

Authors

E. Wallen, A. Madur,
S. Marks, D. Arbalaez

Title:

Measurements on HXU-32 after 1 tuning iteration

Location

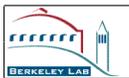
UMF

Date

08/24/2015

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1 Field integrals

1.1 Vertical field integrals

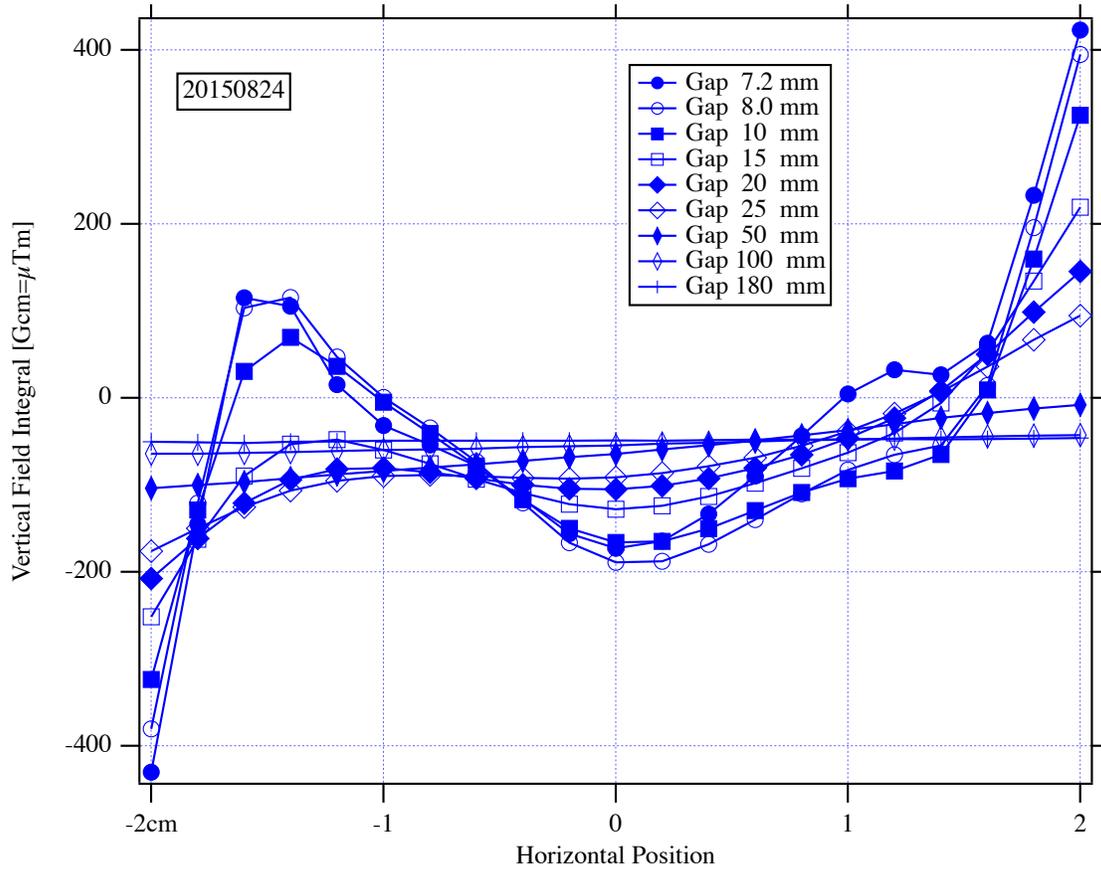


Figure 1: Vertical field integrals measured with a 3.735 m long flip coil.

1.2 Horizontal field integrals



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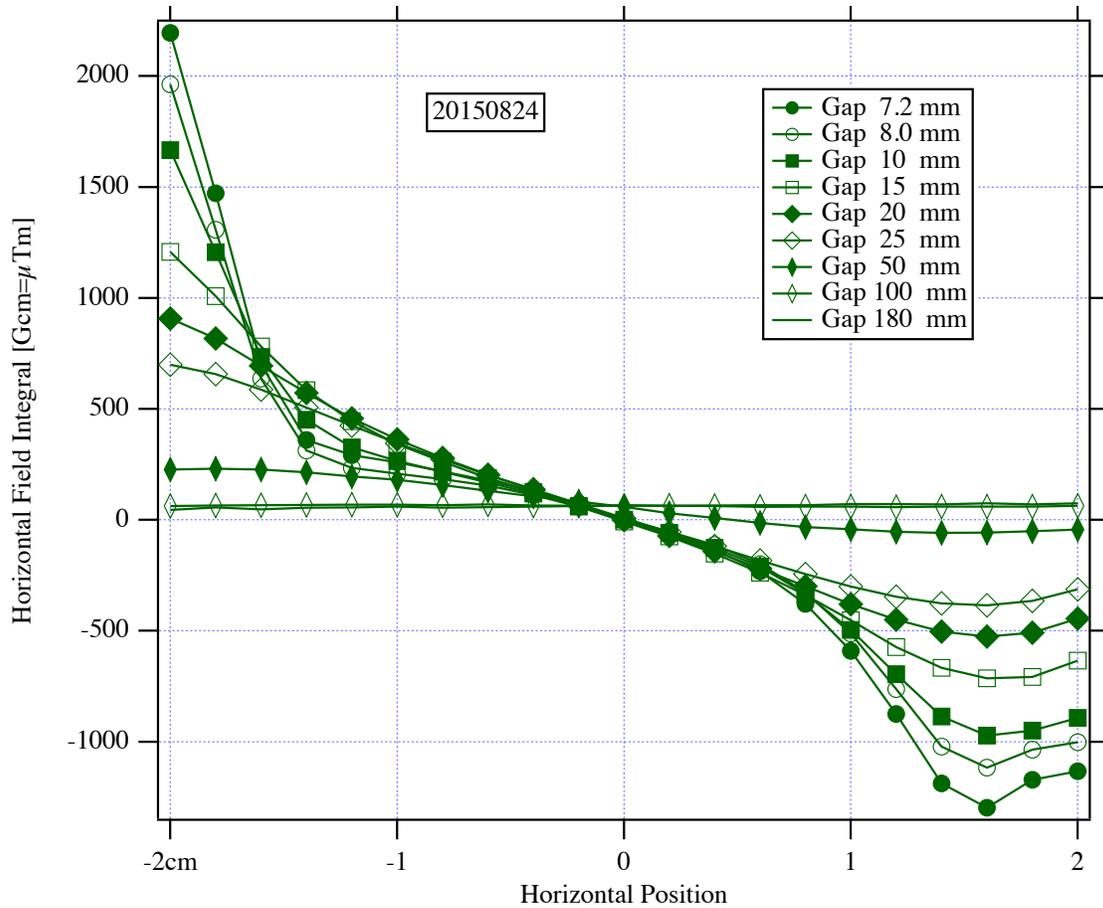


Figure 2: Horizontal field integrals measured with a 3.735 m long flip coil.

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2 Measured fields, angles, trajectories and phase errors

The magnetic fields have been measured on the undulator axis in 4400 mm long Hall probe scans. The field integral found with the flip coil is used for normalizing the magnetic fields measured with the Hall probe system. The normalization is done by adding or subtracting a constant field over the magnetic structure of the undulator. The constant that is added corresponds to the difference between the flip coil and the Hall probe data over the length of the flip coil.

The Hall probe scans have been carried out at 9 different gaps; 7.2, 8.0, 10, 15, 20, 25, 50, 100, and 180 mm. The magnetic fields have been analyzed for the gap range 7.2-25 mm. In the analysis the function of the autotcorrection system for the beam position in the accelerator has been simulated by using virtual coils in the beginning and end of the 4.4 m long scan to correct the orbit of the beam passing through the undulator.

2.1 Gap 7.2 mm

The measured fields, angles, trajectories and phase errors for the HXU-32 at 7.2 mm gap is shown in Figure 3 and Figure 4, which shows the same analysis with the beam path corrected by virtual coils in the beginning and end of the scan.

2.2 Gap 8.0 mm

The measured fields, angles, trajectories and phase errors for the HXU-32 at 8.0 mm gap is shown in Figure 5 and Figure 6, which shows the same analysis with the beam path corrected by virtual coils in the beginning and end of the scan.

2.3 Gap 10 mm

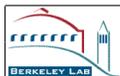
The measured fields, angles, trajectories and phase errors for the HXU-32 at 10 mm gap is shown in Figure 7 and Figure 8, which shows the same analysis with the beam path corrected by virtual coils in the beginning and end of the scan.

2.4 Gap 15 mm

The measured fields, angles, trajectories and phase errors for the HXU-32 at 15 mm gap is shown in Figure 9 and Figure 10, which shows the same analysis with the beam path corrected by virtual coils in the beginning and end of the scan.

2.5 Gap 20 mm

The measured fields, angles, trajectories and phase errors for the HXU-32 at 20 mm gap is shown in Figure 11 and Figure 12, which shows the same analysis with the beam path corrected by virtual coils in the beginning and end of the scan.

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2.6 Gap 25 mm

The measured fields, angles, trajectories and phase errors for the HXU-32 at 25 mm gap is shown in Figure 13 and Figure 14, which shows the same analysis with the beam path corrected by virtual coils in the beginning and end of the scan.



