

NVIS

Near Vertical Incidence Skywave Communication

La zone d'ombre n'existe pas ! Mais tout le monde n'est pas d'accord...

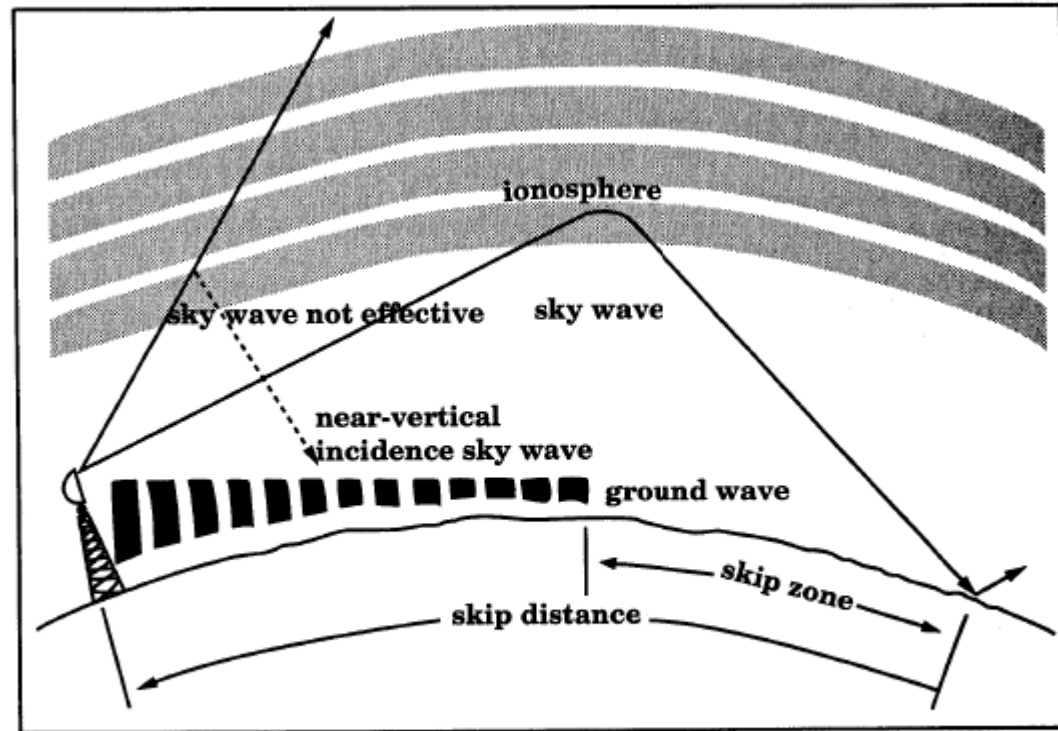


Figure 1. This illustration from FM 24-18 and other publications shows the incorrect concept of a skip zone. If such a skip zone exists when not desired, the communicator has improperly selected the antenna or antenna height.

Le classique : zone d'ombre... (skip zone)

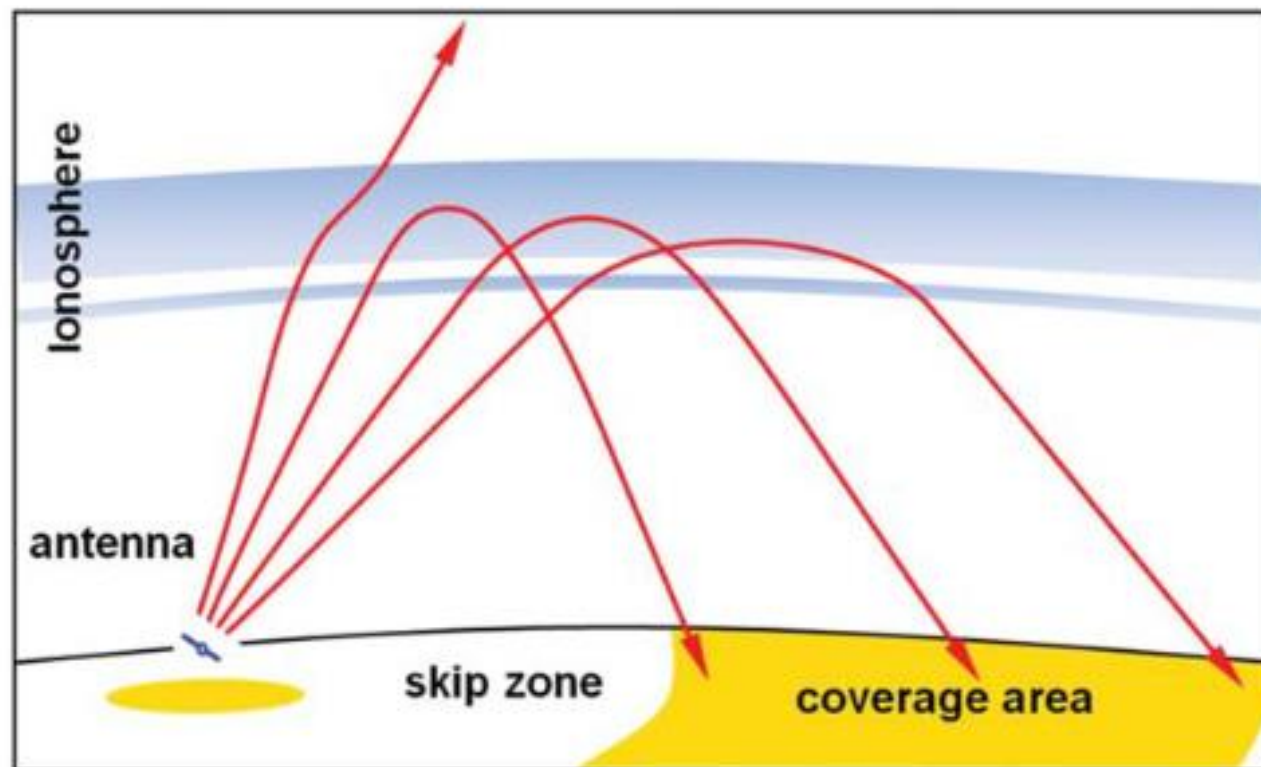
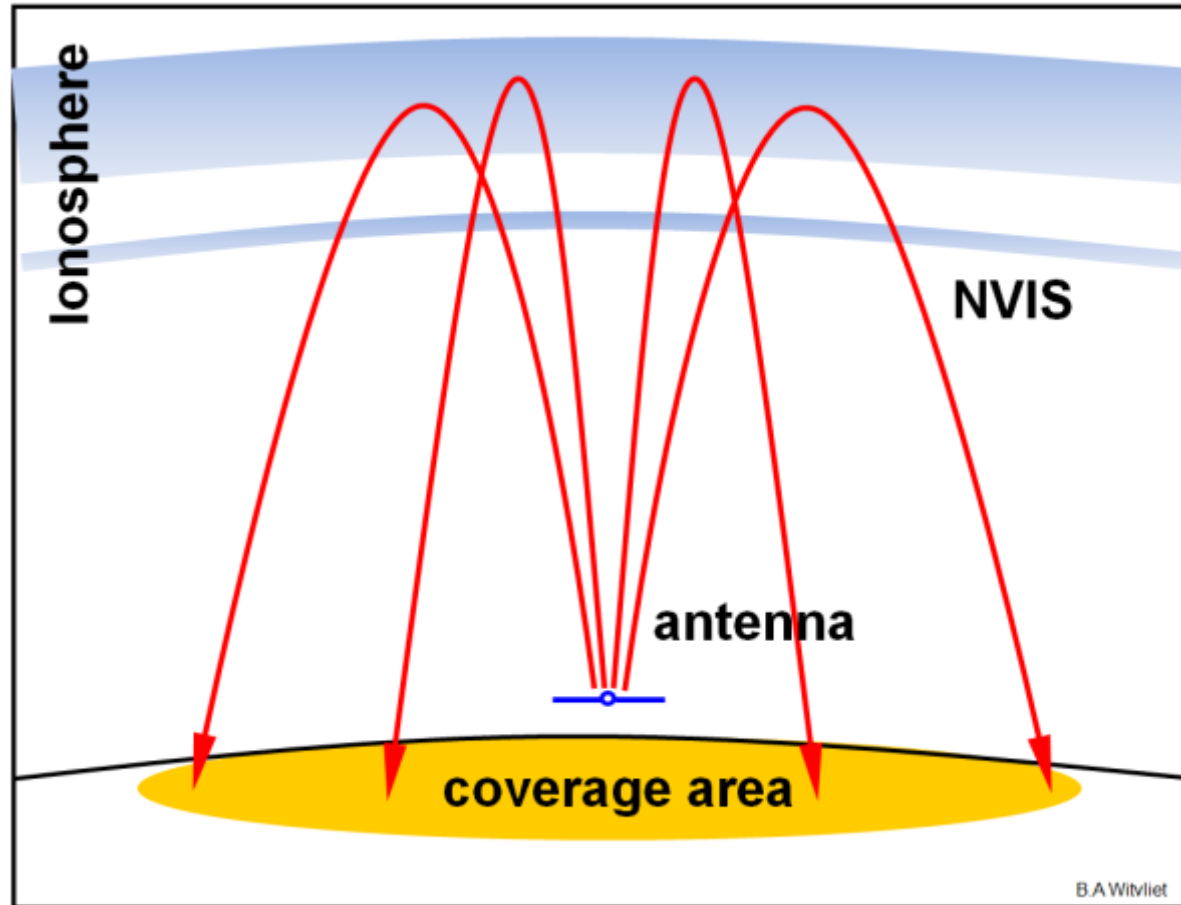


