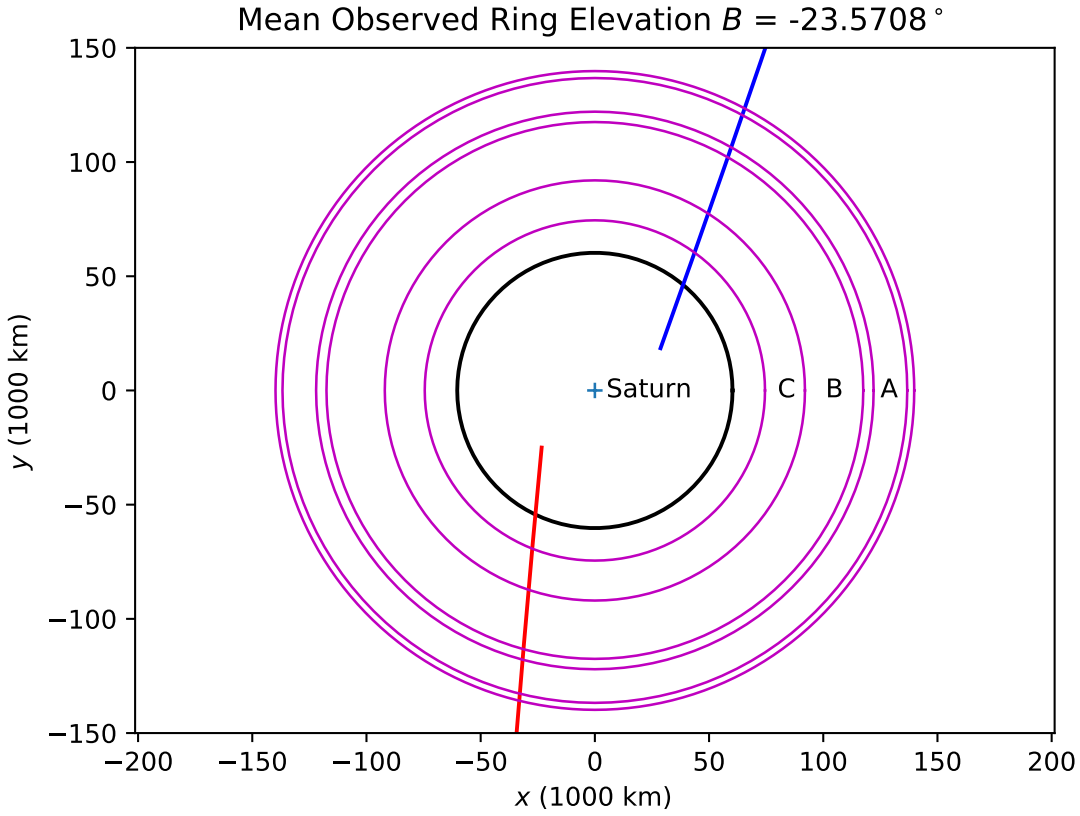
RSS_2005_123_K34_E

Rev007 Cassini Radio Science Ring Occultation: Geometry, Data Calibration, and Reconstructed Optical Depth and Phase Shift Profiles at 1.0 Resolution

January 7, 2019



The radio occultation track as seen looking down on the ring plane. The solid red track is relative to a reference direction defined by the direction to Earth, The dashed blue track is relative to a reference direction defined by the ascending node of J2000 on the ring plane.

Symbol	Parameter Name
t_{OET}	OBSERVED EVENT TIME
t_{RET}	RING EVENT TIME
t_{SET}	SPACECRAFT EVENT TIME
ρ	RING RADIUS
ϕ_{RL}	RING LONGITUDE
ϕ_{ORA}	OBSERVED RING AZIMUTH
B	OBSERVED RING ELEVATION
D	SPACECRAFT TO RING INTERCEPT DISTANCE
$\partial\rho/\partial t$	RING INTERCEPT RADIAL VELOCITY
$\partial\theta/\partial t$	RING INTERCEPT AZIMUTHAL VELOCITY
F	FRESNEL SCALE
R_{impact}	IMPACT RADIUS
r_x	SPACECRAFT POSITION X
r_y	SPACECRAFT POSITION Y
r_z	SPACECRAFT POSITION Z
v_x	SPACECRAFT VELOCITY X
v_y	SPACECRAFT VELOCITY Y
v_z	SPACECRAFT VELOCITY Z

Table 1: Glossary of parameters in file RSS_2005_123_K34_E_GEO.TAB. See companion label (.LBL) file for description of parameters.

Symbol	Parameter Name
t_{OET}	OBSERVED EVENT TIME
f_{sky}	SKY FREQUENCY
f_{resid}	RESIDUAL FREQUENCY
P_{free}	FREESPACE POWER

Table 2: Glossary of calibration data in file RSS_2005_123_K34_E_CAL.TAB. See companion label (.LBL) file for description of the data.

Symbol	Parameter Name
ρ	RING RADIUS
$\Delta\rho$	RADIUS CORRECTION
ϕ_{RL}	RING LONGITUDE
ϕ_{ORA}	OBSERVED RING AZIMUTH
τ	NORMAL OPTICAL DEPTH
ϕ	PHASE SHIFT
τ_{TH}	NORMAL OPTICAL DEPTH THRESHOLD
t_{OET}	OBSERVED EVENT TIME
t_{RET}	RING EVENT TIME
t_{SET}	SPACECRAFT EVENT TIME
B	OBSERVED RING ELEVATION

Table 3: Glossary of optical depth, phase shift, and selected geometry parameters contained in files RSS_2005_123_K34_E_TAU_1.0KM.TAB. See companion label (.LBL) files for description of the data.

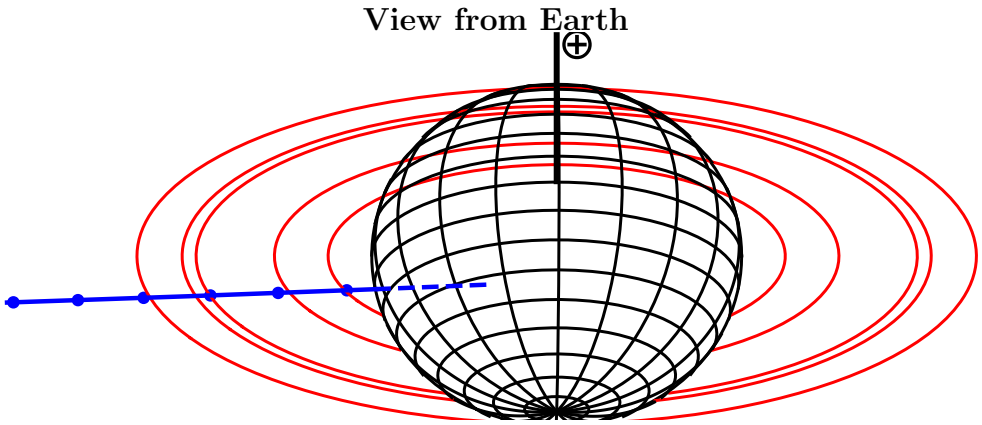


Fig. 1: Earth view of the occultation geometry parameters in RSS_2005_123_K34_E_GEO.TAB.

