IPS
RADIO AND SPACE SERVICES

Introductory Booklet

Introduction

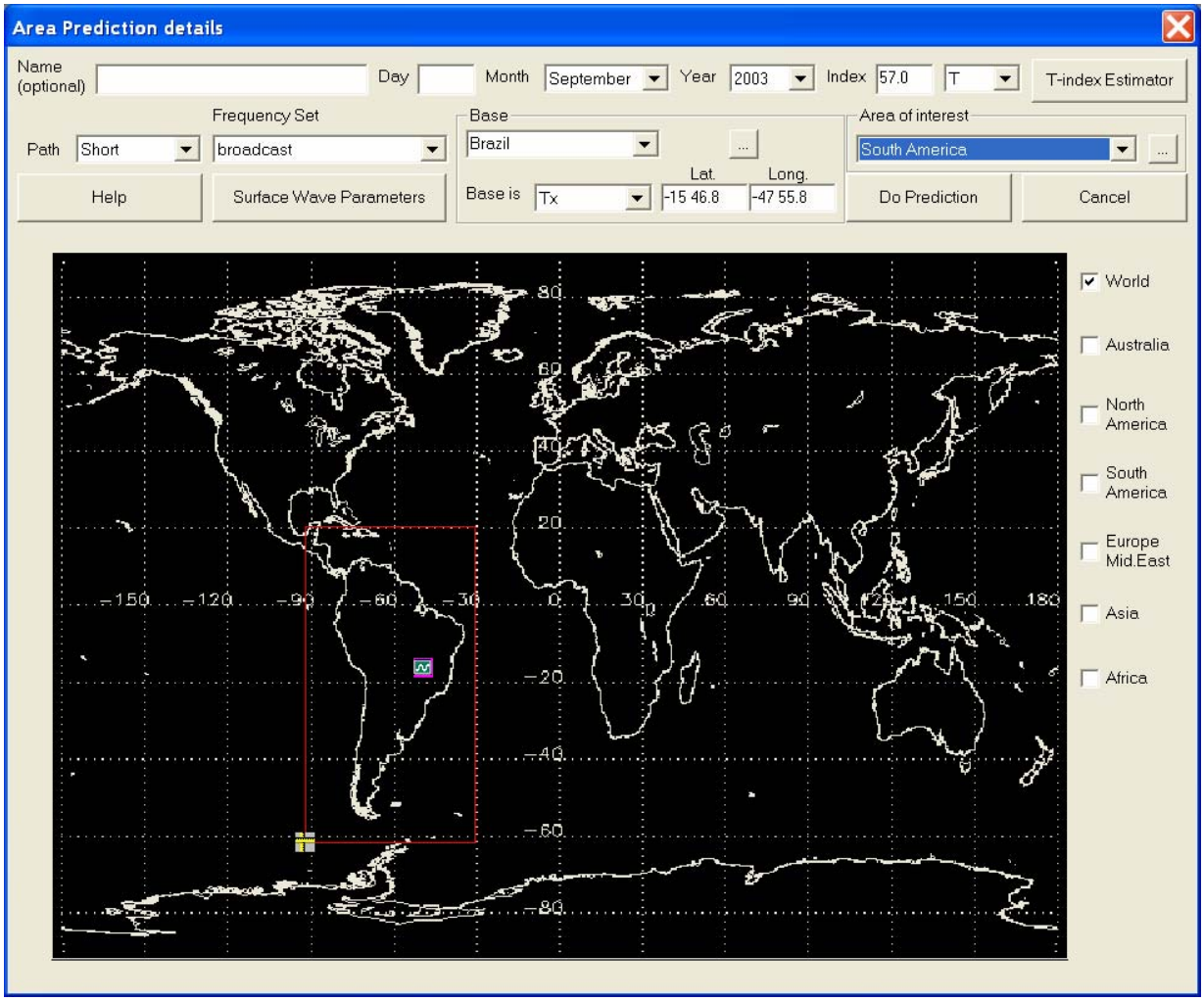
The IPS Advanced Stand Alone Prediction System (ASAPS) allows the prediction of Sky Wave communication conditions in the HF (High Frequency) and low VHF (Very High Frequency) radio spectrum or Short Wave Band (1 to 45 MHz). It is based on an Ionospheric model developed by IPS Radio and Space Services of the Australian Department of Industry, Tourism and Resources, and ITU-R / CCIR models (Rec. ITU-R P.533-8, Rec. ITU-R P.372-8 and CCIR Report 322).

ASAPS V5 is a 32-bit application, designed for Pentium-based Personal Computers with the Microsoft Windows Operating System (Windows 95 or higher). A minimum of 32 MegaBytes of RAM and 50 MegaBytes of hard disk space are necessary, and SVGA video is highly recommended. To run the new Area Predictions, you will need a Pentium 233 or better to provide adequate performance, because of the large number of calculations involved.

What's New for ASAPS V5?

- ASAPS V5 is a **32-bit application**, making it suitable for use on a wider range of Microsoft Operating Systems.

- **A geographical map of the world for use in generating predictions** - terminals, circuits and areas of interest can now be selected quickly and easily via "point and click"**.**



Using "point and click" to generate predictions

- When running either Field Strength (Point-to-Point) or Area predictions:

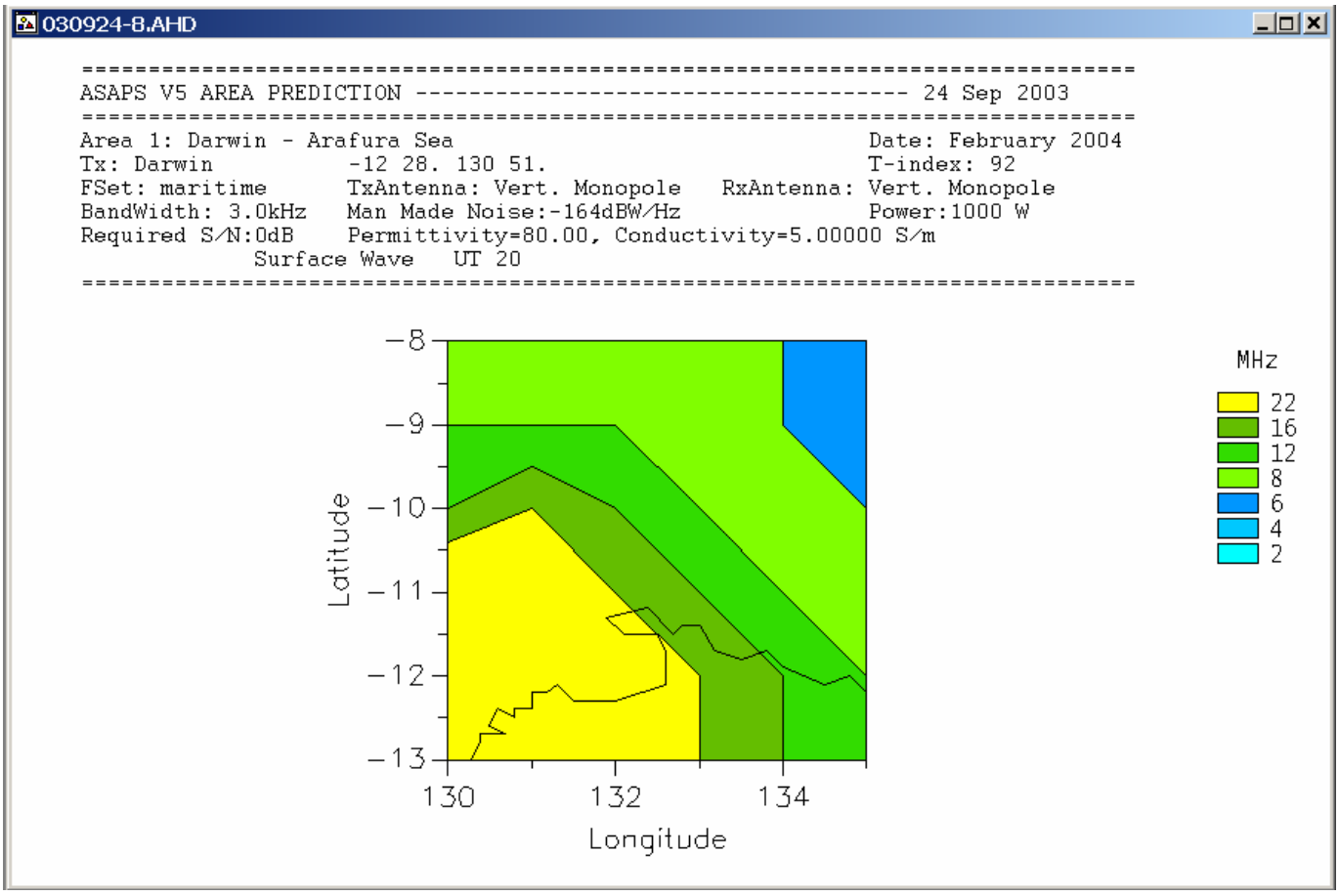
  1. The option of using an **alternative, more complex, Polarisation Coupling Loss algorithm** that includes the specification of the actual polarisations of the antennas.

  2. The ability to select **Prediction Confidence Levels for Signal-to-Noise Ratio predictions,** eg lower decile, median or upper decile values, or anything in between.

  3. A choice between ITU and CCIR Atmospheric Noise maps

- **Frequency Set Selection or Test**, allowing you to predict the optimum frequency set for the HF circuits you operate, or to assess the suitability of your current frequency sets for those circuits.

- **Surface wave range contour maps** for Area predictions, including **Multi-Surface SNR contour plots for specific frequencies**.



Sample surface wave range contour map

- An **on-line Tutorial** that guides the user through the key features of the program, and how to interpret the many output formats.

- **A monthly reminder for the update of ionospheric T indices**, with the ability to do this automatically over the web.

- An **option to customise the colour palette** for easier interpretation of Area Prediction plots.

- The ability to view **four-hourly Area Predictions** (0 - 3UT, 4 - 7UT, etc) on a single screen.

- **Colour plots of BUF modes** for Area Predictions.

- **Frequency sets** may be entered in either **MHz or KHz**

- The ability to **delete individual circuits from a prediction file** or to **delete the complete prediction file,** together with all other output files that are linked to the deleted file.

- The ability to **specify the top margin when printing** GRAFEX or Field Strength predictions.

