# The propagation of decametric waves



HamDXMap Your DX Companion 73!

#### I am Christian F5UII

Amateur radio operator since 1993 REF, Amsat-F, FY5KE





# A little anecdote

Back to 1996...



# **Propagation Briefly, Simply**



# The sun, the fortunate star of amateurs

- Ionosphere
  - o 60-800 km
    - F:120-800
    - E:90-120
    - D:60-90



6

# The sun, the fortunate star of amateurs



# **Electron density**

- Magnetic equator
- Equatorial anomaly
  - +/- 20° from magnetic
     equator
     TEL, TPL



# And what about storm? Solar Flare

- Sudden release of electromagnetic energy: X-rays, UV, light
- Reach earth in 8 min
- Ionization D layer
- HF Black out
- Duration 1, 2 hours
- Impact on lighted face of earth



# And what about storm? CME



### And what about storm - CME









# X4.5 during WAE SSB 14/09/2024



# **Refraction**



- Electrons oscillate at the frequency incoming wave
- Re-emit wave downward like a static reflector
- Curvature form due to gradual electron density

# **Refraction – About take-off angle**



# Ionosonde, vertical ionospheric sounder







# Ionogram

- hmF2 : altitude at max electron density F2
- Relation

Electron Densité N Critical frequency f<sub>c</sub>

$$f_c = sqrt \cdot \frac{Ne^2}{4\pi^2 \varepsilon_0 m}$$



# Ideal ionogram

Textbook case



# **Ionosphere sounder**







### Ionogramme

Hermanus lonogram
 Animation: 24 h en 10 s





# foF2, MUF

• Angle d'attaque *a* 

- Fréquence critique *fc*
- Maximum Usable Frequency

$$fmax = \frac{1}{sin(a)} . fc$$



# Bounce distance vs. take-off angle



Optimal take-off angle, single hop

# Ionosphere sounders around the world

 In 1967 about 27 stations in the world



# Base de données du GIRO

- Digital lonogram DataBase
- <u>https://giro.uml.edu/ionoweb/</u>











#### Leave nothing to chance when making DX contacts



# A real-time application

App' answering to

- For reach a point on the globe
- o now
- which bands to use?



# Working on HamDXMap dxmap.f5uii.net



main features (1)

MUF, foF2 Map

- In real time (15min) a huge thanks to <u>KC2G</u>
- 5 map representations
  - O Globe
  - Mercator
  - Equal Earth
  - O Equirectangular
  - O Natural Earth

#### Main informations

- Distance
- Maihenhead Locator
- Directions RX/TX et TX/RX



#### SP et LP profiles

- Wide useable (MHz) on Short and Long Path (2 tabs)
- Synthesis usable bands (3<sup>rd</sup> tab)



# main features (2)

#### **Automaticaly location**

Special callsign event locations by database from Jim AD1C



#### Station informations

- Position (DXcluster set/gra JN00AA)
- Local time
- Local weather condition

#### Activity on

eQSL

#### 09:34:28 3 LoTW Overcast clouds 4km/h French FY

#### Sun duration

RX & TX sun

Sun

Kourou

28°C

FYSKE is on LoTW

CO 09 ITU 12 SA

Grayline effect

# main features (3)

#### 24 h predictions

Thanks to Jari OH6BG, James
 HZ1JW and Juho OH8GLV



A quick and intuitive overview of propagation potential on 24 hours (Colors shows Circuit Reliability – Probability of successful communication)



# **Secondary features (1)**

#### Sun

- Vertical position
- Image, <u>SDO</u> satellite



Solar activity indices

-ஜ்- SFI 135, K 2.7, A 9 😯

| А     | K   | Conditions        |
|-------|-----|-------------------|
| 0     | 0   | Quiet             |
| 2-3   | 1   | Quiet             |
| 4     | 1   | Quiet / unsettled |
| 7     | 2   | Unsettled         |
| 15-27 | 3-4 | Active            |
| 48    | 5   | Minor storm       |
| 60    | 6   | Major storm       |
| 132   | 7   | Severe storm      |
| 208+  | 8+  | Very severe storm |

#### Northern lights

- Position, intensity
- Real time, source
   <u>NOAA</u>



30 minutes aurora predictive map. The aurora borealis is positione

on the poles of the earth and can affect our radio links. The color indicates the intensity.

