List of Publications

1. Jotin Gogoi, Nayana Gautam, and Mrinal Kumar Das. Neutrino masses and mixing in minimal inverse seesaw using A_4 modular symmetry. Int. J. Mod. Phys. A, 38(03):2350022, 2023.

2. Jotin Gogoi, Lavina Sarma, and Mrinal Kumar Das. Leptogenesis and dark matter in minimal inverse seesaw using A_4 modular symmetry. Eur. Phys. J. C, 84(7):689, 2024.

3. Jotin Gogoi and Mrinal Kumar Das. Constraints on 1-0 texture through neu trino phenomenology and dark matter in minimal inverse seesaw. arXiv:2503.02524 [hep-ph].

4. *Conference Proceedings:* J. Gogoi, L. Sarma, and M. K. Das, Baryogenesis in minimal inverse seesaw using modular symmetry, J. Phys. Conf. Ser. 2957 no. 1, (2025) 012004.

5. *Conference Proceedings:* J. Gogoi and M. K. Das, A study of texture zeros using A_4 discrete symmetry group, J. Subatomic Part. Cosmol. 3 (2025) 100071.

List of Conferences Attended

1. XIV Biennial Conference of Physics Academy of North East (PANE 2024), Department of Physics, Tezpur University, Assam, 12-14 November, 2024.

2. International Conference on Frontiers in Pure and Applied Physics (ICFPAP-2024), Department of Physics, University of Science and Technology Meghalaya, Meghalaya, 29 Feb-2 March, 2024.

3. International Conference on Future Prospects in Neutrino and Astroparticle Physics (ICFPNAP 2024), Department of Physics, Assam Don Bosco University, Assam, 23-24 January,2024.

4. National Conference SPARK 2023 (Symposium on Physics: Advances in Science and Research), Department of Physics, North Lakhimpur College (Autonomous), 14 Oct. 2023.

5. XIII Biennial Conference of Physics Academy of North East (PANE 2022), Department of Physics, Manipur University, Manipur, 8-10 Nov, 2022.

6. Symposium on Particle Physics and Related Topics, Department of Physics, Assam Don Bosco University, Assam, 28-29 October,2021.

7. Workshop on Particle Physics 2020, Department of Physics, Assam Don Bosco University, Assam, 17-31 August, 2020.

References

[1] D. Fournier, "The LHC at CERN: Startup, very first results and prospects," *AIP Conf. Proc.* **1446** no. 1, (2012) 29–54.

[2] B. Pontecorvo, "Mesonium and anti-mesonium," *Sov. Phys. JETP* **6** (1957) 429.

[3] **Super-Kamiokande** Collaboration, K. Abe *et al.*, "A Measurement of atmospheric neutrino flux consistent with tau neutrino appearance," *Phys. Rev. Lett.* **97** (2006) 171801, `arXiv:hep-ex/0607059`.

[4] **MINOS** Collaboration, P. Adamson *et al.*, "Electron Neutrino and Antineutrino Appearance in the Full MINOS Data Sample," *Phys. Rev. Lett.* **110** no. 17, (2013) 171801, `arXiv:1301.4581 [hep-ex]`.

[5] **RENO** Collaboration, J. K. Ahn *et al.*, "Observation of Reactor Electron Antineutrino Disappearance in the RENO Experiment," *Phys. Rev. Lett.* **108** (2012) 191802, `arXiv:1204.0626 [hep-ex]`.

[6] T. Collaboration, K. Abe, N. Abgrall, Y. Ajima, H. Aihara, J. Albert, C. Andreopoulos, B. Andrieu, S. Aoki, O. Araoka, *et al.*, "Indication of electron neutrino appearance from an accelerator-produced off-axis muon neutrino beam," *Physical Review Letters* **107** no. 4, (2011) .

[7] **Double Chooz** Collaboration, Y. Abe *et al.*, "Indication of Reactor $\bar{\nu}_e$ Disappearance in the Double Chooz Experiment," *Phys. Rev. Lett.* **108** (2012) 131801, `arXiv:1112.6353 [hep-ex]`.

[8] R. N. Mohapatra *et al.*, "Theory of neutrinos: A White paper," *Rept. Prog. Phys.* **70** (2007) 1757–1867, `arXiv:hep-ph/0510213`.

[9] E. Ma, "Radiative inverse seesaw mechanism for nonzero neutrino mass,"

Phys. Rev. D **80** (2009) 013013, arXiv:0904.4450 [hep-ph].

[10] R. N. Mohapatra and J. W. F. Valle, "Neutrino Mass and Baryon Number Nonconservation in Superstring Models," *Phys. Rev. D* **34** (1986) 1642.

[11] A. Abada and M. Lucente, "Looking for the minimal inverse seesaw realisation," *Nucl. Phys. B* **885** (2014) 651–678, arXiv:1401.1507 [hep-ph].

[12] G. Altarelli and F. Feruglio, "Discrete Flavor Symmetries and Models of Neutrino Mixing," *Rev. Mod. Phys.* **82** (2010) 2701–2729, arXiv:1002.0211 [hep-ph].

[13] G.-J. Ding, S. F. King, and J.-N. Lu, "SO(10) models with A_4 modular symmetry," *JHEP* **11** (2021) 007, arXiv:2108.09655 [hep-ph].

[14] F. Feruglio, *Are neutrino masses modular forms?*, pp. 227–266. 2019. arXiv:1706.08749 [hep-ph].

[15] A. D. Sakharov, "Violation of cp-invariance, c-asymmetry, and baryon asymmetry of the universe," in *In The Intermissions... Collected Works on Research into the Essentials of Theoretical Physics in Russian Federal Nuclear Center, Arzamas-16*, pp. 84–87. World Scientific, 1998.

[16] S. Davidson, E. Nardi, and Y. Nir, "Leptogenesis," *Phys. Rept.* **466** (2008) 105–177, arXiv:0802.2962 [hep-ph].

