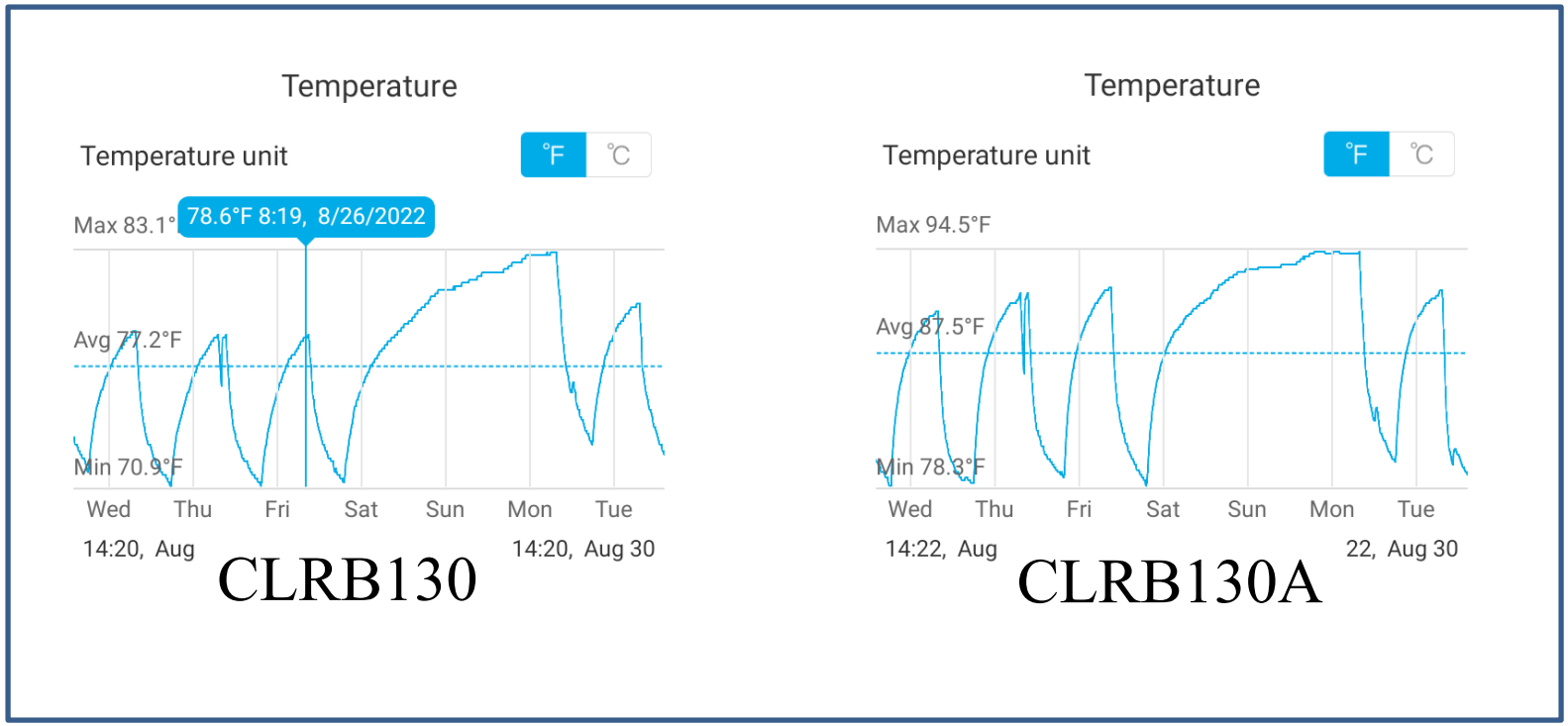
9-3-2023

Shifts and trips

- Next round of shifts
  - September 16-19 worker shifts: Brandon
  - October 14-17 leader shifts: Brandon
    - Hotel: Booked
    - Flight: Booked?

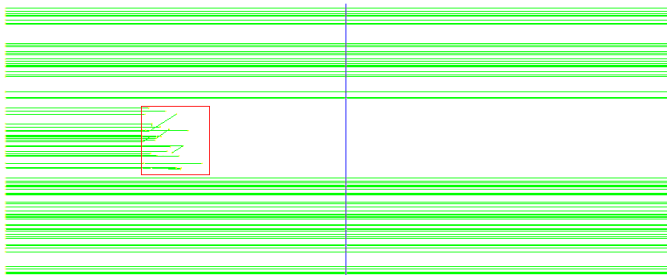
- NSTAR 2022 (Mike)
  - October 16-22
    - Hotel: Booked
    - Flight: Need to book
    - Registration: Registration in progress
    - Conference fees: Need to pay
    - Permission from Unit Head: Obtained
    - Permission from Dean: Obtained