Figure 2.3 Transmission above the critical frequency of the ionosphere results in a 'skip zone'.

Mais en fait :



Dipôle horizontal (à gauche) et vertical (à droite)

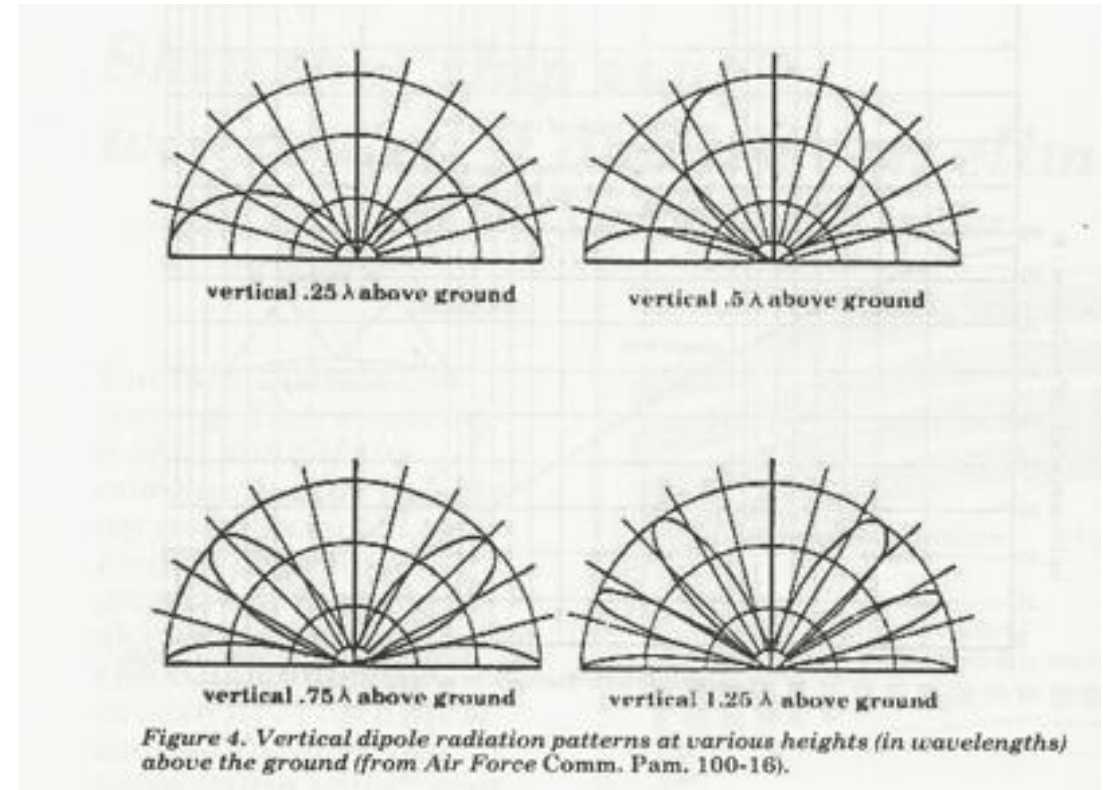
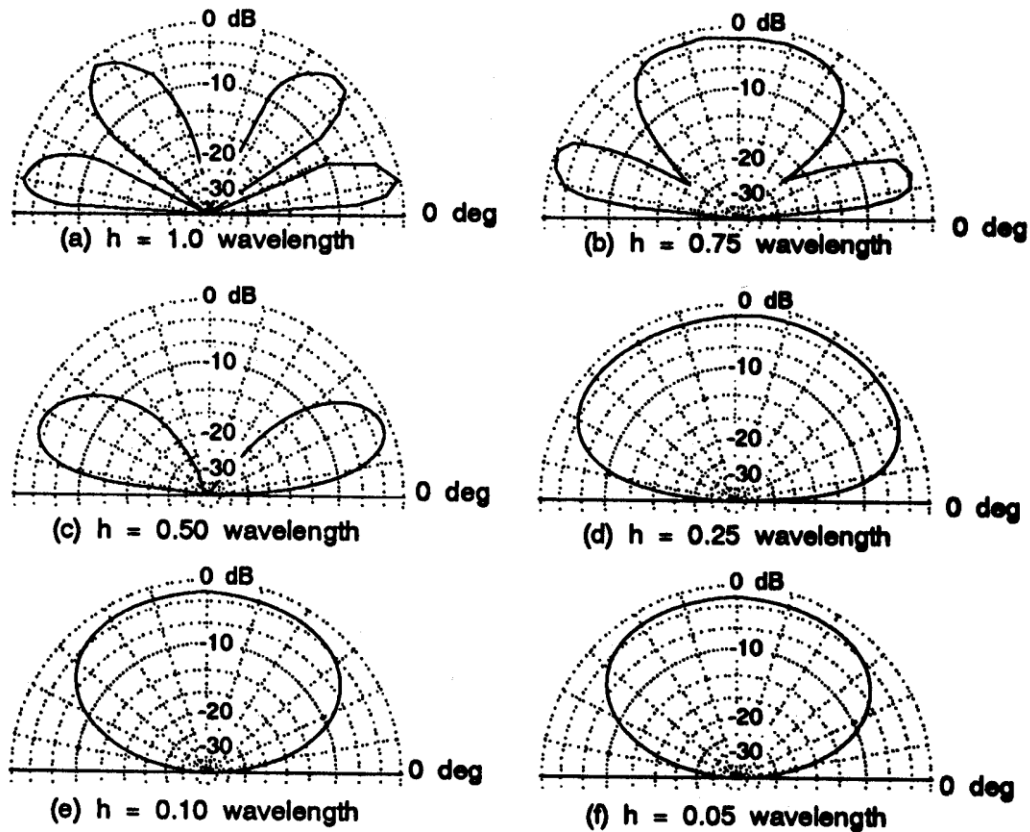


Figure 4. Vertical dipole radiation patterns at various heights (in wavelengths) above the ground (from Air Force Comm. Pam. 100-16).