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HXU-32

Period: 32 mm

Gap: 7.2 mm

Beff: 1.2849 T

20150824,

Without correction coils

1st Int Ix : -2.08 [μ Tm]

1st Int Iz : -183.8 [μ Tm]

2nd Int Jx : -71.86 [μ Tm²]

2nd Int Jz : -299.72 [μ Tm²]

Beam energy: 4 GeV

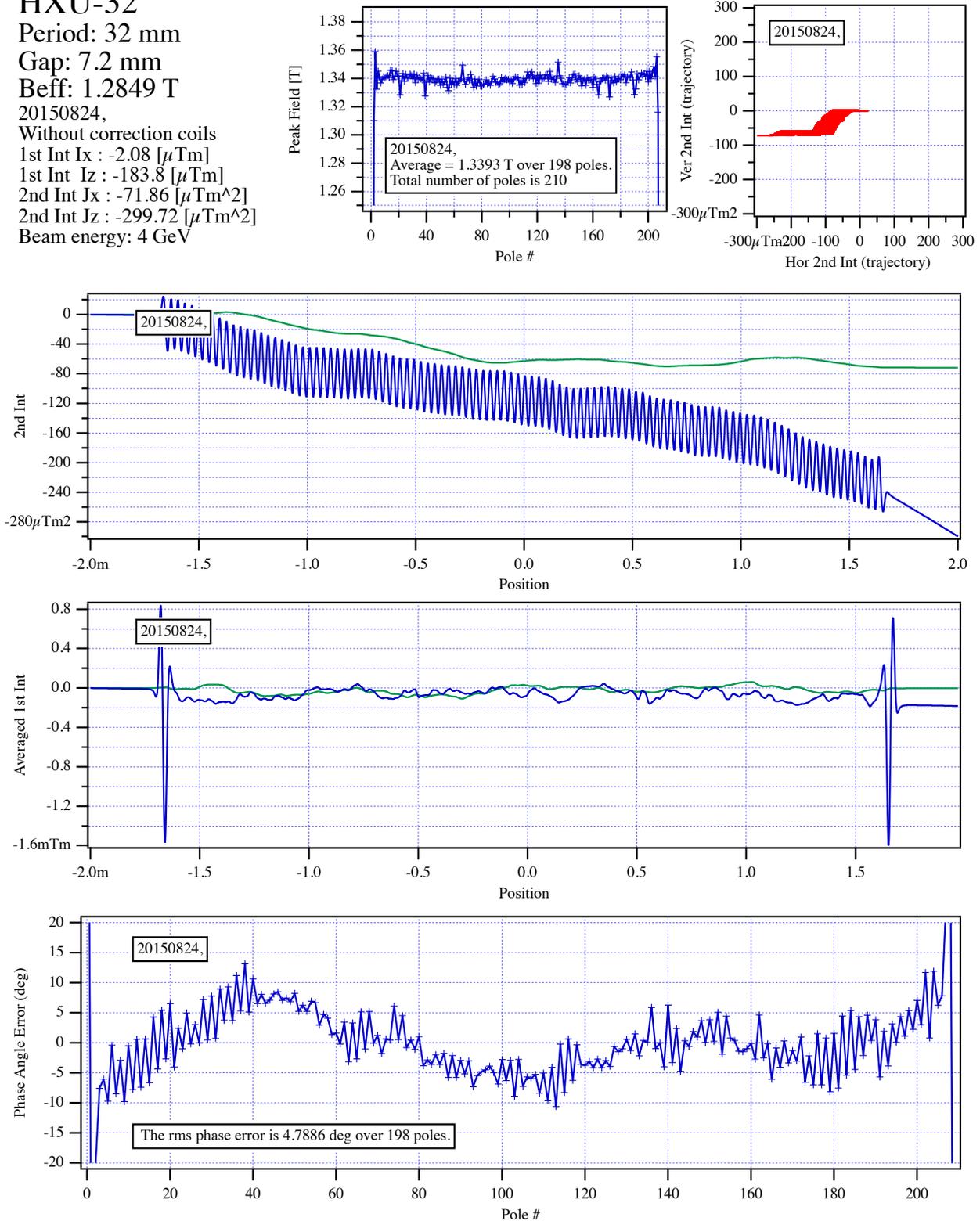
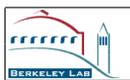


Figure 3: The measured fields, angles, trajectories and phase errors for the HXU-32 at 7.2 mm gap.



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HXU-32

Period: 32 mm

Gap: 7.2 mm

Beff: 1.2849 T

20150824,

With 0.1 m coils at ends of scan

US H-Coil : 16.29 [μ Tm]

US V-Coil : -110.27 [μ Tm]

DS H-Coil : -18.37 [μ Tm]

DS V-Coil : -73.53 [μ Tm]

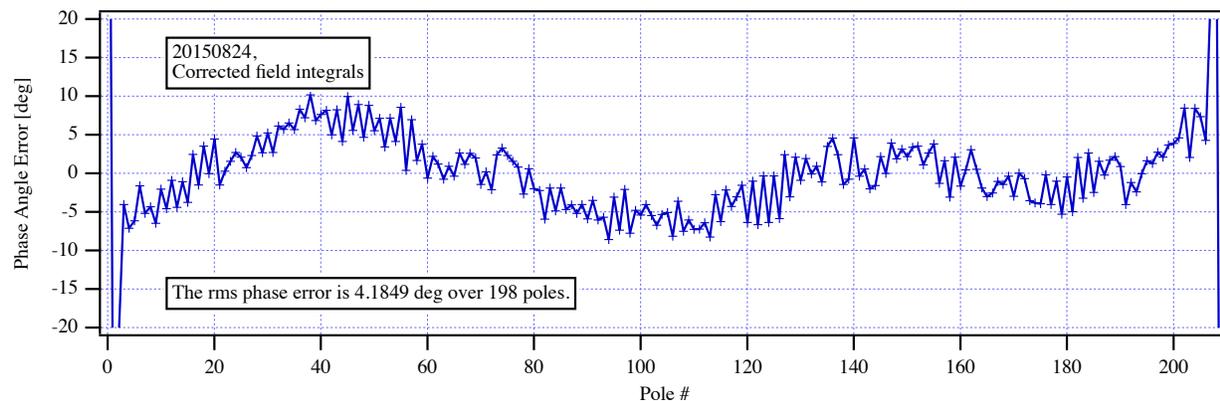
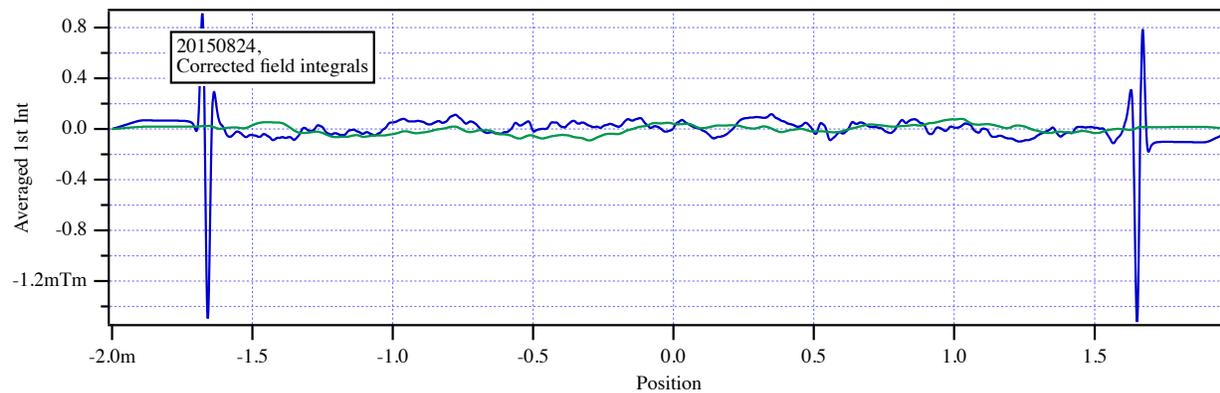
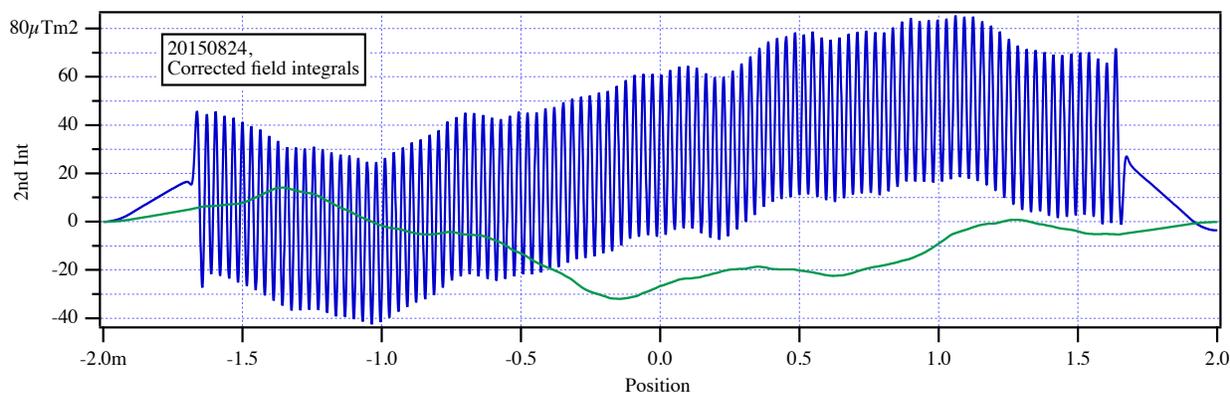
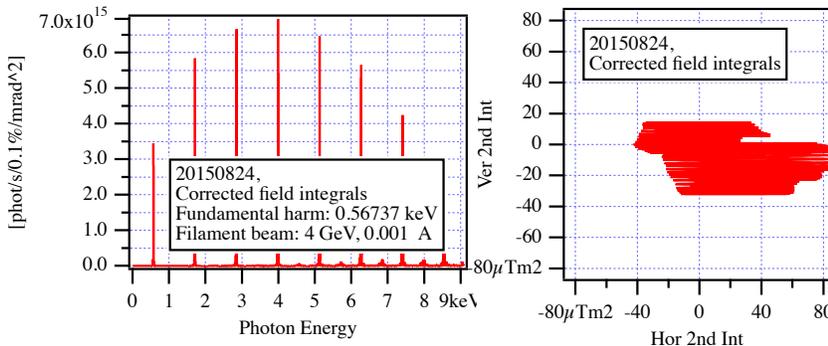


Figure 4: The measured fields, angles, trajectories and phase errors for the HXU-32 at 7.2 mm gap with the beam path corrected by virtual coils.



