Noise discussion in SBND

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August 8, 2024

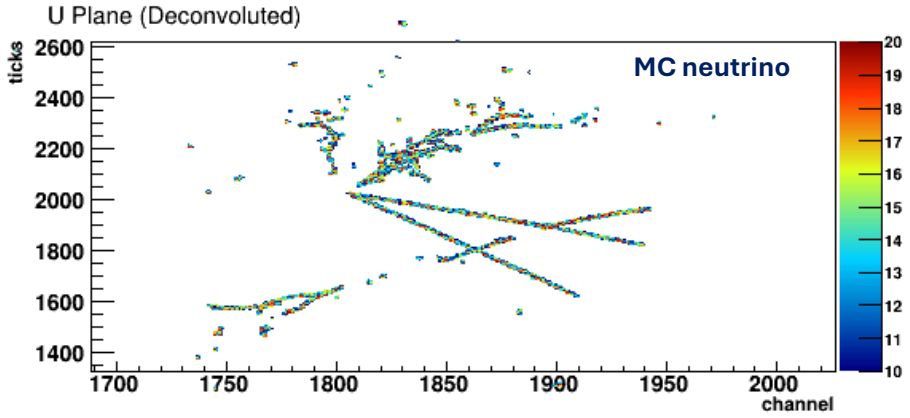
Current status of noise filtering in SBND

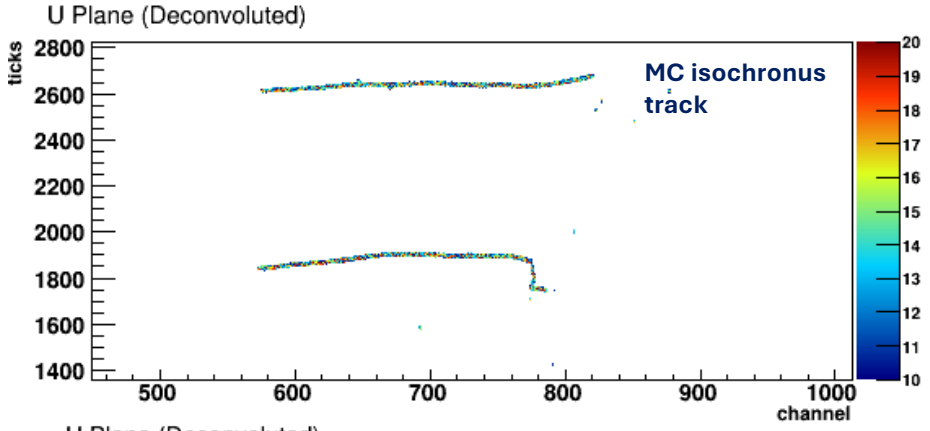
- So far working on noise filtering in SBND for **data only**. PR pushed to sbndcode release one month ago. Good results and collaboration used it to make interesting event displays.

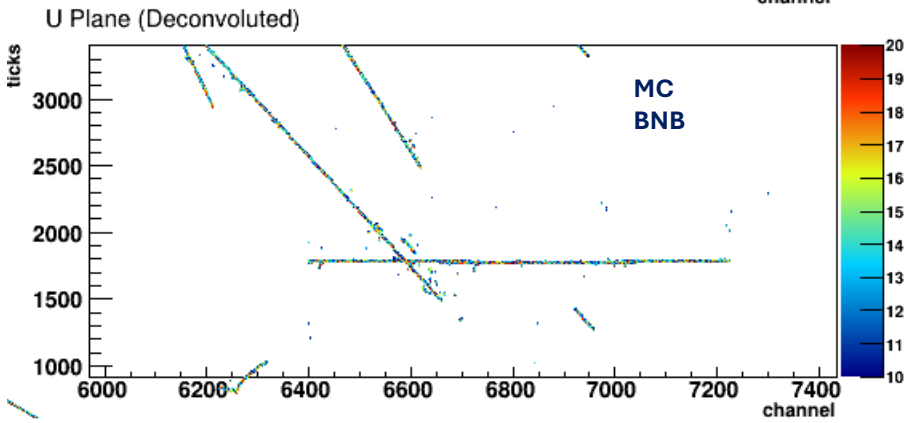
- Right now working on noise filtering for **MC**. Have been doing visual scanning of different event topologies to check any potential issues.

- Noticed some teardrops on **U-plane for MC** event displays when applying either **mbOneChannelNoise** or **pdOneChannelNoise** filtering (next slides). Trying to understand the source of such teardrops.

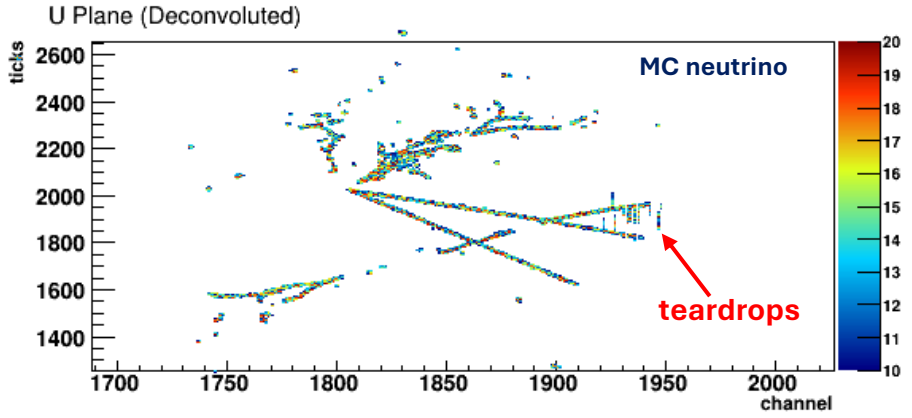
Current MC (no NF)