Soho - video

# **Secondary features (2)**

#### **DXpeditions calendar**

Thanks to William
 NG3K

| ×                                        |                             | ENTITY | ENTITY NAME            | CALLSIGN | START      | END        | TIMELINE     | INFORMATIONS                                                                                            |
|------------------------------------------|-----------------------------|--------|------------------------|----------|------------|------------|--------------|---------------------------------------------------------------------------------------------------------|
| /P9 • Started                            | <ul> <li>Started</li> </ul> |        | Namibia                | V51      | 29/04/2025 | 15/06/2025 | 48 0         | By HB9SHD as V51/HB9SHD;<br>40-6m; SSB + digital - QSL :<br>LoTW                                        |
|                                          | <ul> <li>Started</li> </ul> | VP8    | Falkland Islands       | VP8DPD   | 10/05/2025 | 12/07/2025 | 37 <b>27</b> | By G3WIP; 20-10m; FT8 SSB;<br>spare time operation - QSL :<br>EA5GL                                     |
| ⊡ 2 days left<br>10/06/2025 → 17/06/2025 | <ul> <li>Started</li> </ul> | 3DA    | Kingdom of<br>Eswatini | 3DA0GY   | 22/05/2025 | 20/06/2025 | 25           | By LA9GY; HF; mainly CW,<br>some SSB; QSL via LA9GY<br>direct; perhap QRV for CQ<br>WPX CW - QSL : LoTW |
| By WA4PGM as<br>VP9/WA4PGM fm IOTA NA    | Started                     | 8R     | Guyana                 | 8R1TM    | 01/06/2025 | 10/07/2025 | 15 <b>25</b> | By PY1SAD fm Georgetown<br>(GJ06vs); 160-6m; CW SSB +<br>digital; QSL via PY1SAD<br>direct - QSL : LoTW |
| ට් QSL LoTW                              |                             |        |                        |          |            |            |              | By K9EL as FS/K9EL; 40-6m;<br>holiday style operation: OSL                                              |
| Set RX                                   | • Started                   | FS     | St. Martin             | FS       | 04/06/2025 | 18/06/2025 | 3            | via Club Log OQRS - QSL :<br>LoTW                                                                       |
| Info by OPDX at 22/05/2025               |                             |        |                        |          |            |            |              |                                                                                                         |
|                                          |                             |        |                        |          |            |            |              |                                                                                                         |

#### World SDR

- > 1300 receivers
- Favorites



# **Secondary features (3)**

#### Zone layers

- ITU •
- CQ



#### Bounces

- F layer altitude
- Starting angle



#### **PDF Print**

- with stations
- without station
- Paper Format



# **Communication with Win-Test**





- RX automatically moved on partial keying and/or Logged callsign
- Spots located on map from DXCluster
- Gab message

# **Communication with Win-Test**

#### wtSock gateway Installation guide

About wtSock... Settings... Restart

Exit

wtSock

^ 🗔

| wtSock            |              | ×       |
|-------------------|--------------|---------|
| Win-Test (UDP int | oound)       |         |
| Port:             | 9871         | Default |
| Websocket server  | r (outbound) |         |
| Port:             | 8080         | Default |
| Output messages   |              |         |
| ✓ LoggedCall      | 🗹 Keyboar    | rding   |
| DXCluster         | Status       |         |
| Summary           | Gab          |         |
|                   |              | Help    |
| Cancel            | Apply        | OK      |



### **Communication with Win-Test**



# **Some evolutions**

#### **DXpeditions list**

Add DXCC Most Wanted position



#### **ADIF** import

Simple drag-and-drop to draw all contact on a map

Replaying 48 hours MUF historic maps

#### Frequency steering of SDR receivers with real VFO (WinTest)

**Realtime Alert on** 

From DX cluster, gualified

**DXpeditions** 

Browser extension (Chrome) via wtSock

#### Cooperation with Jari OH6BG

New prediction layers (Voice of America Coverage Analysis Program)... *To be defined* 





# **CQ-DL 11-2023**

#### Danke an Thomas, DJ2TG

#### Aktuelle Funkbedingungen bewerten

#### HamDXMap

Themas Gräve, DJ2TG

Auf welchem Band ist es möglich, eine Funkverbindung zu einem bestimmten Land aufzubauen? Die Webselte durags/Sull.net, die von Christian, FSUII, bereitgestellt wird ermöglicht eine schneile Bewertung der aktuellen Funkbedingungen.