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HXU-32

Period: 32 mm

Gap: 8 mm

Beff: 1.1613 T

20150824,

Without correction coils

1st Int Ix : 2.08 [μTm]

1st Int Iz : -199.84 [μTm]

2nd Int Jx : -50.65 [μTm^2]

2nd Int Jz : -420.94 [μTm^2]

Beam energy: 4 GeV

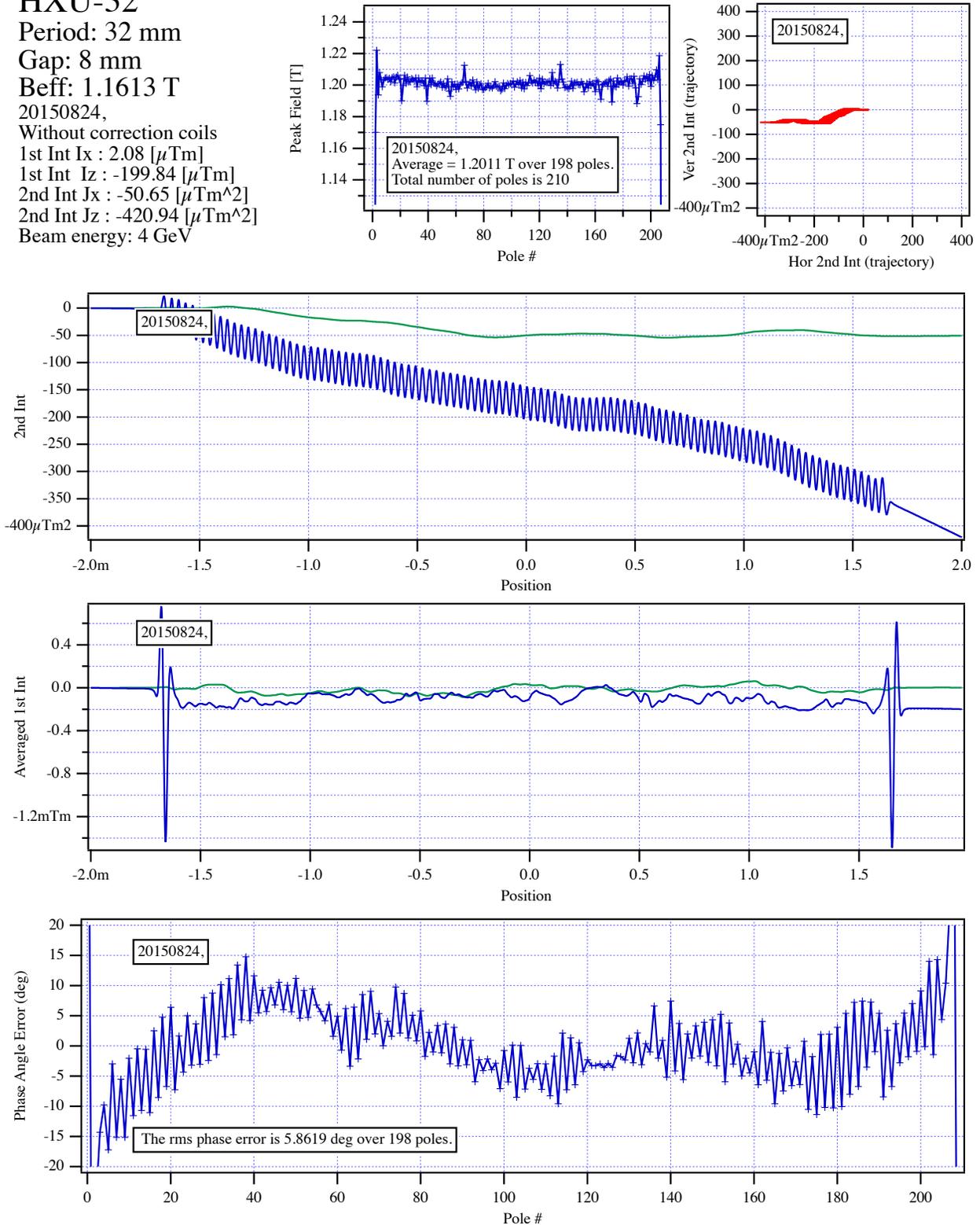
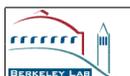


Figure 5: The measured fields, angles, trajectories and phase errors for the HXU-32 at 8.0 mm gap.



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HXU-32

Period: 32 mm

Gap: 8 mm

Beff: 1.1613 T

20150824,

With 0.1 m coils at ends of scan

US H-Coil : 15.08 [μ Tm]

US V-Coil : -95.53 [μ Tm]

DS H-Coil : -13 [μ Tm]

DS V-Coil : -104.32 [μ Tm]

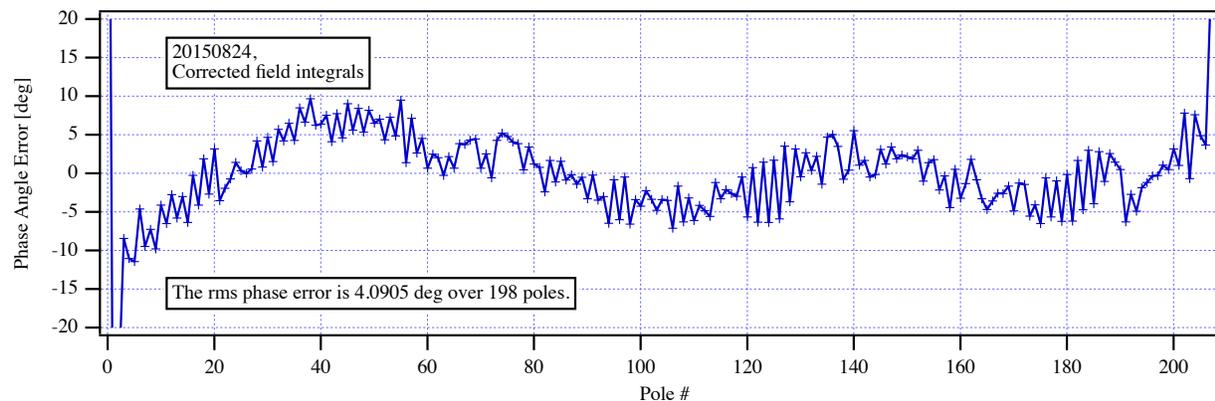
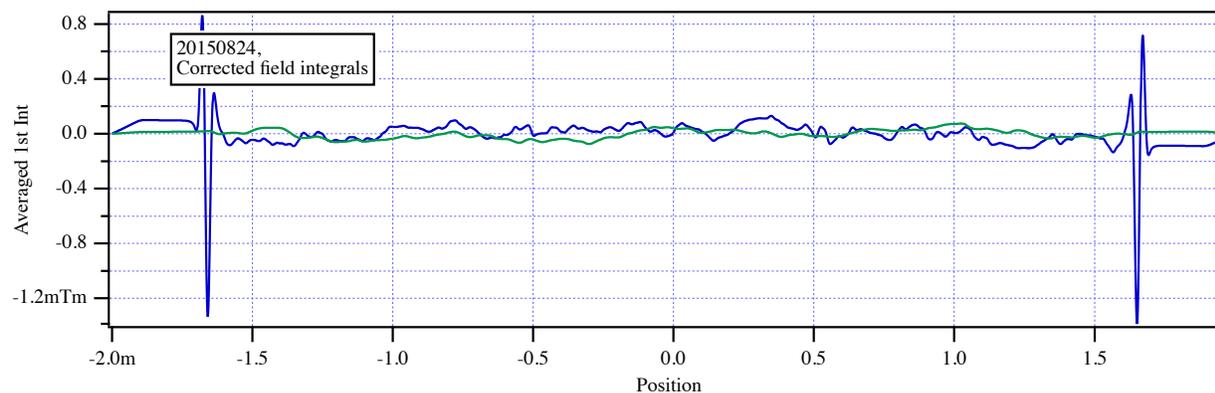
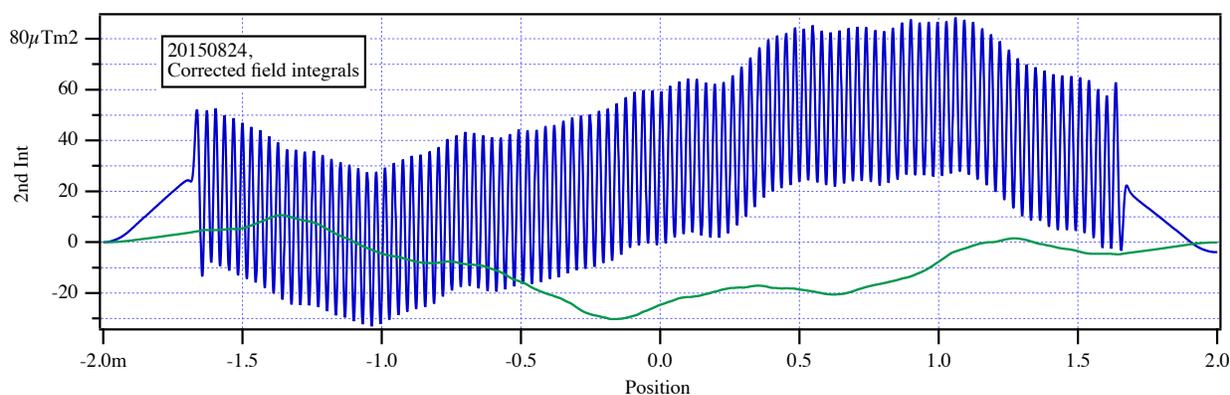
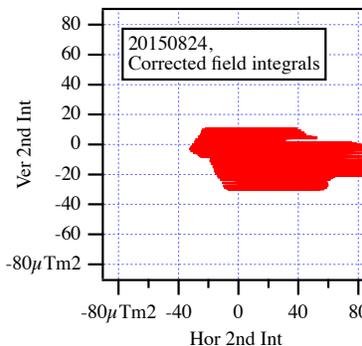
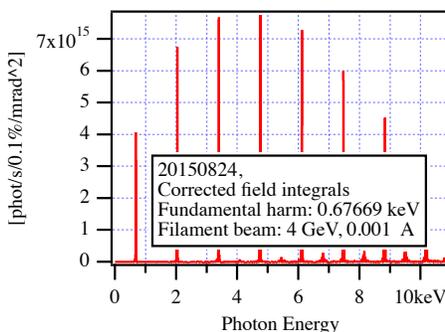