Figure 4. Vertical radiation patterns for a half-wave horizontal dipole at the mounting heights indicated. Note that NVIS effect is pronounced at $h = 0.25$ wavelength and remains so as mounting height is decreased.

Perte en fonction de la hauteur de l'antenne

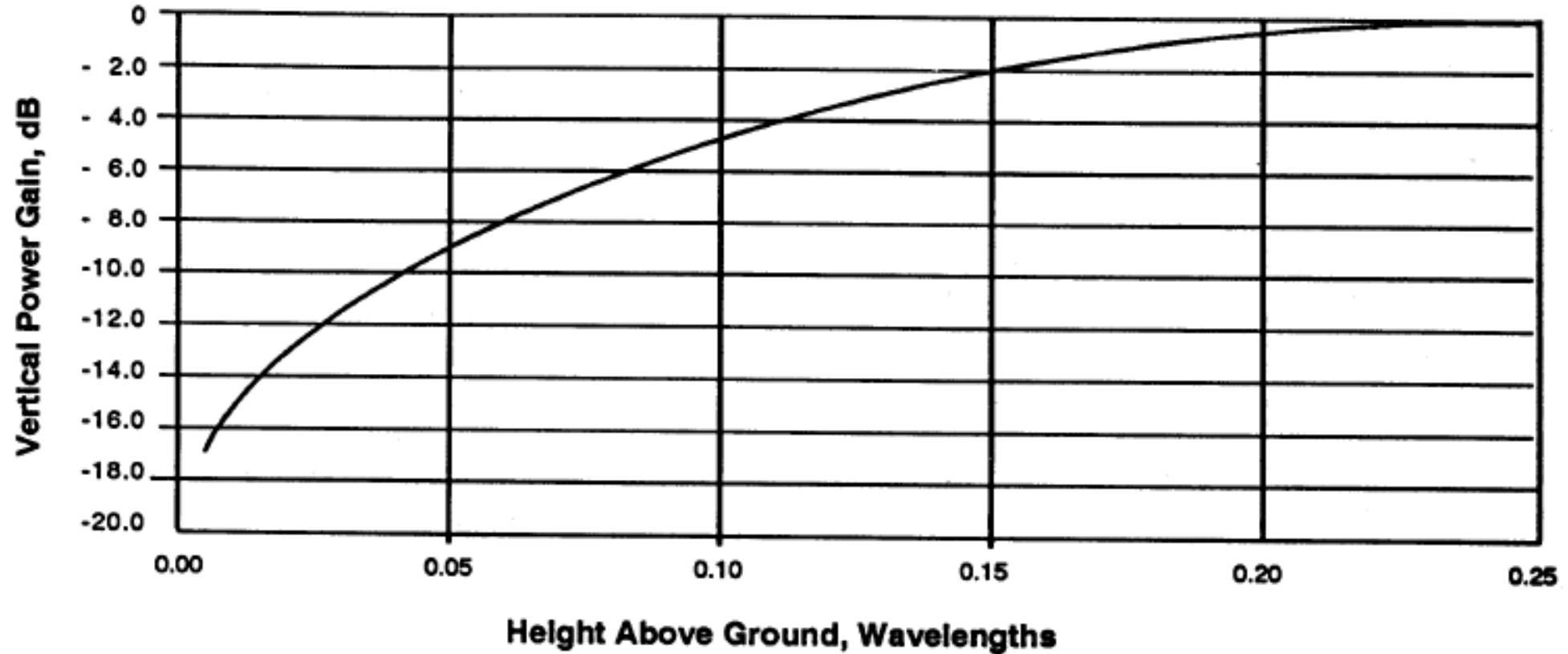
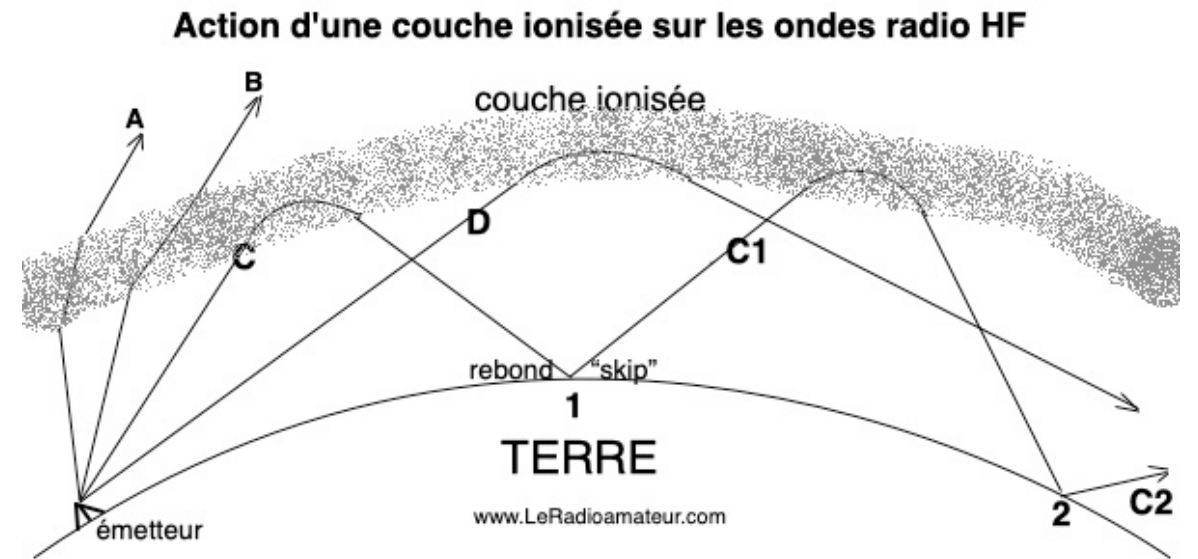
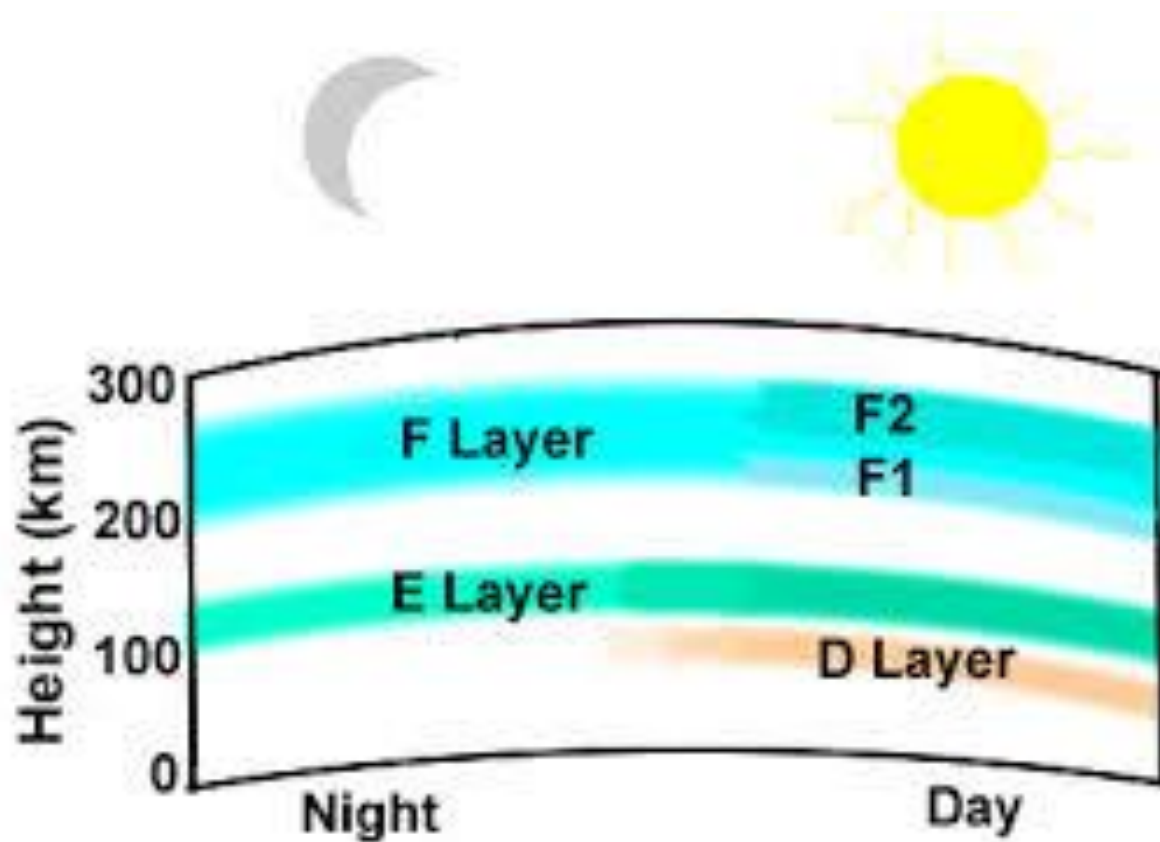


