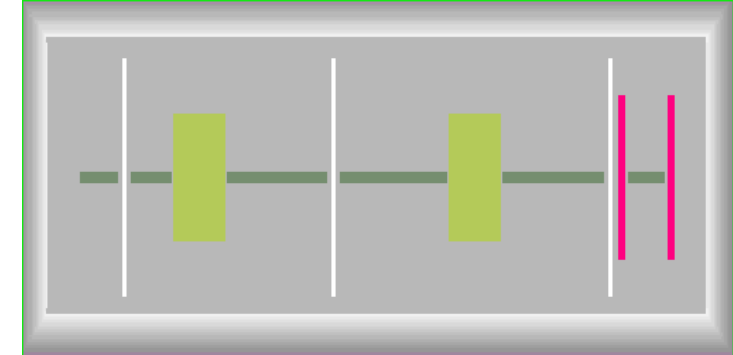


v.9.10.361  
from 10/14/16



1. “The “Solenoid” block : no more drifts
2. “The “Solenoid” block dialog modification
3. TwinSol configuration in LISE++ package
4. TwinSol utility update

**Solenoid 1**

**Solenoid settings**

B, max field  T  
 I, current  A

Field Direction

"+" positive  
 "-" negative

Use the "soft-edge" corrections for solenoid matrix calculations

$V (L * B / \text{PI}) = 0.2568 \text{ Tm}$   
 $V / \text{Brho} = 0.6846$

**Geometry**

Coil length =  m  
 Effective radius =  m  
 Block Length =  m

Modern "non-drift" mode  
 1-st part =  m  
 2-nd part =  m

$MA = MA_{\text{const}} * I$   
 $MA_{\text{const}} = 0.03613 \text{ T/A}$        $MA = 0.83089 \text{ T}$   
 $B(0) = MA * \text{CoilLength} / \text{sqrt}(\text{EffRadius}^2 + \text{CoilLength}^2 / 4)$

**Optical block properties and data**

Setting Charge state for the Block (Z-Q)

