

mdefine: Define a simple model using an arithmetic expression.

Syntax: **mdefine** [name [expression [: [type] [emin emax]]]

where 'name' = the name of the model. If "name" is a previously defined model with mdefine, the current definition will overwrite the old one, and the user is warned; if it is a built-in model, however, the user will be asked to use a different name.

'expression' = a string of arithmetic expression. Simple rules for expression:

- 1) The energy term, must be 'e' or 'E' in the expression. Other words, which are not numerical constants nor internal functions, are assumed to be model parameters.
- 2) If a convolution model varies with the location on the spectrum to be convolved, the special variable ".e" or ".E" may be used to refer to the convolution point.
- 3) The expression may contain spaces for better readability.

'type' = user may optionally specify the type of the model, the valid types are (add, mul, con). (Mix models are not yet implemented as of v12.5.0) Please note that the character ":" must be used to separate the options from the "expression". If "type" is not given default is add.

'emin emax' = user may also specify the minimum and maximum energy values for the model, the default values are 1.e-20 and 1.e+20, respectively.

Note that MDEFINE can also be used to display and delete previously defined models:

- 1) To display the name, type and expression of all previously defined models:

```
XSPEC12>mdefine
```

- 2) To display the name, type and expression of a previously defined model by the name, MNAME:

```
XSPEC12> mdefine MNAME
```

- 3) To delete a previously defined model by the name, MNAME:

```
XSPEC12> mdefine MNAME :
```

Operators:

The following operators are recognized in an expression:

- + = plus operator
- = minus operator
- * = multiplying operator
- / = dividing operator
- ** = exponentiation operator
- ^ = exponentiation operator

Functions:

The following internal functions are supported:

Unary Functions

EXP	(expr)	=	exp of a vector expression
SIN	(expr)	=	sine of vector expression in rad
SIND	(expr)	=	sine of a vector expression in degree
COS	(expr)	=	cosine of a vector expression in rad
COSD	(expr)	=	cosine of a vector expression in degree
TAN	(expr)	=	tangent of a vector expression in rad
TAND	(expr)	=	tangent of a vector expression in degree
LOG	(expr)	=	base 10 log of a vector expression
LN	(expr)	=	natural log of a vector expression
SQRT	(expr)	=	sqrt of a vector expression
ABS	(expr)	=	absolute value of a vector expression
INT	(expr)	=	integer part of a vector expression
ASIN	(expr)	=	\sin^{-1} of a vector expression in rad
ACOS	(expr)	=	\cos^{-1} of a vector expression in rad
MEAN	(expr)	=	mean value of a vector expression
DIM	(expr)	=	dimension of a vector expression
SMIN	(expr)	=	minimum value of a vector expression
SMAX	(expr)	=	maximum value of a vector expression

Binary Functions

MAX	(expr1, expr2)	=	maximum of the two vector expressions
MIN	(expr1, expr2)	=	minimum of the two vector expressions

Examples:

[illegible]

***Warning: bb is a pre-defined model
Please use a different name for your model.

```
XSPEC12> mdef sg exp(-E^2/(2*A*.E)) / sqrt(6.283*A*sqrt(.E)) : con
```

! this defines a Gaussian
convolution model with sigma
varying with square root of
energy.

```
XSPEC12> mdef junk2 : ! delete junk2
```

```
XSPEC12> mdef ! display all user-defined models
```

-- Name	----	Type	-----	Expression	-----
dplaw		add		$E^{**p1} + f * E^{**p2}$	
junk		add		$a * E + b * \text{LOG}(E) / \text{SIN}(E)$	
junk3		mul		$a + b * E$	
sg		con		$\text{EXP}(-E^2 / (2 * A * .E)) / \text{SQRT}(6.283 * A * \text{SQRT}(.E))$	
