



The ENUBET Multi-Momentum Beamline.

IPAC21

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on behalf of the ENUBET collaboration



ENUBET Physics goal

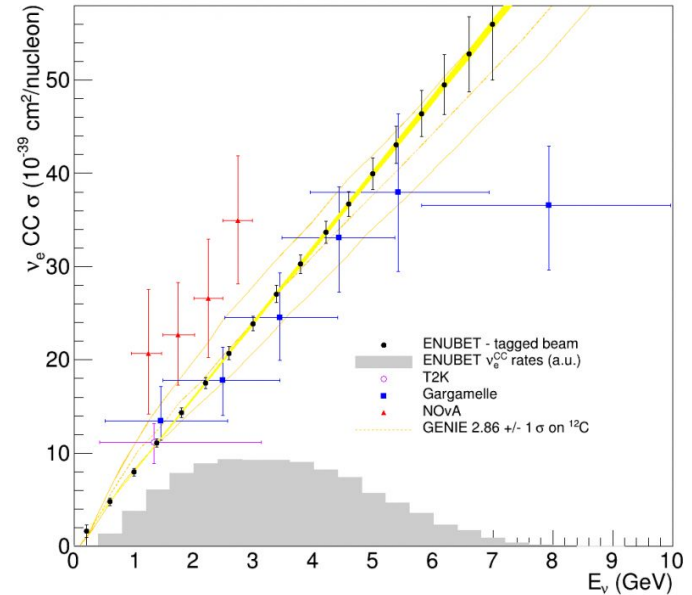
Future experiments require precision O(1%):

- lepton CPV
- Mass hierarchy
- PMNS parameters
- Sterile Neutrino

Current cross section precision measurement is O(5-10%).

ENUBET's physics goal: **overall error on the intensity of the produced neutrinos at the 1 % level.**

→ More precise flux knowledge



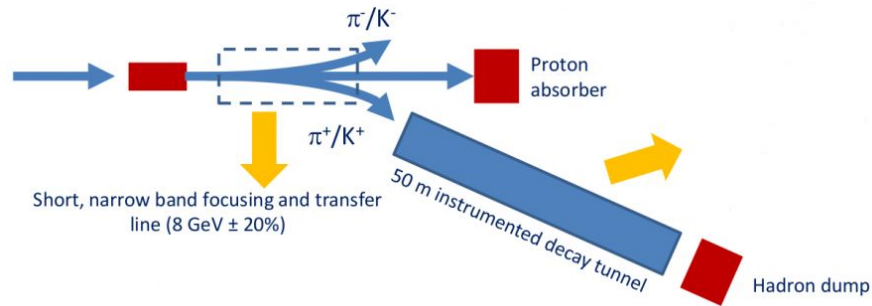
The ENUBET Project

ENUBET (Enhanced NeUtrino BEams from kaon Tagging):

New monitoring technique from the 3-body decay: $K^+ \rightarrow e^+ \pi^0 \nu_e$ (Ke3) inside the decay tunnel in order to reduce the systematic uncertainty on the initial flux and cross section knowledge.

Framework:

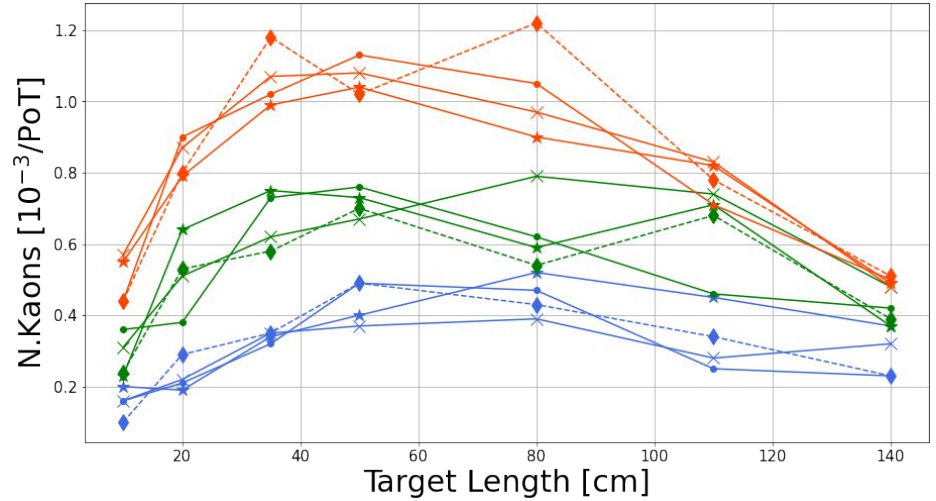
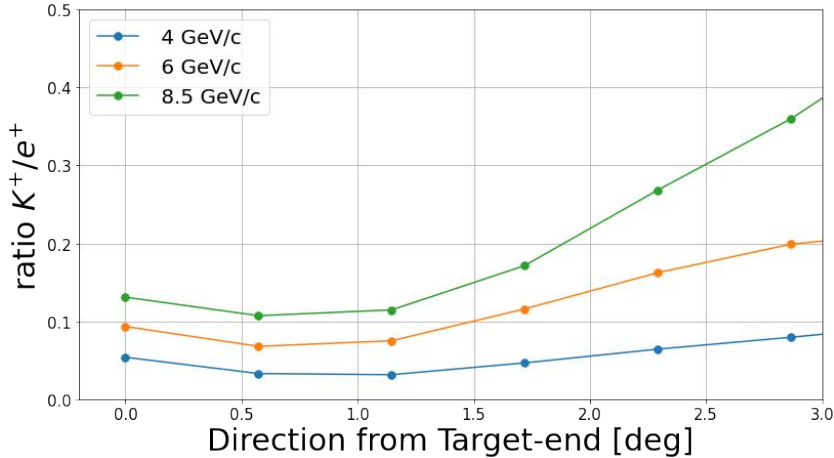
- narrow band beam \rightarrow proton extraction, π/K transport and focusing for maximum collimation.
- Instrumented decay tunnel for positrons (Ke3) monitoring



