Rapporto attività LNF 2020

NA62

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The NA62 Experiment

The branching ratio (BR) for the decay $K^+ \to \pi^+ \nu\bar{\nu}$ can be related to the value of the CKM matrix element V_{td} with minimal theoretical uncertainty, providing a sensitive probe of the flavor sector of the Standard Model. The goal of the NA62 experiment at the CERN SPS is to measure BR($K^+ \to \pi^+ \nu\bar{\nu}$) with an uncertainty approaching 10%.

The experiment makes use of a 75 GeV unseparated positive secondary beam. The total beam rate is 750 MHz, providing ~50 MHz of K^+s. The decay volume begins 102 m downstream of the production target. 5 MHz of kaon decays are observed in the 65-m long fiducial vacuum decay region by means of tracking and particle-identification systems. Ring-shaped large-angle photon vetoes (LAVs) are placed at 12 stations along the decay region and provide full coverage for decay photons with 8.5 mrad < θ < 50 mrad. The last 35 m of the decay region hosts a dipole spectrometer with four straw-tracker stations operated in vacuum. The NA48 liquid-krypton calorimeter (LKr) is used to veto high-energy photons at small angle. Additional detectors further downstream extend the coverage of the photon veto system (e.g., for particles traveling in the beam pipe).

LNF group responsibilities

The principal responsibility of the LNF group in NA62 is in the maintenance, operation, and analysis of data from two of the experiment's main photon detection systems, the Large-Angle Veto (LAV) system and the Small-Angle Veto (SAV) system, as well as providing general support to the experiment, assisting with run planning and coordination, and participating in data taking and data analysis. In 2020, the group made significant contributions in the following areas:

- Analysis of 2017 and 2018 data and measurement of photon veto system performances.
- Coordination of the exotic physics working group.
- Feasibility studies for the experimental program after the end of LHC Run 2.

The LAV system consists of 12 detector stations arranged at intervals of 6 to 10 m along the vacuum tank along its entire length. Each station consists of four or five rings of lead glass blocks, with the blocks staggered in azimuth in successive rings. The total depth of a five-layer station is 27 radiation lengths. This structure guarantees high efficiency, hermeticity, and uniformity of response. The readout chain for the LAV stations consists of two different types of boards, a dedicated front-end board (LAV-FEE) developed for the LAV detector, and a common digital readout board (TEL62) used by many of the NA62 detectors. The LAV detectors and the front-end electronics were designed and constructed at LNF between 2008 and 2014.

The small-angle veto detectors, SAC and IRC, are shashlyk-type electromagnetic calorimeters that provide veto coverage for photons with polar angles down to zero degrees. They are exposed to a very high rate of photons from kaon decays and, for the IRC, muons from pion and kaon decays. The IRC was assembled at LNF in 2014. The SAC and IRC signals are read out with the LAV-FEE and TEL62 boards described above.

LNF group activity: Data analysis and future activities

The NA62 experiment collected its first data sample successfully in 2016-2018 for a total of about 4×10^{12} kaon decays in fiducial volume. Since the end of 2018

- the NA62 in-flight technique for the measurement of BR($K^+ \to \pi^+\nu\bar{\nu}$) has been established and proven to work;
- the first physics result on $K^+ \to \pi^+\nu\bar{\nu}$, based on the 2016 data set, was obtained in 2018 and published in early 2019 [1];
- the analysis of the 2017-2018 data set was completed in 2020; the preliminary results were shown at major conferences and will be published soon.

Data taking in 2018 lasted for 217 days. The beam intensity was kept stable at 2-2.3×10^{12} protons per pulse (ppp), corresponding to 60-70% of the nominal value. This mode of operation was optimized for efficient data taking. Towards the end of the 2018 data taking period, several test runs were taken at 100% of nominal beam intensity to investigate trigger and detector performance. In addition, about one week was dedicated to data collection in beam dump mode. In 2018, data taking was very successful and proceeded very smoothly, mainly due to the stable beam delivered by the SPS and the good performance of the hardware. The LNF group played a crucial role both for the collection and the analysis of the data.

For the analysis, a blind procedure was adopted, with the signal and control regions kept masked until the evaluation of expected signal and background was completed. The branching ratio of $K^+\to \pi^+\nu\nu$ predicted by the SM is BR($K^+\to \pi^+\nu\nu$) = $(0.84 \pm 0.10) \times 10^{-10}$. Control samples of $K^+\to \pi^+\pi^0(\gamma)$, $K^+\to \pi^+\nu(\gamma)$ and $K^+\to \pi^+\pi^+\pi^-$ decays are employed for background studies.