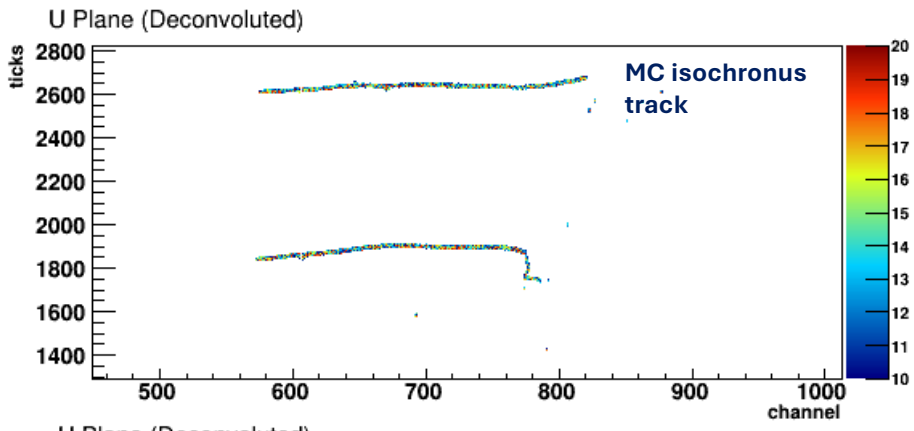


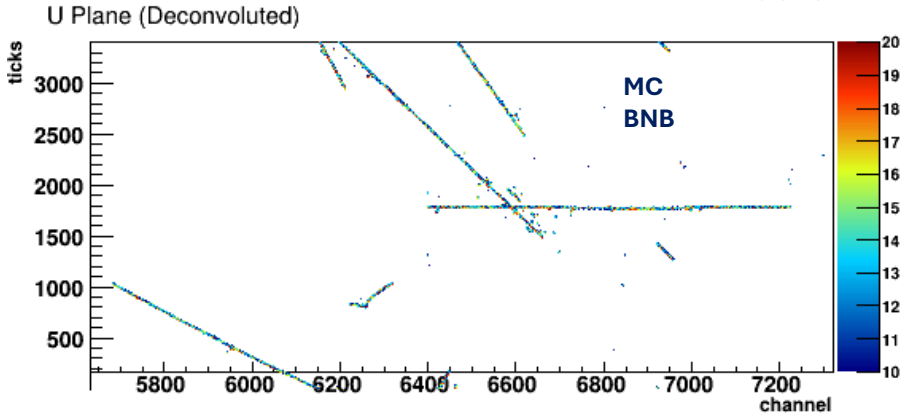




Updated MC (single NF)







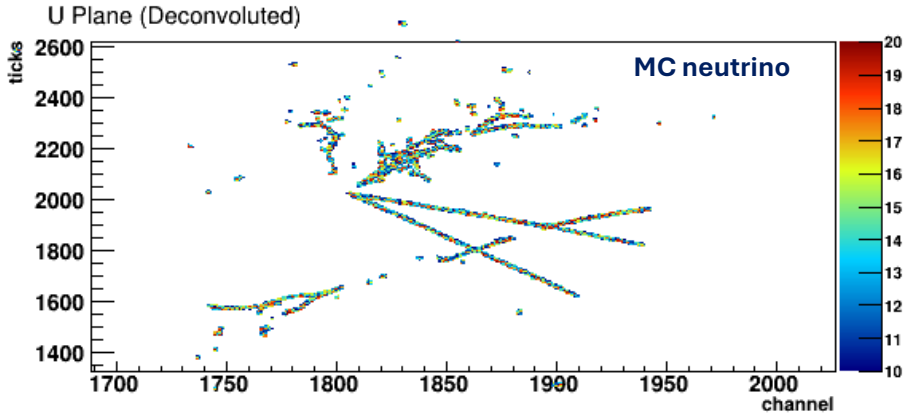
Updates:

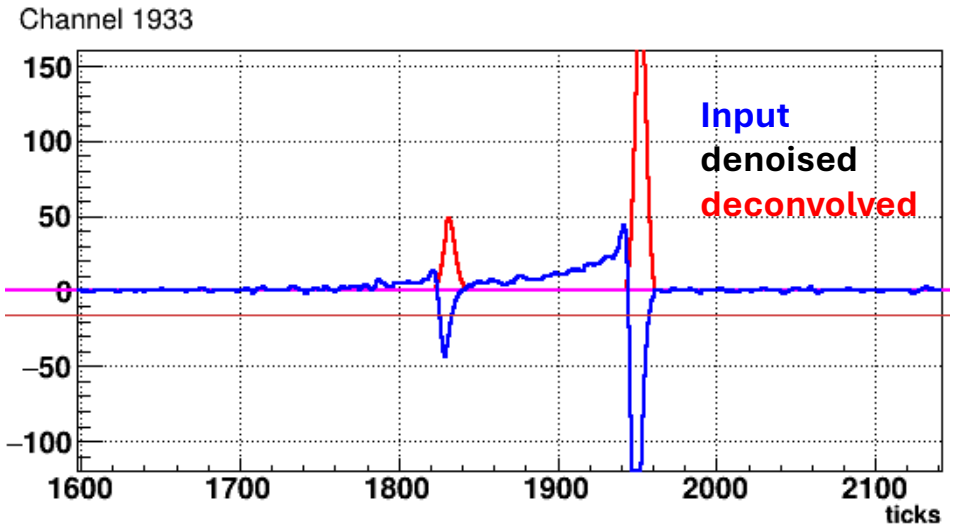
- **Single NF enabled**
- **SBND response**
- **Response offset**
- **mbOneChannelNoise**
- **List of bad channels**

Same comparison for data here

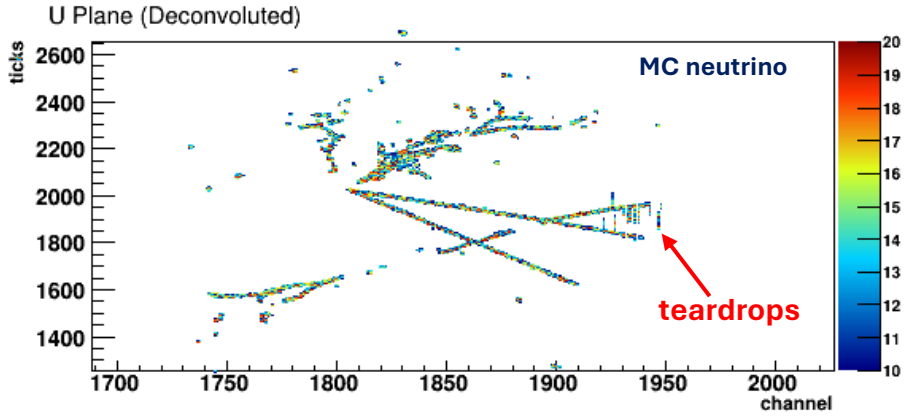
Similar teardrops are seen in MC when using pdOneChannelNoise here

