



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 13, 2026 – 09:18 AM UTC

PDB ID : 1UMW / pdb_00001umw
Title : Structure of a human Plk1 Polo-box domain/phosphopeptide complex
Authors : Rellos, P.; Elia, A.; Yaffe, M.B.; Smerdon, S.J.
Deposited on : 2003-08-29
Resolution : 1.90 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

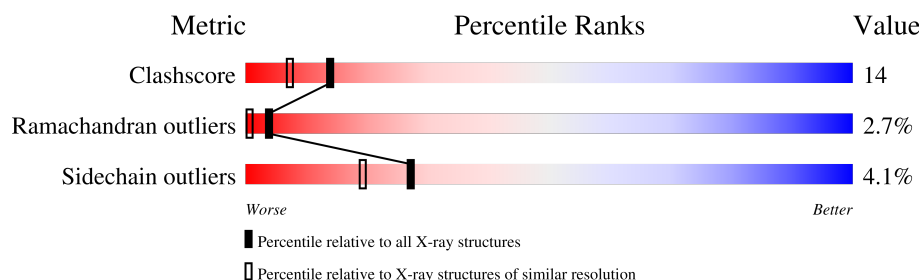
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	237	
1	B	237	
2	E	7	
2	F	7	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3983 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called SERINE/THREONINE-PROTEIN KINASE PLK.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	223	Total	C	N	O	S	0	0	1
			1798	1140	311	337	10			
1	B	223	Total	C	N	O	S	0	0	1
			1798	1140	311	337	10			

- Molecule 2 is a protein called PEPTIDE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	E	7	Total	C	N	O	P	S	0	0	0
			56	33	8	13	1	1			
2	F	7	Total	C	N	O	P	S	0	0	0
			56	33	8	13	1	1			

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	163	Total	O	0	0
			163	163		
3	B	97	Total	O	0	0
			97	97		
3	E	11	Total	O	0	0
			11	11		
3	F	4	Total	O	0	0
			4	4		

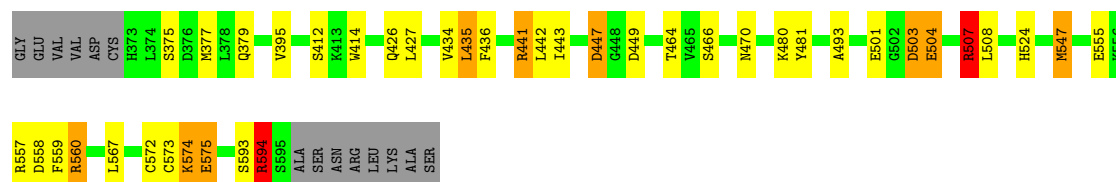
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

Note EDS was not executed.

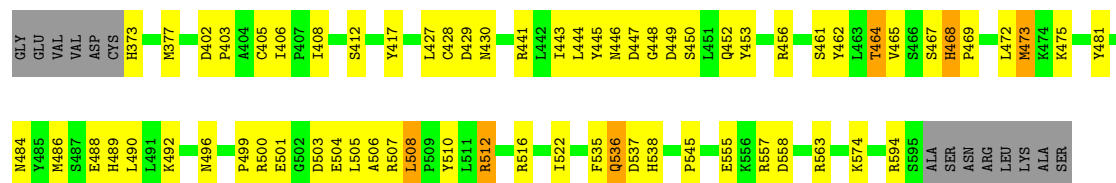
• Molecule 1: SERINE/THREONINE-PROTEIN KINASE PLK

Chain A: 



• Molecule 1: SERINE/THREONINE-PROTEIN KINASE PLK

Chain B: 



• Molecule 2: PEPTIDE

Chain E: 



• Molecule 2: PEPTIDE

Chain F: 



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	62.35Å 79.52Å 61.99Å 90.00° 93.26° 90.00°	Depositor
Resolution (Å)	15.00 – 1.90	Depositor
% Data completeness (in resolution range)	97.9 (15.00-1.90)	Depositor
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	REFMAC 5.0	Depositor
R, R_{free}	0.230 , 0.260	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3983	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: TPO