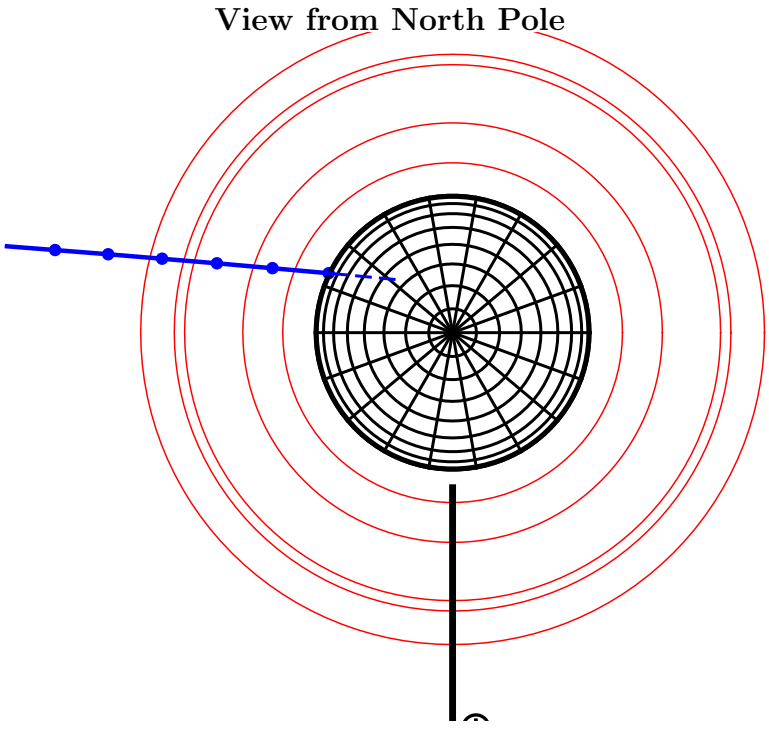


Fig. 2: See caption of Figure 1a. ⊕

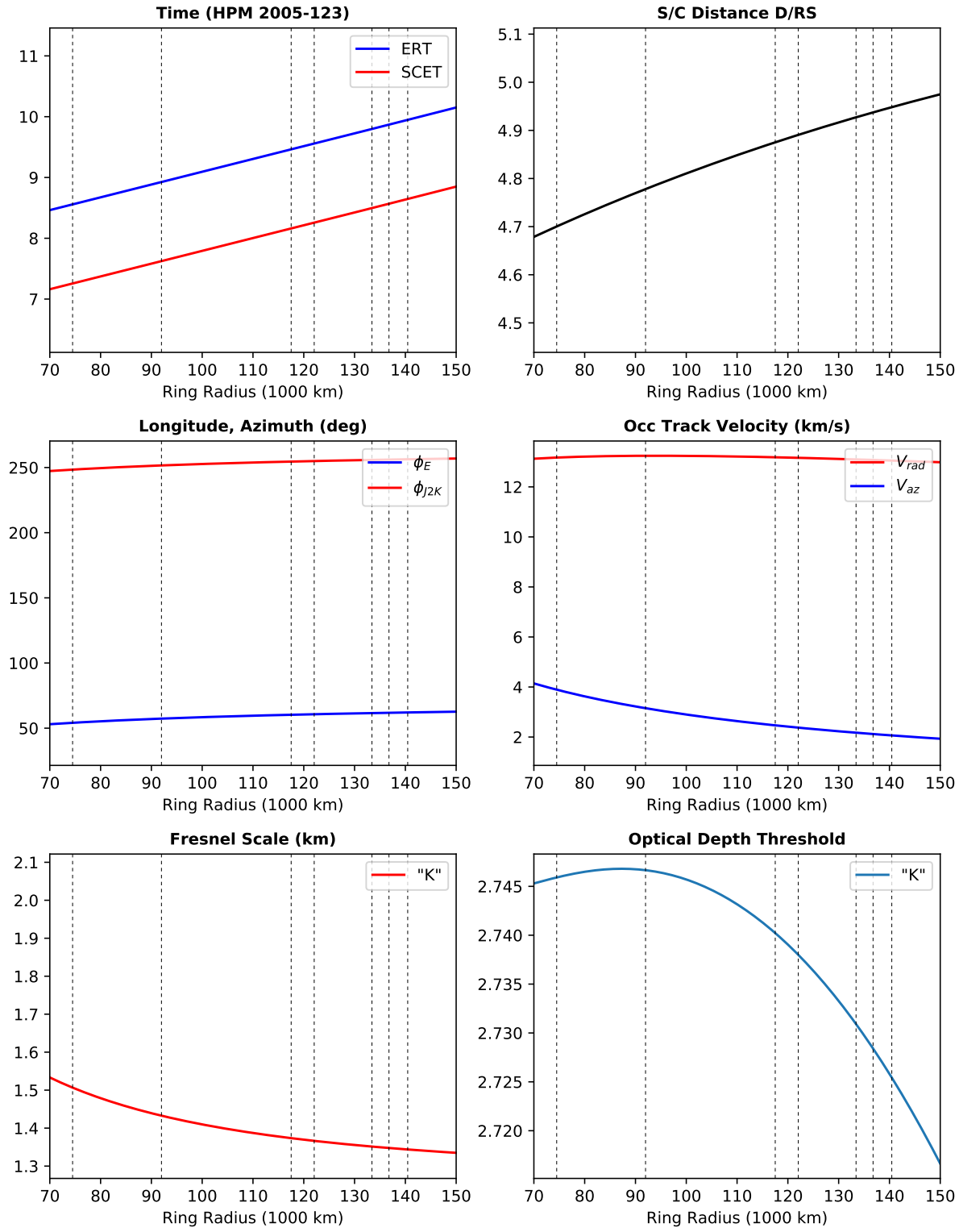


Fig. 3: Calibration data in file RSS_2005_123_K34_E_CAL.TAB. The frequency residuals data (the smooth curve, in the second panel) is used to steer the carrier signal to the middle of the recording bandwidth. The free-space power data (the smooth curve in the third panel) is used to normalize signal power measurements so that the corresponding optical depth has nearly zero value in the absence of rings. Least-square fitting techniques to frequency and power estimates of the direct signal (the green curves in the second and third panels, respectively) are used to compute the calibration data.