Poly lab temperatures

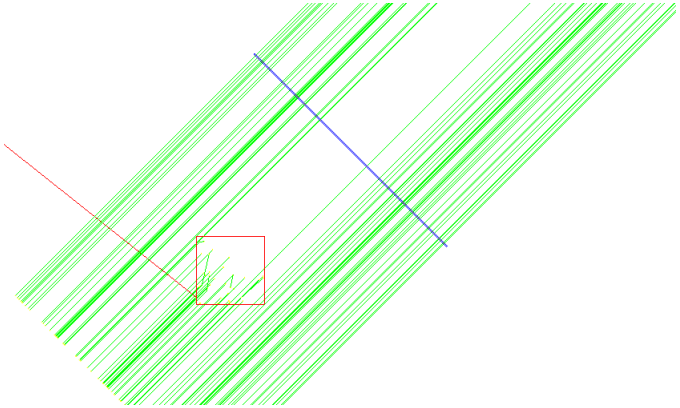


- Facilities management has been contacted

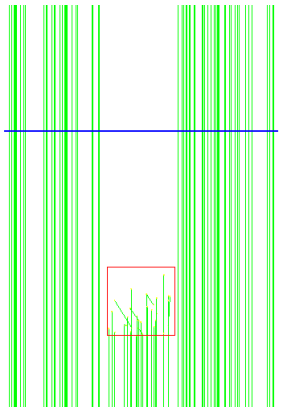
Tomography



Rotation = 0°



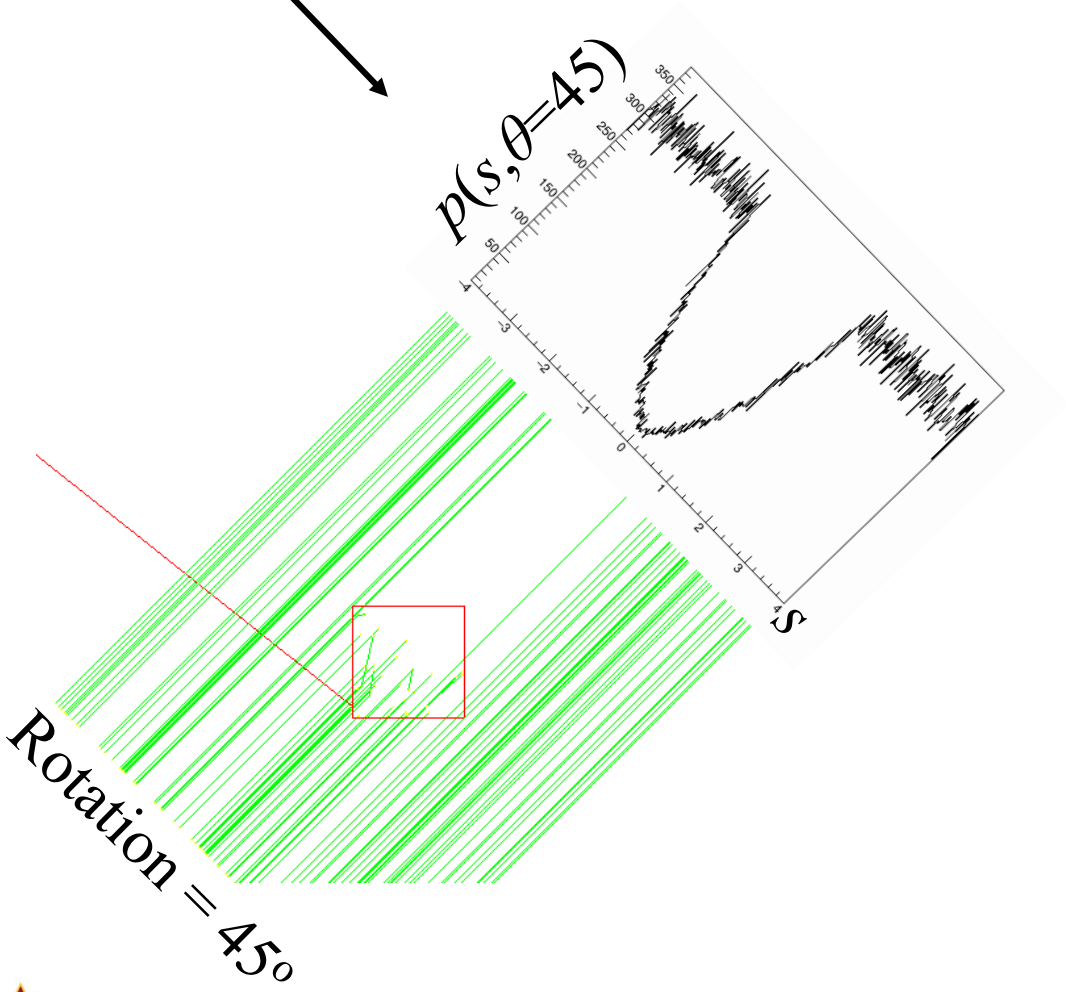
Rotation = 45°



Rotation = 90°

Tomography

Intensity plot $p(s,\theta)$



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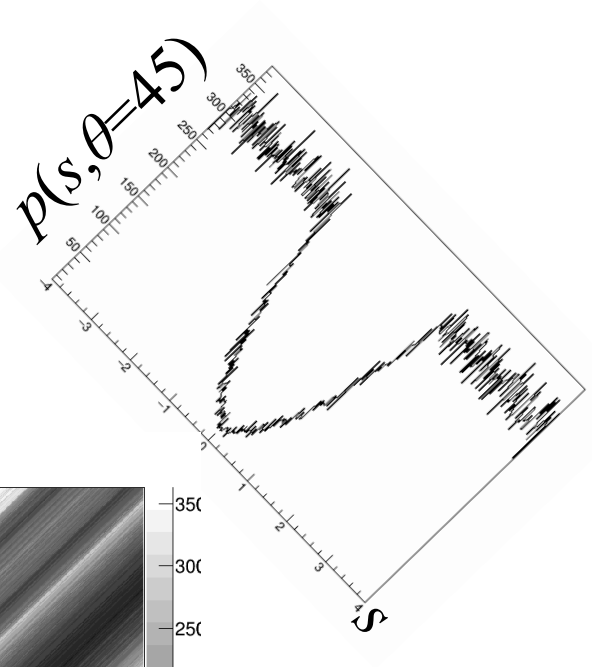

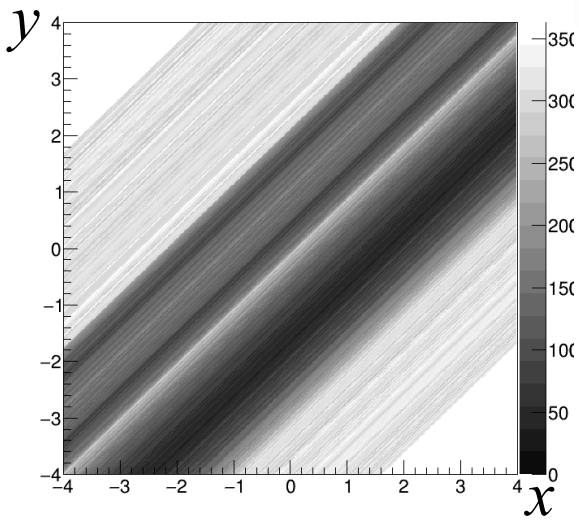

$$p(s,\theta)\Big|_{s=x\cos\theta+y\sin\theta}$$

Back projected 2d plot

Tomography

$$f(x,y) = \int p(s,\theta) * h(s)\Big|_{s=x\cos\theta+y\sin\theta} d\theta$$

What we want: 2d distribution

Tomography

$$f(x,y) = \int p(s,\theta) * h(s)\Big|_{s=x\cos\theta + y\sin\theta} d\theta$$

Intensity at the detector plane measured along direction s for a fixed angle θ

What we want: 2d distribution

Tomography

Convolution

$$f(x,y) = \int p(s,\theta) * h(s)\Big|_{s=x\cos\theta + y\sin\theta} d\theta$$

Intensity at the detector plane measured along direction s for a fixed angle θ

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Tomography

Convolution

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Ramp filter

Intensity at the detector plane measured along direction s for a fixed angle θ

What we want: 2d distribution

Tomography

Convolution

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Ramp filter

Intensity at the detector plane measured along direction s for a fixed angle θ

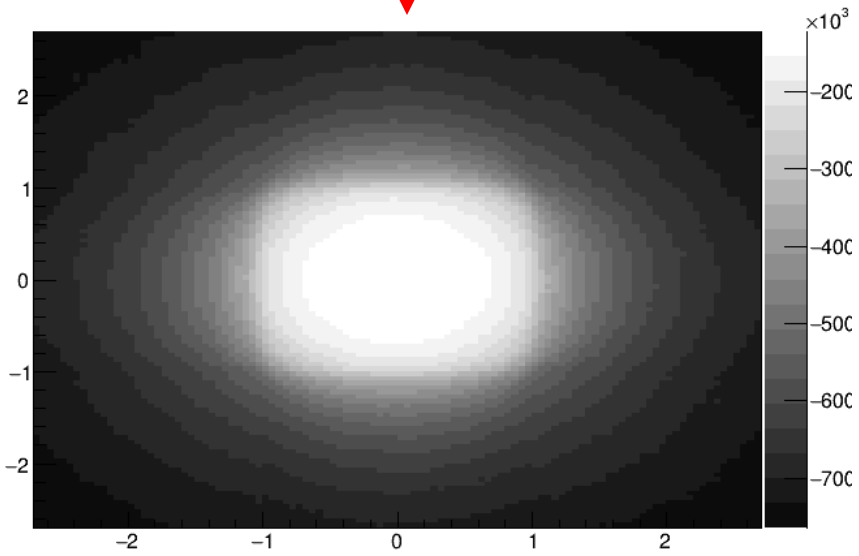
Evaluate along line perpendicular to the detector plane and intersecting at point s

