

Direction de la Production

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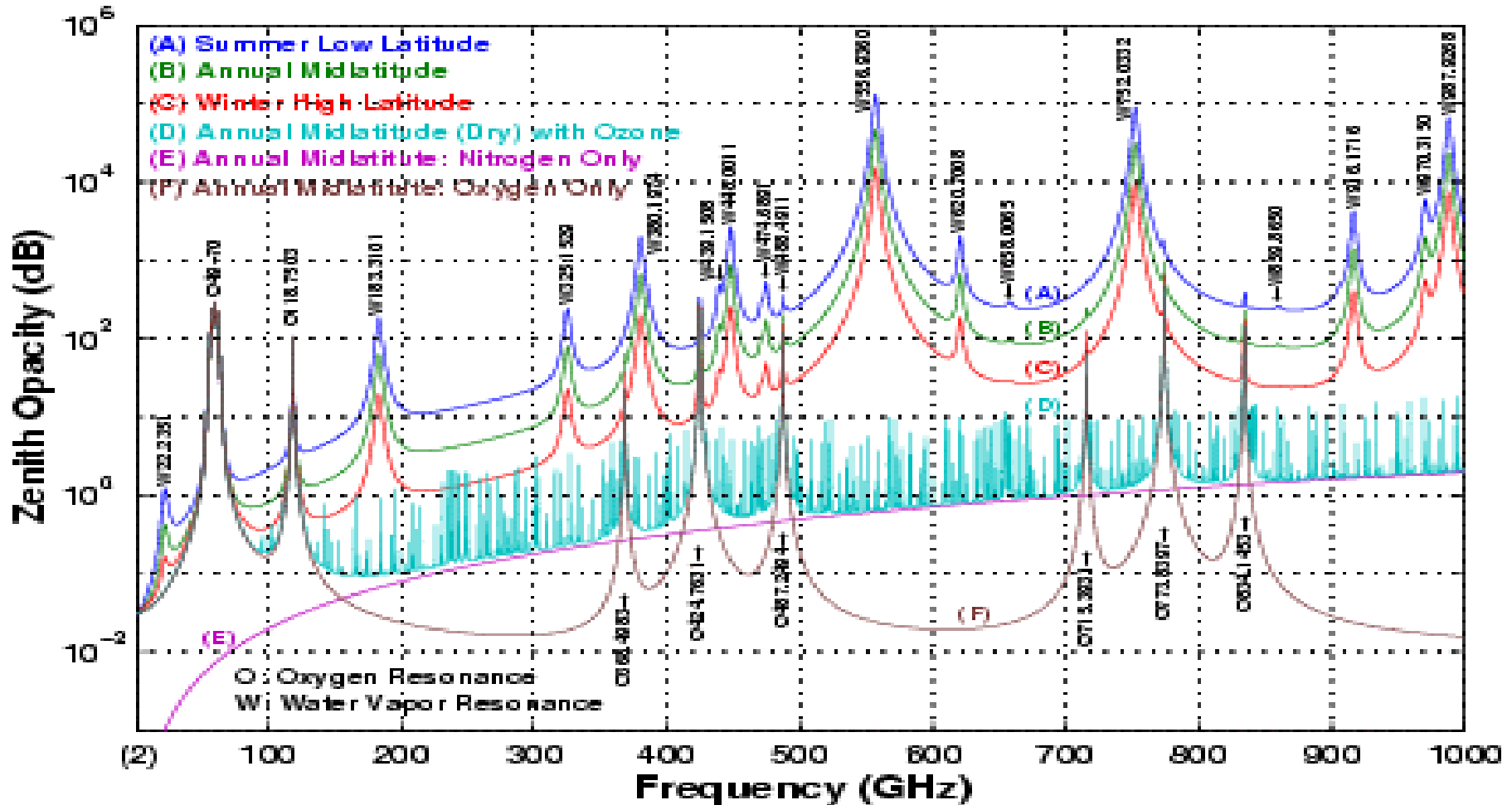


