



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 01:13 PM UTC

PDB ID : 5NBQ / pdb_00005nbq
Title : The structure of the tripartite complex between OspE, the C-terminal domains of factor H and C3dg
Authors : Kolodziejczyk, R.; Mikula, K.M.; Kotila, T.M.; Postis, V.L.G.; Sakari, J.T.; Meri, T.
Deposited on : 2017-03-02
Resolution : 3.18 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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
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

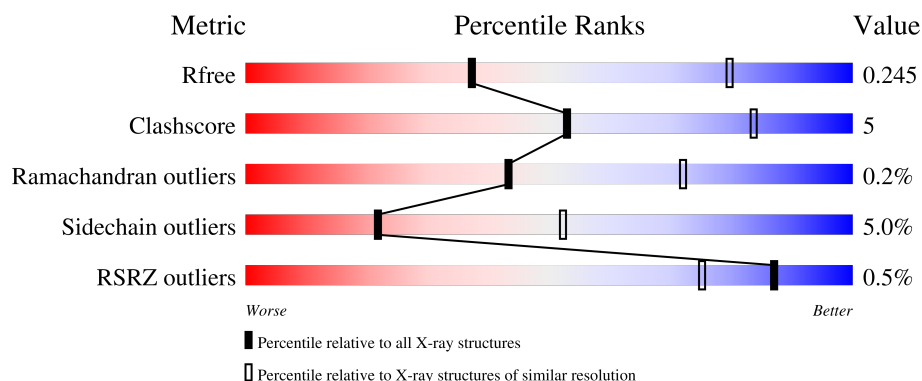
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.18 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	2001 (3.20-3.16)
Clashscore	190562	2119 (3.20-3.16)
Ramachandran outliers	187476	2070 (3.20-3.16)
Sidechain outliers	187428	2069 (3.20-3.16)
RSRZ outliers	180081	2001 (3.20-3.16)

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	294	2% 81% 16% ..
1	B	294	83% 14% .
1	C	294	79% 20% .
2	D	127	88% 11% .
2	E	127	76% 17% .. .

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Mol	Chain	Length	Quality of chain
2	F	127	% 79%15%6%
3	G	129	% 84%12%5%
3	I	129	80%17%
4	H	134	96%

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 11754 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 Complement C3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	290	Total	C	N	O	S	0	0	0
			2246	1445	377	415	9			
1	B	293	Total	C	N	O	S	0	0	0
			2307	1484	387	427	9			
1	C	293	Total	C	N	O	S	0	0	0
			2300	1479	386	426	9			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1010	ALA	CYS	engineered mutation	UNP P01024
B	1010	ALA	CYS	engineered mutation	UNP P01024
C	1010	ALA	CYS	engineered mutation	UNP P01024

- Molecule 2 is a protein called Complement factor H.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	127	Total	C	N	O	S	0	0	0
			1009	630	180	190	9			
2	E	122	Total	C	N	O	S	0	0	0
			947	597	162	179	9			
2	F	120	Total	C	N	O	S	0	0	0
			954	599	167	179	9			

- Molecule 3 is a protein called Outer surface protein E.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	G	129	Total	C	N	O	S	0	0	0
			989	622	159	207	1			
3	I	125	Total	C	N	O	S	0	0	0
			975	619	158	197	1			

- Molecule 4 is a protein called Outer surface protein E,Outer surface protein E.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	H	5	Total	C	N	O	0	0	0
			25	15	5	5			

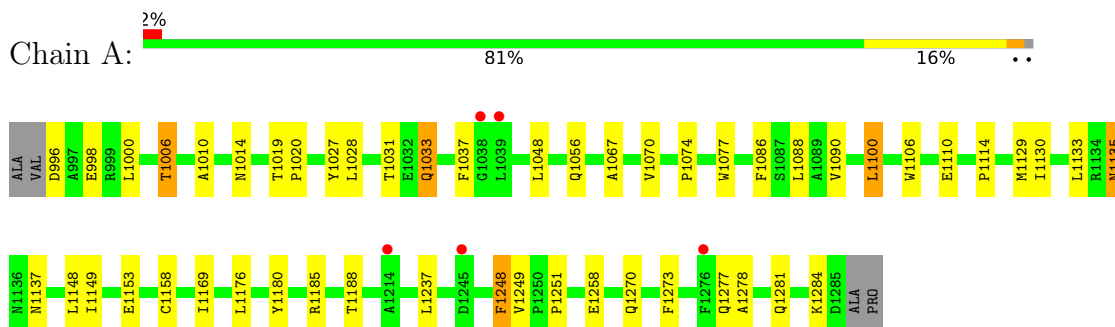
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	G	1	Total	O	0	0
			1	1		
5	I	1	Total	O	0	0
			1	1		