What we want: 2d distribution

Tomography

$$f(x,y) = \int p(s,\theta) * h(s)\Big|_{s=x\cos\theta + y\sin\theta} d\theta$$

Without $h(s)$ convolution



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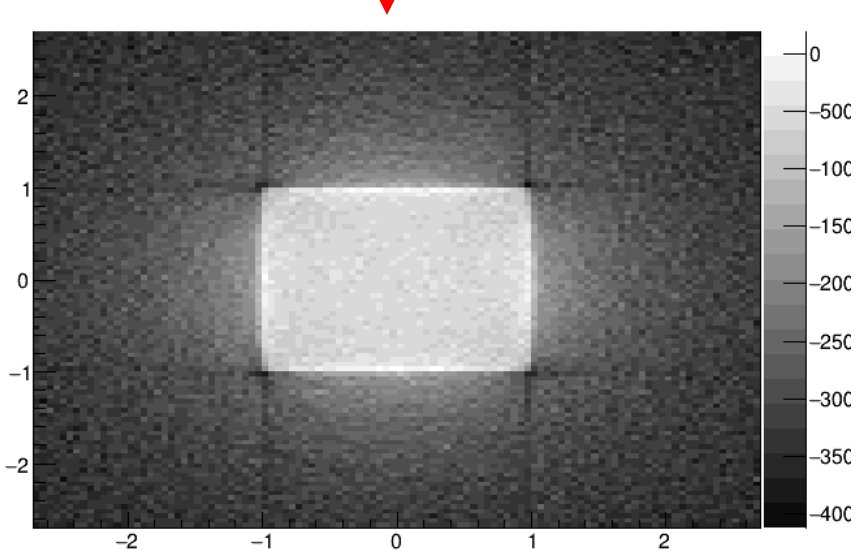
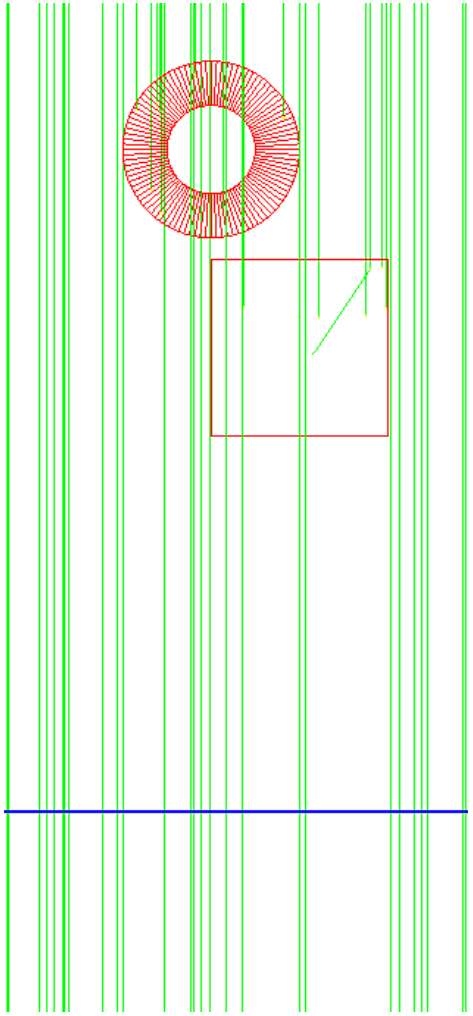
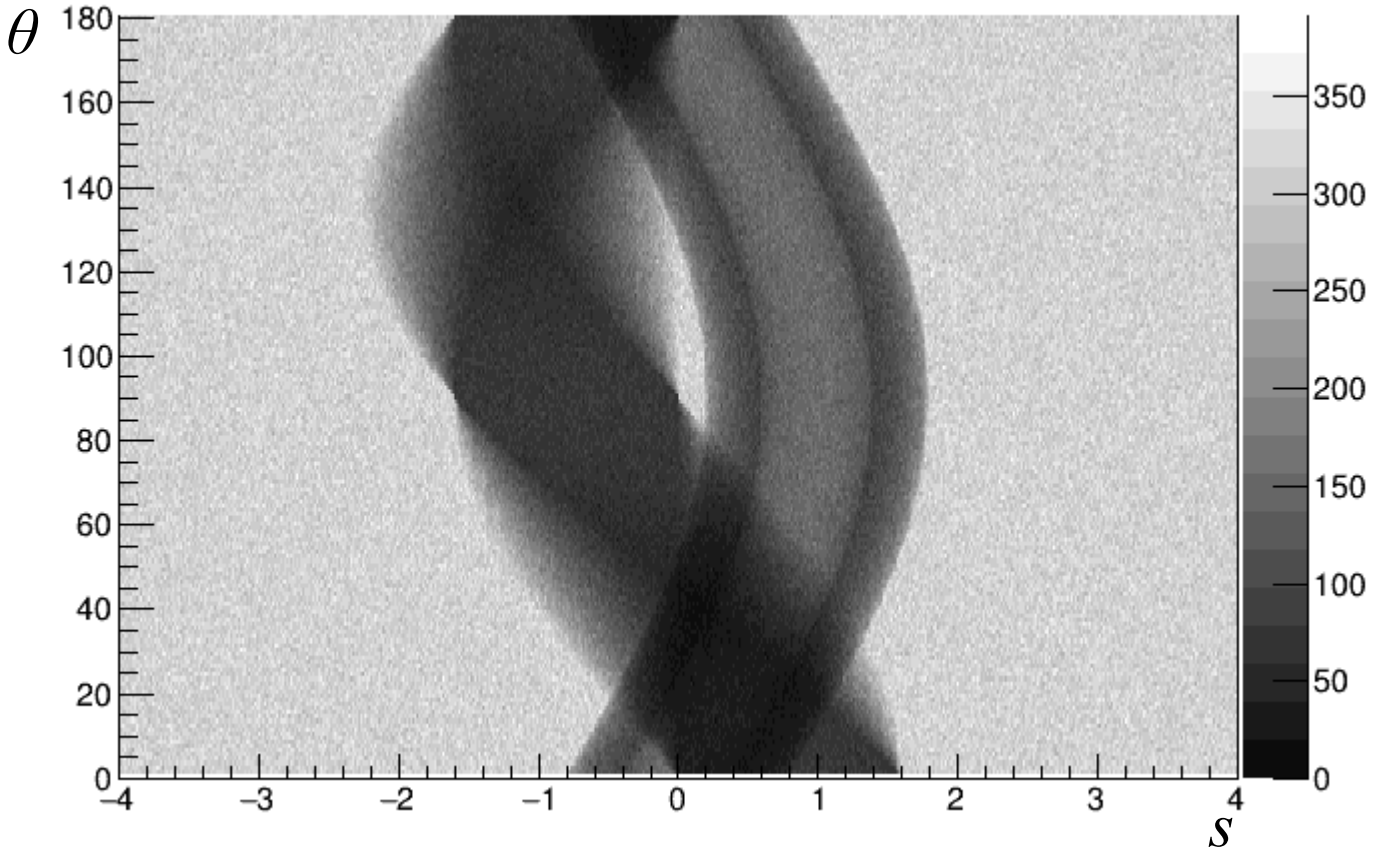


Tomography: More complicated case

This time using solid cuboid and hollow cylinder.

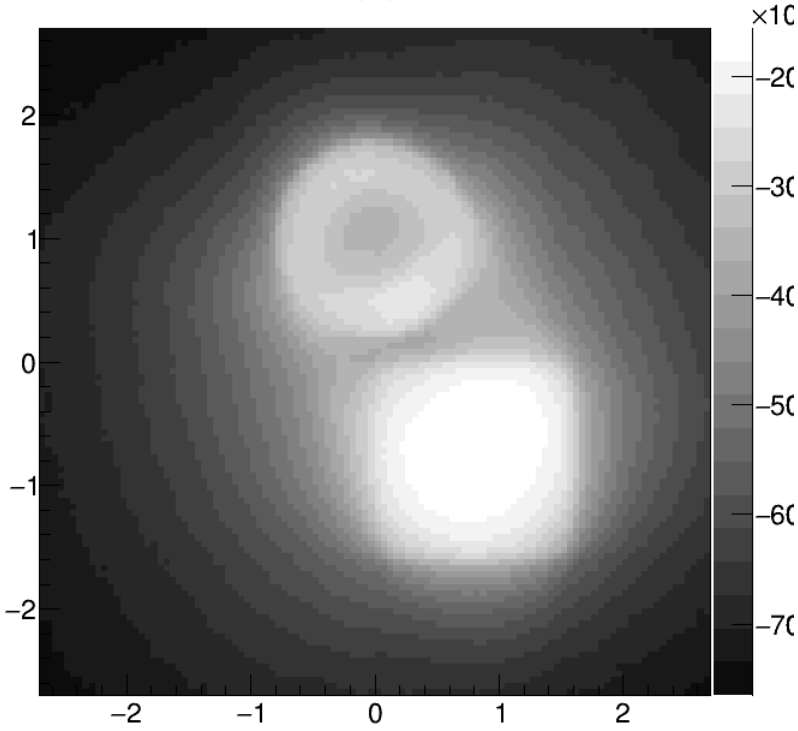


Tomography: More complicated case Sinograph



Tomography: More complicated case

Without $h(s)$ convolution



Tomography: More complicated case

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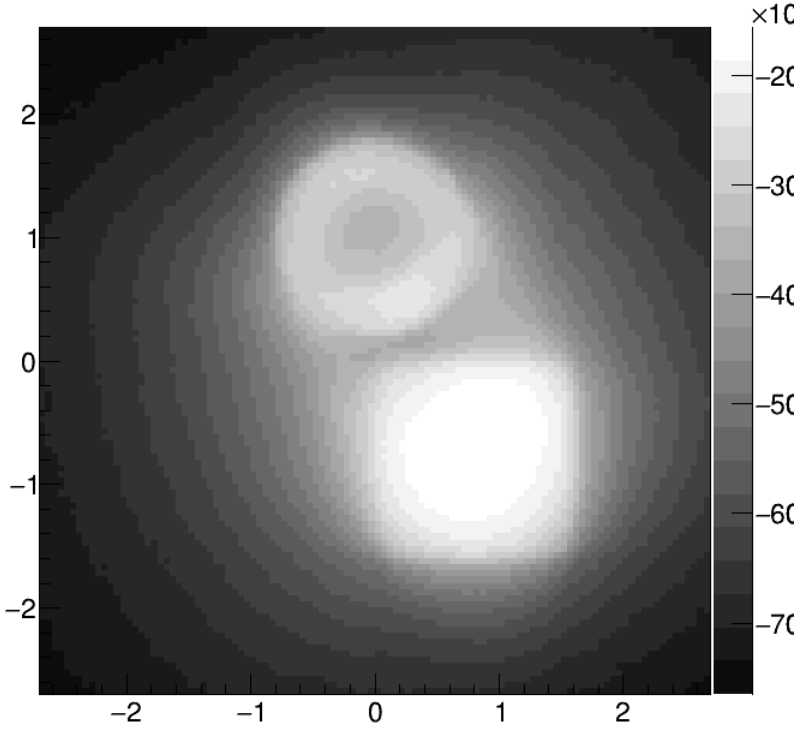

