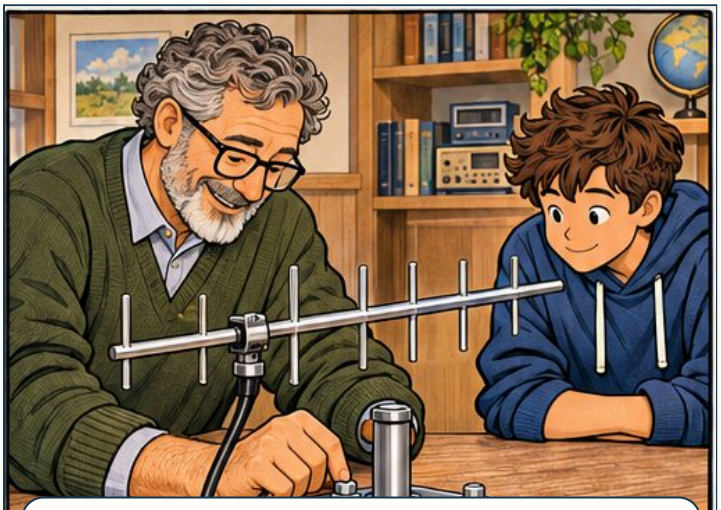
Safety is part of the choice



They rule out every location near power lines.



Even if elements fall, they must not be able to reach those lines.



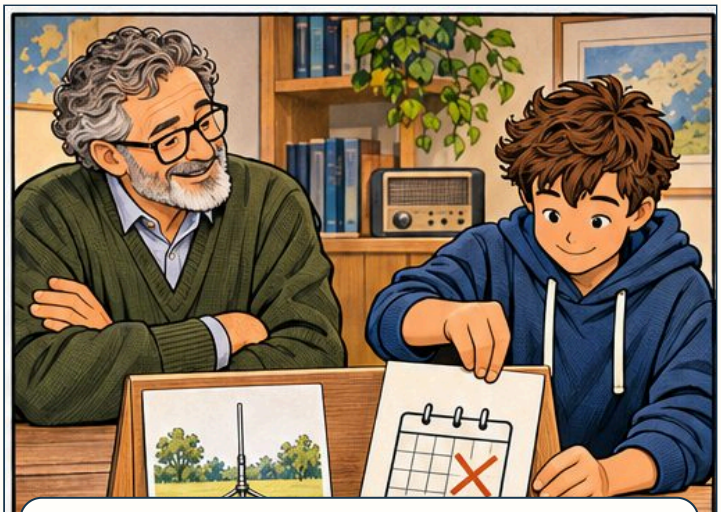
Supports and fastenings must withstand the expected conditions.



Weather may require postponing or stopping the activity.

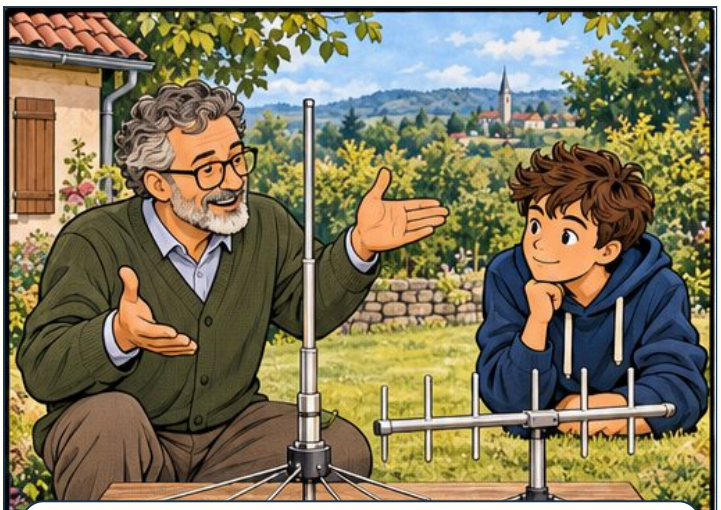


During a thunderstorm, seek shelter and do not handle antennas.

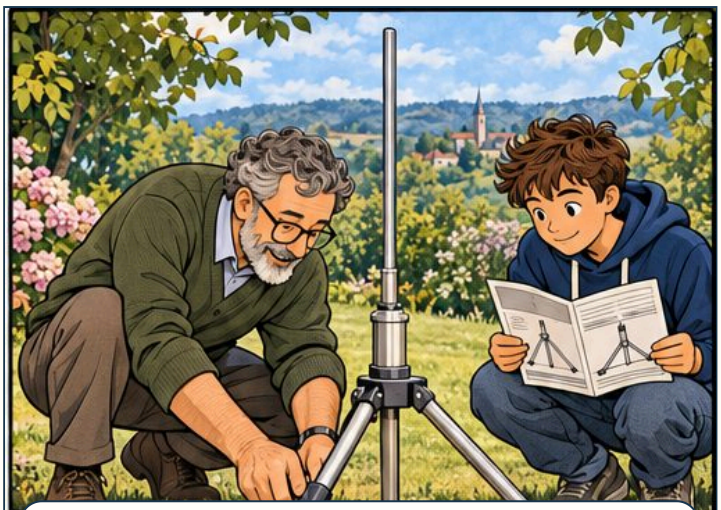


The youngster accepts that a good decision sometimes means giving up.

Prepare everything from the ground



Their demonstration uses light equipment already prepared for reception.



The mentor checks the low support according to its manual.



The youngster sorts cards and routes cables outside the walkways.



Nobody climbs or throws wire into a tree.

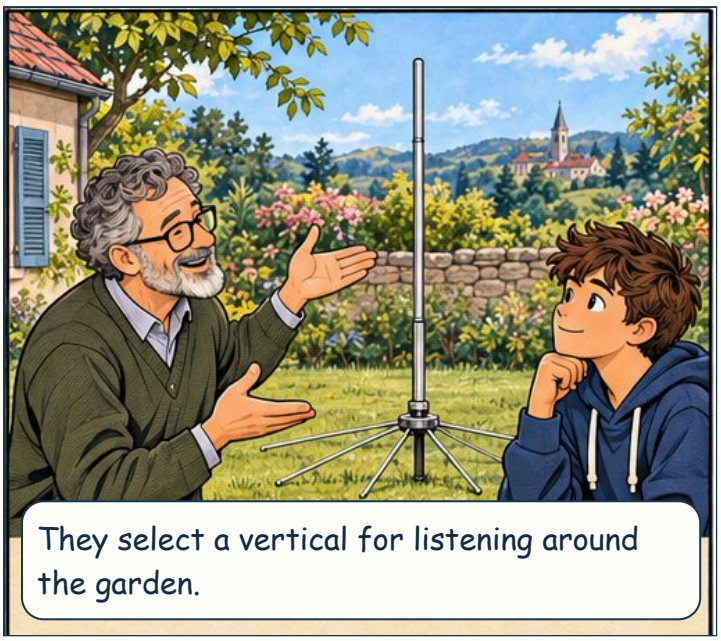


Connections change only with the equipment switched off.

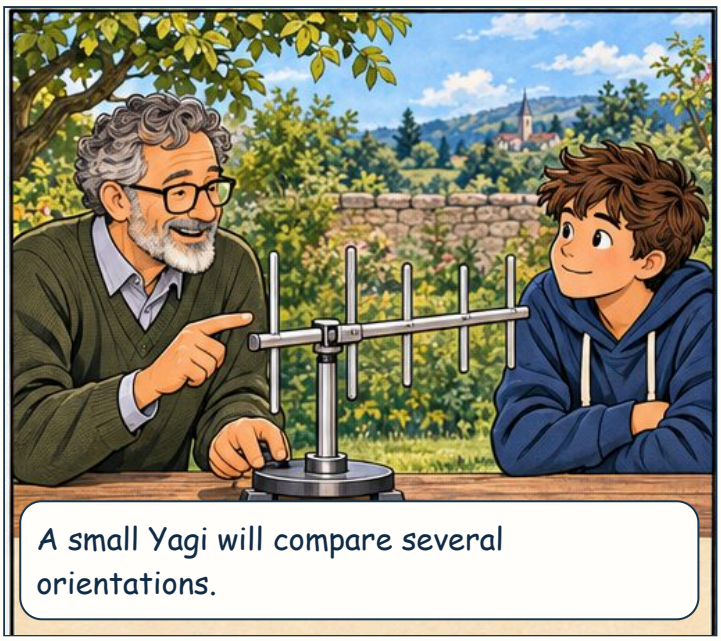


Assembly progresses because everyone knows their role.