[17] **KamLAND-Zen** Collaboration, A. Li, "A Bayesian Approach to Neutrinoless Double Beta Decay Analysis in KamLAND-Zen," *J. Phys. Conf. Ser.* **1468** no. 1, (2020) 012201.

[18] **GERDA** Collaboration, M. Agostini *et al.*, "Final Results of GERDA on the Search for Neutrinoless Double-β Decay," *Phys. Rev. Lett.* **125** no. 25, (2020) 252502, arXiv:2009.06079 [nucl-ex].

[19] **CUORE** Collaboration, D. R. Artusa *et al.*, "Searching for neutrinoless double-beta decay of ^{130}Te with CUORE," *Adv. High Energy Phys.* **2015**

(2015) 879871, arXiv:1402.6072 [physics.ins-det].

[20] **Planck** Collaboration, N. Aghanim *et al.*, "Planck 2018 results. VI. Cosmological parameters," *Astron. Astrophys.* **641** (2020) A6, arXiv:1807.06209 [astro-ph.CO]. [Erratum: Astron.Astrophys. 652, C4 (2021)].

[21] C. Jarlskog, "Birth of the neutrino, from pauli to the reines-cowan experiment," in *History of the Neutrino 2018 conference proceedings*. 2018.

[22] F. Reines and C. L. Cowan, "Free anti-neutrino absorption cross-section. 1: Measurement of the free anti-neutrino absorption cross-section by protons," *Phys. Rev.* **113** (1959) 273–279.

[23] R. Davis, Jr., D. S. Harmer, and K. C. Hoffman, "Search for neutrinos from the sun," *Phys. Rev. Lett.* **20** (1968) 1205–1209.

[24] **DONUT** Collaboration, K. Kodama *et al.*, "Observation of tau neutrino interactions," *Phys. Lett. B* **504** (2001) 218–224, arXiv:hep-ex/0012035.

[25] B. Pontecorvo, "Inverse beta processes and nonconservation of lepton charge," *Zh. Eksp. Teor. Fiz.* **34** (1957) 247.

[26] S. Weinberg, "A Model of Leptons," *Phys. Rev. Lett.* **19** (1967) 1264–1266.

[27] S. Weinberg, "Effects of a neutral intermediate boson in semileptonic processes," *Phys. Rev. D* **5** (1972) 1412–1417.

[28] S. M. Bilenky and J. Hosek, "GLASHOW-WEINBERG-SALAM THEORY OF ELECTROWEAK INTERACTIONS AND THE NEUTRAL CURRENTS," *Phys. Rept.* **90** (1982) 73–157.

[29] **SNO** Collaboration, Q. R. Ahmad *et al.*, "Direct evidence for neutrino flavor transformation from neutral current interactions in the Sudbury Neutrino Observatory," *Phys. Rev. Lett.* **89** (2002) 011301, arXiv:nucl-ex/0204008.

[30] **SNO** Collaboration, B. Aharmim *et al.*, "Electron energy spectra, fluxes, and day-night asymmetries of B-8 solar neutrinos from measurements with NaCl dissolved in the heavy-water detector at the Sudbury Neutrino Observatory," *Phys. Rev. C* **72** (2005) 055502, arXiv:nucl-ex/0502021.

[31] C. Giganti, S. Lavignac, and M. Zito, "Neutrino oscillations: The rise of the PMNS paradigm," *Prog. Part. Nucl. Phys.* **98** (2018) 1–54, arXiv:1710.00715 [hep-ex].

[32] I. Esteban, M. C. Gonzalez-Garcia, M. Maltoni, T. Schwetz, and A. Zhou, "The fate of hints: updated global analysis of three-flavor neutrino oscillations," *JHEP* **09** (2020) 178, arXiv:2007.14792 [hep-ph].

[33] R. Foot, H. Lew, X. G. He, and G. C. Joshi, "Seesaw Neutrino Masses Induced by a Triplet of Leptons," *Z. Phys. C* **44** (1989) 441.

[34] S. Antusch and S. F. King, "Type II Leptogenesis and the neutrino mass scale," *Phys. Lett. B* **597** (2004) 199–207, arXiv:hep-ph/0405093.

[35] E. Ma, "Verifiable radiative seesaw mechanism of neutrino mass and dark matter," *Phys. Rev. D* **73** (2006) 077301, arXiv:hep-ph/0601225.

[36] J. Barry, J. Heeck, and W. Rodejohann, "Sterile neutrinos and right-handed currents in KATRIN," *JHEP* **07** (2014) 081, arXiv:1404.5955 [hep-ph].

[37] X.-G. He and E. Ma, "Seesaw Options for Three Neutrinos," *Phys. Lett. B* **683** (2010) 178–182, arXiv:0907.2737 [hep-ph].

[38] E. Ma, "Inverse Seesaw Neutrino Mass from Lepton Triplets in the U(1)(Sigma) Model," *Mod. Phys. Lett. A* **24** (2009) 2491–2495, arXiv:0905.2972 [hep-ph].

[39] **LSND** Collaboration, A. Aguilar *et al.*, "Evidence for neutrino oscillations from the observation of $\bar{\nu}_e$ appearance in a $\bar{\nu}_\mu$ beam," *Phys. Rev. D* **64** (2001) 112007, arXiv:hep-ex/0104049.

[40] **MiniBooNE** Collaboration, A. A. Aguilar-Arevalo *et al.*, "Improved Search for $\bar{\nu}_\mu \to \bar{\nu}_e$ Oscillations in the MiniBooNE Experiment," *Phys. Rev. Lett.* **110** (2013) 161801, arXiv:1303.2588 [hep-ex].

[41] **MiniBooNE** Collaboration, A. A. Aguilar-Arevalo *et al.*, "Significant Excess of ElectronLike Events in the MiniBooNE Short-Baseline Neutrino Experiment," *Phys. Rev. Lett.* **121** no. 22, (2018) 221801, arXiv:1805.12028 [hep-ex].