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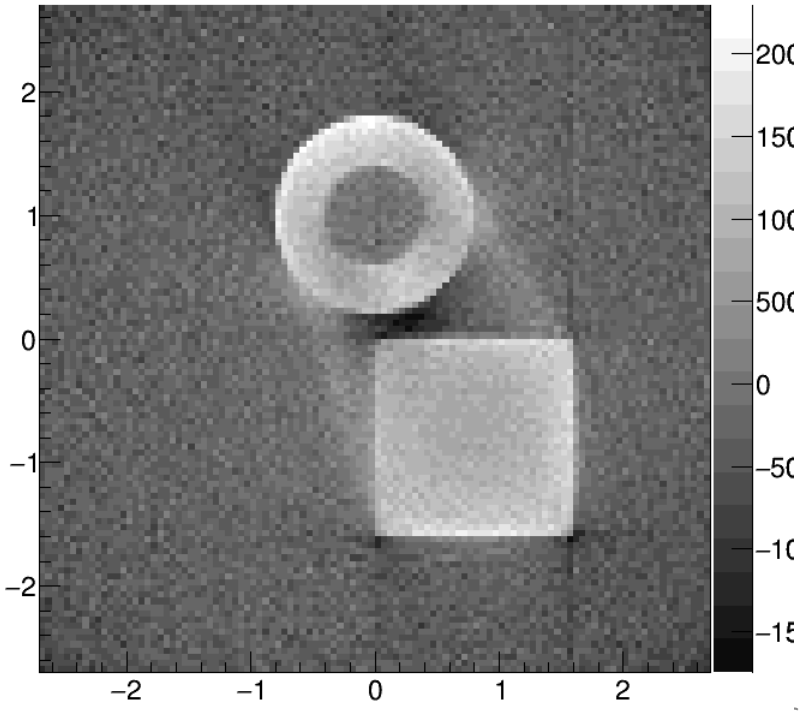
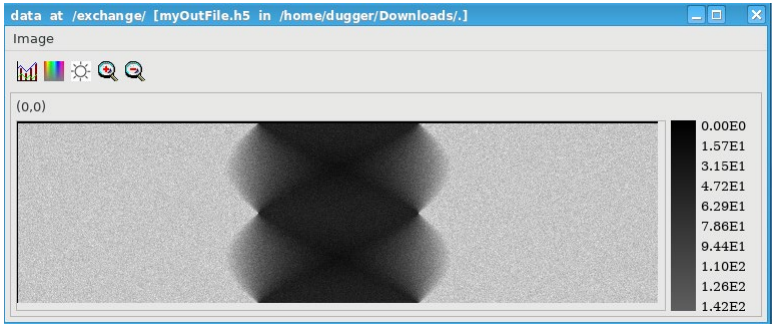


Tomography: File conversion to hdf5

- To use prebuilt tomographic reconstruction software (TomoPy) we need to convert data to the hdf5 file format
- Alan has been successful in converting the ROOT data to hdf5 ☺

Tomography: File conversion to hdf5

Original box sinograph converted by Alan to hdf5 and viewed by HDFView



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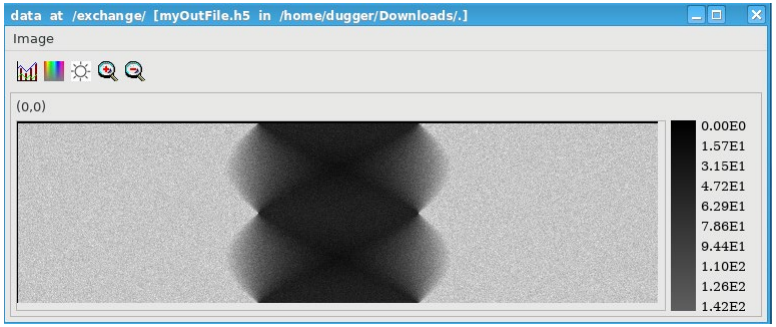
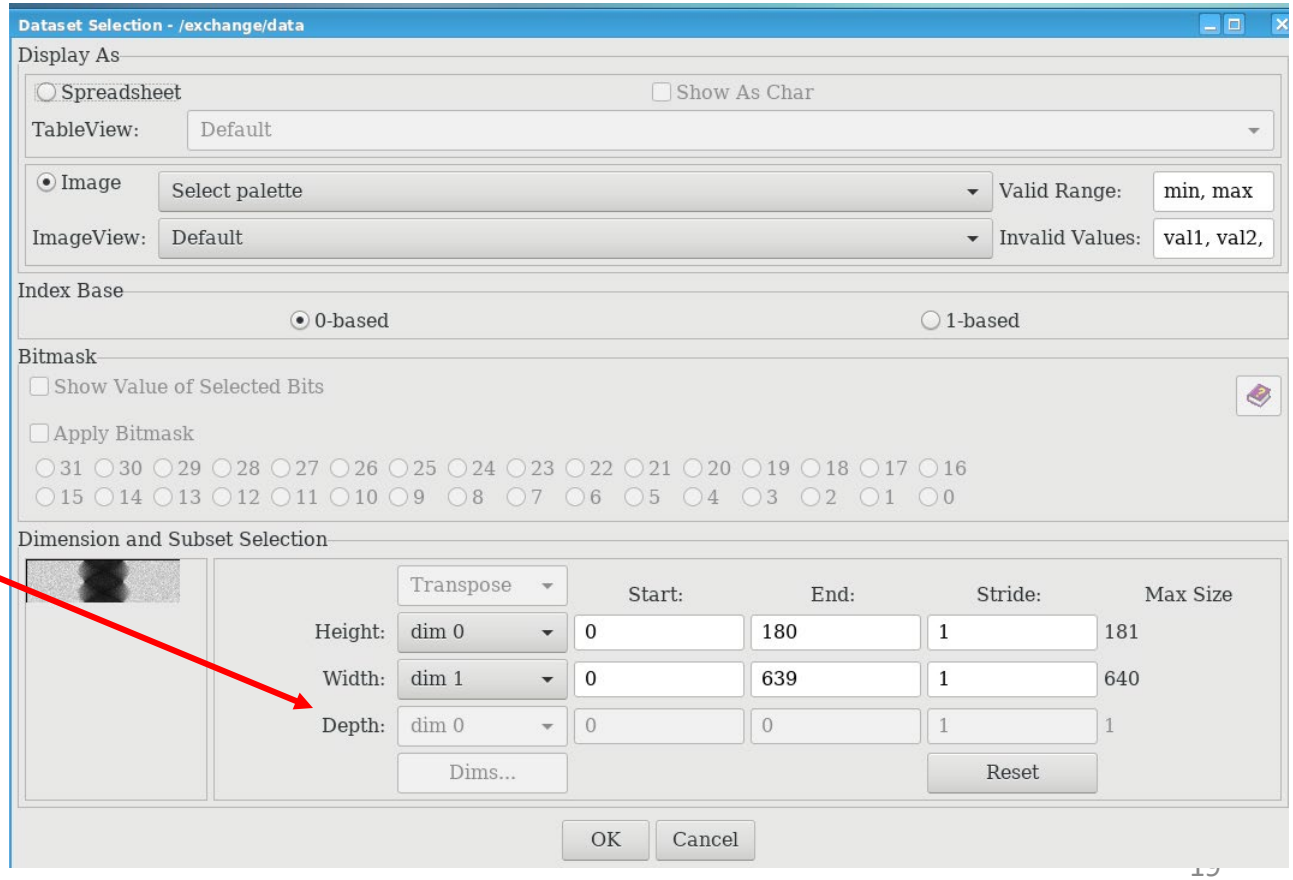


Just need to add in dummy dimension for slice number



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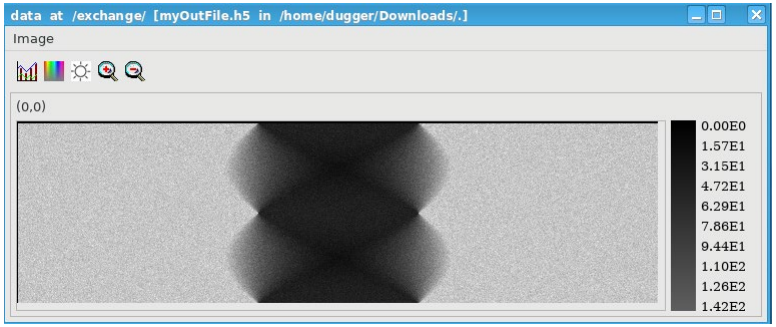

