

# MAD-X DYNAP & TOUSCHEK

dynap modifications

web site & examples for TOUSCHEK

# DYNAP Modifications

- Removed option switch=3 in trrun.F (this was never active). Switch=2 now computes both the tunes and the Lyapunov coefficients. In order to do so, the modules trrun.F (the routine trinicmd), dnap.F and madxn.c (the call of dynap, where the number of tracked particles needed to be doubled to include the Lyapunov partners).
- Rogelio Tomas noticed when tracking several particles, tunes were written to a file for each particle, the smear etc. only for the last one. This was corrected together with the above change.
- The tune error sometimes was very large  $>0.5$ , when one of the tunes was found on the wrong side of the half integer. This problem was corrected, and the tune error is now always correctly estimated.
- The calculation of the Lyapunov exponent was improved. Instead of calculating the 6-D distance in unnormalized phase space, now the phase distance in normalized phase space is used to estimate the Lyapunov exponent.
- Summary: modules trrun.F, dynap.F, and madxn.c were updated

# TOUSCHEK Documentation

MAD-X Touschek web page

<http://mad.home.cern.ch/mad/touschek/touschek.html>

Three examples were posted at

[http://frs.home.cern.ch/frs/mad-X\\_examples/touschek/](http://frs.home.cern.ch/frs/mad-X_examples/touschek/)

# Additions/changes suggested by Catia Milardi

- add **DAFNE lifetime** computation as further TOUSCHEK example
- **MAD changes the values for the sige and sigt variables** assigned by the BEAM command, - sige and sigt are recalculated on the base of the synchrotron tune, machine circumference, momentum compaction and longitudinal emittance; this approach produces an incorrect situation when the user wants to get the Touschek lifetime for a given value of bunch length or for an assigned value of relative energy spread.
- example: DAFNE works in **anomalous bunch lengthening regime**, measured bunch length is ~ 2 cm, much longer than the natural one ~ 1 cm. So one would like to compute the Touschek lifetime using that value, but no matter how she defines sigt and sige by the BEAM command, in the output Catia gets sigt = 1.2 cm and sige = .00048.
- **include the dynamic momentum acceptance in the Touschek lifetime** computation (Catia proposed to determine the ring acceptance performing tracking within the Touschek module; I suggested to specify the ring dynamic momentum acceptance as an optional input parameter) – also this effect is important especially for DAFNE.