Tweak  %

**Block Tuning**

Take into account the GLOBAL matrix of the previous block

Tuning is the minimisation of

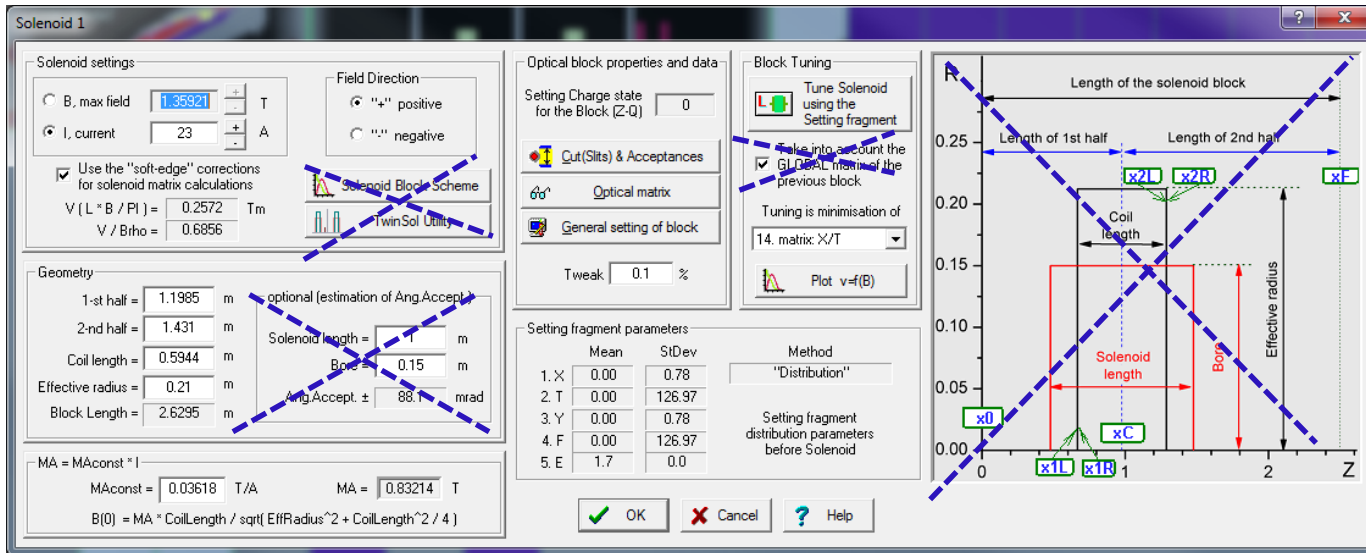
absolute value   
 after the block

**Setting fragment parameters**

	Mean	StDev	Method
1. X	0.00	45.68	"Distribution"
2. T	0.00	50.68	
3. Y	0.00	45.68	
4. F	0.00	50.68	
5. E	1.7	0.0	

Setting fragment distribution parameters before Solenoid, based on the initial beam vector and its transport through blocks located in front of Solenoid

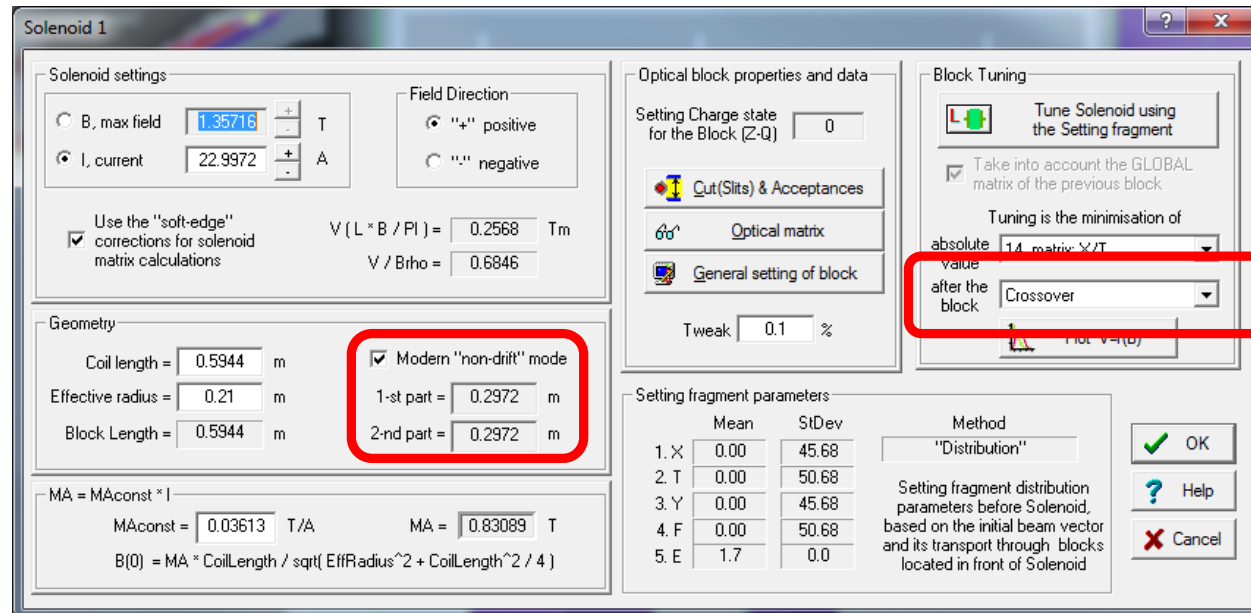
In the previous version it was impossible to insert an additional block (slits, material and so on) between solenoid drift and solenoid core itself., or to set their apertures independently