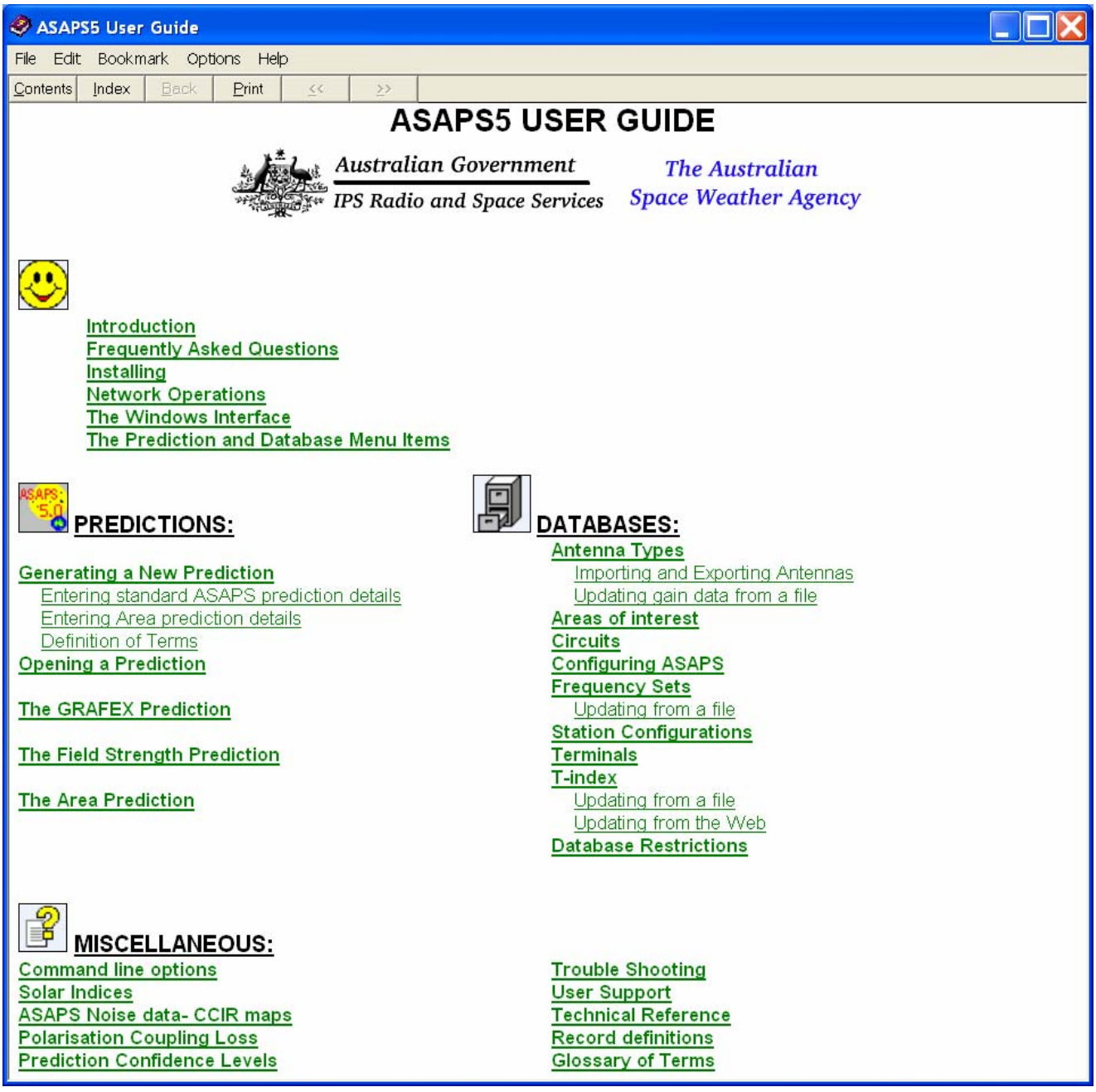
- Installation software available exclusively via **CD format**.

- **Upgrades** available from ASAPS V4. New registration details will be needed for Upgrades to ASAPS V5. (**NOTE**: ASAPS V4 GRAFEX Files can be displayed and "Recomputed" by ASAPS V5. However, ASAPS V5 cannot display ASAPS V4 Field Strength or Area Prediction Files because extra data is produced by the ASAPS V5 FPLOS Kernel for the Polarisation Coupling Loss and S/N Ratio confidence levels).

What else does ASAPS V5 offer?

1) On-line User Guide and Tutorial

ASAPS V5 includes a comprehensive **on-line User Guide**



The ASAPS V5 On-line User Guide

The **on-line Tutorial** gives step by step instructions on how to enter the required input data and how to interpret the various output formats. It includes a set of exercises that takes the user through a wide range of program features.

2) Predictions for any HF circuit world-wide

2A) POINT-TO-POINT HF Propagation and Field Strength Predictions

GRAFEX table

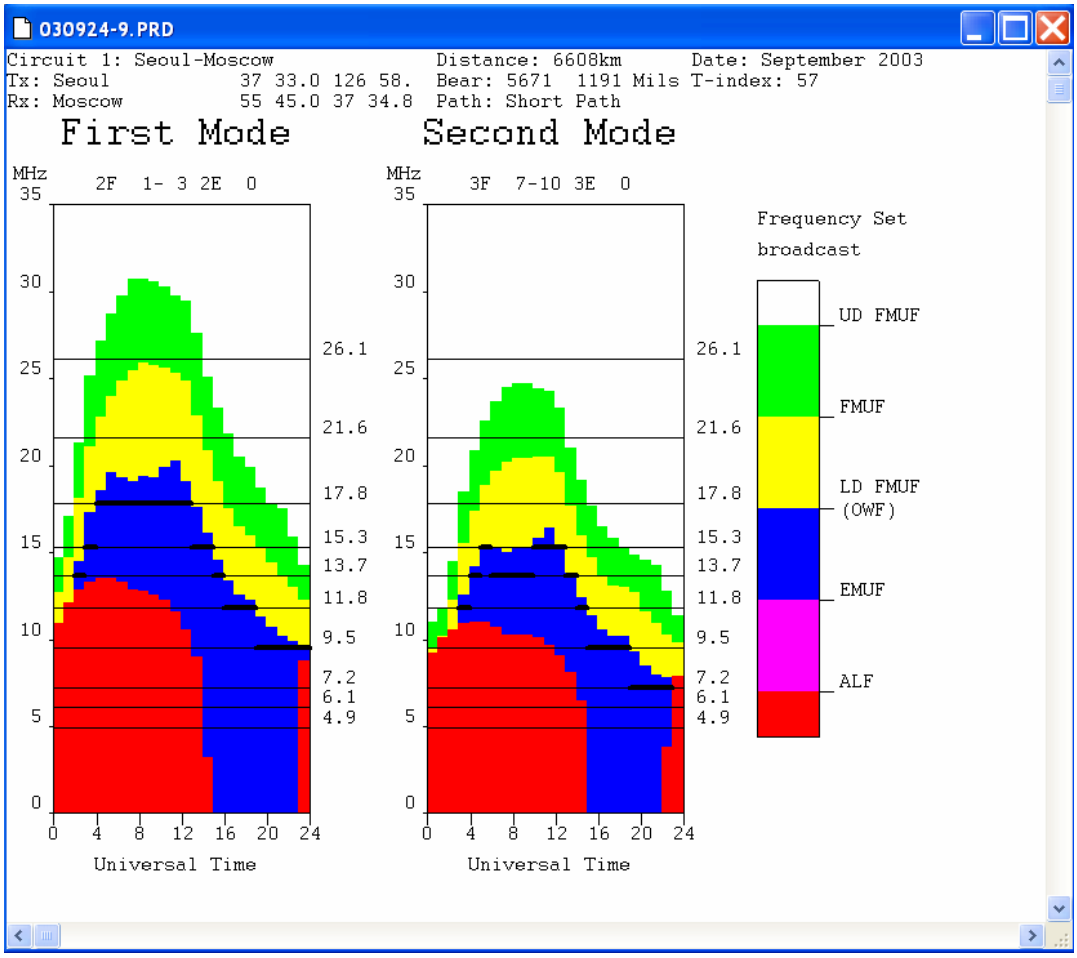
GRAFEX predictions examine the first two propagation modes via the E and F layers of the ionosphere. They predict, for each hour of the day and each mode,

