GammaLib - Feature #3990

Add function to convert sigma for a given number of freedoms to TS value

02/17/2022 10:49 AM - Knödlseder Jürgen

Status:	New	**Start date:**	02/17/2022
Priority:	Normal	**Due date:**	
Assigned To:		**% Done:**	0%
Category:		**Estimated time:**	0.00 hour
Target version:			

Description

The equation to use is at the bottom of

https://people.math.gatech.edu/~ecroot/3225/chisquare.pdf

In this equation *a* is the TS value that corresponds to a given significance level. Since *a* should be the outcome, the equation can only be solved iteratively.
To obtained the Probability on the left hand side of the equation, a Gaussian needs to be integrated over the interval [-sigma,+sigma], and the probability to be used is 1 - the integral.

The other parameters to use are alpha = 1/2 and *k* which is the number of degrees of freedom, see for example https://programmathically.com/chi-square-distribution-and-degrees-of-freedom/.

History

#1 - 03/14/2022 12:27 PM - Knödlseder Jürgen

- Target version deleted (2.0.0)

#2 - 03/22/2022 11:37 AM - Knödlseder Jürgen

For 2 degrees of freedom the equation simplifies to

P(Chi2 > TS) = exp(-E/2.0)

hence

TS = -2 ln(P)

Sigma	P	TS
1	1-0.6827	2.2958
2	1-0.9545	6.1801
3	1-0.9973	11.8290