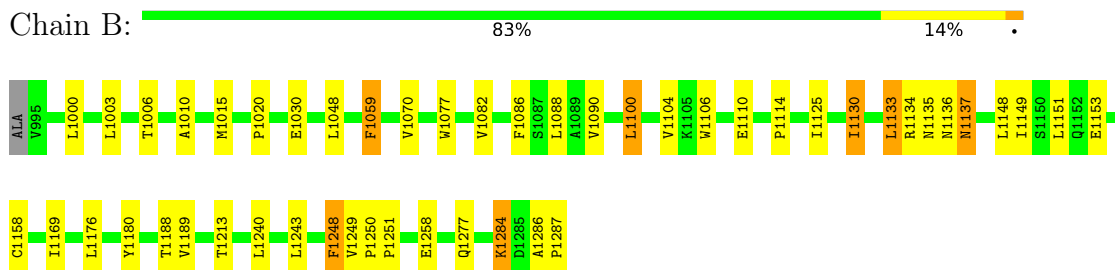
3 Residue-property plots

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.

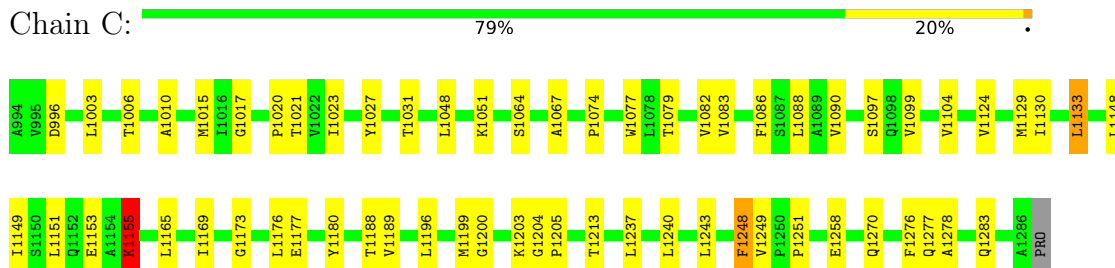
- Molecule 1: Complement C3



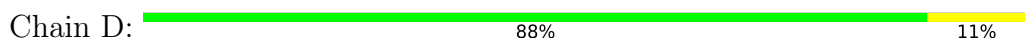
- Molecule 1: Complement C3

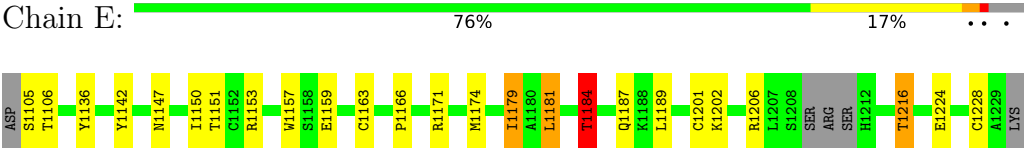
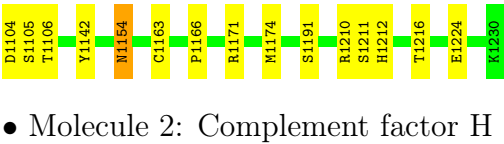