PASSIVE MICROWAVE PROTECTION

Guy.Rochard@meteo.fr

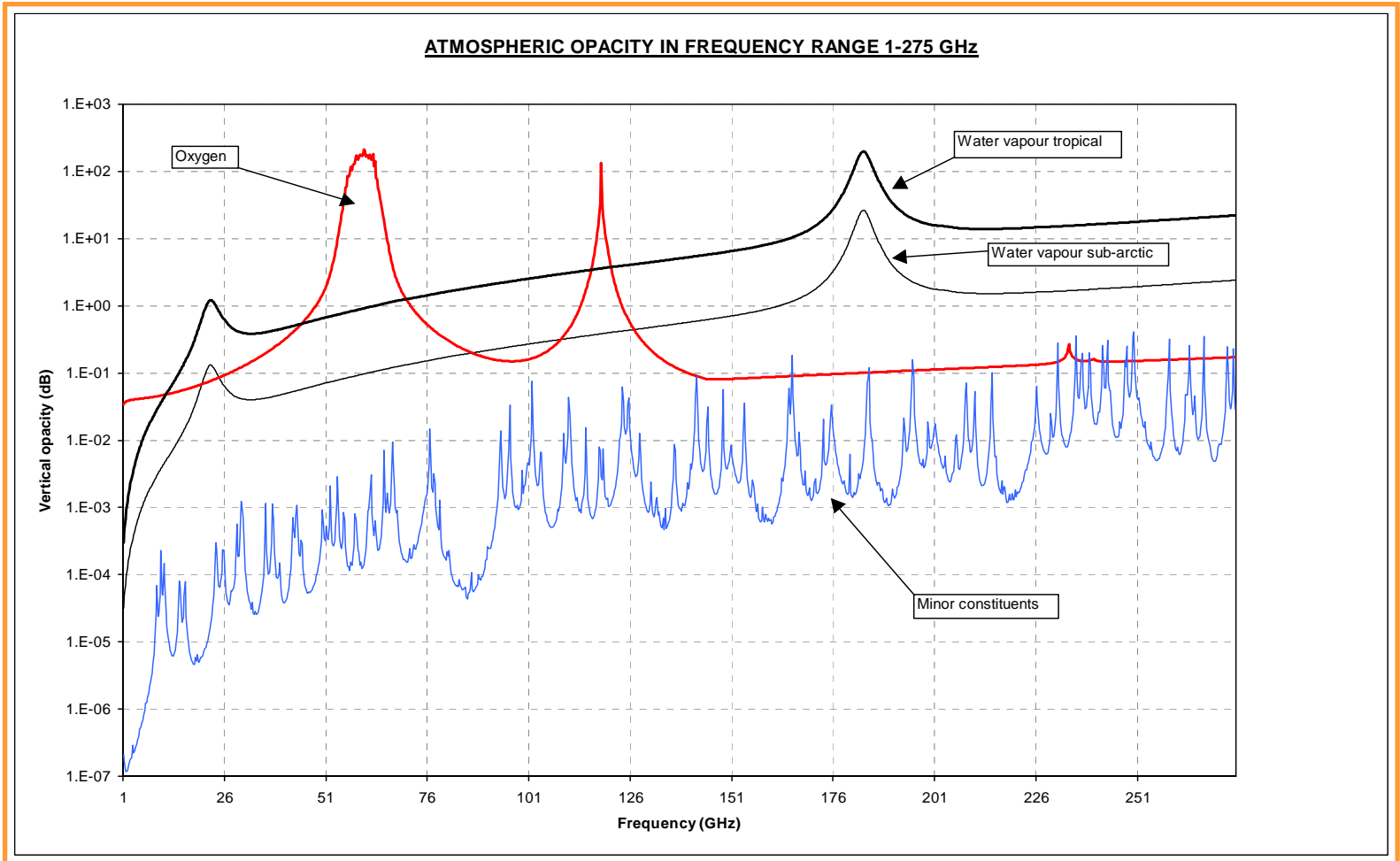
WMO / EUMETNET / ITWG / SFCG

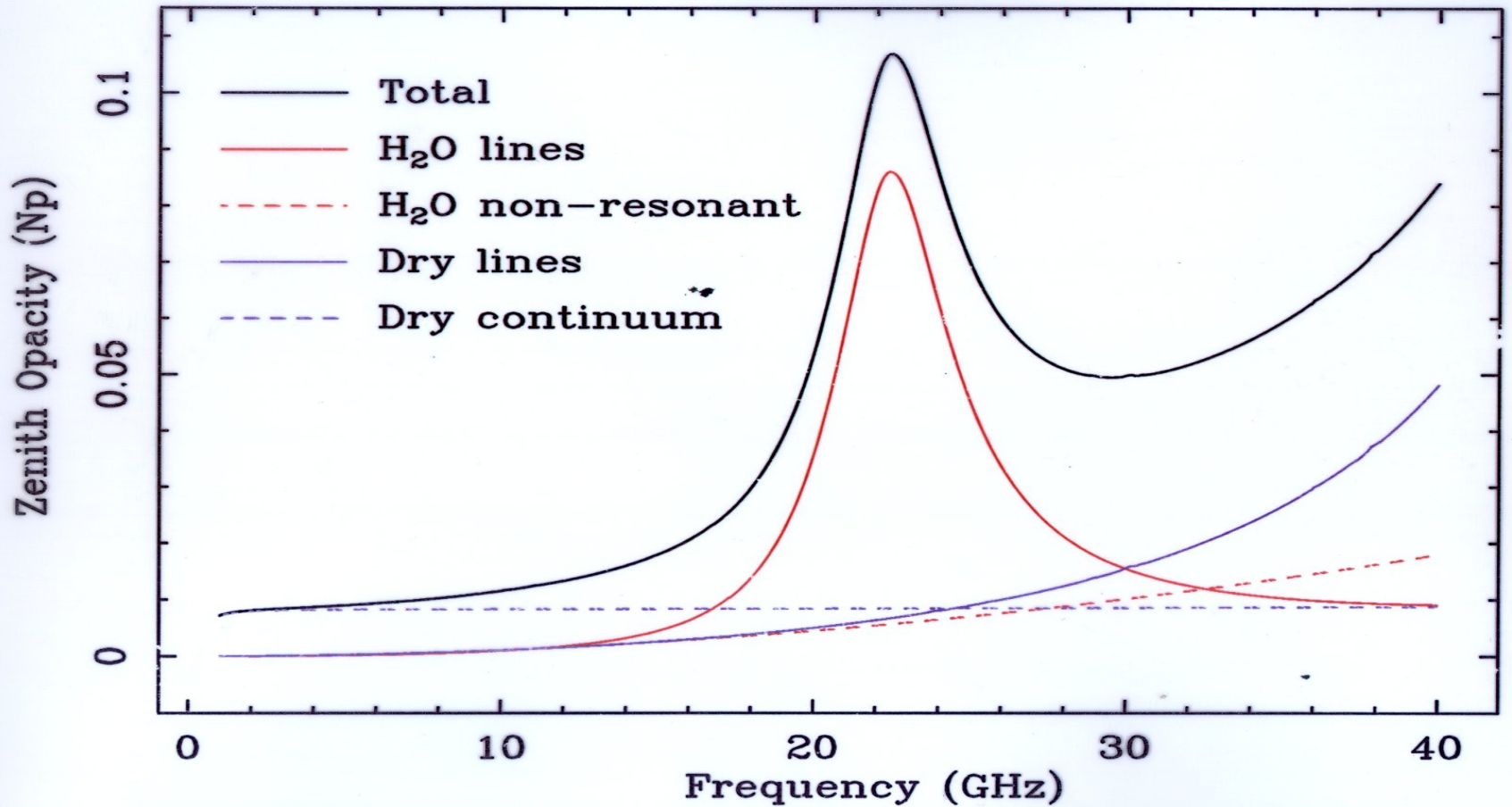
and **METEO-FRANCE**



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