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.51	1/1835 (0.1%)	0.88	4/2482 (0.2%)
1	B	0.42	1/1835 (0.1%)	0.83	2/2482 (0.1%)
2	E	0.40	0/45	0.62	0/57
2	F	0.38	0/45	0.45	0/57
All	All	0.46	2/3760 (0.1%)	0.85	6/5078 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	F	0	1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	594	ARG	C-N	-6.86	1.23	1.33
1	A	594	ARG	C-N	-6.62	1.24	1.33

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	574	LYS	N-CA-C	-9.95	97.39	110.43
1	B	536	GLN	N-CA-C	6.17	118.08	111.36
1	A	470	ASN	N-CA-C	5.40	117.59	111.11
1	B	535	PHE	N-CA-C	5.34	116.79	110.97
1	A	507	ARG	N-CA-C	5.30	122.10	110.80
1	A	503	ASP	CB-CA-C	-5.20	110.60	116.63

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	F	4	SER	Mainchain

5.2 Too-close contacts ⓘ

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1798	0	1781	43	0
1	B	1798	0	1781	62	0
2	E	56	0	55	2	0
2	F	56	0	55	0	0
3	A	163	0	0	18	0
3	B	97	0	0	24	0
3	E	11	0	0	0	0
3	F	4	0	0	0	0
All	All	3983	0	3672	106	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 14.

All (106) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:507:ARG:HA	3:B:2049:HOH:O	1.34	1.28
1:A:447:ASP:CG	3:A:2054:HOH:O	1.77	1.26
1:A:447:ASP:OD1	3:A:2054:HOH:O	1.62	1.08
1:B:447:ASP:O	1:B:449:ASP:N	1.86	1.08
1:B:488:GLU:HB3	3:B:2040:HOH:O	1.49	1.07
1:B:507:ARG:HD3	3:B:2049:HOH:O	1.58	1.03
1:A:574:LYS:O	1:A:575:GLU:HB2	1.58	1.01
1:B:469:PRO:HA	3:B:2033:HOH:O	1.68	0.93
1:B:484:ASN:HB3	3:B:2036:HOH:O	1.78	0.83
1:A:507:ARG:HB3	3:A:2102:HOH:O	1.79	0.81
1:A:379:GLN:HG2	3:A:2007:HOH:O	1.81	0.81
1:A:395:VAL:HG23	3:A:2018:HOH:O	1.81	0.79

