A key question in the physics of unstable nuclei is the knowledge of the EOS for asymmetric nuclear matter (ANM) away from normal conditions. We recall that the symmetry energy at low densities has important effects on the neutron skin structure, while the knowledge in high densities region is crucial for supernovae dynamics and neutron star properties. The only way to probe such region of the isovector EOS in terrestrial laboratories is through very dissipative collisions of asymmetric (up to exotic) heavy ions from low to relativistic energies. A general introduction to the topic is firstly presented. We pass then to a detailed discussion on the neck−fragmentation process as the main dissipative mechanism at the Fermi energies and to the related isospin dynamics. From Stochastic Mean Field simulations the isospin effects on all the phases of the reaction dynamics are thoroughly analysed, from the fast nucleon emission to the mid-rapidity fragment formation up to the dynamical fission of the spectator residues. Simulations have been performed with an increasing stiffness of the symmetry term of the EOS. Some differences have been noticed, especially for the fragment charge asymmetry. New isospin effects have been revealed from the correlation of fragment asymmetry with dynamical quantities at the freeze-out time. A series of isospin sensitive observables to be further measured are finally listed.

1. Introduction

While we are planning second and third generation facilities for radioactive beams our basic knowledge of the symmetry term of the EOS is still extremely poor. Effective interactions are obviously tuned to symmetry properties around normal conditions and any extrapolation can be quite dangerous. Microscopic approaches based on realistic $NN$ interactions, Brueckner or variational schemes, or on effective field theories show a rather large variety of predictions. While all the potential symmetry energies obviously cross at normal density $\rho_0$, quite large differences are present for values, slopes and curvatures in low density and particularly in high den-
sity regions. Moreover even at the relatively well known “crossing point” at normal density the various effective forces are presenting controversial predictions for the momentum dependence of the fields acting on the nucleons and consequently for the splitting of the neutron/proton effective masses, of large interest for nuclear structure and dynamics.

In the recent years under the stimulating perspectives offered from nuclear astrophysics and from the new Radioactive Ion Beam (RIB) facilities a relevant activity has started in the field of the isospin degree of freedom in heavy ion reactions, see 1,2,3. Here we quickly review the field trying to pin down the most interesting theory questions and eventually the related key observables.

The slope and curvature of the density dependence of the symmetry term around saturation is related to physics properties of exotic nuclei, bulk densities, neutron distributions and monopole frequencies. The momentum dependence of the interactions in the isovector channel can be analysed discussing the effects on the energy-slope of the Lane Potential at normal density and on the symmetry field seen by high momentum nucleons 4,5.

The study of symmetry properties at low density is important for the Liquid-Gas Phase Transition in Asymmetric Matter. A dynamical approach of great relevance since it leads to the space-time properties of the unstable normal modes which give rise to fragments inside the extended spinodal boundary. Characteristic coupled dispersion relations must be solved. We remind that the coupling of the isoscalar and isovector collective response is well known for stable modes 6,7 in neutron rich exotic nuclei, with transition densities that show a mixed nature. We can extend the same results to the unstable responses of interest in fragmentation reactions. The mixed nature of the unstable density oscillations will naturally lead to the isospin distillation effect, i.e. a different concentration (N/Z) between the liquid and the gas phase 8,9,10,11. We can expect that quantitatively this effect will be dependent on properties of the symmetry energy in very dilute matter, well below the saturation point.

The early emission of particles in heavy ion collisions is relevant for understanding both the reaction dynamics and the mechanism of particle production. The density behavior of the symmetry potential largely influences the value of the pressure that is governing the early reaction dynamics 12. Therefore we can predict important symmetry effects on transport properties (fast particle emission, collective flows) in the asymmetric $NM$ that will be probed by Radioactive Beam collisions at Fermi and intermediate energies. Different parametrizations in the momentum dependence of the
isovector channel can be tested, in particular the transport effect of the sign of the $n/p$ effective mass splitting $m^*_n - m^*_p$ in asymmetric matter at high baryon and isospin density $^{13,5}$.