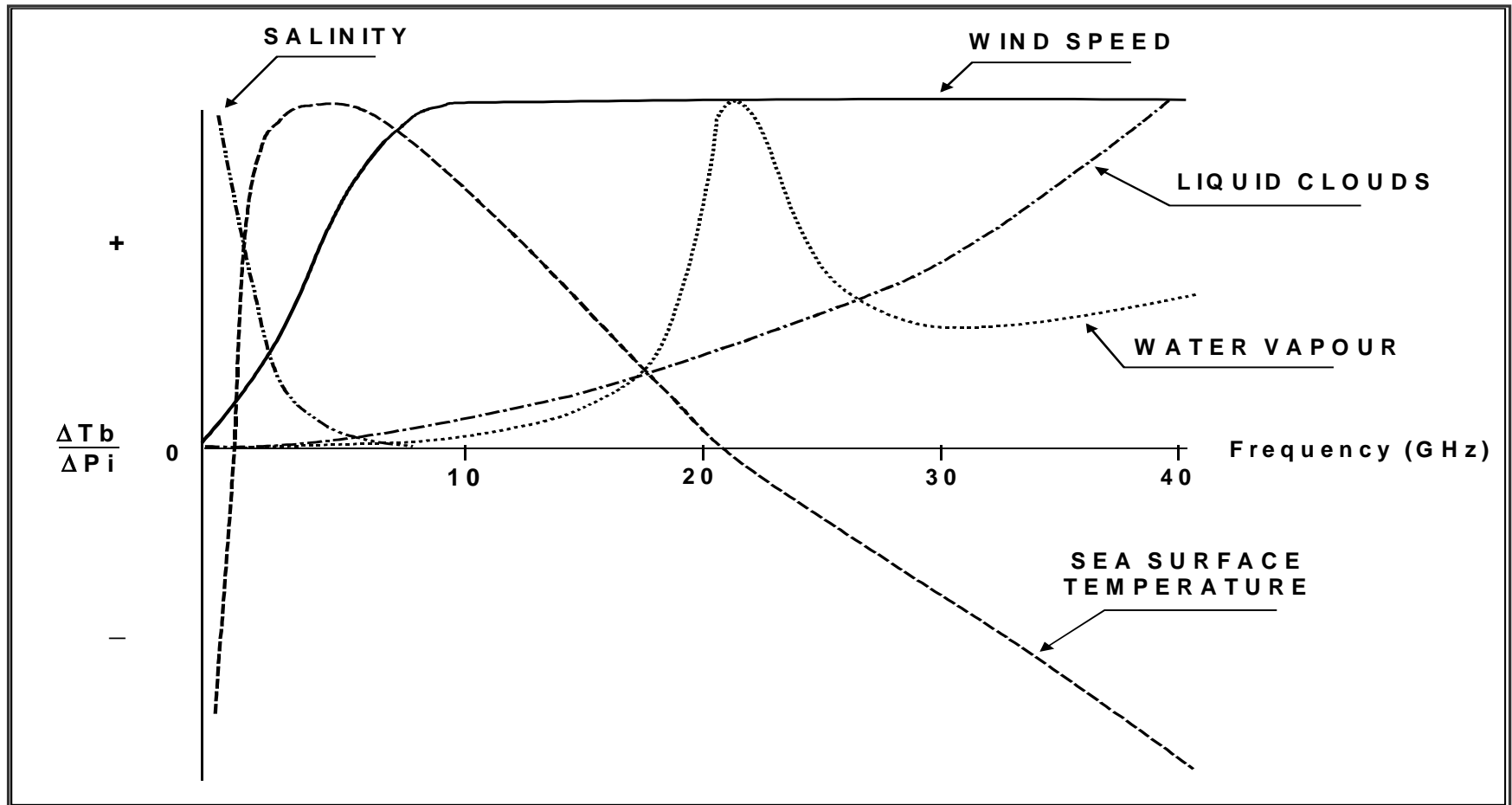
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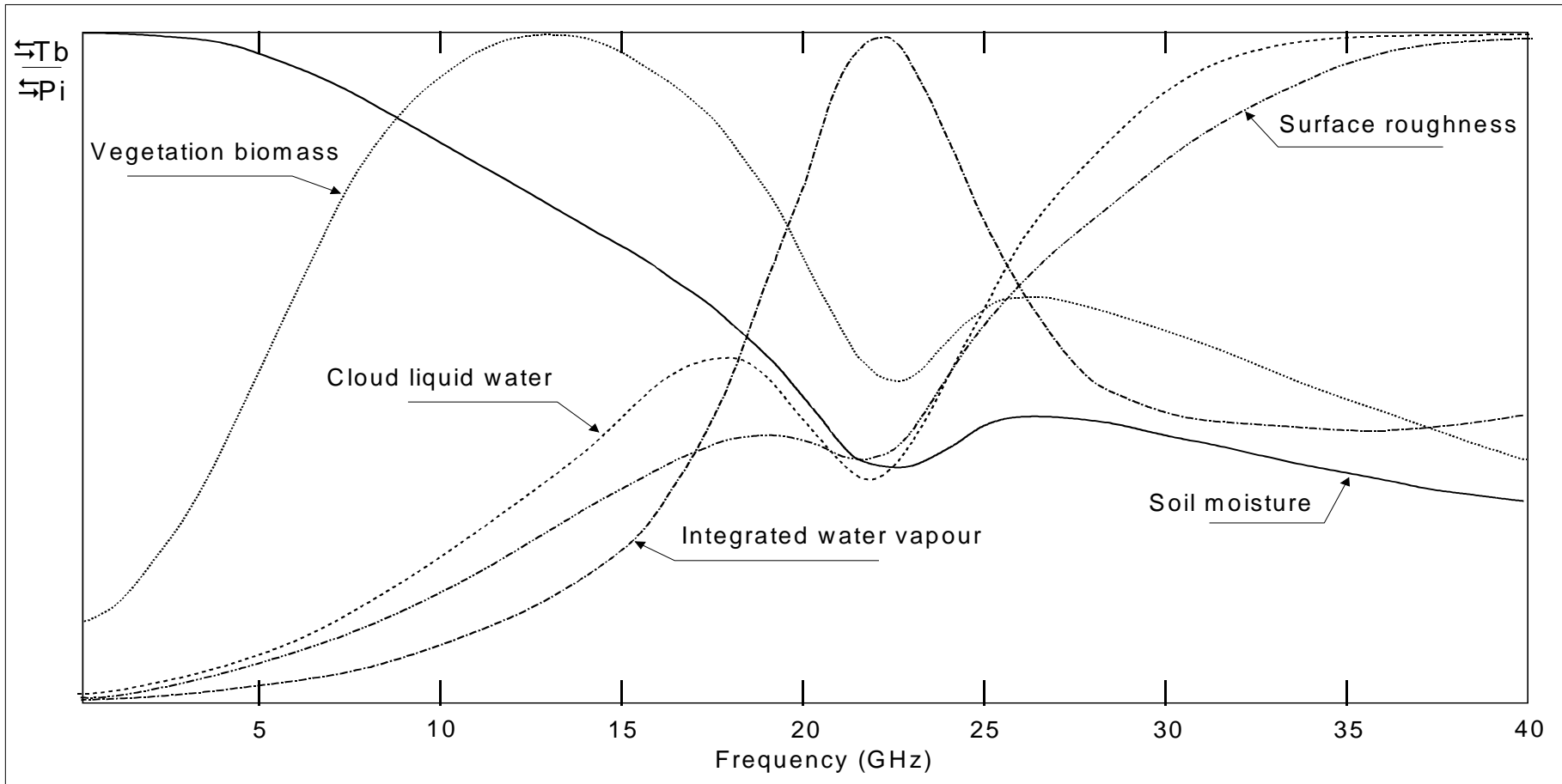


Sensitivity of brightness temperature to geophysical parameters over ocean surface





