S- & E- blocks

Version 9.8.158
from 11/13/2014

- Introduction to Extended configurations
- What are S- and E- blocks ?
- LISE^{++} optical block scheme
- Property of S- and E- blocks
- The Optical blocks editing dialog
- Manual recalculation of e-block matrices

Introduction to Extended configurations

The one of main directions of LISE^{++} development is the “Extended configurations” branch (or “Segmentation”) according to the LISE^{++} “White Book”

- Switch between extended (element) and segment (sector) configurations
- Minimization tools for extended configurations
- Export/Import separator configurations :
  LISE^{++} ↔ other beam transport codes
- Experiment set-up feedback

Why now?

Do not extremely change the optical blocks after adoption of the new version 9.9 in order to avoid complications with LISE^{++} transportation to QT-framework.

1. The SE property is the serious reconstruction of the code;
2. Quad fields minimization need.

Introduction to Extended configurations

http://lise.nscl.msu.edu/9_8/LISE3/Extended%20configurations%20at%20LISE++.pdf

Discussion of configurations in LISE++

This document describes the options for determining the transmission through a fragment separator and includes some description of these options

1. Introduction, definitions
2. Using Quadrupole and Dipole fast editing dialog
3. Concept of "Tuning" dipole
4. Definition of the cuts by the block
   (Angular acceptances, Apertures, Slits)
5. Slits and optical blocks
6. Slits and material blocks
7. Angular acceptance and apertures
8. Using extended configurations with Monte Carlo
9. How to obtain an angular acceptance?
10. Benchmarks

Some definitions will be used in the presentation


User


Advanced


Beam physicist

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Introduction to Extended configurations

http://lise.nscl.msu.edu/9_8/LISE3/Extended%20configurations%20at%20LISE++.pdf

Comparison of the Classical Segmented & Extended configurations

➢ **Classical (segmented) configuration:**

- Fast transmission calculations
- Optical matrices can be input by user or linked to COSY maps
- Simple and compact description of optical system
- Effective with analytical calculations for experiment planning

➢ **Extended (elemental) configuration:**

- Allows detailed analysis of transmission
- Optical matrices can be input by user, linked to COSY maps or calculated in the LISE^{++} code, and used in segmented configurations
- Tools to obtain angular acceptances, (which can be entered into classical segmented configurations)
- Tools for displaying ion-beam optics

Very useful with Monte Carlo calculations including fragment separator design

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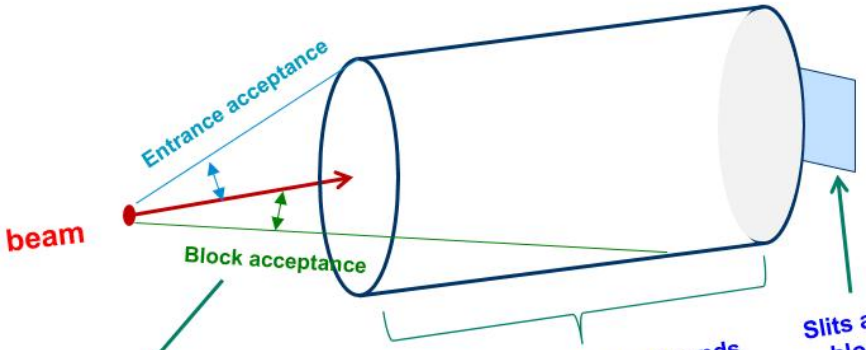
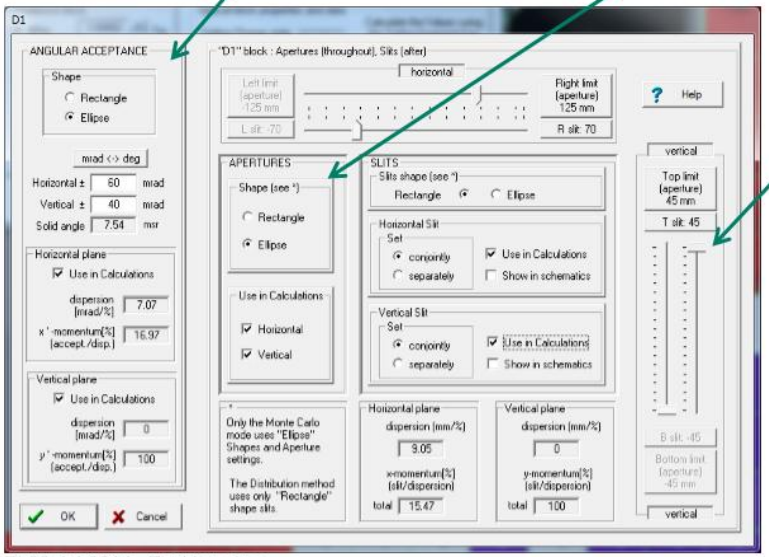
http://lise.nscl.msu.edu/9_8/LISE3/Extended%20configurations%20at%20LISE++.pdf