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:557:ARG:NH1	3:B:2068:HOH:O	2.15	0.79
1:B:447:ASP:O	1:B:447:ASP:OD1	2.01	0.78
1:B:501:GLU:HB2	3:B:2044:HOH:O	1.84	0.76
1:B:500:ARG:HG2	1:B:501:GLU:H	1.51	0.72
1:B:429:ASP:O	1:B:430:ASN:HB2	1.87	0.72
1:A:507:ARG:NH2	3:A:2105:HOH:O	2.21	0.70
1:A:574:LYS:O	1:A:575:GLU:CB	2.31	0.70
1:A:559:PHE:O	1:A:560:ARG:HD3	1.92	0.68
1:A:547:MET:HA	1:A:547:MET:HE2	1.75	0.67
1:A:503:ASP:O	1:A:504:GLU:HB2	1.96	0.66
1:A:449:ASP:OD2	1:A:464:THR:CG2	2.43	0.66
1:A:547:MET:HA	1:A:547:MET:CE	2.26	0.65
1:A:449:ASP:CG	1:A:464:THR:HG23	2.21	0.65
1:B:512:ARG:HD3	3:B:2057:HOH:O	1.96	0.65
1:A:480:LYS:HE3	3:A:2079:HOH:O	1.97	0.65
1:B:469:PRO:CD	3:B:2034:HOH:O	2.46	0.64
1:A:503:ASP:O	1:A:504:GLU:CB	2.47	0.63
1:A:574:LYS:O	1:A:575:GLU:OE1	2.18	0.62
1:A:441:ARG:CZ	3:A:2050:HOH:O	2.48	0.61
1:B:427:LEU:C	1:B:429:ASP:H	2.07	0.61
1:A:434:VAL:HG11	1:A:436:PHE:CZ	2.36	0.61
1:B:469:PRO:HD2	3:B:2034:HOH:O	2.02	0.60
1:B:456:ARG:HG3	3:B:2032:HOH:O	2.00	0.59
1:B:449:ASP:OD1	1:B:464:THR:HG22	2.02	0.59
1:B:469:PRO:CA	3:B:2033:HOH:O	2.38	0.59
1:A:593:SER:O	1:A:594:ARG:C	2.47	0.58
1:A:441:ARG:NH1	3:A:2050:HOH:O	2.37	0.58
1:A:442:LEU:C	1:A:443:ILE:HD12	2.29	0.58
1:B:489:HIS:CD2	3:B:2040:HOH:O	2.57	0.57
1:A:449:ASP:CG	1:A:464:THR:CG2	2.78	0.56
1:B:427:LEU:C	1:B:429:ASP:N	2.64	0.56
1:A:435:LEU:HD13	1:A:441:ARG:HH11	1.72	0.55
1:A:441:ARG:HB3	3:A:2041:HOH:O	2.07	0.54
1:B:417:TYR:HE1	1:B:481:TYR:HE1	1.56	0.53
1:B:469:PRO:N	3:B:2034:HOH:O	2.41	0.53
1:B:468:HIS:NE2	1:B:473:MET:HE3	2.23	0.53
1:A:481:TYR:HE1	3:A:2081:HOH:O	1.90	0.53
1:B:445:TYR:C	1:B:447:ASP:H	2.17	0.53
1:A:507:ARG:NH1	1:A:508:LEU:HD13	2.24	0.53
1:A:443:ILE:HD12	1:A:443:ILE:N	2.25	0.52
1:B:557:ARG:HH11	1:B:557:ARG:HG2	1.74	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:468:HIS:CD2	1:B:473:MET:HE3	2.46	0.50
1:A:493:ALA:O	3:A:2089:HOH:O	2.19	0.50
1:B:427:LEU:O	1:B:429:ASP:N	2.44	0.49
1:B:402:ASP:O	1:B:405:CYS:HB2	2.12	0.49
1:B:444:LEU:HG	3:B:2031:HOH:O	2.12	0.49
1:A:449:ASP:OD2	1:A:464:THR:HG23	2.12	0.49
1:B:447:ASP:C	1:B:449:ASP:N	2.64	0.49
1:B:503:ASP:H	1:B:507:ARG:HG3	1.77	0.48
1:B:507:ARG:O	1:B:508:LEU:HB2	2.12	0.48
1:A:567:LEU:HD22	1:A:572:CYS:HB3	1.95	0.48
1:B:408:ILE:HG12	1:B:500:ARG:HB3	1.96	0.47
1:B:503:ASP:O	1:B:505:LEU:N	2.48	0.47
1:A:573:CYS:C	1:A:574:LYS:O	2.55	0.47
1:B:484:ASN:CB	3:B:2036:HOH:O	2.52	0.47
1:B:405:CYS:SG	1:B:563:ARG:CZ	3.03	0.47
1:B:453:TYR:HB3	1:B:461:SER:OG	2.15	0.47
1:B:469:PRO:HB2	1:B:472:LEU:HB2	1.97	0.46
1:B:452:GLN:HE21	1:B:462:TYR:HE2	1.65	0.45
1:A:507:ARG:CD	1:A:507:ARG:C	2.89	0.45
1:B:453:TYR:OH	1:B:475:LYS:NZ	2.46	0.45
1:A:464:THR:HG22	1:A:466:SER:H	1.81	0.45
1:A:501:GLU:CG	3:A:2099:HOH:O	2.64	0.45
1:B:449:ASP:O	1:B:465:VAL:HG23	2.17	0.45
1:B:496:ASN:CB	3:B:2042:HOH:O	2.65	0.45
1:A:594:ARG:CB	3:A:2162:HOH:O	2.66	0.44
1:A:414:TRP:CD1	2:E:4:SER:HB3	2.53	0.44
1:B:469:PRO:HB3	3:B:2033:HOH:O	2.16	0.44
1:B:429:ASP:O	1:B:430:ASN:CB	2.57	0.44
1:B:467:SER:O	1:B:468:HIS:C	2.60	0.44
1:A:501:GLU:HG2	3:A:2099:HOH:O	2.17	0.43
1:B:496:ASN:N	3:B:2042:HOH:O	2.50	0.43
1:B:557:ARG:HH11	1:B:557:ARG:CG	2.30	0.43
1:B:469:PRO:CB	3:B:2033:HOH:O	2.65	0.43
1:B:496:ASN:HB3	3:B:2042:HOH:O	2.17	0.43
1:B:473:MET:HE2	3:B:2034:HOH:O	2.19	0.43
1:B:377:MET:CE	1:B:545:PRO:HD3	2.49	0.43
1:B:443:ILE:HG21	1:B:508:LEU:HD23	1.99	0.42
2:E:5:TPO:HA	2:E:6:PRO:HD3	1.76	0.42
1:A:449:ASP:OD2	1:A:464:THR:HG21	2.18	0.42
1:B:445:TYR:HB2	1:B:450:SER:HB2	2.02	0.42
1:B:412:SER:HB2	1:B:492:LYS:HG3	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:522:ILE:HD12	1:B:522:ILE:N	2.35	0.42
1:A:377:MET:HG3	3:A:2008:HOH:O	2.19	0.42
1:B:516:ARG:HD3	3:B:2055:HOH:O	2.18	0.41
1:B:441:ARG:CD	1:B:510:TYR:CD1	3.04	0.41
1:A:426:GLN:HG2	1:A:427:LEU:O	2.20	0.41
1:A:524:HIS:HD2	3:A:2151:HOH:O	2.04	0.41
1:B:403:PRO:O	1:B:406:ILE:HG13	2.20	0.41
1:A:507:ARG:HG2	3:A:2104:HOH:O	2.21	0.41
1:B:445:TYR:O	1:B:447:ASP:N	2.54	0.40
1:B:373:HIS:CB	3:B:2046:HOH:O	2.70	0.40
1:B:537:ASP:O	1:B:538:HIS:HB2	2.20	0.40
1:B:486:MET:HG2	1:B:490:LEU:HD12	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	221/237 (93%)	208 (94%)	9 (4%)	4 (2%)	6	1
1	B	221/237 (93%)	199 (90%)	14 (6%)	8 (4%)	2	0
2	E	4/7 (57%)	4 (100%)	0	0	100	100
2	F	4/7 (57%)	4 (100%)	0	0	100	100
All	All	450/488 (92%)	415 (92%)	23 (5%)	12 (3%)	4	1