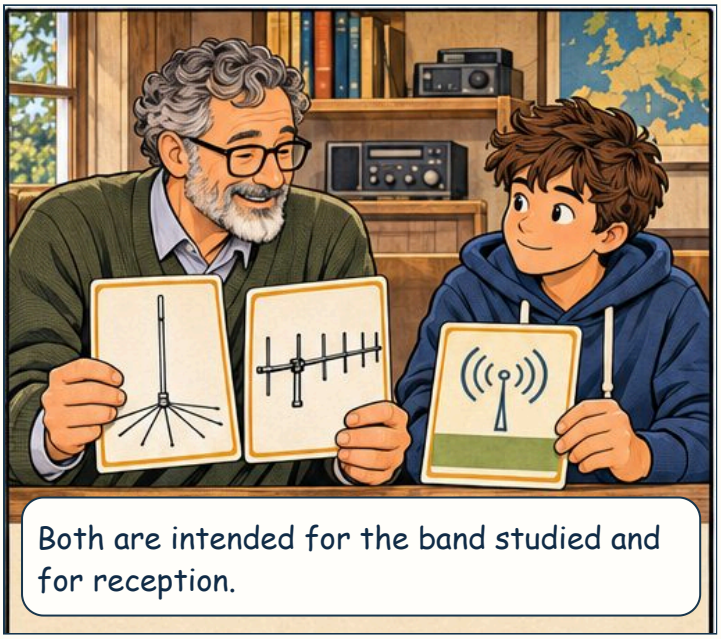
Two candidates, two roles



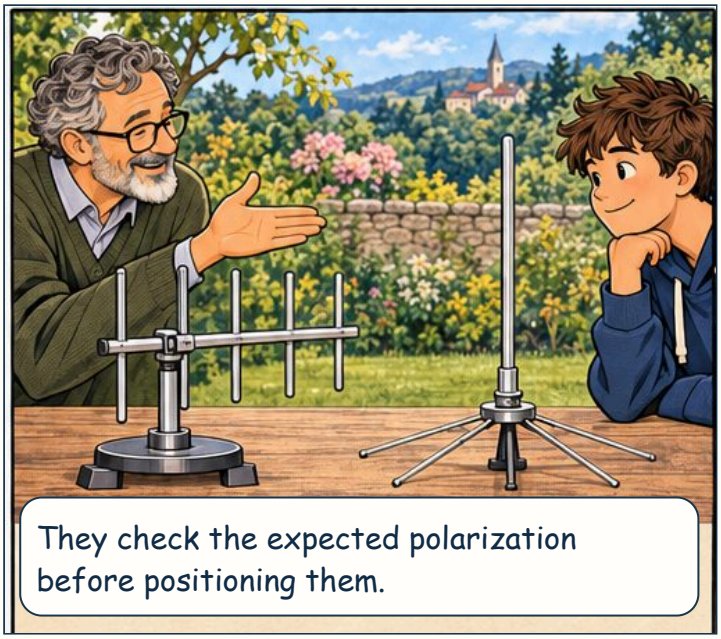
They select a vertical for listening around the garden.



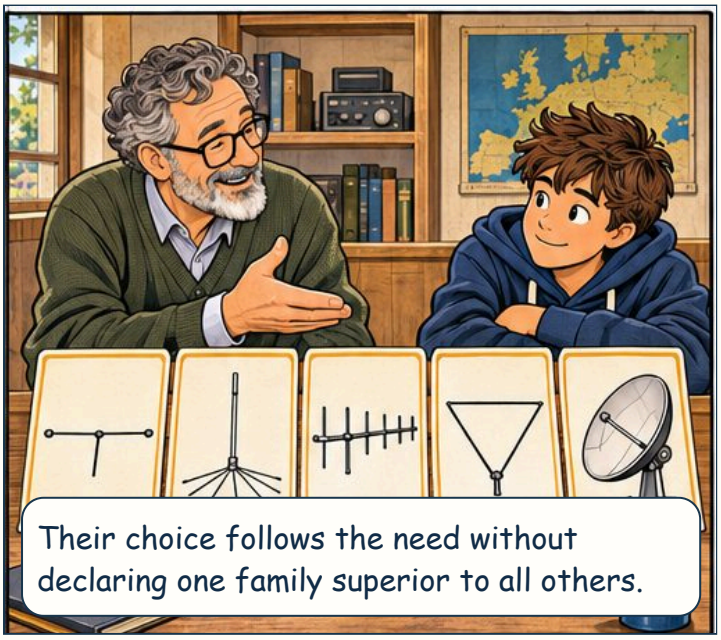
A small Yagi will compare several orientations.



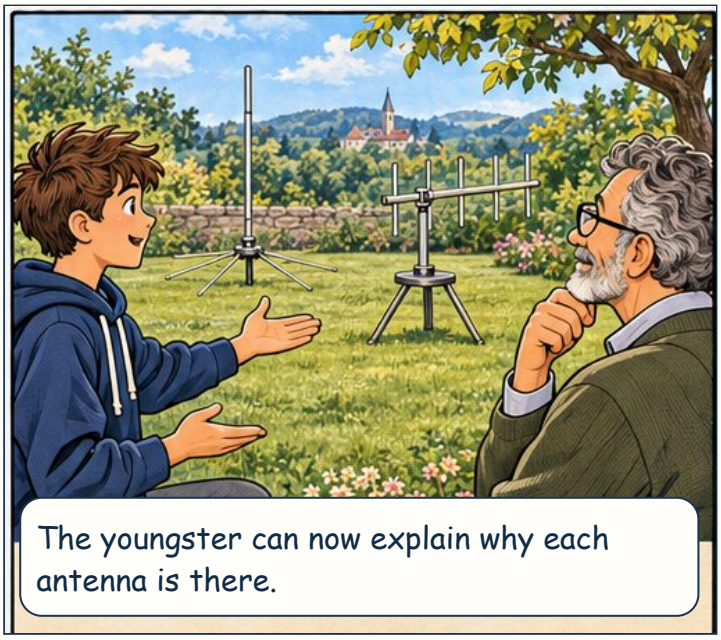
Both are intended for the band studied and for reception.



They check the expected polarization before positioning them.

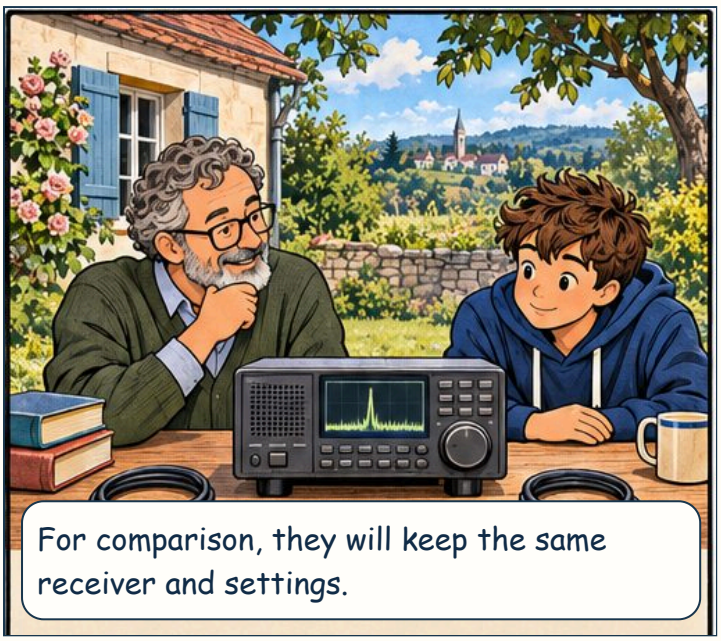


Their choice follows the need without declaring one family superior to all others.

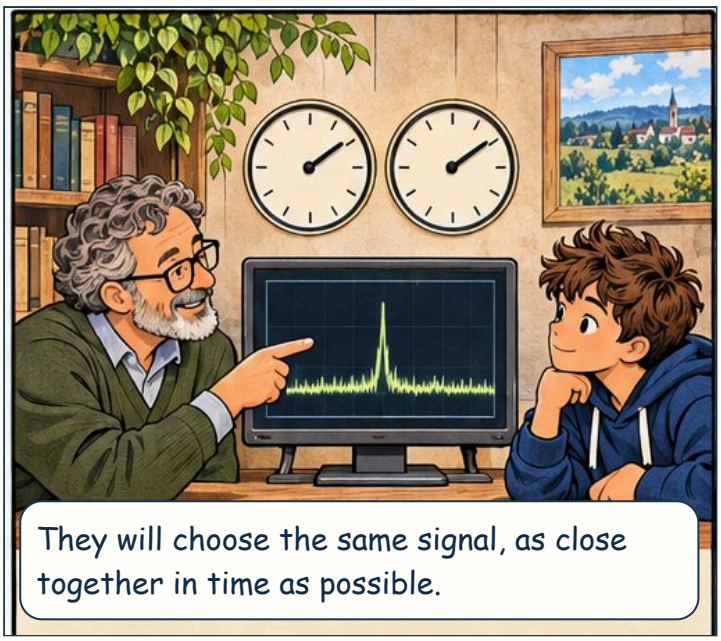


The youngster can now explain why each antenna is there.

