

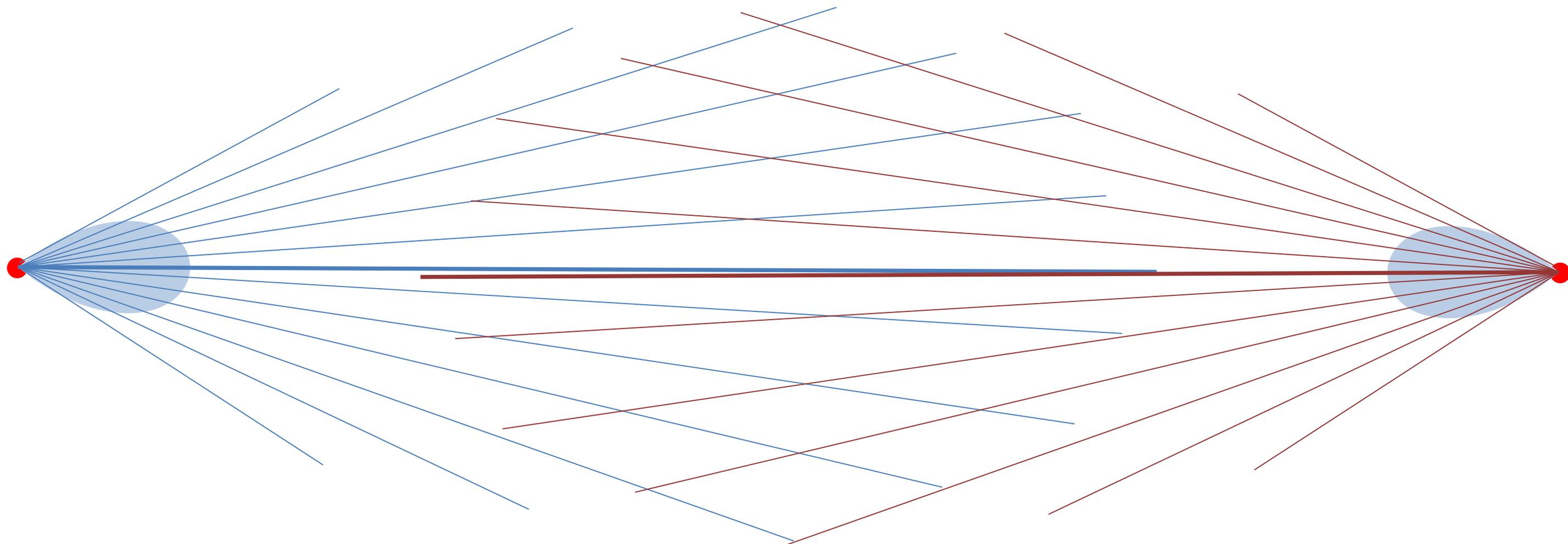
# Antennas and Obstructions

## A Simple Analogy

### Version 2