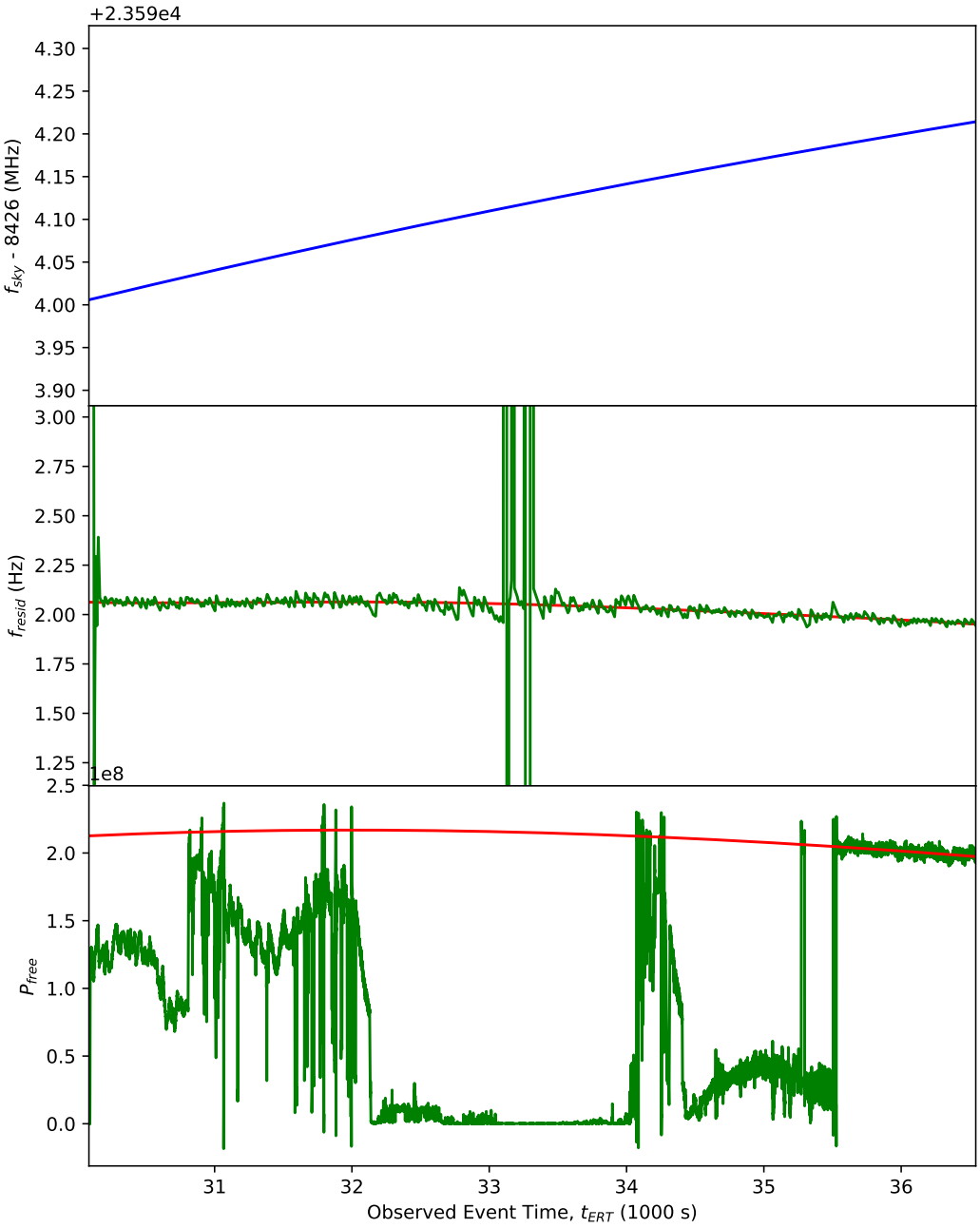


Fig. 4: Ring radius correction and selected occultation geometry parameters contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TAB (solid green).

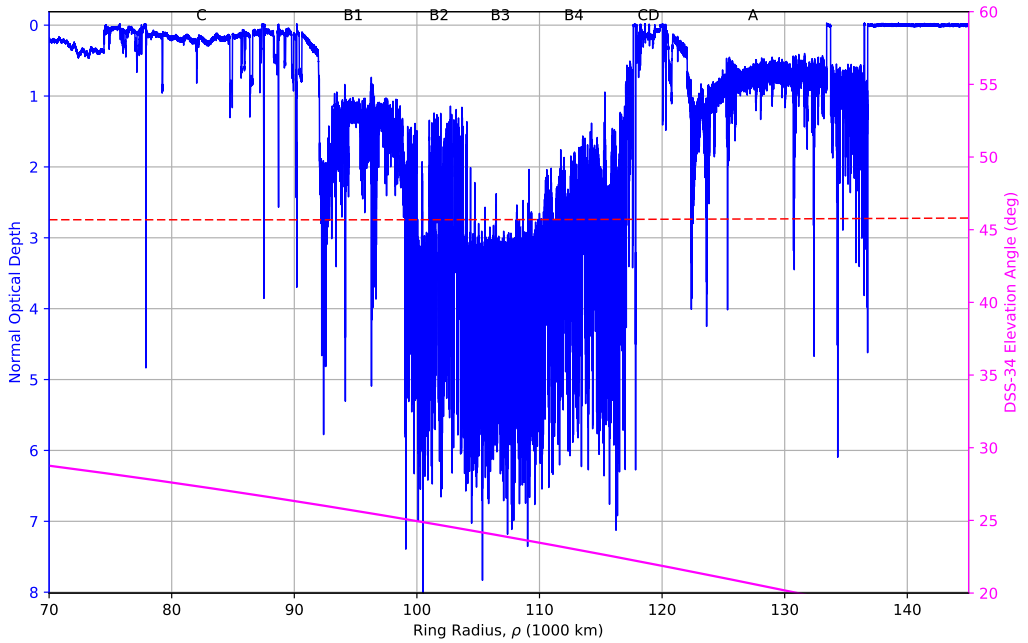


Fig. 5: Rev7-E normal optical depth profiles reconstructed to remove diffraction effects at 1 km resolution contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TABThe 1 km resolution profile is plotted in green.