The Fermi energy domain represents the transition region between a dynamics mainly driven by the mean-field, below $15 - 20$ AMeV, and the one where the nucleon-nucleon collisions play a central role, above 100 AMeV. We can have then a very rich variety of dissipative reaction mechanisms, with related different isospin dynamics. One of the new distinctive features is the enhanced production of Intermediate Mass Fragments ($IMF, 3 \leq Z \leq 20$). We analyse then with great detail the isovector channel effect on the onset of the fragmentation mechanism and on the isotopic content of the produced fragments. In the reaction simulations it is essential the use of a Stochastic Transport Approach since fluctuations, instabilities and dynamical branchings are very important in this energy range $^{14,15}$. With the centrality of the collision we can have different scenarios for fragment production, from the growing instabilities of dilute matter in central reactions to the cluster formation at the interface between low and normal density regions in semicentral collisions. We can then expect a large variety of isospin effects, probing different regions of the symmetry energy below saturation.

The traditional approach to nuclear physics starts from non-relativistic formalisms in which non-nucleonic degrees of freedom are integrated out giving nucleon-nucleon potentials. Then nuclear matter is described as a collection of quantum nonrelativistic nucleons interacting through an instantaneous effective potential. Although this approach has had a great success, a more appropriate set of degrees of freedom consists of strongly interacting effective hadron fields, mesons and baryons. These variables are the most efficient in a wide range of densities and temperatures and they are the degrees of freedom actually observed in experiments, in particular in Heavy Ion Collisions at intermediate energies. Moreover this framework appears in any case a fundamental “Doorway Step” towards a more microscopic understanding of the nuclear matter. Relativistic contributions to the isospin physics for static properties and reaction dynamics deserve an appropriate discussion.

The QHD (Quantum-Hadro-Dynamics) effective field model represents a very successful attempt to describe, in a fully consistent relativistic picture, equilibrium and dynamical properties of nuclear systems at the hadronic level $^{16,17}$. The same isospin physics described in detail at the non-relativistic level can be naturally reproduced. Moreover some new gen-
true relativistic effects can be revealed, due to the covariant structure of the effective interactions. One of the main points of the discussion is the relevance of the coupling to a scalar isovector channel, the effective $\delta[a_0(980)]$ meson, not considered in the usual nuclear structure studies. Particular attention is devoted to the expectations for the splitting of the nucleon effective masses in asymmetric matter, with a detailed analysis of the relationship between the Dirac masses of the effective field approach and the Schrödinger masses of the non-relativistic models. A relativistic Dirac-Lane potential is deduced, which shows a structure very similar to the Lane potential of the non-relativistic optical model, but now in terms of isovector self-energies and coupling constants.

The Relativistic Mean Field (RMF) approximation is allowing more physics transparent results, often even analytical. We must always keep a close connection to the more microscopic Dirac-Brueckner-Hartree-Fock (DBHF) approaches, in their extension to asymmetric matter. It is well known that correlations are naturally leading to a density dependence of the coupling constants, see ref. for the DBHF calculations and ref. just for the basic Fock correlations. Within the RMF model we can get a clear qualitative estimation of the contribution of the various fields to the nuclear dynamics. The price to pay is that when we try to get quantitative effects we are forced to use different sets of couplings in different baryon density regions. In this case we can use the DBHF results as guidelines.

Results for relativistic Heavy Ion Collisions (HIC) in the AGeV beam energy region, for collective flows, charged pion production and isospin stopping, are presented in refs. We recall that intermediate energy HIC’s represent the only way to probe in terrestrial laboratories the in-medium effective interactions far from saturation, at high densities as well as at high momenta. Within a relativistic transport model it is shown that the isovector-scalar $\delta$-meson, which affects the high density behavior of the symmetry term and the nucleon effective mass splitting, influences the isospin dynamics. The effect is largely enhanced by a relativistic mechanism related to the covariant nature of the fields contributing to the isovector channel. The possibility is emerging of a direct measurement of the Lorentz structure of the effective nuclear interaction in the isovector channel. Very sensitive quantities appear to be the elliptic flow, related to the time scale of the particle emissions, and the isospin transparency in central collisions.
2. Neck Dynamics at the Fermi Energies: Theory Survey

The possibility of observation of new effects, beyond the Deep-Inelastic binary picture, in fragment formation for semicentral collisions with increasing energy was advanced on the basis of the reaction dynamics studied with transport models. The presence of a time matching between the instability growth in the dilute overlap zone and the expansion-separation time scale was suggesting the observation of mean field instabilities first at the level of anomalous widths in the mass/charge/... distributions of Projectile-Like or Target-Like (PLF/TLF) residues in binary events, then through a direct formation of fragments in the neck region. It is clear that in the transport simulations stochastic terms should be consistently built in the kinetic equations in order to have a correct description of instability effects. Stochastic Mean Field approaches have been introduced, that well reproduce the presently available data and reveal a large predictive power.