[42] B. T. Cleveland, T. Daily, R. Davis, Jr., J. R. Distel, K. Lande, C. K. Lee, P. S. Wildenhain, and J. Ullman, "Measurement of the solar electron neutrino flux with the Homestake chlorine detector," *Astrophys. J.* **496** (1998) 505–526.

[43] **SAGE** Collaboration, A. I. Abazov *et al.*, "Search for neutrinos from the sun with the reaction Ga-71(nu/e,e-)Ge-71 by the Soviet-American Gallium Experiment (SAGE)," in *International Workshop on Neutrino Telescopes, 3rd*. 1991.

[44] **GALLEX** Collaboration, W. Hampel *et al.*, "GALLEX solar neutrino observations: Results for GALLEX IV," *Phys. Lett. B* **447** (1999) 127–133.

[45] **Kamiokande** Collaboration, Y. Fukuda *et al.*, "Atmospheric muon-neutrino / electron-neutrino ratio in the multiGeV energy range," *Phys. Lett. B* **335** (1994) 237–245.

[46] **Super-Kamiokande, Kamiokande** Collaboration, T. Kajita, "Atmospheric neutrino results from Super-Kamiokande and Kamiokande: Evidence for neutrino(mu) oscillations," *Nucl. Phys. B Proc. Suppl.* **77** (1999) 123–132, arXiv:hep-ex/9810001.

[47] **MACRO** Collaboration, M. Ambrosio *et al.*, "Measurement of the atmospheric neutrino induced upgoing muon flux using MACRO," *Phys. Lett. B* **434** (1998) 451–457, arXiv:hep-ex/9807005.

[48] R. Davis Jr, D. S. Harmer, and K. C. Hoffman, "Search for neutrinos

from the sun," *Physical Review Letters* **20** no. 21, (1968) 1205.

[49] **Daya Bay** Collaboration, F. P. An *et al.*, "Observation of electron-antineutrino disappearance at Daya Bay," *Phys. Rev. Lett.* **108** (2012) 171803, arXiv:1203.1669 [hep-ex].

[50] K. N. Abazajian *et al.*, "Light Sterile Neutrinos: A White Paper," arXiv:1204.5379 [hep-ph].

[51] **KATRIN** Collaboration, S. Mertens, "Status of the KATRIN Experiment and Prospects to Search for keV-mass Sterile Neutrinos in Tritium β-decay," *Phys. Procedia* **61** (2015) 267–273.

[52] E. Akhmedov and T. Schwetz, "LSND and MiniBooNE within (3+1) plus NSI," *AIP Conf. Proc.* **1382** no. 1, (2011) 94–96.

[53] A. Kusenko, "Sterile neutrinos: The Dark side of the light fermions," *Phys. Rept.* **481** (2009) 1–28, arXiv:0906.2968 [hep-ph].

[54] F. Bezrukov, H. Hettmansperger, and M. Lindner, "keV sterile neutrino Dark Matter in gauge extensions of the Standard Model," *Phys. Rev. D* **81** (2010) 085032, arXiv:0912.4415 [hep-ph].

[55] **Particle Data Group** Collaboration, D. E. Groom *et al.*, "Review of particle physics. Particle Data Group," *Eur. Phys. J. C* **15** (2000) 1–878.

[56] P. W. Higgs, "Broken Symmetries and the Masses of Gauge Bosons," *Phys. Rev. Lett.* **13** (1964) 508–509.

[57] P. W. Higgs, "Spontaneous Symmetry Breakdown without Massless Bosons," *Phys. Rev.* **145** (1966) 1156–1163.

[58] **ALEPH, DELPHI, L3, OPAL, LEP Electroweak Working Group** Collaboration, J. Alcaraz *et al.*, "Precision Electroweak Measurements and Constraints on the Standard Model," arXiv:0712.0929 [hep-ex].

[59] P. F. de Salas, D. V. Forero, C. A. Ternes, M. Tortola, and J. W. F.

Valle, "Status of neutrino oscillations 2018: 3σ hint for normal mass ordering and improved CP sensitivity," *Phys. Lett. B* **782** (2018) 633–640, arXiv:1708.01186 [hep-ph].

[60] M. Fukugita and T. Yanagida, "Baryogenesis Without Grand Unification," *Phys. Lett. B* **174** (1986) 45–47.

[61] G. Bertone, D. Hooper, and J. Silk, "Particle dark matter: Evidence, candidates and constraints," *Phys. Rept.* **405** (2005) 279–390, arXiv:hep-ph/0404175.

[62] B. Moore, S. Ghigna, F. Governato, G. Lake, T. R. Quinn, J. Stadel, and P. Tozzi, "Dark matter substructure within galactic halos," *Astrophys. J. Lett.* **524** (1999) L19–L22, arXiv:astro-ph/9907411.

[63] **WMAP** Collaboration, C. L. Bennett *et al.*, "Nine-Year Wilkinson Microwave Anisotropy Probe (WMAP) Observations: Final Maps and Results," *Astrophys. J. Suppl.* **208** (2013) 20, arXiv:1212.5225 [astro-ph.CO].

[64] A. Y. Smirnov, "The MSW effect and matter effects in neutrino oscillations," *Phys. Scripta T* **121** (2005) 57–64, arXiv:hep-ph/0412391.

[65] S. T. Petcov, "The Nature of Massive Neutrinos," *Adv. High Energy Phys.* **2013** (2013) 852987, arXiv:1303.5819 [hep-ph].

[66] M.-C. Chen and K. T. Mahanthappa, "Neutrino Mass Models: Circa 2008," *Nucl. Phys. B Proc. Suppl.* **188** (2009) 315–320, arXiv:0812.4981 [hep-ph].

[67] J. R. Ellis and O. Lebedev, "The Seesaw with many right-handed neutrinos," *Phys. Lett. B* **653** (2007) 411–418, arXiv:0707.3419 [hep-ph].

[68] R. Franceschini, T. Hambye, and A. Strumia, "Type-III see-saw at LHC," *Phys. Rev. D* **78** (2008) 033002, arXiv:0805.1613 [hep-ph].