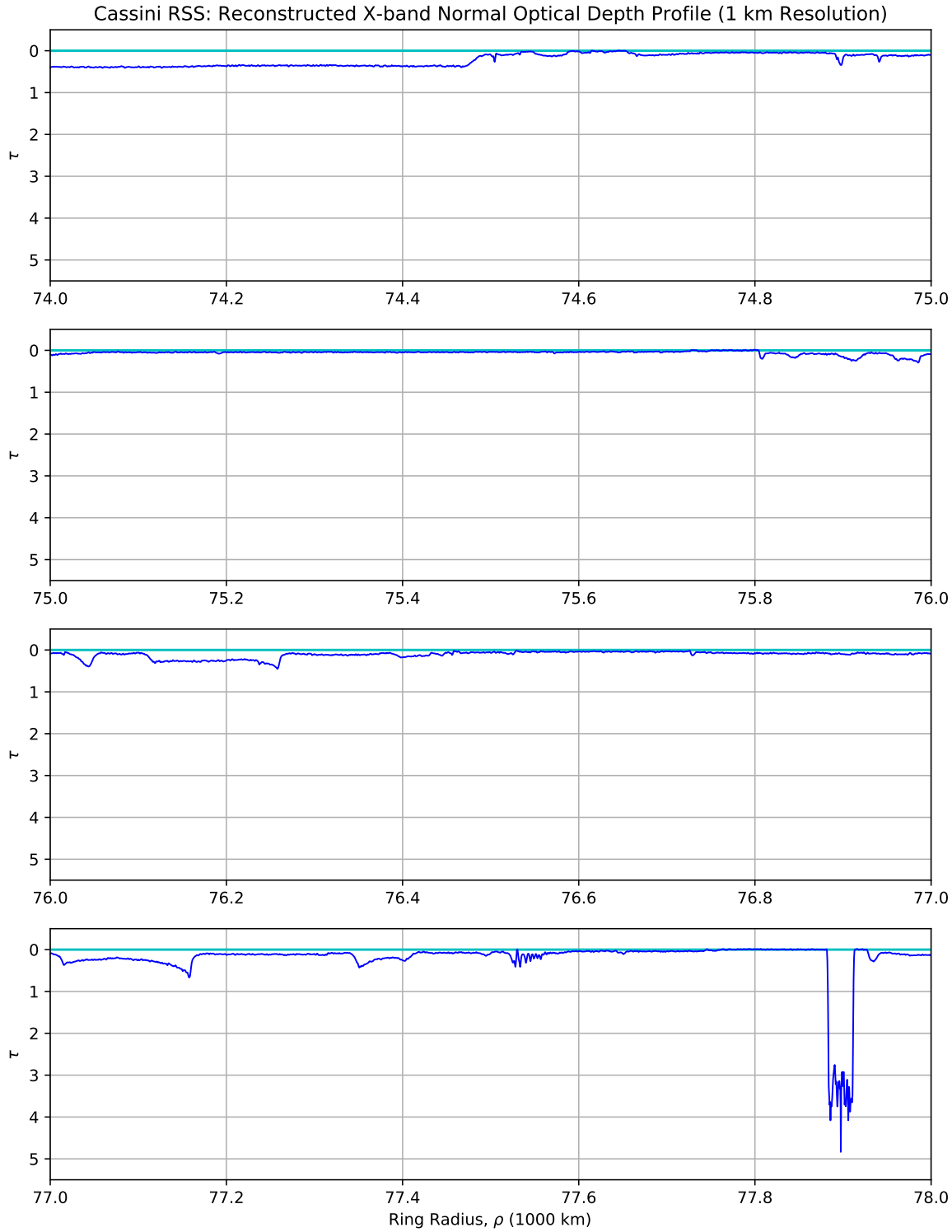


Fig. 6: Rev7-E normal optical depth profiles reconstructed to remove diffraction effects at 1 km resolution contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TAB. The 1 km resolution profile is plotted in green.

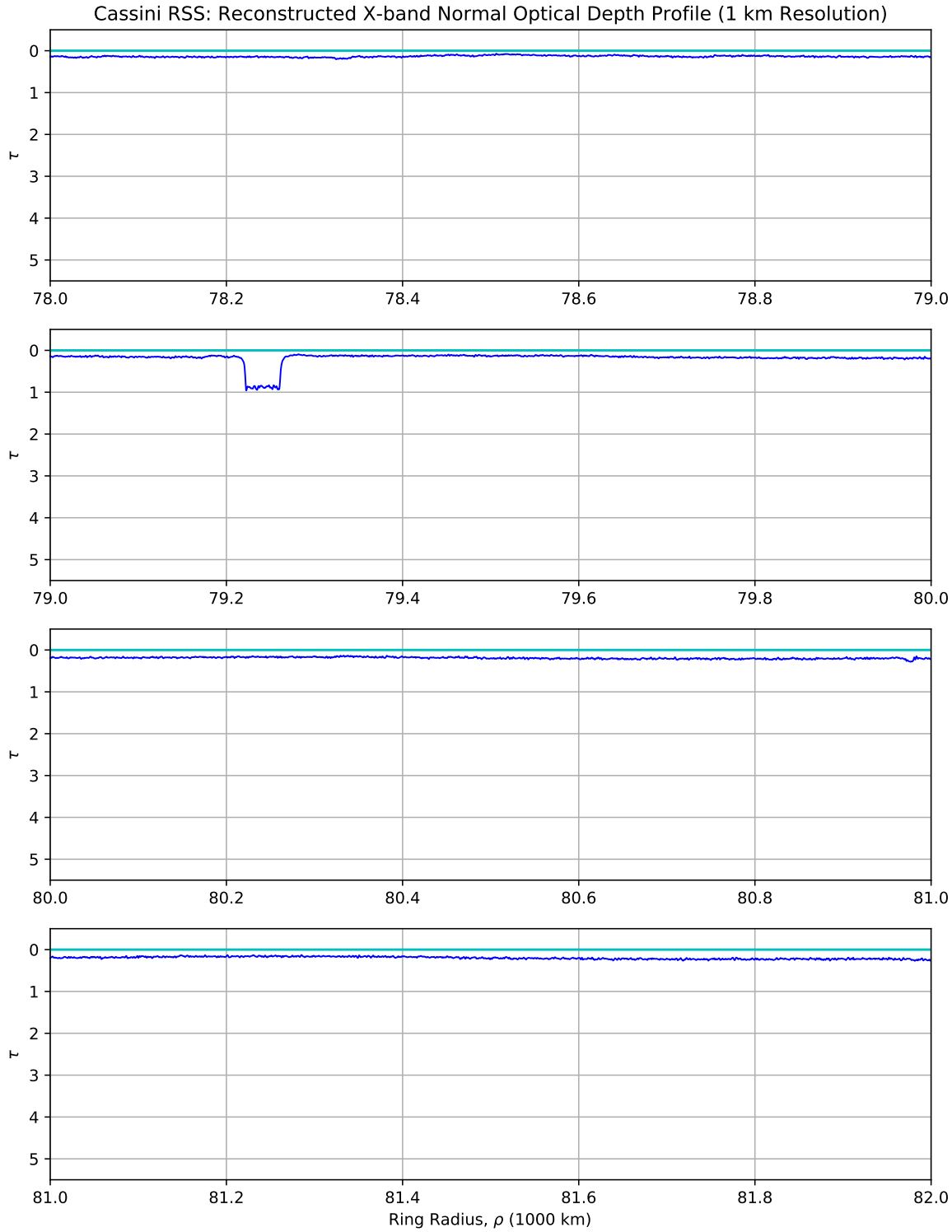


Fig. 7: Rev7-E normal optical depth profiles reconstructed to remove diffraction effects at 1 km resolution contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TAB. The 1 km resolution profile is plotted in green.