“Old”  
v.9.9

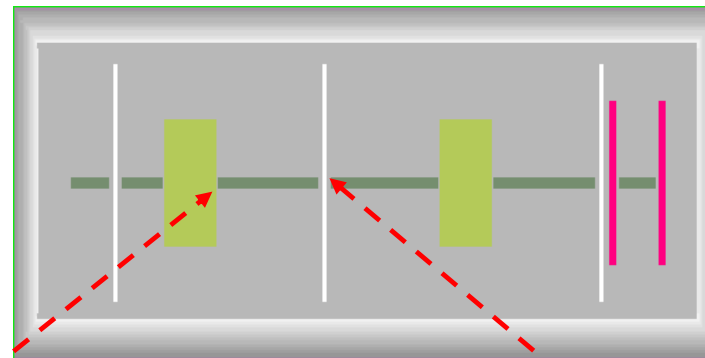
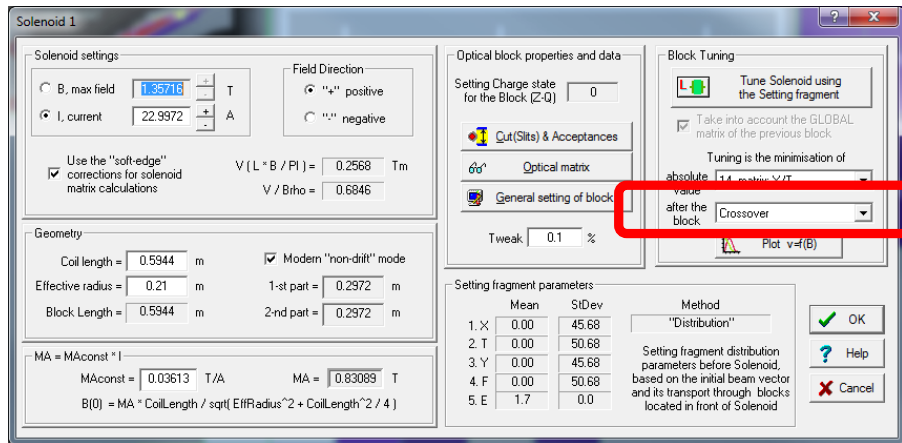
The “old” solenoid block dialog was based on classical solenoid properties from the TwinSol utility. Solenoid tuning was done with a matrix after the solenoid, what assumed drift existence in the solenoid block.

The new” solenoid block allows to select a block which map matrix will be used for tuning.



“New”  
v.9.10.361

The new" solenoid block allows to select a block which map matrix will be used for tuning.

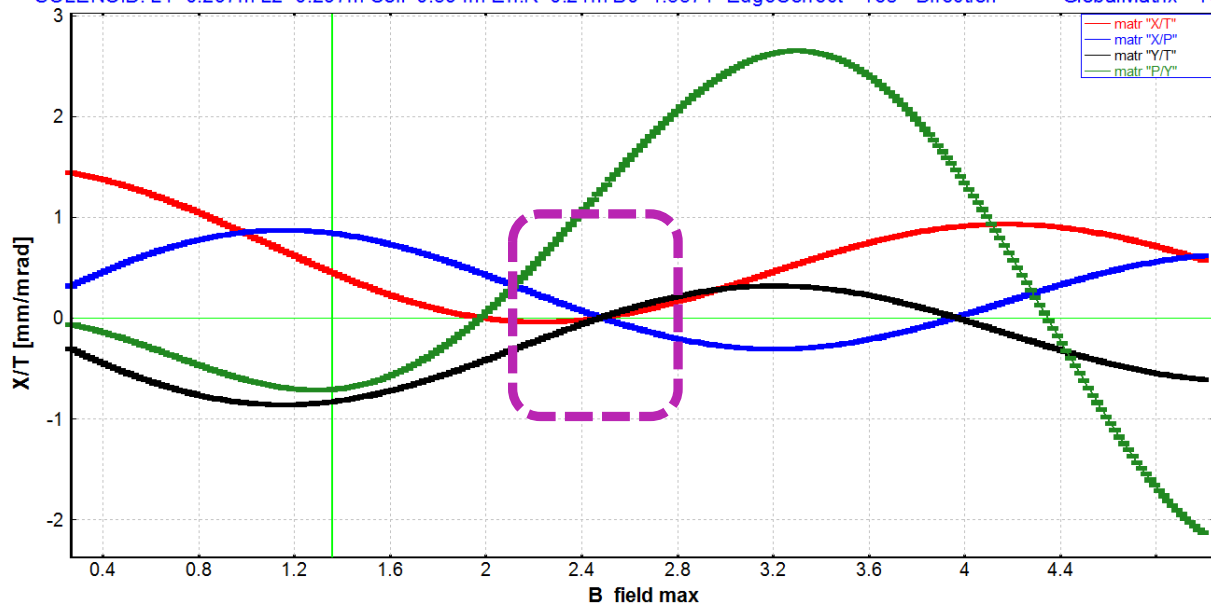


### Solenoid block tuning: X/T [mm/mrad]

Tuning Parameter is <Matrix coefficients>: "14. matrix: X/T"; Tuning is after the "Solenoid 1" block