The analysis is mostly based on kinematic cuts and particle identification. The invariant $m^2_{miss} = (p_{K+} - p_{\pi+})^2$ is used to discriminate between the signal and background kinematics, where p_{K+} and $p_{\pi+}$ are the K^+ and π^+ 4-momenta, respectively. **Fig. 1** (left) shows the distribution of the selected K^+ decays in the (m^2_{miss}, $P_{\pi+}$) plane, with $P_{\pi+}$ the magnitude of the π^+ 3-momentum. Regions populated mostly by $K^+ \rightarrow \pi^+\pi^0(\gamma)$, $K^+ \rightarrow \pi^+\nu(\gamma)$ and $K^+ \rightarrow \pi^+\pi^+\pi^-$ are visible. Two signal regions are defined: the region at lower (higher) m^2_{miss} is referred as region 1 (2). The m^2_{miss} resolution is on the order of 10^{-3} GeV^2/c^4 for the $K^+ \rightarrow \pi^+\pi^0(\gamma)$, and this drives the choice of the boundaries of these regions.

For the analysis of the 2016 and 2017 data, the momentum range was restricted to $15 < P_{\pi+} < 35$ GeV/c, ensuring at least 40 GeV/c of missing energy, thus improving significantly the efficiency for π^0 detection. For the 2018 data, a broader momentum range was used to define region 2, $15 < P_{\pi+} < 45$ GeV/c, since the $K^+ \rightarrow \pi^+\pi^0(\gamma)$ background was seen to be under control and the $K^+ \rightarrow \mu^+\nu(\gamma)$ background is much lower than in region 1. The momentum cut costs roughly half of the signal acceptance. The calorimeters and RICH provide π^+ identification and the photon veto system ensures rejection of photons with angles from 0 up to 50 mrad with respect to the beam axis.

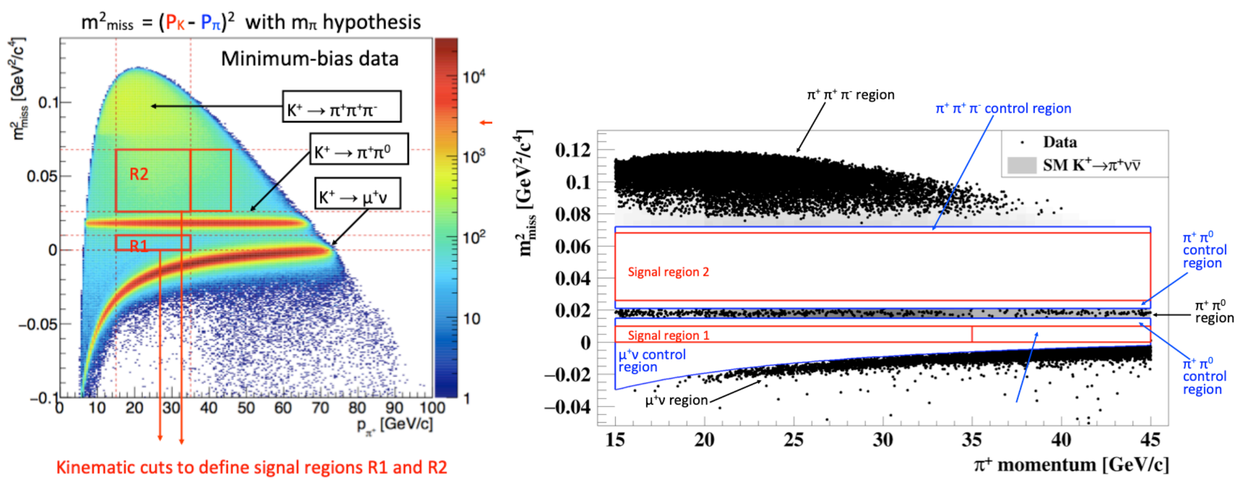


Fig. 1: Left: m^2_{miss} as a function of $P_{\pi+}$ for control data after K^+ decay selection. The red boxes define the signal regions. Right: m^2_{miss} as a function of $P_{\pi+}$ for $\pi^+\nu\nu$-triggered events (dots) passing the selection. The grey area corresponds to the distribution of MC signal events, with darker (lighter) grey indicating more (less) populated regions. The red (black) lines define the signal (control) regions and are masked. Three background regions are also shown.

