Changes in the Pathloss Radio Data File Format

Automatic transmit power control (ATPC)

Note that ATPC is only used in interference calculations. In normal unfaded propagation conditions, the transmit power is reduced by the specified ATPC. In effect, this reduces the interfering potential of the transmitter by the ATPC value. All performance calculations (multipath, rain and obstruction fading) are carried out using the transmit power without ATPC.

The field ATPC_TRIGGER_POINT_DBM was an information only specification which was not used in the program. This has been changed to REQUIRED_RXSIGNAL_DBM to allow the ATPC to be specified indirectly as follows:

$$ATPC = REQUIRED\_RXSIGNAL\_dBm - actual\_RXsignal\_dBm$$

Conventional Microwave Applications

As a result of numerous revisions to the radio data file format, some duplications and inconsistencies in the mnemonics have occurred. The Transmit data entries for a conventional microwave application are shown below.

Transmit data	Option names are used with all radio types				
TX_POWER_OPTIONS_NAME	Standard	Low	High		
TX_POWER_OPTIONS_DBM Max	30.00	25.00	32.00		
TX_POWER_MIN_OPTIONS_DBM	10.00	10.00	12.00		
ATPC_OPTIONS_DB Maximum	20.00	15.00	20.00		
TX_POWER_RANGE_DBM	To be removed in a future release				
ATPC_RANGE_DB	To be removed in a future release				
ATPC_STEP_SIZE_DB	0.50	Information only			
REQUIRED_RXSIGNAL_DBM	-62.00	(was ATPC_TRIGGER_POINT_DBM)			
TX_STABILITY_PERCENT	1.00E-003	Information only			

There are 5 transmit power options available. Each option contains the following:

- name of the option e.g Std, Lo, Hi
- The maximum TX power
- The minimum TX power if the power is adjustable
- The ATPC value. If the operating APTC is determined indirectly from the receive signal, this is the maximum ATPC

The TX_POWER_RANGE_DBM was intended for a continuously adjustable power range between a maximum and minimum value. The ATPC _RANGE_DB was the associated.

With the above 5 power options, these fields are now redundant. They have been left in for backwards compatibility reasons; however, they may be removed in a future release

Adaptive modulation applications

Some clarification may required for this paragraph.

The adaptive modulation section of the radio data file includes five power options for each of the 10 possible modulation states. The power options are the same as conventional microwave radio

- name of the option e.g Std Lo Hi
- The maximum TX power
- The minimum TX power if the power is adjustable
- The ATPC value

An example of the TX power option section of an adaptive modulation radio data file is shown below.

	ADMOD_1B	ADMOD_2B	ADMOD_3B	ADMOD_4B	ADMOD_5B	ADMOD_6B	ADMOD_7B
1 Power option	Std	Std	Std	Std	Std	Std	Std
1 Max pwr (dBm)	25.0	27.0	28.0	28.0	28.0	29.0	30.0
1 Min pwr (dBm)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
1 ATPC top (dB)	15.0	17.0	18.0	18.0	18.0	19.0	20.0
2 Power option	Hi	Hi	Hi	Hi	Hi	Hi	Hi
2 Max pwr (dBm)	27.0	29.0	30.0	30.0	30.0	31.0	32.0
2 Min pwr (dBm)	12.0	12.0	12.0	12.0	12.0	12.0	12.0
2 ATPC top (dB)	17.0	19.0	20.0	20.0	20.0	21.0	22.0

ATPC is inherent in the design of adaptive modulation radios to maintain linearity for the various modulation states.

In the ETSI mode all TX powers are limited to the TX power of the reference modulation.

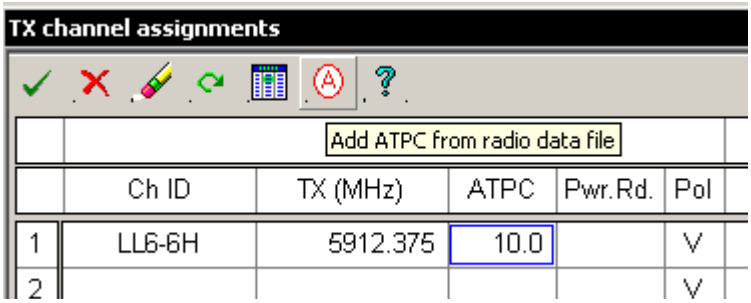
In the ANSI mode the TX powers are as specified in the radio data file.