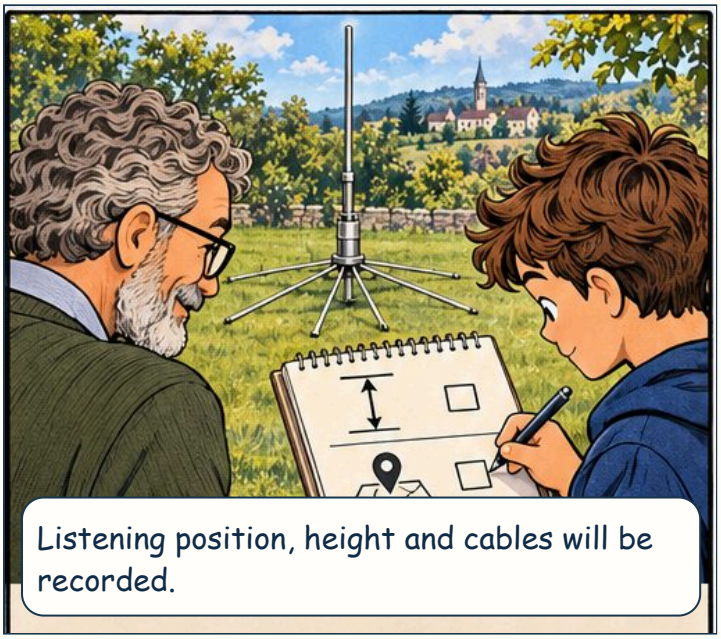
Compare without changing everything



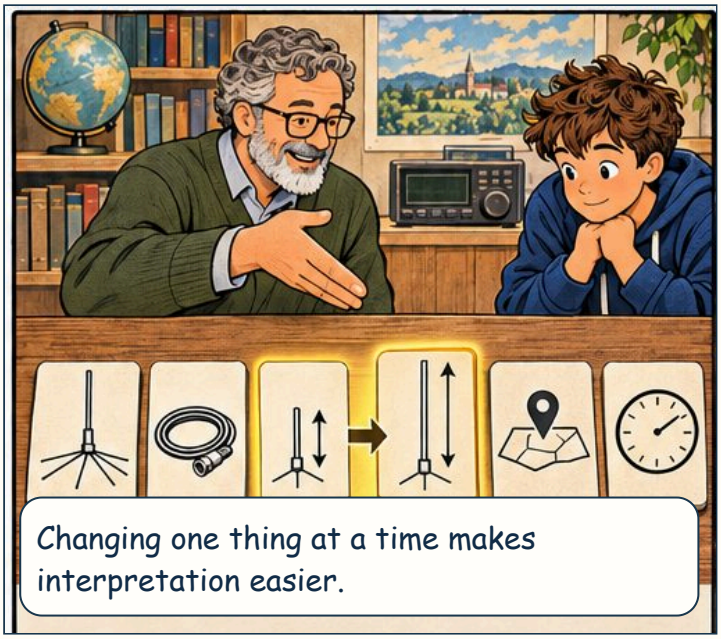
For comparison, they will keep the same receiver and settings.



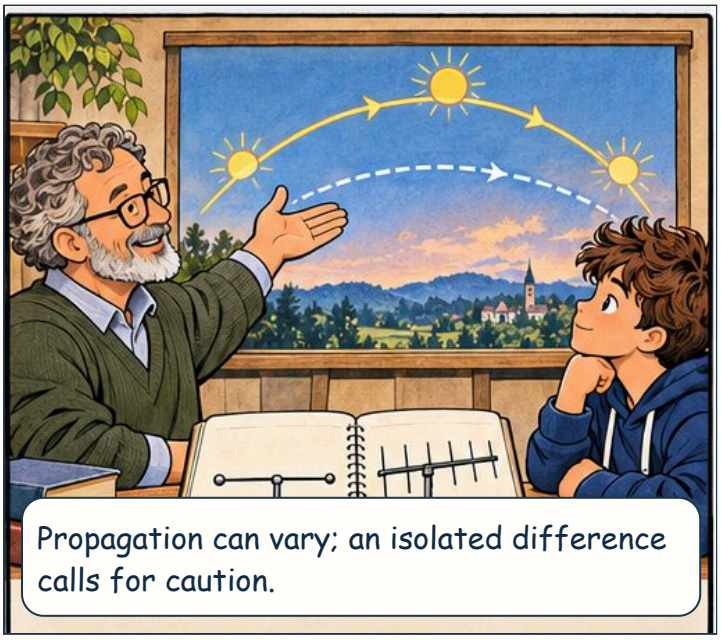
They will choose the same signal, as close together in time as possible.



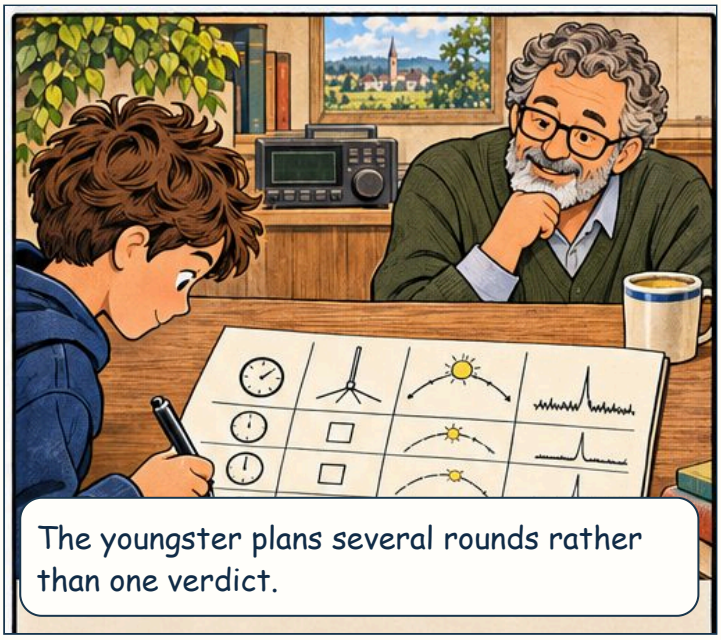
Listening position, height and cables will be recorded.



Changing one thing at a time makes interpretation easier.

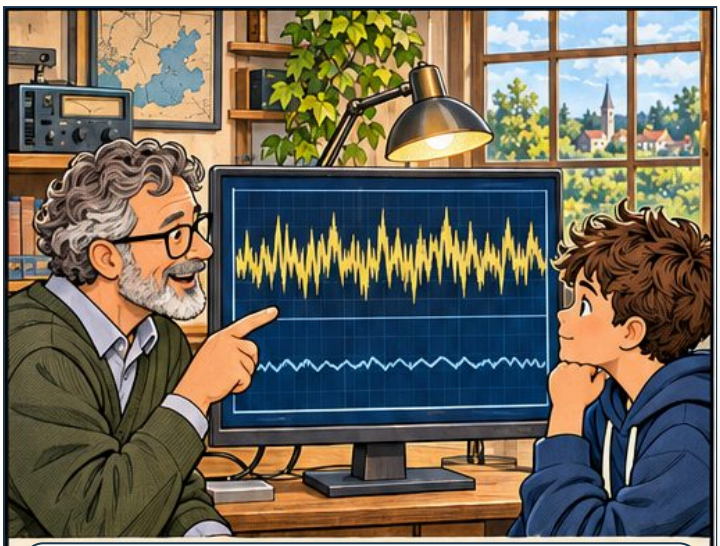


Propagation can vary; an isolated difference calls for caution.



The youngster plans several rounds rather than one verdict.

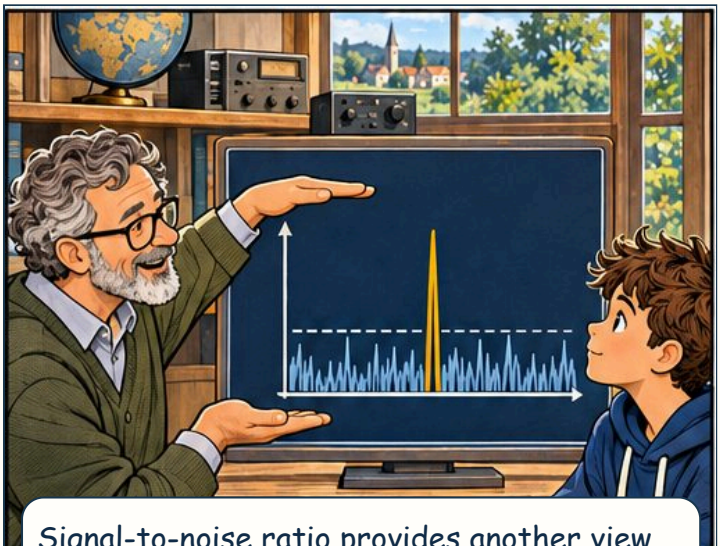
Signal and noise separately



A stronger signal can come with more noise.