The single-event sensitivity SES is defined as $1/(N_K\, \varepsilon_{\pi+\nu\nu})$, where N_K is the number of K^+ decays in the fiducial volume and $\varepsilon_{\pi+\nu\nu}$ is the signal efficiency for the selection. Both are derived from the data using control samples and from simulation. The final measured SES and the corresponding total number of SM expected $K^+ \rightarrow \pi^+\nu\nu$ events in signal regions 1 and 2 are

SES = $(1.11 \pm 0.07_{syst}) \times 10^{-11}$;
$N_{exp}(SM) = 7.58 \pm 0.40_{syst} \pm 0.75_{ext}$

The fraction of background events entering each signal region via the reconstructed tails of the corresponding m^2_{miss} peak is modeled with data control samples and corrected with MC simulation for biases induced by the selection criteria. An additional source of background is from decays or interactions of K^+ mesons occurring upstream of the final collimator, in which a daughter pion mimics a signal event by being accidentally matched to random beam particles that are nearby in time. The geometrical distribution of these upstream events is used to define the analysis cuts and estimate the background for the selected signal sample. The estimated total background is $5.28^{+0.99}_{-0.74}$ events. After unblinding the signal regions, 17 events are found in 2018 data. The m^2_{miss} distribution for 2018 data integrated over the accepted pion momentum range is shown in Fig. 2, and is compared with the MC expectation given by the sum of the number of expected background events and the number of signal events, assuming the SM value of the branching ratio.

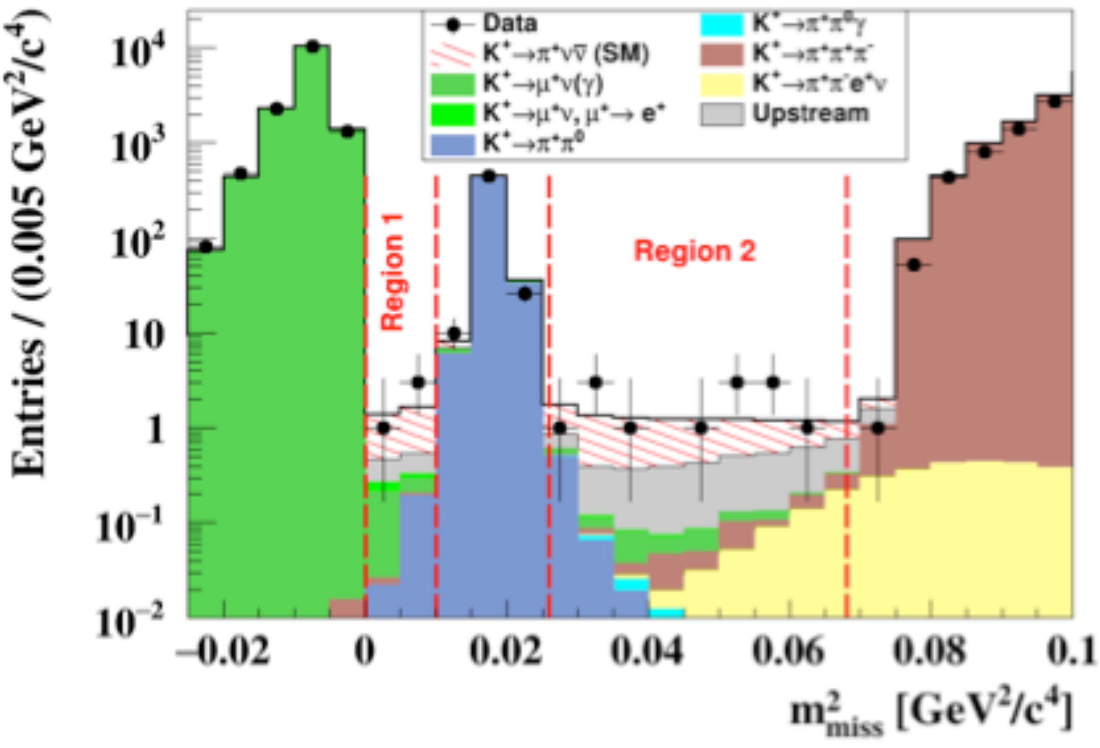


Fig. 2: m^2_{miss} distribution of the selected events: data (solid dots) are compared with the Monte Carlo.

The measurement of the branching ratio is obtained by combining the data samples from 2016, 2017, and 2018 [1,2]. The data set is divided into categories according to the data taking conditions. The first three categories correspond to the 2016 data, the 2017 data, and the first 20% of the data collected in 2018. All of these data were collected with an adjustable collimator upstream of the decay volume. To reduce the upstream background, this collimator was replaced near the beginning of the 2018 run with a fixed collimator that is more hermetic for beam particles in the vertical plane. About 80% of the 2018 data was taken after the installation of the new collimator; this data set is divided into an additional six categories according to the pion momentum, in momentum bins 5 GeV/c wide, ranging from 15 to 45 GeV/c. The stability of the measured branching ratio from category to category is shown in Fig. 3.