Current MC (no NF)



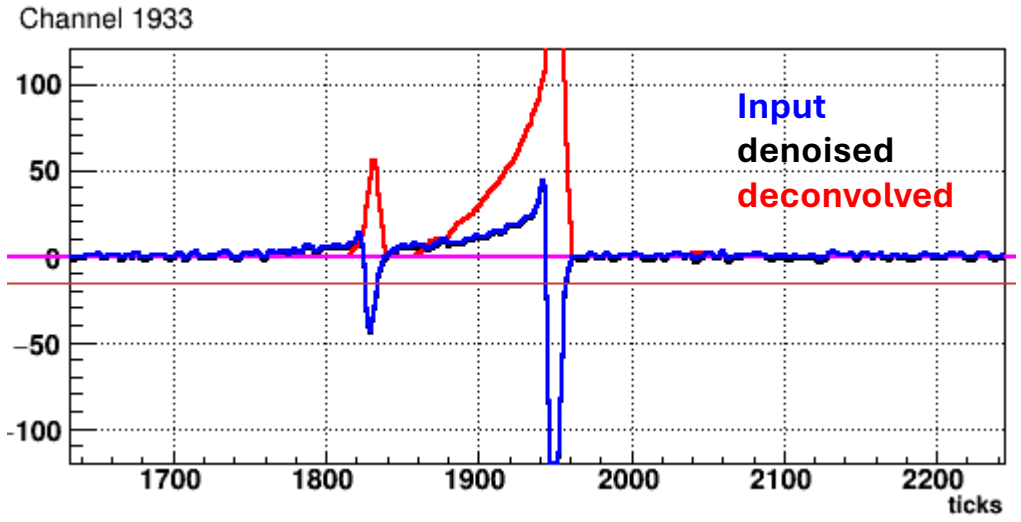


Updated MC (single NF)



Updates:

- **Single NF enabled**
- **SBND response**
- **Response offset**
- **mbOneChannelNoise**
- **List of bad channels**



Signal is protected after noise filtering in both cases. Deconvolved waveform (red) with noise filtering shows a positive porch not seen in deconvolved waveform without NF. What could be causing the creation of that porch?

Backup

SBND parameters for Noise Filtering (similar to PDHD)

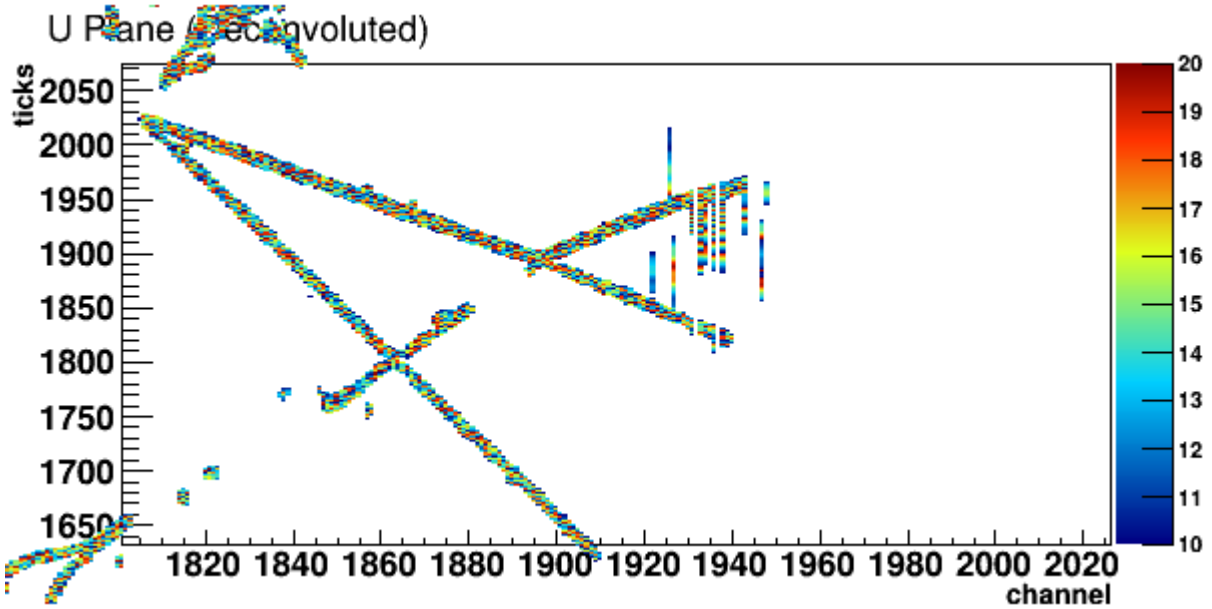
(Most of these parameters are for coherent noise removal)

	all channels		induction 1		induction2		collection	
	PDHD	SBND	PDHD	SBND	PDHD	SBND	PDHD	SBND
nominal_baseline (adc count)	2048.0	2001.0	-	same	-	same	400.0	650.0
gain_correction (unitless)	1.0	same	-	same	-	same	-	same
response_offset (ticks?)	0.0	same	120	125.6	124	129.5	-	same
pad_window_front (ticks?)	10	same	20	same	-	same	-	same
pad_window_back (ticks?)	10	same	-	same	-	same	-	same
decon_limit	0.02	same	0.02	same	0.01	same	0.05	same
decon_limit1	0.09	same	0.07	same	0.08	same	0.08	same
adc_limit	15	same	-	same	-	same	-	same
roi_min_max_ratio	0.8	same	3.0	same	1.5	same	-	same
min_rms_cut (units?)	1.0	same	-	same	-	same	-	same
max_rms_cut (units?)	30.0	same	-	same	-	same	-	same
rcrc (ms)	1.1	same	-	same	-	same	-	same
rc_layers	1	same	-	same	-	same	-	same
reconfig	none	same	-	same	-	same	-	same
freqmasks	none	same	yes	none	yes	none	-	none
response*	none	same	yes	same	yes	same	-	same
harmonic_freqs	none	same	none	same	none	same	none	same
*Total field response (handmade_resp):	chndb-resp.jsonnet							