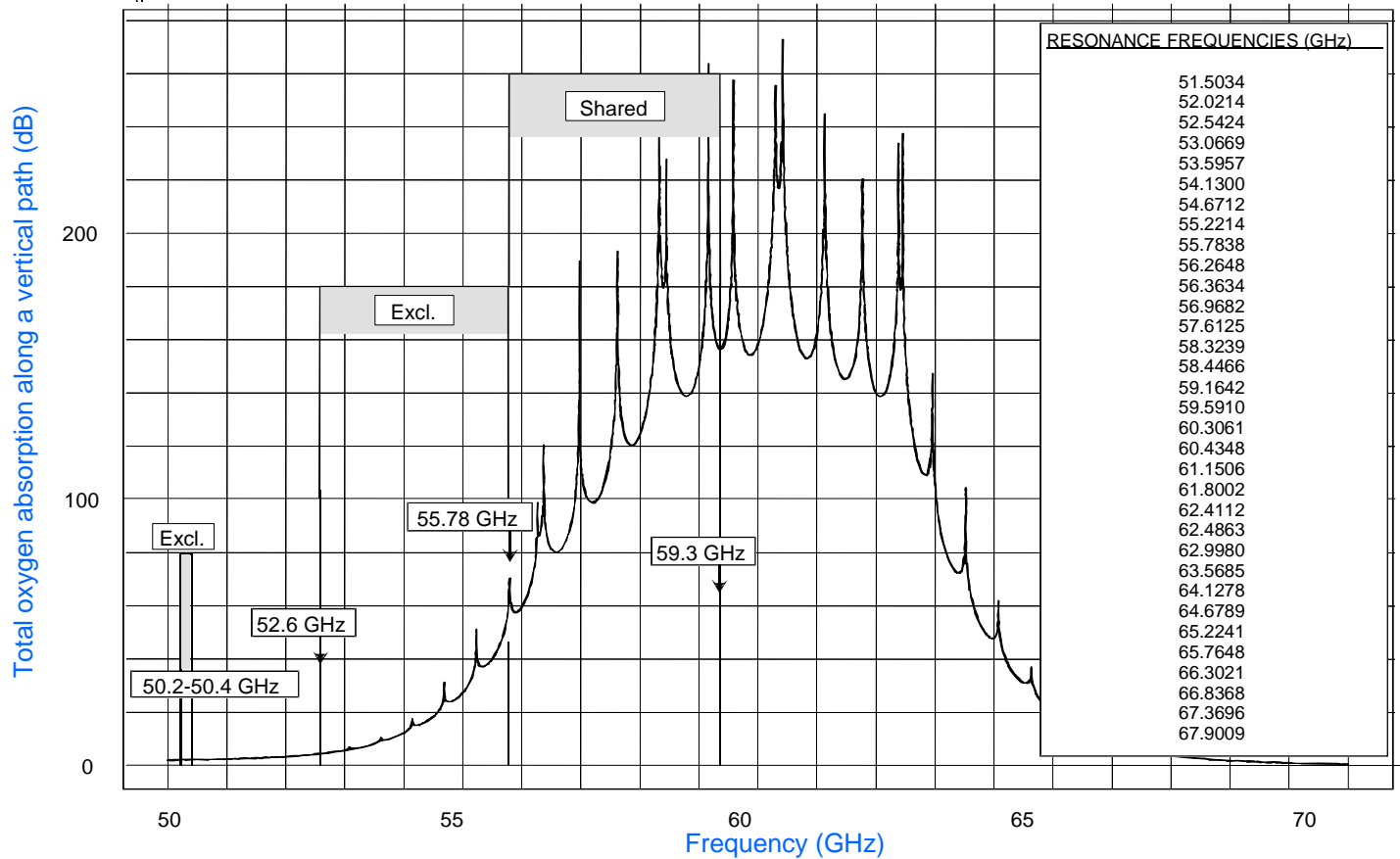
Sensitivity of brightness temperature to geophysical parameters over land surfaces



O₂ absorption spectrum along a vertical path around 60 GHz (multiple absorption lines)

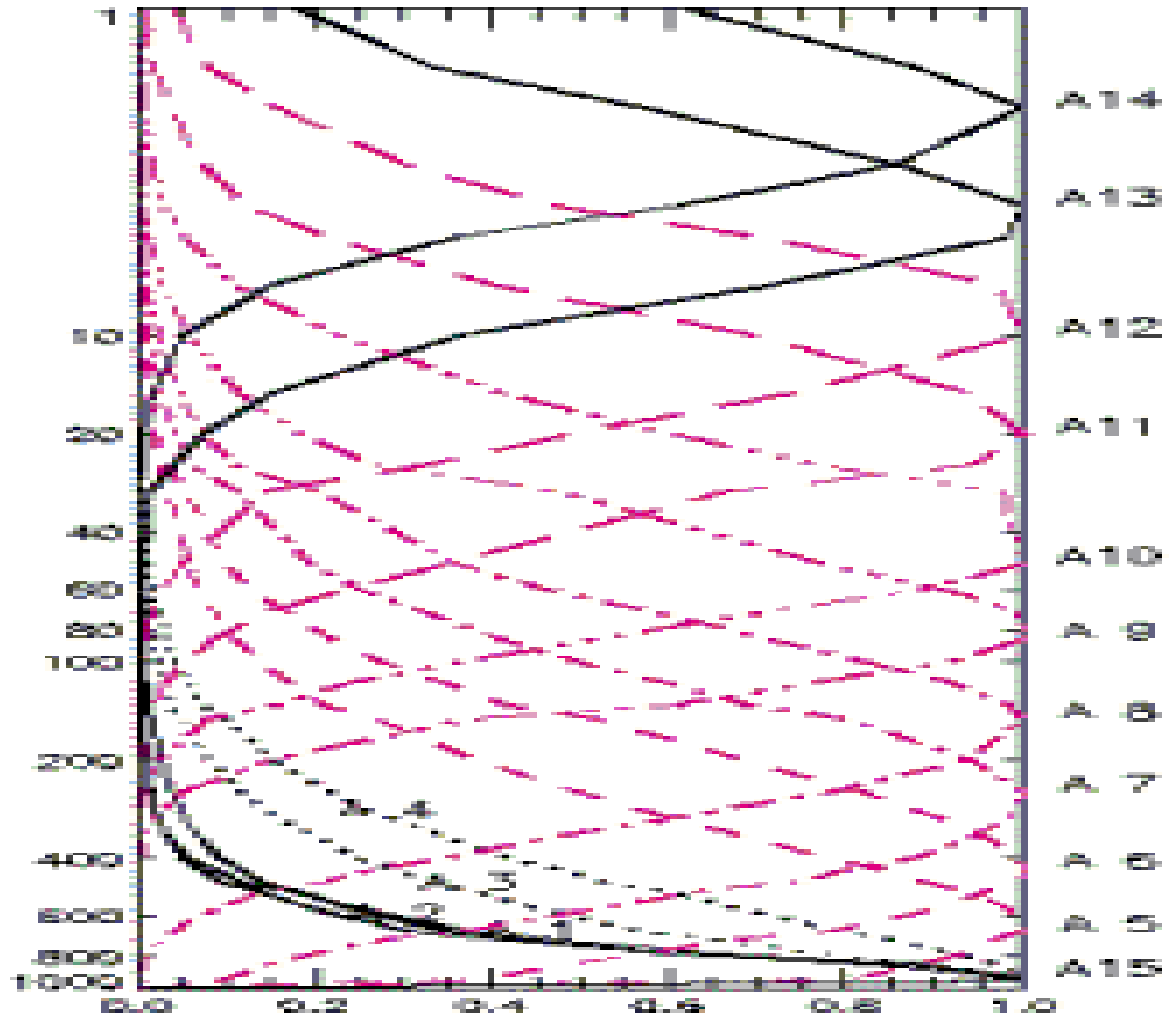


PASSIVE SENSORS REQUIREMENTS IN O₂ 2 ABSORPTION SPECTRUM AROUND 60 GHz
(U.S. standard atmosphère - Absorption model: Liebe 1993)