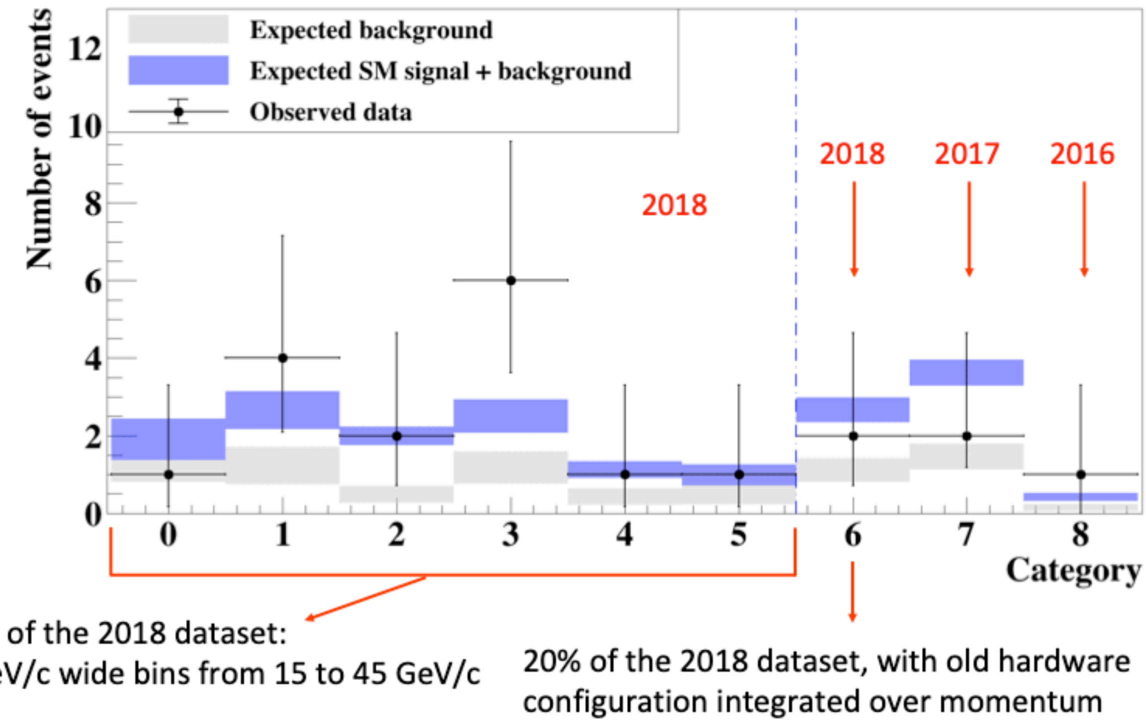
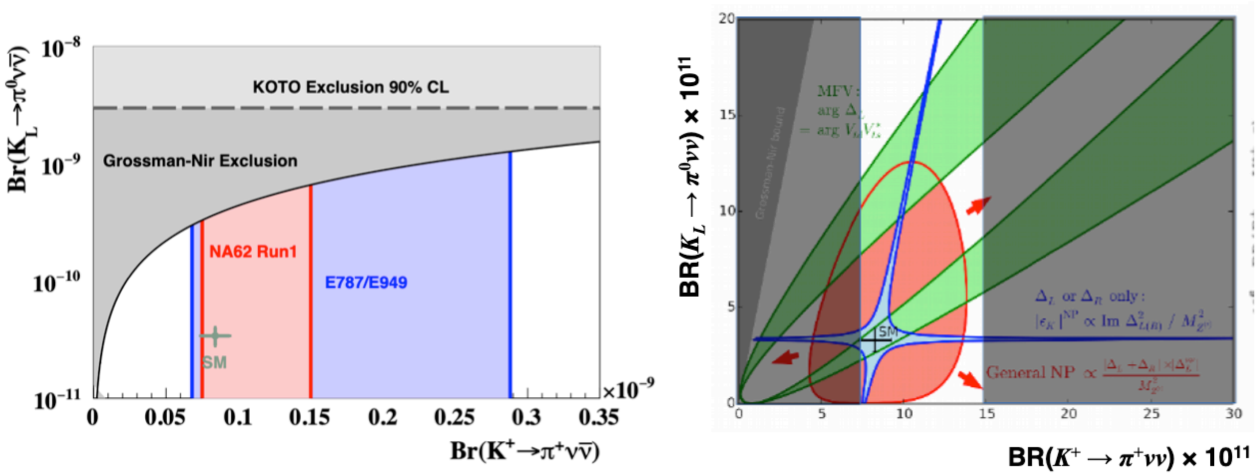


Fig. 3: Number of observed events in each data category defined in the text. The expected number of background events and the expected number of signal plus background events (assuming the SM value for the signal branching ratio) are also shown.