- Upper Decile Maximum Usable Frequency (UD MUF)
- Median MUF
- Optimum Working Frequency (OWF) (or lower Decile MUF)
- Median E-layer MUF (EMUF)
- Absorption Limiting Frequency (ALF)
- Elevation Angles

The GRAFEX format provides information about the likely performance of every MHz frequency for each hour between 1 and 40 MHz, including the probability of propagation via mixed and complex modes.

GRAFEX graph

This is the graphical form of the GRAFEX prediction. Although the same information is presented, this format allows easier comparisons between different modes and circuits.



Users can determine the best frequency for use each hour using the GRAFEX Graph

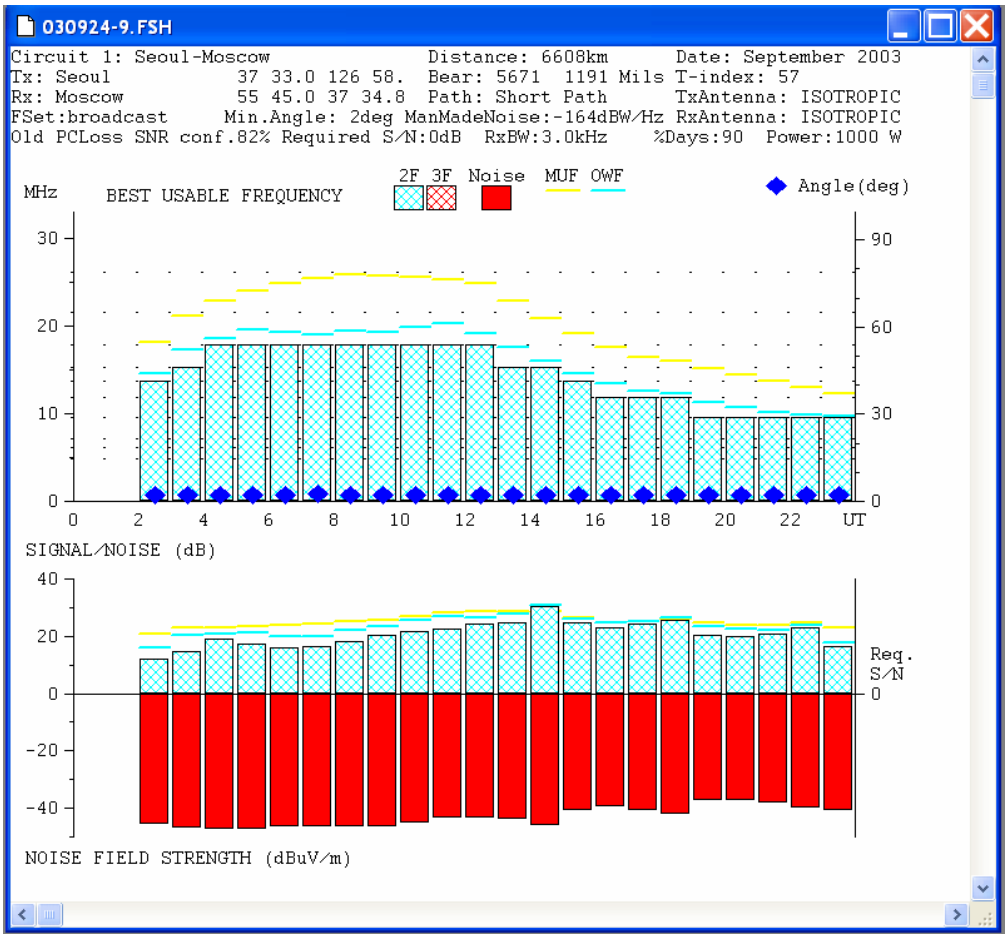
Frequency plan

The Frequency Plan prediction displays frequency schedules. From a user-specified frequency set, ASAPS V5 creates two schedules, one for frequencies with at least a 90% chance of

ionospheric support, the other for 50-90%. The prediction considers the first two modes for both E-layer and F-layer propagation and also shows the corresponding take-off angles.

Best Usable Frequency (BUF) graph

This is a graph of the BUF for each hour, selected from the user's frequency set and determined on the basis of ionospheric conditions and the user's specified system details.



