

Collision detection in WPLOT2000EX KISS-method

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TASKS

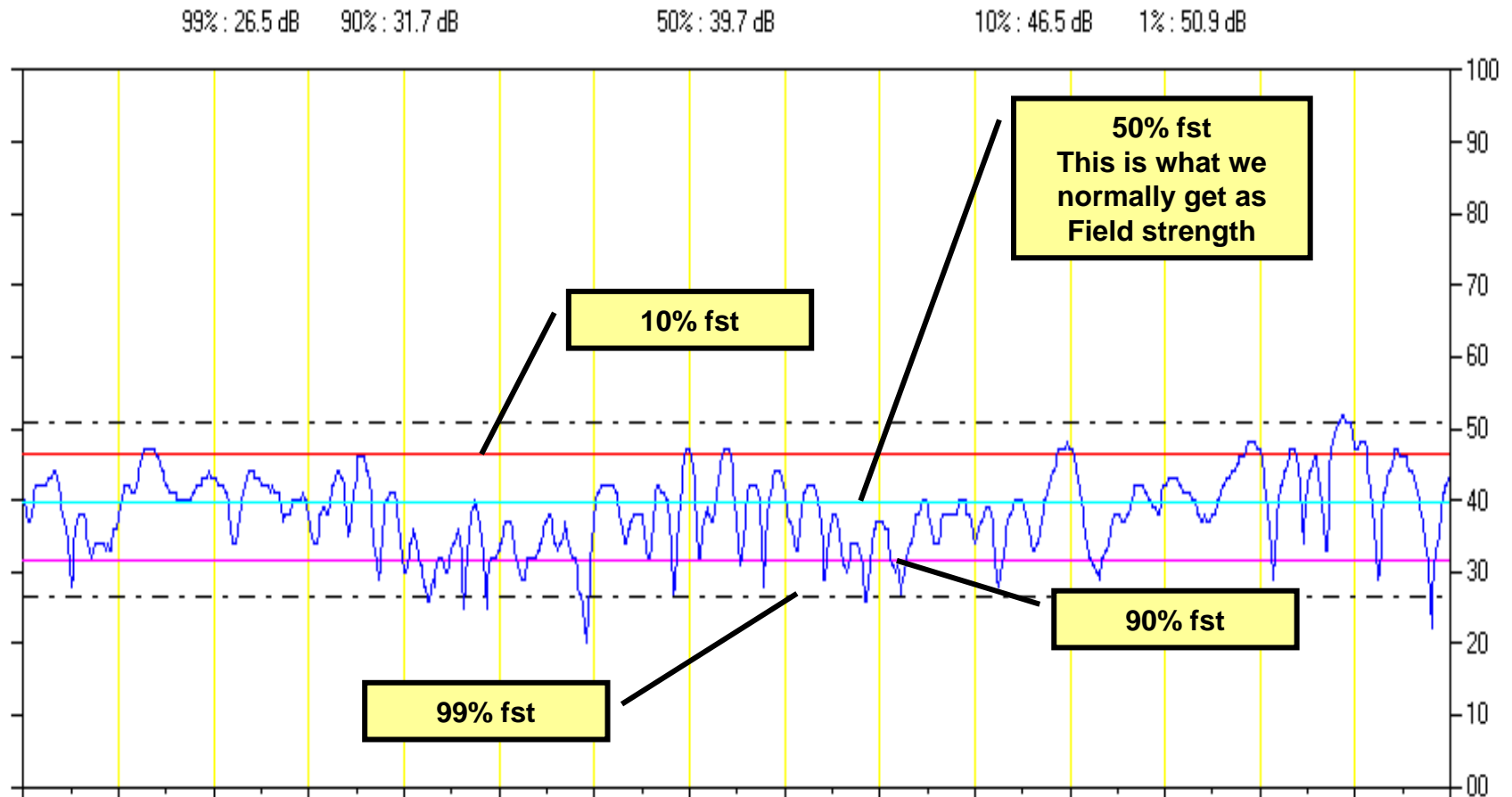
- TOOL:
 - Identify possible collision entries in the HFCC data base that can pose a threat to your entry
 - The tool must be straight-forward and employ a least amount of artificial intelligence that is understood only by a few experts
 - Solution : KISS
 - **K** eep
 - **I** t
 - **S** imple and
 - **S** tupid
- Frequencymanager:
 - Analyze the collisions
 - Decide on the relevance of each flagged collision