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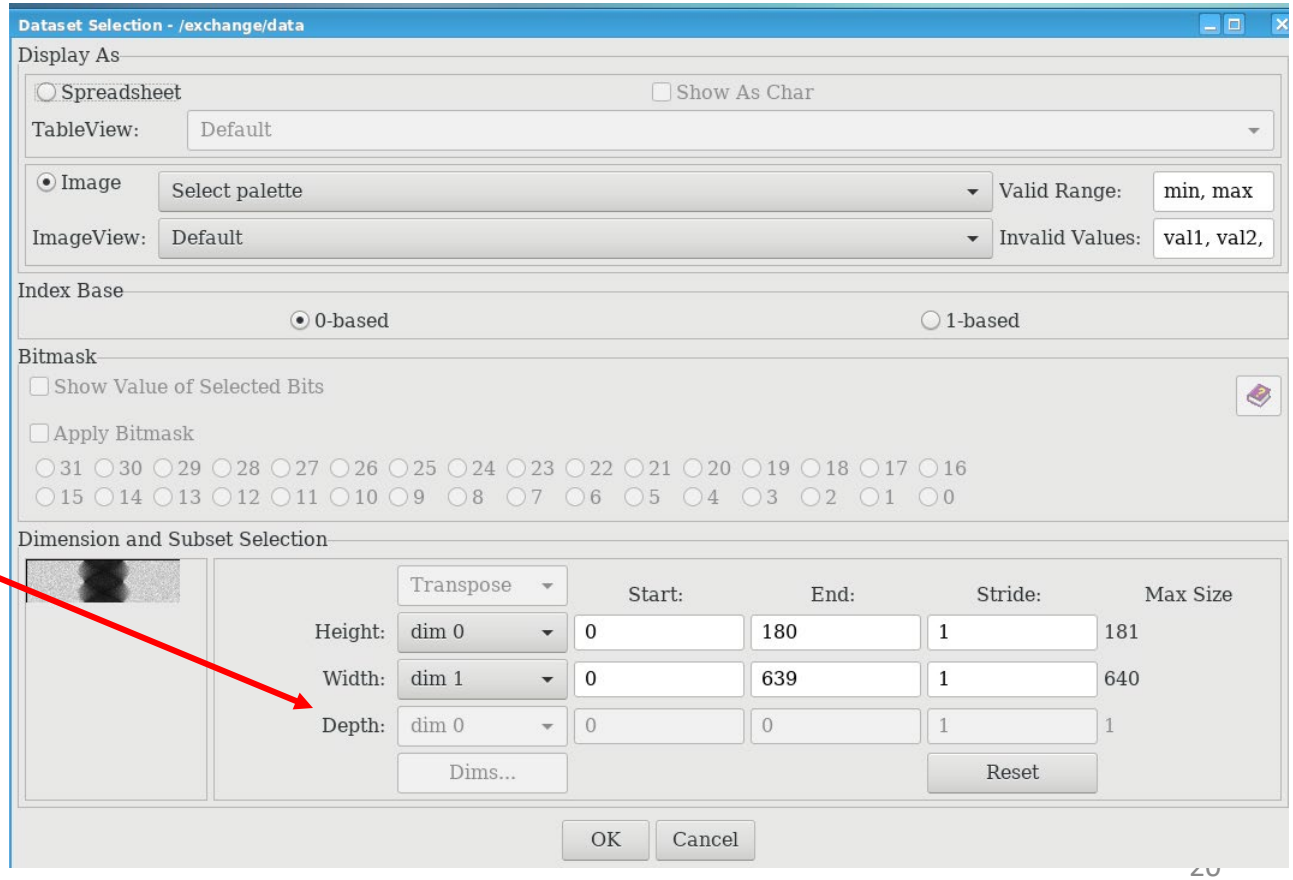
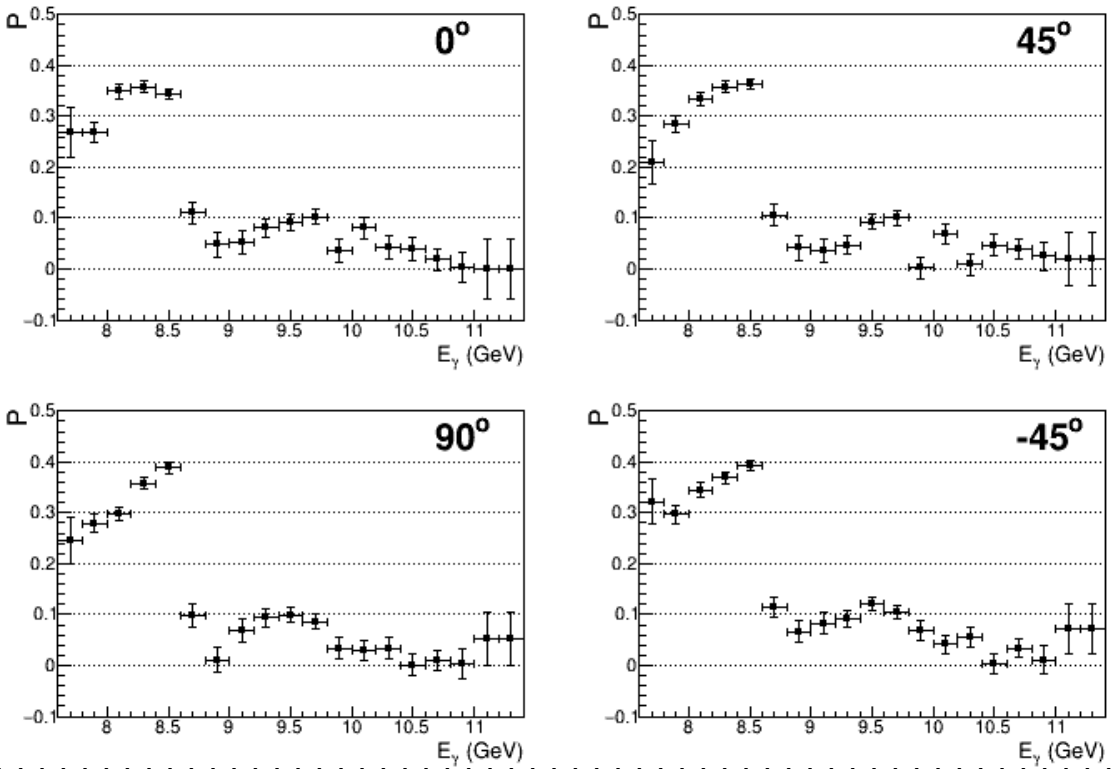
Almost there!



TPOL

- Finished processing Spring 2020 data
- Need to package up the script and send to collaboration

Polarizations for spring 2020 (AKA 2019-11) all batches



****

Polarization values for E_gamma between 8.0 and 8.6 GeV

Beam orientation	Polarization
0 degrees:	0.3525 +/- 0.0077
45 degrees:	0.3535 +/- 0.0066
90 degrees:	0.3536 +/- 0.0074
135 degrees:	0.3721 +/- 0.0066

****

$$K^{+}K^{-}\pi^{0}$$

$K^+K^-\pi^0$

- Presented results to Open Analysis Discussion meeting on Tuesday:

http://meson.hldsite.com/presentations/dugger/kkpi22-8-30.pdf

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- We should be able to distinguish the J=1 nature through PWA

- Will start by assuming *t*-channel prior to searching for *s*-channel contributions (code is currently setup for t-channel).

ASU

Isobar choice for $R \rightarrow K^+K^-\pi^0$

- Convenient to treat potential 3-body decay as two 2-body decays

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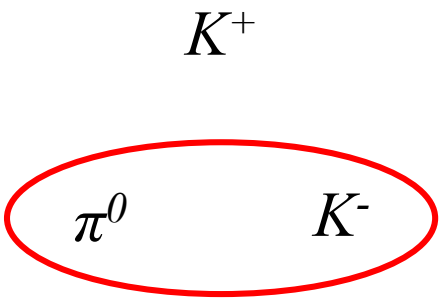

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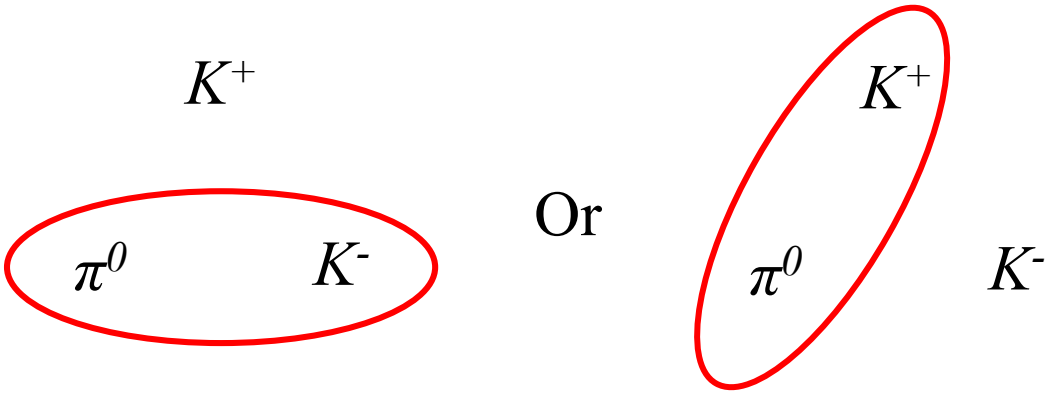