4. Definition of the cuts by the block

Block angular acceptance < Entrance acceptance





Configuration type	Angular Acceptance	Apperture	Slits after block
Classical ("segment")	Yes	No	Yes
Extended ("element")	No	Yes*	please use only for "slits" element

Note: the code does not distinguish segmented and extended configurations, it's up to the user.

* - *Apertures are used only in Monte Carlo calculations*

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What are S- and E- blocks ?

From the previous slide

~~Note: the code does not distinguish segmented and extended configurations, it's up to the user.~~

Nowadays LISE^{++} can distinguish!

s-block
(**s**ection, **s**egment configuration)

Construction property

e-block
(**e**lement, **e**xtended configuration)

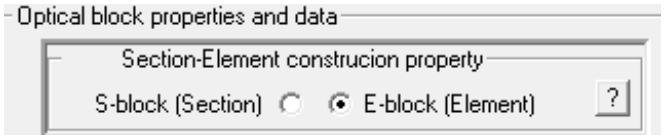
1. Main feature of E-block – possibility to calculate the optical matrix by means of LISE^{++} : so, this construction property tells to the code how and where this block can be used

2. This new construction property allows split properties and utilities of optical blocks. So, less confusion for the user, more simple and informative

3. Use new commands only for blocks of specified construction properties

4. All optical block classes are separated on three construction categories (on 11/14/2014):

a. only e-blocks (6 classes); *b. only s-blocks (6 classes);* *c. property defined by user (M & E- dipoles, Wien-filter)*



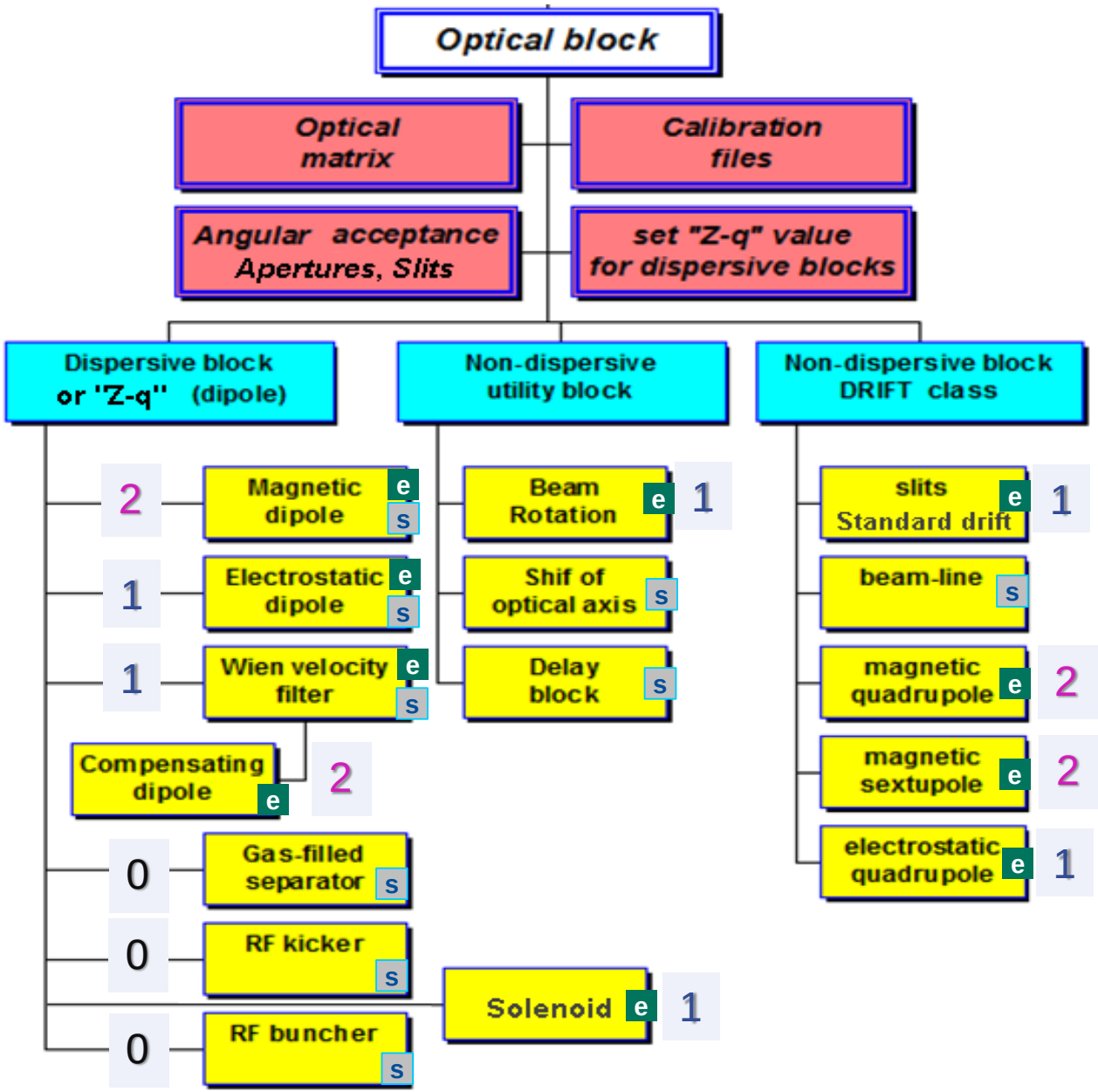
LISE^{++} optical blocks (11/2014)