BASICS

- Every organisation or frequency manager defines a service differently
 - Minimum FST (50%)
 - Minimum FST (90%)
 - Minimum FST (50%) plus additional Margin
 - Emin (90%)
- Every organisation or frequency manager defines the severity of interference differently
 - Minimum S/I not reached
 - Is it wanted FST (50%) and unwanted FST (50%)?
 - Is it wanted FST (90%) and unwanted FST (50%)?
 - Unwanted FST
 - is it the unwanted FST in the target area that exceeds a FST threshold?
 - and maybe other criteria

Implication of median (50%) , 90%, 10% and 99% Field-strength

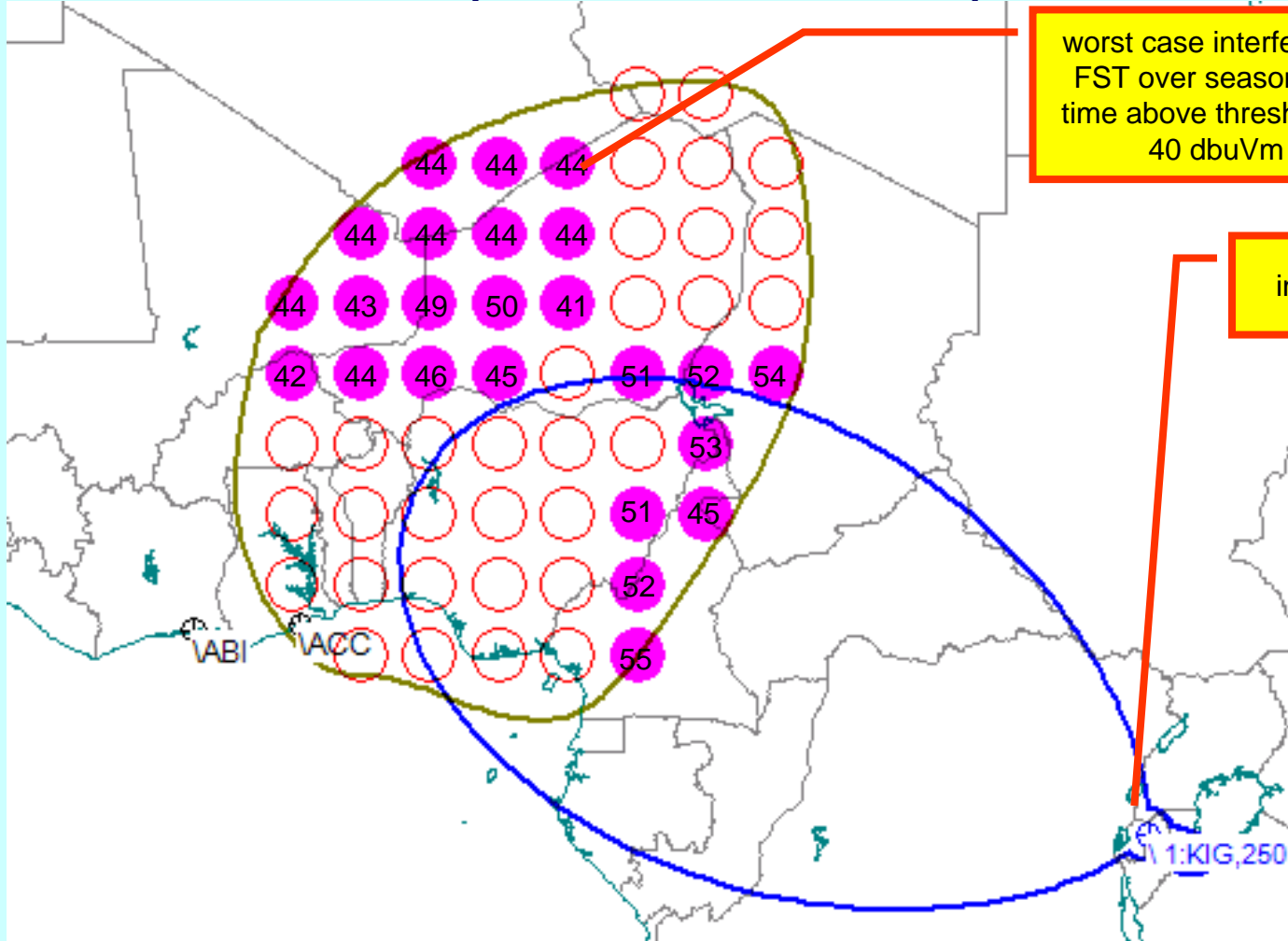
Typical Field-strength of a received signal (short-wave)