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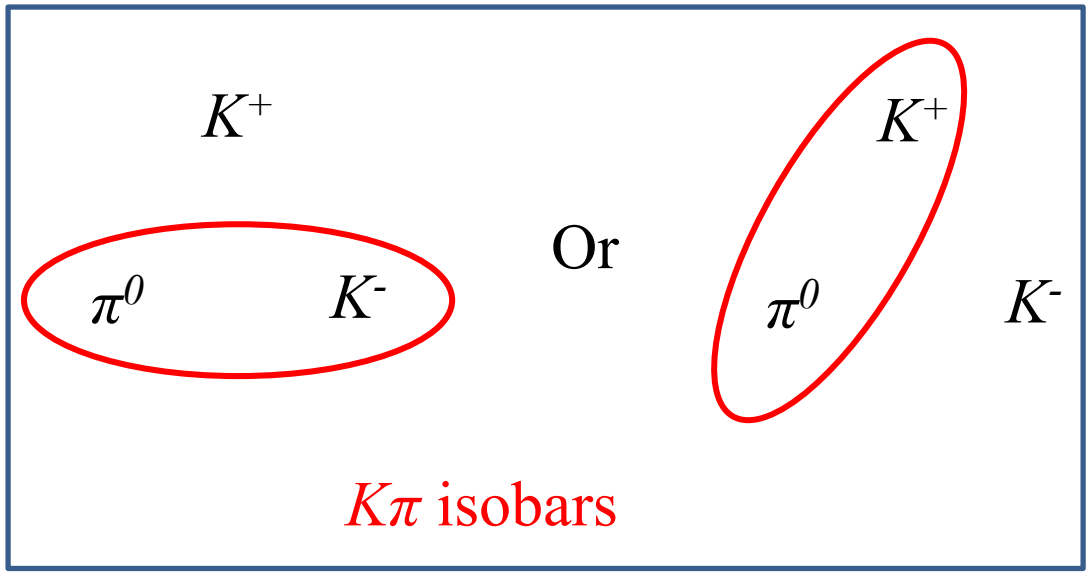

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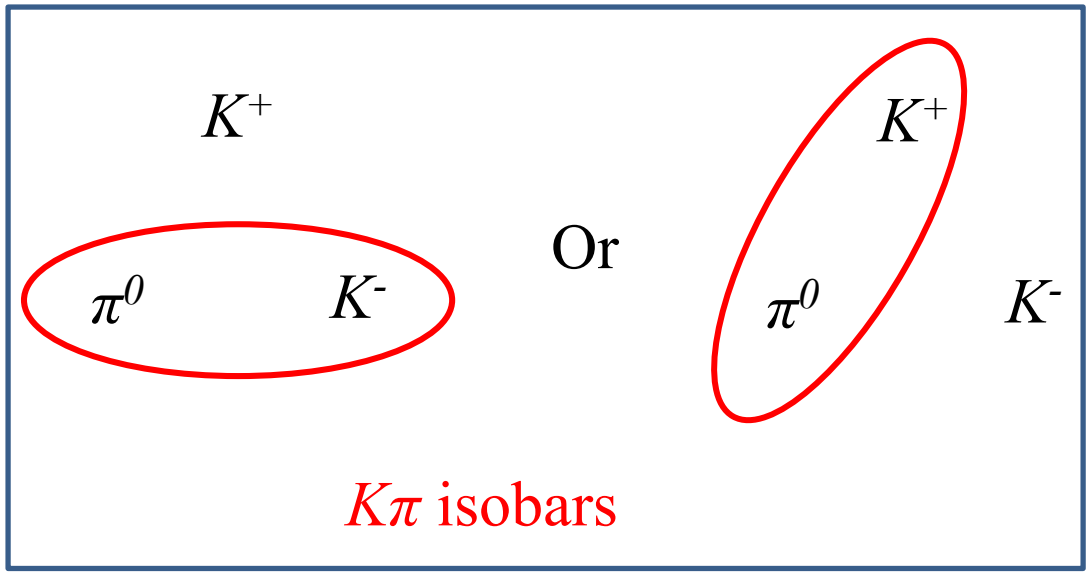

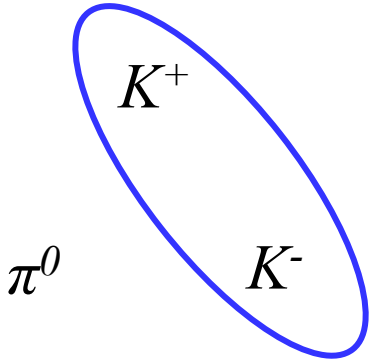

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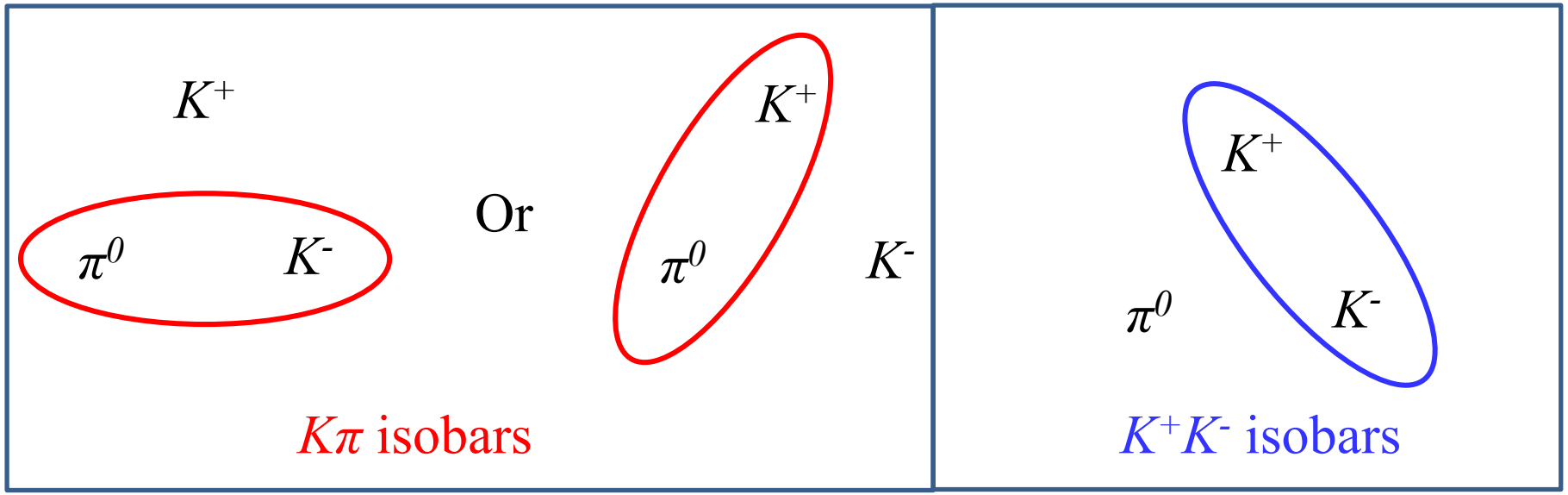

$K\pi$ isobar candidates

$K_0^*(700)$ $\quad I(J^P) = \frac{1}{2}(0^+)$

also known as κ; was $K_0^*(800)$

See the review on "Scalar Mesons below 1 GeV."

Mass (T-Matrix Pole $\sqrt{s}$) = (630–730) $- i$ (260–340) MeV
Mass (Breit-Wigner) = 845 ± 17 MeV
Full width (Breit-Wigner) = 468 ± 30 MeV

$K_0^*(700)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\pi$	100 %	256

$K^*(892)$ $\quad I(J^P) = \frac{1}{2}(1^-)$

Mass (T-Matrix Pole $\sqrt{s}$) = (890 ± 14) $- i$ (26 ± 6) MeV
$K^*(892)^\pm$ hadroproduced mass m = 891.67 ± 0.26 MeV
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$K^*(892)^\pm$ hadroproduced full width Γ = 51.4 ± 0.8 MeV
$K^*(892)^\pm$ in τ decays full width Γ = 46.2 ± 1.3 MeV
$K^*(892)^0$ full width Γ = 47.3 ± 0.5 MeV (S = 1.9)

$K^*(892)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$K\pi$	$\sim$ 100 %		289
$K^0\gamma$	(2.46±0.21) × 10^{-3}		307
$K^\pm\gamma$	(9.8 ±0.9) × 10^{-4}		309
$K\pi\pi$	< 7 × 10^{-4}	95%	223

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Very wide

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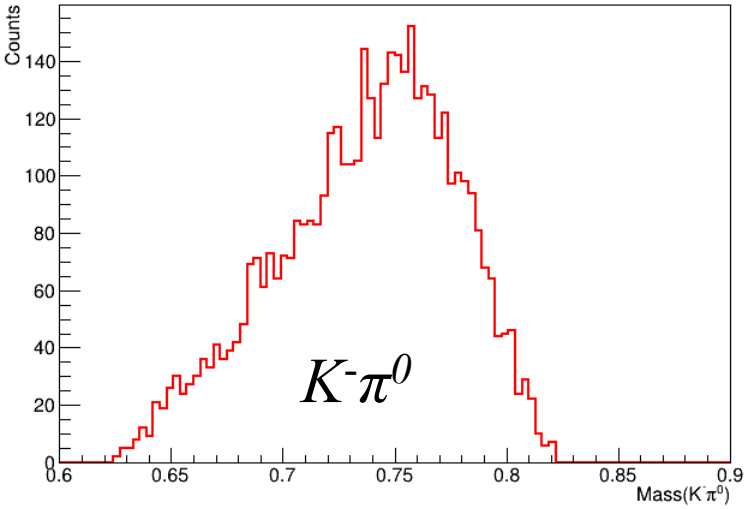