[69] R. N. Mohapatra and J. C. Pati, "A Natural Left-Right Symmetry," *Phys. Rev. D* **11** (1975) 2558.

[70] R. N. Mohapatra and J. C. Pati, "Left-Right Gauge Symmetry and an Isoconjugate Model of CP Violation," *Phys. Rev. D* **11** (1975) 566–571.

[71] E. Ma, "Naturally small seesaw neutrino mass with no new physics beyond the TeV scale," *Phys. Rev. Lett.* **86** (2001) 2502–2504, arXiv:hep-ph/0011121.

[72] A. Donini, P. Hernandez, J. Lopez-Pavon, and M. Maltoni, "Minimal models with light sterile neutrinos," *JHEP* **07** (2011) 105, arXiv:1106.0064 [hep-ph].

[73] S. C. Park and K. Wang, "Inverse seesaw in supersymmetry," *Phys. Lett. B* **701** (2011) 107–110, arXiv:1011.3621 [hep-ph].

[74] J. Garayoa, M. C. Gonzalez-Garcia, and N. Rius, "Soft leptogenesis in the inverse seesaw model," *JHEP* **02** (2007) 021, arXiv:hep-ph/0611311.

[75] S. Khalil, "TeV-scale gauged B-L symmetry with inverse seesaw mechanism," *Phys. Rev. D* **82** (2010) 077702, arXiv:1004.0013 [hep-ph].

[76] A. Ibarra, E. Molinaro, and S. T. Petcov, "TeV Scale See-Saw Mechanisms of Neutrino Mass Generation, the Majorana Nature of the Heavy Singlet Neutrinos and $(\beta\beta)_{0\nu}$-Decay," *JHEP* **09** (2010) 108, arXiv:1007.2378 [hep-ph].

[77] M. Malinsky, "Non-unitarity effects in the minimal inverse seesaw model," *PoS* **EPS-HEP2009** (2009) 288, arXiv:0909.1953 [hep-ph].

[78] **Planck** Collaboration, N. Aghanim *et al.*, "Planck 2018 results. VI. Cosmological parameters," *Astron. Astrophys.* **641** (2020) A6, arXiv:1807.06209 [astro-ph.CO]. [Erratum: Astron.Astrophys. 652, C4 (2021)].

[79] F. Iocco, G. Mangano, G. Miele, O. Pisanti, and P. D. Serpico, "Primordial Nucleosynthesis: from precision cosmology to fundamental physics," *Phys. Rept.* **472** (2009) 1–76, arXiv:0809.0631 [astro-ph].

[80] **ATLAS** Collaboration, G. Aad *et al.*, "Performance of algorithms that reconstruct missing transverse momentum in $\sqrt{s} = 8$ TeV proton-proton collisions in the ATLAS detector," *Eur. Phys. J. C* **77** no. 4, (2017) 241, arXiv:1609.09324 [hep-ex].

[81] S. Weinberg, "Cosmological Production of Baryons," *Phys. Rev. Lett.* **42** (1979) 850–853.

[82] M. Yoshimura, "Unified Gauge Theories and the Baryon Number of the Universe," *Phys. Rev. Lett.* **41** (1978) 281–284. [Erratum: Phys.Rev.Lett. 42, 746 (1979)].

[83] J. R. Espinosa, "Electroweak baryogenesis," in *17th International Workshop on Weak Interactions and Neutrinos*, pp. 115–119. 1, 1999.

[84] M. Dine, L. Randall, and S. D. Thomas, "Baryogenesis from flat directions of the supersymmetric standard model," *Nucl. Phys. B* **458** (1996) 291–326, arXiv:hep-ph/9507453.

[85] I. Affleck and M. Dine, "A New Mechanism for Baryogenesis," *Nucl. Phys. B* **249** (1985) 361–380.

[86] A. Pilaftsis and T. E. J. Underwood, "Resonant leptogenesis," *Nucl. Phys. B* **692** (2004) 303–345, arXiv:hep-ph/0309342.

[87] P. S. B. Dev, "TeV Scale Leptogenesis," *Springer Proc. Phys.* **174** (2016) 245–253, arXiv:1506.00837 [hep-ph].

[88] T. Hambye, J. March-Russell, and S. M. West, "TeV scale resonant leptogenesis from supersymmetry breaking," *JHEP* **07** (2004) 070, arXiv:hep-ph/0403183.

[89] P. S. Bhupal Dev, P. Millington, A. Pilaftsis, and D. Teresi, "Flavour effects in Resonant Leptogenesis from semi-classical and Kadanoff-Baym approaches," *J. Phys. Conf. Ser.* **631** no. 1, (2015) 012087, arXiv:1502.07987 [hep-ph].

[90] K. Agashe, P. Du, M. Ekhterachian, C. S. Fong, S. Hong, and L. Vecchi, "Natural Seesaw and Leptogenesis from Hybrid of High-Scale Type I and TeV-Scale Inverse," *JHEP* **04** (2019) 029, arXiv:1812.08204 [hep-ph].

[91] F. Zwicky, "Die Rotverschiebung von extragalaktischen Nebeln," *Helv. Phys. Acta* **6** (1933) 110–127.

[92] N. W. Evans and M. I. Wilkinson, "The mass of the andromeda galaxy," *Mon. Not. Roy. Astron. Soc.* **316** (2000) 929, arXiv:astro-ph/0004187.

[93] T. Treu, P. J. Marshall, and D. Clowe, "Resource Letter: Gravitational Lensing," *Am. J. Phys.* **80** (2012) 753, arXiv:1206.0791 [astro-ph.CO].

[94] G. Steigman, "When Clusters Collide: Constraints On Antimatter On The Largest Scales," *JCAP* **10** (2008) 001, arXiv:0808.1122 [astro-ph].

[95] R. Durrer, "The cosmic microwave background: the history of its experimental investigation and its significance for cosmology," *Class. Quant. Grav.* **32** no. 12, (2015) 124007, arXiv:1506.01907 [astro-ph.CO].