General remarks

- The criteria that determines a service should be left to the decision of each organisation/frequency manager
- The criteria that determines a interference should be left to the decision of each organisation/frequency manager
- Consequently any system dealing with marking potential interference should take the wanted target area into account and use a simple algorithm to determine potential interference inside the target area
- We will always see more indication of interference problems than reality will show:
 - Target areas become extremely large when defined by CIRAF zones
 - There might still be the thinking around that a large declared target area provides protection?
 - Antennas are in most cases treated as single band antenna because the design-frequency is not given.
 - As long as the transmission parameters are not given accurately it is useless to improve propagation calculation.

How to arrive at the IFU (interference function)



worst case interference
FST over season and
time above threshold of
40 dbuVm

interfering TX

$$IFU=44+44+44+44+44+44+44+44+44+43+49+50+41+42+44+46+45+51+52+54+53+51+45+52+55 = 1125$$

Definition of interference function (IFU)

- Interference can be defined as an interference function (IFU)
- IFU is proportional to the interfering FST at a test-point ($FSTMAX_{TP}$)
- $FSTMAX_{TP}$ is the worst case FST at each test-point over the season and transmission time
- IFU is proportional to the number of test-points (NTP) suffering
- The basic function can be defined as:

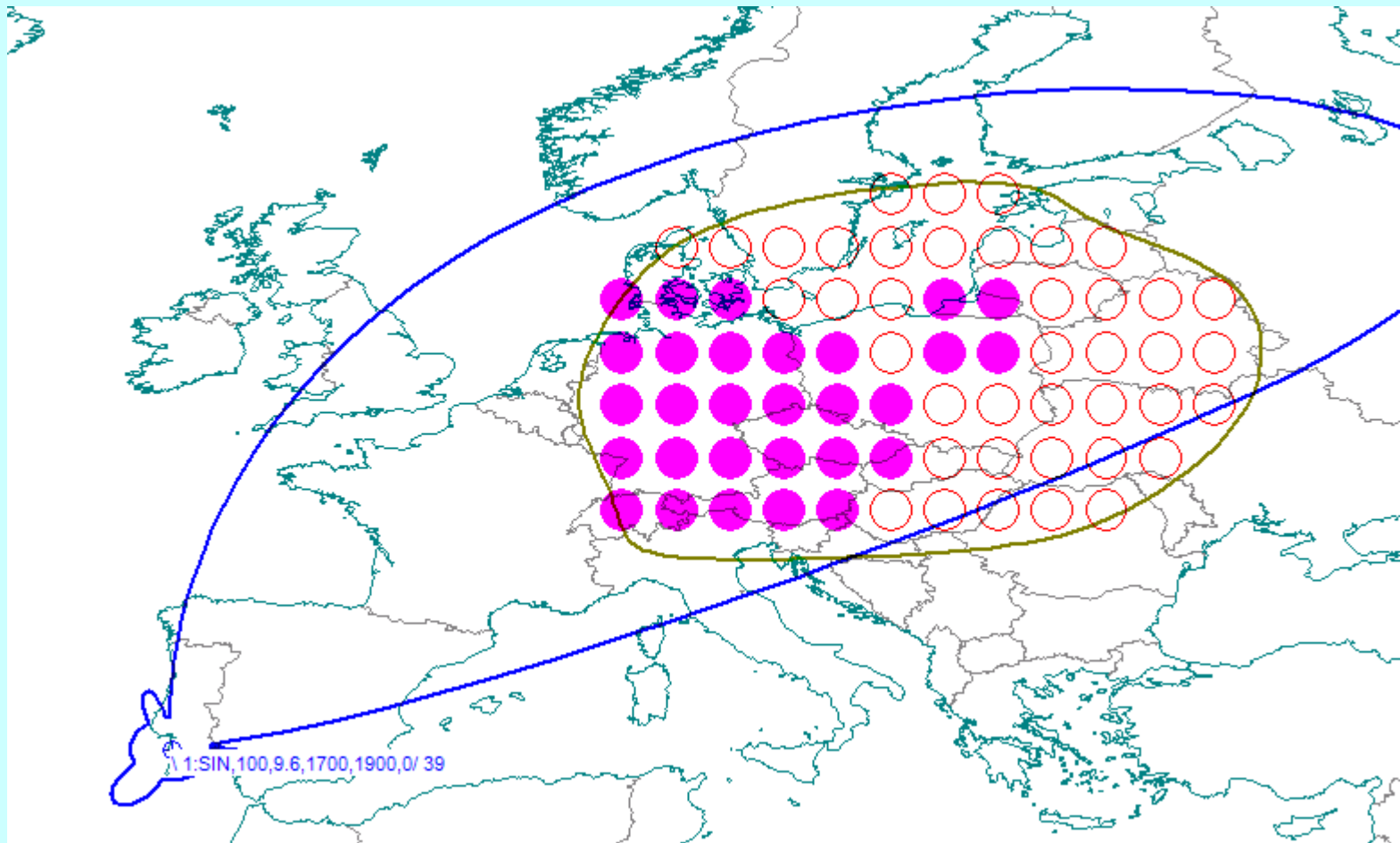
$$IFU = \sum (FSTMAX_{TP})$$

SIMPLE, ALMOST STUPID
that's KISS

In other words:

- There is a significant interference if many test-points show a high FST from the interfering station
- Many test-points affected = strong interference
- High FST at test-points = strong interference