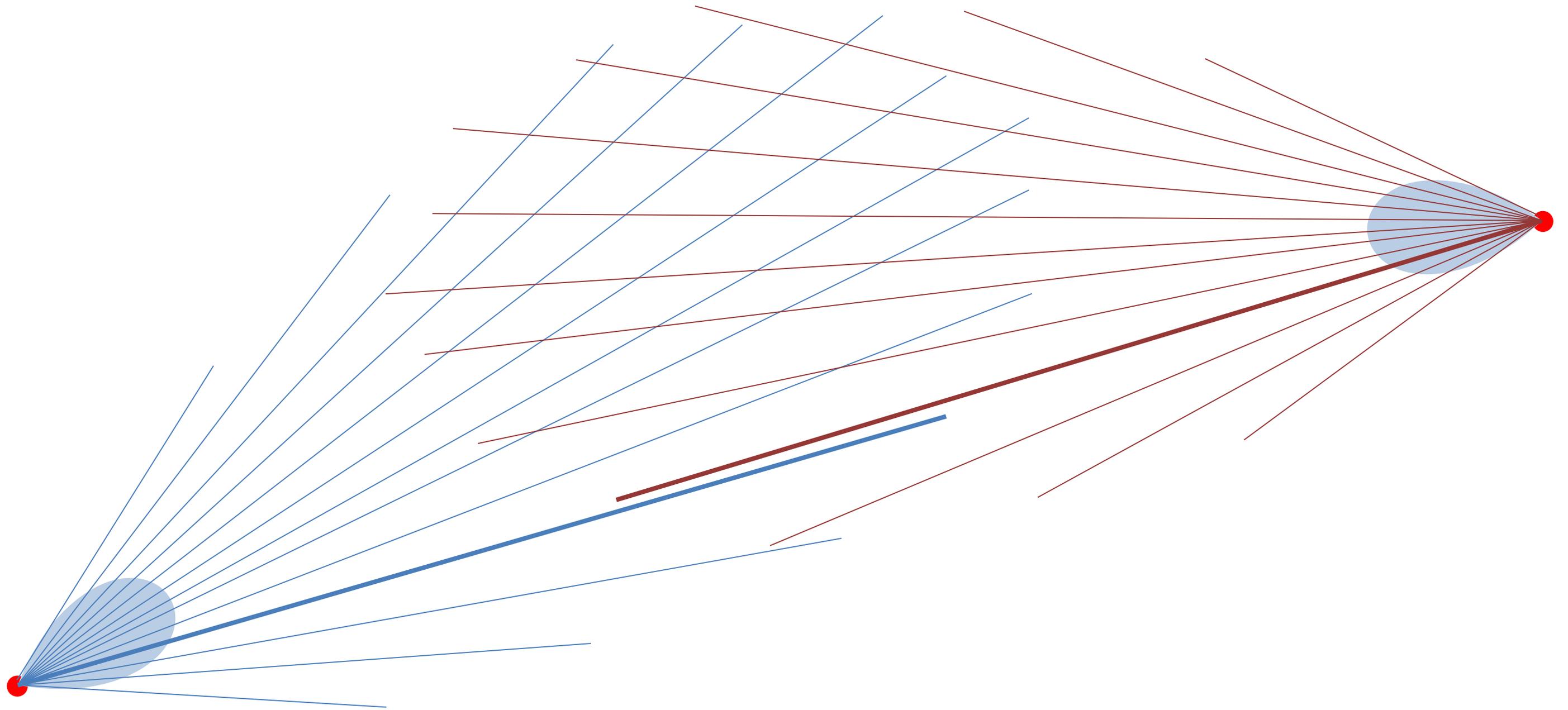
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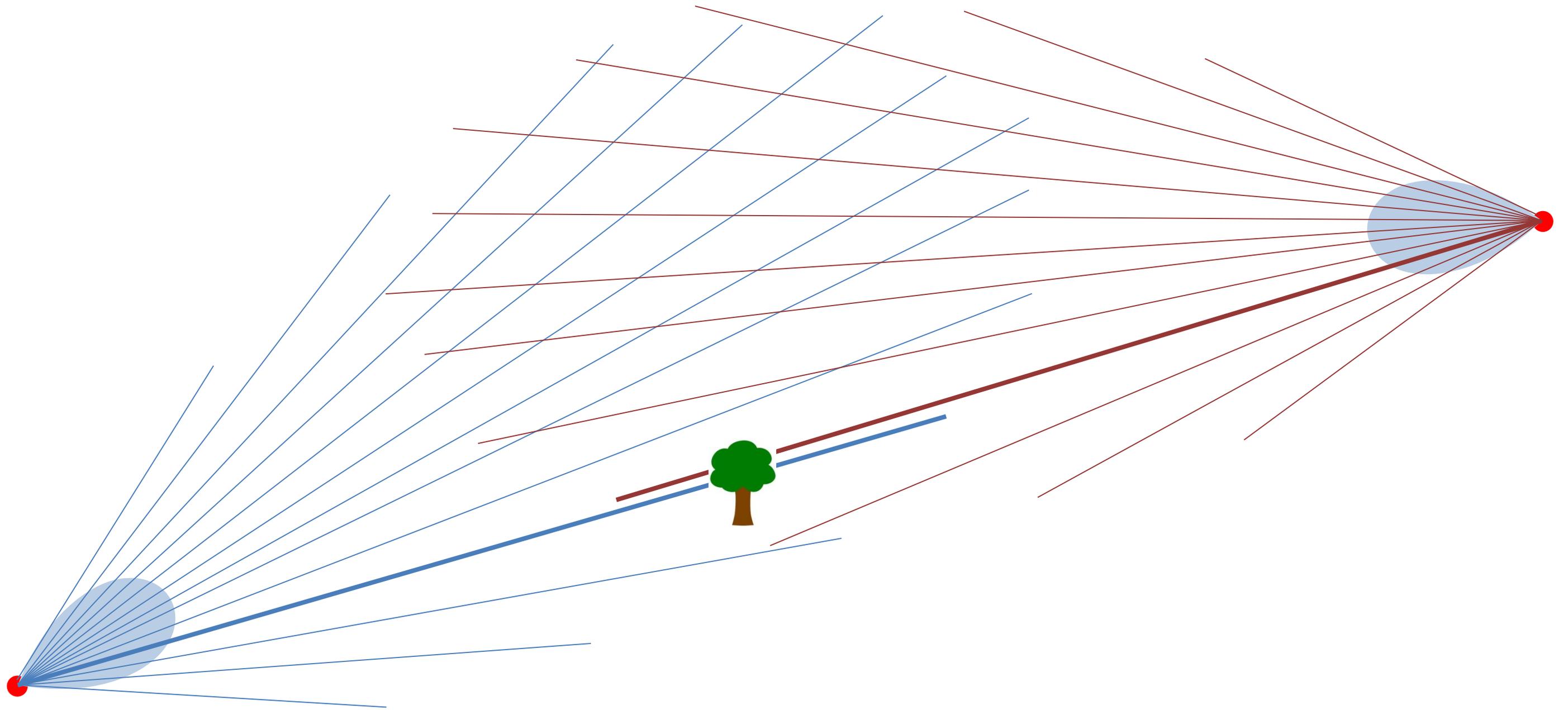