Figure 6: The measured fields, angles, trajectories and phase errors for the HXU-32 at 8.0 mm gap with the beam path corrected by virtual coils.



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HXU-32

Period: 32 mm

Gap: 10 mm

Beff: 0.90585 T

20150824,

Without correction coils

1st Int Ix : 1.25 [μ Tm]

1st Int Iz : -177.3 [μ Tm]

2nd Int Jx : -56.44 [μ Tm²]

2nd Int Jz : -404.1 [μ Tm²]

Beam energy: 4 GeV

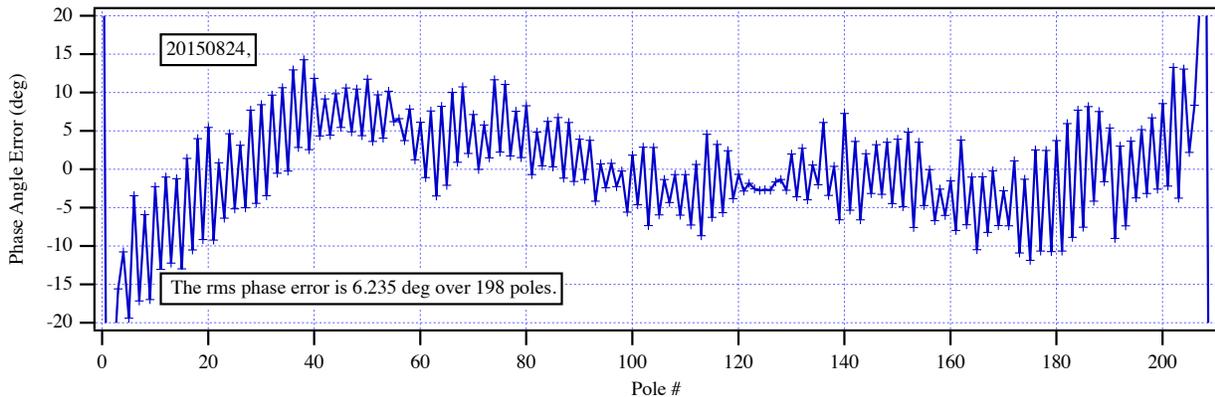
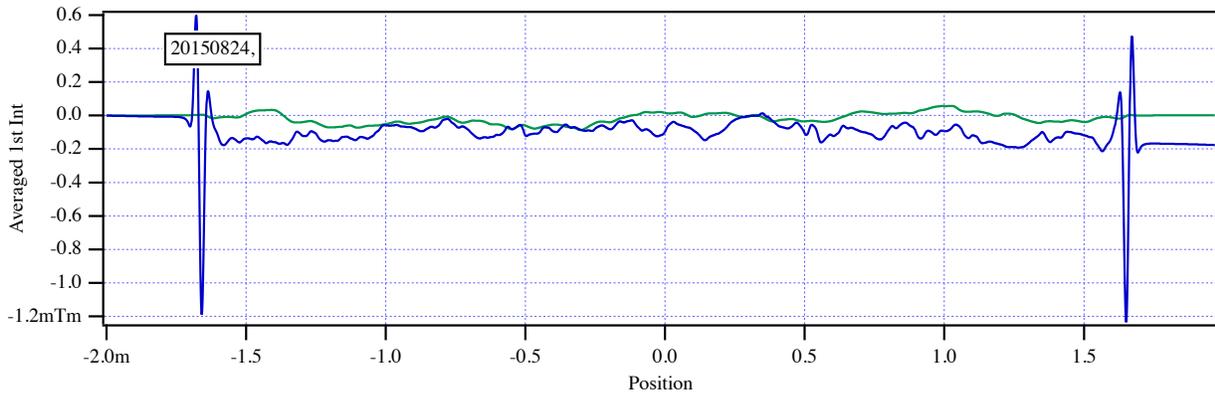
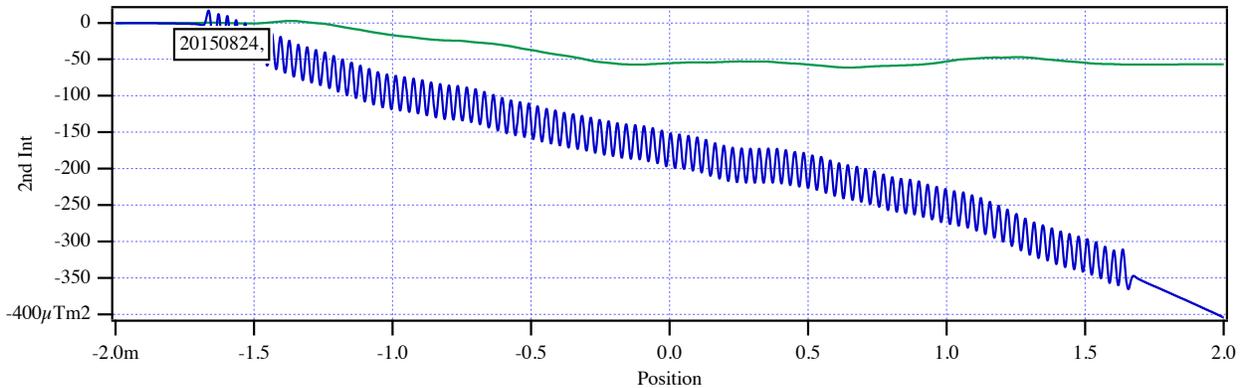
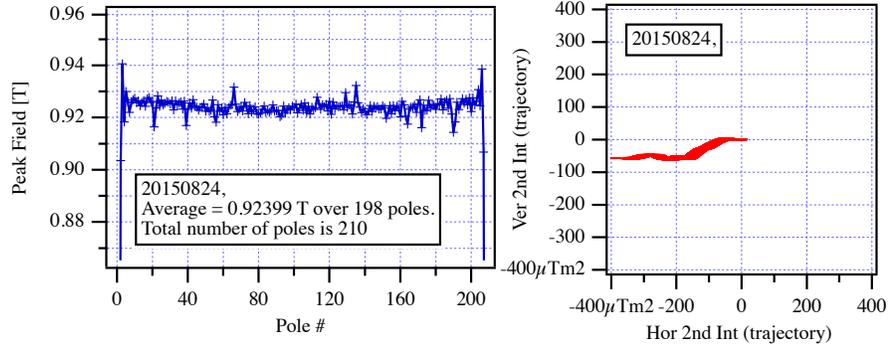


Figure 7: The measured fields, angles, trajectories and phase errors for the HXU-32 at 10 mm gap.