In conclusion at the Fermi energies we expect an interplay between binary and neck-fragmentation events, where Intermediate Mass Fragments (IMF, in the range $3 \leq Z \leq 10$) are directly formed in the overlapping region, roughly at mid-rapidity in semicentral reactions. The competition between the two mechanisms is expected to be rather sensitive to the nuclear equation of state, in particular to its compressibility that will influence the interaction time as well as the density oscillation in the neck region. In the case of charge asymmetric colliding systems the poorly known stiffness of the symmetry term will also largely influence the reaction dynamics. An observable sensitive to the stiffness of the symmetry term can be just the relative yield of incomplete fusion vs. deep-inelastic vs neck-fragmentation events. Moreover for n-rich systems in the asy-soft case we expect more interaction time available for charge equilibration. This means that even the binary events will show a sensitivity through a larger isospin diffusion. At variance, in the asy-stiff case the two final fragments will keep more memory of the initial conditions.

Systematic transport studies of isospin effects in the neck dynamics have been performed so far for collisions of Sn-Sn isotopes at 50AMeV, Sn-Ni isotopes at 35AMeV and finally Fe-Fe and Ni-Ni, mass 58, at 30 and 47 AMeV.

We show in Fig. 1 the density contour plots of a neck fragmentation event at $b = 6 fm$, for the reaction $^{124}Sn+^{124}Sn$ at 50AMeV, obtained from the numerical calculations based on the stochastic transport approach described.
before, \textsuperscript{33}.

Figure 1. $^{124}\text{Sn} + ^{124}\text{Sn}$ collision at 50\,AMeV: time evolution of the nucleon density projected on the reaction plane. Left column: $b = 4\,\text{fm}$. Right column: $b = 6\,\text{fm}$.

We clearly see neck-fragmentation events even at lower energies, now mostly ternary. For the system $^{124}\text{Sn} + ^{64}\text{Ni}$ at 35\,AMeV ($b = 6\,\text{fm}$), neck instabilities favour the appearance of NIMF’s, after 150\,fm/$c$, in a variety of places and ways as can be seen by looking at Fig.2, \textsuperscript{34}. For four events, we illustrate two characteristic stages, the early phase of the fragment formation process and the configuration close to freeze-out.

3. Neck Dynamics at the Fermi Energies: Experimental Survey

It is now quite well established that the largest part of the reaction cross section for dissipative collisions at Fermi energies goes through the Neck Fragmentation channel, with IMFs directly produced in the interacting zone in semiperipheral collisions on very short time scales. We can expect different isospin effects for this new fragment formation mechanism since cluster are formed still in a dilute asymmetric matter but always in contact.
Figure 2. Density contour plots for $^{124}\text{Sn}+^{64}\text{Ni}$ at 35AMeV ($b = 6\text{fm}$). Early stage of fragment formation (top) and same events close to the freeze-out (bottom) for four ternary cases a), b), c), d) in neck fragmentation.

with the regions of the Projectile-Like and Target-Like remnants almost at normal densities.

A first evidence of this new dissipative mechanism was suggested at quite low energies, around 19AMeV, in semicentral $^{100}\text{Mo}+^{100}\text{Mo}$, $^{120}\text{Sn}+^{120}\text{Sn}$ reactions $^{37,38}$. A transition from binary, deep-inelastic, to ternary events was observed, with a fragment formed dynamically that influences the fission-like decay of the primary projectile-like ($\text{PLF}$) and target-like ($\text{TLF}$) partners. Similar conclusions were reached in $^{39}$. Consistent with the dynamical scenario was the anisotropic azimuthal distribution of IMF’s. In fact the IMF alignment with respect to the ($\text{PLF}^*$) velocity direction has been one clear property of the “neck-fragments” first noticed by Montoya et al. $^{40}$ for $^{129}\text{Xe}+^{63,65}\text{Cu}$ at 50AMeV.