[96] **Planck** Collaboration, P. A. R. Ade *et al.*, "Planck 2015 results. XXIV. Cosmology from Sunyaev-Zeldovich cluster counts," *Astron. Astrophys.* **594** (2016) A24, arXiv:1502.01597 [astro-ph.CO].

[97] S. M. Bilenky and C. Giunti, "Neutrinoless double-beta decay: A brief review," *Mod. Phys. Lett. A* **27** (2012) 1230015, arXiv:1203.5250 [hep-ph].

[98] P. Benes, A. Faessler, F. Simkovic, and S. Kovalenko, "Sterile neutrinos in neutrinoless double beta decay," *Phys. Rev. D* **71** (2005) 077901, arXiv:hep-ph/0501295.

[99] **GERDA** Collaboration, V. D'Andrea, "Neutrinoless double beta decay search with the GERDA experiment," *Nuovo Cim. C* **43** no. 2-3, (2020) 24.

[100] **SNO** Collaboration, B. Aharmim *et al.*, "Low Energy Threshold Analysis of the Phase I and Phase II Data Sets of the Sudbury Neutrino

Observatory," *Phys. Rev. C* **81** (2010) 055504, arXiv:0910.2984 [nucl-ex].

[101] **SNO** Collaboration, S. N. Ahmed *et al.*, "Measurement of the total active B-8 solar neutrino flux at the Sudbury Neutrino Observatory with enhanced neutral current sensitivity," *Phys. Rev. Lett.* **92** (2004) 181301, arXiv:nucl-ex/0309004.

[102] **KamLAND** Collaboration, K. Eguchi *et al.*, "First results from KamLAND: Evidence for reactor anti-neutrino disappearance," *Phys. Rev. Lett.* **90** (2003) 021802, arXiv:hep-ex/0212021.

[103] **KamLAND** Collaboration, T. Araki *et al.*, "Measurement of neutrino oscillation with KamLAND: Evidence of spectral distortion," *Phys. Rev. Lett.* **94** (2005) 081801, arXiv:hep-ex/0406035.

[104] **KamLAND** Collaboration, S. Abe *et al.*, "Precision Measurement of Neutrino Oscillation Parameters with KamLAND," *Phys. Rev. Lett.* **100** (2008) 221803, arXiv:0801.4589 [hep-ex].

[105] **MEG** Collaboration, A. M. Baldini *et al.*, "Search for the lepton flavour violating decay $\mu^+ \to \mathrm{e}^+\gamma$ with the full dataset of the MEG experiment," *Eur. Phys. J. C* **76** no. 8, (2016) 434, arXiv:1605.05081 [hep-ex].

[106] **MEG II** Collaboration, A. M. Baldini *et al.*, "The design of the MEG II experiment," *Eur. Phys. J. C* **78** no. 5, (2018) 380, arXiv:1801.04688 [physics.ins-det].

[107] **SINDRUM** Collaboration, U. Bellgardt *et al.*, "Search for the Decay $\mu^+ \to e^+e^+e^-$," *Nucl. Phys. B* **299** (1988) 1–6.

[108] A. Blondel, A. Bravar, M. Pohl, S. Bachmann, N. Berger, M. Kiehn, A. Schöning, D. Wiedner, B. Windelband, P. Eckert, *et al.*, "Research proposal for an experiment to search for the decay {\mu}-¿ eee," *arXiv preprint arXiv:1301.6113* (2013) .

[109] **Mu2e** Collaboration, S. Miscetti, "Status of the Mu2e experiment at Fermilab," *EPJ Web Conf.* **234** (2020) 01010.

[110] **DeeMe** Collaboration, H. Natori, "An experiment to search for mu-e conversion at J-PARC MLF in Japan, DeeMe experiment," *PoS* **ICHEP2018** (2019) 642.

[111] **Comet** Collaboration, H. Nishiguchi, "Search for Muon-to-Electron Conversion at J-PARC: COMET Experiment," *PoS* **EPS-HEP2017** (2017) 674.

[112] **SuperB** Collaboration, E. Grauges *et al.*, "SuperB Progress Reports – Detector," `arXiv:1007.4241 [physics.ins-det]`.

[113] **SuperB** Collaboration, B. O'Leary *et al.*, "SuperB Progress Reports – Physics," `arXiv:1008.1541 [hep-ex]`.

[114] **Belle, Belle-II** Collaboration, K. Hayasaka, "Results and prospects on lepton flavor violation at Belle/Belle II," *J. Phys. Conf. Ser.* **408** (2013) 012069.

[115] E. Ma and G. Rajasekaran, "Softly broken A(4) symmetry for nearly degenerate neutrino masses," *Phys. Rev. D* **64** (2001) 113012, `arXiv:hep-ph/0106291`.

[116] K. S. Babu, T. Enkhbat, and I. Gogoladze, "Finite grand unified theories and the quark mixing matrix," *Phys. Lett. B* **555** (2003) 238–247, `arXiv:hep-ph/0204246`.

[117] B. Adhikary and A. Ghosal, "Constraining it CP violation in a softly broken A(4) symmetric Model," *Phys. Rev. D* **75** (2007) 073020, `arXiv:hep-ph/0609193`.

[118] S. Pakvasa and H. Sugawara, "Discrete Symmetry and Cabibbo Angle," *Phys. Lett. B* **73** (1978) 61–64.

[119] M. Honda and M. Tanimoto, "Examining the Geometrical Model with Inverted Mass Hierarchy for Neutrinos," *Phys. Rev. D* **75** (2007) 096005, `arXiv:hep-ph/0701083`.

[120] R. N. Mohapatra, S. Nasri, and H.-B. Yu, "S(3) symmetry and tri-bimaximal mixing," *Phys. Lett. B* **639** (2006) 318–321, arXiv:hep-ph/0605020.