High order optics calculated by LISE^{++}

0 1 2

e e-block
(element, extended configuration)

s s-block
(section, segment configuration)

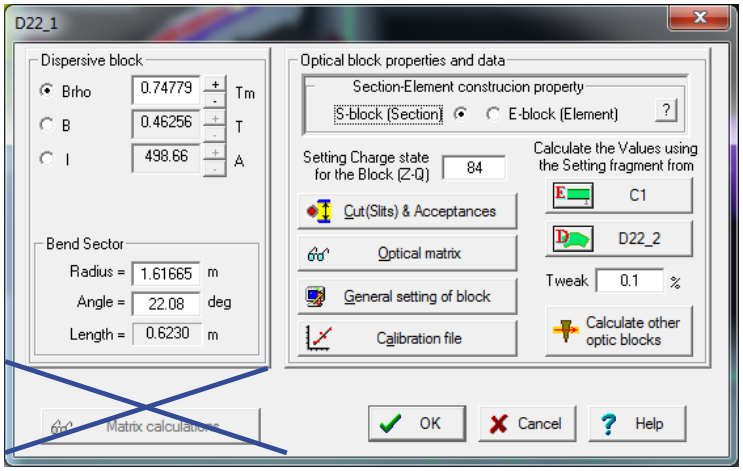


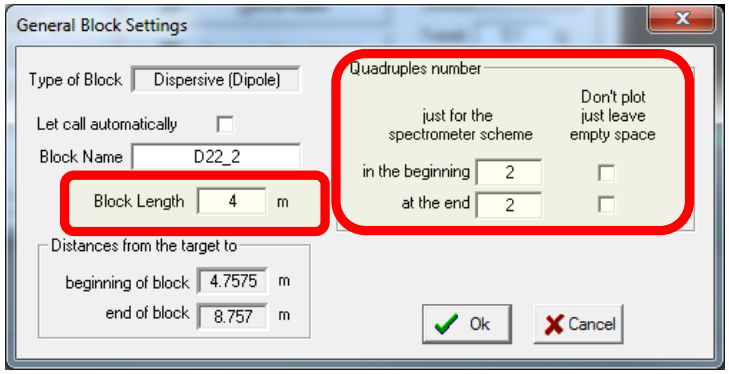
Property of S- and E- blocks

Property	S-block (sector)	E-block (element)
Optical matrix can be calculated inside of the code	no	yes
Length of block	manually	calculated
Drawing quadrupoles in scheme	allowed	no
Aperture property	no	yes
Slits after block property	yes	yes but not recommended
Angular acceptance block property	yes	yes but not recommended
Aperture property	no	yes
Block use in the segmentation process (in future)	no	yes
Block use in the minimization process (in future)	no	yes
Export/Import separator configuration (LISE++ ↔ other beam transport codes)	no	yes
User level	Regular	Expert
Efficiency to calculation model, designation	Effective with analytical calculations for experiment planning	Very useful with Monte Carlo calculations including fragment separator design

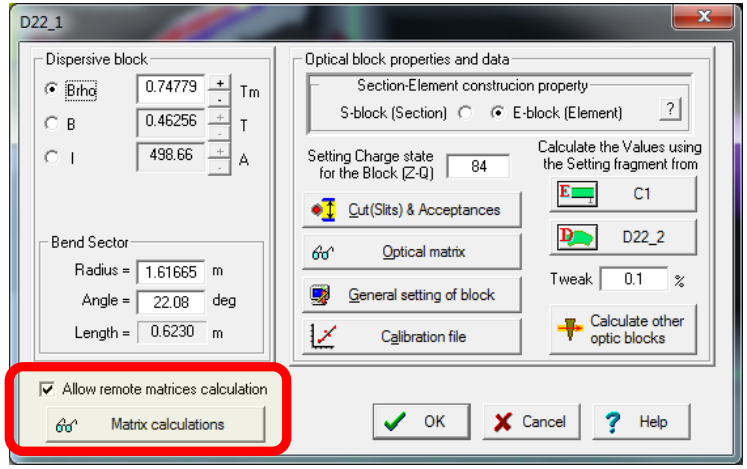
S & E construction methods : properties and utilities of optical blocks

