



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 13, 2026 – 11:27 AM UTC

PDB ID : 2F66 / pdb_00002f66
Title : Structure of the ESCRT-I endosomal trafficking complex
Authors : Kostelansky, M.S.; Lee, S.; Kim, J.; Hurley, J.H.
Deposited on : 2005-11-28
Resolution : 2.80 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) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

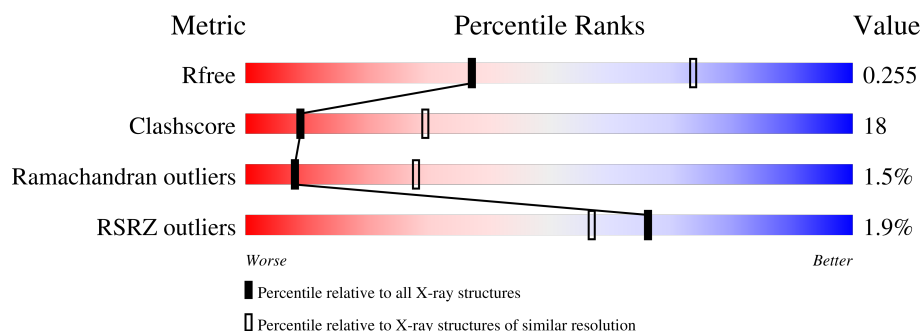
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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))
R_{free}	180053	3866 (2.80-2.80)
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
RSRZ outliers	180081	3869 (2.80-2.80)

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 $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	65	 2% 74% 25% .
1	D	65	 2% 71% 28% .
2	B	116	 2% 62% 34% .
2	E	116	 3% 59% 34% . .
3	C	82	 46% 33% 21%
3	F	82	 2% 40% 35% . 23%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 3976 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 Suppressor protein STP22 of temperature-sensitive alpha-factor receptor and arginine permease.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	65	Total	C	N	O	S	0	0	0
			531	335	97	97	2			
1	D	65	Total	C	N	O	S	0	0	0
			531	335	97	97	2			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	321	MET	-	cloning artifact	UNP P25604
A	344	ALA	CYS	engineered mutation	UNP P25604
D	321	MET	-	cloning artifact	UNP P25604
D	344	ALA	CYS	engineered mutation	UNP P25604

- Molecule 2 is a protein called Vacuolar protein sorting-associated protein VPS28.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	B	111	Total	C	N	O	0	0	0
			904	572	146	186			
2	E	111	Total	C	N	O	0	0	0
			904	572	146	186			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	9	GLY	-	cloning artifact	UNP Q02767
B	10	ALA	-	cloning artifact	UNP Q02767
B	11	MET	-	cloning artifact	UNP Q02767
B	101	ALA	CYS	engineered mutation	UNP Q02767
E	9	GLY	-	cloning artifact	UNP Q02767
E	10	ALA	-	cloning artifact	UNP Q02767
E	11	MET	-	cloning artifact	UNP Q02767

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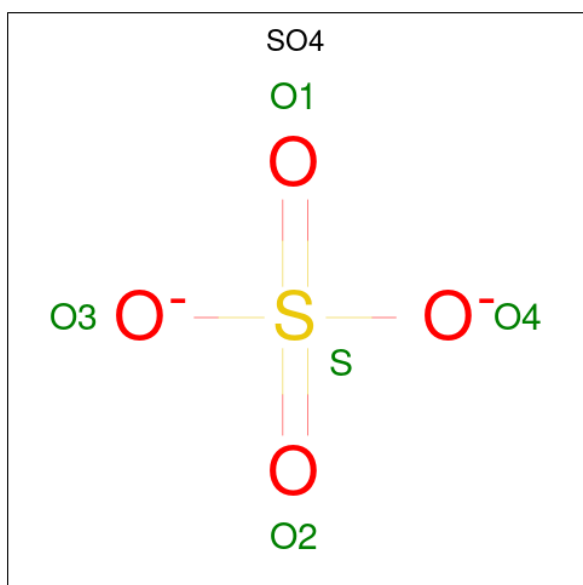
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Chain	Residue	Modelled	Actual	Comment	Reference
E	101	ALA	CYS	engineered mutation	UNP Q02767