From a maximum likelihood fit using the expected number of signal and background events for each category with the branching ratio as a free parameter, we obtain the preliminary result:

$$\mathrm{BR}(K^+ \to \pi^+ \nu\bar{\nu}) = \left(11^{+4.0}_{-3.5}{}_{\mathrm{stat}} \pm 0.3_{\mathrm{syst}}\right) \times 10^{-11}$$

from which the $K^+ \to \pi^+ \nu\bar{\nu}$ decay is observed for the first time with 3.5σ significance. This is the most precise measurement so far. It is compatible with the SM expectation within one standard deviation. The NA62 measurement, together with the preliminary KOTO limit for the analogous K_L branching ratio and theoretical predictions from a number of new-physics models, is illustrated in Figs. 4 and 5. Some of the models predict large deviations from the SM expectation and seem to be excluded. More precise measurements would help to clarify the situation.



Figs. 4, 5: Comparison between K_L and K^+ branching ratio measurements and different theoretical models.

Contributions to the $K^+ \to \pi^+\nu\bar{\nu}$ analysis and search for π^0 decays to invisible states

The LNF group has made significant contributions to essential aspects of the $K^+ \to \pi^+\nu\bar{\nu}$ analysis related to the photon vetoes, specifically, in developing and tuning the conditions applied to reject photon-induced activity in the LAVs, and precisely determining the photon detection efficiency and the NA62 veto capability against $\pi^+\pi^0$ background.

The use of information from the LAVs was tuned to optimize background rejection while reducing the loss of signal events to accidental coincidences. A matching window of ±3 ns between the event time and the LAV hit time was chosen. Moreover, for the 2018 analysis, events with in-time activity in LAV stations upstream of the K^+ decay vertex are kept, thus increasing the signal efficiency by 3% in absolute terms. We have demonstrated that the $\pi^+\pi^0$ background is basically unchanged after the LAV-based veto condition is loosened as described.

A data-driven multivariate analysis making use of the boosted decision tree (BDT) method is under development to further reduce losses from accidental coincidences on the LAVs. The whole 2018 data sample will be used to train and test the BDT and to evaluate the performance of the new LAV veto algorithm for the selection of $\pi^+\nu\bar{\nu}$ events. The aim of the multivariate analysis is to discriminate events that must be rejected (mainly containing activity from photons from $\pi^+\pi^0$ decays and charged pion related signals from $\pi^+\pi^+\pi^-$ final states) from muon-halo signals randomly in time with the event. Geometrical information and intrinsic characteristics of the hits in the LAV blocks are exploited. An enriched sample of physics background is obtained from $\pi^+\nu\bar{\nu}$-triggered data using the signal selection with photon vetoes applied in all calorimeters except the LAVs. The random-veto sample is obtained from a $K_{\mu 2}$ event selection applied to control-triggered data in which the LAV veto in the L1 trigger is emulated. This sample is expected to contain only hits on the LAVs from events in accidental coincidence, and the emulation of the L1 trigger LAV veto logic guarantees that the random hits on the LAVs have the same characteristics expected in the $\pi^+\nu\bar{\nu}$-triggered events. Since the LAV veto is based on hits that are inside a time window of ±3 ns of the reconstructed track time, these hits are studied in the BDT. Two different BDT classifiers are under development, to treating the events with either one or two in-time hits. The sub-dominant contribution from events with more than 2 in-time hits is rejected. Optimization of this multivariate analysis is under study.

A tag-and-probe method exploiting a sub-sample of $K^+ \to \pi^+\pi^0$ events triggered by a minimum-bias condition has been used to thoroughly study the single-photon detection efficiency and the corresponding veto capability against $\pi^+\pi^0$ background. Events with one photon detected in the LKr calorimeter are used to determine the expected momentum and direction of the other photon from the $\pi^0 \to \gamma\gamma$ decay. The efficiency is evaluated as the fraction of events in which the second photon is matched. Various sources of method bias have been studied in detail. In particular, the bias deriving from resolution effects, photon conversions upstream of the LKr, and random-veto activity fulfilling the photon matching conditions have been evaluated and corrected. The photon detection inefficiencies (Fig. 6) have been evaluated separately for each of the detectors of the photon-veto system.

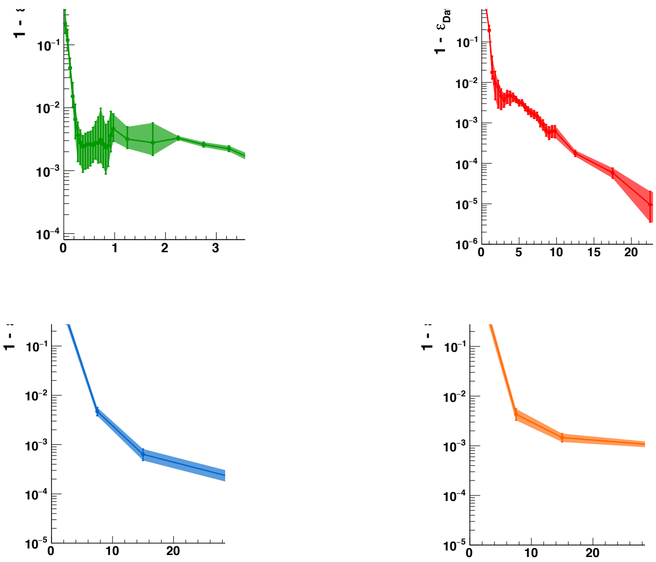


Fig. 6: Photon detection inefficiencies for the four detectors composing the NA62 photon-veto system. The error bands correspond to a 68%-CL coverage.