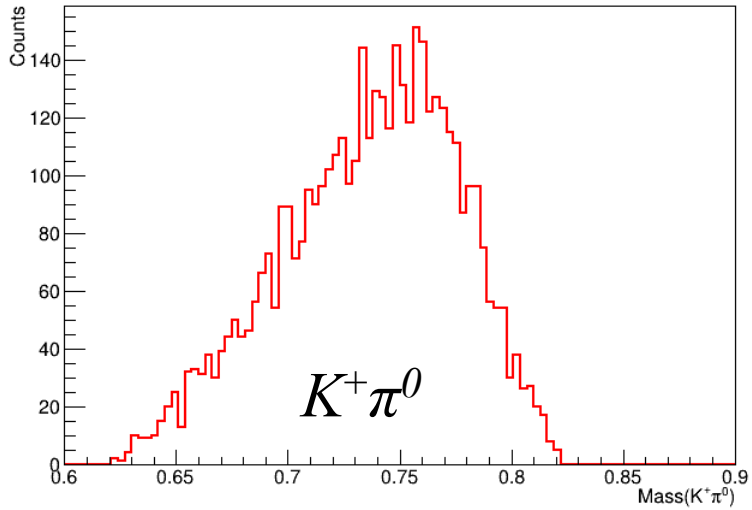

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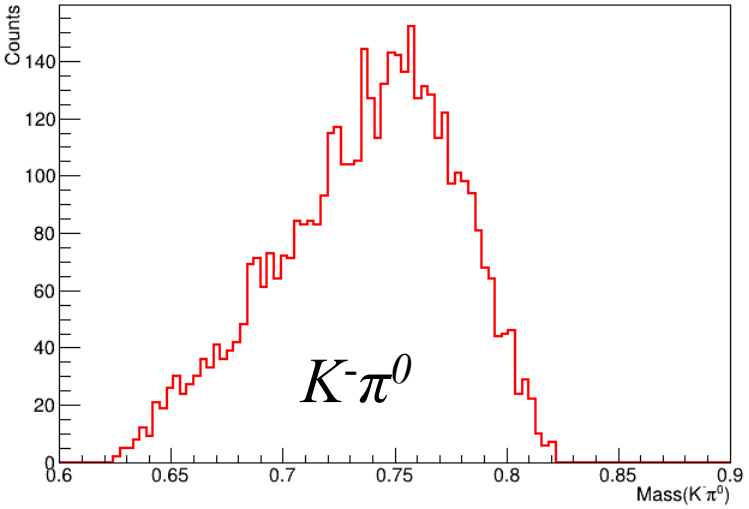

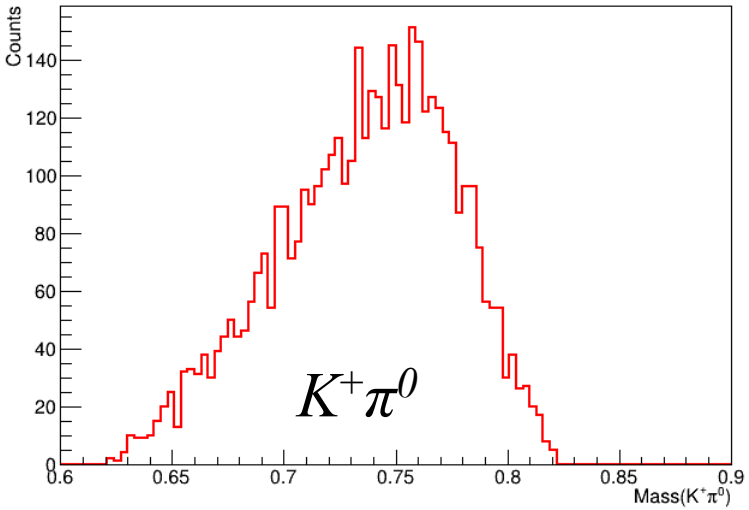

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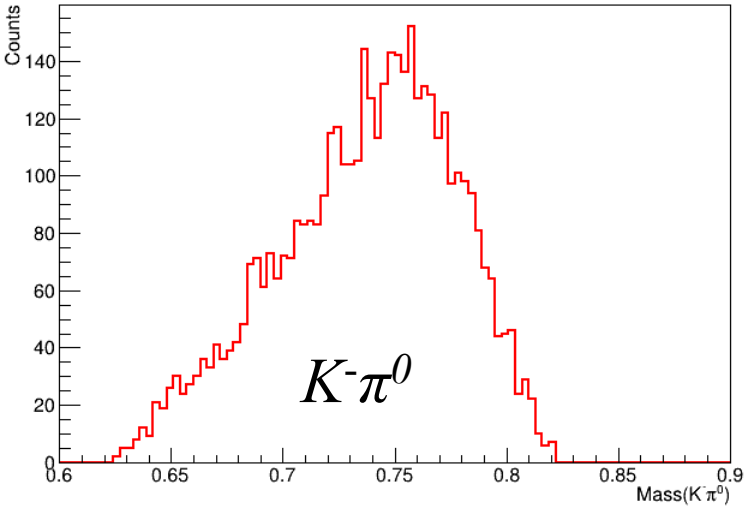
Mass (Breit-Wigner) = 845 ± 17 MeV
Full width (Breit-Wigner) = 468 ± 30 MeV

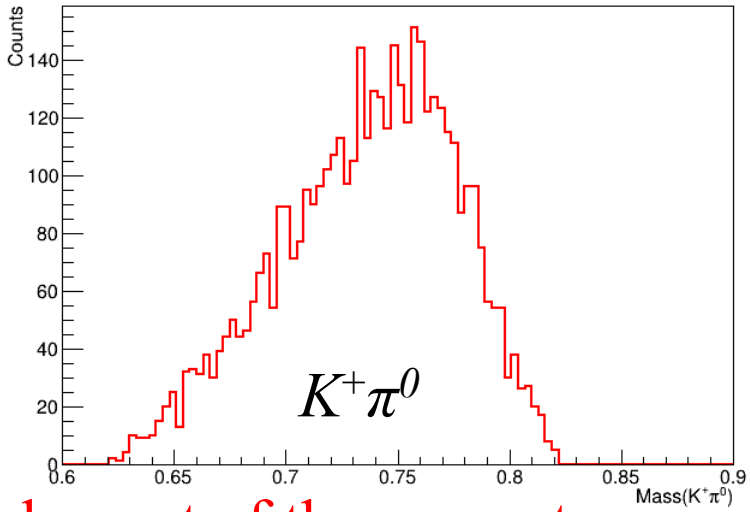
$K_0^*(700)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$K\pi$	100 %	256

$K^*(892)$ $I(J^P) = \frac{1}{2}(1^-)$

Mass (T-Matrix Pole $\sqrt{s}$) = (890 ± 14) $- i$ (26 ± 6) MeV
$K^*(892)^\pm$ hadroproduced mass m = 891.67 ± 0.26 MeV
$K^*(892)^\pm$ in τ decays mass m = 895.5 ± 0.8 MeV
$K^*(892)^0$ mass m = 895.55 ± 0.20 MeV (S = 1.7)
$K^*(892)^\pm$ hadroproduced full width Γ = 51.4 ± 0.8 MeV
$K^*(892)^\pm$ in τ decays full width Γ = 46.2 ± 1.3 MeV
$K^*(892)^0$ full width Γ = 47.3 ± 0.5 MeV (S = 1.9)

$K^*(892)$ DECAY MODES	Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$K\pi$	~ 100 %		289
$K^0\gamma$	(2.46±0.21) × 10^{-3}		307
$K^\pm\gamma$	(9.8 ±0.9) × 10^{-4}		309
$K\pi\pi$	< 7 × 10^{-4}	95%	223