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HXU-32

Period: 32 mm

Gap: 10 mm

Beff: 0.90585 T

20150824,

With 0.1 m coils at ends of scan

US H-Coil : 15.72 [μ Tm]

US V-Coil : -76.89 [μ Tm]

DS H-Coil : -14.48 [μ Tm]

DS V-Coil : -100.41 [μ Tm]

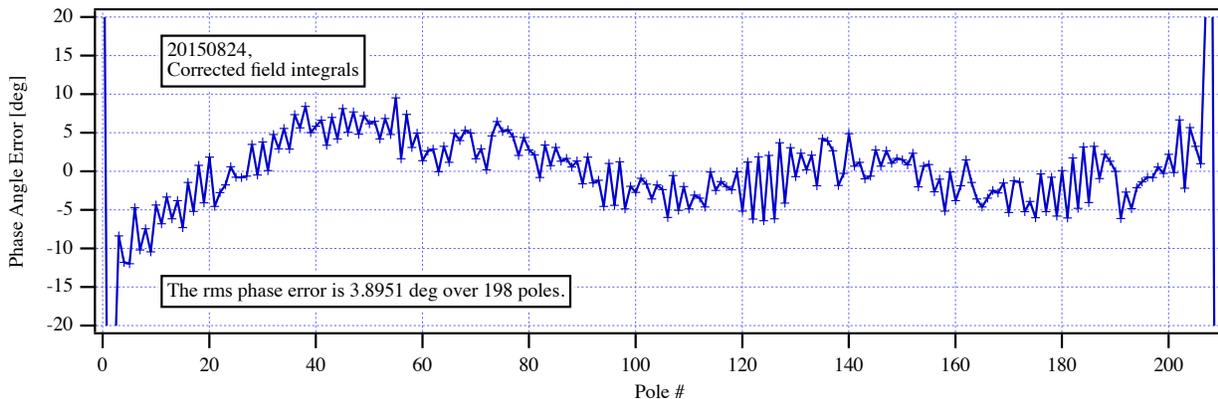
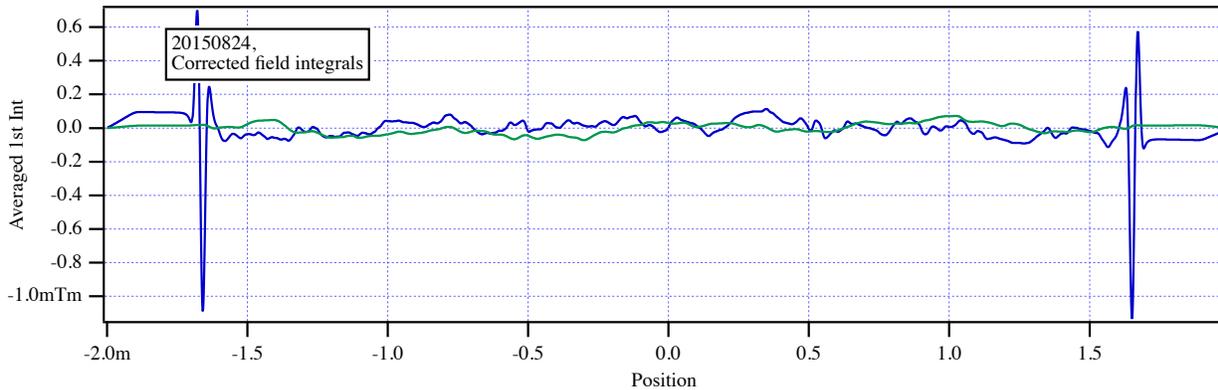
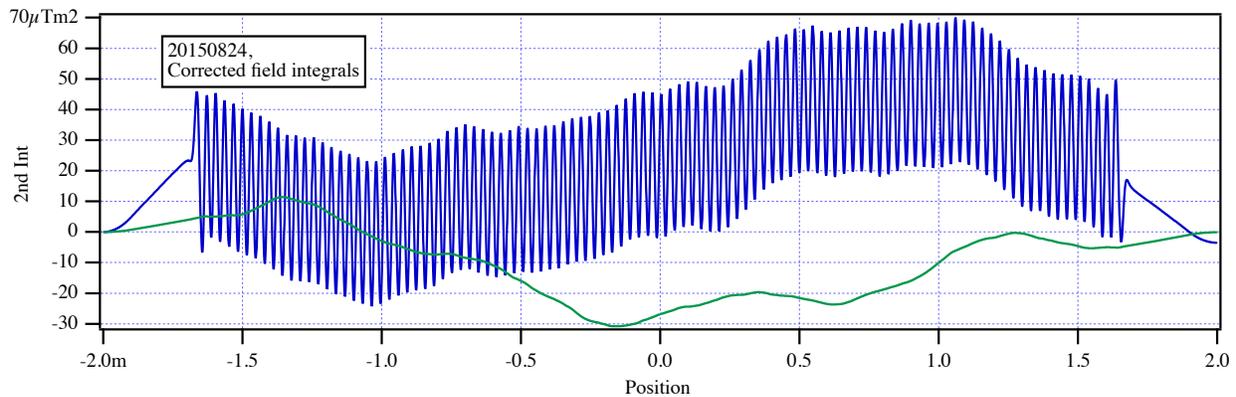
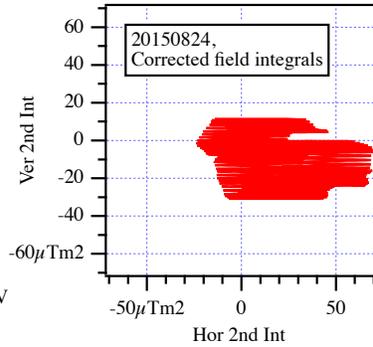
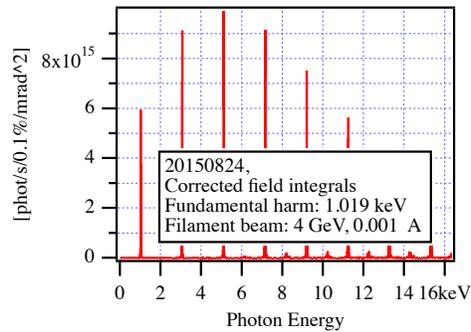


Figure 8: The measured fields, angles, trajectories and phase errors for the HXU-32 at 10 mm gap with the beam path corrected by virtual coils.



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HXU-32

Period: 32 mm

Gap: 15 mm

Beff: 0.51873 T

20150824,

Without correction coils

1st Int Ix : -7.22 [μ Tm]

1st Int Iz : -139.27 [μ Tm]

2nd Int Jx : -87.29 [μ Tm²]

2nd Int Jz : -356.71 [μ Tm²]

Beam energy: 4 GeV

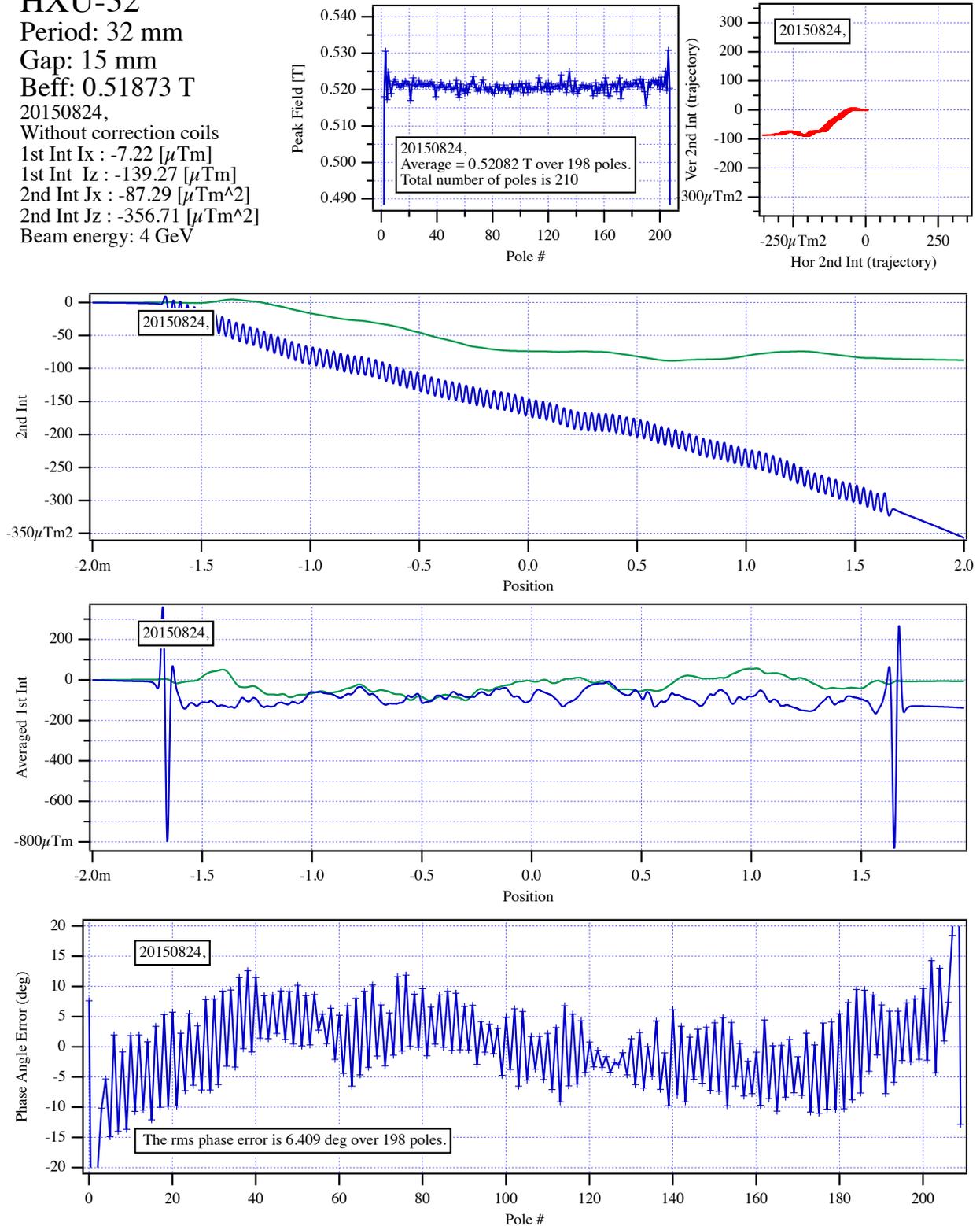


Figure 9: The measured fields, angles, trajectories and phase errors for the HXU-32 at 15 mm gap.



