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Submitter :
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Lorentz Transformations

LORENF transforms the momentum 4-vector of a particle from the Lorentz-frame Σ to the frame Σ' like LOREN4 (U101); it is faster than LOREN4 because the rest-mass M of Σ' is passed as an argument to save the square root.

LORENB executes the inverse transformation.

Structure:

SUBROUTINE subprograms
User Entry Names: LORENF, LORENB

Usage:

`CALL LORENF(SM,SP,PB,PF)`	forward transformation	`PB -> PF`
`CALL LORENB(SM,SP,PF,PB)`	backward transformation	`PF -> PB`

with

SM	Rest-mass M of system Σ' with $M^2 = E^2 - P^2$.
SP	Momentum 4-vector (P, E) of Σ' in Σ.
PB	Momentum 4-vector (p, e) in Σ.
PF	Momentum 4-vector (p', e') in Σ'.

Method:

For LORENF (cf. LOREN4 (U101)):

$$\begin{aligned} e' &= (eE - pP)/M \\ p' &= p - P(e + e')/(E + M) \end{aligned}$$

because $pP = eE - e'M$ and $pP - e(E + M) = -M(e + e')$.
For LORENB:

$$\begin{aligned} e &= (e'E + p'P)/M \\ p &= p' + P(e + e')/(E + M) \end{aligned}$$

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