An approximate position vector of the moon is computed in LSPOS. The unit vector is made up as:

\[
\begin{align*}
R_{\text{MOON}(x)} &= \cos(LOM) \\
R_{\text{MOON}(y)} &= K_1 \sin(LOM) - K_2 \sin(LOM - LON) \\
R_{\text{MOON}(z)} &= K_3 \sin(LOM) + K_4 \sin(LOM - LON)
\end{align*}
\]

The value of LOM is calculated as

\[
LOM = LOM_0 + LOM T - (A \sin(W_A T + \phi_A) + B \sin(W_B T + \phi_B)).
\]

The value of \(W_B\) was inadvertently mis-scaled in Luminary-1D by a factor of 2. The computed value is \(W_B\) (correct) / 2).

The first graph (coded 3 in the lower left corner) shows the Moon position error when things are going good. \(\text{ABS}(\text{EMAX}) < 1.1 \text{ DEG}\).

The second graph (coded 4 in lower left corner) shows the Moon position error as calculated in Luminary-1D. \(\text{ABS}(\text{EMAX}) < 3.3 \text{ DEG}\).

No fix is planned for Apollo 14. The ground can transmit a very accurate Moon position vector if that body should be desired for alignment.

For Apollo 15 the numbers must be changed since the interval of usage for LSPOS is one year (July 1.0 to July 1.0). The present data expires on July 1.0, 1971.

MIT/DL has made a long (4 year +) ephemeris tape and LSPOS values can be fitted for up to 4 years. The first run indicates a 1500 day fit with corrections made as in equation (1), has \(\text{ABS}(\text{EMAX}) < 1.9\) degrees.
ERROR OF UNIT POSITION VECTOR OF THE MOON RELATIVE TO EARTH:
DAY # 0 IS THE MIDNIGHT UPHOLDING IN JULY 1, 1970
INTERVAL OF CONSIDERATION IS JULY 1, 1970 THRU JULY 1, 1971

ERROR (DEGREES)

0 0.5 1.0

0 100 200 300

DAYS

Figure 1
ERROR IN MOON POSITION

BRCS=NBY 1971

TIME (DAYS FROM JULY 1,0, 1970)
ERROR IN MOON POSITION

BRCS=NBY 1972

TIME (DAYS FROM JULY 1, 0, 1971)