A rise and fall of the neck mechanism for mid-rapidity fragments with the centrality, with a maximum for intermediate impact parameters $b \approx \frac{1}{2}b_{\text{max}}$, as observed in $^{41}$, suggests the special physical conditions required. The size of the participant zone is of course important but it appears that a good time matching between the reaction and the neck instabilities time-scales is also needed, as suggested in refs. $^{28,31}$. In fact a simultaneous presence, in noncentral collisions, of different IMF production mechanisms at midrapidity was inferred in several experiments $^{42,43,44,45,46,47,48,49}$.

We can immediately predict an important isospin dependence of the neck dynamics, from the presence of large density gradients and from the possibility of selecting various time-scales for the fragment formation. The first evidences of isospin effects in neck fragmentation were suggested by Dempsey et al. in $^{50}$ from semiperipheral collisions of the systems...
$^{124,136}Xe+^{112,124}Sn$ at 55AMeV, where correlations between the average number of IMF’s, $N_{IMF}$, and neutron and charged particle multiplicities were measured. The variation of the relative yields of $^6He/^3,^4He, ^6He/Li$ with $v_{par}$ for several $Z_{PLF}$ gates shows that the fragments produced in the midvelocity region are more neutron rich than are the fragments emitted by the $PLF$. Enhanced triton production an midrapidity was considered in ref.\textsuperscript{41}, and more recently in \textsuperscript{51}, as an indication of a neutron neck enrichment.

P.M. Milazzo et al. \textsuperscript{52,53} analyzed the the IMF parallel velocity distribution for $^{58}Ni+^{58}Ni$ semiperipheral collision at 30AMeV. The two-bumps structure for IMF’s with $5 \leq Z \leq 12$, located around the center of mass velocity and close to the quasiprojectile ($PLF^*$) source respectively, was explained assuming the simultaneous presence of two production mechanisms: the statistical disassembly of an equilibrated $PLF^*$ and the dynamical fragmentation of the participant region. The average elemental event multiplicity $N(Z)$ exhibits a different trend for the two processes: more n-rich in the mid-rapidity source.\textsuperscript{8,53} This experiment has a particular importance since isospin effects were clearly observed, \textit{in spite of the very low initial asymmetry}. The same reactions have been recently studied at the Cyclotron Inst. of Texas A&M at various beam energies with measurements of the correlations of fragment charge/mass vs. dynamical observables (emission angles and velocities) \textsuperscript{54,55}.

\textbf{Isospin Diffusion}

The isospin equilibration appears of large interest even for more peripheral collisions, where we have shorter interaction times, less overlap and a competition between binary and neck-fragmentation processes. The low density neck formation and the preequilibrium emission are adding essential differences with respect to what is happening in the lower energies regime. Tsang et al. \textsuperscript{56} have probed the isospin diffusion mechanism for the systems $^{124}Sn+^{112}Sn$ at $E = 50AMeV$ in a peripheral impact parameter range $b/b_{max} > 0.8$, observing the isoscaling features of the light isotopes $Z = 3 – 8$ emitted around the projectile rapidity. An incomplete equilibration has been deduced. The value of the isoscaling parameter $\alpha = 0.42 \pm 0.02$ for $^{124}Sn+^{112}Sn$ differs substantially from $\alpha = 0.16 \pm 0.02$ for $^{112}Sn+^{124}Sn$. The isospin imbalance ratio \textsuperscript{57}, defined as

$$R_i(x) = \frac{2x - x_{124+124} - x_{112+112}}{x_{124+124} - x_{112+112}}$$

(1)
(i = P, T refers to the projectile/target rapidity measurement, and \( x \) is an isospin dependent observable, here the isoscaling \( \alpha \) parameter) was estimated to be around \( R_P(\alpha) = 0.5 \) (vs. \( R_P(\alpha) = 0.0 \) in full equilibration). This quantity can be sensitive to the density dependence of symmetry energy term since the isospin transfer takes place through the lower density neck region.

4. Neck Observables

*Properties of Neck-Fragments, mid-rapidity IMF produced in semicentral collisions: correlations between N/Z, alignment and size*

The alignment between PLF – IMF and PLF – TLF directions represents a very convincing evidence of the dynamical origin of the mid-rapidity fragments produced on short time scales. In fact a very selective correlation is provided by the anisotropy in the fragment emission, measured by the in-plane azimuthal angle, \( \Phi_{\text{plane}} \), defined as the angle between the projection of the PL – IMF scission axis onto the reaction plane and the separation axis between PLF and TLF. A \( |\Phi_{\text{plane}}| \approx 0 \) collects events corresponding to asymmetric “fissions” of the PL-system very aligned along the outgoing PL – TL separation axis. At variance a statistical fission dominance would correspond to a flat \( \Phi_{\text{plane}} \) behavior. The form of the \( \Phi_{\text{plane}} \) distributions (centroid and width) can give a direct information on the fragmentation mechanism.