DAS AMATEURFUNKMAGAZIN 11-2023

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(DAR)

FUNKBETRIEB

Danke an des Österreichischen Versuchssender verbandes

**QSP 09-2024** 

| S CAL                                                                      |                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |
|----------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| art                                                                        | DX-Kalen         | der September                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   |
| abe 2024 (Nr. 142) des Newsletters                                         | bie 4. Sept.     | TR/BJOTP, Conside, 10TA EU-014                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                   |
| X Association sterit at jet21 out der                                      | bis 4. Sept.     | #W/WIMD, Timer Lotts                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Purples the man                   |
| hereit. Zu den Hilberunkleren geheren                                      | Die 5. Sept.     | CYNE, SZ, Paul Marss, KOLA INA-DIN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | erisprechen der                   |
| a nächstes INDEXA?" von Otis Vicens                                        | are d, oeps.     | Fordered, THESAPO, THESAP, THESAPP, Frankrich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | withbaran SDR-                    |
| indigi den Next Generation Fund zur                                        | bis 15. Sept.    | FO/FYSMB, Tanki (DTA OC-046) and                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | nom MaushSok ka                   |
| Ibszogener Dispeditionen an" von Hal                                       |                  | Fekarasa (DC-066)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | A toF23 für Shor                  |
| disonsberichte von CBSZA Juan Fem-                                         | 1980 273. Siept. | JSENO_UJ01, Minurei Yatuhenu.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | pagan usser. Fu                   |
| L BETX (Dayana, Pedruar 2024), VP5G<br>2010, UR10 & METS (BC, MS & CC, 266 | No. 23 Cost      | RUIA DC-073                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | herutlerladen kar                 |
| Turing Bergenice des Burbas Silts                                          | the 30 Gent      | SCHOOL AND A DATE OF A DATE OF A DATE OF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Modichest, sich                   |
| ring = DXin* sparie , Developing World-                                    | big 30. Sept.    | CE-ARROXA, Sonderry/zeichen, Österreich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | programm die                      |
| ough Racko Communication" von Jeff                                         | bis 33. Sept.    | CEPOME, Sondemutzekchen, Osterneich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | bedingungen at                    |
|                                                                            | 381.31.Okt       | DE20501X, Sonderry/Jetchen, Österreich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | eigenen Station                   |
|                                                                            | 100.333. Nov. :  | YT10068, YU192488, Sonderrutzsichen,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Deveration avoid                  |
| 25 int benefits viel stärker als erwortet.                                 | In 11 Dec        | AANDREY BARTLA Souders frankler                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Auch-einige aktue                 |
| and Antoine Eathering unit-antoine that                                    |                  | Krodet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Fer) werden einge                 |
| rden. Diese werden wehrscheinlich Em                                       | 546.31.Dec       | CSGM, Ganthia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | DX, de man aut                    |
| CW und \$58 zum Leben                                                      | 88 31 Dec.       | DG225UETY, Sandernutzeichen, Deutschland                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | lan anon de ben                   |
| arwookan, wie wir es seit                                                  | 108 31- Dez.     | DMBCHOTA, Sonderrufzischen, Deutschland                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | gen für einen Kon                 |
| meter als 20 Jahren nicht                                                  | 96 31 ptz.       | DPSULAN, Automoty bland, Deutschland,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                   |
| mahr erlott habon, Die                                                     | Inc. 11 Terr     | EMONTANE IT Southern Franklass (Benning                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <ul> <li>Was ist der t</li> </ul> |
| ersten Arusschen werden                                                    | tes 31 Dec       | HEISOCH HEODEP HENDEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | WSJT-X7 Der 1                     |
| unter Danier nach North                                                    |                  | Sandernafzeichen, Schweiz                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | redglicht as eine                 |
| und Sudamerika sein. TEP                                                   | bio 31. Dez.     | CENDORADED, Sonderrufzschen, Österreich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Usos /mr. hone                    |
| advinte bereits ab Sep-                                                    | 100 31. Dec.     | OR100LGE, Sonters.Eyesten, Beigen                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | farren, an des r                  |
| a tember immer Muliger                                                     | 196 3T. DEL      | SANSOPHIA, SANCE SCHOLENCIES,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | SuperFox sender                   |
| wenden.                                                                    | No. 31. Dec.     | SMSSIM Sandersdanichen Pales                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ting ene konst                    |
| en können sehr klein sein und leicht                                       | be 21. Dec       | VT100R, YU100B, Sondersuber, Sarbern                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | mit einer Breite v                |
| Me von 6m ist bereits ausreichend, hö-                                     | bis 30. April 25 | RELAKE Progress Station, Antarktis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | perfox karn Be                    |
| seer.                                                                      | 28. Sep6. Okt.   | TMSIJP Sonderrafaidchen, Frankraich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Dra zu neuen Supe                 |
|                                                                            | 1-33.Sept        | #4075#, Senderru/Delchen, Italies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |
| ndeation in realized by date/ in in                                        | 7.565-310kt      | Lotatow, sonderuryckien, Bulgaten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                   |
| verbessert worden und bietel zahlre-                                       | T-IS Sent        | 22240 Testation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | HAMBORSE                          |
| ten. Auf der Webseite findet man eine                                      | 14-23 Sect       | \$1240 Jantin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Phoeneochuse                      |
| elbung der einzelnen Features und wie                                      | 18.54pE. Ukt.    | Seriex, Muta Island, KITA AF-054                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                   |
| forn Tool umgaht. Sohr interassant finde                                   | 24. Dep4. Dkt.   | A25A0, Ectoward                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | OESKAP - Klaus.                   |
| hen der wirksch zahlreichen SCHL web-                                      | 131.001          | E-EVEN, Sondamutpacture, Italian                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 3-Band-Beam, 7 E                  |
| to Miles Warnen Ball net/ unit linet                                       | 11.17.00L        | C21999, Nauru, KITA CC-031                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | E-Antenne, lange N                |
| en. Man kann eich einen SDR-Errettin-                                      | 1.31 80          | SARTHI Southern Indee                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Freed Stalkalements               |
| setzten. Um die zahlreichen Empfänger                                      | 1. Not -31. Dez. | LZ2TEPA, Sonderutzsichen, Bulgarien                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | rie autgebout, bie 3              |
| können, Kann man mit dem Mausrad in                                        | 11-20 Nex        | \$62, San Torse, X37A AF-823                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 891,- um 650,- €.                 |
| eri. Mitte August gab es 144 Web/SDR,                                      | 15. Mox4. Dat.   | 3002, Robarna Island, KOTA DC-080                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | OEGANL - Hors.                    |
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OSEP AMATEURFUNKJOURNAL des Österreichischen Versuchesenderverbandes