All (12) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	504	GLU
1	A	575	GLU
1	B	448	GLY

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Mol	Chain	Res	Type
1	B	504	GLU
1	A	594	ARG
1	B	446	ASN
1	B	506	ALA
1	B	428	CYS
1	A	507	ARG
1	B	468	HIS
1	B	508	LEU
1	B	499	PRO

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	199/213 (93%)	189 (95%)	10 (5%)	22	14
1	B	199/213 (93%)	192 (96%)	7 (4%)	32	24
2	E	6/6 (100%)	6 (100%)	0	100	100
2	F	6/6 (100%)	6 (100%)	0	100	100
All	All	410/438 (94%)	393 (96%)	17 (4%)	27	19

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	375	SER
1	A	412	SER
1	A	435	LEU
1	A	441	ARG
1	A	447	ASP
1	A	547	MET
1	A	555	GLU
1	A	557	ARG
1	A	558	ASP
1	A	560	ARG
1	B	464	THR
1	B	473	MET

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Mol	Chain	Res	Type
1	B	512	ARG
1	B	536	GLN
1	B	555	GLU
1	B	558	ASP
1	B	574	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	379	GLN
1	A	426	GLN
1	A	468	HIS
1	A	524	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

2 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	TPO	E	5	2	8,10,11	1.81	2 (25%)	10,14,16	1.36	1 (10%)
2	TPO	F	5	2	8,10,11	1.97	2 (25%)	10,14,16	1.32	1 (10%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	TPO	E	5	2	-	0/9/11/13	-
2	TPO	F	5	2	-	2/9/11/13	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	F	5	TPO	O-C	3.61	1.33	1.20
2	E	5	TPO	O-C	3.48	1.33	1.20
2	F	5	TPO	P-O1P	3.42	1.61	1.50
2	E	5	TPO	P-O1P	3.04	1.59	1.50

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	5	TPO	O3P-P-O2P	2.81	118.35	107.80
2	E	5	TPO	OG1-P-O1P	-2.29	101.16	109.33

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	F	5	TPO	O-C-CA-CB
2	F	5	TPO	C-CA-CB-CG2

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	5	TPO	1	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.