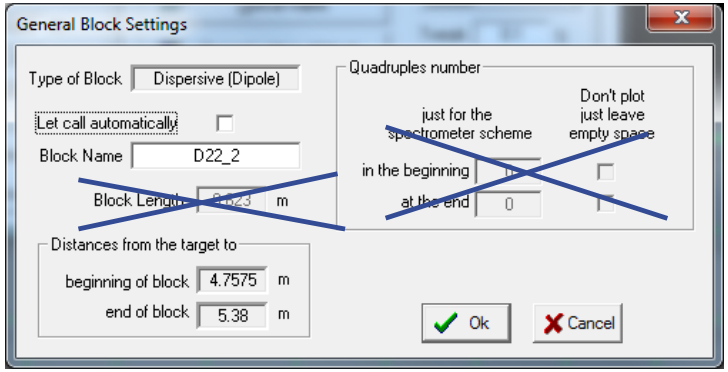
S-block



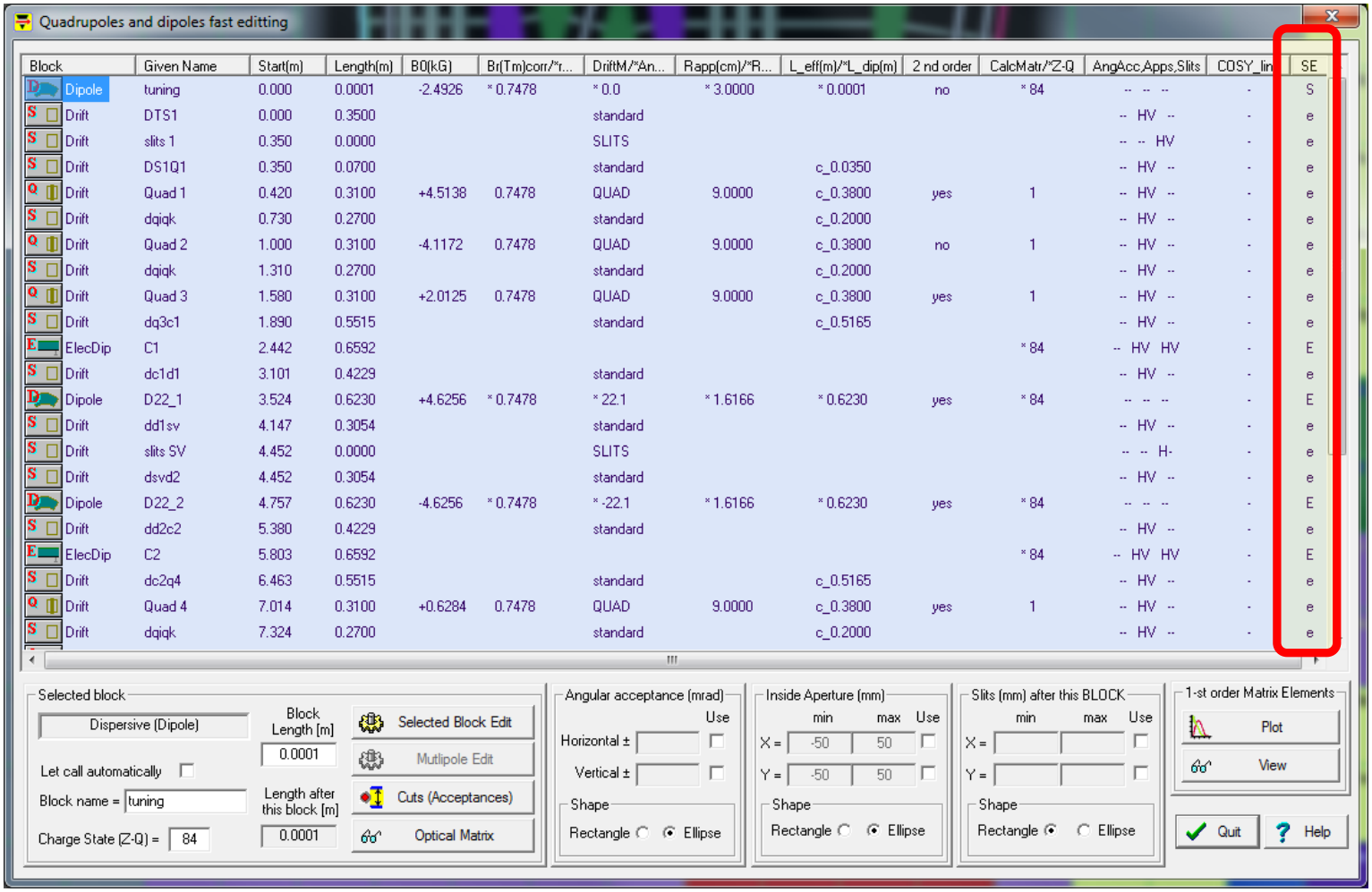


E-block



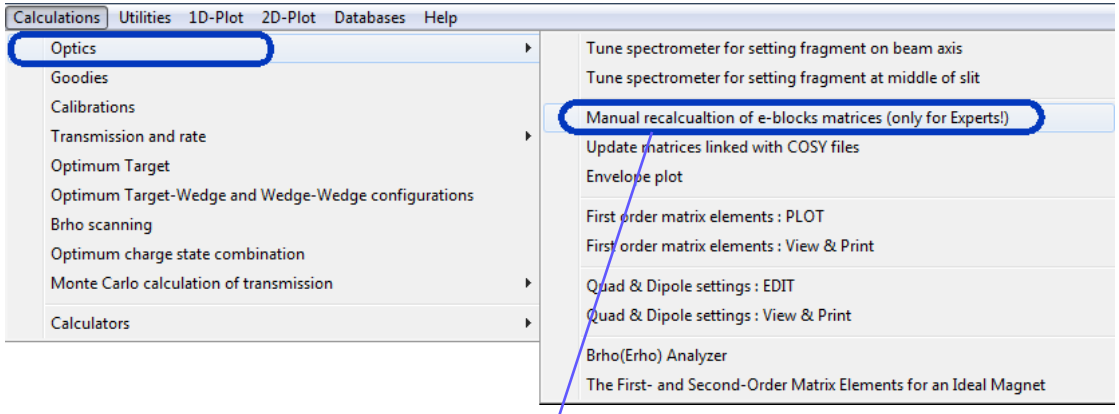


The Optical blocks editing dialog

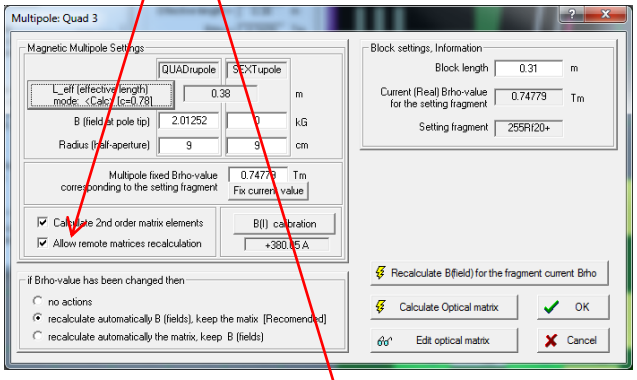


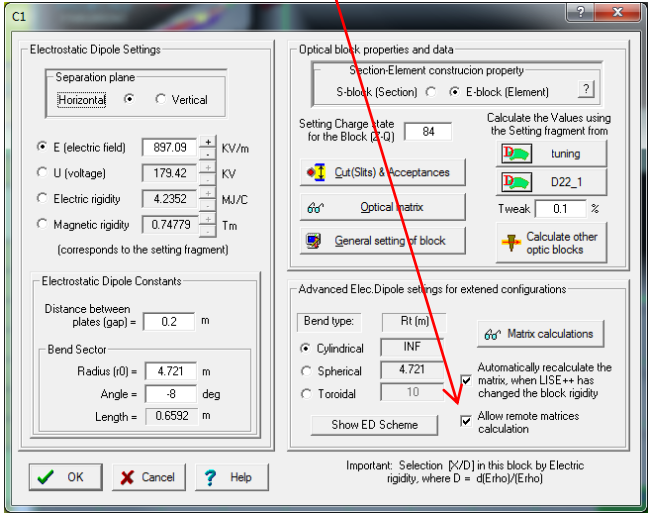
Small “e” and “s” chars show permanent properties of blocks.
Large “E” and “S” chars show block properties set by user.
S-blocks cannot be used for the segmentation process (in future).

Manual recalculation of e-block matrices



Applied only to S-blocks with "allowed remote permission" flag and without COSY-links!!!





Manual recalculation of optical matrices of e-blocks (approved blocks for extended configurations

```
 L I S E ++  [C:\_Popeko\SHELS v7.lpp]
13-11-2014  18:15:28

 N   Block      Name          Option       Status            delta
  1: Dipole     "tuning"                   checked