${}^4\text{He}^{2+}$  (E=1.69 MeV/u or Ptrans=0.112 GeV/c) Emittance: 45.66, 50.66, 45.66, 50.66 mit.Ray: 0, 0, 0

SOLENOID: L1=0.297m L2=0.297m Coil=0.594m Eff.R=0.21m B0=1.357T EdgeCorrect="Yes" Direction="+" GlobalMatrix="Ye

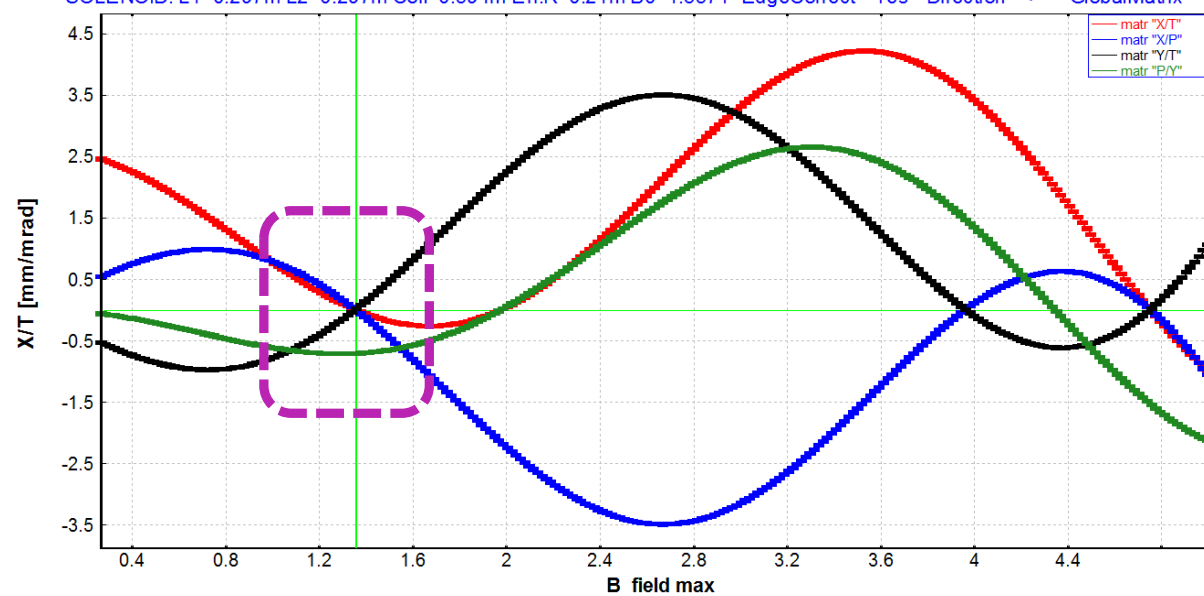


### Solenoid block tuning: X/T [mm/mrad]

Tuning Parameter is <Matrix coefficients>: "14. matrix: X/T"; Tuning is after the "Crossover" block

${}^4\text{He}^{2+}$  (E=1.69 MeV/u or Ptrans=0.112 GeV/c) Emittance: 45.66, 50.66, 45.66, 50.66 mit.Ray: 0, 0, 0

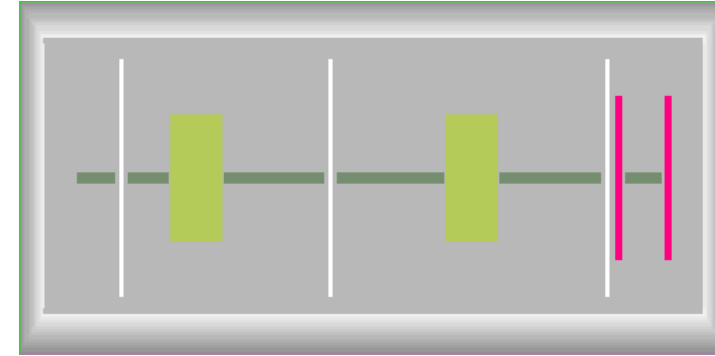
SOLENOID: L1=0.297m L2=0.297m Coil=0.594m Eff.R=0.21m B0=1.357T EdgeCorrect="Yes" Direction="+" GlobalMatrix="Ye