Figure 3. Antenna gain versus mounting height.

Propagation NVIS : surtout la couche F, car verticalement, les fréquences plus hautes traversent l'ionosphère

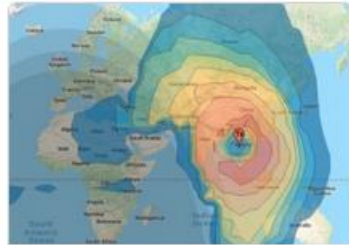


La fréquence... bandes basses 40, 60, 80m
<https://soundbytes.asia/proppy/>

Proppy

HF Propagation Prediction

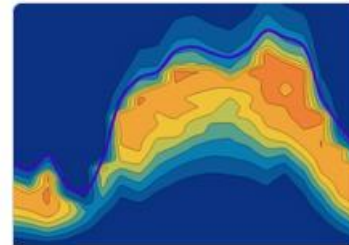
The tools provided by this web application enable users to predict available frequencies, signal levels and corresponding reliabilities for High Frequency (HF) circuits. All predictions are performed using the ITU's ITURHFPROP application; a software method for the prediction of the performance of HF circuits in accordance with Recommendation ITU-R P.533-14.



Région

Create interactive area predictions.

Area Predictions



P2P

Create interactive Point-to-Point predictions.

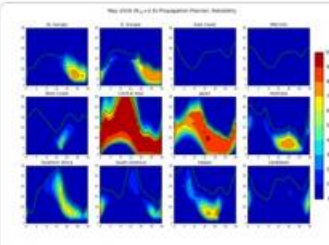
P2P Predictions



Beacons

Predict propagation from NCDXF/IARU Beacons.

Beacon Predictions

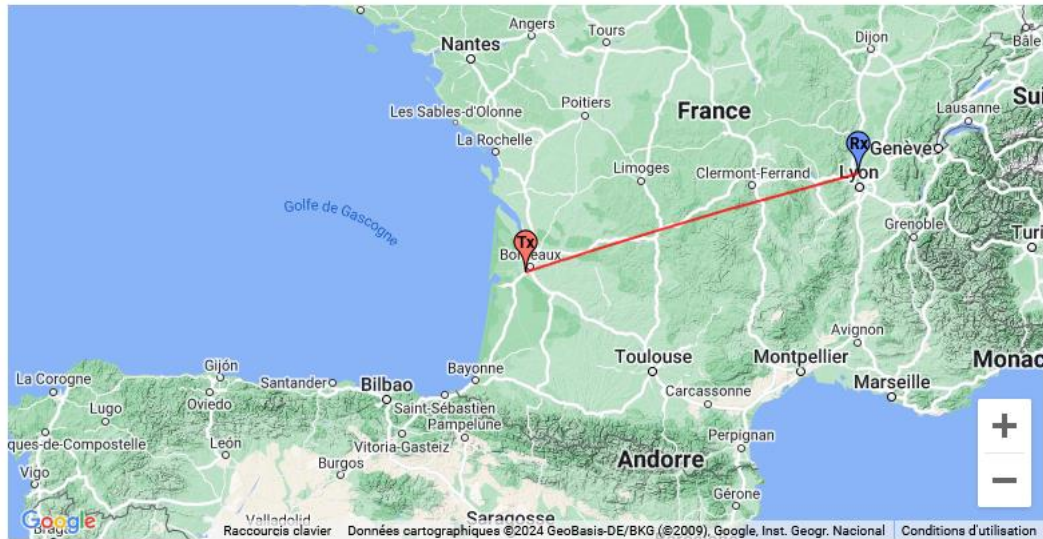


Planner

Create publication quality Point-to-Point predictions for multiple circuits.

Planner Predictions

Proppy HF Prévision de circuit: point à point



Système

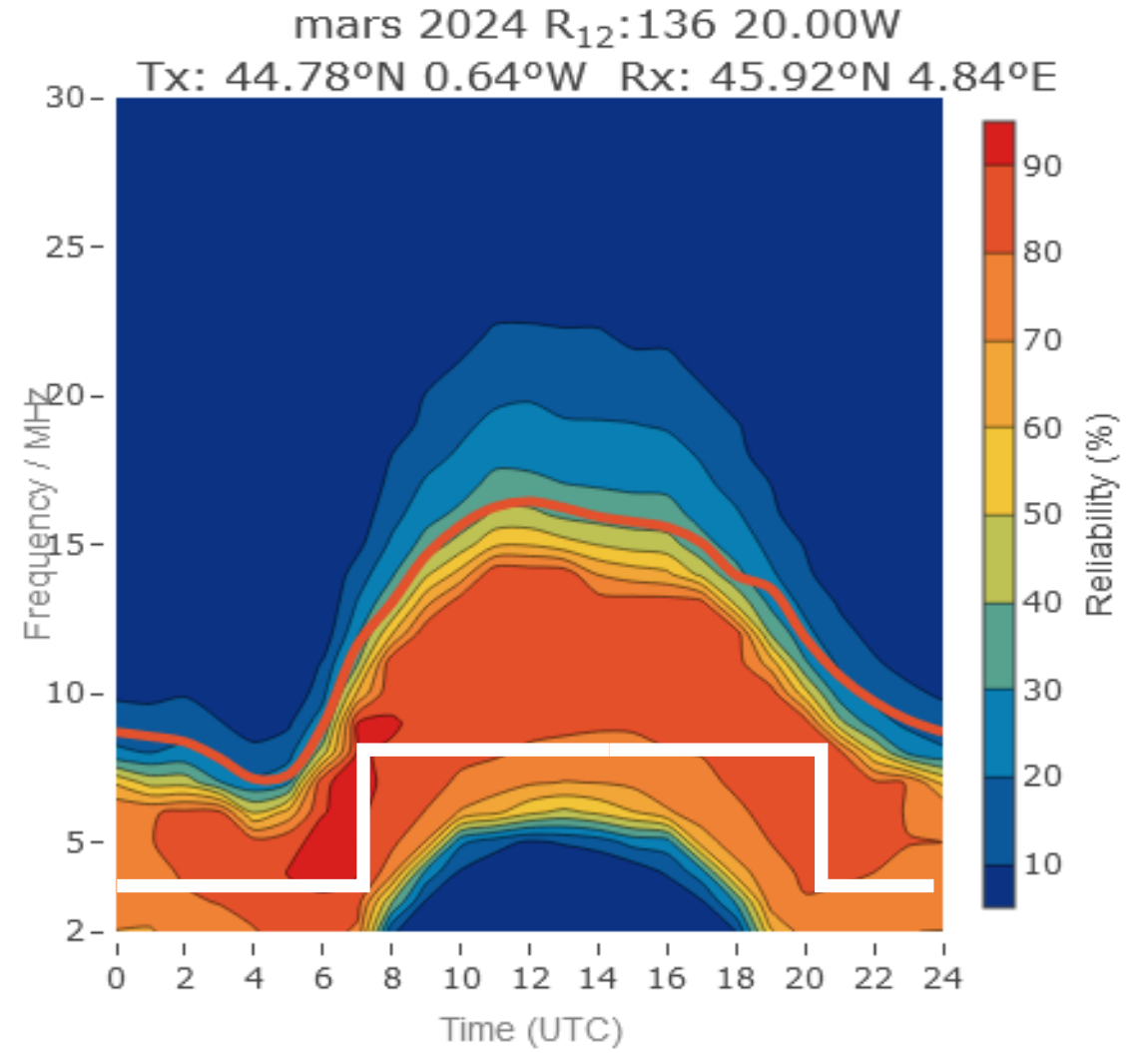
Date	<input type="text" value="mars 2024"/>	Puissance (W)	<input type="text" value="20.0"/>
Bande passante	<input type="text" value="SSB (Usable) (BW=3000Hz / SNR=)"/>	Environnement	<input type="text" value="Rural"/>
SSN Source	<input type="text" value="Standard Curves"/>	Path	<input type="text" value="Short Path"/>