[121] W. Grimus and L. Lavoura, "A Discrete symmetry group for maximal atmospheric neutrino mixing," *Phys. Lett. B* **572** (2003) 189–195, arXiv:hep-ph/0305046.

[122] C. Hagedorn, M. Lindner, and F. Plentinger, "The Discrete flavor symmetry D(5)," *Phys. Rev. D* **74** (2006) 025007, arXiv:hep-ph/0604265.

[123] M.-C. Chen and K. T. Mahanthappa, "CKM and Tri-bimaximal MNS Matrices in a $SU(5) \times^{(d)} T$ Model," *Phys. Lett. B* **652** (2007) 34–39, arXiv:0705.0714 [hep-ph].

[124] D. A. Eby, P. H. Frampton, and S. Matsuzaki, "Predictions of Neutrino Mixing Angles in a T-prime Model," *Phys. Lett. B* **671** (2009) 386–390, arXiv:0810.4899 [hep-ph].

[125] N. I. Polyakov, "Quark and lepton mass matrices in extended standard model with discrete symmetry," *Phys. Lett. B* **255** (1991) 77–83.

[126] P. P. Novichkov, J. T. Penedo, S. T. Petcov, and A. V. Titov, "Generalised CP Symmetry in Modular-Invariant Models of Flavour," *JHEP* **07** (2019) 165, arXiv:1905.11970 [hep-ph].

[127] S. J. D. King and S. F. King, "Fermion mass hierarchies from modular symmetry," *JHEP* **09** (2020) 043, arXiv:2002.00969 [hep-ph].

[128] T. Nomura and H. Okada, "Linear seesaw model with a modular S $_4$ flavor symmetry *," *Chin. Phys. C* **46** no. 5, (2022) 053101, arXiv:2109.04157 [hep-ph].

[129] T. Kobayashi, T. Nomura, and T. Shimomura, "Type II seesaw models with modular A_4 symmetry," *Phys. Rev. D* **102** no. 3, (2020) 035019, arXiv:1912.00637 [hep-ph].

[130] P. P. Novichkov, J. T. Penedo, and S. T. Petcov, "Modular flavour symmetries and modulus stabilisation," *JHEP* **03** (2022) 149, arXiv:2201.02020 [hep-ph].

[131] J. T. Penedo and S. T. Petcov, "Lepton Masses and Mixing from Modular S_4 Symmetry," *Nucl. Phys. B* **939** (2019) 292–307, arXiv:1806.11040 [hep-ph].

[132] G.-J. Ding, S. F. King, C.-C. Li, and Y.-L. Zhou, "Modular Invariant Models of Leptons at Level 7," *JHEP* **08** (2020) 164, arXiv:2004.12662 [hep-ph].

[133] G.-J. Ding and S. F. King, "Neutrino mass and mixing with modular symmetry," *Rept. Prog. Phys.* **87** no. 8, (2024) 084201, arXiv:2311.09282 [hep-ph].

[134] F. Deppisch and J. W. F. Valle, "Enhanced lepton flavor violation in the supersymmetric inverse seesaw model," *Phys. Rev. D* **72** (2005) 036001, arXiv:hep-ph/0406040.

[135] R. N. Mohapatra, "Mechanism for Understanding Small Neutrino Mass in Superstring Theories," *Phys. Rev. Lett.* **56** (1986) 561–563.

[136] S. F. King, "Neutrino mass models," *Rept. Prog. Phys.* **67** (2004) 107–158, arXiv:hep-ph/0310204.

[137] S. F. King, A. Merle, S. Morisi, Y. Shimizu, and M. Tanimoto, "Neutrino Mass and Mixing: from Theory to Experiment," *New J. Phys.* **16** (2014) 045018, arXiv:1402.4271 [hep-ph].

[138] M. C. Gonzalez-Garcia, M. Maltoni, and T. Schwetz, "Global analyses of neutrino oscillation experiments," *Nucl. Phys. B* **908** (2016) 199–217, arXiv:1512.06856 [hep-ph].

[139] D. V. Forero, M. Tortola, and J. W. F. Valle, "Neutrino oscillations refitted," *Phys. Rev. D* **90** no. 9, (2014) 093006, arXiv:1405.7540 [hep-ph].

[140] F. Capozzi, E. Lisi, A. Marrone, D. Montanino, and A. Palazzo, "Neutrino masses and mixings: Status of known and unknown 3ν parameters," *Nucl. Phys. B* **908** (2016) 218–234, arXiv:1601.07777 [hep-ph].

[141] T. Nomura, H. Okada, and S. Patra, "An inverse seesaw model with A_4 -modular symmetry," *Nucl. Phys. B* **967** (2021) 115395, arXiv:1912.00379 [hep-ph].

[142] T. Nomura, H. Okada, and O. Popov, "A modular A_4 symmetric scotogenic model," *Phys. Lett. B* **803** (2020) 135294, arXiv:1908.07457 [hep-ph].

[143] M. Abbas, "Fermion masses and mixing in modular A4 Symmetry," *Phys. Rev. D* **103** no. 5, (2021) 056016, arXiv:2002.01929 [hep-ph].

[144] K. I. Nagao and H. Okada, "Lepton sector in modular A4 and gauged U(1)R symmetry," *Nucl. Phys. B* **980** (2022) 115841, arXiv:2010.03348 [hep-ph].

[145] G. Altarelli and F. Feruglio, "Tri-bimaximal neutrino mixing, A(4) and the modular symmetry," *Nucl. Phys. B* **741** (2006) 215–235, arXiv:hep-ph/0512103.

[146] A. Abada, G. Arcadi, and M. Lucente, "Dark Matter in the minimal Inverse Seesaw mechanism," *JCAP* **10** (2014) 001, arXiv:1406.6556 [hep-ph].

[147] A. Abada, G. Arcadi, V. Domcke, and M. Lucente, "Lepton number violation as a key to low-scale leptogenesis," *JCAP* **11** (2015) 041, arXiv:1507.06215 [hep-ph].