The inefficiencies have been used as weights for simulated $K^+ \to \pi^+\pi^0$ events to determine the expected veto inefficiency. In the π^+ momentum range 25-40 GeV/c, we expect to veto all but a fraction of approximately 3x10^{-9} of the $\pi^0 \to \gamma\gamma$ decays. This study confirms that the NA62 LAV efficiency meets design specifications, which is required for the $\pi^+\nu\bar{\nu}$ analysis to be feasible. Additionally, this study makes possible a high-sensitivity search for π^0 decays to invisible particles. The result, published in [5], has a significant contribution from the LNF team and improves by a factor of 60 on the past literature. It can be interpreted as a search for the emission of an invisible particle X in the decay $K^+ \to \pi^+ X$, where the X mass is around the π^0 mass. Models in which X is an axion-like particle or a dark scalar are constrained significantly with respect to previous results.

Analysis of exotic particle decays

Thanks to its high intensity beam and detector performance (redundant particle-identification capability, extremely efficient veto system and high-resolution measurements of momentum, time, and energy), NA62 can achieve sensitivities to long-lived light mediators in a variety of new-physics scenarios. Such feebly-interacting particles are expected to be produced after interaction of the proton beam with the most upstream collimator (TAX), approximately 23 m downstream of the NA62 target T10. The decay of these "exotic" mediators into SM particles are searched for in the NA62 decay volume, more than 100 m downstream of T10. Two schemes are in use. First, during standard data taking, 40% of the protons punch through T10 and interact in the TAX: dedicated triggers have been designed to collect signal candidates in parasitic mode. Second, a dedicated setup has been tested for short periods, in which the T10 target is lifted and the entire proton beam is dumped into the TAX collimator (beam-dump, or BD, mode). The corresponding analyses and activities are a responsibility of the LNF group.

In 2020, significant progress was made on the analysis of data taken with parasitic triggers and in the BD configuration. As an example, we discuss here the progress in modeling the background for the search for an axion-like-particle (ALP) decaying to two photons.

A data set with statistics equivalent to a few x 10^{16} protons on target (POT) has been collected in BD mode to make possible a first, comprehensive search of exotic particle decays. The search for ALP decays to two photons is particularly advanced and should make it possible to explore a new region of the parameter space [7]. Two main sources of background have been identified:

- Muon-halo showers initiated producing photons in the beam elements just upstream of the NA62 decay volume, which can pollute the sample for total LKr energies below 20 GeV;
- Tertiary production of neutral hadrons such as K_S or Λ decaying to neutral final states, which can mimic the ALP signal for LKr energies above 20 GeV.

The challenging task of achieving an *a priori* background estimate has been tackled using biased simulation techniques, as well as by exploiting studies ongoing within the recently restarted PBC effort. The background estimate for muon-halo showers is being evaluated using control samples with in-time activity detected by the upstream LAV stations. For the neutral hadrons, secondary K^+ mesons produced in the TAX and surviving up to the last elements of the beam line upstream of the decay volume are simulated. These K^+ can produce K_S and Λ tertiaries in the so-called final collimator. Preliminary results show a good agreement between the distribution shapes for data and expected background when the decays $K_S \to \pi^+\pi^-$ and $\Lambda \to p\pi^-$ are reconstructed. The distributions of the K_S momentum and vertex *z*-coordinate are shown in **Fig. 7** for data and simulation.