An interference calculation involving an adaptive modulation radio will be carried out for the reference modulation state. For ANSI operation this will be the top modulation level

The ATPC top value will be used in the calculation. to determine the power reduction - either a fixed value or a value derived from the REQUIRED_RXSIGNAL_DBM parameter

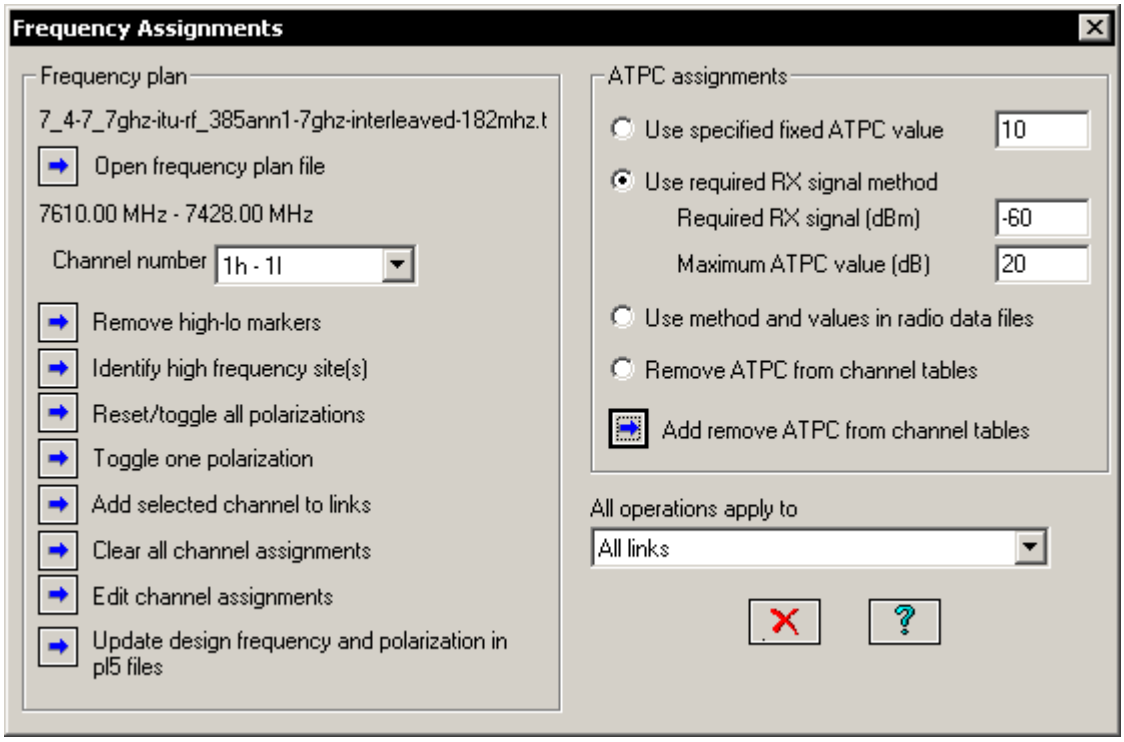
Specifying ATPC in Pathloss Program.

The ATPC value for each channel assignment can be manually entered in the TX channel assignments data entry form



The *Add ATPC from radio data file* button has been added to facilitate this operation. If the radio data file contains a value for the REQD_RXSIGNAL_DBM and there is a value for ATPC_OPTIONS_DBM (max) for the selected power option. and there is an actual RX signal calculation then the ATPC is calculated as stated in the above equation. If the resulting ATPC is greater than the ATPC_OPTIONS_DBM value, then the ATPC will be set to this maximum.

If the value for the REQD_RXSIGNAL_DBM is not available, then the ATPC_OPTIONS_DBM value will be used.



For additional flexibility, the ATPC assignments have been separated from the Frequency assignments.
Four options are available for ATPC assignments:

- a user specified fixed ATPC value
- a variable ATPC using a user specified Required RX signal and maximum ATPC value
- a variable ATPC using data in the radio data files (same as the *A* button in the TX channel assignment table
- remove all ATPC values

Note that the *Edit channel assignments* can be used for both frequency and ATPC assignments

Space Diversity IF Combining

The space diversity improvement using IF combining involves improvements to both the selective and non selective fade probabilities. The method used for the selective fading component has changed from an LCOMB_FACTOR

Space diversity improvement parameters	
SPACE_DIV_OPERATION	IF combining
IF_COMB_GAIN	2.50
LCOMB_FACTOR	

to two new parameters which are used to modify the signature width and the minimum and non minimum phase depths

Space diversity improvement parameters			
SPACE_DIV_OPERATION	BB switching		
	IF combiner gain	Sig width factor	Sig depth factor
GAIN_WIDTH_DEPTH	2.50	2.20	1.60

The use of the IF combiner gain in the non selective fading improvement is unchanged. Equation 127 in ITU-R P.530-15, is modified as follows:

$$I = \left[1 - \exp\left(-0.04 \cdot S^{0.87} \cdot f^{-0.12} \cdot d^{0.48} \cdot P_o^{-1.04}\right)\right] \cdot 10^{\frac{A - V + I_{comb}}{10}}$$

where I_{comb} is the IF combiner gain, A default value of 2.6 dB is used if this parameter is not specified in the radio data file. This parameter is also used in the North American methods in similar manner.

The selective fading improvement factor (L_{comb}) is handled by modifying equation 133 in ITU-R P.530-15 as follows:

$$P_{ds} = \frac{\left(\frac{P_s}{L_{comb}}\right)^2}{n \cdot \left(1 - k_s^2\right)}$$

The default value for the L_{comb} factor is 1

The L_{comb} factor has been replace by two factors which modify the equipment signature.
The signature with is divided by the signature width factor.
The minimum and non minimum phase depths are multiplied by the signature depth factor.
This method allows a direct measurement of these parameters.