[148] R. L. Awasthi, M. K. Parida, and S. Patra, "Neutrinoless double beta decay and pseudo-Dirac neutrino mass predictions through inverse seesaw mechanism," arXiv:1301.4784 [hep-ph].

[149] A. Abada, A. Hernández-Cabezudo, and X. Marcano, "Beta and Neutrinoless Double Beta Decays with KeV Sterile Fermions," *JHEP* **01**

(2019) 041, arXiv:1807.01331 [hep-ph].

[150] M. Blennow, E. Fernandez-Martinez, J. Lopez-Pavon, and J. Menendez, "Neutrinoless double beta decay in seesaw models," *JHEP* **07** (2010) 096, arXiv:1005.3240 [hep-ph].

[151] **KamLAND-Zen** Collaboration, A. Gando *et al.*, "Search for Majorana Neutrinos near the Inverted Mass Hierarchy Region with KamLAND-Zen," *Phys. Rev. Lett.* **117** no. 8, (2016) 082503, arXiv:1605.02889 [hep-ex]. [Addendum: Phys.Rev.Lett. 117, 109903 (2016)].

[152] **CUORE** Collaboration, D. Q. Adams *et al.*, "Improved Limit on Neutrinoless Double-Beta Decay in ^{130}Te with CUORE," *Phys. Rev. Lett.* **124** no. 12, (2020) 122501, arXiv:1912.10966 [nucl-ex].

[153] X. Zhang and S. Zhou, "Inverse seesaw model with a modular S 4 symmetry: lepton flavor mixing and warm dark matter," *JCAP* **09** (2021) 043, arXiv:2106.03433 [hep-ph].

[154] S. Antusch and O. Fischer, "Non-unitarity of the leptonic mixing matrix: Present bounds and future sensitivities," *JHEP* **10** (2014) 094, arXiv:1407.6607 [hep-ph].

[155] E. Fernandez-Martinez, J. Hernandez-Garcia, and J. Lopez-Pavon, "Global constraints on heavy neutrino mixing," *JHEP* **08** (2016) 033, arXiv:1605.08774 [hep-ph].

[156] X.-J. Bi and Y.-B. Dai, "Lepton flavor violation in the supersymmetric grand unified models with a lopsided mass matrix," *Phys. Rev. D* **66** (2002) 076006, arXiv:hep-ph/0112077.

[157] A. Ibarra, E. Molinaro, and S. T. Petcov, "Low Energy Signatures of the TeV Scale See-Saw Mechanism," *Phys. Rev. D* **84** (2011) 013005, arXiv:1103.6217 [hep-ph].

[158] I. Esteban, M. C. Gonzalez-Garcia, M. Maltoni, T. Schwetz, and A. Zhou, "The fate of hints: updated global analysis of three-flavor neutrino

oscillations," *JHEP* **09** (2020) 178, arXiv:2007.14792 [hep-ph].

[159] M. K. Behera and R. Mohanta, "Inverse seesaw in A_5' modular symmetry," *J. Phys. G* **49** no. 4, (2022) 045001, arXiv:2108.01059 [hep-ph].

[160] R. Barbieri, P. Creminelli, A. Strumia, and N. Tetradis, "Baryogenesis through leptogenesis," *Nucl. Phys. B* **575** (2000) 61–77, arXiv:hep-ph/9911315.

[161] E. W. Kolb and S. Wolfram, "The Development of Baryon Asymmetry in the Early Universe," *Phys. Lett. B* **91** (1980) 217–221.

[162] **Particle Data Group** Collaboration, M. Tanabashi *et al.*, "Review of Particle Physics," *Phys. Rev. D* **98** no. 3, (2018) 030001.

[163] A. D. Sakharov, "Violation of CP Invariance, C asymmetry, and baryon asymmetry of the universe," *Pisma Zh. Eksp. Teor. Fiz.* **5** (1967) 32–35.

[164] M. Trodden, "Baryogenesis and leptogenesis," *eConf* **C040802** (2004) L018, arXiv:hep-ph/0411301.

[165] E. W. Kolb and M. S. Turner, *The Early Universe*, vol. 69. 1990.

[166] V. C. Rubin and W. K. Ford, Jr., "Rotation of the Andromeda Nebula from a Spectroscopic Survey of Emission Regions," *Astrophys. J.* **159** (1970) 379–403.

[167] D. Clowe, M. Bradac, A. H. Gonzalez, M. Markevitch, S. W. Randall, C. Jones, and D. Zaritsky, "A direct empirical proof of the existence of dark matter," *Astrophys. J. Lett.* **648** (2006) L109–L113, arXiv:astro-ph/0608407.

[168] **Planck** Collaboration, N. Aghanim *et al.*, "Planck 2018 results. V. CMB power spectra and likelihoods," *Astron. Astrophys.* **641** (2020) A5, arXiv:1907.12875 [astro-ph.CO].

[169] M. Taoso, G. Bertone, and A. Masiero, "Dark Matter Candidates: A

Ten-Point Test," *JCAP* **03** (2008) 022, arXiv:0711.4996 [astro-ph].

[170] H. Murayama, "Physics Beyond the Standard Model and Dark Matter," in *Les Houches Summer School - Session 86: Particle Physics and Cosmology: The Fabric of Spacetime*. 4, 2007. arXiv:0704.2276 [hep-ph].

[171] M. S. Boucenna, M. Hirsch, S. Morisi, E. Peinado, M. Taoso, and J. W. F. Valle, "Phenomenology of Dark Matter from A_4 Flavor Symmetry," *JHEP* **05** (2011) 037, arXiv:1101.2874 [hep-ph].

[172] M. Hirsch, S. Morisi, E. Peinado, and J. W. F. Valle, "Discrete dark matter," *Phys. Rev. D* **82** (2010) 116003, arXiv:1007.0871 [hep-ph].

[173] M. Lindner, S. Schmidt, and J. Smirnov, "Neutrino Masses and Conformal Electro-Weak Symmetry Breaking," *JHEP* **10** (2014) 177, arXiv:1405.6204 [hep-ph].