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HXU-32

Period: 32 mm

Gap: 15 mm

Beff: 0.51873 T

20150824,

With 0.1 m coils at ends of scan

US H-Coil : 15.01 [μ Tm]

US V-Coil : -50.32 [μ Tm]

DS H-Coil : -22.23 [μ Tm]

DS V-Coil : -88.95 [μ Tm]

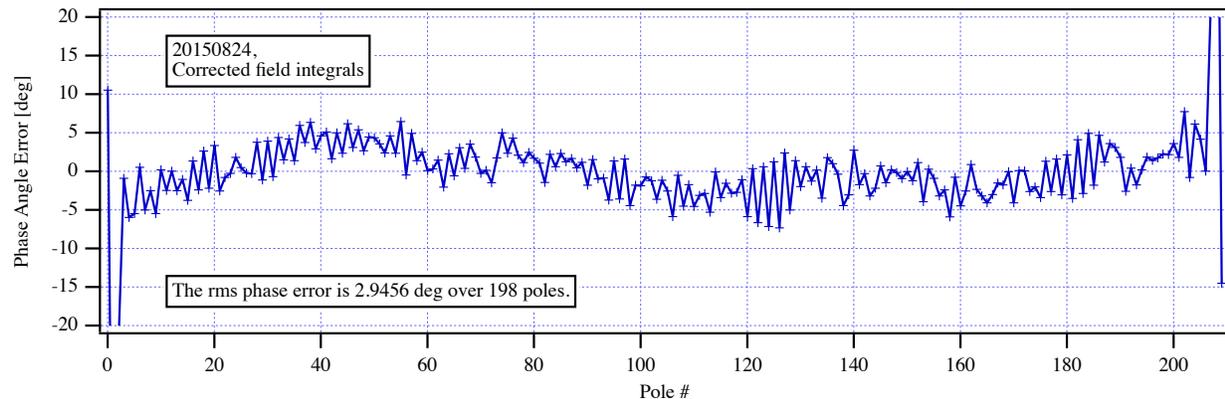
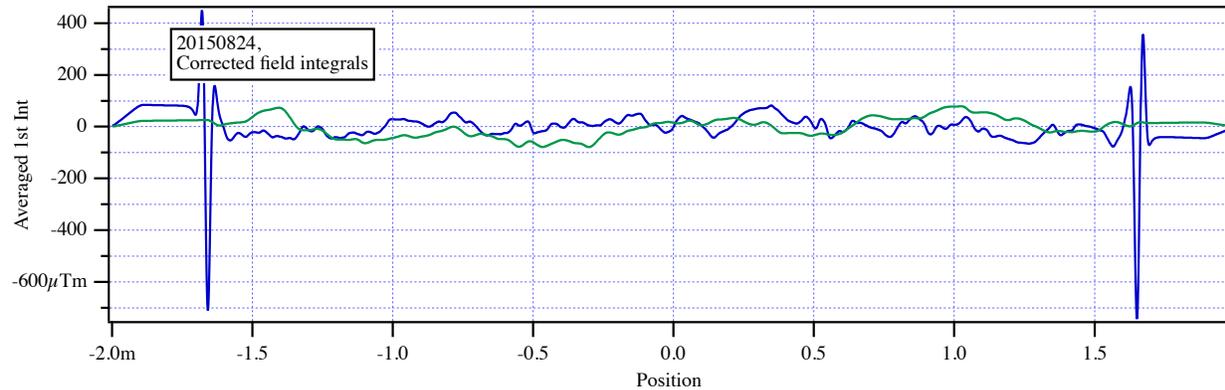
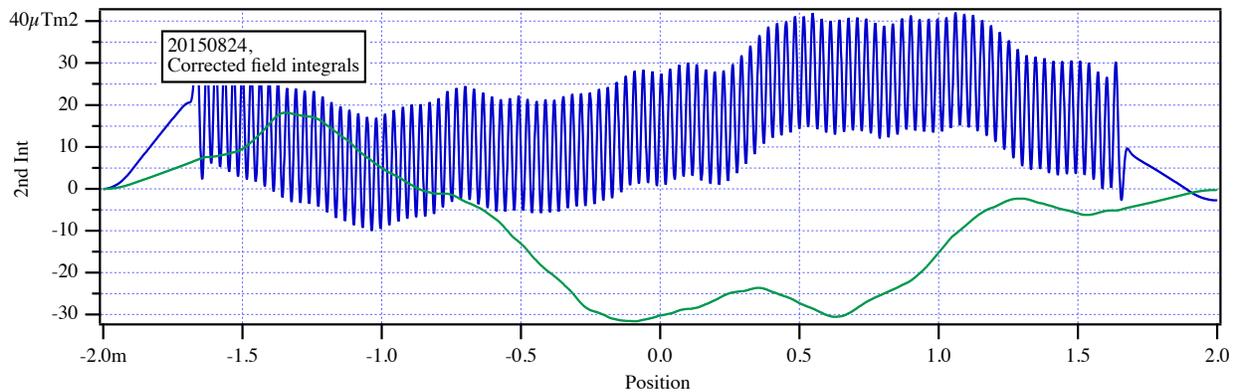
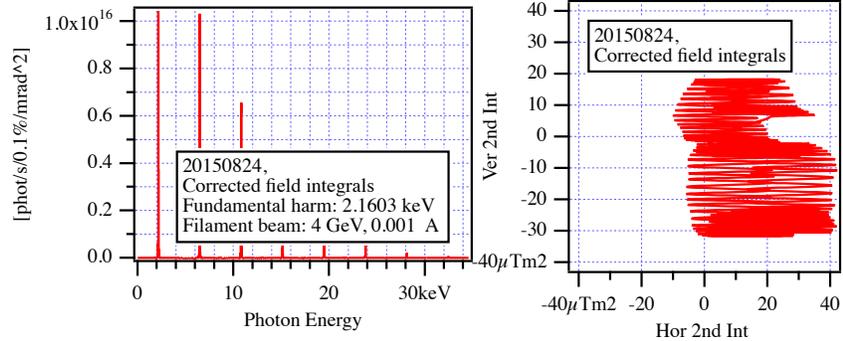


Figure 10: The measured fields, angles, trajectories and phase errors for the HXU-32 at 15 mm gap with the beam path corrected by virtual coils.



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HXU-32

Period: 32 mm

Gap: 20 mm

Beff: 0.30967 T

20150824,

Without correction coils

1st Int Ix : -1.97 [μ Tm]

1st Int Iz : -116.17 [μ Tm]

2nd Int Jx : -77.68 [μ Tm²]

2nd Int Jz : -307.76 [μ Tm²]