Tx. Site

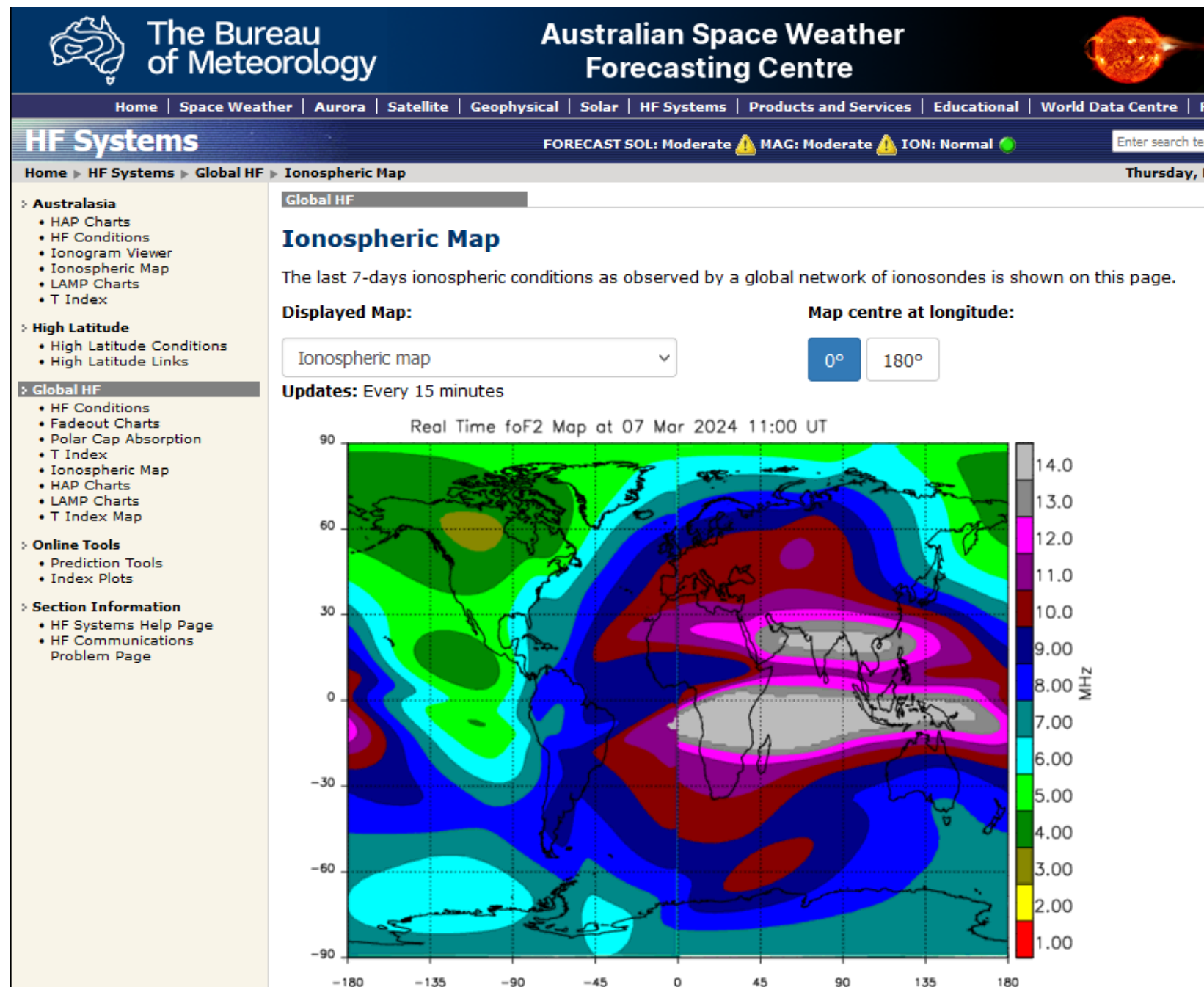
Latitude	<input type="text" value="44,7779"/>
Longitude	<input type="text" value="-0,6445"/>
Antenne	<input type="text" value="Isotrope"/>
Gain moyen (dBi)	<input type="text" value="2,16"/>

Rx. Site

Latitude	<input type="text" value="45,9206"/>
Longitude	<input type="text" value="4,8413"/>
Antenne	<input type="text" value="Isotrope"/>
Gain moyen (dBi)	<input type="text" value="2,16"/>



La MUF est dispo sur différents sites :
https://www.sws.bom.gov.au/HF_Systems/6/5



Les antennes : horizontales ou un peu inclinées pour un effet directif (photo F5NS) ; portée ??? (1000 km ?)