  2: Drift      "DTS1"        standard     checked
  3: Drift      "slits 1"     SLITS        checked
  4: Drift      "DS1Q1"       standard     checked
  5: Drift      "Quad 1"      QUAD         checked
  6: Drift      "dqiqk"       standard     checked
  7: Drift      "Quad 2"      QUAD         checked
  8: Drift      "dqiqk"       standard     checked
  9: Drift      "Quad 3"      QUAD         checked
 10: Drift      "dq3c1"       standard     checked
 11: ElecDip    "C1"                       checked
 12: Drift      "dc1d1"       standard     checked
 13: Dipole     "D22_1"                 == MODIFIED ==      -3.330%
 14: Drift      "dd1sv"       standard     checked
 15: Drift      "slits SV"    SLITS        checked
 16: Drift      "dsvd2"       standard     checked
 17: Dipole     "D22_2"                    checked
 18: Drift      "dd2c2"       standard     checked
 19: ElecDip    "C2"                       checked
 20: Drift      "dc2q4"       standard     checked
 21: Drift      "Quad 4"      QUAD         checked
 22: Drift      "dqiqk"       standard     checked
 23: Drift      "Quad 5"      QUAD         checked
 24: Drift      "dqiqk"       standard     checked
 25: Drift      "Quad 6"      QUAD         checked
 26: Drift      "dq6d3"       standard     checked
 27: Dipole     "D8"                       checked
 28: Drift      "drift"       standard     checked
 29: Drift      "slits 3"     SLITS        checked
 30: Drift      "drift"       standard     checked
 31: Drift      "slits 4"     SLITS        checked
 32: Drift      "drift"       standard     checked

Number of optical blocks: 32
Number of cosy links: 0
Number of udated blocks: 32
Number of modified blocks: 1
```

If the previous matrix is different from the recalculated one, it is shown in the information window