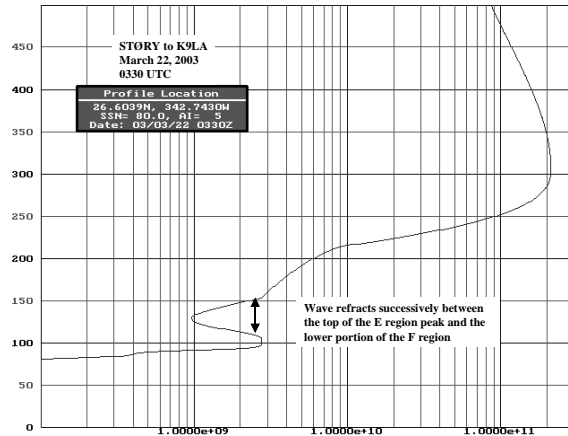


## Ducting on 160-Meters

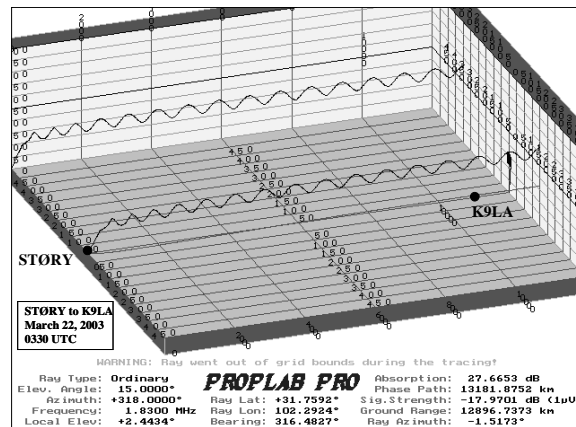
Carl Luetzelschwab K9LA

The short article titled *Multi-Hop on 160-Meters* on this web site concluded that multi-hop on 160-Meters at night appears to be limited to around 7000 km for modest stations, and out to 10,000 km for big gun stations. After that, some other mode offering less ionospheric absorption and less ground reflection loss must come into play.

That other mode is likely to be ducting. The necessary physical attribute for ducting is readily seen in the ionosphere by radars – an electron density valley above the nighttime E region peak. The following figure shows the valley (from Proplab Pro V2).



As annotated in the figure, RF at 1.8 MHz can successively refract between the top of the E region (the lower boundary) and the lower F region (the upper boundary). Ray tracing (again with Proplab Pro) shows what happens using a path from Sudan to K9LA, which is over 10,000 km.



The wave enters the duct and continues in the duct for long distances. There's only ionospheric absorption on the up-going portion and the down-coming portion. And note that there are no ground reflection losses. For this approximate 11,000 km path, the estimated receive power using a transmit power of 1000 Watts and verticals over average ground is -71 dBm. This is some 60 dB more than multi-hop case, and is well above the noise level of a quiet rural location.