- Molecule 3 is a protein called Protein SRN2.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	65	Total	C	N	O	0	0	0
			544	338	95	111			
3	F	63	Total	C	N	O	0	0	0
			529	329	92	108			

- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	6	Total	O	0	0
			6	6		
5	B	10	Total	O	0	0
			10	10		

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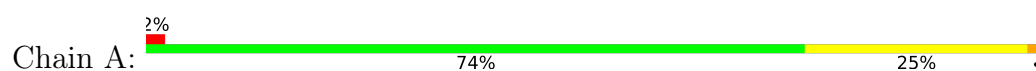
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	C	2	Total 2	O 2	0	0
5	D	1	Total 1	O 1	0	0
5	E	3	Total 3	O 3	0	0
5	F	1	Total 1	O 1	0	0

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 and electron density. 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. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). 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.

- Molecule 1: Suppressor protein STP22 of temperature-sensitive alpha-factor receptor and arginine permease



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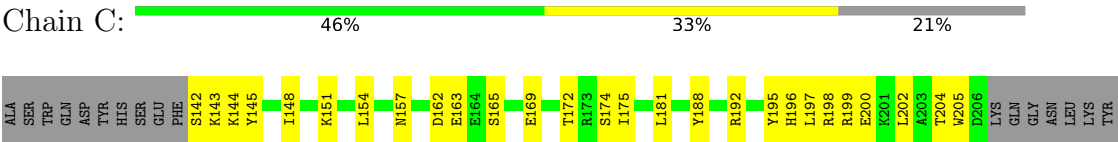
- Molecule 2: Vacuolar protein sorting-associated protein VPS28



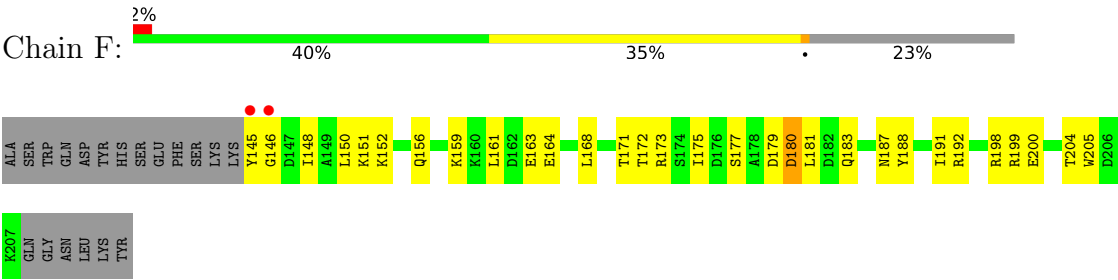
- Molecule 2: Vacuolar protein sorting-associated protein VPS28



● Molecule 3: Protein SRN2



● Molecule 3: Protein SRN2



4 Data and refinement statistics

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	86.00Å 144.64Å 119.38Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.93 – 2.80 19.93 – 2.80	Depositor EDS
% Data completeness (in resolution range)	95.8 (19.93-2.80) 95.6 (19.93-2.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.09	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.10 (at 2.79Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.203 , 0.256 0.202 , 0.255	Depositor DCC
R_{free} test set	905 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	54.1	Xtriage
Anisotropy	0.365	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 55.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.010 for 1/2*h-1/2*k,-3/2*h-1/2*k,-l 0.030 for 1/2*h+1/2*k,3/2*h-1/2*k,-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3976	wwPDB-VP
Average B, all atoms (Å ²)	57.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.43% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

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	0.47	0/540	0.84	0/730
1	D	0.41	0/540	0.85	0/730
2	B	0.46	0/919	0.92	3/1244 (0.2%)
2	E	0.45	0/919	0.84	2/1244 (0.2%)
3	C	0.42	0/550	0.81	1/736 (0.1%)
3	F	0.38	0/535	0.82	2/717 (0.3%)
All	All	0.44	0/4003	0.86	8/5401 (0.1%)