Point-to-Point BUF Graph display

Field strength output tables

The following parameters can be calculated:

- All Noise
- Estimated Power Required
- Antenna Gains
- Losses (Pathloss)
- Noise_Pathloss
- Signal-to-Noise
- BUF
- Field Strength
- Reflection Heights
- Noise Field Strength
- Probability
- Take-off Angle

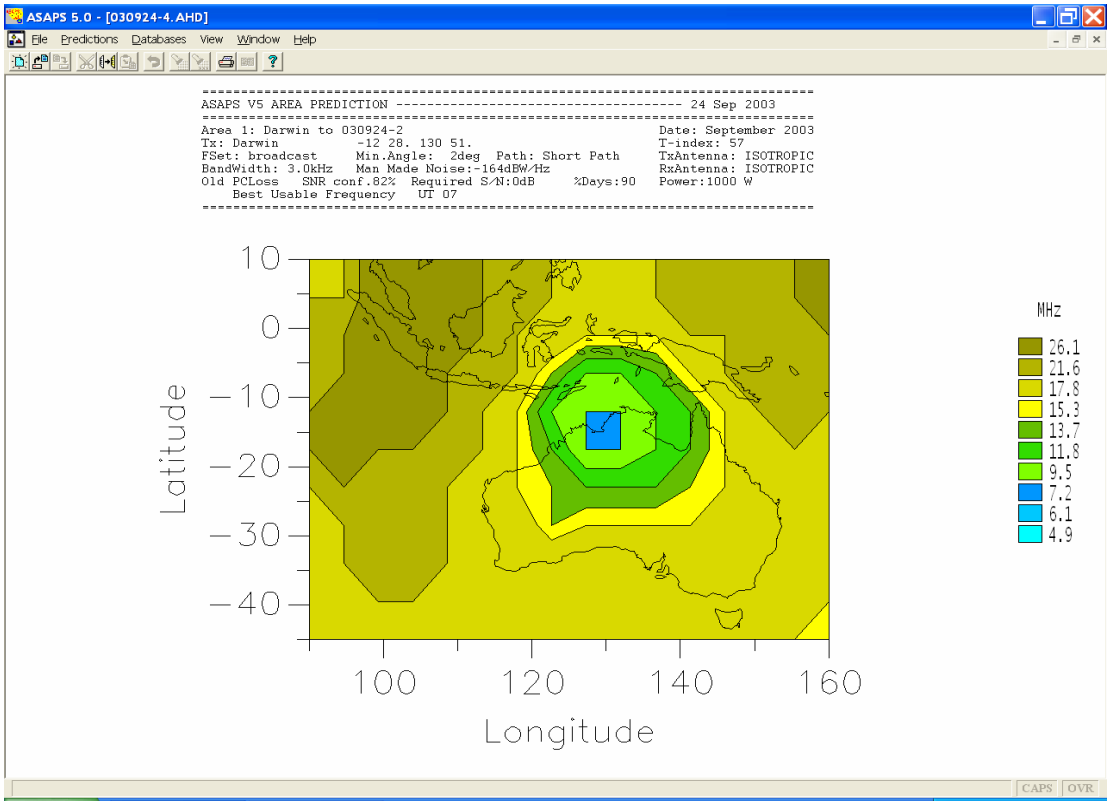
Values are determined for the MUF, OWF and each frequency in the user's specified set. These values are calculated on the basis of the specifications shown at the top of the screen, including the circuit details and system parameters such as transmitting (Tx) and receiving (Rx) antenna, Tx power, Rx site noise, etc.

2B) POINT-TO-AREA Predictions

Contour Maps

With an Area Prediction, you can display the data for each of the circuits between a base terminal and a grid of terminals in the specified geographical Area of Interest. Data that can be displayed includes:

- All the point-to-point **GRAFEX and Field Strength formats for each grid point circuit**.
- **Best Usable Frequency (BUF).** The BUF is defined as the frequency from the specified set with the maximum S/N ratio that also satisfies the specified minimum take-off angle, required S/N ratio and probability level.
- **Maximum Usable Frequency** (MUF) on the BUF propagation mode.
- **Optimum Working Frequency** (OWF) on the BUF propagation mode.
- **BUF propagation modes.**
- **Signal/Noise** ratios at the BUF, MUF and OWF.
- **Noise** field strength at the BUF.
- **Percentage probability of ionospheric support** for the BUF.
- **Take-off angle** for the BUF.
- **Surface wave range** and **frequency-specific Multi-Surface SNR Contour plots**.



Sample BUF Chart - one example of the displays available for Point-to-Area predictions

3) Your choice of solar/ionospheric indices

ASAPS V5 HF predictions can be generated based on one of three indices

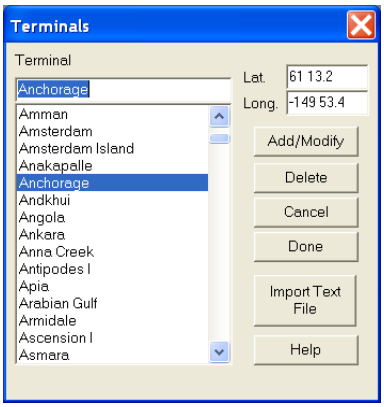
- IPS ionospheric T-index
- 10.7 cm flux
- sunspot number

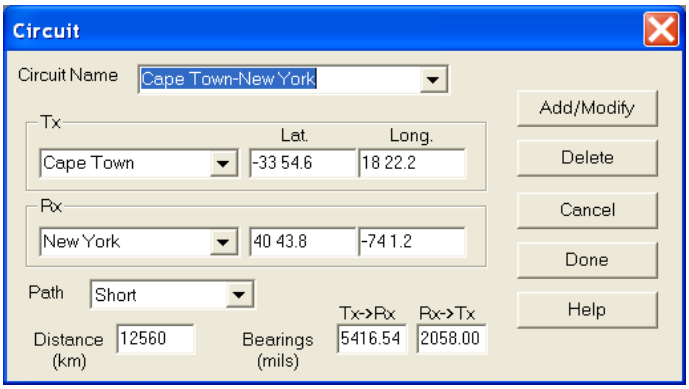
A database of monthly ionospheric T-indices is supplied with the software. This can be updated each month, based on information given in the IPS monthly Solar and Geophysical Summary, and may be updated automatically via the web.