## TwinSol configuration in LISE++ package

\\config\other\\*

Name	Ext	Size	Date
[.]	<DIR>		10/14/2016
FMA	lcn	106,856	09/14/2015
one_dipole	lcn	5,537	08/25/2002
one_drift	lcn	6,029	08/25/2002
PRISMA	lcn	57,265	11/19/2014
RESOLUT_1gap	lcn	60,568	02/28/2013
RESOLUT_3gap	lcn	67,031	02/28/2013
<b>TwinSol</b>	<b>lcn</b>	<b>55,171</b>	<b>10/14/2016</b>



## TwinSol working file in LISE++ package

\\files\examples\\*

Name	Ext	Size	Date
[.]	<DIR>		10/14/2016
[afission]	<DIR>		04/06/2015
[Dubna]	<DIR>		06/02/2016
[GANIL]	<DIR>		11/30/2015
[GSI-SFRS]	<DIR>		04/06/2015
[NSCL]	<DIR>		05/24/2016
[RESOLUT]	<DIR>		04/06/2015
[RIKEN]	<DIR>		04/06/2015
[SECAR]	<DIR>		09/16/2015
[TAMU]	<DIR>		04/06/2015
[TRIUMF]	<DIR>		06/02/2016
Input MC rays	inrays	27,475	04/11/2013
CoulombFissionExample	lpp	116,538	12/29/2014
de_e_test	lpp	64,174	12/29/2014
FITconstraints	lpp	28,118	05/06/2015
FMA_32S_58Ni	lpp	173,157	06/07/2016
PRISMA	lpp	82,331	11/19/2014
<b>TwinSol</b>	<b>lpp</b>	<b>75,327</b>	<b>10/14/2016</b>

Aperture and slits should set correctly!!!  
Angular acceptance should be deduced in order to use this configuration properly in the "Distribution" mode

Optics settings (fast editing)