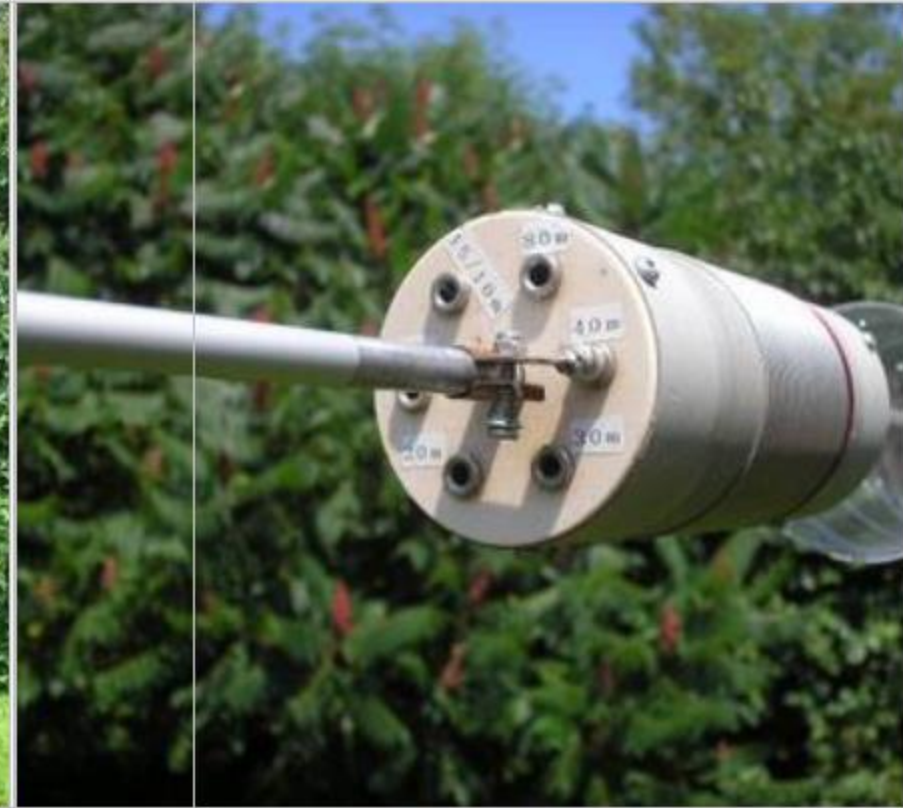


Le dipôle NVIS conçu et testé par Roland F6HGD

(39)

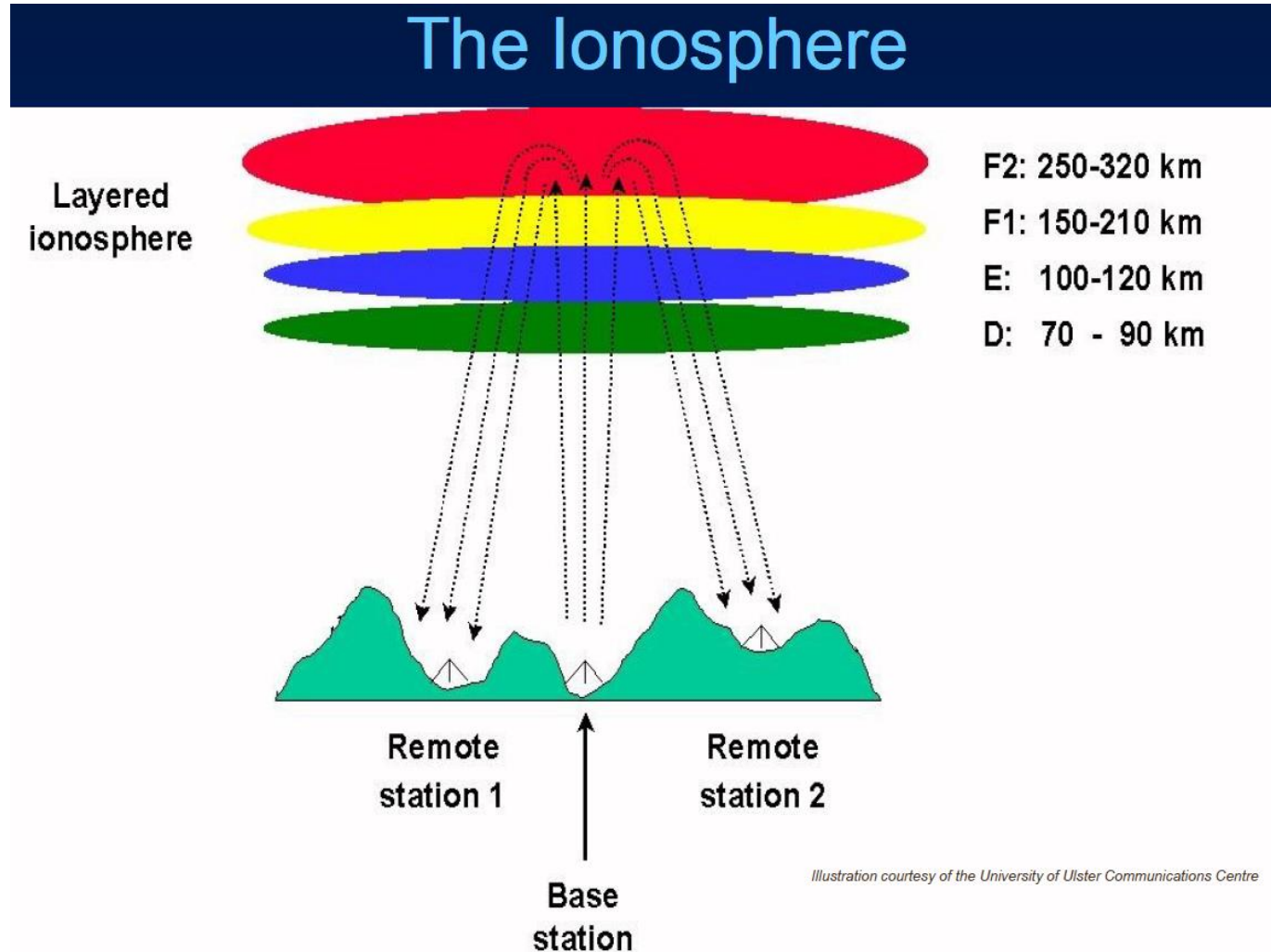


Dipole raccourci NVIS fabrication
F6HGD



La self de raccourcissement

La solution en région vallonnée (camping...)



LA POLARISATION

Tout cela et bien plus est dans la thèse :

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Near Vertical Incidence Skywave – Interaction of Antenna and Propagation Mechanism [PhD Thesis]

Research · November 2015

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1 author:



Ben Witvliet

Universiteit Twente, Enschede, The Netherl...

La compréhension de la polarisation en NVIS ne date pas d'hier

6.1.1 Circular polarization in NVIS propagation

Appleton [1933] showed through experiments in 1931 that double echo's from the ionosphere actually consisted of a pair of characteristic waves reflected by the ionospheric layers. These characteristic waves, the ordinary and extraordinary wave, have circular polarization of opposite sense and experience different delays. For the Northern hemisphere, the extraordinary wave has the lesser delay and right hand circular polarization (RHCP), and the ordinary wave has the greater delay and left hand circular polarization (LHCP). At other instants only one echo was received with varying elliptical polarization. He explained his findings with his magneto-ionic theory in the same document. Varying mismatch between the polarization of the downward wave and that of the receive antenna, further indicated as 'polarization fading', multiplies with the multipath fading. Logically, polarization diversity was described in 1932 as another way to reduce fading [Runge, 1932].

Pourquoi s'en occuper ? Je m'étonnais avec Pascal que tout marchait bien alors que *nos antennes étaient perpendiculaires !*

Le mystère de la polarisation... (certes horizontale, mais NS ou EW ?)

Il faut faire un peu de biblio...