*Time-scale measurements*

The estimation of time scales for fragment formation from velocity correlations appears to be a very exciting possibility. With a good event by event detection of the TL/PL residues we can measure the violations of the Viola systematics for the TLF – IMF and PLF – IMF systems which tell us how much the IMFs are uncorrelated to the spectator remnants.

For each Neck-IMF we can evaluate the ratios \( r = v_{\text{rel}}(\text{PLF})/v_{\text{viola}}(\text{PLF}) \), \( (r1 = v_{\text{rel}}(\text{TLF})/v_{\text{viola}}(\text{TLF})) \). In Figure 3 we plot \( r1 \) against \( r \) for each NIMF for the Sn + Ni reaction. We call such a representation a Wilczynski – 2 plot. The solid lines represent the loci of the \( PL-(r = 1) \) and \( TL-(r1 = 1) \) fission events respectively. The values \( (r, r1) \) appear simultaneously larger than 1 suggesting a weak NIMF correlation with both PLF and TLF, in contrast to a statistical
fission mechanism. The process has some similarities with the participant-spectator scenario. However the dynamics appear much richer than in the simple sudden abrasion model, where the locus of the $r - r1$ correlation should be on mainly the bisectrix. Here the wide distributions of Fig.3 reveal a broad range of fragment velocities, typical of the instability evolution in the neck region that will lead to large dynamical fluctuations on $NIMF$ properties.

![Figure 3. Wilczynski-2 Plot: correlation between deviations from Viola systematics, see text. Results are shown for two $asy - EOS$.](image)

The $\Phi_{plane}$ distributions, corresponding to the same $NIMF$ events analysed before, are covering a quite limited angular window, close to the full alignment configuration, $\Phi_{plane} = 0^\circ$. The distribution becomes wider when we approach the two $r, r1 = 1$ lines of the Fig.3.

With appropriate cuts in the velocity correlation plots and $\Phi_{plane}$ distributions we can follow the properties of clusters produced from sources with a ”controlled” different degree of equilibration. We can figure out a continuous transition from fast produced fragments via neck instabilities to clusters formed in a dynamical fission of the Projectile(Target) residues up to the evaporated ones (statistical fission). Along this line it would be even possible to disentangle the effects of volume and shape instabilities. The isospin dynamics will look different in the various scenarios and rather dependent on the symmetry term of the $EOS$.

A more promising observable seems to be the isotopic content of the Neck-IMF. For the three $asy - EOS$s introduced before we plot in Fig.4 the average isotopic composition $I$ of the $NIMF$’s as a function of the $PLF$ $r$-deviation from Viola systematics. At all impact parameters clear
differences are evident. The average asymmetry does not depend strongly on \( r \). We notice however that it increases with the stiffness of the symmetry potential around and below saturation. The *superasystiff* parametrization, i.e. with an almost parabolic increasing behavior around \( \rho_0 \), produces systematically more neutron rich NIMFs. This effect is clearly due to a differ-

![Figure 4. 124Sn + 64Ni at 35AMeV. NIMF isospin content for *asyssoft* (circles), *asytiff* (rombs) and *superasystiff* (squares) EOS as a function of \( r \)-deviation from Viola systematics, at impact parameters from \( b = 5fm \) to \( 8fm \). The two solid lines represent the mean asymmetries of the projectile (top) and target (bottom).](image)

ent neutron/proton migration at the interface between \( PL/TL \) ”spectator” zone of normal density and the dilute neck region where the NIMFs are formed. The Wilczynski-2 plot will help to make the selections. We have to remind that all the results presented here refer to properties of primary (excited) fragments. The neutron excess signal appears likely to be washed out from later evaporation decays. A reconstruction of the primary fragments with neutron coincidence measurements would be very important.