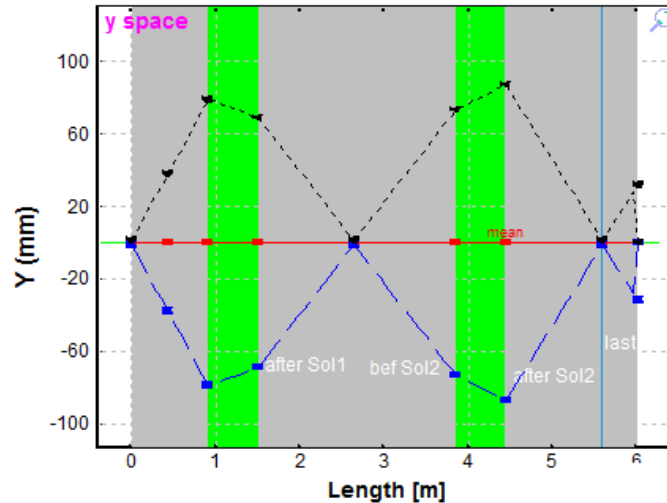
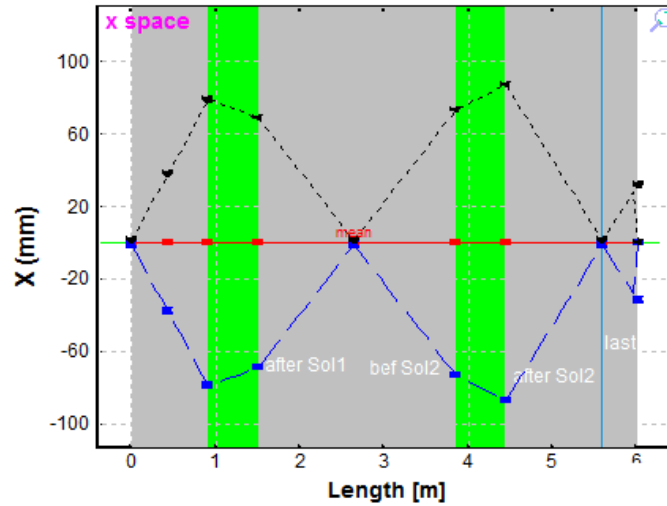
Block	Given Name	Start(m)	Length(m)	B0(kG)/U	Br(Tm)cor/*real	DriftM/*Angle	Rapp(cm)/*R(m)	Leff(m)/*Ldip(m)	2 nd order	CalcMatr/*Z-Q	AngAcc.Apps.Slits	COSY TR	SE
d	drift	Drift 1	0.4325			standard					-- -- --	-	e
S	_slits_	Slit 1	0.432			SLITS					-- HV HV	-	e
d	drift	before Sol1	0.4688			standard					-- HV --	-	e
L	Solenoid	Solenoid 1	0.901	1.3572 T	0.3751		Eff 0.210	Coil 0.594	-	* 0	-- HV --	-	e
d	drift	after Sol1	1.496	1.1338		standard					-- HV --	-	e
S	_slits_	Crossover	2.630	0.0000		SLITS					-- HV HV	-	e
d	drift	bef Sol2	2.630	1.2078		standard					-- HV --	-	e
L	Solenoid	Solenoid 2	3.837	0.5944	1.2691 T	0.3751		Coil 0.594	-	* 0	-- HV --	-	e
d	drift	after Sol2	4.432	1.1398		standard					-- HV --	-	e
S	_slits_	Slits 2	5.572	0.0000		SLITS					-- HV HV	-	e
d	drift	last	5.572	0.4220		standard					-- -- --	-	e

## TwinSol working file in LISE++ package

Name	Ext	Size	Date
[.]	<DIR>		10/14/2016
[afission]	<DIR>		04/06/2015
[Dubna]	<DIR>		06/02/2016
[GANIL]	<DIR>		11/30/2015
[GSI-SFRS]	<DIR>		04/06/2015
[NSCL]	<DIR>		05/24/2016
[RESOLUT]	<DIR>		04/06/2015
[RIKEN]	<DIR>		04/06/2015
[SECAR]	<DIR>		09/16/2015
[TAMU]	<DIR>		04/06/2015
[TRIUMF]	<DIR>		06/02/2016
Input MC rays	inrays	27,475	04/11/2013
Coulomb FissionExample	lpp	116,538	12/29/2014
de_e_test	lpp	64,174	12/29/2014
FITconstraints	lpp	28,118	05/06/2015
FMA_32S_58Ni	lpp	173,157	06/07/2016
FRIMA	lpp	82,881	11/18/2014
<b>TwinSol</b>	lpp	75,327	10/14/2016