Two NanoStations.... Perfectly aligned. Each captures a very small percentage of the energy transmitted by the other station; the rest of the energy goes zipping past the receive antenna. Captured energy is represented as the heavier weight lines through middle. Lost energy shown by the light-weight lines.

I'm representing the transmitted wavefront as lines in the examples here; however they can be better thought of as a curved wavefront, like a pond stone ripple.

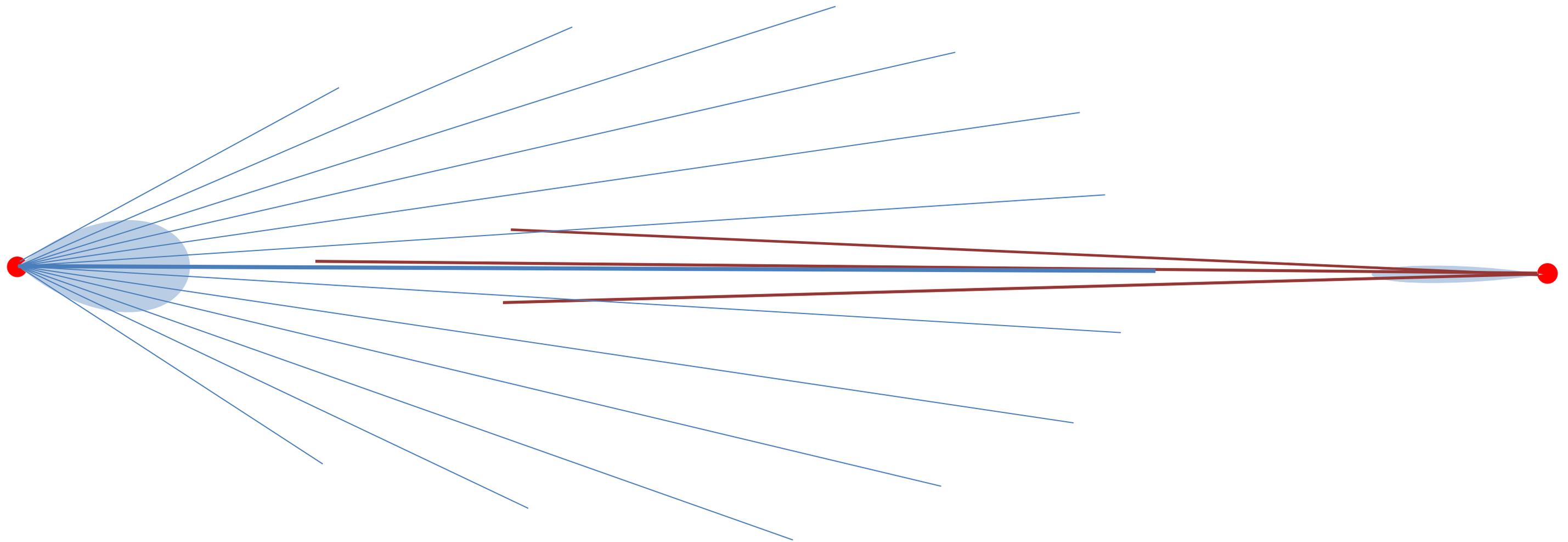


The NanoStation 60 degree radiation pattern has an advantage... in that when the two antennas are NOT aligned... they still have the ability to copy each other... because the transmitted wavefront (beams) are wide angle... and “something” still strikes the target receive antenna. However, performance goes down, because rays that now do connect are of lesser strength.. From the cardioid radiation pattern. We still have a connection... just a worse connection.

