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# Plot style guidelines

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APB meeting  
May 12, 2022

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# Situation

## DUNE Plot Styles

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This page contains a work-in-progress set of requirements and recommendations for DUNE plot styles. The plot requirements are aimed at accessibility and readability, while the plot recommendations produce a DUNE signature style that all collaborators are encouraged (but not required) to adopt. Functions and code examples for each style guideline will be provided.

### Requirements [\[edit\]](#)

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- All DUNE plots should be:
  - Easily readable to their intended audience (i.e. a paper reader or presentation viewer). All text, including axis labels and titles should be large enough to be read.
  - Labeled with the appropriate water mark (typically one of the following: DUNE, DUNE Preliminary, DUNE Work in Progress, DUNE Simulation)
  - Saved in .png, .eps, .C, .root (or python equivalent)

### Recommendations [\[edit\]](#)

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- Font and font size (TBD)
- Color palette:
  - The Color palette for plots should look appealing and be accessible to those with color blindness. The [OkabeIt color palette](#) is recommended.

- Left shows the *entirety* of the DUNE plot style guidance
- We would like, minimally:
  - ▶ More explicit “recommendations,” particularly to provide a unified visual theme
  - ▶ Easy-to-use software toolkit to help users follow the rules & recommendations
- Young DUNE APB representative (i.e., me) was charged by APB to flesh this out

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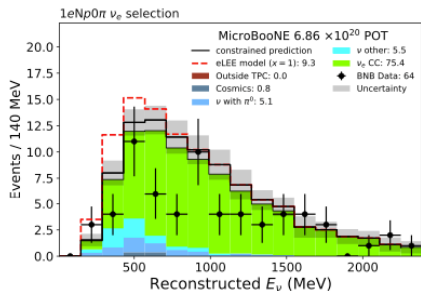
[from DUNE wiki [https://wiki.dunescience.org/wiki/DUNE\\_Plot\\_Styles](https://wiki.dunescience.org/wiki/DUNE_Plot_Styles)]

# “YD Plot Style Guidelines Task Force”

- Rather than do it all myself, I solicited volunteers from Young DUNE to join a “Plot Style Guidelines Task Force”
  - ▶ Self-selection implies volunteers actually care about presentation and/or ease-of-use in tools
  - ▶ Helps diversify opinions/experience so that first draft to APB will already cover many perspectives
- 5 volunteers (+ me):
  - ▶ Adam Lister (Wisconsin)
  - ▶ Andrew Mogan (Colorado State)
  - ▶ Kevin Wood (LBNL)
  - ▶ Oliver Lantwin (IN2P3)
  - ▶ Paula Nehm (Mainz)
  - ▶ JW (Tufts)
- We've had one meeting and done a bunch of coordinating on Slack so far
- Goal is to produce a proposed set of guidelines & associated software package by mid-summer
  - ▶ Then iterate with APB as needed

# Progress so far

From the latest MicroBooNE publication (<https://arxiv.org/pdf/2110.14054.pdf>)



We've assembled a gallery of diverse plots from ~15 different published sources (inside & outside DUNE) and discussed what's good & bad about them

- Pro
  - AL: Axis labels easy to read
  - AL: Like shaded histogram as error bar
  - OL: Data sample clearly labelled
  - OL: Normalisation of histograms explicit
- Contra
  - AL: The green/cyan are hard to distinguish +AM +PN +JW +OL
  - AL: Legend should be much larger +AM +JW
  - AL: Legend ordering could be improved - put all filled histograms in one column?
  - JW: dislike the shaded "error" band (unclear whether something is between the top of green and the black line?)
  - OL: grey uncertainty should be directly under "constrained prediction" in legend to make it clear what it applies to
- Other
  - OL: Are the numbers behind the legend contributions the integral? Why are they

We have a *mostly* finished set of updated recommendations based on that discussion

- Recommendations
  - Font and font size (TBD)
    - AM: Could recommend e.g. 10 pt for axis labels in papers, larger font for talks/slides
    - AM: Should recommend sans serif font (e.g., Helvetica, Arial) for talks/slides. Paper fonts are usually handled by journal style guide.
      - Maybe suggest using freely (public domain/free/open source) fonts, as it can be hard/annoying to get Arial/Helvetica on some operating systems.
  - Color palette:
    - The Color palette for plots should look appealing and be accessible to those with color blindness. The [Okabelto color palette](#) is recommended. The [dune-plot-style](#) package contains easy-to-use tools that provide one such palette.
    - Monochrome (e.g.: white-to-red) or bichrome (e.g.: blue-to-white-to-red) color scales are recommended for the z-axis of 2D histograms, as appropriate. [dune-plot-style](#) again has helper functions to facilitate this.
  - Axis labels & titles:
    - Use consistent capitalization. Whether "Title Case" or "Sentence case" are used, it should be the same on all axes of a plot.
    - Always include units in labels unless a quantity is unitless.
    - Titles should be centered along the axes.
  - Lines and markers:
    - Data should generally be indicated by black solid points

# Progress so far

We have a skeleton/work-in-progress private GitHub repository under the DUNE organization with some prototype tools to apply a DUNE style.

(Doesn't yet apply all recommendations in the doc, nor does it have many examples.)

The screenshot shows a GitHub repository page for 'DUNE / dune-plot-style' (Private). The repository is on the 'main' branch with 1 branch and 0 tags. It has 7 watchers, 0 forks, and 0 stars. The repository description is 'Tools for creating plots with officially approved DUNE styling'. The repository contains files: 'examples', 'matplotlib', 'root', and 'README.md', all marked as 'initial skeleton' and committed 'last month'. The 'README.md' file is open, showing the title 'dune-plot-style - DUNE official plot styling tools'. The README text states: 'This repository contains coding tools to help analyzers easily make plots adhering to the DUNE Plot Style documented at [https://wiki.dunescience.org/wiki/DUNE\\_Plot\\_Styles](https://wiki.dunescience.org/wiki/DUNE_Plot_Styles). It also contains tools to help embed metadata in plot images that contain "provenance" info so they can be back-traced if necessary. To illustrate how to use those tools and what the results look like, some examples are also offered.'

File Name	File Type	Last Commit
examples	initial skeleton	last month
matplotlib	initial skeleton	last month
root	initial skeleton	last month
README.md	initial skeleton	last month

Category	Count
Watchers	7
Forks	0
Stars	0

Language	Percentage
C++	65.7%
Python	34.3%

[<https://github.com/DUNE/dune-plot-style>]

# What's left to do

- Finish draft of guidelines
  - ▶ Very close to done, shouldn't take more than a day or two of prodding by me to get the last opinions in
- Finish fleshing out software toolkit  
(all tasks assigned; probably more progress after NEUTRINO)
  - ▶ More examples
  - ▶ Finish documentation
  - ▶ Testing
  - ▶ Packaging for UPS/Spack/Python installation
- Send to APB & iterate
- Release to the collaboration!