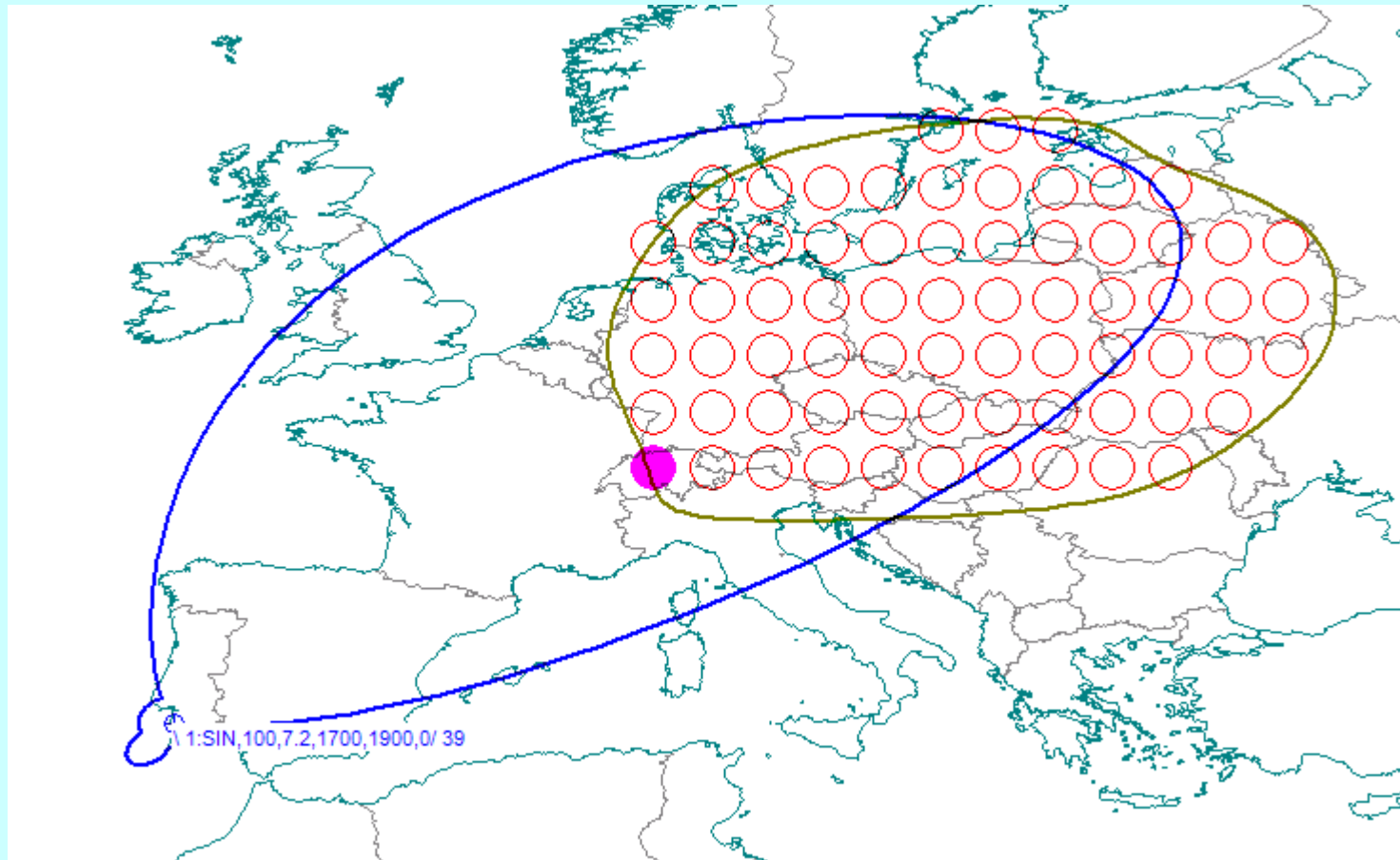
Example: many test points have a FST above threshold



Resulting interference impact figure : 1450

(assuming the worst case FST at all test-points is on average 50dBuVm)

Example: only few test points have a FST above threshold



Resulting interference impact figure : 50

(assuming the worst case FST at the Test-point 50dBuVm)

Result

- If you take the 2 examples and apply a normalization to 100
- The first example will have a IFU of 100
- the second example will get an IFU of 3

- **IMPORTANT:**
- None of the interference cases will be suppressed
- You can use now a selection Threshold to select only cases with IFU ≥ 90 and you will be able to deal with the worst interference cases first, or set the selection criteria to ≥ 0 then you will see all.
- adjacent channel protection is not implemented because in many cases an adjacent channel interferer is more annoying than a co-channel (Try it!)

What does WPLOT2000EX in the KISS-approach?