- Molecule 1: Complement C3

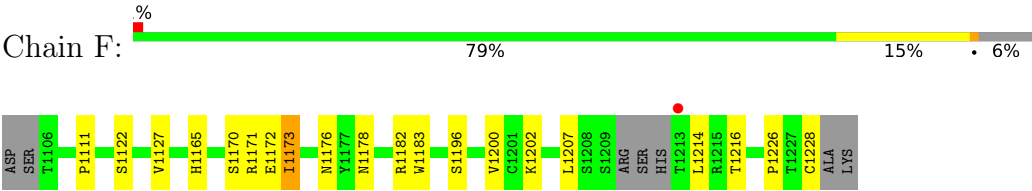


- Molecule 2: Complement factor H

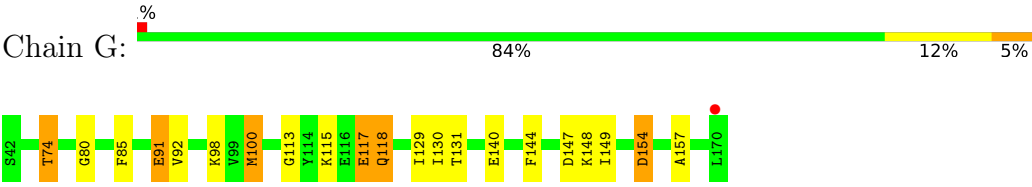




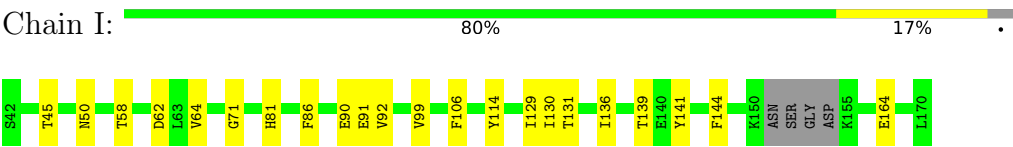
• Molecule 2: Complement factor H



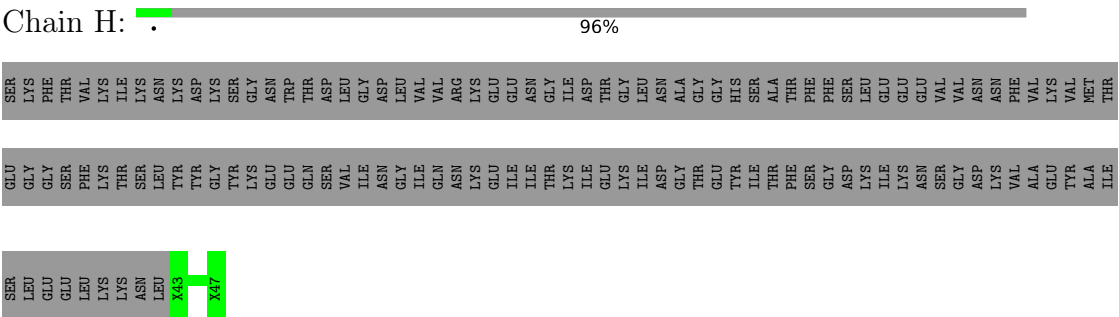
• Molecule 3: Outer surface protein E



• Molecule 3: Outer surface protein E



• Molecule 4: Outer surface protein E,Outer surface protein E



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	124.91Å 165.06Å 84.19Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.60 – 3.18 29.60 – 3.18	Depositor EDS
% Data completeness (in resolution range)	97.1 (29.60-3.18) 97.0 (29.60-3.18)	Depositor EDS
R_{merge}	0.14	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.26 (at 3.18Å)	Xtriage
Refinement program	BUSTER 2.10.3	Depositor
R, R_{free}	0.233 , 0.261 (Not available) , 0.245	Depositor DCC
R_{free} test set	1418 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å ²)	84.3	Xtriage
Anisotropy	0.252	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.30 , 68.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.90	EDS
Total number of atoms	11754	wwPDB-VP
Average B, all atoms (Å ²)	91.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.72% 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

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	0.80	2/2294 (0.1%)	1.42	6/3114 (0.2%)
1	B	0.79	1/2356 (0.0%)	1.40	5/3191 (0.2%)
1	C	0.79	1/2348 (0.0%)	1.41	10/3182 (0.3%)
2	D	0.76	0/1035	1.20	4/1404 (0.3%)
2	E	0.83	0/972	1.22	2/1323 (0.2%)
2	F	0.76	1/978 (0.1%)	1.19	3/1327 (0.2%)
3	G	0.86	0/1002	1.29	7/1349 (0.5%)
3	I	0.82	0/987	1.33	7/1322 (0.5%)
All	All	0.80	5/11972 (0.0%)	1.34	44/16212 (0.3%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1249	VAL	CA-C	5.76	1.58	1.52
1	C	1249	VAL	CA-C	5.59	1.57	1.52
1	B	1249	VAL	CA-CB	5.29	1.56	1.54
1	A	1037	PHE	CA-C	5.17	1.57	1.52
2	F	1111	PRO	CA-C	5.03	1.54	1.51