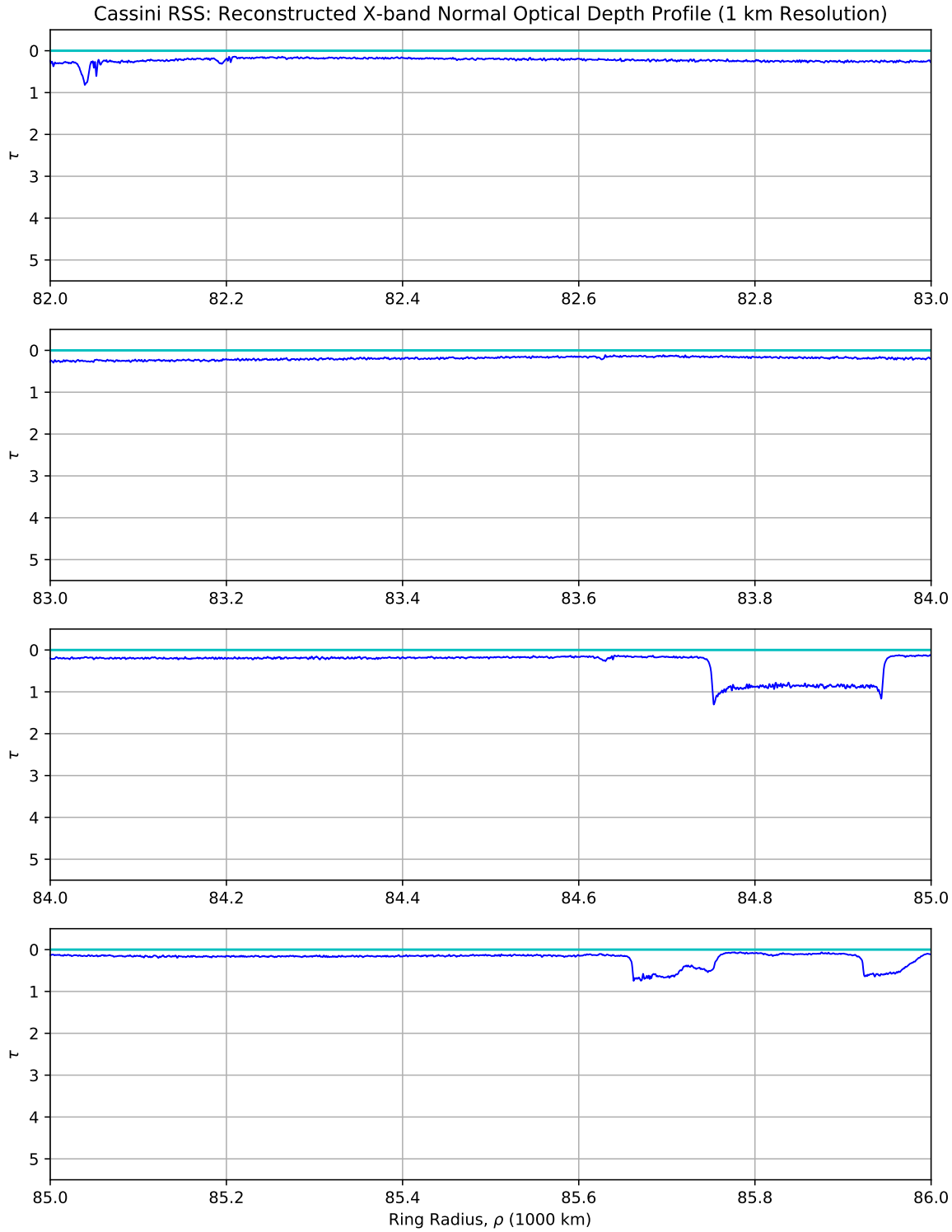


Fig. 8: Rev7-E normal optical depth profiles reconstructed to remove diffraction effects at 1 km resolution (file RSS_2005_123_K34_E_TAU_1.0KM.TAB). The 1 km resolution profile is plotted in green.

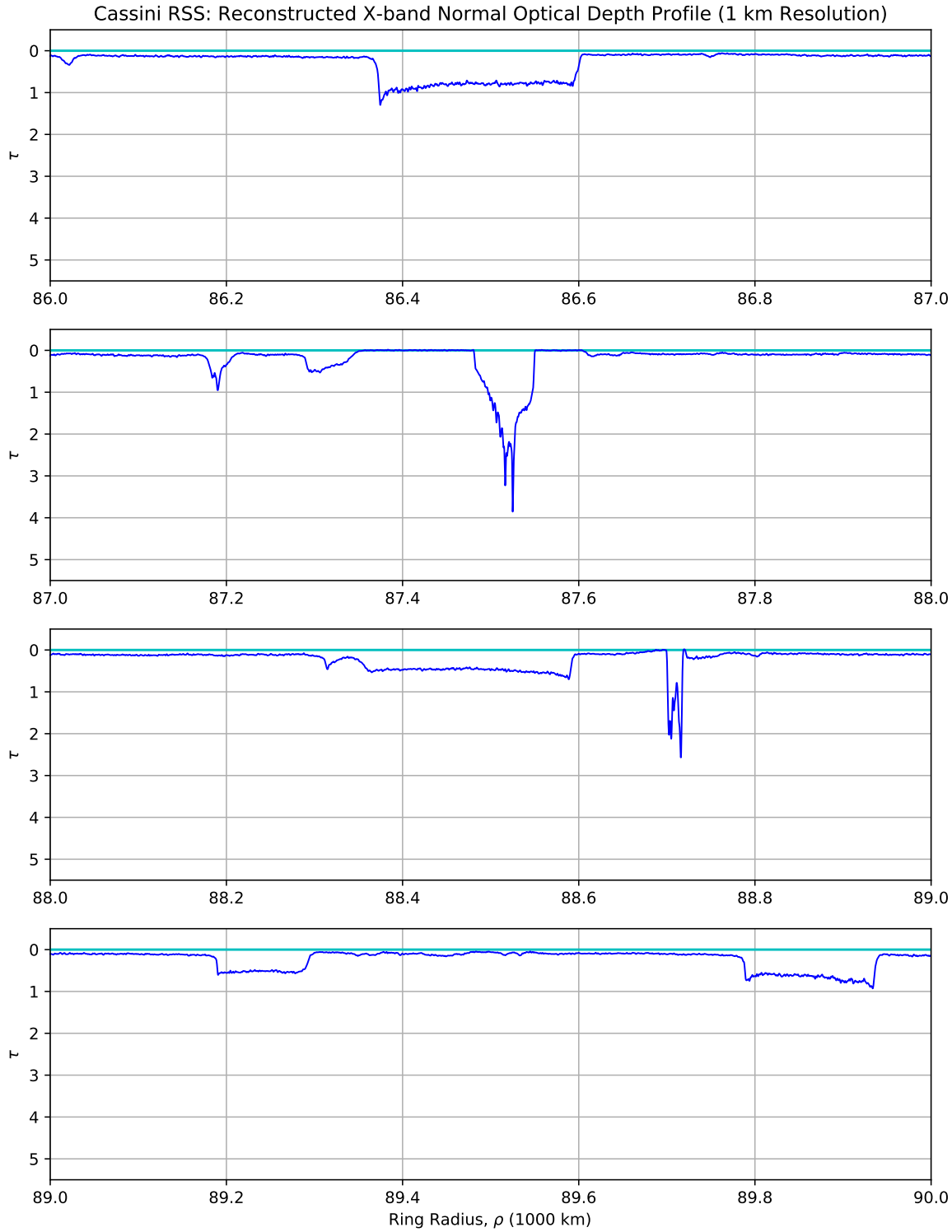


Fig. 9: Rev7-E normal optical depth profiles reconstructed to remove diffraction effects at 1 km resolution contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TAB. The 1 km resolution profile is plotted in green.