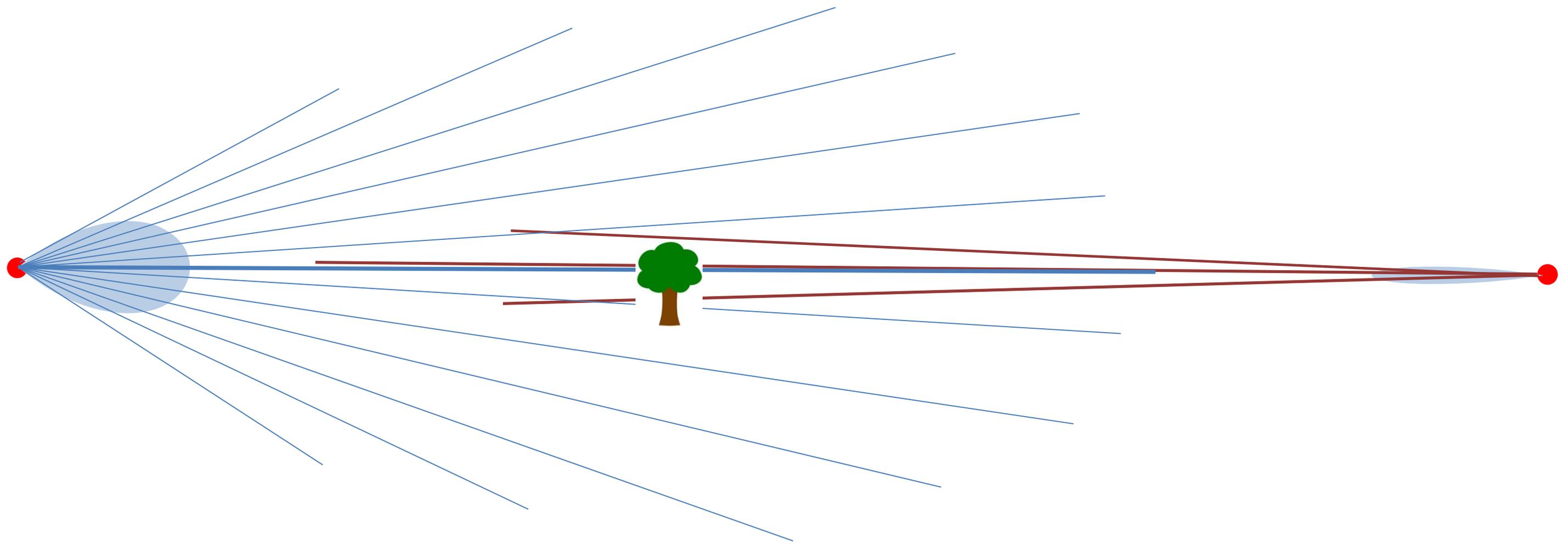


## Now... consider an obstruction.....

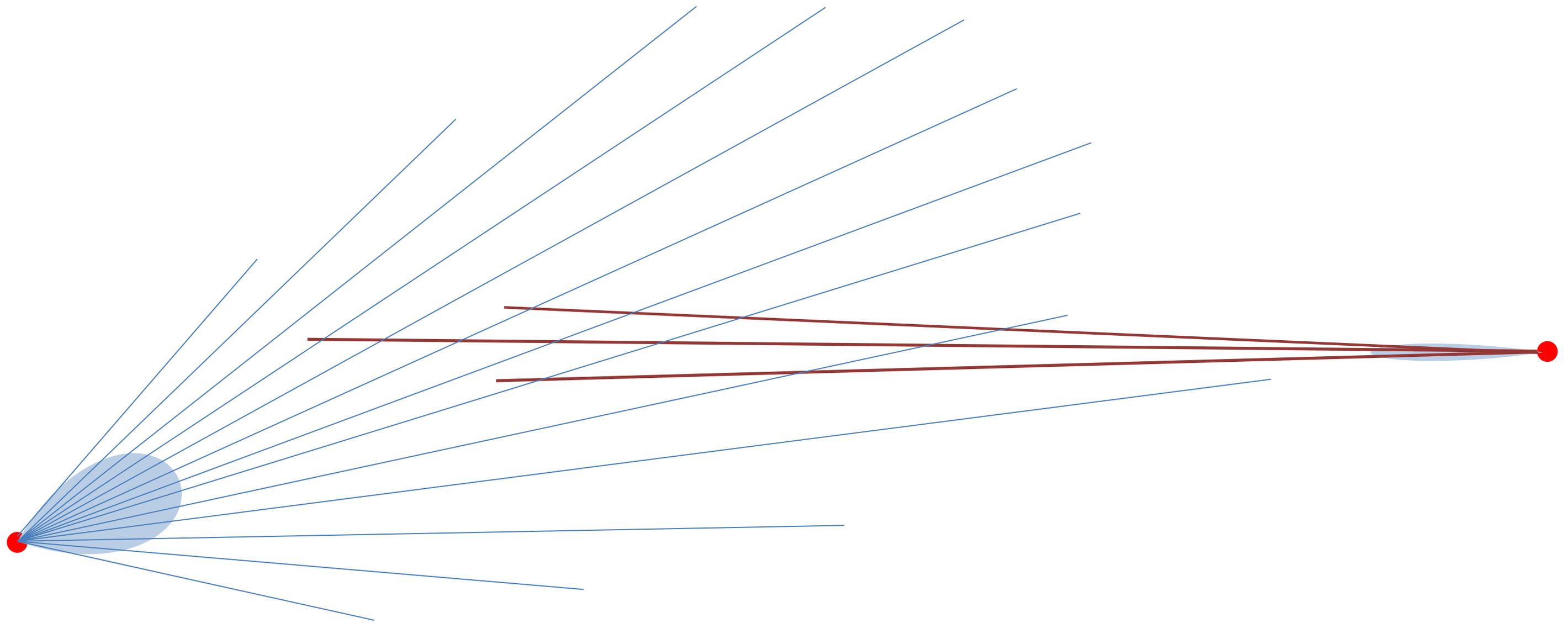
If that obstruction happens to block the part of the wavefront (beam lines) that are making it from one antenna to the other... the connection will still fail. The fact that we are transmitting with a wide beam width doesn't help ... because most of the transmitted energy is wasted, bypassing the receive antenna. The fact that we are receiving with a wide beam antenna doesn't help either... because we are receiving a bunch of unwanted noise from the outside beam. And the obstacle... really doesn't care... it is just as effective in blocking the communication by disrupting the connecting beams... as if it blocked the whole 60 degree beam width.