Target Study

Parameters to be optimized:

- Angular Acceptance
- First Drift length after the target
- Beamline Direction wrt Target (“production angle”) → Proton Dump



Results:

- Graphite 80 cm length - 20 mm radius
- 1° production angle
- 30 cm drift from target-end

Multi Momentum Beamline

Future experiments rely on 0.5-1 GeV ν_e .

Current beamline design: 8.5 GeV - K^+

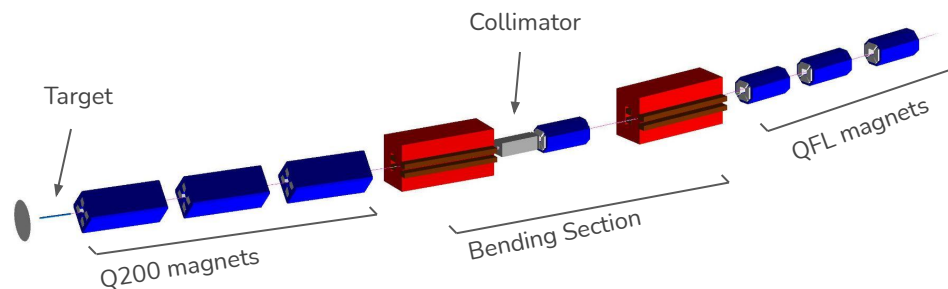
4 and 6 GeV - K^+ beamline → higher statistics for lower energies neutrinos

Multiple momenta Narrow Band beam achievable by different magnet's currents configurations:

“Multi Momentum Beamline”

Optics optimization:

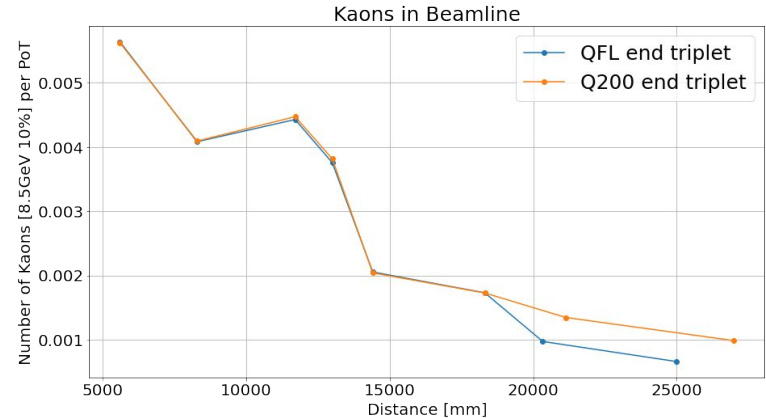
- TRANSPORT
- G4BL
- MAD-X/PTC
- FLUKA



BL Length	H - Ang	V - Ang	K^+ at Tunnel
25 m	20 mrad	16 mrad	$0.7 \times 10^{-3} / \text{pot}$

Conclusion

- Target Optimization: Graphite 80 cm - 20 mm
- Multi Momentum Beamline
 - Optimization Optics
 - Increasing Acceptance
- Next Steps:
 - Background Studies
 - Beam Dump Optimization





Acknowledgements and Bibliography

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