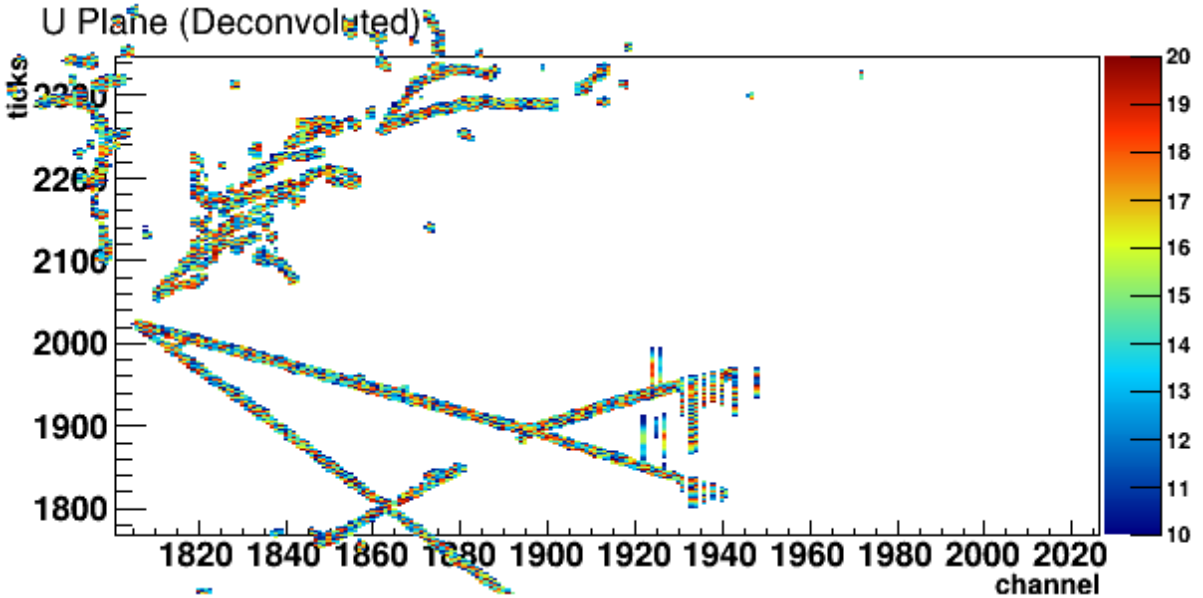
Comparison between single channel filters