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	60	ASP	N-CA-C	6.59	120.49	111.39
2	E	59	LYS	N-CA-C	-6.20	105.57	113.01
2	B	16	GLN	N-CA-C	-6.11	106.15	113.97
2	B	61	SER	N-CA-C	-5.57	106.62	113.41
2	E	16	GLN	N-CA-C	-5.39	106.54	113.23
3	C	157	ASN	N-CA-C	-5.30	105.50	111.28
3	F	173	ARG	N-CA-C	-5.26	105.09	112.25
3	F	180	ASP	N-CA-C	-5.02	105.81	111.28

There are no chirality outliers.

There are no planarity outliers.

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	531	0	537	18	0
1	D	531	0	537	19	0
2	B	904	0	885	33	0
2	E	904	0	885	34	0
3	C	544	0	544	29	0
3	F	529	0	526	25	0
4	B	5	0	0	0	0
4	C	5	0	0	0	0
5	A	6	0	0	1	0
5	B	10	0	0	2	0
5	C	2	0	0	0	0
5	D	1	0	0	1	0
5	E	3	0	0	0	0
5	F	1	0	0	0	0
All	All	3976	0	3914	145	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 18.

All (145) 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)
3:F:148:ILE:H	3:F:148:ILE:HD12	1.26	1.00
2:B:25:PHE:HB3	2:B:29:ILE:HG21	1.49	0.95
3:F:152:LYS:HE2	3:F:156:GLN:HE21	1.44	0.82
3:F:175:ILE:HG23	3:F:180:ASP:HB2	1.60	0.81
1:D:329:TYR:OH	3:F:204:THR:HG21	1.79	0.81
1:A:327:GLN:HE22	2:B:22:VAL:H	1.30	0.79
3:F:145:TYR:HA	3:F:148:ILE:HD13	1.64	0.78
3:F:151:LYS:HE2	3:F:205:TRP:CD1	2.22	0.75
2:E:30:THR:HG23	2:E:33:ASP:H	1.51	0.74
3:F:164:GLU:HG2	3:F:191:ILE:HD13	1.70	0.73
2:E:30:THR:HG22	2:E:33:ASP:OD2	1.90	0.71
1:D:364:ARG:HD2	2:E:45:SER:OG	1.93	0.69
1:D:344:ALA:HA	1:D:347:ARG:NH1	2.09	0.68
2:E:83:ASN:O	2:E:87:LYS:HE2	1.94	0.67
3:C:199:ARG:HG3	3:C:199:ARG:HH11	1.59	0.67
1:A:379:ARG:HD3	5:B:203:HOH:O	1.95	0.66
1:A:329:TYR:OH	3:C:204:THR:HG21	1.96	0.65