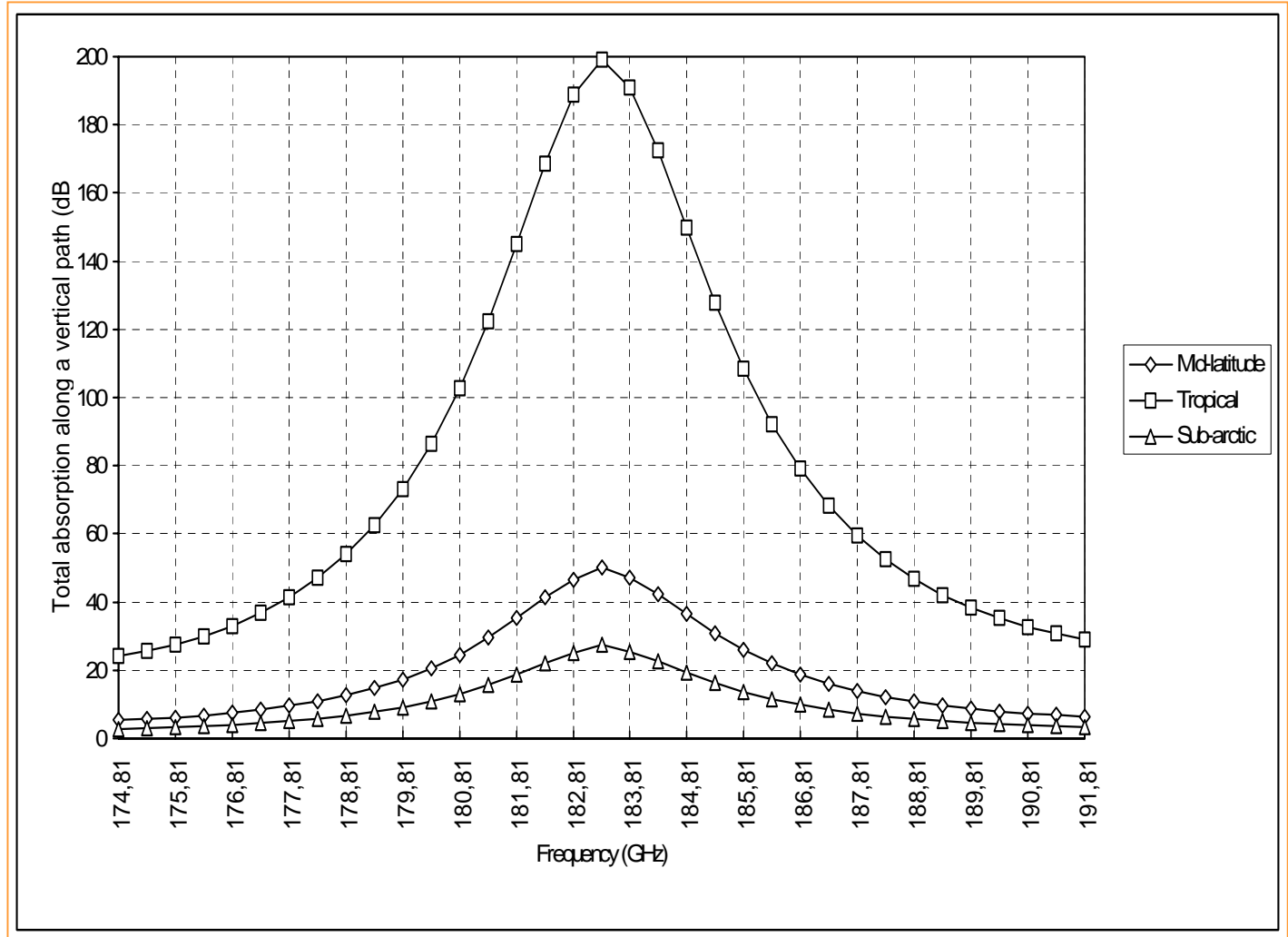


Weigthing functions at 50 to 60 GhZ





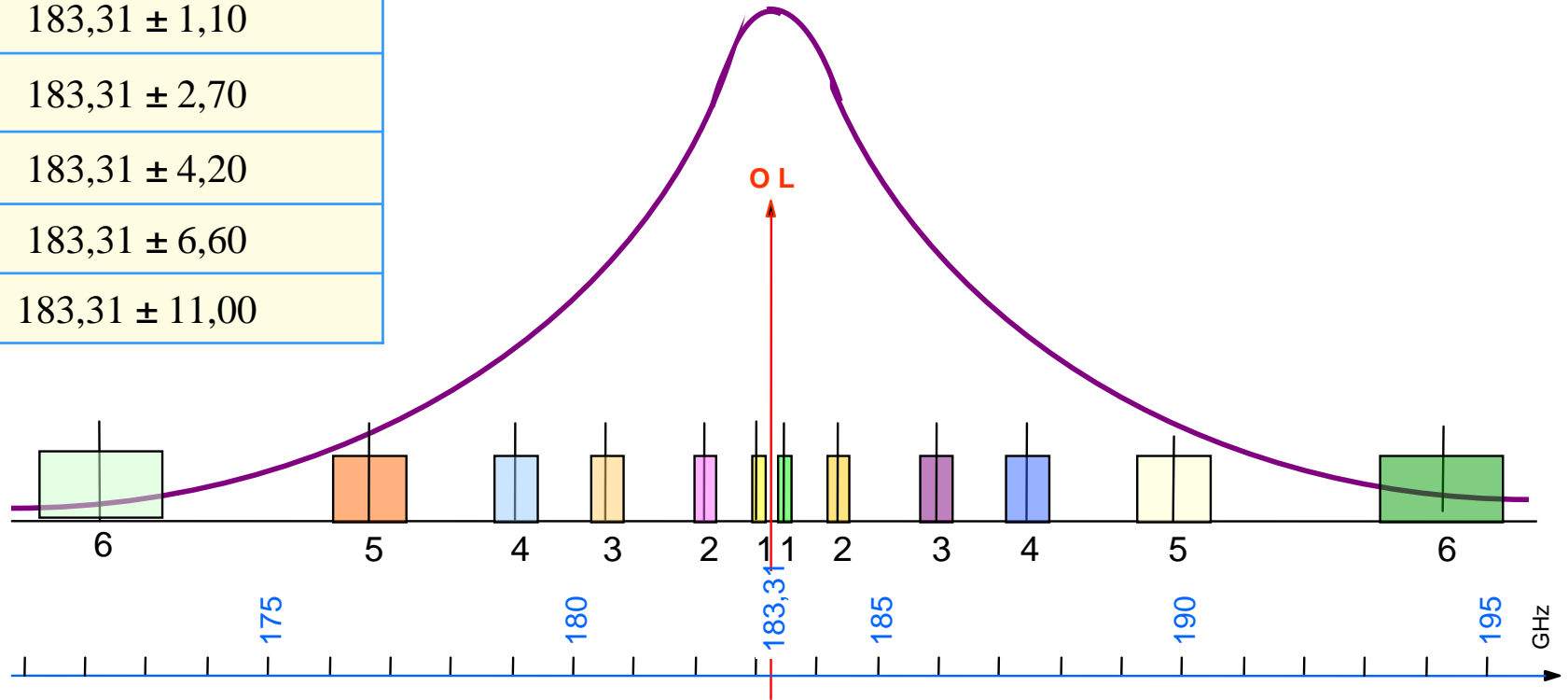
Water vapour absorption spectrum along a vertical path around 183 GHz