## Analytical solution

node: U=3.4e+03 KV; Settings on <sup>4</sup>He; Con  
dp/p=100.00%

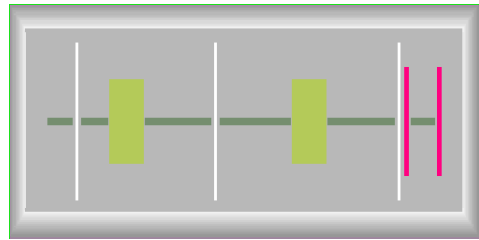
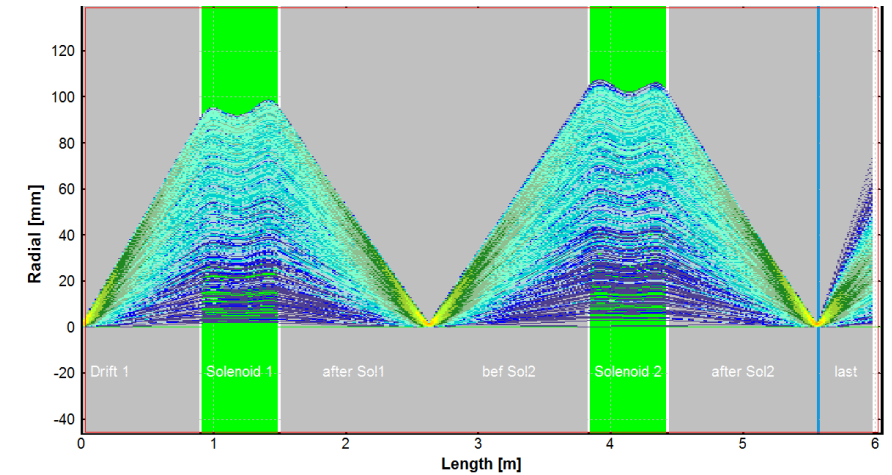
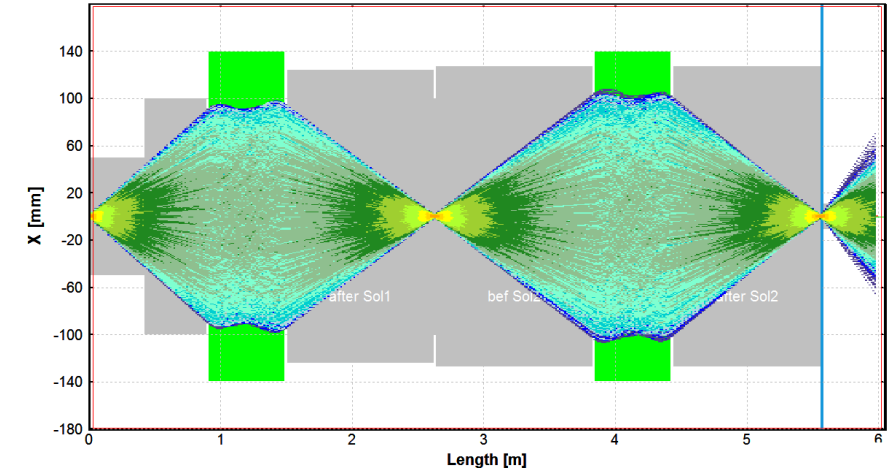


## Monte Carlo solution

### <sup>4</sup>He : MC Transmission Plot - Envelope (only passed)

<sup>4</sup>He (1.69 MeV/u) + ; Transmitted Fragment <sup>4</sup>He (beam); Optics Order: 1  
dp/p=100.00%

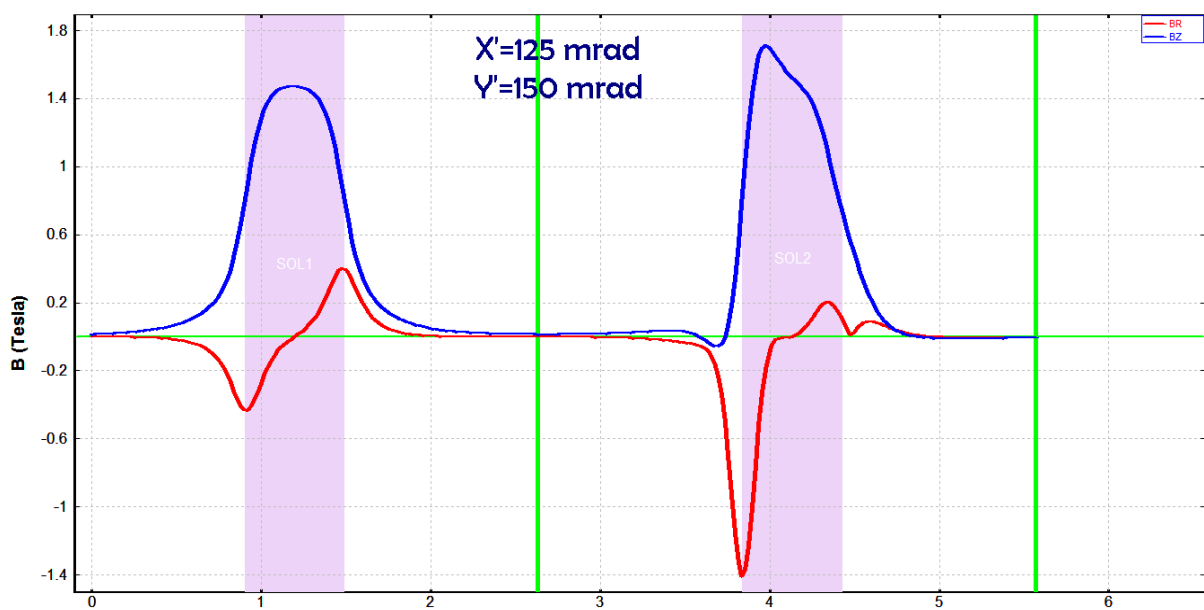
AngAccept: ON; Bounds: Off; "last" - last block for MC calc; no gates; Config: SSSLSSLSMSV