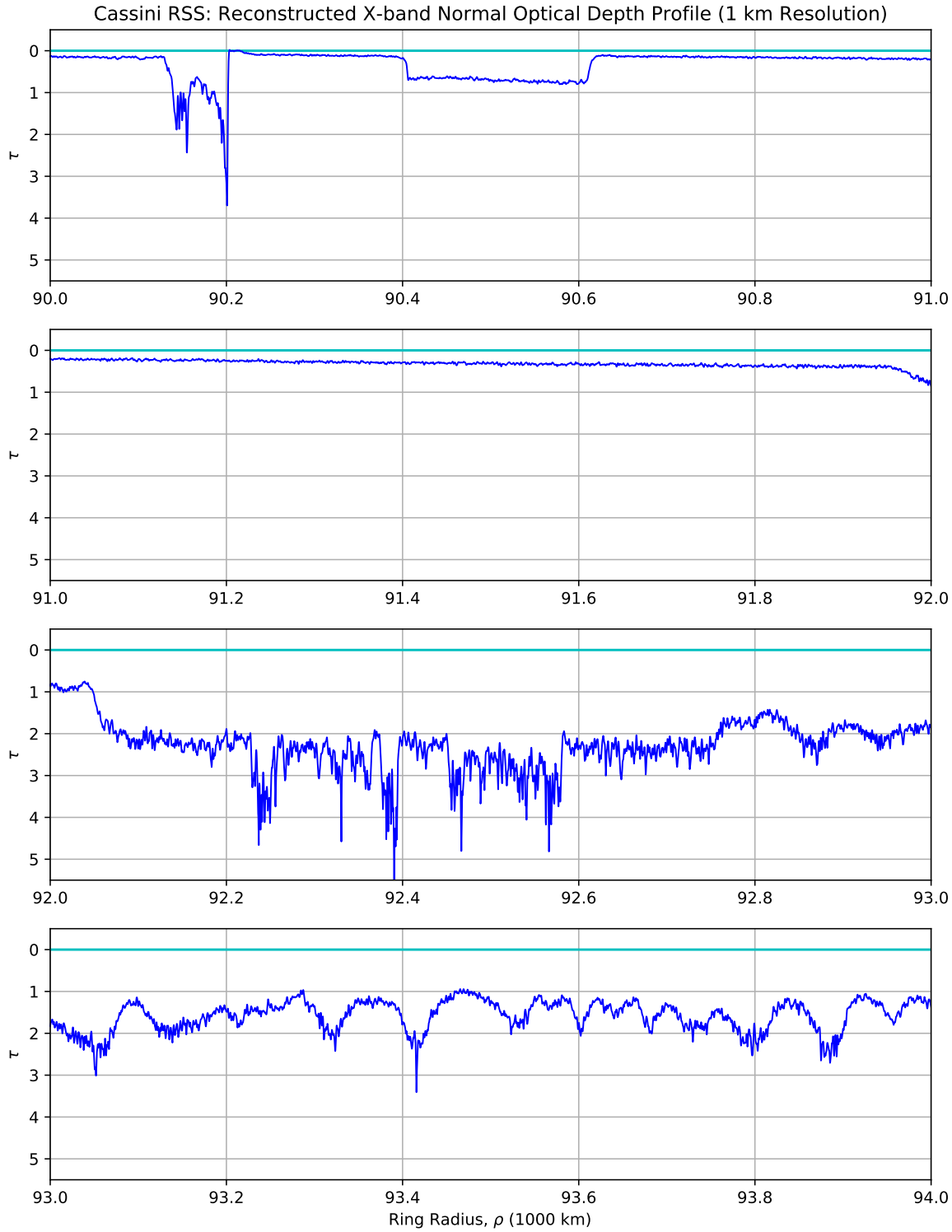


Fig. 10: Rev7-E Phase shift profile reconstructed to remove diffraction effects at 1 km resolution contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TAB. The 1 km resolution profile is plotted in solid green.