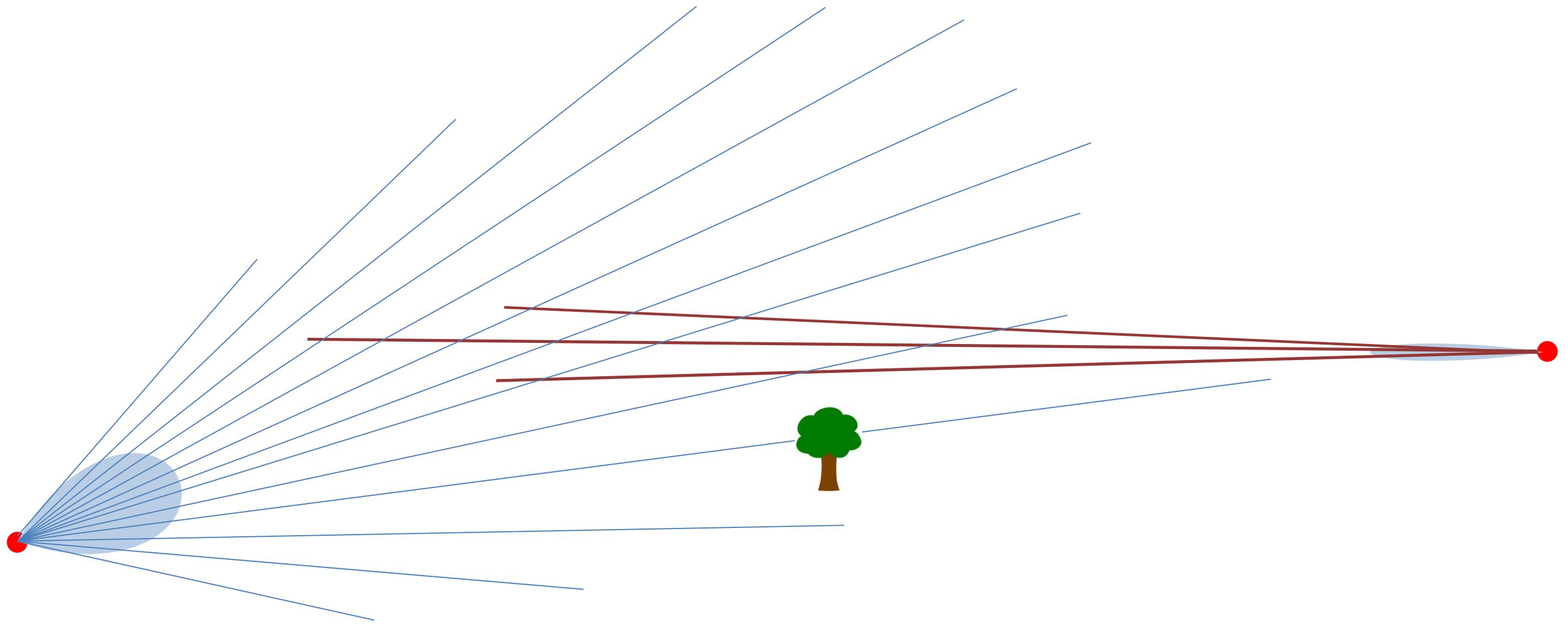
Now... consider the AirGrid talking to the NanoStation. All of the AirGrid's energy is concentrated into the 6 degree beam.... And, if the antennas are aligned.... Most of that energy makes it to the Nanostation. The Nanostation should hear very well.... But unfortunately... the AirGrid won't hear the NS as well, because most of the NS's energy is still being wasted, bypassing the AG.