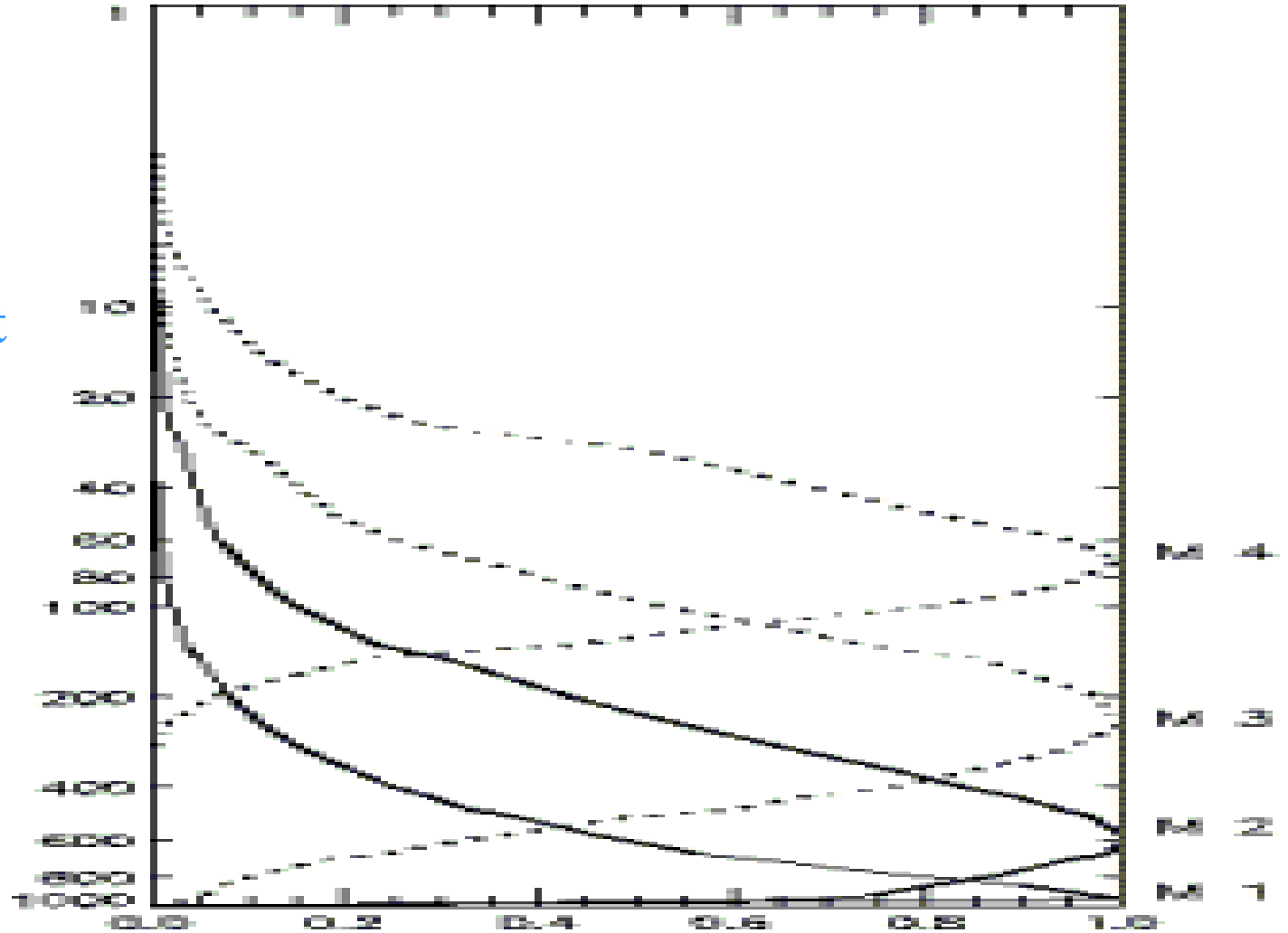
The SAPHIR channels over the water vapor line

Central Frequencies (GHz)
$183,31 \pm 0,20$
$183,31 \pm 1,10$
$183,31 \pm 2,70$
$183,31 \pm 4,20$
$183,31 \pm 6,60$
$183,31 \pm 11,00$