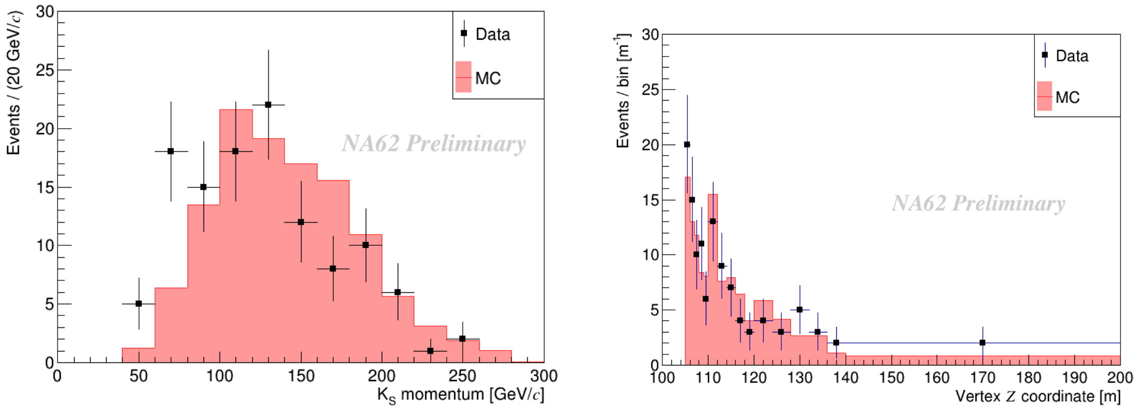


Fig. 7: Distributions from reconstructed $K_S \to \pi^+\pi^-$ decays: momentum (left panel) and *z*-coordinate of the decay vertex (right panel). Data corresponding to $1.6\text{x}10^{16}$ POT (117 events, black dots, error bars statistical only) are compared to the simulation obtained from a combination of G4BeamLine and NA62MC Monte Carlo techniques (red, normalized to the data integral).

A statistics equivalent to a few x 10^{17} protons on target (POT) in parasitic mode has been collected to allow searches of exotic particle decays to di-muon pairs. The analysis of these data has shown that the background from both accidental activity and in-time track pairs is well under control. The sensitivity achievable with a future data set corresponding to a few 10^{18} POT would considerably improve on that of the present data set. The improvement in background rejection obtained from the new anti-halo hodoscope in operation from 2021 onward is under evaluation.

The possibility of collecting around 10^{18} POT in upcoming data taking in beam-dump configuration has triggered a number of readiness studies. Simple and easily reversible optimizations of the beam line have been defined, guaranteeing a reduction of the muon-halo background by a factor of 4 at the trigger level [8], and an improved trigger setup has been defined, guaranteeing acceptance to visible exotic-particle decays both to charged and neutral final states over a broader range in exotic-particle mass than before. The charged modes will be triggered requiring two or more in-time NewCHOD tiles, thus allowing sensitivity starting from the start of the kinematic threshold. The neutral modes will be triggered requiring one or more LKr energy deposits, with a threshold low enough to allow collection of a muon control sample to be exploited for quick monitoring of the efficiency of the charged trigger. The data set collected should allow sensitivities well beyond the past experiments for a multitude of model dependent [9] and model-independent [10] physics cases.

The LNF group and the future of NA62:

Since the start of data taking, the LNF group has had a leading role in planning the future of the rare-kaon decay program at CERN. For the past few years, this effort has focused mainly on design studies for KLEVER, an experiment to measure BR($K_L \rightarrow \pi^0 \nu\nu$) at the CERN SPS with a sensitivity of about 60 signal events at the SM BR and a signal-to-background ratio of about 1. KLEVER is intended as a follow up on NA62, reusing as much of the existing apparatus as possible, but until recently, the transition path from NA62 to KLEVER was not clearly defined. In particular, possibilities for high-statistics measurements of BR($K^+ \rightarrow \pi^+ \nu\bar{\nu}$) decays in a future generation of NA62 were unexplored.

In 2020, a comprehensive vision for the evolution of NA62 was presented for the first time. A long-term plan for program at a high-intensity kaon facility was outlined, consisting of the following phases:

1. A high-statistics K^+ experiment to measure BR($K^+ \rightarrow \pi^+ \nu\bar{\nu}$) to 5% ("NA62x4")
2. A high-statistics K_L experiment to measure BR($K_L \rightarrow \pi^0 \nu\bar{\nu}$) to 20% (KLEVER)
3. A transitional experiment making use of a K_L beam for KLEVER and the downstream detector with tracking and PID for NA62x4 to investigate other rare K_L decays such as $K_L \rightarrow \pi^0 \ell^+ \ell^-$.
4. Additional running in beam-dump mode to attain the highest possible precision in searches for exotic physics, as discussed in the previous section, to the maximum extent compatible with the rare kaon decay program.

This comprehensive program better defines the relationship between KLEVER and NA62. It was presented as a Letter of Intent for Snowmass 2021, in a CERN Detector Seminar in October 2020, and is now the basis for NA62/KLEVER participation in Physics Beyond Colliders. Many of the same detectors would be used in different phases of the program. In particular, the calorimeter and photon veto systems conceptually designed for KLEVER would be used in NA62x4. The order of the phases will depend on the readiness of the detectors and the facility. During the year, continuing simulation work on KLEVER revealed that the potential background from $\Lambda \rightarrow n\pi^0$ decays had been underestimated previously. With help from the CERN EN-EA department, it was determined that extension of beamline by 150 m would be the preferred solution. Because of this development, at present, the NA62x4 phase seems more likely to be ready by 2026. A proposal for the program is in preparation.