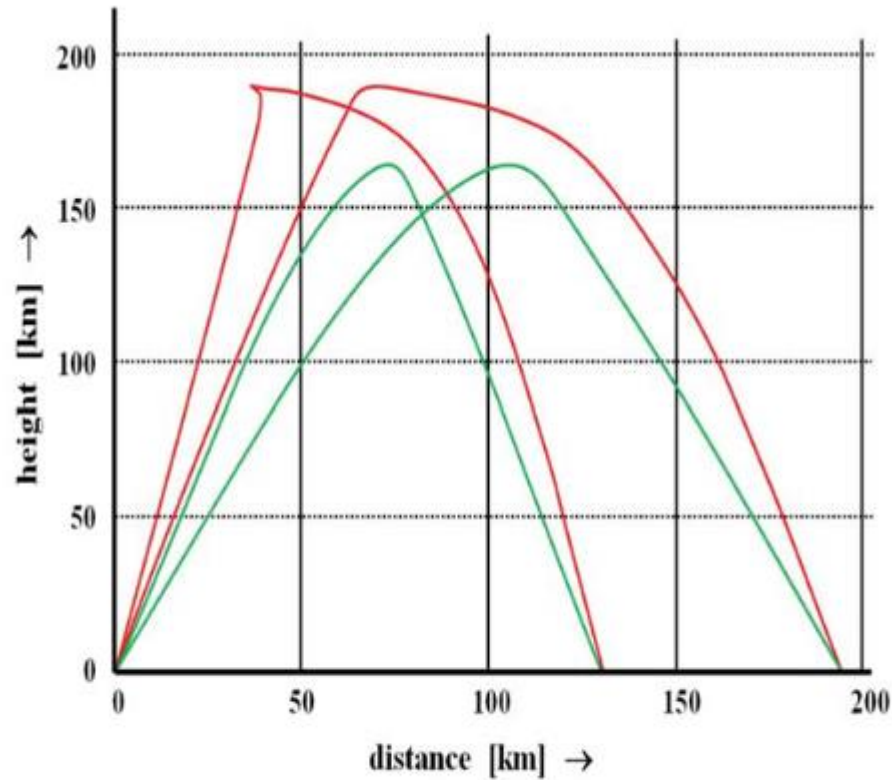


Figure 6.2 Ordinary (red) and extraordinary (green) waves follow different paths through the ionosphere. Simulated paths on 6.75 MHz, 1 October 2012 at 14:00z, at 52°N, 6°E with SSN=75, using PropLab Pro v3.0.

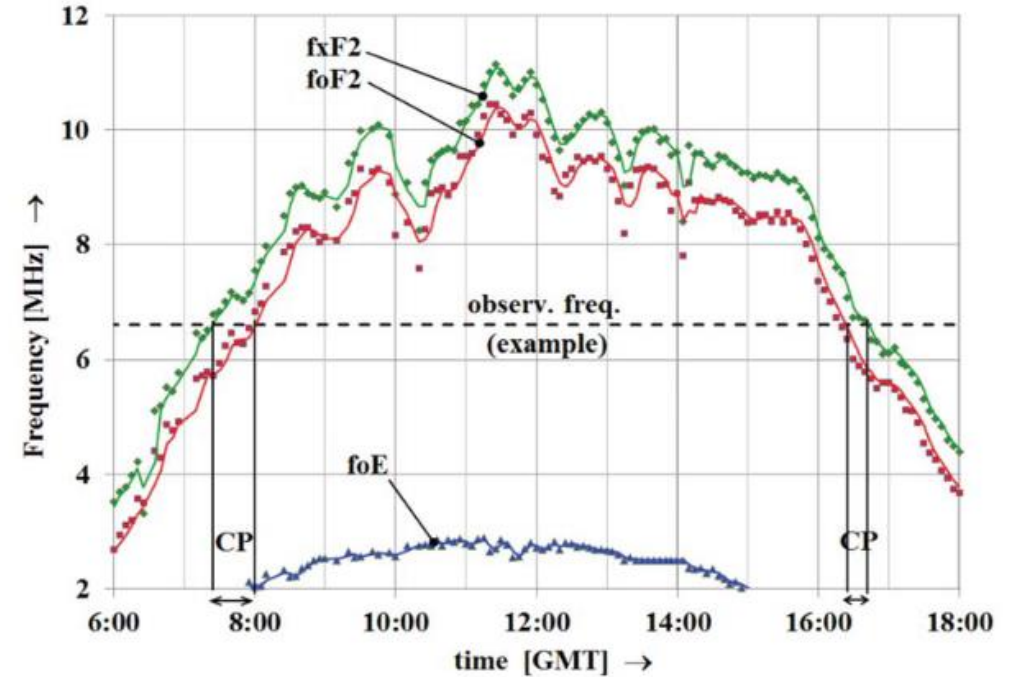


Figure 6.3 Variation of the critical frequencies of the F2-layer for the ordinary (foF2) and the extra-ordinary (fxF2) waves. An example is given of an observation frequency (dashed line) and two intervals in which circular polarization is received (CP). Data from the ionospheric sounder at Dourbes, Belgium of 12 Nov. 2012 is used.

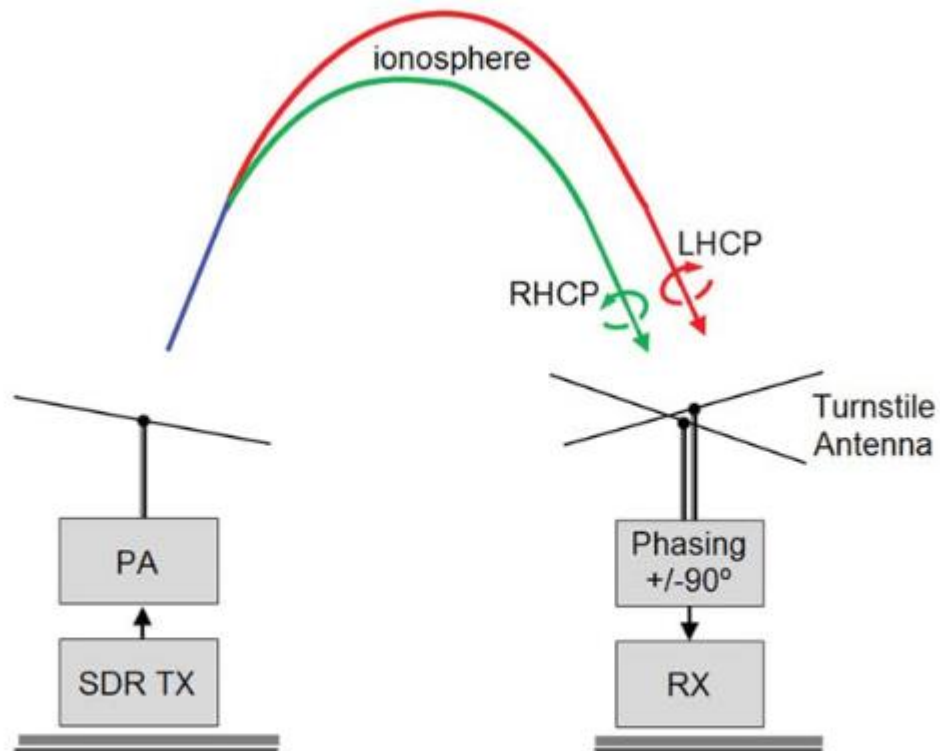


Figure 8.3 Measurement set-up of the NVIS characteristic diversity experiment. The signal of a linearly polarized transmitter is received on a dual circular polarization antenna at 110 km distance. SDR = Software Defined Radio.

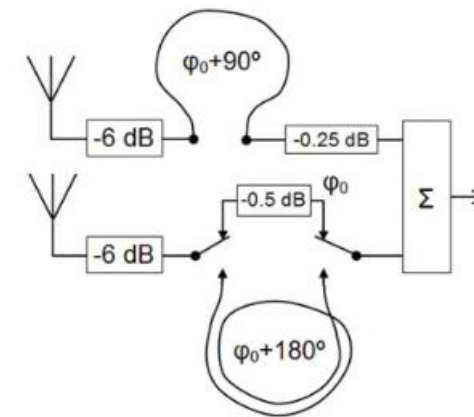


Figure 7.17 Block diagram of the phasing network for the Turnstile antenna using coaxial phasing lines to produce either -90° or $+90^\circ$ phase difference. The attenuation of the phasing lines is compensated with small attenuators (0.25 dB and 0.5 dB).