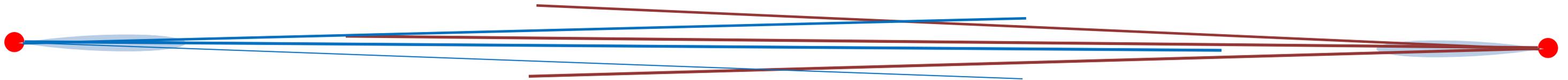
And... about obstructions... well... as before... a well placed obstruction can still ruin everything. Of course... if the obstruction only obstructs wasted rays from the NS... no harm... but no good either. It still comes down to the location of the obstruction... on the pure line-of-sight.



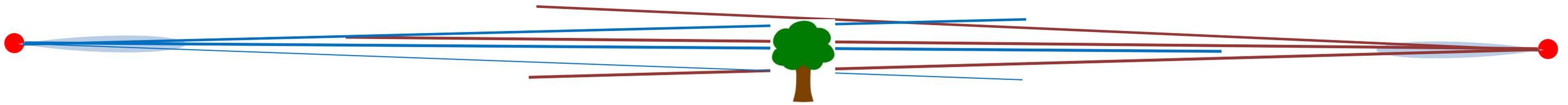
With NS and AG.... If misaligned... we have pretty much the same situation. Transmissions from the AirGrid will be totally missed by the NanoStation, because all waves will fall outside of the 60 degree reception zone. Likewise.... NanoStation radiation reaching the Airgrid will be coming from an angle that will be rejected by the sharp reception zone of the parabolic antenna. So.... Neither station will copy the other.



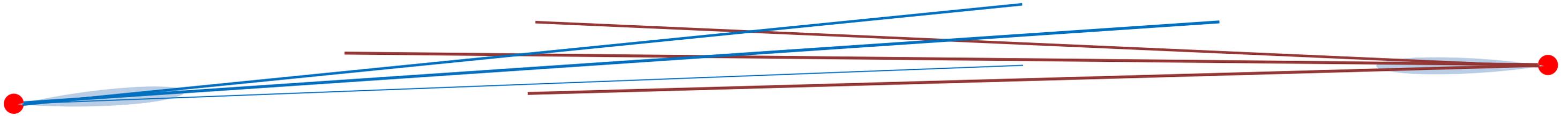
And obstructions are a moot point; they can only block radiation that will not be seen by the receiver at either end.



Now... what I consider the best of all worlds... the two AirGrids, properly aligned. Even with perfect alignment, much of the beam energy is lost going both directions.... But it is a completely different world than the NanoStations. A very large percentage of the energy DOES make it to the receiver... compared to the NS.



As before... a tree in the wrong place... can ruin everything.



And... a “slight” misalignment... is curtains as well.... And we may as well not even consider obstructions in this case... because we have no connecting signal to obstruct.

# Conclusions

- All antennas, regardless of beamwidth... require a clear line-of-sight to work (and a clear Fresnel Zone).
- Anything that obstructs the functional “line of sight”... it will destroy communications. It doesn't matter how wide the beamwidth is... if the part of the beam that is doing the communicating is blocked... it's curtains.
- Most energy from wide beam antennas is wasted. However, alignment of a wide beam antennas is not critical.
- Narrow beam antennas put most of their energy on their targets... but only if properly aligned.
- If your antennas are mis-aligned by more than the beamwidth of either respective antenna..... You're toast. The line-of-sight (LOS) must pass through the received beamwidth of each antenna