The worst 5 of 44 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	1248	PHE	CA-C-N	9.62	128.03	120.33
1	A	1248	PHE	C-N-CA	9.62	128.03	120.33
1	C	1248	PHE	CA-C-N	9.35	127.81	120.33
1	C	1248	PHE	C-N-CA	9.35	127.81	120.33
3	I	62	ASP	CA-CB-CG	8.16	120.76	112.60

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	2246	0	2218	22	0
1	B	2307	0	2314	28	0
1	C	2300	0	2301	30	0
2	D	1009	0	978	8	0
2	E	947	0	900	12	0
2	F	954	0	925	10	0
3	G	989	0	944	10	0
3	I	975	0	965	8	0
4	H	25	0	10	0	0
5	G	1	0	0	0	0
5	I	1	0	0	0	0
All	All	11754	0	11555	116	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 5.

The worst 5 of 116 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:G:131:THR:HG22	3:G:144:PHE:HB3	1.54	0.89
1:A:1031:THR:HG23	1:A:1033:GLN:HB2	1.65	0.79
2:F:1170:SER:OG	2:F:1173:ILE:HG13	1.88	0.74
1:A:1014:ASN:HD22	1:A:1056:GLN:HE21	1.37	0.73
1:C:1189:VAL:HG21	1:C:1213:THR:HG21	1.74	0.69

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	288/294 (98%)	283 (98%)	5 (2%)	0	100	100
1	B	291/294 (99%)	285 (98%)	6 (2%)	0	100	100
1	C	291/294 (99%)	285 (98%)	5 (2%)	1 (0%)	36	66
2	D	125/127 (98%)	121 (97%)	4 (3%)	0	100	100
2	E	118/127 (93%)	112 (95%)	5 (4%)	1 (1%)	16	47
2	F	116/127 (91%)	110 (95%)	6 (5%)	0	100	100
3	G	127/129 (98%)	117 (92%)	9 (7%)	1 (1%)	16	47
3	I	121/129 (94%)	117 (97%)	4 (3%)	0	100	100
All	All	1477/1521 (97%)	1430 (97%)	44 (3%)	3 (0%)	43	72

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	G	154	ASP
1	C	1155	LYS
2	E	1184	THR

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	230/242 (95%)	219 (95%)	11 (5%)	23	53
1	B	242/242 (100%)	234 (97%)	8 (3%)	33	62
1	C	240/242 (99%)	233 (97%)	7 (3%)	37	64
2	D	114/114 (100%)	112 (98%)	2 (2%)	51	71
2	E	105/114 (92%)	94 (90%)	11 (10%)	6	25
2	F	108/114 (95%)	101 (94%)	7 (6%)	15	44
3	G	106/112 (95%)	97 (92%)	9 (8%)	10	34
3	I	106/112 (95%)	99 (93%)	7 (7%)	15	43

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	1251/1292 (97%)	1189 (95%)	62 (5%)	22 52

5 of 62 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	E	1105	SER
3	I	45	THR
2	E	1184	THR
3	G	140	GLU
3	I	129	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 32 such sidechains are listed below:

Mol	Chain	Res	Type
3	G	50	ASN
3	G	70	ASN
1	B	1208	ASN
1	B	1198	GLN
3	I	50	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

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	290/294 (98%)	0.05	5 (1%) 69 49	53, 81, 120, 244	0
1	B	293/294 (99%)	-0.07	0 100 100	49, 75, 104, 159	0
1	C	293/294 (99%)	-0.05	0 100 100	58, 82, 110, 155	0
2	D	127/127 (100%)	-0.09	0 100 100	55, 82, 98, 114	0
2	E	122/127 (96%)	0.01	0 100 100	50, 75, 128, 145	0
2	F	120/127 (94%)	0.09	1 (0%) 82 67	77, 97, 115, 130	0
3	G	129/129 (100%)	0.24	1 (0%) 82 67	84, 131, 155, 165	0
3	I	125/129 (96%)	0.11	0 100 100	79, 111, 143, 161	0
4	H	0/134	-	-	-	-
All	All	1499/1655 (90%)	0.02	7 (0%) 87 75	49, 85, 137, 244	0

The worst 5 of 7 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	G	170	LEU	2.5
1	A	1214	ALA	2.5
1	A	1276	PHE	2.3
1	A	1038	GLY	2.2
2	F	1213	THR	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](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.