1. Identify the wanted records e.g. select all records from ex.: DWL
2. Find all records that are co- or adjacent channel to the wanted records
3. Delete all records that do not have a time overlap with the wanted set
4. Copy this subset of data (Wanted and time overlapping unwanted) to a separate table
 - This would already be a nice working data base with only relevant records
5. Calculate all non DWL-entries on co and adjacent channel to every test-point in the DWL-target area
 - The calculation is done over 3 month in the season and in every hour of the time overlap with the DWL-entry
 - The worst case of FST (50%) is taken
 - There is NO distinction between co- and adjacent channel
6. If the worst case FST exceeds a threshold (ex. 40dBuVm), the max FST value reached, will be added up in a counter
7. In the end the result over all interfering cases will be normalized to 100

How is it used WPLOT2000EX?

Start the calculation from DATA form

The screenshot shows the WPlot2000EX software interface. The main menu bar includes 'maintenance', 'Collisions', 'Calculations', 'Realtime', 'Schedule', 'Report', 'Selection', 'Band', 'bookmark', 'Utility', 'Help', and 'About'. The 'Collisions' menu is open, showing options like 'Calculate HIDDEN Collisions ->COLLISION', 'Collisions by FMO', 'Collisions by BRC', 'Show Selection Table', and 'Refresh Collisions'. A table of collision data is visible in the background.

Five dialog boxes are overlaid on the screen, numbered 1 through 5, illustrating the steps to start a calculation:

- 1**: 'Calculate HIDDEN Collisions ->COLLISION' menu option.
- 2**: 'CALCULATE COLLISION' dialog box asking for the reference BRC code (EX: DWL?).
- 3**: 'CALCULATE COLLISION' dialog box asking for the interferer code (*=ALL).
- 4**: 'CALCULATE COLLISION' dialog box asking for the field strength treated as interference (DBUV/M).
- 5**: 'CALCULATE COLLISION' dialog box asking for the month or season for calculation.

HOW is it used WPLOT2000EX?

COLLISIONS [X]

ENTER SEVERITY OF INTERFERENCE (0..100)

5

90

OK

Abbrechen

Result will be stored in the table "COLLISION"

UTC TIME NOW >10kw **COLLISION**

COLLISION FROM B_HFCC_07 10-29-2007/12:37:30

DATE	TDATE	MOI	NOTES	REQ	LANGU	ADM	BRC	O	TFREQ1	2	REQ3	X	na	
81007	3		COLL 90% :BRC=DWL >> ALL, from Table:COLLISION											
81007	3													
81007	3													
81007	3													
81007	3													
10208	3													
81007	3													
81007	3													
81007	3													
81007	3													
81007	3													
81007	300308	D					RUS	VOR		0	0	50	X	
81007	300308	D					Alban:	BUL	RBU		0	0	81	X

automatic map
 206 Entries
 create EXCEL Back to Table

NO	FREQ	STN	STAR	STOP	<COL	FMO
1758	7145	SIN	2000	2057	1	RTC
1845	12010	SNG	1030	1150	1	TRW
1859	12090	TRM	1430	1458	1	IRB
1756	7145	WOF	1700	1959	1	RTC
16100	12080	SIN	1600	1659	1	SYR
1728	5980	DHA	1800	2000	1	TRT

Finally

- Every frequency manager has a feeling what a particular interfering FST will do to his service
- The danger using S/I is to get into the same situation as in the 1980's when the necessary S/I was reduced to 17 dB in order to accommodate services.
- so sometimes we tend to forget that 17 dB S/I for a service is really poor.
- HFCC is not a planning system but a forum where solutions are discussed and it has proven to be successful
- The aim should not be to get an "frequency assignment machine" but to provide the necessary tools to support the frequency managers work.

Future improvements

- The target area assignments by CIRAF zones provide only a very poor base for serious calculations
- There are not enough test-points and quadrants
- It should be considered to freely define target areas as they are really intended (realized in WPLOT2000EX)
- Transmitting parameters must be as accurate as possible (antenna design frequency etc)
- Calculations should be carried out for every month in the season (realized in WPLOT2000EX)
- Collision calculation in WPLOT2000EX supports freely defined target areas starting from release 1.9.2