Using SBND response

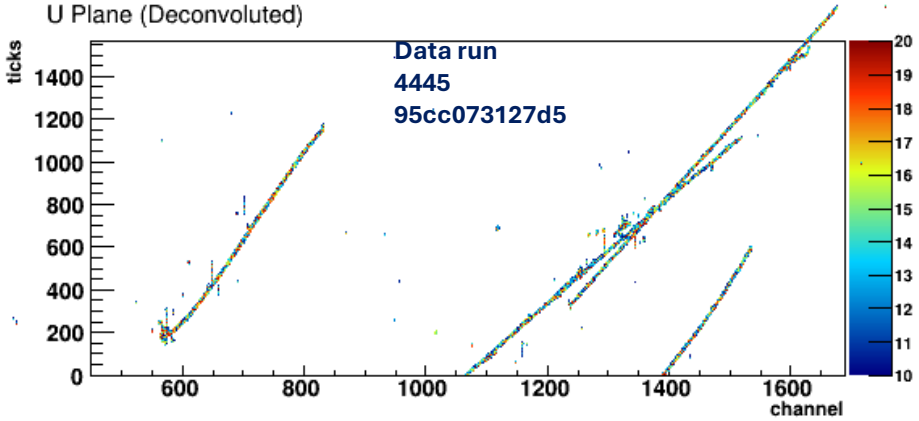
mbOneChannelNoise

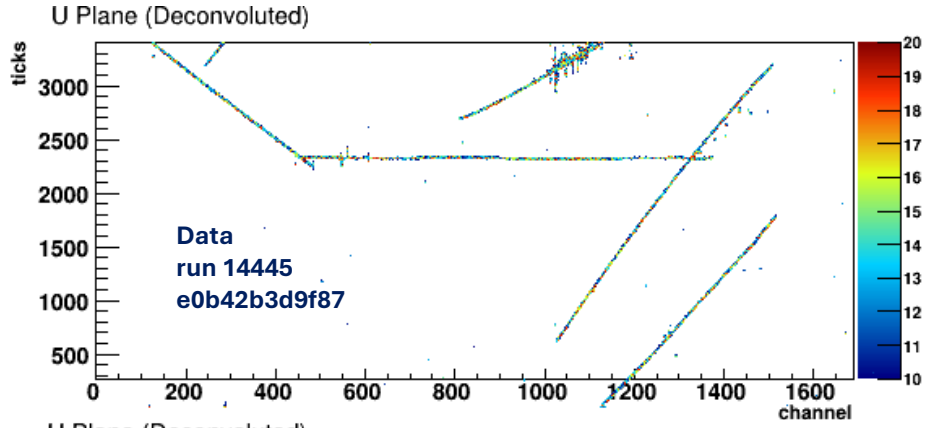


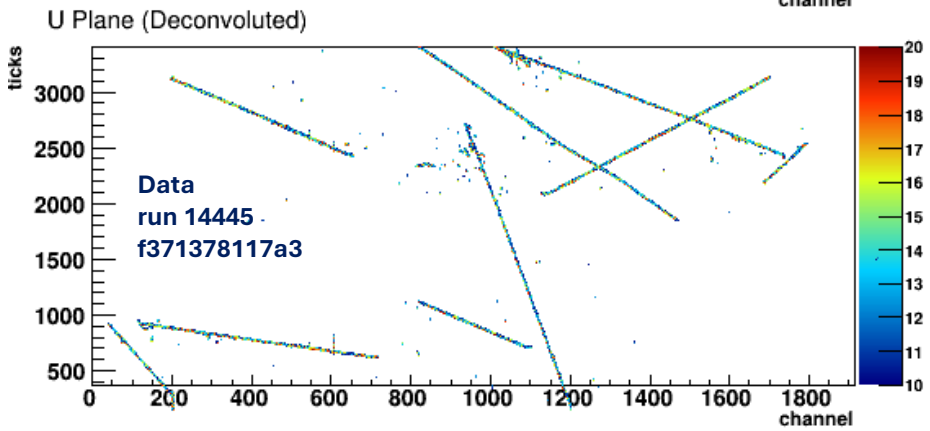
pdOneChannelNoise



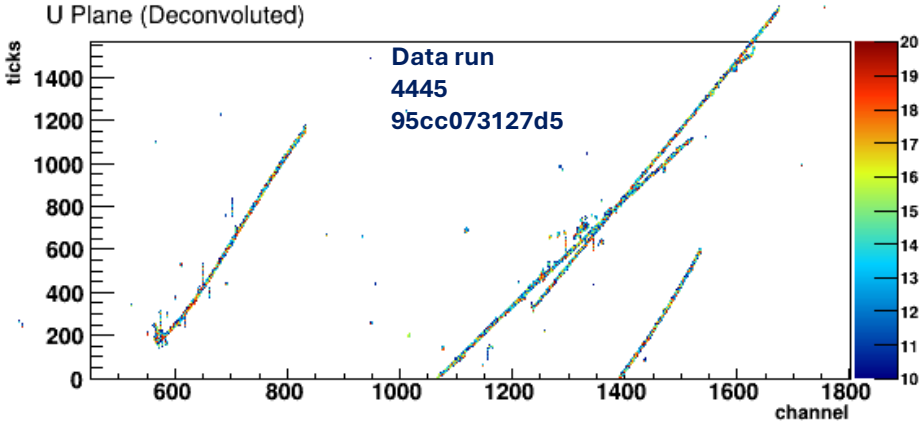
Current data (single + CNF)

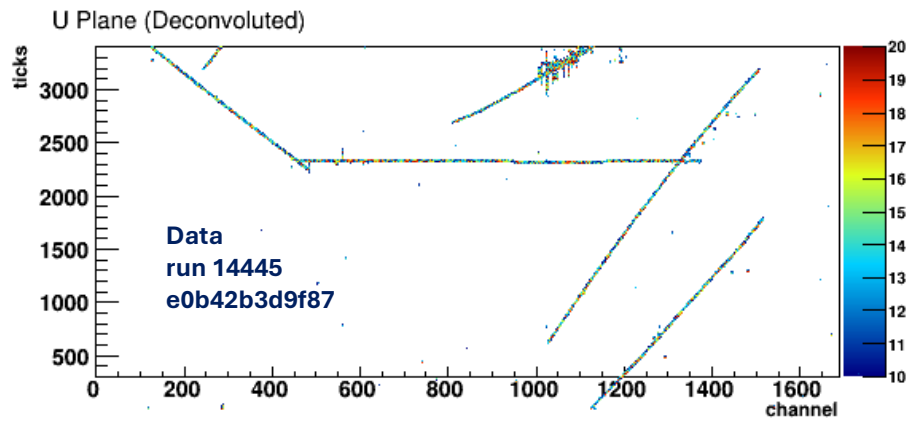


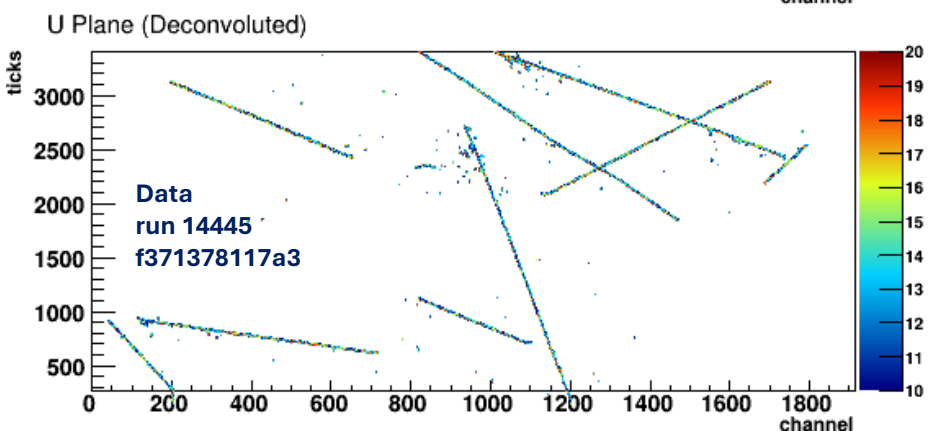




Updated data (single + CNF)







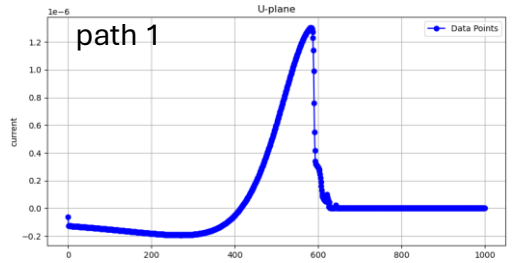
Current data:

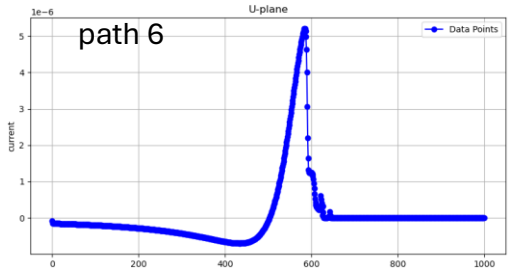
- 64 grouped channels
- Single + CNF enabled
- PD response
- pdOneChannelNoise

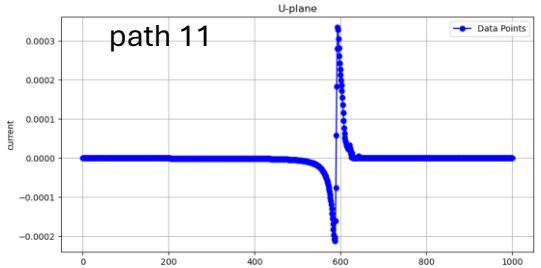
Updates:

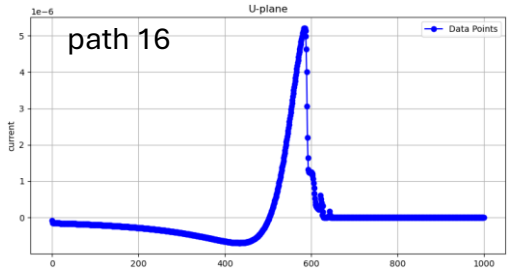
- SBND response
- mbOneChannelNoise
- Updated list of bad channels

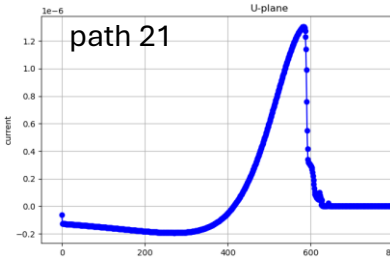
SBND wire region average field response (U-plane)

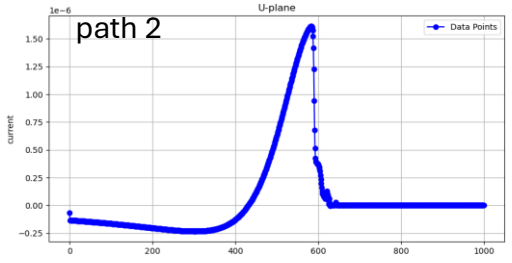


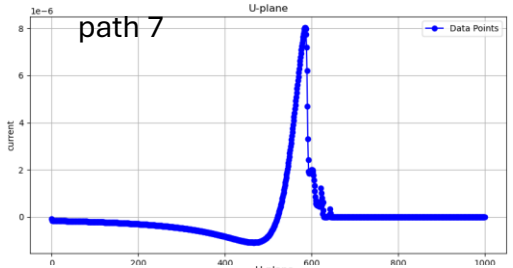


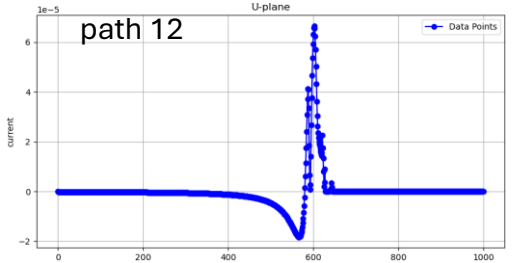


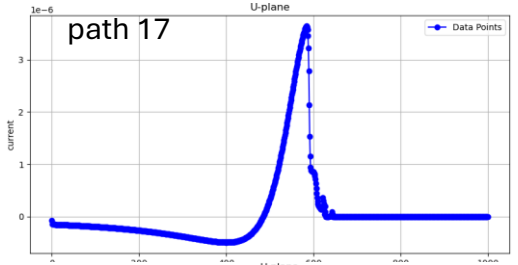


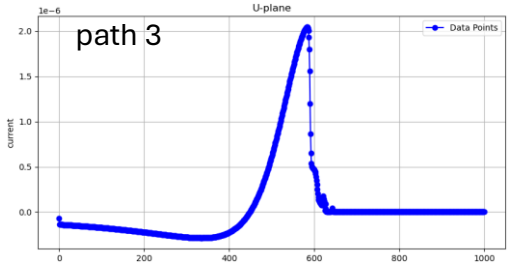


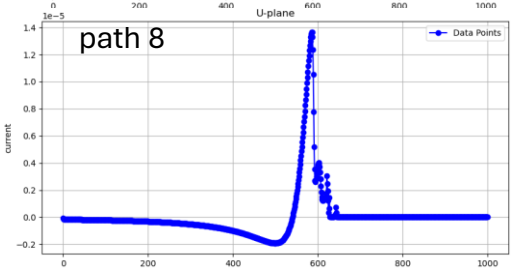


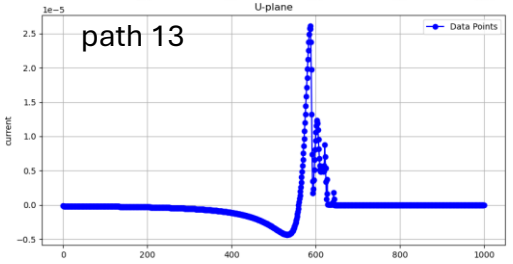


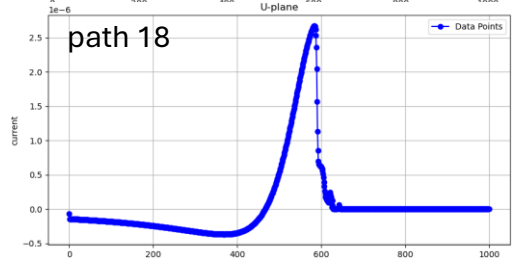


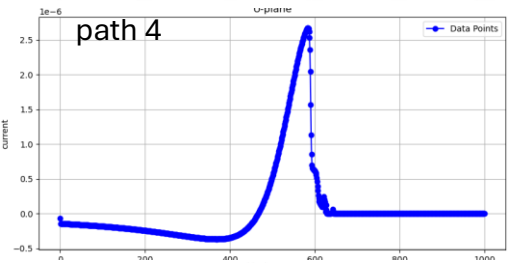