They will record the observed level and how clearly they understand it.



Signal-to-noise ratio provides another view of listening.



A receiver indicator is not necessarily a calibrated measuring instrument.



They will therefore keep observations and their conditions.

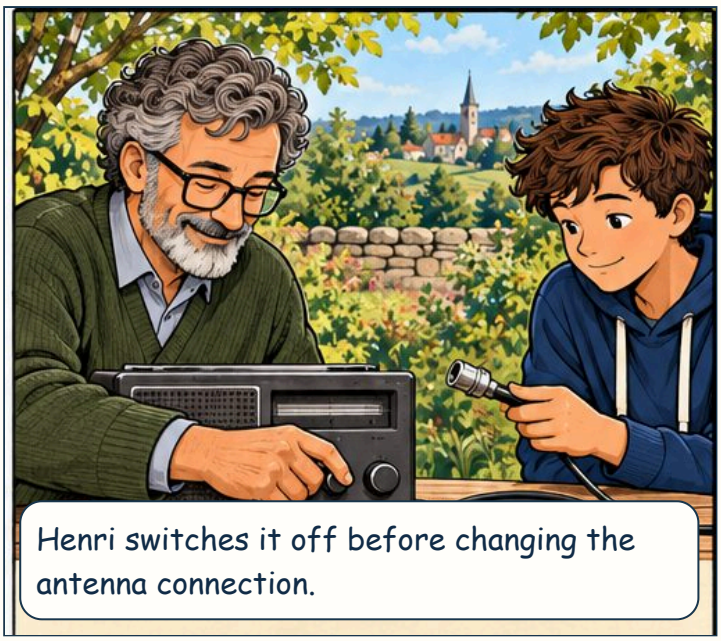


The youngster listens first without trying to make his choice win.

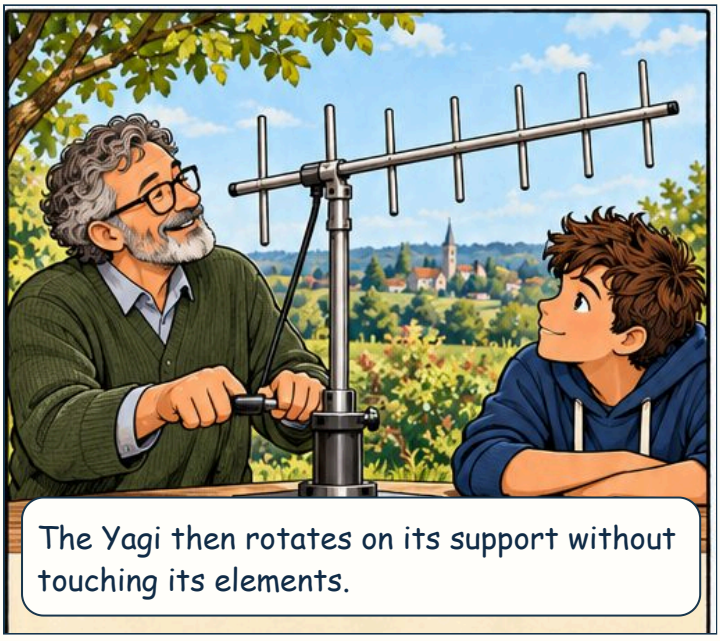
Putting orientation to the test



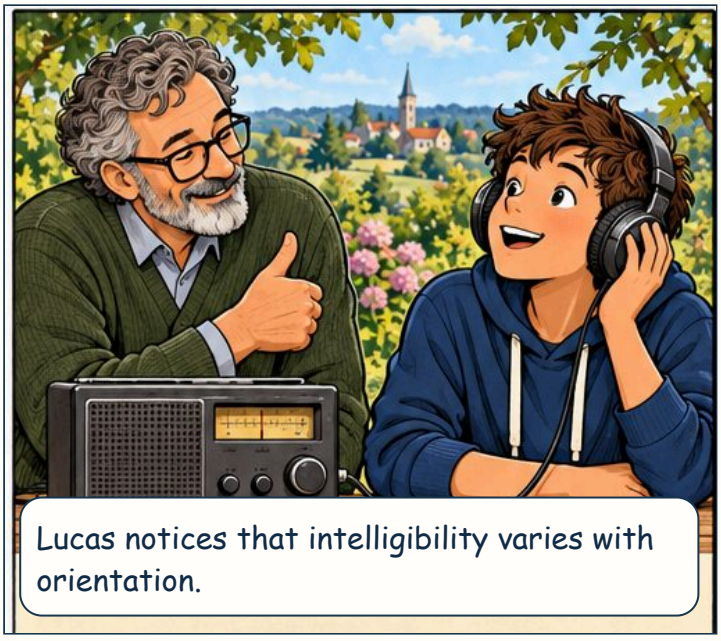
In their illustrated test, they follow a local conversation on the receiver.



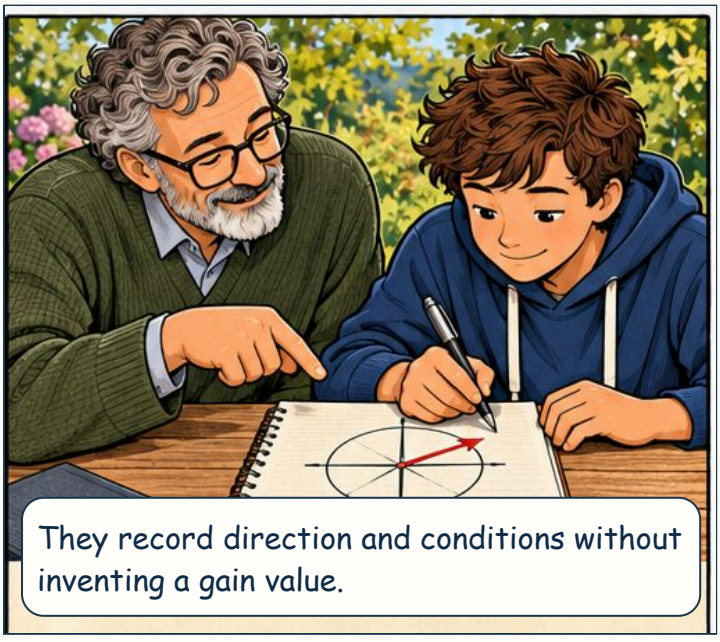
Henri switches it off before changing the antenna connection.



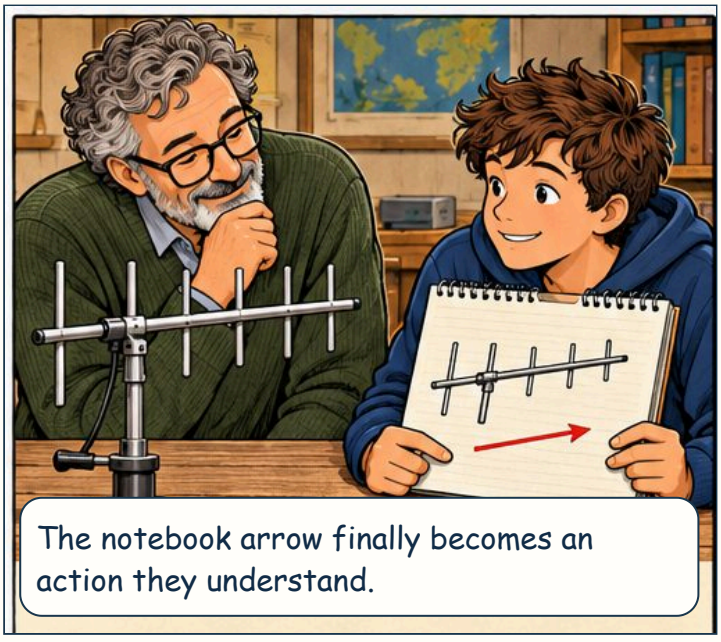
The Yagi then rotates on its support without touching its elements.



Lucas notices that intelligibility varies with orientation.