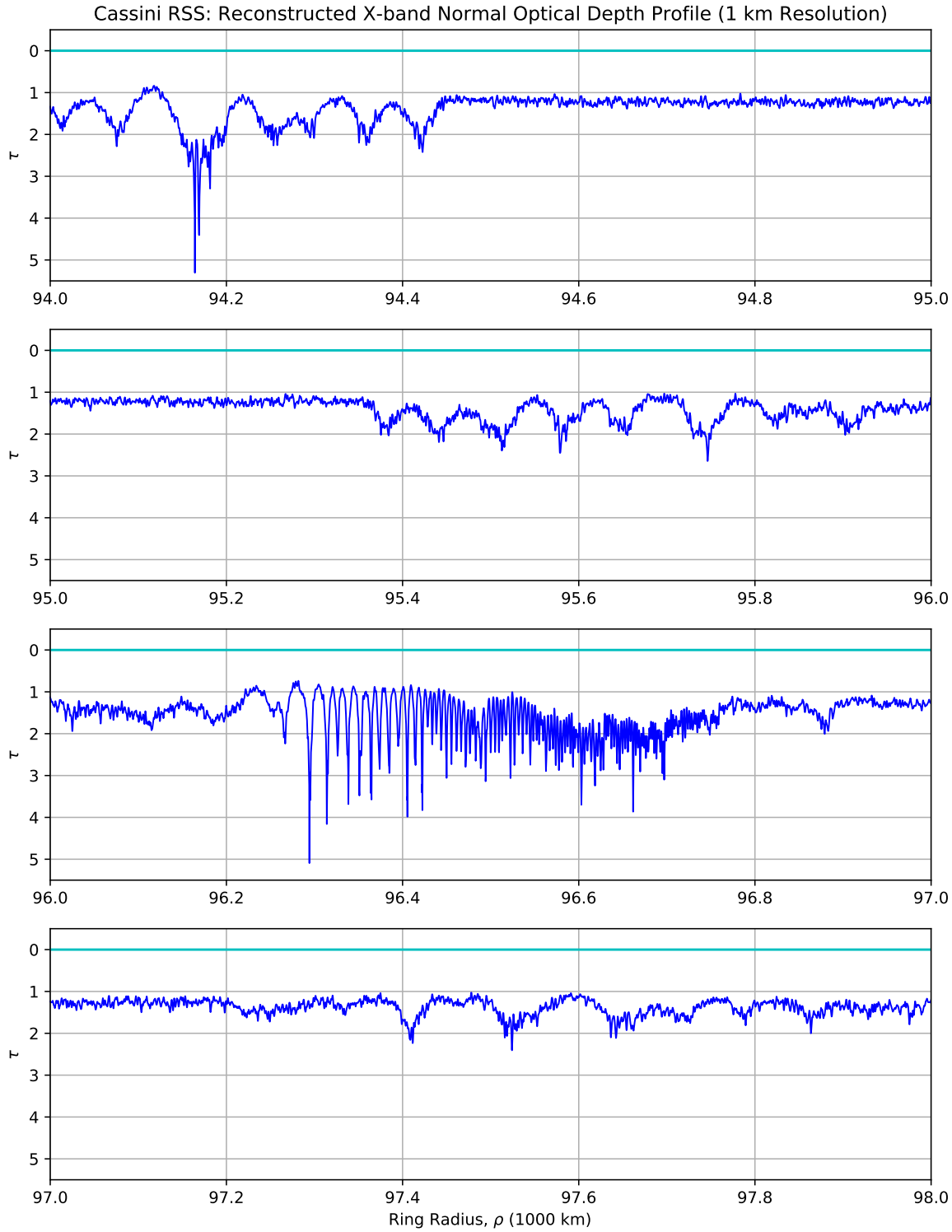


Fig. 11: Rev7-E Phase shift profile reconstructed to remove diffraction effects at 1 km resolution contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TAB. The 1 km resolution profile is plotted in solid green.

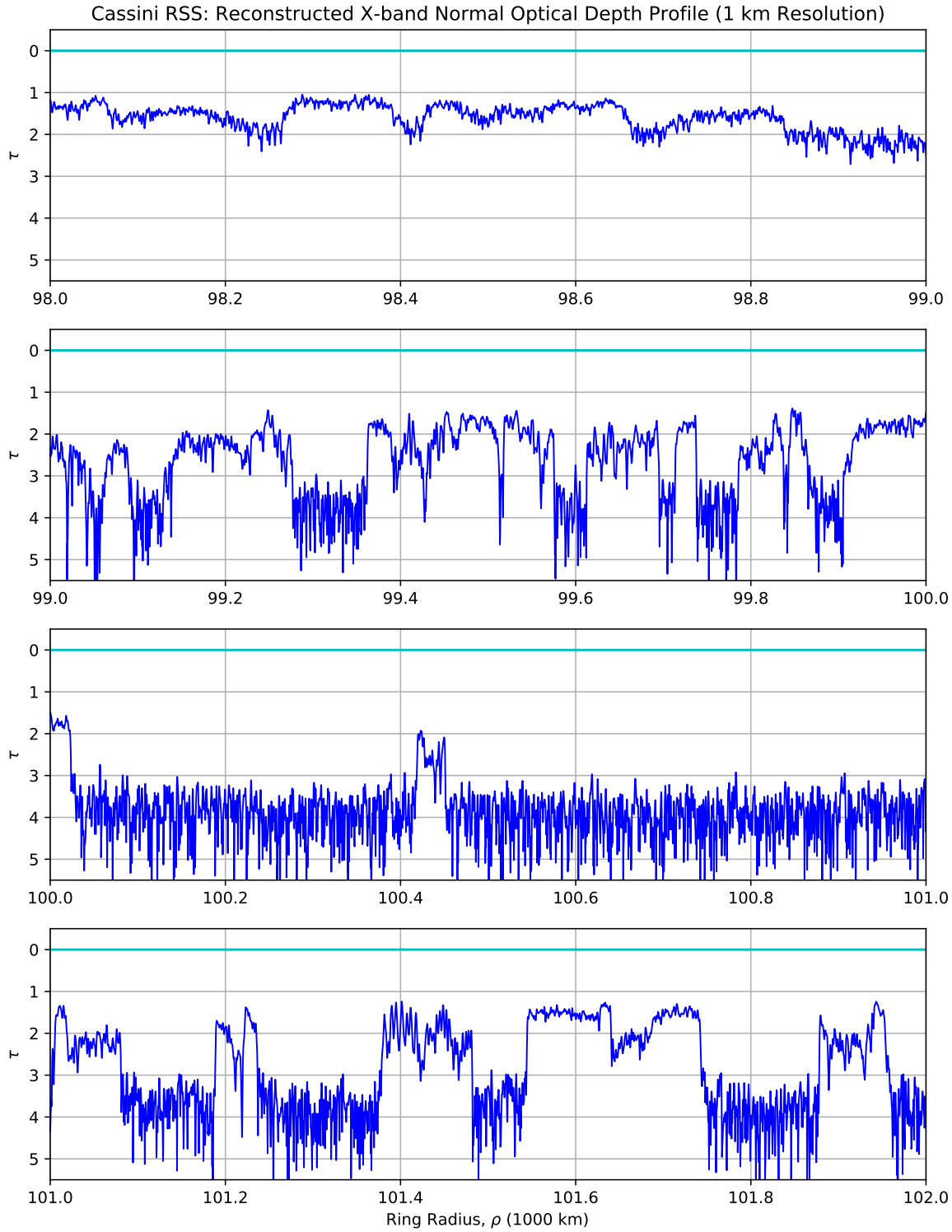


Fig. 12: Rev7-E Phase shift profile reconstructed to remove diffraction effects at 1 km resolution contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TAB. The 1 km resolution profile is plotted in solid green.