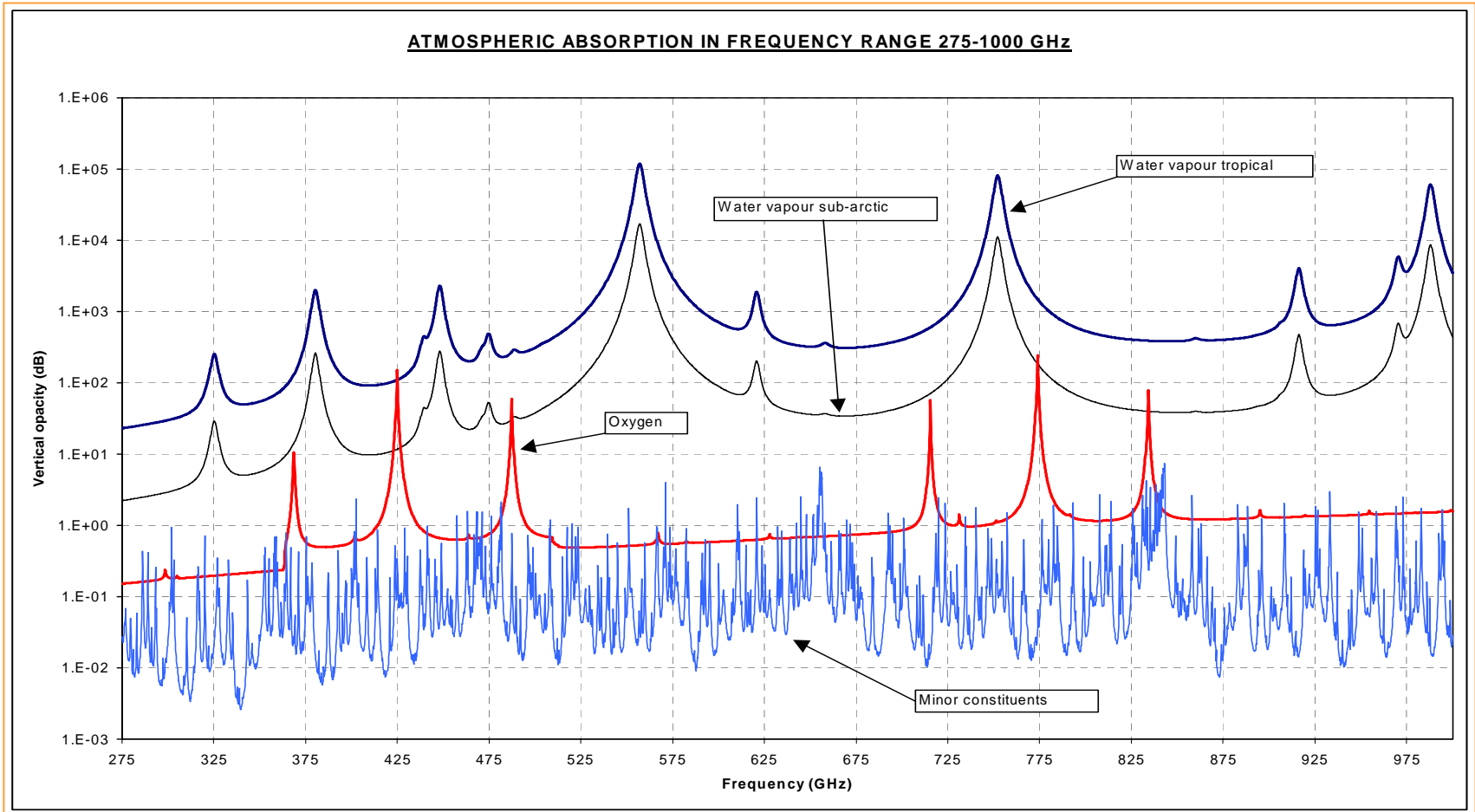


Weigthing functions at 183 GhZ



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GOMAS or GEM

Antenna Ø	54 GHz	118 GHz	183 GHz	380 GHz	425 GHz
1 m	242 km	112 km	73 km	35 km	31 km
2 m	121 km	56 km	36 km	18 km	16 km
3 m	81 km	37 km	24 km	12 km	10 km
4 m	60 km	28 km	18 km	8.8 km	7.8 km



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Draft Revision Of RECOMMENDATION ITU-R **SA.515-3
Frequency bands and bandwidths used for satellite passive sensing
(Question ITU-R 140/7**

(1978-1990-1994-

1997-2002)

The ITU Radiocommunication Assembly,
considering

- a) that environmental data relating to the Earth is of increasing importance;

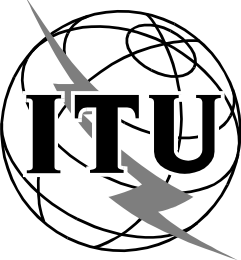


Spectrum requirements for passive sensing of environmental data

Up to 1000 GHz

Frequency Band(s)(1) (GHz)	Total BW required (MHz)	Spectral Line(s) or Centre frequency (GHz)	Measurement	Scan mode N, L(4)
1.37-1.4s, 1.4-1.427P	100	1.4	Soil moisture, ocean salinity, sea surface temperature, vegetation index	N
2.64-2.655s, 2.655-2.69s, 2.69-2.7P	45	2.7	Ocean salinity, soil moisture, vegetation index	N
4.2-4.4s, 4.950-4.990s	200	4.3	Sea surface temperature	N
6.425-7.25	200	6.85	Sea surface temperature	N
10.6-10.68p, 10.68-10.7P	100	10.65	Rain rate, snow water content, ice morphology, sea state, ocean wind speed	N



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**DRAFT REVISION OF RECOMMENDATION ITU-R SA.1028-1
PERFORMANCE CRITERIA FOR SATELLITE PASSIVE
REMOTE SENSING
(Question ITU-R 140/7)**

(1994-1997-2002)

The ITU Radiocommunication Assembly,
considering

a) that certain frequency bands, including some absorption bands of atmospheric gases (e.g., O₂ (oxygen) and H₂O (water vapour)), have been allocated for spaceborne passive microwave remote sensing;



Spectrum requirements for passive sensing of environmental data

Up to 1000 GhZ

Frequency Band(s) ⁽¹⁾ (GHz)	Total BW Required (MHz)	Required ΔT_e (K)	Data availability (%) ⁽⁷⁾	Scan Mode (N,L) ⁽⁴⁾
1.37-1.4s, 1.4-1.427P	100	0.05	99.9	N
2.64-2.655s, 2.655-2.69s, 2.69-2.7P	45	0.1	99.9	N
4.2-4.4s, 4.950-4.990	200	0.3/0.05 ⁽⁶⁾	99.9	N
6.425-7.25	200	0.3/0.05 ⁽⁶⁾	99.9	N
10.6-10.68p, 10.68-10.7P	100	1.0/0.1 ⁽⁶⁾	99.9	N
15.2-15.35s, 15.35-15.4P	200	0.1	99.9	N
18.6-18.8p	200	1.0/0.1 ⁽⁶⁾	95/99.9 ⁽⁶⁾	N
21.2-21.4p	200	0.2/0.05 ⁽⁶⁾	99/99.9 ⁽⁶⁾	N
22.21-22.5p	300	0.4/0.05 ⁽⁶⁾	99/99.9 ⁽⁶⁾	N
23.6-24.0P	400	0.05	99.99	N



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DRAFT REVISION of RECOMMENDATION ITU-R SA.1029-1
PERMISSIBLE INTERFERENCE CRITERIA LEVELS FOR SATELLITE
PASSIVE REMOTE SENSING
(Question ITU-R 140/7)

(1994-1997-2002)

The ITU Radiocommunication Assembly,
considering

- a) that certain frequency bands, including some absorption bands of atmospheric gases (e.g., O₂ (oxygen) and H₂O (water vapour)), have been allocated for spaceborne passive microwave remote sensing;



DATA AVAILABILITY

Data availability is the percentage of area or time for which accurate data is available for a specified sensor measurement area or sensor measurement time. For a 99.99% data availability, the measurement area is a square on the Earth of 2,000,000 km², **unless otherwise justified**; for a 99.9% data availability, the measurement area is a square on the Earth of 10,000,000 km² unless otherwise justified; for a 99% data availability the measurement time is 24 hours, unless otherwise justified



Long-term objectives for passive sensor sensitivities

**THE WMO TABLE
IS A
DRAFT DEFINED
UP TO
1000 GHz**

**(not clear for 1000
to 3000 GHz range)**

Frequencyband(s)(GHz	Objective ΔT_e (K)
1.37-1.4s, 1.4-1.427P	0.05
2.64-2.655s, 2.655-2.69s, 2.69-2.7P	0.05
4.2-4.4s, 4.950-4.990s	0.05
6.425-7.25	0.05
10.6-10.68p, 10.68-10.7P	0.1



N.B.