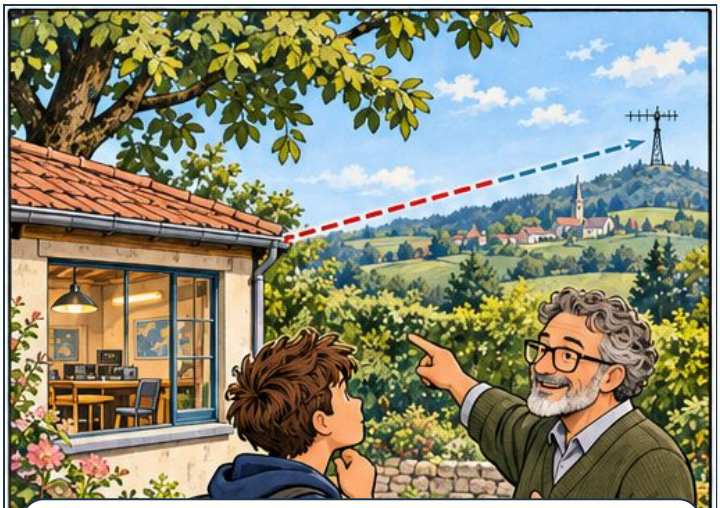


They record direction and conditions without inventing a gain value.

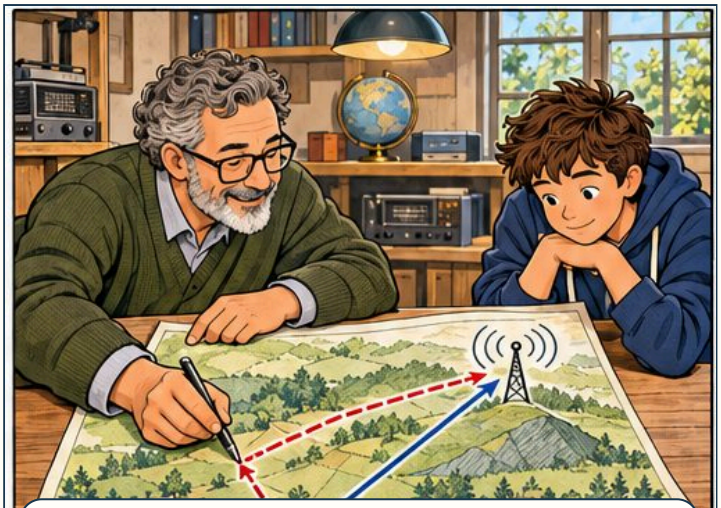


The notebook arrow finally becomes an action they understand.

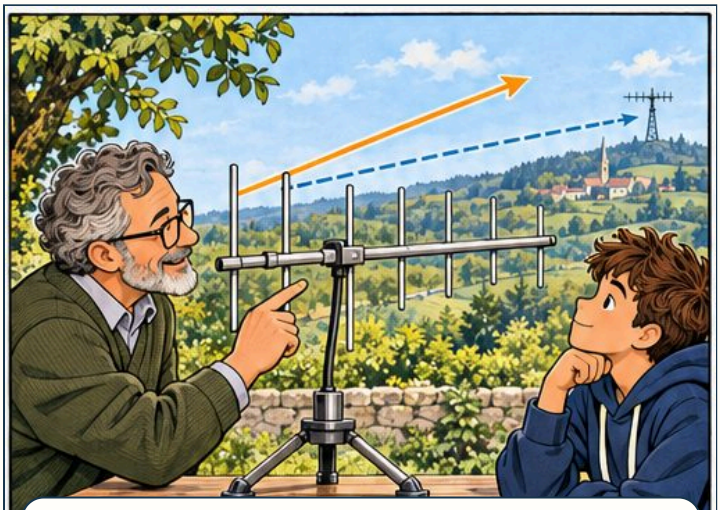
An obstacle makes them think



In one direction, the building lies between the garden and the station heard.



The signal may also arrive through reflections or other paths.



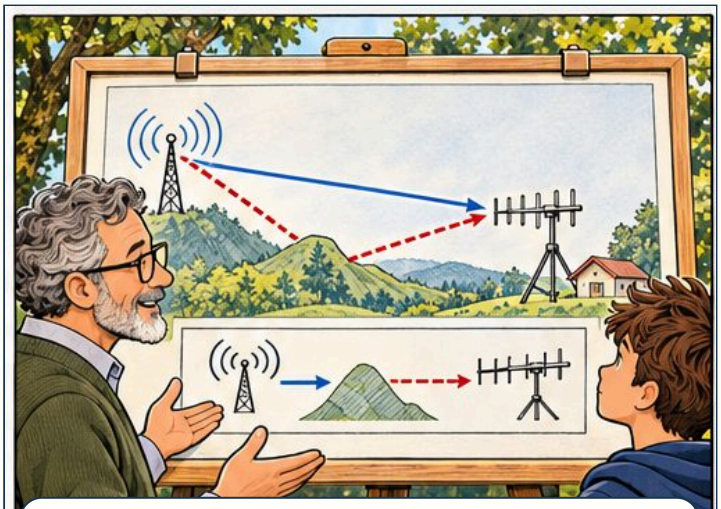
The strongest reception therefore does not always show the direct route.



They repeat the observation instead of concluding too quickly.

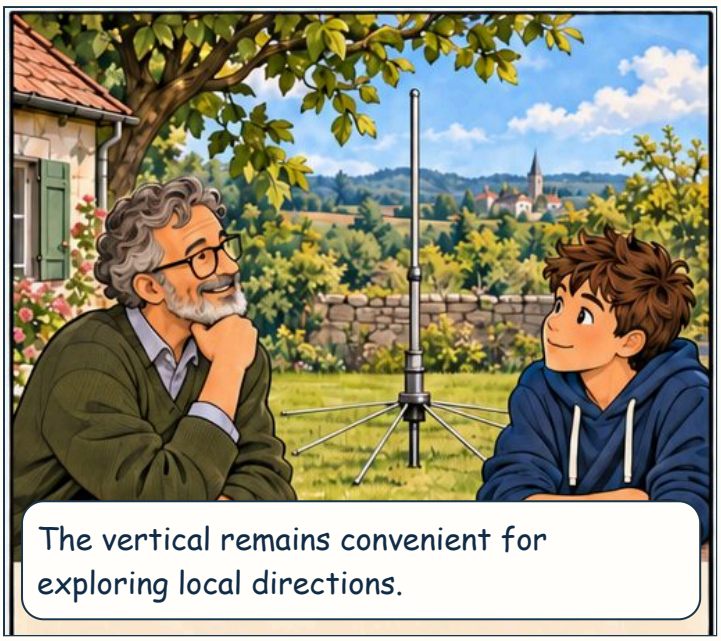


The youngster compares the garden plan with his notes.

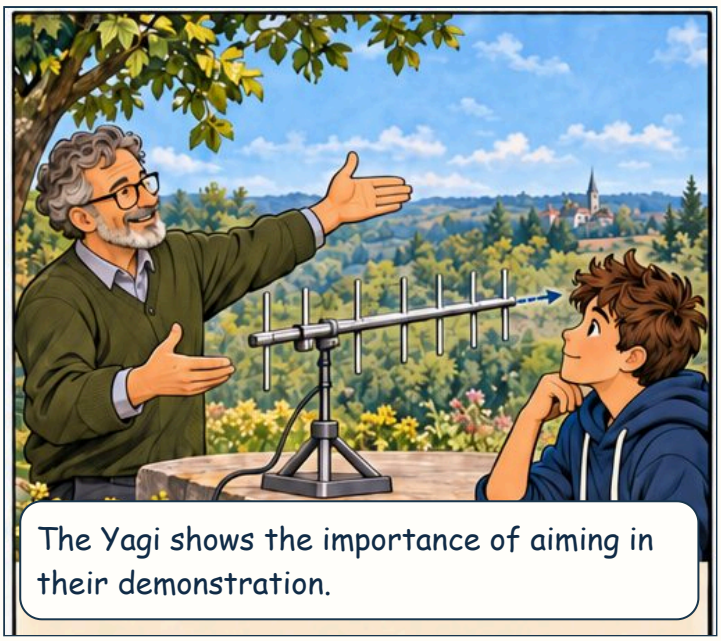


The antenna alone does not explain the entire link.

