

User Guide for Respirator Filtration Efficiency Calculator

Tool Reference

RST Reference Number: RST26EP06.01

Date of Publication: 8/31/2026

Recommended Citation: U.S. Food and Drug Administration. (2026). *Respirator Filtration Efficiency Calculator* (RST26EP06.01). <https://cdrh-rst.fda.gov/respirator-filtration-efficiency-calculator>

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USER GUIDE

Respirator Filtration Efficiency Calculator

Website for Calculator: <https://dmsaylor-ppecalculator.hf.space/>

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Purpose of this User Guide

The Respirator Filtration Efficiency Calculator is a conservative computational tool that assists stakeholders with the assessment of personal protective equipment (PPE) textile materials to estimate particle filtration efficiencies compared with those of a reference surgical N95[®] respirator.

It does this by using quantitative data characterizing the microstructure of a textile material to estimate filtration efficiency of particles of different size ranges. The user inputs the microstructure data and the Calculator outputs a filtration efficiency percentage.

The purpose of this User Guide is to orient the user to the appearance and function of the web interface when inputting microstructural data and obtaining output filtration data.

Prerequisites to Using this Tool

To correctly use this tool, a user should have already obtained quantitative data (fiber diameter, packing density and material thickness) for a respirator filtration material as imaged by Scanning Electron Microscopy (SEM) and analyzed using ImageJ (Fiji) v1.51. For detailed instructions on how to obtain these data, users should consult the file titled, “Example Use of ImageJ and DiameterJ” embedded in the Regulatory Science Tool Document where this User Guide is also embedded.

User Interface

A screenshot of the input page is shown on the next slide. Data entry points are displayed for the mean and standard deviation values of fiber diameter (in microns), packing density (unitless) and thickness (in microns), respectively. Sample values are displayed in this screenshot. Sample mean fiber diameter is shown as 5.0 micron with a standard deviation of 0.1 micron. Sample mean packing density is shown as 0.07 with a standard deviation of 0.01. Sample thickness is shown as 500 micron with a standard deviation of 10 micron.

After entering these values, the user should click “Estimate Log_{10} Reduction of Particles.”

Input Measurements to Filtration Efficiency Calculator

Example Screenshot of the Calculator Tool:

Respirator Filtration Efficiency Calculator v1.0 11/21/2024

For details about Material Characteristics, please click on the information icon.

Material Characteristics ⓘ

d_f	Mean Fiber Diameter (μm):	5.0	Fiber Diameter Standard Deviation (μm):	0.1
α	Mean Packing Density:	0.07	Packing Density Standard Deviation:	0.01
L	Mean Thickness (μm):	500	Thickness Standard Deviation(μm):	10

Filtration Efficiency Assessment

Click to review the results of your material's filtration efficiency: Estimate Log₁₀ Reduction of Viable Particles

User Interface (cont'd)

A screenshot of the output is shown on the next slide. Output data are visualized as (1) violin plots juxtaposing calculated filtration efficiency based on microstructure against actual N95[®] performance, stratified by particle size range and (2) an overall filtration efficiency percentage. For the sample characterization values mentioned on Page 5, the efficiency percentage is 82.04.

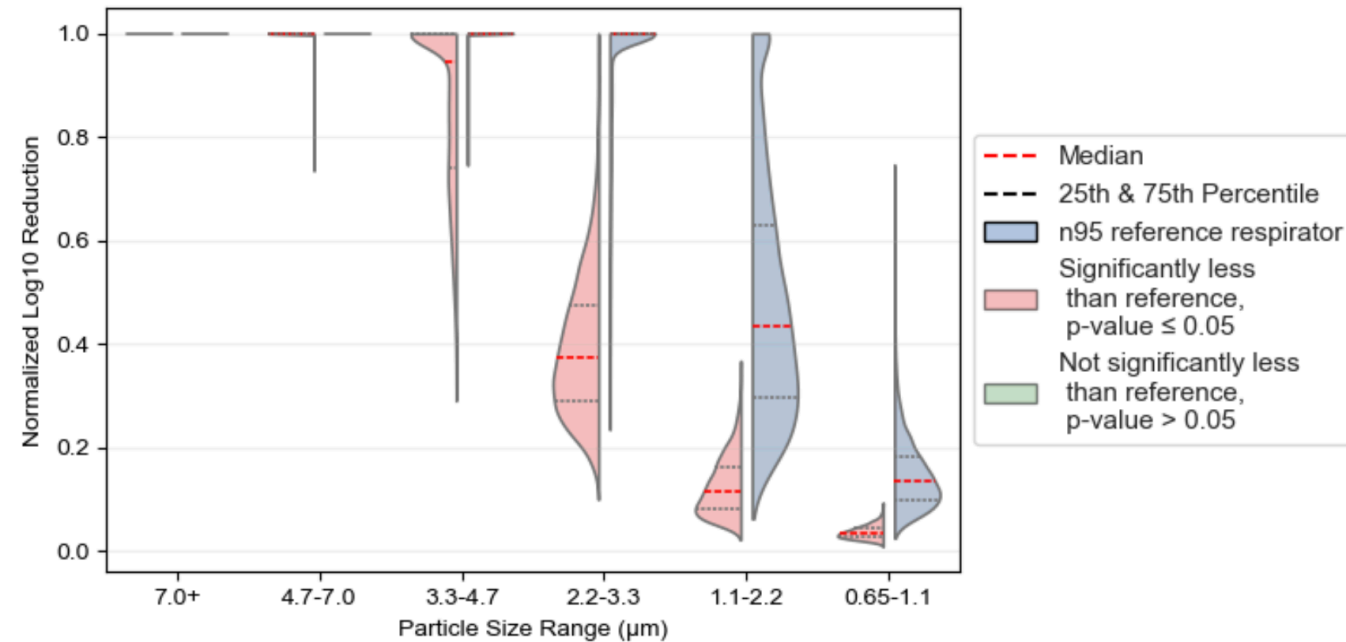
Example of output (1 of 2): violin plot with performance & reference

Filtration Efficiency Assessment

Click to review the results of your material's filtration efficiency: [Estimate Log₁₀ Reduction of Particles](#)

See how your material compares with an N95 respirator in the violin plots below

[How To Interpret Violin Plots](#)



Predicted Overall Filtration Efficiency as per ASTM F2101

overall filter efficiency
82.04%

User Interface (cont'd)

The following slide shows a screenshot of the quantitative $\log_{10}$ reduction data for the stratified particle size ranges, each corresponding to a stage in the Andersen Impactor instrument. The table contains data and is not a screenshot.

Example of output (2 of 2): table with log reduction values at particle size ranges +7µm to 0.65-1.1µm

Percentiles of normalized log₁₀ reduction values at each particle size range

Stage	Particle Size Range (µm)	Normalized Log Reduction Value 5th percentile	Normalized Log Reduction Value 25th percentile	Normalized Log Reduction Value 50th percentile	Normalized Log Reduction Value 75th percentile	Normalized Log Reduction Value 95th percentile
1	7.0+	1	1	1	1	1
2	4.7-7.0	1	1	1	1	1
3	3.3-4.7	0.551332	0.741792	0.944129	1	1
4	2.2-3.3	0.213972	0.291001	0.372891	0.473957	0.624311
5	1.1-2.2	0.053065	0.08024	0.11486	0.161327	0.226561
6	0.65-1.1	0.019279	0.026969	0.034575	0.04422	0.059197

If you have feedback, please email
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