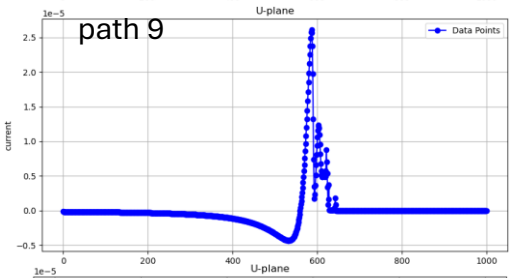


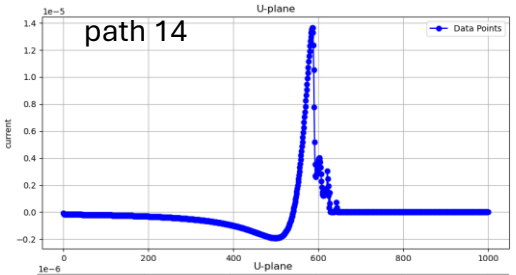


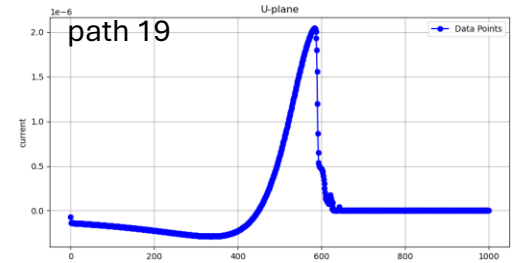


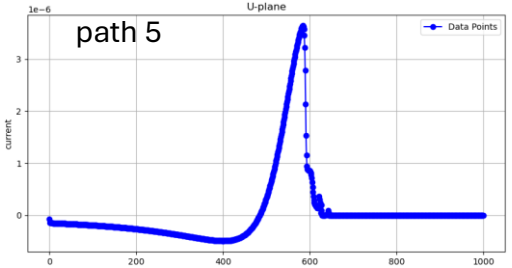


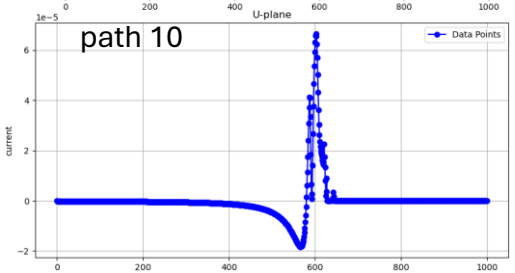


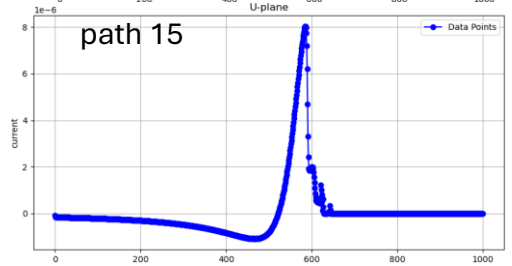


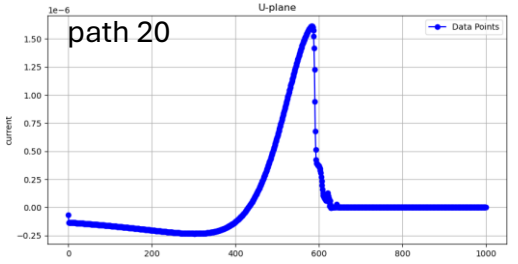






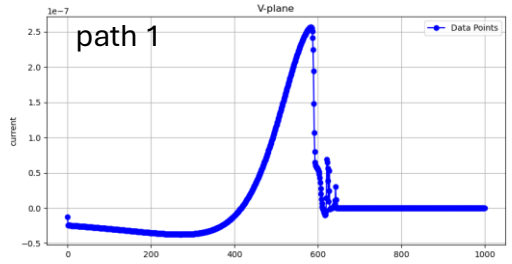


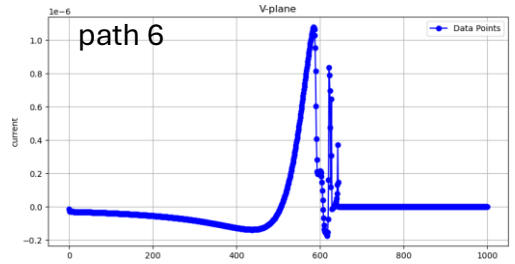


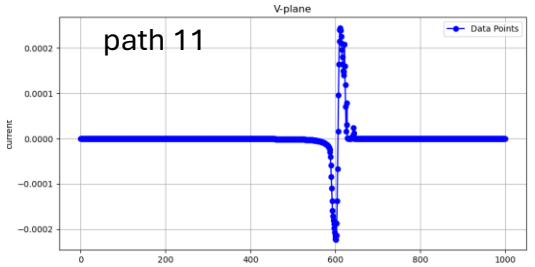


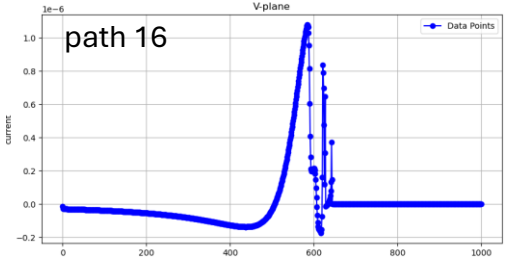
APA0
Nsamples = 1000

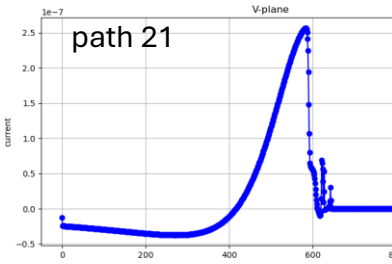
SBND wire region average field response (V-plane)