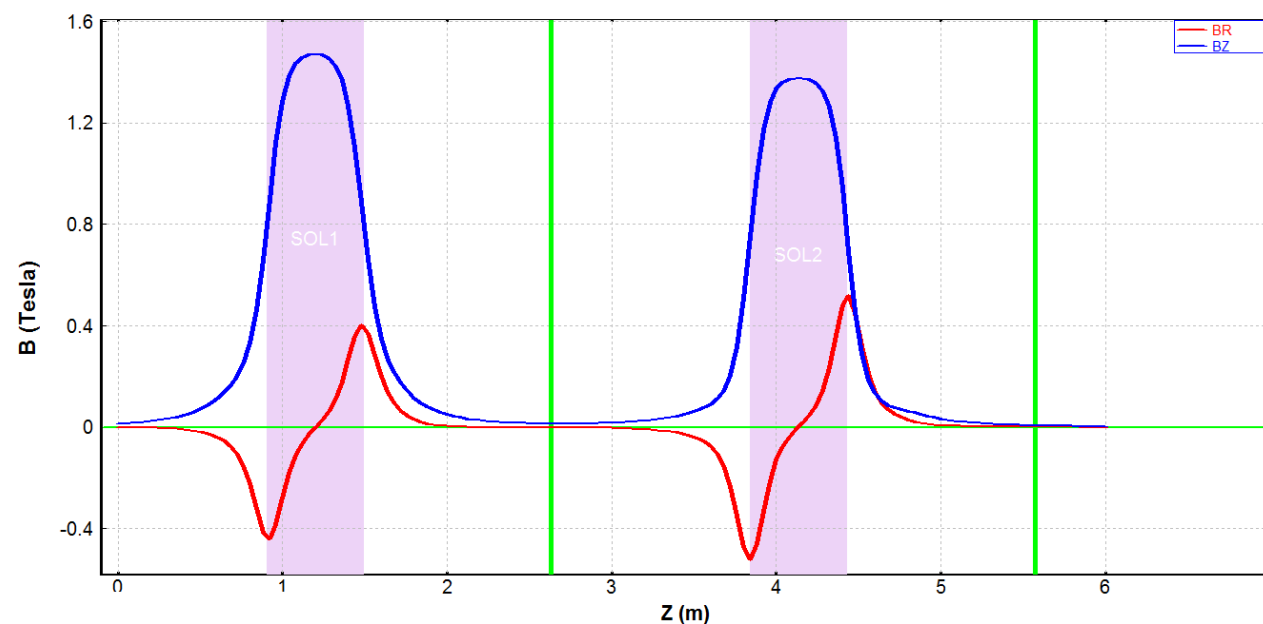


## Twin Sol: B-field (@ ray trajectory)

${}^4\text{He}^{2+}$  (E=1.69 MeV/u or Ptrans=0.112 GeV/c) Emittance:1.5,125,1.5,150 Init.Ray:1.5,125,1.5,150  
 1st SOL: L1=1.2m L2=1.4m Coil=0.6m B0=1.359T Efield=No; 2nd SOL: L1=1.5m L2=1.4m Coil=0.6m B0=1.271T Efield=No



**v.9.10.354**  
**Should be corrected!**



**v.9.10.361**  
**Modified!**

It happened if  $x$  (or  $y$ , or  $r$ ) is larger than  $R_{\text{eff}}$ .

In reality this ray could not pass "TwinSol" : out of its apertures