Figure 7.18 Practical realization of the phasing network for the Turnstile antenna.

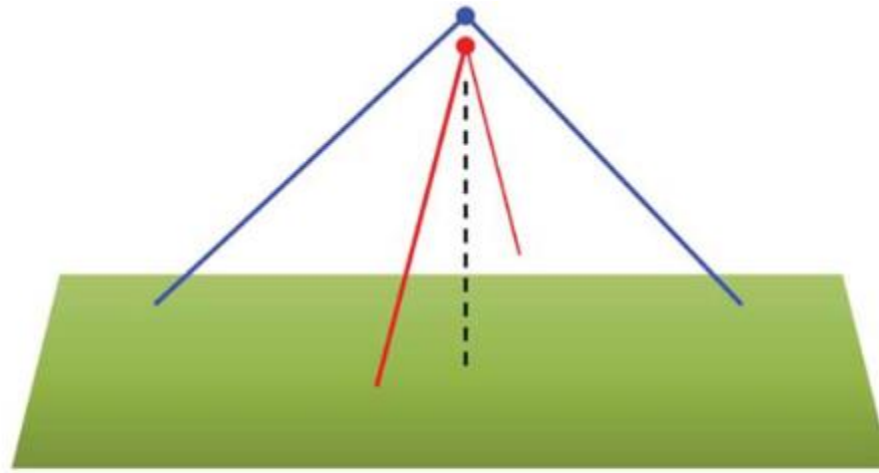
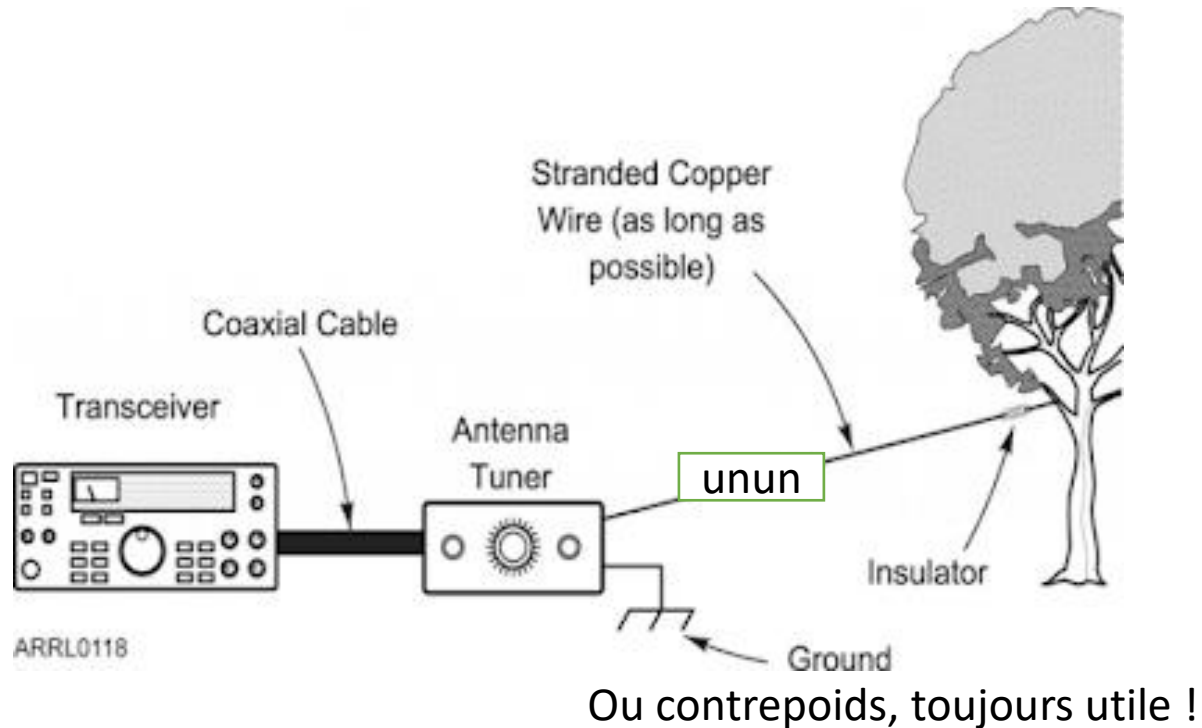


Figure 7.12 Turnstile antenna made of two quadrature-fed half-wave dipole antennas suspended in an 'Inverted Vee' configuration from a single extendable mast.



Figure 7.16 Turnstile antenna installed at the measurement location. The farmhouse and barn shown on the picture are at approximately 50 and 80 m distance. Other buildings are at >800 m distance.

La config typique du club :



Le unun est important si $L = k\lambda/2$, sinon il est facultatif.

Souvent, $L = 16,2$ m, pourquoi pas (perso le préfère 16, 23456789 m c'est plus efficace)

RESULTATS de QSO entre Pascal et moi

aucun échec entre:

- l'Alsace et la Côte d'Azur
- l'Auvergne et le 33
- le 69 et le 33

Bref toute la France et une bonne partie de l'Europe. LA ZONE D'OMBRE N'EXISTE PAS !

Conclusion : une antenne de 16,2 m horizontale entre 2 et 4 m de hauteur (par exemple), orientée comme on veut, une boîte d'accord, et on fait tout dans un rayon variable de 500 km et plus (1000 km), même depuis un fond de vallée, sur 40 m de jour, 80 m de nuit, et même avec une petite puissance (typiquement 10 ou 20 W).

Bibliographie... (la plupart des images de cette présentation sont tirés de ces liens)

EN FRANCAIS :

<http://www.radioamateur.ca/techniques/nvis.html>

http://f5rku.free.fr/files/la_propagation_par_ondes_nvis.pdf Il y a probablement petite bêtise dans ce texte, où l'on lit :

Directivité de l'Antenne NVIS Optimisée. L'Antenne dirige la totalité de son faisceau d'ondes vers le zénith. Par conséquent, son azimut (orientation) est sans importance.

Ce n'est pas correct. Si l'ionosphère était un miroir parfait, la polarisation serait conservée, et avec une antenne d'émission au sol NS, une autre antenne EW au sol ne recevrait rien. Ce qui nous sauve, ce n'est pas ce qui est indiqué dans ce texte, mais le fait que l'onde est réfléchiée en polarisation circulaire (dans les deux sens, « ordinaire » et « extraordinaire »).

<https://ref39.r-e-f.org/mapage2/index.html>

<https://www.radioamateurs-france.fr/wp-content/uploads/nvis.pdf>

https://f4eed.files.wordpress.com/2013/05/nvis-pas-sorcier_finale.pdf

EN ANGLAIS :

<https://link.springer.com/article/10.1007/s11235-017-0287-2>

<https://brushbeater.org/wp-content/uploads/2017/04/1996-fiedler-near-vertical-incidence-skywave-communication-book-worldradio-books-2.pdf>

<https://research.utwente.nl/en/publications/near-vertical-incidence-skywave-the-propagation-mechanism-the-imp>

<https://www.researchgate.net/publication/261551961> The Importance of Circular Polarization for Diversity Reception and MIMO in NVIS Propagation

<https://www.researchgate.net/publication/355645765> Escaping the Dead Zone a Bottleneck in Humanitarian Ionospheric Radio Communications

<https://www.researchgate.net/publication/316860666> The quality of the prediction for the NVIS propagation with ITS-HF propagation

<https://link.springer.com/article/10.1007/s11235-017-0287-2>