4) User-friendly management databases

Using ASAPS V5, you can generate Point-to-Area and Point-to-Point predictions for any HF circuit in the world. Several management databases are included to assist in providing the required input data for these predictions. Some examples are shown below. In each case, ASAPS V5 comes with a standard set of data, which can be added to, or modified, by the user:

Terminals and Circuits

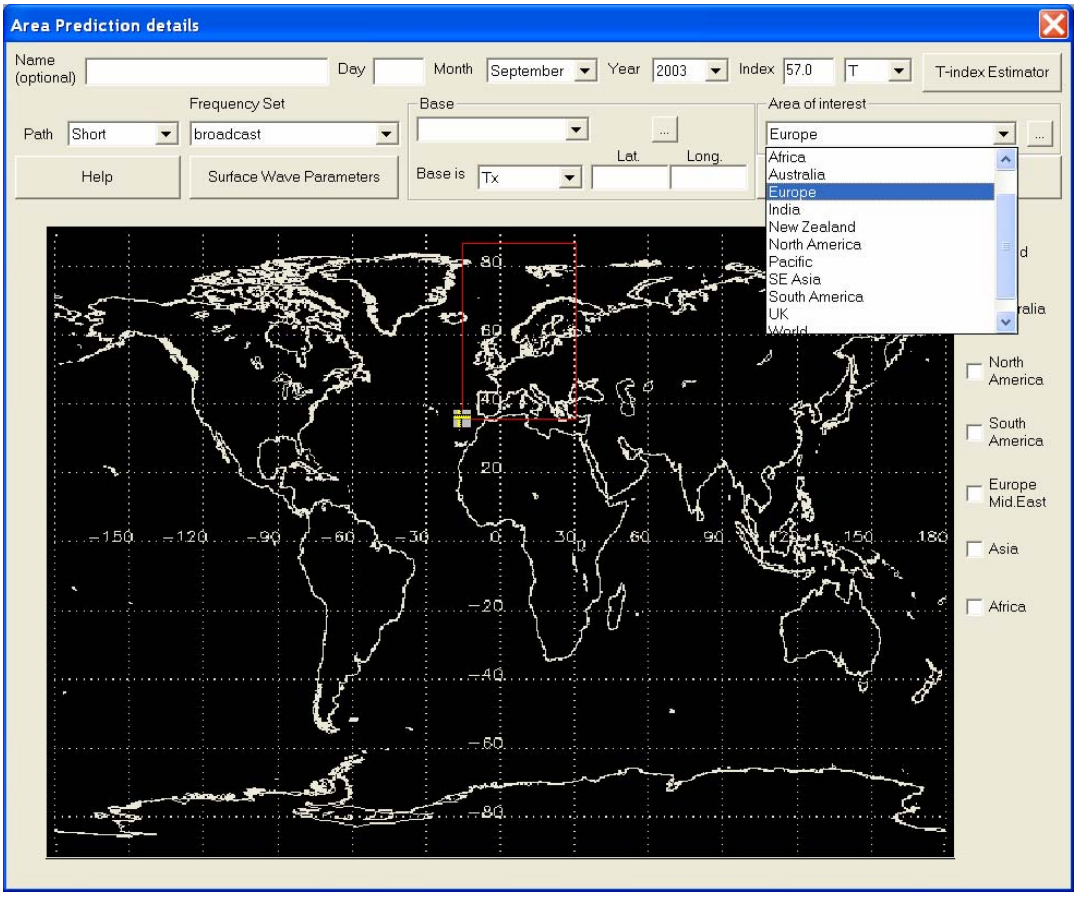




Areas of Interest

Geographical Areas of Interest for base-to-mobile and/or mobile to base communications can be selected from

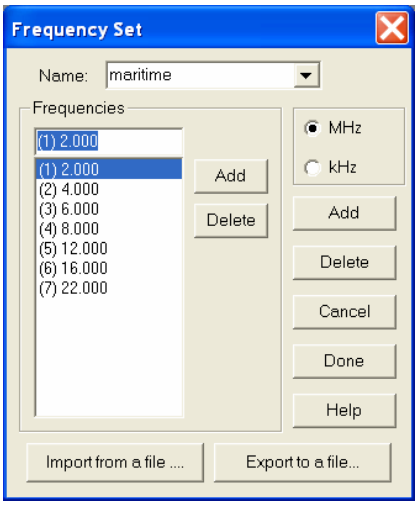
1. a standard set available via the Area Predictions menu, or
2. user-specified sets defined via latitude/longitude boundaries and grid resolution entered by the user.



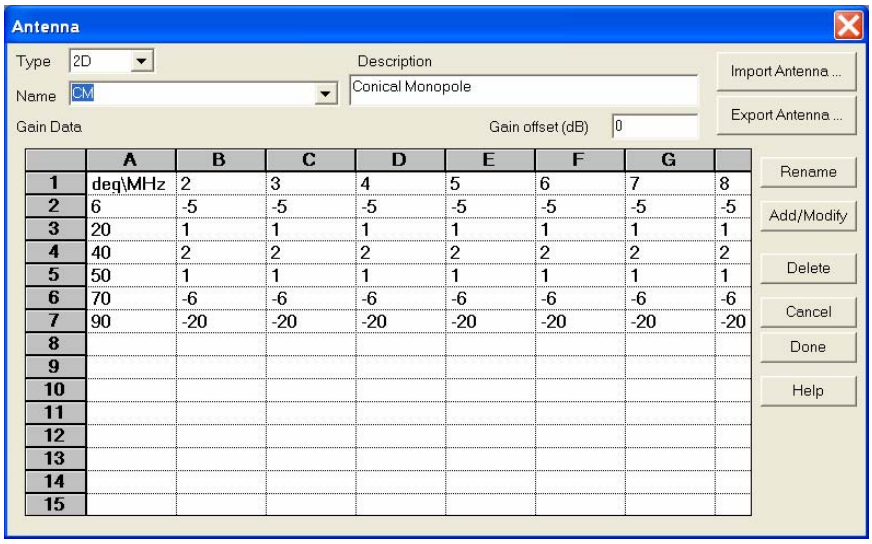
Selecting a Prediction Area.

Frequency sets

Frequency sets can be entered in units of either kHz or MHz. The data can be entered manually, or imported from a text file. It can also be exported to a text file.