[174] M. Lucente, A. Abada, G. Arcadi, V. Domcke, M. Drewes, and J. Klaric, "Freeze-in leptogenesis with 3 right-handed neutrinos," *PoS* **ICHEP2018** (2019) 306, arXiv:1811.08292 [hep-ph].

[175] I. Chakraborty, H. Roy, and T. Srivastava, "Resonant leptogenesis in (2,2) inverse see-saw realisation," *Nucl. Phys. B* **979** (2022) 115780, arXiv:2106.08232 [hep-ph].

[176] L. Covi, E. Roulet, and F. Vissani, "CP violating decays in leptogenesis scenarios," *Phys. Lett. B* **384** (1996) 169–174, arXiv:hep-ph/9605319.

[177] A. Pilaftsis and T. E. J. Underwood, "Electroweak-scale resonant leptogenesis," *Phys. Rev. D* **72** (2005) 113001, arXiv:hep-ph/0506107.

[178] K. Griest and D. Seckel, "Three exceptions in the calculation of relic abundances," *Phys. Rev. D* **43** (1991) 3191–3203.

[179] P. Gondolo and G. Gelmini, "Cosmic abundances of stable particles: Improved analysis," *Nucl. Phys. B* **360** (1991) 145–179.

[180] Y. Bai and J. Berger, "Fermion Portal Dark Matter," *JHEP* **11** (2013) 171, arXiv:1308.0612 [hep-ph].

[181] G. Jungman, M. Kamionkowski, and K. Griest, "Supersymmetric dark matter," *Phys. Rept.* **267** (1996) 195–373, arXiv:hep-ph/9506380.

[182] N. F. Bell, Y. Cai, and A. D. Medina, "Co-annihilating Dark Matter: Effective Operator Analysis and Collider Phenomenology," *Phys. Rev. D* **89** no. 11, (2014) 115001, arXiv:1311.6169 [hep-ph].

[183] A. Mukherjee and M. K. Das, "Neutrino phenomenology and scalar Dark Matter with A_4 flavor symmetry in Inverse and type II seesaw," *Nucl. Phys. B* **913** (2016) 643–663, arXiv:1512.02384 [hep-ph].

[184] N. Nath, M. Ghosh, S. Goswami, and S. Gupta, "Phenomenological study of extended seesaw model for light sterile neutrino," *JHEP* **03** (2017) 075, arXiv:1610.09090 [hep-ph].

[185] **Fermi-LAT** Collaboration, A. A. Abdo *et al.*, "Constraints on Cosmological Dark Matter Annihilation from the Fermi-LAT Isotropic Diffuse Gamma-Ray Measurement," *JCAP* **04** (2010) 014, arXiv:1002.4415 [astro-ph.CO].

[186] H. Ishimori, T. Kobayashi, H. Ohki, Y. Shimizu, H. Okada, and M. Tanimoto, "Non-Abelian Discrete Symmetries in Particle Physics," *Prog. Theor. Phys. Suppl.* **183** (2010) 1–163, arXiv:1003.3552 [hep-th].

[187] P. H. Frampton, S. L. Glashow, and D. Marfatia, "Zeroes of the neutrino mass matrix," *Phys. Lett. B* **536** (2002) 79–82, arXiv:hep-ph/0201008.

[188] P. O. Ludl and W. Grimus, "A complete survey of texture zeros in the lepton mass matrices," *JHEP* **07** (2014) 090, arXiv:1406.3546 [hep-ph]. [Erratum: JHEP 10, 126 (2014)].

[189] Z.-z. Xing, "Texture zeros and Majorana phases of the neutrino mass matrix," *Phys. Lett. B* **530** (2002) 159–166, arXiv:hep-ph/0201151.

[190] M. Singh, G. Ahuja, and M. Gupta, "Revisiting the texture zero neutrino mass matrices," *PTEP* **2016** no. 12, (2016) 123B08, arXiv:1603.08083 [hep-ph].

[191] D. Meloni, A. Meroni, and E. Peinado, "Two-zero Majorana textures in the light of the Planck results," *Phys. Rev. D* **89** no. 5, (2014) 053009, arXiv:1401.3207 [hep-ph].

[192] H. Fritzsch, Z.-z. Xing, and S. Zhou, "Two-zero Textures of the Majorana Neutrino Mass Matrix and Current Experimental Tests," *JHEP* **09** (2011) 083, arXiv:1108.4534 [hep-ph].

[193] M. Borah, D. Borah, and M. K. Das, "Discriminating Majorana neutrino textures in light of the baryon asymmetry," *Phys. Rev. D* **91** (2015) 113008, arXiv:1503.03431 [hep-ph].

[194] J. Alcaide, J. Salvado, and A. Santamaria, "Fitting flavour symmetries: the case of two-zero neutrino mass textures," *JHEP* **07** (2018) 164, arXiv:1806.06785 [hep-ph].

[195] S. Kaneko and M. Tanimoto, "Neutrino mass matrix with two zeros and leptogenesis," *Phys. Lett. B* **551** (2003) 127–136, arXiv:hep-ph/0210155.

[196] R. R. Gautam, S. Dev, L. Singh, and M. Gupta, "Two texture zeros and near maximal atmospheric neutrino mixing angle," *Pramana* **86** no. 2, (2016) 379–386.

[197] K. Bora, D. Borah, and D. Dutta, "Probing Majorana Neutrino Textures at DUNE," *Phys. Rev. D* **96** no. 7, (2017) 075006, arXiv:1611.01097 [hep-ph].

[198] S. Zhou, "Update on two-zero textures of the Majorana neutrino mass matrix in light of recent T2K, Super-Kamiokande and NOνA results," *Chin. Phys. C* **40** no. 3, (2016) 033102, arXiv:1509.05300 [hep-ph].

[199] P. F. Harrison, D. H. Perkins, and W. G. Scott, "Tri-bimaximal mixing and the neutrino oscillation data," *Phys. Lett. B* **530** (2002) 167.