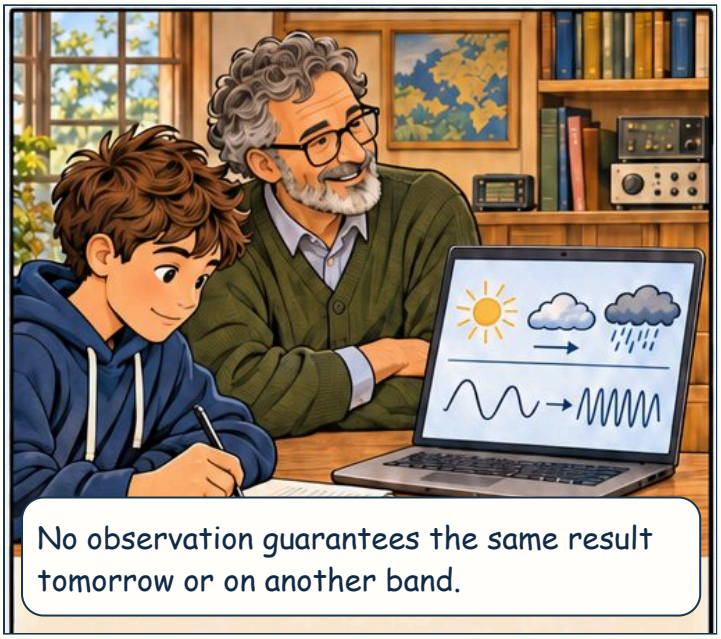
The outcome is not a podium



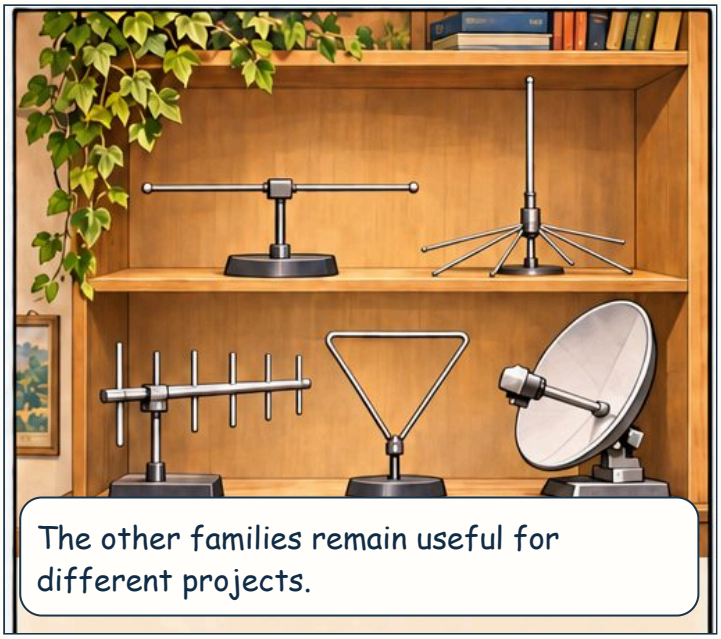
The vertical remains convenient for exploring local directions.



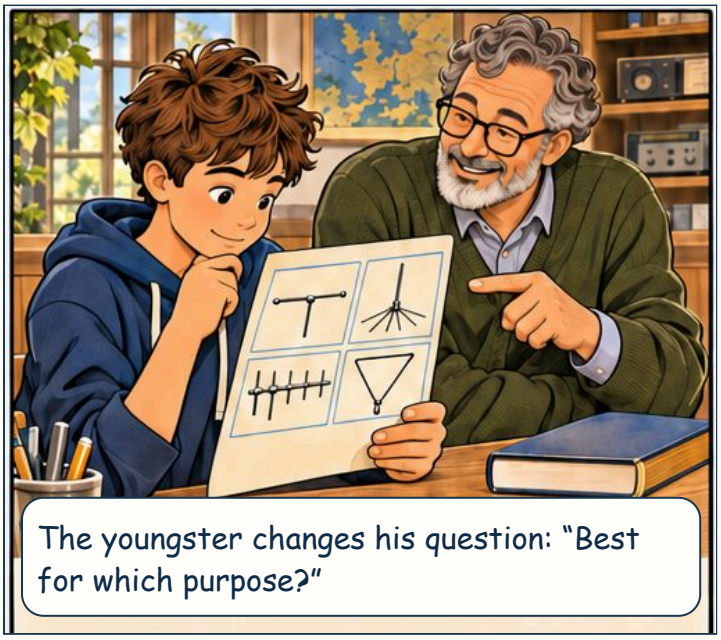
The Yagi shows the importance of aiming in their demonstration.



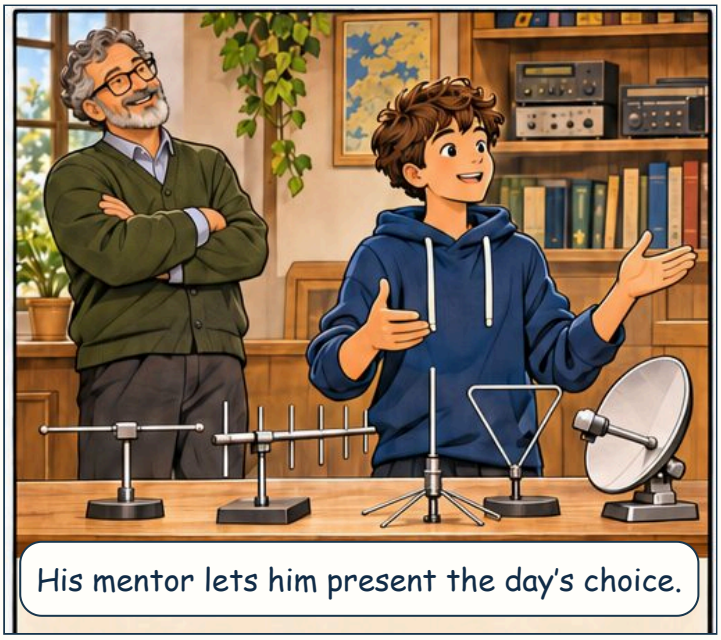
No observation guarantees the same result tomorrow or on another band.



The other families remain useful for different projects.

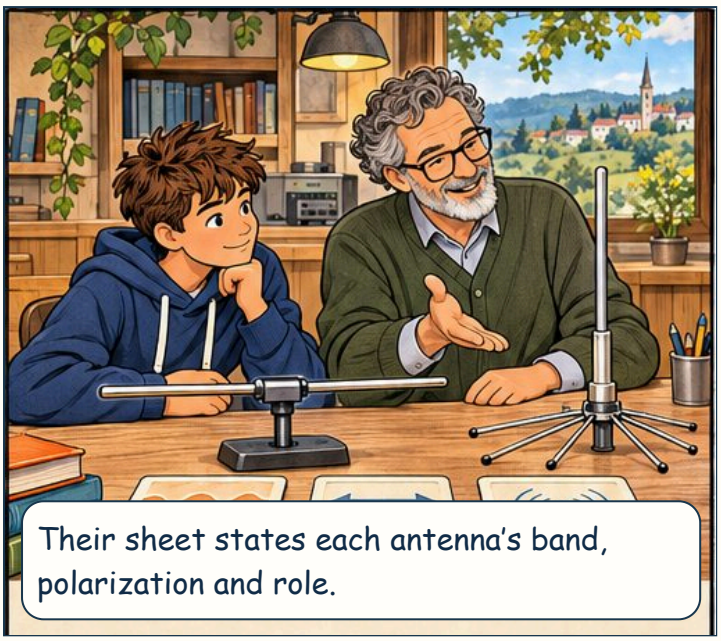


The youngster changes his question: “Best for which purpose?”

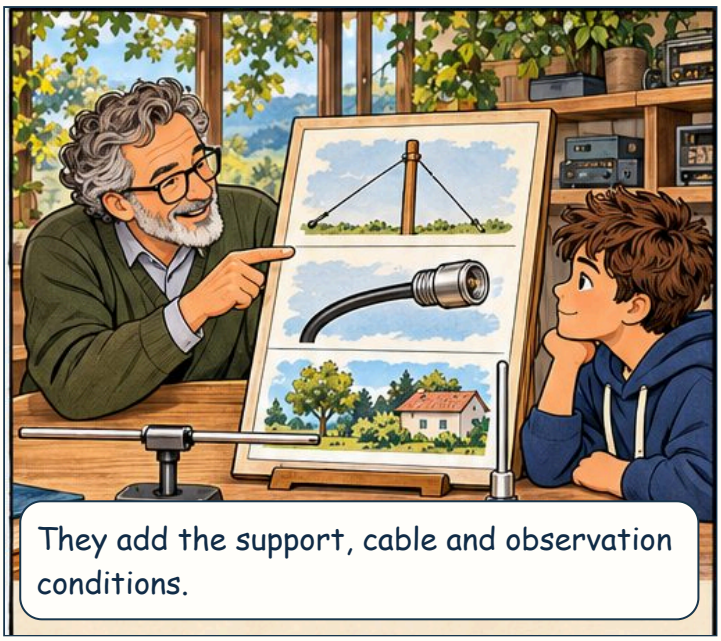


His mentor lets him present the day’s choice.