Several summer students were involved in simulation work on the KLEVER detectors, including on the KLEVER Monte Carlo and reconstruction framework (KLMC), on the use of the preshower detector to improve K_L reconstruction quality and increase the acceptance, and on the detailed simulation of the shashlyk calorimeter with spy tiles (MEC) and small-angle calorimeter (SAC).

Participation of several KLEVER collaborators from INFN in AIDAinnova began in

November after project approval, with M. Moulson serving as INFN task leader for 8.3.1 (innovative crystals for calorimetry). Together with I. Sarra and the LNF muon collider group, beam time at the BTF-2 beamline was scheduled for 2021 to test a small prototype crystal calorimeter (CRYLIN) that is nearly identical in design to the KLEVER SAC.

Significant progress was made on analysis of data taken together with the AXIAL collaboration in the H2 beamline at the SPS in August 2018, with a draft of a paper on photon conversion in a thick tungsten crystal in final revisions at the end of 2020.

Published papers

1) First search for the $K^+ \rightarrow \pi^+\nu\bar{\nu}$ decay using the decay-in-flight technique
Author: E.Cortina Gil et al, NA62 Collaboration, arXiv.1811.08508 [hep-ex], Phys. Lett. B 791 (2019) 156-166

2) An investigation of the very rare $K^+ \rightarrow \pi^+\nu\bar{\nu}$ decay
Author: E.Cortina Gil et al, NA62 Collaboration, arXiv:2007.08218, hep-ex (submitted to JHEP)

3) Search for K^+ decays to a muon and invisible particles
Author: E.Cortina Gil et al, NA62 Collaboration, CERN-EP-2021-018, arXiv:2101.12304 [hep-ex] (January 28,2021) Publ. ref : submitted to Physics Letters B

4) Search for a feebly interacting particle X in the $K^+ \rightarrow \pi^+X$ decay
Author: E.Cortina Gil et al, NA62 Collaboration, arXiv:2011.11329 [hep-ex] (November 23,2020) Publ. ref : Journal of High Energy Physics, Volume 2021,Issue 3, page 058

5) Search for π^0 decays to invisible particles
Author: E.Cortina Gil et al, NA62 CERN-EP-2020-193 arXiv:2010.07644 [hep-ex] Publ. ref : Journal of High Energy Physics, Volume 2021,Issue 2, page 201

6) Search for heavy neutral lepton production in the K^+ decays to positrons
Author: E.Cortina Gil et al, NA62 Collaboration CERN-EP-2020-089 arXiv.2005.09575 [hep-ex] Publ. ref : Phyics Letters B 807 (2020)

References

7) B. Dobrich, J. Jaeckel and T. Spadaro, "Light in the beam dump - ALP production from decay photons in proton beam-dumps," JHEP **05** (2019), 213 [erratum: JHEP **10** (2020), 046] doi:10.1007/JHEP05(2019)213 [arXiv:1904.02091 [hep-ph]].

8) M. Rosenthal, *et al.*, "Single-muon rate reduction for beam dump operation of the K12 beam line at CERN," Int. J. Mod. Phys. A **34** (2019) no.36, 1942026 doi:10.1142/S0217751X19420260

9) J. Beacham, *et al.*, "Physics Beyond Colliders at CERN: Beyond the Standard Model Working Group Report," J. Phys. G **47** (2020) no.1, 010501 doi:10.1088/1361-6471/ab4cd2 [arXiv:1901.09966 [hep-ex]].

10) B. Dobrich, F. Ertas, F. Kahlhoefer and T. Spadaro, "Model-independent bounds on light pseudoscalars from rare B-meson decays," Phys. Lett. B **790** (2019), 537-544 doi:10.1016/j.physletb.2019.01.064 [arXiv:1810.11336 [hep-ph]].

CONFERENCE TALKS

T. Spadaro:

Dark sector searches at the CERN high-intensity kaon beam facility, Oct 2020, Rare processes and Precision Frontier Townhall meeting

M. Moulson:

Perspectives for high-intensity kaon physics at the SPS", CERN Detector Seminar, 23 Oct 2020

Rare kaon decay experiments, Anomalies 2020, IIT Hyderabad, India, 11 Sep 2020

Future experiments for rare kaon decays , FPCP 2020, A Toxa, Spain, 12 Jun 2020

A. Antonelli

New result on the search for the $\mathbf{K^+ \rightarrow \pi^+ \nu\nu}$ at the NA62 experiment at CERN, QCD 20 Montpellier, France, 27-30 Oct 2020

S. Martellotti:

New result on the search for the $K^+ \rightarrow \pi^+ \nu\nu$ decay at the NA62 experiment at CERN ICNFP2020 (9th International conference on New Frontiers in Physics), Crete, 9 Sep 2020