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:104:TYR:O	2:E:105:ASN:HB2	1.96	0.65
1:D:343:GLU:O	1:D:347:ARG:HG3	1.96	0.65
3:C:142:SER:C	3:C:144:LYS:H	2.05	0.64
2:E:32:LYS:HE2	2:E:89:GLU:HG3	1.79	0.63
3:F:152:LYS:HE2	3:F:156:GLN:NE2	2.14	0.63
1:A:382:SER:O	1:A:384:LEU:N	2.30	0.62
1:D:365:GLU:OE2	1:D:368:ARG:NH1	2.32	0.61
3:C:198:ARG:HG3	3:C:198:ARG:HH11	1.66	0.61
2:E:39:THR:HG21	2:E:90:ILE:HD13	1.82	0.60
3:F:148:ILE:H	3:F:148:ILE:CD1	2.04	0.60
3:F:200:GLU:O	3:F:204:THR:HG22	2.02	0.60
3:C:154:LEU:HD12	3:C:202:LEU:HD13	1.84	0.60
3:F:171:THR:HG22	3:F:171:THR:O	2.00	0.60
2:E:30:THR:HG22	2:E:33:ASP:CG	2.27	0.59
3:F:148:ILE:HD12	3:F:148:ILE:N	2.07	0.59
3:F:175:ILE:HG21	3:F:181:LEU:HB2	1.82	0.59
1:A:375:TRP:CH2	1:A:379:ARG:HD2	2.37	0.59
2:E:26:ASP:OD2	2:E:28:SER:HB3	2.05	0.57
2:E:63:ASP:OD2	2:E:66:GLN:HG3	2.05	0.57
1:D:322:THR:HG23	1:D:325:LEU:HB2	1.86	0.56
2:B:112:ILE:HD11	1:D:329:TYR:HA	1.87	0.56
1:A:347:ARG:HD2	3:C:169:GLU:OE2	2.06	0.56
1:A:384:LEU:O	1:A:385:SER:HB2	2.06	0.55
1:D:383:PRO:HG2	1:D:385:SER:O	2.06	0.54
2:B:76:LYS:HB3	2:B:76:LYS:NZ	2.23	0.54
3:C:195:TYR:O	3:C:199:ARG:HB2	2.07	0.54
3:C:145:TYR:HD1	3:C:148:ILE:HD12	1.72	0.54
3:C:198:ARG:HG3	3:C:198:ARG:NH1	2.23	0.54
2:E:103:THR:O	2:E:103:THR:HG22	2.07	0.54
3:C:188:TYR:O	3:C:192:ARG:HB2	2.08	0.53
3:F:177:SER:C	3:F:179:ASP:H	2.16	0.53
3:C:175:ILE:HG21	3:C:181:LEU:HB2	1.91	0.53
3:F:199:ARG:HH11	3:F:199:ARG:HG2	1.73	0.53
1:D:383:PRO:O	1:D:385:SER:N	2.42	0.53
1:A:343:GLU:O	1:A:346:SER:HB2	2.09	0.53
1:A:378:GLN:HB3	2:E:95:GLN:HG2	1.90	0.53
1:A:383:PRO:O	1:A:384:LEU:C	2.52	0.52
3:F:164:GLU:HG2	3:F:191:ILE:CD1	2.39	0.52
3:C:199:ARG:HG3	3:C:199:ARG:NH1	2.24	0.52
3:F:161:LEU:HD11	3:F:198:ARG:HE	1.74	0.51
2:E:104:TYR:O	2:E:105:ASN:CB	2.58	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:330:ASN:HB3	5:D:6:HOH:O	2.09	0.51
1:D:383:PRO:O	1:D:384:LEU:C	2.53	0.51
3:C:174:SER:C	3:C:175:ILE:HD12	2.36	0.51
2:E:109:SER:O	2:E:112:ILE:HG22	2.10	0.51
2:B:43:ILE:HG23	2:B:78:PHE:HE1	1.76	0.51
5:B:202:HOH:O	2:E:92:LYS:HD2	2.11	0.50
1:D:322:THR:OG1	2:E:19:HIS:HA	2.11	0.50
1:A:364:ARG:HH12	2:B:42:GLU:HG3	1.77	0.50
2:B:39:THR:HG21	2:B:90:ILE:HD13	1.94	0.50
3:C:151:LYS:NZ	3:C:205:TRP:HB3	2.26	0.50
2:B:85:GLN:HA	2:B:85:GLN:OE1	2.11	0.50
3:C:142:SER:C	3:C:144:LYS:N	2.70	0.49
2:B:104:TYR:O	2:B:105:ASN:HB2	2.12	0.49
2:E:114:ARG:HB3	2:E:119:ILE:HB	1.95	0.49
2:E:123:ALA:C	2:E:125:HIS:H	2.21	0.49
2:B:42:GLU:HG2	2:B:81:TYR:CZ	2.48	0.48
2:B:43:ILE:HG23	2:B:78:PHE:CE1	2.49	0.48
2:E:124:GLU:O	2:E:125:HIS:C	2.57	0.48
2:E:29:ILE:HG13	2:E:33:ASP:CB	2.44	0.47
3:C:162:ASP:O	3:C:165:SER:HB3	2.14	0.47
2:E:113:THR:O	2:E:117:ARG:HG2	2.15	0.47
1:D:371:PHE:HB2	2:E:44:TYR:CD2	2.50	0.47
3:F:168:LEU:HD21	3:F:187:ASN:HB3	1.96	0.47
2:B:104:TYR:CD1	2:B:104:TYR:N	2.82	0.47
2:B:87:LYS:NZ	2:B:87:LYS:HB3	2.30	0.47
3:F:146:GLY:O	3:F:150:LEU:HG	2.13	0.47
1:A:329:TYR:O	3:C:200:GLU:OE2	2.33	0.47
3:C:154:LEU:HD13	3:C:154:LEU:C	2.40	0.47