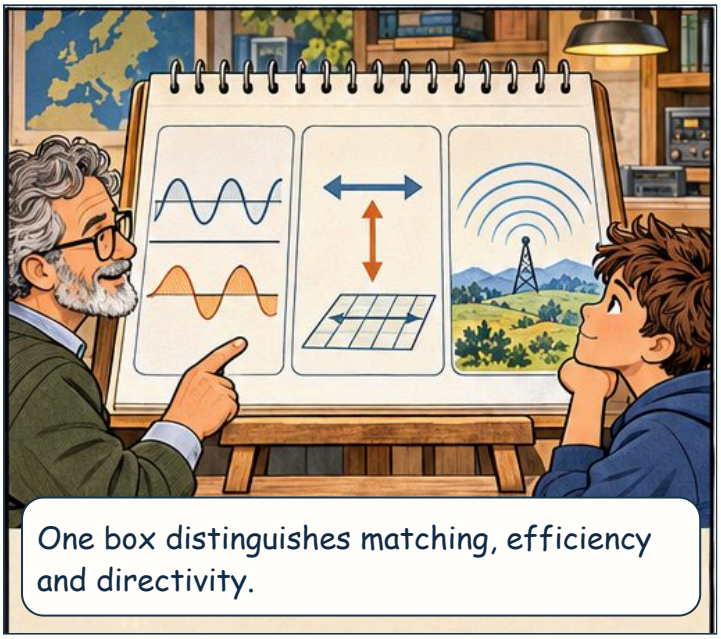
A sheet to share knowledge



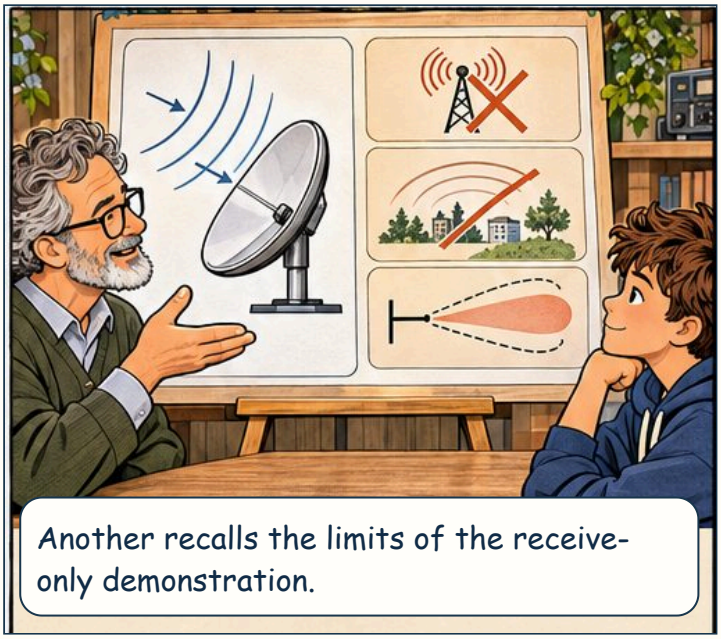
Their sheet states each antenna's band, polarization and role.



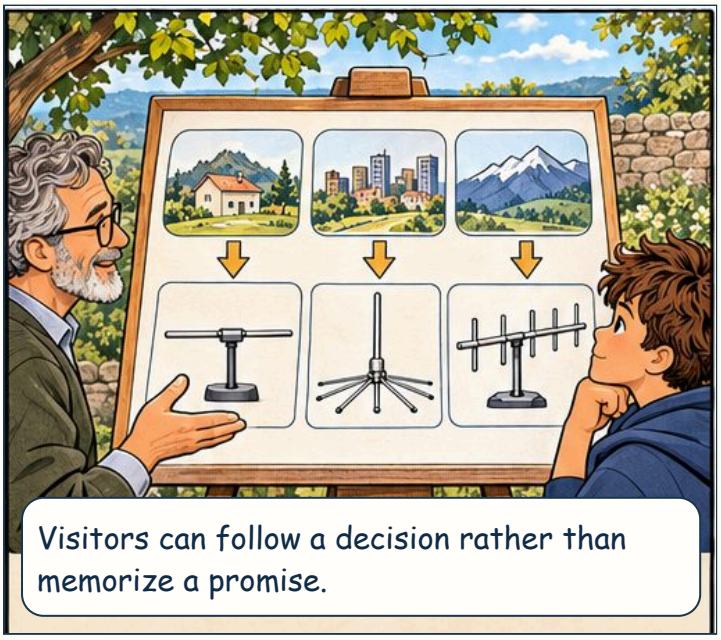
They add the support, cable and observation conditions.



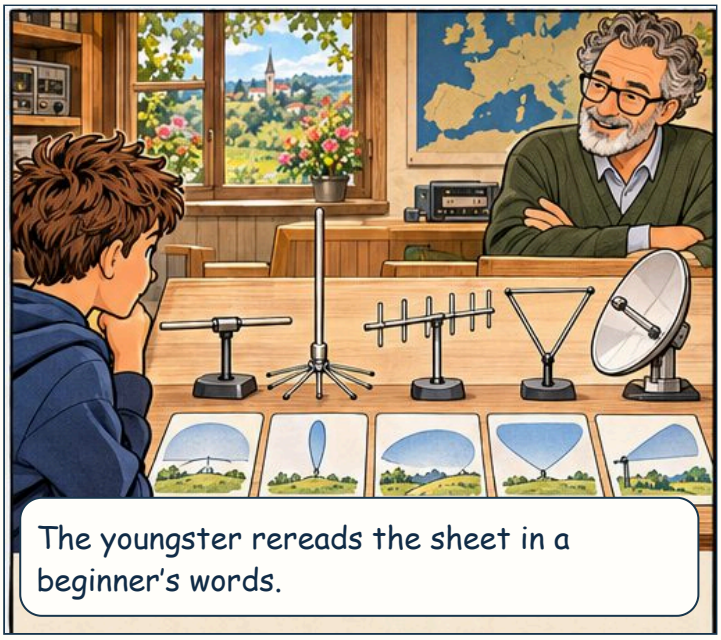
One box distinguishes matching, efficiency and directivity.



Another recalls the limits of the receive-only demonstration.

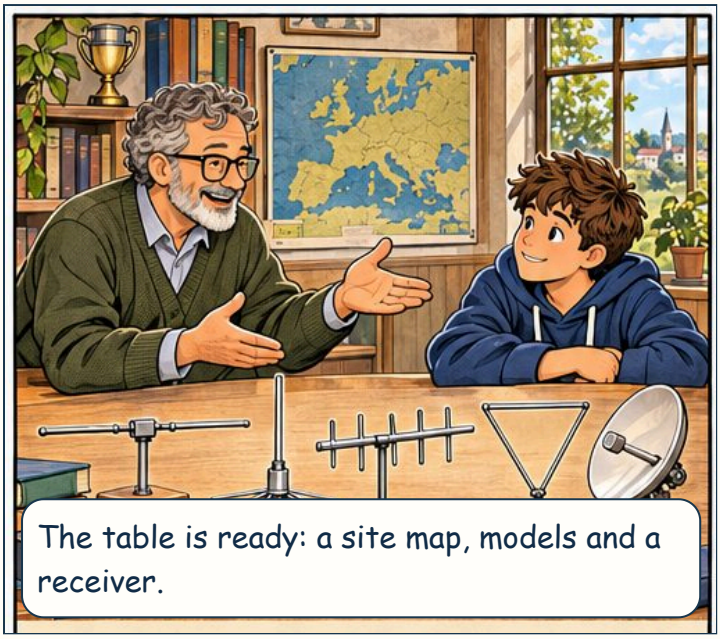


Visitors can follow a decision rather than memorize a promise.

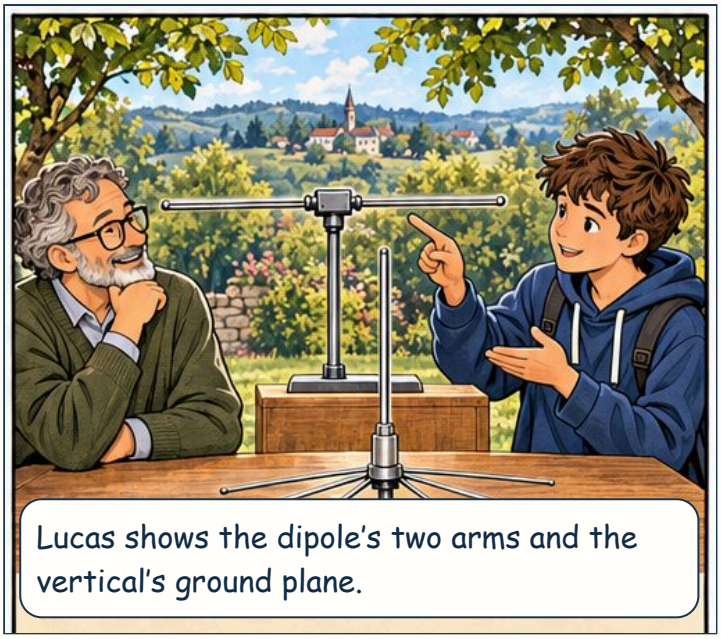


The youngster rereads the sheet in a beginner's words.