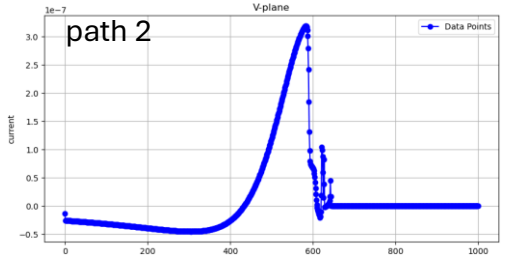


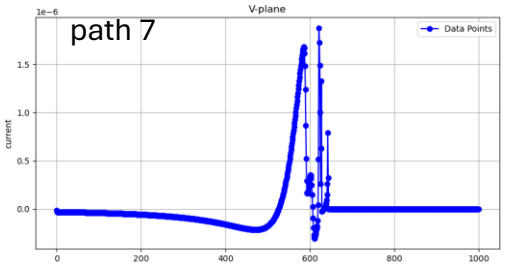


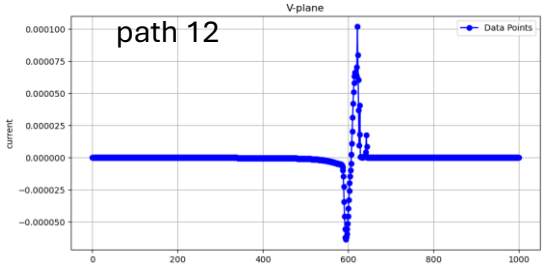


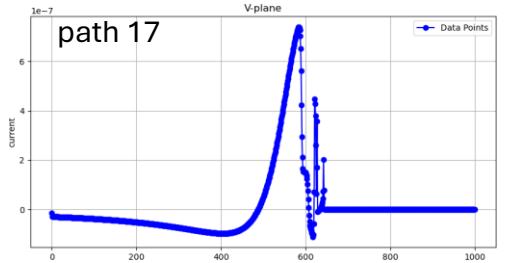


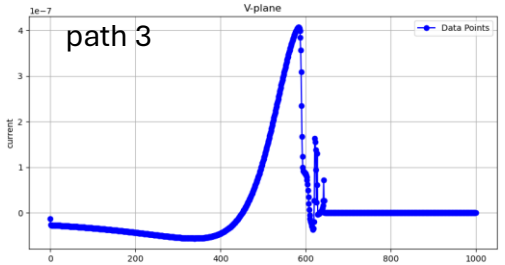


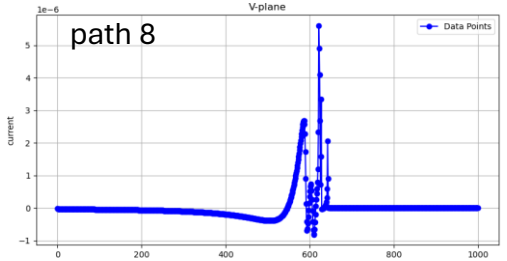


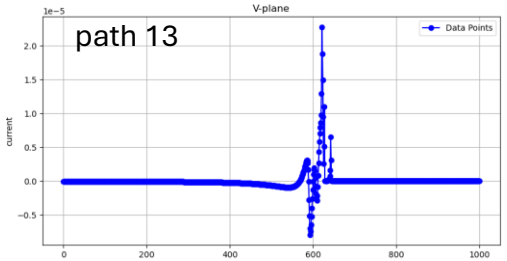


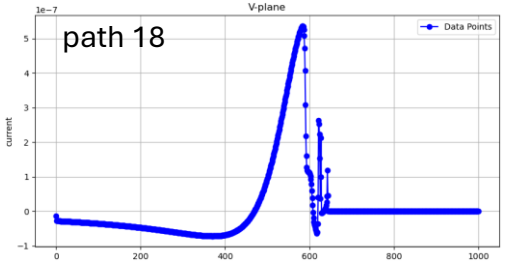


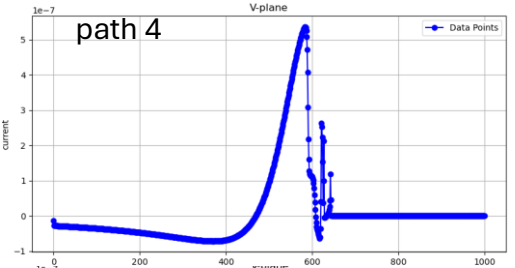


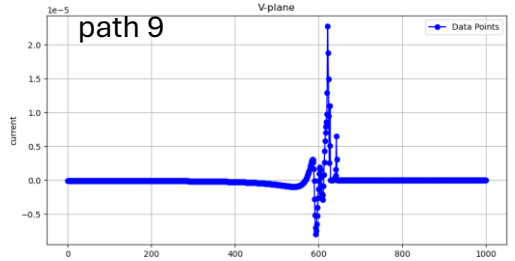


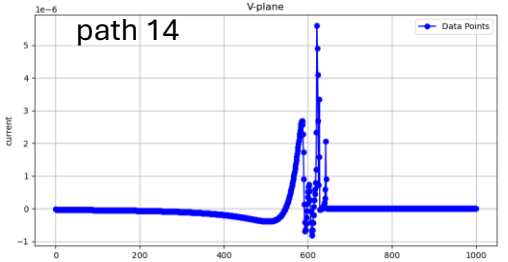


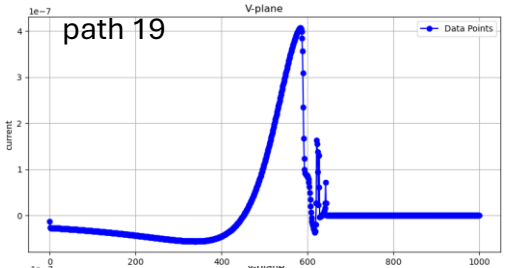


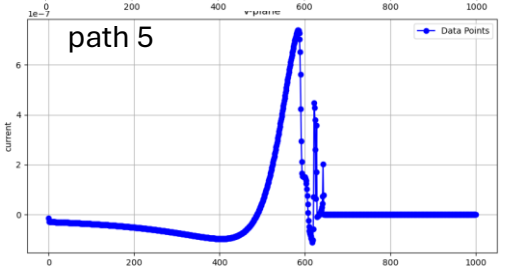


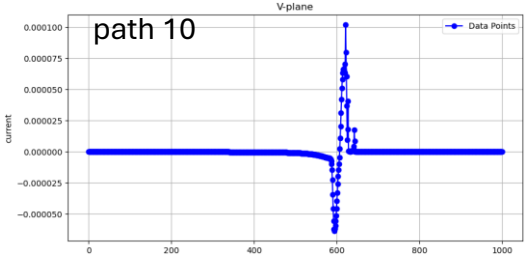


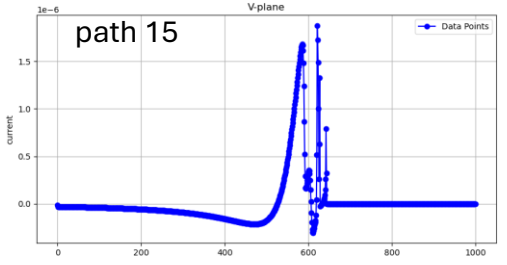


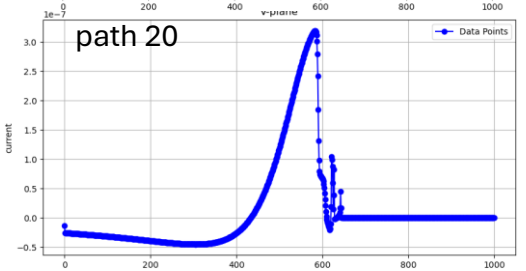












APA0
Nsamples = 1000

Updated overall response for noise filtering (SBND response)