2:B:103:THR:C	2:B:104:TYR:CD1	2.93	0.47
1:D:322:THR:HG22	1:D:325:LEU:HD12	1.97	0.46
3:C:163:GLU:HA	3:C:163:GLU:OE1	2.16	0.46
2:E:23:PRO:HG2	2:E:26:ASP:HB3	1.97	0.46
2:B:95:GLN:HE22	1:D:379:ARG:NH2	2.14	0.46
2:E:42:GLU:O	2:E:45:SER:HB3	2.16	0.46
2:B:75:LEU:O	2:B:79:LYS:HG2	2.15	0.46
2:E:34:LYS:HE2	2:E:38:GLU:OE1	2.16	0.46
2:B:67:TYR:CZ	2:B:71:VAL:HG21	2.51	0.46
2:B:104:TYR:O	2:B:105:ASN:CB	2.64	0.45
3:C:151:LYS:HZ3	3:C:205:TRP:CB	2.29	0.45
3:C:145:TYR:CD1	3:C:148:ILE:HD12	2.51	0.45
3:C:196:HIS:O	3:C:200:GLU:HG2	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:29:ILE:CG1	2:E:33:ASP:HB2	2.46	0.45
3:C:151:LYS:HZ1	3:C:205:TRP:HB3	1.82	0.45
2:B:76:LYS:HB3	2:B:76:LYS:HZ3	1.81	0.45
1:A:327:GLN:NE2	5:A:21:HOH:O	2.49	0.45
2:B:34:LYS:HE2	2:B:38:GLU:OE2	2.18	0.44
2:B:55:LYS:O	2:B:59:LYS:HG2	2.18	0.44
2:E:43:ILE:HG23	2:E:78:PHE:HE1	1.83	0.44
2:B:122:THR:O	2:B:124:GLU:HG3	2.18	0.44
1:A:382:SER:C	1:A:384:LEU:N	2.75	0.44
2:E:37:ILE:N	2:E:37:ILE:HD12	2.33	0.44
3:F:145:TYR:CA	3:F:148:ILE:HD13	2.42	0.44
1:A:380:ILE:HG12	2:B:22:VAL:HB	1.99	0.44
3:C:172:THR:HG22	3:C:175:ILE:HD11	1.99	0.44
2:B:47:VAL:HG13	2:B:122:THR:HG22	1.99	0.43
3:C:175:ILE:HD12	3:C:175:ILE:N	2.32	0.43
2:B:53:VAL:O	2:B:56:ALA:HB3	2.17	0.43
1:A:382:SER:C	1:A:384:LEU:H	2.24	0.43
2:E:102:ASP:OD1	2:E:104:TYR:CD1	2.72	0.43
1:D:373:VAL:O	1:D:377:ILE:HG13	2.19	0.43
1:D:383:PRO:C	1:D:385:SER:N	2.77	0.43
3:F:183:GLN:O	3:F:187:ASN:HB2	2.18	0.43
3:F:159:LYS:O	3:F:163:GLU:HG3	2.19	0.42
3:C:200:GLU:O	3:C:204:THR:HG22	2.19	0.42
3:F:188:TYR:O	3:F:192:ARG:HG2	2.19	0.42
3:C:154:LEU:HD13	3:C:154:LEU:O	2.19	0.42
2:E:102:ASP:OD1	2:E:104:TYR:HD1	2.03	0.42
2:E:29:ILE:HG13	2:E:33:ASP:HB2	2.02	0.42
2:B:63:ASP:OD2	2:B:63:ASP:C	2.63	0.42
1:D:322:THR:CG2	1:D:325:LEU:HD12	2.50	0.42
3:F:177:SER:C	3:F:179:ASP:N	2.78	0.42
2:B:67:TYR:O	2:B:71:VAL:HG23	2.20	0.41
2:B:102:ASP:C	2:B:104:TYR:HD1	2.27	0.41
1:A:356:LEU:O	1:A:360:VAL:HG23	2.20	0.41
1:D:334:GLN:O	1:D:338:LEU:HG	2.20	0.41
3:F:172:THR:HG22	3:F:172:THR:O	2.20	0.41
1:A:345:LEU:HA	1:A:345:LEU:HD12	1.80	0.41
2:B:42:GLU:CG	2:B:81:TYR:CZ	3.03	0.41
2:B:73:LYS:O	2:B:77:GLN:HG3	2.20	0.41
3:C:148:ILE:H	3:C:148:ILE:HG13	1.59	0.41
2:B:26:ASP:O	2:B:29:ILE:HG22	2.21	0.41
2:B:104:TYR:C	2:B:106:ILE:H	2.29	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:104:TYR:CD1	2:E:104:TYR:N	2.89	0.41
2:E:43:ILE:HG23	2:E:78:PHE:CE1	2.56	0.40
2:B:29:ILE:O	2:B:29:ILE:CG2	2.70	0.40
3:C:197:LEU:O	3:C:200:GLU:HG2	2.21	0.40
2:E:39:THR:HG21	2:E:90:ILE:CD1	2.48	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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	63/65 (97%)	59 (94%)	3 (5%)	1 (2%)	7	27
1	D	63/65 (97%)	61 (97%)	1 (2%)	1 (2%)	7	27
2	B	109/116 (94%)	102 (94%)	7 (6%)	0	100	100
2	E	109/116 (94%)	98 (90%)	7 (6%)	4 (4%)	2	9
3	C	63/82 (77%)	55 (87%)	7 (11%)	1 (2%)	7	27
3	F	61/82 (74%)	50 (82%)	11 (18%)	0	100	100
All	All	468/526 (89%)	425 (91%)	36 (8%)	7 (2%)	8	28