Beam energy: 4 GeV

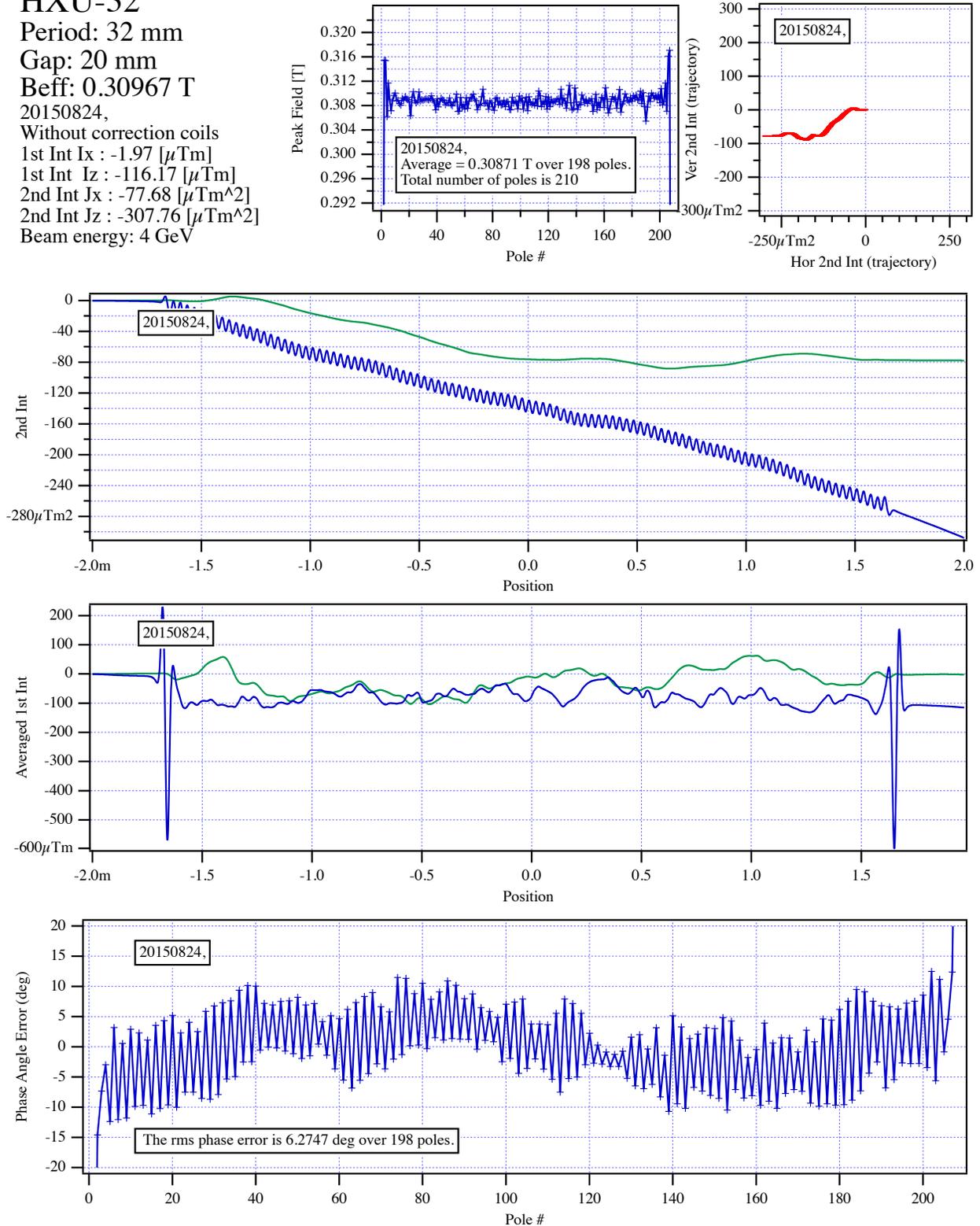


Figure 11: The measured fields, angles, trajectories and phase errors for the HXU-32 at 20 mm gap.



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HXU-32

Period: 32 mm

Gap: 20 mm

Beff: 0.30967 T

20150824,

With 0.1 m coils at ends of scan

US H-Coil : 17.9 [μTm]

US V-Coil : -39.35 [μTm]

DS H-Coil : -19.86 [μTm]

DS V-Coil : -76.82 [μTm]

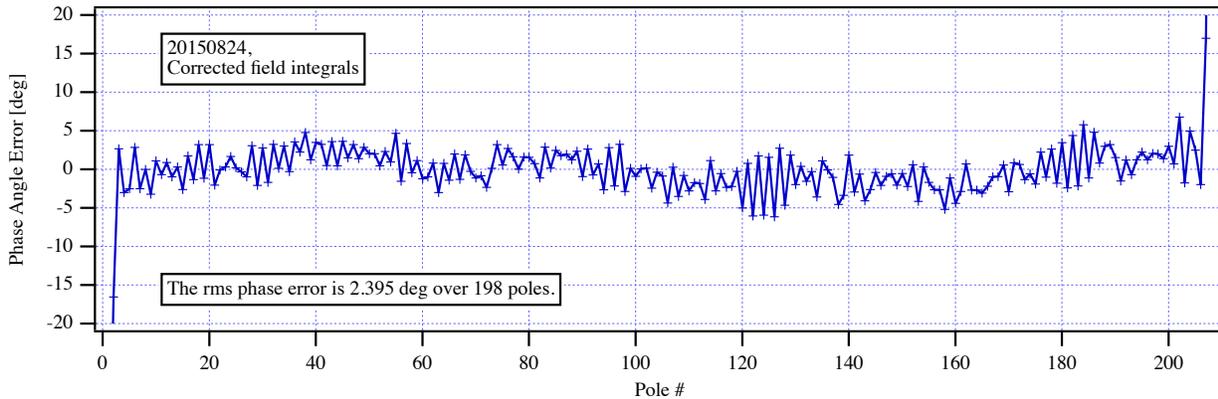
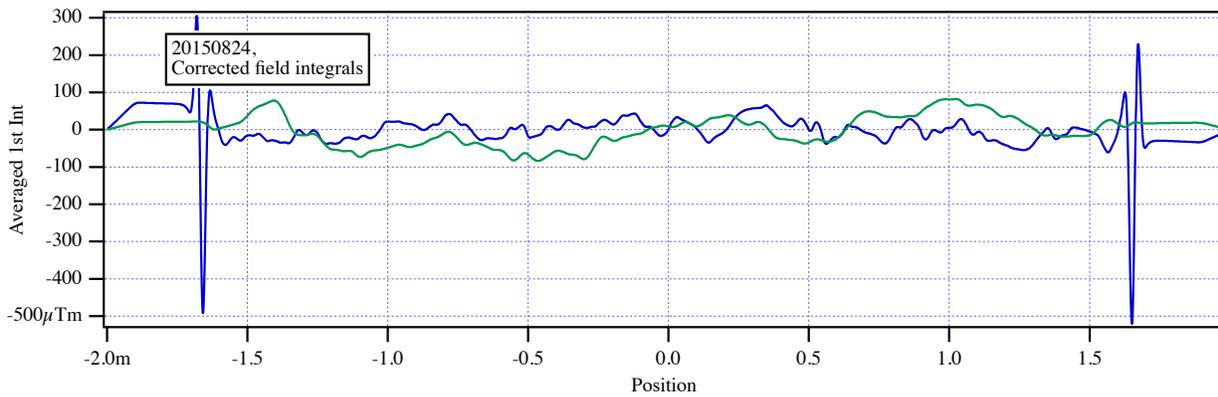
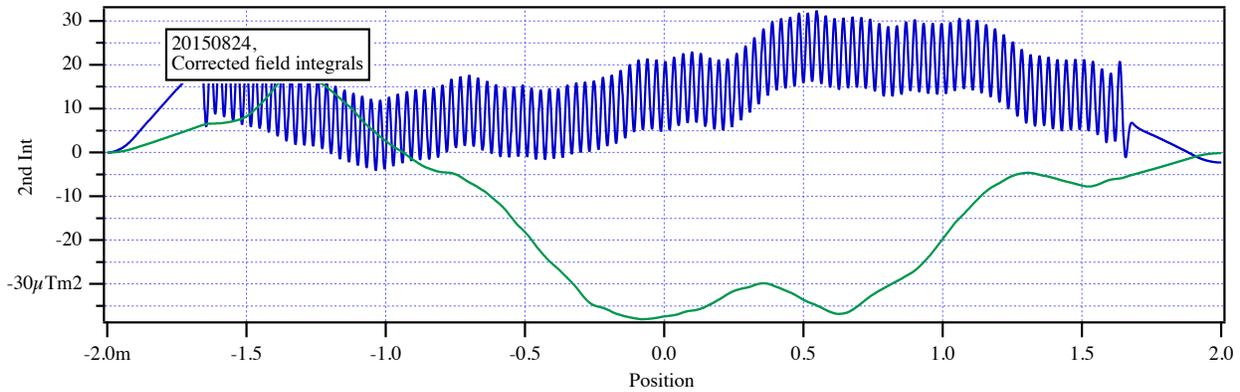
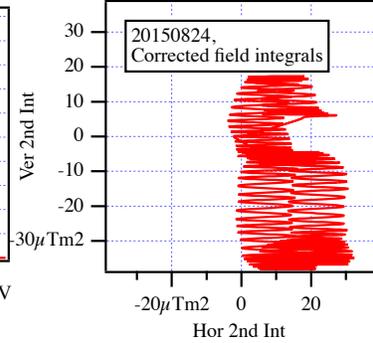
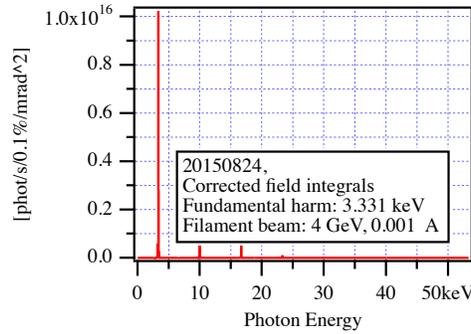


Figure 12: The measured fields, angles, trajectories and phase errors for the HXU-32 at 20 mm gap with the beam path corrected by virtual coils.



