

# NAG Fortran Library Routine Document

## F06TCF (ZSPMV)

**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

F06TCF (ZSPMV) performs the matrix-vector operation

$$y \leftarrow \alpha Ax + \beta y$$

where  $A$  is an  $n$  by  $n$  complex symmetric matrix stored in packed form,  $x$  and  $y$  are  $n$  element complex vectors, and  $\alpha$  and  $\beta$  are complex scalars.

### 2 Specification

```
SUBROUTINE F06TCF (UPLO, N, ALPHA, AP, X, INCX, BETA, Y, INCY)
  INTEGER          N, INCX, INCY
  complex*16     ALPHA, AP(*), X(*), BETA, Y(*)
  CHARACTER*1     UPLO
```

The routine may be called by its BLAS name *zspmv*.

### 3 Description

None.

### 4 References

None.

### 5 Parameters

- 1: UPLO – CHARACTER\*1 *Input*  
*On entry:* specifies whether the upper or lower triangular part of  $A$  is stored as follows:  
 if UPLO = 'U', the upper triangular part of  $A$  is stored;  
 if UPLO = 'L', the lower triangular part of  $A$  is stored.  
*Constraint:* UPLO = 'U' or 'L'.
- 2: N – INTEGER *Input*  
*On entry:*  $n$ , the order of the matrix  $A$ .  
*Constraint:*  $N \geq 0$ .
- 3: ALPHA – **complex\*16** *Input*  
*On entry:* the scalar  $\alpha$ .
- 4: AP(\*) – **complex\*16** array *Input*  
**Note:** the dimension of the array AP must be at least  $\max(1, N \times (N + 1)/2)$ .  
*On entry:* the  $n$  by  $n$  symmetric matrix  $A$ , packed by columns. More precisely, if UPLO = 'U', the upper triangle of  $A$  must be stored with element  $a_{ij}$  in  $AP(i + j(j - 1)/2)$  for  $i \leq j$ ;

if UPLO = 'L', the lower triangle of  $A$  must be stored with element  $a_{ij}$  in  $AP(i + (2n - j)(j - 1)/2)$  for  $i \geq j$ .

- 5: X(\*) – **complex\*16** array *Input*  
*On entry:* the vector  $x$ .
- 6: INCX – INTEGER *Input*  
*On entry:* the increment in the subscripts of X between successive elements of  $x$ .  
*Constraint:* INCX  $\neq$  0.
- 7: BETA – **complex\*16** *Input*  
*On entry:* the scalar  $\beta$ .
- 8: Y(\*) – **complex\*16** array *Input/Output*  
*On entry:* the vector  $y$ . If BETA = 0, Y need not be set.  
*On exit:* the updated vector  $y$ .
- 9: INCY – INTEGER *Input*  
*On entry:* the increment in the subscripts of Y between successive elements of  $y$ .  
*Constraint:* INCY  $\neq$  0.

## 6 Error Indicators and Warnings

None.

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