The updated and consolidated WMO table quoted above should and must be as well the reference for a correct agreement between « local » and « global » **1b radiances**. Same concerning the computation of **synthetic** radiances.

→ *This is ...not yet ...the case today .*

→ *What about tomorrow when using together*

NPOESS, METOP, FY-3 etc ...?



WEB(s) sites fore more infos.



<http://cimss.ssec.wisc.edu/itwg/groups/frequency/>

<http://guy.rochard.free.fr/meteo/>

<http://www.eumetnet.eu.org/>

<http://www.wmo.ch/web/www/TEM/SG-RFC/Handbook.htm>

<http://www.itu.int/ITU-R/index.html>

<http://www.sfcgonline.org>

and Guy.Rochard@meteo.fr fore more questions



Some *big* problems to solve ...

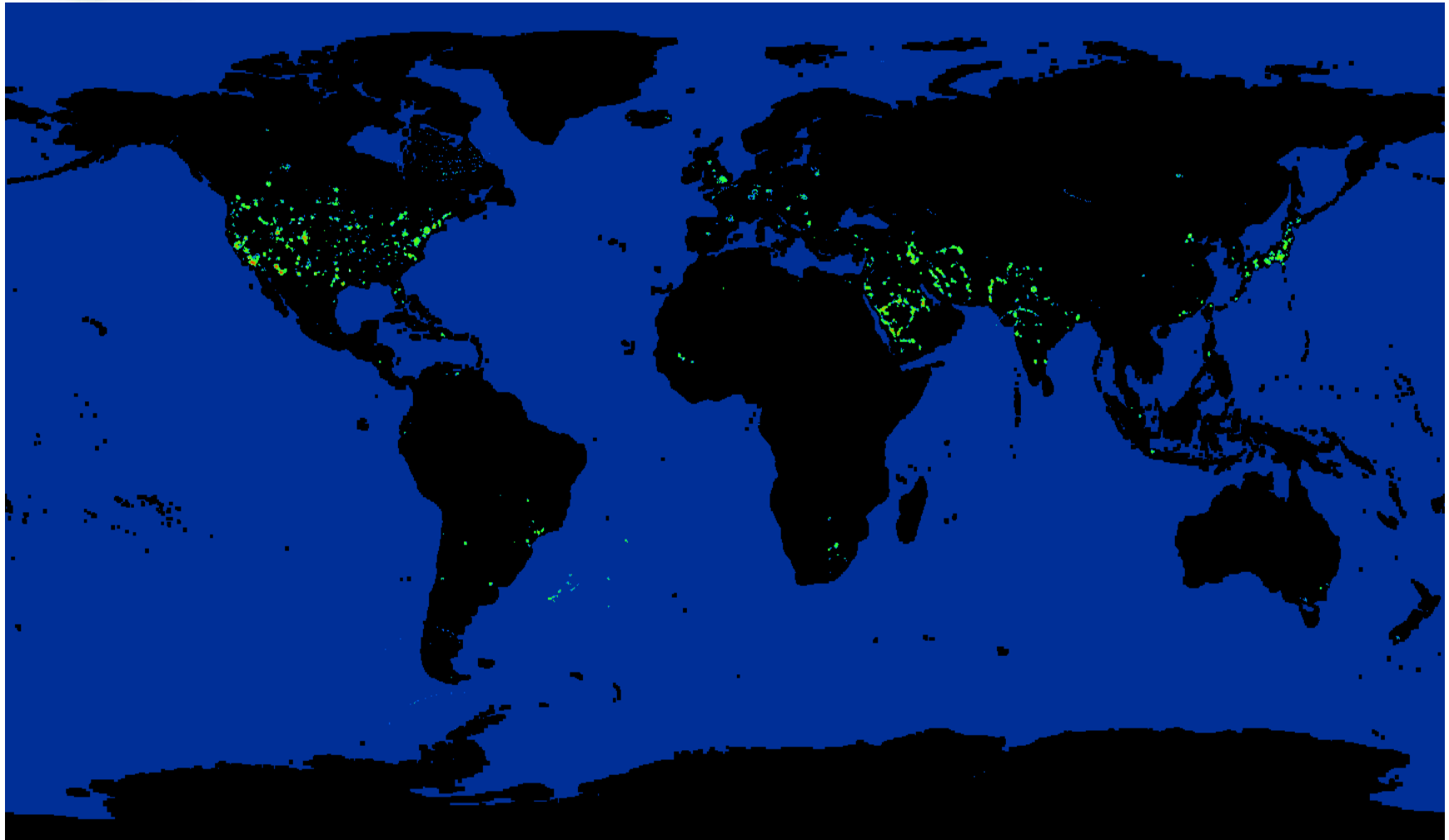
- 1) To conclude what is needed above 275 GHz (central frequencies and bandwidths)
- 2) To conclude about 'Delta T' tables between WMO and ITU proposals
- 3) To archive emissivity pictures of the Earth in microwaves below 50 GHz.
- 4) To save 23.6-34 GHz as a key exemple for ever !

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Contamination around 7 GHz





1990



Measurements
in the 10.6 to
10.7 GHz band
with the
Effelsberg
100m radio
telescope

2000





The global problem :

- 1) **To get a clear, consolidated and justified request (that include for our instruments to avoid « wrong » bands).**
- 2) **To make lobbying against those which don't respect WMO and ITU rules...**
- 3) **A first way is to cooperate with SFCG and a complementary way is to react country by country *now*.**



Suggestions from now to next ITSC-14 :

*** To have a one hour meeting ,here, with interested people**

*** To clean and update the informations on ITWG Web**

*** To host next SFCG/24 in Perros-Guirec in one year**

→ if ITWG agrees

→ if some money can be collected from :

**NASA, NOAA, ESA, EUMETSAT, NASDA, WMO,
CNES, ISRO, CSA and some others...**

(SFCG-25 is planned in Beijing by september 2005).



SFCG-24 (60 people)

- A) Two actions given to the ITWG representative :**
- * one about how to update the WMO/ITU handbook**
 - * the other about to complete and consolidate the « table » from 1 to 3000 GHz for passive microwaves**
- B) Evaluation of the cost of SFCG-24 at Perros-Guirec**
- 30 KEUROS for the facilities of the Conference Center**
 - 4 KEUROS for the coffee breaks**
 - 4 KEUROS for the SFCG-24 dinner**
 - 2 KEUROS for the bus**
- ➔ Total 40000 Euros ...so around 4000 Euros by Organism.**
- (answer needed urgently)*