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HXU-32

Period: 32 mm

Gap: 25 mm

Beff: 0.18774 T

20150824,

Without correction coils

1st Int Ix : 7.95 [μ Tm]

1st Int Iz : -102.5 [μ Tm]

2nd Int Jx : -47.27 [μ Tm²]

2nd Int Jz : -274.56 [μ Tm²]

Beam energy: 4 GeV

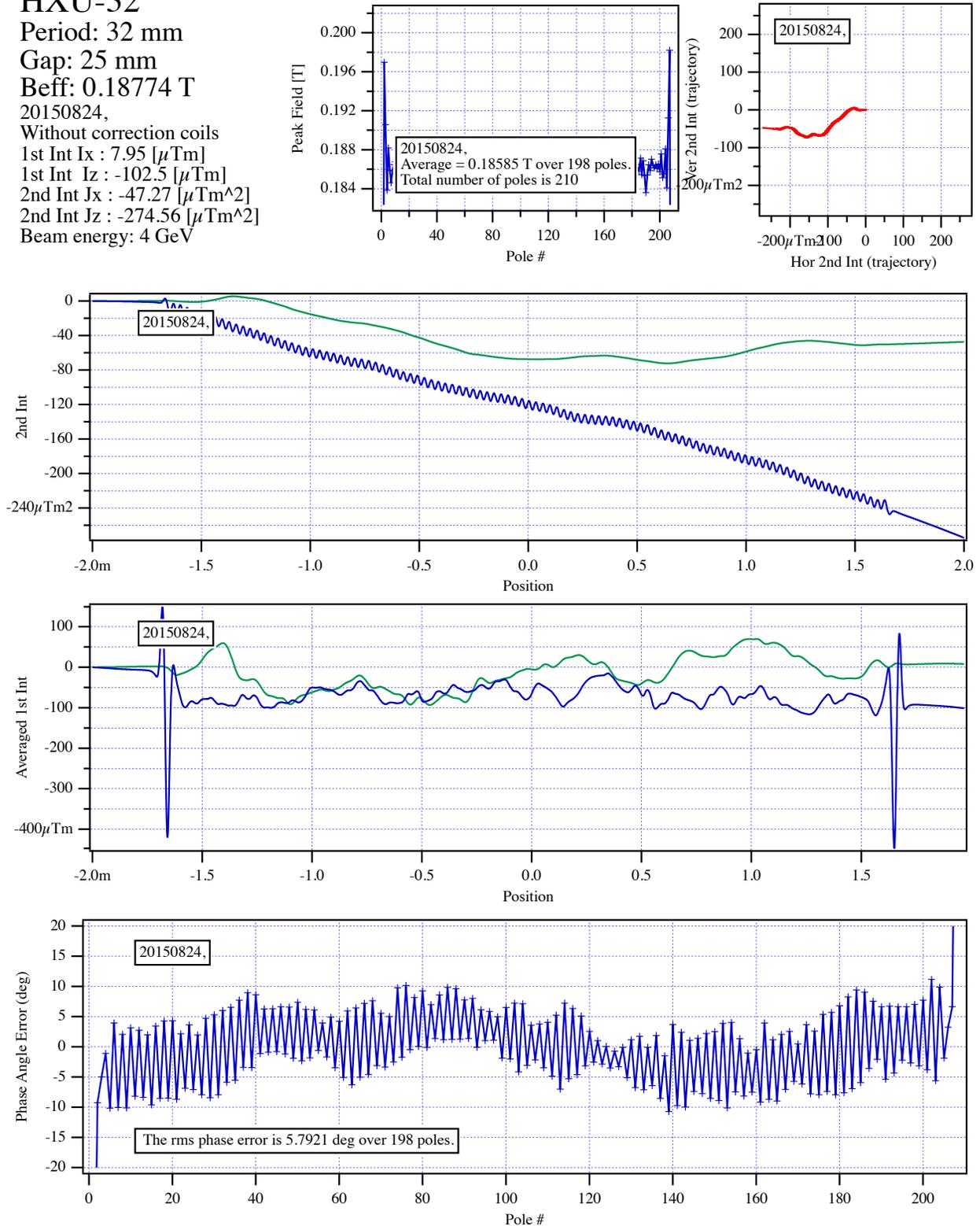
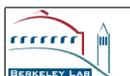


Figure 13: The measured fields, angles, trajectories and phase errors for the HXU-32 at 25 mm gap.



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HXU-32

Period: 32 mm

Gap: 25 mm

Beff: 0.18774 T

20150824,

With 0.1 m coils at ends of scan

US H-Coil : 20.2 [μ Tm]

US V-Coil : -33.94 [μ Tm]

DS H-Coil : -12.25 [μ Tm]

DS V-Coil : -68.55 [μ Tm]

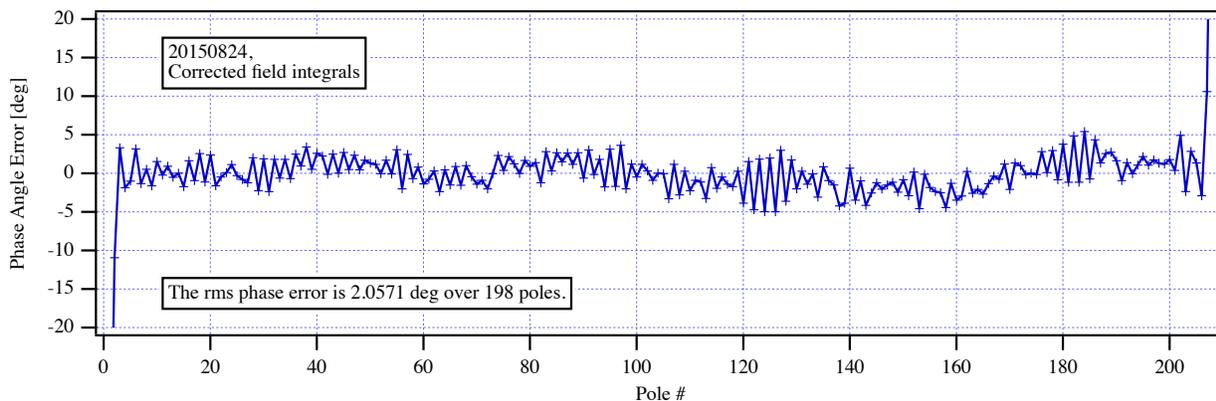
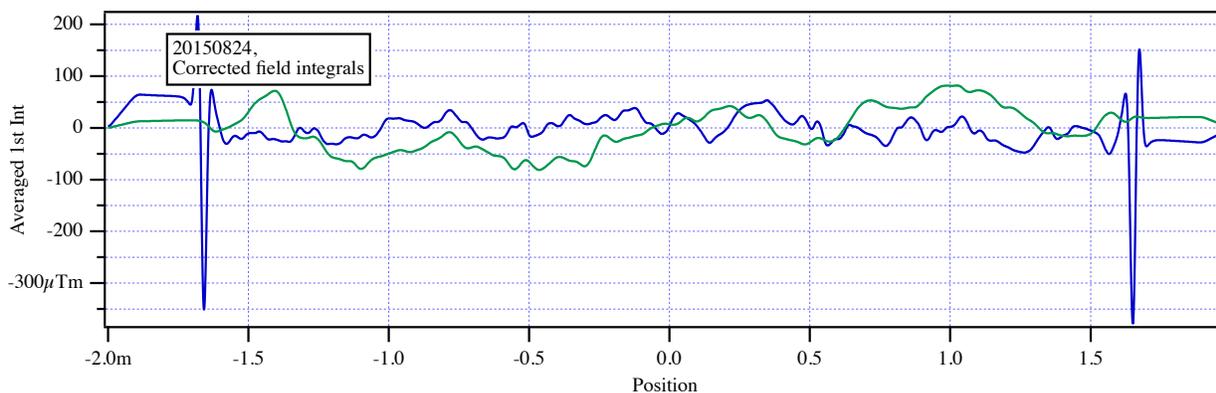
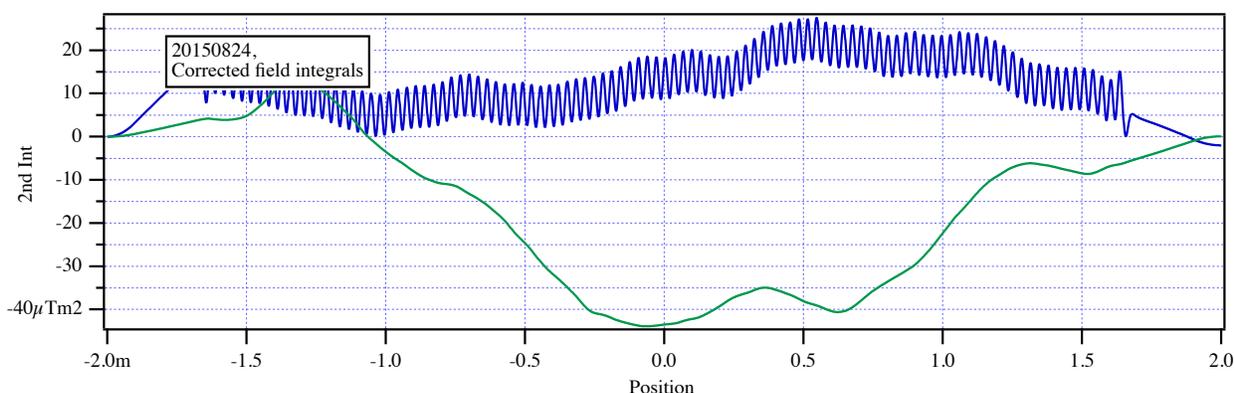
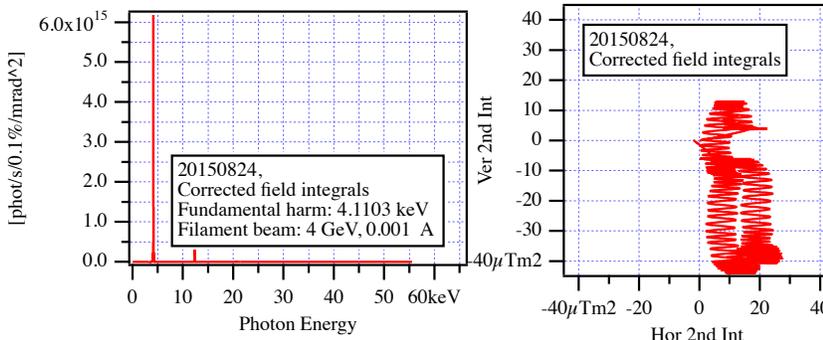


Figure 14: The measured fields, angles, trajectories and phase errors for the HXU-32 at 25 mm gap with the beam path corrected by virtual coils.