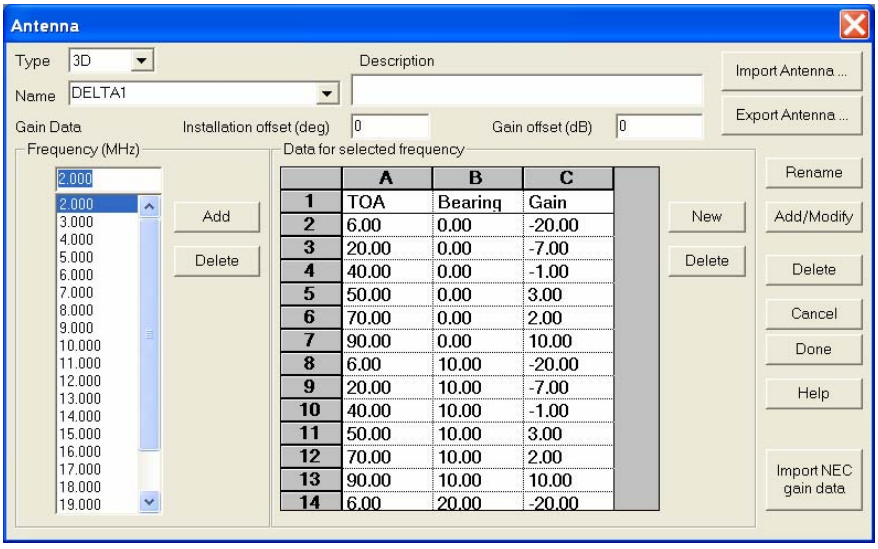


2-D and 3-D antenna types



	A	B	C	D	E	F	G	
1	deg\MHz	2	3	4	5	6	7	8
2	6	-5	-5	-5	-5	-5	-5	-5
3	20	1	1	1	1	1	1	1
4	40	2	2	2	2	2	2	2
5	50	1	1	1	1	1	1	1
6	70	-6	-6	-6	-6	-6	-6	-6
7	90	-20	-20	-20	-20	-20	-20	-20
8								
9								
10								
11								
12								
13								
14								
15								

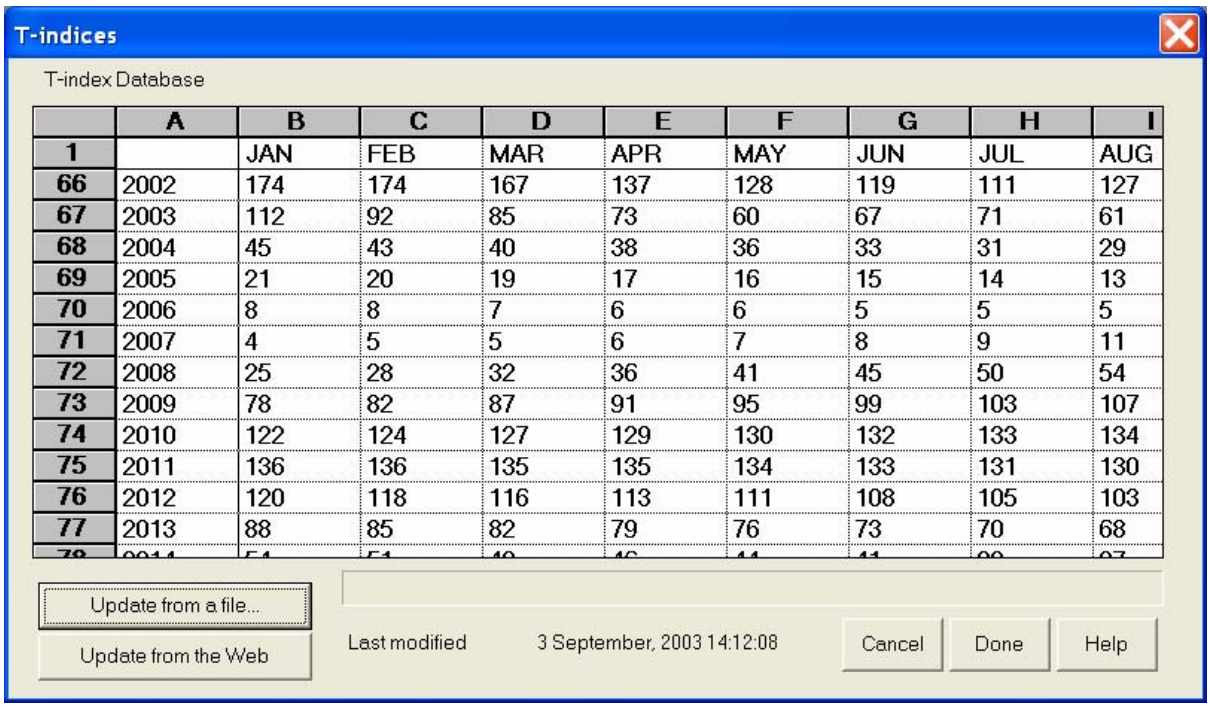
Sample 2-D antenna gain pattern – Conical Monopole



	A	B	C
1	TOA	Bearing	Gain
2	6.00	0.00	-20.00
3	20.00	0.00	-7.00
4	40.00	0.00	-1.00
5	50.00	0.00	3.00
6	70.00	0.00	2.00
7	90.00	0.00	10.00
8	6.00	10.00	-20.00
9	20.00	10.00	-7.00
10	40.00	10.00	-1.00
11	50.00	10.00	3.00
12	70.00	10.00	2.00
13	90.00	10.00	10.00
14	6.00	20.00	-20.00