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	384	LEU
1	D	384	LEU
2	E	84	SER
2	E	26	ASP
2	E	64	ASP
2	E	124	GLU
3	C	143	LYS

5.3.2 Protein sidechains [i](#)

There are no protein residues with a non-rotameric sidechain to report in this entry.

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

2 ligands 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	$\# Z > 2$
4	SO4	B	201	-	4,4,4	1.12	0	6,6,6	1.30	1 (16%)
4	SO4	C	101	-	4,4,4	1.09	0	6,6,6	1.29	1 (16%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
4	B	201	SO4	O4-S-O3	2.85	124.27	108.54
4	C	101	SO4	O4-S-O3	2.85	124.25	108.54

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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](#)

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	65/65 (100%)	-0.66	1 (1%) 72 63	26, 40, 79, 107	0
1	D	65/65 (100%)	-0.36	1 (1%) 72 63	32, 53, 88, 105	0
2	B	111/116 (95%)	-0.47	2 (1%) 67 58	26, 49, 85, 122	0
2	E	111/116 (95%)	-0.27	3 (2%) 56 46	29, 57, 93, 116	0
3	C	65/82 (79%)	-0.03	0 100 100	32, 63, 97, 103	0
3	F	63/82 (76%)	-0.10	2 (3%) 50 40	40, 65, 101, 111	0
All	All	480/526 (91%)	-0.33	9 (1%) 66 57	26, 55, 98, 122	0

All (9) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	103	THR	5.8
1	D	384	LEU	3.6
1	A	385	SER	3.5
2	E	15	SER	3.4
2	B	125	HIS	2.8
3	F	146	GLY	2.6
3	F	145	TYR	2.2
2	E	104	TYR	2.1
2	B	15	SER	2.1

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

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	SO4	B	201	5/5	0.96	0.07	75,77,78,83	0
4	SO4	C	101	5/5	0.96	0.07	56,63,69,77	0

6.5 Other polymers [i](#)

There are no such residues in this entry.