

DM-2026-003

PDF Tools Working Group
Technical Lead

DATE: January 19, 2026

TO: Document Processing Stakeholders

SUBJECT: SF901 Layout Implementation (TikZ vs Alternatives)

OFFICE OF PRIMARY RESPONSIBILITY: PdfTools

1. Purpose

This memorandum documents the decision to use TikZ with absolute positioning for the SF901 CUI Cover Sheet template layout, rather than alternative LaTeX layout approaches.

2. Background

The SF901 template requires precise reproduction of a government form with:

- Full-page purple background with white margin border
- Two white content boxes at specific positions
- Text elements positioned precisely on both purple and white areas
- Exact visual match to the official GSA Standard Form 901

Several implementation approaches were evaluated for achieving this layout in LaTeX.

3. Analysis

Approach A: TikZ with Absolute Positioning

- Uses TikZ `overlay` and `remember picture` for full-page drawing
- All elements positioned with absolute coordinates from page origin
- Provides pixel-perfect control over placement
- Requires manual adjustment when elements change
- No automatic content flow between sections
- Well-suited for fixed-format government forms

Approach B: Standard LaTeX with Boxes/Minipages

- Uses standard LaTeX flow with colored boxes
- Content flows automatically within containers
- Difficult to achieve full-page colored background extending to margins
- Less precise control over exact positioning
- Better suited for dynamic content documents

Approach C: `tcolorbox` Package

- Specialized package for colored boxes with content
- Better handling of content within colored regions
- Still requires absolute positioning for purple background
- Adds package dependency
- Hybrid approach still needed for full layout

Approach D: PDF Form Overlay

- Use official GSA PDF and overlay custom text
- Preserves exact original layout
- Requires external PDF manipulation tools (`pdftk`, `qpdf`)
- Text positioning on existing PDF is technically challenging
- Runtime dependency on external tools

4. Decision

Approved: Approach A — TikZ with absolute positioning.

Rationale:

- SF901 is a fixed government form that has not changed since November 2018
- Low maintenance burden due to form stability
- Pixel-perfect reproduction of official form is achievable
- No external tool dependencies
- Single LaTeX file contains complete template
- TikZ is part of standard TeX Live distribution
- Absolute positioning trade-off is acceptable for stable, fixed-format forms

Trade-offs Accepted:

- Manual positioning required (no auto-flow)
- Changes to spacing require adjusting multiple coordinate values
- Less intuitive than CSS/HTML-style layout

- Acceptable because form layout is fixed and rarely changes

5. Implementation Notes

The SF901.tex template uses:

- `tikzpicture` with `[remember picture, overlay]` for full-page drawing
- `calc` library for coordinate calculations
- `current page.north west` as origin reference
- All vertical positions as negative offsets from top
- Customizable variables at top of file for colors and margins
- Requires two xelatex passes for correct positioning

Maintenance Guidance:

- When adjusting vertical spacing, update all dependent element positions
- Keep official SF901 PDF for visual comparison during changes
- Run `build.sh` to generate PNG comparison images

6. References

- TikZ/PGF Manual: <https://ctan.org/pkg/pgf>
- Official SF901 Form: <https://www.archives.gov/cui/registry/forms>
- Related Decision: DM-2026-001 (SF901 LaTeX Recreation)
- Related Decision: DM-2026-002 (Font Selection)