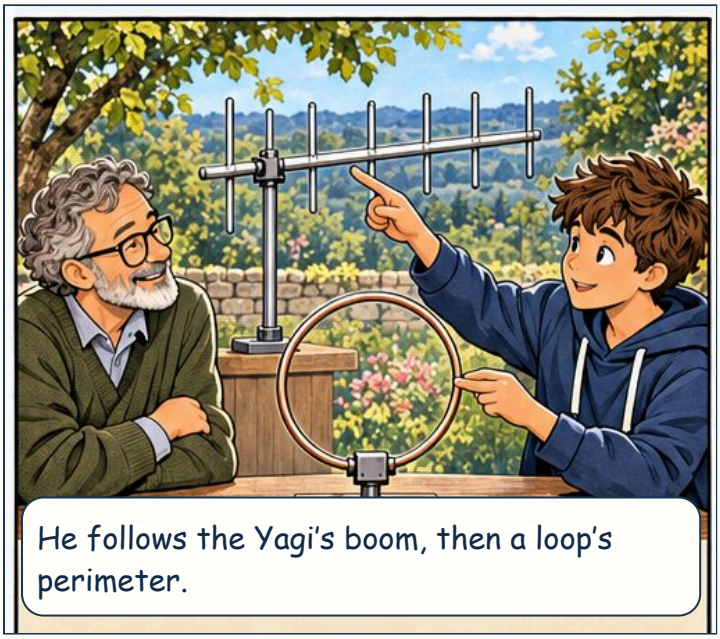
Welcome the next question



The table is ready: a site map, models and a receiver.



Lucas shows the dipole's two arms and the vertical's ground plane.



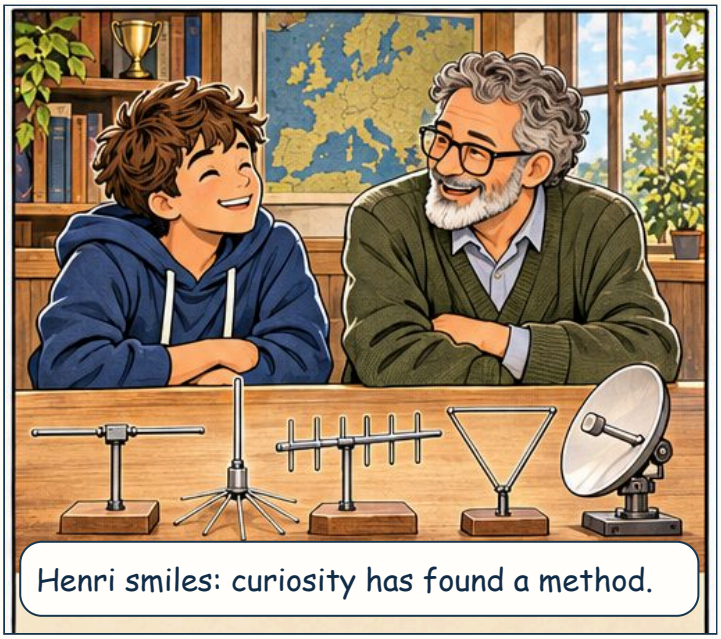
He follows the Yagi's boom, then a loop's perimeter.



The miniature dish reminds him there is much more to explore.

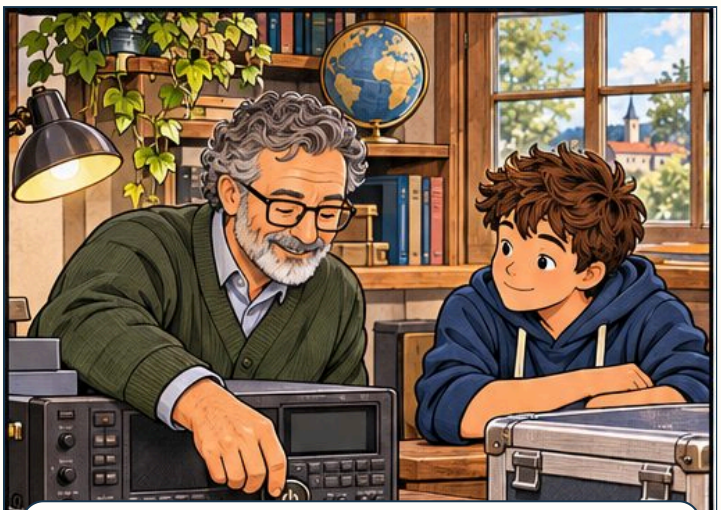


He now knows to ask about band, direction and installation.



Henri smiles: curiosity has found a method.

The reach of a good choice



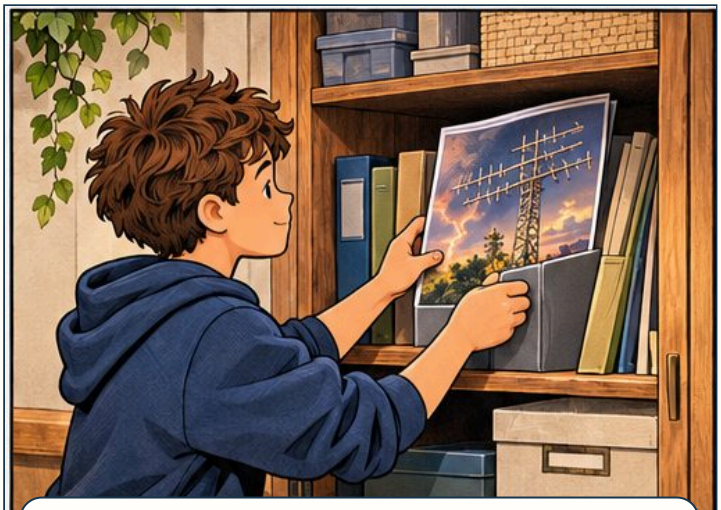
After the activity, they switch off the equipment before packing connections.



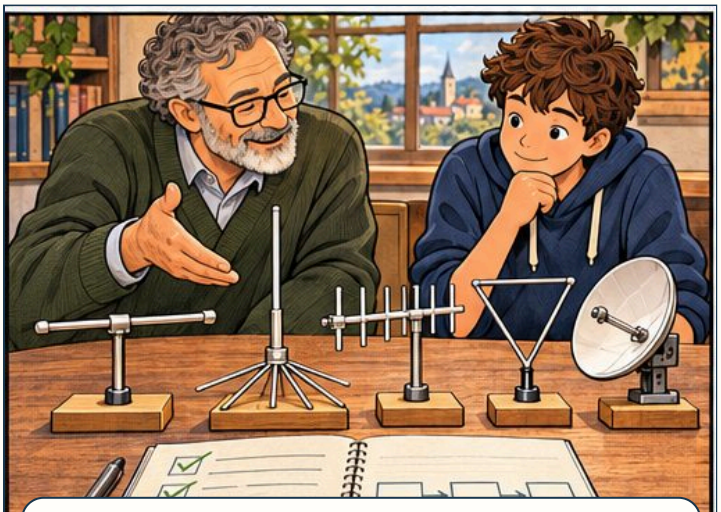
Cables return to their boxes and the garden stays clean.



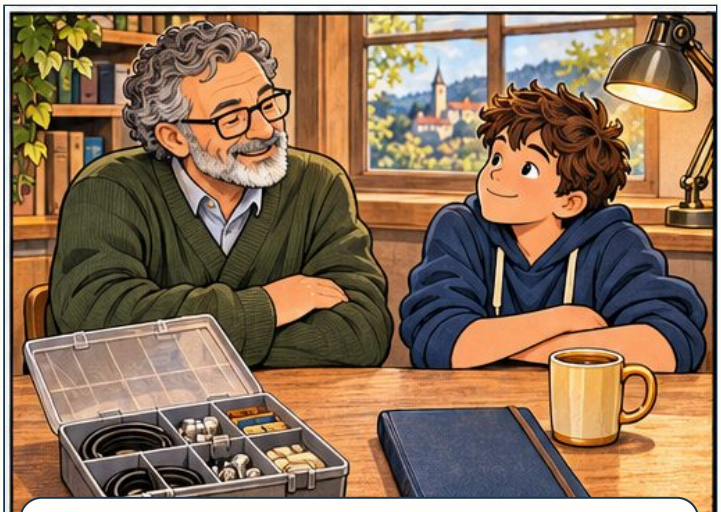
The notebook keeps unanswered questions, not just answers.



Lucas no longer seeks an antenna promising every contact.



He seeks an installation suited to his project, understood and checked.



A new page awaits: understanding the components that bring the station to life.