Mass too large and narrow to be part of these events

$K\pi$ isobar candidates

$K_0^*(700)$ $I(J^P) = \frac{1}{2}(0^+)$

also known as κ; was $K_0^*(800)$

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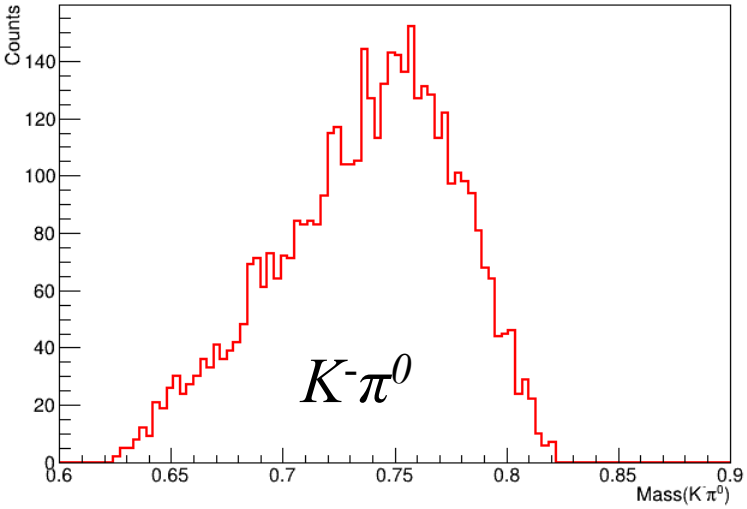

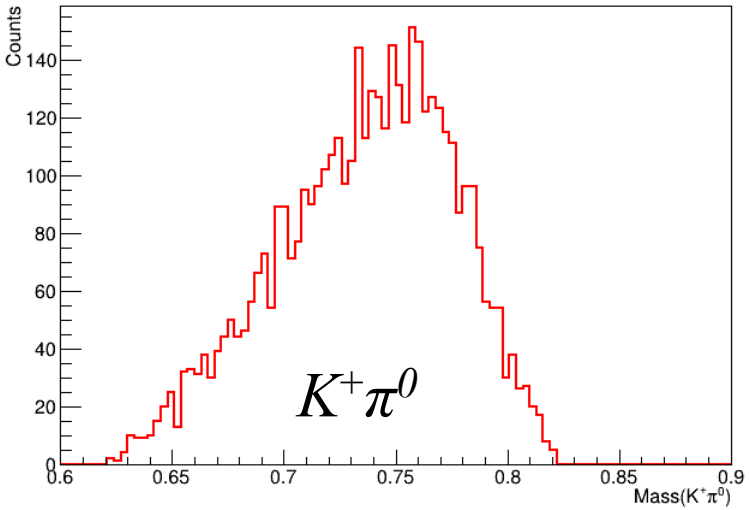

K^+K^- isobar candidates

$f_0(980)$ $I^G(J^{PC}) = 0^+(0^{++})$

See the review on "Scalar Mesons below 1 GeV."

T-matrix pole $\sqrt{s} = (980–1010) - i\ (20–35)$ MeV [i]

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Mass $m = 1019.461 \pm 0.016$ MeV
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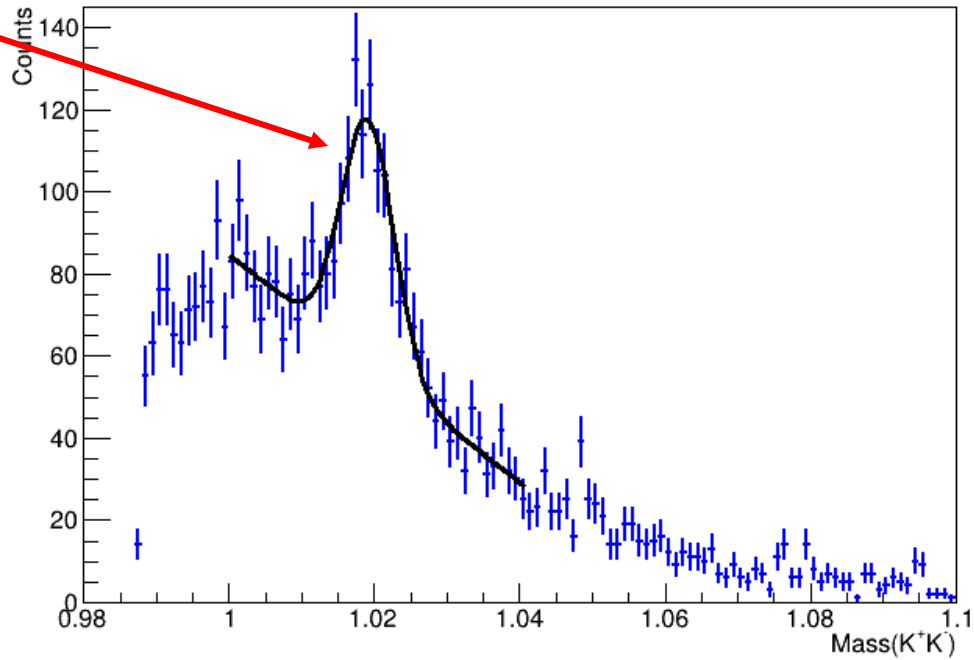

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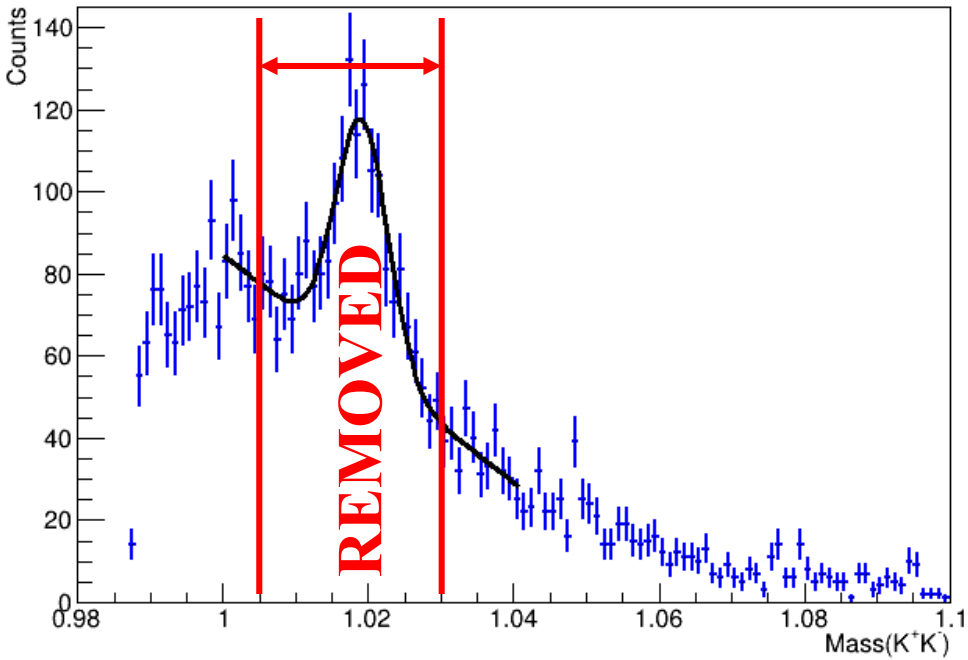

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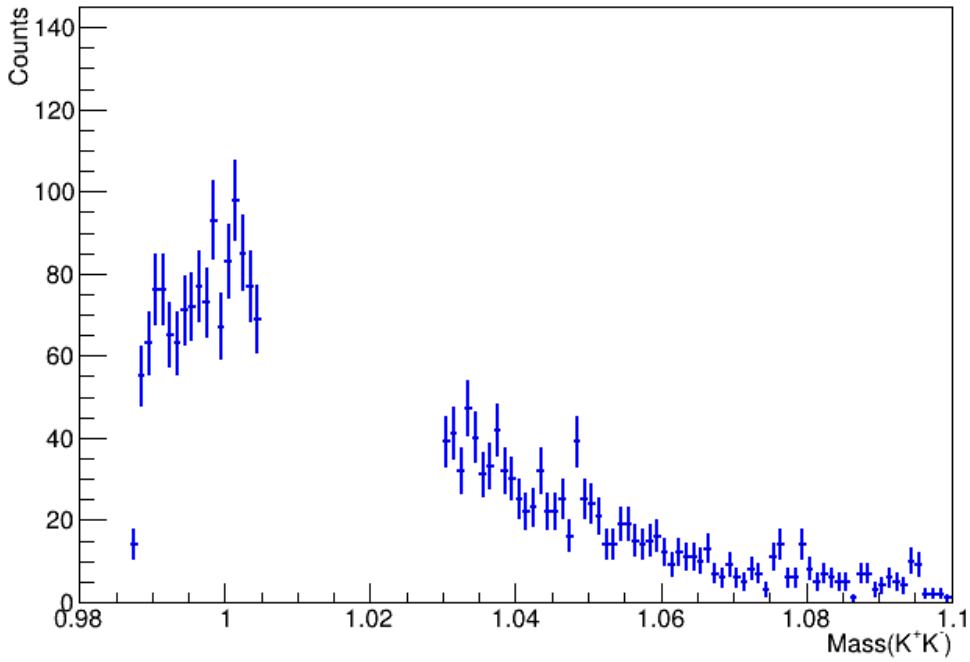

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