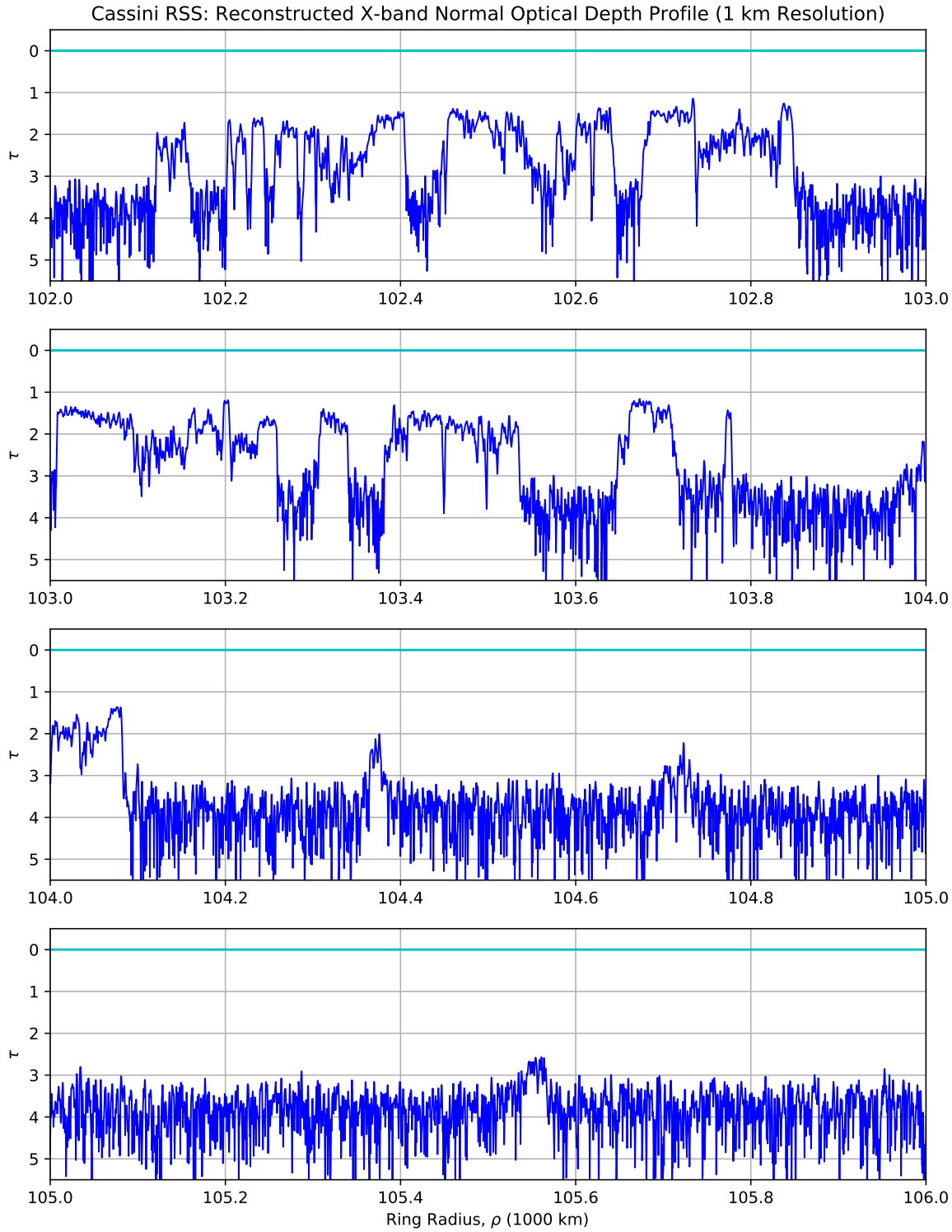


Fig. 13: Rev7-E Phase shift profile reconstructed to remove diffraction effects at 1 km resolution contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TAB. The 1 km resolution profile is plotted in solid green.

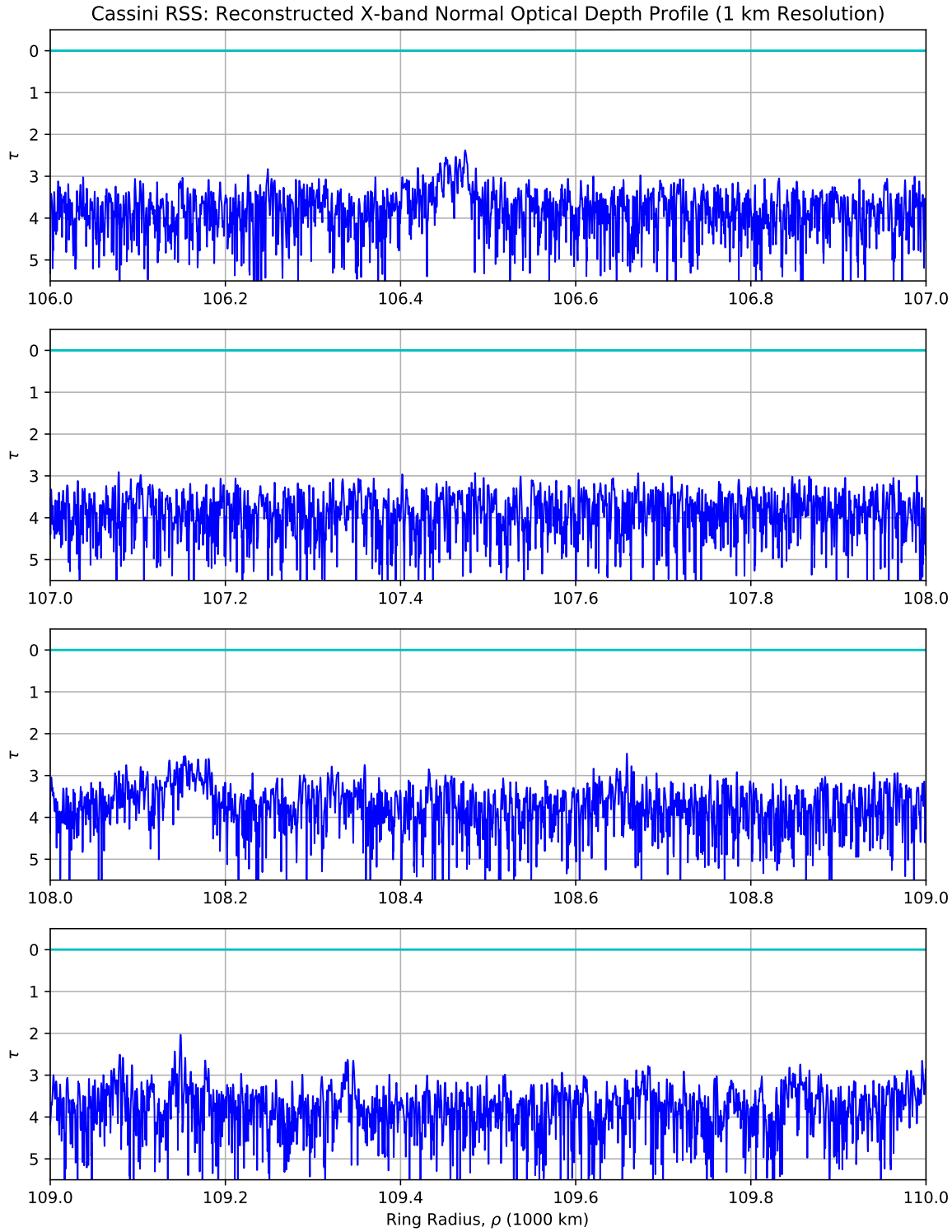


Fig. 14: Rev7-E Phase shift profile reconstructed to remove diffraction effects at 1 km resolution contained in the file RSS_2005_123_K34_E_TAU_1.0KM.TAB. The 1 km resolution profile is plotted in solid green.