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# YouTube

### **Funkwelle DL2ART**



# **F5SVP**

Présentation du site HamDXMap de F5Ull

# 

# **DL2YMR**



# Ham Shack Reviews



# **110 000 visits**

Since 04/2023

# **42 % Deutschland** Total success!

États-Unis

### **Some other resources**

• VOACAP

www.voacap.com/hf





www.wsprnet.org/drupal/ws

**WSPR** 

prnet/map

wspr.live

#### **Reverse Beacon**

https://www.reversebeacon. net/main.php



How help?

 Put a link to HamDXMap on your ORZ page on your website

Integrating guide https://codepen.io/f5uii/full/vYVEmYg

| Share 🌒 HamD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | XMap on                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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# How to help?

- Suggest ideas
- Report a bug





# They have already helped HamDXMap

- Features suggestions :
  - Stefan DF6SU, Alex, Laurent F6FVY, Florent F4CWN, Tom DJ2TG, David F4HJA, Aurélien F4ANS, Pieter N4IP

Sources & Releases



# How to help?

- Your fee support
  - One-shot coffee
  - Monthly subscription





### Resources

- DL2YMR <u>https://www.youtube.com/watch?v=MENYKcBe1yU</u>
- Physics Solutions PH, MAPUA Manille, Philippines :
  - Space Science Lecture Measuring the lonosphere <u>https://www.youtube.com/watch?v=Dk4vy1plveM</u>
  - Space Physics Lecture The Ionosphere <u>https://www.youtube.com/watch?v=kjthQdc\_bx0</u>



### **Resources**

- About Ionosonde system: <u>https://www.earth-</u> prints.org/server/api/core/bitstreams/33291929-7f8c-44a3-ab8eb7efb1fd528d/content
- The Ionospheric Propagation Channel : <u>SermiPhDthesisLowRes06.pdf</u>
- Ionosonde setup NOAA :

https://data.ngdc.noaa.gov/instruments/remotesensing/active/profilers-

sounders/ionosonde/documentation/VIPIR/VIPIR\_Site\_Needs-May-15.pdf



# Merci



How propagation works



# www.f5uii.net

Templiner twethe pxer

#### To thank you, stickers as a gift...