**Isospin Dynamics**

Isospin effects on the reaction dynamics and *Isospin Migration*: an interesting neutron enrichment of the overlap ("neck") region is expected, due to the neutron migration from higher (spectator) to lower (neck) density regions. This effect is also nicely connected to the slope of the symmetry energy. Neutron and/or light isobar measurements in different rapidity regions appear important. Moreover, moving from mid- to "spectator"-rapidities an increasing hierarchy in the mass and \( N/Z \) of the fragments is
expected\cite{36}. Some experimental evidences are in ref.\cite{48}. An interesting related observable is the corresponding angular correlation due to the driving force of the Projectile(Target)-like partners\cite{36}. The analysis of the N/Z distribution versus the emission angle reveals that larger fluctuations are present close to forward and backward angles, suggesting that IMF’s that are more correlated to the spectator matter may become more neutron-rich, see Fig.5 for the Fe, Fe/Ni, Ni systems at 47AMeV\cite{36}.

We stress again that the neck – IMF always present a neutron enrichment, \textit{even in the case of a n-poor system}. The latter paradox is due to the pre-equilibrium isospin dynamics. In fact, as anticipated above, due to pre-equilibrium, the system will loose some protons and acquire a N/Z larger than the initial one. Then, before the di-nuclear system reseparates, the neutron excess is transferred to the neck region that is at low density.

\textit{Isospin Diffusion}

Measure of charge equilibration in the ”spectator” region in semicentral collisions: \textit{Imbalance Ratios} for different isospin properties. Test of the interplay between concentration and density gradients in the isospin dynamics\cite{5,62,63}. For the reasons noted before we expect to see a clear difference in the isospin diffusion between binary (deep-inelastic like) and neck-fragmentation events.

We report its dependence on the interaction time (impact parameter) for asysoft (squares) and asysuperstiff (circles) EOS in Fig.6, for the Sn, Sn case\cite{5,62}. A good degree of isospin equilibration corresponds to a “convergence” to 0 of both $R_P$ (upper curves) and $R_T$ (lower curves). From our

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure5}
\caption{Fe, Fe vs. Ni, Ni reactions at 47AMeV ($b = 4\text{fm}$): Contour plots of the N/Z distribution versus the emission angle.}
\end{figure}
results we conclude that an asystiff-like EOS provides a better agreement to the experimental observations, shown as arrows in Fig.6, \(^{56}\). In fact in the MSU experiment there is no particular selection on binary events. We expect that the presence of events with production of Neck-IMFs will induce an apparent larger isospin equilibration since more neutrons will migrate to the neck region (and vice versa for protons), as discussed before.

![Figure 6. \(^{124}\text{Sn} + ^{112}\text{Sn} 50 \text{AMeV} \) collision: interaction time evolution of the projectile (upper) and target (lower) isospin imbalance ratios. Squares: Asysoft EOS. Circles: Superasystiff. The arrows correspond to the data of ref.\(^{56}\).](image)

A clear difference between the two equations of state is evident especially for the longer interacting time, \(b = 8 \text{ fm} \) case. Smaller values of the isospin imbalance ratios for asysoft EOS point towards a faster equilibration rate. In ref. \(^{56}\) a possible explanation was proposed related to the observation that below normal density the asysoft EOS has a larger value of symmetry energy. Therefore an enhanced isospin equilibration has to be triggered if the diffusion takes place at lower density. In fact the mechanism of charge equilibration is more complicated at these energies due to reaction dynamics (fast particle emissions, density gradients, etc.), with interesting compensation effects.

"Pre-equilibrium" emissions

As already remarked, the isospin content of the fast particle emission can largely influence the subsequent reaction dynamics, in particular the isospin transport properties (charge equilibration, isospin diffusion). We can reach the paradox of a detection of isospin dynamics effects in charge symmetric
systems.

Finally the simultaneous measurements of properties of fast nucleon emissions and of the neck dynamics can even shed lights on the very controversial problem of the isospin momentum dependence $^{5,63}$.

Outlook

We stress the richness of the phenomenology and nice opportunities of getting several cross-checks from completely different experiments. Apart the interest of this new dissipative mechanism and the amazing possibility of studying properties of fragments produced on an almost continuous range of time scales, we remark the expected dependence on the isovector part of the nuclear EOS. From transport simulations we presently get some indications of "asy-stiff" behaviors, i.e. increasing repulsive density dependence of the symmetry term, but not more fundamental details. Moreover, all the available data are obtained with stable beams, i.e. within low asymmetries.

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