Sample 3-D antenna gain pattern - Delta

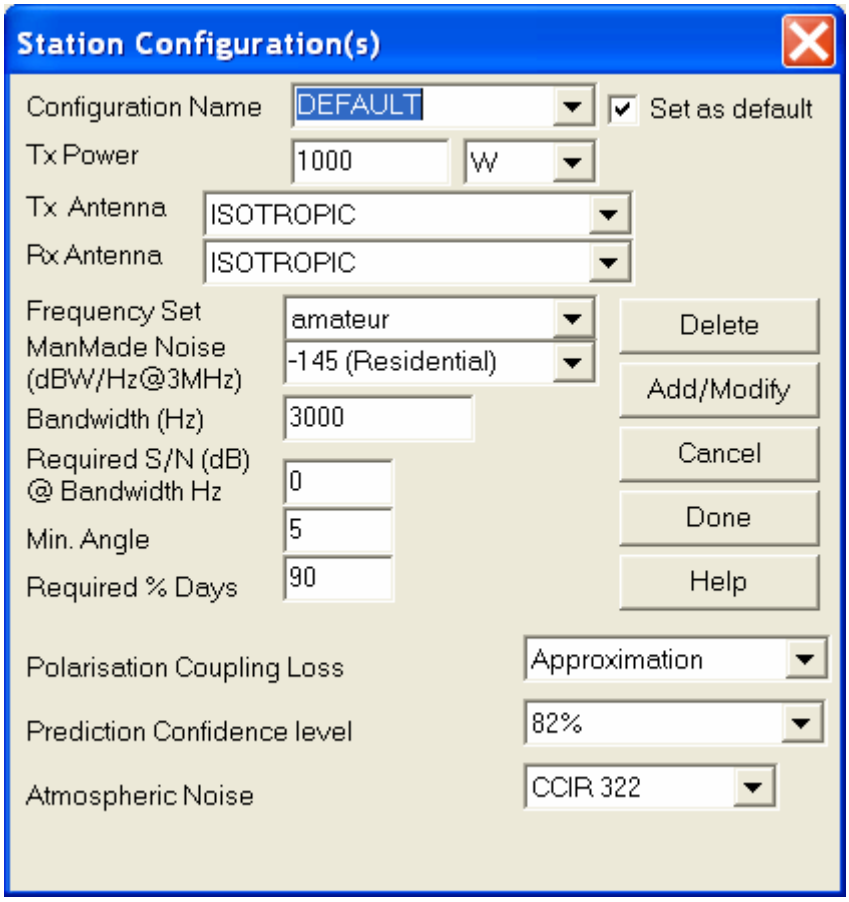
Ionospheric T indices



	A	B	C	D	E	F	G	H	I
1		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG
66	2002	174	174	167	137	128	119	111	127
67	2003	112	92	85	73	60	67	71	61
68	2004	45	43	40	38	36	33	31	29
69	2005	21	20	19	17	16	15	14	13
70	2006	8	8	7	6	6	5	5	5
71	2007	4	5	5	6	7	8	9	11
72	2008	25	28	32	36	41	45	50	54
73	2009	78	82	87	91	95	99	103	107
74	2010	122	124	127	129	130	132	133	134
75	2011	136	136	135	135	134	133	131	130
76	2012	120	118	116	113	111	108	105	103
77	2013	88	85	82	79	76	73	70	68

The IPS T index database can now be updated automatically via your web browser. It also has been placed in standard spreadsheet format, with row numbers and column letters

Station configurations



5) Command Line Options

Predictions can easily be generated for large numbers of HF circuits by running ASAPS V5 command line options. If started in this mode, ASAPS V5 will read in circuit and (optionally) frequency set details from user-generated files and generate the associated predictions immediately.

Demonstration Software

A free demonstration copy of ASAPS V5 is available via our web-site. To access this, please go to our home page at www.ips.gov.au and follow links as follows:

Products & Services > Software - ASAPS > Download Demo Version

Predictions are restricted to a set date (January of the current year) and level of ionospheric activity (T index =50), otherwise the user is free to input a range of data, and explore the program's output.

Ordering ASAPS V5

ASAPS V5 is available directly from IPS Head Office or through our distributors. Contact our distributors directly for sales in the **Americas** or **Italy**, based on the contact details that follow. For all other sales, you may complete the order form that follows and return it to IPS.

Upgrades to ASAPS V5 are available from ASAPS V4. Please note that a new set of registration details will be required for ASAPS V5 Upgrades.

Distributor sales – Americas and Italy

Americas:

Prices

- Original: $275 (USD)
- Upgrade: $35 (USD)

Mr Jacques d'Avignon

- Email: monitor@rac.ca
- Phone: +1 613 745 6522
- Fax: +1 613 745 4195

Italy:

Prices

- Original: $200 (EURO)
- Upgrade: $30 (EURO)

Mr Luca Barbi

- Email: luca.barbi@libero.it
- Web: www.lucabarbi.it
- Phone and Fax: +39 0386 467203

IPS ASAPS V5 Order Form

This form is to be used for purchasing directly from IPS Head Office **only**. For details about sales through our **Americas** and **Italian** distributors, check the details on the previous page.

Step 1: Fill in your details

Registered User _____

Organisation: _____

Australian Business Number (Aust. Only): _____

Postal Address: _____

_____

_____

Telephone: _____ ( ) _____

Mobile: _____

Facsimile: _____ ( ) _____

Internet: _____

Step 2: Select your item

Software	Location	Price (AUD)	Quantity	Sub-Total
Original	Australia (inc. 10% GST)	1st 5 copies: $375 per copy extra copies: $225 per copy		
	International	1st 5 copies: $350 per copy extra copies: $210 per copy		
Upgrade *	Australia (inc. 10% GST)	$54 per copy		
	International	$50 per copy		
			TOTAL (AUD)	$

* only available from ASAPS V4

Step 3: Fill in your payment details

[_] Send Invoice/Purchase Order Number:

……

[_] Cheque enclosed $……. Cheque payable to *IPS Radio and Space Services*.

[_] Charge $……. [_] Bankcard [_] Mastercard [_] Visa [_] Amex

Card Number:

……

Amex only – 4-digit security code: ……

Card Expiry Date: …….. / ……..

Card Holder Name:

……..

Signature: ……Date: ….. /…..

/…….

<u>Mail or Fax Form To:</u>
IPS Radio and Space Services
PO Box 1386
Haymarket NSW 1240
Australia

Fax: +61 2 9213 8060