NAG Fortran Library Routine Document

G01ZUF

Note: before using this routine, please read the Users' Note for your implementation to check the interpretation of ***bold italicised*** terms and other implementation-dependent details.

1 Purpose

G01ZUF is used to initialize routines G01MUF and G01EUF.

It is intended to be used before a call to G01MUF or G01EUF.

2 Specification

```
SUBROUTINE G01ZUF (RKAPPA, BETA2, MODE, XL, XU, WORK, IFAIL)
INTEGER            MODE, IFAIL
double precision   RKAPPA, BETA2, XL, XU, WORK(322)
```

3 Description

G01ZUF initializes the array WORK for use by G01MUF or G01EUF in the evaluation of the Vavilov functions $\phi_V\left(\lambda;\kappa,\beta^2\right)$ and $\Phi_V\left(\lambda;\kappa,\beta^2\right)$ respectively.

4 References

Schorr B (1974) Programs for the Landau and the Vavilov distributions and the corresponding random numbers *Comp. Phys. Comm.* **7** 215–224

5 Parameters

1: RKAPPA – ***double precision*** *Input*

On entry: the argument κ of the function.

Constraint: $0.01 \leq \text{RKAPPA} \leq 10.0$.

2: BETA2 – ***double precision*** *Input*

On entry: the argument β^2 of the function.

Constraint: $0.0 \leq \text{BETA2} \leq 1.0$.

3: MODE – INTEGER *Input*

On entry: if $\text{MODE} = 0$, then G01MUF is to be called after the call to G01ZUF. Otherwise, G01EUF is to be called.

4: XL – ***double precision*** *Output*

On exit: x_l, a threshold value below which $\phi_V\left(\lambda;\kappa,\beta^2\right)$ will be set to zero by G01MUF and $\Phi_V\left(\lambda;\kappa,\beta^2\right)$ will be set to zero by G01EUF if $\lambda > x_l$.

5: XU – ***double precision*** *Output*

On exit: x_u, a threshold value above which $\phi_V\left(\lambda;\kappa,\beta^2\right)$ will be set to zero by G01MUF and $\Phi_V\left(\lambda;\kappa,\beta^2\right)$ will be set to unity by G01EUF if $\lambda > x_u$.

6: WORK(322) – ***double precision*** array *Communication Array*

On exit: this parameter should be passed unchanged to G01EUF or G01MUF.

7: IFAIL – INTEGER *Input/Output*

On entry: IFAIL must be set to 0, −1 or 1. Users who are unfamiliar with this parameter should refer to Chapter P01 for details.

On exit: IFAIL = 0 unless the routine detects an error (see Section 6).

For environments where it might be inappropriate to halt program execution when an error is detected, the value −1 or 1 is recommended. If the output of error messages is undesirable, then the value 1 is recommended. Otherwise, for users not familiar with this parameter the recommended value is 0. **When the value −1 or 1 is used it is essential to test the value of IFAIL on exit.**

6 Error Indicators and Warnings

If on entry IFAIL = 0 or −1, explanatory error messages are output on the current error message unit (as defined by X04AAF).

Errors or warnings detected by the routine:

IFAIL = 1

On entry, RKAPPA < 0.01,
or RKAPPA > 10.0,
or BETA2 < 0.0,
or BETA2 > 1.0.

IFAIL = 2

The initialization has been abandoned due to an internal error. This error exit is unlikely to occur, but if it does change the values of RKAPPA and/or BETA2 and rerun G01ZUF.

7 Accuracy

At least 5 significant digits are usually correct.

8 Further Comments

None.

9 Example

See Section 9 of the documents for G01MUF and G01EUF.